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| ICS 03.220.20; 35.240.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <div>Entwurf</div> | Einsprüche bis 2024-06-19<br>Vorgesehen als Ersatz für<br>DIN EN ISO 12855:2022-07  |
| <p><b>Elektronische Gebührenerhebung –<br/>Informationsaustausch zwischen Dienstleistern und<br/>Gebühreneinzugsunternehmen (ISO/DIS 12855:2024);<br/>Englische Fassung prEN ISO 12855:2024</b></p> <p>Electronic fee collection –<br/>Information exchange between service provision and toll charging (ISO/DIS 12855:2024);<br/>English version prEN ISO 12855:2024</p> <p>Perception de télépéage –<br/>Échange d’informations entre la prestation de service et la perception du péage<br/>(ISO/DIS 12855:2024);<br/>Version anglaise prEN ISO 12855:2024</p> <p><b>Anwendungswarnvermerk</b></p> <p>Dieser Entwurf mit Erscheinungsdatum 2024-04-19 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.</p> <p>Weil das beabsichtigte Dokument von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfs besonders zu vereinbaren.</p> <p>Stellungnahmen werden erbeten</p> <ul style="list-style-type: none"><li>– vorzugsweise online im Norm-Entwurfs-Portal von DIN unter <a href="http://www.din.de/go/entwuerfe">www.din.de/go/entwuerfe</a> bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter <a href="http://www.entwuerfe.normenbibliothek.de">www.entwuerfe.normenbibliothek.de</a>, sofern dort wiedergegeben;</li><li>– oder als Datei per E-Mail an <a href="mailto:naautomobil@din.de">naautomobil@din.de</a> möglichst in Form einer Tabelle. Die Vorlage dieser Tabelle kann im Internet unter <a href="http://www.din.de/go/stellungnahmen-norm-entwuerfe">www.din.de/go/stellungnahmen-norm-entwuerfe</a> oder für Stellungnahmen zu Norm-Entwürfen der DKE unter <a href="http://www.dke.de/stellungnahme">www.dke.de/stellungnahme</a> abgerufen werden;</li><li>– oder in Papierform an den DIN-Normenausschuss Auto und Mobilität (NAAutomobil), 10004 Berlin, Postfach 8 04 62 oder Behrenstr. 35, 10117 Berlin.</li></ul> <p>Es wird gebeten, mit den Kommentaren zu diesem Entwurf jegliche relevanten Patentrechte, die bekannt sind, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.</p> <p>Gesamtumfang 275 Seiten</p> <p>DIN-Normenausschuss Auto und Mobilität (NAAutomobil)<br/>DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE</p> |                    |                                                                                     |

## Nationales Vorwort

Dieses Dokument (prEN ISO 12855:2024) wurde vom Technischen Komitee ISO/TC 204 „Intelligent transport systems“ in Zusammenarbeit mit dem Technischen Komitee CEN/TC 278 „Intelligente Verkehrssysteme“, dessen Sekretariat von NEN (Niederlande) gehalten wird, erarbeitet.

Das zuständige deutsche Normungsgremium ist der Gemeinschaftsarbeitsausschuss NA 052-00-71 GA „Gemeinschaftsarbeitsausschuss NAAutomobil/DKE: Intelligente Verkehrssysteme“ im DIN-Normenausschuss Auto und Mobilität (NAAutomobil).

Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die Englische Fassung von prEN ISO 12855:2024.

Da Mautsysteme in Europa weit verbreitet sind, müssen Vorkehrungen für Anwender getroffen werden, die sich in unterschiedlichen Mautgebieten bewegen. Ziel sollte es sein, dass ein Kunde mit nur einem Mautvertrag eines beliebigen Anbieters sich in unterschiedlichen Mautgebieten bewegen kann. Dort, wo für die Fahrzeuge eine fahrzeuginterne Gebühreneinheit benötigt wird, ist es notwendig, dass diese interoperabel mit den verschiedenen Mautsystemen ist. In Europa wurde bereits die Gesetzgebung zur Interoperabilität der Gebührenerhebung mit der Richtlinie 2004/52 angepasst.

Dieses Dokument identifiziert und spezifiziert entsprechend den generischen Anforderungen in ISO 17573 notwendige Botschaften für den Austausch zwischen Maut-Dienstleister und Mauterheber. Um diese Schnittstellen zu definieren, werden in diesem Dokument entsprechende Informationen aus den Unternehmen zur Mautumgebung und deren Interaktionen verwendet.

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DIN ([www.din.de](http://www.din.de)) durch eine Suche nach der Dokumentennummer aufgerufen werden.

## Änderungen

Gegenüber DIN EN ISO 12855:2022-07 wurden folgende Änderungen vorgenommen:

- a) Überarbeitung Anwendungsdateneinheiten (ADUs);
- b) Überarbeitung der Datendefinitionen und Semantiken, einschließlich Referenz zur Hauptquelle ISO 17573-3;
- c) restliche Referenzen zur ISO 17575-Serie wurden gelöscht;
- d) Unterstützung von ANPR-basierten Mauterhebungen und Überwachung durch entsprechende Adaption in den betroffenen ADUs;
- e) allgemeine redaktionelle und strukturelle Anpassungen.

## Nationaler Anhang NA (informativ)

### Begriffe

In diesem Dokument werden keine Begriffe aufgeführt.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- ISO Online Browsing Platform: verfügbar unter <https://www.iso.org/obp>
- IEC Electropedia: verfügbar unter <https://www.electropedia.org/>



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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](http://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](http://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](http://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 fourth edition cancels and replaces the third edition (ISO 12855:2022), which has been technically revised.

The main changes are as follows:

- revision of application data units (ADUs);
- the data definitions and semantics have been updated, including making reference to ISO 17573-3 as the primary source;
- removal of the remaining references to the ISO 17575 series;
- removal of the `MacKeyObject` in the `TrustobjectAdu` (see 6.7);
- adapted the ADUs to support of ANPR-based fee collection and enforcement;
- alignment of the structure of all major clauses in a consistent manner to improve readability.

This document has been prepared under a standardization request<sup>[14]</sup> addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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](http://www.iso.org/members.html).

## Introduction

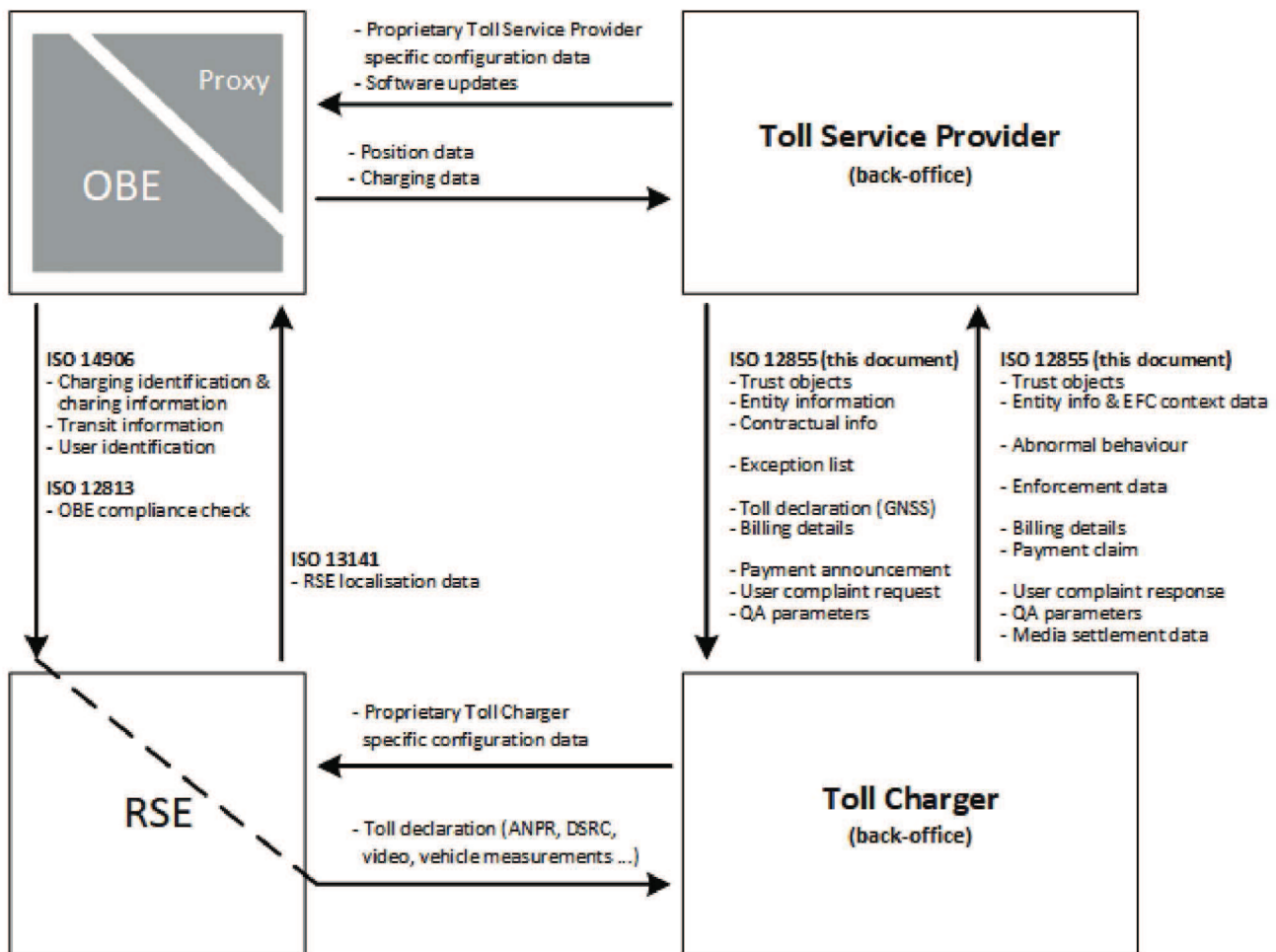
The widespread use of road tolling requires provisions for users of vehicles that circulate through many different toll domains. Users should be offered a single contract for driving a vehicle through various toll domains. Whether those vehicles require on-board equipment (OBE) or tolling is based on automatic number plate recognition (ANPR) these should be interoperable with the toll systems in the various toll domains. In Europe, for example, this need has been officially recognized and legislation on interoperability has already been adopted (see Directive 2019/520,<sup>[7]</sup> related Commission delegated regulation 2020/2003<sup>[9]</sup> and Commission implementing regulation 2020/204<sup>[8]</sup>). There is both a commercial and economic justification regarding the OBE and the toll systems for International Standards supporting interoperability.

The system architecture defined in ISO 17573-1 is the basis for all International Standards that relate to tolling systems in the toll domain. With respect to ISO 17573-1, this document:

- adopts its definitions of terms and concepts and basic system functionalities and structure,
- uses its terminology, and
- specifies the interfaces identified therein.

ISO 17573-1 uses ISO/IEC 10746-3<sup>[3]</sup> for the description of the architecture.

Figure 1 shows the scope of the group of International Standards related to electronic fee collection (EFC) based upon the ISO 17573-1 system architecture.



#### Key

ANPR automatic number plate recognition  
DSRC dedicated short-range communication  
GNSS global navigation satellite system  
QA quality assurance  
OBE on-board equipment  
RSE roadside equipment

**Figure 1 — Scope of EFC-related International Standards**

A given transport service for a given vehicle is fully identified by one or several toll declarations made available to the toll charger (TC). It is necessary to make toll declarations available according to the rules of the toll regime of the toll domain. These toll declarations can either be acquired on the road-side equipment (RSE) of the TC or acquired by an autonomous OBE and sent to the TC by the toll service provider (TSP).

The amount due for a given transport service used by a vehicle liable to toll is finalized by the TC with the use of the acquired or received toll declarations (as described above) and calculations are made according to the rules of the toll regime (formula, tariff tables, specific situations rules, traffic conditions, etc.). This means that the TC has the authority to decide on the amount due, even if it decides to assign the task of calculating the amount due to the TSP.

The calculated amount due above, associated with a given transport service, is referred to as "billing details". For a given transport service, the billing details refer to one or several toll declarations.

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Depending on the toll regime, billing details are computed by means of the information collected either by the TC or the relevant TSP, or both. They are finalized by the TC – or by the TSP if the TC has assigned this task to the TSP – and sent to the counterparty.

The TC derives the payment claims from the billing details and makes them available to each TSP, or requires the TSP to send payment announcements, according to the bilateral agreements it has with each TSP, referring to one or several billing details. These payment claims include an amount due, considering any specific commercial conditions applicable to a vehicle, a fleet of vehicles or a given TSP, if defined for the transport service.

This document defines a set of interactions in support of technical interoperability between back-office systems of TCs and TSPs. The EFC service and the EFC system model on which this document is based are defined in ISO 17573-1.

This document does not provide a full solution for interoperability and it does not define other parts of the EFC system, other services, other technologies and non-technical elements of interoperability. It is defined as a toolbox International Standard of an application protocol data unit (APDU), which can be used for the assigned purpose. This APDU may contain different ADUs, which bear the transferred data. The detailed definitions of mandatory and optional elements in a real implementation are defined elsewhere. It does not define all communication sequences, communication stacks and timings.

The development of a common European Electronic Toll Service (EETS), as a part of the already cited European EFC Directive and related Regulation and Implementing acts, also calls for the definition of an interoperable EFC service. It should be noted that EN 16986 specifies interoperable application profiles (IAP), applicable based on this document. These profiles define a specific coherent set of transactions, triggers, timings, conditions, data elements, transfer mechanisms and supporting functions for an interoperable exchange of data between the back-office system of TCs and TSPs. EN 16986 is consistent with and is intended to provide support for the technical specification of EETS.

This document identifies and specifies the APDU and a set of ADUs exchanged between two actors in the roles of TSP and TC as defined in ISO 17573-1. To specify these interfaces, this document uses the enterprise description of the toll environment, and the interactions defined between the named classes of roles, as defined in ISO 17573-1. This supports a complete specification of the data that is transferred between those identified entities. In addition, a number of computational interfaces are identified and interactions in terms of sequences of APDUs are defined.

# Electronic fee collection — Information exchange between service provision and toll charging

## 1 Scope

This document specifies:

- the interfaces between electronic fee collection (EFC) back-office systems for vehicle-related transport services, e.g. road user charging, parking and access control;
- an exchange of information between the back-office system of the two roles of service provision and toll charging, e.g.:
  - charging-related data (toll declarations, billing details, payment claims, payment announcements),
  - administrative data (trust objects, EFC context data, ...), and
  - confirmation data;
- transfer mechanisms and supporting functions;
- information objects, data syntax and semantics.

This document is applicable for any vehicle-related toll service and any technology used for charging.

The data types and associated coding related to the data elements described in Clause 6 are defined in Annex A, using the abstract syntax notation one (ASN.1) according to ISO/IEC 8824-1.

This document specifies basic protocol mechanisms over which implementations can specify and perform complex transfers (transactions).

This document does not specify, amongst others:

- any communication between TC or TSP with any other involved party;
- any communication between elements of the TC and the TSP that is not part of the back-office communication;
- interfaces for EFC systems for public transport;
- any complex transfers (transactions), i.e. sequences of inter-related ADUs that can possibly involve several APDU exchanges;
- processes regarding payments and exchanges of fiscal, commercial or legal accounting documents; and
- definitions of service communication channels, protocols and service primitives to transfer the APDU.

## 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 612, *Road vehicles — Dimensions of motor vehicles and towed vehicles — Terms and definitions*

ISO 639-1, *Codes for the representation of names of languages — Part 1: Alpha-2 code*

ISO 1176, *Road vehicles — Masses — Vocabulary and codes*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country code*

ISO 4217, *Codes for the representation of currencies*

ISO 8583-1, *Financial transaction card originated messages — Interchange message specifications — Part 1: Messages, data elements and code values*

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

ISO/IEC 8825-4, *Information technology — ASN.1 encoding rules — Part 4: XML Encoding Rules (XER)*

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

ISO/IEC 9797-1:2011, *Information technology — Security techniques — Message Authentication Codes (MACs) — Part 1: Mechanisms using a block cipher*

ISO/IEC 10118-3, *IT Security techniques — Hash-functions — Part 3: Dedicated hash-functions*

ISO/IEC 11770-3, *Information security — Key management — Part 3: Mechanisms using asymmetric techniques*

ISO 13616-1, *Financial services — International bank account number (IBAN) — Part 1: Structure of the IBAN*

ISO/IEC 14888-2:2008, *Information technology — Security techniques — Digital signatures with appendix — Part 2: Integer factorization based mechanisms*

ISO 14906, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO/TS 17573-2, *Electronic fee collection — System architecture for vehicle related tolling — Part 2: Vocabulary*

ISO 17573-3, *Electronic fee collection — System architecture for vehicle related tolling — Part 3: Data dictionary*

ISO/IEC 18033-2, *Information technology — Security techniques — Encryption algorithms — Part 2: Asymmetric ciphers*

ISO 19299, *Electronic fee collection — Security framework*

ISO 20524-1:2020, *Intelligent transport systems — Geographic Data Files (GDF) GDF5.1 — Part 1: Application independent map data shared between multiple sources*

ISO/TS 37444, *Electronic fee collection — Charging performance framework*

IETF RFC 4347, *Datagram Transport Layer Security, April 2006*

IETF RFC 5246, *The Transport Layer Security (TLS) Protocol, August 2008*

IETF RFC 5746, *Transport Layer Security (TLS) Renegotiation Indication Extension, February 2010*

IETF RFC 6040, *Tunnelling of Explicit Congestion Notification, February 2013*

W3C Recommendation *XML Signature Syntax and Processing Version 1.1*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 17573-2 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/>

## 4 Symbols and abbreviated terms

|       |                                           |
|-------|-------------------------------------------|
| ADU   | application data unit                     |
| ANPR  | automatic number plate recognition        |
| APCI  | application protocol control information  |
| APDU  | application protocol data unit            |
| BIC   | bank identifier code                      |
| CCC   | compliance check communication            |
| CRL   | certificate revocation list               |
| cXER  | canonical XML encoding rules              |
| DSRC  | dedicated short-range communication       |
| DST   | daylight saving time                      |
| DTLS  | datagram transport layer security         |
| EFC   | electronic fee collection                 |
| FTP   | file transfer protocol                    |
| GDF   | geographical data file                    |
| GNSS  | global navigation satellite system        |
| HOT   | high occupancy tolling                    |
| HTTPS | hyper-text transfer protocol secure       |
| IANA  | internet assigned numbers authority       |
| IBAN  | international bank account number         |
| ICC   | integrated circuit card                   |
| IEC   | International Electrotechnical Commission |
| ITU   | International Telecommunication Union     |
| LAC   | localization augmentation communication   |
| LPN   | licence plate number                      |
| NMEA  | National Marine Electronics Association   |
| OBE   | on-board equipment                        |
| OCSP  | online certificate status protocol        |
| OSI   | open systems interconnection              |
| PAN   | personal account number                   |
| QA    | quality assurance                         |

|       |                                                                                                            |
|-------|------------------------------------------------------------------------------------------------------------|
| RINEX | receiver independent exchange format                                                                       |
| RSA   | Rivest, Shamir and Adleman                                                                                 |
| RSE   | roadside equipment                                                                                         |
| SMTP  | simple mail transfer protocol                                                                              |
| SU    | service user                                                                                               |
| TC    | toll charger                                                                                               |
| TLS   | transport layer security                                                                                   |
| TSP   | toll service provider                                                                                      |
| UTC   | coordinated universal time                                                                                 |
| VAT   | value added tax                                                                                            |
| VPN   | virtual private network                                                                                    |
| VRM   | vehicle registration mark                                                                                  |
| XER   | XML encoding rules                                                                                         |
| NOTE  | RSA is an algorithm for public-key cryptography, also referred to as asymmetrical cryptographic technique. |

## 5 Architectural concepts and information exchanges

### 5.1 Main roles in the toll charging environment

This document is built upon the system architecture defined in ISO 17573-1.

ISO 17573-1 specifies the four main roles shown in Figure 2.

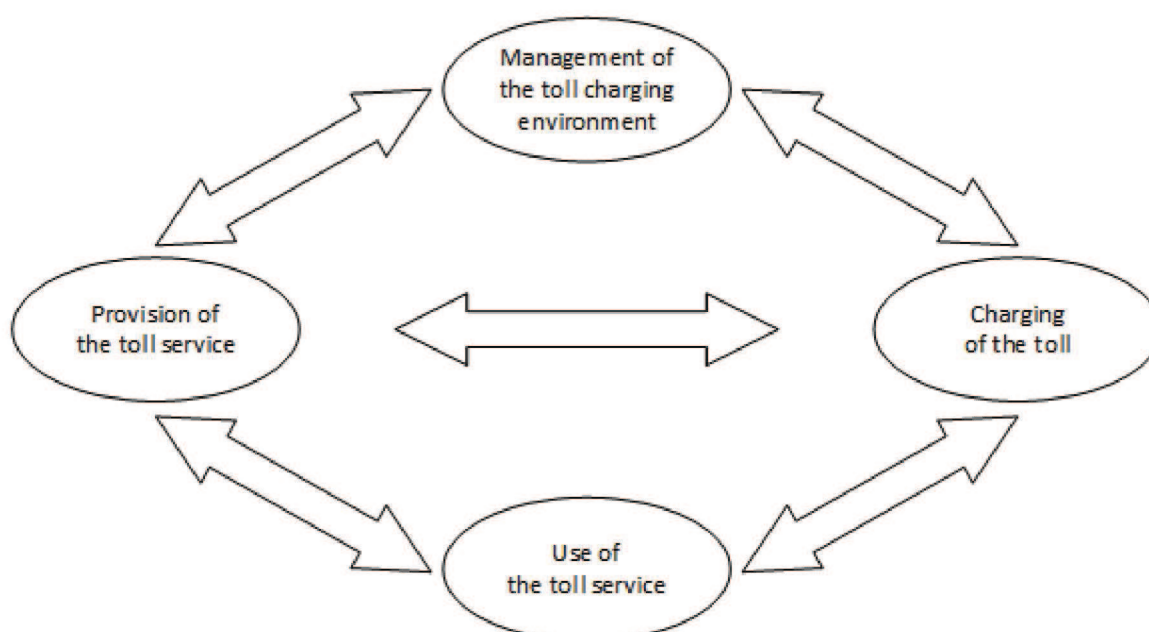


Figure 2 — Roles in the toll charging environment

Information exchanges are agreed upon between TC and TSP, considering privacy regulations and other legal requirements of the jurisdiction of the TC. The information exchanges needed by the toll charging role covered by the TC and the service provision role covered by the TSP are described in this clause.

## 5.2 Information exchange between toll charger and toll service provider

### 5.2.1 General

This document leaves implementers the freedom of specifying suitable protocol procedures, i.e. for complex transactions. Therefore, it only specifies:

- a basic interaction protocol (request – response) for information exchange
- basic protocol mechanisms, to be used to build more complex protocol procedures
- the semantics and the format of the APDU and ADUs that are exchanged

The information exchange between the TC and TSP supports the provision of functionalities that are based on the EFC system service specifications in ISO 17573-1. Figure 3 gives an overview of the functionalities provided in this document.

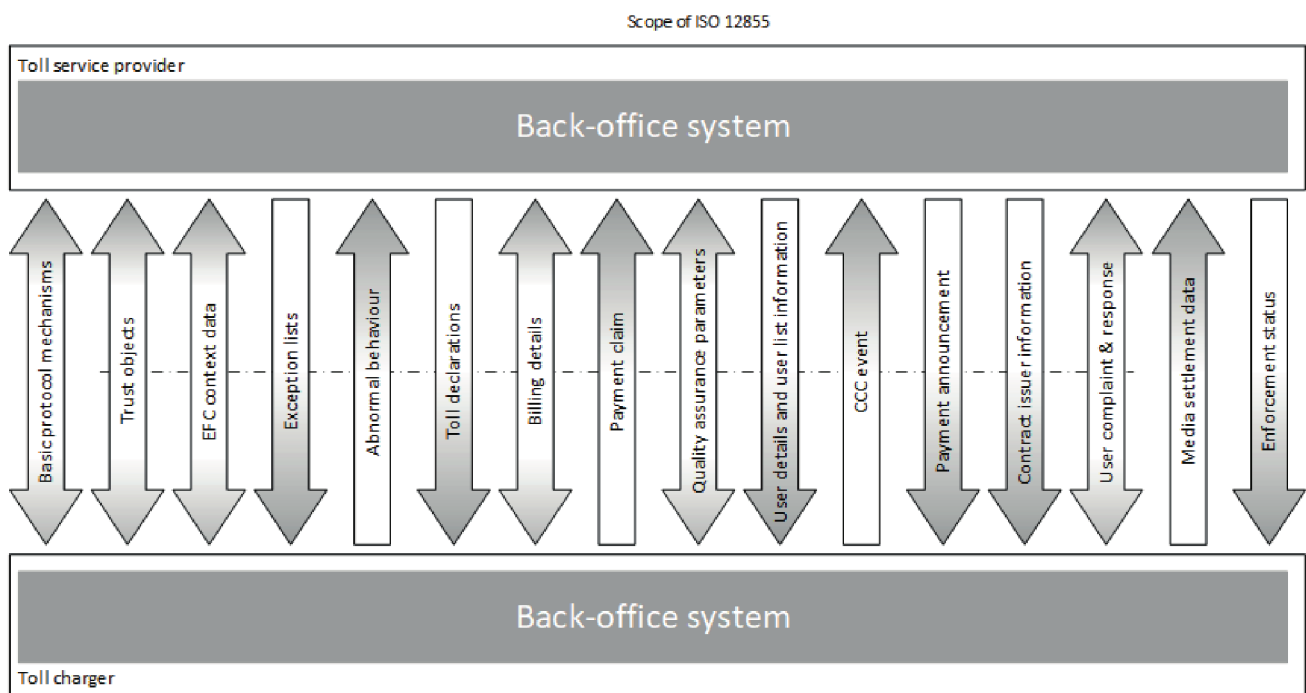


**Figure 3 — Functionalities of this standard**

The functionalities depicted in Figure 3 are described in 5.2.2 to 5.2.17.

### 5.2.2 Basic protocol mechanisms

#### 5.2.2.1 General approach

Information exchanges are performed by means of APDU transfers.

Some APDU transfers need to be acknowledged. When this happens, related protocol procedures are specified. This document specifies no provisions for complex transfers (transactions), i.e. sequences of inter-related ADUs which may involve several APDU exchanges. Instead, this document specifies basic protocol mechanisms to be used by implementations that need to specify and perform transactions.

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This document provides the following basic protocol mechanisms to exchange information between the TSP's and the TC's back-office systems. These basic protocol mechanisms consist of:

- an identification schema for the APDUs that are exchanged,
- a generic interaction (i.e. not related to any specific functionality) that supports requesting a specific information exchange from the counterpart. This interaction is provided by the “request” ADU in 6.3.5,
- a generic acknowledge mechanism (i.e. not related to any specific functionality) that supports acknowledging a specific interaction. The “acknowledge” ADU in 6.4.9 provides this mechanism, and
- an optional generic status mechanism (i.e. not related to any specific functionality) that supports providing status information for a specific interchange. This mechanism is provided by the “status” ADU in 6.6.

By means of the above mechanisms, an implementation can build more complex protocol procedures, including rollback, recovery, check point or restart.

This document does not specify timings and retry procedures for acknowledgements. Timeouts can be specified as agreements between TC and TSP to cover the case of missing acknowledgements.

#### **5.2.2.2 Identification schema**

Each APDU contains a unique identifier in the namespace of the originator of the APDU. The combination of originator identifier and APDU identifier ensures that all APDUs are uniquely identified.

#### **5.2.2.3 Request functionality**

The request functionality is used to:

- alert the counterpart in a generic request (see 6.4.1) that one is ready to accept any kind of information exchange,
- request the counterpart in a generic request (see 6.4.1) to resend a specific APDU or ADU, by indicating the type and the identifier of the APDU or ADU,
- request the counterpart in a generic request (see 6.4.1) to send the most current version of a specific ADU, by indicating the type of the ADU,
- request the counterpart in a generic request (see 6.4.1) to revoke a specific APDU or ADU, by indicating the type and the identifier of the APDU or ADU and
- inform the counterpart in a specific request (see 6.4.2 to 6.4.8) that one is ready to accept this specific type of ADU (e.g. trust objects or exception list),
- request information in a specific request (see 6.4.2 to 6.4.8) identified by type and ADU content (e.g. trust objects or user information).

#### **5.2.2.4 Acknowledgement functionality**

The acknowledgement functionality is used to inform the counterpart that a specific APDU has been either accepted or rejected and whether the contained ADU(s) could be processed correctly, or that errors have been detected during its processing.

#### **5.2.2.5 Status functionality**

The status functionality may be used to provide the counterpart with general status information about the interface or to inform it about a status on previously transferred information. It is used to:

- provide general information on the status of the interface,
- alert the counterpart that some previously provided information becomes invalid without any new information being currently available, and

- alert the counterpart that the previous information shall be revoked (e.g. because it contained an error).

### 5.2.3 Exchange trust objects functionality

The exchange trust objects functionality is derived from the EFC system service “trust object exchange”.

The functionality is used whenever the TC or the TSP, needs to send new or updated trust objects to its counterpart or when requested by its counterpart via a “request” ADU to update or resend an already existing trust object.

NOTE Examples of trust objects are asymmetric public keys, certificates, symmetric keys and certificate revocation lists.

Requiring the counterpart to send trust objects is performed by means of a “request” ADU. The “request” ADU supports requesting already issued trust objects to be resent, as well as requesting newly issued trust objects.

The exchange trust objects functionality provides the “trust objects” ADU to transfer the requested or newly generated trust objects to the counterpart as described in 6.7.

The exchanged trust objects are valid from either the time of their acknowledgment or from the validity date, if specified in the “trust object” ADU. Trust objects may also become valid based on bilateral agreements between TSP and TC (as defined in the implementation conformance statement).

The recipient may either accept the received “trust objects” ADU or partly or fully reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.4 Originate EFC context data functionality

The originate EFC context data functionality is derived from ISO 17573-1 as specified in the EFC system service “adding or modifying a toll regime”.

The originate EFC context data functionality gives a TC the possibility to send any change in a toll domain or toll regime, including the start of a new toll domain, by issuing an “EFC context data” ADU defined in 6.8.

A TSP has the possibility of requiring a TC to provide information about the toll context data for a toll domain under its responsibility by using a generic request in a “request” ADU (see 6.3.5). The TC provides the information requested by this “request” ADU by using an “EFC context data” ADU.

The originate EFC context data functionality gives a TSP the possibility to send any change of its entity data by issuing an “EFC context data” ADU defined in 6.8.

A TC has the possibility of requiring a TSP to provide information about its entity by using a generic request in a “request” ADU (see 6.3.5). The TC provides the information requested by this “request” ADU by using an “EFC context data” ADU.

The TSP may either accept the received “EFC context data” ADU or partly or fully reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.5 Manage exception list functionality

The manage exception list functionality originates from ISO 17573-1 and is specified in the EFC system service “exceptions handling”.

NOTE 1 This document uses the term “exception list” to summarize all possibilities of providing or limiting the availability of transport services to a user or giving information on the special handling of the user in a toll regime. Other standards use different terms, but they are all included in the term “exception list”.

NOTE 2 The conditions and the periods of time that a user can be accepted within a toll regime are limited by putting it on the exception list or removing it. This is solely the responsibility of the related TSP. Any information sufficient for the identification of a specific vehicle or OBE by the TC, e.g. OBE ID, personal account number (PAN), licence plate number (LPN), are included in the exception list as agreed between TC and TSP.

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The manage exception list functionality supports a TSP in notifying a TC about additions, modifications or removals of users in its exception lists by using the “exception list” ADU defined in 6.9.

NOTE 3 The “exception list” ADU can, among others, be used for one of the following reasons:

- the TSP has terminated or suspended its support/responsibility for a user
- a stolen vehicle, a stolen or lost OBE
- the TSP has started/accepted its support/responsibility for a user
- the TC is informed about the commercial conditions to apply to a user (e.g. discount for a vehicle or group of vehicles).

NOTE 4 The exception list can be used to provide additional information about a vehicle/OBE for a toll regime (e.g. tariff relevant information) where an exchange of data between TSP and TC is needed (e.g. for ANPR systems).

NOTE 5 The exception list can be used to provide information on the country of registration of a vehicle and a value added tax identifier (VAT ID) to support a TC in the correct application of VAT for ferry operations, where this information is needed for handling of reverse charge VAT in the EU.

The TC may either accept the received “exception list” ADU or partly or fully reject it including optional information about any perceived errors therein by using the “acknowledgment” ADU. The last correct list “exception list” ADU remains active in the systems of the TC if a received “exception list” ADU was declined. It remains active until a newly transmitted “exception list” ADU has been positively acknowledged by the TC.

#### **5.2.6 Report abnormal behaviour functionality**

The report abnormal behaviour functionality supports a TC in notifying a TSP about detected violations by a specific user or wrong technical behaviour by a specific OBE by using a “report abnormal behaviour” ADU defined in 6.10. The TC may request from the TSP to add a user showing an abnormal behaviour in the exception list of the TSP.

The TSP may either accept a received “report abnormal behaviour” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgment” ADU.

#### **5.2.7 Report toll declarations functionality**

The report toll declarations functionality originates from ISO 17573-1 and is specified in the EFC system service “collecting charging information (autonomous systems)”.

NOTE 1 The charging data generated by an OBE is used to report a service user (SU) entering, moving around in or leaving a toll domain. A service usage statement with or without an amount due can be made either by the detected usage of a single tolled object or by a combination of several tolled objects. Any service usage is reported as charging data through an exchange of data between an OBE/proxy (front-end) of the TSP and the back-office system managed by a TSP. This interface between front-end and back-office system of the TSP is proprietary and is not covered by this document.

The TSP has the possibility to enrich the charging data gathered by the OBE before sending that data as a “toll declarations” ADU to the TC as defined in 6.11. This possibility supports the concept of shared user data, where only limited information may be included in the OBE, while the rest of it is held centrally at the issuing TSP.

The “toll declarations” ADU provides the TC with all information needed to calculate the amount due for the use of a toll domain or to verify the calculation done by the TSP, or it may contain only summary data, according to the optional data elements that are implemented.

NOTE 2 The toll declarations can be delivered periodically in an agreed frequency (e.g. weekly, daily, hourly, in real time, etc.) or upon a specific trigger condition (e.g. when leaving a toll domain) and with the quantity of information agreed for a toll regime.

The TC may either accept a received “toll declaration” ADU or fully or partly deny it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

NOTE 3 If the TC detects a contradiction between the toll declarations provided by the TSP and its own data (e.g. CCC data, LPN reading, etc.), it has the possibility to ask the TSP for additional information about the provided toll declarations for a specific vehicle or service user by sending a “request” ADU to the TSP to provide any detailed toll declarations for either a specific service user or a specific period of time, or both. This enables the TC to receive only summation records of the use of its toll domain from the TSP and to produce its billing details in normal operation without any detailed knowledge about each segment passed by an OBE. When the TC detects a contradiction in the provided high level toll declarations during comparison with the CCC data it recorded, it can ask the TSP for detailed toll declarations for this specific vehicle or Service User.

The procedure for handling a negative “acknowledgement” ADU as a response to a “toll declaration” ADU is outside the scope of this document.

### 5.2.8 Report billing details functionality

Depending on the characteristics of a toll system, a TC either acquires the toll declarations directly from the RSE it operates (e.g. DSRC-based or ANPR-based systems) or receives it from the TSP's back-office system by the means of a “toll declaration” ADU (e.g. autonomous systems) as defined in 6.12. That information is then used for the generation of billing details.

A single billing detail may refer to one or more toll declarations. The generation of billing details is based on the requirements specified for the toll regime. Thus, a billing detail may consist of:

- an elementary usage of a transport service (e.g. regarding the toll for a road section);
- several usages of a transport service within a given period of time (a day, a week, a month, etc.) or
- several elementary usages of a transport service within a given journey.

If some relevant information is missing to build a billing detail out of the available toll declarations, the TC has the possibility to request it from the back-office system of the TSP (see 5.2.12.2).

The TC and TSP can agree to aggregate the generated billing details in order to reduce the number of information to be processed (e.g. lines in their bookkeeping systems). The TC and the TSP need to agree on common aggregation methods for billing details to avoid any rounding differences between VAT declarations for the local tax authorities (when applicable). Such rounding rules are not defined in this document, but an example is provided in the informative Annex D.

NOTE Aggregation methods can be, for example:

- After generating the billing details, the TC aggregates any billing details prior to claiming the payment. A unique identifier (reference number) for each aggregate is generated during aggregation and associated with all billing details to link them to the derived payment claim. By this method, the TSP is always able to check the consistency of the payment claim with the billing details from which they stem.
- The TC and TSP agree to use the same aggregation process and aggregate the billing details independently from each other for the representation on the invoice in their own back-office system to avoid any rounding differences.

See informative Annex E for an example of one possible solution to deal with the aggregation of billing details.

The TC or the TSP, depending on the respective operational model, have the possibility of transferring billing details by means of a “billing detail” ADU. There are two basic operational models:

- A TC dominant operational model in a global navigation satellite system (GNSS)-based toll system can require the generation of billing details and the maintaining of complete control over the usage of its toll domain by a TC. In this case, the TC will generate and send the “billing details” ADU to the TSP.
- A TSP dominant operational model in a GNSS-based toll system can limit the responsibility of the TC to carry out spot checks of the usage. In this case, the TC requires the TSP to generate and send the “billing details” ADU to the TC.

It can be necessary for the recipient of a “billing details” ADU to check the completeness and the conformity of the provided billing details for a given service usage. Therefore, the billing details can optionally reference previously exchanged toll declarations so as to provide further information.

The recipient of a “billing details” ADU may either accept it or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.9 Report payment claim functionality

The report payment claim functionality is derived from ISO 17573-1 and is specified in the EFC system service “payment settlement”.

The report payment claim functionality starts once all underlying billing details have been agreed between the TC and the TSP (see 5.2.8). The payment claim is based upon these agreed and possibly aggregated billing details.

The TC uses the report payment claim functionality by sending a “payment claim” ADU to the TSP as defined in 6.12.4.

The “payment claim” ADU also gives the possibility of including additional claims for services that do not rely on billing details (e.g. fees for overdue payment, reimbursement, penalties, etc.). Discounts may be specified as a particular type of payment claim, which may, for example, carry the reference to the services for which a discount has been applied, or they may be included at a later time in a separate payment claim as a credit note (e.g. when billing details for a longer time period are used in a scaled discount scheme).

The “payment claim” ADU is intended to contain or to address all information required by each toll regime to be used for invoicing between the TC, the TSP and the service user.

NOTE 1 The payment claim can be used by the TSP to generate invoices for its customers (service users) on behalf of the relevant TC (agency model) or for its own account (reseller model, where the TSP is buying the toll from the TC and reselling it to the service user).

The TSP can either accept a received “payment claim” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

NOTE 2 Possible reasons for dispute, among others, are inconsistency of the payment claim with received billing details or non-conformance of specific commercial conditions.

### 5.2.10 Exchange quality assurance parameters functionality

The report quality assurance (QA) parameters functionality is derived from ISO 17573-1 and is specified in the EFC system service “monitoring operations”. In ISO 17573-1, the monitoring operations functionality is used to report and monitor the EFC activities of TCs and TSPs. In this document, the exchange quality assurance parameters functionality is used to exchange information to monitor the quality of operations between the TC and the TSP.

EXAMPLE One of these QA parameters is the detection rate (i.e. the percentage of detected OBE issued by a TSP in the toll regime of a TC) to support the monitoring of a service level agreement.

Types and ranges of QA parameters are agreed between a TC and TSP in a bilateral agreement.

The functionality is used whenever a TC or a TSP, needs to send new or updated QA parameters to its counterpart or when it is asked by its counterpart to update or resend already sent QA parameters. It is performed by issuing a “report QA” ADU as defined in 6.14.

Requesting the counterpart to send QA parameters is performed by means of a “request” ADU. The “request” ADU supports requests for already issued QA parameters to be resent, QA parameters to be updated or the sending of additional QA parameters.

The receiver of a “report QA” ADU can either accept the received QA parameters or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.11 Report CCC event functionality

The report CCC event functionality supports a TC in delivering the details of any CCC events for either a specific service user or a specific period of time, or both. This functionality is initiated either by the TC directly or on request from the TSP via an “request” ADU by sending a “report CCC event” ADU as defined in 6.16.

The TSP may either accept a received “report CCC event” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.12 Provide user details and user list information functionalities

#### 5.2.12.1 General

The user and user list information functionalities originate from ISO 17573-1 and is specified in the EFC system service “Detecting exceptions”.

The user and user list information functionality may be used each time a TC needs additional information about a user or a list of users. The compliance checking process consists of:

- gathering additional information about a user, which is missing to calculate the correct amount of toll (e.g. tariff relevant parameters about a vehicle in an ANPR system)
- gathering additional information about users, which are related to a specific user (e.g. to calculate a discount on a group of vehicles belonging to the same operator, to see if an abnormal behaviour of one vehicle is also occurring at related vehicles)

#### 5.2.12.2 Provide user details functionality

The provide user details functionality originates from ISO 17573-1 and is specified in the EFC system service “Detecting exceptions”.

This functionality supports a TC in allowing to request missing information about a user from the TSPs, which have a contractual relation with this user identified in a “request” ADU.

The TSP shall answer to such a request with “provide user details” ADU, as defined in 6.19. The TSP may either deliver the requested user details in the “provide user details” ADU or decline the request.

When details on a user are provided, the minimum set of data contained in a “provide user details” ADU includes the `userId`.

Any additional details about the service user depend on what is specified in the “request” ADU and on the actual availability of the requested data. The actual delivery of user details can be subject to local data protection regulations.

The TC may either accept the received “provide user details” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

#### 5.2.12.3 Provide user list functionality

The provide user list functionality originates from ISO 17573-1 and is specified in the EFC system service “Detecting exceptions”.

This functionality supports a TC in allowing to request a list of users from a TSP, which are related to the user specified in a “request” ADU. This supports the TC in its enforcement activities and is useful for detecting potential fraud patterns of related vehicles.

The TSP shall answer to such a request with “provide user list” ADU, as defined in 6.17.

The TC may either accept a received “provide user list” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.13 Report payment announcement functionality

The report payment announcement functionality is derived from ISO 17573-1 and is specified in the EFC system service “payment settlement”.

This functionality supports a TSP in informing a TC of a payment that has been or is going to be made for the use of the transport services by its users. Unlike the payment claim functionality, the payment announcement functionality is initiated either by the TSP directly or on request from the TC via an “request” ADU by sending a “payment announcement” ADU to the TC as defined in 0. The information carried in the “payment announcement” ADU may include references to billing details, toll declarations or even single elements of a charge report.

The TC may either accept a received “payment announcement” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.14 Provide contract issuer information functionality

The provide contract issuer information functionality supports a TSP in delivering to the TC all relevant information to correctly identify the OBEs of the TSP, which are to be accepted in the toll domain of the TC by using the “contract issuer list” ADU defined in 6.19.

The “contract issuer list” ADU includes all required information to associate an OBE to this TSP and the key set to be used in the calculation of dedicated short-range communication (DSRC) authenticators. This functionality supports, among others, the TC in configuring its RSE for the acceptance of the OBEs specified by the TSP.

**NOTE** This document does not specify any actions to be taken in an acceptance procedure between TC and TSP to allow the TSP to include information about an OBE in the “contract issuer list” ADU.

The TC may either accept the received “contract issuer list” ADU or partly or fully reject it including optional information about any perceived errors therein by using the “acknowledgment” ADU.

### 5.2.15 User complaint and response functionality

The user complaint and response functionality is derived from the ISO 17573-1 service “Providing customer care”. In ISO 17573-1, the providing customer care service belongs in the group of services that involve the service user and the TSP. This functionality specifies an aspect of customer care that involves only the interaction between the TC and the TSP to handle user complaints.

**EXAMPLE** The user complaint and response functionality can be used to provide a user complaint regarding a previously accepted billing detail, possibly also included in an accepted payment claim, to the TC and requesting its revocation and refund due to a wrong classification of a vehicle.

This functionality supports both the TSP and the TC by transferring a user complaint from a specified user through a structured interface in a “user complaint” ADU instead of using other unstructured communication channels (e.g. telephone or mail).

The TSP, after having verified the validity of a user complaint, can deliver the complaint to the TC, by means of a “user complaint” ADU as defined in 6.20.

The TC may either accept a received “user complaint” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU. The “acknowledgement” ADU thereby indicates that the complaint was received by the TC and will be processed.

The TC shall send a “user complaint response” ADU, as defined in 6.21, after it has completed the processing of the user complaint, indicating the acceptance or the refusal of the user complaint to the TSP.

The TC may either accept a received “user complaint response” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgement” ADU.

### 5.2.16 Provide media settlement data functionality

The provide media settlement data functionality supports a TC in responding to a “request” ADU from a TSP asking payment settlement data to be transmitted to the media provider. This functionality is performed by means of the “media settlement data” ADU, as defined in 6.22. The information in the “media settlement data” ADU is generated from a medium connected with an OBE independently of the used tolling technology.

The settlement is initiated by an OBE and transparently performed via the OBE either from the RSE or the central server, or both. Media settlement data is provided to an OBE when a vehicle is passing close to a physical charging station in a DSRC-based system or whenever settlement data need to be generated in a GNSS-based system.

NOTE 1 Media settlement data contain evidence of payment settlement using a medium for both road charging and invoicing to the service user and are transmitted to the media provider via the TC and the TSP without any modification since they contain a tamper-proof code.

The toll service can either accept a received “media settlement data” ADU or fully or partly reject it including optional information about any perceived errors therein by using the “acknowledgment” ADU.

NOTE 2 If the media provider has either doubts or suspicions, or both, about received media settlement data, another recovery processing is performed by the TSP and the TC under a bilateral agreement with the media provider.

### 5.2.17 Report enforcement status functionality

The report enforcement status functionality supports a TSP in delivering an enforcement status that supports enforcing of an autonomous OBE that does not support DSRC for compliance checking. This functionality is realized by issuing an “enforcement status” ADU as defined in 6.23 or responding to a “request” ADU by the TC.

## 6 Computational specification

### 6.1 Overview

This clause specifies the computational objects for the information exchanges between TCs and TSPs. Each computational object is identified by:

- a name;
- the function(s) it performs and
- the ADUs it is able to generate or accept.

For the sake of simplicity, the functionalities identified in the previous clauses correspond to computational objects in this clause. This means that the functions performed by each object have already been described in the previous clauses. A given computational object can be instantiated for the TSP or for the TC role, with the limitations and permissions stated as rules in the previous clauses. The fact that computational objects are modelled here as each having one logical interface for interactions does not put any limits on the number of real interfaces offered in an implementation of this document.

Table 1 lists the specified computational objects. For each object, the relevant interface interactions are listed, together with the limitations, permissions and obligations for each role derived by the rules specified in previous clauses.

An implementation conforming to this document shall declare which of the computational objects and related interactions listed in Table 1 are supported. For each implemented computational object and interaction, the implementer declares their support, and depending on the implementation’s role (TC or TSP), the rules stated in Table 1 shall be obeyed, with the following meanings:

- may initiate: an entity is able and allowed to initiate an interaction;
- shall initiate: an entity shall initiate an interaction;

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- shall be able to receive: an entity shall be able to receive and process this kind of interaction. If a related ADU is not supported, the receiver shall respond with an `AckAdu` (see Table 49) containing in the data element `issues` the value “notSupportedAdu”;
- shall respond: an entity shall respond to a received interaction.

**Table 1 — Computational objects and interactions**

| Computational object                | Interaction             | TSP rules                                                   | TC rules                                                    |
|-------------------------------------|-------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| Exchange trust objects              | Request                 | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
|                                     | Trust objects           | may initiate,<br>shall respond,<br>shall be able to receive | may initiate,<br>shall respond,<br>shall be able to receive |
|                                     | Acknowledge             | shall respond,<br>shall be able to receive                  | shall respond,<br>shall be able to receive                  |
|                                     | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Originate EFC context data          | Request                 | may initiate                                                | shall be able to receive                                    |
|                                     | EFC context data        | shall be able to receive                                    | may initiate,<br>shall respond                              |
|                                     | Acknowledge             | shall respond                                               | shall be able to receive                                    |
|                                     | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Provide contract issuer information | Request                 | shall be able to receive                                    | may initiate                                                |
|                                     | Contractual information | may initiate,<br>shall respond                              | shall be able to receive                                    |
|                                     | Acknowledge             | shall be able to receive                                    | shall respond                                               |
|                                     | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Manage exception list               | Request                 | shall be able to receive                                    | may initiate                                                |
|                                     | Exception list          | may initiate,<br>shall respond                              | shall be able to receive                                    |
|                                     | Acknowledge             | shall be able to receive                                    | shall respond                                               |
|                                     | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Report abnormal behaviour           | Request                 | may initiate                                                | shall be able to receive                                    |
|                                     | Report abnormal OBE     | shall be able to receive                                    | may initiate,<br>shall respond                              |
|                                     | Acknowledge             | shall respond                                               | shall be able to receive                                    |
|                                     | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Report toll declarations            | Request                 | shall be able to receive                                    | may initiate                                                |
|                                     | Toll declaration        | may initiate,<br>shall respond                              | shall be able to receive                                    |
|                                     | Acknowledge             | shall be able to receive                                    | shall respond                                               |
|                                     | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |

**Table 1 (continued)**

| Computational object        | Interaction             | TSP rules                                                   | TC rules                                                    |
|-----------------------------|-------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| Report billing details      | Request                 | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
|                             | Billing details         | may initiate,<br>shall respond,<br>shall be able to receive | may initiate,<br>shall respond,<br>shall be able to receive |
|                             | Acknowledge             | shall respond,<br>shall be able to receive                  | shall respond,<br>shall be able to receive                  |
|                             | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Report payment claim        | Request                 | may initiate                                                | shall be able to receive                                    |
|                             | Payment claim           | shall be able to receive                                    | may initiate,<br>shall respond                              |
|                             | Acknowledge             | shall respond                                               | shall be able to receive                                    |
|                             | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Payment announcement        | Request                 | shall be able to receive                                    | may initiate                                                |
|                             | Payment announcement    | may initiate,<br>shall respond                              | shall be able to receive                                    |
|                             | Acknowledge             | shall be able to receive                                    | shall response                                              |
|                             | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Report CCC event            | Request                 | may initiate                                                | shall be able to receive                                    |
|                             | Report CCC event        | shall be able to receive                                    | may initiate,<br>shall respond                              |
|                             | Acknowledge             | shall respond                                               | shall be able to receive                                    |
|                             | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Provide user details        | Request                 | shall be able to receive                                    | may initiate                                                |
|                             | Provide user details    | may initiate,<br>shall respond                              | shall be able to receive                                    |
|                             | Acknowledge             | shall be able to receive                                    | may respond                                                 |
|                             | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Provide user list           | Request                 | shall be able to receive                                    | may initiate                                                |
|                             | List of Users           | may initiate,<br>shall respond                              | shall be able to receive                                    |
|                             | Acknowledge             | shall be able to receive                                    | may respond                                                 |
|                             | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| User complaint and response | user complaint          | may initiate                                                | shall be able to receive                                    |
|                             | Acknowledge             | shall be able to receive                                    | shall respond                                               |
|                             | User complaint response | shall be able to receive                                    | shall respond                                               |
|                             | Acknowledge             | shall respond                                               | shall be able to receive                                    |
|                             | Status                  | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |

**Table 1** (continued)

| Computational object          | Interaction                         | TSP rules                                                   | TC rules                                                    |
|-------------------------------|-------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| Exchange QA parameters        | Request                             | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
|                               | Report QA                           | may initiate,<br>shall respond,<br>shall be able to receive | may initiate,<br>shall respond,<br>shall be able to receive |
|                               | Acknowledge (report QA)             | shall respond,<br>shall be able to receive                  | shall respond,<br>shall be able to receive                  |
|                               | Status                              | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Provide Media Settlement Data | Request                             | may initiate                                                | shall be able to receive                                    |
|                               | Media settlement data               | shall be able to receive                                    | may initiate,<br>shall respond                              |
|                               | Acknowledge (media settlement data) | shall respond                                               | shall be able to receive                                    |
|                               | Status                              | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |
| Report enforcement status     | Request                             | shall be able to receive                                    | may initiate                                                |
|                               | Enforcement status                  | may initiate,<br>shall respond                              | shall be able to receive                                    |
|                               | Acknowledge                         | shall be able to receive                                    | shall respond                                               |
|                               | Status                              | may initiate,<br>shall be able to receive                   | may initiate,<br>shall be able to receive                   |

The offering of an interface by an actor may require different behaviours depending on the activities to be performed with the exchange of information.

The interface interactions summarized in Table 1 are performed by exchanging open systems interconnection (OSI) application layer APDUs. They are described in detail in the following subclauses and are formally defined in Annex A. In case of any conflict between this description and the definition in Annex A, the definition in Annex A takes precedence.

To facilitate reading, the following conventions are adopted in subclause 6.2:

- a) the ASN.1 data elements are written with a lower case first letter using *Courier New font*;
- b) the corresponding ASN.1 data types are written with an upper case first letter using *Courier New font*.

## 6.2 Application protocol data units

### 6.2.1 General

The whole data exchange in this standard is based upon one APDU carrying the complete payload.

The APDU is the root data type of any exchange of data in this standard.

Figure 4 gives a top-level view of the structure of the APDU, its related data types down to the ADU level and a brief explanation of their content.

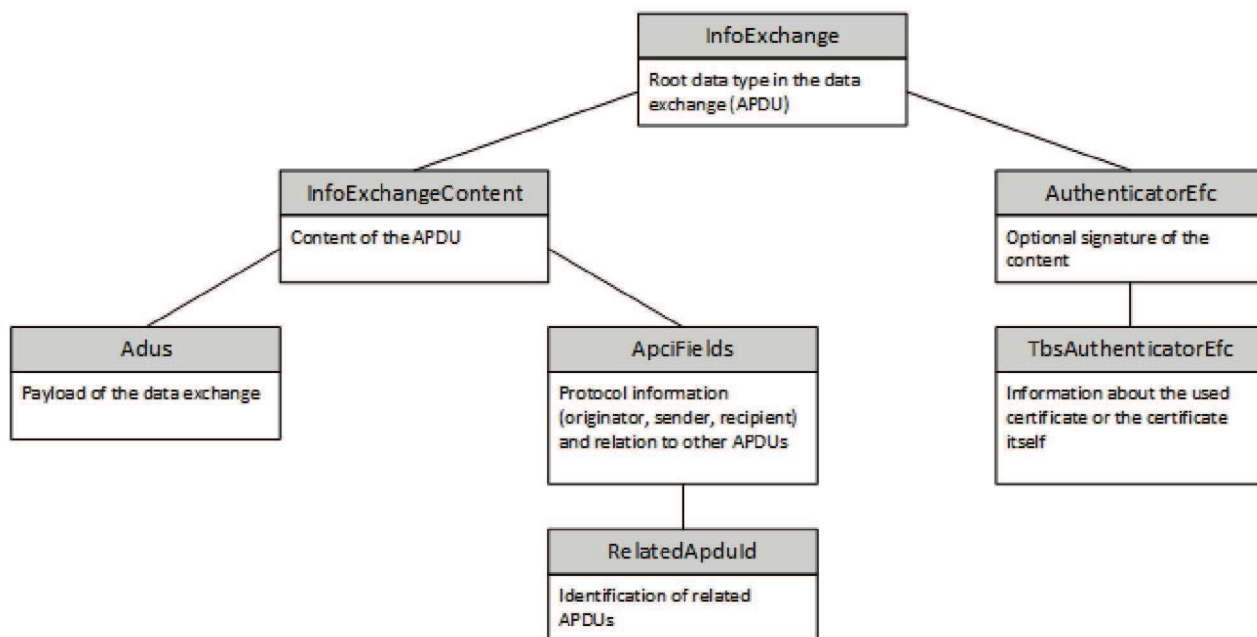


Figure 4 — InfoExchange data type structure

The following subclauses describe the APCI and the ADUs for the specified APDU.

The APDU, the APCI and each ADU and their sub-structures are described in the following way in this standard:

- Tables list the data elements that make up data types. Each table contains the data elements, their data type definition with a brief semantic description and whether the data element is mandatory (M), optional (O) or it is not applicable (N/A) when a data element is part of a selection (ASN.1 CHOICE statement). The data type definition is indicative and is formally specified in Annex A. In cases where there are discrepancies, the formal definition in Annex A takes precedence.
- Additional tables are inserted to better describe additional data types used in the ADUs to explain complex structures.
- Additional semantic definitions and usage descriptions of data elements may be given as text after each table.

Table 2 describes the data elements of the data type `InfoExchange`, which is formally specified in Annex A.

Table 2 — Data elements of `InfoExchange`

| Data element                           | Data type/data description                                                                                                                                                                                                                                                             | Status |
|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>infoExchangeContent</code>       | <code>InfoExchangeContent</code> (see Table 3)<br>The data element shall contain the ADU(s) as content of the APDU.                                                                                                                                                                    | M      |
| <code>infoExchangeAuthenticator</code> | <code>AuthenticatorEfc</code> (see Table 16 in 7.3.2)<br>The data element may optionally contain a calculated signature over the data element <code>infoExchangeContent</code> . This signature can be calculated either by the APDU originator or the information sender (see 6.2.2). | O      |

Table 3 describes the data elements of the data type `InfoExchangeContent`, which is formally specified in Annex A.

**Table 3 — Data elements of InfoExchangeContent**

| Data element | Data type/data description                                                                                                                                                                                                                     | Status |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| apci         | ApciFields (see Table 4)<br>The data element shall contain the application protocol control information (APCI) of the APDU defining originator, sender and recipient of the APDU, its relation to other APDUs and the version of the protocol. | M      |
| adus         | Adus (see Table 7)<br>The data element shall contain the ADUs as payload of the APDU.                                                                                                                                                          | M      |

### 6.2.2 Application protocol control information

Table 4 describes the data elements of the data type ApciFields, which is formally specified in Annex A.

**Table 4 — Data elements of ApciFields**

| Data element           | Data type/data description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Status |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| aidIdentifier          | AidIdentifier (see Table 5) defined as INTEGER ranging from 0 to 255<br>This data element in association with the value of informationSenderId shall contain a reference to a protocol version either based on a specific version of ISO 12855 or EN 16986 or a private implementation specification with additional restrictions or extensions of this standard. Any change to a data specification shall be identified by a different value in aidIdentifier.<br>Allowed values are specified in Table 5. | M      |
| apduOriginator         | Provider (imported from ISO 17573-3)<br>This data element shall contain the identifier of the entity originating the contents of the APDU, which can either be a TC or a TSP. This may be, but is not necessarily, the actual sender of the information.                                                                                                                                                                                                                                                    | M      |
| informationSenderId    | Provider (imported from ISO 17573-3)<br>This data element shall contain the identifier of the entity sending the APDU.<br>It shall contain a different identifier as the data element apduOriginator when a technical entity is supporting the originator of the APDU in the task of compiling and transferring information.<br>It shall contain the same identifier as the data element apduOriginator when the originator and the sender of the APDU are the same entity.                                 | M      |
| informationRecipientId | Provider (imported from ISO 17573-3)<br>This data element shall contain the identifier of the entity the content of the APDU is sent to, which can be a TC or a TSP.                                                                                                                                                                                                                                                                                                                                        | M      |
| apduIdentifier         | ApduIdentifier defined as INTEGER ranging from 0 to 2 <sup>63</sup> -1<br>This data element shall contain a unique identifier for each apduOriginator. It is assigned by the originator of the APDU.                                                                                                                                                                                                                                                                                                        | M      |
| previousApduId         | RelatedApduId (see Table 6)<br>This data element may optionally contain the unique identifier of the previously sent APDU.                                                                                                                                                                                                                                                                                                                                                                                  | 0      |

Table 4 (continued)

| Data element      | Data type/data description                                                                                                          | Status |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------|
| nextApuId         | RelatedApuId (see Table 6)<br>This data element may optionally contain the unique identifier of the APDU to be sent next.           | O      |
| inResponseToApuId | RelatedApuId (see Table 6)<br>This data element may optionally contain the unique identifier of the APDU it is sent in response to. | O      |
| apduDate          | GeneralizedTime<br>This data element shall specify the time stamp of the generation of the APDU in UTC.                             | M      |

Additional semantics for the data elements in Table 4:

The `apduOriginator` and `apduIdentifier` together form a unique key for an APDU. It is used to reference other APDUs when acknowledging or requesting a retransmission of a previously issued APDU.

`previousApuId` may optionally be used by the originator of an APDU to indicate that the APDU is related to a previously sent APDU of the originator. If used, it shall identify the APDU by stating the identifier of the originator (itself) and the unique APDU identifier of the referenced APDU. It shall not be used if no previous APDU has been sent by the originator or the previous APDU is unrelated to this APDU.

`nextApuId` may optionally be used by the originator of an APDU to indicate that the current APDU is not complete and further information will be sent in another APDU by the originator. If used, it shall identify the APDU by stating the identifier of the originator (itself) and the unique APDU identifier of the referenced APDU. It shall not be used if this APDU concludes a chain of APDUs or is a single APDU.

The data elements `previousApuId` and the `nextApuId` may be used to identify chains of APDUs in multi-part APDUs as depicted in Figure 5.

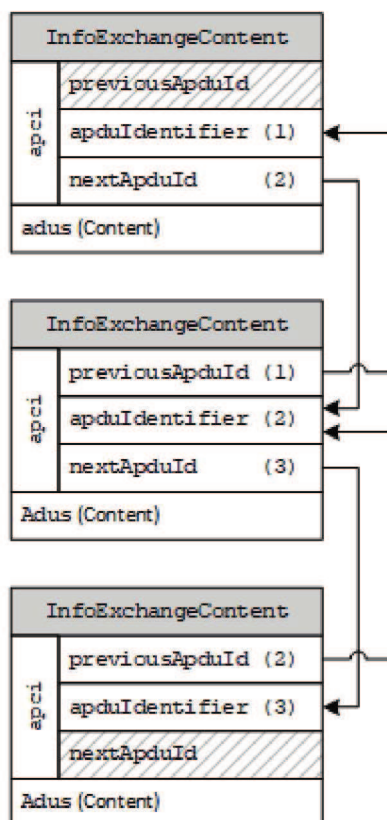


Figure 5 — Linking of APDUs

E DIN EN ISO 12855:2024-05  
ISO/DIS 12855:2024(en)

The data element `inResponseToApuId` may optionally be used to indicate that the APDU is either a response to a requested APDU or an acknowledgement of a received APDU, as depicted in Figure 6. This functionality may be needed to identify a chain of APDUs in a transaction.

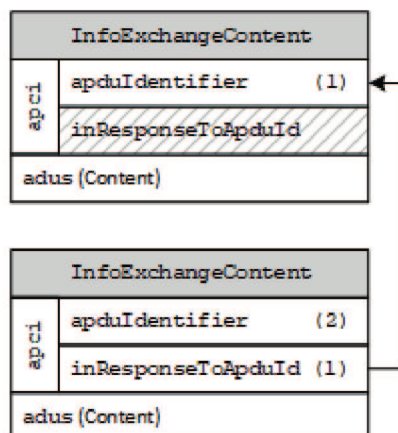


Figure 6 — Responding to an APDU

Table 5 lists the defined values and semantics of `AidIdentifier` in decimal notation.

Table 5 — Values and semantics of `AidIdentifier`

| Name                         | Semantics                                                                                                                                                                  | Value   |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|
| <code>iso12855v4</code>      | Identifies the OID version 4 of the IS document (published in 2015)                                                                                                        | 0       |
| <code>isoDIS12855v5</code>   | Identifies the OID version 5 of the DIS version of the IS document                                                                                                         | 1       |
| <code>isoFDIS12855v5</code>  | Identifies the OID version 5 of the FDIS version of the IS document                                                                                                        | 2       |
| <code>iso12855v5</code>      | Identifies the OID version 5 of the IS document (published in 2020)                                                                                                        | 3       |
| <code>isoDIS12855v6m1</code> | Identifies the OID version 6 minor version 1 of the DIS version of the IS document                                                                                         | 4       |
| <code>iso12855v6m2</code>    | Identifies the OID version 6 minor version 2 of the FDIS and final version of the IS document (not yet published)                                                          | 5       |
|                              | Values reserved for future ISO use                                                                                                                                         | 6..15   |
| <code>cen16986x2016</code>   | Identifies the OID version of the CEN TS document (published in 2016)<br>NOTE There was no ASN.1 code for this version and is therefore not registered in the OID database | 16      |
| <code>enENQ16986v1m1</code>  | identifies the OID version 1 minor version 1 of the CEN enquiry version of the EN document                                                                                 | 17      |
| <code>en16986v2m1</code>     | identifies the OID version 2 minor version 1 of the CEN final vote and final version of the EN document                                                                    | 18      |
|                              | Values reserved for future CEN use                                                                                                                                         | 19..31  |
|                              | Values reserved for private use                                                                                                                                            | 32..255 |

Table 6 describes the data elements of the data type `RelatedApuId`, which is formally specified in Annex A.

Table 6 — Data elements of `RelatedApuId`

| Data element                | Data type/data description                                                                                                                                                    | Status |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>apduOriginator</code> | Provider (imported from ISO 17573-3)<br>This data element shall contain the identifier of the entity which originated the referenced APDU, which can either be a TC or a TSP. | M      |
| <code>apduIdentifier</code> | <code>ApduIdentifier</code> defined as <code>INTEGER</code> ranging from 0 to $2^{63}-1$<br>This data element shall contain the unique identifier of the referenced APDU.     | M      |

### 6.2.3 Application data units

The data element `adus` is of data type `Adus` and shall contain the actual payload of the APDU.

The data type `Adus` contains a selection (ASN.1 CHOICE) among different lists of one or more (ASN.1 SEQUENCE OF) elements of the ADU to be sent. Table 7 describes the data type and the data elements in the CHOICE statement, which is formally defined in Annex A.

**Table 7 — Data elements of `Adus`**

| Data element                             | Data type/data description                         | Status |
|------------------------------------------|----------------------------------------------------|--------|
| <code>requestAdus</code>                 | <code>RequestAdu</code> (see 6.4)                  | N/A    |
| <code>ackAdus</code>                     | <code>AckAdu</code> (see 6.5)                      | N/A    |
| <code>trustObjectAdus</code>             | <code>TrustObjectAdu</code> (see 6.7)              | N/A    |
| <code>efcContextDataAdus</code>          | <code>EfcContextDataAdu</code> (see 6.8)           | N/A    |
| <code>exceptionListAdus</code>           | <code>ExceptionListAdu</code> (see 6.9)            | N/A    |
| <code>reportAbnormalBehaviourAdus</code> | <code>ReportAbnormalBehaviourAdu</code> (see 6.10) | N/A    |
| <code>tollDeclarationAdus</code>         | <code>TollDeclarationAdu</code> (see 6.11)         | N/A    |
| <code>billingDetailsAdus</code>          | <code>BillingDetailsAdu</code> (see 6.12)          | N/A    |
| <code>paymentClaimAdus</code>            | <code>PaymentClaimAdu</code> (see 6.13)            | N/A    |
| <code>reportQaAdus</code>                | <code>ReportQaAdu</code> (see 6.14)                | N/A    |
| <code>statusAdus</code>                  | <code>StatusAdu</code> (see 6.6)                   | N/A    |
| <code>provideUserDetailsAdus</code>      | <code>ProvideUserDetailsAdu</code> (see 6.15)      | N/A    |
| <code>reportCccEventAdus</code>          | <code>ReportCccEventAdu</code> (see 6.16)          | N/A    |
| <code>provideUserIdListAdus</code>       | <code>ProvideUserIdListAdu</code> (see 6.17)       | N/A    |
| <code>paymentAnnouncementAdus</code>     | <code>PaymentAnnouncementAdu</code> (see 6.18)     | N/A    |
| <code>contractIssuerListAdus</code>      | <code>ContractIssuerListAdu</code> (see 6.19)      | N/A    |
| <code>userComplaintAdus</code>           | <code>UserComplaintAdu</code> (see 6.20)           | N/A    |
| <code>userComplaintResponseAdus</code>   | <code>UserComplaintResponseAdu</code> (see 6.21)   | N/A    |
| <code>mediaSettlementDataAdus</code>     | <code>MediaSettlementDataAdu</code> (see 6.22)     | N/A    |
| <code>enforcementStatusAdus</code>       | <code>EnforcementStatusAdu</code> (see 6.23)       | N/A    |

Additional semantics of the data elements:

The data elements containing the ADUs in Table 7 are specified in the indicated clauses in this document. Table 8 links the functionality with the involved ADUs and describes their purpose.

**Table 8 — ADUs overview**

| Functionality                          | ADU type name                            | Description                                                                                                         |
|----------------------------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Basic protocol mechanisms (see 5.2.2)  | <code>RequestAdu</code> (see 6.4)        | Request to send ADUs from TC or TSP                                                                                 |
|                                        | <code>AckAdu</code> (see 6.5)            | Acknowledge of received ADUs by TC or TSP                                                                           |
|                                        | <code>StatusAdu</code> (see 6.6)         | Provide a generic status information to TC or TSP                                                                   |
| Exchange trust objects (see 5.2.3)     | <code>TrustObjectAdu</code> (see 6.7)    | Exchange keys and certificates between TC and TSP                                                                   |
| Originate EFC context data (see 5.2.4) | <code>EfcContextDataAdu</code> (see 6.8) | Send a formal description of the TCs toll domain from TC to TSP or information about the TSP from the TSP to the TC |
| Manage exception lists (see 5.2.5)     | <code>ExceptionListAdu</code> (see 6.9)  | Send exception list of type blacklist, whitelist or discounted user list from TSP to TC                             |

**Table 8 (continued)**

| Functionality                                      | ADU type name                         | Description                                                                  |
|----------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------|
| Report abnormal behaviour (see 5.2.6)              | ReportAbnormalBehaviourAdu (see 6.10) | Report abnormal behaviour of an OBE or a service user from the TC to the TSP |
| Report toll declarations (see 5.2.7)               | TollDeclarationAdu (see 6.11)         | Send acquired toll declarations from the TSP to the TC                       |
| Report billing details (see 5.2.8)                 | BillingDetailsAdu (see 6.12)          | Send calculated billing details either from TC to TSP or from TSP to TC      |
| Report payment claim (see 5.2.9)                   | PaymentClaimAdu (see 6.13)            | Send a payment claim for accepted billing details from TC to TSP             |
| Exchange quality assurance parameters (see 5.2.10) | ReportQaAdu (see 6.14)                | Exchange QA parameters between TC and TSP                                    |
| Report CCC event (see 5.2.11)                      | ReportCccEventAdu (see 6.16)          | Report CCC event from TC to TSP                                              |
| Provide user & user list information (see 5.2.12)  | ProvideUserDetailsAdu (see 6.15)      | Provide details on a user or vehicle from TSP to TC                          |
|                                                    | ProvideUserIdListAdu (see 6.17)       | Provide a list of related users from TSP to TC                               |
| Report payment announcement (see 5.2.13)           | PaymentAnnouncementAdu (see 6.18)     | Send a payment announcement for a payment from TSP to TC                     |
| Provide contract issuer information (see 5.2.14)   | ContractIssuerListAdu (see 6.19)      | Provide information on the accepted OBE from TSP to TC                       |
| User complaint and response (see 5.2.15)           | UserComplaintAdu (see 6.20)           | Send a user complaint from TSP to TC                                         |
|                                                    | UserComplaintResponseAdu (see 6.21)   | Send the result of handling a user complaint from TC to TSP                  |
| Provide media settlement data (see 5.2.16)         | MediaSettlementDataAdu (see 6.22)     | Send media settlement data from TC to TSP                                    |
| Report enforcement status (see 5.2.17)             | EnforcementStatusAdu (see 6.23)       | Report enforcement status from TSP to TC                                     |

#### 6.2.4 ADU identification

Each ADU is identified by the mandatory data element `aduIdentifier` of data type `AduIdentifier`, which is defined as an `INTEGER` ranging from 0 to  $2^{63}-1$ . The data element `aduIdentifier` is specified by the originator of the ADU with the rule that the `aduIdentifier` shall be unique within the type of the ADU. With that rule, considering that each ADU originator is uniquely identified by its `providerId`, each ADU may be uniquely identified by a triple of identifiers of data elements `providerId`, `aduType` and `aduIdentifier`.

Table 9 lists the defined values and semantics for the defined ADUs in decimal notation. The semantics point to the computational specification of each ADU.

**Table 9 — Values and semantics of `AduType`**

| Name                                    | Semantics                                 | Value |
|-----------------------------------------|-------------------------------------------|-------|
|                                         | Value reserved for future ISO and CEN use | 0     |
| <code>requestAdu</code>                 | Definition see 6.4                        | 1     |
| <code>ackAdu</code>                     | Definition see 6.5                        | 2     |
| <code>trustObjectAdu</code>             | Definition see 6.7                        | 3     |
| <code>efcContextDataAdu</code>          | Definition see 6.8                        | 4     |
| <code>exceptionListAdu</code>           | Definition see 6.9                        | 5     |
| <code>reportAbnormalBehaviourAdu</code> | Definition see 6.10                       | 6     |
| <code>tollDeclarationAdu</code>         | Definition see 6.11                       | 7     |

Table 9 (continued)

| Name                     | Semantics                                  | Value    |
|--------------------------|--------------------------------------------|----------|
| billingDetailsAdu        | Definition see 6.12                        | 8        |
| paymentClaimAdu          | Definition see 6.13                        | 9        |
| reportQaAdu              | Definition see 6.14                        | 10       |
| statusAdu                | Definition see 6.6                         | 11       |
| provideUserDetailsAdu    | Definition see 6.15                        | 12       |
| reportCccEventAdu        | Definition see 6.16                        | 13       |
| provideUserIdListAdu     | Definition see 6.17                        | 14       |
| paymentAnnouncementAdu   | Definition see 6.18                        | 15       |
| contractIssuerListAdu    | Definition see 6.19                        | 16       |
| userComplaintAdu         | Definition see 6.20                        | 17       |
| userComplaintResponseAdu | Definition see 6.21                        | 18       |
| mediaSettlementDataAdu   | Definition see 6.22                        | 19       |
| enforcementStatusAdu     | Definition see 6.23                        | 20       |
|                          | Values reserved for future CEN and ISO use | 21.. 127 |
|                          | Values reserved for private use            | 128..255 |

## 6.3 Common data types

### 6.3.1 ADU action codes

#### 6.3.1.1 Action initiated by sender

Each ADU contains an optional data element `actionCode`, used to specify the action of the sender for this ADU. Table 10 lists the available values for `actionCode`. The allowed values are specific for each ADU and are defined there.

Table 10 — Values of `ActionCode` and semantics for use in `actionCode`

| Name    | Semantics                                             | Value    |
|---------|-------------------------------------------------------|----------|
| send    | The sender is sending this ADU without a request      | 0        |
|         | Not allowed                                           | 1        |
| respond | The sender is responding with this ADU upon a request | 2        |
|         | Not allowed                                           | 3        |
| resend  | The sender is resending this ADU                      | 4        |
|         | Not allowed                                           | 5        |
|         | Not allowed                                           | 6        |
|         | Values reserved for future CEN and ISO use            | 7..127   |
|         | Values reserved for private use                       | 128..255 |

#### 6.3.1.2 Action requested from recipient

Each ADU contains an optional data element `actionRequest`, used to specify the action the sender requests to perform with this ADU. Table 11 lists the available values for `actionRequest`. The allowed values are specific for each ADU and are defined there.

**Table 11 — Values of `ActionCode` and semantics for use in `actionRequest`**

| Name    | Semantics                                                                                                                                                                                                                                                                                    | Value    |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| send    | The recipient should send the requested ADU                                                                                                                                                                                                                                                  | 0        |
| revoke  | The recipient should revoke this ADU                                                                                                                                                                                                                                                         | 1        |
|         | Not allowed                                                                                                                                                                                                                                                                                  | 2        |
| adjust  | The recipient should adjust its systems with the data contained in this ADU                                                                                                                                                                                                                  | 3        |
| resend  | The recipient should resend the requested ADU                                                                                                                                                                                                                                                | 4        |
| process | The recipient should process this ADU and all ADUs recursively linked through <code>previousAdu</code>                                                                                                                                                                                       | 5        |
| wait    | The recipient should wait for further ADUs before it processes the content of this ADU. The sender may indicate the start to process this ADU in a new ADU recursively linked to this ADU through <code>previousAdu</code> with an <code>ActionCode</code> indicating <code>process</code> . | 6        |
|         | Values reserved for future CEN and ISO use                                                                                                                                                                                                                                                   | 7.. 127  |
|         | Values reserved for private use                                                                                                                                                                                                                                                              | 128..255 |

### 6.3.2 User identification

The data type `UserId` is a data type used in most ADUs to identify a user. This data type is extended in this standard over the definition in ISO 17573-3. The data elements `pan`, `contractSerialNumber`, `obeId`, `equipmentIccId` and `customerId` are identical to the definition in ISO 17573-3. The data element `efcContextMark` was added in this standard to allow the aggregation of an 18-digit OBE identifier.

A user can be identified in various ways, and by different methods. The data type `UserId` is represented as a record (ASN.1 SEQUENCE) of different optional data elements. At least one of the included data elements shall be stated when the data element `userId` is used. The only exception is the data element `efcContextMark` which shall only be used in- combination with the data element `obeId`. On the other hand, `obeId` may also be stated without the data element `efcContextMark`.

Table 12 lists the data elements of the data type `UserId`, which is formally specified in Annex A.

**Table 12 — Data elements of `UserId`**

| Data element                      | Data type/data description                                                                                                                                                                                                                                                                                                                 | Status |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>pan</code>                  | <code>PersonalAccountNumber</code> (imported from ISO 17573-3)<br>This data element may optionally be used to identify the user by their personal account number.                                                                                                                                                                          | 0      |
| <code>contractSerialNumber</code> | <code>ContractSerialNumber</code> (imported from ISO 17573-3)<br>This data element may optionally be used to identify the user by their contract serial number.                                                                                                                                                                            | 0      |
| <code>licencePlateNumber</code>   | <code>Lpn</code> (imported from ISO 17573-3)<br>This data element may optionally be used to identify the user by their nationality and licence plate number.                                                                                                                                                                               | 0      |
| <code>obeId</code>                | <code>ObeId</code> (imported from ISO 17573-3)<br>This data element may optionally be used to identify the user by the OBE identifier.<br>The data element <code>efcContextMark</code> may be used to provide additional information about the OBE, if needed.                                                                             | 0      |
| <code>equipmentIccId</code>       | <code>EquipmentIccId</code> (imported from ISO 17573-3)<br>This data element may optionally be used to identify the user by their integrated circuit card (ICC).                                                                                                                                                                           | 0      |
| <code>customerId</code>           | OCTET STRING<br>This data element may optionally be used to identify the user by their customer identification issued by the TSP.                                                                                                                                                                                                          | 0      |
| <code>efcContextMark</code>       | <code>EfcContextMark</code> (imported from ISO 17573-3)<br>This data element may optionally be used to provide additional information about an OBE. It shall not be used without the data element <code>obeId</code> as an identification of a user.<br>NOTE 1 <code>efcContextMark</code> is not suitable to identify the user by itself. | 0      |

### 6.3.3 Version and validity of information

Some data exchange over the back-office interfaces is valid for a limited time. The data type `VersionAndValidity` is used to indicate such a limitation and additionally adds a mechanism for a version control of such provided information.

Table 13 lists the data elements of the data type `VersionAndValidity`, which is formally specified in Annex A.

**Table 13 — Data elements of `VersionAndValidity`**

| Data element           | Data type/data description                                                                                                                                                                                                                                                                        | Status |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>version</code>   | <code>VersionId</code> (see Table 14)<br>This data element shall contain a unique version information of the information to which it refers.<br>NOTE 2 The format of the version information is defined by the originator or sender of the information and is outside the scope of this standard. | M      |
| <code>validFrom</code> | <code>GeneralizedTime</code><br>This data element shall contain the starting date and time of the validity of the information to which it refers.<br>NOTE 3 The decision to use UTC or local time needs to be bilaterally agreed between TC and TSP.                                              | M      |

Table 14 lists the data elements of the data type `VersionId`, which is formally specified in Annex A.

Table 14 — Data elements of `VersionId`

| Data element | Data type/data description                                                                                                                                                                    | Status |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
|              | <code>OCTET STRING</code><br>This data element shall contain a unique identification of the version of an object.<br>NOTE 4 An object may be a list of data elements of a specific data type. | M      |

#### 6.3.4 Textual descriptions

A textual description can be provided as a text in a specified language.

The data type `TextualDescription` can be provided as a list (ASN.1 SEQUENCE OF) of elements if a textual description is needed in more than one language.

Table 15 describes the data elements of `TextualDescription`, which is formally defined in Annex A.

Table 15 — Data elements of `TextualDescription`

| Data element              | Data type/data description                                                                                                                               | Status |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>textLanguage</code> | <code>LanguageId</code> defined as <code>UTF8String SIZE(2)</code><br>This data element shall contain a two-letter language code according to ISO 639-1. | M      |
| <code>text</code>         | <code>UTF8String</code><br>This data element shall contain the textual description in the language indicted in data element <code>textLanguage</code> .  | M      |

#### 6.3.5 Authentication of data elements

The authentication on the level of the APDU is provided in the data element `infoExchangeAuthenticator` over the whole data element `infoExchangeContent`.

The authentication on the level of various data elements inside of the ADUs is provided in the respective data elements `subRecordAuthenticator`, which is calculated over the indicated data elements.

Table 16 describes the data elements of the data type `AuthenticatorEfc`, which is formally defined in Annex A.

Table 16 — Data elements of `AuthenticatorEfc`

| Data element                     | Data type/data description                                                                                                                                                                                                                                                                                                          | Status |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>tbsAuthenticatorEfc</code> | <code>TbsAuthenticatorEfc</code> (see Table 17)<br>This data element shall contain either information about a previously transmitted certificate or the certificate itself, which shall be used to generate the signature.                                                                                                          | M      |
| <code>signatureAlgorithm</code>  | <code>AlgorithmIdentifier</code> (see Table 18) using the parameter <code>Pkcs1Algorithms</code><br>This data element may optionally contain the algorithm used to generate the signature.<br>If present, it shall contain the same value as the data element <code>signatureAlgorithm</code> in <code>tbsAuthenticatorEfc</code> . | O      |
| <code>signatureValue</code>      | <code>OCTET STRING</code><br>This data element shall contain signature over the hashed transformation of the cXER encoded data in data element <code>tbsAuthenticatorEfc</code> .                                                                                                                                                   | M      |

Table 17 describes the data elements of the data type `AuthenticatorEfc`, which is formally defined in Annex A.

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**Table 17 — Data elements of `TbsAuthenticatorEfc`**

| Data element           | Data type/data description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Status |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Version                | INTEGER ranging from 0 to $2^{16}-1$ with a default value of 1.<br>This data element may optionally contain a version number of the certificate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | O      |
| signatureAlgorithm     | AlgorithmIdentifier (see Table 18) using the parameter Pkcs1Algorithms<br>This data element shall contain the algorithm used to generate the signature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | M      |
| Issuer                 | Name (see Table 67)<br>This data element shall contain the name of the issuer to be used for the calculation of the signature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | M      |
| serialNumber           | CertificateSerialNumber defined as INTEGER<br>This data element shall contain the unique serial number of the certificate to be used for the calculation of the signature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | M      |
| apduContentDigest      | ApduContentDigest (see Table 19)<br>This data element shall contain the hash calculated of the cXER encoded payload and the identifier of the hash algorithm used to calculate the hash.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | M      |
| signatureDate          | GeneralizedTime<br>This data element shall contain the time stamp of the generated signature.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | M      |
| certificates           | List (ASN.1 SEQUENCE OF) of zero or more records of data type EncryptionKeyId (see Table 65)<br>This data element may optionally contain all certificates needed to calculate the hash and the signature if they were not previously shared.<br>The data element certificate shall be selected in the data type EncryptionKeyId to transmit the certificate.<br>NOTE It is not advised to send the certificates to calculate the signature in the same APDU as the signature itself, as this poses the risk of providing correctly signed data by an impostor. It would be better to provide the certificate by another means via a trusted channel or in a separate APDU via the TrustObjectAdu (see Table 57). | O      |
| signingCertificateHash | CertHash (see Table 20)<br>This data element may optionally contain a hash code calculated over the certificate provided in the data element certificates used to generate the signature. It may optionally be used to avoid an attack based on reissuing a certificate by a key certification authority with the same identification but other certificate attributes, i.e. the certificates to sign the APDU and to verify it are not identical.                                                                                                                                                                                                                                                               | O      |

Table 18 describes the data elements of the data type `AlgorithmIdentifier`, which is formally defined in Annex A.

**Table 18 — Data elements of `AlgorithmIdentifier`**

| Data element | Data type/data description                                                                                                                                  | Status |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| algorithm    | This data element shall contain the identification of the algorithm provided in the first parameter of the <code>AlgorithmIdentifier</code> .               | M      |
| parameters   | This data element may optionally contain additional parameters for the algorithm provided in the second parameter of the <code>AlgorithmIdentifier</code> . | O      |

Table 19 describes the data elements of the data type `ApduContentDigest`, which is formally defined in Annex A.

**Table 19 — Data elements of `ApduContentDigest`**

| Data element         | Data type/data description                                                                                                                                                                                                                                                        | Status |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| hashAlgorithm        | AlgorithmIdentifier (see Table 18) using the parameter <code>OaepPssDigestAlgorithms</code><br>This data element shall contain the algorithm used to generate the hash.                                                                                                           | M      |
| hashedMessageContent | This data element shall contain the hash calculated of the cXER encoded payload of the data to be authenticated.<br>EXAMPLE This data element contains the cXER encoded content of <code>infoExchangeContent</code> to calculate the authenticator in <code>InfoExchange</code> . | M      |

Table 20 describes the data elements of the data type `CertHash`, which is formally defined in Annex A.

**Table 20 — Data elements of `CertHash`**

| Data element  | Data type/data description                                                                                                                                              | Status |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| hashAlgorithm | AlgorithmIdentifier (see Table 18) using the parameter <code>OaepPssDigestAlgorithms</code><br>This data element shall contain the algorithm used to generate the hash. | M      |
| certHash      | OCTET STRING<br>This data element shall contain the hash calculated over the certificate used to calculate the signature.                                               | M      |

The private key used for generating the signature shall belong to the signing public key certificate of the entity or to the certificate in the field certificates, if present.

The signature and hash algorithms are specified in 7.3.3.

### 6.3.6 Payment amount

The data type `VersionAndValidity` is used to indicate the amount to be paid either in the definition tariff of a toll domain or in its usage.

Table 21 describes the data elements of the data type `PaymentAmount`, which is formally defined in Annex A.

**Table 21 — Data elements of `PaymentAmount`**

| Data element     | Data type/data description                                                                                                                           | Status |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| paymentFeeAmount | INTEGER ranging from $-2^{63}$ to $2^{63}-1$<br>This data element shall contain the net amount.                                                      | M      |
| paymentFeeUnit   | PayUnit (imported from ISO 17573-3)<br>This data element shall contain the currency and the unit of the amount and currency.<br>EXAMPLE in EUR cents | M      |
| vatRate          | INTEGER ranging from 0 to 10000<br>This data element may optionally contain the VAT rate to be applied to the amount in 0,01 %.                      | O      |

### 6.3.7 Geographical points and areas

The data type `Point` contains a selection (ASN.1 CHOICE) between two different data elements, allowing to provide absolute coordinates or relative coordinates in relation to the previous point.

NOTE 1 This data element is defined differently in this standard from the definition in ISO 17573-3

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Table 22 describes the data type and the data elements in the CHOICE statement, which is formally defined in Annex A.

**Table 22 — Data elements of `Point`**

| Data element                          | Data type/data description                                                                                                                                       | Status |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>absolutePointCoordinates</code> | <code>AbsolutePosition3d</code> (imported from ISO 17573-3)<br>This data element shall contain (if used) the absolute coordinates of a point.                    | N/A    |
| <code>relativePointCoordinates</code> | <code>RelativePosition3d</code> (imported from ISO 17573-3)<br>This data element shall contain (if used) the coordinates of point relative to a reference point. | N/A    |

Table 23 describes the data elements of the data type `Link`, which is formally defined in Annex A.

**Table 23 — Data elements of `Link`**

| Data element                    | Data type/data description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Status |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>linkId</code>             | <code>LinkId</code> (see Table 23)<br>This data element shall contain a unique identifier of a link within the toll context partition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | M      |
| <code>startPoint</code>         | <code>Point</code> (see Table 22)<br>This data element shall contain the start point of the link.<br>This data element may be specified by using the data element <code>relativePointCoordinates</code> to provide relative coordinates to the data element <code>chargeObjectRefPoint</code> in data type <code>Section</code> (see Table 158), if it is provided, or to the data element <code>geoRefPoint</code> in data type <code>TollContextPartitionOverview</code> (see Table 150), if it is provided.                                                                                                                                                                                              | M      |
| <code>intermediatePoints</code> | List (ASN.1 SEQUENCE OF) of zero or more elements of data type <code>Point</code> (see Table 22)<br>This data element may optionally contain (a unidirectional list of) intermediate point(s) from the start point to the end point of the link, to provide a more accurate model of the link.<br>This data element may be specified by using the data element <code>relativePointCoordinates</code> to provide relative coordinates to the data element <code>chargeObjectRefPoint</code> in data type <code>Section</code> (see Table 158), if it is provided, or to the data element <code>geoRefPoint</code> in data type <code>TollContextPartitionOverview</code> (see Table 150), if it is provided. | 0      |
| <code>endpoint</code>           | <code>Point</code> (see Table 22)<br>This data element shall contain the end point of the link.<br>This data element may be specified by using the data element <code>relativePointCoordinates</code> to provide relative coordinates to the data element <code>chargeObjectRefPoint</code> in data type <code>Section</code> (see Table 158), if it is provided, or to the data element <code>geoRefPoint</code> in data type <code>TollContextPartitionOverview</code> (see Table 150), if it is provided.                                                                                                                                                                                                | M      |

Additional semantics for Table 23:

Figure 7 explains the meaning and usage of the elements of a link.

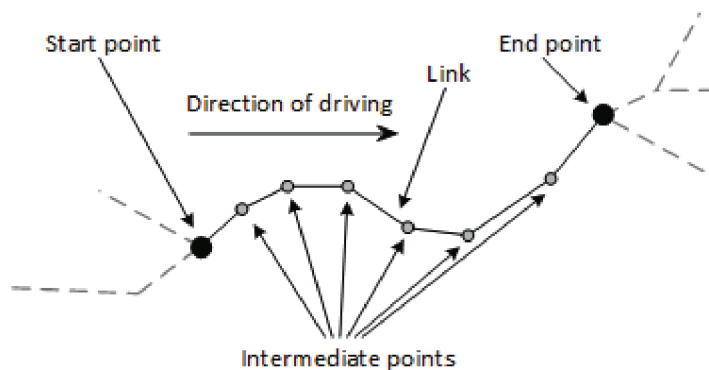


Figure 7 — Elements of a link

Table 24 describes the data type `Polygon`, which is formally defined in Annex A.

NOTE 2 The data type `Polygon` does not contain any data elements.

Table 24 — Data elements of `Polygon`

| Data element | Data type/data description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Status |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| -            | <p>List (ASN.1 SEQUENCE OF) of three or more elements of data type <code>Point</code> (see Table 22)</p> <p>NOTE 3 A polygon consists of at least three points to form an area.</p> <p>The segments of the polygon shall be created by connecting each of the points with its successor point in a clockwise direction.</p> <p>The polygon shall be closed by connecting the last point in the list with the first point.</p> <p>The points shall be specified in a way that means the connections between the points do not intersect.</p> <p>The inner side of the polygon (tolled area) is defined as the geographical area that is located at the right-hand side when moving on a polygon segment from its start point to its end point.</p> | M      |

Table 25 describes the data elements of the data type `SupportingPoint`, which is formally defined in Annex A.

Table 25 — Data elements of `SupportingPoint`

| Data element                         | Data type/data description                                                                                                                                                                                                         | Status |
|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>supportPoint</code>            | <p><code>Point</code> (see Table 22)</p> <p>This data element shall contain the location of a point on the section.</p>                                                                                                            | M      |
| <code>supportPointDescription</code> | <p><code>UTF8String</code></p> <p>This data element may optionally contain a textual description of the supporting point and the adjacent road.</p>                                                                                | 0      |
| <code>distanceToNextRoad</code>      | <p><code>Distance</code> (imported from ISO 17573-3)</p> <p>This data element may optionally contain the minimum distance from the supporting point defined in the data element <code>supportPoint</code> to an adjacent road.</p> | 0      |

### 6.3.8 Textual descriptions or attachments

The data type `InfoData` contains a selection (ASN.1 CHOICE) between two different data elements, allowing to provide information as a textual description or within an attached document. Table 26 describes the data type and the data elements in the CHOICE statement, which is formally defined in Annex A.

**Table 26 — Data elements of `InfoData`**

| Data element            | Data type/data description                                                                                                           | Status |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>textItem</code>   | OCTET STRING<br>This data element shall contain (if used) a textual description.                                                     | N/A    |
| <code>binaryItem</code> | BinaryItem (see Table 27)<br>This data element shall contain (if used) a document in different formats.<br>EXAMPLE Word, PDF or ZIP. | N/A    |

Table 27 describes the data elements of the data type `BinaryItem`, which is formally defined in Annex A.

**Table 27 — Data elements of `BinaryItem`**

| Data element           | Data type/data description                                                                                                             | Status |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>content</code>   | OCTET STRING<br>This data element shall contain the binary content.                                                                    | M      |
| <code>mediaType</code> | OCTET STRING<br>This data element shall contain the IANA Registry application media-type describing the type of <code>Content</code> . | M      |

### 6.3.9 Identification of toll events

The data type `TollEventId` contains a selection (ASN.1 CHOICE) among a substructure and data elements, each one specifying a different way to uniquely specify a toll event. Table 28 describes the data type and the data elements in the CHOICE statement, which are formally defined in Annex A.

**Table 28 — Data elements of `TollEventId`**

| Data element                        | Data type/data description                                                                                                                                                                                                                   | Status |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>tollDeclarationEventId</code> | Record (ASN.1 SEQUENCE) made of the data elements described in Table 29.<br>This data structure shall contain (if used) the identification of a toll declaration by means of an identification of either a charge report or usage statement. | N/A    |
| <code>tollTransactionEventId</code> | INTEGER ranging from 0 to $2^{63}-1$<br>This data element shall contain (if used) a unique identification of a toll event issued by the TC.                                                                                                  | N/A    |
| <code>transactionCounter</code>     | INTEGER ranging from 0 to 4095<br>This data element shall contain (if used) an identification of a toll event read from a DSRC OBE as part of the equipment status during a GET statement (see EN ISO 14906).                                | N/A    |

Table 29 describes the data elements of the sub-structure of the data element `tollDeclarationEventId`, which is formally defined in Annex A.

**Table 29 — Data elements of `tollDeclarationEventId`**

| Data element                     | Data type/data description                                                                                                                                                      | Status |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>chargeReportCounter</code> | INTEGER ranging from 0 to $2^{32}-1$<br>This data element shall contain an identification of a charge report (see definition of <code>chargeReportCounter</code> in Table 224). | M      |
| <code>usageStatementId</code>    | INTEGER ranging from 0 to $2^{16}-1$<br>This data element shall contain an identification of a usage statement (see definition of <code>usageStatementId</code> in Table 225).  | M      |

## 6.4 RequestAdu data structure

The `RequestAdu` data type is used to indicate a general readiness to receive, or to specifically request a data structure to be sent.

The data type `RequestAdu` contains a selection (ASN.1 CHOICE) among different substructures, each one specifying a different type of request. Table 30 describes the data type and the data elements in the CHOICE statement, which are formally defined in Annex A.

**Table 30 — Data elements of `RequestAdu`**

| Data element                            | Data type                                                               | Status |
|-----------------------------------------|-------------------------------------------------------------------------|--------|
| <code>genericRequest</code>             | Record (ASN.1 SEQUENCE) made of the data elements described in Table 31 | N/A    |
| <code>exceptionListRequest</code>       | Record (ASN.1 SEQUENCE) made of the data elements described in Table 32 | N/A    |
| <code>trustObjectRequest</code>         | Record (ASN.1 SEQUENCE) made of the data elements described in Table 33 | N/A    |
| <code>tollDeclarationRequest</code>     | Record (ASN.1 SEQUENCE) made of the data elements described in Table 36 | N/A    |
| <code>userDetailsRequest</code>         | Record (ASN.1 SEQUENCE) made of the data elements described in Table 37 | N/A    |
| <code>cccEventRequest</code>            | Record (ASN.1 SEQUENCE) made of the data elements described in Table 40 | N/A    |
| <code>userListRequest</code>            | Record (ASN.1 SEQUENCE) made of the data elements described in Table 41 | N/A    |
| <code>mediaSettlementDataRequest</code> | Record (ASN.1 SEQUENCE) made of the data elements described in Table 42 | N/A    |
| <code>qaParameterRequest</code>         | Record (ASN.1 SEQUENCE) made of the data elements described in Table 43 | N/A    |
| <code>enforcementStatusRequest</code>   | Record (ASN.1 SEQUENCE) made of the data elements described in Table 44 | N/A    |

Semantics of the data elements:

The semantics of the various types of requests are described in the following sub-chapters.

### 6.4.1 Generic request

A generic request can be used to state the general readiness of the sender to receive ADUs of any type, to request the resending of a specific APDU identified through an `apduIdentifier` or a list of specific ADUs identified through a list of `aduIdentifier`. It can also be used to request the sending of a new version of a specific type of ADU and to revoke a previously sent APDU identified through an `apduIdentifier` or a list of specific ADUs identified through a list of `aduIdentifier`.

Table 31 describes the sub-structure of the data element `genericRequest`, which is formally defined in Annex A.

**Table 31 — Data elements of the sub-structure of `genericRequest`**

| Data element                  | Data type/data description                                                                                                                                                                                                                                | Status |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>apduIdentifier</code>   | <code>ApduIdentifier</code><br>This data element may optionally be used to request that the APDU carrying the same identifier is resent.                                                                                                                  | 0      |
| <code>requestedAduType</code> | <code>AduType</code> (see Table 9)<br>This data element may optionally be used to specify the type of the requested ADU.                                                                                                                                  | 0      |
| <code>aduIdentifier</code>    | List (ASN.1 SEQUENCE OF) of one or more records of data type <code>AduIdentifier</code><br>This data element may optionally be used to ask for retransmission of the specified ADUs.                                                                      | 0      |
| <code>actionCode</code>       | <code>ActionCode</code> (see Table 10)<br>This data element may optionally be used to indicate specific actions done by the sender of the request. Only the value <code>send</code> is allowed.                                                           | 0      |
| <code>actionRequest</code>    | <code>ActionCode</code> (see Table 11)<br>This data element may optionally be used to indicate specific actions to be pursued by the receiver of the request. Only the values <code>send</code> , <code>resend</code> or <code>revoke</code> are allowed. | 0      |

The `genericRequest` supports the following functionalities under the following rules:

- A general readiness to receive any type of ADU shall be indicated by omitting all optional data elements in the `genericRequest`. This is the same functionality as sending a `StatusAdu` with a `generalStatusCode` value of `readyToReceive` (see 6.6).
- A request for the resending of one specific APDU shall be indicated by stating `apduIdentifier` and omitting `requestedAduType` and `aduIdentifier` in the `genericRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`.
- A request for the resending of specific ADU's shall be indicated by stating a list of one or more data elements in the `aduIdentifier` and omitting `apduIdentifier` and `requestedAduType` in the `genericRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`.
- A request for the sending of a new version of a specific type of ADU shall be indicated by stating the `requestedAduType` and omitting `apduIdentifier` and `aduIdentifier` in the `genericRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`.
- A request to revoke a specific APDU shall be indicated by stating the `apduIdentifier` and omitting `requestedAduType` and `aduIdentifier` in the `genericRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `revoke`.
- A request to revoke specific ADU's shall be indicated by stating a list of one or more data elements in the `aduIdentifier` and omitting `apduIdentifier` and `requestedAduType` in the `genericRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `revoke`.

#### 6.4.2 Request for an exception list

A request for exception lists can be used to state the general readiness of the sender to receive ADUs of the type `ExceptionListAdu`, to request the resending of previous ADUs of the type `ExceptionListAdu` or the sending of a new exception list in an `ExceptionListAdu`.

The sub-structure of the data element `exceptionListRequest` is described in Table 32 and formally defined in Annex A.

**Table 32 — Data elements of the sub-structure of `exceptionListRequest`**

| Data element                      | Data type/data description                                                                                                                                                                                                                                                                                                                   | Status |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>requestedAduType</code>     | <code>AduType</code> (see Table 9)<br>This data element shall contain the value <code>exceptionListAdu</code> .                                                                                                                                                                                                                              | M      |
| <code>period</code>               | <code>Period</code> (imported from ISO 17573-3)<br>This data element may optionally be used to indicate a certain period of time for the requested exception lists.                                                                                                                                                                          | 0      |
| <code>exceptionListType</code>    | <code>ExceptionListType</code> (see Table 212)<br>This data element may optionally be used to indicate a certain type of a requested exception list.                                                                                                                                                                                         | 0      |
| <code>exceptionListVersion</code> | <code>ExceptionListVersion</code> defined as <code>INTEGER</code> ranging from 0 to 2 <sup>63</sup> -1<br>This data element may optionally be used to indicate a certain version of a requested exception list defined in the data element <code>exceptionListVersion</code> of the data type <code>ExceptionListAdu</code> (see Table 211). | 0      |
| <code>actionCode</code>           | <code>ActionCode</code> (see Table 10)<br>This data element may optionally be used to indicate specific actions done by the sender of the request. Only the value <code>send</code> is allowed.                                                                                                                                              | 0      |
| <code>actionRequest</code>        | <code>ActionCode</code> (see Table 11)<br>This data element may optionally be used to indicate specific actions to be pursued by the receiver of the request. Only the values <code>send</code> or <code>resend</code> are allowed.                                                                                                          | 0      |

The `exceptionListRequest` supports the following functionalities under the following rules:

- A general readiness to receive ADUs of the type `ExceptionListAdu` shall be indicated by omitting all optional data elements in the `exceptionListRequest`.
- A request for the resending of all ADUs of the type `ExceptionListAdu` from a specific period of time shall be indicated by stating `period` and omitting `exceptionListVersion` in the `exceptionListRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`. The data element `exceptionListType` may optionally be specified to request only a certain type of `ExceptionListAdu`.
- A request for the resending of all ADUs of the type `ExceptionListAdu` of a specific type shall be indicated by stating `exceptionListType` in the `exceptionListRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`. The data element `period` and may optionally be specified to request `ExceptionListAdu` from the indicated period.
- A request for the resending of one ADU of the type `ExceptionListAdu` with a specific type and version shall be indicated by stating `exceptionListType` and `exceptionListVersion` and omitting `period` in the `exceptionListRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`.
- A request for the resending of the last ADU of the type `ExceptionListAdu` of a specific type of exception list shall be indicated by stating the `exceptionListType` and omitting `period` and `exceptionListVersion` in the `exceptionListRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`.
- A request for the sending of a new ADU of the type `ExceptionListAdu` of a specific type of exception list shall be indicated by stating the `exceptionListType` and omitting `period` and `exceptionListVersion` in the `exceptionListRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`.

### 6.4.3 Request for trust objects

A request for trust objects can be used to state the general readiness of the sender to receive ADUs of the type `TrustObjectAdu`, to request the resending of the current trust objects or the sending of new trust objects in a `TrustObjectAdu`.

The sub-structure of the data element `trustObjectRequest` is described in Table 33 and formally defined in Annex A.

**Table 33 — Data elements of the sub-structure of `trustObjectRequest`**

| Data element                  | Data type/data description                                                                                                                                                                                                          | Status |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>requestedAduType</code> | <code>AduType</code> (see Table 9)<br>This data element shall contain the value <code>trustObjectAdu</code> .                                                                                                                       | M      |
| <code>trustObjectSpec</code>  | <code>TrustObjectSpec</code> (see Table 34)<br>This data element may optionally be used to indicate the type and purpose of the requested trust object.                                                                             | 0      |
| <code>actionCode</code>       | <code>ActionCode</code> (see Table 10)<br>This data element may optionally be used to indicate specific actions done by the sender of the request. Only the value <code>send</code> is allowed.                                     | 0      |
| <code>actionRequest</code>    | <code>ActionCode</code> (see Table 11)<br>This data element may optionally be used to indicate specific actions to be pursued by the receiver of the request. Only the values <code>send</code> or <code>resend</code> are allowed. | 0      |

The `trustObjectRequest` supports the following functionalities under the following rules:

- A general readiness to receive ADUs of the type `TrustObjectAdu` shall be indicated by omitting all optional data elements in the `trustObjectRequest`.
- A request for the resending of the current trust objects of a specific type shall be indicated by stating the requested type of trust object in the data element `trustObjectSpec` in the `trustObjectRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`.
- A request for the sending of new trust objects of a specific type of trust object shall be indicated by stating the requested type of trust object in the data element `trustObjectSpec` in the `trustObjectRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`.

Table 34 describes the data elements of the data type `TrustObjectSpec`, which is formally defined in Annex A.

**Table 34 — Data elements of `TrustObjectSpec`**

| Data element                       | Data type/data description                                                                                                                                                                         | Status |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>typeOfTrustObject</code>     | Record (ASN.1 SEQUENCE) of data type <code>RequestedTrustObjectType</code> (see Table 35)<br>This data element shall contain the type of the requested trust object.                               | M      |
| <code>purposesOfTrustObject</code> | List (ASN.1 SEQUENCE OF) of one or more records of data type <code>TrustObjectPurpose</code> (see Table 58)<br>This data element may optionally contain the purpose of the requested trust object. | 0      |

The data type `RequestedTrustObjectType` contains a selection (ASN.1 CHOICE) among different data elements, each one specifying a different type of trust object. Table 35 describes the data type and the data elements in the CHOICE statement, which is formally defined in Annex A.

**Table 35 — Data elements of RequestedTrustObjectType**

| Data element      | Data type/data description                                                                                                    | Status |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------|--------|
| certificates      | CertificateType (see Table 62)                                                                                                | N/A    |
| publicKeys        | PublicKeyType (see Table 64)                                                                                                  | N/A    |
| dsrCMasterKeys    | NULL, send only tag <sup>[3]</sup> to indicate the request for DSRC master keys in the data type DsrcKeyObject (see Table 65) | N/A    |
| macMasterKeys     | NULL, send only tag <sup>[4]</sup> to indicate the request for MAC master keys in the data type DsrcKeyObject (see Table 65)  | N/A    |
| dsrCKeyRefs       | ReferenceType (see Table 76)                                                                                                  | N/A    |
| otherTrustObjects | TrustObjectType (see Table 78)                                                                                                | N/A    |

A detailed description of trust object types and trust object purposes is in subclause 6.6.

**NOTE** This document does not limit the use of individual combinations of trust object types and trust object purposes. In real systems, however, some of the theoretically possible combinations of these two parameters do not make sense and are not normally used in implementations. The correct use of these parameters remains under the responsibility of either the implementor(s) or the entities operating the TC and TSP systems, or both.

#### 6.4.4 Request for toll declarations

A request for toll declarations can be used to state the general readiness of the sender to receive ADUs of the type TollDeclarationAdu, to request the resending of specific toll declarations or the sending of new (unsent) toll declarations in a TollDeclarationRequest.

The sub-structure of the data element tollDeclarationRequest is described in Table 36 and formally defined in Annex A.

**Table 36 — Data elements of the sub-structure of tollDeclarationRequest**

| Data element     | Data type/data description                                                                                                                                                                   | Status |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| requestedAduType | AduType (see Table 9)<br>This data element shall contain the value tollDeclarationAdu.                                                                                                       | M      |
| userId           | UserId (see Table 12)<br>This data element may optionally be used to indicate the user for the requested toll declarations.                                                                  | 0      |
| period           | Period (imported from ISO 17573-3)<br>This data element may optionally be used to indicate the start of a period of time for the requested toll declarations.                                | 0      |
| actionCode       | ActionCode (see Table 10)<br>This data element may optionally be used to indicate specific actions done by the sender of the request. Only the value send is allowed.                        | 0      |
| actionRequest    | ActionCode (see Table 11)<br>This data element may optionally be used to indicate specific actions to be pursued by the receiver of the request. Only the values send or resend are allowed. | 0      |

The tollDeclarationRequest supports the following functionalities under the following rules:

- A general readiness to receive ADUs of the type TollDeclarationAdu shall be indicated by omitting all optional data elements in the tollDeclarationRequest.
- A request for the resending of all ADUs of the type TollDeclarationAdu for a specific user in a specific period of time shall be indicated by stating userId and period in the tollDeclarationRequest. The actionCode shall contain the value send and the actionRequest shall contain the value resend.

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- A request for the resending of all ADUs of the type `TollDeclarationAdu` for all users in a specific period of time shall be indicated by stating `period` and omitting `userId` in the `tollDeclarationRequest`. The `actionCode` shall contain the value `send` and the `actionRequest` shall contain the value `resend`.
- A request for the sending of all new (unsent) toll declarations for a specific user shall be indicated by stating `userId` and omitting `period` in the `tollDeclarationRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`.
- A request for the sending of all new (unsent) toll declarations for all users in a specific period of time shall be indicated by stating `period` and omitting `userId` in the `tollDeclarationRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`.
- A request for the sending of all new (unsent) toll declarations for all users shall be indicated by omitting `userId` and `period` in the `tollDeclarationRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`.

#### 6.4.5 Request for user details

A request for user details can be used to state the general readiness of the sender to receive ADUs of the type `ProvideUserDetailsAdu` or to request the sending of user details in a `ProvideUserDetailsAdu`.

The sub-structure of the data element `userDetailsRequest` is described in Table 37 and formally defined in Annex A.

Table 37 — Data elements of the sub-structure of `userDetailsRequest`

| Data element                           | Data type/data description                                                                                                                                                                                                                                                                                      | Status |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| <code>requestedAduType</code>          | <code>AduType</code> (see Table 9)<br>This data element shall contain the value <code>provideUserDetailsAdu</code> .                                                                                                                                                                                            | M      |
| <code>userId</code>                    | <code>UserId</code> (see Table 12)<br>This data element may optionally be used to indicate the user for the requested user details.                                                                                                                                                                             | 0      |
| <code>listOfParametersRequested</code> | List (ASN.1 SEQUENCE OF) of one or more records of data type <code>UserParameterRequest</code> (see Table 38)<br>This data element may optionally be used to specify the list of requested parameters.                                                                                                          | 0      |
| <code>userDetailsRequestReason</code>  | <code>UserDetailsRequestReason</code> (see Table 39)<br>This data element may optionally be used to indicate a reason for the request for user details.                                                                                                                                                         | 0      |
| <code>period</code>                    | <code>Period</code> (imported from ISO 17573-3)<br>This data element may optionally be used to indicate a certain point in time for the requested user details.<br>The data elements <code>beginOfPeriod</code> and <code>endOfPeriod</code> in the data type <code>Period</code> shall contain the same value. | 0      |
| <code>actionCode</code>                | <code>ActionCode</code> (see Table 10)<br>This data element may optionally be used to indicate specific actions done by the sender of the request. Only the value <code>send</code> is allowed.                                                                                                                 | 0      |
| <code>actionRequest</code>             | <code>ActionCode</code> (see Table 11)<br>This data element may optionally be used to indicate specific actions to be pursued by the receiver of the request. Only the value <code>send</code> is allowed.                                                                                                      | 0      |

The `userDetailsRequest` supports the following functionalities under the following rules:

- A general readiness to receive ADUs of the type `ProvideUserDetailsAdu` shall be indicated by omitting all optional data elements in the `userDetailsRequest`.

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- A request for the sending of the parameters specified in `listOfParametersRequested` for a specific user in a specific period of time shall be indicated by stating `userId`, `listOfParametersRequested` and `period` in the `userDetailsRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`. The data element `userDetailsRequestReason` may optionally be specified to a reason for the request.
- A request for the sending of all parameters for a specific user in a specific period of time shall be indicated by stating the `userId` and `period` and omitting `listOfParametersRequested` in the `userDetailsRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`. The data element `userDetailsRequestReason` may optionally be specified to a reason for the request.
- A request for the sending of the current parameters specified `listOfParametersRequested` for a specific user shall be indicated by stating `userId` and `listOfParametersRequested` and omitting `period` in the `userDetailsRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`. The data element `userDetailsRequestReason` may optionally be specified to a reason for the request.
- A request for the sending of all current parameters for a specific user shall be indicated by stating `userId` and omitting `period` and `listOfParametersRequested` in the `userDetailsRequest`. The `actionCode` and the `actionRequest` shall contain the value `send`. The data element `userDetailsRequestReason` may optionally be specified to a reason for the request.

Table 38 lists the defined values and semantics of `UserParameterRequest` in decimal notation. Each value identifies the respective parameter in Table 306.

**Table 38 — Values and semantics of `UserParameterRequest`**

| Name                                      | Semantics                                                                                                                                                                                                                                                                                                                 | Value |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|                                           | Value reserved for future CEN and ISO use                                                                                                                                                                                                                                                                                 | 0     |
| <code>contractSerialNumber</code>         | Request to provide the number of the contract of the user in the system of the TSP.                                                                                                                                                                                                                                       | 1     |
| <code>contractValidity</code>             | Request to provide the <code>contractValidity</code> as used in the parameter <code>contval</code> in the <code>EfcContainer</code> of the OBE.                                                                                                                                                                           | 2     |
| <code>driverCharacteristics</code>        | Request to provide the class of the driver and purpose of a trip for a specific trip of a vehicle.<br>A trip shall be specified by providing a <code>userId</code> and specific point in time in the data element <code>period</code> , where the <code>startTime</code> and <code>endTime</code> contain the same value. | 3     |
| <code>efcContextMark</code>               | Request to provide the EFC context mark of the OBE                                                                                                                                                                                                                                                                        | 4     |
| <code>environmentalCharacteristics</code> | Request to provide the environmental characteristics <code>euroValue</code> and <code>copValue</code> of a vehicle                                                                                                                                                                                                        | 5     |
| <code>engineCharacteristics</code>        | Request to provide the vehicle's engine type and fuel characteristics.                                                                                                                                                                                                                                                    | 6     |
| <code>equipmentObuId</code>               | Request to provide the unique number of the OBE defined by the manufacturer.                                                                                                                                                                                                                                              | 7     |
| <code>equipmentStatus</code>              | Request to provide the operator-specific EFC application-related information of the OBE.                                                                                                                                                                                                                                  | 8     |
| <code>paymentMeans</code>                 | Request to provide the payment means of the user and its expiry date.                                                                                                                                                                                                                                                     | 9     |
| <code>paymentMeansBalance</code>          | Request to provide the balance of the payment means of the user.<br>NOTE 1 Typically requested together with <code>payUnit</code> .                                                                                                                                                                                       | 10    |
| <code>payUnit</code>                      | Request to provide the <code>payUnit</code> for the <code>paymentMeansBalance</code> .<br>NOTE 2 Typically requested together with <code>paymentMeansBalance</code> .                                                                                                                                                     | 11    |
| <code>personalAccountNumber</code>        | Request to provide the PAN of the OBE.                                                                                                                                                                                                                                                                                    | 12    |

**Table 38 (continued)**

| Name                           | Semantics                                                                                                                                                                                                                                                                       | Value |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| provider                       | Request to provide the identification of the contract issuer of the OBE or for the vehicle.<br>NOTE 3 The provider may identify the contracting TSP in an ANPR scheme without an OBE.                                                                                           | 13    |
| receiptContract                | Request to provide the identification for a contract for a specified period.                                                                                                                                                                                                    | 14    |
| validityOfContract             | Request to provide information about any validity restrictions and the validity period of the user's contract.                                                                                                                                                                  | 15    |
| vehicleAuthenticator           | Request to provide an authenticator calculated over the vehicle data at the time of entry.                                                                                                                                                                                      | 16    |
| vehicleClass                   | Request to provide the class of the vehicle.                                                                                                                                                                                                                                    | 17    |
| vehicleDimensions              | Request to provide the dimensions of the vehicle.                                                                                                                                                                                                                               | 18    |
| vehicleLicencePlateNumber      | Request to provide the licence plate number and nationality of the vehicle.                                                                                                                                                                                                     | 19    |
| vehicleIdentificationNumber    | Request to provide the unique vehicle identification number of the vehicle.                                                                                                                                                                                                     | 20    |
| vehicleWeightLaden             | Request to provide the laden weight of a vehicle for a specific trip or time span.<br>NOTE 4 A trip is specified through the <code>userId</code> and <code>period</code> , where <code>startTime</code> and <code>endTime</code> have the same value.                           | 21    |
| vehicleWeightLimits            | Request to provide the three weight limits <code>vehicleMaxLadenWeight</code> , <code>vehicleTrainMaximumWeight</code> and <code>vehicleWeightUnladen</code> of a vehicle.<br>NOTE 5 This parameter does not include the <code>vehicleTechnicalPermissibleMaxLadenMass</code> . | 22    |
| vehicleAxles                   | Request to provide the height over the first axle and the number of axles of a vehicle.                                                                                                                                                                                         | 23    |
| exhaustEmissionValues          | Request to provide the exhaust emission values of a vehicle.                                                                                                                                                                                                                    | 24    |
| dieselEmissionValues           | Request to provide the diesel emission values of a vehicle.                                                                                                                                                                                                                     | 25    |
| userPostalAddress              | Request to provide the postal address of the holder of a vehicle, i.e., the user.                                                                                                                                                                                               | 26    |
| preferredUserLanguage          | Request to provide the preferred language of communication of a user.                                                                                                                                                                                                           | 27    |
| icc                            | Request to provide the number of the ICC.                                                                                                                                                                                                                                       | 28    |
| co2EmissionValueLoad           | Request to provide the specific CO <sub>2</sub> emission of a vehicle in g/t km.                                                                                                                                                                                                | 29    |
| initialVehicleRegistrationDate | Request to provide the initial date of registration of a vehicle.                                                                                                                                                                                                               | 30    |
| euVehicleGroup                 | Request to provide the EU vehicle group of a vehicle.                                                                                                                                                                                                                           | 31    |
| engineDetails                  | Request to provide the engine capacity and net power of a vehicle.                                                                                                                                                                                                              | 32    |
| cabType                        | Request to provide the cabin type of a vehicle.<br>NOTE 6 Used to distinguish between the usage profile long haul (LH) and regional distribution (RD) for the EU vehicle sub-group.                                                                                             | 33    |
| co2Class                       | Request to provide the CO <sub>2</sub> class of a vehicle.                                                                                                                                                                                                                      | 34    |
| chassisType                    | Request to provide the chassis type of a vehicle.                                                                                                                                                                                                                               | 35    |
| wheelsConfiguration            | Request to provide the configuration of wheels of a vehicle.                                                                                                                                                                                                                    | 36    |

**Table 38 (continued)**

| Name                                    | Semantics                                                                                                                                      | Value    |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| vehicleTechnicalPermissibleMaxLadenMass | Request to provide the technical permissible maximum laden mass of a vehicle.<br>NOTE 7 This parameter is not included in vehicleWeightLimits. | 37       |
|                                         | Value reserved for future CEN and ISO use                                                                                                      | 38..127  |
|                                         | Values reserved for private use                                                                                                                | 128..255 |

Table 39 lists the defined values and semantics of `UserDetailsRequestReason` in decimal notation.

**Table 39 — Values and semantics of `UserDetailsRequestReason`**

| Name                        | Semantics                                                                | Value    |
|-----------------------------|--------------------------------------------------------------------------|----------|
| generalInterest             | Request without a specified reason.                                      | 0        |
| allowingCalculatingFee      | Request to calculate the amount due for the use of a charge object.      | 1        |
| incompleteCccReadout        | Request to supplement a CCC readout of an OBE.                           | 2        |
| forwardingEnforcementTicket | Request to support the generation of an enforcement case against a user. | 3        |
|                             | Values reserved for future CEN and ISO use                               | 4..127   |
|                             | Values reserved for private use                                          | 128..255 |

#### 6.4.6 Request for CCC events

A request for CCC events can be used to state the general readiness of the sender to receive ADUs of the type `ReportCccEventAdu`, to request the resending of specific CCC events or to send all not yet sent CCC events in a `ReportCccEventAdus`.

The sub-structure of the data element `cccEventRequest` is described in Table 40 and formally defined in Annex A.

**Table 40 — Data elements of the sub-structure of `cccEventRequest`**

| Data element     | Data type/data description                                                                                                                                                                                                          | Status |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| requestedAduType | <code>AduType</code> (see Table 9)<br>This data element shall contain the value <code>reportCccEventAdu</code> .                                                                                                                    | M      |
| userId           | <code>UserId</code> (see Table 12)<br>This data element may optionally be used to indicate the user for the requested CCC events.                                                                                                   | 0      |
| period           | <code>Period</code> (imported from ISO 17573-3)<br>This data element may optionally be used to indicate the start of a period of time for the requested CCC events.                                                                 | 0      |
| actionCode       | <code>ActionCode</code> (see Table 10)<br>This data element may optionally be used to indicate specific actions done by the sender of the request. Only the value <code>send</code> is allowed.                                     | 0      |
| actionRequest    | <code>ActionCode</code> (see Table 11)<br>This data element may optionally be used to indicate specific actions to be pursued by the receiver of the request. Only the values <code>send</code> or <code>resend</code> are allowed. | 0      |

The `cccEventRequest` supports the following functionalities under the following rules:

- A general readiness to receive ADUs of the type `ReportCccEventAdu` shall be indicated by omitting all optional data elements in the `cccEventRequest`.