

ArcPad™ Field Data Collection for Sonoma County's 911 Dispatch System

By
Kevin Lacefield
County of Sonoma, California

Abstract

The Sonoma County Law Enforcement Consortium (SCLEC) regional emergency dispatch system for law, fire and EMS requires accurate dispatching of Public Safety resources. Traditional street centerline "geocoding" is insufficient for dispatching to areas with irregular address ranges, necessitating point addressing to resolve this shortcoming. SCLEC explored the available options and, given that the address data was already maintained in the Enterprise GIS, opted to deploy ArcPad for field collection of address locations. This inexpensive and easy-to-use solution enabled public safety personnel to leverage their personal knowledge of the landscape and to quickly and efficiently collect the required information by using GIS data as a reference. This paper will describe SCLEC support staff's role in customizing the ArcPad interface and preparing the hand-held computer for data collection, describe how public safety personnel use the data collection tools, and explain how data was transferred from the GIS to the dispatch system.

Introduction

After the abduction and murder of Polly Klaas in October of 1993, Sonoma County law enforcement agencies began investigating better methods of sharing information and coordinating crime suppression activities between jurisdictions. Through this effort, the Sonoma County Law Enforcement Consortium (SCLEC) was born.

In April 1999, SCLEC was awarded a federal grant for Community Oriented Policing Services Making Officer Redeployment Effective (COPSMORE). Using this grant, SCLEC requested proposals for a new countywide Computer-Aided Dispatching (CAD) system to cover all law enforcement jurisdictions in Sonoma County.

In July 2000, Intergraph Public Safety (IPS) of Huntsville, Alabama was awarded the contract for the new CAD system. The IPS system provides a GIS-based dispatching platform that will interface with the County's ESRI Enterprise GIS.

By first quarter of 2002, SCLEC added all fire and Emergency Medical Services (EMS) agencies into the countywide project, thus making the new dispatching system responsible for all aspects of emergency response in Sonoma County.

Currently there are 9 law agencies, 38 fire agencies and 8 EMS agencies participating in the regional, multi-PSAP dispatch system.

Address verification is an important function for an emergency dispatch system as an unverified address can add anywhere from 30 seconds to several minutes to a response time. The IPS dispatching system uses two sources of data to match addresses; point addresses, which are referred to as Special Addresses (SPADs) and street address ranges. The system will first attempt to match an address to a SPAD, if a SPAD does not exist then the system will match the address to the street centerline.

It is common for traditional street centerlines with address ranges to not be sufficient for geocoding all addresses, making the creation of SPADs important to fix the shortcomings of street centerline addresses. The question then was what is the best method for creating spatially accurate addresses from a valid data source?

The county's base parcel layer did not have the spatial accuracy required to create centroids to be used as SPADs thus field data collection was a logical choice for collecting the addresses in the known problem areas. An inexpensive tool was required that could be run on multiple platforms, interact with the GPS units already being used by the public safety agencies and easily used by a non-GIS/GPS individual. Ease of use by a non-GIS/GPS individual was extremely important to the decision making process in order to capitalize on the local knowledge that the public safety personnel had for their jurisdiction while collecting addresses. It was determined that ArcPad was the software to use.

ArcPad Development

Once it was determined that ArcPad was to be used for the field data collection, it was purchased along with ArcPad Application Builder. Development of a form was the first step undertaken for this project. Forms within ArcPad make data entry easy. It displays only the fields which are necessary to be filled out and also allows for standardized pick lists to be created. Application Builder was used to complete this step. Before the form was finalized a shapefile containing all of the fields necessary for data collection was created. With the shapefile created the form was generated to match it. While this form allowed a user to create a point and fill in the necessary fields it was not to a point where a non-GIS user could quickly pick up the unit and begin data collection.

So, what is necessary to make the tool ready for use by the public safety personnel? The necessary improvements were the simplification of SPAD collection, the ability to edit or delete an address and incorporating GPS into the tool. Application Builder uses XML to create the forms and toolbars, but most of the functionality would require additional programming in Visual Basic Script (VBScript).

ESRI's Support Center is a great resource when designing an ArcPad tool. Researching various postings and code samples helped give direction to this project.

The need for a custom button stems from the step intensive workflow necessary to even add a simple point. In the normal ArcPad workflow the user must turn on the edit/drawing toolbar, begin an edit session on the shapefile, select the point button, tap on the map where the point is to be placed, and fill out the form. When all the points are collected the user must end the edit session and turn off the edit/drawing toolbar. By programming a custom button the workflow is greatly simplified. The new workflow involves selecting the "SPAD button", tapping the map where the point is to be located, and filling out the form. The code automatically starts and stops the edit session. Since buttons and tools need to be stored on a toolbar, a generic toolbar was created which could then be further customized to hold additional tools and buttons.

The ability to track change history was also added to the process. To accomplish this, a login screen was created. This login screen forces the user to select their name and agency before continuing. If the user name or agency is left blank, ArcPad will close. The name and agency are stored as global variables which are used to auto populate the user name and agency attributes when a SPAD is created/edited. Another important feature the login allows for is the ability to set permissions. The user name sets the permissions either to a default user or an administrative user. The main difference between the two is that the administrator user has access to all ArcPad functions, while the default user has limited menu options.

In addition to the "SPAD button", select buttons and tools found on the main toolbar were added to the generic toolbar. The one function the default user's toolbar is missing is the ability to edit reference data. Only the administrative user has access to this tool. The SPAD Toolbar also forces the user to create a SPAD using the correct form.

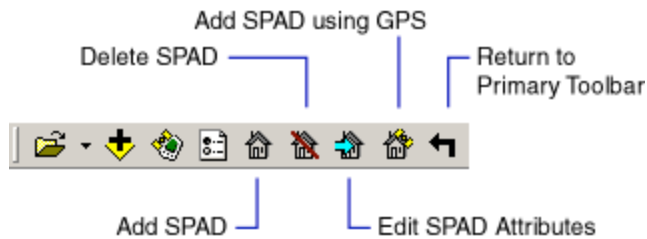
By far the most difficult aspect of the tool and the one that took the most programming was implementing the ability to edit/delete a SPAD and to add a SPAD based upon GPS coordinates. For these functions the User Forums on ESRI's Support Center site were heavily relied upon. Three new buttons were created to add this functionality; delete SPAD, edit SPAD, and add SPAD Using GPS. To edit or delete a SPAD the user only needs to tap the appropriate button and then tap on the SPAD that needs to be deleted or edited. The GPS functionality was added in a way that allows the user to tap one button, the add address form automatically pops up and based upon the location given by the GPS a point will be added. It was necessary to program in these functions for two reasons. The first was to streamline the workflow process. The second was to make administrative functions available to the non-administrator user.

After beta testing of the tools by various users, the SPAD tool for ArcPad was ready for use by the public safety personnel. The SPAD tool has been available and in use since early 2003. Since that time the code has been refined, additional tools have been added and the structure of the shapefile has changed. However, the basic workflow and functionality has remained the same.

Special Address Toolbar and Tools

Toolbar: This section describes the toolbar used for the special address tools within ArcPad.

The Special Address Toolbar appears when the Special Address Tools button is tapped. The tools on this toolbar allow the user to create, delete or edit Special Addresses (SPADs). A Special Address is an address associated to a specific point.



Process: This section describes how to create, delete and edit attributes of special addresses.

Creating a special address by tapping on the screen.

1. Tap the Add SPAD button (🏠).
2. Tap on the map where you want the special address to be added.
3. Fill out the forms
4. Tap OK

Creating a special address using the GPS coordinates

1. Tap the Add SPAD Using GPS button (📍).
2. Fill out the forms
3. Tap OK

Deleting a special address

1. Tap the Delete SPAD button (🗑️).
2. On the map tap on the special address you wish to delete.

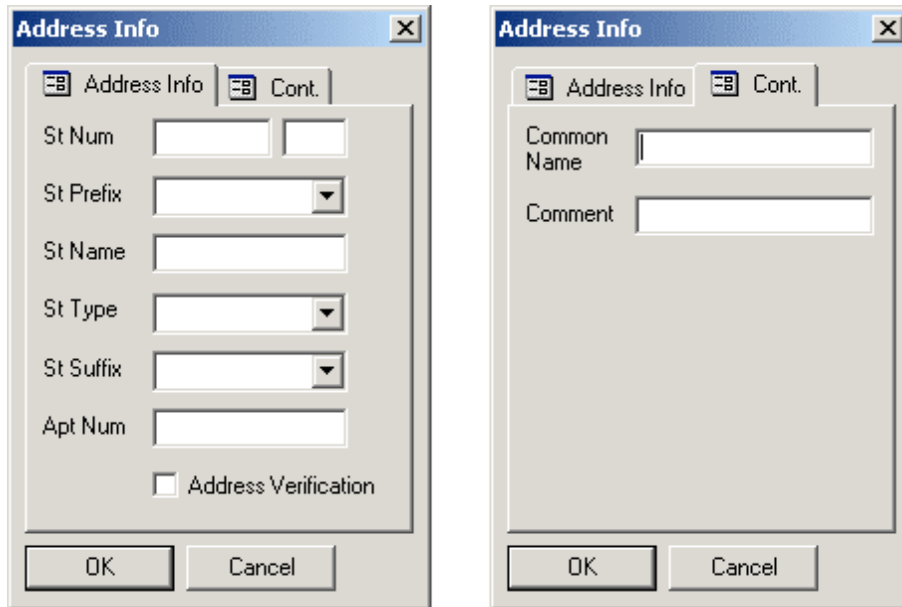
Changing the attribute of a special address

1. Tap the Edit SPAD Attributes button (🏠).
2. On the map tap on the special address you wish to make the edit to.
3. Make the appropriate edits to the form.
 - a. *You only need to edit the fields that are in error.*
4. Tap OK

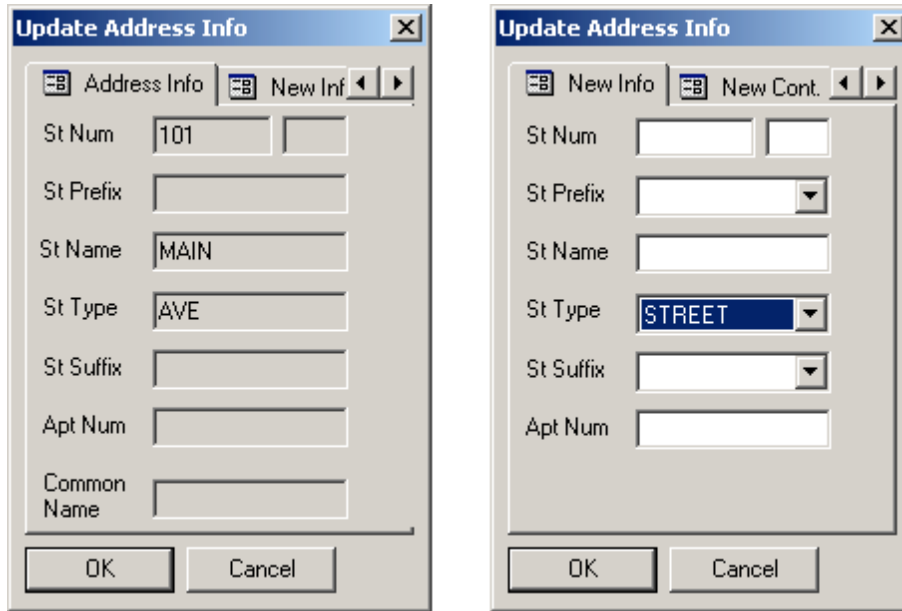
Forms: This section describes the various forms for the special address tools.

There are two forms associated with the SPADs; the Address Info form and the Update Address Info form.

The Address Info form (pictured below) pops up when a new SPAD is placed on the map. The St Num field (first on the form) needs to contain a numeric value, even if it is zero (0). The SPAD will not be created if this field is left blank. If the SPAD is to replace or fix an existing SPAD, then the Address Verification box needs to be checked. This lets the GIS Techs back in the office know that this address along with the original address already in the system need to be researched and verified. To add a comment, which appears in the dispatch system, or a commonplace name, the Cont. tab needs to be selected.



The Update Address Info form (pictured below) pops up when SPAD is selected with using the Edit SPAD Attributes button. This form is very similar to the Address Info form, but has some minor differences; there is no Address Verification checkbox and the first tab shows what data is currently attached to this point. The second and third tabs are for adjusting/fixing the values that are in error. *Only the fields that are in error need to edited.* For example, if the SPAD is for 101 Main Ave and it should be for St then only the St Type needs to be change to St and then the OK button tapped.



ArcPad Setup and Data Exchange Workflow

When an agency is ready to use ArcPad in the field they are sent three zip files, system.zip, applets.zip and data.zip. The system.zip file contains all of the files to be copied into the \Program Files\ArcPad\System\ folder on their handheld device. The applets.zip file contains all of the necessary files that need to be copied into the \Program Files\ArcPad\Applets\ folder. The data.zip file contains reference shapefiles, an empty data collection shapefile called dispatch_pt_data.shp and a generic map file. These files are copied into \My Documents\ArcPad Data\ folder. The ArcPad Data folder needs to be created by the user before they can copy the shapefiles into it. The generic map file contains the reference shapefiles and the blank dispatch_pt_data shapefile. The agency has the ability to add additional reference files if they so desire. At this point the user is ready to start collecting data.

When the agency is ready to have the SPADs which have been collected loaded into the dispatch system they zip up the dispatch_pt_data shapefile and email it to SCLEC GIS Technicians. They replace dispatch_pt_data.shp with a new copy of the original blank shapefile which was originally sent to them. This insures that the data collected will not have the same records as the previous addresses which have been set to be entered into the dispatching system.

Once the new SPADs have been received by the GIS group they are uploaded an SDE layer called adr_base. The script used to upload the data insures that any new addresses will not cause the creation of a duplicate address within the same community code. Any addresses that would cause a duplicate are rejected. At the end of each upload a list is generated showing which addresses were not rolled into the base address layer. Any

issues which arise are resolved with input from the originating agency. Once all of the issues are resolved a new reference address file is sent out to the submitting agency.

Other Current ArcPad Tools and Future Tools

Additional tools have been developed for SCLC agencies to use. These tools all use the same philosophy and majority of code as the above special address tool. The field personnel can collect Hydrant data, Comment Points, River Markers (similar to mile markers on a road) and street centerlines.

Future tools to be developed include mile markers, editing of street centerline attributes, gate collection and bridge restrictions.

Conclusion

Programming in ArcPad can be challenging, but at the same time it was easier than anticipated. The public safety personnel being able to use the tool and therefore at the same time input their local knowledge into the dispatch system more than compensates for the amount of time it took to develop the tools.

Without ArcPad, field data collection would have been done one of two ways, using a paper map and marking it up or taking GPS waypoints and creating a document which links the waypoints to the addressing attributes. Both methods would mean additional work for the field personnel and for the GIS department. The field personnel would be spending a great deal of their time using an inefficient method while the GIS department would spend their time compiling the data into a GIS friendly format and then scrubbing the data to match required standards.

SPADs collected by ArcPad make up roughly 5% of the 70,000 SPADs. These SPADs have been created in some of the biggest problem areas so while they might make up a relatively small percentage of the total, they solve many dispatching problems. For example a whole community in Sonoma County has addresses that flip back and forth between 3 digit and 4 digit addresses. Creating an address for each residence has fixed this area so most of the addresses now verify within CAD. Another community had an issue with wrong units being sent to a call. This was due to county islands existing within the city limits. By creating SPADs for this entire area the recommended deployment by CAD is correct, decreasing the response time for calls within this area.

About the Author

Kevin Lacefield is a GIS Technician II with the Sonoma County Law Enforcement Consortium Support Team (SCLEC), a division of the County of Sonoma's Information Systems Department. He has been with the County of Sonoma for 4 years. He holds a Bachelor of Arts degree in Geography from the University of California, Santa Barbara. Kevin is also an adjunct instructor at Santa Rosa Junior College where he teaches the Introduction to GIS course.

Kevin Lacefield
GIS Technician II
County of Sonoma
Information Systems Department
2615 Paulin Dr
Santa Rosa, CA 95403
(707) 565-2109 Phone
(707) 565-2187 Fax
klacefie@sonoma-county.org