



White Paper

# Next Generation 9-1-1 NICE Solution Overview

**NICE**<sup>®</sup>

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## WHAT IS NEXT GENERATION 9-1-1?

NG9-1-1 is an initiative that aims to transform the current PSAPs and Public Safety emergency communications environment to support the widely varied methods of communication that is in use by the public today and will be in the future. A key characteristic of NG9-1-1 is the build of multiple new applications and capabilities enabled by broadband IP Networks.

The awareness to the limitations of the current 9-1-1 network has grown in the last years as consumer communications technologies outpaced the capabilities of the current 9-1-1 infrastructure and the initiative to build the Next Generation 9-1-1 had started to gain shape in the last two years.

The limitations of the current network are based on the fact that it is built on legacy technology which cannot handle new requirements such as handling of new media, support for VoIP, consolidation requirements, redundancy and other new capabilities without significant system and engineering modifications.

The building of the NG9-1-1 brings an opportunity to enhance the public safety service with new capabilities that will increase its efficiency.

The new capabilities would help law enforcement, fire departments, and emergency medical services in managing their response to and at the scene of the emergency. An NG9-1-1 system would also be able to quickly reroute emergency calls to another PSAP when the primary answering point is overloaded or experiencing some technical problems. These new and advanced capabilities would enhance the ability to provide a more efficient, effective and dynamic emergency responses.

Transition to NG9-1-1 is not a matter of switch flip and is expected to happen gradually. This is why it is important to understand what NG9-1-1 is comprised of so Public Safety agencies can plan their transition. NG9-1-1 includes the ability to support emergency and non-emergency calls via not only audio but also via text messaging and possibly via other multimedia formats. Furthermore, NG9-1-1 also supports rule-based routing using location, call type, target PSAP status, network status, and other factors. The focus of NG9-1-1 on GIS and location information is critical, this is the metadata requirement for all forms of communications because rules-based routing depends on it. The location information determines the very PSAP that the communication will arrive at.

**“NG911 will dramatically improve emergency response by providing first responders, who are the first line of defense in local emergencies, with access to more and more useful data in a timely manner. In an era of increased security and situational awareness, NG911’s multi-media capabilities offer real-time tangible information that can make the difference in time-sensitive law enforcement situations. What law enforcement agency wouldn’t want immediate access to a suspect’s picture, for example? NG911 includes more accurate information about a caller’s location, as well as actionable information about the caller and the scene.”**

**– Mary A. Boyd Vice President for Regulatory, Policy and External Affairs West Safety Services, On Behalf of the Industry Council for Emergency Response Technologies (iCERT)**

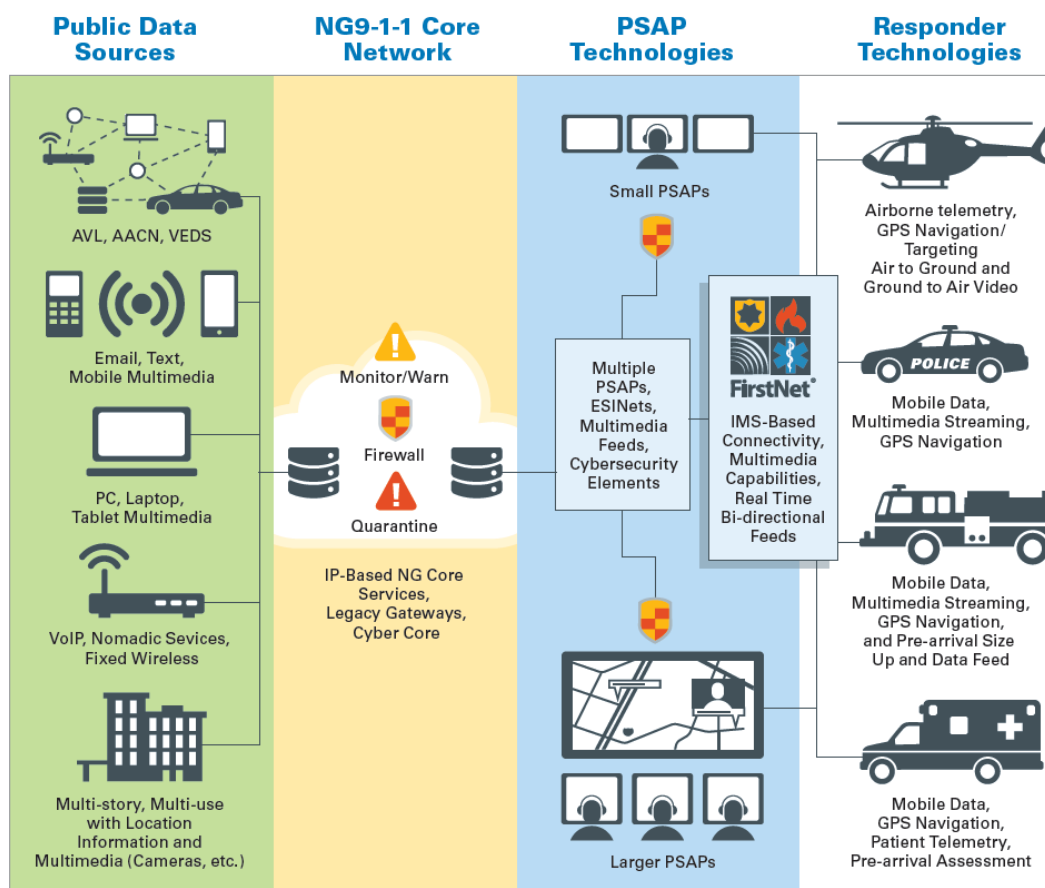
**Testimony before U.S. House of Representatives. March 2017”**

## NEXT GENERATION 9-1-1 BENEFITS

NG9-1-1 will:

- Enable the PSAP to process all types of emergency calls including non-voice messages.
- Add functional flexibility for the PSAPs and 9-1-1 Authorities, including transfer of calls, messages, and data between any PSAPs on any interconnected NG9-1-1 system anywhere in the country; much quicker alternate routing and control of data flow; other emergency related entities will be able to interconnect to the NG9-1-1 to receive calls and data.
- Enable the PSAP to access a wide range of supportive databases and share new and more robust forms of data.
- Add capabilities to integrate and interoperate with emergency entities beyond the PSAP.
- Support for disaster management and intercommunications with and between PSAPs, EOCs, and other emergency management entities.

In essence, NG9-1-1 is an opportunity to improve service to the public and promote interoperability among Public Safety agencies while using resources more efficiently.



Interconnected NG9-1-1 and FirstNet Networks- hosted, shared technology can serve multiple PSAPs.  
PROJECT 43™ | APCO International

“Consider a world where 9-1-1 calls automatically reroute in the event of a PSAP failure or overload... where additional data associated with the call describes, in an instant, the source and type of the call... where dynamic queue analytics identify areas of high calling and sort likely duplicate calls to the bottom of the answering queue... where the ability exists to pass along video and audio from the scene to responders effortlessly... where a fully-redundant “system of systems” links PSAPs and all 9-1-1 calls are answered in a timely manner by a trained dispatcher—no matter what the condition or emergency... This is the world of Next Generation 9-1-1.”

– Introduction to NENA’s NG9-1-1 Standards & Best Practices Conference 2019

## NENA I3 STANDARDS

The expression ‘NG9-1-1’ has been used in the Public Safety community for some time but has meant different things to different people. NENA has assembled the NG9-1-1 program to define the way forward for PSAPs as the move from current technology to the next generation world.

A significant milestone in this program was reached in 2011 when ‘Version 1.0 of NENA Technical Standard 08-003, Detailed Functional and Interface Specification for the NENA i3 Solution – Stage 3’ was approved by the NENA executive board. This document defines the operation of an NG9-1-1 network.

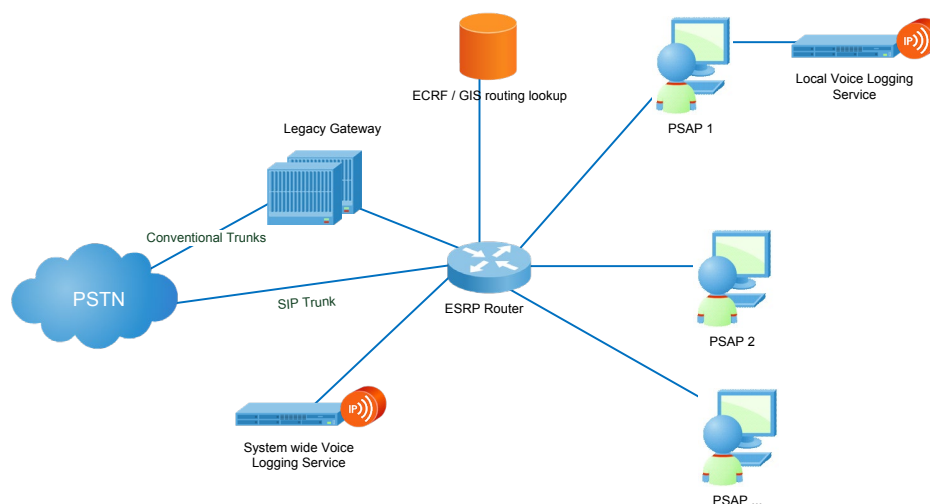
This i3 document was the result of collaborative work between members of both the public safety community and equipment suppliers to ensure that all relevant stakeholders were able to represent their views.

### WHAT I3 COVERS

The i3 document defines all the interfaces and operations between the functional elements of an NG9-1-1 system such as the gateways, routers and loggers. Together these elements make up the ESInet which is the replacement for the existing system of trunks and selective routers.

The i3 document describes the total call flows through the system. Starting with the handover of calls from the public telecommunications operators and ending at the telecommunicator’s desk, eventually leading to on-site response.

## Simplified i3 Network (ESInet)



**Legacy Gateway** – All calls within the ESInet must be SIP/VoIP calls. The legacy gateway converts conventional analog or digital calls SIP/VoIP calls.

**ESRP / Router** – Incoming calls are routed to the relevant PSAP by one or more Emergency Services Routing Proxies. These extract location information metadata contained in the SIP header and use this to locate the relevant PSAP using the ECRF. The ESRP may also access a policy store to determine special rules such as out of hours service or PSAP over flow re-routing.

**ECRF / GIS lookup** – The Emergency Call Routing Function provides the route for a call

based on location information. Given a street address or GIS coordinate it looks up the correct route to send the call to the proper PSAP.

**Voice Logging Service** – Voice logging can be achieved in the ESInet in various ways. All items in the ESInet are capable of sending call handling events and voice streams to one or more logging services. The call events and the voice streams can be collected together and stored at the expense of extra network traffic.

Alternatively, the voice logging service can passively monitor standard call events and voice streams.

## NICE SOLUTION FOR NG9-1-1

NICE Systems is committed to supporting the Public Safety Community in the transition to NG9-1-1 and i3 compliance.

As part of this program NICE has participated in various NENA events and committees to ensure our understanding the NG9-1-1 program and the i3 standards.

NICE has demonstrated i3 compliant recording at industry collaboration events. The NICE i3 recording is based on a combination of existing NICE voice loggers and databases used to store the extensive call metadata that is now available via the i3 specification.

NICE will continue to evolve its i3 compliant recording product as future revisions of the specification are approved.

We also understand that initially full i3 systems may be difficult to specify and install so NICE is also working with VoIP 911 systems suppliers to offer a range of integrations with current 911 VoIP systems.

The NICE solution for NG9-1-1 is centered on the NICE Inform Public Safety multimedia application suite. This application suite is well established with a variety of Public Safety and transportation customers. It offers the ability to view recorded information from a variety of sources including audio, video and text. Recorded information can be collected into incident folders, stored and distributed.

Multi-media integration is a core architectural feature of NICE Inform. So NICE is able to add support for future media types to NICE Inform while maintaining the same simple, single application to operators. This architecture allows NICE to incorporate new media types as they become relevant in the future while preserving investment in previous platforms.

NICE Inform Matrix allows current standalone recording systems to integrate with central, cloud based, NG9-1-1 recording systems keeping existing on-site recording during the initial transition to NG9-1-1. In many cases, even if the main 911 services are recorded centrally, there will be local administration services that need recording. NICE Inform allows a mixture of on-site and cloud recording to be accessed through one application suite.

The NICE NG9-1-1 solution is:

- Ready to build a system today. The NICE Inform application suite is ready for NG9-1-1.
- Ready to incorporate new media types as they become relevant.
- Ready to handle central recording architectures.

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## **SIP-BASED VOIP RECORDING IN NG9-1-1**

NG9-1-1 allows voice recording to be performed either passively or actively. The NICE solution supports both options.

### **Passive recording**

Passive recording sniffs the ESInet for RTP voice communications packets and SIP call control information. The voice logger makes copies of the data and assembles it in to calls for storage. This is the simplest form of logging and can be implemented in most systems without impacting the rest of the NG9-1-1 system.

### **Active Recording**

The active solution provides expanded metadata that can be associated with the call. In active recording the NG9-1-1 system makes a conference call to the voice logger for each call that needs recording. The logger records the voices on the conference call and receives supplementary call routing information.

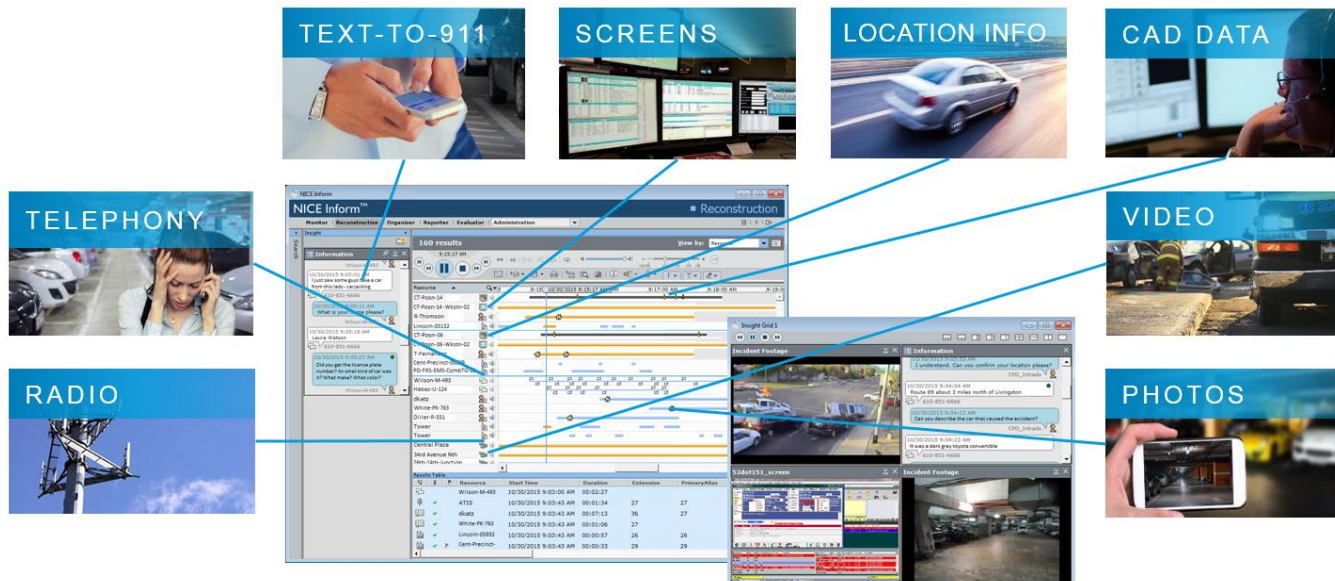
	Passive	Active
<b>Connection</b>	Voice logger needs access to all network packets. Some network topologies are complex to configure for this.	Simple point to point network connections.
<b>Security</b>	Voice logger may not be able to record encrypted calls.	Encryption is handled using normal procedures.
<b>System Load</b>	No extra load on the NG9-1-1 system.	Each recorded call requires the voice to be copied to the conferenced voice logger. Parallel recording doubles the load.
<b>Resilience</b>	Simple Parallel recording.	Parallel recording, or N+1 with the co-operation of the NG9-1-1 switch.

## MULTIMEDIA MANAGEMENT

NG9-1-1 is being designed to enable processing of multimedia calls in forms of text messages as well as sharing of video-based information, and other non-audio call formats. NICE Inform is a suite of applications that provides a platform for multimedia capture and management from multimedia sources including audio, video, text and data. In addition to traditional means of communications, communication over IP-based and wireless technologies, both for voice and video can be managed in a synchronized manner with NICE Inform. This is important especially during the transition phase from legacy PSAP to i3 PSAP.

With NICE Inform the process of reconstruction, investigation and information-sharing is more complete and efficient. There is a single interface for users to manage the information of the incident including search and retrieval, investigation, creation of an incident package, enriching the incident package with additional information available post incident, and sharing the information with others.





NICE Inform is a NG9-1-1-ready solution, providing the capability to manage multimedia that will travel on the ESInet, in a secure and efficient manner. NICE Inform offers unique capabilities aligned with the concept of NG9-1-1:

- **Consolidated multimedia information.** NICE Inform provides a single interface for the user to retrieve information from multiple sources of data and geographic locations. The information is synchronized and organized in a chronological manner allowing a complete and authentic incident reconstruction.
- **Multimedia management.** Incident information is captured from multiple sources, regardless of its type and format of the source system. These systems include: telephony, radio, CCTV, GIS and AVL information, CAD information, photos taken by cell phones or any other camera, video clips, text messages and documents, any other information in digital format. Moreover, multimedia information management by NICE Inform is location independent. Each of the sources mentioned, can be integrated into the NICE Inform system regardless of its location.
- **Secure quarantine of sensitive incident information.** Each incident has dedicated incident folder to which only users with granted access can, view, modify or transfer information in the incident folder.
- **Improved interoperability.** Easy and secure information-sharing within the agency and between agencies. NICE Inform is a browser-based application, so any authorized user with the right level of privileges can access the incident folder assigned for them. For example, a police investigator can access a specific incident folder, review information – playback voice and video, add additional information he or she finds relevant or might have produced during their investigation, such as an incident report. Information sharing can also be accomplished using NICE Inform Media Player, which enables a non-NICE Inform recipient to view the event in a graphical, consolidated and organized manner.

- **Secured and authenticated incident information.** Once centralized in the incident folder, any item as well as the collection of all the items can be authenticated. NICE Inform applies a digital signature and will detect tampering with any of the incident folder items.
- **Traceability of actions.** This adds the security NICE Inform provides – every action taken with the data is recorded and available for review to monitor the interactions with critical incident data.

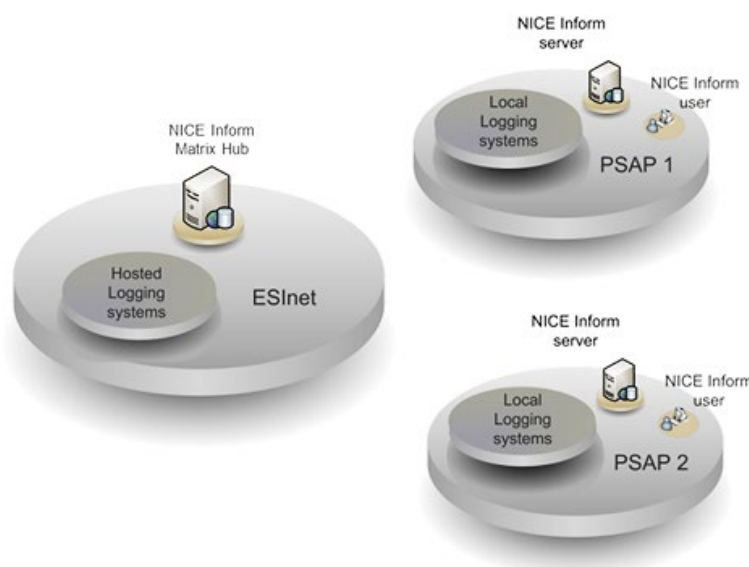
## HOSTED SOLUTION SUPPORT

NG9-1-1 makes a hosted call recording solution a viable option for the PSAP. In a hosted solution the call recording is provided as a central service operated within the ESInet. The call recording equipment is kept centrally and shared between many PSAPs.

This reduces the capital investment and ongoing maintenance costs for individual PSAPs by allowing them to be shared.

NICE Inform can be deployed in a hosted environment allowing each PSAP to access their own recordings using a feature known as agency partitioning. NICE is ready for hosted NG9-1-1 recording solutions and has experience with installing hosted solutions already for its well known trunked radio recording solutions.

While a hosted recording solution has advantages in reduced costs many PSAPs will have local administration lines or radio consoles that need recording on site. NICE Inform Matrix offers a solution for such customers by seamlessly blending on site and shared hosted recording solutions into one system.



## I3 EVENT LOGGING

The NICE Event Logging Solution provides a fully NENA i3 compliant capability to capture NENA i3 LogEvents, Additional Data and EIDD in line with the current NENA-STA-010.2-2016 specification utilizing a SIP/SIPREC (RFC 7866)/SIPREC Metadata (RFC7865) interface.

The NICE Event Logging capability fully adheres to the current NENA defined Session Recording Client (SRC) / Session Recording Service (SRS) architecture and protocol including implementation of RTCP on the recording session. The NICE i3 Event Logging solution is designed to process both long term steady state and peak ingest rates.

The NICE Event Logging Solution utilizes NTP and all captured media and associated metadata and records are timestamped to millisecond accuracy to enable synchronized replay of multiple media streams. Timestamps contained in XML documents are represented by the “dateTime” datatype described in XML Schema Part 2: Datatypes Second Edition (<http://www.w3.org/TR/xmlschema-2/>) and will be indicated in schema definitions accordingly.

The NICE Event loggers implement the Clean Logging Service Shutdown scenario by sending a BYE when they shut down.

The NICE Event Logging Solution will, in line with the current NENA specification, implement a keep-alive mechanism between the Session Recording Client (SRC) and Session Recording Service (SRS) using an OPTIONS transaction. A configurable time period will be implemented that will default to one (1) minute. NICE assume that all Session Recording Clients (SRC) will implement this.

### Supported LogEvent Types

All NENA LogEvents defined in the current specification are capable of being logged. The NICE Event Logging Solution fully supports logging of the following EventTypes as well as others defined by the NENA-STA-010.2-2016 standard.

AdditionalAgency	EIDD	LocationQuery	SecurityPostureStateChange
AdditionalDataQuery	ElementStateChange	LocationResponse	ServiceStateChange
AdditionalDataResponse	EndCall	LoSTquery	SiprecMetadata
AgentStateChange	EndMedia	LoSTresponse	SplitIncident
ALILocationQuery	EndRecCall	MalformedMessage	StartCall
ALILocationResponse	EndRecMedia	MergeIncident	StartMedia

CallProcess	GatewayCallEvent	Message	StartRecCall
CallSignalingMessage	HookFlash	QueueStateChange	StartRecMedia
CallStateChange	KeepAliveFailure	RecordingFailed	TransferCall
ClearIncident	LegacyDigits	ReopenIncident	UnLinkIncident
DiscrepancyReport	LinkIncident	Route	UnMergeIncident

## TRANSITION TO NG9-1-1

The full NG9-1-1 vision allows the public to contact PSAPs using multiple technologies, not just the traditional method of making telephone calls. Even today’s telephone calls are to be delivered via IP with integrated location information rather than separate ALI.

To realize this vision, the public communications operators need to provide the public safety community calls in the i3 format. Additionally, all the functional elements need to be available in an i3 compliant version.

As of the date of this white paper, many suppliers are not yet ready to provide this. In the intervening period, various partial transitional systems are being built in order to take advantage of selected portions of NG9-1-1 technology as a route to full i3 compliance.

Many if not most NG9-1-1 transitions will occur in series of stages. The practice shows that each jurisdiction takes its own route forward, which is typically dictated by a combination of local facilities and selected technology partners. A number of jurisdictions have rolled out secure IP networks between PSAPs. Some have moved to internal VoIP within the PSAP. Others are evaluating the adoption of SMS and social media communications.

### NICE Delivers Flexibility for Incremental Deployments

NICE has developed flexible, adaptable solution that can accommodate a variety of approaches and even change the approach over time for its clients, while preserving investment in operating procedures and training through consistent interfaces.

This is very important in order to assure the availability of fallback plans for the critical facility of 9-1-1 call taking as new technology is introduced. If any part of the system does not offer the correct service level during the transition, there must be a way to continue to offer service using the old technology.

NICE has worked with a number of large facilities during such transitions. PSAP operational staff does not need to be concerned about which system is active because NICE Inform offers a single point of access to the logging system throughout the change process.

“ Transition to NG9-1-1 is also expected to be an evolutionary process involving technological, economic, and institutional change. In some cases, the path to NG9-1-1 implementation will depend on the underlying infrastructure involved and the nature of 9-1-1 systems in a defined geographic area. In other cases, the transition to NG9-1-1 may depend more on the ability of originating service networks to deliver NG9-1-1 calls via native IP-based networks to jurisdictions that are prepared to receive those calls.

Regardless of the specific evolutionary steps, it is expected that NG9-1-1 system implementation within the public sector will stem from one of the two general deployment environments described below, which largely reflect existing institutional and service delivery arrangements around the country:

- **Coordinated, Intergovernmental Implementation.** System services generally reflect planned and coordinated deployments of 9-1-1 capabilities, facilitated by state-wide 9-1-1 authorities, regional authorities, or informal mechanisms that enable a cooperative environment.
- **Independent, Unilateral Implementation.** System services generally reflect a starting point that features decentralized deployments of 9-1-1 capabilities by local jurisdictions through an environment featuring piloting independent initiatives.

– US DOT NG9-1-1 Transition Plan

## NICE EXPERIENCE WITH IP AND NG9-1-1

NICE is experienced in VoIP and involved with NENA’s planning and standard definition for NG9-1-1. NICE has deployed over 1,000,000 channels of VoIP and 25,000 channels of IP-based radio logging.

NICE takes pride in its VoIP patent portfolio. NICE has invented, pioneered and patented VoIP recording and to date has 42 VoIP granted patents and additional 10 pending. NICE is an active member of the Internet Engineering Task Force (IETF) and has established organized and regularly participate in IETF’s SIPREC workgroup.

This working group is chartered to define a SIP-based protocol for controlling a session (media) recorder which is a critical requirement in many business communications environments, such as: call centers and financial trading floors as well as public safety communication centers – 9-1-1 centers.



NICE is also an active member of NENA's Next Generation Partner Program and is involved in the work related to both defining multimedia recording standards and interfaces as well as interoperability testing. NICE has successfully completed the Industry Collaboration Event that took place in May 2010 (ICE2) in which transitional elements of the NG9-1-1 network (ESInet) were tested. NICE also completed ICE3 in December 2010, testing of location information, and as well as ICE4, Call Routing Based on LoST Hierarchy, in November 2011. NICE is an active member in ICE8 planning committee. ICE8 is a dedicated on-going event for logging and interoperability testing of calls, events and data.



## SUMMARY

There is an understanding across all stakeholders that transition to NG9-1-1 is not going to be possible overnight, but rather will be gradual. The initial focus is on IP Networks and Location information is the starting point for NG9-1-1 transition. Consequently, Public Safety agencies will need to prepare for managing both legacy and i3 calls.

NENA i3 requirements (standards) aim to provide structure to the NG9-1-1 IP network, as well as clear definitions to the functional requirements of the various elements comprising the ESInet. However, there are still open questions as to how a Public Safety agency makes its transition and operate as an NG9-1-1 agency.

NG9-1-1 is an opportunity to improve service to the public and promote interoperability among Public Safety agencies while using resources more efficiently. Many agencies collaborate on planning and implementation of their transition to NG9-1-1. This makes perfect sense from operational and financial perspectives. Number of agencies located in the same region would share the same ESInet and will operate jointly or share load answering emergency calls in response to incidents.

NICE Systems is committed to supporting the Public Safety Community in the transition to NG9-1-1 and i3 compliance and will continue to evolve its i3 compliant recording product as future revisions of the i3 specification are approved.

NICE offers a NG9-1-1-Ready solution to support customer needs in the transition phase and thereafter.

## WHY NICE IS THE RIGHT PARTNER

NICE is the most experienced multimedia recording vendor in the industry, uniquely positioned for recording of a combination of NG9-1-1 as well as LTE communications over FirstNet, along with all other forms of communications. In Summary:

- NICE has an in-depth understanding of the NG9-1-1 infrastructure
- Is ready to connect to new interfaces as they become available
- Is inherently multimedia ready, building on the many years of experience with delivering recording and incident reconstruction solutions spanning digital, analog, and IP voice, conventional and P25 radio, text-to-911, surveillance video, computer screens, data, images, documents and more
- Offers flexible upgrades for new services
- Has road map for future as the vision of NG9-1-1, FirstNet and ESN evolves
- Can provide powerful quality monitoring for communications as a valuable feedback mechanism to help with the development of new processes and training methods
- Provides support for your entire digital evidence strategy