Volunteer Firefighters Get Improved Notification from Integrated Technology

Overview

Country or Region: United States
Industry: Government—Public safety

Customer Profile

The Cumberland Fire Department has a staff of about 100 volunteers who serve approximately 9,000 residents of a suburban community located between the cities of Portland and Freeport in Maine.

Business Situation

Traditional fire pagers were losing their effectiveness in reaching volunteers who often work outside the range of radio frequencies.

Solution

A volunteer firefighter who owns a technology solution company designed a system using Microsoft® Visual Studio® to combine fire tone signals, text messaging, and voice over IP telephony to help volunteers stay in touch with their department.

Benefits

- Improved notification and response times
- Familiar, easy-to-use interface
- Powerful development tools

"If we can get to a fire a minute faster, that much less damage has occurred. The technology helps volunteer fire departments make great strides in their response times."

Dan Small, Chief, Cumberland (Maine) Fire Department

Like most small towns and suburbs in the United States, Cumberland, Maine, relies on volunteers to provide public services such as firefighting. As in most rural departments, Cumberland firefighters carry traditional fire pagers to hear signals sent out by a dispatcher. As volunteers traveled farther away to jobs in other cities, however, the signals from the pagers weakened and their usefulness decreased. To help volunteers stay informed about evolving incidents in Cumberland, local technology solution provider Northern Collaborative Technologies used Microsoft® Visual Studio® .NET to create an integrated solution that employs a Web server and voice over IP telephony to provide real-time communication to volunteer firefighters working many miles from Cumberland so they can stay in touch with potential emergencies in their community.

Situation

Cumberland, Maine, is a scenic coastal community of about 9,000 residents. The once-rural town is now an affluent suburb located about midway along a 20-mile stretch of Interstate 295 connecting Portland, the state's largest city and busiest financial and retail center, and Freeport, best known as the home of the L.L. Bean outdoor clothing and equipment retailer.

Like the majority of small towns and suburbs throughout the United States, Cumberland relies on a network of volunteers for public services that in larger cities are usually provided by paid employees. The Cumberland Fire Department has about 100 volunteers, and its only full-time employee is the department administrator.

With the evolution of towns like Cumberland from rural communities to bedroom suburbs, the nature of volunteer-based public safety has changed. In the past, volunteer firefighters would likely be nearby—no more than a couple of miles at most—so they could respond quickly to an incident, such as a fire or traffic accident. Most volunteer fire departments distribute "fire pagers" to their volunteers. The pagers use a radio signal to transmit tones that indicate an event in progress. The specific tones cause the pagers to "activate," and after beeping loudly they become one-way radios that let firefighters hear what firefighting equipment is being assigned and the nature and location of the incident.

The problem, says Cumberland Fire Chief Dan Small, who is also a full-time firefighter for the City of Portland, is that the pagers have a limited range. "The reception for the pagers gets poor beyond about four to six miles," he says. "These days, more and more firefighters are working farther and farther away from the community, perhaps in office buildings that can be 20 or 30 miles away."

That puts them outside the range of their pagers. Even if firefighters are within range, the pagers can be disruptive in office environments by distracting people at nearby desks or interrupting phone calls and meetings.

It's a problem that got Andrew Pollack thinking about a potential solution. Pollack is a Cumberland volunteer firefighter who, when not responding to department calls, is President of Northern Collaborative Technologies, a Cumberland-based solution provider.

"The radio-based pagers are fine for volunteers in close range, but aren't an effective tool if a volunteer works many miles away," Pollack says. "The chances are good that he won't hear the signal. There had been some patchwork solutions attempted, but they involved multiple devices that make the volunteer look like he's wearing a *Batman* utility belt. They also add cost, such as solutions requiring a volunteer to carry an additional telephone-based pager.

"The result is that a lot of volunteer firefighters are out of range from a lot of calls, and start feeling pretty disconnected from their departments," he continues. "And then department membership goes down."

Pollack felt that, with the abundance of good technology on the market, there had to be a better way of connecting geographically dispersed volunteer firefighters with the department and community that they wanted to serve.

Solution

Pollack developed a scalable and affordable solution called Second Signal, which uses the Microsoft® Visual Studio® .NET development system to integrate technologies. The solution, which Pollack began working on in 2005, includes an IBM Lotus Domino server that provides a Web service–based interface

in a service-oriented architecture (SOA) that enables communications with client applications residing on local department PCs. The solution also uses Asterisk, an open source Private Branch Exchange (PBX) telephony standard that uses software to mimic the functionality of PBX switches and enables voice over IP (VoIP) telephony, which allows voice communications over the Internet.

The integrated solution enables dispatchers to reach volunteer firefighters wherever they are without having to rely exclusively on the radio-based pagers. Second Signal detects dispatch calls by their sound and then notifies volunteers by text messages sent to the device of the volunteer's choice. It uses VoIP telephony to relay radio traffic to a conference call number so volunteers can listen to dispatch communications—either recordings or in real time.

Components of SecondSignal include:

- **Tone Capture Tool**, a Visual Studio–based application that resides on a PC located within radio range, usually at the fire station or a volunteer's home. This tool is used in instances where the local or regional dispatcher center is unable to participate directly in text notifications. In many cases, a single dispatch center may be covering the needs of several towns, and bringing in new technology can take quite a while. In that case, this tool can detect activation tones automatically and send out notifications to subscribers.

- **3-Click Paging System**, a dispatch center client application created in Visual Studio and designed to require as little time as possible from a dispatcher, while still providing substantially more information to firefighters than simply capturing the tones. It runs on the dispatcher's PC as a system tray icon, is easy to use, and does not require any typing. After receiving an emergency call, the dispatcher clicks the

icon, clicks a menu choice indicating the geographic area, and then clicks to indicate the type and severity of the call. The three clicks are all that is necessary for the information about the event to be transmitted to Second Signal subscribers. Menu items are customizable so they fit the local context of the dispatch center.

- **Audio Relay**, a Visual Studio–based client application that resides on a PC located within radio range. The PC is connected to an emergency service scanner through the microphone or line-in jack on the PC sound card. Audio from the scanner is relayed to the Second Signal servers.

- **Second Signal HQ**, a cluster of Domino-based servers that provides a secure workflow site that allows each department member to manage his or her own cell phone or pager for receiving messages. Members can list multiple devices and can schedule which device should receive messages at what times and in what priority. In addition, nonemergency messages can be sent by members to each other as individuals or groups (for example, members assigned to a particular engine company). The site includes a departmental calendar and document library. Members can configure their Microsoft Outlook® or Outlook Express messaging and collaboration client to use the department's personnel directory.

- **Second Signal HQ SOA Process**, which includes a secure Web-service interface that handles messaging from the tone capture and paging tools, as well as an interface used by the PBX system.

- **Second Signal HQ PBX**, which uses the Asterisk system. It provides PBX functionality so users with cell phones or regular telephone lines can call in and listen to radio traffic. When users call, they can listen to recorded audio stored on the Web server, starting from last activation
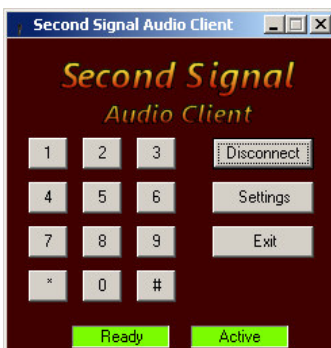
The Second Signal Audio Client application resides on users' PCs. Users can listen in on Cumberland Fire Department radio traffic just as they would using a telephone or an emergency scanner.

tone (fire call), to catch up on information. They can also use their telephone keypad to skip the recorded audio and go immediately to live audio, or navigate to previous calls.

- **Second Signal Audio Client**, a Visual Studio–based application that runs on any PC connected to the Internet. Users can connect to Second Signal HQ PBX and hear the audio traffic through their PC speakers or headsets just as if they were using a telephone. This solution is ideal for volunteers who work in office buildings. A low-bandwidth signaling mechanism allows the application to activate and begin listening to audio when an active call is dispatched.

Benefits

The new communication solution for volunteer firefighters is easy to use and cost-effective—frequently less expensive than existing paging systems, while also being easy to modify and upgrade. Most importantly, Cumberland firefighters say the solution helps them stay fully informed about emergency situations in their hometown even as they work many miles away.

Improved Notification and Response Time

The notification system has been successful in connecting distant volunteer firefighters with events happening in Cumberland, according to the fire chief. "When the Cumberland dispatcher sends out a tone to activate the standard fire pagers, the solution can notify any cell phone or pager that the volunteers choose to carry," Small says. "In my case, I have a Motorola RAZR, and I get an instant text message to my phone that says 'fire tone.' I have my speed dial programmed to call the dispatch system, so I can listen to the radio traffic to determine what is going on and whether I need to travel to Cumberland.

"This technology helps me be more informed, whether or not I'm actually in Cumberland," he adds. "For example, if there's been a fatal car injury, I can make a quick call to set up a briefing with the department chaplain. I don't have to wait until I call in the next day to find out exactly what happened."

Other volunteers can receive pages on their phones or desktop PCs, and then quickly check in to get up-to-date information without disrupting their office. Then they can decide whether or not to leave work to help out.

Small says the biggest advantage provided by the solution is timesavings. "This technology is helping shave minutes off the response time of volunteers," he says. "In firefighting, time saved is lives saved, property saved, and money saved. If we can get to a fire a minute faster, that much less damage has occurred. The technology helps volunteer fire departments make great strides in their response times."

Familiar, Easy-to-Use Interface

When it came to deciding on the development environment for the client applications, Pollack felt that Visual Studio was the best choice. "Visual Studio .NET provides a professional-quality installer and a stable environment in which to run the solution—it is well supported by PCs and workstations," he says. "It allowed me to create a client application that has the same kind of look and feel that users are familiar with on their PCs, such as dialog boxes, headers, and options."

Pollack considered creating a Java-based client application but ultimately ruled that out. "For end-user applications, Java-based software adds a great deal of configuration and support issues on the desktop," he says. "With Visual Studio, on the other hand, I knew I could make a good desktop application that would help pull all the components together,

would install correctly, and would not pose any big issues in terms of operating and maintaining it."

Powerful Development Tools

With efficient tools for integrating new technologies such as Web services and VoIP, Visual Studio .NET provided Pollack with a rich and stable development environment for creating an effective client application that works smoothly with server-based components from different types of computer systems.

Pollack used a number of Visual Studio tools to help him create the fire alert solution. "There are digital signal processing add-ins that I could have used for the system, but I chose to learn and write my own instead," he says. "Doing this requires a Fast Fourier Transform [operation] so that the software can pick out specific frequencies and touch tones. Visual Studio was helpful because it has very good debugging tools and interfaces, and a flexibility that enabled me to create my own digital signal processing method."

Another challenge was adding the VoIP component. With VoIP, volunteer firefighters can call in when they get a "fire tone" message on their pagers or cell phones, and listen to calls —either played back or in real time—to get information that helps them determine whether the event warrants driving to Cumberland.

In creating the VoIP component, Pollack used the Microsoft Real-Time Communications (RTC) Client application programming interface (API), a set of COM interfaces and methods designed to create applications that make PC-to-PC, PC-to-phone, and phone-to-phone calls, or send text-only instant messaging sessions over the Internet. "I found what I needed to make this work with the Microsoft RTC Client API, which is used for

communicating in real time with the Web server," Pollack says.

"The Microsoft tools," he continues, "have been highly effective in helping create a powerful yet easy-to-use solution that is addressing the needs of the firefighters."

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Microsoft .NET

Microsoft .NET is software that connects people, information, systems, and devices through the use of Web services. Web services are a combination of protocols that enable computers to work together by exchanging messages. Web services are based on the standard protocols of XML, SOAP, and WSDL, which allow them to interoperate across platforms and pro-gramming languages.

.NET is integrated across Microsoft products and services, providing the ability to quickly build, deploy, manage, and use connected, secure solutions with Web services. These solutions provide agile business integration and the promise of information anytime, anywhere, on any device.

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