Monitoring as a service for Automated Border Control (ABC)

Project: FastPass

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Motivation for ABC

- Significantly increasing passenger flows
  - from 2012 to 2016 +800 million

- Border guards face big challenges
  - in-depth document checks
  - reliable identity checks
  - check of entry conditions
  - discover possible threats

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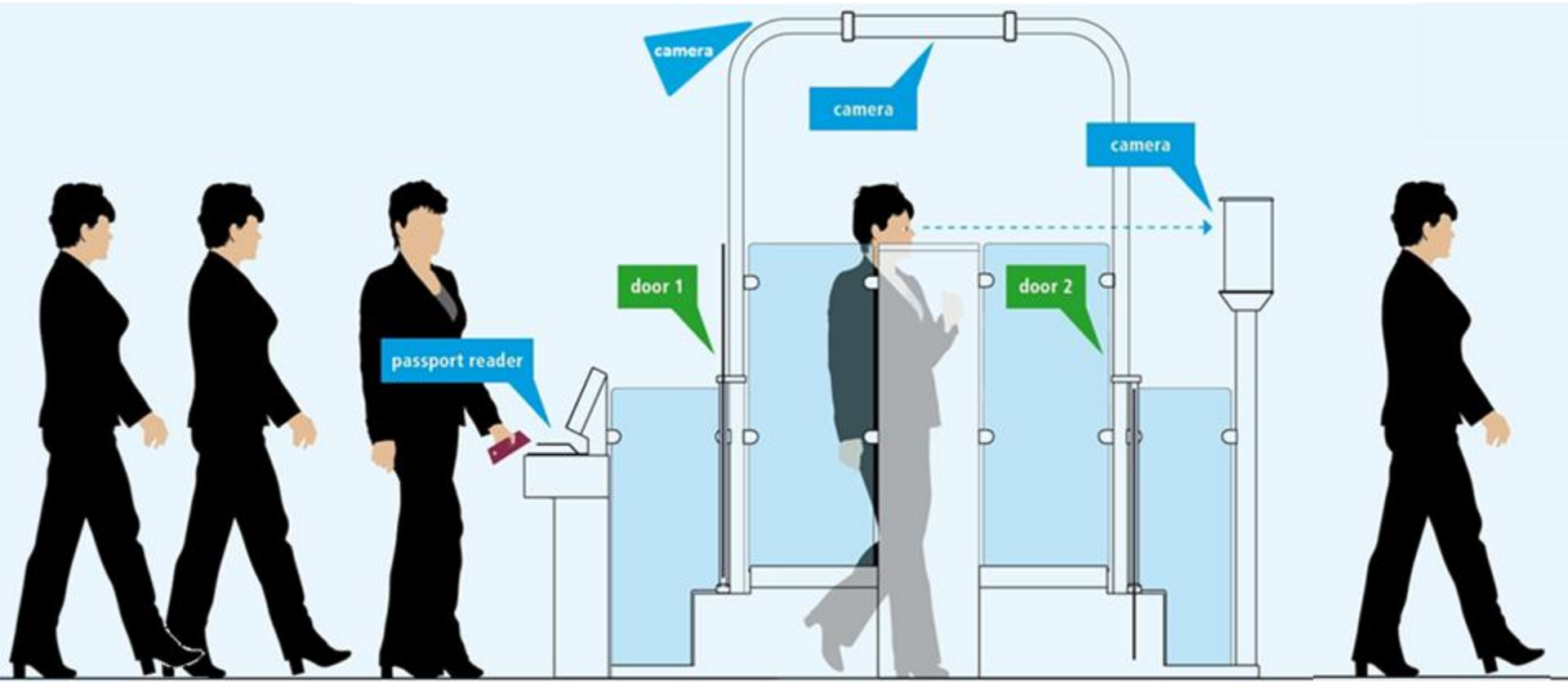
Schematic representation of an state of the art - ABC Gate



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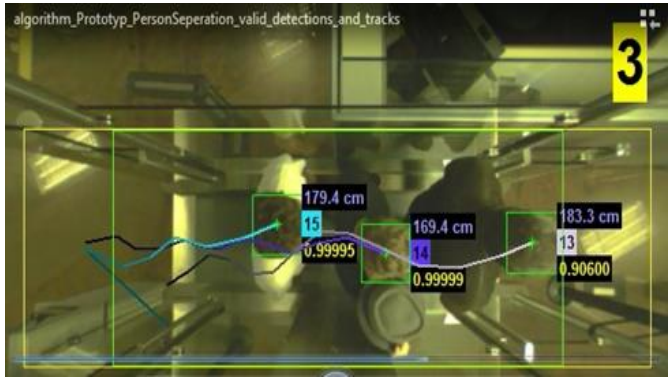
Monitoring as a service for ABC

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.



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Addressed Examples

Possible 3D Video Surveillance in traditional ABC systems

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

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

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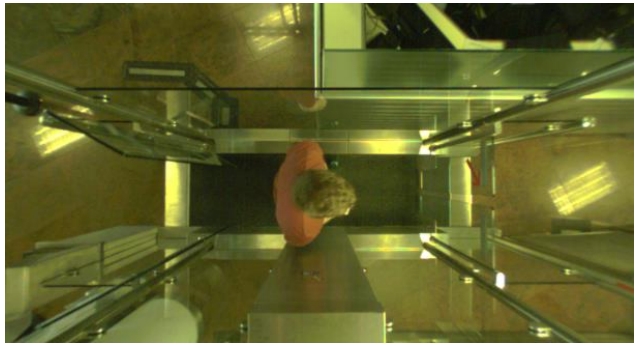
The Sensor

3D stereo-camera system developed by AIT

- Top-view camera
- ~15 frames per second
- RGB Video image & depth information

- Advantage
  - robust and reliable detection under variable situations
  - new options for queue length estimation



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Single Person Detection

Motivation / Challenges

- Ensure **only one person** 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

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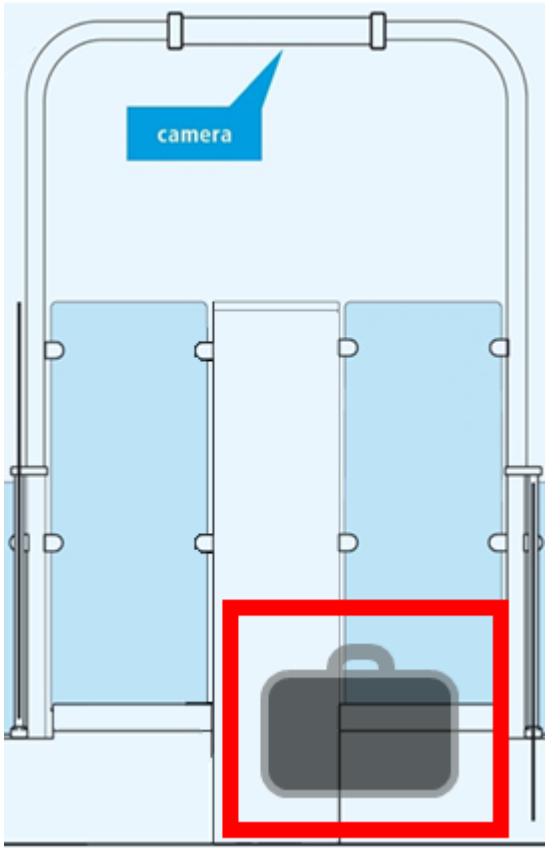
Left Object Detection

Motivation / Challenges

- **Detect left objects** to assure smooth border crossings
  - border crossing area has to be empty after passenger transit
  - **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



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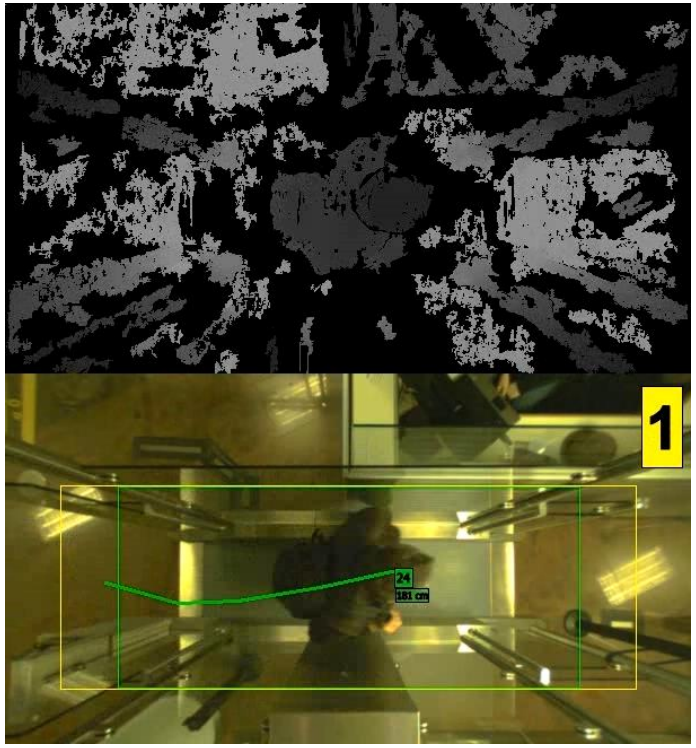
Single Person & Left Object Detection

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



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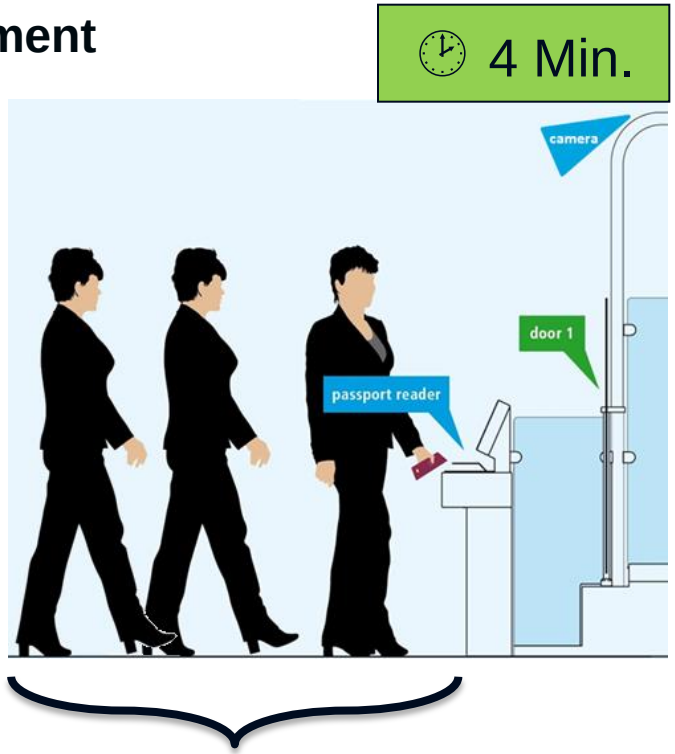
Queue Length Estimation / Waiting Time

Motivation / Challenges

- Automated enhancement of **queue management**
  - number of persons per queue
- Announcement of **waiting times** (customer satisfaction)
  - visual tracking of queue dynamics
- **Input for risk management**
  - detection of anomalous behaviour
- **Advantage**
  - overcome occlusion problems
  - eliminate top-view requirement



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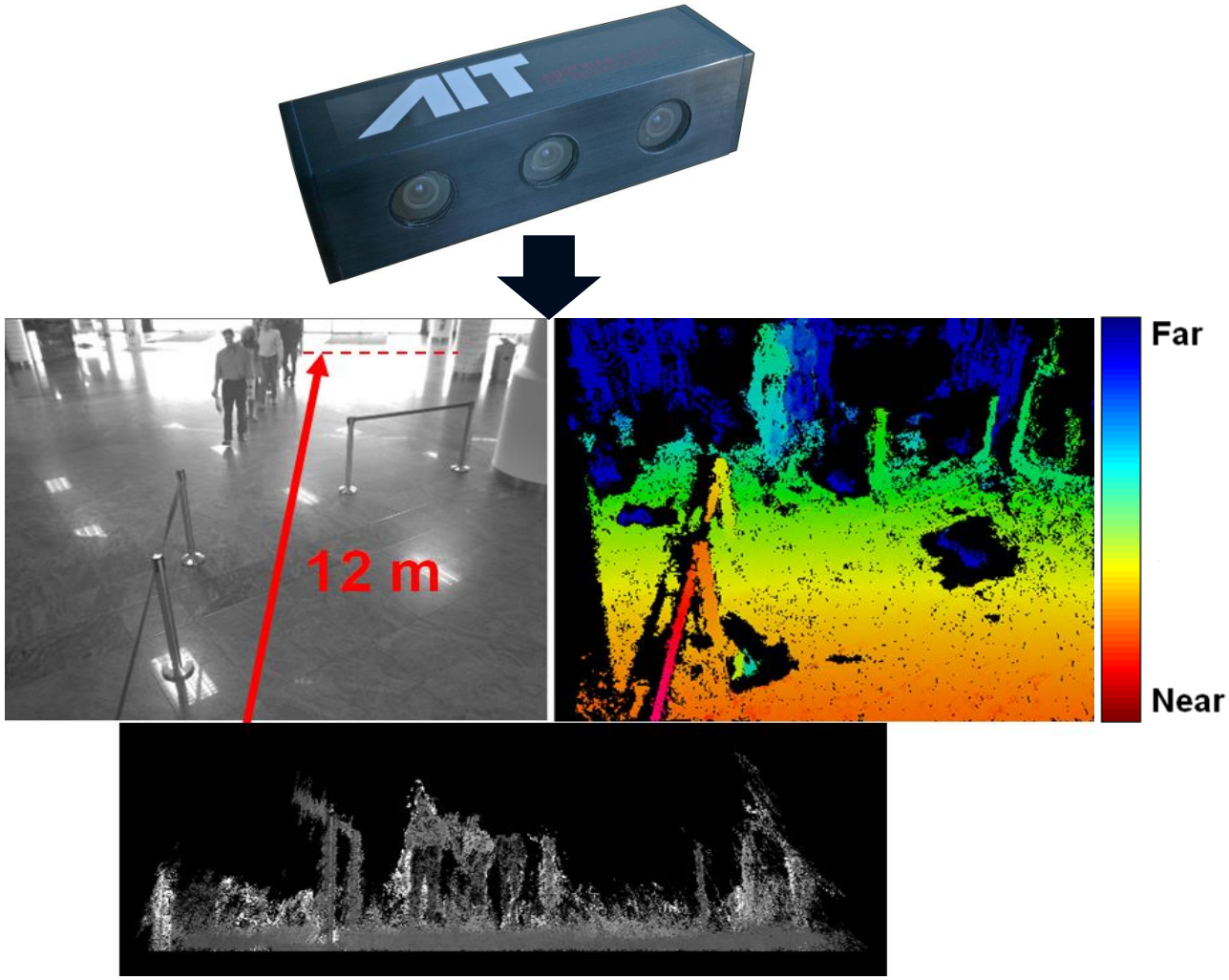
Queue Length Estimation

The Method



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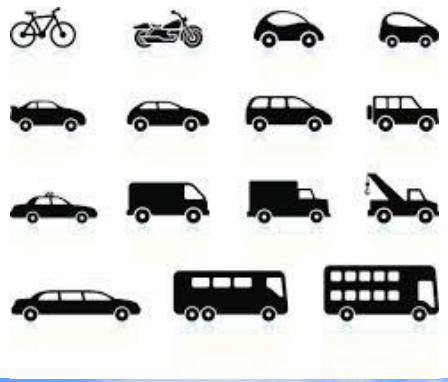
Innovative monitoring services for different types of borders

Different requirements require flexible, modular solutions



Land border | Airport | Sea border

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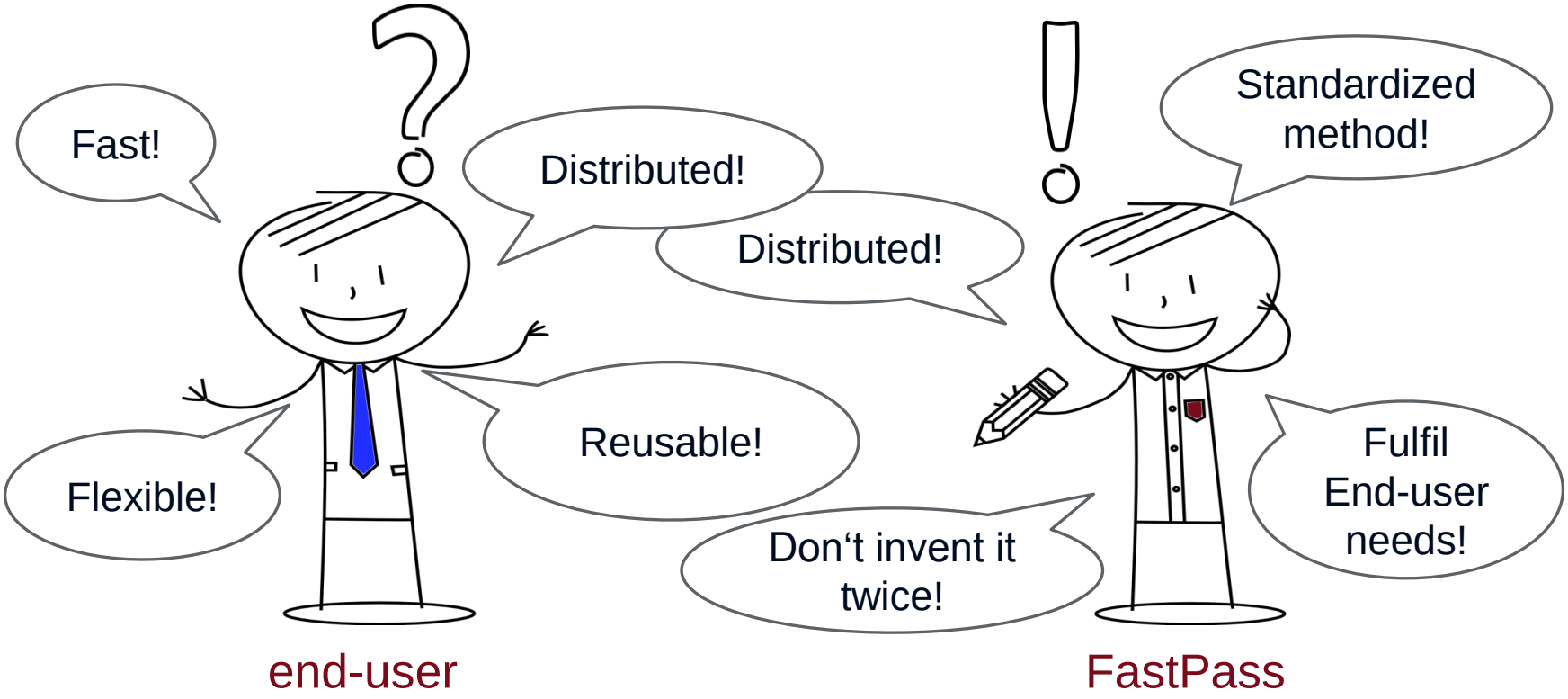
End-user management in innovative systems



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

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… and therefore we developed

Connected Vision

to make Computer Vision Algorithms

- available
  - PC, tablet, mobile phone
- self-descriptive
- universally combinable
  - within a flexible environment
  - room for evolution/innovation
- data management efficient
  - result data accessible, reusing results
- developer support

… a video computation concept & SDK for rapid application development

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The end-users interest…

end-user

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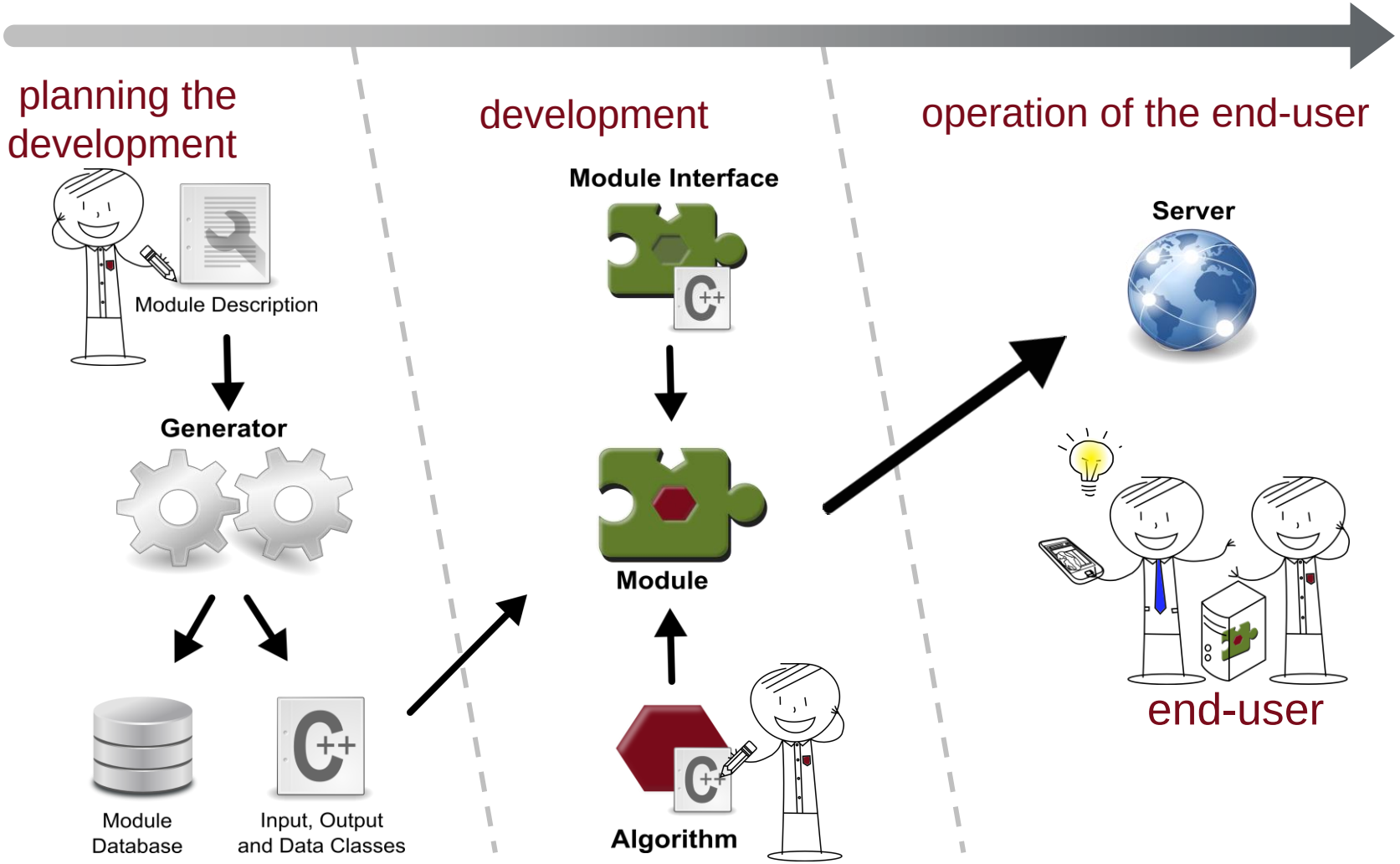
What Connected Vision is doing for FastPass …



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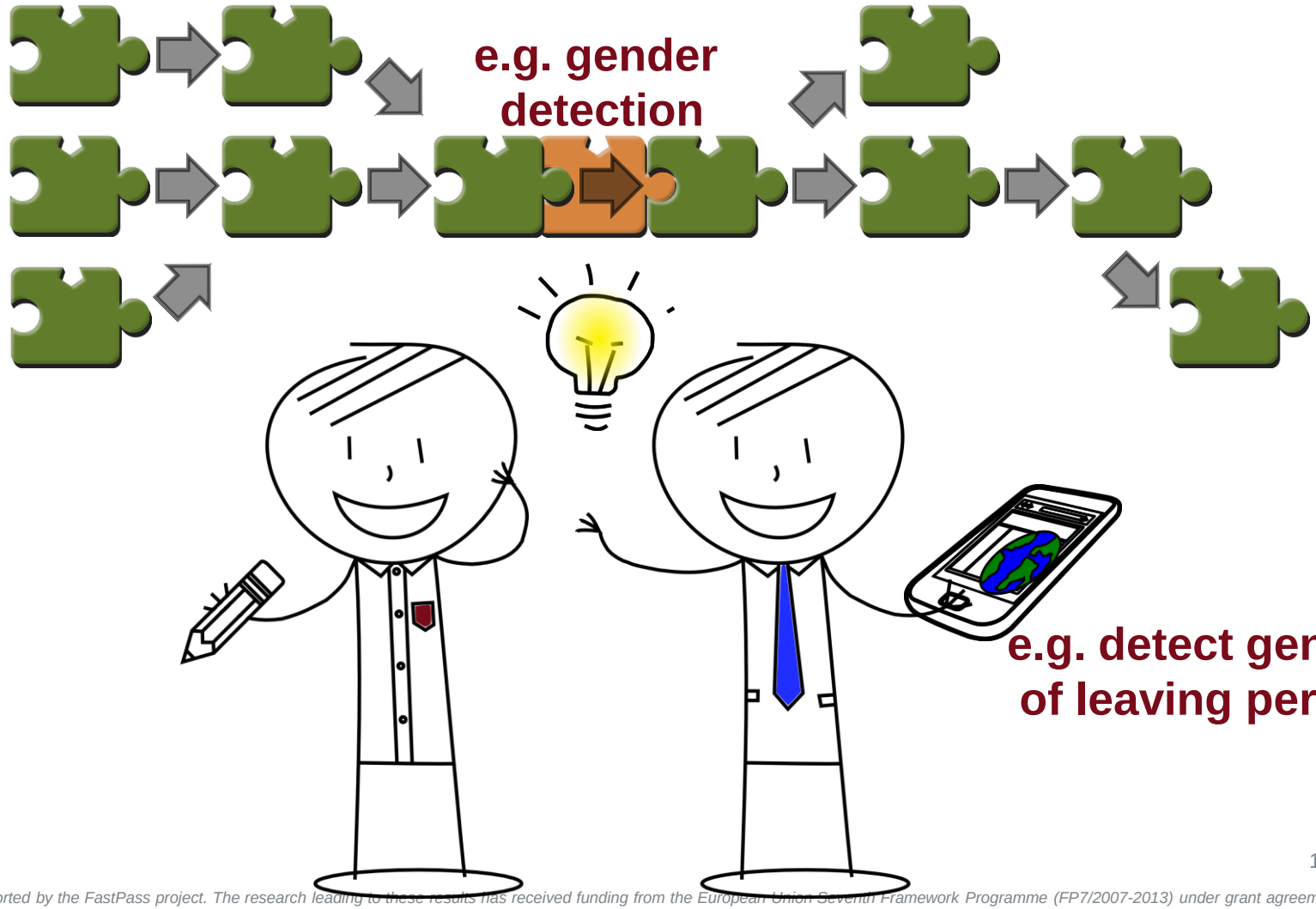
Endless Innovation Possibilities…



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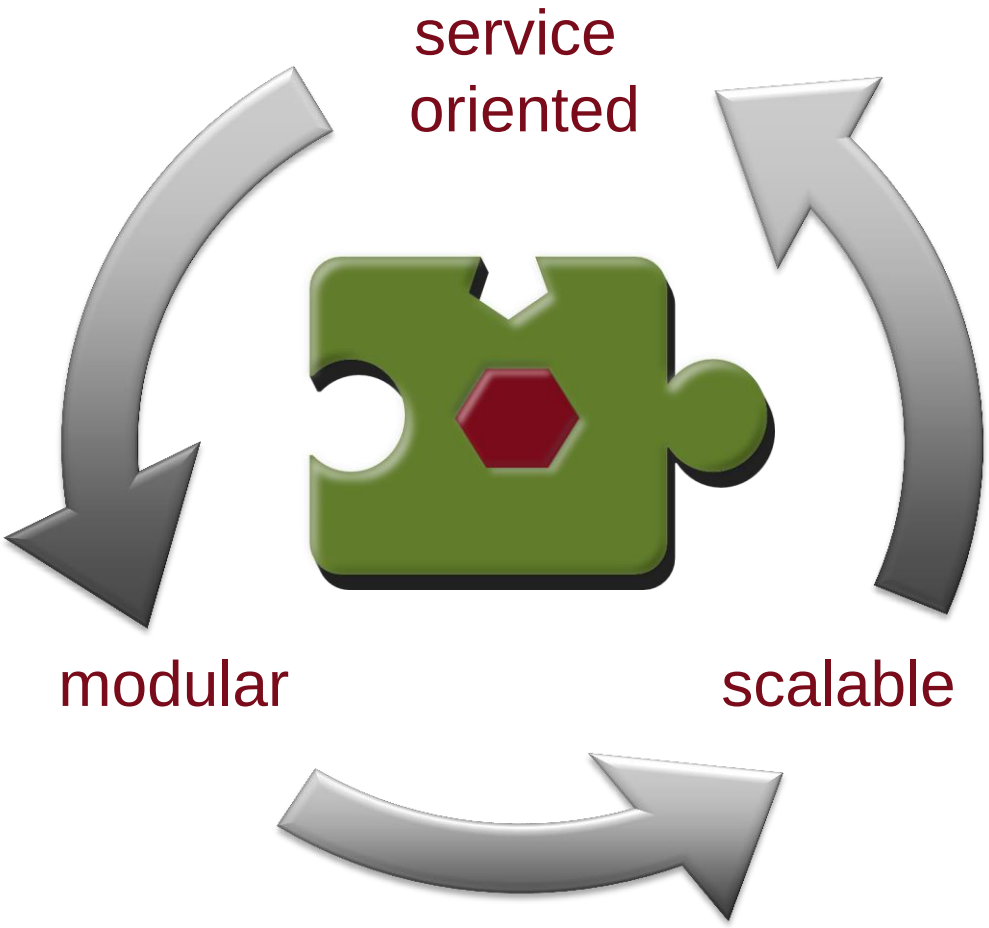
Connected Vision – As a FastPass monitoring service for ABC



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your ingenious partner

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