International Civil Aviation Organization

Sixth Symposium and Exhibition on ICAO MRTDs, Biometrics and Security Standards

ICAO Headquarters, Montréal, Canada
1 - 4 November 2010

Biometric Enrolment for the European Visa Informationsystem (VIS)

German Experiences

EU Visa Information System (VIS)

Federal Foreign Office

• Visa Application

Border Police

• Border Control

• Territory Control

• Border Visa

ABHn **BAMF** **Police** **Secr. Service**

• Search
• ID – Check
• Extension
• Shortening
• etc.

Federal Office of Administration (BVA)

EU VIS

The BioDEV II Pilot Project

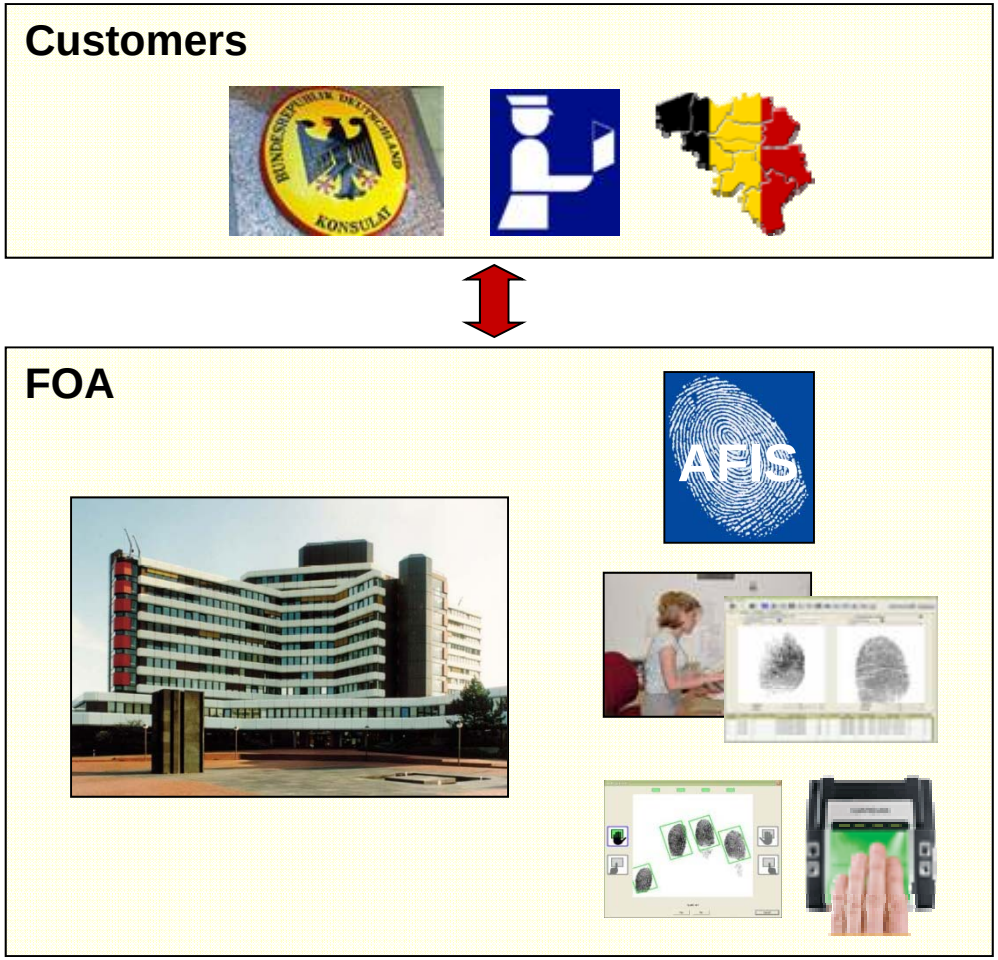
- Gain experiences with regard to the introduction of VIS
  - Enrolment, Verification and Identification **with focus on fingerprints**
  - Organizational consequences for consulates and border posts
  - Interoperability of devices, processes and software
  - Ensure compliance with international standards

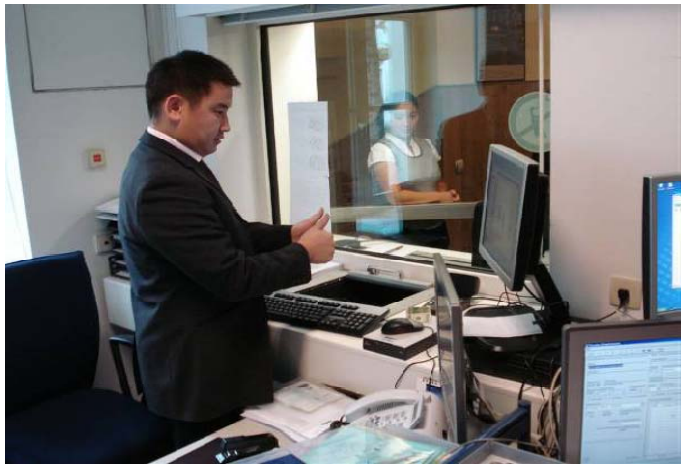
- 8 participating countries
  AT, BE, DE, FR, LU, PT, ES, UK

- Launched in 2007 and planned until the end of March 2010

Federal Office of Administration in BioDEV II

- **AFIS Hosting**
  - Consular Posts (Damascus, Ulan Bator)
  - Border Control (Berlin TXL & SXF)
  - Belgium
- **Dactyloscopic Service** for
  - Consular Posts
  - Border Control
- **Evaluation, Statistics, Monitoring**
- Specification and Installation of **Enrolment Solution**





Fingerprints Capturing in Consular Post

- Here: Ulan Bator, Mongolia

Image quality and performance

- Strive for *best* finger image quality
  - Quality (according to ISO/IEC 29794-1:2009)
    - Character of a sample
    - The fidelity of a sample to the source from which it is derived
    - The utility of a sample within a biometric system:
      An expression of quality based on utility reflects the predicted positive or negative contribution of an individual sample to the overall performance of a biometric system. Utility-based quality is dependent on both the character and fidelity of a sample. Utility -based quality is intended to be more predictive of system performance, e.g. in terms of FMR, FNMR, failure to enrol rate, and failure to acquire rate, than measures of quality based on character or fidelity alone.
- What's the meaning of quality within our AFIS setting?
  - Typical AFIS assumptions of the Biometric Matching System (BMS) of the EU VIS
    - Better quality of fingerprints yields to better AFIS performance
    - Use only fingerprints of a certain quality level: Enrolment performance is predicted by the Sagem quality control **USK 4**.
- Quality for the VIS practically means Sagem USK 4 quality
- How to enrol subjects within these constraints?

Enrolment Solution Phase 1

- Pragmatic Enrolment approach
  - Easy to use client
  - Quality Control with NFIQ
    - Good: 1, 2, 3
    - Bad: 4, 5
  - Operator tries to capture best fingerprints
- Training by Federal Foreign Office and Federal Office of Administration
- Few Acquisition Guides, Training Material

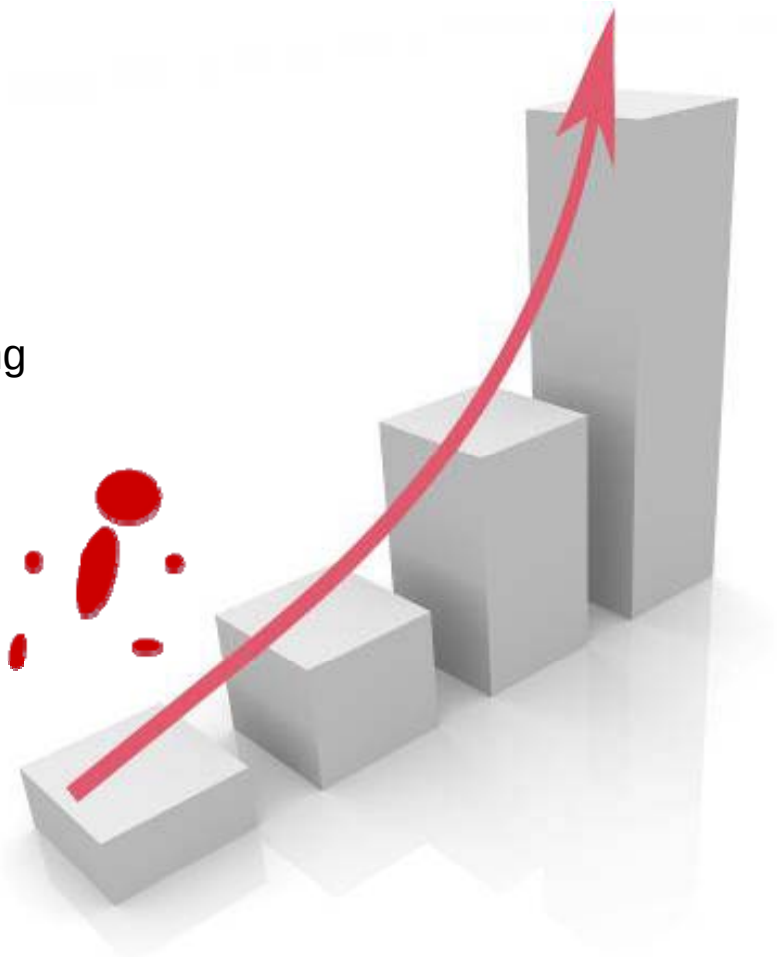
Conclusion – Phase 1

- ~ 12000 fingerprints
- 2 German consular posts
- Assessing performance of the enrolment solution by analysing the Sagem quality control **USK 4** rejection rate.
- Rejection Rate: ~ 75% do **NOT** match minimum requirement for VIS
  - Damascus ~ 69%
  - Ulan Bator ~ 82%

- Possible conclusions
  - Simple NFIQ is not enough!
  - VIS BMS QA (USK 4) has to be implemented in Client?
  - Training not enough?
  - VIS BMS QA is too strict?

Improving performance by improving fingerprint image quality

- General mechanisms
  - E.g. training, acquisition guides, auxiliary utilities
- Hardware improvements
  - E.g. silicon pads, feedback monitor, sensor positioning
- Software / workflow improvements
  - E.g. iterations, feedback, algorithms
- **All elements are necessary to achieve suitable quality**



Training & Information Material

- Training for operators
  - Acquisition guides
  - Training videos
  - Personal training of operators
- Instructions for applicants
  - Preparation by guidance poster
  - Video instructions

Hardware Improvements

- Fundamental: Use high quality capture device
  - Technical Guideline (TR-03104) from BSI (**www.bsi.de**)
  - Fingerprint scanners certified according to TR-03104
    - Certified single finger scanners (2009)
      - Cross Match, Sagem, Dermalog, Green Bit
    - Certified four finger scanners (2009)
      - Cross Match, L1 Identity
- Feedback monitor for applicants
  - Pro: Support finger positioning by direct feedback
  - Contra: Expensive and space requirement

Enhancers

- Enhancers to improve image quality & contrast
  - Silicon pads
    - Contra: Regular exchange necessary, Requires different calibration
  - Pre-Scan
    - Contra: Regular cleaning of device necessary
  - Other products also available

Ergonomics

- Sensor positioning
  - **Height**: BRIDGE recommends scanner at elbow height
    - TRUE BUT**:**
      Operator might not see hands during capture process
      → No manual False Finger Detection!

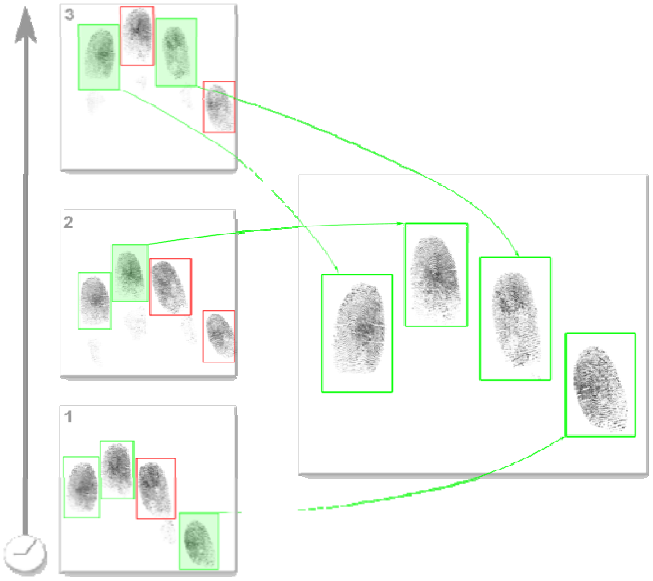
  - **Angle**: BRIDGE recommends central position of scanner, so that angle is comfortable for both hands
    - TRUE BUT:
      Not always possible because of local restrictions!

Software / Workflow Mechanisms

- Build composite records out of multiple captures
  - Option 1: choose best fingerprint by fingerprint cross matching
  - Option 2: choose best fingerprint by QA algorithm (e. g. Sagem, NEC, NFIQ)
  - Thresholds have to be configurable!

- **Switch to single finger** mode
  for difficult fingers

- **Enforce strict workflow**
  to avoid early overrule by operator



2 Improved Enrolment Solutions – Main differences

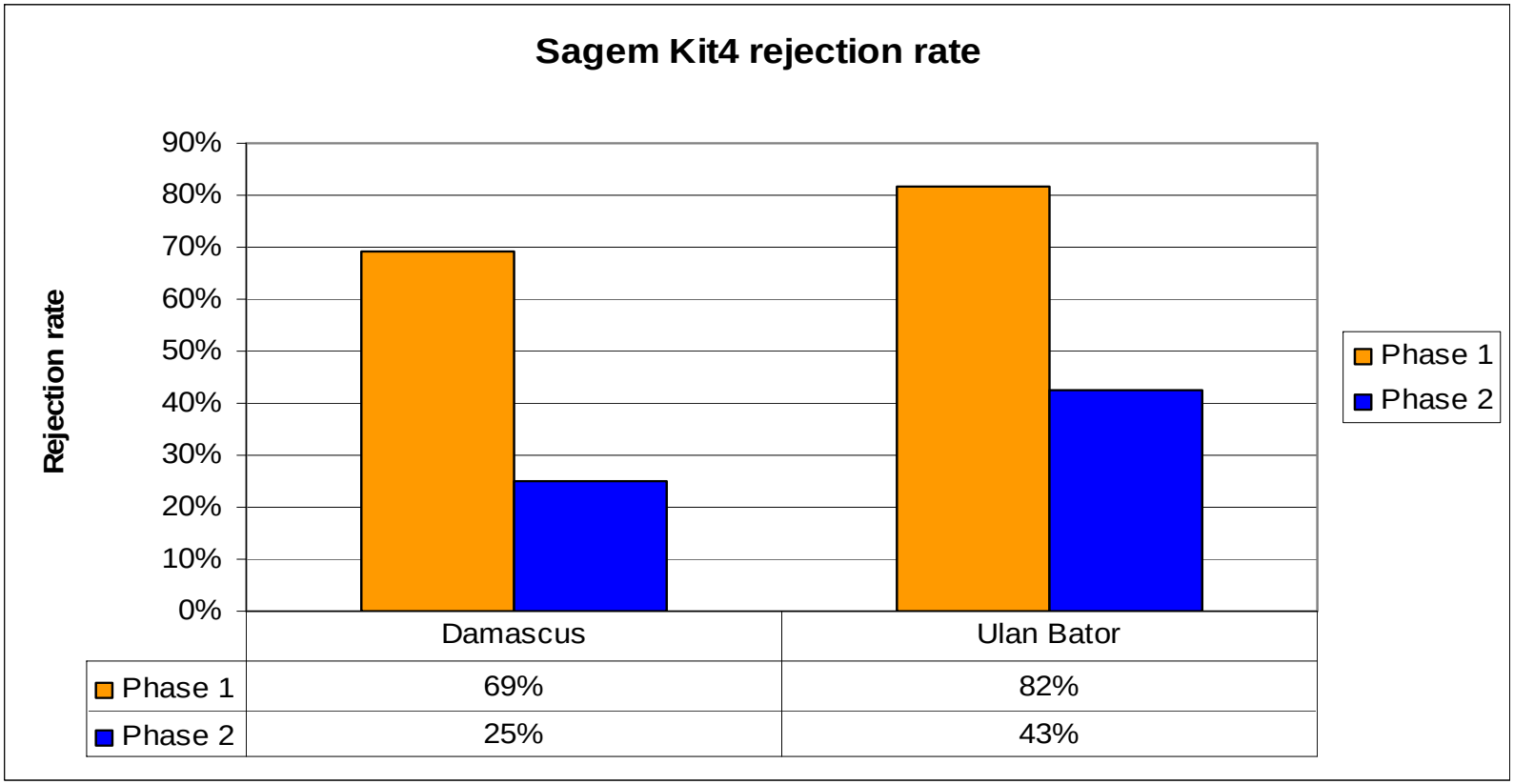
secunet

- Usage of auto-capture
- 3 times putting slaps on scanner
- Always whole slap is captured
- QA Sagem Kit4 included
- Open Source NIST QA & segmentation
- Cross matching used for composite record (3 slaps min.)

NEC

- No auto-capture, NEC QA controls
- Slap stays on scanner
- Switch to single-finger capturing
- QA Sagem Kit4 included
- NEC QA and segmentation algorithms
- NEC QA for composite record

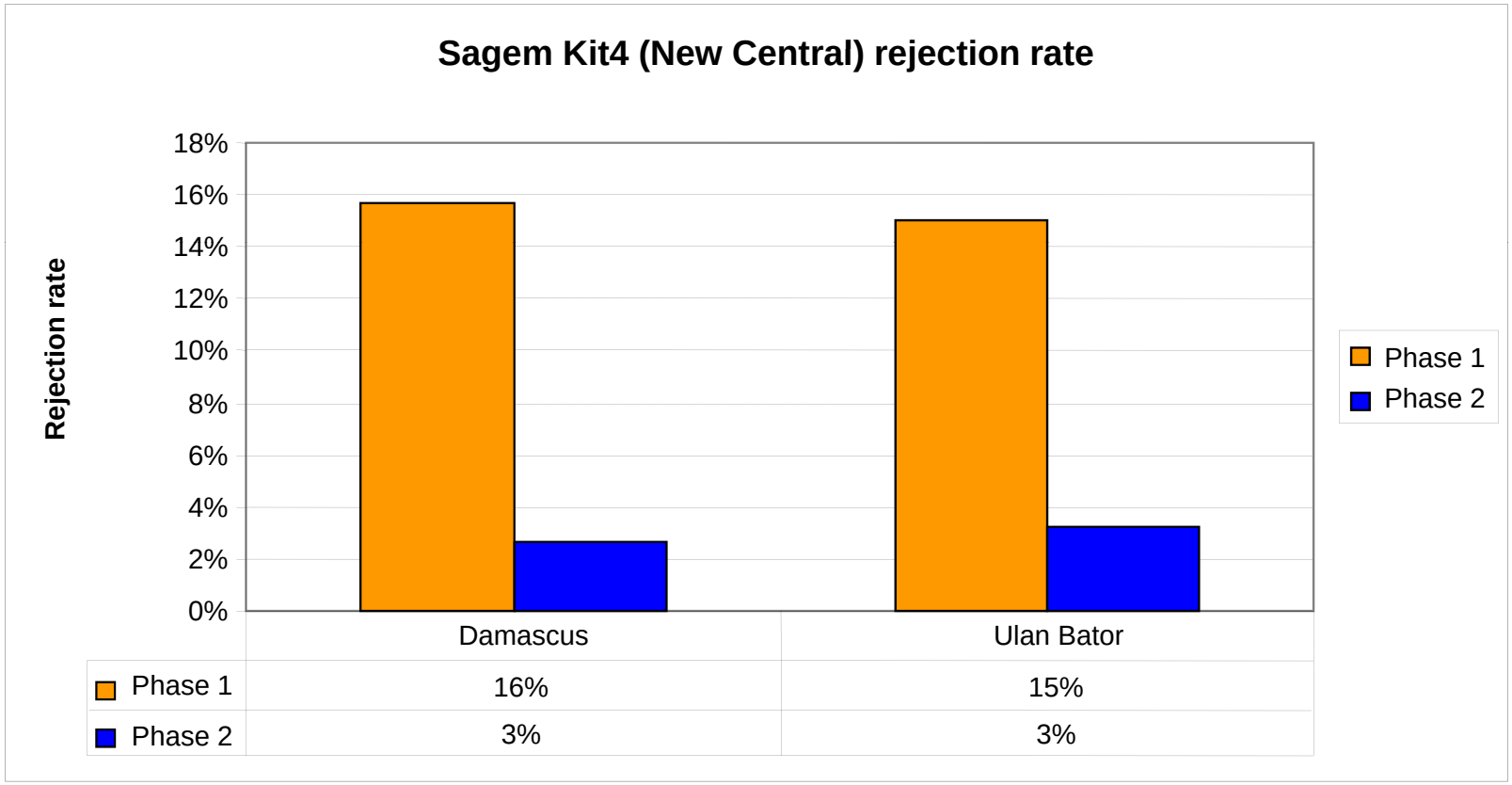
Results: Fingerprint Quality - Classic Rejection Rate



	Damascus	Ulan Bator
Phase 1	69%	82%
Phase 2	25%	43%

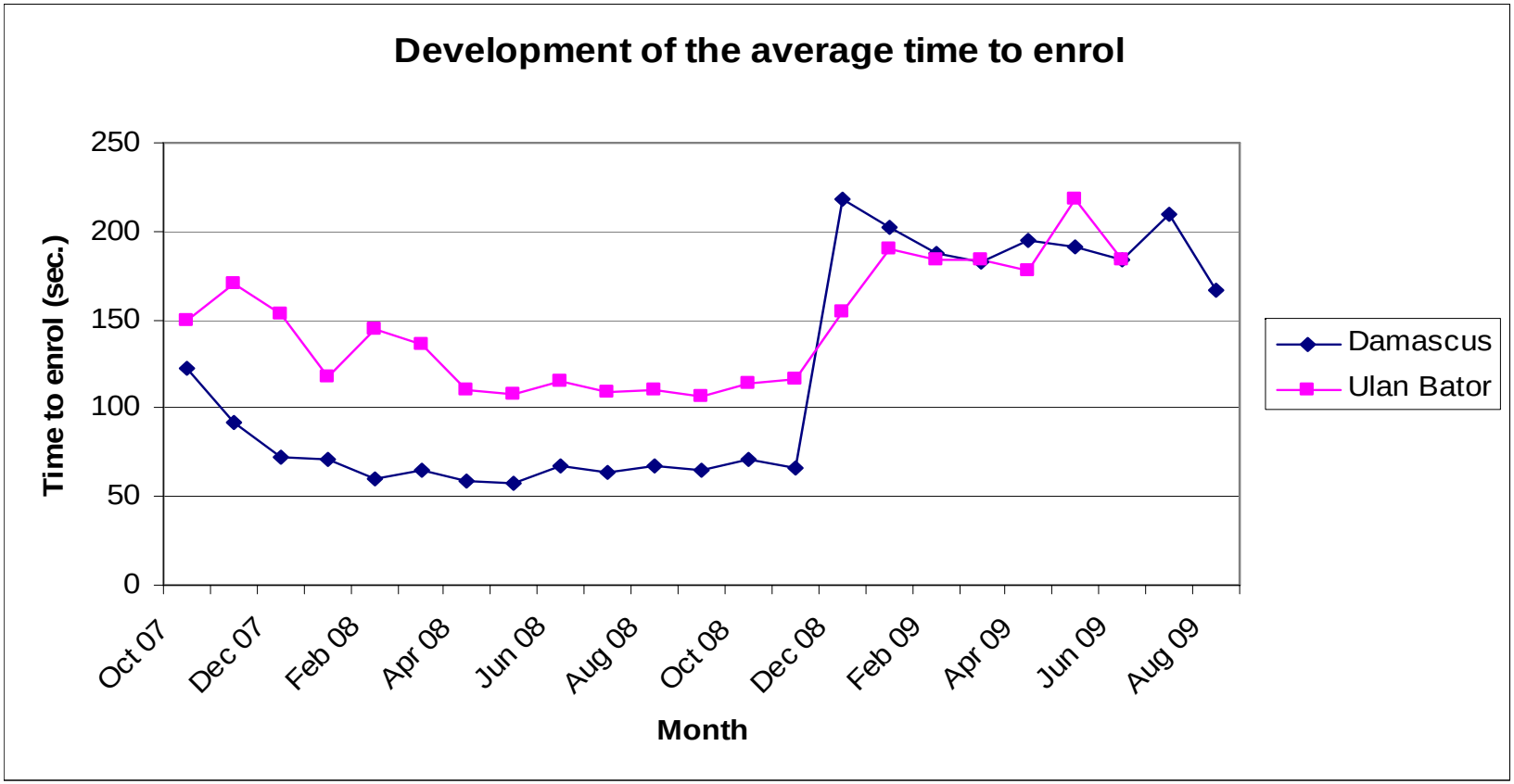
- Significant decrease of Kit4 rejection rate in Phase 2 (up to one third)

Results: Fingerprint Quality - New Central Rejection Rate



- Much lower rejection rate for new Central Kit4

Results: Enrolment Duration

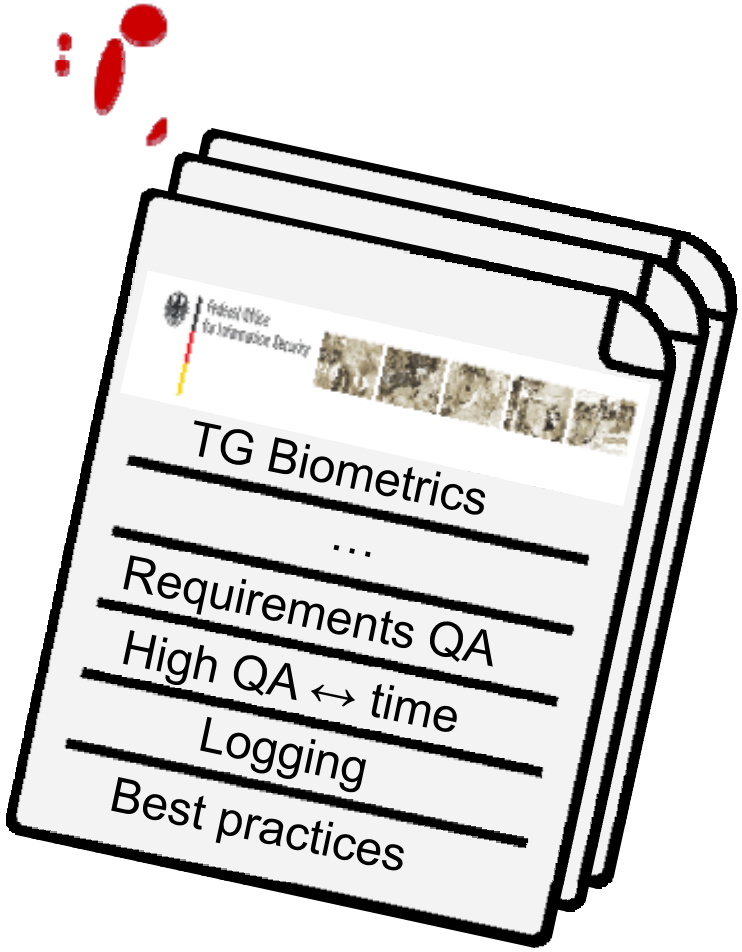


Enrolment: Final German Solution

- Time Optimised Workflow
  - **Capturing all images in a row** (3 / slap)
  - **Quality Control in the background**, allowing parallelization of processes
- Cross matching with NIST Bozorth selects “best” fingerprint image **(like ePass)**
- Uniqueness check
- Only Open Source Software
- Rejection Rate: still around 3% (good!)
- Duration reduced:
  - **Pure capture process**: between 60 and 90 seconds for most cases (no re-capturing)
  - minimum 15 sec of instructions (up to 60)

Lessons Learned

- **Quality assurance** has a **large impact** on the overall process
- Good quality can only be achieved as a **combination of operational and software-based** quality measures
- **High quality** comes at a price (**enrolment time**)
- You can learn how your system works if you have enough **logging data**!
- Need for specifying **best practices** for high quality enrolment processes



Why a Technical Guideline?

Biometric *Lessons Learned* exist: they have to be made reusable

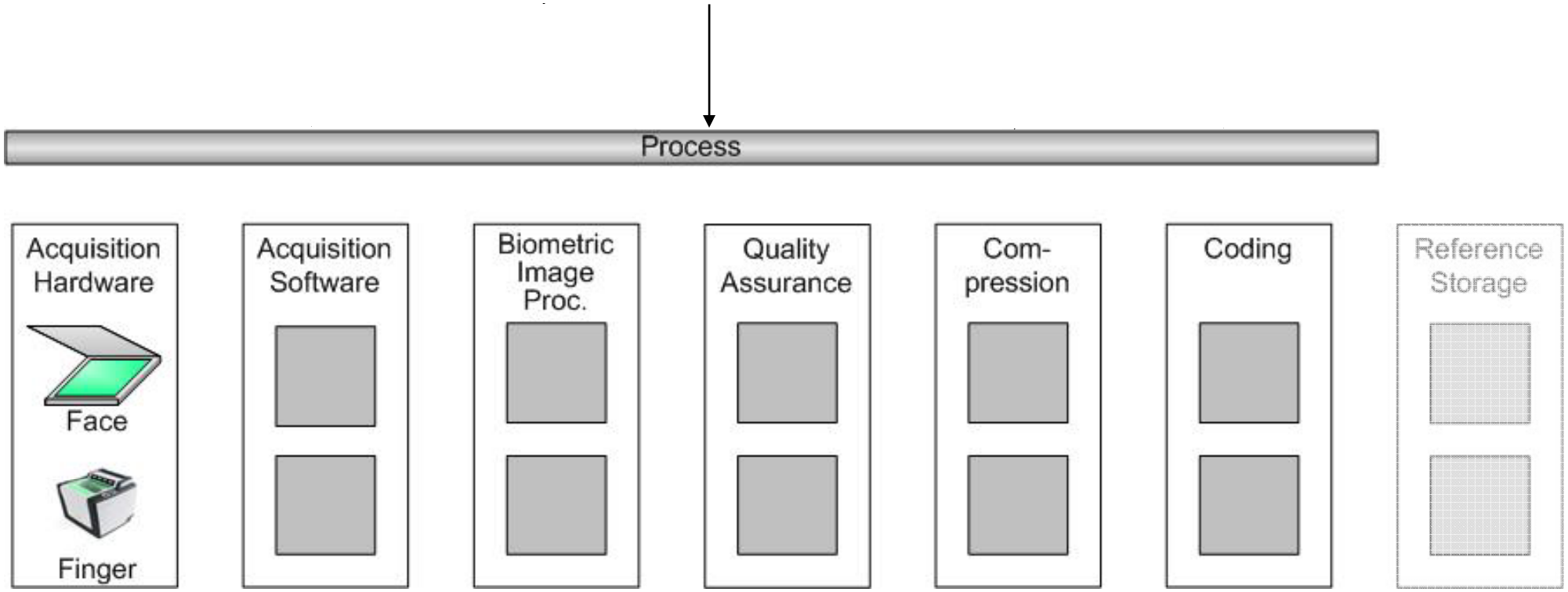
Project Leaders: preparing a call for tender

End Users: requesting quality

Companies: general requirements and standards

Typical Enrolment Workflow (e.g. for VISA)

- Process description for high quality fingerprint enrolment



All biometric processes are – roughly – the same

VISA Enrolment Profile: Fingerprint process requirements

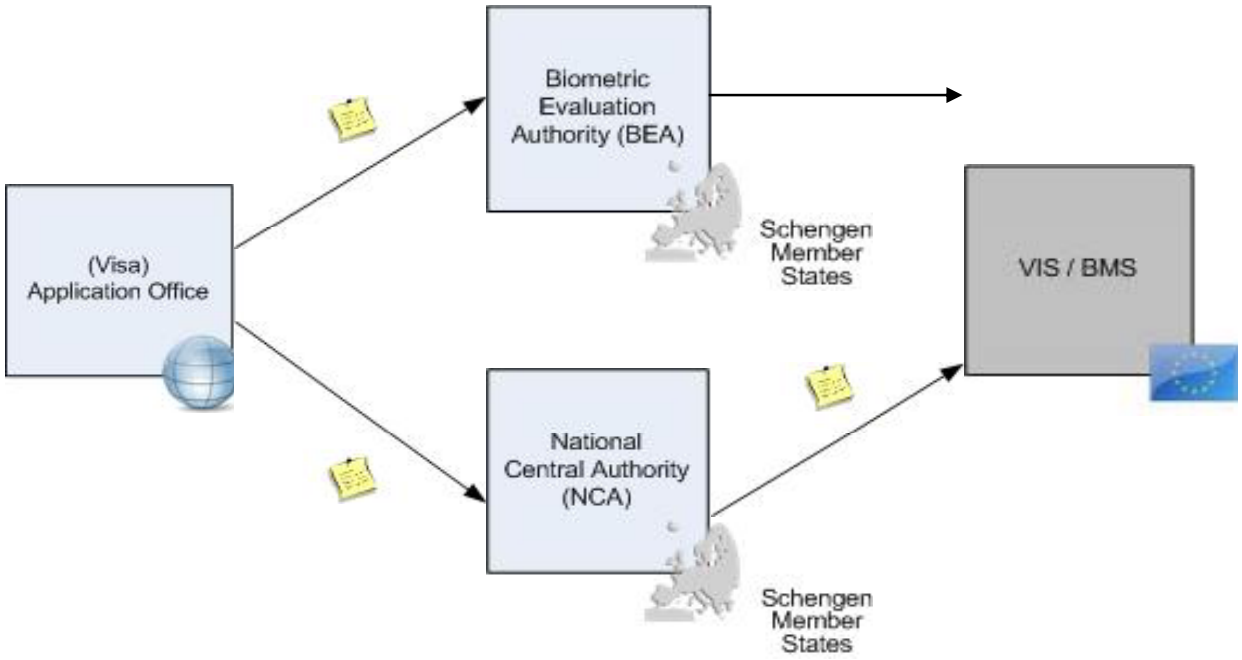
- Based on composite records
- Several QA mechanisms possible
- Proposed QA is a 3-way cross matching of fingerprints
- re-capture of single fingers possible, if necessary

VISA Enrolment Profile: Other aspects

- Collection of recommendations that were established while running the BioDEV II project
  - User guidance
  - Operator guidance
- The guideline provides information on the coding
  - of the biometric data itself plus additional data
- Data to collect (Function Module **Logging**)
  - Quality values, HW/SW information, timing information, errors, demographic data
- Only **Logging data** provides information
  - Analyse failures, increase of the rejection rate etc.
  - Discover possible optimisations
  - Monitoring system performance in quality and time

VISA Enrolment Profile: Data Flow Overview

- Biometric data is collected for the VIS through the Nationa Central Authority (NCA)
- Additional quality data is collected for evaluation purposes by the Biometric Evaluation Authority (BEA)



Federal Office of Administration

Federal Office for Information Security

Technical Guideline Biometrics for Public Sector Applications

- Visit the Homepage of the

  Federal Office for Information Security
  Bundesamt für Sicherheit in der Informationstechnik - BSI

- http://www.bsi.bund.de/technicalGuidelines
  TR Biometrics: TR-03121 (Version 2.1)

- German Identity Card & German Electronic Passport
- Verification ePassport & Identity Card w. facial biometrics
- Application for Biometric Visa
- Basic and Extended Identity Check Biometric Visa

Bundesamt für Sicherheit in der Informationstechnik

Thank you for your attention!

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