

## 16h. Omnitrak AFIS

### 16h.1 Omnitrak AFIS System Description

Omnitrak AFIS has a full feature set of robust technical features and capabilities, including configurability and expandability. Omnitrak offers the following:

- ❖ Real-time performance
- ❖ Use of all available data. Omnitrak matches rolled images larger than 1" x 1" (1.5" x 1.6", compliant with the FBI's 800 x 750 standard), facilitating additional hits and more accuracy.
- ❖ Customer control of workflow automation for two-finger, tenprint and palmprint submissions. For two-finger, tenprint and palmprint submissions, the system manager can control the criteria used to decide whether quality control and tenprint:tenprint and two-finger:two-finger verifications are performed automatically or manually.
- ❖ Integrated palm entry, storage, and matching subsystem. All workstations and servers are capable of handling both fingerprint and palmprint data, should these be added to the base two-finger system.
- ❖ Security via a multi-level access control system with user names and passwords; tasks available are based on user roles and privileges granted through the system manager.
- ❖ System reporting capabilities, with the ability to generate a pre-defined report set for tracking and a complete audit trail for each transaction, including operator sign-on and logout; all data is stored in an ODBC compliant database.

Additional system features increase system efficiency and productivity and lead to higher accuracy and fewer operator errors, by eliminating or greatly reducing manual interventions.

Omnitrak is a release-based product, forming a system foundation that supports extensive future system enhancements easily. Printrak pursues ongoing improvements of search accuracy, Web-based technology, palmprint processing, lights out operations, middle-ware business process management tools, and many other advances via continual significant research and development funding.

The workstations, as offered to the Commonwealth of Virginia, contain the Omnitrak generic workflows and generic descriptors. Any modifications to those may be offered on a per hour consulting fee for the analysis and implementation.

## 16h.2 Components of Omnitrak AFIS

Components of the Omnitrak AFIS include:

### 16h.2.1. Advanced Data Server (ADS)

The major functions of the Advanced Data Server (ADS) are Workflow Management, Data Management, Data Presentation, and User Security.

#### **Workflow Management**

One of the major functions of the Omnitrak ADS is Workflow Management. The major components of Workflow Management are the Workflow Engine (WFE) and the Workflow Manager database (WFM). The WFE manages the workflow process steps within the AFIS middle tier and servers. Omnitrak business logic is defined by a set of states and state transitions. A group of states and transitions that perform one unit of business logic is referred to as a “workflow”. Units of work, known as “actions”, are associated with states and transitions. An example of a workflow would include states, transitions, and actions that receive a case, add that case to the Advanced Data Server (ADS) database, search that case against the known fingerprint database, perform quality control and tenprint search verification, and finally disposition the case.

The WFM is an Oracle database that stores each step of a workflow. As a step in the workflow is completed, information about that step is stored. This information can be used by applications to manage workload, to monitor case states, and to produce reports.

#### **Data Management**

The ADS contains relational database management software (RDBMS) to store and retrieve case data from an Oracle database. The proposed configuration is specifically designed to meet your anticipated database capacity requirements. A large amount of data for each individual can be stored. The data is intelligently incorporated into the matching process. Unlike older systems that only store a single record for each individual, the ADS stores multiple cases (arrests, bookings, applications, or enrollments) for each individual. In addition, Omnitrak is not limited to the storage of ten rolled fingers; when available, the ADS can be configured to store slap (plain) fingers and palmprint data.

The data management system, which incorporates a scalable architecture, uses Redundant Array of Independent Disks (RAID) technology on magnetic disk arrays for database storage and near-immediate image retrieval. These arrays store both data and parity information, enabling on-line regeneration of any lost data in background mode should one of the array’s disks fail. To protect further against a single disk failure, the ADS comes configured with a hot spare drive, which provides an on-line backup disk for easy change-over and allows data recovery without interrupting normal AFIS operations.

### **Data Presentation**

The ADS contains software to create web pages to be displayed with Internet browsers on Omnitrak workstations. The functions provided by the web pages include the following: verification, system status, case state status, quality control, system management, case charting, case image viewing, and case management.

### **User Security**

The ADS provides the functionality of managing the privileges assigned to each system user. The ADS uses OpenLDAP as the protocol for storing the user data. OpenLDAP is an open source implementation of the **L**ightweight **D**irectory **A**ccess **P**rotocol (LDAP).

Other components of the Omnitrak system will utilize the information stored in the LDAP database to ensure that each user is given access to their specific authorized functions.

## **16h.2.2. Advanced Matcher Controller (AMC)**

The AMC (Advanced Matcher Controller) orchestrates the work performed by the adaptive matchers. The AMC receives requests from the Advanced Data Storage (ADS) server. Requests direct the AMC to search, add, delete or modify file case records that are stored on the matchers. The AMC coordinates the work of the available matching resources.

There is one AMC and several adaptive matchers. The AMC will make sure that the case records are distributed evenly and that all matchers are performing to optimum levels. Each matcher is independent of all other matchers. This means that matchers can be added or deleted with affecting any other matcher. After the matching process, the AMC applies database information (crime type, automatically generated pattern classification, etc.) to the candidate list. These are not used as filters to exclude data, but are used as "score boosters" to increase the score of the true matching candidate.

## **16h.2.3. EXPERT Matching**

If minutiae matching does not yield a definitive hit/no-hit determination, the system automatically performs EXPERT Matching. In the EXPERT Matching process the top-ranking candidates from minutiae matching are subjected to additional matching processes, including minutiae types (bifurcation or ridge endings), minutiae connectivity, ridge count, automatic ridge matching, and other data. These additional dynamic processes provide further matching accuracy and are capable of increasing the score separation between the true matching candidate and the other candidates to move the true matching candidate to the top of the list.

After all matching processes are completed, the Advanced Matching Service evaluates the candidate lists generated during matching. Rather than relying upon a single match score to make hit/no-hit determinations, the Advanced Matching Service evaluates candidates based upon multiple criteria, including combined scores for multiple fingers, individual scores for single fingers, and confidence levels.

After candidates have been evaluated, the Advanced Matching Service returns a list of candidates, along with (for non-latent searches) computer-generated hit/no-hit determinations, to the review queue. The workflow can also be configured to send a preliminary Hit/No-Hit message to the submitting workstation. Regardless of the result, all results are stored in the system for use in future matches.

#### **16h.2.4. Omnitrak Web / Application Server**

Omnitrak is designed using a three-tier architecture consisting of user interface (client), the process management component (business rules), and the database management component (server). The middle tier Application Server manages the business logic for the Omnitrak AFIS applications, enabling reuse of business logic within both Web browser *thin* clients and traditional *thick* applications. Performing database-intensive business logic near the database saves network traffic and access latency. Web browser clients can be used within Omnitrak to perform both database and system maintenance functions, and to create reports. The Application Server allows the use of Internet-standard secure protocols SSL or HTTPS in place of less secure proprietary DBMS protocols to access the database.

#### **16h.2.5. Omnitrak Workflow Manager Service**

The Workflow Manager (WFM) Service manages and controls the workflow process steps within the AFIS. The WFM stores information about one or more workflows (depending upon agency requirements), each with its own set of process flow steps and state transitions. Information is sent to WFM as each step is executed; the following step is then communicated to the appropriate subsystem. The workflow is completed when the last process step has been completed. The WFM architecture is flexible in performance and reliable in operation. In addition to managing workflows, WFM also records information on each workflow step as it is completed. This information is stored in an Oracle database and can be included in reports.

#### **16h.2.6. Omnitrak Data Exchange Services**

This service allows external devices (Omnitrak workstations, third-party AFIS workstations, and third-party text systems) to submit data to the Omnitrak server, and vice versa. It contains standard translation modules that support a variety of formats (e.g. national and state ANSI/NIST fingerprint formats, SQL, and XML).

Data and images submitted from the NEC AFIS to the Omnitrak AFIS would be submitted in ANSI/NIST format.

#### **16h.2.7. Omnitrak Data Processing Services**

This service allows fingerprint and palmprint records submitted by Omnitrak CardScan Stations and non-Omnitrak workstations to be processed for submission to the Omnitrak server. It uses the same automatic processing and correction functionality that is performed on the Omnitrak Tenprint Station and the LiveScan Station 3000N.

After data is received, Printrak's proprietary print processing algorithm automatically separates four-finger slap group images into individual fingers for processing (while retaining the original image), prepares the print for feature extraction, extracts minutiae and EXPERT features, evaluates image quality, identifies data inconsistencies (e.g. errors resulting from

slap-to-roll comparison), automatically corrects data as needed, chooses the highest-quality fingers for search, and submits the search to the Omnitrak(tm) server. All of these processes are automatic, requiring no operator intervention or special fingerprint training.

## 16h.2.8. Electronic Data Conversion

The two-thumbprint database provided by the Virginia State Police in ANSI/NIST format, would be in electronic format, and would be used as input to the Printrak conversion process.

Printrak will electronically convert stored two-thumbprints to Omnitrak AFIS format. Printrak performs careful pre-hiring selection of its conversion personnel, and insists on demonstrations of proficiency during the training process. Printrak's headquarters-based conversion personnel are fully trained and are periodically given refresher-training courses to keep their skills at peak levels. All employees go through an initial training program. At the end of the initial training, personnel must pass a practical exam that thoroughly tests their knowledge. Testing and refresher courses are repeated periodically to ensure skills are kept polished.

Because of its potential impact on search accuracy, the most essential element of a satisfactory conversion is high quality, fully reliable converted databases. Printrak takes the following steps to ensure that converted customer databases are of the highest possible accuracy:

- ❖ *Conversion by a fully trained staff (all conversions).* Printrak recommends that conversion be performed at its existing, secure conversion facility in Anaheim, California by its trained file conversion staff. Printrak performs careful pre-hiring selection, and insists on demonstrations of proficiency during the training process.
- ❖ *Assistance to the customer in the conversion process (all conversions).* Corporate experience in assisting more than 70 customers in the prior conversion of more than 58 million records provides Printrak with insight into potential customer needs during the conversion process.
  - ▶ Perform quality checks on all converted data
  - ▶ Perform a database synchronization on every group to ensure the minutiae and image databases are synchronized
  - ▶ Run system performance checks during conversion, including daily running of known-result system diagnostics
  - ▶ Encourage auditing or periodic checking of any portion of the conversion process at any time by agency representatives

The electronic data conversion will be performed in the following way:

***Preparation and Media Tape Shipment to Anaheim:***

Printrak delivers all batch control documents and transmittal documents to the customer site and advises procedures for preparing and shipping media. A common media format, along with the methodology for writing the database to the shipping media, will be identified during the initial phases of the project.

The production data will be written to the shipping media in preparation for transport.

The customer ships the media containing the fingerprint images to Anaheim, California via a “signature security” courier.

### **16h.2.9. Omnitrak Review Station**

The Review Station is designed for review of fingerprint and palmprint search results.

The workstation provides access to the Omnitrak Server subsystem, allowing properly privileged users to review fingerprint and palmprint search results. All search results information is stored centrally, reducing network traffic. The user accesses the data via a supported web browser. Prints are presented side-by-side, and the operator may scroll through the candidate list to view the prints of possible candidates. The user then indicates his or her hit/no-hit determination(s).

Additional features include charting, or the capability to indicate points of similarity on two prints, and match analysis, or the capability to see how modifications to the original data (e.g. re-encoding of the minutiae) can affect search results are available.

### **16h.2.10. Omnitrak Latent Station**

The Latent Station is designed for latent print input, and review of fingerprint and palmprint search results.

### **16h.2.11. Latent Entry Capabilities**

The workstation is designed to provide highly user-friendly latent entry and search review capabilities. Latent prints may be captured using a latent camera, or imported from another application. The workstation operator enters and encodes minutiae on latent prints and initiates comparison of a latent print to an existing tenprint, or unsolved latent record file.

The workstation includes features such as side-by-side zoom, and on-screen controls for contrast, brightness, and other image enhancements. On-screen response is fast, and individual areas of the print can easily be expanded and/or adjusted. Such improved encoding tools make previously unidentifiable minutiae visible and assist latent examiners in print encoding. More accurate and complete minutiae identification means more accurate searching for every latent print, thereby increasing the number of hits. Finally, a graphic chart of matching minutiae can be produced on-screen and in hard copy form.

The workstation allows access to a server latent case relational database, which stores AFIS quality latents, other images, and crime information. This case management tools allow a latent operator to manage his or her latent case information.

### **16h.2.12. Search Results Review Capabilities**

The workstation provides access to the Omnitrak Server subsystem, allowing properly-privileged users to review fingerprint and palmprint search results. All search results information is stored centrally, reducing network traffic. The user accesses the data via a supported web browser. Prints are presented side-by-side, and the operator may scroll through the candidate list to view the prints of possible candidates. The user then indicates his or her hit/no-hit determination(s).

Additional features include charting, or the capability to indicate points of similarity on two prints, and match analysis, or the capability to see how modifications to the original data (e.g., re-encoding of the minutiae) can affect search results are available.

### **16h.3 Omnitrak IdentiScan Station**

The Omnitrak IdentiScan Station is designed for remote live capture, processing, searching, and enrollment of one or two plain (flat) fingerprints and associated textual data. It is especially suitable for situations in which a subject's identity must be positively confirmed.

The workstation provides operators with on-screen prompts to make operation as clear and simple as possible. Workstation design and automated features make the workstation very easy to use.

The standard workstation supports capture of one or two plain (flat) fingerprints via a livescan finger capture device, as well as capture of text for the subject's enrollment in the Omnitrak AFIS. If the IdentiScan Station is configured with facial image and signature capability, these items can be captured along with the fingerprints and text.

Once fingerprint capture is complete, the workstation processes the captured fingerprint(s) by extracting fingerprint features and performing quality checks. Because the IdentiScan Station is designed as a typical AFIS workstation, the same quality checks are performed that are standard at the Central AFIS. This ensures that fingerprints are not later rejected due to quality issues.

Data capture and processing can be performed regardless of whether the Central AFIS or the communications link is available. If the AFIS is not available, records are stored on the IdentiScan Station's work in process disk until the AFIS or its communications link is restored to full operation. The ability to perform real-time fingerprinting helps ensure that printing processes will not be delayed beyond legal or regulatory time limits.

Fingerprints can be submitted for a one-to-many search where the prints are compared against some or all of the existing fingerprints in the database. This type of search is most often used when the subject is initially enrolled in the system to ensure the person is not registered under multiple person ID numbers. The following one-to-one verification search compares the prints to the single set of prints associated with a particular ID number. This search is used for subsequent identity verification. In either case, a Hit/No-Hit determination is displayed on the IdentiScan Station screen, along with any associated information from the Omnitrak database, e.g., facial images when available.

#### **16h.4 Omnitrak MultiPrint Station**

The MultiPrint Station is a comprehensive workstation designed for tenprint and palmprint card scanning, latent print input, and review of fingerprint and palmprint search results.

#### **16h.5 Tenprint and Palmprint Entry Capabilities**

The workstation's tenprint features answer the needs of customers who want more automated, accurate, and faster AFIS systems without the burden of costly manual labor. Prints are captured by a high-resolution flatbed document scanner, which quickly captures an entire tenprint card at 500 dpi in 256 shades of gray.

The workstation supports entry of text associated with the tenprint record, as well as entry of data that will be used in the search (information about amputated or bandaged fingers, preferred search filters and search priority, etc.).

After a card is scanned, Printrak's proprietary print processing algorithm automatically separates four-finger slap group images into individual fingers for processing (while retaining the original image), prepares the print for feature extraction, extracts minutiae and EXPERT features, evaluates image quality, identifies data inconsistencies (e.g., errors resulting from slap-to-roll comparison), and submits the search to the Omnitrak(tm) server. All of these processes are automatic, requiring no operator intervention or special fingerprint training.

#### **16h.6 Latent Entry Capabilities**

The workstation is designed to provide highly user-friendly latent entry and search review capabilities. Latent prints may be scanned on a flatbed scanner, captured using a latent camera, or imported from another application. The workstation operator enters and encodes minutiae on latent prints and initiates comparison of a latent print to an existing tenprint, or unsolved latent record file.

The workstation includes features such as side-by-side continuous zoom, and on-screen controls for contrast, brightness, and other image enhancements. Color charting and on-screen print rotation capabilities simplify visual verification of latent search results. On-screen response is fast, and individual areas of the print can easily be expanded and/or adjusted. Such improved encoding tools make previously unidentifiable minutiae visible and assist latent

examiners in encoding. More accurate and complete minutiae identification means more accurate searching for every latent print, thereby increasing the number of hits. Finally, a graphic chart of matching minutiae can be produced on-screen and in hard copy form.

The workstation allows access to a separate latent case relational database, which stores AFIS quality latents, other images, and crime information up to 1,000 images per case. This case management tool allows a latent operator to manage his or her latent case information.

### **16h.7 Search Results Review Capability**

The workstation provides access to the Omnitrak Server subsystem, allowing properly privileged users to review fingerprint and palmprint search results. All search results information is stored centrally, reducing network traffic. The user accesses the data via a supported web browser. Prints are presented side-by-side, and the operator may scroll through the candidate list to view the prints of possible candidates. The user then indicates his or her hit/no-hit determination(s).

Additional features include charting, or the capability to indicate points of similarity on two prints, and match analysis, or the capability to see how modifications to the original data (e.g., re-encoding of the minutiae) can affect search results are available.

### **16h.8 Omnitrak PrintScan Station**

The PrintScan Station is designed for tenprint and palmprint card scanning, and review of fingerprint and palmprint search results.

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The workstation supports entry of text associated with the tenprint record, as well as entry of data that will be used in the search (information about amputated or bandaged fingers, preferred search filters and search priority, etc.).

After a card is scanned, Printrak's proprietary print processing algorithm automatically separates four-finger slap group images into individual fingers for processing (while retaining the original image), prepares the print for feature extraction, extracts minutiae and EXPERT features, evaluates image quality, identifies data inconsistencies (e.g. errors resulting from slap-to-roll comparison), and submits the search to the Omnitrak(tm) server. All of these processes are automatic, requiring no operator intervention or special fingerprint training.

## **16h.10 Search Results Review Capabilities**

The workstation provides access to the ADS subsystem, allowing properly-privileged users to review fingerprint and palmprint search results. All search results information is stored centrally, reducing network traffic. The user accesses the data via a supported web browser. Prints are presented side-by-side and a computer generated hit/ no-hit determination is noted, and the operator may scroll through the candidate list to view the prints of possible candidates. The user may change the computer generated hit/ no-hit determination as desired.

Additional features include charting, or the capability to indicate points of similarity on two prints, and match analysis, or the capability to see how modifications to the original data (e.g., re-encoding of the minutiae) can affect search results are available.