The FastPass Project Research on ABC Systems to Secure EU Borders and Improve Border-Crossing Efficiency

SMI Border Security Conference, Rome

Presented by

Markus Clabian (Coordinator)
Senior Engineer, Safety & Security Department,
AIT Austrian Institute of Technology, Austria

Presentation Overview
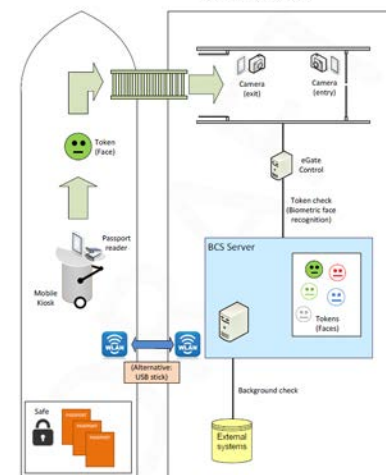
FastPass consortium

- **FastPass project, consortium, objectives, achievements and time line**
- **Next generation sensors, algorithms and frameworks**
- **Innovative scenarios and planned demonstration**
- **Summary and Outlook**
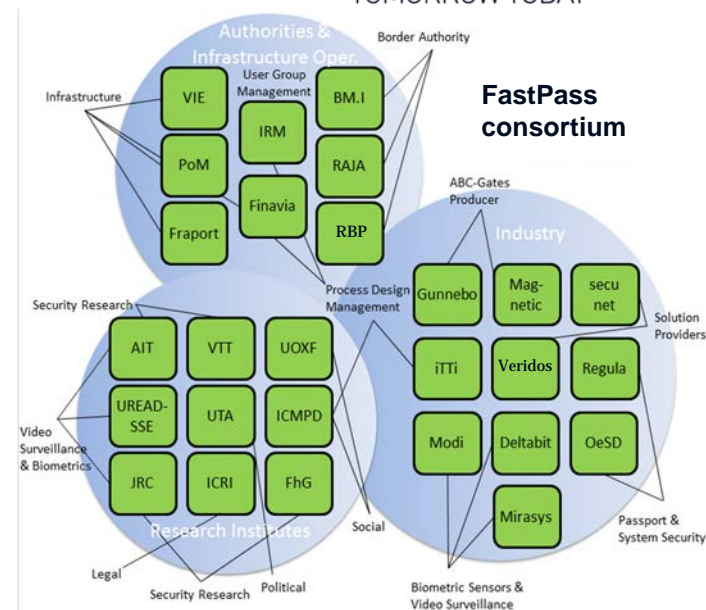
Camera-mirror system for kiosks (from Modi)
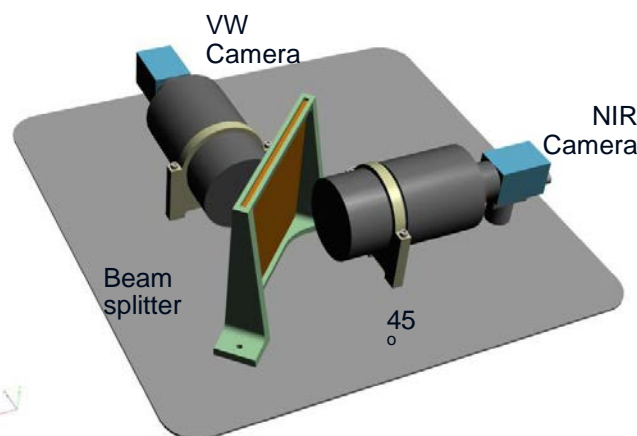
Multispectral iris sensor (from UREADSSE)
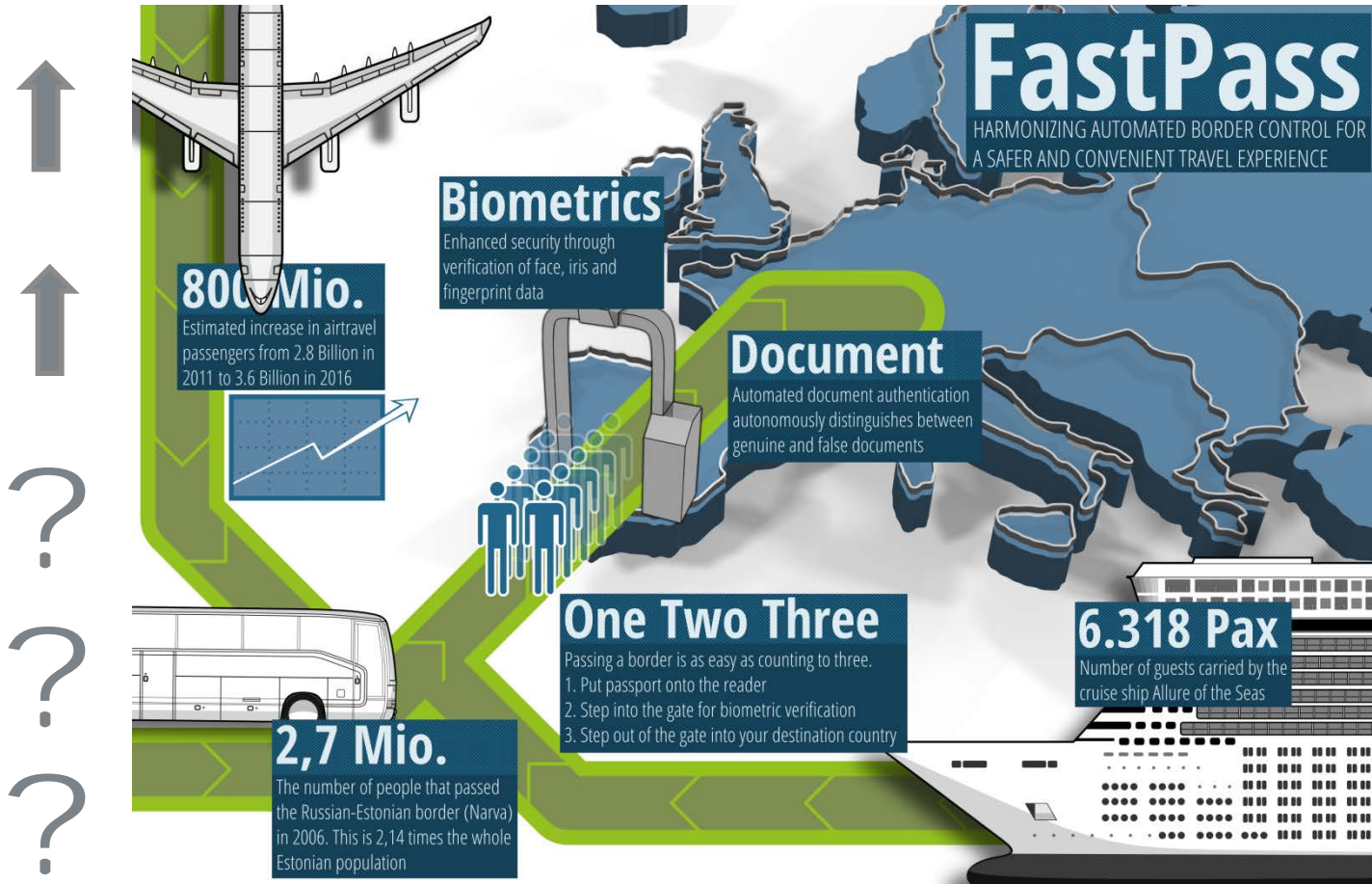
Cruise ship scenario

Motivation

Challenges :

Passenger flow

Requirements on the border control process

System risk assessment

Harmonization

Variety in usage

FastPass Objectives

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

Integration with EES and RTP

Extend usability to TCN

Evaluate the value of RTP for EU citizens

Harmonized ABC Systems

Usage of passport scanners

Usage of kiosks

Instaneous „Go Through"

Process harmoni-zation

European cooperation

Liason with commission, EP, Frontex, eu-LISA, FRA

Liason with other European Research Projects

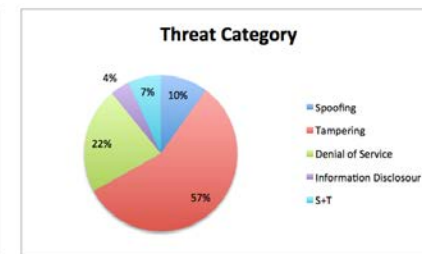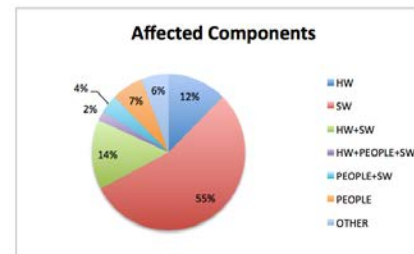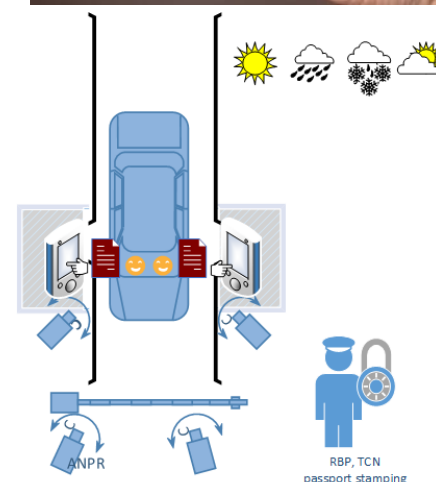Liason with industry

Liason with BG authorities

Main achievements

- **Next-generation sensor development and novel frameworks, software and algorithms**
  - On-the-move biometric identification, speed, quality, reduced intrusiveness, counter spoofing and costs

- **Innovative scenarios based on harmonized architectures**
  - Several air border scenarios, cruise-ship scenario, land border scenario with travellers remaining in the cars

- **Methodology for a holistic risk and security assessment**
  - List of threats, with type, impact, exploitability and mitigation strategy

Timeplan

WP 11 - Demo

WP 10 - Evaluation

WP 9 - Implementation

WP 4, 5, 6, 7, 8 – Modules,Design&Processes

WP 3 - Requirements

WP 2 – Stakeholder Interaction

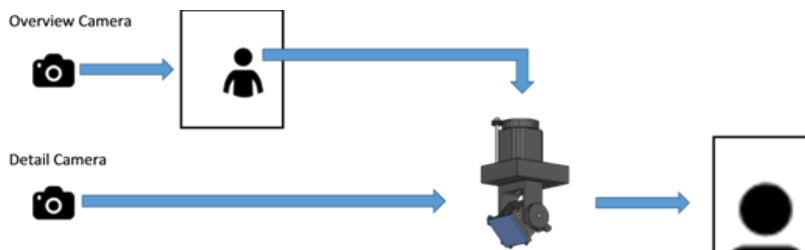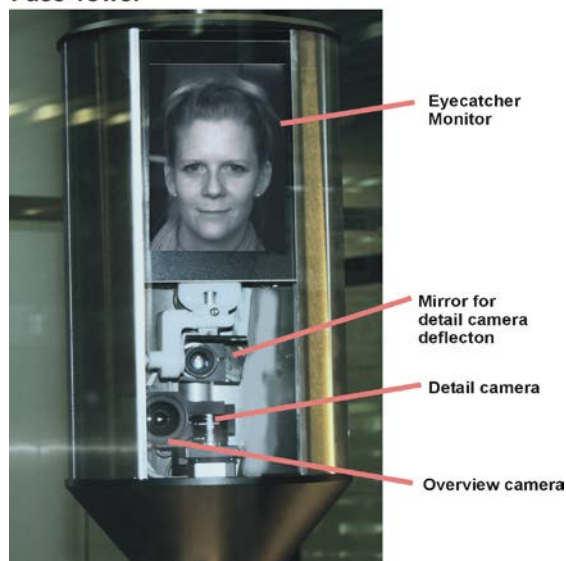| FP1 | 1st review | FP2 | 2nd review | FP3 |

2013   2014   2015   2016

First iteration
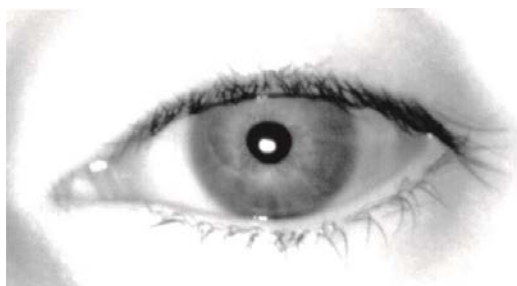
Second iteration
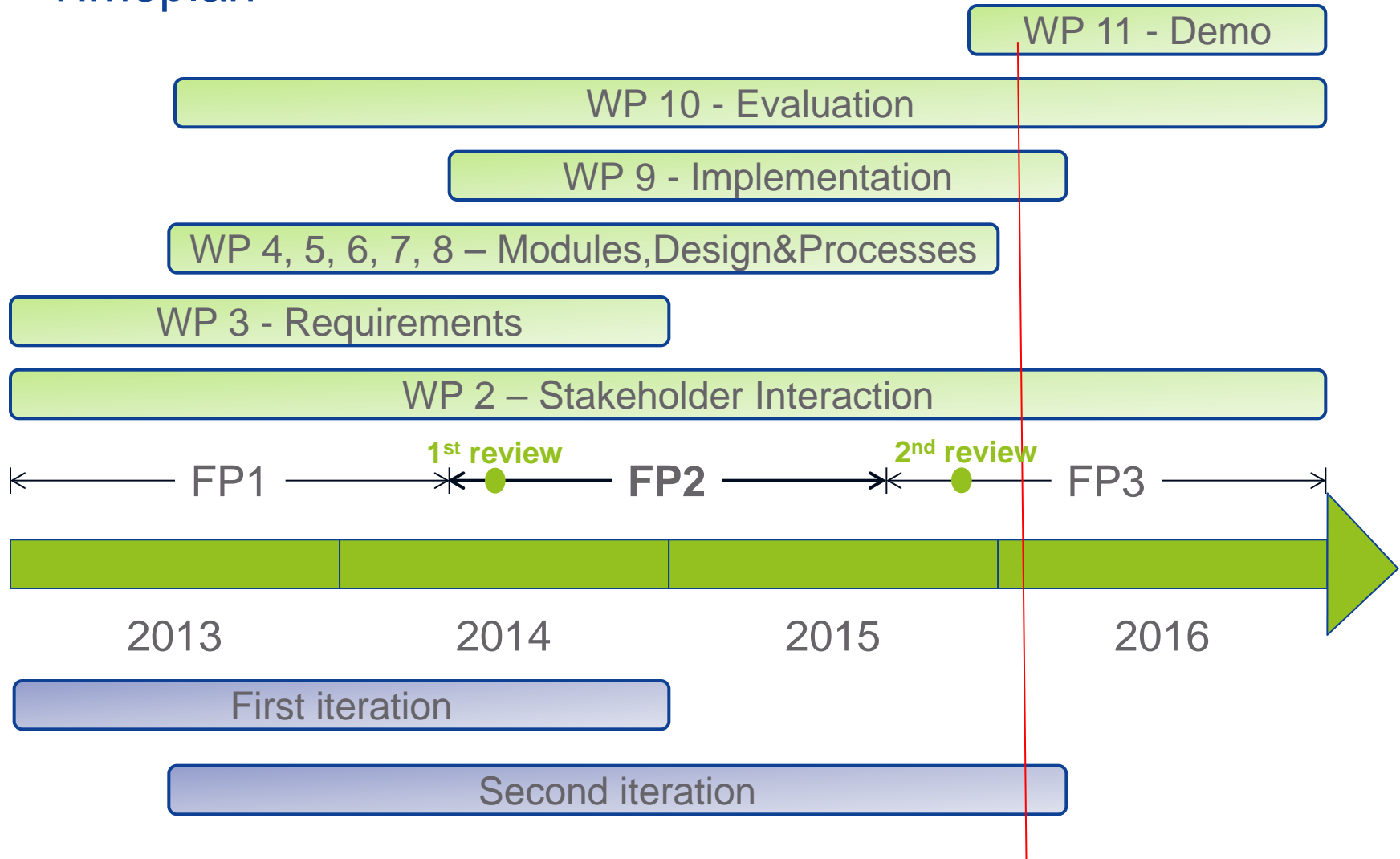
On-the-move face identification

New type of Face ID unit:
- Camera field of view deflected by fast moving mirror.
- ID unit in walking direction above the gate
- Adomo® cameras for face / iris capturing at height of 1,2 – 2,2 m at different positions.

- **Challenge:** for capturing face, users look around without looking at the camera properly and standing still close to the sensor
- **Solution:** face template generation from a series of face images (10+ images)
- Can be installed for land border and sea border scenarios
- **Results in >700 travellers throughput per hour instead of 150 per hour**

Face Tower
- Eyecatcher Monitor
- Mirror for detail camera deflecton
- Detail camera
- Overview camera

Overview Camera

Detail Camera

Iris recognition prototype

Current challenge on the market:
- Two groups of iris cameras
    1) Distance up to 0.5m, price range €1-5K, require user cooperation
    2) Distance up to 2m, price range €15-40K, require less user cooperation
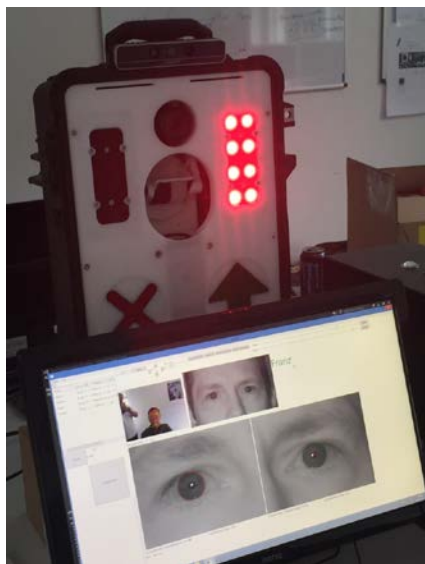
Objective:
- Longer distance
- Less intrusive, more user friendly
- Much lower price

Solution:
- Distance & region: 1.5m x 2m, with Adomo® mirror
- Novel iris capture camera
- Usable as token
- Minimum user cooperation
- Kiosk iris enrolment
- Price: around €5K

Future focus:
- Development to reduce the size of the mirror
- To make integration into different housing easier

Sclera segmentation and periocular recognition

Sclera segmentation:

- Won 1st place in BTAS 2015 competition – "Sclera Segmentation Benchmarking Competition"
- Two-stage classifier learning based algorithm
- Robust to changes in illumination and skin colour
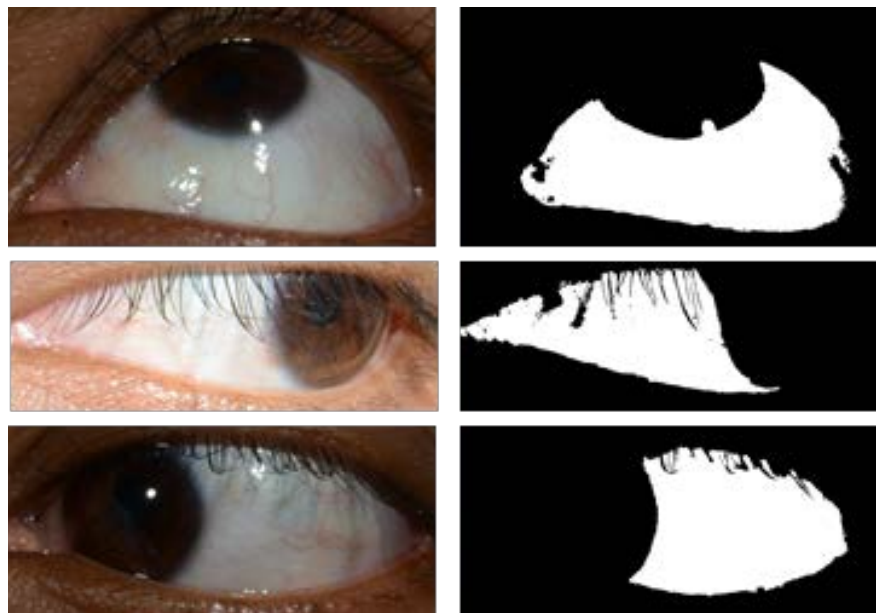
Periocular recognition:

- Identification using eye region
- Fusion: 2D texture + 3D shape
- Evaluation under less-constrained conditions: facial expression, head pose, partial occlusion
- Complement to overall face or iris recognition performance
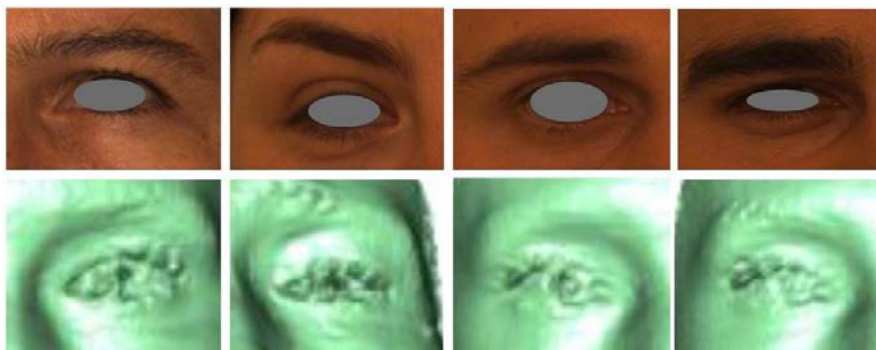
Spoofing-resistant multimodal face and fingerprint fusion

Contribution:

- Extension of Multi-Fingerprint + Anti-Spoofing Framework (IJCB'14) towards multiple modalities
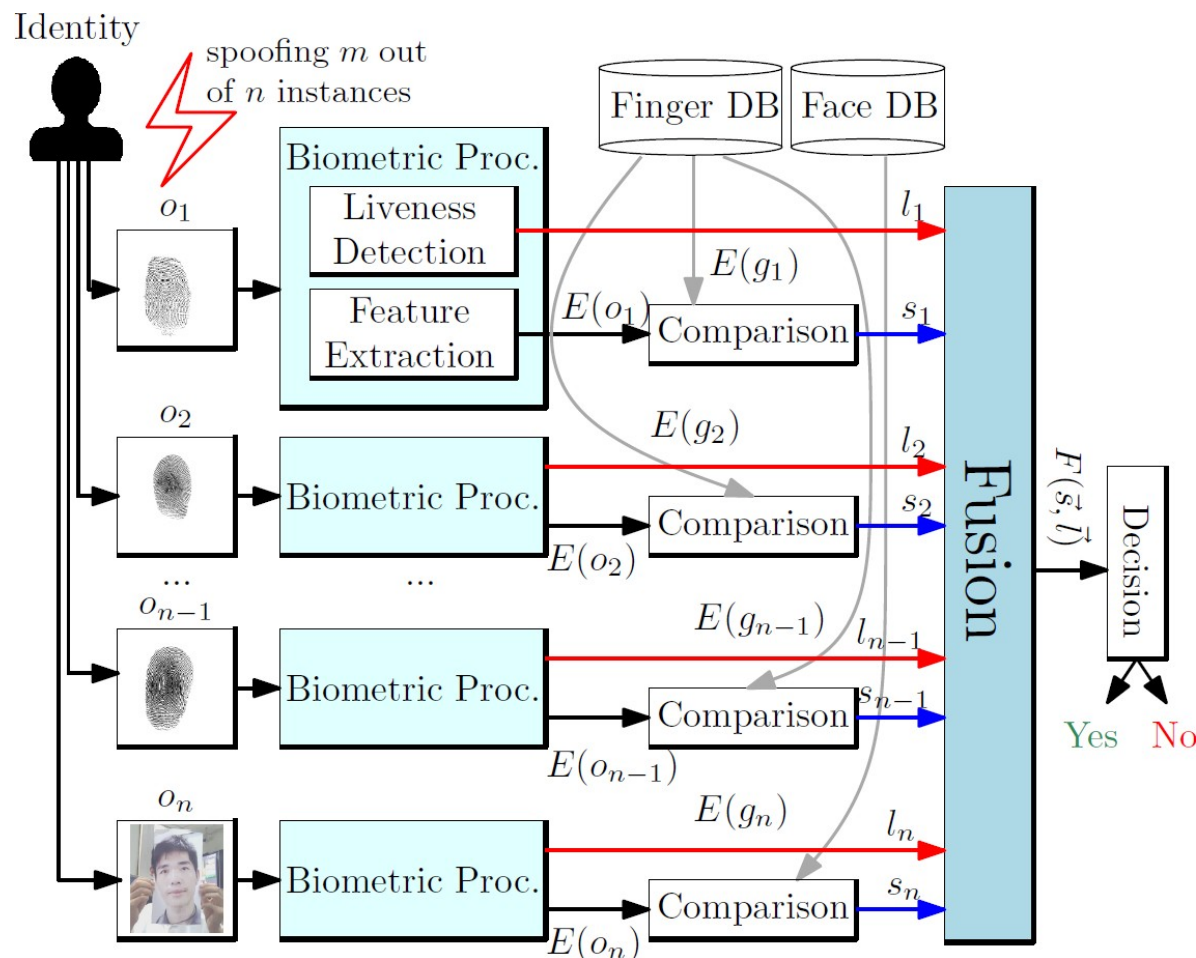- Novel fingerprint counter-spoofing algorithm, improved performance (LivDet dataset)
- Further theoretical presentations of technique.
- Can be ported to multiple modalities

For technical description, please refer to:

P. Wild, P. Radu, L. Chen and J. Ferryman, Robust multimodal face and fingerprint fusion in the presence of spoofing attacks. Pattern Recognition Journal, 2015.

Document authentication
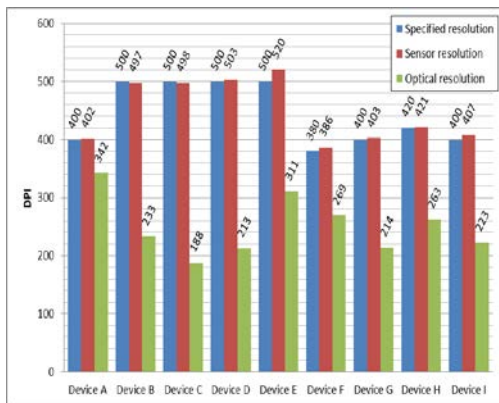
Interoperability analysis
- Comparison of sensors and hardware
- Analysis of document aging and deterioration
- Measurement of illumination spectra

Security analysis
- Document simulator
- IEMI analysis and improvements

Advanced feature detection and Doc-Teacher (Regula)
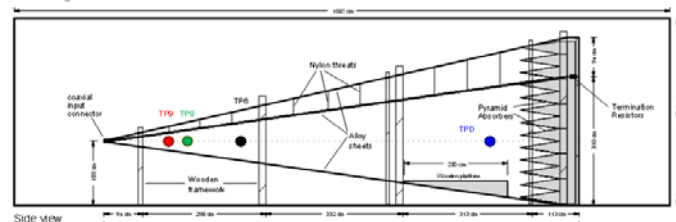- Comparison of optical information against electronic data
- Administrative module for detailled document template generation
- Document checks on various levels

Person separation /Left object detection

Color image | Depth image | Fused Static Foreground

glove
empty bottle
passport
magazine
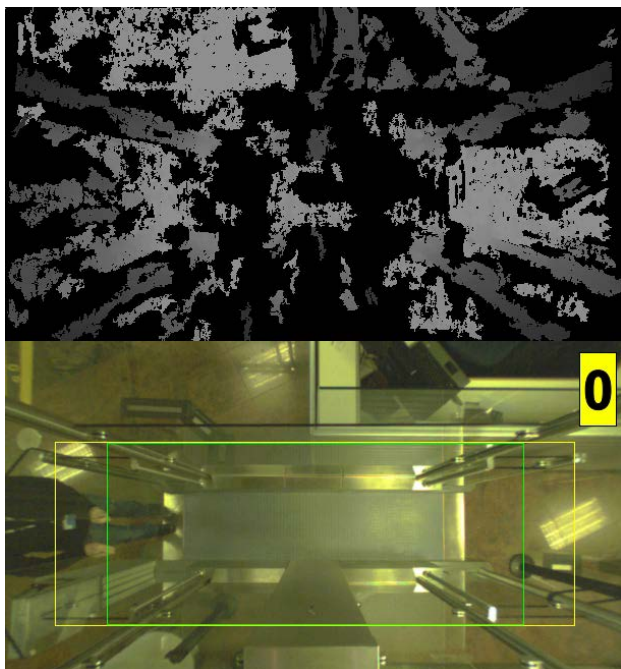
3D-enhanced object detection, using AIT's stereo-camera system
- Performance-optimized stereo matching
- WVGA resolution (608x328), depth resolution: 2 cm

Each algorithm exploits most suitable data
- Person separation: depth information + head-shoulder model
- Left item detection: fusion of separate color and depth background subtraction

Robustness of algorithm further increased by temporal integration and synchronization with the eGate's door signals
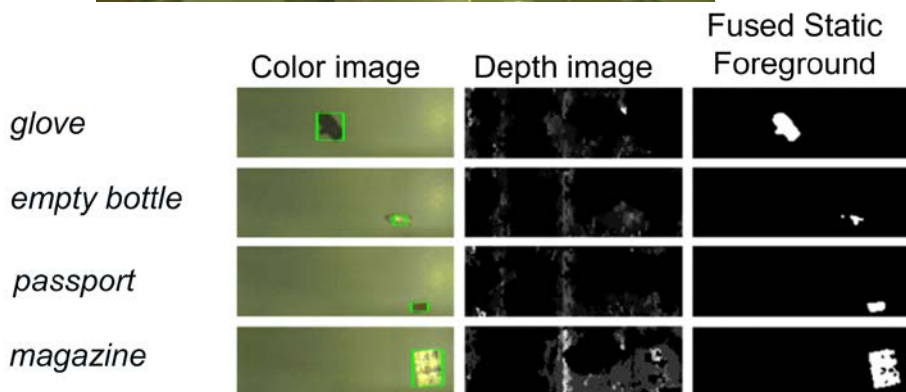
Queue length

Length of queues
- Depth ordering of people
- Robustness against illumination, shadows,
- Enables scene analysis

Waiting times
- Actual vs. estimated
- Enables queue management

Air border

June 2015

- Classical passport reading at the eGate (slow)
- New Biometric sensor (Face)
- Different workflows tested (M1, M2)

Stage 1 "Baseline Mantrap"

Feb 2016

Stage 2 "Segregated 2-step Kiosk"

- Passport reading at the Kiosk (parallel, faster)
- Passport/Face (fast read) enable the eGate
- Passport as token, Face as token (K1, K2)

June 2016

- Registration at Kiosk is valid for longer period
- **Face& Iris Identification** (Update of biometric units also for continued Stage 2)
- R1 as simulation

Stage 3 "RTP with Multibiometrics"

14
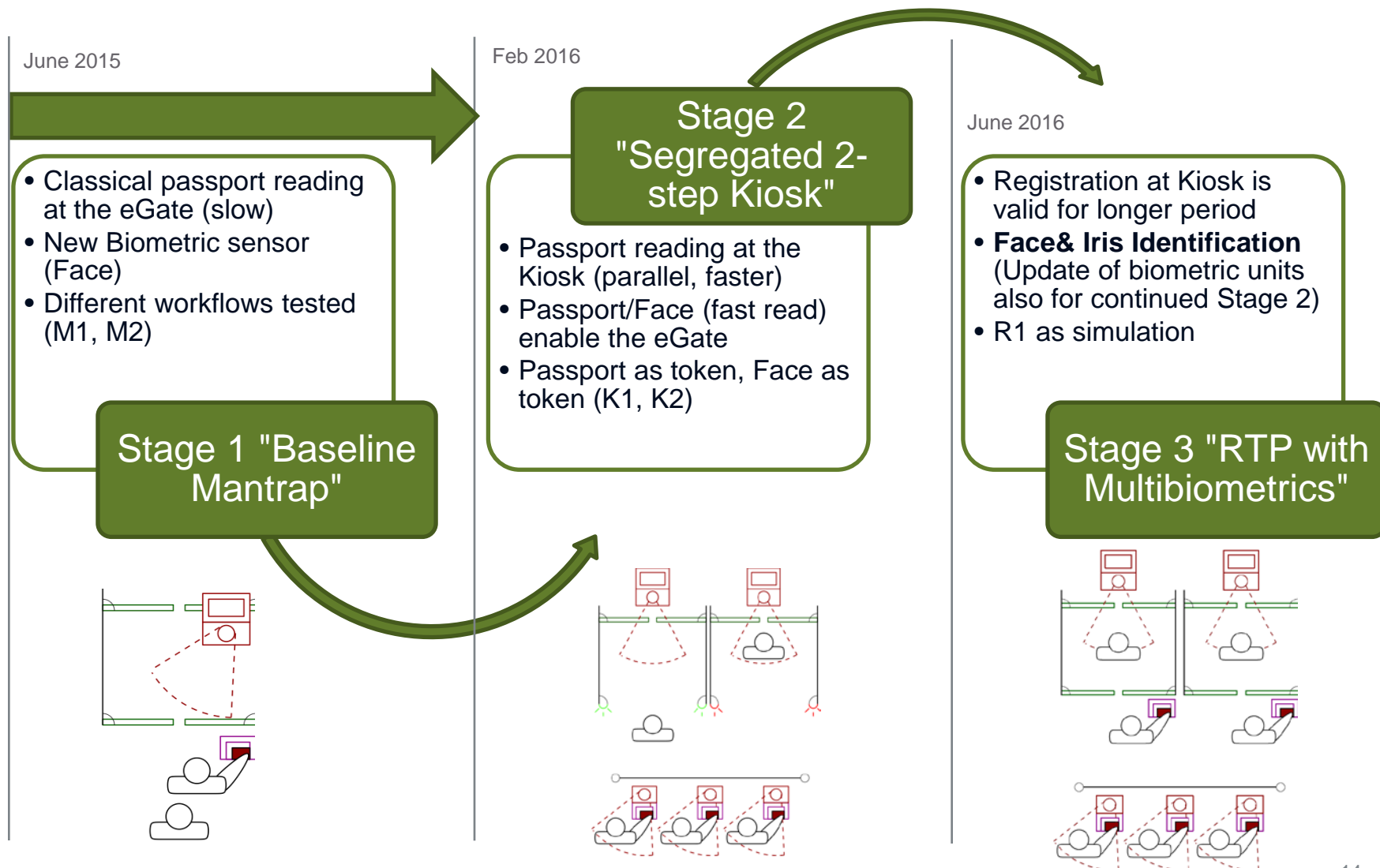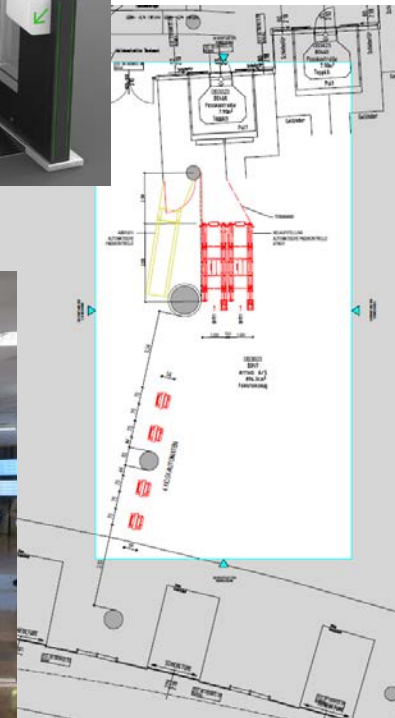
Air border

- Operational Test at Vienna Internation Airport
- Comparison of several installation types
- Documents: ePassports
- Travellers:
  - Stage 1: EU/EEA/CH
  - Stage 2 +3: + TCNVH, + TCNVE
- Biometrics:
  - Face (all Stages)
  - +Finger (Stage 2), +Iris (Stage 3)
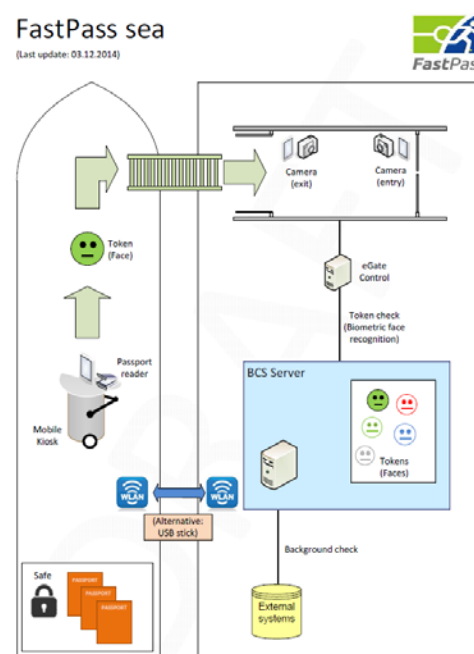- RTP (Stage 3) will be simulated

Air border

Cruise ship

- Demonstration Test at Port of Piraeus
- Document Authentication
- Passenger Authentication and Identification (1 :n)
- Documents: ePassports
- Travellers: EU/EEA/CH, TCNVH, TCNVE
- Biometrics:
  - Face (+ Iris as test)
- RTP will be simulated

Land border

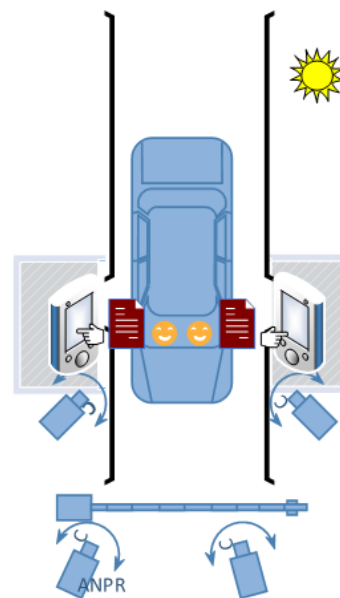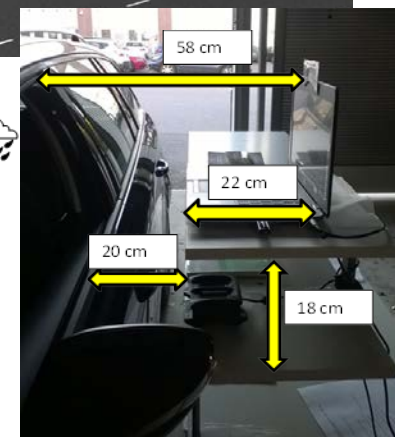- Demonstration at Moravita
- Exit control for frequent traveller
- Enrolment of
  - ID documents
  - Vehicle documents
  - Driving license
- Moveable terminals
- ANPR to detect vehicle
- Driver and Co-driver check
- Customs check, occupancy check, stamping is done manually

AUTOMATIC NUMBER PLATE RECOGNITION

THE TERMINALS APPROACH THE CAR

58 cm
22 cm
20 cm
18 cm

ANPR

RBP, TCN
passport stamping

FastPass – the system/technology, 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
    - Real comparison of different approaches on an airborder crossing point

Dissemination Activities

Research project conferences 2014, 2015 and 2016

European Association for Biometrics eab — Human Identity in Europe

Type	
Papers in Journals or Conference proceedings	25
Presentations of the project (conferences)	54
Workshop (among them 4 organisation/chairing)	15
Press articles, specialised magazines	18
Academic work	2
Stand (among them 6 demo)	10
Video	3
Newsletter	8
Blog	4
Total dissemination activities	**139**

Presentations at Passenger Terminal Expo, Secure Document World and other conferences

SDW 2015 — QEII CENTRE, WESTMINSTER, LONDON, UK — CONFERENCE: 9-11 JUNE 2015 — EXHIBITION: 10-11 JUNE 2015

Passenger Terminal CONFERENCE 2015 — SHARE › INNOVATE › DEVELOP › DEPLOY

AVSS 2015 — 12th IEEE International Conference on Advanced Video- and Signal-based Surveillance — August 25-28, 2015, Karlsruhe Institute of Technology & Fraunhofer IOSB, Karlsruhe/Germany.

Organizing

1st International Workshop on Identification and Surveillance for Border Control (ISBC 2015)

Best Voted Poster Award

IJCB 2014

Journal Paper in

PATTERN RECOGNITION

eu-LISA conference:
The future tested: Towards a Smart Borders reality

eu-LISA

Thank You !

Contact information
www.fastpass-project.eu
Email: FastPassCoordinator@ait.ac.at