

Feature-Rich Voice over IP Gives Crisis Communications New Levels of Survivability and Interoperability



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Executive Summary 1

Introduction 1

Survivability 2

Interoperability 3

Public Safety Answering Point 4

Feature-Rich IP Communications 6

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Executive Summary

As leaders from state and local as well as federal government bodies work to improve crisis communications preparedness and response, IP communications infrastructure and applications stand out as solutions that out-perform legacy TDM solutions in crisis situations. Survivability, interoperability and powerful new features address head on the requirements of ensuring continuity of communications and operations in the public sector. This paper analyzes the most promising developments in convergence communications and how they can fill the gaps in crisis communications.

Introduction

In the months following perhaps the largest natural disaster in modern US history, Hurricane Katrina, public and political debate remains focused on the critical role that crisis communications plays in disaster preparedness and response. The communications failures were a painful reminder of lessons still to be learned from breakdowns during the terrorist attacks of Sept. 11, 2001— in spite of concerted public and political attention on the importance of continuity of operations during a crisis. Congressman Lee Hamilton captured the frustration in a Dec. 4, 2005 interview on Meet the Press, when he stated: “This is a no-brainer. From the standpoint of responding to a disaster, the key responders must be able to talk with one another. They could not do it on 9/11, and as a result of that, lives were lost. They could not do it at Katrina. They still cannot do it.”

Lawmakers and federal oversight agencies, such as the Department of Homeland Security (DHS) and the Federal Communications Commission (FCC), have released a flood of initiatives, directives, and bills aimed at improving the emergency communications infrastructure. For example, in the fall of 2005 lawmakers introduced a bipartisan bill in the Senate calling for federal financial support for states and communities to help develop survivable, interoperable communications during the coming five years.

These measures are by no means without precedent, however. Ever since 9/11, federal oversight agencies have been working with public and private sector organizations, and coalitions such as the National Emergency Number Association (NENA), to improve the technology and practices, by which emergency response teams communicate, receive and share vital alerts and other information, and coordinate actions.

The DHS, the Department of Defense, the Department of Justice, and the FCC are among the government bodies involved in designing and implementing a next-generation emergency communications infrastructure based on the Internet Protocol (IP) networking standard.

While government oversight agencies focus on the big picture, a growing number of public sector organizations have already begun deploying converged communications platforms that support both circuit-switched and Voice over IP (VoIP) communications. Such platforms, integrated with specialized software and equipment, enable new communications features and capabilities that can enhance the power of crisis communications platforms, such as Public Safety Answering Points (PSAPs), dispatch, and command and control centers that direct and coordinate activities among multiple emergency personnel and organizations.

This paper will discuss the underlying architecture and features of these platforms, and how they are being deployed to meet all of the government’s key criteria for emergency communications systems and applications: survivability, interoperability, and able to support the rich new array of features that have become possible in the world of IP communications.

Survivability

Recent natural and manmade disasters have made it clear that emergency response systems need multiple layers of disaster-proofing. Converged communications platforms can incorporate a modular architecture based on proven, standard components such as Intel processors. They also incorporate redundancy at every level, including hardware components, call control modules, gateways, sites, systems, and network connections.

The underlying IP framework offers a rich set of backup and recovery capabilities and fault tolerant features. They include:

- Quality of service (assigning high priority to critical, latency-sensitive voice packets, for example, during congested traffic conditions)
- Automatic, dynamic rerouting of IP calls to alternative network paths
- Web-based systems for fault and performance management

IP plays a key role in disaster-proof communications by supporting intelligent links between systems over distance. "If a PBX goes down, you're out of business," says Ron Leeburg, product manager at Siemens Communications. "But with IP you can set up a backup system with its own processor, whose database is synchronized with the primary system via a wide area or local area network. Then if the first system goes down, the second one takes over."

Sites can be separated by hundreds of miles, ensuring that if one emergency system goes down, communications can continue to flow through the backup site. This is particularly important for government installations located in target areas such as Washington, D.C.: A backup site can be located far out of range of anything from a terrorist attack to an earthquake.

IP communications between sites ensures that crucial services, such as collaboration and unified communications, remain accessible. "Suppose I'm in Dallas, and the network connection with the Dallas communications system goes down. I can reestablish access to communications services by contacting the center in Colorado, maybe by a satellite link," says Alok Vasudeva, product marketing manager for Siemens Communications.

Converged communications platforms also protect vital communications services by allowing operators to switch between VoIP and circuit-switched communications modes. When Hurricane Katrina hit, many emergency response centers lost the ability to communicate when the local fixed network operator's phone service failed. Facilities that had at least one alternative networking connection, such as radio frequency, satellite, or VoIP, continued to operate.

Interoperability

An improved survival rate is only one reason—albeit an important one—why emergency response systems need more than one way to communicate. In order to be effective, PSAPs and command and control centers need to be able to interface with the broad array of communications devices and modes used by first responders and by the public they seek to protect.

Callers no longer use strictly fixed-line residential lines to call into a 9-1-1 facility. They use cell phones, PDAs, VoIP. PSAPs can pick up such calls without difficulty; the problem has been providing emergency responders with information about the caller. The nationwide enhanced 9-1-1 (E911) infrastructures, which now serve 96 percent of the country, provides PSAPs with critical data such as caller ID and latitude and longitude coordinates. The PSAP's communication system hands that data over to a computer aided dispatch system, which can then send that information to a computer terminal in the police car or ambulance it dispatches to the emergency.

Converged communications platforms can be configured with dispatch systems that address one of the most serious obstacles to effective disaster response: incompatibilities between the devices and media used by local emergency responders and government agencies.

"Ever since 9/11, the DHS has been working on regionalized interoperability among agencies, for both voice and data," says Jeff Vining, a vice president in Gartner's public sector worldwide group.

The Assure Emergency and Interoperable Communications for First Responders Act of 2005 calls for a grant program to help develop and implement interoperable communications systems at the state and local levels. The bill would earmark \$400 million in 2006 and increase funding annually to about \$1 billion by 2010 for a total of \$3.3 billion.

While government oversight agencies work on a long-term solution, PSAPs and command and control centers can address the problem immediately, through dispatch and alert systems that run on top of, and exploit the interoperability and survivability of, converged communications platforms.

A dispatch emergency response system provides a single interface for multiple communications devices. It allows operators to merge multiple wireless and wireline devices and set up conferences with land mobile radio, air-to-ground, UHF/VHF and satellite communication users. The system provides integrated conferencing, and an automatic notification feature with authentication.

One or more controllers can access multiple lines, radios, and conferences, all with the push of a single button. The system provides integrated conferencing and is especially important to reach different sets of people for different types of emergencies.

"So if the New Orleans police want to talk to the National Guard, the system can patch them together," says Siemens' Leeburg. "The dispatcher can press a button and instantly create a conference between a helicopter putting out a fire, communicating via air-to-ground, and police using mobile radio."

Operators can monitor conversations on different frequencies and phone lines, and can intervene when appropriate, Leeburg says. For example, they can interconnect people working on different aspects of a problem, or pass information from one conversation to another.

Used in PSAPs and command and control centers, dispatch communications systems are designed to help synchronize communications and quickly coordinate personnel during situations when a quick response is critical. Command post operators are able to initiate telephone conference calls rapidly, and patch radio communications between the ground crew and on-scene commands, through one centralized console.

An alert system enables a disaster response center to notify large groups through computer-based notification or call broadcasts, and set up phone conferences over the Internet, in seconds.

"If a disaster hits, someone can press a button on the (communications console), call up a list of 500 or a thousand people, and send out calls that could simply say, 'There's a bomb in this location, don't go there,' or 'There's a bomb, please call in or press '1' to verify you're okay,'" says Siemens' Leeburg.

The system saves time and boosts productivity by doing away with the old manual method of going down a list of people to call, Leeburg adds. It can be programmed to try to reach people on multiple devices: pager, cell phone, regular phone, email.

Finally, such a dispatch system can be installed in multiple locations to create back-up sites with mirror images to ensure survivability in a crisis. The HiPath Dispatch database maintains its integrity over multiple sites via automatic data propagation that keeps all involved databases up-to-date. What this means is that if one site goes down, dispatchers can move to the other site, log on to the system and have immediate access to an exact duplicate of the original system including the same lines, the same user interface, etc.

A Mobile PSAP Saves the Day

When Hurricane Katrina ripped through Louisiana, Plaquemines Parish was hit hard. The hurricane demolished the parish's emergency service buildings, cutting off 9-1-1 telephone service, and destroying the local Sheriff's department building where the Public Safety Answering Point (PSAP) was housed.

With funding provided by the Federal Emergency Management Administration (FEMA), Siemens, along with its channel and technology partners, built the parish a mobile, self-contained E911 command center in five days. Operators can now handle all calls—landline, cell phone, and responder radio communications—on a single touch-screen console, wearing a single head set. Two additional radio interfaces and a second console position provide both for future growth and survivability. An onboard generator and uninterruptable power supplies kept the screens and computers up and running during an hour-long black out.

The PSAP currently uses time division multiplexing/circuit switched connections. The platform also supports VoIP, the direction in which the nationwide E911 infrastructure is moving.

Feature-Rich IP Communications

A survivable and interoperable infrastructure is the backbone of the new world of IP communications. But what also sets IP communications apart from the world of legacy TDM is the power of the applications riding on top of that network. One example that is highly relevant to the work of emergency responders is the personal communications portal. These portals provide a rich set of communications capabilities from within familiar applications, such as Microsoft Windows. They enable end users to contact each other instantly, independent of location and type of communications device; send group notifications, initiate voice or video conferences, and share key information at the click of a mouse. A team leader can send alerts or messages to subordinates, or set up a teleconference with his group; a senior government official can send critical information to first responders at other agencies; an airport security official can put out an all points bulletin to personnel. The sender has the assurance that the message will get through to any recipient with a working communications device, and otherwise, will go to the designated backup person.

A key feature of such platforms is presence-based contact management. Users designate preferred contact numbers, by which they can be reached at a given time of day, or day of the week. They can put in special rules, such as, "call my mobile phone if my office phone is busy," or change rules on the fly if, for example, an unexpected meeting or crisis comes up. They can also tell the system to route calls to a backup person if they are unreachable. Presence awareness saves the caller or message-sender precious time by determining whether the recipient is on- or offline, even before contact is initiated. Therefore, the user can know, not guess, who is available at any time.

Aggregated-device communications allow seamless transition of communications activity across a variety of devices and media. This enables the system to contact people independent of whether they are using land lines or cell phones, laptops or desktop computers.

Together, the above features support one-number service: the ability to contact people via a single phone number, transparently, no matter where they happen to be or what type of device they are using at any given time. Once contacted, team members can be directed to a common repository where they can pick up instructions or other material, or attend a multi-party audio or video conference. To set up a conference, the team leader simply clicks on the team icon on his or her desktop, which automatically sends out the invitation, along with a call-in number.

Personal collaboration portals enable users to store, access and manage voice, fax and email messages from the same mailbox. Voice-activated commands and text-to-speech conversion features enable users to access their mail, and send messages over whatever device they have on hand: a telephone, a PDA, or a laptop.

The above offerings form the building blocks for an emergency communications infrastructure that can meet the needs of individual agencies—from a small town police department to the Federal Aviation Administration (FAA). A single, integrated, fault-tolerant communications platform supports emergency response in all three key areas—9-1-1, command and control, dispatch.

While government oversight agencies work toward the next generation of emergency response communications, converged communications platforms enable emergency response agencies and organizations to prepare for that future, and at the same time improve their responsiveness in the present.

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