Virginia Association of Counties

ACHIEVEMENT AWARDS

APPLICATION FORM

All applications must include the following information. Separate applications must be submitted for each eligible program. **Deadline: June 1, 2018.** Please include this application form with electronic entry. If you do not receive an email confirming receipt of your entry within 3 days of submission, please contact Gage Harter.

PROGRAM INFORMATION

County: Roanoke

Program Title: Mobile Incident Command Center

Program Category: Criminal Justice & Public Safety

CONTACT INFORMATION

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SIGNATURE OF COUNTY ADMINISTRATOR OR DEPUTY/ASSISTANT COUNTY ADMINISTRATOR

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Title: County Administrator

Signature:

EXECUTIVE SUMMARY / BRIEF OVERVIEW

Roanoke County's Public Safety departments desired an application to replace a paper map-focused incident command system to one which could be easily deployed from any mobile device or computer. The Mobile Incident Command Center (MICC) leverages GIS application technology to create a map-based interface with address and latitude and longitude integration that creates accurate maps and structure data for incident areas and also allows personnel to collect data from the field and share that data with command in near real-time.

The MICC allows data sharing within and between public safety entities through a multi-application suite which allows the Police and Fire & Rescue departments to coordinate during emergency incidents, training scenarios and incident pre-plans. The MICC was built in-house, leveraging GIS technologies and systems already deployed by the County at very minimal additional cost. The requirements for the system fell into three major categories: ease of use for personnel, live and disconnected editing, and ability to work within the major mobile and desktop ecosystems deployed throughout the County.

The MICC allows individuals from each agency to use smartphones to submit photographs and data to command posts in near real-time, while the back-end system processes the data and displays situational map-based data back to the field in symbology unique to each agency.

The Mobile Incident Command Center (MICC) and associated applications are innovative, effective, proven and cost efficient. The program is innovative as it combines the availability of readily available geo-capable communication technologies and the functionality of cloud-based mapping solutions. The effectiveness of the program is related to the time saved at emergency incidents and the ability to manage large groups of personnel with less overhead. MICC is cost-effective while traditional paper-based systems struggle to adapt to ever-changing needs. MICC can evolve as needed and can do so through in-house GIS development staff that does not add financial burden to the departments, and without the lengthy upgrade and deployment timelines usually dictated by outside vendors. Use of the MICC will continue to expand and become more robust as it is used by Roanoke County's Public Safety departments.

THE PROBLEM OR CHALLENGE

The County's Public Safety Departments typically do not share data or resources unless they are working in close proximity during training sessions or active incidents. Additionally, normal operations revolve around radio communication and either small printed, hand drawn maps, or commercially available (USGS) maps to assist them in their duties while on site.

The principle reason for the development of the Mobile Incident Command Center (MICC) was to allow the departments to share resources and data, while preserving each agency's specialized symbology, giving them the tools to project command authority across wide areas without sacrificing the flexibility of individual personnel or teams in the field.

Originally, the Police and Fire & Rescue employed only radio communication and paper maps, either printed before the event or commercially available map products. It became apparent there had to be a far better way to view, store and recall information while searching for individuals, fighting wild fires, responding to emergencies, or creating training scenarios for existing and new personnel. Requesting printed maps from GIS personnel was not always feasible or timely, especially in times of active incidents that risk the lives or property of the County's residents. GPS mapping applications have matured to the point of always being available in the small form factor of cellular phones, and allow officers or firefighters on the ground to quickly relay information back to command.

The GIS staff was tasked with developing a robust, secure and user-friendly application suite to accommodate these needs. This application suite also needed to replicate their paper versions of the original workflow while making it easier to update and recall the data more efficiently during an actual incident.

PROJECT DESCRIPTION

Objectives:

Objectives include the following: 1) Create a common database schema to which each department would employ their own symbology, 2) create applications and web maps (consumed within the applications and Collector), 3) develop multiple applications as needed for each department, 4) allow for the retention and recall of previous incidents while keeping the maps clear so as not to allow overlap of

individual incidents within the same geographic area, and 5) make it easy for personnel to quickly understand the operation and deploy it into the field. The system is designed around the Esri ArcGIS mapping technology, including, but not limited to, ArcMap, ArcGIS Server, ArcGIS Online (AGOL), ArcGIS Collector, REST Services and the Esri Application Builder (for website application creation).

Time Frame for Development and Implementation

The Mobile Incident Command Center (MICC) project's inception was in August 2014 with the first beta iteration of applications, Police MICC and Fire & Rescue Pre-Incident Planning, created Q2 2015. The second wave of applications centered on the Fire & Rescue Departments, which included the Wildfire Application and Hydrant Maintenance were launched in Q3 2016.

The applications and web maps were updated when Esri published new functionality in 2016 and 2017 while testing of the applications was ongoing. The first field test of the MICC, notably the beta Wildfire Application, was Q3 2016 to locate a lost hiker. The delay was due to issues with the new AGOL format and the original database configuration/schema.

Initial implementation was scheduled for Q1 2017; however, a database redesign slowed implementation and adoption while the application data structures were re-written to use the new database schema and enhanced AGOL functions. In addition, a new temporal function was added to ArcGIS Online which allowed tracking of individuals based on minutes and not hours or days as the previous version. This allowed the location commanders a better view of personnel in the field and to better coordinate their movements during an incident.

Final roll-out was completed in Q3 2017, after a staff time cost of approximately 950 hours, with field testing and usage. Training of personnel was completed in Q1 2018 consisting of two day session with 30 Fire & Rescue personnel and the US Forest Service. The training incorporated Esri Collector training and usage with a full introduction of the mobile and desktop applications in a series of live scenarios. This allowed system testing and demonstrated the benefits of the MICC compared to the standard operating procedure of paper map-only usage.

Clientele

Public Safety personnel use Esri Collector on a mobile platform and a web browser on the desktop. The field usage pushes and pulls data live from the County's GIS server, which allows personnel to edit, simply by pressing on the screen and selecting the appropriate symbol, and track the incident in real-time from the field. Additionally, the off-site commanders can direct the field personnel as changes occur. The benefit of the use of smart phones for the collection of data is the inclusion of the internal GPS which will allow the users to track themselves and allows commanders to track the entire group, while facilitating their role in the incident. Using the developed interface, the possibility of transcription errors is minimized through the use of pre-defined drop-down lists; however, free form boxes are available to facilitate comments or to relate other information to or from the scene commanders.

Along with the MICC and wildfire applications, we have included a fire hydrant maintenance solution. Instead of field personnel needing to section off areas on a paper map, the hydrants can be associated with a particular fire station, thus keeping the maintenance specific to the station personnel. Each hydrant, which needs flow testing or maintenance, would have their status changed through a simple drop-down menu. The teams can be dispatched to evaluate those hydrants. All of the relevant data is synched to the database in real time, reducing paper usage, reducing transcription errors and reducing man hours lost on transcription from field data to other systems. Synching of the database in real-time, including changing the color of the hydrants based on the water flow as measured in the field. All of this work will allow responding fire personnel to have up to date information on the location and status of hydrants near any fire calls.

While printed maps are still some of the best way to disseminate information to various teams, the technology behind the MICC allows the commander to export a PDF, after setting up the directives, and those PDF documents can be emailed to each team member in case internet connectivity is threatened. Through the use of third-party software, those PDF documents will allow the users to track their position on their mobile devices and complete the same work as if they had full connectivity. So, while they are not using a live link to the database, they will still access some of the same information of the MICC but in an off-line capacity.

The final portion of the suite is the inclusion of off-line editing. If there is a loss of cellular coverage or a known area lacking coverage, the users can download a snapshot of the area and edit the data as if they were using it as normal. However, in order to share that edit data, the users will have to sync it to the servers once they arrive back into cellular coverage. The GIS staff will push the data to the main

database, from the users' remote instance, with a server-side script, which can be run automatically at whatever interval is requested. Once the data is compressed into the main database, it will appear on any other of the clients once refreshed.

COSTS AND STAFFING

With the ever shrinking budget, departments must find ways to expand their capability without adding to the operations costs. The Public Safety departments evaluated various third party solutions, but while the initial costs, some well into the hundreds of thousands of dollars, may have been covered through the use of grants, any ongoing maintenance cost would have to be met through their budget. Even though the use of the third party solutions, both custom developed and existing software solutions, would have taken a similar amount of time, the customization of the applications may have expanded the overall cost and time of the initial solution. The ability of the County to employ staff time to develop the applications, even with out of scope requests for enhancements, did not expand any costs because due to the flexibility afforded by the individuals and the use of already existing infrastructure.

The Roanoke County's search for a solution was met with varying cost values, and most were over the hundred thousand dollar range just for the initial software package. The follow-up costs were between $20,000 to $50,000/year for upgrades, maintenance and, possible hosting fees and would have placed a significant financial strain on County departments. With the in-house development of our MICC, the only costs for the Police and Fire & Rescue departments to absorb were the already existing need for mobile hardware (laptops with mobile data hot spots, tablets and cell phones, many which were already in use by the departments). Additional costs included staff time which, over the course of the approximate 950 hour development time, equated to approximately $19,000 for the entire development cycle.

The existing partnership with Esri through the existing Enterprise Licensing Agreement (ELA) allowed the County's existing infrastructure to leverage the use of ArcGIS Server, the extension allowing the hosting of web-based data. ArcGIS Online (AGOL) is a web-based development and cloud-based deployment solution which is included with the ELA, and allows the creation of web maps and applications, through the Web AppBuilder.

Collector, the free mobile component of AGOL, is used for field inspection, data collection and visualize the necessary components to complete the tasks. When the cost of development, configuration, out of

scope additions, upgrades, maintenance, hosting and training is taken into account, cost of the final solution could have potentially been more than 10 times the figure of staff time alone.

RESULTS

All of the goals set forth in the initial proposal were met and the additional out of scope requests were folded into the later development time of the applications. In terms of efficiency, the ability to conduct operations through web maps on mobile devices has streamlined operational requirements to address incidents promptly and with less lost data. Additionally, data can be analyzed far more expeditiously, as it is in a digital format. Paper maps have been replaced with live and interactive maps which can track the user, allowing for less experienced personnel to assist with operations and to share resources between groups of personnel and departments.

An example of the success of the program was evident during involving multiple agencies. The on scene commander was able to plot out the required containment plan, print to a PDF from the existing application, and send it via email to the outside personnel. Coordination of this action took only 20 minutes, allowing the incident commander and personnel to focus on their priority – the fire. If the same team had utilized traditional methods, the group would have had to meet at the command post, discuss each groups' responsibilities, draw/print individual maps and then move out to the fire location, potentially taking more than an hour, depending on location of the command center's relation to the fire. The time saved through the use of the system prevented the fire from expanding beyond its original size and it was contained quickly.

Another example of program success involved a lost hiker on the Appalachian Trail. Search personnel were given a radio and an area in which to search using the mobile application. The scene commander was able to coordinate with each search party member through the application's tracking function. As new data was fed to the command post, the commander was able to quickly ascertain each search party member's location on the map, and re-focus them to new areas. If this was conducted before the application was implemented, the only way to communicate with each team was via radio and the approximate location based on a large paper map. Through the use of the digital technology, each searcher was able to be located via their mobile phone's GPS locator and then guided to the hiker's location. If the hiker needed emergency extraction, the team could have located an area for the helicopter to land and the commander would have been able to guide them, again in real-time, to the

proper location while limiting the terrain variables and ensuring everyone's safety. The rescue was conducted in low light conditions which made the operation even more hazardous to the searchers. However, with the technology, their location was far easier to relate and thus safer for the teams.

The MICC is a model for other localities due to its relative ease and low cost of implementation, its comprehensive solution for public safety and the availability of the highly configurable base models from Esri's Local Government team. With the majority of the cost coming from staff time and the use of readily available devices, already used by most personnel, and configuration of services, which are hosted on the locality's existing infrastructure, it has a low entry point for the initial deployment. The ability to start with one application and slowly roll out the rest, or others, as time and staffing allows is a strong argument for implementation.