Minnesota

Department of Public Safety

Emergency Communication Networks

Next Generation 9-1-1 Strategic Plan

04/19/2017

DOCUMENT CHANGE HISTORY

Version	Publication Date	Description of Change
Draft 1	07/27/2011	Internal review
Final Plan	04/19/2017	Approved by SECB NG911 Committee
Plan Progress Report	04/19/2017	Approved by SECB NG911 Committee
Amendment 1	04/19/2017	Approved by SECB NG911 Committee
Amendment 2	04/19/2017	Approved by SECB NG911 Committee

Executive Summary

Recent reviews by the National Emergency Number Association (NENA), the United States Department of Transportation (USDOT) and the Federal Communications Commission (FCC) formalized a reality which those working closely with the 911 environment (technology, governance, funding, legislation, etc.) already knew; change is required to meet current and future requirements for those requesting- as well as those providing, emergency services. The new environment is referred to as Next Generation 911 (NG9-1-1).

Call patterns have shifted over the years and currently the majority of calls to 911 are from wireless devices (estimated in the range to 70% – 75% of calls). This presented a challenge to 9-1-1 call location processes which resulted in the Wireless Phase 1 and Wireless Phase 2 programs to improve the accuracy of wireless call location information. This was purely a technical challenge. The advent of new communication capabilities such as texting, still photo and video challenges the entire 9-1-1 environment.

The industry is early in the definition of new technology standards, as well as developing positions with regard to funding, collection and remittance regulations (i.e. administration). Technical standards are emerging which provide a starting point for vendors to begin developing systems. There is no doubt that these standards will evolve and system changes will be required and that vendors will rise to the task and keep their products current. The industry has also produced discussion and directional documents covering administrative changes necessary to support NG9-1-1 service. A more daunting task than development of the technology is the development of new legislation to affect administrative changes, given that the "9-1-1 community" is a part of a much larger "telecommunications industry and governmental body" with multiple federal, state and local governing entities. It is a time where the path to the end is not crystal clear; however, it is a time when strategies must be developed to meet the new challenge.

The Minnesota Emergency Communication Networks partnered with local authorities via the 9-1-1 Advisory Committee to develop a strategic plan to establish the framework for initiating and guiding projects to implement the Minnesota 9-1-1 community's vision as it relates to the challenge. The strategy employs a phased approach in which one phase builds on the previous. The current framework is divided into four phases.

Phase 1 – Call Transfer Interoperability

This phase addresses the need to transfer calls between any of the current Public Safety Answering Points (PSAP) in the state with the data required to accurately identify the location of the caller. The phase successfully completed in September 2010.

Phase 2 – IP Connectivity Proof of Concept / Legislation, Governance and Funding Review

Phase 2 is designed to provide Internet Protocol (IP) connectivity within the 9-1-1 network. This proof of concept involves a limited number of PSAPs to reduce risk. IP connectivity is a fundamental requirement of the NG911 technical infrastructure.

Phase 2 also provides recommendations for revising existing statutes and rules to reflect the NG9-1-1 administrative environment as we know it today. The recommendations provide for aligning the current legislative documents with known changes.

This phase is scheduled to complete in the fourth quarter 2011.

Phase 3 – IP Connectivity Full Implementation

Following the successful completion of the proof of concept in Phase 2, IP connectivity will be rolled out to all PSAPs in the state. This positions the Minnesota 9-1-1 system for the commencement of the NG migration. Phase 3's completion date is July 2013.

Phase 4 – i3 Implementation

With the IP connectivity in place the migration to the NG9-1-1 technology can begin. The functions of this technology are often referred to as "i3 functions" following NENA's designation. In the end state, these functions will deliver the vision of ubiquitous connection to emergency services from all communications devices with advanced data presented to emergency service professionals which support their duties. Recognizing that NG9-1-1 is a transition and not an event, a plan will be developed which takes advantage of the then current capabilities and addresses issues facing the Minnesota 9-1-1 community.

This planning effort was undertaken with the full knowledge that in this nascent stage of NG there will be changes which affect the strategic plan. A commitment to the review and revision of the plan is being made so that the state remains on track to a successful implementation of NG9-1-1.

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Introduction

The public safety community has recognized the need to evolve legacy emergency services networks to next generation concepts which may facilitate new capabilities and services. As such, there are numerous industry associations and Standard Development Organizations (SDOs) defining architectures and protocols for next generation networks. The public safety community desires to take advantage of this work and address the challenge it represents to emergency communications. To this end, work is progressing in other NENA committees to define the specific emergency services architectures and protocols involved. The transition of emergency services addressed by this document relies upon this collective work.

Transition to NG9-1-1 is expected to be an evolutionary process, involving technological, operational, economic, and institutional change. In some cases, the path to NG9-1-1 implementation will depend on the underlying infrastructure of the Public Safety Answering Points (PSAP) and 9-1-1 Authorities involved. The NG9-1-1 environment may differ considerably from the current 9-1-1 environment.

According to the National Emergency Number Association (NENA) NG9-1-1 is:
"...an IP based replacement for E9-1-1 features and functions that supports all sources of emergency access to the appropriate PSAPs, operates on reliable, secure, managed multi-purpose IP networks, and provides expanded multimedia data capabilities for PSAPs and other emergency responders…."

Calls to 9-1-1 have been migrating for some time from being predominantly wire-line to wireless. The Wireless Association®, formerly known as the CTIA, reports that as of December 2010, there were 302.9 million wireless connections in the US. This equals approximately 96% of the population. As well, the CTIA also reports that about 26.6% of households are wireless only. The industry had to adjust, and wireless Phase 1 and Phase 2 programs were implemented to improve location information associated with wireless calls.

End user devices have changed as well. The devices are much more sophisticated and support a significant number of data services such as text messaging, gaming, streaming video and the downloading and transferring of pictures. According to a study conducted by the CTIA, US wireless consumers used more than 2.2 trillion minutes during the 12 months ending December 2010 (or just over 6.3 billion minutes per day) and more than 2.1 trillion text messages were sent and received (or 5.75 billion text messages per day). There were in excess of 296,000 wireless 9-1-1 calls placed every day in the US.

This increasing dependence on new communications technology is changing the consumers' expectations of how they communicate with 9-1-1. The newer

expectation within our communities is that they will be able to reach 9-1-1 using the capabilities of their devices which they use in everyday communications.

The current 9--11 system in Minnesota is based on a traditional Public Switched Telephone Network (PSTN). There are two 9-1-1 service providers: Qwest Communications and Independent Emergency Services LLC (IES).

Qwest (recently acquired by CenturyLink) is the incumbent local exchange carrier (ILEC) in the state, while IES is a company formed by seven independent telephone companies located in central Minnesota. Both Qwest and IES provide E9-1-1 network facilities, PSAP customer premises equipment (CPE) and ALI database services on a competitive basis.

Qwest and IES support a statewide analog network that provides access to 9-1-1. Both companies collect wireline and wireless surcharge fees and remit those fees to the state. The state, in turn, distributes surcharge funds to PSAPs using a legislated formula-calculation system that attempts to distribute surcharge funding equally across the state.

Funds from the enhanced 9-1-1 service fee are sent monthly to the qualifying cities, counties, and other governmental entities operating 9-1-1 centers. Distribution is on a modified pro rata basis, with half the amount divided equally among the 87 counties (and included cities) and 13 other governmental entities, and the other half divided only among counties and cities on the basis of percentage of population.

Although extremely reliable, the current networks will not keep up with advancing technology and will therefore be unable to guarantee access to 9-1-1 services to emerging communication devices. Currently, the network it is not capable of processing data, such as text messaging, pictures or video.

In short, the Minnesota E9-1-1 networks and infrastructure must begin the transition to a modern IP-based network capable of meeting future public safety needs in the state as soon as possible.

Purpose

The purpose of this document is to communicate the vision of the Minnesota NG9-1-1 System to stakeholders so that they may be actively engaged in its development and deployment. The Minnesota NG9-1-1 Strategic Plan presents a Minnesota perspective of the system functionality, management, operations, security and governance required to meet current and future user expectations.

Background

The first 9-1-1 systems in Minnesota were implemented in the cities of Windom and St. James in 1968. Today, every city and county provides E9-1-1 services. This accomplishment involved the passage of legislation, the establishment of a 9-1-1

funding mechanism, and State assistance to the cities and counties for the purpose of providing public safety services for the citizens of Minnesota.

Statewide 9--11 coverage is provided by 87 county systems. All counties are served by selective router-based enhanced 9-1-1 systems with Automatic Number Identification (ANI), and an automatically updated off-premises database, Automatic Location Identification (ALI). The selective router-based enhanced 9-1-1 systems are operated by IES and Qwest Communications.

There are seven IES selective routers, serving 60 counties, and five Qwest selective routers serving 27 counties. Having two competing 9-1-1 service providers presents challenges of interoperability among counties served by different 9-1-1 networks and databases.

As the cities and counties evolved from basic 9-1-1 to E9-1-1, the networks evolved with limited commonality or standardization. This is also true with regard to the equipment being used on the networks and at the local PSAPs.

Minnesota's E9-1-1 system has served its citizens well, but is based on older technologies and capabilities of the past. The Minnesota Department of Public Safety (DPS), in collaboration with the 9-1-1 Advisory Committee, recognized the need to begin the transition to NG9-1-1 technology, governance and funding environments and began with creating a vision.

Overall Vision

The Minnesota DPS, in a continuing effort to provide assistance to counties in the state of Minnesota, recognized the need for a statewide, fully-redundant, fail safe, IP-enabled, state-of-the-art 9-1-1 system for providing 9-1-1 services to the citizens of the State, hereafter referred to as the MN NG9-1-1 system. This vision is in alignment with that held by the NENA, as well as the USDOT. Technology will be built using open standards systems and next generation IP-based networks.

NENA envisions an IP-based inter-network (network of networks) shared by all agencies which may be involved in any type of emergency response. In this vision, multiple local networks (e.g. counties) may be interconnected to form regional networks, which in turn may be interconnected to form a statewide network. The ultimate NENA/USDOT vision is that state networks are interconnected such that calls may be received from any communication device and any agency or responder, regardless of location, can participate in the delivery of emergency services as requested by users of the system.

To advance a nationwide vision of an IP-based 9-1-1 system, the USDOT assisted in the research and development needed to bring about a more capable IP-based solution design. The overarching goal was to produce a system that supports all types of emergency call delivery and maximizes service responses across a diverse

stakeholder community, such as those in Minnesota. The USDOT participation in the NG9-1-1 vision and plan development resulted in several items of reference that included the USDOT NG9-1-1 Transition Plan version 1.0, February 2, 2009, as well as the NENA NG9-1-1 Transition Plan Considerations Information Document (NENA 77-501), Version 1, February 24, 2011.

The path to NG9-1-1 implementation in Minnesota strongly depends on the underlying infrastructure involved and the characteristics of the PSAPs and 9-1-1 authorities in a defined geographic area. At the same time, it is also true that Minnesota's transition to NG9-1-1 will depend on the ability of service networks to deliver NG9--11 content and calls via native IP-based infrastructure to jurisdictions that are prepared to receive it.

In this document, we are adopting the following broad definitions of Next Generation:

- "NG" refers to the technology, process and legislative environments required to deliver the vision.
- "i3" is the set of functional components of hardware and software which deliver the database, validation, routing and policy to connect those seeking service with agencies that provide the service.
- "ESInet" is the IP network transport which interconnects i3 components.

Minnesota will implement the MN NG9-1-1 system based on the set of evolving NENA standards. There is much discussion in the industry during this early stage of developing the standards, but the State cannot stand still and wait; it must move forward on a well-planned journey. It is anticipated that change will occur for some time so decisions made now must address a path to remaining compliant. Given NG9-1-1 is a transition not an event, and to mitigate the effects of change, the State is employing a phased approach.

A Phased Approach to the Vision

In recognition that NG is a multi-faceted evolution and not a flash cut to a new technology, a *phased approach* is being adopted. The NG9-1-1 vision not only includes technology change, it may also require changes to legislation, governance, funding and PSAP processes.

Four phases have been identified as follow:

Phase 1 – Call Transfer Interoperability

> Phase 1 provides the capability for all primary and secondary PSAPs in Minnesota to transfer a 9-1-1 call to any other primary or secondary PSAP within the state, along with ANI and ALI regardless of the 9-1-1 service provider.

This addresses one of the largest problems PSAPs are facing in Minnesota, as well as all over the country. With the reality that wireless calls are the predominant type handled in PSAP, as documented earlier in this plan, and the inherent issues with determining the location of the caller, transfers are critical to ensure the correct PSAP handles the call. Phase 1has successfully addressed this issue.

Phase I was completed on September 28, 2010 and is a resounding success for Minnesota PSAPs. As of June 2011, statistics show 75 of the 116 PSAPs have taken advantage of the improved transfer capabilities since the launch. Calls transferred to the Qwest-served State Patrol PSAPs from IES-served PSAPs account for approximately 69% of the call transfer volume.

Transfers may be performed from all 116 primary and secondary PSAPs in the state to any other PSAP in the state, regardless of who the 9-1-1 service provider may be. This sets the stage for the next phase, implementing IP connectivity and preparing for other changes required to implement NG9-1-1.

Phase 2 – IP Connectivity Proof of Concept / Legislation, Governance and Funding Review

In Minnesota planning and design is underway for the IP network which will interconnect the 116 PSAPs, 12 Selective Routers and two redundant ALI databases. A robust Multiprotocol Label Switching (MPLS) architecture will be implemented to ensure the performance and security required of this mission critical transport network. Once proven, the full roll out of the network will be completed in Phase 3.

Phase 2 also includes a review of state rules and statutes to identify changes required in support of the NG environment.

Technology

In the NG architecture, it is required that all elements of technology are connected via an IP network. The new capabilities which are part of the NG9-1-1 vision require transport of data (e.g. texting, video, etc.); the voice grade circuits used in the current state networks are not capable of meeting this requirement. However, once again it is prudent to ensure a smooth transition via a phased approach.

The goal in Phase 2 is to provide IP connectivity to a limited number of PSAPs on each provider's network that will eventually lead to the replacement of the emergency message (EM) trunks and ALI circuits. This phase establishes the foundational IP network known as the ESInet in the NG9-1-1 architecture.

Gateways are to be installed at each access point (e.g. PSAP, selective router, ALI

provider) to provide legacy interworking since at this stage existing routing and database system which cannot interface with the IP network remain in place.

It is anticipated that this proof of concept phase will complete in the fourth quarter of 2011.

Legislation, Governance and Funding Review

In addition to the IP network proof of concept, an effort to address the non-technical components of the NG transition in this phase include a thorough review of existing state statutes and rules applicable to telecommunications, 9-1-1, and cost recovery. The intent is to identify outdated language and recommend it for removal or revision through the state's legislative and/or regulatory process.

This activity follows recommendations documented in NENA Next Generation 9-1-1, Transition Policy Implementation Handbook, A Guide for Identifying and Implementing Policies to Enable NG9-1-1, March 2010. This handbook states:

"It is important to note that most policy and governance issues should not be addressed by individual Public Safety Answering Points (PSAPs) or even individual 9‑1‑1 Authorities. Given the interconnected nature of NG9‑1‑1 systems, it is important for all 9‑1‑1 Authorities in a region or state, along with other related emergency response and government stakeholders, to jointly address policy and governance issues in a coordinated manner."

This collaboration of "all 9-1-1 Authorities" will continue to be accomplished by close working of the NG911 Advisory Committee and ECN staff.

Governance

The NG9-1-1 vision potentially impacts responsibility for systems, but not the responsibility for delivery of emergency services. Governance issues and methodologies must mature as NG9-1-1 standards, systems, and stakeholder experience mature. Minnesota's vision is supported by state level network & systems. Though regional and state networks are being considered and current statutes provide for their existence, the strategic direction responsibility for emergency service delivery remains at the local level.

Funding & Costs

Funding and cost distribution models will be researched using the NENA funding model report[1] as a guide. There is one funding mechanism in the state of Minnesota, and that consists of 9-1-1 surcharge fees on fixed landline phones

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[1] Funding 911 Into the Next Generation: An Overview of NG911 Funding Model Options for Consideration March 2007

and wireless (cellular) phones. The current funding distribution model will not be changed; however, the existing service fee legislation will need modification to ensure that it reflects today's funding realities. As well, legislation is in process to address point of sale pre-paid wireless, and "pay as you go" wireless devices. This point of sale approach captures devices not under the umbrella of the traditional emergency telecommunications surcharge service fee. It consists of a point of sale transaction fee assessed for pre-paid wireless as well as pay as you go phones. In addition, the definition of 9-1-1 service must be expanded to cover all appropriate "providers" such as VoIP and other non-traditional purveyors of 9-1-1 capable telecommunications devices. In other words, specific requirements must be developed for service providers delivering calls via non-traditional transport arrangements to accurately identify line equivalents (e.g. Vonage, Comcast, Magic Jack, etc.)

It is anticipated that this review will be completed in the third quarter of 2011.

Phase 3 – IP Connectivity Full Implementation

Phase 3 is the last of the two-step process, implementing the full roll out of the network.

Full implementation of the network in Phase 3 will be undertaken once the Phase 2 proof of concept is successfully completed.

In this phase the remaining PSAPs are migrated to the IP network. At this point the transport infrastructure is in place to support NG9-1-1 routing and database systems.

Figure 1 shows the MN NG9-1-1 IP network concept as it will exist post-Phase 3.
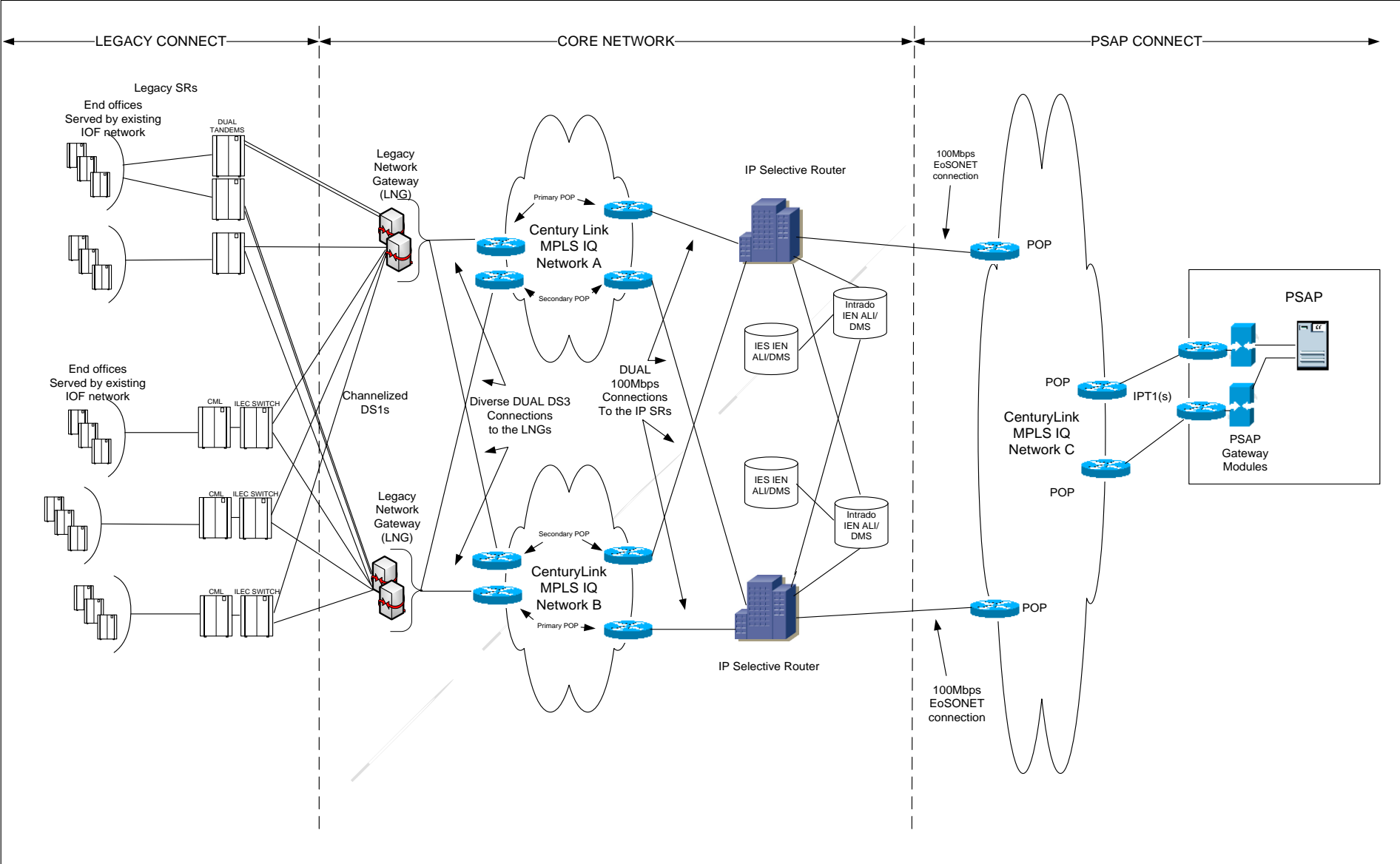
Figure 1 - MN-NG911 IP Network

It is anticipated that Phase 3 will complete in 2012 and positions the state to move forward with implementation of NG i3 components.

Phase 4 – i3 Implementation

Phase 4 involves the implementation of a NENA i3 compliant set of functions which deliver on the visions previously stated. It may be that progress on standards and vendor product development dictates that this effort be further divided into sub-phases. That decision cannot be determined at this time.

To further assess industry progress toward providing systems which deliver i3 functionality, a process often referred to as "Due Diligence" will be undertaken to allow for the exchange of information between the State and vendor community. The purpose of Due Diligence is to facilitate the understanding of MN NG9-1-1 requirements as well as the current state of product development applying to those requirements. Based on the results of this process, a plan will be developed to implement i3 functionality.

NG911 i3 Compliant Functions

Though using IP protocol inside the 9-1-1 domain is new, the IP protocol is well established and has been used in other telecommunication and IT domains for many years. What is totally new, are the i3 routing and database functions and systems used to deploy the functions.

The core set of i3 functions making up the technology of Next Generation environments are defined in the following standards:

- National Emergency Number Association's (NENA's) i3 Technical Requirements Document NENA 08-751, Issue 1, September 28, 2006

- National Emergency Number Association's (NENA's) Functional and Interface Standards for Next Generation 9-1-1, Version 1.0, (i3)

- Detailed Functional and Interface Specification for the NENA i3 Solution - Stage 3_1 Document 08-003, June 14, 2011

- U.S. Department of Transportation's (USDOT's) NG9-1-1 System Initiative Concept of Operations.

The state plans to follow the recommendations and specifications of NENA.

An important change in the NG9-1-1 environment is the definition of "calls." As part of the Phase 2 work on statutes and rules, a recommendation will be made to adopt NENA's revised definition:

"A generic term used to include any type of request for emergency assistance (RFEA); and is not limited to voice."

NG i3 compliant functions are interworked via standards driven protocols to form a "system" capable of receiving calls, accessing databases for routing and policy data, and connecting to the appropriate answering point. The i3 functions and protocols are illustrated in the figure below.

Given the early stages of i3 definition, standards will likely experience changes for several years. To address this reality the state will include a "Due Diligence" process to strengthen requirements definition prior to entering the procurement process. The intent of the due diligence process is to meet with potential service providers of i3 features and functions to learn about the respective service offerings and educate the potential service provider about Minnesota's needs. These are highly interactive sessions surrounding the information provided by state stakeholders and the service provider.

The over-arching goal is to craft an RFP document that ultimately generates thoughtful, relevant, and high-quality proposals from potential service providers.

Each i3 function is further described in this section.
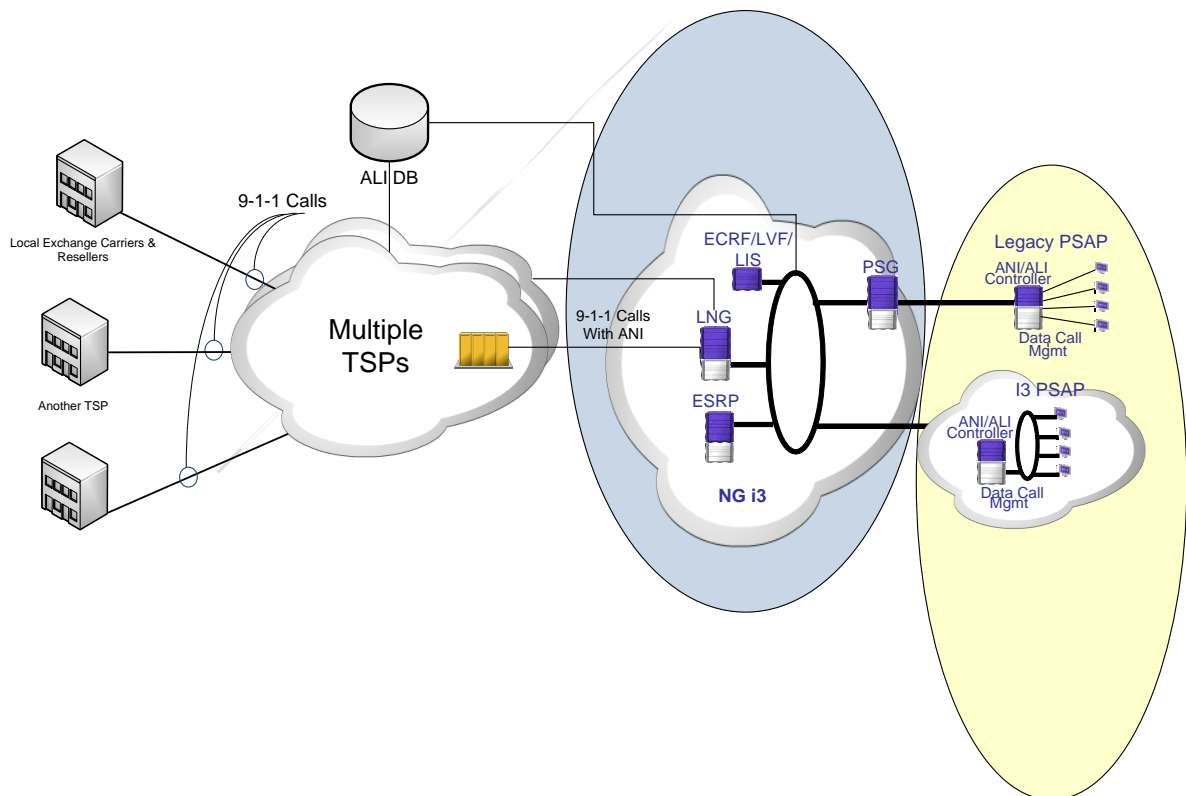
Figure 2- i3 Functions and Protocols

Border Control Function (BCF) – The BCF provides a secure entry into the ESInet for emergency calls presented to the network. The BCF incorporates firewall, admission control, and may include anchoring of session and media as well as other security mechanisms to prevent deliberate or malicious attacks on PSAPs or other entities connected to the ESInet.

Emergency Call Routing Function (ECRF) – The ECRF receives location information (either civic address or geo-coordinates) as input and uses this information to provide a URI that can be used to route an emergency call toward the appropriate PSAP for the caller's location. Depending on the identity and credentials of the entity requesting the routing information, the response may identify the PSAP, or an Emergency Services Routing Proxy (ESRP) that acts on behalf of the PSAP to provide final routing to the PSAP itself. The same database that is used to route a call to the correct PSAP may also be used to subsequently route the call to the correct responder, e.g., to support selective transfer capabilities.

Emergency Services IP Network (ESInet) – This term is used to refer to a private IP network or IP Virtual Private Network (VPN) that is used for communications between PSAPs and among other entities that support, or are supported by PSAPs in providing emergency call handling and response.

Emergency Services Routing Proxy (ESRP) – ESRP is an i3 functional element which is a SIP proxy server that selects the next hop routing within the ESInet based on location and policy. There is an ESRP on the edge of the ESInet. There is usually an ESRP at the entrance to an i3 PSAP. There may be one or more intermediate ESRPs between them.

i3 Public Safety Answering Point (i3 PSAP) – The i3 PSAP is a PSAP that is capable of receiving IP-based signaling for delivery of emergency calls and for originating calls. The internal functions are not being specified in the i3 requirements, but the i3 PSAP is expected to be able to use SIP signaling for calls and IP-based data protocols for exchange of other information. It is expected that the CPE Technical Committee will produce a document describing the functionality of i3 PSAP equipment. An i3 PSAP is an instance of an IP PSAP, but in this document, we mean a PSAP conforming to the i3 standard.

Legacy PSAP – This term is used to describe PSAPs that are not capable of communicating with VoIP protocols or of supporting the i3-based interfaces specified as part of the i3 solution.

Legacy Gateway (LNG) – This term is used to refer to a signaling and media interconnection point between callers in legacy wireline/wireless originating networks and the i3 architecture, so that i3 PSAPs are able to receive emergency calls from such legacy networks.

Location Information Server (LIS) – A LIS is a functional element that provides locations of endpoints. A LIS can provide Location-by-Reference, or Location-by-Value, and, if the

latter, in geo or civic forms. A LIS can be queried by an endpoint for its own location, or by another entity for the location of an endpoint. In either case, the LIS receives a unique identifier that represents the endpoint, for example an IP address, circuit-ID or MAC address, and returns the location associated with that identifier. The LIS is also the element that provides the dereferencing service, exchanging a location reference for a location value.

Location Validation Function (LVF) – The LVF is used to validate location objects against the next generation Master Street Address Guide (MSAG). Pre-validation of the location information ensures that the calls can be routed to the appropriate PSAP and that emergency services can be dispatched to the correct location.

Multimedia – Multimedia functions might include such things as conference bridge resources, or logging recording services for all forms of media: voice, video and text.

Policy-based Routing Function (PRF) – This functional element applies techniques to determine alternate routing addresses based on policy information associated with the destination PSAP. The PRF uses its state knowledge, such as PSAP registration state or time of day and the policy for a PSAP to make a route determination. The PRF resides in the terminating ESInet.

Routing Proxy – A term used in SIP to describe a SIP server that receives SIP requests and forwards them on behalf of the requestor. A routing proxy determines the next hop for a SIP message and forwards the message.

Supplemental Data – Databases and Database Access Services that provide information requested by PSAPs and other entities on the ESInet in support of emergency services handling.

NG9-1-1 Database Services

The roles of databases are drastically different in NG9-1-1. As with other parts of the architecture a period of dual operation will exists and it must me planned. This section discusses these topics.

ALI

The ALI database will continue to be involved in routing 9-1-1 calls until legacy originating networks convert to the NG9-1-1 architecture. There is no indication that this will occur in a short period of time.

The i3 architecture calls for Telecommunications Service Providers (TSP) to implement the LIS function which replaces the ALI database in a fully implemented and transitioned NG environment. At the writing of this plan there are no TSP governing body statutes or rules which require the implementation of the LIS. Therefore, this plan accounts for the continued operation of the ALI database as part of transition considerations.

Geographic Information Systems (GIS)

In the NG environment GIS changes from a storage and mapping system to a key routing component. This change precipitates a review of GIS data management as boundary precision requirements are much higher for routing calls and much higher point precision is required to support the NG vision (e.g. the ability to access structure floor plans and support data).

Transition Considerations

The transition has begun. Phase 1 is complete and Phase 2 is well on its way to a successful completion of the IP network proof of concept. Once Phase 2 completes, then Phase 3 is a matter of replicating the successful network to interface with all PSAPs.

Phase 4 represents a significant change. It is likely that this phase will be further subdivided in moving to the final NG9-1-1 configuration. A full assessment and planning will be undertaken to achieve a successful transition. This section discusses considerations for that plan as it is known today.

Public Education

This is listed first as it is of paramount importance that the public understand the purpose, proper usage and capabilities of 9-1-1. As NG9-1-1 technologies and networks evolve, new methods of accessing public safety services will also evolve. There must be a clear and consistent message prepared and delivered to the public insofar as to what devices currently are capable of accessing 9-1-1 services. As well, the public must be aware of what devices are not yet capable of directly accessing 9-1-1. As NG9-1-1 networks evolve, and as access to 9-1-1 evolves beyond traditional telecommunications devices, public education must also evolve accordingly. Non-traditional methods such as text messaging, instant messaging, and email to name a few, must be included in present and future public education initiatives.

The state will coordinate with counties to develop and deliver a consistent message as the phased approach to NG9-1-1 is executed. Existing resources and educational tools such as "Cell Phone Sally", methods for measuring public education initiatives are available for these purposes.

Statutes and Rules

Phase 2 began the revision of state statutes and rules to broaden them to include what is currently understood about NG9-1-1. This process will be repeated as more unfolds during further development of NG9-1-1.

Governance

NENA's vision of a "networks of networks" where regional, state and national networks all interconnect and the investment required to implement an i3 based solution requires review of roles and responsibilities. The state will continue to partner with local authorities to collaboratively identify and implement the most efficient model for Minnesota.

Funding

Of all the considerations, this is by far the one which requires a more national approach to reach a final position. Changes to Minnesota statutes and rules as part of Phase 2 is only the first step. These changes are targeted at defining roles as they exist in the current transitional state to bring clarity to responsibilities for collecting and remitting 9-1-1 emergency telecommunications service fees (fee). The state will stay current with and participate in industry discussions regarding changes telephone line or equivalent based fees to other methods.

Transition Timeline

The transition timeline to NG9-1-1 must include all aspects of the vision as outlined in this document. As expected, timing is highly dependent on NG9-1-1 standards maturation, the legislative process, and the available resources including both people and budget.
A baseline will be established founded on the results of investigations associated with developing this strategic plan. It is anticipated that the actual timeline will be a living, dynamic and evolving process that will be updated periodically as more and more is learned in execution of this plan.

Critical Supporting Functions

Services such as CAD and logging must interface with new functions and handle new data sources and/or formats. Definition has not progressed to a point that these requirements can be articulated; however, they are included here to facilitate further discussion and inclusion in implementation plans at the appropriate time.

Summary

Recognizing the need to evolve Minnesota legacy emergency services networks to next generation concepts which may facilitate new capabilities and services the Emergency Communication Networks partnered with local authorities via the 9-1-1 Advisory Committee to developed a strategic plan to establish the framework for initiating and guiding projects to implement the Minnesota 9-1-1 community's vision. Work is underway as evident by the fact that Phase 1 is completed and Phase 2 well on its way. The same level of expertise and professional approach brought to bear in these two phases will be used in the implementation of Phase 3 and 4 as well as future projects undertaken in the execution of the strategy.

It is anticipated that this will be a living document which will be reviewed and modified to adapt to a changing 9-1-1 environment. The ultimate goal is to continue to provide reliable 9-1-1 service to users in Minnesota and meet the current and future requirements resulting advances in communication capabilities adopted by the public.

References

(1) NENA 03-003 Recommendation for the implementation of Inter-Networking, E9-1-1 Tandem to Tandem, February 2000 (Tandem)

(2) NENA 03-005 January 2004 (Issue 1) Generic Requirements for an Enhanced 9-1-1 Selective Routing Switch (SR Standard)

(3) NENA 08-001 v2 - Interim VoIP Architecture (i2)

(4) NENA 08-002 v1 - Functional & Interface Standards for NG9-1-1 (i3)

(5) NENA 08-003 DRAFT - NENA i3 Solution

(6) NENA 08-501 v1 - Network Interface to IP Capable PSAP

(7) NENA 08-502 v1 - E9-1-1 Requirements

(8) NENA 08-503 v1 - VoIP Characteristics

(9) NENA 08-504 v1 - VoIP Standards Development Organizations (SDOs)

(10) NENA 08-505 v1 - Location Determination: IP-Based Emergency Services

(11) NENA 08-751 v1 - i3 Requirements (Long Term Definition)

(12) NENA 08-752 v1 - Location Information to Support IP-Based Emergency Services

(13) NENA i3 Technical Requirements Document NENA 08-751, Issue 1, September 28, 2006 (i3 TRD)

(14) NENA Functional and Interface Standards for Next Generation 9-1-1 Version 1.0 (i3) NENA 08-002 Version 1.0, December 18, 2007 (i3 Standard)

(15) NENA 08-DRAFT - Emergency Services IP Network Design for NG9-1-1

(16) NENA 75-001 v1 - NENA Security for Next-Generation 9-1-1 Standard (NG-SEC)

(17) NENA Baseline Next Generation 9-1-1 Description, February 22, 2011

(18) NENA NG9-1-1 Transition Plan Considerations Information Document, NENA 77-501, Version 1, February 24, 2011

(19) NENA Standard Data Formats for ALI Data Exchange & GIS Mapping (Data Standard) NENA-02-010, Version 8.2, June 10, 2009

Minnesota

Department of Public Safety

Emergency Communication Networks

Next Generation 9-1-1 Strategic Plan

Progress Report

Introduction

In July 2011, Emergency Communications Networks (ECN) partnered with local authorities via the 911 Advisory Committee to developed a strategic plan, *Minnesota ECN Strategic Plan (the Plan), to* establish the framework for initiating and guiding projects to implement the Minnesota 911 community's vision as it relates to the challenge of Next Generation 9-1-1 (NG9-1-1) implementation.

The strategy employed a phased approach in which one phase builds on the previous.

With the support of the 911 Advisory Committee and the local authorities it represents, considerable progress has been made on the journey to the NG9-1-1 vision as defined in the Plan.

Phase	Status	Date
Phase 1 – Call Transfer Interoperability*	Complete	Q2/2010
Phase 2 – IP Connectivity Proof of Concept	Complete	Q1/2012
Phase 3 – IP Connectivity Full Implementation	Complete	Q1/2014
Legislation, Governance and Funding Review	Complete	Q2/2014
Phase 4 – i3 Implementation	Ongoing	

* Phase 1 was competed prior to the Plan development. It is included for completeness.

Progress Summary

Phase 1 – Call Transfer Interoperability

This phase addressed the need to transfer calls between any of the current Public Safety Answering Points (PSAP) in the state with the data required to accurately identify the location of the caller. The phase successfully completed in September 2010.

Phase 2 – IP Connectivity Proof of Concept

The proof of concept was successfully completed in the first quarter 2012 when Carver County, a CTL/Intrado database supported PSAP and Kandiyohi County, an IES database supported PSAP, both migrated to the ESInet.

Phase 3 – IP Connectivity Full Implementation

IP connectivity to all PSAPs in the state was completed in February 2014. With IP connectivity in place, the State is positioned to plan and implement i3 capabilities that have matured since the development of the Plan.

Legislation, Governance and Funding Review

Due to the passage of legislation in 2014, the Statewide 9-1-1 Program was formally brought under the governance structure of the Statewide Radio Board, and the board was renamed as the Statewide Emergency Communications Board (SECB), to encompass planning, coordination, and standards development for end to end public safety networks, including NG9-1-1, ARMER radio, and later FirstNet and Integrated Public Alert and Warning System (IPAWS).

Phase 4 – i3 Implementation

As envisioned when the Plan was developed in 2011, i3 has progressed from a basic set of standards to implementations across the United States. The 9-1-1 industry is in the early stages of planning NG9-1-1 (i3) implementation. This will require Phase 4 to be broken into additional phases as described below.

The Path Forward

The Plan recognized that NG9-1-1 standards were evolving and would continue to evolve as the industry gained knowledge through trials and actual implementations. ECN is keeping the commitment to review the Plan to keep it aligned with industry standards and best practices.

The 9-1-1 Program Manager, with input from the Next Generation 9-1-1 Committee, will provide the SECB with comprehensive overviews which highlight industry trends, along with recommendations for taking the best path forward with continued migration to reach end state NG9-1-1 deployment.

Amendments to the Plan

Amendment Number 1 – Statewide SIP Guidelines   030817
Amendment Number 2 – Statewide Text to 9-1-1 Plan   030817
Amendment Number 3 – Statewide GIS Plan   *Under Development*

040417

Minnesota Department of Public Safety Emergency Communication Networks
Statewide SIP Enablement Guidelines
Amendment Number One (1) to the SECB Statewide NG911 Plan

PURPOSE

Minnesota's Department of Public Safety Emergency Communication Networks division (ECN) has made significant investments in time and money to build a reliable and robust Emergency Services Internet Protocol (IP) Network (ESInet). It is the goal of ECN to encourage and help guide Public Safety Answering Points (PSAPs) to utilize the ESInet to the fullest extent. The first step is to move away from Centralized Automatic Message Accounting (CAMA) technology by implementing Session Initiation Protocol (SIP) to deliver 9-1-1 calls. The SIP enablement for a PSAP and its customer premises equipment (CPE) will help to bring public safety technology up to the same level used by wireline and wireless carriers when they deliver service to the community.

SCOPE

The guidelines in this document are designed to help PSAPs plan for and implement a SIP conversion from CAMA, and to provide them with a better understanding of the tasks, costs, and requirements for this undertaking. PSAPs will be responsible for ensuring that their public safety applications are capable of converting to SIP. If the CPE and/or call-taker applications are not capable of supporting SIP, the replacement of those systems may be necessary and is beyond the scope of this document. Conversion from CAMA to direct SIP ESInet connections requires an update to the PSAP's 9-1-1 Plan on file with the State.

IMPLEMENTATION GUIDELINES

The design goal for any PSAP converting to SIP will be reliability. This is achieved through enhanced functional requirements for SIP and redundancy at the hardware level. In addition, it is required that a final design incorporate SIP-capable firewalls in front of the CPE as a security measure for Internet-facing CPE functions, and as a security layer for future Next-Generation 9-1-1 (NG9-1-1) capabilities. Any PSAP connected to the ESInet will be required to sign an agreement with the State of Minnesota that outlines acceptable use and management of the firewall devices. PSAPs unwilling to accept the installation and management structure defined in the agreement will be disconnected from the State supported ESInet and have to establish connectivity to a 9-1-1 service provider at their own expense, or have their 9-1-1 calls routed to the nearest willing and able PSAP on the ESInet.

CONVERSION COST GUIDE

To help PSAP managers prepare for the SIP-conversion process, some associated cost ranges are listed below for a typical conversion from CAMA to SIP. Each PSAP will be responsible for determining the exact costs involved with the conversion and should solicit specific, individual quotes from its CPE vendor, as well as from CenturyLink, the State's ESInet provider. The amounts provided in Table 1 below are based on the following assumptions:

- The CPE is SIP capable
- CPE version/maintenance is current
- Cost calculations based on a four-position PSAP

Table 1: SIP Conversion Cost Estimate*

Quantity	Description	Estimated Price Range	Estimated Total
4	SIP CPE Licensing	$260 – $410	$1,040 – $1,640
4	SIP CPE Support Option	$50 – $160	$200 – $640
2	Firewall Hardware	$0	$0
2	Firewall Licensing/Support	$0	$0
2	Firewall Managed Services	$0	$0
120	Vendor Labor Hours	$60 – $100	$7,200 – $12,000
30	West Labor Hours	$196	$5,880
		Estimated Grand Total	**$14,320 – $20,160**

*Pricing is subject to change based on the number of PSAP positions and CPE configuration (CPE may require initial configuration/upgrades to become SIP capable).
** Firewall hardware, licensing/support, and management will be covered by ECN.

FIREWALL MANAGEMENT AND GOVERNANCE

Management
As Minnesota PSAPs schedule their migrations to SIP call handling, appropriate planning must include the management of the firewall devices that act as a first step in protecting the ESInet from cyber threats and intrusions. These devices are placed at a critical point in the call-delivery path and therefore require consistent monitoring, support, and governance. The State wants PSAPs to stay focused on their core mission, and because of that desire, ECN will provide monitoring and support services for the firewalls that are deployed in a SIP conversion.

The management and support of the firewalls will be conducted by a third party that reports directly to ECN. Once a vendor is chosen by the State, it will be charged with the task of monitoring, maintaining, and implementing the firewalls as SIP conversions take place at PSAPs across Minnesota.

In general, there will be three areas of focus to sustain the integrity of each PSAP's network that can be best described as **Prevention and Protection, Detection, and Response.**

- **Prevention and Protection** includes SIP firewall management and administration, lifecycle and oversight management. The ongoing services also will include consultative support on an as-needed basis, as related to the network firewall use, security, functionality and accessibility.

- **Detection** involves proactive SIP firewall monitoring through the service provider's Network Operations Center (NOC).

- **Response** includes call center support, trouble reporting and problem escalation, along with logging and reporting. It also will include scheduled onsite support and preventive maintenance.

The monitoring and support services component of the SIP firewall implementation will be required for both new and existing SIP deployments. PSAPs with firewalls currently in place that are designed per the guidelines described in this document will be included in the monitoring-and-support-services solution offering, and thus will supersede the PSAP's existing monitoring/management efforts.

Governance

Adherence to the standards and guidelines set forth in this document is crucial to ensuring the integrity of the ESInet, as well as each PSAP's respective network environment. Scheduled and on-demand reporting will be conducted concerning the state of the monitored firewalls across Minnesota, to include the ongoing support provided to them and their settings. ECN also reserves the right to order onsite audits—on a schedule of its choosing—that will report on the functionality, physical layout, and setup of the SIP firewalls at each PSAP.

ECN also will work with the appropriate State offices/departments, the Statewide Emergency Communications Board (SECB), and the selected monitoring vendor to create a standard and consistent ruleset that governs the device configuration policies. ECN, working with the selected monitoring vendor, will verify on a regular basis that all firewall device configurations adhere to the State's security policies. ECN may ask for input from the PSAP managers regarding the development of the hardware, software, and telecommunications profile, when appropriate. Finally, the ongoing costs for the monitoring and support services will be covered by ECN.

CALL CONTROL CONFIGURATION

In a direct SIP environment, the call control that defines how many simultaneous 9-1-1 calls a PSAP can receive is determined by the 9-1-1 answering application configuration, rather than the ESInet. This call control configuration can determine whether a PSAP is in compliance with the 9-1-1 system load capacity required by MN Administrative Rule 7580.0500, Subpart 1, Load, which requires the 9-1-1 system to be designed and operated to maintain a grade of service such that no more than one call out of 100 incoming calls will receive a busy signal on the first dialing attempt during the busy hour of an average week during the busy month (AKA - P.01 grade of service). When PSAPs prepare to convert to a direct SIP connection to the ESInet, the PSAP and the vendor need to work with the MESB in the metro region and ECN in greater MN to determine a 9-1-1 answering application configuration that meets the State 9-1-1 system load requirements.

FREQUENTLY ASKED QUESTIONS

Question: Why should I convert to SIP?

Answer: SIP is already a primary call-delivery method for the public across the country. It is utilized by multiple entities that provide phone services in Minnesota, and it is a primary and necessary step for the PSAP to take in order to be NG9-1-1 ready. Public safety officials know that the systems fielding the requests for emergency help need to align closely with the capabilities of the devices used by citizens. SIP implementation is a big step in that direction, and many CPE systems currently are in development cycles that are leveraging SIP as the foundation for NG9-1-1 capabilities.

Question: What other costs may be associated with my conversion to SIP?

Answer: There may be costs associated with upgrading your CPE or replacing it altogether if SIP is not supported. Converting to SIP should be a phase in your upgrade to new CPE.

Question: Will I be required to make any updates to my call logger when migrating to SIP?

Answer: Depending on the brand, age, and version of your master recorder, there may be some upgrade requirements, especially if you currently record at the trunk level.

In a SIP environment, IP recording capability must be enabled. This may require the purchase of a third-party recording kit. In most instances, such a kit is necessary only to accomplish trunk-level recording. Recording at the position level only may not require any logging recorder modifications.

It is important to understand that trunk-level recording does not work exactly the same as it did in the legacy environment. All "audio before answer" is eliminated in a SIP environment; thus, there is nothing to record prior to the call being answered by a call-taker. However, the third-party recording kit does make it possible to record during the time a call is placed on hold.

Please coordinate SIP recording capabilities between your CPE and call-logging vendors to ensure that your specific needs and requirements for recording are met.

Question: What if my PSAP already has a firewall in place?

Answer: As the process to select a vendor for the management and monitoring of the firewalls is ongoing, it is difficult to state one way or another. In one scenario, the chosen vendor is able to work with the existing devices and incorporates it into their monitoring program. In another scenario, the vendor is not able to incorporate it and requires their own device and configuration. How and when that process occurs will be done in coordination with the PSAP, their CPE vendor, ECN, and the chosen vendor for the firewall project.

Question: How do these costs apply to a PSAP that is part of a shared call-handling system?

Answer: This depends on the network configuration between the PSAPs on the shared system and the terms contained in the cooperative agreement in place related to cost management.

Question: Can I use my Enhanced 9-1-1 (E9-1-1) money to pay for costs associated with this transition?

Answer: Yes.

Minnesota Department of Public Safety Emergency Communication Networks

Statewide Text-to-9-1-1 Plan

Amendment Number Two (2) to the SECB Statewide NG911 Plan

PURPOSE

Minnesota's Department of Public Safety Emergency Communication Networks division (ECN) recognizes the need to provide all citizens with equal access to the highest level of 9-1-1 service available by implementing text-to-9-1-1. Wireless customers have enjoyed the ability to send text messages to other wireless subscribers for several years and within the Deaf and Hard of Hearing community, this has become a very popular method of communication. The Emergency Access Advisory Committee (EAAC) presented a report to the FCC in July 2011 noting that texting has become one of the preferred methods of communication for the Deaf and Hard of Hearing. Text-to-9-1-1 allows this community equal access to 9-1-1 services for the first time in history.[1] Text-to-9-1-1 also offers an alternative method for accessing 9-1-1 services when it is not safe to make a voice call, such as during a home invasion, or domestic incident. The goal of the statewide text-to-9-1-1 plan is to provide a proven method for equal access to 9-1-1 for the state's citizens and visitors in the most expeditious and cost effective way, while allowing local Public Safety Answering Points (PSAPs) to migrate to the service when appropriate for them to do so based on available funding, policy and staffing.

BACKGROUND

In December of 2012, AT&T, Sprint Nextel, T-Mobile, and Verizon entered into a voluntary agreement with the National Emergency Number Association (NENA) and Association of Public-Safety Communications Officials (APCO) International in which each of the four carriers agreed to provide text-to-9-1-1 service by May 15, 2014, to PSAPs that are capable of, and request to receive, text-to-9-1-1 service. The Federal Communications Commission (FCC) has placed a priority on deploying text-to-9-1-1 and in his January 2014 statement in relation to PS Docket No. 11-153, *Facilitating the Deployment of Text-to-911 and Other Next Generation Applications*, Chairman Wheeler stated "We've done our part. Now, the PSAPs must do theirs." The FCC ruling helped to ensure that 9-1-1 keep pace with new technology, and, most importantly, save lives.

ASSESMENT OF OPTIONS

ECN has reviewed and evaluated the options available for deployment of a Short Message Service (SMS) solution and has determined the most viable interim SMS text-to-9-1-1 solution and deployment option is to provide statewide service with an integrated solution. The interim text-to-9-1-1 solution will utilize the most commonly available texting technology, carrier native - SMS texting. Carrier native SMS is a feature provided by the carrier, and not a third party texting or messaging application (app) that may be installed on the mobile device. The interim SMS text-to-9-1-1 service provides support for wireless subscribers to send 9-1-1 SMS text messages to PSAPs and for subscribers to receive text replies from PSAPs. Wireless

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[1]   Report on Emergency Calling for Persons with Disabilities Survey Review and Analysis 2011

customers with SMS service are able to send emergency SMS messages to a PSAP by using the single code "911" as the destination address of the SMS message. SMS text-to-9-1-1 service is national in scope and is independent of any vendor applications implemented in individual PSAPs.

BENEFITS OF SELECTED OPTION
Providing statewide service in this manner will provide the following benefits to the citizens of Minnesota:

- An integrated solution deployed statewide will provide equal access to 9-1-1 services for all subscribers;
- A statewide integrated solution will eliminate public confusion and disparate levels of services within the state. All citizens and visitors will have capability to text 9-1-1 and have their call received at a PSAP with trained personnel equipped to handle their request for service;
- A statewide approach will allow the state to facilitate a consistent public education message to help ensure the speech and hearing impaired community are aware of the service capability and educated on its use.
- A statewide approach will facilitate a more consistent method for training PSAP staff to become proficient and stay proficient in managing text-to-9-1-1 requests for service.

On April 22, 2015, the NG911 Committee Chair presented a text-to-9-1-1 resolution to the SECB asking the it to adopt the resolution for a statewide PSAP implementation approach for Text-to-9-1-1. The motion was approved unanimously. Prior to presenting this to the SECB, each of the seven regions passed the same resolution at the regional level. (See Attachment A)

IMPLEMENTATION APPROACH
Minnesota will implement a statewide approach to text-to-9-1-1 service in a phased approach with a cohesively managed methodology. The phased implementation will deploy texting initially in at least one identified PSAP in each of the seven regions. The regional PSAP will accept text on behalf of all PSAPs within the region. This will provide statewide service with all four of the major wireless providers in the most expeditious manner possible. In this way, deployment, testing, and practical application can be monitored and evaluated, and the lessons learned applied to future implementations. Additional PSAPs will deploy the integrated solution as call handling equipment is upgraded by local 9-1-1 authorities.

Technical requirements for PSAP Customer Premise Equipment (CPE) to interface with the NG9-1-1 network in deploying text-to-9-1-1 have been created to provide the technical interface requirements between the ESInet and the PSAP 9-1-1 Call Handling System necessary for an integrated text-to-9-1-1 solution. This Technical Requirements Standard document will assist PSAPs in communicating with their CPE vendors and help to ensure a smooth transition with the least amount of cost to achieve the text-to-9-1-1 solution for their jurisdiction.

In accordance with language contained in MS 403, which was followed when wireless service was integrated into Minnesota PSAPs, text-to-9-1-1 will be similarly integrated. As stated in MS 403.08 Subd 10 Plan integration, "Counties shall incorporate the statewide design when modifying county 9-1-1 plans to provide for integrating wireless 9-1-1 service into existing

county 9-1-1 systems." The initial seven regional PSAPs shall complete a 9-1-1 Plan Change Letter which states they will accept text messages on behalf of all PSAPs in their region until the other PSAPs are ready to take their own or until December 31, 2018. The other PSAPs in each region shall complete a 9-1-1 Plan Change Letter stating their texts will be accepted by the designated regional PSAP until they are ready to take their own, or until December 31, 2018. On or before December 31, 2018, PSAPs must file a 9-1-1 Plan Change Letter documenting they are taking their own texts, or have entered into a cooperative agreement with another PSAP to perform this service on their behalf. Establishing a future date for subsequent implementations will allow sufficient time for the other PSAPs in the region to plan for and fund upgrades to their CPE, establish necessary policy, and train personnel while supporting rapid text-to-9-1-1 service for their residents.

COST

All Minnesota PSAPs are responsible for all costs associated with any necessary (or required) CPE replacements or upgrades to enable them to receive the interim SMS text-to 9-1-1 deployment with an integrated solution.

ECN will pay the monthly recurring charges associated with Text Control Center (TCC) connectivity on behalf of all Minnesota PSAPs.

SUMMARY

All PSAPs within Minnesota are connected to the statewide Emergency Services IP Network (ESInet) designed to deliver 9-1-1 calls to the appropriate PSAP. ECN will leverage the investment in the ESInet and expand the service enhancements to keep pace with the communications technologies available for accessing emergency services. An integrated solution will utilize the ESInet connectivity to deliver text messages into the PSAP call handling equipment via a Session Initiation Protocol/Message Session Relay Protocol (SIP/MSRP). This solution allows the text to display on call handling equipment and should provide the smoothest transition to full Next Generation 9-1-1 (NG9-1-1) deployment.