WHITE PAPER: The Changing Face of 9-1-1

By: Tim Kenyon, ENP (Emergency Number Professional)

While the history of 9-1-1 in the United States spans nearly half a century, there has been relatively little change in some of its primary constructs. On February 16, 1969, in the small Alabama town of Haleyville, the Alabama Telephone Company proved that they could implement a direct-dial solution that would allow the public to dial the digits 9-1-1 and reach public-safety.

The technology in play with 9-1-1 is simple routing; routing to a specific endpoint based on the originating devices telephone number (TN), regardless of which origination point made the call. Looking under the covers, this was nothing more than a dial-plan change. Commonplace today, but in the late 60's this was a new concept that amazed the public.

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With multiple public-safety agencies in existence, and a single ubiquitous number (9-1-1) being used to reach emergency services, the concept of "selective routing" needed to be developed and introduced. Selective routers selectively route calls to 9-1-1 based on their origination point in the network. This was a complete reversal of the routing logic where previously the dialed number determined the destination. This logic change allowed for the universal use of the digits "9-1-1" across the entire network. It did not matter where a person was, the network would understand that, then route the call appropriately.

In the 80's, the next major addition to the 9-1-1 networks in the U.S. was automatic number identification, or ANI. ANI provided the originating telephone number of the call to the public-safety dispatcher, based on billing data, and was valuable information on how the originating party could be reached in the event the line was disconnected. It was shortly after ANI was added that the automatic location information or ALI was made available to public-

safety. ALI would provide a street address where the service was located, based on telephone company Service Order Input, (SOI) records. Finally, nearly two decades after 9-1-1 was first implemented, public-safety officials were aware of the caller's physical location, entirely based on the telephone company's billing records and databases.

The ANI/ALI databases served their purpose; telephone endpoints typically had their locations fixed in specific addresses, and the nation was just starting to witness the emergence of cellular telephones and user mobility. It was during this time that Phase 1 & 2 cellular reporting was developed and perfected to accommodate location reporting for users experiencing this new concept of 'mobility', however enterprise businesses still had not yet discovered Voice over IP (VoIP), and the nomadic user revolution that this new technology was about to allow.

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It is at this point where location determination technology stayed on the straight-and-narrow path when it should have made an abrupt right turn. Rather than looking at the issues with a fresh set of eyes, 9-1-1 service providers reached back and tried to reuse solutions that were developed to solve the cellular mobility challenge, adapting them for the enterprise location problem, which was an entirely different use case.

Clearly, IT administrators were stuck in a rut. Very few, if any, understood the emergency services telephone network contained within the public switched telephone network (PSTN). Many people believed then, and still do, that originating devices transmit location information; they have no idea of the archaic databases and queries that must occur to associate a calling line ID, or ANI, with an appropriate ALI record or location. There simply had to be a better way.

In 2011, at the Illinois Institute of Technology, I saw Mark Fletcher from Avaya present his bold new concept of "Next Generation 9-1-1 Over the Top of the Legacy Network". What was unique here was that his proposed architecture did not use the ANI or ALI databases. Instead, in his design, he relied on the existence of a web uniform resource

locator (URL), or uniform resource identifier (URI), in the originating network demilitarized zone (DMZ). This URL or URI could be physically encoded in the legacy ALI record, and then associated with a single ANI, or group of ANI's for a given building.

Should anyone in that building place an emergency call, the public-safety answering point (PSAP) would simply retrieve the additional data from the static URI or URL, obtaining whatever pertinent information was parked there against that particular incident.

Examples of data that could be offered to public safety in that enterprise functional element are things like floor plans, proxies to video feeds, environmental statistics, or any relevant information the commercial enterprise felt was useful to public-safety. The beauty behind this design was that it allowed IT administrators within the enterprise to become NG9-1-1 compliant and ready immediately before the local PSTN network; and when NG9-1-1 services became available in any particular region, the URL/URI information could be placed in the session initiation protocol (SIP) header and sent by a presence information data format location object (PIDF-LO), as per the existing National Emergency Number Association (NENA) 08 – 003 NG9-1-1 functional specification.

In the audience at this meeting was Henning Schulzrinne, a noted Columbia University Professor, and recently appointed Chief Technology Officer at the Federal Communications Commission (FCC). Considered by many as the 'Father of SIP', Schulzrinne was intrigued by Fletcher's bold new concept for NG9-1-1 service delivery. He asked Fletcher if this was just a concept or reality, and Fletcher proudly responded that this was in fact developed, and in the final testing phases as delivered by Conveyant Systems, Inc. for the Avaya call server platforms. Subsequently, Fletcher and Conveyant President Tim Kenyon, were invited to Washington DC, where these concepts were presented, along with other industry leaders, to a packed audience at an FCC Indoor Location Accuracy Workshop held at the FCC headquarters.

The proposed solution received the accolades of the entire audience, as this new concept for delivering rich, multi-media information to public safety was revealed.

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For those keeping score at home, this is what changed the game significantly for enterprise IT administrators. In the past, legacy providers for enterprise location management would charge considerable amounts of money to manage the location of endpoints around the network. Each endpoint had an individual ANI/ALI record that would require additional monthly maintenance fees, making the overall operating expense (OPEX) a potentially expensive proposition.

The new model, on the other hand, uses information already in the enterprise corporate network, correlates that information with data about the emergent event, then presents that information to the people who need it. Quite simply, that is first responders within the building.

Do public-safety first responders need this information? Not likely, because their job is to respond to the correct building, ideally at the proper entrance. Once they get there, they need to be met by local, on-site response teams that are well aware of their presence, and ready to guide them to directly where the emergency is. The fact that the user is in office 2C-231, or cubicle 5D-394 is irrelevant to the police car, fire truck, or ambulance responding to the building. When they arrive on scene is when that information becomes important.

Being able to provide that level of detail in advance of arrival increases the cost of the solution tenfold, leaving one to wonder if precious IT funds are being allocated on viable endeavors.

Tim Kenyon, ENP is the President and CEO of Conveyant Systems, Inc., and a member of the National Emergency Number Association. The Conveyant SENTRY™ Emergency Location Management solution is part of the Avaya Select Product Program and provides on-site situational awareness and endpoint location correlation information to enterprise networks eliminating the need for complex and costly ANI/ALI based solutions provided by the ILEC..