

BIOGRAPHICAL INFORMATION

Steven H. Jenkins
SR. GIS Analyst
Chesterfield County Department of Utilities

Specific Responsibilities:

Main responsibilities include the development and maintenance of GIS applications for use in the office environment and in the field using ArcObjects through Visual Basic. Aside from programming his duties also include map production and data maintenance. Steven's main software focus is on the ESRI suite of products known as ArcInfo and ArcView, but is also proficient in the use of AutoCad and programming AutoCad through AutoLisp.

Past Experience:

Mr. Jenkins has fourteen years experience in the area of utility mapping and has been with the Department Of Utilities since the early years of its GIS. Beginning in the mid nineties with the ArcInfo Unix based product he programmed with AML (Arc Macro Language). Then onto ESRI's ArcView product he utilized Avenue to customize and implement GIS applications for field use. Since early 2000 he has worked with Visual Basic, programming ArcObjects to facilitate his departments need for up to date mapping applications. He also acts as a trainer, teaching to staff the very applications that he customizes for their use.

Educational Information:

Mr. Jenkins received an Architectural Engineering Technology Associate Degree from the College of John Tyler where he also received Career Certificates in Civil Engineering and Computer Aided Drafting. He is also a graduate of the Chesterfield Technical Center with a Certificate in Technical Drafting where he received the honor of the Richard B. Engard Outstanding Senior Award. Steven also holds the honor of having been the Department of Utilities Employee of year in 2002.

Professional Memberships:

(GITA) Geospatial Information Technology Association
(AWWA) The American Water Works Association
The Richmond Area GIS User Group
(VICA) Vocational Industrial Clubs of America.

**Portable Utilities Map Application
Providing GIS From The Office To The Field**

Steven H. Jenkins
Chesterfield County Department of Utilities
P.O. Box 608
Chesterfield, VA. 23832

Chesterfield County's Department of Utilities strives to provide quality water and wastewater services to a growing residential, business, and industrial community. Chesterfield County's land area totals 446 square miles and since the year 2000, has been growing at a rate of about 2 percent per year. This translates into approximately 2,500 new residential dwellings annually. Of the current 284,000 residents, there are approximately 91,000 water customers and 76,000 wastewater customers. The County's Utilities Department works with an annual budget of \$47 million, employs 285 people, owns one water treatment plant and two wastewater treatment plants, controls 23 water storage tanks and 35 pump stations, and manages more than 3,200 miles of water and wastewater lines. With this constant growth in residents and assets the department has a great need to utilize geographical information in the office and out in the field to help map and manage this utility infrastructure.

To facilitate this need for a portable mapping solution Chesterfield contracted ESRI in 1997 to produce a customized ArcView application. In October 1998 a beta version was delivered that consisted of an address location tool, a water-main break simulation feature, and a hot link tool for cad drawings. From this basic application Utilities Department GIS staff programmed additional tools and automated search features. By September 1999 all field crews were trained and using the application. The introduction of the ArcGIS products brought an end to the Avenue scripting language used by ArcView 3.2 and ushered in the need for Visual Basic to customize the ArcMap product. It was decided to rewrite the entire application in VB to be used with ArcMap 8.1. This task would be done completely in house by the GIS staff of the Utilities Department. Staff worked from July 2001 to February 2002 writing the new P.U.M.A. application in the Microsoft Visual Basic language. The application is constantly evolving with new functionality being added at the request of users. The core objects are even being used for the County-wide GIS application. Currently the Utilities Departments has about 110 ArcMap licenses, all of which run P.U.M.A.

Depending on the needs of the user the data for P.U.M.A. is stored locally on either a laptop or a PC. The application accesses a combination of shapefiles, personal geo-databases, and DBF files. For this reason the user must submit to a weekly update of the information. The update process is relatively simple for the user. New shapefiles are generated at the end of each week and placed out on the network. Annotation is imported into a personal geo-database from ArcInfo coverages. Various tabular files are also updated and made accessible. The downloading of these files to the PC or Laptop can occur between 5:00 am and 7:00 pm Tuesday through Friday. Saturday through Monday is reserved for creation of the necessary files and any maintenance to be performed. A laptop user can choose when to dock his or her laptop and initiate the update routine during the Tuesday to Friday time slots. A laptop user starts the update by docking the machine, logging into the network, and double clicking an icon on the desktop. A PC user's process is slightly different and somewhat automated. During the allotted update time when a user opens an ArcMap MXD file they are prompted with an update message. They are informed that their GIS data is in need of update and they can choose to start the update or skip

it. Once they choose to start the update they will not be prompted again until the following week. However, if they skip the update they will be prompted again each time they open an MXD. The reason they are given a choice about the update is to accommodate situations where one needs immediate access to information, even if it is a week old, and they simply cannot wait for an update. The majority of customer or service related inquiries revolves around data that has been in the system for more than a week, so this method has served the department well. The update itself takes approximately fifteen minutes. The update routine cycles through and removes existing data files and replaces them with the new ones. This is done to clean out any temporary files or indexes that may have been generated through normal use. Items such as aerial photos do not need to be updated weekly and therefore are only copied down if missing or if they've been altered. Both the PC and the laptop updates use the same core program to accomplish their task and this update protocol has functioned well over the years.

One of the biggest challenges with any application, especially a customized one, is training. In the case of P.U.M.A. a variety of user disciplines would exist. Users would vary from engineers and right of way agents in the office to utility locators and pipe maintenance crews in the field. Customer technicians would also use the application to assist the public on the front counter. Step one to the training process was to develop a manual to be used for the training sessions. A printed manual was created and has been maintained and updated over the years. The manual is also available in an html format thus allowing it to be viewed through a standard web browser. Utilities Department GIS staff performed each of the training sessions. Users were grouped together by sections, thus allowing each class to be tailored toward their specific need. Focus was placed on the functionality that was needed for them to complete specific tasks for their job. The Utilities Department is also equipped with its own Information Technologies (IT) staff who maintain a trouble call line, thus providing quick response to any technical problems that may arise. Training was administered on the original ArcView 3.2 version and then re-administered as part of the migration to ArcMap 8.1. Training in house was extremely beneficial for follow up questions or issues that arose after the sessions were over. Training continues to be offered on an as needed basis specifically for new employees.

One of the original functions for the application was the Valve Location Diagram hotlink tool. This feature enables a user to pick on a water valve and launch its corresponding CAD file into any number of viewers. Currently the County has about ten thousand individual Valve Location Diagrams. Each valve is attributed with a drawing number upon entry into the GIS system. For laptop users all of the CAD drawings are stored on the local hard drive. The weekly update process copies down only new or altered files. PC users access the drawings straight off the network. This feature is programmed to figure out if the drawings are local or stored on the network. All of which is transparent to the user. The program uses whatever viewer the system is defaulted to use to open DWG files. So, the program adapts to the users environment to display the data.

In addition to the CAD file hotlink a valve isolation trace or water main break isolation tool was also one of the early features. This feature worked in conjunction with the hotlink by indicating which valve drawings a user needed to view. Should a break occur where there were long distances between valves this feature would help to determine which valves needed to be closed to isolate the point selected by the user. The user simply picked on the pipe where the break or tie in was located. ArcView would then trace the pipe in all directions until it found a valve. If a valve was physically unable to be closed the user could toggle the status of that valve and re-run the simulation and the trace would pass by that valve to the next. The valves and all the pipes in between would then be selected and highlighted.

The County's Utilities Department has a customer information system known as CUBIS. The majority of the information contained within CUBIS is billing and customer information. However, there is also a great deal of data that revolves around the service itself. There are location codes and descriptions used by locators and meter readers. CUBIS contains notes about a service or warnings indicating any hazards that may be around the meter. Meter sizes and consumption history are also stored in this database. CUBIS data is categorized and extracted early on Sunday mornings into DBF tables. These tables are indexed on the service number field. A service point layer is maintained to show which services go with which parcel. The combination of the points layer and the database tables allows a user to click on a parcel and be prompted with customer and meter information. The consumption data can also be used in the office to populate water demand boundaries to be used with a water model. The integration of the spatial GIS data with tabular CUBIS data benefits those in the field and those in the office.

Photos and images are a significant enhancement to any application and having them available in the field is a great asset. Originally only low resolution Digital Ortho Quarter Quad Sheets were available, but after the County was flown in 2002 the higher resolution Aerial Photos have been added. Photos, building footprints, and pavement outlines of the entire County are available on each laptop for field use. Buttons for adding and removing the photos are available. The user picks the Add Photo button and the photos that intersect the current extent are automatically added into a group layer and turned on. The user is prompted if the image level exceeds a certain number in case they would prefer to zoom in closer. Scanned images of subdivision plats are also accessible. This tool selects a subdivision and then launches a corresponding PDF file for the user to view.

Years ago the Utilities Department managed and tracked fire hydrants using a card file system. Cards were typed up indicating make, model, and year for each fire hydrant installed. Minor maintenance information was recorded on the cards and an address or location was indicated. Over time the cards were keyed into various database forms and today they exist in a Microsoft Access Database. All of this information has been combined with the GIS by relating the MDB file with the fire hydrants on the "water points" layer by hydrant number. A user can click on a hydrant and have the data displayed quickly and clearly.

As wastewater is mapped from marked up asbuilt drawings pipe and manhole data is recorded and placed in a database. Inverts, top elevations, and slopes are all tracked. This data is available at the click of a button. The user does not have to preload any tables or turn on any layers--it's all done automatically. The user only has to click on the manhole and the data is displayed. This information is mostly used by the engineers for calculations but is available to all users.

The need to work with coordinates is prevalent in the field and in the office. A collection of tools has been programmed in P.U.M.A. to make it easier for users to locate or retrieve coordinate information. A user can enter coordinates in state plane format and ArcView will zoom to and center that point. If necessary the user could also use latitude and longitude to locate a point within the county. A county grid system number can also be entered to get to specific area. The user can retrieve the XY coordinate, latitude and longitude, and the county tile number all with a single click. There is even a tool that enables a user to add latitude and longitude to any point layer on the fly. P.U.M.A. also has equipped users with the ability to generate Tools such as these are the result of user suggestions and request

P.U.M.A. is basically a stand-alone ArcMap application and to date has not incorporated any wireless capabilities. A wireless connection is a highly probable addition to the P.U.M.A. application. However, storing and accessing data locally is likely to be the preferred method for the foreseeable future. Widespread power outages during Hurricane Isabel in fall of 2003 prevented many County offices from opening thus limiting access to data through their PCs. Utilities Department field crews and other essential personal were able to continue to utilize their laptops independently of a network. This allowed them to view GIS data uninterrupted by their surrounding environment. Laptops could easily be powered and charged while in the vehicle. With all of the chaos surrounding the events of the hurricane field crews could still rely on their basic map data. In the future a wireless network would allow real time data to be displayed in P.U.M.A., however keeping the base data local is still the plan.

Chesterfield County's Department of Utilities will continue using and customizing ArcMap for all GIS uses for the foreseeable future. Currently plans are underway to migrate from the Visual Basic 6 environment to VB Net. This migration will also include moving from the ArcMap 8.3 to the 9.x suite of products. A primary goal is to upgrade laptops to include wireless capabilities and internal GPS. The use of portable electronic equipment coupled with the power of GIS has improved the quality and speed of information accessed the field. With the rapid changes in technology applications such as P.U.M.A. will continue to simplify mapping task.