

Technology Corner: Voice Over Data...The Next Challenge for 9-1-1

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On July 20, Reuters News Service reported that phone company Frontier Corporation announced that its communications unit and Lucent Technologies, Inc., would design and build an Internet Protocol telephone network. Frontier said in the reported statement that their IP network was expected to carry all of Frontier's voice traffic by 2002. Other significant announcements have been made by AT&T, Cisco, and Lucent that point to a voice over data network in the near future. How will this effect 9-1-1? Will we be left holding the back again as new telephony technology in this century passed us by and did not make provisions for 9-1-1?

As we move into the next millennium, it is time to consider just what a future Public Safety Management Network (PSMN) might look like. New network technology will be based on broadband media, be it high cap twisted pair, coaxial cable, fiber optic, wireless, or terrestrial. With broadband comes bandwidth, and there's a lot we can do with bandwidth, such as transport and react to large amounts of voice and data. By utilizing the capabilities of DSL, Frame Relay, and ATM type technologies, a network of networks could serve all the needs of Public Safety. A Public Safety Network built on nodes of Voice/Data Network Servers and Routers will be capable of sharing information worldwide.

The nature of telecommunications is changing at an alarming rate. Broadband is overtaking homes and businesses throughout the nation. On a single piece of wire, combined services of internet connectivity, audio/video entertainment, and telephone service are all delivered to the home in the form of digitized data. Electronic commerce is driving a new market based on the public's desire to be online, and the request for new IP addresses is doubling each month. All of the major Call Center ACD/CTI equipment manufactures are deploying, or in the process of deploying commercial Call Center ACD's capable of processing request from email, internet, facsimile, and voice. Commercial Call Centers use CTI applications to marry telephony to information data, thereby providing additional levels of call processing, and skill-based routing. On-site ACD/CTI applications are used to determine call routing decisions, link to additional databases, and back room systems to better serve the public.

The PSAP of the future will have to take advantage of these technologies to keep up with the public's demand for advanced communications networks. Most PSAP equipment manufactures are not far from providing an interface for a voice over data network. If your PSAP is a PC LAN based answering point, there may be off-the-shelf technology out there today capable of getting you online and providing voice over IP.

A voice over data PSMN would allow for advances in call routing and information dissemination not heard of today. Today, calls originating from an end office can either be delivered to the PSAP as it is today, or sent via a voice over IP network gateway to a dedicated PSMN data

network. The advantage of the latter is, once on the PSMN, a packet of ANI information can be used to trigger routing decision, poll other databases, and select a skilled base agent before even being offered to the PSAP. The ANI could be looked up in the conventional manner, but in an expanded role the DBMS could translate the ANI into more than the current ALI message.

Additional hooks added to the ALI packet, such as location in a GIS format, could be shared with other databases on the PSMN voice/data network. The hooks offered to the rest of the network could determine how to initially route the call, determine which agencies need to be involved, and what additional information is available based on past history of the location or calling party. Once the call is offered to the PSAP via its own PSMN voice over data interface, the 9-1-1 caller is connected, and the ALI is delivered to the PSAP workstation along with additional information in the form of URL links to other pertinent database servers. A voice data network allows for initial voice call along with all additional information to be transferred to the next agency.

A voice over data network would not be limited to call routing based on the caller's ANI or ESCO. As the world of telecommunications changes, routing by phone number will become an impossible undertaking, because not all communications devices will have an associated phone number. A move to call routing via imbedded caller location information, may be the next logical step.

In cases of Wireless Phase II, PS-ALI, Non-POTS Wireline (broad band cable), Internet phones, Automatic Crash Notification, Local Number Portability, Geographical Number Portability, Personal Security Devices, TTY, and such, there is no reason location information as well as a call back number or device address, could not be pushed with the call as suggested previously (please see NENA News "*Virtual MSAG...ALI on-the-fly*", published March 1996). Given that a major part of any 9-1-1 system implementation is mapping, should we still be looking up phone numbers to determine a location, and select a route choice to the appropriate PSAP? This will certainly not work for wireless telephones.

Geographical position of emergency services requester to geographical emergency service provider would allow for point-to-point service regardless of the calling parties telephone number, IP address, or any other method of Communication Device Identifier. Spatial orientation may become the standard method of determine the proper route choice, and serving agencies in the future. Ask your Mapping or CAD vendor what they can do with a map location for dissemination of information and dispatching. Then ask them what they can do with that same information if shared on a data driven Wide Area Network, with access to fleet AVL and MDT equipment.

With a Virtual Public Safety Answering Position (VPSAP), do we really need to be tied to one physical location? One of the many capabilities of voice over data networks will be the ability to dial into an IP server, and have all the capabilities, and functionality of a position regardless of your physical location. The PSAP could be configured as needed to add or remove staffing based on demand, using home agents. In the case of evacuation, a center could be abandoned, and adjacent centers configured by login to accept, and dispatch calls for the abandon center.

With advancements in trunked radio, voice and data RF, and NT radio controllers, even radio dispatching over a voice over data network is feasible.

As we move into the future, the role of the PSAP will be expanded beyond 9-1-1 call taking, and dispatching. We are already seeing demand for 3-1-1 which leads into even more requirements for real-time data, interagency departmental interface, and dispatching of services. In cases of major disaster the PSAP may even take on the role of the EOC (Emergency Operations Center) and become an integral part of FEMA's ICS (Incident Command System) philosophy. Voice over data networks allow for the resources needed to properly manage, and dispatch resources through out the network regardless of size.

These types of networks are in use today by banking, securities, insurance, health, and other high volume, real-time, data driven business. State lottery systems often are tied to a frame relay, or ATM data network to keep track of real-time point of sale information. These types of networks are scalable, so if a state lottery system were to share some bandwidth, every PSAP in the state could realistically be tied together in a common network. The common network would be a virtual, switchable, and configurable, integrated voice over data network. PSAP's could share resources through out the state, or jump off to a national level, sharing resources of other states and federal agencies. The Federal Government is deploying a network in the form of the Intelligent Transportation System, along major highways adding additional useable infrastructure. Today's developers of advanced communications and data networks have recognized the advantages of open architecture, and the need to tie together a number of voice and data applications. The industry leaders are in the process of developing middleware, software development tool kits, and servers for just this reason.

As an industry representative, NENA is working to ensure that future concerns of Emergency Services and 9-1-1 are considered as the communications architecture for the next millennium is developed.

The author wishes to thank Rick Tomalewicz, a 9-1-1 Systems Specialist with Rockwell EC, for contributions to this article. Rick has 25 years in telecommunications and data systems with 15 years in 9-1-1. Rick was a member of the Rockwell Space Systems Division Advanced Projects Strike Force which was formed to develop a migration of Department of Defense technology into the commercial market, and worked with FICC (Federal Interagency Communications Consortium) to advance technologies for emergency services during natural disaster, wide area resource sharing, advance notification and detection, and post disaster recovery.