

Enhancing the Law Enforcement Workflow

Server GIS app supports analysis, resource management, and communication

By Aaron Bodbyl-Mast, GIS Technician, Ottawa County
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The rapid growth and geographically dispersed character of Ottawa County, Michigan, presents a constant challenge for the Ottawa County Sheriff's Office.

Ottawa County is a popular tourist destination with a diverse economy that experienced a 50 percent increase in population between 1980 and 2000. Serving an estimated population of 250,000, the sheriff's office has more than 400 employees who handle more than 75,000 incidents each year.

The sheriff's office prides itself on being at the forefront of public safety technology. The sheriff's office has collaborated with the Ottawa County Central Dispatch Authority (Ottawa County 911) on major technology initiatives. Both agencies have worked closely with the GIS unit in the county's Information Technology (IT) Department to deploy spatial tools to aid in emergency response and public safety. Although these agencies have used GIS tools for some day-to-day tasks, the sheriff's office wanted a more robust spatial tool that would take better advantage of GIS capabilities and enhance its daily operations.

In 2007, the IT Department began collaborating with the sheriff's office and central dispatch to develop an application that provided additional capabilities through a user-friendly interface for sheriff's office staff who had limited GIS experience. In November 2007, after months of analysis and development, the IT department moved the Sheriff's Incident Mapping Web application into production. The new application provides sheriff's office staff with a powerful tool for viewing 911 incident calls spatially by making data on all incidents from the previous day available.

Scrubbing the Data

All incident calls from Ottawa Central Dispatch are currently stored in a computer-aid dispatch (CAD) file format. This dataset contains addresses that are entered by dispatchers after obtaining a location from a caller or verifying information provided by the caller identification system.

On many occasions, Ottawa County GIS staff used data exported from this dataset to create maps for analysis. This data was generated by geocoding from the address

field in the CAD dataset to the county's comprehensive centerline layer in the GIS. The centerline layer, maintained with quality control/quality assurance assistance from central dispatch, offers a high potential for accurate geocoding from the CAD dataset. However, the addresses from this CAD dataset are broken into separate fields, which created some difficulties for the project.

Scrubbing the CAD dataset for geocoding to produce a single map was a minor inconvenience. However, using this dataset to automatically geocode to a Web service was one of the project's major obstacles.

Rich Francisco, the county's GIS systems analyst, tackled this problem. "When I first geocoded from the raw data, I was getting 50–60 percent matches in my results. For a Web application for the sheriff's office, this success rate was unacceptable," said Francisco. To improve the geocoding accuracy, he developed a data model that handled the mismatched fields between the CAD dataset and the format needed. Through trial and error, refining the data model, and refining a custom Python script, Francisco was eventually able to consistently achieve more than 90 percent geocoding accuracy.

Once this data model was complete, central dispatch implemented an automation that performed a daily export of the CAD dataset to Microsoft Excel format. On the GIS side, an automated script was created to pull the Excel table from the dispatch server, convert it to a personal geodatabase format, append it to an enterprise database (ArcSDE), scrub the data, and geocode the points. With the process of automating the mapping of incidents complete, the final step for the project was to create a successful interface for users in the sheriff's office.

Developing a User-Friendly Interface

As originally conceived, the Incident Mapping application would utilize ArcIMS 9.1 and the Active Server Pages (.asp) site, which the GIS Department had operated for years. While this setup was workable, it was not ideal, according to GIS programmer Patrick Lowman. "The .asp site was adequate, but it didn't provide the level of functionality we wanted. Fortunately,

ArcGIS Server was released during this time frame, and we were able to utilize many of the new tools available from ArcGIS Server to create a user-friendly site that also had advanced capabilities. This was critical because many of our target users had little or no exposure to GIS," Lowman said.

The ArcGIS Server application developed by Lowman allowed for intuitive viewing of more than 100 incident types or venues. He also developed tools that made it simple to export all geocoded or nongeocoded incidents to an Excel spreadsheet; create a buffer from an incident or parcel and view a list of incidents within the range of the buffer; cross-reference incident calls with parcel numbers; and perform a variety of queries: incidents by sheriff's office patrol zone or municipal unit, a specific day's incidents, incidents over a range of time, and incidents by incident code.

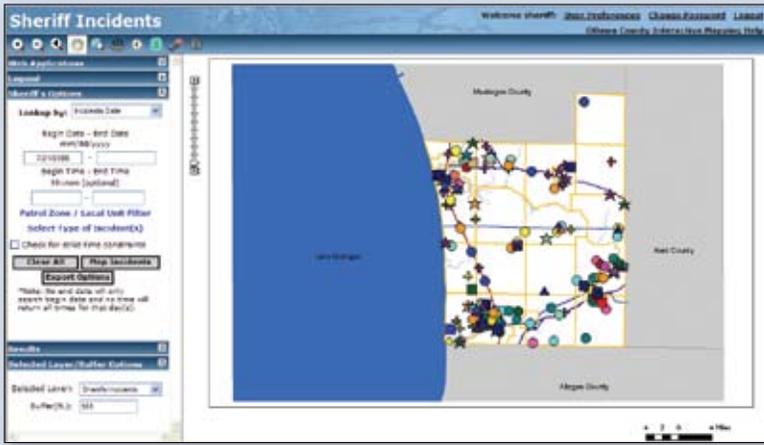
After the initial development period, Lowman worked closely with sheriff's office staff and incorporated their feedback to create the final application. On completion, in-depth training sessions were conducted to ensure that the sheriff's office became familiar with the application before it went into production.

A Flexible Application with Numerous Benefits

Incident Mapping has now become part of the workflow for many units of the Ottawa County Sheriff's Office. The investigative unit of the sheriff's office, in particular, has taken advantage of the tool.

According to Steve Kraai, records management director for the sheriff's office, "Incident Mapping has enhanced the ability of the department to conduct analysis and patterning of crimes across the county, analyze high crime areas, and assist investigations of certain properties where suspicious activity is occurring."

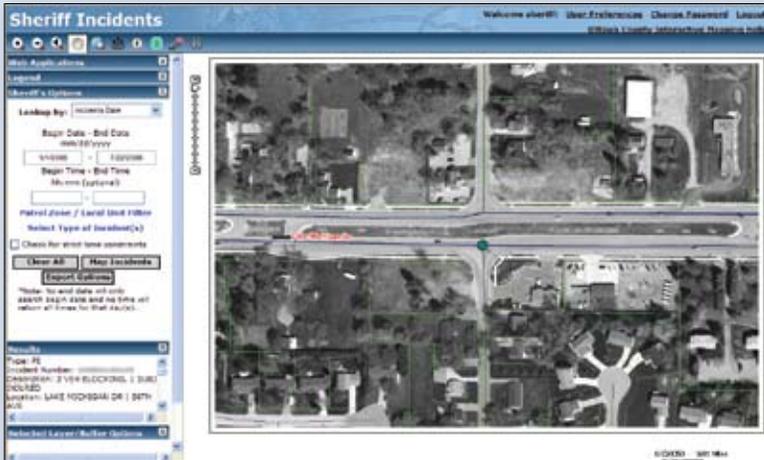
"In the investigations area, we use quite a bit of the Incident Mapping program," said Lt. Mark Bennett, Investigative Services Commander. "My investigators love the program and its user-friendly attributes." Bennett describes how the program is used on a daily basis. "We tend to use the incidents in looking at crime patterns both retrospectively and prospectively. We also



Incident Mapping displaying all 911 incident calls for a single day, symbolized according to the Incident Code

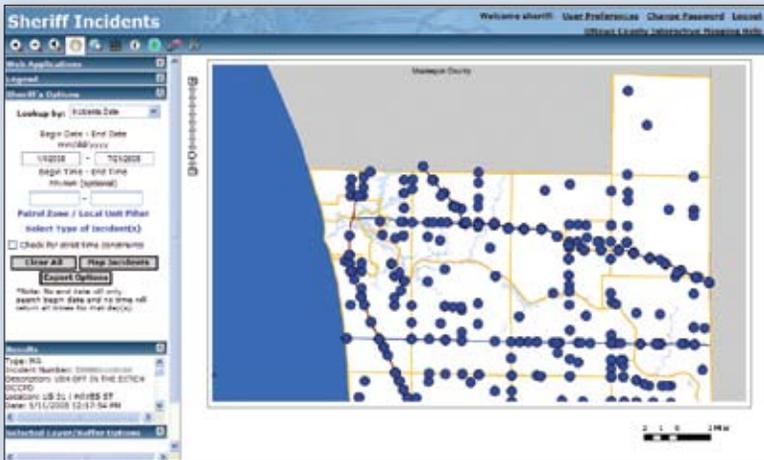
SUMMARY

Through developing a data model and custom Python script that enabled consistent geocoding accuracy of more than 90 percent, a sheriff's office was able to supply current incident data from the county central dispatch to a server application that has robust spatial analysis and visualization capabilities in a user-friendly interface.



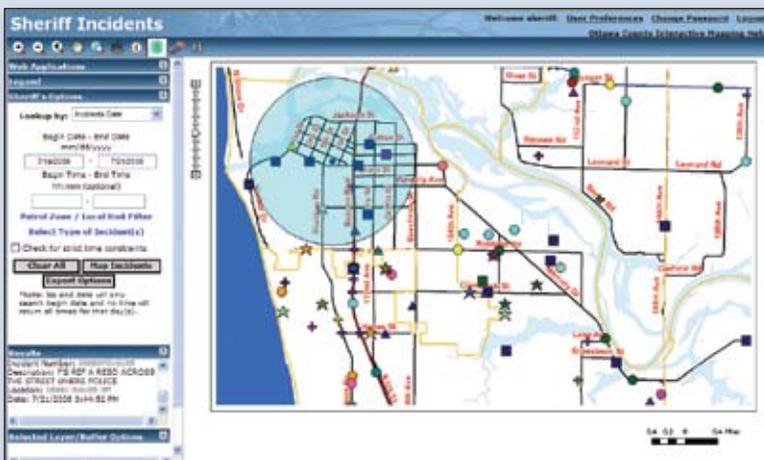
Users can zoom in and view incidents with parcels, lines, centerlines, and the county's aerial photo.

use it to identify potential suspects based upon crime locations and suspect address. Incident Mapping has also been used for manpower allocation." It even has played an important role in helping to break a case. "Recently, we made an arrest on several gang graffiti complaints based upon venue of crime to residence of the suspect," Bennett added.



Users can query incidents by code over a period of time. This map shows all Motorist Assist Incident calls for a seven-month period.

In addition to these daily functions, the sheriff's office has used Incident Mapping for broader applications. It is employed as an education tool for the community and an information tool for stakeholders. Incident Mapping has been used in crime prevention talks and presentations to community groups. Kraai describes Incident Mapping as "a tremendous visual tool," and he believes the uses of the application will increase as officers and staff further explore its tools.



Users can query incidents with a buffer from a parcel or an incident.

Ottawa County GIS manager Aaron Boos said that his staff plans to continue to develop and add functionality as well as data to Incident Mapping. "We hope to add a customizable print functionality in the near future. We also are investigating the possibility of geocoding a few years' worth of past incident data from our central dispatch. With the additional data, we can add depth to the application. Finally, as integration with the CAD systems becomes easier, we will investigate making the application closer to an actual 'real-time' application," Boos said.

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About the Author

Aaron Bodbyl-Mast is a GIS technician in the Ottawa County Information Technology Department. A county employee since 2003, he has worked for Ottawa County GIS since 2005. He is the author of another article, "The Art of GIS," which appeared in the Summer 2008 issue of *ArcUser*.

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