Philadelphia Police Department Mapping and Analysis Application

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The infusion of geospatial technology has been game changing for the Philadelphia Police Department. Putting functionality in the hands of users and giving them the ability to manipulate their own data in real time has led to more effective and efficient decision making.

In the mid-1990s, the Philadelphia Police Department was at the cutting edge of geospatial technology. The creation of a Mapping & Analysis Unit, which would ultimately develop an internal mapping site (GIS) along with a host of other data-related services, started the initial concept of using spatial data to make decisions in a more effective way. This was furthered by the introduction of the comparative statistics program (CompSTAT) under Commissioner John Timoney in the late 90s, which still continues to be used today but in a modified format. Unfortunately, the same could not be said for the use and leveraging of geospatial technology.

The CompSTAT process required additional work to be performed by the Mapping & Analysis Unit. There were more data variables coming into the mapping system

databases, and the information had to be manually manipulated in a number of new and different ways. In response to the questions raised at the meeting, there was an exponential increase in the number of paper mapping requests by staff along with changing initiatives. Numerous other factors, including staff attrition and lack of funding before and during the economic downturn, led to a stoppage in the advancement of geospatial technology at the police department.

In 2009, despite ongoing budget cuts, a decision was made to build a public safety GIS environment for the City of Philadelphia. The environment provides all the geospatial technology for the city's public safety agencies, mainly police, fire, and emergency management, while also providing it for the Delaware Valley Intelligence Center (DVIC) in South Philadelphia. Due to the availability of staff, increases in officer time required for the CompSTAT process, an inefficient, outdated mapping site, and a number of other technology issues, the police department was determined to be the first into the new environment.

The entire process took three years to accomplish and started with an extensive look at the current geospatial capabilities of the police department from both a technology and a human resource perspective. Once completed, similar assessments were performed for the fire department and the Office of Emergency Management to determine the number of servers, amount

of storage and the overall architecture of the environment in order to support the needs of the departments not only now but in the future. Factoring in the expected usage of the DVIC member agencies was the final part of the assessment. It was imperative to ensure that there was enough technology for public safety to grow into it over the next three to five years. The ability to expand, without adding cost, has been a key factor in the current success of the environment.

The main component of the department's new mapping environment is an interactive site that is published across the entire department. The application provides a single location for all users to view all departmental data in both spatial and tabular formats. In addition to all police incident-based data, prison releases, warrants, field activity (car stops), traffic crashes, the city's preliminary arraignment system (PARS), the firearms analysis system (FAS), mug shots, and other city departmental data sets and feeds are also integrated into the mapping site. Any and all data or systems that would help officers, detectives, commanders or analysts make better decisions have been integrated into the mapping application.

Let's look at a few examples where using GIS technology has been able to provide more effective and efficient policing in Philadelphia.

One of the most important and most used tools of the

new mapping site is the calendar widget. The calendar widget allows users to search for specific crime types, groups of crime types, specific nature codes (like “Drugs” for any incident that involved drugs), warrants, firearm violations—basically any data integrated in the system—and have them displayed on the map. Users can also include search parameters for time of the day and day(s) of the week for a given police boundary layer like a district or police service area. They can also draw custom polygons and use those as search parameters. Using backend processing, a user driving the mapping site has the ability to ask an unlimited number of questions, from myriad different angles, about the department’s data and have those results returned to them in a few seconds on their screen. It is also important to note that the tool has two additional pieces of functionality that are extremely beneficial. First, the tool creates an interactive heat map that lets users focus on crime hot spots. Second, the tool further breaks down the queried data by district, day of the week, hour of the day, crime type, and tour while also showing arrest numbers. This tool has been crucial in giving spatial functionality to those who have never had it but have always needed it.

The task the calendar tool performs was previously performed by a trained GIS Analyst over the course of a couple of days, weeks or even months. These data analysis requests often included printing numerous paper maps, which when examined by police staff would almost

always result in a deviation from the original request. As the continual drilling of data occurred, these requests spanned multiple weeks and led to frustration on both sides and even worse, the timeframe to make the data effective would pass in the interim. Now this entire process has been shortened to about ten minutes, which has obviously led to greater effectiveness on both sides.

Integrating all the relevant data sets into the mapping environment with the ability to query the data has done more than help the command staff direct the department's resources. It's also helped free up departmental resources in other ways to help bring down the crime rate in the city. The department's crime briefing process, formerly known as CompSTAT, has been in use by the department for over a decade. The process involves at least one officer in each police district and each special unit to maintain that unit's arrest and activity data for monthly briefings with command staff to look at activity in their given areas. Every other a week, a report sheet was generated by the department's Research & Planning group by manually taking all the submitted numbers and merging them into one report. The new ArcGIS server environment has been used to automate this entire process by serving as the data warehouse for the department. Crime briefing reports are now generated, on demand, via a Web page that pulls data from a central data repository. Now all data across the department is properly aligned, with tabular data

matching the map-based data for the first time in the department's history. The district officers, formerly tasked with gathering data, are now back on the street fighting crime, or in some cases performing crime analysis in support of their district's crime initiatives.

Philadelphia detectives from the field and the Criminal Intelligence Unit have also seen a great deal of success using the mapping system, mainly because of the greater access to the data and the ability to query it. Historically, detectives have had a hard time identifying patterns of crime that cross multiple districts or occur within a given area over a period of time. Countless hours were spent going through stacks of reports looking for similarities in crimes, and this was especially true after an individual was arrested and the department was linking the person to specific incidents. Using the mapping site, detectives have been able to focus on specific types of crimes, committed at specific times of the day, in a specific area that they have the ability to delineate. Using this information from the mapping site, they can determine a general area where they think the same crime is going to occur again. Working with officers in the field, they have been able to make a number of arrests by placing patrolmen in specific areas. Once they make the arrest, they can look at criminal history in conjunction with the mapping site to determine other crimes in the area that fit a similar profile to what the person was arrested for. In one instance, using the mapping site and maps printed from it,

an individual admitted to 16 of the 23 burglaries identified on the map in addition to providing information related to two homicides in the city that ended up being solved. Numerous similar examples are starting happen across the department. Previously, it wasn't uncommon for a detective to sort through 150 to 200 cases to identify the 10 to 15 that were the most likely. The mapping site has shortened that group down to 20 to 25 cases to sort through.

Lastly, and not to be over looked, is the ability of the new mapping site to make changes on the fly at the request of users. Adding new layers to the mapping site or editing existing ones can be done by the next business day. In law enforcement, things move at a rapid pace, so having the flexibility to make changes on the fly has been extremely advantageous. In the past, a change to a boundary usually included requests for updated paper maps across the department, consuming time and resources. The mapping site contains all of the most current information, so requests for updated paper maps are almost nonexistent —the mapping site is available to all, online, 24/7/365. Another factor to take into consideration is the backend data processes of the new mapping site have been completely automated. Data from all the stove-piped systems are geolocated on the fly, allowing the GIS staff to perform more administrative and analysis work. The site has also allowed the department to coordinate with other city, state and federal agencies on initiatives such as

GunSTAT, which focuses on the reduction of gun-based violence in specific targeted areas of the city.

Overall, the infusion of geospatial technology at the department has been game changing for the Philadelphia Police Department. Putting functionality in the hands of the user with the ability to have them manipulate their own data in real time has led to more effective and efficient decision making. This was recognized earlier this summer when the police department's Mapping & Analysis Unit application won a prestigious Special Achievement in GIS (SAG) award from Environmental Systems Research Institute (ESRI), the primary GIS software provider in the world. Annually there are over 100,000 submissions for the SAG award, but fewer than 100 winners each year. The police department also had the privilege of being the only law enforcement agency to present on the plenary session stage in the history of the ESRI International User Conference.

With all of the success and accolades the application has received, the Mapping & Analysis Unit still sees a number of areas where the application needs to be expanded, especially in data analysis. Now that we have all of the data coming into the application, it's important to look at what the data is telling us when we begin to analyze it. This is not only from a tabular perspective but more importantly from a spatial perspective. How does location affect where crimes occur? What is it about that specific location that lends itself to crimes being committed

there? How are crimes related to one another in terms of their spatial location? What effect do environmental, social, economic, etc. factors play in the occurrence of crime? It's these types of questions and the information gleaned from answering them that are important in further reducing crime. It's not always about how much data you have but about the quality of that data and what the data tells you.