Strategic Plan for Statewide 9-1-1 Service

For

FY 2015 – 2019

Purpose

Section 771.055 of the Health and Safety Code requires the Commission on State Emergency Communications (CSEC) to prepare for each state fiscal biennium a strategic plan for statewide 9-1-1 service for the following five state fiscal years. This document is submitted in fulfillment of that requirement.

The strategic plan must:

(1) include a survey of the current performance, efficiency, and degree of implementation of emergency communications services throughout the whole state;

(2) provide an assessment of the progress made toward meeting the goals and objectives of the previous strategic plan and a summary of the total expenditures for emergency communications services in this state;

(3) provide a strategic direction for emergency communications services;

(4) establish goals and objectives relating to emergency communications;

(5) provide long-range policy guidelines for emergency communications;

(6) identify major issues relating to improving emergency communications;

(7) identify priorities for this state's emergency communications system; and

(8) detail the financial performance of each regional planning commission in implementing emergency communications service including an accounting of administrative expenses.

SURVEY OF 9-1-1 SERVICE IN TEXAS

9-1-1 service is statutorily defined as a communications service that connects users to a public safety answering point through a 9-1-1 system. In Texas, 9-1-1 service is provided by a mix of 9-1-1 entities consisting of 52 Emergency Communication Districts (ECDs)[1] and the state program administered by the CSEC and operated by 23 Regional Planning Commissions (RPCs). Texas Health and Safety Code, Chapter 771, is the statutory basis for the CSEC/RPC 9-1-1 program. Under the program, the CSEC contracts with the RPCs for the provision of 9-1-1 service in those areas of the state where 9-1-1 service is not provided by an ECD. The statewide program is well established, and the CSEC and the RPCs work together to further develop and maintain access to efficient and effective statewide 9-1-1 services. Figure 1 – *Map of Texas 9-1-1 Service Entities* - illustrates the geographical service areas of the 9-1-1 entities.

DEGREE OF IMPLEMENTATION

The following levels of 9-1-1 service have been implemented by all 9-1-1 entities in all areas of the state.

- Basic 9-1-1 provides the caller the ability to reach a PSAP by dialing the digits 9-1-1
- Enhanced 9-1-1 (E9-1-1) adds the following three key capabilities to basic 9-1-1 service, and has been implemented throughout the state for landline, wireless and voice over internet protocol (VoIP) service.
    - Selective routing provides intelligence and flexibility in the routing of calls to the correct, predetermined PSAP;
    - Automatic Number Identification (ANI) provides the caller's telephone number so call takers can call back if the call is disconnected; and
    - Automatic Location Identification (ALI) provides call takers with the caller's location or address, which assists in the dispatch of emergency services.

CURRENT PERFORMANCE

Citizens rely on 9-1-1 to reach assistance in times of individual crisis or major disaster. The mission of the CSEC is to preserve and enhance public safety and health in Texas through reliable access to emergency communications services. In accomplishing our mission, the CSEC collaborates with regional and local governments and other state agencies to promote stewardship and accountability, set high standards, and foster efficient emergency communications services. Performance is reflected by the number of calls to 9-1-1.

[1] Twenty-five Emergency Communications Districts have been formed and operate under the authority of Health and Safety Code Chapter 772. Twenty-six municipalities and one county that are recognized as Emergency Communication Districts in Health and Safety Code § 771.001(3)(A) operate 9-1-1 systems that are independent of the state's system. 9-1-1 service in the incorporated portion of Dallas County is provided by Emergency Communications Districts, or pursuant to the North Central Texas Council of Governments' Regional 9-1-1 Plan. 9-1-1 service in the unincorporated portion of Dallas County is provided by Dallas County.

9-1-1 Call Volume for 2013

- 24,922,909 per year
    - 68,473 per day
        - 2,853 per hour

Limitations on performance exist. The performance of the current 9-1-1 of technology is subject to inherent limitations due to its age and design. The existing 9-1-1 system is based on wireline technologies established decades ago, and uses outdated systems to deliver 9-1-1 calls and location information to the PSAPs. The current 9-1-1 system cannot accept digital media such as text messages, photographs or video, all of which are mainstream technologies used by the public today; nor is the current 9-1-1 system interoperable with emergency responder public safety communications systems.

EFFICIENCY

The technology supporting the current 9-1-1 system is nearing end-of-life and will soon be obsolete. The national telecommunications infrastructure is changing as is the way the public communicates and adopts new technology. These changes have a direct impact on the ability of 9-1-1 service to support and serve the public. As more new digital communications technologies are introduced that cannot access the existing 9-1-1 system, the effectiveness and efficiency of 9-1-1 service will erode. The cost of supporting and maintaining the aging 9-1-1 infrastructure, if possible at all, will increase.

Recent actions by the Federal Communications Commission will require the wireless carriers and 9-1-1 systems to send and receive text messages to better serve the needs of the deaf and hearing impaired, as well as those "callers" that would put themselves in danger by speaking aloud to a 9-1-1 call taker. Texas' major telephone companies that currently provide the 9-1-1 infrastructure have begun planning to decommission and replace their aging network and equipment.

Incorporating these advanced capabilities will require major changes to the 9-1-1 infrastructure. A digital replacement of the current analog 9-1-1 system is needed to leverage and increase the efficiency of the existing 9-1-1 system.

ASSESSMENT OF PROGRESS ON MEETING THE GOALS AND OBJECTIVES OF 2013 – 2017 PLAN

The goal of the previous biennium's plan was to establish a more effective, efficient and resilient 9-1-1 system for providing 9-1-1 service. The following objectives were established to obtain the goal. The progress made to-date on each objective is noted.

1. Maintain the present level of 9-1-1 service while transitioning to a system capable of addressing newer consumer devices and other needs.
    - The current level of 9-1-1 service, Enhanced 9-1-1, has been maintained throughout the state.

2. Plan and employ a statewide Emergency Services IP-enabled Network (ESInet) as the backbone for Next Generation 9-1-1 in Texas.
    - The 83rd Legislature (2013) appropriated $12.8 million for FY 2014 – 2015 for 9-1-1 geospatial data development and the first phase of a state-level digital 9-1-1 network. Geospatial database management services have been

procured and data development has commenced at the twenty-three RPCs in the CSEC program. On the digital 9-1-1 network, CSEC completed the initial stakeholder assessment and planning project in FY 2014; and, is procuring technical services, equipment and network components in FY 2015 to achieve its strategic plan performance measure to connect eighty (80) PSAPs to a state-level network.

3. Plan and deploy "early adopter" regional/local ESInets.
    - During the FY 2014 – 2015 biennium, several ESInets have been planned, implemented or are in progress –Four RPCs in the CSEC program, and ten individual ECDs, report having planned, implemented, or partially implemented regional ESInets. The CSEC has reported progress on its strategic plan performance measure goal for regional connectivity: seven RPCs have reported a total of 127 PSAPs with regional connectivity. In response to a recent CSEC survey, thirty-six ECDs reported 129 PSAPs with regional connectivity.

4. Plan and deploy additional regional/local ESInets.
    - RPC Strategic Plan (Stage One) submissions for FY 2016 – 2017 reflect that additional eight RPCs are planning for the deployment of regional ESInets, contingent upon funding. Another twelve RPCs have indicated interest in connecting directly to the state-level ESInet.

SUMMARY OF TOTAL EXPENDITURES

The annual cost for calendar year 2013 for emergency communications services for the state of Texas was $213 million. This figure is based on the assumption that fee collections equal expenditures. Fee collections were reported to the FCC in July of 2014 as mandated by the federal New and Emerging Technologies Improvement Act of 2008. Reported collections are summarized in Table 2.

	Wireline 9-1-1 Fees	Wireless 9-1-1 Fees	Prepaid Wireless 9-1-1 Fees	9-1-1 Equalization Surcharge	TOTALS
State of Texas[2]		$102,747,464	$21,306,879	$19,675,421	$143,729,764
State 9-1-1 Program	$15,547,976				$15,547,976
772 ECDs	$35,230,707				$35,230,707
Municipal ECDs	$18,707,036				$18,707,036
TOTALS	$69,485,719	$102,747,464	$21,306,879	$19,675,421	$213,215,483

Table 2: Summary of Total Expenditures

[2] The wireless 9-1-1 fee, the prepaid wireless 9-1-1 fee, and the equalization surcharge are statewide fees that are remitted by service providers to the Texas Comptroller of Public Accounts. Each month CSEC distributes to the ECDs their pro-rata share of remitted wireless and prepaid wireless fees. On a quarterly basis, the Commission allocates to the RPCs their pro-rata share of appropriated wireline, wireless, and prepaid wireless fees. Appropriated equalization surcharge is used by CSEC to fund the state's poison control program and to supplement those RPCs whose allocated wireline/wireless/prepaid wireless fees are insufficient to fund 9-1-1 service.

MAJOR ISSUES RELATING TO IMPROVING 9-1-1 SERVICE IN TEXAS

The current 9-1-1 system is approaching the end of its useful life. It uses legacy technology to deliver 9-1-1 calls and location data for landline voice, and landline teletype/telecommunications device for the deaf (TTY/TDD); and "bolted on" additional systems to deliver, wireless/cellular voice, and VoIP 9-1-1 to the Public Safety Answering Point (PSAP). Each introduction of a new access technology (e.g., wireless, text messaging) or expansion of system functions (e.g., determining the location of a caller or emergency situation) requires significant engineering and system modifications. The existing system is based on technologies that were established decades ago and is a barrier to creating an integrated emergency call management system that would have the ability to exchange voice, data, text, photographs and live video through the 9-1-1 emergency communications center. These capabilities would assist law enforcement, fire departments, and emergency medical services in tailoring their response to conditions at the scene of the emergency.

An advanced, integrated 9-1-1 system would also provide the ability to quickly and easily reroute emergency calls to another call center when the primary answering point is unavailable or overloaded. The incorporation of these advanced capabilities would no doubt enhance the ability to provide more efficient, effective and dynamic emergency responses; however, major changes will be required in the 9-1-1 system. The new system is referred to as Next Generation 9-1-1, or NG9-1-1.

The major issues framing the necessary improvements and the future of 9-1-1 service in Texas and the nation are:

Keeping up with changing technology.

Consumer calling devices and modes of communication continue to evolve, with changes measured in weeks and months. Changes to 9-1-1 systems seem to be measured in years. That differential can preclude callers from being able to access 9-1-1 at a critical time. As an example, use of text messaging would be the preferred method of communication during a domestic violence incident or a Virginia Tech - type shooting, when speaking aloud would endanger the caller. Short of another "bolt-on" solution, there is no way for text messages to directly access the 9-1-1 system with the analog technology in place currently in a majority of the regions of the state.

On May 15, 2014, the 4 largest wireless service providers voluntary made available text to 9-1-1 upon request by the PSAPs. The FCC has proposed requiring all other wireless service providers, as well as over-the-top text messaging providers, to provide text to 9-1-1 upon request. The 9-1-1 Entities and PSAPs will be responsible for requesting and implementing text. The Commission has adopted policies and instructions for the implementation of text to 9-1-1 to ensure consistency in implementation. However, the ability of a PSAP to request this new service will depend significantly on its ability to have implemented digital network connectivity and upgraded call taking equipment.

System vulnerabilities and potential single points of failure.

Security breaches to major corporations, the U.S. Department and others, underscore security risks to all types of mission critical networks, including 9-1-1. Lack of redundancy and diversity in 9-1-1 networks can impact their reliability. Outage of a single key network element can result in a service outage over a widespread area. Additionally, 9-1-1 systems are vulnerable to outage in the event of major manmade and natural disasters. Hurricanes have an immense impact on large areas of the Texas coast, and the current, manual, method of rerouting 9-1-1 calls is insufficient to support the emergency communications needs. Isolated 9-1-1 outages occur on a daily basis as a result of inadvertent acts such as the cutting of a buried cable by a construction crew.

Lost opportunities to improve emergency response.

Many newer calling devices incorporate features that can generate additional data, such as imagery or advanced telematics (e.g. automatic crash information from OnStar and Ford Sync – type services) that could be useful to call takers or emergency responders in tailoring the response to conditions. Additionally, information like building plans, which could be of assistance to law enforcement or fire fighters, is readily available in electronic form. However, little information beyond a voice call can be sent via the current 9-1-1 systems.

Predictable and adequate levels of funding.

The 83rd Legislature provided CSEC with funding in the FY 2014 – 2015 biennial appropriation for NG9-1-1 Implementation – State-level ESInet (Phase I). Funding will again be required in FY 2016 – 2017 and FY 2018 – 2019 to complete the transition and operate the implemented components of the new state-level digital network. Funding is also required to implement and maintain regional networks. Once the transition is complete, legacy network elements can be decommissioned and associated costs eliminated.

Maintenance of the current level of service during transition.

Although migration to an advanced, integrated 9-1-1 system is a priority, it is important to maintain the current level of service in existing 9-1-1 systems during migration. As a part of normal operating costs, call taker equipment must be replaced at the end of its service life. The CSEC's standard for equipment replacement in the state program is based upon computer industry standards. The risk of losing an emergency call due to equipment failure increases when these replacement thresholds are not met. Costs for equipment maintenance and repair also increase when equipment is required to remain in service after the vendor has designated the item end-of-life or obsolete. Equipment failures, due to age and/or equipment operating past recommended life cycles, could materially affect public safety and health.

STRATEGIC DIRECTION AND LONG-RANGE POLICY GUIDELINES

In order to address the issues inherent in today's 9-1-1 technology, Texas 9-1-1 entities should implement Next Generation 9-1-1, or NG9-1-1. NG9-1-1 planning, transition and implementation will be an extensive, multi-year effort. Implementing the new 9-1-1 system presents both opportunity and challenge. The opportunity lies in the ability to

enhance a vital public safety service. The challenge will be to marshal the resources required to effect the change.

The National Emergency Number Association (NENA) defines NG9-1-1 as follows:

Next Generation 9-1-1 (NG9-1-1)

> *NG9-1-1 is an Internet Protocol (IP) based system comprised of managed Emergency Services IP networks (ESInets), functional elements (applications), and databases that replicate traditional E9-1-1 features and functions and provides additional capabilities. NG9-1-1 is designed to provide access to emergency services from all connected communications sources, and provide multimedia data capabilities for public safety answering points (PSAPs) and other emergency service organizations.*

TEXAS NG9-1-1

The Texas NG9-1-1 System will be realized with the implementation of a state-level ESInet that will interconnect regional ESInets and individual PSAPs. The Texas state-level ESInet is specifically defined in Health and Safety Code 771.0511 as,

> *[A] private internet protocol network or Virtual Private Network that is used for communications between and among public safety answering points and other entities that support or are supported by public safety answering points in providing emergency call handling and response; and, will be a part of the Texas Next Generation Emergency Communications System.*

The Texas NG9-1-1 system will be a network-of-networks with multiple vendors/solutions deployed across the state. The state-level ESInet will provide NG9-1-1 services directly and indirectly. Direct services will be provided to those entities that subscribe to CSEC's state-level ESInet services. Indirect services will provide region-to-region ESInet interoperability facilitated by the state-level ESInet's functional elements.

Emergency Communications Advisory Committee (ECAC)

As required by Health & Safety Code, 771.0511, the CSEC adopted Rule 252.8 to establish the Emergency Communications Advisory Committee composed of stakeholders, under Government Code Chapter 2110.

The Committee's tasks are to:

- Advise CSEC on matters regarding the establishment and management of the state-level ESInet; and
- Provide for 9-1-1 Entity collaboration on the management of the state-level ESInet, collective decision-making, and assurance that the requirements of the 9-1-1 administrative entities are met.

The membership of this committee includes representatives from each of the three types of 9-1-1 entities in Texas and formalizes the cooperative working relationship between

entities to facilitate the effective implementation of a state-level ESInet that will meet the needs of the entire state.

Next Generation 9-1-1 Master Plan

The *CSEC Next Generation 9-1-1 Master Plan (Ver. 4.0, July 2014)* presents the Texas perspective of the system's functionality, management, operations, security and governance; and, includes guidance for implementing NG9-1-1. The purpose of the document is to communicate the vision of the Texas NG9-1-1 System to stakeholders so that they may be actively engaged in its development and deployment. The Master Plan was originally published in 2010, and revised in July 2014 to directly solicit and incorporate input from the ECAC, RPCs and ECDs. The Master Plan will be updated biannually and included in future Statewide Strategic Plans for 9-1-1 Service.

The Master Plan is incorporated into this plan as Appendix 1, and provides detailed information on the strategic direction and long-range policy issues related to the implementation of NG9-1-1. The NG9-1-1 Master Plan contains the following sections:

- System Overview
- Transition Overview
- Method of Finance
- Governance, Legal and Regulatory
- System Management and Operations
- Resource Sharing
- Public Education
- Supporting Radio Communications Interoperability
- Texas NG9-1-1 System and ESInet Vision Diagram

As reflected in the NG9-1-1 Master Plan, timing of the transition to NG9-1-1 is dependent upon appropriation of adequate resources. It lays out the following high-level, phased timeline of NG9-1-1 development, aligned with strategic planning and biennial funding cycles:

FY 2015

- NG9-1-1 Geospatial Data Initiative
    - Enterprise Geospatial Database Management Services (EGDMS) – Implementation
    - 9-1-1 Database Management System – Procurement
- State-level ESInet (Phase I) – Procurement
- Regional ESInets – Procurement and Implementation

FY 2016 - 2017

- NG9-1-1 Geospatial Data Initiative
    - 9-1-1 Database Management System - Implementation (FY 2016)
- State-level ESInet (Phase I) – Implementation (FY 2017)
- State-level ESInet (Phase II) – Procurement (FY 2016)
- Regional ESInets Procurement, Implementation and Maintenance

FY 2018 – 2019

- State-level ESInet (Phase II) – Implementation (FY 2018)
- State-level ESInet (Phase III)
    - Procurement (FY 2018)
    - Implementation (FY 2019)
- Regional ESInet – Procurement, Implementation and Maintenance
- State-level and Regional ESInets – Interconnected and Fully Functional
- Legacy 9-1-1 Systems – Decommissioned (FY 2019)

GOALS, OBJECTIVES AND PRIORITIES FOR TEXAS 9-1-1

Goal: Establish a more effective, efficient, resilient and enhanced Next Generation 9-1-1 system.

Objectives (in priority order):

1. Maintain the present level of 9-1-1 service while transitioning to NG9-1-1.

2. Plan and deploy the State-level ESInet

3. Plan and deploy Regional ESInets

4. Identify, develop and adopt operational and technical guidelines and requirements that govern the state-level ESInet.

5. Identify resources and tools to educate and support 9-1-1 Entities, in particular smaller entities that may lack resources at the local level.

6. Develop and recommend standards for interoperability with public safety communications.

FINANCIAL PERFORMANCE OF RPCS IN PROVIDING 9-1-1 SERVICE

Figure 2 details the financial performance of each RPC in providing 9-1-1 service.

FIGURE 1

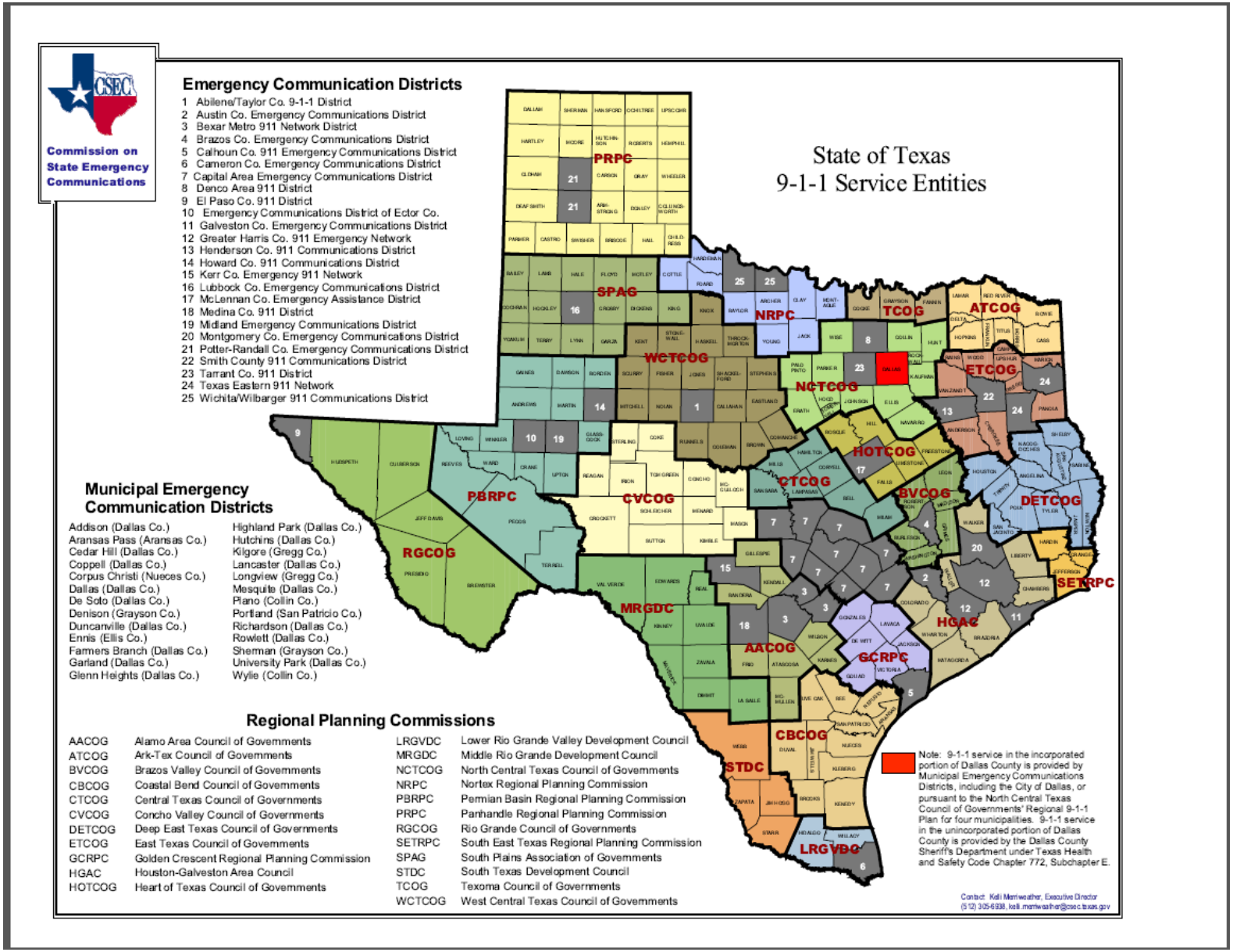
Commission on State Emergency Communications
Emergency Communication Districts
1 Abilene/Taylor Co. 9-1-1 District
2 Austin Co. Emergency Communications District
3 Bexar Metro 911 Network District
4 Brazos Co. Emergency Communications District
5 Calhoun Co. 911 Emergency Communications District
6 Cameron Co. Emergency Communications District
7 Capital Area Emergency Communications District
8 Denco Area 911 District
9 El Paso Co. 911 District
10 Emergency Communications District of Ector Co.
11 Galveston Co. Emergency Communications District
12 Greater Harris Co. 911 Emergency Network
13 Henderson Co. 911 Communications District
14 Howard Co. 911 Communications District
15 Kerr Co. Emergency 911 Network
16 Lubbock Co. Emergency Communications District
17 McLennan Co. Emergency Assistance District
18 Medina Co. 911 District
19 Midland Emergency Communications District
20 Montgomery Co. Emergency Communications District
21 Potter-Randall Co. Emergency Communications District
22 Smith County 911 Communications District
23 Tarrant Co. 911 District
24 Texas Eastern 911 Network
25 Wichita/Wilbarger 911 Communications District
State of Texas
9-1-1 Service Entities
PRPC
SPAG
NRPC
TCOG
ATCOG
WCTCOG
ETCOG
NCTCOG
HOTCOG
CTCOG
BVCOG
DETCOG
PBRPC
CVCOG
RGCOG
SETRPC
MRGDC
HGAC
AACOG
GCRPC
CBCOG
STDC
LRGVDC
Municipal Emergency Communication Districts
Addison (Dallas Co.)
Aransas Pass (Aransas Co.)
Cedar Hill (Dallas Co.)
Coppell (Dallas Co.)
Corpus Christi (Nueces Co.)
Dallas (Dallas Co.)
De Soto (Dallas Co.)
Denison (Grayson Co.)
Duncanville (Dallas Co.)
Ennis (Ellis Co.)
Farmers Branch (Dallas Co.)
Garland (Dallas Co.)
Glenn Heights (Dallas Co.)
Highland Park (Dallas Co.)
Hutchins (Dallas Co.)
Kilgore (Gregg Co.)
Lancaster (Dallas Co.)
Longview (Gregg Co.)
Mesquite (Dallas Co.)
Plano (Collin Co.)
Portland (San Patricio Co.)
Richardson (Dallas Co.)
Rowlett (Dallas Co.)
Sherman (Grayson Co.)
University Park (Dallas Co.)
Wylie (Collin Co.)
Regional Planning Commissions
AACOG Alamo Area Council of Governments
ATCOG Ark-Tex Council of Governments
BVCOG Brazos Valley Council of Governments
CBCOG Coastal Bend Council of Governments
CTCOG Central Texas Council of Governments
CVCOG Concho Valley Council of Governments
DETCOG Deep East Texas Council of Governments
ETCOG East Texas Council of Governments
GCRPC Golden Crescent Regional Planning Commission
HGAC Houston-Galveston Area Council
HOTCOG Heart of Texas Council of Governments
LRGVDC Lower Rio Grande Valley Development Council
MRGDC Middle Rio Grande Development Council
NCTCOG North Central Texas Council of Governments
NRPC Nortex Regional Planning Commission
PBRPC Permian Basin Regional Planning Commission
PRPC Panhandle Regional Planning Commission
RGCOG Rio Grande Council of Governments
SETRPC South East Texas Regional Planning Commission
SPAG South Plains Association of Governments
STDC South Texas Development Council
TCOG Texoma Council of Governments
WCTCOG West Central Texas Council of Governments
Note: 9-1-1 service in the incorporated portion of Dallas County is provided by Municipal Emergency Communications Districts, including the City of Dallas, or pursuant to the North Central Texas Council of Governments' Regional 9-1-1 Plan for four municipalities. 9-1-1 service in the unincorporated portion of Dallas County is provided by the Dallas County Sheriff's Department under Texas Health and Safety Code Chapter 772, Subchapter E.
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FIGURE 2

	Details of the Financial Performance of Each Regional Planning Commission							
	Appropriation Year 2012				Appropriation Year 2013			
	Administration	Network Operations	Equipment Replacement	AY 2012 Total	Administration	Network Operations	Equipment Replacement	AY 2013 Total
Alamo Area	$124,456	$695,752	$0	$820,208	$100,529	$729,020	$265,644	$1,095,193
Ark-Tex	$121,749	$1,163,712	$0	$1,285,461	$117,060	$1,204,110	$125,000	$1,446,170
Brazos Valley	$58,640	$519,192	$0	$577,832	$65,745	$663,534	$30,642	$759,921
Capital Area *	$358,866	$4,750,560	$0	$5,109,426	$407,242	$5,594,625	$0	$6,001,867
Central Texas	$44,783	$1,085,453	$0	$1,130,236	$172,088	$2,165,945	$589,698	$2,927,731
Coastal Bend	$176,101	$751,032	$0	$927,133	$186,588	$804,317	$184,782	$1,175,687
Concho Valley	$52,838	$1,073,242	$0	$1,126,080	$60,512	$1,147,773	$0	$1,208,285
Deep East	$103,821	$1,366,474	$36,504	$1,506,799	$119,738	$1,496,508	$156,721	$1,772,967
East Texas	$199,259	$1,040,615	$0	$1,239,874	$328,692	$2,083,164	$157,419	$2,569,275
Golden Crescent	$52,238	$505,634	$0	$557,872	$25,155	$670,905	$34,832	$730,892
Heart of Texas	$75,831	$405,935	$0	$481,766	$60,461	$706,188	$30,161	$796,810
Houston-Galveston	$218,933	$3,205,559	$0	$3,424,492	$202,762	$2,923,712	$0	$3,126,474
Lower Rio	$351,468	$2,142,569	$0	$2,494,037	$349,344	$2,787,255	$289,849	$3,426,448
Middle Rio	$25,034	$748,164	$0	$773,198	$78,266	$809,757	$198,463	$1,086,486
Nortex	$39,590	$554,923	$0	$594,513	$36,887	$600,091	$21,857	$658,835
North Central	$308,635	$3,435,913	$0	$3,744,548	$328,910	$4,950,036	$0	$5,278,946
Panhandle	$161,526	$1,372,980	$0	$1,534,506	$161,526	$1,399,244	$49,100	$1,609,870
Permian Basin	$80,251	$579,662	$0	$659,913	$72,296	$810,116	$0	$882,412
Rio Grande	$31,336	$477,760	$0	$509,096	$38,626	$416,582	$67,408	$522,616
South East	$122,467	$1,249,685	$0	$1,372,152	$127,833	$2,130,794	$98,429	$2,357,056
South Plains	$222,379	$502,292	$0	$724,671	$221,946	$839,754	$182,390	$1,244,090
South Texas	$0	$834,395	$0	$834,395	$0	$1,289,520	$49,650	$1,339,170
Texoma	$33,428	$460,761	$0	$494,189	$45,820	$478,358	$234,235	$758,413
West Central	$85,691	$1,309,253	$0	$1,394,944	$79,000	$1,596,313	$115,416	$1,790,729
TOTAL	$3,049,320	$30,231,517	$36,504	$33,317,341	$3,387,026	$38,297,621	$2,881,696	$44,566,343

STATEWIDE STRATEGIC PLAN FOR 9-1-1 SERVICE
APPENDIX A

COMMISSION ON STATE EMERGENCY COMMUNICATIONS

NEXT GENERATION 9-1-1 MASTER PLAN

DOCUMENT CHANGE HISTORY

Version	Publication Date	Description of Change
v1.0	February 2009	Initial Publication
v2.0	July 2009	Added Migration Path and minor corrections.
V3.0	December 2010	Revised Background to include promulgation of CSEC Rule 252.8. Added section on Radio over IP. Edits to clarify PSAP connectivity as via Regional ESInet and updated Drawing 1 to reflect it. Additional edits to address consideration of transitional systems, cyber security and IPv6.
V4.0	July 2014	Revised based on May 7, 2014 *Texas NG-1-1 Master Plan Recommended Updates,* stakeholder input facilitated and gathered by Mission Critical Partners. The Master Plan will be the basis of Fiscal Years 2016 2017 Strategic Plan for Statewide 9-1-1 Service.

EXECUTIVE SUMMARY

THE EXISTING 9-1-1 SYSTEM IS OUTDATED.

A digital replacement of the current analog 9-1-1 system is needed.

The technology supporting the current 9-1-1 system uses legacy technology to deliver 9-1-1 calls and location information is nearing end-of-life and will soon be obsolete.
The national telecommunications infrastructure is changing as is the way the public communicates and adopts new technology. These changes have a direct impact on the ability of 9-1-1 service to support and serve the public.

THE CURRENT 9-1-1 SYSTEM IS NOT INTEROPERABLE WITH OTHER PUBLIC SAFETY COMMUNICATIONS SYSTEMS.

It is critical that public safety communication systems be interoperable and with the ability to exchange information with first responders, and quickly reroute emergency calls during natural and manmade disasters.

NEXT GENERATION 9-1-1

The National Emergency Number Association (NENA) refers to the new system as Next Generation 9-1-1, or NG9-1-1, and defines it as:

- *An Internet Protocol (IP) based system comprised of managed Emergency Services IP networks, functional elements (applications), and databases that replicate traditional E9-1-1 features and functions and provides additional capabilities. It is designed to provide access to emergency services from all connected communications sources, and provide multimedia data capabilities for PSAPs and other emergency service organizations.*

INCORPORATING THESE ADVANCED CAPABILITIES WILL REQUIRE MAJOR CHANGES TO THE 9-1-1 INFRASTRUCTURE.

- NG9-1-1 planning, transition and implementation will be an extensive, multi-year effort. Implementing the new 9-1-1 system presents both opportunity and challenge.

The *CSEC Next Generation 9-1-1 Master Plan (Ver. 4.0, July 2014)* sets the strategic direction and long-range policy guidelines, as well as the new system's functionality, management, operations, security and governance, and charts the course for the transition.

CONTENTS

1 Introduction 1

1.1 Purpose 1

1.2 Background 1

2 System Overview 5

2.1 Vision of the Texas NG9-1-1 System 7

2.2 state-level ESInet 8

2.3 NG9-1-1 Core Functions/Services 9

2.3.1 Emergency Services Routing Proxy (ESRP) 9

2.3.2 Border Control Function (BCF) 10

2.3.3 Emergency Call Routing Function (ECRF) 10

2.3.4 Policy Routing Function (PRF) 11

2.3.5 Location Validation Function (LVF) 12

2.3.6 Legacy Network Gateways (LNG) 12

2.3.7 Emergency Incident Notification 14

2.4 NG9-1-1 Database Services 14

2.4.1 Geographic Information Systems (GIS) 14

2.4.2 Policy Store 16

2.5 NG9-1-1 Applications 16

2.5.1 Call Handling 16

2.5.2 Logging 17

2.5.3 Emergency Agencies Directory 17

2.6 Additional NG9-1-1 Data 17

3 Transition Overview 19

3.1 Transition Stages 20

3.2 Transition Risks 21

3.3 Transition Timeline 25

4 Method of Finance (MoF) 27

4.1 Current MoF 27

4.2 MoF Options for NG9-1-1 28

5 Governance, Legal and Regulatory 31

6 System Management and Operations 33

7 Resource Sharing 34

8 Public Education 35

9 Supporting Radio Communications Interoperability 36

9.1 Radio over Internet Protocol 36

Glossary of Terms 38

figure 1 – Texas NG9-1-1 System and ESInet Vision 0

1 INTRODUCTION

The current 9-1-1 system, while working well today, is approaching the end of its useful life. It uses legacy technology to deliver 9-1-1 calls and location data for landline voice, landline teletype/telecommunications device for the deaf (TTY/TDD); and bolted on additional systems to deliver, wireless/cellular voice, and VoIP 9-1-1 to the Public Safety Answering Point (PSAP). Each introduction of a new access technology (e.g., wireless) or expansion of system functions (e.g., location determination) requires significant engineering and system modifications. The existing system is based on technologies that were established decades ago and is a barrier to creating an integrated emergency call management system that would have the ability to exchange voice, data, text, photographs and live video through the 9-1-1 emergency communications center. These capabilities would assist law enforcement, fire departments, and emergency medical services in tailoring their response to conditions at the scene of the emergency. An advanced, integrated 9-1-1 system would also provide the ability to quickly and easily reroute emergency calls to another call center when the primary answering point is unavailable or overloaded. The incorporation of these advanced capabilities would no doubt enhance the ability to provide more efficient, effective and dynamic emergency responses; however, major changes will be required in the 9-1-1 system. The new system is referred to as Next Generation 9-1-1, or NG9-1-1.

1.1 PURPOSE

The purpose of this document is to communicate the vision of the Texas NG9-1-1 System to stakeholders so that they may be actively engaged in its development and deployment. The Commission on State Emergency Communications (Commission or CSEC) NG9-1-1 Master Plan (Master Plan) presents a Texas perspective of the system's functionality, management, operations, security and governance. Additionally, a high level transition plan is provided to chart the course of CSEC initiatives and activities on this extensive, multi-year effort.

1.2 BACKGROUND

The CSEC requested and received funding for Next Generation Planning in the Fiscal Years 2008-09 Legislative Appropriation Request (LAR). Employing the services of an outside contractor to engage 9-1-1 stakeholders, the Master Plan was developed to chart the course of CSEC activities necessary to transition all Texas Public Safety Answering Points (PSAPs) from the current Texas 9-1-1 system to the Texas NG9-1-1 System using a phased approach.

The purpose of the Master Plan is to ensure the successful transition from the current 9-1-1 system to the Texas NG9-1-1 System and the management and operation of the Texas NG9-1-1 System for optimal health and security.

Since the initial release of the Master Plan in 2009, the following events and activities occurred:

State-level Emergency Services Internet Protocol Network (ESInet) Pilot Project (2010). CSEC implemented a pilot project using a onetime grant under the ENHANCE Act, awarded to Texas by the National Highway Traffic Safety Administration. The pilot implemented the following:

1. A limited feature state-level ESInet that interconnected IP capable PSAPs and allowed for the receipt and delivery of traditional wireline calls via a Legacy Network Gateway; and
2. A state-level Enterprise Geospatial Database Management System (EGDMS) that coalesced and provisioned 9-1-1 geospatial data to the state-level ESInet.

Upon completion of the pilot, the limited state-level ESInet and EGDMS were shut down.

The experience of CSEC's initial deployment of the state-level ESInet may be leveraged to assist 9-1-1 administrative entities[1] that are planning, or contemplating, development of regional ESInets. The CSEC ESInet Installation Project Plan is provided as a tool for ESInet planning and development, and can be found at http://csec.texas.gov/images/Next_Gen/CSEC_ESInet_Project_Plan_V8_Final.pdf.

While risks vary from project to project, access to the risk-management experience and lessons learned in a similar project would be beneficial. The risk-management plan in the document could serve as a template for developing similar plans for other ESInets.

[1] Texas Public Utilities Commission §26.5: *9-1-1 administrative entity--A regional planning commission as defined in Texas Health and Safety Code §771.001(10) or an emergency communication district as defined in Texas Health and Safety Code §771.001(3).*

82nd Legislature (2011). Upon the recommendation of the Sunset Advisory Commission[2], the legislature enacted legislation (Health and Safety Code § 771.0511[3]) authorizing CSEC, with the assistance of an advisory committee, to "coordinate the development, implementation, and management of an interconnected, state-level emergency services Internet Protocol network [state-level ESInet]... The commission shall establish policy and oversee agency involvement in the development and implementation of the [state-level ESInet]." The state-level ESInet "will be a part of the Texas Next Generation Emergency Communications Network."

Emergency Communications Advisory Committee (ECAC). CSEC adopted Rule 252.8 to establish the Emergency Communications Advisory Committee composed of stakeholders, under Government Code Chapter 2110. The ECAC's tasks are to:

- Advise CSEC on matters regarding the establishment and management of the state-level ESInet; and
- Provide for 9-1-1 Entity collaboration on the management of the state-level ESInet, collective decision-making, and assurance that the requirements of the 9-1-1 administrative entities are met.

Fiscal Years 2014-2015 NG9-1-1 Projects. CSEC requested and was appropriated funds to implement two NG9-1-1 projects:

1. NG9-1-1 Geospatial Database Project to implement two database management systems:
    a. A state-level EGDMS with data management services to coalesce federated geospatial data sourced from 9-1-1 administrative entities, perform quality control, and provision the validated data to NG9-1-1 system components; and
    b. An Automatic Location Identification (ALI) database management system with NG9-1-1 location validation capabilities with services for ALI data management, ALI delivery, and NG9-1-1 location validation utilizing geospatial data provisioned by the state-level EGDMS.

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[2] See: https://www.sunset.texas.gov/reviews-and-reports/agencies/commission-state-emergency-communications-csec

[3] http://www.statutes.legis.state.tx.us/Docs/HS/htm/HS.771.htm

2. State-level Digital 9-1-1 Network Project to implement the initial phase of the Texas NG9-1-1 System, capable of connecting and delivering calls to a minimum of 80 Regional Planning Commission (RPC) PSAPs.

Additionally, several 9-1-1 administrative entities have implemented regional ESInets in various degrees of completion. Furthermore, efforts to complete National Emergency Number Association (NENA) i3[4] and related standards have progressed.

[4] The NENA i3 standard describes the network, components, and interfaces required to establish NG 9-1-1 service.

2 SYSTEM OVERVIEW

The vision of the Texas NG9-1-1 System is aligned with the following:

- NENA 08-003[5] v 1.0, Detailed Functional and Interface Specification for the NENA i3 Solution – Stage 3
- NENA 08-506[6] v 1.0, Emergency Services IP Network Design for NG911
- NENA 75-001[7] v 1.0, Security for Next Generation 9-1-1 Standard (NG-SEC)
- U.S. Department of Transportation (USDOT), Research and Innovative Technology Administration (RITA) - NG9-1-1 System Initiative- Concept of Operations[8]

According to NENA[9], the basic building blocks required for NG9-1-1 are:

- **Emergency Services IP Network (ESInet)** - Network capable of carrying voice plus large amounts of varying types of data using IP and standards; intended to be multi-purpose, supporting extended Public Safety communications services in addition to 9-1-1.
- **International Standards Compliant IP Functions** - Internet Engineering Task Force (IETF) protocol standards provide the basic functionality of the system. NENA applied standards from IETF and other standards developing organizations (SDOs) to specific NG9-1-1 requirements.
- **Software Services/Applications** - NG9-1-1 uses service oriented architecture, software applications and data content to intelligently manage and control its IP based processes. NG9-1-1 is software and database driven to enable an exponential increase in available data and information sharing possibilities.

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[5] NENA 08-003 available at http://www.nena.org/?page=i3_Stage3

[6] NENA 08-506 available at http://www.nena.org/?IP_Network_NG911

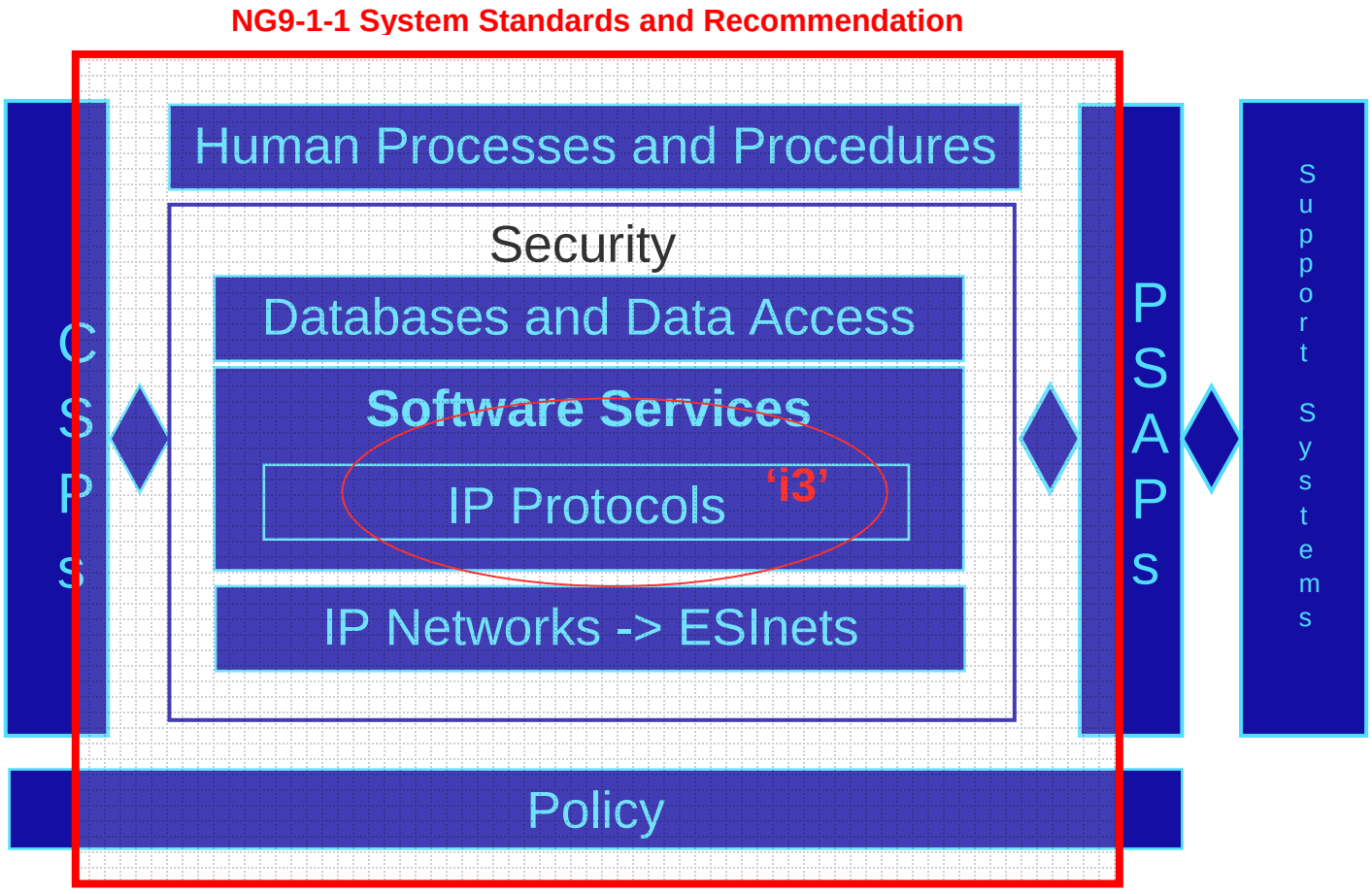
[7] NENA 75-001 available at http://www.nena.org/?page=NG911_Security

[8] USDOT, RITA – *Next Generation 9-1-1 Initiative – Concept of Operations.* Can be found at http://www.its.dot.gov/ng911/

[9] NENA - *A Policy Maker Blueprint for Transitioning to the Next Generation 9-1-1 System: Issues and Recommendations for State and Federal Policy Makers to Enable NG9-1-1*, September 2008: Appendix B. http://www.nena.org/?page=NGPartnerProgram

- **Databases and Data Management** - NG9-1-1 uses a set of database systems to house and provide management of the above data content.
- **Security** - NG9-1-1 provides extensive security methods at the hardware and software levels to replicate the privacy and reliability inherent in Enhanced 9-1-1 services.
- **Human Processes** - NG9-1-1 as a service system, involves a multitude of human procedures and system operations procedures to control and monitor the functionality and effectiveness of the systems and services that provide NG9-1-1 service.

NG9-1-1 Building Blocks[10]



[10] See http://www.nena.org/resource/resmgr/ng9-1-1_project/ng9-1-1_overview_030909.ppt

2.1 VISION OF THE TEXAS NG9-1-1 SYSTEM

The Texas NG9-1-1 System will be realized with the implementation of a state-level Emergency Services Internet Protocol (IP)-enabled Network (ESInet) that will interconnect regional ESInets and individual PSAPs.

ESInets will enable access to public emergency services by any personal communication device regardless of its mobility and/or technology. This includes emergency "calls"[11] using text messages, instant messages, voice and video from handheld, laptop and desktop computers, wireless and wire line phones. ESInets will have the capability to accept information to improve response, such as an image of the scene of an accident; and to access information designed to facilitate emergency services such as a caller's medical records or the building plans of the caller's location. Interconnected ESInets, given the IP nature of the networks, improve reliability, robustness and resiliency.

The distinct advantage of implementing a state-level ESInet and interconnected regional ESInets, are as follows:

- Enables call access, transfers and backups among and between PSAPs within Texas, and eventually, across the nation;
- Provides flexibility in call-taking such that Texas call takers no longer will have to be physically constrained to a specific communication center;
- Enables Texas PSAPs access to and backups from other emergency services organizations such as Texas Poison Control and the Federal Emergency Management Agency, via the state-level ESInet interconnection with these and other public safety-grade emergency services networks;
- Enables Texas PSAPs and the general public the ability to receive up-to-date information, warnings, and/or instructions on large-scale events; and
- Enhances reliability, robustness and resiliency, but requires additional attention to security, monitoring, and overall management.

Thus, the Texas NG9-1-1 System is an interconnected and interoperable system of local, regional and national emergency services networks.

[11] The term "call" is used in this document to indicate any real-time communication—voice, text, or video—between a person needing assistance and a PSAP call taker.

Appendix A depicts the logical configuration of the ESInet that is envisioned for Texas The names and entities used are hypothetical and intended only as examples to illustrate the proposed “network of networks”.

2.2 STATE-LEVEL ESINET

An IP-enabled network infrastructure will be used to interconnect regional ESInets and other public safety-grade emergency services networks serving the regions, within and beyond Texas. As such, it must be engineered and managed to provision the bandwidth necessary to carry the volume of traffic for all PSAPs in Texas, currently numbering five hundred seventy-three (573). PSAPs will be connected directly to the ESInet, or indirectly via regional ESInets.

It should be noted that based on the results of the State-level ESInet Pilot Project, interconnecting some regional ESInets may be cost prohibitive due to a lack of broadband build-out to support transport requirements. However, the need for broadband to meet emergency communications requirements may spur investment in infrastructure and improve availability and affordability for the public at large. Furthermore, Congress has passed legislation directing the Federal Communications Commission (FCC) to take steps to increase broadband availability throughout the country.

Internet Protocol version 6 (IPv6) is planned for the initial deployment of the ESInet. The IP version that precedes IPv6 is IP version 4 (IPv4). IPv6 mandates built-in Internet Protocol Security (IPsec), a protocol suite for securing IP communications by authenticating and encrypting each IP packet of a communication session. IPsec also includes protocols for establishing mutual authentication between agents at the beginning of the session and negotiation of cryptographic keys to be used during the session. Thus, IPsec is an end-to-end security scheme and IPv6 security deployment more efficient and effective.

Regional ESInets will also have to adopt and deploy IPv6 at their own pace, which is designed to allow users to adopt and deploy IPv6 in a highly diffused fashion.

In order to evolve the ESInet to provision other public safety-grade emergency services, the network infrastructure must be easily and seamlessly scalable and extensible. Furthermore, the network infrastructure must also be public safety grade, and must meet a higher standard of availability, resiliency, reliability, security and survivability than non-mission critical enterprise network infrastructure.

The Texas Department of Information’s (DIR) TEX-AN Next Generation (NG) Services will be utilized to procure the applicable IP network components and services for the

ESInet where service is available at the appropriate service level and price. TEX-AN NG is a portfolio of communications technology contracts with multiple service options to satisfy DIR customers' broad public service and business requirements.

ESInet operator(s) will provide core services related to generic IP-enabled networks such as address allocation, domain name systems, services broker, security and network monitoring and management. ESInet operator(s) will also provide multimedia services such as bridges, loggers, media servers etc. Regional ESInets may choose to assign some or all of the core and multimedia services to the ESInet operator(s).

2.3 NG9-1-1 CORE FUNCTIONS/SERVICES

NG9-1-1 core functions/services are embedded functions essential to the operation of a NG9-1-1 system and provided as a service to other applications. They use service oriented architecture, software applications and data content to intelligently manage and control its IP based processes.

Calls presented to an ESInet by carriers, enterprises or other entities must follow many of the protocol standards promulgated by the IETF. Furthermore, services and devices used to make emergency calls must also be built to IETF emergency calling protocol standards. The IETF protocol standards are consensus standards incorporating requirements from a wide variety of nations, carriers, industry associations and vendors. The IETF emergency calling protocol standards applied to meet 9-1-1 requirements, provide the core functionality of an NG9-1-1 system.

2.3.1 Emergency Services Routing Proxy (ESRP)

In the Texas NG9-1-1 System configuration, the state-level ESInet will serve as one of several primary input points for all calls for the state. The ESRP is the first element to make routing decisions. The ESRP determines routing based on location and policy, and forwards the call to the next hop. The next hop is either an intermediate ESRP (i.e. an ESRP for an ESInet), or a terminating ESRP (i.e. an ESRP for a PSAP). The state-level ESRP is the terminating ESRP for PSAPs directly connected to the state-level ESInet.

To do its job, the ESRP has interfaces to the Emergency Call Routing Function (ECRF) for location based routing information, as well as event notification sources to gather the state of the next hop, used by its Policy Routing Function (PRF). Every ESRP consults an ECRF and contains a PRF. It first determines the "serving" next hop by location. Its PRF then extracts a rule set from the policy store for that "serving" next hop and

evaluates the applicable rules, using other inputs such as time of day, "serving" next hop state, etc. Based on its policy rule evaluation, the policy rule is applied and the route decision made. The ESRP forwards the call to the next hop.

2.3.2 Border Control Function (BCF)

The Border Control Function acts as the security clearinghouse for the ESInet for all incoming calls and data. It is an outer defensive perimeter to prevent deliberate and malicious attacks on PSAPs. In addition to firewalls, the BCF exerts control over the signaling and the media streams involved in setting up, conducting, and tearing down calls. Although IP networks are managed, it should not be assumed they are secure. As such, it is expected that every ESInet will deploy a BCF at its edge and firewalls will be deployed at the edge of every PSAP; and implement a NG-SEC compliant security policy. However, the state-level BCF is expected to be the most robust with large amounts of IP bandwidth between the sources of call and the PSAPs.

Based on the results of the State-level ESInet Pilot Project, network security for ESInets must:

- be preceded with the establishment of requirements for interconnection to include a robust security policy—one that is "baked in" as opposed to "bolted on"
- exceed NG-SEC,
- be compatible with the network security strategies currently contemplated by FirstNet as it plans its nationwide broadband network for first responders.
- incorporate aspects of National Institute of Standards and Technology (NIST) Special Publication 800-53[12] and other information technology (IT) industry security best practices.

As part of the overall security solution for the Texas NG9-1-1 System, CSEC must address how Identity and Access Management (IdAM) policies are constructed, and specifically whether CSEC should create its own security certificates, as one's own Certificate Authority (CA); or rely on those provided by the carriers.

2.3.3 Emergency Call Routing Function (ECRF)

The IETF emergency call protocol standard requires a calling device to make its location information available such that when calls are presented to ESInets, location information comes with them. In the ESInet, the ECRF uses the IETF Location to

[12] ,see http://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-53r4.pdf

Service Translation (LoST) protocol to determine the route of the call based on the location of the calling device. The ECRF queries its database with geodetic coordinates or civic address and the requested emergency service in the form of a "service Uniform Resource Name (URN)". The ECRF database responds with a Uniform Resource Identifier (URI) that indicates the next hop. A single emergency call can be routed by one or more ESRPs within the Texas NG9-1-1 System, resulting in use of the ECRF once per hop. The ECRF is also used by the PSAP to determine appropriate responders for an emergency call based on the location of the caller and onward route the call to the responder. Where the location provided with the call is incorrect and the call taker can determine the correct location, the ECRF can be queried by the PSAP using the corrected location to determine the appropriate responders and onward route the call. Outside the ESInet, access or call network operators use the ECRF to route calls towards the target ESInet.

The ECRF database is map based and provisioned using Geospatial Information System (GIS) layers. 9-1-1 administrative entities are responsible for the data used by the ECRF. NG9-1-1 requires all 9-1-1 administrative entities to use fields as defined in the relevant standards with no local variation. For each emergency service URN supported by the ECRF, a layer of polygons and their associated URIs will be provisioned in its database. The route is determined by point-in-polygon. For example, the PSAP URI is determined by the polygon representing the service boundary of the PSAP where the caller's location (point on the map) falls within. The route determination for a civic address conceptually requires geocoding; in other words, a mapping of the civic address to a point on the map. Once the point is defined, the route can be determined by point-in-polygon. To ensure the accuracy of the location information, no address conversions (from geodetic coordinates to civic address and vice versa) can occur outside the ESInet.

More than one ECRF database and operator is anticipated in Texas. Location routing queries to the originating ECRF will be forwarded to the appropriate ECRF for those locations not served by the originating ECRF, and the responses returned to the originating ECRF. To facilitate the forwarding of mapping queries, ECRFs will have to be interconnected with a "forest guide." The state-level GIS forest guide will have knowledge of the coverage region of each ECRF database/operator. Queries for location information outside of Texas will be facilitated by a national forest guide.

2.3.4 Policy Routing Function (PRF)

Policy routing refers to the determination of the next hop of a call based on the policy of the entity which would normally receive the call. The policies of an entity, i.e. PSAP or regional ESInet, are defined in its policy rule set. Policy rules use variables such as the

entity's availability, security posture, and the number of calls in its queue. Other variables, such as time of day, origin of the call, specific information about the call, and caller or location of the call may also be used in policy rules. Policy rule sets must have priorities to facilitate the application of the rules.

At the initial deployment of the PRF, it is expected to act on a minimal number of policy rule sets to achieve the equivalence of default routing of the legacy selective router and PSAP routing contingency plans.

2.3.5 Location Validation Function (LVF)

Communications service providers (CSPs) that provide location information in civic address format must validate the civic address prior to use in a call. The LVF receives validation requests from Location Information Servers (LIS), gateways and VoIP endpoints using the IETF LoST protocol. Given a request for location validation, the LVF queries its database and returns the correct and complete civic address to the requestor, if found. 9-1-1 administrative entities are responsible for the data used by the LVF. Like the ECRF, the LVF database is map based and provisioned with GIS layers for parcels, municipal boundaries and zip codes, and/or GIS points that represents civic addresses. The LVF database is the authoritative address database. Validation means that there is exactly one record/parcel/point for the address in the LVF database.

More than one LVF database and operator is anticipated in Texas. Like the ECRF, validation requests to the originating LVF will be forwarded to the appropriate LVF (facilitated by the forest guide) for those locations not served by the originating LVF and the responses returned to the originating LVF. To ensure accurate validation, the location to be validated may not be an address converted from geodetic coordinates.

It is expected that the LVF and the ECRF will be eventually combined into one service.

2.3.6 Legacy Network Gateways (LNG)

Placed logically outside an ESInet, the LNG is comprised of the following:

- Protocol Interworking Function (PIF) - converts legacy wire line/wireless 9-1-1 calls from analog into Session Initiation Protocol (SIP), a VoIP protocol;
- Location Interworking Function (LIF) - obtains the caller's location information from a location server/database, a logical element of the LNG; and
- NG Interworking Function (NIF) - converts the location information for SIP location conveyance and presents the call to the ESInet.

The pre-processing of legacy calls allow for all calls to be processed in the same manner within the ESInet. Legacy carriers will be responsible for transporting the calls directly from their end offices, or indirectly by utilizing CSPs networks that aggregate traffic, and delivering it to the interconnection point at the Legacy Network Gateway. The points of interconnection (POIs) will be collectively designated by CSEC and 9-1-1 administrative entities, by executing Interconnection Agreements with the 9-1-1 Service Providers and CSPs. The LNG is responsible for obtaining the caller's location information from associated location server/database and forwarding the call onward to the ESInet.

It is anticipated that initially, all carriers will ingress ESInets via LNGs. Legacy carriers may not deploy LIS and Call Information Database (CIDB) to store Additional Caller Data, called for by the end state i3 system design; where data previously received in a single response to an ALI query, will now come from a variety of sources.

To facilitate transition of E9-1-1 data structures and functions to NG9-1-1 data structures and functions, a Location Database (LDB)[13] may be deployed. Essentially, the LDB retains all of the current information, functionality, and interfaces of today's ALI and can utilize the new protocols required by i3.

The LDB may be deployed to functionally serve as follows:

- Legacy ALI database for PSAPs not yet served by i3 core functions and the LNG's LIF. When all PSAPs have transitioned to NG9-1-1, the LDB may be decommissioned; or
- Location server/database, as defined by i3 (i.e. as LIS) where the LDB/LIS and CIDB residing "within" the LNG. In other words, deployed as a public sector LIS and CIDB; and supporting the LNG as the source of resolution for Additional Caller Data that is stored in the CIDB. When LIS systems and other additional data sources are deployed by carriers, the LDB may be decommissioned.

The LDB will be provisioned using existing ALI processes/interfaces; and has the flexibility of performing MSAG validation and NG9-1-1 location validation using LVF.

[13] See NENA NG9-1-1 Transition Plan Considerations Information Document NENA-INF-008.1 available at http://www.nena.org/?page=NG911_TransitionPlng

2.3.7 Emergency Incident Notification

Emergency incident notification services enable ESInet stakeholders to exchange and share information. Where information is known to exist (e.g., a database) and is readily available, consumers will request the information from the producer when they need it. In other cases, the information a producer wishes to make available may not be known or available in advance. The producer will push out the information, which may be location-sensitive, as it becomes available (e.g., hazmat alerts). The following are examples of emergency incident notifications:

- Department of Homeland Security could be notified whenever certain types of incidents occur so that it may trigger a specialized incident correlation process.
- A PSAP could receive Amber Alerts, but only those relevant to its jurisdiction (location-sensitive event).
- An Integrated Transportation System could send a closed road advisory to an Emergency Operations Center.
- A PSAP could get notified that a Computer Aided Dispatch system came back into service.

2.4 NG9-1-1 DATABASE SERVICES

NG9-1-1 databases will be called upon to deliver meaningful information, such as call and data routing information and business rules/policies. The database architecture must be functional, scalable, highly available, secure and have low latency. To enable data storage and information sharing across jurisdictional boundaries, the database architecture must support an interoperable hierarchical network of databases that aggregate and consolidate data from 9-1-1 administrative entities and their local sources. To achieve high availability and complete disaster recovery, the database architecture assumes maximum system uptime through redundancy, replication and no single point of failure. Data storage and acquisition must be secured through IdAM – authentication, credentialing, authorization and entity management services to establish a trusted identity and various access control mechanisms.

2.4.1 Geographic Information Systems (GIS)

NENA defines GIS as the base database for NG9-1-1, where all location related data is derived. The Spatial Information Function (SIF)[14] is the mechanism that replicates and provisions geospatial data and layers from the GIS to ECRFs/LVFs, and provides map views when accessed by call handling and computer aided dispatch systems. The SIF

[14] See Section 5.5 of NENA 08-003 version 1.0

is vendor neutral and communicates changes in geospatial data and layers. NENA i3 standard requires the following GIS layers be standardized:

- GIS data fields that correspond to the Presence Information Data Format – Location Objects (PIDF-LO), location information in IETF format;
- PSAP service boundary;
- 9-1-1 entity service boundary; and
- Service boundaries corresponding to local response agencies such as law enforcement, fire, and emergency medical services.

More than one ECRF/LVF operator is anticipated in Texas, where multiple 9-1-1 administrative entities will be served by any single ECRF/LVF operator and may not necessarily be the state-level ECRF/LVF operator. Authorized ECRF/LVF operators will acquire the necessary geospatial information from a secured authoritative source, as will access or call network operators. However, the granularity of the geospatial information provided depends on whether it's use is for inside or outside the ESInet .

9-1-1 administrative entities currently provision geospatial information, limited to its PSAP and/or region service area, into its customer premise equipment to provide map views for call handling and computer aided dispatch. The current practice constrains backup capabilities among and between PSAPs within Texas, because the back-up PSAP has no access to the map view for the PSAP it is serving.

In order to achieve mapping interoperability and enable a unified geospatial data management system for all participating entities, it is envisioned that the state-level EGDMS would evolve to serve as the authoritative GIS in the state; maintaining coalesced boundaries and address points; provisioning geospatial information to the relevant Texas NG9-1-1 System components; and providing access to map views for PSAP backup purposes, when needed.

The state-level EGDMS must provide for near real time updates of the geospatial information via enterprise GIS web services. The suite of GIS web services, at a minimum, must include the following:

- receipt and integration of geospatial data from each 9-1-1 administrative entity's GIS;
- provide quality assurance results on the validation of geospatial data against accuracy standards;
- facilitate and coordinate resolution of conflicting geospatial data sets;
- timely export of the geospatial data on a permission basis;

- dynamic (real time) changes to routing geospatial data, and its export; and
- access to map views.

It is imperative that 9-1-1 administrative entities develop and maintain accurate geospatial data in a timely manner, so as to provide the most accurate and current data to the state-level ESInet for purposes of NG9-1-1 call routing, location validation and map viewing.

2.4.2 Policy Store

Policy rule sets are developed by the 9-1-1 administrative entities using a Policy Editor and stored in the Policy Store for the ESRP to fetch. At the time of this writing, standards and/or requirements for the provisioning of policy rule sets to the Policy Store have not been developed. The Policy Editor may be a local application or a remote web browser interface. It is anticipated that each ESRP, state-level and regional, will be implemented with a Policy Store, and policy editing service, to serve Texas PSAPs and regional ESInets.

Until the requirements for Policy Editors and the service are available, the initial deployment of the PRF is expected to act on a minimal number of policy rule sets, without policy editing services.

2.5 NG9-1-1 APPLICATIONS

The implementation of an i3 compliant NG9-1-1 system means migrating from old to new technologies, and the introduction of an entirely new set of solutions and vendors. Specifically, i3 compliant application-based (software) solutions will be available to replace equipment based legacy systems such as call handling, call recorders, computer aided dispatch, and call records management. The following are descriptions of some NG9-1-1 applications:

2.5.1 Call Handling

Current call handling systems are proprietary (i.e. not standards based), designed specifically to utilize the transfer functions of the legacy selective routers, bid the ALI database for location information; and provide mapping functions through proprietary software applications. Legacy call handling systems are not designed to handle 9-1-1 calls that deliver location information using PIDF-LO; transfer calls to another PSAP based on an ECRF look-up; communicate with the ESInet about its state (i.e. PSAP) as a network resource in order to facilitate policy based routing; and serve as a backup PSAP, when the serving PSAP's maps are not pre-loaded into the backup PSAP's equipment.

In order to keep non-i3 compliant systems in service, great care and expense is necessary to upgrade and adapt them to leverage ESInets.

The i3 compliant application-based (software) call handling solution may be hosted at the ESInet and provided as a service with limited equipment at the PSAP. It is anticipated that the mapping component of such a solution would utilize the EGDMS to provide map views and thus achieve mapping interoperability.

2.5.2 Logging

Current logging systems are equipment based and limited to the recording of voice only. The NG9-1-1 logging service must be capable of logging voice, text, images, video and other data. The logging service is primarily a web service provided on an ESInet. All significant steps in processing a call and its associated media are logged. PSAPs and/or regional ESInets may acquire their own logging services to log external events, internal events, media and messages. Play back service is provided for recorded media streams. Recorded media streams include integral time reference data within the stream. Time stamps must be synchronized across all logging services. Retrieval of data by other PSAPs, 9-1-1 administrative entities or emergency services agencies is determined by the policy of the PSAP/9-1-1 administrative entity that provides the logging service.

2.5.3 Emergency Agencies Directory

Another service provided on the ESInet is a directory of emergency agencies connected to the network. The service enables intra ESInet routing of calls and inter-agency calls. Every agency MUST maintain an entry in the directory.

2.6 ADDITIONAL NG9-1-1 DATA

Additional data in the form of large and complex collections of multi-media based data sets, referred to as “Big Data,” will become a significant part of NG9-1-1. The challenge is in coordinating and standardizing the capture, curation, storage, search, sharing, transfer, analysis and visualization of a seemingly endless number of endpoints where additional data can exist.

Predictive analytics applied to “Big Data” has been proven by enterprise call centers to be a productive tool for improving customer service; recognizing trends improving products, productivity, customer needs and desires; and improving call handling by customer services representatives. Predictive analytics uses a variety of statistical techniques applied to the analysis of current and historical data to make predictions about future or unknown events.

Similarly, predictive analytics applied to NG9-1-1's "Big Data" provides opportunities to revolutionize emergency communications and enable smarter, faster response that will turn today's PSAP into tomorrow's information sharing hub, as well as the evolution of the call taker's role in keeping responders informed and the public safe. Predictive analytics can allow 9-1-1 administrative entities/PSAPs the ability to plan for future events based on data regarding specific areas of concern, whether they be location - based, incident–based, or manpower and resources–based.

3 TRANSITION OVERVIEW

The Texas NG9-1-1 environment will differ considerably from the current 9-1-1 environment. The changes are not limited to standards and technology. They include the governance, security, management and operation of the system and the delivery of services. The changes affect the entire 9-1-1 community, including the general public and other emergency services. The planning and transition to NG9-1-1 will be an extensive, multi-year effort, and completely dependent upon the availability of funds.

The transition will require CSEC and the seventy five (75) Texas 9-1-1 administrative entities [15]to coordinate and collaborate on the migration of five hundred and seventy three (573) PSAPs from the current 9-1-1 system to the Texas NG9-1-1 System.

CSEC has commenced with the implementation of a state-level EGDMS for the coalescing and provisioning of 9-1-1 geospatial data to the relevant state-level NG9-1-1 core functions; and the acquisition of a 9-1-1 Database Management System, with legacy and NG9-1-1 location validation functionality. The 9-1-1 Database Management System will enable legacy PSAPs to receive the caller's location information as ALI; and NG9-1-1 PSAPs to receive the caller's location information with the call, as interworked by the LNG using the LDB.

For some 9-1-1 administrative entities the transition has already begun, with deployment of regional ESInets and core functions in various degrees of completion.

As a "system-of-systems" and "network-of-networks," the Texas NG9-1-1 System provides 9-1-1 administrative entities with the choice to connect their PSAPs directly to the state-level ESInet, or indirectly via regional ESInets; utilize NG9-1-1 core functions and services implemented at the state-level or regional-level; and interconnect regional ESInets with other regional ESInets and/or the state-level ESInet.

[15] Twenty-five Emergency Communications Districts have been formed and operate under the authority of Health and Safety Code Chapter 772. Twenty-six municipalities and one county that are recognized as Emergency Communication Districts in Health and Safety Code § 771.001(3) (A) operate 9-1-1 systems that are independent of the state's system. 9-1-1 service in the incorporated portion of Dallas County is provided by Emergency Communications Districts, or pursuant to the North Central Texas Council of Governments' Regional 9-1-1 Plan. 9-1-1 service in the unincorporated portion of Dallas County is provided by Dallas County.

This overview also acknowledges that wireless and Voice over IP (VoIP) CSPs are not broadly making changes to their networks to support PIDF-LO delivery and maintenance of LIS/CIDBs; and intends to use LNGs for Location Interworking Function (LIF) to process Wireless/VoIP calls for some time to come. Additionally, support of the multiple 9-1-1 system providers in the planning of the synchronized transition to NG9-1-1 that is outlined in the transition stages is necessary, requiring open communication and coordination between and among the multiple vendors.

3.1 TRANSITION STAGES

The stages of transition are identified to accommodate the incremental implementation of the state-level EGDMS, state-level ESInet, its NG9-1-1 core functions, databases and application, and the LNGs that serve the PSAPs directly connected to the state-level ESInet, collectively referred to as the state-level subsystem (of the Texas NG9-1-1 System). The implementation will be paced according to the extent funding is available. Each stage will require a significant level of effort, with differing sets of stakeholders and varying levels of involvement.

The five main stages of the transition are as follows:

Stage One: State-level EGDMS

Deployment of a state-level EGDMS, including SIF, with geospatial data and base maps established for the entire state, from which SIF updates will be provided to state-level ESInet components, and regional ESInet components, as authorized. While there may be multiple EGDMSs operating within the state, it is critical that there be a single authoritative GIS source for all Texas NG9-1-1 System components and PSAPs requiring map views for PSAP backup purposes. The single authoritative source will ensure that the current complexity, inadvertently introduced to ensure delivery of ALI from the 9-1-1 administrative entity customer's ALI database operator, will not be replicated in the NG9-11 environment.

This stage also includes the deployment of a 9-1-1 Database Management System with legacy and NG9-1-1 location validation functionality; essentially, an ALI database management system with LVF capabilities, and including LDB (collectively, ALI-LVF).

Stage Two: State-level ESInet

Deployment of a state-level ESInet with LNGs and NG9-1-1 core functions (i.e. BCF, ESRP with PRF, and ECRF) to serve interconnected PSAPs.

Stage Three: State-level ESInet and regional ESInets interworked

Interwork the state-level ESInet and regional ESInets with NG9-1-1 by developing IP network interconnection points, and network-to-network interfaces for call delivery/call transfer; provisioning SIF updates to regional ECRF/LVFs; and implementing a state-level GIS Forest Guide.

Stage Four: Decommission legacy systems

Decommission legacy systems, such as legacy selective routers and ALI database.

Stage Five: Decommission LNGs

Decommission LNGs as CSPs change their networks to support PIDF-LO delivery, and maintain their own LIS/CIDBs. The LDB may also be decommissioned when CSPs no longer provide wireline services or wireline CSPs implement and maintain their own LIS/CIDBs.

3.2 TRANSITION RISKS

On April 10, 2014, the ECAC designated a group of stakeholders to participate in a facilitated discussion to identify new and/or revised needs for the state-level subsystem; and provide input regarding technology, operational, and policy considerations affecting the implementation of NG9-1-1 services throughout the state of Texas.

The transition risks identified are as follows:

System host locations - Hosting systems in PSAPs will not enable the operation of remote virtual PSAPs if critical systems are located in PSAP facilities, especially when PSAPs must be evacuated or are impacted by a disaster.

The greatest level of system availability and solution resiliency will be attained by hosting 9-1-1 databases and NG9-1-1 core functions in redundant, geo-diverse data centers. Tier III and Tier IV data centers are typically only found in major metropolitan areas, such as Dallas, Austin, San Antonio, and Houston (DASH). It is anticipated that identifying data center facilities outside of the DASH cities will be difficult.

In general, state-level ESInet design may mitigate risks associated with distance for PSAPs directly connected to the state-level ESInet, as follows:

- Carrier diversity between PSAP and system host site to ensure carrier level network issues do not impact availability.
- Network facility diversity through the use of terrestrial and non-terrestrial (e.g., microwave, wireless, etc.) network paths between PSAP and system host site to ensure resiliency.

- Path diversity between PSAP and system host site to ensure that disruption or failure does not impact 100% of traffic.

LNG connectivity - The LNG may be deployed in data center facilities hundreds of miles away from CSPs switches, unlike a legacy selective router that is a couple dozen miles away from CSPs switches. The distance can result in three risks:

1. high cost for the delivery of mileage sensitive legacy trunks to the LNG;
2. the greater the point-to-point legacy circuits distance, the higher the risk of the circuit being cut; and
3. the greater the distance between the CSP's switch and LNG, the less likely the CSP would be willing to rehome their trunks from the legacy selective router.

The LNG's PIF may be deployed at local POIs, ideally at the central offices where legacy selective routers reside. The PIF would convert the calls from legacy to IP locally; and deliver the IP calls over redundant, carrier diverse multi-protocol label switched (MPLS) networks to the facilities that host the LNG's NIF and LIF. This risk mitigation strategy offers greater resiliency due to the intrinsic characteristics of MPLS networks; and is only mileage sensitive from the CSP's switch to the local POIs.

CSP traffic migration to ESInets - CSPs may not be motivated to interconnect to ESInets due to their inability to recover costs; and because they are unable to split traffic from a switch that serves multiple PSAPs using different 9-1-1 system service providers (legacy and NG911). The result is long delays in migrating originating traffic to ESInets, and increases the risk for incurring legacy selective routing fees on top of the costs for the new NG9-1-1 system.

Synchronized migrations that focus on cutting over all traffic from CSP switches in a region should eliminate the need for CSP switches to be interconnected with legacy selective routers and the LNG's PIF for any extended period of time; and minimize CSPs trunking costs.

Another risk-mitigation technique is to offer CSPs the option of ingressing SIP calls directly into the LNG, as many carriers would like to decommission legacy trunks.

Lastly, CSEC must collaborate with the Texas Public Utility Commission (PUC) to ensure that the PUC is aware of the requirements put upon CSPs for interconnecting with the state-level ESInet; and identify potential roadblocks early in the design process.

Certification – To interconnect with other CSPs in the state, the CSEC may need to become a certificated local exchange carrier. The Public Utility Commission has

recognized the authority of governmental entities to become “certificated” for specific purposes, including 9-1-1 service.

The certification process must begin early in the design phase of implementation. Alternatively, the CSEC may outsource to a Software as a Service (SaaS) NG9-1-1 provider that holds such certification.

Interconnection Agreements (ICA) – In order to interconnect with CSPs, ICAs will be necessary to define how 9-1-1 traffic will be delivered, how 9-1-1 calls are handed off between systems and how call transfers to legacy selective routers will be performed. The ICA process is likely to be time-consuming and lengthy.

This process must begin early with appropriate legal counsel to better understand the interconnection needs, and engage CSPs as early as possible.

Network-to-Network Interfaces – The interconnection of the state-level ESInet with regional ESinets will require close collaboration between network engineering resources from the interconnecting parties to ensure: proper security protocols are implemented for all end points on a network; QoS markings are honored; virtual private network tunnels are allowed; and other such activities. Operationally, the two interconnecting network operators will need to agree upon standard operating procedures for the purpose of troubleshooting, trouble ticket management, NOC-to-NOC communications, and service level agreements.

The risk to optimal implementation may be mitigated by developing and establishing security and operational standards.

Geospatial/GIS data management – GIS data management is a cornerstone of NG9-1-1. 9-1-1 administrative entities need resources that are proficient in geospatial data management and maintenance, and knowledgeable about address data management. Where in-house expertise is unavailable, 9-1-1 administrative entities will have to outsource this function or acquire staff with this skill set. 9-1-1 administrative entities may be reluctant to do so without an immediate return on their investment in the form of call routing changes by the ECRF/LVF and PRF.

Stakeholder education on the importance of geospatial data management and its direct impact on the service PSAPs provide to their communities is the best means of minimizing this risk. The education should provide hands-on examples of how legacy data is managed and routing is performed today; and how geospatial data will be

managed and geo-spatial boundaries will impact call routing in the future i3 environment.

Availability of broadband – The rural areas of the state have difficulty acquiring broadband facilities for their PSAP, let alone carrier-diverse broadband facilities. While not optimal, these geographically remote PSAPs may be able to obtain multiple MPLS T-1s over existing copper facilities, bonded to replicate higher bandwidth to provide sufficient capacity to carry voice and SMS data, including location information. If the state-level ESInet is to be utilized for GIS database updates as well, special attention must be paid to updating larger datasets.

Evolving standards – NG9-1-1 standards continue to evolve with many fundamental elements requiring future work. Examples include SIF standard development, logging, and Additional Data. Until the standards for these elements are defined, vendors' solutions will vary and future releases will be required. This may have an impact on total cost. The varying levels of completion on standards may also have an impact on vendor interoperability, which could lead to delays or limitations on feature functionality, especially in the deployment of i3 event logging.

These risks can be minimized by gaining a thorough understanding of which standards are complete, in development, and how those under development may have downstream impacts on vendors' solutions. This knowledge will enable CSEC to, develop a set of realistic expectations on feature functionality available in the marketplace today and expected for the near term; and develop a feature functionality roadmap with identified risks that could impact its rollout. The work done by the USDOT's National 9-1-1 Program, specifically the *NG9-1-1 Standards Identification and Review*[16] document should be leveraged for this effort.

CSEC resources – CSEC will be responsible for the implementation, operation and security of the state-level subsystem. However, CSEC is limited to 25 full time employees, staffed mostly to administer grant funds for two programs, one of which is the 9-1-1 Program. CSEC does not currently own or operate any IT infrastructure in the provisioning of 9-1-1 service. While CSEC has staff with project management, 9-1-1 subject matter expertise and IT skills and abilities, it is geared towards scope of work development for a limited number of procurements and program projects; and addressing technical and operational issues with vendors, RPCs and CSPs (and their

[16] See http://911.gov/pdf/NG911-StandardsIdentificationAnalysis-jan2014.pdf

agents). CSEC will require additional resources in order to implement and operate the state-level subsystem for maximum health and security.

For the purposes of implementing the state-level subsystem, DIR's Deliverables-based IT services (DBITS) contract may be used to acquire technical assistance for the procurement and integration of system components, functions and services in a multi-supplier environment; and development of operational and technical guidelines and requirements that govern the state-level subsystem during the course of the transition and evolution. The DBITS contract will allow CSEC to implement incrementally and to the extent funding is available.

3.3 TRANSITION TIMELINE

Timing of the transition of the state 9-1-1 program to NG9-1-1 is significantly dependent on the appropriation of funds. The CSEC's *Agency Strategic Plan – Fiscal Years 2015-19*[17] includes a high-level, phased timeline of NG9-1-1 development, tied to biennial funding cycles:

FY 2015

NG9-1-1 Geospatial Data Initiative
Enterprise Geospatial Database Management Services (EGDMS) – Implementation
9-1-1 Database Management System – Procurement
State-level ESInet (Phase I) – Procurement
Regional ESInets – Procurement and Implementation

FY 2016 - 2017

NG9-1-1 Geospatial Data Initiative
9-1-1 Database Management System - Implementation (FY 2016)
State-level ESInet (Phase I) – Implementation (FY 2017)
State-level ESInet (Phase II) – Procurement (FY 2016)
Regional ESInets Procurement, Implementation and Maintenance

[17] On May 14, 2014, the Commission accepted and approved the Agency Strategic Plan for submission to the Legislative Budget Board (LBB) and Governor's Office of Budget, Planning and Policy (GOBPP) division by no later than June 23, 2014.

FY 2018 – 2019

State-level ESInet (Phase II) – Implementation (FY 2018)
State-level ESInet (Phase III) – Procurement (FY 2018)
State-level ESInet (Phase III) – Implementation (FY 2019)
Regional ESInet – Procurement, Implementation and Maintenance
State-level and Regional ESInets – Interconnected and Fully Functional
Legacy 9-1-1 Systems – Decommissioned (FY 2019)

4 METHOD OF FINANCE (MOF)

4.1 CURRENT MOF

The current MoF for the State 9-1-1 Program, operated by the RPCs and administered by CSEC, consists of three emergency service fees and one surcharge[18] that follow:

911 Service Fee

This fee is collected by CSPs, monthly, for each local exchange access line or equivalent local exchange access line as defined in CSEC's Rule 255.4.[19] This fee collected from the State 9-1-1 Program areas is currently set by CSEC at the maximum allowable $0.50 per line or equivalent per month and is remitted to the Comptroller for deposit in the 9-1-1 Service Fee Account 5050.

This fee varies in areas in which 9-1-1 service is provided by an Emergency Communication District (ECD) as defined in Health and Safety Code Section 771.001(3).

9-1-1 Service Fee for Wireless Telecommunications Connections

This fee is imposed according to statute at a rate of $0.50 per month for each wireless telecommunications connection; it is remitted to the Comptroller and initially deposited into a trust fund account. A wireless telecommunications connection means any voice-capable wireless communication mobile station that is provided to a customer by a wireless service provider. Each month CSEC distributes, to each ECD that does not participate in the State 9-1-1 Program, a portion of the total amount collected; this portion is proportional to the population of the area served by the district in relation to the population of the state. The remaining money collected is deposited to the 9-1-1 Services Fee Account 5050.

Prepaid 9-1-1 Service Fee

This fee is collected by the seller from the consumer at the time of each retail transaction of prepaid wireless telecommunications service for use in Texas and is remitted to the Comptroller. "Prepaid wireless telecommunications service" means a mobile telecommunications service that is paid for in advance and allows a person to

[18] http://www.csec.texas.gov/fees-a-surcharge

[19] http://info.sos.state.tx.us/pls/pub/readtac$ext.ViewTAC?tac_view=4&ti=1&pt=12&ch=255&rl=Y

access 9-1-1 emergency communications services. Any person who sells prepaid wireless telecommunications services, or who uses their own prepaid wireless telecommunications services, must collect and remit the fee. The rate is 2 percent of the purchase price of each prepaid wireless telecommunications service purchased in person, by telephone, over the Internet, or by any other method. The fee is collected, deposited and distributed in the same manner as the 9-1-1 Service Fee for Wireless Telecommunications Connections.

Equalization Surcharge

This fee is imposed on each local exchange access line, equivalent local exchange access line or wireless telecommunications connection. The fee is set by CSEC, currently at $0.06, for each local exchange access line, equivalent local exchange access line or wireless telecommunications connection, and is remitted to the Comptroller and held in CSEC's Account 5007.

Per the Texas Health and Safety Code, Section 771.072 (Equalization Surcharge)[20], up to 40 percent of the equalization surcharge can be allocated to the RPCs, with the remainder being periodically allocated to fund grants that support the state's poison control centers. This fee may also be allocated to ECDs.

Although the existing legislation allows the equalization surcharge to be set at a maximum rate of $0.10 for each access line, Section 771.0725 states: "The commission shall establish the rate for the equalization surcharge imposed under Section 771.072 for each state fiscal biennium in an amount that ensures the aggregate of the anticipated surcharges collected from all customers for the following 12 months does not exceed the aggregate of the surcharges collected from all customers during the preceding 12 months." As a result, the surcharge is designed to be revenue neutral, and surcharge revenue cannot be enhanced by increasing the rate.

4.2 MOF OPTIONS FOR NG9-1-1

Below are MoF options for the planning, design, implementation, and maintenance of the state-level ESInet:

9-1-1 Service Fee Revenue

As the largest source of funding for 9-1-1, it is logical to contemplate the use of 9-1-1 service fee revenue to finance the implementation and subsequent operation of the

[20] http://www.statutes.legis.state.tx.us/Docs/HS/htm/HS.771.htm

state-level subsystem. CSEC's enabling legislation, Health and Safety Code 771.071(f) states: "The commission shall distribute money appropriated to the commission from the 9-1-1 services fee fund to regional planning commissions for use in providing 9-1-1 services as provided by contracts executed under Section 771.078."

Health and Safety Code 771.079(c) states: "… money in the account may be appropriated only to the commission for planning, development, provision, or enhancement of the effectiveness of 9-1-1 service or for contracts with regional planning commissions for 9-1-1 service, including for the purposes of:

1) maintaining 9-1-1 service levels while providing for a transition to a system capable of addressing newer technologies and capable of addressing other needs;
2) planning and deploying statewide, regional, and local emergency network systems; and
3) updating geospatial mapping technologies."

Equalization Surcharge

Health and Safety Code 771.072(d) states: "… not more than 40 percent of the amount derived from the application of the surcharge shall be allocated to regional planning commissions or other public agencies designated by the regional planning commissions for use in carrying out the regional plans provided for by this chapter. The allocations to the regional planning commissions are not required to be equal, but should be made to carry out the policy of this chapter to implement 9-1-1 service statewide. Money collected under this section may be allocated to an emergency communication district regardless of whether the district is participating in the applicable regional plan."

The enabling legislation provides authority to CSEC to use Equalization Surcharge to finance the implementation and subsequent operation of the state-level ESInet. Health and Safety Code Sec. 771.072(f) states: "The comptroller shall deposit the surcharges and any prior balances in accounts in the general revenue fund in the state treasury until they are allocated to regional planning commissions, other 9-1-1 jurisdictions, and regional poison control centers in accordance with this section. From those accounts, the amount necessary for the commission to fund approved plans of regional planning commissions and regional poison control centers ***and to carry out its duties under this chapter shall be appropriated to the commission.***" [Emphasis added.] This fee is paid by all telecommunications users in the State, regardless of 9-1-1 administrative entity type, and may also be allocated to 9-1-1 administrative entities regardless of type.

Appropriated Receipts

Appropriated receipts are “fees and other revenue collected for services performed by a state agency which are usually appropriated to the agency to help recover the agency’s cost of providing the services.”[21]

The state-level ESInet will eventually support all areas of the State, including those areas not served by the RPCs; approximately two-thirds of the population lives in an area that is not served by the State 9-1-1 Program. CSEC could recover the costs incurred in providing access to the state-level subsystem from the ECDs. This would require establishing an ongoing methodology for establishing the value received, as well as allocating and collecting reimbursement for services from the ECDs.

[21] Senate Research Center, Austin Texas, Budget 101, A Guide to the Budget Process in Texas, (2013), 52. http://www.senate.state.tx.us/SRC/pdf/Budget101WebsiteSecured_2013.pdf

5 GOVERNANCE, LEGAL AND REGULATORY

The Commission is comprised of representatives from each of the two types of 9-1-1 administrative entities in Texas, as well as ex officio representatives from DIR and PUC; and will be responsible for setting policy and overseeing agency involvement in the development and implementation of the state-level subsystem. The composition of the ECAC is similarly comprised of representatives from each of the three types of 9-1-1 administrative entities in Texas, further ensuring that the interests of all stakeholders are taken into account in the recommended policies presented to CSEC for policy making decisions.

It is envisioned that CSEC, with the assistance of the ECAC, will identify and develop operational and technical guidelines and requirements that govern the state-level subsystem during the course of the transition and its evolution; and educate stakeholders that may not have the resources or knowledge to decide, if and how to leverage the state-level subsystem to transition their PSAPs to NG9-1-1.

The ECAC will assist CSEC by establishing sub-committees, comprised of the state's subject matter experts with involvement from a cross-section of the state's PSAP and 9-1-1 community, to execute the NG9-1-1 Master Plan, enabling the vision to become a reality. CSEC will need to acquire services for technical assistance to facilitate this effort.

Specifically, CSEC envisions that the ECAC will be engaged to develop and recommend, but not limited to, the following:

- Standards and requirements for the creation, maintenance, management, and utilization of geospatial data by the ECRF/LVF.
- Resources to educate 9-1-1 administrative entities and other interested government stakeholders on the importance of geospatial data management.
- Tools or resources to guide 9-1-1 administrative entities—particularly smaller entities—through the decision-making process and help them in their planning should they choose to utilize services from the state-level ESInet.

- Standards for adoption using as its baseline, the *NG9-1-1 Standards Identification and Review*[22], developed by the National 9-1-1 Program.
- A robust security policy for adoption. The policy must exceed NG-SEC, incorporate aspects of NIST Special Publication 800-53 and other IT industry security best practices, and be compatible with FirstNet.
- A technical requirements document that defines network protocols, specifies standards-based interfaces, and security requirements for the interworking of state-level and regional subsystems. The document may also define a security audit process, network reporting requirements, and operational procedures.
- Policy and standards for deployment, operation and management of the state-level subsystem.
- Network backhaul needs for public safety applications in order to effectively process and leverage NG9-1-1 "Big Data."
- CSP requirements for connecting with the state-level ESInet.
- A checklist and project plan that defines the documentation requirements, communications plans, and operational methodology for migrating to the NENA i3 end-state environment.

The existing legal and regulatory environment may also have to change. Existing laws and regulations will be reviewed and revised to allow for 1) architecture and technology neutrality; 2) the delivery of new services by non-Local Exchange Carrier service providers or service providers with new technologies; 3) the extension of liability protection laws to future service providers; and 4) the alignment of new service arrangements, costs and funding mechanisms with NG9-1-1. With the availability of more data associated with the 9-1-1 caller and his/her location, the confidentiality of personally identifiable information (PII) will have to be examined and protected. The CSEC will facilitate and coordinate this effort with its stakeholders.

[22]See http://911.gov/pdf/NG911-StandardsIdentificationAnalysis-jan2014.pdf

6 SYSTEM MANAGEMENT AND OPERATIONS

The Texas NG9-1-1 System will be a more comprehensive emergency communications system with enhanced capabilities that allows for greater situational intelligence than today's 9-1-1 system. NG9-1-1 services are expected to expand beyond the 9-1-1 services of today and require higher levels of interaction and coordinated response among Texas 9-1-1 stakeholders both vertically and horizontally.

As a mission critical system, the management, operations and maintenance of its IT infrastructure must be performed by staff with IT and public safety expertise; and meet the following objectives:

- Does not increase CSEC staff size.
- Limits, to the extent possible, fork-lift replacement of the state-level subsystem due to expiration of service provider contracts.
- Manage and operate the state-level subsystem for maximum health and security, and continuous improvement.
- Utilize concepts of converged infrastructure to centralize the management of IT resources, consolidate systems, increase resource utilization rates, and lower costs.
- Utilize policy driven, automated IT processes and best practices to effectively monitor and report functions and services in a multi-supplier environment.
- Coordinate the execution of processes (e.g. change management, configuration management and problem management) in a multi-supplier environment.

Funding notwithstanding, the option available to CSEC that achieves the objectives above is to utilize the services of a multi-sourcing service integrator with enterprise system management experience and expertise to manage, operate and maintain the IT infrastructure of the state-level subsystem. The integrator will enter into Operating Level Agreements (i.e. contracts) with other service providers, under separate contract with CSEC in the implementation of the state-level subsystem, to enforce the service level agreements (SLA) established with CSEC.

7 RESOURCE SHARING

In order to avoid duplication of effort, which would only add to the cost of building the Texas NG9-1-1 System, a database of available NG9-1-1 technology resources (currently or shortly) for sharing would greatly benefit 9-1-1 administrative entities. Information would include but, not limited to:

- Host-remote, IP-based, call handling equipment,
- LNGs,
- datacenter space available for co-location of equipment.

The database would be complete and current, to the extent 9-1-1 administrative entities participate, and its implementation, completely dependent upon the availability of funds.

To ensure interoperability between and among the multiple subsystems of the Texas NG9-1-1 System, inter-government agreements must be established to memorialize specific responsibilities, identify the specific standards that must be followed, and other terms agreed upon. Provided CSEC has sufficient resources, CSEC will provide guidance on the terms that should be contained within these inter-government agreements; and facilitate and coordinate the effort by 9-1-1 administrative entities to:

- Prepare and train call takers to work in a multimedia environment, and handle increased quantity and quality of information available with the call;
- Prepare themselves and PSAP Administrators to handle contingency planning without geographic constraints. This involves developing up front agreements with neighboring PSAPs and 9-1-1 administrative entities on the relevant terms of cooperation;
- Prepare for the responsibility of deployment, security, maintenance, upkeep and oversight for their regional infrastructure; and
- Prepare themselves and NG9-1-1 data administrators to handle widely dispersed and highly replicated databases inherent in the NG9-1-1 System.

8 PUBLIC EDUCATION

With the assistance of the ECAC, CSEC will facilitate and coordinate this effort with 9-1-1 administrative entities to identify the key message to the public and deliver that message in a timely and effective manner. The phased deployment of NG9-1-1 will require the general public to be aware of where, when, what and how NG9-1-1 services are available. New communications options for the elderly, deaf and hard of hearing, disabled, and non-English speaking populations will also need to be addressed in the effort to manage the public's expectation.

9 SUPPORTING RADIO COMMUNICATIONS INTEROPERABILITY

CSEC will work with the Governor's Office of Homeland Security to support state needs for statewide communications interoperability among public safety agencies (e.g., police, fire, emergency medical services) and other service agencies (e.g., public works, transportation, and hospitals). Specifically, CSEC will support the Texas Department of Public Safety Law Enforcement Support Division in its effort to build a statewide "system-of-systems" network consisting of regional standards-based shared voice and data communications systems for the purpose of statewide communications interoperability. The Texas Statewide Communications Interoperability Plan (SCIP) defines communications interoperability as the ability of public safety agencies (e.g., police, fire, emergency medical services) and service agencies (e.g., public works, transportation, and hospitals) to talk within and across agencies and jurisdictions via radio and associated communications systems, exchanging voice, data and/or video with one another on demand, in real time, when needed, and when authorized.

The Texas "System of 24 Regional P25 Voice Communications Systems" is being built at the regional level utilizing the regional framework of the 24 Council of Governments and five U.S. Department of Homeland Security -designated Urban Areas of Houston, Dallas/Fort Worth/Arlington (these three areas operate as a single metro urban area), Austin, San Antonio and El Paso; by planning and collaborating on the strategic implementation of regional communications systems infrastructure. The same approach used by CSEC and the 76 9-1-1 administrative entities for the transition to the Texas NG9-1-1 System.

9.1 RADIO OVER INTERNET PROTOCOL

The CSEC and Texas Department of Public Safety intend to leverage the collective state level and regional ESInets (IP-enabled network infrastructure) to achieve long-haul radio communications interoperability with Radio over Internet Protocol (RoIP). RoIP is similar to VoIP, but augments two-way radio communications rather than telephone calls. From the user's point of view, it is essentially VoIP with Push-To-Talk. With RoIP,

at least one node of a network is a radio (or a radio with an IP interface device) connected via IP to other nodes in the radio network.

RoIP will be implemented using secure Virtual Private Network (VPN) tunnels on the collective ESInet to transport long-haul radio traffic between the IP interfaces of state, regional and local radio communications systems. The VPN keeps the radio traffic from intervening with 9-1-1 traffic (and vice versa) to ensure guaranteed access for both forms of traffic during an emergency. This enables a straight forward cost allocation for the radio VPN. It also enables the management and operation of collective IP-enabled network infrastructure including the radio VPN as a whole, resulting in operational and cost savings.

GLOSSARY OF TERMS

The following are commonly used Acronyms	
Acronym	*Description*
ALI	Automatic Location Identification
BCF	Border Control Function
CIDB	Customer Information database
CPE	Customer Premises Equipment
DBITS	Deliverables-based IT services
DIR	Department of Information
E9-1-1	Enhanced 9-1-1
ECD	Emergency Communication Distric
ECRF	Emergency Call Routing Function
EGDMS	Enterprise Geospatial Database Management System
ESInet	Emergency Services IP-Enabled Network
ESRP	Emergency Services Routing Proxy
FCC	Federal Communications Commission
FY	Fiscal Year
GIS	Geographic Information Systems
i3	Functional and Interface Standards for Next Generation 9-1-1 Version 1.0 (i3) NENA 08-002
ICA	Interconnection Agreements
IdAM	Identity and Access Management

The following are commonly used Acronyms	
IETF	Internet Engineering Task Force
IP	Internet Protocol
IPsec	Internet Protocol Security
IPv6	Internet Protocol version 6
IT	Information Technology
LAR	Legislative Appropriation Request
LDB	Location Database
LIF	Location Interworking Function
LIS	Location Information Server
LoST	Location to Service Translation
LVF	Location Validation Function
MoF	Method of Finance
MPLS	Multi-Protocol Label Switching
NIF	NG Interworking Function
NG9-1-1	Next Generation 9-1-1
NG-SEC	Security for Next Generation 9-1-1 Standard Version 1 (NG-SEC) NENA 75-001
P25	Project 25 (formerly APCO Project 25)
PIDF-LO	Presence Information Data Format – Location Objects
PIF	Protocol Interworking Function
PII	Personally Identifiable Information
POI	Points of Interconnection
PRF	Policy Routing Function

The following are commonly used Acronyms	
PSAP	Public Safety Answering Point or Primary Public Safety Answering Point
PUC	Public Utility Commission
QoS	Quality of Service
RITA	Research and Innovative Technology Administration
RoIP	Radio over Internet Protocol
RPC	Regional Planning Commission
SaaS	Software as a Service
SCIP	Statewide Communications Interoperability Plan
SDO	Standards Development Organization
SIF	Spatial Information Function
SIP	Session Initiation Protocol
SLA	Service Level Agreements
TTY/TDD	Teletype/Telecommunications Device for the Deaf
URI	Uniform Resource Identifier
URN	Uniform Resource Name
USDOT	U.S. Department of Transportation
VoIP	Voice over Internet Protocol
VPN	Virtual Private Network

FIGURE 1 – TEXAS NG9-1-1 SYSTEM AND ESINET VISION