Revisions to the PIV Biometrics Specifications

DRAFT FIPS 201-2 WORKSHOP
APRIL 18 + 19, 2011

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Agenda

1. Preamble
2. Iris
3. Match-on-Card
4. Swipe sensors
5. Accuracy specifications
6. What's in, out, and next steps

Part 1:
Preamble

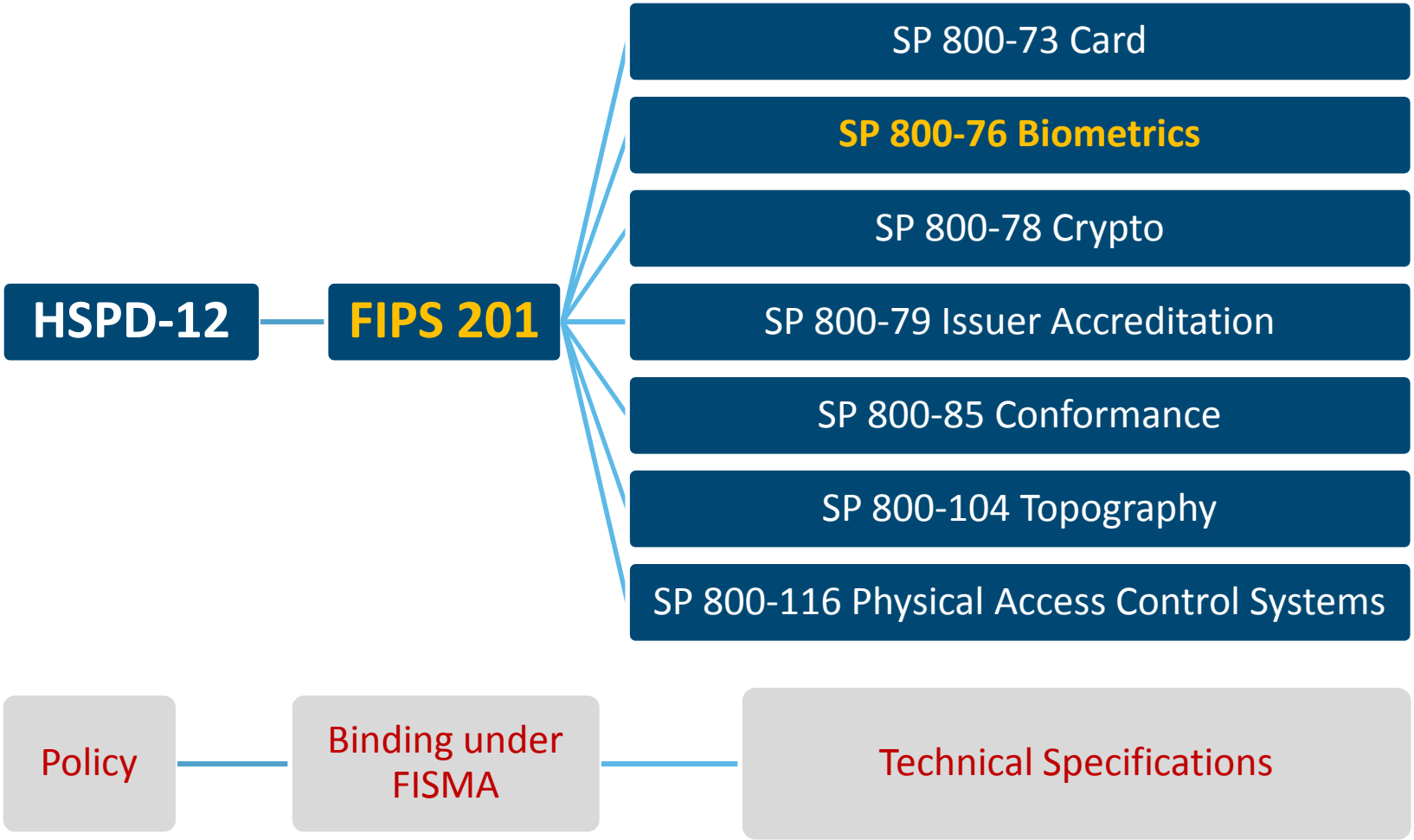
http://biometrics.nist.gov/76.pdf

Draft 800-76-2 released April 17, 2010

Posting to the SP register is imminent

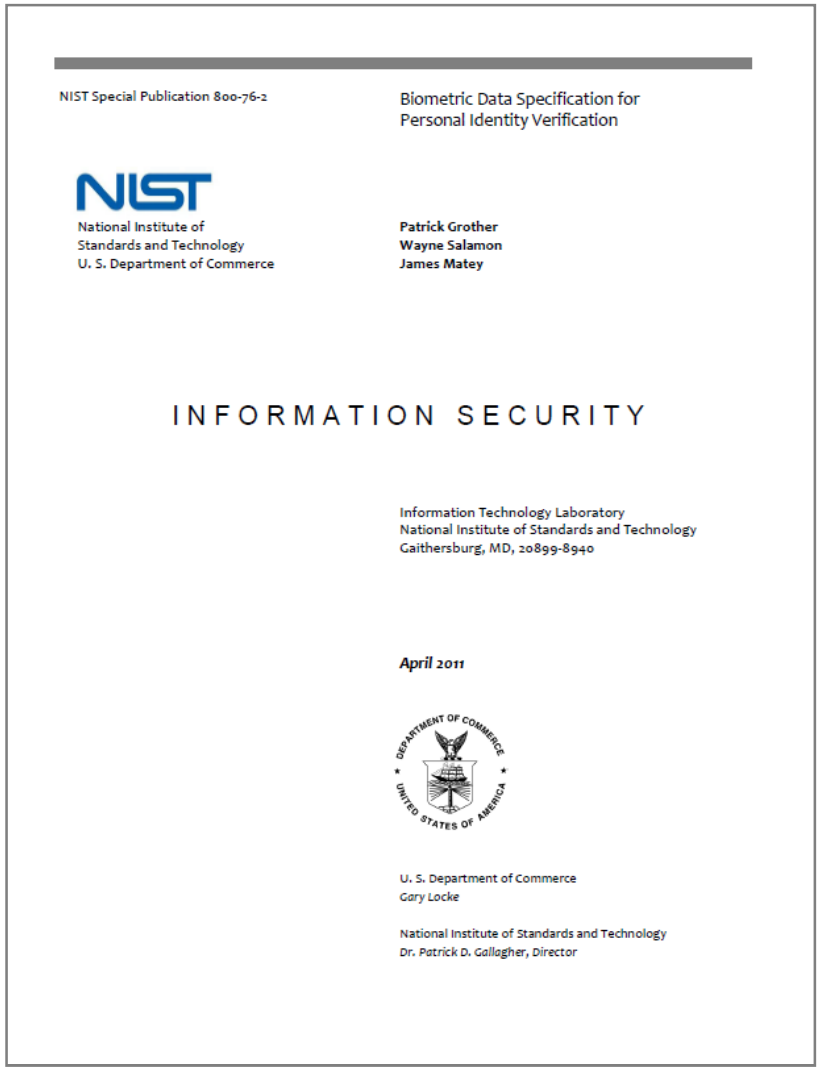
http://csrc.nist.gov/publications/PubsSPs.html

PIV :: Documents Hierarchy



NIST SP 800-76 Lineage

- Prior: "-0" on 2006-02-01 27 pages
- Current: "-1" on 2007-01-25 33 pages
- **Draft: "-2" on 2011-04-17 61 pages**
  - **Draft - Out for public comment**
  - **http://biometrics.nist.gov/76.pdf**
  - **http://csrc.nist.gov/publications/PubsSPs.html**



NIST Special Publication 800-76-2

Biometric Data Specification for Personal Identity Verification

NIST

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2. **Iris**
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Part 2: Iris

Change #1 :: Iris for PIV :: Why/How

The problem

- Fingerprints sometimes do not work
  - **Some people are difficult to image (dry skin)**
  - **Permanent damage to fingers**
  - **Temporary damage to fingers**
  - **Non-habituated users**
  - **Poor quality control during enrolment (?)**

One solution

- Add iris to PIV
  - **Iris image on the card**
  - **Iris image off the card (CMS)**
  - **Support with specifications**
    - For minimum accuracy requirements
    - For tests of algorithms
    - For tests of cameras
    - For interfaces to cameras
    - For interfaces to recognizers
    - Conformance tests

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Change #1 :: Iris for PIV :: Context

The PIV Context

- Iris is required for cardholders for whom fingerprint authentication during issuance fails
  - **Iris as fallback modality**

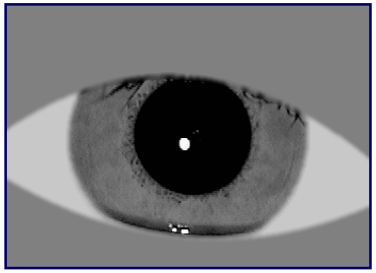
The consequences

- Requires purchase of camera and ancillaries
  - **Capital cost**
  - **Variable costs(?)**
- Presence of iris equipment extends a new option for operational authentication
  - **Attended**
  - **Unattended PACS + LACS**

Change #1 :: Addition of iris :: Data format

Parent image from camera

Type 1 or 2



Cropped and masked image

Type 7

- Standard defines interoperable images
  - **ISO/IEC 19794-6:2011**
    - **Type 7 On Card with JPEG 2000**
    - **Type 2 Off Card with PNG or RAW**
  - **US Registry of Biometric Standards recommends these.**
  - **Tested in IREX I**
    - **http://iris.nist.gov/irex**

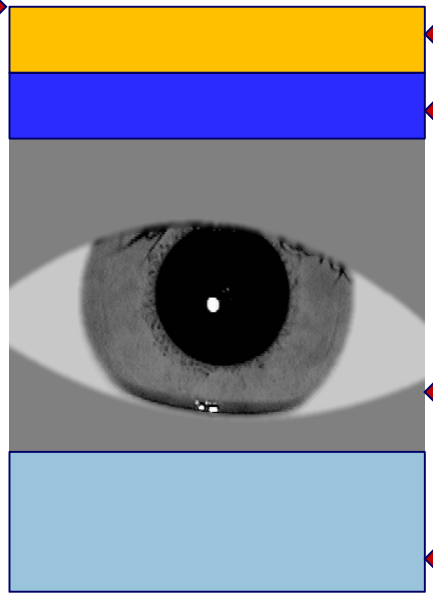
irex IRIS EXCHANGE

- Not storing / sending / requiring templates
  - **Proprietary, non-interoperable, laden with intellectual property, sometimes larger than the image itself**

Change #1 :: Iris for PIV :: Implementation

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 or 1 * 3-6 KB
CBEFF Signature block	~ 500 bytes

2.65M cards issued 07/2009

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Part 3: Match-on-Card

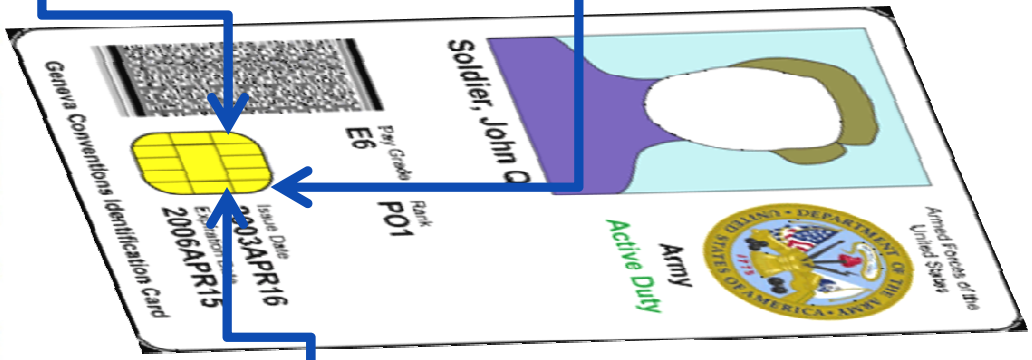
Change #2 :: Addition of MOC :: Background

- MINEX II
  - **Accuracy and speed of card-based algorithms**
  - **P. Grother, W. Salamon, C. Watson, M. Indovina, and P. Flanagan, MINEX II Performance of Fingerprint Match-on-Card Algorithms Phase II / III Report NIST Interagency Report 7477**
    - **Three editions, 2008, 2009 and 2011**
  - **Contact: patrick.grother@nist.gov**
- sBMOC "Secure Biometric Match-on-Card"
  - **Demonstration of secure protocols for biometric authentication.**
  - **D. Cooper, H. Dang, P. Lee, W. MacGregor, and K. Mehta. Secure Biometric Match-on-Card Feasibility Report. NIST Interagency Report 7452, November 2007.**
  - **Contact: william.macgregor@nist.gov**

Change #2 :: Addition of MOC :: Background

Reference Template: sent via PUT DATA

Verification Template sent via VERIFY



Verification Template sent via VERIFY

- Privacy Enhancing Technology (PET):
- The template cannot be read from the card
- No need for a central database
- Cryptographically hardened token

Change #2 :: Addition of MOC :: Why / When

The problem

- PIN release of a biometric is
  - **time consuming**
  - **PINs are sometimes forgotten, and committed to paper**
  - **well motivated: PIN protects biometric from free-read (e.g. after Card loss)**

The proposed solution

- Allow on-card comparison
  - **for authentication after PIN**
  - **for card activation no PIN, prohibit release of current card templates**

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Change #2 :: Addition of MOC :: How

The PIV implementation

- Four ISO/IEC 19794-2:2011 templates
  - **Primary + secondary finger with plain-impression sensor AND swipe sensor**
- Use 7816-4, 7816-11
- No extensions
  - **Not standardized ones, and**
  - **Not proprietary ones either**

The consequences

- Cannot use the existing PIV Cards directly.
  - **Needs ISO/IEC 19794-2 "compact card" templates**
  - **Client-side issuance software effects conversion.**
- MOC is agency-optional
  - **Requires cards with on-board matcher**
  - **Contact + contactless with cryptographic protection**
    - **Secure Session**

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Part 3: Swipe Sensors

Change #3 :: Swipe Sensors :: Drivers

The problem

- Fingerprint sensors exist on many PCs today, why the need to add "PIV-certified" sensors?
  - **Answers: Performance, Interoperability**
- Plain-impression "area" sensors are more expensive

A solution

- Allow swipe sensors
  - **Reduced cost**
  - **For authentication against enrolled swipe data**
  - **With qualification criteria**
  - **Restrict domain-of-use**
    - **Use with MOC only**
    - **Logical access only?**
    - **Not in attended operations (issuance, re-issuance etc)**
    - **Not with mandatory PIV templates**

Change #3 :: Swipe Sensors :: Input Needed

Specific caveats

- Little empirical data on which to safely include swipe matching into PIV. Swipe is attractive on grounds of cost, and possibly on grounds of spoof resistance.
- Specific request for comment
  - **swipe accuracy and viability**
  - **interoperability with optically-derived templates**
  - **operating with standardized minutia templates**
  - **operational experiences**
  - **liveness**

Possible ways forward

- All swipe-related specifications may be withdrawn in the next version of this draft.
  - **Defer until quantitative evidence is available**
- Swipe goes forward as drafted
  - **But no implementation passes the mandated performance test.**

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Part 5: Minimum Accuracy Specifications

Change #4 :: Minimum Accuracy :: Why

The problem

- 800-76-1 established interoperability criteria for fingerprint minutia equipment
  - **FRR ≤ 1% when FAR ≤ 1% for ALL template generators and matchers**
- BUT
  - **FAR of 1% is non-operational (but fit-for-purpose nevertheless)**

The backdrop

- FIPS 201 does not establish agency biometric security requirements of biometric match
- But FIPS 140-2 does!
  - **Motivation for six digit PIN in PIV today**
  - **FIPS 140-3 is under development**

Change #4 :: Minimum Accuracy :: How

The specifications

- Establish minimum security requirements
  - **By requiring false match rates be less than X.**
  - **Agency optional on whether FMR < X or FMR << X per**
    - Agency requirements
    - Application requirements
  - **For all modalities**
    - Iris
    - On-card comparison
    - Off-card comparison

The mechanism

- Algorithm tests exist within PIV today
- FMR objective is achieved by setting a calibrated threshold
  - **Threshold calibration is a by-product of existing NIST tests**
- Not specifying FRR

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Part 6: Next Steps

SP 800-76-2
IS OPEN FOR COMMENT

EMAIL COMMENTS PIV_COMMENTS@NIST.GOV

BY JUNE 6, 2011

THIS IS THE SAME DEADLINE AS THE FIPS 201-2

Draft SP 800-76-2 :: In + Out

What's in

- Off-card fingerprint, mandatory
- Iris, conditional mandatory
- On-card fingerprint, optional
- Face, optional on card, for human adjudication
- Swipe sensors
- Minimum accuracy requirements

What's not in

- Is face available for biometric authentication
- No mentioned of UUID
- No guidance on biometric update (the ageing problem)
- New biometric standards
  - **INCITS 378:2009 minutia templates**
  - **ISO/IEC 19794-2 for off-card minutiae**
  - **ISO/IEC 19794-5:2005 or 2011 face**
- Other modalities
  - **Vein, Face (automated FR), Hand Geometry, etc.**