



Next Generation 9-1-1 What's Next Forum

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Before 9-1-1

Contacting emergency services pre-1970's

Box Alarms

1

Since most people didn't have a phone in their home until the early 1900's, citizens used "box alarms," often on street corners, to notify the fire department.

Operator-Assisted

2

Some 40-50 years later, with home telephones ("landlines") readily available, the police could be called "directly" (but often through an operator).

Advent of 9-1-1

3

The very first 9-1-1 call was made in Haleyville, Alabama on February 16, 1968. 9-1-1 provided an easy-to-remember, three-digit phone number that would connect the caller to the police.

Today's 9-1-1

Progress since 1968

Late 1960's – 1970's

9-1-1 is established across the U.S., starting mostly with urban areas.

1980's

9-1-1 was upgraded to Enhanced 9-1-1 (E9-1-1)* which provided the caller's telephone number and address

1990's – Present

E9-1-1 was upgraded to support calls from wireless devices and Voice over Internet Protocol (VoIP) devices.

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207
(585) 522-3428 07:35:01 07082010
Doe, John & Jane
150 RESD
Chili Ave

Rochester NY
Bldg Unit Flr
ESN=325 MTN:585-522-3428

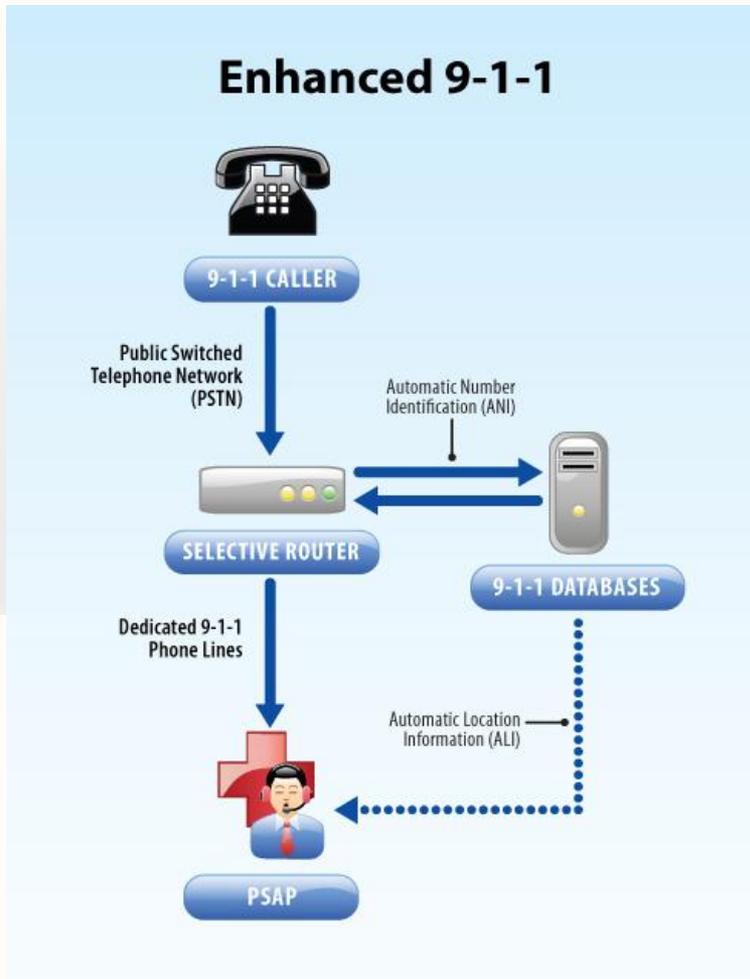
ROCHESTER PD
ROCHESTER FIRE
ROCHESTER FIRE
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Sample E9-1-1 Screen

** E9-1-1 delivers Automatic Number Identification and Automatic Location Information (ANI/ALI)*

Today's 9-1-1 – Wireline Call

(traditional, fixed location callers)



- Dialing 9-1-1 is more than just being connected to a 9-1-1 emergency call taker...
- The phone system routes your call based on predefined data
- The 9-1-1 system looks up the location (ALI) of the phone number (ANI) in a 9-1-1 database built from a “Master Street Address Guide” or MSAG
- ANI/ALI is immediately forwarded to the call taker at the public safety answering point (PSAP – also known as a “9-1-1 Center”)

Today's 9-1-1 – Wireless Call

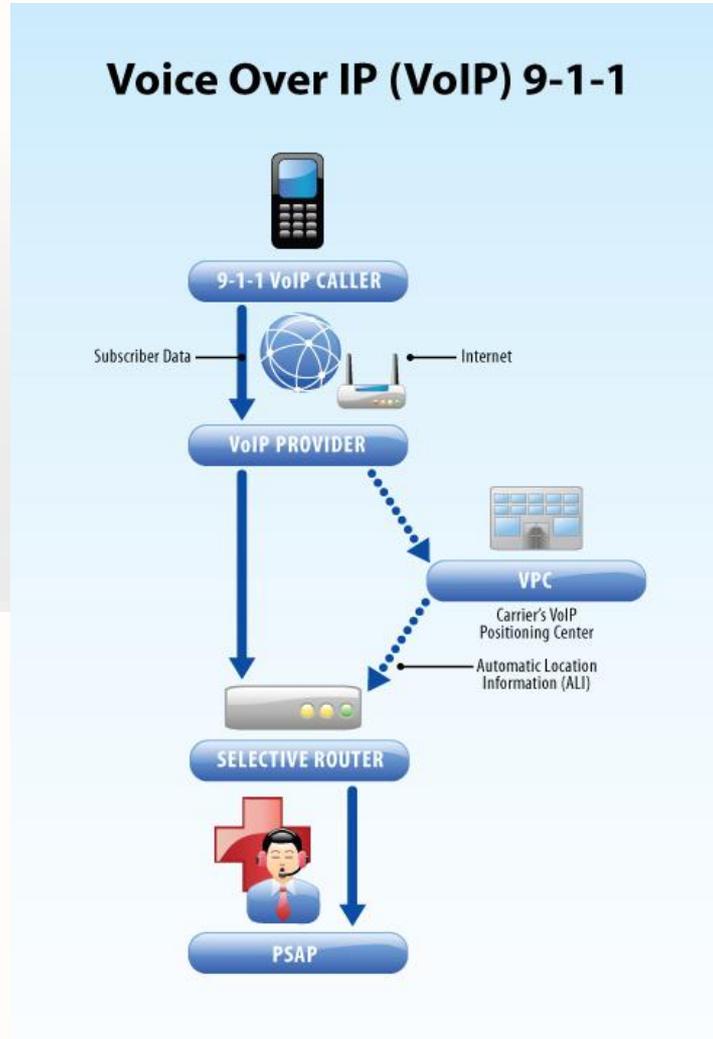
(wireless users, potentially-changing location)



- Wireless 9-1-1 is a bit more complicated, requiring the wireless service provider to locate the caller using either a GPS chip embedded in the phone, or cell phone signal power and triangulation between multiple cell phone towers.
- Somewhere between 33% and 50% of all 9-1-1 calls made today are wireless calls.
- 95% of PSAPs currently have some “Phase II Wireless” ability (wireless location accuracy to 50-300 meters).

Today's 9-1-1 – Voice over IP Call

(Internet-based users, user-supplied location)



- Voice over IP (VoIP) callers use a process that is similar to wireless 9-1-1, however the VoIP user typically must pre-define the location.
- Some VoIP services (e.g., Skype and Google Voice) do not offer 9-1-1 services.
- A recent FCC report indicated some 23 million VoIP subscribers as of June 2009 (up **10%** in the just the first 6 months of 2009).
- Locating VoIP callers can be problematic, especially if the device is moved without the subscriber updating their location.

The Need for Next Generation 9-1-1

Today's 9-1-1 system is being outpaced by emerging technologies

- 1 Constant adaptation of legacy 9-1-1 is expensive and slow
- 2 New communications technologies need “plug and play” access and interfaces
- 3 Growing data rich environment (that today's 9-1-1 can't handle)
- 4 Need data bandwidth, modernized network (IP), open standards
- 5 Need a more flexible and easily controlled 9-1-1 system
- 6 Need nationwide and beyond intercommunication, including other emergency services (transportation operations, emergency management, etc.)
- 7 Post transition, NG9-1-1 can be significantly more efficient (and likely less expensive to implement new features)

Features of a Next Generation 9-1-1 System

What is NG9-1-1? What will NG9-1-1 do?

Includes Legacy Features

Fully replaces E9-1-1 while retaining the capabilities, services, and functionality in place today

Supports New Technologies

Adds capabilities to support new types of originating service providers and flexibility to manage calls / share costs

Enhances Interoperability

Add capabilities to better integrate and interoperate with emergency entities beyond the PSAP (e.g., data sharing)

NG9-1-1 is a system of 9-1-1 services and databases that run on an Emergency Services IP Network (ESInet)

Sometimes referred to as a “system of systems” or “network of networks”

Today's 9-1-1 vs. NG9-1-1

NG9-1-1 improves capabilities for all stakeholders

9-1-1 CAPABILITY	E9-1-1	NG9-1-1
Voice Calls	Yes	Yes
Transfer Misrouted Calls	Limited Capability	Yes
Location Delivered with Calls	No	Yes*
Policy Based Call Routing	Managed by E9-1-1 SSP	Managed by 911 Authority
Text/Multimedia	No	Yes*
Additional Data	No	Yes*
Data Sharing Across Regions	No	Yes
Data Sharing with Responders	Limited Capability	Yes
Virtual PSAPs	Limited Capability	Yes
Standard IP Interfaces	No	Yes

** These services require next generation originating networks as well as NG9-1-1*

Typical Emergency Response

NG9-1-1 provides an opportunity to enhance the entire encounter



Enhanced Routing Abilities

Geographic-based data provides the ability to route callers faster and with more accuracy.

Flexible PSAP Call Handling

Better and more useful forms of information, give PSAPs options on how best to manage calls.

More Coordinated Response

Increased sharing of data, resources, procedures, and standards, improves a response.

Next Generation 9-1-1 System Technologies

How will it work? What are the components of NG9-1-1?

Multimedia Devices

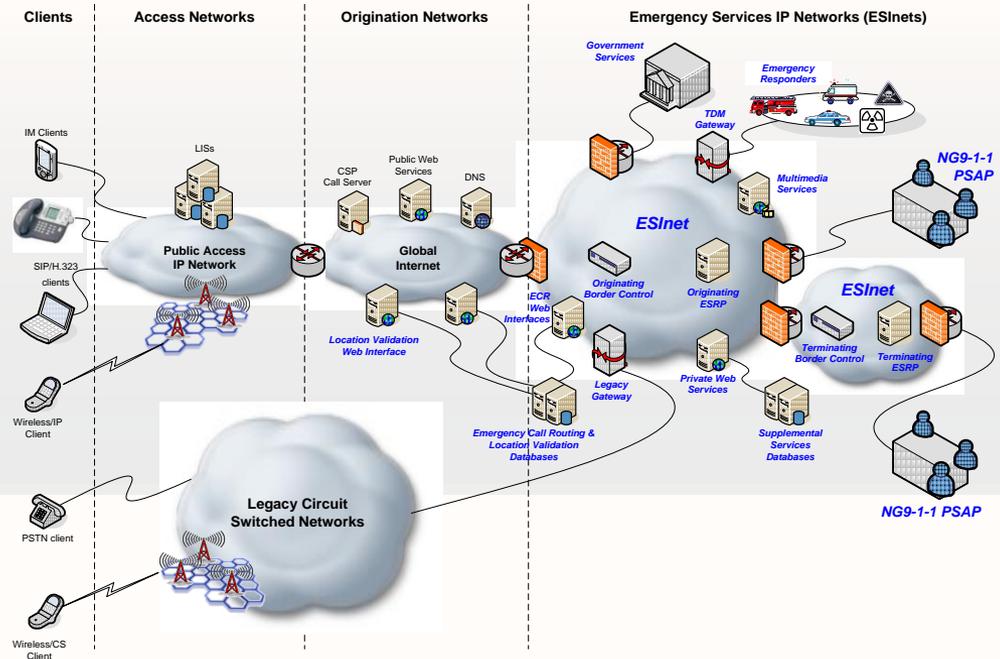
Includes traditional “wireline”, wireless, VoIP and other “clients” connecting to access/originating service providers.

Access/Originating Networks

A mix of public and private networks that deliver requests for 9-1-1 to the most appropriate ESInet.

Emergency Services IP Networks

Provides a secure gateway and routing of all inbound 9-1-1 calls and delivers them to the most appropriate PSAP.



NENA Functional and Interface Standards for Next Generation 9-1-1 Version 1.0 (i3)

NG9-1-1 System Design Characteristics

NG9-1-1 is being designed with the future in mind

Standardization

1

Employing consensus-based open standards is essential to achieve national interoperability and to share data among geographically dispersed PSAPs and other responder agencies.

Non-Proprietary Technologies

2

The NG9-1-1 system relies on commercial off-the-shelf (COTS), open source, and common telecommunications and networking products used throughout the industry.

Key Mission-Critical System Engineering Design Features

3

NG9-1-1 is designed to provide: scalability (sized to fit/expandable), extensibility (supports future technologies), reliability (able to withstand failures), and configurability (meet diverse needs).

New Capabilities in NG9-1-1

Improved interoperability and responder data sharing

A “Simple” Accident

Everyday across the U.S., there are over 15,000 motor vehicle accidents. Frequently there will be no initial reports of injury and a police officer is dispatched to take a report. When the unit arrives, the initial situation can sometimes escalate into something else. Perhaps there is a fuel spill and the fire department must respond. Then, moments later, one of the occupants collapses and needs immediate medical care. And, of course, the accident occurred right before the start of the rush hour. Now, with all the drivers slowing down to “take a look” at all the commotion, the first officer on the scene has a much different situation to deal with.

Making Quicker, More Accurate Data Available

With NG9-1-1, the ability to share data across the emergency responder community is significantly improved. The first alert of an accident arrives thanks to a speed sensor, instead of a traditional 9-1-1 call. Video from the police officer’s dash camera or a nearby traffic camera alerts a dispatcher to upgrade the response and modify the recommended route that responding emergency vehicles take. The Traffic Operations Center is automatically alerted and dynamically changes traffic signal timing to help ease congestion. The responding HAZMAT team can start assessing the scene prior to their arrival and acquire real-time weather data.

New Capabilities in NG9-1-1

Improved reliability and availability of PSAPs

Catastrophic Weather

In 2005, Hurricane Katrina devastated 9-1-1 call centers across the Gulf Coast region, rendering **38** of them inoperable. **When storm victims tried to call for help, their calls went unanswered.** Today's 9-1-1 systems are connected to physical operations centers and often have limited, if any, ability to restore service beyond an affected area. Some jurisdictions have a stand-by facility, which is typically located within their service areas. However, situations affecting a primary operations facility often affect its backup facility, rendering it useless during an evacuation scenario.

PSAP Reliability in NG9-1-1

With NG9-1-1, the physical location of an emergency call center is no longer a limiting factor. 9-1-1 callers are rerouted quickly and automatically around areas affected by any hazard situation, ensuring that callers can still access 9-1-1 when they call for help. NG9-1-1 provides additional options for call handling, congestion control, and system reliability and recovery. Overflow situations are handled through sharing of resources instead of a busy signal. Additionally, mobile PSAPs can be deployed quickly to allow for recovery when a facility is damaged.

New Capabilities in NG9-1-1

Support for text-based communication methods

Texting 9-1-1

In 2007, the shootings on the campus of Virginia Tech resulted in the deaths of 32 people and injuries to dozens more, during a rampage that shocked the nation. When students and faculty (comfortable with today's wireless phone technologies) tried to "text 9-1-1", those text messages went nowhere. Using decades-old technology, virtually all of today's 9-1-1 centers are not capable of receiving text messages, even though consumers send a staggering **5 billion** text messages *per day*. The ability to send text messages would also help the deaf and hearing-impaired community communicate directly with 9-1-1.

PSAPs Support Non-Voice Communication

NG9-1-1 is designed to accept various forms of multimedia data, including text messages, from callers unable to make a voice 9-1-1 call. Although with today's technology there are some limiting factors, most notably the ability to automatically acquire the location of the sender. NG9-1-1 supports "real-time texting" which is similar to a character-by-character instant message chat. The entire conversation can be shared with responders as it occurs. In a barricade situation, the data that victims share with 9-1-1 would be forwarded to the mobile command post that can guide the SWAT entry teams with critical "inside" information.

New Capabilities in NG9-1-1

Improved location determination methods

Voice over IP (VoIP) Challenges

Using the Internet to make a phone call is simple and easy (and often less expensive) and has become commonplace for many people. However a family from Maryland vacationing at their summer home in the Adirondack Mountains didn't anticipate the problems caused by taking their Internet-based VoIP phone adapter with them when they needed to call 9-1-1. Instead of being answered by a 9-1-1 call taker in New York State, the call was routed based on their provider's records that they were in their home in Maryland.

Location Provided With NG9-1-1 Call

With NG9-1-1, the caller's location is part of the call stream and was used to properly route the call to the most appropriate PSAP. As new "location aware" devices become more common in the access and originating networks, the onus to identify a VoIP caller's location no longer resides with the user to self-provision. Instead, advanced features within the network are used to help locate the caller quicker and with more accuracy.

New Capabilities in NG9-1-1

Enhanced call routing capabilities

Handling a Non-Local Caller

One day, when chatting with an elderly parent who lives out-of-state, an audible thump was heard over the telephone line. Fearing the worst, the son called out several times, but there was nothing else heard. Calling 9-1-1 to get help for his ailing parent was frustrating and took time, because neither he or his local 9-1-1 center had an easy way to contact help several states away. Although help finally arrived, the outcome was worse due to the time delay.

NG9-1-1 Integrates PSAPs Nationwide

NG9-1-1 supports the routing (and rerouting of callers beyond traditional jurisdictional boundaries (e.g., between cities, counties, and sometimes within a state). Using GIS data as the fundamental basis of NG9-1-1, call takers will input the location of the emergency and the NG9-1-1 system will redirect the caller **and all associated data**, to the most appropriate PSAP for that location.

New Capabilities in NG9-1-1

Data leveraged to provide language translation quicker

Non-English Speaking Callers

When calling 9-1-1, an excited caller reverts back to their native language and starts talking to the 9-1-1 call taker, who only understands English. Following procedure, the call taker conferences in a translator and after a few moments was able to get an appropriate translator on the line to help ask the caller questions and obtain the needed information. Today's 9-1-1 centers regularly rely on translation services for non-English-speaking callers. While this method is generally workable, it takes time to initiate and does not consider what language capabilities might internally exist within the 911 center.

NG9-1-1 Uses Handset-Based Data

NG9-1-1 can take advantage of data that is currently unknown to today's 9-1-1 systems. By using the language preference of the caller's phone, as the 9-1-1 call is made, the system identifies the need for language translation. The call is routed to a call taker that can communicate in the caller's native tongue (eliminating the need for translator). If a call taker is not available, the language translation service can automatically be "conferenced in" to the call, at the time the call is answered.

New Capabilities in NG9-1-1

Telematics data speeds a more appropriate response

Automatic Crash Notification

Early one morning while travelling along a scenic highway in rural Idaho, a family of four is returning from attending a sporting event. Unfortunately, the driver is exhausted and falls asleep at the wheel. The vehicle leaves the roadway, careens down an embankment (and out of view) and comes to rest at the bottom of a ravine. The occupants are seriously injured and trapped in the vehicle. Luckily, their vehicle is equipped with an automatic crash notification system and a call is made to the telematics service provider.

Telematics-Based Response Decisions

With NG9-1-1, vehicle sensor data is automatically and electronically transmitted to the most appropriate PSAP. The vehicle's GPS location is used to route the call and identify where to send responders. Specific details about the accident (speed of the vehicle, airbag deployment, and "delta-v" [the change in vehicle velocity]) are used as inputs to the injury risk prediction algorithm. The predictive model gauges the likelihood of serious injuries to the vehicle occupants. Additionally, physical descriptive details (make, model, color, etc.) are provided to responders.

New Capabilities in NG9-1-1

Video-based calling provides access for the deaf/hearing-impaired

Limited Access to 9-1-1 for Deaf Callers

While eating lunch at a local outdoor cafe, a deaf citizen notices a suspicious person enter a bank nearby. Without a TDD (Telecommunications Device for the Deaf) handy, he is unable to call 9-1-1 directly and report the situation. Suddenly, the bank doors burst open and the suspicious person runs out, carrying what appears to be a bank bag. Using his smartphone, the citizen quickly records the suspect and his vehicle on video. Once police officers respond and secure the scene, the citizen is finally able to get an officer's attention to share the video evidence with them. However, the officer is unable to do anything with the recorded video.



NG9-1-1 Accepts Multimedia Calls

NG9-1-1 accepts multimedia data (voice, video, images, text and data) as part of the call. Deaf and hearing-impaired callers can call 9-1-1 directly with NG9-1-1 and the system recognizes that a deaf person is initiating a video call, in order to conference in a sign language interpreter. A 3-way conversation is established and the call taker is able to see the video of the scene. If the caller had been on the phone with 9-1-1 at the time the suspect ran out, 9-1-1 would have been able to see that in real time. Video (or still images) received by the PSAP is forwarded to the responding officers, giving them a better chance to apprehend the perpetrator,

New Capabilities in NG9-1-1

Responder coordination improved with increased access to data

Missing Person Report

A father is watching his child enjoying a ride on a carousel. Dad gets distracted by his infant son, only for a moment...The ride is over and dad starts looking for his child. However, the child is gone from view. Missing. Every day, across the U.S., more than 2,000 children (younger than 18) are reported missing. After a brief and frantic search, the father's first response is to get help – by contacting 9-1-1. The call taker takes down basic information and dispatches a police officer. Officers respond and confirm that the child is missing and requests additional resources. Much time has passed already and a search has yet to begin.

Data Sharing Across Multiple Disciplines

Upon receiving a call for a missing person, NG9-1-1 can receive a picture of a missing child and distribute it to all users (not just police) via mobile computers, smart phones and email. Leveraging the power of a mass notification system, the PSAP can alert citizens to details of the missing person, along with a picture. Data is shared with other agencies, such as the Traffic Operations Center, so that variable message signs (VMS) can be updated based on an authorized AMBER Alert activation. The PSAP helps coordinate search parties, requesting additional resources, such as a state police helicopter and the search and rescue and K-9 teams.

New Capabilities in NG9-1-1

NG9-1-1 supports high volume call management techniques

Spike in Inbound Calls

With the proliferation of cell phones, when there is a multiple vehicle accident on I-95, a significant uptick in 9-1-1 calls occurs when multiple witnesses all call for help simultaneously. The PSAPs normal hourly call volume occurs in the span of 5-10 minutes, resulting in a short-term strain on 9-1-1 and simply not enough resources to answer every call in a timely manner. Some callers don't even get through and all they hear is "all circuits are busy" message. Those that are able to get through hear the phone ring and ring, seemingly never to be answered and many hang up in frustration (and try calling back, only to compound the situation).

Advanced Congestion Control Features

Business rules define how to handle situations, such as an influx of calls due to a single incident. An interactive voice response (IVR) system allows callers to hear a quick, recorded message that there is an emergency response to the accident and to hold on if their call is unrelated. NG9-1-1 also evaluates other pending calls for potential "outliers" that are likely to be unrelated to the accident and could be handled before the other calls. Neighboring jurisdictions may also lend a hand for a short duration, in order to handle the flood of incoming calls. The local 3-1-1 (non-emergency) call center could assist as well.

Summary of NG9-1-1 Benefits

NG9-1-1 transforms today's 9-1-1 by leveraging emerging technologies

- Ability to receive voice, video, text, or data sent over IP networks from various communications devices (e.g., wireline, wireless, VoIP, sensors, etc.) – making 9-1-1 more accessible for **all** users
- Automatic and advanced data sharing between all public safety responders, PSAPs, emergency management, traffic operations, etc.
 - The ESInet has been designed as an **Emergency Services network**, not just a “9-1-1 network”. This network can provide access to public safety databases, remote systems, provide transport for Radio over IP (RoIP), etc.
 - Data is shared from the caller to PSAP to dispatch to responders and beyond
 - NG9-1-1 is designed to be flexible, open, non-proprietary (standards-based), and a secure interoperable internetwork (a “system of systems”)
- Advanced call handling processing and dynamic routing of callers based on caller’s geographic location and most appropriate PSAP
 - Rule-based configurability and control for PSAPs and 9-1-1 Authorities

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