

Voice over IP (VoIP) White Paper

A Public Safety Perspective

March 24, 2003

Overview of VoIP Technology

Voice over IP, commonly abbreviated VoIP, refers to the transmission of voice conversations over a data network.

The “IP” represents the Internet Protocol (as in TCP/IP), a protocol that facilitates data communications over a variety of networks including the internet. VoIP digitizes voice audio, sends it in the form of data packets over an IP network, then converts the data back into audible voice at the receiving end.

While VoIP has many applications, the following are of particular interest to the Public Safety environment:

1- Placing phone calls over the public Internet

In this application, an IP device converts voice audio to digital packets and sends them via the public Internet to another IP enabled phone, computer or even a gateway to the public telephone network (which allows the IP phone users to converse with regular landline phone users).

This application affects Public Safety by its lack of a mechanism to ensure that:

- 9-1-1 calls dialed on these IP devices are routed to the appropriate PSAP
- Location information is provided to that PSAP

It is likely that the 9-1-1 call (if processed at all) would be routed based on the location of the gateway that connects the IP and Telephone networks. This gateway could very well be a thousand miles away, and if the call were to reach any PSAP, it would not have an associated ALI delivered.

The remainder of this white paper focuses solely on the following application.

2 - Routing voice communications over a privately managed network

In this application, VoIP technology carries voice conversations over privately managed network(s). The emphasis on “private” and “managed” is important, due to the reliability requirements of emergency communications – the communication network is “managed” to ensure that data packets containing voice communications are given priority over other data transmissions. Quality of Service (or “QoS”) is a measure of the assured reliability of data communications.

This need for guaranteed Quality of Service is one of the reasons the public Internet is unsuited to emergency communications.

The following section examines some of the ways VoIP can benefit Public Safety, while considering the readiness of existing infrastructure to accommodate the technology.

Public Safety Applications for VoIP

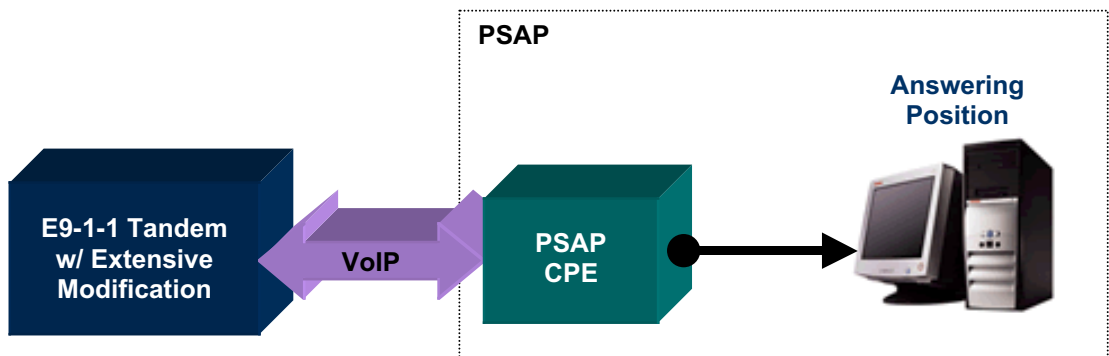
VoIP as a replacement for E9-1-1 Trunks

Idealistic View – VoIP could replace E9-1-1 CAMA Trunks, providing delivery of voice as well as ALI (and possibly other supplemental information). This would reduce the number of links coming into the PSAP, eliminate a process that waits for a call to reach a PSAP before ALI request, reduce the call delivery time and possibly increase the amount of supplemental information delivered to the PSAP.

Reality – Public Safety Telecom has a significant investment in its present infrastructure, which has a proven record of accomplishment of features and capabilities. While the promise of VoIP is attractive, its implementation would require widespread and instant change to an infrastructure that supports VoIP.

The change to VoIP represents a significant investment by the telephone companies and PSAPs. The issue of whether this investment is justified in terms of the value returned and the lack of a cost recovery mechanism is unclear.

Additionally, the change to VoIP must not diminish, and should add to, the capabilities and service level offered by the existing infrastructure. At present, there are several significant technical challenges whose solution is unclear, such as call supervision and retention of calling party number between transfers.



Public Safety Applications for VoIP (continued)

VoIP as a link between the Backroom CPE and a Local Answering Position

Idealistic View – VoIP could replace the link between a PSAP's Backroom CPE and a local Answering Position. This would allow the use of a single CAT5 network cable between the backroom equipment and each answering position and use VoIP for voice and data delivery.

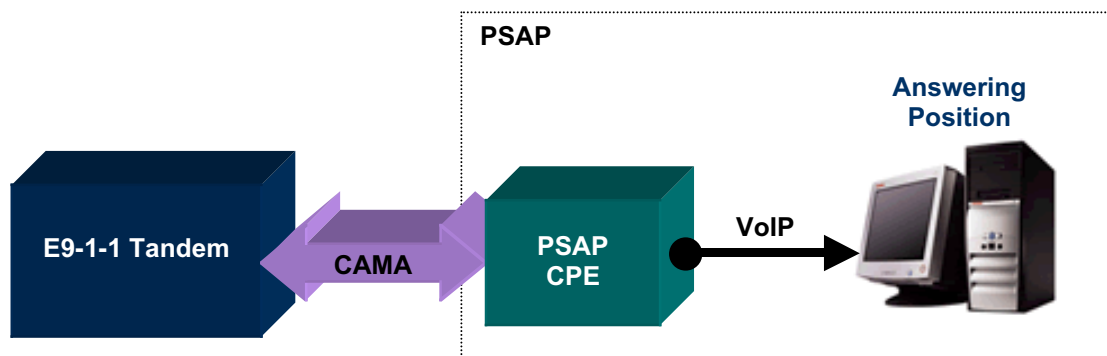
Reality – This application of VoIP is a simple one, with a simple benefit – mainly that of having a single cable between the answering position and the backroom instead of two. As there is no significant operational or end-user benefit, however, the value of this application is limited.

There are serious considerations with this application. The primary one is ensuring that existing services/functionality that the PSAP is accustomed to does not diminish. These include, but are not limited to TTY/TDD communication, ring down circuits, radio integration, etc.

The secondary consideration is the sharing of a common transmission media, the LAN, between 9-1-1 voice and other applications. It is unclear how the voice and control of the call is unaffected on the same LAN that MIS reports and other non-mission critical activities are occurring.

Additionally, if the LAN is open to external sources, this represents a point of vulnerability to viruses and hackers, who would be capable of interfering with 9-1-1 calls.

A final consideration is redundancy. If a PSAP wants to have a redundant system, they need to add more equipment and cables, effectively removing the one benefit this application now provides.

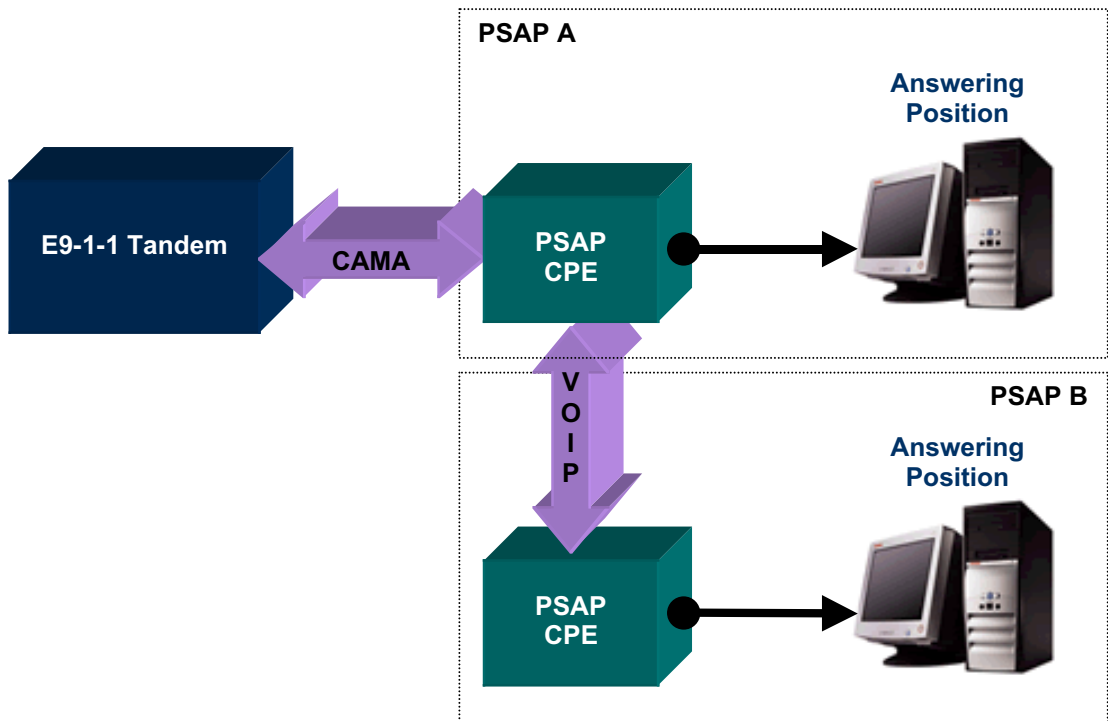


Public Safety Applications for VoIP (continued)

VoIP as a link between PSAPs

Idealistic View – VoIP could be used as a link between PSAPs, and provide near-instantaneous transmission of both Voice and Data over a single data connection. This would be more cost efficient and provide better performance for PSAPs that are functioning as one consolidated PSAP.

Reality – This application of VoIP is viable today. The consolidation of voice and data provides costs savings between the PSAPs in reusing centrally located E9-1-1 specialized equipment. It increases the richness of information than be exchanged between the PSAP that answered the call and the PSAP that received the transfer. Examples include location information, incident information, questions and answers gathered so far.



Conclusion

Voice over IP has limited applications for Public Safety that are viable today.

For the Public Safety environment, the logical path forward is the implementation of Voice over IP initially for those functions that provide an immediate advantage within the current infrastructure. Gradual evolution of the infrastructure will over time allow phase-in of additional applications of VoIP connectivity where warranted by the value provided.