



June, 2012

WORKING GROUP 1
Subgroup 2
Report

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1 Preamble

This document contains the report of the Communication Security Reliability and Interoperability (CSRIC) Working Group 1 - Subgroup 2. This report is intended to be incorporated into the overall CSRIC report.

2 Introduction

2.1 Overview

The contents of this document serve as an addendum to the report submitted by Working Group 1 which was accepted by CSRIC during its December meeting. This document contains the description of the assigned action items and the findings of the group related to these action items. The sections and/or tables from Working Group 1’s December report referenced by these action items have been included in this document.

The additional tasks assigned to Working Group 1 sought to clarify and build upon the tasks already accomplished, which broadly include the identification of technical standards, related technical gaps and overall readiness of the 9-1-1 system for accepting information generated by Next Generation 9-1-1 (NG9-1-1) applications. While there is much work that has been done to date, much work remains to be done with respect to NG9-1-1 development, including the completion of a wide range of operational procedures at the overall NG9-1-1 system level, for Public Safety Answering Points (PSAPs) and other emergency entities expected to use NG9-1-1 functionality.

2.1.1 Organization Chart

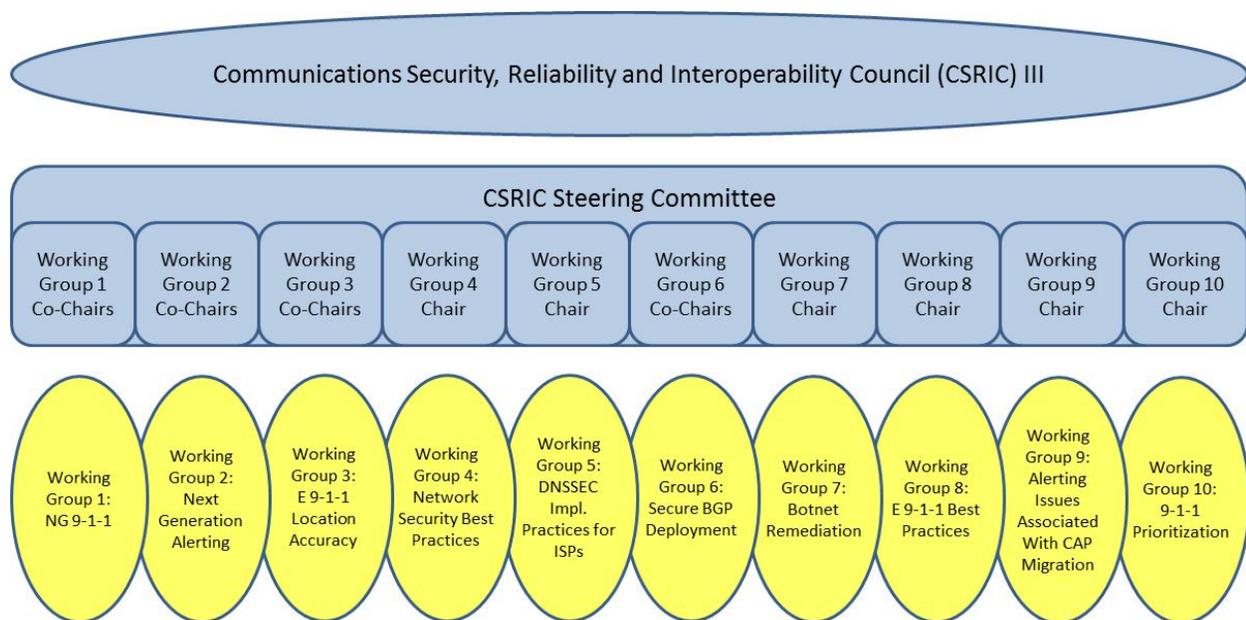


Figure 2-1: CSRIC Organization Chart

2.1.2 Working Group 1 Membership

Table 2-1: CSRIC Working Group Team Members

Name	Organization	Sub 1	Sub 2
Laurie Flaherty, Co-Chair	National Highway Traffic Safety Administration; USDOT		
Brian Fontes, Co-Chair	NENA		
Angel Arocho	Comcast		
Jeb Benedict	CenturyLink	x	x
Marc Berryman	Digital Data Technologies, Inc.	x	x
Donna Bethea-Murphy	Iridium	x	
David Connor	US Cellular Corporation		
Brian Daly	AT&T	x	
Thomas Dombrowsky	Wiley Rein LLP	x	
James Goerke	Texas 9-1-1 Alliance	x	x
Jeanna Green	Sprint	x	
Jenny Hansen	Northrop Grumman Corporation	x	x
Tom Hanson	Charlottesville/UVA/Albemarle County	x	x
Roger Hixson	NENA	x	
Mike Hooker	T-Mobile USA Inc.	x	x
Farrokh Khatibi	ATIS (works for Qualcomm)	x	
Elise Kim	9-1-1 FOR KIDS: Public Education	x	
Frank Korinek	Motorola Solutions		
Michael Mangini	Cassidian Communications, an EADS North America Company	x	
Kathryn Martin	Access Partnership		
Kathy McMahon	APCO	x	x
Jennifer McNamara	CenturyLink	x	x
Richard Muscat	Bexar Metro 911 Network District		x
Mike Nelson	Intrado, Inc.	x	x
Tristan Nelson	Verizon	x	x
Judy Ocondi	TeleCommunication Systems, Inc.	x	
Jerry O'Neill	Northrop Grumman Corporation	x	x
Chuck Powers	Motorola Solutions		
Jacqueline Randall	Washington State Military Department E911 Program Office	x	
Brian Rosen	Neustar	x	x
Brent Schimke	City of New York, Mayor's Office of Citywide Emergency Communications		
Greg Schumacher	Sprint	x	x
Dorothy Spears	Virginia Information Technologies Agency	x	x
Bill Tortoriello	U.S. Cellular		
Christian Vogler	Gallaudet University	x	
Norman Williams	Gallaudet University	x	x
Jeffery Wittek	Cassidian Communications, an EADS North America Company	x	

Also, DeWayne Sennett of AT&T served as document editor for the development of the CSRIC Working Group 1 report.

2.2 Objective of CSRIC Working Group 1 Subgroup 2

Original Tasks

Subgroup 2 shall identify criteria that signify the technical and/or operational readiness of a regional and/or Statewide 9-1-1 system, to accept NG9-1-1 calls and data.

Additional Tasks

After the December report of Working Group 1 was reviewed by CSRIC and the FCC, the following additional task was assigned to Working Group 1 Subgroup 2:

For each activity listed in Section 2.5.5 and 2.5.6, prepare a list of measurable outcomes that could serve as objective evidence of each activity's completion. The items in the list should be expressed as results or outcomes, rather than processes or activities.

- Analogous to the process used to implement Phase I of E911, the report should provide specific information about the evidence signaling the readiness of PSAPs within a given region or state to accept NG911 calls, which could serve as the basis for a validation processes that PSAPs and providers would implement in order to accommodate NG911 calls or text (if text is to be part of Release 1).
- The list does not need to be overly inclusive. For example, the list does not need to include a complete list of every data, GIS, and logging feature that is internal to the PSAP. The list also does not need to include transition elements, such as the LSRG.
- Deadline: June 2012

2.3 Analysis, Findings, and Recommendations of CSRIC Working Group 1 Subgroup 1

2.3.1 Methodology

In the December report from Working Group 1, Subgroup 2 recognized the interdependence of multiple organizations and agencies in achieving successful NG9-1-1 call processing. A list of contributing stakeholder entities was developed and organized into three major categories. A checklist was then developed for each stakeholder entity to be used as a guide in determining technical and operational readiness to accept and manage NG9-1-1 calls. Stakeholders could be represented in multiple categories, as they may provide a wide range of services.

NG9-1-1 stakeholders were categorized as follows.

NG9-1-1 Stakeholders

9-1-1 Entity	Access / Origination Networks*	Originating Service Providers*
<ul style="list-style-type: none"> • National 9-1-1 Entities • State 9-1-1 Authority • Regional 9-1-1 Authority • Host 9-1-1 Entity (County or Municipality) • PSAPs 	<ul style="list-style-type: none"> • Broadband Providers • Telcos • Cable Companies • Satellite Providers • WiFi Hotspots • Enterprises • Carrier Network Providers 	<ul style="list-style-type: none"> • Internet Service Providers • Wireless Service Providers • Over-the-Top Application Providers • VoIP Service Providers • Relay Services • Telmatics • Texting Solutions

Figure 2-6: NG9-1-1 Stakeholders

*Stakeholders may be represented in multiple categories as they may provide a wide range of services.

The list of stakeholders as represented in Figure 2-6 recognizes previous efforts to categorize NG9-1-1 stakeholders such as those contained resources such as the *NENA NG9-1-1 Transition Plan Considerations* and the *US DOT's NG911 Initiative and Stakeholder considerations*, and further delineates the agencies and organizations included as 9-1-1 entities as they currently exist.

9-1-1 Entity Descriptions

There are multiple types and levels of governmental entities potentially involved with the change from E9-1-1 to NG9-1-1 systems in support of the 9-1-1 emergency communications service process. In each case, their involvement and responsibilities may vary based on governmental and public safety structure and the recognition of economic and operational effectiveness priorities.

2.3.1.1 National 9-1-1 Entities

National entities include those with nationwide activities. They may include interested, affecting, or affected national organizations, and may or may not be federal government agencies. Examples include: FCC, NHTSA, USDOT, DHS, FEMA, NENA, APCO, NASNA. Federal entities have national interests in terms of operations, interoperability, disaster recovery, with 9-1-1 calling as part of national security and emergency communications, etc.

2.3.1.2 State 9-1-1 Authority

The State 9-1-1 Authority is the governance group at state level concerned with planning and

preparation for 9-1-1 service evolution, decision making (in conjunction with regional and local governance) on geographic level of ESInets and NG9-1-1 systems, related legislation, regulation, and funding methods, and coordination across the state for accomplishing NG9-1-1 in the state. A State 9-1-1 Authority may have operational and support responsibility for ESInet and NG9-1-1 (including data) functions if implemented at state level, directly or through vendors. While most often such an authority is a unit of state government, it does not have to be.

2.3.1.3 Regional 9-1-1 Authority

Where applicable, a Regional 9-1-1 Authority is a multi-county governance group (region within a state) responsible in conjunction with a state 9-1-1 Authority, sub-state and local governing bodies for planning and preparation for 9-1-1 service evolution in their region. Where present, a regional 9-1-1 Authority would typically have operational and support responsibility for NG9-1-1 (including data) functions if implemented at the regional system level, directly or through vendors, and for an ESInet implemented regionally. Typically established and managed through a consortium or other cooperative multi-governmental authority set.

2.3.1.4 Sub-State 9-1-1 Authority

Where applicable, this governance group exists at the multi-county (region within a state), county, or municipal level responsible in conjunction with a state 9-1-1 Authority and local governing bodies for planning and preparation for 9-1-1 service evolution in their area. Generally such entities have 9-1-1 funding and support responsibilities (e.g., network infrastructure and connectivity, GIS and data functions, etc.) These entities may be part of a regional 9-1-1 authority operating a regional NG9-1-1 system.

2.3.1.5 PSAP Host Governmental Entity (usually County or Municipality)

The host entity has direct oversight and operational responsibility for one or more PSAPs. The host entity also funds those PSAP costs that are not funded through other mechanisms like 9-1-1 service fees (e.g., call taker personnel cost, etc.)

2.3.1.6 PSAPs

The PSAP is physical facility which functions as the 9-1-1 call center operational environment, receiving and processing 9-1-1 calls. It operates under the authority of a host governmental entity. Note that various emergency entities other than traditional PSAPs are expected to part of the Next Generation 9-1-1 user set.

Access Networks Descriptions

Access Networks enable connectivity to telecommunication services.

2.3.1.7 Broadband Providers

Broadband providers are network providers who provide the local loop facilities to end users, assumed to include both wireline and wireless access. Examples of providers include telephone companies, wireless companies, cable companies, some satellite providers and, in some cases, power companies that deliver broadband connectivity to neighborhoods.

2.3.1.8 Telcos

The Local Exchange Carriers (LECs) are local telephone companies that own facilities and equipment to provide for transmission and routing of telephone exchange services and exchange access. LECs are usually divided into incumbent local exchange carriers (ILECs) and competitive local exchange carriers (CLECs). Examples of telcos include Verizon, AT&T, CenturyLink, etc.

2.3.1.9 Cable Companies

Historically, a cable company or operator is a system provider of video programming using closed transmission paths. Many cable companies now additionally provide voice services and internet broadband access to a subscriber base. Examples include Comcast, Time Warner, Cablevision, etc.

2.3.1.10 Satellite Providers

Satellite providers are companies that host transmission networks to provide access to telecommunications and broadcasting via satellite communication links to satellite phones, cable head-ends, subscriber TV dishes, etc. Satellite network technical design varies greatly from geostationary to non-geostationary orbits; single satellite or multi-satellite networks; broadband or narrowband transmission. Examples of satellite providers include: DirecTV and Dish Network (DTV BSS), Iridium (MSS), Intelsat and SES World Skies (FSS).

2.3.1.11 WiFi Hotspots

WiFi “hotspots” or wireless access points use IEEE 802.11 standards to connect end users across limited-range wireless transmission to backbone networks. The “hotspots” are generally found in localities, such as airports, coffee shops, and campuses frequented by an influx of WiFi enabled mobile device users. These wireless access points can be delivered by wireless network providers (e.g. Verizon Wireless, T-Mobile, Sprint, etc), although the majority of WiFi Hotspots are provided by private parties that utilize public internet backbone services from Broadband Providers (both wire line and wireless)."

2.3.1.12 Enterprises

These networks include local area network (LAN) implementations in campus-like environments, and Private Branch Exchanges (PBXs). An enterprise network is usually built by a company to support communications interconnections and to share resources. In the context of this document it is assumed the networks and/or PBXs are owned and operated by the entity that inhabits the campus. Examples include colleges, corporations, military bases, etc.

2.3.1.13 Carrier Network Providers

Generally refers to long-haul network providers that may not provide the local loop facilities to the end user. Examples include Level 3, AT&T, Verizon, etc.

Originating Service Provider Descriptions

Originating Service Providers are entities that provide telecommunications services to end users.

2.3.1.14 Internet Service Providers (ISPs)

ISPs are companies/vendors that provide internet access and offer a core group of internet utilities and services, such as e-mail, online news readers, and a wide range of media reviews. In the context of this document, the ISPs are classified as those that do not also provide the local loop facilities to the end user. One such example of this type of ISP is AOL.

2.3.1.15 Wireless Service Providers

The WSPs are licensed owners who provide call and data communication services to consumers over cellular radio networks, which interconnect with the public switched telephone and/or IP-based networks. The wireless services generally support mobility as the user moves between cells towers and other service providers. A few examples of WSPs include Verizon Wireless, T-Mobile, AT&T Mobility, and US Cellular.

2.3.1.16 Over-the-top (OTT) Applications Providers

Over-the-top Applications Providers provide services that ride on top of existing broadband infrastructure and are not integrated with the access service provider. It may be implemented as a software application on a personal computer, tablet, smart-phone, or other device. The majority of these OTT applications make use of the underlying bandwidth provided by access networks. Some of the OTT services from which data is expected to emanate in Next Generation-911 (NG9-1-1) include soft-phone clients, sensors and alarms. Prominent OTT application providers include Skype, Google and Microsoft.

2.3.1.17 VoIP Providers

VoIP Service Providers (VSPs) offer voice communications services that originate or terminate via IP networks rather than the circuit switched PSTN. They are characterized by their service, which enables real-time, two-way voice communications, requires a broadband connection from the user's location, requires IP-compatible CPE, and generally permits users to receive calls that originate on the PSTN and terminate calls to the PSTN. In the context of this document, the VSPs are classified as those that do not also provide the local loop facilities to the end user. Examples of this type of VSP include Vonage and Phone.com.

2.3.1.18 Relay Services

Telecommunication relay service and private call centers are physical places with personnel who provide interaction between a caller and a PSAP. They do not provide direct access to 9-1-1 and, hence, they need to verbally pass the caller's location information to the PSAP. These relay services specialize in communications translation services for the deaf, hard of hearing and speech-impaired community. Service providers include AT&T Relay Services, Hamilton Relay, etc.

2.3.1.19 Telematics Providers

The term Telematics Providers typically refers to the integrated use of information technology and telecommunications. The most commonly acknowledged form of telematics is vehicle telematics. Vehicle telematics is a technology that uses the vehicle's electronics to establish two-way wireless communication between a device and a call processing center or a PSAP, to transmit voice and data information. Telematics devices are commonly installed in newer motor vehicles and can be activated manually by the vehicle owner or automatically upon a predefined

trigger. OnStar provides vehicle telematics services.

2.3.1.20 Texting solutions

Texting Solutions are services utilizing plain text, such as short message service (SMS), IP-based messaging, and real-time-text (RTT), which will allow for non-vocal communications with emergency services personnel in the NG9-1-1 environment. Purveyors of text messaging services generally include WSPs such as Sprint, AT&T Mobility, Verizon Wireless, and a variety of regional providers.

Using these stakeholder groups as a basis, a checklist was developed, which included suggested procedural steps (in no particular order) that a PSAP or 9-1-1 Authority may use as a guide to assist in determining its technical and operational readiness to accept and manage NG9-1-1 calls. The original checklist submitted in Working Group 1's December report was revised to include the additional tasks assigned. The remainder of this document contains this revised checklist.

Working Group 1 Subgroup 2 used more general language for the technical guidelines section as that section involved specific technical items, making the completion measurement self-evident. The other sections were enhanced with measurable outcomes: Operations; Governance; System Management.

2.3.2 Findings and Recommendations

Technical Readiness Guidelines

Technical readiness is contingent upon the readiness state of individual Functional Elements (FEs) used by PSAPs. A Functional Element does not correspond to a specific product or system and may be hosted at a different physical location than the PSAP. (For instance, the set of FEs that make up a central NG9-1-1 system will not be specific to, or at any individual PSAP.) A FE may be available within multiple products and is not limited to any specific working position at the PSAP (e.g. Call-taker, Dispatcher or Supervisor).

Assess preparatory education requirements for 9-1-1 Authority groups

These groups must have a basic understanding of what is involved in preparing for, converting to, and operating NG9-1-1, whether managed by vendors with 9-1-1 Authority oversight and management, or in some cases directly managed by 9-1-1 Authorities.

Assess impact to and identify upgrade and/or interface requirements for internal PSAP networks and/or other Local Area Networks owned or managed by the PSAP or 9-1-1 Authority

Assess impact and identify upgrade and/or interface requirements for the planning, implementation and operation of IP-based NG9-1-1 as a transition from E9-1-1

See details in the System Management section below.

Assess impacts and identify upgrade and/or interface requirements for PSAP administrative PBX or internal telephone system

The PSAP Administrative PBX includes telecommunication equipment that handles processing of administrative, non-emergency telephone communications. This PBX can also be integrated with other systems within the organization in order to provide additional administrative services such as email, instant messaging, voicemail and other non-emergency business related functions.

Assess impact to and identify upgrade and/or interface requirements for Radio systems owned or operated by the PSAP or 9-1-1 Authority

The primary method for many PSAPs to disseminate information to responding emergency service units is via dispatch over radio frequencies (RF). Radio over IP systems (ROIP) have been implemented in some areas as well.

Assess impact to and identify upgrade and/or interface requirements for emergency call handling software and hardware

The Emergency Call Handling FE manages incoming emergency calls regardless of media type and handles all communication from the caller. It is commonly referred to as Customer Premise Equipment (CPE) or Computer Telephony Integration (CTI) in a legacy PSAP environment.

Assess impacts and identify upgrade and/or interface requirements for TTY capability

Legacy telecommunications capability for the deaf and hard of hearing (TTY) must be maintained as part of the PSAP call handling FE.

Assess impacts and identify upgrade and/or interface requirements for emergency notification systems that are owned or maintained by the PSAP or 9-1-1 Authority

Emergency notification systems (ENS) are used by PSAPs or municipalities to notify the public of significant events that could impact the integrity of life or property. ENS may be integrated into or interfaced with other FEs such as call handling or dispatch.

Assess impacts and identify upgrade and/or interface requirements for Incident Creation hardware and software

The Incident Creation FE is used to declare an incident (event) upon which further action or dissemination may be necessary. Incident creation functions are commonly included in CPE software or Computer Aided Dispatch (CAD) systems in the legacy PSAP environment.

Assess impacts and identify upgrade and/or interface requirements for Dispatch hardware and software

The dispatch FE is used to electronically disseminate an incident to first responders in the field. It is most commonly included as a module within a CAD system.

Assess impacts and identify upgrade and/or interface requirements for Mobile Data systems

Mobile data systems can be integrated as modules within other FEs such as CAD or can be stand-alone systems that use interfaces. NG9-1-1 impact should be assessed from both PSAP perspective as well as the users in the field.

Assess impacts and identify upgrade and/or interface requirements for Management Information Systems (MIS)

MIS can be associated with multiple functional elements within a PSAP. It is commonly used to produce statistical data on call handling, dispatch and personnel performance.

Assess impacts and identify upgrade and/or interface requirements for Records Management Systems (RMS)

RMS can be associated with multiple functional elements within a PSAP and is the data repository for incident related information. Access to RMS data is often controlled by the agency having primary jurisdiction for an incident. Multiple agencies may store data in a single RMS. NG9-1-1 impact should be assessed from both PSAP perspective as well as the users in the field.

Assess impacts and identify upgrade and/or interface requirements for Jail Management Systems (JMS)

JMS are often managed by the agency having jurisdiction over the incarceration facility. These systems may interface to multiple FEs in a PSAP.

Assess impacts and identify upgrade and/or interface requirements for Logging/Recording Systems

Logging & recording of 9-1-1 voice transmissions is mandated by law in most regions. It is commonly associated with call handling and dispatch FE's where voice transmissions via the telephone or radio are most likely to occur. Storage capacity and functional requirements of logging systems will change significantly in an NG9-1-1 system.

Assess impacts and identify upgrade and/or interface requirements for time synchronization

Most systems and FEs within a PSAP (or 9-1-1 region) are required to maintain synchronization with a master time source to assure that an accurate chain of events for an incident can be documented.

Assess impacts and identify upgrade and/or interface requirements for responder alerting systems

Responder alerting systems are most commonly interfaced with the dispatch FE at a PSAP and are used to notify emergency responders of an incident to which they must respond. Examples of responder alerting systems are pagers, fire station tones and automated cell phone text messaging.

Assess impacts to functionality and connectivity to external interfaces/systems

Many PSAP FEs have interfaces to external networks or other proprietary software systems that could be impacted by implementation of NG9-1-1. Examples of external interfaces/systems are NLETS, State DMV, court systems, storm tracking and hospital status.

Operational Readiness Guidelines

Assess education requirements for 9-1-1 Authority groups outside the PSAP

These groups must have a basic understanding of what is involved in preparing for, converting to, and operating NG9-1-1, including ongoing database management, whether managed by vendors with 9-1-1 Authority oversight and management, or in some cases directly managed by 9-1-1 Authorities. See also the System Management section below for detail.

Upon completion of this assessment, the 9-1-1 Authority shall own a Next Generation 9-1-1 (NG9-1-1) training curriculum consisting of operational and technical training milestones for identified subject matter experts, funding requirements and availability, and any applicable regulatory issues that require action. A product of completing the curriculum will be anticipated executive decisions to draft RFP's to contract outside expertise for specific technical implementations and system management.

Assess training requirements for all public safety sector stakeholders

Training will likely be required for all FEs that undergo a change to accommodate NG9-1-1. Training requirements must be identified for PSAP personnel, first response agencies and other stakeholders such as network specialists and municipal and/or state level Information Technology staff.

Upon completion of this assessment, the 9-1-1 Authority shall own a Next Generation 9-1-1 (NG9-1-1) training curriculum outline (final curriculum will be dependent on specific implementations) consisting of operational and technical training milestones for each identified group (e.g. PSAPs, Police, Fire, EMS) of public safety stakeholders/practitioners. The curriculum prepared for each stakeholder group will address all functional elements that will undergo a change. A product of completing this assessment will be anticipated executive decisions to engage non-public safety municipal subject matter expertise to assist in the training and subsequent management of the systems involved.

Assess training requirements for the public

Assuring that appropriate public expectations are established is critical

Upon completion of this assessment, the 9-1-1 Authority or applicable government agency shall own a Next Generation 9-1-1 (NG9-1-1) project plan for Public education. A product of the plan will include an assessment of the funding requirements and fund availability for deployment of public education as well as they type(s) of delivery media that should be involved.

Conduct staffing needs assessment for NG9-1-1 implementation and post cutover

NG9-1-1 will provide additional functionality such as multimedia, the impact of which has not been accounted for in legacy E9-1-1 systems

Upon completion of this assessment, the 9-1-1 Authority or applicable government agency shall be in possession of a completed report detailing the current and future required staffing

compliment for all PSAP work positions within the Authority's jurisdiction. The staffing projections will be used to assist with budget considerations for NG9-1-1 deployments.

Assess existing PSAP and first responder mutual aid agreements for compatibility with expectations of NG9-1-1 related interoperability.

NG9-1-1 will provide increased opportunity for interoperability between disparate agencies that may require new or modified working agreements.

Upon completion of this assessment, the 9-1-1 Authority or applicable government agency(s) shall be in possession of new or updated interagency mutual aid agreements that will allow for the effective routing and dissemination of emergency calls in the specified jurisdictions.

System Management

NG9-1-1 system management involves considering, preparing, and confirming all matters associated with the management of the entire impacted NG9-1-1 system enterprise, from the initiation of the emergency communications request to the final delivery and documenting of the incident response. NG9-1-1 system management necessarily follows from the established governance and system functional technical requirements, but focuses more on identifying specific matters, functions, coordination, responsibilities, accountabilities, and demarcations that may change and how they will be addressed in the transition from E9-1-1 to NG9-1-1.¹

Even at strictly the system and PSAP operations level, these issues can be challenging because they may necessitate recognizing and understanding matters that were previously outside the scope of coordination, responsibilities, accountabilities, and demarcations, and may have aspects that can be materially different from existing operational, technical, regulatory, or contractual perspectives.² In addition, when in some cases prior foundations of a State's Public Utility

¹ In some cases, NG9-1-1 system management coordination, responsibilities, accountabilities, and demarcations may logically follow from funding sources or the preferences of the entity performing the specific operational matter or technical function. But in other cases NG9-1-1 system management coordination, responsibilities, accountabilities, and demarcations may follow from agreement of involved parties, standards, best practices, operating procedures, regulations, service level agreements, and or inter-governmental or vendor contractual documents.

² The USDOT NG9-1-1 Procurement Tool Kit (available at www.its.dot.gov/ng911) presents the issue as far as System and PSAP operations as follows in 2.7.1 Overview:

System and PSAP operations will generally require preparation, training, and understanding regarding the NG9-1-1 system and the operational differences between today's 9-1-1 and NG9-1-1, and development of policies and procedures to support NG9-1-1 operations. Although many organizations have developed their own policies over the course of many years, the introduction of NG9-1-1 will change some of the basic tenets of call processing and handling. A solid understanding of these changes will help to reduce risk in transition to NG9-1-1 as well as better prepare the end users for the change.

Planning for system and PSAP operational changes include two general steps ...:

Step 1—Identify Operational Differences Between E9-1-1 and NG9-1-1. Knowledge of the differences between today's 9-1-1 systems and NG9-1-1 is crucial to prepare for the transition. Once the gaps are identified, the missing policies and training plans can be developed.

Step 2—Establish Processes and Procedures for NG9-1-1 Operations. For most organizations, the policies and procedures for handling 9-1-1 operations are intact and effective. The project team should develop and tailor specific guidance for NG9-1-1 operations needs to the individual organization's needs. The guidance should adhere to emerging standards for governance, training, and operation in order to improve interoperability with neighboring or backup resources.

Commission and/or Federal Communications Commission regulations do not exist, are reduced, or are different or uncertain, there may be additional matters to be addressed.

Following is a brief list of major NG9-1-1 system management matters for which the transition from E9-1-1 to NG9-1-1 may change as far as the scope of coordination, responsibilities, accountabilities, and demarcations, and may have aspects that can be materially different from existing operational, technical, regulatory, or contractual perspectives. A more detailed checklist type list is presented as Appendix D with suggestions on the potential type of impacts, changes and interdependencies.

Identify and document initial and immediate path changes on coordination, responsibilities, accountabilities, demarcations, regulations, and contractual matters for major existing and new *network and data systems* in transition from E9-1-1 to NG9-1-1 ESInets:

- 9-1-1 Network
- Database Management
- Mapping/GIS
- Authorization, Authentication, and Credentialing
- Points of Interconnection
- Intra-and inter-ESInet Issues
- Confidentiality and Security System(s)

Upon completion of readiness checks associated with this section, initial and immediate path changes on coordination, responsibilities, accountabilities, demarcations, regulations, and contractual matters will have been identified and documented. All items identified will have been reviewed for detailed change impacts, and arrangements and documentation will be in place to ensure proper treatment and outcomes for all items during both transition and ongoing operations.

Identify and document initial and immediate path changes on coordination, responsibilities, accountabilities, demarcations, regulations, and contractual matters for major existing and new *intergovernmental interrelationships* in transition from E9-1-1 to NG9-1-1:

- Confidentiality and Security System(s)
- Recording System(s)
- Records Retention System(s)
- Sources of policies and practices for Voice, Text, Images, Video, etc.

Upon completion of readiness checks associated with this section, initial and immediate path changes on major existing and new intergovernmental interrelationships will have been identified and documented. All items identified will have been reviewed for detailed change

impacts, and arrangements and documentation will be in place for all items to ensure proper treatment and outcomes during both transition and ongoing operations.

Identify and establish initial and immediate process changes for major *network and data systems* from E9-1-1 to NG9-1-1:

- Policy Statements
- Contractual review, approval, and process
- Regulation review, approval, and process
- Payment review, approval, and process

Upon completion of readiness checks associated with this section, initial and immediate process changes for major network and data systems will have been identified and documented. All items identified will have been reviewed for detailed change impacts, and arrangements and documentation will be in place for all items to ensure proper treatment and outcomes during both transition and operations.

Identify and establish initial and immediate process changes for major existing and new *intergovernmental interrelationships* from E9-1-1 to NG9-1-1:

- Policy Statements
- Contractual review, approval, and process
- Regulation review, approval, and process
- Payment review, approval, and process

Upon completion of readiness checks associated with this section, initial and immediate process changes for major existing and new intergovernmental interrelationships will have been identified and documented. All items identified will have been reviewed for detailed change impacts, and arrangements and documentation will be in place for all items to ensure proper treatment and outcomes during both transition and ongoing operations.

GIS Data

The Location Validation Function (LVF) is the manner in which the location of a caller's device (e.g. phone) is validated or checked before a call is ever routed over the network. In this sense, the LVF validates the caller's location. The validation process uses the 9-1-1 Authority's locally derived GIS data to check and verify the location information. The location is usually stored in a Location Information Server (a LIS), or a Legacy Gateway device that transforms the location information, such as the ALI, into the location format used in NG9-1-1. This location information is sent to the LVF. Once the location is validated, it will be part of the incoming 9-1-1 call received at the PSAP. While the Master Street Address Guide (MSAG) also uses the 9-1-1 Authority's GIS data, the LVF may serve as a replacement to the MSAG in the NG9-1-1 environment as the LVF can validate location information to a level of detail that is not possible with the MSAG.

This high-level checklist is intended to ensure GIS data meets the minimum required standards needed to function properly within the NG9-1-1 environment:

- The GIS data have been collected to meet the standards set forth in **NENA 02-014 - GIS Data Collection and Maintenance**.
- The ALI, GIS, and MSAG data have been standardized according to **NENA 02-010 - Standard Data Formats for 9-1-1 Data Exchange & GIS Mapping**.
- The GIS data have been validated and synchronized (including database cleanup) as outlined **NENA 71-501 - Synchronizing GIS databases with MSAG and ALI**.

In the NG9-1-1 environment, the GIS database serves several critical functions:

- Location Validation Function (LVF) for the validation of the location of devices capable of calling 9-1-1 prior to a 9-1-1 call being routed on the network
- GIS data is used to determine call-routing to the appropriate PSAP
- GIS data is used to determine call-routing to the appropriate responding agency within the Emergency Call Routing Function (ECRF).

GIS data used in the NG9-1-1 environment must meet NENA Standards (e.g. NENA 02-014 - GIS Data Collection and Maintenance, NENA 71-501 Synchronizing GIS databases with MSAG & ALI, NENA, NENA 71-003 NG9-1-1 GIS Data Model (Draft) . This will ensure interoperability, capability, and adherence to NG9-1-1 processes.

Governance

USDOT's NG9-1-1 Initiative notes that the ". . . deployment of NG9-1-1 will require increased coordination and partnerships among government and public safety stakeholders, 9-1-1 Authorities, service and equipment providers, and PSAP Administrators in planning and implementing NG9-1-1."³ Acknowledging the challenge, NENA observed that "[t]ransitioning our nation's legacy 9-1-1 system to a modern IP-based Next Generation 9-1-1 (NG9-1-1) system must be a major policy objective at all levels of government."⁴ Without effectively addressing issues of policy, governance and regulation, NG9-1-1 will never realize its full vision of a ". . . new internet network [that] will provide the foundation for public emergency services in an increasingly mobile and technologically diverse society and ultimately enable E9-1-1 calls from most types of communication devices."⁵

State 9-1-1 legislation varies significantly across the country. Specific 9-1-1 legislation at any level does not exist in every state, and, in a number of states, the state-level function is limited to a specific type of 9-1-1 (e.g., wireless). Funding models vary, and, where they do exist, they may not be adequate to support migration to NG9-1-1, or they may not be consistent with emerging technologies.⁶ In light of the above, the National 9-1-1 Program currently has a

³ U.S. Department of Transportation, Intelligent Transportation systems, "Transition Plan," February 2, 2009, p43. <https://www.911resourcecenter.org/code/ContentDetail.aspx?ContentID=275>.

⁴ National Emergency Number Association (NENA), "Next Generation 9-1-1 Transition Policy Implementation Handbook," March 2010, p1. <http://www.nena.org/?NGPPPPolicyTransHndbk>.

⁵ U.S. Department of Transportation, Intelligent Transportation systems, "Next Generation 9-1-1 (NG9-1-1) System Initiative, Concept of Operations," April 6, 2007, p4. <https://www.911resourcecenter.org/code/ContentDetail.aspx?ContentID=254>.

⁶ For a more thorough discussion of the "funding" challenge, see: FCC, Communications Security, Reliability and Interoperability Council (CSRIC), Final Reports, WG4B, "Transition to Next Generation 9-1-1," March 2011. <http://transition.fcc.gov/pshs/docs/csric/CSRIC-WG4B-Final-Report.pdf>.

project underway to develop “9-1-1 Model Legislation.” As part of that project, the Program has completed an “assessment” of existing state 9-1-1 legislation, and examined appropriate provisions to include in the model.⁷ Attached as an appendix is a “DRAFT Summary Chart of Key Provisions of [existing] State Legislation and Regulation Related to 9-1-1 (as of January 1, 2011).”⁸

The National 9-1-1 Program through the National 9-1-1 Resource Center is also supporting a project to develop consensus-based universal guidelines to serve as the basis for a 9-1-1 statewide program assessment process. While the assessment guidelines developed under that project are not necessarily limited to the “next generation” of 9-1-1, they do serve as an excellent resource for helping judge readiness for that migration.⁹

Following is a brief list of governance related responsibilities, activities and authorities essential to the full implementation of NG9-1-1.¹⁰

State-Level 9-1-1 Leadership, Coordination and Planning

Upon completion of readiness checks associated with *State-Level 9-1-1 Leadership, Coordination and Planning*, state-wide capacity will be in place to ensure that all NG9-1-1 systems in the state are able to interoperate through the adoption of state-level standards, rules policies and procedures; and that all relevant and appropriate stakeholders have been involved in the process. Such capacity includes the state-level authority necessary to deploy and manage those state-level functions necessary for inter-system interoperability:

- Ensure that an organization (or organizations) exists, with appropriate authority and/or capability for statewide planning, coordinating and implementing NG9-1-1 systems.
- Confirm that such planning and coordination reflects effective coordination with relevant stakeholders within and beyond the state.
- Ensure that appropriate state-level authority exists to adopt and enforce appropriate industry-based standards, rules, policies and procedures.

Funding the NG9-1-1 System

Upon completion of the *Funding* check, an appropriate sustainable funding mechanism will be in place to support all transition, implementation and operational costs associated with all NG9-1-1 systems in a state, including those state-level functions necessary for inter-system interoperability.

⁷ See: National Highway Traffic Safety Administration (NHTSA), “DRAFT 9-1-1 Model Legislation Project Assessment Document,” November 2011.

⁸ Ibid.

⁹ For a copy of the draft guidelines, see: <https://www.911resourcecenter.org/911Guidelines/>. For more information about the National 9-1-1 Program and the National 9-1-1 Resource Center, see: <http://www.911.gov/>.

¹⁰ In the context of this document, ‘full implementation of NG9-1-1’ implies that an end state has been reached after a migration from legacy TDM circuit-switched telephony, and the legacy E9-1-1 system built to support it, to an all IP-based telephony system with a corresponding Emergency Services IP network. For the sake of this report, “governance” means the management of NG9-1-1 systems and the entire public safety emergency communications enterprise. The goal of any “governance” structure should be to determine the most inclusive, efficient and cost effective way to manage the systems from a technical and systems operation perspective. For a more detailed discussion of this issue, see: NENA, “Next Generation 9-1-1 Transition Policy Implementation Handbook,” *ibid*, along with the other sources referenced herein.

- Ensure that a funding mechanism(s) is in place to ensure sustainable support for current E9-1-1 operations, transition to and ongoing operation of NG9-1-1 systems.

Transitional Regulation/Legislation/Tariff Modifications to Enable Next Generation 9-1-1 Deployment

Upon completion of those checks associated with *Transitional Regulation/Legislation/Tariff Modifications to Enable Next Generation 9-1-1 Deployment*, statewide laws, rules and regulations will be in place to authorize and help facilitate (not hinder) NG9-1-1 deployment and operations, recognizing the private/public nature of the service, from call origination to emergency response.

- Recognizing the intergovernmental, public/private IP-based, software and database controlled structure of NG9-1-1, evaluate and implement regulations and laws that facilitate (or do not inhibit) the local, regional and state interoperable environment of NG9-1-1
- Ensure statutory support for intergovernmental cooperation and arrangements essential to an efficient statewide system environment

Establishing State-Wide Emergency Services IP Networks (ESInets)

Upon completion of those checks associated with Establishing State-Wide Emergency Services IP Networks (ESInets), policy will be in place at all appropriate levels of government necessary to ensure the state-wide interoperability of all sub-state NG9-1-1 systems. Such policy may include, but is not limited to cooperative and inter-local governmental arrangements and agreements involving ESInet interconnection and service coordination.

- Ensure that policymakers at all levels are formally committed to the development and deployment of interoperable state-wide ESInets as a fundamental 9-1-1 and emergency communications policy objective
- Ensure that policymakers are committed to providing authority for 9-1-1 entities to work interactively through cooperative governmental arrangements to support regional and state-level NG9-1-1 systems that maximizes interoperability and functional sharing of resources and costs

Confidentiality, Disclosure and Retention of 9-1-1 Call and Other Emergency Information

Upon completion of those checks associated with Confidentiality, Disclosure and Retention of 9-1-1 Call and Other Emergency Information, appropriate laws and regulations will be in place to ensure consistent public access to information associated with NG9-1-1 service, while protecting individual privacy that may be inherent in requests for emergency response.

- Evaluate the applicability of current state confidentiality, disclosure and retention laws/rules to all types of 9-1-1 calls and call content

- As necessary, modify such laws/rules to treat all types of 9-1-1 calls and call content in a consistent manner, recognizing the potential data rich environment inherent in NG9-1-1, and the need for functional access to that data

Next Generation 9-1-1 Liability Issue

Upon completion of the *Next Generation 9-1-1 Liability Issue* check, liability statutes impacting and/or associated with 9-1-1 services will have been evaluated, and, if necessary, modified to ensure all service providers, both public and private, involved in the delivery of NG9-1-1 are appropriately protected.

- Review (and made appropriate changes as necessary to) liability protection statutes to ensure that existing liability protection for PSAPs, users of technology, communications service providers and third party vendors will continue to effectively apply as new services and technologies are enabled by NG9-1-1.

NG9-1-1 Awareness and Accessibility

Upon completion of the *NG9-1-1 Awareness and Accessibility* check, specific access needs for the elderly, deaf and hard of hearing, disabled and non-English speaking populations will have been addressed within the context of NG9-1-1 deployment and operation; along with appropriate public education programs to ensure the consistent and correct use of 9-1-1 within such an environment.

- Examine and address the impact NG9-1-1 deployment has on the elderly, deaf and hard of hearing, disabled, and non-English speaking populations, as well as the appropriate public use of NG9-1-1 services and capabilities

Access and Originating Networks and Originating Service Providers

The following checklist includes suggested procedural steps (in no particular order) that an access or origination network provider can use as a guide to assist in determining its technical and operational readiness to accept and deliver NG9-1-1 calls. This is in no way meant to imply that PSAPs or 9-1-1 Authorities would have regulatory authority over service providers. It is also important to note that overall readiness is contingent upon the readiness of the set of 9-1-1 entities to which the calls are delivered. Moreover, every item on each checklist may not be applicable to every type of access or origination network provider.

Planning Considerations:

Upon completion of these specific *Planning Considerations* checklist items, the Access and Originating Networks shall own a formulated Next Generation 9-1-1 (NG9-1-1) project plan consisting of milestones, compatibility checks to respective standards, and review of integrated peering networks and services that will be associated with or impacted by the identified packet-switched emergency services. Also, completion of the checklist will result in the Access and Originating Network providers having assessed funding requirements and availability, and

having familiarized themselves with any regional regulatory idiosyncrasies. A product of completing the checklist will be the anticipation of receipt of the expected Public Safety 9-1-1 entities' readiness notification, vendor Letter of Authorization (LOA) representing the associated group of PSAPs, and Public Safety deployment contact information.

- Assess project plans, business cases, architecture design, and migration schedules to support NG9-1-1 call and data transmission
- Quantify level of familiarity with available industry standards
- Assess the readiness of the 9-1-1 entities expected to receive NG9-1-1 calls and data generated by end users connected to the access network
- Identify possible architecture alternatives
- Develop RFI/RFP
- Determine capital and expense funding requirements and availability
- Clarify any unique regulatory requirements for all applicable state/local jurisdictions
- Review existing reseller agreements and quantify NG9-1-1 responsibilities inherent from reseller partnerships
- Review internal timeline of applicable transitional steps to gage current status
- Confirm the receipt of Letters of Authorization from Public Safety entities, in support of delivering NG9-1-1 services, as applicable

Infrastructure Considerations:

Upon completion of these specific *Infrastructure Considerations* checks, the Access and Originating Networks shall obtain a completed network analysis for NG9-1-1 supported services. This analysis will include network recommendations for the required expansion, transport specifications, engineering suggestions on leveraging existing broadband infrastructure, Emergency Service IP Network (ESInet) interface specification standards, and network security policies. The Access and Originating Networks shall certify reasonable availability of sufficient broadband backbone network bandwidth to accommodate heavy emergency multimedia traffic to the general target areas.

- Authorization or equivalent
- Confirm the receipt of Letters of Authorization from Public Safety entities, in support of delivering NG9-1-1 services, as applicable
- Assess the availability of broadband connectivity in target service area
- Assess the tiers of broadband bandwidth offerings in target service area, for sufficiency in supporting high-data multimedia
- Assess network route diversity
- Verify the redundancy and geographic diversity of critical voice and data network elements (e.g. LIS) and core IMS network components (e.g. E-CSCF)
- Assess the capability to receive and transmit calls using SIP protocol
- Confirm the availability of protocol conversion gateways (or media gateways) where applicable
- Review implemented network security practices for compliance

Location Determination:

Upon completion of these specific *Location Determination* checks, the Access and Originating Networks shall confirm supportability of location determination techniques for emergency sessions. The assessment shall lead to the definition of location determination solutions that will enable specific user scenarios (e.g., fixed, nomadic, mobile) and Multimedia Emergency Services (MMES) that can be supported across the proposed design architecture to the Public Safety entities. In essence, completion of the checklist will help to affirm whether the necessary network elements, database processes and validation procedures are in place to support industry standard location determination for call originators.

- Determine the existence of an available and applicable automatic location determination mechanism for providing end user location
- Determine capability and feasibility for implementing industry standard location determination techniques
- Assess capability for location determination for fixed, nomadic, and mobile users, in support of identified use cases
- Assess capability for location determination for multimedia (i.e. video, voice, text, etc.) data transmission, in support of identified use cases.
- Verify location database provisioning support processes are in place to support location determination for NG9-1-1 call routing
- Verify location data validation processes are in place
- Assess the capability to make available upon query the location information of a connected end point, using industry standard mechanisms and protocols

Originating Service Providers

Planning Considerations:

Upon completion of these specific *Planning Considerations* checks, the Originating Service Provider shall own a developed and clear NG9-1-1 deployment plan that captures significant milestones, including defined implementation tasks, funding requirements and availability. It will also result in affirmation of the plan's conformance to applicable industry standards.

- Quantify level of familiarity with available and applicable industry standards
- Develop RFI/RFP as applicable
- Determine capital and expense funding requirements and availability
- Clarify any unique regulatory requirements for all applicable state/local jurisdictions
- Review internal timeline of applicable transitional steps to gage current status

Infrastructure Considerations:

Upon completion of these specific *Infrastructure Considerations* checks, the Originating Service Provider shall conduct a functional review of its application infrastructure to validate efficient SIP processing capability and IMS compatibility. The infrastructure shall be deemed secure for supporting NG9-1-1 emergency services based upon established and industry-approved cyber

security controls that are safeguarded by the Originating Service Provider, to provide protection of the system and respective network elements and or components.

- Assess the capability to receive and transmit calls using SIP protocol
- Review security practices for compliance

Location Acquisition:

Upon completion of these specific *Location Acquisition* checks, the Originating Service Provider shall own a decisive understanding of the specified location acquisition methodologies defined by industry standards, and the OSP's capability to adhere thereto. The checklist seeks to confirm the Originating Service Provider's ability to interact with end user devices to obtain location for specific user scenarios (e.g. fixed, nomadic, etc.) and Multimedia Emergency Services (MMES), as applicable.

- Assess capability to interact with end user devices and associated Location Retrieval Function (LRF) and/or LIS platforms for the purpose of automatically obtaining the device location data.
- Assess capability to convey end user location data in industry standard syntax and formatting
- Determine the existence of an available and applicable automatic location retrieval mechanism for obtaining end user location
- Determine capability and feasibility for implementing industry standard location retrieval and conveyance techniques
- Assess capability for location retrieval and conveyance for fixed, nomadic, and mobile users, as applicable, in support of identified use cases
- Assess capability for location retrieval and conveyance for multimedia (i.e. video, voice, text, etc.) data transmission, as applicable, in support of identified use cases

Appendix A: Acronyms

This section contains the acronyms that are referenced within this document.

(Source: NENA Master Glossary of 9-1-1 Terminology, <http://www.nena.org/default.asp?page=Glossary>)

Acronym	Definition
3GPP	3 rd Generation Partner Project
3GPP2	3 rd Generation Partnership Project 2
A&E	Architectural and Engineering
AAA	Authorization, Admission and Accounting
AAR	Association of American Railroads
ABNF	Augmented Backus-Naur Form
ACB	All Circuits Busy
ACCDEN	Access Denied
ACD	Automatic Call Distribution, Automatic Call Distributor
ACK	Acknowledgement
ACM	Address Complete Message
ACN	Automatic Collision Notification
ADA	Americans with Disabilities Act
ADEA	Age Discrimination in Employment Act
ADSL	Asymmetrical Digital Subscriber Line
AEAN	Alternate Emergency Access Number
AES	Advanced Encryption Standard
AHJ	Authority Having Jurisdiction
AIP	Access Infrastructure Provider
ALE	Access Location Entity
ALEC	Alternate Local Exchange Carrier
ALI	Automatic Location Identification
ALI DB	Automatic Location Identification Database
AMPS	Advanced Mobile Phone Service
AMR	Adaptive Multi Rate (codec)
AMR-WB	Adaptive Multi Rate (codec) – Wide Band
ANI	Automatic Number Identification
ANI/ALI	Automatic Number Identification/Automatic Location Identification
ANS	American National Standard
ANSI	American National Standards Institute
AOA	Angle of Arrival
AoR	Address of Record
APCO	Association of Public Safety Communications Officials
API	Application Programming Interface
APU	Answering Position Unit
AQS	NENA ALI Query Service
AQSI	ALI Query Services Interface
ARES	Amateur Radio Emergency Service
ARIB	Association of Radio Industries and Businesses
ARP	Address resolution Protocol
ASCII	American Standard Code for Information Exchange
ASL	American Sign Language
ASLARRA	American Short Line and Regional Railroad Association
ASP	Application Service Provider
ASRR	Average Sector Radius Range
ATA	Analog Terminal Adapter

Acronym	Definition
ATIS	Alliance for Telecommunications Industry Solutions
ATIS-ESIF	Alliance for Telecommunications Industry Solutions – Emergency Services Interconnection Forum
ATM	Asynchronous Transfer Mode
AVL	Automatic Vehicle Location
B2BUA	Back to Back User Agent
BASK	Binary Amplitude Shift Key
BBF	BroadBand Forum
BCD	Binary Coded Decimal
BCF	Border Control Function
BellCore	Bell Communications Research
BISACS	Building Information Services and Control System
BLI	Busy Line Interrupt
BLV	Busy Line Verification
BOC	Bell Operating Company
BOOTP	Bootstrap Protocol
BP	Best Practice
BPL	Broadband Over Power Lines
BRAS	Broadband Remote Access Server
BRI	Basic Rate Interface
BTS	Bureau of Transportation Statistics
BUI	Building Unit Identifier
C-TAG	The innermost VLAN tag as defined in IEEE 802.1ad
CA	Communications Assistant, Certificate Authority
CAD	Computer Aided Dispatch
CAMA	Centralized Automatic Message Accounting
CAP	Competitive Access Provider, Common Alerting Protocol
CART	Child Abduction Response Team
CAS	Call-path Associated Signaling, Channel Associated Signaling
CBA	Cost Benefits Analysis
CBN	Call Back Number
CBR	Constant Bit Rate
CCA	Cost Comparison Analysis
CCH	Computerized Criminal History
CCS	Common Channel Signaling or Hundred Call Seconds
CCSA	China Communications Standards Association
CCS7	Common Channel Signaling 7
CDE	Continuing Dispatch Education
CDMA	Code Division Multiple Access
CdPN	Called Party Number
CDR	Call Detail Record
CERT	Community Emergency Response Team
CFS	Consolidated Firearms System
CGI	Common Gateway Interface
CGL	Calling Geodetic Location Parameter
CgPN	Calling Party Number
CHGN	Charge Number Parameter
CID	Company Identification/Identifier
cid	Content Indirection
CIDB	Call Information Database
CIF	Critical Issues Forum

Acronym	Definition
<i>CII</i>	Criminal Identification and Investigation
<i>CISC</i>	Canadian Radio-Television and Telecommunications Commission Interconnection Steering Committee
<i>CJIC</i>	Criminal Justice Information System
<i>CLEC</i>	Competitive Local Exchange Carrier or Certified Local Exchange Carrier
<i>CLID</i>	Calling Line Identification
<i>CLLI</i>	Common Language Location Identifier
<i>CMRS</i>	Commercial Mobile Radio Service
<i>CMTS</i>	Cable Modem Termination System
<i>CO</i>	Central Office
<i>CODEc</i>	Coder/EDCoder or Compression/DECompression
<i>COG</i>	Council of Government
<i>COLT</i>	Cell on Light Truck
<i>CONUS</i>	Continental United States
<i>COOP</i>	Continuity of Operations Plan
<i>CoS</i>	Class of Service
<i>COW</i>	Cell on Wheels
<i>CPAS</i>	Cellular Priority Access Service
<i>CpCAT</i>	Calling Party CATegory
<i>CPE</i>	Customer Premise Equipment
<i>CPN</i>	Calling Party Number Parameter
<i>CPU</i>	Central Processing Unit
<i>CRDB</i>	Coordinate Routing Data Base
<i>CRL</i>	Certificate Revocation List
<i>CRM</i>	Committee Resource Manager
<i>CRN</i>	Contingency Routing Number
<i>CRT</i>	Cathode Ray Tube
<i>CRTC</i>	Canadian Radio-television and Telecommunications Commission
<i>CS</i>	Circuit Switched
<i>CSCF</i>	Call Session Control Function
<i>CSP</i>	Communications Services Provider
<i>CTI</i>	Computer Telephone Integration
<i>CTIA</i>	Cellular Telephone Industry Association
<i>CTX-IP</i>	Centrex-based Internet Protocol
<i>CW</i>	Call Waiting
<i>dB</i>	Decibels
<i>DB</i>	Deaf-Blind
<i>DBMS</i>	Data Base Management System
<i>DBMSP</i>	Data base Management System Provider
<i>DCE</i>	Data Communications Equipment
<i>DHCP</i>	Dynamic Host Control Protocol (i2) Dynamic Host Configuration Protocol
<i>DHHS</i>	United States Department of Health and Human Services
<i>DHS</i>	United States Department of Homeland Security
<i>DID</i>	Direct Inward Dialing
<i>DMS</i>	Data Management System
<i>dMSID</i>	Default Mobile Station Identity
<i>DMST</i>	Domestic Minor Sex Trafficking
<i>DMT</i>	Discrete Multi Tone
<i>DN</i>	Directory Number
<i>DNS</i>	Domain Name Server (or Service or System)
<i>DOCSIS</i>	Data over Cable Service Interface Specification
<i>DoD</i>	Department of Defense

Acronym	Definition
<i>DOD</i>	Direct Outward Dialing
<i>DOE</i>	United States Department of Energy
<i>DOJ</i>	United States Department of Justice
<i>DOL</i>	United States Department of Labor
<i>DoS</i>	Denial of Service
<i>DOS</i>	Disk Operating System
<i>DOT</i>	Department of Transportation
<i>DP</i>	Dial Pulse
<i>DRP</i>	Disaster Recovery Plan
<i>DSL</i>	Digital Subscriber Line
<i>DSLAM</i>	Digital Subscriber Line Access Multiplexer
<i>DSP</i>	Digital Signal Processing
<i>DTE</i>	Data Terminal Equipment
<i>DTMF</i>	Dual Tone Multi-Frequency
<i>DVROS</i>	Domestic Violence Restraining Order System
<i>E9-1-1</i>	Enhanced 9-1-1
<i>E9-1-1M</i>	Mobile E9-1-1, Mobile Emergency Service
<i>EAAC</i>	Emergency Access Advisory Committee
<i>EAB</i>	Education Advisory Board
<i>EAS</i>	Emergency Alert Systems
<i>ECOM</i>	Essential Communications During Emergencies
<i>ECR</i>	Emergency Call Register
<i>ECRF</i>	Emergency Call Routing Function
<i>ecrit</i>	Emergency Context Resolution In the Internet
<i>E-CSCF</i>	Emergency Call Session Control Function
<i>EDGE</i>	Enhanced Data rates for GSM Evolution
<i>EDXL</i>	Emergency Data eXchange Language
<i>EEOC</i>	Equal Employment Opportunity Commission
<i>EENA</i>	European Emergency Number Association
<i>EFM</i>	Ethernet in the First Mile
<i>EIA</i>	Electronic Industry Association
<i>EIA RS-232</i>	Electronic Industry Alliance Recommended Standard 232 (serial interface)
<i>EISI</i>	Emergency Information Services Interface
<i>ELA</i>	Emergency Line Access
<i>ELD</i>	Electro-Luminescent Display
<i>ELIN</i>	Emergency Location Identification Number
<i>ELT</i>	English Language Translation
<i>EM</i>	Emergency Message
<i>EMD</i>	Emergency Medical Dispatcher
<i>EMS</i>	Emergency Medical Service
<i>EMT</i>	Emergency Medical Technician
<i>EMTEL</i>	Emergency Telecommunications
<i>ENS</i>	Emergency Notification Systems
<i>EO</i>	End Office
<i>EOC</i>	Emergency Operations Center
<i>EPAD</i>	Emergency Provider Access Directory
<i>EPROM</i>	Erasable Programmable Read-Only Memory
<i>EPZ</i>	Emergency Planning Zone
<i>ERDB</i>	Emergency Services Zone Routing Database
<i>ERL</i>	Emergency Response Location
<i>ES</i>	Emergency Service
<i>ESA</i>	Emergency Stand Alone

Acronym	Definition
<i>ESC</i>	Emergency Services Call
<i>ESCO</i>	Emergency Service Central Office
<i>ESGW</i>	Emergency Services Gateway
<i>ESIF</i>	Emergency Services Interconnection Forum
<i>ESInet</i>	Emergency Services IP Network
<i>ESME</i>	Emergency Services Message Entity
<i>ESMI</i>	Emergency Services Messaging Interface
<i>ESMR</i>	Enhanced Specialized Mobile Radio
<i>ESN</i>	Emergency Service Number, Electronic Serial Number, Emergency Service Network
<i>ESNE</i>	Emergency Services Network Entity/Element
<i>ESNet</i>	Emergency Services Network
<i>ESNI</i>	Emergency Services Network Interfaces
<i>ESQK</i>	Emergency Services Query Key
<i>ESP</i>	Emergency Services Provider, or Emergency Services Protocol
<i>ESRD</i>	Emergency Services Routing Digit
<i>ESRI</i>	Environmental Services Research Incorporated
<i>ESRK</i>	Emergency Services Routing Key
<i>ESRN</i>	Emergency Services Routing Number/Name
<i>ESRP</i>	Emergency Services Routing Proxy
<i>ESZ</i>	Emergency Services Zone (same as ESN)
<i>ETA</i>	Estimated Time of Arrival
<i>ETB</i>	Emergency Transport Backup
<i>ETNS</i>	Emergency Telephone Notification System
<i>ETSI</i>	European Telecommunications Standards Institute
<i>EUMI</i>	End User Move Indicator
<i>EVRC</i>	Enhanced Variable Rate Narrowband Codec
<i>EVRC-WB</i>	Enhanced Variable Rate Wideband Codec
<i>FAA</i>	Federal Aviation Administration
<i>FAQ</i>	Frequently Asked Questions
<i>FBI</i>	Federal Bureau of Investigation
<i>FCC</i>	Federal Communications Commission
<i>FDD</i>	Frequency Division Duplex
<i>FDDI</i>	Fiber Optic interface
<i>FE</i>	Functional Entity
<i>FG-D</i>	Feature Group D
<i>FGDC</i>	Federal Geographic Data Committee
<i>FHA</i>	United States Federal Highway Administration
<i>FLSA</i>	Fair Labor Standards Act
<i>FMLA</i>	Family and Medical Leave Act
<i>FOC</i>	Function of Change
<i>FQDN</i>	Fully Qualified Domain Name
<i>FRA</i>	United States Federal Railway Administration
<i>FTP</i>	File Transfer Protocol
<i>FTTA</i>	Fiber To The Access
<i>FTTH</i>	Fiber To The Home
<i>FTTP</i>	Fiber To The Premises
<i>FX</i>	Foreign Exchange
<i>GA</i>	Go ahead
<i>GAP</i>	Global Address Parameter
<i>GA SK</i>	Go Ahead Stop Keying (Go Ahead or Ready to Hang Up)
<i>GDP</i>	Generic Digit Parameter
<i>geopriv</i>	Geolocation and Privacy

Acronym	Definition
<i>GeoRSS</i>	Geodetic Really Simple Syndication
<i>Geoshape</i>	Geodetic Shape
<i>GETS</i>	Government Emergency Telecommunications Service
<i>GHC911</i>	Greater Harris County 9-1-1 Network
<i>GIS</i>	Geographic Information Systems
<i>GML</i>	Geographic Markup Language
<i>GMLC</i>	Gateway Mobile Location Center (MLC)
<i>GMT</i>	Greenwich Mean Time
<i>GNP</i>	Geographic Number Portability
<i>GOS</i>	Grade of Service
<i>GPOSDIR</i>	GeoPositionDirective INVOKE (see JSTD-036)
<i>Gposdir</i>	GeoPositionDirective RETURN RESULT (see JSTD-036)
<i>GPOSREQ</i>	GeoPositionRequest INVOKE (see JSTD-036)
<i>gposreq</i>	GeoPositionRequest RETURN RESULT (see JSTD-036)
<i>GPRS</i>	General Packet Radio Service
<i>GPS</i>	Global Positioning System
<i>GR-2945</i>	Telcordia Year 2000: Systems and Interfaces General Requirements Document
<i>GSM</i>	Global Standard for Mobile Communication
<i>GUID</i>	Globally Unique Identifier
<i>HCO</i>	Hearing Carry Over
<i>HELD</i>	HTTP-Enabled Location Delivery protocol
<i>HFC</i>	Hybrid Fiber Coax
<i>HDSL</i>	High bit rate Digital Subscriber Line
<i>HDTV</i>	High-Definition Television
<i>HID</i>	Hardware Identity
<i>HIPAA</i>	Health Insurance Portability and Accountability Act
<i>HLR</i>	Home Location Register (see ANSI-41)
<i>HOH</i>	Hard of Hearing
<i>HRRC</i>	Houston Rescue and Restore Coalition
<i>HSPD</i>	Homeland Security Presidential Directive
<i>HSS</i>	Home Subscriber Server
<i>HTML</i>	Hyper Text Markup Language
<i>HTRA</i>	Human Trafficking Rescue Alliance
<i>HTTP</i>	Hyper Text Transfer Protocol
<i>HVAC</i>	Heating Ventilation and Air Conditioning
<i>Hz</i>	Hertz
<i>i2</i>	NENA 08-001 Interim VoIP Architecture for Enhanced 9-1-1 Services (i2)
<i>IAB</i>	Internet Architecture Board
<i>IAD</i>	Integrated Access Device
<i>IAM</i>	Initial Address Message
<i>IANA</i>	Internet Assigned Numbers Authority
<i>ICANN</i>	Internet Corporation Assigned Names and Numbers
<i>ICE</i>	Immigration Customs Enforcement
<i>ICO</i>	National 9-1-1 Implementation and Coordination Office
<i>ICR/IRR</i>	Instant Call Recorder/Instant Recall Recorder
<i>ICS</i>	Incident Command System
<i>ID</i>	Identified
<i>IDP</i>	Identity Provider
<i>IEEE</i>	Institute of Electrical and Electronics Engineers
<i>IESG</i>	Internet Engineering Steering Group
<i>IETF</i>	Internet Engineering Task Force
<i>IID</i>	Incident Identification

Acronym	Definition
<i>ILEC</i>	Incumbent Local Exchange Carrier
<i>IM</i>	Instant Messaging
<i>IMEI</i>	International Mobile Equipment Identity
<i>IMS</i>	IP Multimedia Subsystem
<i>IMSI</i>	International Mobile Station Identity
<i>IMTC</i>	International Multimedia Teleconferencing Consortium
<i>IN</i>	Intelligent Network
<i>INP</i>	Interim Number Portability
<i>IP</i>	Internet Protocol
<i>IPBX (or IP-PBX)</i>	Internet Protocol Private Branch Exchange
<i>IP-CAN</i>	IP Connectivity Access Network
<i>IP-COAD</i>	Internet Protocol-Coordination Ad-Hoc Committee
<i>IPI</i>	Imagery and Geospatial Plans and Policy Branch
<i>ipm</i>	Interrupts per minute
<i>IpoE</i>	Internet Protocol over Ethernet
<i>IP PSAP</i>	Internet Protocol Public Safety Answering Point
<i>IP Relay</i>	Internet Protocol Relay
<i>IPSec</i>	Internet Protocol Security
<i>Ipv4</i>	Version 4 of the Internet Protocol
<i>IRIG</i>	Inter-Range Instrumentation Group
<i>ISDL</i>	ISDN Digital Subscriber Line
<i>ISDN</i>	Integrated Services Digital Network
<i>ISOC</i>	Internet Society
<i>ISP</i>	Internet Service Provider
<i>ISUP</i>	Integrated Services Digital Network User Part
<i>ITS</i>	Intelligent Transportation System
<i>ITSP</i>	Internet Telephone Service Provider
<i>ITU</i>	International Telecommunications Union
<i>ITU-D</i>	International Telecommunications Union – Development
<i>ITU-R</i>	International Telecommunications Union – Radiocommunications
<i>ITU-T</i>	International Telecommunications Union – Telecommunications
<i>IVR</i>	Interactive Voice Response
<i>IWS</i>	Intelligent Workstation
<i>J CM</i>	Joint Committee Meeting
<i>KP</i>	Key Pulse
<i>KSU</i>	Key Service Unit
<i>KTS</i>	Key Telephone System
<i>KTU</i>	Key Telephone Unit
<i>LAENS</i>	Large Area Emergency Notification System
<i>L2TP</i>	Layer-2 Tunneling Protocol
<i>LAN</i>	Local Area Network
<i>LATA</i>	Local Access and Transport Area
<i>LCD</i>	Liquid Crystal Display
<i>LCP</i>	
<i>LCR</i>	Least Cost Routing
<i>LDAP</i>	Lightweight Directory Access Protocol
<i>LDT</i>	Location Determination Technology or Line Digital to Trunk
<i>LEC</i>	Local Exchange Carrier
<i>LED</i>	Light Emitting Diode
<i>LERG</i>	Local Exchange Routing Guide
<i>LIE</i>	Location Information Element
<i>LIF</i>	Location Interwork Function

Acronym	Definition
<i>LIS</i>	Location Information Server
<i>LIS-ID</i>	Location Information Server Identifier
<i>LK</i>	Location Key
<i>LLDP-MED</i>	Link Layer Discovery Protocol Media Endpoint Discovery
<i>LNP</i>	Local Number Portability
<i>LO</i>	Location Object
<i>LOCREQ</i>	Location Request
<i>LoST</i>	Location to Service Translation
<i>LPN</i>	Local Public Safety Number
<i>LRF</i>	Location Retrieval Function
<i>LRO</i>	Last Routing Option
<i>LSMS</i>	Local Service Management System
<i>LSO</i>	Local Serving Office
<i>LSP</i>	Local Service Provider
<i>LSR</i>	Local Service Request
<i>LSSGR</i>	LATA Switching Systems Generic Requirements
<i>LTD</i>	Long Term Definition
<i>LVF</i>	Location Validation Function
<i>MapInfo</i>	Mobile Information (see JSTD-036) (MapInfo is a trademark registered name!)
<i>MCC</i>	Mobile Competence Centre
<i>MDC</i>	Mobile Data Communications
<i>MDF</i>	Main Distribution Frame
<i>MDN</i>	Mobile Directory Number
<i>MDT</i>	Mobile Data Terminal
<i>MEC</i>	Missing and Exploited Children
<i>MEID</i>	Mobile Equipment Identity
<i>MEP</i>	Message Exchange Pattern
<i>MF</i>	Multi-Frequency
<i>MGCP</i>	Media Gateway Control Protocol
<i>MIB</i>	Management Information Base
<i>MIN</i>	Mobile Identified Number, Mobile Identification Number
<i>MLP</i>	Mobile Location Protocol
<i>MIS</i>	Management Information System
<i>MLTS</i>	Multi-Line Telephone System
<i>MMES</i>	Multi-Media Emergency Services
<i>MMTA</i>	MultiMedia Telecommunications Association
<i>MOA</i>	Memorandum of Agreement
<i>MOU</i>	Memorandum of Understanding
<i>MP</i>	Mobile Phone
<i>MPC</i>	Mobile Positioning Center
<i>MPCAP</i>	Mobile Positioning Capability (see JSTD-036)
<i>MPLS</i>	Multi-Protocol Label Switching
<i>MPOA</i>	Multi-Protocol Over ATM
<i>ms</i>	Milliseconds
<i>MS</i>	Mobile Station
<i>MSA</i>	Metropolitan Statistical Area
<i>MSC</i>	Mobile Switching Center
<i>MSAG</i>	Master Street Address Guide
<i>MSC</i>	Mobile Switching Center
<i>MSID</i>	Mobile Station Identity
<i>MSISDN</i>	Mobile Station ISDN Number
<i>MSO</i>	Mobile Switching Office

Acronym	Definition
<i>MSRN</i>	Mobile Station Routing Number
<i>MSRP</i>	Message Session Relay Protocol
<i>MSS</i>	Mobile Satellite Services
<i>MTA</i>	Multimedia Terminal Adapter
<i>MTID</i>	Mobile Terminal Identity
<i>MTP</i>	Message Transfer Point
<i>MTSO</i>	Mobile Telephone Switching Office
<i>NAD83</i>	North American Datum 83
<i>NAED</i>	National Academies of Emergency Dispatch
<i>NAI</i>	Network Access Identifier
<i>NANP</i>	North American Numbering Plan
<i>NANPA</i>	North American Numbering Plan Administration
<i>NARUC</i>	National Association of Regulatory Utility Commissioners
<i>NAS</i>	Network Access Server
<i>NASAR</i>	National Association of Search and Rescue
<i>NASNA</i>	National Association of State 9-1-1 Administrators
<i>NAT</i>	Network Address Translation
<i>NBMA</i>	Non-Broadcast Multiple Access
<i>NCAS</i>	Non Call-path Associated Signaling
<i>NCIC</i>	National Crime Enforcement Center, National Crime Information Center
<i>NCMEC</i>	National Center for Missing and Exploited Children
<i>NECA</i>	National Exchange Carrier Association
<i>NENA</i>	National Emergency Number Association
<i>NFPA</i>	National Fire Protection Association
<i>NGA</i>	United States National Geospatial Intelligence Agency
<i>NG9-1-1</i>	Next Generation 9-1-1
<i>NGES</i>	Next Generation Emergency Services
<i>NGESN</i>	Next Generation Emergency Services Network
<i>NGN</i>	Next Generation Network
<i>NGO</i>	Non-Governmental Organization
<i>NHTRC</i>	National Human Trafficking Resource Hotline
<i>NHTSA</i>	National Highway Traffic Safety Administration, United States Department of Transportation
<i>NID</i>	Network Interface Device
<i>NIF</i>	NG9-1-1 Specific Interwork Function
<i>NIMS</i>	National Incident Management System
<i>NIP</i>	NYNEX Information Publication
<i>NIS</i>	Not In Service
<i>NIST</i>	National Institute of Standards and Technology
<i>NLSI</i>	National Lighting Safety Institute
<i>NMC</i>	9-1-1 Malicious Content
<i>NNSA</i>	United States National Nuclear Security Administration
<i>NOCC</i>	Network Operations Control Center (for wireless carriers)
<i>NORAD</i>	North American Aerospace Defense Command
<i>NPA</i>	Numbering Plan Area
<i>NPAC</i>	Number Portability/Pooling Administration Center
<i>NPD</i>	Numbering Plan Digit
<i>NPRM</i>	Notice of Proposed Rulemaking
<i>NRC</i>	National Reliability Council
<i>NRIC</i>	Network Reliability and Interoperability Council
<i>NRF</i>	No Record Found
<i>NRS</i>	NENA Registry System

Acronym	Definition
<i>NRTL</i>	National Recognized Testing Laboratory
<i>NSI</i>	Non-Service Initialized (as in phones)
<i>NSP</i>	Network Service Provider
<i>NTIA</i>	National Telecommunications and Information Administration, United States Department of Commerce
<i>NTP</i>	Network Time Protocol
<i>NTSB</i>	United States National Transportation Safety Board
<i>NXX</i>	Telephone Numbering Code for Exchange Code or Telephone exchange code
<i>OASIS</i>	Organization for the Advancement of Structured Information Standards
<i>OCN</i>	Operating Company Number
<i>ODC</i>	Operations Development Conference
<i>OEM</i>	Original Equipment Manufacturer
<i>OID</i>	Operations Information Document
<i>OGC</i>	Open Geospatial Consortium
<i>OLI</i>	Originating Line Identification parameter
<i>OMA</i>	Open Mobile Alliance
<i>ORD</i>	Operations Requirement Document
<i>ORR</i>	Office of Refugee and Resettlement
<i>ORREQ</i>	Origination Request Invoke (see JSTD-036)
<i>Orreq</i>	Origination Request RETURN RESULT (see JSTD-036)
<i>OSI</i>	Open Systems Interconnection
<i>OST</i>	United States Office of Secure Transportation
<i>P.01</i>	Probability of one (1) call in one (100) hundred calls being blocked
<i>PAI</i>	P-Asserted-Identity
<i>pALI</i>	Pseudo Automatic Location Identification
<i>PAM</i>	PSAP to ALI Message specification
<i>PAN</i>	Personal Area Network
<i>PAP</i>	Prohibited Armed Persons
<i>pANI</i>	Pseudo Automatic Number Identification
<i>PAS</i>	Priority Access Service
<i>PBX</i>	Private Branch Exchange
<i>PCA</i>	PSAP Credentialing Agency
<i>P-CBN</i>	PSAP Call Back Number
<i>PCIA</i>	Personal Communications Industry Association
<i>PCS</i>	Personal Communications Service
<i>PCSC</i>	Personal Communications Switching Center
<i>P-CSCF</i>	Proxy Call Session Control Function
<i>PDA</i>	Personal Digital Assistant
<i>PDE</i>	Position Determining Entity
<i>PDOP</i>	Position Dilution of Precision
<i>Pesn</i>	Pseudo Electronic Serial Number
<i>PGID</i>	Paging Identity
<i>PHB</i>	Per Hop Behaviors
<i>PIDF</i>	Presence Information Data Format
<i>PIDF-LO</i>	Presence Information Data Format – Location Objects
<i>PIF</i>	Protocol Interworking Function
<i>PIO</i>	Public Information Office
<i>PKI</i>	Public Key Infrastructure
<i>PMI</i>	Project Management Institute
<i>PMP</i>	Project Management Professional
<i>POC</i>	Point of Contact
<i>PON</i>	Passive Optical Network

Acronym	Definition
<i>POS</i>	Packet Over SONET
<i>PPP</i>	Point-to-Point Protocol
<i>PPPoA</i>	Point-to-Point Protocol over ATM
<i>PPPoE</i>	Point-to-Point Protocol over Ethernet
<i>PRF</i>	Policy Routing Function
<i>PRI</i>	Primary Rate Interface/ISDN
<i>PSA</i>	Public Safety Agency, Public Service Announcement
<i>PSALI</i>	Private Switch ALI
<i>PSAP</i>	Public Safety Answering Point or Primary Public Safety Answering Point
<i>PSAP-ECR</i>	Public Safety Answering Point – Emergency Call Register
<i>PSO</i>	Provisioning Service Object
<i>PSQM</i>	Perceptual Speech Quality Measurements
<i>PSP</i>	Provisioning Service Provider
<i>PSTN</i>	Public Switched Telephone Network
<i>PTSC</i>	Packet Technologies and Services Committee (ATIS Standards Committees)
<i>PUC</i>	Public Utility Commission
<i>PVC</i>	Permanent Virtual Circuit
<i>Q or QQ</i>	Indicates a question
<i>QoS</i>	Quality of Service
<i>RA</i>	Requesting Authority
<i>RACES</i>	Radio Amateur Civil Emergency Service
<i>RADIUS</i>	Remote Authentication Dial-In User Service
<i>RANP</i>	Regional Access Network Provider
<i>RAS</i>	Remote Access Server
<i>RBAC</i>	Role Based Access Control profile
<i>RCC</i>	Remote Call Center or Rate Center Consolidation
<i>RDF</i>	Routing Determination Function
<i>RDO</i>	Root Discovery Operator
<i>REL</i>	Release (message)
<i>REST</i>	Representational State Transfer
<i>RF</i>	Radio Frequency
<i>RFC</i>	Request for Comments
<i>RFI</i>	Request for Information
<i>RFP</i>	Request for Proposal
<i>RFQ</i>	Request for Quote
<i>RG</i>	Response Gateway, Routing Gateway
<i>RLC</i>	Release Complete (message)
<i>RMS</i>	Records Management System
<i>RNA</i>	Routing Number Authority
<i>ROHC</i>	Robust Header Compression
<i>ROI</i>	Return on Investment
<i>ROM</i>	Rough Order of Magnitude
<i>ROUTREQ</i>	Route Request (see ANSI-41)
<i>RPC</i>	Remote Procedure Call
<i>RSU</i>	Remote Switching Unit
<i>RSVP</i>	Resource Reservation Protocol
<i>RTCP</i>	Real Time Control Protocol
<i> RTP</i>	Real Time Transport Protocol
<i>RTSP</i>	Real Time Streaming Protocol
<i>RTT</i>	Real Time Text
<i>SAC</i>	Standards Advisory Committee
<i>SAE</i>	Society of Automotive Engineers

Acronym	Definition
<i>SAML</i>	Security Assertion Markup Language
<i>SBC</i>	Session Border Control
<i>SBS</i>	Straight Binary Seconds
<i>SC</i>	Service Consumer
<i>SCCP</i>	Signaling Connection Control Part
<i>SCP</i>	Service Control Point (see ANSI-41) or Switching Control Point
<i>S-CSCF</i>	Serving Call Session Control Function
<i>SCTP</i>	Stream Control Transport Protocol
<i>SDES</i>	Session Description protocol Security Descriptions
<i>SDO</i>	Standards Development Organization
<i>SDP</i>	Session Description Protocol
<i>SDSL</i>	Symmetrical Digital Subscriber Line
<i>SFG</i>	Simulated Facility Group
<i>SFTP</i>	Secure Shell File Transfer Protocol
<i>SHA</i>	Secure Hash Algorithm
<i>SIF</i>	Signaling Information Field, Spatial Information Function
<i>SIO</i>	Service Information Octet
<i>SIP</i>	Session Initiation Protocol
<i>SK</i>	Stop keying
<i>SKSK</i>	Stop keying, stop keying. Officially ends a TDD conversation
<i>SLA</i>	Service Level Agreement
<i>S/MIME</i>	Secure Multipurpose Internet Mail Extensions
<i>SMDPP</i>	SMS Delivery Point to Point INVOKE (see ANSI-41)
<i>SME</i>	Subject Matter Experts
<i>SMS</i>	Short Message Service
<i>SMTP</i>	Simple Mail Transfer Protocol
<i>SNA</i>	System Network Architecture
<i>SNL</i>	Sandia National Laboratories
<i>SNR</i>	Signal to Noise Ratio
<i>SNTP</i>	Simple Network Time Protocol
<i>SOA</i>	Service Oriented Architecture
<i>SOAP</i>	Simple Object Assess Protocol
<i>SOG</i>	Standard Operating Guidelines
<i>SOHO</i>	Small Office/Home Office
<i>SOI</i>	Service Order Input
<i>SONET</i>	Synchronous Optical NETwork
<i>SOP</i>	Standard Operating Procedures
<i>SP</i>	Service Provider
<i>SPCS</i>	State Plane Coordinate Systems
<i>SPID</i>	Service Provider Identifier
<i>SPML</i>	Service Provisioning Markup Language
<i>SPVC</i>	Soft Permanent Virtual Circuit
<i>SR</i>	Selective Routing, Selective Router [a.k.a., E9-1-1 Tandem, or E9-1-1 Control Office]
<i>SRDB</i>	Selective Routing Data Base
<i>SRTP</i>	Secure Real Time Protocol
<i>SRV</i>	Service (a DNS record type)
<i>SS</i>	Serving System
<i>SS-ECR</i>	Serving System – Emergency Call Register
<i>SSH</i>	Secure Shell
<i>SSH-2</i>	Secure Shell, Version 2
<i>SSP</i>	Signal Switching Point
<i>SS7</i>	Signaling System 7

Acronym	Definition
<i>ST</i>	Start
<i>S-TAG</i>	The outermost VLAN tag as defined in IEEE 802.1ad
<i>STCP</i>	Stream Control Transport Protocol
<i>STP</i>	Start Prime or Signal Transfer Point
<i>STUN</i>	Simple Transversal of Universal Datagram Protocol (UDP) Network Address Translations (NATs)
<i>SVC</i>	Switched Virtual Circuit
<i>TA</i>	Technical Advisory (published by Bellcore) or Technical Assistance
<i>TC</i>	Telecommunications Carrier
<i>TCAD</i>	Technical Committee Administrative Document
<i>TCAP</i>	Transaction Capabilities Application Part
<i>TCP</i>	Transport/Transmission Control Protocol
<i>TCP/IP</i>	Transmission Control Protocol/Internet Protocol
<i>TCU</i>	Telematics Control Unit
<i>TDC</i>	Technical Development Conference
<i>TDD</i>	Telecommunications Device for the Deaf or Time Division Duplex Mode
<i>TDD-TTY</i>	Telephone Device for the Deaf-Teletypewriter (Text Telephone)
<i>TDM</i>	Time Division Multiplexing
<i>TDMA</i>	Time Division Multiple Access
<i>TDOA</i>	Time Difference of Arrival
<i>TELCO</i>	Telephone Company
<i>TIA</i>	Telecommunications Industry Association
<i>TID</i>	Technical Information Document (published by NENA) or Technical Issues Director
<i>TLDN</i>	Temporary Long Distance Number
<i>TLS</i>	Transport Layer Security
<i>TLT</i>	Technical Lead Team
<i>TMSI</i>	Temporary Mobile Station Number
<i>TN</i>	Telephone Number
<i>TOPS</i>	Technology and Operations Council
<i>TR</i>	Technical Reference (published by Bellcore)
<i>TR45</i>	TIA Engineering Committee on Mobile and Personal Communications Standards
<i>TR 45.2</i>	Telecommunications Industry Association Subcommittee responsible for “Wireless Intersystem Technology – Mobile and Personal Communications Standards”
<i>TRD</i>	Technical Requirements Document
<i>TRS</i>	Telecommunications Relay Service
<i>TSD</i>	Technical Standards Document
<i>TSP</i>	Telephone Service Priority or Telecommunications Service Provider, Telematics Service Provider
<i>TTA</i>	Telecommunications Technology Association
<i>TTC</i>	Telecommunication Technology Committee, or Time to Completion
<i>TTL</i>	Transistor to Transistor Logic
<i>TTY</i>	Teletypewriter (a.k.a. TDD, Telecommunications Device for the Deaf and Hard-of-Hearing)
<i>TU</i>	Telematics Unit
<i>TVPA</i>	Trafficking Victims Protection Act of 2000
<i>TVPRA</i>	Trafficking Victims Protection Reauthorization Act of 2003
<i>TVSS</i>	Transient Voltage Surge Suppression
<i>TVW</i>	Testing Validation Worksheet
<i>TWC</i>	Three-Way Calling
<i>UA</i>	User Agent
<i>UAC</i>	User Agent Client
<i>UAS</i>	User Agent Service

Acronym	Definition
UBR	Unavailable Bit Rate
UDDI	Universal Description, Discovery and Integration
UDP	User Datagram Protocol
UE	User Equipment
UIM	User Identity Model
UL	Underwriters Laboratories
uLPN	Unique Local Public Safety Number
UNI	Unbundled Network Interface
UPS	Uninterruptible Power Supply
URI	Uniform Resource Identifier
URISA	Urban and Regional Information Systems Association
URL	Uniform Resource Locator (location sensitive)
URN	Uniform Resource Name (location insensitive)
USAR	Urban Search and Rescue
USF	Universal Service Fund
USGS	United States Geological Survey
USMC	United States Marine Corps
USNG	United States National Grid
USNO	United States Naval Observatory
USPS	United States Postal Service
USTA	United States Telephone Association
USTSA	United States Telecommunications Suppliers Association
UTC	Universal Coordinated Time
UTRA	Universal Terrestrial Radio Access
VBRnrt	Variable Bit Rate non-real time
VBRrt	Variable Bit Rate real-time
VC	Virtual Circuit
VCI	Virtual Circuit Identifier
VCIN	Violent Crime Information Network
VCO	Voice Carry Over
VDB	Validation Data Base
VDSL	Very high-speed Digital Subscriber Line
VE2	Voice over Internet Protocol E2 Interface
VEDS	Vehicle Emergency Data Sets
VEP	VoIP End Point
VESA	Valid Emergency Services Authority
VF	Validation Function
VFG	Virtual Facility Group
VI	Video Interpreter
VIN	Vehicle Identification Number
VLAN	Virtual LAN
VLR	Visitor Location Register
VoATM	Voice over ATM
VoDSL	Voice over Digital Subscriber Link
VoFR	Voice over Frame Relay
VoIP	Voice over Internet Protocol
VON	Voice over Network
VoP	Voice over Packet
VPC	VoIP Positioning Center
VPI	Virtual Path Identifier
VPN	Virtual Private Network
VRI	Video Remote Interpreting

Acronym	Definition
VRS	Video Relay Service
VSP	VoIP Service Provider
W3C	World Wide Web Consortium
WAENS	Wide Area Emergency Notification System
WAN	Wide Area Network
WAP	Wireless Access Point
WCM	Wireline Compatibility Mode
WFS	Web Feature Service
WG	Working Group
WGS 84	World Geodetic System 1984
WiFi®	Wireless Fidelity
WiMAX	Worldwide Interoperability for Microwave Access
WNC	Wireless Network Controller
WPS	Wireless Priority Service
WSDL	Web Service Definition Language
WSP	Wireless Service Provider
WSS	Web Services Security
WTSC	Wireless Technologies and Systems Committee
WWW	World Wide Web
XACML	eXtensible Access Control Markup Language
XML	eXtensible Markup Language
XMPP	eXtensible Messaging and Presence Protocol
XSD	W3C XML Schema Definition
XXXXX	Indicates an error or mistake in typing (erasing the error)

Appendix B: Glossary

This section contains the glossary associated with this document.

(Source: NENA Master Glossary of 9-1-1 Terminology, <http://www.nena.org/default.asp?page=Glossary>)

Term	Definition
<i>3GPP</i>	The 3 rd Generation Partnership Project (3GPP) is a collaboration agreement that was established in December 1998. The collaboration agreement brings together a number of telecommunications standards bodies which are known as “Organizational Partners”.
<i>9-1-1</i>	A three-digit telephone number to facilitate the reporting of an emergency requiring response by a public safety agency.
<i>Access Provider</i>	An access provider is any organization that arranges for an individual or an organization to have access to the Internet or telecommunications services.
<i>Alliance for Telecommunications Industry Solutions (ATIS)</i>	A U.S.-based organization that is committed to rapidly developing and promoting technical and operations standards for the communications and related information technologies industry worldwide using a pragmatic, flexible and open approach. http://www.atis.org/
<i>American National Standards Institute (ANSI)</i>	Entity that coordinates the development and use of voluntary consensus standards in the United States and represents the needs and views of U.S. stakeholders in standardization forums around the globe. http://www.ansi.org/
<i>American Sign Language</i>	A visual/gestural, non-written language with its own unique syntax and grammar based on hand shapes, body movements and facial expressions.
<i>American Standard Code for Information Interchange (ASCII)</i>	A standard for defining codes for information exchange between equipment produced by different manufacturers. A code that follows the American Standard Code for Information Interchange.
<i>Association of Public Safety Communications Officials (APCO)</i>	APCO is the world’s oldest and largest not-for-profit professional organization dedicated to the enhancement of public safety communications.
<i>Authentication</i>	A security term referring to the process of reliably identifying an entity requesting access to data or a service.
<i>Automatic Call Distributor (ACD)</i>	Equipment that automatically distributes incoming calls to available PSAP attendants in the order the calls are received, or queues calls until an attendant becomes available.
<i>Automatic Location Identification (ALI)</i>	The automatic display at the PSAP of the caller’s telephone number, the address/location of the telephone and supplementary emergency services information of the location from which a call originates.
<i>Automatic Number Identification (ANI)</i>	Telephone number associated with the access line from which a call originates.

Term	Definition
<i>Call</i>	A session established by signaling with two-way, real-time media and involves a human making a request for help. We sometimes use “voice call”, “video call” or “text call” when specific media is of primary importance. The term “non-human-initiated call” refers to a one-time notification or series of data exchanges established by signaling with at most one way media, and typically does not involve a human at the “calling” end. The term “call” can also be used to refer to either a “Voice Call”, “Video Call”, “Text Call” or “Data-only call”, since they are handled the same way through most of NG9-1-1.
<i>Call Routing</i>	The capability to selectively route the 9-1-1 call to the appropriate PSAP.
<i>Call Session Control Function (CSCF)</i>	General term for a functional entity within a IMS core network that can act as Proxy CSCF (P-CSCF), Serving CSCF (S-CSCF), Emergency CSCF (E-CSCF), or Interrogating CSCF (I-CSCF).
<i>Carrier</i>	A function provided by a business entity to a customer base, typically for a fee. Examples of carriers and associated services are; PSTN service by a Local Exchange Carrier, VoIP service by a VoIP Service Provider, email service provided by an Internet Service Provider.
<i>Catypes</i>	A component of a civic address in a PIDF-LO such as a Street Name or House Number, which has a code used to identify what kind of component.
<i>Domain (or Domain Name)</i>	The domain name (hostname) of an agency or element in an ESInet.
<i>Emergency Call Routing Function (ECRF)</i>	A functional element in an ESInet which is a LoST protocol server where location information (either civic address or geo-coordinates) and a Service URN serve as input to a mapping function that returns a URI used to route an emergency call toward the appropriate PSAP for the caller’s location or towards a responder agency.
<i>Emergency Call Session Control Function (E-CSCF)</i>	The entity in the IMS core network that handles certain aspects of emergency sessions, e.g. routing of emergency requests to the correct emergency center or PSAP.
<i>Emergency Routing Data Base (ERDB)</i>	The ERDB contains routing information associated with each Emergency Service Zone (ESZ) in a serving area. It supports the boundary definitions for ESZs and the mapping of civic address or geo-spatial coordinate location information to a particular ESZ.
<i>Emergency Service Zone Routing Data Base (ERDB)</i>	The ERDB contains routing information associated with each Emergency Service Zone (ESZ) in a serving area. It supports the boundary definitions for ESZs and the mapping of civic address or geo-spatial coordinate location information to a particular ESZ.
<i>Emergency Services Interconnection Forum (ESIF)</i>	An open, technical/operational forum, under the auspices of the Alliance For Telecommunications Industry Solutions, with the voluntary participation of interested parties to identify and resolve recognized 9-1-1 interconnection issues.
<i>Emergency Services IP Network (ESInet)</i>	An ESInet is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core functional processes can be deployed, including, but not restricted to, those necessary for providing NG9-1-1 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks).

Term	Definition
<i>Emergency Services Query Key (ESQK)</i>	The ESQK identifies a call instance at a VPC, and is associated with a particular SR/ESN combination. The ESQK is delivered to the E9-1-1 SR and as the calling number/ANI for the call to the PSAP. The ESQK is used by the SR as the key to the Selective Routing data associated with the call. The ESQK is delivered by the SR to the PSAP as the calling number/ANI for the call, and is subsequently used by the PSAP to request ALI information for the call. The ALI database includes the ESQK in location requests sent to the VPC. The ESQK is used by the VPC as a key to look up the location object and other call information associated with an emergency call instance.
<i>Emergency Services Routing Digit (ESRD)</i>	Either a 10-digit North American Numbering plan or non-NANPA number that uniquely identifies a base station, cell site, or sector that is used to route wireless emergency calls through the network. The ESRD may also be used to retrieve the associated ALI data with the call. These numbers can be dialable or non-dialable.
<i>Emergency Services Routing Key (ESRK)</i>	Either a 10-digit North American Numbering plan or non-NANPA number that uniquely identifies a wireless emergency call, is used to route the call through the network, and used to retrieve the associated ALI data. These numbers can be dialable or non-dialable.
<i>Emergency Services Routing Number (ESRN)</i>	The ESRN is used by the Call Server/Routing Proxy to route an emergency call to the correct ESGW, and by the ESGW to select the desired path to the appropriate SR for the call.
<i>Emergency Services Routing Proxy (ESRP)</i>	An i3 functional element which is a SIP proxy server that selects the next hop routing within the ESInet based on location and policy. There is an ESRP on the edge of the ESInet. There is usually an ESRP at the entrance to an NG9-1-1 PSAP. There may be one or more intermediate ESRPs between them.
<i>Enhanced 9-1-1 (E9-1-1)</i>	A telephone system which includes network switching, data base and Public Safety Answering Point premise elements capable of providing automatic location identification data, selective routing, selective transfer, fixed transfer, and a call back number. The term also includes any enhanced 9-1-1 service so designated by the Federal Communications Commission in its Report and Order in WC Docket Nos. 04-36 and 05-196, or any successor proceeding.
<i>Gateway</i>	The Point at which a circuit-switched call is encoded and repackaged into IP packets – Equipment that provides interconnection between two networks with different communications protocols.
<i>Geocoding</i>	Translation of one form of location into another, typically a civic address into an x, y coordinate.
<i>Geographic Information System (GIS)</i>	A computer software system that enables one to visualize geographic aspects of a body of data. It contains the ability to translate implicit geographic data (such as a street address) into an explicit map location. It also can be used to graphically display coordinates on a map i.e. Latitude/Longitude.
<i>Geo Location</i>	Latitude, longitude, elevation, and the datum which identifies the coordinate system used.
<i>Geospatial</i>	Data accurately referenced to a precise location on the earth's surface.
<i>GIS (Geographic Information System)</i>	A system for capturing, storing, displaying, analyzing and managing data and associated attributes which are spatially referenced.
<i>Global Positioning System (GPS)</i>	A satellite based Location Determination Technology (LDT).

Term	Definition
<i>Global Standard for Mobile Communications (GSM)</i>	International standard digital radio interface utilized by some North American PCS carriers.
<i>IP Public Safety Answering Point (i3 PSAP)</i>	A PSAP that is capable of receiving IP-based signaling for delivery of emergency calls and for originating calls and is conformant to NENA specifications for such PSAPs.
<i>Implementation and Coordination Office (ICO)</i>	National 9-1-1 Implementation Coordination Office, also known as the National 9-1-1, jointly operated by NHTSA and the National Telecommunication Information Administration which was created and funded by the ENHANCE 9-1-1 Act of 2004. (http://www.e-911ico.gov)
<i>Instant Messaging (IM)</i>	A method of communication generally using text where more than a character at a time is sent between parties nearly instantaneously
<i>Institute of Electrical and Electronic Engineers (IEEE)</i>	A publishing and standards making body responsible for many telecom and computing standards.
<i>Integrated Services Digital Network (ISDN)</i>	International standard for a public communication network to handle circuit-switched digital voice, circuit-switched data, and packet-switched data.
<i>Internet Engineering Task Force (IETF)</i>	Lead standard setting authority for internet protocols.
<i>Internet Protocol (IP)</i>	The method by which data is sent from one computer to another on the Internet or other networks.
<i>Internet Protocol Access Network (IP Access Network)</i>	The network in which the first IP address is assigned to an end-point. For residential networks the creation and supply of an access network may require the cooperation of several different providers.
<i>Internet Protocol Address (IP Address)</i>	A 32-bit address assigned to hosts using TCP/IP. An IP address belongs to one of five classes (A, B, C, D, or E) and is written as 4 octets separated by periods (dotted decimal format). Each address consists of a network number, an optional sub network number, and a host number. The network and sub network numbers together are used for routing, while the host number is used to address an individual host within the network or sub network.
<i>Internet Protocol-Connectivity Access Network (IP-CAN)</i>	The collection of network entities and interfaces that provides the underlying IP transport connectivity between the user endpoint and the IMS entities.
<i>Internet Protocol Multimedia Subsystem (IMS)</i>	The IP Multimedia Subsystem comprises all 3GPP/3GPP2 core network elements providing IP multimedia services comprising audio, video, text, chat, etc. and a combination of any or all of them delivered over the packet switched domain.
<i>Internet Protocol Relay Service (IP Relay Service)</i>	A call center service similar to VRS that provides a third party communications relay between Internet texting users (mobile or stationary) and voice telephone users.
<i>Internet Protocol Telephony (IP Telephony)</i>	A general term for the technologies that use the IP's packet-switched connections to exchange voice, fax, and other forms of information that have traditionally been carried over the dedicated Circuit-Switched (CS) connections of the PSTN. The IP address may change each time the user logs on.
<i>Internet Service Provider (ISP)</i>	Company that provides Internet access to other companies and individuals
<i>Jurisdiction</i>	A government agency that has contracted for Enhanced 9-1-1 service. This may be a county, a city, a COG, or a 9-1-1 Area.

Term	Definition
<i>Legacy Gateway</i>	A signaling and media interconnection point between callers in legacy wireline/wireless origination networks and the i3 architecture, so that i3 PSAPs are able to receive emergency calls from such legacy networks.
<i>Legacy PSAP</i>	A PSAP that cannot process calls received via i3-defined call interfaces (IP-based calls) and still requires the use of CAMA or ISDN trunk technology for delivery of 9-1-1 emergency calls
<i>Legacy PSAP Gateway (LPG)</i>	An NG9-1-1 Functional Element which provides an interface between an ESInet and an un-upgraded PSAP
<i>Local Access and Transport Area (LATA)</i>	The geographical areas within which a local telephone company offers telecommunications services.
<i>Local Area Network (LAN)</i>	A transmission network encompassing a limited area, such as a single building or several buildings in close proximity.
<i>Local Exchange Carrier (LEC)</i>	A Telecommunications Carrier (TC) under the state/local Public Utilities Act that provide local exchange telecommunications services. Also known as Incumbent Local Exchange Carriers (ILECs), Alternate Local Exchange Carriers (ALECs), Competitive Local Exchange Carriers (CLECs), Competitive Access Providers (CAPs), Certified Local Exchange Carriers (CLECs), and Local Service Providers (LSPs).
<i>Location</i>	In the context of location information to support IP based emergency services: The physical position of VoIP end-point expressed in either civic or geodetic form. A spot on the planet where something is; a particular place or position. Oxford Dictionary, Oxford University Press, 2009.
<i>Location Information Server (LIS)</i>	A Location Information Server (LIS) is a functional entity that provides locations of endpoints. A LIS can provide Location-by-Reference, or Location-by-Value, and, if the latter, in geo or civic forms. A LIS can be queried by an endpoint for its own location, or by another entity for the location of an endpoint. In either case, the LIS receives a unique identifier that represents the endpoint, for example an IP address, circuit-ID or MAC address, and returns the location (value or reference) associated with that identifier. The LIS is also the entity that provides the dereferencing service, exchanging a location reference for a location value.
<i>Location Interwork Function (LIF)</i>	The functional component of a Legacy Network Gateway which is responsible for taking the appropriate information from the incoming signaling (i.e., calling number/ANI, ESRK, cell site/sector) and using it to acquire location information that can be used to route the emergency call and to provide location information to the PSAP. In a Legacy PSAP Gateway, this functional component takes the information from an ALI query and uses it to obtain location from a LIS.
<i>Location to Service Translation (LoST) Protocol</i>	A protocol that takes location information and a Service URN and returns a URI. Used generally for location-based call routing. In NG9-1-1, used as the protocol for the ECRF and LVF.
<i>Location URI</i>	A URI which, when de-referenced, yields a location value in the form of a PIDF-LO. Location-by-reference in NG9-1-1 is represented by a Location URI.
<i>Location Validation</i>	Refers to the action of ensuring that a civic address can be used to discern a route to a PSAP.
<i>Mapping</i>	The act of determining a value in one domain from a value in another domain. For example, mapping a location to the URI of a PSAP that serves that location using the LoST protocol.

Term	Definition
<i>Master Street Address Guide (MSAG)</i>	A data base of street names and house number ranges within their associated communities defining Emergency Service Zones (ESZs) and their associated Emergency Service Numbers (ESNs) to enable proper routing of 9-1-1 calls.
<i>Media Gateway Control Protocol (MGCP)</i>	In computing, MGCP is a protocol used within a Voice over IP system. MGCP is an internal protocol used within a distributed system that can appear to the outside world as a single VoIP gateway. This system is composed of a Call Agent, at least one “media gateway” (MG) that performs the conversion of media signals between circuits and packets, and at least one “signaling gateway” (SG) when connected to the PSTN.
<i>MESSAGE</i>	A SIP method which passes information, often an Instant Message, between endpoints in the body of the SIP message
<i>Mobile</i>	In the context of location information to support IP based emergency services: A user is said to be mobile if they are able to change access points while preserving all existing sessions and services regardless of who is providing the access network, and their location may be definitively represented by a geographic co-ordinates but only indicatively represented by a civic address.
<i>Mobile Position Center (MPC)</i>	The MPC serves as the point of interface to the ANSI wireless network for the Emergency Services Network. The MPC serves as the entity which retrieves, forwards, stores and controls position data within the location network.
<i>Mobile Switching Center (MSC)</i>	The wireless equivalent of a Central Office, which provides switching functions from wireless calls.
<i>National Emergency Number Association (NENA)</i>	The National Emergency Number Association is a not-for-profit corporation established in 1982 to further the goal of “One Nation-One Number.” NENA is a networking source and promotes research, planning and training. NENA strives to educate, set standards and provide certification programs, legislative representation and technical assistance for implementing and managing 9-1-1 systems.
<i>Network Layers Model</i>	The OSI, or Open System Interconnection, model defines a networking framework for implementing protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station, and proceeding to the bottom layer, over the channel to the next station and back up the hierarchy. In ascending order the layers are: physical, data link, network, transport, session, presentation, and application.
<i>Network Layer Security</i>	This is security deployed by layer 3 devices that prevent attacks aimed at terminating network services. This includes firewalls, ACL’s and other network related devices and techniques for threat mitigation.
<i>Network Location Determination</i>	In the context of location information to support IP based emergency services: Refers to the mechanism and data that a network entity can use to ascertain the whereabouts of a terminal in the access network such that the location can be specified in a valid PPDF-LO.
<i>Next Generation 9-1-1 (NG9-1-1)</i>	NG9-1-1 is an IP-based system comprised of managed IP-based networks (ESInets), functional elements (applications), and databases that replicate traditional E9-1-1 features and functions and provide additional capabilities. NG9-1-1 is designed to provide access to emergency services from all connected communications sources, and provide multimedia data capabilities for PSAPs and other emergency service organizations.

Term	Definition
<i>NG9-1-1 Specific Interwork Function (NIF)</i>	The functional component of a Legacy Network Gateway or Legacy PSAP Gateway which provides NG9-1-1-specific processing of the call not provided by an off-the-shelf protocol interwork gateway.
<i>Nomadic</i>	In the context of location information to support IP based emergency services: A user is said to be nomadic if they are constrained within an access network such that their location can be represented as a definitive civic address for that network attachment. The user may move from one network attachment to another but cannot maintain a session during that move. If the user is able to move outside the definitive civic address without losing network attachment then the user is considered to be mobile, not nomadic.
<i>Nomadic VoIP Call</i>	Call generated by a VoIP user other than their originally provisioned fixed location using the terminal equipment from that location (i.e.: VoIP handset, laptop, VoIP terminal, PC).
<i>Origination Network</i>	The network which originates a 9-1-1 call. Includes the access network and the calling network. Typically operated by carriers or other service providers.
<i>Packet</i>	Logical grouping of information that includes a header containing control information and (usually) user data. Packets are most often used to refer to network layer units of data.
<i>Packet-Switched Data Networks</i>	In telecommunications, packet-switching is now-dominant communications paradigm, in which packets (units of information carriage) are individually routed between nodes over data links which might be shared by many other nodes. In packet switched networks, such as the Internet, the data is split up into packets, each labeled with the complete destination address and routed individually.
<i>Presence Information Data Format (PIDF)</i>	The Presence Information Data Format is specified in IETF RFC 3863; it provides a common presence data format for Presence protocols, and also defines a new media type. A presence protocol is a protocol for providing a presence service over the Internet or any IP network.
<i>Presence Information Data Format – Location Object (PIDF-LO)</i>	Provides a flexible and versatile means to represent location information in a SIP header using an XML schema.
<i>Protocol</i>	A set of rules or conventions that govern the format and relative timing of data in a communications network. There are three basic types of protocols: character-oriented, byte-oriented, and bit-oriented.
<i>Protocol Interworking Function (PIF)</i>	That functional component of a Legacy Network Gateway or Legacy PSAP Gateway that interworks legacy PSTN signaling such as ISUP or CAMA with SIP signaling.
<i>Provisioning Service provider (PSP)</i>	The component in an ESI-net functional element that implements the provider side of a SPML interface used for provisioning
<i>Proxy</i>	An entity in a call path that is an intermediary, and not an endpoint.
<i>Proxy Call Session Control Function (P-CSCF)</i>	The P-CSCF is the first contact point for the user equipment (UE) within the IMS core network. For an IMS-based emergency call, the P-CSCF detects the emergency call and forwards it to an E-CSCF.

Term	Definition
<i>Proxy or Proxy Server/Policy and Routing Server</i>	“A policy and routing server in the context of SIP is a proxy server, an intermediary entity that acts as both a server and a client for the purpose of making requests on behalf of other clients. A proxy server primarily plays the role of routing, which means its job is to ensure that a request is sent to another entity “closer” to the targeted user. Proxies are also useful for enforcing policy (for example, making sure a user is allowed to make a call). A proxy interprets, and, if necessary, rewrites specific parts of a request message before forwarding it.” (Refer to IETF RFC 3261[5].) It can be a policy/routing element in other protocols.
<i>Public Agency</i>	A state or any unit of local government or special purpose district located in whole or in part within a state, which provides police, fire-fighting, medical or other emergency services or has authority to do so.
<i>Public Safety Agency</i>	An entity that provides fire fighting, law enforcement, emergency medical or other emergency service.
<i>Public Safety Answering Point (PSAP)</i>	Public Safety Answering Point (PSAP): An entity operating under common management which receives 9-1-1 calls from a defined geographic area and processes those calls according to a specific operational policy.
<i>Quality of Service (QoS)</i>	As related to data transmission a measurement of latency, packet loss and jitter.
<i>Real Time Protocol (RTP)</i>	An IP protocol used to transport media (voice, video, text) which has a real time constraint.
<i>Real Time Text (RTT)</i>	Text transmission that is character at a time, as in TTY.
<i>Real-time Transport Control Protocol (RTCP)</i>	RTCP is a sister protocol of RTP and provides out-of-band control information for an RTP flow. It partners RTP in the delivery and packaging of multimedia data, but does not transport any data itself. It is used periodically to transmit control packets to participants in a streaming multimedia session. The primary function of RTCP is to provide feedback on the quality of service being provided by RTP.
<i>Real-Time Transport Protocol (RTP)</i>	A network protocol used to carry packetized audio and video traffic over an IP network that helps ensure that packets get delivered in a timely way.
<i>Router</i>	An intelligent device that forwards data packets from one local area network (LAN) to another and that selects the most expedient route based on traffic load, line speeds, costs, or network failures to complete the call
<i>Selective Router</i>	(see Enhanced 9-1-1 Control Office)
<i>Selective Routing (SR)</i>	The process by which 9-1-1 calls/messages are routed to the appropriate PSAP or other designated destination, based on the caller’s location information, and may also be impacted by other factors, such as time of day, call type, etc. Location may be provided in the form of an MSAG-valid civic address or in the form of geo coordinates (longitude and latitude).
<i>Selective Routing Data Base (SRDB)</i>	The routing table that contains telephone number to ESN relationships which determines the routing of 9-1-1 calls.
<i>Session Border Control</i>	A commonly available functional element that provides security, NAT traversal, protocol repair and other functions to VoIP signaling such as SIP. A component of a Border Control Function

Term	Definition
<i>Session Initiation Protocol (SIP)</i>	An IETF defined protocol (RFC3261) that defines a method for establishing multimedia sessions over the Internet. Used as the call signaling protocol in VoIP, i2 and i3
<i>Short Message Service (SMS)</i>	A service typically provided by mobile carriers that sends short (160 characters or fewer) messages to an endpoint. SMS is often fast, but is not real time.
<i>Simple Network Management protocol (SNMP)</i>	A protocol defined by the IETF used for managing devices on an IP network.
<i>Simple Network Time Protocol (SNTP)</i>	A utility for synchronizing system clocks over a TCP/IP network. This protocol is similar to NTP and is used when the ultimate performance of the full NTP implementation is not needed.
<i>Spatial</i>	Relating to, occupying, or having the character of space. Geographic Information Systems store spatial data in regional databases. See Geospatial.
<i>Standards Development Organization (SDO)</i>	An entity whose primary activities are developing, coordinating, promulgating, revising, amending, reissuing, interpreting, or otherwise maintaining standards that address the interests of a wide base of users outside the standards development organization.
<i>Stream Control Transport Protocol (SCTP)</i>	SCTP is defined by IETF RFC2960 as the transport layer to carry signaling messages over IP networks.
<i>Synchronous Optical Network (SONET)</i>	High speed digital transport over fiber optic networks using synchronous protocol.
<i>TDD/TTY Detector</i>	Any device that automatically detects TDD/TTY tones and audibly and/or visually notifies the call-taker.
<i>Telecommunications Device for the Deaf (TDD)</i>	Also known as TTY. (see Teletypewriter (TTY))
<i>Telecommunications Industry Association (TIA)</i>	A lobbying and trade association, the result of the merger of the USTA (United States Telephone Association) and the EIA (Electronic Industries Association).
<i>Telecommunications Relay Service (TRS)</i>	A federally mandated service provided by states that provides communication relay between TTY users and voice telephone users, via a third party, for communications assistance.
<i>Telecommunications Service Provider (TSP)</i>	A business that provides voice or data transmission services. These services are provided over a telecommunications network that transmits any combination of voice, video and/or data between users. A TSP could be, but is not limited to, a Local Exchange Carrier (LEC), a wireless telecommunications provider, a Commercial Mobile Radio Service provider, or a PBX service provider.
<i>Teletypewriter (TTY)</i>	Also known as TDD. A device capable of information interchange between compatible units using a dial up or private-line telephone network connections as the transmission medium. ASCII or Baudot codes are used by these units. (per EIA PN-1663)
<i>Text Telephone</i>	Another term for TDD/TTY

Term	Definition
<i>Third Generation Partnership Project 2 (3GPP2)</i>	A collaborative third generation (3G) telecommunications specifications-setting project comprised of interests from the Americas and Asia developing global specifications for Mobile Application Protocol (MAP) “Wireless Radio-telecommunication Intersystem Operations” network evolution to 3G. The project is focused on global specifications for the radio transmission technologies supported by MAP and the wireless IP core networks, together known as the cdma2000® family of standards.
<i>Transmission Control Protocol (TCP)</i>	A communications protocol linking different computer platforms across networks. TCP/IP functions at the 3 rd and 4 th levels of the open system integration model.
<i>Transmission Control Protocol/Internet Protocol (TCP/IP)</i>	A layered set of protocols used to connect dissimilar computers together. The TCP part of this provides the transport service required by the application layer. The IP part of this provides the service user to deliver the datagram to its destination.
<i>Transport Control Protocol (TCP)</i>	The end-to-end reliability protocol that recognizes and corrects lower layer errors caused by connectionless networks.
<i>Video Relay Service (VRS)</i>	A service provided by common carriers and other vendors that provides third party communication relay between video telephone users using Internet connections and videophone or webcam and voice telephone users.
<i>Voice over Internet Protocol, Voice over IP (VoIP)</i>	Provides distinct packetized voice information in digital format using the Internet Protocol. The IP address assigned to the user’s telephone number may be static or dynamic.
<i>Voice over the Internet</i>	Transmit voice with varying consistency depending on overall traffic and engineering of the Internet circuits.
<i>Voice Service Provider (VSP)</i>	Operates the network equipment that provides call processing for Voice over Internet Protocol subscribers.
<i>VoIP Positioning Center (VPC)</i>	The VoIP Positioning Center (VPC) is the element that provides routing information to support the routing of VoIP emergency calls, and cooperates in delivering location information to the PSAP over the existing ALI DB infrastructure.
<i>Wide Area Network (WAN)</i>	Network using common carrier-provided lines that covers and extended geographical area.
<i>Wireless Service Provider (WSP)</i>	Cellular or other radio based telephony or data transport commercial entity.
<i>Working Group (WG)</i>	A group of people formed to discuss and develop a response to a particular issue. The response may result in a Standard, an Information Document, Technical Requirements Document or Liaison.
<i>X,y</i>	Shorthand expression for coordinates that identify a specific location in two dimensions representing latitude and longitude.

Appendix C: System Management Impacts and Interdependencies

Checklist

<u>Matters</u>	<u>E9-1-1 to NG9-1-1</u>
<input type="checkbox"/> Inbound PSTN emergency 10-digit lines	No change or modified
<input type="checkbox"/> Inbound PSTN non-emergency 10-digit lines	No change or modified
<input type="checkbox"/> Outbound PSTN lines	No change or modified
<input type="checkbox"/> 9-1-1 Network	SR tandem, IPSR, ESInet; tariffs, contracts, and applicable regulations
<input type="checkbox"/> Connection to 9-1-1 Network	CAMA, SS7, ISDN, MPLS, SIP; tariffs, contracts, and applicable regulations
<input type="checkbox"/> Database Management	Legacy MSAG & ALI, GIS, ESRP, ECRF, LVF; tariffs, contracts, and regulations
<input type="checkbox"/> Mapping/GIS	Local, Regional, Statewide, Sharing and Distribution; public information and retention
<input type="checkbox"/> Connection to Database Management	Legacy MSAG & ALI, GIS, ESRP, ECRF, LVF; tariffs, contracts, and regulations
<input type="checkbox"/> Automatic Call Distribution	Stand-alone, Hosted, ESInet
<input type="checkbox"/> Customer Premise Equipment	Stand-alone, Hosted, ESInet
<input type="checkbox"/> Computer Aided Dispatch	Stand-alone, Hosted, ESInet
<input type="checkbox"/> Local Gov't PSAPs	Training, equipment, personnel, funding
<input type="checkbox"/> Regional Gov't PSAPs	Training, equipment, personnel, funding
<input type="checkbox"/> Federal Gov't and Military Base PSAPs	Training, equipment, personnel, funding
<input type="checkbox"/> Private PSAPs	Training, equipment, personnel, funding
<input type="checkbox"/> Management and Coordination Entities	World and national, federal, state, regional, local,
<input type="checkbox"/> Sources of Policy Rules	Standards, best practices, contracts, regulations, laws
<input type="checkbox"/> Personnel Selection and Hiring	Standards, best practices, contracts, regulations, laws
<input type="checkbox"/> Operations and Call-Taker Training	Standards, best practices, contracts, regulations, laws
<input type="checkbox"/> Public Education	Standards, best practices, contracts, regulations, laws
<input type="checkbox"/> Incoming Certification Authorization Process	PUC, FCC, state, region, local, standards
<input type="checkbox"/> Across Certification Authorization Process	Statutes, ordinances, Interlocals, practices, standards
<input type="checkbox"/> Outgoing Certification Authorization Process	Statutes, ordinances, Interlocals, practices, standards
<input type="checkbox"/> Special IP Security and Access Issues	Special procedures to handle potentially dangerous requests
<input type="checkbox"/> Incoming Requirements Process	PUC, FCC, state, region, local, standards
<input type="checkbox"/> Across Requirements Process	PUC, FCC, state, region, local, standards
<input type="checkbox"/> Outgoing Requirements Process	statutes, ordinances, Interlocals, practices, standards
<input type="checkbox"/> Wireline Access (including PBX)	Point(s) of Interconnection
<input type="checkbox"/> Wireless Access	Point(s) of Interconnection
<input type="checkbox"/> VoIP Access (including PBX)	Point(s) of Interconnection
<input type="checkbox"/> Telematics Access	Point(s) of Interconnection
<input type="checkbox"/> Voice Calls	TDM, SIP

<u>Matters</u>	<u>E9-1-1 to NG9-1-1</u>
<input type="checkbox"/> Text Messaging	SMS, RTT, primary, supplemental, downstream
<input type="checkbox"/> Relay Services	Point(s) of Interconnection, standards, operational
<input type="checkbox"/> Image	Primary, supplemental, downstream, interoperability
<input type="checkbox"/> Video	Primary, supplemental, downstream, interoperability
<input type="checkbox"/> Dispatch	Stand-alone, ESInet, downstream, Interoperability
<input type="checkbox"/> Radio	Stand-alone, ESInet, downstream, Interoperability
<input type="checkbox"/> Police, Fire, EMS	Stand-alone, ESInet, downstream, Interoperability
<input type="checkbox"/> Response Vehicles	Stand-alone, ESInet, downstream, Interoperability
<input type="checkbox"/> Emergency Notification Systems	Stand-alone, ESInet, downstream, Interoperability
<input type="checkbox"/> Sensors & Alarms	Stand-alone, ESInet, downstream, Interoperability
<input type="checkbox"/> Human-machine interface (HMI)	Primary, supplemental, downstream, interoperability
<input type="checkbox"/> Recording System	New laws and issues to consider
<input type="checkbox"/> Record Retention	New laws and issues to consider
<input type="checkbox"/> Highly Sensitive Medical or other Data	New laws and issues to consider
<input type="checkbox"/> Confidentiality & Public Information Requests	New laws and issues to consider
<input type="checkbox"/> Disaster and Contingency Planning	Contractual, functional, operational, regulatory, statutory
<input type="checkbox"/> Operational Changes	Contractual, functional, operational, regulatory, statutory
<input type="checkbox"/> Interoperability Changes	Contractual, functional, operational, regulatory, statutory
<input type="checkbox"/> Demarcation Changes	Contractual, functional, operational, regulatory, statutory
<input type="checkbox"/> Responsibility Changes	Contractual, functional, operational, regulatory, statutory
<input type="checkbox"/> Accountability Changes	Contractual, functional, operational, regulatory, statutory
<input type="checkbox"/> Coordination Changes	Contractual, functional, operational, regulatory, statutory
<input type="checkbox"/> Vendor Changes	ILEC, LEC, deregulated, non-regulated, government contracts
<input type="checkbox"/> Funding Process Changes	Federal, state, regional, local, private parties
<input type="checkbox"/> Payment Process Changes	Federal, state, regional, local, private parties
<input type="checkbox"/> Contractual Process Changes	Federal, state, regional, local, private parties
<input type="checkbox"/> Escalation Process Changes	Federal, state, regional, local, private parties
<input type="checkbox"/> Dispute Resolution Changes	Standards, mediator, arbitration, regulatory courthouse
<input type="checkbox"/> Regulatory Changes	Tariff & Interconnection, Commercial & Contract, Fed or State
<input type="checkbox"/> Legal Changes	Authorities, entities, responsibilities, requirements, attorneys
<input type="checkbox"/> Moot Issues	
<input type="checkbox"/> New Issues	

Appendix D: System Functional Requirements

NG9-1-1 is a large and complex undertaking with many functional elements compared to traditional 9-1-1 call processing. There are several distinct approaches to establishing an NG9-1-1 system and it is expected that each state, region, county and agency will take a path based on their readiness, needs, available solutions, budget, perceived value, governance, and business environment. Various functions are required to implement an NG9-1-1 system as currently envisioned. The Functional Elements are primarily linked together by an IP network transport foundation that stretches between Ingress traffic points, egress traffic points and application processing elements. Ingress and egress traffic points exist for call traffic but can also be established for supporting data and enhanced services.

The following functional capabilities are realized through one or more functional processing elements:

- Functional elements that handle foundation data that enables NG9-1-1 processing logic and often provision real time call processing elements. Foundation data includes, but is not limited to, GIS with additional data elements specific to public safety services.
- Accept IP ingress traffic
- Accept Legacy TDM ingress traffic
- Call control including determining and routing to the appropriate call handling destination
- Manage destination readiness and status through policy functions and determine alternate destinations as appropriate
- Deliver calls to IP PSAPs
- Deliver calls to legacy PSAPs
- Interoperate (call hand-off and transfer) with legacy Selective Routers (ingress and egress) serving neighboring PSAPs
- Interoperate with legacy ALI (ingress and egress) serving neighboring 9-1-1 PSAPs
- Determine emergency service providers such as Police, Fire, and Medical emergency responders
- Interoperate with other ESInets and NG9-1-1 systems (ingress and egress)
- A service that allows originating service providers to validate their own location information.
- A service that allows originating service providers to determine the geographic area (e.g., appropriate ESInet) that should receive their 9-1-1 request for assistance traffic
- Provide additional data from data sources to data consumers. The Additional Data Sources can exist either within or external to the NG9-1-1 related network itself.
- There can be numerous functional elements that contribute to solution management, logging, provisioning, alarms, security, trouble shooting, and reports.
- Agencies can prepare to realize a full NG9-1-1 system by starting on one or more of the four foundation elements:
 - 1 Establish the foundation IP transport network
 - 2 Convert legacy PSAPs to IP enabled PSAPs
 - 3 Convert legacy selective routing to an IP application server environment
 - 4 Prepare GIS based data as a basis to perform call routing and retire current

SRDB/ESN/MSAG approaches

After establishing one or more of the above foundation elements, or in parallel with one or more of the foundation elements, the agency can implement either the initial approach below, followed by the i3 based system, or move directly to the NENA i3 based system:

- An IP Selective Router (IPSR) which utilizes the IP transport network and an IP application server environment but continues to utilize a legacy SRDB and ESNs for routing and selective transfer functions. This step is often combined with transporting legacy ALI information to PSAPs over the high speed network transport versus legacy data communication links. This step requires implementation of the i3 LNG PIF and LNG NIF functions to perform protocol conversion of ingress traffic from TDM to IP protocols. This step can be combined with either CAMA PSAPs or IP PSAPs via the RFAI protocol.
- Geographic-based routing utilizing i3 ESRP and ECRF functional elements utilizing the IP transport network and an IP application server environment. This step requires the implementation of i3 LNG and LSRG functions. This step can be implemented with either CAMA PSAPs via the i3 LPG or IP PSAPs.
 - Agencies should consider a two step approach where they implement wireline and fixed location VoIP calls followed by wireless.
 - Wireline has straightforward location information that can be used within the ECRF to determine routing. There are on-going discussions regarding MSAG valid addresses versus Civic addresses that must be considered on a regional basis depending on local addressing standards.
 - Wireless calls are still problematic in terms of the timing of location information availability and the gross location information that is provisioned and maintained in legacy databases. Wireless location information for call routing and NG9-1-1 is a current topic in standards forums.
- Policy Routing functions where rules can be setup based on the determined call handling destination to override or further determine call routing treatment can be implemented with either an ESRP or IPSR.
- Agencies need to consider their transitional strategies from legacy approaches to NG9-1-1 based on their scope, number of PSAPs and data readiness to derive a dual operating model or flash cut-over.
- Deliver additional data and services. Once the IP network transport is established to IP PSAPs additional protocols can be deployed that enable a wide range of information sources and collaboration based services.
- Neighboring NG9-1-1 or legacy Selective Router interoperability to hand-off call traffic for routing and call transfer between neighboring PSAPs supported by different 9-1-1 systems. An NG9-1-1 deployment usually requires interoperability with a neighboring agency to get certain calls to the agency that can dispatch emergency services.
- IP PSAP eliminating legacy PSAP CAMA TDM trunks with IP protocols. This step can be combined with an IPSR if the agency wishes to continue implementing ESN based routing and selective transfer or with an ESRP/ECRF if the agency is ready to implement GIS based functions.
- An IP PSAP's ability to determine emergency service responders such as Police, Fire, Medical emergency responders and Poison Control based on call location and geographic

service boundaries utilizing an i3 ECRF and a LoST protocol interface.

- A location validation function for originating service providers to validate their location information should be made available by an agency as soon as carriers indicate their commitment to utilize such services. An LVF is dependent on suitable GIS information and enables retirement of legacy MSAG techniques.
- An agency can begin accepting ingress IP traffic when one or more originating service providers serving their area are prepared to deliver Ingress IP traffic. The NENA i3 post-transition model expects the originating service provider will deliver the caller's location information at call setup time, enable the retirement of the LNG function(s) and enable routing based on location.

Functional elements can reside in various places depending on the implementation approach and business dynamic. It is generally accepted that the ESRP and ECRF that replace legacy call processing Selective Routers will reside within the NG9-1-1 network supporting multiple agencies. The i3 model also defines ECRF elements that are public internet accessible to allow for originating service providers to determine the geographically appropriate ESInet and NG9-1-1 system to send calls to, for NG9-1-1 routing to the appropriate PSAP.

- Gateway functions
The LNG and LSRG functions can reside in either the origination network or the NG9-1-1 Network depending on various factors. The LPG can reside in either the NG9-1-1 Network or the IP PSAP local network.
- Location information data stores are assumed to reside within the Access Networks but location information is also assumed to reside within the NG9-1-1 system during transition periods to a pure i3 model.
- The location validation function is assumed to exist within the NG9-1-1 network. However the i3 model assumes the GIS data used to perform validation can be distributed to ECRFs and LVFs outside the agencies NG9-1-1 network domain and therefore the LVF function could also reside in an origination network or a public network.
- Logging, security, provisioning, trouble shooting, monitoring and related management platforms are expected to reside in all NG9-1-1 networks and associated networks.