NENA Operational Impacts of Devices and Sensors Information Document

Abstract: This NENA Information Document is provided to assist Public Safety Answering Points (PSAPs) and governing 9-1-1 authorities with information for evaluating the operational impacts of devices and sensors which may interface with the PSAP.

NENA Operational Impacts of Devices and Sensors Information Document

NENA-INF-004.1.2-2018
DSC Approval: 07/23/2013
PRC Approval: 08/02/2013
NENA Board of Directors Approval: 08/05/2013
Document Reviewed: 08/17/2018
Next Scheduled Review Date: 02/17/2023

Prepared by:
National Emergency Number Association (NENA) PSAP Operations Committee, Document Review Working Group

Published by NENA
Printed in USA

1 Executive Overview

As the vision of Next Generation 9-1-1 (NG9-1-1) becomes reality and additional integration with Devices and Sensors becomes the norm; designers, manufacturers, and operators of this technology will need to work closely with the system providers, Authorities Having Jurisdiction (AHJ) and operators of Public Safety Answering Points (PSAPs) to ensure that devices and sensors integrate into and improve system performance.

This NENA Information Document is provided to assist Public Safety Answering Points (PSAPs) and governing 9-1-1 authorities with information for evaluating the operational impacts of devices and sensors which may interface with the PSAP. For the purpose of this document, devices and sensors are being classified by their characteristics and operational impacts.

The unique nature of Communications Centers/PSAPs requires that any system that interacts with the agency and its systems be fully tested and the operational impacts be understood prior to implementation.

This document includes information for agencies to understand:

- Operational impacts associated with the introduction of devices and sensors into emergency services
- Device Categories, Types and Features
- Emergency Call Scenarios utilizing devices and sensors
- Pre-recorded Voice and/or Pre-configured Text/Data
- Considerations related to Connectivity, Design, Security, Operational Testing, Accessibility, and Public Education as they relate to the introduction of devices and sensors into emergency services.

Table of Contents

NENA
INFORMATION DOCUMENT
NOTICE

This Information Document (INF) is published by the National Emergency Number Association (NENA) as an information source for 9-1-1 System Service Providers, network interface vendors, system vendors, telecommunication service providers, and 9-1-1 Authorities. It is not intended to provide complete design or operation specifications or parameters or to assure the quality of performance for systems that process such equipment or services.

NENA reserves the right to revise this Information Document for any reason including, but not limited to:

- Conformity with criteria or standards promulgated by various agencies,
- Utilization of advances in the state of the technical arts,
- Reflecting changes in the design of equipment, network interfaces, or services described herein.

This document is an information source for the voluntary use of communication centers. It is not intended to be a complete operational directive.

It is possible that certain advances in technology or changes in governmental regulations will precede these revisions. All NENA documents are subject to change as technology or other influencing factors change. Therefore, this NENA document should not be the only source of information used. NENA recommends that readers contact their 9-1-1 System Service Provider (9-1-1 SSP) representative to ensure compatibility with the 9-1-1 network, and their legal counsel to ensure compliance with current regulations.

Patents may cover the specifications, techniques, or network interface/system characteristics disclosed herein. No license expressed or implied is hereby granted. This document shall not be construed as a suggestion to any manufacturer to modify or change any of its products, nor does this document represent any commitment by NENA or any affiliate thereof to purchase any product whether or not it provides the described characteristics.

By using this document, the user agrees that NENA will have no liability for any consequential, incidental, special, or punitive damages arising from use of the document.

NENA's Committees have developed this document. Recommendations for change to this document may be submitted to:

National Emergency Number Association
1700 Diagonal Rd, Suite 500
Alexandria, VA 22314
202.466.4911
or commleadership@nena.org

NENA: The 9-1-1 Association improves 9-1-1 through research, standards development, training, education, outreach, and advocacy. Our vision is a public made safer and more secure through universally-available state-of-the-art 9-1-1 systems and better-trained 9-1-1 professionals. Learn more at nena.org.

Intellectual Property Rights (IPR) Policy

NOTE – The user's attention is called to the possibility that compliance with this document may require use of an invention covered by patent rights. By publication of this document, NENA takes no position with respect to the validity of any such claim(s) or of any patent rights in connection therewith. If a patent holder has filed a statement of willingness to grant a license under these rights on reasonable and nondiscriminatory terms and conditions to applicants desiring to obtain such a license, then details may be obtained from NENA by contacting the Committee Resource Manager identified on NENA's website at www.nena.org/ipr.

Consistent with the NENA IPR Policy, available at www.nena.org/ipr, NENA invites any interested party to bring to its attention any copyrights, patents or patent applications, or other proprietary rights that may cover technology that may be required to implement this document.

Please address the information to:

National Emergency Number Association
1700 Diagonal Rd, Suite 500
Alexandria, VA 22314
202.466.4911
or commleadership@nena.org

Reason for Issue/Reissue

NENA reserves the right to modify this document. Upon revision, the reason(s) will be provided in the table below.

Document Number	Approval Date	Reason For Issue/Reissue
NENA-INF-004.1-2013	08/15/2013	Initial Document
NENA-INF-004.1.1-2015	05/28/2015	Update web page links
NENA-INF-004.1.2-2018	08/17/2018	Non-substantive and scrivener edits made for clarity during periodic review.

2 Operational Description

2.1 Device Categories, Types and Features

2.1.1 Traditional Alarm Devices

These typically provide local alerting only, and no data is transmitted. Traditional alarm devices are out of scope for this document.

2.1.2 Voice Only Devices

Voice only devices are limited to transmission of voice, and provide no associated data. Voice only devices are out of scope for this document.

2.1.3 Data Only Devices

Data only devices are limited to transmission of data, and do not support voice. Data only devices are **in** scope for this document.

2.1.4 Telematics Devices (Voice/Data)

Telematics devices are devices which provide specific connections to downstream systems to monitor and report on activity. Historically, telematics devices have been associated with the transportation industry, installed permanently or temporarily on vehicles or fixed infrastructure, and which provide data to monitoring systems. Some telematics devices have voice as well as data capabilities; that voice/data capability may be able only to reach a proprietary call center, which then mediates the contact with the PSAP. Other implementations may include the ability for the voice/data capability to reach a PSAP directly. Examples of telematics implementations include OnStar® by General Motors, mbrace® by Mercedes-Benz, SYNC® by Microsoft, and others. Telematics devices are in scope for this document.

2.1.5 Non-Service Initialized Devices (Voice/Data)

(Extracts from NENA Technical Information Document 03-509 – Femtocell and UMA Issue 1, January 27, 2011)

- A Non-Service Initialized (NSI) handset is a handset that is not registered with a carriers' network. Under Federal Communications Commission (FCC) rules, carriers are obligated to allow emergency calls from NSI handsets on any network with a compatible air interface.
- For NSI calls, the CBN is 911+the last 7 digits of the International Mobile Equipment Identity / Electronic Serial Number (IMEI / ESN). This will usually be presented to the PSAP.

- In the case of an NSI phone, callback is not supported since the callback number supplied to the PSAP is a non-dialable number. NSI devices are out of scope for this document.

2.2 NENA Three-Tiered Data Concept (circa 2002)

The three-tiered data concept is a process to ensure the effectiveness and integrity of E9-1-1 systems, both now and into the future.

The NENA 9-1-1 Future Path Plan established a vision for data delivery that consisted of three tiers of data that will or may be associated with a 9-1-1 call. The overall concept is that voice and "mission-essential" data travel on a single primary path. Everything else is either supportive or supplemental to the essential data. Each tier is described here for background only.

-tier 1 data is: **Essential** data that supports call delivery and adequate response capability if all other sources of information fail. It includes; Call Back Number, the caller's location information, call routing code (aka: ESN), origination code (aka: ESCO if applicable), Database routing access code. It also includes information necessary for trouble shooting, plus additions based on changed technology, ex: ESCO, CoID, error codes.

-tier 2 data is: **Supportive** data, analogous to other ALI data today, e.g., Carrier ID, Carrier contact information, PSAP position/sequence number, additional information typically associated with an ALI response message.

-tier 3 data is: **Supplemental** data, such as; medical records, motor vehicle department data etc.

Essential data arrives with the call, supportive and supplemental data arrive through other paths.

2.3 Emergency Call Scenarios utilizing devices and sensors

It is important to note that proper routing of the following call scenarios is heavily dependent on the use of i3 routing algorithms in order to ensure delivery to the correct location. In no case (even in early applications) is the owner or operator of the device to attempt to determine and manually select the PSAP that they deem appropriate to receive the call. Reasons for this include, but are not limited to:

- Manual selection will over-ride the dynamic nature of the NG9-1-1 network to alternate route a call to an appropriate alternate location based on policy routing rules. This prevents backup PSAPs from receiving the call in the event of the primary being busy, out of service, or unavailable for some other reason.
- Manual selection may select the inappropriate location, one that is not able to respond to the particular type of sensor, or is not yet equipped to do so. The PSAP that handles

typical E9-1-1 service for the particular location may not be able to handle the particular conditions or may not yet be equipped to respond to the type of device or sensor in an NG9-1-1 environment. The use of policy routing rules would prevent this type of mismatch.

- The appropriate PSAP may change over time due to such things as: PSAP Boundary Changes/Annexations, PSAP Moves/Consolidations, or additional capabilities added to a PSAP to make a more geographically appropriate PSAP the new or proper location to handle a call from any specific type of device or sensor, based on policy routing rules.

2.3.1 Human Initiated Direct to PSAP.

A person actively initiates the emergency call through an action. The call is routed to the appropriate PSAP.

2.3.2 Human Initiated to 3rd Party Call Center.

A person actively initiates the emergency call through an action. The call is directed to a 3rd party call center. The call may be transferred to, or conferenced with the appropriate PSAP, the call center may relay information to the appropriate PSAP or the call center may have the device call the appropriate PSAP.

2.3.3 Device/Sensor Initiated Direct to PSAP.

Utilizing established analysis criteria a device/sensor initiates an emergency call directly to a PSAP without human intervention.

2.3.4 Device/Sensor Initiated to 3rd Party Call Center.

Utilizing established analysis criteria a device/sensor initiates an emergency call to a 3rd party call center, without human intervention. The 3rd party call center may then conference or transfer the call to the appropriate PSAP, providing pertinent information about the call.

2.4 Pre-recorded Voice and/or Pre-configured Text/Data

In order for a call to be processed it should contain information in a standardized format:

2.4.1 Primary Information (Essential data – Tier 1):

- Location- Network based or supplemental Global Positioning System (GPS) data
- Identification –
  - Device Call Back Number (CBN) if applicable.
  - Company or Service Provider Name (e.g., Great Call, Philips Lifeline)
  - Device Name (e.g., jitterbug)

- Nature of Emergency (e.g., automated medical alert, automated fire alarm, automated security alarm, automated biochemical alert, etc.)

2.4.2 Supportive Information (Supportive data – Tier 2):

- Contact and Escalation Information –
  - Company or Service Provider contact information should include, at a minimum:
    - A 24 X 7 contact phone number for service-affecting issues,
    - A Phone number and email address for Non-Emergency issues

2.4.3 Supplemental Information (Supplemental data – Tier 3)

- Additional personal information (e.g., medical records)
- Vehicle/Structural Information (e.g., make & model of vehicle, number of occupants, speed and delta force change in speed at the time of incident, etc. For a structure it could be floor plans, fire hose connections, etc.)
- Other Pertinent Information (e.g., high crime area, dangerous animal, type of suspected biochemical substance, etc.)

2.5 Connectivity Considerations

This section provides information that the AHJ and/or the PSAP may need to know from manufacturers/providers of devices & sensors.

2.5.1 Connectivity Protocols

NENA's i3 architecture specifies protocols to be used by devices and sensors to interface with the PSAPs. The AHJ should use these protocols for any such devices. If the AHJ elects to permit interconnection of non-compliant devices, they will need to work with those vendors/manufacturers to accommodate such interconnection.

2.6 Design Considerations

The provider should provide information on the design and information flow of their product. A key issue is that interfacing with the product should not negatively impact the daily work flow of the telecommunicators.

2.7 Security Considerations

The provider should provide information regarding security measures to ensure there is no degradation of security with the implementation of the new technology.

2.8 Error Reporting Considerations

The provider should provide processes to report errors, misuse and security breaches. The provider should also affirm that they have the capacity to notify the PSAP regarding errors found or reported to the provider.

2.9 Operational Testing Considerations

The provider should provide or accept a plan for operational testing of their product, under the coordination of the 911 AHJ. This plan should include:

- Scheduling
- Verification
- Tests to be conducted (including the ability to pause testing due to events)
- Expected results
- Test acceptance

The above items are typically needed in any testing regimen. There could be other items to include depending on local practices and/or specific needs of the device or sensor.

2.10 Accessibility Considerations

- Can the device initiate a 9-1-1 call on behalf of the deaf, hearing impaired or speech impaired?

2.11 Public Education Considerations

- The device providers are encouraged to provide owner guides and device manuals to the device owner so they understand the interface with 9-1-1.
- The device providers are encouraged to make owner guides and device manuals available to the AHJ for training of personnel.

3 Impacts, Considerations, Abbreviations, Terms, and Definitions

As advances in technology allow devices and sensors to integrate with PSAPs, it will become incumbent upon the AHJ to understand the potential operational impacts involved. Managing expectations of citizens, telecommunicators and emergency responders, training, policy implications and human resources issues must be addressed to best prepare for and deploy new technology into the PSAP.

3.1 Operations Impacts Summary

Devices and Sensors will have operational implications which every AHJ and/or PSAP should address. Those may include:

- **Training**

Device manufacturers are strongly encouraged to create training material for the PSAP. The AHJ will need to determine for their own personnel what if any training or continuing education is required.

- **Policies and Procedures**

Policies and Procedures should be reviewed and updated as required to include devices and sensors into the operations documentation used within the AHJ and/or PSAP.

- **Communications**

The AHJ and/or PSAP should develop a communications plan to inform all Public Safety stakeholders about how various devices and sensors will interface with the PSAP, so that they understand the impact on them.

- **Redundancy/Contingency Planning**

As expectations regarding devices and sensors increase, the AHJ and/or PSAP should ensure that their Contingency Plans incorporate redundancy or a plan for operational degradation.

- **Emergency Responders**

Prior to implementation, communications about device and sensor installations should occur with the involved emergency responders. Communications and planning should include changes in AHJ and/or PSAP policy and procedures and any changes in information flow.

3.2 Technical Impacts Summary

Technical impacts are beyond the scope of this document. If NENA determines that technically oriented documentation is needed to set requirements or establish standards for the use of devices and sensors for emergency services that will be accomplished in subsequent NENA work activity.

3.3 Security Impacts Summary

See section 2.7 above

3.4 Recommendation for Additional Development Work

The NENA PSAP Operations Committee, Devices & Sensors Working Group recommends further standards development work for devices not already covered under the i3 architecture e.g., bio-sensors, etc.

3.5 Anticipated Timeline

Deployment of devices and sensors for emergency services purposes are expected to take place as the commercial and public safety sectors embrace the value that such technology can bring to enhancing the telecommunicators' ability to efficiently handle emergency situations.

3.6 Cost Factors

Potential cost factors include staff time for testing and training. Having standardized processes in place may further reduce cost factors.

3.7 Cost Recovery Considerations

It is expected that normal public and private sector business funding streams will constitute the cost recovery mechanism for the introduction of devices and sensors for emergency services purposes. The authoring group does not foresee any new cost recovery mechanisms specific to the introduction of devices & sensors into the realm of emergency services.

3.8 Additional Impacts (non-cost related)

Based on the original analysis of the authoring group, the information contained in this NENA document is expected to have PSAP operations impacts as devices and sensors begin to be deployed for emergency services purposes.

3.9 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.

Term or Abbreviation (Expansion)	Definition / Description
9-1-1 Authority	A State, County, Regional or other governmental entity responsible for 9-1-1 service operations. For example, this could be a county/parish or city government, a special 9-1-1 or Emergency communications District, a Council of Governments or other similar body. Also known as Authority Having Jurisdiction (AHJ), 9-1-1 Governing Authority, 9-1-1 Administrator

ALI (Automatic Location Identification)	The automatic display at the PSAP of the caller's telephone number, the address/location of the telephone and supplementary emergency services information of the location from which a call originates.
ANI (Automatic Number Identification)	Telephone number associated with the access line from which a call originates.
ATIS (Alliance for Telecommunications Industry Solutions)	A U.S.-based organization that is committed to rapidly developing and promoting technical and operations standards for the communications and related information technologies industry worldwide using a pragmatic, flexible and open approach. Please refer to: http://www.atis.org/
CBN (Call Back Number)	A number used by the PSAP to re-contact the location from which the 9-1-1 call was placed. The number may or may not be the number of the station used to originate the 9-1-1 call.
ESCO (Emergency Service Central Office)	The information delivered to the PSAP when there is an ANI failure between the end office and the 9-1-1 Control Office. When ANI is not available, the 9-1-1 call is default routed and the ANI display at the PSAP will be "911-0TTT" (or 911-TTTT) with TTT identifying the incoming trunk group.
ESN (Emergency Service Number)	A 3-5 digit number that represents one or more ESZs. An ESN is defined as one of two types: Administrative ESN and Routing ESN (Refer to definitions elsewhere in this document.)
ESN (Electronic Serial Number)	An Electronic Serial Number is a code created to identify mobile devices.

IMEI (International Mobile Equipment Identity)	IMEI (International Mobile Equipment Identity) is a 15- or 17-digit code that uniquely identifies mobile phone sets. The IMEI code can enable a GSM (Global System for Mobile communication) or UMTS (Universal Mobile Telecommunications Service) network to prevent a misplaced or stolen phone from initiating calls. whatis.techtarget.com/definition/IMEI-International-Mobile-Equipment-Identity
NSI (Non-Service Initialized) (as in phones)	A mobile device for which there is no valid service contract with any CMRS provider. As such, NSI devices have no associated subscriber name and address, do not provide a call-back number, and may not provide location.

PSAP (Public Safety Answering Point)	An entity responsible for receiving 9-1-1 calls and processing those calls according to a specific operational policy. **Variations:** **Primary PSAP:** A PSAP to which 9-1-1 calls are routed directly from the 9-1-1 Control Office. **Secondary PSAP:** A PSAP to which 9-1-1 calls are transferred from a Primary PSAP. **Alternate PSAP:** A PSAP designated to receive calls when the primary PSAP is unable to do so. **Consolidated PSAP:** A facility where one or more Public Safety Agencies choose to operate as a single 9-1-1 entity. **Legacy PSAP:** A PSAP that cannot process calls received via i3-defined call interfaces (IP-based calls) and still requires the use of CAMA or ISDN trunk technology for delivery of 9-1-1 emergency calls. **Serving PSAP:** The PSAP to which call would normally be routed. **NG9-1-1 PSAP:** This term is used to denote a PSAP capable of processing calls and accessing data services as defined in NENA's i3 specification, NENA-STA-010, and referred to therein as an "i3 PSAP".

4 Recommended Reading and References

[1] NENA Master Glossary of 9 1 1 Terminology, NENA-ADM-000
[2] APCO/CSAA ANS 2.101.1-2008 - Automated Secure Alarm Protocol (ASAP) (Formerly Alarm Monitoring Company to Public Safety Answering Point (PSAP) Computer-Aided Dispatch (CAD) External Alarm Interface Exchange)
[3] APCO Recommended Best Practices For PSAPs When Processing Vehicle Telematics Calls from Telematics Service Providers (07-17-2012)
[4] NENA TID 07-504 Automatic Collision Notification and Vehicle Telematics Technical Information Document (06/01/07) Pg. 20 -2.4.2 Vehicle to PSAP Communications

[5] NMRI – National Mayday Readiness Initiative (2000)
https://www.fhwa.dot.gov/pressroom/fhwa0048.cfm
[6] OASIS – Organization for the Advancement of Structured Information Standards
https://www.oasis-open.org/org
[7] NENA-STA-010, NENA i3 Standard for Next Generation 9-1-1

5 Exhibits

Not Applicable

6 Appendix

Not Applicable

ACKNOWLEDGEMENTS

The National Emergency Number Association (NENA) PSAP Operations Document Review Working Group developed this document.

NENA Board of Directors Approval Date: 08/05/2013

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

Members	Employer
Wendi Lively ENP, PSAP Operations Committee Co-Chair	Spartanburg, SC
April Heinze ENP , PSAP Operations Committee Co-Chair	INdigital Telecom
Tom Breen ENP, Technical Editor	Comtech Telecommunications Corp.
Lisa Dodson ENP	TriTech Software Systems
Anthony Ellis	Voigt Industrial Electronics LLC
Tammy Smith	Ottawa County MI
Michael Smith	Equature/DSS Corp.
Chris Carver ENP	NENA

Special Acknowledgements:

Delaine Arnold, ENP, Committee Resource Manager, has facilitated the production of this document through the prescribed approval process.

The PSAP Operations Document Review Working Group is part of the NENA Development Group that is led by:

- Pete Eggimann, ENP, and Jim Shepard, ENP, Development Steering Council Co-Chairs
- Roger Hixson, ENP, Technical Issues Director
- Chris Carver, ENP, PSAP Operations Director