



BSI Standards Publication

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

National foreword

This British Standard is the UK implementation of EN ISO 12855:2025. It is identical to ISO 12855:2025. It supersedes BS EN ISO 12855:2022, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/278, Intelligent transport systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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English Version

Electronic fee collection - Information exchange between
service provision and toll charging (ISO 12855:2025)

Perception de télépéage - Échange d'informations
entre la prestation de service et la perception du péage
(ISO 12855:2025)

Elektronische Gebührenerhebung -
Informationsaustausch zwischen Dienstleistern und
Gebühreneinzugsunternehmen (ISO 12855:2025)

This European Standard was approved by CEN on 22 March 2025.

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European foreword

This document (EN ISO 12855:2025) has been prepared by Technical Committee ISO/TC 204 "Intelligent transport systems" in collaboration with Technical Committee CEN/TC 278 "Intelligent transport systems" the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2025, and conflicting national standards shall be withdrawn at the latest by October 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN ISO 12855:2022.

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

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The text of ISO 12855:2025 has been approved by CEN as EN ISO 12855:2025 without any modification.

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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 document 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).

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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:

- the application data units (ADUs) have been revised;
- the data definitions and semantics have been updated, including making reference to ISO/TS 17573-2 as the primary source;
- the remaining references to the ISO 17575 series in [5.2.7](#) and in the Bibliography have been removed;
- the `MacKeyObject` has been removed from the `TrustObjectAdu` (see [6.7](#));
- the ADUs have been adapted to support automatic number plate recognition (ANPR)-based fee collection and enforcement;
- the structure of all major clauses has been harmonized to improve readability.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

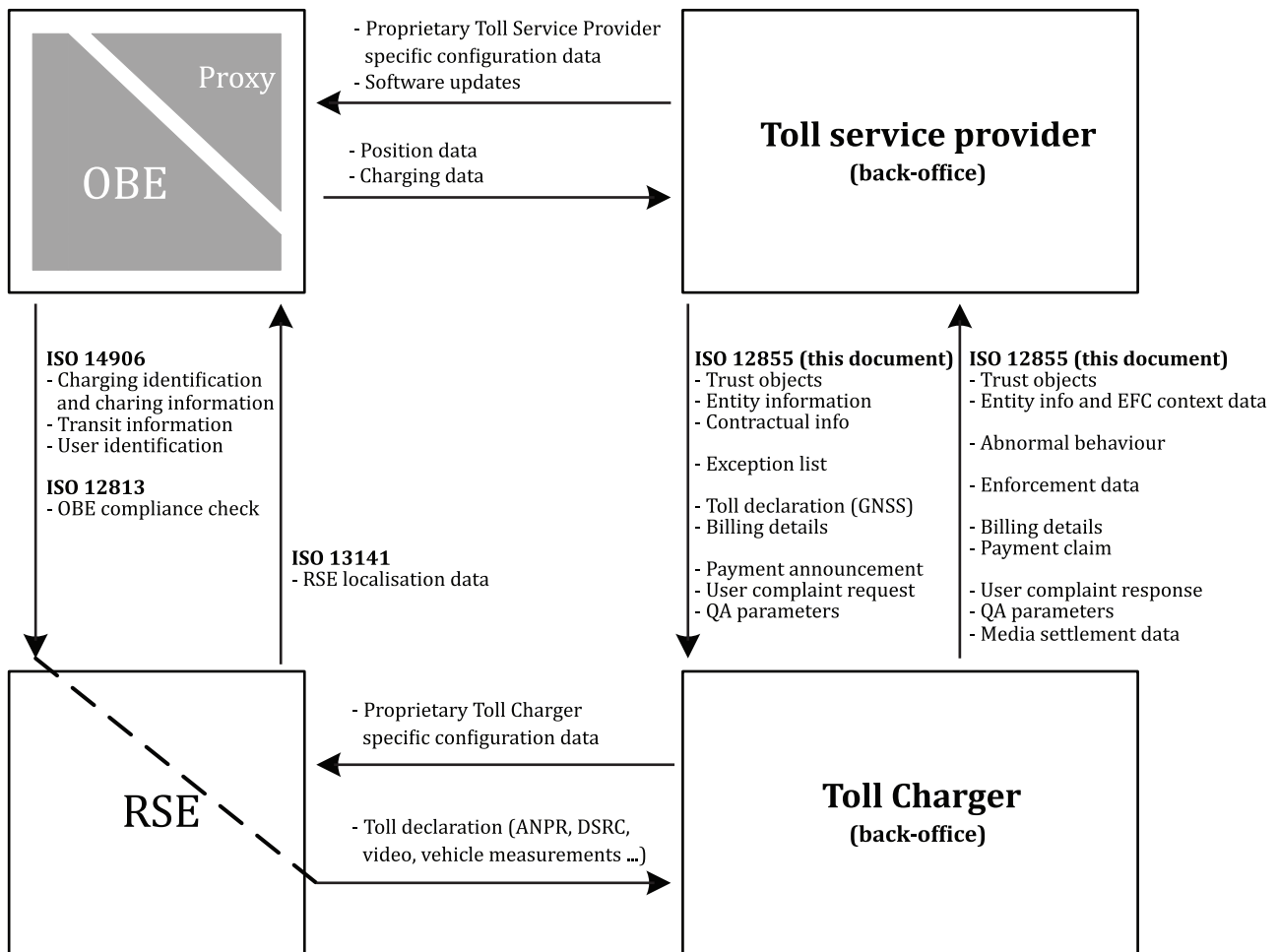
The widespread use of road tolling requires provisions for users of vehicles that circulate through many different toll domains. Users should be offered a single contract for driving a vehicle through various toll domains. Where vehicles require on-board equipment (OBE) or where tolling is based on automatic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

The system architecture specified in ISO 17573-1 is the basis for all ISO and CEN Standards in the road tolling domain. This document:

- adopts the concepts and basic system functionalities and structure of ISO 17573-1;
- uses the terminology of ISO 17573-1; and
- specifies the interfaces identified in ISO 17573-1.

ISO 17573-1 uses ISO/IEC 10746-3 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, 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.

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 counterpart.

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 specified for the transport service.

This document specifies 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 specified in ISO 17573-1.

This document does not provide a full solution for interoperability and it does not specify other parts of the EFC system, other services, other technologies and non-technical elements of interoperability. It is specified 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 specified elsewhere. It does not specify all communication sequences, communication stacks and timings.

The development of a common European Electronic Toll Service (EETS), as a part of the aforementioned European EFC Directive and related Regulation and Implementing acts, also calls for the definition of an interoperable EFC service. EN 16986 specifies interoperable application profiles (IAP), applicable based on this document. These profiles specify 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 the 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 specified in ISO 17573-1. To specify these interfaces, this document uses the enterprise description of the toll environment, and the interactions specified between the named classes of roles, as specified 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 specified.

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, etc.), 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 specified 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;
- 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 639, *Code for individual languages and language groups*

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/IEC 7812-1, *Identification cards — Identification of issuers — Part 1: Numbering system*

ISO/IEC 7812-2, *Identification cards — Identification of issuers — Part 2: Application and registration procedures*

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 8825-8, *Information technology — ASN.1 encoding rules — Part 8: Specification of JavaScript Object Notation Encoding Rules (JER)*

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 11568, *Financial services — Key management (retail)*

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

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

ISO 13141, *Electronic fee collection — Localization augmentation communication for autonomous systems*

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/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
JER	JavaScript Object Notation Encoding Rules
LAC	localization augmentation communication
LPN	licence plate number
NMEA	National Marine Electronics Association
OBE	on-board equipment
OCSP	online certificate status protocol
OID	object identifier

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 specified in ISO 17573-1.

ISO 17573-1 specifies the four main roles shown in [Figure 2](#).

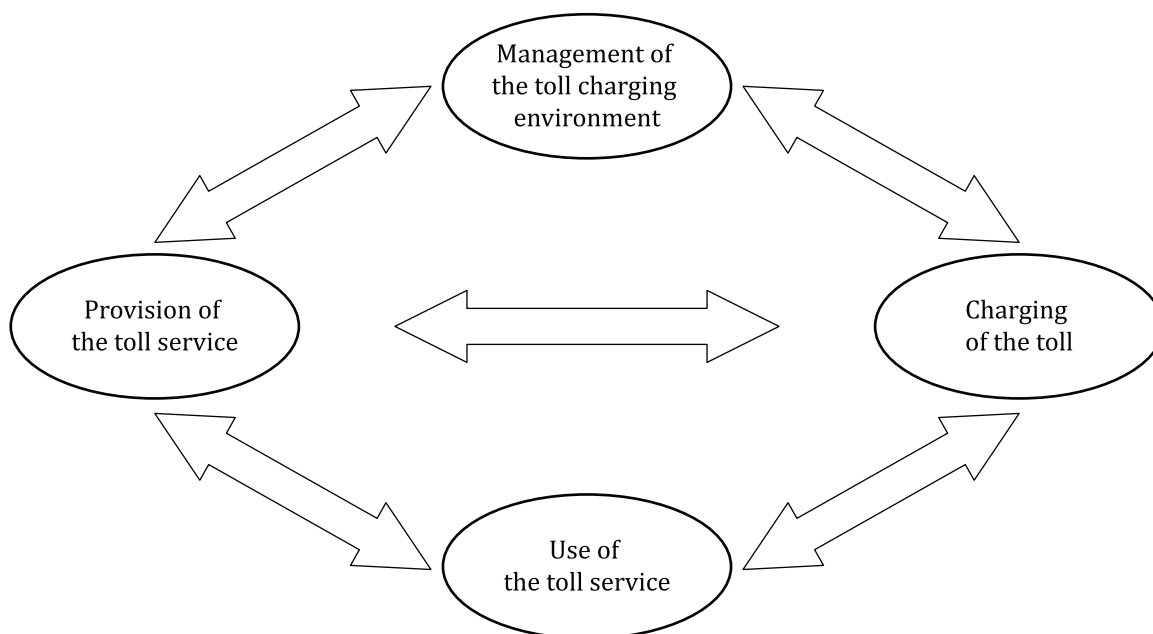


Figure 2 — Roles in the toll charging environment

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.

[Annex C](#) depicts examples of data exchanges between these roles.

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.

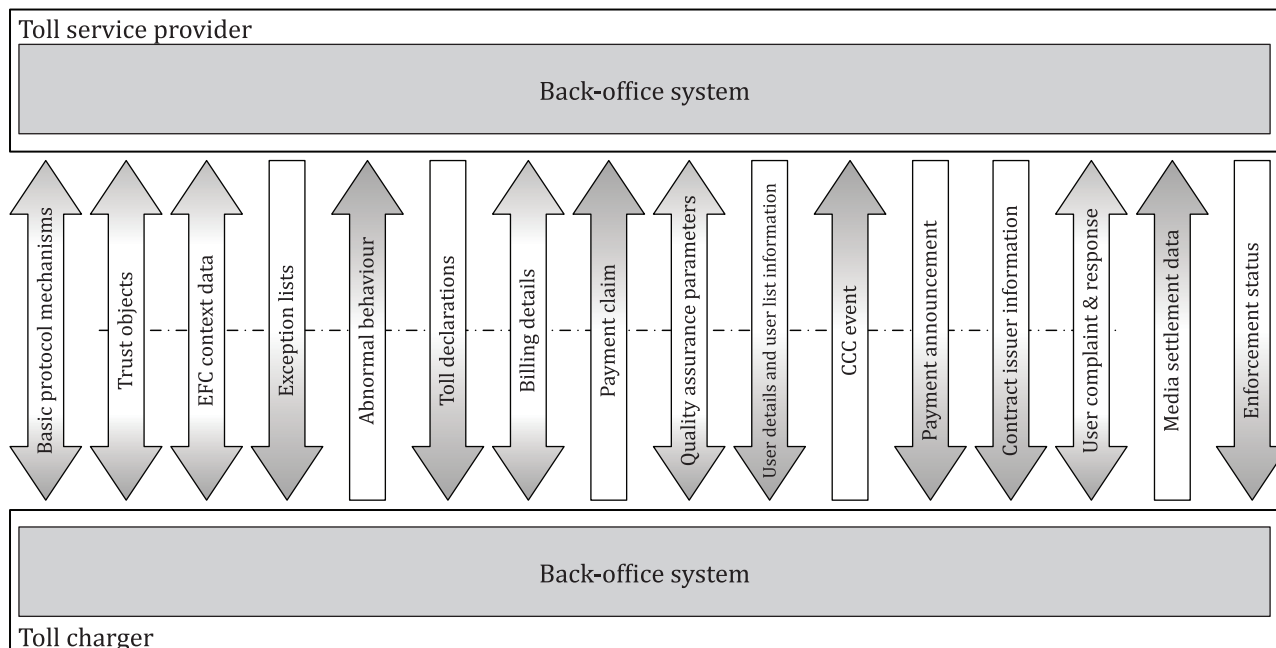


Figure 3 — Functionalities of the back-office interface

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.

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 [6.4](#);
- a generic acknowledge mechanism (i.e. not related to any specific functionality) that supports acknowledging a specific interaction. The “acknowledge” ADU in [6.4.10](#) 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 [6.4.2](#)) that one is ready to accept any kind of information exchange;
- request the counterpart in a generic request (see [6.4.2](#)) 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 [6.4.2](#)) 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 [6.4.2](#)) to revoke a specific APDU or ADU, by indicating the type and the identifier of the APDU or ADU;
- inform the counterpart in a specific request (see [6.4.3](#) to [6.4.9](#)) 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 [6.4.3](#) to [6.4.9](#)) 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; and
- alert the counterpart that some previously provided information shall be revoked without any new information being currently available.

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 specified 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 specified 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 [6.4.2](#)). 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 specified 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 [6.4.2](#)). 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.

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 specified 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 specified 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 “acknowledgement” 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 within 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 specified 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 performed 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. compliance check communication (CCC) data, LPN reading, etc.), it has the possibility of asking 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.

NOTE 4 The “toll declarations” ADU as specified in 6.11 can also be used by TCs to exchange toll declarations with other entities than TSPs. Such an exchange is not covered in 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 specified 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 (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 to reduce the quantity 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 specified in this document, but an example is provided in [Annex D](#).

EXAMPLE Aggregation methods can be as follows, 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 [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.
- An ANPR- or DSRC-based toll system is always a TC-dominant operational model since the toll declarations are captured by the TC and are sent to the TSP in the “billing details” ADU.
- 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 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 specified 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 later 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 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 monitor and report 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 specified 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, or both. This functionality is initiated either by the TC directly or on request from the TSP via a “request” ADU by sending a “report CCC event” ADU as specified 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 are specified in the EFC system service “Detecting exceptions”.

The user and user list information functionalities 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 specified 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 data element `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 specified 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 a “request” ADU by sending a “payment announcement” ADU to the TC as specified in [6.18](#). 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 OBE of the TSP, which are to be accepted in the toll domain of the TC by using the “contract issuer list” ADU specified 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 OBE 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 specified 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 specified 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 specified 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 specified in [6.23](#) or responding to a “request” ADU by the TC.

5.3 Use of private values and extensions

This document allows the use of private values in named integer data types and the use of private extensions of the defined data elements and data types to add non-standardized functionality needed in a specific toll context.

This feature shall not replace the defined data elements and data types with other data structures.

The data element `protocolIssuerId` (see [Table 4](#)) shall uniquely identify the issuer of such private values and extensions to avoid a misinterpretation on the recipient’s side. Each private value and extension shall be unique for the issuer of a private code.

The same private value may be used by different originators with their specific meaning.

EXAMPLE 1 The German TC sends a `BillingDetailsAdu` to a TSP and states the private value 32 in the data element `aidIdentifier` to indicate the version number of the used protocol. It states its own identifier in the data element `protocolIssuerId` to indicate, that this is a German protocol for this exchange.

EXAMPLE 2 The Austria TC sends a `BillingDetailsAdu` to a TSP and states the private value 32 in the data element `aidIdentifier` to indicate the version number of the used protocol. It states the identifier of EasyGo in the data element `potocolIssuerId` to indicate that EasyGo protocol is used for this exchange.

EXAMPLE 3 A TSP sends an `ExceptionListAdu` to the Austrian TC and also uses the private value 32 in the data element `aidIdentifier` to indicate the version number of the used protocol. It states the identifier of EasyGo in the data element `protocolIssuerId` to indicate that EasyGo protocol is used for this exchange, which is required by the Austrian TC.

All privately extended data elements shall be `OPTIONAL`, as they are not part of the standardized data exchange.

Whether private extensions shall be processed by the recipient or not is outside the scope of this document and shall be specified in bilateral agreements between TC and TSP.

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 can 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 allowed to initiate an interaction;
- shall initiate: an entity shall initiate an interaction;
- 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 50](#)) 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
Status of interface	Status (availability)	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive
		shall be able to receive	shall respond to Status
Exchange trust objects	Request	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Trust objects	may initiate	shall be able to receive
		shall be able to receive	may initiate
		shall respond to Request	shall be able to receive
		shall be able to receive	shall respond to Request
	Acknowledge	shall respond to Trust objects	shall be able to receive
		shall be able to receive	shall respond to Trust objects
	Status (revoke)	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive
		shall be able to receive	shall respond to Status

Table 1 (continued)

Computational object	Interaction	TSP rules	TC rules
Originate EFC context data	Request	may initiate	shall be able to receive
		shall be able to receive	may initiate
	EFC context data	may initiate	shall be able to receive
		shall be able to receive	may initiate
		shall respond to Request	shall be able to receive
		shall be able to receive	shall respond to Request
	Acknowledge	shall respond to EFC context data	shall be able to receive
		shall be able to receive	shall respond to EFC context data
	Status (revoke)	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive
		shall be able to receive	shall respond to Status
Manage exception list	Request	shall be able to receive	may initiate
	Exception list	may initiate	shall be able to receive
		shall respond to Request	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Exception list
	Status (revoke)	may initiate	shall be able to receive
Report abnormal behaviour	Request	may initiate	shall be able to receive
		shall be able to receive	shall respond to Request
	Report abnormal OBE	shall be able to receive	may initiate
		shall be able to receive	may initiate
	Acknowledge	shall respond to Report abnormal OBE	shall be able to receive
Report toll declarations	Status (revoke)	shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive
	Request	shall be able to receive	may initiate
	Toll declaration	may initiate	shall be able to receive
		shall respond to Request	shall be able to receive
Report toll declarations	Acknowledge	shall be able to receive	shall respond to Toll declaration
	Status (revoke)	may initiate	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Status

Table 1 (continued)

Computational object	Interaction	TSP rules	TC rules
Report billing details	Request	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Billing details	may initiate	shall be able to receive
		shall be able to receive	may initiate
		shall respond to Request	shall be able to receive
		shall be able to receive	shall respond to Request
	Acknowledge	shall respond to Billing details	shall be able to receive
		shall be able to receive	shall respond to Billing details
	Status (revoke)	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive
		shall be able to receive	shall respond to Status
Report payment claim	Request	may initiate	shall be able to receive
	Payment claim	shall be able to receive	shall respond to Request
		shall be able to receive	may initiate
	Acknowledge	shall respond to Payment claim	shall be able to receive
	Status (revoke)	shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive
Exchange QA parameters	Request	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Report QA	may initiate	shall be able to receive
		shall be able to receive	may initiate
		shall respond to Request	shall be able to receive
		shall be able to receive	shall respond to Request
	Acknowledge	shall respond to Report QA	shall be able to receive
		shall be able to receive	shall respond to Report QA
	Status (revoke)	may initiate	shall be able to receive
		shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive
		shall be able to receive	shall respond to Status
Report CCC event	Request	may initiate	shall be able to receive
	Report CCC event	shall be able to receive	shall respond to Request
		shall be able to receive	may initiate
	Acknowledge	shall respond to Report CCC event	shall be able to receive
	Status (revoke)	shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive

Table 1 (continued)

Computational object	Interaction	TSP rules	TC rules
Provide user details	Request	shall be able to receive	may initiate
	Provide user details	may initiate	shall be able to receive
		shall respond to Request	shall be able to receive
	Acknowledge	shall be able to receive	may respond to Provide user details
	Status (revoke)	may initiate	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Status
Provide user list	Request	shall be able to receive	may initiate
	Provide user list	may initiate	shall be able to receive
		shall respond to Request	shall be able to receive
	Acknowledge	shall be able to receive	may respond to Provide user list
	Status (revoke)	may initiate	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Status
Report payment announcement	Request	shall be able to receive	may initiate
	Payment announcement	may initiate	shall be able to receive
		shall respond to Request	shall be able to receive
	Acknowledge	shall be able to receive	shall response to Payment announcement
	Status (revoke)	may initiate	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Status
Provide contract issuer information	Request	shall be able to receive	may initiate
	Contractual information	may initiate	shall be able to receive
		shall respond to Request	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Contractual information
	Status (revoke)	may initiate	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Status
Provide user complaint and response	user complaint	may initiate	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Request
	User complaint response	shall be able to receive	shall respond to Acknowledge
	Acknowledge	shall respond to User complaint response	shall be able to receive
		shall be able to receive	may initiate to revoke user complaint response
	Status (revoke)	may initiate to revoke user complaint	shall be able to receive
		shall be able to receive	may initiate to revoke user complaint response
	Acknowledge	shall respond to Status shall be able to receive	shall be able to receive shall respond to Status
Provide Media Settlement Data	Request	may initiate	shall be able to receive
	Media settlement data	shall be able to receive	shall respond to Request
		shall be able to receive	may initiate
	Acknowledge	shall respond to Media settlement data	shall be able to receive
	Status (revoke)	shall be able to receive	may initiate
	Acknowledge	shall respond to Status	shall be able to receive

Table 1 (continued)

Computational object	Interaction	TSP rules	TC rules
Report enforcement status	Request	shall be able to receive	may initiate
	Enforcement status	may initiate	shall be able to receive
		shall respond to Request	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Enforcement status
	Status (revoke)	may initiate	shall be able to receive
	Acknowledge	shall be able to receive	shall respond to Status

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.

To facilitate reading, the following conventions are adopted in [6.2](#):

- the ASN.1 data elements are written with a lower case first letter using `Courier New` font;
- 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 document is based upon one APDU carrying the complete payload.

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

[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.

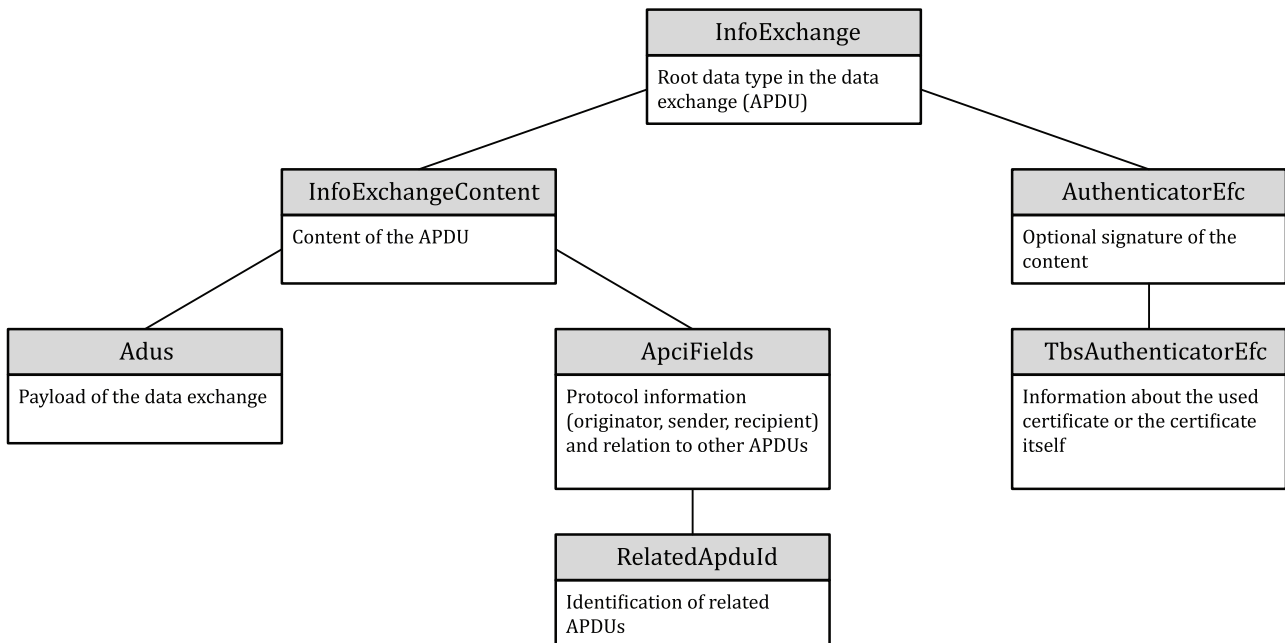


Figure 4 — Structure of data type InfoExchange

The following subclauses describe the application protocol control information (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 document:

- a) Tables list the data elements that make up data types. Each table contains the data elements, their data type with a 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 is indicative and is specified in [Annex A](#). In cases where there are discrepancies, the formal specification in [Annex A](#) shall take precedence.
- b) Additional tables are inserted to better describe additional data types used in the ADUs to explain complex structures.
- c) Additional semantic 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 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) 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) 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 specified in [Annex A](#).

Table 3 — Data elements of InfoExchangeContent

Data element	Data type/data description	Status
<code>apci</code>	<code>ApciFields</code> (see Table 4) The data element shall contain the <code>apci</code> of the APDU specifying originator, sender and recipient of the APDU, its relation to other APDUs and the version of the protocol.	M
<code>adus</code>	<code>Adus</code> (see Table 7) 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 specified in [Annex A](#).

Table 4 — Data elements of ApciFields

Data element	Data type/data description	Status
aidIdentifier	AidIdentifier (see Table 5) specified as INTEGER ranging from 0 to 255 This data element in association with the value of protocolIssuerId shall contain a reference to a protocol version either based on a specific edition of this document or EN16986 or a private implementation specification with additional restrictions or extensions of this document. Any change to a data specification shall be identified by a different value in aidIdentifier. Permitted values are specified in Table 5. See 5.3 on the use of private values. If a private value is specified, the indicated implementation specification shall be compliant to all normative requirements specified in a specific edition of this document or EN 16986. That edition shall be stated in the indicated implementation specification.	M
apduOriginator	Provider (imported from ISO 17573-3) 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) This data element shall contain the identifier of the entity sending the APDU. 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. 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
protocolIssuerId	Provider (imported from ISO 17573-3) This data element shall contain the identifier of the issuer of the protocol defined in data element aidIdentifier. The data element protocolIssuerId shall contain the same value as the data element apduOriginator if the originator of the APDU uses its own protocol. The data element protocolIssuerId shall contain the same value as the data element informationSenderId if the originator of the APDU uses a protocol defined by the sender. The data element protocolIssuerId shall contain another value as the data element apduOriginator or the data element informationSenderId if the originator of the APDU uses a “foreign” protocol defined by someone else. EXAMPLE A TSP states the identifier of the TC to which it sends information. See clause 5.3 on the use of private values.	M
informationRecipientId	Provider (imported from ISO 17573-3) This data element shall contain the identifier of the entity to which the content of the APDU is sent, which can be a TC or a TSP.	M
apduIdentifier	ApduIdentifier specified as INTEGER ranging from 0 to 2⁶³-1 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) This data element may optionally contain the unique identifier of the previously sent APDU.	O

Table 4 (continued)

Data element	Data type/data description	Status
nextApduId	RelatedApduId (see Table 6) This data element may optionally contain the unique identifier of the APDU to be sent next.	O
inResponseToApduId	RelatedApduId (see Table 6) This data element may optionally contain the unique identifier of the APDU to which it is sent in response.	O
apduDate	GeneralizedTime This data element shall specify the time stamp of the generation of the APDU in coordinated universal time (UTC).	M

Additional semantics for the data elements in [Table 4](#):

The data elements `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.

The data element `previousApduId` 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.

The data element `nextApduId` 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 `previousApduId` and the `nextApduId` may be used to identify chains of APDUs in multi-part APDUs as depicted in [Figure 5](#).

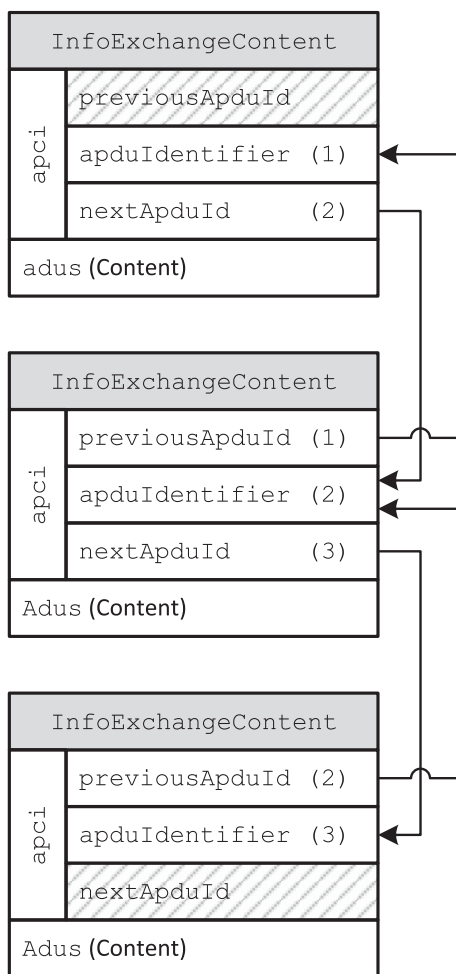


Figure 5 — Linking of APDUs

The data element `inResponseToApduId` 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.

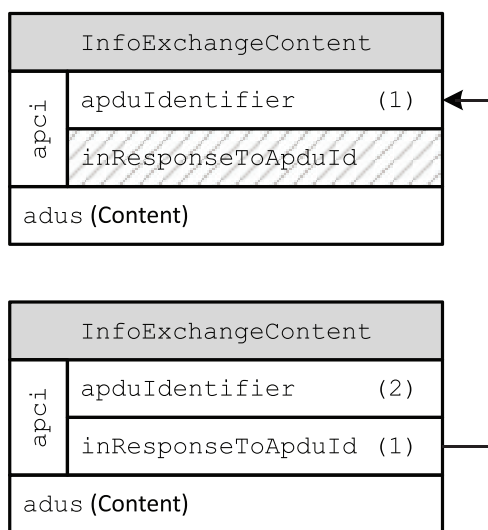


Figure 6 — Responding to an APDU

[Table 5](#) lists the specified values and semantics of `AidIdentifier` in decimal notation.

Table 5 — Values and semantics of AidIdentifier

Name	Semantics	Value
iso12855v4	Identifies the object identifier (OID) version 1.0.12855.4 of ISO 12855:2015	0
isoDIS12855v5	Identifies the OID version 1.0.12855.5 of ISO/DIS 12855:2020	1
isoFDIS12855v5	Identifies the OID version 1.0.12855.5 of the FDIS version of ISO 12855:2021	2
iso12855v5	Identifies the OID 1.0.12855.5 of ISO/FDIS 12855:2022	3
isoDIS12855v6m1	Identifies the OID 1.0.12855.6.1 of ISO/DIS 12855:2024	4
iso12855v7m1	Identifies the OID 1.0.12855.7.1 of ISO/FDIS 12855:2025	5
	Values reserved for future ISO use	6..15
cen16986x2016	Identifies CEN/TS 16986:2016 NOTE There was no ASN.1 code for this edition and it is therefore not registered in the OID database.	16
enENQ16986v1m1	identifies the OID 1.3.162.16986.1.1.1, 1.3.162.16986.2.1.1, 1.3.162.16986.3.1.1 or 1.3.162.16986.4.1.1 of prEN 16986:2022 (i.e. the CEN Enquiry version)	17
en16986v2m1	identifies the OID 1.3.162.16986.1.2.1, 1.3.162.16986.2.2.1, 1.3.162.16986.3.2.1 or 1.3.162.16986.4.2.1 of EN 16986:2024	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 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) 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> specified as INTEGER ranging from 0 to $2^{63}-1$ 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 specified 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

Table 7 (continued)

Data element	Data type/data description	Status
provideUserDetailsAdus	ProvideUserDetailsAdu (see 6.15)	N/A
reportCccEventAdus	ReportCccEventAdu (see 6.16)	N/A
provideUserIdListAdus	ProvideUserIdListAdu (see 6.17)	N/A
paymentAnnouncementAdus	PaymentAnnouncementAdu (see 6.18)	N/A
contractIssuerListAdus	ContractIssuerListAdu (see 6.19)	N/A
userComplaintAdus	UserComplaintAdu (see 6.20)	N/A
userComplaintResponseAdus	UserComplaintResponseAdu (see 6.21)	N/A
mediaSettlementDataAdus	MediaSettlementDataAdu (see 6.22)	N/A
enforcementStatusAdus	EnforcementStatusAdu (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 subclauses 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)	RequestAdu (see 6.4)	Request to send ADUs from TC or TSP
	AckAdu (see 6.5)	Acknowledgement of received ADUs by TC or TSP
	StatusAdu (see 6.6)	Provide a generic status information to TC or TSP
Exchange trust objects (see 5.2.3)	TrustObjectAdu (see 6.7)	Exchange keys and certificates between TC and TSP
Originate EFC context data (see 5.2.4)	EfcContextDataAdu (see 6.8)	Send a formal description of the TC's toll domain from TC to TSP or information about the TSP from the TSP to the TC
Manage exception lists (see 5.2.5)	ExceptionListAdu (see 6.9)	Send exception list of type block list, access list or discounted user list from TSP to TC
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

Table 8 (continued)

Functionality	ADU type name	Description
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 specified 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 specified values and semantics for the specified 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>	see 6.4	1
<code>ackAdu</code>	see 6.5	2
<code>trustObjectAdu</code>	see 6.7	3
<code>efcContextDataAdu</code>	see 6.8	4
<code>exceptionListAdu</code>	see 6.9	5
<code>reportAbnormalBehaviourAdu</code>	see 6.10	6
<code>tollDeclarationAdu</code>	see 6.11	7
<code>billingDetailsAdu</code>	see 6.12	8
<code>paymentClaimAdu</code>	see 6.13	9
<code>reportQaAdu</code>	see 6.14	10
<code>statusAdu</code>	see 6.6	11
<code>provideUserDetailsAdu</code>	see 6.15	12
<code>reportCccEventAdu</code>	see 6.16	13
<code>provideUserIdListAdu</code>	see 6.17	14
<code>paymentAnnouncementAdu</code>	see 6.18	15
<code>contractIssuerListAdu</code>	see 6.19	16
<code>userComplaintAdu</code>	see 6.20	17
<code>userComplaintResponseAdu</code>	see 6.21	18
<code>mediaSettlementDataAdu</code>	see 6.22	19
<code>enforcementStatusAdu</code>	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 specified 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 specified 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. Any ADUs which are recursively linked via <code>previousApdu</code> to the APDU containing this ADU should be processed as well if they contained the value <code>wait</code> in the data element <code>actionRequest</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 APDU recursively linked to the APDU containing this ADU through <code>previousApdu</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

[Figure 7](#) shows the initiation of the processing of APDUs linked through the data element `previousApdu` by stating the action codes `wait` and `process` in the data element `actionRequest` of the included ADUs.

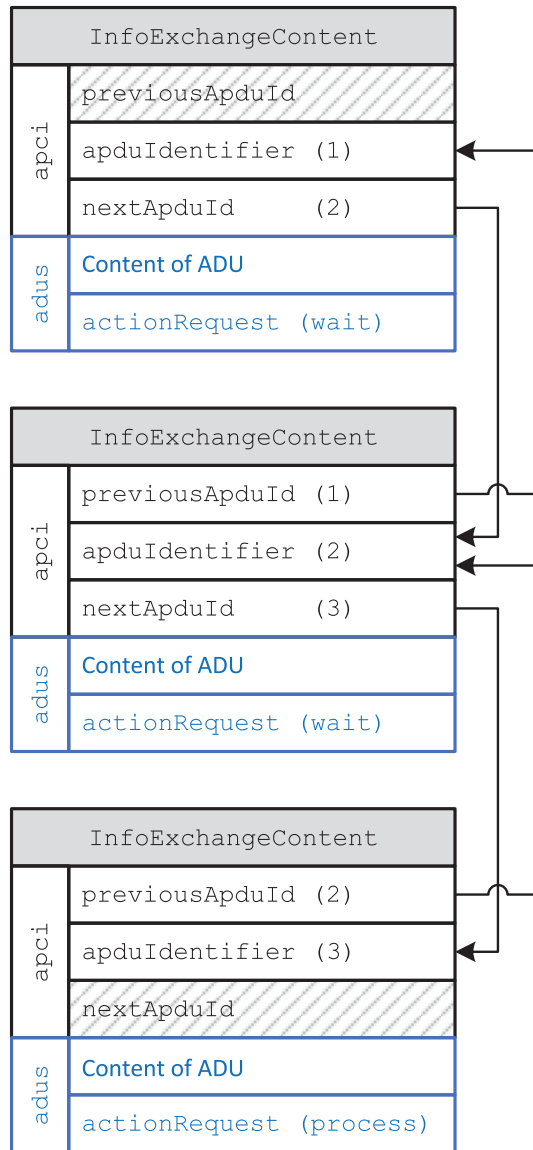


Figure 7 — Initiating processing of linked APDUs

The originator sends the first APDU containing an ADU with the value `wait` in the data element `actionRequest`. The recipient acknowledges the reception of the first APDU containing the ADU but does not process it.

The originator sends the second APDU containing an ADU with the value `wait` in the data element `actionRequest`. The recipient acknowledges the reception of the second APDU containing the ADU but does not process it.

The originator sends the third APDU containing an ADU with the value `process` in the data element `actionRequest`. The recipient acknowledges the reception of the APDU containing the ADU and processes all three ADUs.

6.3.2 User identification

The data type `UserId` is a data type used in most ADUs to identify a user or vehicle. This data type is extended in this document beyond the specification in ISO 17573-3.

NOTE The specification of the data type `UserId` in ISO 17573-3 is no longer used and only kept for the legacy versions.

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 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) This data element may optionally be used to identify the user by their personal account number.	0
<code>contractSerialNumber</code>	<code>ContractSerialNumber</code> specified as <code>UTF8String</code> SIZE(1..32) This data element may optionally be used to identify the user by their contract serial number. NOTE 1 The data element <code>contractSerialNumber</code> , specified as data type <code>Int4Unsigned</code> in ISO 17573-3, can be stated as a <code>UTF8string</code> if provided in this data element. NOTE 2 The definition of this data element as data type <code>UTF8string</code> also allows the provision of a character-oriented serial number.	0
<code>licencePlateNumber</code>	<code>Lpn</code> (imported from ISO 17573-3) 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) This data element may optionally be used to identify the user by the OBE identifier. 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) This data element may optionally be used to identify the user by their integrated circuit card (ICC).	0
<code>customerId</code>	<code>OCTET STRING</code> 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) 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. NOTE 3 The data element <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 specified in [Annex A](#).

Table 13 — Data elements of VersionAndValidity

Data element	Data type/data description	Status
version	VersionId (see Table 14) This data element shall contain a unique version information of the information to which it refers. NOTE 1 The format of the version information is specified by the originator or sender of the information and is outside the scope of this document.	M
validFrom	GeneralizedTime This data element shall contain the starting date and time of the validity of the information to which it refers. The decision to use UTC or local time should be bilaterally agreed between TC and TSP.	M

[Table 14](#) lists the data elements of the data type `VersionId`, which is specified in [Annex A](#).

Table 14 — Data elements of VersionId

Data element	Data type/data description	Status
	OCTET STRING This data element shall contain a unique identification of the version of an object. 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 specified in [Annex A](#).

Table 15 — Data elements of TextualDescription

Data element	Data type/data description	Status
textLanguage	LanguageId specified as UTF8String SIZE(2) This data element shall contain a two-letter language code in accordance with ISO 639.	M
text	UTF8String SIZE (1..2000) This data element shall contain the textual description in the language indicted in data element <code>textLanguage</code> . This data element shall not contain more than 500 characters consisting of up to 2 000 bytes because of multi-byte character-sets.	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 specified in [Annex A](#).

Table 16 — Data elements of AuthenticatorEfc

Data element	Data type/data description	Status
tbsAuthenticatorEfc	TbsAuthenticatorEfc (see Table 17) 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
signatureAlgorithm	AlgorithmIdentifier (see Table 18) using the parameter Pkcs1Algorithms This data element may optionally contain the identifier and parameters of the algorithm used to generate the signature. If present, it shall contain the same value as the data element signatureAlgorithm in tbsAuthenticatorEfc.	O
signatureValue	OCTET STRING This data element shall contain a signature over the hashed transformation of the canonical XML encoding rules (cXER) encoded data in data element tbsAuthenticatorEfc.	M

[Table 17](#) describes the data elements of the data type TbsAuthenticatorEfc, which is specified in [Annex A](#).

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. This data element may optionally contain a version number of the certificate.	O
signatureAlgorithm	AlgorithmIdentifier (see Table 18) using the parameter Pkcs1Algorithms This data element shall contain the identifier and parameters of the algorithm used to generate the signature.	M
issuer	Name (see Table 69) This data element shall contain the name of the issuer to be used for the calculation of the signature.	M
serialNumber	CertificateSerialNumber specified as INTEGER 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) 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

Table 17 (continued)

Data element	Data type/data description	Status
signatureDate	GeneralizedTime This data element shall contain the time stamp of the generated signature.	M
certificates	List (ASN.1 SEQUENCE OF) of zero or more elements of data type EncryptionKeyId (see Table 67) This data element may optionally contain all certificates needed to calculate the hash and the signature if they were not previously shared. The data element certificate shall be selected in the data type EncryptionKeyId to transmit the certificate. 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 59).	0
signingCertificateHash	CertHash (see Table 20) 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.	0

Table 18 describes the data elements of the data type AlgorithmIdentifier, which is specified 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 AlgorithmIdentifier.	M
parameters	This data element may optionally contain additional parameters for the algorithm provided in the second parameter of the AlgorithmIdentifier.	0

Table 19 describes the data elements of the data type AduContentDigest, which is specified in Annex A.

Table 19 — Data elements of AduContentDigest

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

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

Table 20 — Data elements of CertHash

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

Additional semantics for [Table 20](#):

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 data element `certificates`, if present.

The signature and hash algorithms are specified in [7.3.3](#).

6.3.6 Payment amount

The data type `PaymentAmount` is used to indicate the amount to be paid.

[Table 21](#) describes the data elements of the data type `PaymentAmount`, which is specified in [Annex A](#).

Table 21 — Data elements of PaymentAmount

Data element	Data type/data description	Status
paymentFeeAmount	INTEGER ranging from -2^{63} to $2^{63}-1$ This data element shall contain the net amount.	M
paymentFeeUnit	PayUnit (imported from ISO 17573-3) This data element shall contain the currency and the unit of the amount and currency. EXAMPLE in EUR cents	M
vatRate	INTEGER ranging from 0 to 10 000 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 the provision of absolute coordinates or relative coordinates in relation to the previous point.

NOTE 1 This data element is specified differently in this document from the specification in ISO 17573-3

[Table 22](#) describes the data type `Point` and the data elements in the CHOICE statement, which is specified in [Annex A](#).

Table 22 — Data elements of Point

Data element	Data type/data description	Status
absolutePointCoordinates	AbsolutePosition3d (imported from ISO 17573-3) This data element shall contain (if used) the absolute coordinates of a point.	N/A
relativePointCoordinates	RelativePosition3d (imported from ISO 17573-3) 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 specified in [Annex A](#).

Table 23 — Data elements of Link

Data element	Data type/data description	Status
linkId	LinkId (see Table 23) This data element shall contain a unique identifier of a link within the toll context partition.	M
startPoint	Point (see Table 22) This data element shall contain the start point of the link. 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 Section (see Table 164), if it is provided, or to the data element <code>geoRefPoint</code> in data type <code>TollContextPartitionOverview</code> (see Table 156), if it is provided.	M
intermediatePoints	List (ASN.1 SEQUENCE OF) of zero or more elements of data type Point (see Table 22) 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. 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 Section (see Table 164), if it is provided, or to the data element <code>geoRefPoint</code> in data type <code>TollContextPartitionOverview</code> (see Table 156), if it is provided.	0
endpoint	Point (see Table 22) This data element shall contain the end point of the link. 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 Section (see Table 164), if it is provided, or to the data element <code>geoRefPoint</code> in data type <code>TollContextPartitionOverview</code> (see Table 156), if it is provided.	M

Additional semantics for Table 23:

Figure 8 explains the meaning and usage of the elements of a link.

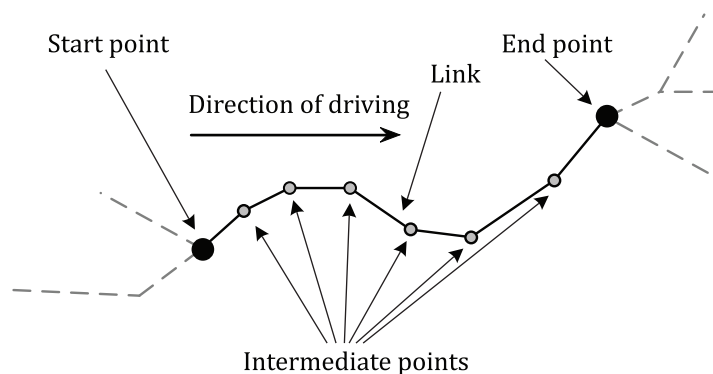


Figure 8 — Elements of a link

Table 24 describes the data elements of the data type `Polygon`, which is specified 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
—	List (ASN.1 SEQUENCE OF) of three or more elements of data type <code>Point</code> (see Table 22) NOTE A polygon consists of at least three points to form an area. The segments of the polygon shall be created by connecting each of the points with its successor point in a clockwise direction. The polygon shall be closed by connecting the last point in the list with the first point. The points shall be specified in a way that means the connections between the points do not intersect. The inner side of the polygon (tolled area) is specified 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.	M

[Table 25](#) describes the data elements of the data type `SupportingPoint`, which is specified in [Annex A](#).

Table 25 — Data elements of SupportingPoint

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

6.3.8 Textual descriptions or attachments

The data type `InfoData` contains a selection (ASN.1 CHOICE) between two different data elements, allowing the provision of 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 specified in [Annex A](#).

Table 26 — Data elements of InfoData

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

[Table 27](#) describes the data elements of the data type `BinaryItem`, which is specified in [Annex A](#).

Table 27 — Data elements of BinaryItem

Data element	Data type/data description	Status
<code>content</code>	OCTET STRING This data element shall contain the binary content.	M
<code>mediaType</code>	OCTET STRING This data element shall contain the Internet Assigned Numbers Authority (IANA) Registry application media-type describing the type of Content.	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 specified 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 . 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 $2^{63}-1$ 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 4 095 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 specified in [Annex A](#).

Table 29 — Data elements of tollDeclarationEventId

Data element	Data type/data description	Status
<code>chargeReportCounter</code>	INTEGER ranging from 0 to $2^{32}-1$ This data element shall contain an identification of a charge report (see specification of <code>chargeReportCounter</code> in Table 231).	M
<code>usageStatementId</code>	INTEGER ranging from 0 to $2^{16}-1$ This data element shall contain an identification of a usage statement (see specification of <code>usageStatementId</code> in Table 232).	M

6.3.10 Time

The data type `PreciseTimeCompact` is derived from the data type `TimeCompact` in ISO 17573-3 but allows the specification of single seconds instead of double seconds.

[Table 30](#) describes the data elements of the data type `PreciseTimeCompact`, which is specified in [Annex A](#).

Table 30 — Data elements of PreciseTimeCompact

Data element	Data type/data description	Status
<code>hours</code>	INTEGER ranging from 0 to 23 This data element shall contain the number of hours of the time of the day after midnight.	M
<code>mins</code>	INTEGER ranging from 0 to 59 This data element shall contain the number of minutes after the hour of the time of the day.	M
<code>secs</code>	INTEGER ranging from 0 to 59 This data element shall contain the number of seconds after the minute of the time of the day.	M

6.4 RequestAdu data structure

6.4.1 Requesting information

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 31](#) describes the data type and the data elements in the CHOICE statement, which are specified in [Annex A](#).

Table 31 — Data elements of RequestAdu

Data element	Data type	Status
<code>genericRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 32	N/A
<code>exceptionListRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 33	N/A
<code>trustObjectRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 34	N/A
<code>tollDeclarationRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 37	N/A
<code>userDetailsRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 38	N/A
<code>cccEventRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 41	N/A
<code>userListRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 42	N/A
<code>mediaSettlementDataRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 43	N/A
<code>qaParameterRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 44	N/A
<code>enforcementStatusRequest</code>	Record (ASN.1 SEQUENCE) made of the data elements described in Table 45	N/A

6.4.2 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 32](#) describes the sub-structure of the data element `genericRequest`, which is specified in [Annex A](#).

Table 32 — Data elements of the sub-structure of genericRequest

Data element	Data type/data description	Status
apduIdentifier	ApduIdentifier This data element may optionally be used to request that the APDU carrying the same identifier is resent.	0
requestedAduType	AduType (see Table 9) This data element may optionally be used to specify the type of the requested ADU.	0
aduIdentifier	List (ASN.1 SEQUENCE OF) of one or more elements of data type AduIdentifier This data element may optionally be used to ask for retransmission of the specified ADUs.	0
actionCode	ActionCode (see Table 10) This data element may optionally be used to indicate specific actions performed by the sender of the request. Only the value <code>send</code> is allowed.	0
actionRequest	ActionCode (see Table 11) 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 one APDU containing a specific type of an ADU 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`.

6.4.3 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 33](#) and specified in [Annex A](#).

Table 33 — Data elements of the sub-structure of exceptionListRequest

Data element	Data type/data description	Status
requestedAduType	AduType (see Table 9) This data element shall contain the value exceptionListAdu.	M
period	Period (imported from ISO 17573-3) This data element may optionally be used to indicate a certain period of time for the requested exception lists.	0
exceptionListType	ExceptionListType (see Table 218) This data element may optionally be used to indicate a certain type of a requested exception list.	0
exceptionListVersion	ExceptionListVersion specified as INTEGER ranging from 0 to 2 ⁶³ -1 This data element may optionally be used to indicate a certain version of a requested exception list specified in the data element exceptionListVersion of the data type ExceptionListAdu (see Table 217).	0
actionCode	ActionCode (see Table 10) This data element may optionally be used to indicate specific actions performed by the sender of the request. Only the value send is allowed.	0
actionRequest	ActionCode (see Table 11) 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 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 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 ExceptionListAdus.
- 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 may optionally be specified to request ExceptionListAdus 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.

6.4.4 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, in order 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 34](#) and specified in [Annex A](#).

Table 34 — Data elements of the sub-structure of `trustObjectRequest`

Data element	Data type/data description	Status
<code>requestedAduType</code>	<code>AduType</code> (see Table 9) This data element shall contain the value <code>trustObjectAdu</code> .	M
<code>trustObjectSpec</code>	<code>TrustObjectSpec</code> (see Table 35) 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) This data element may optionally be used to indicate specific actions performed by the sender of the request. Only the value <code>send</code> is allowed.	0
<code>actionRequest</code>	<code>ActionCode</code> (see Table 11) 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 35](#) describes the data elements of the data type `TrustObjectSpec`, which is specified in [Annex A](#).

Table 35 — 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 36) 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 elements of data type <code>TrustObjectPurpose</code> (see Table 60) 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 36](#) describes the data type and the data elements in the CHOICE statement, which is specified in [Annex A](#).