



# **NEXT GENERATION 9-1-1 RECORDING AND QUALITY ASSURANCE Are You Ready?**

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## Are You Ready?

A car hits black ice and spins out of control and crashes into a tree. The driver is badly injured and unable to use his cell phone to call for help. The accident occurs in rural Jackson County near the border of Columbia County. The nearest hospital in Jackson County is 40 miles away. However, there is one in adjacent Columbia County just 10 miles from the accident. Diego Garcia spots the accident from his car and stops to help. He calls 9-1-1 on his cell phone. Mr. Garcia is not a local resident and is a foreign national who speaks in broken English. He is unable to give precise instructions on the accident location and Jackson County is not yet capable of capturing location information from cell phones. He has a camera built into his phone and would be happy to send photos, including the injured person, the damaged vehicle, and nearby street signs. He could text in the information since the call taker is having difficulty understanding him. However, the PSAP has no way to accept text or video. Since the call is routed to the Jackson County PSAP an ambulance from the hospital 40 miles away is dispatched as well as a local Sheriff's deputy. It takes an hour to locate the accident and another two hours to administer emergency care and take the patient to the Jackson County hospital.

What we have described is a scenario that plays out all too often in today's siloed 9-1-1 network. The Department of Transportation, Intelligent Transportation Systems, stated in its February 2009 NG9-1-1 transition plan that "The nation's 9-1-1 system, based on decades-old technology, cannot handle the video, text, images and other data that are increasingly common in personal communications." It needs to be adapted to today's environment of advanced interconnected high-speed networks and the proliferation of voice and data communications devices that can transmit valuable information to speed emergency response and better prepare first responders to deal with the situation once they arrive. The vision of Next Generation 9-1-1 (NG9-1-1), according to the National Emergency Number Association (NENA), is expressed simply as "An evolved, fully-functional, NG9-1-1 system that is accessible **anytime, anywhere, from any device.**"

NENA first identified the need for NG 9-1-1 in 2000, and started development actions in 2003. Since 2006, the US Department of Transportation (DOT) has been leading the way with its Intelligent Transportation Systems initiative and with the support and involvement of NENA and over 30 other organizations. A great deal of progress has been made in defining the functional and technical requirements. Proof-of-Concept (POC) testing was conducted in 2008 and involved a mix of actual PSAPs and laboratories. Based on test results the DOT published a final system design in February 2009. At least one PSAP has already implemented fully-compliant technologies. More general implementation is expected to begin in 2010 and accelerate in 2011 and beyond.

## A Changing Technology Environment

The legacy 9-1-1 infrastructure was initially designed for a different environment – when public telephone companies dominated the telecommunications world and the only practical and affordable means of communications was traditional circuit-switched wired telephones. In the past decade we have seen amazing changes in the way we communicate.

### The Multi-Channel Challenge (Figure 1)

- There are now over 270 million cell phones in use today in the United States
- One out of five households rely exclusively on wireless communications
- Most cell phones leased today are equipped with cameras and even full-motion video.
- 110 billion text messages are transmitted every month - roughly 14 per day per cellular customer.
- Telematics is here and growing. OnStar now has over 4 million subscribers for telematics services. The OnStar service is becoming a standard feature on many new cars. In addition, personal navigation devices (PND's) sold as stand alones or embedded in high-end cell phones are becoming very popular with consumers.
- Vonage started the move to VoIP for the home in 2001. They now have over 2.6 million subscribers, second only to Comcast. Virtually all major cable companies are now offering "digital" voice. Leading analysts predict a continuing surge to VoIP.
- The growth of VoIP and wireless-only households has contributed to a decline of 10% in traditional wireline services

The legacy network has served the nation well but it's now time to react to the many changes in society and particularly the ways in which we communicate.

## The Promise of Next Generation 9-1-1

Next Generation 9-1-1 provides a transition path to the emerging communications networks of today and the future. The vision is a network that is fully interconnected across the USA and Canada. The system would be IP-based, capable of capturing voice and data streams from multiple devices transmitted over multiple channels. Intelligent call routing would direct emergency calls to the most qualified and available call taker in the PSAP closest to the incident.

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"The nation's 9-1-1 system, based on decades-old technology, cannot handle the video, text, images and other data that are increasingly common in personal communications."

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The vision of NG9-1-1 is expressed simply as "An evolved, fully-functional, Next Generation 9-1-1 system that is accessible **anytime, anywhere, from any device.**"

- National Emergency Number Association (NENA)

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Since compliance would require a much more advanced PSAP infrastructure than exists today, the DOT chose Internet Protocol as the backbone for the planned Emergency Services IP Network (ESInet). Internet protocol standards provide the basic functionality of the systems. Standards are mature, widely deployed, and transit both voice and data. The technical details of NG9-1-1 are spelled out on NENA and DOT documents. NG9-1-1 seeks to accomplish several important goals.

**Goals and Benefits of NG9-1-1 (Figure 2)**

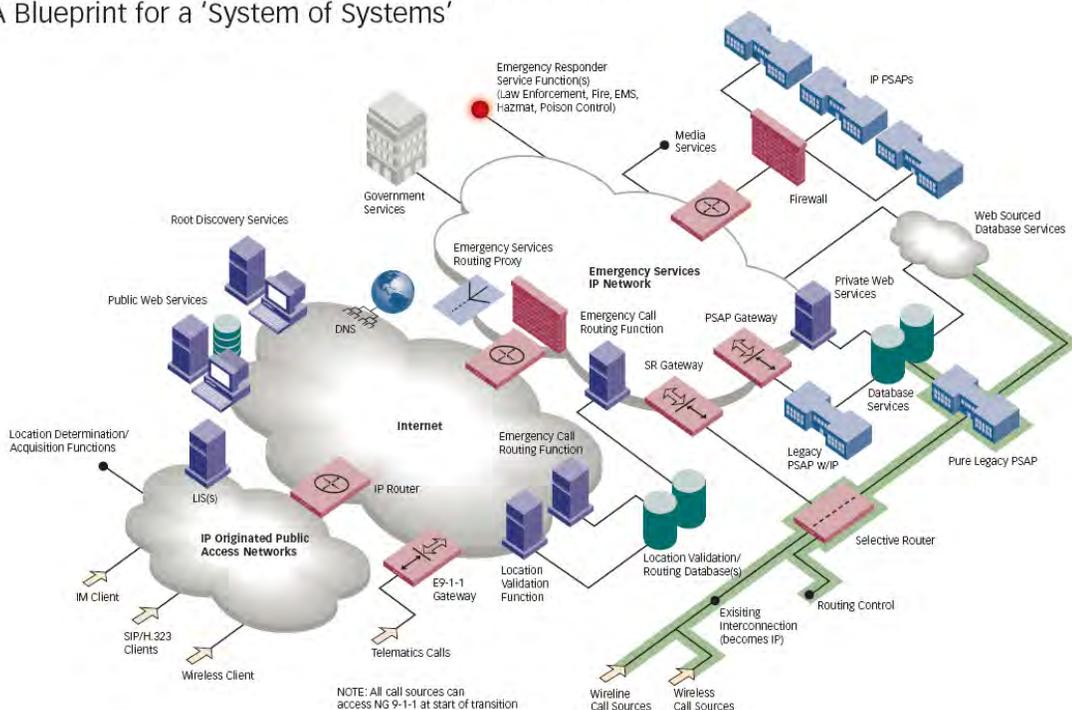
- Standardize service capabilities across the US and Canada
- Create a North American IP-based emergency network by linking together current local, regional, and national networks.
- Provide emergency services from the nearest capable provider regardless of local or state boundaries.
- Quickly and efficiently access external knowledge bases that may provide valuable information to first responders.
- Receive data from multiple channels and devices, including radio, cell phones, PDA's, PND's, VoIP, as well as traditional landlines.
- Ability to receive telematics information directly from the vehicle
- Quicker receipt of more robust information delivered to responders
- Achieve communications interoperability among PSAPs and other emergency resources like hospitals, transportation agencies, utilities, military, and others.
- Acquire and integrate additional data useful to call routing and handling
- Help reduce multiple reports of the same incidents
- Standardize interfaces from call and message services
- Plug-and-play integration capability
- Provide a secure environment for emergency communications
- Leverage new products and services that can help pinpoint incident locations and nature of the emergency to help assure that the correct emergency service is dispatched.

“NG9-1-1 seeks to accomplish several important goals... All communications, both external and internal, are to be funneled through a secure dedicated network based on Internet Protocol signaling. Emergency calls will be intelligently routed to the nearest PSAP that is equipped to handle the incident, regardless of jurisdiction.”

- U.S. Department of Justice

We are talking about a very different public safety infrastructure than what we have today. All communications, both external and internal, are to be funneled through a secure dedicated network based on Internet Protocol signaling. Emergency calls will be intelligently routed to the nearest PSAP that is equipped to handle the incident, regardless of jurisdiction.

**The Future of 9-1-1 and Emergency Communications**  
A Blueprint for a 'System of Systems'



Source: Bill McMurray, ENP, NENA Past President

## Leveraging the New NG9-1-1 Infrastructure

PSAP's will vacuum up data from any source – including the information we have today from voice calls, trunked radio, cellular, data messages, still and streaming video, and the data sources we may have tomorrow like telematics from vehicles and personal medical data stored in PDA's or cell phones, vehicle crash notification (VCN) systems, HAZMAT data for buildings and vehicles, stolen vehicle reports, criminal records and other databases yet to be developed. All services can work collaboratively sharing the same information and communicating with each other via conference calls or messaging. Systems based on open architecture encourage the development and commercialization of tools and resources we cannot even envision now.

PSAPs around the country need to be preparing migration plans and budgets to manage the transition to NG9-1-1. Virtually all major components of PSAP communications infrastructure will have to be replaced if they cannot be upgraded. The good news is that this is an opportunity for those operations that are still using older equipment that cannot be upgraded to build a first-class fully integrated emergency communications network designed to meet the needs of today and the future. Several funding sources are available but the local governing entity, county, state or region will have primary responsibility for managing and funding the transition.

### Implications for PSAP Recorders

The vast majority of the PSAP recorders in use today were designed for a voice-only world and a circuit-switched network. They were purchased primarily on the basis of reliability and cost, not features and technology. Some of these units have the ability to capture and store screen actions initiated by the call-taker but none have the ability to capture, index, archive, or retrieve text messages, video, telematics and other data calls.

Another glaring deficiency is how legacy recorders handle VoIP. Most recorders can record voice regardless of the source. However, tagging the call with essential information and associating it with a specific call taker is very different. Unless the recorders are specially designed to read ANI/ALI and other identifiers from the IP data stream and connected devices, all you will have is someone's voice and maybe date and time. You won't know with precision who was calling and from what location, much less what the call was about. Further, with VoIP, there is no direct circuit that passes through the call server to the call-taker. The recorder needs special software that creates the association.

In today's world and certainly more so in the future the device needs to capture and accurately recreate multi-channel events. A text message may be followed by a voice call and then a video image. If telematics data are transmitted, that too must be recorded and associated with the correct event and call taker. Finally, the recorder must be architected such that the entire event – including all channels and conference calls – must be assembled in such a form that the complete data file can be shared in real-time with other PSAP's and emergency services over the IP backbone.

In addition to the ability to process multi-channel communications, modern recorders need to be equipped with quality monitoring and coaching features, so supervisors can effectively evaluate call-taker and dispatcher performance and address training and coaching needs.

Figure 3 summarizes the major limitations of today's recorders.

#### The Multi-Channel Challenge (Figure 3)

- Unable to capture multi-channel events
- Not architected to readily conform to coming changes
- Lack quality monitoring and agent evaluation tools.
- Lack the security and authentication requirements of NG9-1-1
- Are not tightly integrated with leading VoIP call server vendors.
- Not designed to readily adopt to evolving requirements

#### Unable to Capture Multi-Channel Events

The majority of today's PSAP recorders are not designed to capture, store, and retrieve data messages. This is because PSAP call servers cannot capture and route data messages. However, IP-based multi-channel call servers have been available for many years and are in wide use in business enterprises and commercial contact centers. Many manufacturers do not even produce analog and TDM call distributors today and those that do are in the process of phasing them out. PSAPs will have to replace or upgrade (if possible) their legacy call servers with current-generation IP-PBX's or ACD's to meet the specifications of NG9-1-1. At that time, they will also need to replace the PSAP recorder.

#### Not Architected to Readily Conform to Coming Changes

The majority of recorders installed in the nation's 6,600 PSAPs are closed systems designed with proprietary hardware and software. They are not economically scalable and in most cases cannot be modified for IP. Vendors did not foresee

“PSAPs around the country need to be preparing migration plans and budgets to manage the transition to NG9-1-1. Virtually all major components of PSAP communications infrastructure will have to be replaced if they cannot be upgraded... this is an opportunity to build a first-class fully integrated emergency communications network designed to meet the needs of today and the future.”

“The majority of recorders installed in the nation's 6,600 PSAPs are closed systems designed with proprietary hardware and software. They are not economically scalable and in most cases cannot be modified for IP... The NG9-1-1 architecture favors open standards and customer-owned off-the-shelf (COTS) hardware and software.”

- Dick Bucci

a need to add future capabilities nor to integrate with systems, devices, and software applications produced by other vendors. The NG9-1-1 architecture favors open standards and customer-owned off-the-shelf (COTS) hardware and software. Quoting from the DOT NG9-1-1 Final System Design Document, "The use of COTS, wherever possible and appropriate, is encouraged for NG9-1-1 to reduce risk and increase usability and ease of maintenance." The motive is to eliminate barriers to national inter-operability and to expedite the development of innovative new devices and applications that can contribute to more effective nationwide emergency communications network.

### **Lack Quality Monitoring and Agent Evaluation Tools**

The quality monitoring and evaluation process helps PSAP management identify problem areas and provides a measure of progress. The ability to maintain or improve quality of emergency response and to objectively monitor progress is critical - especially at the time of implementation of new NG9-1-1 infrastructure. Modern call recording applications automatically present evaluators with targeted evaluation forms and synchronized interaction audio and screen video (if captured) – selected manually or automatically based on rules for identification of critical calls - to enable efficient assessment of single calls or entire incidents. Most systems in place today are not designed to intelligently select calls for supervisor evaluation nor provide management with helpful tools for designing and completing the forms.

### **Lack Proper Security and Authentication Measures**

Call recordings are often used as court evidence. It is very important that the recordings be secured from access by unauthorized personnel and if there is an intrusion that there be a mechanism for identifying and tracing the security breach. Leading vendors like VPI will be ready when you are – with encryption, file watermarking, password-protected exports, audit logs and more. The new recorder will capture inputs from any device; including, voice, data, and video. Each incident will be indexed with ANI/ALI information, incident number, and other identifiers like call taker name or ID and associated information such as CAD logs and maps. Incident scenarios will include all communications sequenced just as they happened.

### **Are Not Tightly Integrated with Leading VoIP Call Server Vendors**

While several vendors now offer recorders capable of recording and tracking VoIP calls, they may be very limited in the number of IP-PBX's with which they integrate. In some cases, the recorder is compatible with only one vendor. However, switch vendors handle VoIP in different ways and with different communication protocols. The recording vendor should be a development partner with the switch manufacturer. Only then will the recording vendor have full and complete access to the latest specifications and be able to certify, through test beds, that the recorder functions properly with the vendor's switch.

### **Not Designed to Readily Adapt to Evolving Requirements**

As mentioned, legacy recorders are largely closed systems. Consequently, PSAPs cannot use industry standard servers with common operating systems. Legacy recording systems do not have open interfaces –that are recommended by NENA and US DOT under NG9-1-1 initiatives - and so cannot seamlessly integrate with the other PSAP systems that are (or will be) built to open standards. Examples include the new data base formats specified for NG9-1-1 infrastructure, to include CAD systems, mapping software, and more. With closed systems, each integration point is a custom job adding to costs of acquisition and ownership and creating unnecessary complexity to the task of replacing legacy sub-systems. As new or improved communications channels and devices are adopted by the general public, the PSAP needs a flexible architecture that can readily adjust to these changes.

## **Your Next PSAP Recorder**

The next PSAP recorder you invest in must have all the qualities that are important today as well as the native ability to perform basic performance management operations and finally, the ability to conform to the evolving requirements of NG9-1-1. Figure 4 summarizes the floor-level attributes of the basic systems in use by the vast majority of PSAP's today

### **Goals and Benefits of NG9-1-1 (Figure 4)**

- Record, index, and retrieve audio from analog or digital lines
- Record, index, and retrieve audio from traditional or trunked radio
- Record 100% of both sides of voice interactions
- Tag calls with critical identifiers such as ANI/ALI, channel ID, call direction, agent ID, date and time.
- Archiving to local storage, removable media (DVD or DAT Tapes), NAS, SAN, and RAID
- Mirrored hard drives
- Auto alerts and alarms
- Tight integration with PBX or dedicated call server
- Variable speed replay
- Incident replay

"The use of COTS, wherever possible and appropriate, is encouraged for NG9-1-1 to reduce risk and increase usability and ease of maintenance."

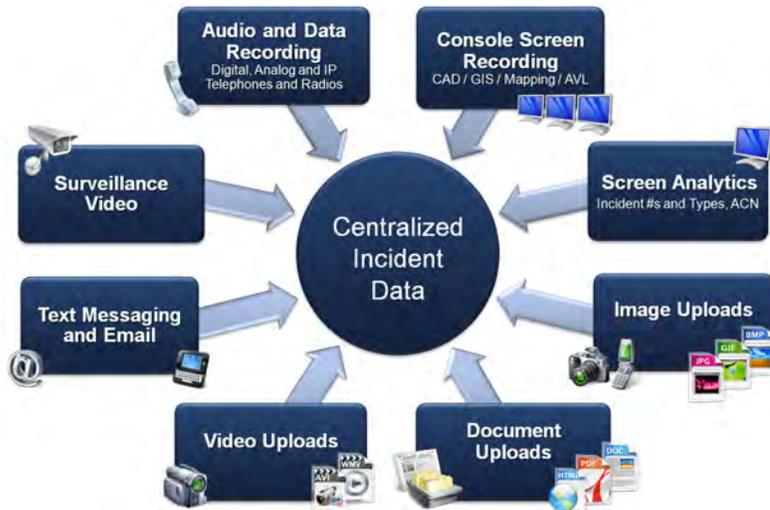
- National Emergency Number Association (NENA)

Beyond the basics, progressive PSAP's are now adopting many of the performance management practices of commercial centers. Principal among these is the capability to perform objective and thorough evaluations of call takers. The practice is known as quality monitoring and involves the selection of a sample of call-taker interactions, than scoring these interactions based on key attributes and skill compliance requirements. The more advanced quality monitoring systems come with integrated electronic learning systems that automatically design and deliver custom training programs for individual call takers or dispatchers, according to their skill gaps. Our resource guide, Emerging in Public Safety Recording, Quality Assurance and Training explains why and how more public safety operations are adapting some of the best practices of commercial contact centers.

Finally, your next PSAP recorder needs to be ready for NG9-1-1. This does not mean that it has all of the recommended features and functions out of the box, but it must be architected from the ground up to meet the requirements for open architecture, flexibility to add features without wholesale replacement or costly upgrades, able to handle both voice and data communications, centralized incident information management, and fully integrated with the IP-PBX's and call servers of the leading vendors.

Figure 5 summarizes the primary elements of centralized NG9-1-1 incident information capture and management.

**Key Elements of Centralized NG9-1-1 Incident Information Management (Figure 5)**

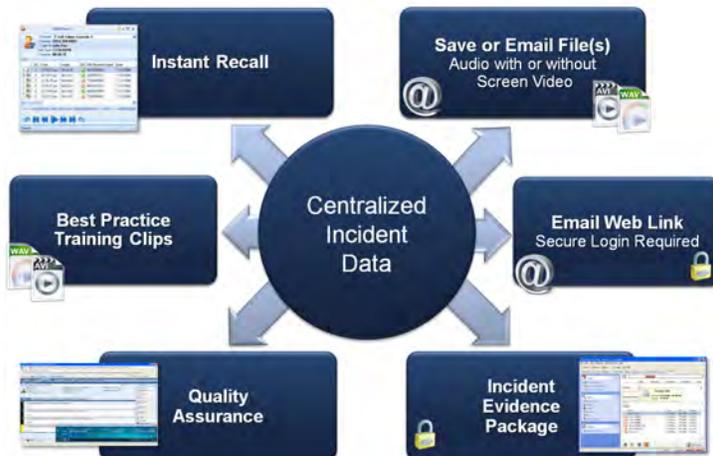


Source: VPI

Incident information that is captured in a centralized location should be easily reviewed and securely shared during and after the emergency event to improve collaboration and case handling. Information shared needs to be complete so the agencies and units that receive the information are all on the same page.

Desktop instant recall software tools enable call takers to quickly access any difficult to understand call or radio transmissions during the incident. The latest incident recreation tools help PSAPs reconstruct and share complete multimedia incidents, regardless of the number of channels, recording servers, or sites involved. The ability to export and securely share an entire incident from the recording system greatly improves the effectiveness of emergency response and assists in more convincing evidence which can lead to a higher rate of DA cases closed.

**Best Practices for Incident Information Sharing (Figure 6)**



Source: VPI

“Your next PSAP recorder needs to be ready for NG9-1-1... it must be architected from the ground up to meet the requirements for open architecture, flexibility to add features without wholesale replacement or costly upgrades, able to handle both voice and data communications, centralized incident information management, and fully integrated with the IP-PBX's and call servers of the

leading vendors.”

The private sector has developed a science around getting maximum results from their contact centers. It helps to work with a vendor that has a reputation for both reliability and innovation. California-based VPI (Voice Print International) has already brought to market VPI EMPOWER 911 Suite 5.0 with migration to IP-based call capture servers and advanced quality monitoring, evaluation, coaching, and learning features. VPI has now launched its next-generation recording suite that includes many of the recommendations of the current NG9-1-1 specification.

Figure 7 lists the current and planned enhancements to the VPI EMPOWER 911 suite.

<b>Figure 7: VPI's Next Generation PSAP Recorder</b>			
<b>Features and Functions</b>	<b>VPI EMPOWER 911™</b>	<b>Future Release</b>	<b>Your Recorder?</b>
Efficiently capture any mix of analog, TDM, VoIP, radio and wireless calls in the same system	✓		
Tags VoIP calls with ANI/ALI, incident type, date stamp, call taker, and user-defined attributes	✓		
Capture and record text messages		✓	
Capture and record Instant Messages from wireless devices		✓	
Capture and record email messages		✓	
Capture and record fixed and streaming video images		✓	
Capture and record Automatic Crash Notification information (if provided)	✓		
Provide instant incident replay of all voice and data interactions, end to end	✓		
Open architecture design	✓		
Tag calls with telemetric or mapping location identifiers (if transmitted)	✓	✓	
Tag calls with vehicle identification numbers (if transmitted)	✓		
Tag calls with health information identifiers (if transmitted)	✓		
Continue to record and track the call even after transfer to another PSAP location?	✓		
Authenticate all voice communications	✓		
Authenticate all data communications	✓		
Watermarking of all stored voice and data communications	✓		
Encryption of all stored voice and data communications	✓		
Tabular and graphical audit logs for monitoring user access and activities within the system	✓		
Provides built-in analytics?	✓		
Seamlessly integrate with leading IP call server vendors?	✓		
Allow supervisors to send instant messages and announcements to call takers and dispatchers across locations?	✓		

“VPI has already brought to market VPI EMPOWER 911 Suite 5.0 with migration to IP-based call capture servers and advanced quality monitoring, evaluation, coaching, and learning features. VPI has now launched its next-generation recording suite that includes many of the recommendations of the current NG9-1-1 specification.”

Features and Functions	VPI EMPOWER 911™	Future Release	Your Recorder?
Intelligently selects the most coachable calls for quality evaluation	✓		
Provides embedded evaluation forms and authoring tools	✓		
Provide embedded and user-designed graphical reports	✓		
Provides heat-maps for at-a-glance graphical overview and categorization of all or selected communications?	✓		
Allow for objective, form-based quality evaluation of single calls as well as entire multi-call incidents	✓		

Technology and the architecture behind a recording and quality management system will have a fundamental impact on a PSAP's future success. At a time when organizations look for ways to leverage the technology investments they have already made, service-oriented architecture (SOA) allows applications to be evolved and adapted instead of replaced in order to handle process and technology changes cost-effectively. It also allows for interoperability and easy integrations between heterogeneous applications and technologies.

The standards-based architecture directly translates into lower investment and lower costs of operations – users can leverage COTS hardware and other 3rd party interfaces and data to subordinate the rules and procedures for data access to processes and policies. As a member of leading trade associations NENA and APCO, VPI has been heavily involved in the NG9-1-1 process and is fully committed to the success of NG9-1-1.

### About the Author

Dick Bucci is Principal of Pelorus Associates ([www.PelorusAssoc.com](http://www.PelorusAssoc.com)) where he specializes in contact center technologies. He has authored nine in-depth reports on workforce optimization applications and numerous articles and white papers. Prior to founding Pelorus Associates Dick was a senior sales and marketing executive with leading telecommunications vendors and value added resellers. He has over 30 years of experience in the telecommunications industry and is one of the most widely quoted analysts in the contact center industry.



### About VPI

VPI (Voice Print International, Inc.) is a premier innovator and provider of mission-critical interaction recording and workforce optimization solutions for government agencies, first responders, emergency service providers, security companies, and enterprises worldwide. More than 1,200 customers in 50 countries rely on VPI's award-winning suite of communications center solutions to capture, analyze, evaluate, and share their recorded communications. In addition to secure records management for evidentiary purposes, VPI solutions enable federal, state, local, and private agencies to ensure compliance with policies and regulations, improve the quality of their mission-critical voice and data interactions, maximize the performance and retention of their staff, and deliver first-rate customer service. For more information, contact us at 1-800-200-5430 or visit [www.VPI-corp.com](http://www.VPI-corp.com)



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