



Business Processes

Annex 4.3 to Joint Venture Agreement Toll Service Provider Agreement

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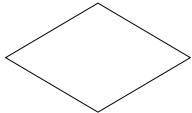




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Document Revision History

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0.98	2013.01.10	MHS	Final draft for approval by Steering Committee
1.0	2013.02.27	SC	Approved by steering committee
1.2	2015.01.09	ASK	Revision to include EasyGo Basic General revision with new structure
1.3	2015.03.27	ASK	Structure agreed at 14 Jan EM meeting Preliminary comments 18 March telco
1.4	2015.08.14	ASK	Revision after 7 May EM meeting
1.5	2015.10.29	ASK	Revision after latest clarifications
2.0	2015.11.12		Approved by steering committee

Symbols

The processes in this document use the following symbols.

	<p>Solid circles represent a starting point of a data exchange</p>
	<p>White rounded corner boxes indicate mandatory responsibilities and related activities within the processing of data</p>
	<p>Grey rounded corner boxes indicate optional responsibilities and related activities within the processing of data</p>
	<p>Hatched rounded corner boxes indicate activities only relevant for EasyGo+</p>
	<p>White rhombuses indicate a decision to be taken</p>
	<p>White boxes indicate a process call, where the mentioned process defined elsewhere is called</p>
	<p>Horizontal arrows indicate information exchanged between roles as activities performed within responsibilities. The name of the message is attached to the arrow.</p>
	<p>Vertical arrows represent execution steps within the data exchange</p>
	<p>Empty circles represent an ending point of a data exchange</p>

1 Introduction

1.1 Purpose of the document

This document compiles all relevant information on business processes for the EasyGo services. Any business process performed between the involved Parties shall be included here. This document is an Annex to the Joint Venture Agreement and the Toll Service Provider Agreement.

1.2 Scope of the document

This document shall compile all necessary business processes between all actors in EasyGo. The definition of the roles is based on the architecture standard EN ISO 17573 - EFC - System architecture for vehicle related tolling (see chapter 2) and thus based on the CESARE IV model.

The document covers the processes of all participating EFC systems for vehicle related transport services (e.g. road user charging, parking, ferries and access control).

The definition of the interfaces between the different roles will be dependent on the business processes described in this document, the relevant international and European standards and the EasyGo documents. The most relevant standards are:

- EN ISO 17573 Electronic fee collection — System architecture for vehicle related tolling
- EN ISO 12855 Electronic fee collection — Information exchange between Service Provision and Toll Charging
- EN ISO 14906 Electronic fee collection — Application interface definition for dedicated short range communication
- EN 15509 Electronic fee collection — Interoperability Application Profile for DSRC

References to EasyGo documents are made in the description of the individual business process. Many of the process descriptions in this document refer to other EasyGo documents/annexes. In case of discrepancies the text in the individual document/annex applies.

2 Architecture

2.1 Main roles in a toll charging environment

The interoperability within EasyGo is built upon the standard EN ISO 17573 – EFC – System architecture for vehicle related tolling. EN ISO 17573 defines the four main roles shown in fig. 1.

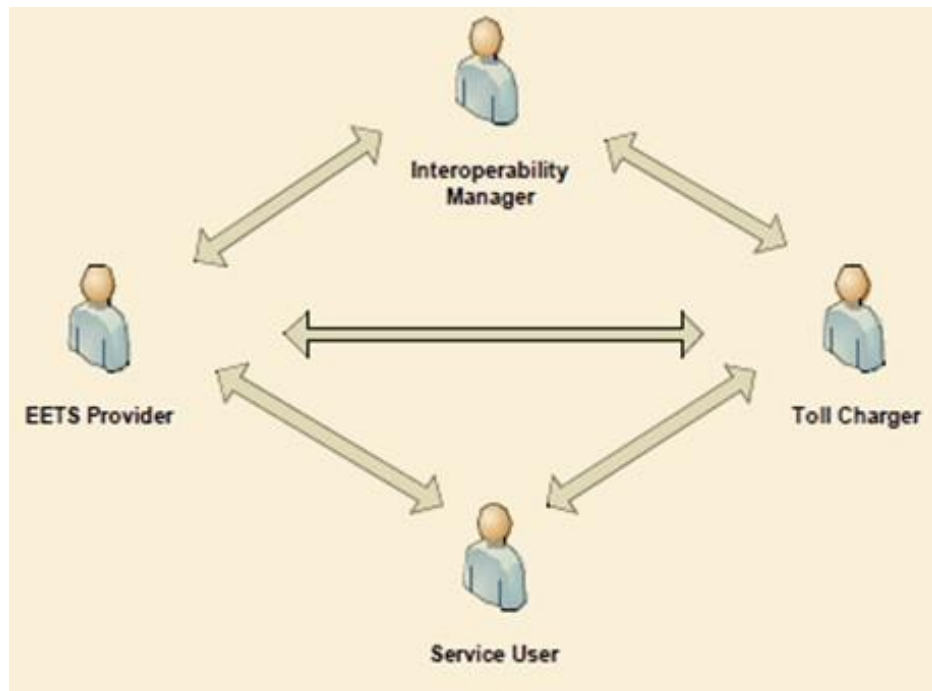


Fig 1. Roles in the Toll Charging environment

2.1.1 Provision of the toll service

The role related to the provision of the toll service is responsible for providing the basic artefacts, mechanisms, organization structures, and information transfer tools needed to run an EFC system. Provision of the OBE and the EFC contract with the Service User (SU) are two of the most important responsibilities of the role. An actor covering all responsibilities of this role is called a Toll Service Provider (TSP) or Service Provider.

2.1.2 Use of the service

In the standard EN ISO 17573 a transport service is related to the use of or the presence of a vehicle in a toll domain. The toll domain may be a road network, a specific section of a road (e.g. a bridge, a tunnel or a ferry connection) or a specific area offering a service (e.g. a country, a region, a parking lot or access to a protected area in a city). This role is thus identified that it covers all aspects of using the toll system and the transport service.

Implementations of toll systems in various toll domains identify actors in this role that are commonly referred to as, e.g. Driver, SU or customer.

2.1.3 Charging of the toll

The role related to the charging of the toll covers all actors who define the toll regime, operate the toll domain and may provide transport services. The role includes the related charging infrastructures and who defines the toll. Enforcement is also part of this role. An actor covering all responsibilities of this role is called a Toll Charger (TC).

2.1.4 Management of the toll charging environment

There is a need for an overall management of the toll charging environment defining and organising the policy that enables the daily operation of the toll charging equipment involving several different actors. A specific role is identified to manage the toll charging environment, i.e. defining and maintaining a set of rules that, taken together, defines the policy of a given regime or of the overall toll charging environment. An entity covering all responsibilities of this role is called an Interoperability Manager.

2.2 Roles, responsibilities and actors

The architecture standard ISO 17573 defines the allocation of responsibilities to the defined roles.

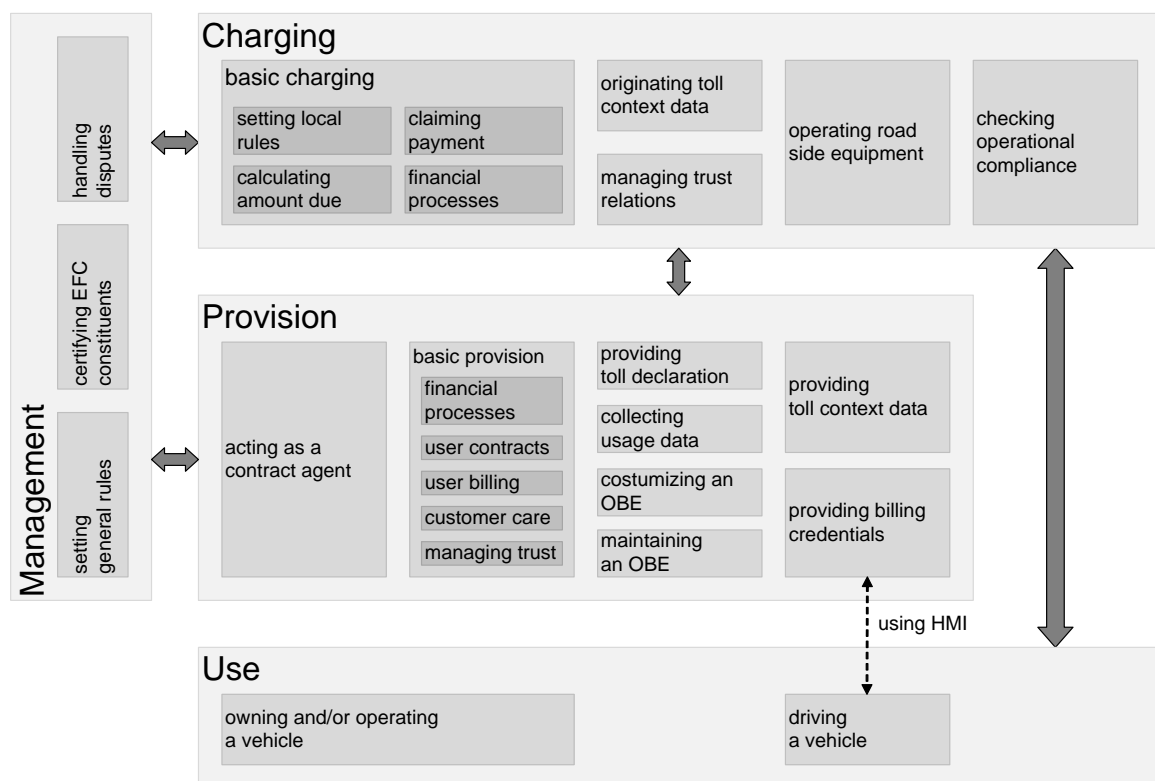


Figure 2: Responsibilities and their relations according to ISO 17573

In the specific context of the interoperability of the EasyGo services the allocation of responsibilities to the roles and actors are slightly adapted.

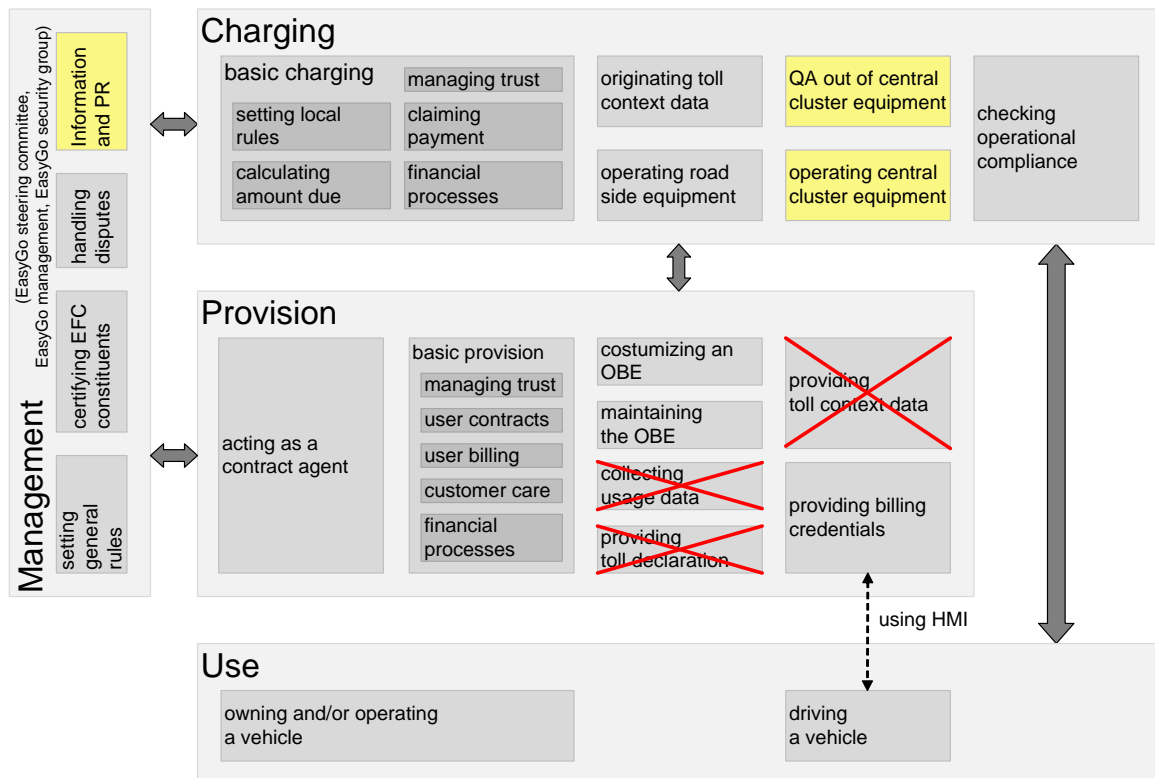


Figure 3: Responsibilities and their relations in the EasyGo context

In EasyGo the responsibilities differ somewhat from the more general architecture standard in the following regards:

- The Information and PR is centrally organized and a responsibility of the Management role. This is not included in the architecture standard as it is a non-technical responsibility outside the scope of the architecture standard.
- The cluster of TCs requires the operation of some common infrastructure (EasyGo HUB) which is under the responsibility of the TCs. The cluster approach is not explicitly detailed in the architecture standard but is needed for the operation of EasyGo.
- Quality assurance is based on data passing the central equipment and on TC / TSP reports. Since quality assurance is not explicitly covered in the architecture standard it is introduced as a new responsibility.
- The responsibilities of “providing toll context data”, “collecting usage data” and “providing toll declarations” are solely associated to the operation of a GNSS based tolling system and are therefore not needed for EasyGo.

NOTE: In EasyGo the Management role as defined in fig 3 is currently held by the ESC, the EM and the EasyGo security group.

Descriptions of processes that are performed internally at a TC or TSP are outside the scope of this document,

According to the above allocation of responsibilities the business processes can be defined for each role. In EasyGo the interactions between the different actors covering the associated roles and responsibilities are according to the figure below.

The illustration below is based upon the EFC standards, but with usage of agreed EasyGo terminology.

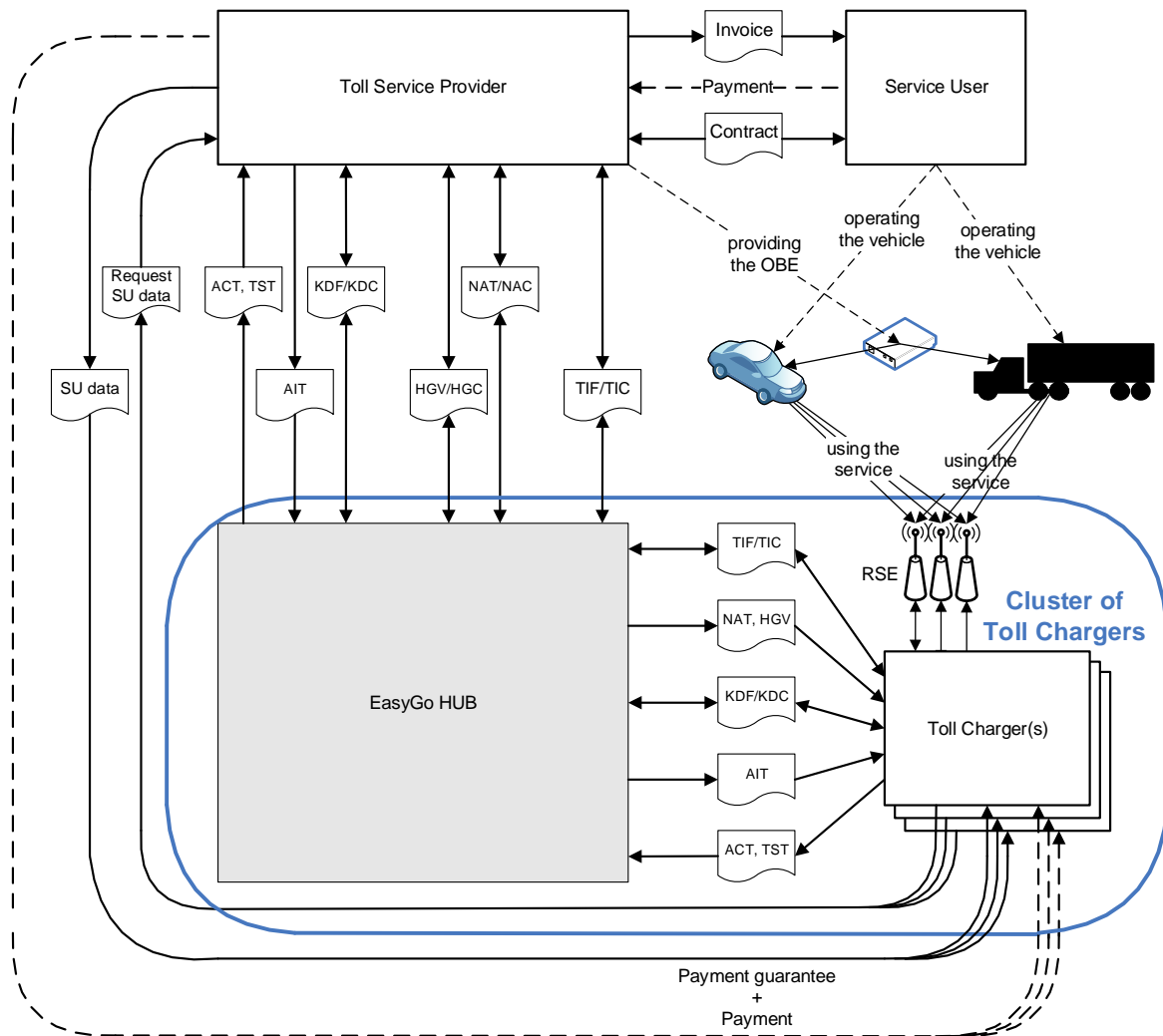


Figure 4: Data flow in EasyGo

The dashed lines indicate that these functions are handled outside the EasyGo HUB but according to EasyGo agreements.

A detailed description of the EasyGo support organisation can be found in Annex 1.1 to the JVA “*Definition of support organisation*”.

The responsibilities of TCs, TSPs are described in the JVA, the TSPA and the annexes to these agreements. The responsibilities of the SUs are described in Annex 3.1 “*Minimum set of clauses of the agreement between Toll Service Provider and Service User*”. The responsibilities of the EasyGo steering committee (ESC) and EasyGo management (EM) are described in Annex 1.1 “*Definition of support organisation*”.

3 Overview of business processes

Each of the business processes of EasyGo involves two or more entities. This is shown in the table below.

Entities marked with X are involved in the process

The entity marked with **X** is the entity that is responsible to initiate the process. Some processes may be initiated by different entities.

The processes are divided into three groups:

- Preconditions: Processes which have to be fulfilled before charging can take place
- Operation: Processes taking place during normal operation of EasyGo
- Changes and deviations: Processes not covered by those above

	Chapter	Business processes	Participation in process				
			SU	TC	HUB	TSP	EIM
Preconditions	4.1	Add new TC (or new equipment)		X	X	X	X
	4.2	Add new TSP (or new equipment)		X	X	X	X
	4.3	Originate EFC context data		X	X	X	X
	4.4	Exchange of trust objects		X	X	X	
	4.5	Open a contract	X			X	
	4.6	Distribute validation data		X	X	X	
Operation	5.1	TC reports billing details to TSP (TIF)		X	X	X	
	5.2	TC claims payment from TSP for service usage		X		X	
	5.3	TSP claims payment from SU for service usage	X			X	
	5.4	TSP claims issuer fee from TC		X		X	
	5.5	KPI management		X	X	X	X
	5.6	Change contract data	X			X	
	5.7	Exchange OBE	X			X	
	5.8	Close contract	X			X	
	5.9	Handle customer relations	X	X		X	
Changes and deviations	6.1	Perform retroactive payment	X	X			
	6.2	Correcting “wrongful” collection by TC	X	X	X	X	
	6.3	Enforce violators	X	X			
	6.4	Handle change request		X		X	X

Table 1 Overview of business processes

- EasyGo HUB is defined as a separate entity because many processes need to differentiate between the responsibility of the individual TC and the responsibility of the infrastructure “owned” by the TCs collectively
- The following processes are different for EasyGo Basic and EasyGo+ :
 - Open a contract (chapter 4.5)
 - Change contract data (chapter 5.6)
 - Exchange OBE (chapter 5.7)

In these processes the EasyGo Basic processes are sub-sets of the EasyGo+ processes.

The rest of the processes are similar for EasyGo Basic and EasyGo+.

4 Preconditional processes

The following business processes must have been performed before charging can take place.

4.1 Add a new Toll Charger

Definition of process: The process is used when a new TC applies for being part of EasyGo and shows the implementation if the application is approved. The TC initiates the process.

There are three types of TCs.

- A general party – a TC with a seat in the ESC
- A limited party – a TC in EasyGo but without a seat in the ESC
- A TC with a license to use the EasyGo HUB, but is not an EasyGo TC

Before a TC applies to become part of EasyGo he will normally study the conditions described by the JVA, the TSPA and relevant annexes. If he, after having studied these documents wants to become part of EasyGo he will apply for this to the EM.

When a new TC applies to become part of EasyGo the initial evaluation is done by EM who gives a recommendation to the ESC. If EM and the ESC do not recommend that the TC is included in EasyGo EM informs the TC about this decision.

If the ESC approves the TC to become part of EasyGo EM informs the TC about this decision. The new TC shall sign the relevant agreements and EM and the TC shall prepare a joint implementation plan.

Tests are carried out according to the EasyGo test specifications and when the tests are approved by EM the new TC can start operation.

To allow sufficient time for planning and testing the start-up of new toll domains should be reported by the parties in due time. This is described in Annex 2.6 “*EasyGo test strategy*”.

The certification process is somewhat different for the three different types of TCs listed above, but they are identical from a technical point.

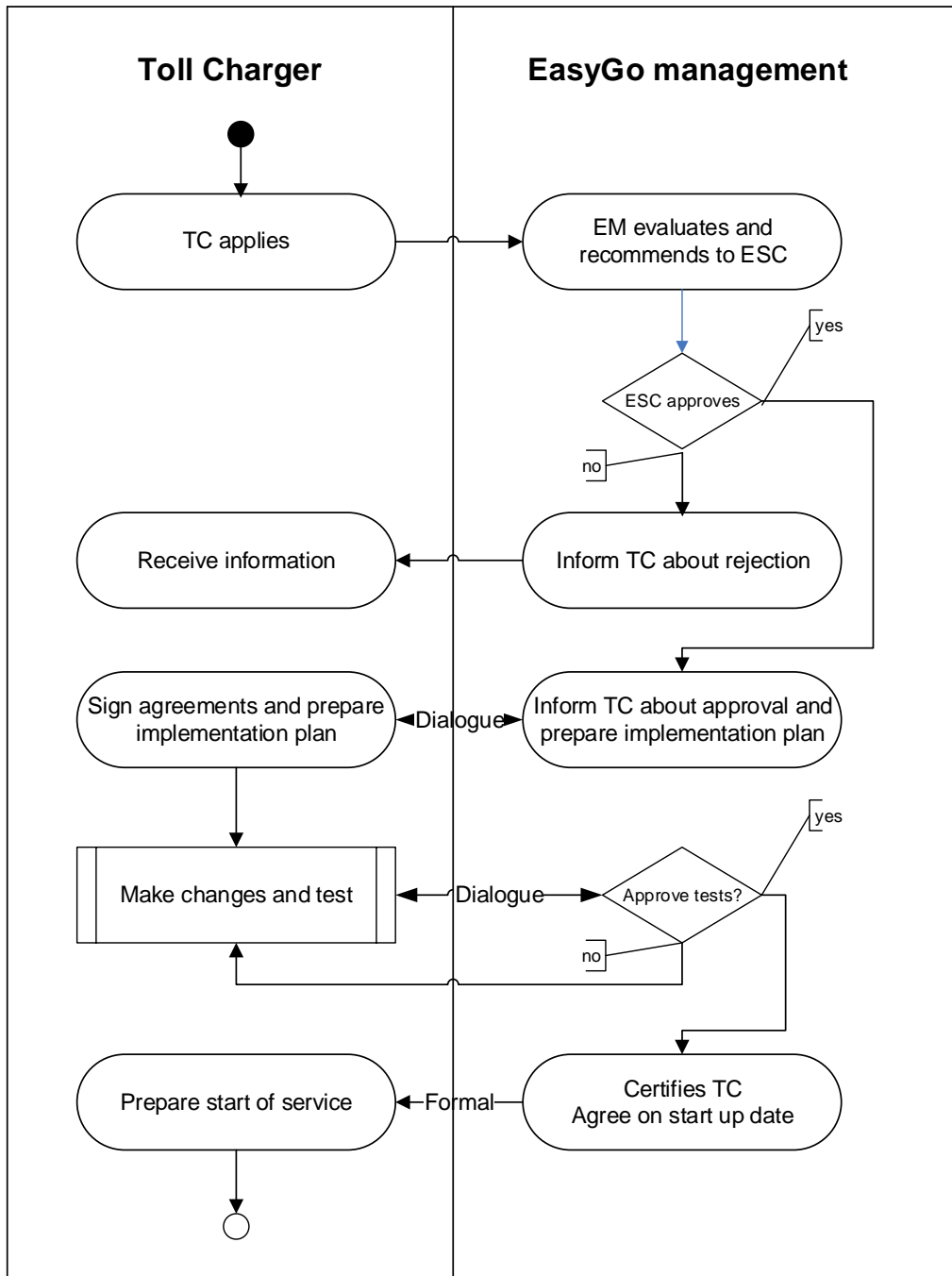


Figure 5: Adding a new Toll Charger

4.2 Add a new Toll Service Provider

Definition of process: The process is used when a new TSP applies for being part of EasyGo and shows the implementation if the application is approved. The TSP initiates the process.

There are two types of TSPs.

- An EasyGo TSP
- A TSP which is not an EasyGo TSP, but has a license to use the EasyGo HUB and has bilateral agreements with one or more EasyGo TCs

Before a TSP applies to become part of EasyGo he will study the conditions described by the TSPA and relevant annexes. If he, after having studied these documents wants to become an approved TSP in EasyGo he will apply for this to the EM.

The initial evaluation of the application is done by EM who gives a recommendation to the ESC. If EM and the ESC do not approve the TSP EM informs the TSP about this decision.

If the ESC approves the TSP, EM informs the TSP about the decision. The new TSP shall sign the TSPA, and EM and the TSP shall prepare a joint implementation plan.

Tests are carried out according to the EasyGo test specifications and when the tests are approved by EM the new TSP can start operation in the EasyGo toll domains.

The certification process is somewhat different for the two types of TSPs listed above, but from a technical point they are identical.

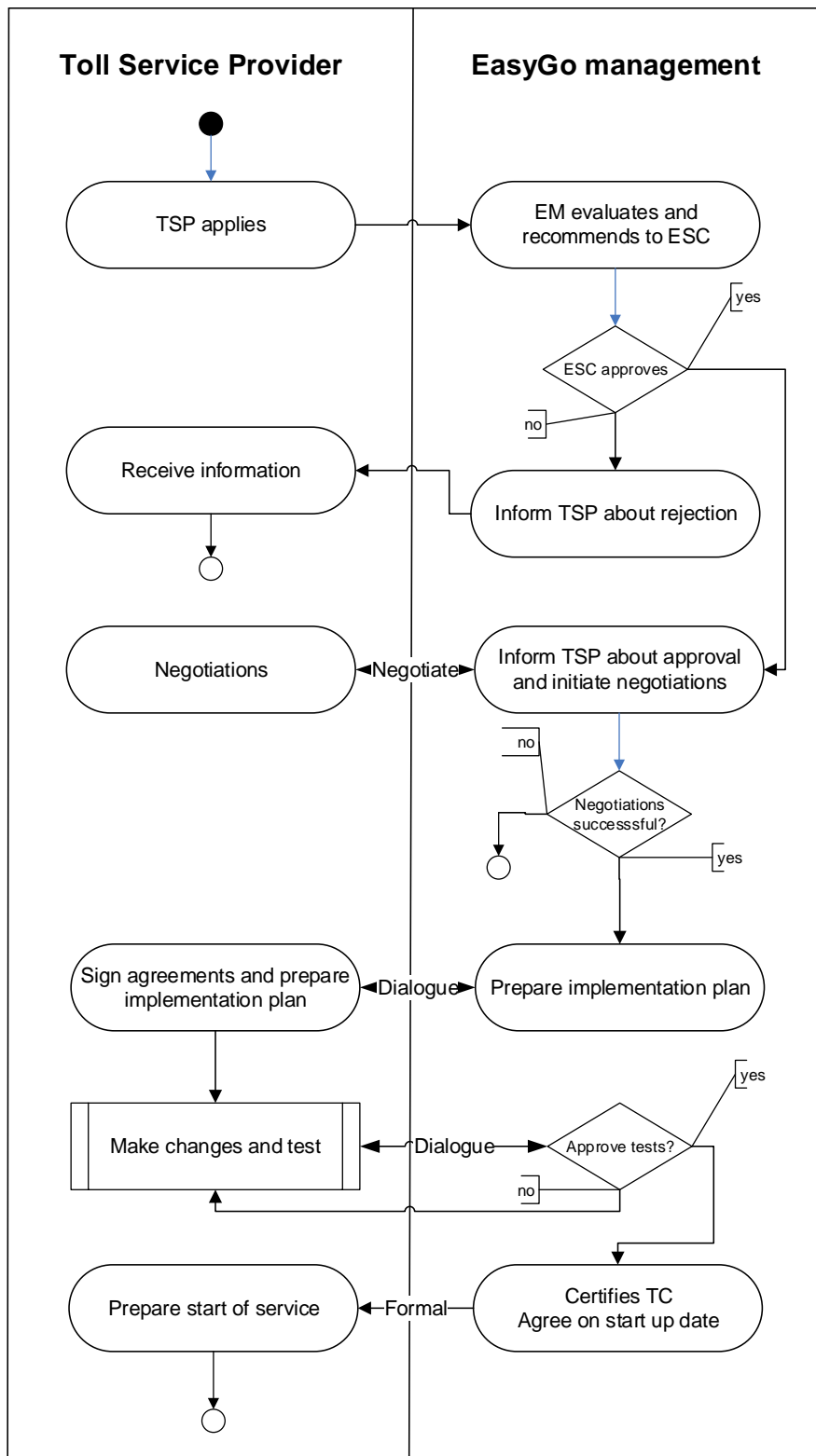


Figure 6: Adding a new Toll Service Provider

4.3 Originate EFC context data

Definition of process: The process is used when a TC or TSP defines properties for toll collection system, OBEs etc. The TC or the TSP initiates the process.

The information describing a toll regime uses one or more sets of EFC context data. It is defined through its EFC Objects and the rules associated with them. The EFC context data for a toll regime consists of several parts:

- Toll Regime Overview
- Tariff Table
- Tariff Class Definition
- Local Vehicle Class Definition
- Time Class Definition
- User Class Definition
- Toll Context Layout
- Charge Reporting Events and
- Charge Report Configuration

Other toll regime properties to be configured by the TC are the interrelations a toll regime may have in relation to others. These rules and configuration parameters are defined in ISO TS 17575-4.

The usage of the “Originate EFC context data” process is initiated by any of the following changes:

- establishing of a new toll domain (ACT)
- closing of an existing toll domain (ACT)
- change of the toll regime for an existing toll domain (ACT)
- change of a toll domain (TST)
- change of the issued OBE types (AIT)

NOTE: A toll regime is defined as set of rules and regulations for any area (toll domain) where a fee is collected for its use or passage. It is described by the TC as a set of parameters which define its physical, geographical, interface and fee related properties as a set of tolled objects needed by any TSP to offer its service in the toll regime. The EFC context data may be implemented in the form of the EasyGo toll station table.

NOTE: An implementation or an update of a toll regime may be triggered by a road administration (public or private authority), in whose jurisdiction the toll regime is located. Some changes to toll regimes may require approval by the authorities and starts with some form of legislative measure. The responsibility to implement or update a toll regime may be transferred to the TC, who may be responsible for it. When all necessary changes are completed the TC has to update the EFC context data for the affected toll regime, before it becomes effective for any vehicle which uses the toll regime.

If a new toll domain is established, an existing toll domain is closed, the toll regime of an existing toll domain is changed or the actor data of the responsible TC is changed the process is initiated by either sending an updated “local” Actor Table (ACT) to the EasyGo HUB according to the defined timing (see Annex 2.1 chapter 5) or by sending the updated

data to the management of the EasyGo HUB by e-mail who will enter it directly into the “global” Actor Table (ACT).

If an existing toll domain is changed the process is initiated by the TC responsible for the toll domain. The TC has to update his Toll Station Table (TST) and distribute the “local” EFC context data to the EasyGo HUB according to the defined timing (see Annex 2.1 chapter 5).

If the actor data of a TSP is changed the process is initiated by the TSP either sending an updated “local” Actor Table (ACT) to the EasyGo HUB according to the defined timing (see Annex 2.1 chapter 5) or by sending the updated data to the management of the EasyGo HUB by e-mail who will enter it directly into the “global” Actor Table (ACT).

If the types of issued OBE are changed the process is initiated by the TSP. The TSP has to update his Accepted Issuer Table (AIT) and distribute the “local” EFC context data to the EasyGo HUB according to the defined timing (see Annex 2.1 chapter 5). A relevant change may be initiated by the issuing of a new type of OBE or a major software update leading to a change of the Context mark.

The responsibility of the delivery of a valid “local” ACT or AIT list on time to the EasyGo HUB lies always with the TSP. The responsibility of the delivery of a valid “local” TST list on time to the EasyGo HUB lies always with the TC.

Any of the above changes has the origination of new “global” EFC context data by the EasyGo HUB as a consequence. The EasyGo HUB shall validate the formal correctness of the transferred “local” EFC context data (ACT, AIT and/or TST) and dispute it to the sending TC and/or TSP by e-mail if an error is detected.

The EasyGo HUB shall after a positive validation compile new “global” EFC context data from all valid “local” ACT or “local” AIT received on time from a TSP or respectively all valid “local” ACT or “local” TST received on time from a TC according to the defined timing (see Annex 2.1 chapter 5). If no new or an invalid “local” ACT, “local” AIT and/or “local” TST are received the last valid list will be used during the compilation.

This “global” EFC context data makes up the System Overview of the whole EFC scheme. After the compilation of a new “global” ACT, AIT and/or TST it shall be distributed by the EasyGo HUB to all TCs and TSPs.

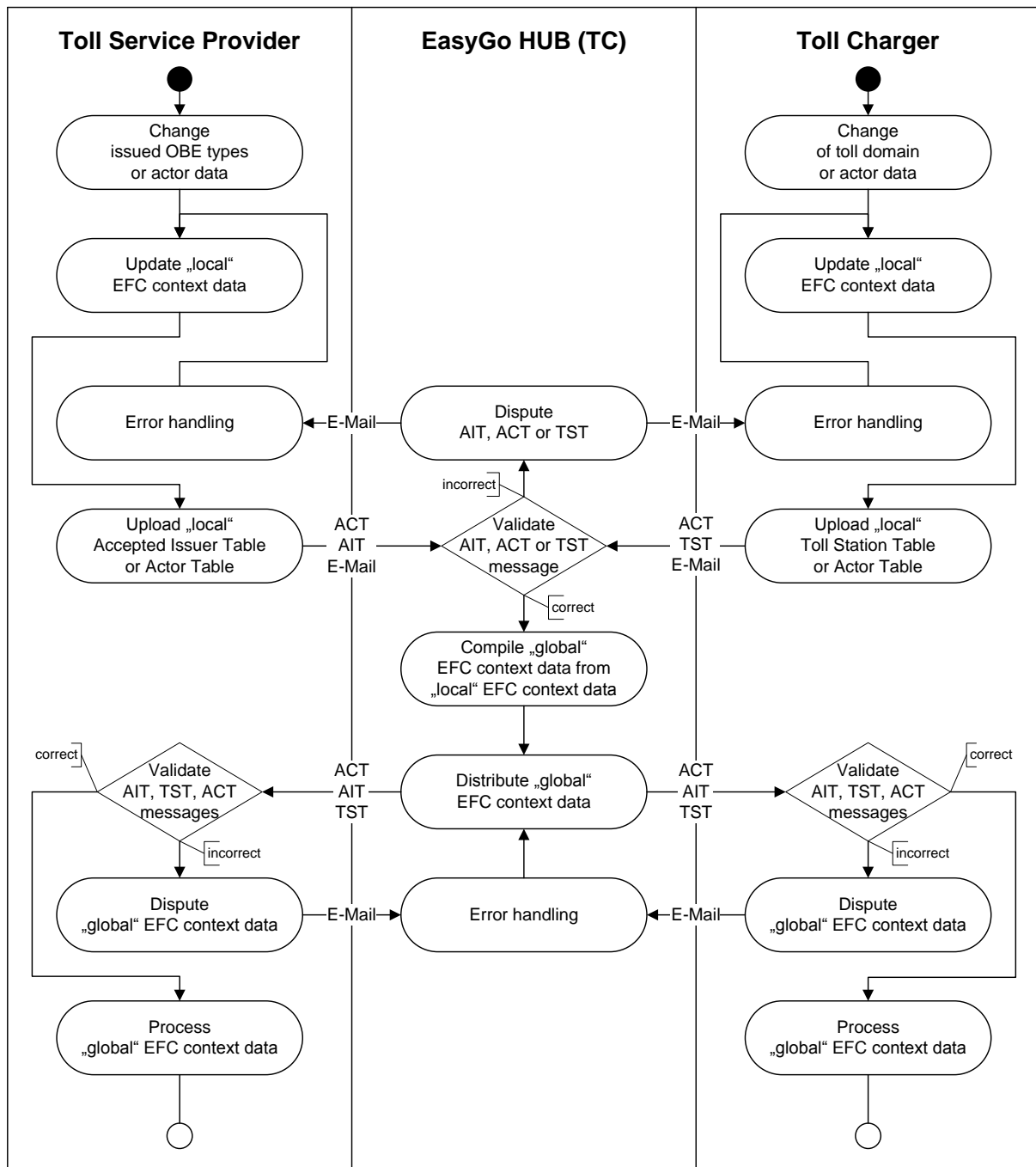


Figure 7: Originate EFC context data

The recipients shall validate the formal correctness of the transferred “global” EFC context data and dispute it to the operator of the EasyGo HUB by e-mail if an error is detected.

The recipient who initiated the update of the “global” EFC context data shall additionally validate his own data for correctness in the new “global” EFC context data and dispute it to the operator of the EasyGo HUB by e-mail if an error is detected.

In case of an error the management of the EasyGo HUB shall analyse the error and rectify the problem and transmit corrected “global” EFC context data according to the defined timing (see Annex 2.1 chapter 5). Until valid “global” EFC context data are transmitted, the last correct lists remain active in the systems of the recipients.

In case of no error, the recipients shall implement them in their systems if needed according to the defined timing (see Annex 2.1 chapter 5).

The format of the messages used in this data exchange is described in Annex 2.3 and the detailed technical process is described in Annex 2.1.

4.4 Exchange of Trust Objects

Definition of process: The “Exchange of Trust Objects” process is initiated, when a TC or a TSP is added to the toll scheme or when one of these entities wishes to update its security keys. In these actions the entities shall exchange Trust Objects to be used for securing their bilateral communication.

Trust objects are mandatory in EasyGo+. In EasyGo Basic only some TCs employ trust objects. When trust objects are used in EasyGo Basic, the process is the same as for EasyGo+.

The process consists of two messages which may be used during any data exchange through this interface. The KDF message contains the Trust Objects provided by the originator and needs to be confirmed by a KDC message.

This interface is used bidirectional and shall be provided by both the TC and the TSP as recipient and as originator. The term Trust Objects contains a compilation of every security key within the toll charging environment.

Public keys will be exchanged between TCs and TSPs used for encrypting specific transferred information, where both entities will act as originator and recipient.

DSRC keys will be sent from the TSP to the TC to secure the communication between OBE and RSE (access credentials).

The use of this interface results in the following sequence of message exchanges, when initiated:

4.4.1 Update Trust Object

A TSP can decide at any time to update his Trust Objects.

Either a new private/public key pair or a new DSRC key is generated by the TSP. This generated Trust Object (e.g. public key or DSRC key) shall then be encrypted with the public key of each TC it will be sent to. The initial public key for each TC used during this encryption will be exchanged by other means (e.g. e-mail).

The encrypted Trust Object shall then be uploaded as a KDF message to the EasyGo HUB. The EasyGo HUB shall validate the formal correctness of the message and dispute it to the sending TSP and the operator of the EasyGo HUB by e-mail if an error is detected. The contents of the message are not checked.

The EasyGo HUB delivers the received message to the addressed TC who shall validate the formal correctness of the message and dispute it to the sending EasyGo HUB by e-mail if an error is detected.

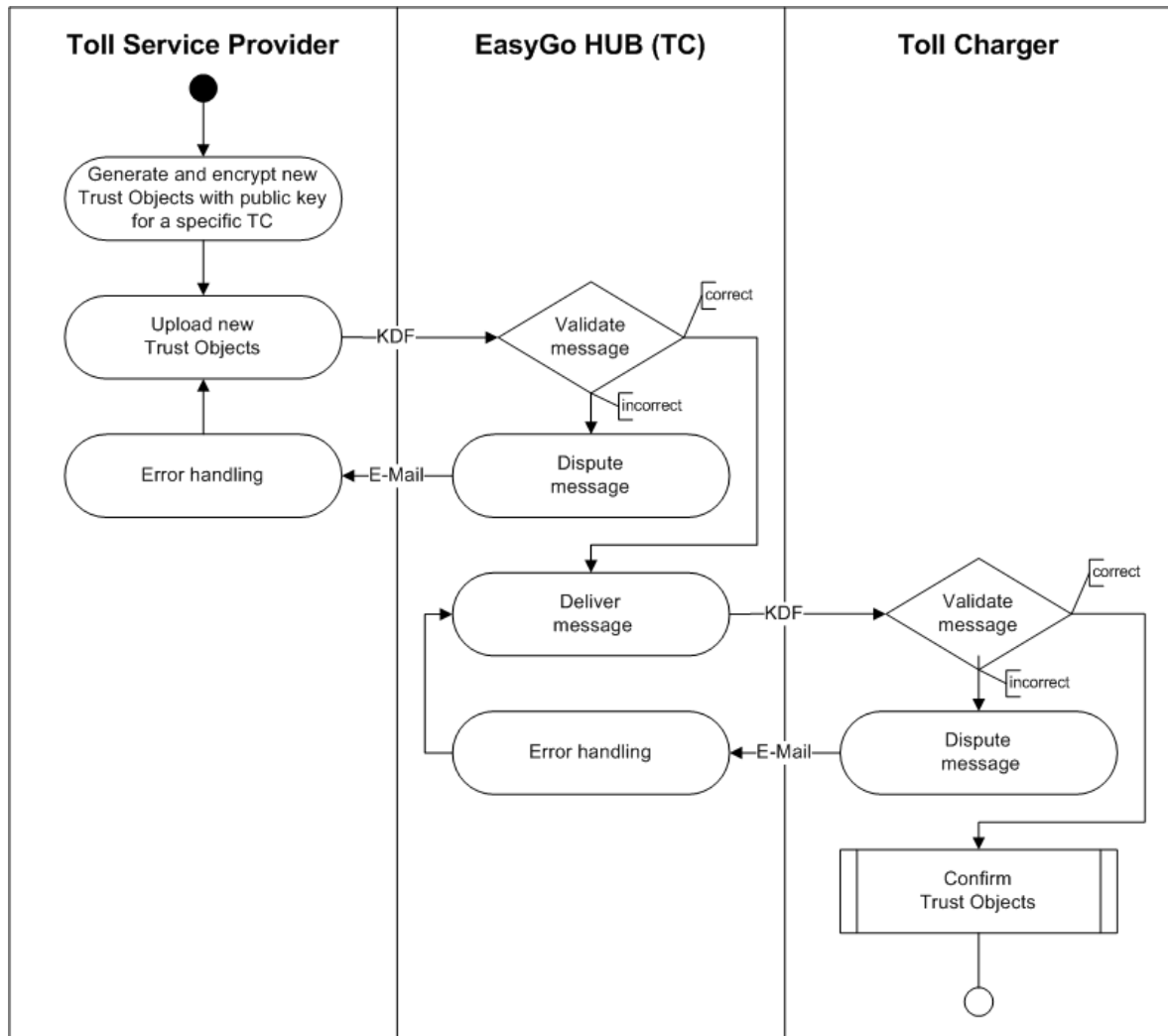


Figure 8: Update Trust Object

If the received message was correct, it shall be processed by the TC.

4.4.2 Confirm Trust Object

The TC shall decrypt the content of the message with his private key and extract the sent Trust Object. If the TC was not able to decrypt the Trust Object, he shall dispute it by sending a negative KDC message, otherwise the Trust Object shall be acknowledged by sending a positive KDC message.

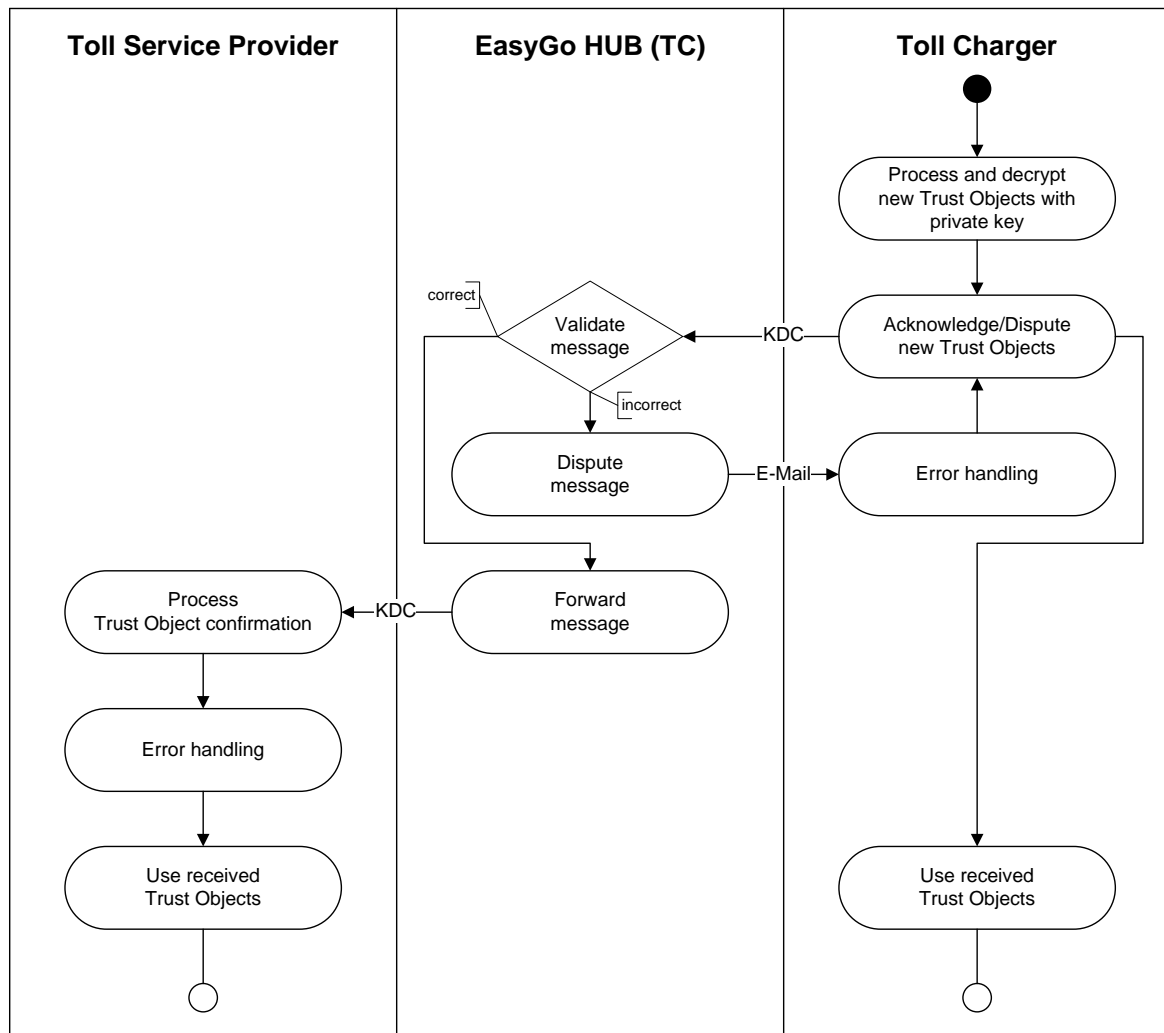


Figure 9: Confirm Trust Object

The KDC message shall be returned through the EasyGo HUB to the TSP who initially sent the KDF message.

If a negative KDC message is received the TSP shall analyse the KDC, resolve the error and send a new KDF message.

If the TC acknowledged the correctness of the transferred Trust Object through a positive KDC message both, the TSP and the TC, shall automatically activate the exchanged Trust Object in their systems at the agreed time.

This process is repeated for every TC, so that all TCs have the new Trust Object securely delivered.

The format of the messages used in this data exchange is described in Annex 2.3 and the detailed technical process is described in Annex 2.1.

The distribution of the DSRC keys within the system of the TC is described in the Annex 2.5.

4.5 Open a contract

Definition of process: The process is initiated, whenever a SU applies to open a contract with a TSP.

There are three different processes to consider:

- A. A new SU who does not already hold a contract / OBE from any TSP (or TC offering local contracts)
- B. A SU who have a local contract which may be replaced with an EasyGo OBE from a new TSP
- C. A SU who has an EasyGo contract / OBE and who wants to enter into a local contract with a TC to receive a higher discount

A is described in chapter 4.5.1 “Open contract”. B is an option within “open contract” but is described separately in chapter 4.5.2 “Cancel local contract”. C is described in chapter 4.5.3 “Add a local contract to an EasyGo OBE”.

The processes are valid for EasyGo Basic and EasyGo+. There are however some elements only valid for EasyGo+. These are:

- Personalisation of OBEs
- Production of Vehicle Declaration documents

4.5.1 Open contract

The TSP shall always verify the SU data before issuing an OBE and updating the whitelist.

For EasyGo+ these verified SU data shall be used as basis for personalisation of the OBE and production of vehicle declaration.

The TSP has also to store the proof documents for a later check by the TC.

The TSP should ask the SU if he already has an OBE from another TSP or TC (local contract). If the SU already has an OBE the TSP should request that this OBE / local contract is terminated if it is no longer needed. The new OBE could be used as a basis for a local contract instead of the SU having two or more OBEs.

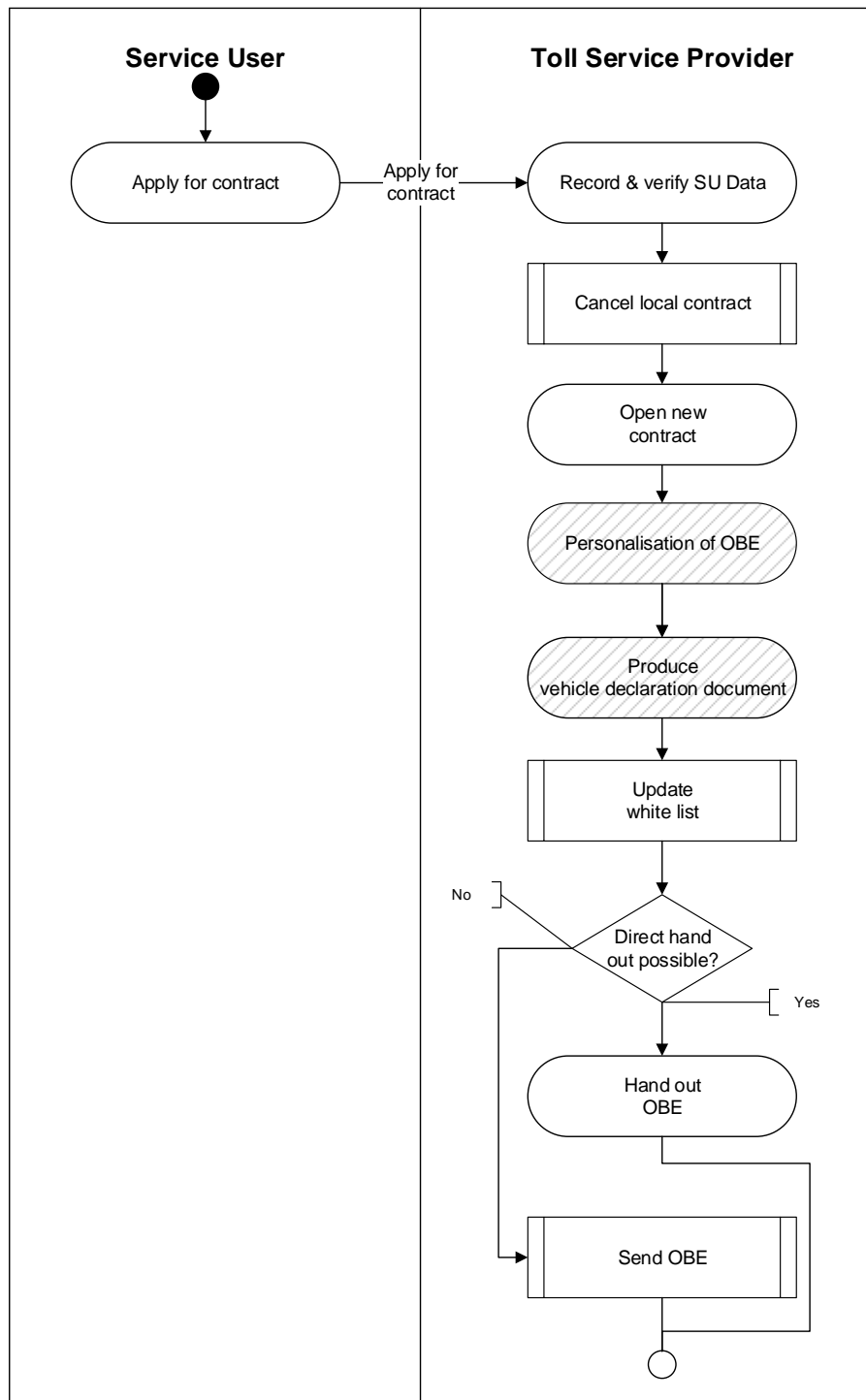


Figure 10: Open contract

The whitelist shall be updated (see chapter 4.6.1.4 “Update whitelist”) to include the new OBE(s) for the SU.

For EasyGo basic:

If a direct hand out of the new OBE is possible the SU has to stop at a location, where he can receive the new OBE

If no direct hand out of the new OBE is possible the TSP shall send the new OBE to the SU (see chapter 4.5.4 “Send OBE”)

For EasyGo+:

If a direct hand out of the new OBE is possible the SU has to stop at a location, where the hand out can be performed (e.g. POS, central personalisation location ...). The SU receives the new OBE and a vehicle declaration document.

If no direct hand out of the new OBE is possible the TSP shall send the new personalised OBE to the SU (see chapter 4.5.4 “Send OBE”) together with a vehicle declaration document.

For EasyGo+ the TSP must also carry out the following:

The new OBE shall be personalised according to the documents provided by the SU.

The TSP shall produce a vehicle declaration document, showing the details of the personalised data. The vehicle declaration document shall at least contain the following information:

- Toll context (EasyGo+)
- Name of TSP and his contact information
- Date and time of personalisation
- PAN
- OBE-ID (ContractProvider+ ManufacturerId+ EquipmentOBUId), printed in hex characters
- License plate number
- Nationality of license plate
- Euro emission category
- Date and time of personalisation
- ManufacturerId and EquipmentOBUId presented as barcode (code 128)

4.5.2 Cancel local contract

When a SU applies for a contract with a TSP, the TSP should check if the SU already has a contract with another TSP or a local contract with a TC. This should be done to avoid the use of multiple OBEs in the vehicle which can disturb communication between OBE and RSE and lead to errors.

The TSP should therefore ask the SU if he has any other contracts and recommend that he terminates this / these contract(s) in favour of one new contract. The SU is not obliged to respond to this request.

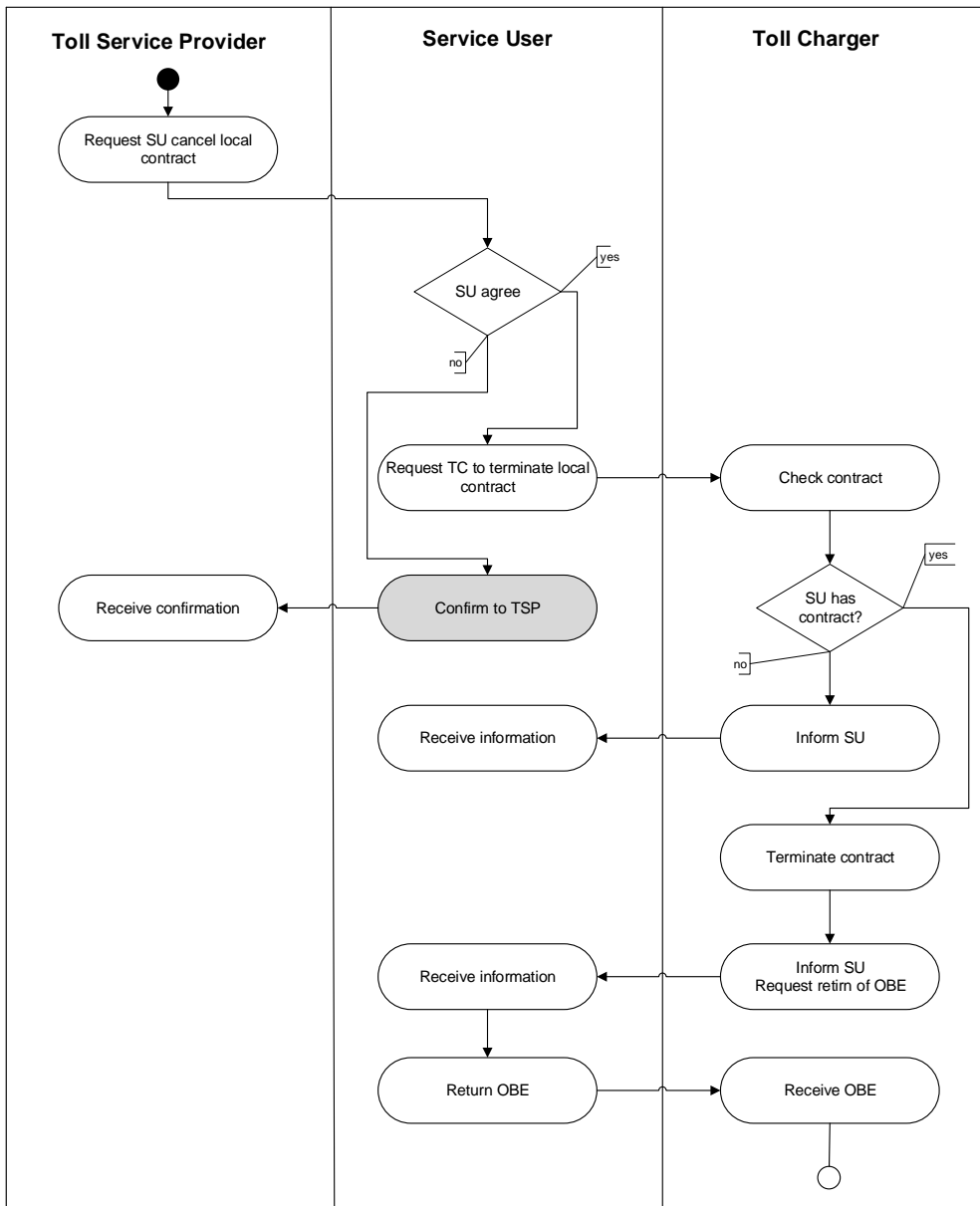


Figure 11: Cancel local contract

4.5.3 Add a local contract to an EasyGo OBE

If a SU who already has an EasyGo contract / OBE wants to enter into a local contract with a TC (to obtain a higher discount), the TC shall make use of the same OBE already distributed to the SU by his EasyGo TSP.

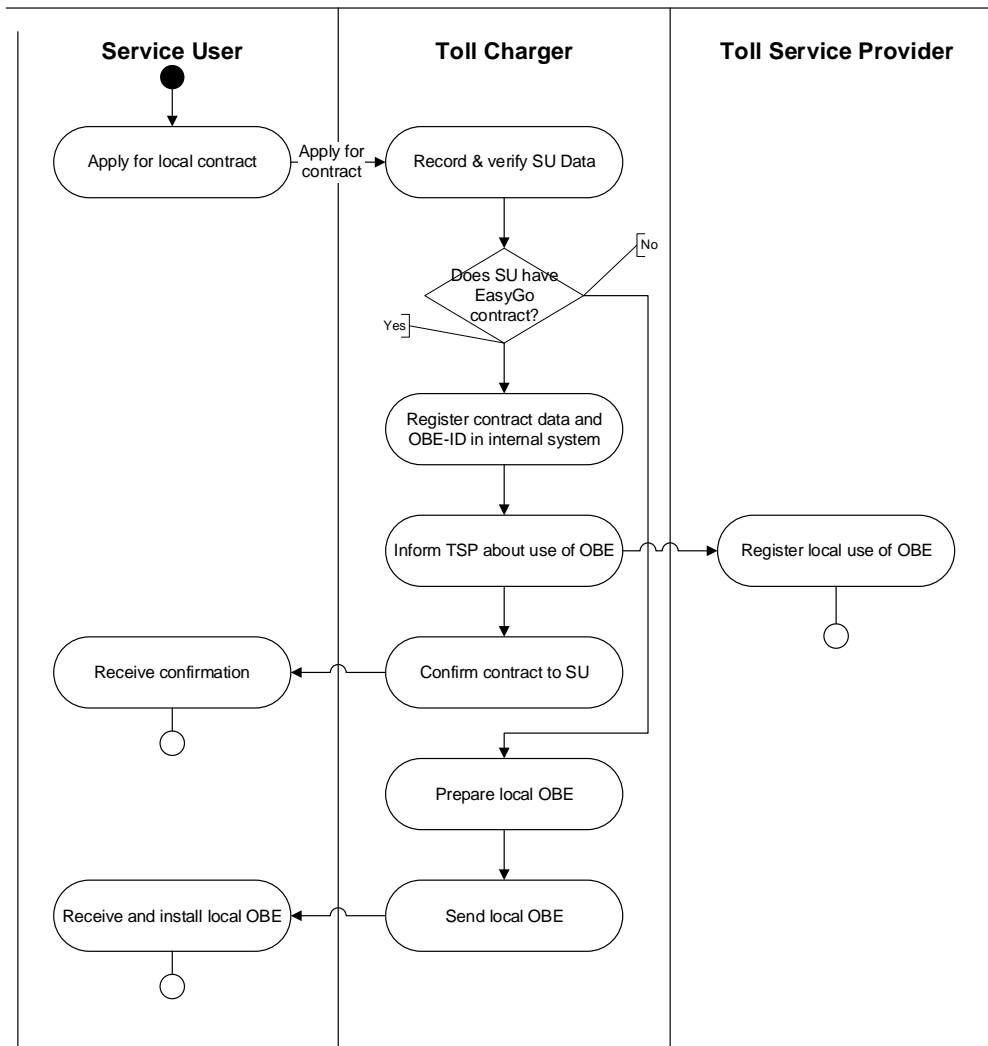


Figure 12: Add local contract to EasyGo OBE

The TC shall inform the TSP about the local use of the OBE as the TSP is entitled to a compensation as described in Annex 3-6 “*Issuer fee*”.

4.5.4 Send OBE

The OBE has to be shielded during sending to prevent it from interacting with the RSE of any toll stations passed during delivery.

After receiving the new OBE the SU shall install it in the correct vehicle.

For EasyGo+ the SU also has to carry the provided vehicle declaration document(s) in the vehicle together with the OBE.

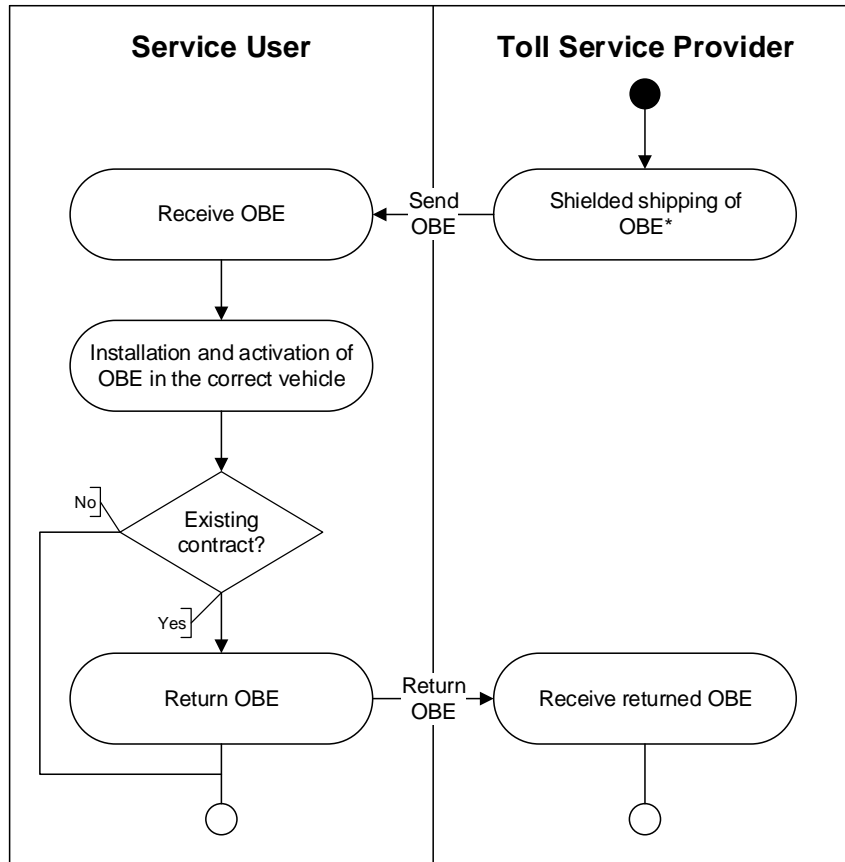


Figure 13: Send OBE

If the SU already has a contract / OBE with the TSP he should return the old OBE to the TSP.

If the SU has any OBE(s) for local contract(s) he should return them to his TSP for the toll domain they were initially issued for.

NOTE 1: The activation may range from removing an OBE from its protective shielding packaging to an actual activation process with a TSP (e.g. If a German OBE is used, the DSRC based toll collection needs to be activated prior to its use).

NOTE 2: The TSP of the local contract may differ from the TSP who sent the OBE.

4.6 Distribute validation data

Definition of process: The process ensures that the data used to check if the user has a valid contract or not, is correct.

The data is produced by the TSP, distributed via the EasyGo HUB and used by the TC. The validation data include two types of data:

- Exception list: Listing OBEs that are not approved
- Whitelist: Listing approved OBEs

The whitelist can hold additional data for vehicle categories, license plate etc.

The handling of these two types of lists is described below with one process for each.

4.6.1 Manage Exception list

The “Manage Exception list” process shall be used whenever a TSP needs to revoke the payment guarantee for an OBE issued to a SU. This could be caused by a SU terminating or violating the contract with the TSP or it may be caused by the report of a broken, lost or stolen OBE (see chapter 5.7.1 “Report abnormal behaviour”).

NOTE 1: To avoid the term of blacklist, which has a differing meaning in various existing toll regimes and to include other lists with a similar meaning (e.g. grey or black list of PAN, block list for license plates or OBEs ...), the term “Exception list” is used as in EN ISO 17573 and EN ISO 12855 to summarize all possibilities of limiting the usability of an OBE in a toll regime. Other standards may still use differing terms, but they are all included in the term “Exception list”.

NOTE 2: The Exception list may only be used to limit or restrict the acceptance of an OBE within all toll domains connected to the EasyGo HUB (not for individual toll domains).

The conditions and the periods of time when the acceptance of an OBE within a toll regime are limited are solely in the responsibility of the TSP that issued the OBE.

An entry in the Exception list always consists of the PAN, the OBE-ID, the Context Mark and a reason code.

4.6.1.1 Update Exception list

An identifier will only be placed in the Exception list following a unilateral decision of the TSP or after a verified report of abnormal behaviour by the TC.

The Exception list is updated whenever the TSP decides to add an identifier to it or delete an identifier from it.

A “local” Exception list is always uploaded by the means of a NAT message as a full update from the TSP to the EasyGo HUB. Incremental updates of Exception lists are not allowed.

NOTE 1: For the TSP it is vitally important to timely block any SU from using any toll domain(s) of a TC, by putting any identification for the OBE of a SU in an Exception list. A failure to do so leads to an upright payment guarantee in favour of the TC, even if the SU is no longer able or no longer required to pay (e.g. SU is not paying, stolen OBE ...).

NOTE 2: It is up to the TSP to organize within the responsibility of its role the distribution of Exception lists to TSP agents dealing with the acquisition of new customers.

The various TSPs shall generate their “local” Exception lists and send them to the EasyGo HUB according to the defined timing (see Annex 2.1 chapter 5). The EasyGo HUB shall validate the formal correctness of the message and shall either acknowledge or dispute it to the sending TSP according to the defined timing (see Annex 2.1 chapter 5) by the means of a NAC message.

If a formal error in the received “local” Exception list is detected the whole list shall be disputed. If an error in the content of the file is detected a partial acceptance of the list is possible only disputing single lines.

The responsibility of the delivery of a valid “local” Exception list on time to the EasyGo HUB lies always with the TSP, i.e. the “infrastructure” cannot be made responsible.

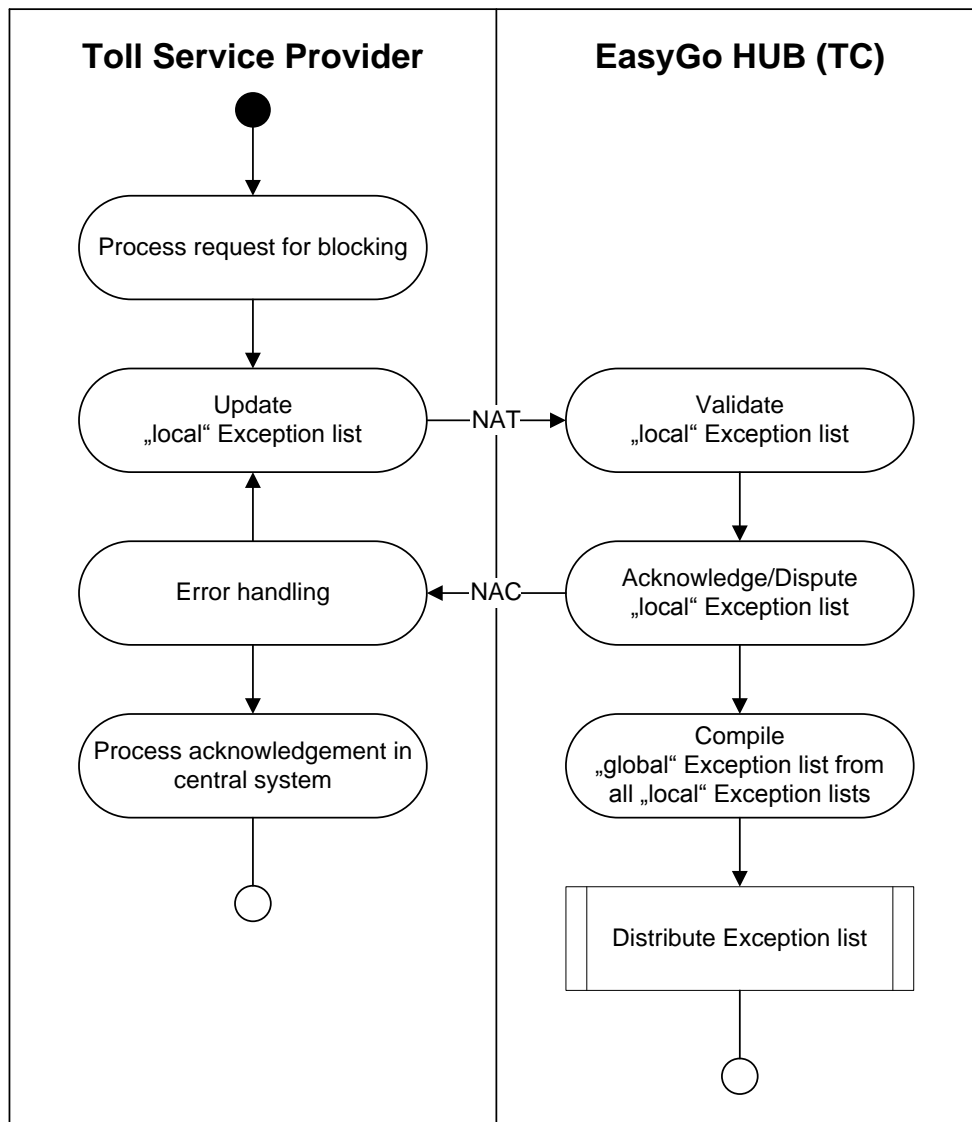


Figure 14: Update Exception list

The EasyGo HUB shall compile a “global” Exception list according to the defined timing (see Annex 2.1 chapter 5) from all valid “local” Exception lists received on time from all connected TSPs. If no new or an invalid “local” Exception list is received from a TSP, the last valid “local” Exception list for this TSP will be used during the compilation.

The format of the messages used in this data exchange is described in Annex 2.3 and the detailed technical process is described in Annex 2.1.

4.6.1.2 *Distribute Exception list*

The EasyGo HUB shall be able to filter the compiled “global” Exception list based on the Context mark or intervals thereof if required by a TC.

After filtering the “global” Exception list it shall be distributed to all connected TCs according to the defined timing (see Annex 2.1 chapter 5) by the means of a NAT message.

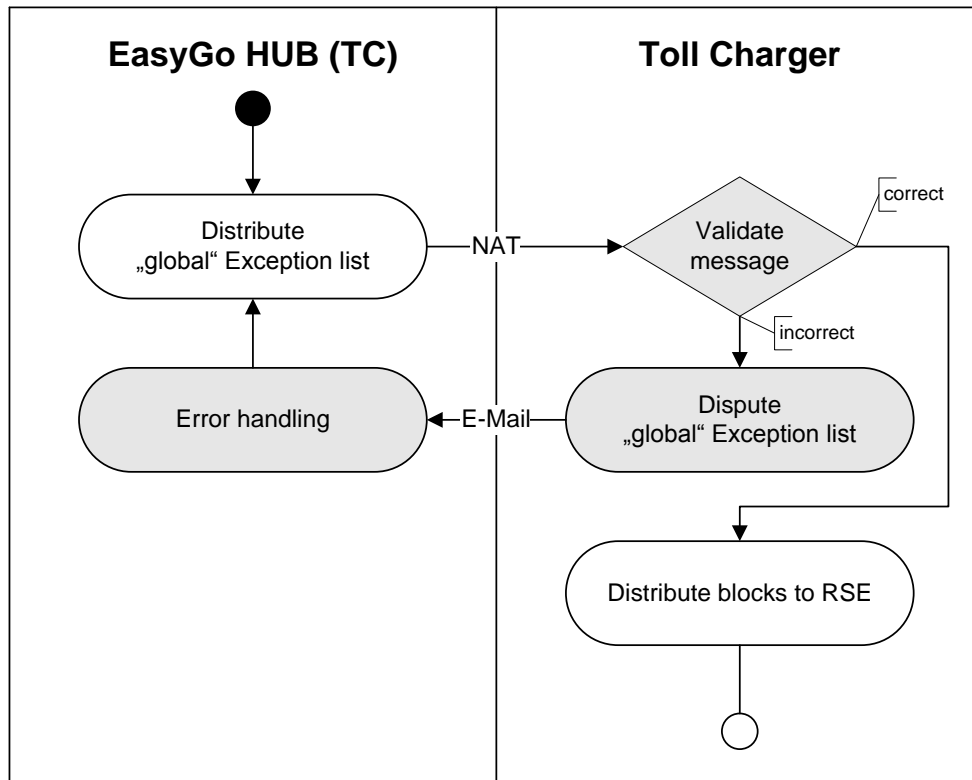


Figure 15: Distribute Exception list

If a new “global” Exception list is received, the TC shall process it. The grace period for the activation of any new blocks ends according to the defined timing (see Annex 2.1 chapter 5) after which the liability for any toll transactions with excepted OBE is transferred from the TSP to the TC (i.e. the payment guarantee of the TSP ends).

NOTE 1: For the TCs it is vitally important to timely block any SUs from using their Transport Service, when any identification of a SU’s OBE is included in a distributed Exception list. A failure to do so may lead to a usage of his toll domain(s) without a payment guarantee and thus to a possible loss of revenue for the TC.

NOTE 2: The EasyGo HUB is prepared to send up to 99 Exception lists per day. It is therefore principally possible to distribute a new Exception list every few hours or when a new change arrives at the EasyGo HUB. This is however only useful if the TCs are able to implement the distribution of the Exception lists to their RSE at this frequency. Currently this is not possible at all TCs. Therefore only one Exception list per day will be distributed.

The TC may optionally validate the formal correctness of the message and dispute it to the operator of the EasyGo HUB by e-mail if an error is detected.

In case of an error the management of the EasyGo HUB shall analyse the error and rectify the problem and transmit a corrected “global” Exception list according to the defined timing (see Annex 2.1 chapter 5). Until a valid “global” Exception list is transmitted, the last correct list remains active in the systems of the TC.

Any error not attributed to a corrupt “local” Exception list sent by a TSP lies in the responsibility of the cluster of TCs. Thus any toll transaction made by an OBE which was correctly blocked by the issuing TSP (i.e. put on an acknowledged “local” Exception list) falls into the responsibility of the cluster of TCs.

4.6.1.3 Use of whitelists

Although the use of a whitelist is not explicitly contained in the EETS decision, the EasyGo service will use this kind of information to improve the usage of the degraded mode and/or the local enforcement process. As long as the information in the whitelist is limited to EasyGo contracts the use of these lists is conformant to the national and European data protection regulations. The processes described under 4.6.1.4, 4.6.1.5 and 4.6.1.6 have to be implemented to establish this interface.

When a SU applies for a contract with TSP A he is issued an OBE with all vehicle criteria necessary to calculate the amount due put on the whitelist.

For EasyGo+ the OBE needs to be personalised with the same data.

This OBE needs to be mounted by the SU in the correct vehicle.

By using the toll domain of a TC the OBE from TSP A communicates with the RSE of the TC, which leads to billing details being sent to the issuing TSP.

In case of a malfunctioning OBE the TC can then check the whitelist whether the license plate of the detected vehicle is included or not. Such an entry can be used to generate a transaction in degraded mode (e.g. video transaction) and sent to the responsible TSP. If this is not possible the information about the TSP can be used to request the SUs address details for the enforcement process.

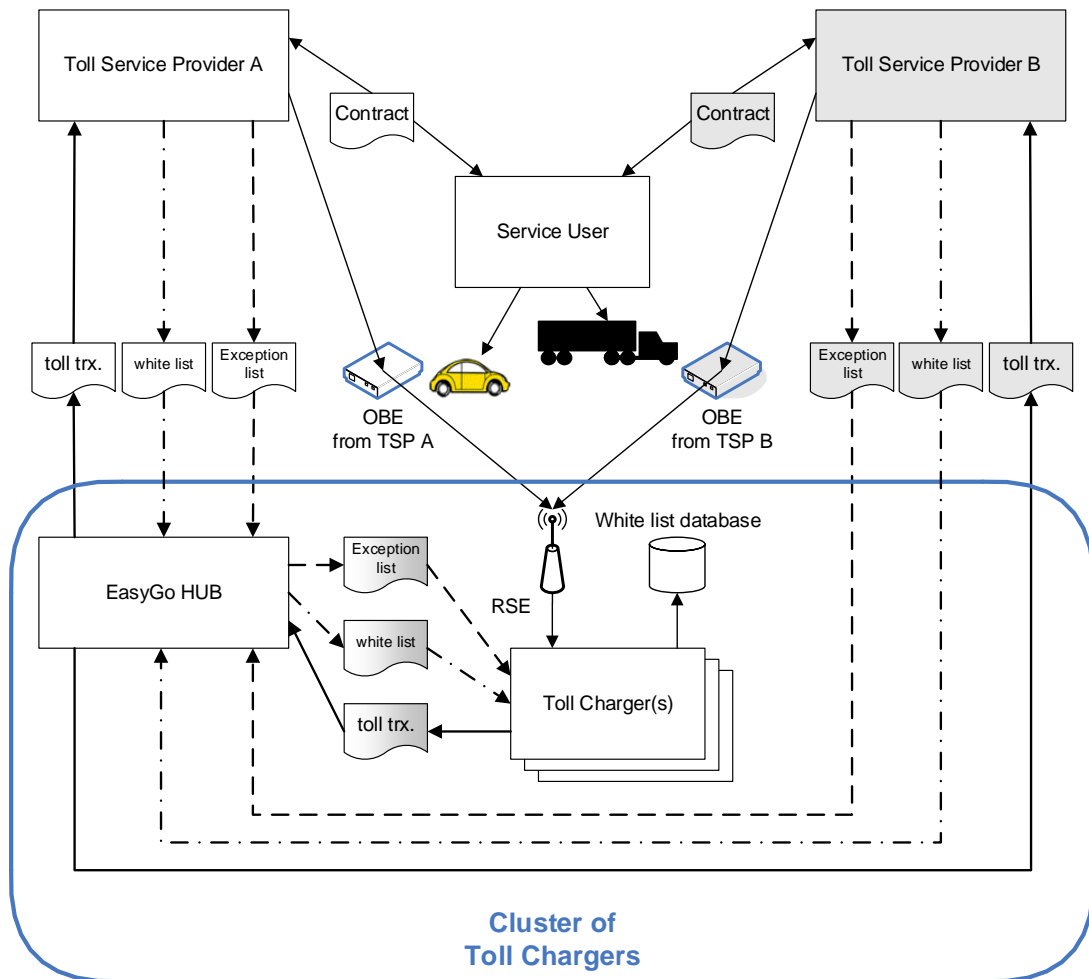


Figure 16: Use of whitelists

By using the toll domain of a TC the new OBE from TSP B or the second OBE from TSP A communicates with the RSE of the TC, which leads to billing details being sent to the issuing TSP.

If a passage shall be handled in degraded mode (e.g. a passage without an OBE-RSE communication) the “global” whitelist shall be checked by the TC (see chapter 4.6.1.6).

Depending on the result of the check the TC decides which TSP any billing details in degraded mode (e.g. video transactions) will be sent to if the result is not unique.

4.6.1.4 Update whitelist

If a TSP establishes a new contract with a SU, an existing contract is changed (e.g. change of license plate number ...) or an existing contract is closed, the “local” whitelist has to be updated and distributed, so that all TCs are able to check for established contracts.

The TSP shall produce the following entries for the whitelist:

- When a new contract is established a new entry shall be put on the whitelist.

- When an existing contract is changed the current entry shall be removed from the whitelist and a new entry is put on the whitelist
- When an existing contract is closed the current entry shall be removed from the whitelist
- When an existing contract is blocked by including an identifier of the OBE of a SU on the Exception list the current entry shall be removed from the whitelist
- When an existing contract is unblocked by removing an identifier of the OBE of a SU from the Exception list a new entry shall be put on the whitelist

NOTE: If a TC needs to implement historical searches all entries need to be time stamped in his systems.

There are 3 different cases (a, b and c) regarding the uniqueness of entries in the whitelist for a license plate:

- a) One SU may have a contract for the same license plate with more than one TSP.

If the SU decides at a certain time to use the services of TSP B and does not inform his former TSP A about it, he will apply for a contract with the new TSP. The TSP B will then provide the needed OBE for the SU who has to mount it in the correct vehicle.

The SU can at no time be prevented from opening a contract with another TSP. Therefore any solution must cope with a condition where a SU has more than one contract and more than one OBE is valid for the same license plate at the same time. Whether this is only for a short time or permanently is of no consequence to the solution as it has to cope with the fact anyway.

- b) Specifically to EasyGo+ where the OBE needs to be personalised:

If no direct update of the personalised data in the OBE held by the SU is possible, he may receive a replacement OBE.

If the data stored in an OBE held by a SU needs to be updated, and the OBE cannot directly be updated by the TSP, he needs to issue a replacement OBE to the SU (see chapter 5.6 “Change contract data”). Independently of whether the old OBE is removed from the interoperable whitelist or the license plate associated with the old OBE on the interoperable whitelist is set to a virtual number, a 1:1 relationship for the entries by one TSP can be maintained.

- c) One SU may require having two OBE for the same license plate.
- If a vehicle owner rents out a vehicle to a regular customer, the customer may want to collect all of his transport activities under one customer number to get a higher volume discounts in a certain toll regime (where this is offered). This would require the vehicle to be equipped with an OBE associated to the customer of the vehicle owner.
 - If the vehicle owner uses the same vehicle for other customers as well, it needs to be equipped with a second OBE associated to the vehicle owner himself.

- ➔ Solution 1: The second OBE has to be from a different TSP. In this case the 1:1 relation for one TSP is maintained.
- ➔ Solution 2: The second OBE has to be a local contract (EasyGo basic contract vs. EasyGo+ contract). In this case the 1:1 relation for one TSP is maintained.

The update of the whitelist is initiated by the each TSP who shall generate their “local” whitelists containing entries for all of their non-blocked contracts and shall send them to the EasyGo HUB according to the defined timing (see Annex 2.1 chapter 5).

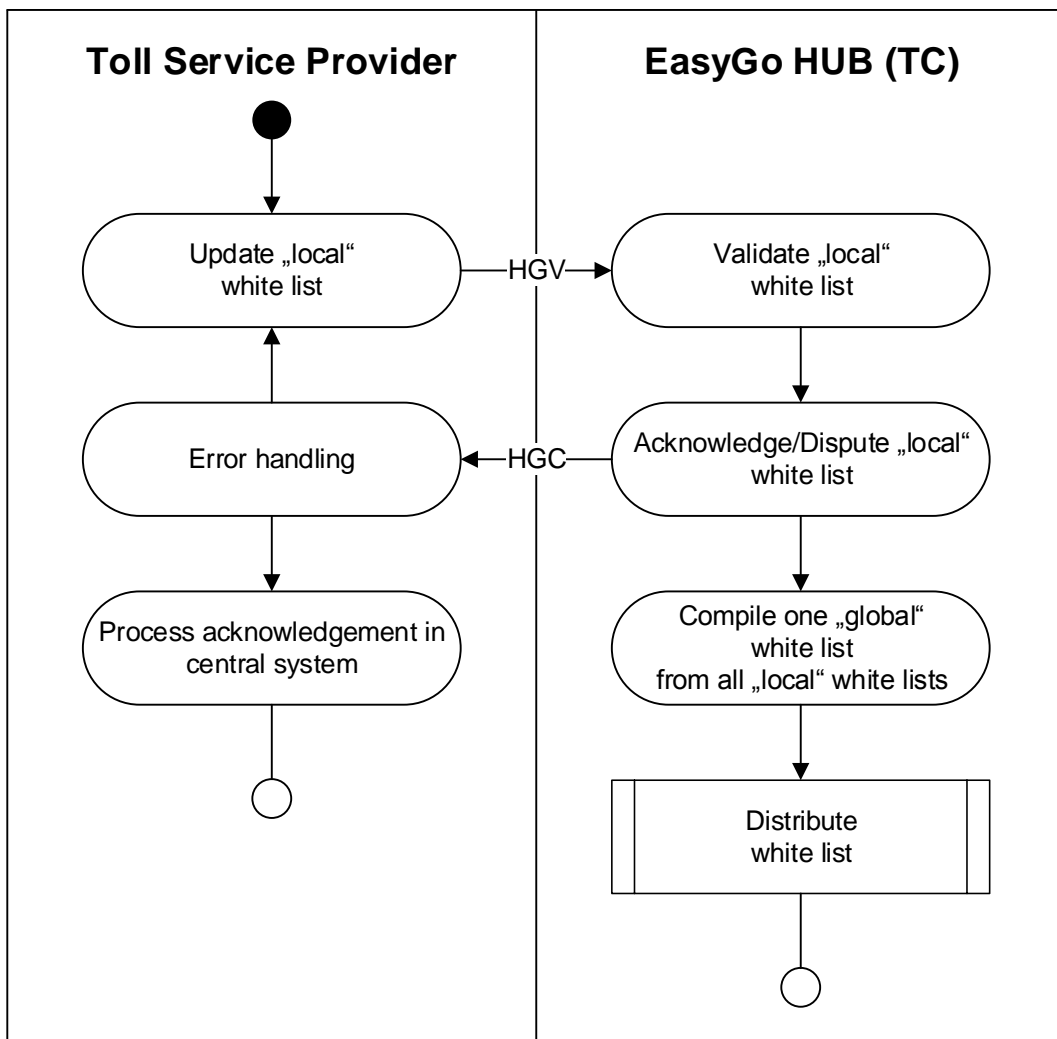


Figure 17: Update whitelist

The EasyGo HUB shall validate the formal correctness of the message and shall either acknowledge or dispute it to the sending TSP according to the defined timing (see Annex 2.1 chapter 5) by the means of a HGC message.

If a formal error in the received “local” whitelist is detected the whole list shall be disputed. If an error in the content of the file is detected a partial acceptance of the list is possible only disputing single lines.

The responsibility of the delivery of a valid “local” whitelist on time to the EasyGo HUB lies always with the TSP, i.e. the “infrastructure” cannot be made responsible.

The EasyGo HUB shall compile a “global” whitelist according to the defined timing (see Annex 2.1 chapter 5) from all valid “local” whitelists received from all connected TSPs. If no new or an invalid “local” whitelist is received from a TSP, the last valid “local” whitelist for this TSP will be used during the compilation.

The format of the messages used in this data exchange is described in Annex 2.3 and the detailed technical process is described in Annex 2.1.

4.6.1.5 Distribute whitelist

The EasyGo HUB shall be able to filter the compiled “global” whitelist based on the Context mark or intervals thereof if required by a TC.

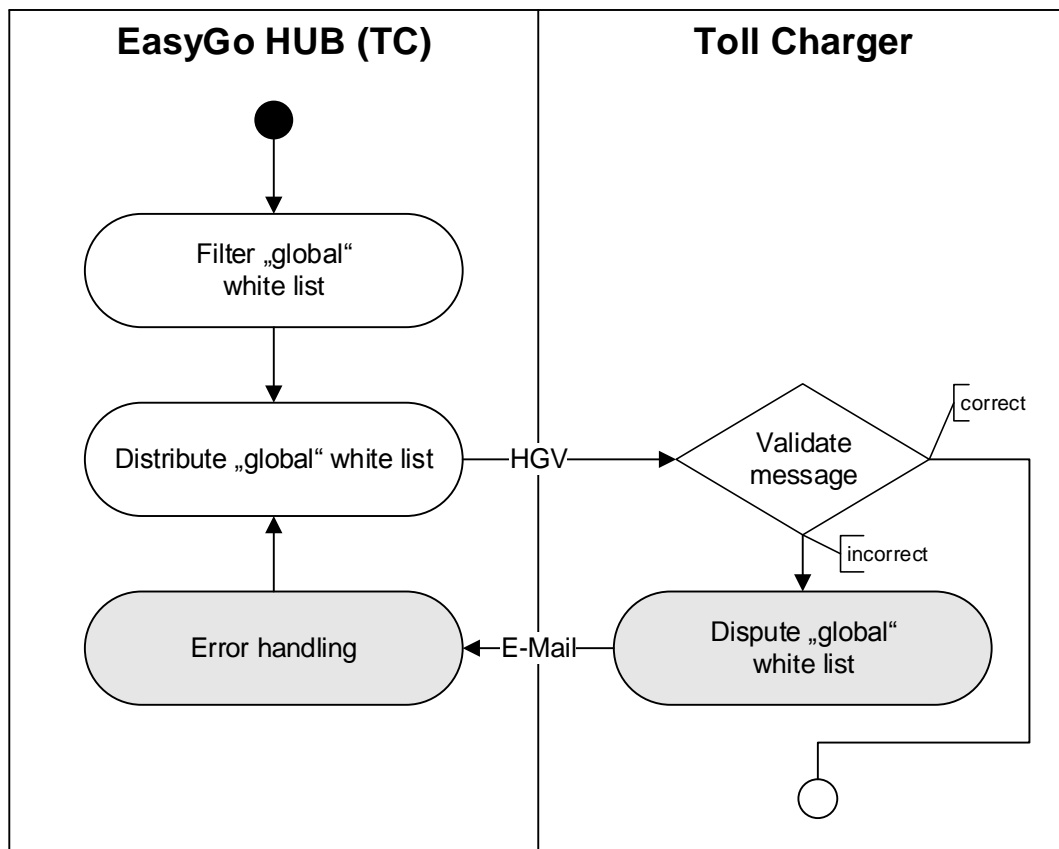


Figure 18: Distribute whitelist

After filtering the “global” whitelist it shall be distributed to all connected TCs according to the defined timing (see Annex 2.1 chapter 5) by the means of a HGV message.

The TC may optionally validate the formal correctness of the message and dispute it to the operator of the EasyGo HUB by e-mail if an error is detected.

In case of an error the management of the EasyGo HUB shall analyse the error and rectify the problem and transmit a corrected “global” whitelist according to the defined timing (see Annex 2.1 chapter 5). Until a valid “global” whitelist is transmitted, the last correct list remains active in the systems of the TC.

5 Operational processes

The following business processes are required to perform normal operation of EasyGo.

5.1 TC reports billing details to TSP

Definition of process: Charging data is collected whenever there is an exchange of data between an OBE and the RSE of the TC by triggering a toll event.

A service usage can be established either by a single toll event (e.g. open system) or by a combination of several toll events (e.g. entry, passage and exit in a closed system). This interface between OBE and road infrastructure is covered in DSRC related standards like EN ISO 14906 and EN 15509.

The gathered Charging data is collected in the central system of the TC and has to be reported as billing details to the TSP.

The TC is responsible for checking the completeness and the conformity of the recorded Charging data for a given service usage. This encompasses:

- Identity of the vehicle
- Reference of the contract
- Validity of the contract (expiry date, check Exception list)
- Vehicle characteristics
- Localisation(s) of the toll event(s)
- Period of time for service usage
- type of the toll event(s), and the associated parameters
- mode (manual , video, DSRC ...)
- Security elements

Each Charging data normally contains the associated security elements. The presence of security elements enables the responsible TSP to check the authenticity of the toll events and authenticate or dispute them, when he receives them as billing details from the TC.

Possible disputing reasons are, among others:

- Inconsistency of one or several data elements
- Payment means, OBE ID or License plate in Exception list at time of usage
- Incorrect security elements

NOTE: Examples: indicators for security elements may be Transaction counter, Authenticators or others

If the security elements are not present in the Billing details for any reason, the TSP has to check if the Billing detail is still acceptable. Reasons why Billing details without security elements may still be acceptable are, among others:

- Using degraded mode (e.g. manual key in at toll plaza with barriers, video detection)
- Synthetic transactions (e.g. vehicle has to have passed Gantry 2 because it was detected at Gantry 1 and Gantry 3 leaving it no time to leave the tolled network in between)

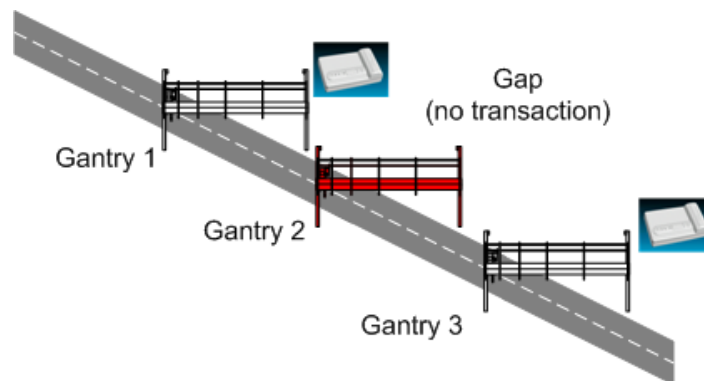


Figure 21: Synthetic transactions

If the TSP is not able to verify the authenticity of the Billing details he may decline it and ask for clarification by the TC. Otherwise the TSP is obliged to accept the transferred Billing details.

5.1.1 Process charging data

For a toll regime where the TC has deployed a system of automated number plate reading (ANPR) only or a combined ANPR/DSRC system the only identifier for a vehicle available to the TC is the license plate, when the DSRC identification fails. In this case the TC may not always know the TSP he has to charge the use of the toll domain to.

The TC shall query the “global” whitelist to identify the responsible TSP for the specific vehicle and claim payment for the usage of his toll domain by means of an inferred object (e.g. degraded mode, synthetic transaction).

Depending on whether the local toll regime allows the generation of inferred objects, the TC may try to do so or directly start the enforcement process.

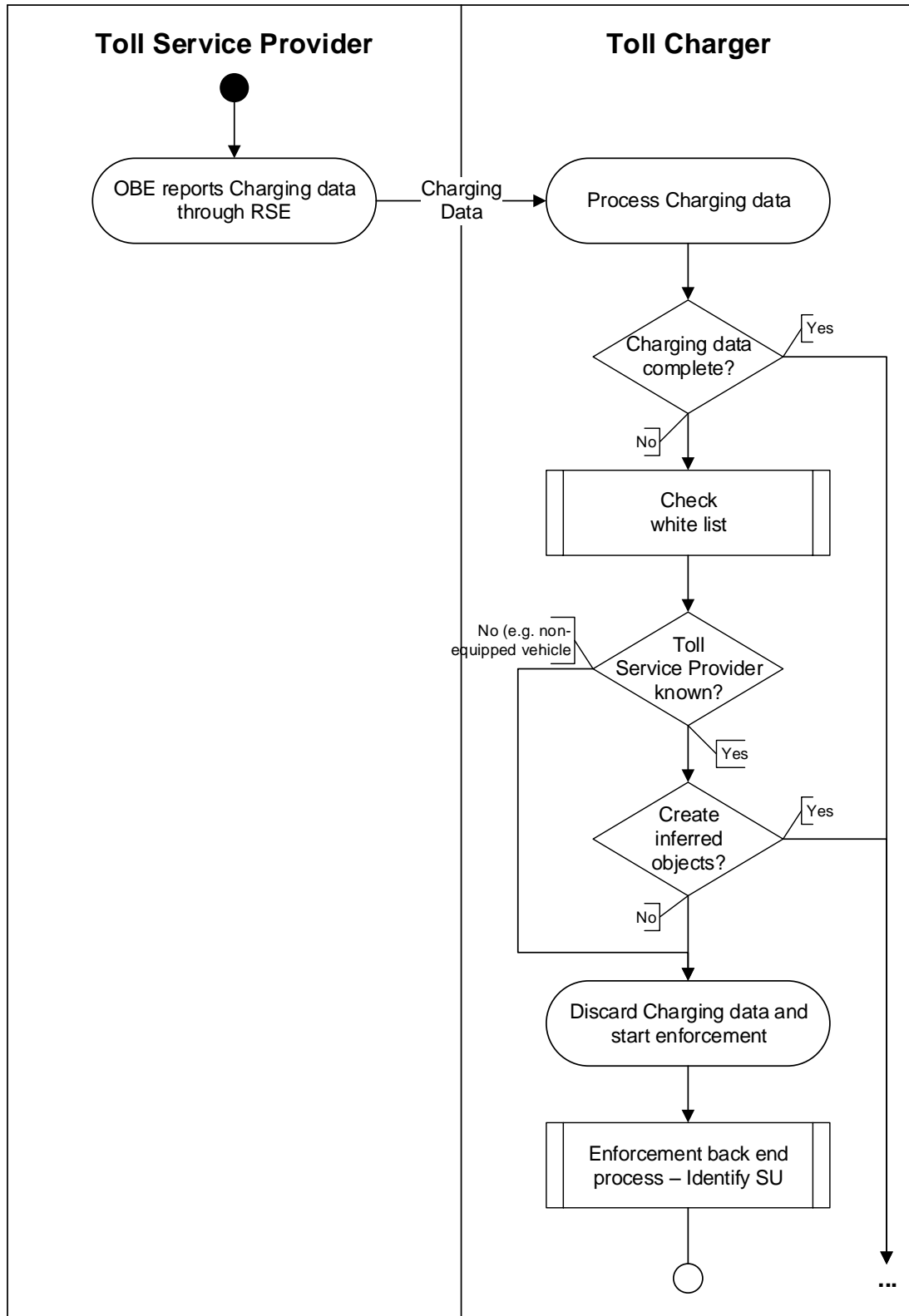


Figure 22: Process charging data

After processing the Charging data if it is complete and the conformity is checked, they become billing details within the central system of the TC.

5.1.2 Report billing details

After preparing the non-local billing details (e.g. where the TC is not also the responsible TSP) the TC shall report them in the defined format for his toll regime to the EasyGo HUB. The EasyGo HUB shall validate the formal correctness of the transferred “non-local” billing details and shall dispute it to the sending TC by e-mail if an error is detected.

The TC shall store any billing details for at least up 90 days in case he cannot deliver them to the EasyGo HUB for later delivery.

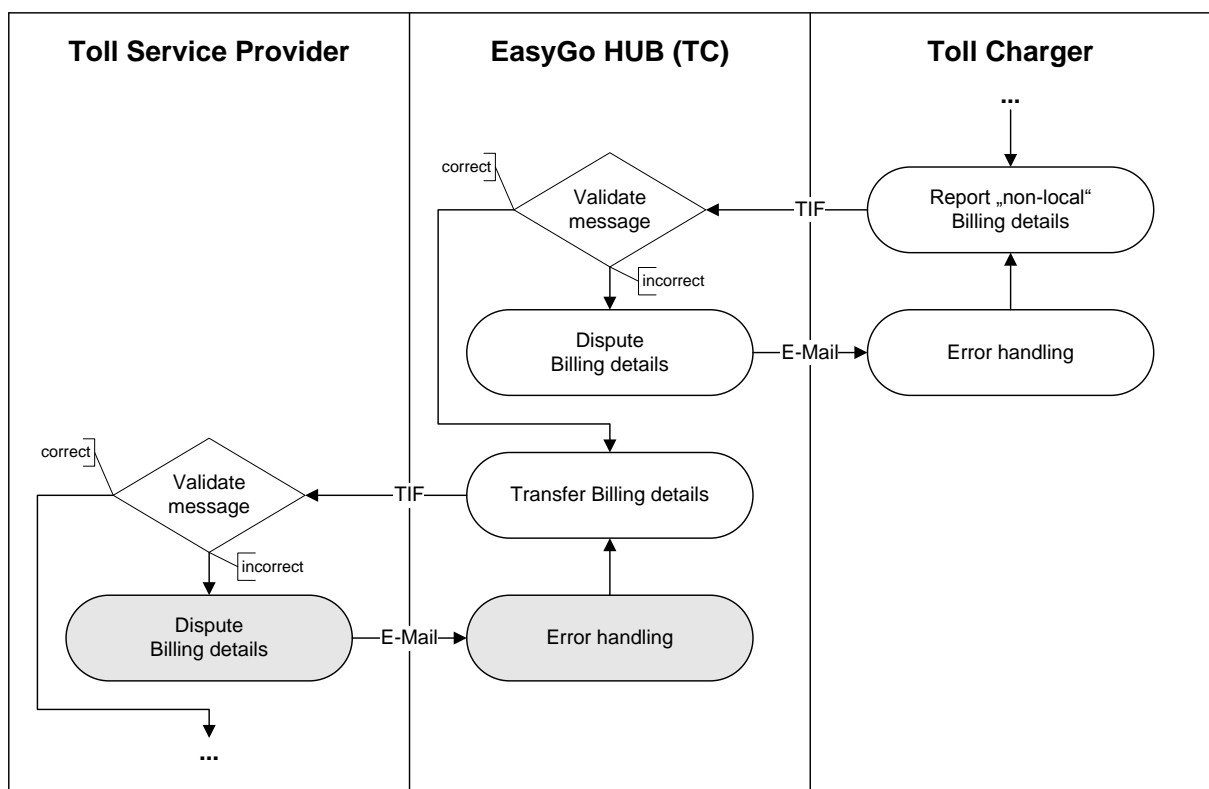


Figure 23: Report billing details

Any valid billing details shall be directly transferred to the addressed TSP by the means of a TIF message.

The TSP shall validate the formal correctness of the transferred billing details and shall dispute it to the EasyGo HUB by e-mail if an error is detected.

NOTE: The TSPs may use this information on single usage level to service its customers (SUs), to handle complaints by the SU. He has to use them to claim payment for service usage from his SU(s).

5.1.3 Acknowledge billing details

The TSP shall check and verify all received billing details he is responsible for. Depending on the result of this check, he may dispute every single billing detail or the

complete TIF message and send this back through the EasyGo HUB as a billing details confirmation message to the issuing TC.

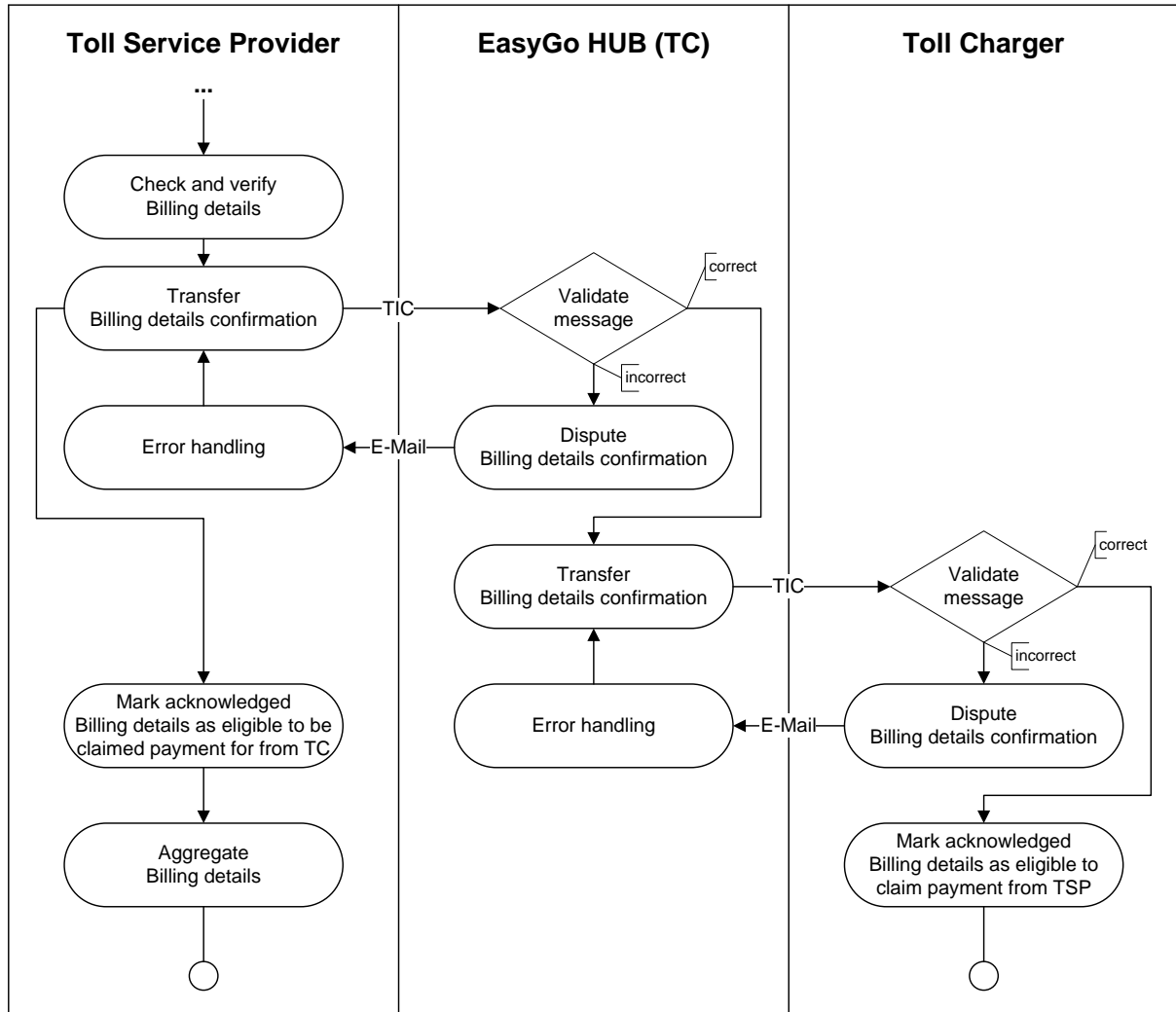


Figure 24: Acknowledge billing details

All non-disputed billing details shall be marked as eligible to claim the payment for service usage from the TSP(s) by the TC. At this point the acknowledged billing details shall be transferred to the bookkeeping systems.

5.1.4 Handling of rounding differences

5.1.4.1 Explicit rules for aggregation

To avoid any rounding differences during the aggregation of billing details in the systems of the TC and/or the systems of the TSP the following explicit rules have to be followed in the different aggregation steps.

The following exchange of billing details is used to better illustrate the importance of applying the correct aggregation procedures.

Report of Billing details by the Toll Charger							
license plate	station	net	VAT rate	VAT	Type	ref. nr	PAN
W-UNI1	112	1,58	20,00%	0,32	C1	A1	SU1
W-UNI1	113	2,44	20,00%	0,49	C1	A1	SU1
W-UNI1		4,02	20,00%	0,80	E1	A1	SU1
W-UNI1		24,00	0,00%	0,00	C1	A2	SU1
W-UNI1		24,00	0,00%	0,00	E1	A2	SU1
G-TEST1	245	12,50	20,00%	2,50	C1	A3	SU2
G-TEST1		12,50	20,00%	2,50	E1	A3	SU2
W-UNI2	746	2,14	20,00%	0,43	C1	A4	SU1
W-UNI2	745	1,59	20,00%	0,32	C1	A4	SU1
W-UNI2	744	4,25	20,00%	0,85	C1	A4	SU1
W-UNI2	743	4,59	20,00%	0,92	C1	A4	SU1
W-UNI2		12,57	20,00%	2,51	E1	A4	SU1
W-UNI2		36,00	0,00%	0,00	C1	A5	SU1
W-UNI2		36,00	0,00%	0,00	E1	A5	SU1
Total C1 20%:		29,09	20,00%	5,83			
Total C1 0%:		60,00	0,00%	0,00			
Total C1:		89,09		5,83			
Total E1:		89,09		5,81			
Total Difference:		0,00		0,02			

Figure 25: Report of billing details

5.1.4.2 Aggregation for MLFF transactions of a TC

To reduce the number of lines to be processed in the bookkeeping systems of the TC and the TSP, the billing details of an MLFF system need to be aggregated in the system of a TC before sending them to the TSP.

All billing details of an MLFF system for the same OBE, VAT rate and calendar day are aggregated into a single aggregate and a unique identifier (Reference number) for each aggregate is generated. This reference number is associated to the generated aggregate (E1-record) and the billing details (Cx-records) it is stemming from. Both types of records will be transmitted in the billing details file (TIF) as they are needed for different purposes. While the Cx-records contain all technical information (e.g. Authenticators, exact location of the transaction ...) the E1-records only contain information relevant for the bookkeeping systems and invoicing the SU.

The aggregated E1-records are highlighted in green in the example above. While the sum of the net amounts of the Cx-records always equals the sum of the net amounts of the E1-records there may be a difference in the sum of the VAT amounts of the Cx records to the sum of the VAT amounts of the E1-records (see difference in the example above).

Therefore it has to be clearly understood, that the Cx-records are not to be regarded as a sum in the bookkeeping systems! This difference stems from the difference of calculating the VAT amount from a single billing detail on Cx-record level and calculating the VAT amount from an aggregated (summed up) E1-record.

During the processing of the single billing details of the above example the following aggregates are generated.

Aggregation by the Toll Charger							
Reference number A1:				Reference number A4:			
license plate	net	VAT rate	VAT	license plate	net	VAT rate	VAT
W-UNI1	1,58	20,00%	0,32	W-UNI2	2,14	20,00%	0,43
W-UNI1	2,44	20,00%	0,49	W-UNI2	1,59	20,00%	0,32
Total net 20%	4,02			W-UNI2	4,25	20,00%	0,85
calc. VAT 20%	0,80		Total VAT 0,81	W-UNI2	4,59	20,00%	0,92
Total	4,82			Total net 20%	12,57		
Difference:	0,01			calc. VAT 20%	2,51		Total VAT 2,52
Reference number A2:				Reference number A5:			
license plate	net	VAT rate	VAT	license plate	net	VAT rate	VAT
W-UNI1	24,00	0,00%	0,00	W-UNI2	36,00	0,00%	0,00
Total net 0%	24,00			Total net 0%	36,00		
calc. VAT 0%	0,00		Total VAT 0,00	calc. VAT 0%	0,00		Total VAT 0,00
Total	24,00			Total	36,00		
Difference:	0,00			Difference:	0,00		
Reference number A3:				Total Difference: 0,02			
license plate	net	VAT rate	VAT				
G-TEST1	12,50	20,00%	2,50				
Total net 20%	12,50						
calc. VAT 20%	2,50		Total VAT 2,50				
Total	15,00						
Difference:	0,00						

Figure 26: Aggregation by the Toll Charger

The total difference between the Cx-records and the generated aggregated E1-records is again 0,02 and stemming from the aggregates A1 and A4.

Important: To avoid any effects of these rounding differences, the bookkeeping systems shall only process E1-records for MLFF systems. Any comparison between Cx-records and the aggregated E1-record is to be limited to the net amount.

5.1.4.3 Aggregation of billing details for invoices to the SU

To avoid any rounding differences between the VAT declarations for the local tax authorities of the TC and the VAT shown on the invoices to the SUs, the TC and the TSP must apply the same aggregation methods for the exchanged and acknowledged E1-records.

As the TC has no information about the relation of the OBEs to the SUs, he is unable to correctly sum up the E1-records and has to regard each E1-record separately (e.g. like a single invoice to a SU). His VAT declaration to the tax authorities has to be based on that principle. The sum of all E1-records is also the payment claim for the service usage he will ask to be paid by the TSP.

Important: While processing the exchanged and acknowledged E1-records the TSP has to calculate a cent adjust for each SU to counter the effects of rounding differences during the summing up of the E1-records for the invoice to the SU.

With this cent adjust the effects of summing up the E1-records per SU are corrected, so that it stays the same as the sum of the net amounts and VAT amounts of the acknowledged E1-records.

Each aggregation of E1-records for a SU is corrected to the original value included in the report of billing details by introducing a cent adjust. The cent adjust needs to be calculated per aggregate according to the following formula:

$$\text{cent adjust} = \text{sum (VAT)} - \text{sum(net)} * (\text{VAT rate})$$

The result of the calculation has to be rounded to two decimals. This cent adjust has to be calculated with 0% VAT because it is just an adjustment of the VAT.

While generating an invoice to a SU, the TSP will use all exchanged and acknowledged Dx-records from the different TCs and the cent adjust calculated by himself.

During the processing of the Dx-records of the above example the following invoices to the SUs would be generated during aggregation.

Aggregation by the Toll Service Provider			
Billing details for SU1:			
license plate	net	VAT rate	VAT
W-UNI1	4,02	20,00%	0,80
W-UNI1	24,00	0,00%	0,00
W-UNI2	12,57	20,00%	2,51
W-UNI2	36,00	0,00%	0,00
cent adjust	-0,01	0,00%	0,00
Toll Service Provider		Toll Charger	
Total net 20%	16,59	Total net 20%	16,59
Total net 0%	59,99	Total net 0%	60,00
calc.VAT 20%	3,32	Total VAT 20%	3,31
calc. VAT 0%	0,00	Total VAT 0%	0,00
Total	79,90	Total	79,90
Difference:	0,00		
Billing details for SU2:			
license plate	net	VAT rate	VAT
G-TEST1	12,50	20,00%	2,50
cent adjust	0,00	0,00%	0,00
Toll Service Provider		Toll Charger	
Total net 20%	12,50	Total net 20%	12,50
calc.VAT 20%	2,50	Total VAT 20%	2,50
Total	15,00	Total	15,00
Difference:	0,00		

Figure 27: Aggregation by the TSP

5.2 TC claims payment from TSP for service usage

Definition of process: Based on the billing details defined in process 5.1 the TC will claim payment for service usage from the TSP.

The claiming of the payment for the service usage is based on the acknowledged billing details.

There are no strict temporal constraints between the phase of “Report billing details” process and the “Claim payment for service usage from TSP” process. The payment claim can happen with a different periodicity than the report of billing details (e.g. once a month vs. daily). In EasyGo this period is set to once a month.

The term financial object is used in this case as a generic identifier for a claim to summarize the terms of invoice, account statement and other similar terms as the actual

selling process depends on the legal status of the levied toll as private fee, tax or customs. This term is used in line with ISO 17573 and EN ISO 12855.

5.2.1 Exchange of financial objects

After the mutual acknowledgement of the billing details between the TSP and the TC for a given period, the information is marked as eligible for the claiming of the payment (e.g. exchange of financial objects) and the TC is able to issue an account statement to the TSP.

There is no data interface needed for this process, as the financial objects are sent either electronically or on paper and any dispute will be handled by e-mail or in writing.

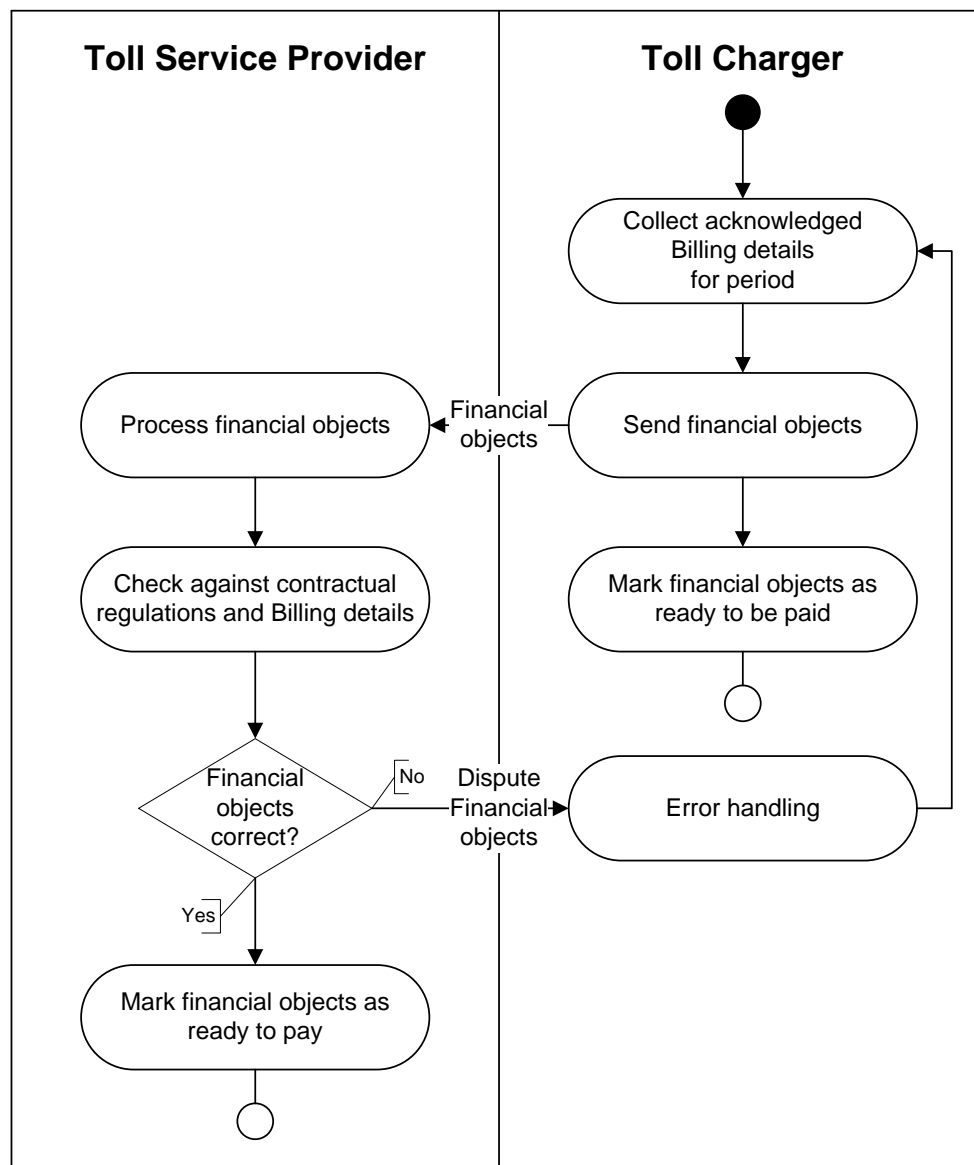


Figure 28: Claim payment for service usage: Exchange of financial objects

Within EasyGo+ a financial object is identical to an account statement, since the agency model from CESARE IV is used and the toll is not sold from the TC to the TSP.

The exchange of financial objects references the agreed billing details and indicates the total amount due. During the exchange of financial objects the billing details may be summed up to allow a more compact presentation. It shall contain in total the finally agreed amount of the already exchanged billing details and additional claims. The exchange of financial objects allows the monitoring of commercial processes operated by entity divisions applying state of the art commercial tools.

In case of non-correct financial objects, the TSP shall contact the TC to clarify the situation. The differing view on the validity of the disputed financial objects has to be sorted out bilaterally between the TC and the TSP.

NOTE: Possible disputing reasons among others are: Inconsistency of one or several data elements or non-conformance to the agreements.

5.3 TSP claims payment from SU for service usage

Definition of process: The process is used by the TSP to claim payment from the SU for use of the transport services provided by the TC(s) of the toll domains used by his vehicles. Depending on the EFC context data the claim of payment may be initiated by sending an invoice in the name of the TSP (reseller model) or in the name of a TC (agency model).

The basic invoicing rules within EasyGo are derived from Annexes 3.3 and 3.4. The main facts are:

- When invoicing EasyGo transactions, the TSPs must distinguish between Austrian, Danish, Norwegian and Swedish transactions and use separate invoicing number sequences. In other words, an invoicing number sequence must be created for each of the countries.
- Each invoice may contain transactions for different TCs, but there must be a clear distinction between the individual TCs and a sub-invoicing number sequence applied for each TC.
- Passages made in the toll domains of the TC(s) have to be invoiced in the currency of the TC.
- For the toll regime of the Øresund Bridge SUs with an OBE from BroBizz A/S will be invoiced in DKK or SEK, depending on the currency selected by the SU via its local agreement with Øresund. SUs from ASFINAG are invoiced in DKK. All other SUs are invoiced in SEK.
- A payment request has to be drawn up in the currency agreed with the SU which references the totals of the underlying invoices. A giro slip may be attached to the payment request.
- The payment request must have its own number sequence. This number can be used to identify the connection between the payment request and the underlying invoices, by stating it on the invoices.

- The conversion rate is calculated by applying the official exchange rate of the last day of the previous month and adding 1 %. The calculated conversion rate between the currency of the TC and the currency agreed with the SU will be applied to each total of the underlying invoices and has to be explicitly stated on the payment request.
- Apart from these rules the legal requirement for invoicing in each country, which are compiled in Annex 3.4, have to be observed.

If the SU agrees with the sent batch of invoices, he accepts the claim by paying the invoice as requested by the TSP on the payment request.

If he disagrees with the invoice he issues a Service request to the TSP, to dispute any wrong invoice he received. In a customer relations process the disputed invoice is clarified between the SU and the TSP. This may also involve a request to the TC for the disputed billing details (see chapter 5.9 “Handle customer relations”).

If the dispute is found to be valid, the TSP requests a credit transaction in order to produce a credit note for the disputed billing details from the responsible TC together with the evidence to support this reclamation.

The TC processes this request for a credit note and either acknowledges or disputes it based on the provided evidence. If the dispute is found to be valid, he creates a new billing detail for a credit note to be included in the next invoice to the SU via the requesting TSP.

This means that the SU has to pay the invoice also if he disputes it. Any credit notes based upon his disputes will be dealt in one of the next invoices.

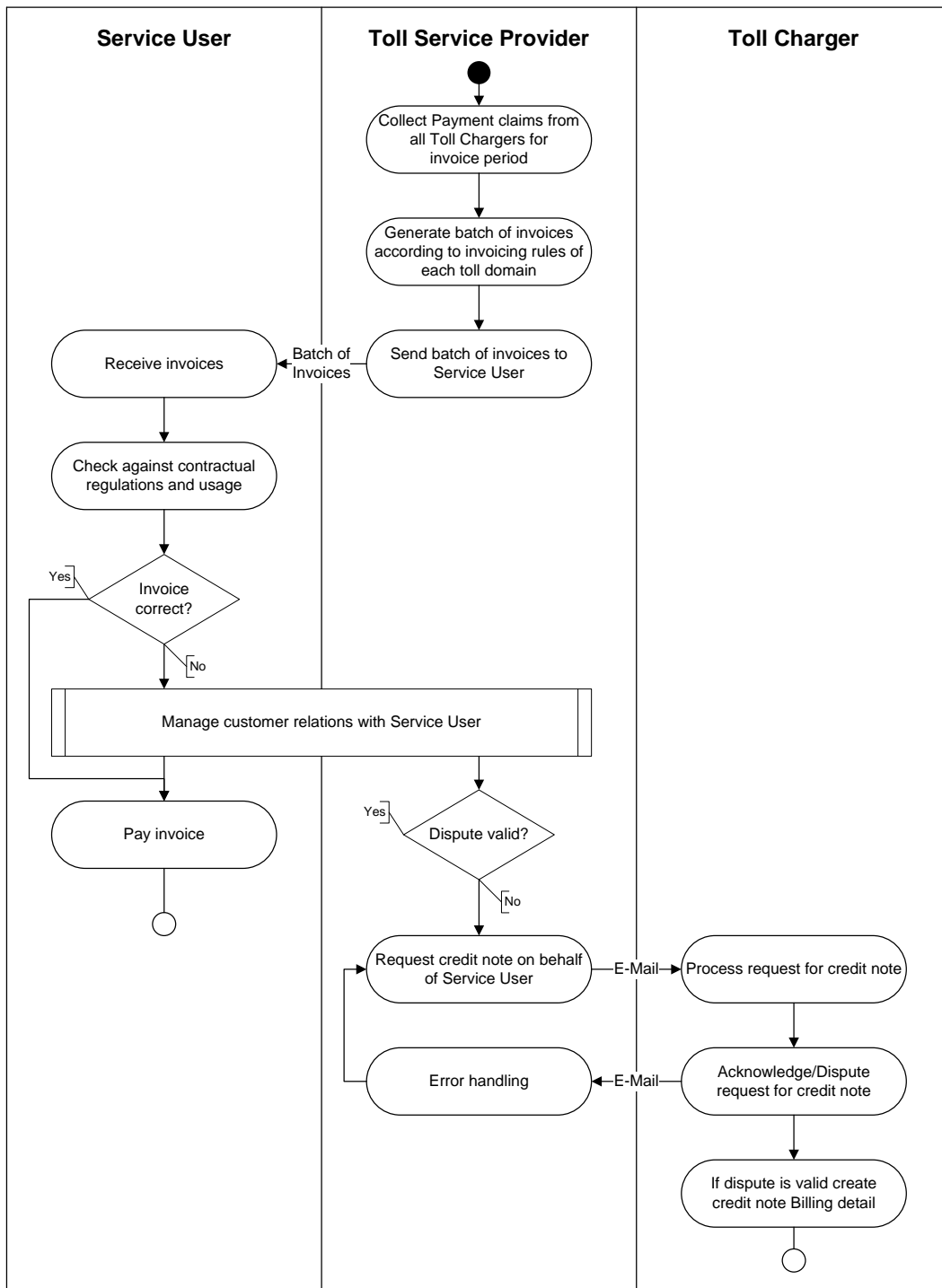


Figure 29: Claim payment for service usage from Service User

5.4 TSP claims issuer fee from TC

Definition of process: The process is used by the TSP to invoice the agreed issuer fee to a TC for the use of his OBE.

The process is initiated at least twice a year (30th of June and 31st of December) by every TSP or by the end of each month whenever the amount to invoice exceeds 60 EUR.

NOTE: This rule helps to reduce the number of “small” invoices to the smaller TCs with few transactions.

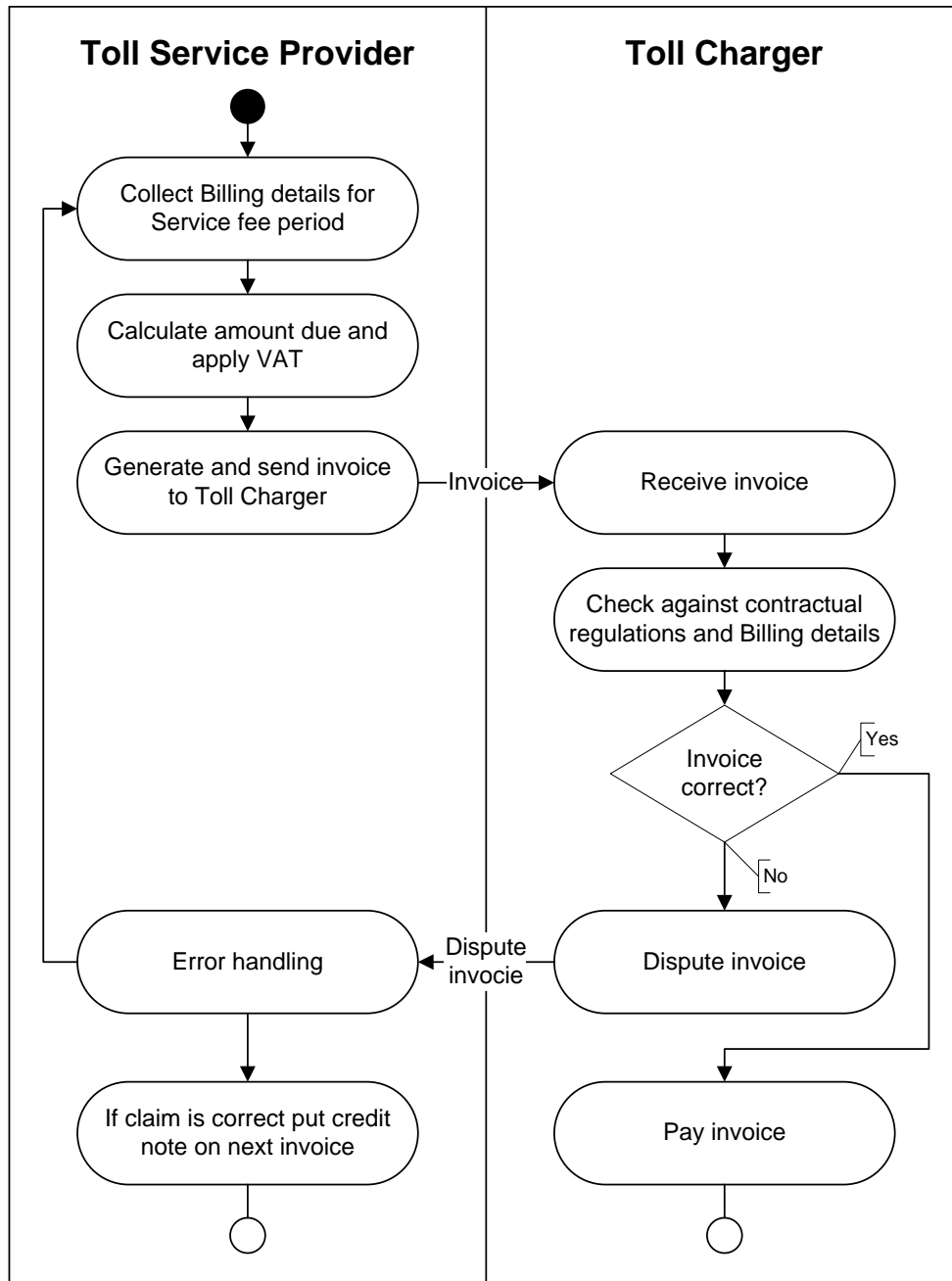


Figure 30: Claim payment for issuer fee

The TSP collects all acknowledged billing details for the issuer fee period and calculates the amount due.

For the use of an OBE of the TSP with any local contract of the TC, the TSP may add the agreed amount defined in Annex 3.6 section 2 per OBE per year to the amount due. To

calculate this amount correctly, the TC is obliged to report the use of “foreign” OBEs for local contracts during the previous year to the issuing TSP no later than the 10th of January (See chapter 4.5.3 “Add a local contract to an EasyGo OBE”).

If the amount due is higher than 60 EUR, an invoice will be generated. If the amount due is less than 60 EUR, no invoice will be generated and the issuer fee period extended by another month unless it is the 30th of June or the 31st of December, when an invoice has to be generated regardless of the amount due.

The TSP then applies its local VAT to the amount due and generates and sends an invoice for his services to the TC, who checks it against the contractual obligations. If the TC is able to validate the invoice he acknowledges it by paying it. If he disagrees to the invoice he shall dispute it.

If the claim is found to be true this shall lead to the cancelling of the wrong invoice and the generation of a new invoice.

There is no data interface needed for this process, as the invoice is sent either electronically or on paper and any dispute will be handled by e-mail or in writing.

5.5 KPI-management

Definition of process: Reporting and analysis of quality data from TCs, TSPs and the EasyGo HUB. It also describes preparation of corrective actions and follow-up of these actions.

Annex 3.7 describes what quality data shall be reported by TCs, TSPs and the EasyGo HUB to EM. EM analyses the data and produces statistics and reports that are distributed (selectively) to the TSPs, TCs as well as the ESC.

Each TC and TSP shall, based on their internal monitoring as well as reports from EM, identify KPIs outside agreed values. This can be KPIs related to other actors (A TC detects low quality of OBEs from one TSP) or internally (A TC detects low quality in his RSE).

When KPIs outside agreed value are detected the TC, TSP or EM shall propose corrective actions to be agreed between the parties involved and follow up and report progress until the KPI is within agreed values.

The detailed description of the quality reporting and follow up is described in Annex 3.7 “*EasyGo quality system*”.

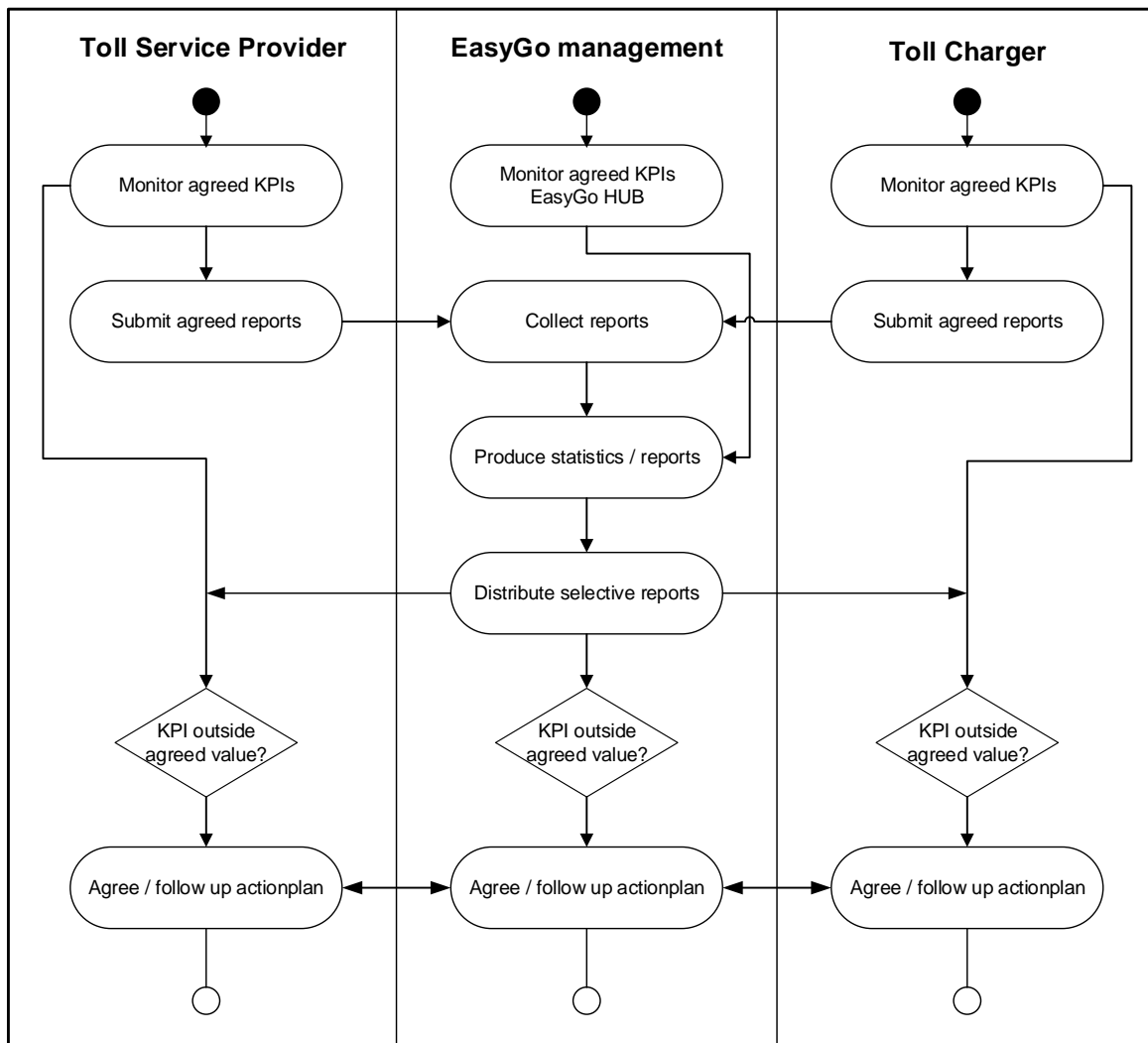


Figure 31: KPI management

The EasyGo quality system is described in Annex 3.7.

5.6 Change contract data

Definition of process: The process is used whenever a SU needs to update his contract data.

The SU has to inform the TSP about any changes. The TSP updates these data in his central system.

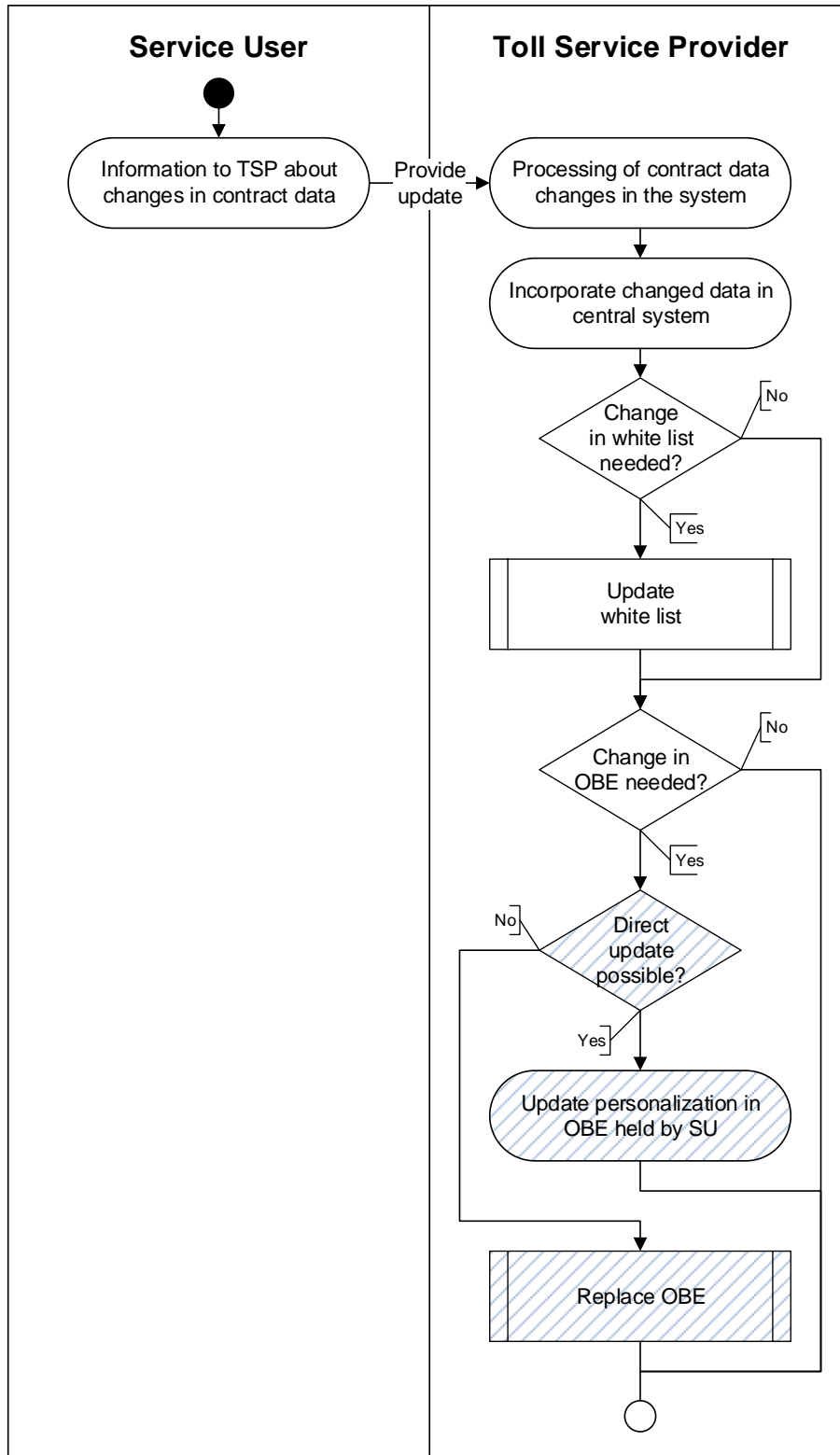


Figure 32: Change of contract relevant data

If the change of contract data includes information which needs to be updated in the whitelist (e.g. a license plate change), the TSP shall include these changes in the next whitelist to be distributed (see chapter 4.6.1.4 “Update whitelist”).

If the change of contract data includes information which needs to be updated inside an OBE (valid for EasyGo+), these changes have to be incorporated by a cooperation of SU and TSP.

If a direct update of the personalised data in the OBE held by the SU is possible:

- The SU has to stop at a location, where the update of the personalised data in the OBE can be performed (e.g. POS, central personalisation location ...). The SU shall also be provided with an updated vehicle declaration document after the update of the personalisation of the same OBE.

If no direct update of the personalised data in the OBE held by the SU is possible:

- The old OBE shall be replaced by a new OBE by the TSP (see chapter 5.7.2 “Replace OBE”).

The old OBE shall be

- put on the Exception list and removed from the interoperable whitelist or
- virtualized (changing the license plate associated with the old OBE on the interoperable whitelist to a virtual number)

before the personalisation of a new OBE.

The new OBE shall be put on the whitelist.

Either of the above actions secures that there is a 1:1 relation between an OBE and a license plate on the interoperable whitelist of one TSP.

The SU shall install the new OBE together with the vehicle declaration document in the correct vehicle.

The SU shall return the old OBE to the TC after installing the new OBE in the correct vehicle. If the TSP did not block the old OBE (i.e. in case of virtualisation of the license plate on the whitelist) the SU shall shield the old OBE before sending it to the TSP.

NOTE 1: The TSP may put the old virtualized OBE on the Exception list after he has received the first transaction (Billing detail) from the new OBE, to prevent any unwanted transactions from the old OBE. This is up to his decision.

After the return of the old OBE the TSP shall remove all entries for the old OBE from the Exception list and the whitelist.

- The SU shall have his old OBE blocked by the TSP or send his old OBE shielded to the TSP for the required update. The TSP shall then send the OBE after the personalisation of the new data into the same OBE to the SU (see chapter 4.5.4 “Send OBE”) together with a new vehicle declaration document.

NOTE 2: This second approach has the drawback, that the SU may not use the OBE in the meantime.

In addition to the regular process described above there are the following exception cases to be regarded:

- Sale of a vehicle while keeping the license plate
 - If a vehicle is sold and the original owner keeps his license plate and his OBE to mount it on a new vehicle, neither the TC nor the TSP is affected.
 - In EasyGo+, if the SU needs to update any personalisation data for the new vehicle (e.g. EURO emission category) he has to return the old OBE and request a new one or have the personalisation data updated in his OBE.

The new owner of the vehicle has to register a new license plate and OBE anyway.

- Sale of a vehicle with the license plate while keeping the OBE

If a vehicle is sold together with the license plate and the original owner keeps his OBE to mount it on a new vehicle, the TC and TSP will see this as a change of license plate in an existing OBE.

For EasyGo+ this requires an update of the personalisation data in the OBE and the SU has to return the old OBE and request a new one or have the personalisation data updated in the OBE he kept according to the process described in chapter 5.6 “Change contract data”.

The new owner of the vehicle and the license plate has to register a new OBE. This is seen by the TC the same way as a change of the TSP, if the new owner of the truck has a transaction before the license plate of the old OBE is changed as described above. He now sees a different OBE for a given license plate on the interoperable whitelist.

The TC is fully unaware of the change of SUs behind the license plate since he has no contact with the SU. The original TSP may know of the condition if the SU informed him of the sale of his vehicle but may also be unaware of it.

- Sale of a vehicle with the license plate and the OBE
 - If a vehicle is sold together with the license plate and the OBE the original owner has to have his OBE blocked to avoid paying for the usage of the new owner. Therefore such a scenario does not make any sense, since the blocked OBE needs either to be updated or returned to the issuing TSP the new owner may not even know.
- Renting of a vehicle while keeping the OBE
 - If a SU returns a rented vehicle he has an OBE for and keeps this OBE, this license plate shows up in the whitelist until he puts it into a new vehicle with a different license plate and has it updated.

Any new renter of the same vehicle needs to get a new OBE which will appear to the TC again as a switch of TSPs.

- Renting of a vehicle with return of the OBE
 - In this case the SU returns his OBE when he returns the rented vehicle. The TSP will block the OBE with a reason code showing the termination of the contract. Any new renter can register his OBE and it will appear like a new contract on the whitelist to the TC.
- Subcontracted vehicle
 - When a vehicle is subcontracted on regular basis for another company, this vehicle will have to have an OBE of this other company to ensure that any applicable volume discount is granted to this other company. This requires that this vehicle is registered for the company it is subcontracted to.

If the vehicle is also used for the owner in parallel, it will result in two permanent OBE issued to one vehicle. This has to be either through two TSPs or one TSP and a local contract.

5.7 Exchange OBE

Definition of process: The TSP may exchange any OBE upon request from the SU or the TC (e.g. a broken, lost or stolen OBE or an OBE with abnormal behaviour is reported to the issuing TSP).

Each request shall be processed by the TSP and instructions shall be given to the SU on how to proceed.

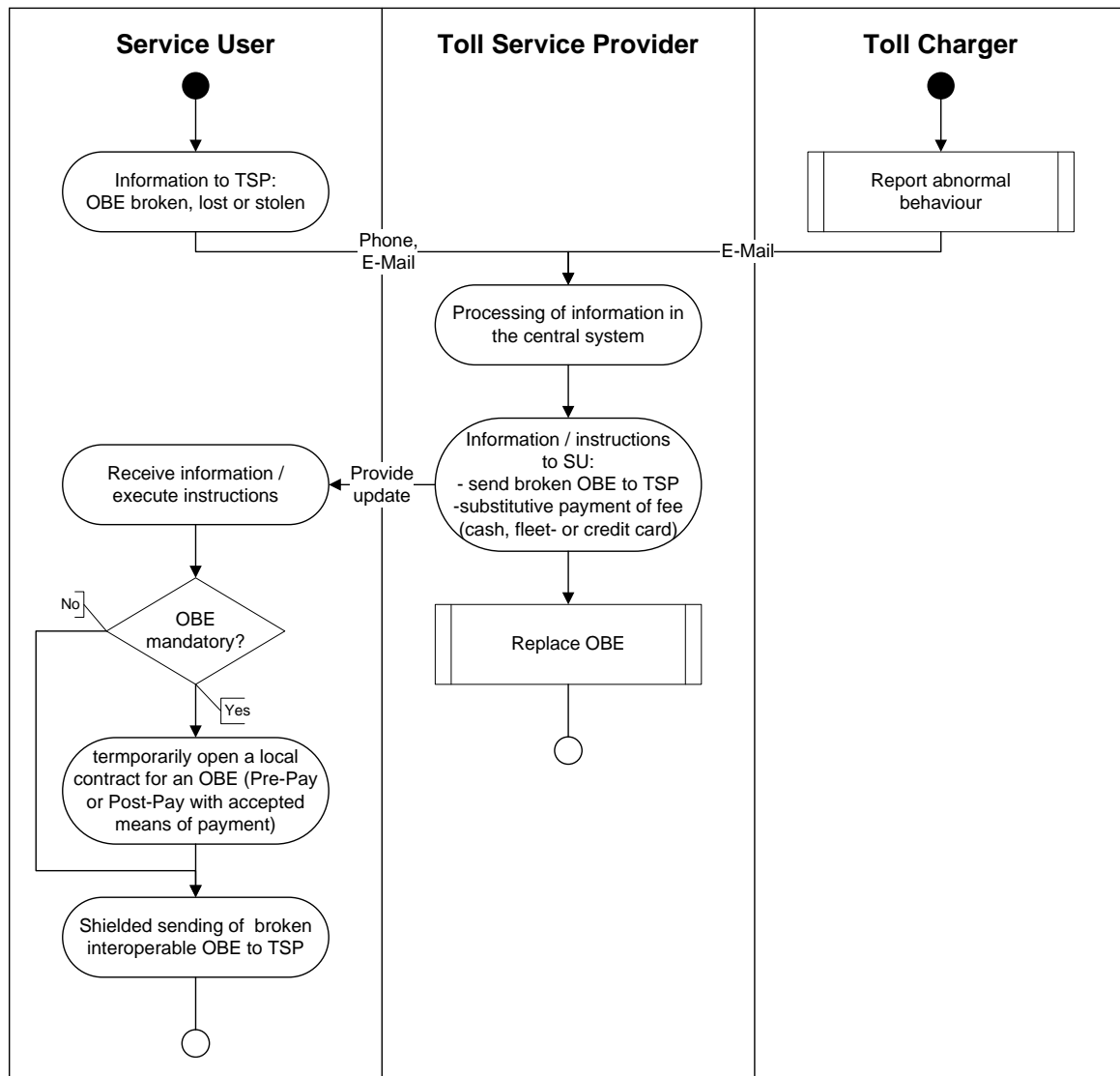


Figure 33: Report broken, lost or stolen OBE

During normal operation all toll transactions (Billing details) provided by a TC to a TSP will be invoiced to the SU. If an OBE is lost or stolen, the responsibility for any toll transactions from this OBE may change according to the applicable law:

- A SU with a contract according to Austrian law is held responsible for any toll transactions of an OBE until he informs his TSP about the loss or theft.
- A SU with a contract according to Danish, Swedish or Norwegian law is not held liable for any transactions after the date of theft of an OBE/vehicle he reported to the police.

NOTE: A time lag may occur where the TSP has still to fulfil his payment guarantee to the TC if the SU only reports a stolen OBE to the police but not to the TSP!

Since the Exception list is transferred at a given time schedule, there may be an interval between the change of liability from the SU to the TSP and the moment the OBE is

blocked at the TC(s). The responsibility for any toll transactions in this interval lies with the TSP.

The SU has to temporarily open a local contract for a toll domain, where the use of an OBE is mandatory when the SU does not receive a replacement OBE before entering this toll domain. He can either:

- open a local contract in Pre-Pay mode, where he may use any accepted means of payment by the local toll domain (e.g. fleet cards, credit cards, debit cards or cash) to load the toll values needed for his journey or
- open a local contract in Post-Pay mode, where he provides any accepted means of payment (e.g. fleet, credit or debit cards) or
- open a new contract with a different TSP.

Finally the SU has to send any broken OBE shielded to the TSP after the block was activated to avoid additional abnormal behaviour in any toll domain it is shipped through.

5.7.1 Report abnormal behaviour

The TC may report any OBE to the issuing TSP and request its blocking if he detects its abnormal behaviour. This is especially important, when the performance of an OBE is not or no longer adequate to prevent any financial losses for the TC.

NOTE: This may be due to non-conformant behaviour of the SU or of an OBE or other reasons.

Based upon the contract with the SU the TSP has to analyse and process the request and has to decide whether the provided information about an abnormal behaviour is syntactically valid and acknowledge or dispute the request from the TC to include it in the Exception list.

If the reported abnormal behaviour of an OBE or a SU using an OBE (e.g. broken, lost or stolen) issued by the TSP is found to be true, then an identifier for the OBE(s) of the SU has to be added to the Exception list within two calendar days from receiving the properly logged request to prevent any possible financial loss to the TC.

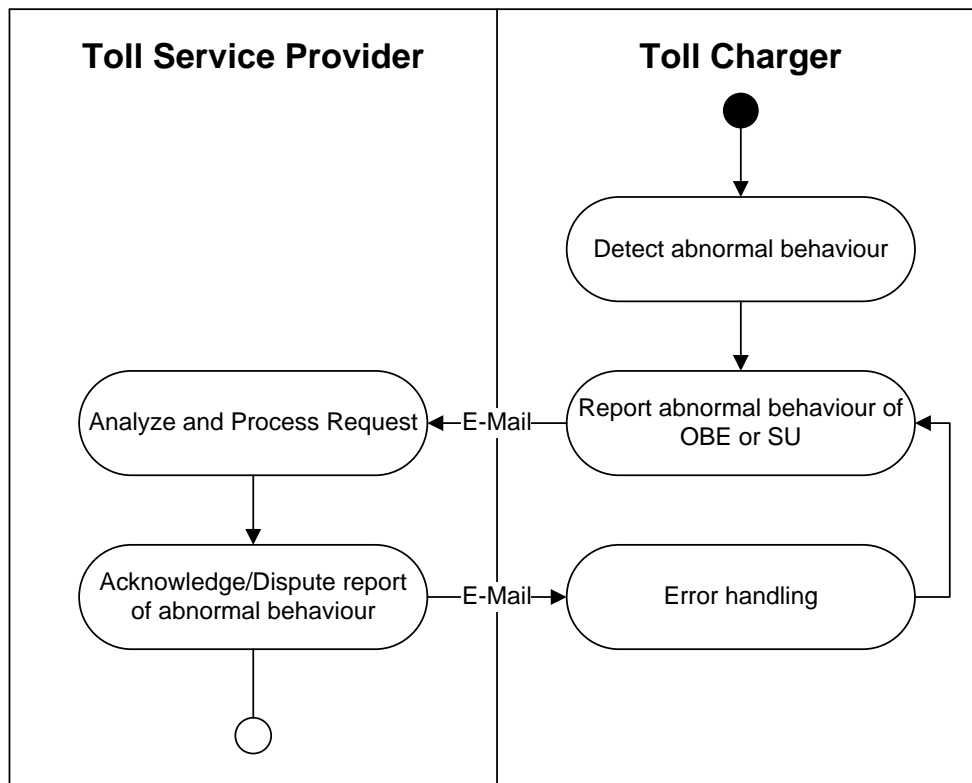


Figure 34: Report abnormal behaviour

This reporting of abnormal behaviour may be done by e-mail or any other appropriate means.

5.7.2 Replace OBE

If the TSP was informed of the abnormal behaviour of an OBE (e.g. broken, bad quality ...) by the TC (see chapter 5.7.1 “Report abnormal behaviour”) or by a SU, he has to block the reported OBE and put it on the Exception list within two calendar days to prevent any (further) financial losses to the TC or SU and replace it.

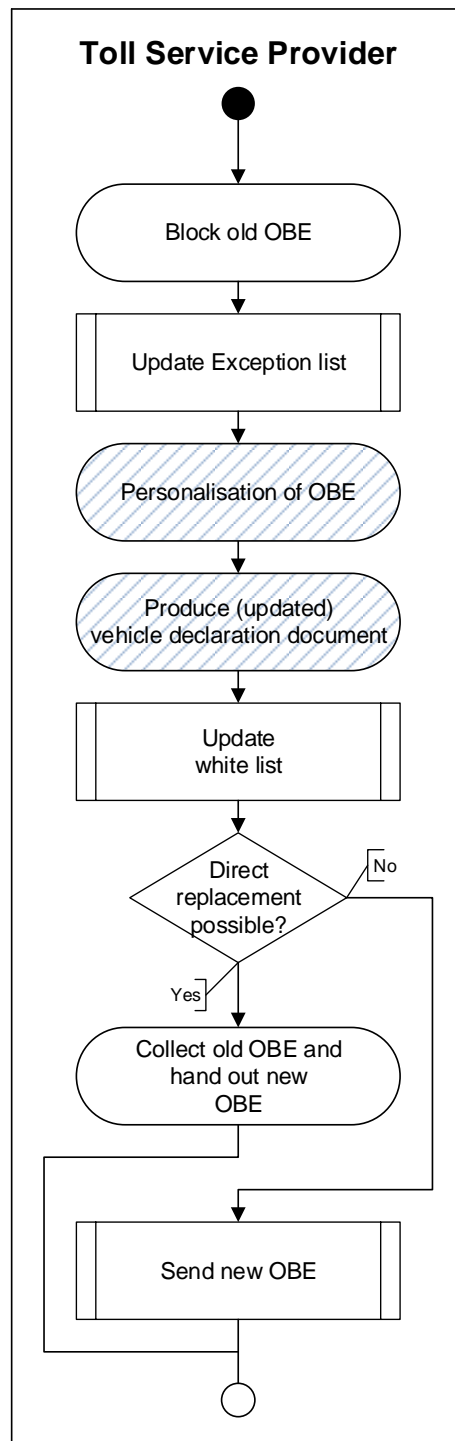


Figure 35: Replace OBE

After updating the Exception list a replacement OBE must be provided.

The replacement OBE has to be included in the whitelist (see chapter 4.6.1.4 “Update whitelist”).

The TSP has to check with the SU whether the OBE can be directly replaced. Depending on this decision the TSP can:

- directly replace the OBE of the SU: If the SU is able to stop at a location where this replacement can be directly performed (e.g. POS, central personalisation location) the TSP can reclaim the old OBE and provide the SU with a new OBE
- send the SU a new OBE: The SU is sent a new OBE. He shall send his old OBE shielded to the TSP. (See chapter 4.5.4 “Send OBE”)

For EasyGo+:

- For EasyGo+ the replacement OBE need to be personalised.
- When the OBE is replaced, either directly or by mail, an updated vehicle declaration document shall be provided along with the new OBE. (See chapter 4.5.4 “Send OBE”)

5.8 Close contract

Definition of process: The process is initiated, whenever a SU decides to close a contract with a TSP or the TSP decides to close a contract with a SU.

After the TSP decides to or is informed by the SU to close the contract, he takes all necessary preparations in his systems (e.g. information in his CRM, setting in his user billing system to collect any outstanding debt) to close the contract.

The following actions are optional:

- The TSP shall inform his SU about any actions to be taken as a result of the closing of the contract and to return any OBE(s) he was issued.
- Additionally the TSP shall put the identifiers of the OBE(s) to return on the Exception list and remove them from the whitelist.
- After the TSP receives the OBE(s) from the SU the contract is closed. In a final step the TSP shall remove the identifiers for the returned OBE(s) from the Exception list.

If the OBE is not returned it needs to remain on the blacklist until expiry date of the PAN or until it is no longer on the AIT list.

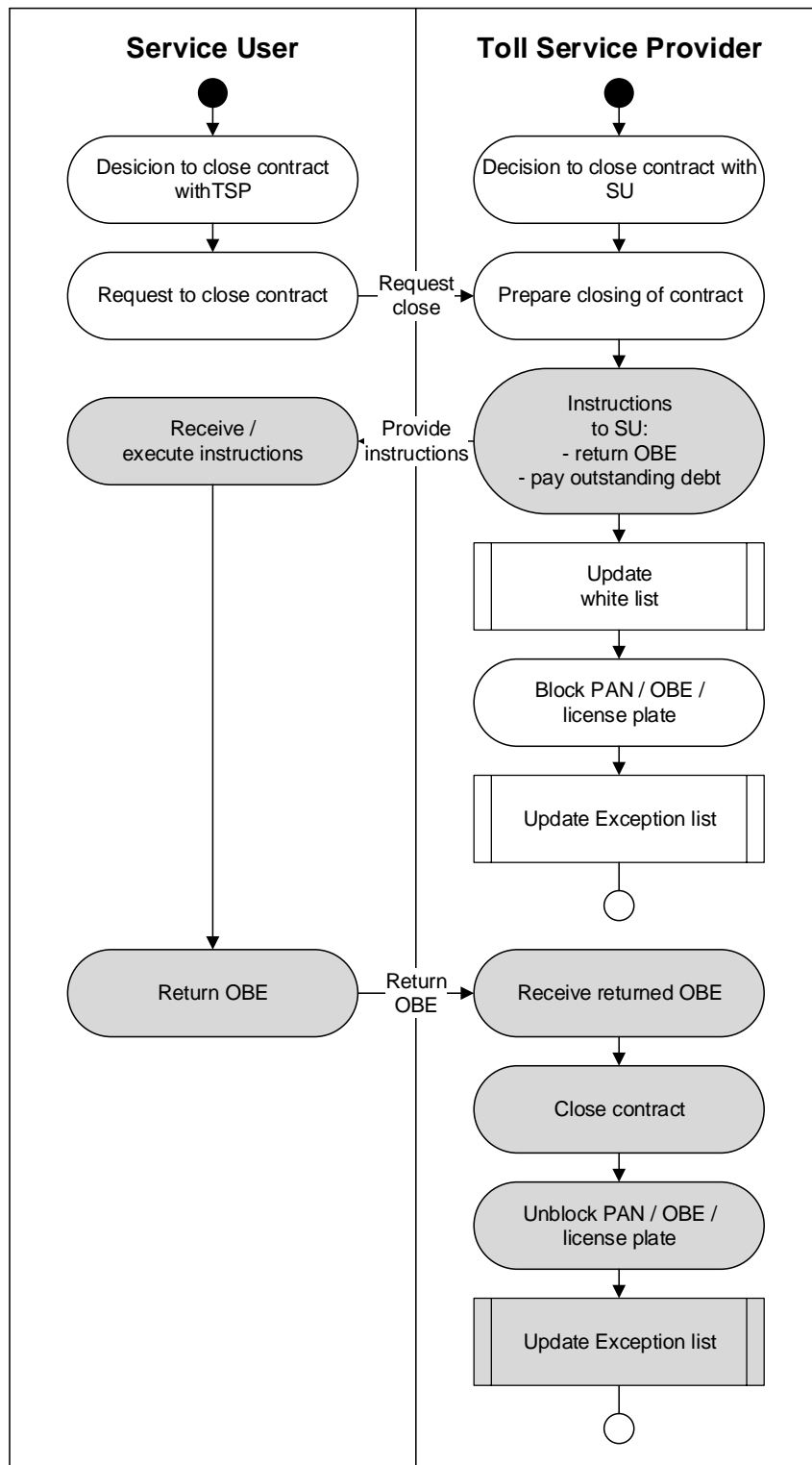


Figure 36: Closing of contract

5.9 Handle customer relations

Definition of process: The process is initiated by the SU whenever he has a question or complaint regarding the toll service.

This question or complaint may regard the tolling within any toll domain operated by any TC, the invoicing or any contractual relation between the SU and the TSP.

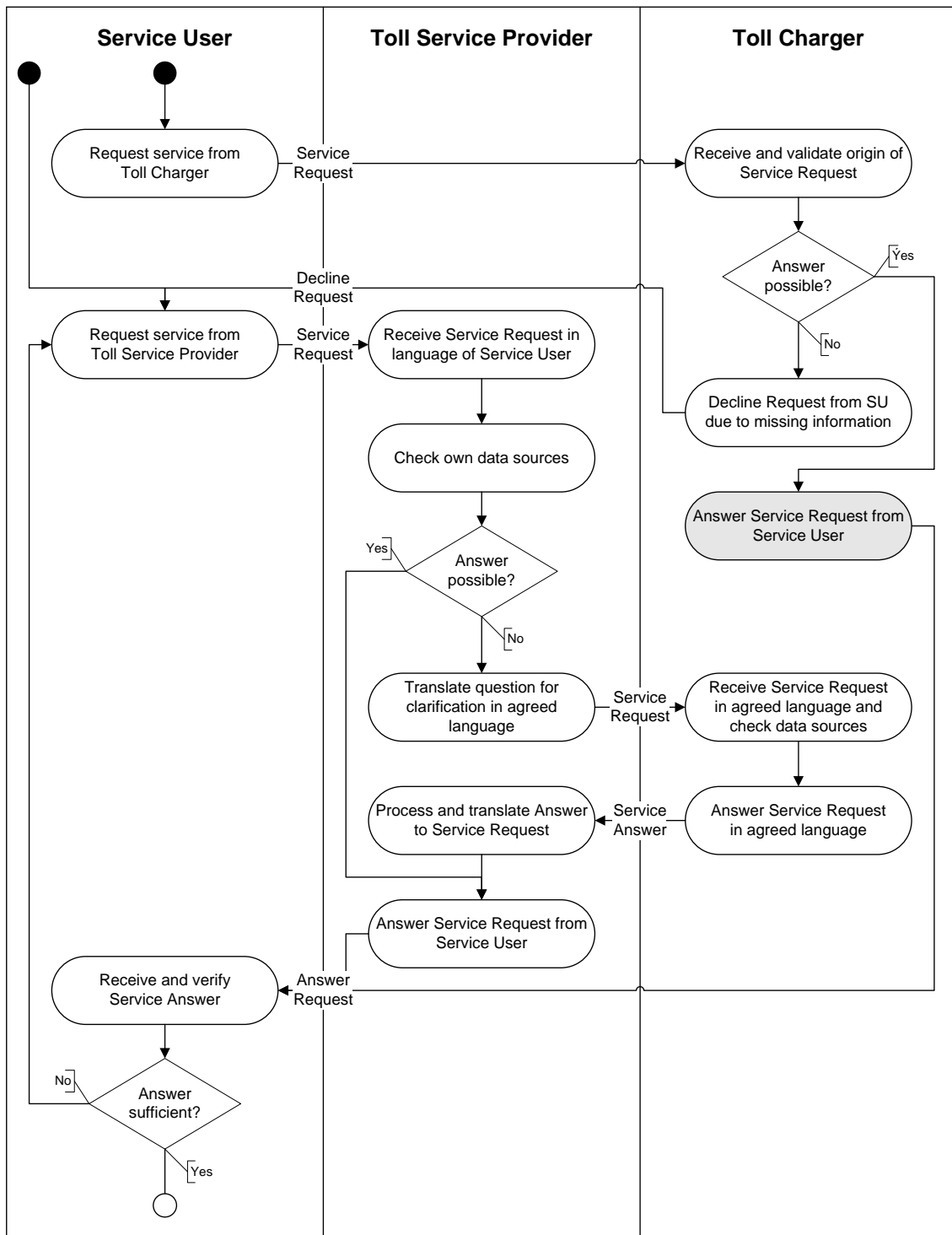


Figure 37: Handle customer relations

Whenever a SU of the toll service contacts a TC directly, the TC has to check the validity of the question. If the question does not target a local issue (i.e. information about the toll domain, enforcement ...) the TC may decline the request by the SU to avoid wrong or misleading answers. Due to the setup of the toll service the TC typically does not know

the SU and has no knowledge about the contract details between the SU and the TSP. If he is able to answer the SUs request, he may do so.

If the TC is not able or does not wish to answer the SUs request, he may decline the request from the SU and direct him to his TSP.

The SU may contact his TSP in an agreed language (typically the SUs mother tongue), who will try to answer the question by using his own data sources (e.g. billing details provided by the TCs, contract details ...). The TSP has therefore to keep all necessary data provided by the TC to answer a SUs request for at least 180 days.

Within the first 180 days after the SU has made his passage the TSP is obliged to handle the request of the SU. Only if the TSP is not able to answer the question of the SU through his own data sources, he may relate the question to the proper TC for further analysis. By doing so he has to translate the question to a language agreed between TSP and TC (e.g. SU asks in Norwegian, TSP translates the question to English to ask a TC not able to understand Norwegian).

After the 180 days the TSP stays the main contact for any claim made by a SU but may transfer the handling of a claim regarding a passage directly to the relevant TC without analysing it.

This has no consequence in respect of the ability of the SU to make a claim, but only as to which party shall make a first assessment of the claim after the SU has addressed it to the TSP. Any SU may forward any claim to the TSP at any time. The handling of the claim then depends on a time-bar provision defined for each TC by his national legislation, which may limit the handling of claims.

If a question is forwarded to the TC he shall try to answer the related question and reports the answer back to the TSP within the time frame defined in Annex 3.7 (Quality system). The TSP will translate the answer back to the language of the SU and answers his question.

If the SU deems the answer sufficient, the process ends. If not, he needs to reformulate his service request to get a sufficient answer. This will be treated as a new service request.

6 Changes and deviations

The following business processes are needed when deviations from normal operation occurs or when changes are required.

6.1 *Perform retroactive payment*

Definition of process: Tolls that either have not been paid or only been paid partly by the use of an OBE can be paid retroactively by a SU to avoid enforcement.

A retroactive payment by a SU is possible via internet, apps or at the POS stations operated by the TC. It might also be possible at the mobile enforcement officers of the TC in certain contexts. The methods of payment is decided by the individual toll domain.



Figure 38: Retroactive payment

Currently the following applies regarding retroactive payment within EasyGo:

- In Austria this foresees the possibility of a retroactive payment only within 100 km and five hours after the vehicle has passed the first toll collection point where the toll transaction was not made correctly.

The central retroactive payment can be made only when a wrong category (number of axles) or a wrong emission category was declared during a successful toll transaction within 48 hours after the vehicle has passed the first toll collection point where the wrong declaration took place. The SU has to contact his TSP to perform the retroactive payment on his behalf. The SU needs to indicate the licence plate number, the start time and end time of the wrong declaration of the toll as well as an accepted means of payment the retroactive payment shall be charged to.

- At Øresund there is no retroactive payment due to a barrier-based system.
- At Storebælt there is no retroactive payment due to a barrier-based system.
- In Norway there is no retroactive payment due to the use of the whitelist to generate degraded mode transactions from a picture taken of the license plate.
- If new toll domains join the EasyGo service this list needs to be expanded.

6.2 Correcting “wrongful” collection by TC

Definition of process: The process is initiated when a TC has invoiced a SU as a non-equipped user even if the SU had a valid contract at the time of passage.

The situation can occur if:

- The OBE was not read correctly at passage of charging point and the TC did not check the whitelist as he should have
- The OBE was not included on the whitelist
- The TSP had not updated the whitelist correctly
- The TSP has not updated the exception list correctly

The SU needs to inform his TSP that he has received an invoice directly from a TC even if he has a valid contract with the TSP at the time of passage. The TSP checks this claim and if he can confirm it he shall inform the TC about this.

If the TC accepts the information from the TSP, the TC will cancel the SU invoice and send “normal” transaction data to the TSP who invoices the SU as an EasyGo transaction.

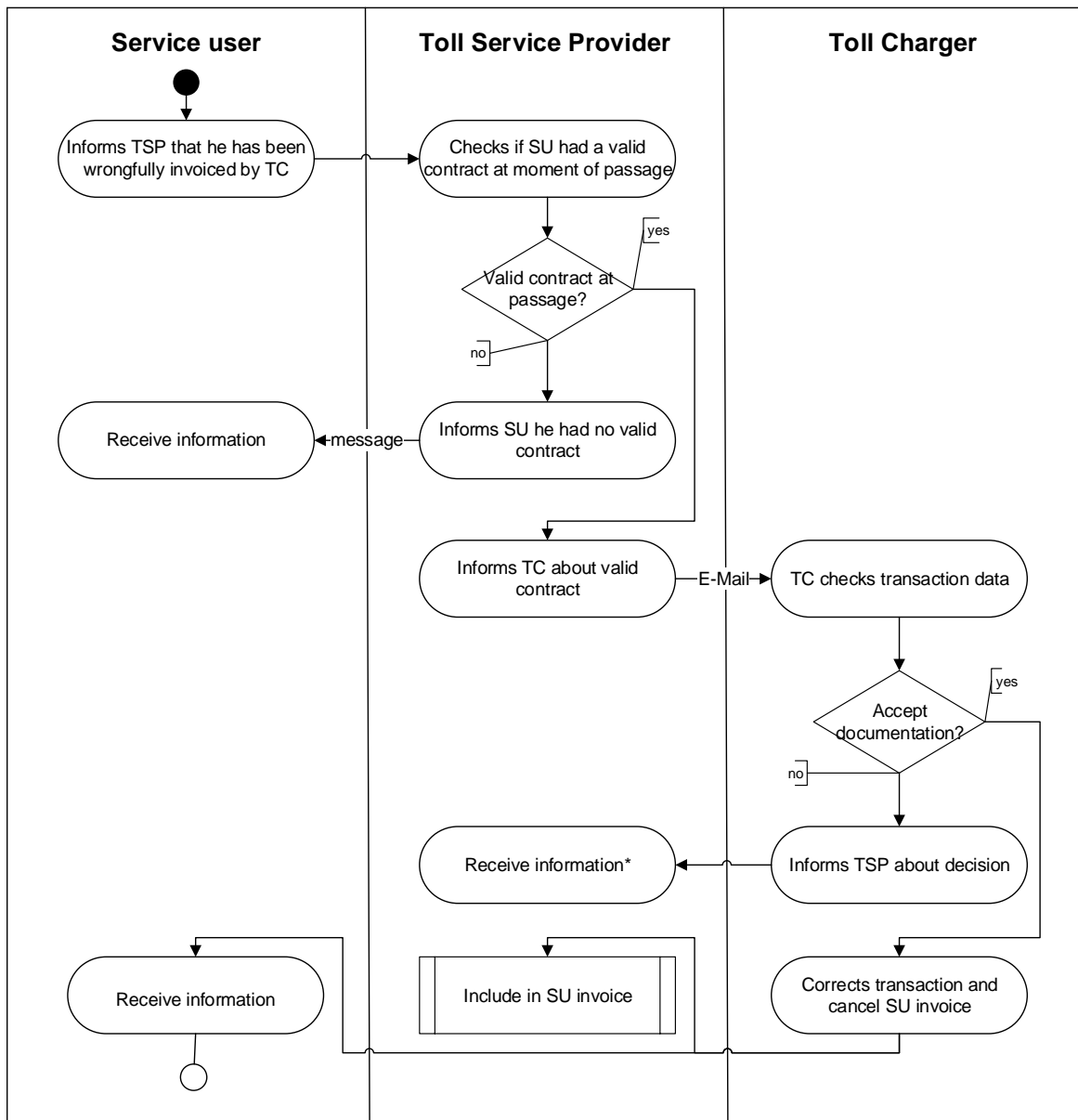


Figure 39: Correcting “wrongful” collection by TC

*If the TSP does not agree to the decision made by the TC they should inform EM about the dispute and may request advice from EM.

6.3 Enforce violators

Definition of process: The process is used every time when a TC needs to enforce a non-compliant behaviour of a SU or a vehicle.

The process when a TC invoices a penalty for non-compliant behaviour is the same as for post payment based on video.

The process starts when the back-office receives transaction data from RSE.

If the transaction data are complete and the OBE represents a valid contract, the transaction data is sent to the TSP for SU invoicing. The transaction is however checked if it, together with other transaction(s) for this OBE, should result in a deduced / inferred transaction, which should also be sent to the TSP for invoicing.

Some TDs can decide to manually enforce the vehicle if no valid transaction is found.

NOTE: In Austria the manual enforcement process is used for all vehicles registered outside of Austria and Germany. The authorized staff (mobile enforcement officer) tries to catch the violator during a period of five months on the Austrian road network.

If manual enforcement is not chosen, the transaction should be verified as a complete transaction. If it is not complete, an attempt to make it complete should be made. If the transaction can be made complete it should again follow the same process with transactions received from RSE.

If a contract is not valid or if an incomplete transaction cannot be made complete, it should be checked if it is possible to identify the TSP (see below).

If the transaction does not include a DSRC transaction, but includes a video registration, it should be checked if the license plate is registered on the whitelist. If so, an EasyGo transaction can be produced and sent to the TSP. In the same way as ordinary valid transactions can be checked if it, together with other transaction(s) for this OBE, should result in a deduced / inferred transaction, also transactions based on whitelist should go through the same check.

When transactions have been sent to the TSP, relevant QA data should be registered (number of correct transactions, transactions produced from whitelist, deduced transactions etc.).

Transactions that have been checked in the whitelist but not found and incomplete transactions that cannot be made complete, are investigated to check if it is possible to identify the TSP from the transaction data. If this is possible a request is sent to the TSP for detailed user data. The TSP is obliged to get any necessary approval of his data protection regulators and/or an assent from the SU to provide the requested address data. The TSP shall send the requested address data of the SU to the requesting TC.

If a TSP cannot be identified the TC checks the license plate against local or foreign vehicle register to identify the vehicle owner.

If user details are received from either a TSP or from a vehicle register the user is invoiced.

NOTE: The form and type of the invoice varies for each toll domain (post payment invoice, penalty etc.).

If all of the taken measures still do not produce the needed address details of the SU, the case can be handed over to a manual enforcement process. If there is no optional manual enforcement process implemented or the violator/user cannot be caught in time, the enforcement case has to be dropped.

Whether the user is invoiced or not relevant QA data should be registered.

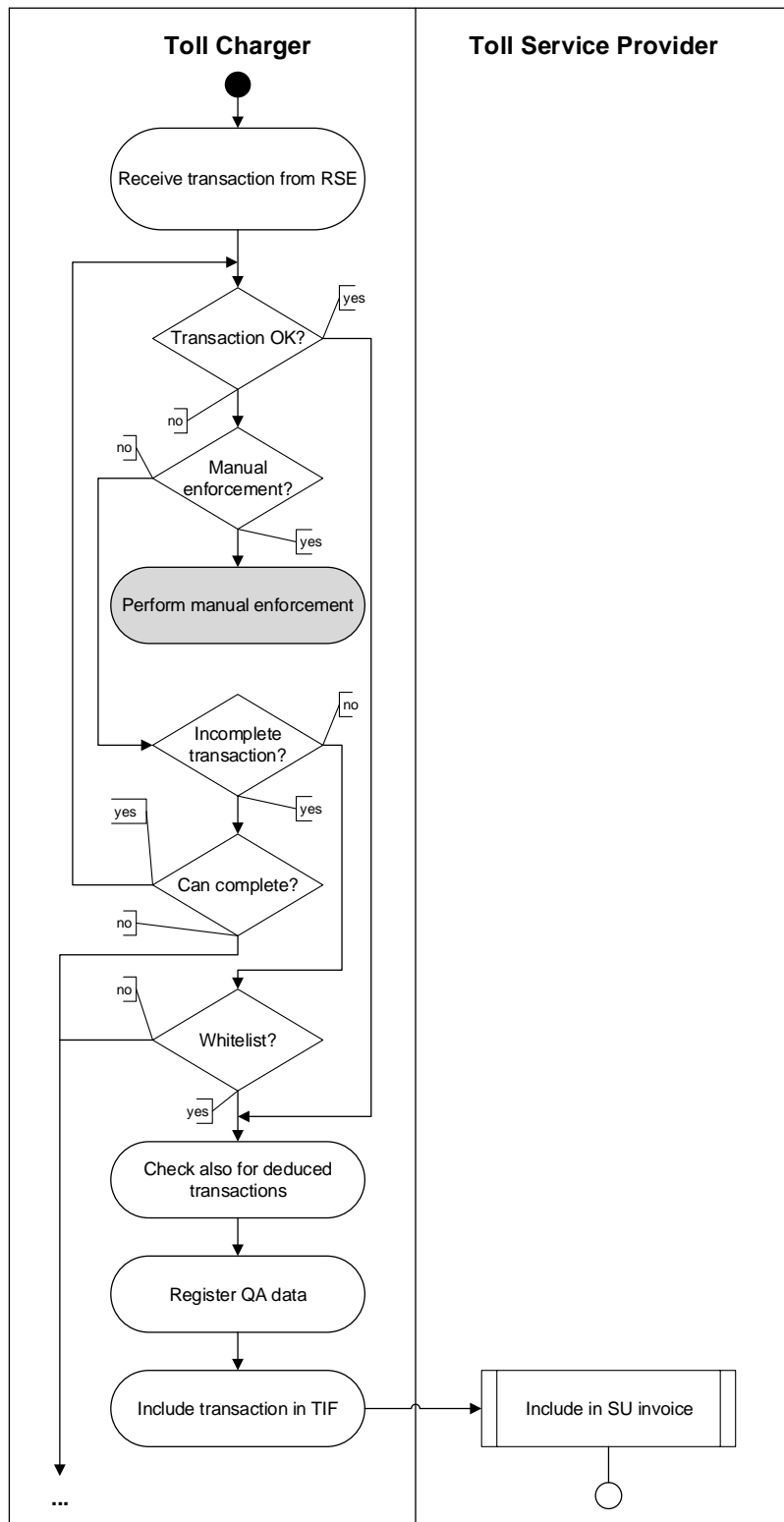


Figure 40: Enforce SU part 1 – Check transaction

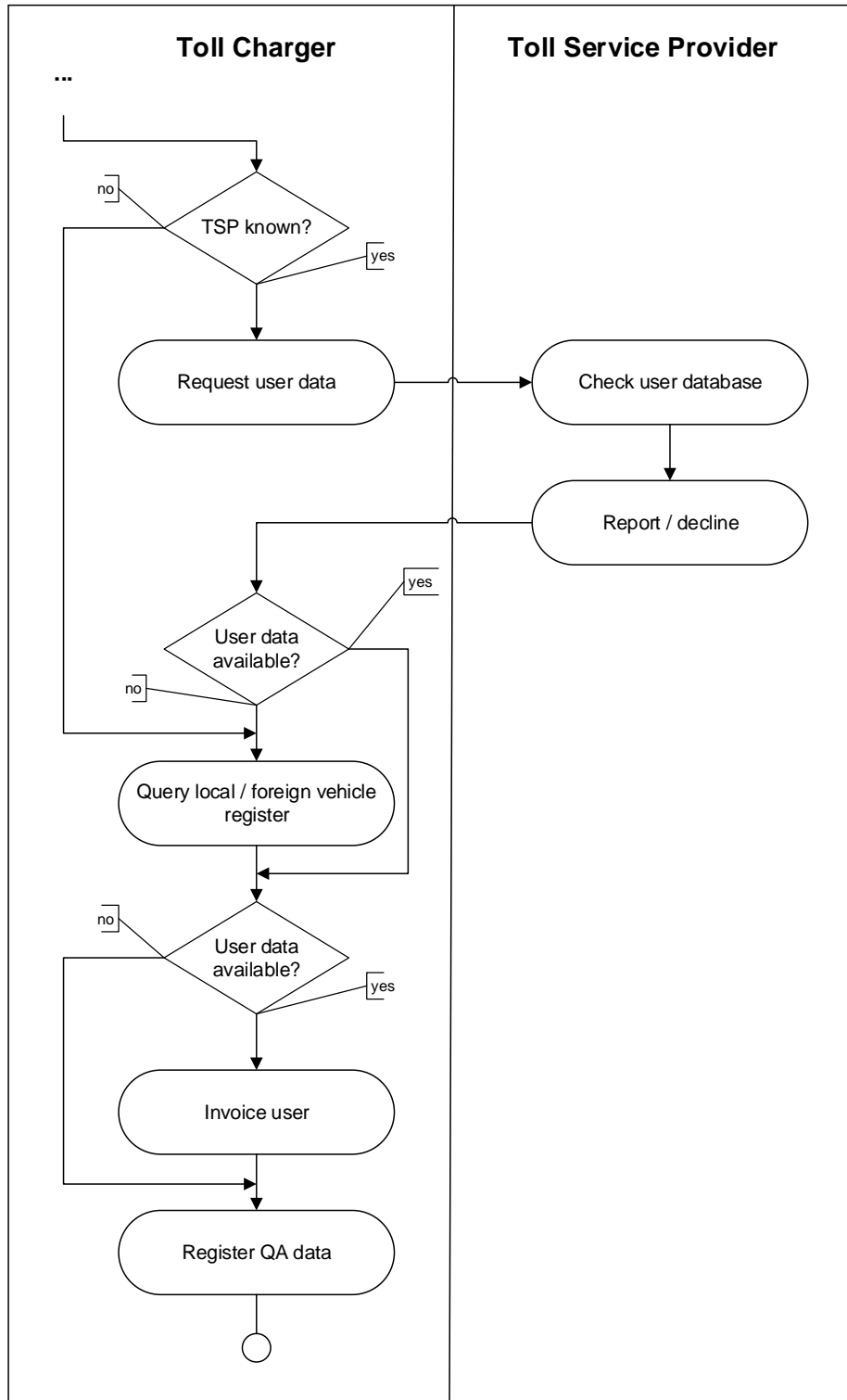


Figure 41: Enforce SU part 2 – Identify SU

6.4 Handle action request / change request

Definition of process: If anyone in the EasyGo interoperability management or other actors proposes a change to the EasyGo service (documentation, technical solution etc.) EM will study the proposal and if agreed will make a change request to the ESC for approval.

A change request is a formal proposal from EM to ESC describing the action / change, the pros and cons of the proposal and the costs and timeline.

The action / change request shall be approved by the ESC before being implemented. The proposer shall be informed about the decision.

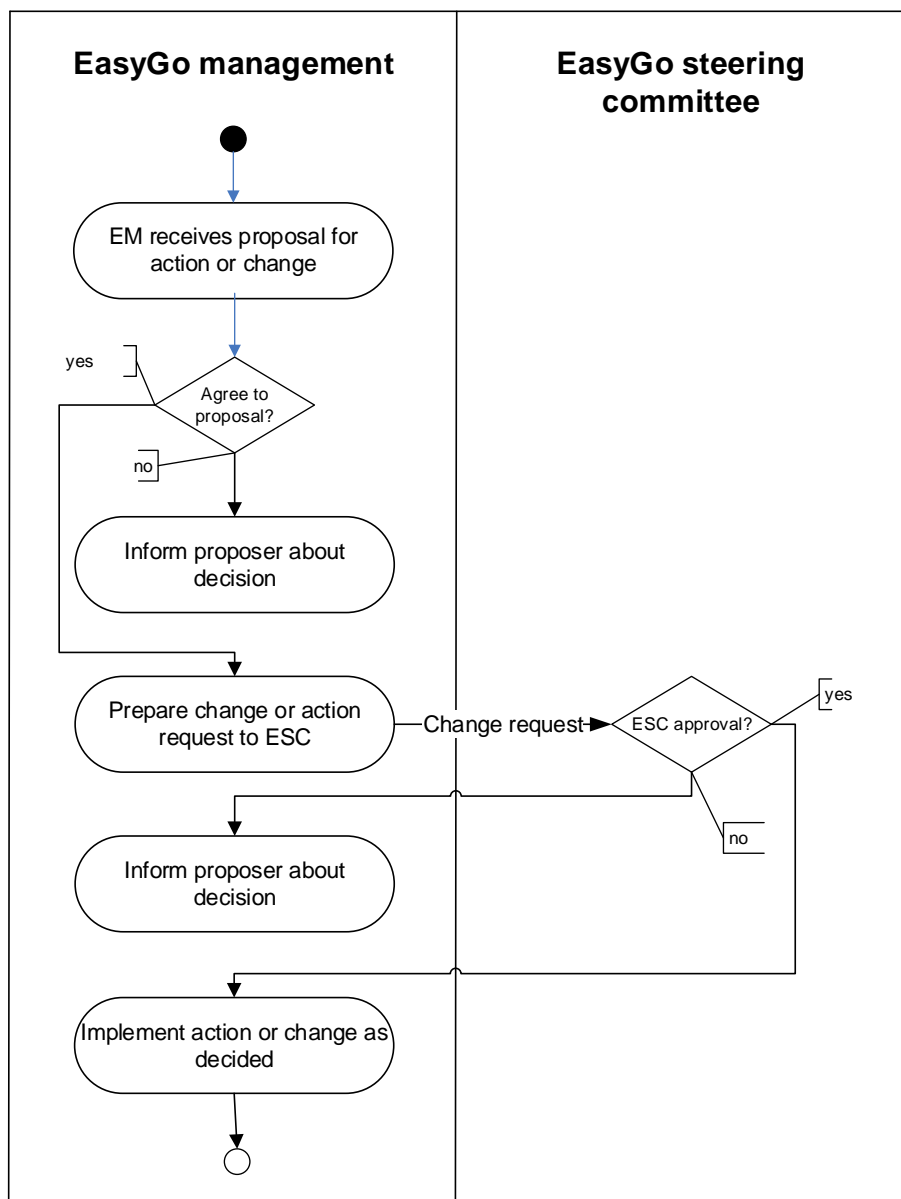


Figure 42: Handle change requests