FastPass

A harmonized, modular reference system for all European automated border crossing points

Presented by

Markus Clabian
Senior Engineer
Austrian Institute of Technology - AIT

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The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583.

Overview

- FastPass – motivation, facts, objectives and status
- Selected topics and results
  - User Needs and Requirements
  - Document inspection
  - Biometrics
  - Surveillance
  - Security and Privacy Assessment
- Summary and next steps

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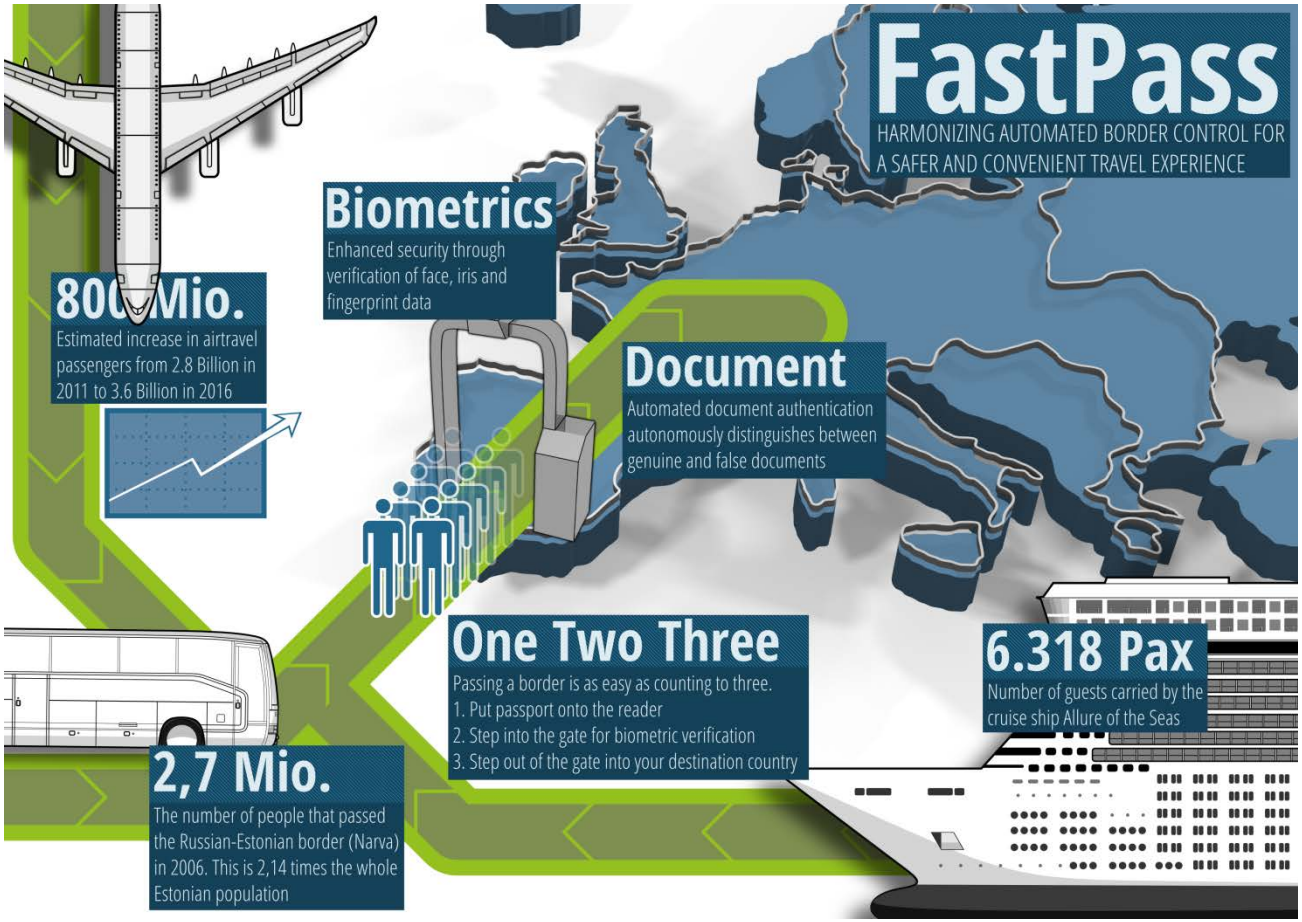
Motivation

Challenges :

- Passenger flow ↑
- Requirements on the border control process ↑
- System risk assessment ?
- Harmonization ?
- Variety in usage ?



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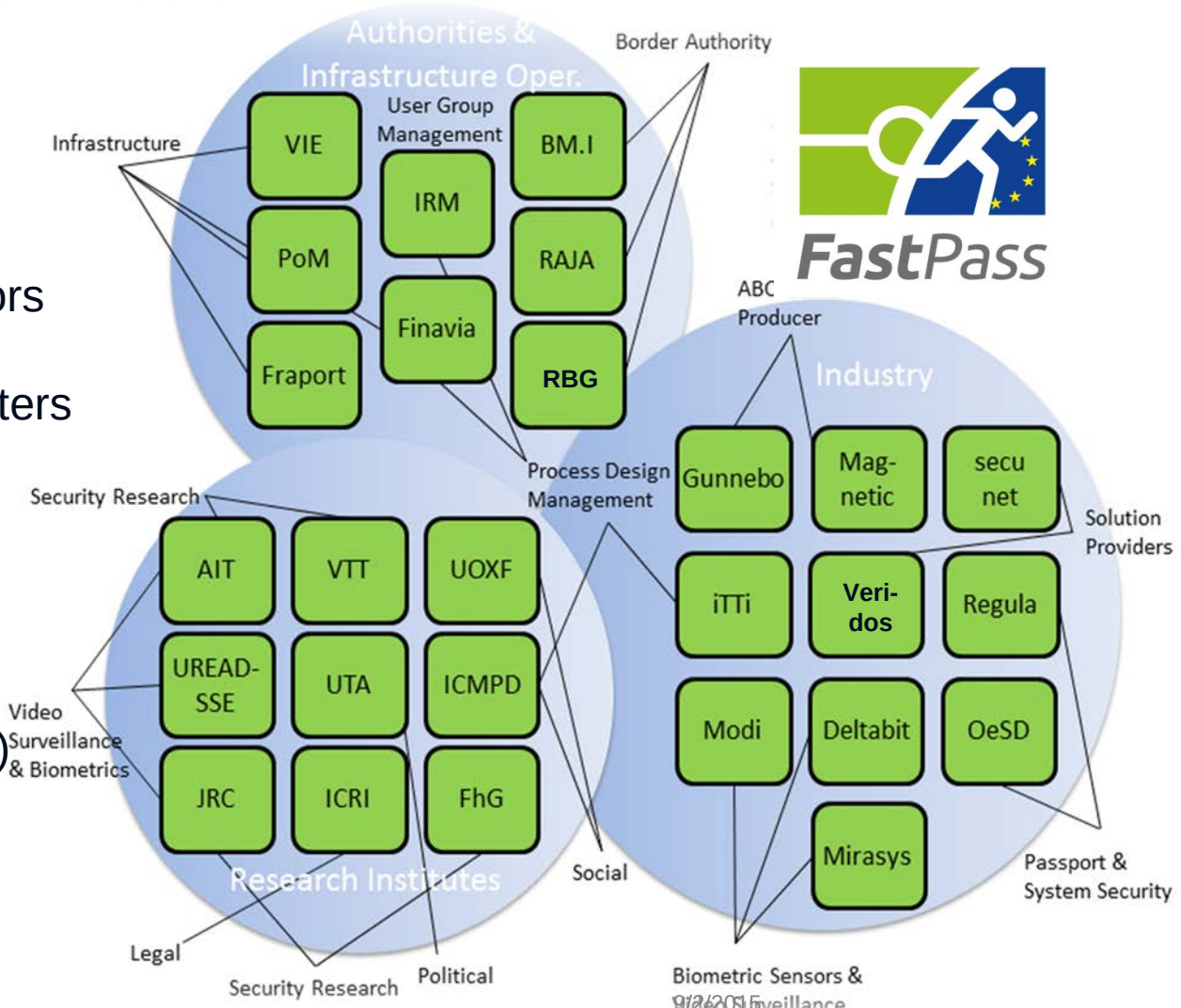
FastPass – Project - Facts

27 partners:
- 3 border authorities
- 4 infrastructure operators
- 11 industry partners
- 5 applied research centers
- 4 universities

Schedule
- 1.1.2013-31.12.2016
- Demonstrations/Pilots
  - Air (started in June)
  - Land (will start in 2016)
  - Sea (will start in 2016)



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FastPass Objectives

Integration with EES and RTP

- Entend usability to TCN
- Evaluate the value of RTP for EU citizens

Harmonized ABC Usability

- Usage of passport scanners
- Usage of kiosks
- Instaneous „Go Through“
- Usage of fingerprint scanners

Supporting Innovative Border Crossing Concepts

- Airborder: Comparison of classical method with kiosk biometric token
- Landborder: Process with/without registration
- Cruise ship: Enhance nominal list with biometric information

Architecture Based on Innovative Technologies

- Reference Architecture with open interfaces
- Advanced Technology Modules (Passport, Identifcation, Video Surveillance)
- Security evaluation

European cooperation

- Liason with commission, EP, Frontex, eu-LISA, FRA
- Liason with other European Research Projects
- Liason with industry
- Liason with BG authorities

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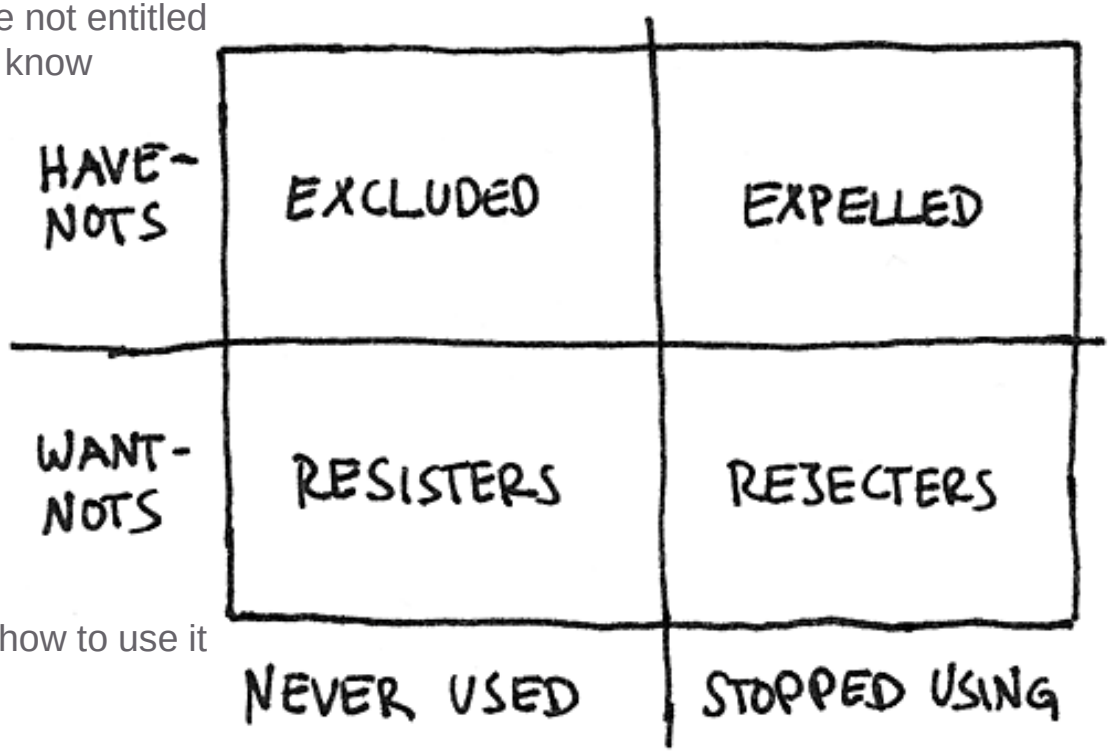
Non-Users of ABCs

8% say, the are not entitled
4% even don‘t know



3% prefer manual control

26% don‘t know how to use it

Matrix illustration of the taxonomy of non-use as described by Wyatt, Thomas and Terranova (2002).

Largest group (57%) are the ‚Unawares‘

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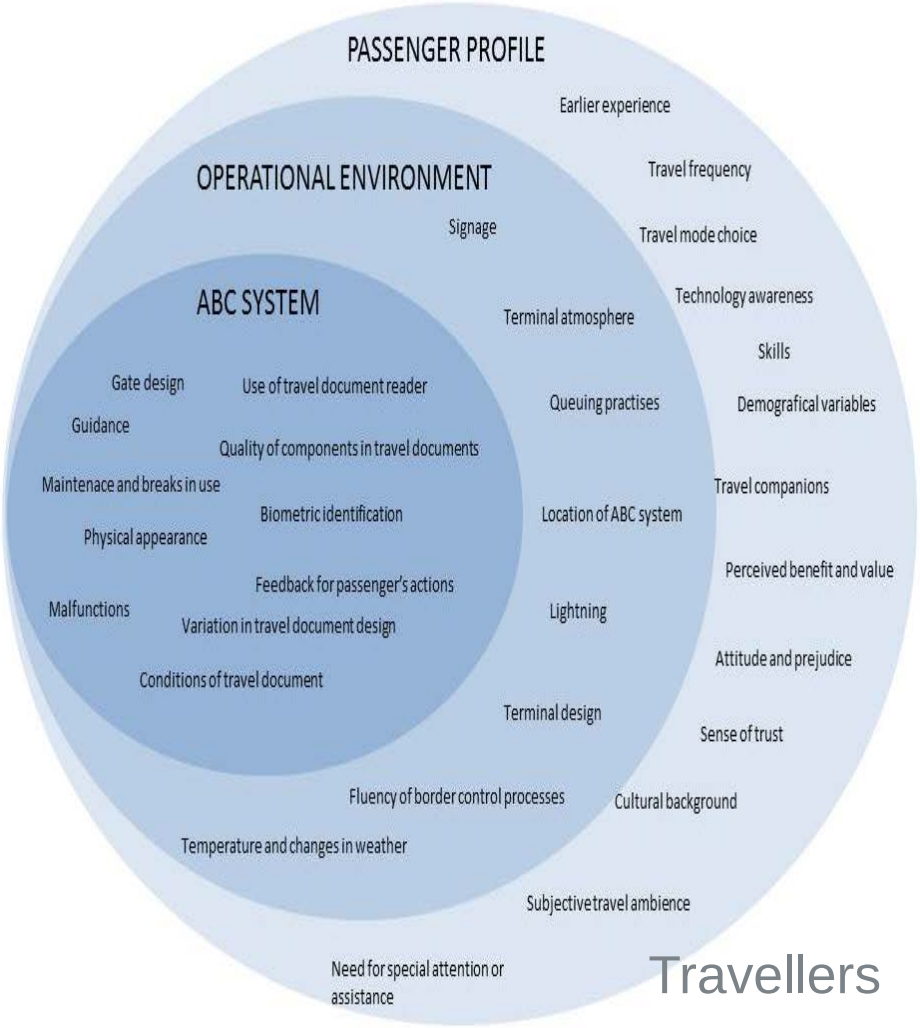
Factors affecting experience

Border guards



Travellers

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Most common challenges in use of ABC

Passenger

- Lack of awareness:
  - ABC concept in general
  - Possibility to use ABC
  - What is necessary to use ABC
- Challenges in use:
  - When to enter/exit the gate
  - How and where to insert the passport
  - How to behave during the face capturing phase

Border guard

- Amount and quality of information:
  - Correction of passenger errors
  - Number, position and quality of information sources
- Poor ergonomics and uncomfortable working conditions
- Limited possibility for profiling

Results in

- Inactivity/inefficient in use
- longer processing time
- increased number of no-match, rejection and retries
- reduced satisfaction
- reduced productivity.

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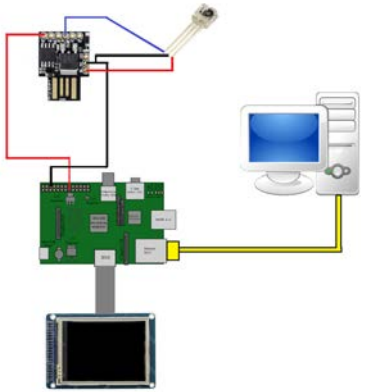
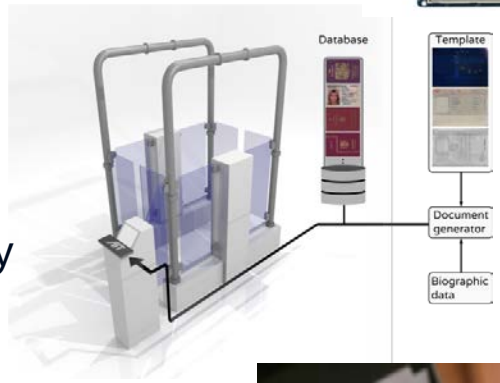
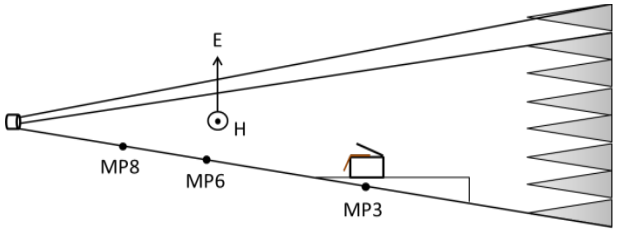
Document scanning and its impact to ABCs

- **Analysis of passport aging effects**
- **New methods for improved feature checking**
- **Robust to presentation attacks**
  - Device mimicking a passport
- **Passport Simulator as testing tool**
  - Black-box testing of whole ABC gate
  - Automated simulation of large quantities of passports
  - Testing robustness against the active display
- **Robust to IEMI**
  - Vulnerability of electronic document readers against High Power Electromagnetics







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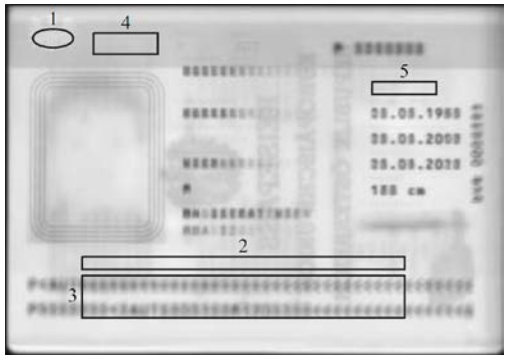
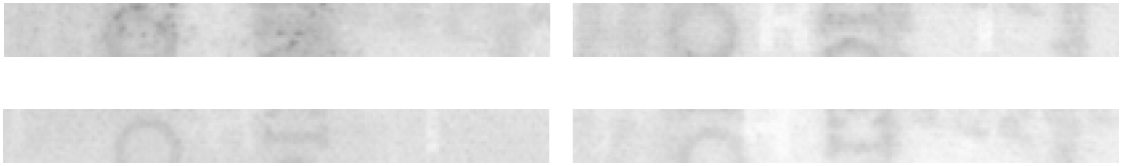
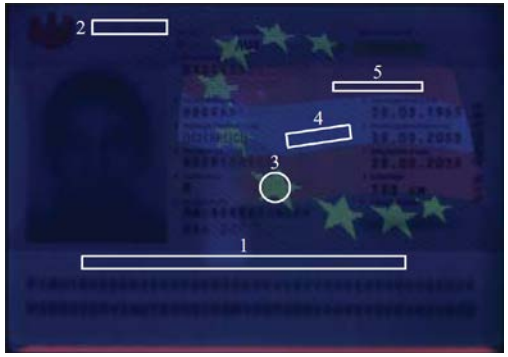
Variation in genuine passports

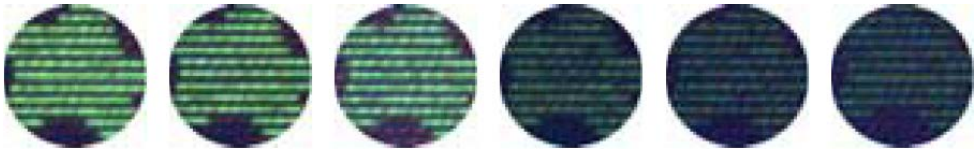
Most stable, variation << 3%





Still stable, variation around 3%





Not stable, variation up to 52%

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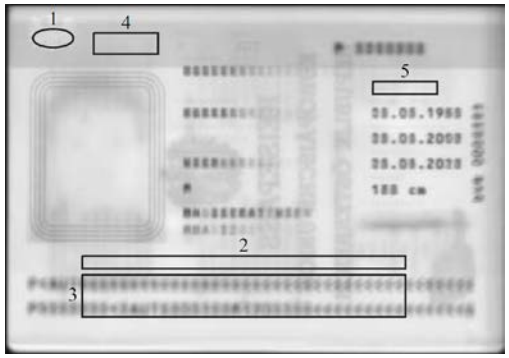
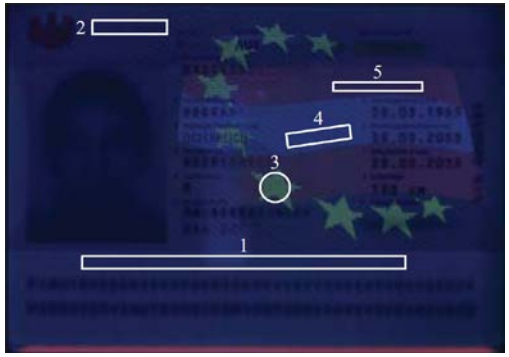
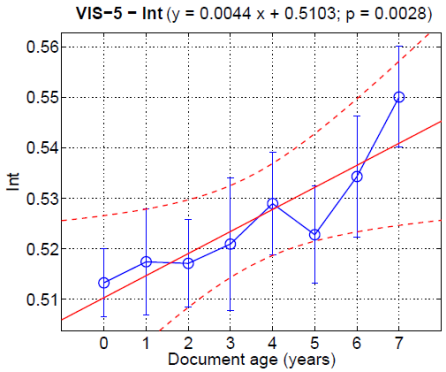
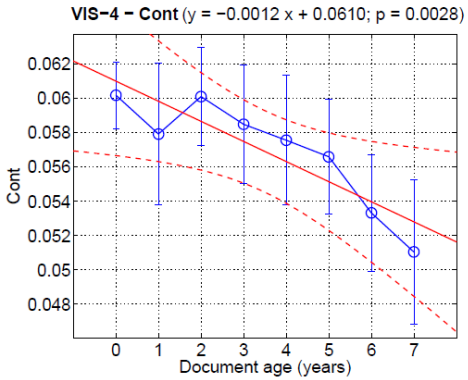
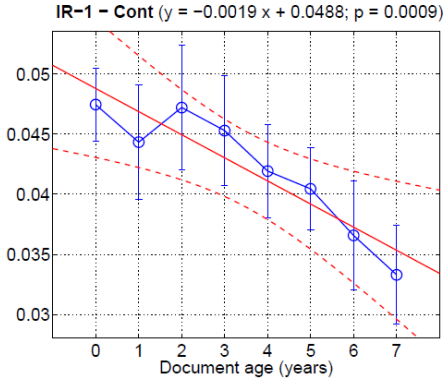
Aging effects

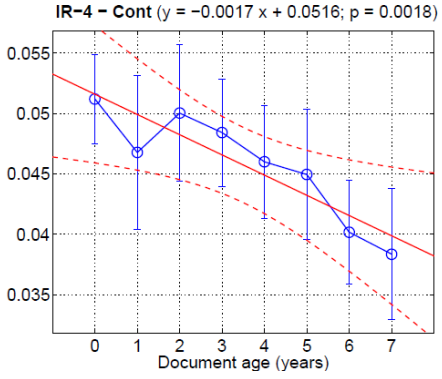


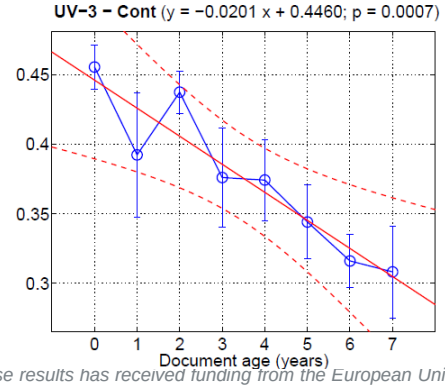


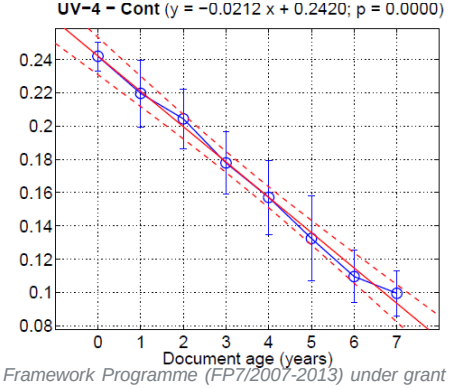












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Document reader interoperability test

Document readers tested

1. *3M AT9000 MK2*
2. *ARH Combo Smart*
3. *ARH PRMc*
4. *Desko Icon*
5. *Desko Penta*
6. *Regula 7024m.111*
7. *Regula 7034.111*
8. *Suprema RealPass-V*
9. *Visotec Expert 600*

Parameters evaluated

- Optical resolution
- Basic radiometry
- Absolute color accuracy
- Special features such as glare suppression, OVD detection or micro-text inspection

Documents tested

41 genuine documents

11 countries

4 types

Results expected

Overview of features relevant to output image quality

Performance comparison of these features

Interoperability analysis of tested devices with the focus on verification of optical security features

Recommendations w.r.t. to the ABC scenario

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Biometrics and ABC

Open Challenge	FastPass contributions until now	Reference
Biometric modality limitation - Passports have face and fingerprint - ABC installations rely on faces - Only RTP programs use additional modalities	FastPass proposes - advanced features for next generation face recognition and - combination with additional modalities (finger, iris)	Technology presentations from Modi at Passenger Terminal Expo and other trade fairs Paper to be presented at BIOSIG 2015 Peter Wild, University of Reading, "Segmentation-level Fusion for Iris Recognition"
Face recognition is slow in some installations	FastPass analyses current face recognition to improve performance in ABC systems FastPass proposes face verification "on the move" and iris from a distance	Paper presented at ISBC/AVSS 2015, Andreas Opitz, AIT, „Evaluation of Face Recognition Technologies for Identity Verification …." Technology presentations from Modi at PTE and other trade fairs
Spoofing is a relevant issue	FastPass proposes face recognition technology with improved 2D/3D spoofing detection FastPass proposes algorithms for improved spoofing detection in multibiometrics	Technology presentations from Modi at PTE and other trade fairs Paper presented in Pattern Recognition, Elsevier, Aug 2015; Peter Wild „Robust multimodal face and fingerprint fusion in the presence of spoofing attacks"
Token for segregated 2-step is process unclear	FastPass proposes biometric token (NIR face)	To be presented

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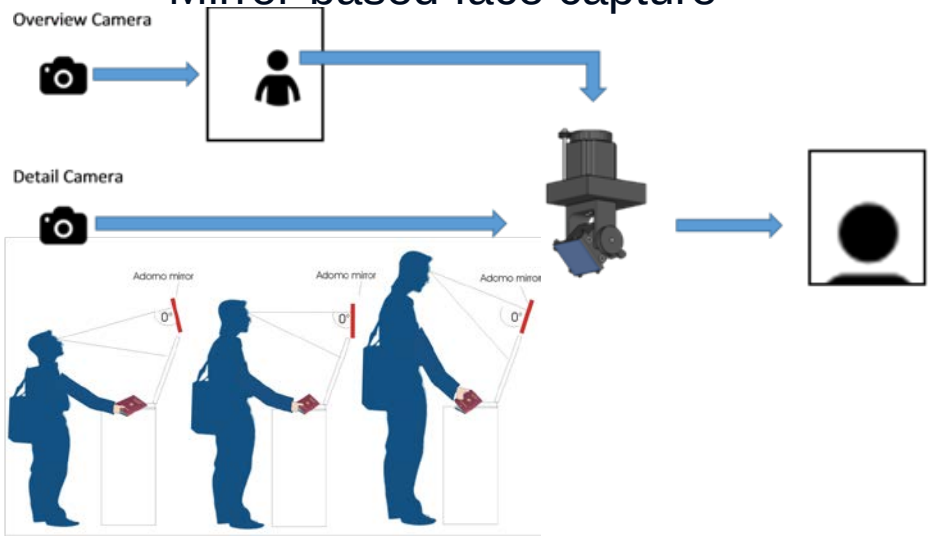
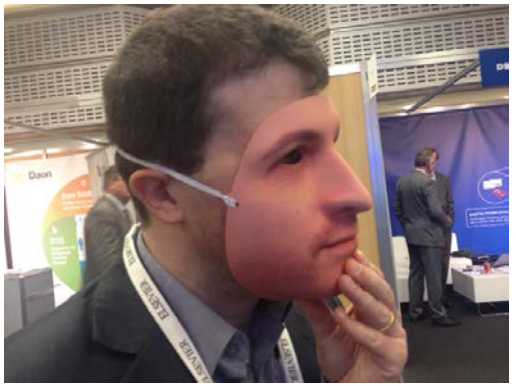
Face recognition on the move

- Mirror-based face capture



- Eye-safe capture in NIR spectrum

- Liveness detection against face image/video, masks



- Iris capture from a distance (option)

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Face recognition on the move

- Kiosk: Enrollment, border checks

- eGate: Fast 1:n identification using face as a token

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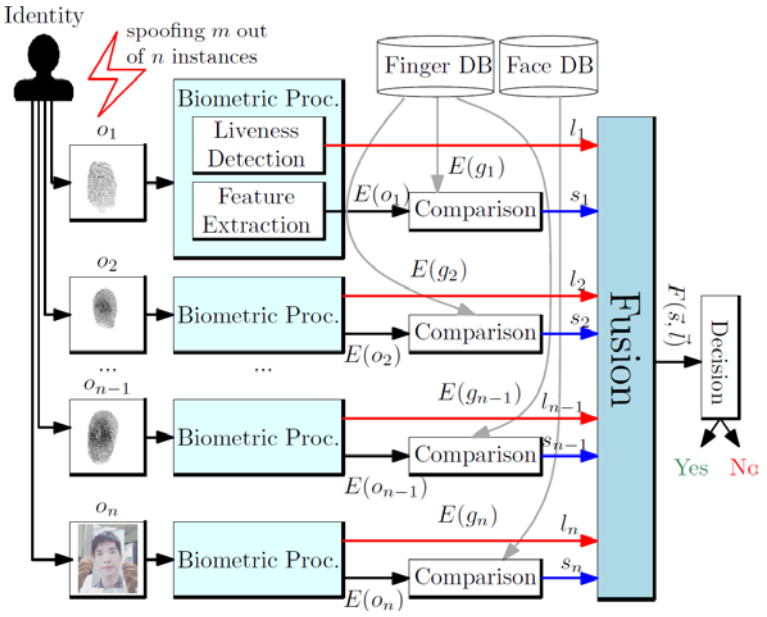
Multibiometric spoofing detection for Face & Fingerprint

(presented in: Pattern Recognition, Elsevier, Aug 2015. doi: 10.1016/j.patcog.2015.08.007)

- **Problem:** even a single spoofed finger can lead to a false accept, if spoof-detection fails.
- **Ambition:** Counter-spoofing at system-level
- **Contributions:**
  - Median filtering (MF) integrating matching and spoofing scores
  - „Outliers“ in scores detected
  - Bagging-based novel fingerprint counter-spoofing algorithm
- **Result:**
  - MF outperforms standard algorithms
  - Equal Error Rate remains stable



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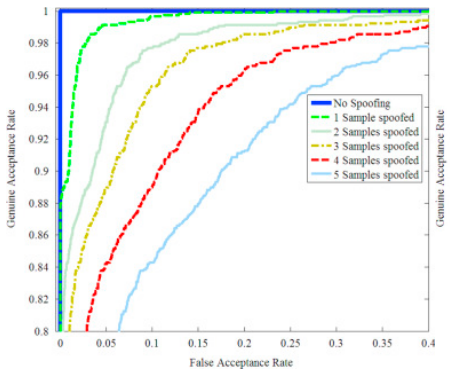

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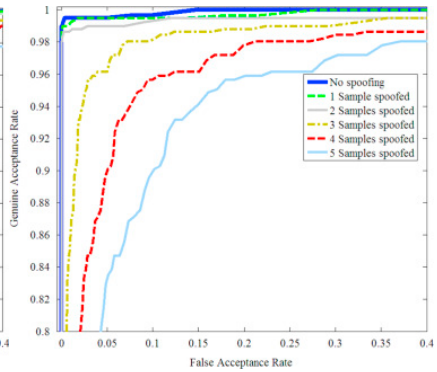

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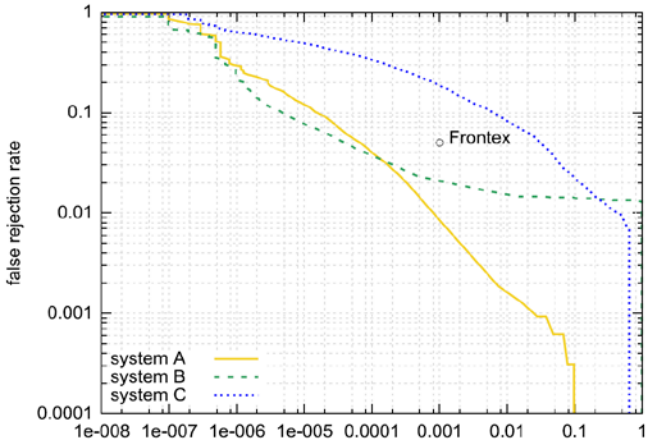
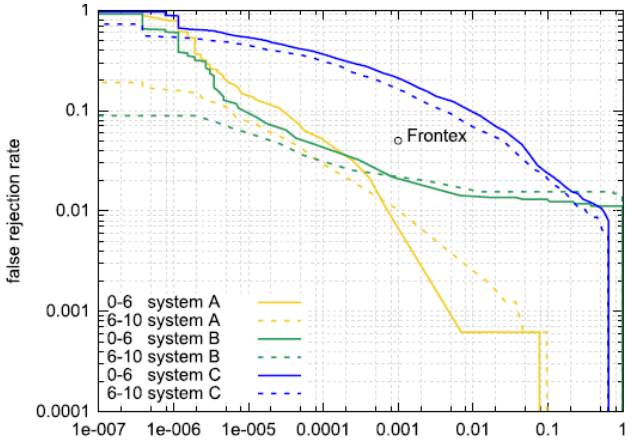
Evaluation of Face Recognition Technologies for Identity Verification

(presented at 12th *IEEE Int'l Conf. on Advanced Video and Signal based Surveillance*)

- **Ambition:** Scenario-based (FastPass system at Vienna Int'l Airport) evaluation of biometric ROC performance verifying Frontex recommendation (FRR of 0.05 at a FAR of 0.001)
- **Results:**
  - 2 out of 3 commercial algorithms achieve these rates
  - Age of the passport has an influence on detection rates
  - Nationality of passport has an influence on detection rates





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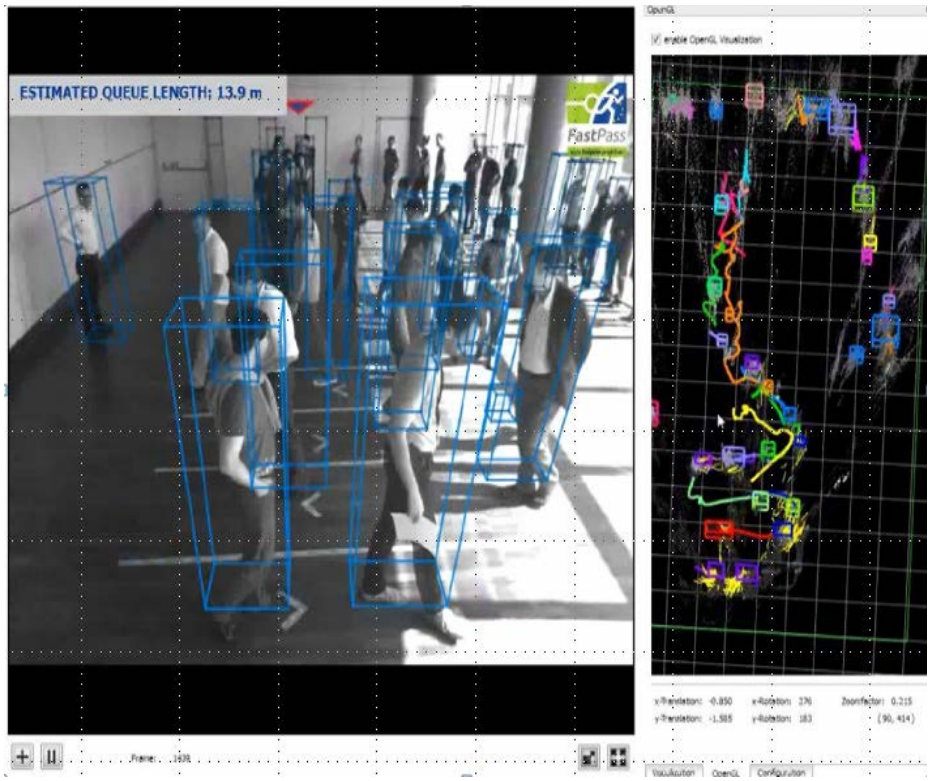
Advanced video surveillance

- Person separation

- Queue analysis (length, dynamics) to get waiting time



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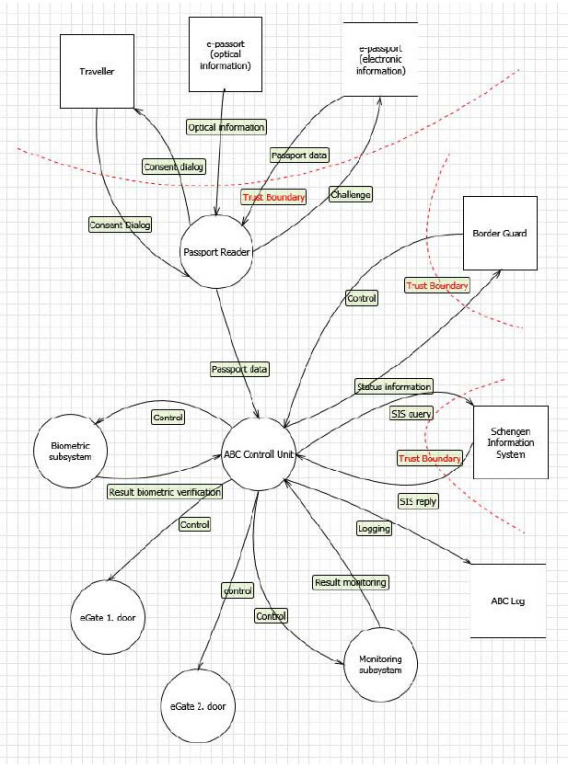
Risk Analysis – Threat Visualization

- STRIDE$_{FastPass}$ - risk classification based on STRIDE
- DREAD$_{FastPass}$ - risk scoring based on DREAD
- Risk analysis
  - IT centric
  - Used centric



	High (3)	Medium (2)	Low (1)
Damage Potential (D)	The person can subvert the security system and pass through the gate.	Long-term malfunction or failure of the gate; the person may overcome single security checks of the gate but not the complete process.	Short-term malfunction or failure of the gate; the person cannot pass through the gate.
Exploit-ability (E)	A novice person could make an unauthorised pass in a short time.	A skilled person could make an unauthorised pass, and then repeat the steps.	An unauthorised pass requires an extremely skilled person and in-depth knowledge to exploit.

- Development of a specific impact assessment for privacy
  - DPIA+ including ethical dimensions

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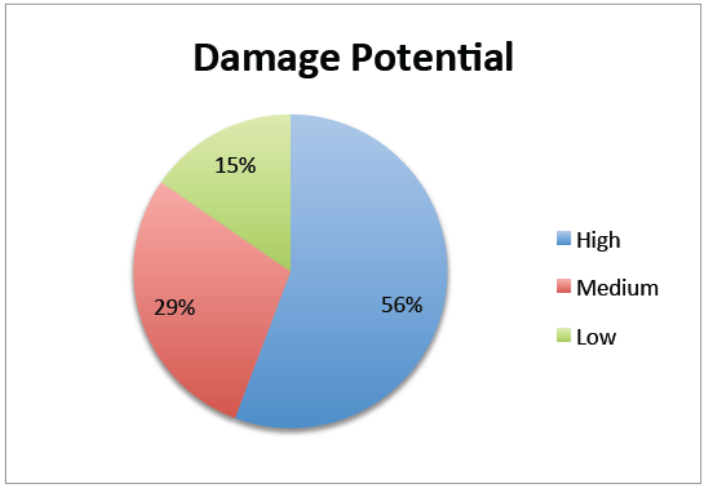
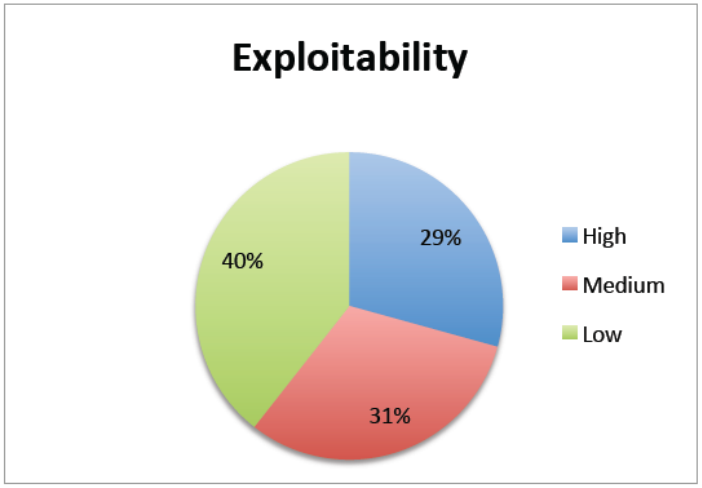
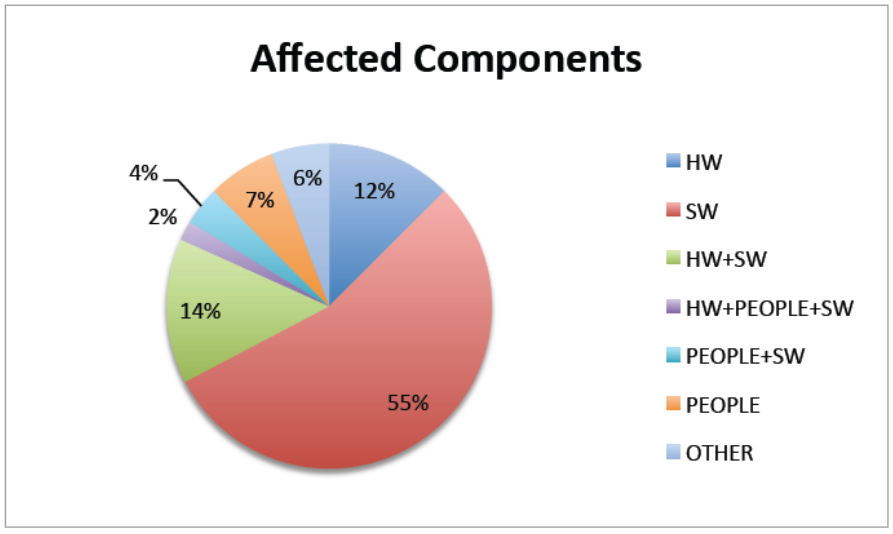
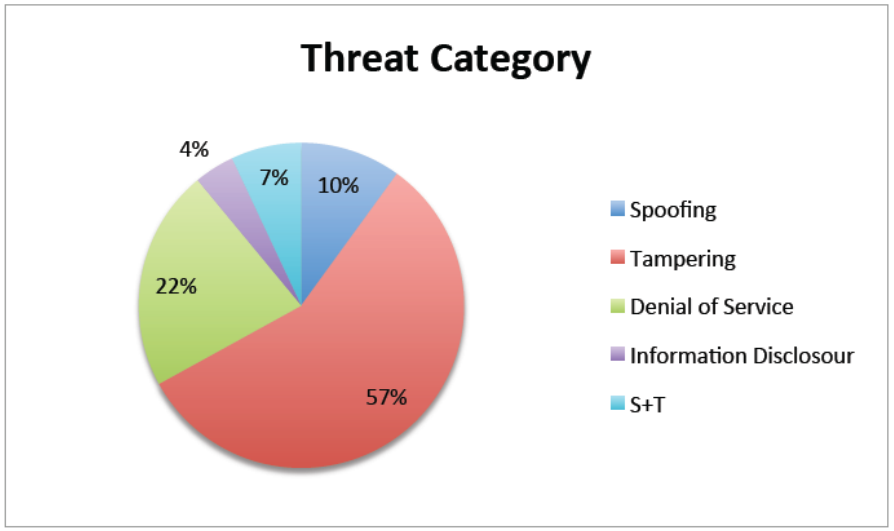
Risk analysis – Threat Visualization





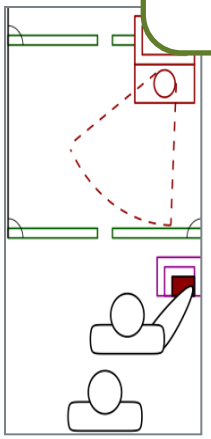




FastPass – Air border scenario

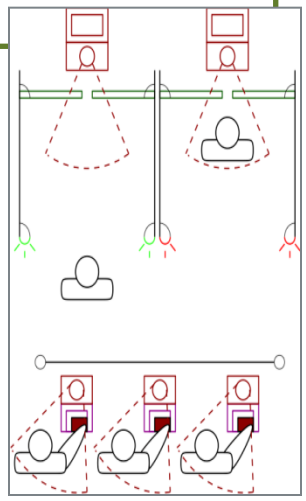
- Classical passport reading at the eGate (slow)
- New Biometric sensor (Face)
- Several workflows (configurations) tested

Stage 1 "Baseline Mantrap"



Stage 2 "Segregated 2-step Kiosk"

- Passport reading at the Kiosk (parallel, faster)
- Passport/Face (fast read) enable the eGate



- Pre-registration using the Kiosk
- Data is stored to speed-up process for return trip
- Multibiometrics for higher accuracy/security

Stage 3 "RTP with Multibiometrics"

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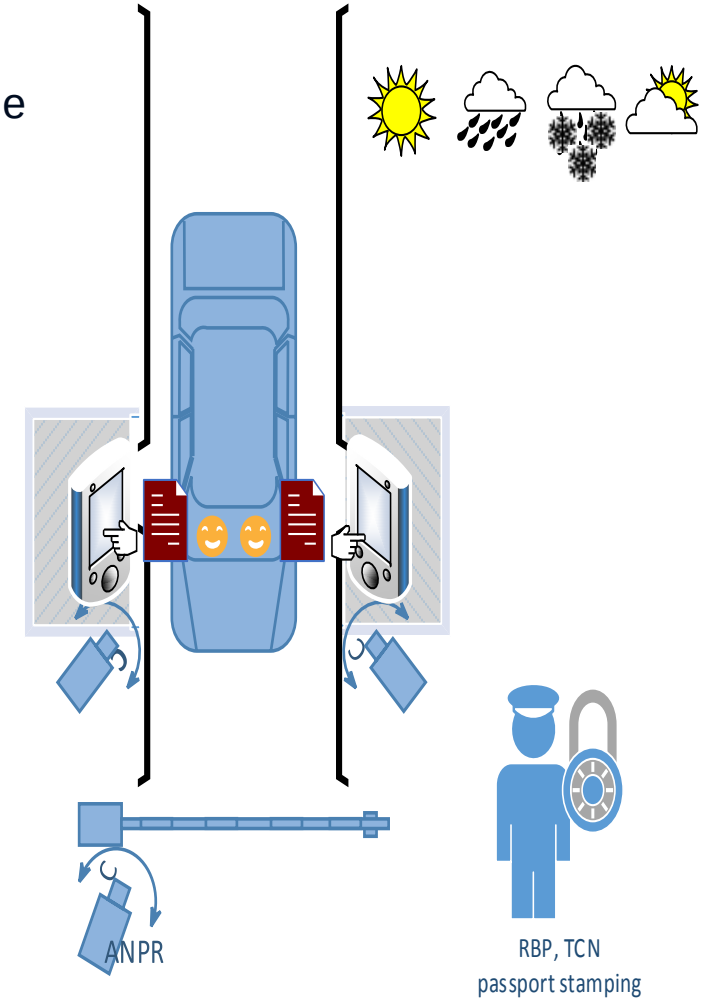
FastPass – Land border scenario

- Land border traffic increasing steadily
- New processes and infrastructures needed to handle the traffic
- Both EU citizen and TCN
- Definitive portion of regular travellers
- No land border ABC in EU exists
- Existing land border solutions use RTP type solutions
- Biometrics in outdoor conditions is an issue



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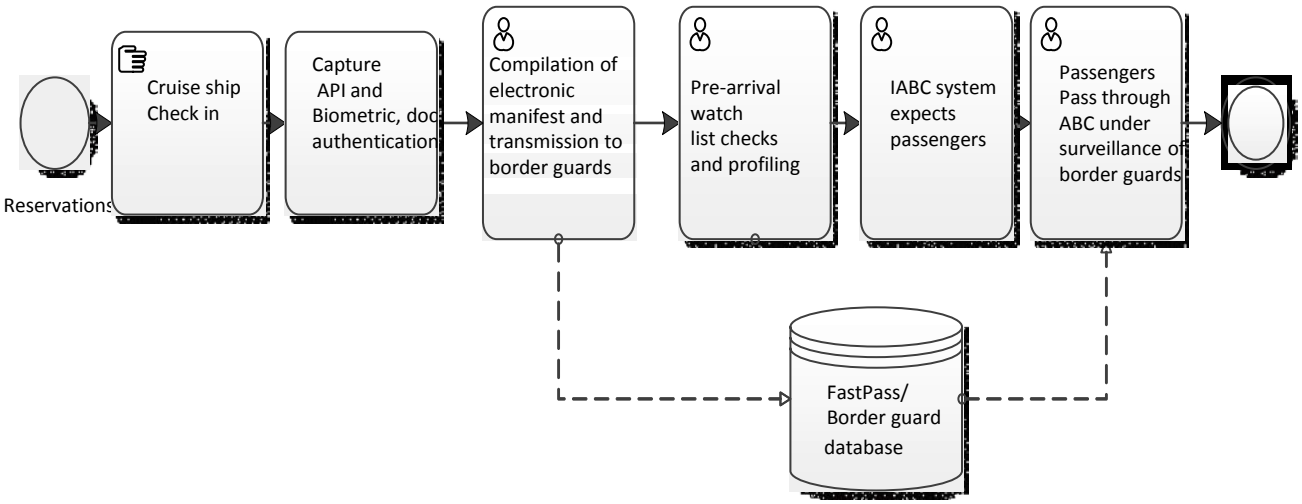
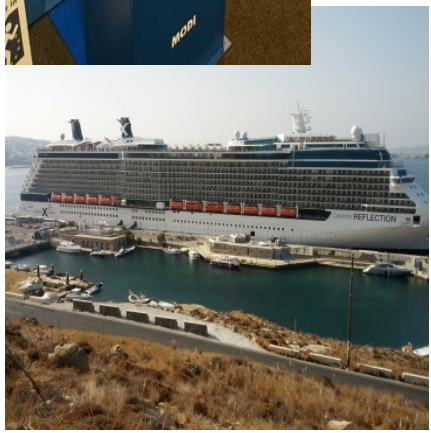
FastPass – Cruise ship scenario

- Carriers collect API from passenger travel
- Special provisions in the Schengen Borders Code for cruise ships
- Facial images are collected for ship management
- Cruise ship passengers are considered low-risk for *passport* control
- Cruise ship companies demand fast, flexible and convenient disembarkation/re-embarkation (mission critical)





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FastPass – the system, that

- **…is secure**
  - Resistent
    - to latest attacks on document scanner,
    - to biometric spoofing
  - Risk Assessment, Security Assessed by dedicated methodology
- **…you like**
  - UI developed with extensive feedback from different European border guards
  - Process and procedures developed with extensive evaluation from traveller groups
  - Respects privacy and data protection (Data protection impact assessment – DPIA)
- **…is harmonized – and shows new processes and scenarios**
  - ONE reference architecture serving many processes
  - First European solution for cars at land border with ABC
  - First solution for cruise ships
  - First solution for segrated two step process with face as biometric token
  - Real comparison of different approaches

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Thank You !

Event information

BIOSIG 2015
Thursday, September 10, 16:00 - 16:30

Peter Wild, University of Reading,
Segmentation-level Fusion for Iris Recognition

Contact information

www.fastpass-project.eu

Email: FastPassCoordinator@ait.ac.at

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