

# “VOICE OVER INTERNET” (INCLUDING VOIP) AND ITS CHALLENGES FOR 9-1-1

## INFORMATIONAL DOCUMENT #4

PREPARED BY THE METROPOLITAN EMERGENCY SERVICES BOARD (MINNEAPOLIS - ST. PAUL  
REGION)

**“Prerequisite” for this “Informational Document”:** In order to develop an understanding of VoIP/E9-1-1 issues and problems faced by the Enhanced 9-1-1 service providing entities of the USA, it is important to first have a basic understanding of how Enhanced 9-1-1 works with both conventional wireline (phones plugged in to a phone network someplace), wireless (cell phones) and multi-line telephone systems (MLTS). This understanding would be facilitated by first reading the initial three papers in this series on these topics. The reason for this is that the kernel of the VoIP/911 problem can be found there<sup>1</sup>.

NOTE: As this is a developing industry and technology, there is yet to be consistency in what it is being called. Some call it VON (Voice over Net), while others call it Voice over Internet and still others call it Voice Over Internet Protocol, or VoIP. For sake of consistency, we will refer to it as VoIP.

Simply put, traditional telephone calls involve the taking of the spoken word and converting it into electrical impulses and sending those impulses across a transport medium (like a phone wire or a cordless or cell phone radio channel) to their desired destination. The call goes through a series of devices where its route is set up and the specific electrical impulses representing the caller's voice are transferred and switched to the appropriate lines to get from the caller all the way to the party being called. It's very much like driving from Chicago to Miami. One looks at a map and decides what roads to take, where the important intersections are, and then navigates over the several routes to get to one's destination.

Under this model, then, it is logical that one of the millions of potential destinations for a given phone call can be your local Enhanced 9-1-1 network. By dialing the digits 9-1-1, and with the awareness that the 1<sup>st</sup> “intersection” (switching center) that your 9-1-1 call will arrive at (*the local wireline Central Office – CO or, in the case of wireless, a corresponding Mobile Switching Office – MSO - that serves your phone*) will recognize that you dialed 9-1-1. This telephone switch can then make an informed decision on where to send that 9-1-1 call. In the case of a wireline 9-1-1 call, they know to send it to the E9-1-1 tandem router which serves that local CO. In the case of wireless, essentially the same process follows.

### **Enter VoIP**

First of all, let's establish that VoIP can be **both** a phone call and not a phone call. With the proper equipment and connections, it is possible for a person at a desktop/laptop computer or hand held Personal Digital Assistant (PDA) device (we'll call it “Device A” but we won't call it a phone) to be connected to the internet via a “broadband connection” like a cable modem or digital subscriber line/DSL connection. This device can place a “call” and conduct a real-time voice conversation with a person using a like device we'll call “Device B”.

In this case, that “device to device call” never touched any element of the wired or wireless public or private telephone network (generally called the Public Switched Telephone Network or PSTN) at all, ever. Consequently, it is probably not proper to even call it a “phone call”. Rather, it is a communication whereby the voices are sent back and forth, from Device A to Device B as packets of digitized data (a bunch of 1's and 0's) and when received at the other end, they are re-constructed into human voices and reported out the earpiece or loudspeaker at the receiving device in essentially, “real-time”.

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<sup>1</sup> The complete series of informational documents on 9-1-1 issues as prepared by the Metropolitan Emergency Services Board can be found on the web at the Board's web site at [www.mn-mesb.org](http://www.mn-mesb.org)

With the above example of VoIP **not** being a telephone call in any way, shape or form, let's now assume that Party A (above), using Device A has subscribed (by paying \$X per month) to a VoIP service provider. We'll call our VoIP provider XYZ to keep the discussion generic. The user loads XYZ software on their device/computer. At this point, they can place a "VoIP call" direct from their computer to another similarly equipped computer and actually talk back and forth, real-time. Party A would need to know Party B's 6 digit VoIP account number, and Party B would have to be at their computer device to answer the VoIP call. But, for a few dollars more, the XYZ VoIP subscriber can also obtain a device or configure their computer to look and act like a telephone that is plugged into their computer, and they can then use the XYZ service to enter the "real world" PSTN for at least a part of their journey to their destination phone, and place calls to any other phone in the world.

In our example, when Device A dials the desired party's phone number, they are essentially sending an e-mail with an embedded piece of data. That data is the phone call. That "e-message" goes through the internet to the XYZ VoIP provider's server someplace. It could even be outside the U.S.A. At that server, the call enters the PSTN and gets switched and routed to the to the phone line serving the phone that was dialed, anywhere in the world. Importantly, in this example, only one end of this communication was a "VoIP Phone". The other was a "regular phone".

Now that we have the basic VoIP call process established, the relevant question for 9-1-1 is:

**FROM WHAT ADDRESS, TELEPHONE NUMBER OR LOCATION WAS THE ABOVE VOIP CALL PLACED?**

By some definitions, it was placed from where the XYZ server connected the call to whichever PSTN carrier was going to carry that call to the destination "regular phone". Therefore, if the VoIP caller was in Florida, and their XYZ equipped VoIP computer/phone connected to the internet via some broadband service and they were calling Edina, Minnesota, it is conceivable that said VoIP call actually entered the PSTN (or was a "phone call placed from") an XYZ VoIP server located in Fargo, North Dakota. In other words, the entire call process went over the internet all the way from Florida to the VoIP provider's server in Fargo, where it left the internet and entered the PSTN and then got switched to Edina, Minnesota.

**So what?**

**9-1-1, that's what.** In the above example, if the number being dialed from the computing device in Florida were to have been 9-1-1, and if the VoIP service provider allowed calls dialed to 9-1-1 to pass through their system (most do), this 9-1-1 call could enter the Qwest local network in Fargo, North Dakota, search of its "appropriate PSAP". But, considering that Qwest local network in Fargo has no connection to any 9-1-1 router down in Florida, the 9-1-1 call could not get routed to any Florida PSAP, and it would become a "default" 9-1-1 routed call in the Qwest Fargo 9-1-1 tandem and it would not be possible to determine what its "appropriate PSAP" ought to be.

We've now established that the place where the VoIP call enters the PSTN is the critical factor for 9-1-1, and if it enters the PSTN at a place other than the area from which the 9-1-1 call is being placed, getting that 9-1-1 call to the proper PSAP becomes very problematic, if not impossible

With this in mind, several of the VoIP providers have begun, in a variety of ways, to deal with the issue of their inability to be totally compatible with E9-1-1. Some of the VoIP carriers have dealt with it with as little as a "hold harmless" type waiver that their subscriber must sign, to release the VoIP provider from any liability for not providing any or appropriate access to 9-1-1. Others have attempted to set up "work-around" systems that have the VoIP provider setting up a "location of my phone" type record at the VoIP provider's head-end, and when their subscriber dials 9-1-1, the VoIP provider sends that 9-1-1 dialed call to the PSAP deemed to be "appropriate" for the location which the subscriber pre-registered at the provider's head-end. These calls most often arrive at the PSAP on regular 10 digit phone lines and not on E9-1-1 trunks, and the do not carry caller number (ANI) or caller location (ALI) data.

These "work-around" systems have proven to be significantly problematic, in that they assume that the user has not taken their "VoIP phone device/adaptor" away from their "home" location (like on vacation or out of town on business) and then dialed 9-1-1, with the system thinking their device is still "home". A secondary problem is that the database that is used to determine the appropriate PSAP for this VoIP call

was created for the purpose of routing wireless 9-1-1 calls, and sometimes the routing decisions for wireless 9-1-1 calls are not applicable for calls being placed from fixed locations as many VoIP 9-1-1 calls would be.

### **Why can't this problem be solved via regulation?**

It's been tried. In fact, the Minnesota Public Utilities Commission (PUC) issued an Order requiring that VoIP providers offering the functional equivalent of "telephone service" in Minnesota must comply with the State laws and PUC regulations requiring that "telecommunications carriers" must file a plan with the PUC and other agencies articulating how they will be dealing with 9-1-1 calls, and the collection and remittance of 9-1-1 and other mandated telephone surcharges. However, a Minnesota VoIP service provider challenged the MN/PUC's authority to issue such an order. Essentially, the VoIP provider's argument was "*We are not a **phone company**, and we are not providing **telephone service**, and, as such, you cannot regulate us and we don't have to obey you*".

Rather, they argued, they were an "information service". The matter went to the U.S. District Court and the Court agreed with the VoIP providers, so as it stands right now (2004), VoIP providers are not phone companies that can be regulated in any way, shape or form by any state regulatory bodies. Appeals are pending.

On another regulatory front, the Federal Communications Commission (FCC) has been asked to clarify whether VoIP services, which are the functional equivalent of telephone service, must meet the core public safety requirements of 9-1-1.

In the meantime, the VoIP providers are promoting their services heavily, selling the service and their devices over-the-counter at major discount electronics stores, and even sponsoring Twins Baseball games on the radio, claiming that their service is the "*worst nightmare the phone companies have ever had*". Many of them are partnering with local cable companies and internet service providers and offering package deals for "dial tone service" (but, remember they're not phone companies!) including all the features, plus unlimited long distance for prices lower than their traditional phone service competitor's prices. Of course, one of the reasons they can offer equivalent service at a lower cost is that they have successfully avoided paying (and therefore having to collect) all phone related taxes and surcharges. .

A few years back, most visionaries probably assumed that voice over the internet might take the place of long distance some day, especially high priced international long distance. But few imagined that it would begin to displace regular local land line services as it has now begun to do.

And even though there are task groups at the national 9-1-1 industry level attempting to come up with workable standards for how VoIP providers can come as close as possible to matching the functionality of "regular E9-1-1", without regulatory clout from the Federal level to require that the VoIP providers comply, the outlook is troubling. Part of the reason for this is that a VoIP provider could easily be an off-shore business in the Bahamas or anywhere else outside the reach of U.S. regulators. And if they offer some super-discounted service because they are not complying with U.S. 9-1-1 regulations, they will still probably get lots of U.S. subscribers, who won't know how their service is deficient until they dial 9-1-1 and by then it may be too late.

And these technical issues don't even begin to address the potential economic impacts of VoIP services. As it stands today, no VoIP carrier is required to collect (or remit) 9-1-1 surcharges for or to any state, county or city. Some VoIP providers have said they will (and are) in voluntary compliance agreements with national 9-1-1 industry groups and individual jurisdictions. But others are certainly not, and it is virtually impossible for a jurisdiction to even know which VoIP providers are operating in their areas. It is important to understand that if, for example, 25% of all the phone lines in a given area were to be replaced by VoIP providers, it would mean that as much as 25% of that area's 9-1-1 surcharge revenue could vanish.

As indicated earlier, there are some promising technical developments from a few of the VoIP providers, but it is nowhere near a universal movement by all providers to come into compliance. Compliance will mean that they will have to spend money they are not otherwise spending.

**What's the technical solution?** It is not up to the public's 9-1-1 authorities to devise or even to mandate the technical specifics of how to solve this problem. But it is up to the 9-1-1 organizations to establish minimum requirements for what we'll call "**virtual 9-1-1 compliance**". At a minimum, this should mean:

1. The VoIP subscriber must be able to dial 9-1-1 from their device.
2. When 9-1-1 is dialed, the call should be routed to the PSAP appropriate for the location from which the call is being placed.
3. Should the VoIP user be a "nomad" (not where it was initially registered), there should be a transparent and automatic mechanism for the VoIP service to detect and appropriately react to this change in location,
4. The VoIP call needs to arrive at the PSAP over the normal incoming 9-1-1 call pathways and be able to be terminated and processed on the normal E9-1-1 telephone equipment.
5. When answered, the VoIP call needs to present the answering 9-1-1 operator with data essentially equivalent to that present in the ALI data with a wired 9-1-1 call or, at worst, with a wireless 9-1-1 Phase 2 call.

#### **What should the potential VoIP Consumer know and do?**

- Know what happens to your VoIP service if your power fails (lights go out). Regular and wireless phones still work when the power goes out. Will your VoIP device?
- Know if you can keep your "regular" phone number when you use your VoIP device or service.
- Know how your location information is sent (and if it is real-time) to 9-1-1 when you dial 9-1-1.
- Know how frequently location information is updated in the VoIP provider's 9-1-1 service plan.
- Know how frequently the accuracy of the info in your VoIP provider's 9-1-1 service is verified.
- Know what happens to your ability to dial 9-1-1 from your VoIP device if you move, or if you take your VoIP device away from your "registered" location.
- Contact your home security system provider.
- Know how to register your location information.
- Test you device and verify your location information by dialing 9-1-1. Report any problems to your VoIP service provider immediately.

#### **Conclusion: 9-1-1 Gets Caught Short Again:**

Since about 1984, the 9-1-1 profession has been waging arduous and not yet totally successful battle against a difficult problem, wireless 9-1-1. In these cases, the industry was somewhat caught by surprise. The 9-1-1 profession was an infant industry in 1983 when cell phones were introduced, and very naive. This naiveté resulted in failing to recognize and/or demand swift resolution to the potential scope of the "wireless 9-1-1 problem" until the problem had begun to overtake the profession, and jeopardize 9-1-1's ability to effectively answer and deal with the response to a 9-1-1 call.

It now appears that a similar, but perhaps even more difficult challenge has presented itself in the form of VoIP and 9-1-1. More difficult, because at least wireless 9-1-1 was subject to some regulation, in the form of the FCC who issued the all-important radio licenses to the wireless carriers, and could certainly command their attention (and has).

This issue is still playing itself out and will be for some time to come. In the interim, it is incumbent on the 9-1-1 community to do the best it can to keep the public apprised of the jeopardy faced by not only their emergency call when they dial 9-1-1, but the entire operational concept and infrastructure underpinning our nation's recognized emergency reporting infrastructure.