AUTOMATED BORDER CONTROL WITH A HARMONIZED MODULAR REFERENCE SYSTEM
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EXPERIENCES IN THE EU RESEARCH PROJECT FASTPASS

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Abstract

The increasing amount of travelers crossing the EU borders as well as Illegal border crossing with sophisticated spoofing methods forces the authorities to implement new solutions for the control process. In order to achieve higher control rates and to increase security and objectivity in the process, the borders of the EU have been supported by automated border control systems (ABC) during the last years. The FP 7 EU project "FastPass" defines a European reference architecture for ABC systems relating to air, sea and land borders. The main objectives are lower cost, higher security for the border guards and increased acceptance for the travelers, authorities, politicians and the public. The FastPass consortium is a balanced mixture from industry, research and authorities/users of ABC systems with 27 partners from 9 countries (Austria, Germany, Finland, UK etc. like the Austrian AIT (coordinator), the Finish VTT and the German Fraunhofer Society.

The main objectives are derived from the following motivating challenges: increased passenger flows, increased spoofing attacks, increased security requirements. They are higher process speeds, anti-spoofing measures, system risk assessment, harmonization, variety in usage, better usability and acceptance.

1 INTRODUCTION

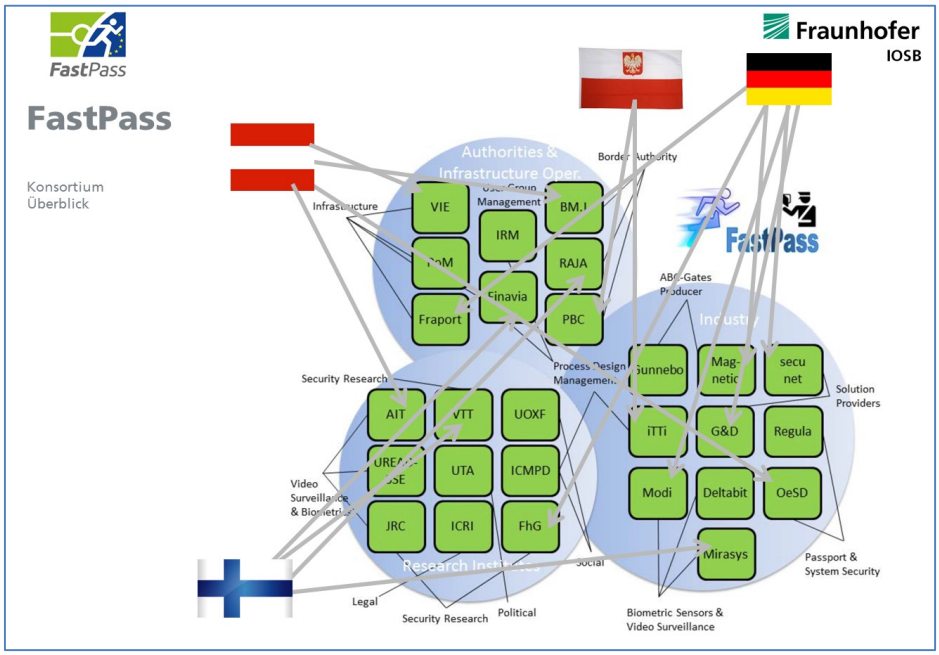

Figure 1: FastPass Consortium

In the last years, ABC systems have been introduced in several countries in Europe and other countries like Canada, Hong-Kong and the USA, in order to encounter the rapidly increasing amount of travelers. A lot of experiences have been gathered, many problems have been solved and many advantages discovered. However, there are still problems in the range of spoofing, missing usability and acceptance, operation failures and many more (comp. [1], [2], [5], [10]).

The FP7 IP FastPass has been set up to define a reference system architecture for European ABC systems and increase usability and acceptance and define the legal framework with respect to privacy and data protection([10], [3]).

2 PROJECT OVERVIEW AND OBECTIVES

The overall objectives of FastPass are shown in Figure 2: After the definition of conceptual items like border crossing concepts for the respective border types and architecture definitions, the focus lies on the integration into present concepts and installation in cooperation with the European authorities and the facilities. Furthermore, acceptance and usability tests shall be performed and lead to an over-all evaluation with lots of requirements and criteria defined in an evaluation framework that will perform data based automatic evaluation loops generating special views for the interpretation and discussion of the results (comp. [7]).

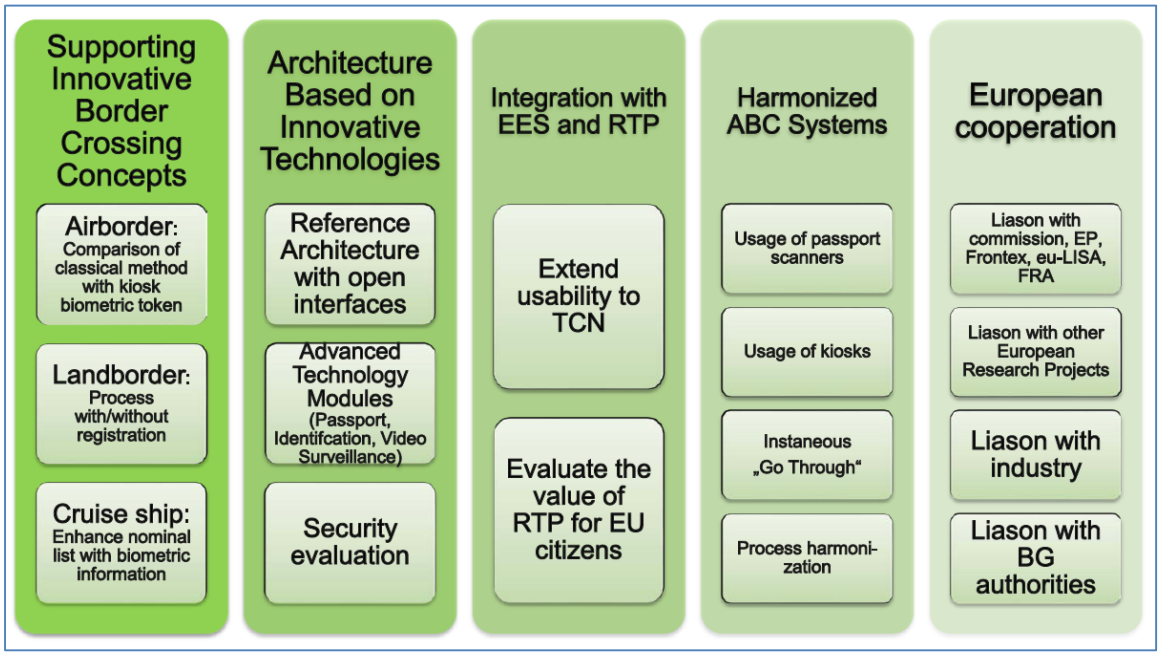

Figure 2: Objectives of FastPass

The requirements for the reference architecture are innovative border crossing concepts, the next-generation sensors, novel frameworks, software and algorithms, on-the-move biometric identification, speed, quality, reduced intrusiveness, counter spoofing and costs. Three typical installations at the different border types air, sea and land are currently being installed, tested, demonstrated and evaluated. They realize several air border scenarios with different paradigmatic concepts in Vienna, a cruise-ship scenario with special document handling at the port of Piraeus, a land border scenario with travelers remaining in the cars what is solved by moveable terminals, ANPR for the detection of the vehicle and driver and co-driver check at Moravita in Romania.

All scenarios are evaluated using a comprehensive framework with requirements, criteria, measurement descriptions, a methodology for a holistic risk and security

assessment, a collection of threats (with type, impact, exploitability and mitigation strategy) and a collection of advanced tools for the evaluation processes.

The architecture concepts for all border types are based on innovative technologies with new biometric sensors, advanced video detection for the control of the passenger's behavior, queue length optimization module for the optimized balancing between the different lines and kiosk concept for the optimization of the complete process at air borders.

The results of FastPass will lead to reference architecture with increased security, with resistance to attacks on the document scanner, with resistance to biometric spoofing, with a risk and security assessment by dedicated methodology, a user interface developed with extensive feedback from the border guards, processes developed with extensive evaluation from traveler groups and privacy and data protection.

3 DEVELOPMENTS

In addition to the architecture, several developments have been performed in the range of FastPass in order to improve the control process. Especially, the problem of spoofing has been encountered by several by several improvements in the biometric process like substantiated face recognition, a new iris scanner system and a fusion algorithm that compares and combines biometric information on a symbolic level.

For the effectiveness of the process, several measures have been added to the over-all process like queue length calculation and optimization, the providence of kiosk systems for the document reading.

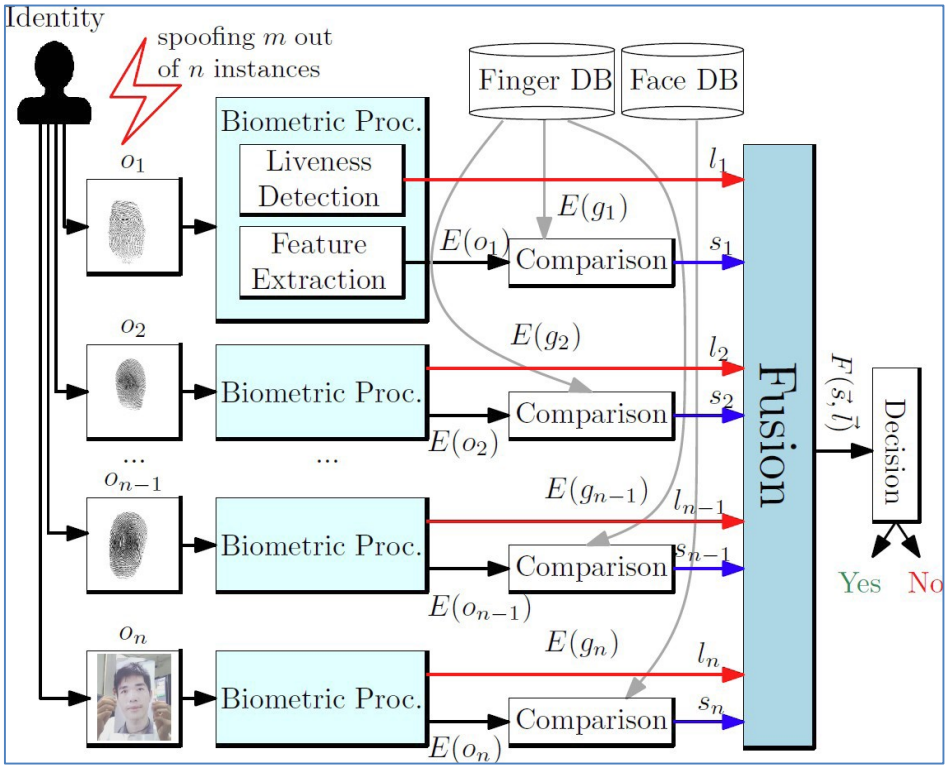

Figure 3: Schematic paradigm for counter spoofing fusion

4 SCENARIOS

For testing, demonstration and evaluation of the reference system, three installations have been developed and realized for the three border types air, sea and land in Vienna (Schwechat airport), the port of Piraeus in Greece and at the land border between Romania and Serbia in Moravita. All generic features of the systems are mainly equal, only in the special properties for the respective border type are differences.

At the air border, special tests with the usage of kiosk systems have been performed. To accelerate the complete process, it has been divided into two steps: the document reading process of the electronic part of the passport and the biometric measurement. The electronic document reading is performed by kiosk systems (comp. Figure 4). For the appointment to the second step of the process, the biometric detection and authentication, a token is required that is reliable enough for a unique appointment of the traveler. In a first step, this is the passport number which can be read optically in the beginning of the second phase in order to increase the speed. In a second step, the face of the traveler will be used as a token for the resume of the process at the mantrap.

For the optimization of the queuing process, there has been a development by AIT for the video based determination of the queue length (comp. Figure 5) and a queue balancing system developed by Fraunhofer IOSB to optimize the distribution between the single queues with an estimation of the respective duration at the single gates.

The installations at the sea border (Piraeus) and the land border (Moravita, Romania) are shown in Figure 6 and Figure 7.

Figure 4: Air border installation at Schwechat airport

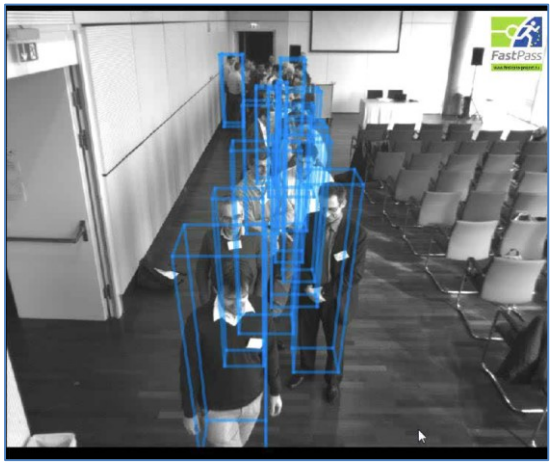

Figure 5: Queue Length Detection and Measurement

Figure 6: Sea border installation at the port of Piraeus

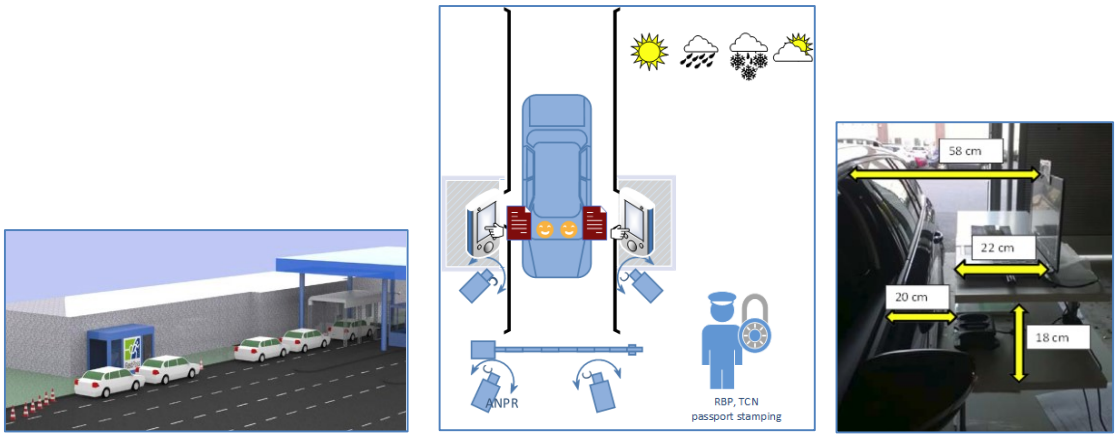

Figure 7: Land border installation in Moravita (Romania)

5 CONCLUSION

For the border control process, automated systems lead to higher effectiveness and more security. The more complex constellation of the gates needs an optimized control of the queues. That is realized by video surveillance, automatic length estimation and the optimization of the queuing process.

ACKNOWLEDGEMENTS

The work for this conference paper has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Program (FP7/2007-2013) under grant agreement n° 312583. This publication only reflects the authors' view and the European Union is not liable for any use that may be made of the information contained therein.

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