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RapidSOS Clearinghouse Android ELS Pilot Project

Testing the impact of delivering
Android Emergency Location Service
(ELS) to PSAPs in the U.S. via the
RapidSOS Clearinghouse

January 2018

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"Why can Uber find me but 9-1-1 can't?"

Apps like Uber locate users with device-based hybrid location, whereas current E911 location services typically use a network-centric approach that often falls back to cell-tower triangulation when a GPS fix cannot be obtained (such as when the caller is located indoors).

With many 9-1-1 Centers across the country now receiving 80+% of their calls from wireless devices, and with citizens expecting 9-1-1 to be able to locate them just as their Uber can, it is imperative that 9-1-1 can receive the most accurate location available during an emergency.

This case study demonstrates what's possible when modern smartphone location services meet Next Gen 9-1-1.

RapidSOS tested Android Emergency Location Service (ELS) with the RapidSOS Clearinghouse to examine the potential to more quickly and more accurately determine the location of wireless 9-1-1 calls.

At a Glance: Key Findings

Key Finding 1
ELS through the RapidSOS Clearinghouse was more accurate and faster than traditional E911 location.

Key Finding 2
PSAPs successfully received Android ELS supplemental location from the RapidSOS Clearinghouse, integrated into their existing software.

Key Finding 3
This location technology was used during real emergencies, saving lives.

Zooming in on the Wireless Location Challenge:
Network-Centric Location vs. Device-Based Hybrid Location

TRADITIONAL NETWORK-CENTRIC E911 LOCATION

Phase 1
Generally not considered "dispatchable location," Phase 1 location is the civic address of the nearest cell tower, or the coordinates of the cell tower or sector centroid.

Phase 2
Best practice is to use GPS location technology, with network-based mechanisms as a fallback when no GPS is available. While GPS is generally very accurate, it only works reliably in outdoor environments where a clear line of sight to satellites is available. Indoors, GPS will often fail and positioning centers will instead utilize less accurate network-based mechanisms, or fall back to Phase 1.

Even if Phase 2 location is available and accurate, it is often only available after a re-bid, which typically incurs a delay of 25-30 seconds.
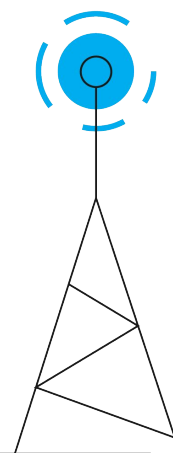
DEVICE-BASED HYBRID LOCATION

Combines all sensors on the device

- GPS
- WiFi Access Points
- Bluetooth beacons
- Barometric pressure
- Pedestrian dead reckoning, gyro sensors, accelerometers, etc.

"Hybrid" indicates that the device can fuse the different sources together and provide the best location based on context and environment, as opposed to having to choose "either/or" and waiting for one method to fail before trying the next.

Fused or hybrid location utilizes a combination of different methods to validate and determine the most accurate location possible. In indoor environments, the device typically relies on WiFi access points and enhances and validates the location with other mechanisms, whereas in outdoor environments the device typically relies heavily on GPS. In all cases, location is cross-referenced across sources to make it more robust and reliable.

Inaccurate & Slow Location Data Impacts Call-Takers
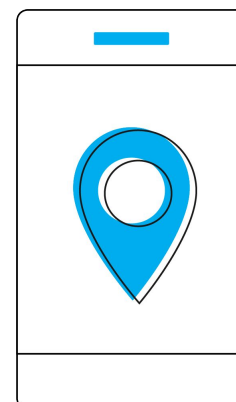
Survey of call-takers and dispatchers from participating agencies.

In your role, what are the negative impacts of inaccurate or slow location data?

"Sometimes it could mean that we don't find the person who needs help until it is too late. At best slow location data delays response to a minor event. At worst it could mean someone loses their life."

The results of the pilot showed the positive impact that improved location accuracy and speed of delivery can have on the outcome of wireless 9-1-1 calls. To better understand how this actually impacts the day-to-day jobs of 9-1-1 call-takers, an extensive survey and interviews were conducted to measure satisfaction and receive feedback from an operational perspective.

Wireless Location Solution:
Android ELS via the RapidSOS Clearinghouse

Android ELS → NG911 Clearinghouse → Call-Taker

Android ELS
Device-Based Location Source

99% of Android devices (version 4.0 and upwards) support Android Emergency Location Service (ELS) – an Android service that transmits a more reliable emergency location both indoors and outdoors (by fusing Wi-Fi, GPS, cell tower data, and other sources) to emergency services during a 9-1-1 call.

This service has already been successfully activated in many countries in Europe and the European Emergency Number Association estimates that 7,500 lives and 95 billion euros could be saved if Android ELS is implemented everywhere in the EU.

LEARN MORE ABOUT ELS:
www.crisisresponse.google/els

RapidSOS Clearinghouse
Location & Data Platform for Public Safety

The RapidSOS Clearinghouse is a NENA i3 compliant Location Information Server (LIS) and Additional Data Repository (ADR) that is accessible to authorized Public Safety Answering Points (PSAPs) through integrations into all major call-taking, dispatch, and mapping software.

Simply put, the RapidSOS Clearinghouse integration is an easy way for PSAPs to receive device-based location and enhanced data for smartphone 9-1-1 calls through their existing PSAP software.

LEARN MORE ABOUT THE RAPIDSOS CLEARINGHOUSE:
www.rapidsos.com/rapidsosclearinghouse

Pilot Project: Android ELS & RapidSOS Clearinghouse

In January 2018, RapidSOS and Google conducted a pilot project to evaluate Android ELS location accuracy and speed of delivery for wireless 9-1-1 calls. Three test regions participated in the pilot project and ELS location was captured via the RapidSOS Clearinghouse and transmitted for a fraction of 9-1-1 calls received in the pilot PSAPs.

Key Findings:

1. ELS through the RapidSOS Clearinghouse was more accurate and faster than traditional E911 location.
2. PSAPs successfully received Android ELS supplemental location from the RapidSOS Clearinghouse, integrated into their existing software.
3. This location technology was used during real emergencies, saving lives.

January 2018 Pilot Project Objective:

To evaluate the location accuracy and speed of Android ELS compared to existing 911 location systems and demonstrate the ability of the RapidSOS Clearinghouse to effectively deliver Android ELS data to PSAPs.

- **January 2018:** Data collection period
- Location only collected when within three geofenced areas of the pilot regions
- Location only delivered to call-takers when within PSAP jurisdiction
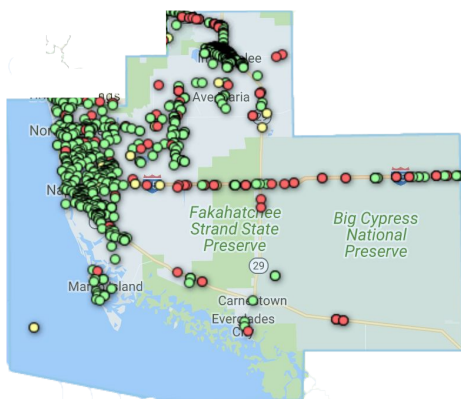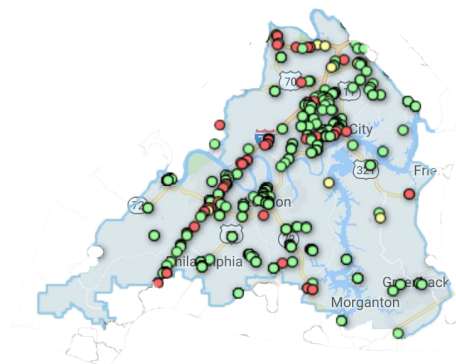
Participating Public Safety Agencies:
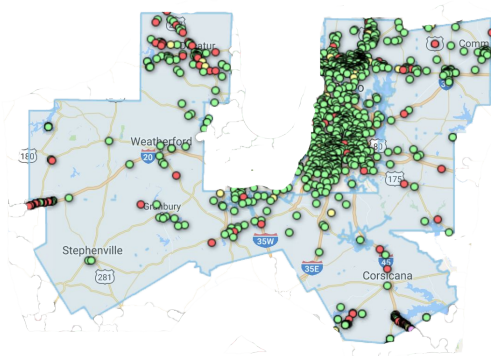
North Central Texas Council of Governments (NCTCOG)
- 44 PSAPs
- Population: ~2 million
- Morphology: Urban/suburban

Loudon County, TN
- 1 PSAP
- Population: ~50,000
- Morphology: Rural

Collier County, FL
- 2 PSAPs
- Population: ~350,000
- Morphology: Suburban

Note: Plots depict the cumulative number of calls in each spatial region for the entire time range.
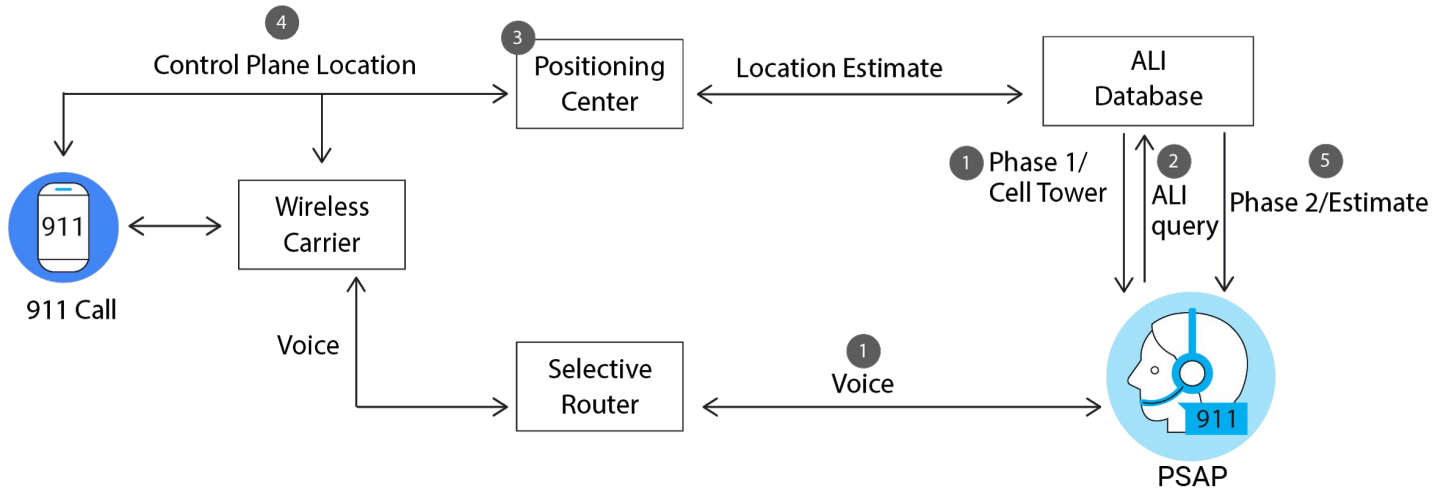
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RapidSOS Clearinghouse Integration Partners

PSAPs can access the RapidSOS Clearinghouse via integrations into their existing call-taking, mapping and dispatch software. More integration partners are always being announced.

GEOCOMM   HEXAGON   INdigital   MOTOROLA SOLUTIONS

PULSIAM   SOLACOM   TRITECH SOFTWARE SYSTEMS   VESTA®

ZETRON   GeoConex® Your Connection for Life   RapidDeploy MISSION CRITICAL DISPATCH   RAVE MOBILE SAFETY

Adashi   911 Datamaster   Digital Data Technologies Inc   Mutualink

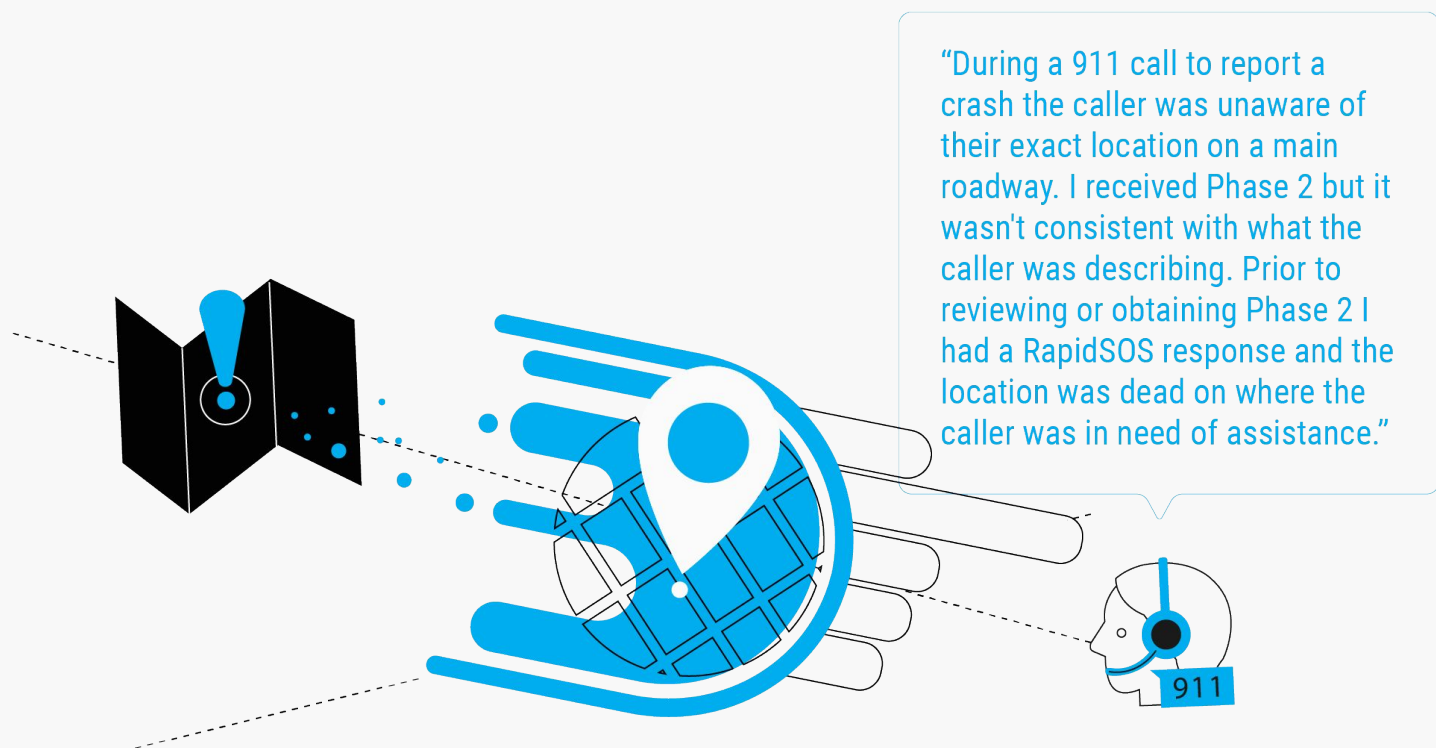## Primary Wireless Location Delivery through the ALI/E911 Mechanism:

Complicated process largely based on landline paradigm, typically rebid required

Supplemental Device Location Delivery through the RapidSOS Clearinghouse:

Designed from the ground up for Wireless & NG911, delivers immediately and updates automatically
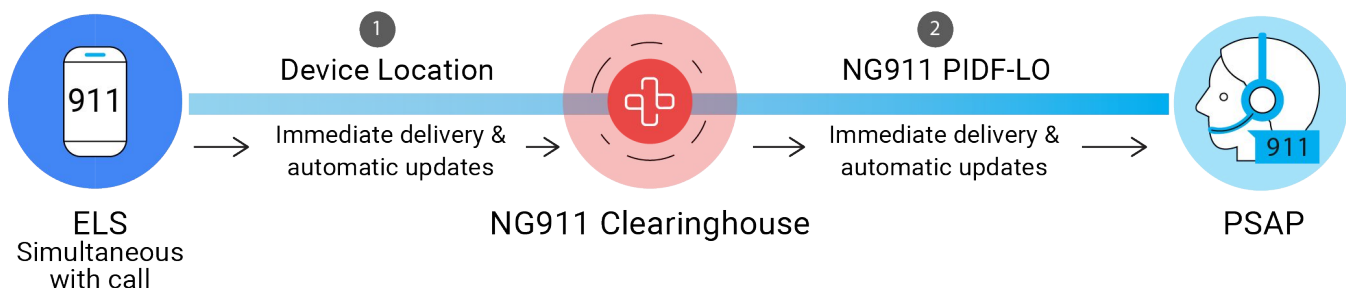
"During a 911 call to report a crash the caller was unaware of their exact location on a main roadway. I received Phase 2 but it wasn't consistent with what the caller was describing. Prior to reviewing or obtaining Phase 2 I had a RapidSOS response and the location was dead on where the caller was in need of assistance."

Key Finding 1

ELS through the RapidSOS Clearinghouse was more accurate and faster than traditional E911 location.

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Test Results: Reported Location Accuracy

To compare location accuracy between ELS and the ALI, uncertainty data was captured. The results show that ELS via the RapidSOS Clearinghouse provides more accurate location data than the ALI.
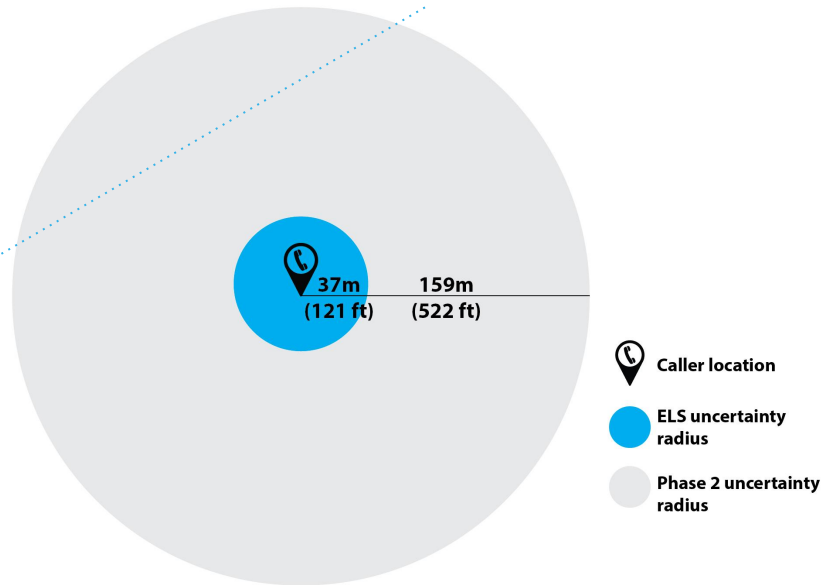
Average Reported Uncertainty (all calls)
Phase 1 radius too large to be displayed at scale

76%

Reported Uncertainty <50 meters
ELS reported an uncertainty of 50 meters or less for 76% of calls.

37m
(121 ft)

159m
(522 ft)

Caller location

ELS uncertainty radius

Phase 2 uncertainty radius

On average, significantly lower uncertainty radius

Average Reported Meters Uncertainty (best in call)

ALI (WPH1 & WPH2)

ALI (WPH2 only)

ELS

2000

1500

1000

500

0

NCTCOG, TX   Collier County, FL   Loudon County, TN
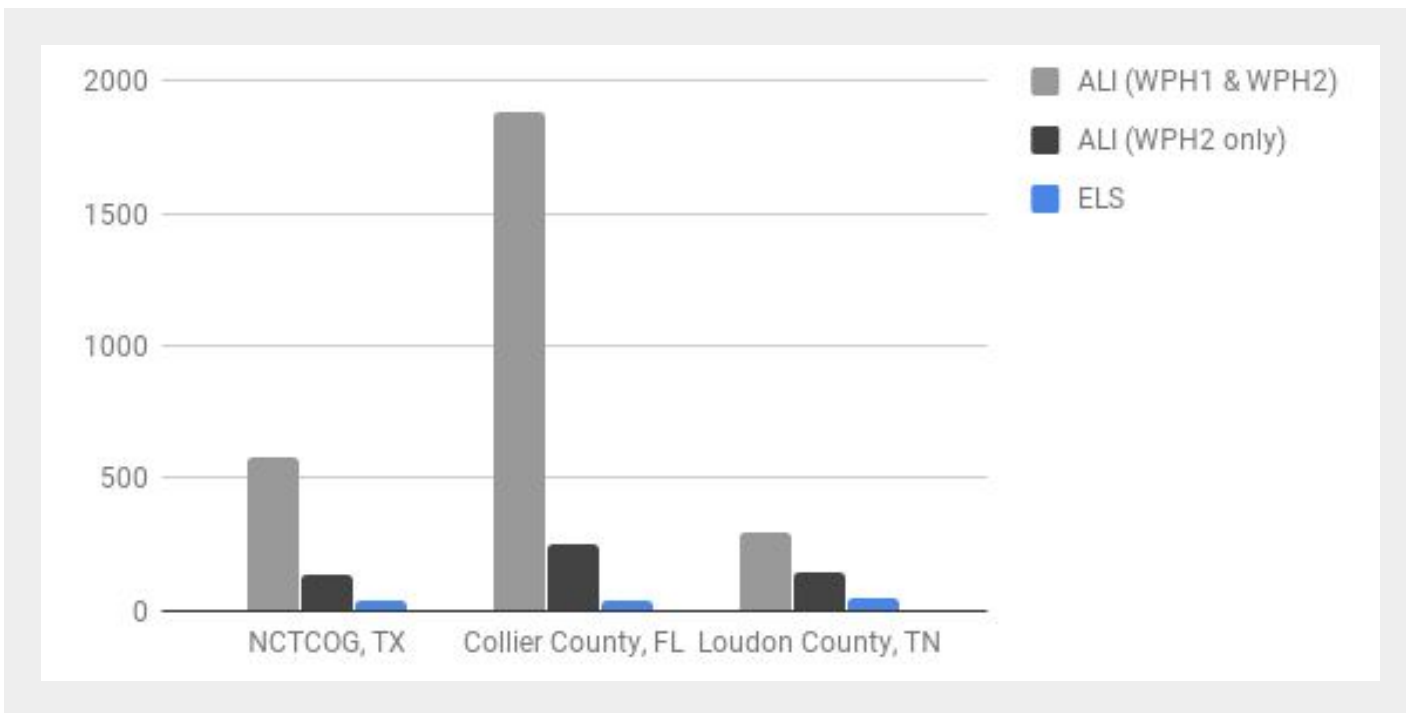
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Test Results: Speed of Delivery

To compare speed of delivery between ELS and the ALI, availability of ELS location was compared to the availability of Phase 2 location to the call-taker. The results show that ELS via the RapidSOS Clearinghouse typically arrives 25-30 seconds faster than the Wireless Phase 2 location.

CDF of time to first availability/retrieval of ELS fix, from initial ALI delivery

Legend:
- ELS first available for delivery
- ELS first delivered to PSAP
- WPH2 first delivered to PSAP

70% of ELS locations delivered to PSAP on initial call delivery

22% of Phase 2 ALI locations delivered to PSAP on initial call delivery

X-axis: Seconds after first ALI payload in call
Y-axis: Fraction of calls

When Seconds Count: Legacy E911 ALI vs. RapidSOS Clearinghouse

The pilot data demonstrates how ELS location, delivered via the RapidSOS Clearinghouse, gets more accurate location data to the call-taker's screen faster than Phase 2.
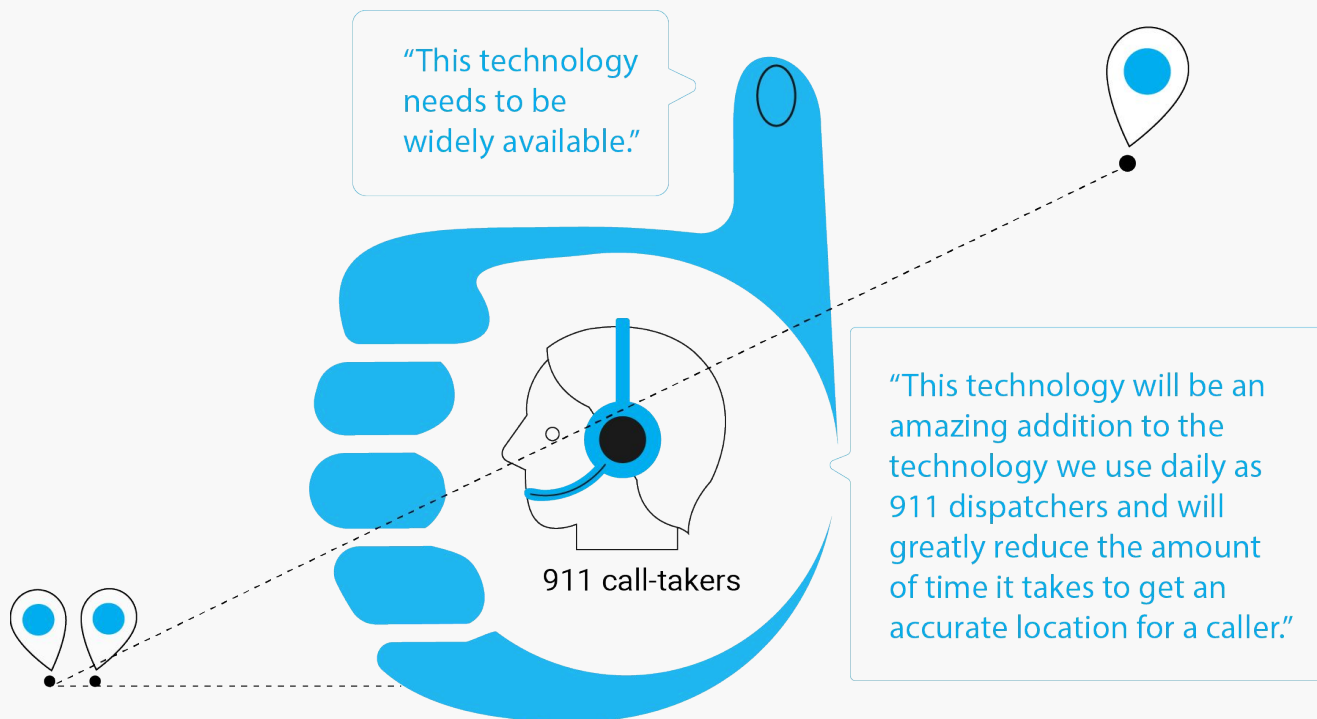
This is driven by two main factors:

1) **ELS is calculated directly on the device, instead of in the wireless network**

   A precise location may already be available on the smartphone before the 911 call, and if necessary calculation starts immediately when the call is placed

2) **The Clearinghouse uses IP-based delivery mechanisms, instead of legacy ALI databases**

   There's no need to wait for a Phase 2 re-bid, requests are returned in milliseconds, and location is updated periodically

"This technology needs to be widely available."

911 call-takers

"This technology will be an amazing addition to the technology we use daily as 911 dispatchers and will greatly reduce the amount of time it takes to get an accurate location for a caller."

Key Finding 2

PSAPs successfully received ELS supplemental location from the RapidSOS Clearinghouse, integrated into their existing software.

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Location Delivery: Collier County, FL

The RapidSOS Clearinghouse integrates with any call-taking, dispatch, and mapping software.

During the pilot, Collier County received the supplemental ELS location from the RapidSOS Clearinghouse via three different software systems: 1) Smart911, 2) VESTA Map Local, 3) VESTA 911.
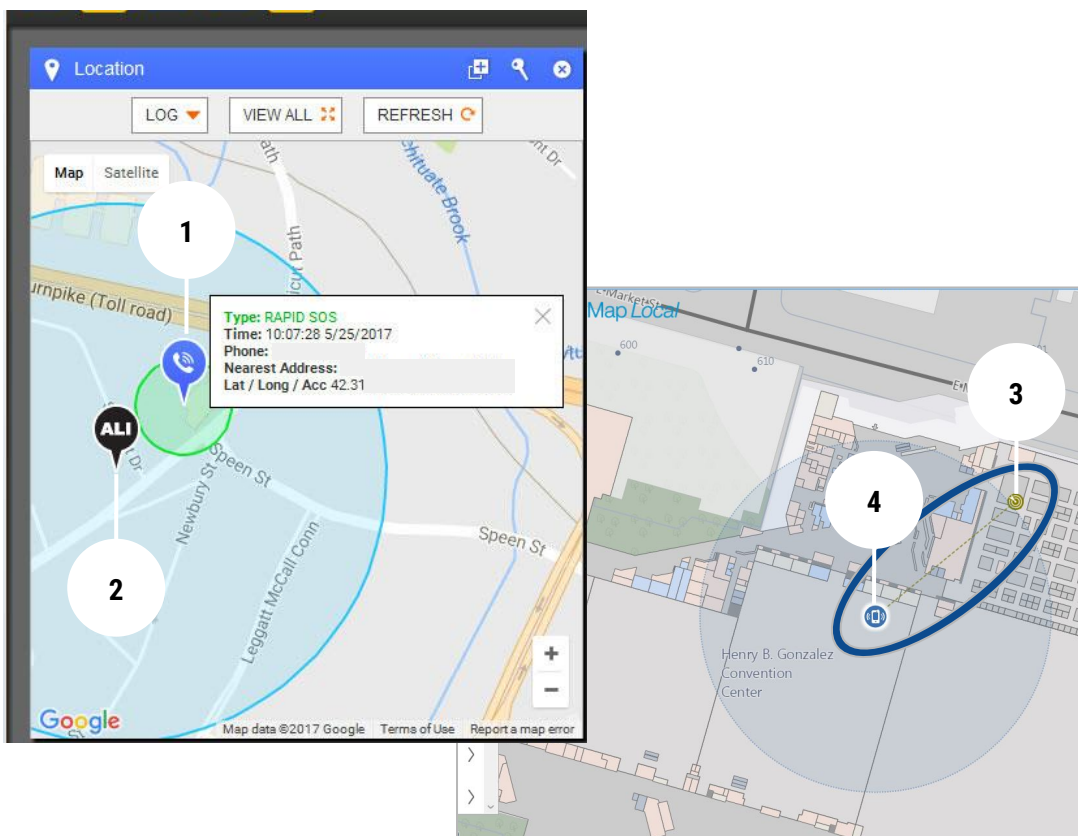
VESTA Map Local

3

ELS location plotted on existing call-taker map as supplemental data

4

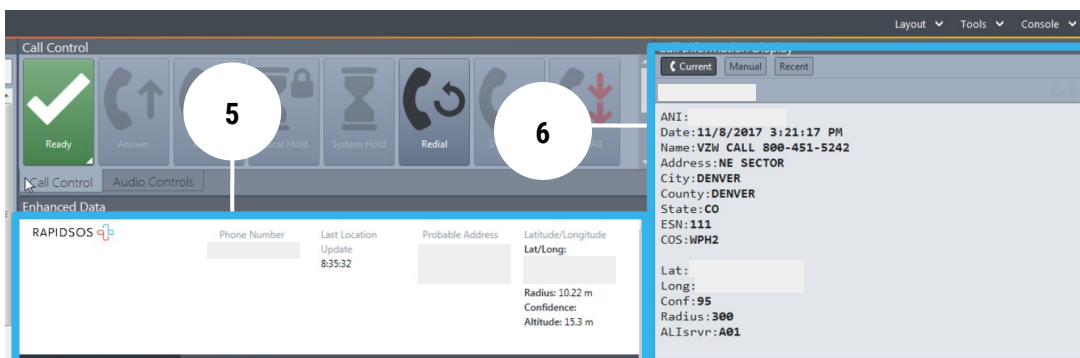E911 ALI Phase 2 also displayed

VESTA 911

5

ELS location displayed in call-taking software

6

E911 ALI Phase 2 also displayed

AIRBUS

Location Delivery: Loudon County, TN

Loudon County received the supplemental ELS location from the RapidSOS Clearinghouse via their Zetron MAX CT, integrated into their CAD Mapping.
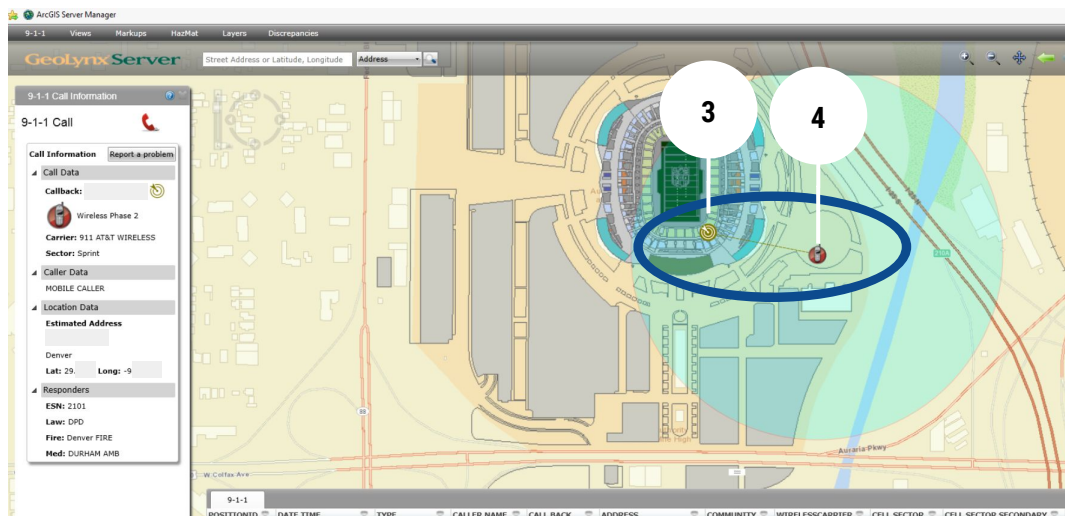

ZETRON MAX CT / CAD INTEGRATION

1
ELS location plotted in existing CAD map

2
User can toggle back and forth between ELS location and Phase 2 location

ZETRON®

Josh Fields
Computer Services

Location Delivery: NCTCOG, TX

NCTCOG PSAPs received the supplemental ELS location from the RapidSOS Clearinghouse via GeoComm's GeoLynx Server mapping product.

SOLACOM GUARDIAN / GEOCOMM GEOLYNX

3
ELS location plotted on existing call-taker maps

4
E911 ALI Phase 2 also displayed

GEOCOMM
SOLACOM

RAPIDSOS
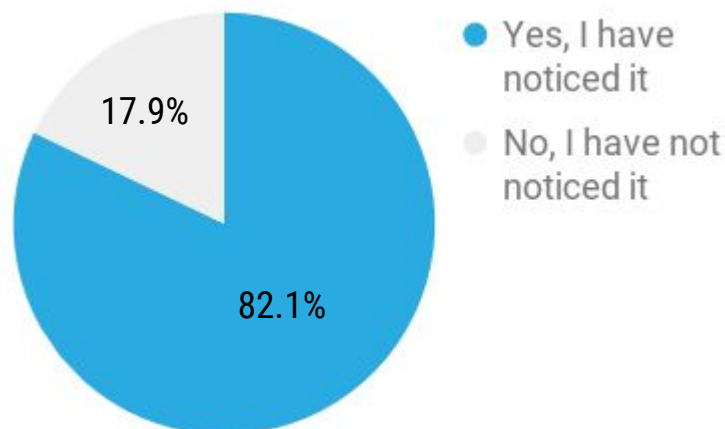
Majority of Call-Takers Noticed the Availability of [ELS-Transmitted] Device Location from the RapidSOS Clearinghouse and Found It Useful*

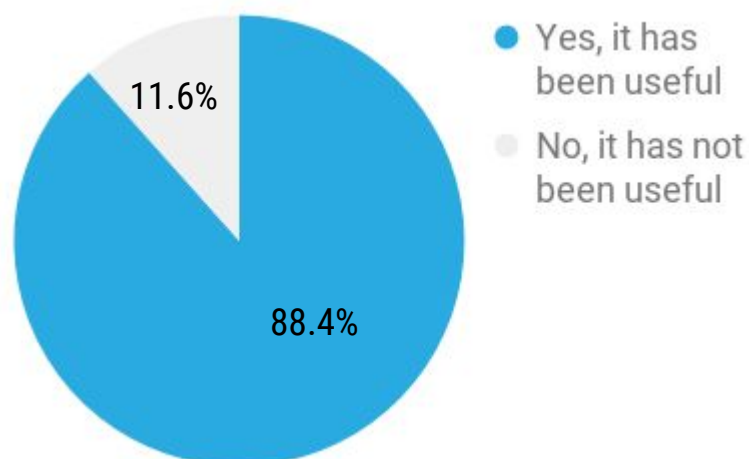Survey of call-takers & dispatchers from pilot agencies; n = 168

82% Have Noticed Device Location via RapidSOS

Have you noticed device-based RapidSOS location information?

17.9%

82.1%

- Yes, I have noticed it
- No, I have not noticed it

88% Found Device Location via RapidSOS Useful

Has it been useful?

11.6%

88.4%

- Yes, it has been useful
- No, it has not been useful

83% Found Device Location via RapidSOS to Be More Accurate than Phase 2

When available, has RapidSOS location been more or less accurate than Phase 2 ALI information?

1.5%

15.9%

82.6%

- More accurate
- Similar
- Less accurate
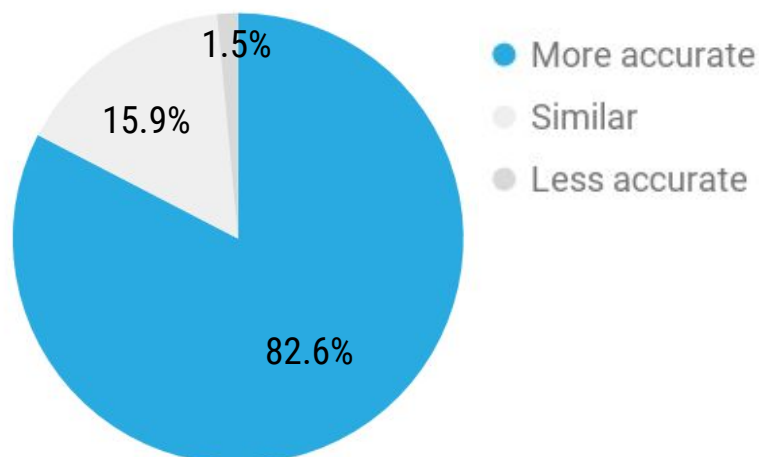
*Call-takers & dispatchers were not informed that ELS location would be available to them during the course of the pilot, but noticed enhanced location on the percentage of calls with ELS location data.

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Call-Takers Embrace Technology to Help Locate Callers

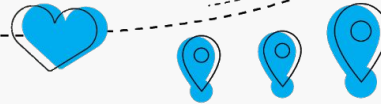Survey of call-takers from participating agencies; n = 168

Is there anything else you would like to share about wireless location accuracy?

"It is great to see the advances in technology that will help us give the public better and faster service."

"The faster and better the location, the faster that we can dispatch the call."

"As a 9-1-1 Supervisor I am incredibly pleased with the location information we are getting with RapidSOS."
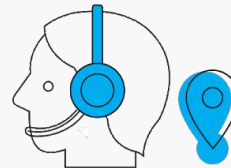
"With more and more people using cell phones and not having house phones wireless location is very important to 911."

*"Location is the most important information we need above all else!"*

"I really like this; it is going to be a great asset."

"For far too long we have had to rely on highly unreliable wireless location data. During this pilot we have been amazed at how accurate the RapidSOS location data has been. Also, it arrives much faster than Phase 2 (and again more accurate). This means time saved which equals lives saved."

911

"
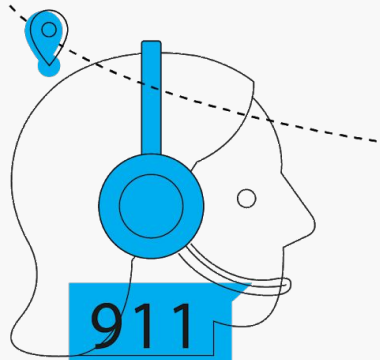
I've been in 911 for over 20 years and for the longest time we had to tell everyone that there's nothing we can do about the wireless location challenge, and we had to wait for someone else to fix it.

Being able to see accurate location at the 911 call-taker position, through existing software systems that the call-takers and dispatchers are already used to, has been very encouraging.
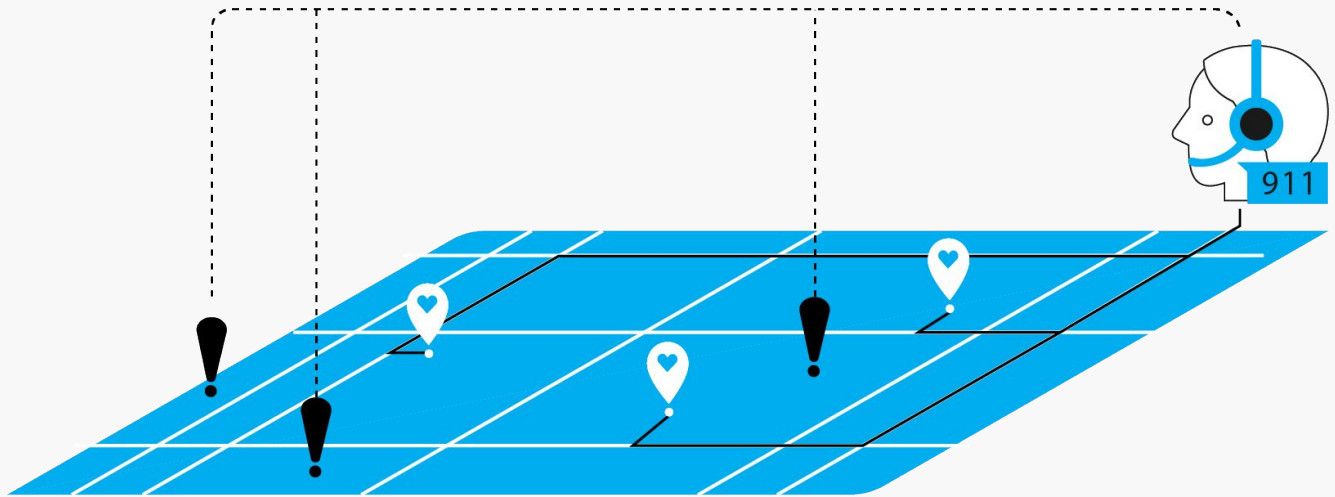
With RapidSOS, we can actually take action in the PSAP to improve the safety of our citizens today.

"

Bob Finney,
911 Communications Director,
Collier County Sheriff's Office

"On a suicide call the location is vital, and this zoomed directly to the house straight away. Worked excellently!"

Key Finding 3

This location technology was used during real emergencies, saving lives.

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Real-Life Example: Collier County, FL

The Situation:

911 caller had a traumatic injury that severed two of her fingers. The caller gave an address, WPH2 showed a location a few houses over, and ELS via the RapidSOS Clearinghouse showed a third location on the other side of the street.

The Response:

1. Responders went to the address given by the caller
2. They were unable to locate the patient and proceeded to the ELS location
3. The ELS location was accurate

1
Control Plane/ALI:
Location Source: N/A
Reported Uncertainty: 51m
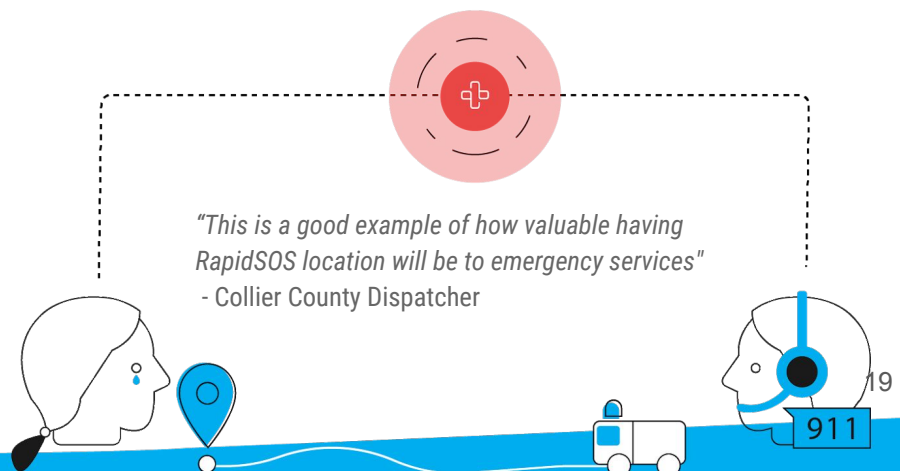
3
ELS/RSOS Location:
Location Source: WiFi
Reported Uncertainty: 42m

2
Actual Caller Location:
Inside This House

The Result:

In the panicked emergency, the caller gave an incorrect location to the 911 call-taker and first responders were unable to locate her. Fortunately, the ELS location was available and accurate – providing first responders with another source of data to quickly locate the caller.

"This is a good example of how valuable having RapidSOS location will be to emergency services"
- Collier County Dispatcher

911

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Real-Life Examples: Loudon County, TN

The Situation: The Response:

MEDICAL PRIORITY

911 call for an unresponsive patient

1. Call-taker confirms ELS location with caller instead of waiting for caller to describe location

2. Call-taker dispatches ALS ambulance immediately

3. Call-taker proceeds to Medical Priority questions and phone instructions as per protocol

FOREIGN LANGUAGE

The caller doesn't speak for the first minute of the call, and afterwards struggles with English

Call-taker immediately sees caller's ELS location, including the apartment number, and is able to dispatch the first unit before getting any verbal information regarding the location or the incident

FASTER CALL TRANSFER

Call comes in from outside Loudon County's jurisdiction

Call-taker immediately recognizes ELS location out of jurisdiction and confirms county with caller; saves multiple seconds in transferring the call quickly

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Real-Life Examples: NCTCOG, TX

The Situation:

Caller is in a major accident with injuries and verbally provides incident location as XXX St. & Main St. (several miles west from actual incident).

0 sec

ELS location came in immediately with the call.

30 sec

Phase 2 location took 30 seconds to arrive.

The Response:

1. Call-taker had location on screen before caller could verbalize address
2. Call-taker was able to confirm location with caller as the ELS location; units were dispatched correctly
3. When Phase 2 was available, call had already been dispatched

"

911 Call-Taker:

"Are you at XXX and Main? Because I am showing you at a different location..."

Caller:

"I'm not sure of the cross street..."

"

The Situation:

Verbal disturbance in an apartment building. ELS location pinpointed the location down to the exact building in the apartment complex.

The Response:

Officers were able to respond immediately to the right apartment.

"In my opinion the [ELS location] works great when it comes to apartment complexes - especially the larger ones, because it breaks down the separate buildings. This allows us to send officers to an exact building to check versus a whole complex."

911
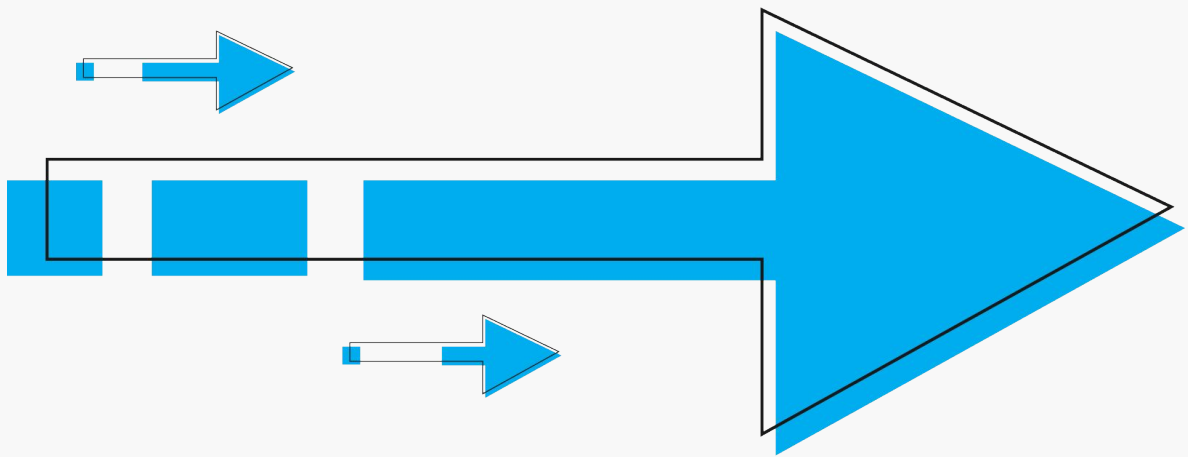
Next Steps

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GET READY TODAY

Follow 3 simple steps to connect your PSAP to the RapidSOS Clearinghouse:

1

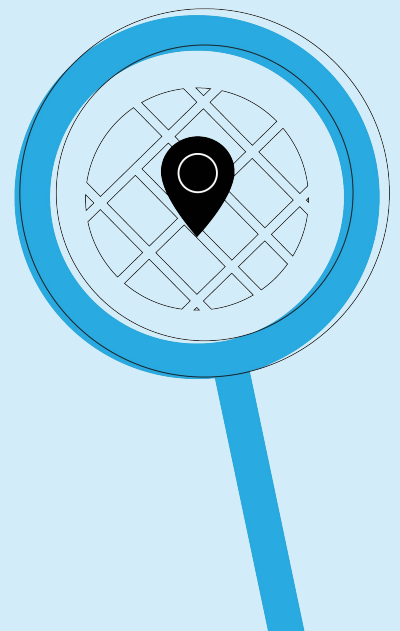Request your free access credentials from RapidSOS

Visit:
info.rapidsos.com/access-credentials

2

Contact your vendor/service provider to ensure your call-taking/CAD/map is on a RapidSOS-enabled version

3

Start testing with the RapidSOS Beacon tools to become familiar with device-based location

Faster, more accurate location using the RapidSOS Clearinghouse

Interested in learning more?

Learn more about the RapidSOS Clearinghouse:
www.rapidsos.com/rapidsosclearinghouse

Learn more about Android ELS:
www.crisisresponse.google/els

Get in touch with your regional RapidSOS 9-1-1 Liaison:
www.info.rapidsos.com/psap-integration

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