

White Paper

# Geospatial Information System



## Company Overview

Fusion Technology LLC (hereinafter referred to as Fusion) is a performance-driven, small business concern dedicated to providing Information Technology (IT) services to the Federal Government. Headquartered in Bridgeport, WV and a location in the Metro DC Area, Fusion has shown a stable commitment to supporting the Federal Bureau of Investigation (FBI)'s mission for national security and public safety by dedicating 100% of business operations to its Federal Government customer. Focused on providing superior IT solutions, Fusion creates unforgettable customer satisfaction by providing quality technology; industry best practice integration, and experienced professionals to provide unsurpassed value to each contract opportunity.

For the past five years, Fusion has provided technical support to the FBI and other federal agencies. Through increased levels of responsibility in the areas of Enterprise-wide Engineering, Architecture, and Operations and Maintenance services, Fusion has expanded its service offerings to include GIS, as well as other boutique services. Fusion is fully versed in providing 24/7 support for critical systems daily operations and mission support.

## GIS Overview

GIS is defined as a system of hardware and software used for storage, retrieval, mapping, and analysis of geographic data. This data can range from geographic regions such as countries, states, counties, zip codes and census blocks to geographic points and line segments such as cities, residences, businesses, infrastructure points and roads. Using data specific to an organization in coordination with general data can lead to more accurate and efficient problem solving, often helping to identify patterns that before were not evident. Additionally, GIS can be used by the business portion of an organization to help manage and visualize data in presentations, meetings, and analysis of business practices.

When evaluating the solution to a problem the commonly held method of analysis is to consider the who, what, when, where, why, and how. Often overlooked or under emphasized is the "where." This is "where" Geospatial Information Services (GIS) can make a large impact to have a successful enterprise solution.

The Office of Management and Budget (OMB) released a geospatial memorandum to the heads of executive departments and agencies to distribute the OMB Circular A-16 Supplemental Guidance. In part it states:

"Data management and particularly geospatial data management is one of the essential components for addressing the management of the business of government and for supporting the effective and economical use of tax dollars."

In essence, this document stressed to all government agencies the need for a centralized portfolio management of geospatial data. This document addresses the inconsistent and varied use of geospatial data throughout the federal government. It is not uncommon for multiple entities to work on a project using differing geospatial datasets that are supposed to represent the same information. This can end

up causing incorrect findings and costing an organization both money and resources. The solution, as alluded to by the OMB in this guidance, is a centralized enterprise level GIS solution.

In an example in the FBI, there are datasets being produced inside the organization that are being used by third parties to create superior products to what is provided internally. Currently, this data is not used geospatially by other projects within the FBI but could be made available to all as part of an Enterprise GIS solution. Additionally, there are multiple systems within the FBI hosting their own GIS services that provide the same solutions as others. This is a prime candidate for saving costs, increasing reliability, and improving the quality of GIS across the FBI. There are even more systems within the FBI that do not utilize geospatial services and should, creating an enterprise, cloud based, GIS solution for the entire CJIS Division would allow enhancement of these systems. The FBI already uses GIS on many projects and is looking to include it in many more. With the push for moving to the cloud within the government, and IT industry as a whole, the need to make GIS an enterprise level service should be considered now before more money is spent to implement piecemeal over several projects.

An enterprise GIS solution includes the following core elements for successful implementation:

- Centralized management of GIS resources
- Tools of collaboration and data sharing
- Security and user management
- Detailed, varied and accurate geographic data
- Geospatial resources such as geocoding as a service to the enterprise
- A repository for geographic data in databases and geospatial servers

## GIS Tools Overview

### Geospatial Data

The backbone of any GIS solution is the scope and reliability of the geospatial data being provided. GIS is already a large part of how the Department of Defense (DOD) and the Department of Homeland Security (DHS) do business. On top of that the National Geospatial-Intelligence Agency (NGA) manages and supports GIS throughout the government. All these resources can be tapped to provide data to an enterprise GIS solution. A joint effort between the Department of Defense, Department of the Interior, National Geospatial Intelligence Agency and the Department of Homeland Security has created a collection of geospatial data sets, both open and secure, as part of HIFLD (Homeland Infrastructure Foundation-Level Data). This data is made up of roads, infrastructure points, 3D building renderings, businesses and other points of interest that are gathered by both commercial and government entities. Additionally, NGA maintains classified and unclassified maps and tools that can be made available throughout a government organization. This data can be utilized to support and supplement data already created by an organization. The FBI itself also has resources within its own organization that can be leveraged on an enterprise level.

Aside from government resources, several companies to include ESRI and Google make their maps publicly available over the internet or on hardware appliances for use where outside connectivity is not desired.

## Geospatial Services

In addition to geospatial data, services play a large role in making enterprise level GIS a success. Examples of GIS services include serving out geospatial data to be utilized in both web maps and client side applications, geocoding services that will take a submitted address or place name and convert it into a geographic coordinate, place name extraction that can facilitate the recognition of addresses and place names within free text, route analysis that can provide and search by drive times, and the creation and editing of geographic points and polygons. ESRI and Google are two examples of vendors that are already delivering these capabilities inside the government. ESRI already has a presence across several FBI tasks and the money invested into those licenses may be able to be utilized in creating an enterprise solution. Fusion Technology has already established a working relationship with ESRI.

## Enterprise Portal

A GIS enterprise solution would provide not only a server side, behind the scenes access to these services and data but also would require a user accessed web-based portal for interaction with that data from a user's level. This would provide an entire organization with access to GIS tools and resources that would only be possible with the purchase of a client-side application and license otherwise. ESRI currently offers a solution that provides many of the web services provided by the ArcGIS.com interface, but as part of an organization's own established and secure on premise or cloud-based architecture and available only to authorized users. This portal would provide a central location for all GIS data within an enterprise. It would host services for that enterprise and provide a way for datasets created by authorized users to be uploaded and shared to the rest of the organization in a secure and access-controlled environment. ArcGIS server can be readily deployed into AWS and Azure with the ArcGIS Enterprise Cloud Builder and/or extensive support from ESRI complete with examples.

## Fusion's GIS Experience

Fusion is one of the largest single subcontractors to the FBI COMPS task that provides system administration services to several tasks, such as NDEx Operations, III Operations, UNET Operations, NICS Operations, and Enterprise Network/Security Operations. Services performed by Fusion include, but are not limited to: e-mail; analyzing system logs and identifying potential issues with computer systems; introducing and integrating new technologies into existing data center environments; performing routine audits of systems/software and performing backups; applying operating system updates, patches and configuration changes; installing and configuring new hardware and software; adding, removing or updating user account information and resetting passwords; answering technical queries; documenting the configuration of the operating system. As part of its support of the CJIS Division of the FBI, Fusion Technology designed and engineered a web based geospatial solution to integrate into the OneDOJ system that was later used as the basis for the NDEx solution. Additionally, as part of the COMPS contract Fusion staff have been asked to consult in the UNET and LEO implementations of GIS and how to leverage their datasets and leverage resources (including those hosted by NDEx ) to enhance their respective systems and users.

Fusion personnel were responsible for both server side and front-end components of the OneDOJ solution, integration of the new capability into the current framework, creation of custom point layers, geocoding, and installation and maintenance of the geospatial software. This software included ESRI ArcGIS Server, ArcSDE (Spatial Database Engine) integrating with an Oracle DB, and ArcCatalog/ArcMap as part of the ArcINFO suite. Fusion Technology was responsible for deciding the appropriate existing hardware the software needed installed on to minimize impact on existing system, designing the database schema and geodatabase tables for the geocoded data, identifying additional software needed to support solution, and gathering pricing quotes from the vendor for that software. Additionally, Fusion Technology staff assisted in the development and design of the web based geospatial product written in JavaScript using the ArcGIS JavaScript API. This solution utilized custom layers created from points geocoded internally in addition to Census Tiger Data, TeleAtlas infrastructure point data, and ESRI mapping tiles. The custom layers provided the specific data to be searched and plotted on a web-based map, and the Tiger and TeleAtlas data was used to provide users with additional data to supplement analysis of system specific data.

These system supports hundreds of users performing thousands of searches per month, many now utilizing geospatial components that were before impossible. Fusion Technology was able to integrate a web-based mapping capability to the existing website without affecting the users existing experience. Even though the records searched within the system were significantly changed this was not evident to the users outside of the ability to now perform more complex queries containing geographic data. Due to the success of the new components of the system and the positive feedback from the user base, the customer has repeatedly requested consulting on additional geospatial initiatives within CJIS and aid in reporting and analysis of geospatial data.

Additionally, the NDEx program office has multiple times requested Fusion Technology staff to represent their interests at the ESRI International Users Conference and in dealings with FBI resources responsible for Geospatial operations within the Bureau. Multiple systems within the FBI including NDEX, UNET and UCR have utilized many of the same technology and techniques and has leaned on Fusion personnel to act as Subject Matter Experts and to continue providing maintenance to the geospatial aspects of the system.

Following the FBI Life Cycle Management (LCM) process, Fusion Technology was instrumental in the entire life cycle of creating the geospatial solution including requirement creation and implementation, documentation, testing, and user training. The team aided in gathering requirements from the customer as well as assisting in the creation of those requirements by advising the customer on GIS standards and the best ways to provide users with the analytical tools necessary to make full use of the data. Fusion Technology staff met directly with that testing teams to train them on the basics of GIS and on how it was applied on the project. Fusion Technology also consulted with the team responsible for the user's guide provided on the website and with the training teams that are sent out to directly interface with users.

The geospatial functionality became a showcase item for the customer when advocating the systems use to the law enforcement community. After its implementation it was one of the main priorities for enhancements and improvements in the system's fast paced build schedule. Fusion staff continues to provide Operations and Maintenance GIS support for NDEx.

## For More Information:

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