How *smart sensors* will facilitate future automated border crossings?

Eighth ACM/IEEE International Conference on Distributed Smart Cameras – ICDSC 2014
November 4 - November 7, 2014, Venezia, Italy

Andreas Kriechbaum-Zabini

Video- and Security Technology
Safety & Security Department
AIT Austrian Institute of Technology GmbH

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.

Outline

- What is Automated Border Control?
  - Problem description & motivation
  - Example of a state-of-the-art ABC system & deployments
  - Steps in a manual & automated process
  - Benefits
- FastPass – the project
  - Objectives and approach
- Challenges
  - Stakeholder analysis
  - Security analysis
  - Monitoring
  - Automated document inspection
  - Approach: One Stop Shop
  - Concept for end-user management in complex systems
- Conclusion – Illustrated challenges that can be handled by smart sensors
  - Relation to several conference topics

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.

Outline

- What is Automated Border Control?
  - Problem description & motivation
  - Example of a state-of-the-art ABC system & deployments
  - Steps in a manual & automated process
  - Benefits

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.

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.

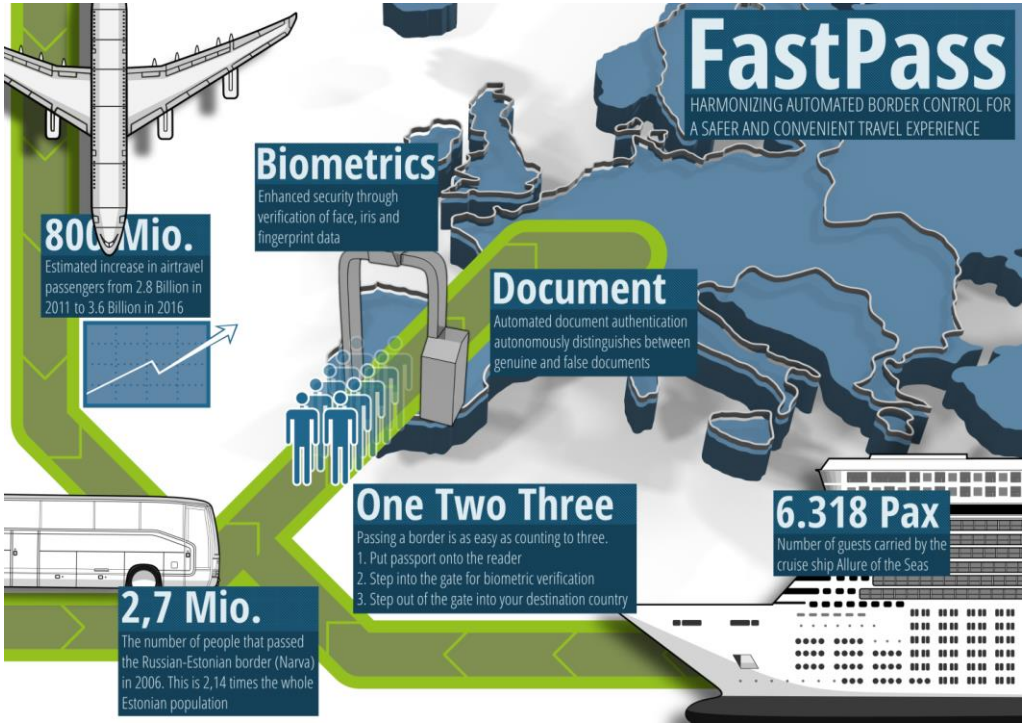
Process that a traveller goes through at the airport

Source: Vision-Box®-developed platform, the vb i-shield®

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Border Control - Problem Description and Motivation

- Increasing passenger flows
  - from 2009 (400 Mio Pax) to 2030 (720 Mio) -> +80% only at air borders
- Border guards face big challenges
  - in-depth document checks/ reliable identity checks/check of entry conditions/discover possible threats
- Different border types (sea, air, land)
  - different processes
  - no harmonisation in the usage
- Smart Border Package
  - entry-exit, registered traveller programme



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.

What is Automated Border Control (ABC)?

- No formal definition, despite growing number of national ABC programmes (e.g. PRIVIUM, PARAFE, EASYPASS, etc.)
- *Manual border control* regulated by the Schengen Borders Code

"*ABC means a fully automated system which authenticates the travel document, establishes that the traveler is the rightful holder of the document, queries border control records and on this basis automatically verifies the conditions governing entry laid down in Article 5(1).*"

(Smart Borders Package, Proposed amendment No. 562/2006 (COM (2013) 96 final))

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.

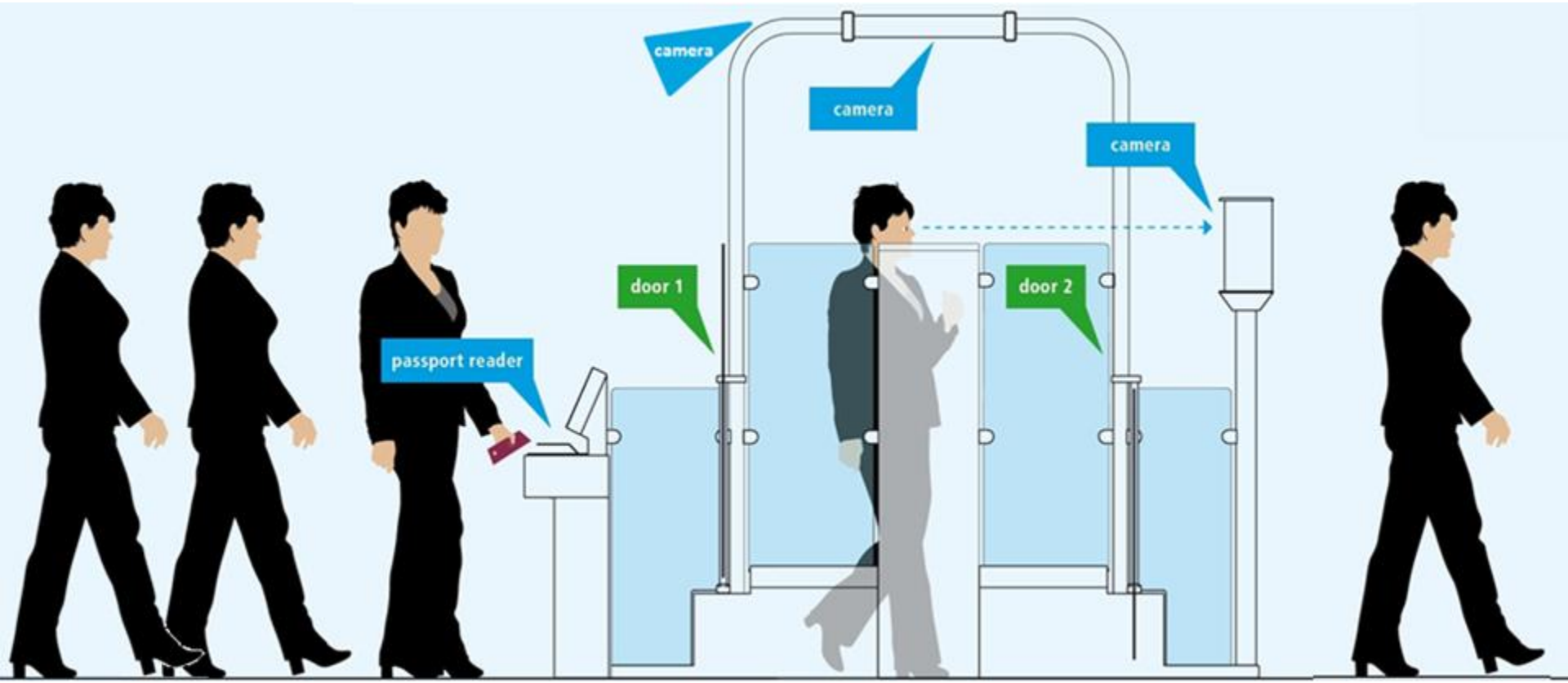
Automated Border Control (ABC)
Border guards duties

- Automated Border Control as a self-service system
  - Minimized involvement -> Monitored by border authority

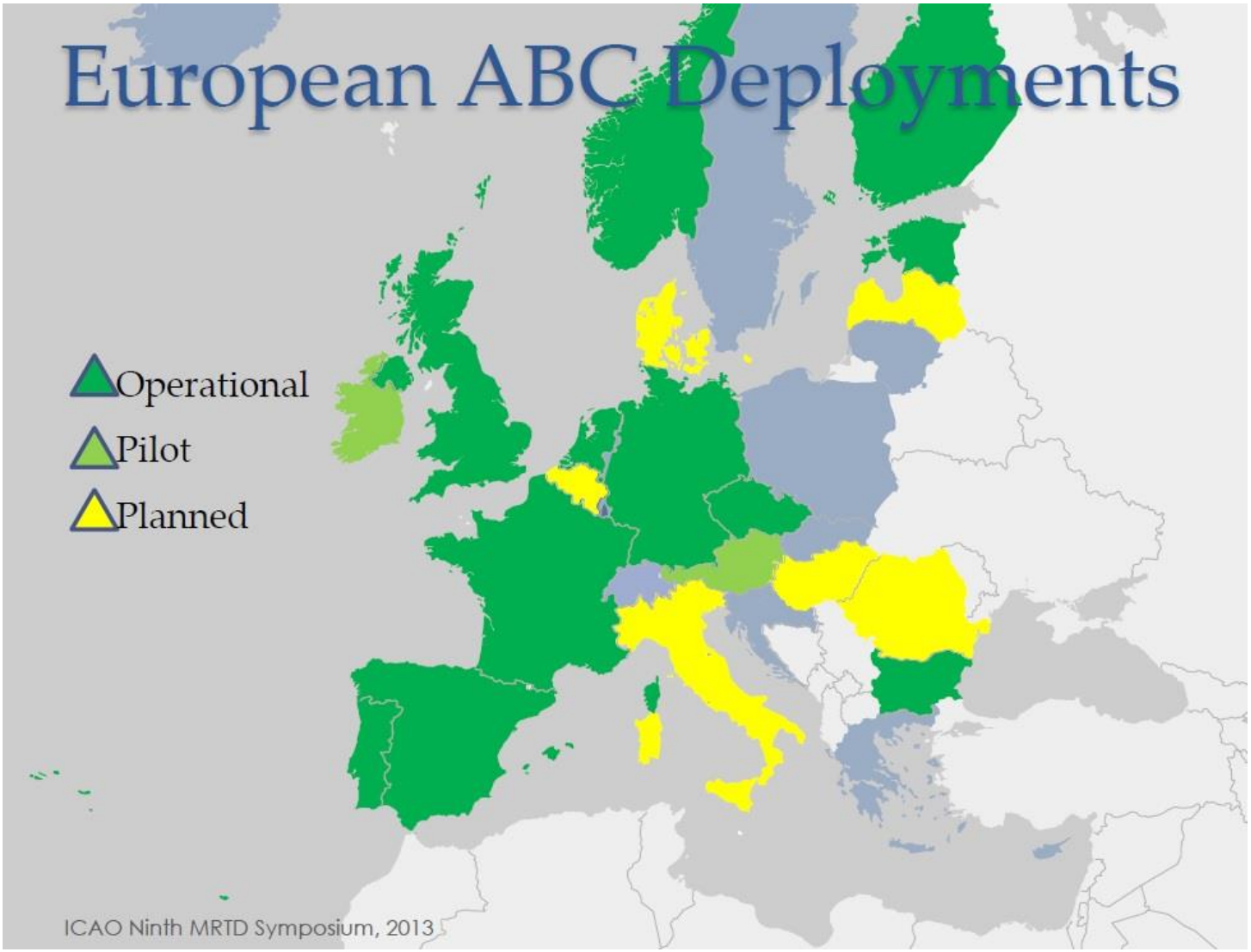
- ABC process consists of
  - Travel document authentication, e.g. expired validity, fake
  - Identity verification, e.g. forged identity
  - Monitoring
    - E.g.Check entry conditions: searching in databases for lost/stolen/invalidated/misappropriated documents (e.g. SIS II, for EU/EEA/CH)
      Non-systematic check in databases on persons (e.g. SIS II, national databases), systematic check for TCNs
    - Threat analysis: surveillance cameras

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Schematic representation of a State-of-the-art ABC system

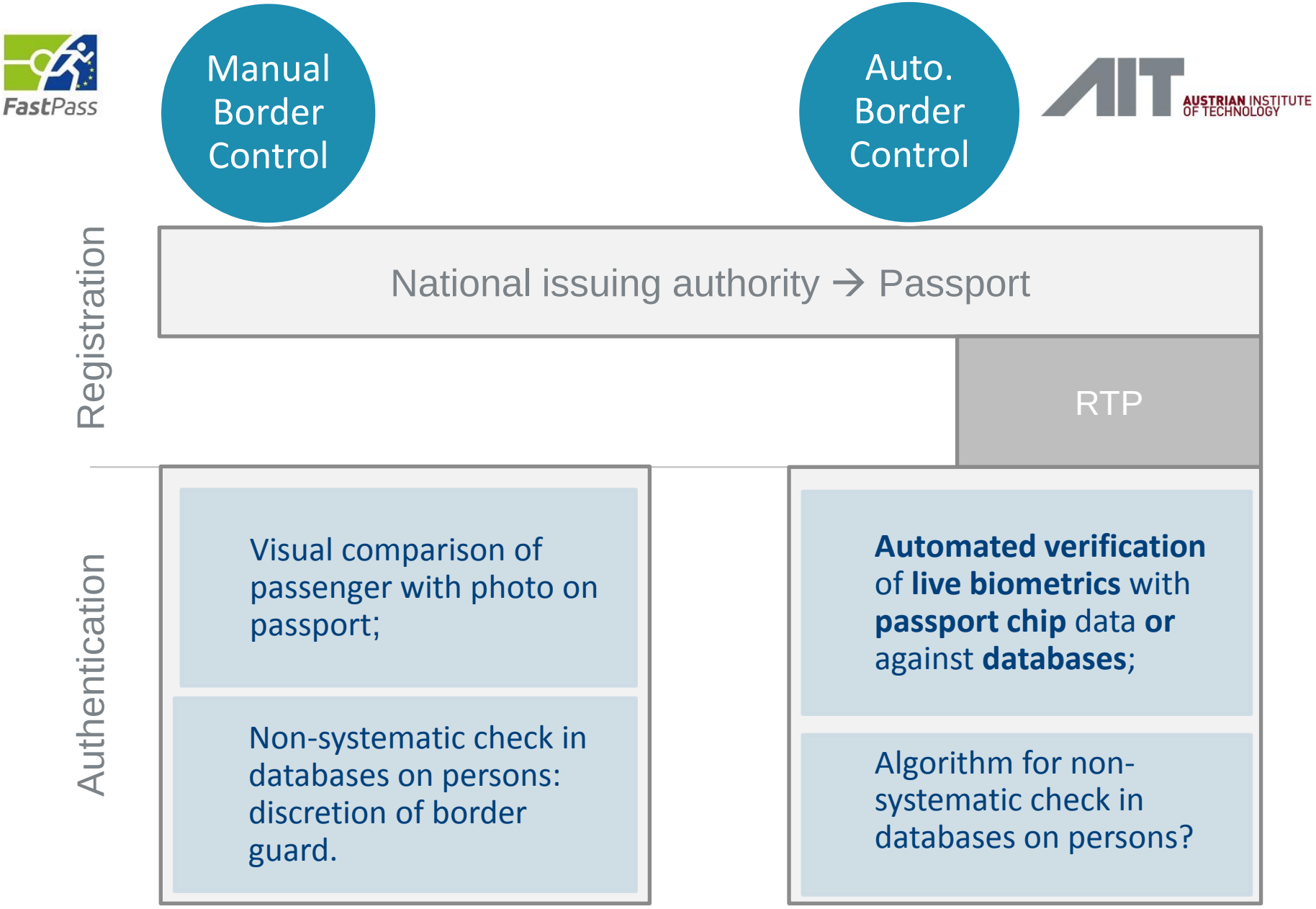


The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.



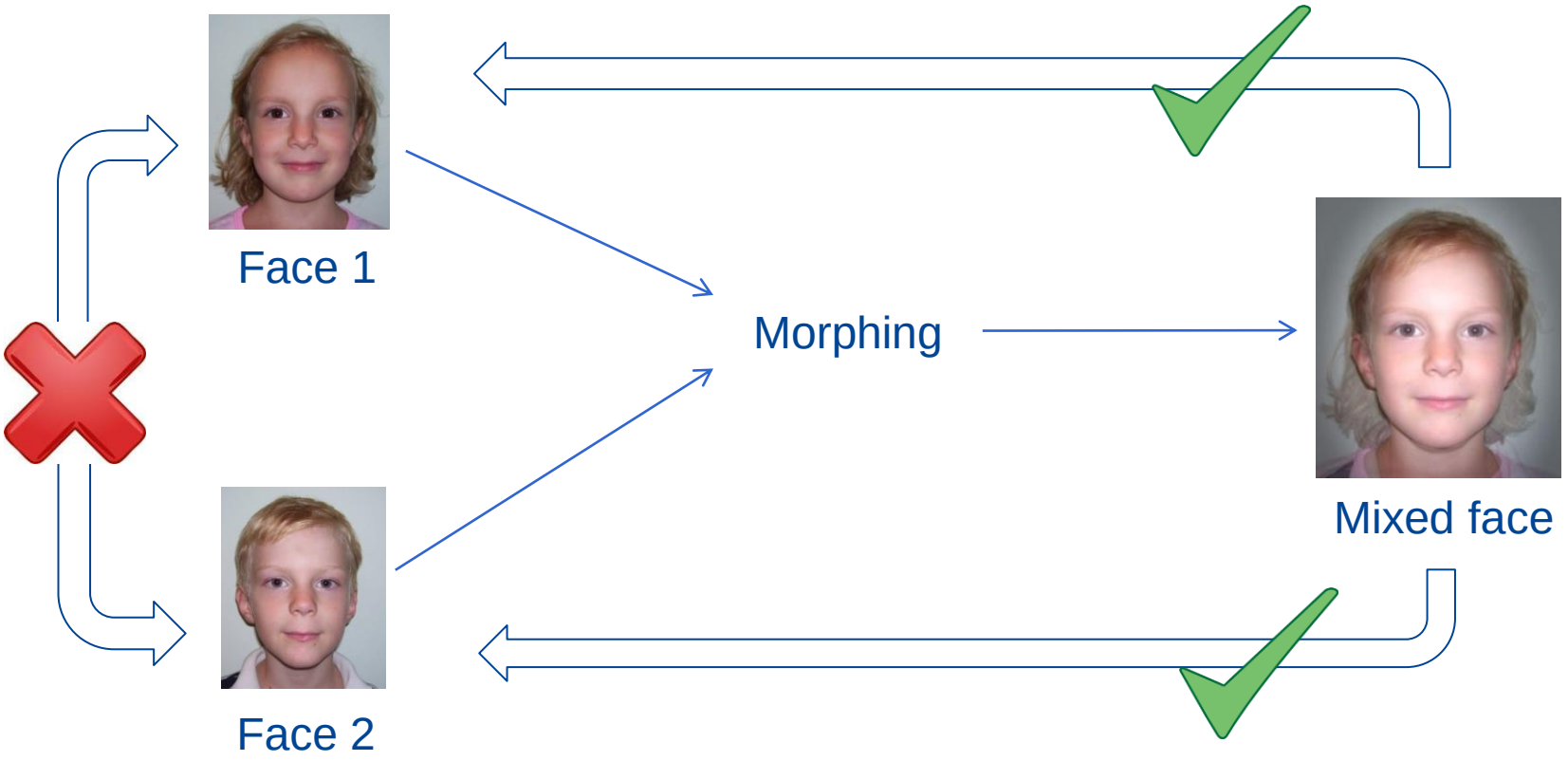
Source: Frontex

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.



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.

Example of a problem appearing in automated border control solutions: Spoofing - Faces in passports



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Benefits of Automated Border Control (ABC)

- Introduction of ABC is expected to
  - Improve efficiency
    - Speeds up the control process at the same border area
    - Reduce need for human resources
  - Improve security of border
    - Accuracy of verification and identification
- Improvements lead to a common benefit
  - Smooth, fast and predictable border crossing
  - Increased user satisfaction, facilitation
  - Enhanced security of the borders
  - Reduced costs
  - Implementation of the Smart Border Package

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.

Outline

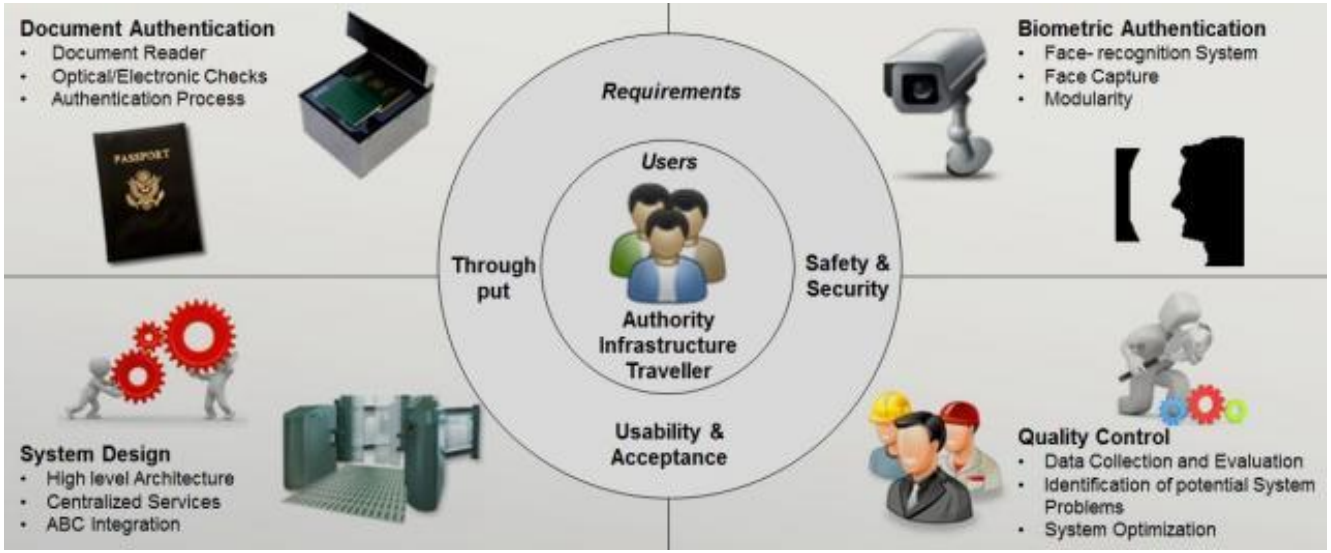
- FastPass – the project
  - Objectives and approach

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.

The FastPass Project

- Project start: 1.1.2013
- Project duration: 4 years
- Funding: EU FP-7 Security

- Coordinator: AIT Austrian Institute of Technology
- Further info: www.fastpass-project.eu

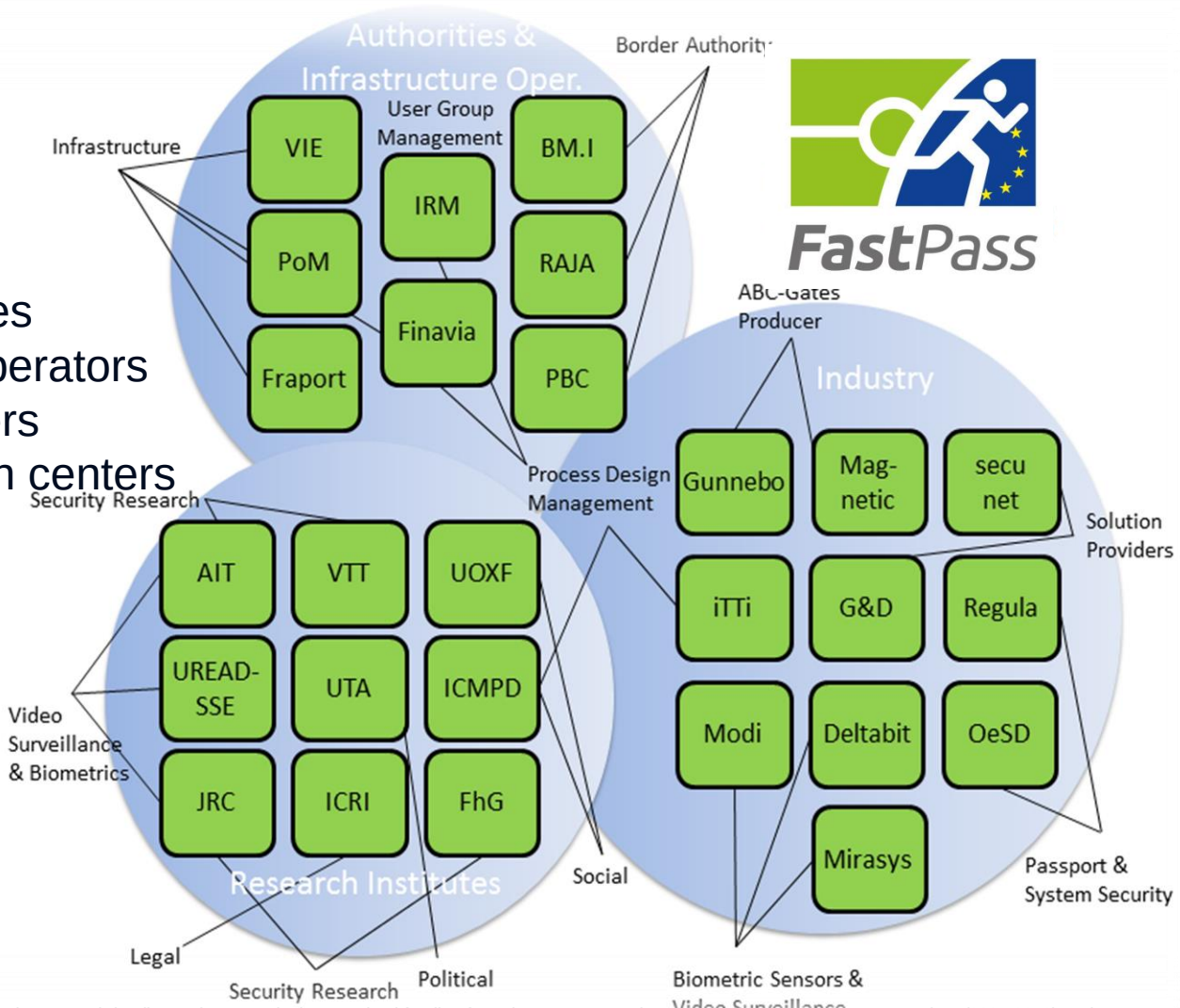


Key element:
The users are in the center of innovation!

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.

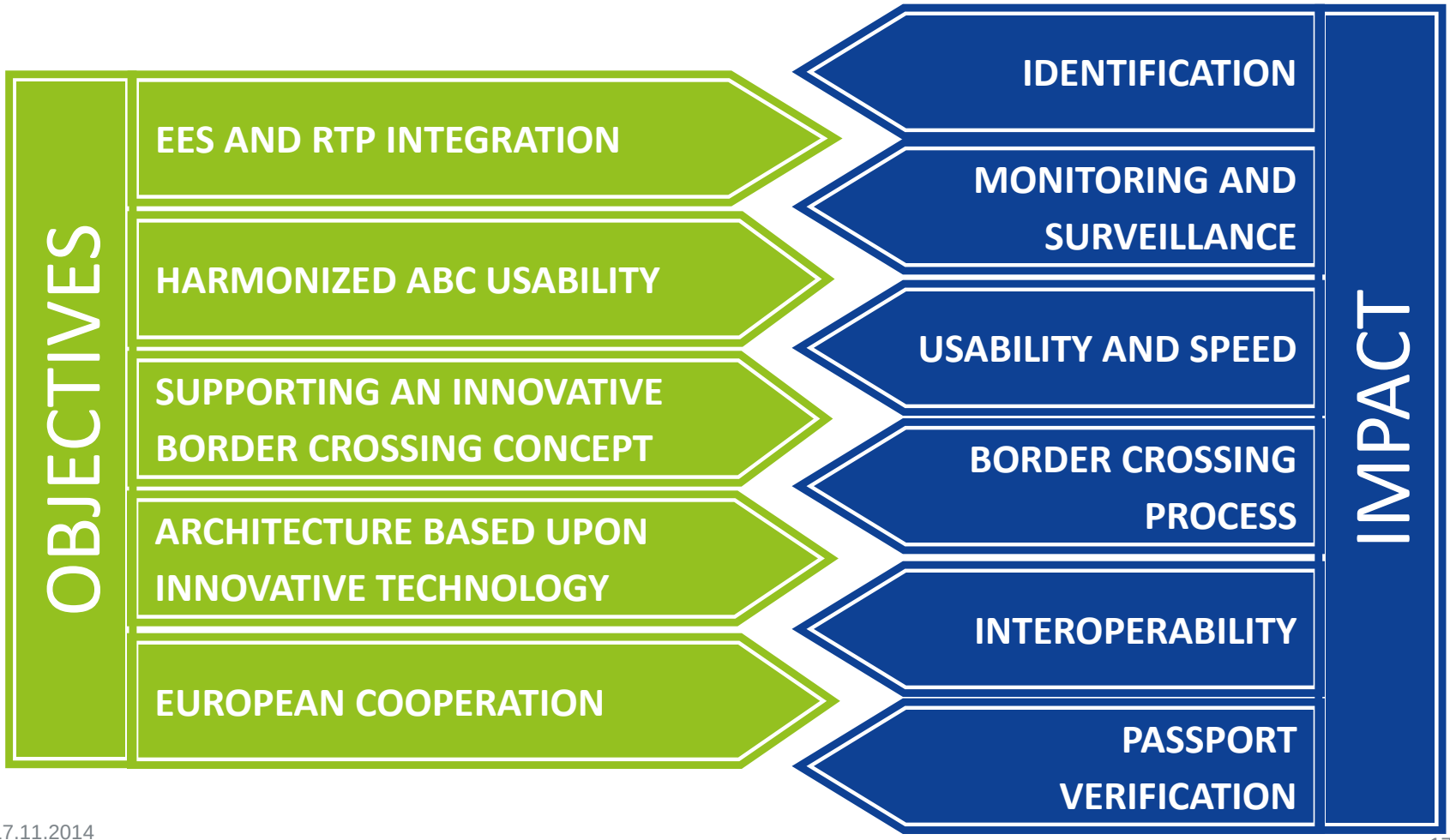
FastPass - Consortium

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



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

FastPass Objectives



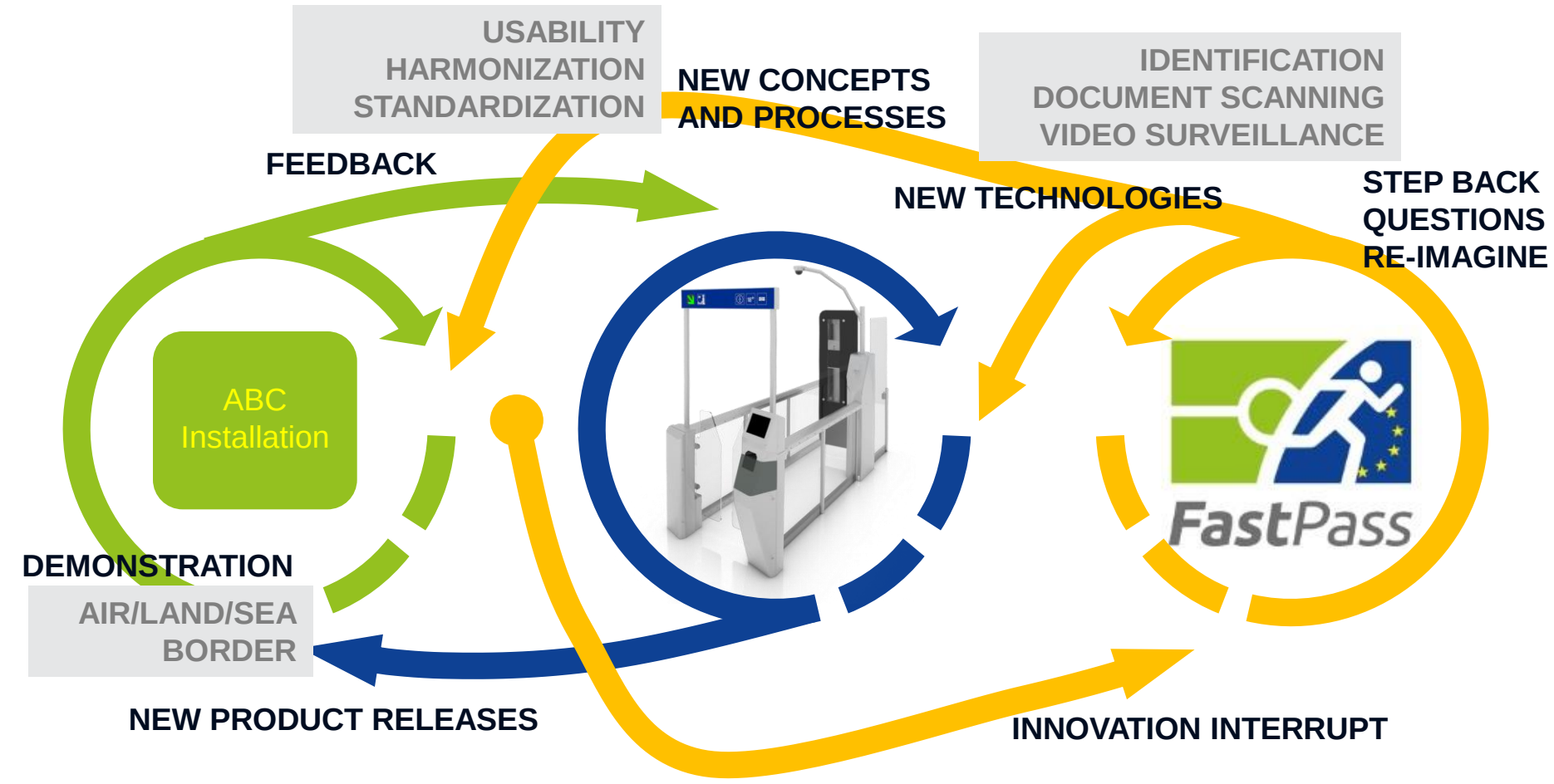
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583.

FastPass – the system, that

- **…is secure**
  - Resistent
    - to latest attacks on document scanner,
    - to biometric spoofing
  - Risk Assessment, Security Assessment 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

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.

ABC from science to solutions



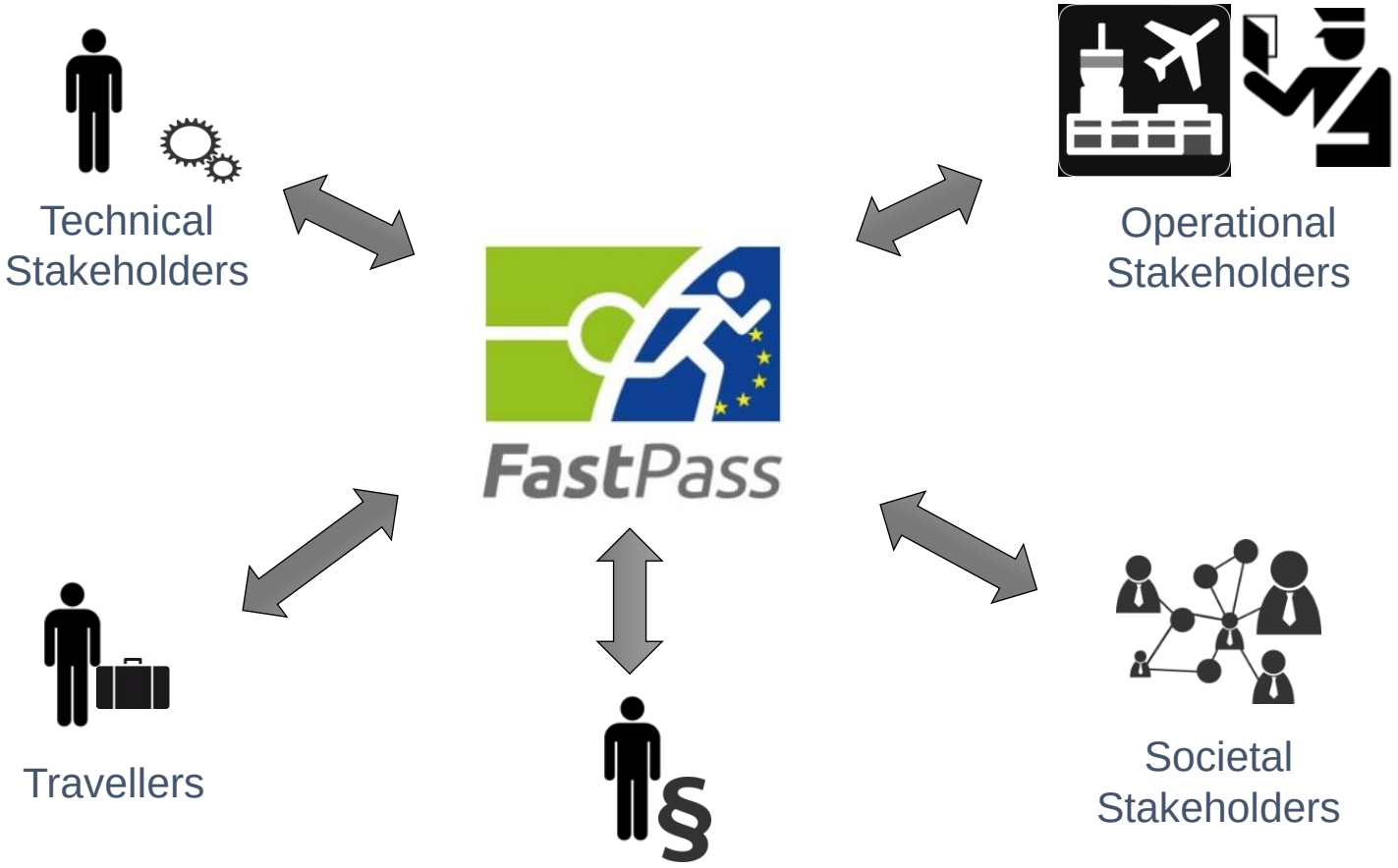
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583.

Outline

- Challenges
  - Stakeholder analysis
  - Security analysis
  - Monitoring
  - Automated document inspection
  - Approach: One Stop Shop
  - Concept for end-user management in complex systems

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.

Stakeholder Groups



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Stakeholders and their interests

Considered Stakeholders		
Border controlling authorities (BA)	**Travellers (T)**	**Infrastructure stakeholders (IS)** airport/seaport operators & security authorities
• security • core border processes • re-usable technologies & interoperability • legal aspects	• human factors and usability • harmonization • user acceptance and guidance needs • speed	• system development interoperability • security • efficiency and harmonization

- high-level requirements
  - security (S): Reliable and universal technologies to detect alarms in multiple security breaches
  - speed-up facilitation (F): Throughput optimization to handle the increasing travel capacities

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Study – Most common challenges in use of ABC

Passenger

- Lack of awareness:
  - ABC concept in general
  - Possibility to use ABC
  - Requirements to be able 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
  - Quantity, position and quality of information sources
- Poor ergonomics and uncomfortable working conditions
- Limited possibility for profiling

ICDSC may help!

Results in

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

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

What is Automated Border Control (ABC)?

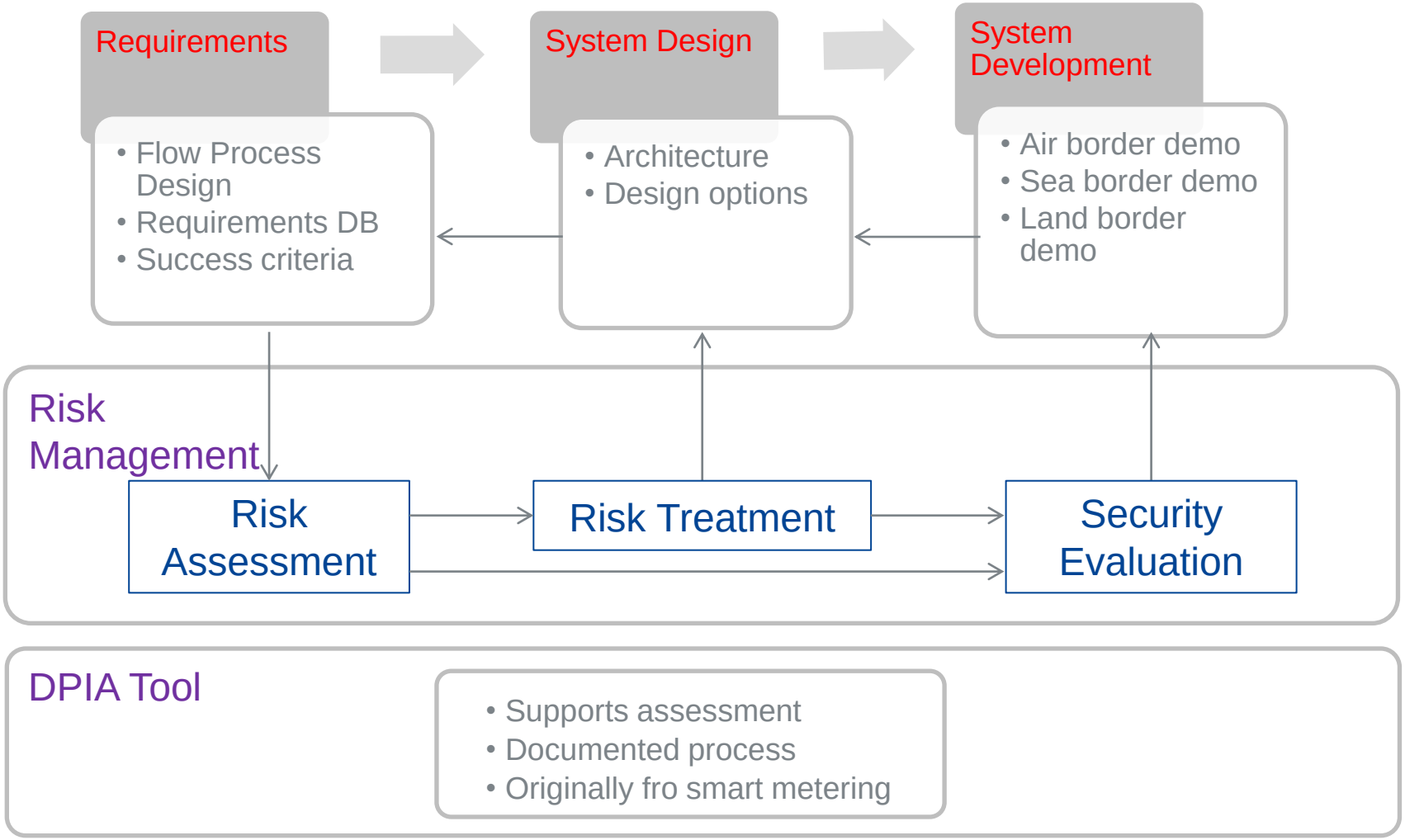
An ABC System …

- is an automated door system?
- is a traveller service built upon an automated door?
- needs a security concept built upon an automated door?

- needs careful design methodology
- requires assessment against security objectives

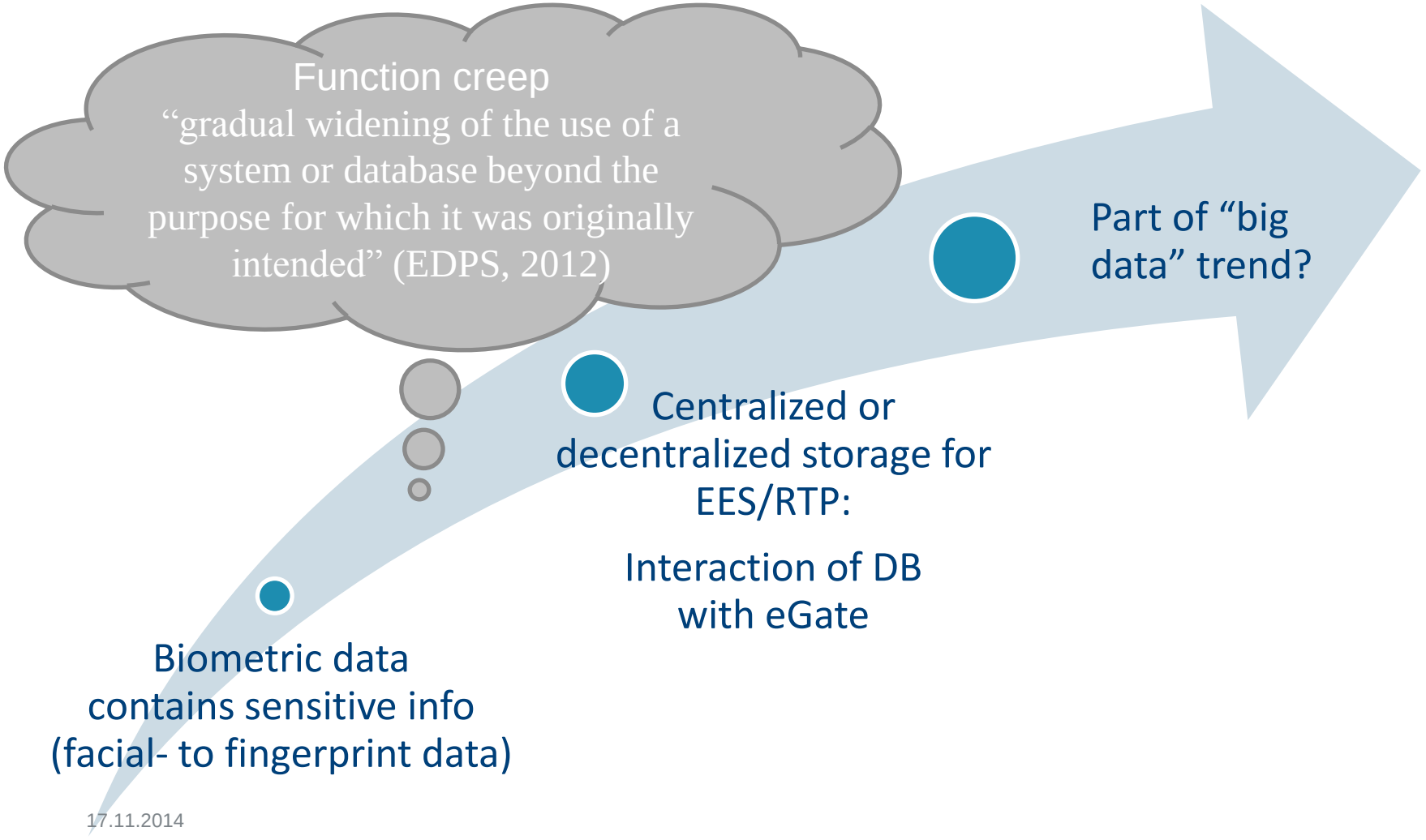
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Next Generation ABC: will come with security evaluation



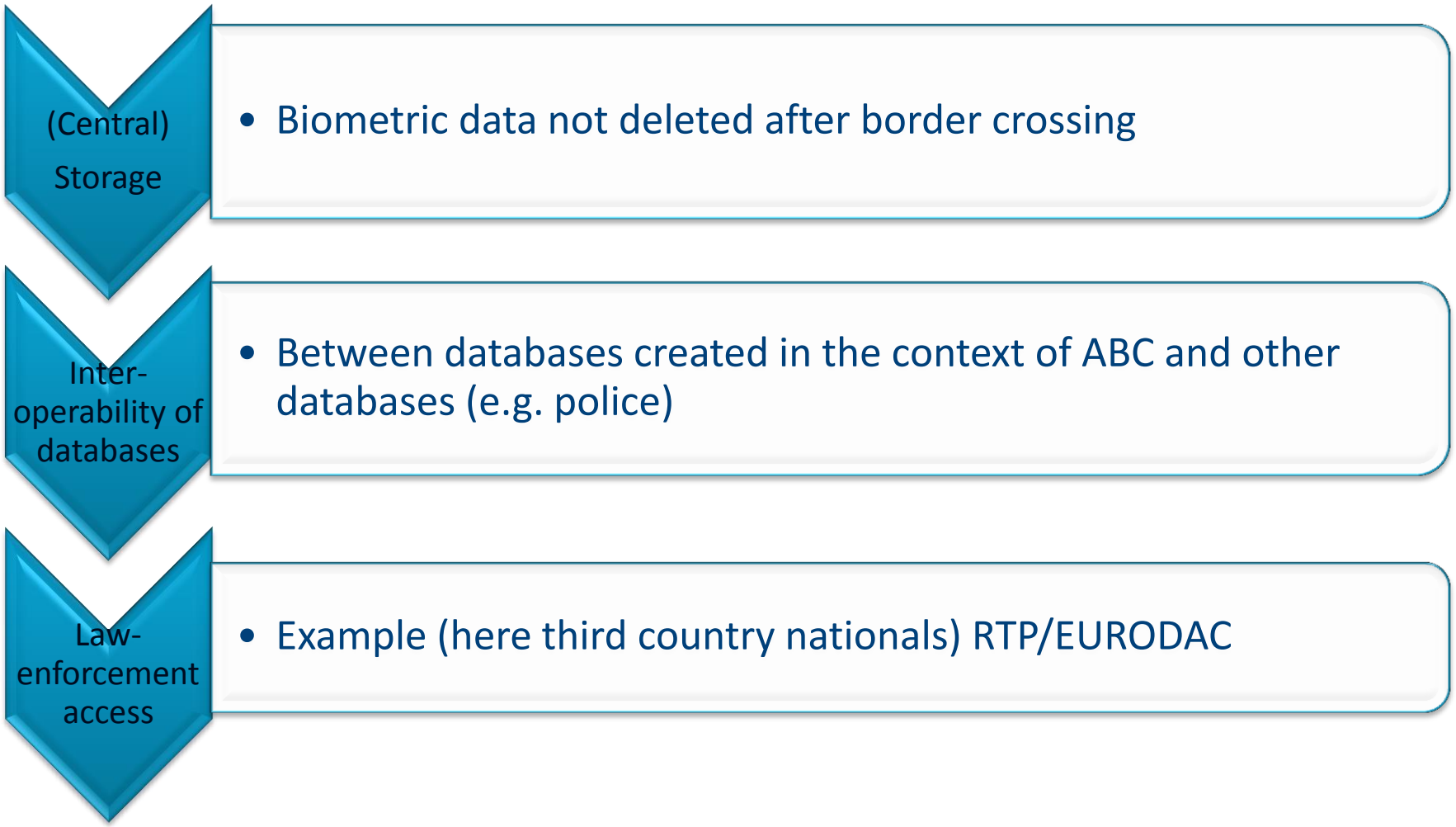
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Data Protection Implications: Function creep



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.

Data Protection Risks



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.

Results in Privacy by Design – concept development

From Directive 95/46/EC…

- ✓**Data minimisation principle (Article 6.1 b & c)**
- ✓**Obligation to security (Article 17 & Recital 61)**

and the launch of the overall discussion on Privacy Enhancing Technologies ("PETs")

"A coherent **system** of ICT measures **that protects privacy by eliminating or reducing personal data or by preventing unnecessary and/or undesired processing of personal data**, all **without losing functionality** of the information systems (European Commission, 2007)"

ICDSC may help!

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Monitoring as a service for ABC

Motivation / Challenges

- **Traveller Monitoring**
  - surveillance: automated recognition of events/anomalies/anomalous behaviour of individuals
- Enhancing **risk assessment** for Border Guards
- **Support and Helper** functionality
  - optimising traveller flow (e.g. recognizing need to open more gates)
  - reporting, etc.

ICDSC may help!

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

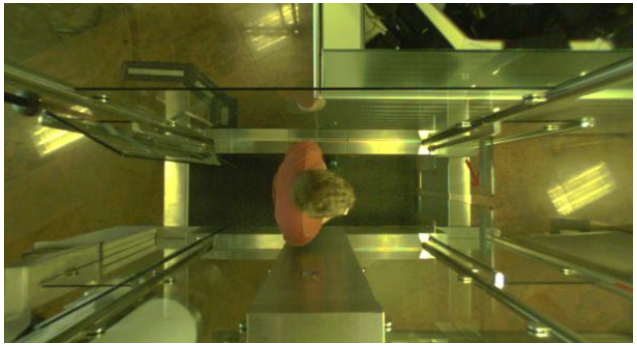
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583.

Sensor for Monitoring

3D stereo-camera system developed by AIT

- Top-view camera
- ~15 frames per second (Core-i7)
- Resolution: typically ~1 Mpixel
- RGB Video image & depth information
- Excellent “depth-quality-vs.-computational-costs” - ratio

- Advantage
  - robust and reliable detection under variable situations (against illumination, shadows)
  - enables scene analysis



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Single Person Detection

Motivation / Challenges

- Ensure **only one person (per passport)** who is crossing the border
  - reliable detection and counting of persons
  - multiple persons must not pass!

- **Real-time** processing
  - low latency

- **Advantage**
  - Reduced error-rate in tailgating / piggybacking scenarios
  - Reduced number of false alarms

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.

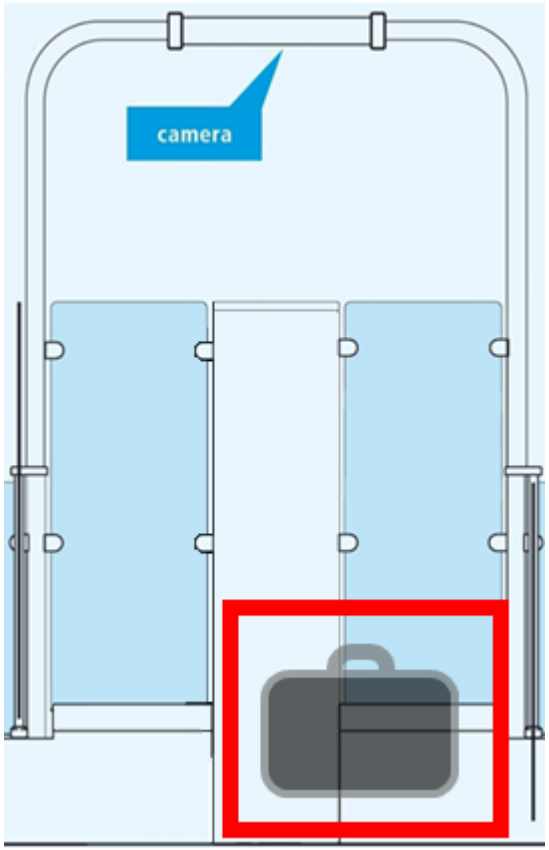
Left Object Detection

Motivation / Challenges

- **Detect left objects** to assure smooth border crossings
  - border crossing area has to be empty after passenger transit, clean secure zone
  - **show left objects**

- **Real-time** processing
  - low latency

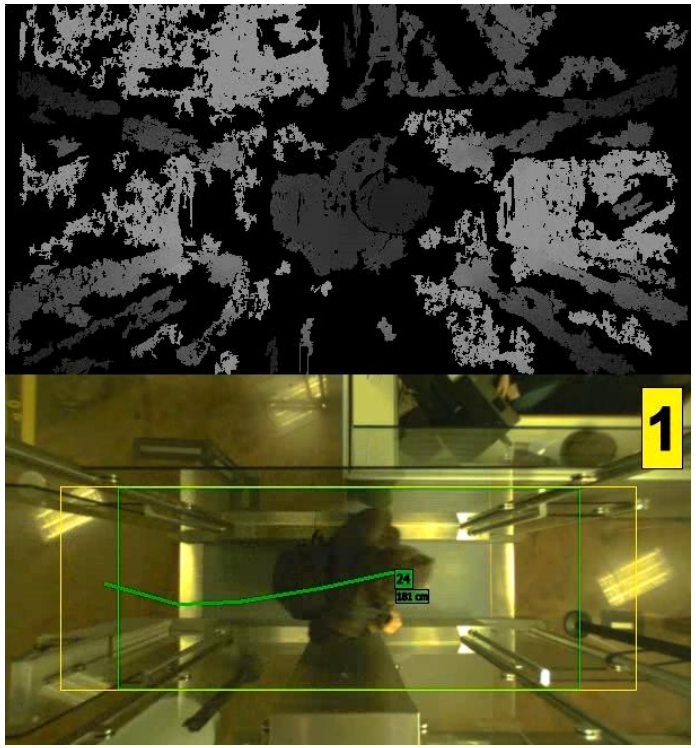
- **Advantage**
  - reduced error rates for small objects and / or difficult appearances like
    -> small size: e.g. passport
    -> low contrast: e.g. empty bottle



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Single Person & Left Object Detection

- Single Person Detection



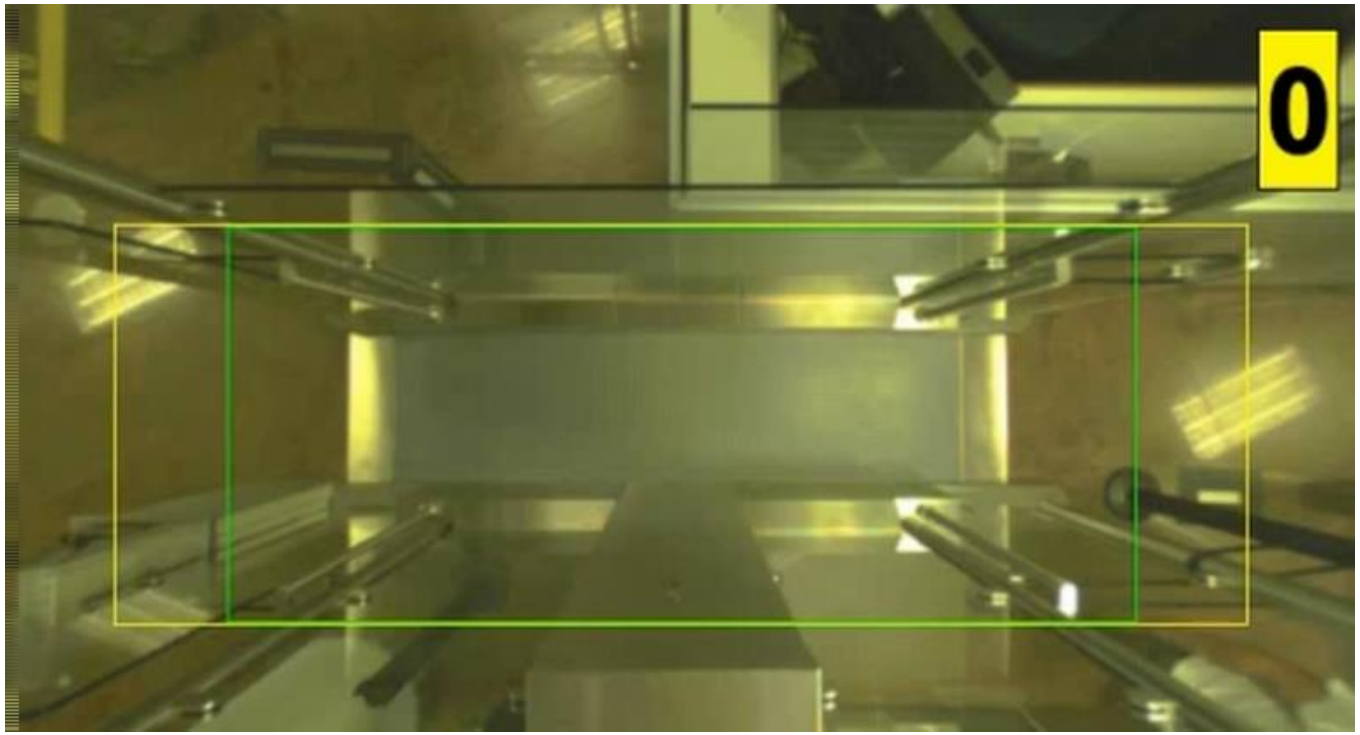
- Left Object Detection

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Single Person & Left Object Detection

Play Example Video

- 0:00 – 0:28: multiple persons.avi
- 0:28 – 0:57: closed doors.avi
- 0:57 – 1:09: trolley.avi
- 1:09 – 1:23: mobile phone.avi



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Left Item Detection – Demo video

Queue Length Estimation / Waiting Time

Motivation / Challenges

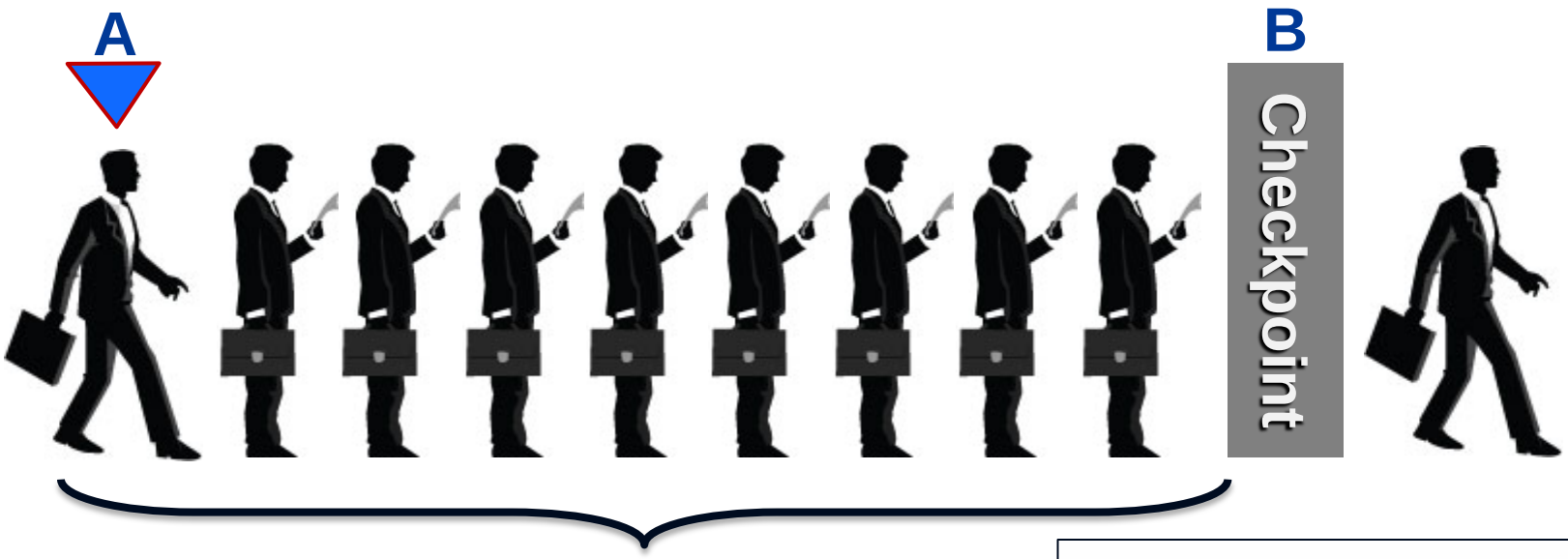
- Provides **situation overview in front of the ABC**

- Announcement of **waiting times** (customer satisfaction)
  - Automatic enhancement of **queue management**

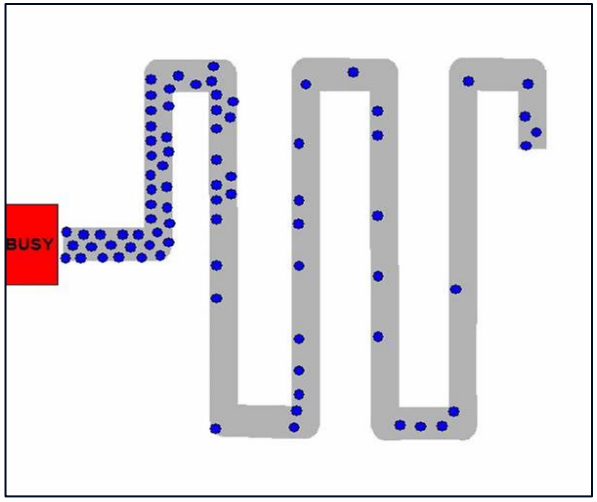
- **Advantage**
  - overcome occlusion problems
  - eliminate top-view requirement

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Waiting time: Estimation of length and dynamics



Waiting time

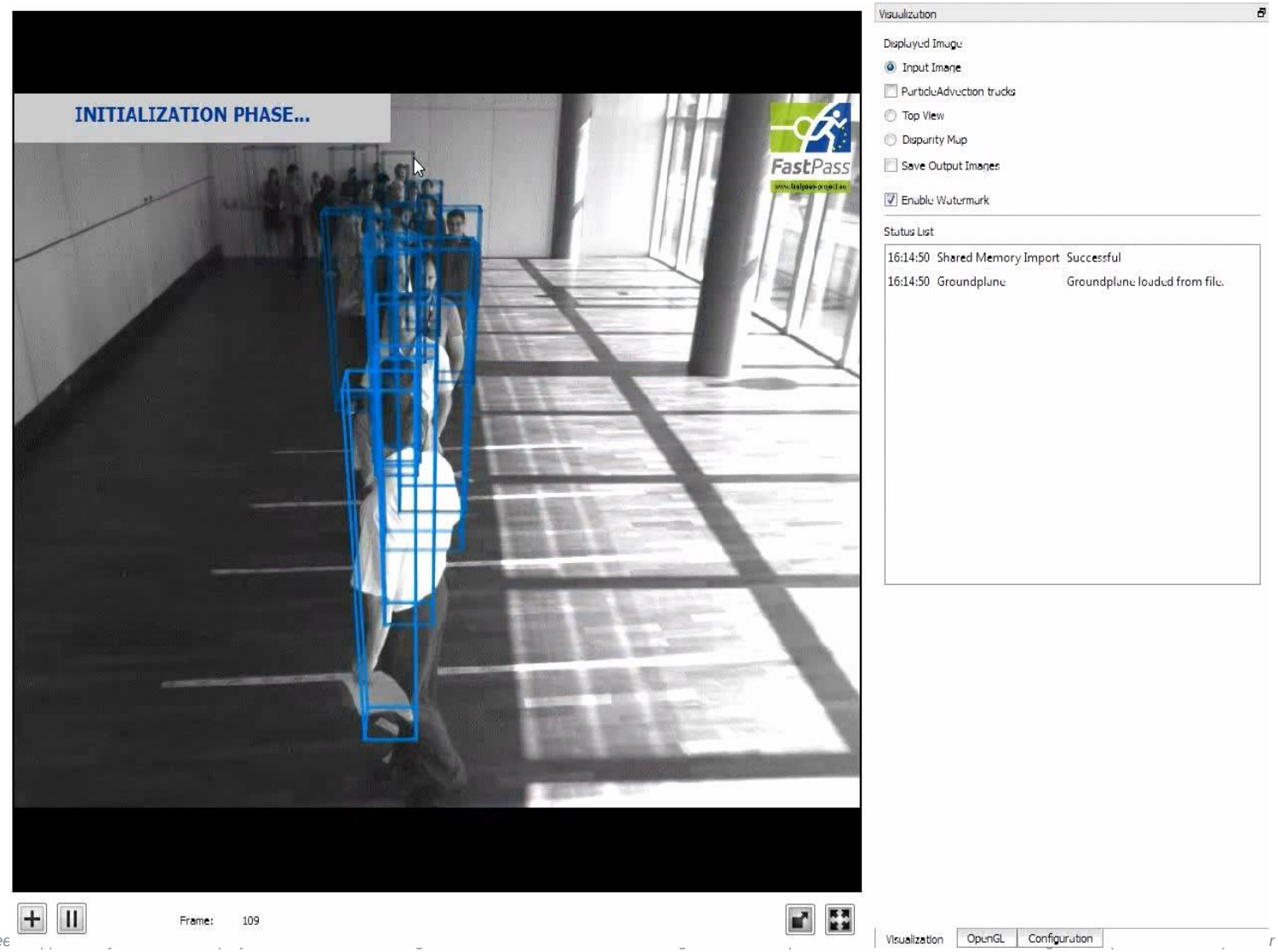


Relevance

- For traveler → customer satisfaction
- Infrastructure → load balancing

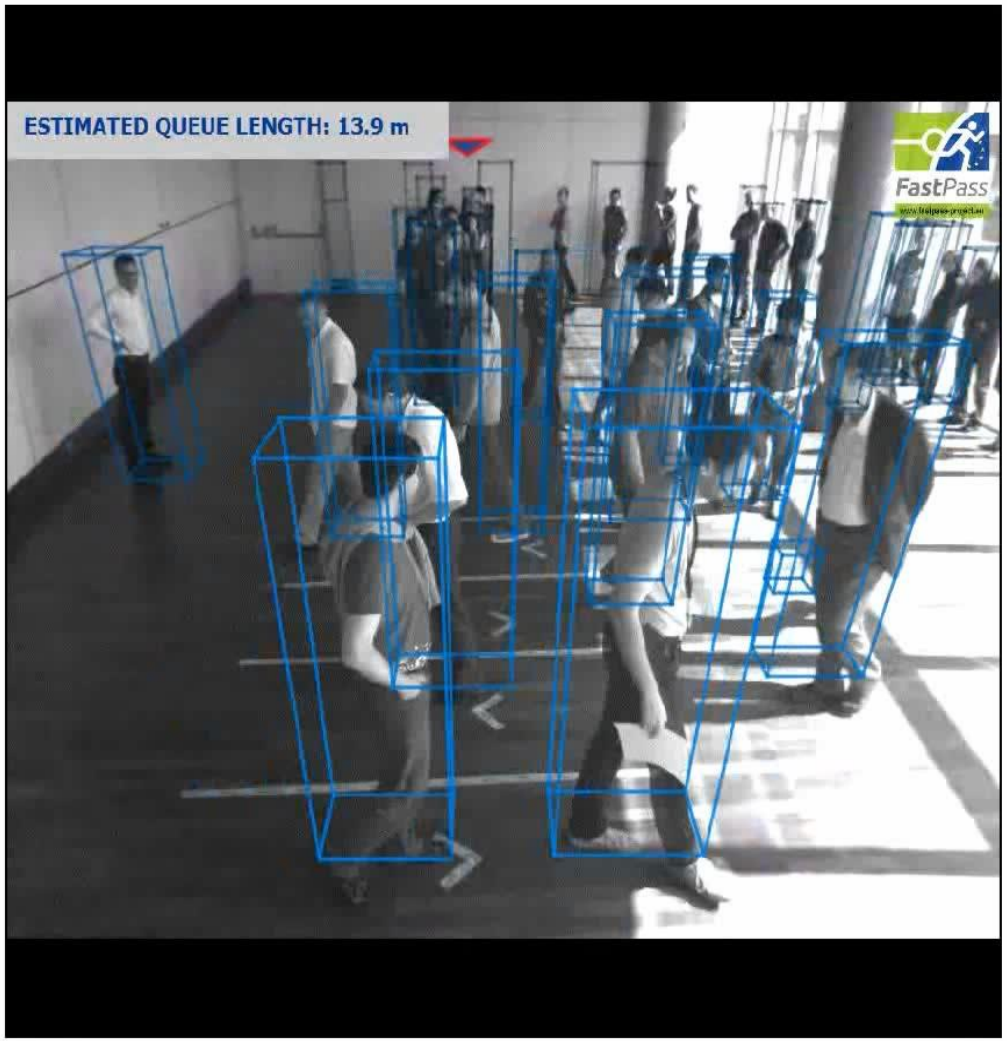
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583.

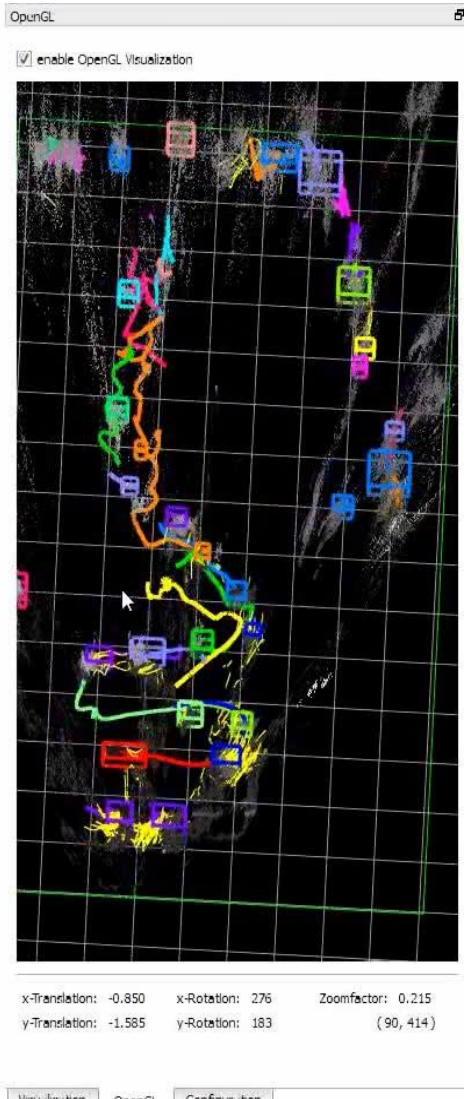
Queue Analysis (Length, dynamics)



The work has bee r grant agreement n° 312583.

Queue Analysis (Length, dynamics)



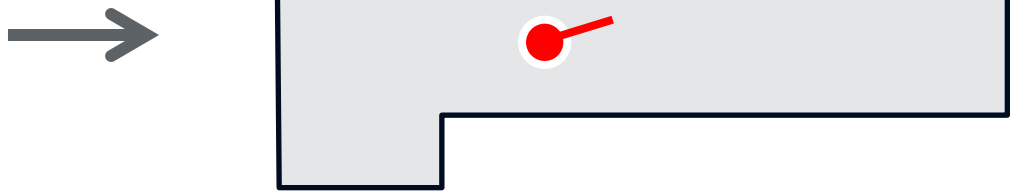


The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583.

Localization Service for Passenger Guidance

- Passenger
  - takes image from current positition

image



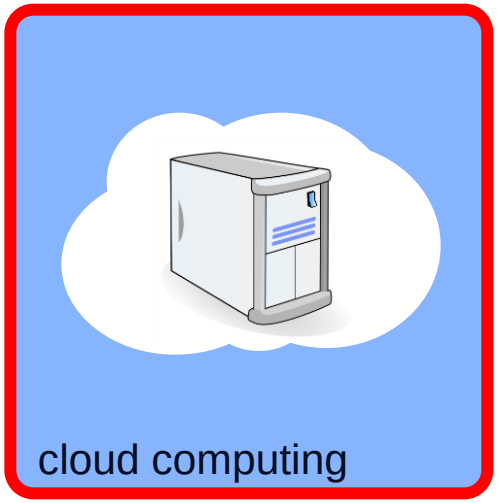
camera location

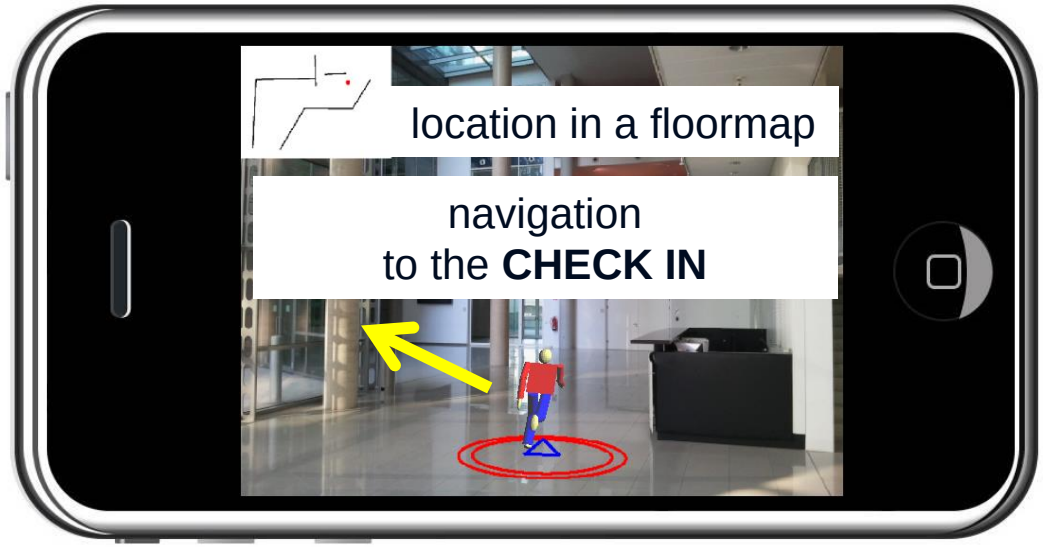
  - infrastructure service guides the passenger to the next process step

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Example – mobile cameras

image





location

navigation

uropean Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n °

Automated document (ePassport) inspection

- ABC ≠ manual border control
- Different process – same document
- Same security features

- Optical security features
  - Microstructures
  - Special inks
  - Special printing methods
  - Security laminates, fibres
  - Optically variable devices (e.g., Holograms)
  - Watermarks
  - Special paper
- Electronic security features
  - Basic authentication
  - Passive authentication
  - Active authentication
  - Extended Access Control

Should the epassport have features designed for automated authentication?

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Automated checking of optical security features

1. Acquire image of the passport in white, infrared, and ultraviolet light
2. Determine the type of the document (e.g., Austrian ePassport)
3. Compare patches extracted from the acquired images with the correct model stored in a database
4. If the patches and the model are similar enough, the document is considered authentic

Microtext acquired with 1200dpi, usually 400dpi.

ICDSC may help!
Improvement in an automated process needed

Hologram (OVD), it is intended for being viewed from different angles.

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.

What about document inspection algorithms?

- Commercially available document authentication systems
  - Sophisticated metrics/checks
  - Counterfeiter has to create a document that **fools** the **human observer AND the document inspection system** at the same time

- Attacks on automated document inspection can exploit weaknesses of a specific checking algorithm
  - Demonstration: a real passport vs. modified UV page

UV page of a real document.
Similarity - ground-truth: 87%

Modified UV page
Similarity - ground-truth: 94%

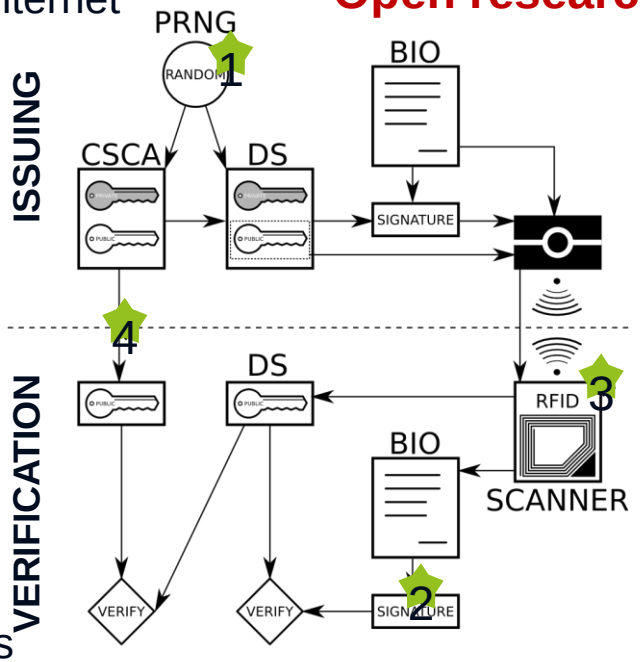
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Can electronic security fully substitute for optical security?

- Public key cryptography used in electronic passports for signing (if done correctly) has not yet been broken
- Electronic passport security consists NOT ONLY of the public key cryptography -> following angles detected:

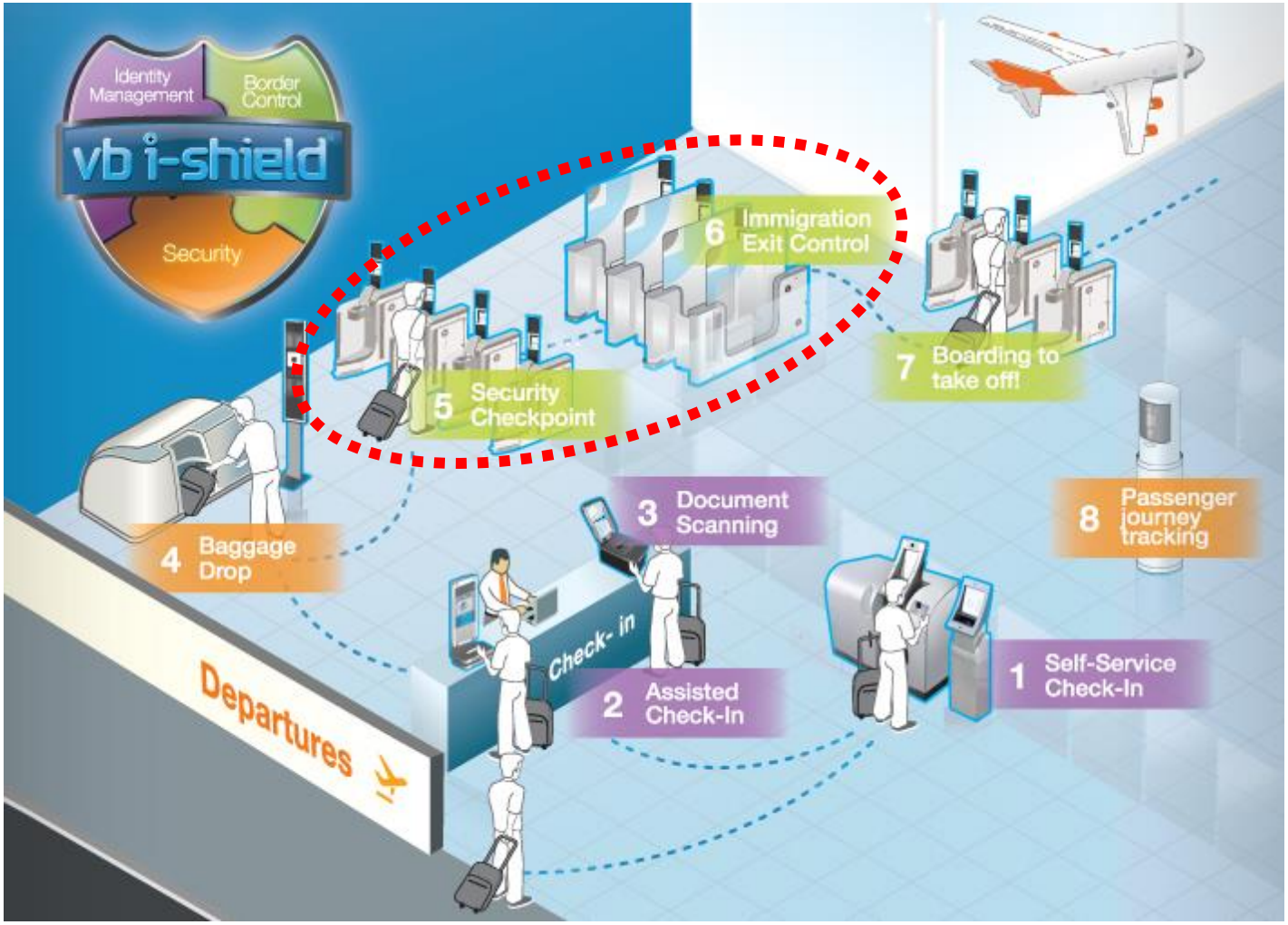
Every step has to be secure,
Optical & electronic features!
Open research!

- 4 Certificate management by people, distribution vie internet
- 1 Are random number generators not secure?
  OpenSSL (2008), Windows 2000/XP
- Attacks to signing keys companies have happened!
  recently Opera, Bit9
- 2 Are cryptographic hash algorithms secure?
  MD5, SHA-0
- 3 Can the scanner be compromised?
- Blackmail:
  - 105 ICAO member countries use ePassports
  - Several people/country with access to the keys
  - 1 key to create an arbitrary number of passports



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.

Novel One Stop Shop - border control system



Source: Vision-Box®-developed platform, the vb i-shield®

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

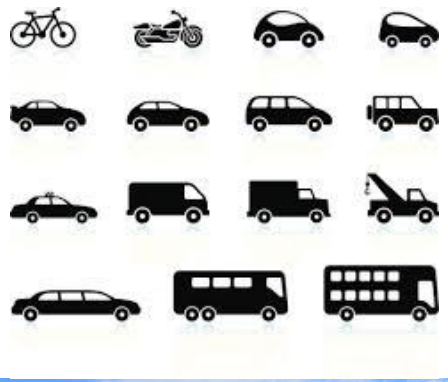
Component proposal for a pedestrian/vehicle handling OSS

SH	T	Pedestrian Description	SH	T	Vehicle Description
BA	S	Identity verification	BA	S	Identity verification
BA	S	Document authentication	BA	S	Travel document authentication
BA	S	Human trafficking detection – (tailgating & piggybacking)	BA	S	Detection of persons leaving a vehicle/control area
BA	S	CCTV surveillance to monitor passenger behavior	BA	S	Vehicle identification (e.g. by scanning car plates)
BA IS	S	Left luggage detection	IS T	F	Vehicle counting, to direct them to different terminals
IS T	F	Queue length detection (waiting time)	BA	S	Pre-clearance of travellers/vehicles support
BA	S	Detection of suspicious behavior (e. g. loitering)	BA	S	Count number of travellers in a vehicle **ICDSC may help!**
IS	F S	People counting and tracking	IS T	F	Detection of illegal passengers hidden in a vehicle
BA IS	S	Detection of weapons and other illegal substances	BA	S	Detection of vapours/toxins emitted by a vehicle
			T IS	F	Border checks while travellers remain seated
			BA IS	S	Observation of the OSS system via video surveillance cameras

The
312583. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Innovative monitoring services for different types of borders

Different requirements require flexible, modular solutions



Land border

Airport

Sea border

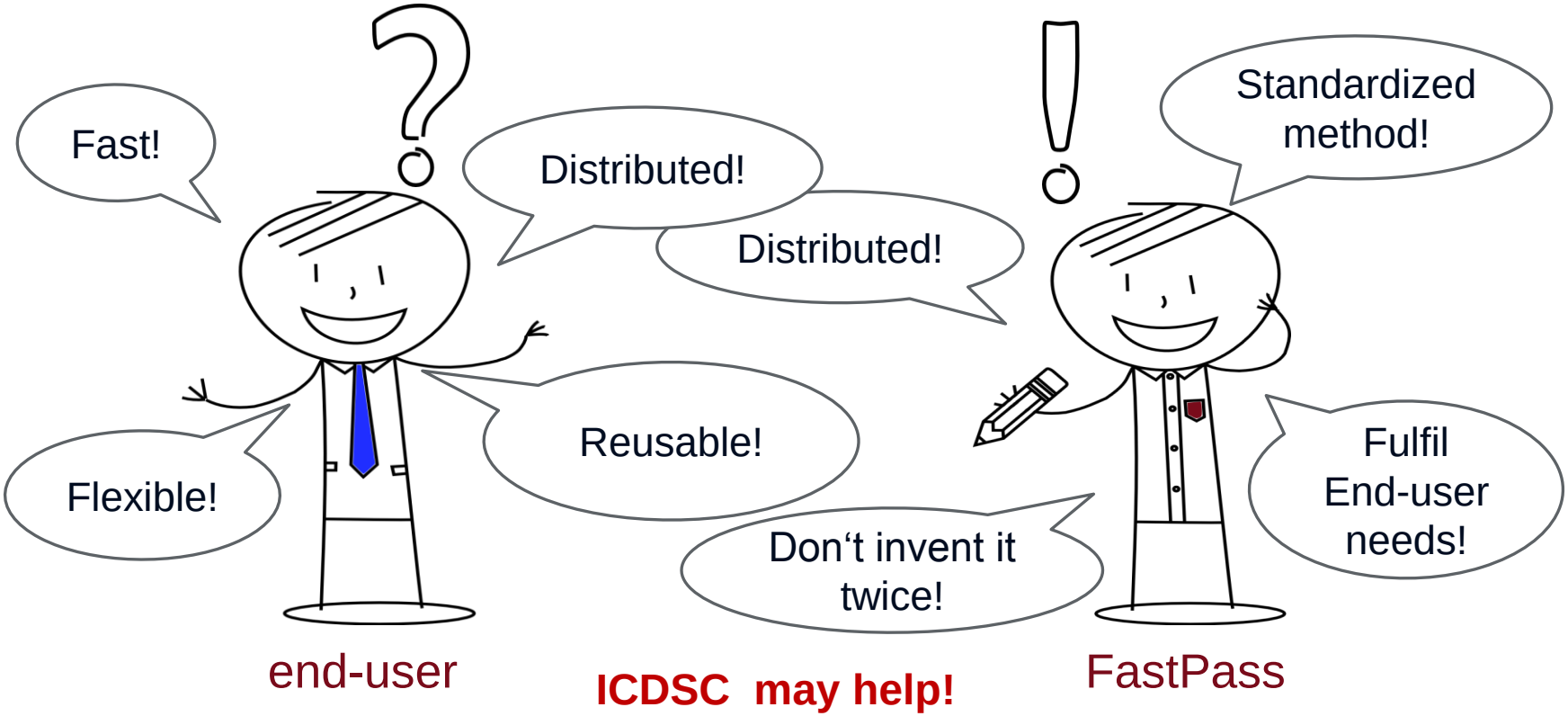
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Next Generation Processes and Systems

- Demonstration for technologies in following advanced processes
  - **sea border control** with shared responsibilities between departure and arrival to enable minimal border crossing time
  - control of passengers inside a car on **land borders**, with and without RTP like passenger and vehicle registration
  - various processes on one **air border** location to evaluate different concepts
- Contribution to future processes
  - third country nationals transits and the possible inclusion into ABC process
  - clarifying open challenges of the smart border package (EES and RTP integration)
  - possible impacts and challenges of including VISA holders into ABC process

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.

End-user management in complex innovative systems

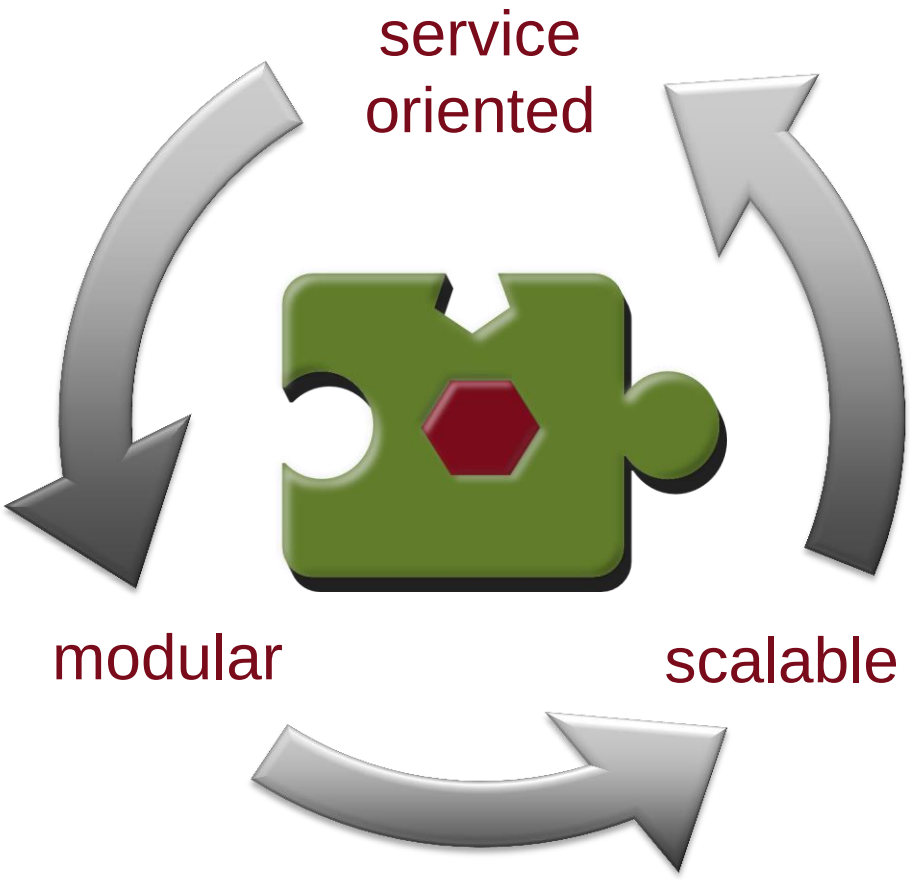


So… we need a concept that supports all the needs and provide a monitoring service for the end users

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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

… and therefore we developed

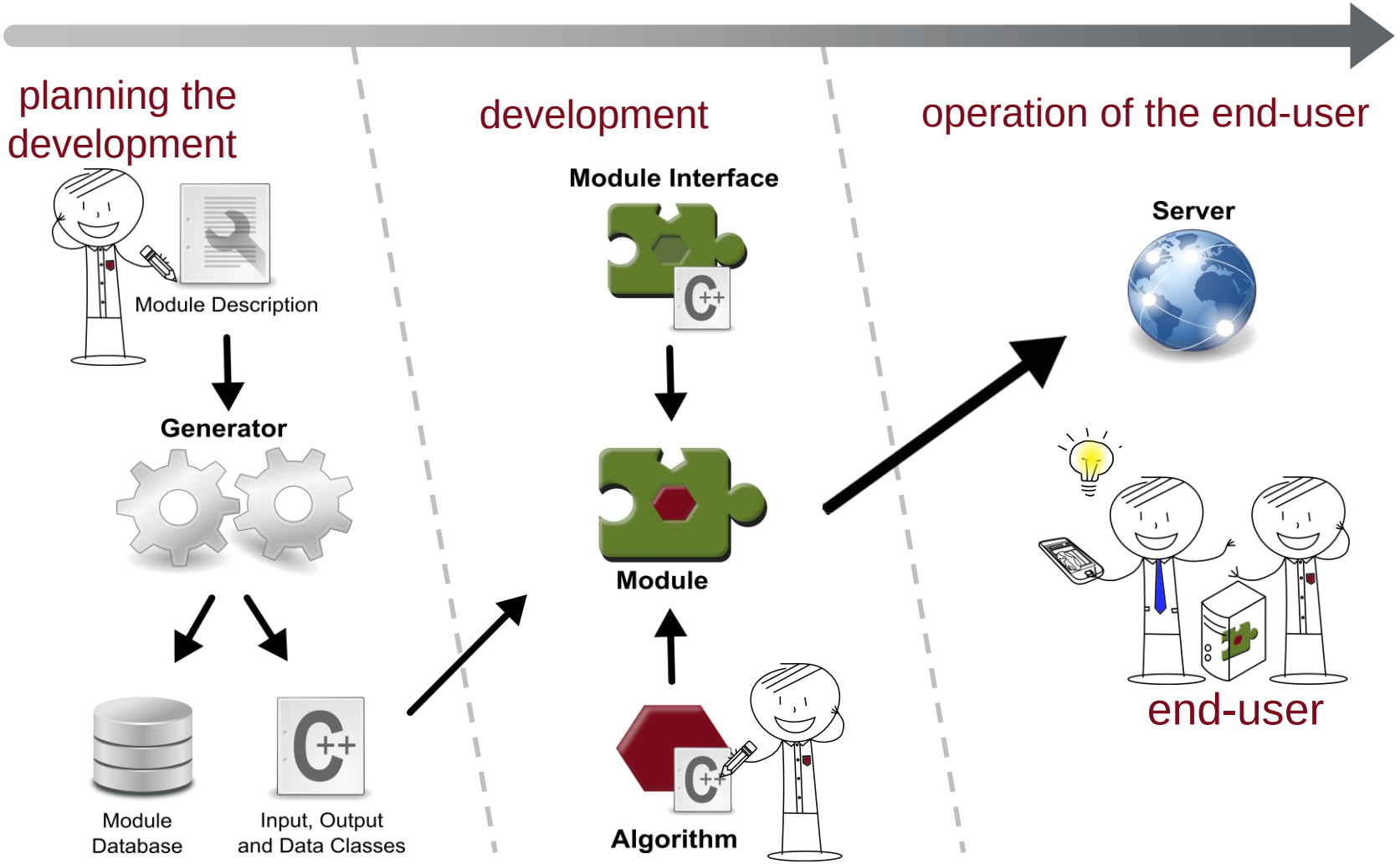
Connected Vision - a FastPass monitoring service for ABC



… a video computation concept & SDK for rapid application development

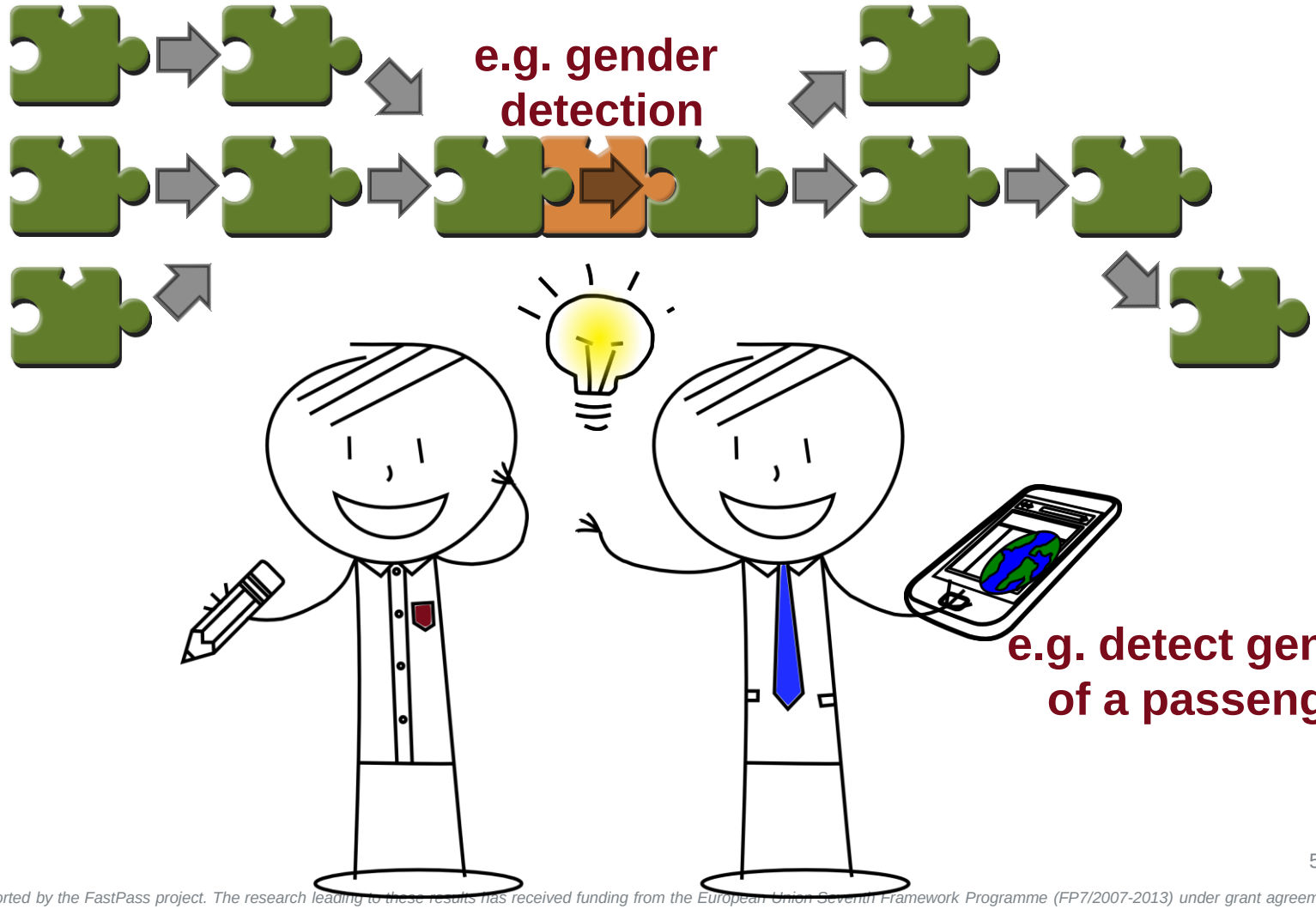
The work has been supported by the FastPass project. The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 312583. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

What Connected Vision is doing for FastPass …



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Endless Innovation Possibilities…



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. This publication only reflects the author's view and the European Union is not liable for any use that may be made of the information contained therein. All document contained therein cannot be copied, reproduced or modified in the whole or in the part for any purpose without written permission from the FastPass Coordinator with acceptance of the Project Consortium.

Outline

- Conclusion – Illustrated challenges that can be handled by smart sensors
  - Relation to several conference topics

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.

Illustrated challenges that can be handled by smart sensors

- Privacy
  - Embedded devices help to minimize data: Analysis of biometric data in embedded cameras
- Data fusion
  - Acceptable amount of analysis information (e.g. face recognition, fingerprint, person separation)
  - Big data trend
- IT Security
  - Current systems not security evaluated
  - Modular security with smart devices
- Analysis
  - Monitoring with smart cameras (e.g. passenger in vehicle)
  - Passport reading

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.

Illustrated challenges that can be handled by smart sensors

- Scalability
  - Current systems are limited **-** weak integration into infrastructure processes, reuse of existing technology
  - ABC solution is a set of technologies: extendable systems & exchange of technology provider
  - Distributed Systems can handle the vast amount analysis modules
  - Distributed systems are more flexible for different borders
  - Simpler architecture -> more concept possibilities
- Usability
  - Maintenance as critical point in operative ABC systems (many different stakeholders)
  - Easier to handle malfunctions with embedded devices

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.

ABC are interdisciplinary and related to several topics of this conference

- Distributed video analytics
- Multi-sensor data aggregation
- Information fusion
- Vision-based smart environments
- Surveillance
- Tracking applications
- Middleware applications

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.

Questions?

Special tanks go to:

- AIT

Stephan Veigl, Martin Boyer, Michael Rauter, Csaba Beleznai, David Schreiber, Axel Weissenfeld, Christian Zinner, Andreas Zweng, Andreas Zoufal, Julia Simon, Daniel Steininger, Markus Hofstätter, Dan Shao, Markus Hofstätter, Georg Nebehay, Roman Pflugfelder, Peter Gemeiner, Branislav Micusik, Erich Voko, Michael Cyniburk, Markus Clabian, Michael Gschwandtner, Svorad Štolc, Franz Daubner

- VTT

Mari Ylikauppila, Sirra Toivonen, Minna Kulju

- Raja

Minna Jokela

- ITTI

Łukasz Szklarski

- JRC

Guenter Schumacher

- Projects: FastPass, Future Border Control, D-SenS, EPiCS

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.

AIT Austrian Institute of Technology

your ingenious partner

Andreas Kriechbaum-Zabini

Video- and Security Technology

Safety & Security Department

AIT Austrian Institute of Technology GmbH

andreas.kriechbaum-zabini@ait.ac.at

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.