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National Institute of Justice
Final Report
January 2005 – April 2006

The partnership between the University of Central Florida and the National Institute of Justice enabled the Florida Integrated Network for Data Exchange and Retrieval (FINDER) to achieve significant progress on an agenda of important public safety and research objectives. An emerging and nationally recognized set of standardized performance measures provides the opportunity to evaluate the effectiveness and efficiency of information sharing networks. From January 2005 to April 2006, these metrics of system performance concerning FINDER reported the following results:

Number of search tasks completed:	1.6 million (2005 – May 2006)
Number of participant agencies:	135
Number of network users:	1,300
Type of data available on the network:	pawn, property, and persons records
Training provided on system:	5 regional training sessions were conducted attended by a total of over 400 officers and detectives
Number of logged success stories:	452
Change in time needed to perform investigative assignments:	Significant reduction in investigative time through FINDER searches
Positive user evaluations:	A November focus group of officers and investigators conducted by Mitretek yielded highly positive user evaluations for system access, ease of use, effectiveness, efficiency, and overall satisfaction. A statewide user survey found a high level of user satisfaction and practical application.
Degree of user input in system design and modifications:	High
New functionalities in development:	Development and implementation of the Query Router / Query Broker architecture in FINDER 4.0. This architecture allows for a scalable, hierarchical structure to the system network. It also provides an open interface

that supports interactivity with other data sharing systems. PawnSuite add-on is being moved into the deployment phase. This includes the ability to import data from existing commercial pawn applications as well as providing a data entry system for pawn shops that do not have commercial applications. Data can now be transferred electronically from the pawn shops to the local agency and into the FINDER network. Version 4.0 has been undergoing testing. This includes both beta testing at limited agencies and in-house integration testing. The query broker system has passed testing. The query router is undergoing testing to ensure scalability.

Interstate Connections:

Ten agencies in Georgia have agreed to connect with FINDER along with the Mississippi MASP project.

Research – Publications and Presentations

Publications:

Reynolds, K. Michael, Pamala Griset, Ernest Scott, Jr. "Law Enforcement Information Sharing: A Florida Case Study." American Journal of Criminal Justice. Forthcoming Fall 2006.

Kursun, O., Reynolds, K., Favorov, O. (2006) Matching Images of Never-before-seen Individuals in Large Law Enforcement Databases. IEEE International Conference on Intelligence and Security Informatics (ISI-2006), San Diego, CA (conference proceedings)

Kursun, O., Koufakou, A., Chen, B., Georgiopoulos, M., Reynolds, K.M., Eaglin, R. (2006) A Dictionary-based Approach to Fast and Accurate Name Matching in Large Law Enforcement Databases. IEEE International Conference on Intelligence and Security Informatics (ISI-2006), San Diego, CA.

Kursun, O., Koufakou, A., Chen, B., Georgiopoulos, M., Reynolds, K.M., Eaglin, R. (2006b) A Novel Approach to Fast and Accurate Name Matching In Large Databases in Homeland Security Applications. IEEE International Conference on Intelligence and Security Informatics (ISI-2006), San Diego, CA. (conference proceedings)

Kursun, O., Koufakou, A., Wakchaure, A., Georgiopoulos, M., Reynolds, K., Eaglin, R. (2006a) ANSWER: Approximate Name Search With ERRors in Large Databases by a Novel Approach Based on Prefix-Dictionary (accepted to International Journal on Artificial Intelligence Tools, in-press, 2006).

Reynolds, K. Michael, Griset, Pamela, and Ronald Eaglin. 2005. "Controlling Terrorism Through Automated Sharing of Low-Level Law Enforcement Data." Law Enforcement Executive Forum, Vol.5(5).

Koufakou, A., Wakchaure, A., Kursun, O., Georgiopoulos, M., Reynolds, K., Eaglin, R. (2005) Burglary Data Mining - A Three Tiered Approach: Local, State, And Nation-Wide. GIS Symposium 2005, Troy State University, Troy, AL. (conference proceedings)

Kursun, O., Reynolds, K., Eaglin, R., Chen, B., Georgiopoulos, M. (2005) Detection and Visualization of Auto Theft Recovery Patterns Across Jurisdictions. GIS Symposium 2005, Troy State University, Troy, AL. (conference proceedings)

Presentations:

2005 "An Affordable Data-Integration Model: The Florida Data Sharing Consortium." U.S. Department of Justice, National Institute of Justice. Information Led-Policing: Program Review and Technical Working Group Meeting. Washington, D.C., October.

2005 "The Florida Integrated Data Exchange and Retrieval Information Sharing Program: Overcoming Data-interopability Challenges." U. S. Department Justice, National Institute of Justice. Annual Conference on Criminal Justice Research. Washington, D.C., July.

2005 "An Affordable Information Sharing Solution: Sharing Low-level Police Information." U.S. Department of Justice, Rural Law Enforcement Technology Institute, San Diego, CA., October.

2005 "Solving the Data-Interopability Problem: The Florida Data Sharing Consortium." U.S. Department of Justice, Bureau of Justice Statistics, Justice Research and Statistics Association: Crime and Statistics in the 21st Century, Using Data and Technology to Improve Justice. St. Petersburg, FL., October.

2005 "A Statewide Data-Integration Low-cost Solution for Law Enforcement." San Antonio, Texas, Regional Data-Integration Working Group. October.

2005 "A Statewide Data-Integration Low-cost Solution for Law Enforcement."
Oklahoma Automated Security Information Systems Consortium, Oklahoma City, June.

2005 "A Statewide Data-Integration Low-cost Solution for Law Enforcement."
Arkansas State Data-Integration Committee, Little Rock, July.

Reynolds, K. (2005) A National Model for Information Sharing. 2nd Annual Public Affairs Research Conference, October 2005, University of Central Florida, Orlando, FL.

Survey Research - Evaluation

A 14-item survey, containing 48-subquestions, was administered to 367 Florida law enforcement chief executive officers; 301 police chiefs and 66 sheriffs. To date, there is a 28% response rate comprised of 83 police chiefs and 17 sheriffs.

Regarding current levels of electronic information sharing, a brief descriptive analysis of the data seem to indicate that, with specific information types, such as suspect information, witness information, and field interview information to name a few, a majority of the agencies collect their information in an electronic format. Moreover, there is a high level of consensus among chief executive officers that this information is important to share. However, their agencies do not routinely share this information electronically. Survey responses reveal that overall levels of electronic information sharing of specific information types between agencies remain low.

Regarding levels of participation in a Florida law enforcement information sharing project, 57 respondents (63%) reported that their agency participates in an information sharing initiative. The Florida Law Enforcement Data Sharing Consortium, with the FINDER system, had the highest level of participant respondents, with 24 respondents, or 22%, saying that they participate.

Survey responses indicate that a majority of respondents "agreed" or "strongly agreed" that the cost of technology, the cost of personnel, the agency's liability for misused data, data warehousing, data ownership, and data security, were all important issues regarding electronic information sharing among law enforcement agencies.

On the topics of funding, implementation, and current support levels of local, state, and federal governments, descriptive indicators suggest that a majority of respondents "agreed" to "strongly agreed" that funding for information sharing among Florida law enforcement agencies should be provided at the state and federal level; that implementation of such projects should be conducted by local, state and federal governments; and that, while local and state government are doing a good job at supporting Florida's law enforcement information sharing efforts, the federal government is not.

Regarding the issues of budgeting for information sharing, descriptive indicators suggest that 21% of respondents would be willing to spend zero dollars from their regular operating budgets this year to facilitate information sharing with other Florida law enforcement agencies; 33% would be willing to spend between \$1,000-\$5,000 from their regular operating budgets this year to facilitate information sharing with other Florida law enforcement agencies; and 13% would be willing to spend between \$5,000-\$10,000 from their regular operating budgets this year to facilitate information sharing with other Florida law enforcement agencies.

Finally, descriptive indicators suggest that a majority of respondents, 53%, believe that the implementation of information sharing between all law enforcement agencies in Florida will be a "moderately difficult" task to complete.

Please note that this is an on-going study from which only brief descriptive indicators have been generated at this time for this report. More in-depth statistical and analytical results will be made available at the conclusion of this study.

Pawn Suite – Additional FINDER Module

Numerous participants in the previous data consortium meetings have expressed that there is a pressing need for a summarization and visualization pawn activity tool. This tool will assist law enforcement personnel, such as pawn analysts and investigators, to easily view and identifying pawn activity that should be further investigated. This tool will be based upon certain features of the pawnshop customers (e.g. name, date of birth, physical characteristics, criminal records, etc.), as well as their pawn activity characteristics (e.g. frequency with which they pawn items over a specified period of time, value of the items they pawn, pawn shop locations they visit, etc). The pawn features we will be using for our experiments come from a 4 year (213 week) database with more than a million records of pawn transactions (1,035,395 to be exact), and are listed below:

- Pawn frequency, i.e. how many pawn transactions the individual has in each week.
- Pawn value, i.e. the total value of each pawning transaction per week.
- Pawning transaction type, i.e. number of times the individual borrowed money or sold the items (buy, loan, or other).
- Pawn item type, i.e. number of times a specific type of item was pawned (Jewelry, Firearm, or Other, J/O/F).
- Location, i.e. pawn locations a person visits every week. For that purpose, we count the distinct pawn shops visited each week, as well as the average geographical distance that the individual has traveled in order to pawn his/her items each week.

The first step is to provide the pawn analysts and other law enforcement personnel with visualization tools depicting the weekly, monthly, or yearly pawn activity of distinct individuals, as well as groups of individuals. We give the user the option to create various graph plots by selecting different features from the ones listed above, for example pawn total values versus pawn frequency, and pawn frequency versus distance traveled. The user is also be able to choose a time period for the plots, i.e. per week/month/year. This

way, the user can visualize the pawn activity for the selected period of time, and then easily identify the outliers, i.e. the pawn activity that is outside the norm, or that looks suspicious. Then, they can choose to view the coordinates of a data point on the plot by placing the mouse over the point, and get further information on the corresponding pawn activity by clicking at the corresponding data point (individual) on the graph plot. This will bring up a menu that the user can use to select between viewing a report of the individual's transactions, or a summary of items pawned, or a graph plot of the pawn activity, or the distance traveled of that individual for the past week, month, or year. The user can also select a group of data points (individuals) that appear interesting, instead of a single point, and select similar plots and reports for these individuals. The menu also gives the user the option of viewing the associates of this person, and then view the pawn activity of those associates, through the related reports and graphs as the ones listed above.

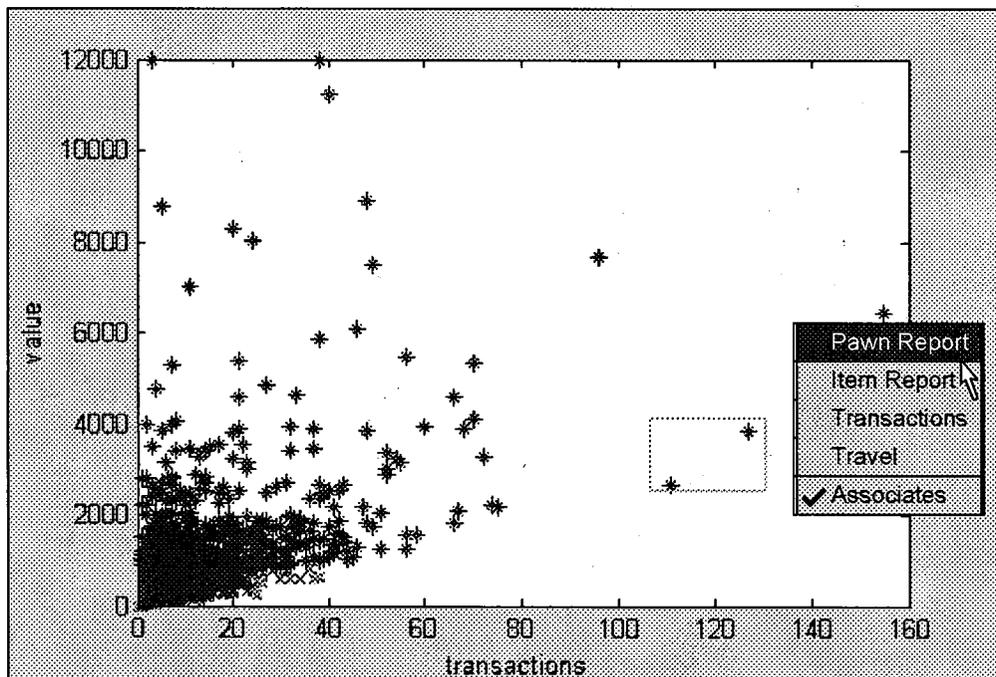


Figure 1. A graph plot depicting total pawn transactions number vs. total pawn value, for a one-year time period; the user has selected a group of 2 data points, checked the Associates menu item, and highlighted the Pawn Report menu option.

What we provide is the capability to find people with suspicious activity, for example: "find people who pawn more than 5 times a week, and travel more than 25 miles", or "show top 10 highest value transactions". A sample query return is shown below:

First	Last	Pawns	Value	Shops	Travel
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<u>Julia</u>	<u>Hill</u>	10	200	3	40
<u>Mike</u>	<u>Smith</u>	9	250	2	15
<u>Adam</u>	<u>Fleishman</u>	3	1000	4	25

The pawn transactions also have a link that brings up the pawn tickets for that person. For example:

Name	Julia H
Items	10
Items	22
Item types	20 jewelry, 2 other
Zip code	32819
Pawn Shops	3
Pawn ZIPs	32819, 32817, 32801
Distance	40
Associates	John H, Mike S, Will D

ANSWER: Approximate Name Search With ERrors

The obvious need for using modern computer networking capabilities to enable the effective sharing of information has resulted in data-sharing systems which store, and manage large amounts of data. These data need to be effectively searched and analyzed. In doing so, there are a number of major issues that ought to be addressed. One such issue is the issue of dirty data, which is the focus of our work. In particular, in the presence of dirty data, a search for specific information by a standard query (e.g., search for a name that is misspelled or mistyped) does not return all needed information. This is an issue of grave importance in homeland security, criminology, medical applications, GIS (geographic information systems) and so on.

First Name	Error Bit	# of Returns
YOUSEF	1	4

Last Name	Error Bit	Time (mSec)
KODAXR	1	934

FirstName	Distance_F	LastName	Distance_L
YOUSEF	1	KODAXR	1
YOUSEF	0	KODAXAR	1
YOUSEF	0	KODAXR	0
YOUSEF	0	KONAXR	1

Simple but promising trial implementation of ANSWER in FINDER environment.

There is room for significant improvements to this version, more specifically:

develop an algorithm for faster database access, enhance the user interface, and

connect with the other tools in FINDER such as the associates-module.

Conclusion

The Florida Data Sharing Consortium FINDER project now serves 135 law enforcement agencies. A pilot project that will connect FINDER to the Mississippi gulf coast MASP project has been initiated. Three dissertations are in progress now regarding this project. One is gathering detailed user information. Preliminary analyses of two independent Florida FINDER surveys overwhelming report user acceptance and success. Several more journal publications are underway (one has been submitted and pending review). The most rewarding component of this project has been the widespread practitioner use and subsequent results. FINDER has demonstrated that affordable and reliable distributed database designs are an acceptable model for rapid deployment and results. By using a service oriented architecture combined with an application that is easy to use and provides real-time access in a federated environment, inter-jurisdictional information sharing is relatively easy to implement and operate.