



pennsylvania
EMERGENCY MANAGEMENT AGENCY

9-1-1 Advisory Board Recommendations:

9-1-1 System Standards and Requirements



DOCUMENT CHANGE HISTORY

Version	Publication Date	Description of Change
1.0	11/15/2016	Initial Version for PEMA Approval



TABLE OF CONTENTS

1. Introduction.....	2
2. ESInet Architecture and Interfaces	4
2.1. Network Architecture.....	4
2.2. Network Interfaces.....	7
3. Network Security and Data Integrity	8
4. Call Delivery Components and Functional Elements	10
5. Call Processing Components and Functional Elements	13
6. Quality Assurance / Quality Improvement Programs	15
7. Training and Certification Programs.....	17



1. INTRODUCTION

The advancement of Next Generation 9-1-1 (NG9-1-1) technology has significantly influenced the design, implementation, and operation of legacy 9-1-1 systems and components. The Commonwealth has acknowledged this changing landscape and provided a structure that will support this transition with the adoption of Act 12 of 2015. As the PSAP community migrates from the current legacy technology and operations to a NG9-1-1 environment, a primary focus must be adherence to a uniform set of standards.

A standard, as defined by the International Organization for Standardization (ISO), is:

“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.”¹

Standards are implemented in all aspects of commerce and industry, in both the public and private sectors. They are typically classified as **voluntary, consensus-based, and open**.²

- Voluntary—Use of the standard is not mandated by law. Mandatory requirements are typically adopted as a code, rule, or regulation by a regulatory body.
- Consensus-based—Published standards have attained general agreement through cooperation and compromise in a process that is inclusive of all interested parties
- Open—Standards are not proprietary and are available for anyone to use

Without established standards to guide the public safety community through the NG9-1-1 transition, the outcome from activities or completed tasks would be based on subjective judgment and rarely achieve common results. Failure to follow standards can lead to inconsistencies in system design, disparate deployments, and ultimately result in significant operational errors and roadblocks. For example, an inconsistent design of a call processing interface between two PSAPs could cause a data exchange failure, not permitting vital location information to be delivered with a transferred or rerouted emergency call.

Standards development is a proven and accepted practice in public safety. Established Standards Development Organizations (SDOs) have developed standards, requirements, and best practices regarding the design, deployment, and management of an Emergency Services IP network (ESInet), Next Generation Core Services, and other systems and components included in an NG9-1-1 environment. Several governmental agencies and commissions also have provided recommendations and best practices that benefit the migration toward NG9-1-1. Subsequently, the 9-1-1 Advisory Board

¹ International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC) Guide 2:2004, definition 3.2

² RITA Intelligent Transport Systems, *What Are Standards?* Available at: <http://www.standards.its.dot.gov/LearnAboutStandards/ITSSStandardsBackground> (last accessed April 15, 2016).



will be recommending the adoption of established standards by these SDOs, agencies, and commissions. A list of some primary organizations are in the succeeding table. Additional Commonwealth-specific requirements also are recommended that will supplement the standards and strengthen areas important to NG9-1-1 transition in Pennsylvania.

Primary Organizations

National Emergency Number Association (NENA)
The Association of Public-Safety Communications Officials (APCO)
Federal Communications Commission (FCC)
Department of Justice (DOJ)
Department of Transportation (USDOT)
Internet Engineering Task Force (IETF)
National Institute of Standards and Technology (NIST)
Telecommunications Industry Association (TIA)
North American Electric Reliability Corporation (NERC)
Alliance for Telecommunications Industry Solutions (ATIS)

This document offers recommendations to PEMA toward the adoption of standards, requirements, and best practices that will guide the following areas of NG9-1-1 design, deployment, and operation in the Commonwealth:

- ESInet architecture and associated interfaces
- Network security and data integrity
- Call delivery components and functional elements
- Call processing components and functional elements
- Quality assurance / quality improvement programs
- Training and certification programs

The structure of some standards and requirement documents is diverse and may focus on several areas of NG9-1-1 services and components. For example, one standards document may offer system capability criteria for everything from interfaces to operational training programs. Therefore, the same standards or requirement document may be recommended for adoption in multiple sections of this submitted recommendation document. It is understood that standards, requirements, and recommendations specific to the focus of the section in which it appears will be applied.

Enterprise IT policies and standards exist in the Commonwealth and are currently in an evaluation process that will identify any necessary modifications and updates. The 9-1-1 Advisory Board will review new versions of these policies and standards as they become available, and will make a determination to adopt or request a waiver.

Recognizing the standards, requirements, and recommendations development is a continual process, an annual review will be performed to evaluate the relevance and value of currently adopted documents, and monitor new document development activity. Presently, several SDOs have started the



development process to produce an updated version of documents or new documents that will be exceptionally valuable to the NG9-1-1 transition. Examples of documents currently under development include:

- NENA Management & Monitoring Document: a future NENA informational document that will provide system monitoring guidance to network managers.
- GIS Model for NG9-1-1 (future NENA STA-006.): A future NENA standard that will provide the GIS database models in NG9-1-1 call routing, call handling, and other related processes.
- NENA 70-Draft: a future NENA standard that will detail the processes necessary for GIS database provisioning and maintenance, supporting the ECRF and LVF in i3 call routing.
- APCO Third Party Application Integration Document: a future APCO standard that provides requirements for smart device applications that integrate with 9-1-1 service.

2. ESINET ARCHITECTURE AND INTERFACES

The NG9-1-1 environment is centered on an open network architecture that allows interfacing and integration between core services and between PSAPs. Information sharing is accomplished through an IP network dedicated for public safety use called the Emergency Services IP Network, or ESInet. The ESInet design typically is comprised of a network of networks, with each individual network accomplishing an interconnectivity task, or set of tasks, for a designated PSAP or region. As a result, PSAPs are able to easily divert workload among each other and share systems that were once isolated in an individual facility. Redundancy capabilities are increased and duplication of services and hardware is decreased. In such an environment, the Commonwealth's 9-1-1 system begins to work more efficiently and effectively as a single unit, rather than a collection of disparate individual sites.

The design and deployment of an ESInet in an NG9-1-1 environment requires a different set of standards compared with the traditional legacy technology platform. New technology frameworks must be planned carefully in a standard fashion, allowing implementation phases to move toward an NG9-1-1 system that provides uniform service and capacity throughout the Commonwealth. The following network functions should be the focus of standards being considered for adoption regarding the design, deployment, and operation of a Commonwealth ESInet.

2.1. NETWORK ARCHITECTURE

Unlike the current legacy environment that is comprised of many disparate networks designed to handle one primary function, an NG9-1-1-capable network provides a high-capacity infrastructure, such as leased or owned fiber or microwave, to handle many, if not all, of the communication needs in a PSAP environment. Radio, phone, and data all can share one network infrastructure with no restriction on media mode or data format. Removing single-task legacy networks provides opportunities to focus support and backhaul on a central network. However, the need for resiliency in backhaul design is crucial. A network failure could result in complete interruption of a PSAP or region's 9-1-1 operations. Additionally, network traffic should be prioritized and configured in such a manner as to avoid degradation in QoS. All aspects of Commonwealth ESInet design, deployment, and operation must be



in full compliance with standards, requirements, and recommendations located in the following documents.

SDO	Standard ID	Standard Title	Standard Description	Latest Revision/ Release Date
APCO/ NENA	1.102.2-2010	Public Safety Answering Point (PSAP) Service Capability Criteria Rating Scale	APCO and NENA have jointly developed an assessment tool to evaluate current 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.	Version 2 July 28, 2010
ATIS	ATIS-0500017	Considerations for an Emergency Services Next Generation Network (ES-NGN)	Identifies standards and standards activities that are relevant to the evolution of emergency services networks in the context of next generation telecommunications networks.	Version 1 June 2009
IETF	RFC 3261	SIP: Session Initiation Protocol	Describes the Session Initiation Protocol (SIP), an application-layer control (signaling) protocol for creating, modifying, and terminating sessions (including Internet telephone calls, multimedia distribution, and multimedia conferences) with one or more participants.	Version 1 July 7, 2002
IETF	RFC 3986	Uniform Resource Identifier (URI): Generic Syntax	Defines the generic URI syntax and a process for resolving URI references, along with guidelines and security considerations for the use of URIs on the Internet.	Version 1 January 2005
NENA/ APCO	REQ-001.1.1-2016	Next Generation 9-1-1 PSAP Requirements	Provides requirements for functions and interfaces between an i3 PSAP and NG9-1-1 Core Services, and among Functional Elements associated with an i3 PSAP.	Version 1 January 15, 2016
NENA	STA-008.2-2014	Registry System Standard	Describes how registries (list of values used in NG9-1-1 functional element standards) are created and maintained.	Version 2 October 6, 2014
NENA	08-002	Functional and Interface Standards for NG9-1-1 (i3)	Establishes standards for functions and interfaces between elements within an ESInet and describes the relationship between NENA standards and the standards of other SDOs such as the IETF and 3GPP/3GPP2.	Version 1 December 18, 2007
NENA	STA-010.2-2016	Detailed Functional and Interface Specifications for the NENA i3 Solution	Builds upon prior NENA publications including i3 requirements and architecture documents and provides additional detail on functional standards.	Version 2 September 10, 2016
NENA	08-506	Emergency Services IP Network Design for NG9-1-1 (ESIND)	Provides information that will assist in developing the requirements for and/or designing an i3 compliant ESInet.	Version 1 December 14, 2011 Update in progress
NENA	08-751	Technical Requirements Document	Provides requirements for ESInet architecture, security, among other i3 PSAP functions, and establishes a foundation for future i3 standards development.	Version 1 September 28, 2006



TIA	TIA-942-A	Telecommunications Infrastructure Standard for Data Centers	Specifies the minimum requirements for telecommunications infrastructure of data centers and computer rooms, including single tenant enterprise data centers and multi-tenant Internet hosting data centers.	Revision A March 2014
-----	---------------------------	---	--	--------------------------

In addition to the standards provided, the following requirements are recommended by the 9-1-1 Advisory Board for the Commonwealth ESInet.

Network architecture requirements:

- Network architecture must deliver a level of reliability that meets or exceeds the established “five-nines” (99.999%) standard traditionally adopted in the PSAP community. Network reliability is defined as the ability for system end-points to effectively communicate with each other, and all associated data and information is exchanged in usable formats. An IP-based network lends itself to looking at reliability as an overall redundancy design, rather than component-by-component. Reliability can be achieved by having redundant active components, with each component attaining less than the desired reliability standard.
- The initial design and deployment of the network shall include capacity that will handle 150 percent of current and planned IP network traffic and usage that occurs as a result of data sharing in, and between, all participating PSAPs and designated support agencies. All current and potential core services and applications should be considered (e.g. CPE, CAD, logging, streaming media, ISP, traffic management systems, communications systems, incident management systems, etc.).
- The network must be designed and deployed in a way that is easily scalable, with the capability to grow in both capacity and coverage without significant loss in the original investment.
- Router and switch configuration must support the determined network throughput.
- Quality of Service (QoS) configuration must prioritize system traffic based on established operational needs and goals.
- Backhaul path design must be geographically diverse, self-healing and eliminate all mission critical single points of failure.
- Technical support service level agreements (SLAs) must establish identification, response, and repair parameters that comply with network reliability and availability standards.
- Network Operations Center (NOC) monitoring, management, notification, and response functions must be developed to comply with established SLA requirements.



2.2. NETWORK INTERFACES

Standardized data exchange models provide an opportunity for disparate systems and functions in and among PSAPs and other critical partner agencies including, but not limited to, remote dispatch sites and incident management facilities to share information in methods that are not possible, or required complex and customized configurations, in a legacy environment. Effective data exchange models require standard interface language and configurations; concept that many of the standards governing the NG9-1-1 architecture supports. This option may lack some of the manufacturer's proprietary optional features, but vital and pertinent data sharing must pass from one system, or PSAP, to another. To successfully sustain an environment that supports uniform interface configuration standards in an open market, core services and functional elements in an NG9-1-1 environment will need to be less customized in a PSAP. All aspects of network interface design, deployment, and operation must be in full compliance with standards and requirements located in the following documents.

SDO	Standard ID	Standard Title	Standard Description	Latest Revision/ Release Date
APCO/ CSAA	2.101.2-2014	Alarm Monitoring Company to PSAP Computer-Aided Dispatch (CAD) Automated Secure Alarm Protocol (ASAP)	Provides detailed information on data elements and structure standards for electronic transmission of new alarm events from an alarm monitoring company to a PSAP.	Version 2 August 5, 2014
IETF	RFC 3261	SIP: Session Initiation Protocol	Describes the Session Initiation Protocol (SIP), an application-layer control (signaling) protocol for creating, modifying, and terminating sessions (including Internet telephone calls, multimedia distribution, and multimedia conferences) with one or more participants.	Version 1 July 7, 2002
NENA/ APCO	REQ-001.1.1-2016	Next Generation 9-1-1 PSAP Requirements	Provides requirements for functions and interfaces between an i3 PSAP and NG9-1-1 Core Services, and among Functional Elements associated with an i3 PSAP.	Version 1 January 15, 2016
NENA/ APCO	INF-005	Emergency Incident Data Document (EIDD)	Provides a recommended list of data components, their relationships to each other, the data elements contained within each data component, and the registries that control the available values for appropriate data elements. Initiates the process to create a National Information Exchange Model (NIEM).	February 21, 2014 Scheduled to be replaced by a standards document
NENA	02-010	Data Formats for 9-1-1 Data Exchange & GIS Mapping	Establishes standard formats for Automatic Location Identifier (ALI) 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 March 28, 2011
NENA	08-002	Functional and Interface Standards for	Establishes standards for functions and interfaces between elements within an ESInet	Version 1 December 18,



		NG9-1-1 (i3)	and describes the relationship between NENA standards and the standards of other SDOs such as the IETF and 3GPP/3GPP2.	2007
NENA	STA-010.2-2016	Detailed Functional and Interface Specifications for the NENA i3 Solution	Builds upon prior NENA publications including i3 requirements and architecture documents and provides additional detail on functional standards.	Version 2 September 10, 2016
NENA	08-501	Network Interface to IP Capable PSAP	Provides technical requirements for the development of IP-based interfaces between the network and PSAP CPE in an NG9-1-1 transitional environment.	Version 1 June 15, 2004

In addition to the standards provided, the following requirements are recommended by the 9-1-1 Advisory Board for network interfacing.

Network Interface Requirements:

- Legacy gateway interfaces provide critical interoperability benefits to both legacy and NG9-1-1 PSAPs, and must be in place and operational during the NG9-1-1 transitional phase until all dependent PSAPs and support agencies have completed the transition.

3. NETWORK SECURITY AND DATA INTEGRITY

NG9-1-1-capable networks follow an open-structure design and allow multiple public safety networks to interface with each other and commercial networks. This design allows for improved information gathering and sharing, and provides an efficient means for the public to contact a PSAP from any IP-based mobile device. There are significantly more access points in an open network, allowing both ingress and egress traffic to move between private and public network borders. This increased traffic produces an increased security risk on any other interconnecting networks. Therefore, security plans need to include a central security plan that provides quick and effective notification and response procedures, allowing network administrators at local, regional, and Commonwealth levels to maintain clean and succinct lines of communication. All network security and data integrity measures designed for and deployed on the Commonwealth ESInet must be in full compliance with standards and requirements located in the following documents.

SDO	Standard ID	Standard Title	Standard Description	Latest Revision/ Release Date
DOJ	CJISD-ITS-DOC-08140-5.5	Criminal Justice Information Services (CJIS) Security Policy	Provides information security requirements, guidelines, and agreements reflecting the will of law enforcement and criminal justice agencies for protecting the sources, transmission, storage, and generation of Criminal Justice Information.	Version 5.5 June 1, 2016
NENA/ APCO	REQ-001.1.1-2016	Next Generation 9-1-1 PSAP Requirements	Provides requirements for functions and interfaces between an i3 PSAP and NG9-1-1 Core Services, and among Functional Elements associated with an i3 PSAP.	Version 1 January 15, 2016



NENA	08-002	Functional and Interface Standards for NG9-1-1 (i3)	Establishes standards for functions and interfaces between elements within an ESInet and describes the relationship between NENA standards and the standards of other SDOs such as the IETF and 3GPP/3GPP2.	Version 1 December 18, 2007
NENA	STA-010.2-2016	Detailed Functional and Interface Specifications for the NENA i3 Solution	Builds upon prior NENA publications including i3 requirements and architecture documents and provides additional detail on functional standards.	Version 2 September 10, 2016
NENA	08-506	Emergency Services IP Network Design for NG9-1-1 (ESIND)	Provides information that will assist in developing the requirements for and/or designing an i3 compliant ESInet.	Version 1 December 14, 2011 Update in progress
NENA	08-751	Technical Requirements Document	Provides requirements for ESInet architecture, security, among other i3 PSAP functions, and establishes a foundation for future i3 standards development.	Version 1 September 28, 2006
NENA	75-001	Security for Next Generation 9-1-1 (NG-SEC)	Establishes the minimal guidelines and requirements for levels of security applicable to NG9-1-1 entities.	Version 1 February 6, 2010
NERC	CIP 002-009	Critical Infrastructure Protection	Addresses the security of cyber assets essential to the reliable operation of the nation's critical infrastructure.	Version 1 December 16, 2009
NIST	FIPS 140-2	Security Requirements for Cryptographic Modules	Specifies security requirements that will be satisfied by a cryptographic module utilized with a security system protecting sensitive but unclassified information.	Version 1 December 3, 2002 Update in progress
NIST	Cybersecurity Framework	Framework for Improving Critical Infrastructure Cybersecurity	Provides standards, guidelines, and best practices that promote the protection of critical infrastructure.	Version 1 February 12, 2014

In addition to the standards provided, the following requirements are recommended by the 9-1-1 Advisory Board for the Commonwealth ESInet.

Network security and data integrity requirements:

- Each point of ingress and egress between ESInets, or an ESInet and a commercial network, requires an independent Border Control Function (BCF) to act as a heavier security barrier at the outermost edges of each ESInet.
 - Security service level agreements (SLAs) must establish progressive threat intelligence and security-alert procedures that comply with network security and data integrity standards.
 - Vulnerability assessment testing at regular intervals (e.g. weekly, monthly, quarterly) must be included in the established SLAs.



- Security Operations Center (SOC) monitoring, management, notification, and response functions must comply with established SLA requirements.
- Network security and data integrity policies, procedures, and practices must be in full compliance with the Commonwealth Breach of Personal Information Notification Act of 2005 ([P.L. 474, No. 94](#)) and any successor documents.

4. CALL DELIVERY COMPONENTS AND FUNCTIONAL ELEMENTS

The design and deployment of an ESInet in an NG9-1-1 environment should provide the necessary architecture to support the NG9-1-1 Core Services (NGCS) critical to call routing and call delivery. New components such as the Emergency Call Routing Function (ECRF), the Emergency Services Routing Proxy (ESRP), the Location Validation Function (LVF), and the Policy Routing Function (PRF) can support all legacy and emerging technology devices that have the ability to call 9-1-1 or otherwise contact a PSAP (e.g., text, picture, video, telematics).

Geographic Information Systems (GIS) play a significant role in NG9-1-1 call routing and call delivery. The location-verification process now must evolve into one that utilizes dynamic information based on current coordinates and related geospatial data. GIS benefits the location-verification process for all devices – wireline, wireless, or IP-based. However, there is added accuracy value for the large majority of 9-1-1 calls originating from wireless or VoIP devices annually.

Call delivery core functions and components can be deployed in a more resilient and redundant network design without an unnecessary level of equipment duplication. Rather than each PSAP deploying and maintaining isolated systems and services, the Commonwealth can design an interconnected network of call delivery systems and services that balances workload, supports system-wide PSAP communication, and establishes seamless alternate call routing policies.

The design, deployment, operation, and maintenance of call delivery systems and components in the Commonwealth must be in full compliance with standards, requirements, and recommendations located in the following documents.

SDO	Standard ID	Standard Title	Standard Description	Latest Revision/ Release Date
APCO/ CSAA	2.101.2-2014	Alarm Monitoring Company to PSAP Computer-Aided Dispatch (CAD) Automated Secure Alarm Protocol (ASAP)	Provides detailed information on data elements and structure standards for electronic transmission of new alarm events from an alarm monitoring company to a PSAP.	Version 2 August 5, 2014
APCO/ NENA	1.102.2-2010	Public Safety Answering Point (PSAP) Service	APCO and NENA have jointly developed an assessment tool to evaluate current capabilities of the PSAP against models representing the	Version 2 July 28, 2010



		Capability Criteria Rating Scale	best level of preparedness, survivability, and sustainability amidst a wide range of natural and man-made events.	
NENA/APCO	REQ-001.1.1-2016	Next Generation 9-1-1 PSAP Requirements	Provides requirements for functions and interfaces between an i3 PSAP and NG9-1-1 Core Services, and among Functional Elements associated with an i3 PSAP.	Version 1 January 15, 2016
NENA	02-010	Data Formats for 9-1-1 Data Exchange & GIS Mapping	Establishes standard formats for Automatic Location Identifier (ALI) 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 March 28, 2011
NENA	02-014	GIS Data Collection and Maintenance Standards	Provides information on data collection to meet accuracy requirements for wireless and Voice over Internet Protocol (VoIP) 9-1-1 technologies that use x, y, z coordinates to provide location of the 9-1-1 caller.	Version 1 July 17, 2007
NENA	08-001	Interim VoIP Architecture for Enhanced 9-1-1 Services (i2)	Outlines the architecture to connect emergency callers in the IP domain with Public Safety Answering Points (PSAPs) supported by the existing E9-1-1 network infrastructure.	Version 2.1 May 25, 2015
NENA	08-002	Functional and Interface Standards for NG9-1-1 (i3)	Establishes standards for functions and interfaces between elements within an ESInet and describes the relationship between NENA standards and the standards of other SDOs such as the IETF and 3GPP/3GPP2.	Version 1 December 18, 2007
NENA	STA-010.2-2016	Detailed Functional and Interface Specifications for the NENA i3 Solution	Builds upon prior NENA publications including i3 requirements and architecture documents and provides additional detail on functional standards.	Version 2 September 10, 2016
NENA	08-751	Technical Requirements Document	Provides requirements for ESInet architecture, security, among other i3 PSAP functions, and establishes a foundation for future i3 standards development.	Version 1 September 28, 2006
NENA	56-506	PSAP Selection Criteria Operations Information Document	Provides strategies, points of consideration, and other operational guidance related to the processes and criteria used in the identification and selection of facilities and/or sites considered for a community's PSAP.	Version 1 July 17, 2007
NENA	57-750	NG9-1-1 System and PSAP Operational Features and Capabilities Requirements	Provides the minimum levels of required functionality for operational capabilities or features that are expected to be supported in an NG9-1-1 environment.	Version 1 June 14, 2011
NENA	71-001	NG9-1-1 Additional Data	Identifies supportive data sources and defines their use during the 9-1-1 call flow to provide proper routing instructions.	Version 1 September 17, 2009 Update in



				progress
NENA	STA-003.1.1-2014	NG9-1-1 Policy Routing Rules	Provides templates to facilitate the Policy Routing Rules that a 9-1-1 Authority must develop for any new NG9-1-1 system.	Version 1 December 1, 2014
NENA	STA-004.1.1-2014	NG9-1-1 United States Civic Location Data Exchange Format (CLDXF) Standard	Provides a definitive set of core civic location data elements that support emergency call routing and dispatch.	Version 1 March 23, 2014
NFPA	1221	The Standard for the Installation, Maintenance, and Use of Emergency Services Communication Systems	Provides information on the installation, performance, operation, and maintenance of public emergency services communications systems and facilities.	2016 Edition
IETF	RFC 6881	Best Current Practices for Communications Services in Support of Emergency Calling	Describes best current practices on how devices, networks, and services using IETF protocols should use such standards to make emergency calls.	Version 1 March 2013
Uptime Institute		Tier Classification and Performance Standard	Develops a performance-based methodology for the data center during the design, construction, and commissioning phases to determine resiliency, redundancy, and reliability	August 1, 2012
BICSI	002-2014	Data Center Design and Implementation Best Practices	Provides recommendations on the best practice methods of implementing a data center design	Version 3 December 2014

In addition to the standards provided, the following requirements are recommended by the 9-1-1 Advisory Board for call delivery in the Commonwealth.

Call delivery requirements:

- Transitional systems and components must be designed and deployed in a way that is easily expanded to full i3 compliance without significant loss in the original investment.
- Scheduled alternate routing policies of each PSAP in the Commonwealth must be collected by PEMA and distributed to the collective PSAP community.
- Remote dispatch points (RDPs) that receive transferred 911 calls from a PSAP must possess call delivery functionality and capability that allows the transfer of vital location and caller identification information



5. CALL PROCESSING COMPONENTS AND FUNCTIONAL ELEMENTS

In an NG9-1-1 environment, ESInet infrastructure provides opportunities for PSAPs to share the systems and services utilized for call processing. Components such as the Customer Premise Equipment (CPE), Computer-Aided Dispatch (CAD) system, and logging system established in a central data center at a host PSAP or neutral site can be shared by multiple PSAPs or regions based upon the capacity of the network connectivity and system being shared. There are examples of interconnected PSAPs successfully sharing call processing systems, allowing for real-time data exchange for emergency incident functions. In Pennsylvania, two regionally shared CPE systems already have provided successful operational models of NG9-1-1-capable call-processing functions using a fiber network to connect each PSAP within the region to a central core.

Redundant core design provides workload balance and necessary backhaul for all critical components of the call processing function. If service at any individual PSAP is interrupted, calls are seamlessly routed to an alternate PSAP for processing. Adding a shared CAD system in this environment would provide for an even more efficient call-processing function throughout the region. Calls could be received, processed, and shipped to the appropriate PSAP for dispatch of emergency responders regardless of where the 9-1-1 call is routed. No longer do isolated networks and infrastructures need to be deployed at every individual PSAP. System resiliency and redundancy are accomplished through a networked and geographically diverse design.

The design, deployment, operation, and maintenance of call processing systems and components in the Commonwealth must be in full compliance with standards, requirements, and recommendations located in the following documents.

SDO	Standard ID	Standard Title	Standard Description	Latest Revision/ Release Date
APCO	1.111.1-2013	Public Safety Communications Common Disposition Codes for Data Exchange	Provides a standardized list of incident disposition codes that can be used by emergency communications and public safety stakeholders when sharing incident related information.	Version 1 December 12, 2013
APCO	2.103.1-2012	Public Safety Communications Common Incident Types for Data Exchange	Provides a standardized list of incident type codes that can be used by emergency communications and public safety stakeholders when sharing incident related information.	Version 1 November, 2012
APCO	1.116.1-2015	Public Safety Communications Common Status Codes for Data Exchange	Provides a standardized list of status codes that can be used by emergency communications and public safety stakeholders when sharing incident related information.	Version 1 April 7, 2015
APCO/ CSAA	2.101.2-2014	Alarm Monitoring Company to PSAP Computer-Aided Dispatch (CAD)	Provides detailed information on data elements and structure standards for electronic transmission of new alarm events from an alarm monitoring company to a PSAP.	Version 2 August 5, 2014



		Automated Secure Alarm Protocol (ASAP)		
NENA	STA-010.2-2016	Detailed Functional and Interface Specifications for the NENA i3 Solution	Builds upon prior NENA publications including i3 requirements and architecture documents and provides additional detail on functional standards.	Version 2 September 10, 2016
NENA	08-506	Emergency Services IP Network Design for NG9-1-1 (ESIND)	Provides recommendations on best practices regarding network reliability that meet requirements for i3 core services	Version 1 December 14, 2011 Update in Progress
NENA	08-751	Technical Requirements Document	Provides requirements for ESInet architecture, security, among other i3 PSAP functions, and establishes a foundation for future i3 standards development.	Version 1 September 28, 2006
NENA	56-506	PSAP Selection Criteria Operations Information Document	Provides strategies, points of consideration, and other operational guidance related to the processes and criteria used in the identification and selection of facilities and/or sites considered for a community's PSAP.	Version 1 July 17, 2007
NENA	57-750	NG9-1-1 System and PSAP Operational Features and Capabilities Requirements	Provides the minimum levels of required functionality for operational capabilities or features that are expected to be supported in an NG9-1-1 environment.	Version 1 June 14, 2011
NENA	71-001	NG9-1-1 Additional Data	Identifies supportive data sources and defines their use during the 9-1-1 call flow to provide proper routing instructions.	Version 1 September 17, 2009 Update in progress
NENA/APCO	REQ-001.1.1-2016	Next Generation 9-1-1 PSAP Requirements	Provides requirements for functions and interfaces between an i3 PSAP and NG9-1-1 Core Services, and among Functional Elements associated with an i3 PSAP.	Version 1 January 15, 2016
NENA/APCO	INF-005	Emergency Incident Data Document (EIDD)	Provides a recommended list of data components, their relationships to each other, the data elements contained within each data component, and the registries that control the available values for appropriate data elements. Initiates the process to create a National Information Exchange Model (NIEM).	February 21, 2014 Scheduled to be replaced by a standards document
NFPA	1221	The Standard for the Installation, Maintenance, and Use of Emergency Services Communication Systems	Provides information on the installation, performance, operation, and maintenance of public emergency services communications systems and facilities.	2016 Edition
Uptime Institute		Tier Classification and Performance Standard	Develops a performance-based methodology for the data center during the design, construction, and commissioning phases to	August 1, 2012



			determine resiliency, redundancy, and reliability	
BICSI	002-2014	Data Center Design and Implementation Best Practices	Provides recommendations on the best practice methods of implementing a data center design	Version 3 December 2014

In addition to the standards provided, the following requirements are recommended by the 9-1-1 Advisory Board for call processing in the Commonwealth.

Call processing requirements:

- Transitional systems and components must be designed and deployed in a way that is easily expanded to full i3 compliance without significant loss in the original investment.
- Shared call processing systems must comply with established data collection and reporting requirements for any management information system (MIS) deployed by a region or the Commonwealth.

6. QUALITY ASSURANCE / QUALITY IMPROVEMENT PROGRAMS

A vital component of any PSAP operation is ensuring that telecommunicators are performing to a high level of efficiency that the public expects, and providing the education and tools necessary to improve their skill set throughout the life of their career. Answering, processing and dispatching emergency services should be done in a timely fashion according to standards set forth by industry experts. To ensure a training program is effectively meeting the needs of the telecommunicator and the organization, metrics should be put in place to measure the success of the program as a whole. In an NG9-1-1 environment, there is a far greater frequency of integrated systems, components and data sharing. This is not only true between core services within a PSAP, but also among PSAPs within a region or larger geographical area. With this significant increase in communication capabilities and interconnectivity, quality assurance and improvement programs will need to consider new origins of data and logs, such as text-to-911 calls of streaming video from body-worn cameras, in the information-gathering process for a review or investigation.

Act 12 of 2015 provides the 9-1-1 Advisory Board authority to "...advise the agency [PEMA] on regulations and guidelines relating to the administration and operation of 911 systems in this Commonwealth relating to...standards for performance reviews and quality assurance programs to ensure public safety, and maintain and improve the performance of 911 systems."³ In several states, including Pennsylvania, an established standard or regulation mandates an active QA/QI program at the PSAP level. Portions of the current Commonwealth quality assurance regulations can be beneficial as new requirements are developed in accordance with nationally accepted standards.

³ Act 12 of 2015 amends Chapter 53 of Title 35 (Health and Safety) of the Pennsylvania Consolidated Statutes. <http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2015&sessInd=0&act=12>



All aspects of Commonwealth quality assurance and quality improvement programs must be in full compliance with standards, requirements, and recommendations located in the following documents.

Agency	Document ID	Document Title	Standard Description	Latest Revision/ Release Date
NENA/ APCO	APCO/NENA ANS 1.107.1-2015	Standard for the Establishment of a Quality Assurance and Quality Improvement Program for Public Safety Answering Points	Defines the recommended minimum components of a Quality Assurance/Quality Improvement (QA/QI) program within a public safety communications center. It recommends effective procedures for implementing the components of the QA/QI program to evaluate the performance of public safety communications personnel.	Version 1 April 2, 2015
NENA/ APCO	APCO/NENA ANS 1.102.2- 2010	Public Safety Answering Point (PSAP) Service Capability Criteria Rating Scale	Provides PSAP managers with criteria to identify their current level of service capability.	Version 2 July 28, 2010
APCO	APCO ANS 3.106.1-2013	Core Competencies and Minimum Training Standards for Public Safety Communications Quality Assurance Evaluators (QAE)	Identifies the core competencies and minimum training requirements for the Public Safety Communications Quality Assurance Evaluators.	Version 1 April 11, 2013
NENA	56-006	Emergency Call Processing Protocol Standard	Provides a uniform and consistent protocol for handling and processing 9-1-1 and other emergency calls, including call types, prioritization, and pre-planned responses	Version 1 June 7, 2008

In addition to these standards and documents provided, the following requirements are recommended by the 9-1-1 Advisory Board for the Commonwealth Quality Assurance and Quality Improvement programs.

Quality Assurance/Quality Improvement requirements:

- QA/QI evaluation reports will be completed quarterly, at minimum, for every telecommunicator working in a full-time or part-time capacity.
- Completed QA/QI evaluations will be measured individually, per telecommunicator, rather than overall agency.
- QA/QI evaluations for multi-discipline telecommunicators will include an assessment of all certified communication skill sets.
- Random sampling QA/QI evaluations should adhere to the following schedule (average):



- No more than five days should separate the call or radio traffic and the completion of the evaluation.
- No more than five days should separate the completion of the evaluation and the review of the evaluation with the telecommunicator.

7. TRAINING AND CERTIFICATION PROGRAMS

A sustainable training program needs to be relevant and transferrable to every PSAP in the Commonwealth. The diversity in PSAP size, scope, and activity level is wide-ranging across Pennsylvania. In addition, different regions experience distinctive emergency situations, and as such require emphasis in varied areas of training. For example, a PSAP that serves a rural public waterway may require specific training on boating emergencies, whereas a PSAP in an urban setting would benefit from additional training for specific crimes in progress, such as gang activity. Regardless of the differences experienced from PSAP to PSAP, all telecommunicators should benefit from a strong foundation that develops a professional skillset required in any setting.

Act 12 of 2015 requires PEMA to "...adopt, in consultation with the [9-1-1 advisory] board, minimum training and certification standards for emergency dispatchers, call takers, and supervisors."⁴ As the appointed 9-1-1 coordinating entity for Pennsylvania, PEMA is in good position to establish a comprehensive training and certification program for the call-taker, dispatcher, and supervisor skillsets based on the established standards.

An effective professional certification process integrates instructional, examination, and continuing education phases that encourage an advanced level of learning, experience, and application. Instructional sessions traditionally have been structured as onsite programs. However, distance learning methodologies have gained popularity with the interaction capabilities provided to students through online and webinar-style techniques. Distance learning allows the delivery of a high-quality program to a more diverse audience, while maintaining a reasonable cost.

Exams are able to measure the level of course material comprehension and proficiency at a given point in time. However, they are unable to provide an accurate assessment of long-term knowledge retention and skill application. Documented continuing education ensures that a telecommunicator is maintaining a level of active learning on current and relevant topics. As the landscape in the 9-1-1 community continues to migrate from legacy to NG9-1-1, the use of continuing education will be an important key to a smooth transition. It will allow for a natural progression between recertification periods rather than a complete relearning process from one exam to the next.

All aspects of Commonwealth Training and Certification program must be in full compliance with standards, requirements, and recommendations located in the following documents.

⁴ Act 12 of 2015 amends Chapter 53 of Title 35 (Health and Safety) of the Pennsylvania Consolidated Statutes. <http://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2015&sessInd=0&act=12>



Agency	Document ID	Document Title	Standard Description	Latest Revision/ Release Date
Joint working group		Recommended Minimum Training Guidelines for the 9-1-1 Telecommunicator	Identifies and recommends topics for inclusion in any minimum training curriculum for the telecommunicator assigned to the role of call taker or dispatcher.	Version 1 May 19, 2016
APCO	APCO ANS 3.103.2-2015	Minimum Training Standards for Public Safety Telecommunicators	Identifies minimum training requirements of all personnel assigned to any public safety function.	Version 1 July 14, 2015
APCO	APCO ANS 3.102.1-2012	Core Competencies and Minimum Training Standards for Public Safety Communications Supervisor	Identifies the core competencies and minimum training requirements for the supervisor position, including knowledge, skills, and abilities needed to provide vital leadership and guidance to other public safety personnel.	Version 1 December 7, 2012
APCO	APCO ANS 1.101.3-2015	Responding to Calls of Missing, Abducted and Sexually Exploited Children	Provides best practice guidelines and operational models in support of the role and responsibilities of public safety communications personnel when responding to incidents of missing, abducted, and sexually exploited children.	Version 3 January 8, 2015
NENA/ APCO	APCO/NENA ANS 1.105.2-2015	Telecommunicator Emergency Response Taskforce (TERT) Deployment	Provides information required for developing, training, equipping, and deploying a standardized TERT team.	Version 2 July 14, 2015
NENA/ APCO	APCO/NENA ANS 1.102.2-2010	Public Safety Answering Point (PSAP) Service Capability Criteria Rating Scale	Provides PSAP managers with criteria to identify their current level of service capability.	Version 2 July 28, 2010
NENA/ APCO	APCO/NENA ANS 3.105.1-2015	Minimum Training Standards for TTY/TDD Use in the Public Safety Communications Center	Provides minimum training requirements necessary to foster levels of consistency for all personnel in an emergency communications environment assigned to answering TTY/TDD calls for service.	Version 1 February 24, 2015
NENA	56-006	Emergency Call Processing Protocol Standard	Provides a uniform and consistent protocol for handling and processing 9-1-1 and other emergency calls, including call types, prioritization, and pre-planned responses	Version 1 June 7, 2008

In addition to these standards and documents provided, the following requirements are recommended by the 9-1-1 Advisory Board for the Commonwealth Training and Certification program.



Training and certification requirements:

- Instructors who currently hold a training certification with an established nationally accepted training program shall be permitted to facilitate, or participate in, Commonwealth training courses within their scope of practice, without any geographical or service area restrictions.