SOLACOM
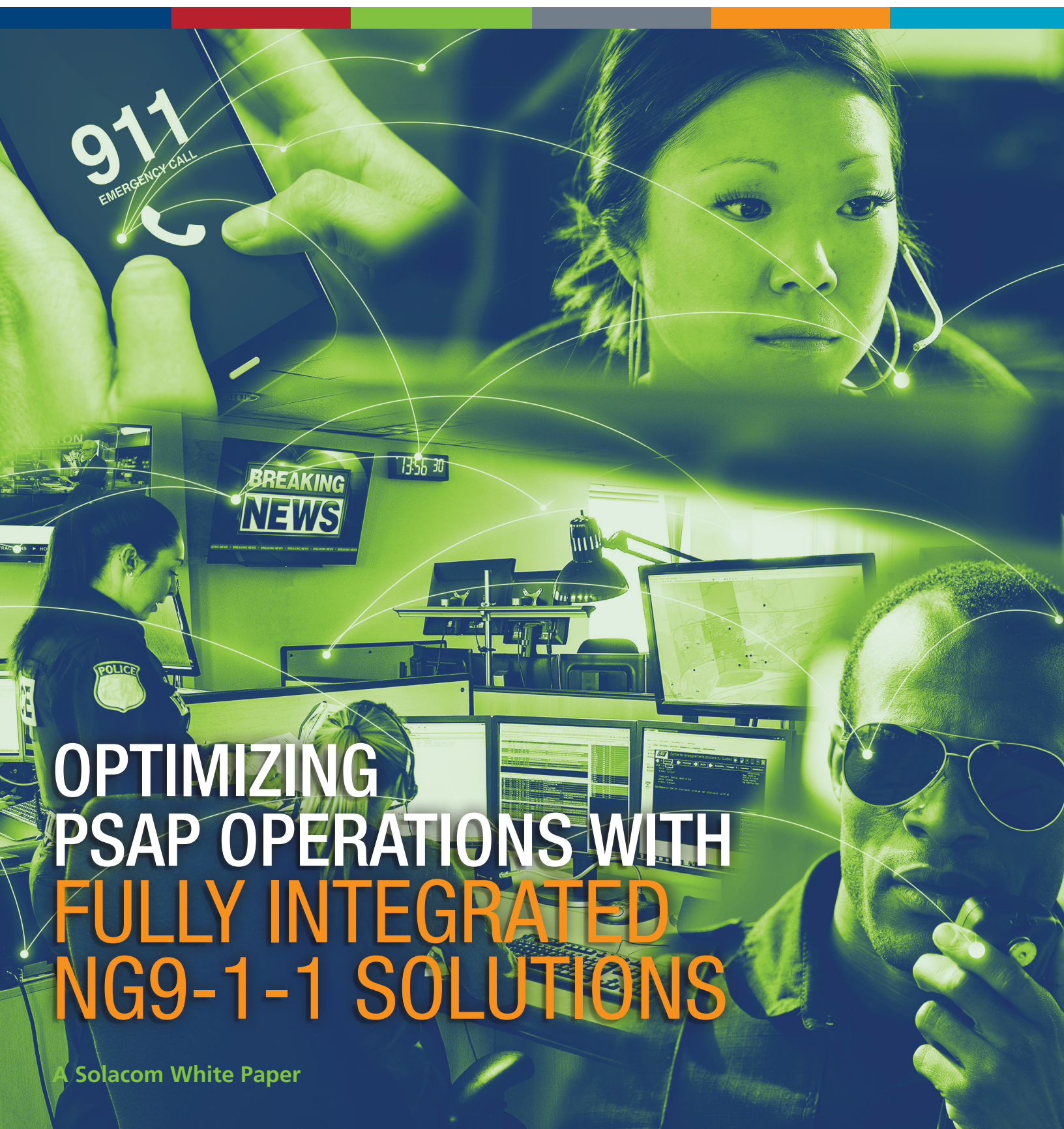
A Subsidiary of
Comtech Telecommunications Corp.

OPTIMIZING
PSAP OPERATIONS WITH
FULLY INTEGRATED
NG9-1-1 SOLUTIONS

A Solacom White Paper

Integration Is Essential to Meet New Demands

Today, the world for public safety answering points (PSAPs) is evolving at an unprecedented rate. The types and volumes of calls they receive, the technologies available to them, and the pressure to respond faster are all increasing.

The types and volumes of calls PSAPs receive have been evolving since cellphones became a viable option for the public. Now, many PSAPs receive more calls each day from cellphones than from landlines. And demand for text-to-911 support is skyrocketing, with major incidents, including an Orlando nightclub shooting[1], highlighting the need for PSAPs to provide text-to-911 services. The demands on PSAPs will continue to grow. In the not-too-distant future, PSAPs will also need to support multimedia text messages that include photos and videos as well as real-time texting (RTT).

The cellphones that started the texting craze have evolved into smartphones that can provide PSAPs with highly accurate caller location data, including Z axis data that indicates height. And the move to more detailed and sophisticated geographic information system (GIS) databases allows PSAPs to incorporate important additional details, such as building floor plans, into their systems to help emergency response teams locate callers faster.

> **The move to more detailed and sophisticated geographic information system (GIS) databases allows PSAPs to incorporate important additional detail to help emergency response teams locate callers faster.**

All of these advances significantly increase the volume and variety of data that PSAP networks and desktop systems need to streamline and deliver so call takers can quickly and accurately process the relevant details and provide them to first responders. At the same time, PSAPs must improve interoperability with first responder systems and networks to ensure the right people have the right information at the right time. This ability will become even more important as the FirstNet national broadband public safety communications network expands.

As they migrate to Next Generation 9-1-1 (NG9-1-1) systems, PSAPs have new opportunities to deploy more advanced systems that allow them to process more information faster, meet new requirements, and increase interoperability. But, PSAPs' deployment strategy will be crucial to their ability to evolve to more efficient and responsive operations.

Deploying disparate solutions and systems that were not designed for seamless integration with one another will not give PSAPs the level of efficiency needed for fast and effective NG9-1-1 call handling and management.

To achieve the levels of speed, accuracy, and interoperability needed for efficient and effective NG9-1-1 operations, PSAPs must deploy NG9-1-1 solutions that are fully integrated all the way from the network that receives the 9-1-1 call through the emergency call handling and management system to the computer-aided dispatch (CAD) solution.

PSAPs have new opportunities to deploy more advanced systems that allow them to process more information faster, meet new requirements, and increase interoperability.

The Main Components in an Integrated Network-To-Desktop Approach

NENA provides standards and recommendations for almost every aspect of PSAPs' evolution to NG9-1-1, and these documents provide a vital resource for PSAPs as they plan and execute their strategy for NG9-1-1 evolution.

While some of the equipment, tools, and functionality PSAPs will deploy as they migrate to NG9-1-1 will be new to them, other elements will be more advanced versions of tools and functionality they already use. The main components in an integrated network-to-desktop approach include new and familiar elements:

- Next Generation Core Services (NGCS)

- Emergency call handling and management solution

- CAD system

NGCS is defined as the base set of services needed to process a 9-1-1 call on the managed IP network.

Next Generation Core Services

NGCS is a new concept in NG9-1-1. NENA defines NGCS as the base set of services needed to process a 9-1-1 call on the managed IP network that is used for emergency services communications — the Emergency Services Internet Protocol Network (ESInet). This base set of services includes the elements summarized below[2].

Element	Description
Emergency Service Routing Proxy (ESRP)	Determines the next hop for a 9-1-1 call based on location and policy as it is routed within the ESInet.
Emergency Call Routing Function (ECRF)	Uses location information, such as a civic address or geo-coordinates, and a Uniform Resource Name (URN) to determine the appropriate PSAP or responder agency for the emergency call based on the caller's location.
Location Validation Function (LVF)	Validates civic location information against the information in the GIS database. A civic address is considered valid if it is: • Unique in the GIS database • Suitable to provide an accurate route for an emergency call • Specific enough to direct first responders to the right location
Border Control Function (BCF)	Establishes a secure entry point into the ESInet for emergency calls.
Bridging services	Provides conferencing and call transfer services across the ESInet.
Policy store	Stores the rules for routing 9-1-1 calls through the ESInet.
Logging services	Logs events from all of the NG9-1-1 functional elements as well as voice and media recording services.
IP services such as DNS and DHCP	Determines the network hosts to which requests for emergency services are routed.

The ESInet can include NGCS elements that are dedicated to a particular PSAP as well as elements that are shared among PSAPs. ESInets can also be interconnected so that local, regional, state, federal, national, and even international "networks of networks" can be created.

Emergency Call Handling and Management Solution

NG9-1-1 emergency call handling and management solutions include the hardware and software needed for call takers to answer and manage 9-1-1 voice and text calls made from any device. While implementations can vary widely among vendors, most emergency call handling and management solutions provide a graphical user interface (GUI), can capture and record call information, and include a map that shows caller location.

Some of the more sophisticated emergency call handling and management solutions include advanced features, such as the ability to manage calls from the map, view critical operational data in near real time, and customize the GUI for PSAP operations. They also include the ability to generate a wide variety of reports that help PSAPs meet mandatory reporting requirements, quickly analyze new issues, and identify longer term trends.

CAD System

As the traditional link between PSAPs and first responders, CAD systems have long played a crucial role in ensuring that requests for emergency assistance are delivered to the appropriate agency. In NG9-1-1 systems, an Emergency Incident Data Document (EIDD) is used to share emergency incident information between and among authorized entities and systems.

The EIDD provides a standardized format for emergency incident updates so that information can be more easily distributed among organizations that are directly and indirectly affected by an incident. Organizations receiving information can range from first responders and federal agencies to emergency operations centers, utility companies, tow truck operators, and even news organizations.

An Incident Data Exchange (IDX) will be used to aggregate EIDD information within an agency and create a composite EIDD that summarizes everything the agency knows about an incident.

CAD systems have long played a crucial role in ensuring that requests for emergency assistance are delivered to the appropriate agency.

Disparate Systems Introduce Disconnects

Traditionally, the main elements in the end-to-end emergency call handling and management process have been deployed as a disparate collection of independent solutions and were not engineered to operate together seamlessly.

With the increasing demands PSAPs face, deploying disparate NGCS, emergency call handling, and CAD solutions will introduce latency, incompatibilities, and complexity that will slow response times and increase the risk of human and system errors. It will also make interoperability with first responders and compliance with national public safety requirements far more difficult.

PSAPs' need to effectively incorporate higher volumes of data and a wider variety of data types into their call handling processes highlights the requirement for fully integrated NG9-1-1 systems. In this case, deploying disparate components for database management instead of an integrated geographic information system (GIS) database will significantly increase the risk of inadequate data storage and inconsistent data classification. These deficiencies will make it far more difficult to smoothly incorporate new types of information, such as Z axis data for caller location, into call mapping applications.

Deploying disparate NGCS, emergency call handling, and CAD solutions will introduce latency, incompatibilities, and complexity that will slow response times.

Key Considerations for End-To-End Integration

To ensure that end-to-end integration of NGCS, emergency call handling, and CAD solutions goes as smoothly as possible, PSAPs must consider a number of factors.

Start with the underlying technologies and protocols. The NGCS components, emergency call handling solution, and CAD must all communicate using Session Initiation Protocol (SIP). That's because the ESInets upon which NGCS run are IP-based networks that use SIP for call routing. Calls arrive at the ESInet using the SIP protocol, and the ESRP that routes the call is a SIP proxy server.

Selecting components that all speak the same language with no need for protocol translation simplifies integration and reduces the risk that translation errors will affect call acceptance, routing, or delivery.

Security, information flows, and legal requirements must also be considered.

Security of the Network and the Information It Transports

When systems and solutions are integrated, there is a higher risk that a vulnerability or malicious attack on one part of the overall system will affect other parts of the end-to-end system. This is particularly true in NG9-1-1 systems that rely on IP networks and provide a wider variety of data types to a larger number of stakeholders.

PSAPs must understand and prepare for a range of potential cyberattacks and ensure the appropriate mitigation and containment strategies are built into their business continuity plan.

As the doorway to all PSAP systems, preventing unauthorized access to the network is a key priority. Unauthorized network access can be used to launch denial-of-service (DoS) attacks, telephony denial-of-service (TDoS), and man-in-the-middle attacks, among others. In addition, once hackers gain access to internet-connected network, they can potentially access any computer on the network. This puts call-taker workstations, which typically do not have a direct internet connection, at risk.

PSAPs must develop processes and procedures for network and data security and for managing data rights. For more information about cybersecurity in an NG9-1-1 world, read our guide Building Cybersecurity Into Your Business Continuity Plan.

Once hackers gain access to internet-connected systems, they can potentially access any computer connected to that system.

Diversity of Information

As more and more information flows into the PSAP network, there are many more types of data and images that need to be dealt with at each stage of call processing. For example, there may be graphic images of car accidents and video of fires in progress along with detailed information about past incidents at that location.

The diversity of information formats, types, and content creates new requirements for data segregation and distribution on the network and at the PSAP premises. While video that shows the scale of a fire in progress may be helpful for a call taker, graphic images of a car accident or victim may be too upsetting for some call takers to deal with.

In these cases, receiving images can create mental distress that impedes the call taker's ability to work efficiently and effectively. These incidents can lead to call taker absences and even contravene union rules for acceptable workplace environments. In some cases, different unions that work within the PSAP may have different rules for information that is acceptable for call takers to view. To comply with these rules, data must be segregated so that only certain call takers can see certain types of images or information.

In addition to new information structuring requirements, the availability of more diverse types of data also means that call takers must be trained to ensure they understand the different types of data that are available to them and how that information is best incorporated into the call handling process.

Legal Requirements

Once data is in the PSAP system, it must be transmitted, shared, and viewed in a way that meets all relevant regulatory requirements and laws for personal privacy and confidentiality. While PSAPs have always had to meet regulatory requirements for data, establishing the appropriate level of governance over data in NG9-1-1 systems is a more complex task because networks, databases, and applications are often shared among PSAPs and across legal borders.

To meet the combined set of legal requirements, stakeholders from each PSAP must come together to collaborate and develop a comprehensive set of shared policies and processes. Overall authority over the integrated system will also need to be determined when multiple PSAPs share resources.

Moving Ahead With End-To-End Integration

Deploying NG9-1-1 solutions that are integrated end-to-end is a complex undertaking that requires the involvement of experts with deep understanding of the functionality each solution provides and the intricacies of how the solutions interoperate.

Solacom understands that PSAPs can't afford to waste time, effort, or money attempting to coerce disparate systems into smooth interoperation. They need NG9-1-1 solutions that are designed to be smoothly integrated and that enable seamless interoperation. And they need the expertise required for efficient and cost-effective deployments.

To help PSAPs reduce risks, frustration, time, and money as they evolve to NG9-1-1, all Solacom solutions are engineered from the ground up for full integration. We provide:

- **An NGCS Suite** that is ideal for PSAPs looking to share services with other PSAPs. Our comprehensive NGSC Suite includes all of the NENA-defined NGCS elements, as well as services for network and system engineering, deployment, system integration, and network monitoring and maintenance.
- **The Solacom Guardian 9-1-1 Call Handling solution**, a standards-based and purpose-built emergency call handling and management solution that is designed to integrate with standards-based NGCS and CAD solutions.

Solacom solutions are engineered from the ground up for full integration.

The Partner to Leading PSAPs

Solacom (a subsidiary of Comtech Telecommunications Corp.) has extensive experience partnering with PSAPs who are leading the way in integrated NG9-1-1 systems. These PSAPs are proving that, with the right NG9-1-1 solutions and deployment strategy, they can benefit from integrated, shared solutions that increase efficiency and reduce costs. We have very successfully partnered with:

- The State of Maine to deploy the country's first statewide NG9-1-1 network. With our solutions, recommendations, and assistance, 26 Emergency Services Communications Bureau (ESCB) PSAPs in Maine are now using the Solacom Guardian 9-1-1 Call Handling solution. And the ESCB estimates it is saving more than one million dollars a year on its 9-1-1 services contract. Read the case study.

- The counties of Franklin, Gulf, and Calhoun in Florida to deploy a shared NG9-1-1 solution that allows the counties to divide costs but retain full control over how they operate their individual agencies. The regional system also enables the PSAPs to provide services for one another when call volumes are high and when unforeseen disasters, such as hurricanes, affect PSAP operations. Read the case study.

Solacom is 100 percent focused on continuing to deliver a complete portfolio of fully integrated solutions for PSAPs as they migrate to NG9-1-1 and beyond. And we will continue to expand our offerings with the hardware, software, and services that are most crucial to optimizing PSAP operations and accelerating response times.

Solacom is 100 percent focused on continuing to deliver a complete portfolio of fully integrated solutions for PSAPs as they migrate to NG9-1-1 and beyond.

Acronyms

BCF	Border Control Function		GIS	geographic information system
CAD	computer-aided dispatch		GUI	graphical user interface
DoS	denial-of-service		IDE	Incident Data Exchange
ECRF	Emergency Call Routing Function		LVF	Location Validation Function
EIDD	Emergency Incident Data Document		NG9-1-1	Next Generation 9-1-1
			NGCS	Next Generation Core Services
ESRP	Emergency Service Routing Proxy		PSAP	public safety answering point
			RTT	real-time texting
ESCB	Emergency Services Communications Bureau		SIP	Session Initiation Protocol
			TDoS	telephony denial-of-service
ESInet	Emergency Services Internet Protocol Network		URN	Uniform Resource Name

References

[1] https://www.wavy.com/news/crime/orlando-shooting-shines-light-on-need-for-text-to-911/1100187534

[2] Source: NENA Master Glossary of 9-1-1 Terminology.
https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/NENA-ADM-000.22-2018_FINAL_2.pdf

Additional Information
Click here for more information about how Solacom can help you make the move to fully integrated, network-to-desktop emergency response solutions.

Contact Us
Solacom 9-1-1 call handling and management solutions are built on more than 30 years of research and innovation in the application of advanced hardware and software technologies for public safety. Today, Solacom solutions support thousands of agencies affecting millions of lives annually — from dense urban environments to statewide deployments.

Contact us today to discover how our solutions can help your PSAP streamline 9-1-1 call handling and management processes and enable more efficient collection of critical information in emergency situations.

Visit our website: www.solacom.com

SOLACOM
A Subsidiary of
Comtech Telecommunications Corp.