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Foundations Directorate

Supplement 3 to annex 1 to the FDF EETS and Fuel Card Providers Ordinance

EETS Provider Interface

Contents

1 Introduction 3
1.1 Scope 3
1.2 List of changes 3
1.3 References 3
1.4 Terms and abbreviations 4

2 Transactions and messages 5
2.1 General 5
2.2 Basic protocol 7
2.3 EETS journey declaration 10
2.4 Holder data 17
2.5 Assessment and eVV 20
2.6 Refunds and subsequent payment 24
2.7 Payment claim 25
2.8 Exception list (black list) 26
2.9 DSRC contract data 28
2.10 Confirmation and error messages (ackADU) 35

3 Transport layer 36
3.1 EETS Service Location 36
3.2 ASN.1 encoding 36
3.3 Transport security 36
3.4 Data integrity 36
3.5 Certificates 37
3.6 Transport API 37
3.7 Data transfer 39

1 Introduction

1.1 Scope

This document is a supplement to Annex 1 and contains the requirements and specification for the interface between the EETS provider and the Federal Office for Customs and Border Security (FOCBS), the Toll Charger of the LSVA.

The relevant information regarding the toll context and the toll transaction policy required for implementation of this interface can be found in Annex 1.

This document is written under the assumption that the reader is familiar with the standards EN ISO 12855, CEN/TS 16986 and EN ISO 17575-1.

1.2 List of changes

Version	Date	Section	Change
2.0	01.03.2020		First published version
2.1	12.06.2020	2.3.2.1 2.3.2.3 2.3.2.4 2.5.5 2.9.2 2.9.7.1 3.1 3.5	Figure with overview exchanged Examples of declarations over several days No overlap betweeen UsageStatements two AduReasonCodes added actionCode value **0** (send) one AduReasonCode added New section EETS Service Location inserted Certificates procedure adapted
2.2	21.08.2020	2.3.2.4 2.9.1 to 2.9.7 2.9.8	With attribute *rawDataList* (SEQUENCE OF MeasuredRawData) added in correspondance to ASN.1 Precisions on the time periods for activations and deactivations Clarification on key convertion before encryption, key encryption methode and content of CertificateSerialNumber
2.3	01.01.2022	various	Renaming of the Federal Customs Administration (FCA) to the Federal Office for Customs and Border Security (FOCBS)

1.3 References

The EETS provider Interface specified within this document is based on the standards and documents listed below:

Document	
[1]	Annex 1 to the FDF EETS and Fuel Card Providers Ordinance: Technical and Operational Requirements for EETS Provider
[2]	EN ISO 12855 2015; Electronic fee collection - Information exchange between service provision and toll charging

Document	
[3]	CEN/TS 16986 2016; Electronic Fee Collection - Interoperable application profiles for information exchange between Service Provision and Toll Charging
[4]	EN ISO 17575-1 2016; Electronic fee collection - Application interface definition for autonomous systems - Part 1: Charging
[5]	Supplement 2 to annex 1: LSVA Compliance Check Communication
[6]	ISO/IEC 8824-1 2015; Information technology - Abstract Syntax Notation One (ASN.1): Specification of basic notation
[7]	ISO/IEC 18033-2 2006; Information technology - Security techniques – Encryption algorithms – Part 2: Asymmetric ciphers
[8]	ISO 11568-2 2012; Financial services - Key management (retail) - Part 2: Symmetric ciphers, their key management and life cycle
[9]	ISO/IEC 8825-4 2015/Cor 1:2018; Information technology - ASN.1 encoding rules: XML Encoding Rules (XER)
[10]	EN ISO 14906 2018; Electronic fee collection - Application interface definition for dedicated short-range communication. 2018; Electronic fee collection - Application interface definition for dedicated short range communication Amendment 1

1.4 Terms and abbreviations

Term/Abbreviation	Meaning
ADU	Application Data Unit
APDU	Application Protocol Data Unit
APCI	Application Protocol Control Information
Assessment	Assessment is understood to mean the procedure by which the amount of LSVA to be paid is determined from the individual pieces of information presented (weights, distances recorded, etc.). Provided sufficient information is available, an ordinary assessment can be conducted. Ideally, this will be an automatic procedure that does not involve any manual steps. If there is not enough information for an ordinary assessment, the assessment will be made at the discretion of the FOCBS.
black list	List of vehicles for which the EETS provider denies contractual re-sponsibility
CCC	Compliance check communication (ISO 12813)
Declaration	Notification of all information required for the assessment.
DSRC	Dedicated short-range communication: technology for communication between recording device and beacon

Term/Abbreviation	Meaning
EETS	European Electronic Toll Service
EETS contract	The unambiguous identification of a contractual relationship between an EETS provider approved for the EETS Service and an EETS User for a single vehicle.
EETS journey	The journey of a vehicle in the LSVA toll domain subject to a charge is recorded via EETS and the charge due is paid via EETS. An EETS journey begins with the entry into the LSVA toll domain and ends with the exit of the vehicle from the LSVA toll domain.
EETS OBE	On-board equipment (On-board unit), the device supplied by the EETS provider and installed in the vehicle for recording the EETS journey.
EETS provider (EP)	A service provider accredited by the FOCBS for the LSVA with its approved EETS OBE.
EETS User	Customer subscribing to an EETS contract with the EETS provider
eVV	Electronic assessment decision (eVV = elektronische Veranlagungs-Verfügung)
exception list	A list either of type black list or of white list.
FCA	Federal Customs Administration (Toll Charger of the LSVA) replaced by Federal Office for Customs and Border Security (FOCBS) at 01.01.2022
FOCBS	Federal Office for Customs and Border Security (Toll Charger of the LSVA)
Holder	Holder specifically refers to the (natural or legal) person who has de jure power of disposal over the vehicle and who uses the vehicle or lets it be used.
licence plate	Number plate of the vehicle including country code.
LSVA	Performance-related heavy vehicle charge
LSVA toll domain	The area in which the LSVA is levied. The LSVA is levied for the use of all public roads in Switzerland and the Principality of Liechtenstein, Büsingen, Campione and the "Flughafenstrasse" in Basel.
OBU	On-board equipment = On-board unit = OBU
PAN	Personal account number, unique vehicle identifier for an EETS journey.
RSE	Roadside Equipment (boarder and enforcement DSRC beacons)
white list	List of vehicles for which the EETS provider accepts contractual responsibility.

2 Transactions and messages

2.1 General

All data is transmitted via an interface that essentially complies with EN ISO 12855 and CEN/TS 16986.

2.1.1 Transactions

The FOCBS uses the InfoExchange defined in section 2.2.2 for requests and confirmations. All data transmissions from the EETS provider to the FOCBS shall comply with the defined InfoExchange message in section 2.2.3.

The confirmation messages of EN ISO 12855 (e.g. InfoExchange with AckADU) are used to confirm or refuse the contents and functional correctness of the data at the application level.

The sequence diagrams in this section define the order of the application data unit (ADU) types used in the InfoExchange when transferring data between the FOCBS and the EETS provider.

A protocol for the transmission and acknowledgment of the individual messages will be provided by the underlying transport layer. The transport layer also provides functionality to ensure data confidentiality (encryption), integrity and authenticity (signature) of the messages. The transport layer is defined in section 3.

2.1.2 Message definition

The tables in this section define the use of InfoExchange with the associated ADUs in accordance with EN ISO 12855 and the data elements imported from EN ISO 17575-1. The semantics of the data elements applies as defined in EN ISO 12855 and EN ISO 17575-1 and is not repeated in this document. The restrictions and transaction definitions of CEN/TS 16986 are complied with whenever possible.

The column "Value range and description" in the tables contains if necessary:

- The detailed value range of the type attributes. The value range or assignment of values are given in decimal numeral system unless otherwise explicitly stated. Binary numbers are expressed using the notation 'B immediately following binary numbers, whereas hexadecimal numbers are expressed using the notation 'H immediately following hexadecimal numbers.

- Additional restrictions of the type attributes.

- Deviating definitions of the attributes compared to the standard EN ISO 12855, EN ISO 17575-1 and CEN/TS 16986 are denoted by Top-Up.

- Additional descriptions of the type attributes.

The column "Qty" provides information about the frequency of attributes. In addition, this column determines whether optional attributes according to the mentioned standards shall be present or not in the LSVA context. In summary, this means:

- 0 = optional data element that shall not be transferred

- 1 = optional data element shall be transmitted, in case of sequence data element exactly one element shall be transmitted

- 0..n = none or at most n data elements,
  1..n = at least 1 and at most n data elements,
  where n is only limited by the maximum size of a message (see section 3.6.1).

The rows in the tables in section 2 are highlighted using the following rules and colour codes to provide a better overview and give some additional information:

- attributes to be transmitted are highlighted by noting these against white background
- attributes according to standards to be submitted but not used by the FOCBS are highlighted against orange background
- attributes not to be transmitted (number = 0) are highlighted against grey background
- attributes for future use in LSVA toll domain are highlighted against green background
- and attributes that are Top-Up to standards are highlighted against blue background

2.1.3 General requirements

The PAN (`pan` = personal account number from `userId`) shall be the unique vehicle identifier for an EETS journey. During an EETS journey the `userId`, the combination of `pan`, `obeId` and `licencePlateNumber` shall not change.

2.1.4 Data type restrictions

For data elements that have not been otherwise restricted in terms of scope or format, the following restrictions apply:

- In the ASN.1 definition unlimited INTEGER shall not exceed the maximum value 2^63-1.
- In the ASN.1 definition of non-limited types "UTF8String" or "OCTET STRING" shall not include more than 1024 characters or octets.
- All time data elements without a time base defined shall be in coordinated universal time (UTC).
- Data elements of the type GeneralizedTime shall have, according to ISO/IEC 8824-1, section 46.3, the format b) with a resolution of one second.

2.1.5 ASN.1 files

The FOCBS will provide a complete set of ASN.1 files to the EETS provider. This set of ASN.1 files starts with the EN ISO 12855 module and includes

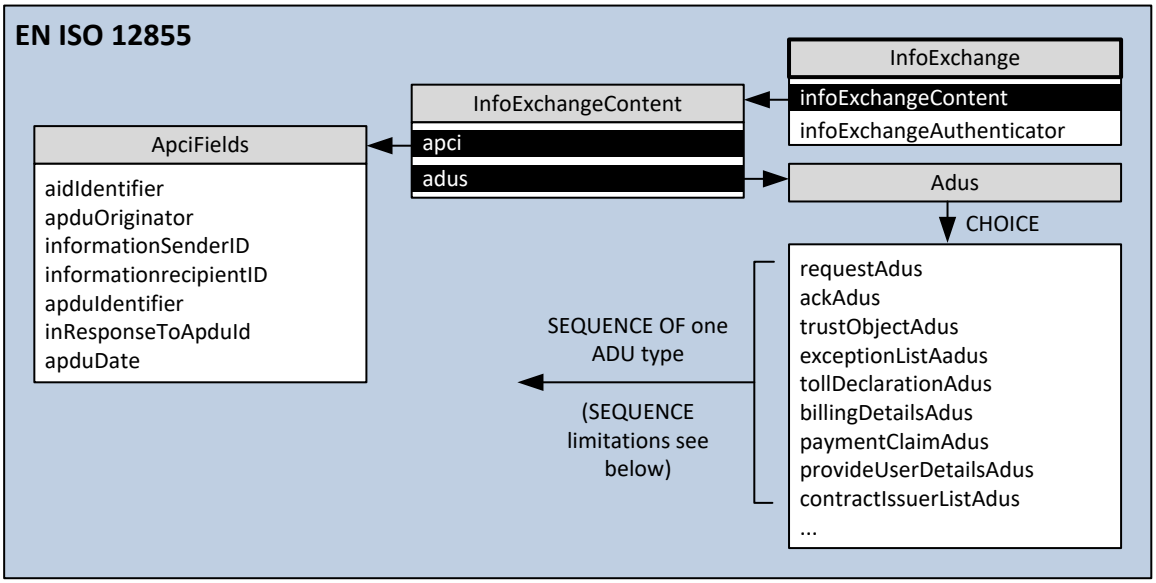
- all required definitions from CEN/TS 16986,
- all Top-Up definitions from the current document,
- and all required sub modules.

The provided ASN.1 sub modules will contain all enumeration and value range restrictions defined in the current document.

2.2 Basic protocol

2.2.1 Overview

The basic protocol is based on the InfoExchange from EN ISO 12855 and shown below. For Adus CHOICE, only the variants required for the interface of the FOCBS are listed.



An InfoExchange shall contain a SEQUENCE OF with only one single ADU (with the exception defined in section 2.9.1 for TrustObjectADU).

2.2.2 Messages from FOCBS to EETS provider

All messages from the FOCBS to the EETS provider are transmitted with the InfoExchange as defined below.

Data element	Qty	Value range and description
InfoExchange	1	
├ **infoExchangeContent**	1	
│ ├ **apci**	1	
│ │ ├ **aidIdentifier**	1	0 = EN ISO 12855:2015
│ │ ├ **apduOriginator**	1	
│ │ │ ├ **countryCode**	1	CH, binary (10 Bits) = 0111000101'B
│ │ │ └ **providerIdentifier**	1	FOCBS = 1
│ │ ├ **informationSenderID**	1	
│ │ │ ├ **countryCode**	1	CH, binary (10 Bits) = 0111000101'B
│ │ │ └ **providerIdentifier**	1	FOCBS = 1
│ │ ├ **informationrecipientID**	1	Configured and registered Provider-ID of the communication channel for this provider.
│ │ │ ├ **countryCode**	1	
│ │ │ └ **providerIdentifier**	1	
│ │ ├ **apduIdentifier**	1	0 to 2^63-1
│ │ ├ **previousApduId**	0	
│ │ ├ **nextApduId**	0	
│ │ ├ **inResponseToApduId**	0..1	Used in response to a request or in case of confirmation (i.e. AckADU). Otherwise not present.
│ │ │ ├ **apduOriginator**	1	Configured and registered Provider-ID of the communication channel for this provider.
│ │ │ │ ├ **countryCode**	1	
│ │ │ │ └ **providerIdentifier**	1	
│ │ │ └ **apduIdentifier**	1	0 bis 2^63-1
│ │ └ **apduDate**	1	Shall specify a time stamp for the APDU
│ └ **adus**	1	Only one ADU in one InfoExchange. Allowed ADU types (and Request CHOICE) are: - RequestADU (with CHOICE userDetailsRequest), defined in section 2.4.2 - AckADU, defined in section 2.10

│ │		- BillingDetailsADU, defined in section 2.5.2 - PaymentClaimADU defined in 2.7
└ **infoExchangeAuthenticator**	0	
├ **authenticatorEFC**	0	
└ **ackAuthenticatorEFC**	0	

2.2.3 Message from EETS provider to FOCBS

All messages from the EETS provider shall be submitted to the FOCBS with the InfoExchange in accordance with the following definition.

Data element	Qty	Value range and description
InfoExchange	1	
├ **infoExchangeContent**	1	
│ ├ **apci**	1	
│ │ ├ **aidIdentifier**	1	0 = EN ISO 12855:2015
│ │ ├ **apduOriginator**	1	Configured and registered Provider-ID of the communication channel for this provider.
│ │ │ ├ **countryCode**	1	
│ │ │ └ **providerIdentifier**	1	
│ │ ├ **informationSenderID**	1	The information shall be identical to the apduOriginator.
│ │ │ ├ **countryCode**	1	
│ │ │ └ **providerIdentifier**	1	
│ │ ├ **informationrecipientID**	1	
│ │ │ ├ **countryCode**	1	CH, binary (10 Bits) = 0111000101'B
│ │ │ └ **providerIdentifier**	1	FOCBS = 1
│ │ ├ **apduIdentifier**	1	0 to 2^63-1
│ │ ├ **previousApduId**	0	
│ │ ├ **nextApduId**	0	
│ │ ├ **inResponseToApduId** │ │ │ │	0..1	Used in response to a request or in case of confirmation (i.e. AckADU). Otherwise not present.
│ │ │ ├ **apduOriginator**	1	
│ │ │ │ ├ **countryCode**	1	CH, binary (10 Bits) = 0111000101'B
│ │ │ │ └ **providerIdentifier**	1	FOCBS = 1
│ │ │ └ **apduIdentifier**	1	0 to 2^63-1
│ │ └ **apduDate**	1	Shall specify a time stamp for the APDU
│ └ **adus** │ │ │ │ │ │ │ │	1	Only one ADU in one InfoExchange (with the exception defined in section 2.9.12.9 for TrustObjectADU). Allowed ADU types are: - AckADU, defined in section 2.10 - TrustObjectADU, defined in section 2.9 - ExceptionListADU, defined in section 2.8 - TollDeclarationAdu, defined in section 2.3.2.2 - ProvideUserDetailsADU, defined in section 2.4.3 - ContractIssuerListADU, defined in section 2.9.2
└ **infoExchangeAuthenticator**	0	
├ **authenticatorEFC**	0	
└ **ackAuthenticatorEFC**	0	

2.2.4 Error handling

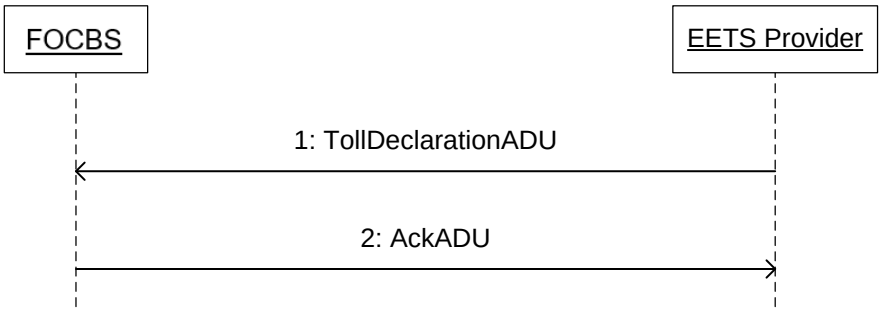
The correct syntax of the whole message will be checked by the transport layer described in section 3. Possible error message are described there.

In case of content and logical errors of the application protocol control information (apci) part of the APDU, an AckADU according to section 2.10.1 with apduAckCode (without an issue) listed in section 2.10.3 shall be sent by the FOCBS or EETS provider.

2.3 EETS journey declaration

2.3.1 Declaration requirements

The EETS provider shall automatically provide the FOCBS with all data regarding an EETS journey. The EETS journey declaration data consists of the journey position data and the vehicle parameters. The declaration process is shown below:



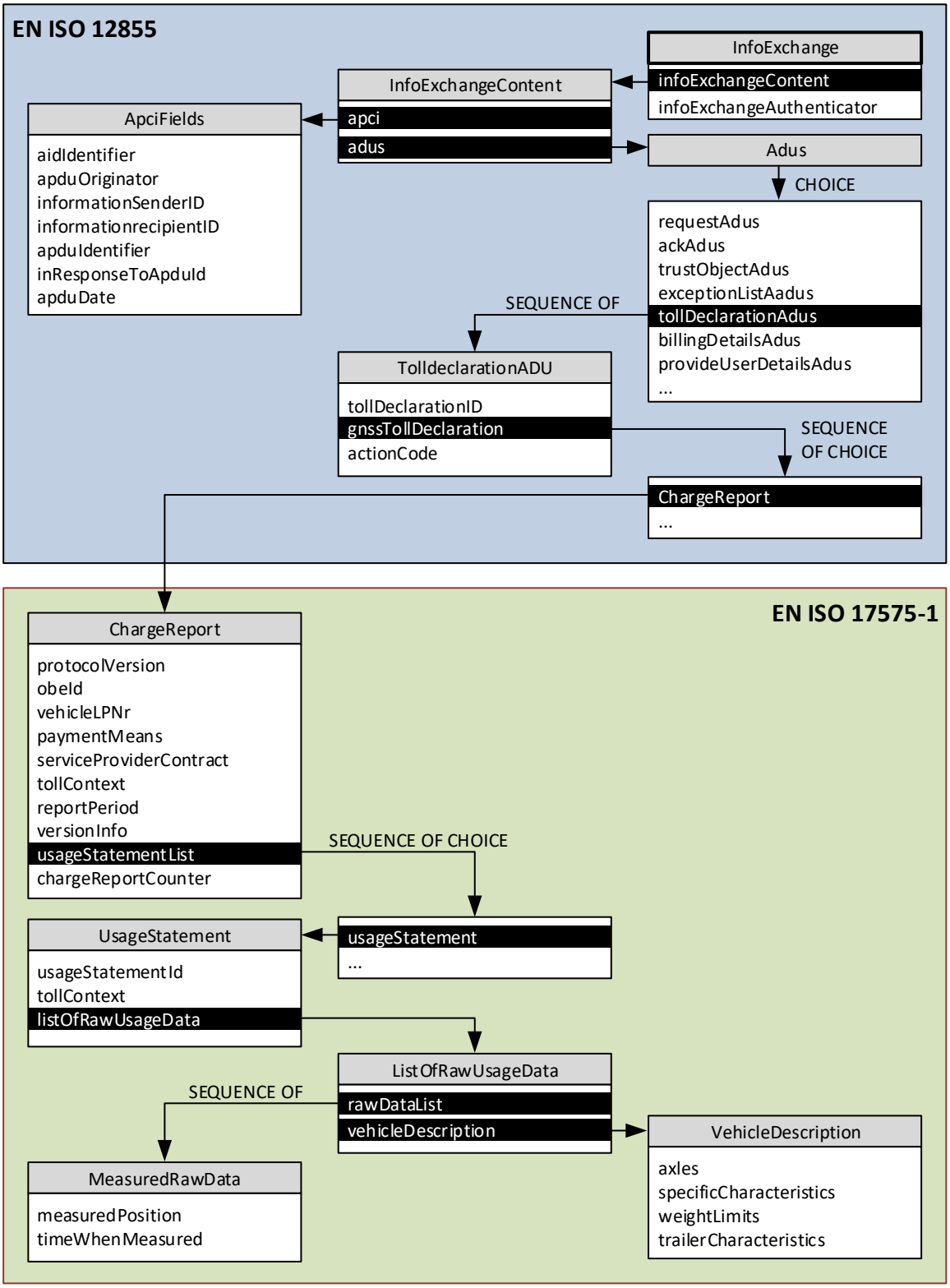
The following conditions apply:

- The transmission of the EETS journey declaration takes place automatically according to Annex 1.
- A TollDeclarationADU contains only the EETS journey declaration of a single journey and vehicle.
- An EETS journey completed on a single day shall always be transmitted as a single EETS journey declaration in one TollDeclarationADU.
- A multi-day EETS journey shall be split into one TollDeclarationADU per day of the EETS journey. For EETS journey days without vehicle moving an empty declaration (see **`ChargeReport.usageStatementList`**) is required. There shall be no time gaps in the daily EETS journey declaration (see requirements for **`ChargeReport.reportPeriod`**).
- An InfoExchange shall contain only TollDeclarationADUs of a single EETS journey.
- The transmission of the EETS journey declaration by the EETS provider is considered successful only after it has been acknowledged by the FOCBS with an AckADU (no single issue/error in any ADU existing).

2.3.2 EETS journey declaration message

2.3.2.1 Data structure overview

The TollDeclarationADU is used to transmit the EETS journey declaration. An overview of these data structures from EN ISO 12855 and EN ISO 17575-1 is shown in the figure below.



2.3.2.2 TollDeclarationADU

The EETS journey declaration, which is the position and vehicle data of the EETS journey, is transmitted automatically with a TollDeclarationADU according to the following table:

Data element	Qty	Value range and description
adu └ tollDeclarationADU	1	TollDeclarationADU of a single EETS journey
├ tollDeclarationId	1	
│ ├ issuerID	1	Configured and registered Provider-ID of the EETS provider
│ │ ├ countryCode	1	
│ │ └ providerIdentifier	1	
│ └ declarationID	1	0 to 2^63-1 according to CEN/TS 16986:2016
├ gnssTollDeclaration │ └ ChargeReport	1	Contains the data of one or a part of an EETS journey according to section 2.3.2.3.
└ actionCode	1	Constant value 0 = send (normal sending of a Toll declaration)

2.3.2.3 ChargeReport

The position data and vehicle parameters of the EETS journey are transmitted in the data structure ChargeReport (defined in EN ISO 17575-1).

Data element	Qty	Value range and description
ChargeReport	-	
├ protocolVersion	1	Current constant value: 0 = EN ISO 17575-1:2016
├ obeId	1	
│ ├ manufacturerId	1	0..65535, see ISO 14816 register
│ └ equipmentOBUId	1	According to EN ISO 14906
├ vehicleLPNr │ │	1	Same format and restrictions as defined in Supplement 2 for Attribute 16: VehicleLicencePlateNumber
│ ├ countryCode	1	
│ ├ alphabetIndicator	1	
│ └ licencePlateNumber	1	
├ paymentMeans	1	According to EN ISO 14906
│ ├ personalAccountNumber │ │ │ │	1	PAN coded in the OCTET STRING (SIZE(10)) in binary code decimal (BCD) = max 19 digits decimal and padding bits set to 1'B
│ ├ paymentMeansExpiryDate │ │ │	1	Shall not be expired for reportPeriod, it is the entry time and date of LSVA toll domain
│ │ ├ year	1	
│ │ ├ month	1	
│ │ └ day	1	
│ └ pamentMeansUsageControl	1	
├ serviceProviderContract	1	EFC-ContextMark (= CCC-ContextMark)
├ tollContext	1	Mandatory according to CEN/TS 16986:2016
│ ├ countryCode	1	CH, binary (10 Bits) = 0111000101'B
│ └ providerIdentifier	1	FOCBS = 1
├ chargeReportFinalRecipient	0	
├ timeOfReport	0	
├ reportPeriod	1	Period of the EETS journey declaration
│ ├ beginOfPeriod │ │ │ │	1	Date and time of LSVA toll domain entry or in case of no entry the report date with time 00:00:00. Detailed definition see remarks below.
│ └ endOfPeriod │ │	1	Date and time of LSVA toll domain exit or in case of no exit the report date with time 23:59:59. Detailed definition see remarks below.
├ versionInfo	1	CHOICE basicVersionId
│ └ basicVersionId │	1	Current status of the relevant components of the EETS provider Front End. See remark below.
├ usageStatementList	1	CHOICE usageStatement
│ └ usageStatement	0..n	0 = empty EETS journey declaration, see remark below

EETS Provider Interface

Data element	Qty	Value range and description
│		1…n UsageStatement according to 2.3.2.4
├ **sumVatForThisSession**	0	
├ **accountStatus**	0	
├ **chargeReportCounter**	1	0..2^32-1, OBE counter, mandatory in CEN/TS 16986:2016
├ **mileage**	0	
└ **listOfCccAttributes**	0	

Remarks:

- LSVA toll domain entry means date and time of the first position delivered in the domain entry declaration. This first position is geographically located before entering the LSVA toll domain.

- LSVA toll domain exit means date and time of last position delivered in the domain exit declaration. This last position is geographically located after leaving the LSVA toll domain.

- In case of a multi-day EETS journey declaration of n days, the FOCBS shall be able to check the EETS provider obligation to declare every day without gaps.

- In case of empty EETS journey declaration, **reportPeriod** shall covering then the whole day (00:00:00 to 23:59:59) without vehicle movement.

- Therefore, the rules according to the following examples shall apply:

Examples:

1. Single-day EETS journey in a single declaration:

    - Declaration of day X (LSVA toll domain entry and toll domain exit):
      beginOfPeriod = Date and time of the first position delivered (see LSVA toll domain entry above).
      endOfPeriod = Date and time of the last position delivered (see LSVA toll domain exit above)

2. Two-day EETS journey in two declarations

    - Declaration of day X (LSVA toll domain entry with no exit):
      beginOfPeriod = Date and time of the first position delivered (see LSVA toll domain entry above).
      endOfPeriod = Date X / time = 23:59:59

    - Declaration of day X+1 (LSVA toll domain exit with no entry):
      beginOfPeriod = Date X+1 / time = 00:00:00
      endOfPeriod = Date X+1 / time of the last position delivered (see LSVA toll domain exit above).
      The **usageStatement** (**listOfRawUsageData**) may include a part of position data of day X to X+1.

3. Three-day EETS journey in three declarations

    - Declaration of day X (LSVA toll domain entry with no exit):
      beginOfPeriod = Date and time of the first position delivered (see LSVA toll

domain entry above).
endOfPeriod = Date X / time = 23:59:59

- Declaration of day X+1 (no LSVA toll domain entry or exit):
  beginOfPeriod = Date X+1 / time = 00:00:00
  endOfPeriod = Date X+1 / time = 23:59:59
  The **usageStatement** (**listOfRawUsageData**) may include a part of position data of day X to X+1.

- Declaration of day X+2 (LSVA toll domain exit with no entry):
  beginOfPeriod = Date X+2 / time = 00:00:00
  endOfPeriod = Date X+2 / time of the last position delivered (see LSVA toll domain exit above).
  The **usageStatement** (**listOfRawUsageData**) may include a part of position data of day X to X+2.

4. Single-day EETS journey in two declarations, late delivery of position data
   Late delivery of position data may for example occur because the EETS OBE was not able to transmit all journey data on the days before due to unavailable data connection or early switch off.

   - Declaration day of X (LSVA toll domain entry with no (missing) exit):
     beginOfPeriod = Date and time of the first position delivered (see LSVA toll domain entry above).
     endOfPeriod = Date X / time = 23:59:59

   - Declaration day X+1 (LSVA toll domain exit on day X with no entry):
     beginOfPeriod = Date X/ time = hh:mm:ss of the first position following the last declared position in the declaration of day X
     endOfPeriod = Date X / time of the last position delivered (see LSVA toll domain exit above).

- The **basicVersionId** should contain as a minimum the major HW and SW versions of the OBE. The EETS provider shall deliver a description of the content of **basicVersionId** to the FOCBS.

- In case the EETS journey declaration message is representing a day without moving of the vehicle, the data element **usageStatementList** shall be empty.

2.3.2.4 UsageStatement

A usage statement (defined in EN ISO 17575-1), as shown in the following table, contains the complete list of position data and vehicle parameters for the part of an EETS journey with identical vehicle parameters (i.e., no trailer condition changes).

The position data requirements for the EETS journey declaration are defined in the Annex 1.

If the trailer parameters (trailer on/off or trailer weight) changes during the EETS journey, a new UsageStatement shall be generated. The new UsageStatement starts with the position data from this point in time with the new, changed trailer parameters.

An EETS journey can also for other reasons be split into multiple UsageStatement. The measuredPositions in the individual UsageStatements must not overlap under any circumstances, even across several ChargeReports.

Data element	Qty	Value range and description
UsageStatement	1	One UsageStatement per applicable tariff
├ usageStatementId	1	0..65535, Mandatory according to CEN/TS 16986:2016
├ tollContext	1	Mandatory according to CEN/TS 16986:2016
│ ├ countryCode	1	CH, binary (10 Bits) = 0111000101'B
│ └ providerIdentifier	1	FOCBS = 1
├ chargeReportFinalRecipient	0	
├ aggregatedFee	0	
├ sumVat	0	
├ aggregatedSingleTariffClassSession	0	
├ listOfChargeObjects	0	
├ listOfDSRCUsageData	0	
├ listOfRawUsageData	1	
│ ├ rawDataList (SEQUENCE OF MeasuredRawData)	1..n	Contains the gap-less position data of a part of an EETS journey.
│ │ ├ measuredPosition	1	Position data requirements and coordinate system see Annex 1.
│ │ │ ├ longitude	1	as defined in ISO 6709, in microdegrees, >0=east, <0=west, absolute value <=180°
│ │ │ ├ latitude	1	as defined in ISO 6709, in microdegrees, >0=north, <0=south, absolute value <=90°
│ │ │ └ altitude	0	
│ │ ├ timeWhenMeasured	1	Time in UTC, shall be a time in the reportPeriod
│ │ ├ nMEPData	0	
│ │ └ additionalGNSSData	0	
│ ├ currentTariffClass	0	
│ └ vehicleDescription	1	
│ ├ vehicleLPNr	0	
│ ├ axles	1	Tractor and trailer axles
│ │ ├vehicleFirstAxleHeight	1	
│ │ └vehicleAxlesNumber	1	
│ │ ├ tyreType	1	
│ │ └ numberOfAxles	1	
│ │ ├ trailerAxles	1	
│ │ └ tractorAxles	1	
│ ├ class	0	
│ ├ dimensions	0	
│ ├ specificCharacteristics	1	
│ │ ├ environmentalCharacteristics	1	According to EN ISO 14906
│ │ │ ├ euroValue	1	0 = not present, 1 = EURO 1, 2 = EURO 2, 3 = EURO 3, 4 = EURO 4, 5 = EURO 5, 6 = EURO 6, 15 = EEV. EURO emission class (currently according to Annex 1 of the Directive 88/77/EEC) or EEV (currently according to the Directive 2005/55 / EEC (Annex I, section 6.2.1)
│ │ │ └ copValue	1	CO_2 (in g/km) value. The European registration certificate element V.7. Cop value as defined in EC directive 2003/127/EC: noEntry (0) = default if value is unknown co2class1 (1) = below 101 g/km co2class2 (2) = 101 to 120 g/km co2class3 (3) = 121 to 140 g/km co2class4 (4) = 141 to 160 g/km co2class5 (5) = 161 to 200 g/km co2class6 (6) = 201 to 250 g/km co2class7 (7) = above 250 g/km
│ │ ├ engineCharacteristics	1	The European registration certificate element P.3. Type of fuel or power source:

Data element	Qty	Value range and description
│ │ │		0 = noEntry = default if value is unknown 1 = noEngine 2 = petrolUnleaded 3 = petrolLeade 4 = diesel 5 = lPG 6 = battery 7 = solar 8 = hybrid 9 = hydrogen 10-255 are reserved for future CEN use
│ │ ├ **descriptiveCharacteristics**	1	
│ │ └ **futureCharacteristics**	1	
│ ├ **ladenWeight**	0	
│ ├ **weightLimits**	1	According to EN ISO 14906
│ │ ├ **vehicleMaxLadenWeight**	1	Maximum permissible laden mass of the vehicle in service in the Member State of registration (F.2) in 10 kg units, rounded downwards
│ │ ├ **vehicleTrainMaximumWeight**	1	Maximum permissible laden mass of the whole vehicle in service in the Member State of registration (F.3) in 10 kg units, rounded downwards
│ │ └ **vehicleWeightUnladen**	1	Mass of the vehicle in service with bodywork, and with coupling device in the case of a towing vehicle in service from any category other than M1 (G), also with hitch in 10 kg units, rounded downwards. If the weight has not been registered, the value 0 shall be set.
│ └ **trailerCharacteristics**	1	According to section 2.3.2.5
├ **noUsage**	0	
└ **additionalUsageInformation**	0	

2.3.2.5 Trailer data

It is up to the EETS provider to decide whether to implement a detailed trailer weight declaration or the simplified trailer declaration (trailer available / no trailer).

The following definitions specify the values of the data element trailerCharacteristics for both cases:

Trailer weight declaration:

The following table describes the values for the declaration of the correct trailer weight. The `trailerAxles`, `trailerMaxLadenWeight` and `trailerWeightUnload` values are 0 if `trailerType` = 0 (no trailer is present).

Data element	Qty	Value range and description
trailerCharacteristics	1	
└ **trailerDetails**	1	
│ ├ **trailerType**	1	0 = no trailer, 1 = pull-bar trailer, 2 = semi-trailer In case of no trailer (0) and trailerAxles > 0, for LSVA weight calculation a pull-bar trailer type will be used.
│ └ **trailerAxles**	1	Number of trailer axels, otherwise 0
├ **trailerMaxLadenWeight**	1	Maximum permissible total weight of the trailer including payload in 10 kg units, rounded down / 0 = no trailer
└ **trailerWeightUnladen**	1	Trailer nominal weight empty in 10 kg units, rounded down / 0 = no trailer

Simplified trailer declaration:

The following table describes how the values for the simplified trailer declaration are to be assigned. The values `trailerMaxLadenWeight` and `trailerWeightUnladen` shall be set to 0 in any case. In case of simple trailer declaration, it does not matter if a present trailer is declared by a value 1 (trailer) or 2 (semitrailer) in `trailerType`.

Data element	Qty	Value range and description
trailerCharacteristics	1	
└ **trailerDetails**	1	
│ ├ **trailerType**	1	0 = no trailer, 1 = trailer, 2 = semitrailer
│ └ **trailerAxles**	1	number of trailer axels, if no trailer = 0
├ **trailerMaxLadenWeight**	1	set to 0
└ **trailerWeightUnladen**	1	set to 0

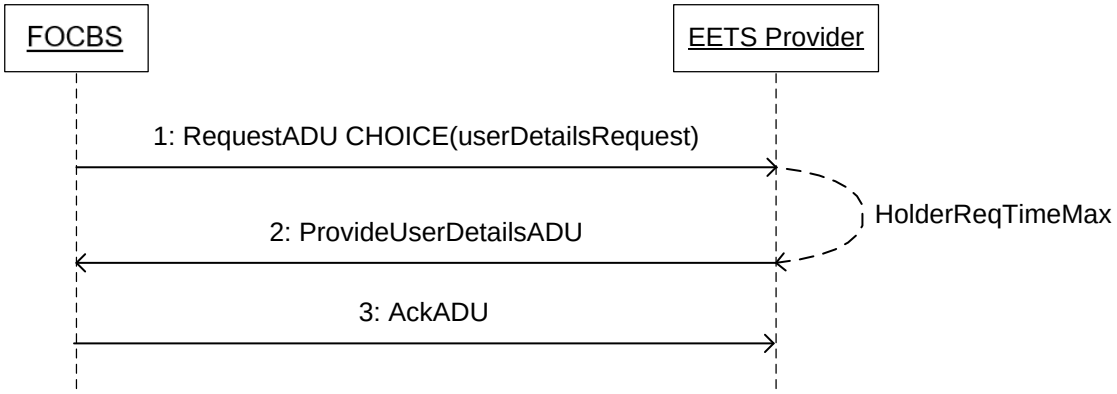
2.3.3 TollDeclarationADU error handling

At the present time, no error codes for the EETS journey declaration regarding business (content and logical) errors are sent by the FOCBS in an AckADU. There will be always an AckAdu according to section 2.10.1 with apduAckCode = apduOK (2).

2.4 Holder data

2.4.1 Transaction and requirements

In a holder data request one RequestADU will be transmitted in one InfoExchange. The following sequence diagram defines the data transmission for the request of the holder data:



The following conditions apply:

- Regardless of whether individual attributes or all attributes of the requested holder data are not available, the EETS provider shall respond with a ProvideUserDetailsADU.
- For each missing attribute in the ProvideUserDetailsADU, the userParameterStatus in UserParameterResponse shall then set to 1 (= attribute is not available).
- The EETS provider shall send the ProvideUserDetailsADU not later than 12 hours (= HolderReqTimeMax) after the request.

The FOCBS requests the holder data for every EETS journey with the RequestADU defined in section 2.4.2. The transmission of the holder data of the vehicle is carried out by the EETS provider in the data format according to section 2.4.3.

2.4.2 Holder data request (RequestADU)

With a RequestADU with CHOICE userDetailsRequest, the required holder data for a vehicle will be requested.

Data element	Qty	Value range and description
adu └ **requestAdus**	1	
└ **userDetailsRequest**	1	RequestADU with CHOICE userDetailsRequest
├ **requestedADUType**	1	provideUserDetailsADU
├ **userId**	1	
│ ├ **pan**	1	
│ ├ **contractSerialNumber**	0	
│ ├ **licencePlateNumber**	0	
│ └ **obeId**	0	
├ **listOfParametersRequested** │ └ **UserParameterRequest**	2	The following 1 to 2 listed UserParameterRequest are requested.
│ ├ **extendedUserPostalAddress**	1	(26)
│ └ **preferredUserLanguage**	1	(27)
├ **userDetailsRequestReason**	0	
└ **userInfoValidityPeriod**	1	Period is start date of the EETS journey
│ **beginOfPeriod**	1	Date/time for the validity of the requested details.
└ **endOfPeriod**	1	No period, same value as in beginOfPeriode

The time for the request in **userInfoValidityPeriod** shall be the time when the vehicle has entered the LSVA toll domain identified by a CCC transaction or by evaluating the GNSS coordinates of the EETS journey.

2.4.3 Holder data transmission (ProvideUserDetailsADU)

The answer to a holder data request shall provide the information valid at the date/time defined in **userInfoValidityPeriod** date element.

The transmitted data contain the details of the EETS User according to the Annex 1.

Data element	Qty	Value range and description
adu └ **provideUserDetailsADU**	1	
└ **ProvideUserDetails**	1	
├ **originaluserIdRequest**	1	
│ ├ **pan**	1	
│ ├ **contractSerialNumber**	0	
│ ├ **licencePlateNumber**	0	
│ └ **obeId**	0	
├ **userId**	1	
│ ├ **pan**	1	
│ ├ **contractSerialNumber**	0	
│ ├ **licencePlateNumber**	0	
│ └ **obeId**	0	
├ **statusFlag** │	1	0…5 and 101 (Top-Up, range 0…7 in CEN/TS 16986:2016), see remark below.

Data element	Qty	Value range and description
└ **listOfUserParameters**	0 or 2	The following 2 listed UserParameterResponse have to be transmitted if statusFlag has a value from 1 to 5.
├ **UserParameterResponse**	1	
├ **requestedUserParameter**	0	
├ **userParameterResponse**	0..1	Present if userParameterStatus = 0 (attribute is available)
└ **extendedUserPostalAddress**	1	
├ **addresseeRoleDescriptor**	0	
├ **organisationName**	0..1	Full company name, including its legal form (AG, GmbH, Ltd., etc.). This attribute shall be filled if the holder is a company.
├ **organisationUnit**	0	
├ **function**	0	
├ **formOfAddress**	0	
├ **qualification**	0	
├ **surname**	0..1	This attributes shall be filled if the holder is a person.
├ **givenName**	0..1	
├ **deliveryServicePoint**	0..1	Shall contain, if present additional address information
├ **thoroughfare**	1	Shall contain the street name and house number
├ **postcode**	1	
├ **town**	1	
├ **country**	1	
├ **phoneInternationalDial**…	0	
├ **phoneDiallingCode**	0	
├ **mobileInternational**…	0	
├ **mobileDiallingCode**	0	
├ **mobileSubscriberNumber**	0	
├ **faxInternationalDial**…	0	
├ **faxDiallingCode**…	0	
├ **faxSubscriberNumber**…	0	
└ **email**	0	
├ **userParameterStatus**	1	0 = attribute is available, 1 = attribute is not available
└ **userInfoValidityPeriod**	0	
└ **UserParameterResponse**	1	
├ **requestedUserParameter**	0	
├ **userParameterResponse**	0..1	Present if userParameterStatus = 0 (attribute is available)
└ **preferredUserLanguage**	1	'de' | 'fr' | 'it' | 'en' (language code according to ISO 639-1)
├ **userParameterStatus**	1	0 = attribute is available, 1 = attribute is not available
└ **userInfoValidityPeriod**	0	

Remark to the allowed statusFlag values:

0 = Means user unknown (noContractualRelation)

1 = Contract as private user (standardPrivateUserContract), userParameterResponse expected

2 = Contract as a commercial user (standardCommercialUserContract), userParameterResponse expected

3 = Put on black list, expect to remove it soon before the requested date/time (tempExceptionListed), userParameterResponse expected

4 = Put permanently on black list before the requested date/time (permanentExceptionListed), userParameterResponse expected

5 = Contract with the user has ended before the requested date/time (contractClosed)

101 = No user data available for the requested date/time (noDataAvaliableForPeriode)

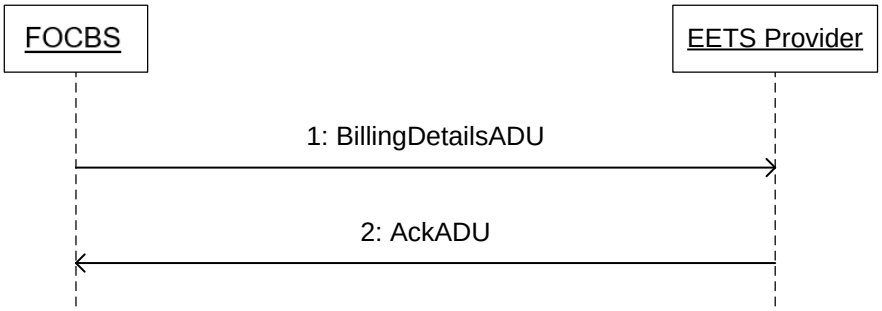
2.4.4 ProvideUserDetailsADU error handling

The FOCBS will not send any error message for this ADU and always send an AckADU according to section 2.10.1 with apduAckCode = apduOK (2).

2.5 Assessment and eVV

2.5.1 Transaction and requirements

The FOCBS transmits the assessment data, containing the performance-related heavy vehicle charge due for the EETS journey and the detailed charge-relevant factors of the journey, via the BillingDetailsADU (see section 2.5.2) to the EETS provider. The EETS provider shall confirm reception of the assessment data record with an AckADU.



For the language dependent texts in all data elements used for the BillingDetailsADU, the language used shall be in accordance with the answer in "preferredUserLanguage" of the holder data. In case there is no preferred language or it is none of the four supported languages (i.e. 'de' | 'fr' | 'it' | 'en') by the LSVA scheme, then "en" (English) shall be used.

2.5.2 BillingDetailsADU

Data element	Qty	Value range and description
adu **└ billingDetailsADU**	1	This ADU represents the eVV for an EETS journey. Only one ADU due to signature and archive reasons.
├ billingDetailsId	1	
│ ├ issuerId	1	See apduOrginator in section 2.2.2
│ │ ├ countryCode	1	CH, binary (10 Bits) = 0111000101'B
│ │ └ providerIdentifier	1	FOCBS = 1
│ ├ billingDetailsNum	1	0 to 2^63-1 according to CEN/TS 16986:2016
│ └ dateOfService	0	Not used according to CEN/TS 16986:2016
├ tollContext	1	See apduOrginator in section 2.2.2
│ ├ countryCode	1	CH, binary (10 Bits) = 0111000101'B
│ └ providerIdentifier	1	FOCBS = 1
├ userId	1	

Data element	Qty	Value range and description
│ ├ **pan**	1	Personal account number, the primary user identifier PAN coded in the OCTET STRING (SIZE(10)) in binary code decimal (BCD), max 19 digits decimal and padding bits set to 1'B
│ ├ **contractSerialNumber**	0	
│ ├ **licencePlateNumber**	1	
│ └ **obeId**	1	
├ **relatedBillingDetails**	0..1	Only present in case of refunds and subsequent payment for an earlier assessed EETS journey
│ ├ **issuerId**	1	See apduOrginator in section 2.2.2
│ │ ├ **countryCode**	1	CH, binary (10 Bits) = 0111000101'B
│ │ └ **providerIdentifier**	1	FOCBS = 1
│ ├ **billingDetailsNum**	1	0 to 2^63-1 according to CEN/TS 16986:2016 Contains the related billingDetailsNum
│ └ **dateOfService**	0	Not used according to CEN/TS 16986:2016
├ **period**	1	Start and end of EETS journey
│ ├ **beginOfPeriod**	1	Date/time of CH entry (EETS journey start)
│ └ **endOfPeriod**	1	Date/time of CH exit (EETS journey end)
├ **billingDetailsAmount**	1	Assessed LSVA amount (CHF)
│ ├ **paymentFeeAmount**	1	Amount in cents, 1 = 0.01 CHF (-2^49 to 2^49-1)
│ ├ **paymentFeeUnit**	1	2756'H Currency in minor units of 100 :1 ('Rappen')
│ └ **vATrate**	0	Not used according to CEN/TS 16986:2016
├ **usageDetails**	1	
│ ├ **contextName**	1	Constant value: "LSVA toll domain"
│ ├ **appliedUserClass**	1	Constant value: "Standard"
│ └ **perDeclaredVehicleClasses**	1..n	One element for each part of EETS journey with the same applicable tariff (no trailer status change)
│ ├ **declaredVehicleClass**	1	Assessed Euro class and assessed weight of the vehicle, see remark below.
│ └ **perUsedTimeClasses**	1	
│ ├ **appliedTimeClass**	1	Period from/to of EETS journey part with format: "DD:MM:YYYY hh:mm - DD:MM:YYYY hh:mm"
│ ├ **costCenter**	1	Mandatory according to CEN/TS 16986:2016, not used in LSVA toll context, empty string.
│ └ **usageList**	1	UsageList element according section 2.5.3
├ **refTollDeclaration**	0..n	Reference to all declarations (TollDeclarationADU) of the assessed EETS journey, see remark below.
│ ├ **issuerID**	1	Configured and registered Provider-ID of the EETS provider
│ │ ├ **countryCode**	1	
│ │ └ **providerIdentifier**	1	
│ └ **declarationId**	1	declarationID of the related TollDeclarationADU
├ **associatedEventData**	0	
├ **actionCode**	1	Constant value 0 = send
└ **paymentReference**	0	

Remarks:

- The format of the assessed Euro class and assessed weight of the vehicle in the **declaredVehicleClass** UTF8String shall be according to the following definition "Euro e / tt'ttt kg" where
  e = Euro class 1 to 6, with option for Euro 5: "5 (EEV)"
  tt'ttt = Assessed weight of the vehicle train in kilogram
  Examples:

"Euro 5 / 26'600 kg"
"Euro 5 (EEV) / 40'000 kg"

- The data element **`refTollDeclaration`** is not present if there was no EETS journey declaration in time and the assessment was made at the discretion of the FOCBS (the vehicle was identified by one or more CCC transaction in the LSVA toll domain).

2.5.3 UsageList

The data element usagList is defined below. The currency of the fee is in CHF.

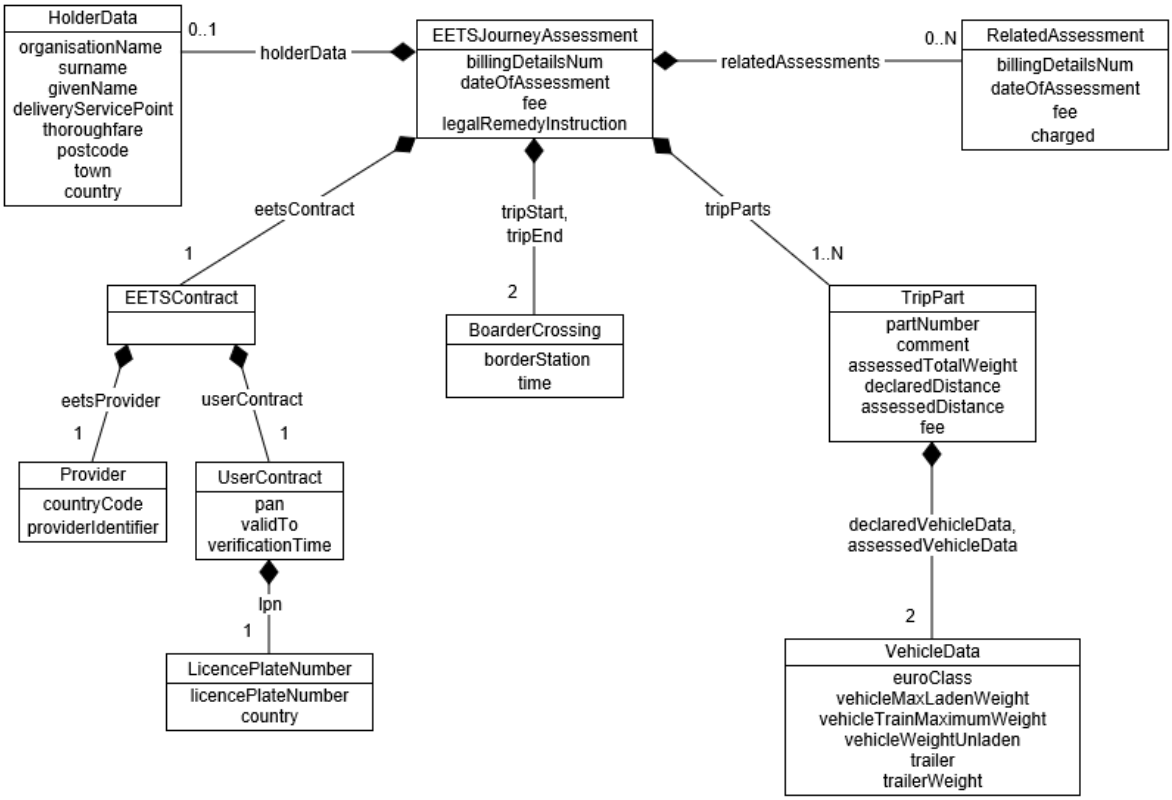
Data element	Qty	Value range and description
`UsageList`	1	
├ **`usageListEntry`**	1	CHOICE freeTextDetail
│ └ **`freeTextDetail`**	1	
│ ├ **`textLanguage`**	1	see preferredUserLanguage in 2.4.3: 'de' | 'fr' | 'it' | 'en' (language code according to ISO 639-1)
│ ├ **`textDetail`**	1	see 2.5.4 below
│ ├ **`fee`**	1	Fee for this part of the EETS journey in CHF
│ │ ├ **`paymentFeeAmount`**	1	Amount in cents 1 = 0.01 CHF (-2^49 to 2^49-1)
│ │ ├ **`paymentFeeUnit`**	1	2756'H Currency in minor units of 100 :1 ('Rappen')
│ │ └ **`vATrate`**	0	Not used according to CEN/TS 16986:2016
│ └ **`feeQualifier`**	1	0 = standardCharge
├ **`includedDiscounts`**	0	
├ **`associatedEventData`**	0	
└ **`externalCosts`**	0	

2.5.4 textDetail

The **`textDetail`** of the first data element from the SEQUENCE of **`perDeclaredVehicleClasses`** in **`billingDetailsADU`** shall contain the assessment description (eVV) in extensible markup language (XML) of the whole EETS journey defined in this section. The **`textDetail`** of all other data elements from the SEQUENCE of **`perDeclaredVehicleClasses`** shall contain an empty string.

The overview of the XML structure for the assessment description is shown in the figure below:

EETS Provider Interface



The XML schema definition (XSD) for the assessment description is available: link to EETS-Providers – see "Documents".

Remarks to the XML structure:

- The filed <legalRemedyInstruction> (German "Rechtsmittelbelehrung") gives instruction on the right to appeal if the EETS user does not agree with the EETS journey assessment.

- The element <RelatedAssessment> is only present in case of an assessment correction as described in section 2.6.

The EETS journey assessment XML document shall be signed according to section 3.4. The signature can be verified with the XML document signature certificate defined in section 3.5.2.

The XML control characters of the signed EETS journey assessment XML document shall be escaped according to the table below (see https://www.w3.org/TR/2008/REC-xml-20081126/#sec-predefined-ent) before inserted in the **`textDetail`**.

Control character	Escape string
<	<
>	>
"	"
'	'
&	&

Remark:

- For verification of the signature, the XML control character escaping shall be undone.

2.5.5 BillingDetailsADU error handling

The following BillingDetailsADU specific error codes shall be sent in an AckADU according to section 2.10.2 by the EETS provider:

Name (AduReasonCode)	Meaning	Value
invalidADU	textDetail of first data element in the SEQUENCE of perDeclaredVehicleClasses (assessemnt description) is emty or the content is invalid	0
billingDetailsClaimIdRejected	BillingDetailsADU with corresponding Id already received	701
bilD-unknownDeclarationId	Reference to one or more declarations (TollDeclarationADU) are not known. Only allowed if one or more declarationId is referenced in BillingDetailsADU.	11001
bilD-unknownRelatedBillingDetails	Reference to the related billing details (BillingDetailsADU) is not known. Only in case of refunds or subsequent payment possible, see 2.6 below.	11002
bilD-invalidPan	Invalid/unknown PAN	11003
bilD-invalidObeId	Invalid/unknown OBE ID	11004
bilD-invalidLpn	Invalid/unknown licence plate number	11005

Remark:

- In case of a negative AckADU, an internal process for error analysing will be started. After error correction the BillingDetailsADU will be sent with a new **`billingDetailsId`** (= new **`billingDetailsNum)`**.

- For each unknown reference to a TollDeclarationADU (AduReasonCode = bilD-unknownDeclarationId) an issue structure will be added to the list of issues in the AckADU. The unknown reference will be indicated with the **`declarationId`** in the attribute **`issueLocation`**.

2.6 Refunds and subsequent payment

The correction of an EETS journey assessment may result in a refund or subsequent payment. In such case a new BillingDetailsADU according to section 2.5.2 above shall be provided with the following different content:

- The additional data element **`relatedBillingDetails`** shall identify the corrected EETS journey assessment, i.e. the previous sent BillingDetailsADU.

- The data element **`billingDetailsAmount->paymentFeeAmount`** shall contain the amount of refund as negative value or subsequent payment as positive value.

- The data element **`textDetail`** shall contain the assessment descriptions (eVV) with the content defined in section 2.5.4 including at least one RelatedAssessment.

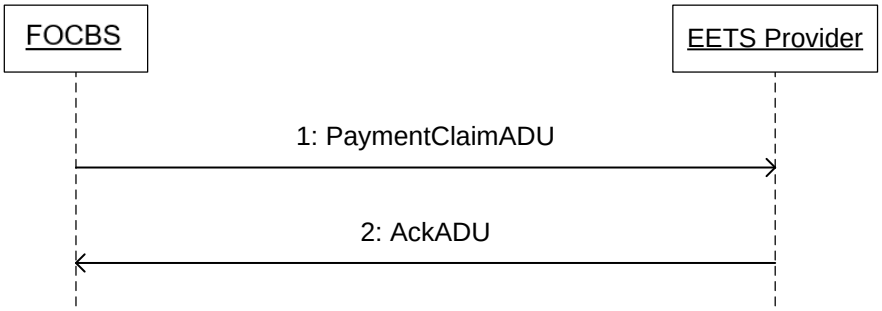
Remark:

- The amount in **`billingDetailsAmount->paymentFeeAmount`** shall be the difference of the two EETS journey assessments.

2.7 Payment claim

2.7.1 Transaction and requirements

The payment claim contains the summarised amount of and the reference to the BillingDetailsADUs (eVV) for an invoice period. The payment claim will be provided per calendar day to the EETS provider, even it is a payment claim without a **`billingDetailsList`** and **`paymentFeeAmount`** = 0.



The payment claim shall include all assessments, refunds and subsequent payments (all of type BillingDetailsADUs) provided to the EETS provider during the period defined by **`startDateTime`** and **`endDateTime`** of the PaymenClaimADU.

2.7.2 PaymentClaimADU

Data element	Qty	Value range and description
adu └ **PaymentClaimADU**	1	
├ **paymentClaimId**	1	0 to 2^63-1, primary reference number for the payment system. Shall be unique independent of the receiving EETS provider.
├ **startDateTime**	1	date of claim day with time = 00:00:00
├ **endDateTime**	1	date of claim day with time = 23:59:59
├ **userId**	0	Top-Up, mandatory in CEN/TS 16986:2016, but the billingDetailsList refers to BillingDetailsADU for different userId
├ **paymentClaimAmount**	1	Summarised amount of the billingDetailsList in CHF
│ ├ **paymentFeeAmount**	1	Amount in cents, 1 = 0.01 CHF (-2^49 to 2^49-1)
│ ├ **paymentFeeUnit**	1	2756'H Currency in minor units of 100 :1 ('Rappen')
│ └ **vatRate**	0	
├ **paymentClaimStatus**	1	0 = first version
├ **typeOfFee**	1	0 = toll
├ **referenceDetailsList**	1	SEQUENCE OF CHOICE billingDetailsList
│ └ **billingDetailsList**	0..n	SEQUENCE OF BillingDetailsId
│ ├ **issuerId**	1	See apduOrginator in section 2.2.2
│ │ ├ **countryCode**	1	CH, binary (10 Bits) = 0111000101'B
│ │ └ **providerIdentifier**	1	FOCBS = 1
│ ├ **billingDetailsNum**	1	0 to 2^63-1 according to CEN/TS 16986:2016
│ └ **dateOfService**	0	
├ **actionCode**	1	Constant value 0 = send
└ **paymentReference**	0	

Remark:

- An amendment version of a PaymentClaimADU is not foreseen, therefore the **`paymentClaimStatus`** has always the value 0 = first version.

2.7.3 PaymentClaimADU error handling

The following PaymentClaimADU specific error codes shall be sent in an AckADU according to section 2.10.2 by the EETS provider:

Name (AduReasonCode)	Meaning	Value
paC-wrongPaymentClaimAmount	The paymentClaimAmont is not the result of the sum from the billingDetailsList amounts.	11101
paC-unknownBillingDetails	One or more referenced billing details are unknown.	11102

Remark:

- In case of a negative AckADU, an internal process for error analysing will be started. After error correction the PaymentClaimADU will be sent with a new **`paymentClaimId`**.

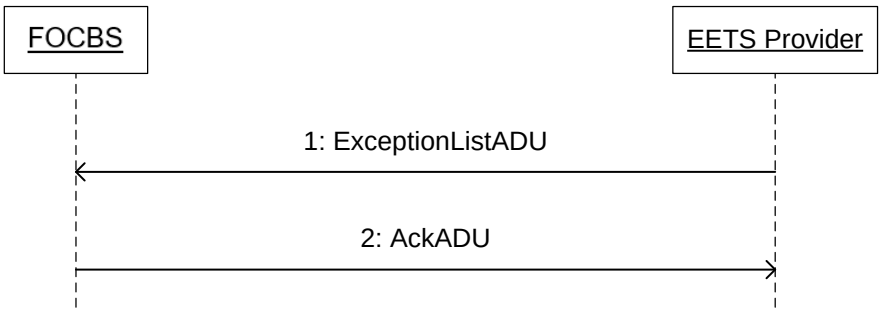
- For each unknown reference to a billing detail (AduReasonCode = paC-unknownBillingDetails) an issue structure will be added to the list of issues in the AckADU. The unknown reference will be indicated with the **`billingDetailsNum`** in the attribute **`issueLocation`**.

2.8 Exception list (black list)

2.8.1 Transaction and requirements

The EETS provider shall keep the black list up to date. The black list maintenance requirements are defined in the Annex 1.

The transmission of the exception list shall occur once a day before 24:00. The exception list shall be deemed to have been successfully transmitted by the EETS provider when it receives the acknowledgment sent by the FOCBS. If no or no error-free exception list is received by FOCBS before 24:00, the last transmitted error-free list is used throughout the next day (24 hours).



The submitted exception list of type "black list" contains only black list entries but no white list entries. Each entry in the exception list consists, as a minimum, of a PAN, a vehicle license plate and the EETS OBE device number.

A transmitted exception list always contains all entries and completely replaces the previously transmitted list. This means that no partial updates are allowed.

2.8.2 ExceptionListADU

Data element	Qty	Value range and description
adu **└ exceptionListADUs** **└ ExceptionListADU**	1	
├ exceptionListVersion	1	Shall be greater than or equal to the previous exception-list version (0 to 2^63-1)
├ exceptionListType	1	1 = black list, list of users for which TSP disclaims responsibility.
├ exceptionValidityStart	1	Mandatory according to CEN/TS 16986:2016
├ exceptionValidityEnd	0	
└ exceptionListEntries **└ ExceptionListEntry**	0..n	0 = empty list, all entries deleted
├ userId	1	
├ pan	1	Personal account number, the primary user identifier PAN coded in the OCTET STRING (SIZE(10)) in binary code decimal (BCD) = max 19 digits decimal and padding bits set to 1'B
├ contractSerialNumber	0	
├ licencePlateNumber	1	Mandatory according to CEN/TS 16986:2016 Same format and restrictions as defined in Supplement 2 for Attribute 16: VehicleLicencePlateNumber
└ obeId	1	Optional according to CEN/TS 16986:2016
├ statusType	1	0..3
├ reasonCode	1	Allowed reason codes 0..7, 13, 14
├ entryValidityStart	1	Mandatory according to CEN/TS 16986:2016.
├ entryValidityEnd	0	Not used according to CEN/TS 16986:2016
├ vehicleParameters	0	
├ actionRequested	1	1 = rejectOBE or 2 = invalidateOBE
├ efcContextMark	0	
└ vatId	0	

The according to CEN/TS 16986:2016 mandatory data element `exceptionValidityStart` is not used, because a black list sent by the EETS provider is always activated during the heavy vehicle night driving ban, at the latest by 04:00 of the day following the transmission.

A vehicle cannot and may not be black listed retroactively for the first time transmission. The first time an entry is submitted, the `entryValidityStart` data item shall have the value 00:00 (night) of the day following the transmission.

For vehicles still on an EETS journey when set on the black list, the payment obligation of the EETS provider is valid until the EETS journey is terminated (the vehicle leaves the LSVA toll domain).

2.8.3 ExceptionListADU error handling

An exception list with one or more incorrect entries is not accepted and an AcKADU with apduAckCode = apduNotOK (3) is sent to the EETS provider. In this case the EETS provider may resend a corrected exception list either at the same day before 24:00 to be used for the next day or at the next day.

The following ExceptionListADU specific error codes shall be sent in an AckADU according to section 2.10.2 by the FOCBS. For each erroneous **`ExceptionListEntry`** an issue structure will be added to the list of issues. The erroneous **`ExceptionListEntry`** will be indicated with the list index (0 … n) in the attribute **`issueLocation`**.

Name (AduReasonCode)	Meaning	Value
exL-oldExeptionListEntry	One or more ExceptionListEntry are too old (see date/time in entryValidityStart).	10301
exL-notAllowedToSendExeptionList	The provider is not allowed to send an ExceptionListADU in this stage of approval procedure.	10302
exL-EntryRetoactivelyBlackListed	The entryValidityStart date of a first time submitted entry is older than allowed.	10303

2.9 DSRC contract data

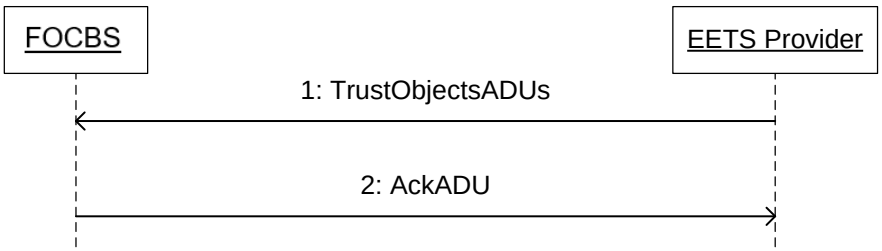
2.9.1 New contract

The EETS provider shall submit the following data elements to the FOCBS for each DSRC contract (i.e. for each EFC-ContextMark = CCC-ContextMark):

- CCC Authentication Master Key (TrustObjectADU)
- CCC Access Credential Master Key (TrustObjectADU)
- CCC Non-Repudiation Key reference (TrustObjectADU)

The three CCC key data elements shall be transferred simultaneously in one InfoExchange in three TrustObjectADUs.

The FOCBS shall confirm receptiont of the three TrustObjectADUs with an AckADU.



The three TrustObjectADUs message shall have the structure as defined in section 2.9.6. The date element **`startValidity`** shall contain the required date for the DSRC contract activation.

To complete a new DSRC contract and start its activation at least one EETS OBE type information (ContractIssuerListADU) for the EFC-ContextMark is required.

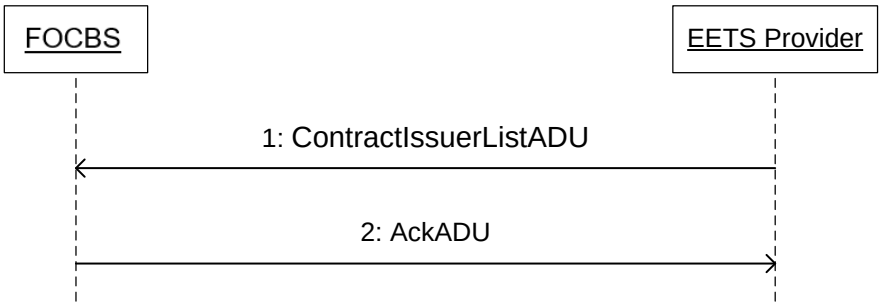
Remark:

- A prerequisite for the activation of the new DSRC contract data is that the associated FOCBS tests have been successfully accomplished. The duration for these tests may take up to the time defined in the Annex 1. The corresponding lead time should be taken into account when planning the introduction of a new DSRC contract (including the **`startValidity`** date).

2.9.2 New EETS OBE type information

The EETS provider shall submit the EETS OBE type information (equipmentClass and manufacturerID) used with a DSRC contract / EFC-ContextMark in a ContractIssuerListADU.

The FOCBS shall confirm reception of the ContractIssuerListADU with an AckADU.



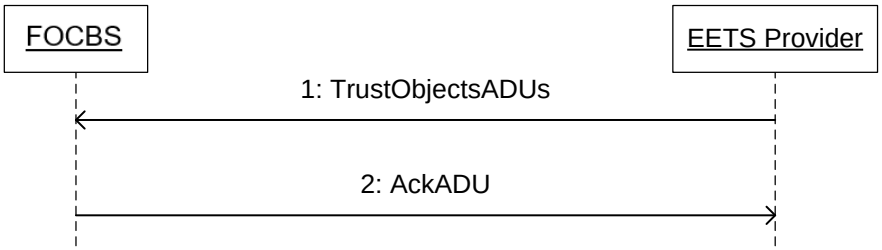
The one ContractIssuerListADU message shall have the structure as defined in section 2.9.7 actionCode value 0 = send. The date element **`startValidity`** shall contain the required date for the EETS OBE type activation.

Remark:

- A prerequisite for the activation of the new EETS OBE type information is that the associated FOCBS tests have been successfully accomplished. The duration for these tests may take up to the time defined in the Annex 1. The corresponding lead time should be taken into account when planning the introduction of a new EETS OBE type information (including the **`validFrom`** date).

2.9.3 Contract termination

The EETS provider shall send a message defined in this section to terminate a DSRC contract and its keys from the use in the boarder beacons.



The TrustObjectADUs message shall have the structure and values (especially same **`trustObjectID`** and **`eFCContextMark`**) as defined in section 2.9.6 with the following differences:

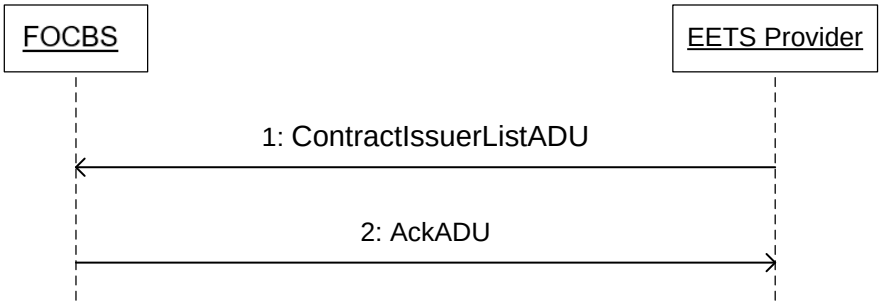
- All data elements **`trustObjectStatus`** shall have the value 2 = revoked
- All data elements **`startValidity`** shall have the same date for the required DSRC contract deactivation

This message deletes the DSRC contract information including the EETS OBE type information used with this EFC-ContextMark.

2.9.4 Remove EETS OBE type information

To remove EETS OBE type information from a DSRC contract / EFC-ContextMark, the EETS provider shall send a ContractIssuerListADU.

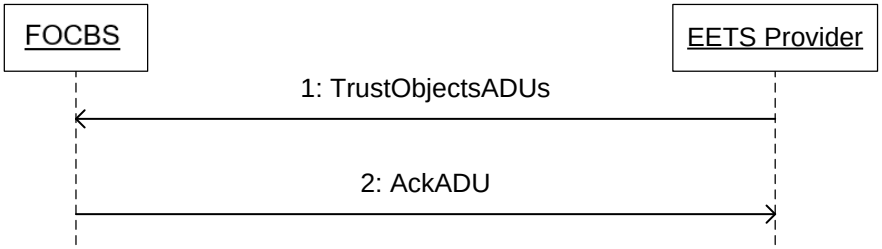
The FOCBS shall confirm reception of the ContractIssuerListADU with an AckADU.



The one ContractIssuerListADU message shall have the structure as defined in section 2.9.7 with actionCode value 1 = revoke and **`validFrom`** shall have the date for the required removal of EETS OBE type information.

2.9.5 Contract update/key change

The EETS provider shall send a message defined in this section to change the keys and keyRef of a DSRC contract.



The TrustObjectADUs message shall have the structure as defined in section 2.9.6 with the following differences and requirements:

- For the identification of the DSRC contract to be changed, the message shall have in all adu the **`eFCContextMark`** of the original contract.
- All data elements **`trustObjectStatus`** shall have the (private) value 101 = key update.
- Each of trustObjectAdus shall have a new trustObjectId identifying the new key.
- The date element **`startValidity`** shall contain the date for the required DSRC contract change.

2.9.6 TrustObjectADUs

The following table defines the three TrustObjectADUs of a DSRC contract used in the LSVA toll domain for submitting a new contract, contract update or contract deactivation:

Data element	Qty	Value range and description
`adu` **`└ trustObjectAdus`**	1	**CCC Authentication Key**
`├ trustObjectID`	1	0 to 2^32-1

Data element	Qty	Value range and description
├ purposesOfTrustObject	1	3 = oBEInterrogation
├ startValidity	1	Same validity start in all 3 adu
├ endValidity	0	Shall not be used according to CEN/TS 16986:2016
├ trustObjectStatus |	1	Status of master key (0 = valid, 2 = revoked, 101 = update)
└ trustObject	1	with CHOICE dsrcMasterKeys
├ encryptionKeyId	1	According to section 2.9.8
├ timestamp	1	UTC
└ dsrcKeys	1	
├ eFCCM	1	
| ├ eFCCM	1	Same EFC-ContextMark in all 3 adu
| └ bitmask |	1	Map of the data elements TypeOfContract + ContextVersion; 0 indicates discard, 1 indicate consider
└ key	1	
├ keyType	1	
| ├ normativeReference	0	
| └ keyUsage	1	0 = authentication
├ keyRef	1	0..255 according to GetStampedRq in EN ISO 14906
├ encrKey	1	Key encrypted according to section 2.9.8
├ kVC	1	kVC according to section 2.9.8
└ keyDescription	0	
adu └ trustObjectAdus	1	**Access Credential Key**
├ trustObjectID	1	0 to 2^32-1
├ purposesOfTrustObject	1	4 = oBEInterrogationAC
├ startValidity	1	Same validity start in all 3 adu
├ endValidity	0	Shall not be used according to CEN/TS 16986:2016
├ trustObjectStatus |	1	Status of master key (0 = valid, 2 = revoked, 101 = update)
└ trustObject	1	with CHOICE dsrcMasterKeys
├ encryptionKeyId	1	According to section 2.9.8
├ timestamp	1	UTC
└ dsrcKeys	1	
├ eFCCM	1	
| ├ eFCCM	1	Same EFC-ContextMark in all 3 adu
| └ bitmask	1	Same bitmask as in the first adu
└ key	1	
├ keyType	1	
| ├ normativeReference	0	
| └ keyUsage	1	1 = acceess credentials
├ keyRef	1	0..255 according to GetStampedRq in EN ISO 14906
├ encrKey	1	Key encrypted according to section 2.9.8
├ kVC	1	kVC according to section 2.9.8
└ keyDescription	0	
adu └ trustObjectAdus	1	**Non-RepdudiationkeyRef**
├ trustObjectID	1	0 to 2^32-1
├ purposesOfTrustObject	1	3 = oBEInterrogation
├ startValidity	1	Same validity start in all 3 adu
├ endValidity	0	Shall not be used according to CEN/TS 16986:2016
├ trustObjectStatus |	1	Status of reference key (0 = valid, 2 = revoked, 101 = update)
└ trustObject	1	with CHOICE dsrcKeyRef
├ eFCContextMark	1	Same EFC-ContextMark in all 3 adu
├ keyRef	1	0..255 according to GetStampedRq in EN ISO 14906
└ referenceType	1	0 = cCCNonRepKeyRef

Remarks:

- Only the date part (YYYYMMDD) of the data element **`startValidity`** will be used for activation, deactivation or update of a new contract.
- The activation date of new DSRC contract data may be after **`startValidity`** if the conditions in section 2.9.1 are not fulfilled.
- If **`startValidity`** is in the past or not within the period defined in Annex 1, the deactivation or update will happenwithin the defined period from the date of the message transmission.
- The authentication of the TrustObjectADU is given by the signature of the XML InfoExchange data structure of the transport layer, see section 3.4.

2.9.6.1 TrustObjectsADU error handling

Issue regarding TrustObjectADU are sent in a message according to section 2.10.2. Only the first detected issue will be sent in the AckADU. The following table contains the AduReasonCode delivered in the attribute issueCode for the erroneous ADU.

Name (AduReasonCode)	Meaning	Value
tObj-differentContractProvider	EFCContextMark.contractProvider <> apci.apduOriginator	10101
tObj-invalidEncryptionKeyIssuer	EncryptionKeyId.issuer is not Kapsch	10102
tObj-statusExpiredNotAllowed	trustObjectStatus with value expired not allowed	10103
tObj-trustObjectMissmatch	InfoExchange does not contain the required trust objects (AccessCredentialsKey, CCCAuthenticationKey, NonRepudiationKeyRef)	10104
tObj-differentEfcContextMark	Different EFC-ContextMark in the trust objects.	10105
tObj-differentBitmask	Different bitmask in the trust objects.	10106
tObj-differentStartValididty	Different startValidity in the trust objects.	10107
tObj-differentTrustObjectStatus	Different trustObjectStatus in the trust objects.	10108

Remark:

- In case decryption of the DSRC key by the RSE operator is not successfully, an error message will be sent by Email to the EETS provider.

2.9.7 ContractIssuerListADU

The ContractIssuerListADU is used for exchange of the VST information "equipmentClass" and "manufacturerID" for a DSRC contract.

Data element	Qty	Value range and description
`adu` **`└ contractIssuerListADU`**	1	
`├ efcContextMark`	1	Same EFC-ContextMark as in the trustObjectAdus

├ **equipmentClass**	1	Shall contain the equipment class as stored in the OBE
├ **manufacturerID**	1	Shall contain the manufacturer id as stored in the OBE
├ **uniquePartOfPAN**	1	Empty string – not used in LSVA toll domain
├ **typeOfEFCApplication**	1	Empty string – not used in LSVA toll domain
├ **securityLevel**	1	Empty string – not used in LSVA toll domain
├ **acCrKeyReference**	1	Not used in LSVA toll domain
├ **authKeyReference**	1	Not used in LSVA toll domain
├ **validFrom**	1	
└ **actionCode**	1	Top-Up: Additional date element with values send = 0, revoke = 1

Remarks:

- Only the date part (YYYYMMDD) of the data element **validFrom** will be used for activation or deactivation of the VST information "equipmentClass" and "manufacturerID".
- If **validFrom** is in the past or not within the period defined in Annex 1, the deactivation will happen within the defined period from the date of the message transmission.

2.9.7.1 ContractIssuerListADU error handling

Issues regarding ContractIssuerListADU are sent in a message according to section 2.10.2. The following table contains the AduReasonCode delivered in the attribute issueCode for the erroneous ADU.

Name (AduReasonCode)	Meaning	Value
ciL-shortValidity	period until activation of ObeConfiguration too short	10201
ciL-alreadyExists	ObeConfiguration exists already (sent actionCode = 0, send)	10202
ciL-doesNotExist	ObeConfiguration does not exists (sent actionCode = 1, revoke)	10203

2.9.8 Key encryption

Before encrypting the key, its value shall be converted into an ASCII based text representation of the keys hexadecimal bytes, where all alphabetic-hex-components are considered to be uppercase letters.

Conversion example:

The table below contains an example how the converted version of a given key should look.

Format	Key	Expected representation
Binary	11111111010100100101110111101110100111011101100100111011100010100100010010010011010100001111110001110101011100101000000010111011	100011001000110001101010011001000110101010001000100010101000101001110010100010001000100001110010011001101000010001110000100000100110100001101000011100100110011001101010011000001000110010000011001101110011010100110111001100100011100000110000010000100100000 10
Hexa-decimal	**ff525dee9dd93b8a449350fc757280bb**	46463532354445453944443933423841343439333530464337353732383042 42
ASCII	-	**FF525DEE9DD93B8A449350FC757280BB**

Encrypt the converted key according to the following requirements:

- The RSA algorithm with the RSA encoding method REM1 using a public key >= 2048-bits, according to ISO/IEC 18033-2, shall be used for key encryption. The required key encryption algorithm (REM1) according to ISO/IEC 18033-2 is equal to RSAES-OAEP in PKCS#1 v2.1 when KDF1 with default mask generation function (MGF1) of RSAES-OAEP in PKCS#1 v2.1 with SHA-1 is applied. The hash used for REM1 shall be (equal to the default hash algorithm in RSAES-OAEP) SHA-1.

The following table shows the identification of the used key encryption key for the receiver.

Data element	Qty	Value range and description
`EncryptionKeyId` └ **`publicKey`**	1	
├ **`serialNumber`**	1	Certificate expiry date, format see below
└ **`issuer`** ├ **`countryCode`**	1 1	Provider of the key according to ISO 14816
└ **`providerIdentifier`**	1	

The required public key will be provided to the EETS provider in a public key certificate by a trusted key exchange procedure outside of the scope of this interface.

Certificate expiry date format (for `serialNumber`):
The certificate expiry date shall have the format yyyymmdd, where yyyy = year, mm = month and dd = day.

Example:
Expiry date "10 December 2021 13:59:02" is represented by the decimal value = 20211210. (The time of day part of the expiry date shall be ignored.)

The value in `serialNumber` shall contain the certificate expiry date instead the real certificate serial number due to the fact that these numbers may be larger than the limitation in "2.1.4 Data type restrictions" for unlimited INTEGER which is the data type of `serialNumber`.
In case of a new certificate/public key a different expiry date is expected to allow verifying the use of the new public key.

kVC (Key Verification Code)**:**
The key verification code shall be according to ISO 11568-2 calculated encrypting one block size of zeros with the plain key, then truncated to leftmost three octets (bytes) to obtain the kVC.

2.10 Confirmation and error messages (ackADU)

2.10.1 APDU confirmation and error message

The following message defines the response to an ADU transmission:

Data element	Qty	Value range and description
adu **└ ackADU**	1	
├ apduIdentifier	1	0 to 2^63-1 - shall indicate the identifier of the APDU containing the data structure(s) being acknowledged
├ explicitlyAckedAdus	0	
├ apduAckCode	1	**Codes 2, 7 and 8 according to 2.10.3**
├ apduAckText	0	
└ issues	0	

2.10.2 ADU error messages

The following AckADU is used if an ADU in the infoExchange is not OK and has one or more issues.

Data element	Qty	Value range and description
adu **└ ackADU**	1	
├ apduIdentifier	1	0 to 2^63-1 - shall indicate the identifier of the APDU containing the data structure(s) being acknowledged
├ explicitlyAckedAdus	0	Not used according to CEN/TS 16986:2016
├ apduAckCode	1	**3 = apduNotOK**
├ apduAckText	0	Not used according to CEN/TS 16986:2016
└ issues	1..n	List of the ADUs having one or more issues. An ADU is listed for each issue occurring to it.
├ issueADUStruct	1	0 = constant value, see remark below
├ issueLocation	0..1	Top-Up: Shall be present only in case of AckADU for - BillingDetailsADU see section 2.5.5 - PaimentClaimADU see Section 2.7.3 - ExceptionListADU (black list) see section 2.8.3
├ issueContent	0	
├ issueCode	1	Issue codes according to ADU specific error handling
├ issueText	0	
└ issueUsers	0	

Remark:

- In most cases only one ADU will be included in an APDU. Therefore the attribute **issueADUStruct** shall contain the constant value 0. No exception shall be made in case of an error answer to the 3 TrustObjectADUs.

2.10.3 ApduReasonCode (apduAckCode)

The following table contains the allowed ApduReasonCode from EN ISO 12855:2015 and CEN/TS 16986:2016:

Name	Meaning	Value	Source
apduOK	APDU was accepted	2	EN ISO 12855
apduNotOK	APDU rejected	3	EN ISO 12855
originatorRejected	APDU rejected because Apdu Originator not known or no valid contract exists	7	CEN/TS 16986
recipientUnknown	APDU rejected because Information Recipient not known (or no valid contract exists)	8	CEN/TS 16986

3 Transport layer

3.1 EETS Service Location

The URL to the FOCBS EETS service shall be published on the FOCBS webpage, link to EETS-Providers – see "Documents".

3.2 ASN.1 encoding

The XML Encoding Rules (XER) according to ISO/IEC 8825-4 shall be used to encode the ASN.1 InfoExchange data.

3.3 Transport security

The exchange of the InfoExchange messages shall be done using the Transport Layer Security, TLS 1.2 protocol. The identity of the EETS provider shall be validated using a client certificate.

3.4 Data integrity

The XML payload InfoExchange shall be signed by its originator.

In addition, the EETSJourneyAssessment (eVV) defined in section 2.5.4 shall be signed by the FOCBS.

The digital signatures of the InfoExchange and the EETSJourneyAssessment shall be according to the W3C standard "XML Signature Syntax and Processing Version 1.1" (W3C Recommendation 11 April 2013, https://www.w3.org/TR/2013/REC-xmldsig-core1-20130411). From that standard the following options shall be used:

- Canonicalization of the XML document, Identifier for canonical XML 1.0 (omits comments): https://www.w3.org/TR/2002/REC-xml-exc-c14n-20020718

- Signature with envelope, Identifier:
  http://www.w3.org/2000/09/xmldsig#enveloped-signature
  The signature element will be inserted inside the content (i.e. InfoExchange) that it is signing:

```
<InfoExchange>
   <InfoExchangeContent>
   </InfoExchangeContent>
   <Signature>
      <SignedInfo>...</SignedInfo>
```

```
            <SignatureValue>...</SignatureValue>
            <KeyInfo>...</KeyInfo>
        </Signature>
    </InfoExchange>
```

- For the <KeyInfo> element, the option <X509Data> (Identifier http://www.w3.org/2000/09/xmldsig#X509Data) with exactly one attribute of type <X509SubjectName> and <X509Certificate>

- Signature algorithm PKCS#1 v1.5 with digest sha256, identifier: http://www.w3.org/2001/04/xmldsig-more#rsa-sha256

3.5 Certificates

3.5.1 General

The used certificates shall be according X.509. The length of the RSA keys in the X.509 certificates shall be 2048 bits.

3.5.2 FOCBS

The TLS server certificate will be provided to the EETS provider during TLS handshake.

The currently used FOCBS XML document signature certificate shall be published on the FOCBS webpage, link to EETS-Providers – see "Documents".

3.5.3 EETS provider

3.5.3.1 TLS Client Certificate

The EETS-Provider shall provide a certificate signing request (CSR) to the FOCBS.
Once the CSR is validated and signed by the FOCBS, the certificate and its chain will be returned to the EETS provider. This certificate shall be used by the EETS Provider to establish the connection to the FOCBS EETS system. The CSR should contain the following attributes:

CN: eets-pis-<providerName>.ezv.admin.ch
OU: EZV EETS
O: Admin
C: CH

3.5.3.2 Signing key

The EETS provider shall provide the FOCBS with the necessary information to validate the message signatures. This can either be in the form of a public key or a certificate of his choice.

The EETS provider is responsible for notifiying the FOCBS if the security of one of the certificates can no longer be guaranteed or if he wants to renew his signing key.

3.6 Transport API

The exchange of InfoExchange messages in both directions is done using the HTTPS protocol. This section introduces the basic concept of the API. A detailed technical specification is available as Open API specification: link to EETS-Providers – see "Documents".

3.6.1 Sending Messages to FOCBS

An EETS provider shall send an InfoExchange message using the **SendMessage** operation.

Verb	PUT	
Path	`/api/messages/toFCA/{countryCode}/{providerIdentifier}/{messageId}`	
Parameters	countryCode	Configured and registered Provider-ID of the communication channel for this provider.
	providerIdentifier	
	messageId	Unique messageId, see Idempotence
Body	XER encoded, signed InfoExchange Maximum size 10MB	

In case the Message is successfully received and stored by the FOCBS, the request will be answered with HTTP (200).

Remarks:

- This operation is **idempotent**. This means in case of timeout the EETS provider can safely repeat the operation, using exactly the same messageId, until the operation is successful.
- Replacing of a messages is not supported. FOCBS will always use the first message successfully received for the messageId specified.

3.6.2 Receiving Messages from FOCBS

The EETS provider has to poll messages from the FOCBS system. The API to poll messages from the FOCBS system consists of three operations:

ListMessages	Get a list of all messages waiting to be read
GetMessage	Receive one message
ConfirmReceipt	Confirm receipt of one message

3.6.2.1 ListMessages

To get a list of the messages to be read (receipt not yet confirmed) the EETS provider shall use the ListMessages operation.

Verb	GET	
Path	`/api/messages/fromFCA/{countryCode}/{providerIdentifier}`	
Parameters	countryCode	Configured and registered Provider-ID of the communication channel for this provider.
	providerIdentifier	

The response body is a JSON document listing all pending messages. For each message three attributes are provided:

messageId	The unique id of the message (UUID) needed to reference this message
aduType	The ADU Type of the message, one of - AckADU - RequestADU - BillingDetailsADU - PaymentClaimADU
published	Date/Time of publication

3.6.2.2 GetMessage

To download a message, the GetMessage operation shall be used.

Verb	GET	
Path	`/api/messages/fromFCA/{countryCode}/{providerIdentifier}{messageId}`	
Parameters	countryCode	Configured and registered Provider-ID of the communication channel for this provider.
	providerIdentifier	
	messageId	The messageId

Remark:

- Downloading a message does not remove the message from the list of messages.

3.6.2.3 ConfirmReceipt

To remove a message from the list of messages after successful download, the ConfirmReceipt operation shall be used.

Verb	DELETE	
Path	`/api/messages/fromFCA/{countryCode}/{providerIdentifier}{messageId}`	
Parameters	countryCode	Configured and registered Provider-ID of the communication channel for this provider.
	providerIdentifier	
	messageId	The messageId

Remark:

- This technical message confirmation is related to the transport layer and has no impact on business processes. Receipt of an ADU, relevant for business processes, is confirmed by sending an AckADU.

3.7 Data transfer

3.7.1 Limitations

The EETS provider shall use only one thread to send messages to the FOCBS and only one other thread for receiving message from the FOCBS. That means the EETS provider shall use the send and receive functionalities of the FOCBS server like it would be a "single-threaded server" for each of this two functionalities and a next command would therefore only be possible after the HTTP response.

Reason:
The reason for this requirement is to avoid overloading the FOCBS server. All EETS provider uses the same server and therefore the restriction to only one thread for sending and one thread for receiving per EETS provider avoids blocking of other EETS providers caused by a multithreaded overload of the FOCBS server by a single EETS provider.

3.7.2 Recommendations

The FOCBS recommends to send an EETS journey declaration in a short time after the vehicle has left the LSVA toll domain. In addition, the FOCBS recommends sending and getting messages to and from the FOCBS during the whole day (not only once a day as a batch job).

Depending on the workload, the FOCBS system will process and reply to a message from the EETS provider as quickly as possible. A quick EETS journey declaration and fast reply to the holder data request decreases the delivery time of the assessment data and eVV (BillingDetails) to the EETS provider.