Federal Office
for Information Security

EasyPASS –

Evaluation of face recognition performance in an operational automated border control system

Markus Nuppeney – Federal Office for Information Security (BSI)
Marco Breitenstein – secunet Security Networks AG
Matthias Niesing – secunet Security Networks AG

Markus Nuppeney	**Gaithersburg, March 2. 2010**	**1**

Federal Office
for Information Security

Motivation for usage of the new features of ePassports

- Increase security
    - electronic security mechanisms prevent forgery
    - biometrics prevent misuse of real documents
- Improve efficiency
    - by using automated checking routines
- Ease of use
    - for the holder of the document
      (self-service scenarios)
    - for the border control officer
      (more time for critical cases)

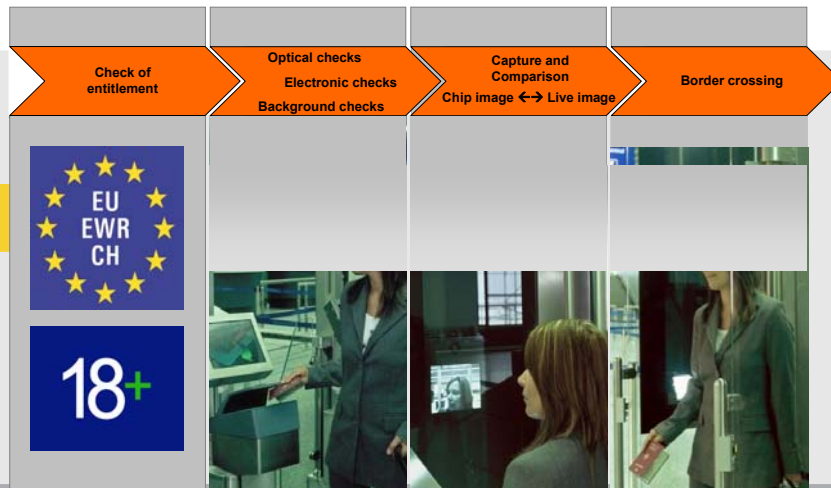|		
Markus Nuppeney	**Gaithersburg, March 2. 2010**	**2**

Main steps towards EasyPASS

- Nov. 2005: Issuance of the 1st generation ePassport (face)
- Nov. 2007: Issuance of the 2nd generation ePassport (face and finger)
- Nov. 2007: Start of the pilot project "Reading and Checking ePassports"
  - Read and checked ePassports from **62 countries**
  - Setup of the background infrastructure to provide trusted CSCA certificates
  - Able to check the complete chain of trust from **40 countries**
- Aug. 2009: Start of the pilot project **EasyPASS**

The EasyPASS project – overview

- Pilot project of BSI and the German Federal Police
- Semi-automated eGate scenario
  - Monitoring (and if necessary interaction) by border police officer
- 4 Self-service eGates, 1 monitoring station
- Open for citizens of EU/EEA/CH (18+ years old)
- Located at Frankfurt Airport
- Timetable
  - Start of operation was in August 2009
  - Initial pilot will run until March 2010

**The EasyPASS border control process using facial recognition**

| Check of entitlement | Optical checks / Electronic checks / Background checks | Capture and Comparison / Chip image ←→ Live image | Border crossing |

EU EWR CH

18+

Markus Nuppeney Gaithersburg, March 2. 2010 5

EasyPASS – software architecture

- Software integration platform BioMiddle
  - Modular and platform independent architecture for biometric applications
  - Standard interfaces and protocols (SOAP, BioAPI 2.0, ISO/IEC 19794-x, etc.)
  - Allows an easy integration of document readers, biometric components and background systems
    - Electronic document reading by ePassportAPI
    - Access to optical document reader via oPassportAPI
    - Access to biometric components based on BioAPI 2.0 (ISO/IEC 19784)
    - Access to INPOL/SIS and LDAP directory via Background Interface providers
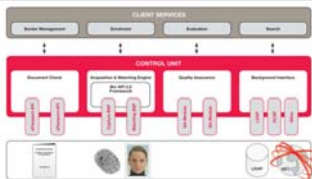
Markus Nuppeney Gaithersburg, March 2. 2010 6

EasyPASS – face biometrics

- Image acquisition
  - Integration of camera via BioAPI Capture BSP
  - Internal pre-qualification regarding ISO19794-5
- Verification
  - 3 different biometric verification algorithms
    - one main algorithm for each eGate
    - two additional algorithms for statistical and evaluation purposes
- Quality measurement
  - 3 different quality assurance (QA) tools for statistical and evaluation purposes

Biometric evaluation – theory and practice

- Algorithm evaluations (e.g. FRVT)
  - Good for benchmarking
  - But not significant for real life performance
- Real life performance depends on the specific application scenario
  - Characteristic of reference data
  - Live image source
  - Environmental conditions
  - User behavior
  - Process design (allowed number of attempts, time-outs etc.)

Biometric evaluation – specific EasyPASS conditions

- Reference data
  - DG2 images from European ePassports
  - Should be compliant to ISO19794-5, but are they?
- Live images
  - Source: CCD camera
  - Configuration adjusted to the specific EasyPASS scenario
- Process design
  - Continuous capturing of live images
  - Successive verifications with the best of the captured images (based on the internal pre-qualification regarding ISO19794-5)
  - Process stops when verification successful (depending on a threshold) or after time-out

---

Biometric evaluation – data collection

- "Pre-operational" project phase (Aug. – Sept. 2009)
  - Temporary database built up with image data collected from real passengers using the EasyPASS system
  - Database consists of images of about 9.000 passengers
    - DG2 image from the ePassport
    - Live image(s) captured within the eGate
- Operational project phase (since Oct. 2009)
  - Genuine scores
    - Comparison of DG2 image against live image(s) of the passenger
  - Imposter scores
    - Comparison of DG2 image of the current passenger against live images in the database
    - Comparison of live image(s) of the current passenger against DG2 images in the database

Federal Office for Information Security

Biometric evaluation – objectives for EasyPASS project

- Evaluation of **usability and security** in the real life environment
  - Calculation of complete DET curves based on genuine and imposter scores for each biometric verification algorithm
- Identification of proper algorithm configurations for the specific EasyPASS application scenario
- Evaluation of ePassport image quality
  - Specific for the different countries
- Correlation between image quality and verification performance

---

Federal Office for Information Security

EasyPASS – very first statistics
(since Oct. 2009, first 5 months of operation)

- Total number of users: **≈ 25.000**
  - 100 – 200 people per day
- Period to pass the eGate: **≈ 16 sec.**
  - Time from presenting the passport on the reader until the exit door is closed
- Recognition performance: **≈ 5% FRR @ 0,1% FAR**
- Origin: **85%**   german nationals
              15%   foreign nationals from EU/EEA/CH
- Gender: **60%**   male
          40%   female

Federal Office for Information Security

BSI

EasyPASS – first lessons learned (biometrics)

- Verification thresholds recommended by vendors did not fit to the actual application scenario
- Appropriate thresholds have to be calculated based on the real user group and the actual system setup
- Recommendation for iterative system configuration
  - Operate the system on a (assumed) high security level and collect genuine and impostor comparison scores
  - Calculate verification performance in terms of FAR and FRR
  - Update the algorithm configuration to the required security level (expected FAR)

Markus Nuppeney　　　　　　**Gaithersburg, March 2. 2010**　　　　　　**13**

Federal Office for Information Security

BSI

EasyPASS – first lessons learned (operation)

- Passengers do not know if they have an ePassport
  - Even there is a labelling at the EU/non-EU separation and at the document reader many passengers with an "old" passport try to use the eGates
- Passengers do not know how to put the passport onto the reader
  - Results in high reading errors
  - Reading errors where reduced by changing the user guidance and some mechanical changes
- Passengers are surprised about the fast and easy process

Markus Nuppeney　　　　　　**Gaithersburg, March 2. 2010**　　　　　　**14**

Federal Office for Information Security

BSI

EasyPASS – summing-up key features

- Combination of different checks to ensure a secure process
  - Validation of optical and electronic document security features
  - Biometric comparison on a high secure level
  - Online background checks
- Complete checking of the electronic features
  - **Biometrics are of no use, if not authenticated!**
  - Online requests for trusted CSCA certificates
- Fast and easy process (Approx. 16 sec)
- Innovative software architecture (BioMiddle)
- Detailed evaluation of real life performance
  - Different biometric algorithms in the real life environment

---

Federal Office for Information Security

BSI

EasyPASS – project partners

- BSI
  - System design
  - Realisation of pilot project

- Federal Police
  - Specification of requirements
  - Operation of EasyPASS

- FRAPORT AG
  (owner and operator of Frankfurt Airport)
  - Provision of infrastructure

Slide 17

Federal Office for Information Security

EasyPASS – technology providers

- secunet Security Networks AG
  - Software framework
  - System integration
  - Monitoring and evaluation

- L-1 Identity Solutions AG (in cooperation with Magnetic Autocontrol GmbH)
  - Camera system
  - eGate hardware
  - Biometric verification algorithm
  - Biometric quality measurement

- Cognitec Systems GmbH
  - Biometric verification algorithm
  - Biometric quality measurement

- NEC Deutschland GmbH
  - Biometric verification algorithm
  - Biometric quality measurement

- Bundesdruckerei GmbH
  - Document readers
  - Document database

Markus Nuppeney Gaithersburg, March 2. 2010 **17**

Slide 18

Federal Office for Information Security

Thank you!

Federal Office for Information Security (BSI)

Markus Nuppeney

markus.nuppeney@bsi.bund.de
www.bsi.de

Markus Nuppeney Gaithersburg, March 2. 2010 **18**