

**Before the
Federal Communications Commission
Washington, D.C. 20554**

Location-Based Routing)	
)	
For Wireless 911 Calls)	PS Docket No. 18-64
)	

COMMENTS OF T-MOBILE USA, INC.

I. INTRODUCTION AND SUMMARY

T-Mobile USA, Inc. (“T-Mobile”)¹ is committed to using the best available location technologies in providing 911 service for emergency calls on its network. T-Mobile is working aggressively to evaluate and implement new and emerging location technologies that are practical to implement and provide meaningful improvements to location performance. For instance, T-Mobile is at the forefront of incorporating “device-based hybrid” methods into its location technologies, in which the sensors available to the handset are leveraged to produce a high accuracy, low latency location estimate, particularly in challenging indoor and dense urban settings. Indeed, since 2015, T-Mobile has been using Apple’s Hybridized Emergency Location (“HELO”) for 911 calls.²

In addition to working to ensure that it can provide PSAPs with the best possible estimate for any 911 call, T-Mobile works with PSAPs transitioning to NG911 to ensure delivery of 911 calls to their serving Emergency Services IP Networks (“ESINets”). T-Mobile is engaging with state and county PSAP authorities to understand their NG911 progress and, along with their

¹ T-Mobile USA, Inc., is a wholly-owned subsidiary of T-Mobile US, Inc., a publicly traded company.

² See, e.g., Ryan Knutson, *Why Uber Can Find You but 911 Can’t*, WALL STREET JOURNAL, Jan. 7, 2018 (noting T-Mobile’s use of Apple’s “Hybridized Emergency Location” service for 911 calls).

technology partners, to offer support in testing NG911 features to assist with interoperability and transition issues.

T-Mobile also looks forward to utilizing the National Emergency Address Database (“NEAD”) for 911 calling when that database comes online. The NEAD leverages Wi-Fi and Bluetooth wireless access points that have been provisioned with civic addresses in order to provide a dispatchable location for some (mostly indoor) wireless 911 calls. T-Mobile is implementing the necessary network and handset changes to make NEAD information available to PSAPs on 911 calls from its customers. In fact, T-Mobile participated in the first functional test of the NEAD system in the fourth quarter of 2017. This testing demonstrated full functionality, and T-Mobile is currently using data from that test to further optimize its location selection algorithms in preparation for the full NEAD system performance testing, and subsequent use for 911 calls.

Even as new and improved location technologies enhance carriers’ ability to provide PSAPs with better location estimates, other impending upgrades will inherently improve 911 call routing. Specifically, the continued deployment of NG911 will obviate many of the issues addressed in the Communications Security, Reliability and Interoperability Council (“CSRIC V”) “Task 2” report (“LBR Report”)³ and the Commission’s Notice of Inquiry on location-based routing.⁴ In a NG911 environment, granular, intraregional routing decisions will be made by the ESINet operator rather than by the carrier, ensuring delivery of a 911 call to the most appropriate

³ Communications Security, Reliability and Interoperability Council V, Working Group 1, Evolving 911 Services, Final Report – Task 2: 911 Location-Based Routing (Sept. 2016), https://transition.fcc.gov/bureaus/pshs/advisory/csric5/WG1_Task2_FinalReport_092016.docx (“LBR Report”).

⁴ *Location-Based Routing for Wireless 911 Calls*, Notice of Inquiry, PS Docket No. 18-64 (rel. Mar. 1, 2018) (“NOI”).

PSAP as determined by the relevant emergency services authority. Given this, the most important thing all stakeholders can do to improve 911 call routing is to support and encourage the expeditious transition to NG911.

As the Commission reviews the record on this inquiry, T-Mobile encourages it to recognize the inherent limitations of legacy wireless networks with respect to changes to 911 call routing and avoid proposing any mandates that divert resources away from deployment of next-generation networks and technologies—particularly where those networks and technologies are already designed to improve 911 service. T-Mobile also asks that the Commission take care to understand the true scope of the issue of “misrouted” 911 calls, so that it can properly evaluate the costs and benefits to wireless providers and consumers of any new proposals.

II. THE COMMISSION SHOULD CAREFULLY REVIEW THE SCOPE OF THE ISSUE AT HAND.

T-Mobile routes 911 calls, whether originating on its legacy network or as VoLTE traffic,⁵ through its Gateway Mobile Location Center (“GMLC”), which determines which PSAP to route a 911 call to based on the coverage area of the serving cell site/sector of the 911 call and T-Mobile’s agreements with PSAPs or other emergency communications authorities. In T-Mobile’s network, the GMLC performs that routing without delay under normal operational circumstances.⁶ This timing is critical because it ensures that 911 calls are transmitted to a PSAP as quickly as possible while also reducing the likelihood that a caller will hang up and re-dial, a process that introduces more delay and that can cause more congestion if networks are

⁵ Where T-Mobile traffic originates in IP format, T-Mobile can deliver that traffic in IP to a fully IP-capable NG911 PSAP.

⁶ The NOI cites the Location Based Routing (“LBR”) Report as noting that routing occurs “within six seconds from when the caller presses ‘send,’” NOI ¶ 18 (citing LBR Report at 8). T-Mobile believes six seconds is far longer than most networks allow for 911 call routing.

overloaded from a mass event. This near instantaneous routing process, though, leaves little opportunity for a wireless carrier to obtain a real-time location fix and route the 911 call based on that fix.

This legacy routing system is, of course, a holdover, the result of enabling emergency communications in networks that were not designed for them.⁷ And while the NOI notes that wireless carriers continue to use cell-tower based routing despite “significant advances” in wireless technology and location technology,⁸ that statement misapprehends the difficulty of leveraging those technological advances in the few hundred milliseconds before a 911 call is routed. Even if a “real-time” location fix could be obtained in a sufficiently short amount of time so as not to disrupt the need to route the call quickly, as discussed in more detail below, leveraging any location fix for legacy PSAP call routing would require fundamental changes to the wireless carrier’s legacy call flow logic. That, in turn, would require changes to legacy network components—a lengthy process involving redirection of resources that could be better used in the transition to next-generation networks and implementation of NG911.

The Commission should also ensure it understands the true scope of the issue of “misrouted” 911 calls before taking any further steps. Misrouted 911 calls can occur, but not all transferred 911 calls are transferred due to a misroute. For instance, the NOI cites to the fact that 3.7 million calls in California are transferred from one PSAP to another.⁹ This high number, however, is not due to “misrouted” calls but rather to the California Office of Emergency

⁷ See NOI ¶ 6.

⁸ NOI ¶ 8.

⁹ NOI ¶ 2 n.3.

Services' policy of having all 911 calls on state highways routed to the California Highway Patrol before being transferred to the proper PSAP.¹⁰

NG911 standards have been developed specifically to address these routing and location issues and put control in the hands of emergency services authorities, allowing them to adopt policies and procedures that put emergency communications first. As the NOI notes, NG911 systems are already designed to route calls using caller location in real time,¹¹ while also giving the ESINet operator control over 911 call routing to the PSAPs within its region; this provides emergency communications officials with the tools to implement protocols that are most appropriate for their local communities, geography, and resources.

Furthermore, stakeholders are taking concrete steps forward to implement NG911 today; therefore, leveraging NG911 for emergency call routing is not a far distant promise. For instance, several states and regions have deployed or are well underway in deploying ESINets, including fully implemented statewide systems in Iowa, Indiana, and Vermont.¹² In fact, as of the end of 2016, the great majority of states had begun the process of transitioning to NG911, with at least 11 states using NG911 systems to process calls and another 10 in the process of

¹⁰ See, e.g., Reply Comments of T-Mobile USA, Inc., PS Docket No. 07-114, WC Docket No. 05-196 at 12-13 (filed July 11, 2007); see also Letter from Daphne Rhoe, California 9-1-1 Emergency Communications Office, to Marlene H. Dortch, FCC, PS Docket No. 08-51, at 2 (filed June 27, 2008) (noting that “[e]ach month California processes an average of 1 million wireless 9-1-1 calls, with 72 percent of these calls routing to the CHP and 28 percent routing to local PSAPs”).

¹¹ NOI ¶ 4.

¹² See *National Progress on IP Network, ESINet, and NG9-1-1*, NENA: THE 9-1-1 ASS'N, https://www.nena.org/page/NG911_StateActivity (last visited May 7, 2018); see also *2016 NG911 Progress Snapshot*, 911.GOV, https://www.911.gov/issue_nextgeneration911.html (last visited May 7, 2018).

implementing next generation emergency calling.¹³ And it is not just ESINet implementation that demonstrates real progress towards NG911. In some places, individual PSAPs are becoming NG911 operational, such as in the state of Maine.¹⁴ T-Mobile is already working proactively with some state authorities and their technology partners to identify possible interoperability issues, and other transition challenges as the transition to NG911 continues.

Carriers have begun delivering 911 calls to these next generation systems and, in those cases, the NG911 network performs location-based routing based on the first location available to the carrier—which is far preferable, from an emergency services standpoint, than the legacy process. For instance, NG911 service providers are in the best position to know when a more precise location is needed for PSAP selection than was available at the time of the emergency call and can take into account the uncertainty of a location estimate provided at call time and how that relates to PSAP jurisdictional boundaries.

For these reasons, the Commission must carefully consider the cost-benefit analysis of any changes to 911 call routing on legacy systems and refrain from proposing burdensome new rules that would divert resources away from deployment of new technologies and other forward-looking improvements. NG911, which is designed for location-based call routing, and the emerging low-latency/high-accuracy location methods necessary to enable such routing, are both becoming available at roughly the same point in time—making the best course of action clear. The Commission should focus its efforts on policy initiatives that hasten the transition to NG911 and encourage 911 stakeholders to migrate expeditiously to next generation technologies.

¹³ See *NG911 Progress Snapshot Across the U.S. Now Available*, 911.GOV, <https://www.911.gov/911connects/issue-1/NG911-progress-across-the-us-snapshot-now-available.html> (last visited May 7, 2018).

¹⁴ See *State of Maine Successfully Completes NG9-1-1 Implementation*, GEOCOMM, <http://www.geo-comm.com/maineng911project/> (last visited May 7, 2018).

Diverting resources to redesign routing for legacy operations could ultimately slow the transition to NG911 and the realization of the broader benefits of next generation technology.

III. THE COMMISSION MUST CAREFULLY CONSIDER THE COST-BENEFIT ANALYSIS OF ANY PROPOSED RULES BASED ON THE LBR REPORT.

As the Commission investigates the various technologies and methodologies described in the LBR Report, it should take seriously that report's conclusions about the viability of any one potential solution. Critically, the LBR Report concluded that several of the options reviewed had fundamental shortcomings that would undermine the benefits the Commission hopes to achieve.

For instance, the LBR Report correctly states that holding legacy 911 calls for a Phase 2 location fix would take far too much time to be a useful solution for location-based routing.¹⁵ While it is possible to achieve a Phase 2 fix in less than 30 seconds, even the first ALI bid for Phase 2 location (which process is triggered when the PSAP answers a 911 call) takes on average about five seconds, and full Phase 2 location currently takes, on average for T-Mobile, 17 seconds. The 30 second window for a Phase 2 fix was adopted to ensure that carriers could transmit the most accurate location estimate to a PSAP. Holding a 911 call for a high-accuracy Phase 2 fix before routing could therefore result in lengthy delays, consumer confusion, and high hang up rates with potentially dire results.

Holding 911 calls for an interim fix on legacy 911 systems in which the call is held for up to six seconds in an attempt to generate an X/Y coordinate that is then plotted on a geospatial shape file presents the same core challenge. Even assuming good location information could be obtained within six seconds, requiring a carrier to use that location information provided for routing would, as noted above, require changes to call flow logic—something that could not be

¹⁵ See LBR Report at 12.

done without extensive legacy network component design changes. Furthermore, delays of more than a few seconds are likely to result in callers hanging up and re-dialing 911, resulting in even more delay in dispatching first responders to an emergency and adding to caller frustration in times of critical need. The LBR Report acknowledged these limitations when it noted that an interim fix should only be used “where its implementation is expected to derive sufficient benefit to justify investment.”¹⁶

Here, the value of undertaking the necessary network component re-design efforts must be weighed against the ability of carriers to obtain location information within a few seconds that would, on the whole, result in more accurate routing than is in use today. If “interim fix” location-based routing results in call processing that for the most part is no better than today’s cell-site based routing, any investment in such a solution would be wasted. And even when device-based hybrid location methods are available to aid 911 call routing, it cannot be assumed that 911 calls would meaningfully benefit from the low-latency location estimates provided by device-based hybrid methods. The main use case for low-latency location estimates are for callers with pre-existing location information available in the handset (*i.e.*, those who have pre-authorized location services¹⁷), and for 911 calls from indoors, where surrounding Wi-Fi measurements are plentiful. For 911 callers who have not pre-authorized location services and are calling from outdoor locations, there will likely be no improvement to the current latency figures associated with the use of A-GPS, which can take up to 30 seconds. For these callers, the

¹⁶ LBR Report at 14.

¹⁷ *See, e.g.*, LBR Report at 9 (“[Location-based routing] is more challenging for technologies utilizing location techniques from a ‘cold start’ than those relying on long-term location tracking of callers, also known as ‘hot start’ location methodology.”).

overall service experience will be degraded because they will wait longer for someone to answer their 911 call, without any countervailing improvement in call routing accuracy.

One critical element to this inquiry is understanding how much tolerance callers have for delays before they will hang up and re-dial. While the LBR Report notes that successful location-based routing requires a fix to be calculated in five seconds or less,¹⁸ that is a far longer duration than current 911 call routing in T-Mobile's network. Moreover, that presumes that a viable location fix can be generated within five seconds and that callers, who may very well be in a panic, will wait that long before hanging up and dialing 911 again. If callers will not wait more than five seconds before hanging up and carriers cannot obtain location fixes suitable for routing in less than five seconds, there will be no net improvement and, in fact, the result might be increased delay in reaching the PSAP, which would result in much greater harms than under the current routing procedures.

Finally, use of geocoding or validation of registered civic addresses presents some of the same issues as the other solutions investigated in the LBR Report. While advanced location technologies may enable carriers to locate callers with a good degree of accuracy, leveraging that location information for 911 call routing on legacy 911 systems will require changes to call flow logic and existing network components. Given the pace with which NG911 is being adopted and the length of time that would be required to design, implement, and test any required modifications to the legacy 911 system, it is likely there would be no practical use cases remaining once the legacy modifications were available to service 911 calls.

¹⁸ LBR Report at 9.

IV. RECOMMENDATIONS AND CONCLUSION

T-Mobile supports improving 911 call routing, utilizing emerging location technologies, and the transition to NG911 systems. The technological improvements capable of producing high-accuracy/low-latency locations that are becoming available for use in 911 solutions have been aggressively sought-after and are welcomed by all stakeholders. But today, the single most important contribution that public safety and the Commission can make in this regard is to encourage PSAPs to expeditiously make the transition to NG911, so that public safety and consumers can benefit from these technological advancements.¹⁹

T-Mobile believes that focusing limited resources in an attempt to add location-based 911 call routing to legacy 911 systems would offer a poor return for a very significant level of effort. T-Mobile instead proposes that the concerted effort to improve 911 call routing be directly associated with the transition to NG911 systems. T-Mobile is already taking steps to help encourage this transition and subsequent testing and refinement of such improved call routing methods.

In this effort, T-Mobile believes all parties would benefit from a better understanding of the real-world trade-offs between minimizing the delay of 911 call placement, and the ability to more precisely route the call to the desired PSAP. Which of these parameters is the highest priority? How long is too long to delay a 911 call to improve the precision of call routing? With better insight into these types of system design trade-offs, and a concerted effort from all relevant stakeholders, there is a strong potential for improvement.

¹⁹ T-Mobile believes the Commission can take concrete steps to aid this process by working to help end the practice of 911 fee diversion, which will only slow the growing momentum towards NG911 implementation.

T-Mobile urges the Commission to recognize that the transition to NG911 systems holds significant promise for improved 911 call routing, given the nature of location-based routing inherent in the NG911 system design, and to encourage all stakeholders to focus on fully implementing NG911 to achieve these goals.

Respectfully submitted,

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May 7, 2018

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