

2003 NASCIO Recognition Awards

Enterprise Information Architecture Category

Adaptive Architecture For Criminal Justice Systems

*NORTH CAROLINA
DEPARTMENT OF JUSTICE
INFORMATION TECHNOLOGY DIVISION*



2003 NASCIO Recognition Awards Nomination Form

Title of Nomination:	Adaptive Architecture for Criminal Justice Systems
Project/System Manager:	Ed Johnson
Job Title:	CIO
Agency:	Department of Justice
Department:	Information Technology Division
Address:	407 Blount Street
City:	Raleigh
State:	North Carolina
Zip:	27601
Phone:	919-716-1000
FAX:	919-716-1104
Email:	EJohnson@mail.jus.state.nc.us

Category:	Enterprise Information Architecture
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Person Nominating: (if different from above)	George Bakolia
Title:	State Chief Information Officer
Address:	PO Box 17209
City:	Raleigh
State:	NC
Zip:	27609
Phone:	919-981-2680
FAX:	919-981-2548
Email:	George.bakolia@ncmail.net

Executive Summary

The growing need for a central computerized network of criminal justice information for the state of North Carolina prompted the North Carolina General Assembly to enact legislation in 1969 authorizing the Department of Justice to collect, store, and disseminate criminal history and criminal statistical information.

Today, in addition to maintaining criminal history information and criminal statistical information, the North Carolina Department of Justice Information Technology Division serves as the statewide telecommunications center for North Carolina law enforcement agencies. This central computer network operates twenty-four hours a day, seven days a week, linking local, state, national, and international criminal justice agencies with up to the minute information on crimes and criminals. From 10,000 devices throughout North Carolina, users of the network not only have the ability to transmit and receive any law enforcement related message within seconds, but they also have access to other law enforcement computers located throughout the state and nation, as well as Canada and Mexico.

In 1998, the North Carolina Department of Justice management began to address technology and compliance issues related to the Criminal Justice Information System (CJIS). Specifically, they identified that existing technology did not afford North Carolina law enforcement end users access to newer available tools and products (such as NCIC 2000 standards, data security, and graphical imaging).

To meet the expected needs, management formulated a long-range plan to replace the existing proprietary hardware with an adaptive architecture environment. They also chose to replace the proprietary-protocol end user interface with a browser-based interface that is capable of providing users with fast, efficient, and secure access to all currently accessible data via any web-compliant browser. The plan also specified that online computer-based operator training, testing, and certification be implemented. Once this new environment was established, the applications would be migrated from legacy code to JAVA.

The North Carolina Department of Justice Information Technology Division's migration from the existing mainframe and its associated functions began in 2000. Functions that previously resided on the mainframe were incorporated in the new n-tier client/server environment. On January 15, 2003, the new infrastructure and the new end-user interface were implemented.

The new enterprise architecture has proven to be beneficial to both state and local law enforcement agencies, as well as to the citizens of North Carolina. The benefits recognized from the adaptive architecture for NC Criminal Justice Systems include:

- Reduction in costs,
- Effective management of funding,
- Increased availability of public safety officers,
- Greater responsiveness to new business requirements, and
- Unlimited growth potential for devices accessing the NC Criminal Justice System.

In the April 2003 issue of Government Technology, the North Carolina Department of Justice was recognized for selecting XML to improve their ability to share criminal justice information.

Description of the Project

The North Carolina Criminal Justice Information System

The North Carolina Department of Justice (DOJ) serves as the criminal justice and public safety gateway to the nation as well as to state and local law enforcement entities. It is critical that information is shared easily and as seamlessly as possible. Law enforcement and public safety require a technology infrastructure that is extremely reliable and resilient.

The North Carolina Criminal Justice System operates in a highly sophisticated and complex environment. The system provides access to state law enforcement agencies, district attorneys, courts, and the North Carolina penal system. The system also provides law enforcement agencies (LEA) access to national criminal justice systems such as the NCIC and NLETS plus it allows citizens access to a sex offender registry and to statistics related to criminal justice in North Carolina.

Why Move to Adaptive Architecture?

- *To align with NC Statewide Technical Architecture Strategy*
A North Carolina legislative mandate passed in 1996 provided a framework of principles, recommended best practices, and created state standards to direct the design, construction, deployment, and management of distributed, client/server information systems for state agencies. DOJ began with this framework and extended it to support the LEA business.
- *To disengage from a monolithic, proprietary environment*
DOJ's former mainframe environment supported only a proprietary communications protocol that limited the ability to communicate with other agencies. The mainframe system had limited capacity to add additional communications devices. Applications were written in "primitive" languages such as COBOL and Assembler.
- *To build upon past experiences*
For many years DOJ operated a "messaging" environment. Opening the system up with common messaging system software greatly simplified inter-agency data access.

Technical Infrastructure/Architecture

The North Carolina Department of Justice depends on a number of business-critical applications for law enforcement and public safety. Many of DOJ's applications must communicate with one another, as well as with applications outside the department. External applications include applications operated by federal agencies and applications owned by other NC agencies plus applications used by local law enforcement agencies.

With this in mind, NC DOJ designed and implemented a law enforcement technical architecture that is a prime example of an open system. The enterprise architecture is composed of different components that are interchangeable. Because of the nature of an open system, interfacing with other state and national agencies has been significantly simplified. DOJ chose to deploy their internal applications using the same messaging standards as for inter-agency data access. This allowed DOJ to publish a service for data access that would serve both internal messages as well as messages from outside agencies.

The new technical environment consists of six servers and a DOJ application manager (CORE) – all with a specific function:

1. End User Interface (EUI) Web Server (Tier 1)
A pair of Dell servers make up the Tier 1 server with a Cisco local redirector providing load balancing between the two machines. The EUI Tier 1 servers utilize Datamaxx software to provide the user interface. These servers provide devices in North Carolina Police Departments and Sheriff Offices access to the National Criminal Information Center (NCIC), the National Law Enforcement Telecommunications Center (NLETS), National Oceanic and Atmospheric Administration (NOAA), North Carolina Department of Motor Vehicles (DMV), Administrative Office of the Courts (AOC), and the North Carolina Wildlife Resources Commission (WRC). The EUI Tier 1 servers also provide training and certification software in which new users can familiarize themselves with law enforcement transactions and become certified to use the Criminal Justice Information System.
2. End User Interface (EUI) Validation Server (Tier 2)
A pair of Dell servers make up the Tier 2 server with a Cisco local redirector providing load balancing between the two machines. The EUI Tier 2 servers utilize Datamaxx software to provide authentication and authorization for desktop users. Once users enter their user-id and password into the Tier 1 logon

screen, each user is authenticated and authorized for specific transactions in which they have been certified. The desktop devices communicate via DMPP-2020 protocol over TCP/IP.

3. Law Enforcement Message Switch (LEMS)

Two Sun E4500s running in a clustered environment provide the LEMS system. LEMS controls access to NCIC, NLETS, NOAA, DMV, AOC, and NC WRC through various transactions. The LEMS system allows the connection of mobile devices, hand-held devices, and Computer Aided Dispatch (CAD) systems. These devices connect directly to LEMS and send transactions via period data format. The mobile/CAD/hand-held devices are authenticated and authorized by the Tier 2 Validation Server – just like the desktops. LEMS parses the data and formats XML messages that are sent to CORE and/or other state agencies via MQSeries. LEMS also formats messages to NCIC and NLETS in their respective formats via a direct connection to each of the two agencies.

4. IBM MQSeries/Candle ROMA

Two IBM H80s running in a clustered environment provide the message transport between LEMS and the application server, as well as to agencies communicating with NC DOJ through MQSeries. To promote simplicity, as well as industry standards, XML is used for all messages. The message content is separated from the message presentation. Once a message is received, a stylesheet converts the information into a format for another computer or application or into a readable format for the user. This provides great flexibility by allowing DOJ to alter how the data is displayed without modifying the sending application. Since XML is platform independent, multiple open-source parsers will allow agencies to parse the original XML message if the need arises.

5. Oracle Database Server

Two Sun E4500s running in a clustered environment provide the data services for the LEMS system.

6. Application Server

The UNISYS ES7000 provides the application server used for DOJ local applications. The server is partitioned to provide a production and a development environment.

7. Critical Operations Runtime Environment (CORE)

CORE is a custom-built application that facilitates messaging and provides a repository for common services that can be shared by multiple applications. Because the DOJ applications communicate with other applications by sending and receiving messages, DOJ has implemented the DOJ Justice Message Broker, which enables applications written in different languages and running on different platforms to communicate with each other. DOJ has adopted XML as the standard application messaging protocol between both internal and external applications

The diagram at the end of this document illustrates the North Carolina Department of Justice technical architecture that was implemented on January 15, 2003.

From Green Screens to Browsers

As a part of the initiative to migrate existing mainframe business applications and data to an adaptive environment, the North Carolina Department of Justice developed a new, browser-based end user interface. This migration positioned DOJ to implement the upgraded, federally mandated Criminal Justice Information System (CJIS) security functions relating to access, authorization, and encryption/decryption.

In an addition to meeting the mandates of the enhanced NCIC 2000 standards, the End User Interface met the North Carolina requirements for communication between disparate IT systems. The EUI design also provided computer-based training, testing, and operator certification management for all NC criminal justice system users.

Significance to the Improvement of Government Operation

Staffing

Several key personnel at the DOJ/IT Division have retired in the past few years. DOJ quickly discovered that the skills held by those staff were no longer readily available in today's market. The skills related to the antiquated technology became increasingly difficult to replace through hiring new staff or duplicate through contracted services. That created a critical dependency on current staff and their experience.

The migration to newer technology provided DOJ/IT Division the ability to acquire the needed skills from a large and diverse market. This also allowed DOJ/IT the opportunity to upgrade the skill sets of their remaining staff.

The education and experiences gained from the new technology led to overall greater job satisfaction, higher productivity, and improved employee retention.

Manage Funding more Effectively

Funding requests for enhancements to the older monolithic system were quite large. Many times, they were sole-sourced due to the proprietary architecture. The new adaptive architecture has allowed DOJ to make incremental funding requests based upon system functionality. The smaller, function-related requests are much easier to estimate, as well as to manage. If the requests are not dependent upon each other, enhancements to one function of the system can be implemented, even if the funding of another enhancement is not received.

Flexible End User Interface

The EUI provided North Carolina law enforcement agencies a web-based interface to the DOJ Criminal Justice Information System. The graphical user interface allows agencies access to photos of suspects, stolen vehicles, and sex offenders. Unlike the previous user interface, the new end user interface has no restriction on the number of devices accessing the Criminal Justice Information System.

DOJ Business Liaisons may now change the user screens without DOJ programming staff intervention. Changes to forms, tables, and message layouts on the desktops are automatically synchronized with the EUI presentation services. When a user signs on, the interface will upgrade the presentation software to the latest version.

Certification Training

With the new web-based EUI, DOJ is able to offer online NCIC-required operator training and testing to the state and local law enforcement agencies. Law enforcement personnel may only access criminal justice functions for which they are certified. After attending the initial training, the law enforcement personnel will take the online test for the applicable functions. Once they pass the online test, they are immediately certified to request information from the Criminal Justice Information System. Each time the personnel must be re-certified, they may take the training and testing through a web-based.

Benefits

Ability to Re-architect Applications with New Technology

The North Carolina DOJ/IT Division will no longer rely upon proprietary technology to develop the Criminal Justice Information System functions. They will convert all the DOJ application legacy code to JAVA. This will afford them the use of open-source products and tools. The adaptive architecture will also allow cost-effective management of system upgrades with open competition among vendors.

Application databases will be converted into Oracle. This will allow DOJ the opportunity to integrate all criminal justice information into a data warehouse. With a criminal justice warehouse, DOJ can provide law enforcement agencies (and the public, as appropriate) more comprehensive criminal justice statistical reporting through data mining. The data warehouse will eliminate the need for redundant data entry. This will ensure greater data integrity, as well as reduce labor costs. A data warehouse will provide the ability to share data seamlessly among DOJ internal applications. By standardizing information within the data warehouse, DOJ will promote direct data exchange among all criminal justice agencies and eliminate the burden of data translation.

The use of XML and ROMA/MQSeries messaging for both inter-agency and intra-agency interfaces will enable DOJ to create functions, which can process data from either the EUI or any other agency's application. DOJ/IT will no longer need to create and maintain separate processes for these interfaces. This will ensure that DOJ processes the information in the same manner, regardless of the data's origin. The common interface among criminal justice agencies also provides a simple interface for all functions even though they may be running on different platforms and written in different languages.

System Growth

With the older, monolithic architecture, DOJ did not have the ability to expand the devices used to access the Criminal Justice Information System. However, with the adaptive architecture, DOJ now has unlimited growth potential for devices accessing the Criminal Justice Information System, including access via hand-held, wireless devices. The architecture also allows DOJ to adapt additional technology quickly into the current infrastructure for increased messaging requirements related to disaster situations.

Competitive Pricing

The vendor-neutral components used in the architecture created open competition amongst potential vendors. Multiple vendors will compete to provide hardware and software products and services. This allowed North Carolina Department of Justice to acquire the best services at the best price. Both state and federal governmental agencies plus taxpayers benefit when cost effective products and/or services are purchased.

Enhanced User Satisfaction

Since the implementation of the browser-based EUI, DOJ/IT has received a great deal of positive feedback from both state and local law enforcement agencies. There are drop-down lists and popup menus for data lists and field help aids. The EUI screens send large messages to the user in a single response. Unlike the mainframe-based screens, the browser-based EUI allows multiple screens to be open at one time. With browser-based functions, the end user interface has proven to be a timesaving to both the local and state agencies accessing criminal justice information.

Responsiveness to New Business Requirements

With today's economy and government budget cuts, government agencies struggle to meet the increased needs of the public in a timely manner. The new architecture and EUI allows the North Carolina Department of Justice to implement changes required by legislative mandates and by new LEA business requirements quickly.

The NC Center for Missing Persons contacted DOJ/IT requesting a method for statewide notification to all law enforcement agencies when an Amber-Alert child abduction has occurred. The DOJ/IT Business Liaison Section used the new EUI software to create an Amber Alert Notification message screen. The missing person must first be entered into the federal NCIC system before entering the information on the NC Amber Alert screen. After the information is entered on the Amber Alert Notification screen, the information is immediately transmitted to all law enforcement agencies in the state that receive Be On the Look Out (BOLO) messages. Information provided in the message includes: victim data such as name, race, sex, age, height, weight, hair and eye color; and if available, suspect information such as name, race, sex, age, vehicle description and license plate number. Immediately alerting the state and local law enforcement agencies reduces the opportunity for the victim to be transported out of their local area and increases the chance of successfully returning the victim to their loved ones and apprehending the suspect.

The NC Uniform Crime Reporting (UCR) system began as a manual system consisting of tally sheets submitted by law enforcement agencies. DOJ developed a new web-based UCR system that offers online data-entry with quality assurance controls and rapid updates plus provides citizens and law enforcement personnel access to in-depth crime statistics through the DOJ website.

North Carolina has also developed a Traffic Stop Statistics system that provides demographic statistical information pertaining to traffic stops. The web-based, real-time data entry screens provide convenient input for law enforcement agencies. The public can view up-to-date information via the DOJ website.

Availability of Public Safety Officers

Online certification training reduces the time public safety officers are away from their beat to attend the NCIC-required re-certification training. The officers will now take the training within their schedule at their office rather than traveling to training courses offered only periodically.

Because of the increased accessibility to devices, more public safety officers have key criminal justice information at their fingertips. Rather than calling a communications center for this information, officers are able to access it in their cars instantly. This also frees the communications staff to respond to citizen emergency requests.

By reducing time needed for certification and increasing access to key criminal justice information, the new open system at North Carolina Department of Justice allows public safety officials to spend more time on the street and ensures a quicker respond to citizen requests.

Return on Investment

Reduction in Operational Costs

By moving from the mainframe system to a client/server environment, North Carolina Department of Justice recognized **over 50% reduction in annual maintenance and licensing fees** related to hardware and software. The annual maintenance and licensing fees for the mainframe were over one million dollars while annual maintenance

fees for the new infrastructure are approximately \$426,000. Publishing reports online **reduced DOJ paper costs 30%**.

Reduction in Labor Costs

The implementation of the web-based Uniform Crime Reporting system allowed DOJ to reallocate 75% of the workload in the Crime Reporting Section to another area. The reallocation of personnel saved North Carolina Department of Justice **\$220,000** in personnel costs. The State Bureau of Investigation realized an annual labor cost savings of **\$66,000** because of the Traffic Stop Statistic system. Through the elimination of duplicated data entry and improved data access, NC DMV License & Theft Bureau was able to cut their workload in half. They estimated labor costs were reduced **\$44,000**.

Reduction in Training Overhead Expenses

Printing and postage costs for training and reference manuals have been reduced **\$50,400** due to centralized, online reference materials afforded by the new end user interface. The web-based end user interface allowed DOJ to publish training and reference manuals online, to create job aids such as graphical help functions, and to add interactive links to their newsletter. Online manuals have also reduced storage costs **10%**.

Online re-certification training and testing eliminated LEA travel expenses needed for officer re-certification. This is a significant benefit when travel expenses are reduced or eliminated due to budget cuts. Without the sufficient travel funding, officers lose their certification and no longer have access to the Criminal Justice Information System. Online testing has also significantly reduced the travel expenses related to administering the certification training and tests.

Exhibit 1 – North Carolina Department of Justice Adaptive Architecture



