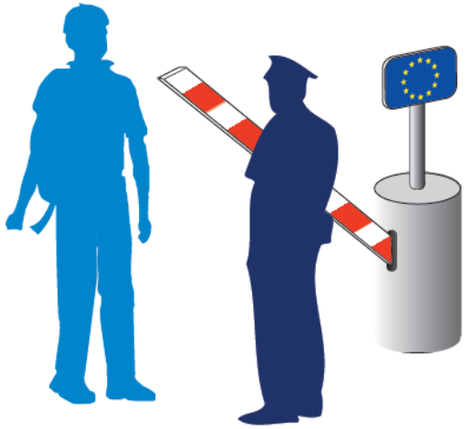
Biometrics and the EES

Warsaw, 10.10.2019



Agenda

1. **The EES regulation**
2. Crucial challenges
3. Why it matters

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What is the Entry/Exit System?

Central database to…

- …register traveller movements into and out of Europe
- …facilitate immigration decisions
- …identify overstayers
- …prevent crime and terrorism

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Who is impacted by the changes?

- Starting 2022…
  - …most Third Country Nationals (TCN) will be registered upon entry
    - Even children
  - …several authorities will need to have implemented changes to their systems in order to communicate with the EES
    - Border Control authorities
    - Immigration authorities
    - Visa authorities
    - Law enforcement
    - (Additional national authorities)

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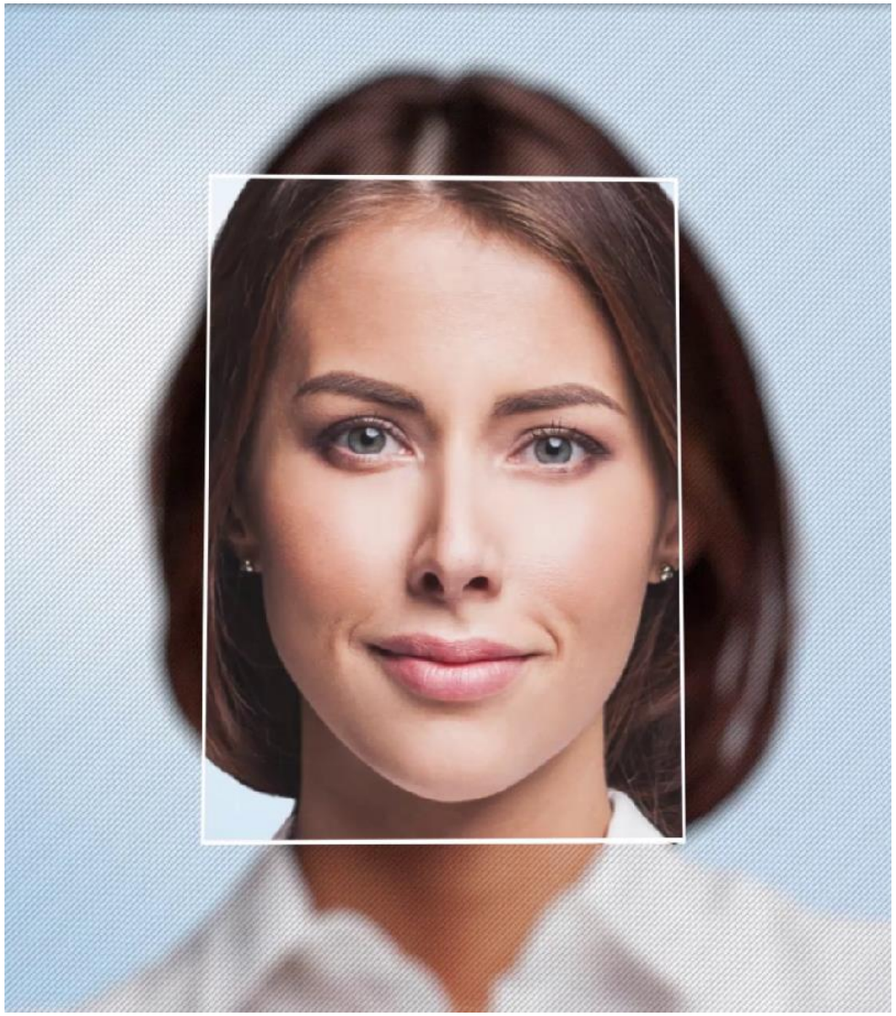
What is being stored?

- Each TCN will have an individual file in the EES
  - Personal data
  - Document information
  - Live biometrics
    - Passport quality face image (ISO/IEC 19794-5 compliant)
    - Four fingers of one hand
- The individual file is created directly at the border
  - Usually during the first entry into the Schengen area
  - By default live captures are stored in the database
- Each border crossing or denial will be associated with the individual file
  - “Electronic Stamp”
- Usually stored for up to three years after the last exit
  - Overstayers: five years



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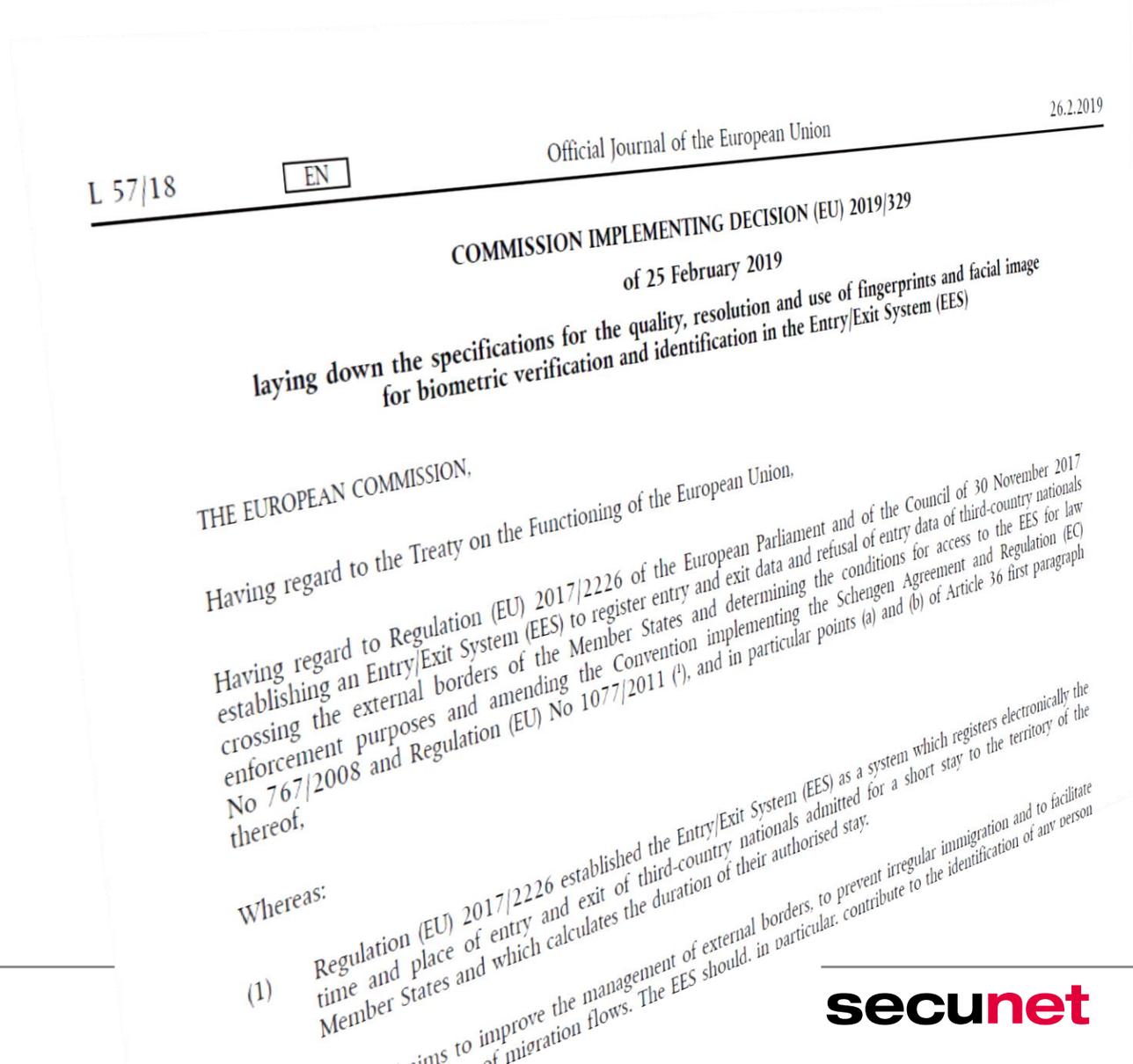
Challenge 1: Biometric requirements - Face

Implications of the EES regulation for facial image acquisition

- Vast database for Identification and Verification

- Commission Implementing Decision (EU) 2019/329
  - Specifications for quality, resolution and use of fingerprints and facial image for EES
    - FPIR < 0.1%, FNIR < 1%
  - Acquisition and quality compliant to **ISO/IEC 19794-5:2011 Frontal image type** required

- Photographic requirements from ISO/IEC 19794-5:2011
  - Pose of head (Pitch, yaw: < 5°, roll: < 8°)
  - Neutral expression required: closed mouth, open eyes
  - Equally distributed lighting on the face, no hot spots
  - Contrast, sharpness, colours, lens distortion



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COMMISSION IMPLEMENTING DECISION (EU) 2019/329

of 25 February 2019

laying down the specifications for the quality, resolution and use of fingerprints and facial image for biometric verification and identification in the Entry/Exit System (EES)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EU) 2017/2226 of the European Parliament and of the Council of 30 November 2017 establishing an Entry/Exit System (EES) to register entry and exit data and refusal of entry data of third-country nationals crossing the external borders of the Member States and determining the conditions for access to the EES for law enforcement purposes and amending the Convention implementing the Schengen Agreement and Regulation (EC) No 767/2008 and Regulation (EU) No 1077/2011 [1], and in particular points (a) and (b) of Article 36 first paragraph thereof,

Whereas:

(1) Regulation (EU) 2017/2226 established the Entry/Exit System (EES) as a system which registers electronically the time and place of entry and exit of third-country nationals admitted for a short stay to the territory of the Member States and which calculates the duration of their authorised stay.

aims to improve the management of external borders, to prevent irregular immigration and to facilitate of migration flows. The EES should, in particular, contribute to the identification of any person

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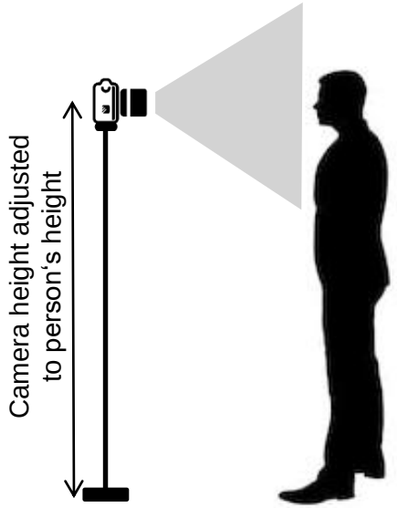
Challenge 1: Biometric requirements - Face

Example - Height adjustable vs fixed frontal image acquisition in SSS

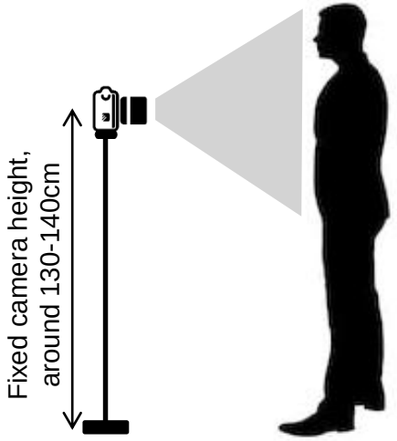


- Height-adjusted camera system
- Frontal acquisition

✓ Pose of head

Deviation of pitch from frontal position < 5°

✓ **Directly compliant with ISO/IEC 19794-5:2011**



- Single camera system at fixed height
- No frontal acquisition

✗ Pose of head

Deviation of pitch from frontal position > 5°

✗ **Post processing required for ISO/IEC 19794-5:2011 compliance**

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Challenge 1: Biometric requirements - Face

Example continued - The problem with pose correction

- Impact on the EES
  - Biometrics are probabilistic
    - Performance depends heavily on a high quality of the features
    - Processing is error-prone and introduces more error sources
      - Worsened by multiple algorithms
- Implications in terms of ISO/IEC 19794-5:2011 compliance
  - When using pose correction, the Frontal subtype must be “Post-processed”, not “Full” (table 19)
    - Original image needs to be sent (section 10.3.2)
      - Not possible in the current data format of the central EES
  - Post-processing discouraged, introduced for cases without alternatives (section 5.7.7)
    - legacy databases
    - data sources which cannot be controlled (e.g. CCTV cameras)
    - “age progression” of the subject
      - New Self-Service Systems hardly meet this requirement

Low probability of meeting the requirements of the Central System

Requirements definitely not met

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Challenge 1: Biometric requirements - Fingerprints

Capturing fingerprints

- Four fingers of one hand
  - In rare cases, both hands have to be captured
- Quality assured by NFIQ 2.0
  - Exceptions for verification
  - QA must also be available on-device at the border

„NFIQ 2.0“ = 89

„NFIQ 2.0“ = 1

Fingerprint image source: https://www.nist.gov/document/nfiq2qualityfeaturedefinitionspdf

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Challenge 2: Process duration

Due to data collection at the stationary border control the handling is much more time-consuming

- Travellers will inevitably face longer wait times
- Border control officers will have less time for profiling
- Airports, land and sea border crossing points are likely to reach their capacity limits, especially as passenger numbers continue to rise (to double at airports by 2037)

- **The pressure on all relevant stakeholders increases.**

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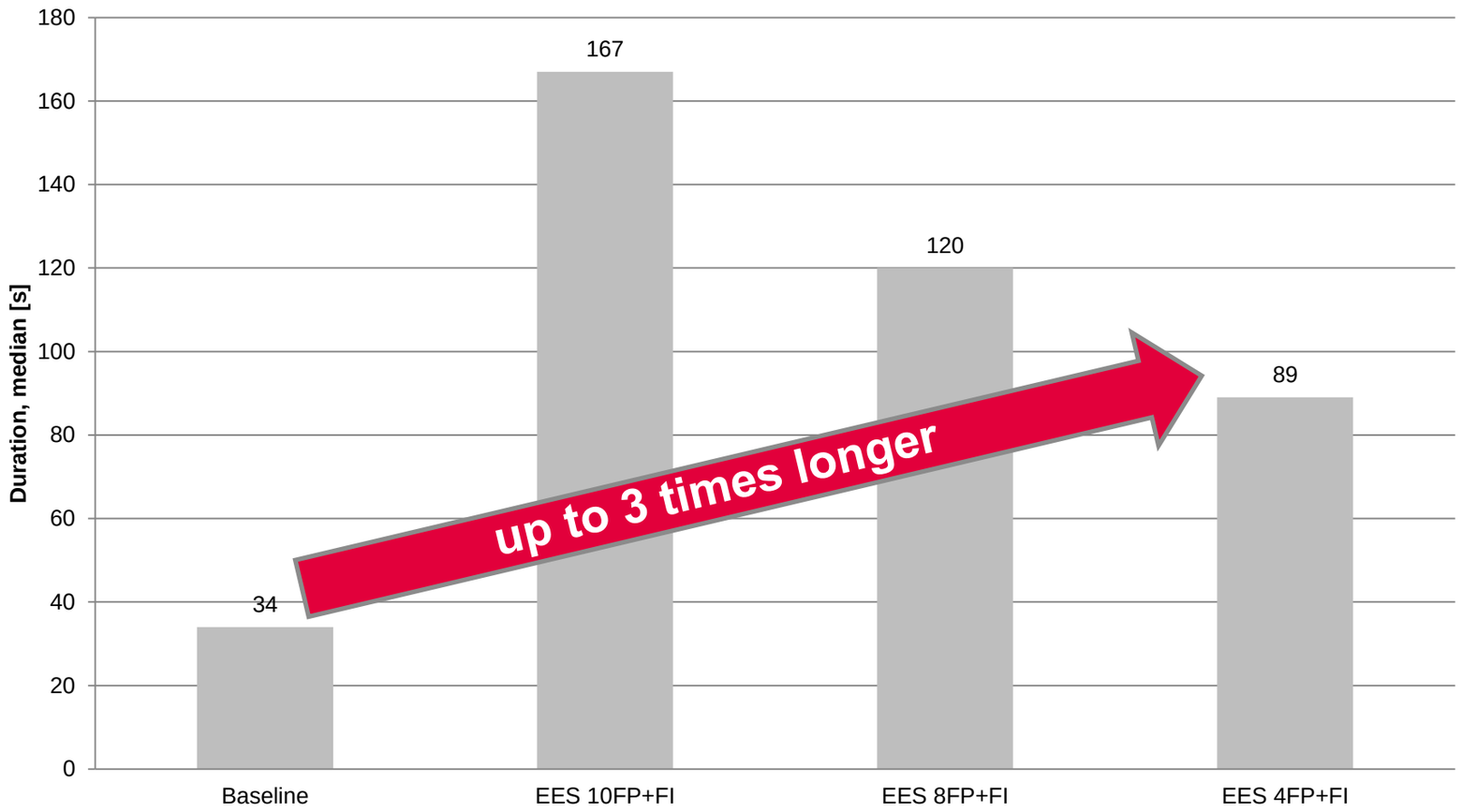
Challenge 2: Process duration

The Smart Borders Pilot

Baseline measures = Border control process as-is in 2015-2017

TCN VE: Average around 34 seconds
TCN VH: Average more than 90 seconds!



Duration of border control process for TCNVE, entry, different biometrics, different devices, different quality thresholds.

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Why it matters
Impact of bad image quality on biometric recognition performance

- NISTIR 8238 Ongoing Face Recognition Vendor Test (FRVT) Part 2: Identification by NIST (Nov. 2018)
  - Evaluation of large-scale datasets for 1:N searches / identification
  - Evaluation of different data sets
  - Executive summary clearly says

    “With good quality portrait photos, the most accurate algorithms will find matching entries, when present, in galleries containing 12 million individuals, with error rates below 0.2%. The remaining errors are in large part attributable to long-run ageing and injury. However, for at least 10% of images - those with significant ageing or ***sub-standard quality*** *- identification often succeeds but* ***recognition confidence is diminished*** *such that matches become indistinguishable from false positives, and* ***human adjudication becomes necessary.”***

Why it matters
Recommendations

- EES database will contain several hundred millions identities of TCN
- According to the EES regulation, for each first-time registration (enrolment) a full 1:N identification has to be conducted to check for deduplication and misuse
  - Every falsely classified identity has to be manually checked by a border guard
  - This results in much higher processing times and longer queues in the end
- To achieve low error rates, high quality acquisition of biometric data is necessary
  - EES regulation requires to compulsory comply to ISO/IEC 19794-5:2011 for the acquisition of facial images

How can that be achieved?

- Use frontal image acquisition with height adjustable camera system at every border crossing point where TCNs are registered for EES!
- Use diffuse lighting to ensure homogenous illumination throughout the captured face and to avoid shadows and hot spots!
- Use user guidance and process indicators in self-service systems to let travellers capture their faces and fingers easily, intuitively and fast!

[redacted]
Senior Consultant

secunet Security Networks AG
Kurfuerstenstrasse 58
45138 Essen, Germany
[redacted]
[redacted]