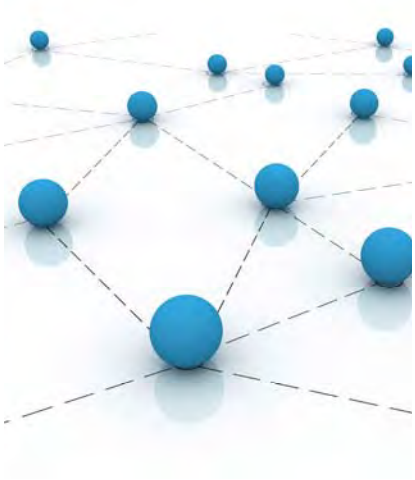

Prepared for

State of Iowa

911 Consolidation Study

December 2016

CDI® L.R. Kimball

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EXECUTIVE SUMMARY

L.R. Kimball respectfully submits this 9-1-1 Consolidation Study to the State of Iowa, Department of Homeland Security and Emergency Management (HSEMD). Citizens of Iowa expect to be able to use new technologies to reach 9-1-1 and to be able to share life-saving data like pictures and video with 9-1-1 calltakers. Iowa's 9-1-1 system was developed over 25 years ago using wireline technology that cannot support the transmission of text messages, pictures and video. A 9-1-1 caller in Iowa deserves a standardized 9-1-1 network with full next generation capabilities regardless of the technology they use to contact 9-1-1.

This Report analyzes network consolidation models and highlights the input and reactions of stakeholders regarding the initiative at five stakeholder meetings conducted across the State in September and October 2016. As a result of our analysis, the following considerations have emerged and are reflected in our recommendations. There is generally a positive response among stakeholders, with some reservations, to the notion of consolidating the current wireline and wireless networks that serve 9-1-1 in the state, into a single, IP-enabled network. Stakeholder comments included concerns over the state's role, robustness and redundancy, potential loss of funding, and clear demarcation of responsibilities and costs between the state and the individual public safety answering points (PSAPs). The recommended conceptual network design addresses these concerns. Recommendations include:

- Merging the Wireline network with the Wireless network to create a single, standardized network throughout the state using existing operating surplus as the upfront costs for network consolidation. *Section 2.7*
- Designing the network to have built-in capacity to handle text, video, social media, telematics, and future technologies as they are introduced. *Section 2.10*
- Constructing the network with diverse fiber networks from redundant providers. *Section 2.10*
- Adopt the full consolidation model with shared services. *Section 2.7.1*
- Create a virtual host/remote environment using six CPEs throughout the five LATA boundaries that local PSAPs could access. This will increase cost savings with the new single network and provide cost savings for local PSAPs for future CPE replacement, upgrade, and maintenance costs. *Section 2.10*
- Providing a funding mechanism for local activities related to NG9-1-1 GIS which feeds the statewide consolidated network. *Section 2.12*
- Returning the percentage of emergency communications service surcharge to be disbursed to the statutorily set amount of forty-six percent to pay for the network in the short term. *Section 3.2*
- Establishing a funding structure based on system costs and pairing any decrease in distributions with a shift in cost responsibility so that a new funding structure would not create a shortage. *Section 3.1*
- Maintain the current $200,000 consolidation grant for physical consolidation only. *Section 2.7.1*
- Updating current legislation to provide for the funding, governance and authority necessary to implement a successful and efficient NG9-1-1 system. *Section 3.*

It must be emphasized that the recommended change in the current environment, if implemented, would yield no upfront cost savings. Consequently, the focus must be on the long term financial impact, as well as the service improvements inherent in a NG9-1-1 network implementation for the citizens of the state. A project of this scope and complexity is unlikely to be fully implemented before 2019. If the state migrates to six regional hosted systems at a cost of $1,200,000.00 and the average maintenance cost of $240,000.00 for a total cost exposure of $1,440,000.00, in the period of five years, the state could save approximately $18,900,000.00, or $3,780,000.00 annually in call taking equipment alone. Strategic planning for technology, governance, legislation and funding must continue to assure an effective and efficient system implementation.

1. BACKGROUND

A previous study and report of the 9-1-1 environment in Iowa completed by Kimball in December 2015, clearly indicated that consumers are driving the telecommunications landscape and PSAPs need to be able to meet the expectations and accommodate a wider range of communication methods. In addition to receiving wireless and legacy 9-1-1 wireline calls, the public expects PSAPs to handle instant messaging, text messages, telematics (automatic crash notification) and live video feeds. A communications shift is also occurring among the hearing and speech impaired community.

While a new platform has been implemented by the State and PSAPs referred to as Next Generation 9-1-1 (NG9-1-1), using an Emergency Services Internet Protocol network (ESInet), work remains to be done to complete the evolution of 9-1-1 to an all-Internet Protocol (IP) based emergency communications system.

This report, commissioned by the State and awarded in July 2016, continues to build on the findings of the previous report in order ensure that sustainability of Iowa's 9-1-1 services remains a priority. Key findings of the 2015 report included the need for the following:

- A funding model appropriate to maintaining consistency of equipment and services among PSAPs and network, in a world of shrinking wireline funds.
- Funding for new technological and network enhancements necessary to complete the transition.
- Continued focus and development of Geographic Information System (GIS) mapping initiatives in recognition of its vital importance to the NG9-1-1 system.
- An increase in bandwidth and the need for additional components to accommodate new capabilities.

It also contained a series of recommendations. Those recommendations provide the backdrop against which this study was undertaken. The next step was to develop a process to gather stakeholder input across the state in order to develop a feasibility strategy detailing a statewide Next Generation 9-1-1 consolidation plan. A further purpose of the study is to provide the proper framework within which to continue towards those goals, and to develop recommendations for appropriate and sustainable changes to the E9-1-1 legislation and help guide the strategic direction for 9-1-1 consolidation in Iowa. The goal is to provide a roadmap, recommendations and a timeline to guide operations, improvements and funding of Next Generation 9-1-1 (NG 9-1-1) systems in the state.

Kimball was once again selected in July 2016 to provide the State of Iowa (State) HSEMD with professional consulting services to gather stakeholder input across the state in order to develop a feasibility strategy detailing a statewide Next Generation 911 consolidation plan. Having fully understood the goals, objectives and scope of the project, the primary focus of this study is to establish a plan for consolidation to meet the challenges of changing technology in an efficient and effective manner. We recognize that the Iowa public safety communications community continues to make technological advances and operational changes to meet public safety requirements and address public expectations. The intent of the study is to provide the proper framework within which to continue this legacy, while working closely with the State to develop recommendations for appropriate and sustainable changes to the E911 legislation, funding and governance.

Kimball understood the business need at the highest level to be threefold:

- To provide guidance and recommendations for legislation changes that will specifically include strategies for addressing changing technology through identifying stakeholders' current and future needs, associated costs and a plan of action to successfully navigate the next five years of provisioning the next steps in NG9-1-1 in Iowa.

- An update or re-working of the legislation will require a strategic plan development process that must include input from and consensus building with the 9-1-1 community of stakeholders at the local and state level. This plan must include a clear roadmap and timeline for an achievable and successful vision and implementation of the future improvements of NG9-1-1 in Iowa.
- The resulting Plan must provide a viable future path for 9-1-1 at the state level, and operational and funding models for the advancement of NG9-1-1 in Iowa. This Plan must apply to the known and projected needs of NG9-1-1 as it is today and the anticipated and unanticipated future needs of NG9-1-1 equipment, network infrastructure, location determination, data sharing and the multitude of applications and devices with which the public expects to be able to access emergency services.

Valuable stakeholder input has helped define the framework that will determine the feasibility and guide the strategic direction for 9-1-1 consolidation in Iowa, as well as providing a roadmap and timeline in support of a recommended comprehensive model to guide operations, improvements and funding of Next Generation 9-1-1 (NG 9-1-1) systems in the state. This input was gathered through the distribution of a comprehensive survey to all 113 PSAPs in the state. A total of five stakeholder workshops were also held during September and October 2016. These meetings were well-attended by more than 200 individuals, representing a broad range of state, county and local PSAP and Public Safety officials, as well as industry and other interested parties. The data collected in response to the survey and from comments during the stakeholder workshops, as well as technical and other research conducted by Kimball staff, provided the essence of the content of this study and its recommendations.

To facilitate development of the State's successful 911 Consolidation Strategic Feasibility Plan, a review of the requirements of the Request for Proposal help highlight the structure and content of the study.

- Discuss the consolidation of PSAPs, functions, enhanced 911 service areas, and physical facilities of two or more PSAPs, resulting in the consolidated PSAP being responsible for all call answering and dispatch functions for the combined enhanced 911 service area.
- Discuss the consolidation of two or more PSAPs utilizing shared services technology to combine PSAP systems, including but not limited to 911 call processing equipment, computer-aided dispatch, mapping, radio, and logging recorders.
- Examine and address PSAP equipment life cycle replacement in order to minimize waste.
- Investigate the potential cost savings, related technological factors, future benefits, and other considerations for merging the Iowa E911 wireline network onto the statewide wireless ESInet.
- Consider utilizing the Iowa Communications Network (ICN) and Iowa Network Services (INS) or other existing transport mechanisms should be considered.
- Discuss how all of these elements can be leveraged to create an emergency services network that encompasses 911, public safety voice communications, and FirstNET data and utilizes the ESInet.
- Review Iowa Code sections 34A.7 and 34A.7A and other relevant Code provisions to determine the most efficient method of distributing surcharge revenues to support a network of consolidated PSAPs and consolidated 911 phone networks.

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This completed report provides multiple, dynamic solutions, featuring different consolidation possibilities, their approximate projected costs, along with a final recommendation, and lays the ground work for future legislative action and a strategic plan for HSEMD and stakeholders to follow to achieve consolidation and more efficient operation of the NG911 network.

1.1 Report Format

This Report is organized in the following manner. Section 2, Consolidation Overview, contains discussion on all aspects of consolidation, beginning with a comprehensive overview of challenges, opportunities and models. It is followed by a discussion of 9-1-1 network design considerations, presentation of potential solutions and network topologies, leading to a recommendation on a favored option. Finally, it concludes with a review of GIS considerations and current state in Iowa, also accompanied by a recommendation.

Section 3, Funding, Governance and Legislation, discusses funding, with a focus on long-term sustainability and short-term surcharge distribution strategies, followed by recommendations regarding governance, concluding with comprehensive recommendations on modernizing current legislation to support future steps.

Scattered throughout the document, the reader will find reference to the comments gathered from the five stakeholder meetings held across the state, as well as the PSAP surveys, where they are appropriate and relevant to the topic at hand.

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2. CONSOLIDATION OVERVIEW

This section provides a high level overview of what consolidation is, reasons to consider it, potential roadblocks and keys to a successful consolidation effort.

2.1 Historical Background

Historically, 9-1-1 call answering and dispatch services have been provided by public safety answering points. The PSAPs were commonly part of a larger law enforcement, fire or emergency medical services (EMS) agency. These PSAPs typically had a staff that answered 9-1-1 calls and dispatched field units for a single primary agency in addition to a host of other non-9-1-1 or dispatch related job tasks. Little specialized training was necessary for the staff to perform these functions and advanced technology was not yet present. In fact, sworn personnel with no 9-1-1 training routinely filled temporary vacancies in the PSAP. However, over the last 25 years several key factors have caused public safety communications to evolve into a profession that requires highly skilled people with extensive on-going training and advanced technology. The key factors are:

- The explosion of cellular phone usage which created two major issues:
  1. A dramatic increase in 9-1-1 call volume.
  2. The need for Wireless 9-1-1 Phase I and II technology to locate cell phone callers and improved mapping abilities.
- Increased public awareness about available 9-1-1 technology and services such as the ability to locate 9-1-1 callers through technology and emergency medical dispatch (EMD) raised public expectations and drove the need for higher service levels.
- The terrorist attacks of September 11, 2001 raised awareness for the need for interoperability among responder agencies and the PSAPs that serve them.
- New technology such as wireless devices with video, photos, EMD (pre-arrival instructions), and text capabilities as well as automatic crash notification (ACN) through such companies as OnStar.

As this evolution progressed, those agencies managing PSAPs found that as training and technology needs increased so did the costs associated with operating a PSAP. In fact, the evolution is continuing as 9-1-1 service levels in the near future will include the ability to handle text messages, video, and photos over IP based networks also known as Next Generation 9-1-1 (NG9-1-1). As time progresses those agencies that maintain individual PSAPs will be faced with supplying even higher levels of training and procuring expensive new technology without which they will no longer be able to meet the 9-1-1 service level expectations of the community.

2.2 Reasons to Consider Physical Consolidation

At the state level, consolidation is often driven by two key reasons; consistent and efficient service levels statewide and cost efficiencies. Consistent service levels that meet national standards of care is an outcome of consolidation. When multiple PSAPs combine into a single organization, employees are trained according to the same standards and procedures which ensures the same service level for the geographic region served by that PSAP. Generally, the fewer PSAPs there are in a given geographical area, the fewer variations that will exist in the service levels that are provided to the community.

As NG9-1-1 technology and the ability for PSAPs to accept images, audio, video and text messages becomes a reality, it is becoming apparent that implementation challenges lay ahead for many PSAPs. First, the technology needed to receive these new data forms must be in place. NG9-1-1 capable networks and phone systems are already available although equipping a primary PSAP with the appropriate equipment can be costly and possibly

prohibitively so for smaller agencies. In addition, secondary PSAPs will require a compatible IP-based system to receive the new data forms from the primary PSAPs and forward them to field units as needed.

At the local level, counties, municipalities and agencies consider consolidation for a number of reasons. Commonly cited reasons are:

- Service level improvements – An important benefit of consolidation is service level improvements. The degree and nature of the improvements will vary depending on the efficiency of each individual PSAP considering consolidation. However, one key improvement is the reduction or, preferably, the elimination of the transfer of 9-1-1 callers. 9-1-1 call takers and dispatchers are truly the "first responder on the scene" and can substantially affect the outcome of an incident. The types of service improvements typically achieved include:
- Regional awareness of workload and the deployment of field personnel. This awareness leads to improved usage of resources regionally and better management of large scale or multi-jurisdictional events from a single point of control.
- Reduction or elimination of the transfer of 9-1-1 calls between PSAPs improves response times and lowers the potential for human or technology errors.
- Quicker call processing and dispatch times, resulting in potentially faster on-scene times for field personnel.

Although studies substantiating this statement are not available, support of this statement is found in an examination of the typical call process taking process where one dispatcher performs both call taking and dispatch functions. Typically, when one person (the telecommunicator) is performing both functions, he or she answers the 9-1-1 call, interviews the caller long enough to confirm basic information and identify if the call has a high priority. The telecommunicator then turns to the radio and dispatches field personnel and handles the initial brief flurry of radio traffic. During this time, however short it may be, the caller is essentially on-hold, perhaps not mechanically, but certainly has been asked to hold on while units are dispatched and no further information is being obtained by the telecommunicator. Once the field units are enroute and the initial radio traffic is handled, then the telecommunicator can turn his or her full attention back to the caller and obtain additional information. However, from this point forward the telecommunicator must split his or her attention between the caller and the radio.

When call taking and dispatch functions are split, the call taker answers the 9-1-1 call and does the same basic interview in the first example. When a call is identified as a high priority, the call is entered into CAD while the call taker continues to gather information. The CAD incident is instantaneously received by the dispatcher(s) and field personnel is sent. There is no lag in gathering information, potentially critical information, from the caller while the telecommunicator balances two tasks. As the call taker gathers new information, it is added to the CAD incident and sent to the dispatcher(s) to be communicated to the responding units. In Kimball's experience, this call processing methodology is highly efficient and more accurate. In reality, a telecommunicator, no matter how experienced or talented, is still limited in the number of tasks he or she can do efficiently by virtue of simple human limitations.

In further support of this model, the 2013 version of NFPA 1221 Standard for Installation, Maintenance and Use of Emergency Communications Systems Section A.7.3.1 (Annex to Chapter 7 Staffing) states "…Consider the following two concepts of communications center operations:

1. Vertical Center. A telecommunicator performs both the call taking and dispatching functions
2. Horizontal Center. Different telecommunicators perform the call taking and dispatch functions.

Telecommunicators working in a vertical center are known to engage in multitasking that can inhibit their ability to perform assigned job functions."

- Sharing of physical space enables communications between call takers, law enforcement and fire dispatchers to be virtually instantaneous. This improved communications enables field personnel to receive information more quickly and accurately which is particularly important in multi-jurisdictional incidents. This communication is the least tangible or quantifiable benefit of consolidation, but is one of the most substantial.
- If large enough, a consolidated PSAP can utilize a call taker / dispatcher organizational structure. This structure enables the call takers to focus solely on the incoming call and obtain the best information possible. The dispatcher's ability to focus solely on field personnel improves field personnel safety.
- Standardized training of all PSAP employees increases regional consistency.
- A consolidated environment will offer the opportunity for smaller participants to benefit from state-of-the-art technology, improved training, and expanded career opportunities that would not be otherwise financially or organizationally feasible.

Individual agencies no longer wish to or are able to support the training and technology needed or handle the personnel issues for PSAP staff. Reassigning sworn personnel functioning as PSAP management and support staff to other positions is possible by eliminating the PSAP.

Another primary reason cited for consolidation is cost savings. While cost savings are possible, it is critical that potential participants understand two points. First, not all consolidations result in cost savings. A common misconception is that consolidating will result in significant personnel reductions thus significant cost savings. Consolidations do not normally involve large staff reductions. The real cost savings come from the elimination of redundant and expensive technology such as CAD, 9-1-1 answering equipment, radio consoles, and logging recorders. The single set of technology and systems found in a consolidated environment reduces costs associated with procurement, connectivity, and maintenance costs.

As an example, currently the state provides grants to replace the call taking equipment every three to five years. With 113 PSAPs within the state and an average cost of $150,000.00 per replacement, the average cost is $16,950,000.00 with the estimated maintenance cost of $3,390,000.00 would show the total cost of $20,340,000.00 for the five year period. If the state migrates to six regional hosted systems at a cost of $1,200,000.00 and the average maintenance cost of $240,000.00 for a total cost exposure of $1,440,000.00. So, in the period of five years, the state could save approximately $18,900,000.00, or $3,780,000.00 annually just in call taking equipment alone.

Second, in those scenarios where cost savings are achievable the actual realization of the savings may not occur for several years. The consolidation process can be expensive and can generate substantial one-time start-up and capital costs for facility and technology needs. These costs delay the actual cost savings.

2.3 Roadblocks to Consolidation

PSAP consolidation is a complex process and one that has potentially negative or *perceived* negative aspects as well as positive aspects. The negative aspects most commonly raised are:

1. Loss of control. Depending on the consolidation model and organizational structure chosen, law enforcement and fire agencies that have had 9-1-1 call taking and dispatch staff as part of their organizations must often relinquish control of the PSAP employees as they become part of the new organization. Complaint and other

personnel investigations and any resulting training or disciplinary actions become the responsibility of the new PSAP management which can be seen as a negative by participating agencies.

Often, the level of control the new PSAP would have over the responses of the participating agencies is misunderstood as well. The role of any PSAP is to implement dispatch plans developed by each individual agency not to dictate response levels to each agency. For example, a law enforcement agency will still have complete control over the type or nature of the incidents they respond to and the level of that response. While standardization among participating agencies is recommended to the degree possible, each agency is still able to customize its responses to the unique needs of the community it serves. Finally, the PSAP dispatches calls for service according to each agency's dispatch plan, but any dispatch can be overridden by an agency command officer if he or she feels it necessary.

2. Start-up costs or increased operational costs. It is important to understand that comparing the cost of current, non-consolidated PSAP operations with that of a consolidated environment is not an apples-to-apples comparison. The typical emergency communications system that has been in place for the last 25 years cannot provide the level of service expected by today's technologically savvy citizens.

3. Ancillary or non-PSAP related duties. In many small PSAPs where the call volume is low, staff members are often responsible for a host of other non-9-1-1 or dispatch related responsibilities. These include tasks such as handling walk-in complaints, holding cell monitoring, dispatchers performing jail duties, releasing impounded animals and vehicles, management of business key holder/contact files, entering records, tickets, and permits, tracking municipal fees such as dog licenses, and functioning as a receptionist and switchboard for the parent agency and/or the entire municipality.

   Not only do PSAP staff perform necessary functions outside what would be considered 9-1-1 and dispatch duties, but also often provide a 24/7 presence within the public safety agency. Many agencies consider this 24/7 presence to be a vital part of the service level provided to the community and do not wish to lose it. Not having a 24/7 presence can be managed in a number of ways such as a direct phone in the lobby of the agency that dials the consolidated PSAP or installing "safe room" capabilities in the facility entrance. However, each community will need to assess if compromises such as these are acceptable when considering consolidation.

   Each entity considering consolidation must determine how these types of tasks will be managed if consolidation becomes a reality. This may mean adding tasks to current non-PSAP employees within the entity, hiring new employees or altering the service levels provided. The hiring of new staff will affect the potential cost savings for the municipality and should be considered when assessing whether to consolidate.

   The Kimball survey asked the question; "Does the PSAP staff perform any duties not related to the processing of 9-1-1 calls and dispatching calls for service?" The results indicate that employees in 83.8 percent of the 74 PSAPs that responded are responsible for a variety of ancillary duties outside what is considered emergency communications. The following table provides complete survey results for this question.

Performance of Ancillary Duties		
Response	Number of Responses	% of Responses
Yes	62	83.8%
No	3	4.00%
Question Not Answered*	9	12.2%
Totals	74	100.0%
*Indicates that a survey was completed by the PSAP, but a specific question was not answered.		

Table 1 - Performance of Ancillary Duties

4. Loss of geographical knowledge of the community and/or personal knowledge of callers. There is no question that PSAP staff in small communities often know the local citizens and geography well. When moving to a larger, consolidated environment, it is also true that some of this knowledge will be lost. However, it is important to recognize that the employees from the small PSAP will likely move over to the consolidated center, taking their knowledge with them to share with other employees. In addition, mapping software is commonly available which reduces the need for a high level of local geographical knowledge.

2.4 Requirements for Successful Consolidation

Stakeholder buy-in, funding, and a champion are the three requirements for a successful co-location or consolidation. The desire and expectation that 9-1-1 calltaking and dispatching (emergency communications) will improve is the primary driver behind public policy change. In Kimball's experience, where emergency communications has been fragmented and provided by disparate systems and agencies for many years, it is difficult and sometimes nearly impossible for those that own and operate the disparate centers to envision a shared services model. Indeed, it is hard for any change to be seen as necessary, or better than what is currently provided. Many times the local experts/agency heads are not confident that their specific requirements can be met in an operation that appears to be out of their direct control. Typically, key decision- makers acknowledge the opportunity to improve service but see funding needs as a roadblock. Operational staff are the most impacted by any converging of operations or technology, thus their primary concerns are about basic needs, such as job security, seniority, pay and benefits protection. It is a difficult process, but one that provides consistent and efficient service levels to both the community and the agencies the consolidated PSAP serves.

2.5 Consolidation Models

When discussing how to achieve the most efficient and effective level of emergency communications service, it is helpful to understand different types of consolidation models before evaluating the current environment statewide. This section provides an overview of the most common PSAP consolidation models and an overview of call-taker and dispatch functions.

2.5.1 Full Physical Consolidation

Full consolidation refers to the consolidation of all 9-1-1 answering (wireline and wireless) and emergency dispatch functions (law enforcement, fire, and EMS) within a defined geographical area into a single organization. This

geographical area can include one or more units of government (e.g., county, city, village or township). The highest level of service level improvements occurs under this model. Model characteristics include:

- Services for law enforcement, fire, and EMS call taking and dispatching.
- The structure of the consolidated PSAP is often a stand-alone agency, a separate department either within an existing county or as an independent organization (e.g. joint powers authority).
- A full consolidation houses employees in a single facility or among two or more regional facilities.
- Commonly configured as a single organizational or reporting structure, which may include a board, advisory and/or user group as a mechanism for served agencies to provide input and resolve issues.
- Combined PSAP systems, which may consist of:
  - Call handling CPE
  - Computer Aided Dispatch
  - Radio
  - Logging recorders
- One consolidated system to upgrade and maintain.

The most recent example of this methodology is with the consolidation the City of Ankeny and Polk County Sheriff. Prior to the above, the cities of Clive, Urbandale and West Des Moines consolidated to form WESCOM, an independent dispatch center.

2.5.2 Partial Consolidation

A partial consolidation is the combining of emergency communications for multiple public safety agencies within a specified geographical area, but not all agencies. For example, several Sheriff's Offices may combine communications into a single PSAP, but fire and EMS handle communications individually. Model characteristics include:

- Communications services for one or two disciplines (law enforcement, fire, and/or EMS), but not all.
- Typically set up as part of an existing agency. For example, three Sheriff's Offices decide to combine 9-1-1 call taking and dispatch functions, so expansion of an existing facility and systems takes place to include the new agencies.
- Usually falls under the organizational structure of the host agency. However, in urban areas the new consolidated PSAP may be large enough to be a stand-alone agency or department.

2.5.3 Co-location

A co-location of PSAPs refers to the sharing of physical space and, at times, critical PSAP technology such as CAD, 9-1-1 answering positions, radio consoles, and logging recorders, while remaining completely separate entities. For example, communications for a city police and fire department reside in the same physical space but each remains part of its original organization. Governance for each department remains under its original organization as well. Model characteristics include:

- Participants that are seeking cost efficiencies by the sharing physical space and technology without giving up direct control of actual call taking and dispatching. This model most often occurs when variables do not allow for an actual full or partial consolidation of services.
- Can be used as precursor to a full consolidation. For example, communications for multiple law enforcement departments could be co-located as the initial step in a full consolidation. The agencies work side by side while cross training is completed and issues associated with creating a single organization are resolved.
- Sharing of infrastructure costs.

Currently, Wapello County Sheriff and Ottumwa PD both inhabit the same building, but operate as two separate PSAPs. They do share technology as part of this arrangement.

2.5.4 Shared Technology or Virtual Consolidation

As technology evolves, the ability for PSAPs to share key systems with or without sharing physical space is now a reality. In this model, participating agencies jointly procure or share through agreements key PSAP systems such as 9-1-1 answering equipment, CAD, ANI/ALI, logging recorders, GIS, and radio consoles. This model is a Host/Remote configuration using redundant, reliable high-speed connectivity between the shared services host location and each remote dispatch center. Although not actually a PSAP consolidation in the same manner as the other alternatives, sharing of space and creation of a single organization, this alternative does offer participants some consolidation benefits including:

- Co-located PSAPs as well as separate stand-alone PSAPs.
- Potential cost efficiencies by purchasing single systems for use by all participants rather than separate systems for each PSAP.
- Improved situational awareness through a shared CAD system.
- Improved interoperability if a single radio system was used. Cost efficiencies associated with a collective purchase of radio consoles would be achievable even if separate radio systems are used.

Many of the stakeholder workshop comments, while not supportive of state mandated consolidations unless backed by clearly identified standards, did not reject consolidation completely but suggest strongly that those decisions are best made at the local level. Some cited examples of where it has already occurred successfully. The decision about the appropriate model should also be left at the local level. Support from the state, in whatever form is required, was seen to be the biggest positive contribution to encourage consolidations "where they make sense."

A current example of this design, Henry County is the remote location off of the call taking equipment located in Lee County. Also, Adams, Clarke and Guthrie are remote locations off of the call taking equipment in Union County as well as Adair County is a remote location from the call taking equipment located in Madison County.

2.6 9-1-1 Call Taker and Dispatch Functions

In recent years, while planning for NG 9-1-1 during difficult economic times, the realization that regionalization may provide many service level benefits has encouraged all levels of government to consider consolidation of PSAPs.

In many states, the 9-1-1 surcharge applied to wireline and wireless telephones is received by and administered by the state. Commonly, the State will have control over the 9-1-1 call receipt technology (9-1-1 answering positions and network connectivity), but not the technology or staffing associated with dispatch functions such as radio infrastructure, consoles and training of personnel. *It is absolutely critical that 9-1-1 call taking and dispatch functions be viewed as two overlapping and intertwined halves of the same whole. Legislation or any other wholesale changes made to either 9-1-1 call taking or the dispatching field personnel impacts the other. Therefore, it is critical to carefully consider and understand the emergency communications systems as a whole when implementing changes.*

In parts of the nation where the 9-1-1 technology is in control of the State, the State will sometimes require the consolidation of the 9-1-1 call taking portion of the emergency communications system. In other words, the number of PSAPs that will receive 9-1-1 calls directly from callers is reduced to a more "efficient" number from the State's perspective. While this process does lower equipment and network costs for the State, it can severely fragment the

system as a whole and create a system of primary and secondary PSAPs. Often a municipality will give up its ability to receive 9-1-1 calls directly, if mandated to do so, but will retain the dispatch functionality. When this happens, the 9-1-1 equipment and network costs are reduced, but the number of call transfers increases and overall effectiveness of the emergency communications system is reduced. In summary, this approach fails to take into account the larger public safety picture and results in an emergency communications system that is less effective than would have been in place without any reduction in the number of answering points.

Throughout this document Kimball assumes that call taking and dispatch functions will generally be performed by the same PSAPs.

2.6.1 PRE-NG911 Consolidation Models

The following provides several methods for consolidation within today's legacy environment and how to consolidate without stranding resources while the state moves toward Next Generation 9-1-1.

Kimball provided each of the 113 PSAPs with an online survey. Part of the survey was designed to provide Kimball with a general knowledge of the existing infrastructure and what will need replaced to move into a full Next Generation 9-1-1 environment.

While each PSAP was provided the online survey and all were reminded at each stakeholder meeting to complete the surveys, only 42 responses were submitted and 32 others were saved, but not completed. Kimball has used both the submitted surveys and the saved survey data in order to provide a better picture of today's environment. Kimball also had to make some assumptions using past experience, available telephone and United States Census data. The following table provides an overview of the response to the survey Kimball distributed.

Overall Survey Response		
	Number of Responses	% of Total Number of PSAPs
Number of PSAPs that **did not** respond to the survey	39	34.51%
Number of PSAPs that **did** responded to the survey	74*	65.49%
Total Number of Primary PSAPs	113	100.00%

*42 surveys were submitted and 32 others were saved, but incomplete

Table 2 - Overall Survey Response

As indicated in the table, response to the survey was limited to 65.49 percent. This response rate limited Kimball somewhat in the conclusions and assumptions that could be made regarding the current emergency communications environment.

Kimball was tasked a looking at consolidation of PSAPs, physically, virtually and functionally. Kimball's study, using data provided and calculations using US Census data, showed that 75% of the PSAPs should be 2 or 3 position PSAPs. While experience has shown that physical consolidation of PSAPs is the most effective method of cost reduction, there are often details such as real estate within the PSAPs, locations, politics or radio interoperability that make physical consolidation undesirable.

In the legacy 9-1-1 environment (Figure 1&1A), other than human resources, the cost of providing service revolves around the cost of CPE, work stations, 9-1-1 controllers, CAD and logging recorders which are part of almost every legacy 9-1-1 PSAP environment. The other costs for providing legacy 9-1-1 revolves around Network trunks, Selective Routing and ALI, all monthly recurring costs.

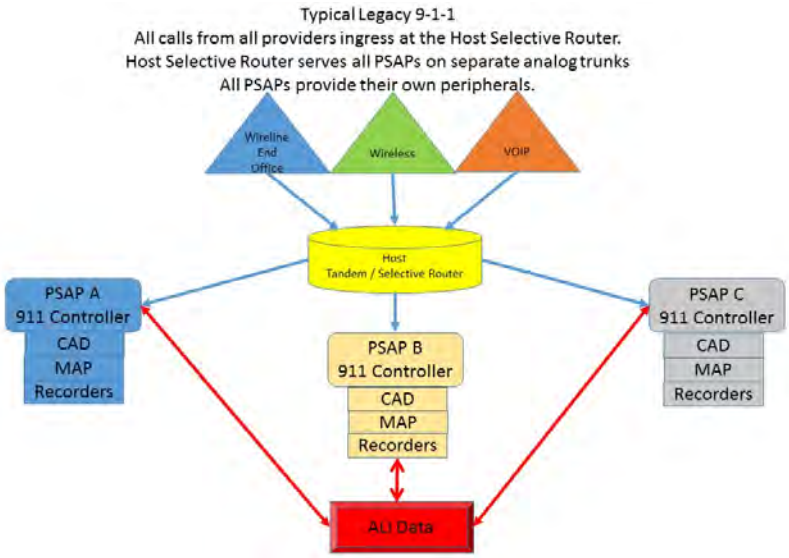

Figure 1 - Typical Legacy 9-1-1

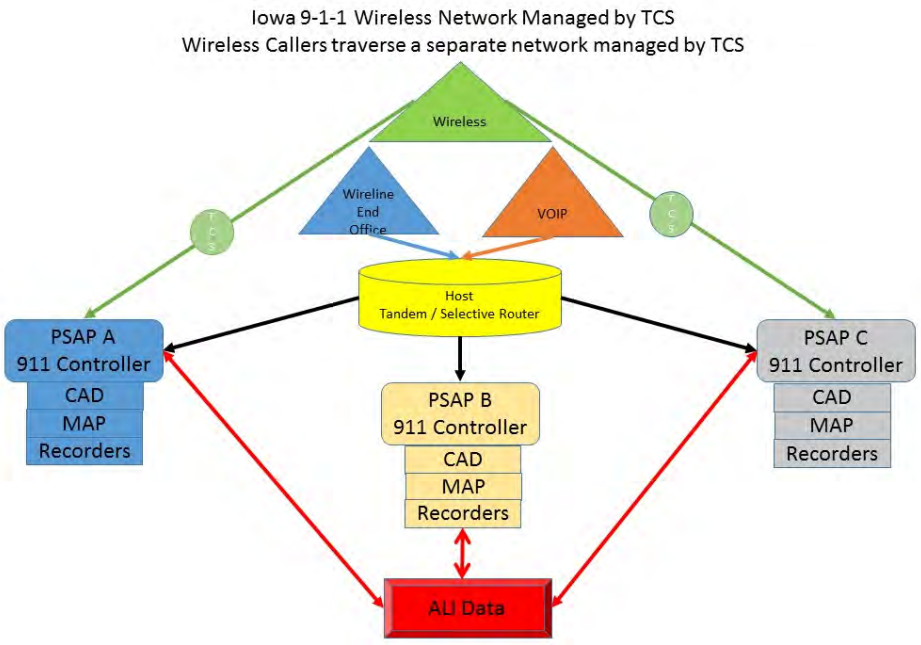

Figure 1A - Iowa 9-1-1 Wireless Network

Consolidation within this environment (Figure 2) will reduce the cost of 9-1-1 controllers, logging recorders, other peripheral devices and possibly human resources, but must be weighed against the possible increased monthly recurring costs of 9-1-1 network and radio coverage.

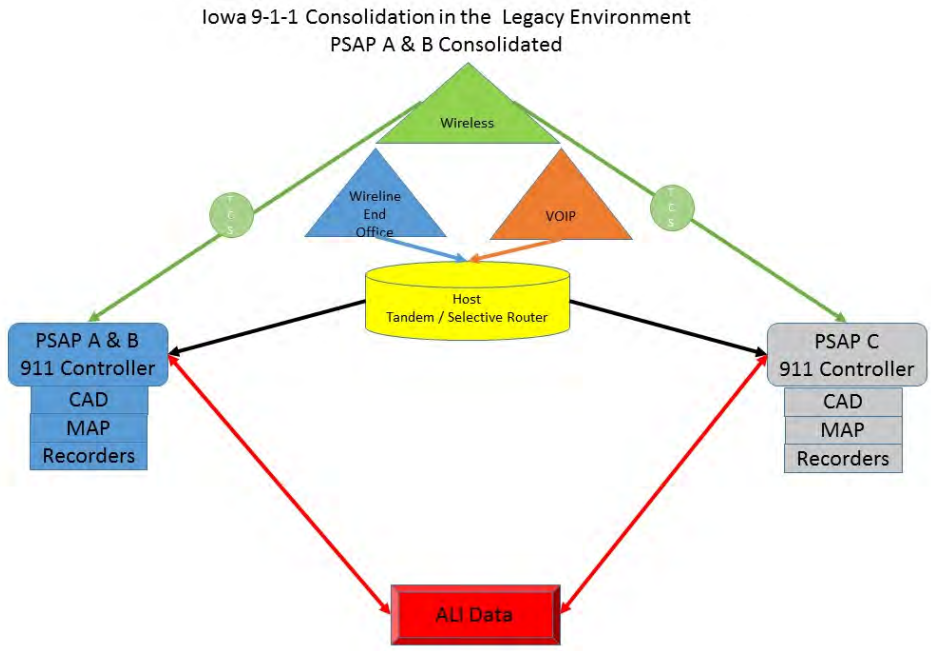

Figure 2 - Iowa 9-1-1 Consolidation - Legacy Environment

Virtual Consolidation in the Legacy Environment maintains the PSAP work stations at their original PSAP locations while consolidating the Controller functionality (Figure 3). Consolidations of this arrangement can be performed with multiple PSAPs and improves the interoperability of those PSAPs. If desired, this consolidation can be performed without changing any of the peripherals such as CAD, logging and mapping.

Currently, Henry, Lee, Adams, Clarke, Guthrie, Union, Adair and Madison counties provide services in this manner.

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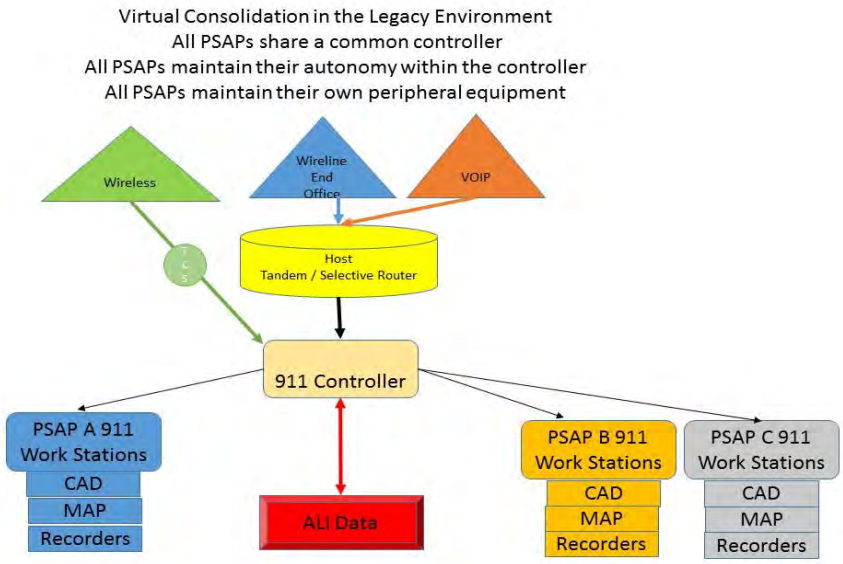

Figure 3 - Virtual Consolidation in Legacy Environment

These peripherals can also be consolidated at the controller for cost reduction (Figure 4). While this configuration greatly improves the interoperability and provides some infrastructure cost reduction, it does not provide the redundancy and diversity required for the move to Next Generation 911.

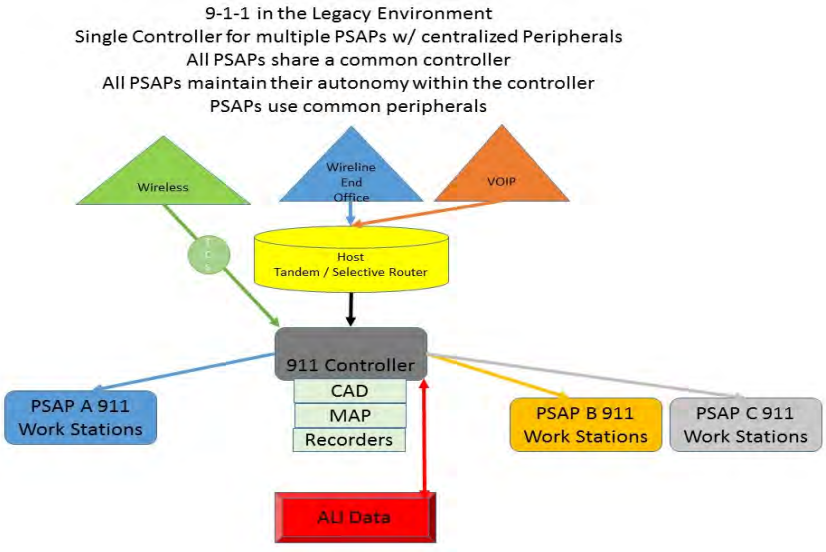

Figure 4 - 9-1-1 in Legacy Environment - Single Controller

It is recommended that either Geo-Diverse or multi-node CPE Controllers should be configured for multiple PSAPs as the geo-diverse configuration or multi-node readies these PSAPs to meet the reliability specifications required for Next Generation 9-1-1 (Figure 5).

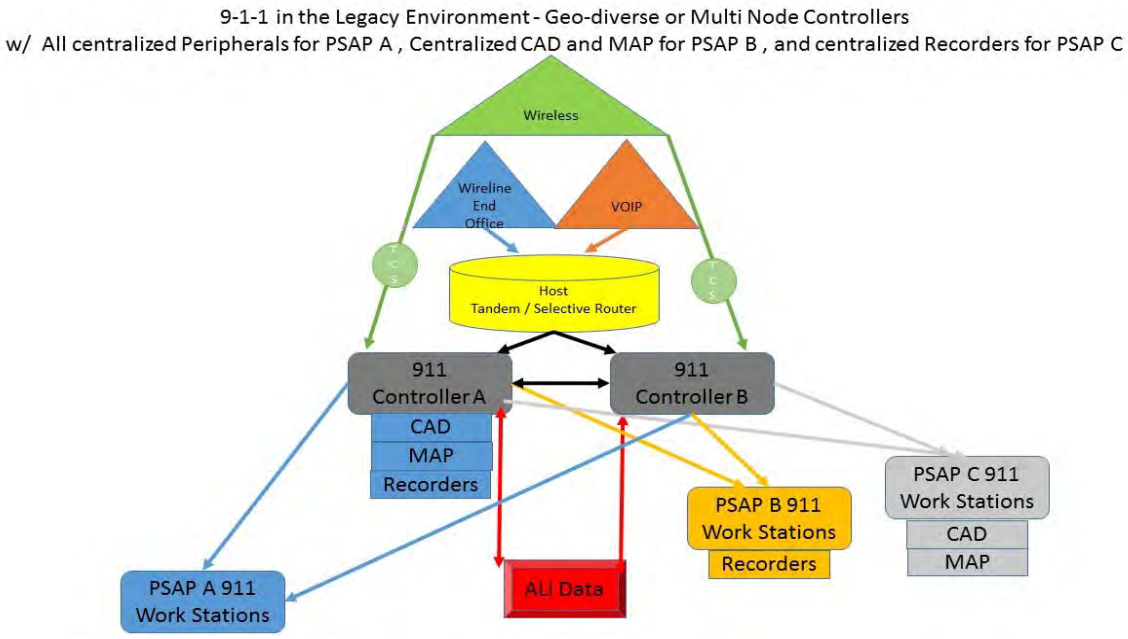

Figure 5 - 9-1-1 in Legacy Environment - Geo-diverse / multi-node Controllers

2.6.2 NG9-1-1 Consolidation Models

Transitioning any of the legacy configurations into the Next Generation 9-1-1 arena starts with the creation of Core Services and the network to interface any of the configurations described above. NENA defines Core Services as *"the base set of services needed to process a 9-1-1 call on an ESInet, and includes the ESRP, ECRF, LVF, BCF, Bridge, Policy Store, Logging Services and typical IP services such as DNS and DHCP"*. The term NG9-1-1 Core Services includes only the services and not the network on which they operate. The network that provides this connectivity is the Emergency Services IP Network (ESInet). The 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 services can be deployed, including, but not restricted to, those necessary for providing NG9-1-1, as defined by NENA. A fully implemented NG9-1-1 system, with consolidated systems, would provide efficient and robust service to all PSAPs throughout the state. Redundancy, Diversity and Security are three of the major qualities of this network that would have multiple access nodes across the state for PSAP interconnection to the ESInet. These features were deemed to be critical during discussions at the stakeholder workshops, reflected in comments like "if redundancy and diversity are included to create a robust network that would be my first consideration and concern".

Providing state-wide Core Services, centralized on redundant servers in geo-diverse areas and connected by a diverse and redundant IP network (ESInet) will take the place of all of the selective routing and ALI functionality that exists today, as well as adding the ability for future data and video attributes for all PSAPs. (Figure 6)

Providing Geo-diverse Next Generation i3 compliant CPE Controllers allows multiple Legacy PSAPs the ability to use these controllers to move from legacy controllers or i3 capable controllers to a Next Generation platform while still maintaining their local authority. Using Next Generation i3 compliant CPE Controllers for multiple PSAPs, also provides the ability to consolidate Mapping and other systems for these PSAPs.

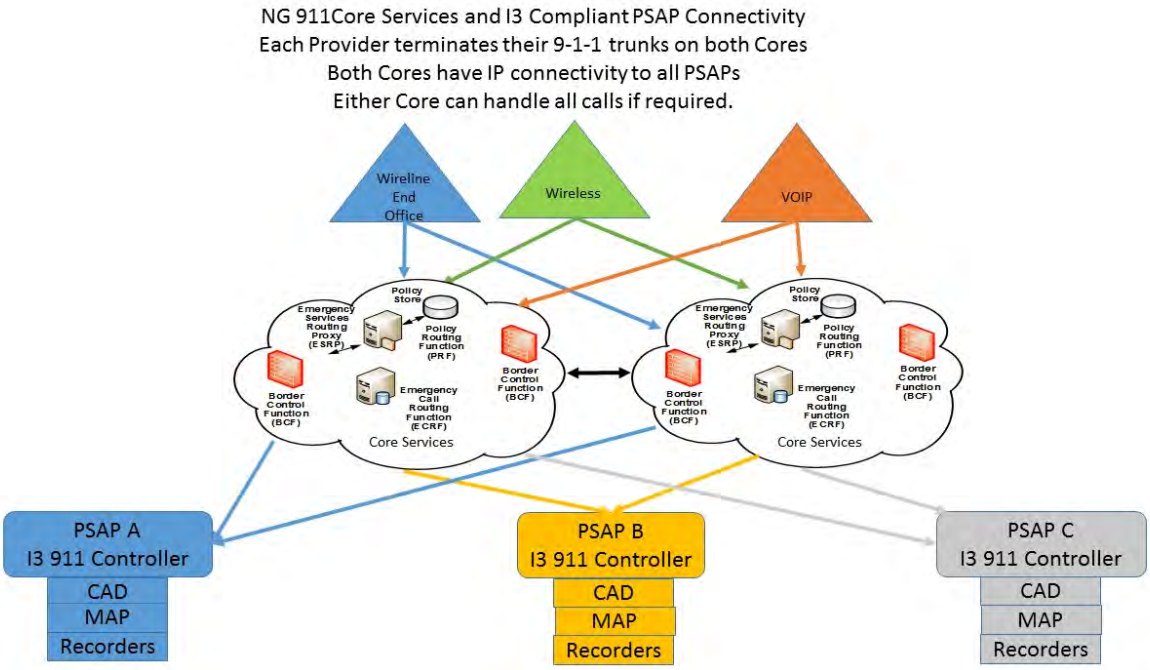

Figure 6 - NG911 Core Services and i3 Compliant PSAP Connectivity

2.6.3 Design Considerations

While reducing the cost of this infrastructure, consolidation of the 9-1-1 controllers to a total of only two serving the entire state would greatly increase the wireline network monthly recurring cost. This occurs because it is the wireless carrier's obligation to provide their 9-1-1 trunks to the ingress point of the PSAP's serving network. In the legacy environment, this point is almost always the Serving Telephone Company's Selective Router. In the Next Generation 9-1-1 arena, the wireless carriers must take their trunks to the Core Services network without charging the PSAP.

In the legacy environment, the wireline carriers must take their trunks to the same Selective Routers, but due to being a regulated utility, the wireline providers charge for every trunk and the mileage to get the trunks to the Selective Router. In many areas, small independent telephone companies do not have facilities to transport these trunks to the Selective Routers and must use an Interexchange Carrier (IXC) to transport the 9-1-1 trunk from their serving area to the Host telephone company that provides the selective routing. In the Next Generation environment, the trunking from each wireline provider's central offices must move from the Selective Routers to the Core Services to provide routing of the call.

For diversity and redundancy, these trunks should be split between the two redundant Core Services servers. This dramatically increases the monthly recurring trunking cost to the PSAP. Over time, this monthly recurring cost can

greatly override the cost of adding another set of Core Services controllers in a more cost effective area that will reduce the wireline monthly trunking costs significantly, while greatly increasing the redundancy and diversity of the system.

2.6.4 PSAP Survey Findings

The Kimball Survey asked if the respondent PSAP was i3 compliant. 52 PSAPs responded that their PSAP was i3 compliant. This means the i3 Public Safety Answering Point (PSAP) is capable of receiving IP-based signaling and media for delivery of emergency calls conformant to the i3 architecture standard. These i3 compliant PSAPs are ready to move onto the ESInet when the Core Services functionality is complete.

However, after further investigation, it was discovered that while some of these 52 PSAPs are i3 capable, they are not compliant. These would require some version upgrades as well as some infrastructure additions to integrate with the Core Services over the ESInet. These fifty-two PSAPs were serviced by eight different CPE manufacturers. There were also fifty-five of these responses that showed eight different CAD vendors and fifty-five responses with eight different mapping providers.

Centralization of Core Services, 9-1-1 controllers, and the associated peripherals such as mapping, provide the greatest cost savings for infrastructure. Providing these services in areas that provide a cost effective network that is truly redundant, diverse and secure can reduce the overall system costs. While cost reduction is essential, this must be weighed against the ability to provide the highest level of service to the PSAP. Providing a robust, statewide Next Generation 9-1-1 system with a diverse, redundant, and secure network is the most cost efficient and provides the best service to the public.

2.6.5 Stakeholder Workshop Findings

In addition to the Survey findings, the stakeholder workshops identified several items that would cause some individual PSAPs to resist this initiative. Some of the resistance noted in comments from local entities are objections to the centralized vendors used to provide the services, loss of input to some of the systems configuration, loss of some revenue due to state maintaining systems, and political disagreements.

Many of the stakeholder comments are linked to common themes, and many are identified specifically under their appropriate headings within the report, such as funding. Some are also incorporated in the justification or explanation of the chosen conceptual design approach.

One area that elicited many comments was surrounding shared services potentially provided by the state. Using CAD as an example, many comments were not so much a rejection of the concept, but a statement on how difficult this would be to do effectively. Disparate needs, capacity, functionality, linkages to RMS systems and the customized nature and relationship between a PSAPs business and/or operational processes and its CAD system were all cited as practical considerations of why this approach might be ill-advised. Kimball supports this position in the current Iowa context, based on our experience.

Another desirable role for the state that was identified was to continue and perhaps expand its support of consolidation efforts and activities by preparing and releasing RFPs for equipment that could then be acquired by PSAPs and public safety agencies. In addition to radios, Controllers, CPE equipment, it was also suggested that NG9-1-1 consultant firms could also be added to the state schedule, to pre-qualify and simplify the process for obtaining consulting services.

For these reasons, Kimball recommends a network architecture that will provide statewide Core Services to any 9-1-1 controller environment. Should an area have an NG911 compliant controller of their choosing and not want to use the state-provided CPE Controllers or shared systems, the state must have a set of specifications that the entities controller and network interconnection must meet to receive service from the Core. Kimball finds that providing these types of alternatives alleviates criticism from those that deem the State provided system not to be acceptable.

2.7 NG911 Recommendations

Kimball has several recommendations for the Statewide Next Generation 9-1-1 System in the State of Iowa. Kimball considered the number of PSAPs in the state, the coverage areas of the PSAPs, the existing network trunking, and the existing Wireless network. Kimball also assumed the existing wireless network adhered to all the specifications and service levels required for a Next Generation ESInet.

2.7.1 Recommended Consolidation Model

The PSAP consolidation model that provides the most effective emergency communications system, including call taking and dispatch functions, is a full consolidation with shared services. In Kimball's opinion, this model represents the "perfect world" solution that should be the focus of any incentives designed to encourage PSAP consolidation statewide. Full consolidation among a group of participants provides the community and the law enforcement, fire and EMS user agencies with the following:

- The ability of hosting multiple remote PSAPs in multiple jurisdictions on one redundant system
- Mitigates some of the delays inherent with caller transfers
- May include co-located PSAPs as well as separate stand-alone PSAPs
- Potential cost efficiencies by purchasing single systems for use by all participants rather than separate systems for each PSAP.
- Improved interoperability if a single radio system was used. Cost efficiencies associated with a collective purchase of radio consoles would be achievable even if separate radio systems are used.

Full Consolidation would provide the following benefits:

- A "one-stop shop" for citizens calling 9-1-1. The callers receive the law enforcement, fire and/or EMS responses needed and any necessary emergency medical dispatch (EMD) instructions as a result of a single interview by the PSAP call taker.
- A minimization of 9-1-1 call transfers.
- Standardized training levels for all PSAP staff which means the community receives the same standard of care within a specific region.
- Law enforcement, fire and EMS agencies all receive the same level of service from the PSAP
- Potential for cost efficiencies when purchasing a single set of critical PSAP technology rather than multiple PSAPs each purchasing their own systems.
- A high level of regional awareness and the ability to better coordinate multi-jurisdictional and discipline (police, fire and EMS) responses to major incidents and manage regional resources.
- The ability for PSAP staff to function as a team and instantaneously react simultaneously to new incoming information or situational changes. This allows field personnel to be better informed and increases field responder safety.

The value of having PSAP staff in the same room is difficult to quantify, but is a key benefit of full consolidation. When call takers and dispatchers can hear each other and react instantly, before they receive added information via

CAD, text or other mechanism, to high priority situations, time is saved and safety is increased. A real-life example includes the immediate escalation and dispatching of an upgraded response to a call for a small fire when subsequent calls reported people trapped in a house. The increased response was on the way before the call ended and the new information added to the CAD incident because the fire dispatch and call taker were in close proximity to each other. Sharing of technology is beneficial, but it does not replace being in the same room and having access to all sources of information simultaneously.

Kimball recommends that the State keep the $200,000 physical consolidation grants that are currently in place to pay for the operational transition costs of an agency that is consolidating into another agency. The State intends to pay for network transition costs. Stakeholder comments on this subject ranged from mildly positive to strongly positive, but generally noted that anything the state mandates should be fully funded.

Although other consolidation models do provide many of these same benefits, none achieve as many benefits as a full consolidation. For example, co-located PSAPs often transfer callers between the agencies even though the PSAPs occupy the same physical space. Time delays and caller frustration increase in this model. In addition, the more times a call is transferred, the more chance for human error or technological failure. However, the type of consolidation must be decided at the local level and be a model that the participating agencies feel best fits their needs. Also, in the co-location model the degree of benefits realized will hinge on the degree that the agencies share technology and information. In some cases, technology is shared and agencies work very well together. However, in other cases there is a literal or figurative wall or partition between agencies, technology is not shared and cooperation is minimal.

In a partial consolidation, where two of the three primary (police, fire and EMS) services are consolidated and one is not, the transfer of 9-1-1 callers is reduced, but not eliminated; situational awareness and communication within the PSAP is improved, but not ideal and some cost efficiencies are possible.

In the case of a shared technology model, today's technology does mitigate some of the delays inherent with caller transfer, but does not provide the same level of coordination between PSAP employees and during major incidents. Managing a major incident will never be as effective when there is multiple points of control that must be contacted, even with excellent technology in place, as it will be when there is a single point of control and communication is instantaneous within the same room. Added to this scenario are staff that are trained according to the same training program and operating under the same set of policies and procedures which only enhances the efficiency of the fully consolidated PSAP. The following table compares consolidation models and the benefits typically found in each one.

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Consolidation Model Comparison						
Model*	Minimization of Call Transfers	Shared Technology	Single Point of Coordination	Potential Cost Efficiencies	Standardized Training Program	Standardized Polices / Procedures
Full	Yes	Yes	Yes	Yes	Yes	Yes
Partial	No	Possibly	No	Some	No	No
Co-Location	No	Possibly	No	Possibly	No	No
Shared Technology	No	Possibly	No	Yes	No	No
*Table is based on how each of these models is typically organized. Individual PSAPs of any of these models may be different.						

Table 3 - Consolidation Model Comparison

2.7.2 NG 911 Core Services

Kimball has researched the existing Iowa wireless network. In order maintain investment in the existing infrastructure, Kimball believes the State of Iowa should expand this network for wireline service. In addition to this expansion, Kimball recommends a redundant diverse network using different carriers be established. These two diverse and redundant networks would provide the IP backbone and connectivity for PSAPs to connect to the statewide ESInet. Kimball would recommend the state deploy Core services in geo-diverse locations within the state. Using the dual networks, the state can immediately start deploying NG 911 to the existing i3 PSAPs. (Fig. 7)

2.7.3 NG 911 Redundant Core Services

This configuration would service the state with a redundant, diverse and secure Next Generation Backbone, increasing the diversity with two diverse networks would greatly increase the ability for the state to survive any major event. Each network would be capable of providing Core Services to the entire state Next Generation infrastructure. (Figure 7)

2.7.4 Iowa Next Generation 9-1-1 Core Functionality

The logical and functional design provides the information required to begin discussing the functionality of the network. A high-level NG9-1-1 conceptual design that is consistent with NENA i3 standards is depicted below. This diagram does not depict every possible interconnection arrangement. Multiple instances of some functions may be deployed at various locations. For example, some originating networks may supply their own Legacy Network Gateways (LNGs), and additional LNGs may be deployed in the statewide Core Services cloud. (Figure 7)

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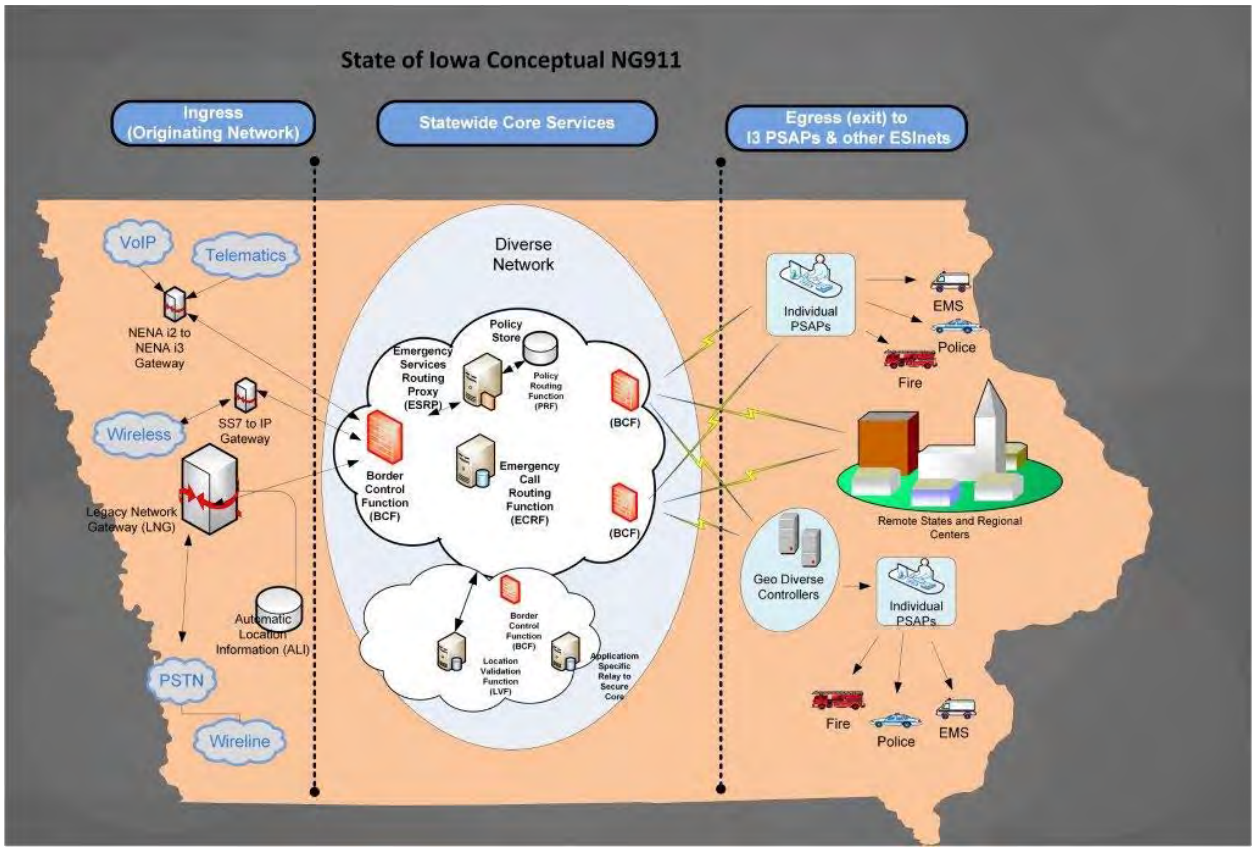

Figure 7 - Core Services with Egress to ESInets, Geo-Diverse Controllers & PSAPs

Kimball has developed this conceptual design functionality of the statewide ESInet to determine the design best suited for Iowa. Design and functionality include:

- Ingress Originating Network
- Statewide Core Services
- Egress to PSAPs and Regional ESInets

2.7.5 Ingress – Originating Network

Components to consider for the composition of the originating call network include:

- Wireline – This includes traditional wireline calls delivered by Local Exchange Carriers (LEC). A LEC may provide and operate their own LNG and deliver the calls in the NENA i3 format, or the State may provide LNGs to terminate legacy 9-1-1 trunks and ALI circuits. The State should consider whether to require LECs to deliver emergency calls in i3 format.
- Wireless – includes traditional wireless calls originating from a cellular phone users. Current delivery holds the expectation that the provider deliver the call via a Signaling System 7 (SS7) to IP gateway.
- Voice over Internet Protocol (VoIP) and Telematics – includes all originating calls that do not fall under traditional wireless and wireline calls. Kimball recommends Iowa require calls to be delivered per NENA i3 standards which may require the provider to translate NENA i2 to NENA i3 prior to the call being sent to the statewide ESInet.

Originating calls and the format required by the carrier(s) and other providers will be i3 open standards based, not proprietary methods and systems.

2.7.6 Statewide Core Services

Iowa should provide core services within the statewide ESInet. These are services that are generally provided to route, deliver, and transfer calls regardless of boundaries and jurisdictions. Iowa core services should be incorporated into an ESInet backbone provided by diverse statewide network providers. Core Service providers will be required to locate their serving equipment in a state approved data center. PSAPs across the State will have options as to how they connect to statewide Core Services:

- Full services - includes core services and hosted CPE from the State
- State Core Services - PSAP owned CPE
- Core Service regions based on individual LATAs with CPE Controllers in each LATA

The State is currently providing wireless and text communications services over a state provided network managed by Comtech/TCS. There are redundant points of presence (POPs) in West Des Moines and Davenport that facilitate access to the wireless network. The Iowa Communications Network (ICN) provides the network directly connecting all PSAPs to the wireless network. The state's goal is to integrate Next Generation 911 IP based communications, such as voice, video, text, telematics, EMD pre-arrival, and emerging technologies by combining the ESInet wireless network with the legacy network. Network Management Services for the combined network will be provided by a single vendor.

The Iowa state network will not be designed to support voice only, but will be designed to support video and other bandwidth intensive forms of public safety communications. Iowa, as in many other NG911 implementations, needs to work with independent rural and other "last mile" connectivity providers to identify and resolve any redundancy, 99.999% availability issues where ever possible. Service Level Agreements (SLAs) to meet NENA i3 requirements and specifications still need to be defined with network providers within the state.

Border Control Functions (BCF) – This function begins with a firewall to protect the statewide ESInet from malicious activity from the originating call providers at the point of ingress and from PSAPs, regional ESInets or other services with access to the statewide core services. Other border control functions may include verifying the call information configuration and/or translation among various call formats and protocols.

Emergency Services Routing Proxy (ESRP) – This is where the call information is processed and then subsequently delivered to the appropriate PSAP or regional ESInet. Included within this function:

- Policy Routing Function and the Policy Store – Determines if the PSAP or Regional ESInet is available to receive the call or if alternate or special call routing is required.
- Geographic Information System (GIS) Services – A GIS database and associated tools which is used by the ECRF to determine the most appropriate PSAP and/or emergency responders associated with a specific location, either latitude and longitude, or a civil address. GIS services are at the discretion of the state and are generally dependent upon the existence of an existing GIS database.
- Location Validation Function (LVF) The LVF provides a means whereby authorities, service providers, and other stakeholders can pre-verify that an address is of the correct form, is valid with respect to the GIS database, and returns PSAP and first responder information appropriate to that location. For example, LECs can use the LVF to verify addresses in their legacy ALI systems will be correctly routed by the NG9-1-

1 system. An LVF instance may be a Statewide Core function which uses the same GIS data that is used by the ECRF. However, such an LFV must be made available to users outside the Core Services cloud while the ECRF is used in real time by processes that handle live emergency calls. Hence, the LFV and ECRF functions have different security requirements.

- Emergency Call Routing Function (ECRF) - A functional element in a NG9-1-1 system which associates a location with a call destination using GIS data. An instance of the ECRF is the Location to Service Translation (LoST) protocol server where location information (either civic address or geo-coordinates) and a Service Universal Resource Name (URN) are the input to a mapping function which returns a Uniform Resource Identifier (URI) used to route an emergency call toward the appropriate PSAP for the caller's location or towards a responder agency.
- Legacy Network Gateway (LNG) - A signaling and media interconnection appliance between legacy wireline/wireless originating networks and the NG9-1-1 ESInet. A LNG may convert legacy ALI to NENA i3 location. LNGs may be provided by the originating network operator, may be provided by the State, or may be provided by a PSAP, in any combination as desired and required.

2.7.7 Egress to Public Safety Answering Points and Regional Emergency Services IP Networks (Diverse provider)

The call is delivered from the statewide core services to the PSAP or regional ESInet. Additional Border Control Functions (BCF) may exist at the point of ingress to the PSAP or regional ESInet. These functions may vary according to the needs of the receiving location and the decisions of Iowa. PSAPs with only legacy equipment will require a Legacy PSAP Gateway (LPG), which performs the inverse function of an LNG, to convert the NENA i3 format back to legacy formats. The main concern is to deliver the call in a format consistent with the receiving location's capabilities. Confirmation and possible changes to formatting are at the discretion of the State.

2.8 Statewide Emergency Services IP Network (ESInet) Design (Diverse provider)

An ESInet is defined as a network of networks and a system of systems designated for Public Safety. It is the goal of the State of Iowa Homeland Security Emergency Management Department (HSEMD) to provide a combined wireless and wireline ESInet that spans the state providing NG9-1-1 services to all 99 counties within the State utilizing a robust and redundant configuration by diverse backbone network providers for the ESInet. There are fiber facilities and or agreements with rural and 3rd party carriers to provide connectivity to all Iowa counties. Current Diverse provider connectivity is demonstrated in Figure 8.

2.8.1 Design Options

Kimball designs public safety networks based on industry standards, best practices, and lessons learned. There are currently statewide ESInets for California, Ohio, and South Dakota being designed by Kimball that are in various stages of implementation The State of Iowa HSEMD has indicated that all 99 counties have access to a statewide network provided by multiple vendors. In most cases, bandwidth is the determining factor of how ESInets are built. Kimball is proposing two options to provide the PSAPs of Iowa, at the very least, the ability to accept IP-based i3 communications over an IP network. Realizing the need for additional redundancy, HSEMD began a project with Comtech/TCS to provide additional safeguards for a statewide or large regional outage of the ESInet. Thirteen of the largest PSAPs were identified to require a secondary, redundant, network connection. Comtech/TCS was contracted to acquire completely diverse fiber circuits to build out a second network, separate from the primary backbone.

Windstream facilities were utilized for this endeavor. The secondary ESInet is able to automatically route calls during an outage to Johnston JFHQ DPS.

PSAP Name	Location
Black Hawk Co	Waterloo, IA
Cedar Rapids JCA	Cedar Rapids, IA
Des Moines PD	Des Moines IA
Dickinson Co	Spirit Lake, IA
Dubuque Co	Dubuque, IA
Johnson Co	Iowa City IA
Johnston JFHQ DPS	Johnston IA
Lee Com	Montrose, IA
Polk Co Sheriff	Des Moines, IA
Pottawattamie Co	Council Bluffs, IA
Scott Co	Davenport, IA
WestCom	W Des Moines, IA
Woodbury	Sioux City, IA

Table 4 - Thirteen Largest PSAPs

Option 1 – Design the bandwidth requirements according to NENA standards[1] for IP Network Design.

- Remote PSAP - Controller = 2 mbps (for the PSAP as a whole) + 2 mbps x number of positions.
- Controller – Gateway/Core Services = Sum of bandwidth of all PSAPs served by a controller

This design option would provide enough bandwidth to handle voice, text, video, images, telematics, and position the state for future technologies. Service upgrades to increase bandwidth should not be needed reducing the possibility of any service interruptions. Option 1 would be the preferred option, however, it would depend on the capacity of the diverse provider networks.

A graphic conceptual depiction of Option 1 is shown in Figure 8.

Option 2 – Design the bandwidth requirements in what has been called "the bottom up" method.

- Remote PSAP - Controller = 1 mbps (for the PSAP as a whole) + 100 kbps x number of positions.
- Controller – Gateway/Core Services = 144 kbps x number of 911 trunks

Kimball has had discussions with 911 CPE manufacturers and have seen this proposed for other statewide Next Generation deployments, but this option is designed with the bare minimum bandwidth capable of handling voice and text. This design would require the network to also be scalable to handle video, images, telematics, and future

[1] NENA 08-506 v1

technologies. An in-service upgrade will need to be planned and implemented with the possibility of a service interruption.

2.8.2 Analysis

In an effort to compile a comprehensive and realistic report, Kimball worked with diverse statewide network providers and other key personnel within the State of Iowa to obtain current operational characteristics of the state network and identify any potential deficiencies. There are diverse providers that currently have direct access or leased access to all 99 counties in the state. There are two methods to access the public safety POPs:

1. Diverse carriers utilizing fiber backbones with negotiated contracts with local network providers across the state, not all providers provide public safety grade services in all of their coverage areas.
2. Comtech/TCS contracted facilities from Windstream.

Comtech/TCS currently provides network monitoring and maintenance for wireless 911 service in Iowa. The NG9-1-1 solution of choice in Iowa is to merge wireline and wireless networks over state provided facilities, Network Management Services for the consolidated network will be provided by a third party selected by the state.

2.8.3 Statewide Core Services Interoperability

The State of Iowa has developed a Next Generation 911 Plan to provide Next Generation 911 services to all PSAPs within the state of Iowa. The plan provides 911 services based on the needs and services required by individual 911 PSAPs and 911 Regions.

2.8.3.1 State of Iowa Providing NG911 Core Services and CPE

The State of Iowa will provide Next Generation Core Services and Geo-diverse Host CPE Controllers for CPE Services to those PSAPs requiring this service. The PSAPs will have the ability to access the State provided CPE hosted positions The State provided Geo-diverse CPE Controllers will interface with the State Core Services and provide NG911 interoperability with other PSAPs using these Core services. (Figure 8).

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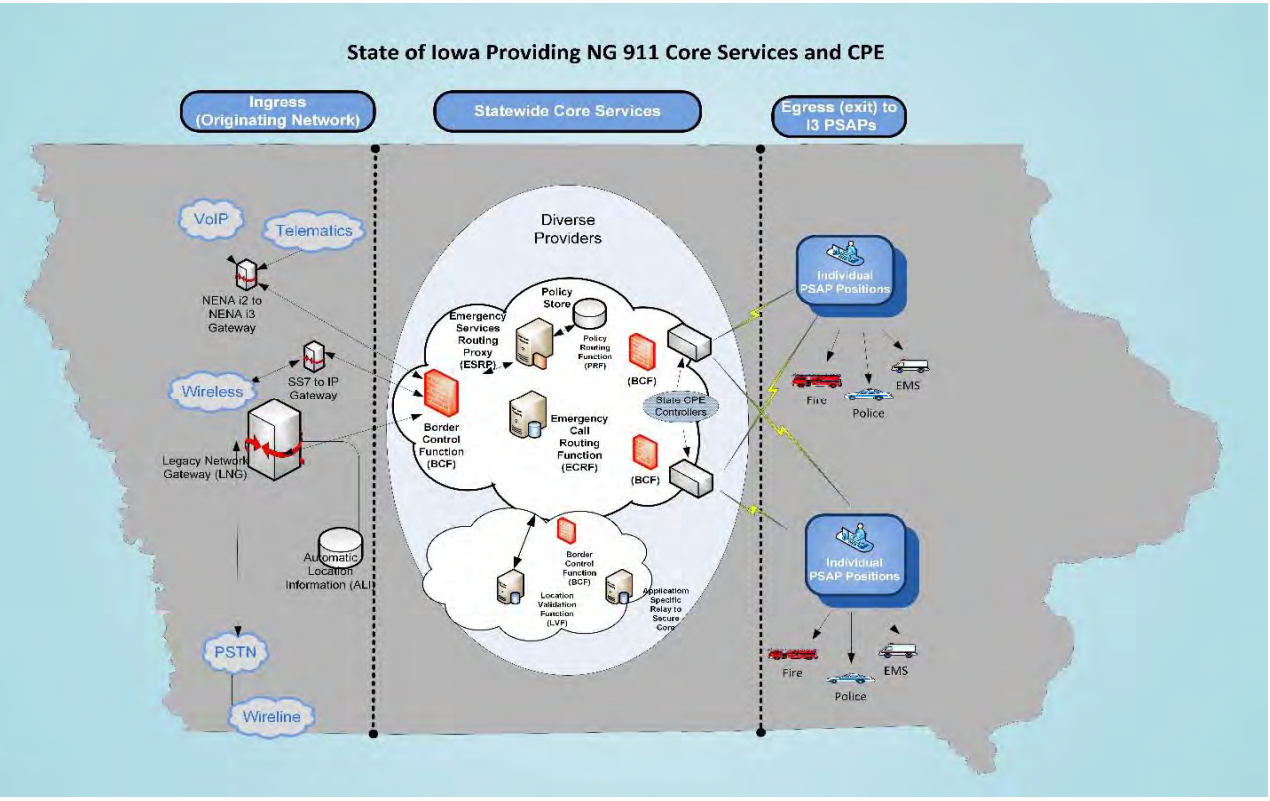

Figure 8 - Core Services with State provided CPE

2.9 Data Network Transport Requirements

2.9.1 Section Deliverables

The following sub-sections describe the requirements for the Data Network Transport supporting the design of the State ESInet. These sections represent the technical, operational, and functional requirements that the requirements must satisfy.

2.9.2 Multi-protocol Label Switching (MPLS)

MPLS is a major component of an ESInet. MPLS is a data communications platform that emulates the features of a circuit-switched network over a packet-switched network. The MPLS must support routers and gateways from multiple manufacturers since this network will be used for multiple public safety applications. If the vendor's solution includes multiple MPLS networks, each network must be identified. Diverse provider must provide the committed bandwidth rates. MPLS security is a concern; Diverse provider must provide SLAs specifying and addressing security on the MPLS networks, including detailed specifications on how they plan to handle security, use of internal security reviews, testing, and mechanisms used.

2.9.3 Network In-service/Uptime Requirements

The network developed for this project needs to be a public safety grade network requiring 99.999 percent availability or better.

2.9.4 Gigabit Ethernet – Network Core Bandwidth Requirements

Core host network interconnections must have a minimum committed information rate (CIR) of 1 gigabyte per second (Gbps) between all backbone/core network devices. All network edge devices must support a minimum of 100 Mbps.

2.9.5 Gigabit Ethernet Transport Requirement to Hosts

Gigabit Ethernet Transport must interconnect all core hosts in the State ESInet. A host can consist of IP servers and gateways, Instant Messaging (IM) servers, Short Message Service (SMS) servers, or systems supporting future emergency requests, such as images or video. The Gigabit Ethernet Transport shall be used for data-centric emergency requests, IP call signaling, media transport, server signaling, network management, monitoring and alarms.

2.9.6 Redundant Gigabit Connections to the Host

All core hosts must have redundant gigabit links or logical connections. Redundant gigabit connectivity must ensure no single point of failure exists and contribute to maintaining the 99.999 percent availability requirement. The redundant gigabit link shall be placed into a separate hardware switch device than the primary gigabit link to ensure redundancy. A separate power supply source for the redundant gigabit switching device is also required.

2.9.7 Redundant Gigabit Connections Load Sharing

To ensure the redundant gigabit links or logical connections are operational and can support data transactions, the design must support load sharing when both links are available or in service. All links and network devices must support this design.

2.9.8 Gigabit Ethernet–Committed Information Rate (CIR)

A CIR on a proposed Gigabit Ethernet of one Gbps must be provided for each of the host locations.

2.9.9 Network Devices

The network design requires that core network devices and equipment be redundant to ensure 99.999 percent reliability and that no failure of a link or device totally isolates the core network. A fail-over must be transparent, automatic and ensure continued, uninterrupted operation of emergency service applications or any service request currently in progress.

The State ESInet must be designed such that the failure of any one network module will not result in total system failure, nor result in blocked, dropped or busy calls. Only the loss of the equipment or connectivity associated with that module should be affected. Any failure resulting in the use of the public switched telephone network (PSTN) must not increase current call setup times. The network provider must test and document this requirement.

Diverse provider must describe and diagram the network architecture with respect to the major components or modules, and must provide a call-flow diagram describing how the entire system will react to a failure of each major component or module.

2.9.10 Remote Location Bandwidth Requirements

Ethernet connections from the core network to the remote workstations must be a minimum of 100 Mbps. All edge network devices must support this bandwidth requirement.

2.9.11 Megabit Ethernet - CIR

A CIR on the Megabit Ethernet of a minimum of 10 Mbps must be provided for each remote workstation from the core network.

2.9.12 Network Disaster Recovery

The network must be designed to include a disaster recovery plan for partial or total loss of the State ESInet (either transport or network devices) and/or loss of connectivity to remote workstations.

2.9.13 Security

The network design must include network security management policies and procedures in sufficient detail to ensure confidence that the State ESInet is not vulnerable to unauthorized activity or unauthorized access that would degrade public safety operations.

2.10 Recommendation

Kimball recommends the State of Iowa 911 Program office move forward with Design Option 1 to prepare an ESInet backbone for statewide connectivity, over a network with the built in capacity to handle text, video, social media, telematics, and future technologies as they are introduced.

The state has also indicated the desire to have a network capable of supporting IP based radio (FirstNet). Although bandwidth requirements for FirstNet have not been clearly defined, it is expected they will likely align with NG9-1-1 Design Option 1. The state should allocate additional bandwidth for FirstNet applications accordingly.

An incremental deployment strategy based on LATA boundaries and population counts is recommended to reduce dual network costs associated with the migration.

The ESInet needs to be designed to meet or exceed NENA i3 technical standards. Kimball would also recommend that this network be constructed of diverse fiber networks from redundant providers and their negotiated facilities wherever feasible. It is important that the State continue to provide leadership and move forward with their vision of utilizing IP-based networks to interconnect Iowa's Public Safety system.

Centralized shared services such as CPE, and GIS systems over a statewide ESInet will provide potential lower-cost path towards implementing services and capabilities that will benefit emergency responders. Leveraging the combined wireless and wireline ESInet with these shared services will allow Iowa PSAPs to exchange additional data and information with responders, improve call processing times, enhance situational awareness, and increase

responder safety. Coordinated deployment of IP based NG911 shared services will reduce the long term cost burden of operating dual legacy and NG911 systems allowing for current available funding to be used on new technology.

With regards to partial requirements of RFP Section 5.1.10, Kimball notes that Iowa's current 9-1-1 statutes have been amended over the years in reaction to new technologies. That has resulted in separate systems, funding structures and authority for different technologies accessing the same service. A fully implemented NG9-1-1 system, with consolidated systems, would merge these disparities to provide efficient and robust service. A consolidation of systems will not only involve technical changes, but also legislative changes to support a smooth transition.

Benefits of NG9-1-1 IP based shared services include:

- Support for New Communications Technologies. NG9-1-1 enables citizens in emergencies to reach the PSAP by virtually any method or available communications technology, enabling emergency calls to be placed from any networked device from laptop to tablet to smartphone. The system also supports the delivery of data in virtually any form; enabling the call for help to do more than just alert first responders to a problem, which ultimately makes call handling easier. NG9-1-1 systems can also deliver better and more useful information that can help speed and optimize response, including data files such as building plans or electronic medical records, and images, photos and even streaming video.
- GIS-Based Call Routing Flexibility. NG9-1-1 systems use advanced GIS-based (i.e., caller location based) routing control that no longer relies on Selective Router databases to route calls, or ALI databases to locate callers, but dynamically transports caller location data with the call. This enables calls or messages to be routed automatically to the most appropriate PSAP, saving time-consuming re-routing and pinpointing the caller's location to virtually the exact spot, even if the caller is incoherent or unable to speak. Responses can be faster and more appropriate, helping to save time, effort and lives.
- Added Integration and Interoperability. NG9-1-1 systems provide advanced interconnectivity with other emergency and public safety agencies and jurisdictions, which enhances response collaboration and coordination. With appropriate access controls, the system will enable other entities to receive calls and data sent by the NG9-1-1 system, and to acquire and pass data between all parties.

2.10.1 Controller Options

Kimball also recommends placing 3 sets of (3x2) Geo-Diverse 9-1-1 controllers on the network, locating one controller in LATAs 644, 630, 634 and 635 and two CPE Controllers in LATA 632. This would provide five regions within the state. Each of these five regions would connect to each of the redundant networks and also provide a point of interconnect for those PSAPs that are currently i3 compliant, should they not want to take advantage of the State provided CPE Controllers. These controller locations would reduce network costs and provide PSAPs with controller redundancy. (Figure 9 &10) Providing Controllers in each Wireline Telephone LATA within the State provides a Point of Presence on the IP backbone for each Controller, all telephone ILECs within the LATA and any PSAPs not using the State provided controllers within each LATA. This point of presence will greatly reduce the current network monthly recurring cost.

As stated previously, within the Kimball Survey, the question was asked if the PSAP was i3 Compliant. 52 PSAPs responded that their PSAP was i3 compliant. This means the i3 Public Safety Answering Point (PSAP) is capable of receiving IP-based signaling and media for delivery of emergency calls conformant to the i3 architecture standard. These i3 compliant PSAPs are ready to move onto the ESInet when the Core Services functionality is complete. However, after further investigation it was concluded that some of these 52 PSAPs are i3 capable, but not compliant.

These would require some version upgrades as well as some infrastructure additions to integrate with the Core Services over the ESInet.

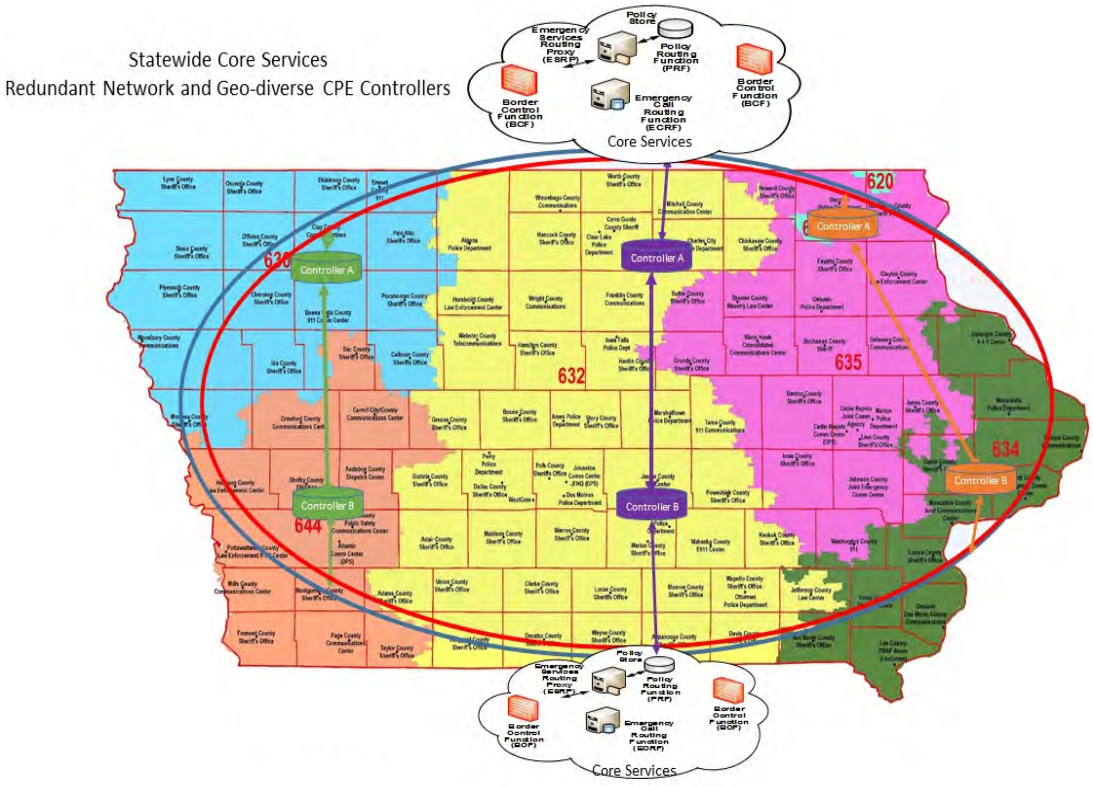

Figure 9 - Statewide Core Services, Redundant Network, and Geo-Diverse CPE

When extrapolated from responses received, the Kimball survey shows that 70% of the respondent's existing controllers are i3 compliant or capable. If this percentage holds true for those PSAPs not responding to the survey, then 79 of the 113 PSAP controllers would be able to move to the IP network and Core services rather quickly which would eliminate the legacy network, selective routing and ALI costs. The State is aware of 75 PSAPs receiving SIP calls. As these controllers age out, they could easily move to the State provided CPE Controllers. Those controllers that are not i3 compliant at the time the Core Services and State CPE Controllers are in place can be migrated onto the State CPE controllers based on the condition of the existing controller or the existing legacy network costs.

Providing geo-diverse Next Generation i3 compliant controllers allows multiple Legacy PSAPs the ability to use these controllers to move from legacy controllers or i3 capable controllers to a Next Generation platform while still maintaining their autonomy. Using Next Generation i3 compliant controllers for multiple PSAPs also provides the ability to consolidate CAD and Mapping systems for these PSAPs.

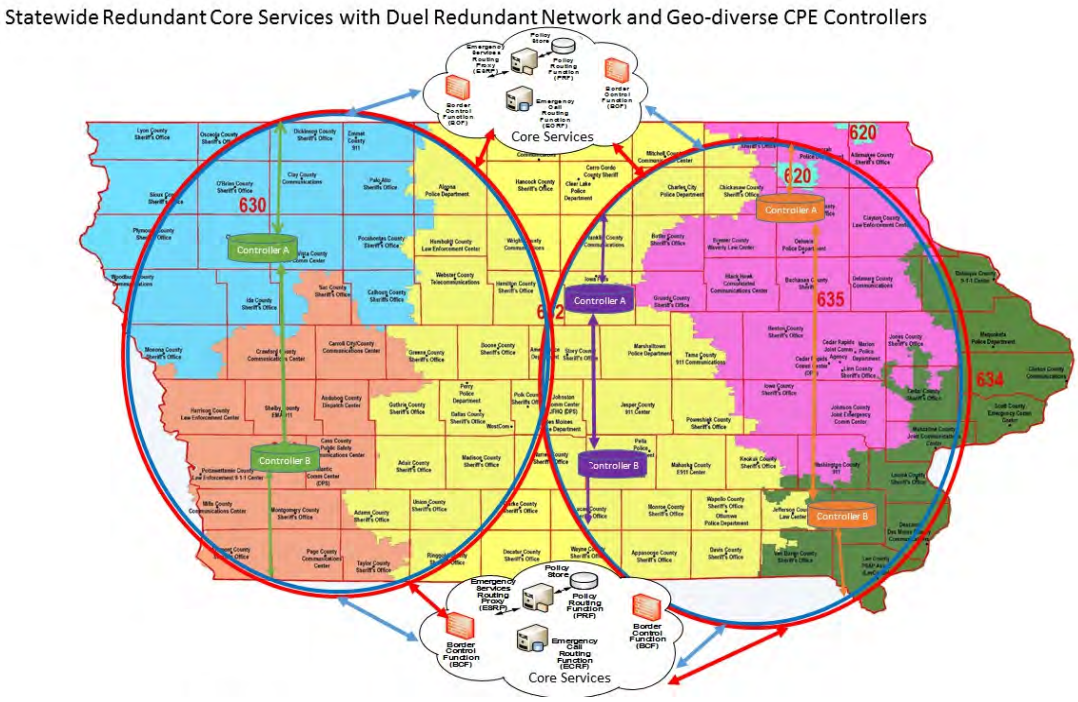

Figure 10 - Statewide Redundant Core Services, Redundant Network, Geo-Diverse CPE

Centralization of Core services, 9-1-1 controllers, and associated peripherals provides the greatest cost savings for infrastructure. Providing these services in areas that provide a cost effective network that is truly redundant, diverse and secure can reduce the overall system costs. While cost reduction is essential, this must be weighed against the ability to provide the highest level of service to the PSAP. Providing a Robust Statewide Next Generation 9-1-1 system with a diverse, redundant, and secure network is the most cost efficient and provides the best service to the public. Stakeholder comments suggests that push back by some individual PSAPs may arise through objections to the centralized vendors used to provide the services, loss of input to some of the systems configuration, loss of some revenue due to state maintaining systems, and political disagreements.

For these reasons, Kimball recommends a network architecture that will provide statewide Core Services to any 9-1-1 controller environment. Should an area have an NG911 compliant controller of their choosing and not want to use the state-provided CPE Controllers, the state must have a set of specifications that the entities controller and network interconnection must meet to receive service from the Core. Kimball finds that providing these types of alternatives alleviates criticism from those not acceptable to the Statewide provided system.

2.11 GIS Data Findings

The State of Iowa's E-9-1-1 Program Office recognizes the importance of quality local GIS data in regards to developing the State's Next Generation 9-1-1 system and supports the State's efforts to acquire and maintain this data. Kimball also recognizes this critical factor, and although not specifically required by the Statement of Work, and consequently conducted an analysis of the current state of GIS matters, in order to support an effective transition to and implementation of NG911.

The State of Iowa partnered with GeoComm to obtain current GIS data from all 99 counties across the State. The initial phase of this project was completed in July 2016 with the creation of a seamless and gapless dataset for the entire State that is compatible with current data standards established by the National Emergency Number Association (NENA). GeoComm continues to work with the State and associated stakeholders to provide on-going GIS data updates to the statewide GIS dataset to improve data integrity.

GeoComm provided the following information to Kimball regarding current statewide estimated accuracy percentages for the GIS dataset.

- Road Centerlines: 88%
- Boundaries: 57%
- MSAG: 99%
- ALI to MSAG: 91%
- Site/Structure Address Points to MSAG: 72%
- ALI to Site/Structure Address Points: 87%
- ALI to Road Centerlines: 83%
- Site/Structure Address Points to Road Centerlines: 92%

GeoComm also provided the following specific information regarding the GIS data currently being used in the statewide GIS dataset.

- Eight (8) counties do not have site/structure address points.
- There are 93,332 ALI to MSAG discrepancies statewide, where an ALI record does not fall within a matching record within the MSAG.
- There are 419,059 Site/Structure Address Points to MSAG discrepancies statewide, where an address point record does not fall within a matching record within the MSAG.
- There are 298,748 ALI to Site/Structure Address Points discrepancies statewide, where an ALI record does not have a matching record within the address point database.
- There are 150,069 ALI to Road Centerlines discrepancies statewide, where an ALI record does not fall within a matching road centerline.

Kimball developed an initial survey for each of the 113 PSAPs located within the State that included questions regarding the PSAPs mapping data and how it is integrated within their CAD systems. Of the 60 PSAP's who participated in the survey, one PSAP indicated that they do not have a CAD system but were using a GeoComm mapping solution. The other 59 PSAPs indicated that they are using mapping within their CAD systems and all but one updates their CAD system with the latest GIS data on a regular basis. Mapping software being used at the PSAPs include versions by Emergency Call Works (ECW), Emergitech, GeoComm, Geoconex, Intergraph, Logistic Systems, Positron, SW CAD, Sungard OSSI, Tyler New World and Zuercher Bulberry, with 78 PSAPs using a GeoComm-supported solution. There are 52 PSAPs utilizing maintenance services agreements with GeoComm, Hansens and Schneider to ensure that accurate GIS data is being provided to their dispatch centers.

The following figures depict the mapping software being used by PSAPs as indicated via the survey and/or local knowledge and the GIS data maintenance providers across the State as indicated via the survey and/or GeoComm.

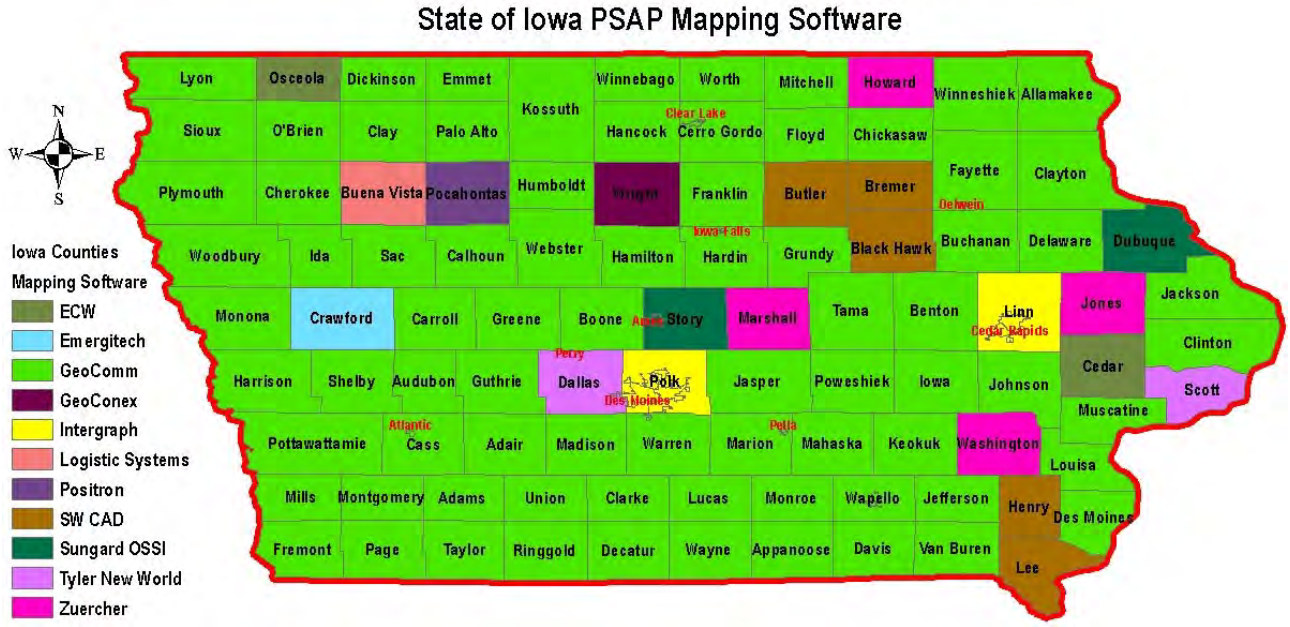

Figure 11 - Mapping Software used at PSAPs within the State of Iowa

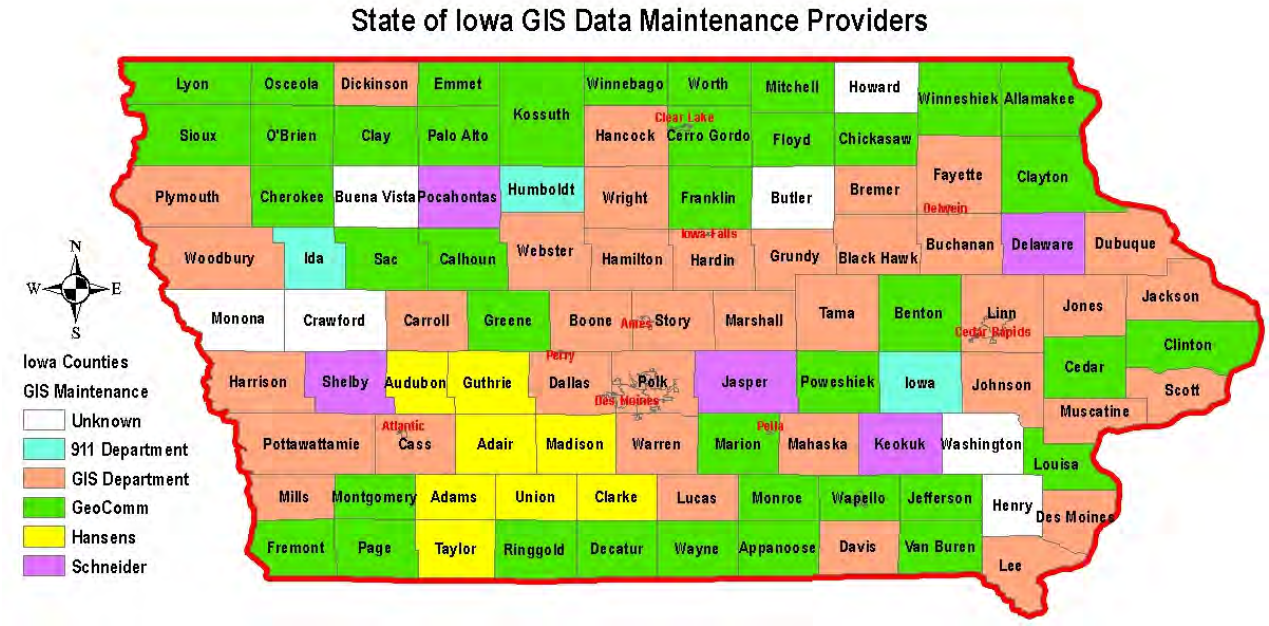

Figure 12 - GIS Data Maintenance Providers within the State of Iowa

2.12 GIS Data Recommendations

Kimball strongly encourages all PSAPs and County GIS Departments across the State to continue to perform maintenance on all data layers and strive for a minimum 98% accuracy percentage across all databases as defined by NENA standards. 9-1-1 entities should develop a succinct process that will consistently identify discrepancies in the data and address them as they are found. Maintaining high levels of coordination between database personnel, GIS personnel, database management systems, the postal authority, local addressing authorities and all service providers will make this process more efficient.

In addition, it is critical that the State stakeholders improve the boundary accuracy between its PSAPs. This includes Authoritative boundaries, PSAP boundaries and individual emergency response boundary development. It is very important to build rules, policies and procedures for these boundaries and establish a governance process for changes to boundary files, taking into account annexations and dissolutions, managing effective dates, providing for conflict resolution among neighboring PSAPs and generally enforcing GIS topology rules.

The State should consider providing funding to those counties who do not have a site/structure address point layer for the development of this layer. It is also recommended that the State consider providing funding to those counties who have data "gaps" or low accuracy percentages for research and development, as well as staff augmentation and training, to improve the quality of their data.

When exploring consolidation between existing PSAPs, it is very important that the State take into consideration the transition of multiple mapping software solutions to one CAD system. It is crucial to establish workflows between the entities who edit/provide the data for the CAD system and Statewide GIS dataset and those who ensure that the data is being used within the CAD system appropriately. Consolidation efforts should consider implementing an ESRI regional or Enterprise GIS solution as part of the consolidation plan to mitigate edge matching and editing concerns.

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3. FUNDING, GOVERNANCE AND LEGISLATION

Current 9-1-1 funding models that assess fees on end use devices or access lines, administered largely by traditional carriers, may no longer be sufficient or efficient enough to fund a fully implemented NG9-1-1 system. Complete overhauls to most 9-1-1 surcharge statutes are typically necessary within states to successfully fund fully implemented NG9-1-1 systems. However, incremental steps can be taken during the transition to NG9-1-1 to move implementation forward while taking the time to effectively overhaul legislation. Kimball reviewed Chapter 34A and analyzed stakeholder input on the allocation of costs in a next generation environment in order to make some interim recommendations for surcharge disbursements while working toward broad legislative change to the funding structure that will be sustainable. This portion addresses the issues identified in Sections 5.1.7 and 5.1.10 of the State RFP Statement of Work requirements.[2]

3.1 Long Term Funding Structure Goals

States continue to face challenges in fitting emerging services into existing funding mechanisms, and the effort to do so has resulted in disparate 9-1-1 funding structures for different devices and technologies. Wireless service, pre-paid wireless subscriptions, pre-paid wireless cards, Voice over Internet Protocol (VOIP) technologies (nomadic, and fixed), and OTT (over the top) Internet data services have all raised such challenges. The release of a new technology has usually resulted in a period of time when the providers of the new service could avoid paying an equitable share of 9-1-1 support until the legislature caught up to the technology. In response, the Federal government and industry groups encourage the transition to an "all device" surcharge model that is technology neutral and recently, many industry groups have been considering how to assess a fee on any device that can access 9-1-1. The National 9-1-1 Program has been urging States to transition to technology neutral funding models for years in a number of their efforts including a Blue Ribbon Panel on Funding and the National 9-1-1 Assessment Guidelines Work Group. Additionally, The NENA Next Generation Partner Program recommended a technology neutral approach to funding 9-1-1. Recently, the National Association of State 9-1-1 Administrators released a white paper that recommends that any funding solution implemented should be technology neutral. Most recently, the FCC's Task Force on Optimal PSAP Architecture (TFOPA), Working Group 3 recommended that any technology or services capable of accessing the 9-1-1 system should contribute its fair share to operate the legacy 9-1-1 systems and also to assist in the build-out of NG9-1-1 networks.[3]

In light of those challenges, Kimball made the following recommendations to overhaul the 9-1-1 funding structure to the State of Iowa in a 2015 report:

- A new funding method should encompass the principle of technology or connectivity access, so that anyone capable of accessing the 9-1-1 legacy or IP networks should share in the costs of 9-1-1 service.

[2] The State of Iowa intends to conduct a legislative update that will be reviewed by Kimball for consistency with industry standards and best practices.

[3] FINAL REPORT OF TFOPA WORKING GROUP 3 Task Force on Optimal Public Safety Answering Point Architecture (TFOPA) Working Group 3: Optimal Resource Allocation, Sept. 28, 2015, 5.

- The funding method should be technology, connectivity, vendor, and competitively neutral, so it does not give competitive advantages to one telecommunications, broadband, or data provider at the expense of other providers.
- The funds collected should be used only for their intended purposes and should not be reallocated at the state or local level for non-9-1-1 purposes.
- The funding method should be easy to understand and administer.
- The funding method should be fair and equitable to all individuals and devices capable of accessing the current or future 9-1-1 network.
- The funding method should be stable, and therefore not require frequent legislative adjustments.

Iowa stakeholders discussed a potential funding overhaul during the five stakeholder meetings held across the State in September and October 2016. Many stakeholders expressed that revenue should be collected by the State and distributed to each PSAP on a percentage basis and that it's important to collect funds from every device able to connect to 9-1-1, regardless of whether it's ever used to do that. Other stakeholders expressed that there should not be a difference in funding allocation based on population. Some alternative funding methods were suggested, such as charging a flat-fee by household for IP/Internet services, charging large corporate users a flat-fee based on numbers of devices and establishing a fund that uses a surcharge based on traffic violations or through devices such as radar camera or red-light cameras. Some stakeholders expressed that the main problem with the current system is the lack of the ability to enforce the collection.

Stakeholders' main concern was how a change in the funding structure would impact their distribution and their ability to fund their costs and where the shortfall would be covered from, as well as a loss of local control of both funding and making decisions on the systems and equipment they want. Kimball recommends that any funding structure that is adopted is based on system costs and that any decrease in distributions would be paired with a shift in cost responsibility so that a new funding structure would not create a shortage.

3.2 Short Term Surcharge Distribution Strategy

In order to make recommendations for an interim surcharge distribution strategy until a legislative overhaul can take place, it is necessary to establish the allocation of system costs. Stakeholders discussed the allocation of costs in a consolidated network environment during five stakeholder meetings held throughout the state in September and October 2016. Many stakeholders suggested that roles and responsibilities related to the system would depend on who funds what. Stakeholders suggested that the State should fund any system components that were under their control, that if it's mandated by the State, it should be funded by the State. Many indicated that responsibilities would depend on potential surcharge distribution changes, that locals will have financial trouble if their distribution is lowered and they are still responsible for costs. Stakeholders expressed that the CPE grants have helped them to be able to afford the technology that they need. Others felt that the surcharge should not be used for statewide projects, but only locally. It was suggested that the State fund the consolidated network and everything to get the call from the caller to the PSAP. For CPE, it was suggested that the State pay from the host to the remote. It was also suggested that it be up to the local agency whether they wanted to sign up for this state provided CPE. Other stakeholders suggested that statewide GIS should be funded by the State. Still, other stakeholders were concerned about a local loss of control of surcharge funds if the State funds anything.

For purposes of recommending an interim distribution strategy Kimball assumes, based on stakeholder feedback from the state and local levels that the State plans to pay for the network, core services and CPE in the new consolidated network environment. In order to fund these system components, the State will need funding. It is

Kimball's understanding that in 2016 the percentage of the emergency communications service surcharge disbursed to joint E911 service boards was increased to sixty percent of the total amount of surcharge generated per calendar quarter. In order to allocate the costs for the network, core services and CPE, Kimball recommends that the percentage of emergency communications service surcharge to be disbursed return to the statutorily set amount of forty-six percent. Funds from the wireline E911 service surcharge should continue to be remitted to E911 service operating authorities for their purposes. In addition, HSEMD should have the flexibility to make network upgrades and changes that are necessary with the state portion of the surcharge funds.

3.3 Governance

An appropriate governance structure should be established with the direct involvement of local PSAP participation to assure an effective and seamless deployment and operation of NG9-1-1, and provide guidance and accountability. While 9-1-1 is delivered largely at the local level, a fully implemented NG9-1-1 system requires coordination of that delivery. To that end, national public safety agencies and the Federal government have encouraged State-level coordination for planning, coordinating and implementing NG9-1-1 and monitoring uniform statewide adherence to established technical and operational standards for the system. Some local entities have begun migrating to NG9-1-1 and should be allowed to continue on that path, however, some local agencies need help sustaining long term upgrades, maintenance, and purchases and might need financial and technical support from the State to move forward. Stakeholders representing local entities were asked to provide input into the NG9-1-1 plan for the State during five stakeholder meetings held across the State. The majority of stakeholders who commented agreed that a coordinated governance structure will be important to keep up with technology changes and assure that everyone is able to interconnect in the new system environment.

Many stakeholders favored state-level governance only if the governing body included broad stakeholder participation and was streamlined to one entity that has vast 9-1-1 expertise. A council was recommended several times. Others stressed the need to not only have broad representation in a governance body, but strong local representation, leaving local decisions to local agencies. Stakeholders shared that they've seen state-wide authority for NG9-1-1 work in other states. There was mixed feedback on whether a state-level governance body should have authority, or just advise local entities to avoid a takeover of local authority.

Other stakeholders suggested governance boards exist at local levels for NG9-1-1 coordination rather than the state-level and that any state-level governance runs the risk of changing with every change in state government control. It was suggested that existing local service boards be expanded to include EMA and EMS and the Sheriff/law department and expand voting authority. Many stakeholders were skeptical of state-level governance of NG9-1-1 due to concerns that the control of surcharge money would be taken from the locals to fund state initiatives like the statewide LMR project. It was suggested that if the State was going to assume the responsibility for NG9-1-1 coordination they should assume all operational responsibilities of a PSAP including SOPs and human resources. Stakeholders asked if existing state agencies have the necessary resources to move to NG9-1-1.

The roles and responsibilities of 9-1-1 stakeholders from PSAPs to state government will evolve with NG9-1-1. In addition to the type of governance structure needed to facilitate the full implementation of NG9-1-1, stakeholders discussed how responsibilities and could be assigned in a fully implemented Next Generation environment. It was identified that stakeholders need the roles and responsibilities defined in order to move forward. It was suggested that responsibilities should go to both State and local levels since both will own a portion of the service delivery and the responsibilities should be collaborative between the two. Another stakeholder said that the responsibility should

stay local since the locals will still have to deliver the response. It was asked why the State has any interest in providing 9-1-1.

Based on stakeholder feedback at the state and local levels, Kimball recommends that Iowa establish a governing board as the coordinating entity for the State. The governing board should be made up of PSAP representatives and other 9-1-1 stakeholders in the State. The establishment of the governing board should occur through a consensus process of stakeholders that results in a structure, processes and assigned roles and responsibilities in the form of a charter, rules or bylaws.

3.4 Authority

Kimball recommends that the state-level 9-1-1 coordinating entity be given the statutory authority to coordinate the system with related state entities that have authority for GIS, public safety, radio systems and public safety networks such as FirstNet because all of these systems will require the need to interconnect and interoperate in the NG9-1-1 environment. In addition, a statewide coordinating entity should be given statutory authority to coordinate the consolidation and interconnection of networks to ensure seamless statewide coverage. A coordinating entity will need to facilitate the definition of roles and responsibilities of local, regional and State government through stakeholder involvement. Kimball recommends authorizing a 9-1-1 Coordinating entity with the sole rulemaking authority for 9-1-1, including technical and operational standards for NG9-1-1.

In addition to the need for a state-level 9-1-1 coordinating entity with the authority to operate, procure and facilitate NG9-1-1 in the State, the statute should include additional provisions to facilitate the efficient implementation of NG9-1-1 by providing for inter local cooperation of 9-1-1 planning and operation, authorizing public and private cooperation in providing 9-1-1 services and providing contractual authority to procure and/or operate statewide 9-1-1 components.

In addition to the statutory authority to carry out its roles and responsibilities, the 9-1-1 Coordinating entity will need an adequate level of dedicated staff to carry out its mission. Kimball urges the State to include a statutory provision that provides for an adequate level of dedicated staff to carry out the day to day functions of the 9-1-1 Coordinating entity.

3.5 Legislative Action Foundation Considerations

3.5.1 Outdated terminology

Outdated terminology in existing 9-1-1 legislation is proving to be a roadblock to the implementation of NG9-1-1 in states across the country. Definitions of outdated terminology prove to be even larger roadblocks when specific technologies referenced in definitions represent a snapshot of time that will soon be outdated, like E911 and enhanced 9-1-1. It is suggested that all statutory definitions be amended to be technology neutral and “timeless” so that regulatory overhauls are not required each time a new technology is introduced. NG9-1-1 requests for help will likely include data requests like texts, photographs and videos that come from devices other than traditional telephones, so even the use of the term “call” can be limiting. It is important for Iowa’s 9-1-1 Statutes to be technology neutral and include a broad definitions for communications that could be used to request 9-1-1 service.

Kimball recommends adding a strong definition of 9-1-1 that covers all potential technologies and removing those technology specific definitions that will not require individual statutory treatment in the NG9-1-1 environment. A

general definition of 9-1-1 service provider should be established instead of limiting the types of service providers by calling out individual providers by technology, which is how the Iowa Statute is currently structured. All references to older technologies and their components should be removed from definitions so that all definitions could apply to any technology. Once the 9-1-1 system transitions and is operating over a statewide ESInet, selective routers will no longer be used to route 9-1-1 calls and the type of technology that sends an emergency request will not matter in the NG9-1-1 environment, so references to these system components should be eliminated from the statute.

The definition of "Public Safety Answering Point" should not limit a PSAP to a facility and should allow for virtual PSAPs that will allow 9-1-1 calls to be answered anywhere IP access to an ESInet is available once an authorized person logs in with the proper user ID and password. This definition should also be carefully crafted to either include or exclude secondary PSAPs depending on the use of the word throughout the chapter.

Make sure statute is broad enough to allow authorized sharing of automated data sources (e.g. telematics, health sensors) with PSAPs and other emergency response agencies. Allow these new services to share the network and access the 9-1-1 system. Allow for non-location based routing and the sharing of IP networks to route calls for other public services such as poison control and other N-1-1 numbers.

3.5.2 Confidentiality

The legacy 9-1-1 system is dedicated, closed and has a single purpose. The information delivered over the system is limited and is generally stored in a single, restricted location. In contrast, NG9-1-1 is a shared system with the potential to be just one part of a network shared with other public safety services and agencies. There will be an influx of the amount and type of data shared in the NG9-1-1 environment. Video, pictures, telematics and medical information are a few of the new data types that will be shared on the NG9-1-1 network. Much of this data will reside in the network rather than localized databases. It will also be important for call takers to access shared information at remote answering locations (virtual PSAPs). Access controls and data rights management will be used to limit access to authorized personnel.[4]

Not only will this data be useful in emergency situations, but the aggregated data will allow governmental entities to research and analyze trends in emergency response in order to improve it. It will be important Iowa's 9-1-1 statute allow for this analysis of aggregate data while protecting sensitive information that is specific to a particular emergency. Confidentiality provisions should not limit the use of these new types of data in emergency situations.

NG9-1-1 applications will allow for the sharing of data from all kinds of devices such as medical monitors and automotive telematics. These new types of data have the potential to improve emergency response and should be readily available to emergency response agencies during real time emergency response and not limited by confidentiality provisions.

[4] NENA, Next Generation 9-1-1 Transition Policy Implementation Handbook, 18.

3.5.3 Liability

NG9-1-1 involves the complex delivery of 9-1-1 calls potentially involving many entities and vendors that deliver individual components of 9-1-1 service at any point in the call process. It is important that all players in NG9-1-1 systems are assured that their good faith efforts to deliver 9-1-1 service will not expose them to liability. Specifically providing all potential players liability protection will cause more entities to participate in the migration to NG9-1-1. Lack of legal clarity on the issue of liability can lead to significant issues, including delays in provisioning critical NG9-1-1 services.

While Federal Laws have addressed liability, those provisions are still based on the liability protections that are provisioned in state statute. In 2008, Congress passed the New and Emerging Technologies 911 Improvement Act of 2008 (Net 911 Act).7 Section 201(a) of the NET 911 Act extends state-law liability protection afforded local exchange companies to all communications services that are required by the FCC to provide 9-1-1/E9-1-1. Additionally, the Act extends liability protection to new types of service enabled by NG9-1-1 where there is state 9-1-1 liability protection. The NG9-1-1 Advancement Act of 2012 went further to extend immunity from liability to NG9-1-1 service providers specifically and to PSAPs; however, it is still important to provide for liability protection within state statute.

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SUMMARY OF RECOMMENDATIONS

- Kimball recommends a network architecture that will provide statewide Core Services to any 9-1-1 controller environment. Should an area have an NG911 compliant controller of their choosing and not want to use the state-provided CPE Controllers, the state must have a set of specifications that the entities controller and network interconnection must meet to receive service from the Core. Kimball finds that providing these types of alternatives alleviates criticism from those not acceptable to the Statewide provided system.
- Kimball recommends the State of Iowa 911 Program office move forward with Design Option 1 (Figure 8) to prepare an ESInet backbone for statewide connectivity, over a network with the built-in capacity to handle text, video, social media, telematics, and future technologies as they are introduced.
- Although bandwidth requirements for FirstNet have not been clearly defined, it is expected they will likely align with NG9-1-1 Design Option 1. The state should allocate additional bandwidth for FirstNet applications accordingly.
- An incremental deployment strategy based on LATA boundaries and population counts is recommended to reduce dual network costs associated with the migration.
- The ESInet needs to be designed to meet or exceed NENA i3 technical standards. Kimball would also recommend that this network be constructed of diverse fiber networks from redundant providers and their negotiated facilities wherever feasible. It is important that the State continue to provide leadership and move forward with their vision of utilizing IP-based networks to interconnect Iowa's Public Safety system.
- A desirable role for the state is to continue and perhaps expand its support of consolidation efforts and activities by preparing and releasing RFPs for equipment that could then be acquired by PSAPs and public safety agencies. In addition to radios, Controllers, CPE equipment, NG9-1-1 consultant firms could also be added to the state schedule, to pre-qualify and simplify the process for obtaining consulting services.
- Kimball recommends that the State keep the $200,000 physical consolidation grants that are currently in place to pay for the operational transition costs of an agency that is consolidating into another agency. The State intends to pay for network transition costs. Stakeholder comments on this subject ranged from mildly positive to strongly, but generally noted that anything the state mandates should be fully funded.
- Kimball strongly encourages all PSAPs and County GIS Departments across the State to continue to perform maintenance on all data layers and strive for a minimum 98% accuracy percentage across all databases as defined by NENA standards. It is also recommended that the State consider providing funding to those counties who have data "gaps" or low accuracy percentages for research and development, as well as staff augmentation and training, to improve the quality of their data.
- Kimball recommends that any funding structure that is adopted is based on system costs and that any decrease in distributions would be paired with a shift in cost responsibility so that a new funding structure would not create a shortage.
- In order to allocate the costs for the network, core services and CPE, Kimball recommends that the percentage of emergency communications service surcharge to be disbursed return to the statutorily set amount of forty-six percent. Funds from the wireline E911 service surcharge should continue to be remitted to E911 service operating authorities for their purposes.
- Kimball recommends that Iowa establish a governing board as the coordinating entity for the State. The governing board should be made up of PSAP representatives and other 9-1-1 stakeholders in the State. The establishment of the governing board should occur through a consensus process of stakeholders that results in a structure, processes and assigned roles and responsibilities in the form of a charter, rules or bylaws.

- On the legislative front, Kimball recommends adding a strong definition of 9-1-1 that covers all potential technologies and removing those technology specific definitions that will not require individual statutory treatment in the NG9-1-1 environment. A general definition of 9-1-1 service provider should be established instead of limiting the types of service providers by calling out individual providers by technology, which is how the Iowa Statute is currently structured. All references to older technologies and their components should be removed from definitions so that all definitions could apply to any technology.
- Kimball recommends that the state-level 9-1-1 coordinating entity be given the statutory authority to coordinate the system with related state entities that have authority for GIS, public safety, radio systems and public safety networks such as FirstNet because all of these systems will require the need to interconnect and interoperate in the NG9-1-1 environment.