Revisions to the PIV Biometrics Specifications

800-76-1 → 800-76-2

Biometrics Consortium Meeting
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Agenda

- Review industry trends in access control
- Fingerprint updates
  - **Exception handling**
  - **Leveraging "lessons learned" on fingerprint enrollment**
  - **MINEX -- Level II Performance + Conformance Specification**
- Second and third modalities
  - **Iris**
  - **Face specifications exist for cards today**
- Next step: Revision of NIST Special Publication 800-76-1
  - **Release for public comment ~ October 2010**
  - **Second or final publication ~ January 2011**

1. **Notes on industry trends for access control**
2. Fingerprint updates
3. Second modalities
   IRIS, MOC etc
4. Next steps

Part 1: Biometrics for Access Control

PIV Biometric Access Control

Biometric Industry Trends

- More devices
  - **Single modalities and multiple modalities**
- Smaller devices
  - **Mobile capture**
    - Iris, Face, Finger
- Standoff capture
  - **Iris, Face gates and portals**
- PACS systems using Face Recognition
  - **Based on e-Passport**
- One-to-one operation
  - **With token**
- One-to-many operation
  - **Without token**

For example…

1. Notes on industry trends for access control
2. **Fingerprint Updates**
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Part 2: Fingerprint Updates

Fingerprint exception handling

- Install the content of the December 2008 biometric FAQ specifications http://www.idmanagement.gov/content/hspd12_faqs_biometric.htm into the upcoming revision of NIST SP 800-76.
- These cover the cases:
  - **Zero fingers available (e.g. amputees) – install signed empty object on card**
  - **One finger available – acquire two impressions of the finger, and install signed object on the card**
  - **Poor quality during enrollment**
  - **Failed biometric verification attempt**

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Improving fingerprint enrollment

- Expand 800-76-2 guidance
  - **Lessons learned in operations**
  - **Development work supporting worldwide programs**
    - **BioDev II (supporting fingerprints in DE e-Passports)**
    - **ISO/IEC 19794-4 Annex on image capture**

- Beyond 800-76-2
  - **NIST Fingerprint Image Quality software: NFIQ 1.0 → NFIQ 2.0**

MINEX

Now

- Cross-vendor interoperability specification
  - **Templates must be accurately matched by certified matching algorithms**
  - **Matchers must accurately match certified templates**
  - **FNMR < 0.01 at FMR = 0.01**

Future

- Higher bar accuracy specification
  - **FMR < 0.0001**
  - **FMR < 0.00001**
  - **Pooled templates**
  - **One + two finger authentication**
- Threshold calibration
- Conformance
  - **Of template generators**

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Part 3: Second Modalities

Biometric Data on 7816 cards

- Fingerprint minutia (PIV mandatory) **NOW**
  - **Minutiae from two fingers, standardized in INCITS 378**
  - **Record size is 500-700 bytes (excluding signature)**
  - **Supported by MINEX (Minutiae Exchange) tests and GSA certification**
- Facial image (PIV optional) **NOW**
  - **Single frontal face image, standardized in INCITS 385**
  - **Record size is approximately 20KB**
  - **Image is suitable for face recognition (both human and automated)**
  - **Specification is closely that of the e-Passport**
- Iris Image (Specifications to appear in SP 800-76-2)
  - **Images of one or two irises, standardized in ISO/IEC 19794-6:2011**
  - **Record size is approximately 3KB**
  - **Image is suitable for biometric verification**

Iris specifications for PIV

- SP 800-76-2 specifications (under consideration):
  - **Iris image (for card)**
  - **Iris image (for CMS)**
  - **Camera performance / properties / interface**
  - **Iris algorithm performance / properties**
  - **Conformance testing**
- Comment is welcome
  - **Now**
  - **On drafts of SP 800-76-2**

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IREX Test (Support for 1:1 and 1:N)

- NIST Interagency Report 7629, Sep 21, 2009
  - ***Performance of Iris Recognition Algorithms on Standard Images***
- Quantitative support for ISO 19794-6 standard
  - **Image size is about 3KB (for 1:1) and ~30KB (for 1:N)**
  - **Compression, cropping, formatting profiles**
  - **Speed-accuracy trade space**
- Ten implementations of standardized interoperable iris image format
  - **Num. iris providers has expand x10 in last five years**
  - **Num core technology providers in iris exceeds that for face recognition**
- Iris image interoperability superior to minutia interoperability
  - **Less dependency on the product that prepares the record**
- http://iris.nist.gov/irex (or google “iris interoperability”)

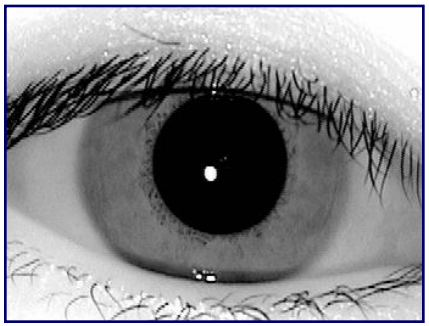
IREX :: Proposed standard formats

Parent image from camera

KIND 1

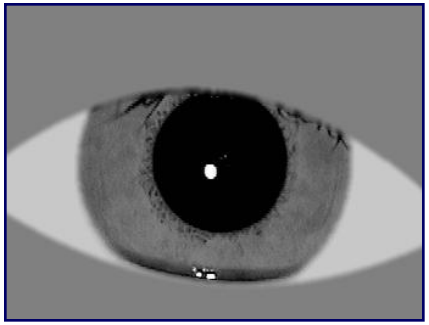
Unsegmented polar

KIND 16



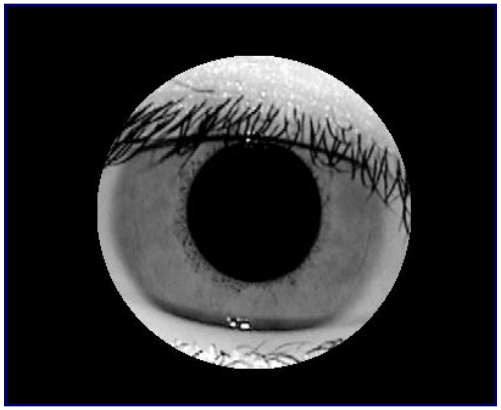
Cropped image

KIND 3



Cropped and masked image

KIND 7

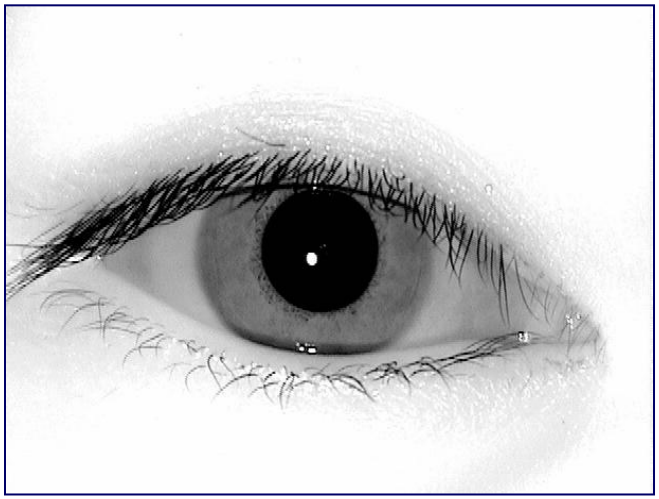


Reconstructed rectilinear

KIND 48

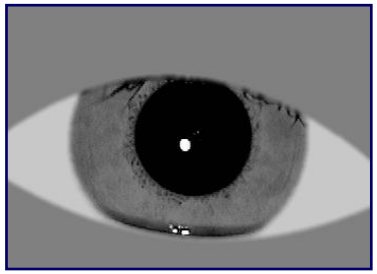
irex IRIS EXCHANGE

Use images, not templates



Parent image from camera

KIND 1



Cropped and masked image

KIND 7

- Standard defines interoperable images
  - **PIV will use these**
  - **US Registry of Biometric Standards will recommend these.**
- Templates are
  - **Proprietary, non-interoperable**
  - **Laden with intellectual property**
  - **Sometimes larger than the image itself**
  - **Not suitable for interoperable USG applications**

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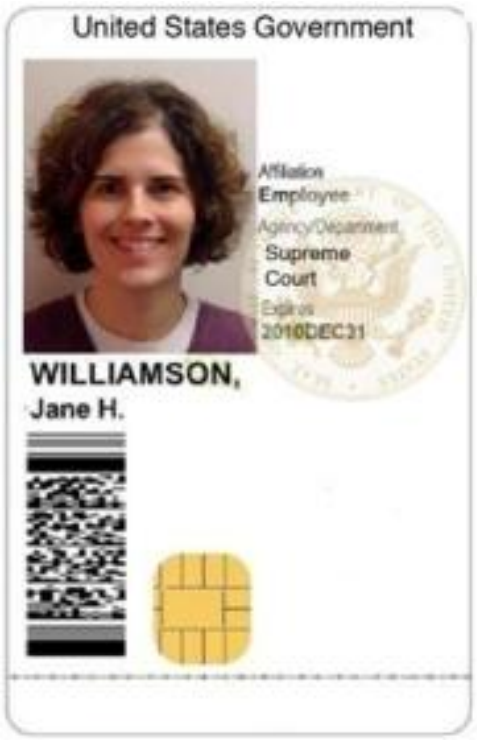
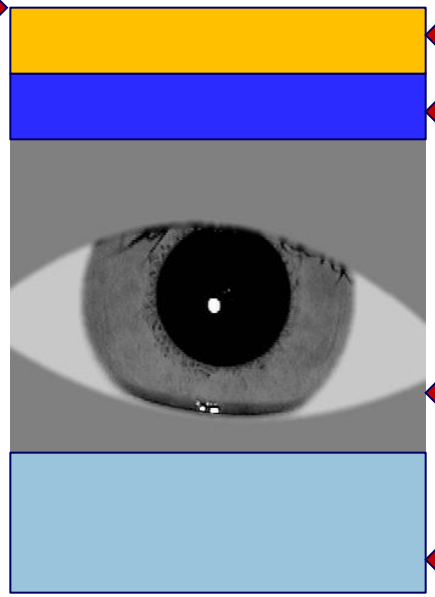
Irises on PIV Cards

Following the arrangement of fingerprint minutia data on current PIV cards… Two irises in one container.

Tagged biometric container (SP 800-73)





CBEFF Header — =88 bytes

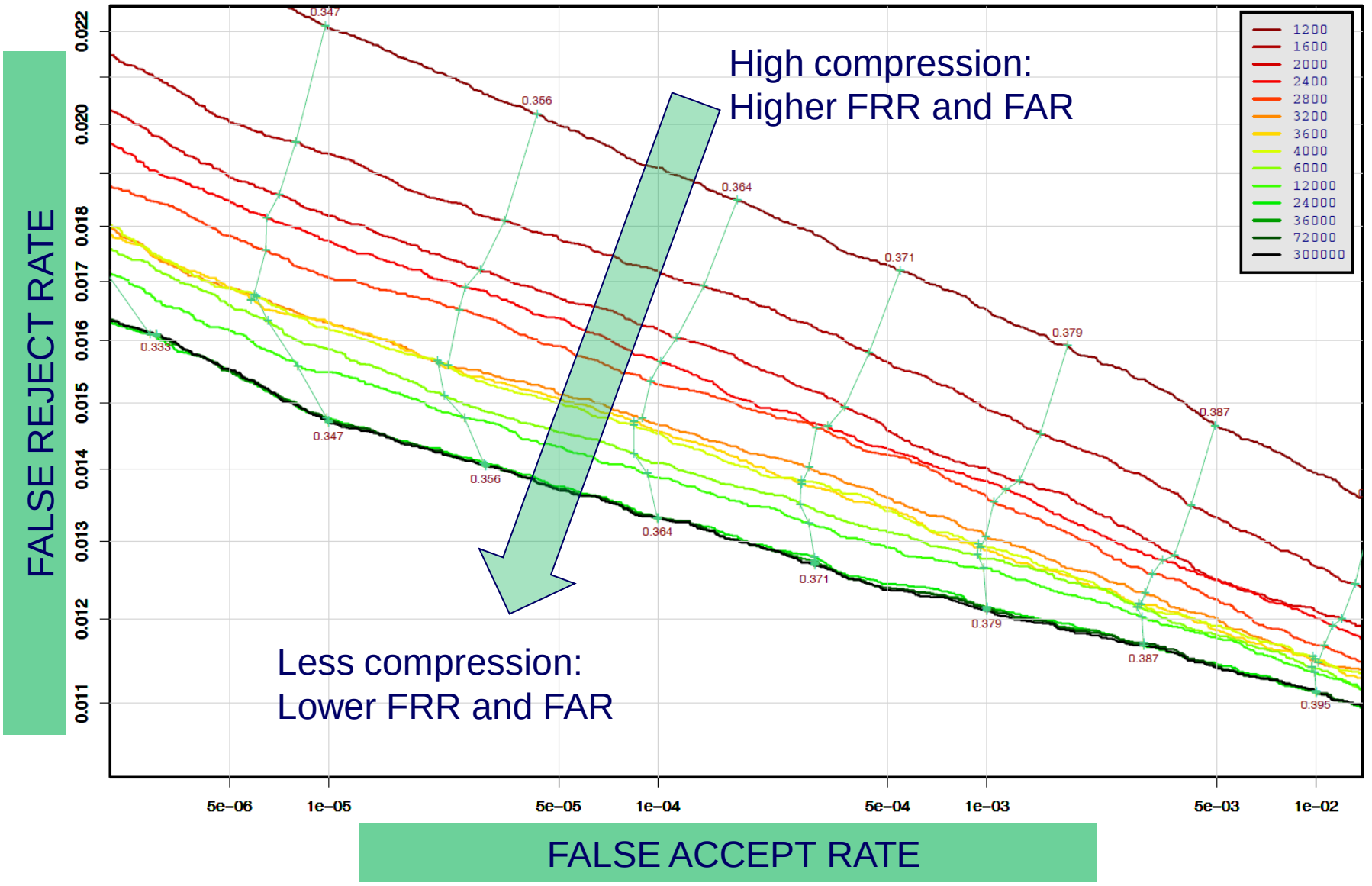
ISO Iris Image Header — ≥107 bytes

ISO Iris Image Data — ~2 * 3KB

CBEFF Signature block — ~ 500 bytes

2.65M cards issued 07/2009

Recognition Error Under Compression



Compression + Format Recommendations

- Compression - Don't do it!
  - **Lossy compression does incremental damage to images.**
  - **Either no compression, or lossless may be sufficient.**

	Recommended		Target Record Size								
Role	Format	Compressor	2KB	4KB	8KB	16KB	32KB	64KB	128KB	256KB	307KB
All	KIND 1	Uncompressed									
All	KIND 3	Uncompressed									
All	KIND 7	Uncompressed									
All	KIND 3	PNG Lossless									
All	KIND 7	PNG Lossless									
1:N	KIND 3	JPEG 2000 Lossy									
1:N	KIND 7	JPEG 2000 Lossy									
1:1	KIND 3	JPEG 2000 Lossy									
1:1	KIND 7	JPEG 2000 Lossy									

20-70KB for 1:N

3KB for 1:1

Commercial entities (partial list)

IRIS CAMERAS

- Short distance
  - **Crossmatch (US)**
  - **IrisID (LG) (US/KR)**
  - **Iris Guard (SU)**
  - **Jiris (KR)**
  - **Kalo-vision (US)**
  - **Kynen (US)**
  - **L1 (Securimetrics) (US)**
  - **Oki (JP)**
  - **Panasonic (JP)**
- Distance
  - **Aoptix (US)**
  - **Honeywell (US)**
  - **Hoyos Group / GRI (US)**
  - **L1 (US)**
  - **Sarnoff Corp (US)**

IRIS RECOGNITION

- Aoptix (US)
- Cambridge University (UK)
- Cogent systems (US)
- Crossmatch Tech. (US)
- Honeywell (US)
- Iritech (KR)
- Jiris (KR)
- Kalo-vision (US)
- L1 (formerly Iridian) (US)
- LG (KR)
- Neurotechnology (LI)
- Smart Sensors (UK)
- MorphoTrak (FR/US)
- Sarnoff (US)

Iris cameras I

Power Indicator

LCD Window
(graphical display enhances interactive interface, communicates authentication status)

Iris Camera
(exclusive autofocus iris image aquisition process delivers rapid two eye enrollment/recog

Face Camera Illuminator

Face Camera for Credentialing Use

Up/Down Button
(motorized auto-drive for easy height adjustment)

Alphanumeric Keypad
(supports PIN input and workforce management interface)

Device-Embedded SmartCard Reader
(delivers LG iDentity token authentication with leading smartcards)

Iris Acquisition III – Stand-off capture

Walk-up-and-stop
Kiosk-style

Portal, walk through style

Biometric Authentication

- Biometric release only from unlocked card
  - **Unlock currently via six-digit PIN**
  - **Does it make sense to unlock via MOC?**
- Should biometric data ever be free read?
  - **To support PACS**
  - **Two more fingers, dedicated to MOC?**
  - **Revision of FIPS-201 would be needed**
- FIPS 201 revision
- FIPS 140 revision

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THANK YOU

INPUT IS WELCOME

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