Small, Large and Very Large AFIS Operations

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Let's ground ourselves:
What is AFIS?

Automated Fingerprint Identification Systems are a combination of software and hardware components which deliver the functions and business processes needed by the Law Enforcement Identification and Forensic units.

AFIS is a turn-key solution – an end-to-end combined computer hardware and software product.

AFIS Functions

Generally can be summarized to:

1. Enroll / book a person; which includes two sub-tasks:

   a) Run tenprint searches to determine if the person is in the AFIS database under another name - TP to TPF;

   b) Run the reverse search to solve a previous case – TP to ULF;

2. Run a crime scene latent to solve a current case and/or relate to a previous case – LP to TPF and to ULF;

3. Forensic unit tasks – prepare exhibits; record management; user management; verification, double blind verifications; etc.

Generalizing the AFIS definition

- AFIS started with fingerprints only, and progressed to functionality for all friction ridge impressions, including palmprints.

- The palmprint function is now standard in all viable AFIS products; i.e., it is an integral part of the product so it does not make sense to treat it as separate technology nowadays.

- Everyone should consider dropping confusing acronyms like APIS, AFPIS, etc., attempting to specify palm capabilities.

AFIS Solution Scales

- **Very Small AFIS** – 5K to 50K database with less than 20 transactions per day (Tenprint and Latent);

- **Small AFIS** – 50K to 100K database with less than 100 transactions per day (Tenprint and Latent);

- **Medium-Size AFIS** – Up to a 1M records with few hundred transactions/day;

- **Large-size AFIS** – Up to 10M records with 1K+ transactions/day;

- **Very Large Size AFIS** – Up to 100M records with 100K+ transactions/day;

What is the most critical component of the AFIS? Is it:

1. The computers and servers?
2. The AFIS fingerprint image processing, minutiae detection and matching technology? The Accuracy – The Speed ?
3. The scope of the functionality?
4. The ergonomics and user friendliness of the GUI – front applications?
5. The ease / scope of the interfaces to other systems – Interoperability?
6. The AFIS records and data completeness, integrity and quality?
7. Product Standards Compliance?
8. Product reliability – support and maintenance from vendor?

My recommendations come from the following recent project:

- A large country-wide AFIS with 3M records database and 1000+ transactions per day;
- A medium size multiple jurisdictions (five city municipalities) AFIS with 800K records and 100+ transactions/day;
- Six very small and small AFIS sites; all having fully engaged CSI and well-defined booking processes with fingerprinting, and in four locations palmprint capture.

AFIS Sites A, B, and C, Very Small AFIS Operations – Less than 10K TP records

- Spent $35K to $50K to buy desktop AFIS: A PC with a FBI certified flatbed scanner; stand alone;
- Day forward operation with no records in the database – no file conversion;
- Run and supported by the Police IT;
- One day site installation and training for everyone; System Admin; Application set up; users training: IT and the CSI Department with 15 employees. No Maintenance - Telephone support with no response time requirements!
- Current status:
  - Manually scanned about 1500 to 3000 cards in the system – very slow scan tedious process – minimal automation - staff has given up;
  - Used a few times a year to run a latent for dog-and-pony show purposes!
  - Operations have abandoned AFIS and returned to paper and ink using Henry Classification to file and search TPs.

AFIS Sites D, Very Small AFIS Operations – Less than 20K TP records

- The Police Force has purchased two operational AFIS – one is used for tenprint and one for latent!

- About $250K for the AFIS #1 – with a full livescan booking station networked from downtown to Police HQ where the AFIS servers are, and one multi-function AFIS workstation. It is designated as a TP operation only!

- AFIS#2: About $150K to buy three desktop AFIS: 3 PCs with an FBI certified flatbed scanner; they work stand alone – having a shared hard drive; designated as the latent AFIS!

- Full data conversion for AFIS #1, 7 years ago.

- AFIS#2: Day-one forward operation, starting with no records in the database;

- TPs and PPs from AFIS #1 are printed to hard-copy on good-quality FBI certified laser printer, then scanned and ingested into AFIS#2.

- Estimated total records of 17K , with about 8000 in AFIS#1 and 7K in AFIS#2.

- Four Police posts where bookings are done – downtown is livescan the other three are paper and ink.

AFIS Sites E and F, Small AFIS Operations – Less than 50 to 200 K TP records

- The Police Forces have been assisted by a funding agency to procure AFIS. Keep the time frame in mind – from 2007 to present!

- Both have decided that a software development company who has been developing the criminal record management (a kind of CCH) is the best candidate to develop the AFIS!!

- In one case the booking workstation with single-finger scanner has produced a disaster non-compliant and practically useless AFIS which stays up only a couple of hours per day with three IT staff working around the clock.

- In the second case, the first prototype was tested last year – only to find out the there are "small" issues with the AFIS records – such as the finger numbers being arbitrarily set (instead of AFIS standard finger position numbers)… So finger 1 is the left pinky!! – The product is a disaster!

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Discussion and Recommendation Lessons Learned(1)

- After 30+ years - AFIS products and major AFIS vendors have reached a very good level of maturity.

- However, there a few existing AFIS vendors and also new AFIS vendors who do not have the history and maturity to deliver a usable solution. They make the sale and deliver the product, but not the solution meeting the need of agency.

- Due to recent merger and acquisition changes impacting some major AFIS vendors – you need to evaluate the vendor.

Discussion and Recommendation Lessons Learned (2)

- In any Decision Support system or tool, the data completeness, integrity, reliability, and quality is the most important component.

- After 30 years of work on the ANSI/NIST standard – we have guidelines for defining and adhering to very high quality data elements.

- Buying an AFIS without initial "file conversion" of existing records can be a meaningless waste of money and time.

- The specs in ANSI/NIST-ITL-2011 for 1000 ppi tenprint scan and 500 ppi for the palmprint scan allows agencies to completely move away from paper and ink operations.

  - Keep the full 1000 ppi paper scan of the cards in a simple directory

  - Store multiple copies of the digital images in a secure place (COOP plan).

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Discussion and Recommendation Lessons Learned(3)

- Saving money by buying "bargain" products, without data conversion and without well-defined support is a bad decision. Examples:

  – A major agency bought a desktop mini-AFIS for a customer without file conversion - three years later the system is still in the corner collecting dust.

  – Another major agency spent close to $5M developing an AFIS for a site (30K records, very small-scale AFIS) from the ground-up. That decision was made in 2007-8 time frame!!

  – Another agency saved "tons of money" by configuring and delivering a dozen booking stations using a PIV certified single finger scanner to capture the standard 14-set TP record!!

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Discussion and Recommendation Lessons Learned(3)

- Let's step back and see what exactly we are trying to accomplish: solving and fighting crime.

- Crime is now seriously spread across all jurisdictions-

  It is international – by product of Global Economy.

- Agencies planning for AFIS upgrades must emphasize Standards and Commercial-off- the-shelf (COTS) products. Minimize customization.

- Via the ANSI/NIST standard and COTS products, interoperability will be achieved without issues.

- FBI/CJIS ULW is not a local AFIS. It is a valuable tool for agencies awaiting proper AFIS interface. ULW is sometimes a source of confusion for LE fingerprint operations.

Questions/Comments

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Dr. *Behnam (Ben)* Bavarian *is a pioneer and leading authority in the field of Automated Fingerprint Identification System (AFIS) and Biometric Identification, with over 26 years of R&D and management experience in industry and academics.*

He founded AFIS and Biometrics Consulting ,Inc. in 2007, providing subject matter expert consulting and strategic management services in the Biometrics Identification Industry. The company has successfully completed more than two dozen contracts in the last three years.

Prior to ABC, Inc. Dr. Bavarian was the Vice-President of Motorola Biometrics, where he led the business turn-around and fourfold increase in sales by directing the development of leading Automated Biometric Identification System products with over 100 large scale AFIS deployments.

Before moving to the AFIS industry in 1992, Dr. Bavarian was a professor in the Department of Electrical and Computer Engineering at the University of California, Irvine, where he conducted original research in image processing, computer vision, and intelligent systems. He published over 120 technical papers and received several awards for outstanding research and distinguished teaching.

Dr. Bavarian received his Ph.D. in Electrical and Computer Engineering from The Ohio State University, Columbus, in 1984.

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