



Statens vegvesen

# Electronic Ticketing

Part 19 Transaction Exchange Specification  
(Spesifikasjon for transaksjonsutveksling)

VEILEDNING

Håndbok 206





# Electronic Ticketing

Part 19

Transaction Exchange Specification

### **Handbooks in the Norwegian Public Road Administration**

This is a handbook in the Norwegian Public Roads Administration's (NPRA) handbook series, a collection of consecutive publications primarily intended for use within the agency.

NPRA has the main responsibility for authoring and maintenance of the handbooks.

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- Level 1 – Yellow color on the front page – includes regulations, norms and guidelines approved by superior authority or by the NPRA by proxy.
- Level 2 – Blue color on the front page – includes instructions, text books and road data approved by the department authorized for this in the NPRA.

### **Electronic Ticketing**

Nr. 206 Part 19 in the Norwegian Public Roads Administration's handbook series.

Responsible department: Road User Charging

## Revision History

Version	Date	Authors	Main changes
1	Mar. 2011	Jørn Hanssen, Kjell-Erik B. Eilertsen et.al.	First version of the document, based on an extended version of the earlier Oslo specification.

## Foreword

Handbook 206 concerns electronic ticketing, primarily focused on public transportation. The handbook is commissioned by the Ministry of Transportation and is financed by the Norwegian Public Roads Administration and the Ministry of Transportation. The main purpose of the handbook is to make it easier for the customer to travel by public transportation. An important part of this simplification is coordination of systems for electronic ticketing on the local, regional and national levels.

The targeted audience for the handbook will be decision makers in public transportation companies and public agencies. In addition it will address personnel working with requirement specifications and acquisition of systems for electronic ticketing.

A complete overview of the contents in Handbook 206 is given in Part 0.

This is part 19 of Handbook 206. The part gives a description the transaction formats and mechanisms used during collect and forward. The detailed format specifications and contents are described in the appendices.

The Norwegian Public Roads Administration presupposes that current international standards and guidelines given in Handbook 206 Electronic Ticketing are followed by projects for electronic ticketing as instructed by the license authority, ref the Norwegian law for professional transportation (Yrkestransportloven) and the corresponding regulations for professional transportation (Yrkestransportforskriften) §30, which is elaborated by the Ministry of Transportation's circular N-1/2006.

Norwegian Public Roads Administration, April 2011

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# 1 General

The purpose of this chapter is to describe the generic model for exchanging transactions between PTOs. The transaction exchange has two main purposes:

- Clearing and apportionment
- Card and product tracking

## 1.1 Clearing and apportionment

The clearing and apportionment is for when a card or product is interoperable between several parties, and there is need for financial clearing and apportionment. This is meant to be performed by a trusted third party, and requires collecting all transactions relevant for apportionment, especially transactions for sales, use and refunds. What information is needed depends on which agreements exist between the interoperable parties.

## 1.2 Card and product tracking

The card and product tracking have several purposes:

- Show transaction flow on the customer's request
- Reconstruct lost or defect cards

This requires collecting all transactions altering the card contents (complete history of applicationSequenceNumber updates) and other transactions relevant for the customer. To be able to perform the customer services needed all collected transactions must be forwarded, so that the card issuer and product owner receive all transactions regarding cards or products they are responsible for towards the customer.

## 1.3 Currency

All currencies are expressed in tenth of NOK, as on the card.

## 2 Data Flow Model

### Interoperability model

Interoperability between Public Transport Operators may be modelled by five levels, according to usual Ticketing System architecture.

- Level 0: Interoperable ticket media
- Level 1: Card Accepting Devices
- Level 2: Station Computers or bus Depots
- Level 3: Operator (System Provider) Central Computers
- Level 4: Interoperability management

Interoperability shall be reached at levels 0 and 4. Interoperability does not impact directly levels 1, 2 & 3. However; level 0 and 4 information are connected, and therefore, no loss of information between them shall be authorised.

Level 4 Interoperability	Interoperability Organisation		
	PTO↔IO translator	PTO2↔IO translator	PTO3↔IO translator
PTO1↔IO protocol	PTO2↔IO protocol	PTO3↔IO protocol	
Level 3 Service Provider Central Computer	PTO1 Central Computer	PTO2 Central Computer	PTO3 Central Computer
	SC↔SPCC protocol	SC↔SPCC protocol	SC↔SPCC protocol
Level 2 Station Computer	PTO1 Station Computer	PTO2 Station Computer	PTO3 Station Computer
	CAD↔SC protocol	CAD↔SC protocol	CAD↔SC protocol
Level 1 Equipment	PTO1 Card Accepting Device	PTO2 Card Accepting Device	PTO3 Card Accepting Device
	IO-cards↔IO-CAD protocol (ISO 14443A, ISO 7816-4, EN 1545:1998, NSD/NORTIC structures)		
Level 0 Smart Card	Smart Card & Smart Ticket		

## 3 Transaction Flow

This chapter describes the exchange of transactions between the different actors in an interoperable fare management system, e.g. between product owners, retailers and card issuers. It can also be used directly between different actors without any clearing houses being involved if necessary. The exchange of transactions fills two main purposes:

- Financial clearing and apportionment
- Collecting transactions to make card issuers and product owners capable of tracking and reconstructing cards and products for the customer when card are lost or defect.

For financial clearing and apportionment the transactions will normally be exchanged through a clearing house, which acts a trusted third party. As a rule, all transactions shall be routed so that the card issuer receives all transactions regarding their cards and all product owners receive all transactions regarding their products.

Both of above mentioned purposes give requirements in regard of transaction contents. However, there are two groups of transactions that have different requirements:

- Transactions meant for forwarding claims
- Transactions meant for product clearing and apportionment and reconstruction

Transactions meant for forwarding claims shall be used when the national or any of the regional charge to account products or stored value has been used as payment for a journey. Other transactions are interesting whenever there are products interoperable between two or more parties. Both are described in this chapter.

### 3.1 Interface Data Definition

Format for transaction messages shall be either XML (Extensible Markup Language) or XDR (External Data Representation Standard).

### Transaction Files Naming Convention

Each Transaction file shall be named as follows:

<XXYYYYZU.NNNNNNNNN>:

Where:

- XX** = Sender's Hardware Type:  
PTO Translator = TR  
Level 4 Middleware for PTO = MW  
Level 4 Middleware for PL4 = IO
- YYYY** = Sender's <PTOID> :  
Example: 0004 = NSB
- Z** = File Type :  
Entity using XDR file format will use (Z = 1 = CSC transaction /  
Z = 2 = CT Transaction)  
Entity using XML transaction file format will use Z = 1 for CSC,  
CT and MT transactions
- U** = DIS version ('A' to 'Z' which is the version of the interface  
definition file between Translators and Level 4)
- NNNNNNNNN**  
= Sequential number in decimal:  
Translators manage the sequential number. It is incremented by 1  
for each new transaction file. It is reset to 0 at its upper limit.

**XDR encoded transaction data**

This section applies to transaction data encoded in XDR.

File header	File header tag
	File creation date
	File event type
Message header 1 (described in this document)	
Transaction 1 (described in Appendix A)	Main header
	Data transaction
Message header 2 (described in this document)	
Transaction 2 (described in Appendix A)	Main header
	Data transaction
...	
Message header n (described in this document)	
Transaction n (*) (described in the Appendix A)	Main header
	Data transaction
End file (described in Appendix A)	Certificate
	Signature

(\*) n is variable

Structure of Upload Transactions message

The transaction file is composed with:

- A file Header
- 1...n messages composed with:
  - o A message Header
  - o Transaction data
- An End file

The messages are grouped into separated files, one for each type of message, according to the File Header Tag.

Transaction data structure is detailed in Appendix A as far as possible, Card Data Layout field as origin is given for each transaction field.

End file structure is detailed in Appendix A

The table below provides the data definition of the file header, which lists the batch file of each PTO. The structures of transactions data are described in appendix A.

Field Description							
Seq	Field Name	Type	Length Byte	Range or Precision	Restricted Value	Default Value	Description
<b>Batch File Header</b>							
0	File Start Position						Offset 0 in the file
1	File Header Tag	Enum	1*		1 = CSC transaction 2 = CT Transaction		The header tag is a 4 byte constant used to identify the actual file type, actually the value is coded on 1 byte, but is <b> padded up to 4 bytes for XDR compatibility</b>
2	File creation date	Uint	4		0..2 <sup>32</sup> -1		The file creation time. The time stamp is based on the Coordinated Universal Time (UTC)
3	File event type	Enum	1*		1		The event type must be 1, the value is coded on 1 byte, but is <b> padded up to 4 bytes for XDR</b>
4	End File position	Uint	4				<b>a)</b> End file Position from the file start, after all messages are encoded.

\*Note – These fields are padded up to 4 bytes for XDR Compatibility

Each message is made of a standard **message header** composed of:

Field Description							
Seq	Field Name	Type	Length Byte	Range or Precision	Restricted Value	Default Value	Description
<b>Message Header</b>							
1	Message number	Uint	4				Sequential number of message issued from the original equipment (at transaction creation)
2	Report date	Uint	4				The message creation time. The time stamp is based on the Coordinated Universal Time (UTC) based on the original equipment transaction creation
3	Device ID	String	3				Identification of the device (original equipment transaction creation) See note 1
4	Complement Device ID	Uint	4				Complement identification (for devices connected through the VCF) (in case of slave equipment)

Note1: The device ID and the Complement device ID are PTO dependant.

Depending on the file type, after the header, the message structure in the files is the following:

5	[Transaction details]	According to the "Message type" Transaction content	Refer to Appendix A
---	-----------------------	--------------------------------------------------------	---------------------

The full Transactions XDR Data description is provided in Appendix B.

### XML encoded transaction data

All messages exchanged in XML format shall be encoded in accordance with the XML Schema Definition XSD description in Appendix C.

### 1.3.2 Transaction contents and formats

For messages containing transaction, the body consists of a set of transactions, each containing both header and body. The transaction types described so far are the following:

No.	Transaction type	Description
Card issuing and -management		
2	CSC Fare Media Sale	Sale of Fare Media Contactless Smart Card
7	CSC Fare Media refund	Refund of Fare Media CSC
18	CSC Fare Media activity Management	Enable or disable activity of CSC Fare media
21	CSC Card Management	For future use. Retention, attachment, detachment of CSC card
23	CSC Fare Media Holder Information	Modify or add any field in Holder's information of CSC Fare media
24	CSC Non-interoperable operation	Operator modifies field on card that gives a TSN increment
Product sales, - use and - management		
3	CSC Fare Product sale	Sale of a product on Contactless Smart Card
5	CT Fare Product sale note 1)	Sale of Fare Media and product Contactless Ticket
8	CSC Fare Product refund	Refund of a product on Contactless Smart Card
10	CT Fare Product refund note 1)	Refund of Fare product Contactless Ticket
15	CSC Fare Product AutoRenew	Automatic renew of product on CSC
20	CSC Fare Product AutoRenew Management	Enable or disable AutoRenew on CSC Fare product
25	CSC garbage collection	Card cleaning. One transaction each deleted product
30	CSC Fare Product checkin	Check in on Contactless Smart Card
31	CSC Fare Product checkout	Check out on Contactless Smart Card
32	CT Fare Product checkin note 1)	Check in on Contactless Ticket
33	CT Fare Product checkout note 1)	Check out on Contactless Ticket

Stored value (t-purse) sales, use and management		
4	CSC tPurse Product sale	Sale of tPurse Product on CSC
6	MT Fare Product sale	Sale of Paper Ticket with Non interoperable product
9	CSC tPurse Product refund	Refund of tPurse product on Contactless Smart Card
11	CSC tPurse Product Reload	Reload of tPurse product on Contactless Smart Card
16	CSC tPurse Product AutoLoad	Automatic load of tPurse product on CSC
19	CSC tPurse management	Change of parameters for CSC tPurse product
Card and product reconstruction		
12	CSC Fare Media Exchange	Exchange of CSC Fare Media
13	CSC Fare Product Exchange	Exchange of CSC Fare Media for the product
14	CSC tPurse Product Exchange	Exchange of CSC Fare Media for the tPurse
Blacklist management		
36	CSC Black list Management	Opposition management with blacklist and for CSC

Note 1): CT related transactions are included for completeness and reference since these are part of the XDR encoded transaction files. Use is optional.

The detailed content of each transaction type is described in Appendix A.



## 4 Transaction security

### 4.1 General requirements

The process of transaction collect and forward requires use of PKI (Public Key Infrastructure) based digital signatures in order to facilitate:

- Integrity control, ie the Receiver of the information shall have the possibility to verify that the information is not changed during transfer
- Autentification, ie the Receiver of the information shal have the possibility to ensure the authenticity of the Sender (signer)
- Non-repudiation, ie in case of a dispute the Sender cannot repudiate, or refute the validity of a digitally signed transaction file

For implementation details and requirements, refer to [Del 16 Appendix A Security Implementation specification]

### 4.2 Certificate Revocation List (CRL)

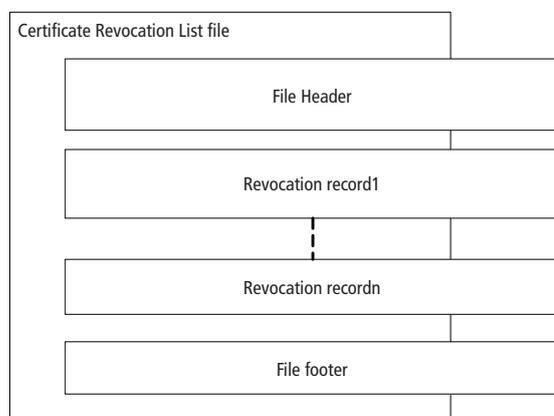
Under normal circumstances the CRL will be handeled under the responsibility of the Security Server implemented in the PTO Domain; refer to [Del 16 Appendix A Security Implementation specification]

#### 4.2.1 Functional Description:

The certificate revocation list contains the certificates that are not valid anymore. The list contains a complete list of all certificates that are revoked (of all PTOs). At Level 4 system level there is only one certificate revocation list file. Previous versions of these file are deleted.

#### 4.2.2 Technical Description:

In case of distribution of an updated CRL, the IFMS security manager delivers this CRL to a removable medium (CD, diskette or USB key) to the PTOs by a manual process.



CRL Interface Structure

4.2.3 CRL Interface Data Definition

		Field Description						
Seq	Field Name	Type	Length	Range or Precision	Nullable	Restricted Value	Default Value	Description
<b>File Header</b>								
1	Version	byte	4		N		2	Version of the applied X.509 standard
2	Algorithm identifier	Byte	20		N		1.2.840.113549.1.1.4 (RSA/MD5)	Algorithm used to sign the CRL, together with any necessary parameters
3	Issuer name	Byte	32		N		CA Issuer Id	Name of the entity that signed the CRL
4	This update date/time	String	15		N		UTCTime	
5	Next update date/time	String	15		N		UTCTime	
<b>Revocation record</b>								
7	Certificate serial number	Byte	4		N			Identifies the Certificate to revoke.
8	Revocation date	String	15		N			Current date
9	CRL entry extensions (optional, v2 only)	Byte	20		N			
<b>File Footer</b>								
10	Certificate	Byte	2048		N			CA Certificate
11	Signature	Byte	128		N			Signature of the CA

## 5 Transaction use-cases

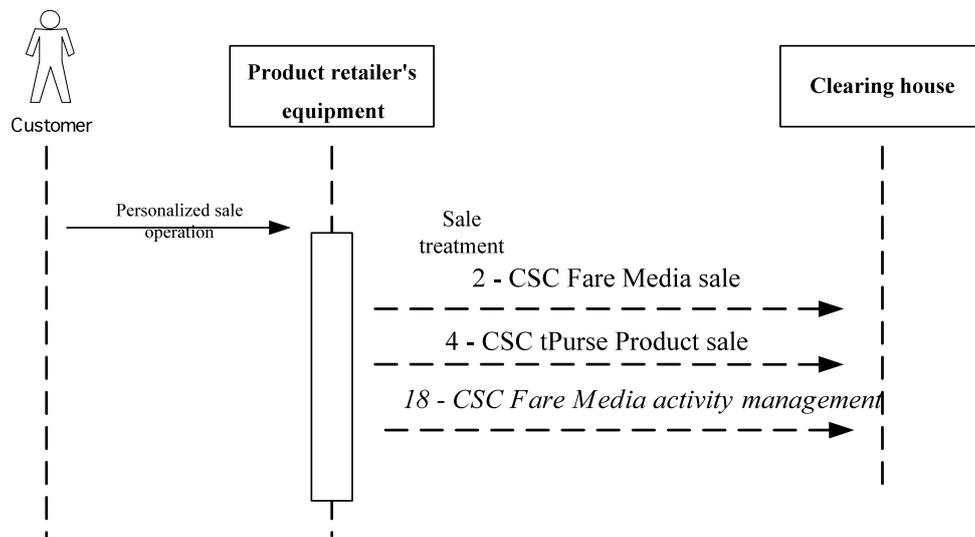
The different transactions fill different purposes, and are often used in conjunction with each other. The following transaction descriptions are done at an elementary operation level. The indicated number is the Transaction type field in the transaction header.

When the transaction's name is presented in *italics*, it's generation is optional and pending on PTO decision

Please also note that transactions involving "CT" type medium are included for reference only.

Use case: anonymous card sale with immediate activation

A customer buys an Anonymous CSC. The card is activated and ready to be used; no specific product or Stored Value load is done.



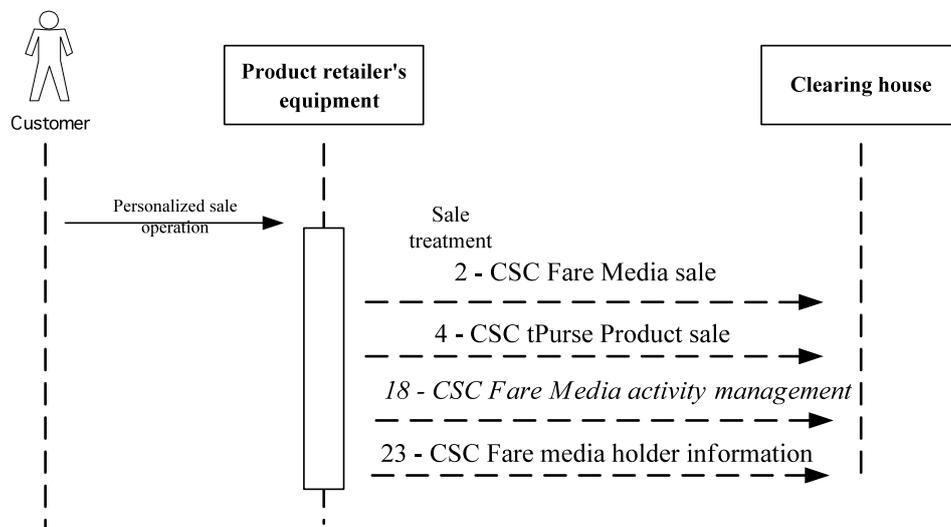
**Transactions during an Anonymous CSC sale**

Sale equipment concerned by the Use Case: e.g. POST, TVM...

Note that Trx 18 sending is optional insofar as CardActivityStatus is set to true in Trx 2 and ContextAndSequence Number.applicationContext.applicationStatus is set to 1 (enabled) in CSC card.

**Use case: personalized card sale with immediate activation**

A customer buys a Personalized CSC with a student profile. The card is personalized with customer's birth date and the student profile, is activated and ready to be loaded with product or value on Stored Value.



**Transactions during a Personalized CSC sale**

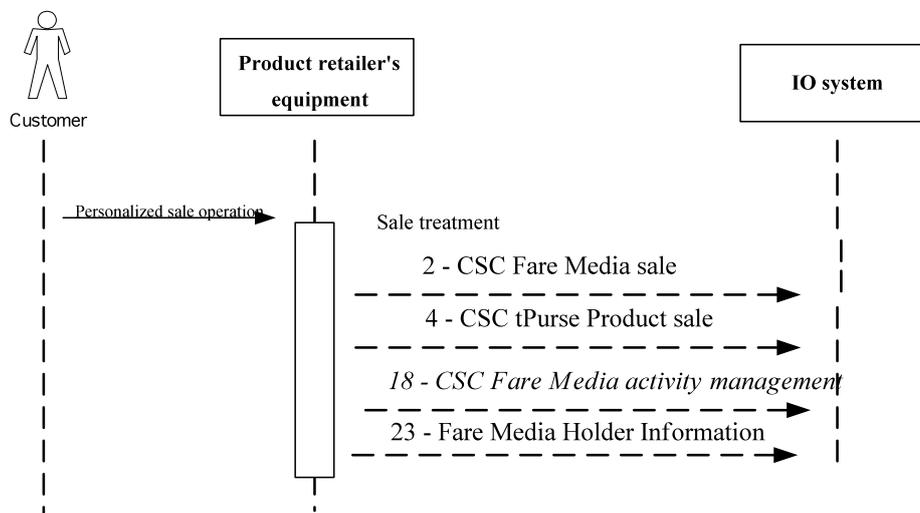
Sale equipment concerned by the Use Case: e.g. POST, TVM...

Note that Trx 18 sending is optional insofar as *CardActivityStatus* is set to *true* in Trx 2 and *ContextAndSequence Number.applicationContext.applicationStatus* is set to 1 (*enabled*) in CSC card.

### Use case: personalized card sale with activation and adding of profiles

A customer buys a Personalized CSC with customer's birth date; the card is activated and ready to be loaded with product or value on Stored Value.

The customer asks for the adding of a disabled profile



**Transactions during a Personalized CSC sale**

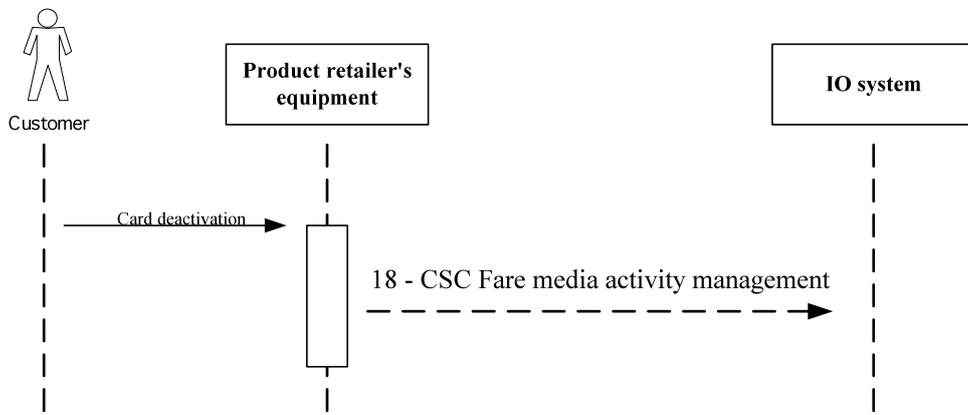
Sale equipment concerned by the Use Case: e.g. POST, TVM...

Note that Trx 18 sending is optional insofar as *CardActivityStatus* is set to *true* in Trx 2 and *ContextAndSequence Number.applicationContext.applicationStatus* is set to 1 (*enabled*) in CSC card.

**Use Case: Card deactivation**

A customer asks to a Point of Service to deactivate his CSC.

A CSC Fare Media activity management transaction is generated.



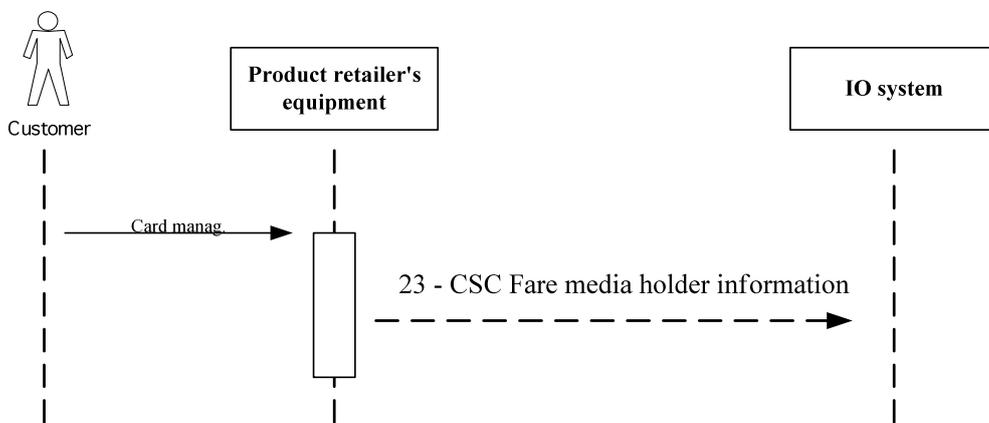
**Transactions during a Card deactivation**

Sale equipment concerned by the Use Case: POST.

### Use Case: Card Holder information

A customer asks to a Point of Service to get a new profile on his personalized CSC or to change profile parameters.

A Card Holder information transaction is generated.

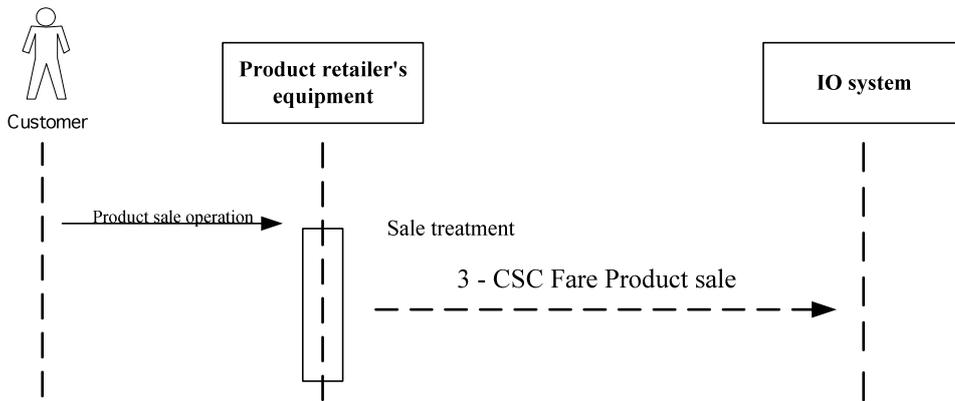


### Transactions during a Card holder Information

Sale equipment concerned by the Use Case: e.g. POST...

**Use case: product sale or product renew**

A customer buys a weekly pass on his CSC.



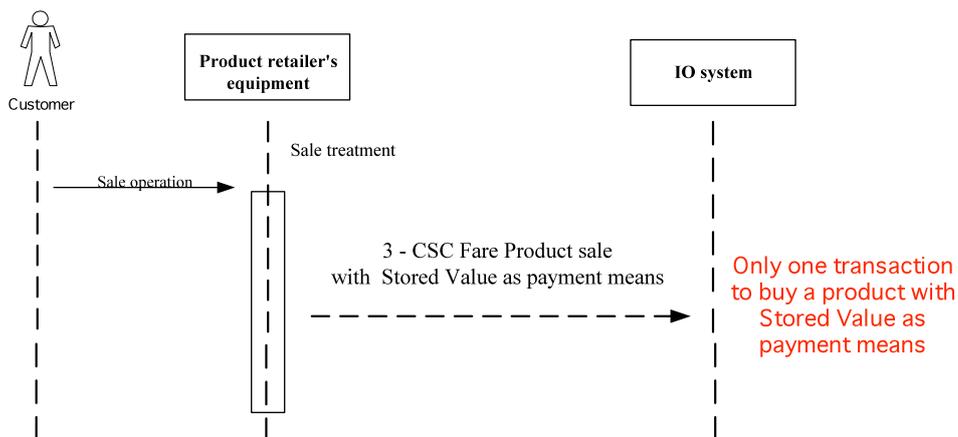
**Transactions during a Product sale**

Sale equipment concerned by the Use Case: e.g. POST, TVM...

If the customer asks for a renewal of his weekly pass, the same transaction is generated.

### Use case: product sale with Stored value as payment means

A customer buys a weekly pass on his CSC and asks to pay it with Stored value.



**Transaction during a Product sale with Stored Value as Payment means**

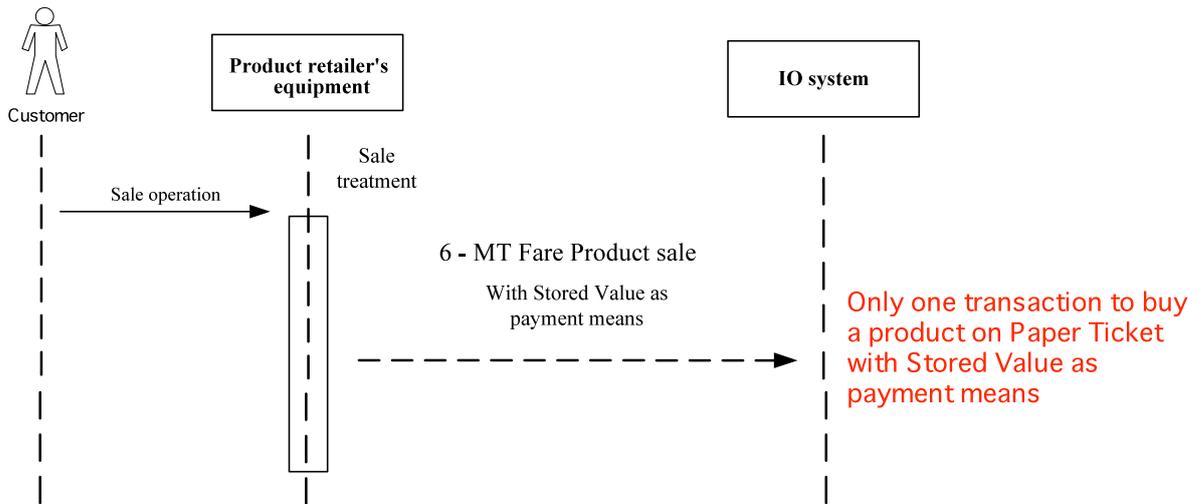
Sale equipment concerned by the Use Case: e.g. POST, TVM...

For a Product sale with Stored Value as payment means, only one transaction is generated filled with product price, last stored Value, new stored value, payment means = stored value.

**Use case: product sale on paper ticket with Stored value as payment means**

A customer buys a fare product on paper ticket and asks to pay it with Stored value embedded on a CSC:

- a unique MT Product sale transaction is generated.



**Transaction during a Product sale on Paper Ticket with Stored Value as Payment means**

Sale equipment concerned by the Use Case: e.g. TVM...

For a Product sale on Paper Ticket with Stored Value as payment means, only one MT product sale transaction (6) is generated filled with :

- product price,
- last stored value,
- new stored value,
- payment means = stored value.
- Holder profile information related to the CSC with SV used

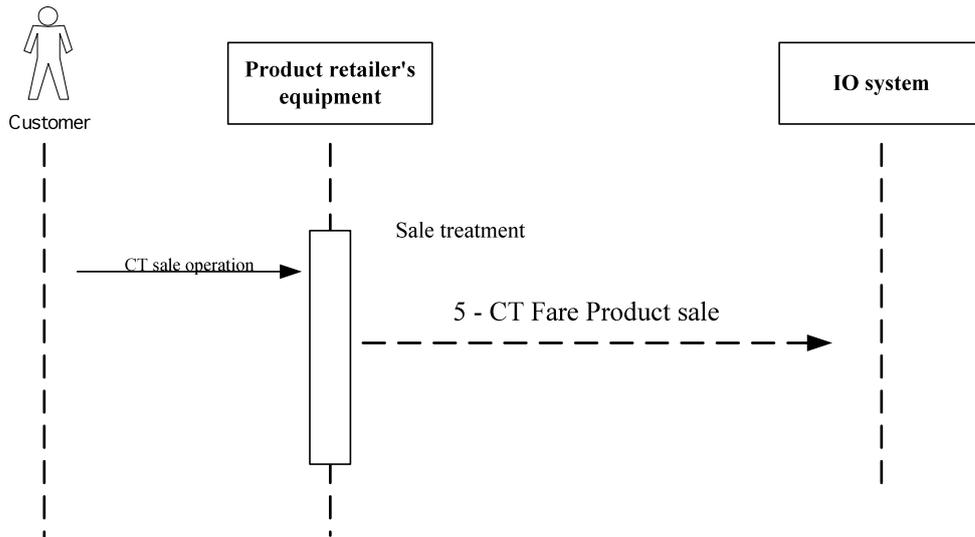
In addition, in the header of the transaction, the following information are filled :

- arId (MediaSerialNumberId) related to the CSC with SV used
- The MediaIssuerId related to the CSC with SV used (this information is used by IOS for forwarding TX to the relevant Stored Value Owner)
- The ApplicationTSN (ApplicationTransactionSequenceNumber) related to the CSC with SV used,

In this case the TX shall be forwarded to the SV owner (as defined by the CSC MediaIssuerId from the TX header)

**Use Case: Product sale on a CT**

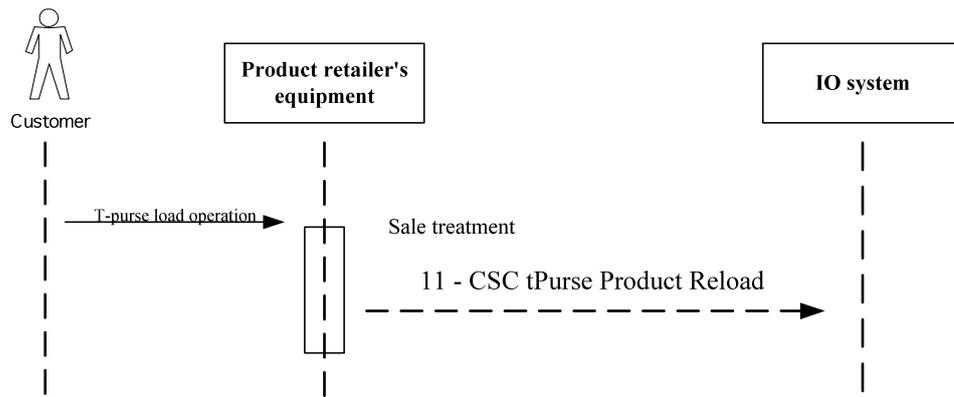
A customer buys a Single Ticket on a CT.

**Transactions during Product sale on a CT**

Sale equipment concerned by the Use Case: e.g. POST, TVM, Driver Console...

**Use case: Stored-Value reload**

A customer reloads a value on Stored Value of his CSC.



**Transactions during Stored-Value reload**

Sale equipment concerned by the Use Case: e.g. POST, TVM...

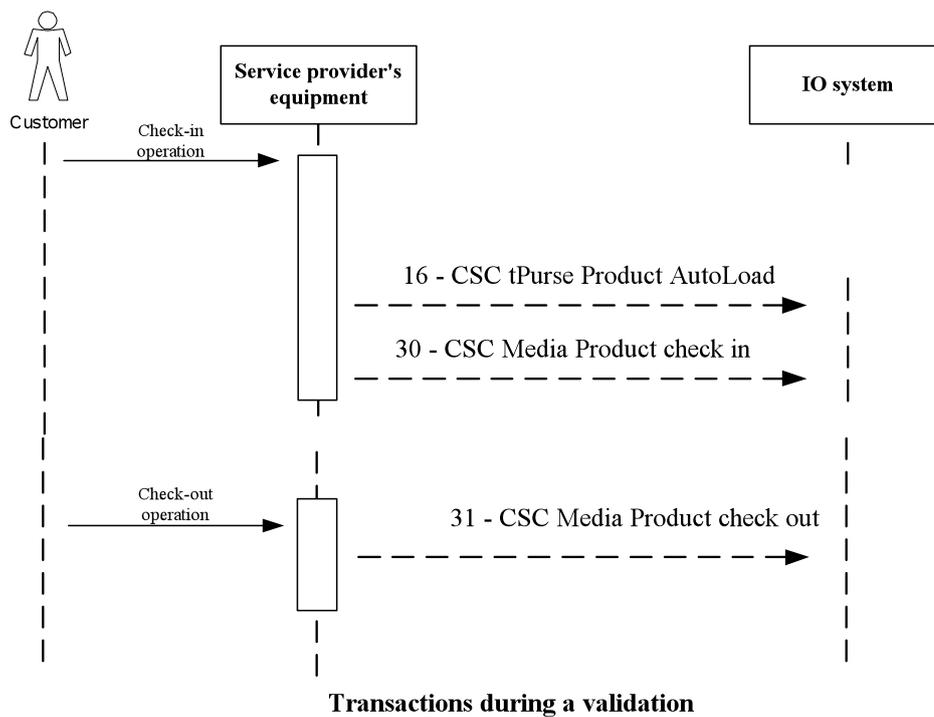
### Use Case: Check-in with a product on a CSC and SV auto-reload action performed

A customer has a weekly pass on his CSC.

This CSC card has an SV auto-reload option.

The customer enters into the transport network.

The Stored Value remaining value is not sufficient, an SV auto-reload operation is executed and an SV Auto-reload transaction is generated.



Service provider's equipment concerned by the Use Case: e.g. Gate, Validator...

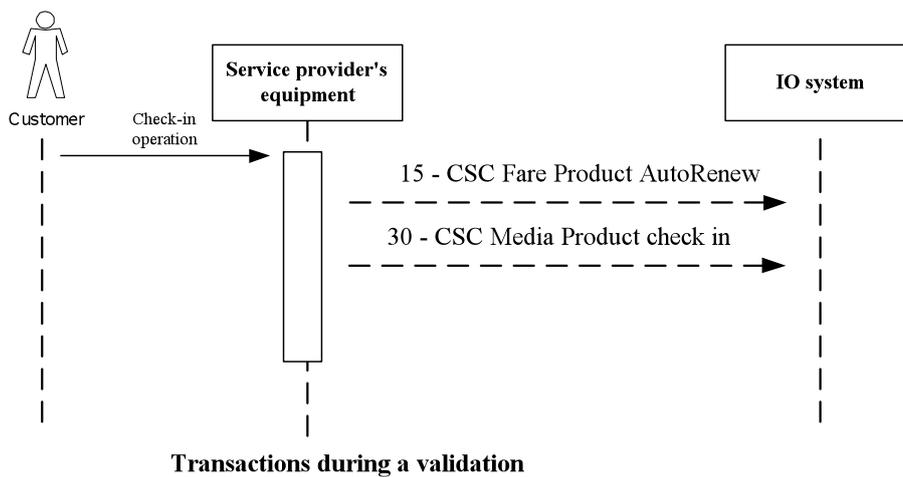
**Use case: Check-in with a product on a CSC and Product auto-renew action performed**

A customer has a weekly pass on his CSC.

This weekly pass has the product auto-renew option.

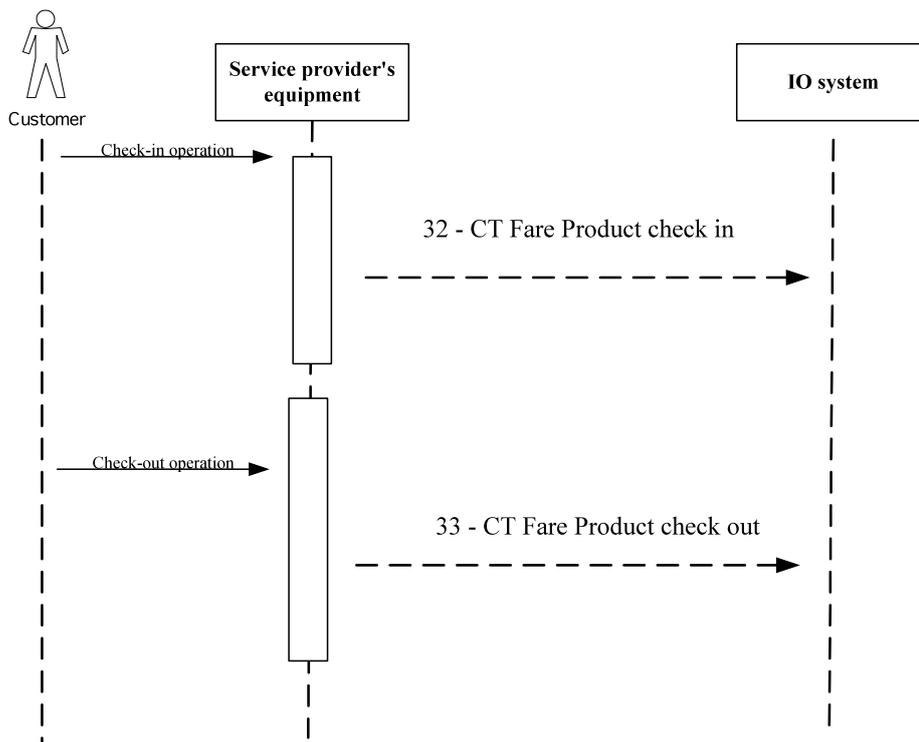
The customer enters into the transport network.

The current day is in the period authorized to auto-renew the weekly pass, the auto-renew operation is executed and an Auto-renew transaction is generated.



### Use cases: Check-in or Check-out with a product on CT-media

A customer enters in the Transport Network with a Single Ticket on a CT.

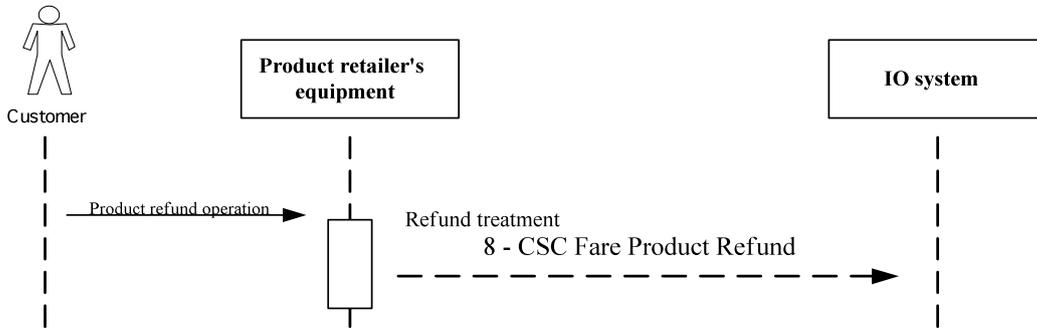


### Transactions during a CI / CO operation with a product in a CT

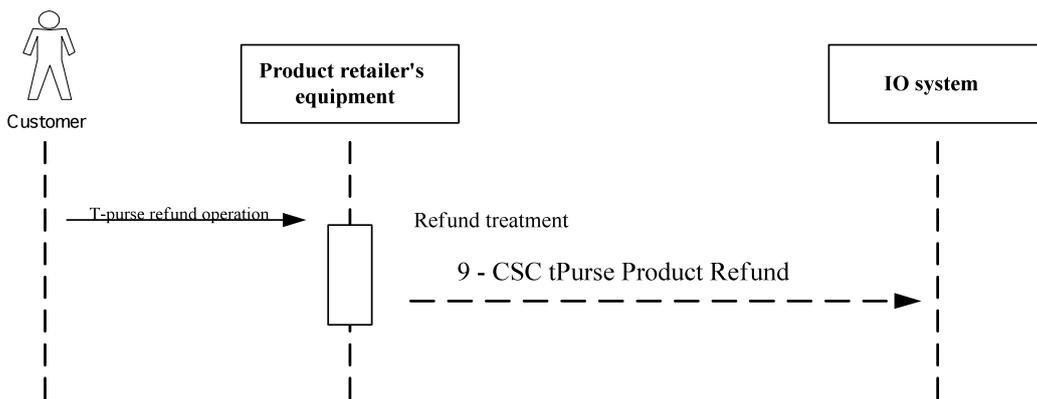
Service provider's equipment concerned by the Use Case: e.g. Gate, Validator...

**Use cases: refund**

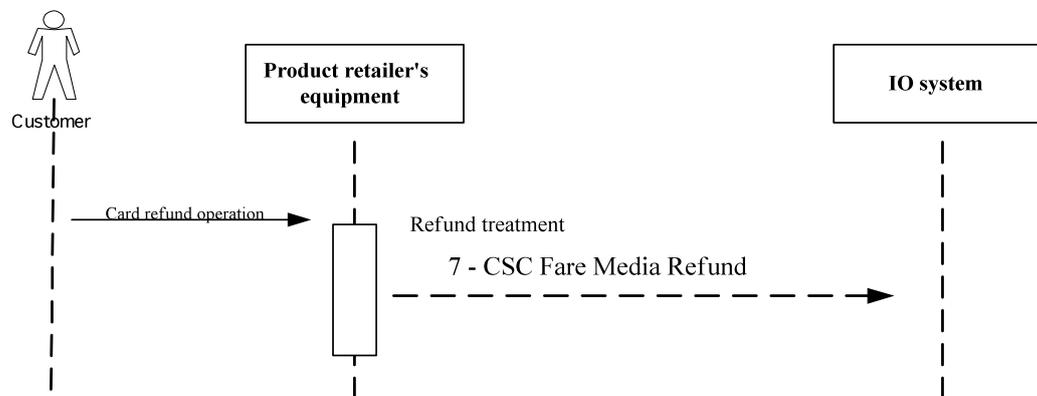
A customer has a CSC and asks for a refund: a product, the Stored Value or the CSC.



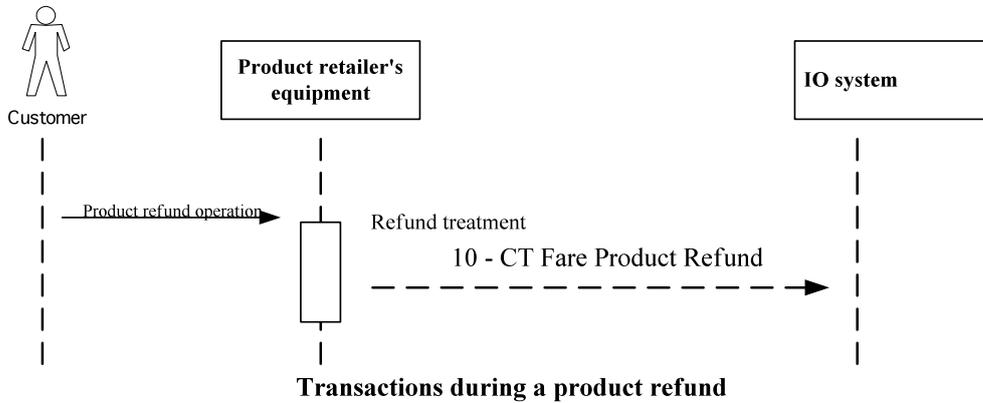
**Transactions during a product refund**



**Transactions during Stored-Value refund**



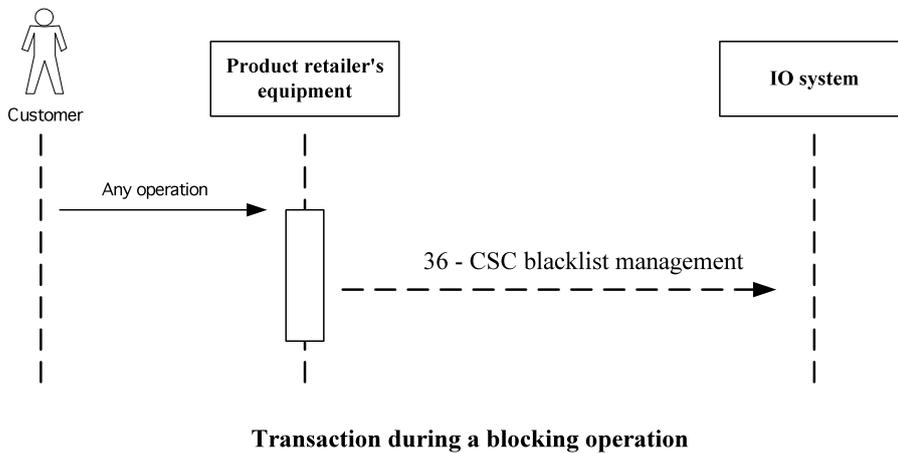
**Transactions during CSC refund**



Sale equipment concerned by the Use Case: e.g. POST, TVM...

**Use case with a blocking operation**

A customer has a CSC which is notified as to be blocked in the Blacklist file. The CSC card or product is set to 'blocked' by the blacklist treatment and a blacklist management is generated.

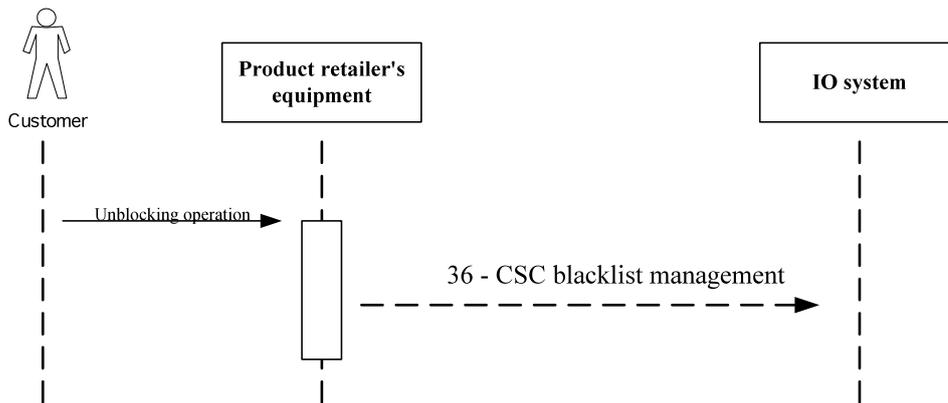


Sale and Service provider's equipment are concerned by the Use Case.

**Use case: unblocking operation**

A customer has an element that is blocked on his CSC: product or card.

He goes to a point of service to unblock it.



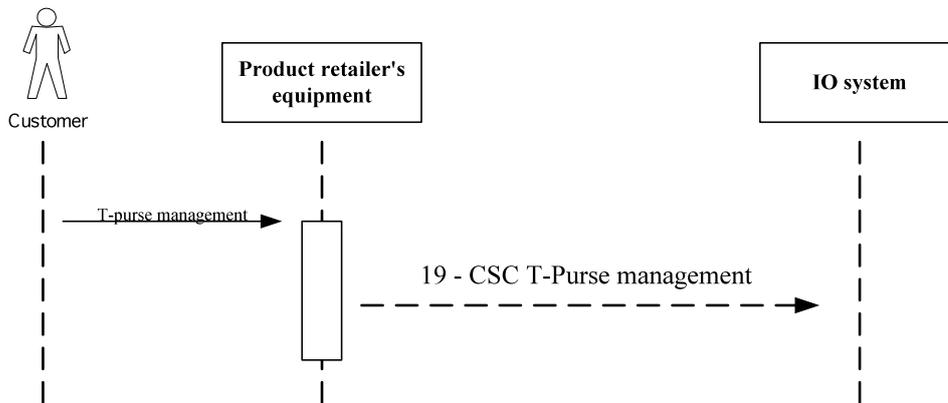
**Transactions during a unblocking operation**

Sale equipment concerned by the Use Case: e.g. POST...

**Use Case: Store-Value management**

A customer asks to a Point of Service to get the Auto-Reload option on his CSC or to change parameters in his Auto-Reload option.

A T-purse management transaction is generated.



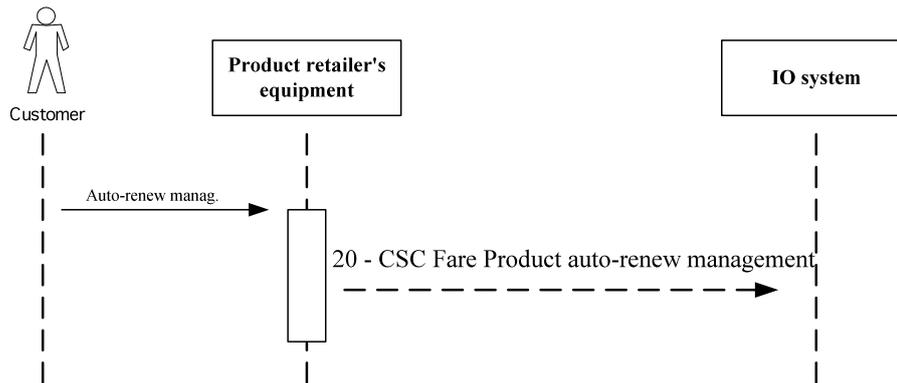
**Transactions during a Stored-Value management**

Sale equipment concerned by the Use Case: e.g. POST...

### Use Case: auto-renew management

A customer asks to a Point of Service to get the Auto-Renew option for a product on his CSC or to change parameters in an Auto-Renew option.

An Auto-renew management transaction is generated.

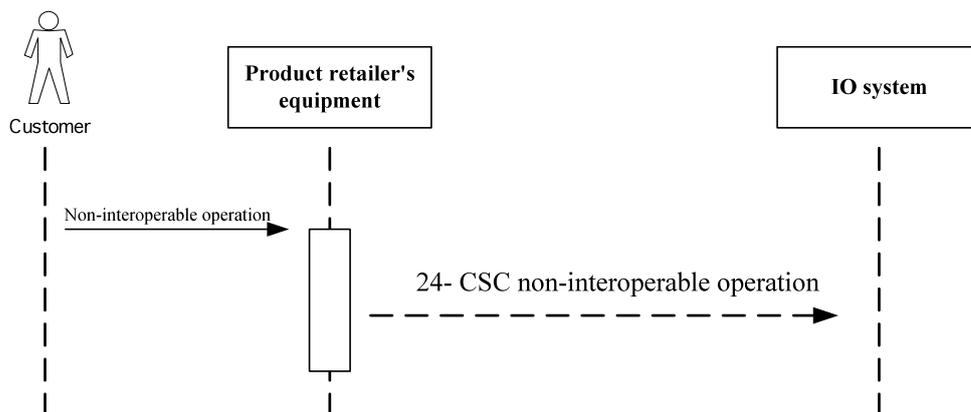


**Transactions during a Product auto-renew management**

Sale equipment concerned by the Use Case: e.g. POST...

### Use case: Non-interoperable operation

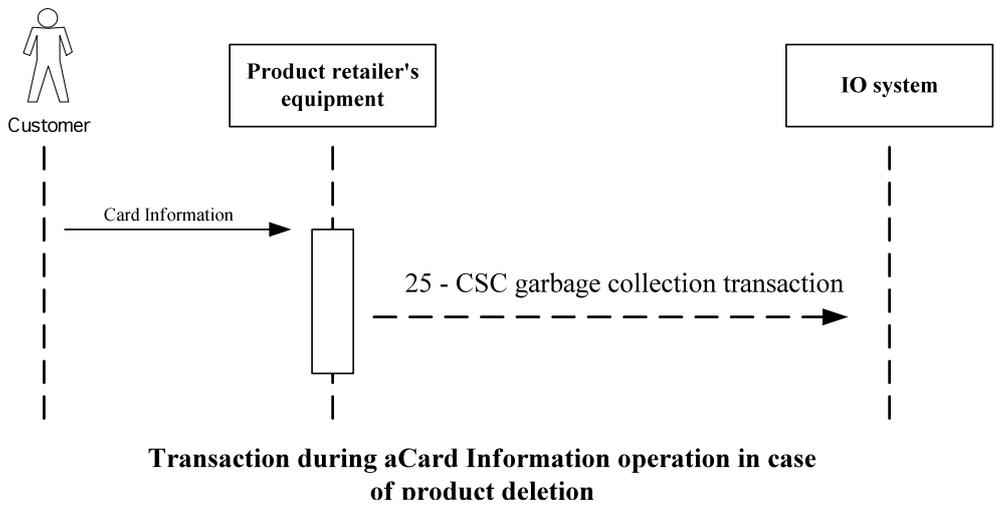
For all non-interoperable operations done in a CSC, a transaction has to be sent in order for the Card Issuer to keep a correct TSN for its Card tracking.



**Transaction during a non-interoperable operation**

**Use case: Deleted product in CSC operation**

During a Card Information at POST or TVM, expired products in CSC are deleted: this deletion is notified in a special Transaction “Garbage collection”.



**Sale uses cases involving cancellations.**

General:

A customer asks to cancel a sale operation he has just performed.

List of concerned operations:

- Product Sale on a CSC
- Product Sale on a CT
- Product Sale on a paper ticket
- Stored Value reload

A Trx is sent with:

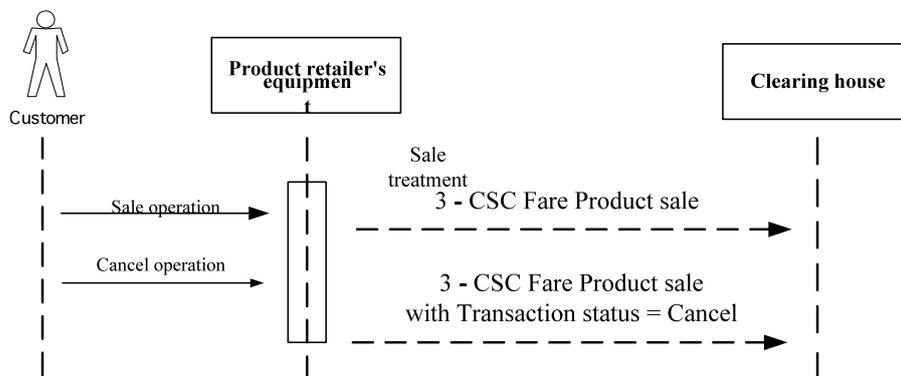
- Trx type similar to cancelled operation,
- Trx Status filled with “Cancelled status” (value 3)
- Trx ApplicationTransactionSequenceNumber filled with current TSN of the card
- Trx fields filled with Trx fields of cancelled operation

**Use Case: Cancellation of a CSC product sale (for all payment means other than Stored-value)**

A customer who has just bought a pass asks to cancel the sale.

Steps in sequence:

- Sale of a pass: amount is 100 Nok
- Write a pass in the CSC (TSN=5)
- Send a Trx CSC product sale with TSN=5 and transaction value = 100 Nok (transaction status = OK)
- Cancel sale of pass
- Update CSC deleting pass (TSN=6)
- Send a Trx CSC product sale with TSN = 6 and transaction value = 100 Nok (transaction status = Cancel)

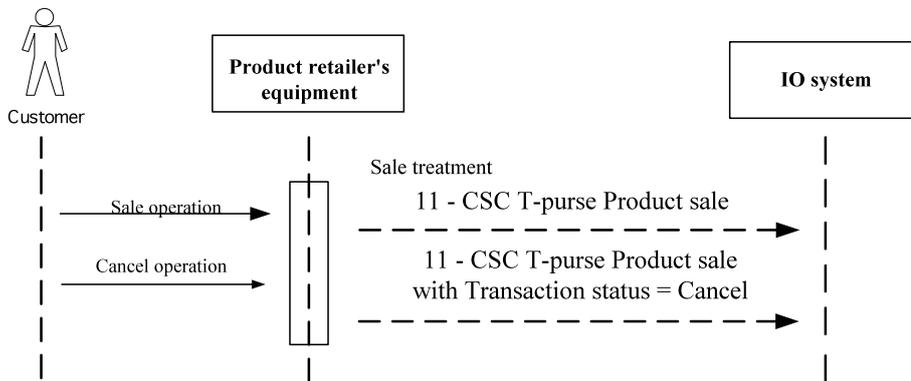


**Transactions during a cancellation of a Product sale on a CSC**

**Use case: Cancellation of a CSC T-purse Reload**

A customer who has just reload Stored Value asks to cancel the sale.

- Reload of 200 NOK on Stored-value
- Update Stored-value in the CSC adding 200 NOK (TSN = 7)
- Send a Trx CSC Stored value reload with TSN = 7 and transaction value = 200 NOK (transaction status = OK)
  
- Cancel Reload T\_purse
- Update Stored Value decreasing 200 NOK (TSN=8)
- Send a Trx CSC Stored value reload with TSN = 8 and transaction value = 200 NOK (transaction status = Cancel)



**Transactions during a cancellation of a T-purse reload**

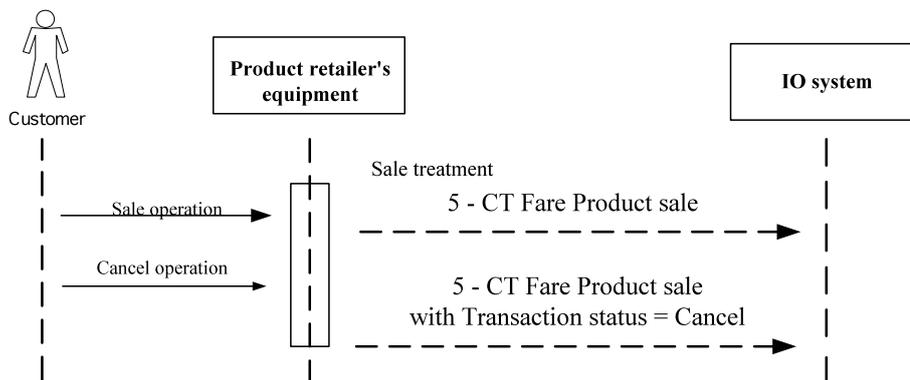
Please note that tPurseRemainingValue and tPurseNewRemainingValue shall be restored to previous (before reload) values.

### Use case: Cancellation of a CT-product sale

A customer who has just bought a single ticket on a CT asks to cancel the sale.

Steps in sequence:

- Sale of a single Ticket in a CT: amount is 20 NOK
- Write a single Ticket in the CT (TSN=0)
- Send a Trx CT product sale with TSN=0 and transaction value = 20 NOK (transaction status = OK)
- Cancel sale of a single ticket in a CT
- Update CT "deleting" single ticket (TSN=1)
- Send a Trx CT product sale with TSN = 1 and transaction value = 20 NOK (transaction status = Cancel)



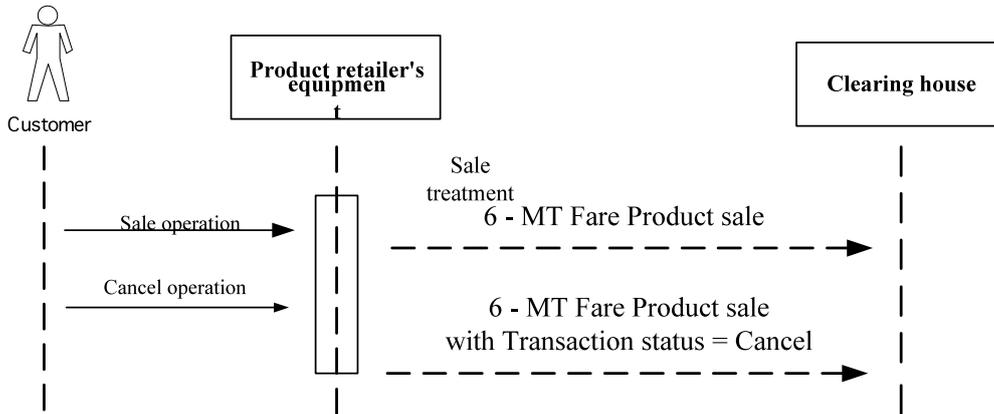
**Transactions during a cancellation of a Product sale on a CT**

**Use case: Cancellation of a sale of a paper ticket**

A customer who has just bought a paper ticket asks to cancel the sale.

Steps in sequence:

- Sale of a Paper ticket: amount is 20 Nok
- Send a Trx MT product sale with transaction value = 20 Nok (transaction status = OK)
  
- Cancel sale of a Paper ticket
- Send a Trx MT product sale with transaction value = 20 Nok (transaction status = Cancel)



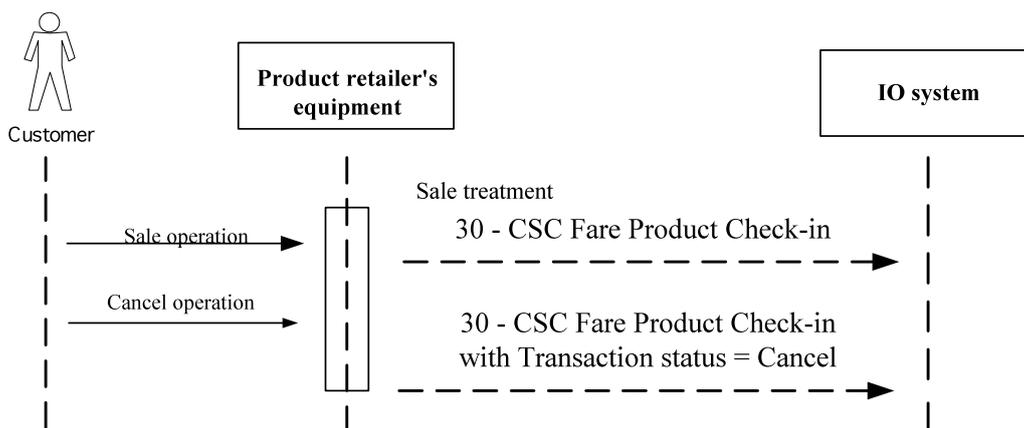
**Transactions during a cancellation of a Product sale on a Paper Ticket**

**Use case: Cancellation of a CSC Fare product check-in**

A customer who has just validated a product can ask to cancel the validation in the same device (for example on-board) or on another device in a defined delay.

Steps in sequence:

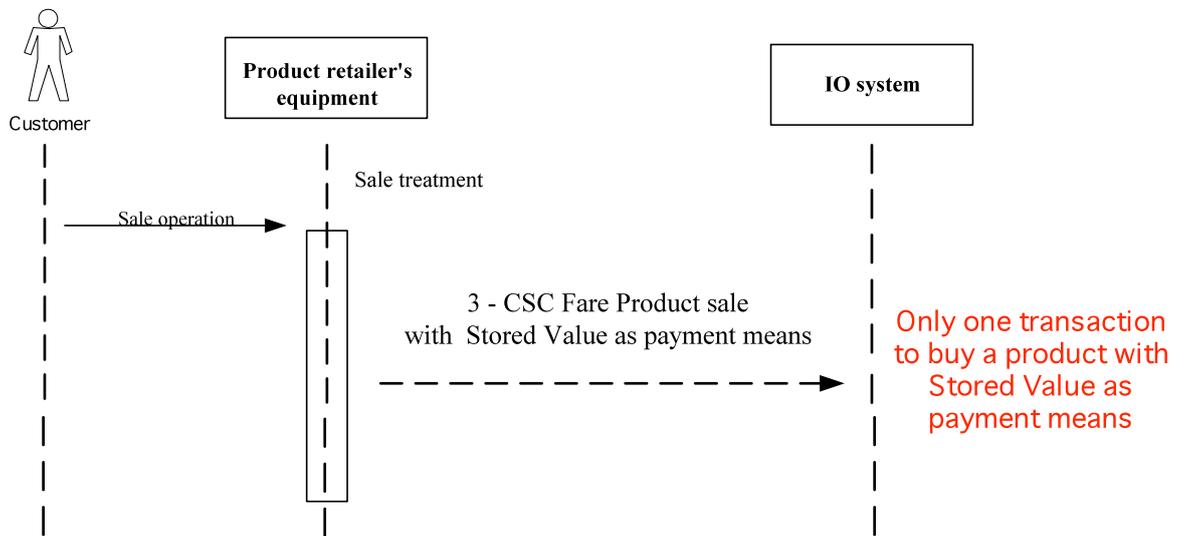
- Validation of a pass: check-in
- Write a General Event in the CSC (TSN=5) and update Contract parameters if necessary
- Send a Trx CSC Fare product Check-in with TSN=5 (transaction status = OK)
- Cancel the validation
- Update CSC pass if modified during the validation (TSN=6)
- Send a Trx CSC Fare product Check-in with TSN = 6 (transaction status = Cancel)



**Transactions during a cancellation of a Product validation on a CSC**

**Use case: Special case – Cancellation of CSC product sale with Stored Value as payment means**

For a Product sale with Stored Value as payment means, only one transaction is generated filled with product price, last stored Value, new stored value, payment means = stored value.



**Transaction during a Product sale with Stored Value as Payment means**

Steps in sequence of a cancellation of a CSC product sale with Stored Value as payment means:

- Sale of a pass: amount is 100 Nok
- Write a pass and update Stored value (value – 100) in the CSC (TSN=5)
- Send a Trx CSC product sale with TSN=5, payment means=SV, remaining value and new remaining value updated and transaction value = 100 Nok (transaction status = OK)
- Cancel sale of the pass
- Update CSC deleting pass and updating Stored value (value + 100) (TSN=6)
- Send a Trx CSC product sale with TSN = 6 and transaction value = 100 Nok (transaction status = Cancelled)

Details of corresponding Transaction fields:

**Product sale: Trx 03 Fare product sale:**

Transaction status = 1 (OK)

ApplicationTransactionSequenceNumber = 5

... ProductOwnerID / ProductTemplateID / ProductCode / ...

tPurseRemainingValue = 350 / tPurseNewRemainingValue = 250 / TransactionValue = 100 / ProductAmount = 100

**Cancellation of Product sale: Trx 03 Fare product sale:**

Transaction status = 3 (Cancel)

ApplicationTransactionSequenceNumber = 6

... ProductOwnerID / ProductTemplateID / ProductCode / ...

tPurseRemainingValue = 250 / tPurseNewRemainingValue = 350 / TransactionValue = 100 / ProductAmount = 100

**Transactions following Action List Treatment**

During an operation of sale or usage, a customer picks up automatically an operation done previously by Web or Customer Service. Related transactions are generated. Transactions are generated during the execution of the action (card writing) by equipment processing the action.

**Special attention to Action List operations:**

According to the result of the operation done by Action List, a transaction is generated or not.

The status of the operations treated by Action List can be:

- Successful execution
  - o a transaction is sent according to the operation with a transaction status = Transaction complete (value 1)
  - o in the CSC, ApplicationTSN is incremented with 1, data operation is written.

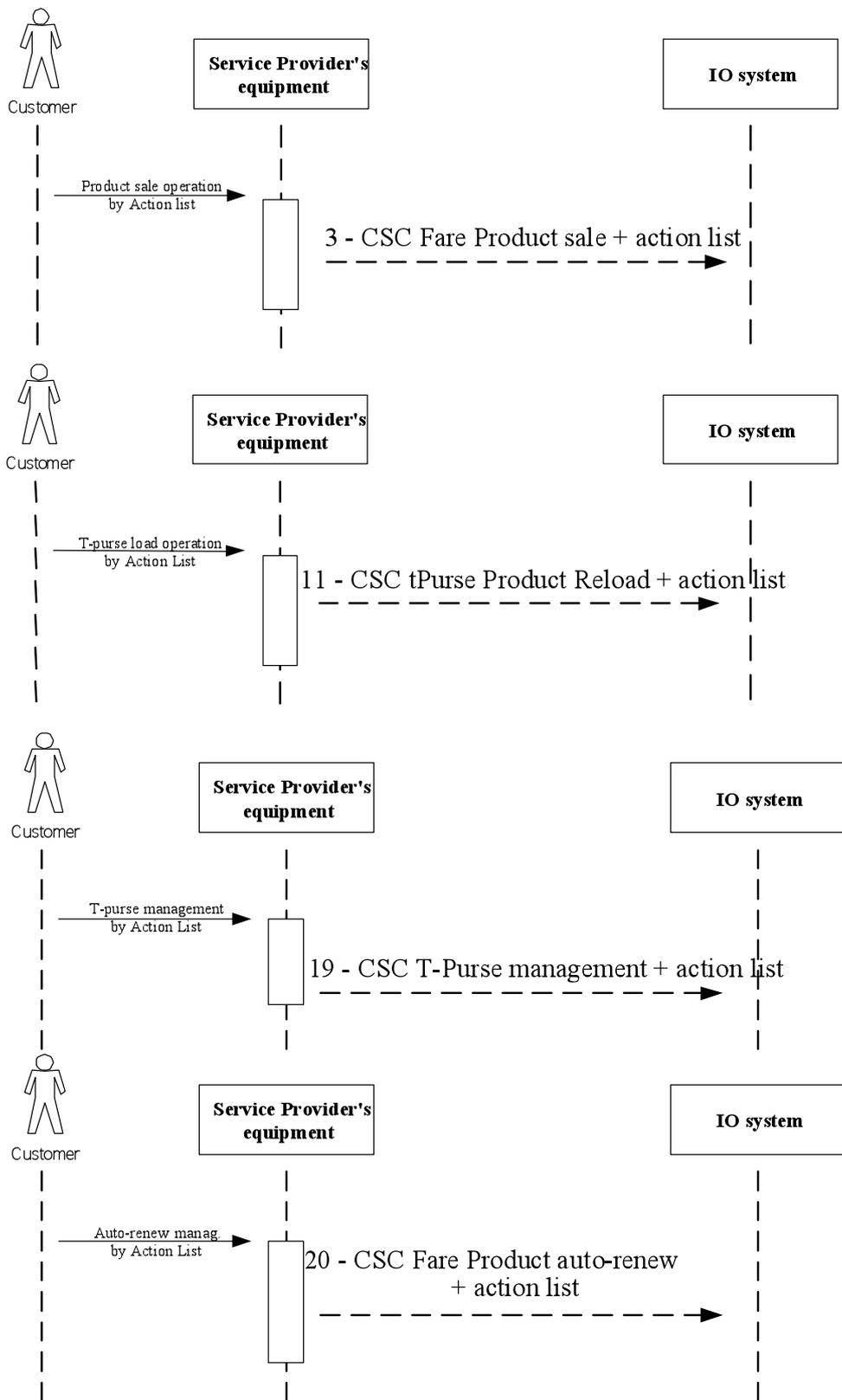
- Operation not executed for one of these 2 reasons:
  - o The execution cannot be done because the requested operation is unavailable:
    - a transaction 24 is sent with a transaction status = Transaction with error or incomplete (value 2)
    - in the CSC, only the ApplicationTSN is incremented with 1, LastServedOrder is filled (nothing else is written in the CSC about the Action List operation).
    - Example of reasons:
      - T\_Purse or Product is blocked
  
      - ContractSerialNumber is not found in the CSC
  
      - Product is unknown
  
      - T-Purse value is unavailable
  
      - Card type is unknown
  
      - Auto-renew activation is invalid
  
      - Auto-renew-date is invalid
  
      - Actionlist ExpiredDate is reached
  - o The execution is impossible to be applied for the time being: it will be done latter
    - No transaction is sent
    - Nothing is written in the CSC
    - Example of reasons:
      - ContractList in the CSC is full
  
      - Error in the Card reading
  
      - Error in the Card writing
  
      - Product is not saleable because of the date

All the generated transactions from Action List operations contains in the Header part:

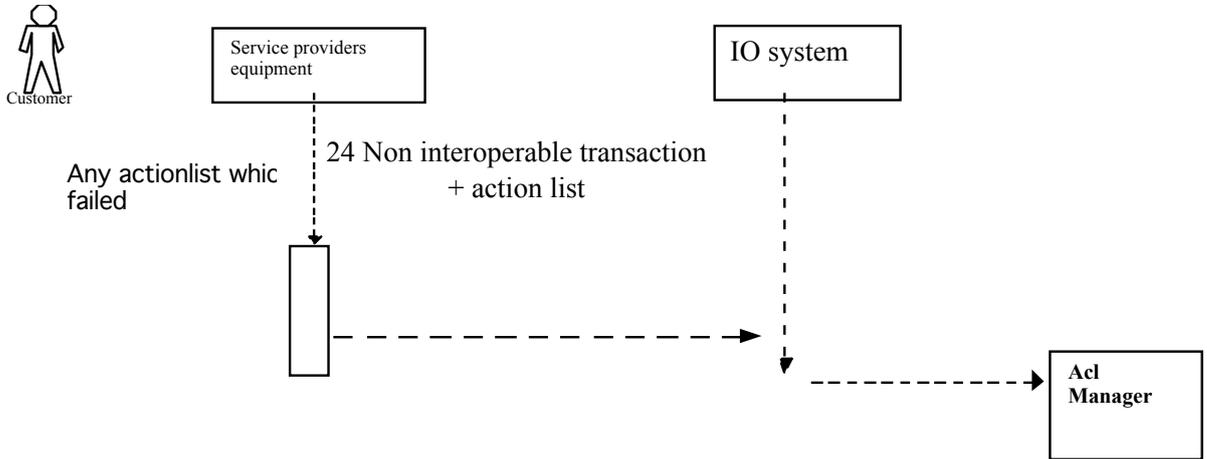
ActionListStatus = True

ActionListID = ActionListID

Whether the transaction status is 1(OK) or 2 (NOK) the transaction is forwarded to the ActionListOwner.



Transactions during Action List



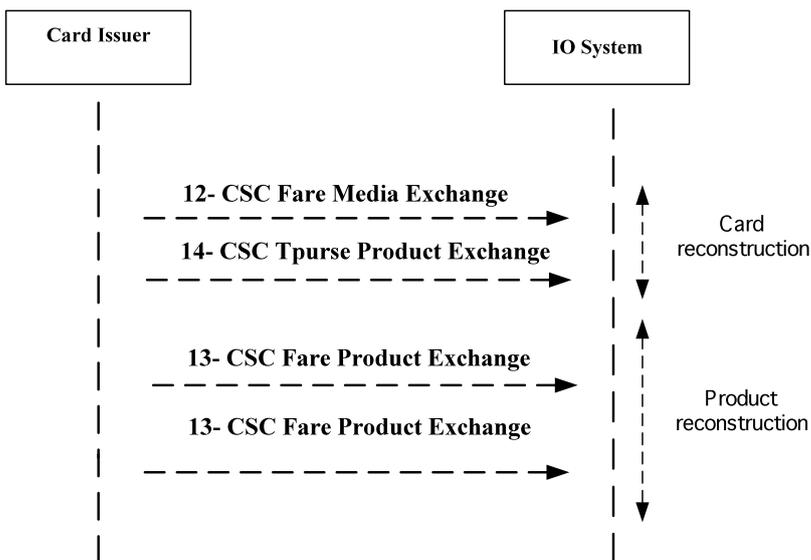
Transactions during Actilon List Processing continued

Service provider’s equipment concerned by the Use Case: e.g. Gate, Validator, etc.

Transactions during a Card Reconstruction

Use case: A customer asks for a Card reconstruction to a point of Service.

A set of transactions is generated.





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