Abstract: Implementation of this document will assist 9-1-1 Authorities in developing an RFP to procure elements of an NG 9-1-1 system, including PSAP Functional Elements, NG 9-1-1 Core Services, Geographic Information System (GIS) Data and Services, and Management Information System (MIS) Data Collection and Reporting.

NOTE: This DRAFT document is not intended for distribution beyond the groups developing or reviewing the document. The document is also not intended to be used or referenced for development or procurement purposes until final publication. All draft material is subject to change and it is possible that the document itself may never be approved for publication.

Prepared by:
National Emergency Number Association (NENA) PSAP Operations Committee, Request for Proposal Working Group

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1 Executive Overview

The Request for Proposal (RFP) Information Document is intended for 9-1-1 Authorities that have made the decision to issue an RFP for the purpose of procuring all or part of a Next Generation 9-1-1 (NG 9-1-1) System. Specifically, this document recommends a structure and content to guide a project team that has been given the charter to develop an RFP. It anticipates that other work has been done and decisions have been made that support the development of the RFP.

The journey to NG 9-1-1 is complex and consists of many factors that need to be considered by 9-1-1 Authorities. The impact on certain elements of Public Safety Answering Point (PSAP) operations may include, but are not restricted to, the following:

- Impact on Stakeholders
- Impact on Operations
- Impacts on Technology
- Impacts on Security

This document attempts to describe an overview of the various steps necessary to research and develop an NG 9-1-1-centric RFP. The many elements of the development of an NG 9-1-1 RFP effort require consideration of the following:

- Reasons for issue or release
- Cost factors associated with the procurement of software, hardware, services and maintenance
- RFP preparation
- Partnerships with other 9-1-1 authorities or agencies
- Decisions regarding the engagement of third-party subject matter experts
- Costs associated to preparation that include:
  - Identification of personnel who may be part of the RFP development process, evaluation, and review activities
  - Analyzing the impact to their existing responsibilities
  - Reviewing their current schedule
  - Understanding the potential need for overtime
- Governance and regulatory issues
- Future organizational and staffing plans
- Data development issues
- NG 9-1-1 system acquisition and migration options plans

Ideally, this document provides a guide and not a complete template, leaving the reader a great deal of flexibility in applying the recommendations contained herein.

Implementation of this document will assist 9-1-1 Authorities in developing an RFP to procure elements of an NG 9-1-1 system, including PSAP Functional Elements, NG 9-1-1 Core Services, Geographic Information System (GIS) Data and Services, and Management Information System (MIS) Data Collection and Reporting.
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- Reflecting changes in the design of equipment, network interfaces, or services described herein.

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**Reason for Issue/ Reissue**

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2 NG 9-1-1 Considerations for Procurement

The following sections cover several dimensions of information that can be included in any procurement process such as a Request For Information (RFI), Request For Quote (RFQ), and/or an RFP. The focus of this document is on RFPs.

The more complete each dimension of a proposal, the fewer assumptions vendors must make. This may increase the accuracy and reliability of the response.

The specific RFP consideration to be used by stakeholders procuring PSAP Functional Elements, NG 9-1-1 Core Services, GIS Data and Services, and MIS Data Collection and Reporting are defined in the following sub-sections:

- Research- Becoming Familiar with NG 9-1-1 (Section 2.1)
- Planning – Scope of Your Project/NG 9-1-1 Transition Planning (Section 2.2)
- Content Consideration – With additional scope provided via diagrams, tables and checklists (Section 2.4)
- NG 9-1-1 System Elements (Section 2.5)
- RFP Drafting and Issuance (Section 3.1)
- RFP Finalization (Section 3.6)
- Response and Evaluation (Section 3.7)

2.1 Research

Developing an RFP for procuring all or part of an NG 9-1-1 system is only one part of the overall system procurement process. Prior to developing the RFP, one should take into consideration the need to research the desired system needs versus what is available. Research steps to consider in preparing for the release of an RFP could include:

- Conducting a basic online search for NG 9-1-1
- Locating and reading industry-related articles and standards
- Attending industry events to meet others who may have NG 9-1-1 procurement experience
- Attending industry events to find vendors providing NG 9-1-1-related products and services
- Issuing an RFI to gather intelligence on currently available systems and services from vendors

2.2 Planning

A 9-1-1 Authority intending to migrate from a legacy E 9-1-1 system to an NG 9-1-1 system should take the time to consider and address a number of issues. Specifically, 9-1-1 Authorities should consider developing the following seven plans:

1. Financial Plan – Costs and Funding
2. Governance Plan
3. Federal and State Regulatory Plan

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4. Organizational and Staffing Plan

5. Data Development Plan to Support an NG 9-1-1 System

6. NG 9-1-1 System Acquisition Plan

7. Migration Plan

2.2.1 Financial Plan – Costs and Funding

The financial planning process is the step 9-1-1 Authorities should consider taking to develop budgets to guide its future activities. Financial models developed may include:

- How much it will cost to migrate to NG 9-1-1. This should include non-recurring and recurring costs, capital expenses and operating expenses.
- The ongoing costs once the system is in production.
- The forecasted revenue collected which can be applied to the NG 9-1-1 system.
- Other sources of funds that may be available to the 9-1-1 Authority to support the migration.
- A plan for peak spending while both the E 9-1-1 and NG 9-1-1 systems are running in parallel.

2.2.2 Governance Plan

The governance planning process is the step 9-1-1 Authorities should consider taking to develop how the NG 9-1-1 system will be managed and used to guide its future activities. Governance models developed may include:

- Identifying the group that will have the authority, knowledge, and commitment to make decisions about the migration to NG 9-1-1.
- The body that will oversee the NG 9-1-1 system when it is in production.
- The method of interaction between the project team and governing body, including project team authority levels for changes and identification of the change process.

2.2.3 Federal and State Regulatory Plan

The federal and state regulatory planning process is the step 9-1-1 Authorities should consider taking to identify the various levels of regulation and mandates of the NG 9-1-1 system to guide its future activities. Federal and state regulatory models developed may include:

- Deciding on the applicability of the current regulations.
  - Will they support the anticipated migration?
  - Do the existing rules need to be modified?
  - Are there new rules to create and implement?
- Federal and State reporting requirements.
2.2.4 Organizational and Staffing Plan

The organizational and staffing planning process is the step 9-1-1 Authorities should consider taking to develop how the organization as a whole and the associated staff can be structured to guide its future activities. Organizational and staffing models developed may include:

- Identification of existing staff levels and their various roles.
- Identification of roles specific to data rights management.
- Identification of staffing requirements during the migration process, with consideration given to required roles and skills during and after each migration phase.
- Evaluation of post-migration staffing requirements as new roles and staff may be needed.
- Reconsideration of organizational structure and management in light of the potential changes.
- Consideration could be given to the use of consultants to augment, on a temporary or permanent basis, the necessary skills and staffing requirements.

2.2.5 Data Development Plan to Support an NG 9-1-1 System

The data development planning process is the step 9-1-1 Authorities should consider taking to develop how the NG 9-1-1 system and the necessary data will be managed and used to guide its future activities. Data development models developed may include:

- The data required to support an NG 9-1-1 system (Emergency Call Routing Function [ECRF], Location Validation Function [LVF], Mapping Data Service [MDS], MSAG Conversion Service [MCS], Geocode Service, Service/Agency Locator and, if applicable, the Location Information Server [LIS]) and Additional Data Repository must be available and of a satisfactory quality.
- Assurance that GIS information is available, and processes are in place to maintain the accuracy and quality of the data in a timely manner.

2.2.6 NG 9-1-1 System Acquisition Plan

The system acquisition planning process is the step 9-1-1 Authorities should consider taking to develop how the NG 9-1-1 system should be procured, ordered, and implemented and used to guide its future activities. Acquisition models developed may include:

- Definition of system requirements, and the needs and requirements of participating groups that may have to be addressed.
- Identification of system elements that are deemed “essential” versus those elements that are considered to be “optional”.
- Determination of the implementation timeline, after determining the desired system architecture and design.
2.2.7 Migration Plan Options

The migration planning process is the step 9-1-1 Authorities should consider taking to develop how the NG 9-1-1 system will be placed into operation and used to guide its future activities. Migration is discussed in NENA-INF-008.2-2014 NG 9-1-1 Transition Plan Considerations Information Document [2].

Migration plan models developed may include:

- Defining the NG 9-1-1 system to replace the existing E 9-1-1 system.
  - The topics above, if covered properly, should provide the necessary level of definition and set expectations with vendors during the procurement process.

- Defining how the migration to the NG 9-1-1 system will be achieved.
  - 9-1-1 Authorities should make vendors and service providers aware of their expectations and note any limitations of which the vendors should be aware.
  - Information on migration to NG911 can be found in the NENA transition planning document.

2.2.8 Planning Summary

The seven plans listed above are interrelated. Decisions or limitations in one plan will impact options in other plans. Development of each plan can occur somewhat independently of all other plans; however, there are interdependencies that require decisions to be made in some plans before work on other plans can progress.

For example, the investment in time and money to develop an RFP should not be made until the 9-1-1 Authority has a reasonable expectation that it can afford to move forward with the migration. Since the costs of staffing the project and developing the underlying data should be included in the Financial Plan, some work in these areas is also required.

Some plans are subject to scheduling limitations. For example, changing state statutes and regulations that affect the migration to NG 9-1-1 can be impacted by the state legislative calendar. Missing deadlines in the legislation process can create significant delays. The timing of RFP development should take into consideration the status of all other plans.

2.3 Standards

As with E 9-1-1, Next Generation 9-1-1 is defined by standards – documents created by a consensus driven process with all stakeholders that multiple vendors can implement such that they all interoperate. Standards are vital to the success of NG 9-1-1 and conformance to standards bring many benefits to 9-1-1 Authorities, responders and the public.

Purchasers have a choice of vendors knowing that components selected from different vendors will reliably work together. Different vendors can’t represent that their products are fully interoperable with each other unless 1) they commit to meeting standards, 2) they have done interoperability testing, such as through NENA’s ICE events, and 3) are willing to document their actions in doing both. Note that “meeting standards” requires specifying
which standards, and that response phrases such as ‘equivalent to’ or ‘consistent with’
may mean that the product doesn’t meet the literal standard, but is what the vendor feels
is ‘good enough’ (for now) and is economical for them to build and sell, or is their view of
‘what you really need’. This will invariably lead to ‘upgrades to handle new developments’,
and new charges. Failing to deal with these issues fully will jeopardize interoperability.

Costs will be lower because all purchasers are buying the same standards, and the cost of
custom development is eliminated, or at least greatly lowered.

Reliability is higher because the standards are written to require modern redundancy and
reliability features and the system architecture has had wide review by a large number of
skilled practitioners which assures purchasers that no significant architectural flaws exist.

In disaster and significant failure scenarios, calls can be handled by any available service
because the all work the same way, driven by the same standards.

All NG 9-1-1 RFPs should require conformance to the appropriate standards, most
importantly, NENA-STA-010 [6], the current i3 standard. Proposers must be encouraged to
implement the standards faithfully. Where there are extenuating circumstances, proposers
should be required to state where they don’t meet any aspect of the standard, state a
satisfactory reason why, specify when they will achieve conformance, and detail the
penalty they propose for not meeting the proposed dates. The penalty for knowingly
misstating conformance should be severe, but because the standards are complex and
large, accidental non-conformance should not be handled the same way, and vendors
should be given a reasonable time (measured in months, typically 6-9) to update their
system to be compliant.

NENA conducts a series of Industry Collaboration Events (ICE) which afford vendors the
opportunity to test their implementations against other vendor’s implementations of the
various NG 9-1-1 Functional Elements. Participation is strictly voluntary, and the rules of
ICE require that no participant reveal any information, including results, of any other
participant. Participants, of course are free to disclose anything they want of their own
experience so long as it does not reveal any information about any other participant. RFPs
may wish to enquire whether a proposer participates in ICE, and what their results were,
keeping the above non-disclosure requirements in mind.

NENA standards define a set of “Functional Elements” (FEs) which are groupings of
functions, where the interfaces between FEs are carefully described. The intention of the
standards is that an FE from one vendor be interchangeable with the same FE from
another vendor, and a complete NG 9-1-1 system be able to be assembled from a set of
FEs from multiple vendors which works in every respect.

The standards also state that it is not a requirement that an FE be built as a stand-alone
system or self-contained implementation. Rather, any set of FEs may be combined into a
single system or implementation, provided that the set implements all of the functions the
standards define for the set and the interfaces to the combined set provide all of the
external interfaces to the set. If the standard defines an interface between two FEs, and an
implementation combines the FEs into one system, the interface between the two FEs
inside the system don’t have to use the specified interface; they can use anything the
vendor wishes to use. If a system incorporates multiple FEs, it may use proprietary
interfaces between them internally, as long as it supports the standard interfaces for
external elements from other vendors. Vendors should be free to group FEs as they see fit,
so long as the set in a physical implementation has all of the external interfaces and
combined functions defined for the set.

Standards evolve, and the current iteration of NENA-STA-010 [25] is continually being
reviewed for updating as determined by the evolution of this industry. Vendors can’t
control what the next version will contain, but if they participate in standards activities,
they can have a voice, and also know in advance what changes a new version will bring. It
is highly desirable that NG 9-1-1 deployments keep up with the standards as they evolve.
By the same token, vendors are reluctant to actually start modifying their products until
they are sure they know what the new standards will say, and thus there is always a
considerable time lag from when a new version of a standard, or the initial version of a
new standard is released and implementations of that version are released. The RFP should
discuss this issue. It is suggested that proposers be required to implement new versions,
and that the proposal state the timeline for such upgrades. Customers have to be
somewhat flexible – a new version may require a vendor to make a significant change to
its architecture that can take a longer time to complete. Although standards writers are
sensitive to the effect of changes to existing implementations, the fact is that standards
evolve and implementations must evolve with them.

Vendors often go beyond standards, adding proprietary features to their products to make
them more attractive to customers. The challenge for customers is that these features
engender vendor lock-in. A careful consideration of such extensions should be made in
evaluating proposals so that the Authority understands what vendor lock-in they have to
contend with, how comfortable they are with that, and what they might do if, for some
reason, a vendor change was needed. Clearly, being able to take advantage of features
without being dependent on them is desirable. Proposers should be required to make such
extensions backward compatible – meeting the standards without reservation, and capable
of interworking with other implementations that don’t have the extensions. NENA standards
are designed to be extended, so that new versions can be deployed incrementally with
older implementations continuing to work while newer implementations are deployed.
These same extension points can be used by vendors to achieve backwards compatibility
with other standards-based implementations. Proposals that require proprietary extensions
to provide functionality described by the standards should not be permitted.

2.4 RFP Content Considerations

To solicit a clear response to the RFP, the writer must articulate the scope of the 9-1-1
Authority’s requirements from an operational and policy management level to the vendor
community. This articulation should establish clear points of demarcation for the vendor for what the 9-1-1 Authority’s vision of enabling NG 9-1-1 capabilities is, what areas the 9-1-1 Authority is seeking to gain insight or technical solutions to, and which areas are seen as being retained by the 9-1-1 Authority for technical operation. It is vital that the RFP writer address the end-to-end scope of the requirements to ensure that “gaps” that might exist between parties involved in providing NG 9-1-1 components of the procured solution and their relationship to the 9-1-1 Authority-owned or -operated components are managed. “Gaps” in responsibility along the NG 9-1-1 solution “call chain” and data chain should be actively addressed in the procurement process to eliminate single points of failure introduced by incomplete reviews of responsibilities in the acquisition process.

The scope identified by the 9-1-1 Authority should clearly establish the range of the services the 9-1-1 Authority is seeking information on or seeking technical assistance or solutions to, with regard to the Emergency Services Internet Protocol (IP) network (ESInet), NG 9-1-1 Core Services, and NG 9-1-1 GIS data preparation activities. For the ESInet and NG 9-1-1 Core Services, the RFP writer’s decision on which services or solutions will be provided via a hosted or managed service and which will be provided through an in-house owner-operated model will influence the type of RFP requirements for the specifications. Likewise, the RFP writer may be seeking consultative assistance across the spectrum of NG 9-1-1 solution components.

As an aid in managing clarity of the scope for the RFP writer, this section provides several contextual visual planning aids in the figures and tables below. Other sections of this INF document provide more detailed explanations that relate to the elements contained in the contextual visual aids.

Figure 1 provides a high-level end-to-end logical overview of an NG 9-1-1 System, from the originating network to the PSAP. A more detailed and technical diagram may be found in the Gateways section of NENA-STA-010.2 [6].
For the purpose of this document, the NG 9-1-1 system includes but is not limited to, the following:

- Originating Network: the portion of the NG 9-1-1 system that delivers the 9-1-1 call from the 9-1-1 caller to the ingress point of the ESI-net;
- ESI-net: the portion of the NG 9-1-1 system that transports, via IP, the 9-1-1 call from the Originating Network to the PSAP;
- The NG 9-1-1 Core Services (NGCS): the applications and services that process and route the call to the proper PSAP (refer to information detailed in Section 3 above for additional information regarding considerations regarding Core Services); and
- PSAP: the portion of the NG 9-1-1 system that terminates and handles the 9-1-1 call.
This INF document is focused toward the services and features of the ESI.net, NGCS and PSAP domains; the Originating Network is not in the scope of this document from a procurement standpoint.

The following diagram depicts an overview of the scope of this document and includes the five (5) components of a complete NG 9-1-1 System.

![Diagram of document scope]

Figure 2. Document Scope

Table 1 (below and Appendix) is provided as a planning worksheet for the RFP writer to place an ‘X’ in the appropriate spaces within the matrix according to the anticipated strategy.

Having completed the matrix, it is strongly recommended that the RFP writer include a Topology Diagram in the RFP to visually convey the overall vision for the NG 9-1-1 effort associated to the RFP, clearly indicating which components are existing, which are in the scope of the RFP, and which might be in the scope of future projects or other authorities.
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2.5 NG 9-1-1 System Elements for Procurement

Due to limitations in time, funding, and authority, parts of a complete NG 9-1-1 system may be procured and implemented in phases or by different entities. Accordingly, an individual RFI/RFP may focus on acquiring one or more segments among those that comprise an NG 9-1-1 system.

2.5.1 ESI net (IP Transport Infrastructure)

RFPs seeking an ESI net should incorporate the provisions contained in this section of this document.

2.5.1.1 Introduction

Guidance for this section has been taken from the NENA Emergency Services IP Network Design (ESIND) Information Document, NENA-INF-016.2-2018 (originally 08-506) [10].

ESInets are private, managed IP networks. An ESInet serves a set of PSAPs, a region, a state, or a set of states. ESInets are interconnected to neighboring ESInets so that traffic can be routed from any point in the ESInet to any point in any other ESInet.

The ESInet is fundamentally a collection of IP circuits and routers that forms the network that connects the PSAPs.

The ESInet is defined in NENA-ADM-000.22, NENA Master Glossary of 9-1-1 Terminology [1] as follows:

An ESInet is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core services can be deployed, including, but not restricted to, those necessary for providing NG 9-1-1 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks). The term ESInet designates the network, not the services that ride on the network. See NG 9-1-1 Core Services.

2.5.1.2 Background Information

Many ESInets have been or are being built as 9-1-1 entities prepare to migrate to NG 9-1-1. The ESInet is a network of IP networks that connects the various 9-1-1 entities that are to be included.

As NENA Emergency Services IP Network Design (ESIND) Information Document, NENA-INF-016.2-2018 (originally 08-506) [10], describes, ESInets are like other IP networks in
that they are a collection of routers and links between routers, in which there are multiple paths, such that link failures leave at least one link path usable by network. ESI nets; however, must be designed to meet more stringent requirements for security and reliability service levels than most other IP networks.

Details on ESI net characteristics can be found in *NENA Emergency Services IP Network Design (ESIND) Information Document*, NENA-INF-016.2-2018 (originally 08-506) [10]. Below is a summary of the requirements for an ESI net or NG 9-1-1 Core Services:

1. The network between the PSAP and the ESI net will be private or a virtual private network (VPN) that supports, at a minimum, Transmission Control Protocol (TCP)/IP, UDP, and RTP.

2. It will have scalable bandwidth to support new enhanced services. Some existing network infrastructure, like a legacy Frame Relay network, is not scalable enough for an ESI net, and may present other problems. Other legacy technologies like Asynchronous Transfer Mode (ATM) are scalable, but present other issues. Metro Ethernet or Multi-Protocol Label Switching (MPLS) are preferred over ATM for this reason. NENA-INF-016 Emergency Services IP Network Design (ESIND) Information Document describes multiple options to choose from for building ESI nets that support scalable bandwidth, and provides details on other advantages and disadvantages for each option. All of this should be considered when developing the requirements for an RFP to procure ESI net infrastructure and NG 9-1-1 Core Services.

3. The ESI net shall be a conventional routed IP network.

4. Multiprotocol label switching (MPLS) or other sub-IP mechanisms are permitted as appropriate.

5. How PSAPs will connect to the ESI net should be considered in the procurement process. Where possible, PSAPs should have redundant connections to the ESI net.

6. The PSAP’s LAN and connection to the ESI net must be resilient, secure, physically diverse, and logically separate.

7. The ESI net shall be engineered to sustain real-time traffic, including data, audio, and video.

8. Connections between the PSAP and ESI net shall support secured TCP/IP connections.

9. All components of the ESI net and any elements connected to it must support both IPv4 and IPv6.
2.5.1.3 Interdependencies with Other NG 9-1-1 Components

2.5.1.3.1 Other NG 9-1-1 Components that must be Implemented Prior to or in Conjunction with ESInets

ESInets connect to the Internet, to other ESInets, and to PSAPs.

- Originating Network Interface: The ESInet connects directly to local Origination Networks via private connection, and also accepts calls from any origination network or device from the Internet. All calls, regardless of origin, including calls from legacy origination networks via the LNG or LSRG, pass through the BCF before connection to any other NGCS function. The calls are presented to the origination ESRP in the right ESInet as directed by the ECRF. The ESRP then routes the calls within the ESInet towards the right PSAP.
- PSAP Interface: The NG 9-1-1 PSAP call interface is also a SIP call interface. The ESRP routes calls towards the right PSAP. In each ESRP, the PRF is used to interpret the current route policy of the next hop based on the state of the downstream entity. The terminating ESRP routes to a PSAP (or IMR). Calls are presented to a legacy PSAP through a Legacy PSAP Gateway (LPG).
- Border Control Function: A BCF sits between external networks and the ESInet and between the ESInet and agency networks. All traffic from external networks, LNGs and LSRGs transits a BCF.

2.5.1.3.2 Other NG 9-1-1 Components that should be Implemented Prior to or in Conjunction with ESInet

The ESInet and NG 9-1-1 Core Services are both required elements for a NG 9-1-1 system. Core Services provide the call routing intelligence and many other functions in an NG 9-1-1 system. See NENA-STA-010 [6] for information on NG 9-1-1 Core Services (NGCS).

2.5.1.4 Information to Provide Proposers

It is recommended that the information below be provided to proposers in an RFP for ESInet and NG 9-1-1 Core Services.

1. Any existing or planned network facilities available to the jurisdiction need to be identified. Sharing of the ESInet with other network facilities is encouraged, in order to save cost, provided that the NG 9-1-1 traffic can properly co-exist with existing traffic.
   a. Network facility stakeholders associated with existing network facilities need to be identified. This includes the provider of the existing facilities and current users of the facilities.
b. The timing of their availability needs to be identified. Are the network facilities available now or at some point in the future?

c. Any other traffic that the network is carrying will need to be identified. Facilities will need to be sized appropriately to accommodate the different types of traffic that are on the network. Appropriate segregation of other traffic so that it does not interfere with NG 9-1-1 traffic is required. If the ESInet shares an IP network topology with other traffic, the other traffic may need to be conditioned (e.g. using DiffServ) so that NG 9-1-1 traffic has appropriate priority.

d. The capacity of the network facilities will need to be identified. Existing facilities may exist but require augmentation before they can be used for public safety purposes.

e. Security associated with the existing facilities will need to be assessed. Entities that currently have access will need to be identified and security measures associated with their access will need to be reviewed.

f. Network management and trouble ticketing capabilities of the network facilities will need to be identified.

2. The scope of the ESInet and NG 9-1-1 Core Services needs to be provided to proposers of ESInet services. This should state whether the ESInet and NG 9-1-1 Core Services will be statewide or regional and include the addresses of the PSAPs and data centers that are to be included. Location of likely interconnect points with origination networks should be identified. Likely interconnection points with neighboring ESInets should be identified.

3. The extent of the ESInet and NG 9-1-1 Core Services should also be described. This should include the point(s) of ingress and egress to the ESInet.

   a. Any specifically desired ESInet topology should be described in detail, with understandable logical diagrams. If proposers are to propose a topology, any requirements of the agency should be provided. Proposers should be required to provide clear diagrams. Diagrams and descriptions should clearly define points of ingress to the ESInet.

   b. All points of egress from the ESInet should be clear in all diagrams and descriptions. These may include interconnections to PSAPs, other ESInets, and redundant instances of the ESInet.

   c. How the proposed ESInet will support the NG 9-1-1 Core Services it will host should be clearly shown and stated. Geodiverse redundancy is a requirement for the ESInet (and the Core Services it hosts). Any specific requirements
should be clearly stated. Proposers should describe how their ESI net redundancy scheme will meet the availability requirements for NG 9-1-1 deployments.

d. Interconnection with all external networks should be clearly described and depicted on any diagrams. These would include networks that host supporting services and functions outside of the 9-1-1 Authority’s control.

4. Bandwidth requirements.

a. Clearly describe the required bandwidth. ESI ND contains some heuristics tied to call taker positions and PSAPs. State clear requirements on how bandwidth is affected by network failures. For example, if there are three redundant connections between two points in the network, does the bandwidth requirement have to be maintained if one or two connections fail?

5. Redundancy requirements.

a. State what requirements exist for redundant facilities where it is important to specify directly (as opposed to specifying reliability requirements and allowing proposers to determine redundancy needed to achieve the reliability which may be preferred). State the requirements for what capacity/capability must be maintained when one (or more) redundant paths fail.

6. BGP.

a. State whether the ESI net is required to use Border Gateway Protocol, and if so, if it must have its own AS. If there are requirements for a particular interior gateway protocol, state them. Describe what options PSAPs must have to connect to the ESI net at the protocol level.

7. Shared facilities.

a. State whether proposers can/should share facilities with other networks/network components, and/or what network segments or facilities must be exclusive to the ESI net to be acquired. Where sharing is allowed (which is generally to be encouraged), state what isolation is required between users to maintain the appropriate level of service the ESI net requires. Interconnection is accomplished by negotiated interconnection agreements between the parties making the connection, such as the Originating Service Provider and the entity owning/operating the NG 9-1-1 network, or a provider of network resources for other purposes. It is prudent for the 9-1-1 Authority or equivalent to get a commitment on time-to-accomplish up front, along with the agreement on exactly what is to be
provided and accomplished. There are no standards for this process, as it is a negotiated business agreement.

8. Addressing.

a. State how much public address space (IPv4 and IPv6) must be made available to the ESInet or provide sufficient information so a proposer can calculate how much space will be needed. Consider future needs, as renumbering addresses is difficult. State whether NAT is allowed (ESIND suggests not).


a. State clear requirements for security. Consider requirements for secure versions of routing protocols. State any requirements for physical security of key network elements. State requirements for what security proposers must meet for admin/network operations access to network elements, both in terms of requirements on devices and operational security for proposer and 9-1-1 Authority staff. Both physical security and cybersecurity merit full focus and attention for Public Safety systems. There are numerous references for physical security and a growing amount of recommendations for cybersecurity, such as the NENA NG Security (NG-SEC) documents, NIST material, and DHS requirements.


a. State the requirements for network management and monitoring. ESIND contains much specific guidance. Consider requirements for what level of access to network monitoring 9-1-1 Authority/PSAP staff should have. State what processes for notification of network outages or degradation are required. Consider requiring redundant Network Operations Centers (NOCs). State what control the primary proposer must have over subcontractors providing network facilities to avoid circular finger-pointing.

11. Performance Requirements.

a. Specify the required packet loss, jitter and latency, and where such requirements must be maintained (such as all paths emergency call media traverses). State what QoS is required, and how it must be measured. Note the requirements in NENA-STA-010 [6] to support DiffServ. ESIND contains specific recommendations for traffic management. Consider which of these best practices should be specified in the RFP.
2.5.1.5 Information to Request from Proposers

2.5.1.5.1 High-level ESInet Requirements

1. General Requirements for the ESInet
   a. FCC Rules – Require proposers to address the appropriate rules that might apply, such as, but not limited to, FCC Rule Part 15, Class A for electromagnetic interference [26], and Part 12 of Title 47 of the Code of Federal Regulations dealing with Resiliency, Redundancy, and Reliability of Communications [27].
   b. ESInet Design Requirements – Require proposers to explain how their proposed ESInet solution follows the guidelines provided in NENA-INF-016.2-2018 (originally 08-506), Emergency Services IP Network Design [10], or its successor document.
   c. Facilitating Carrier Transition of Services to the ESInet – Require proposers to establish the need to transition existing 9-1-1 services from current service providers onto the ESInet and the terms and conditions between the proposed solution and the interfaces to the Originating Service Provider (OSP) and their terms and conditions.

2. ESInet Protocol Network Requirements
   a. Require proposers to describe how they support BOTH IPv4 and IPv6.
   b. Require proposers to describe what routing protocols are used in the network and where, how address numbers (both IP addresses and AS numbers) are acquired and managed.

3. ESInet and NG 9-1-1 Core Services Functional Transport Purpose Statement
   a. Require proposers to state how their proposal supports all NG 9-1-1 applications for voice and data. Require proposals specify specific bandwidth for all links and show how the proposed bandwidth is sufficient to support voice, video, and text communications, and logging of same. Require proposers to describe in detail how they maintain QoS. Request details of what DiffServ Code Points will be used, what Per Hop Behaviors will be configured into each router for these DSCPs, and how policing of DSCPs will be accomplished at the interconnect points with other networks. Require detailed analysis of how expected traffic will maintain the desired QoS and what network impairments would endanger maintaining QoS

4. ESInet Interconnections Topology of Host and Remote Sites
a. Require proposers to describe the topology of their proposed ESInet. Require a description of what routers will be provided, where all links to each router are connected to, what technology each link uses, and the bandwidth provisioned on it at network acceptance as well as what provisions are made for increasing bandwidth as the network grows. Require specification of interconnects between origination networks and other ESInets: location, technology and link capacity. By graphical depiction or reference to a supporting appendix, provide the contextual inventory of the host and remote sites that are part of the procurement which proposers can use as an input to designing an appropriate network solution using the anticipated call volume and network bandwidth available.

5. Bandwidth Growth
   a. Require proposers to specify how their proposed ESInet can grow in a managed, incremental process over the expected lifetime of the contract and beyond it.

6. Real-time Application Monitoring
   a. Require proposers to describe real-time application monitoring functionality.

7. ESInet Architecture Guidance and Requirements (detailed in NENA-INF-016.2)
   a. Assess the availability of local IP networks.

8. Scalability – Expansion Requirements
   a. Require proposers to describe how the network can scale to meet anticipated and unanticipated new requirements, require descriptions of what expansion is possible by upgrade, and what requires replacement, what costs are involved, and what lead times are anticipated.

9. Network Upgrades and Maintenance
   a. Articulate the notification period for when downtime is required (e.g., five business days in advance) and the standard operating procedure (SOP) that describes the procedures agreed to in advance to mitigate the impacts of maintenance.
   b. Include the requirement to obtain the provider’s Continuity of Operations plan.

10. Bandwidth
    a. Specify the current number of 911 Trunks, Admin Lines and anticipated call volume for each PSAP that is part of the ESInet. Indicate the PSAPs currently handling or planning to handle calls at another PSAP for “x” period of time.
RFP authors would need to provide an initial guesstimate / forecast some expectation of growth expectations; based upon growth of not only voice, but video and other media types.

11. ESInet Availability

a. Specify the availability requirement for the ESInet. ESInets that host NG 9-1-1 Core Services always have a "five nines" availability requirement, that is, 99.999% uptime. Individual PSAP connection infrastructure may have a lower availability requirement in cases where NG 9-1-1 routing features like call diversion are employed to provide an overall 9-1-1 service availability of 99.999%. State your requirements clearly, and require respondents to describe how their solution will achieve the required level of availability, including a complete description of how redundancy and geodiversity are employed in the proposed design.

b. Proposers should state their expected Mean Time To Repair (MTTR) for possible failures. RFPs should provide examples of potential failures.

12. Network Facility Interfaces

a. Require clear identification of where all interconnect points for origination networks are physically located, and the role of each interconnect point in the redundancy scheme being proposed. Require proposers to explain how the overall scheme will meet the specified availability requirements.

13. Network Monitoring

a. Specify the requirement for monitoring the ESInet transport structure on a 24-hour-a-day, 7-day-a-week, 365-day-a-year basis and what protocols will be required (e.g., Simple Network Management Protocol Version 3 [SNMPv3], Network Configuration Protocol [NETCONF], or other available protocols).

b. Describe how the proposed solution provides logs of network problems, including portal access and ad-hoc query features. The RFP should also specify a requirement for information on log retention.

c. Require proposers to describe in detail operations of the Network Operations Center (NOC) and staffing requirements for restoration or mitigation of incidents that are encountered.

d. Introduce requirements for a trouble ticket system and require proposers to describe how such information is presented to the jurisdiction, the severity and classification of the issues, and how issues are prioritized, tracked, and managed until trouble ticket closure.
14. Managed Network Services
   a. Require proposers to describe their approach and processes for Managed
      Network Services (MNS) to perform operating system updates, anti-virus
      software used, security software, disaster recovery, applications software
      status, and any outsourced MNS services and methods of access for the
      jurisdiction to monitor equipment.

15. Security Monitoring and Management
   a. Request adherence to and knowledge of implementing best practices for
      security monitoring and management in accordance with NENA 75-001,
      Security for Next-Generation 9-1-1 Standard (NG-SEC) [3], and other relevant
      NENA standards to address access control, user monitoring, security
      techniques and protocols, physical port protection, interconnections with
      other networks, other network qualifications, intrusion, detection, and
      security event logging.
   b. Have proposers describe their Security Operations Center (SOC) facilities.
   c. Have proposers describe their PSAP identity certificates (NENA-STA-010 [25],
      NENA 75-001).

16. Other Equipment Environment Considerations

17. Current and New Equipment
   a. Identify if there are any allowances for refurbished or used equipment in the
      solution.

2.5.1.6 How to Evaluate Responses to ESI net RFPs
   9-1-1 Authorities need expertise, which will often be through consulting arrangements, to
   properly evaluate the ESI net portions of a proposal. The expert needs to have significant
   design/implementation expertise in highly available IP network design. Some general
   advice is below, keeping in mind that an ESI net is comprised of a set of routers and links,
   as well as the services that operate the routers and maintain the links.

   1. Value diversity over quality. The most reliable networks have the most paths
      between endpoints. It’s certainly true that the reliability of the network is
      proportional to the reliability of the links, so that if you are comparing two network
      designs which have the same link paths, but one proposal has more reliable links
      than the other, the more reliable link proposal would be favored. Increasing the
      number of paths has a greater influence on reliability than the range of reliability for
      typical links available for ESI nets.
2. Favor actual geographic diversity. Ideally, all links going into a given facility would have entirely separate physical topology so that, for example, an excavator can’t take out more than one link per incident.

3. An ESInet is a critical network – everything in NG 9-1-1 depends upon it. Having only two ingress or egress paths to your ESInet is a minimum, and not really sufficient. In an IP network, ten paths aren’t too many. The network will route packets over any available path. You need at least five nines of availability for an ESInet, end-to-end, and you should use different types of facilities so that if one type is knocked out, another will survive. Be realistic in your minimum requirements, and explain that they are only the minimum. Require vendors to describe their redundancy scheme in detail, and justify the type of links into and out of the ESInet. Consider using switch/router equipment from different manufacturers in your redundancy scheme at a given network layer. This reduces the likelihood that a software/firmware flaw, or a security hole in one manufacturer’s device will take down the entire network.

4. Require the ESInet to have much more bandwidth than you think you need, now and at least a decade into the future. ESInets are required to support DiffServ (Differentiated Services, RFC 2475 [28]). Routers must respect code points: functional elements must mark packets they create with appropriate mechanisms to ensure that high-priority traffic gets delivered, but having excess bandwidth is the simplest and probably most effective way of ensuring that critical traffic always gets delivered. Require vendors to provide both – an ESInet that has a significant amount of excess bandwidth, implemented with network devices that support DiffServ and respect all DiffServ Code Points specified in NENA-STA-010 [6].

5. All shared facility networks (such as any IP network, or things like Metro Ethernet) are over-subscribed. This means that if the actual bandwidth available at a given switch is 100 Mbit, and each customer connection is 10Mbit, the network operator will sell 12 or 15 or even more 10Mbit connections because it knows (correctly), that not all customers will need all of their bandwidth at the same time. The degree of oversubscription varies among suppliers. It matters how much oversubscription there is, of course. Dark fiber, Wave Division Multiplexed optical, SONET, and some forms of MPLS have isolation between customers such that each customer really can use all the bandwidth that the contract provides simultaneously. Obviously, this is better, but see point 3 above. Knowing how much oversubscription is provisioned is often hard to discern, but be aware that if the bandwidth is not isolated, everyone oversubscribes.

6. When planning networks for last mile to PSAPs, the above suggests that one should look extensively to find diverse facilities for the last mile. Use every possible physical
path into the facility. If there is a cable system, connect to it. If it is within range of cellular networks, employ modems. If there is a copper wire facility that is separate from an optical cable, use both. Diversity and more bandwidth will substantially improve the availability of the PSAP. Networks that have two MPLS (or Metro Ethernet) connections from a single provider won’t be anywhere near as reliable as one with eight connections to six providers using four different technologies.

### 2.5.2 GIS

RFPs seeking GIS services should incorporate the provisions contained in this section of the document.

#### 2.5.2.1 Introduction

While the GIS systems themselves may not be considered part of the RFP for an NG 9-1-1 system, the geospatial information in them drives much of the NG 9-1-1 system, including the ECRF and LVF. The NG 9-1-1 Core Services are all provisioned by using the Spatial Interface (SI) described in NENA-STA-010 [6].

NG 9-1-1 systems will rely on standardized, accurate, and up-to-date GIS data. However, for many jurisdictions, existing GIS data does not meet basic accuracy standards or the business workflow requirements necessary to maintain accurate and up-to-date data.

RFPs that include GIS deliverables should require clear distinction between vendor and jurisdiction responsibilities. This could very well include the need for jurisdictions to maintain GIS data not only in a different format, but also in a time-sensitive workflow environment. Therefore, it is important to fully understand the impacts that the implementation of NG 9-1-1 will have on a respective GIS program.

RFPs should specify what GIS systems are currently deployed in the service area contemplated by the RFP and require vendors to explain how they deploy the SI, which Quality Assurance/Quality Control (QA/QC) processes are supported, and how data is coalesced among the GIS systems that support NG 9-1-1.

#### 2.5.2.2 Background Information

The implementation of an NG 9-1-1 system within a PSAP’s jurisdiction will have significant impacts on existing GIS and addressing business practices and workflows. Historically, local GIS data and addressing practices have evolved in silos between each local jurisdiction. The quality and structure of GIS data and workflows of local addressing has depended on the specific business drivers (Public Utilities, Public Works, Planning, Buildings and Permits, Assessor’s Office, etc.) that leverage the data and are often unique to each municipality. Further, the assumptions made in the i3 architecture about the availability of complete GIS systems and the ability to effectively update errors in that data in near real-time fashion are not reflective of all GIS enterprises at the local level.
In addition, while the PSAP community has been planning and preparing for NG 9-1-1 for years, the same may not be true of the GIS community. Many GIS practitioners are just beginning to become educated about NG 9-1-1 and the associated impacts. Depending on the jurisdiction and associated organizational structure, the impacts to GIS and addressing entities will range from moderate to severe.

The implementation of an NG 9-1-1 system will require new roles and responsibilities for personnel that may work outside of the PSAP organizational structure. In many cases, GIS and addressing functions will become part of the critical path workflow for emergency response. This will add new tasks in addition to existing responsibilities. There may also be resource needs to support the data clean-up/creation phase and new workflows identified to maintain the data at the high precision and quality level required for NG 9-1-1 systems. Therefore, involving and educating GIS and addressing stakeholders as early as possible is critical to successful implementation.

2.5.2.3 Regional Coordination
Migration to an NG 9-1-1 environment may require regional cooperation and coordination. This will be required through the design, development, and deployment of the ESI.net and NG 9-1-1 Core Services, as well as the GIS datasets. While most GIS data responsibilities (quality control/maintenance) will fall inside a specific jurisdiction, there are certain tasks that require cross-border review.

Jurisdictional border and boundary questions that have not been resolved prior to NG 9-1-1 implementation should be identified as high priority tasks. It will be necessary for the GIS authority and/or addressing authority to meet and resolve the PSAP and the Provisioning Boundary polygon issues.

Discussions related to organizational responsibilities and technical workflow processes can be difficult enough within a single jurisdiction. The challenges are compounded when multiple jurisdictions are involved in the process. For these reasons, it is recommended that the identification of stakeholders and the coordination process start as soon as possible.

2.5.2.4 Creation or Upgrade of NENA-required GIS Data Layers for NG 9-1-1
As most deployed GIS data models do not meet the requirements of NG 9-1-1 as defined in the NENA Standard for NG 9-1-1 GIS Data Model (NENA-STA-006) [31], they will need to be upgraded to support NG 9-1-1. NENA-STA-010, Appendix B, defines the ECRF/LVF provisioning data model. The ECRF/LVF requires two types of GIS data: service area boundaries, and address location data. The ECRF/LVF does not require a wide variety of other GIS data layers that are useful for tactical dispatch mapping, such as aerial or satellite imagery, hydrography, topographic maps, fire hydrant locations, infrastructure maps, and so on. The ECRF/LVF should be thought of as using a subset of available GIS layers, and not all GIS layers used for other 9-1-1 functions (NENA Standards for the
Provisioning and Maintenance of GIS data to ECRFs and LVFs, NENA-STA-005.1.1-2017, Section 4.2) [30]. Further, the GIS Dataset should represent a comprehensive set of locations for the ECRF and for dispatchable locations. The civic location dataset must fit the format of NENA-STA-004, NENA Next Generation 9-1-1 United States Civic Location Data Exchange Format (CLDXF) [29]. The planning for that is vital to the success of any NG 9-1-1 deployment but is beyond the scope of this document. How elements ever, the RFP must inform proposers of the GIS migration plan, so that it may be integrated into the response. The RFP response must detail any requirements the proposal assumes of the GIS systems beyond that contemplated in the GIS migration plan. Proposals should detail timelines from when a change is made in the GIS system to when NGCS use the updated data. The RFP may wish to specify a maximum for that.

Even though NENA-STA-006 was designed specifically to detail the minimum requirements needed to support core ESI net functions, it is likely to be more detailed and complex than a locality’s current database schema, while at the same time, additional data may be used that is not mandatory. This complexity will impact not only the creation (if needed) of the dataset, but also ongoing maintenance requirements. In part, this is due to the organic and non-standard driven nature of most GIS databases. The databases generally only contain data necessary to support the business needs of the departments they serve. To maintain continuity of operations with those existing applications, significant measures will need to be put into place to assure that changes made to the databases and/or connections do not break other applications.

It is important to also note the order in which data needs should be addressed. Creation or updates to the required boundary files should occur first, before validating the currency and spatial accuracy of the centerline and address point layers.

2.5.2.5 Quality Assurance/Quality Control (QA/QC)
RFPs should require vendors to explain what QA/QC processes are performed, where and when the processes are performed, workflows to resolving the QA/QC results, and thresholds for acceptance by the functional elements.

2.5.3 NG 9-1-1 Core Services
RFPs seeking NG 9-1-1 Core Services should incorporate the provisions contained in this section of this document.

2.5.3.1 Introduction
Core Services provide the call routing intelligence in an NG 9-1-1 system. The functional elements included in the NG 9-1-1 standards and required in NG 9-1-1 Core Services are as follows:

• ESRP
• ECRF
• LVF
• BCF
• LIS (if not hosted by OSP)
• MSAG Conversion Service
• Geocode Service
• Mapping Data Service
• Civic Location Data Exchange Formatting
• Additional Data Repository (if not hosted by the OSP)
• Policy Store
• Media Bridge
• Interactive Media Response
• Service/Agency Locator
• Logging Service
• Domain Name Service
• Dynamic Host Control Protocol Service
• Time Server

Additional functional elements are defined in the standards that provide support for the transition from Enhanced 9-1-1 (E 9-1-1) to NG 9-1-1.

2.5.3.2 Background Information

The NENA Standard for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress) is used to communicate important call and Incident related data. NG 9-1-1 elements that handle Incident data are expected to support the EIDO standard. This standard is being developed from NENA/APCO Emergency Incident Data Document (EIDD) Information Document [23]. Because a call transferred from one PSAP to another includes a reference (a URI) to an EIDO that has caller location information and Additional Data that is available, all NGCS elements that handle calls must ensure that EIDO references are passed intact to downstream elements. See NENA-STA-010 [25] for details on call transfers.

NG 9-1-1 Core Services provide the intelligence to route a presented call to the appropriate destination. The appropriate destination can be NG 9-1-1 functional elements for call taking, a Legacy PSAP Gateway that fronts legacy call handling equipment, another NG 9-1-1 system supporting a different jurisdiction, a legacy selective router via a Legacy Selective Router Gateway servicing an E 9-1-1 system in a neighboring jurisdiction, or an Interactive Media Response (IMR) device. Call signaling throughout NG 9-1-1 uses the Session Initiation Protocol (SIP).

A few interfaces to NG 9-1-1 Core Services are required to be provisioned on behalf of a 9-1-1 Authority. Examples of these are the ECRF, LVF, LIS (if hosted by the 9-1-1
Authority), and Policy Store. Time should be allocated to understanding these interfaces and clearly articulating requirements in an RFP.

The staff writing requirements for an NG 9-1-1 Core Services RFP will likely be composed of persons knowledgeable in legacy and Next Generation networking, combined with knowledge of the NG 9-1-1 and database requirements. Operations staff also need to be involved to establish requirements for provisioning interfaces and must have an understanding of the background, skills, knowledge, and authority levels of personnel who will be assigned to use the provisioning interfaces.

2.5.3.3 **Interdependencies with Other NG 9-1-1 Components**

2.5.3.3.1 **Other NG 9-1-1 Components that must be Implemented Prior to or in Conjunction with Core Services**

An ESI net must be provisioned to support NG 9-1-1 Core Services. Appropriate gateways must be provided to support the migration of E 9-1-1 components, systems and origination network interfaces to the corresponding NG 9-1-1 facilities.

Certificate Authorities (CAs) must be available to provide credentials to all agencies and functional elements. See NENA-STA-010.3-201y (draft) [25] for credentialing requirements. Higher level authorities (such as a state 9-1-1 Authority when preparing a regional or local NGCS) may provide some CA services, but it is often desirable for there to be a local CA to at least provide credentials to agents. On the other hand, operating a CA must be done in compliance with stringent processes (usually contained in a Certificate Policy and Certificate Practice Statement) and unless there exists a level of expertise that can operate the CA locally, local 9-1-1 Authorities must contract with a competent operator of any local CA to provide the service. Working out exactly how the Public Key Infrastructure works is a vital component of NG 9-1-1 deployment and must be carefully designed and implemented, with appropriate third-party audit, to assure security of the entire system. As with any security mechanism, the security of NG 9-1-1 is only as good as its weakest link, and secure issuance and management of credentials is vital.

A Single Sign On methodology must be established as part of the deployment of NG 9-1-1. NENA-STA-010 specifies exactly how relying parties determine whether a user is validly logged in, in what role, but does not specify exactly how the login process works.

2.5.3.3.2 **Other NG 9-1-1 Components that should be Implemented Prior to or in Conjunction with Core Services**

While not required to process calls, an MIS is required to properly manage an NG 9-1-1 System. Information monitoring and management facilities are critical to managing NG 9-1-1 Core Services. Refer to the MIS section of this document for more information.
2.5.3.3.3 Other NG 9-1-1 Components that can be Implemented Prior to or in Conjunction with Core Services

New NG 9-1-1 call handling systems can be deployed with NG 9-1-1 Core Services. Legacy E 9-1-1 call handling can be used with NG 9-1-1 Core Services if an LPG is also used.

2.5.3.4 Information to Provide Proposers

NG 9-1-1 standards are applicable to every jurisdiction. What drives the configuration in a jurisdiction is its specific requirements. It is recommended that the information below be provided to proposers in an RFP for NG 9-1-1 Core Services.

1. Capacities related to the inbound side of the NG 9-1-1 system need to be identified.
   a. Number of 9-1-1 voice calls needed to be handled annually. This includes calls originated on landline, wireless, VoIP, and all other networks that are mandated to provide 9-1-1 service.
   b. Anticipated voice, text, and video call volume growth in the subsequent 5 to 10 years. This should include growth from an increase in the population or an increase in visitors.
   c. Peak call loads need to be addressed and when the typical peaks occur.
   d. NG 9-1-1 call types the system is expected to handle natively, including audio, text-to-9-1-1, photos\(^1\), full-motion video, chat and real-time text sessions, and data from sensors and other automated devices. The projected volume of the various call types should be specified, as well as the growth in volume that is expected. All NG 9-1-1 RFPs should require support for all media types listed in NENA-STA-010 [25].

2. Capacities related to the delivery of calls to the PSAPs need to be identified.
   a. Number of PSAPs or shared, hosted systems that will be supported by the Core Services.
   b. Expected call volumes for each PSAP and the peak loads that need to be accommodated, by media type.
   c. Initially, the number of PSAPs supported by the Core Services that are fully NG 9-1-1-capable, the number that are IP-capable, and the number that are legacy need to be identified. Describe the plan and target schedule of the migration of all PSAPs to NG capability.

\(^1\) Support for the delivery of photos and other file content in NG 9-1-1 is expected to be added in a future revision of the i3 specifications.
d. Number of call takers that are normally assigned per shift at each PSAP.

e. Any other factors related to PSAPs that should be considered when establishing total system capacity.

3. Network bridging capacities and capabilities related to the transfer of calls to neighboring PSAPs using other legacy or NG 9-1-1 systems need to be identified.

   a. Number of other NG 9-1-1 and E 9-1-1 systems the Core Services must be capable of transferring calls to and from. Call volume for each as well as anticipated growth should be specified.

4. State specific security requirements. Require conformance to all relevant security mechanisms as described in NENA-STA-010 [25] including Single Sign On, Data Rights Management and TLS. State any requirements you have for what proposers must manage with respect to obtaining, assigning, and managing credentials.

2.5.3.5 Information to Request from Proposers

2.5.3.5.1 Functional Element Interface and Functional Information

NG 9-1-1 Interfaces: RFPs should require proposers to describe how they will meet the requirements of NENA-STA-010, *NENA i3 Standard for Next Generation 9-1-1* [25], by providing the interfaces listed below at end-state.

   1. SIP Call
   2. Location
   3. Policy
   4. Event Notification
   5. Spatial Interface for Layer Replication
   6. Discrepancy Reporting

NG 9-1-1 Functions: A network or solution diagram that clearly maps out the end state for the NG 9-1-1 Core Services should be mandatory for all RFP responses. Except where noted, all functions below should be visible on the solution diagram.

   1. BCF
   2. ESRP
   3. PRF
   4. ECRF
   5. LVF
   6. Spatial Interface
7. MSAG Conversion Service
8. Geocode Service
9. PSAP Interfaces
10. LIS
11. Additional Data Repository
12. IMR System
13. Logging Service
14. Forest Guide
15. Domain Name System (DNS)
16. Service/Agency Locator
17. Time Server
18. Originating Networks and Devices
19. Mapping Data Service

Gateways and Transitional Elements: In the transition to the i3 end state, gateways will be required in order to receive and process calls from networks that are not i3-capable and to deliver calls to PSAPs that are not yet i3-capable. As an example, a gateway to the legacy selective router may be required to transfer calls to PSAPs that continue to use selective routers, since selective routers are not part of the end state i3 architecture. Accordingly, RFPs should require the elements described below where necessary.

1. LNG
   a. Details are provided in NENA-STA-010 [6].

2. LPG
   a. An LPG provides a signaling and media interconnection point between the ESI net and a legacy PSAP. It plays a role in the delivery of emergency calls that traverse an i3 ESI net to get to a legacy PSAP, as well as in the transfer and alternate routing of emergency calls between legacy PSAPs and i3 PSAPs. It should provide PIF, NIF, and LIF, as specified in NENA-STA-010. A legacy PSAP might have an LPG if one is not provided as part of the Core Services.

3. LSRG
   a. An LSRG provides a signaling and media connection point between a legacy selective router and an NG 9-1-1 system. The LSRG should allow calls routed via a legacy selective router to terminate on an i3 PSAP, as well as allow calls
routed via an i3 ESInet to terminate to a legacy PSAP that is connected to a
legacy selective router.

b. The LSRG should also facilitate the transfer of calls to and between PSAPs
that are served by legacy selective routers and PSAPs that are served by
ESInets, regardless of the network from which the call originated.

NGCS and Additional Data
NG 9-1-1 Core Services will pass additional data as they are made available, in accordance
with NENA-STA-010.2-2016 (originally 08-003) [6] or its successor document, NENA
Standard for NG 9-1-1 Additional Data (NENA-STA-012.2-2017) [32], and NENA Standard
for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress).

The following provide considerations for what elements may be valuable to include in an
RFP and how to evaluate responses:

1. BCF:
   a. BCFs typically have commercial Session Border Controllers in them.
      Commercial SBCs are designed by a typical carrier maxim of “default deny”:
      when in doubt, meaning don’t allow a call in. 9-1-1 doesn’t work that way, it
      is “default allow”. Only under extreme conditions should the BCF deny a call.
      On the other hand, the BCF is the primary line of defense on attacks against
      the ESInet and NGCS. Understanding how a proposed BCF balances these
      issues is essential to properly compare proposals. Take care to require the
      BCF functions for “Bad Actor” defined in NENA-STA-010, as these require
      capabilities beyond those that commercial SBCs provide.
   b. DDoS (and TDoS) mitigation is a very, very significant issue for any proposal.
      Each proposal must specify how the proposed solution would survive the
      largest feasible attack. In general, it is not feasible to have the BCF perform
      this function itself. It typically requires a DDoS/TDoS mitigation service in
      addition to significant capability at the BCF itself to recognize and filter attack
      traffic from legitimate traffic. The manner in which attack traffic is handed off
      between the BCF and the mitigation service is a key part of a system design
      and should be reviewed as part of any proposal evaluation.

2. ECRF:
   a. Both an internal (to the ESInet) and an external ECRF may be required.
      These really need to be separate as they have different content. The external
      ones need significant protection against DDoS attack. It is desirable to have
      multiple instances of both the internal and external ECRFs. Internal (and
      possibly external) ECRFs can be hierarchical (local, regional, state-wide). The
RFP may wish to specify the hierarchy desired. Where there are only higher-level ECRFs, then coalescing of data is necessary, because the source data is distributed among many local GIS systems. Coalescing can be done at an SI function or can be done in the ECRF itself. The proposal must discuss how the proposer coalesces data. It should also discuss quality assurance issues and the time duration between a GIS update and the implementation of the new call routing. There is a trade-off between achieving adequate QA and implementing a timely update cycle. It is desirable to be ABLE to achieve online, real-time updates in which time from update to routing change is measured in seconds, however, this must be balanced against QA process requirements.

b. The capacity of the ECRF is generally not an issue, but it is affected by the DDoS problem. DDoS mitigation is not an exact science and does not activate immediately. Thus, the ECRF has to be able to withstand some level of attack traffic. Proposers should state how they mitigate attack and how the ECRF copes with whatever the DDoS mitigation does not handle.

3. LVF:

a. All the above statements on ECRF apply to the LVF. The ECRF and LVF can be combined. The argument for making them separate is that the ECRF is real time-call time routing and the LVF is off line, before the call validation, and combining them complicates the difference between them. The argument for combining them is that they are exactly the same function, with the same interface and the same provisioning. Every route request could, theoretically, request validation, and every validation request returns a route. Either is satisfactory, but if they are separate, the proposer should describe the differences between them in terms of capacity, DDoS mitigation, and its effect on cost. If combined, the proposer must describe how the capacity to accomplish both tasks is accomplished.

b. Periodic revalidation of LIS content will overwhelm the use of the LVF from initial LIS pre-load validation, so the capacity of the LVF is gated on the size and revalidation frequency of the LISs it serves. The proposal must describe how this is accounted for. There are new functions in development that will change how validation is maintained current, significantly reducing the need/frequency to revalidate. Proposers should be asked when they will support these new capabilities. Note that the LIS will have to implement the new functions in order to take advantage of them.

c. Consider how you will handle Additional Data about a Location, for which there is provisioning in the LVF for querying by location to determine if such
data exists. Proposals should specify how such data will be provisioned. Note
that the LVF itself uses the SI to provision all data, including the data
associated with Additional Location Data, but the proposal should be
evaluated to understand the entire process of storing and retrieving the data.

4. ESRP:

a. Take particular care to require/evaluate how well proposals conform to the
Policy Routing Function portion of NENA-STA-010 [6]. Development of
appropriate policies is challenging, and any tools or assistance that the
vendor provides should be explained and understood. As with ECRF/LVF, the
ESRPs may be deployed hierarchically (state/region/local) and the RFP should
specify what is required. 9-1-1 Authorities need to understand how the
proposal manages to maintain the desired availability of the SIP call chain,
and specifically, if an ESRP is call stateful (and most are), how a failure of an
ESRP can be recovered without affecting calls that are established and calls
that are in the process of being set up. It is inevitable that a failure early in
call set up will cause the call setup attempt to fail (but should be retried at
the origination side). Implementations vary as to how well they handle
failures and 9-1-1 Authorities need to understand how a particular
implementation proposal maintains availability. Note that the very definition
of availability is part of this discussion: if a call fails to set up because an
instance of an ESRP fails, but other ESRP instances are available to take
succeeding call attempts, is that an availability SLA miss? Is that failure
accounted for in any SLA?

b. Understand how callbacks are handled and what role the ESRP plays. Version
3 of NENA-STA-010 [25] extends mechanisms for how call backs are handled
and should be considered when evaluating responses.

5. LIS (if not hosted by OSP)

a. LISs really need to be operated by the OSP. Legacy systems use LNGs and
LNGs have Location Servers which are a form of LIS, and the LNG is often
part of an NG 9-1-1 procurement, but a real LIS for a migrated Origination
Network should be the responsibility of the OSP. A LIS for an entity like a
cable system or passive optical network operated by a telco should be
provided by the network and not the 9-1-1 Authority. “Should be” and “is”
may not be the same, and it may be that the 9-1-1 Authority is forced into
providing a LIS. Evaluating LIS proposals mostly deal with capacity, strategies
for periodic revalidation and provisioning interfaces, and processes (noting
that because NENA-STA-010 assumes the LIS is operated by the Origination
Network, it doesn’t specify a provisioning interface).
6. MSAG Conversion Service
   a. The MCS is a simple subsystem and is probably best combined with other functional elements. As the MCS is provisioned by the SI, there really isn’t much to consider other than performance. MCS is queried at call time by systems that need backwards compatibility, so transaction rates are actually quite modest for modern systems.

7. Geocode Service
   a. The Geocode Service requires considerations similar to the MCS. Performance considerations dominate the evaluation.

8. Mapping Data Service
   a. This is well specified in version 3 of NENA-STA-010 [25]. Consideration to how well the MCS will perform as an INTERNAL map source is a key evaluation consideration. Performance issues dominate evaluation considerations as long as it meets the requirements of NENA-STA-010.

9. Additional Data Repository (if not hosted by the OSP)
   a. The ADR is a very simple database. The 9-1-1 Authority may need to provide an ADR for OSPs that will not do it themselves. Evaluation of capacity (how many records), provisioning interfaces (since NENA-STA-010 assumes the OSP or third parties will operate the ADR) must be taken into consideration.

10. Policy Store
    a. This is a key component of a successful NG 9-1-1 deployment. It is desirable that there be a single Policy Store that stores all policies for any entity, and all FEs that need policy would fetch from the Policy Store. It is acceptable to combine a policy store with another FE. Any tools or processes that the vendor provides to help create policies might influence selection. As it is such a key element, its availability (through redundancy) is essential to understand.

11. Media Bridge
    a. The issue with media bridges is multimedia. Examine proposals to see that the proposed bridge adequately handles all media types as specified in NENA-STA-010, as well as the mandatory codecs for each of the types. In version 3 of NENA-STA-010 there is a narrowing of options and much more specification as to how bridges work in one of two models of call handling, and especially how transfers of calls between ESI nets work (transfers involve a bridge). Conformance to this new text should be required, with some
allowance for availability if the RFP is issued around the time version 3 is
released. Capacity of a bridge (how many simultaneous calls the bridge can
handle) is important, although the number of calls active on the bridge at the
same time is unlikely to be large.

12. Interactive Media Response

a. As with the Media Bridge, the IMR issues have to do with how they handle
each of the media types and codecs specified in NENA-STA-010 [6]. The
requirement to support VXML [33] should be considered important because it
allows complete control by the 9-1-1 Authority as to how the IMR operates,
as well as benefits upgrades and vendor choices going forward.

13. Service/Agency Locator

a. All ESI nets need a Service/Agency Locator. This is a simple database with a
trivial interface, but since it may be consulted during an emergency call, it
has to be reliable. The provisioning of the S/AL is not specified, and may well
be manual, so evaluating how records are maintained is significant.

14. Logging Service

a. The logging service in NG 9-1-1 is considerably different from classic loggers
used in 9-1-1 systems for decades. There is a great deal of standardization,
not only on the recording side, but also the retrieval side. As new standards
evolve, they often add new “LogEvents”, which are the standardized data
models for what the logging service stores. The logging service is defined to
be able to be in the ESI net, or in a PSAP, or both. Conformance to standards
is essential. Because the logging service must record multimedia, the capacity
of the system is much greater than older loggers. Furthermore, since many
functional elements log events, the transaction rate the logging service has to
achieve is significantly higher than in older systems and must be carefully
considered in evaluating responses.

b. Because the retrieval system is standardized in NENA-STA-010, it should be
possible to develop a wide variety of applications that can mine the data for
events of interest and provide interesting ways to view/access the data.
Making sure the proposed logging service meets all the standards in
NENA-STA-010 is essential to being able to take advantage of such
applications.

15. Domain Name Service

a. DNS is a fundamental part of an IP network, and is one of the more “core”
services in the Next Generation 9-1-1 Core Services. There are two important
DNS paths 9-1-1 Authorities must be concerned with. External DNS that provides the IP address of the external services such as the ECRF, LVF, and the originating BCF/ESRP is outside the ESInet, and subject to significant DDoS attack. Proposals must be evaluated to assure that DNS service is very unlikely to be disabled by a terabit level DDoS attack. Attacks against DNS infrastructure as a way to deny service to the underlying service is a well known, often occurring attack. As with the ECRF and BCF, however the authoritative DNS servers are provided, they must be robust against attack and a DDoS mitigation service must be paired with them in order to survive common attack patterns and sizes.

b. Within the ESInet, DNS infrastructure is needed to resolve queries that originate from all the other functional elements in the NG 9-1-1 system. NENA-STA-010 and ESIND have advice on DNS deployment. We don’t assume isolated systems, so there has to be some significant DDoS mitigation capability within the ESInet if the internal DNS infrastructure is attacked.

16. Dynamic Host Control Protocol Service

a. DHCP is the method by which devices are assigned IP addresses dynamically, rather than being assigned statically. Historically, servers had statically assigned addresses and end devices (PCs, cell phones, etc.) got DHCP-assigned addresses. Experience suggests that more use of DHCP and less use of static assignments is beneficial, and the counter argument for static assignments which is often that the IP address of a server is in a DNS record, so it needs to be static is overcome with more modern dynamic DNS provisioning mechanisms. Proposals should be evaluated based on how IP address assignment is handled, how much static configuration is absolutely needed, and who is responsible for operating the proposed mechanisms. A good question to ask is: what happens if some significant failure of infrastructure occurs, and substitution of servers, or reassignment of services to servers occurs? How much manual work is required to make the IP address assignments work for such a change, which is often unanticipated, and has significant time pressure?

17. Time Server

a. Old models of time sources are obsolete. Satisfactory time synchronization can be achieved with a pair of hardware clocks (or GPS receivers) in an ESInet, and appropriate NTP server deployment to all NGCS elements and PSAPs. PSAPs no longer need their own master clocks. Having said that, making sure that NTP is configured appropriately so that time sync can be maintained when the network is stressed or damaged is not trivial. Proposals
should be evaluated to determine how the proposer will handle time sync throughout the NG 9-1-1 system.

2.5.3.5.2 Human and Machine Interfaces

The 9-1-1 Authority should ask about the availability, functionality, usability, available training, and compliance with Human Machine Interface (HMI) [35] guidelines required for provisioning and maintaining the Core Services and databases, including interfaces for the following:

1. Policy Store
2. LIS (if provided as part of the Core Services)
3. Specific questions for the 9-1-1 Authority to consider include the following:
   a. What is the background, knowledge level, and authority of the individual the proposer recommends to use the interface?
   b. What are the recommended staffing levels?
   c. What does the interface look like?
   d. Does the proposer provide a nice, easy to use, easy to learn, graphical user interface (GUI), or is it a command line interface that requires options expressed in codes?
   e. What error checking does the interface provide? How are errors reported to the user? Can the user put the work they have completed prior to an error on hold, then return later and pick up where they left off, or do they have to start over again?
   f. Is there an application that will populate the Policy Store?
   g. From an operational standpoint, are the interfaces accessible to the 9-1-1 Authority or does the Authority have to call the vendor to make changes?

For each interface outlined above, the 9-1-1 Authority should ask about any Machine-to-Machine interfaces that might be available and request a description of any published interfaces.

2.5.3.5.3 Migration Plan Options

Defining the NG 9-1-1 system to replace the existing E 9-1-1 system is critical. The topics above, if covered properly, should provide the necessary level of definition and set expectations with proposers during the procurement process. Equally important is defining how the migration to the NG 9-1-1 system will be achieved. There are several migration strategies that have been used successfully by 9-1-1 Authorities. These include migrating
OSP types as a group, usually beginning with wireless carriers. Migrating geographically – county by county or region by region – has also been employed. The 9-1-1 Authority should specify in the RFP any preferences they may have for the migration and any context that will be helpful to proposers. Proposers will then be in the best position to propose a migration plan. 9-1-1 Authorities should make proposers aware of any additional expectations and note any limitations of which the vendors should be aware.

2.5.3.6 NG 9-1-1 Core Services Reference Documents

Table 2: NG 9-1-1 Core Services Reference Documents lists documentation from NENA and other standards bodies that are applicable to Core Services. In some cases, these documents also relate to other aspects of an NG 9-1-1 system.

<table>
<thead>
<tr>
<th>Document Number</th>
<th>Document Name</th>
<th>Committee</th>
<th>Approved Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>NENA-INF-014.1-2015</td>
<td>NENA Information Document for Development of Site/Structure Address Point GIS Data for 9-1-1</td>
<td>Data Management</td>
<td>2015/09/18</td>
</tr>
<tr>
<td>NENA-REQ-002.1-2016</td>
<td>NENA Next Generation 9-1-1 Data Management Requirements</td>
<td>Data Management</td>
<td>2016/03/10</td>
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<tr>
<td>NENA-REF-010.2-2019 (originally NENA-INF-006)</td>
<td>NENA NG 9-1-1 Go-To Handbook</td>
<td>Development Steering Council</td>
<td>2019/05/07</td>
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<tr>
<td>REFERENCE</td>
<td>NENA Recommended NG 9-1-1 Public Education Plan for Elected Officials and Decision Makers</td>
<td>Communications</td>
<td>2013/09/24</td>
</tr>
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</table>

What is the Future of 9-1-1 – PowerPoint for Elected Officials & Decision Makers
2.5.4 NG 9-1-1 PSAP Functional Elements

RFPs seeking NG 9-1-1 PSAP Functional Elements, including NG 9-1-1 call handling, incident handling, dispatch, radio and logging services, should incorporate the provisions contained in this section of this document.

2.5.4.1 Introduction

EIDOs are used to exchange Incident data within the PSAP, with other PSAPS, and any authorized agencies. The EIDO also provides initial, updated and validated caller location and Additional Data information on call transfers. It is critically important that the NENA Standard for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress) being developed from NENA/APCO Emergency Incident Data Document (EIDD) Information Document [23] is supported by every element that must communicate Incident data, including, but not limited to, those that implement NG 9-1-1 Call Handling, Dispatch, and Incident Handling functions. See the PSAP Functional Elements, Section 2.5.4.5.1, for details.

This section focuses on RFP development for call handling and other solutions in a transitional period as an agency progresses towards NG 9-1-1. Agencies preparing RFPs may be faced with the challenge of separating a procurement into stages due to budget limitations, governance models, strategic planning, or other challenges. In these situations, it is advisable for agencies to develop call handling RFPs with specific criteria to support progress towards an NG 9-1-1 environment. 9-1-1 Authorities should be demanding systems to be as conformant to the evolving standards as possible with the expectation that they will be brought into conformance with the standards as they are released. NENA - REQ-001.1.2-2018 [24], Next Generation 9-1-1 Public Safety Answering Point Requirements, defines the call handling, incident handling and other functional element RFPs should require acknowledgment that proposers understand each functional element described in the document, as well as other applicable NENA documents, such as the Detailed Functional and Interface Standards for the NENA i3 Solution [6], which defines interfaces the PSAP must provide for connectivity to a serving ESI.net and NG9-1-1 Core Services, the NENA Standard for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress) and NG 9-1-1 PSAP Specifications for the NENA i3 Solution. ANS CANDIDATE NENA-STA-023 [37] (in progress). Proposers should be required to describe in detail how the system(s) they are proposing accomplish the functionality described in those requirements, how they expect to evolve their systems to meet the final NG-PSAP standard, and what costs and time frames PSAPs should expect to see to come into compliance with that standard.

Vendors and solution providers are continually introducing functionality and working to align offerings with requirements as the industry transitions to NG 9-1-1. Due to the nature of standards development, an agency should anticipate varying levels of
compliance with requirements. It is incumbent upon agencies desiring to position their
PSAPs for NG 9-1-1 to develop RFPs that align with NENA requirements and expect
vendors to evolve their systems to meet the standards.

2.5.4.2 Background Information

With the transition to NG 9-1-1, an agency releasing an RFP should anticipate investing
time in conducting background research related to NG 9-1-1 and the advancements in call
handling, incident handling, dispatch and radio, especially if the current call handling
and/or dispatch environment has been in service for a significant number of years.

PSAP systems for NG 9-1-1 has several aspects an agency needs to consider compared
to an E 9-1-1 call handling system. Background research should be conducted on the
following:

- IP Security:
  - In pre-NG 9-1-1 PSAP environments, network connectivity is typically a closed
    system with no or very controlled access to any external networks (i.e., a
    single connection to one external network through a firewall). Often times,
    system providers prohibit equipment they did not supply from being
    connected to the systems they did supply. In the transition to NG 9-1-1, call
    handling, incident handling, dispatch and other systems as well as other
    functional elements that interconnect with them will exist in complex network
    environments and equipment may be located in geographically diverse
    locations with connections to multiple networks.

- Governance:
  - Transitioning to NG 9-1-1 moves agencies towards interoperability. NG 9-1-1
    PSAP systems will be part of this ecosystem. Time should be taken to review
    and understand state, regional, and local laws and policies that may need
    modification to facilitate this type of system.

- Procurement:
  - NG 9-1-1 call handling systems may require agencies to review existing
    procurement vehicles to ensure language is current and supports acquisition
    of advancing systems and does not allow for PSAP systems to be introduced.

NENA documents provide resource material; agencies can refer to NENA-INF-008.2-
2014, NG 9-1-1 Transition Plan Considerations Information Document [2], for additional
background material.
2.5.4.3 Interdependencies with Other NG 9-1-1 Components

2.5.4.3.1 Other NG 9-1-1 Components that must be Implemented Prior to or in Conjunction with NG 9-1-1 Call Handling

An ESI net with functional Core Services and optionally a legacy gateway implementation (LNG, LSRG or both depending on the supporting legacy network) must be implemented.

2.5.4.3.2 Other NG 9-1-1 Components that should be Implemented Prior to or in Conjunction with NG 9-1-1 Call Handling

While not required to process calls, MIS functionality is required to properly manage an NG 9-1-1 system and new capabilities of NG PSAP systems require new capability for MIS systems.

2.5.4.3.3 Other NG 9-1-1 Components that can be Implemented Prior to or in Conjunction with NG 9-1-1 Call Handling

NG 9-1-1 Core Services can be deployed with new NG 9-1-1 call handling systems. Legacy call routing can still be supported with Core Services deployment if an LNG, LSRG, or some combination of both is implemented.

2.5.4.4 Information to Provide Proposers

NG 9-1-1 standards are applicable to every jurisdiction. What drives the specific configuration in a jurisdiction is its specific requirements, along with applicable governance. It is recommended that the information below be considered for inclusion when preparing an RFP for NG 9-1-1 call handling.

1. Current agency network architecture overview
   a. LAN configuration
   b. WAN configuration
   c. Legacy or i3 network configuration
   d. Network redundancy schemes

2. PSAP model
   a. Standalone PSAP
   b. Host/Remote configuration
   c. Shared services model with other agencies

3. Operational overview
   a. Staffing
b. Number of positions

4. Constraints
   a. Procurement method
   b. Budgetary/funding
   c. Technical (e.g., required interfaces call handling must support)
   d. Calendar/timing
   e. Other

2.5.4.5 Information to Request from Proposers

2.5.4.5.1 Functional Element Interface and Functional Information

Functional Elements shared by Multiple Agencies: RFPs should require that functional elements be shared by multiple agencies:
   1. Allow each agency to have its own policies, including security policies.
   2. Allow each agency to control access to configuration data specific to that agency.
   3. Not allow the provisioning of an agency to affect the provisioning of another agency.

General Topics: RFPs should require that a management console be provided to:
   1. Support general management functions for the PSAP, including reporting PSAP security posture and PSAP service state.
   2. Send and receive discrepancy reports on behalf of the PSAP.
   3. Implement a Policy Editor, if desired by the agency issuing the RFP.

Acknowledgement of the management console requirements as described in NENA-REQ-001.1.2-2018, Next Generation 9-1-1 Public Safety Answering Point Requirements [24], or its successor document should be required. In the transition to NG 9-1-1, not all management console functions will be supported or available from vendors, but partial functionality may be offered as part of some other systems. Proposers should be required to describe how systems they are proposing provide any of the functions and/or interfaces described in the management console section of the document.

If an RFP includes integration of the administrative private branch exchange (PBX) with NG 9-1-1 call handling, it should require that the processing of administrative services by the PBX not affect the performance of the emergency call processing.

PSAP Functional Elements:
   1. Call Handling
a. RFPs should require acknowledgement that proposers understand each call handling functional element requirement as well as implement standards for receiving calls, processing calls, call hold and park, state management, bridging calls, receiving bridged calls, originating bridged calls, bridge floor management, media (including TDD/TTY), callback as described in NENA-REQ-001.1.2-2018, Next Generation 9-1-1 Public Safety Answering Point Requirements [24]; NENA Standard for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress), and NENA-STA-010, NENA i3 Standard for Next Generation 9-1-1 [25].

b. RFPs should require this FE to support NENA Standard for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress), and NENA-STA-010 [6] for communicating Incident information with other FEs.

c. Proposers should be required to describe in detail how the system(s) they are proposing accomplish the functionality described in those requirements, how they expect to evolve their systems to meet the final NG-PSAP standard, and what costs and time frames PSAPs should expect to see to come into compliance with that standard.

d. Evaluate responses considering the quality of the HMI, the capacity of the system (positions, simultaneous calls, etc.).

2. Incident Handling

a. RFPs should require acknowledgement that proposers understand each incident handling functional element requirement as well as implement standards for managing incidents described in NENA-REQ-001.1.2-2018, Next Generation 9-1-1 Public Safety Answering Point Requirements [24], NENA Standard for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress), and ANS CANDIDATE NENA-STA-010.3-201Y, NENA i3 Standard for Next Generation 9-1-1 [25].

b. Proposers should describe how their systems provide the applicable functions.

c. Evaluate responses considering the quality of the HMI, ability to integrate with existing systems such as RMS.

3. Dispatch

a. RFPs should require acknowledgement that proposers understand each dispatch functional element requirement as well as implement standards for tracking responders and resources, dispatching units, tracking responders described in NENA-REQ-001.1.2-2018, Next Generation 9-1-1 Public Safety Answering Point Requirements [24]; NENA Standard for Emergency Incident
Data Object (EIDO), NENA STA 021.1 201X [36] (in progress); and NENA-STA-010, NENA i3 Standard for Next Generation 9-1-1 [25].

b. Proposers should describe how their systems provide the applicable functions.

c. Evaluate responses considering the quality of the HMI, the ability to handle the number of incidents and responders within the jurisdiction (and expansion capacity).

4. Radio

a. RFPs should require acknowledgement that proposers understand each radio functional element requirement as well as implement standards for managing incidents described in NENA-REQ-001.1.2-2018, Next Generation 9-1-1 Public Safety Answering Point Requirements [24], NENA Standard for Emergency Incident Data Object (EIDO) [36] (in progress), and NENA-STA-010, NENA i3 Standard for Next Generation 9-1-1. Specify the radio environment that exists and planned enhancements that the radio FE must handle. Specify any requirements for FirstNet integration.

b. Proposers should describe how their systems provide the applicable functions, how the radio FE interfaces to the actual radio systems, how logging of radio is accomplished and what capabilities to accommodate FirstNet exist.

c. Evaluate responses based on HMI, integration level with the radio systems, log service integration and how well FirstNet capabilities match present and future needs of the agencies who will use the system.

5. Outgoing Alert

a. If an RFP seeks an Outgoing Alert functional element, proposers should acknowledge the requirements for the Outgoing Alert as described in NENA-REQ-001.1.2-2018, Next Generation 9-1-1 Public Safety Answering Point Requirements [24], NENA Standard for Emergency Incident Data Object (EIDO), NENA STA 021.1 201X [36] (in progress), and NENA-STA-010, NENA i3 Standard for Next Generation 9-1-1 [25].

b. Proposers should describe how their systems provide the applicable functions.

6. Interactive Media Response (IMR)

a. IMR can be provided by the NGCS or it can be provided inside the PSAP. In general, NGCS systems need IMR to handle calls that need announcements. Given that the NGCS needs IMR, PSAPs RFPs should consider whether a separate IMR is required or even desirable. RFPs should require compliance with the requirements in the Interactive Media Response section and must
support the dequeue function for queues from other PSAPs described in of NENA-STA-010, *NENA i3 Standard for Next Generation 9-1-1* [25].

b. In order to enable management control of diversion, an interface between the IMR and the management console or other management system should be required.

7. Collaboration

a. RFPs desiring collaboration among agents, both within and between agencies, should conform to Collaboration requirements as described in NENA-REQ-001.1.1-2016, *Next Generation 9-1-1 Public Safety Answering Point Requirements* [24], NENA Standard for Emergency Incident Data Object (*EIDO*), NENA STA 021.1 201X [36] (in progress), NENA-STA-010, *NENA i3 Standard for Next Generation 9-1-1* [25].

b. Proposers should describe how their systems provide the applicable functions.

8. Logging Service

a. Consider whether the PSAP needs its own logging service or whether the one in the NGCS can provide it. RFPs should require acknowledgement that proposers understand each logging service functional element requirement as well as implement standards for managing incidents described in NENA-REQ-001.1.2-2018 [24], *Next Generation 9-1-1 Public Safety Answering Point Requirements*, NENA STA 021.1 201X, *NENA Standard for Emergency Incident Data Object (*EIDO*)*, [36] (in progress), and upcoming ANS CANDIDATE NENA-STA-010.3-201Y, *NENA i3 Standard for Next Generation 9-1-1* [25]. Specifically consider what requirements exist for integration with radio and any other systems in the PSAP that may have interfaces or requirements beyond that specified in NENA/APCO standards. NENA-STA-010 specified Logging Service includes the Instant Recall Recorder function and should be required as specified.

b. See section above for what to require of a logging service proposal.

c. Evaluate responses-based capacity, ability to integrate with radio and other systems that may not have firm interface requirements in standards.

**NG 9-1-1 Functions:** A network or solution diagram that clearly maps out the end state for the ESInet and Core Services should be mandatory for all RFP responses. All PSAP interfaces should be visible on the solution diagram.

1. PSAP Interfaces
a. PSAPs will deploy the client-side interfaces as specified in NENA-STA-010, *NENA i3 Standard for Next Generation 9-1-1* [25], including the LoST, LIS, and SIP call interfaces, and support all voice, video, and text media types.

b. Until such time as PSAPs are i3-enabled, an LPG should be employed connect to NG 9-1-1 Core Services.

**Gateways and Transitional Elements:** In the transition to the i3 end state, gateways will be required in order to receive and process calls from networks that are not i3-capable, and to deliver calls to PSAPs that are not yet i3-capable. In addition, a gateway to the legacy selective router will be required to transfer calls to PSAPs that continue to use selective routers, since selective routers are not part of the end state i3 architecture. The guidance in this section applies to gateways that are deployed inside an ESI net or within a PSAP.

1. LNG

   a. LNGs are a transitional function that provide some OSPs with an easier migration to NG 9-1-1 as defined in NENA-STA-010.2-2016 (originally 08-003), *Detailed Functional and Interface Specification for the NENA i3 solution – Stage 3* [6]. OSPs will ultimately interface with an NG 9-1-1 system using SIP with the NG 9-1-1 extensions called for in the standard. A 9-1-1 Authority could require that all OSPs use a SIP interface to the NG 9-1-1 system.

   Placing the burden for interfacing via SIP will require providing additional lead time for the OSPs and may require changes in the regulatory regime in the state. Before deciding to place the burden of interfacing via SIP on the OSP, the 9-1-1 Authority should consider the cost tradeoffs, the migration schedule, the regulatory authority to establish the requirement, and the support of the OSPs for establishing this requirement. In the executive summary of this RFP document, the LNG is placed in both the Core Services box as well as the OSP box.

   b. If the 9-1-1 Authority chooses to include the LNG as part of Core Services, the following should be included in the RFP:

      i. “A Legacy Network Gateway (LNG) should be supplied to provide a signaling and media interconnection point between callers in legacy wireline/wireless originating networks and the i3 architecture. The LNG logically resides between the originating network and the ESI net and allows i3 PSAPs to receive emergency calls from legacy originating networks. It should provide the Protocol Interworking Function (PIF), NG 9-1-1-specific Interworking Function (NIF), and Location Interworking Function (LIF).”

2. LPG
a. An LPG provides a signaling and media interconnection point between the ESI net and a legacy PSAP. It plays a role in the delivery of emergency calls that traverse an i3 ESI net to get to a legacy PSAP, as well as in the transfer and alternate routing of emergency calls between legacy PSAPs and i3 PSAPs. It should provide PIF, NIF, and LIF.

3. LSRG

a. An LSRG provides a signaling and media connection point between a legacy selective router and an NG 9-1-1 system. The LSRG should allow calls routed via a legacy selective router to terminate on an i3 PSAP, as well as allowing calls routed via an i3 ESI net to terminate to a legacy PSAP that is connected to a legacy selective router.

b. The LSRG should also facilitate the transfer of calls to and between PSAPs that are served by legacy selective routers and PSAPs that are served by ESI nets, regardless of the network from which the call originated.

While this section focuses primarily on the considerations for an NG 9-1-1 call handling solution, if an agency is not fully moving to an end-to-end i3 solution, the location and implementation of gateways that impact call ingress and egress for the PSAP should be described within the RFP for design consideration.

2.5.4.6 SLAs and Other System Capacities and Performance

Call quality SLA items that can be included in an RFP for NG 9-1-1 Call Handling are listed in Table 3. Typical information contained in the following table is provided mainly for reference purposes. At a minimum, metrics used for statistical measurements should conform to the NG 9-1-1 Call Processing Metrics Standard, NENA-STA-019.1-2018 [34].

Table 3 - Typical Call Handling SLA Considerations

<table>
<thead>
<tr>
<th>Category - SLA</th>
<th>Target</th>
<th>How measured</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Quality</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call Quality - Jitter</td>
<td>Specified by the 9-1-1 Authority</td>
<td>As measured in the RFC</td>
<td>Ref RFC 3550</td>
</tr>
<tr>
<td>Call Quality - Out of Order Packets</td>
<td>Specified by the 9-1-1 Authority</td>
<td>Total number of packets arriving out of order in a 24-hour period divided by the total number of packets arriving during the same 24-hour period</td>
<td>Rolling 24 hours</td>
</tr>
<tr>
<td>Category - SLA</td>
<td>Target</td>
<td>How measured</td>
<td>Comments</td>
</tr>
<tr>
<td>------------------------</td>
<td>---------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Call Quality – Lost</td>
<td>Specified by the 9-1-1 Authority</td>
<td>Total number of lost packets in a 24-hour period divided by the total number</td>
<td>Rolling 24 hours</td>
</tr>
<tr>
<td>Packets</td>
<td></td>
<td>of packets arriving during the same 24-hour period</td>
<td></td>
</tr>
<tr>
<td>Call Quality –</td>
<td>Specified by the 9-1-1 Authority</td>
<td>Total number of duplicate packets arriving in a 24-hour period divided by</td>
<td>Rolling 24 hours</td>
</tr>
<tr>
<td>Duplicate Packets</td>
<td></td>
<td>the total number of packets arriving during the same 24-hour period</td>
<td></td>
</tr>
<tr>
<td>Call Quality – Mean</td>
<td>Specified by the 9-1-1 Authority</td>
<td>Computed MOS (voice quality score) – the method and software used to compute</td>
<td>Rolling 24 hours or based on an agreed-to</td>
</tr>
<tr>
<td>Opinion Score (MOS)</td>
<td></td>
<td>the score should be identified</td>
<td>number of sample calls during a specified</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>time period.</td>
</tr>
</tbody>
</table>

**Service Capacity**

| Total number of calls | Specified by the 9-1-1 Authority            | Total number of calls arriving at the ESRP in a calendar year               |                                               |
| to be processed       |                                             |                                                                              |                                               |
| during a calendar     |                                             |                                                                              |                                               |
| year                  |                                             |                                                                              |                                               |
| Maximum number of     | Specified by the 9-1-1 Authority            | Peak load                                                                   |                                               |
| simultaneous calls to |                                             |                                                                              |                                               |
| be processed          |                                             |                                                                              |                                               |

**Service**

| Maximum call setup    | Specified by the 9-1-1 Authority            | Maximum elapsed time between presentation to the ESRP to delivery to a call |                                               |
| and delivery time     |                                             | queue                                                                       |                                               |
|                       |                                             |                                                                              |                                               |
| Average call setup    | Specified by the 9-1-1 Authority            |                                                                              |                                               |
| and delivery time     |                                             |                                                                              |                                               |

**Service Availability**

| Percentage of calls   | Specified by the 9-1-1 Authority            | Number of calls delivered to a call queue divided by the total number of    |                                               |
| presented to the      |                                             | calls presented to the ESRP                                                |                                               |
| ESRP and delivered    |                                             |                                                                              |                                               |
| to a call queue       |                                             |                                                                              |                                               |
2.5.5 Management Information Systems

As Management Information Systems (MIS) are evolving, 9-1-1 Authorities should be seeking MIS services to incorporate the provisions contained in this section.

2.5.5.1 Introduction

An MIS provides critical analytical insights needed to properly manage and evaluate the effectiveness of the 9-1-1 network (ESInet) and call handling (CPE) solutions employed to process all calls entering or exiting the 9-1-1 system, including administrative calls, language line conferences, etc.

There are two aspects to MIS in an NG 9-1-1 world: PSAP-specific analytics related to call handling service delivery performance to the public and NGCS-specific analytics related to call processing and routing. This section addresses both ESInet-specific MIS and PSAP-specific analytics, which apply to both NG 9-1-1 and legacy systems. The guidance provided in this section may equally apply to stand alone or shared systems.

2.5.5.2 NG 9-1-1 Components Needed for MIS

An i3 Logging Service must be present in the NGCS to collect LogEvents from NG 9-1-1 Functional Elements (FEs), and to record media. These LogEvents contain unique call and incident-tracking identifiers that support a cradle-to-grave picture of calls. MIS retrieves and uses these same LogEvents for statistical analysis, and may get the events from the Logging Service, or from a LogEvent Replicator. Those including MIS in RFPs should consider how it will receive the LogEvents it needs.

In transitional states, non-standard data sources for PSAP call processing analytics are required (e.g., databases, call detail records [CDRs], log files, etc.).

2.5.5.3 Information to Provide Proposers

NG 9-1-1 standards are applicable to every jurisdiction. What drives the specific configuration deployed in a jurisdiction is its specific requirements. It is recommended that the information below be provided to proposers in an RFP for NG 9-1-1 MIS.

1. Counts and capacities need to be identified.
   a. Number of PSAPs that represent the call handling environment.
   b. Number of interconnected ESInets (could just be one).
   c. Number of 9-1-1 voice calls needed to be handled annually. This includes calls originated on landline, wireless, VoIP, and all other networks that are mandated to provide 9-1-1 service.
d. Anticipated voice call volume growth in the subsequent 5 to 10 years. This should include growth from an increase in the population or an increase in visitors.

2. Capacities related to the delivery of calls to the PSAPs need to be identified.
   a. Number of PSAPs or shared, hosted systems that will be supported by the MIS.
   b. Expected call volumes for each PSAP (i.e., peak loads, etc.)
   c. Number of PSAPs supported by the MIS that are fully NG 9-1-1-capable, number that are IP-capable, and number that are legacy and will require LPGs.
   d. Queues in use per PSAP, if applicable, and their purpose.

2.5.5.4 Information to Request from Proposers

2.5.5.4.1 Common Metrics and Measures

When requesting any MIS, specific metrics should always be considered in order to properly measure and understand operational performance. In general, the following metrics should always be considered when looking at any MIS system: timing, volumes, bandwidth/trunk utilization, call flows, and agent activity. These high-level measures can be broken down into more discrete analytics requirements as described below. At a minimum, metrics used for statistical measurements should conform to the NENA-STA-019 NG 9-1-1 Call Processing Metrics Standard [34]. Some of the reporting item examples in the following list apply only to a transitional environment.

Timing:

1. Legacy and NG 9-1-1 Metrics
   a. Call Taker Answer Time
   b. Caller Answer Time Experience
   c. Queue Answer Timing
   d. Average Caller in Queue Time
   e. NENA and/or National Fire Protection Association (NFPA) Answer Time Standards (are they being met)
   f. Busiest Hour(s)
   g. Most Common Emergency Service Number(s) (ESN)
   h. Highest Repeated Automatic Number Identification(s) (ANI)

2. NG 9-1-1/ESInet Metrics
a. Core Element Response Times
b. LVF Response Timing
c. Top Ingress IP address
d. BCF Responses (200 OK, 600 Overload, etc.)
e. Serviceable versus Unserviceable Calls and Percentage Delivered
f. Number of Participants in Each Call (e.g., call conference); Call Leg Details
g. Routing (e.g., Ingress BCF─>PSAP, Transfer PSAP─>PSAP)
h. Initial Location Query Response Time
i. Location Dereference Response Time
j. Time Between Location Updates Within a Call
k. LoST Query Response Time
l. ALI Location Query Response Time (LPG or LSRG)
m. Additional Data Query Response Times

Volumes:

1. Legacy and NG 9-1-1 Metrics
   a. 9-1-1, 10-digit Emergency and Administrative Call Type Volumes
   b. Class of Service or NG 9-1-1 call type Totals
   c. Abandoned Calls
   d. Text-to- 9-1-1
   e. TDD/TTY

2. NG 9-1-1/ESInet Volume Metrics
   a. ESRP Requests Processed
   b. PRF rules (e.g., how many routed by location versus ESN, diverted, etc.)
   c. LoST Update Volumes (LoST Query Volumes?)
   d. All Core Element Usage Volumes
   e. Payload types (media, voice, text, etc.)
   f. LNG versus 100% SIP (inbound as SIP, arrival at PSAP as SIP, no analog transformations)
   g. LIS/NLIS Lookup Counts (number of location requests)
h. Malformed Message Volumes  
i. Incident Volumes  
j. Merged Incident Volumes  
k. Split Incident Volumes  
l. Linked Incident Volumes  
m. Reopened Incident Volumes  
n. Discrepancy Report Volumes (total and per Agency)  
o. "KeepAlive" Failure Volumes  
p. Recording Failure Volumes  
q. Transferred Call Volumes (total and per Agency)  

Bandwidth/Trunk Utilization:  
1. Legacy Metrics  
a. Calls per Trunk  
b. Trunk Utilization  
c. Overall Circuit Utilization  
d. Overall Capacity  

2. NG 9-1-1/ESInet Bandwidth/Trunk Utilization (for LNG or LSRG)  
a. Percent Total Bandwidth Used (based on available bandwidth; e.g., Peak % of configured bandwidth on the data link)  
b. Jitter, Packet Drop Counts, and other Quality of Service metrics from  
c. Table 2 above  
d. Average Usage per Call  
e. Total Bandwidth Utilized  

Call Flows:  
1. Legacy and NG 9-1-1 Call Flow Metrics  
a. Call Transfers  
b. Call Conference (total duration and broken out by call leg)  

2. NG 9-1-1/ESInet Call Flows
a. End-to-end Analysis (ingress to the ESInet and flow tracing to PSAP BCF; includes all elements involved and full call visibility)

Agent and Queue Activity:

1. Legacy and NG 9-1-1 Agent Activity Metrics
   a. Calls per Agent (9-1-1, 10-digit emergency, administrative)
   b. Agent Status (Busy, Ready, Not Ready, On Call, etc.)
   c. Agent Queue Status

2. Queue Activity (NG 9-1-1 and Legacy), where applicable
   a. Total Volume of Calls by Queue
   b. Average Time of Call in Queue
   c. Number of Calls Returned to Queue
   d. Number of Calls Abandoned in Queue

2.5.5.4.2 Functional Element Interface and Functional Information

NG 9-1-1 Interfaces: RFPs should require proposers to describe how they will meet the requirements of NENA-STA-010, *NENA i3 Standard for Next Generation 9-1-1* [25], by providing the interfaces below at end-state. MIS functionality in NG 9-1-1 is dependent upon the LogEvents defined in NENA-STA-010. Metrics based on these LogEvents are defined in NENA-STA-019 *NG 9-1-1 Call Processing Metrics Standard* [34].

1. Logging:
   a. At least two Logging Service instances must be present to collect LogEvents per NENA-STA-010. A LogEvent Replicator (see NENA-STA-010 [25]) is recommended to support reporting and monitoring functions. Media recording functions can be allocated to Logging Service instances such that there is no single point of failure. The Logging Service must conform to the specifications given in the Logging Service section of NENA-STA-010 [25].

2. Discrepancy Reporting:
   a. Per NENA-STA-010, a Discrepancy Report function is provided to notify agencies and services when any discrepancy is found. Proposers must conform to Discrepancy Reporting as specified in NENA-STA-010 [25].

NG 9-1-1 Functions: A network or solution diagram that clearly maps out the end state for the ESInet and NG 9-1-1 Core Services should be mandatory for all RFP responses. The functions below should be visible on the solution diagram.
1. Logging Service:
   a. The MIS usage of a logging service must be presented in the solution
      diagram. When MIS is specifically required as part of the overall solution,
      proposers should describe how MIS acquires LogEvent data, and any
      interaction between MIS, the Logging Service, and/or a LogEvent Replicator
      (see NENA-STA-010 [25]).

2. Local PSAP Data:
   a. The PSAP Call Handling FE is responsible for logging events related to PSAP
      call processing. This FE may be in the PSAP, or in the serving ESI.net.
      Proposers should describe in detail how the proposed solution supports this
      logging. When MIS is included in the RFP, proposers should describe how MIS
      receives these events in their solution. LogEvent data flow should be shown
      on the solution diagram.

   Call Handling MIS: The transition to NG 9-1-1 will be accomplished in phases and, more
   often than not, a mix of NG 9-1-1 PSAPs and legacy PSAPs will be present in the overall
   system. In order to provide PSAP-level MIS for legacy PSAPs, the functional elements
   below will be present at the legacy PSAP and additional data sources will be needed to
   properly support the MIS system.

   1. LPG:
      a. An LPG provides a signaling and media interconnection point between the
         ESI.net and a legacy PSAP. It plays a role in the delivery of emergency calls
         that traverse an i3 ESI.net to get to a legacy PSAP, as well as in the transfer
         and alternate routing of emergency calls between legacy PSAPs and i3 PSAPs.
         It should provide PIF, NIF, and LIF. An LPG logs important LogEvents that
         should be collected on the NGCS Logging Service. These events will support
         MIS analysis of call processing on the NG 9-1-1 side of the gateway, with
         limited detail of call processing on the legacy interface. It is important that the
         LPG supports the required LogEvents (see NENA-STA-010 [25]), including the
         ALI-related events. An LPG does not log any agent events, so any collection
         of this type of data would not be standardized.

   2. LSRG:
      a. An LSRG may be supplied to provide a signaling and media connection point
         between a legacy selective router and an NG 9-1-1 system. The LSRG should
         allow calls routed via a legacy selective router to terminate on an i3 PSAP, as
         well as allowing calls routed via an i3 ESI.net to terminate to a legacy PSAP
         that is connected to a legacy selective router. The LSRG logs important
         LogEvents that can be used for MIS analysis of this call processing. It is
important that the LSRG supports the required LogEvents (see NENA-STA-010 [25]), including the ALI-related events.

b. The LSRG should also facilitate the transfer of calls to and between PSAPs that are served by legacy selective routers and PSAPs that are served by ESInets, regardless of the network from which the call originated.

2.5.5.5 PSAP Data Source
Using LogEvent data, call delivery to the LPG can be tracked. ALI queries and a limited number of call state change events on the LPG’s legacy interface can also be tracked (see NENA-STA-010). Beyond that, local collection of PSAP call handling data is required. The source should be accessible either via physical connection (e.g., RS-232) or an IP connection to either a logging end point, a custom end point, or similar system to support PSAP call handling reporting.

2.6 Legacy Gateways

2.6.1 Legacy Network Gateway
LNGs are outside the ESInet (or at the edge) and calls must go through a BCF to get into or out of the ESInet. LNGs sit between the OSP’s network and the NG 9-1-1 system. On the ingress side, LNGs facilitate OSP call delivery over TDM networks (typically SS7) to the NG 9-1-1 system. The LNG provides a selective router-like interface. On the egress side, LNGs present the 9-1-1 call to the BCF as a full NG 9-1-1 session.

2.6.2 Legacy PSAP Gateway
LPGs are outside the ESInet (or at the edge) and calls must go through a BCF to get into or out of the ESInet. LPGs sit between the NG 9-1-1 system and a legacy PSAP call handling system. On the ingress side, LPGs facilitate the delivery of calls bound for a PSAP legacy call handling system by providing an NG 9-1-1 call handling interface. On the egress side, the LPG presents the 9-1-1 call to the legacy call handling system using CAMA and provides an interface to ALI that the legacy call handling system expects.

2.6.3 Legacy Selective Router Gateway
LSRGs are outside the ESInet (or at the edge) and calls must go through a BCF to get into or out of the ESInet. LSRGs sit between a NG 9-1-1 system and a legacy selective router. The side of the LSRG facing the NG 9-1-1 system provides an interface that approximates another NG 9-1-1 system. The side of the LSRG facing a selective router provide an interface that approximates a legacy selective router. The use of an LSRG is a potential migration path as defined in NENA-INF-008 [2]. Other migration paths are also possible.
2.7 SLAs and Other System Capacities and Performance

Service Level Agreement (SLA) items that can be included in an RFP for ESInet and NG 9-1-1 Core Services.

Since multiple service providers are possibly involved Services are listed in Table 2. in the ESInet and NG 9-1-1 Core Services, clear demarcation points for identifying responsibilities must be stated. Information contained in the table is for reference purposes only.

Emergency Services availability is the measure of the ability to get help to someone who needs it, and is dependent upon multiple factors and services. With NG 9-1-1 call diversion, multiple PSAPs may be used to achieve an acceptable level of availability. In NG 9-1-1, call handling diversion policy should be defined by an agreement between cooperating Agencies. Within the NG 9-1-1 environment, a PSAP must be prepared to (under local policy control) receive and process, to the best of their ability, diverted calls that do not fall under any formal agreement. Unmanned backup PSAPs increase availability, but the time to bring the backup PSAP online is a significant factor in that availability. It is recommended that availability SLAs be set realistically, and the penalties for failing to meet the SLAs be stated clearly.

It is recommended that availability SLAs be set realistically, and the penalties for missing be substantial.

Note that NENA Managing & Monitoring NG 9-1-1 Information Document, NENA-INF-040.1-2019 (draft) [22] provides additional detail on monitoring and management aspects of the SLA items included in the following table.

Table 4: SLA Considerations

<table>
<thead>
<tr>
<th>Category</th>
<th>SLA item</th>
<th>Target Value</th>
<th>How measured</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Quality</td>
<td>Quality of Service (QoS)</td>
<td></td>
<td>Require vendors to assert that DiffServ per NENA-STA-010 will be implemented in the proposed solution, and that all proposed routers and switches will respect the code points specified therein. 100% of packets must be correctly marked and 100% of packets must get the specified Per Hop Behaviors.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Packet Loss Jitter Latency</td>
<td></td>
<td>Using NENA-STA-010.2-2016, Detailed Functional and Interface Standards for the NENA i3 Solution, specify the network performance requirements.</td>
<td></td>
</tr>
<tr>
<td>Category</td>
<td>SLA item</td>
<td>Target Value</td>
<td>How measured</td>
<td>Comments</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------</td>
<td>--------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Require vendors to describe the QoS they are guaranteeing under normal conditions as well as under stress conditions. Proposers must specify how they monitor this SLA.</td>
</tr>
<tr>
<td>Availability Thresholds</td>
<td></td>
<td></td>
<td></td>
<td>Consider specifying which PSAPs require specific levels of ESI.net availability.</td>
</tr>
<tr>
<td>Troubleshooting Procedures</td>
<td></td>
<td></td>
<td></td>
<td>Define response times for participating in troubleshooting procedures.</td>
</tr>
<tr>
<td>Escalation Procedures</td>
<td></td>
<td></td>
<td></td>
<td>Define response times for executing an escalation process when problems cannot be quickly diagnosed and resolved. Define severity levels for different types of problems, and the escalation actions to be taken based on the severity level.</td>
</tr>
<tr>
<td>Service Performance</td>
<td></td>
<td></td>
<td></td>
<td>The SLA should establish acceptable delivery times and consequences for reports defined in the SLA.</td>
</tr>
<tr>
<td>Reporting Requirements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Availability</td>
<td></td>
<td></td>
<td></td>
<td>Network should never go down. Availability should be measured according to agency defined metrics, with no single point of failure.</td>
</tr>
<tr>
<td>Uptime and Downtime</td>
<td></td>
<td></td>
<td></td>
<td>Specify the required level of network availability, at specified measurement points, such as five 9s (99.999%), as measured on a monthly scale (or another chosen scale).</td>
</tr>
<tr>
<td>Network Availability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Category/SLA item</td>
<td>Target Value</td>
<td>How measured</td>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Maintenance Periods and Windows</td>
<td></td>
<td></td>
<td>Define allowed planned maintenance periods and windows. Require reporting when planned maintenance extends beyond the defined window. Require reporting of any unplanned maintenance. Reduced availability during a maintenance window may be acceptable per a negotiated SLA.</td>
<td></td>
</tr>
<tr>
<td>Mean Time to Repair (MTTR) and Mean Time Between Failures (MTBF)</td>
<td></td>
<td></td>
<td>When any component of NGCS or any segment of the ESI.net experiences an outage, the overall reliability and resiliency of the NG 9-1-1 system is diminished. While a NG 9-1-1 system should be designed to continue to process calls during any outage, the time between the occurrence of an outage and the time to remedy it is a &quot;window of vulnerability&quot;. As such the frequency of outages (MTBF) and the time it takes to remedy the outage (MTTR) should be addressed in the SLAs. NG 9-1-1 systems with lengthy MTBF and short MTTR are recommended. Agencies should consider requiring availability of spare components in order to reduce MTTR. This SLA must be tracked via the trouble ticketing system.</td>
<td></td>
</tr>
<tr>
<td>Application or Service Availability</td>
<td></td>
<td></td>
<td>Specify the required level of application or service availability, such as five 9s (99.999%), as measured on a monthly scale (or another chosen scale). Availability calculations must include hardware and software the application or service is dependent upon.</td>
<td></td>
</tr>
<tr>
<td>Severity Levels</td>
<td></td>
<td></td>
<td>Specify severity levels for</td>
<td></td>
</tr>
<tr>
<td>Category / SLA item</td>
<td>Target Value</td>
<td>How measured</td>
<td>Comments</td>
<td></td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>Response Requirements</td>
<td></td>
<td></td>
<td>different types of service degradations, with corresponding response times and resolution process details.</td>
<td></td>
</tr>
<tr>
<td>Degradations that affect Service Availability</td>
<td></td>
<td></td>
<td>Detail the process for reporting and resolving degradations that cause full or partial unavailability of a critical service or application, specifying strict response and resolution times.</td>
<td></td>
</tr>
<tr>
<td>Degradations that do not affect Availability</td>
<td></td>
<td></td>
<td>Specify any reporting requirements for issues that do not degrade service, such as degradation in redundancy.</td>
<td></td>
</tr>
<tr>
<td>Service Dependencies</td>
<td></td>
<td></td>
<td>Detail infrastructure/services that a given service depends on, and the process for dealing with resulting degradation in the given service.</td>
<td></td>
</tr>
<tr>
<td>Change and Configuration Control</td>
<td></td>
<td></td>
<td>Specify the parameters of an acceptable change/configuration control process for all critical services, applications and infrastructure, including communication and reporting mechanisms. Require proposers to define how long patch processes for routine and severe security vulnerabilities take. All security vulnerabilities should be patched expeditiously as defined by the change control board.</td>
<td></td>
</tr>
<tr>
<td>Security</td>
<td></td>
<td></td>
<td>Specify security requirements for classifying and handling sensitive data, including personnel considerations, physical security, and cybersecurity. Specify security monitoring and incident reporting requirements.</td>
<td></td>
</tr>
<tr>
<td>Dependent Services</td>
<td></td>
<td></td>
<td>Identify services that are dependent upon other services, such as a PSAP on the serving NGCS system. Define monitoring, reporting, and resolution requirements for both entities.</td>
<td></td>
</tr>
</tbody>
</table>
### Category | SLA item | Target Value | How measured | Comments
--- | --- | --- | --- | ---
Service Responsiveness | | | | Define acceptable response times for operations such as critical database or application processes, such as query response times and application decision times.
Discrepancy Reporting | | | | Detail how the i3 Discrepancy Reporting (DR) functionality will be handled, and acceptable times for responding to and resolving different types of DRs.
Information Sharing | | | | SLAs between stakeholders should specify the mechanisms and processes for sharing information about impairments and resolutions.
Intrusion Detection and Prevention | | | | Detail requirements for detecting and preventing unauthorized access to systems and services, reporting requirements, and incident resolution process.

### 3 RFP Elements

This section provides suggestions and considerations for sections that should be included in an RFP to provide adequate information to proposers to develop their response. This list is not all inclusive, nor does it address agency-specific RFP or purchasing processes or requirements.

#### 3.1 RFP Drafting and Issuance

When drafting an RFP, thought should be given to the following:

- Carefully consider agency wants/desires with realistic needs and possibilities.
- Identify needs and requirements with words such as “will”, “shall”, or “must”.
- Identify wants with words such as “optional”, “can”, and “may”.
- Decide if the selected vendor should have the fastest delivery, lowest cost, or a combination.
- Organize the RFP with sections, subsections, introduction, requirements, selection criteria, timelines, optional items, and the process and procedures.
- Create a clear and concise RFP; ensure that it:
  - Is well structured.
  - Is clearly written.
  - Is free of jargon.
1978  
1979  
o Includes a checklist of requirements.  
o Is concise; longer does not necessarily mean better.  
1980  
• Evaluate your target audience:  
1981  
o Take time to pre-qualify recipients by visiting websites, interviewing principals,  
1982  
and requesting portfolios.  
1983  
o Send RFPs to only those companies that have a reasonable chance of doing  
1984  
business with your agency.  
1985  
• Determine who from your organization is authorized to engage with perspective  
1986  
vendors.  
1987  
• Identify any organizational requirements regarding the advertisement or publication  
1988  
of the RFP release; determine:  
1989  
o If RFPs are required to be published in state Registers or Journals.  
1990  
o The minimum requirements for how long/often an RFP must be advertised or  
1991  
published.  
1992  
o If RFPs are required to be posted on an organization, local, or state electronic  
1993  
site for available opportunities.  
1994  
• Determine the method of issuance or release:  
1995  
o Electronic format only.  
1996  
o Hardcopy only.  
1997  
o Both electronic and hardcopy.  
1998  
1999  
3.2 Project Scope/Overview  
In the project scope or overview section:  
2000  
• Provide a summary of the RFP objectives, agency needs, and reasons for issuing the  
2001  
RFP.  
2002  
• Describe the work that the agency will perform and the work the vendor will  
2003  
perform.  
2004  
• Provide a summary of system dimensioning requirements (number of positions;  
2005  
number of lines; additional dependencies, such as loggers; etc.).  
2006  
• Provide as much data as possible so vendors have enough information on how to  
2007  
structure a solution.  
2008  
• Detail the minimum viable solution accepted.  
2009  
• State if alternative solutions are acceptable and/or how far vendors are allowed to  
2010  
stray from the requirements to provide a different and potentially better solution.  
2011  
3.2.1 Current System  
A description of the current system should be provided to give proposers a clear picture of  
2012  
how the agency currently operates.
3.3 Operational Environment

An explanation of the operational environment that will be responsible for interfacing with the vendor and the system should be provided in the RFP. Suggested operational considerations include the following:

Figure 3 is a sample diagram showing PSAP elements and interconnections. For RFPs that incorporate ESI.net or NG 9-1-1 Core Services, a diagram that provides details about the current 9-1-1 service infrastructure (i.e., E 9-1-1) and call delivery mechanisms, should be provided in the RFP.
• Current staffing level of the 9-1-1 Authority:
  o List of current positions including title, responsibilities, percentage of time available to work with the vendor, and the E 9-1-1 system.
  o Provide an organizational chart to help the vendor understand the operational staff currently available to support the new system.
  o Describe the chain of command for decision-making related to the current E 9-1-1 system.

• Target staffing level of the 9-1-1 Authority:
  o List of target positions including title, responsibilities, percentage of time available to work with the vendor, and the NG 9-1-1 system.
  o Provide an organizational chart to help the vendor understand the operational staff that will be available to support the new system.
  o Describe the chain of command for decision-making related to the NG 9-1-1 system.

• Proposer’s recommendation on the operational staff required to properly manage the NG 9-1-1 system.

3.4 Schedule
A high-level schedule that includes RFP-related due dates through project completion dates post-award should be provided. A schedule may include the following:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFP Release Date</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Pre-bid Conference</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Questions Due</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Proposals Due</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Demonstration/Oral Presentations</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Notification of Intent to Award</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Contract Signed</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Installation Begins</td>
<td>Month XX, XXXX</td>
</tr>
<tr>
<td>Project Completed</td>
<td>Month XX, XXXX</td>
</tr>
</tbody>
</table>

3.4.1 Questions
RFPs often include a question and answer period in which proposers are allowed to ask questions of the agency through a defined process. The process should be detailed in the RFP, and may include the following information:

• Identify the contact for questions.
• State the preferred method for questions (e.g., e-mail, written hardcopy, telephone, etc.).
• State if addenda will be issued to provide the answers.
• State how often or when addenda will be issued.
• Ensure vendors have enough time to adjust their responses based on the answers provided.

3.4.2 Pre-bid Conference/ Site Visit

Agencies should reference local procurement policy for requirements on determining whether a pre-bid meeting (conference) or site visit will occur. If allowable, the more complex projects generally benefit from pre-bid meetings.

• Determine if vendors will be required to attend a mandatory pre-bid meeting, or whether the meeting is optional.
• Determine if additional information will be presented or if a site visit will be permitted.
• If screening of vendor personnel is required, provide vendors sufficient notice of this requirement.

3.5 Guidelines for Consistent Responses (Proposal Response Format)

A section for how responses are to be submitted should be included in the RFP.

3.5.1 Instructions to Proposers

Details on specific instructions, if needed, may include the following:

• Electronic format or hard copy
  o If hard copies, quantity requirements for binders, CDs, thumb drives
• Page limits of responses, if any, and supporting documentation requirements (if limited, so state)
• Shipping or email address or instructions

3.5.2 Response Format

A response format (organization of documentation to be received) should be provided to ensure each response is organized in the same manner for ease of review. The sections below describe a sample response format of requested proposer information.

3.5.2.1 Executive Summary

Key high-level decision-makers often only review an executive summary as they rely on other subject matter experts to review the proposal response in depth. An effective executive summary should:
• Explain how the proposer meets the needs of the agency.
• Briefly describe key elements from each proposal section.
• Be written in easy to understand language.
  o Do not include in-depth technical language; this section is often read by people who are not technical experts.

3.5.2.2 Company Overview/Profile
The company profile should include the following:
• Proposer contact information
• General information about the company, including qualifications, staff, financial stability
• References
• Identification of any subcontractors

3.5.2.3 Proposed System Description
The proposed system description should include, from proposers:
• A detailed write-up of the proposed solution and how it meets the RFP objectives
• Diagrams

3.5.2.4 Technical Compliance Section/Matrix
The technical compliance section or matrix should include the following:
• Clear definitions as to how the response to requirements should be stated, for example:
  o Comply
  o Comply with Clarification
  o Exception
• Additional description, if needed
• A spreadsheet for the proposer to complete:
  o Agencies can “hide” scoring to be used later for point tabulation
  o Separate requirements into single line items rather than a paragraph.
An example is provided below. This is an example only. PSAPs should identify acceptable options and define them.
EXAMPLE A
This section addresses the functional specifications set forth in the proposal. The response to the following requirements will be indicated in one of the following ways.

| COMPLY | Shall be used if the proposal meets or exceeds all of the specified requirements. |
| COMPLY WITH CLARIFICATION | Shall be used if most, but not all of the specific requirements are met. The requirements not met must be explained in detail. If the deviation of the requirement is significant enough, it may be considered a major or minor exception. |
| EXCEPTION | Shall be used if the proposal does not substantially meet the specified requirements. Failure to indicate any exceptions shall be interpreted to mean that the proposer fully intends to comply with all RFP requirements as written. Explanation must be made for each item for which exception is taken, giving in detail the extent of the exception, and the reason for which it is taken. The PSAP reserves the right to give consideration or waivers for these exceptions. |

Additional explanation, description, or clarification may be supplied to amplify the compliance responses. However, COMPLY WITH CLARIFICATION or EXCEPTION should require the proposers to explain why they are unable to comply or how they will meet the specifications through an exception.

EXAMPLE B
The same requirements listed in Example A are split into separate line items and can have their own compliance response. Proposer cannot miss a requirement, and each is scored and/or evaluated on its own.

<table>
<thead>
<tr>
<th>RFP Requirement</th>
<th>Compliance</th>
<th>Explanation</th>
<th>Potential Weighted Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Provider shall provide for NENA-compliant serial system interfaces for the delivery of ANI/ALI information to computer aided dispatch (CAD) and mapping applications.</td>
<td>(PSAP could rank needs or assign a weighted score per requirement. Potentially hide this column from proposers and use for scoring only.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The system shall be capable of delivering ANI/ALI information to CAD and mapping applications natively via IP without a hardware</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

© Copyright YYYY National Emergency Number Association, Inc.
<table>
<thead>
<tr>
<th>RFP Requirement</th>
<th>Compliance</th>
<th>Explanation</th>
<th>Potential Weighted Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>or software upgrade being required.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The system must also support delivery of legacy serial ANI/ALI information.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The reporting interface must be capable of integrating multiple databases into one report with the voice recordings as an attachment to the call record. ANI/ALI must be captured and stored with each 9-1-1 call and the following items stored in their own individual database fields of appropriate size that are sortable and searchable:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Originating Phone Number (ANI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Address or Coordinates (ALI)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Caller Name</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ANI/ALI Time of Initiation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ANI/ALI Time of Pickup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ANI/ALI Time of Disconnect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ANI/ALI Date</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ESN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Class of Service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Local Exchange Carrier (LEC)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 3.5.2.5 Pricing/ Costs

Including a simple cost sheet will allow the agency to more easily compare proposals.

- Separate costs into the categories needed for agency review:
  - Hardware
  - Software
  - Database
In most cases, costs are provided in a separate, sealed envelope with the technical proposal.

3.5.2.6 Implementation Plan/ Cutover Plan
The RFP should include a request for a preliminary implementation and/or cutover plan, as well as a project timeline in a spreadsheet or project management software.

3.5.2.7 Training Requirements
The RFP should specify the number and classification of personnel to be trained (e.g., telecommunicators, supervisors, system administrators) by type of training expected. Proposers should provide the following:

- Training Plan
- Course Descriptions
- Equipment Required
- Space/Training Room Requirements

3.5.2.8 Warranty/ Service Plan Options
Proposers should provide information on the standard warranty and additional extended warranty, as well as service and maintenance plan options.

3.5.2.9 SLAs
SLAs establish the specific performance requirements desired by the 9-1-1 Authority. SLAs can be included in an RFP to communicate the 9-1-1 Authority’s expectations. However, the SLAs may be revisited as part of contract negotiations. SLAs applicable to the components discussed have been offered for consideration in the respective sections of this document.

SLAs are specific to the component(s) of the NG 9-1-1 system being purchased by a 9-1-1 Authority. For example, the required availability of an MIS is very different than that of the system that routes 9-1-1 calls in real-time. There are SLA categories that apply to all components including, but not limited to, the following:

- Service Quality: For example, the quality or clarity of the voice of a caller or the accuracy of a database.
- Service Capacity: For example, how many 9-1-1 calls per minute should the system handle or how many records will there be in a database.
- Service Performance: For example, how fast will a 9-1-1 call be completed once it hits the system or how fast reports from a database will be delivered.
• Service Availability: For example, how many minutes per year will a system component be unavailable to process 9-1-1 calls or will the administrative system be available on weekends.

• Systems 24x7x365 Coverage: For example, request a detailed explanation of the support process during normal business hours, available support after business hours, on weekends, and on holidays.

• Detailed Maintenance and Support Program: For example, a detailed explanation of the component update, upgrades, and the very basic SLAs for the system to include service response times based on severity of the issue.

Some SLA-related targets have been established in NENA standards. 9-1-1 Authorities should use these values when they are available. Industry norms are being set for most other SLA targets.

To be useful, information related to the SLA must be gathered and reported to determine if the system is meeting the SLAs. “If you can’t measure it, it doesn’t exist.”

The final contract will detail remedies if SLAs are not met. Proposed remedies can be presented in the RFP, but will be finalized as part of the contract negotiations.

The 9-1-1 Authority can also define SLAs establishing the specific vendor performance requirements desired; for example, how fast must the vendor provide a solution for minor and major system failures.

3.5.2.10 Contract/ Terms and Conditions

If proposers are able to take exceptions or provide compliance to terms and conditions, instructions for doing so should be provided.

3.6 RFP Package

A sample RFP package, once it has been compiled, may consist of the following:

• Cover Letter, containing instructions to vendors
• Signature Page
• Title Page
• Table of Contents
• Schedule of Events, outlining expected timetable for procurement process
• Standard and Special Terms and Conditions
• General Information
  o Definitions of Purpose or Intent
  o Background
  o Method of Payment
  o Contract Term
  o Presentations or Demonstrations
• Pre-bid Meeting
• Question and Answer Period and Contact Information
• Deadline and Delivery Instructions, including address, phone number, and contact person

• Technical Specifications
  o Specifications (goods) or Scope of Work (services)
  o Scope of Activity (projects)
    ▪ Project Management
    ▪ Deliverables Schedule
    ▪ Support, Training, or Maintenance

• SLAs
  o Level of commitment required of proposers
  o Response Time Requirements
  o Reporting Requirements

• Vendor Requirements
  o Mandatory Requirements
  o Vendor Organization
  o Vendor Qualifications and Experience
  o References
  o Financials
  o Resumes

• Proposal Response Format
• Cost Proposal
• Method of Evaluation and Award
  o Evaluation Criteria
  o Discussions and Best and Final Offer
  o Negotiations

• Attachments

3.7 RFP Response and Evaluation

The scope of this section is to provide a generic checklist of response evaluation criteria, which are industry-standard elements commonly used to evaluate RFP responses. The detailed scoring compliance guidelines for each area of compliance for an NG 9-1-1 RFP response (technical, maintenance, cost, etc.) are not provided here, but must be fully understood and defined for each sub-system and area of compliance, which are described in the relevant sections of this document.
There are a number of factors that impact RFP Response evaluation and proposer selection. These factors include the administrative rules all proposers must follow, the elements within the proposal that are scored, the weight or importance the 9-1-1 Authority places on each of the elements, the process used to score all proposals, the staff involved, the additional steps used to evaluate proposals after they are submitted (oral presentations, site visits, etc.), and the scoring to be applied to these additional steps. All of these factors are involved in the procurement process up to the negotiations with the vendor(s) selected. Checklists for each of these factors can be found below.

One of the most important factors the 9-1-1 Authority must consider as an RFP is written is the manner in which requirements are defined. Each requirement that is to be scored should have the following characteristics:

1. Requirements should be stated in unambiguous terms. All proposers should fully understand the requirement.

2. Requirements should be written using unbiased terminology avoiding the use of any vendors’ product names or designations.

3. Requirements should allow for differentiation between proposer responses. Requirements asking for yes or no responses are useful, but do not allow for adequately comparing proposer responses.

4. Requirements that simply refer to the standards violate items 1 and 2 above. Requirements defining what aspects of the standards are most important are very useful.

5. Ideally, requirements should focus on the functionality the 9-1-1 Authority requires and to a lesser degree on how the functionality is delivered as long as it is provided within the standard.

6. Requirements that focus on functionality not defined in the standards are especially useful. As an example, operational interfaces are not documented in the standards. Requirements focused on these non-standardized aspects of an NG 9-1-1 system are important.

7. Requirements should be understood by all staff that will be involved in scoring proposals as well as the proposers.

There are multiple dimensions of this topic that could be included [evaluation factors]:

1. The checklist of things the 9-1-1 authority wants and if the response provides them: example - We want Policy Routing Function - do you provide it? – (Y or N)

2. If the responder does provide it, the next level of question is the degree to which the standard is implemented: Have you designed for all of the identified rule types in
the PRR standard? Is there any practical limit to the number of rules that can be supported? Do you support rules based on the initiating queue as well as the terminating queue?

3. There are the operational aspects of the requirement. Do you provide an interface for the 9-1-1 authority to enter and manage the PRRs or is it required to call the vendor? What does the interface look like? Is an instruction manual provided? What expertise is required to use it? What security features are built in? What checks of the logic are included to avoid infinite loops and other issues? What reports are available? Note that none of these important questions are covered in the standard or INF documents so the Authority can't simply refer to the standards.

If the RFP in question has simply required `Compliance with the NENA i3 standard' or some similar general statement, four issues need to be considered.

1. The term `compliance' or similar is interpreted by vendors in several ways, such as `equivalence' or `similar to' or `conforms with' or `provides the same end result', etc. The intention in RFPs is typically to require that the proposed system actually meets the NG 9-1-1 i3 standard in detail. It should be understood here that the i3 architecture has many design points meant to support sometimes subtle but important capabilities beyond just the obvious routing and delivery of calls and data, and in preparation for known near future needs, driven by impacts of telecommunications evolution.

2. If the vendor(s) responding to the RFP want to push the RFP issuers toward a 9-1-1 service system of the vendor's design that may not completely comply with the i3 standard, then the meaning of their response language must be carefully inspected and evaluated.

3. Vendors may believe that the 9-1-1 Authority issuing the RFP does not (yet) need certain functional capabilities for various reasons and, as a result, propose a less than complete `NG 9-1-1 system' relative to the NENA NG 9-1-1 i3 architectural standard. This also suggests a need for the evaluators to determine what the impact on 9-1-1 service and future costs will be, and how the vendor will treat future additions, either not initially provided or because of future updates to standards.

4. Does the 9-1-1 Authority desire some form of guarantee that the vendor will provide components in reasonable timeframes and at reasonable cost in the future?

---

2 Such as lack of IP interfaces from originating service providers, or because the vendors believe that Policy Routing can be replaced by some other internal vendor-managed process that only supports overflow and alternate routing rather than the full capability of the i3 Policy Routing Function.
A recommendation has been made that a working group be created to more fully provide guidance on all factors of proposer evaluation and selections. The sections below provide a checklist of considerations.

### 3.7.1 Response Evaluation Considerations

Evaluation steps generally include the following:

1. Establish the RFP Evaluation Committee
   a. All evaluators should be familiar with the RFP document and all agency-specific documentation is signed or completed prior to evaluation (such as a non-disclosure agreement)

2. Evaluate technical proposals

3. Evaluate cost proposals

4. Conduct oral interviews and/or demonstrations

5. Re-evaluate based upon steps 2, 3, and 4

6. Enter into negotiations

7. Final recommendation for award according to agency- or state-specific guidelines and regulations

### 3.7.2 Evaluation and Scoring

Considerations for scoring should include the following:

- Proposer’s checklist, used to determine if all required documentation has been submitted
- A breakdown of how scoring will be weighted

<table>
<thead>
<tr>
<th>Technical Compliance</th>
<th>XX% or # of Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance and Support</td>
<td>XX% or # of Points</td>
</tr>
<tr>
<td>Total System Cost</td>
<td>XX% or # of Points</td>
</tr>
<tr>
<td>Vendor Experience and Capability</td>
<td>XX% or # of Points</td>
</tr>
<tr>
<td>Demonstrations or Oral Presentations</td>
<td>XX% or # of Points</td>
</tr>
</tbody>
</table>

### 3.7.3 Demonstrations or Oral Presentations

At the RFP stage or upon selection for a demonstration or oral presentation, agencies may wish to provide the following information to proposers:

- Amount of time available for set up
- Amount of time available to present
- Need for a live system required or if demonstration software/system is sufficient
3.7.4 Agency-specific Requirements

Agency-specific (or city, county, state) requirements may include the following:

- Insurance Requirements
- Bid Bond
- Performance Bond
- Terms and Conditions/Sample Contract
- Minority-owned/Women-owned/Veteran-owned, etc. requirements
- Penalty Fees

3.7.5 Logistics Summary

In summary, the logistics behind drafting, developing evaluation standards, and RFP issuance can require as much effort and input from agency staff as development of the technical requirements. When the agency provides a clear, concise RFP with specific instructions to proposers, the agency will have a higher probability of receiving proposal responses that are easier to evaluate, easier to compare, and will ultimately be able to choose the best equipment or service to meet the agency’s needs.

4 Impacts, Considerations, Abbreviations, Terms, and Definitions

4.1 NG 9-1-1 Operations Impacts Summary

Deciding exactly what resources will be shared and how the work of PSAPs will utilize the shared resources has important implications for exactly how the public’s need for 9-1-1 service will be met.

The use of a common NG 9-1-1 Core Services system across multiple PSAPs, typically operated at either region or state level, involves a number of service system impacts and actions. Since the Core Services systems operate centrally outside the local PSAP environment, administration and management of several functions require a number of central responsible activities. These may be performed by one or more vendors, a combination of vendors and 9-1-1 Authority groups, or entirely by 9-1-1 Authority management groups. Examples include:

- Administration and management of inbound Border Control Function (BCF) assignments, including determination of what Originating Service Provider (OSP) entities are providing calls/messages and data on which logical input points
- Coordination, resolution, and management of Geographical Information System (GIS) data feeds from individual PSAPs or local source points, including resolution of gaps and overlaps, and measuring GIS accuracy overall
- Coordination and management of Location Validation Function (LVF) operations, and the provision of GIS data for validation purposes. Actions will vary depending on whether the LVF process is a service provided within the Core Services by an NG
9-1-1 Core operating vendor or the 9-1-1 Authority, or is operated by individual OSP entities or a third-party provider to OSP entities. In any case, the 9-1-1 Authority with responsibility for NG 9-1-1 Core Service operations has responsibility to see that the process works effectively.

- Management of other databases that control various Core Services functional elements and their processing functions.
- A major consideration is the management of the Policy Routing Function (PRF) which is used to control alternate routing, the distribution of calls for PSAP overflow or out-of-service conditions, the automatic acquisition of selected additional data during an emergency call, and potential call delivery modification (to another PSAP or to specific Telecommunicator positions) based on type of call (text or video). The design of the i3 architecture also includes the Policy Routing Function (PRF) automatically sensing PSAP delivery channel or PSAP equipment status, with the appropriate i3 compliant software at the PSAP, and making pre-defined changes in call routing.
- Logging and alarm messaging in the NG 9-1-1 Core Services system will need to be managed, reacted to, and resolved.
- Administration and authorization of functional elements that subscribe to, and notify subscribers of, events. This is especially important for entities outside the core that wish to participate such as trauma centers and public works departments.
- If digital certificates are used, administration is required.

4.2 Operations Impacts Summary
Evolving to NG 9-1-1 has wide-ranging operational impacts, and implementing this document may have an influence on various stakeholders at the PSAP. Many times, the RFP process includes the managing of personnel not typically assigned to procurement duties. Areas of impact one may consider in the implementation of this document include, but are not restricted to, the following:

- Identification of personnel who may be part of the RFP development process, evaluation, and review activities
- Analyzing the impact to their existing responsibilities
- Reviewing their current schedule
- Understanding the potential need for overtime

4.3 Technical Impacts Summary
Evolving to NG 9-1-1 has wide-ranging technical impacts to stakeholders at the PSAP with the potential delivery of new technology. Implementing the advice given in this document is expected to impact the technical specifications contained in NG 9-1-1 RFPs, and to
similarly impact the resulting implementation of systems and services, and the implementation of infrastructure for monitoring and managing those systems and services.

4.4 Security Impacts Summary

Evolving to NG 9-1-1 has wide-ranging security impacts to stakeholders at the PSAP with the potential delivery of new technology. The impacts in the implementation of this document are both direct and indirect.

Direct impacts to consider during the implementation of this document in relationship to the RFP process include, but are not limited to:

- Physical access to the PSAP
- Information on the PSAP infrastructure
- Design and implementation of infrastructure to monitor and manage security of facilities, systems, and services
- Sharing of information that may fall under Intellectual Property Rights (IPR)

Therefore, stakeholders at the PSAP should review any and all security processes and procedures for the agency during the RFP process, and implement the security specifications and best practices contained in documents included in the “Recommended Reading and References” section of this document.

4.5 Recommendation for Additional Development Work

This INF is intended to provide the basis for NG 9-1-1 procurement. Any additional committee works within NENA have already been, or are being, developed for NG 9-1-1. Therefore, this document does not propose any additional development work.

4.6 Anticipated Timeline

The implementation of this document can be undertaken immediately. The guidelines contained in this document can be applied by anyone preparing RFPs at any stage in their process. Best results may be realized if the recommendations and guidelines are applied at the beginning of the process.

4.7 Cost Factors

The contents of this document propose considerations that will help avoid unnecessary costs and work effort associated with RFP creation, analysis, issuance, and award process for an NG 9-1-1 procurement.

The guidelines may serve to reduce RFP development costs since they provide a procurement baseline. In addition, this document will help teams that are charged with developing an RFP to understand and plan for:

- The full extent of the effort
• The skills and knowledge required
• The depth of research required

Potential cost savings include, but are not limited, to the following:
• The cost of responding to vendor questions related to information missing or unclear in the RFP
• The cost of missing information that may require costly change orders once a contract is signed
• The cost of retracting an incomplete or inaccurate RFP
• The cost of reissuing an RFP due to a lack of qualified responses to an incomplete or unclear initial RFP

A 9-1-1 Authority should understand that there will be a cost to both the PSAP and the proposers in the preparation of an RFP, and it may vary depending on the type of approach taken to generate the RFP.

Three common approaches to RFP creation, analysis, issuance, development, and award process include, but are not restricted to, the following:

1. Prepare the RFP internally – With this approach, the 9-1-1 Authority designates internal staff to create the RFP. The costs associated with this approach may include a calculation focused on the number of hours projected by staff to research, create, and review the RFP. Taking this approach, the 9-1-1 Authority should determine if they have subject matter expertise on staff qualified to create the content for the RFP; if the expertise is not inherent, time will be needed by staff to research the subject and could increase time and cost to complete.

2. Partner with another 9-1-1 Authority or agency – This approach is similar to preparing the RFP internally, but the 9-1-1 Authority identifies a nearby agency or agencies that are considering the same type of procurement. The involved agencies may realize a reduced cost burden by forming a team consisting of members from each agency to prepare the RFP. Taking this approach, the 9-1-1 Authority may be able to leverage the subject matter expertise offered by a nearby agency. Once collaboration is complete, the agencies can do a combined procurement for a shared system or may each elect to release the RFP as stand-alone entities.

3. Engage a third party – Using this approach, the 9-1-1 Authority identifies a qualified external third-party that already has subject matter expertise in the area of procurement sought. In this model, a larger portion of the cost is transferred to the third-party. In taking this approach, the 9-1-1 Authority should anticipate there will still be involvement from internal staff for initial input on the procurement scope in addition to review and approval cycles for the RFP. Ultimately the RFP is still owned by the issuing agency so they must understand the RFP requirements and general
content. If using this method, the 9-1-1 Authority should work with the selected third-party to establish the level of effort for internal staff.

4.8 Cost Recovery Considerations

The contents of this document propose considerations that will help avoid unnecessary costs and the work effort associated with RFP creation, analysis, issuance, and award process for an NG 9-1-1 procurement.

Therefore, normal business practices shall be assumed and RFP development costs are normally borne by the agency issuing the RFP. Cost recovery may be available in some jurisdictions via grants or through the use of surcharge funds, if authorized as an eligible expense.

4.9 Additional Impacts (non-cost related)

The content of this document, in conjunction with other NG 9-1-1 material, will assist in establishing a smooth, timely, and efficient RFP for the implementation of NG 9-1-1. Therefore, additional impacts are not anticipated by this authoring group.

4.10 Abbreviations, Terms, and Definitions

See NENA Master Glossary of 9-1-1 Terminology, NENA-ADM-000 [1], for a complete listing of terms used in NENA documents. All abbreviations used in this document are listed below, along with any new or updated terms and definitions.

<table>
<thead>
<tr>
<th>Term or Abbreviation (Expansion)</th>
<th>Definition / Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BCF (Border Control Function)</strong></td>
<td>Provides a secure entry into the ESI net for emergency calls presented to the network. The BCF incorporates firewall, admission control, and may include anchoring of session and media as well as other security mechanisms to prevent deliberate or malicious attacks on PSAPs or other entities connected to the ESI net.</td>
</tr>
<tr>
<td><strong>CDR (Call Detail Record)</strong></td>
<td>A record stored in a database recording the details of a received or transmitted call. The data information sent to the ALI computer by a remote identifying device (PBX, Call Position Identifier, etc.).</td>
</tr>
<tr>
<td><strong>CSP (Communications Service Provider)</strong></td>
<td>This term is used generically to refer to any and all providers of telecommunications services that may be used to generate a 9-1-1 call, and who would interconnect in any fashion to the 9-1-1 network. CSPs include wireline ILECs and CLECs, Wireless Service Providers, VoIP Service Providers, operators of large PBXs, and any other entity providing telecommunications services.</td>
</tr>
<tr>
<td><strong>DNS (Domain Name System)</strong></td>
<td>A globally distributed database for the resolution of host names to numeric IP addresses.</td>
</tr>
<tr>
<td><strong>ECRF (Emergency Call Routing Function)</strong></td>
<td>A functional element in an ESInet which is a LoST protocol server where location information (either civic address or geo-coordinates) and a Service URN serve as input to a mapping function that returns a URI used to route an emergency call toward the appropriate PSAP for the caller’s location or towards a responder agency.</td>
</tr>
<tr>
<td><strong>EIDD (Emergency Incident Data Document)</strong></td>
<td>A National Information Exchange Model (NIEM) conformant XML-based document that is used to share emergency incident information between and among authorized entities and systems. NENA has adopted the JSON-based EIDO (Emergency Incident Data Object) for sharing incident information among authorized NG 9-1-1 entities and systems.</td>
</tr>
<tr>
<td><strong>EIDO (Emergency Incident Data Object)</strong></td>
<td>A JSON-based object that is used to share emergency incident information between and among authorized entities and systems. NENA has adopted the JSON-based EIDO (Emergency Incident Data Object) for sharing incident information among authorized NG 9-1-1 entities and systems.</td>
</tr>
<tr>
<td><strong>ESI net (Emergency Services IP Network)</strong></td>
<td>An ESI net is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core services can be deployed, including, but not restricted to, those necessary for providing NG 9-1-1 services. ESI nets may be constructed from a mix of dedicated and shared facilities. ESI nets may be interconnected at local, regional, state, federal, national, and international levels to form an IP-based inter-network (network of networks). The term ESI net designates the network, not the services that ride on the network. See NG 9-1-1 Core Services.</td>
</tr>
<tr>
<td><strong>ESN (Emergency Service Number)</strong></td>
<td>A 3- to 5-digit number that represents one or more ESZs. An ESN is defined as one of two types: Administrative ESN and Routing ESN.</td>
</tr>
<tr>
<td><strong>ESRP (Emergency Service Routing Proxy)</strong></td>
<td>An i3 functional element which is a SIP proxy server that selects the next hop routing within the ESI net based on location and policy. There is an ESRP on the edge of the ESI net. There is usually an ESRP at the entrance to an NG 9-1-1 PSAP. There may be one or more intermediate ESRPs between them.</td>
</tr>
<tr>
<td><strong>ESZ (Emergency Service Zone)</strong></td>
<td>A geographical area that represents a unique combination of emergency service agencies (e.g., Law Enforcement, Fire, and Emergency Medical Service) that are within a specified 9-1-1 governing authority’s jurisdiction. An ESZ can be represented by an Emergency Service Number (ESN) to identify the ESZ.</td>
</tr>
<tr>
<td><strong>GIS (Geographic Information System)</strong></td>
<td>A system for capturing, storing, displaying, analyzing, and managing data and associated attributes which are spatially referenced.</td>
</tr>
<tr>
<td><strong>GUI (Graphical User Interface)</strong></td>
<td>A type of user interface that allows users to interact with electronic devices through graphical icons and visual indicators such as secondary notation, instead of text-based user interfaces, typed command labels, or text navigation.</td>
</tr>
<tr>
<td><strong>HMI (Human Machine Interface)</strong></td>
<td>The means through which a person interacts with an automated system/machine. A vehicle or an installation is sometimes referred to as the human-machine interface.</td>
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<tr>
<td><strong>IMR (Interactive Media Response)</strong></td>
<td>An automated service used to play announcements, record responses, and interact with callers using any or all of audio, video, and text.</td>
</tr>
<tr>
<td><strong>IS-ADR (Identity Searchable Additional Data Repository)</strong></td>
<td>An Additional Data Repository that provides a service that can search for Additional Data based on a sip/sips or tel URI: (e.g., Additional Data about the caller).</td>
</tr>
<tr>
<td><strong>IVR (Interactive Voice Response)</strong></td>
<td>A technology that allows a computer to interact with humans by which a person can hear a computer-generated voice and respond by speaking or generating DTMF tones on a keypad. A &quot;Ported Number IVR&quot; is a computer system accessible by registered users utilized to identify the Service Provider and 24 X 7 access number for telephone numbers which have been ported or pooled.</td>
</tr>
<tr>
<td><strong>LDB (Location Database)</strong></td>
<td>The Location Database (LDB) server retains all of the current information, functionality, and interfaces of today's ALI and can utilize the new protocols required in an NG 9-1-1 deployment.</td>
</tr>
<tr>
<td><strong>LIF (Location Interworking Function)</strong></td>
<td>The functional component of a Legacy Network Gateway which is responsible for taking the appropriate information from the incoming signaling (e.g., calling number/ANI, ESRK, cell site/sector), and using it to acquire location information that can be used to route the emergency call and to provide location information to the PSAP. In a Legacy PSAP Gateway, this functional component takes the information from an ALI query and uses it to obtain location from an LIS.</td>
</tr>
<tr>
<td><strong>LIS (Location Information Server)</strong></td>
<td>A Location Information Server (LIS) is a functional element in an IP-capable originating network that provides locations of endpoints (i.e., calling devices). An LIS can provide Location-by-Reference, or Location-by-Value, and, if the latter, in geo or civic forms. An LIS can be queried by an endpoint for its own location, or by another entity for the location of an endpoint. In either case, the LIS receives a unique identifier that represents the endpoint, for example an IP address, circuit ID, or MAC address, and returns the location (value or reference) associated with that identifier. The LIS is also the entity that provides the dereferencing service, exchanging a location reference for a location value.</td>
</tr>
<tr>
<td><strong>LNG (Legacy Network Gateway)</strong></td>
<td>An NG 9-1-1 Functional Element that provides an interface between a non-upgraded legacy origination network and an NGCS.</td>
</tr>
<tr>
<td><strong>LoST (Location-to-Service Translation Protocol)</strong></td>
<td>A protocol that takes location information and a Service URN and returns a URI. Used generally for location-based call routing. In NG 9-1-1, used as the protocol for the ECRF and LVF.</td>
</tr>
<tr>
<td><strong>LPG (Legacy PSAP Gateway)</strong></td>
<td>The Legacy PSAP Gateway is a signaling and media interconnection point between an ESI net and a legacy PSAP. It plays a role in the delivery of emergency calls that traverse an i3 ESI net to get to a legacy PSAP, as well as in the transfer and alternate routing of emergency calls between legacy PSAPs and NG 9-1-1 PSAPs. The Legacy PSAP Gateway supports an IP (i.e., SIP) interface towards the ESI net on one side, and a traditional MF or Enhanced MF interface (comparable to the interface between a traditional Selective Router and a legacy PSAP) on the other.</td>
</tr>
<tr>
<td><strong>LSRG (Legacy Selective Router Gateway)</strong></td>
<td>The LSRG provides an interface between a 9-1-1 Selective Router and an ESI net, enabling calls to be routed and/or transferred between Legacy and NG networks. A tool for the transition process from Legacy 9-1-1 to NG 9-1-1.</td>
</tr>
<tr>
<td><strong>LVF (Location Validation Function)</strong></td>
<td>A functional element in an NGCS that is a LoST protocol server where civic location information is validated against the authoritative GIS database information. A civic address is considered valid if it can be located within the database uniquely, is suitable to provide an accurate route for an emergency call, and adequate and specific enough to direct responders to the right location.</td>
</tr>
<tr>
<td><strong>MIS (Management Information System)</strong></td>
<td>A program that collects, stores, and collates data into reports enabling interpretation and evaluation of performance, trends, traffic capacities, etc.</td>
</tr>
<tr>
<td><strong>MSAG (Master Street Address Guide)</strong></td>
<td>A database of street names and house number ranges within their associated communities defining Emergency Service Zones (ESZs) and their associated Emergency Service Numbers (ESNs) to enable proper routing of 9-1-1 calls.</td>
</tr>
<tr>
<td><strong>NIF (NG 9-1-1 Interworking Function)</strong></td>
<td>The functional component of a Legacy Network Gateway or Legacy PSAP Gateway which provides NG 9-1-1-specific processing of the call not provided by an off-the-shelf protocol interwork gateway.</td>
</tr>
<tr>
<td><strong>PBX (Private Branch Exchange)</strong></td>
<td>A private telephone switch that is connected to the Public Switched Telephone Network (PSTN).</td>
</tr>
<tr>
<td><strong>PIDF-LO (Presence Information Data Format - Location Object)</strong></td>
<td>Provides a flexible and versatile means to represent location information in a SIP header using an XML schema.</td>
</tr>
<tr>
<td><strong>PIF (Protocol Interworking Function)</strong></td>
<td>That functional component of a Legacy Network Gateway or Legacy PSAP Gateway that interworks legacy PSTN signaling such as ISUP or CAMA with SIP signaling.</td>
</tr>
<tr>
<td><strong>POI (Point of Interconnection)</strong></td>
<td>A Physical Demarcation between an originating carrier network and an NG 9-1-1 network.</td>
</tr>
<tr>
<td><strong>QoS (Quality of Service)</strong></td>
<td>As related to data, transmission a measurement of latency, packet loss, and jitter.</td>
</tr>
<tr>
<td><strong>RFI (Request for Information)</strong></td>
<td>A customer document used at an early stage of a procurement to create a list of viable bidders who will later be invited to render an offer or respond to an RFP.</td>
</tr>
<tr>
<td><strong>RFP (Request for Proposal)</strong></td>
<td>A standardized document for requesting negotiated bids. In more general terms, it is an announcement from a customer or funding source that is seeking proposals for a specific program, project, or work effort.</td>
</tr>
<tr>
<td><strong>RFQ (Request for Quote)</strong></td>
<td>A document prepared by a buyer defining his needs for service or equipment in fairly broad terms and sent to one or several vendors. The RFQ is much less detailed than the RFP.</td>
</tr>
<tr>
<td><strong>SBC (Session Border Controller)</strong></td>
<td>A commonly available functional element that provides security, NAT traversal, protocol repair and other functions to VoIP signaling such as SIP. A component of a Border Control Function.</td>
</tr>
<tr>
<td><strong>SI (Spatial Interface)</strong></td>
<td>A standardized interface between the GIS and the functional elements that consume GIS data, such as the ECRF and/or LVF.</td>
</tr>
<tr>
<td><strong>SIP (Session Initiation Protocol)</strong></td>
<td>An IETF-defined protocol (RFC3261) that defines a method for establishing multimedia sessions over the Internet. Used as the call signaling protocol in VoIP, NENA i2, and NENA i3.</td>
</tr>
<tr>
<td><strong>SLA (Service Level Agreement)</strong></td>
<td>A service level agreement (SLA) is a contract between a service provider (either internal or external) and the end user that defines the level of service expected from the service provider. SLAs are output-based in that their purpose is specifically to define what the customer will receive.</td>
</tr>
<tr>
<td><strong>SOI (Service Order Input)</strong></td>
<td>Service Order Input is a file of completed service order updates that is sent to the DBMSP by all Service Providers.</td>
</tr>
<tr>
<td><strong>TVSS (Transient Voltage Surge Suppressor)</strong></td>
<td>Devices designed to protect critical PSAP equipment from transients induced on powering and data/signal/telecommunications conductors.</td>
</tr>
</tbody>
</table>
| **URI (Uniform Resource Identifier)** | A predictable formatting of text used to identify a resource on a network (usually the Internet).  
| OR | A string of characters that must follow prescribed syntaxes such as URL, URN... Note Version 1.1 of the XML namespaces recommendation uses IRIs (Internationalized Resource Identifiers) instead of URIs. However, because version 1.1 is not yet a full recommendation [February, 2003] and because the IRI RFC is not yet complete, this document continues to refer to URIs instead of IRIs. |
5  Recommended Reading and References


### 6 Exhibits

Not Applicable
## Appendix

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<th>NG9-1-1 Component</th>
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ACKNOWLEDGEMENTS

The National Emergency Number Association (NENA) PSAP Operations Committee Request for Proposal Working Group developed this document.

NENA Board of Directors Approval Date: [MM/DD/YYYY]

NENA recognizes the following industry experts and their employers for their contributions to the development of this document.

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