The National 911 Program

Next Generation 911 (NG911) Standards Identification and Analysis

A compilation of existing and planned standards for NG911 systems

Washington, DC
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Introduction

One of the most critical aspects of transforming the Nation's public safety answering points (PSAP) from today's legacy 911 technology to Next Generation 911 (NG911) is adherence to a common set of methods and standards. Development and adoption of international standards will be key to achieving 911 interoperability across multiple local, regional, State, and national public safety jurisdictions, and beyond into the wider emergency communications environment. Based on conceptual definitions dating from 2000, NG911 standards development began in 2003, when the National Emergency Number Association (NENA) initiated technical requirements and definition work on the core Internet Protocol (IP) functionality and architecture.

A variety of standards already exist, and many are actively under development at all levels of technology. However, there is limited coordination across the broad NG911 community regarding what standards are available, what standards overlap, and what standards still need to be established. The National 911 Program, led by the U.S. Department of Transportation's (USDOT) National Highway Traffic Safety Administration (NHTSA), has compiled this list of standards activities related to NG911. This is a living document, and the National 911 Program will publish,[1] monitor, support, and promote the activities of standards development organizations (SDO) in establishing a comprehensive set of standards for NG911.

Input from the standards community and NG911 stakeholders at large is encouraged and appreciated. The National 911 Program can be reached at (202) 366-3485 or via e-mail at: nhtsa.national911@dot.gov.

What Is a Standard?

International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) Guide 2:2004, definition 3.2, defines a standard as[2]—

> ***A document established by consensus and approved by a recognized body that provides for common and repeated use, rules, guideline, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context.***

Standards affect the daily lives of everyone across the Nation. From the most mundane aspects of life (e.g., photographic film's speed rating to determine optimal exposure) to potentially life and death situations (e.g., the concentration of ingredients in generic medications), standards guide the quality, safety, and security of products or processes. Standards are widely used in all areas throughout the US Government, public, and private sectors.

Standards can be *voluntary*—by themselves imposing no requirement regarding use—or *mandatory*. Generally, a mandatory standard is published as part of a code, rule, or regulation by a regulatory government body and imposes an obligation on specified parties to conform to it. However, the distinction between these

[1] Available through the National 911 Program at: http://www.911.gov

[2] International Organization for Standardization (ISO), *ISO/IEC Directives, Part 2: Rules for the structure and drafting of International Standards.* http://isotc.iso.org/livelink/livelink?func=ll&objId=4230456&objAction=browse&sort=subtype (last accessed September 12, 2011)

two categories may be lost when voluntary consensus standards are referenced in government regulations, effectively making them mandatory standards.[3] Most standards are ***voluntary, consensus-based***, and ***open***: [4]

- Voluntary—Their use is not mandated by law
- Consensus-based—Published standards have attained general agreement through cooperation and compromise in a process that is inclusive of all interested parties
- Open—They are not proprietary and are available for anyone to use.

What Are Best Practices?

Typically less formal than standards, best practices are methods or techniques that have been identified as the most effective, efficient, and practical means to achieve an objective. Based on a repeatable process, best practices often emerge as the result of generally accepted principles followed by many individuals, groups, or organizations, which have been established over time. Best practices often supplement the standards process and act as common guidelines for policies and operations.

Stakeholders

Stakeholders in standardization encompass all groups that have an interest in a particular standard because those groups are likely to be most affected by changes and therefore want to contribute to the development process. NG911 stakeholders are members of a broad and diverse community of users who generally can be categorized as follows:

- 911 and public safety agencies and authorities
- Vendor community (including hardware and software) and related industries
- Technology, services, and consulting industries
- SDOs and standards setting organizations (SSO)
- Consumer, research, academic, and consortia communities
- Telematics, third-party call center, Internet, infrastructure, wireline, and wireless service providers
- Transportation agencies
- Local, State, and Federal governments
- Regulatory agencies and public utility commissions
- Professional and trade associations
- The public at large.[5]

Standards Organizations

Standards organizations are bodies, organizations, and institutions whose focus is developing and maintaining standards in the interest of a user community. These organizations can be governmental, quasi-governmental,

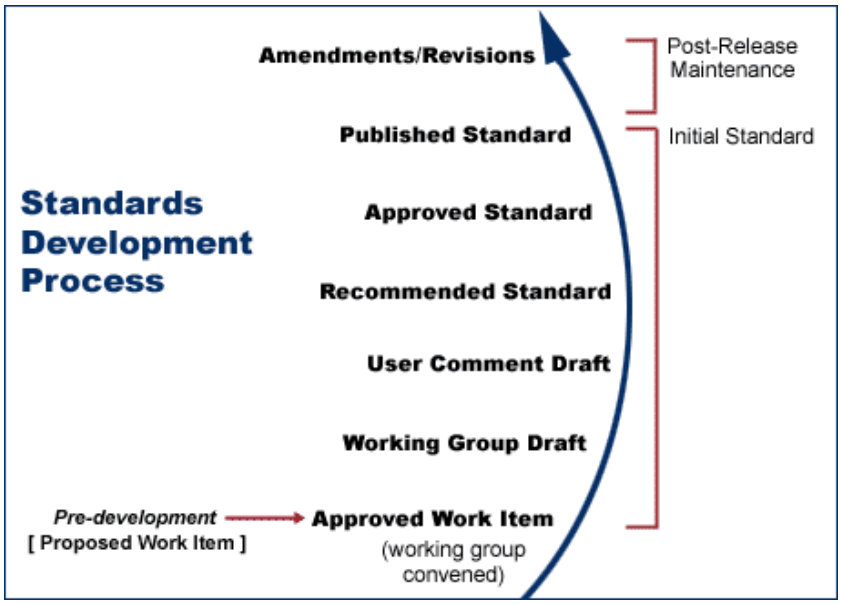
[3] Standards.gov *What Are Standards?* Available at: http://standards.gov/standards.cfm (last accessed September 12, 2011).
[4] RITA Intelligent Transport Systems. *What Are Standards?* Available at: http://www.standards.its.dot.gov/learn_WhatAre.asp (last accessed September 12, 2011).
[5] Although it is generally accepted that the public is an NG911 stakeholder (as the primary 911 call originator), typically any involvement with the standards process occurs only when they participate as part of another stakeholder group.

and non-governmental.[6] Typically, their mandate is geographically oriented—international, regional, or national. Organizations that establish, review, and maintain standards are considered to be SDOs,[7] although consortia are sometimes differentiated as SSOs. Generally speaking, SDOs and SSOs consistently adhere to a set of requirements or procedures that govern the standards development process.

How Are Standards Developed?

At the heart of the US standards system are voluntary standards that arise from a formal, coordinated, consensus-based, and open process. Developed by subject matter experts from both the public and private sectors, the voluntary process is open to all affected parties and relies on cooperation and compromise among a diverse range of stakeholders.

Although the development process may vary to some extent from organization to organization, fundamentally each has an established set of formally documented procedures for initiating, developing, reviewing, approving, and maintaining standards. As an example, the following diagram illustrates the USDOT Research and Innovative Technology Administration (RITA) Intelligent Transport Systems (ITS) standards development process[8]:



The Institute of Electrical and Electronics Engineers (IEEE) emphasizes that standards "are 'living documents,' meaning that they are constantly evolving and can be updated, superseded, or withdrawn."[9] Given that

[6] Quasi- and non-governmental standards organizations are often non-profit organizations.
[7] Standards Development Organization or Standard Developing Organization
[8] Research and Innovative Technology Administration (RITA) Intelligent Transportation Systems (ITS), *Standards Development Process.* http://www.standards.its.dot.gov/learn_StdsDevel.asp (last accessed September 12, 2011).
[9] IEEE, IEEE Volunteer Training Program. *What Are Standards?* Available at: http://ieee.org/web/volunteers/training/standards/01about.html (last accessed September 12, 2011).

standards development is an iterative process, often there are procedures for publishing draft and/or interim documents at different stages in the process prior to formal approval. Once approved, various factors can render a standard outdated, including technological advancements and new or revised requirements. For this reason, the majority of standards require periodic review and potentially, revision. As a general rule, organizations such as the American National Standards Institute (ANSI) and ISO assert that standards should be reviewed at intervals of not more than 5 years.[10]

What Is Standards Accreditation?

Typically, process accreditation bodies do not develop standards but instead provide accreditation services for the purpose of assessing and certifying the standards development process of other SDOs. For example, ANSI facilitates development of American National Standards (ANS) by accrediting the procedures of SDOs. Accreditation by ANSI signifies that the procedures used by the standards body in connection with the development of ANSIs meet the Institute's essential requirements for openness, balance, consensus, and due process.[11] Given the voluntary nature of standards, SDOs are not mandated to attain accreditation. However, accreditation does demonstrate adherence and conformity with a formal and recognized standards development process. Given the expense and time involved, not all SDOs pursue accreditation although they likely still adhere to a similarly rigorous standards development process.

Types of Standards

In an effort to organize the numerous standards that are of interest and applicability to the NG911 community, this document groups standards into the following six categories:

- **Product Standard**—Describes the expectations and minimum requirements for a particular product, typically in the context of a specific use. Product standards would most often be reflected in description of hardware, software, and other technology solutions
- **Interface Standard**—Describes the requirements for connecting two or more systems, or technologies to one another. User interface standards would describe the interconnection between a human and a machine
- **Data Standard**—Describes the definition, format, layout, and other characteristics of data stored within a system or shared across other systems. Data standards help to ensure the seamless exchange of data between disparate systems and permit a common understanding to interpret and use data consistently
- **Test Standard**—Describes the test methodologies, processes, and other requirements associated with determining the performance or fitness of a particular product
- **Performance Standard**—Describes how a product or service should function, often in terms of quality, quantity, or timeliness

[10] International Organization of Standardization. *How are ISO standards developed?* Available at: http://www.iso.org/iso/standards_development/processes_and_procedures/how_are_standards_developed.htm (last accessed September 12, 2011).

[11] American National Standards Institute, Standards Activities. *Domestic Programs (American National Standards) Overview* Available at: http://www.ansi.org/standards_activities/domestic_programs/overview.aspx (last accessed September 12, 2011).

- **Operational Standard—**Describes how a function or business process should occur, setting minimum requirements for performance or delivery. Operational standards could include standard operating procedures (SOP), training guidelines, and policies.

The first three categories (product, interface, and data) are primarily ***design standards*** that describe how a product should be developed and define the particular attributes or characteristics associated with its construction. Alternately, ***performance standards*** describe how a product should function and the testing used to determine that it meets all affirmed requirements.

The Need for Standards in NG911

It is imperative that the necessary NG911 related standards and technology are determined and available for the 911 Authorities and PSAPs to support transitioning to an open, non-proprietary NG911 system. Without the critical standards and technologies in place, service and equipment providers may develop new, vendor-specific solutions that will not benefit the global community. This un-standardized, unplanned approach can and will affect the ability of PSAPs and emergency response entities to effectively share information and be interoperable. Furthermore, without the critical processes and protocols (e.g., certification and authentication, routing business rules), the benefits of the NG911 system, including routing based on criteria beyond location and connection of service providers beyond common carriers to the 911 system, may not be realized. The appropriate use of standards will ensure the compatibility and interoperability required to realize the full potential of NG911.

Standards Affecting NG911

It is important to identify, understand, and actively monitor those standards that are most likely to have a significant impact on the implementation of NG911. This is consistent with the National Technology Transfer and Advancement Act of 1995,[12] which directs government agencies to use "voluntary consensus standards" created by standards development organizations. Specifically, it instructs federal agencies, such as USDOT, to participate in the standards development process so that these organizations remain aware of USDOT's position on relevant standards. This involvement is expected to influence overall development thus ensuring that the resulting standard is appropriate for use by federal agencies.

The specific standards identified in this document are limited to those most directly germane to NG911. For example, numerous technical standards are associated with the existing access and originating networks. However, this document undertakes to highlights only those relating to the changes required to support the enhanced capability, such as emergency call support provisioning between the assortment of client devices and the Emergency Services IP Networks (ESInet). Standards involving network interfaces, including Voice over Packet (VoP), Voice over Internet Protocol (VoIP), or Voice over Digital Subscriber Line (VoDSL), although critical to the end-to-end architecture, are too detailed and non-specific to NG911 for inclusion.

[12] P.L. 104-113. Available at: http://standards.gov/standards_gov/nttaa.cfm (last accessed September 12, 2011).

Standards and Best Practices Organizations

The following section identifies the work performed and currently underway by professional organizations and SDOs involved with the requirements and specifications pertaining to the implementation of NG911. For each, a summary of the organization includes its purpose (e.g., charter, mission statement), pertinent sub-groups (e.g., committees, working groups) within the organization, standards involvement, formal activities coordinated with other SDOs, and a statement of the effect of its activities on NG911 implementation. Additionally, the following section puts into perspective how involved 911 is with the broader world of emergency response and public safety.

Immediately following the next section is a detailed analysis of the additional standards development work that remains for the successful implementation of NG911. Specifically, the work performed and currently underway in the following section was analyzed to determine the necessary work in the current, near, and long term to complete and accept NG911 open standards.

3rd Generation Partnership Project (3GPP)

Name 3rd Generation Partnership Project (3GPP)

Type International Standards Organization—Industry (Mobile Broadband/UTMS)

Summary 3GPP is a collaboration among groups of telecommunications associations to develop a globally applicable third-generation (3G) mobile telephone system specification within the scope of the International Mobile Telecommuncations-2000 (IMT-2000) project of the International Telecommunication Union (ITU). 3GPP specifications are based on the Universal Mobile Telecommunications System (UMTS) 3G mobile technology standards.

Purpose The purpose of 3GPP is to prepare, approve, and maintain globally applicable Technical Specifications and Technical Reports for—

- An evolved 3G and beyond mobile system based on the evolved 3GPP core networks and the radio access technologies supported by the Partners (i.e., UTMS Terrestrial Radio Access [UTRA] both Frequency Division Duplex [FDD] and Time Division Duplex [TDD] modes), to be developed by the Organizational Partners into appropriate deliverables (e.g., standards)
- The Global System for Mobile communication (GSM), including GSM evolved radio access technologies (e.g., General Packet Radio Service [GPRS] and Enhanced Data rates for GSM Evolution [EDGE])
- An evolved IP Multimedia Subsystem (IMS] developed in an access-independent manner.[13]

Relevant Specification Groups

- TSG CT Technical Specification Group Core Network and Terminals: The TSG Core Network and Terminals (TSG CT) is responsible for specifying terminal interfaces (logical and physical), terminal capabilities (such as execution environments) and the core network element of 3GPP systems.[14]

Standards

- 3GPP TS 23.167: *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS) emergency sessions*
- 3GPP TS 23.517: *3rd Generation Partnership Project; Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS); Functional Architecture.*

[13] 3rd Generation Partnership Project. *Third Generation Partnership Project Agreement* Available at: http://www.3gpp.org/ftp/Inbox/2008_web_files/3gppagre.pdf (last accessed September 12, 2011).
[14] 3rd Generation Partnership Project. *CT Plenary Core Networks and Terminals* Available at: http://www.3gpp.org/CT (last accessed September 12, 2011).

Coordinated Activities	• Open Mobile Alliance (OMA): Based on the "OMA-3GPP Standardization Collaboration," the OMA and the 3GPP will work to update on a regular basis the list of dependencies between each organization's specifications and work in progress.[15]
Effects on NG911	• Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data) • Develops standards adhered to by originating service providers' (OSP) network and applications services for emergency calling • Supports location requirements and standards.
Website	http://www.3gpp.org/

[15] Open Mobile Alliance. *3GPP Dependencies* Available at: http://www.openmobilealliance.org/Technical/3gpp.aspx (last accessed September 12, 2011).

3rd Generation Partnership Project 2 (3GPP2)

Name 3rd Generation Partnership Project 2 (3GPP2)

Type International Standards Organization—Industry (Mobile Broadband/UTMS)

Summary The 3GPP2 is a collaboration among groups of telecommunications associations to develop a globally applicable 3G mobile telephone system specification within the scope of the IMT-2000 project of the ITU. 3GPP2 specifications are based on the Code Division Multiple Access 2000 (CDMA2000) 3G mobile technology standards.

3GPP2 can be characterized as a collaborative 3G telecommunications specifications-setting project—

- Comprising North American and Asian interests developing global specifications for ANSI/Telecommunications Industry Alliance (TIA)/Electronics Industry Alliance (EIA)-41 Cellular Radiotelecommunication Intersystem Operations network evolution to 3G
- Developing global specifications for the radio transmission technologies (RTT) supported by ANSI/TIA/EIA-41.

3GPP2 was born out of the ITU's "IMT-2000" initiative, covering high-speed, broadband, and IP-based mobile systems featuring network-to-network interconnection, feature/service transparency, global roaming, and seamless services independent of location. IMT-2000 is intended to bring high-quality mobile multimedia telecommunications to a worldwide mass market by achieving the goals of increasing the speed and ease of wireless communications, responding to the problems faced by the increased demand to pass data via telecommunications, and providing "anytime, anywhere" services.[16]

[16] 3rd Generation Partnership Project 2. *About 3GPP2 What is 3GPP2?* Available at: http://www.3gpp2.org/Public_html/Misc/AboutHome.cfm (last accessed September 12, 2011).

Relevant Specification Groups

- TSG-S Technical Specification Group Services and Systems Aspects[17]: The Services and Systems Aspects TSG (TSG-S) is responsible for development of service capability requirements for systems based on 3GPP2 specifications. It is also responsible for high-level architectural issues, as required, to coordinate service development across the various TSGs. Specifically, it is responsible for—
    - Definition of services, network management, and system requirements to support regional and international 3G and beyond market needs
    - Development and maintenance of network architecture and associated system requirements and reference models
    - Tracking of services, network management, and features development activities across TSGs
    - Technical coordination of inter-TSG activities
    - Management of work items placed within its responsibility
    - Validation and verification of specification text it develops.[18]

- TSG-X Technical Specification Group Core Networks: The TSG Core Networks (TSG-X) is responsible for the specifications of the core network part of systems, based on 3GPP2 specifications. Specifically, it is responsible for—
    - Core network internal interfaces for call-associated and non-call-associated signaling
    - IP technology to support wireless packet data services, including voice and other multimedia services
    - Core network internal interfaces for bearer transport
    - Encouragement of synergy with other relevant standards/specifications setting bodies
    - Charging, accounting, and billing specifications
    - Management of work items placed within its responsibility;
    - Validation and verification of specification text it develops. [19]

Standards

- 3GPP2 S.R0006-529-A: *Wireless Features Description: Emergency Services*
- 3GPP2 X.S0049-0: *All-IP Network Emergency Call Support*
- 3GPP2 X.S0060-0: *HRPD Support for Emergency Services.*

[17] 3rd Generation Partnership Project. *CT Plenary Core Networks and Terminals* Available at: http://www.3gpp.org/CT (last accessed September 12, 2011).
[18] 3rd Generation Partnership Project 2. *TSG-S Services and Systems Aspects* Available at: http://www.3gpp2.org/Public_html/S/index.cfm (last accessed September 12, 2011).
[19] 3rd Generation Partnership Project 2. *TSG-X Core Networks* Available at: http://www.3gpp2.org/Public_html/X/index.cfm (last accessed September 12, 2011).

Coordinated Activities

- Open Mobile Alliance (OMA): Based on the "OMA-3GPP2 Standardization Collaboration," the OMA and the 3GPP2 will work to update on a regular basis the list of dependencies between each organization's specifications and work in progress[20]
- Telecommunications Industry Association (TIA): 3GPP2 is a collaborative effort among five officially recognized SDOs—Association of Radio Industries and Businesses (ARIB), China Communications Standards Association (CCSA), Telecommunications Technology Association (TTA), Telecommunications Technology Committee (TTC), and TIA.

Effects on NG911

- Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data)
- Supports location requirements and standards.

Website http://www.3gpp2.org/

[20] Open Mobile Alliance. *3GPP2 Dependencies* Available at: http://www.openmobilealliance.org/Technical/3gpp2.aspx (last accessed September 12, 2011).

American National Standards Institute (ANSI)

Name American National Standards Institute (ANSI)

Type National Standards Organization

Summary ANSI is a private, not-for-profit organization that oversees development of voluntary consensus standards in the United States. Activities include accrediting programs, assessing conformance, and approving standards developed by organizations such as Alliance for Telecommunications Industry Solutions (ATIS), and Association of Public-Safety Communication Officials (APCO). Membership is composed of Government agencies, academic and international bodies, and individuals. ANSI is the official US representative to the ISO and, via the US National Committee, the IEC.

Mission To enhance both the global competitiveness of US business and the US quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity.[21]

Relevant Standards Panel

- Homeland Security Standards Panel (HSSP): ANSI's Homeland Security Standards Panel (ANSI-HSSP) has as its mission to identify existing consensus standards, or, if none exist, assist the Department of Homeland Security (DHS) and those sectors requesting assistance to accelerate development and adoption of consensus standards critical to homeland security. The ANSI-HSSP promotes a positive, cooperative partnership between the public and private sectors to meet the needs of the nation in this critical area.[22]

Standards

- ANSI/TIA/EIA-41: *G3G CDMA-DS to ANSI/TIA/EIA-41*
- ANSI/TIA-102: *Project 25—Data Overview*
- ANSI/TIA-1057: *Telecommunication—IP Telephony Infrastructure—Link Layer Discovery Protocol for Media Endpoint Devices (LLDP-MED).*

[21] American National Standards Institute. *About ANSI Overview* Available at: http://www.ansi.org/about_ansi/overview/overview.aspx (last accessed September 12, 2011).
[22] ANSI Standards Activities. *Homeland Security Standards Panel* Available at: http://www.hssp.org/standards_activities/standards_boards_panels/hssp/overview.aspx (last accessed September 12, 2011).

Coordinated Activities	• National Institute of Standards and Technology (NIST): A Memorandum of Understanding (MOU) exists between NIST and ANSI that agrees on the need for a unified national approach to develop the best possible national and international standards[23] • ISO: ANSI is the sole US representative and dues-paying member of the ISO. As a founding member of the ISO, ANSI plays a strong leadership role in its governing body while U.S. participation. [24]
Effects on NG911	• Validates the standards development process for SDOs that produce standards affecting NG911.
Website	http://www.ansi.org/

[23] National Institute of Standards of Technology Standards Coordination and Conformity Group. *MEMORANDUM OF UNDERSTANDING between the American National Standards Institute (ANSI) and the National Institute of Standards and Technology (NIST)* Available at: http://ts.nist.gov/Standards/Conformity/ansimou.cfm (last accessed September 12, 2011)
[24] American National Standards Institute. *ANSI Accredited of U.S. Technical Advisory Groups (TAGs) to ISO* Available at: http://www.ansi.org/standards_activities/iso_programs/tag_iso.aspx (last accessed September 12, 2011).

Association of Public-Safety Communication Officials (APCO)

Name Association of Public-Safety Communication Officials (APCO)

Type Standards Setting Organization – Industry (Public Safety Communications)

Summary APCO International is the world's largest organization dedicated to public safety communications and is an ANSI-accredited SDO committed to ensuring public safety communications personnel have a role in the development of standards that affect the industry. APCO's standards development activities have a broad scope, ranging from actual development of standards to representation of public safety communications organizations in other standards development areas.[25]

Mission APCO International is a member-driven association of communications professionals that provides leadership, influences public safety communications decisions of government and industry, promotes professional development, and fosters the development and use of technology for the benefit of the public.[26]

Relevant Committees

- 911/ Emerging Technologies: The 911/Emerging Technologies Committee provides subject-matter experts to the International Committee related to US 911 issues, has established at least two strategic alliances related to the mission of APCO, provides leadership opportunities for committee members by establishing work groups within the 911 Committee, and has established a 911 public policy work group to identify key areas of public policy that APCO should influence or advocate for related 911 operations and effectiveness.[27]

Relevant Projects

- Project 25: A joint effort of APCO and the National Association of State Telecommunications Directors, Project 25 concerns the development of standards for digital telecommunications technology, including an objective to determine consensus standards for digital radio equipment embracing elements of interoperability, spectrum efficiency, and cost economies[28]
- Project 42 (Global Operating Picture): The goal of Project 42 is to identify those areas where standards are needed to achieve system interoperability and create a common operating picture at all levels, horizontal and vertical.[29]

[25] APCO. *About APCO* Available at: http://www.apcointl.org/new/about (last accessed September 12, 2011).
[26] APCO. *Communications Center & 911 Services* Available at: http://www.apcointl.com/new/commcenter911/standards.php (last accessed September 12, 2011).
[27] APCO. *Committees* Available at: http://www.apcointl.org/about/911/committees.php (last accessed September 12, 2011).
[28] APCO. *Communication Center & 911 Services APCO Projects* Available at: http://www.apcointl.org/new/commcenter911/projects.php (last accessed September 12, 2011).
[29] APCO. *Communication Center & 911 Services APCO Projects* Available at: http://www.apcointl.org/new/commcenter911/projects.php (last accessed September 12, 2011).

Standards

- APCO ANS 1.101.2-2010: *Standard for Public Safety Telecommunicators When Responding to Calls Pertaining to Missing, Abducted, and Sexually Exploited Children*
- APCO/NENA ANS 1.102.2-2010: Public Safety Answering Point (PSAP) Service Capability Criteria Rating Scale
- APCO/NENA ANS 1.105.1-2009: *Standard for Telecommunicator Emergency Response Taskforce (TERT) Deployment*
- APCO ANS 1.106.1-2009: *Core Competencies For Public Safety Communications Manager/Director*
- APCO/CSAA 2.101.1-2008: *Alarm Monitoring Company to Public Safety Answering Point (PSAP) Computer-Aided Dispatch (CAD) External Alarm Interface Exchange*
- APCO ANS 3.103.1-2010: *Minimum Training Standards for Public Safety Telecommunicators*
- APCO ANS 3.101.1-2007: Minimum Training Standards for Public Safety Communications Training Officer.

Coordinated Activities

- ANSI: As an ANSI-accredited Standards Developer (ASD), APCO International is dedicated to ensuring public safety communications personnel have a role in the development of standards that affect communication professionals.[30]

Websites

http://www.apcointl.org/

http://www.apcostandards.org/

[30] APCO. *Communication Center & 911 Services APCO International Standards Development Activities* Available at: http://apcointl.org/new/commcenter911/restructure/standards.php (last accessed September 12, 2011).

Alliance for Telecommunications Industry Solutions (ATIS)

Name Alliance for Telecommunications Industry Solutions (ATIS)

Type Standards Setting Organization—Industry (Telecommunications)

Summary ATIS is a standards organization that develops technical and operational standards for the telecommunications industry. Member companies include telecommunications service providers, equipment manufacturers, public sector entities, and others. The ATIS is accredited by ANSI; is a member organization of other standards organizations, including the Radiocommunication Sector (ITU-R) and Standardization Sector (ITU-T) of the ITU; and is an Organizational Partner of 3GPP.

ATIS prioritizes a wide range of industry technical and operational issues, and creates interoperable, implementable standards and solutions in a manner that efficiently allocates and coordinates industry resources. Its activities provide the basis for the industry's delivery of—

- Existing and next generation IP-based infrastructures
- Reliable converged multimedia services, including IPTV
- Enhanced operations support systems and business support systems
- Improved levels of service quality and performance.[31]

Relevant Committees/ Subcommittees

- Emergency Services Interconnection Forum (ESIF): ESIF, composed of wireless and wireline network service providers, manufacturers, public sector entities, and providers of support services, facilitates identification and resolution of technical issues related to the interconnection of telephony and emergency services networks[32]
  - Next Generation Emergency Services Subcommittee (NGES): The NGES Subcommittee coordinates emergency services needs and issues with and among SDOs and industry forums/committees, and within and outside ATIS; and develops emergency services (such as E911) standards and other documentation related to advanced (i.e., next generation) emergency services architectures, functions, and interfaces for communications networks [33]
- Packet Technologies and Systems Committee (PTSC): PTSC develops and recommends standards and technical reports related to packet services and packet service architectures, in addition to related subjects under

[31] ATIS. *About ATIS* Available at: http://www.atis.org/about/ (last accessed September 12, 2011).
[32] ATIS. *Committees & Forums* Available at: http://www.atis.org/committees/index.asp (last accessed September 12, 2011).
[33] ATIS. *NGES: Next Generation Emergency Services Subcommittee* Available at: http://www.atis.org/esif/nges.asp (last accessed September 12, 2011).

	consideration in other North American and international standards bodies[34] • Wireless Technologies and Systems Committee (WTSC): WTSC develops and recommends standards and technical reports related to wireless and/or mobile services and systems, including service descriptions and wireless technologies. WTSC also develops and recommends positions on related subjects under consideration in other North American, regional, and international standards bodies.[35]
Standards	• ATIS-0500002: *Emergency Services Messaging Interface (ESMI)* • ATIS-0500006: *Emergency Information Services Interfaces (EISI) ALI Service* • ATIS-0500007: *Emergency Information Services Interface (EISI) Implemented with Web Services* • ATIS-0500019: *Request for Assistance Interface (RFAI) Specification.*
Coordinated Activities	• 3GPP, European Telecommunications Standards Institute (ETSI), ITU, NENA: The NGES Subcommittee emphasizes standards development as it relates to North American communication networks, in coordination with the development of standards activities, include relevant ATIS committees (e.g., PTSC), ITU, 3GPP, ETSI, and NENA [36] • ANSI: ATIS is an ANSI accredited SDO.[37]
Effects on NG911	• Develops standards adhered to by originating service providers' (OSP) network and applications services for emergency calling • Supports location requirements and standards.
Websites	http://www.atis.org/

[34] ATIS. *The Packet Technologies and Systems Committee (PTSC)* Available at: http://www.atis.org/0191/index.asp (last accessed September 12, 2011).
[35] ATIS. *The Wireless Technologies and Systems Committee (WTSC)* Available at: http://www.atis.org/0160/index.asp (last accessed September 12, 2011).
[36] ATIS. *NGES: Next Generation Emergency Services Subcommittee* Available at: http://www.atis.org/esif/nges.asp (last accessed September 12, 2011).
[37] American National Standards Institute. *ANSI Accredited Standards Developers* Available at: http://publicaa.ansi.org/sites/apdl/Documents/Standards%20Activities/American%20National%20Standards/ANSI%20Accredited%20Standards%20Developers/AUG11ASD-basic.pdf(last accessed September 12, 2011).

Broadband Forum

Name	Broadband Forum (BBF)
Type	Industry (Broadband)
Summary	The BBF is the central organization driving broadband wireline solutions and empowering converged packet networks worldwide to better meet the needs of vendors, service providers and their customers.
Mission	Develop multi-service broadband packet networking specifications addressing interoperability, architecture, and management. Our work enables home, business and converged broadband services, encompassing customer, access, and backbone networks. [38]
Relevant Working Groups	• End-to-End Architecture: This group's mission is to oversee and coordinate all access architecture and transport-related technical work within the Forum. Scope includes access architecture encompassing interface definitions and nodal functional requirements—from Residential Gateway (RG) through Access Node, aggregation network and Broadband Network Gateway (BNG) to peering interfaces with network and application service providers. The focus is end-to-end service delivery across this domain encompassing equipment requirements to support capabilities such as quality of service (QoS) and multicast functionality. Working group interests also encompass policy and control of the key network elements and protocol interworking requirements. All broadband wireline access technologies are within scope of this access architecture work (e.g., DSL, Gigabit Passive Optical Network, point-to-point fiber). Wireless broadband access technologies are addressed via liaison with the appropriate standards body (e.g., WiMAX Forum, 3GPP, etc.). Consideration is also given to the relative energy efficiency aspects of access architectures[39] • Broadband Home: This group's mission is to provide the Broadband industry with technical specifications that define the devices in the DSL broadband Home and eases the deployment and management of broadband services. [40]
Coordinated Activities	• WiMAX Forum • 3GPP.

[38] Broadband Forum. *Technical Working Groups* Available at: http://www.broadbandforum.org/technical/technicalworkinggroups.php (last accessed September 12, 2011).
[39] Broadband Forum. *Technical Working Groups* Available at: http://www.broadband-forum.org/technical/technicalworkinggroups.php (last accessed September 12, 2011).
[40] Broadband Forum. *Technical Working Groups* Available at: http://www.broadband-forum.org/technical/technicalworkinggroups.php (last accessed September 12, 2011).

Effects on NG911	• Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data).
Website	http://www.broadband-forum.org/

CableLabs

Name	Cable Television Laboratories, Inc. (CableLabs®)
Type	International Standards Organization - Industry (Cable)
Summary	CableLabs® is a non-profit research and development consortium dedicated to pursuing new cable telecommunications technologies and to helping its cable operator members integrate those technical advancements into their business objectives.[41]
Mission	In collaboration with CableLabs member companies and their suppliers, our mission is to efficiently evolve cable networks, services, and operations.
Coordinated Activities	• ITU.
Effect on NG911	• Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data).
Website	http://www.cablelabs.com/

[41] CableLabs. *About CableLabs* Available at: http://www.cablelabs.com/about/ (last accessed September 12, 2011).

Commission on Accreditation for Law Enforcement Agencies (CALEA)

Name	Commission on Accreditation for Law Enforcement Agencies (CALEA)
Type	Professional Organization
Summary	CALEA® was created as a credentialing authority through the joint efforts of law enforcement's major executive associations—International Association of Chiefs of Police (IACP), National Organization of Black Law Enforcement Executives (NOBLE), National Sheriffs' Association (NSA), and the Police Executive Research Forum (PERF). The purpose of CALEA's Accreditation Program is to improve the delivery of public safety services, primarily by maintaining a body of standards, developed by public safety practitioners, that covers a wide range of up-to-date public safety initiatives; establishing and administering an accreditation process; and recognizing professional excellence.[42]
Relevant Committees	• Standards Review and Interpretation Committee (SRIC).
Website	http://www.calea.org/

[42] Commission on Accreditation for Law Enforcement Agencies. *About Us* Available at: http://www.calea.org/content/commission (last accessed September 12, 2011).

COMCARE

Name	COMCARE
Type	Standards Setting Organization—Community
Summary	COMCARE is a non-profit national advocacy organization dedicated to advancing emergency communications. As a note, COMCARE is not currently active.
Mission	The COMCARE mission is to advance emergency response to save lives, reduce injuries, and assist the emergency response professions. We achieve this by— • Encouraging collaboration across professional, geographical, and jurisdictional lines • Promoting the adoption of interoperable emergency systems, standards, and forward-thinking policies and procedures • Fostering the innovation and success of our members—individually and collectively.[43]
Relevant Working Groups	• Core Services Initiative
Coordinated Activities	• Organization for the Advancement of Structured Information Standards (OASIS): COMCARE supports standards development efforts that use a "grassroots" bottom-up approach, bringing emergency response practitioners together to draft specifications based on specific emergency response scenarios. Once complete, specifications are submitted to a standards governing body, such as OASIS. COMCARE has participated in the following standards development efforts: o Common Alerting Protocol (CAP) o Emergency Data Exchange Language (EDXL) o Vehicular Emergency Data Set (VEDS). [44]
Effect on NG911	• Develops standards related to handling emergency data sets.
Website	http://www.comcare.org/ (website is not currently active)

[43] Comcare Emergency Response Alliance. *About Comcare* Available at: http://www.comcare.org/About.html (last accessed October 6, 2010, website not currently active).
[44] Comcare Emergency Response Alliance. *Data Standards* Available at: http://www.comcare.org/Data_Standards.html (last accessed October 6, 2010, website not currently active).

Department of Commerce (DOC)

Name Department of Commerce (DOC)

Type Government Agency

Summary The US DOC has a broad mandate to advance economic growth, and jobs and opportunities for the American people. It has crosscutting responsibilities in the areas of trade, technology, entrepreneurship, economic development, environmental stewardship, and statistical research and analysis.

Relevant Agencies

- NIST: NIST is a non-regulatory federal agency within the DOC. NIST's mission is to promote US innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life[45]
  - Information Technology Laboratory (ITL): ITL is one of the major research components of NIST. ITL accelerates the development and deployment of information and communications systems that are reliable, usable, interoperable, and secure; advances measurement science through innovations in mathematics, statistics, and computer science; and conducts research to develop the measurements and standards infrastructure for emerging information technologies and applications[46]
  - Electronics and Electrical Engineering Laboratory (EEEL): As one of NIST's measurement and standards laboratories, EEEL conducts research, provides measurement services, and helps set standards in support of the fundamental and practical physical standards and measurement services for electrical quantities; the fundamental electronic technologies of semiconductors, magnetics, and superconductors; information and communications technologies, such as fiber optics, photonics, microwaves, electronic displays, and electronics manufacturing supply chain collaboration; forensics and security measurement instrumentation; maintenance of the quality and integrity of electrical power systems; and development of nanoscale and microelectromechanical devices. EEEL provides support to law enforcement, corrections, and criminal justice agencies, including homeland security[47]
  - Office of Law Enforcement Standards (OLES): Unique among NIST's program offices, OLES addresses the technology and metrology needs

[45] National Institutes of Standards and Technology. *NIST General Information* Available at: http://www.nist.gov/public_affairs/general_information.cfm (last accessed September 12, 2011).
[46] National Institutes of Standards and Technology. *Information Technology Laboratory* Available at: http://www.nist.gov/itl/index.cfm (last accessed September 12, 2011).
[47] National Institutes of Standards and Technology. *Electronics and Electrical Engineering Laboratory* Available at: http://www.nist.gov/eeel/index.cfm (last accessed September 12, 2011)

of the criminal justice, public safety, public security, and greater homeland security communities. Through working relationships with criminal justice, public safety and public security practitioners, universities, government agencies, professional and scientific organizations, and offices and laboratories throughout NIST, OLES has developed a vast network of resources that can be applied to solving difficult technical problems. In addition to developing minimum performance standards, OLES develops reference materials (RM) and standard reference materials (SRM) for use in test procedures and to calibrate equipment. OLES develops technology and metrology to support advancement of equipment and methods used to address the needs of criminal justice, public safety, emergency responder, and homeland security agencies[48]

- National Telecommunications and Information Administration (NTIA): NTIA is an agency in the DOC that serves as the executive branch agency principally responsible for advising the President on telecommunications and information policies. In addition to representing the Executive Branch in both domestic and international telecommunications and information policy activities, NTIA also manages the federal use of spectrum; performs cutting-edge telecommunications research and engineering, including resolving technical telecommunications issues for the federal government and private sector; and administers infrastructure and public telecommunications facilities grants[49]
    - Institute for Telecommunication Sciences (ITS): ITS is the research and engineering laboratory of the NTIA. ITS supports such NTIA telecommunications objectives as promotion of advanced telecommunications and information infrastructure development in the United States, enhancement of domestic competitiveness, improvement of foreign trade opportunities for US telecommunications firms, and facilitation of more efficient and effective use of the radio spectrum.[50]

Standards

- Federal Information Processing Standards Publications (FIPS PUB)
    - FIPS-PUB-140-2: *Security Requirements for Cryptographic Modules*
    - FIPS-PUB-180-3: *Secure Hash Standard (SHS)*
    - FIPS-PUB-197: *Advanced Encryption Standard (AES).*

Coordinated Activities

- ANSI: An MOU exists between NIST and ANSI that agrees on the need for a unified national approach to develop the best possible national and international standards
- DHS Office of Interoperability and Compatibility (OIC): NIST OLES' Public Safety

[48] National Institutes of Standards and Technology. *Office of Law Enforcement Standards* Available at: http://www.nist.gov/oles/index.cfm (last accessed September 12, 2011).
[49] National Telecommunications and Information Administration. *About NTIA Standards* Available at: http://www.ntia.doc.gov/ (last accessed September 12, 2011).
[50] National Telecommunications and Information Administration. *Institute for Telecommunications Science Standards* Available at: http://www.its.bldrdoc.gov/ (last accessed September 12, 2011).

Communications Systems program provides technical expertise to the DHS OIC.

Effects on NG911

- Manages grant programs that may be used for NG911 purposes
- May affect IP networking and ESInet aspects
- Develops standards related to handling emergency data sets.

Website http://www.commerce.gov/

Department of Homeland Security (DHS)

Name Department of Homeland Security (DHS)

Type Government Agency

Summary The Department of Homeland Security has the broad focus to strengthen and secure the Nation, coordinating across Federal agencies, while shaping homeland security policy and coordinating incident management – through partnerships with individual citizens, the private sector, state, local, and tribal governments, and global partners.[51]

Relevant Directorates

- National Protection and Programs: The goal of the National Protection and Programs Directorate is to advance the Department's risk-reduction mission. Reducing risk requires an integrated approach that encompasses both physical and virtual threats and their associated human elements[52]
  - Office of Cybersecurity and Communications (CS&C): CS&C has the mission of assuring the security, resiliency, and reliability of the Nation's cyber and communications infrastructure[53]
    - Office of Emergency Communications (OEC): The OEC supports the Secretary of Homeland Security in developing, implementing, and coordinating interoperable and operable communications for the emergency response community at all levels of government.[54] The mission of the OEC is to support and promote the ability of emergency responders and government officials to continue to communicate in the event of natural disasters, acts of terrorism, or other manmade disasters, and work to ensure, accelerate, and attain interoperable and operable emergency communications nationwide
- Science & Technology (S&T): The S&T Directorate is the primary research and development arm of DHS.[55] The S&T Directorate's mission is to improve homeland security by providing to customers state-of-the-art technology that helps them achieve their missions. S&T customers include the operating components of the Department, and state, local, tribal, and territorial emergency responders and officials

[51] US Department of Homeland Security. *Quadrennial Homeland Security Review* Available at: http://www.dhs.gov/xabout/gc_1208534155450.shtm/ (last accessed September 12, 2011).
[52] US Department of Homeland Security. *Institute for Telecommunications Science Standards* Available at: http://www.its.bldrdoc.gov/ (last accessed September 12, 2011).
[53] US Department of Homeland Security. *Office of Cybersecurity and Communications* Available at: http://www.dhs.gov/xabout/structure/gc_1185202475883.shtm (last accessed September 12, 2011).
[54] US Department of Homeland Security. *Office of Emergency Communications* Available at: http://www.dhs.gov/xabout/structure/gc_1189774174005.shtm (last accessed September 12, 2011).
[55] US Department of Homeland Security. *Welcome to SAFECOM* Available at: http://www.safecomprogram.gov/default.aspx (last accessed September 12, 2011).

- Office for Interoperability and Compatibility (OIC): OIC strengthens interoperable wireless communications and improves effective information sharing by developing tools—such as standards, reports, and guidelines—and technologies to enhance overall planning and coordination at all levels of government.[56]

Relevant Programs and Projects

- Wireless Public Safety Interoperable Communications Program (SAFECOM): SAFECOM is a federal program that assists federal, state, and local public safety agencies in identifying wireless interoperable communications requirements and ensures those entities can communicate and share information to effectively respond to emergency incidents [57]
- Data Messaging Standards: The S&T Directorate's Command, Control, and Interoperability Division (CID) is partnering with emergency responders, federal agencies, and SDOs to accelerate development of data messaging standards. When established, these standards provide emergency responders with the capability to seamlessly exchange critical data-such as situational reports, personnel requests, maps, and hospital bed availability information across disparate software systems and applications. This project is part of the OIC within CID[58]
- Integrated Public Alert Warning System (IPAWS) Project: The S&T Directorate CID supports the IPAWS in the advancement of interoperability and state-of-the-art technologies for alerts and warnings through standards development and adoption, conformity assessment, industry capability analysis, and technology evaluation. The result of these efforts will enable local, tribal, and state practitioners to provide reliable and accurate alerts and warnings to a wider public. As a result, there will be a significant reduction in the loss of life and property from all hazards. This project is part of the OIC within CID[59]
    - Interoperability Continuum: The S&T Directorate CID's Interoperability Continuum is designed to help the emergency response community and local, tribal, state, and federal policy makers address critical elements for success as they plan and implement interoperability solutions. These elements include governance, standard operating procedures, technology, training and exercises, and use of interoperable communications. Updated in 2008, the Continuum's technology element was divided into data and voice elements to reflect the modern path to improving interoperability via information sharing and voice communications. This project is part of the OIC within CID[60]

[56] US Department of Homeland Security, National Emergency Communications Plan (Washington: Secretary of Homeland Security) 65.
[57] US Department of Homeland Security. *Command, Control, and Interoperability Programs and Projects* Available at: http://www.dhs.gov/files/programs/gc_1218474924792.shtm (last accessed September 12, 2011).
[58] US Department of Homeland Security. *Command, Control, and Interoperability Programs and Projects* Available at: http://www.dhs.gov/files/programs/gc_1218474924792.shtm (last accessed September 12, 2011).
[59] US Department of Homeland Security. *Command, Control, and Interoperability Programs and Projects* Available at: http://www.dhs.gov/files/programs/gc_1218474924792.shtm (last accessed September 12, 2011).
[60] US Department of Homeland Security. *Command, Control, and Interoperability Programs and Projects* Available at: http://www.dhs.gov/files/programs/gc_1218474924792.shtm (last accessed September 12, 2011).

- Voice over Internet Protocol (VoIP): The S&T Directorate CID is leading the VoIP Project. To connect radio systems, emergency responders rely on bridging systems-technology components that connect radio systems. Bridging systems are increasingly using IP-based connections known as VoIP to transmit voice communications across radio systems. Although VoIP is based on standards, the technology lacks a single standard adopted by all manufacturers. CID is working with emergency responders and NIST and the ITS to define a specification for bridging devices that use VoIP. This project is part of the OIC within CID.[61]

Standards

- NIEM: *National Information Exchange Model.*

Coordinated Activities

- National Information Exchange Model (NIEM): The National Information Exchange Model is a partnership of the US Department of Justice and DHS created to develop, disseminate, and support enterprise-wide information exchange standards and processes that can enable jurisdictions to effectively share critical information in emergency situations, as well as support the day-to-day operations of agencies throughout the Nation[62]
- Office of Emergency Communications (OEC): The OIC, in coordination with OEC, is developing an SOP Development Guide, a Shared Channel Guide v2.0, and a brochure on plain language.[63]

Effects on NG911

- Develops standards related to handling emergency data sets.

Website

http://www.dhs.gov/
http://www.niem.gov/

[61] US Department of Homeland Security. *Command, Control, and Interoperability Programs and Projects* Available at: http://www.dhs.gov/files/programs/gc_1218474924792.shtm (last accessed September 12, 2011).
[62] National Information Exchange Model. *National Information Exchange Model* Available at: http://www.niem.gov/
[63] United States, Department of Homeland Security, National Emergency Communications Plan (Washington: Secretary of Homeland Security) 26.

Department of Justice (DOJ)

Name	Department of Justice
Type	Government Agency
Summary	The Department of Justice mission is to enforce the law and defend the interests of the United States according to the law; to ensure public safety against threats foreign and domestic; to provide federal leadership in preventing and controlling crime; to seek just punishment for those guilty of unlawful behavior; and to ensure fair and impartial administration of justice for all Americans. [64]
Relevant Directorates	• Office of Justice Programs (OJP): OJP's mission is to increase public safety and improve the fair administration of justice across America through innovative leadership and programs. [65]
Relevant Bureaus & Offices	• Bureau of Justice Assistance (BJA): BJA supports law enforcement, courts, corrections, treatment, victim services, technology, and prevention initiatives that strengthen the nation's criminal justice system. [66]
Standards	• NIEM: *National Information Exchange Model.*
Coordinated Activities	• National Information Exchange Model (NIEM): NIEM is a partnership of the US Department of Justice and DHS created to develop, disseminate, and support enterprise-wide information exchange standards and processes that can enable jurisdictions to effectively share critical information in emergency situations, as well as support the day-to-day operations of agencies throughout the Nation.[67]
Effects on NG911	• Develops standards related to handling emergency data sets, specifically pertaining to interoperability for data sharing.
Website	http://www.justice.gov/ http://www.niem.gov/

[64] United States Department of Justice. *About DOJ* Available at: http://www.justice.gov/02organizations/about.html (last accessed September 12, 2011).
[65] Office of Justice Programs. *Mission and Vision* Available at: http://www.ojp.usdoj.gov/about/mission.htm (last accessed September 12, 2011).
[66] Office of Justice Programs. *About the Bureau of Justice Assistance* Available at: http://www.ojp.usdoj.gov/BJA/about/index.html (last accessed September 12, 2011).
[67] National Information Exchange Model. *National Information Exchange Model* Available at: http://www.niem.gov/ (last accessed September 12, 2011).

Department of Transportation (USDOT)

Name Department of Transportation (USDOT)

Type Government Agency

Summary The Department of Transportation serves the United States by ensuring a fast, safe, efficient, accessible, and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future. [68]

Relevant Administrations

- National Highway Traffic Safety Administration (NHTSA): NHTSA directs the highway safety and consumer programs established by the National Traffic and Motor Vehicle Safety Act of 1966, the Highway Safety Act of 1966, the 1972 Motor Vehicle Information and Cost Savings Act, and succeeding amendments to these laws[69]
- Research and Innovative Technology Administration (RITA): RITA coordinates USDOT's research and education programs, and is working to bring advanced technologies into the transportation system[70]
    - Intelligent Transportation Systems (ITS): The USDOT ITS program focuses on intelligent vehicles, intelligent infrastructure, and the creation of an intelligent transportation system through integration with and between these two components. The federal ITS program supports the overall advancement of ITS through investments in major initiatives, exploratory studies, and a deployment support program. Increasingly, the federal investments are directed at targets of opportunity—major initiatives—that have the potential for significant payoff in improving safety, mobility, and productivity [71]
    - Transportation Safety Advancement Group (TSAG): The TSAG serves an important function on behalf of the US DOT, RITA, and it's ITS-Joint Program Office (ITS-JPO). Through its members and allied stakeholder groups, TSAG identifies surface transportation-based technologies and applications and promotes a national dialogue on public safety practitioners' first hand experiences and corresponding best practices and lessons learned. [72]

[68] United States Department of Transportation. *About DOT* Available at: http://www.dot.gov/about.html (last accessed September 12, 2011).
[69] National Highway Traffic Safety Administration. *About NHTSA* Available at: http://www.rita.dot.gov/about_rita/ (last accessed September 12, 2011).
[70] U.S. Department of Transportation, Research and Innovation Technology Administration. *Welcome to RITA* Available at: http://www.rita.dot.gov/ (last accessed September 12, 2011).
[71] U.S. Department of Transportation, Research and Innovation Technology Administration, Intelligent Transportation Systems. *ITS Overview* Available at: http://www.its.dot.gov/its_overview.htm (last accessed September 12, 2011).
[72] Transportation Safety Advancement Group, *About TSAG* Available at: http://www.tsag-its.org/whatistsag.php (last accessed September 12, 2011).

Relevant Programs and Projects	• Next Generation 911 (NG911) Initiative: The Nation's current 911 system is designed around telephone technology and cannot handle the text, data, images, and video that are increasingly common in personal communications and critical to future transportation safety and mobility advances. The NG911 Initiative has established the foundation for public emergency communications services in a wireless mobile society[73] • National 911 Program: The Program's mission is to provide Federal leadership and coordination in supporting and promoting optimal 911 services.[74]
Coordinated Activities	• European Telecommunications Standards Institute (ETSI): A memorandum of cooperation exists between USDOT/RITA/ITS and ETSI • Federal Communications Commission, Communications Security, Reliability, and Interoperability Council (CSRIC) • Emergency Services Workshop (ESW).
Websites	http://www.dot.gov/ http://911.gov/

[73] US Department of Transportation, Research and Innovation Technology Administration. *Next Generation 911* Available at: http://www.its.dot.gov/ng911/index.htm (last accessed September 12, 2011).
[74] 911.gov. *About The Program* Available at: http://www.911.gov/about.html (last accessed September 12, 2011).

Emergency Interoperability Consortium (EIC)

Name	Emergency Interoperability Consortium (EIC)
Type	Standards Organization
Summary	The EIC is a group primarily of software development and services industry members that provides emergency and disaster management tools and applications to federal, state, local, and industry organizations. The EIC is a not-for-profit corporation that promotes standards development activities that are affiliated with OASIS.[75] As a note, EIC is not currently active.
Standards	• Common Alerting Protocol • Emergency Data Exchange Language Distribution Element (EDXL-DE) • Emergency Data Exchange Language Resource Messages (EDXL-RM).
Coordinated Activities	• COMCARE • DHS: The EIC has signed a Memorandum of Agreement (MOA) with DHS to promote the development and proliferation of data sharing standards for emergency response [76] • OASIS: The EIC works closely with its partners—the Disaster Management Program at DHS and the Emergency Management Technical Committee of OASIS through a process that ensures that emergent standards are practitioner driven, commercially sustainable, and technically valid, open, and free.[77]
Website	http://www.eic.org/ (website is not currently active)

[75] Emergency Interoperability Consortium. *MEMORANDUM OF UNDERSTANDING between the Department of Homeland Security (DHS) and the Emergency Interoperability Consortium (EIC)* Available at: http://www.eic.org/docs/DHS-EIC%20MOA-%20DM%20PROPOSAL.V1DOC.DOC (last accessed October 6, 2010, website not currently active).
[76] Emergency Interoperability Consortium. *MEMORANDUM OF UNDERSTANDING between the Department of Homeland Security (DHS) and the Emergency Interoperability Consortium (EIC)* Available at: http://www.eic.org/docs/DHS-EIC%20MOA-%20DM%20PROPOSAL.V1DOC.DOC (last accessed October 6, 2010, website not currently active).
[77] Emergency Interoperability Consortium. *Data Standards* Available at: http://www.eic.org/standards.htm (last accessed October 6, 2010, website not currently active).

Emergency Services Workshop (ESW)

Name	Emergency Services Workshop (ESW)
Type	Standards Coordination Group
Summary	An informal consortium of representatives from many of the SDOs affecting emergency services standards, formed to coordinate needs, status, and content among standards developing bodies.
Relevant Working Groups	The ESW is a single group.
Coordinated Activities	The ESW is made up of representatives from many of SDOs listed in this document.
Website	http://www.emergency-services-coordination.info/

European Telecommunications Standards Institute (ETSI)

Name	European Telecommunications Standards Institute (ETSI)
Type	Regional Standards Organization
Summary	ETSI is an independent, not-for-profit organization that produces globally-applicable standards for information and communication technology (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies.[78]
Relevant Committees and Other Bodies	• EMTEL—Emergency Communications: EMTEL addresses a broad spectrum of issues related to the use of telecommunications services in emergency situations[79] • TISPAN - Telecommunications & Internet converged Services & Protocols for Advanced Networks: ETSI TISPAN has been the key standardization body in creating the Next Generation Networking (NGN) specifications.[80]
Standards	• ETSI TS 102 164: *Telecommunications and converged Services and Protocols for Advanced Networking (TISPAN); Emergency Location Protocols* • ETSI TS 102 424: *Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Requirements of the NGN network to support Emergency Communication from Citizen to Authority* • ETSI TS 123 167: *Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsytem (IMS) emergency sessions* • ETSI TS 182 009: *Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Architecture to support emergency communication from citizen to authority* • ETSI ES 282 007: *Telecommunications and Protocols for Advanced Networking (TISPAN); IP Multimedia Subsystem (IMS); Functional architecture* • ETSI HiperMAN • ETSI HIPERACCESS.
Coordinated Activities	• 3GPP • US Department of Transportation (USDOT): A memorandum of cooperation exists between USDOT/Research and Innovative Technology Administration (RITA)/Intelligent Transportation Systems (ITS) and ETSI.

[78] European Telecommunications Standards Institute. *Introduction* Available at: http://www.etsi.org/WebSite/AboutETSI/Introduction/introduction.aspx (last accessed September 12, 2011).
[79] European Telecommunications Standards Institute. *EMTEL Overview* Available at: http://www.emtel.etsi.org/overview.htm (last accessed September 12, 2011).
[80] European Telecommunications Standards Institute, Telecoms & Internet Services & Protocols for Advanced Network. *Overview* Available at: http://www.etsi.org/tispan/ (last accessed September 12, 2011).

Effects on NG911

- Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data)
- Develops standards adhered to by originating service providers' (OSP) network and applications services for emergency calling
- Supports location requirements and standards.

Website http://www.etsi.org/

Federal Communications Commission (FCC)

Name Federal Communications Commission (FCC)

Type Government Agency

Summary The FCC is an independent United States government agency charged with regulating interstate and international communications by radio, television, wire, satellite and cable. [81]

Relevant Bureaus

- Public Safety and Homeland Security Bureau (PSHSB): PSHSB's mission is to collaborate with the public safety community, industry, and other government entities to license, facilitate, restore, and recover communications services used by the citizens of the United States, including first responders, before, during, and after emergencies by disseminating critical information to the public and by implementing the Commission's policy initiatives.[82]

Relevant Advisory Committees

- Communications Security, Reliability, and Interoperability Council (CSRIC): CSRIC's mission is to provide recommendations to the FCC to ensure, among other things, optimal security and reliability of communications systems, including telecommunications, media, and public safety.[83] The following are CSRIC working groups relevant to NG911:
  - Working Group 4B – Transition to NG911: Responsible for investigating and determining what changes or additions in 911 related VoIP standards and best practices are required for the evolution of IP-based originating service providers to the IP-based Next Generation 911 system environment, both during the transition from E911 to NG911 and as identifiable for the longer term all-IP NG911 environment. More specifically, the working group is evaluating and recommended to CSRIC how the changes and additions to standards and best practices should be accomplished, what groups should perform that work, and an appropriate work schedule[84]
  - Working Group 4C – Technical Options for E911 Location Accuracy: Responsible for examining E911/Public Safety location technologies in use today, identifying current performance and limitations for use in

[81] Federal Communication Commission. *About the FCC* Available at: http://www.fcc.gov/aboutus.html (last accessed September 12, 2011).
[82] Federal Communication Commission. *Public Safety and Homeland Security Bureau* Available at: http://www.fcc.gov/pshs/ (last accessed September 12, 2011).
[83] Federal Communication Commission, Public Safety and Homeland Security Bureau. *The Communications Security, Reliability and Interoperability Council* Available at: http://www.fcc.gov/pshs/advisory/csric/ (last accessed September 12, 2011).
[84] Communications Security, Reliability, and Interoperability Council. *CSRIC Working Group Descriptions* Available at: http://transition.fcc.gov/pshs/advisory/csric/wg-descriptions.pdf (last accessed September 12, 2011).

next generation public safety applications. More specifically, the working group is examining emerging E911/public safety location technologies and recommending options to CSRIC for improvement of E911 location accuracy including implementation timelines[85]

- Emergency Response Interoperability Center (ERIC): The mission of ERIC is to establish a technical and operational framework that will ensure nationwide operability and interoperability in deployment and operation of the 700 megahertz (MHz) public safety broadband wireless network. ERIC will adopt, implement, and coordinate interoperability regulations, license requirements, grant conditions and technical standards. DHS, NIST, DOJ, and DOC contribute to ERIC's functions.[86]

Website http://www.fcc.gov/

[85] Communications Security, Reliability, and Interoperability Council. *CSRIC Working Group Descriptions* Available at: http://transition.fcc.gov/pshs/advisory/csric/wg-descriptions.pdf (last accessed September 12, 2011).
[86] Federal Communication Commission, Public Safety and Homeland Security Bureau. *Emergency Response Interoperability Center (ERIC)* Available at: http://www.fcc.gov/pshs/eric.html (last accessed September 12, 2011).

Institute of Electrical and Electronics Engineers (IEEE)

Name Institute of Electrical and Electronics Engineers (IEEE)

Type Professional Organization

Summary IEEE is a professional association with the core purpose to advance technological innovation and excellence for the benefit of humanity. IEEE and its members support a global community through a variety of activities including the development of technology standards. [87]

Relevant Committees

- IEEE 802 LAN/MAN Standards Committee: The IEEE 802 Local Area Network (LAN)/Metropolitan Area Network (MAN) Standards Committee develops LAN standards and MAN standards[88]
  - IEEE 802.1 Working Group: The IEEE 802.1 Working Group is chartered to concern itself with and develop standards and recommend practices in the following area: 802 LANs, MANs and other wide area networks, 802 Security, 802 overall network management, and protocol layers above the MC & LLC layers. The 802.1 working group has four active task groups: Interworking, Security, Audio/Video Bridging and Data Center Bridging[89]
  - IEEE 802.11 Wireless Local Area Networks Working Group: Within the IEEE 802 LAN/MAN Standards Committee, the IEEE 802.11 Working Group develops standards and recommended practices to support development and deployment of wireless local area networks (WLAN)[90]
  - IEEE 802.16 Broadband Wireless Access Working Group: Within the IEEE 802 LAN/MAN Standards Committee, the IEEE 802.16 Working Group develops standards and recommended practices to support development and deployment of broadband wireless MANs[91]
  - IEEE 802.23 Emergency Services Working Group: Within the IEEE 802 LAN/MAN Standards Committee, the IEEE 802.16 Working Group develops standards and recommended practices to support a framework that provides consistent access and data facilitating compliance with applicable civil authority requirements for

[87] Institute of Electrical and Electronics Engineers. *About IEEE* Available at: http://www.ieee.org/about/index.html (last accessed September 12, 2011).
[88] Institute of Electrical and Electronics Engineers. *IEEE 802 LAN / MAN Standards Committee* Available at: http://grouper.ieee.org/groups/802/index.shtml (last accessed September 12, 2011).
[89] Institute of Electrical and Electronics Engineers, *IEEE 802.1 Working Group Available at:* http://www.ieee802.org/1/ (last access September 12, 2011).
[90] Institute of Electrical and Electronics Engineers. *IEEE 802.11 Wireless Local Area Networks* Available at: http://www.ieee802.org/11/ (last accessed September 12, 2011).
[91] Institute of Electrical and Electronics Engineers. *IEEE 802.16 Working Group on Broadband Wireless Access Standards* Available at: http://www.ieee802.org/16/ (last accessed September 12, 2011).

communications systems that include IEEE 802 networks.[92] It should be noted that due to lack of participation, this working group is no longer active.

Standards

- IEEE 802.1AB: *Station and Media Access Control Connectivity Discovery*
- IEEE 802.1AC: *Media Access Control (MAC) Services Definition*
- IEEE 802.11: *Wireless Local Area Networks (WLANs)*
- IEEE 802.16: *Broadband Wireless Metropolitan Area Network*
- IEEE 802.23: *Emergency Services for Internet Protocol (IP) Based Citizen to Authority Communications*
- IEEE 1512: 2006: *Standard for Common Incident Management Message Sets for use by Emergency Management Centers.*

Coordinated Activities

- WiMAX Forum
- 3GPP
- ANSI: IEEE is an ANSI-accredited SDO.[93]

Website http://www.ieee.org/

[92] Institute of Electrical and Electronics Engineers. *IEEE 802.23 Emergency Services Working Group* Available at: http://www.ieee802.org/23/ (last accessed September 12, 2011).

[93] American National Standards Institute. *ANSI Accredited Standards Developers* Available at: http://publicaa.ansi.org/sites/apdl/Documents/Standards%20Activities/American%20National%20Standards/ANSI%20Accredited%20Standards%20Developers/AUG11ASD-basic.pdf(last accessed September 12, 2011).

Internet Engineering Task Force (IETF)

Name Internet Engineering Task Force (IETF)

Type International Standards Organization – Industry (Networking)

Summary The mission of the IETF is to produce high-quality, relevant technical and engineering documents that influence the way people design, use, and manage the Internet in such a way as to make the Internet work better. These documents include protocol standards, best current practices, and informational documents of various kinds. [94]

Relevant Working Groups

- Emergency Context Resolution with Internet Technologies (ECRIT): In a number of areas, the public switched telephone network (PSTN) has been configured to recognize an explicitly specified number as a call for emergency services. These numbers (e.g., 911, 1-1-2) relate to an emergency service context and depend on a broad, regional configuration of service contact methods and a geographically constrained context of service delivery. Successful delivery of an emergency service call within those systems requires both an association of the physical location of the originator with an appropriate emergency service center and call routing to deliver the call to the center. Calls placed using Internet technologies do not use the same systems to achieve those goals, and the common use of overlay networks and tunnels (either as virtual private networks [VPN] or for mobility) makes meeting them more challenging. There are, however, Internet technologies available to describe location and to manage call routing. This working group will describe when these may be appropriate and how they can be used, and is considering emergency services calls that might be made by any user of the Internet[95]
- Geographic Location/Privacy (GEOPRIV): The IETF has recognized that many applications are emerging that require geographic and civic location information about resources and entities, and that the representation and transmission of that information has significant privacy and security implications. It has created a suite of protocols that allows such applications to represent and transmit such location objects and to allow users to express policies on how these representations are exposed and used. The GEOPRIV working group is chartered to continue to develop and refine representations of location in Internet protocols and to analyze the authorization, integrity, and privacy requirements that must be met when these representations of location are created, stored, and used. The group will create and refine mechanisms for the transmission of these representations that address the requirements that have been

[94] The Internet Engineering Task Force (IETF). *Mission Statement* Available at: http://www.ietf.org/about/mission.html (last accessed September 12, 2011).
[95] The Internet Engineering Task Force (IETF). *Emergency Context Resolution with Internet Technology (ECRIT)* Available at: http://datatracker.ietf.org/wg/ecrit/charter/ (last accessed September 12, 2011).

identified.[96]

Standards	• IETF RFC 2396: *Uniform Resource Identifiers (URI): Generic Syntax* • IETF RFC 3261: *SIP: Session Initiation Protocol* • IETF RFC 3966: *The tel URI for Telephone Numbers* • IETF RFC 4119*: A Presence-based GEOPRIV Location Object Format* • IETF RFC 5222: *LoST: A Location-to-Service Translation Protocol* • IETF Internet Draft: *HTTP Enabled Location Delivery* • IETF Internet Draft: *Location Conveyance for the Session Initiation Protocol.*
Coordinated Activities	• ETSI EMTEL • NENA.
Effects on NG911	• Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data).
Website	http://www.ietf.org/

[96] The Internet Engineering Task Force (IETF). *Geographic Location / Privacy (geopriv)* Available at: http://datatracker.ietf.org/wg/geopriv/charter/ (last accessed September 12, 2011).

International Organization of Standardization (ISO)

Name International Organization of Standardization (ISO)

Type International Standards Organization

Summary ISO is the world's largest developer and publisher of international standards. ISO is a network of the national standards institutes of 162 countries, one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system. ISO is a non-governmental organization that forms a bridge between the public and private sectors. On the one hand, many of its member institutes are part of governmental structure of their countries, or are mandated by their government. On the other hand, other members have their roots uniquely in the private sector, having been set up by national partnerships of industry associations. Therefore, ISO enables a consensus to be reached on solutions that meet both the requirements of business and the broader needs of society.[97]

Website http://www.iso.org/

[97] International Organization of Standards (ISO). *About ISO* Available at: http://www.iso.org/iso/about.htm (last accessed September 12, 2011).

International Telecommunication Union (ITU)

Name International Telecommunication Union (ITU)
Telecommunication Standardization Section (ITU-T)

Type International Standards Organization

Summary Through its work on standardization, ITU develops technical standards (known as Recommendations) that facilitate the use of public telecommunication services and systems for communications during emergency, disaster relief, and mitigation operations. In such circumstances, technical features need to be in place to ensure that users who must communicate at a time of disaster have the communication channels they need, with appropriate security and with the best possible quality of service.[98]

Relevant Study Groups

- Study Group 2: Study Group 2 is responsible for the numbering standard ITU-T Recommendation, E.164, which has played a key role in shaping the telecommunications networks of today. E.164 provides the structure and functionality for telephone numbers; without it, individuals would not be able to communicate internationally. In recent years, Study Group 2 has worked on ENUM, an IETF protocol for entering E.164 numbers into the Internet domain name system (DNS). A less well-known, but equally as important product of SG2 is E.212, which describes a system to identify mobile devices as they move from network to network. International mobile subscriber identity (IMSI) is a critical part of the modern mobile telecoms system allowing a roaming mobile terminal to be identified in another network and subsequently for querying of the home network for subscription and billing information to take place[99]
- Study Group 11: Study Group 11 is the "signaling" group within ITU-T; it produces ITU-T Recommendations that define how telephone calls and other calls such as data calls are handled in the network. Previously, this occurred primarily in the PSTN and Integrated Services Digital Network (ISDN). Now, as operators look to align this 'circuit-switched based environment with the rapidly emerging Internet technologies, Study Group 11's work is shifting toward IP-based networks or NGNs[100]
- Study Group 13: Study Group 13 leads ITU's work on standards for NGNs. Broadly speaking, the term NGN refers to the move from circuit-switched to packet-based networks that many operators worldwide will undertake in the next few years. It will mean reduced costs for service providers who, in turn, will

[98] International Telecommunication Union (ITU). *Emergency Telecoms at a Glance* Available at: http://www.itu.int/en/ITU-T/emergencytelecoms/Pages/default.aspx (last accessed September 12, 2011).
[99] International Telecommunication Union (ITU). *Study Group 2 at a Glance* Available at: http://www.itu.int/net/ITU-T/info/sg02.aspx (last accessed September 12, 2011).
[100] International Telecommunication Union (ITU). *Study Group 11 at a Glance* Available at: http://www.itu.int/net/ITU-T/info/sg11.aspx (last accessed September 12, 2011).

be able to offer a richer variety of services.[101]

Coordinated Activities

- IETF: In recent years, Study Group 2 has worked on ENUM, an IETF protocol for entering E.164 numbers into the Internet DNS.[102]

Website http://www.itu.int/

[101] International Telecommunication Union (ITU). *Study Group 13 at a Glance* Available at: http:/www.itu.int/net/ITU-T/info/sg13.aspx (last accessed September 12, 2011).
[102] International Telecommunication Union (ITU). *ENUM* Available at: http://www.itu.int/osg/spu/enum/ (last accessed September 12, 2011).

Law Enforcement Information Technology Standards Council (LEITSC)

Name Law Enforcement Information Technology Standards Council (LEITSC)

Type Standards Setting Organization

Summary The Mission of LEITSC is to foster the growth of strategic planning and implementation of integrated justice systems. Together, participants from these organizations represent of law enforcement as a whole on IT standard issues. The LEITSC will—

- Develop IT standards for law enforcement
- Provide assistance to the law enforcement community on the implementation of standards
- Represent the voice of law enforcement community on standards issues
- Promote the merits of information technology standards
- Share practical solutions and best practices.

These efforts will ultimately influence the integration of justice IT solutions that meet the technical, practical, and political needs of the public safety community and the citizens they serve.

Website http://www.leitsc.org/ (website is not currently active)

National Academies of Emergency Dispatch (NAED)

Name	National Academies of Emergency Dispatch (NAED)
Type	Professional Organization
Summary	The mission of the NAED is to advance and support the public-safety emergency telecommunications professional and ensure that citizens in need of emergency, health, and social services are matched safely, quickly, and effectively with the most appropriate resource. [103]
Certifications	• ETC: Emergency Telecommunicator Certification.
Effect on NG911	• May drive requirements based on call handling protocols.
Website	http://www.emergencydispatch.org/

[103] National Academies of Emergency Dispatch. *Organization* Available at: http://www.emergencydispatch.org/Organization (last accessed September 12, 2011).

National Emergency Number Association (NENA)

Name National Emergency Number Association (NENA)

Type National Standards Organization

Summary NENA (as The Voice of 911™*)* is on the forefront of all emergency communications issues. The association serves its members and the greater public safety community as the only professional organization solely focused on 911 policy, technology, operations, and education issues. With more than 7,000 members in 48 chapters across the United States and around the globe, NENA promotes implementation and awareness of 911, as well as international three-digit emergency communications systems.

NENA works with 911 professionals nationwide, public policy leaders, emergency services and telecommunications industry partners, like-minded public safety associations, and other stakeholder groups to develop and carry out critical programs and initiatives; to facilitate the creation of an IP-based NG911 system; and to establish industry-leading standards, training, and certifications. Through the association's efforts to provide effective and efficient public safety solutions, NENA strives to protect human life, preserve property, and maintain the security of our communities.

NENA began work on what is now termed NG911 in 2000 with discussion and then production of the NENA Future Path Plan for a technologically updated and more feature-rich replacement for Enhanced 911. In 2003, NENA established a committee to develop the technical nature and architecture of NG911, recognizing that this would also require various other work efforts over time to define databases management, system operations and administration, and PSAP operations requirements and standards, as well as transition plans. The NENA NG911 Project was formed to tie all aspects together and is currently made up of the organizational components listed below.

Relevant Committees The NENA NG911 Project encompasses and coordinates many actions aimed to accomplish the capabilities for IP-based NG911:

- Technical development
- PSAP operations development
- NG911 system operations development
- Policy change needs and methods development (NG Partner Program [NGPP])
- Transition plans development
- Education Steering Committee
- Interoperability Testing (Industry Collaboration Events (ICE).

There are also plans to conduct a distributed Pilot Testing process to result in national testing recommendations.

Standards

Data Standards:

- NENA 02-010: *Standard Data Formats For ALI Related Data Exchange, MSAG & GIS*
- NENA 07-504: *Collision Notification & Telematics Information*
- NENA 08-505: *Recommended Method(s) for Location Determination to Support IP-Based Emergency Services*
- NENA 08-752: *Location Information to Support IP-Based Emergency Services*
- NENA 70-001: *NENA Registry System (NRS)*
- NENA 71-001: *NENA Standard for NG911 Additional Data*
- NENA 71-002: *Next Generation 911 (NG911) Civic Location Data Exchange Format (CLDXF)*
- NENA 70-DRAFT: *Standards for the Provisioning and Maintenance of GIS data to ECRF/LVR*
- NENA TBD: *Advances Automatic Crash Notification Data Standard [aka VEDS]*
- NENA TBD: *Location Information Service (LIS) Standard*
- NENA TBD: *Discrepancy Processing/Resolution Requirements (Daily), including data troubleshooting procedures.*

Policy Routing Standards:

- NENA 71-502: *Overview of Policy Rules for Call Routing and Handling in NG911*
- NENA TBD: *NG911 Routing Policy and Business Rules Management.*

Security Standards:

- NENA 75-001: *NENA Security for Next-Generation 911 Standard (NG-SEC)*
- NENA TBD: *Auditing & Reporting Requirements (Annually or Biennial [every 2 years])*
- NENA TBD: *NG911 Security Procedures*
- NENA TBD: *NG-SEC Audit Checklist.*

High-Level Architecture Standards:

- NENA 07-503: Network Interfaces for 911 and Emergency Technologies
- NENA 08-002: *NENA Functional and Interface Standards for Next Generation 911*
- NENA 08-003: *Detailed Functional and Interface Specification for the NENA i3 Solution*
- NENA 08-751: *NENA i3 Requirements (Long Term Definition)*
- NENA 53-507: *Virtual PSAP Management*
- NENA 08-DRAFT: *Emergency Services IP Network Design for NG911*
- NENA TBD: *ESInet Management*
- NENA TBD: *Access Provider Information Standard.*

PSAP Operations Standards:

- NENA 54-750: *Human Machine Interface & PSAP Display Requirements*
- NENA 57-750: *NG911 System & PSAP Operational Features & Capabilities*
- TBD: NG911 CAD Interface
- NENA TBD: *NG911 Operations Management for 911 Authorities*
- NENA TBD: *NG911 Systems Operations*
- NENA TBD: *NG911 Public Safety Answering Point (PSAP) Requirements.*

Transition Standards:

- NENA 71-501: *Information Document for Synchronizing Geographic Information*

System databases with MSAG & ALI

- NENA TBD: *PSAP Procedural Transition to NG911*
- NENA Not Numbered: *Next Generation 911 Transition Policy Implementation Handbook: A Guide for Identifying and Implementing Policies to Enable NG911.*

Database Standards:

- NENA TBD: *DB Performance & Reporting Requirements (Daily, Weekly, Monthly, Quarterly, etc.).*

Management of NG911 Standards:

- NENA 00-001: *Master Glossary of 911 Terminology*
- NENA TBD: *NG911 System Management Guide.*

Coordinated Activities

- USDOT NG911 Initiative
- Integrated Justice Information Systems (IJIS)
- NGPP coordinates with various industry vendors and public safety groups.
- NG911 ICE coordinates with industry vendors on interoperability and standards compliance
- ATIS ESIF re emergency services interconnection issues
- N11 consortium for coordinating interactions between NG911 and N11 services
- Coalition of Geospatial Organizations (COGO)
- URISA
- NCMIC
- FCC CSRIC
- Implementation and Coordination Office (ICO) 911 Resource Center.

Effects on NG911

- Defines ESInet (transport and connectivity) requirements and characteristics, beyond generic IP networking standards
- Defines NG911 IP Functions and Interfaces standards for NG911 core architecture
- Defines NG911 databases used to control call routing processes
- Supports location requirements and standards
- Defines NG911 interface options for originating service provider entry to the system
- Defines emergency entity functionality in coordination with NG911 system functions
- Defines PSAP functional entity downstream interfaces
- Defines mechanisms for acquisition of Additional Data from beyond the NG911 system.

Website http://www.nena.org/

National Fire Protection Association (NFPA)

Name	National Fire Protection Association (NFPA)
Type	Professional Organization
Summary	NFPA is the world's leading advocate of fire prevention and an authoritative source on public safety. It develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks.[104]
Standards	• NFPA 72: *National Fire Alarm Code (Mass Notification Requirements)* • NFPA 1061: *Standard for Professional Qualifications for Public Safety Telecommunicator* • NFPA 1221: *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* • NFPA 1600: *Standard on Disaster/Emergency Management and Business Continuity Programs (2010 Edition).*
Coordinated Activities	• ANSI: NFPA is an ANSI-accredited SDO.[105]
Website	http://www.nfpa.org/

[104] National Fire Protection Organization. *About NFPA* Available at: http://www.nfpa.org/categoryList.asp?categoryID=143&URL=About%20NFPA (last accessed September 12, 2011).
[105] American National Standards Institute. *ANSI Accredited Standards Developers* Available at: http://publicaa.ansi.org/sites/apdl/Documents/Standards%20Activities/American%20National%20Standards/ANSI%20Accredited%20Standards%20Developers/AUG11ASD-basic.pdf(last accessed September 12, 2011).

Network Reliability and Interoperability Council (NRIC)

Name	Network Reliability and Interoperability Council (NRIC)
Type	Standards Organization
Summary	Partner with the FCC, the communications industry and public safety to facilitate enhancement of emergency communications networks, homeland security, and best practices across the burgeoning telecommunications industry. As a note, the NRIC is no longer active and has been superseded by the Communication Security, Reliability, and Interoperability Council (CSRIC) within the FCC.

Relevant Focus Group	• Focus Group 1: Enhanced 911
	  o Subcommittee 1.B: Long Term Issues
	  o Subcommittee 1.D: PSAP/Emergency Communications Beyond E911.

Standards	• Please see Appendix A.
Coordinated Activities	• FCC.
Effect on NG911	• May drive FCC information that affects FCC rules related to NG911.
Website	http://www.nric.org/

Organization for the Advancement of Structured Information Standards (OASIS)

Name	Organization for the Advancement of Structured Information Standards (OASIS)
Type	Standards Setting Organization (Community)
Summary	OASIS is a not-for-profit consortium that drives the development, convergence, and adoption of open standards for the global information society.[106]
Relevant Committees	• OASIS Emergency Management Technical Committee (EM-TC): The mission of the EM-TC is to create incident- and emergency-related standards for data interoperability. The EM-TC welcomes participation from members of the emergency management community, developers and implementers, and members of the public concerned with disaster management and response.[107]
Standards	• OASIS CAP: *Common Alerting Protocol (CAP)* • OASIS EDXL-DE: *Emergency Data Exchange Language Distribution Element (EDXL-DE)* • OASIS EDXL-RM: *Emergency Data Exchange Language Resource Messaging (EDXL-RM).*
Effect on NG911	• Develops standards related to handling emergency data sets.
Website	http://www.oasis-open.org/

[106] Organization for the Advancement of Structured Information Standards. *About OASIS* Available at: http://www.oasis-open.org/who/ (last accessed September 12, 2011).
[107] Organization for the Advancement of Structured Information Standards. *OASIS Emergency Management TC* Available at: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=emergency (last accessed September 12, 2011).

Open Geospatial Consortium (OGC)

Name	Open Geospatial Consortium (OGC)
Type	Standards Setting Organization (Community)
Summary	The OGC is an international industry consortium of companies, government agencies, and universities participating in a consensus process to develop publicly available interface standards. OpenGIS® Standards support interoperable solutions that "geo-enable" the web, wireless, and location-based services, and mainstream IT. The standards empower technology developers to make complex spatial information and services accessible and useful with all kinds of applications.[108]
Mission	To serve as a global forum for the collaboration of developers and users of spatial data products and services, and to advance the development of international standards for geospatial interoperability.
Standards	• OGC 08-007r1: *OpenGIS® City Geography Markup Language (CityGML) Encoding Standard* • OGC 06-121r9*: OGC Web Services Common Standard* • OFC 07-006r1: *OpenGIS® Catalogue Service Implementation* • OGC 06-042: *OpenGIS® Web Map Service (WMS) Implementation* • OGC 09-025r1: *OpenGIS® Web Feature Service Interface Standard* • OGC 07-074: *OpenGIS® Location Service (OpenLS) Implementation Core Services.*
Alliance Partners / Coordinated Activities: [109]	• COMCARE[110] • IEE • IETF o GeoPRIV Working Group • ISO • OASIS • OMA.
Effect on NG911	• Supports location requirements and standards • Develops standards related to handling emergency data sets.
Website	http://www.opengeospatial.org/

[108] Open Geospatial Consortium, Inc. *ComCARE Emergency Response Alliance* Available at: http://www.opengeospatial.org/ogc/partners/comcare (last accessed September 12, 2011)
[109] Open Geospatial Consortium, Inc. *OGC Alliance Partners* Available at: http://www.opengeospatial.org/ogc/alliancepartners (last accessed September 12, 2011)
[110] Open Geospatial Consortium, Inc. *OGC Vision, Mission, & Goals* Available at: http://www.opengeospatial.org/ogc/vision (last accessed September 12, 2011)

Open Mobile Alliance (OMA)

Name	Open Mobile Alliance (OMA)
Type	International Standards Organization
Summary	OMA is a standards organization developing open standards for the mobile telephone industry. OMA specifications are designed to be network independent, supporting functionality across GSM, UMTS, and/or CDMA2000 networks.
Mission	The mission of the OMA is to facilitate global user adoption of mobile data services by specifying market-driven mobile service enablers that ensure service interoperability across devices, geographies, service providers, operators, and networks while allowing businesses to compete through innovation and differentiation. [111]
Relevant Working Groups	• Location Working Group: The OMA Location Working Group (WG) develops specifications to ensure interoperability of location services on an end-to-end basis, as well as to provide technical expertise and consultancy on location services for other groups within OMA[112] • Device Management Working Group: The goal of the Device Management Working Group is to specify protocols and mechanisms that achieve management of mobile devices including the necessary configuration to access services and management of the software on mobile devices.[113]
Standards	• OMA-ERELD-SUPL-V3_O-20110308-D: *Enabler Release Definition for Secure User Plan Location (SUPL)* • OMA-ERELD-LPPe-V1_0-20101012-C: *Enabler Release Definition for LPP Extensions (LPPe)* • OMA-TS-MLP-V3_3-20080627-C: *Mobile Location Protocol (MLP) 3.3* • OMA-ERELD-LOCSIP-V1_0-20100803-C: *Enabler Release Definition for Location in SIP/IP core.*

[111] Open Mobile Alliance. *Collaborating with OMA* Available at: http://www.openmobilealliance.org/Technical/Collaborating.aspx (last accessed (last accessed September 12, 2011)).
[112] Open Mobile Alliance. *Location Working Group* Available at: http://www.openmobilealliance.org/Technical/LOC.aspx (last accessed (last accessed September 12, 2011)).
Open Mobile Alliance. *Device Management Working Group* Available at: http://openmobilealliance.org/Technical/DM.aspx (last accessed September 12, 2011).

Coordinated Activities: [114]

- 3GPP: Based on the OMA-3GPP Standardization Collaboration, the OMA and the 3GPP work to update on a regular basis the list of dependencies between each organization's specifications and work in progress[115]
- 3GPP2: Based on the OMA-3GPP2 Standardization Collaboration, the OMA and the 3GPP work to update on a regular basis the list of dependencies between each organization's specifications and work in progress [116]
- IETF: Based on the OMA-IETF Standardization Collaboration, the OMA and the IETF work to update on a regular basis the list of dependencies between each organization's specifications and work in progress.[117]

Effect on NG911

- Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data)
- Supports location requirements and/or specifies standards.

Website http://www.openmobilealliance.org/

[114] Open Mobile Alliance. *Collaborating with OMA* Available at: http://www.openmobilealliance.org/Technical/Collaborating.aspx (last accessed September 12, 2011).
[115] Open Mobile Alliance. *3GPP Dependencies* Available at: http://www.openmobilealliance.org/Technical/3GPP.aspx (last accessed September 12, 2011).
[116] Open Mobile Alliance. *3GPP2 Dependencies* Available at: http://www.openmobilealliance.org/Technical/3GPP2.aspx (last accessed September 12, 2011).
[117] Open Mobile Alliance. *IETF Dependencies* Available at: http://www.openmobilealliance.org/Technical/IETF.aspx (last accessed September 12, 2011).

Society of Cable Telecommunications Engineers (SCTE)

Name	Society of Cable Telecommunications Engineers (SCTE)
Type	Standards Setting Organization—Industry (Cable Telecommunications)
Summary	SCTE is a non-profit professional association that provides technical leadership for the telecommunications industry and serves its members through professional development, standards, certification, and information.[118]
Mission	The Society is organized to develop, increase, and spread both theoretical and practical technical knowledge of cable telecommunications and broadband communications systems thereby providing opportunities for the professional and technical growth of its membership and the industry.
Coordinated Activities:	• ANSI: The SCTE Standards Program provides an ANSI-accredited forum for development of technical specifications supporting the cable telecommunications industry.[119]
Website	http://www.scte.org/

[118] Society of Cable Telecommunications Engineers. *About SCTE* Available at: http://www.scte.org/content/index.cfm (last accessed September 12, 2011).
[119] Society of Cable Telecommunications Engineers. *About SCTE* Available at: http://www.scte.org/content/index.cfm (last accessed September 12, 2011).

Telecommunications Industry Association (TIA)

Name Telecommunications Industry Association (TIA)

Type National Standards Organization – Industry (Telecommunications)

Summary TIA is a trade association representing the global information and communications technology (ICT) industries through standards development and other activities for companies involved in telecommunications, broadband, mobile wireless, information technology, networks, cable, satellite, unified communications, emergency communications and the greening of technology. Within the association, each area is represented by engineering committees and subcommittees that formulate standards to serve the industry and users.[120]

Relevant Engineering Committees

- TR-8 Mobile and Personal Private Radio Standards: Engineering Committee TR-8 formulates and maintains standards for private radio communications systems and equipment for both voice and data applications. TR-8 addresses all technical matters for systems and services, including definitions, interoperability, compatibility, and compliance requirements. The types of systems addressed by these standards include business and industrial dispatch applications, as well as public safety (such as police, ambulance and firefighting) applications[121]
- TR-45 Mobile and Personal Communications Systems Standards: Engineering Committee TR-45 develops performance, compatibility, interoperability, and service standards for mobile and personal communications systems. These standards pertain to, but are not restricted to, service information, wireless terminal equipment, wireless base station equipment, wireless switching office equipment, ancillary apparatus, auxiliary applications, inter-network and intersystem operations, interfaces, and wireless packet data technologies[122]
- TR-48 Vehicular Telematics: Engineering Committee TR-48 is responsible for development and maintenance of standards relating to vehicular telematics equipment and services. TR-48 works with other TIA committees, national and international standards organizations, and other relevant entities to ensure work items are necessary and not duplicative.[123]

[120] Telecommunications Industry Association. *About TIA* Available at: http://www.tiaonline.org/about/ (last accessed September 12, 2011).
[121] Telecommunications Industry Association. *TR-8 Mobile and Personal Private Radio Standards* Available at: http://www.tiaonline.org/standards/committees/committee.cfm?comm=tr-8 (last accessed September 12, 2011).
[122] Telecommunications Industry Association. *TR-45 Mobile and Personal Communications Systems Standards* Available at: http://www.tiaonline.org/standards/committees/committee.cfm?comm=tr-45 (last accessed September 12, 2011).
[123] Telecommunications Industry Association. *TR-48 Vehicular Telematics* Available at: http://www.tiaonline.org/standards/committees/committee.cfm?comm=tr-48 (last accessed September 12, 2011).

Standards	• TIA-1057: *Telecommunications IP Telephony Infrastructure Link Layer Discovery Protocol for Media Endpoint Devices* • TIA-TSB-146: *Telecommunications—IP Telephony Infrastructures—IP Telephony Support for Emergency Calling Service.*
Technology Focus	The technology areas listed below are of high interest to the telecommunications community and are areas in which TIA has developed standards or closely monitors for future standards development needs: [124] • Project 25 • Communications Assistance for Law Enforcement Act (CALEA) • Next Generation Networks • Voice over Internet Protocol (VoIP).
Coordinated Activities: [125]	• 3GPP • APCO International • ATIS ETSI • ITU • ANSI: TIA is an ANSI-accredited SDO.[126]
Effect on NG911	• Develops standards adhered to by originating service providers' (OSP) network and applications services for emergency calling.
Website	http://www.tiaonline.org/

[124] Telecommunications Industry Association. *Technology Focus* Available at: http://www.tiaonline.org/standards/technology/index.cfm (last accessed September 12, 2011).
[125] Open Mobile Alliance. *Collaborating with OMA* Available at: http://www.openmobilealliance.org/Technical/Collaborating.aspx (last accessed September 12, 2011).
[126] American National Standards Institute. *ANSI Accredited Standards Developers* Available at: http://publicaa.ansi.org/sites/apdl/Documents/Standards%20Activities/American%20National%20Standards/ANSI%20Accredited%20Standards%20Developers/AUG11ASD-basic.pdf(last accessed September 12, 2011).

Wi-Fi Alliance

Name	Wi-Fi Alliance
Type	Standards Organization
Summary	The Wi-Fi Alliance is a global non-profit organization with the goal of driving adoption of a single worldwide standard for high-speed wireless local area networking.
Mission	The Wi-Fi Alliance mission is to— • Deliver the best user experience by certifying products enabled with Wi-Fi technology • Grow the Wi-Fi market across market segments and geographies, on a variety of devices • Develop market-enabling programs • Support industry-agreed standards and specifications. [127]
Related	• ITU.
Effect on NG911	• Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data).
Website	http://www.wi-fi.org/

[127] Wi-Fi Alliance. *Organization* Available at: http://www.wi-fi.org/organization.php (last accessed September 12, 2011).

WiMAX Forum

Name	WiMAX Forum
Type	Industry (WiMAX)
Summary	The WiMAX Forum is an industry-led, not-for-profit organization formed to certify and promote the compatibility and interoperability of broadband wireless products based upon the harmonized IEEE 802.16/ETSI HiperMAN standard.[128]
Mission	The WiMAX Forum is the worldwide consortium focused on global adoption of WiMAX and chartered to establish certification processes that achieve interoperability, publish technical specifications based on recognized standards, promote the technology, and pursue a favorable regulatory environment.
Related	• ITU.
Effect on NG911	• Develops standards that enable text and multimedia transmission from the caller to the NG911 system (transport of data).
Website	http://www.wimaxforum.org/

[128] WiMAX Forum. *About the WiMAX Forum* Available at: http://www.wimaxforum.org/about (last accessed September 12, 2011).

NG911 Standards Analysis Overview

To determine the additional NG911 standards development work, all of the standards discussed in the previous section were analyzed. A systematic approach was followed to properly analyze the standards activity, consisting of the following three steps:

1. **Initial open source research:** Initial open source research was conducted, providing a baseline understanding of the relevant SDOs and stakeholders, previously developed NG911 standards, and NG911 standards currently in development

2. **SDO and other stakeholder interviews:** To further enhance the baseline understanding obtained from the open source research, NG911 SDOs and stakeholders were interviewed. During these interviews, the SDOs and stakeholders discussed their previous, current, and planned efforts in regards to developing NG911 standards. Additionally, the interviews gave the SDOs and stakeholders an opportunity to discuss areas that need additional work, or in some cases, topics that need to be identified

3. **Analysis:** The information received from steps one and two was analyzed to determine the additional work needed in the current, near, and long-term to complete and accept NG911 open standards. The analysis consisted of two major steps. First, the information was analyzed to determine the broad areas where additional work remains. Second, a detailed analysis of the information within each area was conducted to determine the work, at a detailed level, that remains. Specifically, the information was analyzed to identify a description of the remaining work, the responsible SDO(s), and a reasonable timeframe for completion.

Overview of Additional Work

As seen in the analysis above, the additional standards development work for NG911 can be categorized, at a high-level, across the following areas:

- **Data:** Work remains for NG911 standards pertaining to data, specifically the standardization of data and additional data
- **Policy Routing:** Work remains for NG911 standards pertaining to the policy routing within the NG911 System
- **Security:** Work remains for NG911 standards pertaining to the security of the NG911 System
- **High-Level Architecture:** Detail work remains for NG911 standards pertaining to the high-level architecture of the NG911 System
- **PSAP Operations:** Work remains for NG911 standards pertaining to the operations of PSAPs
- **Transition to NG911/E911 and NG911 communication:** Work remains for NG911 standards pertaining to the transition from E911 to NG911 and subsequent communication amongst PSAPs operating in an NG911 environment with PSAPs operating in an E911 environment, and vice-versa
- **Databases:** Work remains for NG911 standards pertaining to the databases supporting the NG911 System
- **Management of NG911:** Work remains for NG911 standards pertaining to the high-level management of the NG911 System.

The following sub-sections identify the work, based on analysis and feedback received from the NG911 SDO and stakeholder community, which needs to be completed in the current, near, and future term for each area above. All work identified within the current term timeframe is anticipated over the next year. All work identified within the near term timeframe is anticipated over the next two years. Lastly, all work identified within the future term timeframe is anticipated over the next 2-4 years.

Additional Work – Data

While significant accomplishments have been made in regards to developing data standards for NG911, the need for standards development will continue for the foreseeable future. A major goal of the NG911 System is enabling geographic-independent call access, transfer, and backup among PSAPs and between PSAPs and other authorized emergency organizations. To accomplish this goal, all parties (e.g., individual PSAPS, authorized emergency organizations) require the ability to transfer and understand data amongst each other. A considerable amount of work has been completed to develop standards for the standardization of data; however, much work remains for the NG911 SDOs.

In addition to the standardization of data, there is additional data inherent with the enhanced capabilities of NG911. A solid foundation to the standards development for additional data has been accomplished with the *NENA Standard for Additional Data*; however, this is only a starting point and must be expanded for additional standards. For example, much work is still needed regarding telematics data as one of the enhanced capabilities of NG911 is the automatic notification and transfer of telematics information. To successfully implement the added telematics features and communicate with the telematics service providers (TSPs), adopted standards are needed.

In regards to standards for data, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	APCO; NENA	Determine if any academic institutions can be leveraged to help develop standards pertaining to data.
Current Term	APCO; NENA	Determine the necessary standards to be developed for telematics data.
Current Term	APCO; NENA; NIEM	Review NENA 71-001: *NENA Standard for NG911 Additional Data* to determine the necessary standards to be developed from NENA 71-001.
Current Term	APCO; NENA; NIEM	Review NENA 02-010: *Standard Data Formats for ALI Related Data Exchange, MSAG & GIS* to determine the necessary standards to be developed from NENA 02-010.
Current Term	TBD	Determine the appropriate party to maintain responsibility for COMCARE's previous work on VEDS as COMCARE is inactive.
Near Term	APCO	Develop technical standard identifying the data elements and components necessary for information sharing between all PSAPs.
Near Term	APCO	Develop standard regarding the standardization of incident codes.

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Near Term	APCO; NENA	Finalize NENA TBD: *Advanced Automatic Crash Notification Data Standard [aka VEDS]*.
Near Term	IETF	Finalize IETF Internet Draft: *HTTP Enabled Location Delivery (HELD)*.
Near Term	IETF; NENA; OGC; OMA	Leverage existing standards to develop and finalize the de facto standard for representing a wireless device indoors and how the location data is brought to context within the NG911 System.
Near Term	NENA	Finalize NENA 71-002: *NG911 Civic Location Data Exchange Format (CLDXF)*.
Near Term	NENA	Finalize NENA 70-DRAFT: *Standards for the Provisioning of GIS data to ECRF/LVR.*
Long Term	APCO; NENA; NIEM	Develop NIEM compliant and technical standard for all data involved with telematics.
Long Term	IETF; NENA	Determine the requirements for including international data in the NG911 System.
Long Term	NENA	Finalize NENA TBD: *Access Provider Information Standard*.
Long Term	NENA	Finalize all necessary standards pertaining to data within the NG911 System.

Additional Work – Policy Routing

Significant accomplishments have been made in identifying the necessary standards for policy routing within the NG911 System. For example, NENA is in the process of finalizing the *Overview of Policy Rules for Call Routing and Handling in NG911,* and *NG911 Routing Policy and Business Rules Management Standard.* However, work remains and it is critical for all standards pertaining to policy routing to be finalized in the near term.

In regards to standards for policy routing within the NG911 System, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	NENA	Determine if any academic institutions can be leveraged to help develop standards pertaining to policy routing.
Current Term	NENA	Finalize NENA 71-502: *Overview of Policy Rules for Call Routing and Handling in NG911.*
Near Term	NENA	Finalize NENA TBD: *NG911 Routing Policy and Business Rules Management Standard.*
Near Term	NENA	Review NENA TBD: *NG911 Routing Policy and Business Rules Management Standard* to determine the remaining standards development work for policy routing within the NG911 System.
Near Term	NENA	Finalize all necessary standards pertaining to policy routing within the NG911 System.

Additional Work – Security

While the IP backbone enables many new features, it also increases the security threats inherent with NG911. As such, a comprehensive suite of security specific standards must be developed to protect the data, PSAP operations, and all other components of NG911. Significant accomplishments have been made in the NG911 security standards, including the *NENA Security for Next-Generation 911 Standard*; however the existing work needs to be leveraged to ensure a secure NG911 environment.

In regards to standards for security, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	IETF; NENA	Determine if any academic institutions can be leveraged to help develop standards pertaining to security.
Current Term	NENA	Review NENA 75-001: *NENA Security for the NG911 Standard (NG-SEC)* to determine the necessary standards to be developed from NENA 75-001.
Near Term	IETF	Finalize the detailed security considerations related to the use of location information for NG911.
Near Term	IETF; NENA	Coordinate to determine if a standard is needed that outlines all of the IT security industry best practices that should be adopted within the NG911 environment.
Near Term	NENA	Finalize NENA TBD: *NG911 Security Procedures*.
Near Term	NENA	Finalize NENA TBD: *Auditing & reporting Requirements (Annually or Biennial)*.
Long Term	NENA	Finalize all necessary standards pertaining to security of the NG911 System.

Additional Work – High-Level Architecture

While the first version of the NENA i3 Architecture has been approved (NENA 08-003: *Detailed Functional and Interface Specification for the NENA i3 Solution*), additional work is needed. Specifically, the second version of the NENA i3 Architecture is currently under development, and is anticipated to be finalized by the end of 2011. While this second version adds additional detail and a few new aspects, an evolution of the NENA i3 Architecture needs to be developed after the completion of the second version. This evolution will start a new working group to address the remaining issues (e.g., IMS, LTE, etc.) and must be completed in tight coordination with IETF and carrier SDOs.

In regards to standards for the high-level architecture of the NG911 System, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	3GPP; IETF; IEEE; NENA	Determine if any academic institutions can be leveraged to help develop standards pertaining to the high-level architecture.

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	3GPP; IETF; IEEE; NENA	Coordinate to determine a plan for developing standards pertaining to link-layer technologies access to the Internet for NG911. Leverage IETF's ECRIT working group's existing documentation.
Current Term	IETF; NENA	Agree on appropriate SDO responsible for developing standard for converting SMS to an IP-based messaging system.
Current Term	IETF; NENA	Coordinate to determine if IETF's ECRIT working group's existing work regarding softer access controls could be translated into requirements and/or standards.
Current Term	NENA	Finalize Version 2 of NENA 08-003: *Detailed Functional and Interface Specification for the NENA i3 Solution.*
Current Term	NENA	Establish working group that will assume responsibility for developing the evolution/Version 3 of NENA 08-003: *Detailed Functional and Interface Specification for the NENA i3 Solution.*
Current Term	NENA	Finalize NENA 08-DRAFT: *Emergency Services IP Network Design for NG911.*
Current Term	USDOT	Coordinate with other Agencies, Departments, and stakeholders across the Federal Government (e.g., Emergency Communications Preparedness Center [ECPC]) to ensure acceptance of standards for all NG911 features (e.g., IM/Chat, video, etc.).
Near Term	APCO; NENA	During the next review cycle, determine if any updates pertaining to NG911 are needed within APCO/CSAA 2.101.1-2008: *Alarm Monitoring Company to Public Safety Answering Point (PSAP) Computer-Aided Dispatch (CAD) External Alarm Interfaces Exchange*.
Near Term	APCO; NENA	Finalize the technical information document stating the required interfaces NG911 PSAPs will have.
Near Term	APCO; ATIS; IETF; NENA	Resolve Issue 74 with the development and finalization of the ATIS IMS Standard.
Near Term	Broadband Forum; IETF	Coordinate the status of the IETF framework to finalize the Broadband Forum requirements for service provider's equipment to meet the IETF standards and NENA i3.
Near Term	IETF; NENA	Determine appropriate manner (e.g., NENA i3, RFPs, etc.) for specifying IPv6 as a requirement.
Near Term	NENA	Finalize the evolution/Version 3 of NENA 08-003: *Detailed Functional and Interface Specification for the NENA i3 Solution.*
Near Term	NENA	Finalize NENA TBD: *ESInet Management.*
Near Term	NENA	Review NENA 53-507: *Virtual PSAP Management* to determine the remaining work that is needed (e.g., operational standard, requirements, etc.).
Long Term	Broadband Forum; NENA	Develop standard for giving emergency calls priority access.

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Long Term	IETF; NENA	Engage platform vendors (e.g., Apple, Microsoft, etc.) for software development to enable NG911 on numerous classes of devices.
Long Term	NENA	Finalize the NENA i3 High-Level Architecture.

Additional Work – PSAP Operations

The technical features of the NG911 System are only as effective as the understanding its users possess of the system. Many SDOs and stakeholders, including APCO and NENA, have been working tirelessly on providing the call takers, dispatchers, and PSAP managers with the appropriate standards to successfully operate NG911. As a result of these efforts, many APCO and NENA standards currently exist to support PSAP operations; however, a PSAP could not fully function and operate with the existing suite of standards.

In regards to standards for the operations of PSAPs, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	APCO; NENA	Determine if any academic institutions can be leveraged to help develop standards pertaining to PSAP operations.
Current Term	APCO; NENA	Review NENA 57-750: *NG911 System & PSAP Operational Features & Capabilities* to determine the necessary standards to be developed from NENA 57-750.
Current Term	APCO; NENA	Review NENA 54-750: *Human Machine Interface & PSAP Display Requirements* to determine the necessary standards to be developed from NENA 54-750.
Near Term	APCO; NENA	During the next review cycle, determine if any updates pertaining to NG911 are needed within APCO ANS1.101.2-2010: *Standard for Public Safety Telecommunicators When Responding to Calls Pertaining to Missing, Abducted, and Sexually Exploited Children.*
Near Term	APCO; NENA	During the next review cycle, determine if any updates pertaining to NG911 are needed within APCO ANS1.102.2-2010: *Public Safety Answering Point (PSAP) Service Capability Criteria Rating Scale.*
Near Term	APCO; NENA	During the next review cycle, determine if any updates pertaining to NG911 are needed within APCO ANS 3.103.1-2010: *Minimum Training Standards for Public Safety Telecommunicators.*
Near Term	APCO; NENA	During the next review cycle, determine if any updates pertaining to NG911 are needed within APCO/NENA ANS 1.105.1-2009: *Standard for Telecommunicator Emergency Response Taskforce (TERT) Deployment.*
Near Term	APCO; NENA	During the next review cycle, determine if any updates pertaining to NG911 are needed within APCO ANS 1.106.1-2009: *Core Competencies for Public Safety Communications Manager/Director.*

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Near Term	APCO; NENA	During the next review cycle, determine if any updates pertaining to NG911 are needed within APCO ANS 3.101.1-2007: *Minimum Training Standards for Public Safety Communications Training Officer*.
Near Term	APCO; NENA	Finalize the APCO minimum training and core competencies standard for PSAP supervisors.
Near Term	APCO; NENA	Finalize the APCO minimum training and core competencies standard for coordinators.
Near Term	APCO; NENA	Finalize the APCO minimum training and core competencies standard for quality assurance evaluators.
Near Term	APCO; NENA	Finalize the APCO minimum training and core competencies standard for PSAP technicians.
Near Term	NENA	Finalize the NENA 57-001: *A PSAP Manager's Guide to Geographic Information Technology, V2*.
Near Term	NENA	Finalize NENA TBD: *NG911 Operations Management for 911 Authorities*.
Near Term	NENA	Finalize NENA TBD: *NG911 Systems Operations*.
Near Term	NENA	Finalize NENA TBD: *PSAP Procedural Transition to NG911.*
Near Term	NENA	Finalize NENA TBD: *NG911 Public Safety Answering Point (PSAP) Requirements.*
Long Term	APCO; NENA	Finalize all necessary standards pertaining to PSAP operations within the NG911 System.

Additional Work – Transition to NG911/E911 and NG911 Communications

In an ideal world, every PSAP across the country would go live with the NG911 System simultaneously and thus all would operate with GIS data. As this is not the case, standards need to be developed to ensure PSAPs operating in an E911 environment can communicate and transfer data with PSAPs operating in an NG911 environment, and vice versa. Specifically, much work remains regarding the synchronization of GIS data and databases with MSAG and ALI.

In addition to standards pertaining to E911 and NG911 communication, many standards are needed to ensure a successful transition from E911 to NG911. Specifically, transitional standards are needed to help PSAPs transition their operations, data, and overall network from an E911 to a NG911 environment.

In regards to standards for the transition to NG911/E911 and NG911 communication, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	APCO; NENA; NIEM	Determine if any academic institutions can be leveraged to help develop standards pertaining to the transition to NG911/E911 and NG911 communication.

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	APCO; NENA; NIEM	Review NENA 71-501: *Synchronizing Geographic Information Systems databases with MSAG & ALI* to determine the necessary standards to be developed from NENA 71-501.
Current Term	NENA	Determine the necessary standards in regards to transitioning from an E911 network to an NG911 network.
Current Term	NENA	Determine the necessary standards in regards to transitioning from MSAG and ALI data to geospatial data.
Near Term	NENA	Review *NENA TBD: Next Generation 911 Transition Policy Implementation Handbook: A Guide for Identifying and Implementing Policies to Enable NG911* to determine any additional standards needed.
Near Term	NENA	Finalize NENA TBD: *PSAP Procedural Transition to NG911.*
Long Term	NENA	Finalize all necessary standards pertaining to the transition to NG911 and E911 and NG911 communication.

Additional Work – Databases

As data standards are progressing, more and more attention needs to be focused on the storing of this data within databases. To date, little to no formal standards exist regarding NG911 databases. While the development of database standards for NG911 may be considered less of a priority and more of a long-term effort, the ball needs to get rolling to ensure a complete and acceptable set of NG911 open standards.

In regards to standards for databases within the NG911 System, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Near Term	ATIS; IETF; NENA	Determine if any academic institutions can be leveraged to help develop standards pertaining to databases.
Near Term	ATIS; IETF; NENA	Coordinate to determine the necessary standards pertaining to NG911 databases have been identified.
Long Term	NENA	Finalize NENA TBD: *DB Performance & Reporting Requirements (Daily, Weekly, Monthly, Quarterly, etc.).*
Long Term	NENA	Finalize all necessary standards pertaining to databases within the NG911 System.

Additional Work – Management of NG911

The NG911 System is a very complex environment, with many technical components. To successfully manage the NG911 System, appropriate standards and guidance must be developed as a central repository of information.

As we move closer and closer to a live NG911 System, standards development pertaining to the management of NG911 must significantly progress. In regards to standards for the management of NG911, the following work should be completed:

Timeframe	Suggested Participants (In Alphabetical Order)	Description of Work
Current Term	NENA	Determine if any academic institutions can be leveraged to help develop standards pertaining to management of NG911.
Current Term	NENA	Within the new working group, determine the additional work needed to complete NENA TBD: *NG911 System Management Guide.*
Near Term	NENA	Finalize the NENA TBD: *NG911 System Management Guide.*
Near Term	NENA	Review NENA TBD: *NG911 System Management Guide* to determine the remaining standards development work for the management of NG911.
Long Term	NENA	Finalize all necessary standards pertaining to the management of the NG911 System.

Recommendations

A significant number and variety of standards will potentially have a key impact on the implementation of NG911. Continuing to actively monitor those that have been identified, along with relevant standards that are likely to emerge, will be essential in ensuring the greatest benefit to the global community. However, this un-standardized, semi-planned approach can and will affect the ability of PSAPs and emergency response entities to effectively share information and be interoperable. To alleviate this issue, increased national oversight (e.g., State oversight, State/regional compliant designs, and Federal coordination working groups) should be considered to ensure a complete set of NG911 open standards that are accepted and adopted by all necessary stakeholders. Additionally, increased national oversight could be utilized to monitor progress on the following options to address standards and technology barriers and issues identified in the *National Plan for Migration to IP-enabled System*:

- Strive for IP-enabled 911 open standards and understand future technology trends to encourage system interoperability and emergency data sharing
- Establish routing and prioritization and business rules
- Determine the responsible entity and mechanisms for location acquisition and determination
- Establish system access and security controls to protect and manage access to the IP-enabled 911 system of systems
- Develop a certification and authentication process to ensure service providers and 911 authorities meet security and system access requirements.[129]

[129] National 911 Program. *National Plan for Migration to IP-enabled Systems* Available at: http://911.gov/911-issues/standards.html(last accessed September 12, 2011).

Lastly, without the critical processes and protocols (e.g., certification and authentication, routing business rules), the benefits of the NG911 system, including routing based on criteria beyond location and connection of service providers beyond common carriers to the 911 system, are unlikely to be fully realized.

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Acronym List

ACRONYM	DESCRIPTION
3G	Third Generation
3GPP	3rd Generation Partnership Project
AES	Advanced Encryption Standard
ANS	American National Standard
ANSI	American National Standards Institute
APCO	Association of Public-Safety Communication Officials
ARIB	Association of Radio Industries and Businesses
ASD	ANSI-accredited Standards Developer
ATIS	Alliance for Telecommunications Industry Solutions
BBF	Broadband Forum
BNG	Broadband Network Gateway
CAD	Computer Aided Dispatch
CALEA	Commission on Accreditation for Law Enforcement Agencies
CAP	Common Alerting Protocol
CESE	Conforming Emergency Services Entity
CDMA	Code Division Multiple Access
CCSA	China Communications Standards Association
CID	Command, Control, and Interoperability Division
COGO	Coalition of Geospatial Organizations
CS&C	Office of Cybersecurity and Communications
CSRIC	Communications Security, Reliability, and Interoperability Council

ACRONYM	DESCRIPTION
DHS	Department of Homeland Security
DNS	Domain Name System
DOC	Department of Commerce
DSL	Digital Subscriber Line
E-CSCF	Emergency Call Session Control Function
EAS	Emergency Alert System
ECES	Entities Consuming Emergency Services
ECRIT	Emergency Context Resolution with Internet Technologies
EDGE	Enhanced Data rates for GSM Evolution
EDXL	Emergency Data Exchange Language
EDXL-DE	EDXL-Distribution Element
EDXL-RM	EDXL-Resource Messages
EEEL	Electronics and Electrical Engineering Laboratory
EGEA	Expert Group on Emergency Access (see EU)
EIC	Emergency Interoperability Consortium
EIDD	Emergency Information Data Document
EIS	Emergency Information Service
EISI	Emergency Information Services Interface
EMTEL	Emergency Communications
EPES	Entities Providing Emergency Services
ERIC	Emergency Response Interoperability Center

ACRONYM	DESCRIPTION
ESIF	Emergency Services Interconnection Forum
ESINet	Emergency Services IP Network
ESMI	Emergency Services Messaging Interface
ESW	Emergency Services Coordination Workshop
ETC	Emergency Telecommunicator Certification
ETSI	European Telecommunications Standards Institute
EU	European Union
FDD	Frequency Division Duplex
FIPS PUB	Federal Information Processing Standard Publication
GEOPRIV	Geographic Location/Privacy
GIS	Geographic Information System
GML	Geography Markup Language
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile communications
HELD	HTTP Enabled Location Delivery
HRPD	High Rate Packet Data (3GPP2 access technology)
HSPA+	Evolved High Speed Packet Access
HSSP	Homeland Security Standards Panel
HTTP	Hypertext Transfer Protocol
HTTPS	HTTP Secure
I-WLAN	Intelligent Wireless Local Area Networking
IACP	International Association of Chiefs of Police
ICO	Implementation and Coordination Office

ACRONYM	DESCRIPTION
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IESG	Internet Engineering Steering Group
IETF	Internet Engineering Task Force
IJIS	Integrated Justice Information Systems
IM	IP Multimedia
IMT-2000	International Mobile Telecommunications-2000
IMS	IP Multimedia Subsystem
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
IP-CAN	Internet Protocol Connectivity Access Network
IPAWS	Integrated Public Alert Warning System
ISDN	Integrated Services Digital Network
ISO	International Organization for Standardization
IT	Information Technology
ITL	Information Technology Laboratory
ITS	Intelligent Transportation Systems
ITU	International Telecommunication Union
ITU-R	ITU—Radiocommunications Sector
ITU-T	ITU—Standardization Sector
L7 LCP	Layer 7 Location Control Protocol
LAN	Local Area Network
LCP	Location Configuration Protocol

ACRONYM	DESCRIPTION
LEITSC	Law Enforcement Information Technology Standards Council
LIS	Location Information Server
LLDP-MED	Link Layer Discovery Protocol-Media Endpoint Discover
LoST	Location-to-Service Translation (protocol)
LRF	Location Retrieval Function
LTE	Long-Term Evolution
MAN	Metropolitan Area Network
MHz	Megahertz
MIH	Media Independent Handover
MLS	Mobile Location Services (see OMA)
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPC	Mobile Positioning Center
MSC	Mobile Switching Center
NAED	National Academies of Emergency Dispatch
NENA	National Emergency Number Association
NG911	Next Generation 911
NGES	Next Generation Emergency Services Subcommittee
NGN	Next Generation Networking
NGPP	
NHTSA	National Highway Traffic Safety Administration
NG-SEC	Security for Next Generation 911 Standard
NGPP	Next Generation Partner Program
NIEM	National Information Exchange Model
NIST	National Institute of Standards and Technology

ACRONYM	DESCRIPTION
NOBLE	National Organization of Black Law Enforcement Executives
NSA	National Sheriffs' Association
NTIA	National Telecommunications and Information Administration
OASIS	Organization for the Advancement of Structured Information Standards
OEC	Office of Emergency Communications
OIC	Office of Interoperability and Compatibility
OJP	Office of Justice Programs
OLES	Office of Law Enforcement Standards
OMA	Open Mobile Alliance
OSP	Originating Service Provider
PERF	Police Executive Research Forum
PIDF-LO	Presence Information Data Format-Location Object
PS SoR	Public Safety Statement of Requirements
PSAP	Public Safety Answering Point
PSHSB	Public Safety and Homeland Security Bureau
PSTN	Public Switched Telephone Network
PTSC	Packet Technologies and Systems Committee
QoS	Quality of Service
RFAI	Request for Assistance Interface
RG	Residential Gateway
RITA	Research and Innovative Technology Administration
RM	Reference Material
RSVP	Resource reserVation Protocol

ACRONYM	DESCRIPTION
S&T	Science & Technology Directorate
SAFECOM	Wireless Public Safety Interoperable Communications Program
SDO	Standards Development Organization
SDP	Session Description Protocol
SHS	Secure Hash Standard
SIP	Session Initiated Protocol
SMS	Short Message Service
SOP	Standard Operating Procedure
SR	Selective Router
SRDB	Selective Routing Database
SRIC	Standards Review and Interpretation Committee
SRM	Standard Reference Materials
SSO	Standards Setting Organization
SUPL	Secure User Plane for Location (see OMA)
SWG	Software Working Group
TDD	Time Division Duplex
TISPAN	Telecommunications & Internet converged Services & Protocols for Advanced Networks
TS	Technical Specifications
TSG CT	Technical Specification Group Core Network and Terminals
TSG-X	Technical Specification Group Networks
TSP	Telematics Service Provider
TTA	Telecommunications Technology Association
TTC	Telecommunications Technology Committee
URI	Uniform Resource Identifier
URL	Uniform Resource Locator

ACRONYM	DESCRIPTION
USDOT	Department of Transportation
UTMS	Universal Mobile Telecommunications System
UTRA	UTMS Terrestrial Radio Access
VEDS	Vehicular Emergency Data Set
VoDSL	Voice over Digital Subscriber Line
VOP	Voice over Packet
VoIP	Voice over Internet Protocol
WAVE	Wireless Access for the Vehicular Environment (802.11p)
WG	Working Group
WLAN	Wireless Local Area Network
WTSC	Wireless Technologies and Systems Committee
xDSL	Example Digital Subscriber Line (see DSL)
XML	eXtensible Markup Language
XMPP	eXtensible Messaging and Presence Protocol

Appendix A: Standards and Best Practices

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
3GPP	3GPP TS 23.167 (Free)	3GPP; Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS) emergency sessions	Defines the service description (Stage 2) for emergency services in the IMS, including the elements necessary to support SIP Multimedia (IM) emergency services.	ETSI TS 123 167	Version 11.1.0/ March 2011	Technical Standard (Product/ Design)		X	X		
	3GPP TS 23.517 (Free)	3GPP; Technical Specification Group Services and System Aspects; IMS; Functional Architecture	Describes the IMS core component of the TISPAN NGN functional architecture and its relationships to other subsystems and components.	ETSI ES 282 007	Version 8.0.0/ December 2007	Technical Standard (Interface/ Design)		X	X		
3GPP2	3GPP2 S.R0006-529-A (Free)	Wireless Features Description: Emergency Services	Describes the wireless Emergency Services (911) feature that permits a subscriber to dial 911 and be connected to a PSAP (appropriate to the calling subscriber's current location) to request an emergency response from the appropriate agency (e.g., fire, police, ambulance).		Version 1.0/ June 2007	Technical Standard (Product/ Design)		X	X		
	3GPP2 X.S0049-0 (Free)	All-IP Network Emergency Call Support	Describes the service and procedures in the IMS, including the elements necessary to support emergency services in IMS.		Version 1.0/ February 2008	Technical Standard (Interface/ Design)		X	X		

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
3GPP2	3GPP2 X.S0060-0 (Free)	HRPD Support for Emergency Services	Describes the characteristics for the provisioning of IMS emergency services using the High Rate Packet Data (HRPD) network.		Version 1.0/ July 2008	Technical Standard (Product/ Design)		X	X		
ANSI	ANSI/TIA/EIA-41 (Fee/Charge)	G3G CDMA-DS to ANSI/TIA/EIA-41	Provides general requirements and detailed Upper Layers (Layer 3) signaling radio protocols and procedures for the DS-41 radio interface.		March 2000	Technical Standard					
	ANSI/TIA-102 (Fee/Charge)	Project 25—Data Overview	Provides an overview of the standardized set of data communication services such that data connectivity will operate in accordance with any Project 25 radio and across any Project 25 digital radio system. The document describes circuit and packet data. Additionally, the description serves the requirement to transport multiple packet protocols, including TCP/IP, X.25 and SNA. The APCO 25 system defines 2 different categories of data services in 3 different categories of data configurations for a total of 6 distinct service/configuration combinations. This document does not include a multipoint A interface, or low speed data, which is data embedded in voice.	TIA-102	June 2004	Technical Standard					

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
ANSI	ANSI/TIA-1057 (Fee/Charge)	Telecommunications—IP Telephony Infrastructure—Link Layer Discovery Protocol for Media Endpoint Devices (LLDP-MED)	Defines/describes extensions to the IEEE 802.1AB protocol requirements (including device location for Emergency Call Service/ E911) that support VoIP equipment in IEEE 802-based LAN environments.		April 2006	Technical Standard (Product/ Design)	x				
APCO	APCO ANS 1.101.2-2010 (Free)	Standard for Public Safety Telecommunicators When Responding to Calls Pertaining to Missing, Abducted, and Sexually Exploited Children	Presents the missing, abducted and/or sexually exploited child response process for public safety telecommunicators. The standard includes the process from first response through ongoing incident and case support.		July 2010	Operational Standard					x
	APCO/NENA ANS 1.102.2-2010 (Free)	Public Safety Answering Point (PSAP) Service Capability Rating Scale	Provides an assessment tool for PSAP Managers and their governing authorities to identify their current level of service capability. The assessment tool objectively assesses the capabilities of the PSAP against models representing the best level of preparedness, survivability, and sustainability amidst a wide range of natural and man-made events.		July 2010	Operational Standard					x

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
APCO	APCO/CSAA ANS 2.101.1-2008 (Free)	Alarm Monitoring Company to Public Safety Answering Point (PSAP) Computer-Aided Dispatch (CAD) External Alarm Interface Exchange	Provides detailed technical data to software providers who support CAD Systems or alarm monitoring applications concerning the common data elements and structure that shall be utilized when electronically transmitting a new alarm event from an alarm monitoring company to a PSAP.		January 2009	Technical Standard					
	APCO ANS 3.103.1-2010 (Free)	Minimum Training Standards for Public Safety Telecommunicator	Identifies the minimum training requirements for Public Safety Telecommunicators, which typically includes with receiving, processing, transmitting, and conveying public safety information to dispatchers, first responders (police, fire, EMS), and emergency management personnel.		February 2011	Training Standard					x
	APCO ANS 3.101.1-2007 (Free)	Minimum Training Standards for Public Safety Communications Training Officer	The focus is to Provide training necessary to foster levels of consistency for training officers providing on-the-job training to active 911 operators and telecommunicators, as well as to promote the leadership role of the CTO in a public safety communications center.		September 2007	Training Standard					x
	APCO/NENA ANS 1.105.1-2009 (Free)	Standard for Telecommunicator Emergency Response Taskforce (TERT) Deployment	Includes information to provide guidance and helpful material regarding the development, maintenance and deployment of a TERT.		May 2009	Operational Standard					

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
APCO	APCO ANS 1.106.1-2009 (Free)	Core Competencies for Public Safety Communications Manager/Director	Outlines the core competencies that define the basic functions, duties, responsibilities, knowledge, abilities and expertise attributable to individuals who manage public safety communication functions.		August 2009	Operational Standard					X
ATIS	ATIS-0500002 (Fee/Charge)	Emergency Services Messaging Interface (ESMI)	Defines/describes the interface, protocols, and messages between the Conforming Emergency Services Entity (CESE) and the Emergency Services Network.	ANSI Standard	July 2008	Technical Standard (Interface/ Design)		X	X		
	ATIS-0500006 (Fee/Charge)	Emergency Information Services Interfaces (EISI) ALI Service	Defines/describes the protocols and message sets used within the Emergency Services Network to communicate between Entities Consuming Emergency Services (ECES) and Entities Providing Emergency Services (EPES).	ANSI Standard	August 2008	Technical Standard (Interface-Data/ Design)		X	X		
	ATIS-0500007 (Fee/Charge)	Emergency Information Services Interface (EISI) Implemented with Web Services	Defines/describes the protocols and message sets used within the Emergency Services Network to communicate (through the use of web services) between Entities Consuming Emergency Services (ECES) and Entities Providing Emergency Services (EPES).	ANSI Standard	January 2008	Technical Standard (Interface-Data/ Design)		X	X		
	ATIS-0500019 (Fee/Charge)	Request for Assistance Interface (RFAI) Specification	Defines/describes the Request for Assistance Interface (RFAI) between the Emergency Services Next Generation Network (ES-NGN) and a PSAP.	ANSI Standard	September 2010	Technical Standard					

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
CALEA	Standards for Law Enforcement Agencies©										
DOC	FIPS-PUB-140-2 (Free)	Security Requirements for Cryptographic Modules	Specifies the security requirements that will be satisfied by a cryptographic module utilized within a security system protecting sensitive but unclassified information.	ISO/IEC JTC 1/SC 27	May 2001 (FPS-PUB-140-3 has been drafted)	Technical Standard					
	FIPS-PUB-180-3 (Free)	Secure Hash Standard (SHS)	Specifies five secure has algorithms for computing a condensed representation of electronic data (message)		October 2008	Technical Standard					
	FIPS-PUB-197 (Free)	Advanced Encryption Standard (AES)	Specifies a FIPS-approved cryptographic algorithm that can be used to protect electronic data. The AES algorithm is a symmetric block cipher that can encrypt and decrypt information.		November 2001	Technical Standard (Data/ Design)		X	X		
DHS/ DOJ	NIEM	National Information Exchange Model (NIEM)	Designed to develop, disseminate and support enterprise-wide information exchange standards and processes that can enable jurisdictions to effectively share critical information in emergency situations, as well as support the day-to-day operations of agencies throughout the US.	EDXL; CAP							

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
ETSI	ETSI ES 282 007 (Free)	TISPAN; IMS; Functional Architecture	Presents the IP Multimedia Subsystem (IMS) core component of the TISPAN NGN functional architecture and its relationship to other subsystems and components.	3GPP TS 23 .517	Version 2.1.1 November 2008	Technical Standard (Interface/ Design)		X	X		
	ETSI TS 123 167 (Free)	Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS) emergency sessions	Defines the stage 2 service description for emergency services in the IP Multimedia Core Network Subsystem (IMS), including the elements necessary to support IP Multimedia (IM) emergency services.	3GPP TS 23.167	Version 10.3.0 March 2011	Technical Standard (Product-Interface/ Design)		X	X		
	ETSI TS 182 009 (Free)	Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); NGN Architecture to support emergency communication from citizen to authority	Defines the architectural description for emergency services in the IP Multimedia Core Network Subsystem (IMS), including the elements necessary to support IP Multimedia (IM) emergency services.	3GPP TS 23.509	Version 2.1.1 October 2008	Technical Standard					
	ETSI TS 102 164 (Free)	Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Emergency Location Protocols	Specifies the protocol that is used by the local emergency operator to obtain the location information that is registered on the operator location server.	OMA-TS-MLP-V3_2-20051124-C [1]	Version 1.3.1/ September 2006	Technical Standard					

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
ETSI	ETSI TS 102 424 (Free)	Telecommunications and Internet converged Services and Protocols for Advanced Networking (TISPAN); Requirements of the NGN network to support Emergency Communication from Citizen to Authority	Contains the requirements of a NGN to support emergency communications (EMTEL) from citizen to authority.		Version 1.1.1/ September 2005	Technical Standard					
IEEE	IEEE 1512 (Fee/Charge)	Standard for Common Incident Management Message Sets for Use by Emergency Management Centers	Addresses the exchange of vital data about public safety and emergency management issues involved in transportation-related events, through common incident management sets.	IEE Std-2000; IEE Std 1512.1-2003; IEE Std 1512.3-2002	2006	Technical Standard					
	IEEE 802.11 (Free)	Wireless Local Area Networks (WLAN)	Defines and describes the characteristics associated with WLANs.		June 2007	Technical Standard (Product/ Design)		X	X		
	IEEE 802.16 (Free)	Broadband Wireless Metropolitan Area Network	Defines and describes the characteristics associated with Broadband Wireless Metropolitan Area Networks (WirelessMAN®).	ETSI HiperMAN	May 2009	Technical Standard (Product/ Design)		X	X		
	IEE 802.23 (Fee/Charge)	Emergency Services for Internet Protocol (IP) Based Citizen to Authority Communications	Defines and describes the characteristics associated with voice, data, and multi-media requests across IEEE 802 networks and provides a uniform approach for transferring required data for emergency services requests.		TBD	Technical Standard (Product-Interface/ Design)					

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
IEEE	IEEE 802.1AB (Fee/Charge)	Station and Media Access Control Connectivity Discovery	Defines and describes the protocol and set of managed objects that can be used for discovering the physical topology from adjacent stations in IEEE 802 LANs		2009	Technical Standard					
	IEEE 802.1AC (Fee/Charge)	Media Access Control (MAC) Services Definition	Defines the MAC found in LANs and MANs, and the Internal Sublayer Service and External Internal Sublayer Service provided within MAC Bridges, in abstract terms of a) their semantics, primitive actions and events, b) the parameters of, interrelationship between, and valid sequences of, these actions and events.		November 2009	Technical Standard					
IETF	RFC 2396 (Free)	Uniform Resource Identifiers (URI): Generic Syntax	Defines the generic syntax of URI, including both absolute and relative forms, and guidelines for their use.		August 1998	Technical Standard					
	RFC 3261 (Free)	SIP: Session Initiation Protocol	Describes the Session Initiation Protocol (SIP), an application-layer control (signaling) protocol for creating, modifying, and terminating sessions (include Internet telephone calls, multimedia distribution, and multimedia conferences) with one or more participants.		June 2002	Technical Standard (Interface/ Design)		X	X		
	RFC 3966 (Free)	The tel URI for Telephone Numbers	Specifies the URI (Uniform Resource Identifier) scheme “tel”. The “tel” URI describes resources identified by telephone numbers.		December 2004	Technical Standard					

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
IETF	RFC 4119 (Free)	A Presence-based GEOPRIV Location Object Format	Defines and describes an object format, which is an extension of the privacy-sensitive Presence Information Data Format (PDIF), for carrying geographical information (physical position) on the Internet.		December 2005	Technical Standard (Data/ Design)		X	X		
	RFC 5222 (Free)	LoST: A Location-to-Service Translation Protocol	Defines and describes an XML-based protocol for mapping service identifiers and geodetic or civic location information to service contact URIs. In particular, it can be used to determine the location-appropriate PSAP for emergency services.		August 2008	Technical Standard (Interface/ Design)		X	X		
	Internet Draft (Free)	HTTP Enabled Location Delivery (HELD)	Defines and describes a XML-based protocol that can be used to acquire device location information from a Location Information Server (LIS) within access networks employing both wired technology (e.g., DSL, cable)and wireless technology (e.g., WiMAX).		August 2009	Technical Standard (Interface/ Design)		X	X		
	Internet Draft (Free)	Location Conveyance for the Session Initiation Protocol	Defines an extension to the SIP to convey geographic location information from one SIP entity to another SIP entity.		September 20111	Technical Standard		X	X		

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
NAED	ETC	Emergency Telecommunicator Certification	Designed to train new employees unfamiliar with emergency communication centers, emergency telecommunication technology, interpersonal communication, legal issues, and job stress factors.		N/A	Operational Standard					X
NENA	NENA 00-001 (Free)	Master Glossary of NG911 Terminology	Guide for readers of NENA publications and a tool for members of the NENA committees that prepare them. It defines the terms, acronyms, and definitions associated with the 911 industry. Intended users of this document are any person needing NENA's definition/description of a 911 related term.		Version 16/ August 2011	Information Document					
	NENA 02-010 (Free)	Standard Data Formats For ALI Related Data Exchange, MSAG & GIS	Sets forth NENA standard formats for Automatic Location Identification (ALI) related data exchange between Service Providers and Data Base Management System Providers, a GIS data model, a Data Dictionary, and formats for data exchange between the ALI Database and PSAP Controller equipment.		Version 9.0/ March 2011	Technical Standard					

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
NENA	NENA 06-750 (Free)	Model Legislation, Enhanced 911 for Multi-Line Telephone Systems	Policy document that reflects changes in IP technology; Implementation & Testing; Training and use of building code Fire Zones to facilitate the creation of the Emergency Response Location.		Version 3.0/ February 2011	Requirements Document					
	NENA 07-503 (Free)	Network Inter faces for 911 and Emerging Technologies	Describes network interfaces for users, manufactures and providers of E911 in Emerging Technologies such as VoP, VoIP, and VoDSL..		Version 1.0/ September 2011	Technical Standard (Interface/ Design)		X	X		
	NENA 07-504 (Free)	Collision Notification & Telematics Information	Defines/describes communications methodologies and protocols to facilitate emergency communications between Telematics Service Providers (TSP) and PSAPs (existing and NG911).		June 2007	Technical Standard (Data/ Design)		X	X		
	NENA 08-002 (Free)	NENA Functional and Interface Standards for Next Generation 911	Describes the Emergency Services IP network (ESInet), which is designed as an IP-based inter-network (network of networks) shared by all agencies that may be involved in any emergency. The NG911 PSAP is capable of receiving IP-based signaling and media for delivery of emergency calls conformant to the i3 standard.		Version 1.0/ December 2007	Technical Standard (Interface/ Design)		X	X		

SDO	Standard ID	Standard Title	Standard Description	Associated Standards	Latest Revision/ Release Date	Standard Type	Relation to NENA i3 Architecture				
							Client	Access Networks	Origination Networks	ESInets	PSAPs
NENA	NENA 08-003 (Free)	Detailed Functional and Interface Specification for the NENA i3 Solution	Builds upon prior NENA publications including i3 requirements [1] and architecture [101] documents and provides a baseline to other NG911 related specifications.		Version 1.0/ June 2011	Technical Standard					
	NENA 08-505 (Free)	Recommended Method(s) for Location Determination to Support IP-Based Emergency Services	First edition of what will be a comprehensive document addressing many access network configurations. This edition has a narrow solutions focus and addresses only the automated mechanism for the residential broadband market. Revised editions of this document will add new sections to address enterprise, hosted and mobile access configurations.		December 2006	Informational Document					
	NENA 08-751 (Free)	NENA i3 Requirements (Long Term Definition)	Specifies the requirements the i3 (Long Term Definition) Standard should meet.		Version 1.0/ September 2008	Technical Standard					
	NENA 08-752 (Free)	Location Information to Support IP-Based Emergency Services	Provides the NENA requirements for providing information to support emergency calling.		Version 1.0/ December 2006	Technical Standard					

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							Client	Access Networks	Origination Networks	ESInets	PSAPs
NENA	NENA 53-507 (Free)	Virtual PSAP Management	Guide for PSAP staff and policy makers to evaluate and consider the opportunities and challenges presented with the Next Generation 911 systems as they relate to personnel and PSAP management.		Version 1.0/ May 2009	Operational Standard					X
	NENA 54-750 (Free)	Human Machine Interface & PSAP Display Requirements	Prescribes the requirements for the human machine interface (HMI) display for NG911.		Version 1.0/ October 2010	Operational Standard					
	NENA 57-750 (Free)	NG911 System & PSAP Operational Features & Capabilities	Contains a list of operational capabilities or features that are expected to be supported in a standards-based NG911 system.		Version 1.0/ June 2011	Operational Standard					X
	NENA 70-001 (Free)	NENA Registry System (NRS)	This document describes how registries are created and maintained in NENA.		Version 1.0/ September 2009	Joint Technical (Data) and Operational Standard					
	NENA 71-001 (Free)	NENA Standard for NG911 Additional Data	Describes the use of additional data available with NG911 (associated with a call, a location, a caller, and a PSAP) that assists in determining the appropriate call routing and handling.		Version 1.0/ September 2009	Technical Standard (Data/ Design)		X	X		

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NENA	NENA 71-002 DRAFT	Next Generation 911 (NG911) Civic Location Data Exchange Format (CLDXF)	Supports the exchange of United States civic location address information about 911 calls, both within the US and internationally. Identifies the data elements needed for address data exchange, and provides an XSD for implemented the standard.		Version 1 is being worked by the NGDD CLDXF WG	Technical Standard					
	NENA 71-501 (Free)	Information Document for Synchronizing Geographic Information System databases with MSAG & ALI	Provides PSAP management, vendors, and other interested parties the necessary guidelines for synchronizing GIS data with existing 911 databases.		Version 1.0/ September 2009	Technical and Operational Standard					
	NENA 71-502 (Free)	Overview of Policy Rules for Call Routing and Handling in NG911	Provides an overview of what policy rules are, how policy is defined, and the ways that they may be used.		Version 1.0/ August 2010	Informational Document					
	NENA 75-001 (Free)	NENA Security for Next-Generation 911 Standard (NG-SEC)	Establishes the minimal guidelines and requirements for the protection of NG911 assets or elements within a changing business environment.		Version 1.0/ February 2010	Technical Standard (Interface/ Design)					
	NENA 08-DRAFT (Free)	Emergency Services IP Network Design for NG911	Provides the 911 Entities with the tools (i.e., design methodologies, best practices, templates for ESInet RFI and RFP, etc.) that will enable them to design and deploy networks today that will be capable of meeting the requirements of an NG911 system.		Version 1 is continuing to be developed by the ESIND WG	Technical Standard				X	

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							Client	Access Networks	Origination Networks	ESInets	PSAPs
NENA	NENA 70-DRAFT (Free)	Standards for the Provisioning and Maintenance of GIS data to ECRF/LVR	Defines the operational processes and procedures necessary to support the i3 Emergency Call Routing Function (ECRF) and Location Validation Function (LVF) and identifies ECRF/LVF performance and implementation tradeoffs for 911 Authorities' consideration.		Version 1 is continuing to be developed by the NGDD ECRF/LVF WG	Technical Standard					
	NENA TBD	NG911 CAD Interface									
	NENA TBD	NG911 Routing Policy and Business Rules Management									
	NENA TBD	Discrepancy Processing/ Resolution Requirements (Daily), including data troubleshooting procedures									
	NENA TBD	DB Performance & Reporting Requirements (Daily, Weekly, Monthly, Quarterly, etc.)									
	NENA TBD	Auditing & Reporting Requirements (Annually or Biennial [every 2 years])									

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							Client	Access Networks	Origination Networks	ESInets	PSAPs
NENA	NENA TBD	ESInet Management	Guide for PSAP staff and policy makers to evaluate and consider the opportunities and challenges presented with the Next Generation 911 systems as they relate to personnel and PSAP management.							X	
	NENA TBD	NG911 Security Procedures									
	NENA TBD	NG911 Operations Management for 911 Authorities									X
	NENA TBD	NG911 Systems Operations									
	NENA TBD	PSAP Procedural Transition to NG911.									X
	NENA TBD	NG911 Public Safety Answering Point (PSAP) Requirements									X
	NENA TBD	NG-SEC Audit Checklist									
	NENA TBD	Advanced Automatic Crash Notification Data Standard [aka VEDS]									
	NENA TBD	NG911 System Management Guide									
	NENA TBD	Location Information Service (LIS) Standard									

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NENA	NENA Not Numbered	Next Generation 911 Transition Policy Implementation Handbook: A guide for Identifying and Implementing Policies to Enable NG911									
NFPA	NFPA 1061 (Fee/Charge)	Standard for Professional Qualifications for Public Safety Telecommunicator	Identifies the minimum job performance requirements for public safety telecommunicators.		2007 Edition	Operational Standard					
	NFPA 72 (Fee/Charge)	National Fire Alarm and Signaling Code (Mass Notification Requirements)	Defines and describes the application, installation, location, performance, inspection, testing, and maintenance of fire alarm systems, supervising station alarm systems, public emergency alarm reporting systems, fire warning equipment and emergency communications systems (ECS), and their components.		2010 Edition	Technical Standard					
	NFPA 1221 (Fee/Charge)	Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems	Defines and describes the installation, performance, operation, and maintenance of public emergency services communications systems and facilities.		2010 Edition	Technical Standard					
	NFPA 1600 (Fee/Charge)	Standard on Disaster/ Emergency Management and Business Continuity Programs	Establishes a common set of criteria for disaster/emergency management and business continuity programs.		2010 Edition	Operational Standard					

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							Client	Access Networks	Origination Networks	ESInets	PSAPs
NRIC	7-7-3214 (Free)	Thresholds of Database Queries/Rebids	Public Safety Answering Points should avoid deploying an automatic ALI rebid function for wireless E911 calls. However, where deemed necessary, an automatic ALI rebid function should only be deployed for the initial bid to retrieve the Phase II location.			Best Practice					
	7-7-3215 (Free)	Mobile Switching Center(MSC) Default Route Operational Standard Recommendation	For Network Operators that operate Mobile Switching Centers (MSCs), the MSC should default route 911 calls based on cell sector/tower location to the proper serving Public Safety Answering Point (PSAP) when necessary and where feasible.			Best Practice					
	7-7-3216 (Free)	Default Routing	For Network Operators that cannot default route 911 calls based on cell sector/tower location, switch level defaulted calls should be routed to a fast busy tone or to an appropriate recorded announcement.			Best Practice					
	7-7-3217 (Free)	E911 Service Provider Contact Information	Network Operators and Service Providers should provide and maintain current 24/7/365 contact information accessible to Public Safety Answering Points (PSAPs) so that PSAPs may obtain additional subscriber information as appropriate.			Best Practice					

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NRIC	7-7-3218 (Free)	Training on Obtaining E911 Phase II Data	PSAPs should provide Training to educate PSAP personnel as to the process to obtain E911 Phase II data.			Best Practice					
	7-7-3220 (Free)	E911 Selective Router Database (SRDB) Diversity	Network Operators and Service Providers that operate E911 Selective Router Databases (SRDBs) should deploy SRDBs with redundancy and geographic diversity.			Best Practice					
	7-7-3221 (Free)	SRDB Update Frequency	Network Operators and Service Providers that operate E911 Selective Router Databases (SRDBs) should maintain SRDBs with as current E911 routing information as is feasible.			Best Practice					
	7-7-3222 (Free)	E911 Selective Router (SR) to PSAP Trunking Architecture	Network Operators, Service Providers and Public Safety Answering Points (PSAPs) should provide, where appropriate, at least one additional trunk between the E911 Selective Router (SR) and the PSAP than the switching entity source with the largest total number of trunks serving that PSAP.			Best Practice					

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NRIC	7-7-3223 (Free)	Originating Source to E911 Selective Router Trunking Architecture	Network Operators and Service Providers should implement dedicated trunk groups between the Mobile Switching Center (MSC) end office or similar source and the E911 Selective Router (SR), based on the geography served by the default Public Safety Answering Points (PSAPs). This should be done rather than aggregating traffic from centralized switching architectures serving wide spread geographic areas onto a single trunk group to the E911 Selective Router. This should be done in conjunction with the local PSAP jurisdictional authorities to ensure that correct choices are made.			Best Practice					
	7-7-3224 (Free)	E911 Dedicated Trunking	Network Operators and Service Providers should use dedicated Signaling System 7 (SS7) or Multi Frequency (MF) controlled trunk groups for the normal routing of E911 calls from originating switching entities to E911 Selective Routers rather than using shared Public Switched Telephone Network trunking.			Best Practice					

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NRIC	7-7-3225 (Free)	Mobile Positioning Center (MPC) Capacity Reserve	Network Operators and Service Providers that deploy geographically diverse 911 Mobile Positioning Centers (MPC) with dual load sharing nodes should ensure that the utilization on either node is less than half of each node's capacity so that if one node fails the other node will absorb the load.			Best Practice					
	7-7-3226 (Free)	MPC 911 network operations support	Network Operators and Service Providers operating Mobile Positioning Centers (MPC) should provide 24x7 network operations support			Best Practice					
	7-7-3227 (Free)	911 Voice traffic and Location Data concurrency	Network Operators, Service Providers and Equipment Suppliers should deploy location solutions such that the E911 related data traffic between the Position Determining Entity (PDE) and the mobile subscriber associated with location determination should not interfere with the voice traffic, when feasible.			Best Practice					

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							Client	Access Networks	Origination Networks	ESInets	PSAPs
NRIC	7-7-3228 (Free)	Global Positioning System (GPS) Location accuracy for E911	Network Operators, Service Providers and Equipment Suppliers that use Global Positioning System (GPS) enabled Phase II location solutions should ensure that the GPS satellite location information (e.g., GPS ephemeris, almanac, etc.) is as current as is feasible to assist the handset in providing improved accuracy of the GPS fix, aiding in the reduction of the time of database responses and reduction of the number of database query rebids.			Best Practice					
	7-7-3229 (Free)	911 Performance Statistics and Logging	Network Operators and Service Providers that operate Mobile Positioning Centers (MPC)/ Gateway Mobile Location Centers (GMLC) should maintain local storage of record logs for a minimum of 7 days showing incoming successful requests from Emergency Services Message Entity (ESME) and outgoing responses to ESME.			Best Practice					

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							Client	Access Networks	Origination Networks	ESInets	PSAPs
NRIC	7-7-3231 (Free)	Satellite Location Identification information Transfer Delay	Network Operators and Service Providers that use Global Positioning System (GPS) enabled Phase II location solutions should ensure that the GPS satellite location identification information (e.g., GPS ephemeris, almanac, etc.) is transmitted to the Phase II Mobile Subscriber or Position Determining Entities (PDE) as soon as is feasible after the E911 call commences in order to reduce the number of database query rebids.			Best Practice					
	7-7-3232 (Free)	Handsets that use a GPS algorithm for E911	Equipment Suppliers should ensure that the Phase II handsets commence Global Positioning System (GPS) acquisition before the GPS satellite location identification information is received so that GPS acquisition time is minimized and to reduce the number of database query rebids.			Best Practice					
	7-7-3233 (Free)	E911 Phase II Accuracy Optimization Reporting and Resolution Process	Service Providers deploying wireless Phase II should work to ensure that Phase II accuracy is optimized and the performance trouble resolution process is followed as needed.			Best Practice					

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OASIS	OASIS CAP (Free)	Common Alerting Protocol	Defines and describes CAP, which provides an open, non-proprietary digital message format for all types of alerts and notifications.		Version 1.2/ July 2010	Technical Standard					
	OASIS EDXL-DE (Free)	Emergency Data Exchange Language Distribution Element (EDXL-DE)	Defines and describes EDXL-DE, which is used to facilitate the routing of any properly formatted XML emergency message to recipients.		Version 1.0/ May 2006	Technical Standard					
	OASIS EDXL-RM (Free)	Emergency Data Exchange Language Resource Messaging (EDXL-RM)	Defines and describes EDXL-RM), which provides a set of standard formats for XML emergency response messages.		Version 1.0/ December 2009	Technical Standard					
OGC	OGC 08-007r1 (Free)	OpenGIS® City Geography Markup Language (CityGML) Encoding Standard	Encoding standard for the representation, storage and exchange of virtual 3D city and landscape models. CityGML is implemented as an application schema of the Geography Markup Language version 3.1.1 (GML3).		Version 1.0/ August 2008	Technical Standard					
	OGC 06-121r9 (Free)	OGC Web Services Common Standard	Specifies many of the aspects that are, or should be, common to all or multiple OWS interface Implementation Standards. Those specifications currently include the Web Map Service (WMS), Web Feature Service (WFS), and Web Coverage Service (WCS).		Version 2.0/ April 2010	Technical Standard					

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OGC	OGC 07-006r1 (Free)	OpenGIS® Catalogue Services Specification	Specifies the interfaces, bindings, and a framework for defining application profiles required to public and access catalogues of metadata for geospatial data, services, and related resource information.		Version 2.0.2/ February 2007	Technical Standard					
	OGC 06-042 (Free)	OpenGIS® Web Map Server Implementation Specification	Provides a simple HTTP interface for requesting geo-registered map images from one or more distributed geospatial databases		Version 1.3.0/ March 2006	Technical Standard					
	OGC 07-074 (Free)	OpenGIS® Web Feature Service 2.0 Interface Standard	Specifies the behavior of a service that provides transactions on and access to geographic features in a manner independent of the underlying data store. It specifies discovery operations, query operations, locking operations, transaction operations and operations to manage stored parameterized query expressions.		Version 2.0.0/ November 2010	Technical Standard					

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OGC	OGC 07-0744 (Free)	OpenGIS® Open Location Services Interface Standard (OpenLS)	Specifies interfaces that enable companies in the Location Based Services (LBS) value chain to "hook up" and provide their pieces of applications such as emergency response (E911, for example), personal navigator, traffic information service, proximity service, location recall, mobile field service, travel directions, restaurant finder, corporate asset locator, concierge, routing, vector map portrayal and interaction, friend finder, and geography voice-graphics.		Version 1.2/ September 2008	Technical Standard					
OMA	OMA-ERELD-SUPL-V3_0-20110308-D (Free)	Enabler Release Definition for Secure User Plan Location (SUPL)	Outlines the Enabler Release Definition for SUPL Enabler and the respective conformance requirements for clients and servers implementing claiming compliance to it as defined by OMA across the specification baseline.		Candidate Version 3.0/ March 2011	Technical Standard		X	X		
	OMA-ERELD-LPPe-V1_0-20101012-C (Free)	Enabler Release Definition for LPP Extensions (LPPe)	Outlines the Enabler Release Definition for LPPe Enabler and the respective conformance requirements for clients and servers claiming compliance to it as defined by OMA across the specification baseline.		Candidate Version 1.0/ October 2010	Technical Standard		X	X		

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OMA	OMA-TS-MLP-V3_3-20080627-C (Free)	Mobile Location Protocol (MLP) 3.3	Identifies the MLP, an application-level protocol for getting the position of mobile stations independent of underlying network technology.		Candidate Version 3.3/ June 2008	Technical Standard		X	X		
	OMA-ERELD-LOCSIP-V1_0-20100803-C (Free)	Enabler Release Definition for Location in SIP/IP Core	The Location Service in SIP/IP core network (LOCSIP) provides mechanisms to expose location information to Location Clients that reside in terminals or in Application Servers connected to a SIP/IP core network.		Candidate Version 1.0/ August 2010	Technical Standard		X	X		
TIA	TIA-1057 (Fee/Charge)	Telecommunications—IP Telephony Infrastructure—Link Layer Discovery Protocol for Media Endpoint Devices	LLDP-MED is widely deployed and supports the majority of Enterprise Networking LAN Switches and Enterprise VoIP desk phone manufacturers. It is one of the methods being specified for deriving locations in emergency services calling (E911 replacement) in IETF. It is recommended for a number of purposes in real world VoIP deployments.		April 2006	Technical Standard		X	X		
	TIA TSB-146 (Fee/Charge)	Telecommunications—IP Telephony Infrastructures—IP Telephony Support for Emergency Calling Service	This TSB covers issues associated with support of ECS from IP Telephony terminals connected to an Enterprise Network (EN). It describes new network architecture elements needed to support ECS, and the functionality of those new elements.		March 2003	Technical Standard		X	X		