Open Smart Card Infrastructure for Europe

v2

Volume 1:   **Application white papers and market oriented background documents**

Part 3:   **Whitepaper on smart card transport applications and evolution**

Authors: **eESC TB9 Public Transport**

Whitepaper on smart card transport applications and evolution

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Foreword

One objective of eEurope Smart Cards is the production of a specific action plan which addresses both the needs of the general public and those of the business community in terms of business cases, multi-functionality and the interoperability of systems and infrastructure, and the provision of trust in all aspects of service delivery. Those aspects are included in the work of Trailblazer 9 Public Transport.

Trailblazer 9 acknowledges especially the contribution of Trailblazers 8 and 7 as well as the specific support of the UIC and the chairs of eEurope Mr. Van Arkel and Dr. Martiny.

*e*Europe Smart Cards Trailblazer 9 on Public Transport is an informal group of some 90 participating organisations and individuals interested in the area of public and private transport and the use of smart cards for electronic ticketing (e-ticketing). *e*Europe Smart Cards Trailblazer 9 has been supported by the CEN/ISSS Workshop FASTEST (Facilitating Smart Card Technology for Electronic Ticketing and Seamless Travel).

For information on *e*Europe Smart Cards Trailblazer 9 or this White Paper you may contact:

Dr. Stefan Kissinger
Chair, *e*Europe Smart Cards Trailblazer 9
Kurfuerstenstrasse 26
10785 Berlin
Germany
stefan.kissinger@bvg.de

Whitepaper on smart card transport applications and evolution

Executive Summary

It is no longer the time to finance research and investigation only, but to support the mass deployment of passenger transport e-ticketing systems based on smart cards.

a) Electronic Ticketing is a key area within the range of services offered by passenger transport enterprises. Current technology provides the possibility for ticketing transactions to be made using electronic media in the form of microchips and/or electronic memory devices, which can be installed in plastic cards (smart cards) or in other portable devices (mobile telephones, PDA's etc.).

b) International standards exist that define the physical nature of the equipment necessary for an e-ticketing scheme (e.g. the smart cards or SIM cards, the card accepting devices etc.), the communication protocols between the microchips on the cards and the card accepting devices and other standards exist to define the data architecture that has to be on the card in order to permit reading and usage of card data by a card accepting device.

c) Passenger transport (private and public) is the most significant application for the distribution and use of smart cards with multiapplication functions. Transport media are used daily, in the public area by everyone. There is no limitation to a special customer group.

The introduction of e-ticketing not only produces economic effects for passenger tansport operators, but it also creates an infrastructure, especially in urban areas, which can be used easily by other sectors. One important issue of electronic ticketing in Europe is that of interoperability. Here the issue of intermodality between the car and public transport, that aims to bring more ridership to the metro, train and bus services and also that of intermodality between different modes and/or operators in public transport can be stimulated through the usage of smart cards as mentioned above.

1. Aims

This white paper provides an essential and short informative set of requirements as well as some crucial aspects for future work in the area of interoperable and multifunctional e-ticketing systems in public services / transport (public and private).

2. Introduction

E-ticketing using smart cards is the key for a higher quality of life in modern urban societies.

The inclusion of Trailblazer 9 Public Transport within the eEurope 2002 initiative in the year 2000 was based on the fact that transport is one of the most important public areas which can be used by members of society.

The right to mobility, the need for mobility and the *de facto* increase of mobility in the last decades cannot be covered by the traditional forms of distribution and validation of access rights. The solution for this issue will be even more crucial in the coming next decade. This situation provides the basis for those requirements that must facilitate the transfer from one transport mode to another and also from one network to another. Customers want to have full transparency of tariffs, terms and conditions of travel access rights (contracts). E-ticketing will ensure the required transparency, i.e. of fares between companies offering the same transport mode, or between different modes, whether they be rail, air, coach, ferry, surface transport or car parks.

In accordance with published EU White Papers regarding transport matters, Trailblazer 9 has identified integrated e-ticketing as one of the most economic and reliable solutions for making travelling conditions easier, more economic and for facilitating modal transfers.

E-ticketing, if it is to be effective, must be accompanied by and integrated with other measures for improving the transport service. Indeed, e-ticketing and smart card schemes in general can enable many improvements to be made to the transport services offered.

The action plan of eEurope Smart Cards 2002 focuses on both the needs of citizens and the business community (transport operators /authorities etc.) alike in terms of business cases, multi-functionality and interoperability of systems and infrastructure.

3. Basic assumptions

While *e*Europe Smart Cards has, among other issues, aimed at accelerating the pace for securing Internet based transactions, Trailblazer 9 on Public Transport aims at supporting seamless travel using modern devices and carriers, such as smart cards.

Trailblazer 9 has been a horizontal activity within *e*Europe Smart Cards that can have a potential impact on a broad number of interest areas of the *e*Europe SC. To fulfil its objective, Trailblazer 9 has related its work with other Trailblazers such as Trailblazer 8 on user requirements, Trailblazer 7 on multi-application, Trailblazers 4, 5 and 6 regarding security, contactless technology, payment and devices. Also there are relations to Trailblazer 10 on eGovernment and Trailblazer 12 on advanced electronic signatures.

The aims of Trailblazer 9 are the following:

a) producing guidelines that support customers' ease of use of ICT services and develop a consistency of user experience with the smart card as an interoperable access token in European public transport and across other associated economic sectors such as parking, road user charging, leisure, sports and culture

b) producing tools that can assist public transport authorities and mobility companies in adopting the concept of interoperability between smart card based products and systems in support of seamless travel.

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The e-ticketing schemes (including system concepts and solutions) must be robust but also be expandable in order to adapt to new user needs or requirements. General system requirements are the following:

a) Adaptability (the capability to conform to the changing patterns of user needs)

b) Continuity (the capability to maintain a service in time + space)

c) Maintainability (the capability to be maintained, repaired, modified or enhanced with minimum disturbance)

d) Robustness (the capability to operate satisfactorily under all expected conditions)

e) Expandability (the capability to add equipment and functions)

f) Scalability (the capability to include a larger customer base)

g) Security (the capability of the system to protect itself from unauthorised access or from critical error)

System security is ensured by introducing specific measures to:

a) protect the system and data from external attack or interference

b) enable secure processing procedures within the systems and within system components

c) allow maintenance, repair, modification or enhancement with the minimum disturbance / costs.

4. User Requirements

There are two types of user requirements: one is linked to the customer and the other to the passenger transport operator.

E-ticketing schemes using at least smart cards or other electronic storage carriers are assumed.

5. Customer

The basic requirement here is that of *seamless travel*, as described by the European Community. Seamless travel is defined as the opportunity to move between one place and another with the minimum of inconvenience, according to the customer's own journey plan, using any combination of transport mode or operator.

Important items for an e-ticketing scheme are requirements such as ease of use, interoperable and intermodal use and multi-application options of the medium and also of the transport application. Other important items for customer requirements include:

a) An integrated approach to intermodality

b) Clarity of procedures

c) Service management at interchange points

d) Quality of transport infrastructures

e) Quality of the new ticketing system

The requirements are based on the assumption that the customer wants to travel from one part of a (mobility) network to another point in the same or in another (mobility) network. To do this, he may perform three basic steps:

a) He acquires information on how to travel to his destination.

b) He acquires access rights for the transport itinerary that will take him there.

c) He makes the trip.

The same ticket (or proof of entitlement, travel access rights) used to make the trip might not expire at the end of the trip, but be used (optionally) to access other services. Even if the proof of entitlement does expire, there is still a general requirement for the customer to retain information or proof regarding the use that he has made of a mobility service.

Additionally the customer will retain information on his perceptions of the quality of the trip, that can be useful for the transport entity (operator and/or authority).

Moreover, although the customer is most likely to acquire his access rights (whatever payment mode is used, whether pre-paid to post-paid, cash to electronic money) before completing the trip, in a post-payment scheme he would pay for these rights after he has made the trip.

To allow for all these contingencies and the possible introduction of other post-trip services (that may also include those of loyalty schemes), another step is required for defining customer requirements: Post-trip Services.

Actually making the trip may involve the following tasks:

a) travelling to/between/from points of access to the mobility network

b) validation of the customer's proof of entitlement to access or continue to use parts of a mobility network

c) inspection of the customer's proof of entitlement and/or of its validation

d) obtaining additional information during the trip, that may affect whether or not the customer completes the trip in accordance with his original itinerary.

The trip may involve changing from one vehicle or mode to another and having to validate and/or present for inspection the proof of entitlement at various stages of the journey. It may involve using one or several transport operator (s). On-trip information may be delivered using infrastructures that are managed and owned by a single transport service supplier or group of suppliers or by an external agency. It may be provided on behalf of one or several suppliers.

6. Passenger Transport Operator

Smart Cards can help to fulfil the requirements of the customer and thus attract additional custom to transport operators.

The deployment of a smart card ticketing scheme must seek to balance customer requirements with those of the transport operator.

The customer requires services for which smart cards or other electronic carriers are merely elements of technologies that may be necessary or desirable for the delivery of required services.

Any business plan for a new e-ticketing scheme must include a risk analysis that examines:

a) migration from a paper-based or magnetic-stripe ticketing system to an e-ticketing system based on smart cards or other portable devices

b) migration from an existing e-ticketing scheme run by a single operator to a multi-operator e-ticketing scheme.

Some of the benefits of e-ticketing schemes for the transport operator are :

a) Overall growth of productivity,

b) More flexible products and tariffs, greater product diversification

c) More reliable and cost-effective equipment (e.g. validation terminals) due to contactless smart card usage

d) Reduced fraud, as the security principles of smart cards make them very difficult to counterfeit than paper or magnetic-stripe tickets

e) Better transport usage data, and, as a consequence: fares more adapted to the users' needs,more accurate clearing, better planning;

f) loyalty programs;

g) Improved customer relations as a result of the better service made possible by e-ticketng schemes.

h) New revenues from advertising activities.

Passenger transport enterprises[1] must decide if they are going to install a new infrastructure for e-ticketing schemes, which can provide more options for their operations, business and the social and societal tasks of transport both today and increasingly in the future.

7. EC Policy and e-Ticketing

The European Commission has published various documents regarding transport and new ticketing schemes. The standardisation process for these issues is also quite well developed.

The issue of interoperable ticketing schemes has been addressed by previous Fourth Framework and IT for Mobility projects (e.g. CALYPSO, SIROCCO) and is being addressed by current IST projects (e.g. TRIANGLE).

The standardisation work is organised in CEN Technical Committee 224/WG11 (Machine-readable cards, related device interfaces and operations: surface transport applications) and CEN Technical Committee 278/WG3 (Road transport and traffic telematics: public transport).

Trailblazer 9 takes also into account documents like the White paper of "Commission of the European Communities, WHITE PAPER, *European transport policy for 2010: time to* decide, COM(2001) 370, Brussels 12/09/2001".

The results of the Trailblazers 9 work should be distributed to the relevant bodies and institutions of the EU as feedback into further standardisation and policy work.

8. Intermodality

Any e-ticketing scheme needs to be planned with an intermodal approach. A transport ticketing application is of course the kernel and the essential application. But to introduce a new media like a smart card (or other portable devices containing smart cards, such as the mobile phone) with a ticketing functionality, the solution must have the option to use this media for transport related applications like parking etc.

Only multi-application smart cards with contactless technology for transport can have the intermodal approach which is necessary to push forward the use of public or mass transit and a new use of private cars.

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[1] An enterprise may be a passenger transport operating company or a public authority responsible for passenger transport policy and support or a consortium involving both types of actor

9. Interoperability

The Global Interoperability Framework (GIF) for pan European interoperability has been focused on the functionality of end user identification, authentication and digital signature. Therefore those results cannot be used in general for transport - interoperability in transport is different.

The range of interoperability solutions are the following:

a) 'Localised' interoperability
Services inside the common fare area (transport authority area), involving interoperability between local scheme operators.

b) Specific transport interoperability
Transport services outside this area (specific interoperability between 2 scheme operators, limited services to be defined to meet user needs);

c) European aspect
Generalised transport interoperability across Europe

d) Specific service interoperability
Other services (non-transport or proprietary transport services)
Means of payment

For customers to travel seamlessly using a single medium across operator networks, a set of agreements are required between entities affected by the customer's decision to travel.

These agreements will cover both financial and commercial aspects and the exchange of usage and sales data that must result to permit the various entities to interoperate.

10. Deployment

Transport enterprises (authorities and/or operators) are unsure about using or installing e-ticketing schemes, because of the lack of official or de facto standards.

In some countries the association(s) of transport operators together with governmental support have produced or are producing some general specifications, but the use of these recommendations or the installations of e-ticketing schemes based on these recommendations are still quite limited.

Industrial suppliers for e-ticketing systems are also limited. There are system component suppliers, but only a few competent system suppliers, who can cover all the components and issues of interoperable e-ticketing schemes. An interesting fact is that a very high number of so-called consultants for e-ticketing systems are on the European market. Most of them are not professionals, but ex-employees of transport operators or persons related to some aspect of the smart card industry.

But deployment is now necessary. Many issues can only be detected and then be solved if deployment takes place.

11. Next Steps

To push forward eEurope it is necessary to use passenger transport (public or private) for the eEurope 2005 program to do the following tasks:

a) Information policy
It is important that the existing e-ticketing schemes in countries such as Portugal, France, Italy etc. should adopt an open information policy to provide all the information necessary to other national and European public administrations and other interested parties for e-ticketing schemes in transport.
That open information policy should not be used for the marketing activities of one solution as a competition tool. Experience in the last 10 years has shown that all interested entities have

well understood the limits of this marketing approach - with the result that no key decisions have been taken.

b) The technology experience
While technology is the facilitator of the surge in e-ticketing for modern mass transit and transport in general it might, however, turn out to be a reason of concern. Certain industry features might impact e-ticketing projects on issues like smart card operation systems, smart card readers / terminals / validators, interoperable security modules etc. Certain aspects such as the installation and deployment time and costs for the infrastructure in the migration paths mentioned before might become critical. Business cases and experiences of deployment of e-ticketing systems should be distributed to interested entities to reduce risks.

c) Data protection and consumers' rights
In spite of the specific referencing of data protection in the directive 99/93/EC, there is some concern associated with the privacy assertions of e-ticketing schemes. The Directive 95/46/EC (Data Control) includes identification of all the actors involved for the purpose of applying Article 2 of the Directive, compliance with the principles of general data processing quality (Article 6), legitimacy (Article 7), control procedures regarding sensitive data processing (Article 8), the right of customers and personnel to access information related to them (Article 12), data ownership: customers and personnel are granted the right to a "justified objection" to the processing of their personal data, with a special emphasis when processing involves direct marketing (Article 14), restrictions on automated processing of data related to creditworthiness, black lists and personnel control (Article 15), personal data access and protection procedures (Articles 16 and 17) and personal data processing related to common fare products enabling cross border trips (Article 4). Those cases should be covered and additional guidance is required for their effective implementation.

Future activity in this area might focus on addressing the deployment of smart cards in public transport areas, to cover most of end-user requirements. In this regard some of the following suggestions could also be considered:

a) To push forward the standardisation process of CEN TC 278 and CEN TC 224

b) Basics
Electronic Ticketing solutions with smart cards should be national and interoperable across Europe. Smart card solutions must include intermodal application(s) (like ticketing, parking...). Legal aspects for European wide use must be removed or solved. Privacy aspects must be covered. Highlighting data protection and consumer protection aspects come as a dire need of services offered to the general public.

c) Important
Smart cards in public and private transport must have a chip-partition to be used as secure carriers for eGovernment solutions.

The EU must support strongly the deployment of multi-application smart cards in passenger transport systems in all European urban areas.

It is now time to produce the infrastructure for a better life through modern transport and also to use more eGovernmental e-application with the T (Transport)-Smart Card.