



VoIP – Which Flavor Do You Like ?

Part 1 – Baking the VoIP Cake

Have you ever walked by the corner bakery, looked in the window, and seen the multi-layered cake of your dreams? To many of our citizens, the cake of their dreams is sold not by their local bakery but by their local VoIP provider.

This Voice Over Internet Protocol (VoIP) cake is appealing to our potential 9-1-1 callers due to its inherent low cost and feature rich services. Where else can you get low cost local and long distance telephone service and maybe even free calls to Europe?

While the hardware that the VoIP customer uses may look almost like the traditional telephone that your mom and dad used ten years ago, VoIP providers are using Internet Protocol (IP) technology. Until recently, IP technology has been commercially limited to use by the public switched telephone network (PSTN) to connect their switching stations over private broadband networks. These switching stations convert voice signals to IP packets and then back to voice for delivery to the plain old telephone service (POTS) analog lines into your house.

Where the PSTN providers convert their digital signals to analog before delivery to your house, the VoIP service providers deliver their digital signals over the internet to your house, and the digital signals are converted to analog audio by your computer sound system or analog telephone adapter.

VoIP Service Providers (VSP) generally state that they are internet communication service providers and therefore not subject to the stringent requirements put forth by your state's public service commission telecommunication related tariffs. This position by the VoIP service providers initially set off alarm bells throughout the 9-1-1 public safety community beginning in 2004. The 9-1-1 community was concerned with such issues as:

- Call Routing
- Information Delivery (ANI/ALI)
- Information Reliability
- Cost Recovery

The first three concerns of the 9-1-1 community were to be soon addressed by the Federal Communications Commission (FCC). Following a lawsuit filed by the Attorney General of Texas in March of 2005 against a VoIP provider concerning a Houston incident in which a 17 year old girl was unable to dial 9-1-1 on her VoIP phone to report the shooting of her parents by an intruder, FCC adopted Order 05-116 on May 19, 2005, and released the following directives on June 3, 2005:

- Interconnected VoIP providers must deliver all 9-1-1 calls to the customer's local emergency operator. This must be a standard, rather than optional, feature of the service.
- Interconnected VoIP providers must provide emergency operators with the call back number and location information of their customers (i.e., E9-1-1) where the emergency operator is capable of receiving it. Although the customer must provide the location

information, the VoIP provider must provide the customer a means of updating this information, whether he or she is at home or away from home.

- By the effective date, interconnected VoIP providers must inform their customers, both new and existing, of the E9-1-1 capabilities and limitations of their service.
- The incumbent LECs are required to provide access to their E9-1-1 networks to any requesting telecommunications carrier. They must continue to provide access to trunks, selective routers, and E9-1-1 databases to competing carriers. The FCC will closely monitor this obligation.

Following this order from the FCC, the Association of Public Safety Communications Officials (APCO) and the National Emergency Number Association (NENA) has done much work in furnishing inputs to the FCC and Congress to further clarify the issues surrounding VoIP and to develop technical and operational guidelines for both the VoIP service providers (VSP) and the Public Safety Answering Points (PSAPs).

U.S. House of Representatives bill H.R. 3403, the 9-1-1 Modernization and Public Safety Act of 2007, addresses the same areas of concern as those addressed by FCC Order 05-116, and also would establish the rights of States and their political subdivisions to collect E9-1-1 fees as long as those fees are obligated or spent in support of 9-1-1 and do not exceed fees imposed on other telecommunication service providers. This bill was passed by the House of Representatives on November 13, 2007. The U.S. Senate is currently considering their version of the bill, IP-Enabled Voice Communications and Public Safety Act of 2007, S.428. Final passage and codification of these two bills will do much to remove the original concerns of the 9-1-1 community toward VoIP.

Part 2 – Choosing The VoIP Flavor of Your Choice

While the VoIP cake has instant appeal to the telecommunications consumer, those of us in the PSAPs, having observed the above mentioned baking process, are somewhat perplexed as to what flavor we want, or even if we want to partake at all. Some of us even have flash backs to that first taste of spinach that we had while holding our nose with one hand and eating with the other.

Just as our mother made us eat our spinach, there is one thing we can be sure of when it comes to VoIP 9-1-1 calls. Our PSAPs are going to be getting those calls, and eat we must. While we must partake, we do, however, have the ability to chose the flavor that we like the most. Three flavors are immediately available, and another is just around the corner.

“Vanilla VoIP”

Vanilla VoIP 9-1-1 calls are directed to the PSAP's 10 digit administrative number. In VoIP language, these calls are referred to as using the “I1 solution”. These calls may either be directed to the ten-digit number by a VoIP centralized call center, or the call may be routed by automatic switching equipment without human intervention.

The benefit of this VoIP flavor is that at least the caller has reached an emergency response agency, although it may not be the normal calltaker that answers the phone. This is certainly better than getting a recorded message as did the 17 year old girl in Houston, Texas.

A drawback to this type of VoIP call is that the call will not have any associated location (ALI) information. Basic call back information (number only) may be available to the person answering the phone if such is equipped with a caller ID feature. The normal ANI/ALI data will not be available and will have to be gathered by calltaker inquiries. In general, this routing is based on the 10-digit emergency number on file which is associated with the caller's reported address.

“Chocolate VoIP”

Chocolate VoIP 9-1-1 calls are directed to the PSAP via the Local Exchange Carrier's (LEC) Selective Router (SR). In general, this routing is based on the Emergency Service Number (ESN) associated with the geographic based Emergency Service Zone (ESZ) associated with the caller's telephone number.

This location may not be the actual location of the caller. The caller may be, for example, on vacation at a distant city and may have neglected to inform his/her VoIP provider of their new, temporary location.

The benefit of this VoIP flavor is that the call has arrived via the normal 9-1-1 system, with associated ANI/ALI information by the use of a single VoIP ESN for the area of coverage for the PSAP in question. Many VSPs call this “single ESN deployment”.

A drawback to this type of VoIP call is that PSAPs will not have the benefit of specified emergency response agencies inherent to an ESN number. Remember, there will be only one VoIP ESN in use by the PSAP, no matter how many sets of emergency response agencies are being dispatched.

Another drawback is that some VSPs may require the PSAP to furnish Geographic Information System (GIS) based “shape files” which outline the ESZ for the single VoIP ESN. Since many PSAPs do not have GIS capabilities, this requirement may be difficult to meet.

“Strawberry VoIP”

Strawberry VoIP 9-1-1 calls are also directed to the PSAP via the LEC's SR. This enhanced “flavor” of VoIP allows the routing of calls to a PSAP based on the same ESZ that apply to conventional landline (POTS) telephone calls. Many VSPs call this “multiple ESN deployment”.

As in the single ESN “chocolate flavored” the location shown in the ALI information field may not be the actual location of the caller. The call taker should be especially vigilant in confirming the caller's actual location whenever answering VoIP calls.

The benefit of this VoIP flavor is that the call has arrived via the normal 9-1-1 system, with associated ANI/ALI information for each ESZ served by the PSAP.

A drawback to this type of VoIP call is that some VSP's may require the PSAP to furnish Geographic Information System (GIS) based “shape files” which outline the Emergency Service Zone for the each landline ESN covered by the PSAP. Large PSAPs which dispatch several hundred sets of emergency responders will be required to maintain “shape files” which contain the same number of ESZ polygons.

“Mocha VoIP”

Mocha VoIP is not yet available on the grocer's shelf and delivery may be several years away. This flavor of VoIP is based on the concept of routing 9-1-1 calls to the PSAP without these calls being first sent to the traditional LEC's SR. This type of call routing would utilize a location-based routing protocol that would send an IP-based call to the appropriate PSAP.

This concept of Next Generation 9-1-1 is being developed by the joint efforts of APCO, NENA, private, public, and governmental entities. Next Generation 9-1-1 is sometimes defined as an IP-based replacement for E9-1-1 features and functions, supporting all sources of emergency access to the appropriate public safety agencies, operating on a managed, multi-purpose IP network.

For example, significant progress has been made by Texas A&M University, working as part of a team which includes Booz Allen Hamilton, L Robert Kimball Associates and the United States Department of Transportation. The end results of this development and proof of concept trials will be a system architecture and transition plan that considers responsibilities, costs, schedule, and benefits of deploying Next Generation 9-1-1. Stay tuned for the results of this effort.

If you like vanilla, chocolate or strawberry, the VoIP cake is ready right now. Just tell your VSP what type of VoIP calls your PSAP will accept. Those who like Mocha may have to wait for the baking process to finish.

Part 3 – Eating the VoIP Cake at the PSAP

The main challenge of handling VoIP calls of any flavor at the PSAP is that of location verification of the caller and the transfer of call related information to the appropriate agency even if that agency is located well outside the area normally served by the PSAP.

A recent example of the challenge facing PSAPs is a VoIP 9-1-1 call from a woman in South Korea whose call for help was received by a St. Clair County, Illinois dispatcher just before 5 a.m. one morning. The call came from the wife of an American military member reporting that she had been assaulted. The woman had moved from her home in St. Clair County to South Korea, but was still using her internet based VoIP phone service. This is a good example of nomadic VoIP service. One day you are in Illinois and the next day you are in South Korea.

In this case, the caller's address had not been updated in the VSP's database. The call was routed to the PSAP serving the last known location. If such a call arrived at your PSAP, would the call taker be able to get information to the appropriate authorities in South Korea?

Another challenge of handling VoIP calls is receiving ALI information that may not be Master Street Address Guide (MSAG) valid. In many cases, the account information provided by the VoIP customer may be based on a civic address. The calltaker may find it difficult to locate the caller without a MSAG valid address. Road names may be misspelled, shortened or placed in an incorrect community. Computer-Aided Dispatch (CAD) and mapping systems typically do not work well without MSAG valid addresses.

Now that you have become familiar with the VoIP cake, which flavor would you like? The answer to this question must be determined based on the PSAP's preference and capabilities. Once you decide which system works best for you, agreements should be signed with each VSP or third party call routing agencies such as Intrado, Inc. and TeleCommunication Systems Inc (TCS). Once agreements have been signed and test calls have been completed, you can expect calls to start arriving which may confuse the average call taker. Therefore, don't forget to develop guidelines and deliver employee training to utilize those guidelines or standard operating procedures. APCO's *Public Safety Telecommunicator 1*, 6th Edition, includes pertinent VoIP related topics and may be useful within your PSAP. This class is available through the APCO Institute. For more information about the course, visit <http://www.apcointl.org/institute/>.