

E911 & Emergency Services

Critical Factors for IP Communications in Business

Introduction

In today's world, public safety and emergency preparedness are critical issues that no organization can afford to take for granted.

As you consider your next enterprise telecommunications system, such as an IP PBX, you need to assess the capabilities of these systems to enable and support your organization's planning for emergency response and crisis management.

Understandably, people most often think of the national 9-1-1 emergency number when first considering emergency response needs. This is one aspect of Emergency Telecommunications Services (ETS) that your enterprise telecommunications solution must support. However, additional aspects of ETS must now be considered in today's business environment. For instance, when faced with a crisis event, key individuals may be required to place high priority calls, not necessarily 9-1-1 calls, and must be assured of service availability.

Therefore, understanding the broader role of ETS and how these services can be reliably offered within a business environment is critical to ensuring the safety of your employees as well as ensuring that communications systems are available in times of emergency.

This document discusses critical aspects of E911 issues specific to enterprise PBX and VoIP environments, explores broader requirements for ETS and emergency response planning, and recommends additional high priority and assured services capabilities to consider when evaluating enterprise telecommunications systems.

Emergency Telecommunications Services

Undoubtedly one of the most critical aspect of ETS relates to placing "9-1-1" calls to local emergency responders. In the USA, the nation-wide emergency number "9-1-1" is well understood.

Looking briefly at the history of 9-1-1 in the USA, you may recall that in January 1968, AT&T announced its intention to implement a national emergency network utilizing the telephone number "9-1-1". Building upon this initiative, Alabama Telephone demonstrated the first 9-1-1 call on February 16, 1968 in Haleyville, Alabama.

Initially, "basic" 9-1-1 could only connect a caller to a predetermined emergency response dispatcher. The dispatcher did not have available any information about the caller or the caller's location. Dispatchers were solely dependant on information offered verbally by the caller. Though this provided obvious limitations, it nevertheless represented a substantial improvement in the handling of emergency situations.

Eventually "enhanced" 9-1-1 (E911) was developed to provide automatic location information and selective routing of emergency calls to the appropriate Public Safety Answering Point (PSAP) dispatch center based on a given jurisdiction for police, fire or other emergency responders.

E911 Today and Voice over IP (VoIP)

Today, the public at large has been conditioned to rely upon 9-1-1 services. We expect 9-1-1 to work, and work consistently whether we are calling from home, school, offices or other public locations. Additionally, when calling 9-1-1, we expect to reach a Public Safety Answering Point (PSAP) that has all the information necessary to send help to the right location.

In fact, though this is what most people expect, it is not always the case. Examples include well-known limitations with cellular service providers, and now VoIP service providers, as

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well as less well-known limitations with Multi-Line Telephone Systems such as PBX's, Key Systems and Centrex services.

Addressing cell phone issues, the FCC now requires that wireless telephone operators offer E911 location identification services to within 50 to 300 meters of the caller in most cases, to ensure mobile subscribers are assured the same level of emergency response as subscribers to traditional telephony services.

Much media attention recently has focused on VoIP telephone service providers that use VoIP technology as an alternative to traditional equipment. The good news is that many of these VoIP service providers are Competitive Local Exchange Carriers (CLEC), which are regulated by the FCC. As such, they are subject to the same laws and regulations as traditional telephone companies, including the requirement to offer E911.

Other VoIP service providers though are not registered carriers. Typically, these companies use the "unregulated" public Internet to deliver VoIP services. With use of these services growing quickly, mostly among consumer or residential telephone service subscribers, there have been a rash of high profile news stories about 9-1-1 services "not working" – resulting from a general lack of understanding by consumers on the limitations of E911 services from these unregulated services. In light of this, in May of 2005 the FCC mandated that all VoIP service providers, including CLEC's and unregulated operators alike, at a minimum notify their customers of limitations to their E911 services.

Though these issues have received considerable attention, it is important for educated administrators of business telecommunications systems to understand that these limitations are not a function of VoIP itself. Rather, these issues have arisen from the systems implemented by many of the VoIP service providers. As a result, it is possible to provide reliable and effective E911 services using VoIP technology, provided that the system has the right capabilities and is implemented correctly. This is particularly true with enterprise IP-PBX systems that by definition utilize VoIP technology.

E911 in the Enterprise

As noted above, it is important to understand that Multi-Line Telephone Systems (MLTS), such as PBX and Key Systems, can present challenges and limitations in terms of the ability to provide location information to PSAPs in times of emergency.

Every day hundreds of thousands of people use phone systems that may or may not give precise location information to 9-1-1 centers. Multi-line telephone systems located in schools, large businesses, hospitals, government facilities and other multi-tenant buildings often provide only the address and phone number of a single location. That location, such as the "front office" of a business, may actually be quite a distance from the location of the caller. Location information is one of the most significant elements in prompt, appropriate response to an emergency, and without this information timely emergency response is hindered or may be prevented altogether.

With the general expectation that 9-1-1 should work consistently and enable emergency responders to quickly reach the right location, it is critically important to ensure that your enterprise telecommunications system can meet these expectations.

Emergency services within a business environment are both similar and different to those in a consumer and residential environment. Emergency services are similar in that Automatic Location Identification (ALI) information is linked to Automatic Number Identification (ANI) information.

ANI is effectively the telephone number of the calling party sent as Caller ID information when the call is placed. For instance your home address is used to populate a location record (ALI) that is associated with your home telephone number (ANI) at the PSAP that serves your area. If you place a 9-1-1 call from your home, the calling number (your home telephone number) is sent via ANI to the PSAP that in turn matches in their computer database to your home address (ALI). This same concept generally applies to your business environment, though differences in size and scope of a business location can be considerable.

Businesses may have several, indeed hundreds or thousands, of telephone numbers. In addition, a business office may consist of a large office building of several floors, or several buildings within a campus.

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Therefore, the coordination and routing of E911 calls placed from a business can be quite complex in some cases. To complicate this further, businesses often have a PBX with telephone extension numbers that are associated only with that system. In other words, these are not telephone numbers the PSAP will recognize and ANI/ALI matching will not occur.

For more than a decade there has been considerable debate over how best to universally implement E911 within a business environment. Key issues include the costs and complexity, variances among MLTS vendors, differences across telephone company service availability as well as the main priorities of the various stakeholders. For these reasons, the FCC has not been decisive in terms of mandating specific compliance and has effectively left regulation and enforcement up to individual states.

Consequently, E911 service is ubiquitous across residential environments, but many businesses do not have E911 capabilities implemented within their environments.

Nevertheless, the FCC has provided guidelines for establishing E911 policy for PBX served environments. Many States have adopted these guidelines, but at the same time, several have deviated from the FCC model considerably. The result is that E911 must be carefully considered when evaluating your enterprise telecommunications needs.

Generally, existing regulations require a certain number of ANI/ALI mappings based on the size of the building environment and the number of phones within the environment.

For instance, Illinois, one of the earliest states to regulate E911 for PBX systems (1996), requires at least one unique ALI per 40,000 square feet of workspace and at least one unique ANI that corresponds to that ALI. Further, if multiple buildings under 40,000 square feet share one common address, such as a multi-tenant building, a unique ANI and ALI per building location must be defined. In other words, a building with 80,000 square feet of office space must have two unique ANI's which correspond to two unique ALI's.

A number of business environments are exempt from these requirements, including businesses that are under 7,000 square feet in size, businesses with key systems and businesses with Centrex services.

While several States regulate E911 service for busi-

nesses with PBX systems, many provide exemptions for government facilities, not-for-profit organizations, schools, hospitals, hotels and other specifically defined environments. In almost all cases, States have identified grace periods and exceptions that may apply to existing installed equipment.

Though these represent minimum requirements, most businesses recognize the public safety advantages of ensuring E911 service availability to all employees. While uniform regulations may be lacking, voluntary compliance by businesses across the country has been substantial.

Emergency Calling Beyond E911

In addition to the ability of a telecommunications system to provide accurate location information to PSAPs in times of emergency, it is important to thoroughly consider a range of emergency scenarios and how the communications capabilities within your business allow employees to reach not only emergency responders like police and fire, but also others throughout your organization who are involved in crisis management and are responsible for crisis communications. If a 9-1-1 call is made today within your company, are designated individuals immediately notified that an emergency may be occurring within one or more facilities? In order for an organization to be in control of their environment, and to be able to respond in a timely and appropriate manner, information like this becomes critical.

Now, if you consider an emergency situation even more broadly than a single individual calling for help, you need to think about more than just the E911 requirements. In fact, many businesses develop an emergency action plan which often includes individuals who act as leaders during an emergency situation.

Their responsibilities include contacting emergency responders (E911) as well as contacting other emergency leaders within the business.

Each emergency leader may be responsible for calling a coordinator at a specific extension number to confirm that all employees have been evacuated from a particular part of the office building. If at that time, perhaps dozens of people are placing calls on the PBX, as often happens during an emergency, consider that the designated emergency leaders

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may not be able to place their calls due to system congestion.

This example illustrates the importance of ensuring that your enterprise telecommunications system can enable the right individuals to gain access to voice channels on your IP PBX at any time. Assured Services is built upon the industry standard protocol “Multi-level Precedence and Pre-emption” (MLPP), and few IP PBX systems offer this critical capability.

NEC Sphere refers to MLPP-based capabilities as “Assured Services”. Assured Services enables authorized users to place “high priority” calls with the assurance that these calls will be completed, regardless of the current availability (or lack of availability) of resources on the PBX system such as voice trunks, channels and stations.

Consider the following scenario:

The Mayor of Mid-Town USA is on her office telephone speaking with her budget director. Suddenly an emergency occurs across town affecting people, transportation and city services.

The city Police Chief tries to call the Mayor to alert her and provide a status of the situation. However, at the moment he tries the call, the tie line between the PBX at Police Headquarters and the PBX at City Hall is fully utilized and does not have any available trunks for this critically important call.

The Police Chief receives a “fast busy” and can only hang up and wait.

The Police Chief tries again a few minutes later. The tie line circuits are now clear, but the Mayor is still on the phone, and the call rolls over to her assistant.

However, at the moment, the assistant is away from her desk for a few minutes, and the Police Chief is transferred to voicemail.

Meanwhile, local news outlets are already aware of the explosion and are broadcasting breaking news, while the Mayor remains unaware of the situation.

After leaving a voicemail message, the Police Chief call for a third time and successfully reaches the Mayor – 15 minutes after the initial call attempt.

If the telephone systems at this municipality had Assured Services capabilities, this scenario would be quite different:
The Police Chief is notified of a crisis situation severe enough

that the Mayor must be alerted immediately. He places his call, selecting “High Priority” level. The Assured Services enabled IP PBX recognizes that all tie line trunks are currently in use, the system terminates a “Low Priority” call on the tie line, and seamlessly reserves the trunk for the Police Chief’s call to the Mayor.

Simultaneously, the “low priority” parties using the tie line trunk are notified via an emergency tone that their call has been preempted.

The high priority call is offered to the Mayor’s phone and a special ring tone is used to inform her of the incoming high priority call. The Mayor is also notified via Caller ID that it is her Police Chief calling. The other party currently on the phone with the Mayor also receives the emergency tone indicating that a higher priority call is being presented to the Mayor. Within seconds, the Mayor answers the Police Chief’s call and immediately begins responding to the crisis situation.

Though hypothetical, this and similar scenarios can play out on a moment’s notice in schools, business offices, hospitals, government facilities, and in many other environments.

In addition to crisis management and emergency response, Assured Services can be a welcome resource for other “high priority” calls pre-empting “low priority” calls including: business calls vs. personal calls, executive calls vs. calls from lobby phones, as well as a variety of other urgent vs. non-urgent calling situations.

Critical Evaluation

In light of the various State regulatory statutes, and other market influences dating back to the early to mid-1990’s, most PBX manufacturers have implemented E911 support.

However, the level of functionality varies widely as do the “platforms” providing these capabilities. Simply put, many older, traditional PBX platforms were not upgradeable to support the E911 requirements. This resulted in a number of 3rd party “black box” solutions which front ended the PBX and provided a translation function mapping extension numbers to ANI for signaling to the PSTN. These solutions can be cumbersome and expensive, but were effective at enabling basic E911 capabilities on a PBX that could otherwise not comply.

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Most current PBX systems, both traditional circuit-based and modern VoIP-based, are capable of native E911 support. Again, to varying degrees. As you consider your businesses E911 needs, you need to assess both the requirements mandated by your local regulatory body as well as the capabilities of the PBX. For instance, considering again the Illinois example above, is it really sufficient for your environment to have only 1 ANI / ALI for 40,000 square feet of space? Does your business require more flexibility or granularity in order to provide the level of safety and security that you want for your employees?

When evaluating communications systems for your business and specifically emergency services capabilities, keep the following items in mind:

- Does the system allow direct dial of 9-1-1 without requiring a PSTN trunk access code? Typically PBX systems require that a user dial an access code (ex 8) in order to place a call to the PSTN. During an emergency situation a caller might not know to dial this access code prior to dialing 9-1-1. The PBX should be “intelligent” enough to place the 9-1-1 call regardless of whether the user entered an access code or not.
- Can the system send a notification to a designated system administrator(s) whenever a 9-1-1 call is placed? For safety and security reasons it is important that others within the business be immediately notified whenever a 9-1-1 call is placed from the telephone system.
- Will the system make available a PSTN trunk for emergency calls even when all trunks are in use at the time of the call? If an employee places an emergency call during a peak usage time when all trunks are tied up, the connect that caller to a 9-1-1 response center.
- How granular can the system be configured with respect to ANI / ALI designations? In many environments having one ANI/LAI for every 40,000 square feet is not sufficient. A system should be capable of granularity down to each DID or telephone number for some users or building locations. For instance, a warehouse may only require 1 ANI / ALI configured per 40,000 square feet while the office complex may have one ANI/ALI per office and one ANI/ALI per grouping of cubes. Configuration flexibility can be critical.

- Is the system capable of assuring service availability at all times to high priority and emergency calls in addition to E911? The ability to deliver services for high priority situations, regardless of current system utilization, can be a critical component of an emergency response plan for any business as well as an important tool for everyday priority communications.

Conclusions

Making the shift to IP-based telecommunications is a big decision, but a smart one. Use this guide to ask the right questions, to fully understand the system, to know your vendor and to clearly understand the value you can offer to your enterprise.

Naturally, being proactive in reviewing emergency services capabilities is paramount in ensuring the safety of your employees and facilities during emergency situations.

It is also critically important to ensure that your telecommunications system is available, and available to the right people, during emergencies and other high priority situations.

To learn more, please contact Sphere Communications and refer to informative web sites noted below.

Industry References

- Federal Communications Commission: www.fcc.gov/9-1-1/enhanced
- FCC Master PSAP Registry: www.fcc.gov/9-1-1/enhanced/reports/psapregistry.html
- National Emergency Number Association: www.nena9-1-1.org
- Association of Public-Safety Communications Officials: www.apcointl.org
- RFC 3689 – General Requirements for Emergency Telecommunication service: www.ietf.org
- Multi-Level Precedence and Pre-emption – ITU-T Recommendation I.255.3 (07/90) Community of Interest Supplementary Services: www.itu.int

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About NEC Sphere

NEC Sphere Communications, Inc. is a leader in software-based enterprise telecommunications, and delivers IP-PBX technology as a business application for your Service Oriented Architecture (SOA).

NEC Sphere is the first to deliver Service Oriented Communications (SOC) software technology as a business application for SOA in IP telephony. NEC Sphere is the winner of many industry awards, including the 2007 Frost & Sullivan Award for Product Differentiation & Innovation.

Tokyo-based NEC Corporation, acquired Sphere Communications Inc. in October 2007. The acquisition provided core technology for new SOC solutions and has enabled NEC to accelerate the growth of its global enterprise business.

A cornerstone of the NEC Sphere value proposition is to offer its customers a wide range of choices for their telecommunications devices. Ultimately, this approach provides users with the greatest flexibility at the lowest possible cost of ownership. NEC Sphere utilizes a certification process that ensures that NEC Sphere Certified devices offer an appropriate level of quality and dependability for our end users.

Today, the award-winning NEC Spherically IP-PBX is in use by all types of enterprise, education, government and U.S. Department of Defense (DoD) organizations in over 15 countries around the world. NEC Spherically IP-PBX is revolutionary in its design and was awarded the patent for packet-based PBX systems.

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About NEC Corporation

NEC Corporation is one of the world's leading providers of Internet, broadband network and enterprise business solutions dedicated to meeting the specialized needs of its diverse and global customer base. NEC delivers tailored solutions in the key fields of computer, networking and electronic devices, by integrating its technical strengths in IT and Networks, and by providing advanced semiconductor solutions through NEC Electronics Corporation. The NEC Group employs more than 150,000 people worldwide. For additional information, visit the NEC home page at: <http://www.nec.com>. NEC Sphere is headquartered in Lincolnshire, Illinois.

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