

## Federal Bureau of Investigation (FBI)

### Next Generation Identification (NGI)

#### Latent Best Practices

##### Purpose:

This document provides recommended best practices for Latent Print Examiners (LPEs) using current technology provided by the Next Generation Identification's (NGI) enhanced latent services. These recommendations have resulted from internal testing of the NGI matching algorithm and information provided by LPEs throughout the law enforcement communities who have achieved success using NGI latent services. This document may be used to assist in developing latent search strategies and provide agencies the framework to incorporate valuable policies and procedures. Additionally, it is intended to encourage agencies to upgrade their automated fingerprint identification systems and Universal Latent Workstation (ULW) Software and update their business practices to take full advantage of NGI's enhanced latent services.

##### Background:

In May 2013, the FBI deployed NGI Increment 3, which improved latent services previously provided through the Integrated Automated Fingerprint Identification System (IAFIS). Benefits of NGI include:

- **Increased accuracy:** Latent searches are three times more likely to hit in NGI than in IAFIS (when the searched repository contains the mate).
- **Image-only searches:** Latent Friction Ridge Image Searches (LFIS) are far more accurate than they were in IAFIS.
- **Easier feature searches:** NGI no longer has the IAFIS requirements for ridge counting, so Latent Friction Ridge Features Search (LFFS) searches are less work.
- **No file penetration requirements:** NGI no longer has the IAFIS requirement to reduce file penetration to 30%.
- **Searching lower-quality latents:** NGI is effective at matching latents that previously would have been considered as unsuitable for any AFIS: if a latent is good enough to compare, it is good enough to search against NGI.
- **Palm prints:** NGI allows direct enrollment of palm prints into the National Palm Print System (NPPS); agencies can now search latent palm prints against the NPPS.
- **Expanded database:** NGI users can now search against the Civil File and Unsolved Latent File (ULF) in addition to the Criminal Master File (CMF).
- **Event based repository:** NGI provides access to an event based repository composed of all retained events for an identity instead of just one composite image set.
- **Enhanced ULF capabilities:** NGI allows for contributor maintenance of their ULF records.
- **Recording biometric decisions:** NGI supports biometric decisions by allowing contributors to provide feedback on candidates provided from search results using the Biometric Decision (BDEC) Type of Transaction (TOT).

- **Information retrieval capabilities:** NGI permits retrieval of images and associated information for fingerprint, palm print, and ULF records.

### **NGI System Design:**

The NGI system's latent functionality infrastructure is called the Latent Friction Ridge (LFR) Repository. It consists of two identity groups:

- Friction Ridge Investigative File (FRIF): The FRIF contains a collection of all biometric events including tenprints, palm prints, and supplemental prints.

One of the most significant and valuable benefits of the NGI is that, unlike in the past where only composite tenprint records were searched, this newly expanded database includes a biometric search of all individually submitted tenprint events. Additionally, the Electronic Biometric Transmission Specification (EBTS) 2.098 Name of Designated Repository (NDR) Field provides the capability for users to indicate multiple files or repositories to be searched, to include the civil file and the ULF.

- ULF: The ULF consists of a variety of unsolved latent prints previously searched through the NGI system that have not been identified.

A drastically improved matching algorithm, the inclusion of searchable friction ridge from incoming tenprint (criminal and civil), palm print, and supplemental images cascading against the ULF will provide latent examiners with additional images available for latent identifications.

### **Latent Searches:**

The NGI matching algorithm and increased search penetration rates combined demonstrates a significant increase in latent search accuracy success. The following represent LPE "Best Practices" for launching latent searches of the NGI:

- Legacy IAFIS file penetration restrictions of 30 percent or less have been completely lifted in extreme cases where no filter parameters (i.e., finger position, gender, etc.) are known. During NGI testing, it was observed that the application of filters minimally increased the accuracy of latent search results. Therefore, it is recommended that filters be applied only when reliable and appropriate.
- NGI will only accept latent search images at 500 pixels per inch (ppi) or 1000 ppi. If good quality latent images are available (i.e., high contrast and little distortion), agencies should consider using the LFIS TOT to auto-encode without examiner editing and submit at 1000 ppi without filters for ULF enrollment purposes (1 search).
- Agencies with large caseloads may consider implementing triage policies instructing examiners to first submit latent searches as LFIS transactions and then compare the two highest-scoring candidates returned. If an identification is not immediately effected, the examiner may then create a LFFS transaction, auto-encode, edit the system encoded minutia (ensuring that a minimum of three minutiae are marked), and launch the latent search again.

- To reduce the number of searches required to generate viable candidates within NGI, it is recommended users simultaneously search both the CMF and Civil File through use of the Name of Designated Repository (NDR) field.
- The performance of the new NGI matching algorithm is superior to that of IAFIS. Many of the low quality latent prints that would not have previously been considered of value by examiners could generate likely candidates in NGI. It is recommended that all latent prints, which remain unsolved upon searching NGI, enroll within the ULF via the EBTS 2.083 (ULF) Field "Y," to benefit from subsequent Unsolved Latent Match (ULM) Notifications.
- When submitting latent prints, search each image in all the possible positions in which the image could be located (e.g., submit right hypothenar image as the right hypothenar, EBTS 2.074 Friction Ridge Generalized Position (FGP) Field 33, and also as the right lower palm, FGP 25). Additionally, it may be beneficial to utilize the Unknown Finger, FGP 00, which will search positions 0-17 and Unknown Palm, FGP 20, to search positions 21-38. Alternatively, Unknown Friction Ridge, FGP 18, will search all possible codes.
- Minutiae that an examiner is unsure of are less detrimental to the matcher than missing true minutiae; therefore, when encoding latent images, it is more important to add true minutiae than it is to remove false minutiae.
- During the NGI Latent Trade Study, the FBI learned of a set limitation to reject any latent with an image smaller than 384 x 384 pixels (on a 1000 ppi image). When marking a region of interest, it must also meet this minimum size requirement. If the image does not meet the required minimum size, it is recommended adding white space and resubmitting the image to NGI.
- If employing ULW, it is considered a "Best Practice" for agencies to regularly upgrade their software as new versions become available.

**Latent Notification:**

NGI provides agencies with unsolicited notifications based on triggering event criteria. An unsolicited notification may be triggered by functions initiated by the system. The end user may:

- Receive a ULM Notification that the established ULF record has been potentially matched to an incoming set of known prints.
- Receive notification when an unknown search of the \*Repository for Individuals of Special Concern (RISC) search cascades against the ULF resulting in a "hit" and sends a ULM Notification to the ULF record owner. (\*RISC searches are often conducted by law enforcement officers during traffic stops or other face-to-face interactions by using mobile biometric collection devices. The RISC is a two to ten finger search a limited repository of Wanted persons, National Sexual Offender Registry subjects, Known or Appropriately Suspected Terrorists, Immigration Violator File subjects, and persons of special interest).

### **ULF Management:**

The ULF has capacity limitations. As designed, once each subdivision of the ULF reaches capacity, the oldest record is deleted from file. It is equally important to provide notification of identifications effected as a result of latent searches (i.e., BDEC) to allow tuning/enhancements to the NGI latent search algorithm. It is recommended that all ULF record owners perform routine inventory and maintenance efforts to ensure only actionable latent prints reside within the ULF thus permitting enrollment of latent prints with active investigations by others.

The NGI system also provides improved maintenance abilities to manage the size of the ULF. For instance, the end user has the ability to:

- Receive an Unsolicited Unsolved Latent Delete (UULD) notification when a latent image has been automatically deleted from the ULF due to exceeded capacity limitations. Note: users may choose to re-submit the transaction if the case remains unsolved and the statute of limitations have not expired.
- Execute an Unsolved Latent Delete (ULD) message that removes their retained image from the ULF.
- Notify of a positive identification executed through the BDEC.

### **Additional Benefits of the NGI System:**

In addition to the enhancements provided to the latent searches, notification, and management functions, LPEs have experienced benefits in the following areas:

- When using NGI compliant versions of ULW (i.e., version 6.3.6 or higher) in combination with EBTS Version 9.3 or higher, associated event-specific information for fingerprint and palm print events will be readily accessible to the latent user community through utilization of the EBTS 2.2029 Biometric Set Identifier (BSI) Field within an Image Retrieval Request (IRQ).
- The accuracy of the NGI latent matcher has greatly improved. The NGI system provides a consistently higher rank for potentially identical candidates in the Search Results Latent (SRL) response.
- LPEs can now review the minutiae returned in the SRL for each candidate returned when the Request Features Record (2.095 RFR) Field is set to a value of "Y" (or checked) in ULW.

For assistance with or additional information regarding NGI latent services, please contact the Latent and Forensic Support Unit at [latentsupport@leo.gov](mailto:latentsupport@leo.gov) or 304-625-L8NT (5868).