State of Nebraska
Next Generation Telephone Communications Study

Final

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Nebraska Public Service Commission
Lincoln, Nebraska

MissionCriticalPartners
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EXECUTIVE SUMMARY

Mission Critical Partners, Inc. (MCP) respectfully submits this report to the State of Nebraska and Nebraska Public Service Commission (PSC). Communications technologies are in the midst of rapid and radical changes. These technologies change the way people, institutions, businesses, and governments relate and interact with one another; they also support communications among the devices we use. These changes in communications have large implications for public safety.

Information Technology (IT) is steadily changing how people do their jobs and live their lives, and this rate of change will continue to accelerate for the foreseeable future. The challenge for public safety and first response agencies is funding and the necessary leadership to evolve with the constantly changing technologies.

MCP contacted all 76 Nebraska public safety answering points (PSAPs)[1] and determined that these PSAPs vary significantly in available local resources. The goal of this report is to identify those resources and propose ways to fully utilize the resources to benefit the state and PSC's Next Generation 9-1-1 (NG9-1-1) efforts.

This report provides an analysis on the current status of 9-1-1 communications equipment in the state, including geographic information systems (GIS), PSAP operations, and broadband and telephone infrastructure in and available to Nebraska. The report provides an assessment of Nebraska's statutory and regulations framework. Efforts and initiatives in progress or planned in other states that may be related to or have an impact on implementation of NG9-1-1 in Nebraska are also explored. In addition, potential costs are estimated for future planning.

MCP utilized a collaborative approach to this project, meeting with PSAPs, service providers, and state agencies to gain important stakeholder input. Program Manager, Jeff Pursley provided beneficial support and documentation.

Recommendations are included in this report. Although it is easy to focus on the technology of NG9-1-1, a significant focus of this document is to the more challenging areas of what this change means in state-level infrastructure and communications, and creating an infrastructure and communications plans that are critical for successful NG9-1-1 transition.

A hallmark of today's 9-1-1 service is its reliability. However, the wholesale replacement of the systems in use today introduces new risks that must be mitigated to preserve reliability during transition and beyond. Risk management must be a practice embedded in all aspects of the migration to NG9-1-1. The changes required for mitigating these risks will require flexibility to new types of interworking at the state level, including the Nebraska PSC working with the Office of the Chief Information Officer (OCIO) in a way that will leverage the strengths and abilities of both.

[1] Definitions may be found on page 42.

One of the most critical elements of change for Nebraska will be creating a governance structure that allows all interested entities in Nebraska to have the ability to provide thoughtful input into decisions and direction. There are communication goals but none are more important than creating communication streams to change some of the current perceptions caused by lack of trust between different entities in Nebraska. As Nebraska navigates the phases of this transformation to NG9-1-1, the PSAP, regions, service providers, and state-level agencies all must be able to understand not only the elements of the transformation, but also why the decisions are being made when they are.

Risk includes technical risk. A key factor that mitigates technical risk is embedded in the fundamental design of NG9-1-1 — the employment of practices and technologies that have been proven in other applications.

Additional risk is due to scope and size of the project. Information collaboration among local, regional, and national agencies attained via interconnected Internet Protocol (IP) networks will enable emergency communications applications to work together on a much larger scale than what currently exists on the local level. The strategy to mitigate this risk includes the use of proven program and project management techniques and employment of experienced program managers and certified project management professionals.

Another area of risk is security. Deployment of NG9-1-1 will fundamentally alter the ways 9-1-1 systems and associated data are secured. The risks involved, if not mitigated (primarily through practices and procedures), are loss of critical data or breach of confidentiality for personal data. A security policy is the first step in any effective attempt at implementing a comprehensive security program.

Other risks will be identified on the course to NG9-1-1. The Nebraska NG9-1-1 governance structure must be flexible and have sufficient authority to mitigate those risks.

Although estimated pricing is provided in this document, it must be understood that pricing for NG9-1-1 is in constant change and the costs provided are high-level for budgeting purposes only.

Undertaking this next generation telephone communications study illustrates the State of Nebraska’s and the PSC’s commitment to consider all relevant tasks for a successful transition to NG9-1-1.

1. APPROACH

1.1. PURPOSE

The purpose of this communications study is to assess the current statewide 9-1-1 network, examine any current or planned initiatives for the implementation of NG9-1-1 and identify the key governing bodies that will need to be involved in order to implement NG9-1-1 throughout the state.

The study provides information relating to the implications, cost, and considerations of next generation emergency telephone communications in Nebraska. It includes regulatory and funding, technology and operational assessments, and recommendations for a variety of options for planning, development, phased-in deployment, interconnection, and management of ESInet and required networks. It is noteworthy to mention that many of the rural Nebraska PSAPs will find they are increasingly challenged to provide the funding and personnel to support the level of effort that NG9-1-1 requires. Recommendations for assisting Nebraska in addressing these challenges are included in this document.

There is generally a strong correlation between funding and legislation. Current legislative language often only addresses today's realities, and requires revision to be progressive with future technologies and inclusive of funding sources. The current regulatory and funding framework as it relates to 9-1-1 at the federal, state, and local levels, including identification of stakeholders, pending actions, and regulatory constraints, were assessed to address any necessary revisions to current legislation to provide the maximum benefit to stakeholders.

Implementing a statewide ESInet within Nebraska will offer residents and visitors to the state an improved level of service, which is an ultimate goal of NG9-1-1. Understanding the processes, requirements/standards, best practices, security and integrity of data related to 9-1-1 is paramount for determining the most efficient and cost effective manner for implementation of next generation services.

1.2. SCOPE OF WORK

MCP was contracted to conduct a study of the implications, costs and considerations of next generation emergency communications in the state of Nebraska. There were statutory requirements for this initial report in Legislative Bill 595, *Provide for a Public Service Commission study of next-generation 911*, enacted May 8, 2013:

> *Sec.5. (1) … The study shall include, but not be limited to, an examination of the following issues:*
>
> *(a) Examination of the current statutory and regulatory framework for the management and funding of E-911 service in Nebraska;*
>
> *(b) Examination and assessment of the current system of E-911 service within Nebraska;*

(c) Examination of the Federal Communications Commission's open rulemaking regarding the deployment of next-generation 911;

(d) Identification of the federal, state, and local authorities, agencies, and governing bodies whose participation and cooperation will be necessary for the implementation of next-generation 911 in Nebraska;

(e) Examination of any efforts, projects, or initiatives currently in progress or planned related to any portion of the implementation of next-generation 911 in Nebraska;

(f) Examination of the plans and efforts of other states regarding the implementation of next-generation 911; and

(g) Any other issues related to the planning and implementation of next-generation 911.[2]

Sec. 5.(4) … The final report of the independent third party shall include:

(a) The initial report of the independent third party as outlined in subsection (3) of this section;

(b) Recommendations providing a variety of options for the planning, development, phased-in implementation, and management of next-generation 911 and the deployment, interconnection, and management of emergency services Internet protocol networks, including, but not limited to, necessary technological upgrades, the timeline and cost of such phases of implementation, and organizational structures with authority to oversee the recommended options;

(c) Identification of any changes to the master street address guide required for next-generation 911 and how geocoding would integrate in the routing of next-generation 911;

(d) Identification of any equipment changes that would be needed by public service answering points, including customer-premise equipment, recording capabilities, and computer-aided dispatching;

(e) An estimated cost of the necessary components for planning, implementation, and management of next-generation 911 and recommended sources of funding; and

(f) Any other necessary issues related to the planning, implementation, and management of next-generation 911.[3]

2. METHODOLOGY

A kick-off meeting was held on September 20, 2013. It was an open meeting in the Nebraska State Capitol building. The meeting was attended by State Senators, PSC representatives, PSAP representatives, vendor representatives, telecommunications providers, and lobbyists; the invitation list was developed to invite as many vendors, public safety individuals, telecommunications providers, and lobbyists as possible. The scope of work and deliverables were reviewed during the day-long meeting, with periods set aside for questions and discussion. Individuals attended different portions of the

[2] http://legiscan.com/NE/text/LB595/2013
[3] http://legiscan.com/NE/text/LB595/2013

meeting deemed of benefit to them or the entity they represented in an in-and-out fashion at different times during the day based on the agenda provided prior to the meeting.

The study began with interviews and analysis of the current regulatory and funding framework. MCP gathered information and assessed the current statewide 9-1-1 network capabilities and PSAP facilities and operations.

MCP analyzed the information and is providing recommendations based on experience and observations from assisting other states navigate their transition to NG9-1-1, including some of the states bordering Nebraska. From that analysis MCP is providing recommendation for the State of Nebraska to take the “next-steps” in their transition to NG9-1-1.

2.1. INTERVIEWS

MCP worked closely with Mr. Pursley, the State’s project manager, to meet with the PSAPs, service providers, and GIS service providers.

2.1.1. PSAPs

MCP contacted all 76 PSAPs in the state. In conjunction with the State GIS committee, MCP sent a survey to each PSAP for the purpose of gathering data. Appendix A contains a copy of the survey questionnaire.

If a PSAP did not initially respond, MCP reached out multiple times with both phone calls and e-mails.

Table 1 lists the PSAPS within the state.

Table 1 – Nebraska PSAPs

Nebraska PSAPs	
Alliance/ Box Butte County	Johnson County
Antelope County Sheriff’s Office	Kearney County Sheriff's Office
Beatrice Communications / Gage County	Keith County 911 / Arthur, Deul, Grant, Hooker, McPherson counties
Boone County	Keya Paha
Boyd/ Holt County	Kimball County
Brown County	Knox County
Buffalo County	Lincoln-Lancaster 911
Burt County 911	Madison County
Butler County	McCook Police Department / Red Willow County
Cass County Sheriff's Office	Merrick County Sheriff
Cedar County Sheriffs 911	Mid Rivers 911
Chadron Police Department/Dawes County	Morrill County
Chase County 911	Nance County

Nebraska PSAPs	
Cherry County	Nemaha County
Cheyenne County	Norfolk Police Department / Stanton / Pierce counties
Clay County	North Platte Police Department / Lincoln County
Colfax County Communications E-911	Nuckolls County
Columbus Police Department/ Platte County	Otoe County
Cuming County 911	Perkins County
Custer County 911	Pierce County Sheriff
Dakota County LEC	Polk County
Lexington/ Dawson County / Gosper County	Region 26 Council
Dixon County Sheriff's Department	Rock County Sheriff's Office
Douglas County 911 Communications Center	Saline County
Dundy County	Sarpy County 911
Fillmore County	Saunders County
Franklin County	Scottsbluff County Communications / Banner / Sioux
Fremont Police Department 911	Seward County
Frontier County 911	Sheridan County
Furnas County Sheriff 911	Thayer County
Garden County	Thurston County
Grand Island-Hall County	Washington County
Hamilton County	Wayne Police Department
Hastings 911 Center / Adams County	York County
Hitchcock County 911 Hitchcock	City Of York Police Department
Harlan / Phelps/ City Of Holdrege	Crete Police Department
Howard County 911	Richardson County / Falls City Police Department
Jefferson County	Lexington Police Department

PSC chose 14 PSAPs to participate in on-site meetings as a representation of the state. These PSAPs are highlighted in gray in the table above. While the on-site team was gathering information for Brown County, Cherry County had some of the information required, and as such was added. During a public meeting forum in Valentine, Nebraska, representatives from Keya Paha County expressed interest and were interviewed via phone. (Both are highlighted in green in the table above.) MCP believes these 16 PSAPs represent the state of Nebraska geographically, by the size of the PSAP and the respective 9-1-1 call volume.

The remaining Nebraska PSAPs were sent multiple notices via e-mail and phone. Of the remaining 60 PSAPs, 28 responded and their data was reviewed with them by phone. These 28 are highlighted in blue in the table above.

These groups total 44 of the 76 PSAPs, approximately 58 percent. This provides a good sample for analysis.

2.1.2. Service Providers

MCP contacted 49 service providers operating in the state to determine if they offered facilities and support suitable for local, regional, and statewide ESInets. Many of the service providers were contacted via telephone and e-mail; when possible, in-person interviews were conducted. The service providers were sent or given a survey as well. This survey was the basis for the analysis of wireless coverage in the state. Twenty-seven of the service providers responded to the survey and/or phone calls. Appendix B contains a copy of this survey.

In addition to the traditional local exchange carrier (LEC) service providers, several non-traditional service providers were contacted, including public power districts; cable television providers; 4G long-term evolution (LTE) wireless service providers; a broadband satellite provider; and the Nebraska Regional Interoperable Network (NRIN), a statewide initiative.

Several smaller LEC service providers believe they are not staffed to support a public safety-grade network or that doing so would not fit their business model. Several other service providers do not have control over the outside plant their services traverse because they are leased or they do not operate any facilities.

For backup networks, several options were examined: NRIN, hybrid fiber coax (HFC) (cable TV), 4G LTE wireless, point-to-point wireless, and satellite broadband providers.

2.1.3. GIS Services

Most of the Nebraska PSAPs, with the exception of a few of the largest counties, use one of two GIS service providers—GIS Workshop or GeoComm— for their mapping updates. The services that each County and PSAP utilize vary significantly, largely in part to the fact that the services provided are priced separately. Most PSAPs work with the minimum services available for creating their mapping data.

2.1.4. Deaf and Hard of Hearing

MCP held discussions with John C. Wyvill, Executive Director, Nebraska Commission for the Deaf and Hard of Hearing. Insight was gained into the importance of Nebraska's NG9-1-1 strategy, including meeting the needs of this growing segment of the Nebraska population.

Nebraska has a growing number of people that are categorized as deaf and hard of hearing. Mr. Wyvill provided information on the following categories:

1. Deaf
2. Hard of Hearing, which presents more of a challenge in some ways with communications
3. Communicative disorders, which includes people who are not hard of hearing but instead have other challenges with communication

4. Medical episodes which inhibit people from being able to communicate; this can be a temporary or permanent issue

Mr. Wyvill also offered the service of the Commission for consultation and training as Nebraska develops and deploys NG9-1-1.

3. FINDINGS – NEBRASKA STATUTORY AND REGULATORY FRAMEWORK

Responsibility for management and oversight of 9-1-1 service in Nebraska is shared between local entities and the PSC.

3.1. WIRELINE 9-1-1 SERVICE

9-1-1 service is viewed by many as a local matter. Local entities own and operate the communications centers or PSAPs that provide the interface between a caller and the emergency services that respond to a caller's request for assistance. Thus, they provide the voice to 9-1-1 service and are naturally the entity most closely associated with 9-1-1. The Emergency Telephone Communications Systems Act, or the Landline 911 Act, provides authority for governing bodies to reimburse service providers for providing 9-1-1 services and further authorizes governing bodies to impose and collect a surcharge on landline telephone service to supplement general revenue in paying for non-recurring or recurring charges for the installation, maintenance, and operation of 9-1-1 service. The Act defines a governing body as the county board, the city council of a city, the board of trustees of a village, or the board of directors of any rural or suburban fire protection district.

3.1.1. Wireline Funding

The Landline 911 Act permits governing bodies to impose a surcharge of up to $1.00 (with the exception of Douglas County which is limited to $.50) per telephone line or functional equivalent for the purpose of paying costs associated with the provision of enhanced 9-1-1 (E9-1-1) service. Funds generated by the surcharge are to be expended only for the purchase, installation, maintenance, and operation of telecommunications equipment and telecommunications-related services required for the provision of 9-1-1 service.

Landline surcharge revenue is remitted directly to local governing bodies by the LECs no later than 60 days after the close of a quarter. During 2012, LECs reported collecting and remitting approximately $7.4 million in surcharges to local government bodies. Counties and municipalities have expressed concern regarding the impact of falling landline surcharge revenue on PSAP budgets. Information provided by the PSC indicates an average annual reduction of 8 percent in the number of residential access lines over the previous nine years. This is consistent with trends reported in other states. Primarily in response to budgetary pressures caused by reduced revenues, some local governing authorities have voluntarily regionalized service in varying degrees through inter-local agreements and the formation of regional authorities.

3.2. WIRELESS 9-1-1 SERVICE

Wireless 9-1-1 services are managed and overseen by the PSC, assisted by an advisory board created to advise the PSC concerning the implementation, development, administration, coordination, evaluation, and maintenance of enhanced wireless 9-1-1 services. Members of the advisory board are appointed by the governor for 3-year terms and must include a sheriff; two county officials or employees; two municipal officials or employees; one representative from the state's wireless telecommunications industry; one manager of a PSAP, not employed by a sheriff; one representative of the state's local exchange telecommunications service industry; and one member of the public. One commissioner and the state's chief information officer both sit on the advisory board as ex-officio members. The advisory board meets quarterly and makes recommendations regarding the surcharge, policies, funding requests from PSAPs, and wireless service provider grant applications.

The Enhanced Wireless 911 Services Act (Wireless 911 Act) assigns the following powers and duties to the PSC:

- Determine the amount of money to be deposited in the Enhanced Wireless 911 Fund (Fund) for the following year and set the surcharge
- Establish a mechanism for determining the level of funding available to each PSAP and wireless carrier for costs determined to be eligible by PSC
    - The PSC has adopted a permanent funding mechanism, the 911 Support Allocation Methodology (911-SAM), for wireless 9-1-1 service. The 911-SAM forecasts the future status of the Fund and assists in the allocation of annual support amounts to eligible PSAPs and wireless carriers.
- Receive, review and act on applications, including supporting documentation for compensation for allowable costs. May be limited based upon the mechanism established by PSC
- Compile and place PSAP information into its annual telecommunications report to the Legislature
- May administratively fine any person who violates the Emergency Telephone Communications Systems Act
- In consultation with the advisory board, adopt and promulgate rules and regulations necessary to carry out the Enhanced Wireless 911 Services Act

The PSC has adopted Enhanced Wireless 911 Services Rules and Regulations.

3.2.1. Wireless Funding

The Nebraska Enhanced Wireless 911 Fund was created in 2001 for the purpose of implementing wireless E9-1-1 services across the state. The Wireless 911 Act grants the PSC broad authority to carry out the Act's intent stating, "The commission shall have any powers necessary to carry out the intent and purposes of the act." However, the purpose for the program is limited to the implementation and provision of wireless E9-1-1 service as reflected in the eligible costs as defined by the PSC.

Wireless carriers are required to collect and remit a surcharge set by the PSC. The surcharge may be up to $.70 per month on all active telephone numbers or functional equivalents, except from users of wireless service whose primary place of use is in a county containing a city of the metropolitan class where the maximum surcharge is $.50 per month.

Initially a $.50 surcharge was collected on all active telephone numbers or functional equivalents every month from each subscriber with a billing address in Nebraska. The surcharge is reviewed and set annually. Effective January 1, 2013, the surcharge was reduced to $.45 for each subscriber with a billing address in Nebraska. Wireless service providers remit the surcharge to the PSC 60 days after the last day of the month. PSC utilizes an on-line remittance system for the collection of the wireless 9-1-1 surcharge. For Fiscal Year (FY) 2012–13, the Wireless 911 Fund collected just over $8.0 million. As of July 1, 2013, the balance of the Wireless 911 Fund was approximately $16.6 million. Table 2 depicts the collections for the past five years.

Table 2 – FY Fund Collections

Fiscal Year	Amount Collected (in Millions)	Balance June 30 (in Millions)
2008–09	$7.5	$15.2
2009–10	$7.0	$14.4
2010–11	$8.1	$16.4
2011–12	$8.0	$17.5
2012–13	$8.0	$16.6

The Prepaid Wireless Surcharge Act (Prepaid Act) became effective July 19, 2012. Under the Prepaid Act, beginning January 1, 2013, each retail seller of prepaid wireless telecommunication services collects wireless 9-1-1 surcharges directly from the consumer at the point-of-sale. The amount of the surcharge collected per retail transaction is based on an annual determination by the Nebraska Department of Revenue.

Retail sellers are allowed to deduct and retain up to 3 percent of the surcharges collected. Amounts collected are remitted by retailers to the Department of Revenue, which remits the collected amounts, less administrative costs not to exceed 2 percent, to the State Treasurer for credit to the Wireless 911 Fund and TRS Fund. Table 3 reflects the revenue the PSC has received from prepaid wireless surcharges in 2013.

Table 3 – 2013 Prepaid Wireless Surcharges

Month	Amount
February	$28,999.34
March	$52,819.95
April	$70,853.20
May	$87,813.04
June	$60,701.34
July	$76,910.31
August	$56,778.66
September	$69,657.93

Current wireless remittance forecasts were updated to identify any effect due to the change in prepaid collection points. Results indicated a downward change to the forecast, indicating a further decrease in monthly fund remittances and the fund balance are expected.

The Wireless 911 Fund is to be used for the costs of administering the fund and for other eligible expenses as determined by the PSC with input from the Enhanced Wireless 911 Advisory Board.

For PSAPs, eligible expenses include costs for the provision of wireless E9-1-1 service related to equipment, software, GIS data, maintenance, telecommunications services, trunking, translation services, personnel, training and capital expenses. Enhanced Wireless 911 funds can only be used for the portion of expenses related to the provision of wireless E9-1-1 services. In the case of expenses that relate to the provision of both wireline and wireless 9-1-1, PSAPs can use enhanced wireless 9-1-1 funds for a percentage of the costs based upon their actual wireless 9-1-1 call volumes, filed with the PSC at the time of their annual application for funding or the PSC determined default of 55 percent, whichever is greater. In addition to the support paid directly to PSAPs, the PSC pays LEC charges on behalf of PSAPs based upon a tariffed rate per wireless subscriber.

For wireless service providers, eligible expenses include software and equipment necessary for the provision of enhanced wireless 9-1-1, database management, transportation, and facilities to carry wireless E9-1-1 calls to the selective router. Eligible expenses do not include personnel costs or the construction of towers; however, certain capital expenses related to tower equipment directly related to the provision of wireless E9-1-1 service are eligible.

The PSC sought and received an Attorney General's Opinion with respect to its jurisdiction as it relates to the implementation of NG9-1-1 as an eligible expense. The Attorney General found the PSC lacks the jurisdiction to utilize the Fund for NG9-1-1 implementation.

The PSC is assisted in its allocation of money from the Fund for annual support amounts to eligible PSAPs and wireless service providers by 911-SAM. Individual funding amounts for PSAPs are approved taking into account their allocation from the 911-SAM, deductions, and any advances for special circumstances. Individual funding amounts are also approved for wireless service providers.

PSAPs and wireless service providers must submit an application for funding annually for the following FY. The distribution of funding is released by an order entered by the PSC in May for the next funding year and outlines amounts for each PSAP and wireless service provider, as well as the amount of funding available through the Wireless Service Provider Grant Program.

Payments of annual funding amounts are made to PSAPs on a monthly basis over an 11 month period. Funding received must be used for eligible expenses incurred during that funding year and are accounted for in an annual audit filed on October 15. However, PSAPs may request alternate payment schedules to accommodate special circumstances.

The annual allocations for wireless service providers are paid no more than monthly in arrears based upon receipt of documentation filed by providers for eligible expenses incurred. Wireless service providers may request all or any portion of their annual allocation so long as documentation supporting expenditures is provided. Under no circumstances will the total payments made exceed the annual allocation.

Only one wireless service provider has applied for grant program funds to date and the grant program is being phased out over a 5-year period. Additional funding is being made available to wireless service providers through the annual allocation and the list of eligible expenses was amended to include the capital expenses that had previously been eligible for reimbursement through the grant program.

3.3. NG9-1-1 STATUTORY AND REGULATORY FRAMEWORK

In the course of preparing the February 2013 Report to Congress on the Legal and Regulatory Framework for Next Generation 911 Services, the Federal Communications Commission (FCC) sought public comment on the role of state governments in the transition to NG9-1-1.

The consensus view expressed by commenters is that state and local authorities should retain their primary role in the management and development of NG9-1-1 by PSAPs, and that general state and local oversight authority for these matters should not be supplanted by the federal government, even in light of the sweeping changes to networks and technology involved in the transition to NG9-1-1.

While there was general agreement on the importance of state and local authorities retaining their traditional PSAP oversight roles as NG9-1-1 develops, many commenters contend that the transition to NG9-1-1 will be achieved more quickly and cost-effectively where decision-making and oversight authority are focused at the state, as opposed to local, level. The National Emergency Number Association (NENA) stated that “[e]xtensive experience in the laboratory of the states has demonstrated that this type of oversight and coordination [at the state level] is most effective when undertaken by an independent body of representative stakeholders.”[4] Commenters noted that about half the states have established state-level 9-1-1 boards or similar entities, and support action by Congress to increase the effectiveness of such boards and to encourage their establishment by states that have not yet done so.

[4] http://www.fcc.gov/document/legal-and-regulatory-framework-ng911-services-report-congress, viewed January 2, 2014.

The NENA Next Generation Partner Program's Next Generation 9-1-1 Transition Policy Implementation Handbook provides an overview of the key policy, regulatory, and legislative issues that need to be considered to facilitate the transition to NG9-1-1.

According to the Handbook, although the staffing of PSAPs and handling of 9-1-1 calls (and associated emergency response) will generally remain a local function, subject primarily to local decisions, aspects of NG9-1-1 will require state-level planning and implementation coordination. For example, network and related information delivery functions will no longer be agency-specific, but will be shared by authorized emergency agencies. Such shared ESInets may be developed and managed locally or regionally, but need strong state-level leadership and coordination to ensure both operability and interoperability of state, local, and regional ESInets, and to ensure they conform to applicable policies and industry-based standards. Further, coordination with national entities to ensure statewide compliance with required standards, federal policies and the like is best accomplished when coordination occurs at the state level.

"Each state needs to have an organization, with appropriate authority, responsible for planning, coordinating and implementing the NG9-1-1 system that reflects the following:

- State-wide scope
- Coordination within the state and with adjacent states and federal authorities;
- Coordination with other emergency service functions and other relevant stakeholders involved in the development and implementation of seamless, end-to-end Next Generation emergency communication services;
- The appropriate adoption of industry-based standards, rules, policies and procedures by stakeholders necessary to support such deployment…"[5]

3.3.1. NG9-1-1 Funding

The current wireless 9-1-1 funding mechanism has produced a balance of $16 million. Because transition will not be a flash cutover, initial stages of the implementation of NG9-1-1 could be accomplished utilizing those funding sources as operating data for NG9-1-1 is collected. It would be important that close monitoring and follow-up was done to ensure that future revenues are adequate to support and sustain NG9-1-1 service and funding legislation must allow for flexibility and the provisioning of all necessary elements for NG9-1-1.

3.4. CONCLUSION

While capable of supporting E9-1-1 service, the current statutory and regulatory framework for the management and funding of 9-1-1 services in Nebraska was not designed to support a statewide NG9-1-1 system. However, it does form the basis for the development of a new framework that can support management and funding of a statewide next generation system.

[5] http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/ngpp/ng911_transition_policy_impl.pdf., page 7, viewed January 2, 2014.

4. FINDINGS – STATEWIDE 9-1-1 NETWORK CAPABILITIES

4.1. NETWORKS

There are several statewide networks in place, but each serves a specific function; for example education, healthcare, homeland security, and land mobile radio (LMR) communications. Currently roadblocks bar the transport of voice services across these networks with the exception of the NRIN network, which is funded through homeland security grants. Roadblocks also limit the use of networks funded by grants based on varying stipulations in the grant itself. For instance, the education network can only be used for educational purposes per the rules of the federal grant used to build it.

There is no coordinated effort for maximizing the availability of these networks and there are no statewide strategies for effectively and efficiently implementing these mixed media networks.

4.1.1. Fiber Optics

Survey results and subsequent discussions with responding service providers show a wealth of fiber optic transport exists in Nebraska, owned and operated by LECs of all sizes, around the state. There is one consortium of seven incumbent local exchange carriers (ILECs) that not only coordinates the extensive network of its members, but also has inter-connection agreements with almost every LEC in the state There are also fiber-to-the-premise (FTTP) deployments that would allow for a complete fiber optic, Ethernet-based connection to certain PSAPs. Many of these providers already provide some level of services to the PSAP(s) in their service areas. These services range from internet to delivering centralized automatic message accounting (CAMA) trunks and automatic location identification (ALI) links to their existing customer premise equipment (CPE). Most providers with an FTTP deployment have expressed a willingness to construct dual entrances (east-west) facilities to PSAPs in order to provide physical redundancy. It was not unusual to see 1 gigabyte (GB) circuits offered to the premise and 10 GB backbone circuits offered on the transport.

4.1.2. Wireless Network

A statewide wireless network, NRIN, is being deployed to PSAPs around the state. At present, the NRIN network is a 100 megabit (MB) microwave network with an effective bandwidth of 85 MB. For a backbone transport network, this is not sufficient to support a statewide NG9-1-1 network, but it could be used as a PSAP backup network in an emergency.

Statewide, 4G LTE wireless coverage is expanding and is also a viable backup network for PSAPs, though there is the risk of losing towers in certain situations. LTE service offers some measure of portability and flexibility, characteristics which are especially important in the event of a disaster. Satellite data network services, such as Hughes, are also available. Either LTE or satellite would be suitable for use with a mobile command post or communications unit.

4.2. 9-1-1 CALL ROUTING

Nebraska is served by two selective router providers: CenturyLink (former Qwest territory) and Windstream. CenturyLink operates six selective routers: Council Bluffs and Sioux City, Iowa; and Grand Island, Norfolk, and Scottsbluff, Nebraska. Windstream operates one selective router in Lincoln, Nebraska.

Although ILECs across the state serve many PSAPs with CAMA trunks, ALI links, and internet/data service, the calls are routed to the selective routers and are then returned to the ILEC for transport to the PSAPs.

Wireless Phase II is currently implemented throughout most of the state; there are still a few remote areas where the PSAPs are only able to receive Phase I.

4.3. NETWORK MANAGEMENT SOLUTIONS

MCP met with the OCIO who sets network standards and guidelines, but has no rule-making authority. The OCIO operates a Network Operations Center (NOC) function for state networks, and provides performance statistics and outage reports. The OCIO has multi-member teams that work together on each project

5. FINDINGS – 9-1-1 OPERATIONS

As expected, 9-1-1 operations vary significantly across the state, depending on population and funding sources. Operations may be the area that is most impacted by the transition to NG9-1-1. To provide equal services to Nebraska citizens, no matter where in the state they are, the ability to understand and implement i3 services at the level of expectations documented by NENA, the Association of Public-Safety Communications Officials, International (APCO) and federal organizations will entail numerous changes in PSAP operations. Recommendations for those changes are included in this report

In some of the smaller PSAPs, MCP observed that 9-1-1 call handling is not the primary function of the call takers. The person receiving, handling, and dispatching calls may be a key person in jail management, bill collections, and other functions. There is concern that call handling and dispatch is tied to their jail services and if that PSAP were to be part of a consolidation effort, it could cause them to lose significant justification for their jail service.

Connectivity and 9-1-1 in-bound call services vary significantly across the state; in some remote areas in northern and eastern Nebraska, service providers do not provide reliable service or redundancy and resiliency options. There are efforts to implement fiber in some areas that have experienced prolonged outages. However, addressing these types of issues appears to be reactive to outages as opposed to a strategy.

In addition, some areas in the northern portion of the state appear to not have enough radio towers for triangulation of calls needed to obtain precise locations. This means that the location may be within 1,700 meters or greater, meaning that the location of a wireless 9-1-1 call could be incorrect by over a mile, creating a high risk of loss of life.

5.1. CALL HANDLING

From the 44 PSAPs that provided information, nine vendors provide call handling solutions. Some products, such as the TCI, CS1000 and Rescue Star, are end-of-life. Emergency Call Works is gaining percentage, as all solutions have been installed in the last few years. Table 4 lists the vendor and their solution percentage of the PSAPs contacted. The table may be slightly skewed for percentage across the state in that the PSAPs that utilize VIPER probably had a higher percentage of response to our request than some of the other PSAPs that likely have other 9-1-1 call handling systems.

Table 4 – Call Handling Vendors

9-1-1 Call Handling	
Vendor	**%**
VIPER	26
Cassidian Pallas	16
Emergency CallWorks	13
Zetron	12
TCI	12
PlantCML Rescue Star	10
Solacom	7
Plant MAARs	2
CML1000	2

MCP found that many vendors have programs that “upgrade” the end-of-life systems by replacing everything. It is essentially a replacement of non-i3 compatible hardware and software with i3-compatible solutions. As an “upgrade,” it may be able to easier to negotiate purchasing requirements.

As the 9-1-1 call handling systems are evaluated, it may be necessary to have three lists for prioritization. The CML1000, MAARs, Plant CML Rescue Star and TCI systems are the most out of date systems; this resultant 26 percent of the systems should be reviewed first for replacement. The second list would include the Cassidian Pallas and Zetron systems, which comprise 28 percent of the total. VIPER, Emergency Call Works, and Solacom systems can likely be upgraded to i3 without being replaced.

5.2. LOGGING RECORDERS

Call logging recorder solutions vary significantly across the state. Less than 10 percent of the PSAPs are considering upgrades or changes to their logging recorder solutions that will enable them to

function in an i3 environment. Table 5 lists the vendor and their solution percentage of the PSAPs contacted.

Table 5 – Logging Recorder Vendors

Logging Recorders	
Vendor	**%**
Eventide	19
DSS Corporation	16
Red Box Recorders	16
NICE	12
WahlTek	9
Stancil Solutions	7
OnviSource, Inc.	5
None	16

Most logging recorders will require replacement to function in an i3 solution. Some vendors have "upgrades" similar to those in 9-1-1 call handling, which requires a replacement of all components.

Of concern is some county attorneys have recommended that their county not use logging recorders, with the thought that their use increases the county's exposure to risk of liability. A key function of 9-1-1 call logging recorders is to provide protection for those taking the calls. There are many documented instances where callers have made claims against the way that a 9-1-1 call was handled, and the call recording supported the professional manner in which the call was handled.

5.3. COMPUTER AIDED DISPATCH (CAD) SYSTEMS

CAD systems vary across the state. Approximately half of the PSAPs do not use a CAD system, relying on some form of paper recording. Table 6 lists the CAD system vendors and their solution of the PSAPs contacted.

Table 6 – CAD System Vendors

CAD	
Vendor	**%**
Sleuth	19
SunGuard	7
Motorola	7
A.L.E.I.R. (Automated Law Enforcement Incident Report)	5
Spillman	2
Emergency CallWorks	2
Information Technologies, Inc. (ITI)	2
Hunter ACS	2

CAD	
Vendor	**%**
Archonix Systems	2
Zuercher Technologies	2
None	50

5.4. MANAGEMENT INFORMATION SYSTEMS (MIS)

MIS solutions also vary across the state. It appears that some PSAPs with an MIS package lack the training or understanding required to generate reports. The primary reason many PSAPs did not provide information for the survey is that the agencies do not have an MIS solutions that tracks calls. The amount of time and effort to go through paper forms required more time than current workforces had available.

Paper documentation of calls will vary greatly in accuracy. When the logging of administrative calls was discussed, indications were that most were logged, especially “important ones.” This means that call volumes may be inaccurate.

As PSAPs move to NG9-1-1, successful use of MIS systems becomes imperative. The state of Nebraska can address this in several ways: require that NG9-1-1 call handling systems meet MIS requirements for accurate and easy to use reports or the state of Nebraska can use a software as a service (SaaS) solution such as ECaTS.

6. FINDINGS – GIS

A high-level quality assessment on specific GIS data was performed on the data provided by the State. The GIS data used for the assessment was downloaded from the Nebraska PSC GIS Data Repository. The assessment performed a series of conformance tests with current and draft NENA standards and best practices. The street centerlines and emergency services boundaries were the primary data layers assessed.

Current NENA GIS data standards are in exhibit 22 of NENA 02-010 *Standard Data Formats for 911 Data Exchange & GIS Mapping*. Best practices were identified from NENA 71-501, *Information Document for Synchronizing Geographic Information System Databases with MSAG & ALI*, and NENA 02-014, *GIS Data Collection and Maintenance Standards*.

There were 298,614 records in the road centerlines data, representing the estimated centerline of a roadway in the real world. Road centerlines are linear segments with a beginning point and an end point, called nodes. A road segment will have a beginning node and an ending node. The beginning and ending nodes are important for interpolating the estimated location for an address point.

Each road segment also has a left and right side. The left and right side of a road segment is defined relative to the beginning node. If a person were standing at the beginning node, the beginning point of the road centerline, and looking toward the end node, the left side of the street is on the same side as the person's left hand and the right side of the street is on the right hand side of the person.

Each road segment has left and right side attributes for emergency service numbers (ESNs), city, zip code, postal community, and Master Street Address Guide (MSAG) community. Each road segment also has four address ranges representing left low address, right low address, left high address, and right high address.

When an address is geocoded, the location of an address is interpolated by locating information contained in the GIS data including the street name and emergency service zone (ESZ). The four address range fields are used to derive an estimate of the address location.

The assessment indicated that the majority of the GIS road centerline data was of high quality. The road centerline assessed compliance with the NENA 02-010 standard using of a series of tests. Table 7 depicts the tests performed, the count of those records that failed the test criteria, the percentage of the failed to the total number of records, and an example of the errors detected.

Table 7 – Road Centerline Tests

Test Performed	Count	Percent of Total	Example of Error
Address Range = 0	13,077	4.38%	Zero_Range
Invalid Prefix Directional	2	0.00%	EB, WB
Street Name is blank	956	0.32%	Unnamed streets
Invalid Street Type	6,227	2.09%	91, AV
Invalid Post Directional	2,593	0.87%	Directionals (N,S,E,W) in Street Type flied
Invalid Road Classification	298,614	100.00%	Field not present in the data
Invalid One-Way	298,614	100.00%	Field not present in the data
Invalid Postal Community Left	298,614	100.00%	Field not present in the data
Invalid Postal Community Right	298,614	100.00%	Field not present in the data
Invalid ZIP Left	298,614	100.00%	Field not present in the data
Invalid ZIP Right	298,614	100.00%	Field not present in the data
Invalid MSAG Community Left	298,614	100.00%	Field not present in the data
Invalid MSAG Community Right	298,614	100.00%	Field not present in the data
Invalid ESN Left	15,637	5.24%	No value in Left ESN field
Invalid ESN Right	15,836	5.30%	No value in Right ESN field
County Name Left	298,614	100.00%	Field not present in the data
County Name Right	298,614	100.00%	Field not present in the data
State Left	298,614	100.00%	Field not present in the data
State Right	298,614	100.00%	Field not present in the data
Date record updated	0	0.00%	No issues
Source of data	298,614	100.00%	Field not present in the data

The “Address Range = 0” test selected all records in the road centerline data where the lower left, lower right, upper left, and upper right address ranges were all equal to zero. Slightly more than 4 percent of the total records had an address range of 0. Being able to locate the address of a 9-1-1 call or dispatching the proper emergency responders to the location of an incident depends on being able to interpolate the address from the address range data contained in the road centerline data. Certain road segments, such as entrance and exit ramps, do not require address ranges.

The road name prefix direction should be N, S, E, W, NE, NW, SE, SW, or blank. Any other characters in this field counted as an error. There was one EB and one WB in the road centerline data.

There were 932 records in the road centerline data that do not contain a street name. All streets, including entrance and exit ramps, should be named. The street type field contained 6,227 invalid entries. Street types are defined by NENA such as AVE for avenue, BLVD for boulevard and ST for street. The majority of the invalid street types in the data were due to highway numbers incorrectly placed in the street type field, such as 91 for Highway 91, or were due to the incorrect street type abbreviation being used, such as AV rather than AVE.

The street post directional field should be N, S, E, W, NE, NW, SE, SW, or blank. There were 2,593 invalid entries in this data field, the majority being street types, such as AVE or RD, being misplaced in the street post direction field.

Road centerlines are often the dividing feature between different counties, townships, municipalities, PSAPs and emergency service boundaries. Because of this, road centerline data has different attribute fields for the left and right side of a roadway.

The tests indicating 100 percent error in Table 7 is the result of these fields not being present in the road centerline data.

Road type classifications are useful for assigning different colors and line widths to the map display, so a major road looks different from a private road or a driveway on a telecommunicator’s map display. NENA recommends road types defined as Interstates, Freeway or Expressways, Minor Arterial, Major Collector, Minor Collector, Local streets and trails. Trails are restricted to non-vehicular traffic. There was no road classification in the road centerline data.

NENA standards require each road centerline contain information on the name of the county and state on each side of the road centerline. Left and right county, zip, postal community, MSAG community and state fields are missing from the road centerline data. It is vital when individual counties begin sharing GIS data with neighboring counties these fields are present in the data. The source of data field was also missing from the road centerline data. This field typically the name of the agency providing the in the data layer, which is useful for determining the contact for updated data.

The Left ESN field contained 15,637 blank values, while the Right ESN field contained 15,836 blank values. These fields are by PSAP maps displays to determine the correct ESN with which to geocode a civic address.

The date the record was updated was present in all records.

Many of the fields shown as not present in the road centerline data is relatively easy to correct. The county, state, and MSAG community information is in the MSAG databases. The postal communities and zip information is a bit more challenging to determine, but as one moves toward NG9-1-1 these data fields become increasingly more important.

The emergency services boundaries or ESZ data was also tested for conformance with NENA standards and best practices. ESZ are geographical representations of the ESNs used for selectively routing 9-1-1 calls to the proper PSAP. The ESN is defined by the PSAP authority in the MSAG. The MSAG contains address ranges, street names, communities, and other information that define each ESN. ESN and ESZ information are also associated with the correct law enforcement, fire or emergency medical services (EMS) responder to a given area.

The ESZ data was also of high quality, with only a few NENA standard fields missing from the data. Table 8 depicts the NENA 02-010 standard conformance test performed on the ESZ data layer. The test performed a count of records not meeting the test criteria, a percentage of the records not meeting the test criteria divided by the total number of records, and an example of the errors detected.

Table 8 – ESZ Tests

Test Performed	Count	Percent of Total	Example of Error
County Name Exist	994	100.00%	Not present in data
County FIPS Code Exist	0	0.00%	No issues
PSAP ID Exist	994	100.00%	Not present in data
Agency ID Exist	0	0.00%	No issues
ESN	0	0.00%	No issues
Date record updated Exist	0	0.00%	No issues
Source of Data Exist	994	100.00%	Not present in data

Several NENA fields do not exist in the data. The name of the county associated with the Federal Information Processing Standards (FIPS) code should exist in the data. The FIPS codes exist, but not the name of the county.

The PSAP ID field should be added and properly populated with the information given by the FCC Master PSAP Registry.

The source of the data field should be added to the data and properly populated with the agency or entity providing the data.

A review of the GIS data indicated that there are topology errors within the road centerline and the ESZ data. Topology errors occur when the geographical extent of a particular ESZ or municipal boundary is not congruent with adjacent boundaries. This non-congruency indicates areas of overlap or gaps within the data layer. Topology errors can be corrected by ensuring adjacent road centerlines and ESZ boundaries meet at a common point, such as a shared county boundary or an agreed to point.

NENA's draft NG9-1-1 GIS Data Model standard, expected to be published in the first quarter of 2014, is designed to meet the needs of an i3-compliant NG9-1-1 system and be backwards compatible with today's E9-1-1 systems. Within an NG9-1-1 system, the ability to validate locations and routing of an emergency call will depend on the standardization, quality, and accuracy of the GIS data being used.

7. NG9-1-1 REQUIREMENTS

"NENA Baseline NG9-1-1 is a description of a basic set of features & functions that constitute a NENA Standards based Next Generation 9-1-1 solution, on the path to end-state i3 architecture. The i3 architecture components are only one aspect of NG9-1-1. There are more components that make up a complete NG911 'system'. As future needs are identified, overall NG9-1-1 standards will be updated."[6]

A baseline NG9-1-1 system must include the functions of today's E9-1-1 system, which includes all network and PSAP system components, as well as capabilities beyond E9-1-1 functionality, such as the ability to support text and video. While these forms of communication may not be immediately available, baseline NG9-1-1 has the system functionality to support multimedia, perform routing, provide for call media logging, and enable PSAP/caller interactive communications.[7]

According to NENA, required components or capabilities of baseline NG9-1-1 include the following:

1. ESInets
2. GIS data creation to support NG9-1-1 validation-related databases and legacy originating services
3. Publication of authoritative NG9-1-1 validation-related databases
4. Geospatial-controlled IP software call routing functions
5. Publication of authoritative NG9-1-1 routing data for state and regional levels
6. Support for transfer of calls with accumulated call taker notes and added data, or an access key to such data, to any authorized entity interconnected by ESInets
7. Ability to interconnect with other NG9-1-1 systems and to interwork with other E9-1-1 systems

[6] http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/Docs/NENA_Baseline_NG9-1-1.pdf, viewed January 2, 2014.
[7] Ibid.

8. Support for system monitoring/logging/discrepancy reporting necessary to support troubleshooting and on-going operation and maintenance[8]

Additional information on baseline NG9-1-1 can be found at http://www.nena.org/?NG911_Baseline.

7.1. TEXTING AND NG9-1-1

When MCP supported the "Town Hall" meetings across the state, the leading area of concern regarding NG9-1-1 by those in attendance, including the media, was the subject of texting 9-1-1.

The top four carriers committed to the FCC to provide the ability to support text to 9-1-1 via Short Message Service (SMS) delivery by May 2014. What is not clear is exactly how that delivery will be operationalized. The Alliance for Telecommunications Industry Solutions (ATIS), the group who helped develop the standards for the carriers, realizes that the majority of today's texting utilizes Multimedia Messaging Service (MMS). It is unclear, at this time, if the carriers will be re-formatting the MMS messages to fit the more limited SMS formats, or exactly how that effort will be implemented. It is known that much of what constituents consider texting today will likely not be fully supported with this initial effort. Because of this issue, this solution is considered an interim text solution. MCP also knows that support of what many constituents would consider texting, today, may or may not be provided with this interim solution.

One of the more publicized capabilities is that carriers will provide "bounce back" messages that will instruct a consumer who attempts to send a text to 9-1-1 to instead dial 9-1-1 when text to 9-1-1 is not available. Handsets roaming on a network will provide bounce back messages to the user assuming the user's originating service provider has subscribed to Text Control Center services. There is a lack of consistency in terms of what happens when a person is using an alternate carrier. Many of the non-four top carriers are also implementing text and bounce-back services; however, availability of these services will vary from carrier to carrier. Nebraska needs to have a clear understanding of which carriers in their state do and do not provide these two services.

Nebraska must ensure they understand specifically how these capabilities work and the environments in which the capabilities will differ. The public must be properly educated on the capabilities and limitations of this service.

Nebraska must also understand that this is the first of many steps the carriers will make to provide text to 9-1-1 messing services to meet the expectations of the public.

As Nebraska implements their NG9-1-1 governance structure, the ability to understand, communicate and educate NG9-1-1's current abilities and foreseen change will be paramount. Nebraska should consider partnering with the Nebraska Commission for the Deaf and Hard of Hearing as well as the Nebraska Commission for the Blind and Visually Impaired.

[8] Ibid.

Public service announcements may be necessary to educate the public as a whole of the current inability of 9-1-1 resources to accept text messages from the public. Many people today do not realize that a text cannot yet be sent 9-1-1.

8. RECOMMENDATIONS – REGULATIONS AND GOVERNANCE

The current state-level organizational structure for the management and funding of 9-1-1 services in Nebraska is capable of supporting current E9-1-1 services, but was not designed to support migration to a statewide 9-1-1 system. Yet it forms the basis for the development of a new framework that can support a statewide NG9-1-1 system. A new integrated governance structure is a “must have” if the state of Nebraska is going to transition to NG9-1-1. As NG9-1-1 deployment progresses from initial planning to fully operational status, current roles and responsibilities among all entities involved in providing 9-1-1 services will change and the current legal and regulatory environment will likely not effectively accommodate new technologies and arrangements. Planning and implementing an NG9-1-1 ESInet will require increased coordination and partnerships among government and public safety stakeholders, 9-1-1 authorities, service and equipment providers, and PSAP administrators.

As Nebraska looks at connectivity between PSAPs and regions of PSAPs for implementing NG9-1-1, structured governance and inter-relations governance processes, procedures, and policies move from being desirable to a necessity. For example, there is the potential for one location to become infected with a virus or trojan. Without structured governance and inter-relations policies, when a location requires attention, then one of the perceived strongest will make tough decisions. Going forward there is a potential for lingering feelings of dis-enfranchisement and lack of fairness that will inhibit implementation of NG9-1-1 with other entities, as a whole, working as effectively and efficiently as possible.

Early in the process of determining an NG9-1-1 strategy, governance should be explored; this is an area in which Nebraska will likely need assistance. The success of this governance model will be directly impacted by how early this governance model is created and a communications plan is implemented between the different layers of the model. The Council of Regions will be a critical component as it is the key level for ensuring that the Functional Tier has a voice and that the Functional Tier has confidence in the NG9-1-1 plan, and will provide the services, communication and support that the PSAPs and constituents desire and need.

Pre-determined and documented policies on how a PSAP or region may be quarantined, remediation of the offending issue, and re-instatement, along with communication protocols and processes for these steps will allow the State and PSAPs to focus on solutions instead of blame. Thoughtful inter-relations policy puts the constituents of these PSAPs in the greatest possible position for their mission critical needs being addressed in a timely manner.

For connecting to other entities, some of Nebraska’s governance strategy must include:

1. Governance plans

2. Detailed results-driven change management processes
3. Change Management Board
4. Change Manager

In an Information Technology Infrastructure Library (ITIL) format, the change management process is coordinated with like processes.

Figure 1 – Change Management Process

Multiple reasons support the requirement of having a strong governance plan; from a technical perspective it includes the following:

- Identification of statutory or regulatory constraints related to implementing an ESInet and the deployment of related technologies
- Establishment of policy authority to determine and oversee PSAP coordination of connectivity standards, utilization guidelines and system requirements
- Connectivity Standards – Setting of minimum technology standards for connectivity and sharing of information from one PSAP to another PSAP and from one ESInet to another ESInet

- Utilization guidelines – Defining the applications and services that can be accessed and utilized, and determining how these applications and services can be accessed and utilized
- System requirements – Defining security and other requirements for connectivity
  - Establishment of a contracting authority
  - Establishment of a procurement authority
  - Requirements for meeting Criminal Justice Information Services (CJIS) policy(s)
  - Requirements for meeting specific security policies

Inter-agency agreements must be in place for the following items:

- Emergency dispatch services
- IT Security Policy
  - Compliance requirements to connect
  - Terms, conditions, and procedures for disconnect
- CAD and CAD-related mobile applications
- Land Mobile Radio
- IT services
  - Hosting and co-location
  - Broadband wireless networking
  - Application development and maintenance

Such agreements would include, when appropriate, governance, funding, procurement, operational and support service level agreements (SLAs), roadmaps, etc. The group that would oversee the processes and procedures, and ensure that decisions are made using mutually beneficial methodology, would be a governance council. This council provides the important oversight elements for successful operations. Overarching areas that must be addressed include the following:

- Fairness – It will be critical for this governance council to be structured and conducted in a manner that provides fairness to all PSAPs to protect the interest of the constituents in smallest counties and equally protect the constituents of the largest counties.
- Tough Decisions – It is a matter of time before a decision will need to be made on whether to quarantine an entity, for the best of others, because of corrupted software or the entity is infected with a virus. There has to be a clear policy, processes and procedures for who will make those tough decisions, how that entity will be quarantined, what will be done to effectively address the problem, and what steps will be taken to bring that entity back on line, as soon as possible.

8.1. STATE-LEVEL OVERSIGHT AND AUTHORITY OVER PSAPS

While visiting the PSAPs, it was apparent the PSAPs believe the State has no one in place who understands the complexity of PSAP operations. The State has funding authority, but no authority to direct and lead the PSAPs into the NG9-1-1 arena. For example, many PSAPs are connected to various copper, fiber, or microwave networks that they do not fully understand, nor were the benefits to the PSAP explained. Some PSAPs were dismayed that they were expected to support and maintain

this network but had no expected return on investment (ROI) because they failed to see or understand their network's benefit.

The State should introduce a two-pronged approach to oversight and authority over the PSAPs. The State needs to maintain funding control, but also needs to explore the operationalization of those funds within the PSAPs. MCP recommends both a technical and an operational component to the State's oversight. The technical part is relatively easy; the human factor creates complications and additional risk. Nebraska can provide telecommunicators with the technology, but if no one, either at the state-level or PSAP-level, is properly trained or held accountable for clear and defined performance goals, then the State cannot ensure the public is receiving the level of service the State expects to deliver.

Many PSAPs in Nebraska will face challenges making the transition from E9-1-1 to NG9-1-1. From an operations perspective, the ability to achieve the true potential of NG9-1-1 will require significant adjustment and change that will require oversight from the governing body significantly beyond what PSAPs perceive they are receiving currently.

The increased quantity of available multimedia data will enhance and expand existing call taking functions. It may also extend the time it takes to process 9-1-1 calls, increase the workload of the call taker, and significantly change the call taker's experience (e.g., seeing the incident unfold in pictures and video versus hearing the incident). Revamped introductory training, as well as continuing education and retraining for experienced staff, will be critical to the success of any NG9-1-1 implementation. Properly designed training programs can enable PSAP managers and supervisors to prepare dispatchers and call takers to effectively utilize the data presented by an IP-enabled system, while maintaining the level of service expected by the public.

The PSAPS in the state of Nebraska will confront the challenge of managing a wider set of shared resources than is typical in the current system, enhancing and expanding capabilities while ensuring personnel, including call takers, expeditiously and correctly handle the new workload. Responsibilities will likely expand, particularly with regard to configuring and managing the NG9-1-1 system.

Currently, there is a perception from the PSAPs that the amount of communication and support by individuals with PSAP operational experience is lacking within the PSC. Of importance will be clear communication plans with understood processes. The state of Nebraska has multiple options for addressing communications.

8.2. PERFORMANCE MEASURES AND GOAL SETTING

Clearly defined and attainable performance goals should be set for the PSAPs based upon nationally recognized best practices. Once the performance goals are set, then the appropriate training plans should be developed to support the goals. Funding should be appropriated for the training materials, equipment and, if possible, the courses themselves. The courses should be conducted in regional areas to ensure the rural PSAPs have the ability and means to attend.

Most PSAPs surveyed rely on the State to provide the training for their telecommunicators, if their staffing allows. Telecommunicator training should be mandatory, and the requirements clearly defined to allow the PSAPs to follow a training plan within a set period of time. For example, the State of Texas provides their telecommunicators with training plans, training aids, and schedules on their website.[9] Texas recently adopted the licensing of telecommunicators. MCP is not recommending the State of Nebraska pursue licensing at this point; although it may be a future goal.

9. RECOMMENDATIONS – OPERATIONS

9.1. NG9-1-1 TRAINING OF PSAP STAFF

With the expectation of new data being presented to PSAP staff, the State of Nebraska will need to provide all staff with proper training to handle the influx of new data sources. Localities will maintain control and set policies and procedures on data storage and retention, and dissemination of data. However, the State will need to provide standards, and processes for enforcing adherence to those standards, for the training of PSAP staff.

MCP suggests a committee comprised of PSAP management and dispatchers to provide input on the training standards that should be in place as well as criteria for meeting the training standards. Maintaining training may be a struggle for rural PSAPs if there is not support from the State. Several options are available for ongoing training, such as:

- Web-based training classes that can be attended from the PSAP workstation
- On-demand training programs where the PSAP logs into a website and completes the training at their pace
- Regional-based training classes within minimal driving distance of rural PSAPs so personnel can attend without costly overnight stays

A key requirement is to develop the training in modular format. This allows for an element of the training program to be easily changed without a major impact to the training tools. The State should have standard training guidelines; APCO, PowerPhone, or others are possibilities.

The State should mandate that anyone answering a 9-1-1 line must meet minimum requirements to ensure the public has the confidence their calls will be answered with the same level of service no matter where they are within Nebraska.

9.1.1. Performance Metrics

Performance metrics measure the operational efficiency of a PSAP against targeted goals and established standards. The most common metric involves the average time it takes a PSAP to answer

[9] http://www.tcleose.state.tx.us/content/licensing_certifications.cfm

its incoming emergency calls. PSAPs typically try to align their call answering goals to either NENA or National Fire Protection Association (NFPA) standards.

NENA 56-005, *9-1-1 Call Answering Standard/Model Recommendation*, recommends that "Ninety percent (90%) of all 9-1-1 calls arriving at the Public Safety Answering Point (PSAP) shall be answered within ten (10) seconds during the busy hour (the hour each day with the greatest call volume, as defined in the NENA Master Glossary 00-001). Ninety-five (95%) of all 9-1-1 calls should be answered within twenty (20) seconds."[1]

NFPA 1221, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*, focuses on emergency communications systems and PSAP operational best practices. The latest edition (2013) of NFPA 1221, section 7.4.1, states that "Ninety-five percent of alarms received on emergency lines shall be answered within 15 seconds, and 99 percent of alarms shall be answered within 40 seconds."[2]

The State should consider adopting a national standard as their performance benchmark.

9.1.2. Sharing and Consolidation of Services

The committee mentioned above should be tasked with some very tough challenges. NG9-1-1 requires a significant amount of change in operations. Some current PSAPs and PSAP personnel who are currently performing well may struggle with those changes. MCP's work in Nebraska made it clear that, today, there is not equal service for every constituent in Nebraska. To provide equal service to all Nebraska constituents, no matter where they live, this committee should evaluate every PSAP and make some evaluations based on three criteria.

1. Can the current PSAP and PSAP personnel make the transition to NG9-1-1, which involves updating GIS almost real-time, learning how to disseminate and manage these new media formats, and providing the services in the manner that NG9-1-1 will require as long as they have good processes and systematic quality training, effective communication plans, and consistent support?

2. Can the current PSAP and PSAP personnel leverage their knowledge of the locality in which they live to effectively dispatch the correct first responders to the correct locations, in the NG9-1-1 world, as long as they have good processes and systematic quality training, effective communication plans, and consistent support? Would the PSAP be better sharing the NG9-1-1 call handling with their neighbors in a regional format?

3. Will that PSAP potentially struggle with transitioning to NG9-1-1, regardless of good processes and systematic quality training, effective communication plans, and consistent support? Would

[1] NENA Call Answering Standard/Model Recommendation, Document 56-005 Section 3.1 June 10, 2006
[2] NFPA 1221 *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* (Edition 2013), Section 7.4.1.

the best thing for their constituents be to share NG9-1-1 call handling and dispatching with neighbors in a regional format?

These types of decisions should never be taken lightly; real people with real responsibilities have often invested their lives servicing their communities for a long time. There comes a time when the best long-term stewardship of NG9-1-1 resources has to be the leading issue. MCP has no recommendations for any of the three choices at this time. These types of decisions require a lot of thoughtful evaluation. MCP does recommend that the processes to make these decisions be followed so that equal service to all Nebraska constituents can be realized.

9.2. DEAF, HARD OF HEARING AND SPEECH-IMPAIRED

Addressing the needs of hearing and speech-impaired persons has been a foundation of NG9-1-1 strategy. On August 19, 2011, then FCC Chairman Genachowski spoke about a five-step action plan to chart the transition to NG9-1-1 services. In this meeting, it was stated that Chairman Genachowski's goal was to ensure that effective emergency response is a critical element of the broadband environment. Chairman Genachowski said, "It's hard to imagine that airlines can send text messages if your flight is delayed, but you can't send a text message to 9-1-1 in an emergency. The unfortunate truth is that the capability of our emergency response communications has not kept pace with commercial innovation has not kept pace with what ordinary people now do every day with communications devices. The shift to NG9-1-1 can't be about if, but about when and how."[10]

In spite of this statement by Chairman Genachowski, these data services cannot yet be provided to 9-1-1 PSAPs.

As our country's population gets older, the number of people who are permanently or temporarily challenged to communicate is rapidly growing. Nebraska's NG9-1-1 plan needs to evaluate how PSAPs communicate with this increasing population.

Studies show that one in every six adults has some level of hearing loss and one in three adults over the age of 60 has hearing loss. Hearing loss has many causes and may be inherited, caused by maternal rubella or complications at birth, certain infectious diseases such as meningitis, chronic ear infections, use of ototoxic drugs, exposure to excessive noise, and aging. Studies show that the number of people who are hearing-impaired, hard of hearing or deaf is increasing at a significant rate. Some of the increase is due to "baby boomers" beginning to experience loss of hearing.

Many people with hearing loss are not open to discussing the challenges they face. Hear-it AISBL, an international non-profit and non-commercial organization, collects scientific and relevant information pertaining to hearing impairments and their human and socio-economic consequences.

"Less than half of all hearing impaired are open about their hearing loss."[11]

[10] http://www.fcc.gov/document/genachowski-announces-plan-improve-next-generation-9-1-1
[11] http://www.hear-it.org/Less-than-half-of-all-hearing-impaired-are-open-about-their-hearing-loss--1

"Many post-9/11 military veterans have suffered injuries; often due to blast pressure and flying debris from explosive devices.

"These injuries could include missing limbs, post-traumatic stress disorder and traumatic brain injuries. Other more down-played injuries include hearing injuries and hearing loss is a common ailment among post-9/11 veterans.

"Among post-9/11-troops, 414,000 have returned home with auditory injuries, including hearing loss, tinnitus, or ringing in the ears. These hearing injuries are the most common disability among veterans."[12]

A person with a hearing loss may not be able to hear on the phone being used to call 9-1-1. Many people who rely on captioned telephone services do not realize that the captions will not automatically appear after dialing 9-1-1. Others never thought about the fact that even though they use text messaging to communicate, a text message cannot be sent to 9-1-1. The FCC is seeking to address these issues with NG9-1-1 in May 2014, which will enable the public to obtain emergency assistance by means of advanced communications technologies beyond traditional voice-centric devices. When that comes to pass, reaching 9-1-1 will be easier for all, whether it be through voice phones, text, email, or video.

Like the hearing-impaired, a speech-impaired person will not necessarily share their loss, often for fear of labeling. In the same way that there are multiple reasons for hearing loss, there are many reasons why people have permanent or temporary loss of speech.

The results are that a person may be able to hear the phone call, but not be able to respond. An individual's speech problem may be caused from stuttering, temporary hoarseness, allergic reaction or other medical issues, to name a few.

An increasing numbers of cell phone, iPad/iPhone, and Android applications are being created for the deaf, hard of hearing, and speech-impaired community to assist their ability to communicate. The teletypewriter (TTY) is becoming obsolete and many people with communication challenges have never had access to, or been trained on the use of, these legacy services.

Nebraska needs to anticipate technology changes and advances, and develop training programs that will assist telecommunicators, dispatchers and first responders in communicating with the deaf, hard of hearing, and speech-impaired persons to best serve this community's needs.

Nebraska will need to continuously review the communications needs of these communities as there is no clarity on the proper protocols. As NG9-1-1 becomes more mature, any existing protocols will likely change.

[12] http://www.hear-it.org/Post-9-11-military-veterans-suffer-from-hearing-loss

Requirements will be two-fold:

1. Consistent statewide training and education of telecommunicators, dispatchers and first responders on how to communicate with the deaf, hard of hearing and speech-impaired, using the devices with which they are most comfortable

2. Training components for the deaf, hard of hearing and speech-impaired on how to best communicate situations to the PSAP or first responders. A key component of this training could be to encourage the deaf, hard of hearing and speech-impaired to develop a safety plan that provides processes to follow when they need assistance.

Nebraska should facilitate a focus group that helps with the development, coordination and communication of the NG9-1-1 strategy for the deaf, hard of hearing, and speech-impaired. The Nebraska Commission for the Deaf and Hard of Hearing and the Nebraska Commission for the Blind and Visually Impaired are potentially great resources to leverage for training assistance, especially in the areas of communication.

9.3. PSC SUPPORT STAFF

The PSC staff is a lean organization with limited staff resources. The transition to NG9-1-1 will require effort beyond what the current staff can provide. Although the creation of a governance structure will provide relief to the pressure of addressing NG9-1-1 demands, additional resources are needed.

One method of addressing this need would be for the PSC to add two positions as liaisons between the PSAPs and the State; this will ensure effective communications. One person filling these roles should be experienced in the current technology, NG9-1-1, and all elements required to make a transition. The second person should have experience in PSAP operations. As the technology person looks at the PSAPs from a “what” and “how” perspective, the operational person would be looking at “why” PSAPs are currently managed the way they are and communicate “why” NG9-1-1 will be of benefit.

Both individuals will need to be in the field meeting with at least one PSAP per week per month – in separate meetings. Ideally, each PSAP should be visited at least three times per year by each individual.

The result will be two-fold: the PSAPs will have the perception that someone is listening and the PSC will be able to gather information in order to make necessary adjustments quickly.

A qualified third-party consultant that can support any required roles is another option. A qualified third-party consultant can provide both technical and operational support to the PSC staff as needed.

The State of Nebraska should develop a statewide network implementation strategy and vision to best leverage the current resources. The OCIO may have resources that possess the knowledge and skills for implementing and managing an NG9-1-1 network; however, as they do not possess rule-making

authority, processes and procedures for successfully sharing responsibility with the PSC would need to be developed through the governance structure. The governance structure can help provide a communications plan between the OCIO and PSC so that standards and guidelines match the authority requirements to successfully implement the standards and guidelines. The OCIO operates a NOC function for state networks, and provides performance statistics and outage reports that can be leveraged with a strong holistic strategy for interworking between the OCIO and PSC.

10. RECOMMENDATIONS – NETWORK FACILITIES AND SERVICES

10.1. NETWORK FACILITIES AND SERVICES

NebraskaLink handles large-scale sales and service for their members' networks, and has interconnection agreements with other LECs around the state. Presently, they are interconnected with all LECs operating in the state except for one as there has been no economic justification for doing so. When or if that changes, they will interconnect. A second provider who was not connected to NebraskaLink is in the process of connecting to one of its members.

Depending on how one traces the potential network routes, there are five or six rings overlaying the state. This number is likely to increase by the time the ESInet implementation begins. There is currently access to long-haul interstate transport west to Denver, east to Chicago, and south to Kansas City. Additionally some service providers have interconnections with LECs in northern Kansas and connectivity to a carrier hotel in Kansas City

Given the extent of and interconnections between fiber optic networks in the state, the statewide ESInet design should include as much fiber as possible, not only on the transport side, but on the access side as well. Many providers have FTTP deployments using either Passive Optical Networking (PON) or Active Ethernet technology. Some offer both, using the Active Ethernet for business-class service and PON for residential. The only limitation with a fiber network is the equipment used to terminate the fiber. Depending on the equipment initially selected, upgrading from 1 GB to 10 GB may be a change of optic modules, an additional card and optics, or simply a few mouse clicks and keystrokes. This aligns with the overall design criteria of robustness, redundancy, and resiliency for the ESInet.

Possible ESInet designs include a statewide ring with each PSAP connected to the ring, a series of interconnected regional rings, or a combination of the two. It is important to note that the state would, through the governance structure, establish standards for the networks, equipment, management, and facilities. Whatever design ultimately is selected, each facility should have physically diverse (east-west) entries. Given that this is a statewide effort, it is important to note that east-west entries into a given facility may not be cost effective for some PSAPs. In these cases, it may be necessary to use other types of networks (HFC, 4G LTE, satellite, or point-to-point wireless) as a backup link. Also, some providers without FTTP deployments may provide the last-mile connection over copper plant. As previously mentioned, most providers have expressed a willingness to construct dual entrances where financially viable. It is important to note that there may be construction costs for the second entrance.

The amount will vary by provider, and should be clearly communicated as part of a Request for Proposal (RFP), should one be issued.

Designated Points of Interconnect (POIs) will be required at geographically diverse locations to provide interconnection points for carriers, service providers, and outside networks. These facilities will need to be secure, redundant, and resilient just like the network infrastructure. These may be carrier/provider or state facilities, or both, depending on availability and suitability.

10.2. DATA CENTERS

Regardless of the ultimate network design, a minimum of three or four geographically diverse Points of Presence (POPs) must be designated as POIs to provide secure, redundant, resilient interconnection points to carriers, service providers, and other networks. These data centers will house core routers and switches, servers, gateways, firewalls, session border controllers (SBCs), and other similar equipment. From an i3 services perspective, the functionalities could include Border Control Function (BCF), Emergency Service Routing Proxy (ESRP), Emergency Call Routing Function (ECRF), Legacy Network Gateway (LNG), Legacy Selective Router Gateway (LSRG), and Legacy PSAP Gateway (LPG). BCF usually includes both SBC and firewall functions. Also, it is common to find that one physical device will handle several of the above functions, such as a gateway device handling SBC, LNG, and LSGR functions. The number of data centers, connectivity, and the implementation of i3 services should be carefully planned. This will require discussions that involve PSAP and regional stakeholders working through a disciplined process, such as a Trade Matrix (described elsewhere in this document.)

These POIs may be located in carrier or service provider facilities, or in state-owned facilities, or a combination of both, depending on availability and support. Nebraska's i3 services may be owned and operated by the state, or delivered as managed services, or a combination of both. The data centers should meet Tier 4 standards as detailed in American National Standards Institute/Telecommunications Industry Association/Electronic Industries Alliance (ANSI/TIA/EIA) 942 Data Center Standards, but at a minimum must meet Tier 3 standards. This means that these data centers will not likely be part of most PSAPs.

10.3. COMMON NETWORK AND APPLICATION DESIGN CRITERIA

It is important to note that the State would, through the governance structure, establish standards for the networks and equipment. The State should not prescribe how service providers implement the network at Open Systems Interconnection (OSI) Layer 1 (Physical Layer) or Layer 2 (Data Layer), beyond the requirement that they use the most robust facilities available in a given service area. However, the providers must disclose, in detail, how they propose to implement the selected network design. The design must have no single point of failure, and must operate at 99.999 percent uptime. The routers and switches must have redundant processors, power supplies, and network interfaces, and must perform fast packet reroute (<50ms) in the event of a failure.

The State's view of the network should be at OSI Layer 3 (Network Layer); that is, at the delivery of IP packets between network nodes. The network must deliver any IP packet from any address to any other address among the interconnected sites. This assumes the packet has met any applicable firewall rules to allow it to enter the network.

The network routers and switches must support both IP version 4 and version 6 (IPv4 and IPv6) addressing and protocols, and must support standard routing protocols such as Open Shortest Path First (OSPF) and Border Gateway Protocol (BGP), Generic Routing Encapsulation (GRE), and NENA IP Security (IPSec). The routers and switches must also support Quality of Service (QoS) marking and traffic prioritization, as well as multicast routing. Multicast traffic is frequently used for video, network services, data and software updates, and heartbeats.

For servers, there should be both hardware and software redundancy. One approach is to use virtual servers running on multiple physical servers, with virtualization software that automatically switches virtual servers between physical servers in the event of a failure. Two such packages are VMware and Citrix' XenServer. The i3 services would then run on the virtual servers.

10.4. ESINET DESIGN OPTIONS

10.4.1. Statewide Fiber Optic Ring Network

The first option is to simply implement a fiber optic ring around the state, and establish physically diverse connections to each PSAP. The ring will have a series of POPs where the PSAPs will connect to it. Each PSAP should have physically diverse connections to two POPs. Four geographically diverse POPs should be chosen to house gateways, servers, core routers and switches, and systems serving i3 elements as they are implemented. Alternatively, the POPs may serve as network gateways to i3 functional elements hosted in nationally geographic diverse data centers.

To the extent feasible, connections from the POPs to the PSAPs should be delivered over fiber optic facilities. Where the last mile cannot be delivered over fiber optic facilities, the next best alternative is Metro Ethernet over copper. If that is not available, multiple T1s or possibly a DS3 may need to be considered. In cases where the existing copper or fiber plant does not lend itself to physically diverse entries to a given PSAP, the alternatives (HFC, 4G LTE, wireless, etc.) will need to be investigated. Solutions may vary based on location. These alternate network facilities must, in the case of wired facilities, have diverse physical entries to the PSAP.

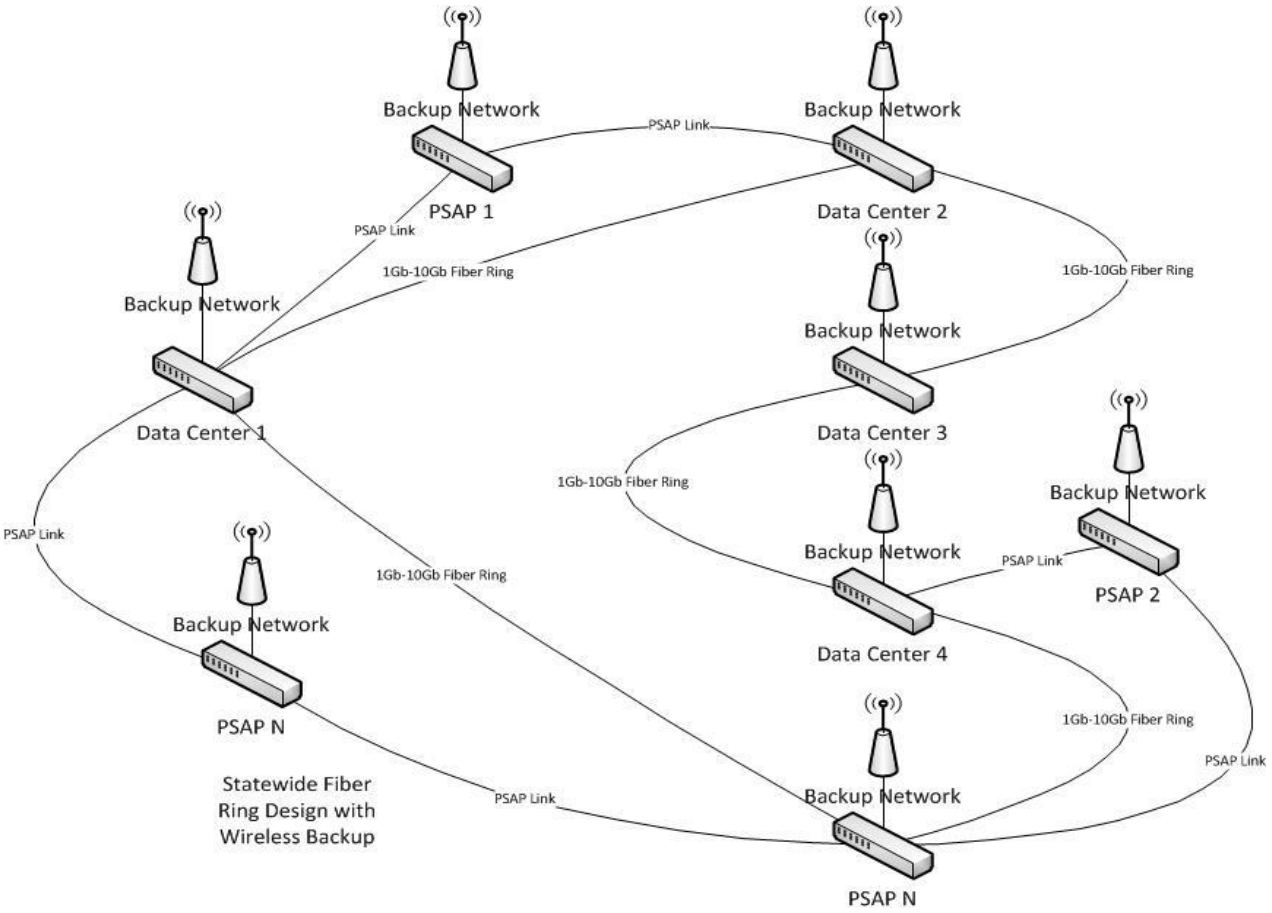

Figure 2 – Statewide Ring

Benefits and Challenges

This has the benefits of centralized i3 systems and services, a resilient backbone network, and state-level control all the way to the PSAP routers. Challenges include each PSAP only having connection into the state ring and not their neighboring PSAPs. It is important to note that the network design will affect the physical configuration of the routers and switches, which will affect their cost. This design would require many ports in the routers and switches located in the data centers, increasing initial costs for equipment, and, depending on the vendor, possibly increasing maintenance costs. It is too early in the process to evaluate the cost of this solution relative to others.

This also presents some interesting governance issues for the State and those groups of PSAPs that have already regionalized their technology. It could potentially put the state in the CPE business as well, or at least the rackspace rental business to host CPE solutions for PSAPs and/or regions.

10.4.2. Interconnected Regional Fiber Optic Rings

The second option is to implement a series of interconnected fiber optic rings, each ring serving a geographic area. Each ring should have dual connections to its neighbor(s). Each PSAP would have physically diverse connections to the ring. Each ring would also require two data centers to house the common i3 systems and provide interconnection facilities for the carriers and service providers.

Benefits and Challenges

One benefit would be that the operator of each ring could choose to implement the CPE system that best fits their needs and budget. One immediate challenge would be the cost of the i3 (not CPE) systems necessary to equip 12–20 data centers (6–10 rings times 2 data centers per ring). The other problem with this design is the requirement for Tier 3, preferably Tier 4, data centers to house the backroom equipment. The likelihood of finding a sufficient quantity of suitable data centers is very small.

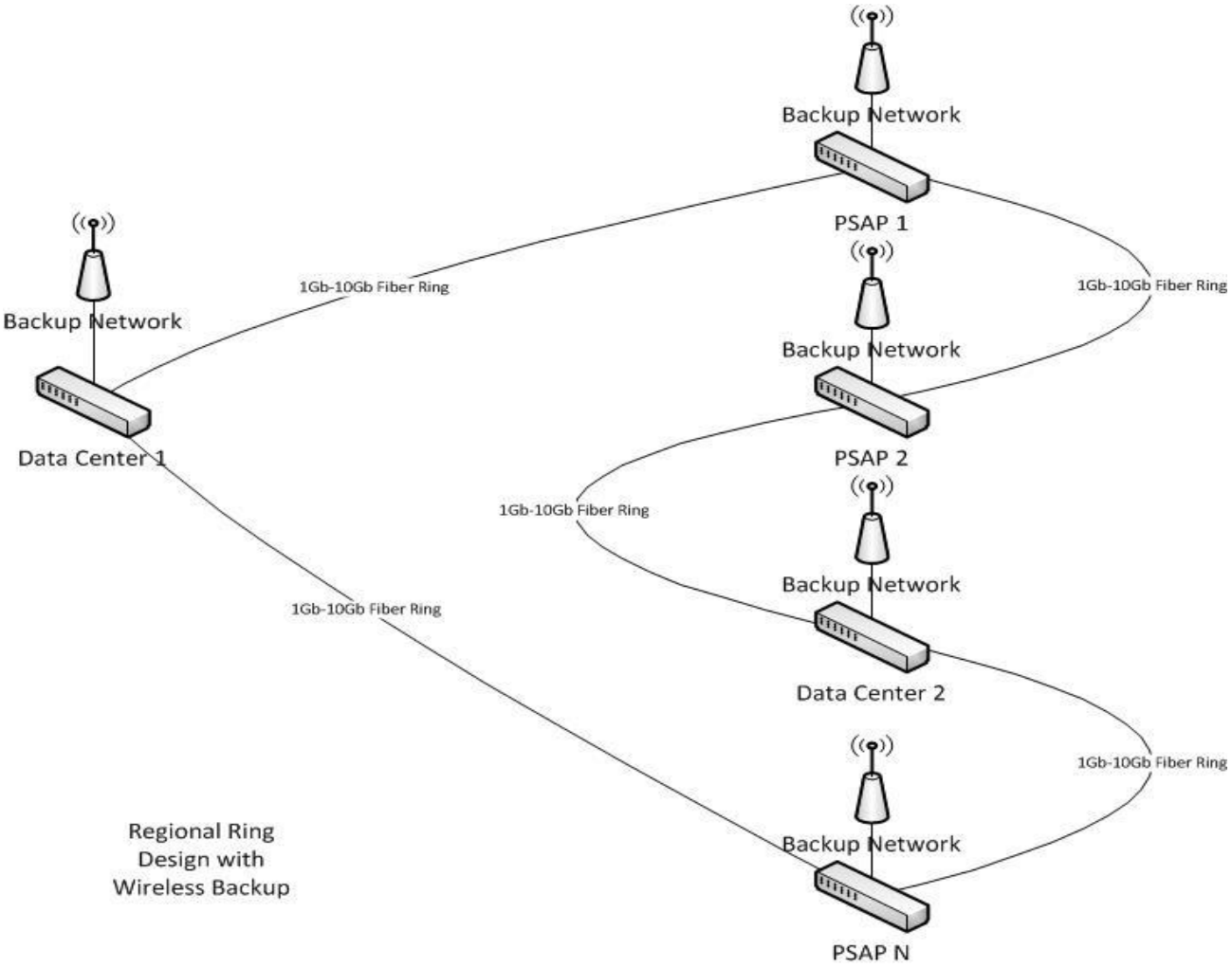

Figure 3 – Regional Rings

10.4.3. Regional Rings Overlaid With a Statewide Ring

The third option is a combination of the first two – a statewide ring overlaying regional rings. The regional rings would support connectivity to each PSAP through two geographically diverse data centers on each ring. The statewide ring and its four or more data centers would support the NG9-1-1 call handling and i3 systems and services. While the State could allow the regions to choose their CPE solution and simply provide data center space to house them, the preferred option would be for the State to offer a single, hosted solution. This is discussed in more detail in the CPE section.

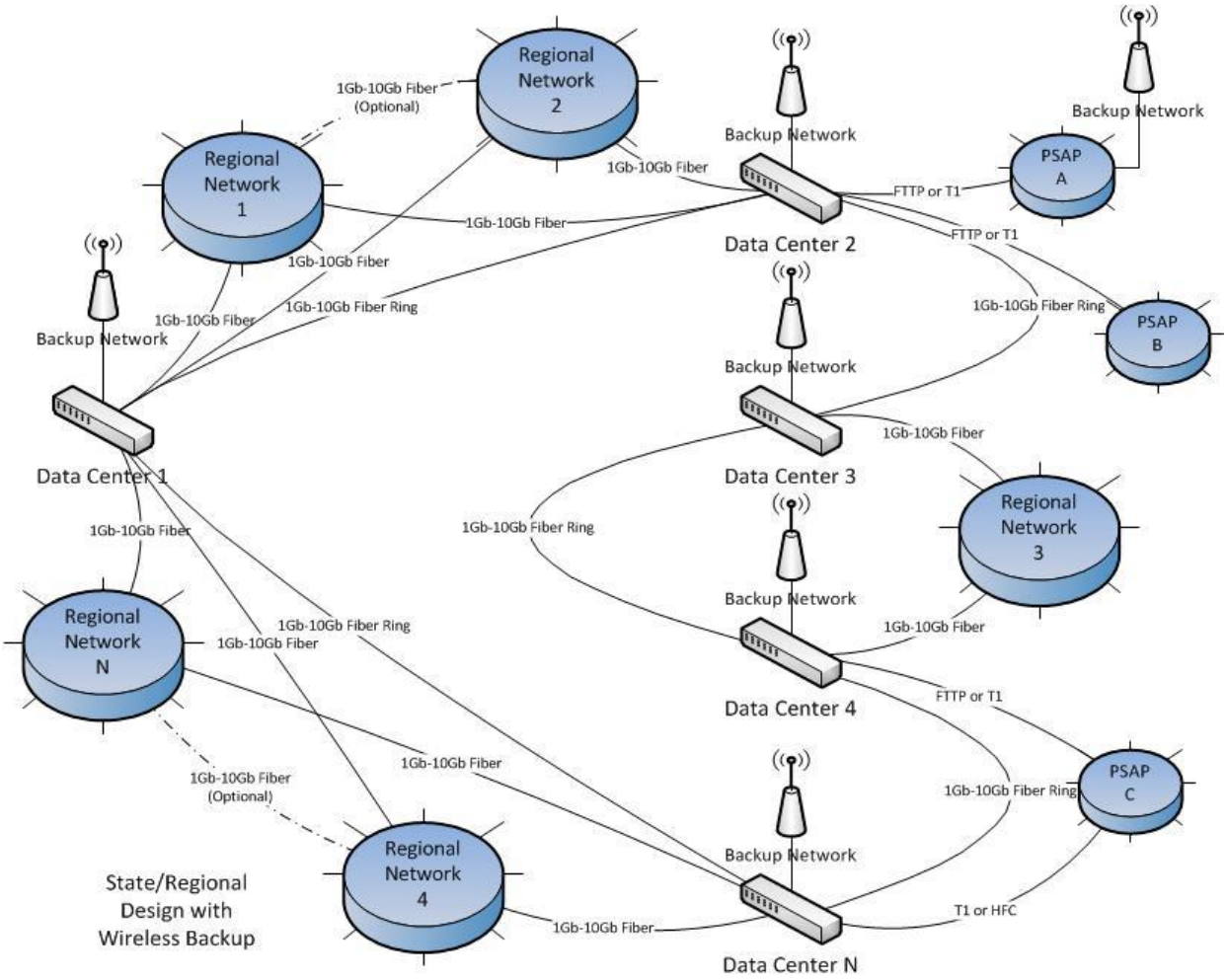

Figure 4 – State & Regional Ring Hybrid

Benefits and Challenges

Costs for i3 systems and services would be the same as for the statewide ring only. Additionally, the routers and switches for the statewide ring would require fewer network ports, lowering initial costs and, in some cases, maintenance.

10.5. NETWORK INFRASTRUCTURE AND SERVICES MONITORING

Network and application monitoring will require significant attention. Having both internal and external entities, and potentially other ESInets, adds complexity to the level of monitoring that public safety ESInets require. It will be important that all ESInet, i3 call handling, and i3 service providers have a clear understanding of the interworking requirements. As ESInets from neighboring states connect to the Nebraska ESInet, part of the governance plan will need to address this just as it will address network interconnections within the state.

Given that this is a statewide endeavor, there will be a number of entities involved in building the network. Each will have their own infrastructure monitoring and management system, their own NOC for trouble tickets and reporting, and their own operating policies and procedures for the aforementioned. Nebraska must select a single entity to have overarching monitoring and management responsibilities for the ESInet. This includes monitoring out to the device at the PSAP, at least to the port up/down level. The selected entity, be it a service provider or public agency, must also maintain a trouble ticketing system for tracking and reporting, and must be prepared to handle the issuance of Reason for Outage (RFO) reports when outages occur.

While this primarily a governance issue, it bears mention because of requirements related to change management and its various aspects. Management and monitoring vendors must provide the following services and supporting documentation:

- Maintain a 24/7/365 NOC
- Provide Levels 1, 2, and 3 technical support
- Provide a service portal for opening trouble tickets, and checking status of existing tickets
- Provide statistics including, but not limited to, uptime, latency, jitter, packet loss, bandwidth utilization, and Mean Opinion Score (MOS) via a web portal
- Provide documented escalation procedures
- Provide documented change management procedures
- Provide monthly trouble reports showing tickets opened, resolved, and unresolved
- Provide regular change reports showing changes requested, approved, completed, in progress, and failed/backed out
- Issue RFOs within a reasonable time (to be determined)

Vendors should also provide critical network services to other customers similar in nature to 9-1-1, such as governments, hospitals, or financial institutions. Change management is an important aspect of network and application monitoring and management. Vendors must demonstrate a grasp of the

concepts of change management as well as their implementation of change management policies, processes, procedures, and systems.

10.5.1. Monitoring Plan

As part of an NG9-1-1 strategy, Nebraska should have a well thought out monitoring plan. As Nebraska reviews monitoring capabilities, tools and services should be evaluated from two perspectives. One perspective is to review what will be required for the State to effectively monitor their system. The State will need to review hardware and software capacity on their management system(s), software licensing requirements, reporting capability versus needs, alerting requirements versus existing capabilities, and staffing (both NOC and support staff). Even if the State elects to monitor the network internally, there will need to be SLAs in place between the PSC and the monitoring agency. The other perspective is for the State to contract this as a service from an outside entity. While some of the system-level concerns go away, they are replaced with security concerns as the outside entity will require access to the entire network. The NOC, support, alerting, and reporting issues will need to be addressed through SLAs. Reporting will also be an issue as the reports offered will need to be reviewed, and it is likely that some new reports will be required.

If Nebraska elects to extend i3 services and i3 call handling CPE capabilities to other entities, then the reporting and alerting concerns change. These entities will require additional reporting and alerting capabilities. Deploying NG9-1-1 and other public safety-related applications across networks requires that interworking governance agreements and processes and procedures be developed for monitoring the network before any live NG9-1-1 calls are handled at a PSAP where Nebraska is extending their services. Some monitoring information that must be documented includes the following:

- Discovery and documentation of all devices with which the State will be connecting. In instances where Nebraska is connected to other entities, written processes and procedures for discovery and documentation of added devices, and documentation of when devices are taken off-line or changed, must be captured and agreed upon as part of the contract or agreement.
- NG9-1-1 incorporates multiple applications and protocols all interworking. These applications are implemented across servers, which are connected to various gateways and other devices. NG9-1-1 requires that Nebraska have a strategy for real-time monitoring of network traffic congestions, equipment problems, services availability, security violations, application availability, etc. across the local area networks (LANs) and wide area networks (WANs) in real-time or as close to real-time as can be provided to the system administrator. This strategy may incorporate managed services providing monitoring and management services for some or many of the elements of the total NG9-1-1 solution. As Nebraska evaluates these NG9-1-1 solution elements, it will be necessary to determine whether self-maintained or managed services are in their best interest. Most entities find that having a third-party entity manage all or a significant portion of these elements with SLAs is more cost-effective than developing and staffing their own NOC. Even if Nebraska utilizes managed services, a system administrator will need to be available to provide support, and monitor vendors and service providers.
- As Nebraska extends services to other entities, the governing body will need to determine what information will be shared with those entities. The processes and procedures for providing

information and notification to those entities must then be developed and made part of any contracts and agreements. Thought must be given to how the State will mitigate breaches of SLAs with their providers. Consequences for breaches of SLAs should be spelled out in RFPs and subsequent contracts.

- Because NG9-1-1 technology involves multiple applications, application vendors will most likely desire the ability to both connect and have access to their software as well as related hardware elements. This is usually part of their support and maintenance and their contract should include SLAs against which their performance is evaluated.
- Notification processes of hardware and software faults and alarms will need to be thoroughly described and understood. Scripts for communicating with entities will need to be developed.
- The State will require processes and procedures for monitoring network QoS features. Clearly, 9-1-1 calls have a priority over map updates. As the State reviews the implementation of NG9-1-1 functions, many of those functions will require that QoS be evaluated and given a priority value. Likewise, if Nebraska looks at extending other applications, such as call recording/logging and others, QoS will need to be evaluated and monitored iteratively, as there may very well be uncompressed voice traffic. Different priorities may be given for recording the call than the priority for re-playing the call.
- 9-1-1 voice traffic can experience significant peaks when there is an event, such as a tornado, train wreck, or large fire. The ability to dynamically adjust bandwidth and traffic should be considered along with other capabilities that will help avoid network saturation.
- The perception of the system administrator's ability to monitor the network will be greatly impacted by communication and information sharing processes. The system will require the ability to provide timely reports on network status, malicious network activity, and other information.

10.5.2. Management Software

Much is said about Simple Network Management Protocol (SNMP) in network and server management discussions, but it is really only the underlying protocol for transporting management information across the network. Software packages are widely available for capturing, analyzing, and reporting the network health based on the SNMP traffic it receives.

There are a number of commercial packages available, such as SolarWinds, Monolith, and OpenView, as well as many full-featured open source packages, such as OpenNMS, Nagios (primarily for servers), and Network Management Information System (NMIS). Prices on commercial packages vary greatly, and features usually vary with price. Commercial packages will usually have a sliding scale of price versus number of devices monitored.

10.5.3. Monitoring Plans Vendor Considerations

I3-compatible call handling and i3 services vendors will use their monitoring and managed services as a critical component of their SLAs. Any RFPs and vendor contract negotiations will need to clarify vendor network access requirements. Likewise, all i3-compatible call handling and i3 services vendors must be aware of each other and the various entities that may require read-only status of their components.

When considering potential i3-compatible CPE vendors and i3 service vendors as potential providers of products and services, network critical elements, such as security, must be kept in mind. Requirements that can impact providing secure services for all entities may impact the viability of a vendor being considered as a potential product or service provider.

Though many vendors are reluctant to share management information, it is recommended that the State require at least read-only access to the management information from the CPE and i3 systems to feed into the State management system

11. RECOMMENDATIONS – NG9-1-1 PSAP CALL HANDLING SYSTEM

The State of Nebraska should, at a minimum, develop requirements to ensure that when upgrades or replacements are made, the PSAP or PSAP regional system can operate and interoperate to take advantage of NENA i3 functionality.

These requirements should require call handling system(s) to include Session Initiation Protocol (SIP)-based call handling equipment at the PSAPs and NG9-1-1-capable answering positions. This equipment must be capable of receiving and interpreting the data delivered with emergency calls transported to the PSAP by the i3 services. The State should consider that call handling CPE must also provide standard interfaces to the CAD system and mapping applications.

Currently, most equipment providers advise that they will include all new standards as they are developed, but many of the basic standards are already in place. The State will find that how the standards are defined and implemented will vary significantly. Vendors should be asked for their plans to implement NENA 54-750, *Human Machine Interface & PSAP Display Requirements*, jointly developed by NENA and APCO.

11.1. CALL HANDLING MANAGEMENT INFORMATION SYSTEM (MIS)

As Nebraska transitions to NENA i3, the ability for the PSC and PSAPs to have accurate information from call statistics becomes more important. Even for the smaller PSAPs, accurate information on their busiest and least busy call times will help determine i3 routing options. Currently many PSAPs in Nebraska do not have an MIS and some that do have MIS are not properly trained on how to create reports.

The types of reports that different manufacturers provide with their MIS packages vary greatly. Many require the knowledge of programing interfaces, such as Crystal Reports, to create custom reports. Several states have reviewed the cost of acquiring and maintaining multiple MIS and services, and have evaluated and are using ECaTS, an SaaS, which can provide PSAPs and the State the ability to look at statistics from any 9-1-1 call handling system.

MCP recommends that the reports the State has been requiring and the value of the accuracy of those reports is evaluated. This information can be combined with the estimated current cost in hardware, software, and personnel required to create these reports in order to determine a current cost baseline. Nebraska can then review the value of the State having additional reports, such as trending analysis for types of calls received and volumes of calls received as to more deeply determine effectiveness of current funding and expectations for future funding requirements. This information can then be used to evaluate the best MIS solution for Nebraska.

11.1.1. MIS Solution Requirements

MIS solutions should record every function in the NG9-1-1 call handling experience as an event. For example, if a call is answered by a 9-1-1 call taker, and that call is transferred, the call transfer should be an event and the MIS package should be able to provide the exact time that each call taker was active on the call for an accurate usage of each call taker's time. Most vendors have made this adjustment, but there are some exceptions.

11.2. PSAP LOGGING RECORDER CAPABILITIES

Some newer logging recorders have the capability to capture and store screen actions initiated by the call taker; few have the ability to capture, index, archive, or retrieve text messages, video, telematics and other data calls. Some limitations that PSAPs experience with current legacy logging recorder systems include the following:

- Not well integrated with leading Voice over IP (VoIP), radio, and CAD vendors
- Unable to capture and correlate multimedia and multi-channel events related to the same incident
- Inadequate quality assurance (QA) and evaluation and report tools
- Not designed to readily conform to coming changes
- Lack the minimum security and authentication requirements of NG9-1-1

Nebraska may want to approach logging recorders as two-phase. The first phase would be that all new logging recorder systems must meet strict requirements for being NG9-1-1-capable and compatible. While this will require an analysis of logging systems that are available, new logging recorder acquisitions should be kept to a minimum during this phase.

The second phase would involve the State looking at logging recorder systems from a holistic perspective of the overall NG9-1-1 solutions that the state of Nebraska will be implementing. NG9-1-1

call handling will be more effective and efficient as applications and resources are consolidated. How and where these resources are consolidated will impact connections to other emergency communications elements, such as CAD and radio systems, and will need to be considered as part of the overall logging recorder strategy.

11.2.1. Logger/Recorder Requirements

Several requirements should be considered when reviewing NG9-1-1 logging recorder systems.

- Open Architecture
  Ideally logging recorder systems should incorporate open, service-oriented architecture that is adaptable and flexible, and provide simple and inexpensive integration with other standards-based systems. NG9-1-1 loggers should utilize commercial off-the-shelf (COTS) hardware as well as industry and NENA standards-based third-party interfaces.

  The NG9-1-1 logging recorder should be able to provide information on each incident that is indexed with automatic number identification/automatic location identification (ANI/ALI) information, incident number, and other identifiers such as call taker name or ID, and associated information such as CAD logs and maps. Incident scenarios should be plotted on a map and include all communications sequenced just as they occurred.

- Integration of NG9-1-1 call handling, private branch exchange (PBX), CAD, radio and other emergency communications systems
  The top recording vendors should currently provide proven integration capabilities with the major PBX, CAD, and radio system vendors and a plan for developing additional integrations as newer technology emerges.

  Vendors should be able to demonstrate how they integrate with various vendors through the adoption of IP. This should provide the common voice and data communications language, subsystems and applications that will be able to communicate with each other both internally and externally.

- Multimedia capture and reporting
  The logging recorder should provide unified capture of and access to all incident information, regardless of the channel that was used to report and resolve it. The logging system must manage analog, digital time division multiple access (TDM), VoIP and other voice traffic as well as data and text messages in a unified consolidated fashion.

- Dispatcher QA evaluation and training tools
  NG9-1-1 logging recorder systems should be designed to allow for the efficient assessment of single calls or entire incidents. The logging recorder should simply and easily present evaluators with targeted evaluation forms and synchronized interactive audio and screen video that has been gathered manually or automatically based on rules for identification of critical calls.

- Security and Authentication
  Security and authentication is a critical element of NG9-1-1. Some communications may fall under CJIS rules; as additional media is available, they may come under other restrictions, such as the Health Insurance Portability and Accountability Act (HIPAA).

  The NENA Next Generation Security (NGSec) processes and procedures should be considered a baseline or starting point for logging recorder security. Base features include audit logs, encryption, password protected export, and file watermarking.

  Many PSAPs in Nebraska will face challenges making the transition from E9-1-1 to NG9-1-1. From an operations perspective, the ability to achieve the true potential of NG9-1-1 will require significant adjustment and change that will require oversight from the PSC significantly beyond what the PSAPs perceive they are receiving currently.

  The increased quantity of available multimedia data will enhance and expand existing call taking functions. It may also extend the time it takes to process 9-1-1 calls, increase the workload of the call taker, and significantly change the call taker's experience (e.g., seeing the incident versus hearing the incident). Revamped introductory training, as well as continuing education (retraining in some cases) for experienced staff, will be critical to the success of any NG9-1-1 implementation. Training programs, properly designed, can enable PSAP managers and supervisors to effectively prepare dispatchers and call takers to respond to the needs of an IP-enabled system, while maintaining the level of service expected by the public.

  The PSAPs in the state of Nebraska will confront the challenge of managing a wider set of shared resources than is typical in the current system, enhancing and expanding capabilities while ensuring personnel, including call takers, expeditiously and correctly handle the new workload. Responsibilities will likely expand, particularly with regard to configuring and managing the NG9-1-1 system.

  Currently, there is a perception from the PSAPs that the amount of communication and support by individuals with PSAP operational experience is lacking within the PSC. Of importance will be clear communications plans with understood processes.

11.3. INTERFACE CONNECTIVITY REQUIREMENTS

Vendors providing i3 call handling solutions should be able to easily provide information for how they incorporate NENA 04-001, *Generic Standards for E911 PSAP Equipment*. Vendors should be required to explain how they are implementing NENA 08-003, *Detailed Functional and Interface Specification for the NENA i3 Solution – Stage 3*; specific attention may be addressed toward the logging recorder service in section 5.12.

12. RECOMMENDATIONS – CAD SYSTEM

The majority of the smaller PSAPs in the state of Nebraska do not currently operate a CAD system. The use of a CAD system is an operational tool used to support the field units by tracking any and all status changes and activities with subsequent actions taken by the dispatcher in support of that field unit (e.g., National Crime Information Center [NCIC] queries on vehicles, persons, or articles in connection with the call for service). The CAD system tracks field unit activities and enables the PSAP to provide statistical data that is both reliable and historically accurate.

MCP recommends the State of Nebraska equip all PSAPs with access to at least basic CAD system capabilities. The State should determine how to provide the basic CAD system capabilities for PSAPs utilizing multiple tools.

12.1. REVIEW CAD SYSTEM CAPABILITIES

A high-level review of CAD systems currently in use in Nebraska, including their expected lifespan, current maintenance agreements, SLAs, and costs should be undertaken. This review would provide a baseline for what is currently available for use in the statewide plan for CAD systems.

In addition to the inventory of CAD systems, it is imperative the State collect data on what the CAD is and is not doing well for agency users. This will give the State a foundation for a due diligence exercise.

12.2. NG9-1-1 CAD SYSTEM CONSIDERATIONS

The CAD system will need to have the following capabilities in an NG91-1-1 environment:

- Ability to accept and manipulate incoming NG9-1-1 data from CPE equipment
- Ability to accept rebid location information and update CAD incidents accordingly
- Ability to accept all files associated with a call record from CPE and store files
- Ability to interface with logging recorder vendors for CAD record retrieval for QA
- CAD-to-CAD data sharing should PSAPs utilize each other for Disaster Recovery
- MIS reporting that meets the needs of PSAP reporting, and in the absence of a records management system (RMS), National Fire Incident Reporting System (NFIRs) or Uniform Crime Reporting (UCR)/National Incident-Based Reporting System (NIBRs) reporting
- CAD-to-RMS interfaces considerations for data mining and storage of NG9-1-1 data
- Personnel to build/maintain CAD tables, GIS data, and the overall system

Many of the current major CAD system vendors have already been providing or are working on NG9-1-1 CAD system requirements. Some changes are in the interface to NG9-1-1 call handling. Legacy CAD systems have, most often, connected to the call handling solutions using RS232. As CAD system vendors move to NG9-1-1 platforms, connections utilizing IP are being offered. IP connections require security products and policies that protect both the CAD system and the call handling equipment from viruses, trojans, denial of service (DoS), distributed denial of service (DDoS), and other

security issues. Minimum security requirements should be developed at a state-level and supported through the Nebraska governance structure.

13. RECOMMENDATIONS – GIS

For years, PSAPs and other public safety entities have been developing and maintaining GIS data. Most PSAPs use GIS data today for displaying the location of a 9-1-1 call, assisting in determining the location of a wireless caller, and for dispatching emergency responders by closest unit.

Current, accurate and standardized GIS data becomes a critical requirement for successful deployment and operation of a NENA i3 NG9-1-1 system. In NG9-1-1, GIS databases are relied upon for routing 9-1-1 calls to PSAPs and determining the emergency response providers for a given area. This GIS data also validates the location of a device capable of calling 9-1-1. For NG9-1-1, GIS data must be highly consistent across the state, standardized, normalized and constantly updated and maintained.

For Nebraska to properly prepare for GIS data to meet the needs of NG9-1-1 requires a vision and long-term commitment on a statewide scale. The time and effort required to prepare GIS data for NG9-1-1 is often longer and more complex than agencies anticipate. Municipalities, PSAPs and entities who currently develop and maintain their own data for addressing and tactical mapping must understand how NG9-1-1 data requirements will affect their current processes.

13.1. GIS CONSIDERATIONS

Today's E9-1-1 systems have stringent requirements for correction of today's E9-1-1 core databases, the Master Street Address Guide (MSAG) and ALI data. NENA standards allow a maximum of three business days to correct an error in the databases. NENA standards and best practices place this same level of timeliness on NG9-1-1 GIS data.

The amount of time between when PSAPs perform updates varies significantly. Some perform these updates daily; others monthly, quarterly or even bi-yearly. In an NG9-1-1 system, the speed of updating and correcting the GIS data should be in near real-time. Data regarding new addresses, changing emergency services boundaries or overriding existing PSAP routing due to an unforeseen emergency, must be available almost immediately. This GIS data will be used for call routing, location validation and dispatching of emergency services. NG9-1-1 significantly increases the need to have current, accurate and standardized GIS data.

The change to updating GIS data will be a challenge for several PSAPs, especially those who are tasked with many other duties in addition to receiving and dispatching 9-1-1 emergency calls. Even with training, some PSAPs are likely to continue in their struggle with these additional tasks. Nebraska should explore all options for evaluating these PSAPs and determining what type of assistance they may require.

Accurate and current data is of paramount importance to 9-1-1 entities. Having MSAG, ALI, and GIS datasets agree is crucial to E9-1-1 calls being properly selectively routed, providing telecommunicators the information they need to correctly verify the location of a caller and dispatch the appropriate emergency responders. Comparing the MSAG and ALI data to the road centerline data will uncover inconsistent naming conventions, inaccurate information, non-standardized naming and abbreviations, improper ESN assignments, improper community assignments and other discrepancies. The process for performing this comparison is detailed in NENA 71-501, *Information Document for Synchronizing Geographic Information System Databases with MSAG & ALI.*

NENA recommends the GIS and MSAG data obtain a 98 percent match rate prior to any GIS data utilized for NG9-1-1. The data synchronizing process is often a long and laborious project. Conflicting information between the databases often requires a constant effort to keep them synchronized. During the synchronization process new addresses, new roads and changing of boundary information is often occurring concurrently. Keeping GIS, MSAG and ALI data updated and aligned during this process demands close coordination with all entities.

The process of synchronizing the databases, MSAG, ALI, and GIS data, and ensuring the GIS data meets the needs of NG9-1-1 is a time-consuming effort. Initial matching of the MSAG, ALI and GIS databases will reveal fictitious data, non-standardized naming conventions, conflicting spellings, incomplete information and data that is no longer valid. This process will uncover discrepancies in each of the data sets. MCP's experience has shown this process requires local knowledge to complete. For this reason, MCP recommends involving the local MSAG coordinators and the addressing authorities in the process. The local MSAG coordinators and addressing authorities know their local data better than anyone does. They will be the subject matter experts on correct street spelling, researching conflicting information and keeping their records updated during the synchronization process. The local or regional 9-1-1 authority will always be the responsible party for data, whether they use in-house staff or contract designated agents to maintain the data. The reality is that some of the more rural PSAPs may require assistance from service providers in meeting these requirements in a timely manner.

Conflicting information between the MSAG, ALI and GIS databases becomes more prevalent without a constant effort to keep the systems synchronized. GIS data of any size will contain errors, and eliminating all errors is an unrealistic expectation; the data will never be 100 percent correct. Data synchronization must be an ongoing process of continuous data improvement. The process will identify errors or discrepancies in the data and provide an ongoing procedures to correct those discrepancies. Databases are in a constant flux, new addresses assigned, boundaries may change, and roads built or renamed. One must maintain the data while synchronizing the data. Database synchronization is a process of continuous improvement, which may be broken into six steps:

1. Data standardization
2. Comparing the data sets to each other
3. Reporting the discrepancies within each database
4. Correcting the discrepancies in each database
5. Maintaining all data while updating with new information and changes
6. Repeat

It is estimated that synchronizing all GIS, MSAG and ALI data in Nebraska will require an effort equal to one full-time employee (FTE) for a period of nine to ten years. If Nebraska moves forward with their goal of transitioning to NG9-1-1, then they should accelerate this effort and a reasonable amount of time for performing this synchronization would be three years. Some of the larger PSAPs may have resources that can be dedicated to provide information for this effort. This is another area where ideally the effort would be performed on the local level; however, based on the information MCP gathered and analyzed, there are not enough local resources for this synchronization. The State will need to provide funding for services that will work with the local resources to provide this synchronization.

Individuals working on the synchronizing project must coordinate with the MSAG coordinators to effect changes in the local MSAG and with the local addressing authorities to determine the proper spelling and addressing and real-world location of problematic addresses in the ALI database. Designating local or regional coordinators will streamline the synchronizing process and allow gains in operational efficiencies through close coordination with local 9-1-1 and addressing authorities.

One manner to utilize local entities to provide, update, maintain and correct their databases is with a spatial database management system (SDBMS), which is similar to today's MSAG and ALI database management system, with the exception of using spatial GIS data rather than tabular E9-1-1 data. This system differs from the GIS repository because the SDBMS allows local or regional entities to upload their GIS data into a statewide, redundant, secure, public safety-grade system that will automate the process of validating the data. The data validation process will provide discrepancy reports almost immediately back to those uploading their data to the system. The SDBMS should be designated to provide meaningful reports back to those uploading their data. The continuous process of uploading the data, receiving discrepancy reports on the data, correcting the data, and reloading the data will greatly enhance GIS data integrity and quality for NG9-1-1.

NENA's i3 NG9-1-1 uses GIS data provided by the local 9-1-1 authority as the core database for civic location validation, call routing and PSAP map display functionality. The process of validating the location occurs in the Location Validation Function (LVF). Using the 9-1-1 call location information to send the call to the proper destination, such as a PSAP, takes place within the ECRF. Both ECRF and LVF use the same underlying GIS data.

Current NENA i3 standards and the pending NENA "*GIS Data Model for NG9-1-1*" standard define the core GIS data layers required for the i3 NG9-1-1 as:

- Authoritative boundaries
- PSAP boundaries
- Emergency services boundaries
- Road centerline data

Address point data is not a required core data layer, but is highly recommended, if available. Address points provide a more precise location than geocoding an address along the road centerline data. Other highly recommended data layers for NG9-1-1 are:

- State, county and municipal boundaries
- Cell site and sector locations
- Road name alias table

Other non-core GIS data layers provide invaluable information for telecommunicators, dispatchers and emergency operations. These data layers include:

- Hydrology (rivers, lakes, streams)
- Railroads
- Common places (landmarks)

All the listed data layers should be included in a statewide public safety SDBMS that would standardize, validate, and prepare the core GIS data for NG9-1-1. This SDBMS must validate the GIS data to meet the data integrity and data quality needs of the core GIS data layers for NG9-1-1. The SDBMS should also validate the GIS data for current E9-1-1 and other approved state and local GIS data needs.

The SDBMS will allow authorized entities to upload their GIS data into the system. The SDBMS will generate data quality and data integrity checks on the uploaded core GIS data layers and provide these reports back to the entities submitting the GIS data. The SDBMS must check the GIS data against all applicable NENA standards and best practices for GIS and related data.

The SDBMS should have the ability to run data quality and integrity checks, then upload validated changes and corrections, on the core GIS data layers, into the i3 LVF and ECRF databases using the NENA i3 NG9-1-1 spatial interface function (SIF). All GIS data layers should be available for downloading to authorized entries by secure File Transfer Protocol (FTP) or similar type of connection.

The SDBMS should:

- Promote the development of complete and consistent quality GIS data for use within NENA NG9-1-1 systems
- Establish standardized GIS data provisioning requirements for all authorized users
- Provide a framework to help migrate existing GIS datasets to NG9-1-1 systems
- Ensure GIS data meets the requirements for validation of the 9-1-1 call location information against the local 9-1-1 authorities' GIS data using the LVF
- Ensure GIS data meets the requirements for correct routing of the 9-1-1 call to the proper destination, using the local 9-1-1 authorities' GIS data provisioned to the ECRF
- Ensure GIS data supports the accurate plotting of 9-1-1 calls on a map display for call handling purposes
- Enable compatibility and interoperability between GIS datasets
- Facilitate GIS data provisioning to NG9-1-1 functional elements

The SDBMS should be available 24 hours a day, 7 days a week, and 365 days a year. The SDBMS must be available for each PSAP, county, regional organization or authorized agent to upload their GIS data and provide data quality and data integrity check and reports back to those uploading data. Only approved entities, or their approved agents, can upload their authoritative data layers. Authoritative

data is the local GIS data provided by the designated 9-1-1 authority. The requirement for the SDBMS to be able to utilize incremental GIS updates dictates the SDBMS database be transactional in nature. The mission critical nature of the SDMBS requires the system be fully redundant, fault tolerant, secure, and for the processes and services perform at a level of 99.999 percent uptime.

When determining the requirements of an SDBMS, one must carefully consider how to make the system reliable and usable for the majority of the potential users. A key aspect to consider for inclusion in the development of an SDBMS is the additional functionality it can provide to the entities providing or correcting their GIS data. Considerations for desirable features and functionality include the following:

- Ability of non-GIS users to easily make edits and corrections over a secure interface
- Interface prompting editors for all required 9-1-1 attribute inputs
- Configuration options for accessing several data sets simultaneously
- Complete audit history of all user interactions, updates and changes
- Ability to run near real-time checks for proper attribution of the core data layers
-
- Auto field population utility of valid attributes
- Ability to retain notes and concerns pending
- Audits of individual user edits
- Full GIS metrics reporting package

Core GIS data layers must meet NENA i3 standards for standardization, attribute and topological accuracy. All GIS data coalesced from multiple data sources should undergo data integrity, quality, and normalization testing. The SDBMS should provide data QA and quality control (QC) checks as an automated and comprehensive process. The quality checks should be available to the providing entity as soon as possible with a maximum turnaround time of within 24 hours of the data upload. Checks performed on the GIS data should include, at a minimum, the following data integrity checks on the core GIS data layers:

- Road Centerlines
    - Overlapping address ranges identified
    - Valid Directional Prefix and Suffix
    - Valid left and right Postal Community
    - Valid left and right ZIP code
    - Valid left and right MSAG Community
    - Valid left and right ESN
    - Valid left and right County Name
    - Valid left and right State Name
    - Valid Address Ranges
    - Address Range Parity Errors identified
    - Valid Road Classification
    - Valid One-Way Classification
    - Valid Source of Data
    - Blank Road Names identified

- Validation of NENA 02-010 GIS Standard fields
- Valid Attributes present in all NENA GIS standardized fields
- Duplicate line segment identified
- Multi-part line segments identified
- Route connectivity errors identified
- Validation of road names with MSAG
- Validation with road names with ALI
- Provide comparison reports between MSAG, ALI and road centerline database
- Road address ranges within MSAG ranges
- Road segments split at emergency services boundaries
- Road segments split at jurisdictional boundaries
- Road segments split at intersections
- Road topology issues identified
- Feature IDs unique
- Validation checks of applicable NENA *GIS Data Model for NG9-1-1* attributes, when published
- Projection information present and valid

- PSAP, Law, Fire, EMS and/or Emergency Services polygons
  - Identification of topology issues
  - Identification of overlaps, gaps and slivers
  - Polygon boundaries coincident checks
  - Validation of NENA 02-010 standard fields
  - Valid Attributes provided in all NENA standardized fields
  - Source of data field exists and is not blank
  - Date updated field exists and is not blank
  - Feature IDs unique
  - Validation checks of applicable NENA *GIS Data Model for NG9-1-1* attributes, when published
  - Projection information present and valid

- Address Points (if utilized)
  - Valid House Number
  - Valid Directional Prefix and Suffix Directional
  - Valid Street Type
  - Validation of NENA 02-010 standard fields
  - Valid attributes in all NENA 02-010 standardized fields
  - Identification of Duplicated Address Points
  - Identification of stacked address points
  - Address parity and centerline range check
  - Site address matches to ALI database

- Site address falls within MSAG range
- Site address matching road centerline attributes
- Provide comparison reports between MSAG, ALI and address point databases
- Feature ID is unique
- Validation checks of applicable NENA *GIS Data Model for NG9-1-1* attributes, when published
- Projection information present and valid

SDBMS data should also be available to 9-1-1 and other authorized agencies for use within call handling, CAD, mobile data terminals and other systems that can utilize this high quality GIS data.

14. SELECTION AND IMPLEMENTION CONSIDERATIONS

The State of Nebraska should go through processes for determining the best choice(s) for implementing NG9-1-1 call handling in the state. As part of this process, focus group meetings should be conducted with stakeholders that represent the counties and PSAPs. The purpose of the meetings is to determine the capabilities and requirements that must be met by the NG9-1-1 call handling solution to meet the needs of those receiving the 9-1-1 calls and providing information to accurately dispatch the correct first responders with all the information they need to best handle the caller's needs. Recommended steps that Nebraska should consider for determining these capabilities and requirements include Due Diligence and a Trade Matrix Evaluation. A determination of whether one or both processes are best for Nebraska can be determined through stakeholder discussions.

14.1. DUE DILIGENCE

Due diligence is a process of evaluating details before business decisions are made. Because of the technical complexity of NG9-1-1 and NENA i3, Requests for Information (RFIs) have proven not to provide the information that entities need to make decisions. MCP has found that a well-designed due diligence process allows vendors and entities to share desires, capabilities and requirements outside of a formal proposal process. This process provides an opportunity for vendors to have the understanding they need, which in turn allows them to respond to a subsequent RFP in a thoughtful and accurate manner.

14.2. TRADE MATRIX EVALUATION

A trade matrix evaluation involves using a customized engineering tool to make decisions. Decisions are extracted from deciding what requirements are desired from an NG9-1-1 system and weighing those requirements. Once the requirements are placed in a matrix, viable options are inserted into the matrix. The strength of the trade matrix evaluation is that it is easy to change an assumption and see how that impacts a weighted score.

15. NG9-1-1 EFFORTS AND INITIATIVES

15.1. NEBRASKA INITATIVES

This study is a significant step by the Nebraska Legislature to implement NG9-1-1. Additionally, the PSC has undertaken two major statewide initiatives that will contribute to the implementation of NG9-1-1— the development of a statewide GIS data set and data repository, and the implementation of inter-tandem trunking.

15.1.1. GIS Data and Repository

Comprehensive, accurate, and timely GIS data for use in call routing is critical to NG9-1-1. The PSC found that development of proper GIS data and map databases or supplementation of existing map databases is necessary for Phase II services and would not be affected by possible consolidation of PSAPs. Furthermore, the PSC ordered that the development of GIS mapping databases proceed. Enhanced wireless 911 funds were used to pay for the development and maintenance of statewide GIS data through two primary contractors; with the exception of Douglas, Lancaster, and Sarpy counties, which utilized in-house GIS staff rather than a contractor to develop and maintain the data. Counties contract with a GIS vendor for updates and maintenance of their data. Expenses related to GIS data, subject to the wireless/landline 9-1-1 call ratio, continue to be eligible expenses and can be paid using a County's allocation of enhanced wireless 911 funds. With respect to Douglas, Lancaster, and Sarpy counties, a portion of their in-house GIS personnel expenses are also eligible for funding.

Cell tower locations and coverage information are treated as proprietary information and disclosed only to the PSAPs for the purpose of providing 9-1-1 service. The remaining layers are treated as public documents.

The PSC has also approved funding for a centralized data repository for the GIS data to allow for maintenance of the data and access to the data by individual PSAPs and the PSC. The repository is maintained for the PSC by GIS Workshop, a private contractor. The PSC maintains security of the data repository through a formal access policy. All requests for access to the repository are processed accordingly and each entity is granted access through a username and password.

A PSC representative currently sits on the GIS Advisory Council. The council has been given access to all GIS data in the repository, which the exception of cell tower information.

15.1.2. Inter-tandem Trunking

Inter-tandem trunking enables the transfer of calls to another PSAP along with access to the associated caller and location data. Implementation has been completed between Council Bluffs, Iowa, to Des Moines, Iowa; Sioux City, South Dakota, to Council Bluffs, Iowa; Grand Island to Council Bluffs, Iowa; and Lincoln to Council Bluffs, Iowa. The PSC pursued and was awarded federal funding for the completion of inter-tandem trunking between Grand Island and Scottsbluff.

This project provided an increase in multiple state systems capabilities as well as the opportunity for interstate cooperation.

15.2. NEIGHBORING STATES

NG9-1-1 implementation in neighboring states varies from well underway to not planned or started. The following is a summary of progress in neighboring states.

15.2.1. Iowa

NG9-1-1 implementation is well underway in Iowa. An IP-based network is in place, provided by Iowa Communications Network (ICN), a state government network. All 119 PSAPs and the carriers have transitioned to the new network. Gateways were installed at each PSAP to convert data back to CAMA until all the PSAPs update their equipment. A contract is in place for a next generation solution provider. Remaining work includes upgrades to PSAP equipment and improvements to GIS data. Matching state grants are available for procurement of PSAP equipment.

The contact is Barbara Vos, E911 Program Manager, Iowa Homeland Security and Emergency Management.

15.2.2. Kansas

Kansas is a neighboring state that Nebraska should observe. Like Nebraska, a significant portion of the population resides on the eastern side of the state, with the rest of the state being mostly rural. Kansas is ahead of Nebraska in that the Kansas 911 Coordinating Council has started creating strategies along with reviewing and testing proof of concept solutions since 2010.

The Kansas 911 Coordinating Council has developed an NG9-1-1 Strategic Plan as a roadmap for transitioning statewide 9-1-1 services to NG9-1-1 in fiscal years 2013–2017. The strategic plan is the result of a cooperative effort between the Coordinating Council, its stakeholders, and MCP.

The Council adopted a 2010 work plan that included oversight of a federally funded NG9-1-1 grant pilot project. On September 6, 2012, the Council accepted the final report on the results of the Federal ENHANCE 911 Grant pilot project, which involved a proof of concept implementation of NG9-1-1 with three PSAPs (one in a rural county, one in a medium-sized city and one in an urban county). The purpose of the pilot project was to identify viable approaches using existing resources that could be used to cost-effectively implement NG911 service in Kansas.

In November 2013, the Council Technical Sub-committee began the effort of taking their NG9-1-1 strategy and creating a plan for implementation of NG9-1-1. In January 2014, the Council approved moving forward with creating a state-level ESInet backbone that will provide many of the i3 applications and services, with regional ESInets connected to that backbone.

The Council plans to utilize fiber already existing in Kansas for creating the ESInets. This fiber is available not only through traditional voice 9-1-1 service providers, but also other multiple carriers that can successfully carry meet the NENA i3 requirements for transporting and managing this data traffic including, Kansas Fiber Network, a consortium of 29 independent service providers. The goal is to provide equal service across the state of Kansas while being the best possible stewards of tax payer resources. The Strategic Plan is a "live" document and has been updated to support these advancements in transitioning toward NG9-1-1. Additional information concerning the Kansas 911 Coordinating Council and Kansas' NG9-1-1 strategy can be found at http://www.kansas911.org/

Kansas' current effort is invested in design, requirements and performance matrix documents for NG9-1-1 in the state.

The contact is Walter Way, Chairman, Kansas 911 Coordinating Council, and Director, Johnson County Emergency Communications.

15.2.3. Colorado

In 2011, the Colorado 911 Resource Center contracted with MCP to conduct a study to determine options for the future transition to NG9-1-1 in Colorado. This study focused on three primary considerations:

- Technology
- Funding
- Governance

The recommendations and the next steps for Colorado were discussed at an NG9-1-1 Summit on January 30 and 31, 2012. Based on the results of that discussion, an NG9-1-1 Steering Committee was formed to further explore the options for a transition to NG9-1-1. Many of the discussions from the Steering Committee are incorporated into the Colorado State 911 Plan. In January 2013, CenturyLink presented a plan for the transition to NG9-1-1 in Colorado to the Public Utilities Commission's 911 Advisory Task Force.

In March 2013, Bandwidth presented their plan to the Task Force, and Level 3 presented its plan to the Task Force in July 2013. In July 2013, the Colorado Public Utilities Commission held an Informational Hearing on NG9-1-1.

The contact is Daryl Branson, Colorado 911 Resource Center.

15.2.4. Wyoming

Without statewide oversight, localities are taking a piecemeal approach to NG9-1-1 and the discussion is coming up on a statewide-level only tangentially and in conjunction with other projects (e.g., broadband).

A contact is Alyssa Watkins 911 Director, Teton County.

15.2.5. South Dakota

South Dakota has a 911 Master Plan. The South Dakota NG9-1-1 System will be initiated with the implementation of a statewide host-remote 9-1-1 platform. Several initial beta test PSAPs will be interconnected via IP-based facilities and systems. The beta test is intended to demonstrate the ability to form a statewide ESInet. The initial ESInet will be expanded to eventually provide all connectivity between individual PSAPs creating a fully functional statewide ESInet.

South Dakota is presently reviewing responses to an RFP for an NG9-1-1 consultant. The consultant will work with the State and the 911 Coordination Board over a period of about two years to transition to an NG9-1-1 system. Step one is to finalize the State's 911 Master Plan, which is followed by an RFP for GIS data and maintenance system. An RFP for a centralized/hosted 9-1-1 system and CPE was released in January 2014; an RFP to transition legacy 9-1-1 networks to NG9-1-1 networks, and an RFP for an NG9-1-1 ESInet were also released in January 2014.

The contact is Shawnie Rechtenbaugh, South Dakota 911 Coordinator, Department of Public Safety.

15.2.6. Missouri

Missouri has no state-level 9-1-1 focus or coordination mechanism in place.

15.2.7. Other States

Many of the other states are in the process of either planning or implementing Next Generation 9-1-1 services and their experiences could be of value. The National Association of State 911 Administrators (NASNA) is a non-profit organization that exists to assist state 9-1-1 administrators to enhance 9-1-1 services in their states. According to NASNA's website, the purpose of NASNA is to:

"A. Promote information sharing amongst those states with programs dedicated to implementing 9-1-1 emergency telephone systems
B. Assist other states with resolving issues necessary to accomplish statewide implementation and maintenance
C. Encourage the establishment of a coordination person within each state or province
D. Identify and recommend minimum standards for 9-1-1 emergency telephone systems
E. Identify and recommend appropriate legislation or rules concerning the administration of statewide 9-1-1 telephone system programs
F. Serve as a knowledge resource for fulfilling the purposes described in this section
G. Provide for membership in this Association in accordance with the language and intent of its Bylaws, which are now, and may later be, in effect. Membership shall not be limited other than

by classification and good character, and shall have such rights and privileges by classifications as may be provided from time to time."[13]

The Association holds two meetings per year in which members report the latest activities in their states and hear from national–level leaders on topics of interest. Active participation by a designated NG9-1-1 program manager from Nebraska would provide ongoing direct access to useful information on NG9-1-1 implementation from other states.

15.3. LEGISLATIVE EFFORTS

Across the country, States are beginning to review statutes regarding networks that can carry 9-1-1 communications. Reasons for States to review legislation are often based on providing risk avoidance and risk reductions, which include states such as Indiana; Vermont, which is using an Intrado-provided network; and Maine, which is using a FairPoint-provided network. Alabama with their Next Generation Emergency Network (ANGEN) is interesting in that they use the company Bandwidth to work with the Alabama Super Computer Authority to provide and manage services. These states perceive that they can provide more redundant and resilient networks by review and modification of statutes such that Voice over IP (VoIP) is recognized as an application; in NG9-1-1 that application is handled by SIP and is essentially data.

Indiana made the transition over several years. As one of the country's first, INdigital built a network for the state to handle wireless calls within Indiana. This solution demonstrated greater network reliability and redundancy than what was previously available. Time is critical when handling 9-1-1 calls, and INdigital's solution demonstrated quicker call setup. These enhancements were implemented while providing a four-fold cost reduction to the state's constituents. Partially based on the success of superior handling of wireless calls, statutes were changed in Indiana to allow INdigital to handle wireline calls.

The 9-1-1 system is designed to take information from general users and get that information to the correct entity. This is best accomplished in an environment that involves cooperation and communication between all parties.

At a national level, the draft report for National 9-1-1 Assessment Guidelines, dated June 2012, prepared for the U.S. Department of Transportation through the National 911 Program, does not have specific statutory or regulatory recommendations, but does provide guidance. Guideline SR15, for example, says that the statutory/regulatory environment should require all service providers, both originating and access, in a respective state that provide services to general users of telecommunications services to coordinate and cooperate with the State in the provision of 9-1-1 services. A registration process is recommended.

[13] http://www.nasna911.org/

The State needs to have a clear understanding of the efforts of all the various service providers and their respective capabilities to help integrate these services into the 9-1-1 system and to educate the public on the services' capabilities.

16. PARTICIPATION AND COOPERATION

16.1. FEDERAL

At the national level, Congress has expressed an interest in 9-1-1 services and passed legislation to advance 9-1-1 and NG9-1-1 services, as briefly summarized below. However, there is no single federal department or agency with single or ultimate authority for 9-1-1 governance and oversight. There are multiple agencies that address issues across the continuum of emergency communications: 1) caller access, 2) 9-1-1 services, and 3) emergency responders. The FCC exerts its regulatory authority over telecommunications providers who provide 9-1-1 services, but has no authority over state and local jurisdictions who implement that service and no authority for regulating PSAPs. The National 911 Program, housed within the U.S. Department of Transportation (DOT) is charged with facilitating coordination among public and private sector 9-1-1 stakeholders at the local, state, and federal levels, but has no jurisdiction to mandate policy. A number of federal agencies address other issues of federal interest, including the National Telecommunications and Information Administration (NTIA) at the U.S. Department of Commerce (DOC), and the U.S. Department of Justice, to name just a few.

16.1.1. Americans with Disabilities Act (ADA)

In 1990, Congress enacted the Americans with Disabilities Act (ADA), which, in part, prohibits state and local governmental programs from discriminating on the basis of disability. Legislative reports accompanying the ADA interpreted this prohibition, contained in Title II of the statute, to require that local governments "ensure that [their] telephone emergency number systems are equipped with technology that will give hearing impaired and speech impaired individuals a direct line to these emergency services." While this mandate has initially required the installation of TTY capabilities by PSAPs, Congress made clear that "future technological advances – such as speech to text services – may offer other means of affording direct and equally effective access for these individuals."

16.1.2. ENHANCE 911 Act

Congress enacted the Ensuring Needed Help Arrives Near Callers Employing 911 Act (ENHANCE 911 Act) in 2004. The act addressed numerous concerns that had been raised about 9-1-1 deployment, including compliance, coverage in rural areas, and the use of fees levied by states and localities to cover 9-1-1 service costs. The ENHANCE 911 Act also created the E9-1-1 Implementation Coordination Office (ICO), an office jointly administered by NTIA and the National Highway Traffic Safety Administration (NHTSA), to assist and coordinate with state and local 9-1-1 authorities in the development of 9-1-1 and E9-1-1 and to administer a grant program for the implementation and operation of Phase II E9-1-1 services and NG9-1-1 services. ICO helps to coordinate the efforts of

states, technology providers, public safety officials, 9-1-1 professionals and other groups, and seeks to ensure a smooth, reliable and cost-effective transition to 9-1-1 systems that takes advantage of new communications technologies to enhance public safety nationwide.

16.1.3. NET 911 Improvement Act

In 2008, Congress enacted the New and Emerging Technologies 911 Improvement Act (NET 911 Act). The NET 911 Act confirmed the PSC's authority to regulate the provision of 9-1-1 by VoIP service providers and took other steps to improve the delivery of 9-1-1 services nationwide. The key provisions of the NET 911 Act are as follows:

- Required VoIP providers to provide 9-1-1 and E9-1-1 in compliance with existing FCC regulations at the time of passage of the act or as modified in the future.
- Provided for equal access for VoIP providers to communications networks needed to complete 911 calls.
- Extended state liability protection for 9-1-1 and E9-1-1 to VoIP providers and other emergency service providers.
- Directed the ICO to develop a national migration plan for transition of 9-1-1 to an IP-enabled 9-1-1 network.
- Protected the rights of states and other political subdivisions to levy fees on 9-1-1 services.
- Required the FCC to report annually on collection of state fees and other levies on 9-1-1 and E9-1-1 services.

16.1.4. Twenty-First Century Communications and Video Accessibility Act

In October 2010, Congress enacted the Twenty-First Century Communications and Video Accessibility Act. Not later than one year after the date of the enactment of this Act, the FCC, in coordination with the Secretary of Homeland Security, the Administrator of NHTSA, and the Office, were to prepare and submit a report to Congress that contains recommendations for the legal and statutory framework for NG9-1-1 services, consistent with recommendations in the National Broadband Plan developed by the PSC pursuant to the American Recovery and Reinvestment Act of 2009, including the following:

- A legal and regulatory framework for the development of NG9-1-1 services and the transition from legacy 9-1-1 to NG9-1-1 networks.
- Legal mechanisms to ensure efficient and accurate transmission of 9-1-1 caller information to emergency response agencies.
- Recommendations for removing jurisdictional barriers and inconsistent legacy regulations including:
    - Proposals that would require States to remove regulatory roadblocks to NG9-1-1 services development, while recognizing existing State authority over 9-1-1 services;
    - Eliminating outdated 9-1-1 regulations at the Federal level; and
    - Preempting inconsistent State regulations

16.1.5. FCC

In October 1999, the Wireless Communications and Public Safety Act of 1999 (911 Act) took effect with the purpose of improving public safety by encouraging and facilitating the prompt deployment of a nationwide, seamless communications infrastructure for emergency services. One provision of the 911 Act directs the FCC to make 911 the universal emergency number for all telephone services.

In recent years, the FCC has taken steps to facilitate the transition to NG9-1-1. In the National Broadband Plan, the FCC made several recommendations to "bridge the gap" to NG9-1-1 in order to encourage innovation in the development and deployment of NG9-1-1 networks and emergency alert systems.

- NHTSA should prepare a report to identify the costs of deploying a nationwide NG9-1-1 system and recommend that Congress consider providing public funding.
- Congress should consider enacting a federal regulatory framework.
- The FCC should address IP-based communications devices, applications and services.
- The FCC should launch comprehensive next-generation alert system inquiry.
- The Executive Branch should clarify agency roles on the implementation and maintenance of a next-generation alert and warning system.[14]

In December 2010, following up on the National Broadband Plan recommendation to "address IP-based NG9-1-1 communications devices, applications, and services, the FCC issued a Notice of Inquiry on facilitating the transition to NG9-1-1, exploring issues of federal oversight or governance of state deployments of NG9-1-1, improving the accuracy of technologies that supply PSAPs with critical location data, as well as near-term and long-term solutions for providing consumers the ability to send text messages to 9-1-1.

In August 2011, then FCC Chairman Genachowski announced a five-step action plan for accelerating NG9-1-1 deployment. Among other things, the Chairman's plan called for the FCC to initiate rulemaking proceedings on NG9-1-1 location accuracy and enabling the public to transmit emergency communications to PSAPs via text, data, and video in addition to voice. The FCC has subsequently initiated rulemaking proceedings in both areas. The plan also called for the FCC to work with "state 911 authorities, other Federal agencies, and other governing entities" to provide technical expertise and develop a coordinated approach to NG9-1-1 governance.

In December 2012, as part of its rulemaking proceeding on communicating with PSAPs via text, data, and video, the FCC adopted a Further Notice of Proposed Rulemaking in which it proposed to require all wireless carriers and providers of "interconnected" text messaging applications to enable their customers to send text messages to 9-1-1 in areas where PSAPs are also prepared to receive the texts. The Further Notice reflected a voluntary commitment by the four largest wireless carriers – Sprint,

[14] Federal Communications Commission, Connecting America: The National Broadband Plan (2010), Chapter 16 PUBLIC SAFETY.

AT&T, Verizon, and T-Mobile – to support text messaging to 9-1-1 to text-capable PSAPs by May 15, 2014.

On November 18, 2013, the FCC's Public Safety and Homeland Security Bureau (Bureau) hosted a public workshop to discuss recent developments in the use of wireless technology to contact emergency services. The workshop explored current trends that may be affecting the provision and quality of 9-1-1 location information delivered to PSAPs, including the increased volume of wireless 9-1-1 calls and the increase in wireless calls originating from indoor locations. The issues raised at the workshop should lead to further rulemaking and the FCC is expected to consider proposed rules in the spring of 2014.

On December 12, 2013, the FCC issued new rules to improve 9-1-1 reliability as a result of the derecho (severe wind storm) that disrupted service to millions. In general, the FCC chose not to impose very strict rules on the telecommunications service providers (phone companies), but rather allow them to "self certify" that they had reliable, diverse networks. Some new requirements have been imposed to ensure that critical circuits follow diverse routes, and that those routes are checked annually. However, the FCC is not convinced that NG9-1-1 networks should be part of the new rules. "…we are not persuaded that NG911 technologies have evolved to the point that reliability certification rules should apply to entities beyond those that offer core services functionally equivalent to current 911 and E911 capabilities."

The FCC has established a Technology Transitions Policy Task Force to examine issues associated with the transition from legacy circuit-switched networks to fully IP-enabled networks. The task force made a presentation at the December 12, 2013, meeting and while their efforts appear to focus on the impact of technology transitions on consumers through diverse experiments and open-data initiatives, they are considering a NG9-1-1 trial that would take place in areas where public safety authorities are transitioning or have taken initial steps to prepare for transition of their legacy systems to NG9-1-1 and where providers, including landline, wireless, and interconnected VoIP, are able to deliver VoIP-based 9-1-1 calls (and potentially other IP-based traffic) to an ESInet, either "natively" or, if necessary, initially through LNGs. The task force is a cross-agency working group charged with presenting an Order to the FCC at its January Open Meeting.

The recent appointment of a new FCC Chairman, Tom Wheeler, will probably result in some realignment and reprioritization of the efforts of the FCC to facilitate the transition to NG9-1-1.

16.1.6. National 911 Program Office

Congress formed the National 911 Office because it recognized the critical importance of the 9-1-1 system in protecting public safety and security; now it is known as the National 911 Program, and is housed within the Office of Emergency Medical Services at NHTSA.

The mission of the National 911 Program is to provide federal leadership in supporting and promoting optimal 9-1-1 services. It was created as a point of coordination for activities among 9-1-1 stakeholders

and to provide information that can be used to improve the 9-1-1 system. This is done by developing a variety of tools and resources that can be used to plan and implement NG9-1-1.

The National 911 Program, in coordinating the efforts of states, technology providers, public safety officials, 9-1-1 professionals and other groups, seeks to ensure a smooth, reliable, and cost-effective transition to a 9-1-1 system that takes advantage of new communications technologies to enhance public safety nationwide.

The program office administered the ENHANCE 911 Act grants and has worked in cooperation with stakeholders to produce several resource documents such as the *Model State 9-1-1 Plan*, *A National Plan for Migrating to IP-Enabled 9-1-1 Systems*, *Guidelines for State NG9-1-1 Legislative Language*, and a Blue Ribbon Panel on 911 Funding report: *Current State of 9-1-1 Funding and Oversight*.

16.1.7. NTIA

Pursuant to Section 6210 of the Middle Class Tax Relief and Job Creation Act of 2012 (Act), the First Responder Network Authority (FirstNet) was established as an independent authority within NTIA. FirstNet is authorized to take all actions necessary to ensure the building, deployment, and operation of a nationwide public safety broadband network based on single, national network architecture.

The FirstNet Statement of Requirements (SOR) acknowledges NG9-1-1 as incorporated in the Public Safety Enterprise Network (PSEN). This is because FirstNet secondary users make emergency calls and those are delivered to a PSAP. Currently, the discussion regarding the interaction between NG9-1-1 and FirstNet services is only beginning, although an NG9-1-1 PSAP may obtain information that is forwarded on to first responders.

16.1.8. Department of Justice

The Department of Justice (Department) is considering revising the regulation implementing Title II of the ADA to address in what manner public entities that operate PSAPs should be required to make changes in telecommunication technology to reflect developments that have occurred since the publication of the Department´s 1991 regulation. Under its existing Title II regulation, the Department requires that PSAPs provide direct, equal access to telephone emergency centers for individuals with disabilities who use analog text telephones (TTYs). Many individuals with disabilities now use the Internet and wireless text devices as their primary modes of telecommunications. Many PSAPs are considering and planning to transition from analog telecommunications technology to IP-enabled 9-1-1 services that will provide voice and data (text, pictures, and video) capabilities. The Department seeks information on possible revisions to the Department´s regulation to ensure direct access to NG9-1-1 services for individuals with disabilities. Any action resulting from this activity could influence the timing of NG9-1-1 implementation in the states.

16.2. STATE

At the state level, the PSC is experienced in the management and oversight of a critical state-level public safety communication program. Their experience in managing wireless funding and rulemaking will be critical as the State's 9-1-1 program moves to a new age. The PSC's work in GIS and inter-tandem trunking has been productive and instructive.

The OCIO could provide a broad range of technology services that will be required to implement NG9-1-1 services. The office develops, implements, and supports the technologies employed in IP-enabled networks that are the foundational elements for NG9-1-1. Their planning and project management services, as well as information systems operations, business continuity, and disaster recovery experience could be very helpful. The OCIO has worked to create partnerships with entities both internal and external to Nebraska State Government and many of their successful projects have been made possible through collaborative efforts. The partnership with Nebraska Public Power District (NPPD), State Patrol, State Fire Marshal, and Game and Parks to establish the statewide radio system has provided them with valuable experience in public safety communications.

16.3. LOCAL

Local entities retain significant responsibility for emergency communications and response in the NG9-1-1 environment. Governing bodies should retain control over their respective 9-1-1 and emergency response functions, including call processing, and are encouraged to participate in state and regional initiatives. Local jurisdictions will also retain responsibility for managing their respective daily PSAP operations, staffing, training, and scheduling in accordance with current and future standards.

17. OTHER RECOMMENDATIONS

The evolution from today's legacy 9-1-1 system to tomorrow's IP-based NG9-1-1 service requires the careful sequencing of a multitude of parallel activities. A coordinated set of actions combining state, regional, and local efforts is necessary to successfully accomplish critical planning, preparations, and implementation.

17.1. PLANNING

A Master Plan should be developed that communicates the vision of the Nebraska NG9-1-1 system to stakeholders, so that they may be actively engaged in its development and deployment. The NG9-1-1 Master Plan should present Nebraska's tailored perspective of the system's desired functionality, concept of operations, and governance structure, including state, regional, and local roles.

Nebraska must develop a Strategic Plan to establish goals, objectives, responsibilities, and timelines for the migration to the system described in the Master Plan. State, regional, and local implementation plans can then be developed to carry out the Strategic Plan.

Key planning factors include:

- In NG9-1-1, transmission of information, both voice and data, will be via IP-based circuits. 9-1-1 data links will be comprised of private, managed networks, not the public Internet, although calls may access the NG9-1-1 system via the Internet.
- NENA 08-003, commonly referred to as i3, introduced the concept of an ESInet designed to be shared by all agencies that may be involved in any emergency. An ESInet is the entry level requirement for implementation of NG9-1-1. It provides the network transport medium to allow for voice and data calls to be delivered between PSAPs within the state and beyond.
- NG9-1-1 is software and database driven, which will enable numerous applications and the ability to share more data and information. However, software must be interoperable and data must be complete and accurate to achieve full benefit of the change in technology
- The NG9-1-1 application will determine call routing using the location information provided by the caller's device and data contained in location databases. GIS data will be essential to NG9-1-1 and its accuracy will become more critical as it is used to route calls to the proper PSAP.
- Deployment of NG9-1-1 will fundamentally alter the ways 9-1-1 systems and associated data are secured. Development of a security policy is the first step to an effective and comprehensive security program.
- The system must be designed to enable a phased implementation starting with the delivery of calls across an ESInet while maintaining connectivity to the existing E9-1-1 network and the public switched telephone network (PSTN).

17.2. DEVELOPMENT

NG9-1-1 systems can be developed at the state, regional, or local level. Regardless of how they are developed, statewide coordination of systems development will be necessary to maximize system capabilities, ensure interoperability and facilitate efficiency. Counties should be encouraged to create regional operating entities, within the state-level NG9-1-1 Strategic Plan, which can develop and carry out action plans for the implementation and subsequent management of a regional NG9-1-1 system to serve a respective region and then assume responsibility for network management.

17.3. PHASED-IN IMPLEMENTATION

NG9-1-1 will not be deployed in a "flash cutover." The system must be designed to enable a phased implementation starting with the delivery of calls across an ESInet while maintaining connectivity to the existing E9-1-1 network and the PSTN. There will be PSAPs and areas that remain tied to the legacy E9-1-1 system for quite some time that must be able to interoperate with PSAPs that have migrated to NG9-1-1. Detailed state-level planning coordination and adherence to standards are crucial to maintaining system integrity during transition to the new system.

Service providers will need to utilize gateways to access the ESInet and will have to meet industry-accepted standards and state requirements for access.

17.4. NG9-1-1 MANAGEMENT

17.4.1. ESInet Deployment

In practice there are a number of ways to achieve statewide ESInet coverage. ESInets may be deployed at a state level and there may be increased efficiencies and economies of scale in doing so. ESInets can be deployed at a sub-state level (regional/county) and then interconnected with other sub-state ESInets to establish a standardized, interconnected and interoperable statewide ESInet. Regardless of the path to such statewide coverage, a state-level entity or organization is recommended to oversee implementation and management of the interconnected statewide ESInet. A state level entity could play a significant role by providing and managing an IP backbone network to make interconnection of regional/local ESInets more efficient

17.4.2. ESInet Interconnection

Interconnected ESInets are critical to the NG9-1-1 architecture. Statewide ESInets are more than just physical pathways. They can host (or provide access to) numerous application layer services that support interoperability among the highly diverse regional/local networks and agency applications. These include appropriate standardized core services such as GIS-based directories of authorized organizations and resources, and access control/identity management for implementation of information sharing policies. These directories will enable interstate and intrastate dissemination and queries for emergency incident information and messages, including references to locations, agencies and data sources. All authorized organizations (local, state, national, public, private) need to be able to implement their data policies through these core services. The ESInets may also offer optional managed services (or access to them) for use by individual agencies.

Consideration must be given to interstate and interregional connectivity and support for interoperability with other public safety functions, such as public safety radio interoperability. The relevant terms of interconnection to the ESInets and other PSAPs must be collaboratively developed and established. PSAPs and regional NG9-1-1 infrastructures will have to meet established requirements and adhere to appropriate standards in order to interconnect at each level

17.4.3. ESInet Management

As part of the governance structure, a governing board or group of governing boards should be able to form an entity for the purpose of planning, implementing, operating, and maintaining a regional ESInet. The entity should be able to employ a commercial or public sector NG9-1-1 system provider to implement, operate, and maintain the network, applications, and databases that may comprise an ESInet. ESInets should be able to share core services with other ESInets. Carriers should be required

to deliver calls to the designated point of interconnection (POI) as determined by the appropriate regional or local entity in collaboration with the state NG9-1-1 authority.

17.5. TECHNOLOGICAL UPGRADES

Today, E9-1-1 supports voice calling for consumers using wireline, cellular, and VoIP services. There are current and future needs for 9-1-1 systems to accommodate emerging calling technologies, including non-voice messaging of various types, devices generating data-only messages (such as sensors), photo and video transmission, and unknown future services. A primary objective of NG9-1-1 is to establish a common IP-based interface to which developers can design as they develop new services. This will allow 9-1-1 to be planned for and then connected to quickly as new 9-1-1 call generating services are introduced to the public. Support of that objective will require the replacement of the legacy circuit-switched analog infrastructure with a new digital IP-enabled infrastructure.

To align call routing with the increasing mobility of consumer calling devices, NG9-1-1 call routing will change from technology that uses predetermined call paths to technology that determines the routing path dynamically based on the caller's location at the time of placing the call and which can be easily modified to meet emerging conditions. This change further emphasizes the importance of originating service providers providing accurate and timely caller location information in order to expeditiously route the call to the proper PSAP.

Completion of migration to NG9-1-1 will not mark the end of the need for change. State, regional, and local systems must be frequently updated to remain in step with the constant changes in industry-supplied technology and consumer-driven expectations. Standardized systems are essential to deploying and maintaining seamless communications and data transfer among PSAPS in the same jurisdiction as well as across county and state borders, and across a multitude of emergency response professions and agencies. Nebraska's Strategic Plan should be updated on an iterative basis to stay current with industry changes.

NENA has applied standards from the Internet Engineering Task Force (IETF) and other standards development organizations (SDOs) to specific NG9-1-1 requirements, such as address validation. IETF-based IP standards, which are consensus standards incorporating requirements from a wide variety of stakeholders, provide the basic functionality of the NG9-1-1 system. These and other component and system functions are defined in recommended standards such as NENA 08-003, *Functional and Interface Standards for the NENA i3 Solution – Stage 3,,*and are a fundamental element of the strategy to ensure that the state maintains a system that is fully interoperable from the local to the national level.

17.6. PHASES TIMELINES

Timely implementation of NG9-1-1 to meet consumer expectations and maintain affordability is the key to the long-term sustainability of emergency calling in Nebraska. Transition to NG9-1-1 will be a process that takes time; however, the current expenditure rate to support stand-alone systems cannot

be justified or sustained indefinitely. Deployment of IP network technology can reduce overall costs by enabling the adoption of regionally shared systems, which are inherently more cost effective than stand-alone systems. Local 9-1-1 operating authorities should embrace a regional approach to 9-1-1 and begin the expeditious transition to advanced network technology. Time is of the essence to maximize return on investment.

Envisioning detailed planning and implementation schedules for entities yet to be formed is difficult, but, the following example roadmap can be used for guidance in developing a target planning and implementation schedule.

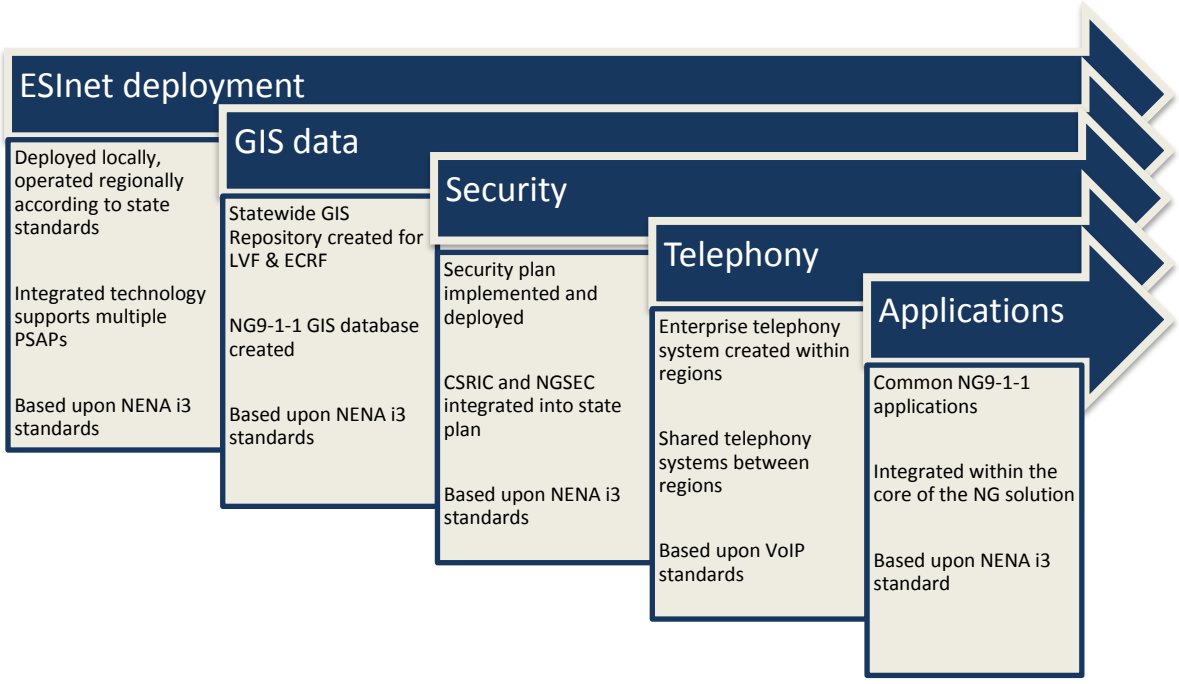

Figure 5 – Implementation

17.7. COST

The legislature should provide incentives for the sharing of resources and regionalization of PSAPs to increase efficiencies and reduce long-term costs.

17.8. ORGANIZATIONAL STRUCTURES WITH AUTHORITY TO OVERSEE OPTIONS

Implementation of NG9-1-1 will entail detailed planning and close cooperation among the public and private sector entities responsible for the build-out and subsequent operation of an NG9-1-1 system. It will cut across multiple existing jurisdictional boundaries. Selection of the organizational structure to guide and oversee the migration to NG9-1-1 is a key decision. “The goal of the structure should be to

provide the most inclusive, efficient and cost effective way to manage the systems from a technical and systems operation perspective."[15]

Ideally the staffing of PSAPs and handling of 9-1-1 calls and associated emergency response should remain a local function, subject to local decisions, but the migration to NG9-1-1 will require state-level planning and implementation coordination. As previously stated, the State may need to consider keeping dispatch as a local function that is subject to local decisions, while some PSAPs may need assistance in successfully handling NG9-1-1 call handling and all of the associated requirements for keeping GIS updated and other required functions.

ESInets may be developed and managed locally or regionally, but strong state-level leadership and coordination will facilitate interoperability and ensure conformance to applicable national policies and industry standards that are essential to a unified network. Further, coordination with national entities to ensure Nebraska's input into national standards and federal policies should be accomplished at the state level.

The current state-level organizational structure for the management and funding of 9-1-1 services in Nebraska is capable of supporting current E9-1-1 services, but was not designed to support migration to a statewide 9-1-1 system. However, it does form the basis for the development of a new framework that can support a statewide NG9-1-1 system. A mix of old and new state-level functions will be required to move NG9-1-1 from concept to reality and achieve an interconnected and interoperable statewide NG9-1-1 system. Examples include, but are not limited to:

- Communicating the vision for the creation and support of a seamless statewide N9-1-1 system set out in the Master Plan
- Coordinating and assisting in the planning and implementation of interconnected regional and local ESInets
- Establishing rules and regulations necessary to facilitate the effective and efficient deployment and operation of a statewide NG9-1-1 system
- Adopting appropriate industry-based standards, policies and procedures necessary to the support of a statewide NG9-1-1 system
- Coordinating with the adjacent states and federal authorities
- Coordinating with any other external stakeholders
- Administering funding distribution
- Contracting for state-level services
- Developing minimum training standards for NG9-1-1 PSAPs
- Developing and providing public education materials and training
- Establishing performance measures
- Establishing and maintaining network security

[15] *Next Generation 9-1-1 Transition Policy Implementation Handbook*, NENA Next Generation Partner Program's March 2010, p.1

These functions should be assigned to the individual agency best suited by experience and capacity. Comprehensive authority is recommended for coordination of the statewide implementation of NG9-1-1; however, responsibility for carrying out the required functions should not necessarily be assigned to a single agency, but rather the entity or organization best suited to accomplish the function.

According to the National 9-1-1 Office, in their Guidelines for State NG9-1-1 Legislative Language, "the establishment of a State-level entity with statewide authority to address necessary state level functions and responsibilities, with a clearly defined 9-1-1 program coordination role, is critical to maximizing the capabilities of 9-1-1 systems. State-level 9-1-1 authority that is comprehensive and accommodates all forms of originating telecommunication services will be required for NG9-1-1 implementation."[16]

Several options are considered viable for assignment of the implementation coordination function.

Option 1: Assign the state-level NG9-1-1 implementation coordination function to the PSC. The PSC is experienced in wireless E9-1-1 and provides the point of contact for emergency communications matters as requested by the FCC. The PSC has the following authority:

- Determine the amount of money to be deposited in the Enhanced Wireless 911 Fund for the following year and set the surcharge
- In consultation with the advisory board, manage the distribution of wireless surcharge revenue
- Compile and place 9-1-1 information into its annual telecommunications report to the Legislature
- In consultation with the advisory board, adopt and promulgate rules and regulations necessary to carry out the Enhanced Wireless 911 Services Act
- May administratively fine any person who violates the Emergency Telephone Communications Systems Act
- Apply for or assist any political subdivision in applying for any federal or other funds available for 911service or E-911service and to distribute the funds consistent with the requirements of the given grant

The PSC currently lacks the authority to coordinate, oversee or manage 9-1-1 systems but was directed to conduct this study to examine issues surrounding the statewide implementation of NG9-1-1 and to contract with an independent third-party to assist with the study using the Enhanced Wireless 911 Fund.

LB 911 (Nebraska 911 Act) as introduced in the current session would authorize the PSC to: (1) develop a plan for the implementation of next generation 911 services based upon the findings of the study conducted pursuant to section 86-471; and (2) contract with any consultants in order to carry out the purposes of the act. The act is not intended to fully fund the provision of 911 service in Nebraska.

[16] Guidelines for State NG9-1-1 Legislative Language, 911 Program Office, http://www.911.gov/pdf/ModelNG911legis-110812.pdf

The multi-level, cross jurisdictional coordination skills necessary to plan, implement and oversee a new statewide NG9-1-1 system will be somewhat different from those required in a primarily regulatory environment that the PSC operates in today.

Option 2: Assign the state-level NG9-1-1 implementation coordination functions to the OCIO. The OCIO is experienced in the planning and management of major state-level telecommunications projects and programs and is active in the development of GIS data, which is critical to NG9-1-1 functionality. With limited experience in 9-1-1, the agency would likely need to obtain additional technical and operational expertise, either through hiring or contracting.

Option 3: Assign the state-level NG9-1-1 implementation coordination functions to an independent agency established to coordinate the transition to NG9-1-1 and its subsequent management. While some states have independent agencies responsible for 9-1-1 matters, the actual number of states employing that organizational structure is quite small, probably due to the high administrative cost of maintaining a relatively small independent program.

Again, according to the National 9-1-1 Office, in their Guidelines for State NG9-1-1 Legislative Language: "A mechanism for coordinating, or sharing this authority, with other State and regional public sector agencies will be necessary to most effectively implement these networks."[17]

No matter which agency is selected to be the implementation coordinator, it will require adequate staff members and support personnel experienced in the current technology, NG9-1-1, and elements required to make a transition. Individuals with experience in PSAP operations will also be required. Qualified third-party consultants can provide support to staff.

The implementation coordinating agency should be assisted with strategic guidance and oversight by a board composed of stakeholder representatives. According to the FCC, "[w]e believe more needs to be done to encourage states to establish state-level governance of the NG911 transition. Not all states, however, have state 911 boards or similar entities, and those that do have such boards do not necessarily have boards with the operational and technical expertise critical to guiding statewide NG911 implementation. We therefore recommend that Congress recognize the importance of state 911 boards and state-level governance entities in the cost-effective and efficient implementation of emergency services."[18] The Next-Generation 911 Advisory Council that would be created by LB 911 could fill this role, given the authority to act as a governance and oversight body.

[17] *Guidelines for State NG9-1-1 Legislative Language, 911 Program Office, http://www.911.gov/pdf/ModelNG911legis-110812.pdf*

[18] *Legal and Regulatory Framework for Next Generation 911 Services, Report to Congress and Recommendations*, Federal Communications Commission, February 22, 2013, Section 4.1.1.2

17.9. LEGISLATION

To actually implement an NG9-1-1 system requires effective laws that facilitate and fully support all aspects of NG9-1-1. To support States in addressing these issues, the National 9-1-1 Program has drafted a guideline document with input from local, regional, state, and federal public sector stakeholders, as well as private sector industry representatives and advocacy associations.

The Guidelines for State NG9-1-1 Legislative Language[19] provides background information, examples of legislative language, and guidance for the use of the language for each key issue identified. This guidance discusses the specific issues or challenges the proposed legislation addresses and explains the intent of the language. It provides ideas that could be helpful when contemplating changes to 9-1-1 legislation that will facilitate adoption and foster progress toward a statutory environment that facilitates the full deployment of NG9-1-1.

In considering changes to legislation, the following may have merit:

- The statutory division between landline and wireless 9-1-1 with respect to funding, administration, and governance could be eliminated. NG9-1-1 will accommodate all forms of originating telecommunication services and the distinction between wireline and wireless 9-1-1 services should no longer be applicable.
- A single, statewide funding source to support the implementation of NG9-1-1and supplement other funding available for ongoing operational and capital expenses of 9-1-1 would assist in the transition.

18. RECOMMENDATIONS SUMMARY

One of the hallmarks of today's 9-1-1 service is its reliability. However, the wholesale replacement of the systems in place today, which is a fundamental premise of NG9-1-1, introduces new risks that must be mitigated to preserve reliability during transition and beyond. Risk management must be a practice embedded in all aspects of the migration to NG9-1-1.

Risk includes technical risk. Technical malfunctions or unpredicted failures without adequate redundancy or resilience or miscalculations can result in system outages, dropped calls, or inadequate or improper response. A key factor that mitigates this risk is embedded in the fundamental design of NG9-1-1 – the employment of practices and technologies that have been proven in other applications. NENA has applied standards from IETF and other SDOs to specific NG9-1-1 requirements, such as call routing and address validation. IETF-based standards, which are consensus standards incorporating requirements from a wide variety of stakeholders, provide the basic functionality of the NG9-1-1 system. These and other component and system functions are defined in recommended standards such as NENA 08-002, *Functional and Interface Standards for NG9-1-1 (i3)*, and NENA 08-003, *Detailed Functional and Interface Standards for the NENA i3 Solution.* Additionally, public and private

[19] Guidelines for State NG9-1-1 Legislative Language, 911 Program Office, http://www.911.gov/pdf/ModelNG911legis-110812.pdf

sector cooperative efforts have been underway to validate standards and further assure the operability and interoperability of NG9-1-1 components and systems. Industry Collaboration Events (ICE) are supported by NENA and the voluntary efforts of industry partners. The latest event, ICE 8, was held at the Illinois Institute of Technology, November 4–8, 2013. The event focused on interfaces for logging and processing events and recordings of NG9-1-1 multimedia and call data, as well as interfaces for retrieving and reproducing call data.

Adherence to standards and following best practices must be a fundamental part of the design and operation of NG 9-1-1 systems.

Additional risk is due to scope and size of the project. NG9-1-1 will improve the efficiency of emergency calling and response by offering unique opportunities to share services and emergency response information in ways not possible today. Information collaboration among local, regional, and national agencies attained via interconnected IP networks will enable emergency communications applications to work together on a much larger scale than what currently exists on the local level. The increased size and complexity of the systems introduces risk. The strategy to mitigate this risk includes the use of proven program and project management techniques and employment of experienced program managers and certified project management professionals. The establishment of a state NG9-1-1 advisory committee or council, with meaningful stakeholder involvement, to provide grass roots-level input as well as to review and offer advice on how and why systems work in the field as they do, can also assist in this area.

Another area of risk is security. Deployment of NG9-1-1 will fundamentally alter the ways 9-1-1 systems and associated data are secured. The risks involved, if not mitigated (primarily through practices and procedures), are loss of critical data or breach of confidentiality for personal data. Specialized equipment, such as BCF, which provides a secure entry into the ESInet for emergency calls presented to the network along with other critical security functions will play an important role. Other security mechanisms may be required to prevent deliberate or malicious attacks on PSAPs or other entities connected to the ESInet, which could result in malfunctions or DOS. NENA 75-001, *Security for Next-Generation 9-1-1 Standard (NG-SEC),* provides recommendations and guidance for effecting that change. A security policy is the first step in any effective attempt at implementing a comprehensive security program.

Other risks will be identified on the course to NG9-1-1. The governance structure must be flexible and have sufficient authority to mitigate those risks.

18.1. PLANNING

The evolution from today's legacy 9-1-1 system to tomorrow's IP-based NG9-1-1 service requires the careful sequencing of a multitude of parallel activities. A coordinated set of actions combining state, regional, and local efforts is necessary to successfully accomplish critical planning, preparations, and implementation.

Adherence to standards must be a fundamental part of the planning process to ensure the building and maintenance of systems that are fully interoperable from the local to the national level. This imposes a burden on states to adopt and enforce standards necessary to maintain overall system integrity. Experience-based systems design and planning are required to implement and realize the potential of a highly capable system and facilitate the operation of a large-scale solution.

Planning efforts should begin with the development, vetting, and promulgation of a Master Plan that communicates the vision of the Nebraska NG9-1-1 system to stakeholders, so they are actively engaged in the system's development and deployment. The NG9-1-1 Master Plan should present Nebraska's tailored perspective of the system's desired functionality, concept of operations, and governance structure, including state, regional, and local roles.

A Strategic Plan can then be developed to establish goals, objectives, responsibilities, and timelines for the migration to the system described in the Master Plan. State, regional, and local design and implementation plans can then be developed to carry out the Strategic Plan.

18.2. DEVELOPMENT

NG9-1-1 systems can be developed at the state, regional, or local level. Regardless of how they are developed, statewide coordination of systems development will be necessary to maximize system capabilities, ensure interoperability, and facilitate efficiency. Counties should be encouraged to create regional operating entities, which can develop and carry out action plans for the implementation and subsequent management of a regional NG9-1-1 system to serve their region, and then assume responsibility for network management.

18.3. PHASED-IN IMPLEMENTATION

The system must be designed to enable a phased implementation starting with the delivery of calls across an ESInet while maintaining connectivity to the existing E9-1-1 network and the PSTN.

18.4. NG9-1-1 MANAGEMENT

The current state-level organizational structure for the management and funding of 9-1-1 services in Nebraska is capable of supporting current E9-1-1 services, but was not designed to support migration to a statewide 9-1-1 system. Yet it forms the basis for the development of a new framework that can support a statewide NG9-1-1 system. A new integrated governance structure is a "must have" if the state of Nebraska is going to transition to NG9-1-1.

As NG9-1-1 deployment progresses from initial planning to fully operational, current roles and responsibilities among all entities involved in providing 9-1-1 services will change and the current legal and regulatory environment will likely not effectively accommodate new technologies and arrangements. Planning and implementing an NG9-1-1 ESInet will require increased coordination and

partnerships among government and public safety stakeholders, 9-1-1 authorities, service and equipment providers, and PSAP administrators.

18.5. ESINET INTERCONNECTION

Interconnected ESInets are critical to the NG9-1-1 architecture. Statewide ESInets are more than just physical pathways. They can host or provide access to numerous application layer services that support interoperability among the highly diverse regional/local networks and agency applications. These include appropriate standardized core services such as GIS-based directories of authorized organizations and resources, and access control/identity management for implementation of information sharing policies. These directories will enable interstate and intrastate dissemination and queries for emergency incident information and messages, including references to locations, agencies, and data sources. All authorized organizations (local, state, national, public, private) need to be able to implement their data policies through these core services. The ESInets may also offer optional managed services, or access to them, for use by individual agencies.

Consideration must be given to interstate and interregional connectivity and support for interoperability with other public safety functions, such as public safety radio interoperability. The relevant terms of interconnection to the ESInets and other PSAPs must be collaboratively developed and established. PSAPs and regional NG9-1-1 infrastructures must meet established requirements and adhere to appropriate standards in order to interconnect at each level.

18.6. DEPLOYMENT AND MANAGEMENT OF REGIONAL ESINETS

In practice there are a number of different ways to achieve statewide ESInet coverage. ESInets may be deployed at a state level and there may be increased efficiencies and economies of scale in doing so. ESInets can be deployed at a sub-state level (regional/county) and then interconnected with other sub-state ESInets to establish a standardized, interconnected, and interoperable statewide ESInet. Regardless of the path to such statewide coverage, MCP recommends a state-level entity or organization oversee implementation and management of the interconnected statewide ESInet. A state-level entity could play a significant role by providing and managing an IP backbone network to make interconnection of regional/local ESInets more efficient.

A governing board or group of governing boards should be able to form an entity for the purpose of planning, implementing, operating, and maintaining a regional ESInet. The entity should be able to employ a commercial or public sector NG9-1-1 system provider to implement, operate, and maintain the network, applications, and databases that may comprise an ESInet. ESInets should be able to share core services with other ESInets. Carriers should be required to deliver calls to the designated POI as determined by the appropriate regional or local entity in collaboration with the state NG9-1-1 authority.

18.7. TECHNOLOGICAL UPGRADES

Today, E9-1-1 supports voice calling for consumers using wireline, cellular, and VoIP services. There are current and future needs for 9-1-1 systems to accommodate emerging calling technologies, including non-voice messaging of various types, devices generating data-only messages (such as sensors), photo and video transmission, and unknown future services. A primary objective of NG9-1-1 is to establish a common IP-based interface to which developers can design as they develop new services, so that 9-1-1 can be planned for and then connected to quickly as new 9-1-1 call generating services are introduced to the public. Support of that objective will require replacement of the legacy circuit-switched analog infrastructure with new digital IP-enabled infrastructure.

To align call routing with the increasing mobility of consumer calling devices, NG9-1-1 call routing will change from technology that uses predetermined call paths to technology that determines the routing path dynamically based on the caller's location at the time of placing the call and that can be easily modified to meet emerging conditions. This change further emphasizes the importance of originating service providers providing accurate and timely call location information in order to expeditiously route the call to the proper PSAP.

Completion of migration to NG9-1-1 will not mark the end of the need for change. State, regional, and local systems must be frequently updated to remain in step with the constant changes in industry-supplied technology and consumer-driven expectations. Standardized systems are essential to deploying and maintaining seamless communications and data transfer among PSAPS in the same jurisdiction as well as across county and state borders, and across a multitude of emergency response professions and agencies.

18.8. PHASES TIMELINES

Timely implementation of NG9-1-1 to meet consumer expectations and maintain affordability is essential to the long-term sustainability of emergency calling in Nebraska. Envisioning detailed planning and implementation schedules for entities yet to be formed is difficult. MCP recommends the State develop a guidance document to be used for scheduling the planning and implementation of the NG9-1-1 system.

18.9. COSTS

Transition to NG9-1-1 will be a process that takes time; however, the current expenditure rate to support stand-alone systems cannot be justified or sustained indefinitely. Deployment of IP network technology can reduce overall costs by enabling the adoption of regionally shared systems, which are inherently more cost effective than stand-alone systems. Local 9-1-1 operating authorities should embrace a regional approach to 9-1-1 and begin the expeditious transition to advanced network technology. Time is of the essence to maximize ROI. The legislature should provide incentives for the sharing of resources and regionalization of PSAPs to increase efficiencies and reduce long-term costs.

18.10. GOVERNANCE

According to the National 9-1-1 Program Office, “To effectively address and coordinate these efforts, State 9-1-1 legislation should identify the statewide 9-1-1 governance structure, including State, regional and local roles. NG9-1-1 systems are likely to be regional (perhaps large scale regional), and new interlocal governmental arrangements may be necessary. Statewide coordination of systems and the establishment of standard network functions will be necessary to maximize emergency communication and information sharing. Legislation should address the structure, authority and functions of the State 9-1-1 authority.”

Staffing of PSAPs and handling of 9-1-1 calls and associated emergency response should remain a local function, subject to local decisions. ESInets may be developed and managed locally or regionally, but strong state-level leadership and coordination will facilitate interoperability and ensure conformance to applicable national policies and industry standards that are essential to a unified network. Further, coordination with national entities to ensure Nebraska’s input into national standards and federal policies should be accomplished at the state level.

While many states across the country have established state-level 9-1-1 programs, there continues to be a great deal of diversity in the nature and organization of those programs. Some states have established programs by statute, and the programs involved are comprehensive in both geography and program scope; other states have done the same in a less formal way, or program scope may be more limited. Beyond that, there are several states that have no state 9-1-1 focus or coordination mechanism at all.

In Nebraska, no entity currently has the authority to coordinate, oversee, or manage 9-1-1 systems at the state level. LB 911 (Nebraska 911 Act), as introduced in the current session, would authorize the PSC to: (1) develop a plan for the implementation of next generation 911 services based upon the findings of the study conducted pursuant to section 86-471; and (2) contract with any consultants in order to carry out the purposes of the act. The act is not intended to fully fund the provision of 911 services in Nebraska, but the outcome.

As Nebraska looks at connectivity between PSAPs and regions of PSAPs for implementing NG9-1-1, structured governance and inter-relations governance processes, procedures, and policies move from being desirable to a necessity. For example, there is the potential for one location to become infected with a virus or trojan. Without structured governance and inter-relations policies, when a location requires attention, then one of the perceived strongest will make tough decisions. Going forward there is a potential for lingering feelings of dis-enfranchisement and lack of fairness that will inhibit implementation of NG9-1-1 with other entities, as a whole, working as effectively and efficiently as possible.

The goal of the organizational structure should be to provide the most inclusive, efficient and cost effective way to manage the systems from a technical and systems operation perspective.

The governance structure can be created many ways and will need to be developed to meet Nebraska needs.

For connecting to other entities, some of Nebraska's governance strategy must include:

- Governance plans
- Detailed results-driven change management processes
- Change Management Board
- Change Manager

18.11. ORGANIZATIONAL STRUCTURES

"Selection of the organizational structure to guide and oversee the migration to NG9-1-1 is a key decision. The goal of the structure should be to provide the most inclusive, efficient, and cost effective way to manage the systems from a technical and systems operation perspective."[20]

The PSC currently lacks the authority to coordinate, oversee, or manage 9-1-1 systems but was directed to conduct this study to examine issues surrounding the statewide implementation of NG9-1-1 and to contract with an independent third-party to assist with the study using the Enhanced Wireless 911 Fund.

If the Nebraska 911 Act passes, PSC would be authorized to develop a plan for the implementation of NG9-1-1 services based upon the findings of the study and contract with any consultants in order to carry out the purposes of the act.

The governance structure will require adequate staff members and support personnel experienced in the current technology, next generation technology, and elements required to make a transition. Individuals with experience in PSAP operations will also be required. Qualified third-party consultants can provide support to staff where needed.

The implementation coordinating agency should be assisted with strategic guidance and oversight by a board composed of stakeholder representatives. According to the FCC, "We believe more needs to be done to encourage states to establish state-level governance of the NG911 transition. Not all states, however, have state 911 boards or similar entities, and those that do have such boards do not necessarily have boards with the operational and technical expertise critical to guiding statewide NG911 implementation. We therefore recommend that Congress recognize the importance of state 911 boards and state-level governance entities in the cost-effective and efficient implementation of emergency services."[21] The Next-Generation 911 Advisory Council that would be created by LB 911 could fill this role if given the authority to act as a governance and oversight body.

[20] Next Generation 9-1-1 Transition Policy Implementation Handbook, NENA Next Generation Partner Program's March 2010, p.1

[21] Legal and Regulatory Framework for Next Generation 911 Services, Report to Congress and Recommendations, Federal Communications Commission, February 22, 2013, Section 4.1.1.2

18.12. LEGISLATION

Implementation of NG9-1-1 will require additional legislative changes beyond those contained in LB 911. To support States in developing required changes, the National 9-1-1 Program has produced a guideline document with input from local, regional, state, and federal public sector stakeholders, as well as private sector industry representatives and advocacy associations. The Guidelines for State NG9-1-1 Legislative Language[22] provides background information, examples of legislative language, and guidance for the use of the language for each key issue identified. This guidance discusses the specific issues or challenges the proposed legislation addresses and explains the intent of the language. It provides ideas that could be helpful when contemplating changes to 9-1-1 legislation that will facilitate adoption and foster progress toward a statutory environment that facilitates the full deployment of NG9-1-1.

In considering changes to legislation, the following recommendations have merit and should also be considered:

- The statutory division between landline and wireless 9-1-1 with respect to funding, administration, and governance could be eliminated. NG9-1-1 will accommodate all forms of originating telecommunication services and the distinction between wireline and wireless 9-1-1 services should no longer be applicable.
- A single, statewide funding source to support the implementation of NG9-1-1and supplement other funding available for ongoing operational and capital expenses of 9-1-1 would assist in the transition.

19. ESTIMATED HIGH-LEVEL COST

MCP is providing some high-level cost estimates. It is MCPs desire to provide as accurate pricing information as possible; however, there are many variables, and as more states are implementing state and regional ESInets, some of these prices, especially in areas such as i3 services are changing significantly.

19.1. NG9-1-1 CALL HANDLING

There are many variables in pricing NG9-1-1 call handling. The pricing shown in Table 9 includes assumptions that are listed. Pricing is based on a 5-year transition model. The reason for a 5-year model is that some PSAPs will transition as soon as possible. At the same time, there are PSAPs that have recently acquired 9-1-1 call handling that would only require adding the NG9-1-1 features, and those can be transitioned later in the 5-year plan. If Nebraska chooses to accelerate or extend the time period for transitioning to NG9-1-1 call handling, the cost of acquiring and implementing the NG9-1-1

[22] Guidelines for State NG9-1-1 Legislative Language, 911 Program Office, http://www.911.gov/pdf/ModelNG911legis-110812.pdf

call handling may change very little. The change will be more noticeable when calculating maintenance over time. Maintenance costs for the NG9-1-1 call handling are not included as the variance will be too great without added assumptions. Pricing does not include logging and logging interfaces, CAD, and other ancillary connectivity. Additional regionalization within Nebraska can provide cost reductions, especially after initial implementations, as cost for upgrades can be spread over multiple PSAPs.

More often, PSAPs, regions and states are viewing NG9-1-1 as a software solution provided by service providers. Names for this can be “service provider-hosted solutions,” “cloud-based solutions” or a form of SaaS. Cost models show that it is approximately five years before those costs become about equal. Service provider-hosted solutions can make it easier to budget a cost per PSAP or PSAP seat and can simplify network management. Care must be given for understanding requirements for connections to various logging systems, CAD systems, and other ancillary devices.

Table 9 – NG9-1-1 Call Handling

Capital Expenditure	1 Year	3 Year	5 Year
NG9-1-1 call handling systems purchase (estimate 52 systems replaced. 10 in year 1, 22 in years 2 and 3, and 20 in years 4 and 5 @ 2.3 stations per PSAP average)	$690,000.00	$1,518,000.00	$1,380,000.00
CPE Upgrades for i3, (15 systems, 7 in year 1 and 8 in years 2 and 3) (9 PSAPs no upgrade) which includes a majority of larger systems and hosted systems	$154,000.00	$176,000.00	
Total Capital Expenditure	$844,000.00	$1,694,000.00	$1,380,000.00
Total Capital Cost	$3,918,000.00		
Capital Cost average per year over 5 years	$783,600.00		

19.2. NETWORK

Network costs can vary across the country, depending on state-level contracts that may be available. Network connections, such as T1 connectivity, are typically based on two cost elements. One portion is the T1 service itself, which is usually a flat rate. The other is a charge based on distance, and can vary significantly. To meet NENA standards for resilience and reliability, it is recommended that these circuits be managed circuits, with strong SLAs.

LEC pricing will vary, but MCP often sees managed circuit prices between $1,000 per month and $1,300 per month from LECs. Distance charges can impact pricing to as high as $3,500 per month for a circuit. A good approximation is $2,100.00 per managed circuit per month, average, across the state of Nebraska. In some parts of the state, there may be large mileage costs. NENA, APCO, and national organizations all recommend as much redundancy and resiliency as can be afforded. Table 10, below, shows estimated costs for one, three, and five years based on the estimated per-PSAP managed circuit cost above for 76 PSAPs, and the state ring with circuits for three data centers.

Table 10 – Estimated Network Connectivity Costs

Estimated Network Costs						
	Quantity	**Monthly Cost**	**Total**	**1 Year Cost**	**3 Year Cost**	**5 Year Cost**
PSAP Links	76	$2,100	$159,600	$1,915,200	$5,745,600	$9,576,000
State Ring	1	$6,500	$6,500	$78,000	$234,000	$390,000
Totals			$166,100	$1,993,200	$5,979,600	$9,966,000

Many states have considered multiple backup network options, including LTE, microwave and other options, where there is not sufficient fiber to have redundant and resilient fiber rings.

19.3. DATA CENTER LAYER 3 SWITCHES

Carrier-grade network switches, which also provide the routing functionality, will vary from $250,000 to $500,000 depending on the final configuration. The number and bandwidth of interface cards and optics will be the cost driver. Some manufacturers may have several variations of a simple 48-port 1 Gb Ethernet card depending on how the switch will be used. Cards and optics for 10 Gb are not required at this stage, but vendors should be required to quote them as an option in an RFP response. The capacity of the routing engine will also drive the price to some extent. The budgetary numbers in Table 11 use an average price and assume two switches per data center for redundancy and resiliency.

19.4. PSAP SWITCHES AND ROUTERS

PSAP routers cost about $6,000 each. If a given PSAP does not have redundant connections for technical or financial reasons, there is obviously no reason to put two routers in that PSAP. A PSAP may also choose to have both circuits connect to a single router. For budgetary purposes, the estimate assumes two routers per PSAP. Table 11 shows the estimated annual maintenance and the non-recurring charges (NRCs) to purchase the equipment.

Table 11 – Estimated Router and Switch Costs

	Quantity	**Unit Cost**	**Annual**	**NRC**
PSAP Routers	152	$6,000		$912,000
Maintenance	152	$352	$53,504	
Data Center Switches	6	$375,000		$2,250,000
Maintenance	6	$37,500	$225,000	
Estimated Annual			$278,504	
Estimated Total NRC				$3,162,000

19.5. GIS DATA

In reviewing costs that other states are expending to bring their GIS data up to NENA i3 standards, and verify that data, it is estimated that cost for Nebraska would be approximately $2,000,000.00. The timing of this effort should be timed with implementation of networks and NG9-1-1 call handling. Once this information is verified at NENA i3 standards, it must be maintained at that standard.

19.6. I3

The cost of i3 services has changed significantly from prices received as little as two years ago. To develop more precise i3 costs, Nebraska would need to determine choices such as how many replications of data will be desired and other information. However, the pricing in Table 10 provides a view of expected cost ranges.

During the transition from legacy to i3, there will be periods of time that will require dual-services. Those costs are not included in the table below and should be calculated at the time of transition.

Table 12 – i3 Services Costs

Operating Expenditure	1 Year	3 Years	5 Years
BCF Maintenance	$4,344.00	$13,032.00	$21,720.00
LNG Maintenance	$3,984.00	$11,952.00	$19,920.00
ECRF and LVF Support and Maintenance	$178,000.00	$534,000.00	$890,000.00
ESRP Support and Maintenance	$28,524.00	$85,572.00	$142,620.00
SDBMS and SIF Support and Maintenance	$17,800.00	$53,400.00	$89,000.00
Total Operating Expenditure	**$232,652.00**	**$697,956.00**	**$1,163,260.00**

Capital Expenditure	1 Year	3 Year	5 Year
BCF	$126,473.00	$0.00	$0.00
LNG	$62,532.00	$0.00	$0.00
ECRF and LVF	$780,000.00	$0.00	$0.00
ESRP	$213,075.00	$0.00	$0.00
SDBMS and SIF	$250,000.00	$0.00	$0.00
Tier One Support Engineer	$200,000.00	$0.00	$0.00
Consultant Expense	$200,000.00	$0.00	$0.00
Total Capital Expenditure	$1,832,080.00	$0.00	$0.00
Total Capital Cost	$1,832,080.00		
Capital Cost average per year over 5 years	$366,416.00		

i3 Services and Routing	Cost
Operating Exp. plus 1/5 Capital Exp. Per year	$599,068.00
Operating Exp. plus Capital Exp. Per week	$11,520.54
Operating Exp. plus Capital Exp. Per day	$1,641.28
Operating Exp. plus Capital Exp. Per hour	$68.39

Definitions

Automatic Location Identification (ALI) - The automatic display at the PSAP of the caller's telephone number, the address/location of the telephone and supplementary emergency services information of the location from which a call originates

Border Gateway Protocol (BGP) – A standardized exterior gateway protocol designed to exchange routing and reachability information between autonomous systems (AS) on the Internet. The protocol is often classified as a path vector protocol, but is sometimes also classed as a distance vector routing protocol. BGP does not use Interior Gateway Protocol (IGP) metrics, but makes routing decisions based on paths, network policies and/or rule-sets configured by a network administrator. BGP plays a key role in the overall operation of the Internet and is involved in making core routing decisions.

Centralized Automated Message Accounting (CAMA) trunks - A type of in-band analog transmission protocol that transmits telephone numbers via multi-frequency encoding. Originally designed for billing purposes. CAMA lines are used to provide 9-1-1 calls to the PSAPs.

Carrier Hotel - A type of data center where equipment, space, and bandwidth are available for rent to retail customers. Co-location facilities provide space, power, cooling, and physical security for the server, storage, and networking equipment of other firms—and connect them to a variety of telecommunications and network service providers—with a minimum of cost and complexity.

Computer Aided Dispatch (CAD) - A computer based system that aids PSAP telecommunicators by automating selected dispatching and record keeping activities.

Emergency Call Routing Function (ECRF) - A functional element in an ESInet which is a LoST protocol server where location information (either civic address or geo-coordinates) and a service URN serve as input to a mapping function that returns a URI used to route an emergency call toward the appropriate PSAP for the caller's location or towards a responder agency.

Emergency Service Zone (ESZ) - A geographical area that represents a unique combination of emergency service agencies (e.g., Law Enforcement, Fire and Emergency Medical Services) that are within a specified 9-1-1 governing authority's jurisdiction. An ESZ can be represented by an Emergency Service Number (ESN) to identify the ESZ.

Emergency Services IP network (ESInet) - An ESInet is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core functional processes can be deployed, including, but not restricted to, those necessary for providing NG9-1-1 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks).

Emergency Services Routing Proxy (ESRP) - An i3 functional element that 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 NG9-1-1 PSAP. There may be one or more intermediate ESRPs between them.

Enhanced 9-1-1 (E9-1-1) - A telephone system that includes network switching, database and PSAP premise elements capable of providing ALI data, selective routing, selective transfer, fixed transfer, and a call back number. The term also includes any enhanced 9-1-1 service so designated by the FCC in its Report and Order in WC Docket Nos. 04-36 and 05-196, or any successor proceeding.

Geographic Information Systems (GIS) - A computer software system that enables one to visualize geographic aspects of a body of data. It contains the ability to translate implicit geographic data (such as a street address) into an explicit map location. It has the ability to query and analyze data in order to receive the results in the form of a map. It also can be used to graphically display coordinates on a map i.e. Latitude/Longitude from a wireless 9-1-1 call.

i3 – i3 is a NENA term. The i3 solution supports end-to-end IP connectivity; gateways are used to accommodate legacy wireline and wireless origination networks that are not IP. NENA introduces the concept of ESInet, which is designed as an IP-based inter-network (network of networks) that can be shared by all public safety agencies that may be involved with an emergency. The i3 PSAP is capable of receiving IP-based signaling and media for emergency calls conformant to the i3 standard

IPv4 - A 32-bit address assigned to hosts using TCP/IP. An IP address belongs to one of five classes (A, B, C, D, or E) and is written as 4 octets separated by periods (dotted decimal format). Each address consists of a network number, an optional sub network number, and a host number. The network and sub network numbers together are used for routing, while the host number is used to address an individual host within the network or sub network.

IPv6 - is the latest revision of IP, the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion. IPv6 is intended to replace IPv4, which still carries the vast majority of Internet traffic as of 2014.

Land Mobile Radio (LMR) – LMR service is regulated in the United States by the FCC in CFR 47 Part 90 for non-federal government wireless use between land-based mobile and fixed stations. The National Telecommunications and Information Administration (NTIA) performs similar functions for federal government spectrum users.

Legacy Network Gateway (LNG) - 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.

Legacy PSAP gateway (LPG) - An NG9-1-1 functional element that provides an interface between an ESInet and an un-upgraded PSAP

Legacy Selective Router Gateway (LSRG) – Uses tandem to tandem transfers to allow ESInet originated call to terminate/transfer to selective router PSAP and selective router originated call to terminate/transfer to ESInet terminated PSAP. LSRG uses ALI with E2 to network location.

Local Exchange Carrier (LEC) - A Telecommunications Carrier (TC) under the state/local Public Utilities Act that provide local exchange telecommunications services. Also known as Incumbent Local Exchange Carriers (ILECs), Alternate Local Exchange Carriers (ALECs), Competitive Local Exchange Carriers (CLECs), Competitive Access Providers (CAPs), Certified Local Exchange Carriers (CLECs), and Local Service Providers (LSPs)

Location-to-service Translation (LoST) - A protocol that takes location information and a Service URN and returns a URI. Used generally for location-based call routing. In NG9-1-1, it is used as the protocol for the ECRF and LVF.

Location Validation Function (LVF) - Refers to the action of ensuring that a civic address can be used to discern a route to a PSAP.

Logger/Recorders - A device that records, stores and is capable of playing back all communication media within the domain to which it is assigned. Media can include, but is not limited to voice, radio, text and network elements involved with routing a 9-1-1 call. Logging recorders should have the capability to simultaneously record from several sources

Long-term Evolution (LTE) - A standard for wireless communication of high-speed data for mobile phones and data terminals. It is based on the GSM/EDGE and UMTS/HSPA network technologies, increasing the capacity and speed using a different radio interface together with core network improvements. The standard is developed by the 3GPP (3rd Generation Partnership Project) and is specified in its Release 8 document series, with minor enhancements described in Release 9.

Master Street Address Guide (MSAG) - . MSAG addresses are used to route 9-1-1 calls and for ALI display. Address recognized by public safety for the dispatch of emergency first responders. It is an absolute and unique address in that variants for directions, street spelling, street suffixes, and community names are not allowed. It is preferred that MSAG Addresses be in Civic Address format. The community name associated with this address format is assigned by the Addressing Authority in cooperation with the 9-1-1 Administrator and may or may not be the same as the community name assigned by the USPS

National Emergency Number Association (NENA) – NENA is a not-for-profit corporation established in 1982 to further the goal of “One Nation-One Number.” NENA is a networking source and promotes research, planning and training. NENA strives to educate, set standards and provide certification

programs, legislative representation and technical assistance for implementing and managing 9-1-1 systems.

Next Generation 9-1-1 (NG9-1-1) - NG9-1-1 is an IP-based system comprised of managed ESInets, functional elements (applications), and databases that replicate traditional E9-1-1 features and functions and provides additional capabilities. NG9-1-1 is designed to provide access to emergency services from all connected communications sources, and provide multimedia data capabilities for PSAPs and other emergency service organizations.

Open System Interconnection (OSI) - A 7-layer hierarchical reference model structure developed by the International Standards Organization for defining, specifying, and relating communications protocols; not a standard or a protocol. Layer descriptions are as follows:

(7) Application - Provides interface with network users,
(6) Presentation - Performs format and code conversion,
(5) Session - Manages connections for application programs,
(4) Transport - Ensures end-to-end delivery,
(3) Network - Handles network addressing and routing,
(2) Data Link - Performs local addressing and error detection
(1) Physical - Includes physical signaling and interfaces

Point of Interconnect (POI) - The geographical location where two networks interconnect and exchange traffic.

Point of Presence (POP) - An artificial demarcation point or interface point between communicating entities.

Public Safety Answering Point (PSAP) - An entity operating under common management that receives 9-1-1 calls from a defined geographic area and processes those calls according to a specific operational policy.

Quality of Service (QoS) - As related to data transmission, a measurement of packet latency, packet loss and jitter.

Selective Router (SR) - The process in which 9-1-1 calls are routed to the proper PSAP or other designated destination, based on the caller's location information, and may also be impacted by other factors, such as time-of-day, call type, etc. Location may be provided in the form of a MSAG-valid civic address or in the form of geo-coordinates (longitude and latitude). Location may be conveyed to the system performing the selective routing function in the form of ANI or pseudo-ANI associated with a pre-loaded database record (in Legacy 9-1-1 systems) or in real time in the form of Presence Information Data Format – Location Object (PIDF-LO) (in NG9-1-1 system) or whatever forms are developed as 9-1-1 continues to evolve.

Session Border Controller (SBC) - A commonly available functional element that provides security, NAT traversal, protocol repair and other functions to VoIP signaling such as SIP. A component of a Border Control Function.

Session Initiation Protocol (SIP) - An IETF-defined protocol that defines a method for establishing multimedia sessions over the Internet. Used as the call signaling protocol in VoIP i2 and i3.

Spatial Interface Function (SIF) – The database for NG9-1-1. The primary function of SIF is to supply data for the LVF/ECRF.

T1 - T1 or T-1 is the most commonly used digital transmission service in the United States, Canada, and Japan. In these countries, it consists of 24 separate channels using pulse code modulation (PCM) signals with time-division multiplexing (TDM) at an overall rate of 1.544 million bits per second (Mbps). T1 lines originally used copper wire but now also include optical and wireless media. A T1 Outstate System has been developed for longer distances between cities. It is common for an Internet access provider to be connected to the Internet as a point-of-presence (POP) on a T1 line owned by a major telephone network. Many businesses also use T1 lines to connect to an Internet access provider.

Appendix A – PSAP Questionnaire

PSAP STATISTICS – (*Enter PSAP Name Here*)

INTRODUCTION

This document assists Mission Critical Partners (MCP) in gathering information for the State of Nebraska Next Generation Communications Study. We would ask you begin collecting this information prior to our on-site visit(s). You may not have all the requested information, but please provide what you have on this form or preferably in softcopy (Burn to a CD/DVD, thumb drive, etc.). The items below will be collected during the MCP Information Gathering visit(s) or you may email to maurahickey@mcp911.com.

1 – CALL STATS

2012 EMERGENCY LINES

	911 Trunks					Non 911 Trunks	
Month	Landline	Land Line Abandoned	Wireless	Wireless Abandoned	Inbound Other	10 Digit	10 Digit Abandoned
January							
February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							
TOTALS							
Grand Total	*911 Landline + 911 Wireless + 911 Inbound Other (i.e.VoIP)*						

2011 EMERGENCY LINES

	911 Trunks					Non 911 Trunks	
	Landline	Land Line Abandoned	Wireless	Wireless Abandoned	Inbound Other	10 Digit	10 Digit Abandoned
TOTALS							
Grand Total	*911 Landline + 911 Wireless + 911 Inbound Other (i.e.VoIP)*						

2010 EMERGENCY LINES

	911 Trunks					Non 911 Trunks	
	Landline	Land Line Abandoned	Wireless	Wireless Abandoned	Inbound Other	10 Digit	10 Digit Abandoned
TOTALS							
Grand Total	*911 Landline + 911 Wireless + 911 Inbound Other (i.e.VoIP)*						

ADMINISTRATIVE LINES

YEAR	Admin Line Inbound	In-bldg Lines Inbound	Misc. Equipment Inbound	Admin Line Outbound
2012				
2011				
2010				

DISPATCHED CALLS FOR SERVICE

YEAR	Law	Fire / Rescue	EMS	Other *(Animal Control, Parks, Streets...)*	Officer Initiated *(if not counted in Law totals)*
2012					
2011					
2010					

HIGH ACTIVITY PATTERNS (i.e. Busy Day / Time) based upon Call Volume and Calls for Service

Busy Hour:

Busy Day of Week:

Busy Month of Year:

2 – YOUR PSAP EQUIPMENT

Please provide the information below, as well as **System Network Diagrams** when possible.

	911 System	CAD System	Logging Recorder	Radio System/Console	Time Source	Mapping System
Vendor Name						
Application(s)						
Version						
Date of Install						
Date of Latest Upgrade						

	NCIC/State Warrants	MIS System(s)	Camera(s)	Door(s)		
Vendor Name						
Application(s)						
Version						
Date of Install						
Date of Latest Upgrade						

GIS Data – Which 911 Systems in your organization use GIS data?	
Phone Mapping	
AVL	
CAD	
Other (Please Specify)	

Maintenance – Who Maintains Your - ---	
911 System	
CAD System	
Logging Recorder	
Radio System/Console	
Time Source	
Mapping System	
GIS Database	

Scheduled Replacement – Do you have any of your 911 Systems scheduled to replace? If you have it scheduled, please provide scheduled date and vendor.		
Scheduled Date	**Upgrade or Replacement**	**Vendor**
911 System		
CAD System		
Logging Recorder		
Radio System/Console		
Time Source		
Mapping System		
GIS Database		

3 – CAD Questions

Does your CAD software have map display capabilities?

Yes
No

If yes, then are you using these capabilities?

Yes
No

4 - GIS Questions

Which of the following GIS layers do you currently have and/or use in your PSAP systems?			
	Have	**Use**	**Want**
Road Centerlines			
Structure layer with assigned addresses (point or building footprints)			
Updated Postal data			
Old Postal data			
Emergency Service zone boundaries			
Zip Code boundaries			
Municipal and county boundaries			
Neighborhood and unincorporated community boundaries			
PSAP boundaries			
Response Areas/Zones			
Recently updated aerial Imagery (1-5 years old)			
Landmarks (common place names or frequent call areas that people reference)			
Railroads			
Hydrology (above ground rivers, streams, lakes, etc.)			
On-site ALI database			
MABAS Box #			
Cell towers and coverage areas			
Any Other			

Road Centerline Data – If you indicated need or desire for road centerline data		
	Partial	**Complete**
Road Names		
Address Ranges		
Address Points		
Linear Referencing		

Which of the following potential issues with GIS data concern you the most? (All that apply)	
	Check
Inaccuracies within you GIS data	
Lack of regular GIS data maintenance	
Lack of data standardization	
No structure address layer	
GIS data not synchronized with MSAG and ALI	
Lack of GIS staff resources	
Lack of GIS data sharing across jurisdictions	
Other	

GIS Questions – (The GIS Council wants to know who completed the GIS Section of information)

a. If your jurisdiction has address points, where are the typically placed?
   i. Rooftop
   ii. Primary entry point of building
   iii. Driveway street entrance
   iv. Other street location
   v. Parcel centroid
   vi. Other (please explain)
b. Approximately how many total address points are in your jurisdiction?
c. Does this number include sub-addresses (apartment numbers suites, etc.)?
   i. If yes, then how many are sub addresses?
d. Did you use a contractor to build the address point database?
   i. If yes, who was the contractor?
e. What is the approximate cost for building your database?
f. What is the status of your address point layer?
   i. Complete
   ii. Work in Progress
   iii. Planned
   iv. No plans for a Structure Address Point Layer
   v. Other (please specify)
g. How often are updates made to your 911 system data?
h. If you have an address structure layer, how is it updated?
   i. Field GPS Collection
   ii. On-Screen “Heads-up” Digitizing
   iii. Unsure
   iv. Other (please specify)
i. Who assigns new addresses to your jurisdiction?
j. Is there an ordinance that specifies a standard process for assigning addresses and/or an address schema?
k. Estimated percentage of completion for your structures address layer?
l. Where does the responsibility of GIS data maintenance fall?
m. How often is the GIS data in the 911 Mapping System normally updated?
n. What is the level of publically available GIS data within your jurisdiction?

o. Do you have any GIS sharing agreements (e.g. between GIS Dept. and PSAP County and City?
   i. We provide GIS data to neighboring PSAPs
   ii. We received GIS data from neighboring PSAPs
   iii. We provide and receive GIS data between neighboring PSAPs
   iv. No exchange is occurring
   v. Other (please specify)
p. How often do you share updated road centerline and address points GIS data with neighboring counties/PSAPs?

5 - YOUR PSAP ORGANIZATION

Please be prepared to provide / discuss the following information:

Funding Sources
Organizational Chart
Job Descriptions
Salary Ranges
Authorized and Current Staffing Levels
Number of positions
Personnel Scheduling/Software Utilized

6 - YOUR PSAP OPERATIONS

Please be prepared to provide / discuss the following information:

Performance Measures (Communications Section specific)
Hiring Process
Entry Level Training Program Description and Syllabus
Telecommunicator Certifications and Recertification's
Pre Arrival Instruction or Protocol Systems (EMD, EFD, EPD, etc)
Standard Operating Procedure Manual
Description of Call Processing Methods and Practices (*may be covered in Training material*)
Description of Dispatching Methods and Practices (*may be covered in Training material*)
Quality Assurance Program Methods and Procedures
Mutual/Auto Aid Agreements for Communications Centers and Response Agencies
Continuity of Operations/Disaster Planning for Communications
- Backup Site(s)
- Roll Over Site
- Make-Busy Switch
- Tandem(s)
- Wireline Trunks
- Wireless Trunks
- ALI circuits

Other duties performed by PSAP personnel (i.e. answering after hours for City/County departments, Warrants, Prisoner checks, etc.):

7 – NETWORK QUESTIONS

Please be prepared to provide and discuss the following information:

Network Questions	Response
Please provide your FCC PSAP ID number.	
Please provide the facility's exact street address (no P.O. Box numbers).	
Is the PSAP a primary or secondary?	
If secondary, what is the Primary PSAP it is attached to?	
What area (county or other geographic area) do you serve?	
How many monitors (systems) per positions do you have in your PSAP? Please list all systems.	
Do you currently have IP (data) connectivity into your center? (Check all that apply)	
None	
T1 (1.5 Mb/s)	
T3 (45 Mb/s)	
DSL	
Fiber	
Metro Ethernet	
MPLS	
Satellite	
Other (please explain)	
What rated (nominal) speed is your data connection? (Check one)	
1.5 Mb/s or less download	
between 1.6 and 5 Mb/s	
between 5 and 10 Mb/s	
between 10 and 20 Mb/s	
more than 20 Mb/s	
What do you currently use your data connection for? (check all that apply)	
ALI	
Access to the Internet	
VoIP	
Traffic or other CCTV cameras	

Network Questions	Response
Access to public safety, law enforcement, public health or similar databases	
Other (please explain)	
Are you connected to a state or county-wide IP network? Please describe briefly.	
How do you get your ALI feed?	
Modem	
Dedicated data connection (private network)	
Internet connection	
Other (please explain)	
If you do not have data connectivity, indicate your main reason(s):	
Currently no need	
Not available in my location	
Too expensive	
I don't have a local PSAP network (LAN)	
Other (please explain)	

8 – ADDITIONAL COMMENTS

Please add any additional comments you feel are relevant for this study. You may add additional sheets as necessary.

9 – CONTACT INFORMATION FOR YOUR PSAP:

Name:
Title:
Phone:
Cell:
Email:
Physical address:

Appendix B – Wireless Service Provider Questionnaire

WIRELESS SERVICE PROVIDER DATA SHEET – (*Enter SP Name Here*)

INTRODUCTION

This document assists Mission Critical Partners (MCP) in gathering information for the State of Nebraska Next Generation Communications Study. We would ask that you begin collecting this information prior to our conference calls. You may not have all the requested information, but please provide what you have on this form. Feel free to also include any drawings, charts, and tables that might provide some additional insight into your written answers. Please return this via email to miltonschober@mcp911.com.

1 – COMPANY INFORMATION

Name:
Address 1:
City:
Phone Number:
Type of Service Provider:
Company Organization:
If Corporation, state in which incorporated:

2 – YOUR ORGANIZATION

a. How long have you been in business?
b. If you are not wireless only, how long have you offered wireless service?
c. Are you a member of a consortium, or owned by another company?

3 – YOUR NETWORK & EQUIPMENT

a. Do you currently provide both Phase 1 and Phase 2 data on 911 calls?
b. Are there any spots in your coverage areas that do not offer Phase 2 data?
c. Do you have any omnidirectional towers?
d. On your sector towers, how do you location for each sector?
e. How do you currently deliver 911 traffic to the selective router or PSAP
f. If you don't currently deliver calls via IP, do you have plans to do so?

4 – YOUR OPERATIONS

a. Do you have a NOC?
b. Do you operate the NOC yourself or is it outsourced to another company?
c. If outsourced, is that company a wholly owned subsidiary?
d. How many field techs, network engineers, and other technical staff do you have?
e. If your technical staff is outsourced, is the company a wholly owned subsidiary?
f. What is the average length of employment of your technical staff?

5 – NETWORK SERVICES QUESTIONS

Please be prepared to provide and discuss the following information:

a. What data service options do you offer (3G, 4G LTE, etc.)?
b. Do you currently perform 911 selective routing services or simply hand the traffic off to the tandem?
c. If so, who is your database provider?
d. If needed can you provide coverage maps?
e. For internet services, who are your upstream providers?
f. What size pipe(s) do you have to your upstream providers?

6 – ADDITIONAL COMMENTS

Please add any additional comments you feel are relevant for this study. You may add additional sheets as necessary.

7 – CONTACT INFORMATION FOR YOUR COMPANY:

Name:
Title:
Phone:
Cell:
Email:
Physical address:

Appendix B – Next Generation Telephone Communications Study

Nebraska Public Service Commission

Nebraska Public Safety Commission
Next Generation Telephone Communications Study

Submitted January 2014 to:

Nebraska Public Service Commission
Lincoln, Nebraska

MissionCriticalPartners
502 N. Carroll Avenue, Suite 120 | Southlake, TX 76092 | 888.8.MCP.911 or 888.862.7911 | www.MCP911.com

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EXECUTIVE SUMMARY

Mission Critical Partners, Inc. (MCP) respectfully submits this report to the State of Nebraska Public Service Commission (PSC). Communications technologies are in the midst of rapid and radical changes. These technologies change the way people, institutions, businesses, and governments relate and interact with one another; they also support communications among the devices we use. These changes in communications have large implications for public safety.

Information Technology (IT) is steadily changing how people do their jobs and live their lives, and this rate of change will continue to accelerate for the foreseeable future. The challenge for public safety and first response agencies is funding and the necessary leadership to evolve with the constantly changing technologies.

Nebraska currently has 76 public safety answering points (PSAPs)[1] that vary significantly in available resources. The goal of this report is to identify those resources and propose ways to fully utilize the resources to benefit the state and PSC's Next Generation 9-1-1 (NG9-1-1) efforts.

This report provides an analysis on the current status of 9-1-1 communications equipment in the state, including geographic information systems (GIS), PSAP operations, and broadband and telephone infrastructure in and available to Nebraska. The report provides an assessment of Nebraska's statutory and regulations framework. Efforts and initiatives in progress or planned in other states that may be related to or have an impact on implementation of NG9-1-1 in Nebraska are also explored. In addition, potential costs are estimated for future planning.

MCP utilized a collaborative approach to this project, keeping the Nebraska PSC involved as MCP met with PSAPs, service providers, and state agencies to gain important stakeholder input. The Nebraska PSC, especially Jeff Pursley, provided beneficial direction and documentation.

This study and subsequent recommendations should allow Nebraska to move forward with implementing robust, secure regional Emergency Services Internet Protocol (IP) networks (ESInets), interconnecting to form a statewide ESInet. This implementation would assist in the delivery of next generation services to callers, PSAPs, and first responders, while offering an improved level of service to the constituents of the respective 9-1-1 jurisdictions, and the state as a whole.

[1] Definitions may be found on page 42.

1. APPROACH

1.1. PURPOSE

The purpose of this communications study is to assess the current statewide 9-1-1 network, examine any current or planned initiatives for the implementation of NG9-1-1 and identify the key governing bodies that will need to be involved in order to implement NG9-1-1 throughout the state.

The study provides information relating to the implications, cost, and considerations of next generation emergency telephone communications in Nebraska. It includes regulatory and funding, technology and operational assessments, and recommendations for a variety of options for planning, development, phased-in deployment, interconnection, and management of ESInet and required networks.

There is generally a strong correlation between funding and legislation. Current legislative language often only addresses today's realities, and requires revision to be progressive with future technologies and inclusive of funding sources. The current regulatory and funding framework as it relates to 9-1-1 at the federal, state, and local levels, including identification of stakeholders, pending actions, and regulatory constraints, were assessed to address any necessary revisions to current legislation to provide the maximum benefit to stakeholders.

Implementing a statewide ESInet within Nebraska will offer residents and visitors to the state an improved level of service, which is an ultimate goal of NG9-1-1. Understanding the processes, requirements/standards, best practices, security and integrity of data related to 9-1-1 is paramount for determining the most efficient and cost effective manner for implementation of next generation services.

1.2. SCOPE OF WORK

MCP was contracted to conduct a study of the implications, costs and considerations of next generation emergency communications in the state of Nebraska. There were statutory requirements for this initial report in Legislative Bill 595, *Provide for a Public Service Commission study of next-generation 911*, enacted May 8, 2013:

> *Sec.5. (1) … The study shall include, but not be limited to, an examination of the following issues:*
>
> *(a) Examination of the current statutory and regulatory framework for the management and funding of E-911 service in Nebraska;*
>
> *(b) Examination and assessment of the current system of E-911 service within Nebraska;*
>
> *(c) Examination of the Federal Communications Commission's open rulemaking regarding the deployment of next-generation 911;*
>
> *(d) Identification of the federal, state, and local authorities, agencies, and governing bodies whose participation and cooperation will be necessary for the implementation of next-generation 911 in Nebraska;*

(e) Examination of any efforts, projects, or initiatives currently in progress or planned related to any portion of the implementation of next-generation 911 in Nebraska;

(f) Examination of the plans and efforts of other states regarding the implementation of next-generation 911; and

(g) Any other issues related to the planning and implementation of next-generation 911.[2]

2. METHODOLOGY

A kick-off meeting was held on September 20, 2013. It was an open meeting in the Nebraska State Capitol building. The meeting was opened by a State Senator. PSC representatives, PSAP representatives, vendor representatives, and lobbyists were in attendance; the invitation list was developed to invite as many vendors, public safety individuals, and lobbyists as possible. The scope of work and deliverables were reviewed during the day-long meeting, with periods set aside for questions and discussion. Individuals attended different portions of the meeting, they determined would benefit them or the entity they represented, in an in-and-out fashion at different times during the day based on the agenda provided prior to the meeting by PSC.

The study began with interviews and analysis of the current regulatory and funding framework. MCP gathered information and assessed the current statewide 9-1-1 network capabilities and operations.

2.1. INTERVIEWS

MCP worked closely with Mr. Pursley, the State's project manager, to meet with the PSAPs, service providers, and GIS service providers.

2.1.1. *PSAPs*

MCP contacted all 76 PSAPs in the state. In conjunction with the State GIS committee, MCP sent an on-line survey to gather PSAPs data. Appendix A contains a copy of the survey questionnaire.

If a PSAP did not initially respond, MCP reached out multiple times with both phone calls and e-mails.

Table 1 lists the PSAPS within the state.

[2] http://legiscan.com/NE/text/LB595/2013

Table 1 – Nebraska PSAPs

Nebraska PSAPs	
Alliance/ Box Butte County	Johnson County
Antelope County Sheriff's Office	Kearney County Sheriff's Office
Beatrice Communications / Gage County	Keith County 911 / Arthur, Deul, Grant, Hooker, McPherson counties
Boone County	Keya Paha
Boyd/ Holt County	Kimball County
Brown County	Knox County
Buffalo County	Lincoln-Lancaster 911
Burt County 911	Madison County
Butler County	McCook Police Department / Red Willow County
Cass County Sheriff's Office	Merrick County Sheriff
Cedar County Sheriffs 911	Mid Rivers 911
Chadron Police Department/Dawes County	Morrill County
Chase County 911	Nance County
Cherry County	Nemaha County
Cheyenne County	Norfolk Police Department / Stanton / Pierce counties
Clay County	North Platte Police Department / Lincoln County
Colfax County Communications E-911	Nuckolls County
Columbus Police Department/ Platte County	Otoe County
Cuming County 911	Perkins County
Custer County 911	Pierce County Sheriff
Dakota County LEC	Polk County
Lexington/ Dawson County / Gosper County	Region 26 Council
Dixon County Sheriff's Department	Rock County Sheriff's Office
Douglas County 911 Communications Center	Saline County
Dundy County	Sarpy County 911
Fillmore County	Saunders County
Franklin County	Scottsbluff County Communications / Banner / Sioux
Fremont Police Department 911	Seward County
Frontier County 911	Sheridan County
Furnas County Sheriff 911	Thayer County
Garden County	Thurston County
Grand Island-Hall County	Washington County
Hamilton County	Wayne Police Department
Hastings 911 Center / Adams County	York County
Hitchcock County 911 Hitchcock	City Of York Police Department
Harlan / Phelps/ City Of Holdrege	Crete Police Department
Howard County 911	Richardson County / Falls City Police Department
Jefferson County	Lexington Police Department

PSC chose 14 PSAPs to participate in on-site meetings as a representation of the state. These PSAPs are highlighted in gray in the table above. While the on-site team was gathering information for Brown County, Cherry County had some of the information required, and as such was added. During a public meeting forum in Valentine, Nebraska, representatives from Keya Paha County expressed interest and were interviewed via phone. (Both are highlighted in green in the table above.) MCP believes these 16 PSAPs represent the state of Nebraska geographically, by the size of the PSAP and the respective 9-1-1 call volume.

The remaining Nebraska PSAPs were sent multiple notices via e-mail and phone. Of the remaining 60 PSAPs, 28 responded and their data was reviewed with them by phone. These 28 are highlighted in blue in the table above.

These groups total 44 of the 76 PSAPs, approximately 58 percent. This provides a good sample for analysis.

2.1.2. *Service Providers*

MCP contacted the 49 service providers operating in the state to determine if they offered facilities and support suitable for local, regional, and statewide ESInets. Many of the service providers were contacted via telephone and e-mail; when possible, in-person interviews were conducted. The service providers were sent or given a survey as well. This survey was the basis for the analysis of wireless coverage in the state. Twenty-seven of the service providers responded to the survey and/or phone calls. Appendix B contains a copy of this survey.

In addition to the traditional local exchange carrier (LEC) service providers, several non-traditional service providers were contacted, including public power districts; cable television providers; 4G long-term evolution (LTE) wireless service providers; a broadband satellite provider; and the Nebraska Regional Interoperable Network (NRIN), a statewide initiative.

Several smaller LEC service providers believe they are not staffed to support a public safety-grade network or that doing so would not fit their business model. Several other service providers do not have control over the outside plant their services traverse because they are leased or they do not operate any facilities.

For backup networks, several options were examined: the NRIN, hybrid fiber coax (HFC) (cable TV), 4G LTE wireless, point-to-point wireless, and satellite broadband providers.

2.1.3. *GIS Services*

Most of the Nebraska PSAPs, with the exception of a few of the largest counties, use one of two GIS service providers—GIS Workshop or GeoComm— for their mapping updates. The services that each County and PSAP utilize vary significantly, largely in part to the fact that the services provided are

priced separately. Most PSAPs work with the minimum services available for creating their mapping data.

3. FINDINGS – NEBRASKA STATUTORY AND REGULATORY FRAMEWORK

Responsibility for management and oversight of 9-1-1 service in Nebraska is shared between local entities and the PSC.

3.1. WIRELINE 9-1-1 SERVICE

9-1-1 service is viewed by many as a local matter. Local entities own and operate the communications centers or PSAPs that provide the interface between a caller and the emergency services that respond to a caller's request for assistance. Thus, they provide the voice to 9-1-1 service and are naturally the entity most closely associated with 9-1-1. The Emergency Telephone Communications Systems Act, or the Landline 911 Act, provides authority for governing bodies to reimburse service providers for providing 9-1-1 services and further authorizes governing bodies to impose and collect a surcharge on landline telephone service to supplement general revenue in paying for non-recurring or recurring charges for the installation, maintenance, and operation of 9-1-1 service. The Act defines a governing body as the county board, the city council of a city, the board of trustees of a village, or the board of directors of any rural or suburban fire protection district.

3.1.1. *Wireline Funding*

The Landline 911 Act permits governing bodies to impose a surcharge of up to $1.00 (with the exception of Douglas County which is limited to $.50) per telephone line or functional equivalent for the purpose of paying costs associated with the provision of enhanced 9-1-1 (E9-1-1) service. Funds generated by the surcharge are to be expended only for the purchase, installation, maintenance, and operation of telecommunications equipment and telecommunications-related services required for the provision of 9-1-1 service.

Landline surcharge revenue is remitted directly to local governing bodies by the LECs no later than 60 days after the close of a quarter. During 2012, LECs reported collecting and remitting approximately $7.4 million in surcharges to local government bodies. Counties and municipalities have expressed concern regarding the impact of falling landline surcharge revenue on PSAP budgets. Information provided by the PSC indicates an average annual reduction of 8 percent in the number of residential access lines over the previous nine years. This is consistent with trends reported in other states. Primarily in response to budgetary pressures caused by reduced revenues, some local governing authorities have voluntarily regionalized service in varying degrees through inter-local agreements and the formation of regional authorities.

3.2. WIRELESS 9-1-1 SERVICE

Wireless 9-1-1 services are managed and overseen by the PSC, assisted by an advisory board created to advise the PSC concerning the implementation, development, administration, coordination, evaluation, and maintenance of enhanced wireless 9-1-1 services. Members of the advisory board are appointed by the governor for 3-year terms and must include a sheriff; two county officials or employees; two municipal officials or employees; one representative from the state's wireless telecommunications industry; one manager of a PSAP, not employed by a sheriff; one representative of the state's local exchange telecommunications service industry; and one member of the public. One commissioner and the state's chief information officer both sit on the advisory board as ex-officio members. The advisory board meets quarterly and makes recommendations regarding the surcharge, policies, funding requests from PSAPs, and wireless service provider grant applications.

The Enhanced Wireless 911 Services Act (Wireless 911 Act) assigns the following powers and duties to the PSC:

- Determine the amount of money to be deposited in the Enhanced Wireless 911 Fund (Fund) for the following year and set the surcharge
- Establish a mechanism for determining the level of funding available to each PSAP and wireless carrier for costs determined to be eligible by PSC
    - The PSC has adopted a permanent funding mechanism, the 911 Support Allocation Methodology (911-SAM), for wireless 9-1-1 service. The 911-SAM forecasts the future status of the Fund and assists in the allocation of annual support amounts to eligible PSAPs and wireless carriers.
- Receive, review and act on applications, including supporting documentation for compensation for allowable costs. May be limited based upon the mechanism established by PSC
- Compile and place PSAP information into its annual telecommunications report to the Legislature
- May administratively fine any person who violates the Emergency Telephone Communications Systems Act
- In consultation with the advisory board, adopt and promulgate rules and regulations necessary to carry out the Enhanced Wireless 911 Services Act

The PSC has adopted Enhanced Wireless 911 Services Rules and Regulations.

3.2.1. *Wireless Funding*

The Nebraska Enhanced Wireless 911 Fund was created in 2001 for the purpose of implementing wireless E9-1-1 services across the state. The Wireless 911 Act grants the PSC broad authority to carry out the Act's intent stating, "The commission shall have any powers necessary to carry out the intent and purposes of the act." However, the purpose for the program is limited to the implementation and provision of wireless E9-1-1 service as reflected in the eligible costs as defined by the PSC.

Initially a $.50 surcharge was collected on all active telephone numbers or functional equivalents every month from each subscriber with a billing address in Nebraska. The surcharge is reviewed and set annually. Effective January 1, 2013, the surcharge was reduced to $.45 for each subscriber with a billing address in Nebraska. Wireless service providers remit the surcharge to the PSC 60 days after the last day of the month. PSC utilizes an on-line remittance system for the collection of the wireless 9-1-1 surcharge. For Fiscal Year (FY) 2012–13, the Wireless 911 Fund collected just over $8.0 million. As of July 1, 2013, the balance of the Wireless 911 Fund was approximately $16.6 million. Table 2 depicts the collections for the past five years.

Table 2 – FY Fund Collections

Fiscal Year	Amount Collected (in Millions)	Balance June 30, 2013 (in Millions)
2008–09	$7.5	$15.2
2009–10	$7.0	$14.4
2010–11	$8.1	$16.4
2011–12	$8.0	$17.5
2012–13	$8.0	$16.6

The Prepaid Wireless Surcharge Act (Prepaid Act) became effective July 19, 2012. Under the Prepaid Act, beginning January 1, 2013, each retail seller of prepaid wireless telecommunication services collects wireless 9-1-1 surcharges directly from the consumer at the point-of-sale. The amount of the surcharge collected per retail transaction is based on an annual determination by the Nebraska Department of Revenue.

Retail sellers are allowed to deduct and retain up to 3 percent of the surcharges collected. Amounts collected are remitted by retailers to the Department of Revenue, which remits the collected amounts, less administrative costs not to exceed 2 percent, to the State Treasurer for credit to the Wireless 911 Fund and TRS Fund. Table 3 reflects the revenue the PSC has received from prepaid wireless surcharges in 2013.

Table 3 – 2013 Prepaid Wireless Surcharges

Month	Amount
February	$28,999.34
March	$52,819.95
April	$70,853.20
May	$87,813.04
June	$60,701.34
July	$76,910.31
August	$56,778.66
September	$69,657.93

Current wireless remittance forecasts were updated to identify any effect due to the change in prepaid collection points. Results indicated a downward change to the forecast, indicating a further decrease in monthly fund remittances and the fund balance are expected.

The Wireless 911 Fund is to be used for the costs of administering the fund and for other eligible expenses as determined by the PSC with input from the Enhanced Wireless 911 Advisory Board.

For PSAPs, eligible expenses include costs for the provision of wireless E9-1-1 service related to equipment, software, GIS data, maintenance, telecommunications services, trunking, translation services, personnel, training and capital expenses. Enhanced Wireless 911 funds can only be used for the portion of expenses related to the provision of wireless E9-1-1 services. In the case of expenses that relate to the provision of both wireline and wireless 9-1-1, PSAPs can use enhanced wireless 9-1-1 funds for a percentage of the costs based upon their actual wireless 9-1-1 call volumes, filed with the PSC at the time of their annual application for funding or the PSC determined default of 55 percent, whichever is greater. In addition to the support paid directly to PSAPs, the PSC pays LEC charges on behalf of PSAPs based upon a tariffed rate per wireless subscriber.

For wireless service providers, eligible expenses include software and equipment necessary for the provision of enhanced wireless 9-1-1, database management, transportation, and facilities to carry wireless E9-1-1 calls to the selective router. Eligible expenses do not include personnel costs or the construction of towers; however, certain capital expenses related to tower equipment directly related to the provision of wireless E9-1-1 service are eligible.

The PSC sought and received an Attorney General's Opinion with respect to its jurisdiction as it relates to the implementation of NG9-1-1 as an eligible expense. The Attorney General found the PSC lacks the jurisdiction to utilize the Fund for NG9-1-1 implementation.

The PSC is assisted in its allocation of money from the Fund for annual support amounts to eligible PSAPs and wireless service providers by 911-SAM. Individual funding amounts for PSAPs are approved taking into account their allocation from the 911-SAM, deductions, and any advances for special circumstances. Individual funding amounts are also approved for wireless service providers. PSAPs and wireless service providers must submit an application for funding annually for the following FY. The distribution of funding is released by an order entered by the PSC in May for the next funding year and outlines amounts for each PSAP and wireless service provider, as well as the amount of funding available through the Wireless Service Provider Grant Program.

Payments of annual funding amounts are made to PSAPs on a monthly basis over an 11 month period. Funding received must be used for eligible expenses incurred during that funding year and are accounted for in an annual audit filed on October 15. However, PSAPs may request alternate payment schedules to accommodate special circumstances.

The annual allocations for wireless service providers are paid no more than monthly in arrears based upon receipt of documentation filed by providers for eligible expenses incurred. Wireless service providers may request all or any portion of their annual allocation so long as documentation supporting expenditures is provided. Under no circumstances will the total payments made exceed the annual allocation.

Only one wireless service provider has applied for grant program funds to date and the grant program is being phased out over a 5-year period. Additional funding is being made available to wireless service providers through the annual allocation and the list of eligible expenses was amended to include the capital expenses that had previously been eligible for reimbursement through the grant program.

3.3. NG9-1-1 STATUTORY AND REGULATORY FRAMEWORK

In the course of preparing the February 2013 Report to Congress on the Legal and Regulatory Framework for Next Generation 911 Services, the Federal Communications Commission (FCC) sought public comment on the role of state governments in the transition to NG9-1-1.

The consensus view expressed by commenters is that state and local authorities should retain their primary role in the management and development of NG9-1-1 by PSAPs, and that general state and local oversight authority for these matters should not be supplanted by the federal government, even in light of the sweeping changes to networks and technology involved in the transition to NG9-1-1.

While there was general agreement on the importance of state and local authorities retaining their traditional PSAP oversight roles as NG9-1-1 develops, many commenters contend that the transition to NG9-1-1 will be achieved more quickly and cost-effectively where decision-making and oversight authority are focused at the state, as opposed to local, level. The National Emergency Number Association (NENA) stated that "[e]xtensive experience in the laboratory of the states has demonstrated that this type of oversight and coordination [at the state level] is most effective when undertaken by an independent body of representative stakeholders."[3] Commenters noted that about half the states have established state-level 9-1-1 boards or similar entities, and support action by Congress to increase the effectiveness of such boards and to encourage their establishment by states that have not yet done so.

The NENA Next Generation Partner Program's Next Generation 9-1-1 Transition Policy Implementation Handbook provides an overview of the key policy, regulatory, and legislative issues that need to be considered to facilitate the transition to NG9-1-1.

According to the Handbook, although the staffing of PSAPs and handling of 9-1-1 calls (and associated emergency response) will generally remain a local function, subject primarily to local decisions, aspects of NG9-1-1 will require state-level planning and implementation coordination. For example, network and related information delivery functions will no longer be agency-specific, but will be shared by authorized emergency agencies. Such shared ESInets may be developed and managed locally or regionally, but need strong state-level leadership and coordination to ensure both operability and interoperability of state, local, and regional ESInets, and to ensure they conform to applicable policies and industry-based standards. Further, coordination with national entities to ensure statewide compliance with required

[3] http://www.fcc.gov/document/legal-and-regulatory-framework-ng911-services-report-congress, viewed January 2, 2014.

standards, federal policies and the like is best accomplished when coordination occurs at the state level.

"Each state needs to have an organization, with appropriate authority, responsible for planning, coordinating and implementing the NG9-1-1 system that reflects the following:

- State-wide scope
- Coordination within the state and with adjacent states and federal authorities;
- Coordination with other emergency service functions and other relevant stakeholders involved in the development and implementation of seamless, end-to-end Next Generation emergency communication services;
- The appropriate adoption of industry-based standards, rules, policies and procedures by stakeholders necessary to support such deployment…"[4]

3.3.1. *NG9-1-1 Funding*

The current wireless 9-1-1 funding mechanism has produced a balance of $16 million. Because transition will not be a flash cutover, initial stages of the implementation of NG9-1-1 could be accomplished utilizing those funding sources as operating data for NG9-1-1 is collected. It would be important that close monitoring and follow-up was done to ensure that future revenues are adequate to support and sustain NG9-1-1 service and funding legislation must allow for flexibility and the provisioning of all necessary elements for NG9-1-1.

3.4. CONCLUSION

While capable of supporting E9-1-1 service, the current statutory and regulatory framework for the management and funding of 9-1-1 services in Nebraska was not designed to support a statewide NG9-1-1 system. However, it does form the basis for the development of a new framework that can support management and funding of a statewide next generation system.

4. FINDINGS – STATEWIDE 9-1-1 NETWORK CAPABILITIES

4.1. NETWORKS

There are several statewide networks in place, but each serves a specific function: education, healthcare, homeland security, land mobile radio (LMR) communications, etc. Currently roadblocks limit the use of these networks for the provision of voice services with the exception of the NRIN network (homeland security). For instance, the education network can only be used for educational purposes per the rules of the federal grant used to build it.

[4] http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/ngpp/ng911_transition_policy_impl.pdf., page 7, viewed January 2, 2014.

Currently, there are multiple networks across the state, but there is no coordinated effort for maximizing the availability of these networks and there are no statewide strategies for effectively and efficiently implementing these mixed media networks.

4.1.1. *Fiber Optics*

Survey results and subsequent discussions with responding service providers show a wealth of fiber optic transport exists in Nebraska, owned and operated by all sizes of LECs around the state. There is one consortium of seven incumbent local exchange carriers (ILECs) that not only coordinates the extensive network of its members, but also has inter-connection agreements with almost every LEC in the state There are also fiber-to-the-premise (FTTP) deployments that would allow for a complete fiber optic, Ethernet-based connection to certain PSAPs. Many of these providers already provide some level of services to the PSAP(s) in their service areas. These services range from internet to delivering centralized automatic message accounting (CAMA) trunks and automatic location identification (ALI) links to their existing customer premise equipment (CPE). Most providers with an FTTP deployment have expressed a willingness to construct east-west facilities to PSAPs in order to provide physical redundancy. It was not unusual to see 1 gigabyte (GB) circuits offered to the premise and 10 GB backbone circuits offered on the transport.

4.1.2. *Wireless Network*

A statewide wireless network, NRIN, is being deployed to PSAPs around the state. At present, the NRIN network is a 100 MB microwave network with an effective bandwidth of 85 MB. For a backbone transport network, this is not sufficient to support a statewide NG9-1-1 network, but could be used in a backup role in an emergency.

Statewide, 4G LTE wireless coverage is expanding and is also a viable backup network for PSAPs, though there is the risk of losing towers in certain situations. LTE service offers some measure of portability and flexibility, characteristics which are especially important in the event of a disaster. Satellite data network services, such as Hughes, are also available. Either LTE or satellite would be suitable for use with a mobile command post or communications unit.

4.1. 9-1-1 CALL ROUTING

Nebraska is served by two selective router providers: CenturyLink (former Qwest territory) and Windstream. CenturyLink operates six selective routers: Council Bluffs and Sioux City, Iowa; and Grand Island, Norfolk and Scottsbluff, Nebraska. Windstream operates one selective router in Lincoln, Nebraska.

Although ILECs across the state serve many PSAPs with CAMA trunks, ALI links, and internet/data service, the calls are routed to the selective routers and are then returned to the ILEC for transport to the PSAPs.

Wireless Phase II is currently implemented throughout most of the state; there are still a few remote areas where the PSAPs are only able to receive Phase I.

4.2. NETWORK MANAGEMENT SOLUTIONS

The Office of the Chief Information Officer (OCIO) sets network standards and guidelines, but has no rule-making authority. They perform a Network Operations Center (NOC) function for state networks, and provide performance statistics and outage reports.

5. FINDINGS – 9-1-1 OPERATIONS

As expected, 9-1-1 operations vary significantly across the state, depending on population and funding sources.

In some of the smaller PSAPs, MCP observed that 9-1-1 call handling is not the primary function of the call takers. The person receiving, handling, and dispatching calls may be a key person in jail management, bill collections, and other functions. There is concern that call handling and dispatch is tied to their jail services and if that PSAP were to be part of a consolidation effort, it could cause them to lose significant justification for their jail service.

Connectivity and 9-1-1 in-bound call services vary significantly across the state; in some remote areas in northern and eastern Nebraska, service providers do not provide reliable service or redundancy and resiliency options. There are efforts to implement fiber in some of the areas where there have been long outages. However, addressing these types of issues appears to be reactive to large outages as opposed to a strategy.

In addition, some areas in the northern portion of the state appear to not have enough radio towers for triangulation of calls. This means that location may be within 1,700 meters or greater. This approximate mile variance creates a high-risk of loss of life.

5.1. CALL HANDLING

From the 44 PSAPs that provided information, nine vendors provide call handling solutions. Some products, such as the TCI, CS1000 and Rescue Star, are end-of-life. Emergency Call Works is gaining percentage, as all solutions have been installed in the last few years. Table 4 lists the vendor and their solution percentage of the PSAPs contacted.

Table 4 – Call Handling Vendors

9-1-1 Call Handling	
Vendor	**%**
Viper	26
Cassidian Pallas	16
Emergency CallWorks	13
Zetron	12
TCI	12
PlantCML Rescue Star	10
Solacom	7
Plant MAARs	2
CML1000	2

MCP found that many vendors have programs that "upgrade" the end-of-life systems by replacing everything. It is essentially a replacement of non-i3 compatible hardware and software with i3-compatible solutions. As an "upgrade," it may be able to easier to negotiate purchasing requirements.

5.2. LOGGING RECORDERS

Call logging recorder solutions vary significantly across the state. Less than 10 percent of the PSAPs are considering upgrades or changes to their logging recorder solutions that will enable them to function in an i3 environment. Table 5 lists the vendor and their solution percentage of the PSAPs contacted.

Table 5 – Logging Recorder Vendors

Logging Recorders	
Vendor	**%**
Eventide	19
DSS Corporation	16
Red Box Recorders	16
NICE	12
WahlTek	9
Stancil Solutions	7
OnviSource, Inc.	5
None	16

Most logging recorders will require replacement to function in an i3 solution. Some vendors have "upgrades" similar to those in 9-1-1 call handling, which requires a replacement of all components.

Of concern is some county attorneys have recommended that their county not use logging recorders, with the thought that their use increases the county's exposure to risk of liability. A key function of 9-1-1 call logging recorders is to provide protection for those taking the calls. There are many documented

instances where callers have made claims against the way that a 9-1-1 call was handled, and the recording supported the professional manner in which the call was handled.

5.3. COMPUTER AIDED DISPATCH (CAD) SYSTEMS

CAD systems vary across the state. Approximately half of the PSAPs do not use a CAD system, relying on some form of paper recording. Table 6 lists the CAD system vendors and their solution of the PSAPs contacted.

Table 6 – CAD System Vendors

CAD	
Vendor	**%**
Sleuth	19
SunGuard	7
Motorola	7
A.L.E.I.R. (Automated Law Enforcement Incident Report)	5
Spillman	2
Emergency CallWorks	2
Information Technologies, Inc. (ITI)	2
Hunter ACS	2
Archonix Systems	2
Zuercher Technologies	2
None	50

5.4. MANAGEMENT INFORMATION SYSTEMS (MIS)

MIS solutions also vary across the state. It appears that some PSAPs with an MIS package lack the training or understanding required to generate reports. The primary reason many PSAPs did not provide information for the survey is that the agencies do not have an MIS solutions that tracks calls. The amount of time and effort to go through paper forms required more time than current workforces had available.

Paper documentation of calls will vary greatly in accuracy. When the logging of administrative calls was discussed, indications were that most were logged, especially “important ones.” This means that call volumes may be inaccurate.

6. NEBRASKA BROADBAND AND TELPHONE INFRASTRUCTURE

The ESInet is one of three components that form the foundation of a successful NG9-1-1 deployment; the other two are clean GIS data and state-level governance and guidance. Probably the most important qualities of an ESInet are resiliency and redundancy as backup networks are critical in an ESInet deployment.

6.1. NETWORK FACILITIES AND SERVICES

Nebraska has a wealth of fiber optic transport and access facilities. NebraskaLink handles large-scale sales and service for their members' networks and has interconnection agreements with other LECs around the state. Presently, they are interconnected with all LECs operating in the state except for one. The only reason they are not connected to the one is that there has been no economic reason to do so. When or if that changes, they will interconnect. A second provider who was not connected to NebraskaLink is in the process of connecting to one of its members.

Depending on how one traces the routes, there are five or six rings overlaying the state. This number is likely to increase by the time ESInet implementation begins. There is currently access to long-haul interstate transport west to Denver, east to Chicago, and south to Kansas City. NebraskaLink can provide service to 1102 Grand, Kansas City, a carrier hotel. Additionally some service providers have interconnections with LECs in northern Kansas.

Given the extent of and interconnections between fiber optic networks in the state, the statewide ESInet design should include as much fiber as possible, not only on the transport side, but on the access side as well. Many providers have FTTP deployments using either Passive Optical Networking (PON) or Active Ethernet technology. Some offer both, using the Active Ethernet for business-class service and PON for residential. The only limitation with a fiber network is the equipment used to terminate the fiber. Depending on the equipment initially selected, upgrading from 1 GB to 10 GB may be a change of optic modules, an additional card and optics, or simply a few mouse clicks and keystrokes.

For backup networks, several options were examined: NRIN, HFC, 4G LTE wireless, point-to-point wireless broadband, and satellite broadband providers. LTE and satellite services offer some measure of portability and flexibility, characteristics which are especially important in the event of a disaster. Either would be suitable for use with a mobile command post or communications unit.

Cable TV providers typically have fairly extensive HFC networks, with a fiber backbone feeding distribution cabinets from which the coax runs to the premises. At present, the NRIN network is a 100 Megabit (Mb) microwave network, with an effective bandwidth of 85 MB. For a backbone transport network, this is not sufficient to support a statewide network, but could be used as a limited backup network in an emergency.

7. NG9-1-1 REQUIREMENTS

"NENA Baseline NG9-1-1 is a description of a basic set of features & functions that constitute a NENA Standards based Next Generation 9-1-1 solution, on the path to end-state i3 architecture. The i3

architecture components are only one aspect of NG9-1-1. There are more components that make up a complete NG911 'system'. As future needs are identified, overall NG9-1-1 standards will be updated."[5]

A baseline NG9-1-1 system must include the functions of today's E9-1-1 system, which includes all network and PSAP system components, as well as capabilities beyond E9-1-1 functionality, such as the ability to support text and video. While these forms of communication may not be immediately available, baseline NG9-1-1 has the system functionality to support multi-media, perform routing, provide for call media logging, and enable PSAP/caller interactive communications.[6]

According to NENA, required components or capabilities of baseline NG9-1-1 include the following:

1. ESInets
2. GIS data creation to support NG9-1-1 validation-related databases and legacy originating services
3. Publication of authoritative NG9-1-1 validation-related databases
4. Geospatial-controlled IP software call routing functions
5. Publication of authoritative NG9-1-1 routing data for state and regional levels
6. Support for transfer of calls with accumulated call taker notes and added data, or an access key to such data, to any authorized entity interconnected by ESInets
7. Ability to interconnect with other NG9-1-1 systems and to interwork with other E9-1-1 systems
8. Support for system monitoring/logging/discrepancy reporting necessary to support troubleshooting and on-going operation and maintenance[7]

Additional information on baseline NG9-1-1 can be found at http://www.nena.org/?NG911_Baseline.

7.1. CALL HANDLING REQUIREMENTS

The state of Nebraska should, at a minimum, have requirements developed to ensure that when any upgrades or replacements are made, the PSAP or PSAP regional system can operate and interoperate to take advantage of NENA i3 functionality.

This call handling system(s) will include Session Initiation Protocol (SIP)-based call handling equipment at the PSAPs and NG9-1-1-capable answering positions. This equipment must be capable of receiving and interpreting the data delivered with emergency calls transported to the PSAP by the i3 services. The state of Nebraska should consider that their call handling CPE must also provide standard interfaces to the CAD system and mapping applications.

Currently, most equipment providers advise that they will include all new standards as they are developed, but many of the basic standards are already in place. The State of Nebraska will find that

[5] http://c.ymcdn.com/sites/www.nena.org/resource/resmgr/Docs/NENA_Baseline_NG9-1-1.pdf, viewed January 2, 2014.
[6] Ibid.
[7] Ibid.

how those standards are defined and implemented will vary significantly. Vendors should be asked for their plans to implement NENA 54-750 *Human Machine Interface & PSAP Display Requirements*, jointly developed by NENA and the Association of Public-Safety Communications Officials, International (APCO).

7.2. LOGGING RECORDER REQUIREMENTS

Call logging recorders for i3 must have the ability to log/record SIP traffic, which most of the current logging recorder systems in Nebraska cannot perform.

7.3. INTERFACE CONNECTIVITY REQUIREMENTS

Vendors providing i3 call handling CPE solutions should be able to easily provide information for how they incorporate NENA 04-001 *Generic Standards for E911 PSAP Equipment*. Vendors should be required to explain how they are implementing NENA 08-003 *Detailed Functional and Interface Specification for the NENA i3 Solution – Stage 3*; specific attention may be addressed toward the logging service in section 5.12.

7.4. CAD SYSTEM REQUIREMENTS

Many of the current major CAD system vendors have already been providing or working on NG9-1-1 CAD requirements. Some changes are in the interface to NG9-1-1 call handling CPE. Legacy CAD systems have, most often, connected to the call handling CPE using RS-232. As CAD vendors move to NG9-1-1 platforms, connections utilizing IP are being offered. IP connections require security products and policies that protect both the CAD and the call handling CPE from viruses, trojans, denial of service (DoS), distributed denial of service (DDoS), and other security issues.

7.5. MIS SOLUTION REQUIREMENTS

MIS solutions should record every function in the NG9-1-1 call handling experience as an event. For example, if a call is answered by a 9-1-1 call taker, and that call is transferred, the call transfer should be an event and the MIS package should be able to provide the exact time that each call taker was active on the call for an accurate usage of each call taker's time. Most vendors have made this adjustment, but there are some exceptions.

7.6. OPERATIONS

Many PSAPs in Nebraska will be challenged to make the transition from E9-1-1 to NG9-1-1 in the area of operations. From an operations perspective, the ability to achieve the true potential of NG911 will require significant adjustment and change that will require oversight from the PSC significantly beyond what they perceive they are receiving currently.

The increased quantity of available multimedia data will enhance and expand existing call taking functions. It may also extend the time it takes to process 9-1-1 calls, increase the workload of the call taker, and significantly change the call taker's experience (e.g., seeing the incident versus hearing the incident). Revamped introductory training, as well as continuing education (retraining in some cases) for experienced staff, will be critical to the success of any NG9-1-1 implementation. Training programs, properly designed, can enable PSAP managers and supervisors to effectively prepare dispatchers and call takers to respond to the needs of an IP-enabled system, while maintaining the level of service expected by the public.

The PSAPS in the state of Nebraska will confront the challenge of managing a wider set of shared resources than is typical in the current system, enhancing and expanding capabilities while ensuring personnel, including call takers, expeditiously and correctly handle the new workload. Responsibilities will likely expand, particularly with regard to configuring and managing the NG9-1-1 system.

Currently, there is a perception from the PSAPs that the amount of communication and support by individuals with PSAP operational experience is lacking. Of importance will be clear communication plans with understood processes. The state of Nebraska has a multiple options for addressing communications.

7.7. DEAF AND HARD OF HEARING AND SPEECH-IMPAIRED

Addressing the needs of hearing and speech-impaired persons has been a foundation of NG9-1-1 strategy. On August 19, 2011, then FCC Chairman Genachowski spoke about a five-step action plan to chart the transition to NG9-1-1 services. In this meeting it was stated that Chairman Genachowski's goal was to ensure that effective emergency response is a critical element of the broadband environment. Chairman Genachowski said, "It's hard to imagine that airlines can send text messages if your flight is delayed, but you can't send a text message to 9-1-1 in an emergency. The unfortunate truth is that the capability of our emergency response communications has not kept pace with commercial innovation has not kept pace with what ordinary people now do every day with communications devices. The shift to NG911 can't be about if, but about when and how."[8]

In spite of this statement by Chairman Genachowski, these data services cannot yet be provided to 9-1-1 PSAPs.

MCP held discussions with John C. Wyvill, Executive Director, Nebraska Commission for the Deaf and Hard of Hearing. Insight was gained into the importance of Nebraska's NG9-1-1 strategy, including meeting the needs of this growing segment of the Nebraska population.

Studies show that one in every six adults has some level of hearing loss and one in three adults over the age of 60 has hearing loss. Hearing loss has many causes and may be inherited, caused by maternal rubella or complications at birth, certain infectious diseases such as meningitis, chronic ear

[8] http://www.fcc.gov/document/genachowski-announces-plan-improve-next-generation-9-1-1

infections, use of ototoxic drugs, exposure to excessive noise, and aging. Studies show that the number of people who are hearing-impaired, hard of hearing, or deaf is increasing at a significant rate. Some of the increase is due to "baby boomers" beginning to experience loss of hearing.

Many people with hearing loss are not open to discussing the challenges they face. Hear-it AISBL, an international non-profit and non-commercial organization, collects scientific and relevant information pertaining to hearing impairments and their human and socio-economic consequences.

> *"Less than half of all hearing impaired are open about their hearing loss."*[9]
>
> *"Many post-9/11 military veterans have suffered injuries; often due to blast pressure and flying debris from explosive devices.*
>
> *"These injuries could include missing limbs, post-traumatic stress disorder and traumatic brain injuries. Other more down-played injuries include hearing injuries and hearing loss is a common ailment among post-9/11 veterans.*
>
> *"Among post-9/11-troops, 414,000 have returned home with auditory injuries, including hearing loss, tinnitus, or ringing in the ears. These hearing injuries are the most common disability among veterans."*[10]

A person with a hearing loss may not be able to hear on the phone being used to call 9-1-1. Many people who rely on captioned telephone services do not realize that the captions will not automatically appear after dialing 9-1-1. Others never thought about the fact that even though they use text messaging to communicate, a text message cannot be sent to 9-1-1. The FCC is seeking to address these issues with NG9-1-1, which will enable the public to obtain emergency assistance by means of advanced communications technologies beyond traditional voice-centric devices. When that comes to pass, reaching 9-1-1 will be easier for all, whether it be through voice phones, text, email, or video.

Like the hearing-impaired, speech-impaired person will not necessarily share their loss, often for fear of labeling. In the same way that there are multiple reasons for hearing loss, there are many reasons why people have permanent or temporary loss of speech.

The results are that a person may be able to hear the phone call, but not be able to respond. An individual's speech problem may be caused from stuttering, temporary hoarseness, allergic reaction or other medical issues, to name a few.

Public service announcements may be necessary to educate the public, not just those with speech and hearing impediments, of the current inability of 9-1-1 resources to accept text messages from the

[9] http://www.hear-it.org/Less-than-half-of-all-hearing-impaired-are-open-about-their-hearing-loss--1
[10] http://www.hear-it.org/Post-9-11-military-veterans-suffer-from-hearing-loss

public. Many people today do not realize that a text cannot yet be sent 9-1-1. The assumption often is that it can be done.

7.8. ADDITIONAL PSC STAFF

For effective communication to and from the PSAPs and the State will require additional staff members and support personnel at PSC. One of these individuals should be experienced in the current technology, NG9-1-1, and all elements required to make a transition.

A second individual will need experience in PSAP operations. As the technology person would be looking at the PSAPs from a “what” and “how” perspective, the individual who understands PSAP operations would be constantly looking at “why” PSAPS are currently being managed the way they are and communicate “why” NG9-1-1 will be of benefit to each PSAP.

Each individual will need to be in the field meeting with at least one PSAP a one week per month, in meetings that are separate from each other. Each PSAP should be visited at least three times per year by each individual.

The result will be two-fold. First, the PSAPs will have the perception that someone is listening. Secondly, information will be able to be received by the PSC in order to make necessary adjustments quickly.

7.8.1. *Qualified Third-party Consultant*

A single qualified third-party consultant can provide support to existing PSC staff. With people experienced in technology and operations within one entity, resources can be deployed as necessary.

7.9. GOVERNANCE STRUCTURE

The current state-level organizational structure for the management and funding of 9-1-1 services in Nebraska is capable of supporting current E9-1-1 services, but was not designed to support migration to a statewide 9-1-1 system. Yet it forms the basis for the development of a new framework that can support a statewide NG9-1-1 system. A new integrated governance structure is a “must have” if the state of Nebraska is going to transition to NG9-1-1. As NG9-1-1 deployment progresses from initial planning to fully operational status, current roles and responsibilities among all entities involved in providing 9-1-1 services will change and the legal and regulatory environment will likely not effectively accommodate new technologies and arrangements. Planning and implementing an NG9-1-1 ESInet will require increased coordination and partnerships among government and public safety stakeholders, 9-1-1 authorities, service and equipment providers, and PSAP administrators.

As Nebraska looks at connectivity between PSAPs and regions of PSAPs for implementing NG9-1-1, structured governance and inter-relations governance processes, procedures, and policies move from being desirable to a necessity. For example, there is the potential for one location to become infected

with a virus or trojan. Without structured governance and inter-relations policies, when a location requires attention, then one of the perceived strongest will make tough decisions. Going forward there is a potential for lingering feelings of dis-enfranchisement and lack of fairness that will inhibit implementation of NG9-1-1 with other entities, as a whole, working as effectively and efficiently as possible.

Pre-determined and documented policies on how a PSAP or region may be quarantined, remediation of the offending issue, and re-instatement, along with communication protocols and processes for these steps will allow the State and PSAPs to focus on solutions instead of blame. Thoughtful inter-relations policy puts the constituents of these PSAPs in the greatest possible position for their mission critical needs being addressed in a timely manner.

For connecting to other entities, some of Nebraska's governance strategy must include:

1. Governance plans
2. Detailed results-driven change management processes
3. Change Management Board
4. Change Manager

In an Information Technology Infrastructure Library (ITIL) format, the change management process is coordinated with like processes.

Figure 1 – Change Management Process

Multiple reasons support the requirement of having a strong governance plan; from a technical perspective it includes the following:

- Identification of statutory or regulatory constraints related to implementing an ESInet and the deployment of related technologies
- Establishment of policy authority to determine and oversee PSAP coordination of connectivity standards, utilization guidelines and system requirements
- Connectivity Standards – Setting of minimum technology standards for connectivity and sharing of information from one PSAP to another PSAP and from one ESInet to another ESInet
- Utilization guidelines – Defining the applications and services that can be accessed and utilized, and determining how these applications and services can be accessed and utilized
- System requirements – Defining security and other requirements for connectivity
  - Establishment of a contracting authority
  - Establishment of a procurement authority
  - Requirements for meeting Criminal Justice Information Services (CJIS) policy(s)
  - Requirements for meeting specific security policies

Inter-agency agreements must be in place for the following items:

- Emergency dispatch services
- IT Security Policy
  - Compliance requirements to connect
  - Terms, conditions, and procedures for disconnect
- CAD and CAD-related mobile applications
- LMR
- IT services
  - Hosting and co-location
  - Broadband wireless networking
  - Application development and maintenance

Such agreements would include, when appropriate, governance, funding, procurement, operational and support service level agreements (SLAs), roadmaps, etc. The group that would oversee the processes and procedures, and ensure that decisions are made using mutually beneficial methodology, would be a governance council. This council provides the important oversight elements for successful operations. Overarching areas that must be addressed include the following:

- Fairness – It is will be critical for this governance council to be structured and conducted in a manner that provides fairness to all PSAPs to protect the interest of the constituents in smallest counties and equally protect the constituents of the largest counties.
- Tough Decisions – It is a matter of time before a decision will need to be made on whether to quarantine an entity, for the best of others, because of corrupted software or the entity is infected with a virus. There has to be a clear policy, processes and procedures for who will make those tough decisions, how that entity will be quarantined, what will be done to effectively address the problem, and what steps will be taken to bring that entity back on line, as soon as possible.

8. GEOGRAPHIC INFORMATION SYSTEMS (GIS)

8.1. CURRENT GIS

A high-level quality assessment on specific GIS data was performed on the data provided by the State. The GIS data used for the assessment was downloaded from the Nebraska PSC GIS Data Repository. The assessment performed a series of conformance tests with current and draft NENA standards and best practices. The street centerlines and emergency services boundaries were the primary data layers assessed.

Current NENA GIS data standards are in exhibit 22 of NENA 02-010 *Standard Data Formats for 911 Data Exchange & GIS Mapping*. Best practices were identified from NENA 71-501, *Information*

Document for Synchronizing Geographic Information System Databases with MSAG & ALI, and NENA 02-014, *GIS Data Collection and Maintenance Standards*.

There were 298,614 records in the road centerlines data, representing the estimated centerline of a roadway in the real world. Road centerlines are linear segments with a beginning point and an end point, called nodes. A road segment will have a beginning node and an ending node. The beginning and ending nodes are important for interpolating the estimated location for an address point.

Each road segment also has a left and right side. The left and right side of a road segment is defined relative to the beginning node. If a person were standing at the beginning node, the beginning point of the road centerline, and looking toward the end node, the left side of the street is on the same side as the person's left hand and the right side of the street is on the right hand side of the person.

Each road segment has left and right side attributes for emergency service numbers (ESNs), city, zip code, postal community, and Master Street Address Guide (MSAG) community. Each road segment also has four address ranges representing left low address, right low address, left high address, and right high address.

When an address is geocoded, the location of an address is interpolated by locating information contained in the GIS data including the street name and emergency service zone (ESZ). The four address range fields are used to derive an estimate of the address location.

The assessment indicated that the majority of the GIS road centerline data was of high quality. The road centerline assessed compliance with the NENA 02-010 standard using of a series of tests. Table 7 depicts the tests performed, the count of those records that failed the test criteria, the percentage of the failed to the total number of records, and an example of the errors detected.

Table 7 – Road Centerline Tests

Test Performed	Count	Percent of Total	Example of Error
Address Range = 0	13,077	4.38%	Zero_Range
Invalid Prefix Directional	2	0.00%	EB, WB
Street Name is blank	956	0.32%	Unnamed streets
Invalid Street Type	6,227	2.09%	91, AV
Invalid Post Directional	2,593	0.87%	Directionals (N,S,E,W) in Street Type flied
Invalid Road Classification	298,614	100.00%	Field not present in the data
Invalid One-Way	298,614	100.00%	Field not present in the data
Invalid Postal Community Left	298,614	100.00%	Field not present in the data
Invalid Postal Community Right	298,614	100.00%	Field not present in the data
Invalid ZIP Left	298,614	100.00%	Field not present in the data
Invalid ZIP Right	298,614	100.00%	Field not present in the data
Invalid MSAG Community Left	298,614	100.00%	Field not present in the data
Invalid MSAG Community Right	298,614	100.00%	Field not present in the data

Test Performed	Count	Percent of Total	Example of Error
Invalid ESN Left	15,637	5.24%	No value in Left ESN field
Invalid ESN Right	15,836	5.30%	No value in Right ESN field
County Name Left	298,614	100.00%	Field not present in the data
County Name Right	298,614	100.00%	Field not present in the data
State Left	298,614	100.00%	Field not present in the data
State Right	298,614	100.00%	Field not present in the data
Date record updated	0	0.00%	No issues
Source of data	298,614	100.00%	Field not present in the data

The “Address Range = 0” test selected all records in the road centerline data where the lower left, lower right, upper left, and upper right address ranges were all equal to zero. Slightly more than 4 percent of the total records had an address range of 0. Being able to locate the address of a 9-1-1 call or dispatching the proper emergency responders to the location of an incident depends on being able to interpolate the address from the address range data contained in the road centerline data. Certain road segments, such as entrance and exit ramps, do not require address ranges.

The road name prefix direction should be N, S, E, W, NE, NW, SE, SW, or blank. Any other characters in this field counted as an error. There was one EB and one WB in the road centerline data.

There were 932 records in the road centerline data that do not contain a street name. All streets, including entrance and exit ramps, should be named. The street type field contained 6,227 invalid entries. Street types are defined by NENA such as AVE for avenue, BLVD for boulevard and ST for street. The majority of the invalid street types in the data were due to in highway numbers, such as 91 in Highway 91, and AV rather than AVE being used.

The street post directional field should be N, S, E, W, NE, NW, SE, SW, or blank. There were 2,593 invalid entries in this data field, the majority being street types, such as AVE or RD, being misplaced in this field.

Road centerlines are often the dividing feature between different counties, townships, municipalities, PSAPs and emergency service boundaries. Because of this, road centerline data has different attribute fields for the left and right side of a roadway.

The test indicating 100 percent error is the result of these fields not being present in the road centerline data.

Road type classifications are useful for assigning different colors and line widths to the map display, so a major road looks different from a private road or a driveway on a telecommunicator’s map display. NENA recommends road types defined as Interstates, Freeway or Expressways, Minor Arterial, Major Collector, Minor Collector, Local streets and trails. Trails are restricted to non-vehicular traffic. There was no road classification in the road centerline data.

NENA standards require each road centerline contain information on the name of the county and state on each side of the road centerline. The left and right county, zip, postal community, MSAG community, and left and right state fields are missing from the road centerline data. It is vital when individual counties begin sharing GIS data with neighboring counties these fields are present in the data. The source of data is typically the name of the agency providing the in the data layer, which is useful for determining the contact for updated data.

The Left ESN field contained 15,637 blank values, while the Right ESN field contained 15,836 blank values. These fields are used to help those handling maps displays determine the correct ESN with which to geocode a civic address.

The date the record was updated was present in all records.

Many of the fields shown as not present in the road centerline data is relatively easy to correct. The county, state, and MSAG community information is in the MSAG databases. The postal communities and zip information is a bit more challenging to determine, but as one moves toward NG9-1-1 these data fields become increasingly more important.

The emergency services boundaries or ESZ data was also tested for conformance with NENA standards and best practices. ESZ are geographical representations of the ESNs used for selectively routing 9-1-1 calls to the proper PSAP. The ESN is defined by the PSAP authority in the MSAG. The MSAG contains address ranges, street names, communities, and other information that define each ESN. ESN and ESZ information are also associated with the correct law enforcement, fire or emergency medical services (EMS) responder to a given area.

The ESZ data was also of high quality, with only a few NENA standard fields missing from the data. Table 8 depicts the NENA 02-010 standard conformance test performed on the ESZ data layer. The test performed a count of records not meeting the test criteria, a percentage of the records not meeting the test criteria divided by the total number of records, and an example of the errors detected.

Table 8 – ESZ Tests

Test Performed	Count	Percent of Total	Example of Error
County Name Exist	994	100.00%	Not present in data
County FIPS Code Exist	0	0.00%	No issues
PSAP ID Exist	994	100.00%	Not present in data
Agency ID Exist	0	0.00%	No issues
ESN	0	0.00%	No issues
Date record updated Exist	0	0.00%	No issues
Source of Data Exist	994	100.00%	Not present in data

Several NENA fields do not exist in the data. The name of the county associated with the Federal Information Processing Standards (FIPS) code should exist in the data.

The PSAP ID field should be added and properly populated with the information given by the FCC Master PSAP Registry.

The source of the data field should be added to the data and properly populated with the agency or entity providing the data.

A review of the GIS data indicated that there are topology errors within the road centerline and the ESZ data. Topology errors occur when the geographical extent of a particular ESZ or municipal boundary is not congruent with adjacent boundaries. This non-congruency indicates areas of overlap or gaps within the data layer. Topology errors can be corrected by ensuring adjacent road centerlines and ESZ boundaries meet at a common point, such as a shared county boundary or an agreed to point.

NENA's draft NG9-1-1 GIS Data Model standard, expected to be published in the first quarter of 2014, is designed to meet the needs of an i3-compliant NG9-1-1 system and be backwards compatible with today's E9-1-1 systems. Within an NG9-1-1 system, the ability to validate locations and routing of an emergency call will depend on the standardization, quality, and accuracy of the GIS data being used.

8.2. NG9-1-1 GIS REQUIREMENTS

The GIS information needed for PSAP and responder jurisdictions will be a critical element in the state of Nebraska. This data will be replicated (mirrored) into the NG9-1-1 GIS data store. This data store, similar to today's GIS Data Repository, will provide updated GIS data to a Spatial Interface Function (SIF), which will convert the GIS data into a Location-to-Service Translation (LoST) data protocol. The SIF will update this LoST data into the Location Validation Function (LVF) and to the ECRF. Since this data store is providing updated data to critical NG9-1-1 components it must also be of a geographically diverse, high-availability design. The NG9-1-1 GIS system should be dedicated to the operation of the NG9-1-1 network, and should be implemented separately from other networks. The GIS data will be provisioned and used by the ECRF and LVF, both of which are LoST servers.

The GIS database that is used for emergency call routing should replicated and an additional image of that information placed on a network server that can be accessed from outside the ESInet for the purpose of location validation prior to the delivery of a call. Operational processes should be in place to ensure that this is kept updated to the same level as the GIS store in the ESInet to ensure proper validation of location data from users. LoST services should be configured with the database to perform the LVF.

NENA's designated core GIS data layers required for the NG9-1-1 system to perform these functions are PSAP, authoritative service boundaries, emergency services boundaries, and road centerlines. Emergency services boundaries include the PSAP boundary and emergency services boundaries for law enforcement, fire and EMS agencies. The PSAP boundary and basic emergency services boundaries can be created from existing ESZ boundary layer data.

Recommended GIS data layers for NG9-1-1 include site structure address points, cell site and sector locations, and boundary layers for counties and municipalities. NENA does not consider address points to be a core GIS data layer for NG9-1-1 due to few entities having this GIS data layer. However, address points should be considered a core GIS data layer as they allow a more precise location than is afforded by geocoding an address using road centerline data. Other GIS data layers that are used in 911 call take and dispatch, such as hydrology and aerial imagery, do not require the high level of standardization required for NG911 systems.

Each GIS layer used in NG9-1-1 requires the following:

- Data source field for the agency that last updated the record
- Updated date field for the last time a record within the data layer was updated
- Effective date for when the new or updated information goes into effect
- Unique feature ID for each road segment, address point or polygon within each data layer
- Country code (e.g., US) and county name (e.g., Custer County) associated with each feature

The emergency services layer also requires the following:

- Agency ID field, which will be the domain name used to uniquely identify each agency
- Route, which will identify the "route" in which to send the 911 call, such as sos.psap@city.psap.state.us
- Service name to identify the emergency service to which the call is routed, such as sos.law
- Agency VCARD field, which will contain the route to obtain the agency contact information
- Display name, which will contain the name of the service, such as York PD

9. NG9-1-1 EFFORTS AND INITIATIVES

9.1. NEBRASKA INITATIVES

This study is a significant step by the Nebraska Legislature to implement NG9-1-1. Additionally, the PSC has undertaken two major statewide initiatives that will contribute to the implementation of NG9-1-1— the development of a statewide GIS data set and data repository, and the implementation of inter-tandem trunking.

9.1.1. *GIS Data and Repository*

Comprehensive, accurate, and timely GIS data for use in call routing is critical to NG9-1-1. The PSC found that development of proper GIS data and map databases or supplementation of existing map databases is necessary for Phase II services and would not be affected by possible consolidation of PSAPs. Furthermore, the PSC ordered that the development of GIS mapping databases proceed. Enhanced wireless 911 funds were used to pay for the development and maintenance of statewide GIS data through two primary contractors; with the exception of Douglas, Lancaster, and Sarpy counties, which utilized in-house GIS staff rather than a contractor to develop and maintain the data. Counties contract with a GIS vendor for updates and maintenance of their data. Expenses related to GIS data,

subject to the wireless/landline 9-1-1 call ratio, continue to be eligible expenses and can be paid using a County's enhanced wireless 911 funds. With respect to Douglas, Lancaster, and Sarpy counties, a portion of their in-house GIS personnel expenses are also eligible for funding.

Cell tower locations and coverage information are treated as proprietary information and disclosed only to the PSAPs for the purpose of providing 9-1-1 service. The remaining layers are treated as public documents.

The PSC has also approved funding for a centralized data repository for the GIS data to allow for maintenance of the data and access to the data by individual PSAPs and the PSC. The repository is maintained for the PSC by GIS Workshop, a private contractor. The PSC maintains security of the data repository through a formal access policy. All requests for access to the repository are processed accordingly and each entity is granted access through a username and password.

A PSC representative currently sits on the GIS Advisory Council. The council has been given access to all GIS data in the repository, which the exception of cell tower information.

9.1.2. *Inter-tandem Trunking*

Inter-tandem trunking enables the transfer of calls to another PSAP along with access to the associated caller and location data. Implementation has been completed between Council Bluffs, Iowa, to Des Moines, Iowa; Sioux City, South Dakota, to Council Bluffs, Iowa; Grand Island to Council Bluffs, Iowa; and Lincoln to Council Bluffs, Iowa. The PSC pursued and was awarded federal funding for the completion of inter-tandem trunking between Grand Island and Scottsbluff.

This project provided an increase in multiple state systems capabilities as well as the opportunity for interstate cooperation.

9.2. NEIGHBORING STATES

NG9-1-1 implementation in neighboring states varies from well underway to not planned or started. The following is a summary of progress in neighboring states.

9.2.1. *Iowa*

NG9-1-1 implementation is well underway in Iowa. An IP-based network is in place, provided by Iowa Communications Network (ICN), a state government network. All 119 PSAPs and the carriers have transitioned to the new network. Gateways were installed at each PSAP to convert data back to CAMA until all the PSAPs update their equipment. A contract is in place for a next generation solution provider. Remaining work includes upgrades to PSAP equipment and improvements to GIS data. Matching state grants are available for procurement of PSAP equipment.

The contact is Barbara Vos, E911 Program Manager, Iowa Homeland Security and Emergency Management.

9.2.2. *Kansas*

The Kansas 911 Coordinating Council has developed an NG9-1-1 Strategic Plan as a roadmap for transitioning statewide 9-1-1 services to NG9-1-1 in fiscal years 2013–2017. The strategic plan is the result of a cooperative effort between the Coordinating Council, its stakeholders, and MCP.

The Council adopted a 2012 work plan that included oversight of a federally funded NG9-1-1 grant pilot project. On September 6, 2012, the Council accepted the final report on the results of the Federal ENHANCE 911 Grant pilot project, which involved a proof of concept implementation of NG9-1-1 with three PSAPs (one in a rural county, one in a medium-sized city and one in an urban county). The purpose of the pilot project was to identify viable approaches using existing resources that could be used to cost-effectively implement NG911 service in Kansas.

9.2.3. *Colorado*

In 2011, the Colorado 911 Resource Center contracted with MCP to conduct a study to determine options for the future transition to NG9-1-1 in Colorado. This study focused on three primary considerations:

- Technology
- Funding
- Governance

The recommendations and the next steps for Colorado were discussed at an NG9-1-1 Summit on January 30 and 31, 2012. Based on the results of that discussion, an NG9-1-1 Steering Committee was formed to further explore the options for a transition to NG9-1-1. Many of the discussions from the Steering Committee are incorporated into the Colorado State 911 Plan. In January 2013, CenturyLink presented a plan for the transition to NG9-1-1 in Colorado to the Public Utilities Commission's 911 Advisory Task Force.

In March 2013, Bandwidth presented their plan to the Task Force, and Level 3 presented its plan to the Task Force in July 2013. In July 2013, the Colorado Public Utilities Commission held an Informational Hearing on NG9-1-1.

The contact is Daryl Branson, Colorado 911 Resource Center.

9.2.4. *Wyoming*

Without statewide oversight, localities are taking a piecemeal approach to NG9-1-1 and the discussion is coming up on a statewide-level only tangentially and in conjunction with other projects (e.g., broadband).

A contact is Alyssa Watkins 911 Director, Teton County.

9.2.5. *South Dakota*

South Dakota has a 911 Master Plan. The South Dakota NG9-1-1 System will be initiated with the implementation of a statewide host-remote 9-1-1 platform. Several initial beta test PSAPs will be interconnected via IP-based facilities and systems. The beta test is intended to demonstrate the ability to form a statewide ESInet. The initial ESInet will be expanded to eventually provide all connectivity between individual PSAPs creating a fully functional statewide ESInet.

South Dakota is presently reviewing responses to an RFP for an NG9-1-1 consultant. The consultant will work with the State and the 911 Coordination Board over a period of about two years to transition to an NG9-1-1 system. Step one is to finalize the State's 911 Master Plan, which is followed by an RFP for GIS data and maintenance system. An RFP for a centralized/hosted 9-1-1 system and CPE will be released, an RFP to transition legacy 9-1-1 networks to NG9-1-1 networks, and lastly the RFP for an NG9-1-1 ESInet.

The contact is Shawnie Rechtenbaugh, South Dakota 911 Coordinator, Department of Public Safety.

9.2.6. *Missouri*

Missouri has no state-level 9-1-1 focus or coordination mechanism in place.

9.3. LEGISLATIVE EFFORTS

Across the country, States are beginning to review statutes regarding networks that can carry 9-1-1 communications. Reasons for States to review legislation are often based on providing risk avoidance and risk reductions, which include states such as Indiana; Vermont, which is using an Intrado-provided network; and Maine, which is using a FairPoint-provided network. Alabama with their Next Generation Emergency Network (ANGEN) is interesting in that they use the company Bandwidth to work with the Alabama Super Computer Authority to provide and manage services. These states perceive that they can provide more redundant and resilient networks by review and modification of statutes such that Voice over IP (VoIP) is recognized as an application; in NG9-1-1 that application is handled by SIP and is essentially data.

Indiana made the transition over several years. As one of the country's first, INdigital built a network for the state to handle wireless calls within Indiana. This solution demonstrated greater network reliability and redundancy than what was previously available. Time is critical when handling 9-1-1 calls, and INdigital's solution demonstrated quicker call setup. These enhancements were implemented while providing a four-fold cost reduction to the state's constituents. Partially based on the success of superior handling of wireless calls, statutes were changed in Indiana to allow INdigital to handle wireline calls.

The 9-1-1 system is designed to take information from general users and get that information to the correct entity. This is best accomplished in an environment that involves cooperation and communication between all parties.

At a national level, the draft report for National 9-1-1 Assessment Guidelines, dated June 2012, prepared for the U.S. Department of Transportation through the National 911 Program, does not have specific statutory or regulatory recommendations, but does provide guidance. Guideline SR15, for example, says that the statutory/regulatory environment should require all service providers, both originating and access, in a respective state that provide services to general users of telecommunications services to coordinate and cooperate with the State in the provision of 9-1-1 services. A registration process is recommended.

The State needs to understand various service providers and their respective capabilities to help integrate these services into the 9-1-1 system and to educate the public on the services' capabilities.

10. PARTICIPATION AND COOPERATION

10.1. FEDERAL

At the national level, Congress has expressed an interest in 9-1-1 services and passed legislation to advance 9-1-1 and NG9-1-1 services, as briefly summarized below. However, there is no single federal department or agency with single or ultimate authority for 9-1-1 governance and oversight. There are multiple agencies that address issues across the continuum of emergency communications: 1) caller access, 2) 9-1-1 services, and 3) emergency responders. The FCC exerts its regulatory authority over telecommunications providers who provide 9-1-1 services, but has no authority over state and local jurisdictions who implement that service and no authority for regulating PSAPs. The National 911 Program, housed within the U.S. Department of Transportation (DOT) is charged with facilitating coordination among public and private sector 9-1-1 stakeholders at the local, state, and federal levels, but has no jurisdiction to mandate policy. A number of federal agencies address other issues of federal interest, including the National Telecommunications and Information Administration (NTIA) at the U.S. Department of Commerce (DOC), and the U.S. Department of Justice, to name just a few.

10.1.1. *Americans with Disabilities Act (ADA)*

In 1990, Congress enacted the Americans with Disabilities Act (ADA), which, in part, prohibits state and local governmental programs from discriminating on the basis of disability. Legislative reports accompanying the ADA interpreted this prohibition, contained in Title II of the statute, to require that local governments "ensure that [their] telephone emergency number systems are equipped with technology that will give hearing impaired and speech impaired individuals a direct line to these emergency services." While this mandate has initially required the installation of teletypewriter (TTY) capabilities by PSAPs, Congress made clear that "future technological advances – such as speech to

text services – may offer other means of affording direct and equally effective access for these individuals."

10.1.2. *ENHANCE 911 Act*

Congress enacted the Ensuring Needed Help Arrives Near Callers Employing 911 Act (ENHANCE 911 Act) in 2004. The act addressed numerous concerns that had been raised about 9-1-1 deployment, including compliance, coverage in rural areas, and the use of fees levied by states and localities to cover 9-1-1 service costs. The ENHANCE 911 Act also created the E9-1-1 Implementation Coordination Office (ICO), an office jointly administered by NTIA and the National Highway Traffic Safety Administration (NHTSA), to assist and coordinate with state and local 9-1-1 authorities in the development of 9-1-1 and E9-1-1 and to administer a grant program for the implementation and operation of Phase II E9-1-1 services and NG9-1-1 services. ICO helps to coordinate the efforts of states, technology providers, public safety officials, 9-1-1 professionals and other groups, and seeks to ensure a smooth, reliable and cost-effective transition to 9-1-1 systems that takes advantage of new communications technologies to enhance public safety nationwide.

10.1.3. *NET 911 Improvement Act*

In 2008, Congress enacted the New and Emerging Technologies 911 Improvement Act (NET 911 Act). The NET 911 Act confirmed the PSC's authority to regulate the provision of 9-1-1 by VoIP service providers and took other steps to improve the delivery of 9-1-1 services nationwide. The key provisions of the NET 911 Act are as follows:

- Required VoIP providers to provide 9-1-1 and E9-1-1 in compliance with existing FCC regulations at the time of passage of the act or as modified in the future.
- Provided for equal access for VoIP providers to communications networks needed to complete 911 calls.
- Extended state liability protection for 9-1-1 and E9-1-1 to VoIP providers and other emergency service providers.
- Directed the ICO to develop a national migration plan for transition of 9-1-1 to an IP-enabled 9-1-1 network.
- Protected the rights of states and other political subdivisions to levy fees on 9-1-1 services.
- Required the FCC to report annually on collection of state fees and other levies on 9-1-1 and E9-1-1 services.

10.1.4. *Twenty-First Century Communications and Video Accessibility Act*

In October 2010, Congress enacted the Twenty-First Century Communications and Video Accessibility Act. Not later than one year after the date of the enactment of this Act, the FCC, in coordination with the Secretary of Homeland Security, the Administrator of NHTSA, and the Office, were to prepare and submit a report to Congress that contains recommendations for the legal and statutory framework for NG9-1-1 services, consistent with recommendations in the National Broadband Plan developed by the PSC pursuant to the American Recovery and Reinvestment Act of 2009, including the following:

- A legal and regulatory framework for the development of NG9-1-1 services and the transition from legacy 9-1-1 to NG9-1-1 networks.
- Legal mechanisms to ensure efficient and accurate transmission of 9-1-1 caller information to emergency response agencies.
- Recommendations for removing jurisdictional barriers and inconsistent legacy regulations including:
  - Proposals that would require States to remove regulatory roadblocks to NG9-1-1 services development, while recognizing existing State authority over 9-1-1 services;
  - Eliminating outdated 9-1-1 regulations at the Federal level; and
  - Preempting inconsistent State regulations

10.1.5. *FCC*

In October 1999, the Wireless Communications and Public Safety Act of 1999 (911 Act) took effect with the purpose of improving public safety by encouraging and facilitating the prompt deployment of a nationwide, seamless communications infrastructure for emergency services. One provision of the 911 Act directs the FCC to make 911 the universal emergency number for all telephone services.

In recent years, the FCC has taken steps to facilitate the transition to NG9-1-1. In the National Broadband Plan, the FCC made several recommendations to "bridge the gap" to NG9-1-1. In December 2010, following up on the National Broadband Plan recommendation to "address IP-based NG9-1-1 communications devices, applications, and services, the FCC issued a Notice of Inquiry on facilitating the transition to NG9-1-1, exploring issues of federal oversight or governance of state deployments of NG9-1-1, improving the accuracy of technologies that supply PSAPs with critical location data, as well as near-term and long-term solutions for providing consumers the ability to send text messages to 9-1-1.

In August 2011, then FCC Chairman Genachowski announced a five-step action plan for accelerating NG9-1-1 deployment. Among other things, the Chairman's plan called for the FCC to initiate rulemaking proceedings on NG9-1-1 location accuracy and enabling the public to transmit emergency communications to PSAPs via text, data, and video in addition to voice. The FCC has subsequently initiated rulemaking proceedings in both areas. The plan also called for the FCC to work with "state 911 authorities, other Federal agencies, and other governing entities" to provide technical expertise and develop a coordinated approach to NG9-1-1 governance.

In December 2012, as part of its rulemaking proceeding on communicating with PSAPs via text, data, and video, the FCC adopted a Further Notice of Proposed Rulemaking in which it proposed to require all wireless carriers and providers of "interconnected" text messaging applications to enable their customers to send text messages to 9-1-1 in areas where PSAPs are also prepared to receive the texts. The Further Notice reflected a voluntary commitment by the four largest wireless carriers – Sprint, AT&T, Verizon, and T-Mobile – to support text messaging to 9-1-1 to text-capable PSAPs by May 15, 2014.

On November 18, 2013, the FCC's Public Safety and Homeland Security Bureau (Bureau) hosted a public workshop to discuss recent developments in the use of wireless technology to contact emergency services. The workshop explored current trends that may be affecting the provision and quality of 9-1-1 location information delivered to PSAPs, including the increased volume of wireless 9-1-1 calls and the increase in wireless calls originating from indoor locations. The issues raised at the workshop should lead to further rulemaking and the FCC is expected to consider proposed rules in the spring of 2014.

On December 12, 2013, the FCC issued new rules to improve 9-1-1 reliability as a result of the derecho last year that disrupted service to millions. In general, the FCC chose not to impose very strict rules on the telecommunications service providers (phone companies), but rather allow them to "self certify" that they had reliable, diverse networks. Some new requirements have been imposed to ensure that critical circuits follow diverse routes, and that those routes are checked annually. However, the FCC is not convinced that NG9-1-1 networks should be part of the new rules. "…we are not persuaded that NG911 technologies have evolved to the point that reliability certification rules should apply to entities beyond those that offer core services functionally equivalent to current 911 and E911 capabilities."

The PSC has established a Technology Transitions Policy Task Force to examine issues associated with the transition from legacy circuit-switched networks to fully IP-enabled networks. The task force made a presentation at the December 12, 2013, meeting and while their efforts appear to focus on the impact of technology transitions on consumers through diverse experiments and open-data initiatives, they are considering a NG9-1-1 trial that would take place in areas where public safety authorities are transitioning or have taken initial steps to prepare for transition of their legacy systems to NG9-1-1 and where providers, including landline, wireless, and interconnected VoIP, are able to deliver VoIP-based 9-1-1 calls (and potentially other IP-based traffic) to an ESInet, either "natively" or, if necessary, initially through LNGs. The task force is a cross-agency working group charged with presenting an Order to the FCC at its January Open Meeting.

The recent appointment of a new FCC Chairman, Tom Wheeler, will probably result in some realignment and reprioritization of the efforts of the FCC to facilitate the transition to NG9-1-1.

10.1.6. *National 911 Program Office*

Congress formed the National 911 Office because it recognized the critical importance of the 9-1-1 system in protecting public safety and security; now it is known as the National 911 Program, and is housed within the Office of Emergency Medical Services at NHTSA.

The mission of the National 911 Program is to provide federal leadership in supporting and promoting optimal 9-1-1 services. It was created as a point of coordination for activities among 9-1-1 stakeholders and to provide information that can be used to improve the 9-1-1 system. This is done by developing a variety of tools and resources that can be used to plan and implement NG9-1-1.

The National 911 Program, in coordinating the efforts of states, technology providers, public safety officials, 9-1-1 professionals and other groups, seeks to ensure a smooth, reliable, and cost-effective transition to a 9-1-1 system that takes advantage of new communications technologies to enhance public safety nationwide.

The program office administered the ENHANCE 911 Act grants and has worked in cooperation with stakeholders to produce several resource documents such as the *Model State 9-1-1 Plan*, *A National Plan for Migrating to IP-Enabled 9-1-1 Systems*, *Guidelines for State NG9-1-1 Legislative Language*, and a Blue Ribbon Panel on 911 Funding report: *Current State of 9-1-1 Funding and Oversight*.

10.1.7. *NTIA*

Pursuant to Section 6210 of the Middle Class Tax Relief and Job Creation Act of 2012 (Act), the First Responder Network Authority (FirstNet) was established as an independent authority within NTIA. FirstNet is authorized to take all actions necessary to ensure the building, deployment, and operation of a nationwide public safety broadband network based on single, national network architecture.

The FirstNet Statement of Requirements (SOR) acknowledges NG9-1-1 as incorporated in the Public Safety Enterprise Network (PSEN). This is because FirstNet secondary users make emergency calls and those are delivered to a PSAP. Currently, the discussion regarding the interaction between NG9-1-1 and FirstNet services is only beginning, although an NG9-1-1 PSAP may obtain information that is forwarded on to first responders.

10.1.8. *Department of Justice*

The Department of Justice (Department) is considering revising the regulation implementing Title II of the ADA to address in what manner public entities that operate PSAPs should be required to make changes in telecommunication technology to reflect developments that have occurred since the publication of the Department´s 1991 regulation. Under its existing Title II regulation, the Department requires that PSAPs provide direct, equal access to telephone emergency centers for individuals with disabilities who use analog text telephones (TTYs). Many individuals with disabilities now use the Internet and wireless text devices as their primary modes of telecommunications. Many PSAPs are considering and planning to transition from analog telecommunications technology to IP-enabled 9-1-1 services that will provide voice and data (text, pictures, and video) capabilities. The Department seeks information on possible revisions to the Department´s regulation to ensure direct access to NG9-1-1 services for individuals with disabilities. Any action resulting from this activity could influence the timing of NG9-1-1 implementation in the states.

10.2. STATE

At the state level, the PSC is experienced in the management and oversight of a critical state-level public safety communication program. Their experience in managing wireless funding and rulemaking

will be critical as the State's 9-1-1 program moves to a new age. The PSC's work in GIS and inter-tandem trunking has been productive and instructive.

The OCIO could provide a broad range of technology services that will be required to implement NG9-1-1 services. The office develops, implements, and supports the technologies employed in IP-enabled networks that are the foundational elements for NG9-1-1. Their planning and project management services, as well as information systems operations, business continuity, and disaster recovery experience could be very helpful. The OCIO has worked to create partnerships with entities both internal and external to Nebraska State Government and many of their successful projects have been made possible through collaborative efforts. The partnership with Nebraska Public Power District (NPPD), State Patrol, State Fire Marshal, and Game and Parks to establish the statewide radio system has provided them with valuable experience in public safety communications.

10.3. LOCAL

Local entities retain significant responsibility for emergency communications and response in the NG9-1-1 environment. Governing bodies should retain control over their respective 9-1-1 and emergency response functions, including call processing, and are encouraged to participate in state and regional initiatives. Local jurisdictions will also retain responsibility for managing their respective daily PSAP operations, staffing, training, and scheduling in accordance with current and future standards.

Definitions

Automatic Location Identification (ALI) - The automatic display at the PSAP of the caller's telephone number, the address/location of the telephone and supplementary emergency services information of the location from which a call originates

Border Gateway Protocol (BGP) – A standardized exterior gateway protocol designed to exchange routing and reachability information between autonomous systems (AS) on the Internet. The protocol is often classified as a path vector protocol, but is sometimes also classed as a distance vector routing protocol. BGP does not use Interior Gateway Protocol (IGP) metrics, but makes routing decisions based on paths, network policies and/or rule-sets configured by a network administrator. BGP plays a key role in the overall operation of the Internet and is involved in making core routing decisions.

Centralized Automated Message Accounting (CAMA) trunks - A type of in-band analog transmission protocol that transmits telephone numbers via multi-frequency encoding. Originally designed for billing purposes. CAMA lines are used to provide 9-1-1 calls to the PSAPs.

Carrier Hotel - A type of data center where equipment, space, and bandwidth are available for rent to retail customers. Co-location facilities provide space, power, cooling, and physical security for the server, storage, and networking equipment of other firms—and connect them to a variety of telecommunications and network service providers—with a minimum of cost and complexity.

Computer Aided Dispatch (CAD) - A computer based system that aids PSAP telecommunicators by automating selected dispatching and record keeping activities.

Emergency Call Routing Function (ECRF) - A functional element in an ESInet which is a LoST protocol server where location information (either civic address or geo-coordinates) and a service URN serve as input to a mapping function that returns a URI used to route an emergency call toward the appropriate PSAP for the caller's location or towards a responder agency.

Emergency Service Zone (ESZ) - A geographical area that represents a unique combination of emergency service agencies (e.g., Law Enforcement, Fire and Emergency Medical Services) that are within a specified 9-1-1 governing authority's jurisdiction. An ESZ can be represented by an Emergency Service Number (ESN) to identify the ESZ.

Emergency Services IP network (ESInet) - An ESInet is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core functional processes can be deployed, including, but not restricted to, those necessary for providing NG9-1-1 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks).

Emergency Services Routing Proxy (ESRP) - An i3 functional element that 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 NG9-1-1 PSAP. There may be one or more intermediate ESRPs between them.

Enhanced 9-1-1 (E9-1-1) - A telephone system that includes network switching, database and PSAP premise elements capable of providing ALI data, selective routing, selective transfer, fixed transfer, and a call back number. The term also includes any enhanced 9-1-1 service so designated by the FCC in its Report and Order in WC Docket Nos. 04-36 and 05-196, or any successor proceeding.

Geographic Information Systems (GIS) - A computer software system that enables one to visualize geographic aspects of a body of data. It contains the ability to translate implicit geographic data (such as a street address) into an explicit map location. It has the ability to query and analyze data in order to receive the results in the form of a map. It also can be used to graphically display coordinates on a map i.e. Latitude/Longitude from a wireless 9-1-1 call.

i3 – i3 is a NENA term. The i3 solution supports end-to-end IP connectivity; gateways are used to accommodate legacy wireline and wireless origination networks that are not IP. NENA introduces the concept of ESInet, which is designed as an IP-based inter-network (network of networks) that can be shared by all public safety agencies that may be involved with an emergency. The i3 PSAP is capable of receiving IP-based signaling and media for emergency calls conformant to the i3 standard

IPv4 - A 32-bit address assigned to hosts using TCP/IP. An IP address belongs to one of five classes (A, B, C, D, or E) and is written as 4 octets separated by periods (dotted decimal format). Each address consists of a network number, an optional sub network number, and a host number. The network and sub network numbers together are used for routing, while the host number is used to address an individual host within the network or sub network.

IPv6 - is the latest revision of IP, the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion. IPv6 is intended to replace IPv4, which still carries the vast majority of Internet traffic as of 2014.

Land Mobile Radio (LMR) – LMR service is regulated in the United States by the FCC in CFR 47 Part 90 for non-federal government wireless use between land-based mobile and fixed stations. The National Telecommunications and Information Administration (NTIA) performs similar functions for federal government spectrum users.

Legacy Network Gateway (LNG) - 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.

Legacy PSAP gateway (LPG) - An NG9-1-1 functional element that provides an interface between an ESInet and an un-upgraded PSAP

Legacy Selective Router Gateway (LSRG) – Uses tandem to tandem transfers to allow ESInet originated call to terminate/transfer to selective router PSAP and selective router originated call to terminate/transfer to ESInet terminated PSAP. LSRG uses ALI with E2 to network location.

Local Exchange Carrier (LEC) - A Telecommunications Carrier (TC) under the state/local Public Utilities Act that provide local exchange telecommunications services. Also known as Incumbent Local Exchange Carriers (ILECs), Alternate Local Exchange Carriers (ALECs), Competitive Local Exchange Carriers (CLECs), Competitive Access Providers (CAPs), Certified Local Exchange Carriers (CLECs), and Local Service Providers (LSPs)

Location-to-service Translation (LoST) - A protocol that takes location information and a Service URN and returns a URI. Used generally for location-based call routing. In NG9-1-1, it is used as the protocol for the ECRF and LVF.

Location Validation Function (LVF) - Refers to the action of ensuring that a civic address can be used to discern a route to a PSAP.

Logger/Recorders - A device that records, stores and is capable of playing back all communication media within the domain to which it is assigned. Media can include, but is not limited to voice, radio, text and network elements involved with routing a 9-1-1 call. Logging recorders should have the capability to simultaneously record from several sources

Long-term Evolution (LTE) - A standard for wireless communication of high-speed data for mobile phones and data terminals. It is based on the GSM/EDGE and UMTS/HSPA network technologies, increasing the capacity and speed using a different radio interface together with core network improvements. The standard is developed by the 3GPP (3rd Generation Partnership Project) and is specified in its Release 8 document series, with minor enhancements described in Release 9.

Master Street Address Guide (MSAG) - . MSAG addresses are used to route 9-1-1 calls and for ALI display. Address recognized by public safety for the dispatch of emergency first responders. It is an absolute and unique address in that variants for directions, street spelling, street suffixes, and community names are not allowed. It is preferred that MSAG Addresses be in Civic Address format. The community name associated with this address format is assigned by the Addressing Authority in cooperation with the 9-1-1 Administrator and may or may not be the same as the community name assigned by the USPS

National Emergency Number Association (NENA) – NENA is a not-for-profit corporation established in 1982 to further the goal of “One Nation-One Number.” NENA is a networking source and promotes research, planning and training. NENA strives to educate, set standards and provide certification

programs, legislative representation and technical assistance for implementing and managing 9-1-1 systems.

Next Generation 9-1-1 (NG9-1-1) - NG9-1-1 is an IP-based system comprised of managed ESInets, functional elements (applications), and databases that replicate traditional E9-1-1 features and functions and provides additional capabilities. NG9-1-1 is designed to provide access to emergency services from all connected communications sources, and provide multimedia data capabilities for PSAPs and other emergency service organizations.

Open System Interconnection (OSI) - A 7-layer hierarchical reference model structure developed by the International Standards Organization for defining, specifying, and relating communications protocols; not a standard or a protocol. Layer descriptions are as follows:

(7) Application - Provides interface with network users,
(6) Presentation - Performs format and code conversion,
(5) Session - Manages connections for application programs,
(4) Transport - Ensures end-to-end delivery,
(3) Network - Handles network addressing and routing,
(2) Data Link - Performs local addressing and error detection
(1) Physical - Includes physical signaling and interfaces

Point of Interconnect (POI) - The geographical location where two networks interconnect and exchange traffic.

Point of Presence (POP) - An artificial demarcation point or interface point between communicating entities.

Public Safety Answering Point (PSAP) - An entity operating under common management that receives 9-1-1 calls from a defined geographic area and processes those calls according to a specific operational policy.

Quality of Service (QoS) - As related to data transmission, a measurement of packet latency, packet loss and jitter.

Selective Router (SR) - The process in which 9-1-1 calls are routed to the proper PSAP or other designated destination, based on the caller's location information, and may also be impacted by other factors, such as time-of-day, call type, etc. Location may be provided in the form of a MSAG-valid civic address or in the form of geo-coordinates (longitude and latitude). Location may be conveyed to the system performing the selective routing function in the form of ANI or pseudo-ANI associated with a pre-loaded database record (in Legacy 9-1-1 systems) or in real time in the form of Presence Information Data Format – Location Object (PIDF-LO) (in NG9-1-1 system) or whatever forms are developed as 9-1-1 continues to evolve.

Session Border Controller (SBC) - A commonly available functional element that provides security, NAT traversal, protocol repair and other functions to VoIP signaling such as SIP. A component of a Border Control Function.

Session Initiation Protocol (SIP) - An IETF-defined protocol that defines a method for establishing multimedia sessions over the Internet. Used as the call signaling protocol in VoIP i2 and i3.

Spatial Interface Function (SIF) – The database for NG9-1-1. The primary function of SIF is to supply data for the LVF/ECRF.

T1 - T1 or T-1 is the most commonly used digital transmission service in the United States, Canada, and Japan. In these countries, it consists of 24 separate channels using pulse code modulation (PCM) signals with time-division multiplexing (TDM) at an overall rate of 1.544 million bits per second (Mbps). T1 lines originally used copper wire but now also include optical and wireless media. A T1 Outstate System has been developed for longer distances between cities. It is common for an Internet access provider to be connected to the Internet as a point-of-presence (POP) on a T1 line owned by a major telephone network. Many businesses also use T1 lines to connect to an Internet access provider.

Appendix A – PSAP Questionnaire

PSAP STATISTICS – (*Enter PSAP Name Here*)

INTRODUCTION

This document assists Mission Critical Partners (MCP) in gathering information for the State of Nebraska Next Generation Communications Study. We would ask you begin collecting this information prior to our on-site visit(s). You may not have all the requested information, but please provide what you have on this form or preferably in softcopy (Burn to a CD/DVD, thumb drive, etc.). The items below will be collected during the MCP Information Gathering visit(s) or you may email to maurahickey@mcp911.com.

1 – CALL STATS

2012 EMERGENCY LINES

	911 Trunks					Non 911 Trunks	
Month	Landline	Land Line Abandoned	Wireless	Wireless Abandoned	Inbound Other	10 Digit	10 Digit Abandoned
January							
February							
March							
April							
May							
June							
July							
August							
September							
October							
November							
December							
TOTALS							
Grand Total	*911 Landline + 911 Wireless + 911 Inbound Other (i.e.VoIP)*						

2011 EMERGENCY LINES

	911 Trunks					Non 911 Trunks	
	Landline	Land Line Abandoned	Wireless	Wireless Abandoned	Inbound Other	10 Digit	10 Digit Abandoned
TOTALS							
Grand Total	*911 Landline + 911 Wireless + 911 Inbound Other (i.e.VoIP)*						

2010 EMERGENCY LINES

	911 Trunks					Non 911 Trunks	
	Landline	Land Line Abandoned	Wireless	Wireless Abandoned	Inbound Other	10 Digit	10 Digit Abandoned
TOTALS							
Grand Total	*911 Landline + 911 Wireless + 911 Inbound Other (i.e.VoIP)*						

ADMINISTRATIVE LINES

YEAR	Admin Line Inbound	In-bldg Lines Inbound	Misc. Equipment Inbound	Admin Line Outbound
2012				
2011				
2010				

DISPATCHED CALLS FOR SERVICE

YEAR	Law	Fire / Rescue	EMS	Other *(Animal Control, Parks, Streets...)*	Officer Initiated *(if not counted in Law totals)*
2012					
2011					
2010					

HIGH ACTIVITY PATTERNS (i.e. Busy Day / Time) based upon Call Volume and Calls for Service

Busy Hour:

Busy Day of Week:

Busy Month of Year:

2 – YOUR PSAP EQUIPMENT

Please provide the information below, as well as **System Network Diagrams** when possible.

	911 System	CAD System	Logging Recorder	Radio System/Console	Time Source	Mapping System
Vendor Name						
Application(s)						
Version						
Date of Install						
Date of Latest Upgrade						

	NCIC/State Warrants	MIS System(s)	Camera(s)	Door(s)		
Vendor Name						
Application(s)						
Version						
Date of Install						
Date of Latest Upgrade						

GIS Data – Which 911 Systems in your organization use GIS data?	
Phone Mapping	
AVL	
CAD	
Other (Please Specify)	

Maintenance – Who Maintains Your - ---	
911 System	
CAD System	
Logging Recorder	
Radio System/Console	
Time Source	
Mapping System	
GIS Database	

Scheduled Replacement – Do you have any of your 911 Systems scheduled to replace? If you have it scheduled, please provide scheduled date and vendor.		
Scheduled Date	**Upgrade or Replacement**	**Vendor**
911 System		
CAD System		
Logging Recorder		
Radio System/Console		
Time Source		
Mapping System		
GIS Database		

3 – CAD Questions

Does your CAD software have map display capabilities?

Yes
No

If yes, then are you using these capabilities?

Yes
No

4 - GIS Questions

Which of the following GIS layers do you currently have and/or use in your PSAP systems?			
	Have	**Use**	**Want**
Road Centerlines			
Structure layer with assigned addresses (point or building footprints)			
Updated Postal data			
Old Postal data			
Emergency Service zone boundaries			
Zip Code boundaries			
Municipal and county boundaries			
Neighborhood and unincorporated community boundaries			
PSAP boundaries			
Response Areas/Zones			
Recently updated aerial Imagery (1-5 years old)			
Landmarks (common place names or frequent call areas that people reference)			
Railroads			
Hydrology (above ground rivers, streams, lakes, etc.)			
On-site ALI database			
MABAS Box #			
Cell towers and coverage areas			
Any Other			

Road Centerline Data – If you indicated need or desire for road centerline data		
	Partial	**Complete**
Road Names		
Address Ranges		
Address Points		
Linear Referencing		

Which of the following potential issues with GIS data concern you the most? (All that apply)	
	Check
Inaccuracies within you GIS data	
Lack of regular GIS data maintenance	
Lack of data standardization	
No structure address layer	
GIS data not synchronized with MSAG and ALI	
Lack of GIS staff resources	
Lack of GIS data sharing across jurisdictions	
Other	

GIS Questions – (The GIS Council wants to know who completed the GIS Section of information)

a. If your jurisdiction has address points, where are the typically placed?
   i. Rooftop
   ii. Primary entry point of building
   iii. Driveway street entrance
   iv. Other street location
   v. Parcel centroid
   vi. Other (please explain)
b. Approximately how many total address points are in your jurisdiction?
c. Does this number include sub-addresses (apartment numbers suites, etc.)?
   i. If yes, then how many are sub addresses?
d. Did you use a contractor to build the address point database?
   i. If yes, who was the contractor?
e. What is the approximate cost for building your database?
f. What is the status of your address point layer?
   i. Complete
   ii. Work in Progress
   iii. Planned
   iv. No plans for a Structure Address Point Layer
   v. Other (please specify)
g. How often are updates made to your 911 system data?
h. If you have an address structure layer, how is it updated?
   i. Field GPS Collection
   ii. On-Screen “Heads-up” Digitizing
   iii. Unsure
   iv. Other (please specify)
i. Who assigns new addresses to your jurisdiction?
j. Is there an ordinance that specifies a standard process for assigning addresses and/or an address schema?
k. Estimated percentage of completion for your structures address layer?
l. Where does the responsibility of GIS data maintenance fall?
m. How often is the GIS data in the 911 Mapping System normally updated?
n. What is the level of publically available GIS data within your jurisdiction?

o. Do you have any GIS sharing agreements (e.g. between GIS Dept. and PSAP County and City?
   i. We provide GIS data to neighboring PSAPs
   ii. We received GIS data from neighboring PSAPs
   iii. We provide and receive GIS data between neighboring PSAPs
   iv. No exchange is occurring
   v. Other (please specify)

p. How often do you share updated road centerline and address points GIS data with neighboring counties/PSAPs?

5 - YOUR PSAP ORGANIZATION

Please be prepared to provide / discuss the following information:

Funding Sources
Organizational Chart
Job Descriptions
Salary Ranges
Authorized and Current Staffing Levels
Number of positions
Personnel Scheduling/Software Utilized

6 - YOUR PSAP OPERATIONS

Please be prepared to provide / discuss the following information:

Performance Measures (Communications Section specific)
Hiring Process
Entry Level Training Program Description and Syllabus
Telecommunicator Certifications and Recertification's
Pre Arrival Instruction or Protocol Systems (EMD, EFD, EPD, etc)
Standard Operating Procedure Manual
Description of Call Processing Methods and Practices (*may be covered in Training material*)
Description of Dispatching Methods and Practices (*may be covered in Training material*)
Quality Assurance Program Methods and Procedures
Mutual/Auto Aid Agreements for Communications Centers and Response Agencies
Continuity of Operations/Disaster Planning for Communications
- Backup Site(s)
- Roll Over Site
- Make-Busy Switch
- Tandem(s)
- Wireline Trunks
- Wireless Trunks
- ALI circuits

Other duties performed by PSAP personnel (i.e. answering after hours for City/County departments, Warrants, Prisoner checks, etc.):

7 – NETWORK QUESTIONS

Please be prepared to provide and discuss the following information:

Network Questions	Response
Please provide your FCC PSAP ID number.	
Please provide the facility's exact street address (no P.O. Box numbers).	
Is the PSAP a primary or secondary?	
If secondary, what is the Primary PSAP it is attached to?	
What area (county or other geographic area) do you serve?	
How many monitors (systems) per positions do you have in your PSAP? Please list all systems.	
Do you currently have IP (data) connectivity into your center? (Check all that apply)	
None	
T1 (1.5 Mb/s)	
T3 (45 Mb/s)	
DSL	
Fiber	
Metro Ethernet	
MPLS	
Satellite	
Other (please explain)	
What rated (nominal) speed is your data connection? (Check one)	
1.5 Mb/s or less download	
between 1.6 and 5 Mb/s	
between 5 and 10 Mb/s	
between 10 and 20 Mb/s	
more than 20 Mb/s	
What do you currently use your data connection for? (check all that apply)	
ALI	
Access to the Internet	
VoIP	
Traffic or other CCTV cameras	

Network Questions	Response
Access to public safety, law enforcement, public health or similar databases	
Other (please explain)	
Are you connected to a state or county-wide IP network? Please describe briefly.	
How do you get your ALI feed?	
Modem	
Dedicated data connection (private network)	
Internet connection	
Other (please explain)	
If you do not have data connectivity, indicate your main reason(s):	
Currently no need	
Not available in my location	
Too expensive	
I don't have a local PSAP network (LAN)	
Other (please explain)	

8 – ADDITIONAL COMMENTS

Please add any additional comments you feel are relevant for this study. You may add additional sheets as necessary.

9 – CONTACT INFORMATION FOR YOUR PSAP:

Name:
Title:
Phone:
Cell:
Email:
Physical address:

Appendix B – Wireless Service Provider Questionnaire

WIRELESS SERVICE PROVIDER DATA SHEET – (*Enter SP Name Here*)

INTRODUCTION

This document assists Mission Critical Partners (MCP) in gathering information for the State of Nebraska Next Generation Communications Study. We would ask that you begin collecting this information prior to our conference calls. You may not have all the requested information, but please provide what you have on this form. Feel free to also include any drawings, charts, and tables that might provide some additional insight into your written answers. Please return this via email to miltonschober@mcp911.com.

1 – COMPANY INFORMATION

Name:
Address 1:
City:
Phone Number:
Type of Service Provider:
Company Organization:
If Corporation, state in which incorporated:

2 – YOUR ORGANIZATION

a. How long have you been in business?
b. If you are not wireless only, how long have you offered wireless service?
c. Are you a member of a consortium, or owned by another company?

3 – YOUR NETWORK & EQUIPMENT

a. Do you currently provide both Phase 1 and Phase 2 data on 911 calls?
b. Are there any spots in your coverage areas that do not offer Phase 2 data?
c. Do you have any omnidirectional towers?
d. On your sector towers, how do you location for each sector?
e. How do you currently deliver 911 traffic to the selective router or PSAP
f. If you don't currently deliver calls via IP, do you have plans to do so?

4 – YOUR OPERATIONS

a. Do you have a NOC?
b. Do you operate the NOC yourself or is it outsourced to another company?
c. If outsourced, is that company a wholly owned subsidiary?
d. How many field techs, network engineers, and other technical staff do you have?
e. If your technical staff is outsourced, is the company a wholly owned subsidiary?
f. What is the average length of employment of your technical staff?

5 – NETWORK SERVICES QUESTIONS

Please be prepared to provide and discuss the following information:

a. What data service options do you offer (3G, 4G LTE, etc.)?
b. Do you currently perform 911 selective routing services or simply hand the traffic off to the tandem?
c. If so, who is your database provider?
d. If needed can you provide coverage maps?
e. For internet services, who are your upstream providers?
f. What size pipe(s) do you have to your upstream providers?

6 – ADDITIONAL COMMENTS

Please add any additional comments you feel are relevant for this study. You may add additional sheets as necessary.

7 – CONTACT INFORMATION FOR YOUR COMPANY:

Name:
Title:
Phone:
Cell:
Email:
Physical address: