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Forensic information management system

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FORENSIC INFORMATION MANAGEMENT SYSTEM

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**Thesis submitted to
The College of Engineering and Mineral Resources
at West Virginia University
in partial fulfillment of the requirements
for the degree of**

**Master of Science
in
Industrial Engineering**

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Dr. Warren R. Myers
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Department of Industrial and Management Systems Engineering

**Morgantown, West Virginia
2004**

**Keywords: Automation, Process Reengineering, Biochemistry, Drug, LIMS,
.Net, PDA**

ABSTRACT

FORENSIC INFORMATION MANAGEMENT SYSTEM

ArunShankar Srinivasan

The primary objectives of this project were to reduce the paper work, increase data reliability and reduce process turnaround time at the West Virginia State Police Forensic Laboratory (WVSPFL) Charleston, WV. The objective was achieved by re-engineering and automating various processes in the seven units of the laboratory. A software tool called Forensic Information Management System (FIMS) was developed. FIMS was implemented in Visual Studio.Net; MS-SQL server was used as the database. The FIMS can be accessed via the internet/intranet, Personal Digital Assistant (PDA), or a stand-alone desktop computer. The key benefits of FIMS are its ability to integrate information flow, information exchange between Originating (ORI) agencies, track the status of cases submitted to WVSPFL, report generation and directly uploading of data to the Laboratory Information Management System (LIMS).

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DEDICATION

To the *Love* and *Affection* of my Parents
Mr. Srinivasan & Mrs. Jayalakshmi Srinivasan

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LIST OF ACRONYMS

ACN	Agency Case Number
AFIS	Automated Fingerprint Identification Systems
CEP	Central Evidence Processing
CER	Central Evidence Receiving
CODIS	Combined DNA Index System
CR	Case Reporting
DC	Document Checklist
DL	Document Laboratory Report Form
EA	Evidence Extraction and Amplification
EP	Evidence Processing
FA1	Tool / Tool mark Worksheet
FA10	Visual / Microscopic Residue Examination Worksheet
FA11	Distance Determination Worksheet
FA12	Chemical Residue Worksheet
FA13	Q/A Case Form
FA2	Photo Notes Worksheet
FA3	Text Notes Worksheet
FA4	Loaded Cartridge Worksheet
FA5	Fired Cartridge Worksheet
FA6	Fired Bullet / General Rifling Characteristics Worksheet
FA7	Firearm Exam Worksheet A-
FA8	Firearm Exam Worksheet B
FA9	Comparison / Examination Worksheet
FTR	Footwear and Tire Track Review Checklist
FW	Foot Wear Examination Worksheet
GC	Glass Comparison
GCR	Glass Comparison Review
GR	Gunshot Residue
GRR	Gunshot Residue Review
HTML	Hyper Text Markup Language
IL	Ignitable Liquid
ILR	Ignitable Liquid Review
LEIF	Laboratory Evidence Inventory Form
LEIF	Laboratory Evidence Inventory Form
LIMS	Laboratory Information Management System
LP1	Technical Procedures Form
LP2	Initial analysis of Submitted Latent Lifts and Photographs

LP3	Analysis of Latent Prints
LP4	Analysis of Exemplar Prints
LP5	ACE-V Worksheet for Inked Fingerprint Comparisons
LP6	Comparison, Evaluation and Verification of Latent Prints
MCA	Miscellaneous Analysis
MCAR	Miscellaneous Analysis Review
MMIT	Microsoft Mobile Internet Toolkit
MT	Marihuana Test
ORI	ORIGinating agency codes
PC	Paint Comparison Form
PCR	Paint Comparison Review
PDA	Personal Digital Assistant
SE	Speedometer Test
SER	Speedometer Test Review
TC	Tablet and Capsule Test
TT	Tire Track Examination worksheet
TX1	Toxicology Work Sheet
TX2	Drug Analysis Sheet
UP	Unknown Powder Test
WAP	Wireless Application Protocol
WML	Wireless Markup Language
WVSPFL	West Virginia State Police Forensics Laboratory

1.0 INTRODUCTION

West Virginia State Police Forensic Laboratory (WVSPFL) is located in Charleston, WV. WVSPFL is an American Society of Crime Laboratory Directors-Laboratory Accreditation Board (ASCD-LAB) accredited laboratory that performs specialized examination of evidence that is collected during criminal investigations. The Forensic Laboratory is a full service laboratory that provides forensic services to all law enforcement agencies in the state and administers the state COmbined DNA Index System (CODIS), and Automated Fingerprint Identification System (AFIS). The goal of WVSPFL is to generate accurate, impartial, and timely scientific examinations and opinions for the criminal justice system of the state. The laboratory is organized in seven units and their functions are briefly outlined below.

1) Bio Chemistry (DNA) Unit

- Analysis of biological materials.

2) Fire Arms/ Tool Marks Unit

- Identification and comparison of tool marks, firearms and distance determination.
- Analysis of obliterated marks, fractured, cut or torn items, and impressions.

3) Trace Evidence Unit

- Identification and comparison of paint, glass, and building materials.
- Analysis and identification of ignitable liquids in charred debris & other forms of evidence and gunshot residues.

4) Drug Testing Unit

- Analysis and identification of controlled substances.

5) Latent Prints Unit

- Analysis, comparison, evaluation and verification of friction ridge skin impressions.

6) Toxicology Unit

- Analysis, identification and quantification of ethyl alcohol, suspected alcoholic beverages, and blood alcohol content level.
- Analysis of urine and blood specimens for the presence of drugs.

7) Questioned Documents Unit

- Analysis and comparison of questioned documents.
- Analysis and comparison of footwear and tire tread impressions.

The traditional processes at WVSPFL involve a series of methods to collect evidence from the crime scene and to retrieve the maximum possible amount of information from it. The forensic process includes collection, examination, analysis and reporting [1]. From storing evidence to retrieving processed sample data, the primary focus of WVSPFL is to ensure the preservation and reliability of evidence records.

At present, many of the processes at the WVSPFL are done manually. There are over 1000 ORIGINating (ORI) codes identifying agencies in the state that send evidence/items for testing. After the items are collected, they are analyzed in the forensics lab and the results are entered in the Laboratory Information Management System (LIMS). The status of a lab case can be known only by contacting WVSPFL personally, which is time consuming. After performing the appropriate tests, the evidence and the corresponding reports are sent back to the investigation officer.

Each evaluation or examination phase creates a large amount of handwritten paperwork. In some cases, processing files can be 250 pages in length. After paperwork is completed for each case, it is entered through a computer software package that interfaces with the LIMS database, where the information is stored for future use. LIMS is an oracle based database system, which can be queried to retrieve the needed information. A brief description of LIMS follows.

1.1 Laboratory Information Management Systems (LIMS)

LIMS [2] is a specialized software program that coordinates and streamlines laboratory operations. It is an information management system designed specifically for analytical laboratory that includes research and development (R&D) labs, in-process testing labs, quality assurance (QA) labs, and more. LIMS helps laboratories increase productivity, lower operating costs, and improves quality [3]. LIMS connects analytical instruments in the lab to one or more workstations or a personal computer (PC).

Originally, LIMS was developed in-house by organizations wishing to streamline their data acquisition and reporting processes [4]. Demand for Customization has

increased the cost of the commercial LIMS and implementation time. Statistics have shown that 60% of LIMS purchased are never fully implemented [2] because the task was bigger than first anticipated and not enough time and resources (usually manpower) were dedicated. The installation phase of a LIMS project can take weeks or months depending on the size of the laboratory and the complexity of the project [5]. Many of the popular commercial LIMS take advantage of open systems architectures and platforms to offer client/server capabilities and enterprise-wide access to lab information.

1.2 Problem Statement

The key objective of this project was to reengineer the flow of documentations and information to reduce the paper work at the WVSPFL and to streamline its processes. The objective were obtained by

- Examining existing processes at WVSPFL.
- Reengineering the processes to
 - Increase data reliability
 - Decrease process turnaround time
 - Minimize duplication.
- Develop a software tool for efficient flow of information between various units
 - Develop a database to store case information.
 - Develop a web based, windows based, and mobile (PDA) based programming environment.
 - Interface WVSPFL database with the LIMS system.

1.3 Literature Review

Manual processes are inefficient, error prone and create day-to-day setbacks in productivity. For years, law enforcement, transportation agencies and many other departments have been working with paper. Manual reports contain errors in information and incomplete information. Some times the information could not be understood because of poor handwriting [6]. Multiple data entry increases the likelihood of errors. An organization cannot offer its customers a high level of service if its data administration is slow, disorganized and disconnected. For a workplace to be highly

efficient and productive, it must offer its employee's timesaving, less labor-intensive methods of processing workflow. The disadvantages of traditional paper processes [7] are:

- It costs more to produce supplies of paper forms.
- Paper forms require hand processing that wastes time and staff resources.
- Paper forms can be easily lost and misrouted causing miscommunication.
- Paper requests can be held up and miss deadlines because of the need for handwritten signatures.

Manual processes are labor intensive - multiple participants involved in completing routine tasks reduce employee productivity; automated solutions allow employees to devote valuable time to core business activities.

Status checking of an operation is difficult with manual processes - employees cannot easily determine the status of their request once submitted; automated solutions allow for real-time status notification.

Manual processes lead to incomplete or lost tasks - organizations cannot avoid it. Ultimately, a manual process suffers a breakdown due to occasional human error. Automated solutions reduce the percentage of tasks that get "lost in the cracks". It has been reported that software automation results in 70% increase in production and 90% reduction in cost [8]. Automated solutions can solve the problems that are inherent in manual processing using desktop computers, handheld computers or the Internet.

Currently, there is backlog of cases at the WVSPFL. According to Captain Ted Smith, WVSPFL has about 300 backlogged cases in the DNA unit and approximately 1500 cases overall in the lab [9]. The backlog primarily exists in two sections: biochemistry, (which tests blood and other body fluids, including DNA), and drug testing. The National Institute of Justice (NIJ) estimates the backlog nationwide is 350,000 in DNA samples [9]. The current backlog is caused by new demands for DNA analysis of old cases. Added resources and manpower is required to meet this need.

In order to minimize the problems due to manual work, organizations need to apply automated solutions [7]. Currently, the use of computer software, web browsers, databases, networks, and e-mail makes it possible to automate many processes. Advances in information technology allow corporations secure storage of information,

instantaneous routing of information and electronic forms for process management [7]. The Supreme Court adopted a new rule in January 2001 permitting officers to use handheld computers or other devices, instead of the traditional paper pads, to issue citations [10]. Some devices record data into an e-ticket with a simple swipe of a driver's license. This has opened a new field for automation.

The entire docketing and scheduling functions in Municipal Civil Courts were done manually [11]. The automation project now assists in the assignment of case numbers, scheduling of court events, and maintaining case files. The project was intended to reduce paper work and improve the efficiency of the docketing and scheduling functions that resulted in a total system evaluation. It laid the foundation for future enhancements such as electronic filing and remote access to electronic files.

There was a need for automation in Pennsylvania civil trial division that had twenty eight thousand pending law suites during the late 90's. The sheer volume of filings and cases underscored the need for efficient access to information for both attorneys and the public. Later, automated management tool was designed and implemented that contains an estimated 1.7 million Philadelphia civil cases [12].

The state of Iowa experienced problems when their law enforcement and transportation cooperation agencies were frustrated with manual paper work on crash reports [6]. The time period from initial crash report to its final destination took up to 18 months. The data had to be re-entered by different people when they found errors due to poor handwriting. Additionally, the location reference system in the crash report left much to be desired and was very labor intensive. The State of Iowa with the Federal Highway Administration developed a mobile system called TraCS Environment, which is a client software based on the Microsoft Windows platform. Using a laptop computer and a scanner, officers can collect data, validate data, complete reports and citations, print reports and citations and receive information through the TraCS environment. TraCS environment can utilize relational databases such as Oracle, Microsoft Access or SQL server. The barcode scanner was used to populate data from driver's license. It eliminated up to 750 keystrokes in a crash report and up to 200 keystrokes in a traffic citation [6].

An automated Marriage Data Management System has been in use in Massachusetts since 1996 [13]. When a couple applies for a marriage license, the data is

entered into the system and retained in a certified format so that certified copies can be printed at any time. It takes only 14 seconds for a staff member to locate the record and print a certified copy. The Dog License Data Management System [13] that was developed in 1998 works similarly as applying for marriage licenses. The annual renewal process is greatly simplified.

Automation technology is also playing a significant role in medical records department. The process of gathering information that is created during a patient visit is an enormous task. The required data for a complete medical record varies by patient type, nature of visit/treatments etc. There is a risk that paper document could be lost or damaged. Tracking old records is a tedious process and hence the chart deficiency tracking system was developed [14]. In this system, the user can track down patient documents from all the departments and put the medical record together. With the power of automation technology, it is possible to reduce redundant steps and have more efficient processes with increased productivity in medical records department.

Bon Secours Richmond Health System had a registration process that was cumbersome and error-prone as the admissions department had to manually retrieve, reproduce, create, and assemble the customized materials for each incoming patient [15]. In addition, all patient data was captured manually, which created additional opportunities for error. Once the patient information was captured, it needs to be manually routed to the appropriate department for patient care, patient tracking, or billing purposes. The company installed Patient Link-Up Enterprise (PLUE) System [15], an integrated solution that combines bar code technology and forms automation software. This automation has significantly reduced the time required to complete patient registration, therefore reducing patient wait times.

Report Automation System (RAS) electronically captures report and forms information from multiple mainframe and other host computers, even if they are from different hospital systems [16]. It combines, stores, displays, and electronically distributes reports based on user-selected criteria; compiles pieces of multi-page hospital reports into single department specific reports, and can extract data for use in spreadsheet and database programs. These functions give users in varying departments or locations

the ability to view or print reports that otherwise would have to be printed and distributed on many pages.

Esso Production Malaysia Incorporated (EPMI) implemented Platform Data Capture project (PDCAP) to improve the efficiency and effectiveness of the data gathering and reporting activities on offshore platforms [17]. The implementation of the PDCAP project allowed the company to capture production and operation data on offshore platforms using existing computing technology in combination with hand-held data entry terminals, personal computers and data acquisition mini-computers. This demonstrates the use of computing technology to reduce time spent by offshore staff on routine manual tasks of data gathering and reporting.

Laboratory Data Solutions Limited has launched Labsform, a new software application for routine data recording in the laboratory [18]. Labsform has been designed to operate alongside the LIMS software, filling an important gap in electronic data recording and management. The product provides users with the freedom to convert existing paper-based recording systems into electronic templates.

In addition to the web based automation system, recent advances in technology have created ability to automate using Personal Digital Assistant (PDA). PDA technology improved healthcare by providing facilities for rapid order entry, collecting clinical information and access the patient record via wireless communication [19]. PDA's offer clinicians the ability to manage and enter critical information at the point of care in the University of Washington Neonatal Intensive Care Unit.

Aether Systems Inc. received a contract from Pennsylvania state police to design and implement state police vehicles with wireless automation software. The project is going to replace the manual forms and reports that are currently in practice. It is going to streamline the data-collection process, eliminate duplication of entry and give instant access to information to anyone in the system. Aether plans to provide software that will allow police officers to file incident reports from remote locations and access 14 databases that track reports of stolen cars, vehicle registration, gun ownership and other information. Work on the contract began in July 2002, and the project is expected to take 46 months [20].

The National Institute of Justice is developing an informational technology system providing inter-regional information sharing among law enforcement agencies. The system provides access to information within a jurisdiction and provides the capability to query information sources from other agencies with appropriate privacy and security [21].

The PDA's have the potential to dramatically increase mobility and decrease the operation cost [22]. According to Santa Ana police department in California, approximately 50% of their citations were defective in some fashion or another [23]. When any misinformation occurs, it must be legally corrected via a "citation amendment" process that can lead to critical delays. They now utilize the PDA's to issue citation. The information is written to a Secure Digital Flash memory card and can be downloaded to their database system back in the department office. PDA's can have large memory capacity and work faster [24]. Currently, 20 officers are utilizing this system. The electronic citation solution reduced the 50 percent citation inaccuracy rate to less than 1 percent [23].

The Houston city police use the Motorola Premier handheld device to issue citations [25]. The premier handheld wireless component also enables real time wireless queries to the National Crime Information Center, National Law Enforcement Telecommunication System and other state and local information databases.

FedEx Corp. and Motorola Inc. have built a PDA that FedEx plans to distribute to its drivers [26]. The PowerPad runs on the Microsoft Pocket PC operating system and PDA will capture, store, and transmit the signature to FedEx's database via a public wireless network or FedEx's private network. The Ontario police department also uses handheld devices and wireless connectivity to check fingerprints of the person in an incident scene by linking to the city's fingerprint database [27].

Although many stand-alone systems exist for PDA, none are designed to work in an integrated client/server environment [28]. There is need for a common environment in which the user can work on any platform, by intranet, internet, PC or the PDA.

2.0 WVSPFL PROCESSES

The purpose of WVSPFL is to process and analyze evidence submitted by over 1000 Originating (ORI) agencies in the state. After the evidence/items are processed and analyzed, each unit prepares a report and the data is entered in LIMS. Figure 2.0 shows the overall organizational structure of WVSPFL. The functions of seven units of WVSPFL are explained below.

Figure 2.0: Various Departments in WVSPFL

2.1 The Biochemistry (DNA) Unit

Biochemistry (DNA) is the unit of the laboratory that processes/examines biological evidence and performs DNA analysis on the evidence. All of the DNA analysis done in this unit is PCR-based (cloning) and done in accordance with the guidelines recommended by the National DNA Advisory Board, the Scientific Working Group on DNA Analysis Methods, and the American Society of Crime Laboratory Directors - Laboratory Accreditation Board [29]. Biochemistry manages the Convicted Offender DNA Identification System (CODIS) project for the State of West Virginia. All individuals convicted of violent crimes and sex offences in the State of West Virginia are required to provide the State Police with a blood sample for DNA analysis. After analysis, the DNA profile of the individual is entered into the national database for search purposes in unsolved crimes. Nationally, the FBI manages the CODIS project.

Case Reporting (CR) in the Biochemistry (DNA) unit receives evidence from the ORI agency. Case Reporting applications entail recording information from a particular officer's point of view of the crime scene. Case Reporting is split into two separate sections: Reporter Information and Investigation Report. The Reporter Information section contains the reporting officer's personal information including address and phone number. The Investigation Report section contains crime description, victim information, suspect information, and evidence/items submitted to the Biochemistry (DNA) unit. It is conclusive that this phase encompasses a substantial portion of the goal of preparing evidence for future testing. The case reporting approves evidence/items and completes the CR form. The evidence/items and the CR form are sent to the Storage of Evidence.

The evidence/items can be anything (of any size or shape) that might be useful in determining information about a case. Facilities at the WVSPFL can accommodate items of various irregular shapes. The most important consideration in storage of evidence is to preserve the evidence. As evidence is handled, possible contamination is always an issue especially at the DNA level. Thus, limiting the amount of processing steps will help in providing evaluations of the evidence. Appropriate containers, bags and boxes are imperative for less opportunity for the loss of evidence integrity. The ideal situation for the DNA unit is to receive evidence exactly as it was found after a crime was committed. The Laboratory Evidence Inventory Form (LEIF) is used to maintain evidence inventory. The evidence and information flow in the DNA unit is shown in Figure 2.1.

Evidence Processing receives the evidence/items and the LEIF form. It is clearly inefficient to do DNA testing on insignificant portions of an item. The Evidence Processing phase deals with performing comprehensive visual examination of all evidence/items submitted before they are subjected to testing. The decoding of submitted evidence, separation of critical points and areas of items, the creation of photographic documentation, and the construction of an organized "file" of real evidence are crucial in evidence preparation. This "file" is held in a bar-coded envelope and placed inside freezer located within the DNA unit.

Figure 2.1: The Biochemistry (DNA) Unit

The barcode is the key in referencing the evidence items back to the *Lab Case Number* of a file. Thus, when a case file is made active, it is simple to retrieve the appropriate items for future extraction and amplification. The envelope remains in the freezer till an event reactivates the case. Until that time the case file remains static. The analyst conducting evidence processing completes the Evidence Processing (EP) form and all records are kept in a “hard-copy” file. Additionally, this information is also entered into a computer.

The evidence is sent to Evidence Extraction phase because all items have been resized and reshaped to a condensed, workable form, evidence extraction takes place immediately. Each individual operator must record information on the Evidence Extraction (EA) form regarding the testing of evidence/items throughout the process. A computer operator enters the data from the form to the computer.

Evidence Amplification receives extracted evidence and the LEIF form. After testing the evidence, the Evidence Amplification (EA) form is completed. The EA, CR, and LEIF forms are then verified and used to produce a draft report. The DNA analyst produces the draft report and then the secretary prepares final draft report. The final draft report is then sent back to the DNA Analyst/Reviewer for initials. The evidence and the final report are then sent to the ORI agency.

2.2 Drug Identification Unit

The purpose of the Drug Identification unit is to analyze and identify any suspected controlled substances that are submitted to the Laboratory from city, county, state, or federal police agencies. In order to achieve this, WVSPFL employs seven chemists. The evidence is analyzed in two steps. First, the substance is subjected to a series of preliminary tests. These tests give an indication of what the substance might be and suggest further analysis. The possible workflow's are Vegetation testing, Tablet and Capsule testing and Unknown Powder Testing. After the tests are performed, the appropriate forms are completed.

The confirmation step is positive identification of the substance using two different instruments - the Gas Chromatograph/Mass Spectrometer and Fourier Transform Infrared Spectrometer. Once the drugs are identified, all evidence and the final report are returned to the submitting officer. The evidence and information flow in Drug Identification unit is shown in Figure 2.2.

Figure 2.2 : Drug Identification Unit

2.3 Firearms / Tool Marks Unit

The Firearms/Tool Marks Unit of WVSPFL serves all 55 counties in West Virginia. When a shooting crime occurs, the firearms evidence is sent to the laboratory for evaluation. The flow of evidence and information in the Firearms/Tool Marks unit is shown in Figure 2.3.

Figure 2.3 : Firearms/Tool Marks unit

Evidence can be firearms, fired cartridge cases or fired bullets. By test firing the weapon and recovering the fired bullets and cartridge cases, comparisons are made with the evidence from the crime scene. This allows the examiner to view unique microscopic imperfections placed on the evidence and test fires by the firearm that fired them. The examiner can often identify the specific firearm used in a homicide or other shooting crime. A lesser-known area is the ability of the examiners to identify tool marks at a crime scene with the tool that made them. For example, a pair of bolt cutters used to cut a lock at the scene of a crime will often leave microscopic striations that can later be used to identify the suspect's bolt cutters. Screwdrivers, saws, pliers, hammers can leave unique marks on surfaces at crime scenes.

The Firearms/Tool Marks unit has a computerized digital imaging system that allows firearm evidence to be compared on screen, stored and printed. A new system

called the National Integrated Ballistics Information Network (NIBIN) allows nationwide comparisons of fired cartridge cases from other crime scenes where cartridge cases were fired. This new technology will allow for a computerized search of data to possibly link serial shooting cases that may have never been linked before. After all the tests are performed, the appropriate forms are completed.

2.4 Latent Print Unit

A latent print is the hidden residue (perspiration, natural oils) left when the underside of the fingers and palms (or the underside of the bare toes and feet) come in contact with a surface. Because the impression is often invisible to the naked eye, it is called a latent or hidden print. If properly recovered, the latent print can potentially lead the investigator to the perpetrator of the crime and later be used as evidence against that individual at a trial. The Latent Print unit of the WVSPFL receives thousands of pieces of evidence a year, collected from crime scenes by police investigators for the various law enforcement agencies throughout the state. This evidence is put through a variety of physical and chemical processes designed to reveal the presence of latent impressions. Some of the processes are old and familiar such as powdering while others are relatively new and less familiar such as super glue fuming and the use of fluorescent chemicals and alternative light sources. The flow of evidence and information in the Latent Print unit is shown in Figure 2.4.

Figure 2.4: Latent Print Unit

Once a latent print has been developed, the examiner evaluates the print and determines whether the impression contains enough information to allow for a positive identification. If an examiner can match the points of identification between a latent print and the known prints of a person then a positive identification is made. In addition to processing evidence and comparing latent prints in the Laboratory, the examiners lend technical assistance to the police investigator by going to major crime scenes and processing the scene for latent prints and collecting evidence to be transported to the laboratory. They are also available for court testimony on all cases worked in the unit and usually testify 25 to 30 times a year. In addition to the 1300 plus latent print cases worked in the unit

annually. After all the tests are performed, the appropriate forms are completed out manually.

2.5 Questioned Documents Unit

The Questioned Document Unit of the Forensic Laboratory is responsible for the examination of document evidence related to criminal investigations and impression evidences. These documents may include, but are not limited to checks, withdrawal forms, credit card receipts, demand notes, suicide notes, anonymous letters, firearms transaction reports, insurance claim forms and prescriptions. Cases are submitted to the WVSPFL by a police officer from an ORI agency.

Questioned documents are compared to known standards to identify or eliminate a suspect by evaluating handwriting or hand printing, including letters and numerals. However, the scope of analysis is not limited to handwriting exclusively. Other examinations can identify or eliminate suspect typewriters, check writers and rubber stamps. Many additional exams are performed to assist the investigator. For example, physical matches between torn papers can be made (this includes notebooks, wrappers or matchbooks). Watermarks can be examined to determine the date and or the manufacturer of the questioned paper. Indented writings can be visualized with a piece of equipment called the Electrostatic Detection Apparatus (ESDA) resulting in an ESDA print.

Questioned photocopies can be examined and linked back to a photocopier provided there are enough identifying features on the questioned copies and known samples are taken a short time after the questioned documents were made. The functions of Questioned Document Unit are shown in Figure 2.5.

Figure 2.5: Questioned Documents Unit

Inks can be evaluated with different wavelengths of light to determine if writing was added, or to visualize obliterated writing on questioned documents. Documents from computer printers can be classified as being produced from a dot matrix, ink jet or laser printer. After all the tests are performed, the appropriate forms are completed.

2.6 Toxicology Unit

The Toxicology unit performs test in three primary areas Breath Alcohol, Blood Alcohol and Drug Toxicology. A Driving under the Influence (DUI) arrest may include a drawing of the suspect's blood, which is analyzed for presence of alcohol. The evidence is received and analyzed, then a report is generated and the evidence is returned to the arresting officer. These cases currently run about 500 a year. Also, the Toxicology unit determines the alcohol content of alcoholic beverages seized in illegal activities. The functions of the Toxicology unit are shown in Figure 2.6.

If an officer believes that a DUI suspect is under the influence of some drugs, blood or urine may be submitted for tests to determine their presence. This evidence is screened to determine which class of drugs is present so that an extraction may be performed to separate that particular drug from the sample. After the extraction is performed, a confirmation is performed on the extracted drug, a report is generated and the evidence is returned to the arresting officer. These cases currently run about 200 a year. After all the tests are performed, the forms TX1 and TX2 are completed.

Figure 2.6: Toxicology Unit

2.7 Trace Evidence Unit

The Trace Evidence Unit of the WVSPFL is responsible for a broad area of forensics concerned with many scientific methods of analysis. It consists of arson analysis, glass comparison/analysis, gunshot residue analysis, lamp analysis, paint comparison/analysis, speed determinations from speedometers, and various other miscellaneous types of analysis involving identification, physical matching, and comparison. After performing tests, the appropriate forms are completed.

The Trace Evidence unit also has a valuable resource called Paint Database Query (PDQ). This is a national and international database consisting of automotive paint data, this database can be used to help determine the make, model, and year of an automobile from a sample of paint found at the scene. The functions of the Trace Evidence Unit are shown in Figure 2.7.

Figure 2.7: Trace Evidence Unit

3.0 RE-ENGINEERING OF WVSPFL

The previous section described in detail the activities carried out in the seven units of WVSPFL. This section shows how some of the operations of the laboratory was re-engineered. Forensic Information Management System (FIMS) was created that supports multiple environments in order to facilitate the evidence and information handling processes at WVSPFL. They are:

1. Windows based (VB.Net) programming environment.
2. Web based (ASP.NET) programming environment.
3. Mobile (PDA) programming environment.

These environments interface with Laboratory Information Management System (LIMS) through the Intranet and the Internet. The FIMS architecture is shown in Figure 3.0.

Figure 3.0 FIMS Architecture

In the above design, the ORI agencies and the prosecutor's office share information via the FIMS system. Each type of user has different data access privileges. Currently, the external agencies (ORI and Prosecutor's office) need to call WVSPFL to determine the status of the case submitted. The details of information flow are explained below.

3.1 FIMS Design for the Biochemistry (DNA) Unit

The FIMS system design for the Biochemistry (DNA) unit is shown in Figure 3.1. The evidence/items from ORI agency is received by WVSPFL and is approved by Case Reporting in the Biochemistry (DNA) unit. The CR form is completed online and the evidence is sent to storage of evidence. In storage of evidence, LEIF form is completed online and the evidence is sent to Evidence Processing. The EP form is also completed online.

Evidence Extraction unit receives the evidence and after extraction process is performed, EA form is completed out. The Evidence Amplification phase receives the evidence from Evidence Extraction and Amplification. EA form is completed out after performing amplification process. The DNA analyst reviews all the form in FIMS system. The final report is generated by FIMS system and the DNA analyst initials the final report. The ORI agency and prosecutor can view the report by accessing the FIMS system. The status of the case submitted by the ORI agency can also be viewed online. The FIMS system interfaces with LIMS and updates the data automatically. The FIMS design for the Biochemistry (DNA) Unit is shown in Figure 3.1.

Figure 3.1: The Biochemistry (DNA) Unit

3.2 FIMS Design for the Drug Unit

The Evidence Receiving phase in the Drug Unit receives and approves evidence/items from the ORI agency. The evidence is tested in Vegetation testing phase and VT form is completed. The information is stored in the FIMS database. The FIMS design for Drug Unit is shown in Figure 3.2. The Tablet and Capsule testing is performed on the evidence and TC form is completed. Also, UP form is completed for the Unknown Powder testing phase. All of the data stored in FIMS is automatically uploaded to LIMS. The chemist reviews the forms and initials the final report generated by the FIMS system. The information flow of MT form, TC form and UP form is eliminated between the phases of Drug unit. The ORI agency and prosecutor's office can access the status of the case in the Drug unit.

Figure 3.2 : Drug Identification Unit

3.3 FIMS Design for Firearms/Tool Marks Unit

The information flow and evidence flow for Firearms/Tool Marks unit is shown in Figure 3.3. The Firearms examiner performs required test depending upon the nature of evidence/items. The FA1 to FA13 forms are completed online and are uploaded automatically to LIMS. The draft report is reviewed by the firearms examiner and is approved.

Figure 3.3 : Firearms/Tool Marks unit

3.4 FIMS Design for Latent Print Unit

The FIMS design for Latent Print Unit is shown in Figure 3.4. The evidence is received and approved by Evidence Receiving and is sent to Central Evidence Processing (CEP). The LP1 form is completed by CEP online. The evidence is sent to the Latent Print Examiner in the unit. Then he completes LP2-LP6 forms online in FIMS after performing analysis on latent prints. The examiner finally reviews the forms and the draft report is generated by FIMS. The reviewer reviews the draft report and the final report is issued and approved.

Figure 3.4: Latent Finger Print Unit

3.5 FIMS Design for Questioned Documents Unit

The FIMS Design for Questioned Documents unit is shown in Figure 3.5. The evidence is sent for Document Examination after it is received and approved by Evidence Receiving. Evidence Receiving completes the DL form. Depending upon the nature of the evidence, it is sent for tire track or footwear examination or document examination. The tire track examination completes TT form in FIMS, footwear examination completes out FW form and document examination completes the DC form.

Figure 3.5: Questioned Documents Unit

After the tests are performed, TT and FW forms are completed online. The examiner completes FTR form. The report is generated by the FIMS and the examiner initials the final report.

3.6 FIMS Design for Toxicology Unit

The toxicology unit receives the evidence from evidence receiving and after tests are performed, they complete TX1 and TX2 forms in the FIMS system. The FIMS design for Toxicology section is shown in Figure 3.6. The chemist accesses the final report in FIMS system and initials after reviewing. The status of the case can be checked when the evidence is submitted for testing WVSPFL.

Figure 3.6: Toxicology Unit

3.7. FIMS Design for Trace Evidence Unit

The evidence is received and approved by Evidence Receiving and depending upon the nature of the evidence, it is sent to the respective phase for testing. Ignitable Liquid test completes IL form after performing the test. Similarly, the GC, PC, GR, and MCA forms are completed online after the tests are performed. The evidence examiner access the review forms of each departments and initials the final report created by FIMS. The FIMS design for Trace Evidence Unit is shown in Figure 3.7.

Figure 3.7: Trace Evidence Unit

3.8 FIMS Design for ORI Agency

ORI agency sends evidence to the WVSPL and completes out CR form online. The required tests are performed in the WVSPFL and the results are stored in FIMS. The final report is available online and the ORI agency can access the draft report. The ORI agency can also track the status of the case submitted to WVSPFL. The different statuses of the case are Case Submitted, Evidence Received, Evidence in Process (in which unit),

and Evidence Processed. The evidence is send to the ORI agency after tests are performed. FIMS design for an ORI agency is shown in Figure 3.8.

Figure 3.8 FIMS Design for ORI agency

3.9 FIMS Design for Prosecutors Office

The prosecutor's office accesses FIMS for tracking the status of the case submitted by ORI agency. The prosecutor can also access the draft report of the case submitted by WVSPFL to the ORI agency. The FIMS design for prosecutor's office is shown in Figure 3.9.

Figure 3.9: FIMS Design for Prosecutors Office

3.10 FIMS Design for LIMS

FIMS utilize an SQL based database system and LIMS is an ORACLE based database system. All the forms are available online in FIMS and the user complete required forms and submit. The information is stored in FIMS database. FIMS database interfaces with LIMS and updates its database. All the information is stored in both FIMS and LIMS database. FIMS database provides a way to store and process data locally. Only authorized users can access the LIMS database. When all the required tests are performed in the lab and the information is stored in the database, reports are generated in FIMS. FIMS provides a mechanism to check the status of an ongoing case. The FIMS design for LIMS is shown in Figure 3.10.

Figure 3.10: FIMS Design for LIMS

4.0 FIMS IMPLEMENTATION

4.1 Introduction

The previous section described FIMS architecture and this section discusses the implementation details. When the evidence is submitted to WVSPFL, FIMS must check whether the evidence/items submitted are related to a new or an existing case. If submitted evidence/items belong to a new case, then a new lab case number has to be assigned in a predefined format (LabID - ORI ID- Year – Case # -Supplemental # - Number of items) and is shown below.

Code	Description	Example
aa	Lab ID	01
bbbb	ORI ID	0001
cccc	Year	2004
dddd	Case Number	0001
eeee	Supplemental Number	0003
ff	Number of Items	01

An example lab case number is 01-0001-2004-0001-0003-01. If submitted evidence/items belong to an existing case, then a supplemental lab case number is assigned to the lab case number. Reporter information and investigation report forms are completed and the case is submitted to WVSPFL by an ORI agency. At this point, the status of the case is set as “*Case Submitted*”. When the Central Evidence Receiving (CER) receives the evidence/items for testing, the status of the case changes to “*Evidence Received*”. The LEIF form is completed by CER and it has the details of all the evidence submitted to the lab.

The evidence is taken to bulk storage and placed in appropriate bags/containers depending upon their size. The lab case number is placed with barcode on the bags/containers that are placed in the storage area. CER department decides which items in the evidence list are to be processed. CER department places completed LEIF form and Case Reporting (CR) form in an envelope and delivers to the section mailbox. Now, the status of the case is changed to “*Evidence in Process*”. Analyst picks up case envelope and calls CER department about collecting the evidence. Analyst then picks up the evidence and completes a new LEIF form. He then initials LEIF form and case submission form if evidence match in both forms.

Figure 4.1: Process Block Diagram

The analyst/examiner performs unit specific tasks, sorts the evidence and sends it to the appropriate unit for testing. After all the evidence is tested in the appropriate units, the evidence technicians in the units review the quality of the test results and creates notes and reports in a standard format. FIMS creates the draft report and the evidence technician can access the draft report.

The analyst/examiner reviews all the materials (CR form, LEIF form, evidence / items, and the draft report). He initials the draft report and all the evidence/items are sent back to the respective investigating officer. The block diagram of the processes is shown in Figure 4.1. Process flow of the individual units is shown in Figure 4.2.

Figure 4.2: Process Flow of Individual Units

4.2 FIMS Database Implementation

In order to implement the FIMS software, a database was developed in Microsoft SQL Server. The Lab Case Number (LCN) is the primary key for all the tables. Hence, all the tables can be linked together for querying using LCN. The link between the different tables is shown in Figure 4.3.

Figure 4.3: Database Table

4.2.1 Reporter Information Table

The Reporter Information Table contains LCN, Your Case Number (YCN), reporter name, address, city, zip code, phone number and the date of report as shown in Table 1.

Table 1: Reporter Information Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
YCN	nvarchar	50	Unique YCN assigned to the case.
From	nvarchar	50	The name of the reporter.

Address	nvarchar	50	The address of the reporter.
City	nvarchar	50	The city of the reporter.
Zip	numeric	5	The zip code of the reporters city
Phone	nvarchar	50	The reporters contact phone number
Date	nvarchar	50	The date of the report filed

4.2.2 Investigation Report Table

The Investigation Report Table contains LCN, investigation officer name, officer rank, and subject of investigation, date and time of crime, place of crime, county, city, state and zip code and is shown in Table 2.

Table 2: Investigation Report Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
Inv officer	nvarchar	50	The name of the investigation officer
Rank	nvarchar	50	The investigation officer's rank in WVSP
Subject	nvarchar	50	The information regarding the subject of the investigation
Date	nvarchar	50	The date crime occurred
Time	nvarchar	50	The time crime occurred
Place	nvarchar	50	The place where the crime occurred
County	nvarchar	50	The county where the crime occurred
City	nvarchar	50	The city where the crime occurred
Zip	numeric	5	The zip code of the city where crime occurred
State	nvarchar	50	The state where the crime occurred

4.2.3 Victim Information Table

The Victim Information Table contains LCN, victim ID, victim name, date of birth, race, sex, victim address including city and zip code as shown in Table 3.

Table 3: Victim Information Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
Vic Name	nvarchar	50	The name of the victim
Vic ID	nvarchar	50	The id of the victim
Vic DOB	nvarchar	50	The victim's date of birth
Vic Race	nvarchar	50	Victim race
Vic Sex	nvarchar	50	The information containing the victim's sex
Vic Address	nvarchar	50	Address of the victim
Vic City	nvarchar	50	Victim's residing city
Vic Zip	numeric	5	The zip code of the victim's residing place

4.2.4 Suspect Information Table

The Suspect Information Table contains LCN, suspect ID, suspect name, date of birth, race, sex, address including city and zip code as shown in Table 4.

Table 4: Suspect Information Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
Sus Name	nvarchar	50	The name of the suspect
Sus ID	nvarchar	50	The id of the Suspect
Sus DOB	nvarchar	50	The Suspect's date of birth
Sus Race	nvarchar	50	The Suspect's race
Sus Sex	nvarchar	50	The suspect's sex
Sus Ht	numeric	5	The suspect's height
Sus Wt	numeric	5	The suspect's weight
Sus History	nvarchar	50	The information containing the suspect's criminal history
Sus Address	nvarchar	50	Address of the Suspect
Sus City	nvarchar	50	Suspect's residing city
Sus Zip	numeric	5	The zip code of the suspect's residing place

4.2.5 Crime Description Table

The Crime Description Table was developed that contains LCN, description of crime, approximate amount of drug seized, street value of drug, and examinations desired. Its various fields are shown in Table 5.

Table 5: Crime Description Table

Field Name	Data Type	Length	Description
LCN	nvarchar	50	Unique LCN assigned to the case.
Crime Des	nvarchar	50	The description of crime
Drug Amount	numeric	5	The approximate amount of drug seized
Drug Value	numeric	5	The street value of the drug seized
Exam Desired	nvarchar	50	The forensic lab examinations desired

4.2.6 Item Description Table

The Item Description table contains LCN, item id and item lists submitted for the particular lab case. Its various fields are shown in Table 6.

Table 6: Item Description Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
Item ID	nvarchar	50	Id of the particular item
Items	numeric	5	The name of the items submitted for lab testing

4.2.7 Acceptance Information Table

The Acceptance Information table contains LCN, name of the officer who receives the items, the date and time items received, mode of delivery of items and disposition of evidence. Its various fields are shown in Table 7.

Table 7: Acceptance Information Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
Received	nvarchar	50	Name of the officer who received the items
Date	nvarchar	50	Date items received
Time	nvarchar	50	Time items received
Delivery	nvarchar	50	The mode of delivery (US mail / personal delivery/other)
Evidence	nvarchar	50	The information containing the disposition of evidence

4.2.8 Evidence Location Table

The Evidence Location Table contains LCN, beginning work date, ending work date, analyst initials and location of evidence as shown in Table 8.

Table 8: Evidence Location Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
Date begin	nvarchar	50	The beginning date of work in lab processing
Date end	nvarchar	50	The ending date of work in lab processing
Initials	nvarchar	50	The analyst initials
Evidence location	nvarchar	50	The location of evidence (locker/freezer/cutting)

4.2.9 Evidence Seal Table

The Evidence Seal Table contains LCN, information regarding number of bags, boxes, envelopes or other, and whether they are sealed or not, seal type and whether the items were taped or not. Its various fields are shown in Table 9.

Table 9: Evidence Seal Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the case.
Number of items	nvarchar	50	The number of items (bag, box, envelope and other)
Information	nvarchar	50	Information on type of bags, boxes, envelope and other
Sealed	nvarchar	50	Whether the items received have been sealed or not
Seal type	nvarchar	50	The type of seal used
Tape	nvarchar	50	Whether the items are taped or not

4.2.10 Test Performed Table

The Tests Performed Table contains LCN, item id, item name, information regarding blood, semen and sperm, whether the sample was retained or not and comment on the tests performed. Its various fields are shown in Table 10.

Table 10: Tests Performed Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the particular case.
Item Id	nvarchar	50	Item Id
Item name	nvarchar	50	The item name under testing
LMG	nvarchar	50	Blood test on LMG (+ Green / - Clear)
Species	nvarchar	50	The information on Blood test on species (+ two / - one band)
AP	nvarchar	50	The information on Semen test on AP (+ Purple or - Clear)
P30	nvarchar	50	The information on Semen test on P30 (+ two bands / - one band)
Sperm	nvarchar	50	The information on sperm test (+ / -)
Sample	nvarchar	50	Whether the sample was retained or not
Comment	nvarchar	50	The comments on items undergone testing

4.2.11 Lab Processing Protocol Information Table

The Lab Processing Protocol Information Table contains LCN, protocols used for testing blood and semen and the date they tested. Its various fields are shown in Table 11.

Table 11: Lab Processing Protocol Information Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the particular case.
LMG	nvarchar	50	Information on Protocol used to test blood with B: LMG
LMG date	nvarchar	50	The date of blood test on B: LMG
S	nvarchar	50	Information about protocol used to test blood with S: HTrace
S Date	nvarchar	50	This includes the date of blood test with S: HTrace
S Other	nvarchar	50	Information about protocol used to test blood with S: other
S Other Date	nvarchar	50	The date of blood test with S: other
AP	nvarchar	50	Information about protocol used to test semen with AP: Test tube
AP Date	nvarchar	50	This includes date of semen test with AP: Test tube
P30 ABA	nvarchar	50	Information about protocol used to test semen with P30: ABA
P30 Date	nvarchar	50	The date of semen test with P30: ABA
SM	nvarchar	50	Protocol used to test semen with SM: Microscope
SM date	nvarchar	50	The date of semen test with SM: Microscopic
Comment	nvarchar	50	The comment on protocol test

4.2.12 Extraction and Amplification Methods Table

The Extraction and Amplification Methods Table contains LCN, extraction method used, questioned extraction date and time and number of hood, known extraction date and time and number of hood with organic area. Its various fields are shown in Table 12.

Table 12: Extraction and Amplification Methods Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the particular case.
Extraction Method	nvarchar	50	Information about method of extraction in DNA analysis which can be either organic or other methods
QE date	nvarchar	50	The date of Questioned extraction analysis
QE time	nvarchar	50	The time of Questioned extraction analysis
Qhood	nvarchar	50	Number of hoods in questioned extraction analysis
QO date	nvarchar	50	The date of Questioned organic analysis
QO time	nvarchar	50	The time of Questioned organic analysis
QO Area	nvarchar	50	The area number of Questioned organic analysis
AP Date	nvarchar	50	The date of semen test with AP: Test tube
KE date	nvarchar	50	The date of Known extraction analysis
KE time	nvarchar	50	The time of Known extraction analysis
K hood	nvarchar	50	The number of hoods in Known extraction analysis
KO date	nvarchar	50	The date of Known organic analysis
KO time	nvarchar	50	The time of Known organic analysis
KO Area	nvarchar	50	The Area number of Known organic analysis
Initials	nvarchar	50	The analyst initials

4.2.13 Items Analysis Information Table

The Item Analysis Information Table contains LCN, item Id, item name, information on type of test in Lysis and Centricon, amplification details and amplification number. Its various fields are shown in Table 13.

Table 13: Item Analysis Information Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the particular case.
Item ID	nvarchar	50	Id of the particular item
Item list	nvarchar	50	The name of the items submitted for lab testing
Lysis	nvarchar	50	The type of Lysis analysis done (S/DL)
Centricon	nvarchar	50	Whether the Centricon analysis was performed or not
Amp	nvarchar	50	Whether the amplification was done on the evidence
Amp num	nvarchar	50	Information on the amplification rating

4.2.14 DNA System Information Table

DNA System Information Table contains LCN, tests performed on system PowerPlex16. Its various fields are shown in Table 14.

Table 14: DNA System Information Table

Field Name	Data Type	Length	Description
LCN *	nvarchar	50	Unique LCN assigned to the particular forensic case.
Pro amp	nvarchar	50	Information of amplification rating on system: Profiler +

CTT amp	nvarchar	50	Information of amplification rating on system: CTT
PP amp	nvarchar	50	The amplification rating information on system Power Plex 16
Pro Date	nvarchar	50	The date of amplification on system: Profiler +
CTT date	nvarchar	50	The date of amplification rating on system: CTT
PP Date	nvarchar	50	The date of amplification rating on system: Power Plex 16
Pro TCYLR	nvarchar	50	The TCYLR information of amplification on system: Profiler
CTT TCYLR	nvarchar	50	The TCYLR information of amplification on system: CTT
PP TCYLR	nvarchar	50	The TCYLR information on PowerPlex16

4.2.15 Feedback Information Table

Feedback Information Table contains name, ORI agency number, email id, feedback, and IP address of the user. Its various fields are shown in Table 15.

Table 15: Feedback Information Table

Field Name	Data Type	Length	Description
Name	nvarchar	50	The name of the person submitting feed back
ORI agency #	nvarchar	50	The ORI agency number
Email Id	nvarchar	50	The email id of the person submitting feed back
Feedback	nvarchar	1000	The feedback information
IP	nvarchar	50	The IP address of the user

4.2.16 Security Information Table

Security Information Table contains ORI ID, ORI agency name, and date & time they logged. Its various fields are shown in Table 16.

Table 16: Security Information Table

Field Name	Data Type	Length	Description
ORI Name	nvarchar	50	ORI agency name
ORI agency #	nvarchar	50	ORI ID
Date Time	nvarchar	50	Date and time of ORI agency logged in the system

4.2.17 ORI Agency Information Table

ORI Agency Information Table contains ORI ID, ORI agency name, and address, city, county, state, zip code, and phone number. Its various fields are shown in Table 17.

Table 17: ORI Agency Information Table

Field Name	Data Type	Length	Description
ORI Name	nvarchar	50	ORI agency name
ORI agency #	nvarchar	50	ORI ID
Street	nvarchar	50	Street address of ORI agency
City	nvarchar	50	ORI agency city
County	nvarchar	50	ORI agency county
State	nvarchar	50	ORI agency state
Zip code	nvarchar	50	Zip code of ORI agency
Phone	nvarchar	50	Phone number of ORI agency

4.2.18 WVSPFL Analyst Information Table

WVSPFL Analyst Information Table contains Analyst ID, first name, and last name, and user login. Its various fields are shown in Table 18.

Table 18: WVSPFL Analyst Information Table

Field Name	Data Type	Length	Description
Analyst ID	nvarchar	50	Analyst ID
First name	nvarchar	50	Analyst first name
Last name	nvarchar	50	Analyst last name
User login	nvarchar	50	Analyst user login

4.3 Windows Based Environment

All phases of the DNA unit were developed in windows based environment and all the phases can be updated in the server through windows based environment. The different phases developed for windows based environment are shown in Figure 4.4.

Figure 4.4: Windows Based Environment Tasks

Evidence Processing

The Evidence Processing phase consists of analyst information, package information and comments on the test performed. This is shown in Figure 4.5.

Figure 4.5: Evidence Processing

Evidence Extraction

The evidence extraction information is shown in Figure 4.6. It includes extraction method, extraction details and DNA item details.

Figure 4.6: Evidence Extraction

Evidence Amplification

The information for evidence amplification is shown in Figure 4.7. It includes Amplification items, Amplification details, and amplification rating and amplification system details with its comments.

Figure 4.7: Evidence Amplification

4.3.1 Flow chart for Windows Based Environment

The windows based environment was developed for the analyst and the staffs working in the WVSPFL. When the user name and password is authenticated by the FIMS, the user enters FIMS main screen for WVSPFL. The flow chart for windows based version is shown in Figure 4.8.

Figure 4.8: Flow Chart for Windows Based Environment

The user has an option of opening either a new case or an existing case. When the user selects new case for submission, FIMS will navigate in a sequence to complete CR, EP and EA form. The user can move to the main screen at any time when completing the CR, EP or EA form. When the user selects existing case, he can either update the information in any of the form or view the report generated by FIMS. If the user selects updating the information, he can enter the case number and select the report needs to update CR, EP, or EA form. If the user selects Report Generation, he can enter the case number and select the report he wants to view CR, EP, or EA form. The user can move to

main screen at any time. If the log off is selected, the user will be navigated to the login screen.

4.4 Web Based Environment

All the phases of the DNA unit were developed in a web-based environment and any of the phases can be accessed from the PC anywhere *through the Internet* and can be updated to the server through web-based environment.

Figure 4.9: Web Based Environment Tasks

Case Report

Case Report phase consists of Reporter Information, Investigation Report and Drug Statistical Details. The user interface for Case Report is shown in Figure 4.10.

Figure 4.10: Case Report

4.4.1 Flow chart for Web Based Environment

Web based environment was developed with three different level of access for a) WVSPFL, b) ORI agency, and c) Prosecutors office. FIMS was developed based on these three levels of access using different login id and password. The ORI agency can submit the CR form online in FIMS. The status tracking, security tracking and feedback tracking modules were also developed in web-based environment for higher level of access. The different levels of access of web-based environment are shown in Figure 4.11.

Figure 4.11: Different Levels of Access for Web Based Environment

The ORI agency and prosecutor's office can access FIMS, check the status of a case submitted to WVSPFL and view the CR form online. In addition to this, WVSPFL can also access the web based environment and complete all the three phases, track the status of the case and view the report generated by FIMS for all the phases. The flow chart for web-based environment is shown in Figure 4.12. The user name and password is entered in the FIMS web based environment login screen. Depending upon the user name and password, FIMS directs the user to the respective level of access.

FIMS Web Based Environment for WVSPFL

When the user name and password for WVSPFL was authenticated by the FIMS, the user enters FIMS main screen for WVSPFL. The user has an option of opening either

a new case or an existing case. When the user selects a new case for submission, FIMS will navigate in a sequence to complete CR, EP and EA form. The user can move to the main screen at any time during completion of CR, EP or EA form. When the user selects existing case, he can either update the information in any of the form or view the report generated by FIMS or track the status of the case in the WVSPFL. If the user selects updating the information, the case number should be entered and selects the form to be updated. If the user selects the report generation, the case number should be entered and selects the form to view. If the user selects the status tracking, the case number should be entered and the status of the case can be checked. The user can move to main screen at any time. If log off was selected, the user will be logged off FIMS.

FIMS Web Based Environment for ORI Agency

When the user name and password for ORI agency was authenticated by FIMS, the user enters FIMS main screen for ORI agency. The user has an option of completing new CR form or views the report generated by FIMS or track the status of the case submitted by ORI. When the user selects new case for submission, FIMS will navigate in a sequence to complete CR, EP and EA form. The user can move to the main screen at any time when completing any of the form. If the user selects the report generation, the case number is to be entered and selects the CR form to view. If the user selects the status tracking, the case number should be entered and the status of the case can be checked. The user can move to main screen at any time. If log off was selected, the user will be logged off FIMS.

FIMS Web Based Environment for Prosecutor's Office

When the user name and password for prosecutor's office was authenticated by FIMS, the user enters FIMS main screen for prosecutor's office. The user has an option of viewing the report generated by FIMS or track the status of the case submitted by ORI. If the user selects the report generation, the case number should be entered and selects the CR form to view. If the user selects the status tracking, the case number should be entered and the status of the case can be checked. The user can move to main screen at any time. If log off was selected, the user will be logged off FIMS.

Figure 4.12: Flow Chart for Web Based Environment

4.5 Mobile Environment

The mobile (PDA) based environment is to acquire, analyze, and distribute information from real time crime scene and update the FIMS database. For DNA unit, case submission phase was developed in PDA environment. This is shown in Figure 4.13.

Figure 4.13: PDA Environment Tasks

Microsoft Mobile Software 2003 was used to develop a mobile application. A device accessing the wireless application will launch a three-stage process on the Web Server.

- 1) Device capability detection.
- 2) Building of the page.
- 3) Response generation.

Device capability detection collects information such as browser type, supported mark-up language, etc. and is done with the machine.config file that contains all the device information. It is important to note that the page will be compiled just one time and it's the same for any type of device. The web server uses the page in the cache to create a new instance of the page and processes it. In the case of a PDA, HTML is sent to the client. The response generation is associated to the device type.

5.0 FIMS ENVIRONMENT

The FIMS environment for the Biochemistry (DNA) unit is shown in Figure 5.1. The three phases of the Biochemistry (DNA) unit a) Case Report b) Evidence Processing c) Extraction and Amplification were developed in FIMS system for both windows based and web based environments. The WVSPFL can access both the web based and windows based environments. Mobile based environment was developed for Case Reporting phase. The Evidence Processing and Extraction & Amplification phases are performed inside the lab and can access either via web based or windows based environment. The external agencies (ORI agency and Prosecutor's office) can access FIMS using web-based environment for viewing the draft report and tracking the status of a case submitted to WVSPFL.

Figure 5.1: FIMS environment for the Biochemistry (DNA) Unit

5.1 Windows Based Environment

All three phases of the DNA unit were developed in a windows based environment. Programming was done using VB.Net. Any of the phases can be accessed by a stand-alone personal computer in the forensics lab through the intranet. All the phases can be updated in the FIMS server through windows based environment. The User Authentication screen of windows based environment is shown in Figure 5.. If the user

types either incorrect user id or password, an error message will pop-up and is shown in Figure 5.3.

Figure 5.2: User Authentication Screen

Figure 5.3: Login Error Screen

The FIMS windows based environment main screen is shown in Figure 5.4. The main screen has the following options a) Start a new case b) Open existing case c) Close current case d) Log off and e) Exit FIMS. When the user selects “Open Existing Case”, the FIMS system will give the list of cases available in the FIMS database and allows user to access available case information. This is shown in Figure 5.5. When the user selects “Start New Case”, a new case is entered in FIMS and is shown in Figure 5.6. After entering the new case or existing case, the user can access the Biochemistry (DNA) unit screen and is shown in Figure 5.7.

Figure 5.4: FIMS Main Screen

Figure 5.5: Opening Existing Case

Figure 5.6: Starting New Case

Figure 5.7: FIMS Biochemistry (DNA) Unit Screen

5.1.1 Case Report

Case Reporting entail recording of crime information from a particular officer's point of view. The investigating officer completes Case Report (CR) Form. The CR form contains a) Reporter Information b) Investigation Information, c) Victim Information, d) Suspect Information, d) Crime and Drug Description, e) Item Information, and f) Acceptance Information. The FIMS screen for Case Report is shown

in Figure 5.8. The user has an option of viewing all the information in a sequence or only the required information. The FIMS screens associated with capturing all the above information is shown in Figures 5.9 to 5.15. Upon completing the CR form, the investigating officer submits the CR form and the evidence/items to Central Evidence Receiving

Forensics Information Management System

Case Report

Applications

Current Lab CaseNumber: 01-0801-2003-0001-0000-01

View All Sections In Sequence

Create Case Submission Report

Return to Main Screen

Click to view and edit a section

- 1 - Reporter Information
- 2 - Investigator Information
- 3 - Victim Information
- 4 - Suspect Information
- 5 - Crime and Drug Information
- 6 - Items Information
- 7 - Acceptance Information

Figure 5.8: FIMS Case Report Screen

Forensics Information Management System

Case Report

Reporter Information

Lab Case #: 01-0801-2003-0001-0000-01

Lab Case Number: 01-0801-2003-0001-0000-01

Your Case Number: Prof 2

Date of Report: Friday, November 21, 2003

From: T.P.R. Francis

Address: 725 Jefferson St

City: S Charleston WV Zip Code: 25309

Phone #: 3042934607

Reset Form Update Continue

Update?

Are you sure you want to update database with changes?

Yes No

Figure 5.9: Reporter Information

Forensics Information Management System

Case Report
Investigation Information

Lab Case #: 01-0801-2003-0001-0000-01

Investigating Officer: Rank:

Subject of Investigation:

Date of Crime:

Time of Crime:

Place of Crime:

Address:

City:

County:

Figure 5.10: Investigation Information

Forensics Information Management System

Case Report
Victim Information

Lab Case #: 01-0801-2003-0001-0000-01

Victims

JOHN DOE

Victim Information

Name:

Race:

Sex:

Date of Birth:

Address:

City:

State:

Zip:

Figure 5.11: Victim Information

Forensics Information Management System

Case Report
Suspect Information

Lab Case # 01-0801-2003-0001-0000-01

Suspects

Timothy G Cutter

Suspect Information

Name:

Race:

Sex:

Date of Birth:

Criminal History:

Height:

Weight:

Address:

City:

State:

Zip:

Figure 5.12: Suspect information

Forensics Information Management System

Case Report
Crime and Drug Description

Lab Case # 01-0801-2003-0001-0000-01

Brief Description of Crime

Suspect went to victims house and fight occurred on porch of victims house. Suspect had been hunting earlier in day

Investigation Report

Drug Statistical Purposes Only:

Approximate amount seized:

Market/Street Value:

Examinations Desired:

Figure 5.13: Crime and Drug Description

Forensics Information Management System

Case Report

Item Information

Lab Case #: 01-0801-2003-0001-0000-01

Items

Pair of boots - Pair of boots
 Pair of pants (Suspect) - Pair of pants (Suspect)
 Knife (Suspects pocket) - Knife (Suspect)
 Scissors (Front Porch) - Scissors (Front Porch)

Add Item
View Info
Delete Item
Update

Item Info

Item#: 3

ItemDescription:

Knife (Suspects pocket)

Update

Return to Case Submission Applications

Figure 5.14: Item Information

Forensics Information Management System

Case Report

Acceptance Information

Lab Case #: 01-0801-2003-0001-0000-01

Report Received by: Ted Smith

Today's Date: Friday, November 21, 2003

Time Received: 2:00:02 PM

Received via: ☒ US Mail ☐ Personal Delivery

Disposition of Evidence:

Reset Form
Update

Update?

Are you sure you want to update database with changes?

Yes
No

Return to Case Submission Applications

Figure 5.15: Acceptance Information

5.1.2 Evidence Processing

The Evidence Processing phase contains information on a) Analysis Time Information, b) Packaging Information, c) Evidence Testing, and 4) Protocol Information. The FIMS screens associated with Evidence Processing are shown in Figures 5.16-5.19.

Forensics Information Management System

Evidence Processing

Analysis Time Information

Lab Case # 01-0801-2003-0001-0000-01

Lab CaseNumber: 01-0801-2003-0001-0000-01

Work Date Begins: Friday, November 21, 2003

Work Date Ends: Friday, November 21, 2003

Analyst: Smith, Ted

Add New Name

Location of Evidence: Freezer
Locker

Reset Form Update Continue

Update?

Are you sure you want to update database with changes?

Yes No

Figure 5.16: Analysis Time Information

Forensics Information Management System

Evidence Processing

Evidence Packaging Information

Lab Case # 01-0801-2003-0001-0000-01

Comments on Packaging: One box containing

	Sealed?	Seal Type:	Tape
Box	Yes		Yes
Bag	Yes		Yes
Envelope	Yes		Yes
Other	5	Brown wrap Paper	Yes

Reset Form Update Back Continue

Figure 5.17: Packaging Information

Forensics Information Management System

Evidence Processing

Evidence Testing

Lab Case # 01-0801-2003-0001-0000-01

GroupBox1

- Knife
- Screw Driver
- scissors
- Pair of boots
- Fatigues Green

Add Item
View Item
Delete Item
Update

Back
Continue

Item

Pair of boots

Blood

LMG

+ green

Species

+ two bands

Semen

AP

+ purple

P30

+ two bands

Sperm

+

Sample Retained?

Yes

Sample Comments

Black rocky boots size 13

Update

Figure 5.18: Evidence Testing

Forensics Information Management System

Evidence Processing

Protocol Information

Lab Case # 01-0801-2003-0001-0000-01

Protocol Used:

		Testing Dates
B: LMG	Yes	11/21/2003
S: HTrace	Yes	11/21/2003
S: Other		11/21/2003
AP: Test Tube		11/21/2003
P30: ABA		11/21/2003
SM: Microscopic		11/21/2003

Test Comments:

Knife blade had gummy type substance and handle rubbed with filter paper

Reset Form
Update
Back
Finish Lab Processing

Figure 5.19: Protocol Information

5.1.3 Evidence Extraction and Amplification

The Extraction and Amplification phase contains information on a) Evidence Preparation, b) Evidence Extraction and Amplification, and c) Test Equipment Information. The FIMS screens associated with Extraction and Amplification are shown in Figures 5.20-5.22.

Forensics Information Management System
Evidence Extraction and Amplification
Evidence Preparation Lab Case # 01-0801-2003-0001-0000-01

Extraction Method: Organic

Questioned Extraction Date/Time: 11/21/2003 2:11:10 PM

Known: Extraction Date/Time: 11/21/2003 2:11:10 PM

Organic Date: 11/21/2003 Area: 2

Organic Date: 11/21/2003 Area: 1

Analyst Initials: maz

Reset Form Update Continue

Update?
Are you sure you want to update database with changes?
Yes No

Figure 5.20: Evidence Preparation

Forensics Information Management System
Evidence Extraction and Amplification Lab Case # 01-0801-2003-0001-0000-01

Items
2221
2222

Add Item View Item Delete Item Update

Back Continue

AmplificationItems
Item
2221

Evidence Extraction
Lysis Centricon
S CN
DL

Evidence Amplification
Amplified? Amp. #
Yes 0
No 1
2

Update

Figure 5.21: Evidence Extraction and Amplification

Figure 5.22: Test Equipment Information

5.2 Web Based Environment

All three phases of the DNA unit were developed in a web-based environment. Programming was done using ASP. Net, which is the advanced version of ASP and the next era of web development. ASP.NET allows using the full featured programming languages such as C# or VB.NET to build web applications easily. All the phases can be accessed from the PC anywhere *through the Internet* and can be updated to the server through web based environment. ASP.Net compiles the code instead of interpreting it like traditional ASP and hence more complex code can be used. After this code is executed for the first time, it is compiled and stored in memory and can run many times faster than an interpreted language. ASP.Net also gives us full server side object-orientated functionality.

The web based version is available online in the <http://wvsp.cemr.wvu.edu> web address. The FIMS main screen is shown in figure 5.23. The User Authentication screen of web-based environment is shown in Figure 5.24. For increased security reason, the web address of the user logging in to the FIMS system was stored. If the user types incorrect user id or password, an error message pops-up. This is shown in Figure 5.25.

The FIMS web based environment was developed for three levels of access for a) WVSPFL, b) ORI agency, and c) Prosecutor's office.

Figure 5.23: FIMS Web Based Main Screen

Figure 5.24: FIMS Web Based Login Screen

Figure 5.25: FIMS Login Error Screen

5.2.1 Web Based Version for WVSPFL

The FIMS main screen for the Biochemistry (DNA) unit is shown in Figure 5.26. The main screen has 3 phases a) Case Report, b) Lab Processing, and c) Extraction and Amplification. In addition to this, the user can select an existing case or a new case. All the cases in the FIMS database were available in a drop down list and the user can select the required case. The user can go to any of the three phases if the existing case number is entered. If the user selects a new case, the new case number was entered and FIMS will navigate the user in a sequence. The user can track the status of the case and view the report for any of the three phases. This is shown in Figure 5.27.

Figure 5.26: FIMS Screen

Figure 5.27: Opening a New Case

5.2.1.1 Case Report

The FIMS Case Report phase for web based environment is shown in Figure 5.28. When the user opens an existing case and updates the information in the FIMS database, a confirmation message will appear to confirm the change. The status of the case will be

indicating whether the information was updated in the database or not. When a new case was opened and the information is entered, the status will automatically change to “Your records were added in the database”. Hence, the user has a clear view whether the information is added or updated in the database. This is shown in Figure 5.29.

FIMS Forensics Information Management System

Reporter Information [1 of 10]

From: Tpr. Francis LabCase #: 01-0001-2003-0001-0000-03 Retrieve Info

Address: 725 Jefferson St Your Case #: Prof-2

City: S Charleston Zip Code: 25309

Phone #: 304-293-46 Date: 304-293-4607

Add / Update Delete

Go to Main Page Continue

Microsoft Internet Explorer

Are you sure you want to Add / Update?

OK Cancel

Your Records were UPDATED in the Database

Figure 5.28: UPDATING Reporter Information in FIMS Database

FIMS Forensics Information Management System

Reporter Information [1 of 10]

From: Tpr. Francis LabCase #: 01-0001-2003-0001-0000-03 Retrieve Info

Address: 725 Jefferson St Your Case #: Prof-1

City: S Charleston Zip Code: 25309

Phone #: 304-293-46 Date: 11/23/03

Add / Update Delete

Go to Main Page Continue

Microsoft Internet Explorer

Are you sure you want to Add / Update?

OK Cancel

Your Records were ADDED in the Database

Figure 5.29: Adding Reporter Information in FIMS Database

After entering the information and adding to the FIMS database, the user can move to the next screen by clicking continue button. The remaining number of screens in the Case Report phase is shown next to the title. Figure 5.30 shows the Investigation Information screen. This screen contains information on the investigation officer and details about crime.

Figure 5.31 shows the victim information screen. After entering the victim information, the user needs to click ADD command button. A confirmation message will pop up to confirm adding the victim information. When the user confirms adding the victim information to the database, the FIMS will provide the details user entered. This is shown in Figure 5.32. Any number of victims can be added to the database. Figure 5.33 shows the update screen of victim information. The user can view the victim information of the particular case and can update any of the victim information. When Retrieve Info command button was clicked, the FIMS will show the number of victim and their information. If any of the victim information needs to be updated, Update button has to be clicked and the EDIT button will appear next to the victim information. Clicking EDIT button allows the user to update the victim information. The case number cannot be edited at any time of the case submission.

Investigation Information - (2 of 10) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/case2.aspx

FIMS Forensics Information Management System

Investigation Information [2 of 10] LabCase # 01-0001-2003-0001-0000-03 Retrieve Info

Investigation Officer Tpr. Francis Rank TPR

Subject of Investigation Malicious Wounding Date of Time 11/24/03 Time 10:00

Place of Crime 40 Evergreen Ave County Monongalia City Poca State WV, WEST VIRGINIA Zip 25123

Are you sure you want to Add / Update?

OK Cancel

Add / Update Delete

Go to Main Page Continue

Figure 5.30: Adding Investigation Information

Add a Victim Information - (3 of 10) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/case2.aspx

F.I.M.S. Forensics Information Management System

Victim Information [3 of 10]

Lab Case #
01-0001-2003-0001-0000-03

Victim Id #
1

Victim Name
Ernest C Stubb

Victim DOB
N/A

Victim Race
White

Victim Sex
Male

Victim Address
40 Evergreen Ave

Victim City
Poca

Victim Zip
25123

Add

Continue

[Go to Main Page](#)

Microsoft Internet Explorer

Are you sure you want to Add Victim?

OK Cancel

Figure 5.31: Adding Victim Information

Add a Victim Information - (3 of 10) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/case3a.aspx

F.I.M.S. Forensics Information Management System

Victim Information [3 of 10]

Lab Case #
01-0001-2003-0001-0000-03

Victim Id #
1

Victim Name
Ernest C Stubb

Victim DOB
N/A

Victim Race
White

Victim Sex
Male

Victim Address
40 Evergreen Ave

Victim City
Poca

Victim Zip
25123

Add

Continue

[Go to Main Page](#)

	VicId	LabcaseNum	VicName	VicDob	VicRace	VicSex
Update Cancel	1	01-0001-2003-0001-0000-03	Ernest C Stubb	N/A	White	Male

Figure 5.32: Confirming Victim Information

Figure 5.33: Retrieve Victim Information

Figure 5.35 shows the suspect information screen and the user can add any number of suspects like victim information. The user can navigate to the main page from any of the screen by clicking “Main Page” hyper link.

Figure 5.34: UPDATE Victim Information

Update a Suspect Information - (6 of 10) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/case4b.aspx

FIMS Forensics Information Management System

Suspect Information [6 of 10]

Lab Case # 01-0001-2003-0001-0000-03

[Go to Main Page](#)

LabcaseNum	SusId	SusName	SusDob	SusRace	SusSex	SusHt	SusWt	SusHistory	SusAddress	SusCity	SusZip
01-0001-2003-0001-0000-03	1	Timothy C Cutter	N/A	White	Male	N/A	N/A	N/A	N/A	N/A	N/A

Figure 5.35: Suspect Information Screen

Figure 5.36 shows the crime and drug information and Figure 5.37 shows the item information screen. The user can add any number of items and also update the saved item information. The item update screen is shown in Figure 5.38. Figure 5.39 shows the Acceptance Information screen. Once the acceptance information was entered, the FIMS navigate the user to the main page. This will end the Case Report phase and the user can move to Lab Processing phase.

Description of Crime Form(7 of 10) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/case5.aspx

FIMS Forensics Information Management System

Crime & Drug Description [7 of 10]

Lab Case # 01-0001-2003-0001-0000-03

Brief Description of Crime Suspect went to victims house and fight occurred on porch of victims house

Drug Statistical Purposes Only :

Approximate amount seized : N/A

Street Value N/A

(Refer to Laboratory Field Manual, Page 10, for Drug Price List)

Examinations Desired Blood Identification

[Go to Main Page](#)

Your Records were ADDED in the Database

Microsoft Internet Explorer

Are you sure you want to Add / Update?

Figure 5.36: Crime and Drug Information

Figure 5.37: Item Information screen

Figure 5.38: Update Item Information

5.2.1.2 Evidence Processing

The FIMS screen shot associated with Evidence Processing phase in web-based environment are shown in Figure 5.41 – 5.44. Analysis Time Information consists of details on beginning date and ending date of work, analyst name, and location of evidence. The user can also delete the information using “Delete” command button. Evidence Packaging Information consists of type of container, comments on the container, type of seal and whether the container is sealed or not. Protocol Information consists of protocol used and testing dates. Once the information was entered in FIMS, the FIMS will generate the Evidence Processing (EP) Report and the sample report is shown in Figure 5.45.

Lab Processing Report (1 of 5) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://157.182.196.78/sqlupdate/labpro.aspx>

FIMS Forensics Information Management System

Analysis Time Information [1 of 5]

LabCase Number

Work Date Begin Work Date End Analyst

Location of Evidence

Your Records were ADDED in the Database

[Go to Main Page](#)

Microsoft Internet Explorer
Are you sure you want to Add/Update?

Figure 5.41: Analysis Time Information

Lab Processing Report (2 of 5) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/labpro1.aspx

F.I.M.S. Forensics Information Management System

Evidence Packaging Information [2 of 5]

LabCase #

01-0001-2003-0001-0000-03 Retrieve Info

Box	0		Sealed	Yes	Seal Type		Tape	Yes
Bag	0		Yes				Yes	
Envelope	0		Yes				Yes	
Other	4	Brown Wrap Paper	Yes		N/A		Yes	

Add / Update Delete

[Go to Main Page](#) Continue

Figure 5.42: Evidence Packaging Information

Lab Processing Report (4 of 5) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/labpro2a.aspx

F.I.M.S. Forensics Information Management System

Evidence Testing [4 of 5]

LabCase #

01-0001-2003-0001-0000-03 Retrieve Info Update Continue

[Go to Main Page](#)

LabCaseNum	ItemId	Items	Lmg	Species	Ap	P30	Sperm	Sample	Comments
01-0001-2003-0001-0000-03	10	Knife	+					Yes	Small 5 Inches lock blade pocket knife,
01-0001-2003-0001-0000-03	11	Screw Driver	+					Yes	Craftsman flat head 3/8
01-0001-2003-0001-0000-03	13	scissors	+					Yes	Black handle with silver blades, blades swabbed ha

Figure 5.43: Evidence Testing

Lab Processing Report (5 of 5) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/labpro3.aspx

F.I.M.S. Forensics Information Management System

Lab Case # 01-0001-2003-0001-0000-03

Protocol Information [5 of 5]

[Retrieve Info](#)

PROTOCOL USED

B : LMG :

S: HTrace :

S : Other :

AP: Test Tube :

P30: ABA:

SM: Microscopic

TESTING DATES

B :

S:

S :

AP:

P30:

Are you sure you want to Add/Update?

Your Records were UPDATED in the Database

[Go to Main Page](#)

Figure 5.44: Protocol Information

F.I.M.S. Forensics Information Management System

Evidence Processing

Lab Case Number 01-0001-2003-0001-0000-03

Work Date Begin Work Date End Analyst

Location of Evidence

		Comments	Sealed	Seal	Tape
<input type="text" value="0"/>	Box	<input type="text"/>	Yes	<input type="text" value="None"/>	Yes
<input type="text" value="0"/>	Bag	<input type="text"/>	Yes	<input type="text"/>	Yes
<input type="text" value="0"/>	Envelope	<input type="text"/>	Yes	<input type="text"/>	Yes
<input type="text" value="4"/>	Other	Brown Wrap Paper	Yes	N/A	Yes

Item Id	Items	Lmg Species	Ap	P30	Sperm Sample	Comments
10	Knife	+			Yes	Small 5 Inches lock blade pocket kni
11	Screw Driver	+			Yes	Craftsman flat head 3/8
12	scissors	+			Yes	Black handle with silver blades, b had swabbed ha

PROTOCOL USED

B : LMG :

S: HTrace :

S : Other :

AP: Test Tube

P30 ABA

SM: Microscopic

TESTING DATES

B :

S:

S:

AP:

P30 :

SM :

Test Comments

Knife Blade had gummy type substance

Figure 5.45: Evidence Processing Report

5.2.1.3 Extraction and Amplification

The FIMS screenshots associated with Extraction and Amplification are shown in Figure 5.46 – 5.48. Evidence Preparation consists of information on extraction method, questioned extraction date and time, questioned organic date and area, Known extraction date and time, Known organic date and area, analyst initials and hood details. This is shown in Figure 5.46. Extraction and Amplification screen consist of information items Lysis, Centricon, Amplification details and number. Test equipment information consists of information on the three different systems including system profiler, system CTT and system power plex 16. The information was entered in FIMS after all the tests were performed for this phase. FIMS generate the EA report automatically and is shown in Figure 5.49.

Extraction & Amplification (1 of 4) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/ExAmp1.aspx

FIMS Forensics Information Management System

Evidence Preparation [1 of 4] Lab Case # 01-0001-2003-0001-0000-03

EXTRACTION METHOD : organic [Retreive Info]

Questioned : Extraction Date : 11/24/03 Time : 10:00 Hood : 3

Organic Date : 11/24/03 Area : 10:00

Known : Extraction Date : 11/24/03 Time : 12:00 Hood : 1

Organic Date : 11/24/03 Area : 12:00

Initials maz

Your Records were ADDED in the Database

Add / Update Delete

Back to Main Page Continue

Figure 5.46: Evidence Preparation

Extraction & Amplification (3 of 4) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://157.182.196.78/sqlupdate/examp2a.aspx>

FIMS Forensics Information Management System

Extraction & Amplification [3 of 4]

Lab Case #

01-0001-2003-0001-0000-03 Retrieve Info Update Continue [Back to Main Page](#)

LabCaseNum	Id	Items	Lysis	Centricon	Amp	Ampnum
01-0001-2003-0001-0000-03	20	2221	S	CN	Yes	1
01-0001-2003-0001-0000-03	21	2222	S	CN	Yes	5

Figure 5.47: Extraction and Amplification

Extraction & Amplification (4 of 4) - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address <http://157.182.196.78/sqlupdate/examp2a.aspx>

FIMS Forensics Information Management System

Test Equipment Information [4 of 4]

Lab Case # 01-0001-2003-0001-0000-03

System Profiler +

Amp #

Date :

TCYLR :

System : CTT

Amp #

Date :

TCYLR :

System : PowerPlex16

Amp #

Date :

TCYLR :

☐ Hot: 95 C - 11 min

☐ D: 94 C - 1 min

☐ A: 59 C - 1 min

☐ E: 72 C - 1 min

☐ Cycles : 28

☐ Extend: 60 C - 45 min

☐ Hot: 95 C - 2 min

☐ D: 94 C - 1 min

☐ A: 60 C - 1 min

☐ E: 70 C - 1.5 min

☐ Cycles : 10

☐ D: 90 C - 1 min

☐ A: 60 C - 1 min

☐ E: 70 C - 1.5 min

☒ Hot: 95 C - 11 min

☒ Hot: 96 C - 2 min

☒ D: 94 C - 1 min

☒ A: 60 C - 1 min

☒ E: 70 C - 1.5 min

☒ Cycles : 10

☒ D: 90 C - 1 min

☒ A: 60 C - 1 min

☒ E: 70 C - 1.5 min

☒ Cycles : 22

☒ E: 60 C - 30 min

☒ S: 4 C

Comments :

Add/ Update
Delete
[Back to Main Page](#)

Figure 5.48: Test Equipment Information

[illegible]

5.2.2 Web Based Version for ORI Agency

The ORI agency can enter FIMS web based version after entering the login id and password and authenticated. The ORI agency can access the case submission, check the status of a case submitted to WVSPFL and send feed back to the WVSPFL. The FIMS main screen for ORI Agency is shown in Figure 5.55. The FIMS main screen for ORI is shown in Figure 5.51.

FIMS : Login Screen - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/password.aspx

West Virginia State Police

Forensics Information Management System ©

Login Screen

User Name

Password

SUBMIT

SECURITY NOTE:
Your IP Address **157.182.196.120** will be Stored

Figure 5.50: FIMS Login Screen for ORI Agency

Figure 5.51: ORI Main Screen

When the ORI agency clicks “New Case Submission”, a new case can be submitted. The ORI new case submission screen is shown in Figure 5.52. The ORI can enter the case number and clicks “Enter – CR Form” to submit new case submission. The ORI can view the screens for case submission as shown in Figure 5.28 to 5.39. After submitting the case report, the ORI agency can come to the ORI Case Submission screen. The ORI can also submit the feed back to WVSPFL and the feed back screen is shown in Figure 5.53.

Figure 5.52: ORI New Case Submission

Figure 5.53: Feed Back Form

The Status Tracking enables the ORI agency to access the status of the case submitted to WVSPFL. The status-tracking screen is shown in Figure 5.54. The ORI can select the case number from the drop down list and click “Track the Status” button. FIMS will track the case submitted and the status will be updated automatically in the status-tracking screen. This is shown in Figure 5.55.

Figure 5.54: Status Tracking Login Screen

The ORI can also print the Case Report submitted to WVSPFL by clicking “View Case Report” command button. The Case Report form is shown in Figure 5.45. The ORI agency can go to the main screen and log off FIMS.

Status Tracking - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://157.182.196.78/sqlupdate/Status.aspx

FIMS Forensics Information Management System

Status Track

LabCase # 01-0001-2003-0001-0000-03

CR Form CR Form Submitted

Evidence Status Evidence Received

Evidence In Process DNA Unit

OverAll Status Evidence Pending

Go to Main Screen

Figure 5.55: Status Tracking Screen

5.2.3 Web Based Version for Prosecutor’s Office

The Prosecutor can enter the FIMS web based version after logging in the user name and password. After the user name and password was authenticated, the prosecutor can check the status of the case submitted to WVSPFL by ORI agency and print the Case Report Form. The FIMS main screen for prosecutor’s office is shown in Figure 5.56.

Figure 5.56: FIMS Main Screen for Prosecutor's Office

The Prosecutor can select the case number from the drop down list and track the status of the case. They can also view the case report form. The sample case report form is shown in Figure 5.40. The status-tracking screen is shown in Figure 5.55.

5.3 Mobile Based Environment

The mobile-based environment was developed for case submission phase. The login screen of FIMS mobile-based environment is shown in Figure 5.49. The FIMS environment screen shots for mobile-based information for case reporting phase are shown in Figure 5.57 –5.64.

Figure 5.57: FIMS Login Screen

Figure 5.58: Reporter Information

Figure 5.59: Investigation Information

Figure 5.60: Victim Information

Suspect Information

Agency Case # 010801000100 Suspect ID 1

Suspect Name Timothy C. Cutt Suspect DOB

Race Hispanic Sex F Ht 6 Wt 80

Address N/A Criminal History N/A

City N/A State WV

Zip Code 25312

Continue

Figure 5.61: Suspect Information

Crime Description

Agency Case # 010801000100

Brief Description of Crime

Suspect went to victims house and fight occurred in the porch.

Drug Statistical Purpose only

Amt Seized N/A Street Value N/A

Exam Desired

Blood Identification

Continue

Figure 5.62: Crime and Drug Information

Item Description

Agency Case # 010801000100

Item Id 1 Item Name Pair of Boots (Suspect's)

Continue

Figure 5.63: Item Description

Acceptance Information

Agency Case # 010801000100 Received by Ted Smith

Date 11/23/03 Time 10:00AM

Acceptance Mode

US Mail

Disposition of Evidence

N/a

Submit End

Figure 5.64: Acceptance Information

6.0 CONCLUSIONS AND FUTURE WORK

The existing processes at WVSPFL were examined. Appropriate processes in the forensic lab were Re-Engineered. A FIMS database was developed that can store case information for the WVSPFL. An integrated Web based, Windows based and Mobile (PDA) based environments were developed with three different level of access for WVSPFL, ORI agency and Prosecutor's office. This project proposes an innovative approach to capture forensic data using relatively inexpensive and commercially available PC/PDA devices. FIMS was used to gather real time data at a crime scene using mobile-based environment. Such an approach had the potential to significantly reduce paper work to zero, to increase data reliability, to decrease turn around process time and cost associated in processing forensic data manually. The system also ensures the high degree of accuracy and reliability of evidence.

Future Work

Develop FIMS system for the remaining six units of WVSPFL in all the three environments.

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