ICAO Adoption of Biometric Standards

September 2004
International Civil Aviation Organization (ICAO)

• United Nations organization
• Established in 1946 by Chicago Convention
• HQ Montreal
• ICAO Assembly (188 Nation States)
• ICAO Council (33 Nation States)
• ICAO Committees comprise the structure (e.g. Air Transport Committee)
• Permanent Delegation – eg US Presidential Appointed Head; one DOS Rep, one FAA Rep
Stakeholders in TAG-MRTD

- Governments
- Passport and Visa issuing agencies
- Border Control and Immigration
- Customs
- Police and Forensic Labs
- Others, e.g. FAA, Public Printers
- International Orgs, e.g. UN, ICAO, Interpol, WCO
- International Standards Organization (ISO)
- International Air Transport Association (IATA)
- Airports Council International (ACI)
- World Travel & Tourism Council (WTTC)
- A myriad of Vendors
Status of ICAO’s Biometric-Related Work

Country’s implementation of biometric technology in their border crossing systems will be based on ICAO’s MRTD work through technical reports and ensuing standards.
In the context of Travel Documents and Border Clearance, Biometrics means MACHINE ASSISTED IDENTITY CONFIRMATION
Introduction of

MACHINE ASSISTED
IDENTITY CONFIRMATION

Along With Greater Vigilance And
More Effective Procedures,

creates the environment for
Improved, More Secure Identification
The First Step ~ 1999
Identifying The Right Biometric

EARLY DAYS:
ICAO chose to identify the requirements as opposed to evaluating industry based technology studies.
Biometrics Selection Technical Report

Developed in 2000-2001

Endorsed by ICAO in Feb 2002

Considers the compatibility and ranking of the available biometric technologies with the complete set of unique requirements imposed on machine-assisted identity confirmation with MRTDs
Ratings Methodology

- Compatibility with MRTD enrolment requirements & Legacy data (walk-in, mail-in, electronic, outsourced)
- Compatibility with MRTD renewal requirements (walk-in, mail-in, electronic, outsourced)
- Compatibility with MRTD MAID verification requirements (walk-in, mail-in, electronic, self-service)
- Redundancy (availability of displayed feature and backup verification method)
- Global public perception (privacy, health risk, incentive, threat, acceptance, stigma)
- Storage requirements (template size, compatibility with database, document storage)
- Performance (speed, accuracy, susceptibility, compatibility, maturity, op efficiency)
Biometrics Selection Technical Report - Results (early 2001)

Group 1 = Face
Group 2 = Fingerprint & Iris
Group 3 = Signature, Hand, Voice
Development and Specification of Globally Interoperable Biometric Standards for Machine Assisted Identity Confirmation Using Machine Readable Travel Documents having regard to the principles of universality, uniformity, urgency, technical reliability, practicality and durability

www.icao.int/mrtd
Biometric Process & Applications

• Potential Methods of Identity Confirmation
• Considerations
  – Enrolment
  – MRTD Issuance
  – Border Control
  – Operationalization
  – Deployment Costs and Impacts
  – Security
  – Technical Reliability
ICAO Biometric Blueprints = 4 Pillars

1. **ENSURE GLOBAL INTEROPERABILITY OF IDENTITY CONFIRMATION**
   - ICAO Selected Face Image as the Global Biometric

2. **EXPAND DATA STORAGE CAPACITY BEYOND OCR-B**
   - ICAO Selected Contactless Integrated Circuit Chips >=32K

3. **ENSURE GLOBAL INTEROPERABILITY OF DATA INTERPRETATION**
   - ICAO Developed Logical Data Structure (LDS)

4. **PROTECT DATA RECORDED IN ELECTRONIC DATA TECHNOLOGY**
   - ICAO Developed Scheme Based on PKI Principles
Writing data to the passport chip
As you can see, that’s what we wrote out to the chip and here it is retrieved!
45K of data now read back from the chip in ICAO LDS Standard format;

38K portrait photo decoded in 3.5 seconds
Facial Recognition
Fingerprint Recognition

Image

Minutiae

Minutia angle Θ

Sample Cell

Ridge Ending

Bifurcation

Ridge Ending
Iris Recognition
• INTEROPERABILITY

• GLOBAL INTEROPERABILITY

• STANDARDS !!
International Standards Organization (ISO)

• ISO SC37
• Referenced via ICAO Biometrics Technical Report
• Biometric Data Interchange Formats
• Final Draft International Standard ~ Nov 2004
  – Face Image
  – Iris Image
  – Fingerprint Image
  – Fingerprint Minutiae
Passport Issuer Photo Matching

Not just ePassport data at borders – also a valuable tool at issuance. 1-many, 1-1, 1-few
ICAO Biometrics Blueprints Endorsed by Air Transport Committee in June 2003

Blueprints published and updated in 2003/04.

All updates endorsed by TAG in May 2004 & not published to ICAO Website
What’s happened in the last 18 months?

Blueprints updated & updates endorsed at ICAO TAG in May 2004
This *Biometrics Deployment Technical Report* focuses on biometrics in relation to Machine Readable Passports, and for simplicity uses the term "ePassports" to denote such biometrically-enabled and globally-interoperable passports.
PKI

- How do we know data has not been changed?
- Digital signature / hashing
- Private key generates; public key pair verifies
- Access control
  - Passive
  - Basic (via MRZ)
  - Active Authentication (protecting against chip substitution)
- Storing public key on chip
- ICAO Key Directory
Typical Business Process for reading ePassports

OCR Reader

RFID Exists? [N] -> checking security features...

RFID Exists? [Y] -> RFID reading

checking digital signatures...

checking security features...

valid? [N] -> closer inspection

valid? [N] -> valid?

valid? [Y] -> valid?

MRZ vs chip? [Y] -> Document valid

Go to biometric verification

checking: watchlists (biometric databases)

closer inspection

valid? [N] -> closer inspection
LDS Data Update by Other States

• To minimise security and data protection complexity, the NTWG has decided at this time [ref The Hague - February 2004] to not endorse updates of chips in ePassports subsequent to their personalisation at the time of passport issue to the holder ie ePassports will be "write-once".

• In the future however, the LDS will need to support "write-many" applications
ICAO-compliant Biometric ePassport

In summary, an ICAO-compliant biometric ePassport is one which stores in LDS format in its IC chip, as a minimum:

- DG1 MRZ
- DG2 facial image (as per Annex D), and
- Security Data (EF.SOD) - hashes
Annexes

A = photo guidelines
B, C = optimal image sizing
D, E, F, G, H = SC37 Data Interoperability
I = Contactless ICs
J = Press Release
K, L = Interoperability Protocols
**ePassports Canberra Tests (Feb 2004)**

ePassports in 2003 were interoperable as kangaroos and koalas
London ePassports/WG8 Update
Annex K

- Held in London on 17 June 2004 and followed on from regular WG8 Task Force 2 meeting.
- Joint chairs Hegenbath and Hartmann.
- Discussed and resolved around 10 major issues and wrote these up.
Annex K = ISO14443 Supplementation

- ePassport Reader Global Interoperability Requirements
- ISO14443 ePassports Supplementary Requirements identifies each of these issues for the MRTD Contactless IC application, and specifies recommendations as to their resolution, in the form of an itemization of ICAO specifications that provide specific qualifications to the ISO14443 standards, in order to resolve the interoperability issues for ePassports
Annex K – Version 2

Version 2 of Annex K – which is the current version and has been on the ICAO website since early July 2004.

Annex K is and will remain the vehicle for advising any interoperability clarifications between chips and readers.
ePassports Morgan-Town Tests Update (July 04)
ePassports Sydney Tests (Aug 04)
Environment

- Testing against the sheet
- 15 reader testers/vendors
- 7 chip manufacturers
- 120 booklets/ID3/ID1
- 19K photo
- 34K photo
- Silver dataset
TEST A

READER DETECTS PRESENCE OF A CHIP
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TEST B

TIME IT TAKES IN SECONDS TO RETRIEVE DATA
TEST C

READER SUCCESSFULLY RETRIEVES EXPECTED DATASET AND DISPLAYS ON PC SCREEN DG1 MRZ & DG2 PHOTO
TEST D

RETRIEVAL WITH BOOK INVERTED SO COVER SIDE IS DOWN
TEST E

RETRIEVAL WITH BOOK CLOSED AND ROTATED 90°
Outcomes
ePassports Task Force OUTCOMES #1

Interoperability is achievable!
ePassports Task Force OUTCOMES #2

No showstopper problems were identified with the LDS TR, or with Annex K of the Biometrics Deployment TR
ePassports Task Force OUTCOMES #3

Vendors want to undertake more testing especially on Basic Access Control and Active Authentication:

Government of Japan has offered to host this test session in late February 2005 in Tokyo
ePassports Task Force OUTCOMES #4

The TASK FORCE Mission of providing a forum for resolving / testing interoperability issues between chips and readers has been achieved!
Questions

www.icao.int/mrtd

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