ACCEPT Institute

Horizon 2020 ETC 636126

Final Report

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Deliverable 1.3

30 April 2018

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 636126.

1 Introduction

1.1 Introduction & Summary

This document describes Deliverable 1.3 Final Report and is part of work package 1 '*Project Management, Program Office & Reporting*'.

Objectives

The objective of work package 1 is the management of the whole program.

Summary

This deliverable provides an overview of the work carried out in the ETC project and its results. The 'technical report' is the basis for this deliverable.

2 Content

3 Explanation of the work carried out by the beneficiaries and Overview of the progress

Below we have explained the work carried out during the period 1st of November 2016 and 30th April 2018. Next to project results towards the objectives, we have including a summary of the deliverables and milestones and how results can be exploited[1].

3.1 Objectives

The objectives of our ETC programme are focussed on the development and initial piloting of interoperable Account-Based Travelling, more in particular:

I. **Organization.** The eco-system and governance structure must be developed prudently with support of both the schemes and the travellers (organizations) in order to be acceptable to all stakeholders. The objectives of this work package are:

- to explore and describe **an open eco-system**;
- develop and implement the **European Travellers Club (ETC)** as a not-for-profit organisation;
- support **knowledge sharing** and innovation among all stakeholders;
- provide policy makers with **economic analyses**.

See work package 3 for the results regarding these objectives.

II. **Privacy**, put the travellers in control of their data. The objectives of this work package are:

- to select technologies and develop processes that give travellers full control of and direct access to their profile and transaction data, while limiting the data that any service provider can collect on an individual customer to only those transactions with that specific service provider for which the customer has agreed to be known.
- develop the requirements, standards and audit procedures for the implementation of next-generation privacy concepts that each national or regional member of the ETC will have to adhere to.

[1] Beneficiaries that have received Union funding, and that plan to exploit the results generated with such funding primarily in third countries not associated with Horizon 2020, should indicate how the Union funding will benefit Europe's overall competitiveness (reciprocity principle), as set out in the grant agreement.

See work package 4 for the results regarding these objectives.

III. The **European Travel Lab**, with the following objectives:

- to develop use cases for travellers and to test technologies and equipment for the pilots.
- to support knowledge sharing and innovation between stakeholders and promotion of the concepts developed.

See work package 5 for the results regarding these objectives.

IV. **Authentication and Routing Hub**. The purpose of this work package is:

- to develop an extremely fast and secure authentication and routing hub and make it available at low costs to all members of the ETC.
- to develop a connectivity layer between hubs.
- to develop standards and requirements for those traveller clubs that wish to develop their own local, regional or national hubs.

See work package 6 for the results regarding these objectives.

V. **Interoperable ID-Layer**. Aims to provide the technological means for transport ticketing schemes to cost-effectively cross-accept and authenticate fare media issued by other transport ticketing schemes. The objectives of this work package are:

- to develop a new release of the open specification of the Generic Secure Token (GST);
- to implement on standard RfID chips that are widely used in public transport;
- to make a reference implementation for terminal suppliers;
- to describe all interfaces and set up certification;
- to make this technology available at no costs to all chip manufacturers and terminal manufacturers, or their clients;

See work package 7 for the results regarding these objectives.

VI. **Interoperable Accounts Systems**. The objectives of this work package are:

- To explore and describe a trust-framework for transport operators in which they can trust the accounts of travellers with third party agencies, including those from other countries or regions, without the need to sign up such customers themselves.

- To develop the standards needed for interoperability of such account systems, such that transport operators can inspect the rights of travellers to use their services.

- To integrate and demonstrate such systems within our Lab environment and pilots.

See work package 8 for the results regarding these objectives.

VII. Interoperable Traveller Interface. The objective of this work package is:

- To develop technological standards and connectivity for members of the ETC to seamlessly and cost-effectively integrate the online booking, payment and ticketing services of clubs from other regions and countries for their member travellers, which they continue to serve in their own language and according to their own preferences.

See work package 9 for the results regarding these objectives.

VIII. Pilots. We foresee three initial Pilots. The specific objectives per initial pilot are the following:

- Germany: To demonstrate Account-Based Travelling for both regional and cross-border travellers on the basis of on-line planned and booked tickets.

- The Netherlands: To demonstrate Account-Based Travelling for both regional and cross-border travellers on the basis of Pay-As-You-Go and Post payment propositions.

- Luxembourg: To demonstrate the integration of transport and non-transport services (such as parking) through Account-Based Travelling.

See work packages 10, 11, 12, 13 and 14 for the results regarding these objectives.

4 Explanation of the work carried per Work Package

4.1 Work Package 1: Project Management, Program Office & Reporting

The (day-to-day) management of the program is the main task in work package 1. This task is done by Accept (formerly OTI).

The first months of the program were used to set up the office in which the program director and the program officer (both from Accept) are working. This is one of the main tasks of Accept as coordinator of the program.

The first 3 tasks were to draft the Inception Report (submitted in month 2), the Program Plan (submitted in month 3) and the online portal (website of the ETC), which was launched in month 6. The 2 remaining deliverables, close-out report and final report are part of the second reporting period. The close-out report was delivered in month 36 and this document reflects the final report of the ETC.

In total we had 9 progress meetings during the first reporting period. In the second reporting period we had 12 progress meetings all organised, chaired and minutes made by Accept Institute. During these meetings (either face-to-face, or via conference call) progress was discussed with all consortium partners. Below an overview is presented of the meetings and what was discussed:

- 2 March 2017, to discuss eg. the overall status and the mid-term meeting results;
- 12 April 2017, to discuss eg. ETC council and e-TSAP and status of the mid-term meeting results;
- 22 May 2017, to discuss overall status and test- and evaluation plan;
- 6 July 2017, to discuss overall status and finalisation of the mid-term review;
- 10 August 2017, to discuss overall status and end-to-end testing in Germany;
- 27 September 2017, to discuss overall status and preparation of the start of the pilots;
- 10 November 2017, to discuss overall status, coordinators meeting in Brussels;
- 14 December 2017, to discuss overall status and meeting 30th January 2018;
- 18 January 2018, to discuss overall status and meeting 30th January 2018;
- 16 March 2018, to discuss finalisation the pilots;
- 4 April 2018, to discuss finalisation of the project and meeting 6th of June;
- 15 May 2018, to discuss final report[2]
- 28 May 2018, to discuss the final report and the final meeting in Brussels on 6 June 2018[3].

[2] This was a conference call after end of action: no costs are claimed.

Next to above mentioned progress meetings we also had several bilateral meetings and, or calls with consortium partners to discuss progress. Specifically, with VDV-ETS, AVV and TLS a lot of meetings took place between January 2017 and November 2017 in order to prepare for the pilots (part of pilot preparation and evaluation). With UL we had a monthly (sometimes every 2 to 3 weeks) progress call to discuss progress on their work packages.

In month 6 (previous reporting period) we launched the website of the ETC: www.europeantravellersclub.eu. In the following months and years this site has been used to present progress, invite (potential) pilot participants, share press releases etc. The site is also used to explain the ETC concept and to publish results of the program. These results and documentation will be published after finalisation of the project.

Amendment

In the previous reporting period an extension of the project of 12 months was asked for in order to be able to execute both the pilots in The Netherlands and Germany. These two Pilots are the core of our development to realise the concept of our program: Account-Based Travelling (ABT). This extension was awarded by the European Commission on 4th of October 2016.

Change of name of Open Ticketing Institute

End of 2017 the Open Ticketing Institute changed its name to Accept Institute, **ACC**ount-based ticketing for **E**uropean **P**ublic **T**ransport. The legal status remains the same, a not-for-profit entity (foundation). This was also communicated to the EC prior to the coordinators workshop on 11th December 2017.

4.2 Work package 2: Quality Assurance

The purpose of Work package 2 was to ensure Quality Assurance (QA) of the entire programme. One side of QA was to check the quality and consistence of the specifications and the other side was the verification of relevant work packages. For this work package, UL (as lead beneficiary) carried out the following activities during the first reporting period:

- Development of a Master Test Plan,
- Development and execution of a set of end-to-end test cases for the Luxembourgish pilot.

During the second reporting period, the following activities were carried out:

- Development of end-to-end test cases for the German and the Dutch pilots in order to be used in the different stages of testing: lab-testing, pre-pilot testing and in the pilot itself;
- Execution of end-to-end testing for the abovementioned pilots; and
- Reporting the results to both The Netherlands and Germany.

Next to the activities carried out by UL, also Accept performed activities with reviewing the documents provided.

4.3 Work package 3: Set up ETC Governance & Franchise Network and Knowledge Sharing

In this work packages the tasks and activities were carried out by Accept. We worked on the set-up of the ETC as not-for-profit organisation and the description of the interoperable scheme which is envisaged. The first goal of our program focusses on organization (see paragraph 1.1 of this report), with specific objectives: (a) to explore and describe an open eco-system, (b) to develop and implement the ETC as a not-for-profit organisation, (c) to support knowledge sharing and innovation among all stakeholders, and (d) provide policy makers with economic analyses.

During the first and second reporting period Accept, as lead beneficiary, worked on the set-up of the European Travellers Club (ETC) as a not-for-profit foundation. Next to the partners in the consortium, other potential 'users' of the ETC-system were identified and asked to join the ETC. This resulted in the set-up of the ETC-Council, now called the Accept Advisory Council (see below).

ETC-Council → ACCEPT Advisory Council

This Council is described in the Grant Agreement and acts as an advisory body to the program and the actual set-up of the ETC as an entity. In the ETC-council directors of the following authorities and companies are present:

1. Trans Link Systems (The Netherlands),
2. Verkéiersverbond (Luxembourg),
3. Transport Scotland (Scotland UK),
4. National Transport Authority (Ireland),
5. Rejsekort A/S (Denmark), and
6. ITSO Ltd. (UK). They joined the Council as of 2017.

By April 2018 the Council has 6 members.

In the first period the Council met 5 times. In the second reporting period, the Council also met 5 times. Accept was responsible for the organisation of the meetings, follow-up and meeting minutes:

- On 8th and 9th of November 2016 in Rotterdam, The Netherlands to discuss the status of the ETC program, the business plan and the mid-term review report;

- On 4th of April 2017 in Dublin (Ireland) to discuss the status of the ETC program and the set-up of the entity (governance model) in order to continue with the results of the ETC. Such an appropriate governance model consists of two tiers:
    1. an association of schemes to decide on standards for interoperability between schemes; and
    2. a support centre to maintain these standards and provide interoperability support.

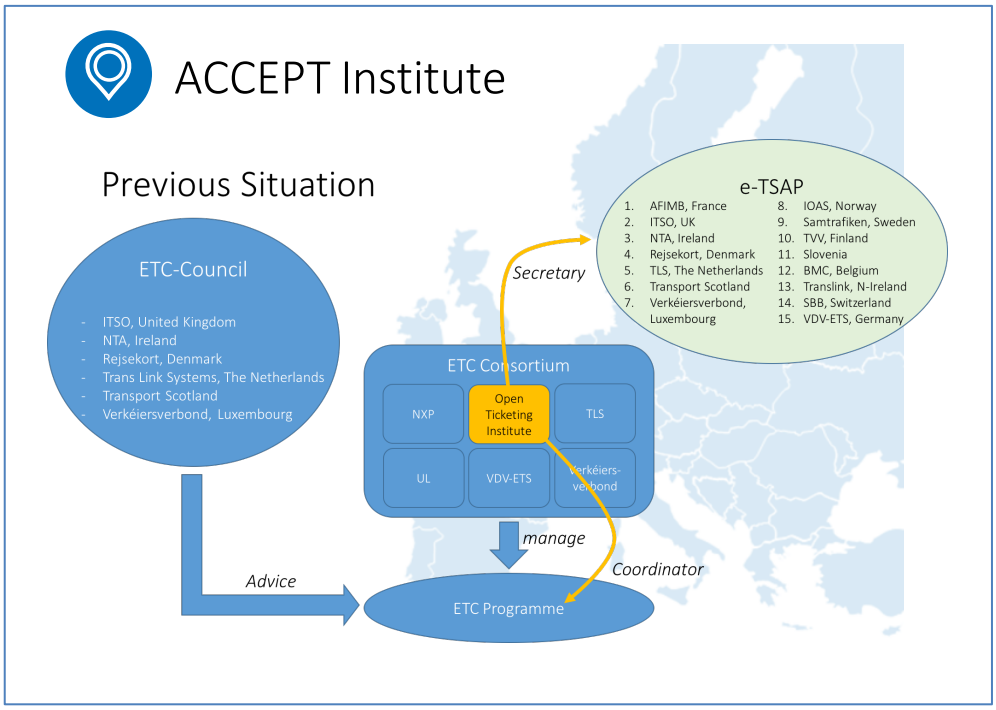
Furthermore, the Council was asked to advice on the name, the legal structure of the entity and the use of existing organisations like the Smart Ticketing Alliance, e-TSAP and OTI.

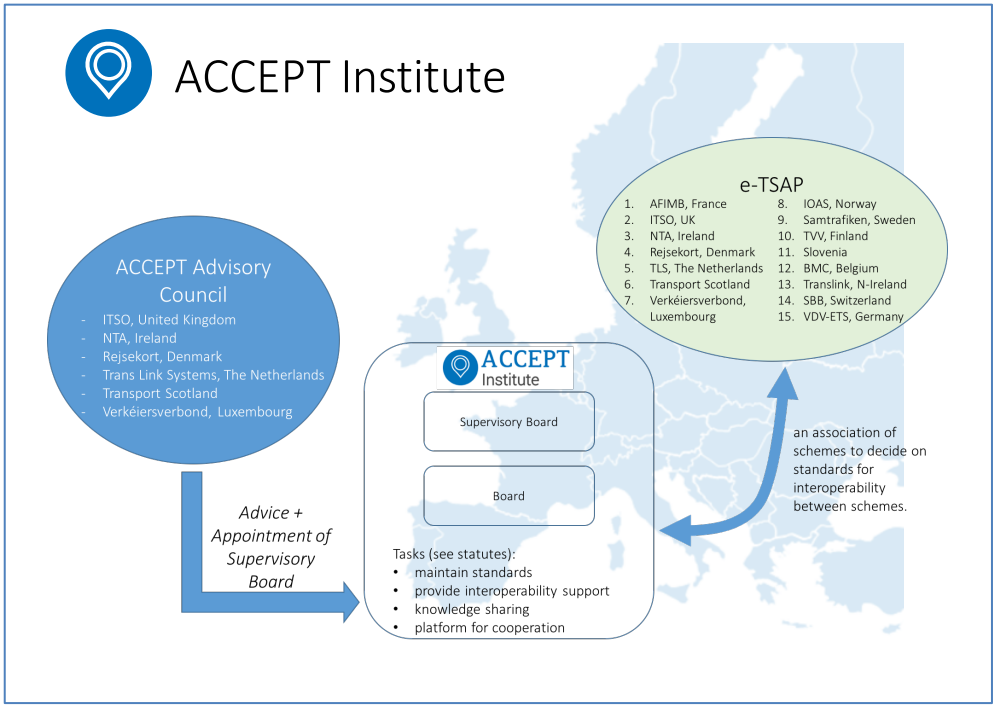
- On 3rd of October 2017 in Helsinki (Finland) to discuss the status of the ETC program, set-up of Accept and new statutes of the Council;

  As stated in the first reporting report, in April 2016 we finalised the statutes for the ETC-Council. In the Helsinki meeting we changed these statutes following and according to the set-up and objectives of the Accept Institute. Next to some changes the Council was renamed to the Accept Advisory Council. The members remained the same.

  Furthermore, we invited members of the Accept Advisory Council to advice on persons for the Supervisory Board of the Accept Institute.

  Please find below an overview of the new governance structure:





Please note, that as of 2018 the Roads & Transport Authority (RTA) of Dubai also joined e-TSAP. So in total e-TSAP now has 16 members.

- On 29th and 30th of January 2018 in Aachen (Germany) to discuss status of the ETC program and visit the pilot location in Germany/The Netherlands; and

- On 19th of April 2018 in Bern (Switzerland) to discuss the results of the pilots, the association of schemes and next steps of Accept.

  It this meeting it was decided to incorporate e-TSAP. Furthermore, it was decided to ask e-TSAP to follow-up on the discussions with Smart Ticketing Alliance towards cooperation between the two bodies and the set-up of working group with regard to account-based travelling. This is outside the scope of the original DoA and not funded through this Grant.

e-TSAP

In this reporting period Accept organised 4 conferences with the e-TSAP association and 1 workshop (visit to the pilot location). Accept was responsible for the organisation and also acted as chair during the conferences. Accept was also responsible to follow-up on action points and management of the website of e-TSAP.

e-TSAP is the e-ticketing schemes association in public transport (currently, by April 2018, 16 e-ticketing schemes (authorities) are a member of this association), see also www.e-tsap.net. During the e-TSAP conferences the status and work delivered of the ETC program was shared with all participants and feedback was asked.

Below an overview is presented of the e-TSAP conferences:

- e-TSAP conference in Rotterdam, The Netherlands, on 9th and 10th November 2016;
- e-TSAP conference in Belfast, Northern-Ireland, on 5th and 6th of April 2017;

- e-TSAP conference in Turku, Finland, on 4th and 5th of October 2017; and
- e-TSAP conference in Bern, Switzerland, on 18th and 19th of April 2018.
  In this conference the formalisation and incorporation of e-TSAP towards a separate entity was discussed and agreed upon. Following that, e-TSAP has drawn up its own statutes and continued its discussions with the Smart Ticketing Alliance on further cooperation between the two.

Next to these conferences all members of the e-TSAP were invited by Accept to the pilot location in Aachen/Heerlen/Maastricht on January 30th 2018. This day was organised by Accept, together with the pilot partners to explore cross-border account-based travelling and to ask for feedback on our concept. In total approximately 40 people from all over Europe attended.

Open Ticketing (now Accept Institute) acts as the secretary to the e-TSAP.

As stated above the ETC (under guidance from Accept) started talks with the Smart Ticketing Alliance (STA) in order to align the work done on account-based ticketing (ABT) and define possible ways of cooperation. A first result is a joint working group with a focus on ABT, which will have its first meeting end of 2018. This will further continue in the next coming months. Note however that this workshop and possible other cooperation is not part of the DoA and not covered by this Grant.

In the first reporting period the first meeting was held with the board of the European Passengers Federation (EPF) in Amersfoort, the Netherlands. This is important to the ETC, because we want to include input from the end-users, the passengers. In March 2017 we presented the ETC concept to the EPF in their conference in Rotterdam. We will continue to work together. This is not part of the Grant however.

4.4 Work package 4: Define & Plan for Traveller-in-Control Privacy Solutions

The activities of Accept focussed in the second period on drafting the specification documents and examples on how to include those into contracts. The principles of privacy are also incorporated in the EcoSpace Core solution of Accept, where only tokenIDs are stored and no account information. This important split is essential and implemented in the ETC systems. Rules for the members of the ETC scheme have been set, but need to be incorporated in real member ship agreements.

The goal of the Privacy Solution of the European Travellers Club (ETC) is to maintain a relation based upon long-term trust from both its travellers as its traveller organisations. As guiding principles for privacy we have defined:

1. separate profile data from transaction data. In other words: the identity platform does not store any transaction data;
2. provide transaction data to service providers only on “derived identities,” so that service providers cannot build a complete profile of the travellers;
3. only travellers are in the position to combine all their data in their own data vault, where they can decide how long they wish to store which kind of data and what kind of analyses they allow to be performed on that data.

The guiding principles can be captured in our view regarding the traveller: Put the traveller first. All decisions affecting Travellers need to be evaluated from the perspective of the Traveller; where possible Travellers must be in control of their own data; the participation of Travellers or their representatives in the governance structure is actively promoted.

The Traveller-in-Control privacy solution design should protect the traveller (the data owner and/or data subject) from insecure system design that allows leakage of personal data and transactional data pertaining to travel, payment, journey planning, and other service subscription. It should also prevent linkage attacks on anonymized data sets thereof and mitigate data theft from cloud storage facilities through zero-knowledge cloud storage techniques.

The Traveller centric privacy solution should incorporate user experience design to ensure that the use of the product is intuitive in design and simple in operation. Allowing a typical traveller to take control of their data and share it only after explicitly opting in for services that offer some tangible return value for the sharing of data via a trusted proxy. Shared data must be scrubbed for the purpose at hand and watermarked to aid in discovery of parties who re-purpose data in contravention of their data processer agreements with ETC.

In the first phase of the program we have defined the following high-level requirements regarding privacy:

1. separation of roles, between an Identity Platform and various service providers, with derived identities per service provider.

2. traveller-in-control, meaning that:

    - the traveller remains the owner of all profile data, and decides what profile data is to be shared with which service provider (not every service provider needs to know the identity of its clients), and

    - all transaction data from every service provider is fed back to the traveller, who can decide on its storage and use by third parties.

Next to these requirements we have also defined 2 other requirements, which have not yet been implemented in the ETC system. Setting the requirements was part of the original DoA, and providing the relevant information for the implementation also. Making sure that the central EcoSpace Core can support these requirements. The 2 other requirements are:

1. private Data Vaults in which a traveller can store his or her own data securely, and – for the future – Zero Knowledge Data Storage, in which that data is stored in a distributed, anonymous and encrypted way, such that a third party cannot reconstruct the data without approval of the traveller.

2. privacy Service Management, as a separate role, to translate third party data requests into executable proposals to Travellers in the most privacy- friendly way.

We will discuss these further with travellers and representatives (like the European Passengers Federation), to identify its relevance and with potential suppliers of Data Vaults and Service Management to implement this in the near future. This work will however not be funded by this Grant.

Next to these requirements we have defined guiding principles for privacy and set design requirements for member schemes of the ETC.

In deliverable 4.2 and 4.3 the Smart Privacy Requirements or regulations for the ETC-system are presented. These requirements, or regulations are examples of the clauses that should be included in ETC agreements between parties pertaining to the use of personal data.

4.5 Work package 5: Expand Travel Lab & Develop Use Cases

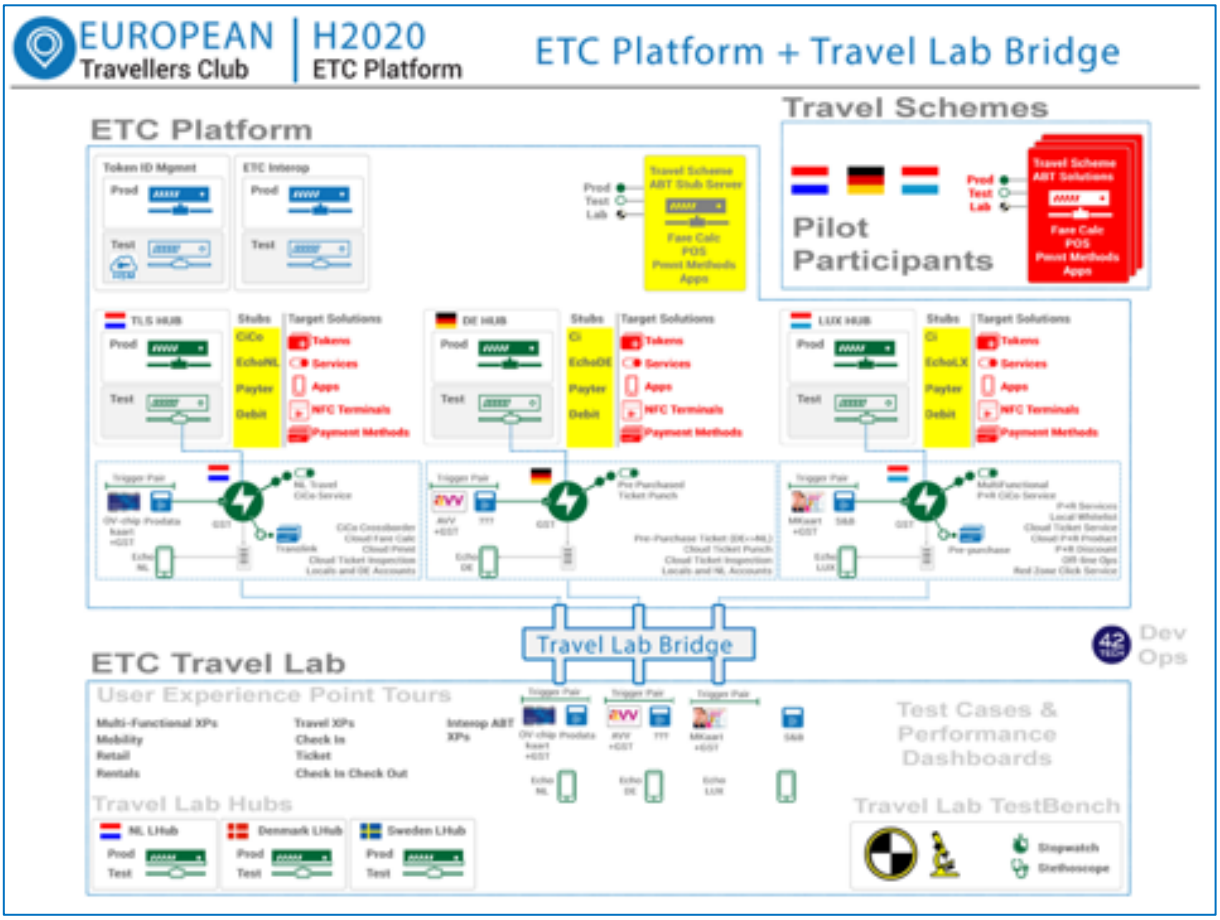
Accept was responsible for the set-up, extension and management of the ET-Lab. In the first phase the Lab was implemented in its current state and in the second phase the Lab was mainly used for test- and demonstration purposes. There are no specific deliverables in the second phase of the project, but a lot of activities took place in the ET-Lab. We used the Lab for testing the pilots and its use cases in Germany and the Netherlands and we used the Lab to demonstrate the functionality of the ETC systems to different stakeholders.

Goal of this work package is to use the European Travel Lab (ET-Lab) to support development of reliable real-world prototypes, specifically connected Account-based Travelling (ABT) solutions featuring a multitude of moving parts, that are based on the ABT use cases required for the three pilots in the 3 countries.

In the first reporting period the ET-Lab was set-up to an integrated test- and demonstration facility. A secure cloud based authentication and routing Hub was added to extend the ET-Lab environment to the net and securely connect it with the three test environments for the 3 pilots. This is used for integration and testing of the ‘local’ travel services, local front-end equipment and payment methods in the ET-Lab. With local travel services we mean transport related services like a ticket stock used to store your travel right, or price calculation engine used to calculate a price for a trip in the back-office (or cloud). With front-end equipment we mean the equipment that is used in the pilot environment, like validators in a bus.

For the pilots in The Netherlands and Germany the set-up in the ET-Lab has been tested prior to start of the pilot. For the pilot in Luxembourg this was done in the previous phase of the project.

The staging server, delivered in month 3, is used to integrate the central systems with the authentication and routing Hub, see picture below.



The ET-Lab test bench is extended to monitor all net based segments in the chain of an end-2-end ABT 'roundtrip'. Thereby aiding participating development teams in the speedy discovery and identification of issues within individual segments.

With above development the ET-Lab is now a working test environment for multi-party iterative design, refinement of account creation, integration of travel & multifunctional and payment services, benchmarking of terminal hardware and embedded software and the vetting of the multi-token token IDs (see work package 7) for the three separate pilots.

The ET-Lab also functions as a showcase, or permanent exhibition, for displaying ABT use cases, and a meeting centre for the sharing of knowledge. We have invited several authorities, operators and e-ticketing schemes to visit our ET-Lab and explain the ETC program. Examples are:

- the Dutch Ministry of Infrastructure and Environment,
- European Passenger Federation,
- Connexxion (Dutch Public Transport Operator),
- Belgian public transport operators and the Belgian Mobility Card,
- ITSO from the United Kingdom,
- NTA from Ireland.

Finally, we have made a film about the ET-Lab, which is also shared on the website of the ETC.

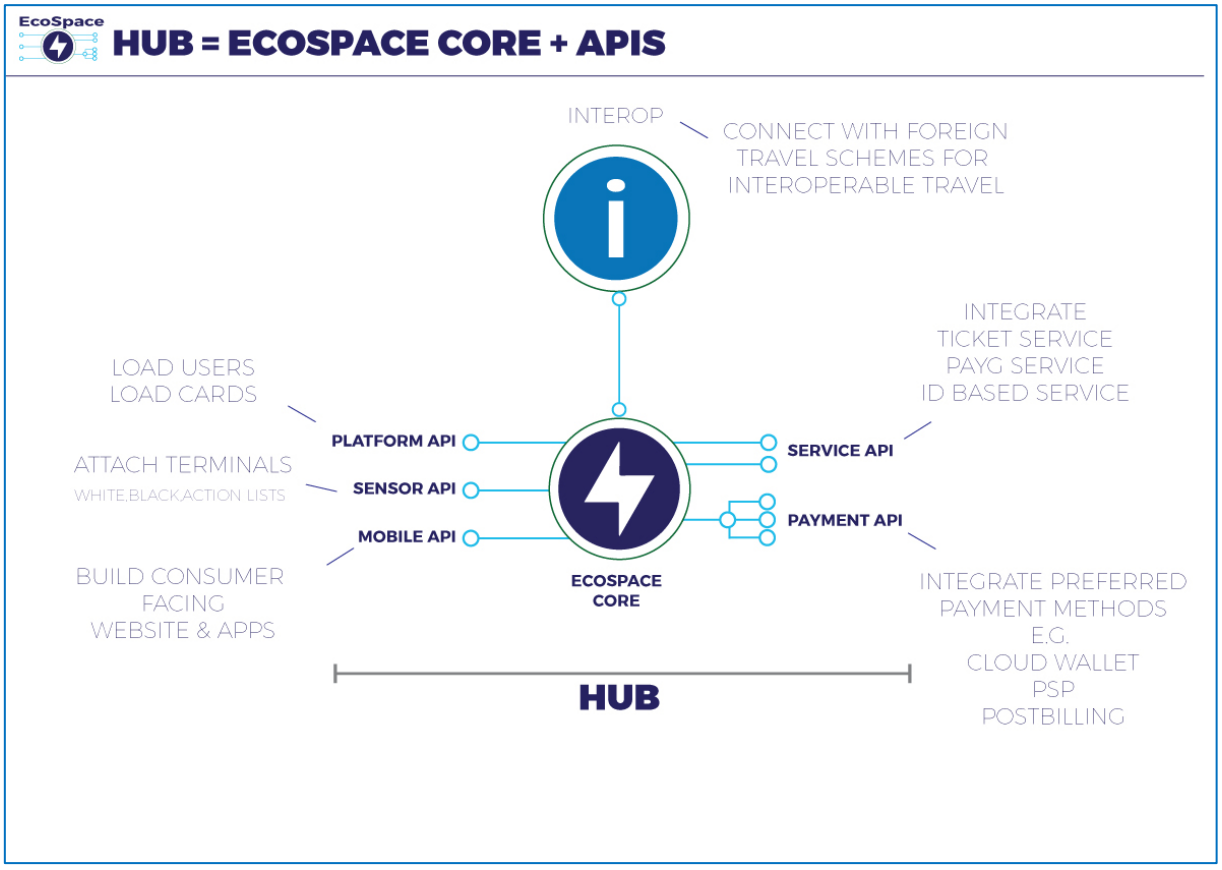
4.6 Work package 6: Define & Develop Authentication & Routing Hub & Token ID management

This work packages focusses on the definition, development and management of the so-called Authentication & Routing Hub and the necessary ID-management. Accept was responsible for this task and (also) used seconded resources to perform the tasks and activities. The first phase was mainly to define and develop, while the second phase focussed on management of the Hub and support the pilots.

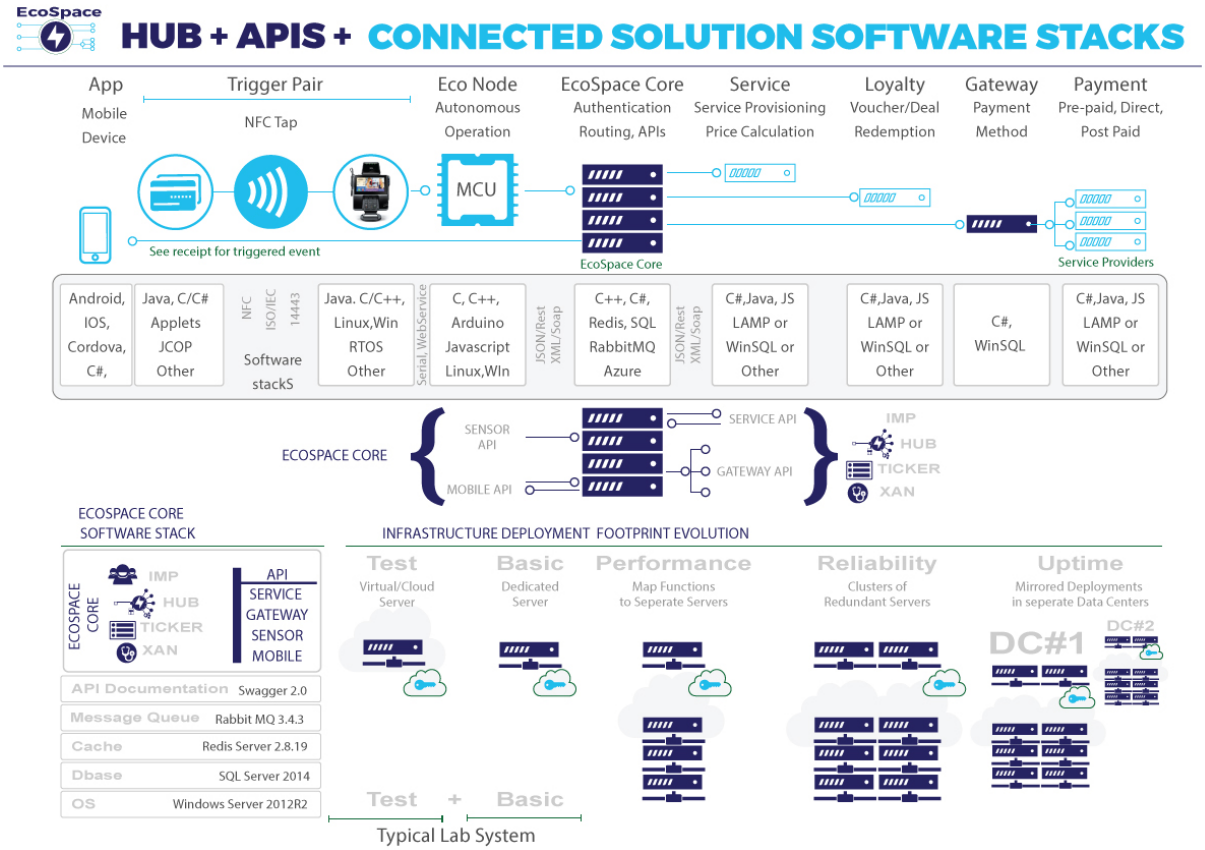
The Authentication & Routing Hub & Token ID is the central component within the ETC system and is used to connect front-end equipment with the back-office systems (in which travel rights are stored) and services towards travellers.

Goal of this work package is to define and develop this authentication & routing Hub for the ETC. This Hub has the following components:

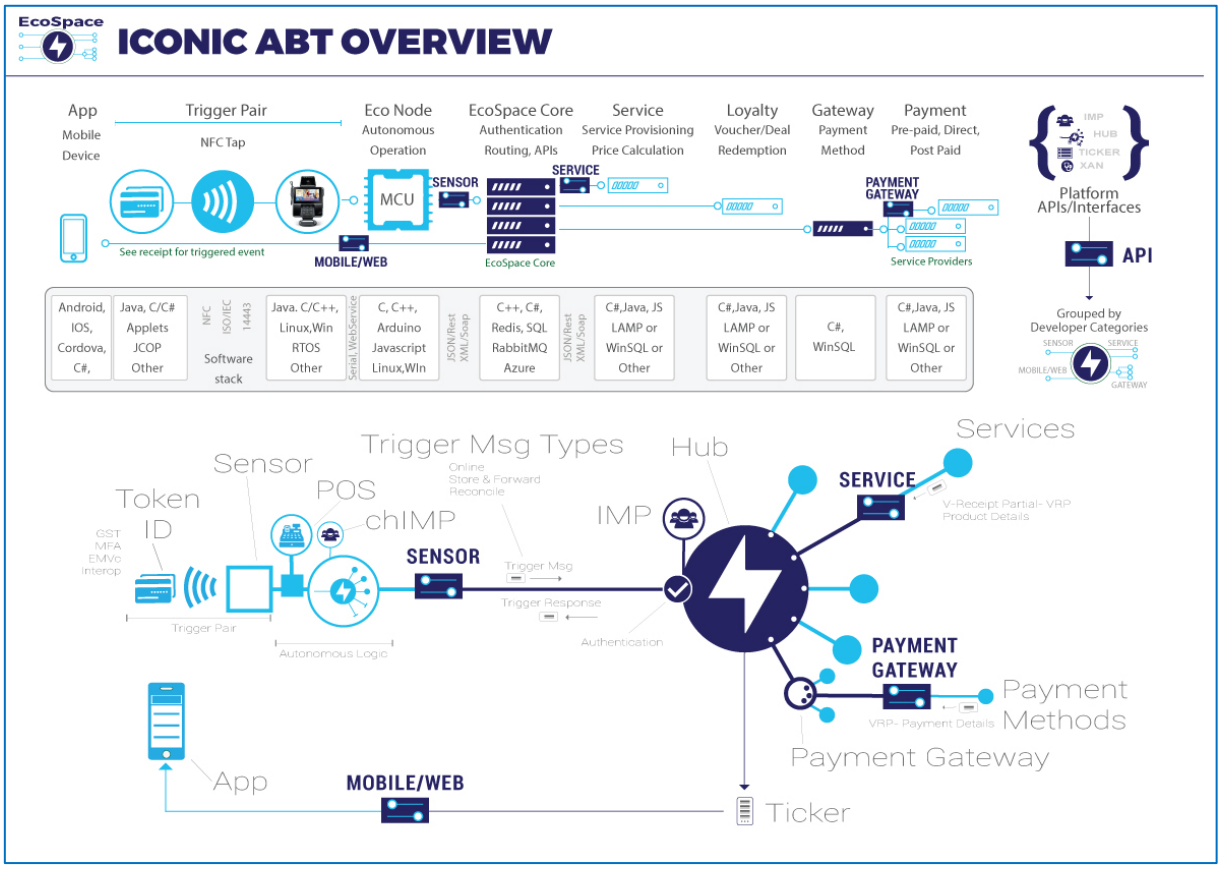
- EcoSpace Core + API Overview



- Lateral Software Stacks



- Iconic ABT Overview

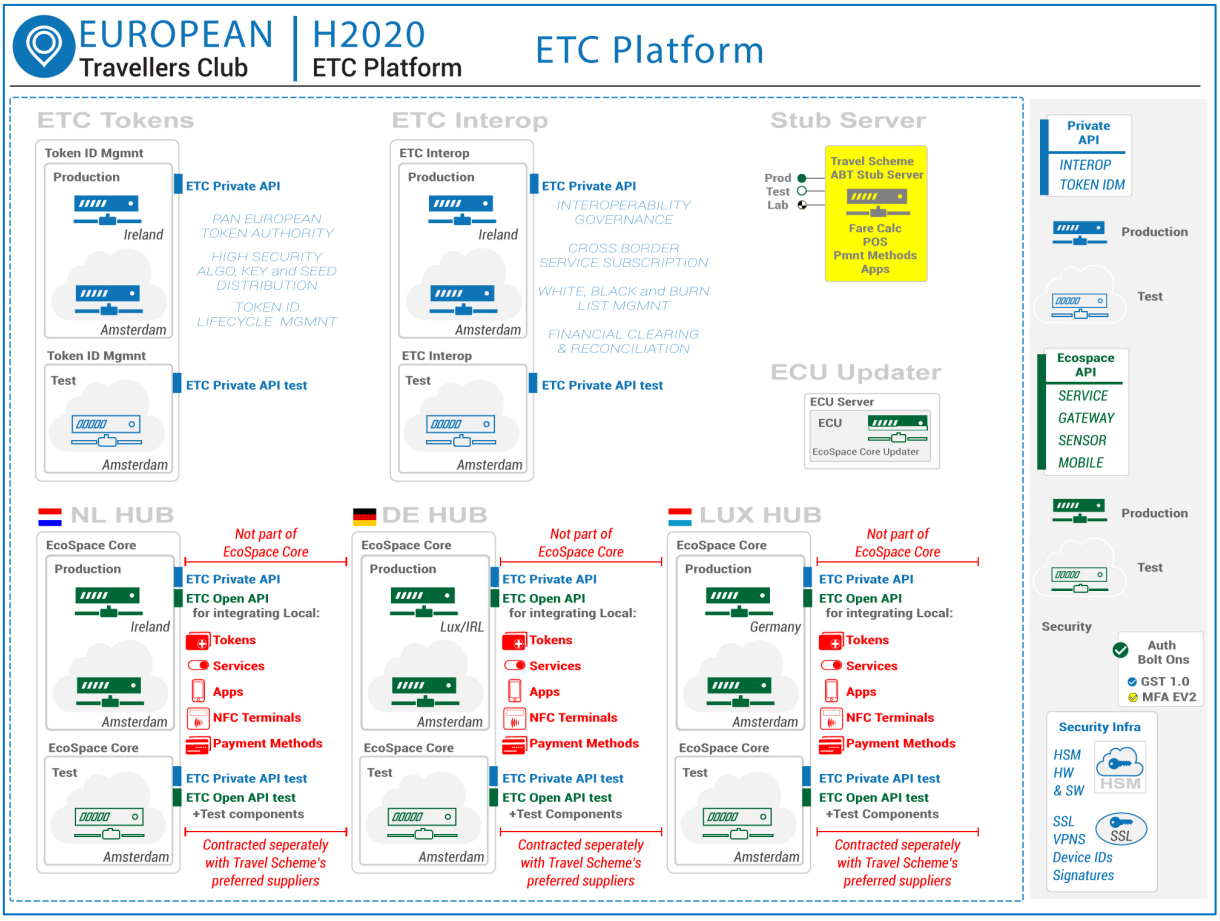


- Key Process Elements

- Example ABT Transactions
- Specifications + API Portal

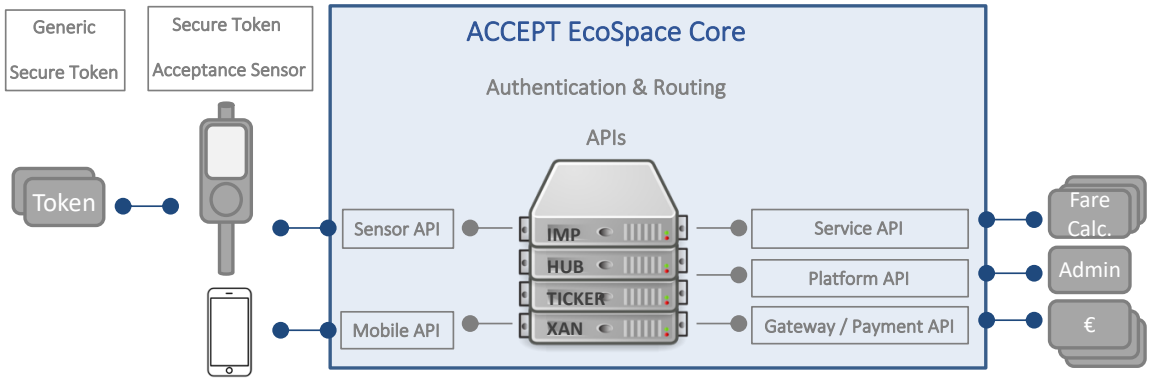
The Hub is part of the ETC Platform, with the following design (see picture below):

- Distributed Travel Scheme Hubs
- Interoperability Hub
- Central Token ID Management Module



As stated in the previous report Accept, as lead beneficiary for this work package, has purchased an EcoSpace Hub, code base and perpetual license, to allow the European Travellers Club (Accept Institute) to refactor its own fork (ETC Hubs) at will and license the ensuing technology at low cost throughout Europe, to the members of the ETC. This agreement has been reviewed by external (legal and IT) experts and Trans Link Systems. The agreement (deliverable 6.4) was signed on11 July 2017 with the supplier of the EcoSpace Hub: 42Tech. The rights and obligations within that document will be used to draft the franchise agreements with the ACCEPT Scheme Participants.

Deliverable 6.5 Open Standards & Requirements has been delivered in April 2018. This document describes the Open Standards & Requirements for the ACCEPT Eco Space Core. The standards and requirements for the ETC Hubs (ACCEPT EcoSpace Core Software) will be published in order to allow ETC Members to develop their own local or regional hubs. This document provides an overview of the EcoSpace Core Software and an overview where all standards and requirements can be found, will be published, see overview below:



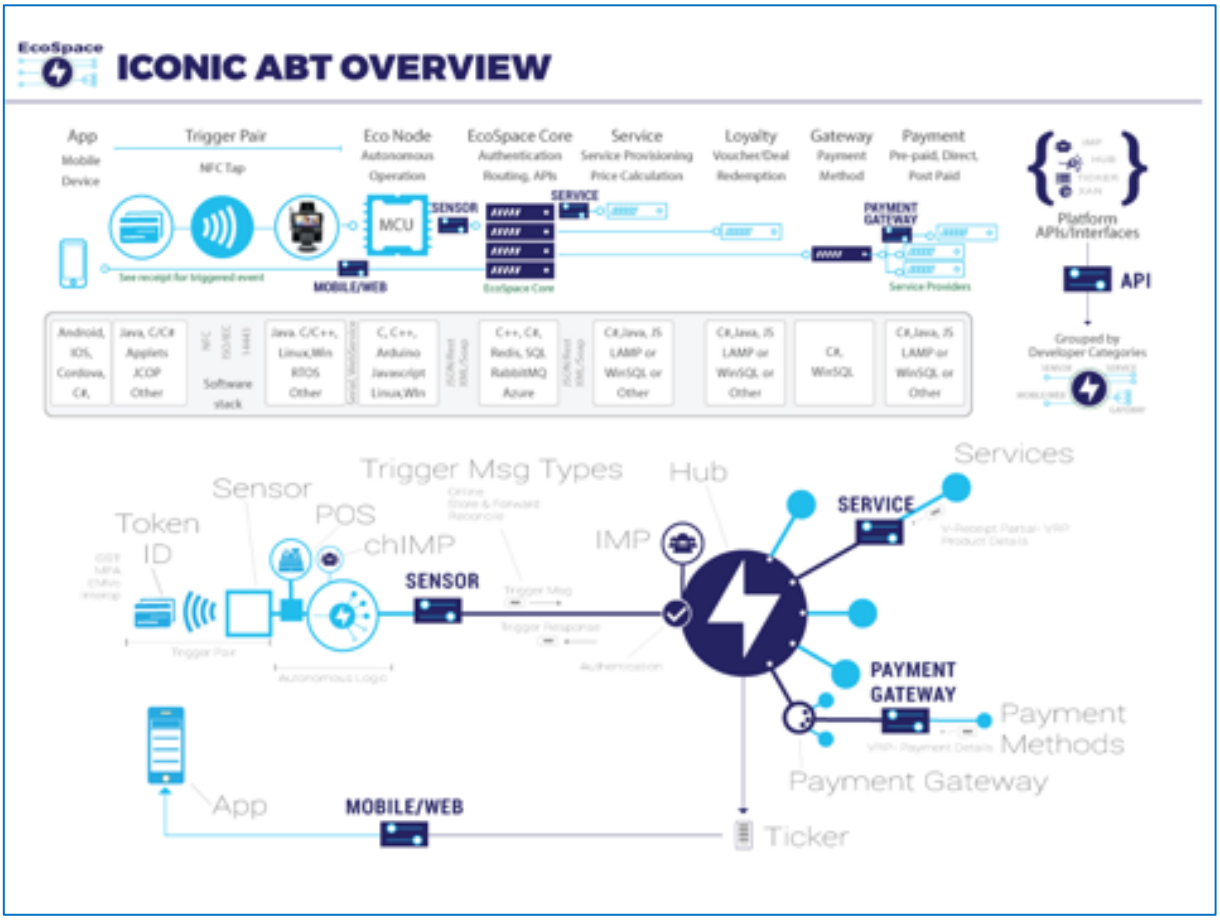
- ACCEPT EcoSpace Core — See deliverable 6.1 and deliverable 6.4
- Sensor API — See appendix A to deliverable 6.5
- Mobile API — See deliverable 9.3
- Service API — See deliverable 8.3
- Platform API — See deliverable 8.3
- Gateway / Payment API — See deliverable 8.3
- Secure Token Acceptance Sensor — See deliverable 7.1
- Generic Secure Token — See deliverable 7.4

4.7 Work package 7: Define and Develop Interoperable ID-layer

For work package 7 two partners of the consortium (UL as lead and Accept) are responsible for the activities, tasks and deliverables.

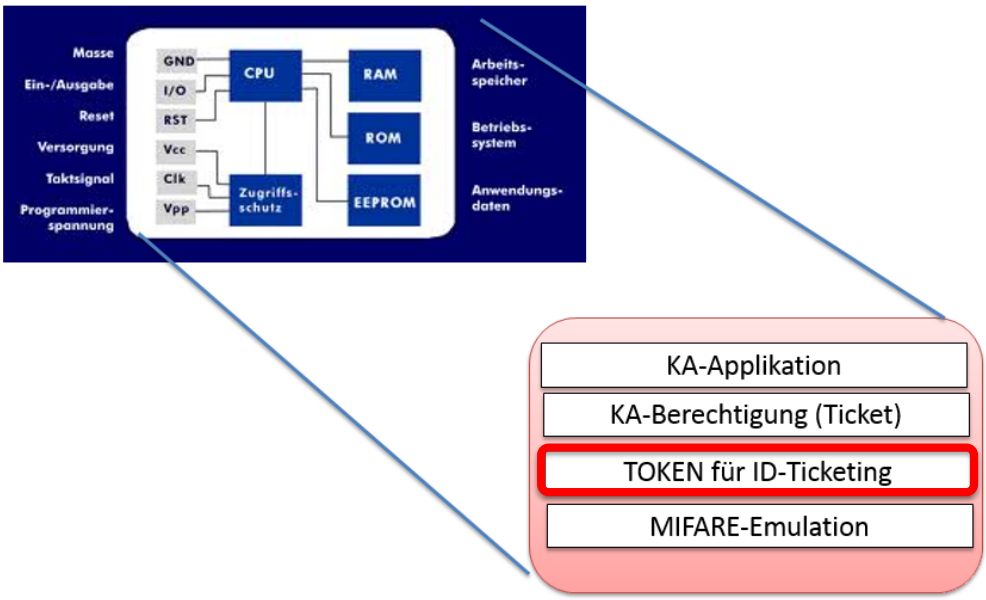
The scope of Work package 7 was to define and develop the interoperable ID-layer in order to provide the technological means for transport ticketing schemes to cross-accept and authenticate fare media issued by other transport ticketing schemes in a cost-effective manner.

In the first reporting period a new and improved version of the token (Generic Secure Token, GST) was delivered which is smaller in size and with new functionality (eg. activation). The GST 2.1 as it is called, can and is implemented on several different platforms next to existing ticketing applications or as part of a ticketing application. The GST should be read by front-end equipment and its transaction will be forwarded to the Hub for authentication and routing of this transaction (see picture below: Token ID).



In the first phase of the program the GST was implemented on a JavaCard platform by UL and Accept. This is used in the ET-Lab and as a reference for other parties, like card producers. Next to this implementation, the supplier of cards in Luxembourg (Identa) has implemented the GST on an existing travel smartcard for Luxembourg and Germany (M-kaart), see also work package 12 and 13 and picture below. On the existing smartcard the current transport application, VDV-KA, is stored including a Mifare emulation. Identa, with cooperation from UL and OTI has loaded the cap-file of the GST on this chip.

In the second phase the same GST was also implemented on a platform from chip producer NXP, see deliverable 7.3.



TOKEN = definite alphanumerical identification number

More specifically, UL as lead beneficiary, has carried out the following activities in the reporting period:

- Defined and finalised GSTv2 application specification
- Defined and finalised GSTv2 personalisation requirements
- Defined and finalised GSTv2 personalisation specifications for Java Card/GP
- Defined and finalised STAS specification
- Developed and finalised GSTv2 test suite
- Developed and finalised GSTv2 personalisation suite
- Developed and finalised STAS test suite
- Developed and finalised GSTv2 implementation on Java Card platform
- Performed and reported tests on GSTv2 implementation on Java Card platform
- Performed and reported tests on Luxembourg terminal
- Drafted a white paper on EMV as a token

All specifications are open and available for suppliers to use. We will publish these documents on the ETC-website as well.

In parallel to the tasks mentioned above, Accept has defined a so-called low cost implementation strategy. For existing infrastructures this means the integration of GST with reader software and fare media. For new infrastructures we believe ABT (handling all complex products) in combination with only standard products on anonymous card centric systems, can lead to a significant reduction of infrastructure investment and maintenance, e.g. through the use of standard readers with all scheme specific software included in an intelligent SAM that is remotely upgradeable (Similar to the management of the SIM cards by Mobile Network Operators), see deliverable 7.6.

4.8 Work package 8: Define and Demonstrate Interoperable Account Systems

Accept is the lead beneficiary of this work package. The objectives of this work package are:

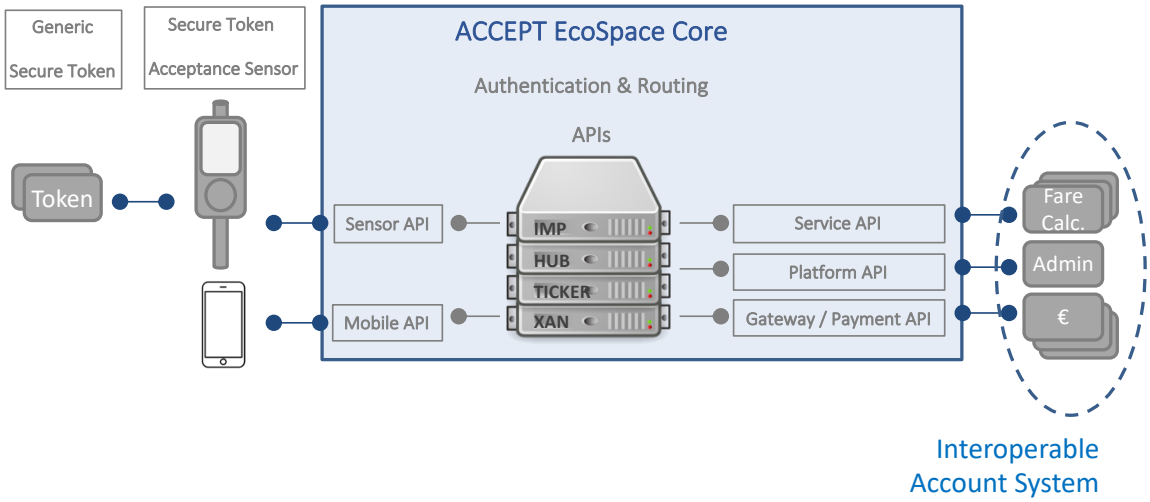
(1) to explore and describe a trust-framework for transport operators in which they can trust the accounts of travellers with third party agencies, including those from other countries or regions, without the need to sign up such customers themselves.

(2) to develop the standards needed for interoperability of such account systems, such that transport operators can inspect the rights of travellers to use their services.

(3) to integrate and demonstrate such systems within our ET-Lab environment and via pilots.

Above objectives were translated into the following deliverables:

Deliverable 8.1 describes the functional specifications for the Interoperable Account System and how the IAS connects (via which APIs) to the Eco Space Core, see picture below:



These APIs were designed and implemented by Accept and are further described in deliverable 8.3 of this work package. Deliverable 8.2 shows examples of implementations of the Interoperable Account System in the ETC project and how it is connected to the EcoSpace core of Accept.

The design of the solution is further described in work package 6.

4.9 Work package 9: Define and Demonstrate Interoperable Travellers Interface

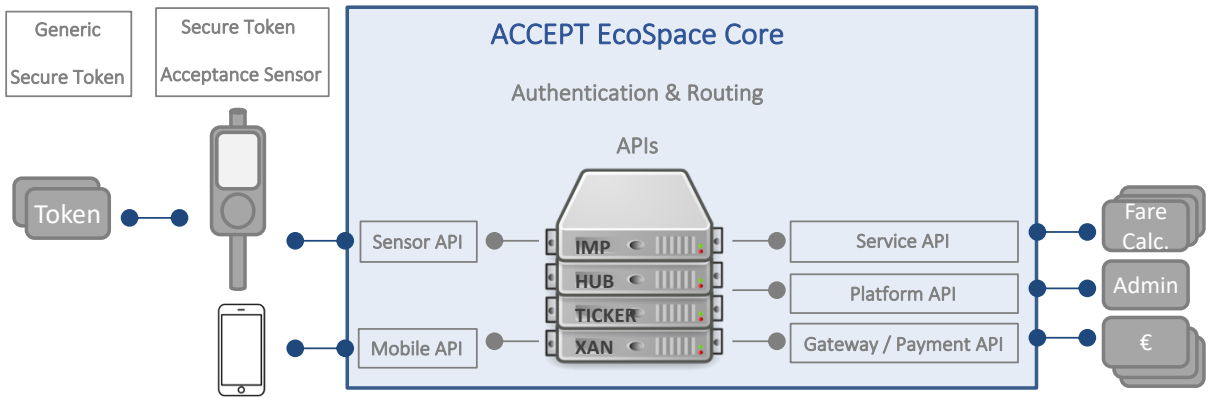
Accept is the lead beneficiary of this work package. The objectives of this work package are:

(1) to develop technological standards and connectivity to seamlessly and cost-effectively integrate the online booking, payment, ticketing services and travel alerts;

(2) to develop a demonstration back end and reference app that depicts the user experience for a traveller travelling cross-border and solely abroad.

Above objectives were translated by Accept into the following deliverables:

Deliverable 9.1 provides an overview of the functional specifications for the Interoperable Traveller Interface, or smartphone app and how it connects to the Eco Space Core (through the Mobile API), see picture below:



Deliverable 9.2 shows examples of implementations of smartphone apps in the ETC project and deliverable 9.3 describes the Mobile API (designed and implemented by Accept) in detail.

The design of the solution is further described in work package 6.

4.10 Work package 10: Set-up Pilots

Work package 10 concerns the coordination across the 3 pilots and the preparation of the pilots. The lead beneficiary is the Accept. Coordination *across* pilots means that the coordinator safeguards that knowledge is exchanged between the pilot project teams, that interfaces are identified, that technology is reused, etc.

A practical example of knowledge exchange and avoidance of double development costs is the preparation of test cards for the Luxembourg and German pilot: both pilots require cards to be issued with production VDV-KA and the GST. The Luxembourg team was the first to engage with the card-supplier and ran into some difficulties. The German pilot would have to go through the same process of procuring cards. Through the pilot coordinator the approach which finally worked with Luxembourg was shared with Germany, to allow for a quicker and smoother procurement process.

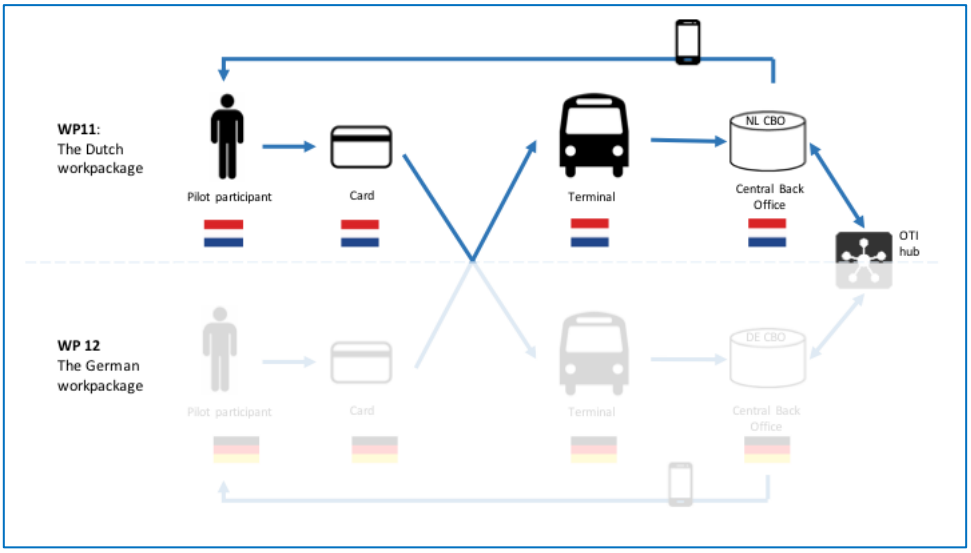
Focus in the first reporting period was drafting of the plan and the preparation of the pilot in Luxembourg, while in the second phase the preparation of the German and Dutch pilot was the main activity. Due to the fact that the project was extended with 12 months, the preparation of the pilots took more time than anticipated.

Regular meetings were held, mostly between the Dutch and German teams, because most overlap is there. At minimum every three weeks a Skype-meeting between the project managers was held in order to discuss progress and issues. Furthermore, joint workshops were organised.

4.11 Work package 11: Dutch Pilot

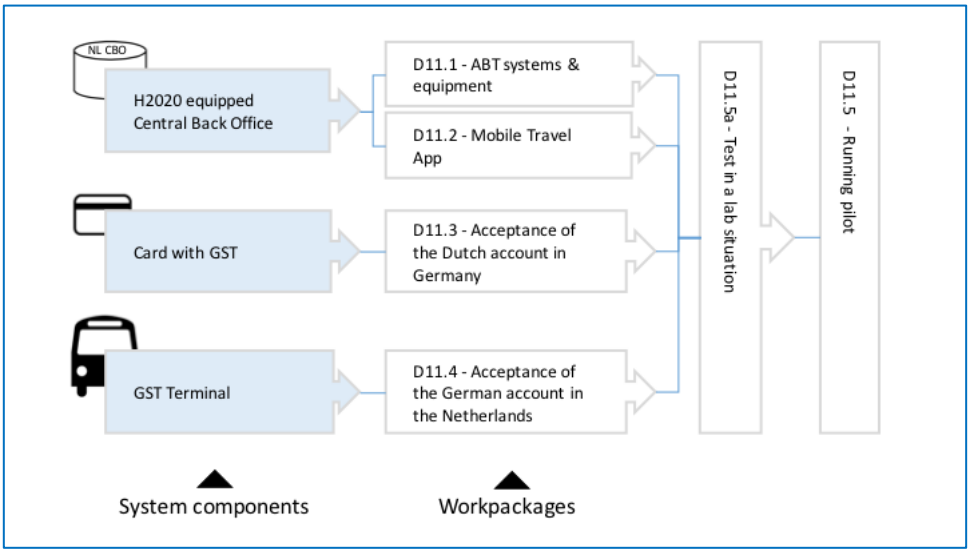
Work package 11 is dealing with the preparation and implementation of the Dutch pilot. TLS acts as the lead beneficiary for this work package. Goal of this pilot is to demonstrate cross border services between the Netherlands and Germany. The focus will be on using pay-as-you-go within the cloud, for cross border travelling.

During the first reporting period, the activities focussed on: requirement gathering, (high-level) solution design and supplier selection. The picture below shows the separation of work and interdependencies on a very high level:



High level design:

Based on the gathered requirements several designs have been created. The high-level design describes the end-to-end solution that will implement the requirements. It lists the high-level changes that need to be made to the OV-chipkaart (D11.3), the OV-chipkaart terminals (or sensors) (D11.4), the Translink Central Back Office systems (D11.1 and D11.2) and how they interact with one another.



Work done by beneficiaries and third parties in WP11

- ACCEPT (beneficiary): development and management of the ETC-hub which allows for the exchange of token related information between Dutch and German schemes.
- PST goSmart (subcontractor): integration of GST terminal reader software on the pilot-specific terminal hardware installed in the buses of Arriva in the pilot area.
- BlueBridge (subcontractor): adaptation of the Dutch Central Backoffice to support the GST and ABT solution, develop its interfaces with the ETC-hub and terminals, and develop mobile app, staff portal and the supporting API's.
- Technolution (subcontractor): developer of the terminal reader software needed to support the GST on the PST goSmart terminals.

Translink Central Back Office systems (D11.1 and D11.2)

The Central Back Office required for the H2020 lab test and pilot is an enhanced version of the EMV Pilot Back Office as part of the token based strategy of Translink.

1. One open Generic Architecture
    - based on open specifications;
    - no duplication of logic or system functionality;
    - account based instead of Card based – i.e. complex logic, products and purse value 'to the back-office'.
2. Travelers can choose their form of payment
    - Mobile (NFC): ID, Bank Card; Bar Code; Bluetooth;
    - EMV contactless;
    - closed loop ID based;
    - bar code 'on paper';
    - new payment methods available in entire network (ie. at all PTOs).

For the implementation of GST specifications and Translink interfaces, the requested (design)documents have been created or adapted to be able to request the Back office supplier(s) for quotes. The supplier of the Central Back Office of Translink has assessed the work that needs to be done to implement the required changes.

In the second phase of the project, the supplier implemented these required changes in parallel to the planned implementation of the work needed for the EMV part of the back-office.

Card with GST (D11.3)

The current OV-chipkaart smartcard platform doesn't support the Generic Secure Token (GST) at this moment. For the lab test the SmartMX smartcard platform has been selected, which supports both the OV-chipkaart and the GST. The fist Card has been successfully produced.

Note: For the pilot a smartcard only containing the GST will be issued to avoid interference with the OV-chipkaart Scheme.

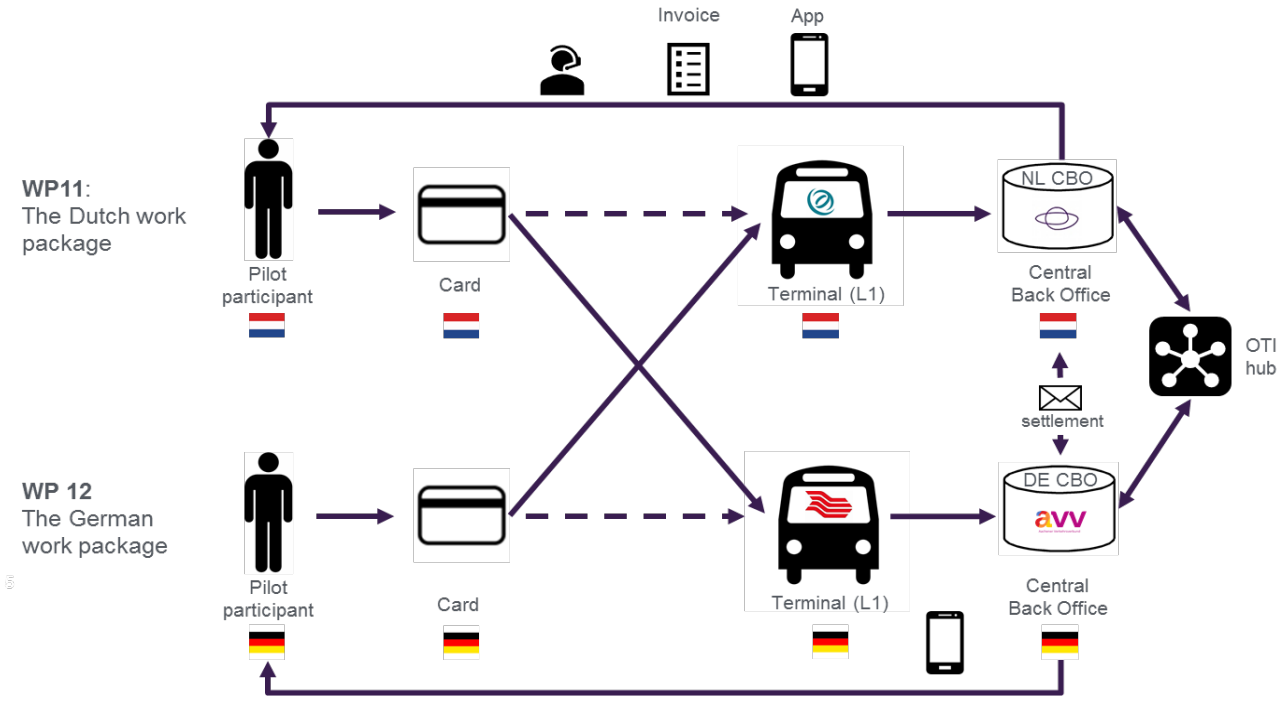
GST terminal (D11.4)

The interfaces between the terminal and the Translink Central Back Office have been detailed. And several documents have either been created or adapted to be able to request terminal (sensor) suppliers for quotes for implementing the GST specifications and Translink interfaces.

As stated in the mid-term report we saw a risk that the current supplier of Arriva could not deliver (in time) the software for the terminal in the busses. We therefor had to rely on our alternative solution and asked another supplier to provide for the terminals including the software. The terminals were delivered in close cooperation with Translink and its terminal reference supplier.

Test in LAB (D11.6)

The above system components were used to test and demonstrate the full end-to-end chain on technical integration of all components (both happy as unhappy flows), including connection with our German partners in a LAB situation (in the ETC LAB).



Running Pilot (D11.5)

After successfully completing end-to-end testing in the ETC-Lab and on-site, preparations for the introduction of the Generic Secure Token (GST) by means of the Dutch Pilot were started.

Prior to going live with the Dutch pilot, the technical production environment had to be set up and connected. Selected buses of public transport operator Arriva in the Netherlands were fitted with terminals that allow for identification and authentication of the Generic Secure Token, prices and stations of Arriva were imported, and the Translink backoffice was adapted including the connection to the ETC Hub which interfaced the Dutch and German back-offices.

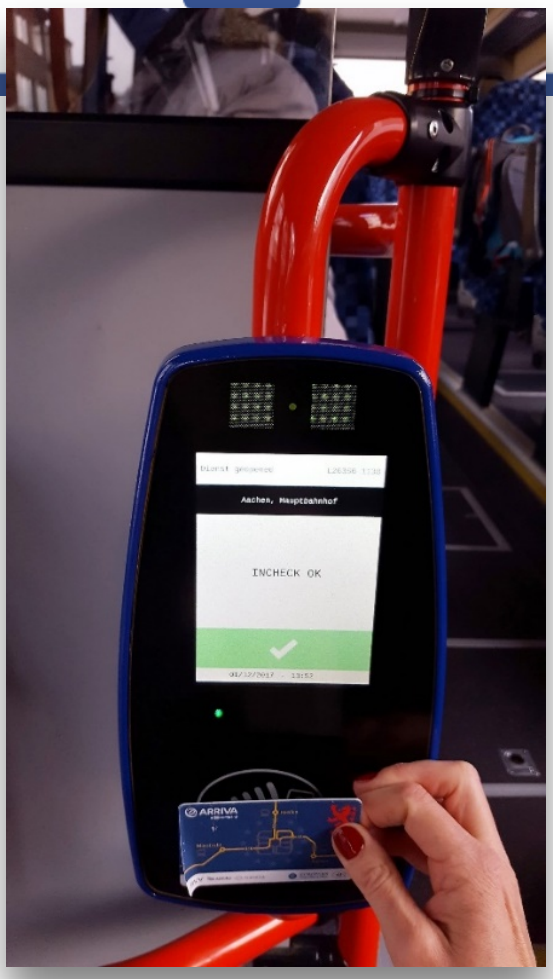
The Dutch pilot started on December 1, 2017 with 104 initial Dutch participants. In the first month after the start of the pilot the self-imposed maximum of 200 participants was reached.

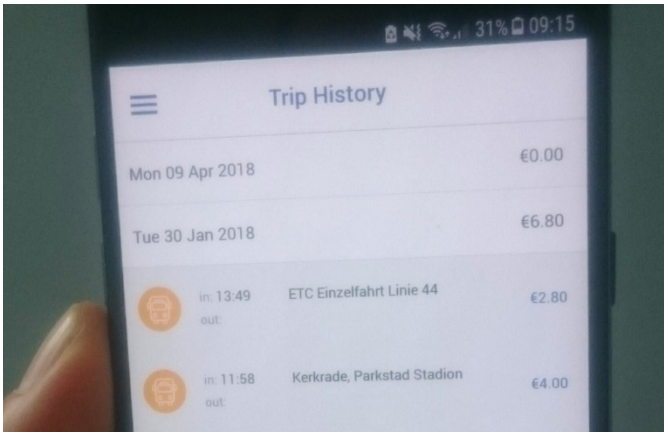
During the pilot, Dutch and German participants travelled with Dutch public transport on Arriva bus lines 44 and 350 between Heerlen, Maastricht (NL) and Aachen (DE).

Travels made in het pilot environment were registered by the Dutch back-office and shown (in near real-time) in:

1. Dutch and German mobile travel app
2. Staff portal (customer service)

After journey reconstruction and fare calculation, the travel data registered in the Dutch backoffice is used to generate settlement for PTO's and detailed invoice data for travellers.





4.12 Work package 12: German Pilot

Within WP 12 the parties responsible for conducting the German pilot carried out all required works in order to design, prepare and finally implement the German part of the cross-border pilot between Germany (Aachen) and the Netherlands (Heerlen and Maastricht).

In this context Aachener Verkehrsverbund GmbH (AVV) as subcontractor of VDV eTicket Service (VDV-eTS) coordinated all required activities such as design of the German system architecture that complements the interoperable cross-border system architecture, while VDV-eTS focuses on preparing the integration of the tested ABT approach into the German e-ticketing standard.

In order to deliver the pilot further required parties have been involved, namely Aachener Straßenbahn und Energieversorgungs-AG (ASEAG) as a public transport operator, who actually delivers the bus service in the Aachen region and on the cross-border bus lines within the cross-border pilot. Since AVV is only a transport authority that doesn't own and operate public transport vehicles, it was necessary to involve a public transport operator as a subcontractor. In order to test the developed equipment in buses operating on cross-border lines, ASEAG was the only public transport company operating in the administrative area of AVV and serving the required cross-border bus lines.

Accept was responsible for development and management of the ETC-hub which allows for the exchange of token related information between Dutch and German schemes.

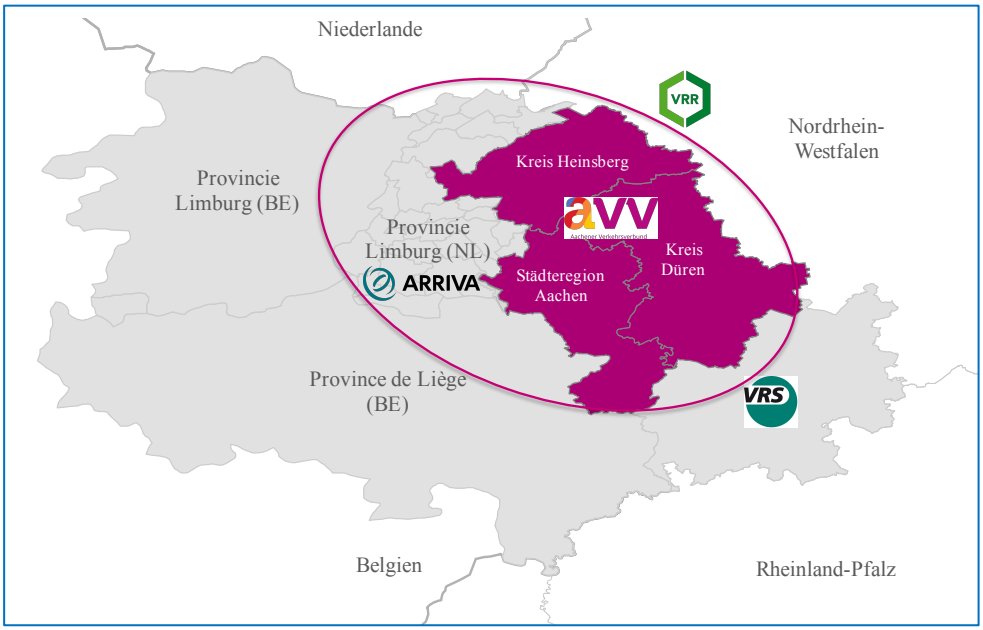
Apart from that different system suppliers have been involved in order to adapt the required system components for ABT. In this context IVU Traffic Technologies AG have carried out adaption works to recognize token cards at terminals installed in ASEAG-busses. IVU has been involved as a subcontractor, since they have won the tender for equipping all ASEAG buses with terminals being used for e-ticketing. These terminals were required to test the ABT approach in a pilot. The supplier Systemtechnik have adapted the ASEAG-back office that needs to store the account for ABT and adapt the inspection devices to recognize and inspect token chip cards. Systemtechnik has been involved as a subcontractor, since they have won the tender for delivering a required e-ticketing back office for ASEAG and also the inspection devices. The system architecture foresees also an online ticket stock, in which tickets for ABT can be stored and validated. This component was delivered by CUBIC Transportation Systems GmbH.

In general work package 12 is dealing with the preparation and implementation of the German pilot. Goal of this pilot is to demonstrate a seamless use of cross-border public transport services between Germany and the Netherlands using an account-based ticketing (ABT) approach.

More specifically, the objectives are to:

- define and implement Account Based Ticketing with use of the eTicket Standard (VDV Core Application);
- run a German Pilot with a focus on cross border traffic between Germany and the Netherlands;
- translate results of the pilots to implementations in "Euregio Maas-Rhein" and other Member States.

For this pilot the Aachen region in Germany is selected, with its border region in the Netherlands (Limburg):



For this work package, VDV-ETS (as beneficiary) and Aachener Verkehrsverbund (AVV) have carried out the following activities:

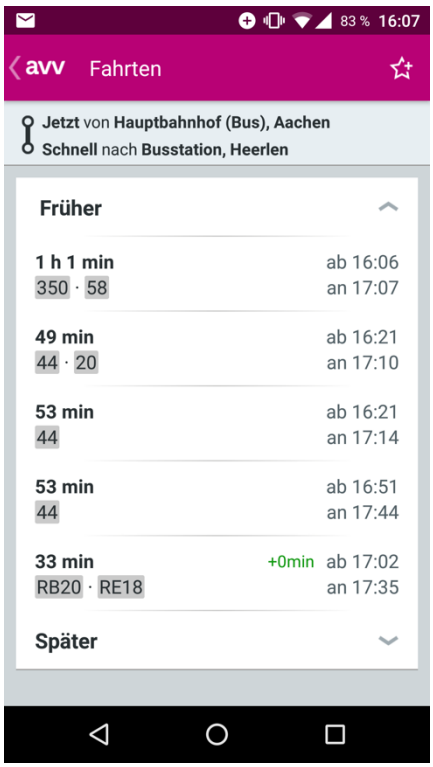
- Set up the consortium for the German pilot. Assign AVV as sub partner for the implementation of the German pilot. AVV has been involved as a subcontractor being responsible to design and implement the German pilot (see also chapter 5.2.1). Integration of further needed partners like ASEAG as the local transportation company. Development and signing contracts in order to have a framework for the further collaboration.
- Design and set up of pilot plan.
- Workshops in order to define a common understanding of the system architecture.
- Workshops with system suppliers to clarify required system components and functionalities.
- Coordination with the Dutch counter parts to agree on an exchange of data and acceptance of foreign passengers and to align the pilots on both sides of the border. In this context the sub-objectives for the German Pilot are:
    - Acceptance of Dutch traveller accounts by a German PTO.
    - Enable Dutch participants to buy tickets for trips served by a German PTO
    - Link online tickets to the account of travellers
- Tendering of required components for the German pilot. Contracting of system suppliers and discussion of functional specifications needed for the German pilot.
- Discussion rounds with system suppliers, OTI and partners involved in the German pilot.
- Acquisition of friendly users, who are engaged as test users in the pilot.
- Onboarding of acquired friendly users.
- Trouble shooting during the pilot phase.
- Dissemination of cross-border pilot activities (presentations during conferences, workshops, official meetings, working groups, formal committees etc.).

- Meetings to discuss and prepare the integration of ABT into the German e-ticket standard (VDV-KA).

Detailed information for all deliverables within WP12:

12.1 Mobility info

Deliverable 12.1 of the German pilot aims to provide Dutch public transport timetable information in German passenger information systems. In order to be as precise as possible, this concerns the integration of Dutch public transport timetable data into the passenger information system on the German side (AVV).

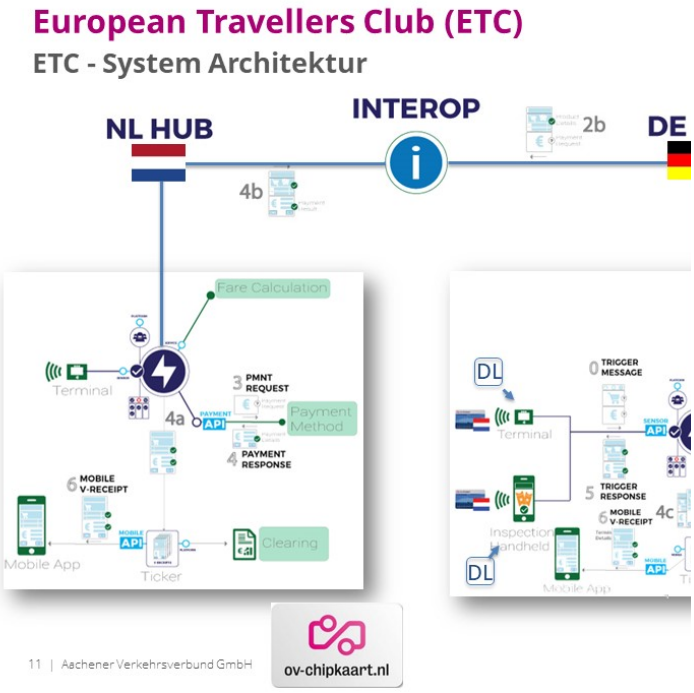


Within the carried out work for deliverable 12.1, Dutch passenger information was integrated into the AVV passenger information system consisting of two different front-ends up to now. Hence, Dutch timetable data is available on both, the AVV website and the mobile app. Hereby information on cross-border trips and for trips on the Dutch side using public transport are provided to German travellers in an easy accessible way. Because of that a German traveller can now use his 'home' travel information system for planning cross-border trips.

12.2 Reservation & Ticketing Platform

As promised in deliverable 12.2 a service and ticketing platform was developed, which provides the functionality to sell and validate tickets for passengers using public transport on the German side of the cross-border pilot area. This allows e.g. Dutch passengers to move seamless across the national border and make use of the public transport system in the neighbour country. Passengers benefit from the fact that they can use their home chip card for these journeys. Hence, they don't have to register or take care to equip themselves with tickets that are only valid in the neighbour country anymore.

The platform allows pilot participants to buy a day-ticket, which is valid in the City of Aachen. This day-ticket gets bought with the first check-in of the token card and is stored in the online ticket stock. A second check-in on the same day results in a validation of an already existing day-ticket stored in the online ticket stock. Hereby it was possible to cover two different use cases ("purchase ticket" and "validate existing ticket") in the pilot. Since the online ticket stock is an online cloud, it allows the opportunity to store and inspect existing tickets via an online connection. This inspection can take place via terminals installed in busses or via handheld inspection devices used by the inspection staff. The online ticket stock is connected to the German hub system via the service API and the German hub connects the whole system to the interoperable hub, which enables the exchange of data between the German and the Dutch system. Thus, the interoperable hub helps to establish cross-border interoperability.



12.3 Fare Medium

The fare medium for the pilot was produced and supplied by the supplier IDENTA Ausweissysteme GmbH, which has the won the national tendering competition for delivering conventional VDV core application chip cards. Since IDENTA is the supplier of chip cards used in the pilot region, they have been involved as a subcontractor in order to implement the generic secure token (GST) on these chip cards. These special enhanced chip cards for the pilot contain both, the VDV core application (VDV-KA) as well as the generic secure token (GST) that is used for ID-based ticketing in the ETC pilot ensuring, that the pilot participants need only one user medium for using public transport services in Germany and the Netherlands.

The pilot demonstrated that the technology on the cards is technically functional.

12.4 ABT equipment adaption

For recognizing the token chip cards, when they are presented at the terminals in German buses, the software for the terminals was adapted. For the Terminals the software adaption was realized and delivered by IVU Traffic Technologies AG which has won the tendering competition for delivering the conventional VDV core application terminals. The software adaption for the handheld inspection devices was delivered by Systemtechnik GmbH, which has won the tendering competition for delivering the conventional VDV core application inspection devices. To communicate with the GST on the chip card the software specifications as provided by Accept, the Secure Token Acceptance Sensor (STAS), was used. To communicate with the German Hub the sensor API was used.

12.5 Pilot

The aim of deliverable 12.5 was to organise and conduct the German pilot within the ETC-project.

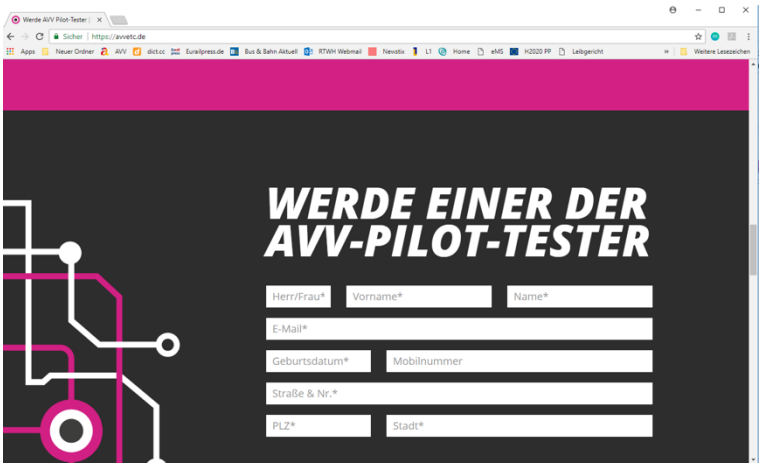
The German cross-border pilot took place between 1st October 2017 and 31st March 2018 and included the cross-border bus lines 44 (Aachen – Heerlen) and 350 (Aachen – Maastricht) as well as all ASEAG buses operating in the City of Aachen. In order to prove the concept of account-based ticketing in daily operation, friendly users have been acquired. These friendly users have received chip cards equipped with the generic secure token (GST), used them in daily operation and hereby generated technical transactions that prove the functionality of account-based ticketing in a cross-border pilot between Germany and the Netherlands.

AVV and Arriva were able to recruit around 500 pilot participants. Validators on the two Arriva lines and all ASEAG buses were enhanced to be able to read the ETC token. Due to this, the Pilot users could use the chip card to travel in both countries. For the pilot time, participants could use the system without any costs for the first 14 days and after this, they could use the Dutch system with a reduced check-in check-out-based fare and the German buses with a ticket that was valid as a day-ticket.

A short video clip, which explains how the pilot works can be found here:

https://www.youtube.com/watch?v=UL_0y3WUrMg

Screenshot of website for registration of friendly users (www.avv.de/etc):



Printed posters for acquisition of friendly users (were hang up in buses and in the city):

Examples of published articles in news papers and on websites:

Grenzenloses „eTicket“

Die Testphase soll noch **bis zum 31. März** laufen

Aachen. Das Pilotprojekt zur Entwicklung eines grenzüberschreitenden Ticketsystems („eTicket“) läuft gut. Davon konnte sich gestern auch Hendrik Wüst, Minister für Verkehr des Landes Nordrhein-Westfalen, in Aachen überzeugen. Das Projekt war im Oktober 2017 gestartet. Bis zum 31. März soll die Testphase mit 400 Testpersonen beendet sein. Danach werden die Daten systematisch ausgewertet.

Im europäischen Forschungs- und Entwicklungsprogramm „Horizon 2020“ kooperieren Aachener Verkehrsverbund (AVV) und Aseag mit Partnern aus den Niederlanden, Luxemburg und Deutschland im European Travellers Club (ETC). Jeder der Partner hatte daher einen Vertreter zum offiziellen Treffen mit dem NRW-Verkehrsminister nach Aachen geschickt.

Die Entwicklung des grenzüberschreitenden „eTicket“-Systems ist nicht nur in NRW von großem Vorteil. Es wäre weltweit einmalig und könnte Vorbild für andere Länder sein, wie Arco Groothedde, Geschäftsführer des niederländischen Trans Link Systems (TLS), anmerkte. Die elektronischen Tickets sollen über Landes- und Verkehrsverbundgrenzen hinweg funktionieren. Hierzu wird das sogenannte ID-Ticketing genutzt. Jeder Kunde hat dabei eine persönliche Identifikationsnummer. (sar)

WDR

Dieser Artikel wurde ausgedruckt unter der Adresse: https://www1.wdr.de/nachrichten/rheinland/e-ticket-alle-laender-100.html

Neues E-Ticket aus Aachen soll Europa erobern

Von Wolfgang Deutz

- Pilotprojekt: 400 Personen testen E-Ticket
- Elektronische Fahrschein könnte Vorbild für Europa werden
- Zukunft ÖPNV mit neun Millionen Euro gefördert

Mit dem E-Ticket wurden erstmals unterschiedliche Ticketsysteme dieseits und jenseits der Grenzen vernetzt. NRW-Verkehrsminister Wüst zeigte sich am Donnerstag (15.02.2018) mit der bisherigen Testphase zufrieden. Das neue E-Ticket könnte langfristig sogar Vorbild für ganz Europa werden, sagte Wüst. Gerade das Dreiländereck Aachen biete mit seinen Grenzen ein interessantes Versuchsfeld. Noch in diesem Jahr soll der elektronische Fahrschein auch auf die internationalen Zugverbindungen nach Maastricht und Lüttich ausgedehnt werden.

Der AVV testet „grenzenlos bargeldlos“

Das **„eTicket“ des Aachener Verkehrsverbunds** hat seinen ersten Probelauf hinter sich. Eine Zwischenbilanz mit Ausblicken.

VON ALEXANDER BARTH

Aachen. Fahrkarten für Bus und Bahn, die bargeldlos über Länder- und Verkehrsverbundgrenzen hinweg funktionieren: Das Projekt „eTicket“ unter Beteiligung des Aachener Verkehrsverbunds (AVV) hat seine erste Testphase hinter sich. Von Oktober 2017 bis Ende März 2018 haben rund 470 Menschen aus Deutschland und den Niederlanden die Möglichkeit genutzt, sich als „Versuchsreisende“ registrieren zu lassen. Das angepeilte Fernziel für die Kunden: „grenzenlos bargeldlos“. Nie mehr Kleingeld zählen beim Fahrer, keine Schweißausbrüche etwa für Aachener, die in Maastricht oder Lüttich ratlos vor dem Fahrkartenautomaten stehen. Nach dem ersten Testlauf gilt es für die Verantwortlichen jetzt, die Testdaten auszuwerten und für das Projekt „eTicket“ zu werben – auch nach der Pannenserie beim AVV-Partner Aseag bei der Einführung Chip-basierter Jahreskarten. Fragen und Antworten nach dem Testlauf.

Was musste man überhaupt tun, um an ein „eTicket“ zu kommen? Und wie funktioniert es?

Die Kunden – bisher die Tester – registrieren sich online auf der Seite des AVV. Es werden die persönlichen Daten sowie eine Kontoverbindung gespeichert. „Aber nicht umfangreicher, als man es vom Online-Einkauf oder ähnlichem gewohnt ist“, sagt Dominik Elsmann von der Euregionalen Koordinierungsstelle des AVV. Jeder Kunde erhält eine persönliche Identifikationsnummer. Die Karten, in der Testphase ausschließlich Tagestickets, sind nach Erhalt sofort gültig. Bei Fahrtantritt in Bus und Bahn müssen die Karten dann vor den Validator, einen Registrierungscomputer, gehalten werden. Am Ende erhalten die Kunden eine Monatsabrechnung mit ihren erfassten Fahrten.

Wer steht hinter dem „eTicket“-Pilotversuch?

Im Rahmen des europäischen Forschungs- und Entwicklungsprogramms „Horizon 2020“ kooperieren AVV und Aseag mit Partnern aus den Niederlanden, Luxemburg und Deutschland im „European Travellers Club (ETC)“. Ziel ist die Zusammenführung der verschiedenen Länderstandards zu einem tragfähigen und kundenorientierten Konzept, betonen die Verantwortlichen. Darüber hinaus wurde zuletzt ein Partnerschaftsabkommen zwischen dem AVV und dem Zweckverband Euregio Maas-Rhein unterzeichnet. Darin sind Verbesserungen bei Übergangstarifen zwischen Belgien, den Niederlanden und dem AVV-Gebiet oder die Ausweitung des belgischen Bahntarifs bis Aachen und Maastricht festgehalten. Auch im Rahmen des Interreg-Projektes „EMR Connect“ wird an der Verbesserung des grenzüberschreitenden Nahverkehrs gearbeitet.

„Einfach fahren“, auch über die Ländergrenzen hinweg: Das ist der Anspruch des AVV mit dem „eTicket“. Foto: Michael Jaspers

Wie waren die Reaktionen aus dem Testerkreis?

„Wer sich für den Pilotversuch registriert hat, wusste um den Charakter des Testlaufs“, glaubt AVV-Geschäftsführer Hans-Peter Geulen. „Es ging vor allem darum, die Technik und den Datenaustausch zu testen.“ Für die Kunden gab es ein überschaubares Nutzungsangebot zum Start. „Von den Testern kam vor allem der Ruf nach einem erweiterten Tarifsystem. Das ist auch unser Ziel“, sagt Geulen. Dazu gehören Zeitkarten oder ein Check-in-System für einzelne Fahrten, die beim Ein- und Aussteigen erfasst werden. Zur Einführung der neuen Zugverbindung RE18 zwischen Aachen und Maastricht im Herbst 2018 soll ein weiterer Testlauf mit erweitertem Angebot starten, so der Wunsch der AVV-Verantwortlichen.

Warum waren die Belgier beim ersten Testlauf außen vor?

Hier stößt die euregionale Kooperation noch an ihre Grenzen. Anders als in den Niederlanden mit einem bereits etablierten System von Chipkarten im Nahverkehr steht man in Belgien noch am Anfang. Der AVV gibt sich vornehm zurückhaltend: „Es gibt etliche Hürden etwa im Verkehrsrecht“, sagt Elsmann. „Wir sind zuversichtlich, dass auch dieser Nachbar demnächst eingebunden wird“. Auch mit Luxemburg sei man auf einem guten Weg.

Thema Datenschutz: Was ist auf dem „eTicket“ gespeichert?

Anders als auf den niederländischen Chipkarten sollen auf dem AVV-Ticket keine persönlichen Daten hinterlegt sein. „Die Chipkarte dient nur der Erfassung der Fahrten“, sagt Elsmann. „Die persönlichen Daten liegen allein im Unternehmen. Unsere Validatoren erkennen nur die Karte und ordnen die gebuchten Fahrten dem Datensatz des Kunden zu.“ In Aachen hatte es erhebliche Pannen bei der Einführung von 120 000 Chip-basierten Jahreskarten gegeben. Hier seien sehr wohl personenbezogene Daten auf den Tickets abgelegt, so die Kritik. Auch gab es massenhaft Beschwerden über das Abrechnungssystem. Negativschlagzeilen, die der AVV rund um das grenzüberschreitende „eTicket“ sicher nur zu gern vermeiden möchte.

Was sind die nächsten Schritte bei der Entwicklung des „eTickets“?

Die Möglichkeiten sollen erweitert werden – auch über das Tarifangebot hinaus. Von einer Ausdehnung der Gültigkeit auf den Verkehrsverbund Rhein-Sieg bis zur eBike-Miete an diversen Bahnhöfen der Dreiländerregion sprechen die Verantwortlichen. Auch eine erweiterte Smartphone-App steht auf der Agenda. Bis zur geplanten Erweiterung des Angebots wird das System übrigens aufrecht erhalten; auch weitere Testkunden werden noch aufgenommen, sagt Koordinator Elsmann. Vorbild sind auf lange Sicht die Niederlande, speziell die nächstgelegene Provinz. „In Limburg liefen bereits vor dem Umstieg auf rein bargeldloses Zahlen im Nahverkehr 95 Prozent über die Chipkarte“, erklärt Elsmann. Im AVV-Gebiet will man vorerst am Bargeld festhalten – „natürlich werben wir um Vertrauen und wollen auch ältere und skeptische Kunden an das neue System heranführen“, verspricht Geschäftsführer Geulen. „Vertrauen schaffen“ sei die Devise.

Wie sieht das Entwicklungspotenzial über die Region hinaus aus?

Beim AVV denkt man an die Kunden und Reisenden, aber auch wirtschaftlich. Die Entwicklung des grenzüberschreitenden „eTicket“-Systems ist laut den Verantwortlichen nicht nur in der Grenzregion und – bei einer ersten Ausdehnung – in NRW von Vorteil. Man möchte das Modell zudem gewinnbringend exportieren. Ein funktionierendes, flächendeckendes und tragfähiges System für grenzüberschreitenden Nahverkehr wäre wohl weltweit einmalig. Der AVV arbeitet daran in der Dreiländerregion.

Informationen im Internet: **www.avv.de**

12.6 Standards and Requirements for Germany

During the ETC project VDV ETS provided guidance regarding the Core Application Standard and reviewed the concepts regarding their perspective compatibility with the Core Application Standard; in particular, accounting for the long-term view. The goal was to facilitate the perspective incorporation of project concepts into the standard by building on commonalities (including the future view) and avoiding incompatibilities with earlier versions.

The focus was therefore on aspects of the proposed ABT concept that would directly affect components of the eTicket Germany Scheme or their interfaces. These aspects can be grouped nicely along the role-based architecture (as defined in ISO/IEC 24014) employed in eTicket Germany as follows.

1. User medium
2. Service provider terminals, used to inspect and validate tickets during transport
3. Customer retailer terminals and systems
4. Product owner system

The primarily relevant specifications produced in the research project were

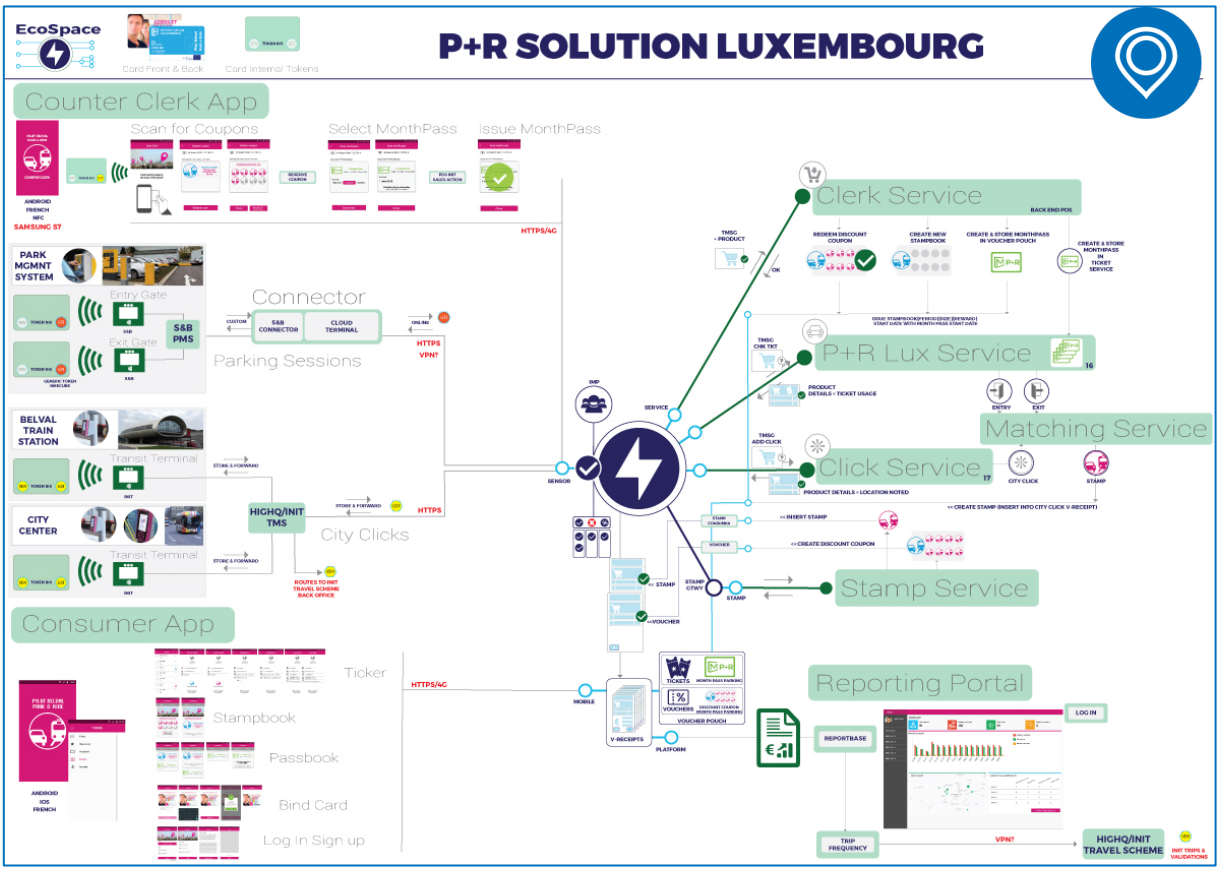
- the Generic Secure Token (GST) Application Specification
- Secure Token Acceptance Sensor specification and Sensor API
- Service API and Platform API

Following the finalisation of the research project and the first results from the pilots, a wider discussion among VDV ETS experts and members of the WGS has been initiated and is ongoing. The main goals of this discussion are detailed analysis of impacts to parts of the Core Application standard and recommendations for implementation of the project results in the Core Application standard documents.

These represent the essential inputs to the formal change request submissions. Formal submissions will be disseminated to all member organisations of eTicket Germany in the run-up to the General Members Assembly. The next General Members Assembly, where submissions containing results from the ETC project could be put up for decision, is in May 2019.

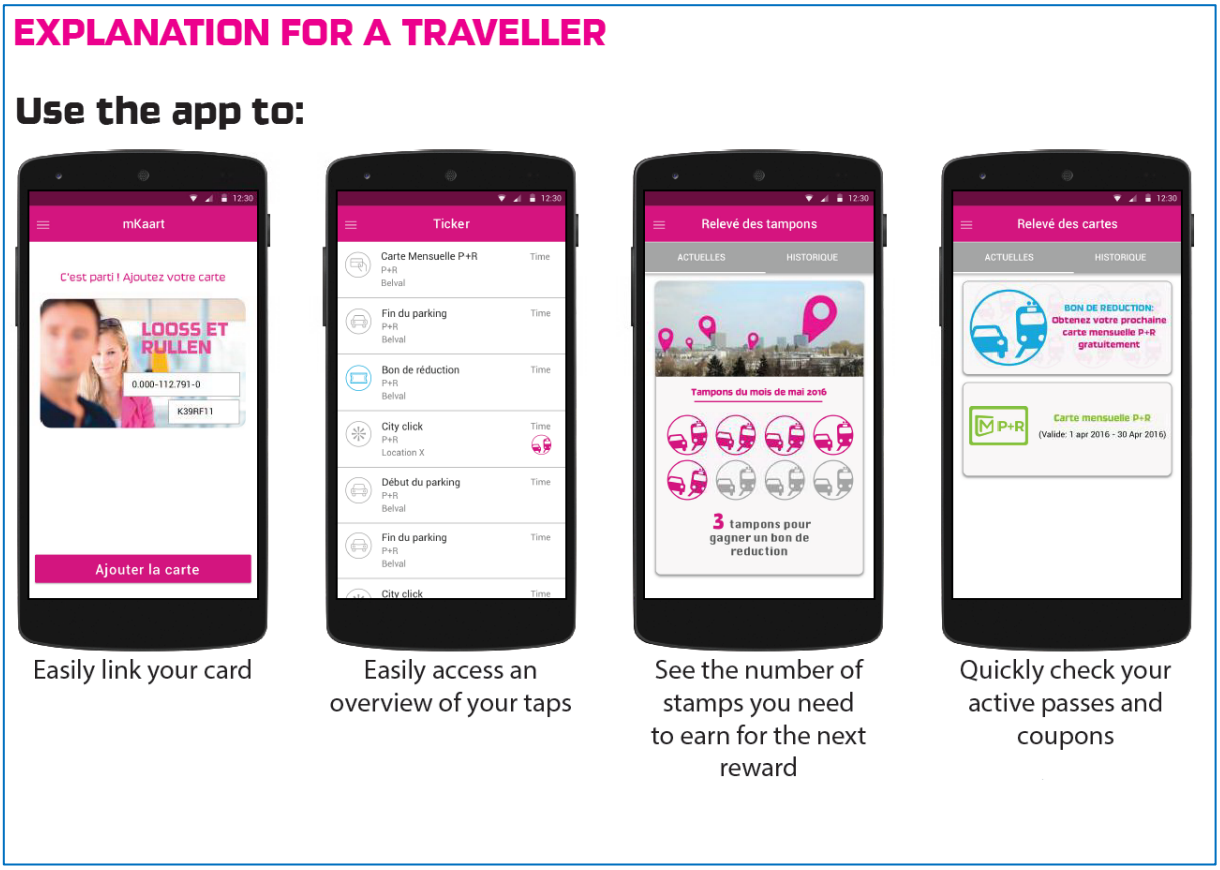
4.13 Work package 13: Luxembourg Pilot

Goal of this work package is to demonstrate in a live environment the multi-functionality aspect of the ETC system. More specifically this means that a combination of park & ride is shown. For parking the ETC system and its token, the GST, is used and for the 'ride' part the existing VDV-KA is used. For an overview of the architecture, see picture below:



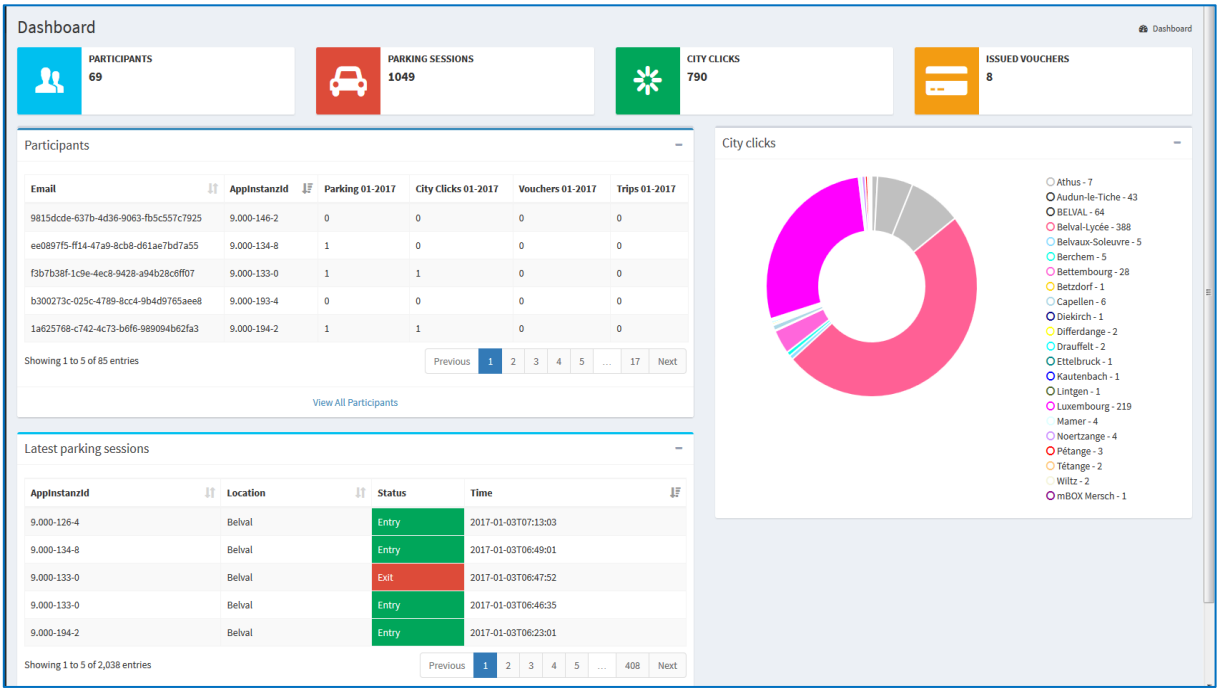
For the Luxembourg pilot the GST Token and the VDV core application had to be implemented (loaded) on a Pilot card. The card producer IDENTA GmbH (supplier, booked in other direct costs) managed to produce the pilot card after various test runs.

A smartphone application has been developed for IOS and Android operating systems by OTI. The application informs the user on every interaction between the card and the peripherals in the project. This means that there is real-time information about entering and exiting the parking area, charging the card with transport or/and parking tickets and finally about interactions with the validators. For this several meetings were necessary to design the application until its final layout (see picture below).



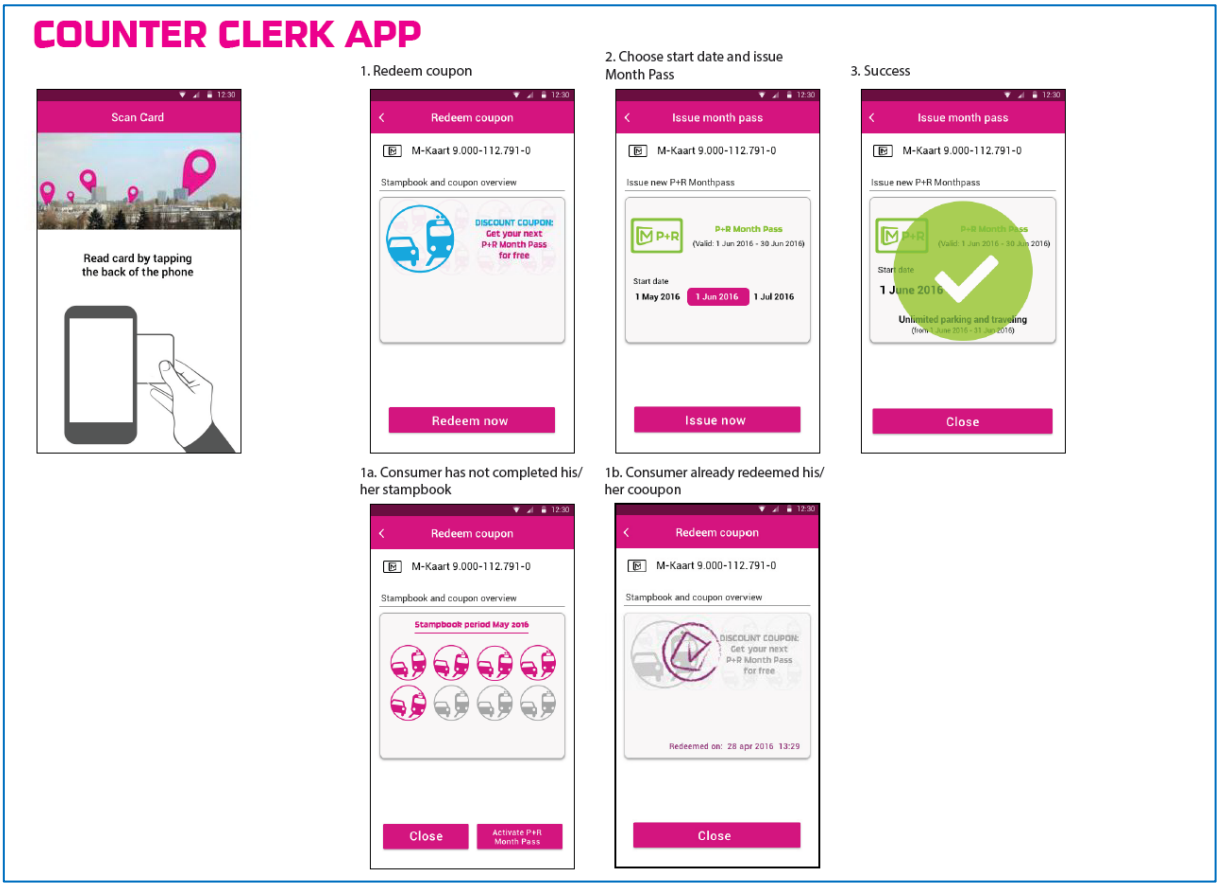
Depending on the configured business rules in the Clickservice HUB, the user can obtain an incentive when respecting certain rules. Example: performing a click during a parking session on the same day.

A Dashboard in order to have an overview of what is going on in the project was developed by OTI.



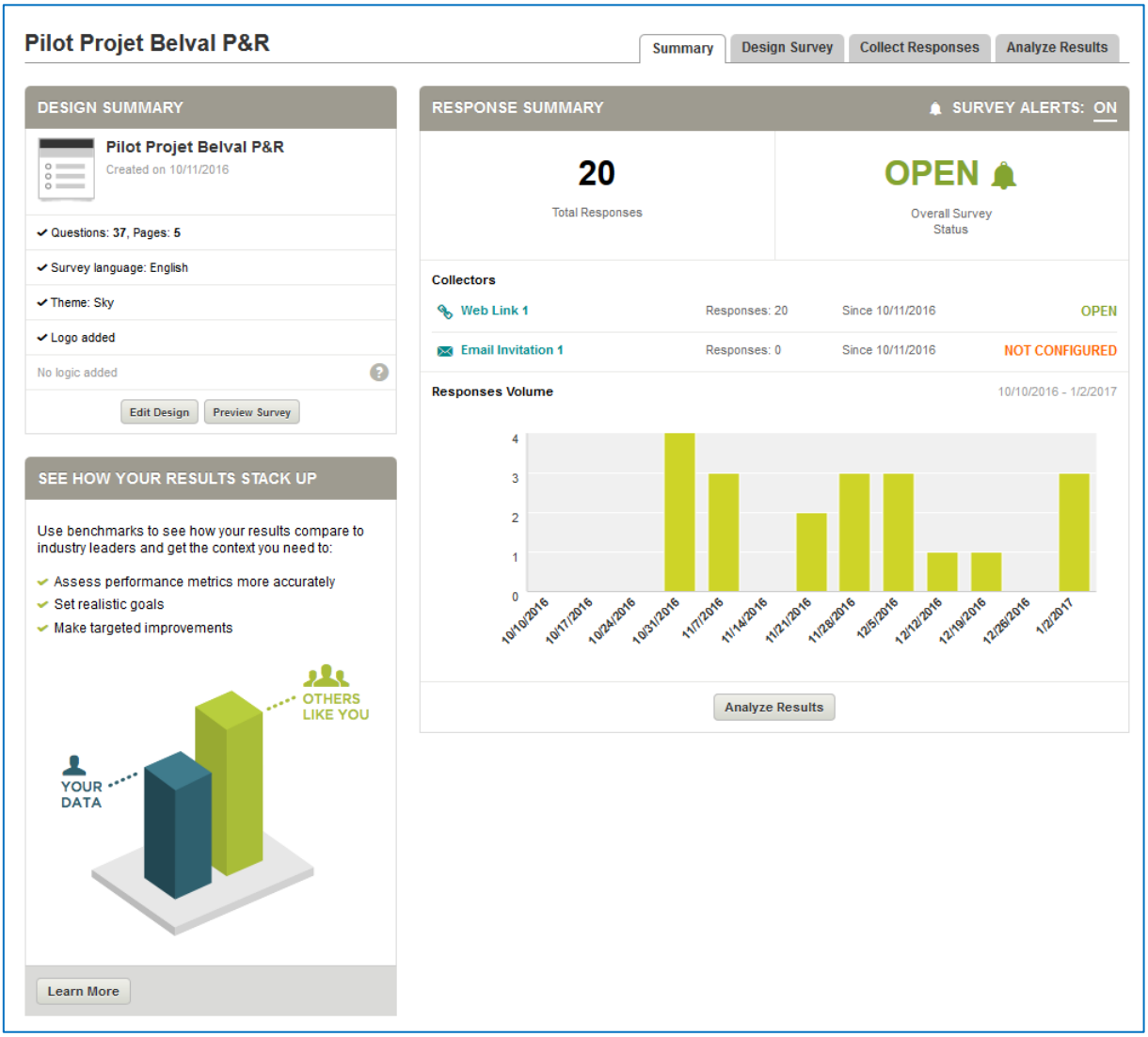
All participants of the pilot were asked to download the application for their smartphone in order to be informed about the interaction of the card, they were handed out at the moment they decided to take part in the project. Once the card is linked to the account, created on the application the customer is asked to park his car in the parking area using the project card and to start earning stamps during a whole month. If all the criteria's are respected and sufficient stamps are earned there is a voucher to be given by the application.

Next to the consumer app, a so-called counter clerk app has been developed (see picture below).



The business rules and the click information are treated in the back office. In order to have the information in the central hub the software of the validators had to be reviewed and re-designed. The validator is able to read the token and the VDV core application on the project card and process the information correctly.

The pilot period was set to 6 months. This means that from October 2016 till February 2017 participants had the possibility to take part in the pilot project. An evaluation was done during the pilot period to gather as much feedback as possible. For this purpose, a questionnaire has been compiled and sent out via mail to the participants.



Finally, we could mention that in the project different readers from different suppliers are used. The readers from Scheidt&Bachmann, activating the gates of the parking area, the validators in busses or at the stations from INIT were all programmed to select the token on the card. For the Scheidt&Bachmann (indirect subcontractor: the CFL (Chemins de fer Luxembourgeois) operate the parking, S&B is their subcontractor, CFL has invoiced part of the costs to Verkéiersverbond) terminals a separate connector was built in order to properly transfer the transaction.

Decision to continue with the pilot

Following the formal end of the pilot project in February 2017, Verkéiersverbond (CdT) decided to keep the system running for demonstration purposes until September 2017.

By the end of 2017 Verkéiersverbond decided to develop a new "Park + Ride" service to Luxembourg and border-crossing commuters. To start with, the "Hub" infrastructure, which had been developed for the bespoken pilot project, will be technically modified and kept alive for another period of 18 months before an entirely new technical infrastructure will be put in place as of 2019.

4.14 Work package 14: Evaluate Pilots

The purpose of Work package 14 is to evaluate the pilots. The main objective is to test all three pilots before the start and to evaluate them also after finalisation. The results of the evaluation is an essential part of the Final Report and Close Out Report of the whole ETC programme.

In the first phase of the project, the Test & Evaluation Plan was drafted for the Luxembourg pilot. This document describes the test entry and exit criteria and the criteria for evaluating the pilot.

As it was done during the preparation of the pilots, the evaluation will be carried out across the pilots. As the execution of the pilots will be led by the participating national schemes, the evaluation will be done by Accept with support of UL. Accept acts as the lead partner in this work package, with support from TLS, VDV-ETS, AVV, CdT and from UL.

To measure the extent to which the pilots achieved their objectives and to get beyond these validations to learning points, three evaluation methods were used:

1. interviews,
2. questionnaires, and
3. data analysis.

Each method involved a different data source and included different data metrics. The Pilot Report describes the methods in more detail and the metrics that were used as part of these methods.

In the Pilot Report also all results have been detailed, the lessons learned and the possible future steps.

In the second reporting period, for this work package, UL and OTI have carried out the following task:

- Finalisation of the Test & Evaluation Plan to include the overall approach as well for the pilot in Germany and Luxembourg.
- Development and distribution of the questionnaire and analysed the responses from the pilot participants.
- Interview of over ten stakeholders, including public transport authorities, public transport operators and ticketing system suppliers.
- Carried out data analysis on travel data to identify the level of usage.
- Documentation of the results in the pilot report (D14.3). As stated the results of the pilot, documented in the Pilot Report represent an important part of the ETC project.

Decision to continue with the Pilots and definition of the roadmap for further roll-out

Following the evaluation of the pilots all participating parties were positive about the results and decided to continue with the pilots. In Luxembourg a new Park&Ride concept was defined based upon the existing ETC project and in Germany and The Netherlands it was decided to continue with the pilots as is.

Next to that a Letter of Intent was drawn up between the relevant parties (the transport operators Arriva and ASEAG, the transport authority of Aachen (AVV), VDV-ETS, Translink and Accept) in which the decision to continue with the pilots in Germany and The Netherlands was included, but also a roadmap was defined to further roll-out the system and add functionality to it. A high-level overview of the phases of this roadmap is presented below:

Phase 1: Continue the ETC pilot as is 1st April 2018 – 31st December 2018

Phase 2: Expand with: 1st January 2019 – 30th June 2019

- Train connection between Aachen – Maastricht (– Liege);
- Add the whole Limburg concession of Arriva.

Phase 3: Expand with: 1st July 2019 – 31st December 2019

- Add travel with a barcode on a smartphone in the AVV region;
- Add travel based upon check-in / check-out and price calculation in the back-office in the AVV region;
- Add the whole concession of ASEAG;
- Add the train connection between Aachen – Köln – Bonn;
- Add the city of Bonn;

Phase 4: Expand with: 1st January 2020 – 30th June 2020

- Add further mobility providers such as car sharing and bike sharing

5 Impact

Our impact has been described in section 2.1 of our DoA, see below:

- The first impact of the program will be to motivate e-Ticketing Schemes and transport operators to embrace ABT as part of their service offering. The standards, processes and technologies developed in the program will be made freely available to all interested parties, thus helping them to migrate better, faster and more cost-effectively, while at the same time reaping the benefits of interoperability, an open ecosystem (no vendor lock-in), and next-generation privacy.

- The second impact will be that more and more schemes (or 'travellers clubs') in member states and regions will cross-recognize each other through the trust framework established by the European Travellers Club, thus allowing their Travellers to use their existing account across borders and schemes. As soon as this has reached a critical mass, with the associated number of Travellers organized, even those transport operators or schemes that are reluctant to join now, will have a strong incentive to participate in the framework.

- The third impact is that the trust framework and the sharing of data within the framework in an interoperable format (which is more than open data regulations would require) will improve and speed up innovations and knowledge sharing between such schemes.

We believe the status at the end of the ETC project (May 2018) of above mentioned impact is very positive, but we also have recognised certain risks that need to be addressed.

Ad 1. The Accept Advisory Council with a focus on Account Based Travelling (ABT) currently (June 2018) has 6 members: Rejsekort A/S (Denmark), ITSO Ltd. (UK), Transport Scotland (UK), National Transport Authority (Ireland), Verkéiersverbond (Luxembourg) and Translink (The Netherlands).

ABT is recognized as the next step for many e-ticketing schemes. We have promoted ABT and the ETC concept at many conferences, towards our e-TSAP members and towards (local) government (like the 4-country platform between Germany, The Netherlands, Belgium and Luxembourg);

Risks is the difference in interpretation of what ABT is and what role to play in the 'new' ecosystem, what role does the authority or scheme provider have in the (new) value chain of ABT?

Ad 2. ETC project council continues as Accept Advisory Council and is committed to promote cross-border ABT further. It has been decided that the e-TSAP association will be formally incorporated for this purpose and joint working group with Smart Ticketing Alliance (STA) on ABT has been agreed. The three ETC pilots will continue and a roadmap has been defined with all relevant parties to further roll-out the concept and include Belgium (Eureka-rail). This could give a core area for cross-border travelling across the Benelux and Germany (talks with Denmark have started).

Risk is how to fund these next steps.

Ad 3. Negative is that the project has taken a year longer. Positive is that ABT development across ETC consortium, Advisory Council Members and e-TSAP members have been embraced as the de facto future vision of ABT and people are actively sharing the concept and experiences in special workshops and the upcoming working group with STA.

Risks are that most schemes (authorities, or e-ticketing scheme providers) feel dependent on what the market can offer and tender procedures are dominated by domestic transport needs and an aversion of innovation risks.

6 Exploitation and dissemination of result

Please find below the status of dissemination activities:

	project's dissemination activities	**Effect, results**
e-TSAP	During the whole duration the ETC project status and results were shared with the e-TSAP association (see www.e-tsap.net). This association has (currently) 16 members, e-ticketing schemes in Europe (and Dubai) and met in total 6 times: • in October 2015 in Berlin (Germany); • in April 2016 in Edinburgh (UK); • in November 2016 in Rotterdam (The Netherlands); • in April 2017 in Belfast (Northern-Ireland); • in November 2017 in Turku (Finland); and • in April 2018 in Bern (Switzerland). The status of the ETC was presented to all participants in both conferences.	The dissemination activities towards the e-TSAP network have the following goals: • to get feedback on the set up of the ETC organisation (work package 3), • to seek for new members of the ETC and • to seek for roll-out opportunities or other pilots (after the ETC program has finished in 2018). During the project's lifetime several new members of the e-TSAP were welcomed: • Ministry of Transport from Slovenia, • National Railway Operator (SBB) from Switzerland, and • the Roads and Transport Authority (RTA) from Dubai in 2018.
website	In 2015 the website of the ETC (see www.europeantravellersclub.eu) was launched. This site is also used for dissemination activities, like brochures, video's, documentation (specifications and interfaces).	
conferences	Next to the e-TSAP conferences we visited UITP in Milan (Italy), Transport Card Forum in Nottingham (UK). In 2016 the ETC presented its progress on Transport Ticketing in London (UK) during a work shop. On the TEN-T days conference in Rotterdam (the Netherlands) we presented our case in front of the Dutch Minister of Transport. In 2017 we presented our progress and pilots on the European Passenger Federation conference (in March in Rotterdam) and in February in Brussels to the 4-country platform (The Netherlands, Germany, Belgium and Luxembourg).	The dissemination activities towards these conferences have the following goals: to present the ETC and its program to a broader public and to interest parties to join the ETC and to seek for opportunities to further roll-out the concept.
pilot conference	On 30th of January 2018 we organised our final dissemination conference in our pilot region (Aachen/Maastricht/Heerlen) to present our findings and invite participants to experience the pilot and provide feedback. Transport authorities, public transport operators etc. from Europe were invited.	Result was that approximately 40 participants experienced the cross-border travel between The Netherlands and Germany and provided relevant feedback.

H2020 ITS cluster	During the lifetime of the project the ETC project had several meetings, or conference calls with the ITS cluster. In those meetings the overall status of the project was presented, and potential cooperation was discussed. The ETC project is part of the pilot subgroup and furthermore discussed potential cooperation with eg. the Masai project.	
exhibition	The ETC project set-up a lab environment in Amersfoort (the Netherlands). This ET-Lab is also used for demonstration purposes. We invited several parties to the ET-Lab in order to inform them about the status of the project.	The feedback from parties visiting the ET-Lab is used in the work packages 5, 6 and also for the pilot work packages.
workshops	We organised several workshops on the concept of the ETC (account-based travelling). We had a workshop with all Belgian public transport companies and their central e-ticketing organisation (BMC) in September 2015 in Amersfoort (the Netherlands). In October 2016 we organised a workshop with the Dutch ministry of Infrastructure and Environment to inform them about the status of the ETC and the potential to expand the concept to cross-border train connections in Europe. Early 2017 we had a workshop with the Dutch passenger federation (Rover). In 2017 we had several meetings with German Transport Authorities and the Dutch Province of Limburg.	These workshops are mainly used to inform others about account-based travelling and the ETC concept. As a result BMC formally joined the e-TSAP association. With the Dutch Ministry we are currently in discussion on the potential cooperation between the ETC and the so-called 4 country platform for cross-border train connections (the 4 countries are The Netherlands, Germany, Belgium and Luxembourg). We defined a roadmap for the further roll-out of the ETC in the Limburg/Aachen area together with our stakeholders.
stakeholder meetings	Project management of the ETC actively reaches out to stakeholders such as suppliers and transport & ticketing consultants to create awareness for the ETC-concept	
AVVs efforts	During the course of the project AVV, as main party in the German Pilot region, has spread information about the European Travellers Club on the German side in various working groups. Presentations about ID-based ticketing as well as the procedure within the ETC project were given in AVV's working group AG EFM dealing with e-ticketing topics as well as in the working group AG TTM, which focuses explicitely on the topic cross-border public transport. Both working groups involve PTOs in the AVV region as well as responsible public bodies. Furthermore, a presentation were given in the working group "LAK eTicket", which is organised by the transport ministry North-Rhine Westfalia and involves elected stakeholder from the whole federal state.	Main focus of AVV is to present the ETC and its account-based ticketing concept to other regions in Germany. As a result the ETC project (AVV, VDV-ETS and OTI) were asked to present the ETC project to a broader group in Germany (in March 2017): several Verkehrsverbunde like Rhein-Rurh, Nachverkehr Rheinland, the province of Nord-Rhein Westfalen and its e-ticketing competence centre.

With the set-up of Accept as the not-for-profit entity to run the ETC scheme and systems, the exploitation of the results of the project should be taken further. It is for that reason that Accept also signs the Letter-of-Intent on the continuation of the pilots and potential further roll-out of the ETC scheme. In the business plan of Accept the potential scenarios have been drafted on the potential roll-out of the scheme.

The members of the Accept Advisory Council will act as a group to discuss and present the further roll-out of the concept in their countries and to take it further into Europe.