FirstNet and Next Generation 9-1-1

High-Level Overview of Systems and Functionality

FINAL REPORT

June 29, 2015

National Public Safety Telecommunications Council

Purpose:

This document has been prepared by the National Public Safety Telecommunications Council (NPSTC) to provide an overview of the similarities and differences, and interconnectivity between the Nationwide Public Safety Broadband Network (FirstNet) and Next Generation 9-1-1 networks (NG9-1-1).

Background:

When properly designed and implemented, NG9-1-1 systems and FirstNet will complement each other in multiple ways and will provide public safety with a broad range of new capabilities. The intent of this document is to better describe the capabilities of, and identify the interconnectivity between, NG9-1-1 systems and FirstNet.

In general, Public Safety Answering Points (PSAPs) will receive incoming calls for help via text message, voice call, or other messaging format which may include attached data such as pictures or video. Data calls to the PSAP may also be generated from machines and sensor systems including automatic crash notification (ACN), break-in alarms, and body health monitors. This data must be accepted and processed by the PSAP. In some cases, all of the data received will be transmitted to the first responder without any review or analysis. This may include one or more pictures of a vehicle crash or house fire, and ACN data burst, or a picture of a robbery suspect.

In other cases, the data may be reviewed/edited/repackaged by the PSAP before being transmitted to first responders. This may require the Public Safety Telecommunicator to identify the single best picture of the incident (from all that are received) and only transmit that image to the first responder. Data information is transmitted to the first responders via the FirstNet broadband network. This may include Computer Assisted Dispatch (CAD) dispatch messages, NG9-1-1 data, and other files and documents.

The diagram below illustrates the high-level conceptual call flow of an emergency incident. It is generic in nature by design. The caller or machine originates an emergency call (e.g., 9-1-1) and information about the call, the caller, and the location are transmitted to the PSAP. As with current 9-1-1 systems, there are two types of location data. The initial, or call routing data, obtained in short order is used to determine which PSAP the call should route to. In addition to this initial location information, the caller's number, call type (e.g., wireless, wireline) and other available data are also transmitted.

In concert with this initial routing determination, other additional data elements are queried to provide additional data to the PSAP. This data may include, but is not limited to, enhanced location (Phase II) information, premises/building information, or other data elements that may be present regarding the caller, location, or specifics related to the call. This is achieved through the use of additional data tools which are not displayed below, including the Emergency Incident Data Document, the Location Server, and various databases which are included in the NG9-1-1 design.

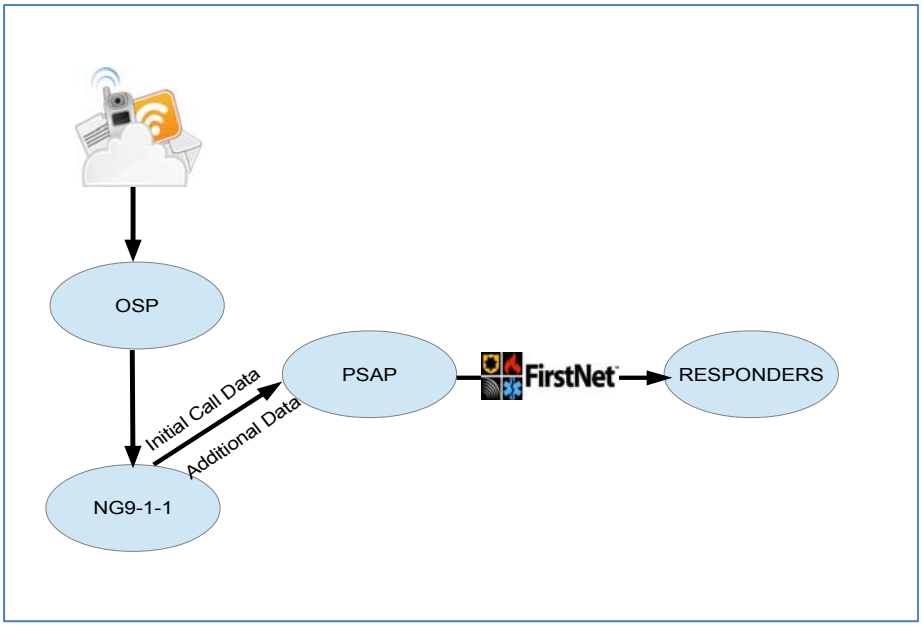

Figure 2: Incident Call Flow

The type of information is dependent upon where information is determined. For example, the Originating Service Provider (OSP) network may determine the location. The OSP network may also have additional information that has been pre-provisioned and may insert a link to that information in the call request. As the call progresses, the information in the call record is used to deliver the additional data to the appropriate PSAP. Other sources of additional data can also be available. As the PSAP triages the call it may retrieve this additional data as required. The Public Safety Telecommunicator may also collect additional information about the incident.

Once the Telecommunicator processes the initial call, a record is generally created containing the pertinent details and the call is ready for dispatch. The dispatcher will utilize a combination of CAD and radio resources to relay information to the appropriate responder resources. In the case of a NG9-1-1 enabled PSAP which is also FirstNet capable, the FirstNet system would be used to relay the appropriate data, which may include text, pictures, and video, to the responding units. FirstNet also enables the use of various applications (apps) to assist both the PSAP and the responder in sharing data. In this way NG9-1-1 and FirstNet systems are highly complementary and both are required to ensure a seamless flow of information from the public, to the PSAP, to the responders. Additionally, the use of both systems ensures multi-media capabilities throughout the entire call process.

The following information provides a high-level overview of the two networks.

NG9-1-1 System Features:

- Requires the creation of a public safety IP network, called an “Emergency Services IP Network” (ESInet).
    - Can support NG9-1-1 services and other public safety oriented applications.
    - Is not specific to NG9-1-1, but requires a network with backhaul capability connecting call and data originators and various PSAPS, as well as other entities that need to receive calls or data about calls (examples could be EOCs, trauma centers, Coast Guard, etc.). The ESInet requires network connectivity to wireless, wireline, and Voice over Internet

Protocol (VoIP) telecommunications provider networks, behind which are the cellular service tower itself, Wi-Fi, Bluetooth, and other originating service devices.
    - Provides network route for 9-1-1 caller voice and data (metadata, images, and video) to the appropriate PSAP
    - Provides interface capability to hand off 9-1-1 call data to CAD systems supporting PSAPs.
    - Is not intended to provide wireless connectivity to public safety first responder units.

- NG9-1-1 Core Services (software applications level)
    - Performs the actual 9-1-1 call routing control process
    - Provides ability to share 9-1-1 caller voice and data between multiple PSAPs.
    - Provides ability to control 9-1-1 call flows and to dynamically rearrange NG9-1-1 call routing zones.
    - Other additional data sources can be connected to the NG9-1-1 system, such as call, caller, or data providers needed for access by PSAPs or other entities.

FirstNet Network Features:

- Provides public safety grade connectivity from PSAPs to and between first responder's resources.
- Provides secure network access for first responders to public safety agency systems and interfaces including Computer Assisted Dispatch [CAD]; local, state, and federal criminal justice databases [e.g., National Crime Information Center (NCIC)]; and other databases and resources, including Records Management Systems (RMS).
- Provides network connectivity between public safety agencies (wired and wireless network access to systems, interfaces, and databases).
- Allows wireless and wired access to agency and FirstNet applications and services.
- Provides support for voice, data, and video services to public safety agencies and first responders.
- Uses a wireless IP network which also has the same technical features of the aforementioned ESInets thus facilitating interoperability and redundancy between public safety agencies.

Draft Flowchart Showing Connection between the Various Networks:

- Telephone company provider network sends 9-1-1 emergency call from wireline, wireless, VoIP network into the NG9-1-1 service system via ESInet(s).
- NG9-1-1 systems on the ESInet send the 9-1-1 call to correct PSAP and allow sharing of 9-1-1 call data with other PSAPs.
- 9-1-1 call data is transferred to public safety agency network and into automated systems (e.g., CAD system) via interface (red/green arrows).
- Call Taker/Dispatcher completes call (generally CAD or a combination of CAD, NG9-1-1, and radio console systems), accessing remote databases and files as necessary.
- Automated systems in the PSAP transmit the emergency call to first responders via FirstNet, which routes the secure data to first responders via voice or data transmission.

- The emergency call may be sent through a FirstNet wired connection (to another agency) or over the FirstNet Radio Access Network (RAN) to the responding public safety vehicle.
- First responders can communicate between themselves and also access remote databases connected through FirstNet. These may include data sources from both NG9-1-1, local, state, and federal systems.

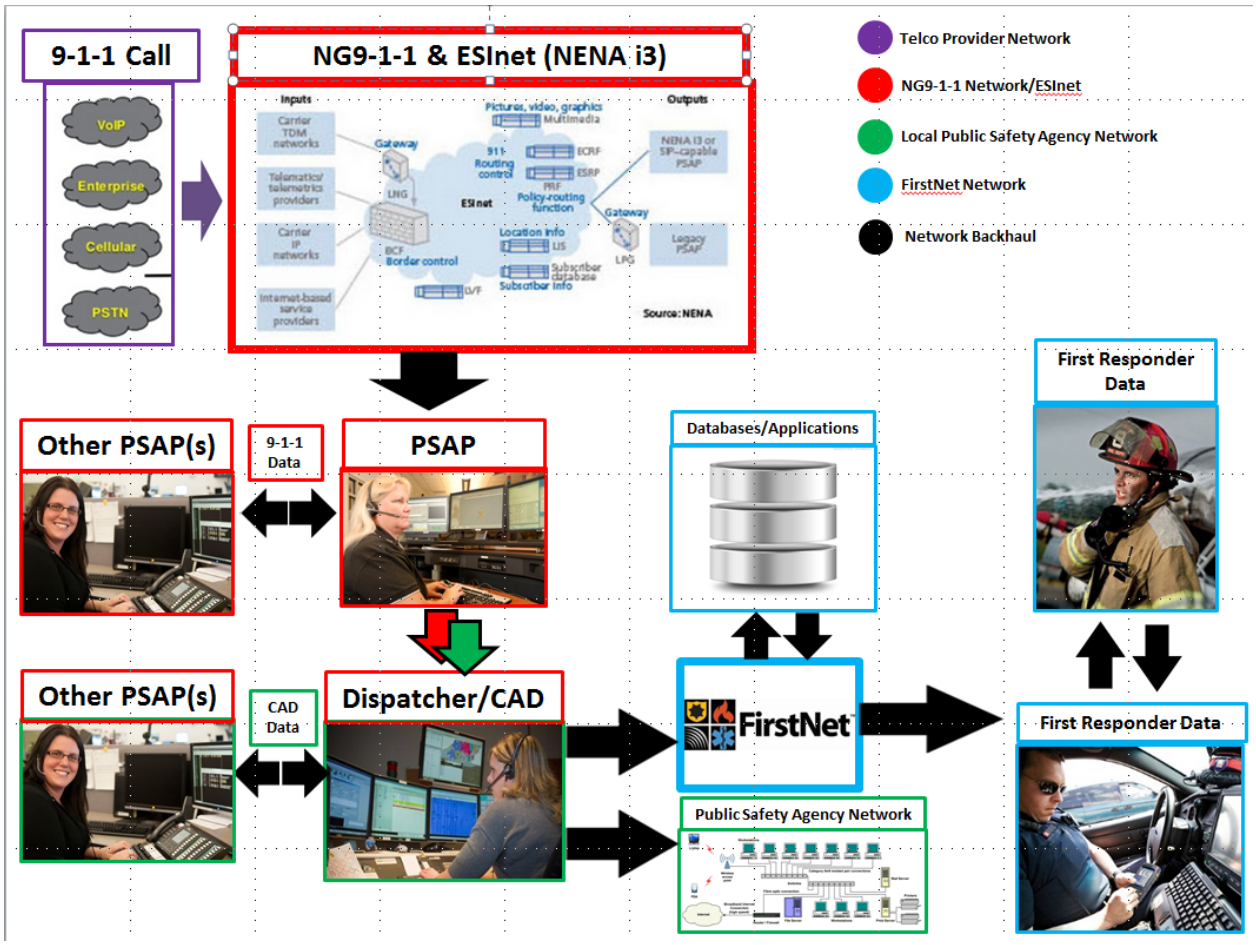

Figure 2: Connection Between Networks

* This diagram shows one example of an implementation. FirstNet wired network connections may also provide for interoperability between different PSAPs and public safety agencies in addition to their wireless broadband network.

Network Demarcation:

In general, the NG9-1-1 system deals with the call from its origination through its arrival and processing at the PSAP. The FirstNet system is designed to take call information from the PSAP, via the agency network, and distribute it to first responders. There are many options for how data is managed as it crosses from the NG9-1-1 network into the public safety agency network and then out to first responders via the FirstNet system. The following demarcations exist:

- Carrier network to the NG9-1-1 Network.
- NG9-1-1 network to the local public safety agency network/PSAP.
- Local public safety agency network to the FirstNet network.

The demarcations may require data standardization. For example, a CAD system must be programmed to accept a standardized NG9-1-1 data stream. Other demarcations may be used only to pass IP traffic to the next network. For example, a public safety agency's CAD system may send an IP message through FirstNet to a fire truck's mobile data terminal.

Interworking Between NG9-1-1 and FirstNet

Once the PSAP has received and processed the initial call, they will continue to obtain additional information that will be useful to the first responders. There are several ways that information may be communicated:

- Information may be pushed from the PSAP (e.g., from CAD) to the first responders.
- The PSAP may push links (e.g., URLs) to the first responders and then the first responders use those links to query for information from the appropriate databases.
- The first responders may verbally request information and the PSAP may then respond by sending that specific information or links that may be used to access the information.

By design, both the NG9-1-1 and FirstNet networks have security, interoperability, and connectivity requirements that can be met by a combination of means. Standards work is ongoing to ensure that these separate networks can communicate with each other. This includes IMS-based [IP Multimedia System] networks, such as those upon which FirstNet is based, and NG9-1-1 networks.

In addition to this standards work, there are a number of existing resources that describe the data flows and interoperable capabilities of NG9-1-1 and FirstNet systems:

- "Detailed Functional and Interface Standards for the NENA i3 Solution". The National Emergency Number Association (www.NENA.org)
- "Next Generation 911 (NG911) Standards Identification and Review". The National 911 Program Office (www.911.gov)
- "FirstNet Statement of Objectives Document". First Responder Network Authority (www.FirstNet.gov)