



VoIP and 9-1-1 - The Technology is Not the Problem

Stephen Meer

Intrado co-founder and chief technology officer



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The twenty years since the breakup of the AT&T system, and the movement toward deregulated telecommunications markets, have been a time of great technological advancement. Today's communication devices are wired, wireless, and integrated into a host of other electronics such as computers, automobiles, personal digital assistants (PDAs), and telephones.

The near-term future is certain to bring more innovation that converge voice communications and data services. From a 9-1-1 perspective, these emerging communication trends are a double-edged sword. While they challenge the very foundations of our existing 9-1-1 systems, they also hold the promise of fundamentally altering how the public summons emergency assistance and improving emergency services providers' efficiency in dealing with emergencies.

Technology Limitations and Opportunities

Throughout the marketplace consumers are benefiting greatly from technologies that provide new, cost-effective ways to communicate. Wireless phones are prevalent, many new cars come with telematics subscriptions, and businesses can equip "road warriors" with portable offices. In contrast, however, public safety answering points (PSAPs) receiving the nation's 9-1-1 emergency calls use technology that is 40 years old. In its inception, this underlying technology made direct dialing of long distance calls a reality. This was accomplished in a world of fixed and wired telephone instruments provided by one company that served all communications needs for the nation. The context has changed drastically, but unfortunately the critical infrastructure used for 9-1-1 has not kept up.

The disparity between the innovation in today's new communications technologies and the underdeveloped 9-1-1 system is rapidly approaching a critical point that will force one of two actions, each with drastically different results:

1. Reconfiguration of the way 9-1-1 calls are processed and delivered so that any person, with any communication device, using any type of protocol, can be connected to an emergency response center responsible for dispatching emergency services in the area. This would result in a vibrant, growing 9-1-1 system that extends and retains its critical relevance and centrality.

2. Resistance to the pressure created by today's technological advancements and the need for critical change. The result would render the 9-1-1 system, and the vital benefits it has brought to the public, an obsolete and archaic vestige of a bygone era.

The latter result, and the degradation to the public welfare it would bring, is obviously unacceptable. 9-1-1 system administrators, 9-1-1 systems solution providers, and regulators must aggressively address technological advancement and the need for business model evolution to further avoid negative impact to the critical 9-1-1 system the public relies on for help in an emergency.

The 9-1-1 system was built to route calls to the jurisdictionally designated PSAP responsible for emergency services dispatch based on a fixed geographic location. Starting with that fixed location, the call is routed and presented to the PSAP with callback and location information. New mobile and portable technologies pose huge technological challenges to this paradigm. Deployment of wireless 9-1-1, in which there is no fixed geographic location associated with the telephone number, is a prime example of the disparity between new technology and traditional 9-1-1.

Many parts of the country are currently struggling to deal with deployment of wireless 9-1-1. Because the 9-1-1 system was not built to handle mobility, when a wireless caller dials 9-1-1, the PSAP cannot identify their specific call location. With 50 percent of PSAP call volume originating from wireless devices, a large part of the population is at risk. The industry has overcome many technological challenges and great strides have been made with deployment of wireless Phase I in which the emergency call is routed based on the fixed location of the cell site. Phase II, with caller location data represented by more specific coordinate information, has had limited deployment.

To remain true to the public welfare foundations that 9-1-1 is built upon, we must continue to effectively route requests for emergency assistance regardless of the technology or protocol of the device used to make the request. It is imperative that 9-1-1 adapt to the public's changing methods of communication.

Five critical principles should shape the evolution of the 9-1-1 infrastructure:

1. Emergency calls, whatever the technology or protocol used, must be automatically routed to the appropriate designated emergency response agency.
2. Emergency calls should be delivered within the 9-1-1 system via designated 9-1-1 paths and using the 9-1-1 routing systems.
3. The rate at which new technologies are being developed and adopted will continue to rise in the future.
4. Users of such technologies will demand the high level of 9-1-1 service that is currently experienced by fixed wireline users today.
5. The regulatory, interconnection and business rules of 9-1-1 should enable providers of new technologies to be good 9-1-1 citizens.

VoIP and 9-1-1

Nothing demonstrates the technological chasm between current communication technologies and 9-1-1 more clearly than the rapidly emerging Voice over Internet Protocol (VoIP) technology applications. VoIP, much like wireless, poses significant new challenges to the quality of emergency services and 9-1-1 because often there is no fixed location for the caller.

VoIP refers to the transmission of voice conversations over a data network. VoIP utilizes packet technology to parse voice conversations into data packets and then distribute them over either a private IP network or via a broadband connection over the Internet.

As technology adoption rates for both residential and enterprise VoIP users grow, subscribers of these services will expect that their emergency calls will be delivered as quickly and efficiently as in today's circuit switched environment. The challenge of successfully offering quality emergency calling service depends on the type of VoIP service offered (see figure 1). Two major types of VoIP service are as follows:

Internet Telephony for residential or small business users with under 10 lines

For this first application the user must have an existing broadband connection to the Internet. The Internet Telephony subscriber uses an IP device that converts voice audio to digital packets and sends the calls to another IP enabled phone, a computer or to the public switched telephone network for termination to the called party. As long as the subscriber remains at a fixed location and utilizes telephone numbers indigenous to the fixed location, Internet Telephony poses no technical challenges to delivery of 9-1-1 calls from these devices. However, as Internet Telephony requires only a broadband connection, the service provider

can easily provide end users telephone numbers outside the indigenous area codes and exchanges, creating potential challenges to 9-1-1 call delivery. The 9-1-1 challenge with this application is ensuring that 9-1-1 calls dialed on IP devices can be routed to the geographically appropriate PSAP.

Enterprise IP technology

In this application, voice communication is routed over a privately managed enterprise network. Given the architecture of managed IP networks and the Internet itself, locating callers in this context presents unique new challenges. The IP network is driven by IP addresses, which are not associated with physical addresses, and as a result providing the location of emergency callers for 9-1-1 service using VoIP is highly problematic.

Each different type of VoIP service offered necessitates a different solution to effectively deliver a 9-1-1 call.

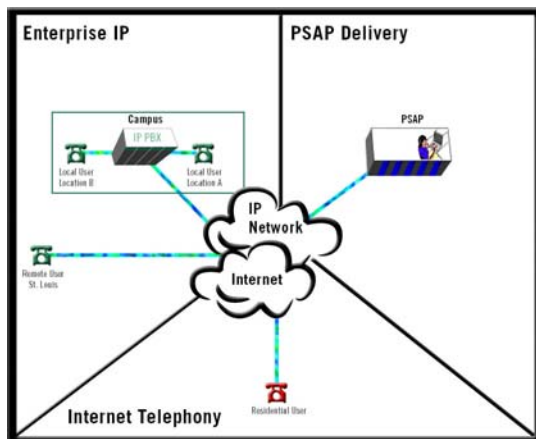


Figure 1

In order to effectively market VoIP technology as an alternative for circuit-switched wireline service, VoIP providers have attempted to implement an effective response to emergency calls placed by their subscribers. They have, for example, required subscribers to associate their initial IP address with a fixed physical address. Additionally, they have arranged for 9-1-1 calls placed by their subscribers to be routed to the PSAP that serves the physical address identified by their subscriber. Unfortunately, without the cooperation of the 9-1-1 service provider, the calls can only be routed to the PSAP via local exchange lines rather than through the selective router into the 9-1-1 network infrastructure.

Good 9-1-1 Citizenship

Also complicating the technical challenge of location determination, are the regulatory challenges faced by VoIP. VoIP uses the Internet or privately managed networks to move data, a fundamentally different form of communications than switched networks. This altered form of communication has generally been considered "information services" rather than regulated "telecommunications services." Today, direct interconnection into the 9-1-1 system is typically only available to entities that provide telecommunications services, not information services. Therefore, many Internet Telephony providers who want to provide 9-1-1 services to their customers simply cannot do so because they cannot interconnect to the 9-1-1 system.

Regardless of the final regulatory decision, to be true to the public welfare, providers of new services like VoIP should be required to be good 9-1-1 citizens. Additionally, 9-1-1 service providers should allow – and even facilitate – such good 9-1-1 citizenry. Specifically, providers of new services should collect and remit 9-1-1 service fees to support the activities to handle their subscribers' 9-1-1 emergency calls. In return, 9-1-1 service providers should allow access into the selective router to interconnect and operate within the traditional 9-1-1 system.

VoIP: A Revolutionary Challenge for 9-1-1

Given the limitations inherent in using the traditional 9-1-1 infrastructure to process emergency calls for assistance from Internet Telephony users, the growth of Internet Telephony presents tremendous challenges to PSAP environments encumbered with outdated technology and arcane business rules. However, the changes needed to meet these challenges do not represent insurmountable obstacles. In fact, industry leaders and technology experts are focused on developing usable, affordable and effective solutions right now.

The challenges presented by wireless devices and now VoIP communications demonstrate that the problem is not with the new technology but is instead with the 9-1-1 system itself. Collectively, we continue to develop more patchwork, ad hoc, short-term solutions to force these new technologies to work within an aging infrastructure. By far, the better alternative is to work together to replace today's 9-1-1 technology with new, innovative, and more flexible solutions for public safety that meet current needs with appropriate long-term solutions, and provides a robust platform upon which to build solutions to future challenges.

The Path Forward

The existing 9-1-1 system, built 40 years ago, is a challenging environment for new technologies like VoIP. The methods currently in place to process and route 9-1-1

calls from Internet Telephony users represent an interim solution that allows subscribers of this new technology to reach the appropriate emergency responders on PSAP designated local exchange lines while requiring a subscriber-validated location and a callback number. This is a short-term solution put in place because interconnection into the 9-1-1 system is blocked and the mechanics for associating physical location information with IP addresses has yet to be developed.

From a regulatory perspective, the existing 9-1-1 system must be open to more than purely "telecommunications services" providers as currently defined by both state and federal regulators and allow providers of new services to be good 9-1-1 citizens. Regulators have and must exercise their authority to require 9-1-1 system providers to incorporate alternative means of connecting to the existing 9-1-1 infrastructure in a way that will not cause irreparable systemic harm to the solid, though inflexible, infrastructure, and in a way that will not lead to degradation of service to those seeking emergency assistance.

Despite the challenges new technologies represent, the emergency call routing system here is the best in the world. Ultimately, the same creative drive and purpose of mission that led to the development of our current 9-1-1 network will lead to the creation and implementation of new solutions and business rules to meet the growing needs of the system.

Unless prudent public regulation and the establishment of a vibrant business environment that engenders investment in the system are present, the result will be a repetition of the ongoing dilemmas faced in the attempt to deploy wireless 9-1-1. Without these key elements, the public benefits of a universal and well-known emergency number like 9-1-1 will not survive the continued service degradation brought about by the ongoing onslaught of new technologies. This is not an acceptable option. Lives hang in the balance.