Location-based routing 101

The impact of routing the 9-1-1 call based on location

Today you can order a pizza or call a ride sharing service from your mobile device, and they know exactly where you are. When you place a wireless 9-1-1 call, however, most people are surprised to learn that the PSAP (Public Safety Answering Point) your call is answered by is not actually the PSAP that covers the location you are calling from. The 9-1-1 telecommunicator may have to transfer you to another PSAP before your emergency request can get a response.

That's because legacy call routing technology does not use the caller's location to route a 9-1-1 call to a PSAP for response. Instead, most calls made on your mobile device are routed by the wireless carrier you subscribe to, based upon the cellular antenna coverage area that your device is connected to at the time of the call – not your actual location.

The result is a misrouted 9-1-1 call. It is estimated that 12 percent of the 192 million wireless 9-1-1 calls made annually are sent to the incorrect PSAPs, requiring agencies to transfer the misrouted calls to the correct PSAPs for response which adds roughly 40 seconds per transfer to the 9-1-1 call processing time. For 9-1-1 calls, when every second counts, this could be a difference in life and death.

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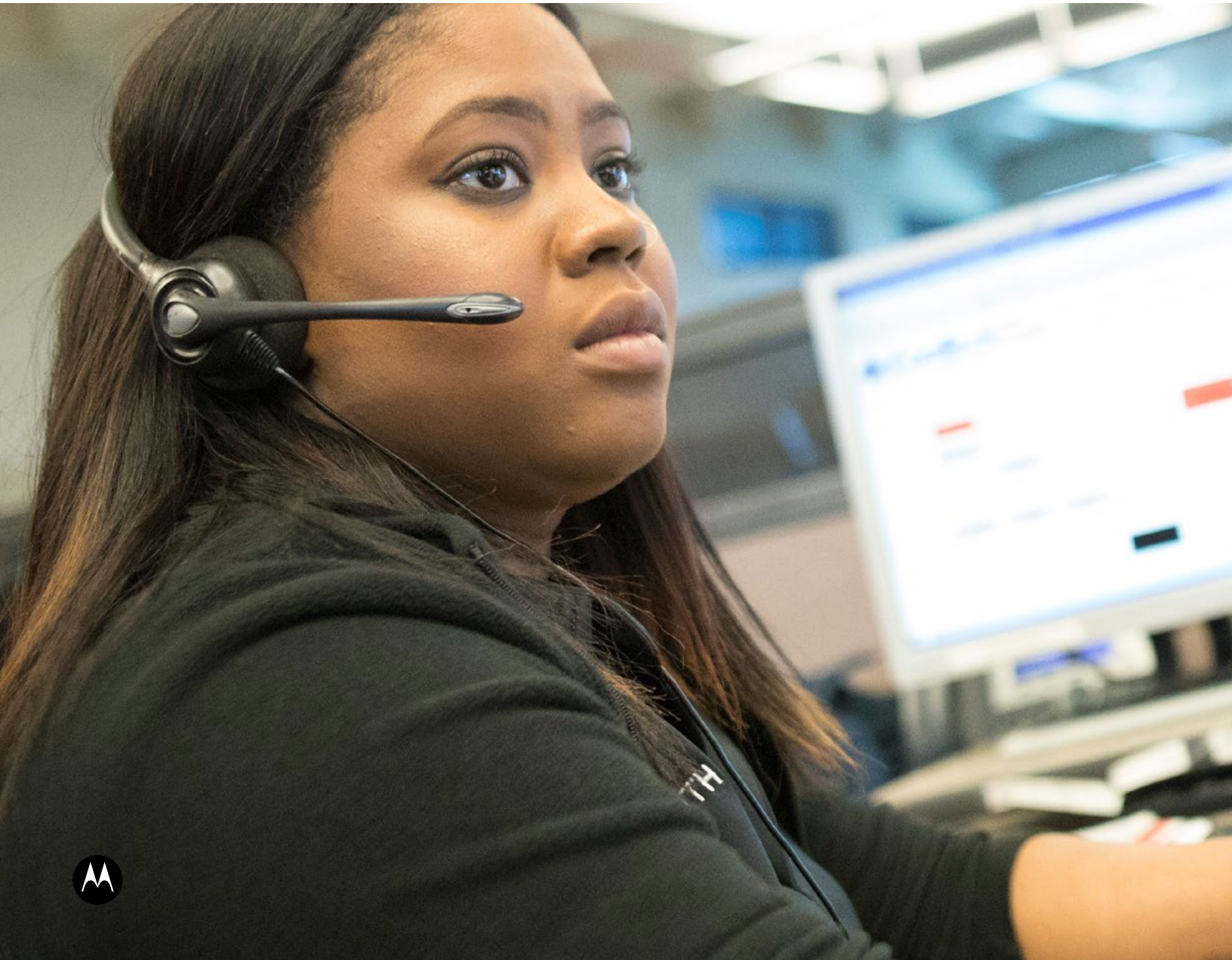
The next gen difference – and how we're getting there

In Next Generation 9-1-1 (NG9-1-1), one of the most important outcomes is routing the call to the correct PSAP using Next Generation Core Services (NGCS), the NG9-1-1 functional elements that enable i3 location-based call routing. So how is this being achieved today?

From legacy to i3

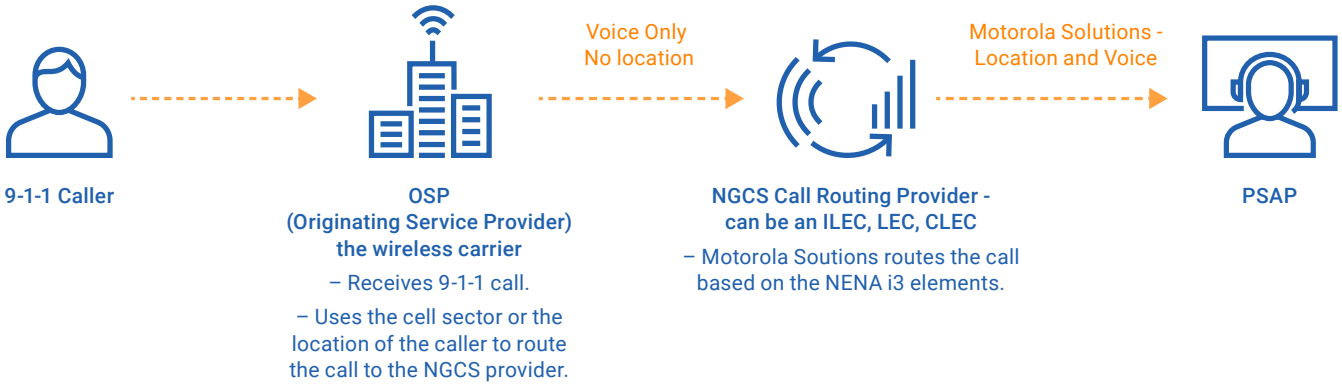
The technology for 9-1-1 call routing is changing from legacy (i.e., using the cell tower antenna for your location) to Next Generation 9-1-1 (where your call is routed based upon your location). Remember, with legacy call routing, 9-1-1 calls made on your mobile device are routed by the wireless carrier you subscribe to, based upon the cell tower antenna coverage area that your device is connected to at the time of the call – not your actual location.



Who Is Involved in Routing a 9-1-1 Call?

This diagram shows the different entities involved in receiving, managing and routing a 9-1-1 call. It's important to note that the OSP and NGCS provider are not the same. It's helpful to have the definition of the different entities and elements.

- Next Generation call routing (NGCS – Next Generation Core Services) is designed to receive location with the call. As mentioned earlier, NGCS comprises the NG9-1-1 functional elements that enable the NENA (National Emergency Number Association) i3 architecture for location-based call routing. It includes the ECRF (Emergency Call Routing Function) and ESRP (Emergency Services Routing Proxy) referred to in the diagram below.
- The NENA i3 standard, developed by public safety professionals, describes protocols, interfaces and systems required to ensure interoperability in NG9-1-1.
- Phase I Location – the location of the cell tower pinged by the caller's cell phone.
- Phase II Location – the latitude and longitude coordinates of the caller's device.



Another important note: the NENA i3 end-state architecture assumes the OSP will provide the caller location at the time the call is presented to the NGCS system for routing. However, OSPs are under no mandate by the Federal Communications Commission (FCC) to deliver the location with the call.

Solving the problem: Location-based routing

To compensate for the absence of not receiving location from the OSP, Motorola Solutions is fulfilling the promise of i3 by using location to more accurately route all 9-1-1 calls using the NGCS elements. We have eliminated legacy call routing methods and implemented the NENA i3 end state architecture. Motorola Solutions is delivering location with every call.

The Process

1 Caller dials 9-1-1.

2 Call is received.

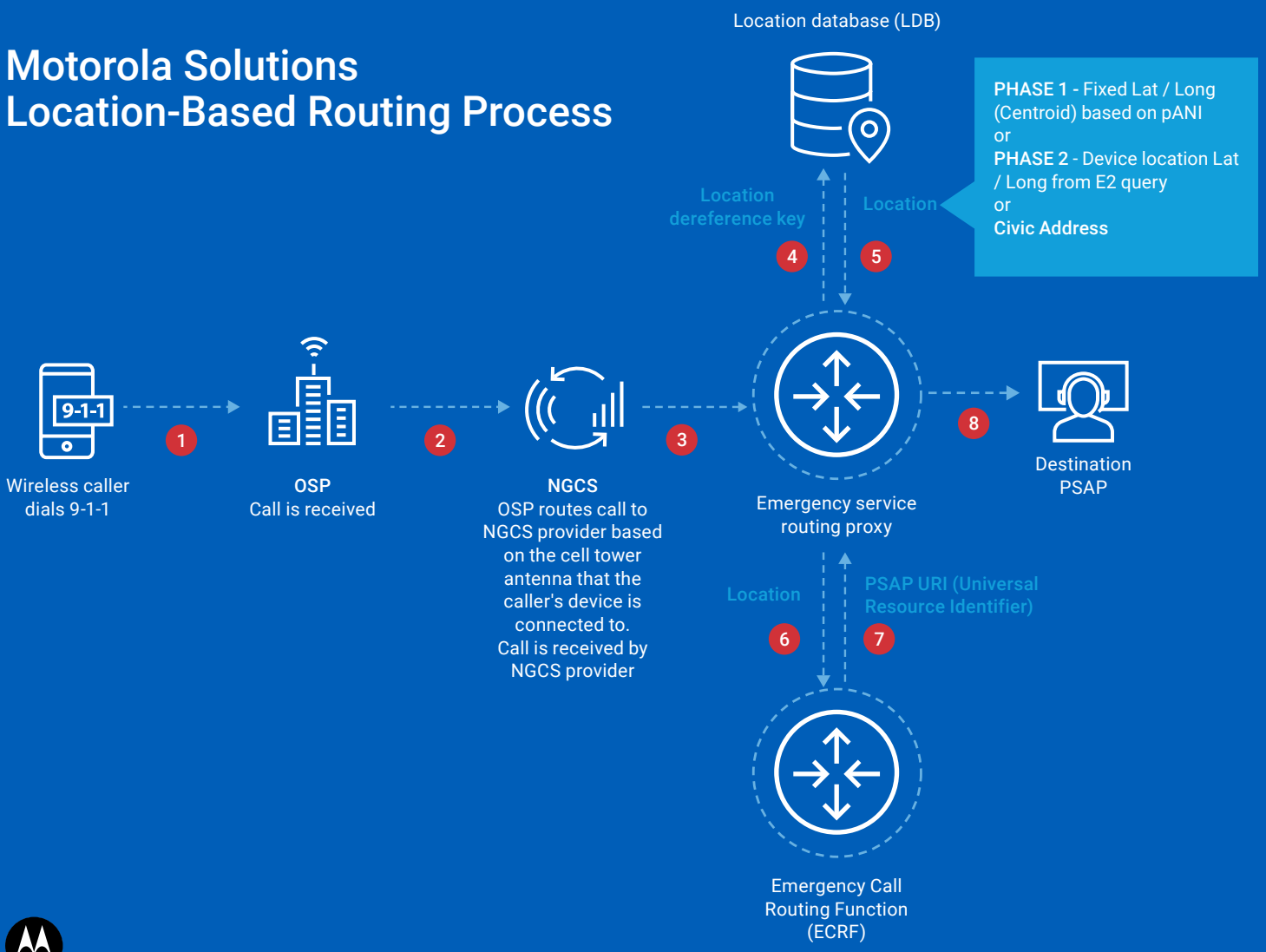
3 OSP routes call to the NGCS provider based on the cell tower antenna pinged by the caller's device.

4-5 Motorola Solutions obtains caller location from the OSP.

6-7 The location is then used to query the ECRF for the jurisdictional PSAP.

8 The ESRP consults the Policy Routing Function (PRF) and routes the call to the destination PSAP, based on agency-defined policies.

Motorola Solutions Location-Based Routing Process



Getting the data to route the calls

A common question - How is Motorola Solutions getting the data to route the calls?

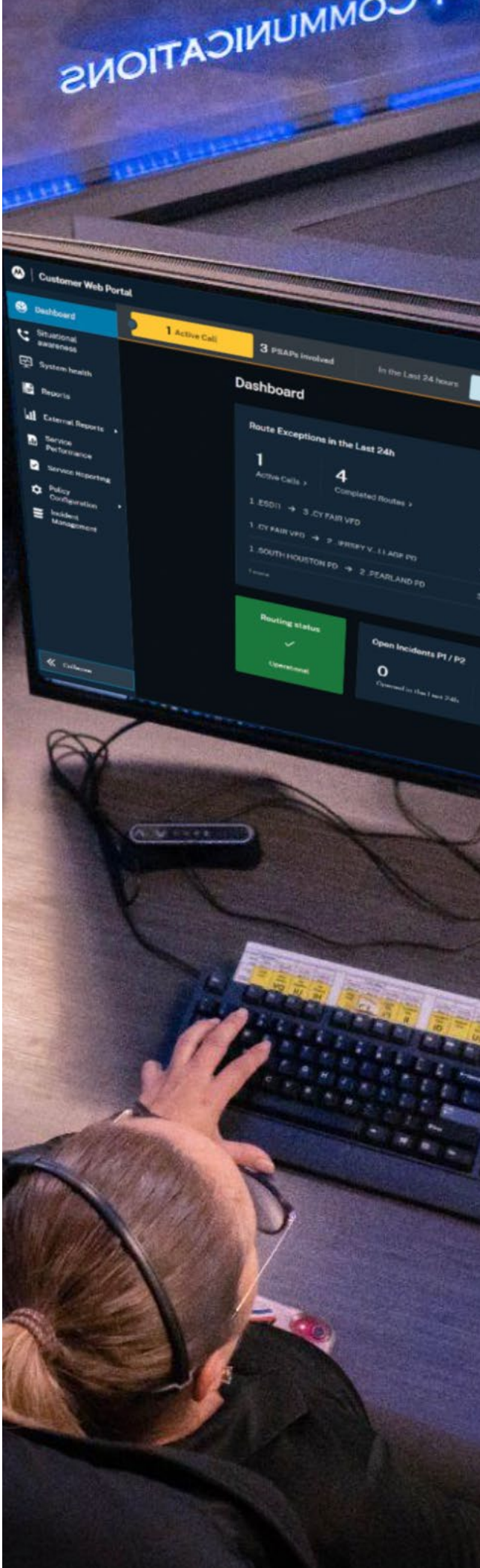
We use the location we have at the time we make the call routing decision. This includes civic address or Latitude/Longitude (lat/long) that is provided by the OSP. We receive location from the OSP by either value or reference. If by reference, we use that dereference key to make the request for location to the OSP. This concept applies to all calls – legacy, i3 formatted calls for wireline, wireless and VoiP. Regardless of the type of call or the technology being used by the OSP to deliver the call to us, we use the best location we have at the time we make the call routing decision to route the call.

Another question we get - What is the OSP doing to make this possible?

The OSPs are not required to take any direct action to enable Motorola Solutions to perform location-based routing, beyond responding to location requests, as they have for many years. It should be noted that OSP actions, as they evolve their technology and practices, can certainly enhance or improve the results. Examples of OSP actions include:

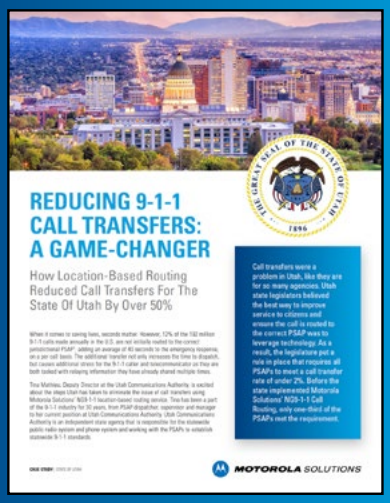
- Using location-based routing within their network helps them send the call to the correct call routing provider (like Motorola).
- Employing technologies and methods that can improve the accuracy and/or quality of the location that they provide to us.
- Employing technologies and networks that facilitate faster response times to our location requests.
- Electing to deploy NENA i3 standard-aligned call handoff format to the call routing provider (like Motorola).

All of these practices can be employed by the OSP at their discretion and on their timetable.



Read The Case Study

Reducing 9-1-1 Call Transfers: A Game Changer



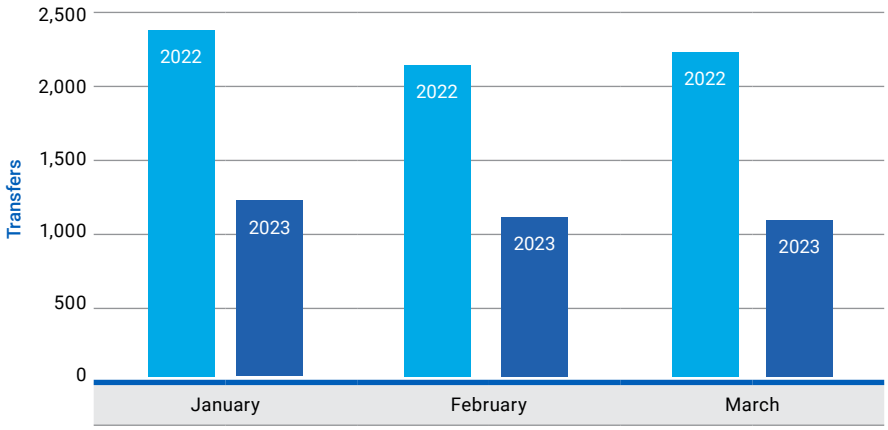
Reducing 9-1-1 Call Transfers: A Game-Changer

For the state of Utah, implementing Motorola Solutions NG9-1-1 location-based routing service has helped the state turn the corner on eliminating call transfers.

"I remember," says Tina Mathieu, the Deputy Director at the Utah Communications Authority, "sitting in a legislative hearing listening to a legislator speak about being transferred after he had to call 9-1-1. That story lit the fire under the legislature to take notice of the call transfer rate."

This is when the Utah Communications Authority stepped in, recognized the critical need for improvement and developed new statutes for the acceptable rate of call transfers.

Utah call transfer statistics



The chart above shows the call transfer statistics for the State of Utah from Q1of 2022, before Motorola Solutions had deployed its call routing service, to that of Q1 2023. The number of call transfers decreased significantly, nearly 50%, a reduction of at least 1,000 call transfers per month, even with a higher call volume than that of the previous year.

"What is really exciting about this," says Tina, "is the fact that there is absolutely no work required on the part of the PSAPs. We are finally in a position to maximize the technology and make a major difference in our service level. I don't think in my 30 years in the 9-1-1 industry, I can think of a time where technology was this impactful without having to make any adjustments in policy."

It's important to note that accomplishing these call transfer results in Utah required no changes by the OSPs.

What about GIS Data?

Many agencies assume they must have a full set of highly accurate GIS data before they can begin the transition to NENA i3 NGCS end state architecture, including road centerlines and point files. With Motorola Solutions' location-based routing, however, the PSAP can move forward today with the NENA-prescribed NG9-1-1 i3 architecture with a basic foundational set of data and add more advanced GIS data layers - over time, based on their implementation schedule.

At Motorola Solutions, our NGCS teams continue to help PSAPs around the country prepare their GIS data. This work is critical and necessary for every PSAP.

Maximizing Integration Between Next Gen Call Routing and the PSAP Workflow

Let's look at what Next Generation call routing can accomplish beyond getting the call to the correct PSAP. Here is an example – from a fictitious use case.

The main roadway traffic bridge into the city of Ames collapses during morning rush hour. The Primary PSAP is inundated with wireless calls. To eliminate the overflow, the PSAP initiates the routing policy that sets up a geofence for all calls in a defined radius – in this case, around the bridge – to be routed to the CAD positions at the Secondary PSAP working the incident. The CAD positions have integrated call control so they are able to take the call and dispatch from one workstation. The PSAP is also receiving a lot of photos and videos from citizens taken at the scene. In order to triage the events, the PSAP has the content routed directly to storage where it is tagged as evidence and can be retrieved and viewed later.

The PSAP's routing policy also states that any alerts from social media are routed directly to a specific position in order to capture information about citizens who may be trapped under the bridge.

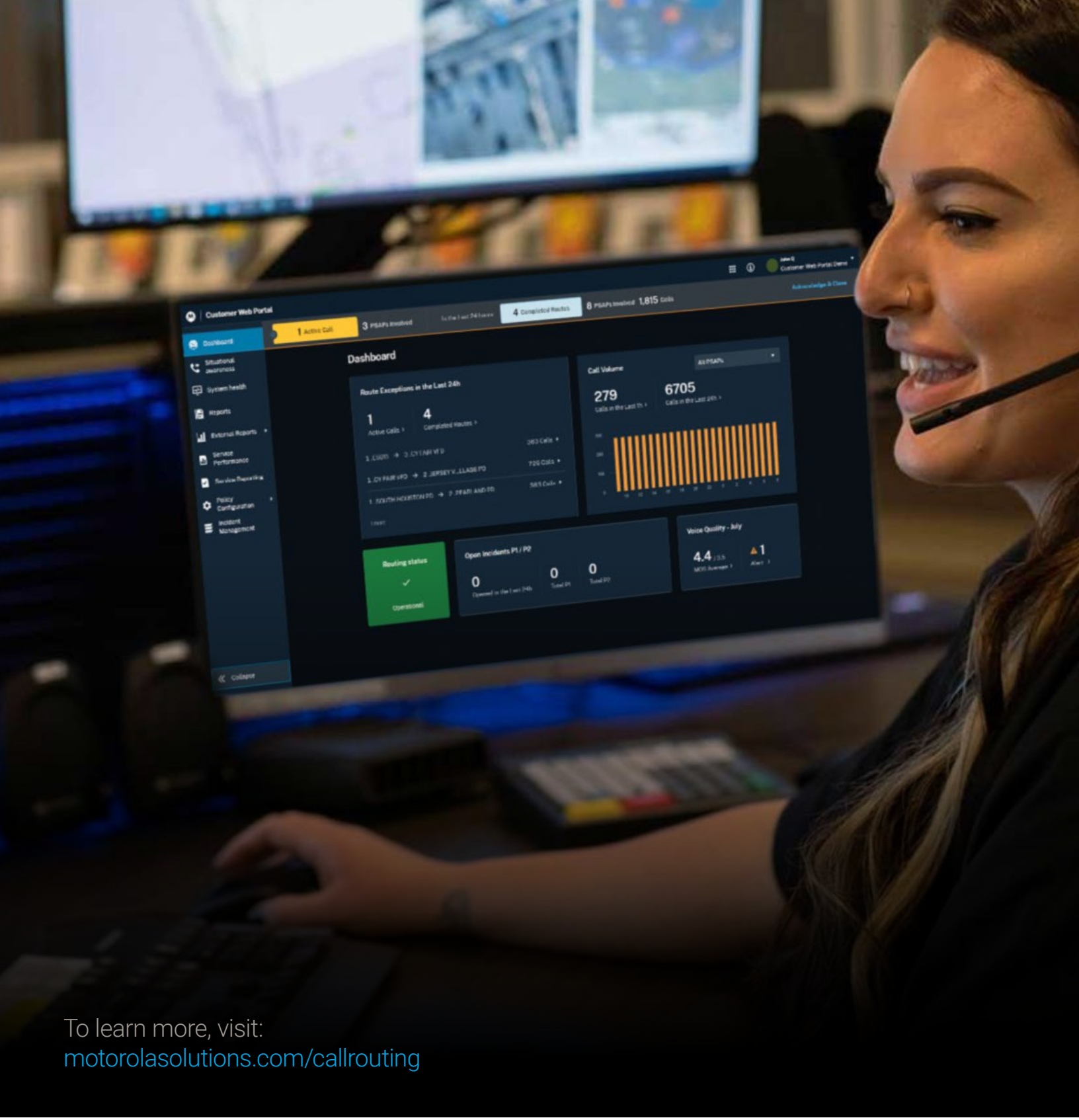
These are the roles Next Generation call routing plays in this scenario:

- The city of Ames's PRF (Policy Routing Function) and the subsequent rules for the different scenarios built into the PRR (Policy Routing Rule) tell the router that [under these conditions] the request for service should be sent directly to [specific location]. Note: the PSAP establishes the policy most appropriate for the incident to be managed.
- For the bridge incident, the router automatically determines, sorts and routes the different types of data and multimedia requests that come into the PSAP. Wireless voice calls are routed to the CAD positions at the secondary PSAP; visual content is routed to storage; and social media posts involving trapped citizens are routed to a specific PSAP position.
- Another function the router could provide is simultaneously routing calls to multiple, alternate PSAPs at the same time if the overflow continues for a set amount of time.

The key takeaway of this example is that each system in the PSAP's workflow has been purposely engineered for seamless and intelligent interoperability with each other and with the router. The PSAP doesn't have to deal with different capabilities between systems and points of failure as the data moves from one system to the next. The router becomes the middle-ware between the systems, enabling a uniform experience each and every time.

Conclusion

Motorola Solutions' location-based routing is helping public safety agencies reduce call transfers and save valuable seconds. To quote Tina Mathieu, "40 seconds is a lifetime."



To learn more, visit:
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