

white paper

## Intelligence Data Fusion

Establishing a single view of your environment enables collaboration and rapid response to public safety and health events.

visibility

Data fusion is now emerging as a strategy rather than a concept. Fusing intelligence data together with the appropriate analytics tools can provide you with a foundation to create a single view of your environment. This enables multi-level government agencies to better collaborate to identify, problem solve and respond to emerging public safety and health events.

A data fusion strategy can help government agencies to overcome many of the key obstacles that exist when trying to act in a critical situation. These obstacles include obtaining critical information concerning crime and emerging terrorist threats, effectively converting data to information and thorough analysis to actionable intelligence, sharing intelligence among government and local law enforcement agencies, and engaging in large scale collaboration to problem solve and respond.

Data Fusion Centers work to provide the right people, with the right information, at the right time. When developing a data center strategy, you need to take into account current best practices including standards, information discovery and exchange, and analysis tools. Thinking through the role of a Fusion Center and available technologies can help you build a strategy that better enables your agencies to protect and preserve the public trust.

## Table of Contents

Fusion: An Overview	4
Data Fusion – An Operational Definition	4
Terrorism, the External Imperative	4
Role of the Fusion Center	4
The National Movement	5
National Workgroups	5
Standards, the Foundation for Sharing	5
The Need to Find the Right Information	6
Information Needs	6
User Interface	6
Information Discovery and Search	6
Making Sense of Unstructured Data	6
In Support of Analysis	7
Advanced Analytics	7
Spatial Analysis	7
Beyond Information Sharing	8
The Need for Interoperability	8
Query, Push, Pull and Publish	8
Alerts and Notification	8
Conclusion: A Data Fusion Strategy	9
About Unisys Fusion Solution	10
About Unisys	11
About the Author	12

## Fusion: an Overview

### Data Fusion - An Operational Definition

The concept of Intelligence Fusion seems to have its origins in the military intelligence community. The Military Dictionary (DOD) defines Fusion, in intelligence usage, as “the process of examining all sources of intelligence and information to derive a complete assessment of activity<sup>1</sup>.” A Fusion Center, in intelligence usage, is defined as “a physical location to accomplish fusion. It normally has sufficient intelligence automated data processing capability to assist in the process<sup>2</sup>.”

From a local law enforcement and public safety perspective, fusion “. . . refers to the overarching process of managing the flow of information and intelligence across all levels and sectors of government and private industry” and a Fusion Center is “. . . an effective and efficient mechanism to exchange information and intelligence, maximize resources, streamline operations, and improve the ability to fight crime and terrorism by analyzing data from a variety of sources<sup>3</sup>.”

### Terrorism, the External Imperative

Prior to the terrorist attacks of 9/11, law enforcement engaged, albeit to a limited degree, in information and intelligence fusion activities<sup>4</sup>. The terrorist events of 9/11 were the catalyst for the establishment of more than 40 state, local, and regional Fusion Centers across the country.

Unlike the local nature of many of the crimes with which local law enforcement had been dealing, terrorist events transcend local and regional boundaries. A key driver of the Fusion movement was the recognition by law enforcement and intelligence agencies of the need to share information across multiple boundaries to deal with the terrorist threat.

While 9/11 was indeed a catalyst, law enforcement had long before recognized the need to share information in order to combat local and regional crime. This fostered an understanding of the fundamental elements associated with the exchange of information among law enforcement agencies using disparate systems. Early on, they recognized data standards as the critical and missing element.

### Role of the Fusion Center

The role of the Fusion Center is to compile, analyze, and disseminate criminal/terrorism intelligence and other information to support efforts to anticipate, identify, prevent, and/or monitor criminal activity<sup>5</sup>. The collection and analysis of disparate information is essential for Fusion Centers to anticipate, identify, prevent, and/or monitor criminal activity. The constant flow and changing nature of information requires Fusion Center activity to be dynamic; collecting law enforcement and intelligence information once must give way to developing the capability to continuously capture, aggregate and synthesize law enforcement information with other relevant information, such as transportation, financial, public health, and social services. This dynamic approach to information gathering is necessary to support the rapid identification of emerging threats; support multidisciplinary, proactive, and community-focused problem-solving activities; support predictive analysis capabilities; and improve the delivery of emergency and non-emergency services.

<sup>1</sup> <http://www.dtic.mil/doctrine/jel/doddict/data/f/02274.html>

<sup>2</sup> *ibid*

<sup>3</sup> DOJ. 2006. Fusion Center Guidelines

<sup>4</sup> CRS. 2007. Fusion Centers: Issues and Options for Congress

<sup>5</sup> BJA, 2005. Fusion Center Guidelines

## The National Movement

### National Workgroups

The creation of national standards required collaboration on a national scale. The main working group involved in the quest to create standards is the Global Committee. Global, formed by the U.S. Attorney General, advises the Attorney General on issues such as improving the administration of justice and protecting the nation's citizens by promoting practices and technologies for the secure sharing of information. Global is a "group of groups," representing more than 30 independent organizations, spanning the spectrum of law enforcement, judicial, correctional, and related bodies.

Other national groups have also made important contributions to the development of national standards. The National Association of State Chief Information Officers (NASCIO), SEARCH, and the IJIS Institute are among those frequently mentioned in the literature who continue to contribute to standards for information sharing.

The Information Sharing Environment (ISE) was congressionally mandated in 2004. It outlines policy designed to enhance sharing of intelligence with foreign governments, and proposes to widen the definition of terrorism information that can be shared. ISE combines policy and business process re-engineering with modern information technology, designed to create a network of systems connecting officials and the terrorism-related information across domains of federal, state and local agencies involved in protecting the United States from terrorism.

### Standards, the Foundation for Sharing

Global, through a series of important initiatives, has been at the forefront of standards development. Through its working groups, the development of technology standards began and has evolved. Efforts such as the creation of the Global Justice XML Data Model (Global JXDM), and the development of white papers on data sharing issues, such as the National Criminal Intelligence Sharing Plan (NCISP), have been important to successful Fusion Center development. NASCIO development of the Concept of Operations for

Integrated Justice Information Sharing and the ConOps Validation Project, both of which were funded by a grant from the Bureau of Justice Assistance, also recognize the need for standards.

Among the more recent standards initiatives with the potential to positively impact data fusion efforts, are the creation of the National Information Exchange Model (NIEM) and the work being done through the IJIS Institute by the Information Sharing Architecture Committee (ISAC) to create a much needed business architecture. In addition, the IJIS Institute is currently developing a Fusion Center Information Sharing Framework that helps agency leaders define mission critical services. This effort will include:

- A list of key considerations for launching or enhancing a Fusion Center
- Materials that facilitate communication across diverse communities
- A synopsis of key information gleaned from numerous related documents

A number of other important standards initiatives have been led by the IJIS Institute such as, the Public Safety/Transportation Information Exchange, Functional Standards (GJXDM) Performance Testing, and the enhancement of Juvenile Justice Information Exchanges.

The movement toward standards-based interoperability is reinforced by the findings in a recent Congressional Research Service (CRS) report<sup>6</sup>. In it CRS recommends, as an option for Congressional consideration, requiring Fusion Centers and states that wish to use federal funds to purchase information management systems to ensure their systems are able to "speak" to other systems. This would enhance the potential of making connections between disparate data points and reduce information silos at state and/or regional levels. In the long term, this move is ". . . likely to force the companies that sell these systems to work in XML or create the appropriate loaders to translate between XML and its proprietary language."

<sup>6</sup> CRS, 2007 (July) Fusion Centers: Issues and Options

## The Need to Find the Right Information

### Information Needs

Data fusion involves the exchange of information from different sources including but not limited to: law enforcement, public safety, public health, social service, public works and the private sector. When combined with appropriate analyses, it can result in meaningful and actionable intelligence and information. The Fusion process turns information and intelligence into knowledge. Key to the success of any Fusion effort is access to information; standards and interoperability have been recognized as fundamental to information access.

### User Interface

Participants must have the ability to find and access crime and terrorism information to support their business processes. Access to this information should be via a single, intuitive user interface using existing devices, such as Web interfaces, mobile terminal devices, and end user applications that support daily activities. The objective is to provide access to actual data centers and not simply systems and networks. The underlying architecture of choice to accomplish this is the service-oriented architecture (SOA) implemented in concert with Global Justice XML or NIEM data standards as outlined above.

### Information Discovery and Search

The sheer volume of information available requires that the Fusion Center analyst use technology capable of discovering information needed without having to know in advance that it exists or without knowing its location. Advanced information discovery tools such as web crawling and knowledge modeling can provide contextual information associated with persons, subjects, or other entities that are or were a subject of inquiry.

Fusion Centers require powerful and flexible search capabilities. The ISE suggests that search capabilities include: entities (people, places, or things), records (e.g., intelligence reports); multi-cultural name resolution; “Drilling-down” through other related data; personally identifiable information (e.g., fingerprints, photographs, biometrics, etc.) to discover the identity of suspects using multiple identities; searching for queries previously performed by other users; and support processing based on business rules (e.g., filtering, scoring, ranking of results).

### Making Sense of Unstructured Data

Search capabilities should be extended to enterprise searches of both structured and unstructured data and should employ advanced utilities such as knowledge modeling to elucidate the meaning of the information returned. Unstructured content is growing more rapidly than the more traditional structured data, and much of it is external to law enforcement and intelligence agency databases. However, experience has demonstrated that this content is of potential value to the Fusion process. Analysts need methods of monitoring, aggregating and analyzing this content. This can be done with tools that can extract relevant information, attributes, values, and meaning from unstructured information on the Web.

This requires the technology to rapidly transform text-based data as well as non-text data into knowledge for modeling, discovery, and predictive analysis. The system must be designed to maintain a current “knowledge” framework.

## In Support of Analysis

### Advanced Analytics

To effectively deal with the vast array of data available, law enforcement and intelligence personnel must have the tools which will enable them to do more than simply access the data. They must be able to consolidate data from a number of different sources and readily discover links that are not apparent. To do this they must apply a wide range of powerful analytical techniques. Link Analysis tools enable the analyst to understand how the individual elements (e.g., events, people, places, vehicles, property) are connected. Understanding all the complex interrelationships among those elements enables the analyst to see the whole picture more quickly and clearly. These tools relieve the analyst of the burden of finding information and relationships in a collection of documents so that the analyst can focus on understanding and interpreting the information.

### Spatial Analysis

Spatial Analysis is defined as the process of using a geographic information system in combination with crime analysis techniques to assess the geographic context of offenders, crimes, and other law enforcement activity.<sup>7</sup> The cliché “a picture is worth a thousand words” is apropos when describing the value of being able to clearly see the associations created via link analysis. A tool called Visual Analytics enables the analyst to actually view computer generated diagrams or link charts of the complex relationships discovered through link analysis. It enables the analyst to see, explore, and discover hidden relationships, links, patterns, and trends, and turn large volumes of information into actionable intelligence. With sophisticated visual link analysis, the analyst can also “drill down” by expanding entities to discover new links further discerning the detailed links among people places, things, events, etc, that are below the surface.

Using advanced mapping capabilities, such as time series analysis, enables the analyst to watch crime or events change geographically over time, enabling trend analysis, and could inform the development of a predictive model.

<sup>7</sup> DOJ, 2005, Fusion Center Guidelines

## Beyond Information Sharing

### The Need for Interoperability

Information sharing across domains, being promoted by DOJ and DHS through the National Information Exchange Model (NIEM), will provide additional valuable information from new sources. It is designed to develop, disseminate and support enterprise-wide information exchange standards and processes that can enable jurisdictions to effectively share critical information in emergency situations, as well as support the day-to-day operations of agencies throughout the nation.

Beyond sharing, the NIEM model can be the foundation upon which the exchange of information among and between systems can be built, enabling true interoperability. Interoperability enhances the Fusion function and has a positive impact on the entire network of contributors by enabling greater efficiencies, improving data quality and providing more timely data for analysis. The NASCIO Concept of Operations for Integrated Justice Information Sharing<sup>8</sup> provides a model to follow in creating an interoperable sharing environment. Functional elements of the NASCIO ConOps that are central to successful Fusion operations are the ability to Query, Push, Pull, Publish, and Subscribe.

### Query Push, Pull, and Publish

Query is one of the more commonly used tools used in many systems. In the context of a Fusion Center and interoperability, it enables the analyst and other personnel to search local, regional, state, and national databases and receive a response. Ideally this is done via one user interface or portal.

Push is a function that enables the system to automatically send operational information from one agency to another based upon actions taken regarding subjects or cases by the sending agency. In a typical justice scenario, for example, the system would automatically push arrest information from the law enforcement officers completed arrest report to the jail booking system and the prosecutor's office.

Pull is a function that enables the system to automatically gather operational information from another agency based upon actions the other agency has taken regarding subjects or cases. In an extension of the arrest scenario above, for example, the system would allow the court system to automatically pull arrest information from the jail booking system in preparation for the preliminary hearing upon completion of the booking process.

Publish is a function that enables the system to automatically publish operational information on key transactions and events regarding subjects, events and cases in traditional (e.g., paper) and electronic media (e.g., to publicly accessible Web pages, secure servers, etc.). An example of a publish function would be the automatic publishing of newly convicted sexual predators to an Internet web site.

### Alerts and Notifications

The criticality and dynamic nature of crime and anti-terrorism information requires more than the ability to search and discover data. Fusion Center personnel (analyst, investigators, managers, etc) who need to track people, places, events, etc., should be able to subscribe to and receive relevant alerts and notifications. These alerts and notifications should be delivered to the requesting party via a number of preferred devices (e.g., desktop, mobile device, e-mail, etc.) through a subscription service that allows users to select from a list of available alerts.

Subscription/Notification functions enable investigators, analysts, etc. to subscribe to and be notified of key transactions and events regarding subjects, events and cases. For example, an investigator might have a case in which John Doe is a subject of interest. The investigator can subscribe to new occurrences of John Doe in any of the systems that are part of the sharing network. If John Doe has a documented contact with a law enforcement officer the investigator will receive a notification of that encounter.

<sup>8</sup> NASCIO, 2003, Concept of Operations for Integrated Justice Information Sharing

## Conclusion: A Data Fusion Strategy

Since the events of 9/11, the data fusion concept has become part of the landscape of state and local law enforcement. Over forty states now have Fusion Centers, not to mention the efforts by local and regional agencies to start up Fusion Centers.

In order for a Fusion Center to do its work, it must have access to information via some type of interagency sharing mechanism. Through a national effort with input from local workgroups, standards have been developed to provide the foundation necessary to enable information sharing and interoperability. These standards have evolved from GJXDM which is justice centric, to NIEM which covers the entire realm of justice, public safety and Homeland Security.

Analysts at Fusion Centers need tools that support analysis and investigative efforts; they must also have certain functional capabilities. These capabilities begin with information discovery, i.e., the capacity to discover information without having to know in advance that it exists or without knowing its location, using advanced tools such as Web crawling and knowledge modeling.

The ability to handle and interpret unstructured data is important to Fusion Center efforts, given the sheer volume of data on the Internet and elsewhere. The Fusion Center should provide the analyst with tools that can extract relevant information, attributes, values, and meaning from unstructured information on the Web.

The vast array of data available requires law enforcement and intelligence personnel to have tools which will enable them to consolidate data from a number of different sources and readily discover links that are not apparent. Link Analysis tools enable the analyst to understand how the individual elements (e.g. events, people, places, vehicles, property) are connected and thus lead to a better understanding of the complex interrelationships between and among events, people, places, vehicles, property, etc. visual link analysis and spatial analysis (Geographic Information Systems) supplement the analytical tools by enabling the analyst to more readily recognize patterns through graphic representations.

## Fusion and Beyond

A comprehensive Fusion Center solution should include data aggregation and sophisticated analytics. However, this effort to integrate data from disparate systems can be built upon a foundation that enables much more. Beyond the information sharing, a Fusion Center can provide the core infrastructure to enable the exchange of information and facilitate collaboration among stakeholders. This requires a solid technological foundation that supports true interoperability and provides a unique set of functions like alerts, notifications, and subscriptions along with the ability to push and pull data among and between systems.

This underlying technical solution should be driven by business requirements and should embrace the following concepts:

- Information is captured at the originating point, rather than reconstructing it later.
- Integrated systems is comprised of, or derived from, the operational systems of the participating agencies; they are not separate from the systems supporting the agencies.
- Data is retrieved from existing systems in each agency; it is system independent.
- Agencies maintain control of their systems and data.
- Justice organizations retain the right to design, operate, and maintain systems to meet their own operational requirements.
- Integration builds on current infrastructure and incorporates capabilities and functionality of existing information systems.

## About Unisys Fusion Solution

### ISM Framework, a Solid Foundation

The Unisys Fusion Solution was built using the Unisys Information Sharing Management (ISM) Framework which serves as its foundation. The ISM Framework integrates multiple diverse systems that use Enterprise Application Integration (EAI) technology to share mission critical data, documents, images, and transactions at key decision points or events. The ISM Framework is based on and leverages modern Service Oriented Architecture technologies, best-of-breed products, and open standards. This true enterprise platform is designed to provide scalable, feature-rich, secure, and reliable searching across multiple repositories serving multiple applications.

The ISM Framework expands Fusion Center functionality through the use of highly advanced query, push, pull, subscribe, publish, and notify procedures. With this added functionality, the independent justice and Homeland Security operations that interface with the Fusion Center, as well as the center itself, will have access to a full suite of day-to-day, intelligence, analytical, and investigative information.

The following list describes the functionality cited above in more detail.

- Query: The Query functionality of the ISM Framework enables justice domain personnel to perform highly advanced searches for up-to-the-minute information from local, regional, statewide, and national databases.
- Push: The Push Information functionality transmits relevant information (such as an arrest) systematically, when a qualifying event takes place, from one justice system agency to another.
- Pull: In reverse, the Pull functionality transmits information systematically, when a user requests it, from one justice system agency to another.
- Subscribe: The Subscribe functionality provides the ability to set up a subscription to receive notification of justice system events.
- Publish: The Publish New Information functionality enables information to be made available in the ISM Framework.
- Notify: The Notification of New Information functionality enables delivery of new alerts and new information to end users who subscribe to the new arrest event.

### Analytic Tools

Integrated into the ISM infrastructure are best of breed analytic tools to support the Fusion process. An important part of the tool set is the enterprise level Knowledge Modeling and Discovery software which can access and interpret high-value data that is not easily structured using traditional database technology. It enables the analyst to find important connections and details buried in multiple documents and easily conveys this information to the investigative team. Its strength lies in its ability to interpret data that has evolving meaning and lacks a single representation. The browser-based portal enables users to filter out irrelevant information; it processes and returns only specific job or objective-relevant information. Coupled with its automated search and notification, as well as its predictive modeling capabilities, this approach enhances efficiencies by decreasing time spent collecting and assembling information while increasing the time available for analysis and decision making.

Link Analysis tools enable the analyst or investigator to discern associations among and between people, places, incidents, property, vehicles, etc. In an actual case in South Carolina, for example, an investigator was able to solve a homicide using this tool. In this case, the investigator was able to link the license plate of a vehicle associated with the homicide to a passenger in that vehicle during a prior traffic stop. That person was linked through several other people to the suspect who was ultimately charged. In this case the investigator was able to “drill down” by expanding entities to discover the new links, and further discovering the detailed links among people and ultimately to the homicide.

Visualization tools in support of Link Analysis enable the analyst to visually see how the individual elements (e.g. events, people, places, vehicles, property) are connected. Viewing the complex interrelationships between elements enables the analyst to see and interpret the big picture more quickly.

The Spatial Analysis tool supports the analytical function through the use of geographic information system software, enabling the analyst to view offenders, crimes, etc, in a geographically-referenced context. The system displays hot spots, crime trends, including changes over time, enabling the analyst to more readily recognize changing patterns, as they change.

## About Unisys

Unisys is a worldwide information technology services and solutions company. We provide consulting, systems integration, outsourcing and infrastructure services, combined with powerful enterprise server technology. We specialize in helping clients use information to create efficient, secure business operations that allow them to achieve their business goals. Our consultants and industry experts work with clients to understand their business challenges and create greater visibility into critical linkages throughout their operations. For more information, visit [www.unisys.com](http://www.unisys.com).

## Homeland Security, Justice and Public Safety Experience

Unisys Corporation has a long tradition of support of the state and federal law enforcement community. Our Justice and Public Safety & Homeland Security Practice offer consulting, systems integration and services-led solutions in partnership with our clients. Many of our consultants have years of experience in public safety at the local, state or federal level.

For more than forty years Unisys has designed and delivered mission-critical systems for the law enforcement and criminal justice communities. Unisys systems, installed at 25 state criminal justice agencies, help protect 55 percent of the U.S. population. We partner with more than 300 justice agencies worldwide.

Unisys Homeland Security, Justice and Public Safety solutions have been installed in 15 states and nine major counties. Justice and Public Safety application solutions have been delivered to international customers and have been adopted as the application standard for local enforcement agencies.

Our solutions fall into five program areas:

- Strategic planning and enterprise architecture for interoperable justice
- Information analytics and data fusion
- Corrections and jail management
- Integrated court management
- Intelligent mobile response (IMR) and voice interoperability
- Integrated justice interoperability

The global presence of Unisys in the justice and public safety arena attests to our proven record and our commitment to our law enforcement and criminal justice system clients.

In the United States, Unisys provides information services, hardware, and software to more than 900 local jurisdictions and to all 50 states. We specialize in the development and implementation of enterprise wide, mission-critical information technology systems and provide our clients with the highly skilled teams of information systems and management professionals required for success.

Unisys worked with the Department of Homeland Security to implement the Transportation Security Administration (TSA) including all infrastructure and application systems. At the state level Unisys has provided the core repositories for the State Crime Information Center in 11 of the 13 largest states.

Unisys has committed itself to helping justice agencies capitalize on the rapid advances in automation to use information technology as a force multiplier for law enforcement. In so doing, we have combined our information management expertise with our public safety domain knowledge to provide innovative solutions to law enforcement problems through a series of public sector practices.

## About the Author

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