FastPass and MobilePass

logo pending …

two European research projects for next generation border control systems

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  - planned developments

Motivation (1)

EU "smart borders" package

- 3 Regulations. They foresee:

- **The establishment of an Entry/Exit system** (a centralized system which records the third country travellers' movements). This system should allow the calculation of authorized stay as well as the verification of third country nationals' individual travel history.
- **The creation of a "registered traveller programme".** This register should facilitate border crossings for frequent, pre-vetted and pre-screened third country travellers at the Schengen external borders.
- **An amendment to the Schengen borders code** as regards facilitated crossings for third-country nationals

Motivation (2)
Automated Border Control (ABC)

- Adress
  significantly dramatically increasing passenger flows
  - 700 million per year today
  - 75% at airports by 2030

- Border guards face big **challenges**
  - Indepth document checks
    (more than 2000 different documents)
  - Reliable identity checks
  - Check of entry conditions
  - Discover possible threats

Motivation (3)
Mobile Border Control

- Where stationary systems can´t be used
- Cars, busses, trains
- Control in the outback, for police patrols
- Additional systems at airports

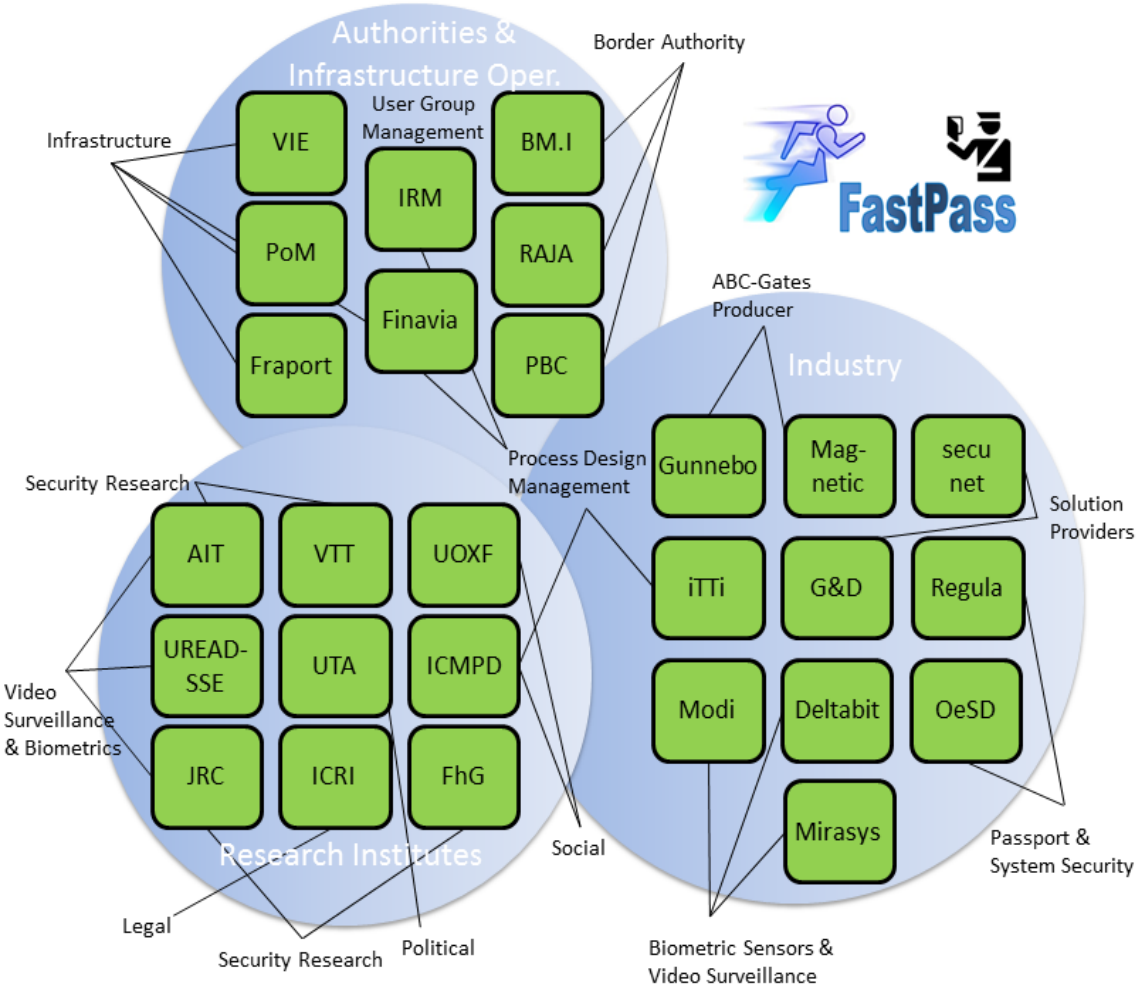
- Practical & fast mobile fingerprint scanners
- Mobile face biometrics verification system
- Mobile full page document scanners
- Reliable, fast & secure data transmission to information systems
- Robustness, Handling, Speed, IT Security

FastPass

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

Proposal	FastPass - 312583
Funding	Security Call, 7th Framework Programme
Topic	SEC-2012.3.4-6: Enhancing the workflow and functionalities of Automated Border Control (ABC) gates
Type	IP – Integration Project
Duration	4 Years
Budget	~ 15 M€
	FastPass will **develop and demonstrate a next generation automated border control gate solution**
	FastPass will result in a harmonized ABC gate contributing to a modern and efficient management of the EU's external borders.
Coordinator	markus.clabian@ait.ac.at; +43 (0) 664 815 78 90

Consortium



Participant organisation name	Participant short name	Country
Austrian Institute of Technology GmbH	AIT	Austria
Teknologian tutkimuskeskus VTT	VTT	Finland
Federal Ministry of the Interior, Republic of Austria	BM.I	Austria
Österreichische Staatsdruckerei GmbH (Austrian State Printing House)	OeSD	Austria
Fraunhofer IOSB	FhG	Germany
Interdisciplinary Center for Law and ICT - K.U. Leuven	ICRI	Finland
Finnish Border Guard RVL	RAJA	Finland
secunet Security Networks AG	secunet	Germany
Mirasys Ltd	Mirasys	Finland
Regula Baltija Ltd.	Regula	Latvia
University of Reading	UREADSSE	UK
International Centre for Migration Policy Development	ICMPD	Austria
Tampereen yliopisto (University of Tampere)	UTA	Finland
Gunnebo Entrance Control Ltd	Gunnebo	UK
Giesecke & Devrient GmbH	G&D	Germany
MODI Modular Digits GmbH	Modi	Germany
Magnetic Autocontrol GmbH	Magnetic	Germany
European Commission - Joint Research Center	JRC	n.a.
ITTI Sp. z o.o.	ITTI	Poland
Deltabit Oy	Deltabit	Finland
Oxford Internet Institute, University of Oxford	UOXF	UK
Polish Border Guard	PBG	Poland
Finavia Cooperation	Finavia	Finland
Port of Mykonos	PoM	Greece
Fraport AG	Fraport	Germany
Flughafen Wien AG (Vienna International Airport)	VIE	Austria
Intrepid Minds	IRM	UK

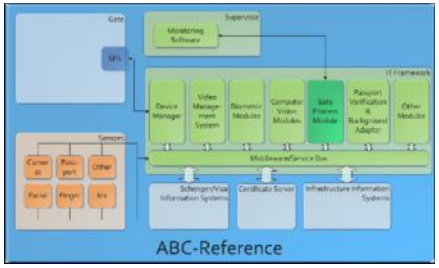
Project Objectives

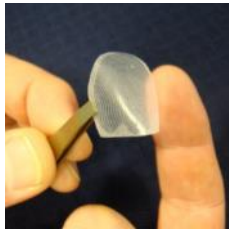
- Harmonized ABC solution
- Harmonized ABC usability
- ABC solution supporting an innovative border crossing concept

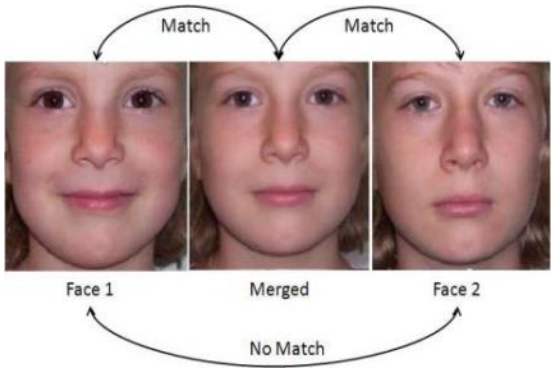
- ABC reference architecture
- A European solution and a new European ABC suppliers network.

Challenges

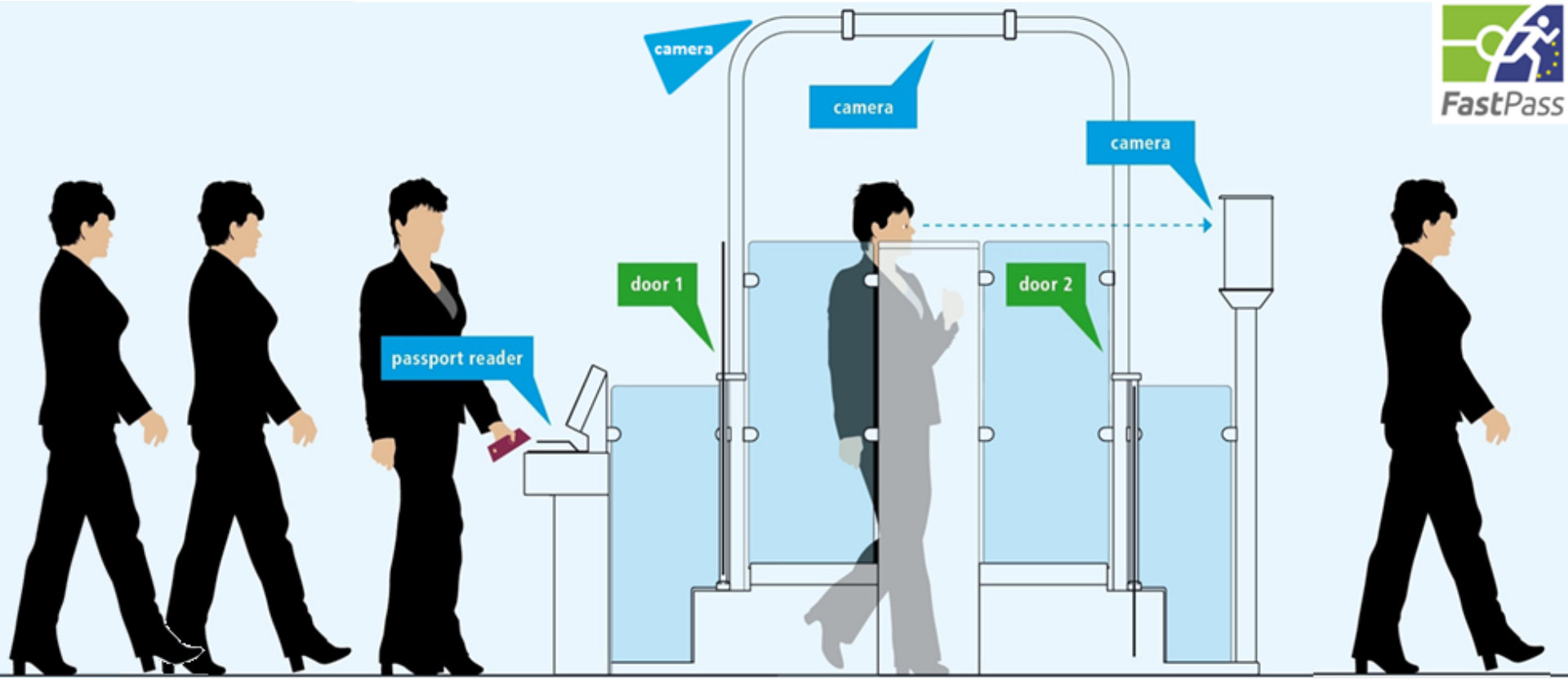
- **Current systems are limited**
  - No usage by third country nationals
  - No usage by frequent travellers
  - No harmonization and no interoperability
  - No or weak integration into infrastructure processes
- **Current systems are not developed around the user**
  - No harmonized usage
  - No customer interaction and satisfaction management
  - Human factors are not analysized and considered
  - Privacy issues are not properly adressed
- **Current systems have not been security evaluated**
  - Passport security features are only partially checked
  - Biometric spoofying is not fully adressed
  - Passport document lifecycle is not fully adressed







Research Example: ABC Gates



ManTrap Concept Issues

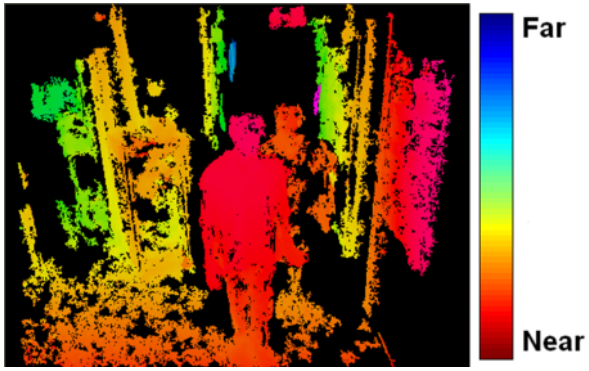
- Exactly **one person** per passport → Single person detection
- **Clean secure zone** → Left object detection
- **Situation overview** → Queue length estimation

Video Surveillance in Gate

- Reliable detections with 3D stereo video camera

Demo eGate: Vienna Airport
(Terminal 2, Non-Schengen-Arrivals)

The Sensor

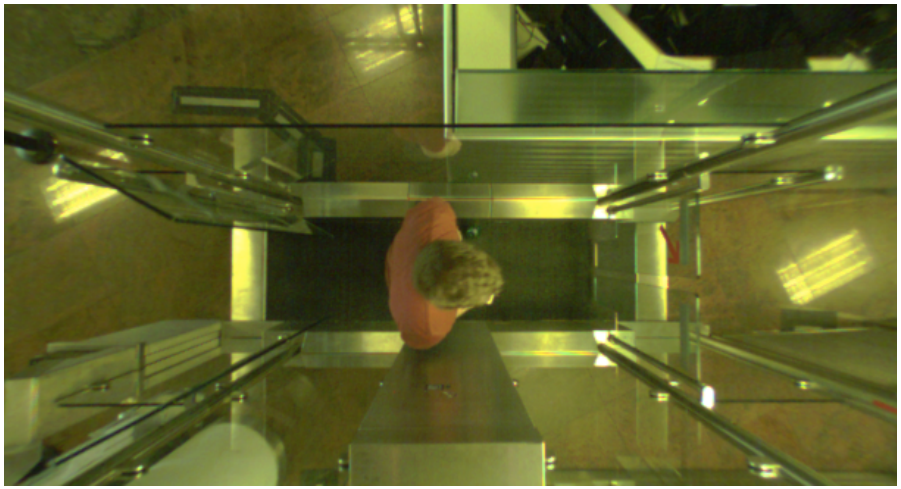


3D stereo-camera system developed by AIT

- Area-based, local-optimizing, correlation-based **stereo matching** algorithm
- Specialized variant of the Census Transform
- Video image
  - Spatial Resolution: 752x480
    → rectified to 608x328
  - RGB
- Depth information
  - 16 bit depth image
- USB 2 interface

Camera Set-Up (inside the gate)

- Top-view of eGate interior
- ~15 frames per second
- Mounting height: 279 cm → depth resolution: ~2 cm
- Ground floor 180x60 cm → spatial resolution: ~1 cm

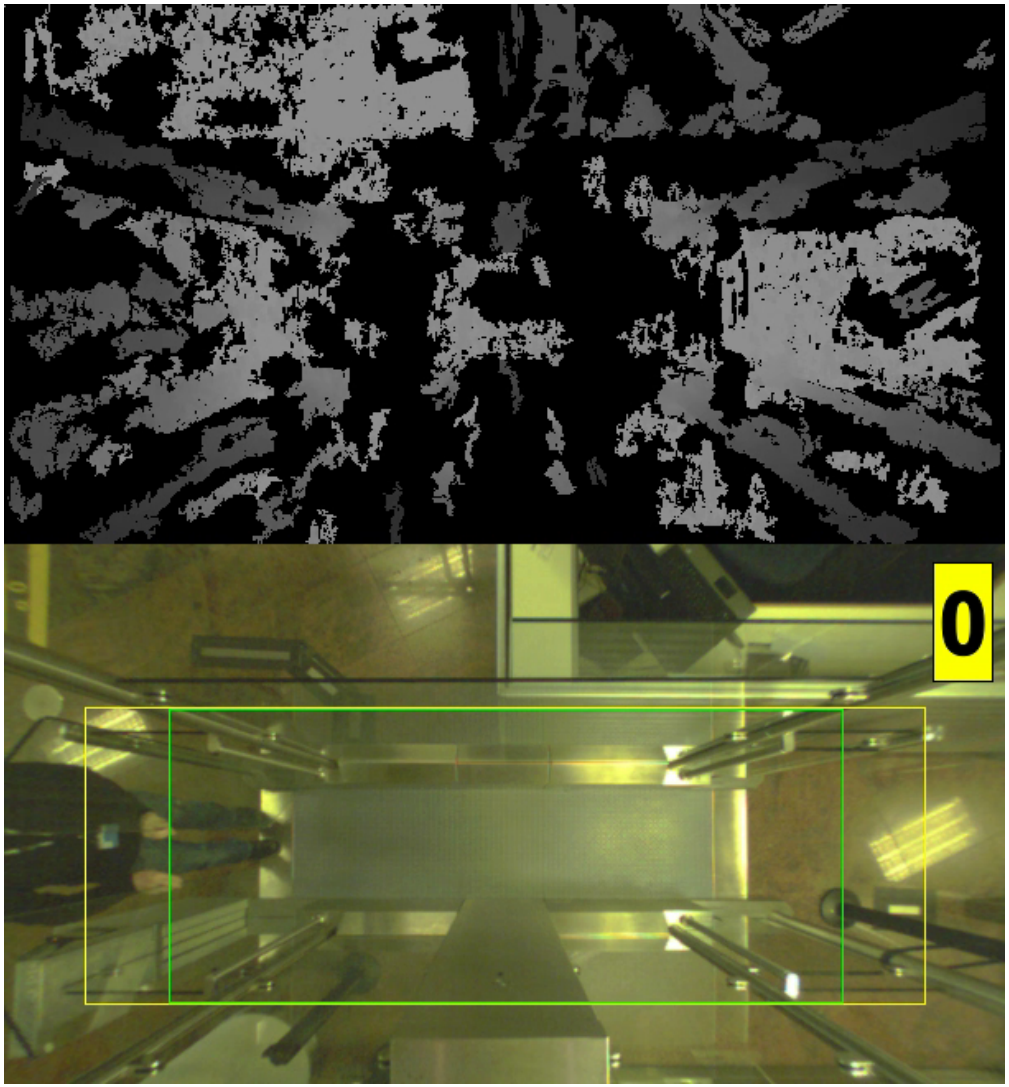


Single Person Detection

Motivation / Challenges

- Ensure **only one person** is inside the eGate
  - reliable detection and counting of persons
  - multiple persons must not pass!
- **Real-time** processing
  - low latency
- **Better than existing system**
  - error-prone to tailgating / piggybacking
  - number of false alarms
- Developed for secure zones

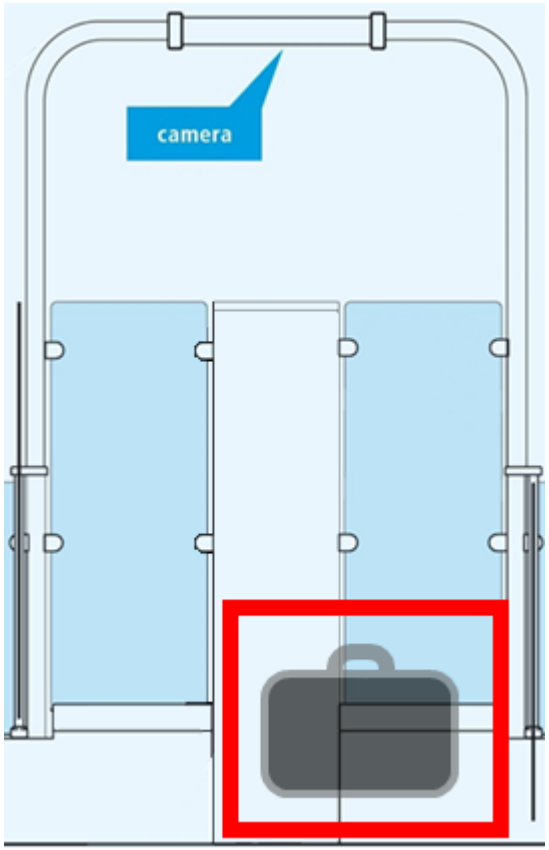
Person Separation: Example Videos with Detection Results



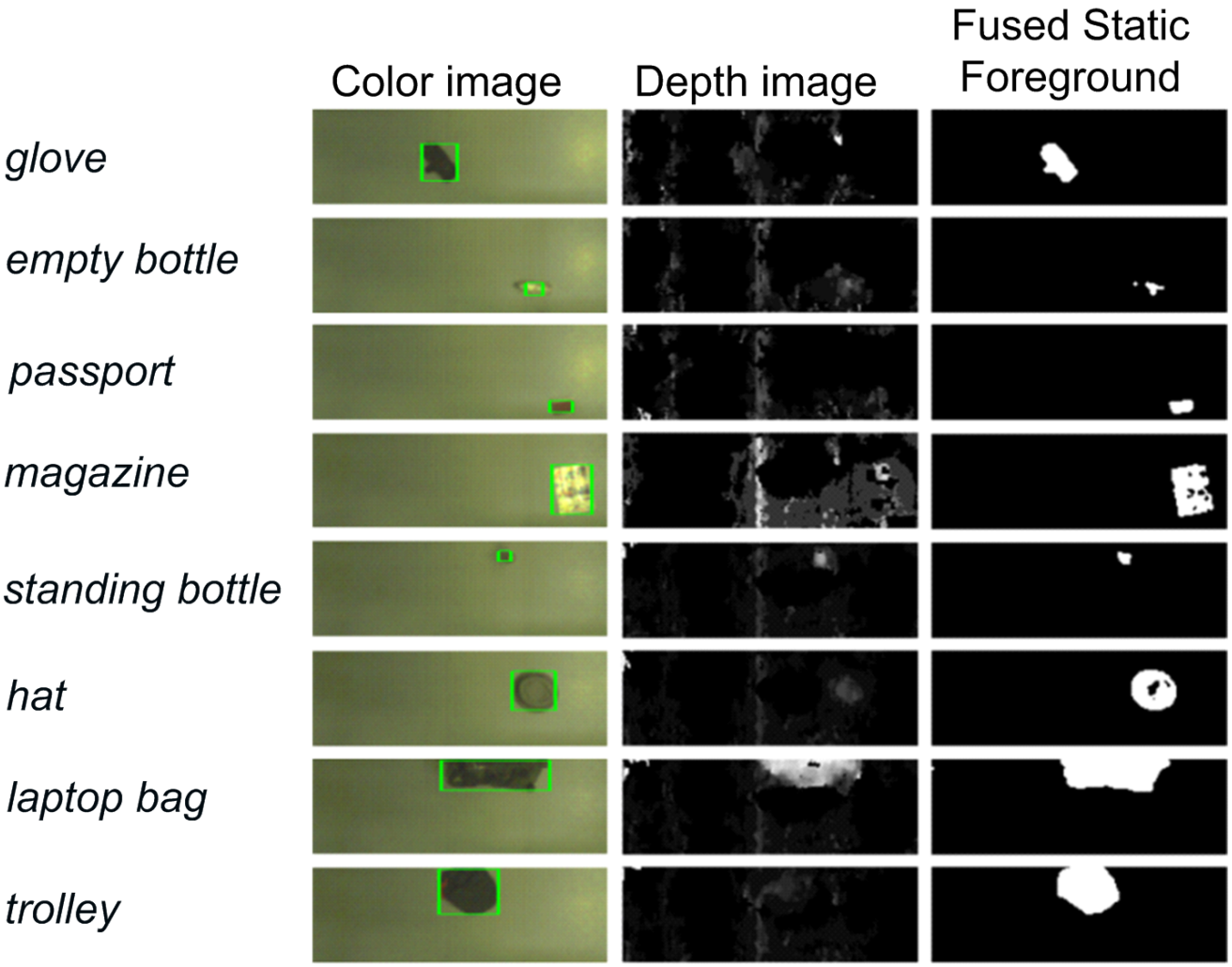
Left Object Detection

Motivation / Challenges

- **Detect left objects** in eGate
  - eGate has to be empty after person left
  - **visualize left object**
- **Real-time** processing
  - low latency
- Difficult object size and / or apperance
  - small size (e.g. passport)
  - low contrast (e.g. empty bottle)



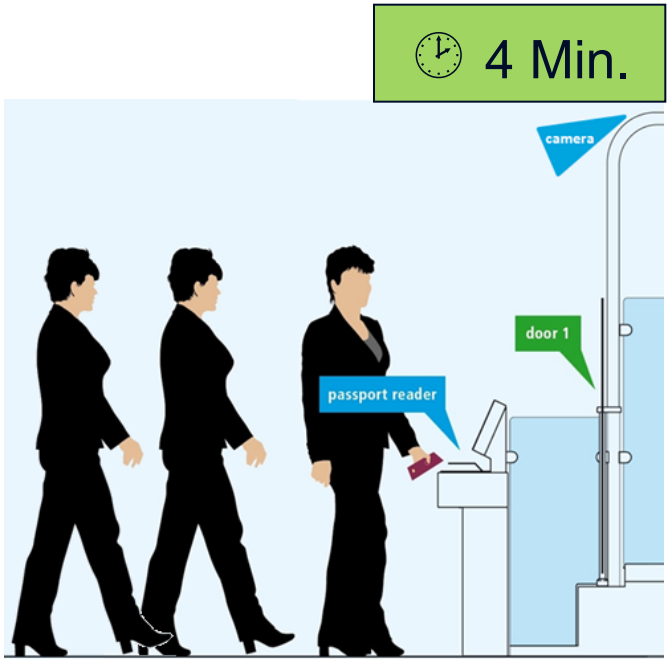
Left Item Detection: Example Results



Queue Length Estimation

Motivation / Challenges

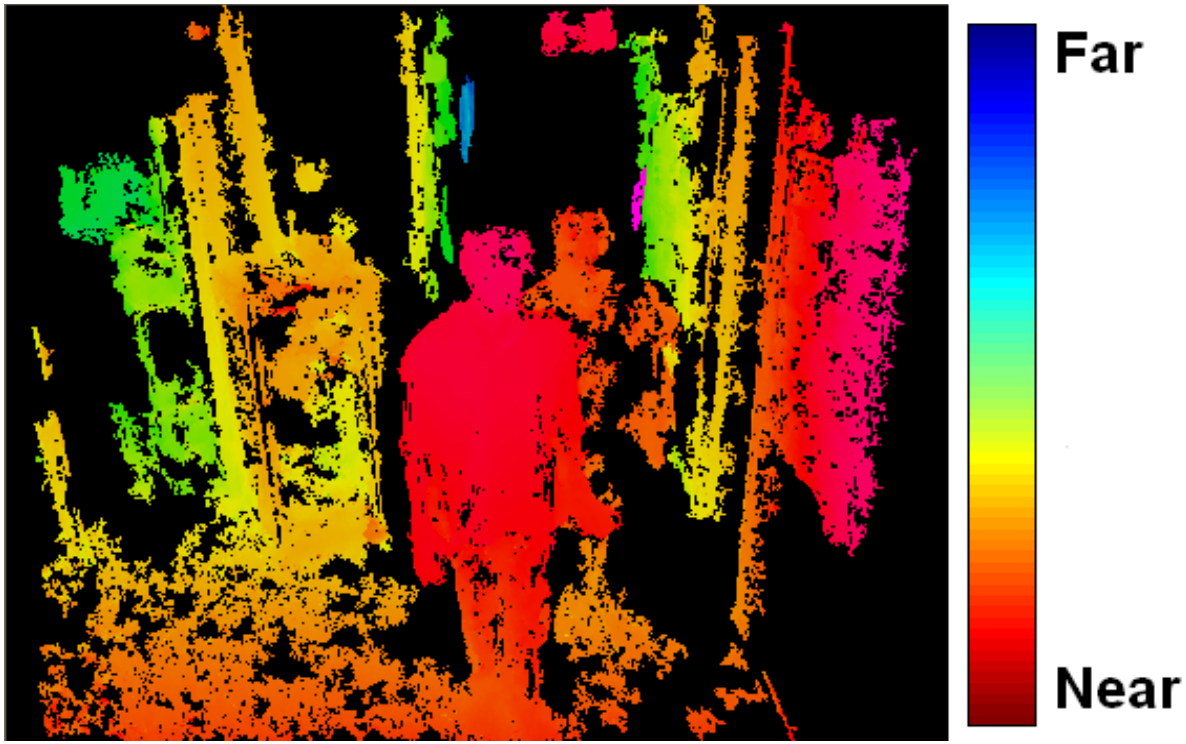
- Enhanced queue management
  - number of persons per queue
- Visual tracking of queue dynamics
  - estimated waiting time
- Overcome occlusion problems
  - eliminate top-view requirement (for low ceiling height environments)
  - use 3D information



Queue Length Estimation

Outlook (Method)

- Stereo camera (e.g. mounted on eGate)
- Detection distance up to 12 meters



Conclusion

Stereo Video Surveillance

- New dimension of information
- Robust and reliable detection under variable situations
- Decrease false alarms for
  - single person detection
  - left object detection
- New options for queue length estimation

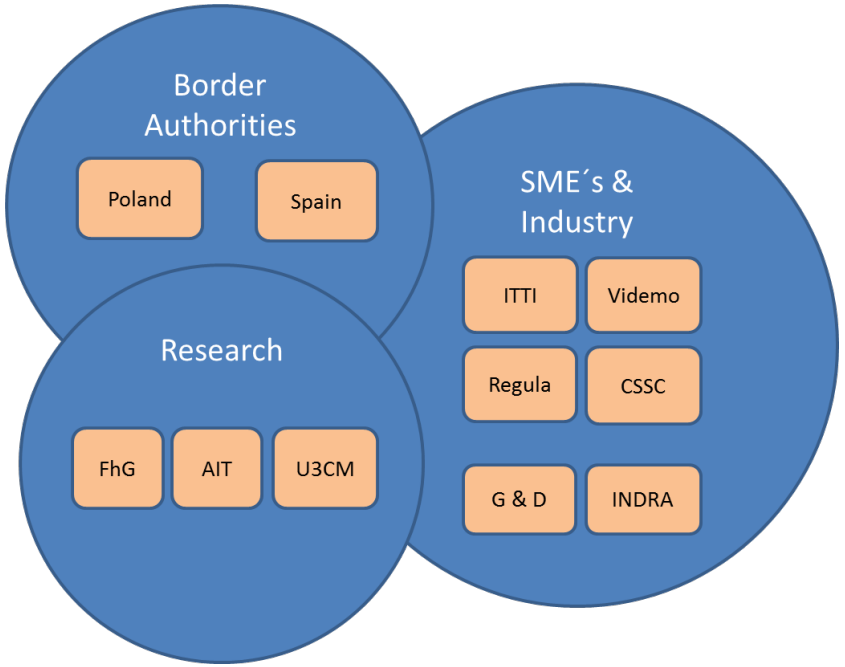
MobilePass

A secure, modular and distributed mobile border control solution for European land border crossing points

Proposal	MobilePass - 608016
Funding	Security Call, 7th Framework Programme
Topic	SEC-2012.3.2-3: Mobile Equipment at land border crossing points
Type	CP – Capability Project
Duration	2.5 Years
Budget	~ 4.2 M€
	Develop new technologies needed in mobile scenarios and embed them in the actual border crossing workflow. Bring together system- and component producers, research institutions and governmental authorities. The entire innovation process, from development to integration, will continuously be evaluated by border guard authorities.
Coordinator	bernhard.strobl@ait.ac.at; +43 (0) 664 815 78 42

Consortium

- University and Research Centers
  - AIT (Embedded systems, Architecture on mobile devices)
  - FhG (2/3D Capture and image enhancement)
  - UC3M (Identification technologies, documents, fingerprint, standards and evaluations)
- SMEs
  - Regula (Passport Reader Systems)
  - ITTI (communication systems)
  - CSSC (Ethics)
  - VIDEMO (Face Biometry)
- Industry
  - G&D (Integrator)
  - INDRA (Integrator)
- National Service Provider, National Authorities
  - RBP Rumanian Border Police
  - SBP Spanish Border Police

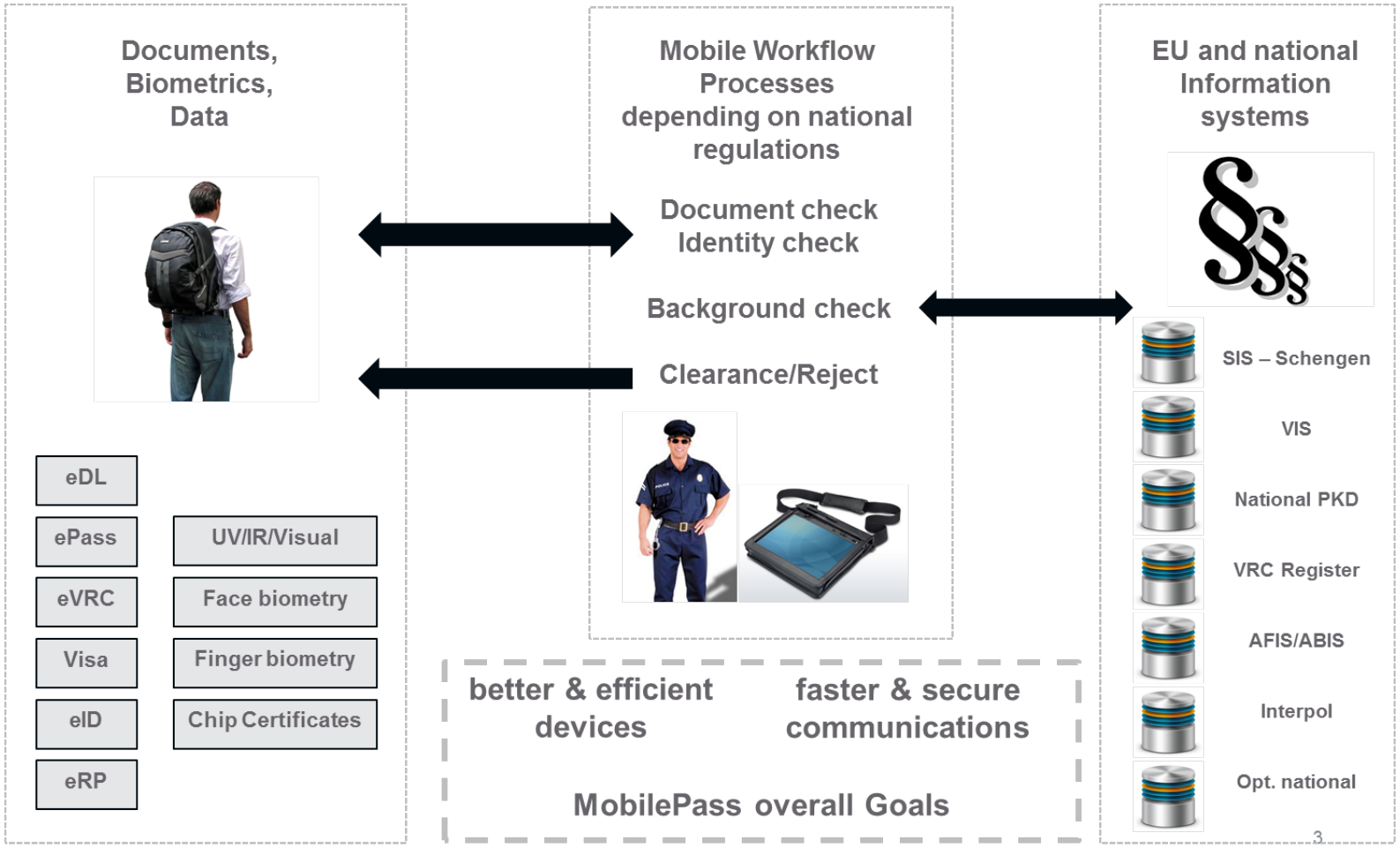


  - Austrian Border Police (Advisory Board)
  - UK Border Police (Advisory Board)
  - PBG Polish Border Guard (Advisory Board)

Status now

- While there are advances in ABC systems, mobile solutions lag behind
- Partial mobile solutions available
- No practical & fast mobile fingerprint scanners
- No real mobile face biometrics verification system
- No mobile full page document scanners
- Reliable, fast & secure data transmission to information systems is to be improved
- Technical challenges:
  - robustness & handling
  - adaptable
  - speed
  - security (IT)

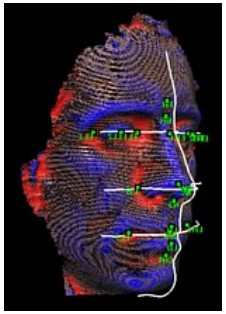
Overview


Documents, Biometrics, Data
Mobile Workflow Processes depending on national regulations
EU and national Information systems
Document check
Identity check
Background check
Clearance/Reject
eDL
ePass
eVRC
Visa
eID
eRP
UV/IR/Visual
Face biometry
Finger biometry
Chip Certificates
SIS – Schengen
VIS
National PKD
VRC Register
AFIS/ABIS
Interpol
Opt. national
better & efficient devices
faster & secure communications
MobilePass overall Goals
3

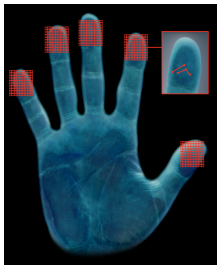
Modular System Architecture
Objective: 1

AUSTRIAN INSTITUTE OF TECHNOLOGY

Fast, Mobile
UV/IR, fullpage
Passport scanner



Fast, Mobile
face verification
camera



Fast, Mobile, contactless
fingerprint scanner/
camera

Advanced Components, Objectives: 2,3,4

Terminal Devices

Information systems

Fast, Reliable, Secure communication
Objective: 5

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