ASSURE911

Next Generation 9-1-1 Access Plan

Developed by

Assure911.net, LLC

For

Counties of Southern Illinois

Emergency Telephone Services Boards

NG-911, Inc.

ILLINOIS INSTITUTE OF TECHNOLOGY

NG-911, Inc.
Next Generation 911
Systems, Consulting, Engineering

clearwave

December 14, 2012

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Table of Contents

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1.0 EXECUTIVE SUMMARY

Sixteen (16) Emergency Telephone System Boards (ETSBs) in southern Illinois have banded together for the purpose of implementing a Regional Next Generation 9-1-1 (NG9-1-1) system. For planning purposes, the Counties of Southern Illinois (CSI) are operating through inter-governmental agreements and by-laws as a not-for-profit 501(c) 3 organization. This document is complementary to the CSI Design Plan document (Assure911.net-DG-CSI/NG911-001), and the CSI Test Plan Document (Assure911-NG911CSI-STP-001.)

This document is being updated December, 2012 ~~at the request of the Illinois Commission (ICC)~~ in conjunction with the related documentation to address NG-911, Inc, becoming the 9-1-1 SSP for the Counties of Southern Illinois and changes from meetings with the ICC and Access Carriers.

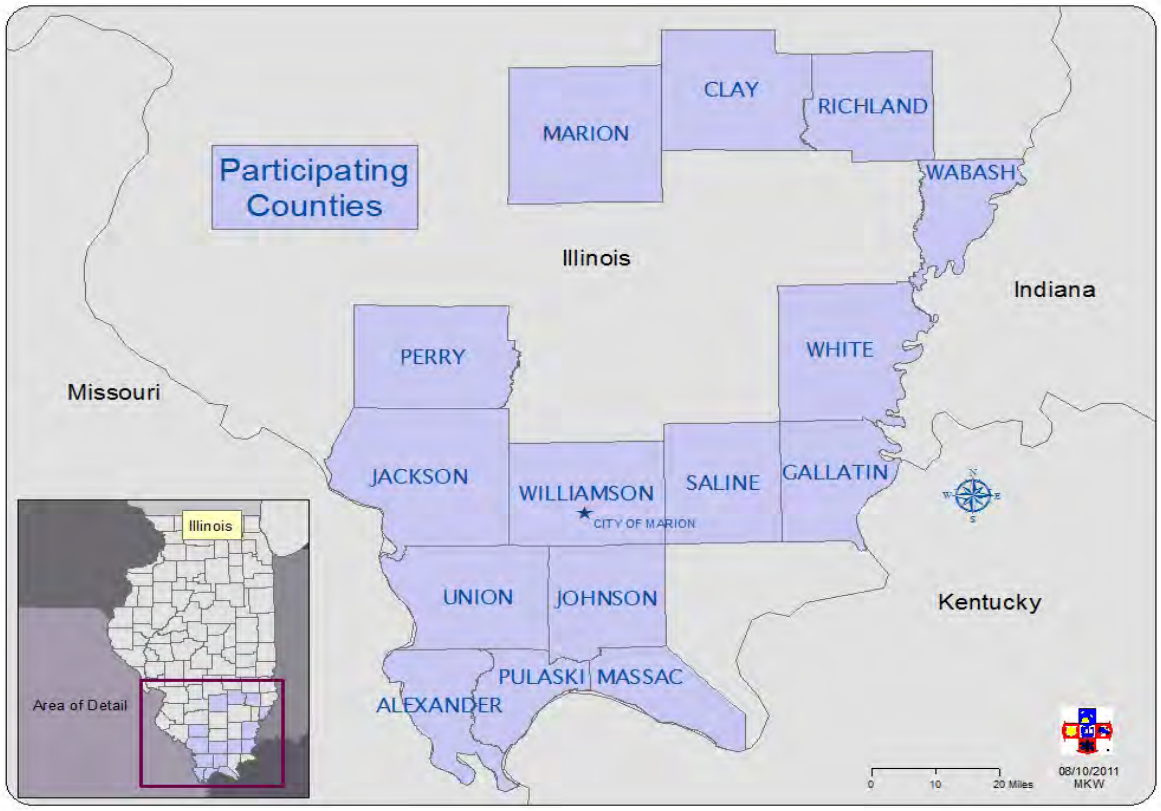
The cooperation of the Access Carrier Service Providers is essential. Joint planning meetings have been held since June 8, 2011 to establish the relationships and to exchange data necessary to engineer the network. Dual network access is required until after successful cutover of the ESInet. The CSI ETSBs plan to cut to live service after successful testing both at the Illinois Institute of Technology's Real Time Communications Laboratory (IIT RTCL) followed by full field testing in southern Illinois led by NG-911, Inc.

ICC Pilot Plan approval will trigger the migration of 9-1-1 to the new, fully redundant architecture for service.

The access strategy assumes that the 9-1-1 SSP and the CSI entities are approved to build and implement their NG 9-1-1 network. Components of the ESInet will reside in two (2) diverse, fully redundant Data Centers over 50 miles apart in Harrisburg and Murphysboro, Illinois.

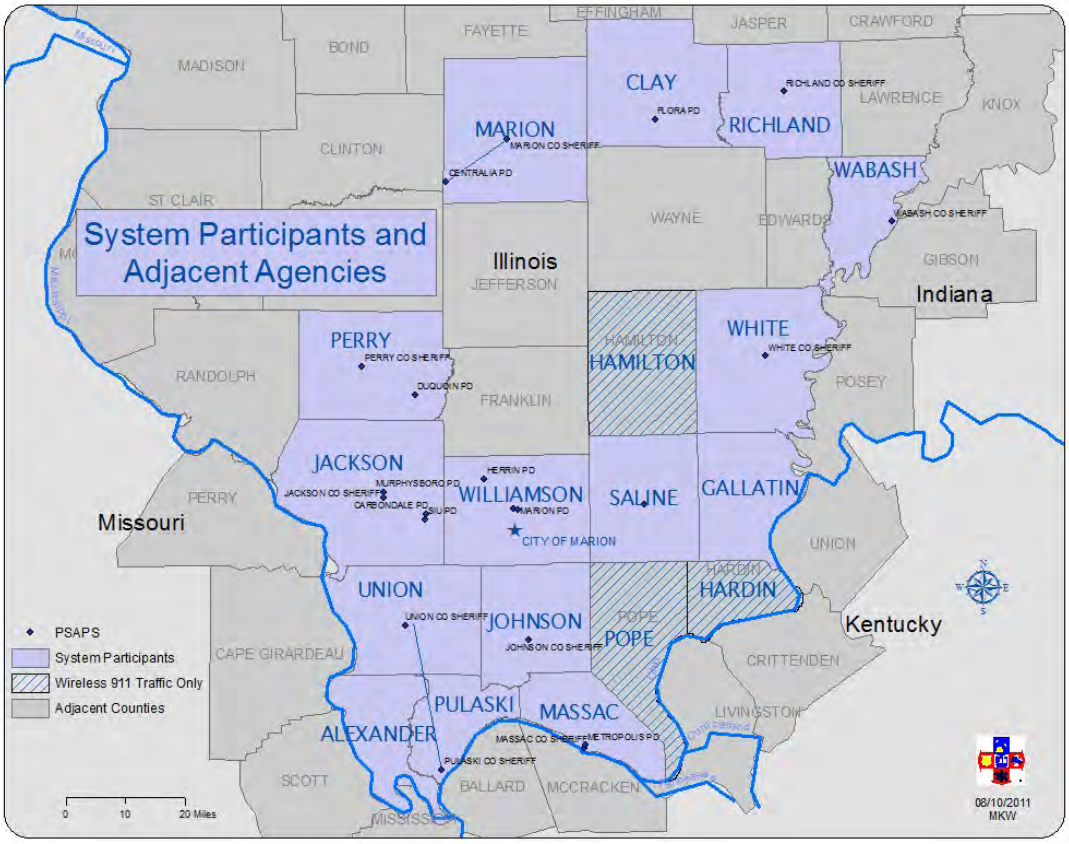
Access Carriers were contacted and invited to connect to the CSI footprint which was described using the following information. There is some overlap between this Access Plan and the Design Plan. The editors chose to do this to avoid the disruption of going back and forth between the documents to gain a complete understanding of the issues related to Access.

Figure 1.1 – Participating Counties of Southern Illinois Map



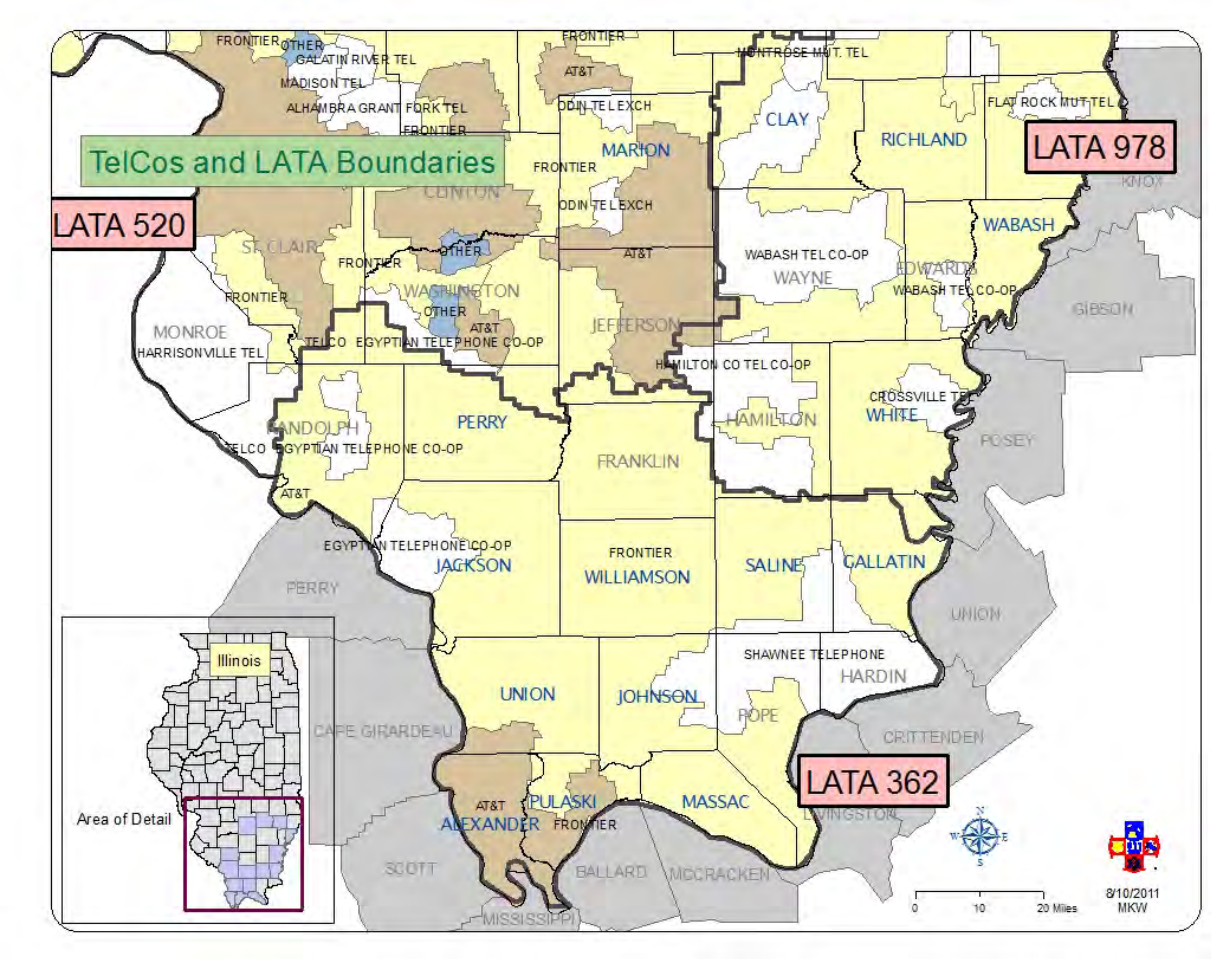
The Counties of Illinois include Alexander, Clay, Gallatin, Jackson, Johnson, Marion, Massac, Perry, Pulaski, Saline, Union, Richland, Wabash, White, and Williamson and the one municipality in the Plan, the City of Marion.

Figure 1.2 – Wireless Carriers



Wireless Carriers are requested to terminate their calls through the Murphysboro and Harrisburg Data Centers for all PSAPs in the footprint including Hamilton, Hardin and Pope Counties. Where Access Carriers have cross boundary originating offices, the Design Plan allows for acceptance of the off-network boundary calls into the ESInet to be dynamically delivered to PSAPs in the surrounding counties by agreement and the use of Legacy PSAP Gateway (LPG) Extension Gateway EG modules of the ESInet. This will be transparent to the callers and the Public Safety agencies adjacent to the ESInet. The Design Plan document shows how this will be accomplished.

Figure 1.3 - Map of Incumbent Exchange Carriers and the Regional Local Exchange Carriers



The Exchange Carriers who provide landline service in the CSI ETSB territory can be viewed on the Exchange Carrier map as shown in Figure 1.3 (Plan Exhibit 2). The key to the figure above is: AT&T-tan; Frontier - yellow; Regional Local Exchange Carriers – white with labels; LATA – Local Access Transport Area – boundaries in bold black with LATA numbers in pink.

Meetings were held starting in June 2011 to inform the Carriers of the plan, and gain their cooperation and participation in the Planning, Engineering, Design, Provisioning, Implementation, Testing, Maintenance, Monitoring and Cutover processes. Meetings have included representatives from Wireline, Wireless, VoIP and CLEC Carriers. The ICC staff hosted a meeting with the 9-1-1 SSP, CSI representatives and representatives of selected Access Carriers on October 31, 2012. ~~The updates to this document are reflect the open issues pending before the ICC and ICC staff with respect to NG9-1-1 and the Pilot Project. Very specifically, the staff asked questions about how the Access Carriers plan to connect to the NG9-1-1 network.~~ The 9-1-1 SSP and members of CSI have sought to meet directly and individually with Carriers within the CSI footprint. Each carrier is entitled to a certain amount of confidentiality, and thus a general summary can be included in this document, but specific provisioning and engineering details may be held in confidence since any of the Carriers are competitors. Data Exchange is but one step of the Carrier relationship. Data sharing facilitates:

1. Optimization of Physical and Logical Routes
2. Confirm Ordering Process
3. First Installation

4. Subsequent Orders Released, Circuits Installed, Tested, Accepted, Billed
5. Trial with IIT Lab Testing followed by CSI Field Testing resulting in Cutover Ready Transition
6. Documented results for the ICC
7. Exchange of Service Level Agreements and Penalties
8. Contract Pricing,
9. Plan to convert to Live Service.

The major purposes of the original and subsequent meetings were to gather data necessary to complete the final Network Design. The final Design uses engineering information about the Access Carriers to size the trunks and facilities bringing traffic to the ESInet based on engineering guidelines for Quality of Service parameters and P.01 Grade of Service.

In 2011, the National Emergency Numbering Association (NENA) released their ESInet Design for NG9-1-1 draft document *NENA 08-506 Version 1, August 16, 2011.* Where appropriate, references are made to the NENA text, diagrams and best practices. The CSI Project Access and Design Plans were prepared ahead of the NENA Design document and the principles guiding the NENA work are included in these documents. See Plan Exhibit 12 for the NENA References.

The following NENA quote is equally important to Design and Access Planning. Access is part of the 9-1-1 network design since calls start with users and go from end to end.

NENA: *"Future Path Plan Criteria for Technical Evolution"*

"In present and future applications of all technologies used for 9-1-1 call and data delivery, it is a requirement to maintain the same level or improve on the reliability and service characteristics inherent in present 9-1-1 system design.

New methods or solutions for current and future service needs and options should meet the criteria below. This inherently requires knowledge of current 9-1-1 system design factors and concepts, in order to evaluate new proposed methods or solutions against the Path Plan criteria.

Criteria to meet the Definition/Requirement:

1. *Reliability/dependability as governed by NENA's technical standards and other generally accepted base characteristics of E9-1-1 service.*
2. *Service parity for all potential 9-1-1 callers.*
3. *Least complicated system design that results in fewest components to achieve needs (simplicity, maintainable).*
4. *Maximum probabilities for call and data delivery with least cost approach.*
5. *Documented procedures, practices, and processes to ensure adequate implementation and ongoing maintenance for 9-1-1 systems.*

This basic technical policy is a guideline to focus technical development work on maintaining fundamental characteristics of E9-1-1 service by anyone providing equipment, software, or services."

CSI fully supports the NENA requirements with respect to Access and has shared work in progress with Access Carriers and challenges related to Access to improve the requirements in place today.

2.0 ACCESS PROJECT OVERVIEW

The Access Carriers delivering 9-1-1 calls to the 9-1-1 SSP and the CSI ETSBs were identified based on PSAP records. Today, carriers access the 9-1-1 network via Legacy Trunking: Multifrequency (MF) signaling, Central Automatic Message Accounting (CAMA) signaling, ISDN Primary Rate (ISDN PRI), or Signaling System Seven (SS7). Trunking is aggregated at Selective Routers (SRs) and forwarded to Public Safety Agencies for receipt and processing. In the future, calls will be routed from each Access Carrier's originating office to the new Next Generation 9-1-1 network as described in the CSI Network Design document.

The CSI NG9-1-1 network Design Plan conforms to the NENA Standards and access will come from anywhere, anytime, and any device capable of delivering emergency 9-1-1 queries via voice, text or video. This document formally outlines CSI's preferred access methodology which conforms to the NENA standards. Access Options have been shared with the Carriers: SIP Trunking which is a new option is the preferred method of access interface. Legacy Options are allowable and include using the same legacy trunk originating approach being used today, or choosing a better option which improves call set up time and connectivity with the CSI Design Plan for the ESInet.

The following sections of this document describe the access options in greater detail. The 9-1-1 SSP and CSI acknowledge there are costs associated with change. The 9-1-1 SSP and CSI request the ICC to assist with the migration strategy and to require the Access Carriers within the CSI network footprint to migrate their 9-1-1 calls to the new CSI ESInet configuration in a timely and expedient manner to provide for improvements in access to Public Safety for the residents of the counties and municipalities and travelers passing through the area.

2.1 Project Plan

Our Project Plan is to have Access trunking connected to two (2) redundant Data Centers connected to 21 PSAPs with a combined 47 answering positions for fifteen (15) counties and one (1) major municipality in two Phases. Phase 1 is proposed for Cutover no later than August 2012 and Phase 2 to follow as early as the end of 2012 and as late as August 2013.

In the October 31, 2012 ICC Staff sponsored meeting, some carriers asked that they be allowed to connect through the Selective Routers. The NENA Standards support this as part of the Transition Plan. The issues that arise are call set-up time and costs. In addition there are concerns that the Selective Routers which are a part of the network today are a Single Point of Failure (SPOF) and by leaving them in the architecture, the diversity of the NG9-1-1 network architecture is thwarted. Carriers and Public Safety agencies pay Selective Router costs. If the Selective Routers are maintained in the architecture, the cost reduction benefits are delayed, and finally most of the new services cannot be accessed end to end if the SRs are in the call flow, including services such as texting. The Plan nevertheless is being modified for the Pilot Project to reflect leaving the Selective Routers in place for Carriers who do not wish to provision access to the 2 CSI ETSB Data Centers.

2.2 Access Carriers

CSI's ETSBs have been actively hosting meetings to provide education through presentations and engage in interactive dialog with the Access Carriers, Wireline, Wireless, VoIP and CLEC. This Plan addresses the terminating 9-1-1 traffic to the two (2) diverse Data Centers. The Design Plan reflects regulatory, technical and operational requirements. See Attachment 1 for a list of known Access Carriers and their representatives by type of Carrier.

2.3 Service Quality and Benefits

The Commission holds the CSI ETSBs responsible to ensure that the public will have at least the same quality of service as is now being provided by Frontier, AT&T and ICTC in their Selective Routers (SRs). It is the CSI ETSBs' intention to provide the citizens with a significantly higher level of service than they enjoy today. The goal is to respond more efficiently and more effectively with emergency services within CSI's communities. Lives will be saved and costs will be manageable under the new architecture. The 9-1-1 SSP and CSI plan to describe and document the service quality they provide during the Pilot Project and beyond.

2.4 Pilot Project

The CSI ETSBs realize there are many lessons to be learned from the Illinois Pilot Project. This is an opportunity to partner with the Access Carriers regardless of their competitive position. Many Access Carriers provided their ideas and recommendations to make this a winning solution for everyone, to serve as a role model for cooperation and measureable results, and some carriers agreed to join the CSI ETSBs on this historic journey. The Access Carriers' feedback helped to shape the Access and Design Plans. Our application provides an exemplary solution which will be a part of an organic network of ESInets into the future, connecting the CSI ETSBs to other states and other ESInets within Illinois seamlessly and efficiently. Questions that remain to be answered are open for several reasons:

- Costs – Carriers have asked for Cost Recovery for the Pilot Project and for the Transition.

- Pilot Project Goals versus Final Post-Pilot Goals – Carriers have open questions about the project: (a) will the access revert to the old network architecture after the Pilot; (b) how long do Carriers have to retain dual trunking to the embedded legacy Selective Routers and to the 2 new CSI NG9-1-1 Data Centers; and (c), do the Carriers have to connect their end offices to Murphysboro and Harrisburg, the CSI Data Centers.

- The ICC staff hosted meetings and suggested that the 9-1-1 SSP consider leaving the Selective Router Trunks in place to the Murphysboro and Harrisburg Data Centers for the duration of the Pilot Project. The request included the SSP to communicate directly with the Carriers to ascertain what facilities are available for connectivity to the Data Centers.

- Authority to Operate – Carriers have asked for proof that CSI has the Authority to Operate as a 9-1-1 SSP before making a commitment of time and resources. As of December 2012, CSI has contracted with NG-911, Inc. to become the 9-1-1 SSP.

- Non-Disclosure – Carriers have, on a limited basis, asked for signed Non-Disclosure Agreements before proceeding. Meetings with the Carriers between the end of October 2012 and this update have been one on one

The ICC Staff recommended that CSI file the initial Pilot Project Plan application in separate documents; one document formally asking for the Design approval and the second document outlining what CSI requires from the Carriers. This document reflects the ideal Carrier requirements and is consistent with the NENA Standards approach which has been moving forward for more than five (5) years with full industry participation and open communications. This document is being updated based on ICC requests for additional information.

Carrier trunking details, traffic measurements, busy hours and busy season data and signaling preferences with facilities designation must be consistent with and complementary to having a good end-to-end Design. Sufficient data was obtained from existing PSAP records and from the PSAP traffic loads to design the internal ESInet for sufficient capacity, resiliency and security levels as to make the access portion of the traffic details less relevant for the final Design Plan to be valuable. The Access part of the design has to be done with Carriers.

In an ideal world, future forecasting of loads would have been helpful to ESInet engineering, but it was not essential. The 9-1-1 SSP and CSI's vendors and have sufficient experience and flexibility to be able to design and evolve the network based on actual data once the real traffic connects and flows into the new network. The initial design allows for all 47 PSAP positions to receive full motion voice and video calls at the same time. This almost never happens in the real world, so the design can withstand the full onslaught of demand expected for the next several years and most certainly handle the normal day to day calling from the 9-1-1 users across the CSI footprint. Because CSI has invested in Border Control Function (BCF) technology, per NENA standard recommendations, the demand that could come from unwanted Denial of Service (DoS) attacks is not going to harm the network with proper administration.

CSI is not consolidating their PSAP operations. On the contrary, the totality of the 47 positions will be available for any and all calls as opposed to the limited back up arrangements provided in today's network architecture, so the design and the standards provide better service for everyone.

The 9-1-1 SSP and CSI's design engineers have engineered the number of trunks terminating to the existing telco Selective Routers (SRs) based on data shared by CSI. The 9-1-1 SSP and CSI acknowledge the Access Carriers are providing P.01 grade of service today as required by Illinois Statute on their existing access and Selective Routing trunk groups, and thereby acknowledge until that an equal number of trunks to BOTH CSI Data Centers will be sufficient for the beginning of the NG 9-1-1 Pilot Project.

The difference with the NG 9-1-1 design is that Carriers are asked to connect using an equal number of trunk groups with an equal number of trunks per group to BOTH Data Centers and to balance the load in real time to BOTH sets of groups from EACH of their access end offices. This provides for diversity, redundancy and resiliency that is not possible with 9-1-1 in Southern Illinois today. There is no SR diversity today. There is no redundancy today. The CSI ESInet will be superior in every way to today's 9-1-1 experience.

To further reiterate: The residents of Southern Illinois today have all of their 9-1-1 calls going through a dedicated SR dependent on their originating central office locations. With dual and fully duplicated Data Centers, there will be 2 trunk paths required from EACH Access End Office to EACH of the Data Centers. If access to a single Data Center fails for any reason, the access trunking automatically, through translations, will route to the alternate Data Center. If one Data Center fails for any reason, the access load automatically will transfer fully to the alternate Data Center. If a route from both Data Centers to a designated PSAP fails for any reason, there is always one and as many as 21 PSAPs who will be pre-designated and capable of answering the 9-1-1 calls and dispatching to the correct agencies for the calls to be properly handled.

To achieve this design criteria and goal means cooperation and data sharing is essential with all Access Carriers and the CSI design and engineering managers and personnel. This is the new "normal" for NG 9-1-1 networks. Responsibility continues to be shared indefinitely for the success of 9-1-1.

The 9-1-1 SSP and Public Safety agencies are assuming a larger responsibility for call completion with NG 9-1-1. They have always been jointly responsible to provide the proper equipment and support at the PSAPs and to provide the methods and personnel trained to respond. In this new design, the sharing of assets across PSAPs reduces costs per PSAP and dramatically increases their ability to serve 9-1-1 user needs more efficiently and effectively.

As customers move rapidly away from landlines and are more mobile using the new devices, the call completion success for 9-1-1 has been going in the wrong direction. The traditional telco landline network can no longer evolve to accept the calls from the new access devices because that is not where the 9-1-1 customers are located. The new NG 9-1-1 networks are the best solution to bring 9-1-1 successfully to everyone who needs help from where they live work and play.

3.0 ACCESS PLAN DETAILS

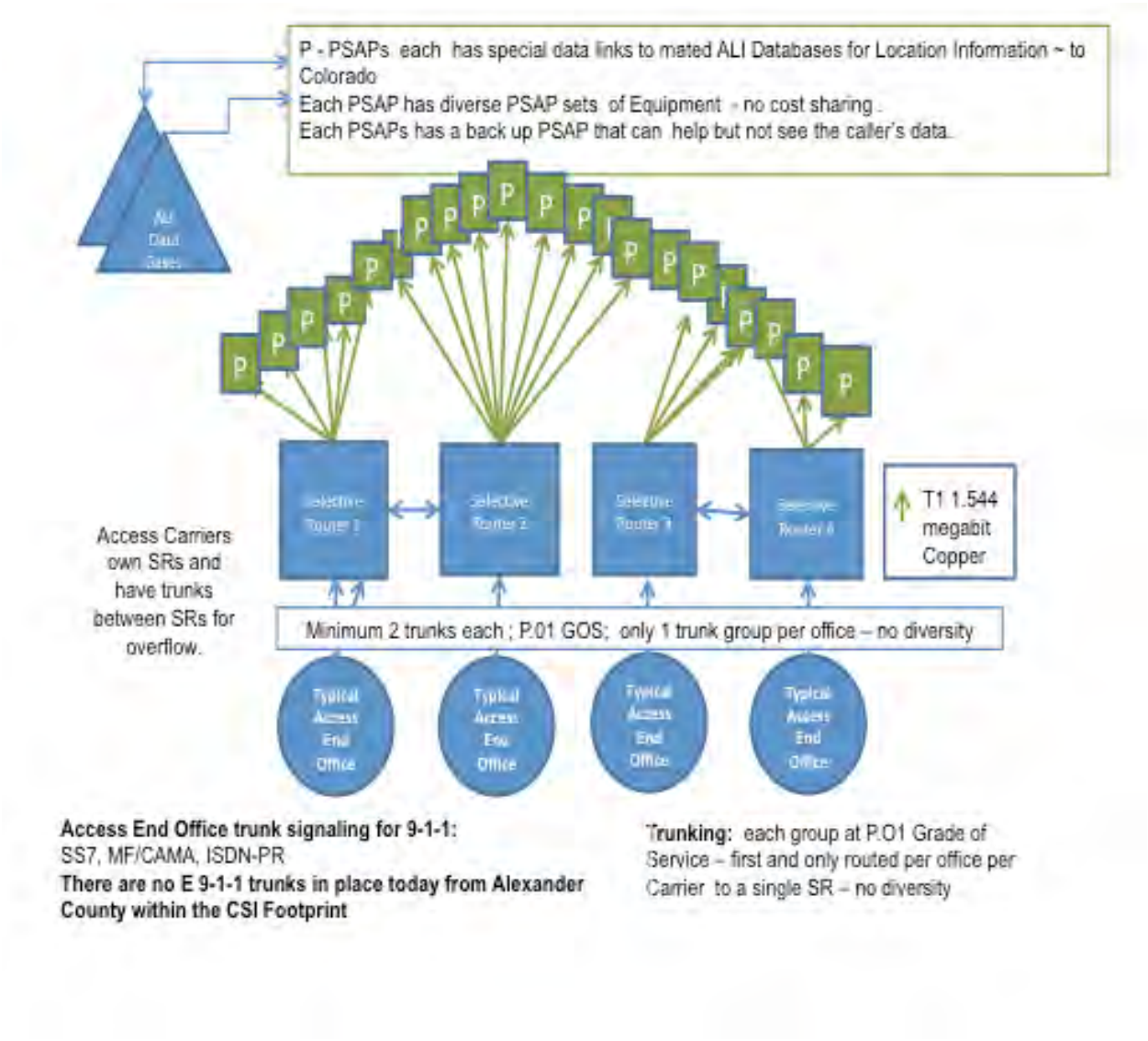


Figure 3.1 – Access Network for CSI 2011

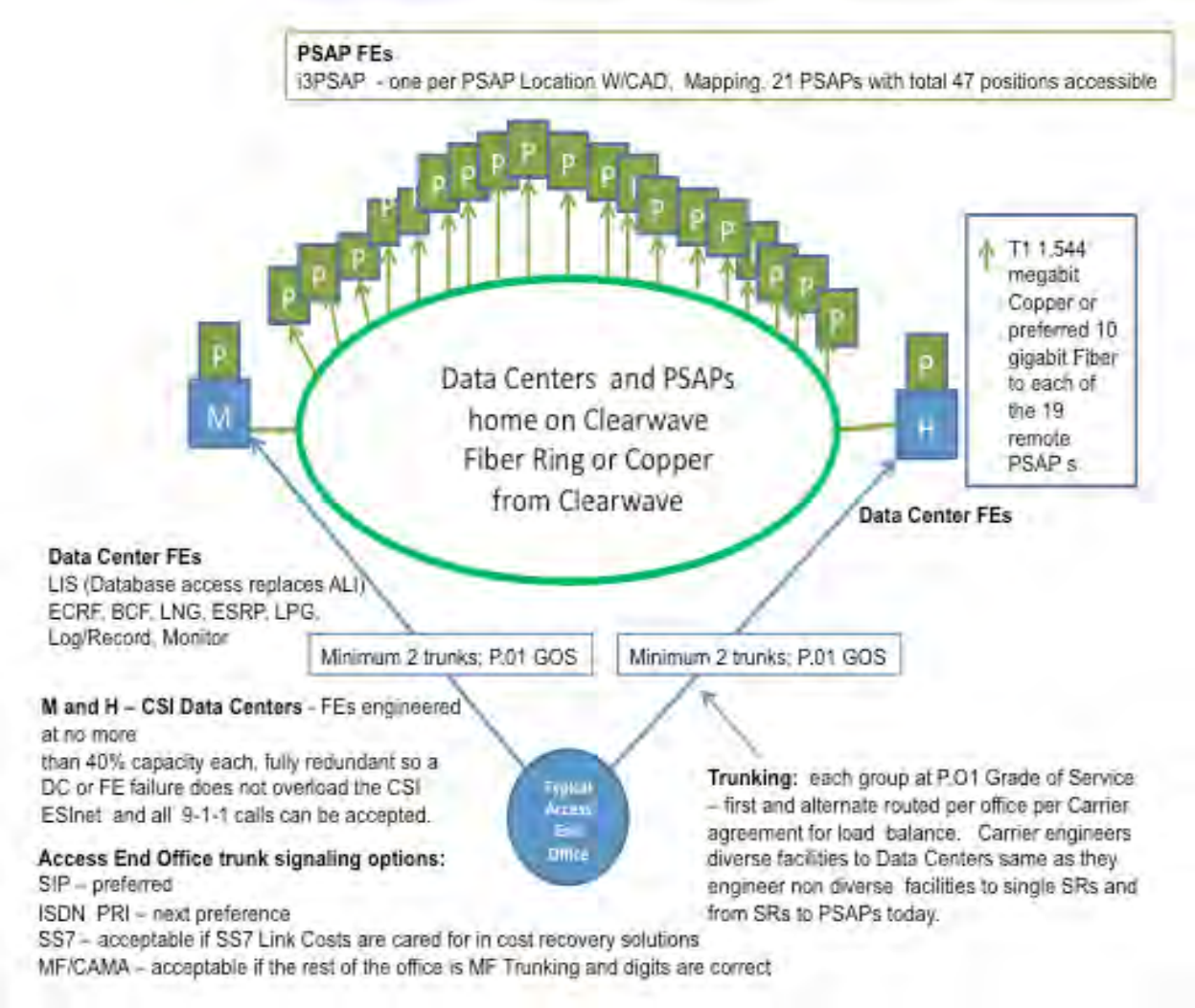


Figure 3.2 – Access Network for CSI Pilot Project with NG 9-1-1

There is an option for the Transition which retains the Selective Routers. While not the ideal option, given that the ICC and the Carriers, especially Carriers owning Landline Selective Routers have asked the 9-1-1 SSP and CSI to consider this option for the Pilot Project. Since landline calls are 20% or less of the 9-1-1 volume of total 9-1-1 calls in the CSI footprint, consideration is being given to negotiating trunking for the Cutover project and for the Pilot Project. The consortium was asked to assist because some Carriers indicated that they have no means to complete calls to Murphysboro and Harrisburg. Subsequent to those meetings, one-on-one meetings have been held with Clearwave, and Mediacom. They are providing options.

Facilities and Trunking Plans from Clearwave or Mediacom are possible from each of their own Soft Switches to the Harrisburg and Murphysboro Data Centers. They may decide to connect using SIP Trunking. This ~~is~~ would be a positive response and allow testing to begin shortly.

Frontier and AT&T are both preparing to bring Engineers into meetings to talk about doing the same for their offices routing directly and/or via their or each others' Selective Routers to the Data Centers. If they

choose to stay on Selective Routers in this Option, their customers may experience slower call set up. The 9-1-1 SSP considers this a competitive disadvantage for them but, it is up to the major carriers to decide how to route their own calls.

Clearwave and Mediacom each agreed in December 2012, to provide pricing to the 9-1-1 SSP to make facilities available to any and all Carriers they can reach and take the calls to Murphysboro and Harrisburg. In these cases, they are not companies with circuit switch technology. Clearwave is not interested in providing equipment for the Point of Interface (POI) to SONET and older circuit switched technology, so the originating Incumbent Carrier would have to make the POI connection either via existing collocation or via one of the parties extends facilities to the other. In the case of Mediacom, they will provide the routers to make the older circuit switched connection to their ethernet and/or MPLS POI connection over their fiber if they provide the access facilities. There are going to be gaps in this arrangement since footprints are not equally matched. A detailed engineering review will be done by the 9-1-1 SSP working with the Competitive Facilities Providers and the Incumbent Carrier(s). CLECs have partners who offer added facilities in the area and are the companies they work with to close the last mile(s) for their rings. Depending on the footprint and gaps, those options will be explored. Regional LECS have fiber partnerships in the area as well. For example, Shawnee has some fiber and Bluebird Networks has a growing fiber footprint in the area. The 9-1-1 SSP will bring options back and forth to the parties until an Access arrangement is agreed upon.

The NG9-1-1 network can accept 9-1-1 calls in a legacy fashion and/or on the latest technology via SIP interfaces. The primary issue of this discussion will be getting engineers to talk and share what is required to lay out the plans and get true costs. In all cases SLAs are required to demonstrate the commitment to Quality of Service and MOPs will be needed and escalation contacts need for 24 by 7 problem resolution.

4.0 BENEFITS

The primary benefits of NG 9-1-1 are location-based routing for increased accuracy, an IP-based architecture that leverages other public safety services the end-user may provide long term cost savings over PSTN 9-1-1 systems for better use of surcharge revenue, and dynamic back up and transfer capabilities which are more redundant, resilient and provide for better public safety.

- User Benefits during Pilot include:
  - Policy based alternate routing with new options.
- New policy based options include routing for:
  - Language preference of the caller and for type of technology in use,
  - Capabilities for persons with disability as required by law

Another Pilot benefit is that Callers can dial 9-1-1 in their own local jurisdiction or on behalf of someone in need of emergency services in other locations. For example, if a caller is aware of someone on the phone with them having a medical emergency, they can call 9-1-1 and their local PSAP will route the call outside their local emergency services network to another PSAP on the network. Benefits after the Pilot Plan are included in the Plan Narrative document.

4.1 Public Safety Agency Benefits

Public safety agencies will share the costs of the components of the next generation 9-1-1 network. The larger the pool of agencies in the network, the lower the unit cost for commonly shared equipment in the two (2) diverse Data Centers. The PSAPs will have less onsite equipment to own, operate and manage and to eventually become obsolete. Information Technology (IT) resources will become part of a shared resource pool. Expertise will be shared for the good of the network in terms of deployment.

With a more reliable and diverse network, the agencies will be able to support each other in new and unique ways, leveraging the language skills in one center for example, and supporting each other during peak loads or in times of major trauma in a local area.

- Time-of-day and day-of-week options for call handling can be maximized across the network.
- Training and business processes can be standardized.
- Common measurements can be used to manage work load and quality of service.
- Reports can be developed once and used by each of the county agencies which will lighten the work load and create efficiencies. This includes day to day operational reports, engineering reports and reports required by Commissions.
- The Public Safety Agencies will be receiving all of their calls (within engineered parameters), not just the ones that are supported by the technology of the Carriers with the Legacy Selective Routers.
- In the worst case scenario, if the whole CSI ESInet area was facing a devastating situation such as an earthquake or flood of a severe magnitude, calls could be routed and handled by other ESInet PSAPs.
- CSI has decided to leave their existing PSAPs in operation in their locations using the same personnel, seating and user interfaces. The Intergovernmental Agreements for back up PSAPs

that exist today will be honored. New Agreements will be created as required. In the event of a challenge to a primary and back up PSAP, the routing of the ESInet allows any other PSAP on the network to pick up the slack and all of the pertinent call origination information will flow to the new location.

The Public Safety agencies have purchased equipment to accept calls from legacy carrier networks and legacy and SIP signaling. The LNG, the Legacy Network Gateway, is needed until all access to the CSI NG 9-1-1 network is provided by SIP trunking. Two mated LNGs were purchased by CSI for the Pilot Project and installed in the Data Centers. Planning meetings with Carriers are necessary to develop forecasts and identify the LNG components to accept the carrier's types of facilities, number of exact trunks and signaling preferences. A Data Request has been outstanding to all known carriers since the summer of 2011. See Attachment 2. Some carriers have provided limited responses. CSI asks the Commission to facilitate the submission of all required information to allow the LNGs and ESRPs (Emergency Services Routing Proxy) to be equipped to fit the access demand. The ICC Staff meeting October 31, 2012 paved the way for one-on-one communication.

CSI purchased 2 mated Session Border Controllers to protect the NG 9-1-1 network from unwarranted cyber attacks. The equipment is covered in the Design Plan. The installation benefits the Public Service agencies and the Access Carriers and their originating 9-1-1 callers.

CSI has purchased new Mapping equipment which is consistent across the PSAPs. This will mean that a caller's identification can be seen by all CSI PSAP Operators anywhere in the CSI footprint and boundary issues that exist with each PSAP having independent mapping equipment today are eliminated thus making it easier to locate callers and save lives.

4.2 Benefits to Access Carriers

Each category of Access Carriers has a variable list of benefits and costs, especially interim costs while the network is in transition.

There will be dual access trunking required during the transition for testing until the cutover to the NG 9-1-1 network. Allocation of costs is a matter for study during the trial. The Access Plan provides options for diversity and reliability while reducing costs overall to a minimum in the long run.

Diversity options are limited today in the existing southern Illinois E9-1-1 architecture; post cutover customers will have diverse means to access the i3 NG 9-1-1 network to complete their calls. On the other hand, it will be incumbent upon the Access Carriers to build and ensure diverse access routing is available to the two diverse redundant CSI Data Centers ESInets during the Provisioning process.

Carriers who invest in Softswitch technology will be able to optimize their network access for their customers who want and need emergency services by providing end-to-end Session Initiation Protocol (SIP) connectivity to the new PSAPs. The SIP standard that is supported in the CSI project is described in "*SIPconnect 1.1 Technical Recommendation"* listed in the references at the end of this document. SIP is a preference for Access to the ESInet.

Newer SIP protocols mean caller location identification may become automatic depending on the device used by the caller when latitude and longitude are sent across the network.

Meetings with Access Carriers provide the forum to discuss the options and allow each of the access service providers to choose the path that works best for them to migrate the 9-1-1 calls to the new diverse CSI ETSB Data Centers to reach the PSAPs.

The crux of the network Design Plan at the practical detail level depends on how the Access Carrier's route their 9-1-1 calls to the new Data Centers for call completion.

Carriers with the Legacy Selective Routers (SRs) will ultimately be relieved of the duties to translate and manage their SRs. Frontier, AT&T and ICTC, as the local SR providers today in this architecture can eliminate trunking to up to 21 of the PSAP locations and route all of their calls to the two (2) Data Centers in Murphysboro and Harrisburg. Frontier already has trunking to the two (2) PSAPs which become Data center locations. AT&T has their trunking strategy defined and will create circuit order layout records using the SS7 Point Codes. Intrado is representing several Wireless and VoIP Access Carriers and will help their clients migrate to NG 9-1-1. Carriers in the CSI footprint are considering their options.

By the same token, Frontier, AT&T, ICTC and all other carriers who use the SRs will migrate their originating 9-1-1 calls to the new CSI Legacy Network Gateway (LNG) and SIP Gateway the Emergency Services Routing Proxy ESRP thus changing routing and trunking at each originating end office.

Eliminating the single Legacy SR from the access architecture eliminates a Single Point of Failure (SPOF) in today's call completion path. The SR locations are listed in the updated Design Plan.

A Session Border Controller (SBC) firewall will be installed in each of the Data Centers to protect the ESInet from Denial of Service Attacks, malicious or accidental attempts that could cause ESInet network overload.

There is one standard ESInet Design. The Access options will vary by Access Carrier and by the type of equipment each carrier has in each individual end office.

If an Access Carrier has a fiber ring, they may choose to bring their fiber directly into the CSI ETSB Data Centers to connect to the ESInet or they may route via diverse Copper T1/DS1 facilities to connect to the ESInet. The ESInet will use the Clearwave ring to reach the PSAPs at Cutover.

Cutover will take place in Phases and the Carriers have been invited to be actively involved with the Cutover Plans.

5.0 ACCESS ENGINEERING

Actual data from all of the participants is valuable to complete the engineering exercise. Structurally, the design is well understood. The standards are defined. The outstanding items that are critical to the complete access are understood.

The Network Design is flexible and scalable; it utilizes the Clearwave Communications Broadband Fiber Network Solution, and utilizes the NG-911, Inc. provided equipment which was designed and manufactured to meet the NENA i3 Standards.

The following information is an excerpt from the Design Plan document and the reason for showing segments again is to enhance the understanding of Access for NG 9-1-1.

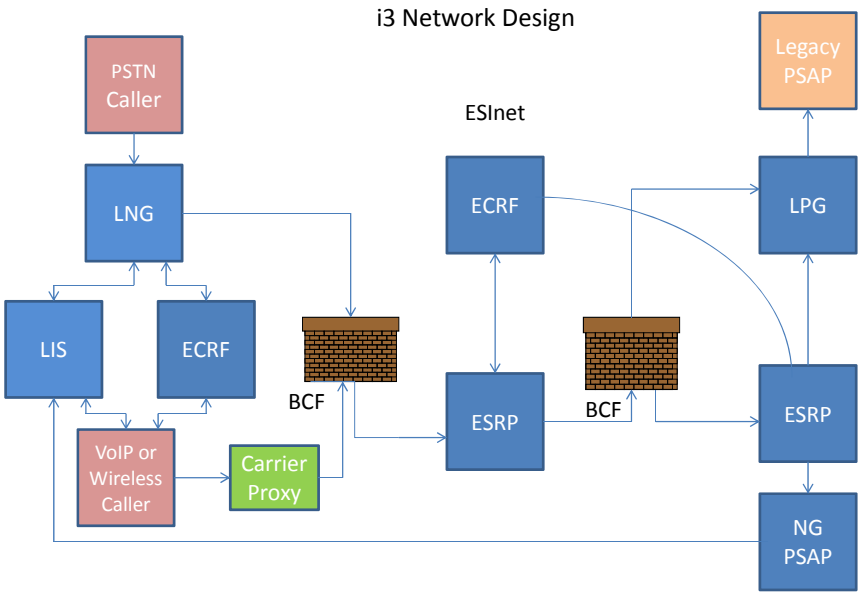


Figure 5.1 - NG 9-1-1 Call Flow

Note: Design Flow Courtesy of Brian Rosen, Neustar. The CSI Network has the same capabilities in both Data Centers for redundancy. The acronyms are explained in the text that follows. The blue boxes represent additional functional elements with the 13 NENA Standard architecture and design. The functional elements are repeated to show the flow. There is only a single ECRF and a single BCF, and a single ESRP for example in each of the Data Centers. For more details go to the Design Plan, Assure911.net-DG-CSI/NG911-001.

5.1 Definitions Important to the Access Plan

LNG and LPG – *Legacy Network Gateways* and *Legacy PSAP Gateways*
There are entry and exit points to and from the ESInet which will exist as long as there are non IP communications devices in the network. They are called Legacy Network Gateways and Legacy PSAP Gateways. Inside the ESInet the architecture uses IP protocol based communications.

LNG - the *Legacy Network Gateway* serves as the bridge between the existing originating networks and the ESInet. One means of interface to the LNG for transition purposes is the existing SR interface to the LNGs. This is an initial step to bring the CAMA/MF SS7 and ISDN PRI (Legacy Signaling protocols) interfaces to the ESInet. The LNG is always outside the ESInet. It can, and in the case of CSI, will reside in each of the dual Data Centers housing the redundant ESInet FEs in Harrisburg and Murphysboro. Note: A pair of LNGs could serve the whole state. The LNG routes via the ECRF, always coming through the BCFs. The LNG always uses the ESRP to route the calls. The LNG interworks location protocols and formats between the legacy network and the ESInet. The E2 interface (wireless) or internal LIS (replaces ALI Data for wireline) faces toward the Legacy Network. The LNG either supplies location-by-value in the SIP signaling, or may supply a location reference that resolves to itself using SIP or HELD protocol towards the ESInet. This is a permanent part of the NG 9-1-1 solution as long as legacy networks are deployed. The LNG is on the Access side of the network architecture.

LPG – the *Legacy PSAP Gateway* allows existing non upgraded PSAPs to connect to the ESInet. In the case of CSI, there will not be any Legacy PSAPs inside the network after Phase 2, but there will be adjacent Legacy PSAPs off net until all PSAPs are converted to NG PSAPs. The LPG has a full NG/SIP interface facing the ESInet and an SR/ALI interface facing the Legacy PSAP. No upgrades are needed at the neighboring Legacy PSAPs but the GIS must be compatible with Next Generation technology. In case of CSI there is an option under discussion to extend a piece of equipment called the EG, the Extended Gateway to the neighboring PSAP to hand off/transfer calls as needed. This will be refined within the Cutover Plan, refer to NG9-1-1/CSI Cutover Strategy, Assure911-NG911CSI-STP-002. The LPG is a temporary measure and is used for Egress until after the Selective Routers have been decommissioned and the neighboring agencies are upgraded to NG 9-1-1.

Addressing - The form of address is changing from MSAG to “LVF Valid”. LVF is the Location Validation Function. This change introduces a few new address elements, for example, the prefix for a street type. Addresses inside the NG9-1-1 standard systems are conformant to the new FGDC (Federal Geographic Data Committee) standards. Note: The Federal Geographic Data Committee (FGDC) is an interagency committee that promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis. This nationwide data publishing effort is known as the National Spatial Data Infrastructure (NSDI). The NSDI is a physical, organizational, and virtual network designed to enable the development and sharing of this nation's digital geographic information resources. FGDC activities are administered through the FGDC Secretariat, hosted by the U.S. Geological Survey.

The biggest change: are no allowances for local variations in addresses. All fields must be used as defined. That is why CSI has spent the last few years updating the addresses in their jurisdictions to conform to additional data fields. All addressing is based on GIS entries. If CSI changes the GIS, it changes everything and allows for flow through provisioning. The new form of address is the PIDF. PIDFs are XML (Extensible Mark-up Language) objects which can contain geographic or civic locations, which can be passed by value or reference. The PIDF is more or less the equivalent of an ALI record, but there is ultimately no requirement for a centralized ALI database. PIDFs are stored in a LIS and sent

with the call and passed around as XML objects. LISs are typically operated by access networks, or, in the case of the LNG, by the LNG operator. In the case of CSI, the LNG Operator is CSI.

LVF – the *Location Validation Function* is used by the LIS Operator to validate location before loading it into the LIS. Similar to MSAG validation, the LVF verifies that the location matches a known address within the 9-1-1 Authority's service area. It is like the ECRF, using the same protocols and same data. The LVF can validate to the street address not just address range. It can also validate to the building, floor, and unit (apartment, suite, etc.,) and room.

Multimedia – Multimedia means the PSAP, Bridge and Logger must handle multimedia the i3 way using standardized interfaces. Video requirements drive ESInet sizing requirements. Brian Rosen's Rule of Thumb: 2Mb/PSAP + 2Mb per Position. For CSI, Clearwave has made a commitment to provide 10Mb to each PSAP. As the PSAPs add positions this is an engineering requirement to augment the bandwidth proportionately.

5.2 Additional Data

NG9-1-1 is by definition Multimedia capable: Voice, text and video. In the beginning you may have only audio operational but eventually all media will flow. If a Carrier does not support video they do not have to deliver it. It is not an option for the NG PSAP to accept less than all media types when the caller is ready. It is assumed Video Relay will send video as soon as the PSAPs can handle it. Text standards are evolving.

Call data is supplied by service providers in the path and possibly the device itself, signaled with the call, by value or by reference. Contains: Service Provider Contact data, Subscriber data, Service data (Class of Service equivalent), and a Hook for device-specific data such as sensors, telematics etc.

Caller data is specific to the caller, (home, work or cell provide the same data). Can be signaled with the call or queried from a database. It contains: Contact Data, Emergency Contact Data, Medical Data, etc.

Location data is specific to the location of the call; two calls from the same location will have the same location data. An ECRF query with a special service URN yields a URI to the data. Contains: Building Owner/Tenant Contact information, Floor Plans, Alarm and Sensor data, Control Panel data and more.

Inside the PSAP Data - Further NENA development is underway to define standards between FEs inside a PSAP. These standards are built around a new data structure, the Emergency Incident Data Document (EIDD), which contains all of the information a PSAP, knows about an incident. An incident is a real world event, like a car crash or a burglary, which may have several 9-1-1 calls associated with it. The EIDD is used between FEs in a PSAP and between PSAPs to pass data about an incident.

Refer to NENA i3 Standards page 194 Figure 7-1 for a Diagram.

Dispatch - *There are no ESZ/ESNs in NG 9-1-1*. The PSAP queries the ECRF with the location of the caller and a "service URN" for the service they want: police fire, EMS, poison control, mountain rescue, coast guard, etc. Service areas will be driven by Polygons in the GIS. Adding new services and Polygons

is relatively easy. There are standard mechanisms to do Call Transfers or send data EIDD to the dispatched agencies.

CAD – There are new and expanded interfaces to CADs. The standards allow the call taker CAD exchange. Any call can be answered by any PSAP and all data to manage the call is included.

5.3 Summary

No one deserves a busy signal; triage is possible only if a PSAP call taker answers the call, gets the information from the caller and gives it to the first responders. By answering EVERY CALL, first responders will be able to effectively prioritize their limited resources. The call taker (and the caller) get no data from a call that is sent a "busy"; they have to answer each call to know if the call is from a bus driver with a bus full of kids about to fall off a barrier, or a random driver annoyed by the delay.

Not all systems will be converted at once, so MSAG and PIDF data are able to be exchanged and will co-exist. Conversion functions are possible with the new GIS system.

Security is a significant issue. i3 provides extensive security mechanisms, but they must be deployed and managed to be effective. There is a public key infrastructure that assigns secure credentials to each agency and employee. There is a single sign-on mechanism. Every protocol interaction should be encrypted.

There is a Test Call facility within the CSI deployed NG 9-1-1 standard architecture which allows a fully automated test by an end device. It includes a complete test of the signaling and media path.

Reference**:** NG 9-1-1 Call Flow – Text adapted from Brian Rosen's Presentation Slides from the October 4, 2011, IIT RTCL Conference, NG9-1-1 Tutorial in Wheaton Illinois. Refer to NENA i3 Standards page 194 Figure 7-1 for a Diagram.

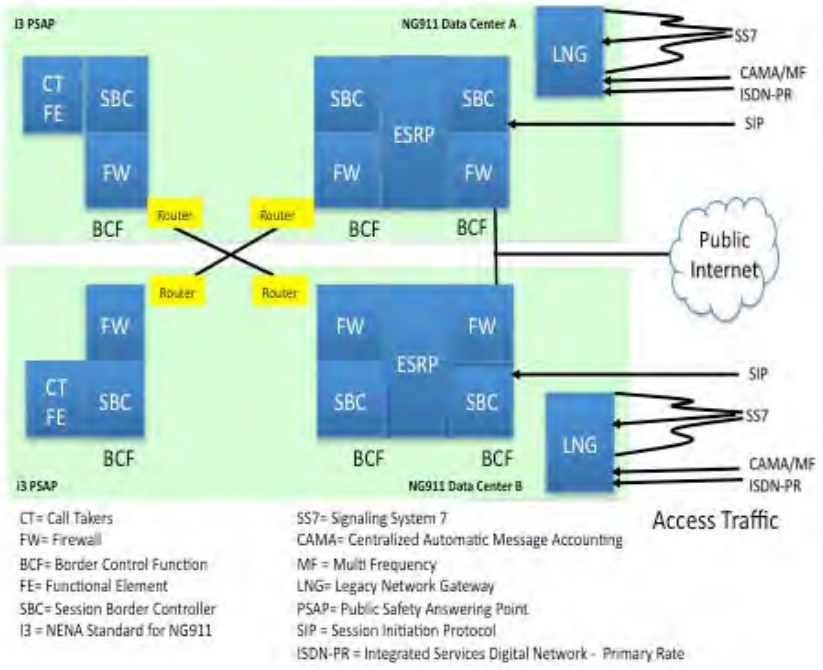


Figure 5.2 - Data Center Architecture – High Level (Diagram Note: The SBC will function for Legacy and SIP call types.)

9-1-1 Access Traffic will enter the ESInet. Trunk Options include legacy signaling and newer SIP protocols. A description of SIP signaling is included in this section of the document. The blue boxes in Figure 5.2 represent Functional Elements of the ESInet architecture. Access can also come from a SIP Softphone via the Public Internet. The Media Server allows voice to flow through the network.

Because two (2) of the CSI Data Centers are also PSAP locations, they each host one (1) of the i3 PSAPs per site. The remaining 19 i3 PSAPs have i3 NG9-1-1 equipment installations planned for their existing telephone and/or radio equipment rooms.

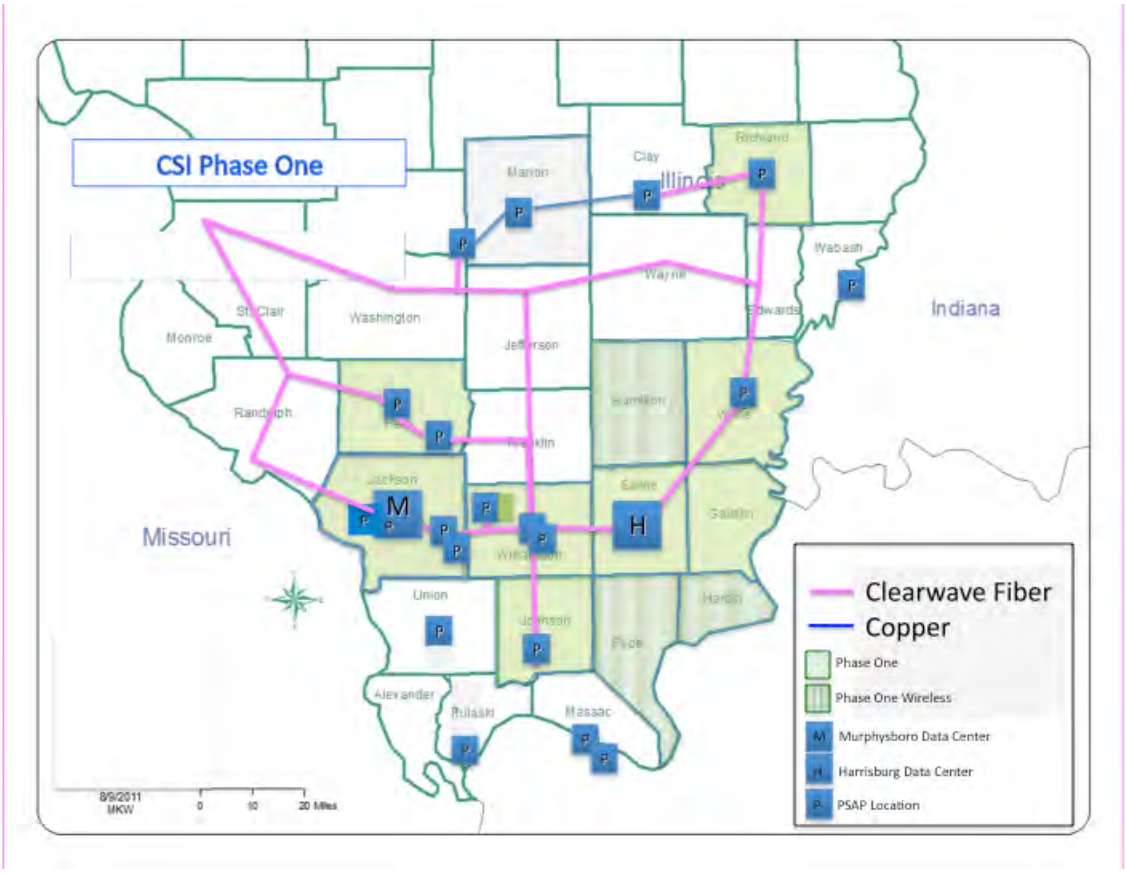


Figure 5.3 – Phase One Map (Diagram Note: Changes to the underlying Clearwave Fiber are addressed in the Design Plan.)

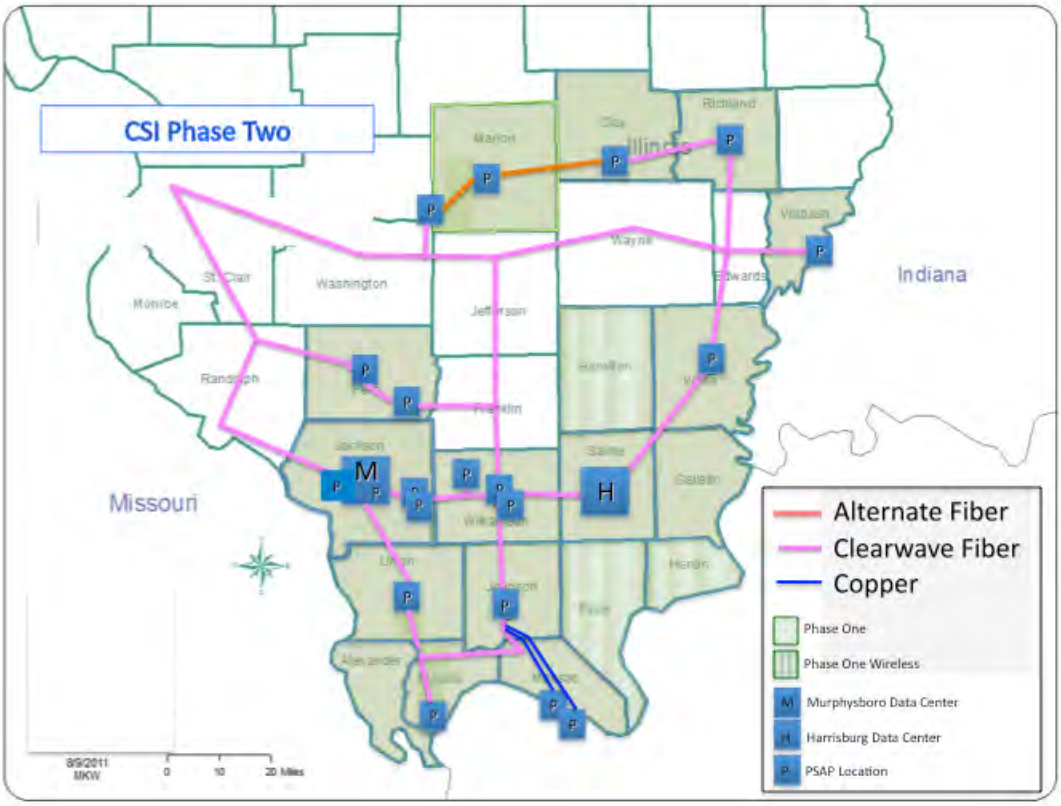


Figure 5.4 – Phase Two Map (Diagram Note: Changes to the underlying Clearwave Fiber are addressed in the Design Plan.)

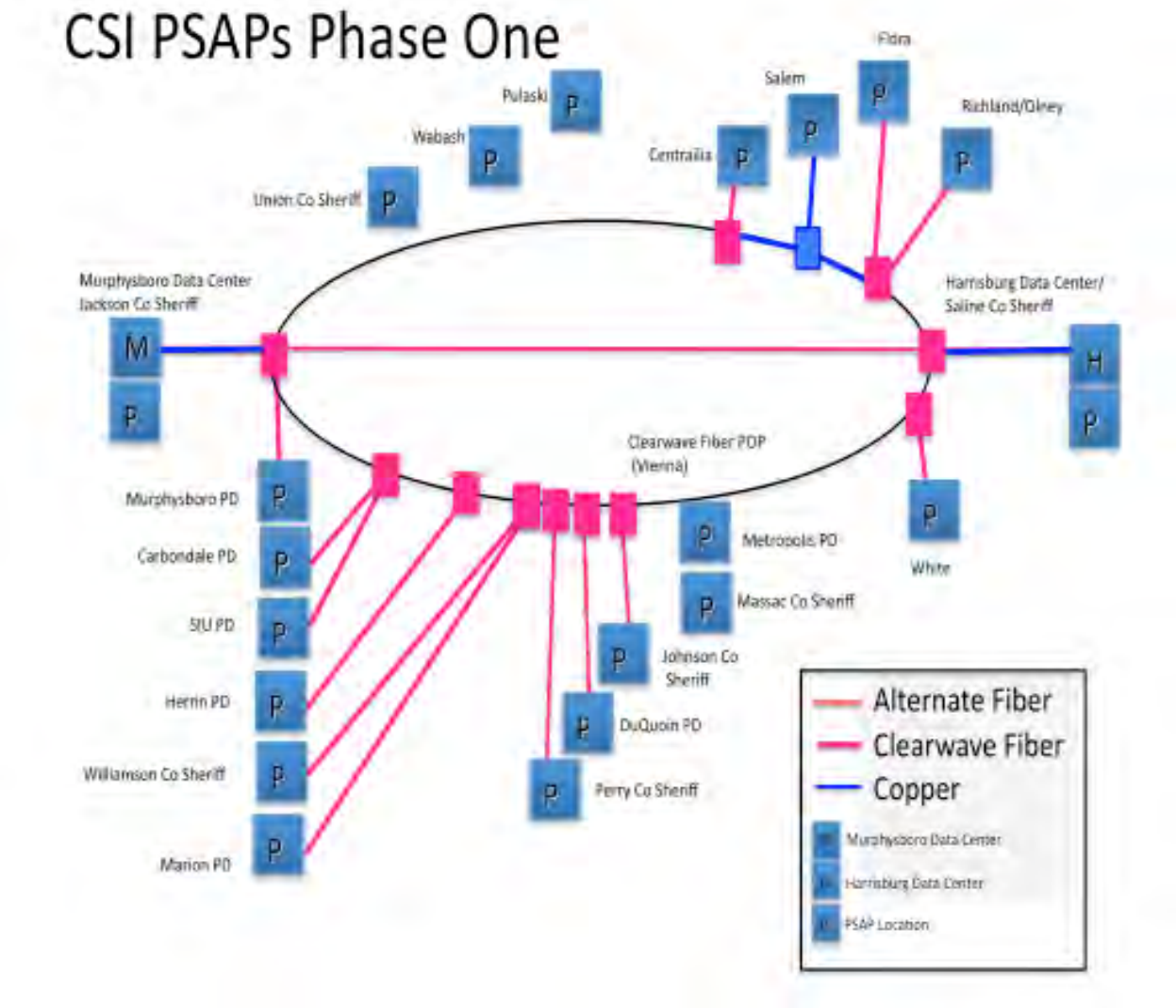


Figure 5.5 – Phase One PSAP Connectivity Detail (Diagram Note: Changes to the underlying Clearwave Fiber are addressed in the Design Plan.)

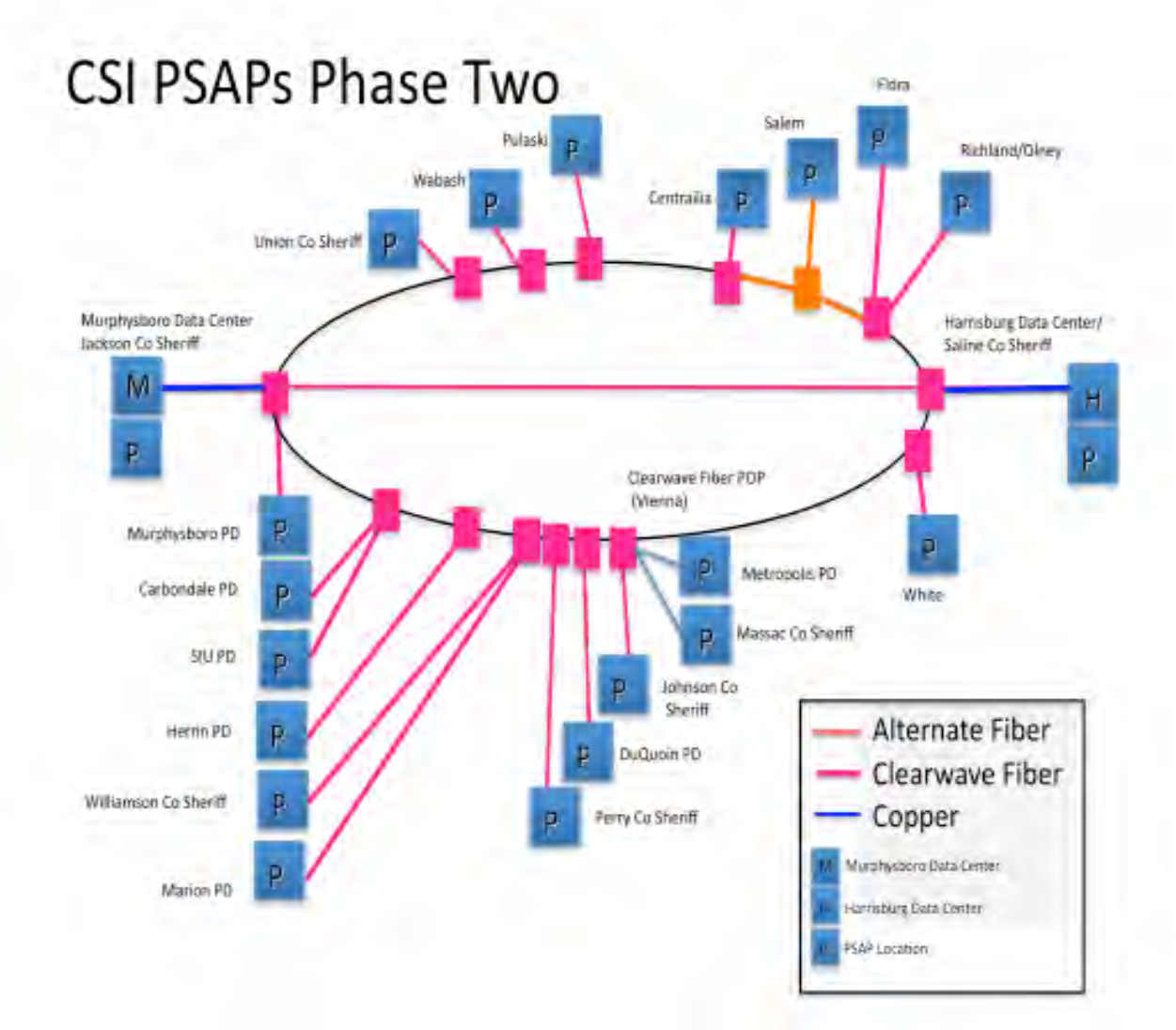


Figure 5.6 – Phase Two PSAP Connectivity Detail (Diagram Note: Changes to the underlying Clearwave Fiber are addressed in the Design Plan.)

5.4 ESInet – Carrier Access

CSI is meeting with Access Services providers across the originating serving area of the 16 ETSBs. Each set of Carriers have unique interfaces. The Access Carriers with embedded Selective Routers (SRs) today were the first to be approached with the design options.

In the traditional SR design in place today across much of Illinois today there are two diverse SR tandems in use for accepting 9-1-1 access calls. One SR is receiving calls and the other one is on standby in case the initial SR is not functioning. If a transfer is required to the secondary SR, it is usually done through

manual intervention activated by either telephone company translations changes at originating end offices or Network Management remote controls. The SRs are embedded within multifunctional Central Offices serving customers calls and providing access to the Public Switched Telephone Network (PSTN.) The 9-1-1 SR software allows the offices to become tandems for the 9-1-1 function, providing a gathering point for incoming calls and an emergency services translations service to assure calls are routed to the appropriate Public Safety Answering Points (PSAPs). The boundaries of the Central Offices and the PSAP are not the same.

The design of the existing 9-1-1 architecture has evolved with the changes in Wireless and VoIP with minor upgrades to the network. With the advent of newer technology, many types of originating devices in use today cannot access 9-1-1 or if they do, there are significant limits on their ability to transmit the calling location to the correct PSAP. When a call arrives at a specific PSAP, and the PSAP is not the correct location to handle the dispatch function, the call is transferred. When the transfer occurs much of the originating data that came with the call is non-transferrable and must be provided (often verbally or via email) to the next agency.

Today, 9-1-1 callers in the Pilot area do not have two redundant SRs protecting their emergency service. When the basic SR fails, emergency 9-1-1 service in the area served is completely disabled and the access providers may experience peak 9-1-1 traffic loads which may degrade their communications services. These peak loads may be caused by repeated ineffective attempts to complete calls. Retries by emergency callers unable to secure the emergency assistance do not go through until Lock Boxes at Access Carrier Central Offices (Wireline) are manned by Police across the calling area. Note: there is not a Lock Box equivalent for VoIP, CLEC or Wireless Callers.

The ESInet design utilizes the duplicated Data Centers to assure that the 9-1-1 calls continue to be delivered to the PSAPs even during a single Data Center failure condition. Lock Boxes are a legal requirement in Illinois for Wireline only customers to get emergency service. This represents only about 20% of al 9-1-1 calls in the network today. The remaining 80% fail in today's SR failure scenario until help can arrive or a remote center is activated and works to resolve the SR problem.

5.5 Data Exchange Information - CLLI – SS7 Point Codes – IP Addresses

5.5.1 CLLI Assignments

The Counties of Illinois have been assigned Common Language Location Identifier (CLLI) codes for the 2 LNG Gateways, one in Harrisburg and one in Murphysboro. The following reflects the 11 character identification for the terminating locations for Access Carriers to use for trunk group provisioning for their NG 9-1-1 trunk groups.

CSI Data Center Addresses	CSI CLLI Codes for ESRP Terminating Equipment (s)
1001 Mulberry St., Murphysboro, IL	MRBOILAF0ED
1 N. Main Street, Harrisburg, IL	HRBGILDC0ED

Each Access Carrier using SS7 will originate their Central office SS7 A Links to their own STP provider as they do today. F Link options are under consideration. Each Access Carrier's ISUP trunks will be terminated to Harrisburg and Murphysboro directly. The Syniverse STP pair in Atlanta and Philadelphia will be terminating their IP Sigtran 56kpbs Quad B SS7 links from their Tekelec STPs via IP VPN connections assuming contracts can be agreed upon for a reasonable price or Cost recovery mechanisms can be put into place. Alternate sources for ISUP 9-1-1 routes are being sought while the Pilot application moves forward. This may change the SS7 Point Codes. During the Carrier meetings, the trunking will be agreed upon. SS7 Provisioning, testing and cutover will be part of the CSI Carrier and Syniverse planning process with the Access Carriers requesting this type of connectivity.

The Topic of SS7 A Links versus the use of SS7 F Links is under discussion with Roger Hixson the CTO Director for NENA.

Standard Service Level Agreements (SLAs) are included with contacts, severity level definitions, quality parameters and escalation procedures. Syniverse reports outages according to FCC guidelines. Access Carriers are encouraged to comment at any time to CSI and NENA on the option differences between A Links and F Links.

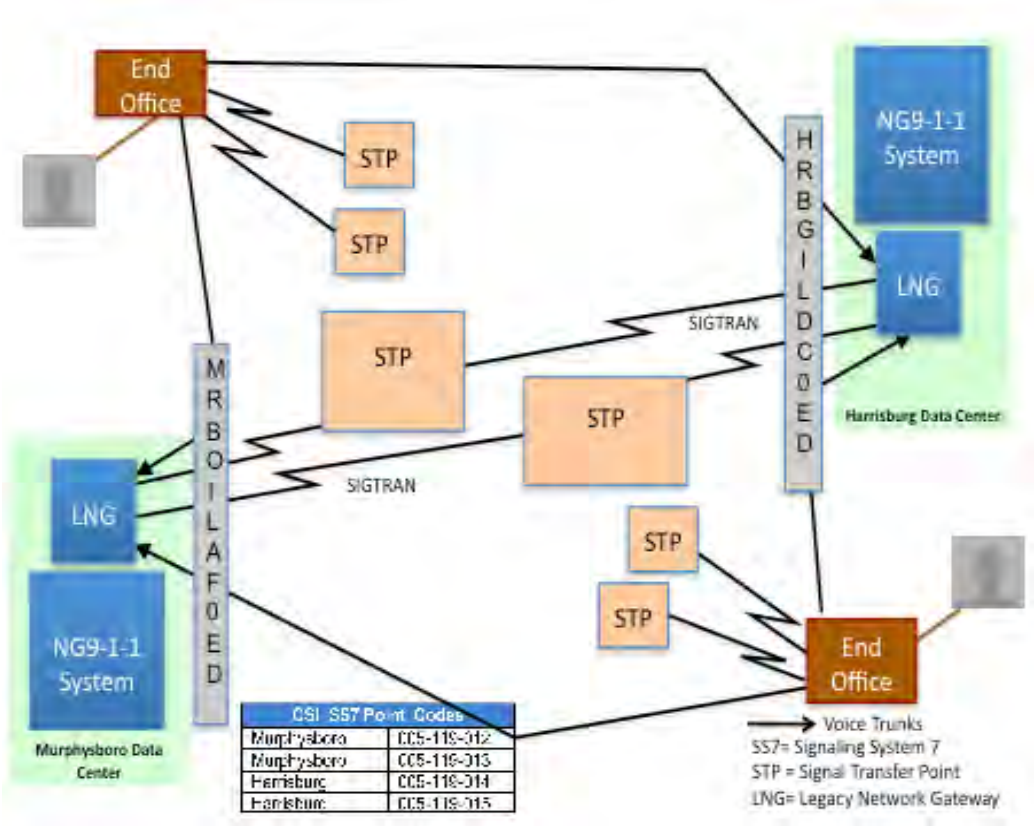


Figure 5.7 – CSI SS7 Design

5.5.2 IP Connectivity

The Internet Service Provider for the Counties of Southern Illinois is Clearwave Communications from which external IPv4 and IPv6 internet addresses will be procured.

Name Address ISP
Clearwave Communications
Corporate Offices 2 N. Vine St. Floor 3 Harrisburg, IL 618-294-8000

CSI Data Center Addresses	CSI IP Addresses for Solacom Terminating Equipment (s)
1001 Mulberry St., Murphysboro, IL	MRBOILAF0ED
1 N. Main Street, Harrisburg, IL	HRBGILDC0ED

CSI IP Addresses for ESRP Terminating Equipment (s)	
Data Center	IPv4 IPV6 External Addresses
Murphysboro	TBD
Murphysboro	TBD
Murphysboro	TBD
Murphysboro	TBD
Harrisburg	TBD
Harrisburg	TBD
Harrisburg	TBD
Harrisburg	TBD

Private internal IP addresses were assigned internally to the Data Center components in the ESInet.

5.5.3 SS7 Connectivity

The SS7 provider for the Counties of Southern Illinois is to be named. CSI will connect to their SS7 network.

Syniverse Address SS7
401 N Broad Street, Philadelphia, PA 19108
56 Marietta Street NW, Atlanta, GA 30303

CSI SS7 Point Codes for ESRP Terminating Equipment (s)	
Murphysboro	005-119-012
Murphysboro	005-119-013 Reserved
Harrisburg	005-119-014
Harrisburg	005-119-015 Reserved

5.6 Safeguards and Access Routing Options

The CSI emergency services end to end network has many safeguards for 9-1-1 service. Requests for emergency services flow from the end user device to the 9-1-1 call takers in the PSAPs and then to the Dispatch organizations. Network Design diagrams show options for connectivity.

Each originating access service provider is authorized under their tariff with the FCC and/or ICC to provide service in the State of Illinois. Design Options for emergency services call delivery are provided in this design document to be negotiated with the authorized access service providers in each of the CSI counties.

5.6.1 Routing Design Options

General Requirement: Access Carriers are requested to send half of their 9-1-1 calls first route to one of the ESInet Data Centers and alternate route to the other Data Center. Loads are to be divided and routing agreed upon in the Data Exchange process to ensure there is balance and each Access Carrier has an equal chance of call completion. Numbers of trunks and the projected loads are expected to be a matter of annual review. The Carriers are asked to share more than numbers of trunks. CSI requests true offered load, busy hour and busy season peak information.

After Access is agreed upon a document will be created listing which trunk groups will be first routed by Carrier to each of the 2 Data Centers.

Option 1 uses SIP Trunking which is available for the first time to the Access Carriers. The number of trunks per group will be the same for the Access Carriers who access the PSTN SRs today as a basic starting point. Minimally, the carriers are asked to provide two (2) trunks regardless of the loads. If carriers determine that additional trunks are necessary, it will be part of the cutover planning discussion.

The carriers have been asked to identify the best means to deliver their access traffic to the Data Center POPs Harrisburg and Murphysboro. It is the Carrier's responsibility to get the traffic on diverse paths to both Data Centers. If there are no diverse options, the Circuit Layout record will show where diversity is not possible. The Carriers must deliver the 9-1-1 calls via a minimum of a DS1/T1 facility to each Data Center. The Carriers are asked to aggregate (using a Digital Cross Connect System) their trunking so the total number of DS1s is minimal to each Data Center while maintaining physical end to end access diversity.

It is the responsibility of the 9-1-1 SSP and CSI ETSBs to provide a diverse ESInet.

It is the Access Carriers' responsibility to design diverse paths with adequate trunking to the ESInet Data Centers.

Option 2 uses traditional telephone signaling – ISDN PRI, CAMA/MF or SS7.

If the Access Carrier chooses to use an SS7 Legacy Option that will connect their SS7 Links and their SS7 trunks to the 2 Data Centers. The Data Exchange Form requires the names and location of the Carrier's STP provider to complete the Engineering. CSI must provide STP location and Point Code information to the Access Carriers. The Access Carriers must provide SS7 STP Locations and Point Code information to CSI.

The Carrier may choose MF and/or CAMA signaling only if used for 9-1-1 in their Legacy 9-1-1network today. Customers should not get service via a slower call set up 9-1-1 delivery option than they have today.

The Access Carriers are asked to provide Circuit Order Layout records to CSI. These records will be used to verify diversity and for provisioning, testing and cutover and later for ongoing maintenance and trouble shooting. Editor's note: much of the following information is included in the Design Plan document (Assure911.net-DG-CSI/NG911-001).

5.7 Cyber Attack Protection

The Session Border Controllers (SBCs) are new Network Elements in the ESInet architecture. CSI is deploying a mated pair of SBCs, one in each of the Data Centers. The Mated SBC pair will have dual power supplies and each of the SBCs is engineered to handle the complete load of the network should one of the SBC pair fail while restoration is being managed.

5.8 Internet Protocol Standards

The ESInet standards from NENA include a requirement for several newer protocols to be operational as part of the network. The heart of the Emergency Services Internet Protocol (ESInet) is Session Initiation Protocol (SIP.)

The essential SIP standards include:

The main SIP Protocols are included in the IETF RFC 3261++. SIP is the logical equivalent of the SS7 Signaling ISDN User Part, ISUP Standard with much greater flexibility. It is the only logical technical choice to build IP based communications for NG 9-1-1 and it forms the basis for most IP Telephony including 3GPP and IMS Standards. SIP separates session management from media, not unlike how SS7 works but media can be voice, video, text and tones. SIP has messages such as "INVITE, 200 OK," and each message has headers. SIP was enhanced to include location in the signaling with the call. Reference: Brian Rosen, Neustar.

RFC 3550: The Real Time Protocol (RTP)
RFC 3261: Session Initiation Protocol (SIP)
RFC 4566: Session Description Protocol (SDP)
RFC 3264: The SDP offer/Answer model and many more.

References that may be helpful:
RFC 3665: SIP call flows
RFC 3666: SIP – PSTN call flows

RFC 4346: Transport Layer Security

Standards Organizations that support SIP:
IETF, ITU-T, ETSI, 3GPP, and OMA

The Internet Protocol Architecture is made up of Protocols, Addressing, Routing, Applications and Security.

The SIP Forum provides the requirements specifications to be used for Access for SIP trunking. Refer to the Design document and Standards Exhibit 12.

6.0 ACCESS OPERATIONS

Data Center Location		First Tier Name/Company/Reach	Second Tier Name/Company/Reach	Third Tier Name/Company/Reach
East	Harrisburg	Onsite PSAP 24x7x365	Steve Dixon/CSI/ 618-457-5911 or cell 618-534-9536 Ryan Trusty/CSI 1 hour response	Travis Stender/NG-911/ 319-350-8430, alternate Michael Ramsey,855-668-6491
West	Murphysboro	Onsite PSAP 24x7x365	Steve Dixon/CSI/ 618-457-5911 or cell 618-534-9536 Ryan Trusty/CSI 1 hour response	Travis Stender/NG-911/ 319-350-8430, alternate Michael Ramsey855-668-6491

CSI is not building new buildings and their track record in supporting PSAP equipment in their 21 locations has been excellent.

The 9-1-1 SSP and CSI intends to track performance of the network at all levels and report proactively to the ICC when required. CSI will hold all vendors accountable for performance warranties. Outage reporting requirements will conform to all FCC and ICC requirements.

The 9-1-1 SSP and CSI will work in good faith openly and actively with all Access Carriers in their footprint to maintain a highly available and reliable environment for 9-1-1 operating within SLAs and adhering to all 9-1-1 applicable state and federal guidelines and laws.

This section references the NENA Design Standards, 08-506.

Monitored by a NOC 24 x 7 x 365

The NENA standards are evolving with respect to Monitoring. Assure911 is a subcontractor for the design work for CSI. In addition Assure911 is a network monitoring systems company with a patent in 9-1-1 assurance and a history of supporting major wireline and wireless carriers including major ILECs, CLECs and the City of Chicago 9-1-1 center for many years. CSI will have tools to monitor their ESInet end to end when the project launches. In meetings with the Access Carriers, they were invited to interface to the same monitoring solution so anyone along the path for a 9-1-1 call can see if there is a problem which can potentially affect service whether it is simplex or duplex.

The CSI network is manned 24 by 7 by 365. The IT staff will have access to the NOC-like tools 24 by 7 by 365. Much of the system information will be sent to the IT support personnel PCs or hand held devices, and any of the managers' devices as well so alerts are made as they occur. The concept of a person sitting in front of a NOC screen watching the network is no longer a requirement for many carriers. Refer to Monitoring in the Design Plan.

Defining Failure Metrics for an ESInet - NENA Draft Design

NENA: *"One of the considerations that must be taken into account when designing and calculating ESInet availability and reliability is to determine what constitutes a failure. A failure could be defined as one of the following:*

1. *The termination of the ability of the overall 9-1-1 system to perform its required function within a specific geographic region.*

2. *The termination of the ability of any individual PSAP to perform its required function but not the termination of the ability of the overall 9-1-1 system to perform within that specific geographic region."*

For example, if the circuits from the PSAP to the Central Office are all located in the same conduit, and there is a fiber cut, typically one of two things will happen:

1. NG9-1-1 Call handling system automatically routes calls to backup PSAP.

2. Someone at the PSAP will throw a make busy switch (or call their service provider) and reroute the 9-1-1 calls to a 10 digit number or back up PSAP.

The failure does not prevent 9-1-1 calls in that region from being completed. However the failure does prevent the calls from being delivered to the primary PSAP. Therefore, according to definition 1, this is not a failure, but according to definition 2, it is a failure.

NENA: *"9-1-1 entities should define what constitutes a failure within their system, and thereby determine how availability and reliability will be calculated."*

In the CSI ESInet the use of a back up PSAP is not a failure. The calls and all related information route to the alternate PSAPs, thus the caller will never experience a different response no matter which PSAP answers the calls.

Test Equipment

NENA: *"Active test equipment that can interrupt normal network activity should only be used on a case by case basis when needed to troubleshoot. Passive/monitoring test equipment should be treated differently than active (i.e. traffic generating) equipment. Active testing for FEs of NG9-1-1 beyond OSI layers 1-3 may help resolve outages."*

NENA: *"During implementation and ongoing management of NG9-1-1, low-level packet analysis tools may be required for performance diagnostics and trouble resolution. These tools are equivalent replacement tools for the existing trunk monitoring techniques and tools that are used in legacy 9-1-1."*

The 9-1-1 SSP and CSI will use appropriate testing tools in their network. IIT's RTCL used several tools to do initial load testing. Other test boxes were used in the IIT RTCL to determine what is efficient for a typical Data Center and share information about the tools needed into the future. NG-911, Inc. will be doing field testing and making similar suggestions and recommendations to CSI. Test tools are essential to any NG 9-1-1 organization.

One free software tool used in the IIT Lab is Wireshark which is helpful for finding protocol based errors.

Performance Requirements

NENA*: "There are a number of factors that affect the overall quality of multimedia traffic on an ESInet including packet loss, jitter, and latency. This section outlines some of the important properties of packet loss, jitter, and latency as pertaining to ESInets."*

Packet Loss

NENA: *"Packets can be dropped by various devices in the network (e.g. routers, ATM and MPLS switches), or the packet may have been corrupted during transport and dropped at the destination. An overall (end to end) packet loss budget for maintaining intelligible voice transmission is about 5 %. Out of that 5% budget approximately ½ of the packet loss should be allocated for the ESInets with the remaining allocated for the origination network. It is a best practice to engineer ESInets to keep the packet loss budget under 2.5%. Audio media streams are the most sensitive to packet loss."*

NENA*: "ESInets should be designed without oversubscription. Packet loss of less than 1% should be achievable on such ESInets."*

This was the NENA draft recommendation. CSI agrees in principal that Packet Loss must be minimized especially in a voice environment. The ESInet is dedicated to CSI. Data Exchange with the Carriers is the only truly accurate means the 9-1-1 SSP and CSI have to ensure there is no over subscription on the network. The NG-911, Inc. and Clearwave sizing algorithms for the Fiber Ring including the bandwidth to get traffic to the 21 PSAPs, was estimated. The lab will test other important factors. Only the field testing will give the CSI organization the ability to test the actual network and friendly carriers' participation would be idea to drive up volumes. The Design team feels they can do their best job on sizing with the Carrier Data and PSAP Data as the two definitive points of comparison. The 9-1-1 SSP and CSI will have tools on hand to measure Packet Loss.

Jitter

NENA: *"A packet's delay varies with its position in the queues of the routers along the path between source and destination and this position can vary unpredictably. Arrival time of packets is ideally equal to the packetization period (i.e. sample rate times samples per packet). Because of the effects of queuing and because 2 sequential packets sent from the same source may not arrive via the same paths, variation in the actual arrival time of packets may occur. It is this variability in the delay that causes jitter. Jitter buffers are utilized to smooth out the variation."*

NENA: *"It is a best practice to design ESInets to maintain less than 20mS variation in the end point jitter buffers."*

The 9-1-1 SSP and CSI accept the NENA Draft recommendation. The 9-1-1 SSP and CSI will have tools on hand to measure Jitter.

Latency

NENA: *"Latency is the amount of time it takes for a packet to reach its destination. The one-way transit delay (i.e. end to end, mouth to ear) for real-time media packets should not exceed 150mS. (ITU-T G.114). When latency exceeds 150 mS, turn taking is significantly impaired. Because the access network is outside the scope of the ESInet, and considerable latency may be incurred, the maximum acceptable delay for packets traversing the ESInet should be less than or equal to 35 mS."*

NENA: *"It is a best practice to design ESInets to operate with less than 15 to 20 mS of latency. This allows the original encode and decode and a conference bridge in the middle of the path and still achieve the maximum 35mS or less packet delay."*

It is our experience that distance can have a significant impact on latency. The Media Server in the CSI ESInet configuration is embedded in the i3PSAP FE. Given the distance from one end of the ESInet to the other of a little over 50 miles, the configuration of the CSI ESInet is such that latency on the CSI ESInet should not be a factor. In a live test at the IIT Lab using an ESInet with FEs in Illinois, Texas and New York, latency was observable in October 2010. The 9-1-1 SSP and CSI will have tools to measure latency.

In the initial network configuration we have not identified SIP Access Carriers who will send their calls via the SIP option. Now that Clearwave and Mediacom have been identified as SIP-capable Carriers, there is a need to have extensive SIP testing. No live ESInet and SIP Access combination exists that we are aware of outside a Lab configuration to pass the 9-1-1 calls. And in any event, Access Carriers within the CSI footprint will be tested thoroughly ahead of service turn up to be sure the NENA standard and their allocation of Latency makes sense. The SBC will protect the CSI ESInet from gross overload.

Hardware/Network Elements - NENA Design Draft

NENA: *"Some of the equipment required to build an ESInet (i.e. routers, firewalls, session border controller(s), etc.) can be leased, other components will have to be purchased. It is a best practice to purchase and/or lease equipment that meets the following criteria:*

- *Is highly reliable*
- *Has a proven track record*
- *Has a warranty*
- *Has an abundance of qualified/trained engineers that can support it.*
- *Vendor provides 24/7 support*
- *Acceptable MTTR*
- *Is scalable"*

The CSI ESInet components meet the criteria and will be subject to testing at IIT's Lab and in the field. Routers and other devices have been identified and will be purchased for the CSI ESInet. In all cases CSI and NG911, Inc will have warranties, vendor contracts and escalation policies and the devices will be included in the monitoring solution set.

The Access calls from the Carriers arrive at the two Data Centers and they connect to the Gateways passing through SBCs as needed to protect the ESInet. Clearwave will convert Fiber to Copper and bring the service into the Data Centers through new entrances from the nearby Frontier Wire Centers where they are collocated. Frontier will be bringing their traffic into the same two buildings through their existing Telco entrances. All the other Carriers will be terminating to the same locations through designated entrances. Some may contract with Frontier. Others may come on their own via Fiber or Copper and others may group themselves together and make design arrangements which are mutually beneficial. Clearwave NTIA Grant funding provides for the Calix and Juniper Carrier interface equipment in the Data Centers. In some cases the Routers have been determined to come from Cisco. Cost and performance are the main reasons.

The 9-1-1 SSP and CSI Conclusion

After covering and reviewing the topics above and noting that a number of the topics covered in this document are fields of study to which people devote their entire careers, this working group has concluded that the information contained in this document by itself, although helpful and educational, does not provide all of the necessary details required to thoroughly design an i3 ESInet. It is rather a best practice document, meant to stimulate discussion and provide background and overall guidance for qualified IP network design engineers tasked with designing i3 ESInets. In this matter we do agree with NENA. Access Planning takes a cooperative effort with everyone in the network architecture and 9-1-1 cannot be considered outside the context of the real world carriers and access opportunities and challenges.

7.0 MIGRATING 9-1-1 SERVICE

In order to migrate the legacy E9-1-1 calls from the existing legacy network, the following deployment plan will be followed.

7.1 Preparation of Access Carriers

All access carriers (Wireline Carriers, Wireless Carriers, CLECs, etc.) will review the sizing of their legacy E9-1-1 trunk groups from their switching entities to the legacy SR. Each access carrier will provide their traffic engineering data and trunk group counts and type description (ISDN PRI, CAMA/MF, SS7, etc) to the CSI ESInet Design Team. Each access carrier will collaborate with the CSI ESInet Design Team to agree upon the appropriate number of trunks and types from each of their switching entities to the LNG function in each of the Data Centers. IP trunking connectivity will be utilized where practicable. Once the new trunking is installed, field testing will commence. The transfer of the 9-1-1 traffic load will occur after all field tests have been passed, the lab and field testing of the ESInet has been passed, the appropriate PSAP or PSAPs required to accept the traffic have been equipped with the new IP work station equipment, and have passed both lab and field testing. A deployment schedule will be developed to coordinate these activities.

7.2 Preparation of PSAPs

All PSAPs in the trial area (13 PSAPs) will review the sizing of their legacy E9-1-1 trunk groups from the legacy SRs providing 9-1-1 traffic to their legacy call answering positions. Each PSAP provided their traffic engineering data, trunk counts and type description (ISDN PRI, CAMA/MF, SS7, etc) and their call taker traffic loads and position requirements to the 9-1-1 SSP and the CSI ESInet Design Team. Each PSAP collaborated with the ESInet Design Team to agree upon the appropriate number of IP work stations required and the date (as shown by the deployment schedule) that they will be required. The PSAP IP equipment will be configured according to this data Network Plan. Each PSAP will also provide the traffic engineering data and trunk/line counts and type description of all incoming, outgoing and 2-way trunks/lines between their PSAP and all other PSAPs to which they connect for the handling of cross-boundary calls, misrouted calls, and failover purposes. Each PSAP will collaborate with the ESInet Design Team to agree upon the appropriate type and number of interconnections with other PSAPs required and the time that they will be required according to the deployment schedule in the new ESInet environment.

7.3 Preparation of Data Centers

The Data Centers will be sized to accept the 9-1-1 traffic loads delivered to them by the Access Carriers, processed, and delivered to the appropriate PSAP. The equipment will be configured according to the data network Design Plan. The configured ESInet will be lab tested at an appropriate level and then field tested. Lab testing will include failover testing and evaluate any lost 9-1-1 calls during failover. When all tests are passed, the first access traffic load will be accepted and delivered to the appropriate PSAP/PSAPs in accordance with the deployment schedule. Subsequent migration will occur as specified in the deployment schedule.

7.4 Cross Boundary Traffic

There are two types of Cross Boundary situations. One is between PSAPs which are both on the ESInet. The second is for PSAPs that are outside the ESInet Boundary and are using Legacy PSAP Equipment to receive the bulk of their calls.

The Figure 7.1 shows the NG PSAPs inside the CSI ESInet boundaries. If for any reason a call ends up with one NG PSAP and the neighboring NG PSAP is inside the ESInet, the calls will be routed, bridged/transferred over to the proper NG PSAP and the whole set of data and call records will be routed along using the ESInet SIP Protocol.

The ESInet will recognize all of the incoming customer information even for those in split wire center boundaries inside the ESInet and the routing from the ECRF function inside the ESInet will send the call first time to the correct NG PSAP. If this happens the NG PSAP database may need to be checked for updates to customer records.

Most split central office exchange boundaries inside the ESInet become automatically resolved problems due to the capabilities of the ESInet architecture.

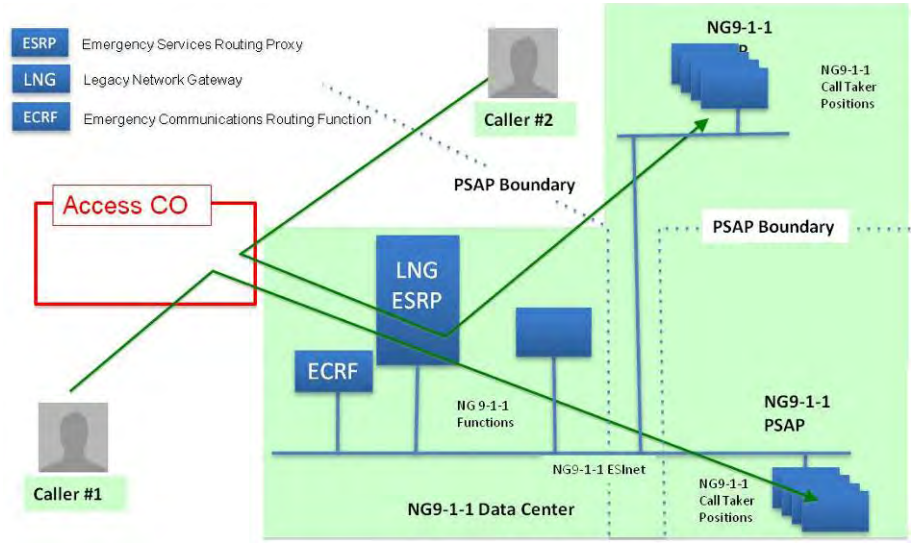


Figure 7.1 - Data Center to NG 9-1-1 PSAP

Figure 7.2 shows one NG PSAP inside the CSI ESInet boundary and one Legacy PSAP outside the ESInet boundary in an adjacent County. These calls come from Split Wire Centers or Exchanges at the boundaries.

In the provisioning process, the 9-1-1 SSP and CSI have agreed to accept MSAG and other records normally loaded into ALI Databases with the current system to be sent via FTP server 24 by 7 by 365 to CSI for updating records going forward. The details will be validated with Access Carriers as the detailed Database Exchange progresses. These records follow the NENA format and eventually there will be fewer records required as the customer devices get "smarter" and provide the Latitude and Longitude of the device that the caller is calling from over the SIP protocol end to end.

The records will be managed much like they are today, except the responsibility shifts from the Legacy SR provider to CSI. If a Carrier faxes Database records today, they can do that with CSI in the future. CSI has told each of the Carriers that whatever means they are using to provide records to Frontier, AT&T or Consolidated Communications, the 9-1-1 SP and CSI will have an SLA and working process for records acceptance and assurance of accuracy. Field testing of calls will be important to test the process. The 9-1-1 SSP and CSI have asked the Access Carriers to participate in testing before the Cutover. The 9-1-1 SSP and CSI's ETSB PSAP personnel and staff will be trained on the new systems.

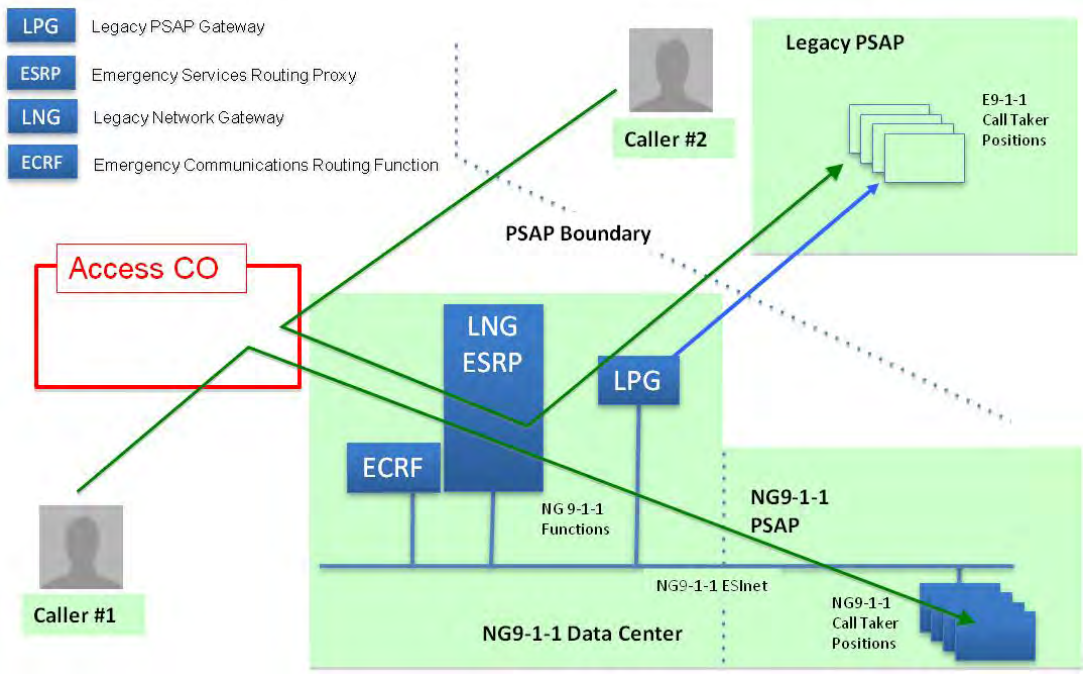


Figure 7.2 - Data Center to Legacy PSAP

In the case of the Legacy PSAP there is a new FE on the chart called a Legacy PSAP Gateway, LPG. CSI is offering to place those FEs or a small subset called an Extended Gateway (EG) at no charge to the neighboring Legacy PSAP.

A small fraction of the calls will be managed this way. Each call will be logged and recorded with the ESInet logging and recording devices. Intergovernmental Agreements for call transfer exist today with the neighboring agencies. The agreements for NG9-1-1 call transfer will be written the same way; boiler plate language will be shared and signed off as required.

Assuming at some point more ESInets are built in Illinois, the systems and ESInets automatically handle ESInet to ESInet call transfers without the extraordinary interim Transition arrangements. There are Functional Elements (FEs) called the ECRFs that have LoST protocols Private and Public LoST. The calls get identified by the ECRF "Public LoST" before being ESRP routed into an ESInet and therefore get routed and handled by the ECRF "Private LoST" to complete the calls to an ESInet PSAP. Refer to the Call Flow discussion in an earlier section of this document, and further details in the Design Plan.

7.5 Transfer Calls Out of the Network

There is a need to Transfer calls off-net. In this case, the database entries point the call to a PSAP on the ESInet but the responsibility for the call lies with an adjacent PSAP. The call is transferred off-net via the LPG. The receiving adjacent PSAP can rebid back through the LPG. The Figure 7.3 shows the call flow process.

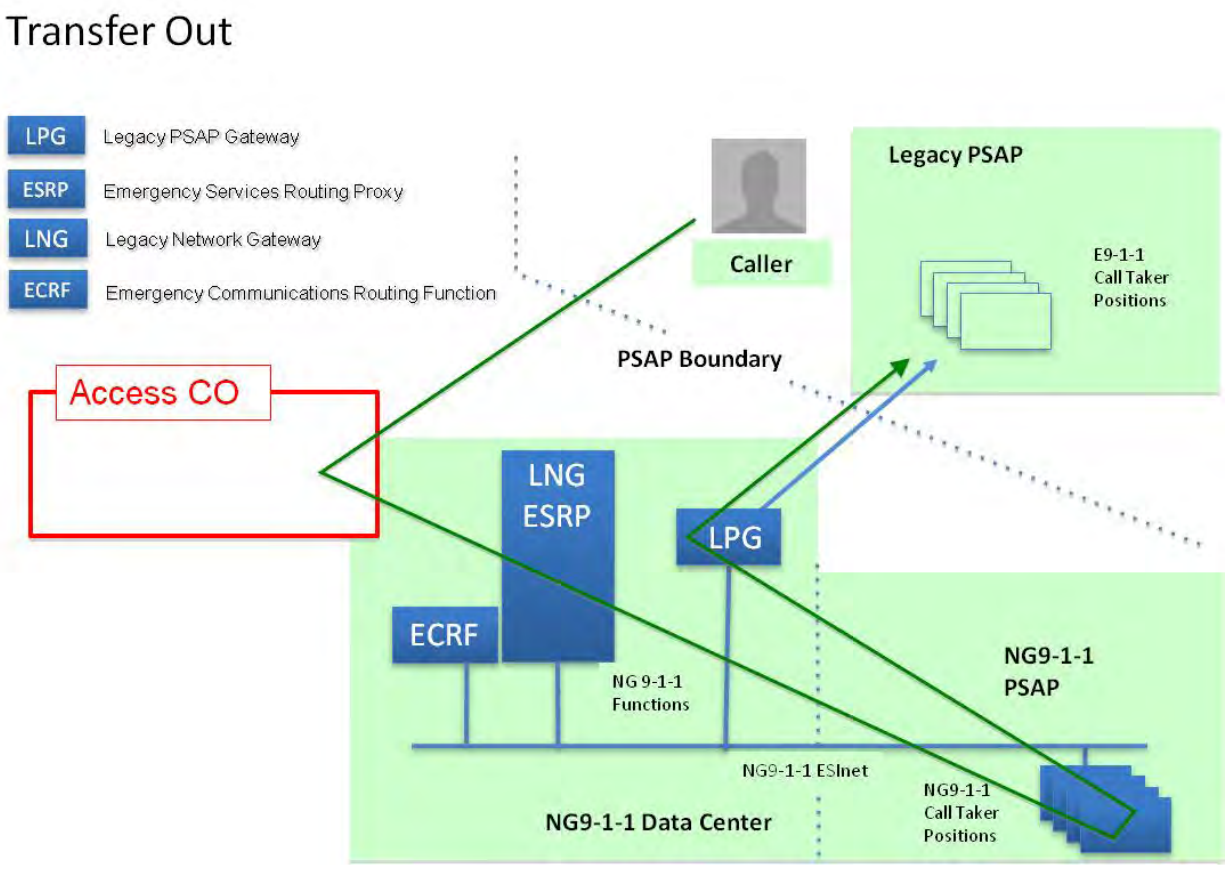


Figure 7.3 - Transfer Calls Out of the Network

7.6 Transfer Calls into the CSI Network

The following Figure 7.4 shows the case where calls need to be transferred into the ESInet from a neighboring Legacy PSAP. Today those calls are handled with 10 digit call transfers or radio transfers.

That 10 digit or radio transfer to the PSAP will have to occur into the near future. Direct PSAP to PSAP facilities have to remain in place if a call transfer is not desired using the PSTN. This is not a change of operation.

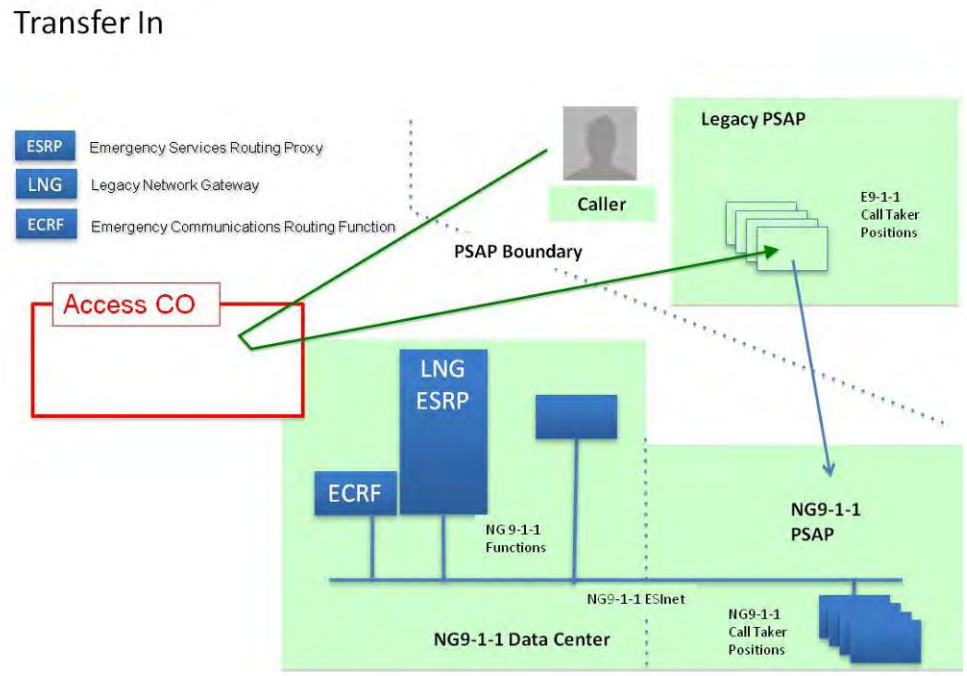


Figure 7.4 - Transfer Calls into the CSI Network

7.7 Database Flow

In order to help the reader and access carriers understand the new i3 NENA Standards call flow, the following Figure 7.5 was added. Datamaster (Vendor) provided this Diagram.

Start with a LIS, a Location Information Services function. A LIS or its equivalent is required to support interactive validation functions, and is especially crucial to support "over the top" IP based originating services. The LIS is the equivalent of the ALI Data base in the new NENA i3 environment only it is much more. Refer to NENA i3 Standards Exhibit12.

When a call comes from an Access Carrier or Service Provider as shown below, it goes to the ESRP - Emergency Services Routing Proxy. The ESRP queries the pre-populated LIS Database and if needed goes to the MPC, Mobile Positioning Center/ Gateway Mobile Location Center System, or the VPC, the VoIP Positioning Center System to rebid and see if there is better location information; the ESRP queries the LoST Server going into the ECRF the Emergency Services routing Proxy to determine which PSAP is supposed to handle the call. The ESInet gathers all relevant information sending the call with the data to the PSAP for answering. In the ESInet architecture, the PSAP equipment does not do the data dip to the database.

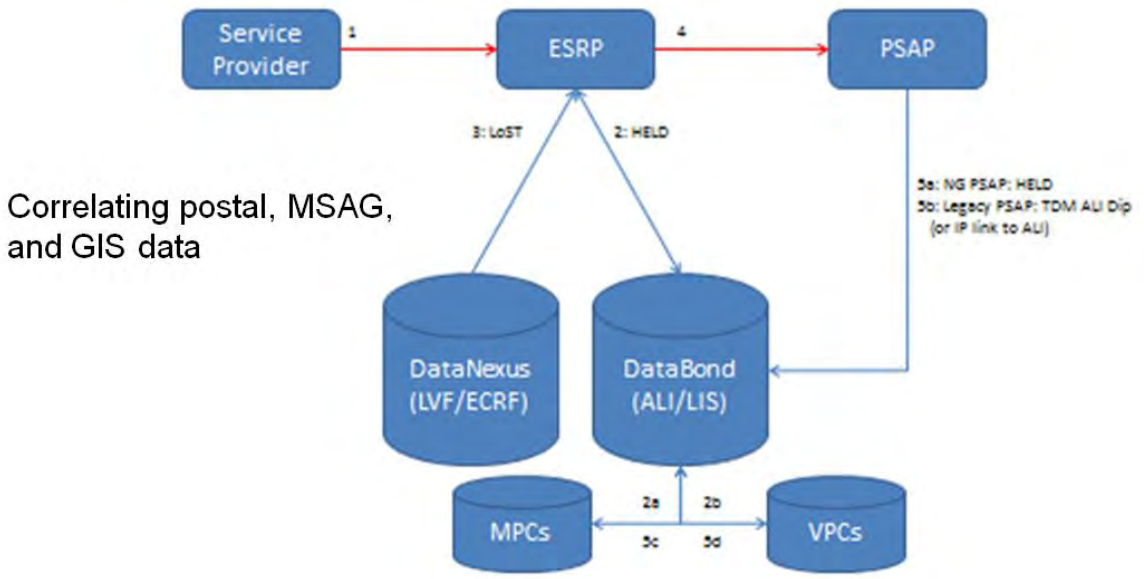


Figure 7.5 - Database Flow

7.8 Recovery and Restoration

All ESInet configuration data and all database data will be backed-up and stored off-premise in two locations yet to be determined. One location will provide real-time restoration capability. On site backup of all configuration data will be maintained.

7.9 Gateways, Switching Equipment or Selective Routers

The Gateway functionality for incoming 9-1-1 calls resides in fully duplicated form in the two geographically separated Data Centers. The ESRP Gateways are the connection points for the Carrier Access Circuits after traffic comes through the Acme Packet SBCs.

The SRs' calls are migrating from are in Carbondale (Frontier), Casey (Frontier), Olney, Centralia (AT&T), Bellville (AT&T), and Mattoon (ICTC – Consolidated). The chart with SR locations is in the Design Plan.

7.10 Redundancy and Diversity

All components of the ESInet are fully duplicated for full redundancy. The core of the Clearwave network is redundant ring architecture. Access trunking and the facility routes to the PSAPs are on diverse facilities where available. PSAP diversity is discussed in the Design Plan, PSAP by PSAP with timing.

Carrier Diversity is being negotiated with each Carrier and the 9-1-1 SSP. The 9-1-1 SSP and CSI have asked for Diverse Access. The Trunking ought to be the same from each end office to each Data Center. If the Carriers cut their trunks in half, should a single Data Center Fail, automatically only half of the Access 9-1-1 traffic can get to the ESInet. The Carriers were asked to connect their facilities and trunks directly to the 2 Data Centers in Murphysboro and Harrisburg and provide Circuit Order Layout Records and Contact information for 24 by 7 by 365 problem resolution and provisioning. Carriers were asked to provide a Forecast of growth for the new and existing services for up to 5 years. An annual review of actual traffic loads has been requested. This means carriers will be doubling their trunking at baseline from the beginning and their facilities.

7.11 Enterprise 9-1-1

The Gateway equipment being deployed by the vendor into the CSI Data Centers is capable of accepting ISDN PRI, SIP, SS7, CAMA and MF interconnections from Enterprise PBXs according to the NG9-1-1 standards. CSI has not identified any Enterprises who require such an interface during the Pilot Program.

PS/ALI entry is available via a web based application.

7.12 Traffic Engineering

ESInets should be designed to provide non-blocking service for high priority traffic. Bandwidth, Traffic Policing, Traffic Shaping and Quality of Service are some of the main design considerations which must be taken into account. This section describes some of the caveats to be avoided and best practices that should be observed with regard to traffic engineering in ESInets.

CSI has made a data request to all known Access Carriers in the footprint. The 9-1-1 SSP is now taking over that function and making similar requests.

Dimensioning ESInet Data Circuits

Traditionally, bandwidth sizing requirements for wide area networks are based on the bandwidth requirements of the applications being utilized on that network. One of the challenges of designing ESInets today is that some of the applications that are expected to be implemented may be outside 9-1-1 and others are yet to be developed.

Traffic Policing

Some of the layer 2 technologies that can be utilized to provide transport for ESInets require that the traffic that is being sent into the network conform to a number of requirements including peak and sustainable cell/packet rate. Traffic that exceeds the rate purchased from the service provider may be discarded immediately, marked as non-compliant, delayed, or left as-is, depending on administrative policy and the characteristics of the excess traffic.

Traffic Shaping

Traffic shaping is commonly applied at the network edges to control traffic entering the network. Traffic shaping is frequently required when the port speeds exceed the amount of bandwidth purchased from the service provider. For example, assume a 10 Mbps Metro Ethernet service is purchased from a service provider. If the 100 Mbps Fast Ethernet port of a router is connected to that circuit, in many cases even though the data being transmitted over a period of 1 second is less than 10 Mega-bits, the router (transmitting at 100Mbps) will exceed the rates deemed acceptable by the service provider and packets will be dropped.

NENA: *"When port speeds are not equal to the amount of bandwidth being purchased from the service provider, it is a best practice to configure traffic shaping on the routers to ensure that the traffic being transmitted is in compliance with the traffic contract."*

Quality of Service (QoS)

Quality of service is the ability to give priority to different data flows. In ESInets QoS is implemented by configuring routers and other network elements to respect DiffServ Code Points (DSCPs) as defined in RFC 2475.

Per the Detailed Functional and Interface Standards for the NENA i3 Solution Version 1.0 (NENA 08-003)

- Functional Elements must mark packets they create with appropriate code points.
- The BCF must police code points for packets entering the ESInet.
- The following code points and Per Hop Behaviors (PHB) must be used on ESInets:

DSCP	Use	Per Hop Behaviors (PBH)
0	Routine Traffic	Default
1	9-1-1 Signaling	AF 12
2	9-1-1 Text Media	AF 12
3	9-1-1 Audio Media	EF
4	9-1-1 Video Media	AF 11
5	9-1-1 Non Human initiated Call	AF 21
6	Intra ESInet Events	AF 21
7	Intra ESInet Other 9-1-1 Traffic	AF 22

See RFC 2475 for a detailed description of DSCP and PHB mechanisms and functionality.

7.13 Comprehensive Test Plan

The Test Plan is being provided in a separate document, Assure911-NG911CSI-STP-001. It should be noted that no live 9-1-1 calls will be involved at any stage of testing until Cutover.

7.14 Network Management and Monitoring

The ESInet and NG9-1-1 systems require a large degree of reliability in order to maintain the high-availability that the public has come to rely on when communicating with emergency responders by dialing 9-1-1. Designing the ESInet with multiple diverse interfaces, sufficient bandwidth capacity, and redundant hardware to eliminate single points of failure can increase its overall level of reliability. However, because of a host of potential unforeseen circumstances and the possibility of human error, high availability requires more than the network design alone. An effective monitoring plan is needed.

Proactive monitoring and responding to faults as well as performance degradations that may interfere with completion of attempts by callers and smart devices to communicate with call takers adds to reliability. It may appear complicated as different aspects of the ESInet and NG9-1-1 System will be procured from a wide variety of suppliers. Service providers for the underlying IP network, carriers bringing calls into the system, the NG9-1-1 equipment itself can all play a part in exchanging data needed to effectively monitor the end-to-end system.

7.14.1 NENA Network Management and Monitoring Design Requirements

The NENA Board approved the ESInet Design for NG9-1-1 NENA 08-506, Version 1, standard which includes a section regarding network alarming recommendations (SS 3.6):

NENA: *"Critical circuits for E9-1-1 calls (i.e. PSAP trunks and ALI circuits) are monitored. Outages may be FCC reportable. By the same token ESInet(s), which provide transport for emergency 9-1-1 calls, should also be monitored."*

The various providers of underlying facilities have their own surveillance systems for monitoring circuits that they are providing to CSI. CSI is asking that information critical to these services be shared with us using a patented approach that is incorporated into the Assure911 monitoring system.

NENA: *"Although there are no reporting requirements in current regulation, discussion of such regulation is underway and 9-1-1 entities should be prepared to report ESInet outages to relevant authorities."*

Every event that occurs is captured by the system being deployed for CSI. Reporting requirements that must be by existing 9-1-1 system providers in the legacy selective router environment can be met by CSI.

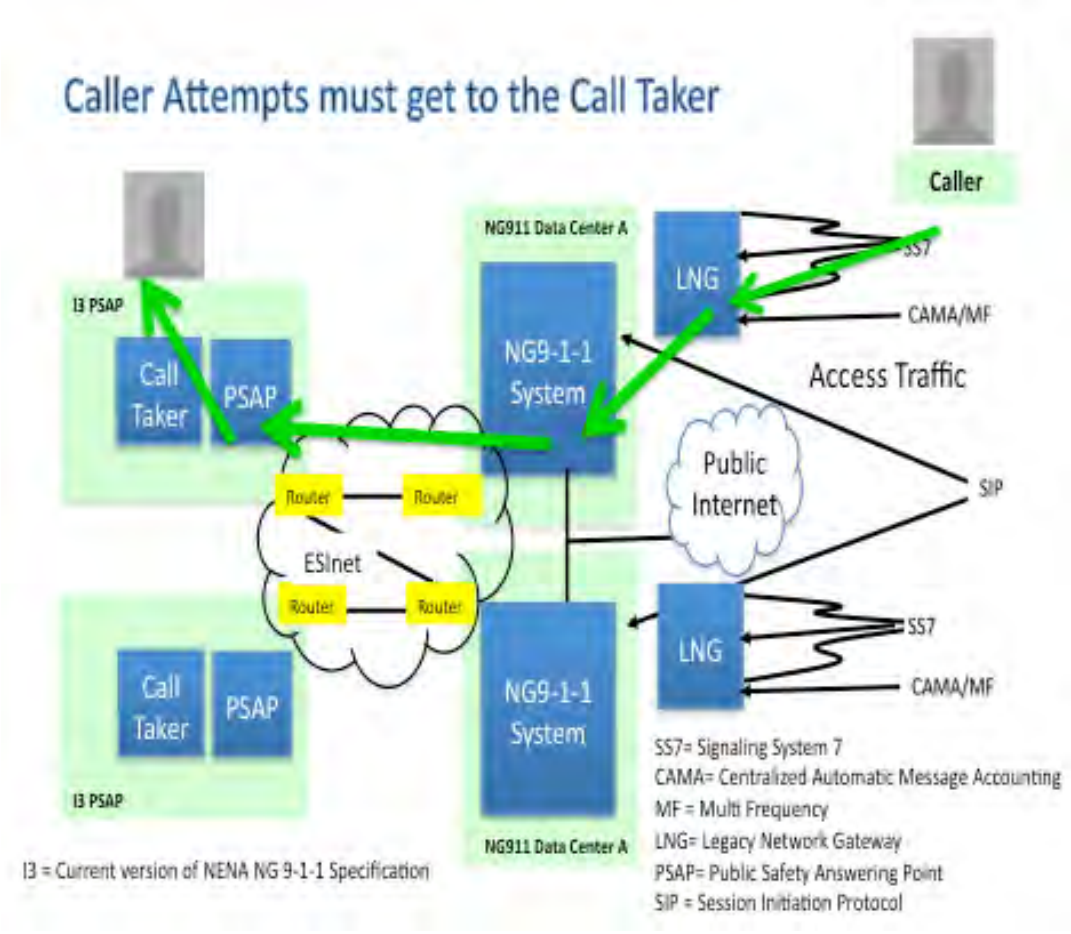


Figure 7.6 – End to End Service View

NENA: *"All data circuits and network components which comprise an ESInet should be monitored. All network components should provide SNMP traps to an approved management system."*

NENA: *"Vendors of all operational network components that form an ESInet should provide an SNMP MIB (management information base) for each component to organizations authorized to operate SNMP management systems. At least one SNMP based network monitoring system should be implemented by an organization with access to the resources necessary to perform effective network maintenance services. Vendors of all non-network components such as NG9-1-1 application servers should also be encouraged/required (RFP requirement to be supported by SLA) to provide element managers for their products. This would allow a network management system to monitor all of the network and applications components necessary for the reliable operation of NG9-1-1 on an ESInet. Companies that connect to the ESInet for the purpose of monitoring and/or management of devices should be NG-SEC compliant."*

CSI plans to deploy the Assure911 Monitoring solution as part of their network architecture. CSI acknowledges the requirements of the Design document with respect to effective Network Management. NG-911, Inc. will be monitoring the performance of the CSI ESInet. Frontline monitoring will be done by CSI's IT organization. CSI understands and will be compliant with the ICC and FCC reporting requirements for outages affecting 9-1-1 service.

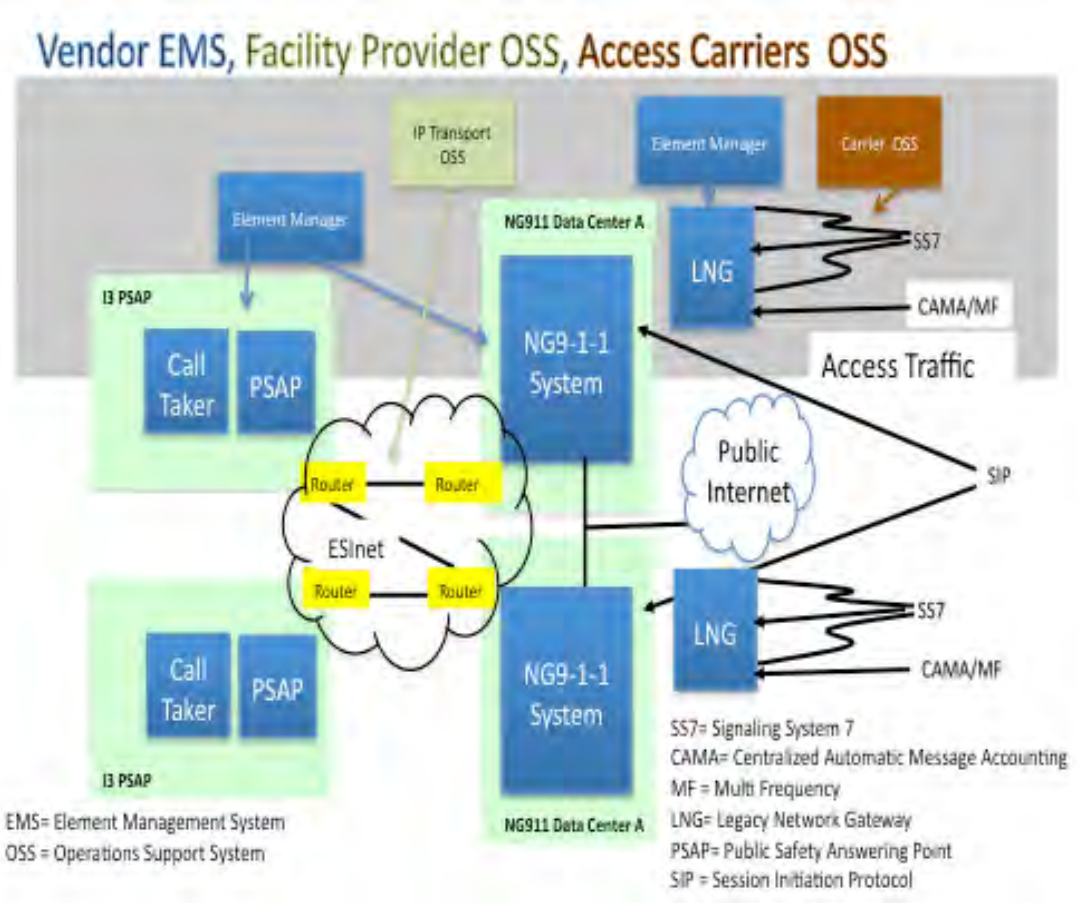


Figure 7.7 – End to End View Participants

7.14.2 Network Monitoring Approach

Effective network management requires:

- Proper/accurate documentation of the network
- Current network diagrams
- IP address range management/assignments
- Demarcation points
- Contact and Escalation lists – Vendor, Service Provider, NOC
- Near real time monitoring/alarming
- SLA benchmarks
- Capacity management / Trending Analysis
- Monitoring the state of element configuration (i.e. QoS)
- Configuration Management / Change Control
- Monitoring solutions will work for test and live traffic which are both expected during the Pilot Project.

Some of the methods above can be used to measure SLA metrics, but may not be reported to the end user.

Assure911 will provide software that performs end-to-end monitoring of the CSI ESInet and NG911 System, including:

- Data collection from devices that comprise the CSI ESInet and NG9-1-1 System
- Identification of adverse conditions in real-time when possible, subject to the capabilities of the target device or intervening element management system.
- Adverse conditions can be viewed on browser-based displays and handheld smart device applications.
- Notification of adverse conditions to personnel via text message, email.
- Real-time and historic reporting of raw data and adverse conditions.

Figure 7.8 – Assure911 Monitoring Solution

The 9-1-1 SSP and CSI ETSBs are responsible for proactive reporting to the ICC when there is an outage in their area affecting 9-1-1 services. Major access carriers, those with Selective Routers today, provide reporting to both the ICC and the FCC when there are outages affecting 9-1-1 services. The initial reporting times and service levels requiring a report varies between the two bodies. In any event, if there is a requirement in the future for additional reporting by CSI ETSBs as the 9-1-1 Gateway provider who replaces the role of the Selective Router in their ESInet, the solutions being deployed will provide data and timing for the reporting process.

The systems that make up the NG9-1-1 FEs all have information that will go to the 9-1-1 SSP and CSI for reporting capabilities. The majority of the reports assist the ETSBs in managing their responsibilities and to detect and resolve any issues in their centers. Reports can be built for external purposes and managed according to the rules and regulations specified by the Commissions. Assure911 has history of providing proactive monitoring tools to assist major wireline and wireless carriers in their Commission reporting role. More importantly the tools assist in detecting a situation within the architecture that is simplex and/or can lead to a service outage before it affects the public. This proactive tool set will be applied to the CSI ESInet. The first place such tool set was deployed in a 9-1-1 PSAP environment in the Chicago OEMC in 1997. The system being deployed by Assure911 uses a patented approach to proactive, end-to-end monitoring.

8.0 NENA PLANNING GUIDANCE

The NENA standards provide good direction for the planning process. The *"Next Generation 9-1-1 Transition Policy Implementation Handbook"* [1] dated March 2010, outlines the steps necessary for a Transition to NG9-1-1. The document includes check lists and useful information for project managers.

Page 11 under "NG9-1-1 Transition Policy Issue Number Three states that the *"NG9-1-1 will not be deployed in a 'flash cutover. With that reality in mind, it is imperative that the 9-1-1 authorities at every level - as well as industry - begin now to lay the foundation for NG9-1-1 by facilitating the deployment of "dual-mode" capabilities in networks and/or IP-enabled PSAPs that can translate between the legacy circuit switched environment and the next generation environment. This will be a significant issue as NG9-1-1 will not be deployed as a single nationwide project."*

The *"Next Generation 9-1-1 Transition Policy Implementation Handbook"* is a comprehensive general reference. It addresses many of the Public Policy issues outlined by the Illinois Commerce Commission.

The NENA documents reference the role of the Federal and State agencies in the planning process.

A Cutover Plan will be documented pending negotiation with the Access Carriers, underlying network providers and vendors.

8.1 ICC and Outage Reporting

CSI's Board of Directors delivered the Design Plan to the Illinois Commerce Commission (ICC). Authorized Pilot, reference: *"Project Public Act 096-1443, HB4990, Enrolled LRB096 18572 MJR 33954 b, AN ACT concerning utilities."* Other Exhibits will outline the request to the ICC for approval of the Pilot Project.

ICC: Outage Reporting Requirements

Note: Current ICC rules do not require a Public Safety Agency to make 911 Outage Reports. Carriers are required to make a report. The 9-1-1 SSP and CSI are willing to report additional 911 outage information in the future. The 9-1-1 SSP and CSI will be monitoring their ESInet and related FEs and maintain a log of all simplex and duplex outages affecting 9-1-1.

URL for ICC Reporting Requirements: http://www.icc.illinois.gov/Telecommunications/CodePart725.aspx

Reference:

"TITLE 83: PUBLIC UTILITIES
CHAPTER I: ILLINOIS COMMERCE COMMISSION
SUBCHAPTER f: TELEPHONE UTILITIES

PART 725
STANDARDS OF SERVICE APPLICABLE TO 9-1-1 EMERGENCY SYSTEMS

Section 725.100 Application of Part

This Part shall apply to all public agencies, public safety agencies, and telecommunications carriers in the State of Illinois except to the extent of any exemptions conferred by law.

[1] *"Next Generation 9-1-1 Transition Policy Implementation Handbook"* NENA standards dated March 2010

SUBPART B: AUTHORIZATION TO OPERATE

Section 725.220 Records and Reports

a) The system management shall maintain those records it considers necessary to document its operations and satisfy the requirements of interagency agreements. As a minimum, those records shall include:

2) Critical equipment outages; and

b) The records specified in subsection (a) shall be preserved for a minimum of one year.

c) The system management shall be required to file with the Commission's 9-1-1 Program, the Commission's Chief Clerk's Office and the Illinois Attorney General by January 31 the following items:

1) The current 9-1-1 contact person for the 9-1-1 system;
2) The current error ratio for the E9-1-1 database;

(Source: Amended at 28 Ill. Reg. 15742, effective December 1, 2004)

SUBPART D: STANDARDS OF SERVICE

Section 725.400 General Standards

f) The 9-1-1 database shall have the capability of allowing non-emergency database queries provided the following procedures are adhered to:

5) Direct database queries shall not adversely affect the normal operation of the 9-1-1 system. Direct database queries shall be limited to off-peak times. Direct database queries shall be suspended during any incident that could possibly result in a number of calls from the public being made to 9-1-1. Direct database queries shall not be made if there is any known outage or impairment in the database system, including a database data link outage. Direct queries shall also be suspended if there is any abnormal lag or delay noticed in receiving responses to database queries, or if notified to cease queries by telecommunications carrier personnel. The telecommunications carrier shall treat notification of 9-1-1 system management of database query suspension as a priority. Where practicable, this notification by the telecommunications carrier to 9-1-1 system management shall be made not later than fifteen minutes after a confirmed incident or event that will cause database queries to be suspended.

g) The system management shall be responsible for the compliance of these standards, overall management, security and coordination of the 9-1-1 system.

j) Each E9-1-1 system shall have only one 9-1-1 system provider that shall provide the overall 9-1-1 database and selective routing network and associated duties for the entire system. In addition, the 9-1-1 system provider shall assume the lead role in coordinating entire projects for each telecommunications carrier in conjunction with 9-1-1 system management. Responsibilities of the 9-1-1 service provider shall include, but not be limited to:

5) Providing notification of errors to the appropriate entities within 24 hours for corrective action

(Source: Amended at 28 Ill. Reg. 15742, effective December 1, 2004)

SUBPART E: ENGINEERING

Section 725.500 Telecommunications Carriers

n) Prior to a 9-1-1 system going on-line, each telecommunications carrier is responsible for having in its records a contact number for each PSAP in the event of outage or failure of a 9-1-1 system.

q) Each telecommunications carrier shall adopt practices to notify a primary point of contact within a 9-1-1 system within 15 minutes after a confirmed outage within the system and to also advise the primary point of contact as to the magnitude of the outage. If more than one 9-1-1 system is served out of a central office, the telecommunications carrier shall make notification to a primary PSAP within each 9-1-1 system affected.

r) Each telecommunications carrier shall adopt practices to notify a primary point of contact within a 9-1-1 system within 15 minutes after the confirmed restoration of 9-1-1 services.

(Source: Amended at 28 Ill. Reg. 15742, effective December 1, 2004)

Section 725.505 Public Safety Answering Point

h) System management shall provide continuous and uninterrupted operation to the persons within the system's boundaries 24 hours per day.

q) System management shall adopt practices to ensure the following:

2) In instances where a call box is situated in split telecommunications carrier exchanges (an exchange shared with more than one 9-1-1 system or jurisdiction), procedures shall be developed by the 9-1-1 systems involved to respond to the call box in instances of outages or disasters;

3) That when a primary point of contact is notified by telecommunications carrier personnel that an outage has occurred in a 9-1-1 system, the PSAP being notified must make notification to other PSAPs in the 9-1-1 system that is affected by the outage; and

u) It shall be the joint responsibility of the 9-1-1 system and the telecommunications carrier to ensure that the error ratio of each 9-1-1 system's database shall not, at any time, exceed 1%.

v) Each PSAP should answer 90 percent of all 9-1-1 calls within 10 seconds.

(Source: Amended at 28 Ill. Reg. 15742, effective December 1, 2004)”

Conclusion: CSI is in compliance with Part 725 PSAP requirements today and will maintain those requirements as required by the ICC and any updated for NG 9-1-1. The ICC specifically requires the telecommunications Carriers most of the Network Outage Reports and manage the Database according to Part 725 especially during overload stress and times of outage. If and when there is a legal requirement for CSI to report to the Commission about outages in the ESInet regarding 9-1-1 services, CSI will comply. Specifically Outage Reporting for Part 725.500 sections n, q and r. The ESInet systems will provide the CSI team with real time information to make the ICC reports resolve the problems or reach the correct parties to resolve the situation and restore service. Rational for the service disruption will be reported once a root cause analysis is conducted and the facts are available to final a final report. Reports will be filed in the manner and format the Commission designates in the timeframe required by law.

8.2 FCC and Outage Reporting

CSI has asked for guidance of NENA and the FCC Department of Homeland Security Attorney Patrick Donovan and the FCC staff. The 9-1-1 SSP is looking for similar guidance and support.

Current FCC rules do not require a Public Safety Agency to make an Outage Report. Carriers are required to make a report. The 9-1-1 SSP and CSI will provide appropriate reports in the future should they be legally required.

URL for FCC Reporting Requirements: http://transition.fcc.gov/pshs/services/cip/nors/nors.html

"Overall FCC rules
[Code of Federal Regulations]
[Title 47, Volume 1]
[Revised as of October 1, 2010]
From the U.S. Government Printing Office via GPO Access
[CITE: 47CFR4]

[Page 675-682]

TITLE 47--TELECOMMUNICATION
CHAPTER I--FEDERAL COMMUNICATIONS COMMISSION

PART 4_DISRUPTIONS TO COMMUNICATIONS--Table of Contents

Sec. 4.5 Definitions of outage, special offices and facilities, and 911 special facilities.

(a) Outage is defined as a significant degradation in the ability of an end user to establish and maintain a channel of communications as a result of failure or degradation in the performance of a communications provider's network.

(b) Special offices and facilities are defined as major military installations, key government facilities, nuclear power plants, and those airports that are listed as current primary (PR), commercial service (CM), and reliever (RL) airports in the FAA's National Plan of Integrated Airports Systems (NPIAS) (as issued at least one calendar year prior to the outage). The member agencies of the National Communications System (NCS) will determine which of their locations are ``major military installations'' and ``key government facilities.'' 911 special facilities are addressed separately in paragraph (e) of this Section.

(e) An outage that potentially affects a 911 special facility occurs whenever:

(1) There is a loss of communications to PSAP(s) potentially affecting at least 900,000 user-minutes and: The failure is neither at the PSAP(s) nor on the premises of the PSAP(s); no reroute for all end users was available; and the outage lasts 30 minutes or more; or

2) There is a loss of 911 call processing capabilities in one or more E-911 tandems/selective routers for at least 30 minutes duration; or

(3) One or more end-office or MSC switches or host/remote clusters is isolated from 911 service for at least 30 minutes and potentially affects at least 900,000 user-minutes; or

(4) There is a loss of ANI/ALI (associated name and location information) and/or a failure of location determination equipment, including Phase II equipment, for at least 30 minutes and potentially affecting at least 900,000 user-minutes (provided that the ANI/ALI or location determination equipment was then currently deployed and in use, and the failure is neither at the PSAP(s) or on the premises of the PSAP(s))."

Conclusion: The FCC Outage reporting language for 9-1-1 outage reporting is not up to date with the NG9-1-1. Two areas overlap with new responsibilities being assumed by CSI:

1. The 9-1-1 SSP and CSI will be providing the equivalent of the Selective Router function.
2. The 9-1-1 SSP and CSI will be providing the function which is equivalent to the ALI Data base.

The 9-1-1 SSP and CSI will be monitoring Outages that affect the ESInet capabilities to serve as a tandem for 9-1-1 calls routing to the PSAPs. They will be monitoring the ability to provide database access to for the NG PSAPs for calling party location identification. They will treat their responsibilities as seriously as any Carrier in terms of service restoration. Given the reasonable comparable loads for 911 on the ESInet in CSI ETSBs' area of responsibility, it is unlikely they would ever break the FCC threshold for reporting blocked calls in the 30 minute period for 9-1-1. A dual outage of a Data Center housing the equivalent of the SR function is highly unlikely. In the event dual outages did occur, they could provide notification to the FCC if legally required assuming they are authorized to access the FCC Reporting System. All 911 related service failures whether they are simplex or duplex will be documented and managed proactively.

By the same token ESInet(s), which provide transport for emergency 9-1-1 calls, will be monitored. All data circuits and network components which comprise an ESInet should be monitored. All network components should provide status data to the appropriate vendor management system.

Refer to the Clearwave Network Operations Plans for further details. Clearwave provides the underlying Layer 1 and 2 architecture for the CSI ESInet.

8.3 Persons with Disabilities

CSI ETSBs will retain all equipment and capabilities in place to accept calls in compliance with the American Disabilities Act. There is an expected update to the American Disability Act. Given the comments received, there is a possibility that the Department of Justice will require PSAPs to support video in NG9-1-1. However, no draft of new rules was available at the time the NENA Standard Draft or at the time Design document was published.

Any new rules promulgated by the Commission regarding persons with disabilities and texting will be supported within the CSI ESInet capabilities once the standard is defined.

8.4 VoIP to SR

The 9-1-1 SSP plans to send a request for waiver draft to the FCC staff to allow a VoIP Carrier to connect to an ESInet Functional Element rather than to a Legacy Selective Router.

8.5 Wireless to SR

The 9-1-1 SSP plans to send a request for waiver draft to the FCC staff to allow a Wireless Carrier to connect to an ESInet Functional Element rather than to a Legacy Selective Router.

8.6 Interconnection

We assume the Access Carriers must meet the 9-1-1 SSP CSI at the 2 Data Centers for NG9-1-1.

9.0 ACCESS ASSUMPTIONS

NG-911. Inc. contracted with CSI to be the 9-1-1 SSP in the State of Illinois.

ESInet major components will be located at the two CSI Jackson County Sheriff's Office - Murphysboro and Saline County Sheriff's Office - Harrisburg Data Centers. This will include all servers, racks, UPS, network components, telephone equipment, cabling, and monitors.

Each Access Carrier has been given an option for signaling and trunking. Options include MF, SS7, and ISDN PRI and SIP trunk signaling.

SIP is a preference for the Pilot Project and the ESInet connectivity going forward. At least two (2) RLECs have stated they have Softswitches, from different manufacturers. In early meetings they indicated a willingness to send 9-1-1 calls via the SIP option: Carriers Egyptian Telephone and Shawnee Telephone. Clearwave as a CLEC has a Softswitch which can use SIP signaling for NG 9-1-1 access. Mediacom has Softswitch which can generate SIP Trunking. Today they send their 9-1-1 calls to Sprint who converts the signaling to ISDN PRI. Intrado is working with their Wireless and VoIP clients, and consideration is being given to SIP trunking at or shortly after the Pilot Project begins.

This project will be a first application in Illinois of SIP for 9-1-1 access. The Access Providers will provision trunk groups to each of the 2 CSI ETSB Data Centers in order to facilitate testing and eventual cutover. The existing PSTN trunking will remain in place until a successful cutover has been tested and the cutover is authorized.

9.1 Service Level Agreements

Carriers and Public Safety agencies will have documented 9-1-1 Service Level Agreements in place before provisioning, testing and call completion activities begin. These agreements will specify provisioning intervals, database delivery, maintenance hours, service quality expectations, and will meet state and federal requirements for customer service.

This requirement is part of the ongoing negotiations between CSI and the Access Carriers.

NENA: *"Service impact levels are typically used to define the severity of the outage denoted by some range of values (e.g.1 through 5). Failure to meet agreed upon service impact levels may result in pre-negotiated financial penalties to the vendor/service provider.*

ESInets are complex and may involve management of SLAs from a number of different vendor/service providers. Best practices include:

- *Where multiple service providers are involved, there should be a demarcation point that defines the boundaries of responsibilities as described in an agreement.*
- *Obtain or establish the MTTR for each piece of equipment used in an ESInet as well as an SLA for the network service. To maintain reliable service and ensure efficient testing, benchmarks should be established, documented, and periodically reviewed for accuracy.*
- *Contracted levels of service should be established to ensure adequate response times for repair.*
- *To minimize downtime critical hot spares should be identified, purchased, and maintained on site.*
- *Maintenance should include regularly scheduled audits of hardware revision levels and code compatibility (including firmware) with hardware revisions.*

- *Redundant systems should be regularly exercised by deliberate fail-over as part of routine maintenance.*
- *Escalation paths should be documented and known to the 9-1-1 entity so that responses to failures can be adequately addressed."*

9.2 Cutover Plans

CSI is recommending the following high level processes and implementation steps for the NG9-1-1 Cutover Plan:

9-1-1 Cutover Process

The Cutover process will involve the existing Selective Routers along with 21 PSAPS. The existing 21 PSAPS will be retrofitted with new hardware to accommodate NG 9-1-1 Calls, Legacy and/or SIP. After installation, the equipment will be acceptance tested for the ability to handle the new traffic. A cutover schedule will be developed that will include all activities: establishing the Trunk Groups, SS7 Links, equipment installation pre and post testing. A Cutover Strategy (Assure911.net-CSI/NG911-STP-002) will be provided as a separate Exhibit to be filed with the ICC.

For the End offices requiring SS7 connectivity to the ESInet both CLLI information and Point Codes must be reserved. SS7 A-Links, or F-Links will need to be equipped and tested. Trunk groups from the Wireline, Wireless, VoIP and CLEC facilities based Carriers will need to be implemented and tested to the new ESInet. It is critical that initial traffic data and signaling requirements are acquired in a timely fashion to determine the number of trunks per trunk group as well as the overall scope of work.

Pre testing capabilities will be required and will include a preliminary test database. This will be required from each Carrier/End Office to initiate preliminary 9-1-1 test calls. The PSAPs will be notified of the pretest schedule. Communication and coordination of all activities is essential for successful cutover of each Carrier

Pre Cutover

- Identify the Selective Routers and PSAPS involved in the Cutover and notify PSAPs at least 30 days in advance
- Establish Trunks from the SRs to the 2 CSI Data Centers.
- Establish carrier end office facilities to the new ESInet Gateway
- Identify Signaling requirements and number of trunks
- Develop Method of Procedure (MOP) for Cutover including contacts
- Develop back out and contingency plan

ESInet Cutover

- Place initial 9-1-1 test calls to verify existing configuration is working to the appropriate primary and secondary PSAP

- Verify New Trunk Groups are Active
- Reroute originating translations to the new ESInet trunk groups
- Place 9-1-1 test calls over new route configuration
- Verify appropriate PSAP answers and verify location information
- Execute complete 9-1-1 test plan following a detailed for Conversion.
- Determine the role of the SR trunking before, during and post cutover.
- Determine the viability of the Split exchange plans, test them before and validate them during cutover.
- Cut to Live Traffic.
- Remove Selective Router Trunking when traffic is removed.

10.0 CONCLUSION

The Counties of Southern Illinois ESInet is a standards-based network, designed to accommodate calls from the PSTN technology as well as advance services offered today and in the future. The system is secure, redundant and resilient and is a significant improvement over the current 9-1-1 systems that serve the Public Safety Agencies in Southern Illinois represented by the CSI 16 ETSBs.

According to the ICC requirements, CSI has contracted with a 9-1-1 SSP ~~was established~~. NG-911, Inc. became a certified SSP in the state of Illinois in August 2012. They entered into contract with the CSI 16 ETBSs to become their NG 9-1-1 SSP.

The system designed as part of the CSI project meets the ICC requirements and complies with Illinois Statutes. This project brings improved 9-1-1 to the citizens of southern Illinois, to improve public safety and save lives.

Meetings with Access Carriers, the 9-1-1 SSP and CSI representatives are a critical part of the Path forward. The 9-1-1 SSP and CSI request the ICC establish a timeline for Public Safety Agency and Access Carrier compliance and enable and encourage the 9-1-1 SSP, CSI and the Carriers to move forward in a cooperative fashion.

Attachment 1 - Access Carriers Data Exchange Form

Master Document Shared with Each Carrier
in Meetings and on Conference Calls

Table Design Plan – Carrier Access Baseline Data Model							**Wireline Wireless CLEC VoIP**
Company Category	Wireline w/SRT	Wireline ILEC w/o SRT	Wireless w/MTSO	CLEC	VoIP (Add)	STP Provider (Add)	
	TBD	TBD	TBD	TBD	TBD		
SRTs CLLI/ Address/ Carrier		Add	Add				
STPs CLLI/ Address/ Carrier	Add	Add	Add				
Name/ Reach Info	Sales Contact Info		Engineering Contact Info		Operations Contact Info		Other Contact Info
	Add		Add		Add		
Notes: Data Collection to complete NLT August 25. Call or email OK.							
This Master Table was revised based on additional requirements from the Gateway Vendor and the SS7 Provider chosen by the 16 ETSBs. Please migrate the Carrier Data to this revised format.							
Complete a line for each of the end offices – add footnotes for any unique characteristics of the company network in general. Preferences and cost recovery issues. Provide maps or supporting data if it helps clarify the issue. There are added worksheets below. Note: Data sent in July was inserted to begin the documentation of Data Exchange where it was received. Please help us verify and complete data entry by August 25.							
Originating 911 End Office Location Note: If split between Counties by County enter info	County/ Street Address	CLLI/ Type of Originating Office	SS7 Point Code Y/N and if Y, PC	SIP Capable Y/N; and if Y, IP Address	Number 911 Trunk Groups /Legacy SRT Carrier/ Location(s)	Number of 911 trunks per group/ Signaling	9-1-1 Busy Day/Busy Hour/BH Peg Count, Usage (CCS), Overflow Holding Time , 10 High Day Data same as above

C.O. X lines Split?	County Name	Add	Add	Add	1 TG/ Frontier SRT CRDLILXE3 ED	xTrunks/ signaling	Day: Hour: PC: CCS: OFL HT: 10HD
Totals							
Validate and Continue Data Exchange Above							Day: Hour: PC: CCS: OFL HT: 10HD:

Notes:	If Carrier end offices are in two of three LATAs where CSI will have its ESInet footprint. Split trunking is an issue will be explored in each LATA. Cross Boundary issues will be documented during Data Exchange.

Note: Add as many lines as needed above until all of your end offices are included.	
Signaling:	One Carrier already specified SS7 signaling for all of their trunking in the initial Cutover. List here if all same. If not specify by Central Office, by trunk group and/or in the schedule below by year.
Signaling Option:	
STP Pair Location, CLLI, DPCs:	
Transport Decision to reach the Data Centers in Harrisburg and Murphysboro: If different for each data Center show each method.	Specify DS1, DS3, Fiber or Delivery, and the nearest Location the Transport is coming from. Please use CLLI. Also specify the number of trunks being delivered over the facility. i.e. Solacom indicated many wireless carriers are delivering a full 24 trunks per T1.
Transport Method Harrisburg DC	
Transport Method Murphysboro DC	

Transport Framing:	Solacom requires the framing on the transport to be identified. i.e. B8ZS, AMI or Superframe, etc.	Solacom requires the fill of/ active DS0s in the transport at Cutover and a Forecast years 2 to 5 where possible
Transport to Harrisburg DC		
Transport to Murphysboro DC		

Trunk Group Information – Negotiated Information after Design Exchange					
Carrier (Name) 1 in (Enter) County Add CLLI	Number of access lines	Switch Type i.e. DMS 100 or 5ESS Host or Remote	Trunk Groups 9-1-1: 0,1 or 2	Signaling to 9-1-1	Trunks to 9-1-1 per group

and Identifier					
Current	Add	Current: Add	Current: Add	Current: Add	Current: Add
2011		Pilot:	Pilot:	Pilot:	Pilot:
2012		Planned:	Planned:	Planned:	Planned:
2013		Planned:	Planned:	Planned:	Planned:
2014		Planned:	Planned:	Planned:	Planned:
CLLI of Switch/ Identifier	Number of access lines	Switch Type i.e. DMS 100 or 5ESS Host or Remote	Trunk Groups 9-1-1: 0,1 or 2	Signaling to 9-1-1	Trunks to 9-1-1 per group
Current	Add	Current:	Current:	Current:	Current:
2011		Pilot:	Pilot:	Pilot:	Pilot:
2012		Planned:	Planned:	Planned:	Planned:
2013		Planned:	Planned:	Planned:	Planned:
2014		Planned:	Planned:	Planned:	Planned:
CLLI of Switch/ Identifier	Number of access lines	Switch Type i.e. DMS 100 or 5ESS Host or Remote	Trunk Groups 9-1-1: 0,1 or 2	Signaling to 9-1-1	Trunks to 9-1-1 per group
Current		Current:	Current:	Current:	Current:
2011		Pilot:	Planned:	Planned:	Planned:
2012		Planned:	Planned:	Planned:	Planned:
2013		Planned:	Planned:	Planned:	Planned:
2014		Planned:	Planned:	Planned:	Planned:
Continue until completed					

Worksheet for Traffic Engineering Data Exchange- extend row from the Central Office							
Current 911 Trunk Group Name*	911 Maintenance Window	Busy Hour/Busy Day	CCS (Usage) in hundred call seconds	Peg Count	Overflow or Blocking	Holding Time of average 911 Calls	10 High Day of Central Office
CLLI/ C.O.							
Note: The trunk group name and the trunks with, signaling, transport data must be given to Gateway Switch within next 2 weeks for data fill. August 25, 2011.							

Reference for Table above:

1. Location Address, CLLI for Switch as published by Telcordia in the LERG
2. Legacy Trunking for 911 calls MF/CAMA/SS7 – specify the type of trunk signaling you use today for accessing the legacy SRT(s)

3. SIP Trunking capable, i.e. SoftSwitch, SIP Trunking, i.e. DMS 100 with SIP Trunking capability or
   Soft Switch with SIP Trunking – if interested in migrating to a different trunk signaling SS7 Point Codes/IP Addresses

4. Number 911 Trunk Groups /Type Signaling /Legacy Gateway Location; i.e. in the ideal Legacy design there are 2 SRTs for each Access End Office, one active and the second standby. In most of the Southern Illinois locations only a single SRT exists per LATA. In the NG9-1-1 Design, the standard access for 911 trunking is to diversely route to two (2) ESRP Gateways, housed in each CSI Data Center. Both ESRPs will be in an active mode, thus load sharing and load balance is a part of the new routing for the Design Plan.

   Note: In the case of much of Southern Illinois, this doubles the 911 trunk group requirements. This question is designed to learn more about the impact to the Access Carriers as we work toward a plan the FCC and ICC will approve for Design including Diversity and Reliability requirements for the NG9-1-1 network. The CSI Pilot is being scrutinized nationally and internationally. The pilot is geared to evaluate the NENA standards. Note: No single trunk group will have any less than 2 trunks per group. Any additional trunking will be specified based on demand history, thus the traffic statistics and growth forecast by the access carriers. A forecast for at least current and next 2 years is requested. If a 5 year forecast is available for a longer period, it will be accepted. Ongoing data exchange will be established through the NG-911, Inc. team working on behalf of CSI.

5. 911 Trunks in Service/ Busy Day/Busy Hour/Peg Count/Usage in CCS of Hundred Call Seconds if available/ Overflow/ Holding Time (HT) if available; i.e. Consistently Peak/Busiest day of week and hour of day: Wednesday at 7:00 to 8:00 CST; Traffic at Peak Hour: 1 Peg Count, x CCS, 0 overflow, and 30 second average HT. If you have any information such as 10 high days for the 911 traffic, please share that data. Typically, 10 High Day is a central office measurement and does not necessarily coincide with the 911 peaks. Anything Carriers want to share about their 911 traffic engineering load is welcome. If Carriers have a future trunk forecast for the group(s), please share information as far as the data supports underlying assumptions.

   Many Carriers have mechanized systems which reflect blocked calls and maintenance outage history with respect to all trunking and 911 is no exception. If Carriers have experienced blockages due to SR outages, facilities outages, response times, diversity issues or trunk shortages during peak loads, and have suggestions for improving performance end to end, CSI welcomes the recommendations.

6. SR Switch Names and Locations with CLLI in CSI Territory
7. STP Names and Locations with CLLI and Point Codes in CSI Territory

Added capabilities of Design Interest for each Access Carrier:

Digital Cross Connect Capabilities:

– Interest/Ability in Connecting to the 2 CSI Data Centers with Fiber Rings to get to the CSI Data Centers

Attachment 2 - Access Carrier Design – Data Exchange

Note: See Attachment 6 for status from PSAP Mapping Exercise for Engineering

Major Carrier	**Lead Contact**		
AT&T Wireline	Paul Stoffels	PS1956@att.com	95%
Frontier Wireline	Michael Davis	Michael.f.davis@ftr.com	NDA Completed
Consolidated Communication Wireline	Kaye Simms	Kaye.sims@consolidated.com	
Regional Carrier			
Crossville	Chris Birkla	cbirkla@crosstelco.com	
Egyptian	Matt Bollinger	mbetca@egyptian.net	
Fairpoint/Oden	Keith McNamara	kmcnamara@fairpoint.com	
Hamilton	Kevin ?	Kevin0@hcc.coop	
Shawnee	Mike Grisham	mgrisham@shawneelink.net	
Wabash	J. Williams	jwilliams@wabash.net	
Stand alone Carrier or part of Frontier?			
Citizens?			
Wireless Carrier			
AT&T Mobility	Allen Muse	allen.muse@att.com	
Allied/Alltel now part of Comnet	Richard Johnston Intrado,Lauren Yarnall, (Janis Johnson interim replacement for Richard Johnston who is changing positions)	Richard.Johnston@intrado.com, laurenyarnall@alltel.com, Janis.Johnson@intrado.com	Conversation Active via Intrado – meeting January 5 most recent on Wireless and VoIP
Sprint PCS	Raymond Greig	Raymond.E.Greig@sprint.com	
T-Mobile	Jim Nixon	jim.nixon@t-mobile.com	
Verizon Wireless	Peter McHale	Peter.McHale@verizonwireless.com	
Cable TV			
Mediacom Jackson County	Brenda Wrolson Data Account Executive Mediacom Communications Corporation Enterprise Solutions Phone: 618.713.3257 or 618.294.2190	bwrolson@mediacomcc.com	Research Internet

	Alan Shaklee, IP Engineer 1, Carbondale and Marion Based		
VoIP			
Vonage	Jane Winsett Irene Brennan Richard Johnston Intrado. Changing leaders	ibrennan@vonage.com Jane.Winsett@intrado.com, Richard.Johnston@intrado.com,janis.johnson@intrado.com	Conversation active via Intrado- meeting January 5 most recent on Wireless and VoIP
Clearwave CLEC	Aaron Carian Engineer, Scott Riggs, President	acarian@corp.clearwave.com	
Other Carriers from Diagrams – No Contacts – need name, email and a plan. What kind of Carrier		**Below Line not on Original Carrier Inventory – Locate Owner or on Intrado or TCI**	
First Cellular SoIL - now part of Comnet	Richard Johnston Intrado. Changing leaders Janis Johnson	Richard.Johnston@intrado.com,janis.johnson@intrado.com	Conversation Active via Intrado. Sales: Allied/Alltel/Verizon? meeting January 5 most recent on Wireless and VoIP
Nextel Partners			Nextel and Sprint PCS? Still separate trunking and networks?
TCI Wireless			
Aero Comm CLEC			
Big River Telcom CLEC			
Sprint CLEC			
LEVEL3 CLEC			
Cello Partners			Type Carrier
Delta Comm			Type Carrier
AT&T CLEC			
Bitwise Communications			Type Carrier
Cell One			
Cellco Comm			
Charter Fiberlink CLEC			
Lightspeed CLEC			
Intrado CLEC			

Attachment 3 – Data Center Locations

Data Center	Address	Primary Contact	Reach Information
East: Saline County Sheriff's Office in **Harrisburg** (1)	1 NORTH MAIN STREET, HARRISBURG, IL. Phase 1 Fiber	Tracy Felty CSI Treasurer, Clearwave Interface	(618) 252-8661, (270) 952-2098, SALINEE911@YAHOO.COM
West: Jackson County Sheriff's Department in **Murphysboro** (2)	1001 MULBERRY STREET, MURPHYSBORO, IL. Phase 1 Fiber	Patrick Lustig CSI Project Manager, President INENA, Co Chair IPSTA	(618) 457-5911, (618) 534-4911, PLUSTIG@JC911.ORG

Attachment 4 - AT&T Wireline Carrier Response to Date- Integrated Mapping

As of December, 2012, AT&T resumed communications with NG-911, Inc. ~~The following is an excerpt of the communications between AT&T and Bart Lovett of NG-911, Inc~~. Face-to-face and/or conference calls will resume when AT&T is ready.

~~**From:** STOFFELS, PAUL R [mailto:ps1956@att.com]~~
~~**Sent:** Friday, December 14, 2012 3:43 PM~~
~~**To:** Bart Lovett~~
~~**Subject:** Re: Counties of Southern Illinois ("CSI") NG 911 Trial~~

~~"Dear Mr. Lovett:~~

~~This e-mail is in response to your e-mail as Project Manager for NG-911, Inc. inquiring about "aggregated trunk pricing and redundant provisioning of 9-1-1 Service trunks to the CSI data centers located in Murphysboro and Harrisburg." Neither of these data centers is located in AT&T Illinois' serving territory. It is my understanding that CSI plans to use NG-911, Inc. as the 911 system provider for the Regional Pilot Project trial, although no contract has yet been signed.~~

~~AT&T Illinois, as a telecommunications carrier, is regulated by the Illinois Commerce Commission. AT&T Illinois has a filed tariff describing its 9-1-1 Service offerings to Public Safety entities (i.e., 9-1-1 Emergency Telephone System Boards). As previously communicated to CSI and its representatives the tariff outlines the parameters under which AT&T Illinois will provide 9-1-1 Service, along with the tariffed rates that AT&T Illinois charges a 9-1-1 System for these services (see AT&T Illinois Tariff ICC 22, Part 8, Section 3)."~~

~~"*Option 1 provides rates that AT&T Illinois charges a Public Safety entity when it is a secondary provider of 9-1-1 Service to a 9-1-1 System, and covers the delivery of AT&T Illinois' end users' traffic to another 9-1-1 System Provider, which would provide Selective Routing. Option 2 provides rates for a service not used in the State of Illinois, as no 9-1-1 system has requested that AT&T Illinois provide Selective Routing without requesting ALI delivery to their 9-1-1 System."*~~

~~"For the CSI Regional Pilot Project, AT&T Illinois would anticipate entering into Option 1 service agreements with individual 9-1-1 emergency telephone system boards (ETSBs). The service agreements would reference the tariff and the applicable rates for the implementation of 9-1-1 Service. Additionally, the service agreements would include a non-recurring charge that would be payable, if after the pilot project, the services are implemented as live 9-1-1 service (or if the service agreements are cancelled). Recurring monthly charges would not begin until any live 9-1-1 service cutover is authorized. The rates are based on the number of AT&T Illinois access lines in service within the geographic boundaries in which each specific 9-1-1 emergency telephone system board operates a 9-1-1 system, and are applied on a per 1000 access line basis."~~

~~*"These rates cover the delivery of AT&T Illinois wireline end user traffic to the 9-1-1 system, and would not involve aggregation or delivery of 9-1-1 traffic from any competitive local exchange carrier (CLEC), Voice over Internet Protocol (VoIP) Service Provider, or wireless service provider. Each local exchange carrier, wireless service provider, and/or VoIP Service Provider operating within the geographic boundaries of the 9-1-1 systems would be responsible for negotiating service agreements with each ETSB serving the geographic boundaries of the 9-1-1 system to be operated by CSI and its 9-1-1 Service Provider. AT&T Illinois has no role in determining how and where each of those providers will deliver their end users' traffic to the 9-1-1 Service Provider selected by CSI."*~~

~~"The AT&T Illinois tariff outlines technical requirements AT&T Illinois meets in provisioning 9-1-1 Service, and specifically provides that AT&T Illinois will determine the appropriate quantity of End Office to Selective Router trunks required to adequately handle calls in the busy hour so that less than 1 call out of~~

~~100 encounters a busy signal (i.e., a p.01 grade of service). In most cases, each AT&T Illinois End Office will require two (2) trunks to achieve this p.01 grade of service."~~

~~*"Per your query on dual trunking for redundancy, AT&T provides a survivability option for End Office to Selective Router trunk failures using a 9-1-1 Call Box. This option is available at no cost to public safety agencies. Further, the 9-1-1 system provider is responsible for all wireline, wireless and VoIP carrier 9-1-1 traffic for CSI. As the new 9-1-1 system provider, NG 9-1-1 is responsible for aggregating 9-1-1 traffic."*~~

~~"In closing, AT&T Illinois has pricing for 9-1-1 Service it provides to 9-1-1 systems, based on its E9-1-1 tariff covering rates per 1000 AT&T Illinois access lines, and this pricing would be set forth in service agreements with each 9-1-1 Emergency Telephone System Board to address the needs of AT&T Illinois end users for access to 9-1-1 service within each county or municipal 9-1-1 System."~~

~~*"AT&T Illinois will provide 9-1-1 call routing with Automatic Number Identification (ANI) for its subscribers' calls, to a meet point between AT&T and the 9-1-1 network of the 9-1-1 System Service Provider selected by CSI. AT&T Illinois will also provide Service Order update activity for its end users (Automatic Location Identification records, or ALI records) to the 9-1-1 Service Provider selected by CSI.*~~

~~*As explained above, AT&T Illinois does not aggregate other service provider 9-1-1 traffic onto its facilities to the network of the 9-1-1 Service Provider selected by CSI."*~~

~~"Please let us know when NG 911, Inc. has a signed agreement with CSI so that the appropriate next steps can be taken."~~

~~Paul Stoffels~~
~~Area Manager – 9-1-1 Operations – IL, IN, OH~~
~~Paul R. Stoffels~~
~~Area Manager - 9-1-1 Operations - IL/IN~~
~~(708) 229-0389 (voice)~~
~~(708) 229-0380 (fax)~~
~~(708) 903-0535 (cell)~~
~~ps1956@att.com (e-mail)~~

~~Summary:~~

Meetings with AT&T will continue.

NG-911, Inc., has been selected by the Counties of Southern Illinois to become their 9-1-1 SSP. The contract is pending final signatures. Costs are being gathered as Carriers are willing to work with NG-911, Inc. and the CSI ETSBs. That is the status as of this ~~ICC requested~~ document update. Avenues are being explored to complete the Access planning with AT&T and all Access Carriers and to prepare for Engineering, Provisioning, Testing, and Cutover of Live 9-1-1 traffic. The NG9-1-1 ESInet is operational for test calls to complete to the PSAPs that are connected. The US GAO representatives were in Murphysboro, Carbondale, Herrin and Harrisburg December 12 and 13 for meetings and their representatives saw a 9-1-1 call demonstration using actual components of the CSI NG 9-1-1 network. The US GAO stated purpose for the meeting:

The Government Accountability Office is undertaking a study for the Senate Committee on Commerce, Science, and Transportation and the House Committee on Energy and Commerce on E9-1-1 and NG9-1-1.

- Primary objectives are to examine:
  - (1) the extent to which revenues collected for E9-1-1 are being used for E9-1-1 and

  - (2) progress made in deploying wireless E9-1-1 and NG9-1-1 services throughout the country and barriers, if any, affecting implementation.

- Tour of Facilities Related to the NG9-1-1 Pilot Program

AT&T CSI Data Exchange – Integrated Worksheet November 3, 2011

County	Central Office	CLLI	Host	Re mot e	SR Primary SR Alternate	Signaling STP Locations	SS7 PC or IP Address (ATT all SS7)	SR Trks C/A	Int Trks Fut ure	H Trks Fut ure	NPA/NXX /Lines Split	On Net Split	Off Net Split
1. Alexandria	1. Cairo	CAIRILCP03D	Y	N	None	None/SS7	250-138-803	0/0	0	0	618-734-	N Alexander C Served by Union P ?	N
2. Alexandria	2. Thebes	THEBILTHR5D	CAIRILCP03D	Y	None	None/SS7	250-138-803	0/0	0	0	618-764-	N Alexander C serve by Union P and Union P	N
3. Alexandria	3. Tamms	TMMSILTMR5D	CAIRILCP03D	Y	Carbondale-F	SS7	250-138-803	0/0	0	0	618-747/ Need lines split	Y Split Union C, Pulaski C Alexander C Served by Union P and Pulaski P	N
4. Alexandria	4. Olive Branch	OLBRILOBR5D	CAIRILCP03D	Y	None	None/SS7	250-138-803	0/0	0	0	618-776	N Alexander serve by Pulaski	N
5. Alexandria	5. McClure	CPGRWIXDCO5D	CPGRWIXDDSA	Y	Carbondale-F	SS7	240-146-828	0/0	0	0	618-661/ Need lines split	Y Alexander C 800 CO – where do trunks come from? DSO or DSA served by Union P	
6. Marion	6. Centralia	CENLILCD05D	Y	N	Belleville-A Alt Centralia-A	SS7	250-033-804	4/3	4	4	618-522 /618-599/ Need Lines split	N	Y Marion C Jefferson C/ Clinton C IL served by 3 PSAPs
7. Marion	7. Kell	KELLILEP5D	CENLILCD05D	Y	Centralia-A	SS7	250-133-802	2/3	3	3	618-822/ Need lines split	N	Y Marion C Jefferson C IL served by 3 PSAPs
8. Marion	8. Salem	SALMILSER5D	CENLILCD05D	Y	Centralia-A	SS7	250-133-802	2	2	2	618-548	N	N
9. Marion	9. Iuka	IUKAILIUT5W/1	CENLILCD05D	Y	Centralia-A	SS7	250-133-802	2	2	2	618-323	N	N
10. Marion	10. Ekmanndy	KMMDILKLY5D	CENLILCD05D	Y	Centralia-A	SS7	250-133-802	2/0	2	2	618-547/ Need lines splits Or split NPA NXX	N	Y Marion C and KY Fayette C Served by Marion P and ?
11. Marion	11. Hamsay	HRAMILHAM5D	CENLILCD05D	Y	Centralia-A	SS7	250-133-802	2/0	2	2	618-755/ Need lines split	N	Y Marion C and Jefferson C IL Served by Marion P and Jefferson P
12. Marion	12. Ole	Missing	CAIRILCP03D	Y	Centralia-A	SS7	Missing, Likely 250-138-803	2/0	2	2	618-366	Missing AT&T ?	Missing AT&T ?
13. Pulaski	13. Mounds City	MTCYILMOR5D GND01903 LB42525G1	CAIRILCP03D	Y	Centralia-A	SS7	250-138-803	2	2	2	618-748	N	N
14. Pulaski	14. Olmstead	OLMSILOAR5D GND01905 LB42522G	CAIRILCP03D	Y	Carbondale-F	SS7	250-138-803	2	2	2	618-742	N	N
15. Pulaski	15. Mounds	MTCYILMOR5D GND01904 LB42552F	CAIRILCP03D	Y	Carbondale-F	SS7	250-138-803	2	2	2	618-745	N	
16. Pulaski	4. Olive Branch	OLBRILOBR5D	CAIRILCP03D	Y	Carbondale-F	SS7	250-138-803	2	2	2	618-776/ Need lines split	Y Split Pulaski C and Alexander C and Served by Union P and Pulaski P	N
17. Pulaski	3. Tamms	TMMSILTMR5D	CAIRILCP03D	Y	Carbondale-F	SS7	250-138-803	0	0	0	618-747/ Need lines split	Y Split Union C, Pulaski C	N

1

AT&T CSI Data Exchange – Integrated Worksheet November 3, 2011

											Alexander C Serve by Union P and Pulaski P	
18. Pulaski 2. Thebes	THBSILTHRS0	CAIRILCFDS0	Y	None	None/557	250-138-001	2	2	2	618-764	N Alexander C serve by Pulaski P	N
19. Union 3. Tamms	TMMSILTMRS0 GN0S1006	CAIRILCFDS0	Y	Carbondale-F	557	250-138-001	2	2	2	618-747/ Need lines split	Y Split: Union C, Pulaski C Alexander C Serve by Union P and Pulaski P	N
20. Union 5. McClure	CPGNMOEDDS0 GN0S1587	CPGNMOEDDSA	Y	Carbondale-F	557	250-138-001	2	2	2	618-661	Y Alexander C and Union C Served by Union P	Y Alexander C MO CO – where do trunks come from? DSB or DSA served by Union P?
21. Union 1. Cairo	CAIRILCFRS0	Y	N	Carbondale-F	557	250-138-001	2	2	2	618-734	N Alexander CC Served by Union P or Pulaski P?	N
CSI					*		*32	28	**		**	***
AT&T	Dis., future SRs and trunking are the major differences						*					

*C PSAP Diagram Trunking. A AT&T Trunking – resolve current and future quantities and designate which are first and which are alternate – difference of opinion. The links are across the SS7 network terminating at the Sycamore location – edit Design Plan.

** Split internal ESInet – resolve with CSI Database – confirm Melinda and CSI PSAP Manager Jane and Becky – AT&T

*** Split cross Boundary – resolve with ISA via CSI and Remote E8 equipment, or with added trunks to SRs. Pat Ken Randy Jane – Jefferson, Clinton, Illinois Missouri and Kentucky. Costs for SRs, SRs – Belleville, Centralia, Carbondale – SR trunking to ESInet Data Centers post cutover – not to PSAP

21 Lines of Data

4 Counties

3 CSI PSAPs

15 Central Offices

15 NPAs NXXs

Need lines split for exchanges requiring tests and cutover verification Melinda AT&T

Validate PSAPs serving – CSI PSAP Managers Union, Pulaski, Marion

CAIRILCFDS0 250.138.001	CPGNMOEDDSA 248.145.028	CERLILCEDS0 250.083.004 ? Belleville?	CERLILCEDS0 250.133.002		

2

Attachment 5 - Clearwave CLEC Carrier Response to Date – Integrated as of December 4, 2012

Clearwave has converted to their Soft Switch in Marion. They agreed to access the Murphysboro and Harrisburg Data Centers using SIP Access Trunking. Next steps are outlined in the meeting notes.

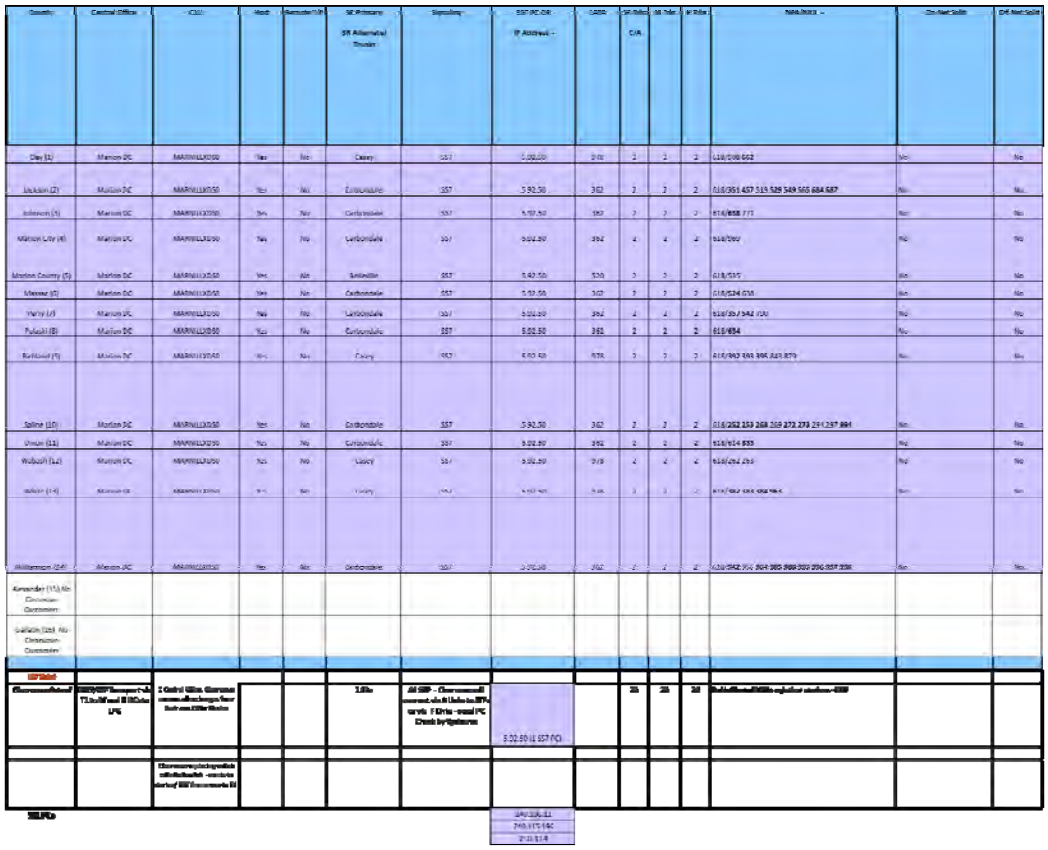
This requires 2 new trunk groups, one to each Data Center for the CSI territories. Traffic statistics from Clearwave will be used in determining the number of trunks to meet P.01 Grade of Service.

Clearwave is willing to connect via their Fiber to the 2 Data Centers and will send calls via Ethernet. Today there are 14 Trunk Groups located on the Clearwave Record. This would be a significant savings to Clearwave to connect to the NG 9-1-1 network at Murphysboro and Harrisburg. They were advised they will be required to maintain the old and new trunking arrangements during the transition.

It is possible Clearwave will be the first Access Carrier to connect to the CSI NG 9-1-1 network directly using SIP trunking protocols. They were advised the Pilot Project will carry live 9-1-1 traffic after planning, engineering, provisioning, and testing completes.

Clearwave also agreed to transport other Access Carrier's traffic to Murphysboro and Harrisburg, if the collocation and footprint match. They are not interested in making circuit switched to IP connectivity. The Carrier's interested in using their transport will make the decisions if the engineering details can be worked out at a cost all parties can agree upon. This will bring added diversity to the Carriers in Southern Illinois and help the Carriers who do not have their own facilities or choose to not deploy them to Murphysboro and Harrisburg.

SLAs and Escalation Agreements will be a part of the negotiation.



Attachment 6 – Engineering from PSAP Records Attachment – work in progress

Attachment 6 - Trunk Engineering Worksheet - From PSAP Diagrams to CSI Receipt – to be validated with all Carriers

Design Document Format for Access Trunking

CSI Access Network

CSI Data Center West Murphysboro, IL 1001 Mulberry Street MRBOILAF0ED And CSI Data Center West Harrisburg, IL 1 East Main Street HRBGILAF0ED	Carrier	County	Current SR	Main Switch/Host	Remote Switch	Trunks in Service	HRBG Future	MRBO Future	Line (000)	Split With Center
	AT&T									
		Alexander				None				SR-SR
		Clay	Olney 3ED - F			2+2				SR-SR
		Marion	Centralia -A			2+2				SR-SR
		Marion	Centralia -A			2+2				SR-SR
		Marion	Centralia - A			2+2				SR-SR
		Marion	Centralia - A			2+2				SR-SR
		Alexander	None							
		Marion	Centralia -A			4				
		Marion	Centralia -A			2				
		Marion	Centralia -A			2				
		Marion	Centralia -A			2				
		Marion	Centralia -A			2				
		Marion	Centralia -A			2				
		Marion	Centralia -A			2				
		Pulaski	Carbondale -F			0				
		Pulaski	Carbondale -F			2				
		Pulaski	Carbondale -F			2				
		Pulaski	Carbondale -F			2				
		Union	Carbondale -F			2				
		Union	Carbondale -F			0				
		SWBT?	Carbondale -F			2				
		Union	Carbondale -F			0				
	Frontier									
		Clay	Olney 3ED - F			2+2				SR-SR
		Clay	Olney 3ED - F			2+2				SR-SR
		Gallatin	Carbondale 3ED -F			7-7				SR-SR
		Jackson	Carbondale 3ED -F			3+3				SR-SR
		Jackson	Carbondale 3ED -F			4+4				SR-SR
		Marion	Centralia - A			2+2				SR-SR
		Marion	Centralia - A			2+2				SR-SR
		Massac	Carbondale 3ED -F			3+3				SR-SR
		Massac	Carbondale 3ED -F			4+4				SR-SR
		Perry	Carbondale 3ED -F			3+3				SR-SR
		Perry	Carbondale 3ED -F			2+2				SR-SR
		Pulaski	Carbondale 3ED -F			7-7				SR-SR
		Richland	Olney 3ED - F			7-7				SR-SR
		Saline	Carbondale 3ED -F			6+6				SR-SR
		Union	Carbondale 3ED -F			2+2				SR-SR
		Wabash	Olney 3ED - F			4+4				SR-SR
		White	Olney 3ED - F			3+3				SR-SR
		Williamson	Olney 3ED - F			2+2				SR-SR
		City of Marion	Carbondale 3ED -F			3+3				SR-SR
		Clay	Olney-F (3ED			2				
		Clay	Olney-F (3ED			2				
		Clay	Olney-F (3ED			2				
		Clay	Olney-F (3ED			2				
		Gallatin	Carbondale -F			2				Split?
		White	Carbondale -F			2				Split?
		Gallatin	Carbondale -F			2				
		Gallatin	Carbondale -F			0				Ridgeway Broad Ripton Saline?
		Gallatin	Carbondale -F			2				
		Jackson	Carbondale -F			2				
		Jackson	Carbondale -F			0				
		Jackson	Carbondale -F			2				
		Jackson	Carbondale -F			0				
		Jackson	Carbondale -F			2				Perry/Split?
		Jackson	Carbondale -F			2				Williamson Split?

:

Attachment 6 - Trunk Engineering Worksheet - Source PSAP Diagram to CSI Footprint –to be validated with all Carriers

Design Document Format for Access Trunking

Jackson	Carbondale -F			2				Williamson Split?
Jackson	Carbondale -F			2				Williamson Split?
Jackson	Carbondale -F			2				Split ? Union Duplicate
Jackson	Carbondale -F			0				Split? Union Duplicate?
Union	Carbondale -F			2				
Johnson	Carbondale -F			0				
Johnson	Carbondale -F			2				Split? Union?
Union	Carbondale -F			2				Split ? Marion/Williamson and Union?
Johnson	Carbondale -F			2				Split? Marion #2 Massac and
Marion	Centralia -A			0				
Clay	Centralia -A			2				Clay Split?
Clay	ICTC -A			2				Clay ICTC BB?
Marion	Centralia -A			2				
Marion	Centralia -A			0				
Marion	Centralia -A			2				
Marion	Centralia -A			0				
Pulaski	Carbondale -F			2				Union Split? Duplicate?
Union	Carbondale -F			2				Split ? Pulaski Duplicate?
Pulaski	Carbondale -F			2				
Pulaski	Carbondale -F			2				
Jackson	Carbondale -F			0				
Union	Carbondale -F			2				Split? Jackson ?
Jackson	Carbondale -F			2				
Massac	Carbondale -F			2				
Massac	Carbondale -F			0				Split ? Marion #1 Johnson ?
Johnson	Carbondale -F			2				Split?
Massac	Carbondale -F			2				
Massac	Carbondale -F			2				
Richland	Olney-F [3ED			2				
Richland	Olney-F [3ED			2				
Richland	Olney-F [3ED			2				
Richland	Olney-F [3ED			2				
Richland	Olney-F [3ED			2				
Richland	Olney-F [3ED			2				
Crawford O	Olney-F [3ED			2				Split?
Richland	Olney-F [3ED			2				
Richland/Cla x	Olney-F [3ED			2				Split?
Richland	Olney-F [3ED			2				
Massac	Carbondale -F			2				Duplicate? Split?
Pulaski	Carbondale -F			2				Duplicate? Split?
Johnson	Carbondale -F							Split? Pulaski?
Massac	Carbondale -F			2				Pulaski/ Split?
Pulaski	Carbondale -F			2				Massac

Attachment 6 - Trunk Engineering Worksheet - Provide PSAP Diagrams to CSI Receipt –to be validated with all Carriers

Design Document Format for Access Trunking

								Split?
Perry	Carbondale -F			2				
Perry	Carbondale -F			2				Jackson Split?
Randolph-O	Carbondale -F			2				Split?
Perry	Carbondale -F			0				
Perry	Carbondale -F			2				
Randolph-O	Carbondale -F			0				Split?
Jackson	Carbondale -F			0				
Perry	Carbondale -F			2				
Perry	Carbondale -F			0				
Perry	Carbondale -F			2				
Perry	Carbondale -F			2				
Perry	Carbondale -F			0				
Perry	Mascoutah -F			2				
Union	Carbondale -F			2				
Union	Carbondale -F			2				Johnson Split?
Johnson	Carbondale -F							Split? Union
Pulaski	Carbondale -F			2				Split? Union? Duplicate?
Saline	Carbondale -F			1				
Saline	Carbondale -F			2				
Saline	Carbondale -F			2				Split?
Saline	Carbondale -F			2				Map
Gallatin -O	Carbondale -F			3				Out to Gallatin – not on G Diagram?
Saline	Carbondale -F			2				
Saline	Carbondale -F			2				
Saline	Carbondale -F							
Union	Carbondale -F			8				Jackson Split? Duplicate?
Wabash	Olney-F [SED]			2				
Wabash	Olney-F [SED]			2				
Wabash	Olney-F [SED]			2				
Wabash	Olney-F [SED]			2				
Wabash	Olney-F [SED]			2				Split?
White	Olney-F [SED]			2				
White	Olney-F [SED]			2				
White	Olney-F [SED]			2				Split?
White	Olney-F [SED]			2				
White	Olney-F [SED]			2				
White	Carbondale -F			2				
Williamson	Carbondale -F			2 (SS7)				
Williamson	Carbondale -F			2 (SS7)				Jackson Split?
Williamson	Carbondale -F			1 (SS7)				City Marion Split?
Williamson	Carbondale -F			2 (SS7)				Split? Marion# 5 Johnson
Williamson	Carbondale -F			2 (SS7)				Split Marion 5 Johnson
Williamson	Carbondale -F			2 (SS7)				City Marion Split?
Williamson	Carbondale -F			2 (SS7)				
Williamson	Carbondale -F			2 (SS7)				
Williamson	Carbondale -F			2 (SS7)				
Williamson	Carbondale -F			2 (SS7)				
Williamson	Carbondale -F			2 (SS7)				
Williamson	Carbondale -F			6 (MF)				Jackson (Split?
Williamson	Carbondale -F			2 (MF)				Jackson (Split?
Williamson	Carbondale -F			0 (MF)				Jackson (Split?
Williamson	Carbondale -F			2				Saline Split?
Saline-O	Carbondale -F			2				Split?
Johnson	Carbondale -F			2				Split?

Attachment 6 - Trunk Engineering Worksheet - Shows PSAP Diagrams in CSI Footprint –to be validated with all Carriers

Design Document Format for Access Trunking

	Williamson	Carbondale -F	[redacted]	[redacted]	2 (SS7)				
Crossville									
	White	Olney -F[3ED]	[redacted]		2				
Egyptian									
	Jackson	Carbondale -F	Baldwin Hos		3				
	Jackson	Carbondale -F	[redacted]	[redacted]	0				
	Perry	Mascoutah - F	[redacted]		3				
	Perry	Mascoutah - F	[redacted]	[redacted]	0				
	Perry	Mascoutah - F	[redacted]	[redacted]	0				
FairpointOden									
	Marion	Centralia -A	[redacted]		2				
	Marion	Centralia -A	[redacted]		2				
Hamilton									
	Saline	Carbondale -F	[redacted]	[redacted]	2				
	White	Olney -F[3ED]	[redacted]	[redacted]	2				
Shawnee									
	Gallatin	Carbondale -F	[redacted]		0				Host included ?
	Gallatin	Carbondale -F	[redacted]	[redacted]	2				Split? Same NEX
	Gallatin	Carbondale -F	[redacted]	[redacted]	2				Split? Same NEX
	Gallatin	Carbondale -F	[redacted]	[redacted]	2				
	Saline	Carbondale -F	[redacted]		0				
	Saline - O	Carbondale -F	[redacted]	[redacted]	2				Split? Opted to Gallatin Same NEX
	Saline - O	Carbondale -F	[redacted]	[redacted]	2				Split? Same NEX Opted to Gallatin
	Johnson	Carbondale-F	[redacted]		2				
	Johnson	Carbondale-F	[redacted]	[redacted]	2				
Wabash									
	Richland	Olney -F	[redacted]	[redacted]	2				Olney/ Marion Split?
	Clay	Centralia -A	[redacted]		2				C/M Split?
	Clay	Olney -F	[redacted]	[redacted]	2				Double shown R/C split?
	Wabash	Olney -F[3ED]	[redacted]	[redacted]	2				
	Marion	Centralia -A	[redacted]		2				
	Clay	Olney-F [3ED	[redacted]	[redacted]	2				C/M Split?
	Clay	Olney-F [3ED	[redacted]	[redacted]	2				
	Marion	Centralia -A	[redacted]	[redacted]	2				C/M Split?
AT&T Mobility									
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		4				
	Massac	Carbondale -F	[redacted]		2				
	Marion	Centralia -A	[redacted]		2				
	Perry	Carbondale -F	[redacted]		2				
	Pulaski	Carbondale -F	[redacted]		2				
	Saline	Carbondale -F	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	Wabash	Olney-F [3ED	[redacted]		2				
	White	Olney-F[3ED]	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
	City Marion	Carbondale -F	[redacted]		2				
Allied/Alltel									
	Clay	Olney-F [3ED	[redacted]		2				
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		2				
	Perry	Carbondale -F	[redacted]		2				
	Pulaski	Carbondale -F	[redacted]		2				
	Saline	Carbondale -F	[redacted]		2				
	Richland	Olney-F [3ED	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	Wabash	Olney-F [3ED	[redacted]		2				
	White	Olney-F[3ED]	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				

Attachment 6 - Trunk Engineering Worksheet - Provide PSAP Diagrams to CSI Footprint –to be validated with all Carriers

Design Document Format for Access Trunking

	City Marion	Carbondale -F	[redacted]		2				
Sprint PCS									
	Clay	Olney-F [3ED	[redacted]		2				
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		4				
	Marion	Centralia -A	[redacted]		2				
	Massac	Carbondale -F	[redacted]		2				
	Pulaski	Carbondale -F	[redacted]		2				
	Richland	Olney-F [3ED	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	White	Olney-F[3ED]	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
	City Marion	Carbondale -F	[redacted]		2				
T-Mobile									
	Clay	Olney-F [3ED	[redacted]		2				
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		2				
	Marion	Centralia -A	[redacted]		2				
	Percy	Carbondale -F	[redacted]		2				
	Pulaski	Carbondale -F	[redacted]		2				
	Richland	Olney-F [3ED	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	White	Olney-F[3ED]	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
	City Marion	Carbondale -F	[redacted]		2				
[redacted]									
	Gallatin	Carbondale -F	[redacted]		2				
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		4				
	Percy	Carbondale -F	[redacted]		2				
	Pulaski	Carbondale -F	[redacted]		2				
	Saline	Carbondale -F	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	Wabash	Olney-F [3ED	[redacted]		2				
	White	Olney-F[3ED]	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
Mediacom			Via Sprint changing	Contact Randy Moss per Patrick L.					
	Jackson	Carbondale -F							
Vonage									
	Jackson	Carbondale -F	[redacted]		6				
	Marion	Centralia -A	[redacted]		4				
Clearwave CLEC									
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		2				
	Massac	Carbondale -F	[redacted]		2				
	Percy	Carbondale -F	[redacted]		2				
	Saline	Carbondale -F	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
	City Marion	Carbondale -F	[redacted]		2				
Other			Below Line not on Carrier inventory - Locate						
[redacted]									
	Gallatin	Carbondale -F	[redacted]		2				
	Jackson	Carbondale -F	[redacted]		3				
	Johnson	Carbondale -F	[redacted]		2				
	Percy	Carbondale -F	[redacted]		2				
	Pulaski	Carbondale -F	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	Richland	Olney-F [3ED	[redacted]		4				
	Saline	Carbondale -F	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
Nextel Partners									
	Jackson	Carbondale -F	[redacted]		4				
	Johnson	Carbondale -F	[redacted]		2				
	Wabash	Olney-F [3ED	[redacted]		2				
	White	Olney-F[3ED]	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
	City Marion	Carbondale -F	[redacted]		2				
TCI Wireless									
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		2				
	Massac	Carbondale -F	[redacted]		2				
	Saline	Carbondale -F	[redacted]		2				
	Union	Carbondale -F	[redacted]		2				
	Williamson	Carbondale -F	[redacted]		2				
Aero Comm CLEC									
	Gallatin	Carbondale -F	[redacted]		2				
	Jackson	Carbondale -F	[redacted]		2				
	Johnson	Carbondale -F	[redacted]		2				

Attachment 6 - Trunk Engineering Worksheet - [illegible] PSAP Diagrams in CSI Footprint –to be validated with all Carriers

Design Document Format for Access Trunking

	Massac	Carbondale -F	[illegible]		2				
	Saline	Carbondale -F	[illegible]		2				
	Williamson	Carbondale -F	[illegible]		2				
	City Marion	Carbondale -F	[illegible]		2				
Big River Telcom CLEC									
	Saline	Carbondale -F	[illegible]		2				
	Union	Carbondale -F	[illegible]		3				
	Wabash	Olney-F [3ED	[illegible]		2				
	White	Olney-F[3ED]	[illegible]		2				
Sprint CLEC									
	Jackson	Carbondale -F	[illegible]		2				
	Percy	Carbondale -F	[illegible]		2				
	Pulaski	Carbondale -F	[illegible]		2				
	Saline	Carbondale -F	[illegible]		2				
	Union	Carbondale -F	[illegible]		2				
	Williamson	Carbondale -F	[illegible]		2				
	City Marion	Carbondale -F	[illegible]		2				
LEVEL3 CLEC									
	Percy	Carbondale -F	[illegible]		2				
	Pulaski	Carbondale -F	[illegible]		2				
	Saline	Carbondale -F	[illegible]		2				
Cello Partners									
	Percy	Carbondale -F	[illegible]		2				
	Pulaski	Carbondale -F	[illegible]		2				
	Williamson	Carbondale -F	[illegible]		2				
	City Marion	Carbondale -F	[illegible]		2				
Delta Comm									
	Pulaski	Carbondale -F	[illegible]		2				
AT&T CLEC									
	City Marion	Carbondale -F	[illegible]		2				
Bitwise Communications									
	Saline	Carbondale -F	Bitwise Communications		2				
Cell Line	Verizon/								
	Clay	Olney-F [3ED	[illegible]		2				
	Marion	Centralia -A	[illegible]		2				
CellcoComm									
	Saline	Carbondale -F	[illegible]		2				
Charter Fiberlink CLEC									
	Marion	Centralia -A	Charter Fiberlink CLEC		2				
Lightspeed CLEC									
	Marion	Centralia -A	[illegible]		2				
Intrado CLEC									
	Marion	Centralia -A	[illegible]		4				

[illegible]
[illegible]
[illegible]

References

Documents filed by CSI

1. Next Generation Design Plan, Assure911.net-DG-CSI/NG911-001
2. Next Generation Access Plan, Assure911.net-DG-CSI/NG911-002
3. Test Plan Document, Assure911-STP-CSI/NG911-001
4. NG9-1-1/CSI Cutover Strategy, Assure911-STP-CSI/NG911-002

Title 83 Administrative Code Part 725:

1. http://www.ilga.gov/commission/jcar/admincode/083/08300725sections.html

NENA and SIP References, included in the filing as Exhibit 12

1. NENA i3 standards, "Detailed Functional and Interface Standards for the NENA i3 Solution Version 1.0," Standard number: 08-003 v1", approved June 16, 2011, http://www.nena.org/stories/technical/executive-board-approves-i3-standard
2. NENA Glossary of terms document, http://www.nena.org/sites/default/files/NENA%2000-001_V16.pdf.
3. NENA: "The NENA 75-001 Security for Next-Generation 9-1-1 Standard (NG-SEC) contains a number of sections which apply to ESInets including; Security Policies, Information Classification, Safeguarding Information Assets, Physical Security Guidelines, Network and Remote Access Security Guidelines, Change Control Documentation, Compliance Audits and Reviews. ESInets should be NG-SEC compliant. http://www.nena.org/?page=ng911_security&terms=security+and+standards
4. NENA Operations Standards for NG9-1-1, NENA 57-750 NG9-1-1 System and Operational Features and Capabilities Requirements pdf. Rick Jones - lead.
5. Access Trunking Reference IP-PBX / Service Provider Interoperability, *"SIPconnect 1.1 Technical Recommendation"*, SIP Forum Document Number: TWG-2
6. NENA ESInet Design for NG9-1-1 draft document NENA 08-506 Version 1, August 16, 2011.
7. ESInet Design for NG9-1-1 NENA 08-506, Version 1
8. CSI Narrative including Future Benefits not covered in CSI ICC Pilot application Design Plan

List of Exhibits included in this filing:

1. Exhibits 1-9 Legal and Regulatory References.
2. Exhibit 10 Assure911 Test Plan
3. Exhibit 13 CSI RFP - This document defines the Network Design as described in the *"REQUEST FOR PROPOSAL FOR AN IP-BASED NEXT GENERATION 9-1-1 COMMUNICATION SYSTEM for Counties of Southern Illinois NG9-1-1 Association,"* submitted on September 21, 2010 by: Ken Smith – Chairman, 300 N. Park Ave., Herrin, Illinois 62948, 618-988-6911, document dated August 2, 2010.
4. Exhibit 14 Design Plan
5. Exhibit 15 Access Plan
6. Exhibit 16 Cutover Strategy
7. Exhibit 17 CSI Contracts