

## HSPD-12 Fingerprint Process Considerations & Research

### Background:

The following research and analysis was conducted as a part of the HSPD-12 Architecture Working Group (AWG) effort to develop standard interfaces for the Enrollment Service Providers. This summary was developed in cooperation with the Architecture Working Group (AWG), Enrollment Station Working Group (ESWG), Laurie McCandless (OPM), Mark Pekrul (OPM), Shannon Morris (OPM), Scott Phillips (FBI), William Barker (NIST), Ramaswamy Chandramouli (NIST), and Andrew Chiu (Enspier Technologies)

### Questions:

Two critical questions were put to the team:

1. Do shared or similar requirements and processes exist for submission of fingerprint checks to OPM/FBI across agencies that can be leveraged to streamline the enrollment process?
2. What standards must be supported by the enrollment stations to provide usable fingerprints to agencies?

### Summary of Results:

The confusion around HPSD-12 fingerprinting is a result of differing language around fingerprint processing and lack of adoption of the Type 14 submission in the Electronic Fingerprint Transmission Specification (EFTS)<sup>1</sup> by the personnel security community. The FBI does accept and process flat prints via Type 14 EFTS. OPM's rough-order-of-magnitude (ROM) estimate for updating internal systems to support receipt, processing, and relay of Type 14 prints is ~ 6 months.

The central issue to be addressed is in fact the personnel security community has not yet approved acceptance of flat prints in background investigations (BI). The Personnel Security Working Group (PSWG) is scheduled to evaluate this issue during the June meeting.

If the desire is to standardize acceptance and use of flat prints, this meeting is a critical juncture in the progress towards establishing shared HSPD-12 services.

The decision as to whether flat prints are acceptable for BI will drive two end-states:

1. If flat prints are acceptable to the PSWG for HSPD-12/NACI BIs, then:
  - a. Shared enrollment stations may capture flat prints as currently planned by the ESWG on behalf of agencies for submission to the FBI
  - b. Agencies & OPM must begin efforts to support flat fingerprints (Type 14 EFTS) as soon as possible.
2. If flat prints are not acceptable to the PSWG for HSPD-12/NACI BIs, then enrollment processes must account for capture of both rolled *and* flat prints. Effects may include acquisition of different equipment, training, longer enrollment times/lower station "throughput", and a more complex shared enrollment process.

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<sup>1</sup> The EFTS spec can be found at <http://www.fbi.gov/filelink.html?file=/hq/cjisd/iafis/efts71/efts71.pdf>

- a. Agencies have reported that they do not generally have the ability to verify that the individual appearing for enrollment is the same individual whose background was previously investigated. OPM and FBI also do not have this ability. This finding may require that all individuals enrolling to receive a PIV card may be required to undergo a new background investigation (e.g., NACI or better).

On a technical note, some members of the AWG have asserted that it is in fact possible to generate INCITS 378 minutia from rolled fingerprints and that such minutia are more useful in matching against flat fingerprints at runtime. NIST's feedback was that they have not yet tested minutia matching in such a manner, but that they have received no indication that matching flat prints against minutia generated from rolled prints is superior. Further, guidance in SP 800-76 requires generation of the minutia templates from the flat fingerprint images<sup>2</sup>.

### **Feedback:**

The team received significant feedback and input from a large number of agencies as well as staff from OPM and FBI. The responses generally fell into one of four umbrella concepts:

1. There are 3 fingerprint types described in conversations – slaps, flat, and rolled.
2. Agencies follow one of two different submission paths:
  - a. Direct to FBI
  - b. Through OPM to FBI
3. Some agencies asserted that FBI does not accept flat prints, while others disagreed.
4. OPM does not accept flat prints, only rolled prints.

These concepts clearly represent a wide and varying view of the fingerprint check process. The team determined additional research was necessary to address the questions.

### **Research Results:**

Concept #1: There are 3 fingerprint types described in conversations – slaps, flat, and rolled.

- Partially correct. There are two types – flat prints, and rolled prints. Flat prints are also known as flat impressions, slaps, or plain impressions. From discussions, the team notes that there is no common method of referring to slaps/flat prints and this is causing confusion when discussing requirements and capabilities. Flat prints are taken by placing the finger on the reader. Rolled prints are taken by rolling the finger from nail-to-nail on the reader, resulting in significantly more fingerprint data. Flat prints provide ~40% less data than rolled prints.
- There are two critical EFTS fingerprint formats to this discussion: Type 4 and Type 14. Both are available via the FBI Electronic Fingerprint Transmission Specification (EFTS) today and the FBI supports production-level processing of both transactions.
  - A Type 4 fingerprint submission may be either paper (on card) or electronic. Paper submissions are scanned and converted to electronic form for processing. Type 4

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<sup>2</sup> Per Section 3.3.1 of NIST SP 800-76: Two [MINUSTD] fingerprint templates ... shall be those obtained by segmenting the plain impressions of the full set of fingerprints captured during PIV ...

submissions consist of 10 individually-rolled fingerprints<sup>3</sup> and 10 flat prints<sup>4</sup>. These are the standard for criminal investigations. These may be submitted to both FBI (direct or via OPM) electronically or via traditional ink-on-card. In either case, the recipient (FBI or OPM) will convert ink-on-card to electronic Type 4 form for processing by FBI.

- A Type 14 fingerprint submission may be provided to the FBI in electronic form only, and contains only a 10-finger slap. Type 14 submissions are intended for non-criminal justice purposes and are much faster to capture than rolled prints. FBI reports that only the State Dept, DHS, and FBI are doing limited scale submissions using Type 14 prints; no entity is using them in production today. For non-HSPD-12 purposes, several non-Federal organizations are submitting Type 14 EFTS in production to the FBI.

Concept #2: Agencies follow one of two different submission paths: Direct to FBI and Through OPM to FBI

- Correct. FBI receives both Type 14 and Type 4 submissions from Agencies today, although the Type 14 submissions are of a pilot or interoperability-test nature at this time. FBI also receives Type 4 submissions from OPM on behalf of Agencies that use OPM.

Concept #3: Some agencies asserted that FBI does not accept flat prints, while others disagreed.

- Incorrect. FBI receives both flat and rolled prints via Type 14 and Type 4 submissions, respectively, from Agencies and OPM. The confusion around this issue may have occurred for two reasons – conflicting information regarding the availability of Type 14 processing in production, and OPM support for only the Type 4 (rolled) submissions.

Concept #4: OPM does not accept flat prints, only rolled prints.

- Correct. OPM scans ink-and-card prints into Type 4 EFTS for processing by the FBI. Type 4 EFTS does not support flat prints.
- Currently, policy states that background investigations require a fingerprint check. Although this language does not discriminate between flat/rolled fingerprints, the PSWG and personnel security community have not formally agreed to accept flat prints for investigations. The issue is on the agenda for the next PSWG meeting, scheduled for June 2006. The considerations around accepting flat prints for BI are:
  1. Flat prints are ~50% quicker to capture than rolled prints.
  2. Flat prints result in a larger pool of “candidate” matches. This takes longer to process.
  3. Flat prints are less likely to return “hits” on latent fingerprints; however, flat prints do sometimes provide hits on latent prints that are not discovered using the corresponding rolled impression.

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<sup>3</sup> Rolled prints are taken by rolling the finger on the scanner from one nail edge to the other nail edge.

<sup>4</sup> Impressions of the left 4 and right 4 fingers of each hand captured simultaneously, then acquiring each of the thumbs individually.

- An effort is underway at OPM to evaluate support for Type 14 EFTS (flat fingerprints) however support for receiving, processing, and forwarding Type 14 EFTS at OPM may take ~ 6 months and depends upon acceptance of flat prints for BI by the personnel security community.

**Other Findings:**

- A new connection between the FBI and an agency/contractor for fingerprint checks takes 4-6 months to complete, but an existing connection to FBI can be used for a new fingerprint check type (e.g., type 4, type 14, etc) with ~ 1 month of transaction testing.
- OPM’s ROM estimate for receiving, processing, and relaying Type 14 prints to the FBI is ~ 6 months.
- FBI reports that their maximum *theoretical* daily capacity for fingerprint processing (for all types) is ~ 125,000 checks, although actual processing volume is ~90,000 checks today. For new FBI fingerprint projects (e.g., TWIC, potential guest worker, etc) and HSPD-12 requests, available fingerprint check capacity today therefore stands at ~ 35,000 daily fingerprint checks. Due to the reduced information provided by flat prints, fingerprint checks on flat prints result in a larger pool of “candidates” and as a result do take more processing time. Estimated capacity numbers may differ if Type 14 prints are used in lieu of Type 4. Capacity needs should be coordinated amongst the FBI Criminal Justice Information Services (CJIS) Division, the Enrollment Station Working Group, and Agencies to ensure this is sufficient for anticipated daily HSPD-12 needs – current shared enrollment estimates call for a peak volume of 140,000+ enrollments per month, or ~7,000 per day.
- FBI is aware that some Agencies are submitting flat prints (e.g., slaps) in Type 4 EFTS transactions and does not approve of this use. Submission of flat individual-finger impressions using the rolled fingerprint transaction is inappropriate and may return incorrect results.
- OPM and FBI cannot, on any large scale, compare current fingerprint samples with fingerprint images submitted for a previous NACI. Agencies also lack this capability. It will be difficult to confirm (within a reasonable timeframe) whether each individual enrolling for a card is the same one who was previously investigated as required by FIPS 201-1.
- Per NIST SP 800-76, Section 3.5 - Fingerprint Image Specifications for Background Checks, “Table 5 enumerates the appropriate transaction formats for the three acquisition options of Section 3.2. The FBI documentation [EFTS] should be consulted for definitive requirements.”

**Table 5: Record Types for Background Checks**

Option	Transaction Data Format in [FFSMT]	Reference
1	Three Type 14 records.	[EFTS, Appendix N]. See Note 2
2 or 3	Fourteen Type 4 records	Section 3.1.1.4 "Federal Applicant User Fee" of [EFTS]

- Some members of the AWG recommended generation of the PIV card fingerprint minutia templates using the rolled fingerprint images as the source data. While this is not permitted currently by SP 800-76, the team did raise this question with NIST. In response, NIST advised that:

1. Testing based on image (not minutiae templates) has demonstrated that flat-to-flat and rolled-to-rolled matching are both more accurate than flat-to-rolled matching.
2. The present Minex SDK specification does not allow rolled-to-flat testing and none of the Minex test datasets have matching rolled fingerprints.
3. The present conformance test for m1 378 templates has been built for flats only.
4. To date there is no empirical evidence to prove that matching using templates generated from livescan rolled images has superior matching performance.