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December, 2011

WORKING GROUP 1  
Subgroups 1 and 2  
Report



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# **1 Preamble**

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

## **2 Introduction**

### **2.1 Overview**

The contents of this document 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. Also, work remains to be done among the management groups involved, to address issues such as system operations, database management, troubleshooting, and potential resource sharing.

Over the years of evolving 9-1-1 technologies, we've also realized the importance of education. In addition to public education (e.g. consumer uses of Next Generation applications on their devices), NG9-1-1 readiness involves education and training, planning, and implementation across several stakeholder groups. Call takers will need training regarding changes to current PSAP and 9-1-1 Authority operational procedures. They will also need to learn new databases, changes in network governance, software applications and database management. Education and training may be provided by a variety of public and private entities, and in differing relationships with single or multiple vendors. For some parties, education around the change to IP technology in NG9-1-1 may be necessary.

In addition to technical and operational standards, readiness, and education, there are multiple broad issues that will require further ongoing work. For example, without effectively addressing issues of policy, funding, governance, and regulation, NG9-1-1 may not realize its full potential. Effectively addressing these matters will be critical in creating the most productive environment for NG9-1-1 implementation.

The majority of the technical standards are in place to support the transition to NG9-1-1. However, an area that appears to be lacking is a comprehensive plan on how the various standards tie together to facilitate that transition. There are standards in place for various functional entities and interfaces, but missing is a complete end-to-end view that ties these standards together to allow for the orderly transition to NG9-1-1. This gap could be addressed by the development of an NG9-1-1 transition implementation guide.

## 2.1.1 Organization Chart

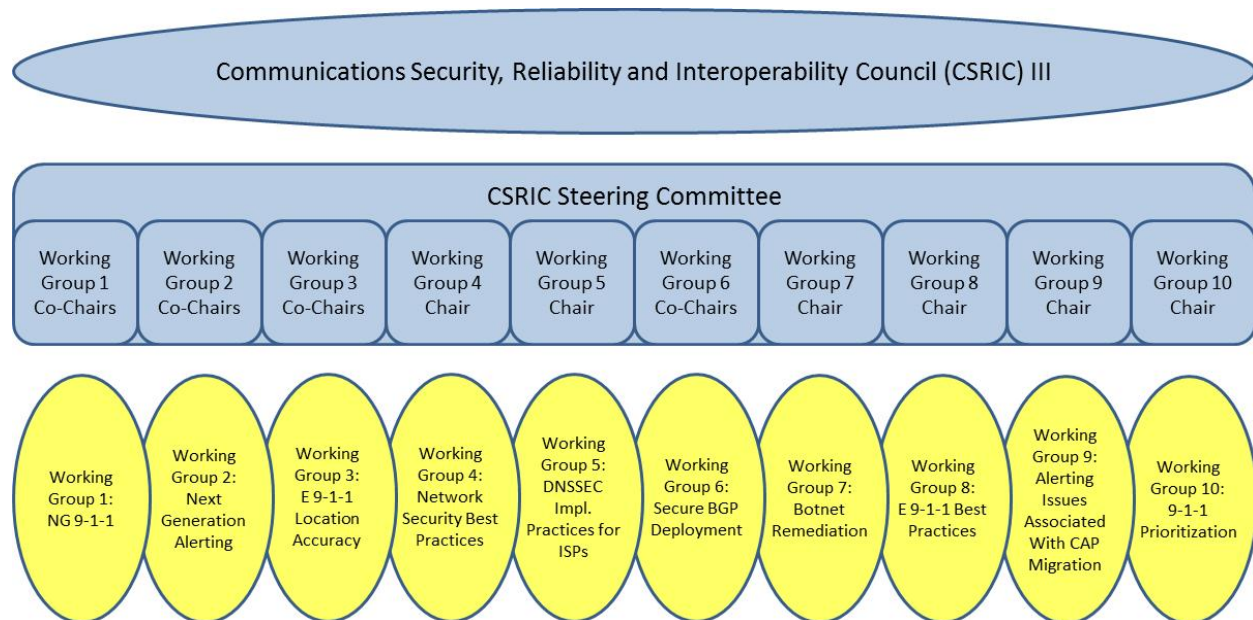


Figure 2-1: CSRIC Organization Chart

## 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

Name	Organization	Sub 1	Sub 2
Jennifer McNamara	CenturyLink	x	x
Richard Muscat	Bexar Metro 911 Network District		x
Mike Nelson	Intrado, Inc.	x	x
Tristan Nelson	Verizon	x	x
Judi 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 1

Subgroup 1 shall identify ongoing work related to Next Generation (NG) NG9-1-1 network architecture, including standards development efforts such as the National Emergency Number Association's (NENA's) i3 standard and others. The Working Group shall label aspects of identified standards as:

- Critical for deployment,
- Critical for competition,
- Desirable,
- Long-term, or
- Non-critical.

In addition, the Working Group shall identify any gaps in existing or developmental standards work and classify the importance and urgency of resolving those gaps.

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

### Methodology

Technical diagrams were used to provide a framework for identification and analysis of standards. Using diagrams, the standards were listed and classified according to their corresponding functional entity. Their current status was described. Standards were then rated as to their priority and gaps in existing standards were identified. Only those technical standards specific to NG9-1-1 were discussed, rated as to the urgency of their completion and analyzed for gaps. In order to manage the scope of the assignment and the corresponding report, the working group recognizes the many standards developed by such groups as 3GPP2, TIA and others;

however, the Working Group focused on those standards specific to NG9-1-1.

## Summary

A total of 154 functional entities/interfaces in seven (7) major categories were considered as to the status of their corresponding technical standards. Of these:

- Standards are complete for 125 functional entities,
- 14 are in publication queue,
- 8 are in the approval stage,
- 4 are in development,
- 2 are covered by BCF interface, and
- 1 is without a comprehensive document.

Cumulatively, standards are complete for 81% of the reviewed entities/interfaces.

A total of 35 technical standards were rated. Of these:

- 25 were considered critical for deployment,
- 29 were rated critical for competition,
- 2 were assessed as desirable,
- 23 were applicable to long-term (post transition), and
- 2 were considered non-critical.

These ratings were not mutually exclusive.

### 2.3.1 High Level System Diagrams

The high level diagrams provided in this section are the complete architecture of the NG9-1-1 system. The purpose of these diagrams is to provide a framework for the identification and analysis of standards activities.

The NG9-1-1 Context Diagram illustrates the subject domain at the center and identifies the major interacting domains around the Emergency Services IP Network (ESInet)/NG9-1-1 network. Each interacting domain is unique in its purpose and utilizes a specific set of interactions and protocols. NG9-1-1 Network inputs, outputs and external factors can be considered by inspecting the relationship of each interacting domain. This approach provides the foundation for a comprehensive evaluation of ongoing work related to NG9-1-1 network and architecture.

Significant implementation diversity exists in the marketplace. As such, the NG9-1-1 network must simultaneously support multiple service providers. This document does not attempt to recommend one service provider technology over another, rather to explicitly show how multiple service provider networks (i.e. IMS, non-IMS, Internet, etc.) can all be integrated into the NG9-1-1 solution.



### 2.3.1.1 NG9-1-1 Context Diagram

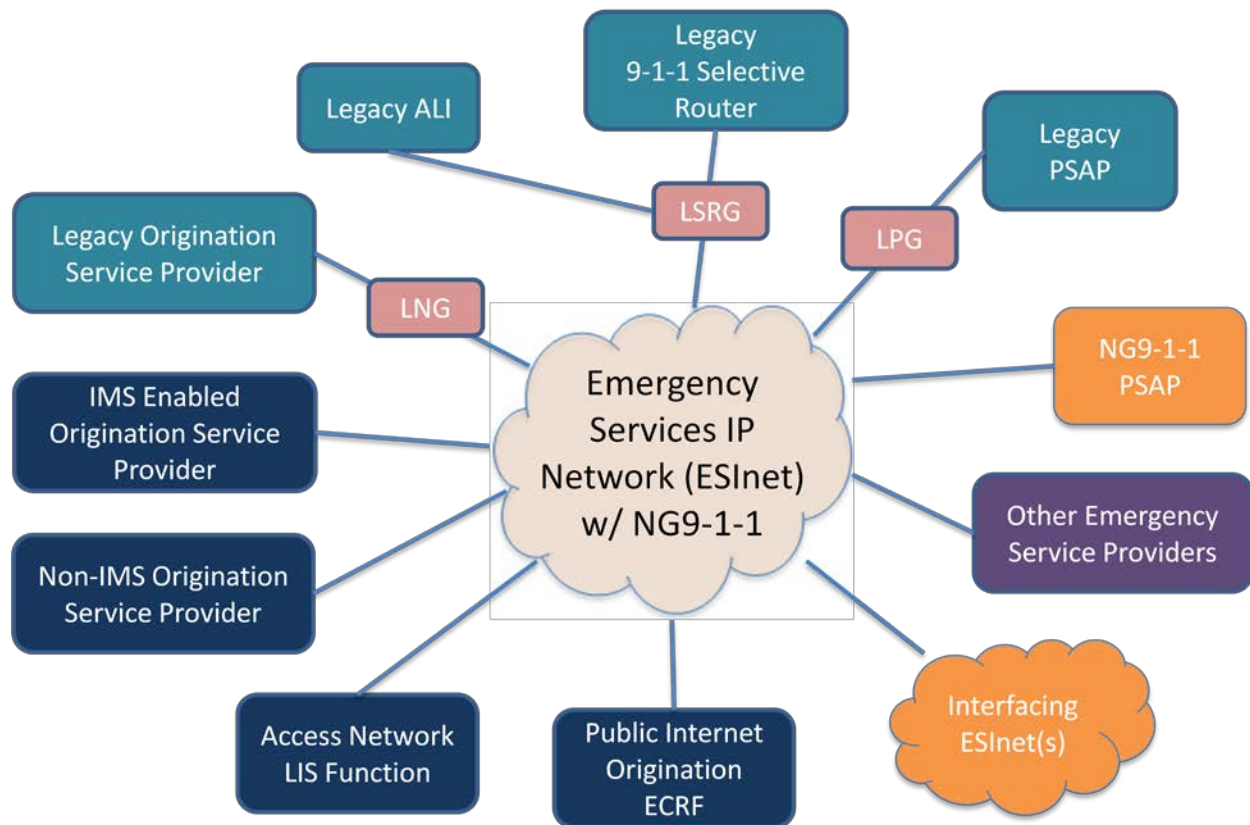


Figure 2-2: NG9-1-1 Context Diagram

### 2.3.1.2 IP Origination Diagram

The following figure illustrates an expanded architecture that takes into account the network elements of an IP Multimedia Subsystem (IMS) origination Network, a non-IMS IP origination network, and NENA's i3 architecture. For simplicity, the IMS cloud shown does not include all the IMS network elements. The Common IMS Network supports a variety of access types with mobile, nomadic or fixed user equipment.

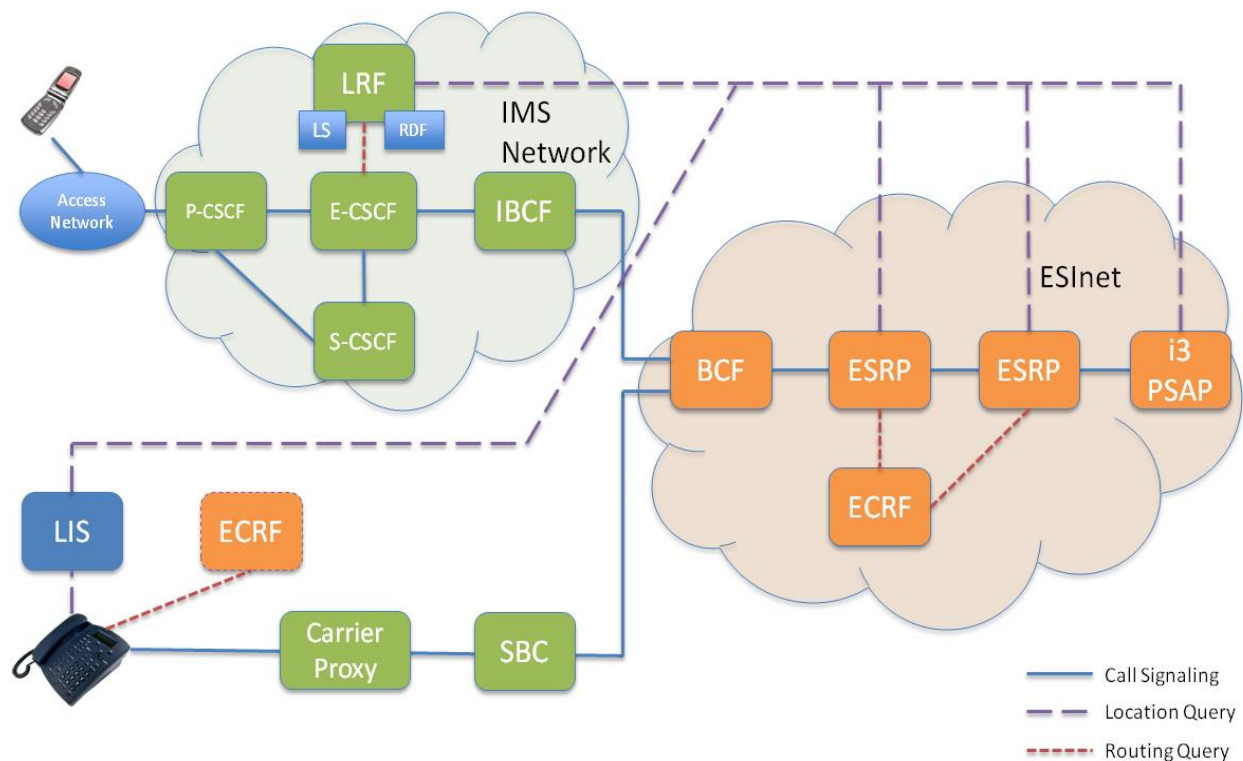


Figure 2-3: IP Origination Diagram

### 2.3.1.3 Legacy Origination Diagram

The following figure illustrates origination from legacy wireless and wireline networks terminating in i3 PSAPs via an ESInet. Legacy origination in this diagram shows the use of the Legacy Network Gateway (LNG) as the bridge element between the origination network and the ESInet.

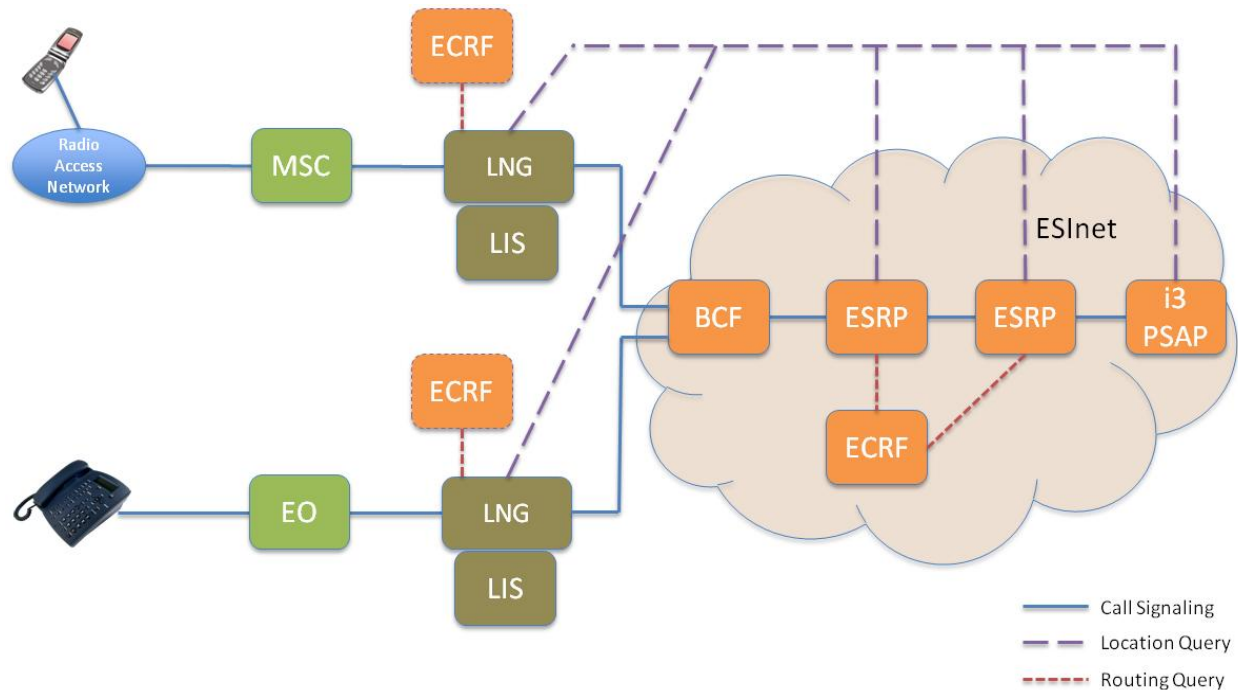


Figure 2-4: Legacy Origination Diagram

### 2.3.1.4 Transition Diagram

The following figure illustrates transition from current E9-1-1 systems to NG9-1-1 systems. It shows a Legacy Selective Router Gateway (LSRG) between an existing selective router/Automatic Location Identification (ALI) and the ESInet.

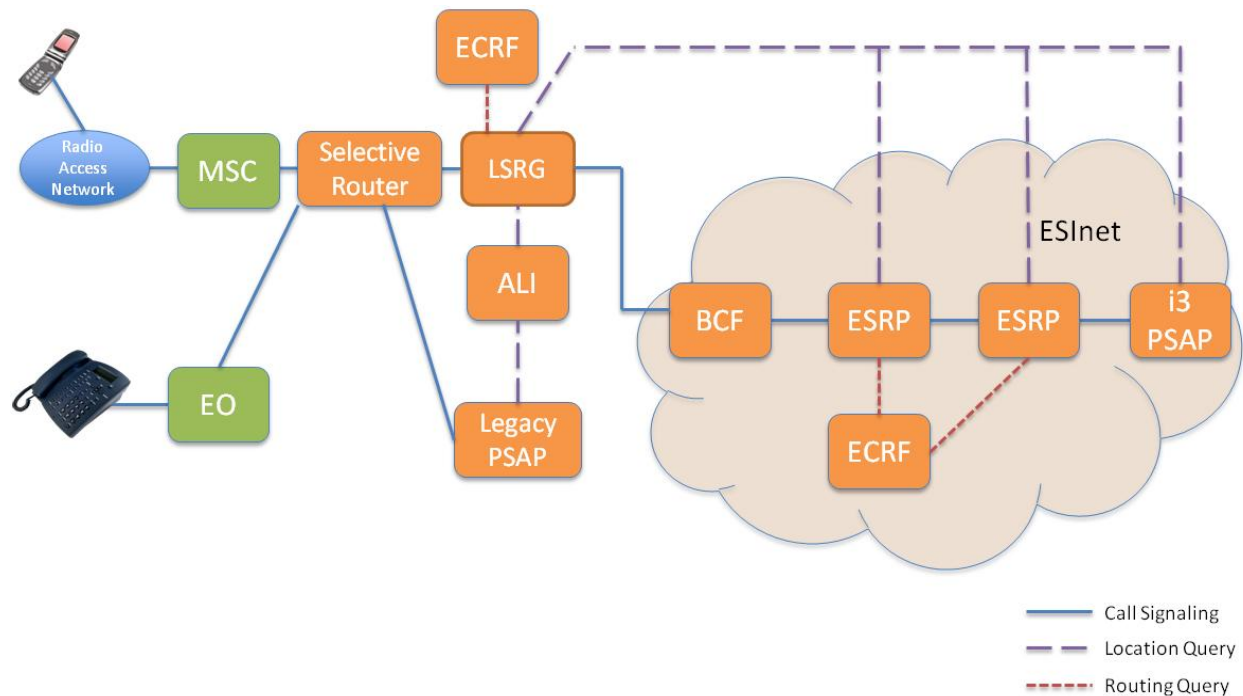


Figure 2-5: Transition Diagram

## 2.3.2 IMS Functional Elements

### 2.3.2.1 User Equipment (UE)

User Equipment is used here as defined in 3<sup>rd</sup> Generation Partner Project (3GPP) Technical Standard (TS) 23.167. The UE initiates the emergency session establishment request.

### 2.3.2.2 Proxy Call Session Control Function (P-CSCF)

The Proxy Call Session Control Function is used here as defined in 3GPP TS 23.167. The P-CSCF receives the emergency session establishment request from the UE, detects that it is an emergency, and forwards to the E-CSCF.

### 2.3.2.3 Emergency Call Session Control Function (E-CSCF)

The Emergency Call Session Control Function is used here as defined in 3GPP TS 23.167. The E-CSCF receives the emergency session establishment request from the P-CSCF, validates or obtains location information, determines or obtains routing information, and forwards per the routing information.

### 2.3.2.4 Serving Call Session Control Function (S-CSCF)

The Serving Call Session Control Function is used here as defined in 3GPP TS 23.167.

### **2.3.2.5 Location Retrieval Function (LRF)**

The Location Retrieval Function (LRF) is used here as defined in 3GPP TS 23.167 and its functionality is expanded within this standard. The LRF retrieves location information for a UE and obtains routing information for an emergency session of the UE from the Routing Determination Function (RDF).

### **2.3.2.6 Routing Determination Function (RDF)**

The Routing Determination Function (RDF) is used here as defined in 3GPP TS 23.167 and its functionality is expanded within this standard.

The RDF provides routing information for an emergency session.

### **2.3.2.7 Media Gateway Control Function (MGCF)**

The Media Gateway Control Function (MGCF) is used here as defined in 3GPP TS 23.167.

The MGCF interworks signaling on the origination network IMS side (e.g. SIP) to signaling on the legacy PSAP side (e.g. SS7 ISUP).

### **2.3.2.8 Emergency Access Transfer Function (EATF)**

The Emergency Access Transfer Function (EATF) is used here as defined in 3GPP TS 23.167.

The EATF supports session continuity (e.g., Handover) of an emergency call initially established using IMS when movement of the UE requires a change of access network from packet network (e.g., LTE) to circuit network (e.g., GSM or UMTS).

### **2.3.2.9 Interrogating Call Session Control Function (I-CSCF)**

The Interrogating Call Session Control Function is used here as defined in 3GPP TS 23.167 and it is the typical point of entry into an IMS network from some other network.

### **2.3.2.10 Location Server (LS)**

The Location Server is used here as defined in 3GPP TS 23.167.

## **2.3.3 Emergency Services Network Functional Elements**

### **2.3.3.1 Automatic Location Identification (ALI)**

The location information service for E9-1-1. ALI is a database keyed by telephone number that returns location. For wireline, there is an entry per telephone number served, containing the street address of the subscriber. For wireless and VoIP, the record in the database is a dummy (shell) record, and the ALI function steers queries to an appropriate Mobile Positioning Center (MPC), GSM Mobile Positioning Center (GMLC), or VoIP Positioning Center (VPC). The query uses a pseudo ANI (pANI) assigned to the call by the MPC/GMLC/VPC. The MPC/GMLC/VPC returns the location of the caller.

### **2.3.3.2 Border Control Function (BCF)**

The Border Control Function (BCF) is used here as defined in NENA i3 and ATIS PTSC SBC TR. The BCF controls all traffic into and out of an ESInet. BCFs contain firewall and SIP specific “Session Border Controller” (SBC) functionality.

### **2.3.3.3 Emergency Services Routing Proxy (ESRP)**

The Emergency Services Routing Proxy (ESRP) is used here as defined in NENA i3.

The ESRP acts as a SIP proxy server within the ESInet, and routes emergency calls within the ESInet.

#### 2.3.3.4 Emergency Call Routing Function (ECRF)

The Emergency Call Routing Function (ECRF) is used here as defined in NENA i3. The ECRF is the routing database for emergency calls. It is queried with the location of the caller and provides the next hop route for the SIP signaling. For queries outside the ESInet, the route obtained from the ECRF is to the entry ESRP in the right ESInet. Within the ESInet, the ECRF implements multistage routing towards a PSAP, and is also used to identify the corresponding emergency service providers that have jurisdiction for the location of the incident.

#### 2.3.3.5 Location Information Server (LIS)

The Location Information Server (LIS) is defined by NENA Standard 08-003 as the source of location for NG9-1-1. The LIS can be a database keyed by some quantity (IP address, MAC address, Telephone Number, etc.) or it can be a protocol converter between NG9-1-1 location protocols (e.g. HELD or SIP) and network specific location protocols (e.g. E2, MLP).

#### 2.3.3.6 Public Safety Answering Point (PSAP)

The Public Safety Answering Point (PSAP) can be either a legacy PSAP or NENA i3 PSAP. For legacy PSAPs the call is delivered from a Selective Router or a Legacy PSAP Gateway. An i3 PSAP is a SIP end point (client) within or connected through the ESInet.

#### 2.3.3.7 Selective Router (SR)

A Selective Router (also known as a Legacy Selective Router, Enhanced 9-1-1 Control Office, or 9-1-1 Selective Routing Tandem), routes emergency calls to the appropriate PSAP. . (See “NENA Master Glossary of 9-1-1 Terminology” <http://www.nena.org/default.asp?page=Glossary> for further details.)

### 2.3.4 Standards by Functional Entity and Interface

The following table identifies the NG9-1-1 related standards associated with the functional entities and the interface between functional entities.

**Table 2-2: Standards by Functional Entity / Interface**

Functional Entity / Interface		Associated Standards	Standards Status
<b>IMS</b>			
	E-CSCF Functional Entity	3GPP TS 23.167	Completed
	E-CSCF ↔ IBCF Interface	3GPP TS 24.229	Completed
	E-CSCF ↔ LRF Interface	3GPP TS 24.229	Completed
	E-CSCF ↔ P-CSCF Interface	3GPP TS 24.229	Completed
	E-CSCF ↔ S-CSCF Interface	3GPP TS 24.229	Completed
	IBCF Functional Entity	3GPP TS 23.228	Completed
	IBCF ↔ BCF Interface	3GPP TS 24.229	Completed
		NENA 08-003	Completed

Functional Entity / Interface		Associated Standards	Standards Status
	LRF Functional Entity	3GPP TS 23.167	Completed
	LRF ↔ ESRP Interface	IETF 3856	Completed
		IETF 4119	Completed
		IETF deref-protocol	In approval stage
		IETF sipcore-location-conveyance	In approval stage
	LRF ↔ i3 PSAP Interface	IETF 3856	Completed
		IETF 4119	Completed
		IETF deref-protocol	In approval stage
		IETF sipcore-location-conveyance	In approval stage
	P-CSCF Functional Entity	3GPP TS 23.167	Completed
		3GPP TS 23.228	Completed
	P-CSCF ↔ Access Network Interface	3GPP TS 24.229	Completed
	P-CSCF ↔ S-CSCF Interface	3GPP TS 24.229	Completed
	S-CSCF Functional Entity	3GPP TS 23.167	Completed
		3GPP TS 23.228	Completed
ESInet			
	BCF Functional Entity	ATIS-1000026.2008	Completed
		NENA 08-003	Completed
		NENA Emergency Services IP Network Design for NG9-1-1	In development
	BCF ↔ ESRP Interface	NENA 08-003	Completed
	ECRF Functional Entity	IETF RFC5222	Completed
		NENA 08-003	Completed
		NENA Emergency Services IP Network Design for NG9-1-1	In development
	ECRF ↔ ESRP Interface	IETF RFC5222	Completed
		NENA 08-003	Completed
	ESRP Functional Entity	IETF RFC3261	Completed
		NENA 08-003	Completed
		NENA Emergency Services IP Network Design for NG9-1-1	In development
	ESRP ↔ ESRP Interface	IETF RFC3261	Completed



Functional Entity / Interface		Associated Standards	Standards Status
		NENA 08-003	Completed
ESRP ↔ i3 PSAP Interface		IETF RFC3261	Completed
		NENA 08-003	Completed
Gateway ↔ PSAP		ATIS-0500007.2008	Completed
i3 PSAP Functional Entity			No comprehensive document. Several projects in development on various aspects.
PSAP ↔ Gateway		ATIS-0500002.2008	Completed
<b>Non-IMS IP based origination</b>			
Carrier Proxy Functional Entity		IETF RFC3261	Completed
		IETF phonebcp	In publication queue
Carrier Proxy ↔ SBC Interface		IETF RFC3261	Completed
Endpoint Functional Entity		IETF RFC3261	Completed
		IETF phonebcp	In publication queue
Endpoint ↔ Carrier Proxy ltf		IETF RFC3261	Completed
		IETF phonebcp	In publication queue
Endpoint ↔ ECRF Interface		IETF RFC5222	Completed
		IETF RFC5223	Completed
		IETF phonebcp	In publication queue
Endpoint ↔ LIS Interface		IETF RFC4119	Completed
		IETF RFC4776	Completed
		IETF RFC5139	Completed
		IETF RFC5491	Completed
		IETF RFC5774	Completed
		IETF RFC5985	Completed
		IETF RFC6155	Completed
		IETF RFC6225	Completed
		IETF phonebcp	In publication queue
SBC Functional Entity			Covered by BCF interfaces
SBC ↔ BCF Interface		IETF RFC3261	Completed
LIS Functional Entity		NENA 08-003	Completed
LIS ↔ ESRP Interface		IETF RFC3261	Completed
		IETF RFC4079	Completed
		IETF RFC4119	Completed
		IETF RFC5139	Completed



Functional Entity / Interface		Associated Standards	Standards Status
		IETF RFC5491	Completed
		IETF RFC5985	Completed
		IETF RFC6155	Completed
		IETF deref-protocol	In approval stage
LIS ↔ i3 PSAP Interface		IETF RFC3261	Completed
		IETF RFC4079	Completed
		IETF RFC4119	Completed
		IETF RFC5139	Completed
		IETF RFC5491	Completed
		IETF RFC5985	Completed
		IETF RFC6155	Completed
		IETF deref-protocol	In approval stage
Enterprise			
	Carrier Proxy Functional Entity	IETF RFC3261	Completed
		IETF phonebcf	In publication queue
	Carrier Proxy ↔ SBC Interface	IETF RFC3261	Completed
	Endpoint Functional Entity	IETF RFC3261	Completed
		IETF phonebcf	In publication queue
	Endpoint ↔ Carrier Proxy ltf	IETF RFC3261	Completed
		IETF phonebcf	In publication queue
	Endpoint ↔ ECRF Interface	IETF RFC5222	Completed
		IETF RFC5223	Completed
		IETF phonebcf	In publication queue
	Endpoint ↔ LIS Interface	IETF RFC4119	Completed
		IETF RFC4776	Completed
		IETF RFC5139	Completed
		IETF RFC5491	Completed
		IETF RFC5774	Completed
		IETF RFC5985	Completed
		IETF RFC6155	Completed
		IETF RFC6225	Completed
		IETF phonebcf	In publication queue
	SBC Functional Entity		Covered by BCF interfaces
	SBC ↔ BCF Interface	IETF RFC3261	Completed
	LIS Functional Entity	NENA 08-003	Completed

Functional Entity / Interface		Associated Standards	Standards Status
	LIS ↔ ESRP Interface	IETF RFC3261	Completed
		IETF RFC4079	Completed
		IETF RFC4119	Completed
		IETF RFC5139	Completed
		IETF RFC5491	Completed
		IETF RFC5985	Completed
		IETF RFC6155	Completed
		IETF deref-protocol	In approval stage
LIS ↔ i3 PSAP Interface	IETF RFC3261	Completed	
	IETF RFC4079	Completed	
	IETF RFC4119	Completed	
	IETF RFC5139	Completed	
	IETF RFC5491	Completed	
	IETF RFC5985	Completed	
	IETF RFC6155	Completed	
	IETF deref-protocol	In approval stage	
Relay ↔ BCF Interface	IETF RFC3261	Completed	
	IETF phonebcp	In publication queue	
	NENA 08-003	Completed	
Relay Services			
Relay Functional Entity	IETF RFC3261	Completed	
	IETF phonebcp	In publication queue	
	NENA 08-003	Completed	
Carrier Proxy ↔ Relay Interface	IETF RFC3261	Completed	
	IETF phonebcp	In publication queue	
	NENA 08-003	Completed	
Relay ↔ BCF Interface	IETF RFC3261	Completed	
	IETF phonebcp	In publication queue	
	NENA 08-003	Completed	
Legacy Network			
EO Functional Entity	NENA 03-005	Completed	
	Telcordia SR-4163	Completed	
EO ↔ LNG Interface	NENA 05-001	Completed	
	NENA 08-003	Completed	
Legacy Network IP ↔ LNG Interface	ATIS IMS ESInet P0030 Project Spec	In development	

Functional Entity / Interface		Associated Standards	Standards Status
	LNG Functional Entity	NENA 08-003	Completed
	LNG ↔ BCF Interface	NENA 08-003	Completed
	LNG ↔ ESRP Interface	NENA 08-003	Completed
	LNG ↔ i3 PSAP Interface	NENA 08-003	Completed
	MSC Functional Entity	NENA 05-001	Completed
	MSC ↔ Access Network Interface	NENA 05-001	Completed
<b>Transition Network</b>			
	ALI Functional Entity	NENA 04-005	Completed
	ALI ↔ Legacy PSAP Interface	NENA 04-005	Completed
	EO Functional Entity	NENA 03-005	Completed
	EO ↔ Selective Router Interface	NENA 03-005	Completed
	Legacy PSAP	NENA 04-001	Completed
	IP Selective Router ↔ IP PSAP	ATIS-0500019.2010	Completed
	LSRG Functional Entity	NENA 77-501	Completed
	LSRG ↔ ALI Interface	NENA 77-501	Completed
	LSRG ↔ BCF Interface	NENA 77-501	Completed
	LSRG ↔ ESRP Interface	NENA 77-501	Completed
	LSRG ↔ i3 PSAP Interface	NENA 77-501	Completed
	MSC ↔ Selective Router Interface	3GPP TS 29.010 NENA 03-005	Completed
	Selective Router Functional Entity	3GPP TS 29.010 NENA 03-005	Completed
	Selective Router ↔ Legacy PSAP Interface	3GPP TS 29.010 NENA 03-005	Completed
	Selective Router ↔ LSRG Interface	3GPP TS 29.010 NENA 03-005	Completed

### 2.3.5 List of Processes

1. Device
2. Access Networks
3. Origination Networks
  - a. IMS Origination Networks
  - b. Non-IMS Origination Networks

- c. Third party Originating Service Providers (e.g., OnStar, Relay services)
  - d. Legacy Origination Networks
- 4. ESInet
  - a. IP network
  - b. Core functions (DNS, DHCP, ...)
  - c. Interconnect with other ESInet
  - d. Interconnect with origination networks
  - e. Interconnect with access networks
  - f. ESInet to PSAP interface
  - g. Interconnection with other emergency service entities
  - h. Management
- 5. Location
  - a. PIDF-LO - the location interchange format
  - b. Functional definition of Location Information Server (and similar terms)
  - c. Location Configuration Protocols
  - d. Location Dereferencing Protocols
  - e. Location Query Protocols (to the extent we decide they are different from LCPs)
  - f. Location Validation
  - g. Interwork to existing location sources, such as ALI
- 6. GIS
  - a. Address, political boundary, and service boundary layer
  - b. Service boundary polygons – how we route
  - c. Data management, quality assurance
  - d. Distribution – how does it get from GIS to everything else
  - e. Adjustment of street/address layer to polygon layer
- 7. Call Signaling
  - a. Basic SIP call signaling
  - b. IMS SIP call signaling
- 8. Call Routing
  - a. Routing database (ECRF)
  - b. Routing proxies (ESRP)
  - c. Policy based routing

9. Media

- a. Voice
- b. Video
- c. Text
- d. Data only – “non-human initiated”
- e. RTT, IMS MMES, “total conversation”

10. Accessibility

- a. EAAC issues & gaps in i3

11. Callback

12. Additional Data about:

- a. Call
- b. Caller
- c. Premise (e.g. floor plans, alarm data, etc.)
- d. PSAP

13. Logging

- a. Within the ESInet and related functions
- b. Within the PSAP

14. Bridging / Conference Calls

15. Security

- a. Credentials
- b. Securing Protocol Interaction including authentication, integrity protection, privacy
- c. Attack Mitigation
- d. End User Location Integrity

16. Transition (including data)

- a. Wireline
- b. Wireless
- c. VoIP
- d. PSAP aspects
- e. Relay services (e.g., IP relay, Video relay, etc.)
- f. TTY
- g. Legacy PSAP

17. Testing

- a. Self-test

18. Discrepancy Reporting
19. Data Management & Maintenance
20. CPE/PSAP operations (NENA work in progress)

### 2.3.6 Standards by Category

The following table maps the standards to the NG9-1-1 transition category. The columns of the table are defined as follows:

Standard Number – Document number of the associated standard. The full document reference information is provided in

*Appendix A: Referenced Documents*

Standard Short Title – Short title of standard. The full document title is provided in

*Appendix A: Referenced Documents*

Critical for Deployment – Required standards for the transition to NG9-1-1

Critical for Competition – Required standards to allow for competition for NG9-1-1 access.

Desirable – Standard is not required for NG9-1-1 transition but provides additional capabilities that may be desired

Long Term (Post Transition) – Standards required for the long term NG9-1-1 end-to-end environment

Non-critical – Standard is not critical to the transition to NG9-1-1.

**Table 2-3: Standards by Category**

Standard Number	Standard Short Title	Critical for Deployment	Critical for Competition	Desirable	Long Term (Post Transition)	Non-Critical
3GPP TS 23.167	IMS Emergency Sessions	x	x		x	
3GPP TS 23.228	IMS Stage 2	x	x		x	
3GPP TS 24.229	IP multimedia call control	x	x		x	
3GPP TS 29.010	Signaling & MAP Protocol	x	x			

Standard Number	Standard Short Title	Critical for Deployment	Critical for Competition	Desirable	Long Term (Post Transition)	Non-Critical
ATIS-0500002. 2008	Emergency Services Messaging Interface (ESMI)	Depending on implementation option	X			
ATIS-0500007. 2008	Emergency Information Services Interface (EISI)	Depending on implementation option	X			
ATIS-0500019. 2010	Request for Assistance Interface (RFAI)	Depending on implementation option	X			
ATIS-1000026. 2008	SBC Functions & Requirements	X	X		X	
ATIS IMS ESInet P0030 Project Spec	IMS Emergency Procedures for IMS Origination & ESInet/Legacy Selective Router Termination	X	X		X	
IETF RFC3261	SIP	X	X		X	
IETF RFC3856	Presence Event Package for SIP	X	X		X	
IETF RFC4079	Presence Arch for Distribution of GEOPRIV Location Objects	X	X		X	
IETF RFC4119	Presence based GEOPRIV Location Object Format	X	X		X	
IETF RFC5139	Revised Civic Location Format for PIDF-LO	X	X		X	
IETF RFC5222	LoST	X	X		X	
IETF RFC5223	Discovering LoST Servers using DHCP	X	X		X	
IETF RFC5491	PIDF-LO Usage Clarification	X	X		X	
IETF RFC5985	HELD	X	X		X	
IETF RFC6155	Use of Device Identity in HELD	X	X		X	
IETF deref-protocol	Location Deferencing using HELD	X	X		X	
IETF phonebcf	Best Practice of Comm Services supporting Emergency Calling	Critical due to accessibility concerns	X		X	

Standard Number	Standard Short Title	Critical for Deployment	Critical for Competition	Desirable	Long Term (Post Transition)	Non-Critical
IETF sipcore-location-conveyance	Location Conveyance for SIP					
NENA 03-005	Requirements for E9-1-1 Selective Routing Switch	x	x			
NENA 03-509 v1	Femtocell Technical Info Doc			x		x
NENA 05-001	Wireless Emergency Service E2 Interface	x	x			
NENA 07-504 v1	Collision & Telematics Info			x		x
NENA 08-003	i3 Functional & Interface Standards	x	x		x	
NENA 08-505	Location Determination for IP based Emergency Services				x	
NENA 08-752 v1	Location Info for IP based Emergency Services		x		x	
NENA 71-001	NG9-1-1 Additional Data		x		x	
NENA 71-501	Synching GIS with MSAG & ALI	x				
NENA 73-501 v1	Non-Voice Centric Emergency Services		x		x	
NENA 75-001	Security for NG9-1-1	x	x		x	
NENA 77-501 v1	NG9-1-1 Transition Plan	x	x			
Telcordia SR-4163	E91-1-1 Service Description	x				



## 2.3.7 Standards Gaps

NG9-1-1 brings a wealth of new kinds of data into a PSAP. Most of the data is of interest to responders. NENA and APCO are working on standards that bring the data to the dispatcher. NPSTC has recently started to work on Multimedia Emergency Services use case and requirements that would to extend this data to responders but this may be the only effort to date. This is one of the largest gaps our work has identified.

**Table 2-4: Standards by Process**

Process		Applicable Standards	Identified Gaps
UE (IMS)		IETF phonebc 3GPP IMS Emergency Services ATIS focus group on over the top applications Cable Labs	Several are still in development There is no way to quantify all possible end user devices as related to standards.
Access Networks		3GPP wireless and broadband IMS networks Generic IP access networks – IETF phonebc Cable networks Legacy selective router Legacy network gateway Telecommunications network providers connecting by SS7 or CAMA	IMS networks for OTT origination Cable networks for both cable specific VoIP and OTT origination, DSL networks for both DSL specific VoIP and OTT origination including possibly FTTC and FTTH.
Origination Networks			
	IMS Origination Networks	3GPP TS 23.228, 23.167, 24.229 ATIS IMS ESInet project (P0030)	None
	Non-IMS Origination Networks	IETF phonebc	Possibly cable networks for both cable specific VoIP and OTT origination, DSL networks for both DSL specific VoIP and OTT origination including possibly FTTC and FTTH.
	Third party Originating Service Providers (e.g., OnStar, Relay services)	NENA 08-003	Some are proprietary but they must comply with ESInet interfaces using a standard public interface
	Legacy Origination Networks	Legacy selective router Legacy network gateway NENA 08-003 Telecommunications network providers connecting by SS7 or CAMA	
	Femto Cell	NENA 03-509 v1	Specification needs to be updated for NG9-1-1

Process		Applicable Standards	Identified Gaps
ESInet			
	IP network	NENA 08-003	Testing, Ops
	Core functions (DNS, DHCP, ...)	IETF	None
	Interconnect with other ESInet	NENA 08-003	Testing, Ops
	Interconnect with origination networks	NENA 08-003, IETF phonebcf	Testing, Ops
	Interconnect with access networks	NENA 08-003, IETF phonebcf	Testing, Ops
	ESInet to PSAP interface	NENA 08-003	Testing, Ops
	Interconnection with other emergency service entities	NENA 08-003, other NENA and APCO standards in development	Testing, Ops
	Management		NENA work in development
Location		3GPP ATIS IMS ESInet IETF NENA	
	PIDF-LO - the location interchange format	IETF 4119	IMS and IETF/NENA location format incompatibilities
	Functional definition of Location Information Server (and similar terms)		
	IP Based Emergency Services	NENA 08-505	Initial version is incomplete. Future revisions of document are required.
	Location Configuration Protocols		IMS OTT issues
	Location Dereferencing Protocols	IETF Deref	Depends on results of ATIS IMS ESInet work
	Location Query Protocols (to the extent we decide they are different from LCPs)		
	Location Validation	IETF 5222, IETF5223	
	Interwork to existing location sources, such as ALI	NENA LSRG	

Process		Applicable Standards	Identified Gaps
GIS & 9-1-1 Attribute Data			
	Address, political boundary, and service boundary layer	NENA GIS V3	
	Service boundary polygons – how we route	NENA GIS V3, NENA 08-003	
	Data management, quality assurance	NENA	Further work needed
	Distribution – how does it get from GIS to everything else	NENA 08-003, OGC	OGC work needs further standardization
	Adjustment of street/address layer to polygon layer	NENA ECRF/LVF	Further work needed
Call Signaling			
	Basic SIP call signaling	IETF 3261, IETF phonebc	
	IMS SIP call signaling	3GPP	IMS ESINET identified some gaps
Call Routing			
	Routing database (ECRF)	IETF 5222, 5223 NENA 08-003	
	Routing proxies (ESRP)	IETF 3261, phonebc & NENA 08-003	
	Policy based routing	NENA 08-003	
Media			
	Voice	3GPP, IETF, NENA	
	Video	3GPP, IETF, NENA	
	Text	3GPP, IETF, NENA	
	Data only – “non-human initiated”	3GPP, IETF, NENA	
	RTT, IMS MMES, “total conversation”	3GPP, IETF, NENA	
Accessibility			
	EAAC issues & gaps in i3	FCC EAAC ATIS INES Incubator FCC NG9-1-1 NPRM	EAAC report and recommendations need to be reviewed once finalized and approved and then gaps can be identified.  Output of FCC NG9-1-1 NPRM may identify additional gaps

Process		Applicable Standards	Identified Gaps
	Interface between IMS- originating networks and relay services	FCC EAAC ATIS	How do calls originating from IMS connect to the relay service. Also, given that 9-1-1 calls originating on IMS are direct to ESINet, how do the responders get notification that a relay service needs to be involved?  Need to have specification developed to define how IMS interfaces with Relay Service.
Callback		3GPP, IETF, NENA	
Additional Data about:			NENA 71-001: NENA Standard for NG9-1-1 Additional Data – There are significant gaps on how this data is obtained, stored, accessed, secured, and maintained.
	Call	NENA 08-003, 70-001 IETF additional data, 3GPP ATIS IMS ESInet	
	Caller	NENA 08-003, 70-001 ATIS IMS ESInet	Emergency Medical Data
	Premise (e.g. Floor plans, alarm data, etc.)	NENA 08-003, 71-001 NIST	Further work needed
	PSAP	APCO, NENA, EIDD	Further NIEM work needed
Logging			
	Within the ESInet and related functions	NENA 08-003	NENA and APCO have identified a number gaps such as Radio over IP
	Within the PSAP	NENA NG PSAP	
	NENA, IETF	Could have IMS and other origination network impacts.	
Bridging/Conference Calls		NENA, IETF	Could have IMS and other origination network impacts.
Security			
	Credentials	3GPP, IETF, NENA ATIS IMS ESInet	
	Securing Protocol Interaction including authentication, integrity protection, privacy	IETF, NENA 08-003 ATIS IMS ESInet	
	Attack Mitigation	NENA 08-003	
	End User Location Integrity – What extent should this be discussed in this report?	IETF ATIS IMS ESInet	Standards in development

Process		Applicable Standards	Identified Gaps
			NENA 77-501 v1 is the initial version of the transition plan to NG9-1-1 but there are still gaps remaining for some originating access network types.
Transition (including data)	Wireline	NENA	
	Wireless	NENA	
	VoIP	NENA	
	PSAP aspects	NENA ATIS RFAI	
	Relay services (e.g., IP relay, Video relay, etc.)	NENA	
	TTY	NENA	
	Legacy PSAP	NENA	
			Several gaps associated with Testing
Testing	Self-test	IETF, NENA	
		NENA	
Discrepancy Reporting		NENA	
Data Management & Maintenance		NENA	In development

## 2.4 Objective of CSRIC Working Group 1 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.

## 2.5 Analysis, Findings, and Recommendations of CSRIC Working Group 1 Subgroup 2

### Methodology

Recognizing 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.

## 2.5.1 NG9-1-1 Stakeholders

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

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 the *NENA NG9-1-1 Transition Plan Considerations*, and further delineates the agencies and organizations included as 9-1-1 entities.

## 2.5.2 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.

### 2.5.2.1 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.

### 2.5.2.2 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.

### **2.5.2.3 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.

### **2.5.2.4 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.

### **2.5.2.5 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.)

### **2.5.2.6 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.

## **2.5.3 Access Networks Descriptions**

Access Networks enable connectivity to telecommunication services.

### **2.5.3.1 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, satellite providers and, in some cases, power companies that deliver broadband connectivity to neighborhoods.

### **2.5.3.2 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.

### **2.5.3.3 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.

### **2.5.3.4 Satellite Providers**

Satellite providers are companies that host transmission networks to provide telecommunications services via satellite communication links to subscriber antennas. The satellites used within the network are in geostationary or geosynchronous orbit for optimum transmission. DirecTV and Dish Network are prominent satellite providers.

### **2.5.3.5 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 wireline and wireless)."

### **2.5.3.6 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.

### **2.5.3.7 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.

## **2.5.4 Originating Service Provider Descriptions**

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

### **2.5.4.1 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.

### **2.5.4.2 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.

#### **2.5.4.3 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.

#### **2.5.4.4 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.

#### **2.5.4.5 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.

#### **2.5.4.6 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 telematic services.

#### **2.5.4.7 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

## 2.5.5 NG9-1-1 Readiness Guidelines by Stakeholder Group

### 2.5.5.1 9-1-1 Entity

#### **PSAP/9-1-1 Authority Readiness**

The following checklist includes 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. 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).

#### **Technical Readiness Guidelines**

☐ **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 also been implemented in some areas.*

☐ **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 utilize 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.*

☐ **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.*

☐ **Assess training requirements for the public**

*Assuring that appropriate public expectations are established is critical*

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

*NG9-1-1 will provide additional functionality such as multimedia whose impact that has not been accounted for in legacy E9-1-1 systems*

☐ **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.*

### **2.5.5.2 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.<sup>1</sup>

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.<sup>2</sup> In addition, when in some cases prior foundations of a State's Public Utility 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.

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<sup>1</sup> 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.

<sup>2</sup> The USDOT NG9-1-1 Procurement Tool Kit (available at [www.its.dot.gov/ng911](http://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.

**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)

**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.

**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

**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

### **2.5.5.3 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 your GIS data meets the minimum required standards needed to function properly within the NG9-1-1 environment:

- ☐ The GIS data has been collected to meet the standards set forth in **NENA 02-014 - GIS Data Collection and Maintenance**.
- ☐ The ALI, GIS, and MSAG data has been standardized according to **NENA 02-010 - Standard Data Formats for 9-1-1 Data Exchange & GIS Mapping**.
- ☐ The GIS data has 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.

## **2.5.5.4 Governance**

### **Introduction**

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."<sup>3</sup> 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."<sup>4</sup> Without effectively addressing issues of policy, governance and regulation, NG9-1-1 will never realize its full vision of a "... new internetwork [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

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

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

most types of communication devices.”<sup>5</sup>

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.<sup>6</sup> In light of the above, the National 9-1-1 Program currently has a 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.<sup>7</sup> 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).”<sup>8</sup>

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.<sup>9</sup>

Following is a brief list of governance related responsibilities, activities and authorities essential to the full implementation of NG9-1-1.<sup>10</sup>

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

- ☐ 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

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<sup>5</sup> 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>.

<sup>6</sup> 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/csrc/CSRIC-WG4B-Final-Report.pdf>.

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

<sup>8</sup> Ibid.

<sup>9</sup> 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/>.

<sup>10</sup> 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.



### **Funding the NG9-1-1 System**

- ☐ 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**

- ☐ 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)**

- ☐ 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**

- ☐ 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**

- ☐ 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
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### **NG9-1-1 Awareness and Accessibility**

- ☐ Examined 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

#### **2.5.5.5 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. It is 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.

#### **Planning Considerations:**

- ☐ 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 gauge 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:**

- ☐ 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:**

- ☐ 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

## **2.5.6 Originating Service Providers**

### **Planning Considerations:**

- ☐ 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:**

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

### **Location Acquisition:**

- ☐ 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

### **2.5.6.1 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 network and it is expected that each agency will take a path based on their readiness, needs, available solutions, budget, perceived value 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.

Functional capabilities are realized through one or more functional processing elements that are provided in Appendix E.

## Appendix A: Referenced Documents

### 3GPP

3GPP TS 23.167, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS) emergency sessions*  
<http://www.3gpp.org/ftp/Specs/html-info/23167.htm>

3GPP TS 23.228, *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS); Stage 2*  
<http://www.3gpp.org/ftp/Specs/html-info/23228.htm>

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<http://www.3gpp.org/ftp/Specs/html-info/24229.htm>

3GPP TS 29.010, *3rd Generation Partnership Project; Technical Specification Group Core Network and Terminals; Information element mapping between Mobile Station - Base Station System (MS - BSS) and Base Station System - Mobile-services Switching Centre (BSS - MSC); Signaling procedures and the Mobile Application Part (MAP)*  
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### 3GPP2

3GPP2 S.R0006-529-A: *Wireless Features Description: Emergency Services*, July 2007  
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### 9-1-1

*9-1-1 Statewide Program Assessment Guidelines*  
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National 9-1-1 Program and the National 9-1-1 Resource Center: <http://www.911.gov/> .

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ATIS-0500007.2008, *Emergency Information Services Interface (EISI) Implemented with Web Services*, January 2008 <http://www.atis.org/docstore/default.aspx>

ATIS-0500019.2010, *Request for Assistance Interface (RFAI) Specification*, September 2010 <http://www.atis.org/docstore/default.aspx>

ATIS-1000026.2008, *Session/Border Control Functions and Requirements*, April 2008 <http://www.atis.org/docstore/default.aspx>

ATIS IMS ESInet P0030 Project Specification, *ATIS Standard for Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination*, Date: TBD

## FCC

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/csrc/CSRIC-WG4B-Final-Report.pdf>.

## IETF

IETF RFC3261, *SIP: Session Initiation Protocol*, June 2002  
<http://www.ietf.org/rfc/rfc3261.txt>

IETF RFC3856, *A Presence Event Package for the Session Initiation Protocol (SIP)*, August 2004 <http://www.ietf.org/rfc/rfc3856.txt>

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

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

Acronym	Definition
<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
<i>DOD</i>	Direct Outward Dialing
<i>DOE</i>	United States Department of Energy

Acronym	Definition
<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
<i>ESC</i>	Emergency Services Call
<i>ESCO</i>	Emergency Service Central Office

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

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

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



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



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

Acronym	Definition
	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 Invoice (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
<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

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

Acronym	Definition
<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>SRTTP</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
<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)

Acronym	Definition
<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
<i>UBR</i>	Unavailable Bit Rate
<i>UDDI</i>	Universal Description, Discovery and Integration
<i>UDP</i>	User Datagram Protocol
<i>UE</i>	User Equipment
<i>UIM</i>	User Identity Model
<i>UL</i>	Underwriters Laboratories
<i>uLPN</i>	Unique Local Public Safety Number

<b>Acronym</b>	<b>Definition</b>
<b>UNI</b>	Unbundled Network Interface
<b>UPS</b>	Uninterruptible Power Supply
<b>URI</b>	Uniform Resource Identifier
<b>URISA</b>	Urban and Regional Information Systems Association
<b>URL</b>	Uniform Resource Locator (location sensitive)
<b>URN</b>	Uniform Resource Name (location insensitive)
<b>USAR</b>	Urban Search and Rescue
<b>USF</b>	Universal Service Fund
<b>USGS</b>	United States Geological Survey
<b>USMC</b>	United States Marine Corps
<b>USNG</b>	United States National Grid
<b>USNO</b>	United States Naval Observatory
<b>USPS</b>	United States Postal Service
<b>USTA</b>	United States Telephone Association
<b>USTSA</b>	United States Telecommunications Suppliers Association
<b>UTC</b>	Universal Coordinated Time
<b>UTRA</b>	Universal Terrestrial Radio Access
<b>VBRnrt</b>	Variable Bit Rate non-real time
<b>VBRrt</b>	Variable Bit Rate real-time
<b>VC</b>	Virtual Circuit
<b>VCI</b>	Virtual Circuit Identifier
<b>VCIN</b>	Violent Crime Information Network
<b>VCO</b>	Voice Carry Over
<b>VDB</b>	Validation Data Base
<b>VDSL</b>	Very high-speed Digital Subscriber Line
<b>VE2</b>	Voice over Internet Protocol E2 Interface
<b>VEDS</b>	Vehicle Emergency Data Sets
<b>VEP</b>	VoIP End Point
<b>VESA</b>	Valid Emergency Services Authority
<b>VF</b>	Validation Function
<b>VFG</b>	Virtual Facility Group
<b>VI</b>	Video Interpreter
<b>VIN</b>	Vehicle Identification Number
<b>VLAN</b>	Virtual LAN
<b>VLR</b>	Visitor Location Register
<b>VoATM</b>	Voice over ATM
<b>VoDSL</b>	Voice over Digital Subscriber Link
<b>VoFR</b>	Voice over Frame Relay
<b>VoIP</b>	Voice over Internet Protocol
<b>VON</b>	Voice over Network
<b>VoP</b>	Voice over Packet
<b>VPC</b>	VoIP Positioning Center
<b>VPI</b>	Virtual Path Identifier
<b>VPN</b>	Virtual Private Network
<b>VRI</b>	Video Remote Interpreting
<b>VRS</b>	Video Relay Service
<b>VSP</b>	VoIP Service Provider
<b>W3C</b>	World Wide Web Consortium
<b>WAENS</b>	Wide Area Emergency Notification System
<b>WAN</b>	Wide Area Network
<b>WAP</b>	Wireless Access Point
<b>WCM</b>	Wireline Compatibility Mode

Acronym	Definition
<b>WFS</b>	Web Feature Service
<b>WG</b>	Working Group
<b>WGS 84</b>	World Geodetic System 1984
<b>WiFi®</b>	Wireless Fidelity
<b>WiMAX</b>	Worldwide Interoperability for Microwave Access
<b>WNC</b>	Wireless Network Controller
<b>WPS</b>	Wireless Priority Service
<b>WSDL</b>	Web Service Definition Language
<b>WSP</b>	Wireless Service Provider
<b>WSS</b>	Web Services Security
<b>WTSC</b>	Wireless Technologies and Systems Committee
<b>WWW</b>	World Wide Web
<b>XACML</b>	eXtensible Access Control Markup Language
<b>XML</b>	eXtensible Markup Language
<b>XMPP</b>	eXtensible Messaging and Presence Protocol
<b>XSD</b>	W3C XML Schema Definition
<b>XXXXX</b>	Indicates an error or mistake in typing (erasing the error)

## Appendix C: 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
<b>3GPP</b>	The 3 <sup>rd</sup> 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”.
<b>9-1-1</b>	A three-digit telephone number to facilitate the reporting of an emergency requiring response by a public safety agency.
<b>Access Provider</b>	An access provider is any organization that arranges for an individual or an organization to have access to the Internet.
<b>Alliance for Telecommunications Industry Solutions (ATIS)</b>	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. <a href="http://www.atis.org/">http://www.atis.org/</a>
<b>American National Standards Institute (ANSI)</b>	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. <a href="http://www.ansi.org/">http://www.ansi.org/</a>
<b>American Sign Language</b>	A visual/gestural, non-written language with its own unique syntax and grammar based on hand shapes, body movements and facial expressions.
<b>American Standard Code for Information Interchange (ASCII)</b>	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.
<b>Association of Public Safety Communications Officials (APCO)</b>	APCO is the world’s oldest and largest not-for-profit professional organization dedicated to the enhancement of public safety communications.
<b>Authentication</b>	A security term referring to the process of reliably identifying an entity requesting access to data or a service.
<b>Automatic Call Distributor (ACD)</b>	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.
<b>Automatic Location Identification (ALI)</b>	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.
<b>Automatic Number Identification (ANI)</b>	Telephone number associated with the access line from which a call originates.



Term	Definition
<b>Call</b>	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.
<b>Call Routing</b>	The capability to selectively route the 9-1-1 call to the appropriate PSAP.
<b>Call Session Control Function (CSCF)</b>	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).
<b>Carrier</b>	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.
<b>Catypes</b>	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.
<b>Domain (or Domain Name)</b>	The domain name (hostname) of an agency or element in an ESInet.
<b>Emergency Call Routing Function (ECRF)</b>	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.
<b>Emergency Call Session Control Function (E-CSCF)</b>	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.
<b>Emergency Routing Data Base (ERDB)</b>	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.
<b>Emergency Service Zone Routing Data Base (ERDB)</b>	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.
<b>Emergency Services Interconnection Forum (ESIF)</b>	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.
<b>Emergency Services IP Network (ESInet)</b>	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
<b><i>Emergency Services Query Key (ESQK)</i></b>	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.
<b><i>Emergency Services Routing Digit (ESRD)</i></b>	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.
<b><i>Emergency Services Routing Key (ESRK)</i></b>	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.
<b><i>Emergency Services Routing Number (ESRN)</i></b>	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.
<b><i>Emergency Services Routing Proxy (ESRP)</i></b>	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.
<b><i>Enhanced 9-1-1 (E9-1-1)</i></b>	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.
<b><i>Gateway</i></b>	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.
<b><i>Geocoding</i></b>	Translation of one form of location into another, typically a civic address into an x, y coordinate.
<b><i>Geographic Information System (GIS)</i></b>	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.
<b><i>Geo Location</i></b>	Latitude, longitude, elevation, and the datum which identifies the coordinate system used.
<b><i>Geospatial</i></b>	Data accurately referenced to a precise location on the earth's surface.
<b><i>GIS (Geographic Information System)</i></b>	A system for capturing, storing, displaying, analyzing and managing data and associated attributes which are spatially referenced.
<b><i>Global Positioning System (GPS)</i></b>	A satellite based Location Determination Technology (LDT).

Term	Definition
<b>Global Standard for Mobile Communications (GSM)</b>	International standard digital radio interface utilized by some North American PCS carriers.
<b>IP Public Safety Answering Point (i3 PSAP)</b>	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.
<b>Implementation and Coordination Office (ICO)</b>	National 9-1-1 Implementation and Coordination Office, previously known as the National 9-1-1 Program Office, currently jointly operated by NHTSA and the National Telecommunication Information Administration which was created and funded by the ENHANCE 9-1-1 Act of 2004. ( <a href="http://www.e-911ico.gov">http://www.e-911ico.gov</a> )
<b>Instant Messaging (IM)</b>	A method of communication generally using text where more than a character at a time is sent between parties nearly instantaneously
<b>Institute of Electrical and Electronic Engineers (IEEE)</b>	A publishing and standards making body responsible for many telecom and computing standards.
<b>Integrated Services Digital Network (ISDN)</b>	International standard for a public communication network to handle circuit-switched digital voice, circuit-switched data, and packet-switched data.
<b>Internet Engineering Task Force (IETF)</b>	Lead standard setting authority for internet protocols.
<b>Internet Protocol (IP)</b>	The method by which data is sent from one computer to another on the Internet or other networks.
<b>Internet Protocol Access Network (IP Access Network)</b>	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.
<b>Internet Protocol Address (IP Address)</b>	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.
<b>Internet Protocol-Connectivity Access Network (IP-CAN)</b>	The collection of network entities and interfaces that provides the underlying IP transport connectivity between the user endpoint and the IMS entities.
<b>Internet Protocol Multimedia Subsystem (IMS)</b>	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.
<b>Internet Protocol Relay Service (IP Relay Service)</b>	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.
<b>Internet Protocol Telephony (IP Telephony)</b>	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.
<b>Internet Service Provider (ISP)</b>	Company that provides Internet access to other companies and individuals
<b>Jurisdiction</b>	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.

<b>Term</b>	<b>Definition</b>
<b><i>Legacy Gateway</i></b>	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.
<b><i>Legacy PSAP</i></b>	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
<b><i>Legacy PSAP Gateway (LPG)</i></b>	An NG9-1-1 Functional Element which provides an interface between an ESInet and an un-upgraded PSAP
<b><i>Local Access and Transport Area (LATA)</i></b>	The geographical areas within which a local telephone company offers telecommunications services.
<b><i>Local Area Network (LAN)</i></b>	A transmission network encompassing a limited area, such as a single building or several buildings in close proximity.
<b><i>Local Exchange Carrier (LEC)</i></b>	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).
<b><i>Location</i></b>	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.
<b><i>Location Information Server (LIS)</i></b>	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.
<b><i>Location Interwork Function (LIF)</i></b>	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.
<b><i>Location to Service Translation (LoST) Protocol</i></b>	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.
<b><i>Location URI</i></b>	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.
<b><i>Location Validation</i></b>	Refers to the action of ensuring that a civic address can be used to discern a route to a PSAP.
<b><i>Mapping</i></b>	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
<b><i>Master Street Address Guide (MSAG)</i></b>	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.
<b><i>Media Gateway Control Protocol (MGCP)</i></b>	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.
<b><i>MESSAGE</i></b>	A SIP method which passes information, often an Instant Message, between endpoints in the body of the SIP message
<b><i>Mobile</i></b>	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.
<b><i>Mobile Position Center (MPC)</i></b>	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.
<b><i>Mobile Switching Center (MSC)</i></b>	The wireless equivalent of a Central Office, which provides switching functions from wireless calls.
<b><i>National Emergency Number Association(NENA)</i></b>	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.
<b><i>Network Layers Model</i></b>	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.
<b><i>Network Layer Security</i></b>	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.
<b><i>Network Location Determination</i></b>	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 PIDF-LO.
<b><i>Next Generation 9-1-1 (NG9-1-1)</i></b>	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.



<b>Term</b>	<b>Definition</b>
<b><i>NG9-1-1 Specific Interwork Function (NIF)</i></b>	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.
<b><i>Nomadic</i></b>	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.
<b><i>Nomadic VoIP Call</i></b>	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).
<b><i>Origination Network</i></b>	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.
<b><i>Packet</i></b>	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.
<b><i>Packet-Switched Data Networks</i></b>	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.
<b><i>Presence Information Data Format (PIDF)</i></b>	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.
<b><i>Presence Information Data Format – Location Object (PIDF-LO)</i></b>	Provides a flexible and versatile means to represent location information in a SIP header using an XML schema.
<b><i>Protocol</i></b>	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.
<b><i>Protocol Interworking Function (PIF)</i></b>	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.
<b><i>Provisioning Service provider (PSP)</i></b>	The component in an ESInet functional element that implements the provider side of a SPML interface used for provisioning
<b><i>Proxy</i></b>	An entity in a call path that is an intermediary, and not an endpoint.
<b><i>Proxy Call Session Control Function (P-CSCF)</i></b>	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
<b><i>Proxy or Proxy Server/Policy and Routing Server</i></b>	“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.
<b><i>Public Agency</i></b>	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.
<b><i>Public Safety Agency</i></b>	An entity that provides fire fighting, law enforcement, emergency medical or other emergency service.
<b><i>Public Safety Answering Point (PSAP)</i></b>	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.
<b><i>Quality of Service (QoS)</i></b>	As related to data transmission a measurement of latency, packet loss and jitter.
<b><i>Real Time Protocol (RTP)</i></b>	An IP protocol used to transport media (voice, video, text) which has a real time constraint.
<b><i>Real Time Text (RTT)</i></b>	Text transmission that is character at a time, as in TTY.
<b><i>Real-time Transport Control Protocol (RTCP)</i></b>	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.
<b><i>Real-Time Transport Protocol (RTP)</i></b>	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.
<b><i>Router</i></b>	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
<b><i>Selective Router</i></b>	(see Enhanced 9-1-1 Control Office)
<b><i>Selective Routing (SR)</i></b>	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).
<b><i>Selective Routing Data Base (SRDB)</i></b>	The routing table that contains telephone number to ESN relationships which determines the routing of 9-1-1 calls.
<b><i>Session Border Control</i></b>	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
<b><i>Session Initiation Protocol (SIP)</i></b>	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

Term	Definition
<b>Short Message Service (SMS)</b>	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.
<b>Simple Network Management protocol (SNMP)</b>	A protocol defined by the IETF used for managing devices on an IP network.
<b>Simple Network Time Protocol (SNTP)</b>	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.
<b>Spatial</b>	Relating to, occupying, or having the character of space. Geographic Information Systems store spatial data in regional databases. See Geospatial.
<b>Standards Development Organization (SDO)</b>	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.
<b>Stream Control Transport Protocol (SCTP)</b>	SCTP is defined by IETF RFC2960 as the transport layer to carry signaling messages over IP networks.
<b>Synchronous Optical NETWORK (SONET)</b>	High speed digital transport over fiber optic networks using synchronous protocol.
<b>TDD/TTY Detector</b>	Any device that automatically detects TDD/TTY tones and audibly and/or visually notifies the call-taker.
<b>Telecommunications Device for the Deaf (TDD)</b>	Also known as TTY. (see Teletypewriter (TTY))
<b>Telecommunications Industry Association (TIA)</b>	A lobbying and trade association, the result of the merger of the USTA (United States Telephone Association) and the EIA (Electronic Industries Association).
<b>Telecommunications Relay Service (TRS)</b>	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.
<b>Telecommunications Service Provider (TSP)</b>	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.
<b>Teletypewriter (TTY)</b>	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)
<b>Text Telephone</b>	Another term for TDD/TTY
<b>Third Generation Partnership Project 2 (3GPP2)</b>	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 <sup>®</sup> family of standards.



<b>Term</b>	<b>Definition</b>
<b><i>Transmission Control Protocol (TCP)</i></b>	A communications protocol linking different computer platforms across networks. TCP/IP functions at the 3 <sup>rd</sup> and 4 <sup>th</sup> levels of the open system integration model.
<b><i>Transmission Control Protocol/Internet Protocol (TCP/IP)</i></b>	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.
<b><i>Transport Control Protocol (TCP)</i></b>	The end to end reliability protocol that recognizes and corrects lower layer errors caused by connectionless networks.
<b><i>Video Relay Service (VRS)</i></b>	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.
<b><i>Voice over Internet Protocol, Voice over IP (VoIP)</i></b>	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.
<b><i>Voice over the Internet</i></b>	Transmit voice with varying consistency depending on overall traffic and engineering of the Internet circuits.
<b><i>Voice Service Provider (VSP)</i></b>	Operates the network equipment that provides call processing for Voice over Internet Protocol subscribers.
<b><i>VoIP Positioning Center (VPC)</i></b>	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.
<b><i>Wide Area Network (WAN)</i></b>	Network using common carrier-provided lines that covers an extended geographical area.
<b><i>Wireless Service Provider (WSP)</i></b>	Cellular, satellite or other radio based telephony or data transport commercial entity.
<b><i>Working Group (WG)</i></b>	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.
<b><i>X,y</i></b>	Shorthand expression for coordinates that identify a specific location in two dimensions representing latitude and longitude.

## Appendix D: 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"/> 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 E: 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 PSAPs 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.