



An overview of NORITS

Internal

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Document Revision History

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0.2	08-12-2004	Arild Skadsheim	Revised according to received comments and additional process descriptions
0.3	09-06-2005	Arild Skadsheim	Revision of procedures Integration of signage, organisation and operation General update

Definitions and abbreviations

ACFC	Collection and Forwarding Central – A; Regional central for the collection and distribution of data between regional issuers /operators in region A (Norway) and other regions in NORITS
ASECAP	Association Européenne des Concessionnaires d'Autoroutes et d'Ouvreages à Péage – Organisation of toll road operators in Europe
AutoPASS	The Norwegian specification for EFC-tolling
BCFC	Collection and Forwarding Central – B; Regional central for the collection and distribution of data between regional issuers /operators in region B (Storebælt and Øresund) and other regions in NORITS
BroBizz	The EFC-system used at Storebælt and Øresund.
CEN	Committee European Normalisation
CESARE	Common EFC System for an ASECAP Road Tolling European System
CFC	Collection and Forwarding Central; Central for the collection and distribution of data between issuers and operators
CS	Central System; The administrative data system used by operators and issuers
DSRC	Digital Short Range Communication
EFC	Electronic Fee Collection
HGV-register	Heavy Goods Vehicles register. A common register for heavy vehicles registered by the issuers
Issuer	The company that issues contracts (and distribute OBUs) that enables the user to pay with an OBU in the EFC-lanes at the NORITS operators
NCFC	Collection and Forwarding Central – NORITS; Central for the collection and distribution of data between the regions in NORITS
NORITS	NORdic Interoperable Tolling System
OBU	On-Board Unit
Operator	The operator of the individual toll station / toll system
PISTA	Pilot on Interoperable System for Tolling Application

1. Introduction

This document is primarily meant for internal use in the NORITS project. The intention is to give an overview of NORITS from a user perspective and to show the legal and institutional framework for the implementation of NORITS. The document also shows the technology and overall architecture of NORITS and the most important procedures related to customer relations and technical operation.

2. What is NORITS?

NORITS is a service offered to all users of toll collection systems in the Scandinavian countries. The service makes it possible for any user to pay the toll fee of any toll collection system in this area with the on-board unit he has received from his local issuer / toll operator. NORITS will be available from 2006 and will, from the beginning, include toll operators only. At a later stage NORITS will also include ferries, parking facilities and other transport applications.

3. The project

NORITS is a joint initiative between road authorities and toll road operators in the Scandinavian countries. The 4 partners involved in the project are



Fig. 1 The partners in NORITS

Norvegfinans (organisation of Norwegian toll road operators) and the Finnish Ministry of Transport take part as observers in the project group.

The project is organised in 6 workgroups, a project group and a steering group. The 4 partners are represented in the steering committee. The project organisation and the deliverables from the working groups are illustrated below:

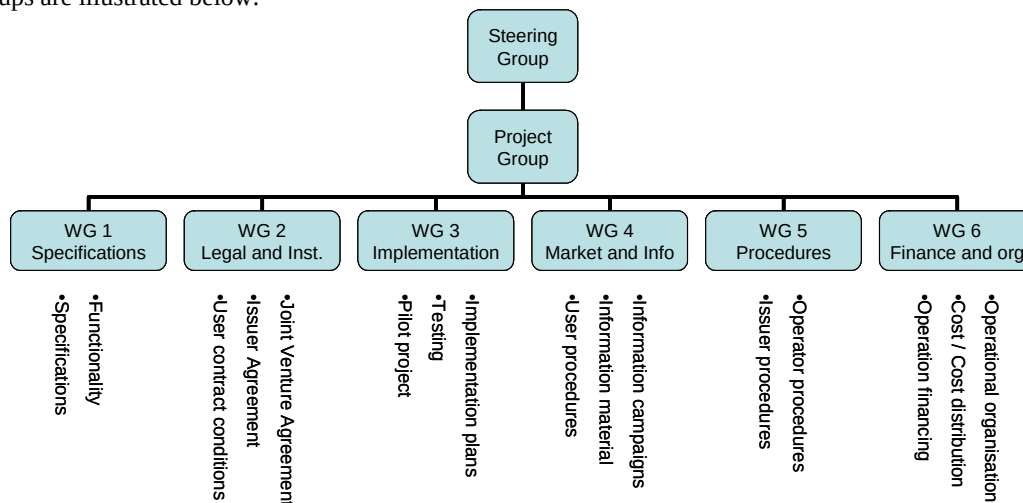


Fig. 2 The NORITS project organisation

A study carried out during the first half of 2004, confirmed the need for NORITS and the feasibility of the project. The organisation shown above was established in the summer of 2004. An extensive test period will take place dd/mm-yyyy and the opening of NORITS is planned for dd/mm-yyyy.

4. The user perspective

To the individual user NORITS is a new service offered by their local issuer. The user may use the OBU received from his local issuer as payment means in all other toll collection systems in the Scandinavian countries. Payment is debited the user's account / contract by his local issuer. This will provide increased convenience to the user when travelling by car in the Scandinavian countries. There will be no costs related to the use of NORITS except the toll fee.

The NORITS service will not require an application from the user or any other action. The contract with the issuer of the OBU will include a paragraph, stating that the use of the EFC equipment at "non-local" EFC installations automatically puts the NORITS service in operation. It will however, be possible for a user to make reservations against the NORITS service. In this case, the EFC equipment is regarded as non-valid at all foreign installations and manual payment is required.

There will be no specific NORITS-product. The user will automatically be debited a pre-determined price at the individual operator.

All NORITS users can use the dedicated EFC-lanes in the different toll stations, which makes it possible to pass without stopping or queuing. The use of signs, light signals and barriers as well as price may vary from one toll station to the other. However, a harmonisation is being carried out to minimize these differences. When receiving the invoice or overview from his local issuer, the user can find information about which transactions have been registered and the price debited for each transaction.

The user can always contact his local issuer with enquiries or complaints about invoices concerning toll fees or penalties from toll stations in Scandinavia. He may also choose to contact the operator concerning penalties, prices or other issues specific to the individual operator / toll station.

The user will have access to a NORITS website where he / she can obtain information about the local fees and regulations for all the operators / toll stations connected to NORITS. Information is obtained via the homepage of the local issuer with links to NORITS and the individual operator.

The Scandinavian toll operators and road authorities who have designed and implemented NORITS, are planning further development of the service. A later version will include other transport services like ferries and parking as well as making it possible to pay for similar services outside the Scandinavian countries. Some of the main benefits for the users are:

- No need for preparing the payment at each toll station. (What methods of payment are available? Which lanes do I use? What is the price for my type of vehicle? What currencies are accepted?)
- No queues or waiting times at the toll stations
- One contract with your local issuer is sufficient and will allow you to pay for all transport services that are a part of NORITS.
- Expenses to roads, ferries and parking in one invoice
- All questions and complaints can be handled by your local issuer

NORITS users will be charged in his own currency. If he has travelled in another country, the operator sends transaction data to the issuer in the operator's local currency. The issuer calculates the price for the user based on the exchange rate of the first day of the previous month.

Two of the NORITS-operators are located on the border between two countries. At the Øresund Bridge (between Sweden and Denmark), Danish users is charged in Danish Kroner and Swedish users in Swedish

Kroner. At Svinesund (between Norway and Sweden), Swedish users are charged in Swedish Kroner and Norwegian user in Norwegian Kroner.

In addition to the user benefits, it is important to focus on the positive effects of NORITS when it comes to minimising the queues caused by the payment systems in general and contribution to increased efficiency for the toll operators. NORITS will also give new valuable information on travel patterns within the limitations given by privacy considerations

It is important to acknowledge that the NORITS service is “nice to have” for the customer, but very seldom “need to have”. Therefore, it is essential, that the system appears simple to the user.

This means that the following issues must be solved:

- The user should always get a price that is no more expensive than the local users. It is essential that the NORITS system is not considered to be expensive. The user must have the possibility to make local agreements if he can achieve a better price by doing so. This is most often the case in systems where discounts are based upon pre-payment.
- In the event that a customer has a complaint regarding the use of NORITS in another facility, the customer service must be efficient and fast.
- NORITS is based on the principle “one vehicle – one OBU”. As this is not the case today at Storebælt and Øresund, user contracts must be redefined and considerations must be made to maintain the flexibility of the present solution.

4. Signs and information at the toll stations

There will be no specific signs for the NORITS service. The EFC-symbol used in both AutoPASS and BroBizz toll stations will be used to show that this toll station / this lane offer payment by NORITS OBU.



Fig. 3 The EFC-symbol used in NORITS



Fig. 4 The EFC-symbol integrated into the AutoPASS sign



Fig. 5 The EFC-symbol integrated into the BroBlizz sign

The signal lights used to indicate valid or invalid passages / transactions are different for the different operators.

5. Legal and institutional issues

Planning and implementation of an interoperable payment system, involves a number of actors and the roles and responsibilities that have to be agreed upon. The most important of these are:

Agreements and contracts

- The operators taking part in NORITS signs an agreement which states the conditions of the cooperation (The NORITS agreement)
- All companies issuing payment means accepted by NORITS operators must sign an issuer agreement with the NORITS operators. (The issuer agreement)
- New paragraphs must be added in the issuer's contract with the individual user describing the conditions under which the user can use his OBU as payment means in all NORITS facilities

The NORITS service

- The NORITS service will automatically be available for all users with a contract with any of the NORITS issuers.
- NORITS is based on the principle "one vehicle – one on-board unit".

Classification and price determination

- Each operator should determine the characteristics of the individual vehicle and decide the price to be charged
- There will be no "NORITS-product", but NORITS users is automatically charged a pre-determined price. This price will be different for different operator
- As a basis for calculating the correct price, all issuers will distribute a list of all heavy vehicles (called the HGV-register) extracted from their local contracts, to all operators offering the NORITS service

Local products, which offer the user a better price than the NORITS-price, will be available for an indefinite period. The user may use the same OBU for the two (or more) contracts, but will receive one invoice per contract.

Other conditions

NORITS is based on a number of international agreements, standards and directives of which the most important are:

- The EU-Directive on EFC
- The Directive 1999/62/EC on “the charging of heavy goods vehicles for the use of certain infrastructures” and the proposal dated 23, July 2003 for a revision of this Directive.
- The principles stated in the CESARE II specifications with additions and complements made in the PISTA project.
- The detailed documents and procedures produced in AutoPASS (national interoperability in Norway) will be an important input to NORITS.

In addition, NORITS will take action to influence the developments in the CESARE III project which are aiming at a further harmonisation of EFC-systems in Europe.

For the Stockholm toll collection project and the Swedish side of the Svinesund project, Swedish authorities have adopted / will adopt new legislation. The consequences of the new legislation must be taken into account to make practical common solutions.

6. Organisation and operational costs

Organisation

The illustration below is agreed as a principle for the operation of NORITS (oversettes evt. Til engelsk senere):

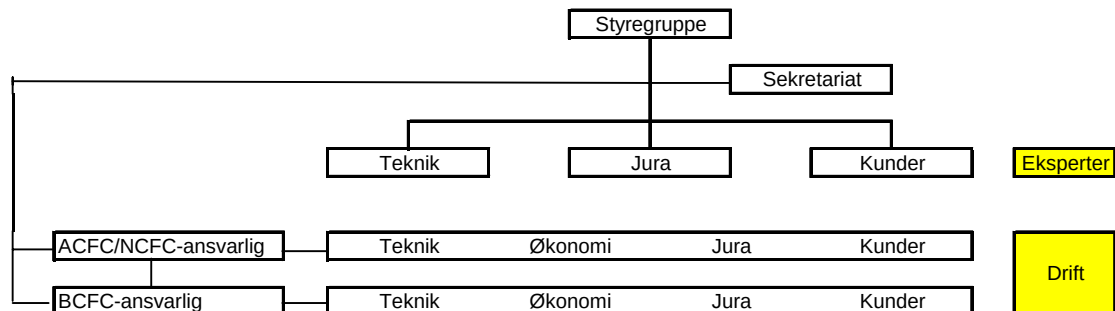


Fig. 6 NORITS operational organisation

The intention is that personnel already involved in similar activity perform the day-to-day operation. The new responsibilities will only moderately increase the workload of these personnel.

The steering group is responsible for the following tasks:

- Administration and evaluation of the operation of NORITS
- Responsibility for the development of technical systems
- Responsibility for development of the NORITS concept
- Manage and decide on applications and terminations of participation in NORITS
- External communication concerning general NORITS topics

- Financial control of NORITS including follow-up on cost-models
- Legal and institutional issues

The expert- and operation group will handle the day-to-day business as well as the development of NORITS. The responsibilities are divided into the following areas:

- Technology
- Legislation and contractual topics
- Customer relations
- Internal administration
- Implementation of new (types of) participants
- Reporting

The regional responsible manages the daily operation and the reporting of this to the steering group and should also manage the running co-operation between the regions.

Operational costs

The operational costs of NORITS are divided into three levels:

- Common costs at NORITS level (NCFC)
- Regional costs (ACFC and BCFC level)
- Local cost (the individual operator / issuer)

The following are the common costs of NORITS:

- Information to new issuers
- Information to new operators
- NORITS administration (Secretariat)
- Annual costs for development and evaluation

All other costs are covered regionally and locally.

The common costs per NORITS-transaction¹ is defined by the following formula:

Price per NORITS-transaction = (Fixed costs operator n / no of NORITS-transactions at operator n) + (variable costs operator n / no of NORITS-transactions at operator n)

Variable costs operator n = (Sum variable costs / total no of NORITS-transactions) * No of NORITS-transaction at operator n

Fixed costs operator n = Total fixed costs / No of operators

If all costs are defined as variable, a fixed price per NORITS-transaction is achieved. This will benefit the smaller operators.

¹ A NORITS-transaction is a transaction where the data is transferred via the NCFC. That means that a regional transactions are not NORITS-transactions.

To compensate the issuers for the increased credit risk and the increased customer relations including invoicing etc. an issuer fee is to be defined.

7. Technology and Architecture

Technology

From the implementation of the first electronic toll collection systems more than 15 years ago up to now, each project has been planned separately and the choice of EFC-systems has mainly been based on price and performance. Interoperability issues have rarely been discussed. However, interoperability has later become a major issue and although there are several products on the market it is now possible to make these systems work together. The following principles regarding technology in the NORITS project have been defined:

- On-board units should be based on the CEN TC278 DSRC standard
- NORITS operators should be able to read on-board units issued according to the three following specifications:
 - o PISTA specification / Swedish EFC-specifications
 - o BroBizz-specification
 - o AutoPASS-specification

Approximately 1.250.000 on-board units in total are already in operation in the Scandinavian countries. Up to 500.000 on-board units are planned for distribution in the Stockholm toll ring trial project to be opened January 2006.

The NORITS-project will define contents and formats of interfaces needed to exchange the necessary data between the involved issuers and operators in NORITS. These specifications are largely based on the work carried out by the EU-funded CESARE II project and the PISTA-project run by ASECAP.

Architecture of NORITS

The general architecture of NORITS is illustrated below

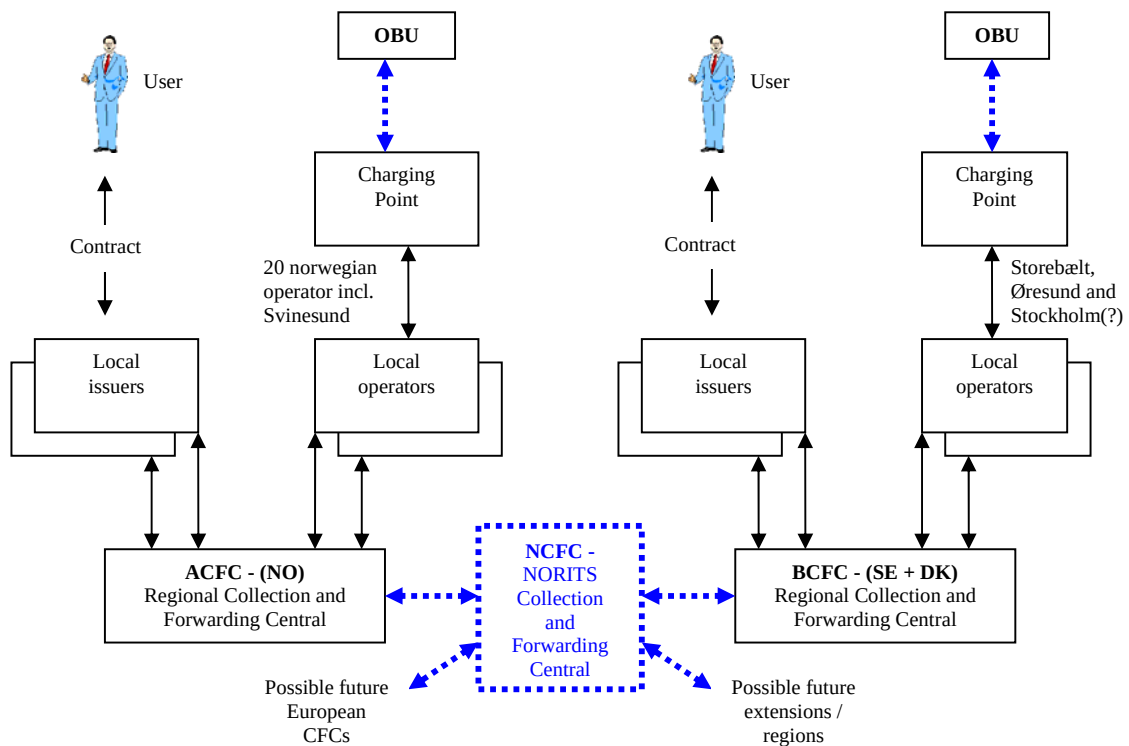


Fig. 7 The NORITS architecture

The ACFC is already in operation in Norway and more than 20 operators (/ issuers) are connected to this central. The new Svinesund project will be connected to the ACFC. The BCFC must be implemented in co-operation between Sweden and Denmark. The three projects Storebælt, Øresund and Stockholm should be connected to NORITS via the BCFC and local clearing between these three companies will be done by the BCFC. All local central systems and charging points must be upgraded to be able to communicate in accordance with the NORITS interfaces and procedures.

The NORITS specification describes the following three elements [\(shown in blue dotted lines\)](#):

- Common functionality (NORITS Collection and Forwarding Central = NCFC)
- Interfaces when connecting to the NCFC
- Interface between OBU and Charging Point

There are a few principles that are important to observe:

- All operators, issuers and regional CFCs that will be a part of NORITS, must implement the interfaces included in the NORITS-specification
- Clearing between issuers and operators is done bilaterally. The collection and forwarding centrals are only forwarding data and do not include clearing functionality.
- Clearing between issuers and operators in the same region is carried out locally, and data is

forwarded through the regional CFC. No data is distributed via the NCFC

- In the illustration above, issuers and operators are two separate entities. Today most toll operators are also issuers of their own OBUs. The specification is however made general to allow for a development where some operators choose not to issue OBUs (example Svinesund) or the role of issuing OBUs is handled by separate entities.

8. Technical procedures

NORITS consists of three main technical processes. These are:

1. Distribution of parameters
 - a. Licensed issuers authorized by the NORITS organisation
 - b. Toll station tables from the individual operator
2. Distribution of validity data
 - a. Status lists from AutoPASS issuers to all operators
 - b. Blacklists from BroBizz and PISTA issuers to all operators
 - c. HGV-register from the individual issuer to all operators
3. Registration of transactions and payment
 - a. Transaction data from operator to issuer identified by on-board unit
 - b. Confirmation of transaction data from issuer to operator for each set of transaction data received

Each of these three processes is described below:

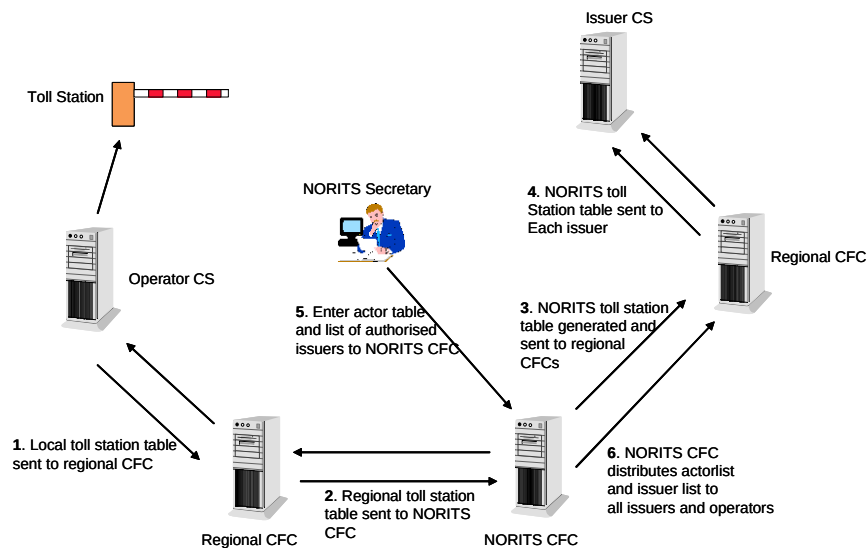


Fig. 8 Distribution of parameters

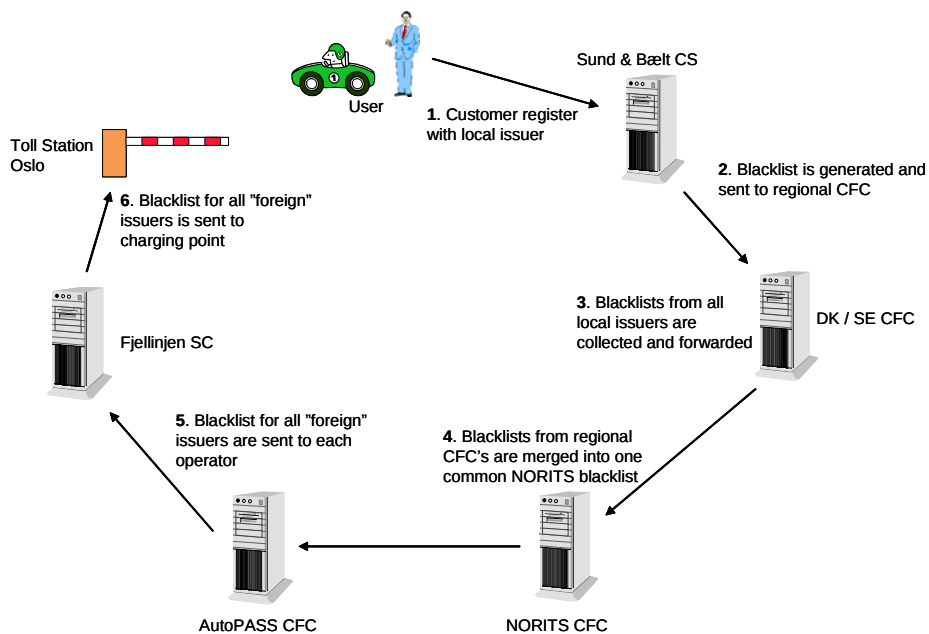


Fig. 9 Distribution of validity data

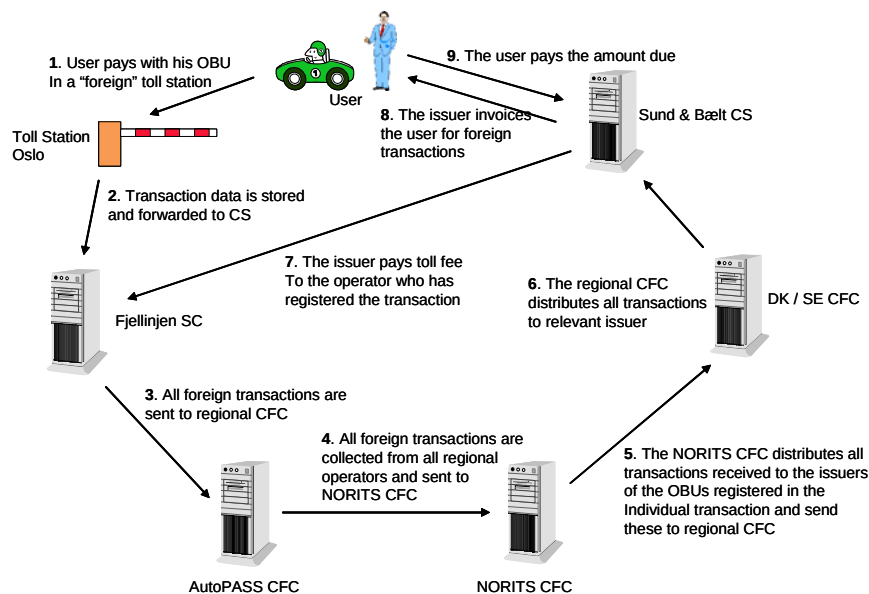


Fig. 10 Register transaction and payment

In addition, procedures will be developed for the following functions:

- Surveillance of NORITS functionality
- Detection of errors in data exchange
- Correction of data being exchanged
- Detection of errors in the system and corrective action
- Reporting of operational data (traffic, value, errors etc)

9. Customer relations procedures

Only procedures specific to NORITS are described below.

Normal NORITS transactions

The most important procedure is describing what takes place when a user with a valid on-board unit passes through the toll station of a NORITS operator:

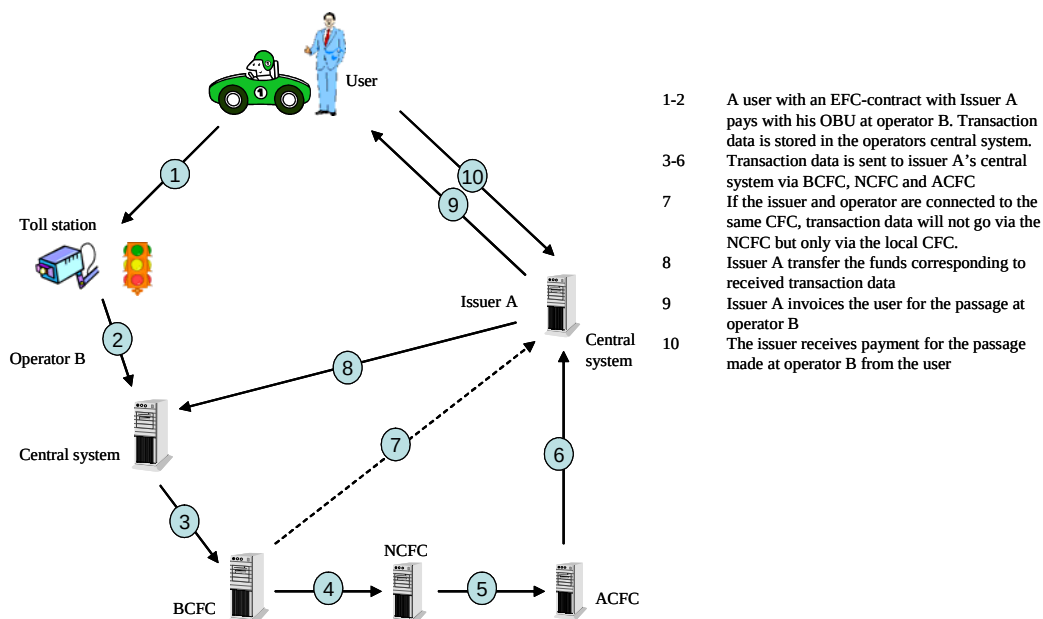


Fig. 11 A normal NORITS transaction

Below, descriptions of situations where NORITS users with a (valid) contract are disputing transactions or violation fees are shown. The following disputes are identified:

- The user has received a violation fee from an operator even if he claims to have a valid contract
- The user has been debited a transaction even if he claims that he was not “there” at the time given
- The user claims he has been debited a wrong price (vehicle class, discount, electric car etc)
- As long as the principle “one vehicle – one OBU” is not introduced I Denmark / Sweden, there will be claims that they had an OBU but it was not read (can be agreed with neighbour or colleague to avoid violation fee).
- A NORITS-transaction has been debited even if he has an additional contract with the operator where the passage took place

There are more situations than those described above, but these are considered less important (few in numbers). Each situation is described I more detail below:

Principle: If the user contacts the operator, the operator should handle the complaint unless the user himself, decides to make direct contact with the issuer

If the user contacts his issuer, the issuer should handle the complaint unless the user himself, decides to make direct contact with the operator

Only in cases where legislation or agreements prevents the execution of the principles stated above can the operator refer the user to the issuer or vice versa.

The user receives violation fee when he claims to have valid contract

This situation can occur from the following reasons:

- i) OBU has not been read correctly, or the OBU was not correctly installed
- ii) The user has a contract with a non-licensed issuer
- iii) The issuer has not updated validity lists correctly
- iv) The operator has not updated the validity lists correctly
- v) The user has not fulfilled contract obligations and has been blacklisted

iii) and v) must be documented by the issuer, i), ii) and iv) must be checked by the operator.

The following procedure is used:

1. The issuer / operator receive a complaint on the violation fee.
2. The user is asked to clearly identify his contract (OBU-no., contract no. license plate no, name etc) and the time and location of where the passage took place
3. The operator / issuer register the complaint as a “case”
4. The following is checked:
 - a. Does the user have a contract with a valid issuer? (answered by issuer)
 - b. If yes, was the contract valid when the passage took place? (answered by the issuer)
 - c. If yes, does the contract data match the vehicle data in the violation fee? (answered by operator)
5. If the user is correct in his claim, the violation fee is reimbursed from operator to user and a “normal” transaction is generated from the operator to the issuer.

The user is debited a transaction when he claims he was not “there”

The following procedure is used:

1. The issuer / operator receive a complaint on toll fee.
2. The user is asked to clearly identify his contract (OBU-no., contract no. license plate no, name etc) and the time and location of where the passage is supposed to have taken place (information given in the transaction invoice)
3. The operator / issuer register the complaint as a “case”
4. The following is checked:
 - a. Does the passage have a corresponding picture and / or transaction data? (answered by operator)
 - b. If yes, does the picture / transaction data match the vehicle data / contract details of the user? (answered by issuer and operator)
5. If the user is correct in his claim, the fee is reimbursed from operator to issuer and from issuer to user

The user claims he has been debited a wrong price

This situation can occur from the following reasons:

- i) The vehicle is debited the price of a heavy vehicle in stead of a light vehicle
 - 1. The user has registered the wrong vehicle class in the contract
 - 2. The issuer has registered the wrong vehicle class from the contract
 - 3. The operator has measured wrongly or used the wrong data when deciding vehicle class
- ii) The vehicle is given the wrong discount
- iii) The vehicle should be exempted toll fee

i1) and i2) must be documented by the issuer

i3), ii) and iii) must be documented by the operator.

The following procedure is used:

1. The issuer / operator receives a complaint on the price
2. The user is asked to clearly identify his contract (OBU-no., contract no. license plate no, name etc) and the time and location of where the passage is supposed to have taken place (information given in the transaction invoice)
3. The operator / issuer register the complaint as a “case”
4. If the user claims a wrong price, the following must be checked:
 - a. From which source is the vehicle class decided? (must be answered by operator)
 - b. If vehicle class received from issuer, what does it say?
 - c. If the issuer says light vehicle, the transaction should be reversed and a new transaction generated. It should also be investigated how the error could occur.
 - d. If issuer says heavy vehicle, the issuer must confirm that i1) or i2) is the case before transaction is reversed and a new transaction generated. If so, the issuer must also correct his contract data.
 - e. If the operator generates the vehicle class, he should check his transaction data against the claim of the user.
 - f. The discount given must be checked against the
5. If the user claims a wrong discount, the following is checked (by the operator):
 - a. What are the conditions for discount at this operator?
 - b. How has the user fulfilled these conditions (number of trips within a given period, second trip within a given time etc)?
 - c. How does the user claims match the operators’ documentation?
6. If the user claims that his vehicle is exempted all toll fees, the following is checked by the operator:
 - a. What is the criteria for exemption?
 - b. Does this user / his vehicle meet these criteria?
7. If the user is correct in his claim, the wrong toll fee is reimbursed from operator to user and a “normal” transaction is generated from the operator to the issuer.