

**FCC FACT SHEET\***

**Location-Based Routing for Wireless 911 Calls**

Report and Order – PS Docket No. 18-64

**Background:** Americans expect that every 911 call will be answered by the public safety answering point (PSAP) that has the ability to promptly dispatch aid to the caller’s location. Wireless 911 calls are typically routed through the cell site (tower) where the call is received and are sent to the PSAP associated with that cell site. Sometimes, however, the 911 call is routed to the wrong PSAP because the receiving cell site is not in the same jurisdiction as the 911 caller. This, in turn, means that the PSAP must transfer the 911 call, which consumes time and resources and ultimately delays the arrival of first responders. With location-based routing, more precise information about the location of the wireless caller’s device can be used to route 911 calls to the appropriate PSAP. In December 2022, the Commission proposed to require wireless providers and certain other providers to implement location-based routing. The record indicates that implementing location-based routing nationwide will reduce by millions the number of wireless 911 calls that would otherwise be routed to an inappropriate PSAP and need to be transferred. This improved routing for 911 will reduce emergency response times and save lives.

**What the Report and Order Would Do:**

- Require all Commercial Mobile Radio Service (CMRS) providers to:
  - Deploy location-based routing technology nationwide for wireless voice calls and real-time text (RTT) communications to 911 originating on their Internet Protocol (IP)-based networks (i.e., 4G LTE, 5G, and subsequent generations of IP-based networks).
  - Use location-based routing to route wireless 911 voice calls and RTT communications to 911 originating on their IP-based networks when location information available to the CMRS provider’s network at time of routing is ascertainable within a radius of 165 meters at a confidence level of at least 90%.
  - In the absence of these conditions, CMRS providers must use alternative routing methods based on “best available” location information, which may include but is not limited to device-based or tower-based location information.
- Require nationwide CMRS providers to implement location-based routing within six months and non-nationwide providers to implement location-based routing within twenty-four months. For RTT communications to 911, the Report and Order would require all CMRS providers to implement location-based routing within 24 months.
- Defer consideration of proposals concerning IP-formatted delivery of wireless 911 voice calls, texts, and associated routing information to Next Generation 911 (NG911) networks to the Commission’s pending NG911 transition docket (PS Docket No. 21-479).

---

\* This document is being released as part of a “permit-but-disclose” proceeding. Any presentations or views on the subject expressed to the Commission or its staff, including by email, must be filed in PS Docket No. 18-64, which may be accessed via the Electronic Comment Filing System (<https://www.fcc.gov/ecfs/>). Before filing, participants should familiarize themselves with the Commission’s *ex parte* rules, including the general prohibition on presentations (written and oral) on matters listed on the Sunshine Agenda, which is typically released a week prior to the Commission’s meeting. See 47 CFR § 1.1200 *et seq.*

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

In the Matter of
Location-Based Routing for Wireless 911 Calls
PS Docket No. 18-64

REPORT AND ORDER\*

Adopted: []

Released: []

TABLE OF CONTENTS

Table with 2 columns: Heading and Paragraph #. Rows include I. INTRODUCTION (1), II. BACKGROUND (4), III. DISCUSSION (21), and sub-sections A through F with further numbered items.

\* This document has been circulated for tentative consideration by the Commission at its January 25, 2024 open meeting. The issues referenced in this document and the Commission’s ultimate resolution of those issues remain under consideration and subject to change.

1. Benefits of Location-Based Routing ..... 116

2. Costs of Implementation ..... 118

IV. PROCEDURAL MATTERS..... 134

V. ORDERING CLAUSES..... 139

Appendix A – Proposed Rules

Appendix B – Final Regulatory Flexibility Analysis

Appendix C – List of Commenting Parties

**I. INTRODUCTION**

1. In this *Report and Order*, we require Commercial Mobile Radio Service (CMRS) providers<sup>1</sup> to implement location-based routing for wireless 911 voice calls and real-time text (RTT) communications<sup>2</sup> to 911 nationwide. With location-based routing (LBR) as implemented under these rules, CMRS providers will use precise location information to route wireless 911 voice calls and RTT communications to 911 to the appropriate public safety answering point (PSAP). For the millions of individuals seeking emergency assistance each year by wireless 911 voice call or RTT communication to 911, improving routing for these services will reduce emergency response times and save lives.

2. In December 2022, the Commission adopted a *Notice of Proposed Rulemaking* proposing to require CMRS providers and covered text providers to implement location-based routing for wireless 911 voice calls and texts nationwide.<sup>3</sup> Public safety commenters overwhelmingly supported the Commission’s proposals. Legacy tower-based routing results in millions of 911 voice calls nationwide arriving at the incorrect PSAP for the caller’s location, which can result in a delay of a minute or more in dispatch and response.<sup>4</sup> The record confirms that implementing location-based routing is technologically feasible and will significantly reduce wireless 911 voice call transfers, saving valuable time for both PSAPs and callers. As a result of the location-based routing rules we adopt today, millions more wireless 911 calls will reach the appropriate PSAP without the need for transfer or delay.

3. To facilitate the implementation of location-based routing for wireless 911 voice calls and RTT communications to 911, we take the following actions:

---

<sup>1</sup> In this *Report and Order*, we use the term Commercial Mobile Radio Service (CMRS) provider to refer to providers of CMRS, as defined in 47 CFR § 9.3 (“Commercial mobile radio service (CMRS)”). When addressing the record in this proceeding, we assume that commenters using terms such as “wireless carriers” or “wireless providers” refer to CMRS providers subject to part 9 of the Commission’s rules.

<sup>2</sup> The Commission defines real-time text as “[t]ext communications that are transmitted over Internet Protocol (IP) networks immediately as they are created, e.g., on a character-by-character basis.” 47 CFR § 9.3; *accord id.* § 67(g). In this *Report and Order*, we use the term “RTT communications” to refer to instances in which an RTT user initiates contact with 911, for consistency with our part 9 and part 67 rules. *See* 47 CFR §§ 9.10(c), 67.1(g), 67.2(c)(2). When addressing the record in this proceeding, we assume that commenters using the terms “RTT call” or “RTT message” refer to the same RTT communications described in the Commission’s part 9 and part 67 rules.

<sup>3</sup> *Location-Based Routing for Wireless 911 Calls*, PS Docket No. 18-64, Notice of Proposed Rulemaking, 37 FCC Rcd 15183, 15184, para. 1 (2022) (*Notice of Proposed Rulemaking*).

<sup>4</sup> The Commission has previously found that a one minute increase in response times increases mortality, and that a one minute decrease in response times decreases mortality. *See, e.g., Wireless E911 Location Accuracy Requirements*, Third Further Notice of Proposed Rulemaking, 29 FCC Rcd 2374, 2388-89, para. 33 & n.70 (2014). As stated in the *Notice of Proposed Rulemaking* and affirmed in this *Report and Order*, the Commission estimates that the implementation of wireless location-based routing under the rules we adopt today will save 13,837 lives annually, assuming a one-minute decrease in response time. *See Notice of Proposed Rulemaking*, 37 FCC Rcd at 15206-07, para. 61 & n.161; *see also* Section III.F.1.

- We require CMRS providers to deploy location-based routing technology for wireless 911 voice calls and RTT communications to 911 on their Internet Protocol (IP)-based networks (i.e., 4G LTE, 5G, and subsequent generations of IP-based networks). We also require CMRS providers to use location-based routing to route wireless 911 voice calls and RTT communications to 911 originating on their IP-based networks when location information meets certain thresholds for accuracy and timeliness.
- We require CMRS providers to use location-based routing for wireless 911 voice calls and RTT communications to 911 when caller location information available to the CMRS provider's network at time of routing is ascertainable within a radius of 165 meters at a confidence level of at least 90%. In the absence of these conditions, CMRS providers must use alternative routing methods based on "best available" location information, which may include but is not limited to device-based or tower-based location information.
- We adopt the proposed six-month timeline for nationwide CMRS providers to implement location-based routing for wireless 911 voice calls and provide twenty-four months for non-nationwide CMRS providers to implement location-based routing of wireless 911 voice calls.<sup>5</sup> In addition, we provide 24 months for all CMRS providers to implement location-based routing for RTT communications to 911.
- We require CMRS providers within 60 days of the applicable compliance deadlines to certify and submit evidence of compliance with location-based routing requirements. At that time, CMRS providers also must submit one-time live call data reporting on the routing methodologies for calls in live call areas, and they must certify the privacy of location information used for location-based routing.
- We defer consideration of proposals in the *Notice of Proposed Rulemaking* to require CMRS providers and covered text providers<sup>6</sup> to implement location-based routing for Short Message Service (SMS) texts to 911.
- We defer consideration of proposals and issues raised in the *Notice of Proposed Rulemaking* concerning IP-formatted delivery of wireless 911 voice calls, texts, and associated routing information for consideration in the Commission's pending Next Generation 911 (NG911) Transition docket (PS Docket No. 21-479—Facilitating Implementation of Next Generation 911 Services).<sup>7</sup>

## II. BACKGROUND

4. *Legacy Enhanced 911 Routing.* When the first 911 call was placed in 1968,<sup>8</sup> 911 service was provided to the public over wireline telephone networks, and wireline providers used the fixed

<sup>5</sup> The Commission defines a "[n]on-nationwide CMRS provider" for purposes of its part 9 rules as "[a]ny CMRS provider other than a nationwide CMRS provider." 47 CFR § 9.10 (i)(1)(v). A "[n]ationwide CMRS provider" for purposes of the Commission's part 9 rules is "[a] CMRS provider whose service extends to a majority of the population and land area of the United States." 47 CFR § 9.10 (i)(1)(iv).

<sup>6</sup> The Commission defines "covered text provider" as including "all CMRS providers as well as all providers of interconnected text messaging services that enable consumers to send text messages to and receive text messages from all or substantially all text-capable U.S. telephone numbers, including through the use of applications downloaded or otherwise installed on mobile phones." 47 CFR § 9.10(q)(1).

<sup>7</sup> See *Facilitating Implementation of Next Generation 911 Services (NG911)*, PS Docket No. 21-479, Notice of Proposed Rulemaking, FCC 23-47, 2023 WL 3946685 (June 9, 2023), <https://www.fcc.gov/document/fcc-proposes-action-expedite-transition-next-generation-911-0> (NG911 Notice of Proposed Rulemaking).

<sup>8</sup> FCC, *911 and E911 Services* (Nov. 3, 2023), <https://www.fcc.gov/general/9-1-1-and-e9-1-1-services> ("[T]he first 911 call was placed in Haleyville, Alabama in 1968.").

location of the calling telephone to route 911 calls to the nearest PSAP.<sup>9</sup> With the deployment of the first generation of cellular service, wireless 911 voice calls could originate from any location served by the wireless network,<sup>10</sup> and the caller could move locations during the call. To enable timely routing of wireless 911 voice calls, CMRS providers typically programmed their networks to use the location of the first cell tower receiving the call to determine the nearest PSAP and route the call accordingly.<sup>11</sup> This became the basis for routing of wireless Enhanced 911 (E911) calls (legacy E911 routing).

5. *Wireless 911 Voice Call Misroutes.* Technical limitations of legacy E911 routing can result in a CMRS provider routing a wireless 911 voice call to a PSAP other than the one designated by the relevant state or local 911 authority to receive 911 calls from the caller's actual location.<sup>12</sup> The Commission considers wireless 911 voice calls routed to a PSAP other than the one designated for the caller's location to be "misrouted,"<sup>13</sup> although such misroutes generally result from tower-based call routing mechanisms working as designed, not from technical failure of those mechanisms.<sup>14</sup> The Alliance for Telecommunications Industry Solutions (ATIS) estimates that on average 12% of wireless legacy E911 voice calls nationwide are misrouted.<sup>15</sup> Other commenters indicate that the percentage of misrouted wireless 911 voice calls is higher in some jurisdictions.<sup>16</sup> These estimates support the conclusion that tower-based routing causes millions of wireless 911 voice calls to be misrouted annually.<sup>17</sup>

6. When a wireless 911 voice call is misrouted, the answering telecommunicator must transfer the call to the PSAP that has jurisdiction to dispatch aid to the 911 caller's location. This process consumes time and resources for both the transferring PSAP and the receiving PSAP and delays

---

<sup>9</sup> *Location-Based Routing for Wireless 911 Calls*, PS Docket No. 18-64, Notice of Inquiry, 33 FCC Rcd 3238, 3240, para. 6 (2018) (*Notice of Inquiry*).

<sup>10</sup> *Id.*

<sup>11</sup> *Id.* at 3240, para. 7.

<sup>12</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15185-86, para. 7. For example, a cell tower in Northern Virginia may pick up a wireless 911 voice call originating in Washington, D.C., but route the call to a Virginia PSAP. *Id.*

<sup>13</sup> *Id.*

<sup>14</sup> *Id.* at 15186, para. 7 n.11.

<sup>15</sup> Alliance for Telecommunications Industry Solutions (ATIS), Analysis of Predetermined Cell Sector Routing Outcomes Compared to Caller's Device Location, ATIS-0500039 at 4 (July 2, 2019), [https://access.atis.org/apps/group\\_public/document.php?document\\_id=48697](https://access.atis.org/apps/group_public/document.php?document_id=48697) (*ATIS-0500039*). Intrado cites a 2018 study concluding that 12.96% out of a set of five million wireless 911 calls were misrouted. Intrado Life & Safety, Inc. (Intrado) Public Notice Comments at 3 & n.8, 4 (rec. July 11, 2022) (Intrado PN Comments).

<sup>16</sup> For example, the Fayetteville (Arkansas) Police Department reports that "roughly 30% or more" of the 911 calls its jurisdiction receives are misrouted from neighboring jurisdictions. Natisha Claypool, Assistant Dispatch Manager, Fayetteville Police Department Public Notice Comments (rec. July 11, 2022) (Fayetteville Police Department PN Comments). Intrado estimates, based on data collected in AT&T's pilot implementation of location-based routing in February/March 2022, that Palm Beach County, Florida, was experiencing misrouted calls with tower-based routing at a rate of at least 11%, and as high as 20-50% along PSAP boundaries. Intrado PN Comments at 4-5.

<sup>17</sup> In the Commission's 2022 annual 911 fee report, 50 states and five other jurisdictions reported receiving a combined total of approximately 149 million wireless 911 voice calls in calendar year 2021. FCC, Fourteenth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges at 13-15, Table 3 (2022), <https://www.fcc.gov/general/911-fee-reports> (Fourteenth Annual 911 Fee Report). Assuming 12% of these calls were misrouted, misroutes would total nearly 18 million calls. NENA: The 9-1-1 Association (NENA) estimates that 23 million wireless 911 voice calls are misrouted annually. NENA Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 15, 2023) (NENA NPRM Comments).

the dispatch of first responders to render aid.<sup>18</sup> Commenters submit anecdotal evidence that a typical misroute introduces a delay of about a minute.<sup>19</sup> NENA estimates that call transfers consume over 200,000 hours per year of excess 911 professional labor.<sup>20</sup> Misrouted wireless 911 voice calls can also contribute to confusion and delay in emergency response.<sup>21</sup> This delay can have deadly consequences.<sup>22</sup>

7. *Location-Based Routing Notice of Inquiry.* In 2018, the Commission released a *Notice of Inquiry* seeking comment on issues related to misrouted wireless 911 calls, including the feasibility of location-based routing.<sup>23</sup> Historically, generating precise caller location information typically required too much time to be used for 911 call routing.<sup>24</sup> The Commission noted, however, that then-recent advances in location technology suggested it was feasible to pinpoint a wireless 911 voice caller's location quickly enough to support an initial routing determination.<sup>25</sup> The Commission also found that many location-based routing methods were promising.<sup>26</sup> The record received in response to the *Notice of Inquiry* confirmed the emergence of potential location-based routing solutions but also indicated

---

<sup>18</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15186-87, para. 8.

<sup>19</sup> See, e.g., APCO PN Comments at 2 (noting that “it’s possible that a misrouted call will introduce a delay of a minute or longer”); NENA Public Notice Comments at 4 (rec. July 11, 2022) (“[T]he general anecdotal consensus was that a call transfer typically takes ‘about a minute.’”); Peninsula Fiber Network Public Notice Comments at 1 (rec. July 8, 2022) (“Each transfer takes between 15 to 90 seconds to set up and complete.”).

<sup>20</sup> NENA Public Notice Comments at 4 (rec. July 11, 2022) (NENA PN Comments).

<sup>21</sup> For example, on June 4, 2020, 16-year-old Fitz Thomas drowned at Confluence Park on the Potomac River, which separates Loudoun County, Virginia, and Montgomery County, Maryland. Press Release, Loudoun County Office of the County Administrator, Public Affairs and Communications, Loudoun County Releases Significant Incident Review of Goose Creek Drowning at 1 (Aug. 31, 2020), <https://www.loudoun.gov/ArchiveCenter/ViewFile/Item/10062>. Due to the incident’s proximity to the jurisdictional border of the Potomac River and the use of legacy E911 routing, both counties received wireless 911 calls routed from the park located on the Virginia side of the river. *Id.* at 2. Efforts to determine Thomas’s actual location contributed to a delay in dispatching first responders. *Id.* On July 15, 2022, Ma Kaing was shot and killed by a stray bullet outside her home in the East Colfax neighborhood of Denver. Jennifer Kovaleski, *Stuck on the line: Cellphone calls routed to the wrong 911 center are costing life-saving seconds*, Denver7 (Nov. 19, 2022), <https://www.denver7.com/news/investigations/stuck-on-the-line-cellphone-calls-routed-to-the-wrong-911-center-are-costing-life-saving-seconds>. The news media reported that four calls from her family and neighbors were misrouted to a neighboring PSAP and required transfer; three callers hung up after waiting minutes on hold. *Id.*

<sup>22</sup> The news media have widely reported on such tragic occurrences. For example, in December 2015, dispatchers were unable to locate Shanell Anderson, who drowned after accidentally driving off the road and into a pond close to the line between Fulton and Cherokee Counties in Georgia. Brendan Keefe and Phillip Kish, *Lost on the Line: Why 911 is broken*, 11ALIVE (Aug. 12, 2019), <https://www.11alive.com/article/news/local/lost-on-the-line-why-911-is-broken/85-225104578>. According to the news media, Shanell Anderson was able to call 911, but the call was picked up by a cell tower in Fulton County and routed to that county’s PSAP, where critical minutes were lost while dispatchers sought to determine the county in which she was located (Cherokee County). *Id.* In another incident in 2008, Olidia Kerr Day made a wireless 911 call before she was fatally shot in a murder-suicide in front of the Plantation, Florida, police department. Sofia Santana, *Cell Phone 911 Calls Are Often Routed to the Wrong Call Centers*, Sun Sentinel (June 21, 2008), <https://www.sun-sentinel.com/sfl-flbsafe911calls0621sbjun21-story.html>. According to the news media, although she placed the call in Plantation, the call was routed to the 911 center in Sunrise, Florida, and had to be transferred to Plantation. *Id.*

<sup>23</sup> *Notice of Inquiry*, 33 FCC Rcd at 3246-51, paras. 17-33.

<sup>24</sup> *Id.* at 3240, para. 3.

<sup>25</sup> *Id.*

<sup>26</sup> *Id.* at 3240, para. 4.

uncertainty about the capabilities of such solutions at the time.<sup>27</sup>

8. *Location-Based Routing Public Notice.* In June 2022, the Commission released a *Public Notice* to refresh the record on location-based routing developments since the *Notice of Inquiry*.<sup>28</sup> Commenters confirmed that continued reliance on legacy E911 routing methodology results in a considerable number of wireless 911 voice call misroutes,<sup>29</sup> which imposes significant burdens on public safety.<sup>30</sup> Public safety commenters agreed that early location-based routing implementations by CMRS providers had shown that the technology was now technologically feasible.<sup>31</sup> Several commenters noted that device-based hybrid (DBH) location technologies<sup>32</sup> were widely available on mobile devices and could be used for routing a high percentage of wireless 911 voice calls.<sup>33</sup>

9. *Location-Based Routing Notice of Proposed Rulemaking.* On December 22, 2022, the Commission adopted the *Notice of Proposed Rulemaking* in this proceeding, which proposed rules for CMRS and covered text providers to implement location-based routing for wireless 911 voice calls and 911 texts<sup>34</sup> nationwide, including wireless 911 voice calls and 911 text messages originating in legacy, transitional, and NG911-capable public safety jurisdictions.<sup>35</sup> The Commission proposed to establish

---

<sup>27</sup> Commenters to the *Notice of Inquiry* offered varying opinions about whether technologies were capable of location-based routing without delaying 911 calls. *See, e.g.*, AT&T Notice of Inquiry Reply at 11 (rec. June 28, 2018) (“Even the most promising of location-based technologies . . . have limits.”); Motorola Solutions, Inc. Notice of Inquiry Comments at 2 (rec. May 7, 2018) (asserting that testing has confirmed that location-based wireless routing is faster and more accurate than legacy wireless routing).

<sup>28</sup> *Federal Communications Commission Seeks to Refresh the Record on Location-Based Routing for Wireless 911 Calls*, PS Docket No. 18-64, Public Notice, 37 FCC Rcd 7196, 7196 (2022) (*Public Notice*).

<sup>29</sup> *E.g.*, Intrado PN Comments at 3 & n.8, 4-5; NENA PN Comments at 2; Fayetteville Police Department PN Comments; *see also* ATIS-0500039 at 4.

<sup>30</sup> *E.g.*, APCO PN Comments at 2; Boulder Regional Emergency Telephone Service Authority (BRETSA) Public Notice Reply at 1-3 (rec. July 25, 2022) (BRETSA PN Reply).

<sup>31</sup> APCO PN Comments at 2; NENA Public Notice Reply at 6 (rec. July 25, 2022) (NENA PN Reply); BRETSA PN Reply at 5.

<sup>32</sup> Device-based hybrid (DBH) location is an estimation method that typically utilizes either a selection or a combination of location methods available to the handset in a given environment, including crowd-sourced Wi-Fi, A-GNSS, and possibly other handset-based sensors. *Public Notice*, 37 FCC Rcd at 7197-98 n.8 (citing *CSRIC V LBR Report* at 16). It also includes an associated uncertainty estimate reflective of the quality of the returned location. *Id.*

<sup>33</sup> CTIA Public Notice Reply at 3 (rec. July 25, 2022); AT&T Public Notice Comments at 2 (rec. July 11, 2022) (AT&T PN Comments); Intrado PN Comments at 8-9.

<sup>34</sup> A “911 text message” is “a message, consisting of text characters, sent to the short code ‘911’ and intended to be delivered to a PSAP by a covered text provider, regardless of the text messaging platform used.” 47 CFR § 9.10(q)(9). The Commission’s text-to-911 rules are technology neutral and apply to both Short Message Service (SMS) and real-time text (RTT). *Transition from TTY to Real-Time Text Technology; Petition for Rulemaking to Update the Commission’s Rules for Access to Support the Transition from TTY to Real-Time Text Technology, and Petition for Waiver of Rules Requiring Support of TTY Technology*, CG Docket No. 16-145, GN Docket No. 15-178, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 13568, 13593, para. 45 n.181 (2016) (*RTT Order*). RTT transition obligations only apply to a subset of covered text providers: “those entities that are involved in the provision of IP-based wireless voice communication service, and only to the extent that their services are subject to existing TTY technology support requirements under Parts 6, 7, 14, 20, or 64 of the Commission’s rules.” *RTT Order*, 31 FCC Rcd at 13576-77, para. 12.

<sup>35</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15184-85, para. 3. In the *Notice of Proposed Rulemaking*, the Commission used the term “NG911-capable” to refer to PSAPs or jurisdictions that have implemented IP-based network and software components that are capable of supporting the provision of NG911, including but not limited

(continued....)

requirements with respect to the accuracy and timeliness of location information CMRS and covered text providers would use to comply with location-based routing requirements.<sup>36</sup> In particular, the Commission proposed to require CMRS providers and covered text providers to use location-based routing for 911 calls and texts when they have location information that meets the following specifications for timeliness and accuracy: (i) the information must be available to the provider network at the time the call or text is routed, and (ii) the information must identify the caller's horizontal location within a radius of 165 meters at a confidence level of at least 90%.<sup>37</sup>

10. The Commission also proposed that when location information does not meet one or both of these requirements, CMRS providers and covered text providers would be required to route 911 calls and texts based on the best available location information, which could include cell tower coordinates.<sup>38</sup> In addition, to help ensure that public safety jurisdictions transitioning to NG911 could realize the benefits of location-based routing in an efficient and cost-effective manner, the Commission proposed to require CMRS providers and covered text providers to deliver wireless 911 voice calls, texts, and location information for routing<sup>39</sup> in IP format upon request of 911 authorities<sup>40</sup> who have established the capability to accept NG911-compatible IP-based 911 communications.<sup>41</sup> At the time of the *Notice of Proposed Rulemaking*, AT&T, T-Mobile, and Verizon had stated publicly in the record or elsewhere that they had deployed or planned to deploy location-based routing to some extent on their networks for voice calls.<sup>42</sup> The Commission received twenty-six comments, fourteen replies, and several *ex parte* filings.<sup>43</sup>

---

to an Emergency Services Internet Protocol Network (ESInet). *Id.* at 15184, para. 3 n.5. NG911 relies on IP-based architecture rather than the Public Switched Telephone Network (PSTN)-based architecture of legacy 911 to provide an expanded array of emergency communications services that encompasses both the core functionalities of legacy E911 and additional functionalities that take advantage of the enhanced capabilities of IP-based devices and networks. *Framework for Next Generation 911 Deployment*, PS Docket No. 10-255, Notice of Inquiry, 25 FCC Rcd 17869, 17877, para. 18 (2010). NG911 architecture also provides for transitional network components to enable delivery of legacy 911 calls to ESInets during the transition to full end-state NG911. *See id.* at 17878, para. 20 (explaining that emergency calls can be delivered to ESInets from legacy networks).

<sup>36</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15198, para. 37.

<sup>37</sup> *Id.*

<sup>38</sup> *Id.* at 15195-97, paras. 28, 30.

<sup>39</sup> In NG911 architecture, device-based location information embedded in IP-formatted 911 calls is first used by the provider to route the call to an ESInet, and the ESInet operator then applies NG911 network routing policies to the embedded information to route the call to the appropriate PSAP. *Notice of Proposed Rulemaking* 37 FCC Rcd at 15203, para. 53.

<sup>40</sup> While the Commission has not specifically defined the term "911 authorities" in this proceeding, we use this term in this *Report and Order* to generally mean "[t]he state, territorial, regional, Tribal, or local agency or entity with the authority and responsibility under applicable law to designate the point(s) to receive emergency calls." *NG911 Notice of Proposed Rulemaking* 37 FCC Rcd at 15203, para. 53 (proposing a definition of the term "911 Authority" that would define the term for purposes of Commission rules related to the NG911 transition).

<sup>41</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15185, para. 4.

<sup>42</sup> Press Release, T-Mobile USA, Inc. (T-Mobile), T-Mobile First to Roll Out Cutting-Edge 911 Capabilities (Dec. 17, 2020), <https://www.t-mobile.com/news/network/tmobile-next-generation-911-location-based-routing> (T-Mobile Dec. 17, 2020 Press Release); T-Mobile Public Notice Reply at 2 & n.6 (rec. July 25, 2022) (T-Mobile PN Reply); AT&T PN Comments at 4; CB Cotton, *Verizon plans to update 911 routing technology after Denver's East Colfax neighborhood calls for change*, Denver7 (Aug. 5, 2022), <https://www.denver7.com/news/local-news/verizon-plans-to-update-911-routing-technology-after-denvers-east-colfax-neighborhood-calls-for-change>.

<sup>43</sup> A list of entities that filed comments, replies, and *ex partes* in response to the *Notice of Proposed Rulemaking* may be found in Appendix C.



11. Virtually all public safety commenters<sup>44</sup> and some additional commenters<sup>45</sup> support Commission action to require CMRS providers to implement location-based routing for wireless 911 voice calls. Multiple public safety commenters and Intrado support the Commission's proposal that CMRS providers implement location-based routing nationwide.<sup>46</sup> Commenters representing wireless interests urge the Commission to allow CMRS providers to implement location-based routing voluntarily or on a PSAP-by-PSAP basis, as opposed to a nationwide mandate.<sup>47</sup> With respect to text-to-911, numerous commenters support requiring covered text providers to implement location-based routing,<sup>48</sup> but some commenters contend that such a requirement would be premature.<sup>49</sup> Citing a lack of technical standards for routing SMS texts to 911, NENA, ATIS, and Southern Linc oppose requiring covered text providers to implement location-based routing for SMS but suggest that the Commission should require location-based routing for IP-based text solutions such as RTT.<sup>50</sup>

---

<sup>44</sup> NENA NPRM Comments at 1; APCO Notice of Proposed Rulemaking Comments at 1 (rec. Feb. 16, 2023) (APCO NPRM Comments); National Association of State 911 Administrators (NASNA) Notice of Proposed Rulemaking Comments at 8 (rec. Feb. 16, 2023) (NASNA NPRM Comments); Michigan State 911 Committee Notice of Proposed Rulemaking Comments at 1 (rec. Feb. 9, 2023) (Michigan State 911 NPRM Comments); Colorado Public Utilities Commission (COPUC) Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 15, 2023) (COPUC NPRM Comments); Keith Johnson, System Chief LC-CFRS, Nicole Pickrell, Deputy Chief LCFR Notice of Proposed Rulemaking Comments at 3 (rec. Feb. 16, 2023) (filed on behalf of Loudoun County, Virginia) (Loudoun County NPRM Comments); Texas 9-1-1 Alliance, Texas Commission on State Emergency Communications, Municipal Emergency Communication Districts Association Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 16, 2023) (Texas 9-1-1 Entities NPRM Comments); BRETSA Notice of Proposed Rulemaking Comments at 10 (rec. Feb. 16, 2023) (BRETSA NPRM Comments); Adams County E-911 Emergency Telephone Service Authority, Arapahoe County 911 Authority, Jefferson County Emergency Communications Authority Notice of Proposed Rulemaking Comments at 1-2 (rec. Feb. 17, 2023) (Adams County et al. NPRM Comments); Acadian Ambulance Service Inc., Benjamin Blanchard, Senior IT Director Notice of Proposed Rulemaking Comments at 1 (rec. Feb. 13, 2023); Joseph Lyons Notice of Proposed Rulemaking Comments (rec. Feb. 3, 2023) (Joseph Lyons NPRM Comments); Val Sprynczynatyk Notice of Proposed Rulemaking Comments (rec. Feb. 7, 2023); Jon Marcy, Kevin Brown, John Holloway Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 8, 2023) (filed on behalf of Defense Information Systems Agency (DISA)) (DISA NPRM Comments).

<sup>45</sup> Verizon Notice of Proposed Rulemaking Comments at 9 (rec. Feb. 16, 2023) (Verizon NPRM Comments); Intrado Notice of Proposed Rulemaking Comments at 1 (rec. Feb. 16, 2023) (Intrado NPRM Comments); Industry Council for Emergency Response Technologies, Inc. (iCERT) Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 14, 2023) (iCERT NPRM Comments); Motorola Solutions Connectivity, Inc. Notice of Proposed Rulemaking Reply at 1 (rec. Mar. 20, 2023); American Trauma Society Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 16, 2023).

<sup>46</sup> APCO NPRM Comments at 2; Adams County et al. NPRM Comments at 1; DISA NPRM Comments at 2; Michigan State 911 NPRM Comments at 1; Intrado NPRM Comments at 2-3.

<sup>47</sup> *See, e.g.*, CTIA Notice of Proposed Rulemaking Comments at 4 (rec. Feb. 16, 2023) (CTIA NPRM Comments); Verizon NPRM Comments at 1; T-Mobile Notice of Proposed Rulemaking Comments at 3 (rec. Feb. 16, 2023) (T-Mobile NPRM Comments); AT&T Notice of Proposed Rulemaking Comments at 3 (rec. Feb. 16, 2023) (AT&T NPRM Comments); Southern Linc Notice of Proposed Rulemaking Reply at 4 (rec. Mar. 20, 2023) (Southern Linc NPRM Reply); iCERT NPRM Comments at 2; Rural Wireless Association, Inc. Notice of Proposed Rulemaking Reply at 4 (rec. Mar. 20, 2023) (RWA NPRM Reply); CCOA NPRM Reply at 1-2.

<sup>48</sup> NASNA NPRM Comments at 13; COPUC NPRM Comments at 2; BRETSA NPRM Comments at 10; DISA NPRM Comments at 2; Intrado NPRM Comments at 1.

<sup>49</sup> CTIA NPRM Comments at 2; Competitive Carriers Association (CCA) Notice of Proposed Rulemaking Comments at 16-18 (rec. Feb. 16, 2023) (CCA NPRM Comments); T-Mobile NPRM Comments at 11; Verizon NPRM Comments at 5-6.

<sup>50</sup> NENA Notice of Proposed Rulemaking Reply at 8-9 (Mar. 20, 2023) (NENA NPRM Reply); ATIS Notice of Proposed Rulemaking Comments at 1, 3 (rec. Feb. 16, 2023) (ATIS NPRM Comments); Southern Linc NPRM

(continued....)

12. In response to the Commission’s proposed timeliness and accuracy requirements for use of location-based routing, some commenters express support for the proposed requirements,<sup>51</sup> while others oppose the proposed accuracy threshold and request flexibility for providers to set their own thresholds.<sup>52</sup> In response to the Commission’s proposed requirement for CMRS and covered text providers to deliver 911 calls, texts, and associated routing information in IP format upon request of 911 authorities who have established the capability to accept such communications, multiple commenters ask the Commission to address such proposals together with corresponding proposed requirements for other types of originating service providers in a separate proceeding.<sup>53</sup>

13. *NG911 Notice of Proposed Rulemaking.* In June 2023, the Commission adopted a *Notice of Proposed Rulemaking* in PS Docket No. 21-479 to advance the nationwide transition to Next Generation 911 (*NG911 Notice of Proposed Rulemaking*).<sup>54</sup> In the *NG911 Notice of Proposed Rulemaking*, the Commission proposed to require wireline, interconnected Voice over Internet Protocol (VoIP), and Internet-based Telecommunications Relay Service (TRS) providers to complete all translation and routing to deliver 911 calls, including associated location information, in the requested IP-based format to an Emergency Services IP network (ESInet) or other designated point(s) that allow emergency calls to be answered, upon request of 911 authorities who have certified the capability to accept IP-based 911 communications.<sup>55</sup> This proposal is similar to that proposed for CMRS and covered text providers in the *Notice of Proposed Rulemaking* in this proceeding.

14. *Ongoing Location-Based Routing Deployment.* As the Commission noted in the *Notice of Proposed Rulemaking*, several developments indicate that location-based routing has become a viable methodology for CMRS providers to route wireless 911 voice calls and texts.<sup>56</sup> These developments include studies on misroutes and location-based routing technology<sup>57</sup> and increased deployment of DBH

---

Reply at 6-7; *see also* T-Mobile NPRM Comments at 11 (urging the Commission to “refrain from adopting an LBR mandate for interim and legacy texts to 911 and focus its efforts on encouraging all stakeholders to invest in next-generation communication technologies”); Alaska Telecom Association Notice of Proposed Rulemaking Reply at 3-4 (rec. Mar. 20, 2023) (Alaska Telecom NPRM Reply).

<sup>51</sup> APCO NPRM Comments at 2; Adams County et al. NPRM Comments at 3; BRETSA Notice of Proposed Rulemaking Reply at 6 (rec. Mar. 20, 2023) (BRETSA NPRM Reply); Intrado NPRM Comments at 5; *see also* AT&T NPRM Comments at 4 (supporting a definition of “device-based location information” that is tied to timeliness and accuracy metrics “that the Commission believes would represent a significant improvement over cell-based routing methodologies”).

<sup>52</sup> CTIA Notice of Proposed Rulemaking Reply at 5 (rec. Mar. 20, 2023) (CTIA NPRM Reply); T-Mobile NPRM Comments at 9; Verizon NPRM Comments at 4; Southern Linc NPRM Reply at 5-6; ATIS NPRM Comments at 3-4; iCERT NPRM Comments at 3-4.

<sup>53</sup> Letter from Christiaan Segura, Director, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 18-64, at 2 (filed July 3, 2023) (CTIA July 3, 2023 *Ex Parte*); Intrado NPRM Comments at 2, 5-6; Texas 9-1-1 Entities NPRM Comments at 5-6 n.21; NENA NPRM Reply at 4-5; Verizon Notice of Proposed Rulemaking Reply at 4-5 (rec. Mar. 20, 2023) (Verizon NPRM Reply) (recommending the Commission “coupl[e] LBR with a framework for i3-based NG911 implementation”); *see also* Letter from Joely Denking, Regulatory Counsel, Federal Affairs, GCI Communication Corp., to Marlene H. Dortch, Secretary, FCC, PS Docket Nos. 18-64, 21-479, at 1 (filed July 17, 2023) (GCI July 17, 2023 *Ex Parte*).

<sup>54</sup> *NG911 Notice of Proposed Rulemaking*, 2023 WL 3946685.

<sup>55</sup> *NG911 Notice of Proposed Rulemaking* at \*1, \*34-35, para. 2, Appx. A.

<sup>56</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15188-89, paras. 11-12.

<sup>57</sup> ATIS-0500039; ATIS, Enhancing Location-Based Routing of Emergency Calls, ATIS-0700042 (July 12, 2019), [https://access.atis.org/apps/group\\_public/document.php?document\\_id=48218](https://access.atis.org/apps/group_public/document.php?document_id=48218) (ATIS-0700042).

location technologies on consumer handsets.<sup>58</sup> In 2019, ATIS published two studies on legacy E911 misroutes and the feasibility of location-based routing.<sup>59</sup> In those studies, ATIS concluded that “location-based routing is technically feasible within the timing considerations recommended by [Communications Security, Reliability, and Interoperability Council (CSRIC)] V”<sup>60</sup> and evaluated where “sub-optimal routing” occurred for a sample set of wireless emergency calls.<sup>61</sup> ATIS has also issued two standards that support location-based routing: ATIS-0700042 (Enhancing Location-Based Routing of Emergency Calls) and ATIS-0700015 (ATIS Standard for Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination).<sup>62</sup> The Competitive Carriers Association (CCA) states that in these and other documents, “ATIS has defined several architecture options that carriers can use to provide location-based routing as well as several call flow options from which carriers can choose to employ to conduct location-based routing.”<sup>63</sup>

15. The three nationwide CMRS providers are continuing to deploy location-based routing for wireless 911 voice calls on their networks. AT&T completed the rollout of location-based routing on its network in June 2022 and uses location-based routing to deliver wireless 911 voice calls to nearly all PSAPs nationwide, regardless of whether such PSAPs support legacy E911 or are transitioning to NG911.<sup>64</sup> T-Mobile launched location-based routing on its network in the states of Texas and

---

<sup>58</sup> Press Release, CTIA, Wireless Industry Announces Development in Improving 9-1-1 Location Accuracy (Sept. 5, 2018), <https://www.ctia.org/news/wireless-industry-announces-development-in-improving-9-1-1-location-accuracy>; Letter from Paul Margie, Counsel, Apple Inc., to Marlene H. Dortch, Secretary, FCC, PS Docket No. 18-64 et al., at 2 (filed Sept. 24, 2019) (Apple Sept. 24, 2019 *Ex Parte*). Device-based hybrid (DBH) location is “[a]n estimation method that typically utilizes either a selection or a combination of location methods available to the handset in a given environment—including crowd-sourced Wireless Fidelity (Wi-Fi), Assisted-Global Navigation Satellite System (A-GNSS), and possibly other handset-based sensors.” *ATIS-0700042* at 2. “It also includes an associated uncertainty estimate reflective of the quality of the returned location.” *Id.*

<sup>59</sup> *ATIS-0700042*; *ATIS-0500039*. ATIS observed that calls that are “sub-optimally routed” tend to occur “[a]long PSAP boundaries,” “[i]n areas having a dense concentration of PSAPs,” “[a]round major water features,” and “[a]long narrow strips of jurisdictional territory.” *ATIS-0500039* at 12.

<sup>60</sup> *ATIS-0700042* at 22. CSRIC is a federal advisory committee subject to the requirements of the Federal Advisory Committee Act (FACA), 5 U.S.C. App. 2, and charged with providing recommendations to the Commission to ensure, among other things, the security and reliability of communications systems. FCC, *Communications Security, Reliability, and Interoperability Council*, <https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability-council-0> (last visited Nov. 11, 2023).

<sup>61</sup> *ATIS-0500039* at 1.

<sup>62</sup> *ATIS-0700042*; ATIS, ATIS Standard for Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination and ESInet/Legacy Selective Router Termination, ATIS-0700015.v005, (June 1, 2021) [https://www.techstreet.com/standards/atis-0700015-v005?product\\_id=2226711](https://www.techstreet.com/standards/atis-0700015-v005?product_id=2226711); CCA NPRM Comments at 7, n.10. CCA also cites to *ATIS-0500039*. *Id.*

<sup>63</sup> CCA NPRM Comments at 7. CCA also states that “3GPP has also addressed how to implement location-based routing, and several 3GPP specifications relate to location services and emergency calling.” CCA NPRM Comments at 9. In particular, CCA identifies TS 23.167, entitled “Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS) emergency sessions,” as identifying “architectural principles, location information principles, a reference architecture, functional descriptions, procedures for establishing an IMS emergency session, call flows, and related information.” *Id.* CCA also notes that other 3GPP specifications, including TS 36.305—“Stage 2 functional specification of User Equipment (UE) positioning in E-UTRAN” and TS 38.305—“NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN,” provide additional pertinent information regarding the implementation of location services data. *Id.* at 9-10.

<sup>64</sup> AT&T PN Comments at 4; AT&T NPRM Comments at 1. AT&T notes that a few PSAPs are using unique internal routing solutions and that the company is working to ensure that its implementation of location-based routing meets the needs of these PSAPs. AT&T PN Comments at 4 n.3.

Washington in 2020 and as of December 2023 had deployed location-based routing for wireless 911 voice calls to 1,591 PSAPs with an additional 596 in progress.<sup>65</sup> In December 2023, Verizon reported that it had implemented location-based routing for wireless 911 voice calls to 414 PSAPs with an additional 277 PSAPs in progress.<sup>66</sup>

16. For wireless 911 voice calls, AT&T, T-Mobile, and Verizon have, to date, implemented their own different thresholds to determine whether device location information arriving with the call is sufficiently precise for routing. According to Intrado, AT&T's location-based routing solution uses a threshold with a radius of 165 meters and 90% confidence,<sup>67</sup> which has enabled AT&T to use location-based routing for over 80% of all wireless 911 voice calls on its network.<sup>68</sup> T-Mobile reports that it has implemented "a location estimate uncertainty threshold for LBR currently set to 300 meters with a confidence level of 90%," and reports that more than 95% of location estimates available at call routing fall within these metrics.<sup>69</sup> Verizon reports that it uses "an accuracy threshold of 200 meters maximum horizontal uncertainty with confidence of 90 percent."<sup>70</sup> AT&T and T-Mobile state that they default to legacy E911 routing when device location information arriving with the call exceeds the radius of the providers' respective thresholds.<sup>71</sup>

17. *Text Messaging Platforms.* Since 2014, all CMRS providers and covered text providers have been required to support delivery of 911 texts to PSAPs that are capable of receiving them.<sup>72</sup> While availability of text-to-911 has increased significantly as more PSAPs become text-capable, the number

---

<sup>65</sup> Letter from Eric Hagerson, Government Affairs Director, Public Safety and Security, T-Mobile, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 18-64 at 1 (filed Dec. 21, 2023) (T-Mobile Dec. 21, 2023 *Ex Parte*). T-Mobile reports that it only deploys location-based routing in response to a PSAP's request. *See, e.g.*, T-Mobile Public Notice Comments at 1, 4-7 (rec. July 11, 2022) (T-Mobile PN Comments); T-Mobile PN Reply at 2-4. For context, the latest NENA data indicate that 5,748 PSAPs operate in the United States. NENA, *9-1-1 Statistics*, <https://www.nena.org/page/911Statistics> (last visited Dec. 15, 2023).

<sup>66</sup> Letter from Robert G. Morse, Associate General Counsel, Federal Regulatory and Legal Affairs, Verizon, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 18-64 at 1 (filed Dec. 7, 2023) (Verizon Dec. 7, 2023 *Ex Parte*).

<sup>67</sup> Intrado PN Comments at 9.

<sup>68</sup> *Id.* at 2, 9.

<sup>69</sup> Letter from Kristine Laudadio Devine, Counsel to T-Mobile USA, Inc., HWG LLP, to Marlene H. Dortch, Secretary, FCC, P.S. Docket Nos. 18-64, 21-479, at 1 (filed July 26, 2023) (T-Mobile July 26, 2023 *Ex Parte*). For purposes of this *Report and Order*, we assume that when commenters specify an uncertainty measurement for an implementation of location-based routing, that they are referring to the radius in meters from the reported position at the same confidence level. This assumption is consistent with prior Commission discussion of confidence and uncertainty data in the *Wireless Location Accuracy* proceeding, i.e., that the uncertainty statistical estimate is expressed as a radius in meters around the reported position, and the confidence level is expressed as a percentage, indicating the statistical probability that the caller is within the area defined by the uncertainty. *See, e.g., Wireless E911 Location Accuracy Requirements*, Fourth Report and Order, PS Docket No. 07-114, 30 FCC Rcd. 1259, 1326-27, para. 182 n.458 (2015) (*E911 Fourth Report and Order*).

<sup>70</sup> Letter from Robert G. Morse, Associate General Counsel, Federal Regulatory and Legal Affairs, Verizon, to Marlene H. Dortch, Secretary, FCC, PS Docket Nos. 18-64, 21-479, at 1 (filed July 13, 2023) (Verizon July 13, 2023 *Ex Parte*).

<sup>71</sup> AT&T PN Comments at 4; T-Mobile July 26, 2023 *Ex Parte* at 2. Verizon did not indicate in the record whether it defaults to tower-based routing when device location information exceeds its chosen threshold.

<sup>72</sup> 47 CFR § 9.10(q). *See Facilitating the Deployment of Text-to-911 and Other Next Generation 911 Applications; Framework for Next Generation 911 Deployment*, PS Docket Nos. 11-153 and 10-255, Second Report and Order and Third Further Notice of Proposed Rulemaking, 29 FCC Rcd 9846 (2014) (*T911 Second Report and Order*).

of 911 texts sent by the public is far smaller than the number of wireless 911 voice calls.<sup>73</sup> The Commission's text-to-911 rules are technology neutral and apply to both SMS and RTT.

18. SMS is the predominant mobile wireless messaging technology in use for 911 texts today.<sup>74</sup> SMS is not an IP-native format, though IP-enabled networks can deliver SMS traffic.<sup>75</sup> All three nationwide CMRS providers report that they are using location-based routing for at least some SMS texts to 911, but this implementation appears to be distinct from and less extensive than the implementation of location-based routing for 911 voice calls. According to Verizon, "SMS still uses call path, routing and device processing methods that are distinct from VoLTE and RTT calls, with architecture configurations that still resembles second- and third-generation networks in some respects."<sup>76</sup> AT&T reports that it provides device-based hybrid location for "the majority of text messages" but does not provide specifics.<sup>77</sup> T-Mobile reports that it is using location-based routing for at least some text-to-911 messages.<sup>78</sup> Verizon indicates that it "has worked with its wireless 911 vendor Comtech to incorporate LBR in Comtech's centralized text control center (TCC) in a manner that supports LBR for 911 text messages nationwide."<sup>79</sup> Moreover, while the nationwide providers appear to be capable of using location-based routing for some SMS texts, NENA and other commenters indicate that standards have not been developed for location-based routing of SMS and that further work on standards is needed.<sup>80</sup>

19. RTT, unlike SMS, is a native IP technology, in which each text character appears on the receiving device at roughly the same time it is typed on the sending device, allowing for a conversational flow of communication.<sup>81</sup> RTT also allows text characters to be sent simultaneously with voice,<sup>82</sup> which allows the PSAP to both see the typed message and hear background noises and potentially the voice of the caller.<sup>83</sup> The Commission's rules require that CMRS providers choosing to implement RTT to and

---

<sup>73</sup> In the Commission's 2022 annual 911 fee report, 50 states and five other jurisdictions reported receiving a combined total of 781,201 texts to 911 in comparison to 148,952,960 wireless 911 voice calls in calendar year 2021. Fourteenth Annual 911 Fee Report at 13-15, Table 3.

<sup>74</sup> CTIA NPRM Comments at 7; BRETSA NPRM Reply at 9-10; *see T911 Second Report and Order*, 29 FCC Rcd at 9872-73, paras. 52-55.

<sup>75</sup> *See Verizon NPRM Comments* at 5.

<sup>76</sup> *Verizon NPRM Comments* at 5. *Id.*

<sup>77</sup> AT&T PN Comments at 5. AT&T explains that "[w]hen the SMS message arrives at the TCC, [the TCC] queries [AT&T's] wireless network for commercial location estimates to deliver the text message to the appropriate PSAP." *Id.*

<sup>78</sup> T-Mobile July 26, 2023 *Ex Parte* at 3. T-Mobile explains that texts to 911 are routed from T-Mobile's network to its TCC vendor and, "whenever possible," T-Mobile includes device-based hybrid location information with those texts. *Id.*

<sup>79</sup> Verizon Dec. 7, 2023 *Ex Parte* at 1. Verizon states that its location-based routing implementation will support location-based routing for RTT. *Verizon NPRM Comments* at 5.

<sup>80</sup> NENA NPRM Reply at 9.

<sup>81</sup> *RTT Order*, 31 FCC Rcd at 13576, para. 10; FCC, *Real-Time Text: Improving Accessible Telecommunications* (Jan. 27, 2021), <https://www.fcc.gov/consumers/guides/real-time-text-improving-accessible-telecommunications#:~:text=Real%2Dtime%20text%20%E2%80%93%20or%20RTT,or%20other%20types%20of%20texting>.

<sup>82</sup> *RTT Order*, 31 FCC Rcd at 13569, para. 1.

<sup>83</sup> *See Donny Jackson, APCO speakers say RTT being used operationally, could be key platform for 911 in the future*, IWCE's Urgent Communications (Aug. 8, 2023), <https://urgentcomm.com/2023/08/08/apco-speakers-say-rtt-being-used-operationally-could-be-key-platform-for-911-in-the-future/> (Jackson, *APCO speakers*).

from any PSAP served by their network in lieu of text telephone (TTY) technology must do so in a manner that fully complies with all applicable 911 rules.<sup>84</sup> The Commission also requires CMRS providers who choose to support RTT to make RTT backward-compatible with TTY devices.<sup>85</sup> This enables PSAPs without end-to-end RTT capability to use their existing TTY terminals to handle RTT 911 communications.<sup>86</sup>

20. While SMS is used more frequently than RTT for messaging to 911, CMRS providers are beginning to partner with some PSAPs to implement end-to-end RTT capabilities. T-Mobile reports that it is currently operating NG911 RTT technology at a PSAP in Hood County, Texas.<sup>87</sup> Verizon indicates that it now supports RTT for 911 in Livingston Parish, Louisiana, and Logan County, West Virginia.<sup>88</sup> The record does not indicate the degree to which CMRS providers have implemented location-based routing for RTT communications to 911, but the providers and other industry commenters state that location-based routing for RTT communications to 911 is feasible.<sup>89</sup>

### III. DISCUSSION

#### A. Location-Based Routing

##### 1. Wireless 911 Voice Calls

21. We adopt requirements for nationwide and non-nationwide CMRS providers to implement location-based routing as proposed in the *Notice of Proposed Rulemaking* for voice calls,<sup>90</sup> with certain modifications. Specifically, we require all CMRS providers to (1) deploy technology that supports location-based routing on their IP-based networks (i.e., 4G LTE, 5G, and subsequent generations of IP-based networks), and (2) use location-based routing to route all wireless 911 voice calls originating on their IP-based networks when location information meets certain requirements for accuracy and timeliness. We note that nothing in today's decision, including this definition of "location-based routing" and other rules we adopt today, authorizes the use of any non-U.S. satellite system in conjunction with the 911 system. CMRS providers seeking to employ foreign satellite navigation

---

<sup>84</sup> *RTT Order*, 31 FCC Rcd at 13591-92, para. 43. This includes the requirement to deliver RTT communications within six months to PSAPs that submit a valid request. *Id.* at 13592-93, para. 45 & n.181.

<sup>85</sup> *RTT Order* at 13589, para. 37.

<sup>86</sup> *Id.* at 13590, para. 39. Currently, RTT communications to 911 that are received at many PSAPs are converted to TTY. Letter from AnnMarie Killian, Chief Executive Officer, TDIforAccess, Inc., and Mark Seeger, Policy Coordinator, TDIforAccess, Inc., to Marlene H. Dortch, Secretary, FCC, PS Docket No. 18-64, at 2 (filed Aug. 31, 2023) (TDIforAccess Aug. 31, 2023 *Ex Parte*).

<sup>87</sup> T-Mobile, *T-Mobile and Sinch Deliver NextGen 911 Real-Time Text to Make Fast Access to Public Safety Support Easier for Customers* (Nov. 1, 2022), <https://www.t-mobile.com/news/community/t-mobile-and-sinch-deliver-ng911-rtt>.

<sup>88</sup> Verizon, *Verizon continues industry leadership with additional NG911 i3 deployment* (June 20, 2023), <https://www.verizon.com/about/news/verizon-continues-industry-leadership-additional-ng911-i3-deployment>; CISION PR Newswire, *NGA and Verizon deliver Real-Time Text (RTT) in Logan County, W. Va.* (Jan. 3, 2023), <https://www.prnewswire.com/news-releases/nga-and-verizon-deliver-real-time-text-rtt-in-logan-county-w-va-301712242.html>; see also Jackson, *APCO speakers* (noting that the Logan County, West Virginia, PSAP initially adopted RTT with Verizon and later T-Mobile).

<sup>89</sup> Verizon NPRM Comments at 5 ("Verizon's planned LBR implementation for VoLTE will support real-time-text (RTT) 911 calls."); see also ATIS NPRM Comments at 3 (urging the Commission "to clarify that only providers of such next generation text solutions [as defined in ATIS and NENA standards] are required to use LBR").

<sup>90</sup> *Notice of Proposed Rulemaking* 37 FCC Rcd at 15192, para. 17.

systems for 911 should follow the existing approval process.<sup>91</sup>

22. We require nationwide CMRS providers to comply with these location-based routing requirements for voice calls within six months after the effective date of the final rules. We require non-nationwide CMRS providers to comply with these location-based routing requirements for voice calls within 24 months after the effective date of the final rules in recognition of resource constraints faced by these providers. As discussed below, we adopt these requirements in light of record support that location-based routing for wireless 911 voice calls promotes public safety, is technologically feasible at reasonable cost for both nationwide and non-nationwide CMRS providers, and has been deployed by the three nationwide CMRS providers. We find that these requirements are necessary to extend the demonstrated, life-saving benefits of location-based routing to all wireless 911 callers nationwide.

**a. Nationwide and Network-Wide Implementation**

23. We require all CMRS providers to deploy location-based routing technologies for voice calls across their IP-based networks. In the *Notice of Proposed Rulemaking*, the Commission sought comment on whether CMRS providers should be required to use location-based routing to deliver 911 calls to all PSAPs served by their networks, or whether the requirement should be triggered by PSAP request or limited to certain categories of PSAPs.<sup>92</sup> We find that requiring CMRS providers to implement this technology across their IP network areas is necessary to ensure that wireless 911 callers receive the demonstrated benefits of improved routing, regardless of the caller's geographic location or CMRS provider.

24. We find that nationwide implementation of location-based routing will reduce 911 call transfers and improve wireless 911 service. As wireless 911 voice calls account for the vast majority of communications to 911, we consider it to be particularly important that these calls are routed to the appropriate PSAP.<sup>93</sup> CMRS providers' voluntary deployments of location-based routing have resulted in important and evident improvements to 911 wireless voice call routing. The record indicates that ongoing deployments of location-based routing have significantly reduced the occurrence of transferred wireless 911 voice calls.<sup>94</sup> AT&T estimates that, as a result of its nationwide implementation, 10% of all wireless 911 voice calls on its network received a more optimal route and therefore did not need to be transferred.<sup>95</sup> NASNA states that uniform implementation of location-based routing has the potential to route 911 calls to the right PSAP faster than traditional cell sector-based routing in many cases and, in an emergency, "seconds can mean the difference between life and death."<sup>96</sup> Public safety commenters emphasize, and we agree, that increasing the implementation of location-based routing will reduce delays

---

<sup>91</sup> See *Wireless E911 Location Accuracy Requirements; AT&T Services, Inc. Request for Authorization and Waiver*, Order, PS Docket No. 07-114, 35 FCC Rcd 8805, 8808-09, para. 11 (PSHSB 2020); *E911 Fourth Report and Order*, 30 FCC Rcd at 1272-73, para. 40.

<sup>92</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15193, para. 21.

<sup>93</sup> In the Commission's 14<sup>th</sup> annual fee report, 50 states and five other jurisdictions reported receiving a combined 148,952,960 wireless 911 voice calls in calendar year 2021 out of a total call volume of 220,107,525 from wireless wireline, VoIP, and other providers. Fourteenth Annual 911 Fee Report at 13-15, Table 3.

<sup>94</sup> AT&T NPRM Comments at 2; Texas 9-1-1 Entities Public Notice Comments at 2-4 (rec. July 11, 2022) (Texas 9-1-1 Entities PN Comments) (showing that average percentage of 911 call transfers for two out of three PSAPs in initial beta sites decreased by roughly 4-5% after T-Mobile implemented location-based routing; the remaining PSAP showed a slight increase in transfers of less than 1%); T-Mobile, *T-Mobile First to Roll Out Cutting-Edge 911 Capabilities* (Dec. 17, 2020), <https://www.tmobile.com/news/network/tmobile-next-generation-911-location-based-routing> (announcing that some areas where T-Mobile implemented location-based routing have experienced up to 40% fewer call transfers).

<sup>95</sup> AT&T PN Comments at 2.

<sup>96</sup> NASNA NPRM Comments at 18.

and save lives.<sup>97</sup> We find that it is in the public interest that the benefits of location-based routing should extend to all wireless 911 callers, regardless of the CMRS provider or jurisdiction from which the call is made.

25. Further, the public safety community strongly supports requiring CMRS providers to deploy location-based routing on a nationwide basis. Several public safety organizations urge the Commission to require CMRS providers to implement location-based routing.<sup>98</sup> Other public safety commenters and Intrado also support a nationwide location-based routing requirement.<sup>99</sup> The record indicates that the nationwide CMRS providers have implemented location-based routing without increased costs or problems for public safety.<sup>100</sup> In particular, no commenter indicates that AT&T's nationwide implementation of location-based routing, completed to "virtually all" PSAPs in June 2022,<sup>101</sup> has caused additional cost or other problems for public safety.<sup>102</sup> Given the success of nationwide CMRS

---

<sup>97</sup> BRETSA NPRM Comments at 9 ("By eliminating delay in delivery of a 9-1-1 call to the correct PSAP, LBR can improve outcomes."); BRETSA NPRM Reply at 4 ("LBR reduces delay in processing and dispatching 9-1-1 calls even where 9-1-1 [m]isroutes do not occur."); iCERT NPRM Comments at 2 ("The improved location and routing methodology made available with LBR will reduce the potential for 911 voice calls and texts to be directed to Public Safety Answering Points (PSAPs) that are not the ones best able to provide timely and effective response. As a result, the use of LBR technologies should eliminate the delays associated with 911 call transfers, improve emergency response times, and save lives."); Intrado NPRM Comments at 2 ("Requiring LBR for all CMRS and text providers will ensure the availability of this life saving location technology for all 911 callers while increasing the efficiency of Public Safety Answering Points (PSAPs) by eliminating the time and effort to execute call transfers."); DISA NPRM Comments at 2 ("The vast majority of 911 calls from wireless devices destined for DoD PSAPs are currently being misrouted. DoD bases would immediately benefit from the reduction in call delivery time has a direct and immediate impact on emergency incident response."); APCO NPRM Comments at 1 (noting that location-based routing has saved valuable time for PSAPs and callers). In addition, AT&T notes that Kurt Mills, the Executive Director of Snohomish County (Washington) 911, has described location-based routing as a "game changer" that caused the County to experience a "significant decrease in 9-1-1 transfers." AT&T NPRM Comments at 1-2.

<sup>98</sup> NENA NPRM Comments at 2; APCO NPRM Comments at 1; NASNA NPRM Comments at 8; Michigan State 911 NPRM Comments at 1; COPUC NPRM Comments at 2; Loudoun County NPRM Comments at 3; Texas 9-1-1 Entities NPRM Comments at 2; BRETSA NPRM Comments at 10; Adams County et al. NPRM Comments at 1-2; Acadian Ambulance Service NPRM Comments at 1; Joseph Lyons Joseph Lyons NPRM Comments; Val Sprynczynatyk NPRM Comments; DISA NPRM Comments at 2.

<sup>99</sup> See, e.g., APCO NPRM Comments at 2 (stating that "location-based routing should be required of wireless carriers nationwide"); DISA NPRM Comments at 2 ("CMRS providers should use LBR to deliver 911 calls to all PSAPs served by their networks." (emphasis in original)); Adams County et al. NPRM Comments at 2 ("The Commission should require location-based routing on a nationwide basis."); Loudoun County NPRM Comments at 3 ("Loudoun strongly supports the proposed rules requiring wireless carriers and covered text providers to implement all available technology options for location-based routing of 911 calls and texts nationwide using the device-based location."); BRETSA NPRM Comments at 10 ("There is no question but that the Commission should require all CMRS providers to implement LBR for wireless voice calls and text messages as soon as possible."); Intrado NPRM Comments at 1 ("Intrado strongly supports the Commission's proposed requirement for nationwide implementation of location-based routing (LBR) of wireless 911 calls and texts.").

<sup>100</sup> Adams County et al. NPRM Comments at 2 (stating that the commenting entities "have not experienced increased costs, adverse impacts, or significant issues with the implementation of location-based routing"); CCOA NPRM Reply at 3 (stating that "deployments [of LBR for at least six Colorado 911 authorities] were successful and without significant issue or additional expense").

<sup>101</sup> AT&T NPRM Comments at 3.

<sup>102</sup> We note that AT&T indicated in July of last year that it had "very few exceptions" to its nationwide rollout, and indicated that "a few PSAPs are using unique applications of Emergency Services Numbers to implement internal routing solutions. . . and that [the company was] working with these PSAPs to ensure [its] location-based routing

(continued....)



providers in voluntarily implementing location-based routing on their IP-based networks, and in particular the success of AT&T's nationwide implementation, we agree with Boulder Regional Emergency Telephone Service Authority (BRETSA), which states that requiring wireless service providers to implement location-based routing at the earliest possible moment is "a no-brainer."<sup>103</sup>

26. We also find that requiring location-based routing to all PSAPs nationwide supports the Commission's goal to promote parity of wireless 911 service across jurisdictions. NASNA states, and we agree, that "[a]ttempting to create areas of exclusive enhanced location accuracy fosters deployment of disparate levels of service; all those who call or text 911 should benefit from LBR."<sup>104</sup> NENA points out, and we agree, that "[i]t would be inequitable to restrict the life-saving benefits of location-based routing only to residents of and visitors to the United States with the good fortune of having an emergency in a convenient location."<sup>105</sup> Commenters also urge the Commission not to limit deployment of this technology to jurisdictions subject to frequent misroutes<sup>106</sup> or to jurisdictions that have deployed NG911 capabilities.<sup>107</sup> Intrado comments that even in low misroute areas, the implementation of location-based routing will result in a significant reduction in misroutes compared to relying exclusively on tower-based routing.<sup>108</sup> Public safety commenters also note that implementation of location-based routing on a nationwide basis will provide technological consistency for PSAPs, which will help them provide better service,<sup>109</sup> and that technological consistency between CMRS providers is important for managing the expectations of 911 callers.<sup>110</sup>

27. Wireless industry commenters oppose a mandatory nationwide approach,<sup>111</sup> arguing

---

solution meets their unique needs." AT&T PN Comments at 4, n.3. T-Mobile also notes that it is aware of "at least one instance" in which "an emergency calling authority requested that another 911 vendor indefinitely suspend using LBR for 911 calls to its PSAPs because the vendor's LBR implementation resulted in a greater number of 911 calls that required transfer to another PSAP." T-Mobile NPRM Comments at 5. T-Mobile did not provide additional details on this occurrence, including when it occurred or whether or not the issue was resolved.

<sup>103</sup> BRETSA NPRM Comments at 3 (internal quotations omitted). Joseph Lyons, Dispatch Supervisor for the City of Poughkeepsie 911 Communications Center, also states that location-based routing is a "no brainer." Joseph Lyons NPRM Comments at 1.

<sup>104</sup> NASNA NPRM Comments at 11.

<sup>105</sup> NENA NPRM Comments at 5.

<sup>106</sup> Adams County et al. NPRM Comments at 2; COPUC NPRM Comments at 5-6; NASNA NPRM Comments at 11; NENA NPRM Comments at 5; APCO NPRM Comments at 3.

<sup>107</sup> Intrado NPRM Comments at 3; APCO NPRM Comments at 3; BRETSA NPRM Reply at 12; DISA NPRM Comments at 2; NASNA NPRM Comments at 9; COPUC NPRM Comments at 4.

<sup>108</sup> Intrado NPRM Comments at 3, n.6. *See also* COPUC NPRM Comments at 5-6 ("The implementation of location-based routing on all cell tower sectors is the best way to ensure that instances of misrouted calls are minimized to the greatest extent possible.").

<sup>109</sup> Adams County et al. NPRM Comments at 1-2.

<sup>110</sup> Michigan State 911 NPRM Comments at 1 ("[H]aving some [CMRS providers] provide LBR while others do not, creates an expectation for callers that all wireless calls provide this information to 911 centers, and that 911 centers will be able to locate them when they are experiencing an emergency.").

<sup>111</sup> *See, e.g.*, T-Mobile NPRM Comments at 3 ("T-Mobile cautions the Commission from adopting rules that require wireless carriers to do nothing more than turn on location-based routing regardless of PSAP preference."); Verizon NPRM Comments at 2 ("[I]nstead of a blanket flash-cut nationwide implementation deadline, implementation should be based on PSAP requests. . . ."); CTIA NPRM Comments at 4 ("[A]ny obligation for a provider to commence use of LBR to route wireless 9-1-1 voice calls to a PSAP should only be triggered by a 'valid request' from a state or local 9-1-1 authority."). One public safety commenter, the Colorado Council of Authorities (CCOA), also "gives deference to the comments of T-Mobile, Verizon, and CTIA that deployment of LBR for wireless 911

(continued....)

instead that CMRS providers should implement location-based routing voluntarily<sup>112</sup> or only in response to individual PSAP requests.<sup>113</sup> These commenters argue that CMRS providers should only be required to use location-based routing for 911 calls to a particular PSAP after receiving a valid request from that PSAP.<sup>114</sup> In addition, they argue that for a PSAP request to be deemed valid, the PSAP should be required to demonstrate that it is “technically ready”<sup>115</sup> to receive calls routed using location-based routing and to provide shapefiles of PSAP boundaries to CMRS providers.<sup>116</sup> As explained below, we find that the concerns of industry commenters are unsupported in the record, contradict the stated preferences of public safety for a nationwide approach to deployment, and would unnecessarily delay the benefits of location-based routing to the public.

28. *Per-PSAP Implementation.* We decline to adopt a per-PSAP deployment approach. Contrary to the assertion of industry commenters, the record does not demonstrate that individual PSAPs must take specific technical steps in order to be ready to receive wireless 911 calls routed using location-based routing. The generation of location-based routing information as contemplated in this proceeding occurs entirely within CMRS provider networks prior to call delivery to the PSAP,<sup>117</sup> and therefore there are no specific actions that PSAPs need to take to be technically ready to receive wireless 911 calls routed by device-based rather than tower-based location.<sup>118</sup> As the Colorado Public Utilities Commission (COPUC) states, “Because LBR is performed before the call is even delivered to the 9-1-1 system service provider for delivery to the PSAP, there is no additional preparation that must be made by the PSAP in order for carrier-provided LBR to be of benefit.”<sup>119</sup>

29. AT&T’s completed rollout of location-based routing on its nationwide network provides additional evidence that location-based routing can be successfully deployed without requiring PSAPs to demonstrate technical readiness. AT&T deployed location-based routing in 2022 on a region-by-region basis and completed its nationwide rollout in less than six months.<sup>120</sup> Moreover, although AT&T

voice calls should be initiated by a valid request from a PSAP or governing 911 authority.” CCOA NPRM Reply at 1 (footnote omitted).

<sup>112</sup> CTIA NPRM Comments at 4; Letter from Joely Denking, Regulatory Counsel, Federal Affairs, GCI Communication Corp., to Marlene H. Dortch, Secretary, FCC, PS Docket Nos. 18-64, 21-479, at 5 (filed Aug. 7, 2023) (GCI Aug. 7, 2023 *Ex Parte*); RWA NPRM Comments at 4.

<sup>113</sup> Verizon NPRM Comments at 2; T-Mobile NPRM Comments at 3; iCert NPRM Comments at 2; RWA Notice of Proposed Rulemaking Comments at 4 (rec. Feb. 16, 2023) (RWA NPRM Comments); Southern Linc NPRM Reply at 4; *see also* AT&T NPRM Comments at 3 (arguing for either a per-PSAP approach or “a process under which a PSAP could signal that it requires more time to achieve readiness, and that PSAP would be carved out from the six-month requirement.”).

<sup>114</sup> T-Mobile NPRM Comments at 4; AT&T NPRM Comments at 3; Verizon NPRM Comments at 2; CTIA NPRM Comments at 4; Southern Linc NPRM Reply at 4; RWA NPRM Comments at 4.

<sup>115</sup> CTIA NPRM Comments at 4 (stating that “[t]o make a valid request, a PSAP should be technically ready to receive 9-1-1 calls routed using LBR”); CCA Notice of Proposed Rulemaking Reply at 6 (rec. Mar. 20, 2023) (CCA NPRM Reply); RWA NPRM Comments at 3.

<sup>116</sup> T-Mobile NPRM Comments at 7 (stating that a valid request must be conditioned on “the provision of accurate shapefiles—and the maintenance and update of those shapefiles”).

<sup>117</sup> As Intrado notes, CMRS providers must implement a geospatial routing-capable Gateway Mobile Location Center (GMLC) in order to enable their networks to support location-based routing. Intrado NPRM Comments at 3.

<sup>118</sup> Intrado NPRM Comments at 3; APCO NPRM Comments at 6; BRETSA NPRM Reply at 8; COPUC NPRM Comments at 4.

<sup>119</sup> COPUC NPRM Comments at 4.

<sup>120</sup> AT&T Comments at 3. In a news release announcing AT&T’s rollout of location-based routing, AT&T stated “The nationwide rollout has started and is available in Alaska, Colorado, Hawaii, Idaho, Montana, Oregon,

(continued....)

supports the Commission adopting a per-PSAP approach in which each PSAP would have to request location-based routing, it is notable that AT&T did not use this approach in its own rollout. Instead, AT&T deployed location-based routing to “virtually all PSAPs” in the U.S. without soliciting PSAP-by-PSAP requests or requiring each PSAP to demonstrate technical readiness.<sup>121</sup> Thus, it does not appear that these are necessary prerequisite steps before CMRS providers implement location-based routing nationwide on their networks.

30. We also do not agree with commenters’ assertions that PSAPs are not ready from an operational perspective to manage changes in call distribution or volume resulting from the implementation of location-based routing on a nationwide basis. T-Mobile asserts that “[m]any emergency authorities want to understand the impact LBR will have on operations, call volume, and workflows before deploying it; they often also want the ability to implement reporting and tracking of call transfers prior to enabling LBR in order to understand and see the effects of the new 911 routing.”<sup>122</sup> T-Mobile cites its initial implementation of location-based-routing in Minnesota and Texas,<sup>123</sup> where T-Mobile states that 911 authorities required First Office Applications (FOAs) before expanding deployment to more PSAPs.<sup>124</sup> However, T-Mobile’s initial deployments in those areas occurred at a time when no other carrier had deployed location-based routing for 911 anywhere in the U.S., which could reasonably lead the first PSAPs receiving location-based routed calls to take a cautious approach.<sup>125</sup> Since then, AT&T has implemented location-based routing nationwide to thousands of PSAPs with no reported adverse operational impacts. To the contrary, the record indicates that PSAPs have reaped operational benefits from implementation of location-based routing in the form of reduced misroutes and call transfers.

31. CMRS providers’ assertions about potential adverse operational impacts to PSAPs are also contradicted by virtually all statements of public safety commenters on the record. Despite industry commenters’ preference,<sup>126</sup> the vast majority of public safety commenters support a rapid nationwide rollout of location-based routing and specifically oppose the per-PSAP approach advocated by CMRS

---

Washington, Wyoming, Kansas, Illinois, Iowa, Minnesota, North Dakota, Missouri, Nebraska, South Dakota and Guam. Additional regions will be rolled out over the next several weeks. The nationwide rollout is scheduled to be completed by the end of June.” Press Release, AT&T, AT&T Launches First-Ever Nationwide Location-Based Routing with Intrado to Improve Public Safety Response for Wireless 9-1-1 Calls (May 10, 2022), at <https://about.att.com/story/2022/nationwide-location-based-routing.html>.

<sup>121</sup> AT&T NPRM Comments at 3.

<sup>122</sup> T-Mobile NPRM Comments at 5 (emphasis omitted).

<sup>123</sup> See Metropolitan Emergency Services Board, Metropolitan Emergency Services Board 9-1-1 Technical Operations Committee July 15, 2021 Draft Meeting Minutes at 7, <https://mn-mesb.org/wp-content/uploads/July-TOC-Meeting-Packet-070921.pdf> (MESB July 15, 2021 Meeting Minutes) (indicating that at the time of deployment in select counties in Minnesota, no other carriers had deployed or announced future deployment of location-based routing); Metropolitan Emergency Services Board, Metropolitan Emergency Services Board 9-1-1 Technical Operations Committee Agenda at 25 (Jan. 21, 2021), <https://mn-mesb.org/wp-content/uploads/January-Meeting-911-TOC-Packet-012121.pdf> (MESB Jan 21, 2021 Agenda) (including a presentation from T-Mobile to Greater Harris County, Texas, indicating that “[t]oday, T-Mobile is the only wireless carrier positioned to route 911 calls based on caller location, rather than [sic] cell sector”).

<sup>124</sup> T-Mobile NPRM Comments at 5.

<sup>125</sup> See MESB July 15, 2021 Meeting Minutes at 7; MESB Jan 21, 2021 Agenda at 25.

<sup>126</sup> T-Mobile NPRM Comments at 5; see also iCERT NPRM Comments at 2 (arguing for a per-PSAP approach as location-based routing “may impact a PSAP’s operations”).

providers.<sup>127</sup> Only one public safety commenter, the Colorado Council of Authorities, Inc. (CCOA), supports the per-PSAP approach in order to ensure “collaboration” between PSAPs and service providers.<sup>128</sup> We agree that such collaboration is important to the successful implementation of location-based routing, and we encourage PSAPs and 911 authorities to collaborate during the implementation period established by this Order. However, this does not require establishing a process in which every PSAP must affirmatively opt in to location-based routing. In fact, such a process would be far more cumbersome than a uniform nationwide implementation timetable and could lead to fragmented and inconsistent deployment. We agree with APCO that given the immediate feasibility of nationwide implementation, substantial voluntary deployment that has already occurred, and the clear public safety benefits of location-based routing, deployment and use of location-based routing should not be optional or conditional.<sup>129</sup>

32. We are also not persuaded by commenters who compare implementation of location-based routing to past implementation of the Commission’s E911 Phase I and Phase II location requirements<sup>130</sup> or text-to-911,<sup>131</sup> which were predicated on individual PSAPs achieving the technical capability to receive E911 location data and 911 texts, respectively.<sup>132</sup> For location-based routing, there is no similar reason to predicate CMRS provider compliance on PSAP technical capability, because AT&T’s rollout demonstrates that PSAPs do not need to have any specific technical capabilities in place to receive calls routed using location-based routing.<sup>133</sup> Accordingly, we agree with COPUC that “[t]here is no compelling reason to require PSAPs to opt in to this service or to predicate the use of location-based routing methodology on any sort of ‘readiness’ of the PSAP.”<sup>134</sup> Implementing location-based routing on a per-PSAP basis could lead to uneven and inconsistent implementation of routing approaches between jurisdictions and result in a risk of wireless 911 misroutes for jurisdictions that do not request location-based routing service. We find that this would be contrary to the public interest and the Commission’s interest in facilitating improved routing of wireless 911 voice calls.

---

<sup>127</sup> See NENA NPRM Comments at 2; APCO NPRM Comments at 1; NASNA NPRM Comments at 8; Michigan State 911 NPRM Comments at 1; COPUC NPRM Comments at 2; Loudoun County NPRM Comments at 3; Texas 9-1-1 Entities NPRM Comments at 2; BRETSA NPRM Comments at 10; Adams County et al. NPRM Comments at 1-2; Acadian Ambulance Service NPRM Comments at 1; Joseph Lyons Joseph Lyons NPRM Comments; Val Sprynczynatyk NPRM Comments; DISA NPRM Comments at 2.

<sup>128</sup> CCOA NPRM Reply Comments at 1-2.

<sup>129</sup> APCO NPRM Comments at 3.

<sup>130</sup> T-Mobile NPRM Comments at 4; CCOA NPRM Reply Comments at 1-2; *see also* 47 CFR § 9.10(d)(1), (f), (g), (m).

<sup>131</sup> T-Mobile NPRM Comments at 4; CTIA NPRM Comments at 4; *see also* 47 CFR § 9.10(q)(10)(ii)-(iii).

<sup>132</sup> To receive texts, PSAPs must either upgrade their equipment to receive text messages or implement text-to-911 capabilities on existing equipment. *T911 Second Report and Order*, 29 FCC Rcd at 9861, para. 32. To receive Phase I location information, PSAPs must use switches, protocols, and signaling systems that will allow them to obtain the calling party’s number from the transmission of ANI. *Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, RM-8143, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd 18676, 18709, para. 63 n.119 (1996). To receive Phase II location information, PSAPs must “install equipment to determine the geographic coordinates of the caller, transfer that information through the telephone networks, and have a mapping system in place at the PSAP that can display the latitude and longitude coordinates of the caller as a map location for dispatching assistance.” General Accounting Office, *Uneven Implementation of Wireless Enhanced 911 Raises Prospect of Piecemeal Availability for Years to Come*, GAO-04-55, at 9 (Nov. 2003), <https://www.gao.gov/assets/gao-04-55.pdf>.

<sup>133</sup> APCO NPRM Comments at 3; BRETSA NPRM Reply at 10; COPUC NPRM Comments at 4.

<sup>134</sup> COPUC NPRM Reply at 4.

33. *Voluntary Implementation.* We also decline to permit CMRS providers to deploy location-based routing on a purely voluntary basis. Wireless entities supporting voluntary implementation argue that flexibility in implementation is needed to account for differences in providers' networks and devices and to allow technologies to continue to evolve.<sup>135</sup> However, public safety commenters note that permitting CMRS providers to deploy location-based routing on a purely voluntary basis would require additional and unnecessary coordination and would only delay the implementation of location-based routing as a general matter.<sup>136</sup> The record confirms the Commission's reasoning in the *Notice of Proposed Rulemaking* that relying on voluntary implementation would "result in inconsistent routing of calls to PSAPs and a higher risk of 911 misroutes for subscribers on CMRS networks that did not support location-based routing."<sup>137</sup> Thus, we find that allowing CMRS providers to implement location-based routing on a voluntary basis would undermine our goal of ensuring that this important capability benefits all wireless 911 callers nationwide.

**b. Technical Considerations**

34. *Technological Feasibility.* We find that implementing location-based routing for wireless 911 voice calls is technologically feasible for nationwide and non-nationwide CMRS providers. The three nationwide CMRS providers have implemented location-based routing for wireless 911 voice calls across or for some part of their networks.<sup>138</sup> CCA, an industry association with membership including non-nationwide CMRS providers, states that "wireless carriers can eventually deploy location-based routing to any PSAP" if provided with adequate time and financial support.<sup>139</sup> iCERT agrees that location-based routing is technologically feasible.<sup>140</sup> NGA 911 also offers support for this conclusion, stating that both Google's Emergency Location Service (ELS) and Apple's Hybridized Emergency Location (HELO) provide a device location estimate, and these mobile operating systems comprise 99.62% of the handset market.<sup>141</sup> NENA states that AT&T's nationwide deployment of location-based routing demonstrates that "transitional location-based routing mechanisms are technically feasible and improve 9-1-1 outcomes, and are in use today."<sup>142</sup> No commenter argues that implementing location-based routing on CMRS provider networks is technologically infeasible.

35. *Calls originating on IP-based networks.* In light of the technical obstacles and ongoing retirement of legacy networks, we apply our location-based routing requirements to IP-based networks but we decline to require location-based routing for 911 calls originating on circuit-switched, time-division multiplex (TDM) networks. This is consistent with the Commission's proposal in the *Notice of*

---

<sup>135</sup> CTIA NPRM Reply at 3 (urging the Commission to provide flexibility for wireless providers to implement location-based routing in the manner that meets their "unique network and handset configurations" and is coordinated with public safety); *see also* CCA NPRM Reply at 1-2.

<sup>136</sup> *See, e.g.*, BRETSA NPRM Reply at i, 10; COPUC NPRM Comments at 3-4; NASNA NPRM Comments at 8-9.

<sup>137</sup> *Notice of Proposed Rulemaking* 37 FCC Rcd at 15192-93, para. 20; *see* Michigan State 911 NPRM Comments at 1; Adams County et al. NPRM Comments at 2; COPUC NPRM Comments at 5-6; NASNA NPRM Comments at 11; NENA NPRM Comments at 5; APCO NPRM Comments at 3.

<sup>138</sup> *See* AT&T NPRM Comments at 1; T-Mobile July 26, 2023 *Ex Parte* at 1; Verizon July 13, 2023 *Ex Parte* at 1.

<sup>139</sup> CCA NPRM Comments at 2.

<sup>140</sup> iCERT NPRM Comments at 2.

<sup>141</sup> NGA 911, LLC (NGA 911) Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 16, 2023) (NGA 911 NPRM Comments).

<sup>142</sup> NENA NPRM Comments at 5.

*Proposed Rulemaking*<sup>143</sup> and is supported by commenters.<sup>144</sup> For example, the Rural Wireless Association (RWA) agrees that requiring location-based routing for 911 calls originating on TDM networks would be unduly burdensome.<sup>145</sup> CCA asserts that “TDM networks can lack the speed and capacity necessary to transmit and evaluate confidence and uncertainty information and query the location server for PSAP routing instructions prior to the time for a call to commence.”<sup>146</sup> ATIS assumes for purposes of ATIS-0700042 that location-based routing is only supported on originating networks supporting Long Term Evolution (LTE) and beyond.<sup>147</sup>

36. *PSAP Boundary Maps.* Some commenters contend that location-based routing requirements should be conditioned on 911 authorities providing updated maps or shapefiles of PSAP boundaries to CMRS providers.<sup>148</sup> We conclude that such a condition is unnecessary. We recognize that accurately mapping PSAP jurisdictional boundaries is important to the accurate routing of 911 calls.<sup>149</sup> However, the record demonstrates that CMRS providers and the third-party vendors they use to route 911 calls already have maps and shapefile records of PSAP boundaries generated to support earlier E911 deployments and upgrades,<sup>150</sup> and that “numerous companies” maintain PSAP boundary shapefile information to support CMRS 911 call routing.<sup>151</sup> CMRS providers have long used this information to support legacy tower-based routing of 911 voice calls.<sup>152</sup> Moreover, the Commission has never conditioned the 911 routing obligations of CMRS providers on PSAPs or 911 authorities providing mapping data. As NASNA explains, legacy and E911 routing “relies on tabular location databases that are updated by the originating service provider,” and 911 authorities may support the maintenance and quality assurance of these databases, but “there are no rules addressing how frequently this data must be updated, nor is there transparency when data updates are operationalized.”<sup>153</sup>

37. The record indicates that CMRS providers and their vendors can use existing PSAP

---

<sup>143</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15195, para. 27.

<sup>144</sup> APCO NPRM Comments at 2, n.7; NENA NPRM Comments at 5; RWA NPRM Comments at 4; DISA NPRM Comments at 2; CCA NPRM Comments at 12.

<sup>145</sup> RWA NPRM Comments at 14.

<sup>146</sup> CCA NPRM Comments at 12.

<sup>147</sup> *ATIS-0700042* at 6. CCA argues that limiting location-based routing to IP-based wireless networks provides “an important increment of regulatory relief” but notes that this relief is limited because many non-nationwide carriers have already retired non IP-based technology. CCA NPRM Comments at 12. CCA also asserts that limiting location-based routing to IP networks does not reduce costs burdens on the wireless sector. *Id.* at 12-13. Nonetheless, we find that this provision will ease burdens for CMRS providers that have not yet transitioned to IP-based networks.

<sup>148</sup> T-Mobile NPRM Comments at 6; CTIA NPRM Reply at 3.

<sup>149</sup> Letter from Christiaan Segura, Director, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 18-64, at 1 (filed July 3, 2023).

<sup>150</sup> See Verizon July 13, 2023 *Ex Parte* at 1 (“If Verizon has a [s]hapefile of the PSAP’s boundaries due to earlier E911 deployments or upgrades, the PSAP may be able to simply confirm that the earlier document remains accurate.”); GCI Aug. 8, 2023 *Ex Parte* at 5 (“GCI’s network serves geographic areas where the boundaries between PSAP service areas are sparsely populated or unpopulated, in general. Therefore, the existing shapefiles could likely be used to route calls using more precise on-device location as well.”).

<sup>151</sup> NENA NPRM Comments at 7-8.

<sup>152</sup> See NASNA NPRM Comments at 4 (“Legacy and enhanced 911 relies on tabular location databases that are updated by the originating service providers (OSPs), and maintained by the 911 service provider to act as the authoritative source of location information used to validate the location of the 911 caller.” (footnote omitted)).

<sup>153</sup> *Id.*

boundary information to support location-based routing to the same extent that such information has supported tower-based routing. The purpose of this information is to associate a specified location – whether it is the caller’s location or the tower location – with the jurisdiction served by a particular PSAP, and CMRS providers are already using this information to support their implementation of location-based routing. If PSAP boundary maps are not updated to reflect current jurisdictional boundaries, it is possible that some calls originated near those boundaries could be misrouted even when location-based routing is used. However, the overall frequency of misroutes is still likely to be lower than with tower-based location because tower-based location routes all calls in a cell sector to the same PSAP regardless of the jurisdiction where the caller is located. For example, GCI states that “existing shapefiles could likely be used to route calls using more precise on-device location” information on its network, although the importance of updated maps may be affected in some locations by factors such as population density near the PSAP boundary area, the number of PSAPs served, and the density of cell sites.<sup>154</sup> BRETSA comments that the record does not indicate whether the provider of the PSAP boundary maps AT&T is relying on “could and would also provide them to non-national providers and on what terms.”<sup>155</sup> As noted above, we conclude that it is not necessary for AT&T’s provider of PSAP boundary maps to provide them to other CMRS providers, who should be able to use their existing sources of boundary maps.

38. While we do not require PSAPs to provide updated shapefiles as a prerequisite to location-based routing, we recognize that location-based routing is most effective when service providers use up-to-date shapefiles that precisely and accurately identify jurisdictional boundaries for routing purposes.<sup>156</sup> In addition, we recognize that 911 authorities and PSAPs are the most authoritative source for current jurisdictional boundary information.<sup>157</sup> Therefore, we encourage CMRS providers and their third-party vendors to work with 911 authorities and PSAPs to ensure that location-based routing decisions on CMRS provider networks are based on shapefiles that accurately reflect current boundaries. NENA suggests establishment of an “authoritative database for PSAP boundary information”<sup>158</sup> and states that with sufficient funding and appropriate governance, this tool could be expanded to serve as the industry’s authoritative reference for location-based routing purposes.<sup>159</sup> We encourage 911 authorities, relevant industry groups, and CMRS providers to consider further whether such a database is needed, what steps to take, and what parties should take them.

39. *NG911 Geospatial Routing.* NASNA and the Texas 9-1-1 Entities suggest that as jurisdictions transition to NG911, location-based routing by CMRS providers may not be necessary and could cause delay in call routing by NG911-capable jurisdictions that will use ESInets and geospatial routing to route calls to individual PSAPs.<sup>160</sup> While these parties are correct that NG911 will introduce new geospatial routing mechanisms, this does not obviate the need for the location-based routing requirements we adopt in this Order, nor will these requirements impede NG911 call routing.

40. First, while many states have already made significant commitments to implementing

---

<sup>154</sup> GCI Aug. 7, 2023 *Ex Parte* at 5.

<sup>155</sup> BRETSA NPRM Reply at 12.

<sup>156</sup> See CCOA NPRM Reply at 3; Intrado NPRM Comments at 3.

<sup>157</sup> See NASNA NPRM Comments at 5; NENA NPRM Comments at 7-8.

<sup>158</sup> NENA NPRM Comments at 8.

<sup>159</sup> See *id.*

<sup>160</sup> NASNA NPRM Comments at 11 (“By definition, LBR will introduce delay into the delivery of the 911 call or text to NG911 that is no longer needed with a fully functional NG911 system that is using geospatial routing.”); Texas 9-1-1 Entities NPRM Comments at 4 (noting that the NG911 transition in some areas “may potentially make it unnecessary for some CMRS providers to make LBR modifications to their existing legacy 9-1-1 solutions, at least in those areas”).

NG911,<sup>161</sup> the NG911 transition remains ongoing, and there are no fully enabled NG911 systems yet operating.<sup>162</sup> As COPUC notes, “most 911 call delivery networks do not have the ability to provide geospatial routing at this time and it is unknown when such technology will be universally deployed. Requiring CMRS providers to deploy LBR in the meantime is essential . . . .”<sup>163</sup> We agree.

41. Second, the provision of location-based routing information by CMRS providers will remain essential in the NG911 environment because NG911 systems will need this information to perform the additional geospatial routing functions necessary to direct 911 calls to the correct PSAP behind the ESInet.<sup>164</sup> APCO notes that “[w]ireless service providers perform routing functions before passing a 9-1-1 call or text to a 9-1-1 network – regardless of whether the 9-1-1 network is legacy or IP-based – and even if such networks are able to perform an additional routing function, carriers should remain responsible for first engaging in location-based routing.”<sup>165</sup> BRETSA further notes that location-based routing “is not inconsistent with the eventual transition to full i3 NG9-1-1.”<sup>166</sup> Finally, we do not agree that location-based routing implemented on CMRS networks consistent with the proposed rules will introduce delay into NG911 call routing.<sup>167</sup> The location-based routing requirements we adopt in this order expressly apply only when location information meeting the accuracy threshold is available at time of routing. Thus, these requirements will not delay delivery of 911 calls in either the legacy E911 environment or the NG911 environment.<sup>168</sup>

### c. Compliance Timelines

42. *Overview.* We require nationwide CMRS providers to comply with the location-based routing requirements within six months after the effective date of the final rules, as proposed in the *Notice of Proposed Rulemaking*.<sup>169</sup> We require non-nationwide CMRS providers to comply with the location-based routing requirements within 24 months after the effective date of the final rules, a time frame which is six months longer than the eighteen months proposed in the *Notice of Proposed Rulemaking*.<sup>170</sup> We also permit a PSAP and a CMRS or covered text provider to set, by mutual consent, alternative deadlines to implement location-based routing in the PSAP’s jurisdiction that are different from those otherwise established by the rules.

43. *Nationwide CMRS Providers.* We require nationwide CMRS providers to comply with the location-based routing requirements within six months after the effective date of the final rules, as

---

<sup>161</sup> *NG911 Notice of Proposed Rulemaking*, 37 FCC Rcd at 15192, para. 18.

<sup>162</sup> *Id.* at \*5, para. 12.

<sup>163</sup> NASNA NPRM Comments at 6 (“For localities that have deployed any form of NG911 this unrestricted access to 911 call routing data is mission critical. . . .”).

<sup>164</sup> See Verizon NPRM Comments at 3 (stating that some jurisdictions “have implemented their own form of LBR and prefer that originating service providers not also perform LBR on a call”).

<sup>165</sup> APCO NPRM Comments at 6.

<sup>166</sup> BRETSA NPRM Reply Comments at 5; see also Intrado PN Comments at 10 n.14 (“Implementing LBR on the carrier side has the added benefit of avoiding any potential adverse consequences to the present transitional NG911 environment and eventual NG911 end state. In fact, LBR (and the enhanced location information behind it) will work hand-in-hand with the PSAPs ongoing NG911 adoption of IP-based, geospatial ESInets.”).

<sup>167</sup> NASNA NPRM Comments at 11.

<sup>168</sup> See Intrado NPRM Comments at 5 (“[T]he carrier GMLC now has sufficient information and time with 4G/5G to determine, transmit and evaluate confidence and uncertainty of device-based location information and to query the location server for PSAP routing instructions before the time to route.”).

<sup>169</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15195, para. 25.

<sup>170</sup> *Id.* at 15195, para. 26.



proposed in the *Notice of Proposed Rulemaking*.<sup>171</sup> NENA, COPUC, NASNA, DISA, and iCERT support the proposed six-month timeline for nationwide CMRS providers,<sup>172</sup> and no commenter indicates that it would be infeasible or burdensome for nationwide CMRS providers to complete the implementation of location-based routing within six months. The three nationwide CMRS providers have already deployed or are actively working toward deploying location-based routing capabilities on their networks, indicating that they have made substantial progress in implementing this technology at the network level.<sup>173</sup> AT&T has already deployed location-based routing on a nationwide basis.<sup>174</sup> Verizon has indicated that it is “turning up Location-Based Routing for hundreds of PSAPs nationwide” and directs “PSAPs that are interested in deploying Location Based Routing to contact Verizon engineers.”<sup>175</sup> This statement indicates Verizon’s readiness to deploy location-based routing and that Verizon has made necessary progress to implement the technology at the network level. T-Mobile was the first to deploy this technology on its network in 2020 and as of December 2023 had fully implemented location-based routing for 1,591 PSAPs with an additional 596 PSAPs in progress, which indicates that it has made progress on implementing the technology on a network level.<sup>176</sup>

44. The nationwide CMRS providers do not argue for an implementation timeline that is longer than six months from the effective date of the rules. Instead, T-Mobile, AT&T, Verizon, and CTIA support a six-month timeline for nationwide providers conditioned on each PSAP requesting location-based routing and demonstrating technical and operational readiness.<sup>177</sup> As discussed above, we have determined that a per-PSAP request mechanism would delay the critical benefits of a nationwide deployment of location-based routing and is not a necessary component to ensure PSAP operational continuity during the transition. Industry commenters’ arguments nevertheless indicate that nationwide providers are capable, from both a technical and cost perspective, of deploying location-based routing within a six month timeframe. Indeed, if the Commission were to adopt a per-PSAP request mechanism and all or virtually all PSAPs opted in immediately, the nationwide CMRS providers would effectively be required to deploy location-based routing nationwide within six months. Finally, we accord little weight to AT&T’s request to condition CMRS provider compliance timelines on PSAP requests, as AT&T deployed location-based routing on a nationwide basis and states that it “was able to deploy location-based routing to virtually all PSAPs within a six-month timeframe,” with few exceptions.<sup>178</sup>

45. Some commenters point out that the nationwide CMRS providers had several years to

---

<sup>171</sup> *Id.* at 15195, para. 25.

<sup>172</sup> NENA NPRM Comments at 1; COPUC NPRM Comments at 3; NASNA NPRM Comments at 11; DISA NPRM Comments at 2; iCERT NPRM Comments at 2.

<sup>173</sup> AT&T completed the rollout of location-based routing on its network in June 2022 and uses location-based routing to deliver wireless 911 voice calls and texts to nearly all PSAPs nationwide. AT&T PN Comments at 4; AT&T NPRM Comments at 1. T-Mobile launched location-based routing on its network in the states of Texas and Washington in 2020 and as of December 2023 has fully implemented location-based routing for 1,591 PSAPs with an additional 596 PSAPs in progress. T-Mobile NPRM Comments at 3-5; T-Mobile PN Reply at 2 n.6. In December 2023, Verizon reported that it had initiated location-based routing for 414 PSAPs with an additional 277 PSAPs in progress. Verizon Dec. 7, 2023 *Ex Parte* at 1.

<sup>174</sup> AT&T NPRM Comments at 1.

<sup>175</sup> Press Release, Verizon, Verizon continues industry leadership with additional NG911 i3 deployment (June 20, 2023), <https://www.verizon.com/about/news/verizon-continues-industry-leadership-additional-ng911-i3-deployment>.

<sup>176</sup> T-Mobile Dec. 21, 2023 *Ex Parte* at 1; T-Mobile PN Reply at 2 n.6.

<sup>177</sup> AT&T Comments at 3; Verizon NPRM Comments at 2; CTIA NPRM Comments at 4.

<sup>178</sup> AT&T NPRM Comments at 3.

plan and carry out their voluntary implementation of location-based routing.<sup>179</sup> However, we disagree that this argues in favor of allowing the nationwide providers more than six months to complete nationwide implementation. Location-based routing technology is no longer nascent, unknown to PSAPs, or unproven. Use of location-based routing has expanded significantly since 2020, when T-Mobile first deployed it,<sup>180</sup> technical standards now exist for its implementation,<sup>181</sup> all three nationwide carriers have deployed it on their networks,<sup>182</sup> and public safety is aware of and eager for this improved routing technology.<sup>183</sup> Given the extent of this progress, we believe that six months is more than adequate for nationwide CMRS providers to implement location-based routing nationwide. We therefore find that six months from the effective date of the rules provides adequate time for these providers to complete the implementation on their networks. NENA, COPUC, NASNA, DISA, and iCERT support the proposed six-month timeline for nationwide CMRS providers,<sup>184</sup> and no commenter indicates that it would be infeasible or burdensome for nationwide CMRS providers to complete the implementation of location-based routing within six months.

46. APCO, Adams County et al., and Fenwick support a timeline shorter than six months for nationwide providers to deploy location-based routing.<sup>185</sup> We decline to adopt a shorter mandatory timeline, as it is unclear whether it is feasible for all three nationwide CMRS providers to complete their deployment of location-based routing in fewer than six months. However, nationwide CMRS providers may deploy location-based routing voluntarily prior to the compliance deadline.

47. *Non-Nationwide CMRS Providers.* In the *Notice of Proposed Rulemaking*, the Commission proposed an 18-month timeline for non-nationwide CMRS providers to implement location-based routing.<sup>186</sup> We received mixed comments on this issue. NASNA, iCERT, and COPUC support the proposed 18-month timeline for non-nationwide CMRS providers,<sup>187</sup> while other public safety entities argue for a shorter timeline.<sup>188</sup> On the other hand, CMRS provider commenters generally

<sup>179</sup> RWA NPRM Reply at 3; *see also* CCA NPRM Comments at 2, 4-5 (citing AT&T PN Comments at 2-4).

<sup>180</sup> T-Mobile NPRM Comments at 3-5; T-Mobile PN Reply at 2 n.6.

<sup>181</sup> *ATIS-0700042; ATIS-0500039.*

<sup>182</sup> AT&T PN Comments at 4; AT&T NPRM Comments at 1; T-Mobile NPRM Comments at 3-5; T-Mobile PN Reply at 2 n.6; Verizon Dec. 7, 2023 *Ex Parte* at 1.

<sup>183</sup> *See, e.g.,* APCO NPRM Comments at 2; DISA NPRM Comments at 2; Adams County et al. NPRM Comments at 2; Loudoun County NPRM Comments at 3; BRETSA NPRM Comments at 10.

<sup>184</sup> NENA NPRM Comments at 1; COPUC NPRM Comments at 3; NASNA NPRM Comments at 11; DISA NPRM Comments at 2; iCERT NPRM Comments at 2.

<sup>185</sup> APCO NPRM Comments at 3; Adams County et al. NPRM Comments at 2; Ronald Fenwick NPRM Comments at 1.

<sup>186</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15195, para. 26.

<sup>187</sup> NASNA NPRM Comments at 11 (agreeing with 18-month timeline for non-nationwide CMRS providers); iCERT NPRM Comments at 2 (supporting 18-month timeline for non-nationwide CMRS providers); COPUC NPRM Comments at 3 (agreeing with the 18-month timeline for non-nationwide CMRS providers); *see also* NENA Comments at 3 (stating, as a general matter, that “the Commission has proposed sufficient compromises to avoid undue burden on the wireless industry, such as a later implementation date for non-nationwide CMRS providers”).

<sup>188</sup> Adams County et al. NPRM Comments at 2 (stating that 18-month implementation schedule for non-nationwide CMRS providers is “acceptable,” but noting that “[s]ooner is better”); APCO NPRM Comments at 3. BRETSA comments that non-nationwide CMRS providers have not yet determined the actual cost and time required to implement location-based routing, and urges the Commission to require non-nationwide CMRS providers to implement location-based routing within six or twelve months (i.e., rather than eighteen months) and to “grant waivers or extensions upon showings of the actual costs of and impediments to deployment.” BRETSA NPRM Reply at ii; *id.* at 13 (“Such an approach would allow providers a reasonable time to implement LBR, while avoiding

(continued....)

support a longer timeline for non-nationwide CMRS providers to implement location-based routing. CTIA states that “non-nationwide providers need more time to deploy LBR capability than the 18 months proposed in the NPRM due to the significant costs and technical modifications necessary to implement LBR.”<sup>189</sup> GCI recommends that non-nationwide CMRS providers be given a timeline of at least 24 months or potentially longer.<sup>190</sup> RWA recommends that small rural CMRS providers be given 36 months to implement location-based routing.<sup>191</sup> CCA asserts that non-nationwide providers need at least four years to “select, test, modify, perfect, and deploy” location-based routing, stating that AT&T’s deployment took four years and that “[m]ost CCA member companies do not possess anywhere near the scope and scale of resources that AT&T enjoys.”<sup>192</sup> Southern Linc agrees with CCA’s concerns that non-nationwide CMRS providers may require considerably longer than 18 months.<sup>193</sup>

48. The Commission has previously recognized that non-nationwide CMRS providers can face obstacles that warrant additional time for compliance beyond the time afforded to nationwide CMRS providers during technology transitions.<sup>194</sup> Smaller CMRS providers may have difficulty obtaining necessary commitments from device makers, technology vendors, and software service providers<sup>195</sup> to implement location-based routing within a time frame that would be feasible for nationwide CMRS providers. We therefore adopt a timeline of twenty-four months (two years) from the effective date of the rules for non-nationwide CMRS providers to deploy and begin using location-based routing. This timeline provides an additional 18 months beyond the deadline applicable to nationwide CMRS providers. We adopt this extended timeline in recognition of the obstacles that non-nationwide CMRS providers may encounter in deploying location-based routing on their networks. We also anticipate that the additional time will assist non-nationwide CMRS providers in absorbing capital costs. It is consistent with past Commission decisions to permit non-nationwide CMRS providers additional time to accommodate technology transitions.<sup>196</sup> Based on the progress that nationwide CMRS providers have made and that some non-nationwide CMRS providers advocate for a 24-month timeline, it is our predictive judgment that the 24 months afforded will be sufficient from both technological feasibility and cost perspectives for non-nationwide CMRS providers to implement location-based routing. If individual CMRS providers encounter unique or unusual factual circumstances that support a lengthier timeline, they

---

unnecessary delay and impacts upon victims of accidents, illnesses, crimes, and fires.”). BRETSA also suggests that in rural areas, which generally have a lower incidence of misroutes (e.g., because a single PSAP serves the entire county), regional wireless providers should have an “earlier date for implementation of LBR,” with deployment prioritized based on the level of misroutes, and “allowing a longer overall phase-in period.” BRETSA NPRM Comments at 7-8.

<sup>189</sup> CTIA NPRM Reply at 5.

<sup>190</sup> GCI Aug. 7, 2023 *Ex Parte* at 5.

<sup>191</sup> RWA NPRM Comments at 1-3. RWA discusses reasons smaller carriers require more time and financial support, including that “many RWA members are in the midst of efforts to ‘rip and replace’ unsecure Huawei and ZTE equipment in their networks,” *id.* at 2, which is a “top priority over regulatory compliance unrelated to national security.” *Id.* at 3. RWA requests small rural CMRS providers have 36 months from effective date of final rules to implement, “and then only if the PSAP is capable of handling the call routing.” *Id.* at 3.

<sup>192</sup> CCA NPRM Comments at 3-5; *see* CCA NPRM Reply at 5 & n.9.

<sup>193</sup> Southern Linc NPRM Reply at 2-5.

<sup>194</sup> *See, e.g., E911 Fourth Report and Order*, 30 FCC Rcd 1259, 1297-98, para. 104 (2015).

<sup>195</sup> RWA NPRM Reply 3.

<sup>196</sup> For example, for horizontal location accuracy requirements, certain benchmarks for non-nationwide CMRS providers are tied to the deployment of specific technical capabilities, which has permitted additional time for compliance. *See* 47 CFR § 9.10(i)(2)(i)(B)(3), (4). For vertical location accuracy requirements, certain non-nationwide CMRS providers are permitted an additional year to meet relevant benchmarks. *See* 47 CFR § 9.10(i)(2)(ii)(F).

may seek a waiver under the Commission's waiver rules.<sup>197</sup>

49. We decline to extend the timeline for compliance for non-nationwide CMRS providers to thirty-six months or four years, as advocated by RWA and CCA, respectively. RWA argues that small non-nationwide CMRS providers should have 36 months to comply with location-based routing requirements because they are simultaneously focusing “substantial time and attention” on replacing network equipment under the Secure and Trusted Communications Networks Reimbursement Program (Reimbursement Program), which they assert takes “top priority over regulatory compliance unrelated to national security.”<sup>198</sup> We see no basis for extending the 24-month location-based routing timeline for non-nationwide CMRS providers based on their concurrent obligations under the Reimbursement Program. Protecting national security and ensuring effective 911 emergency response are both important regulatory obligations that all CMRS providers must meet. We reject the view that one takes priority over the other. In addition, RWA has failed to show how the timeline for the Reimbursement Program would conflict with non-nationwide provider implementation of location-based routing when Reimbursement Program removal, replacement, and disposal deadlines are determined on an application-specific basis<sup>199</sup> and may be extended pursuant to the conditions set forth in the Secure and Trusted Communications Networks Act and the Commission's rules.<sup>200</sup>

50. RWA also argues that location-based routing should only be required “to the extent that there is federal financial support afforded to small providers for the cost of compliance and additional time afforded for compliance beyond that proposed in the NPRM.”<sup>201</sup> The Commission has never conditioned CMRS providers' compliance with 911 obligations on the receipt of federal funding and we decline to do so today. Further, the record does not provide compelling evidence that such funding is necessary. RWA fails to provide any specific estimates as to the actual cost of compliance for its members or to otherwise document a need for federal financial support.<sup>202</sup> Without information on the

---

<sup>197</sup> 47 CFR § 1.925.

<sup>198</sup> RWA NPRM Comments at 3.

<sup>199</sup> Federal Communications Commission, *Secure and Trusted Communications Networks Reimbursement Program Second Report* at 4 (July 10, 2023), <https://docs.fcc.gov/public/attachments/DOC-395005A1.pdf>. See *Protecting Against National Security Threats to the Communications Supply Chain Through FCC Programs*, WC Docket No. 18-89, Second Report and Order, 35 FCC Rcd 14284, 14354, para. 170 (2020). The Commission may grant recipients extensions of this term on an individual basis. See *Secure and Trusted Communications Networks Act of 2019*, Pub. L. No. 116-124, § 4(d)(6)(C), 134 Stat. 158, 163 (2020) (*Secure Networks Act*) (codified at 47 U.S.C. § 1603(d)(6)(C)).

<sup>200</sup> A Reimbursement Program recipient may request and the Commission may grant an individual extension of a recipient's removal, replacement, and disposal term for a period of up to six months after the Bureau finds, that due to no fault of such recipient, such recipient is unable to complete the permanent removal, replacement, and disposal by the end of the term. 47 CFR § 1.50004(h)(2); see also *Secure and Trusted Communications Networks Act*, § 4(d)(6)(C); see also, e.g., *Protecting Against National Security Threats to the Communications Supply Chain Through FCC Programs*, WC Docket No. 18-89, Order, DA 23-875, at 1, para. 1 (WCB Sept. 22, 2023) (granting Stealth Communications Services, LLC's request for extension from September 29, 2023 until March 29, 2024); *Protecting Against National Security Threats to the Communications Supply Chain Through FCC Programs*, WC Docket No. 18-89, Order, DA 23-938 (WCB Oct. 10, 2023) (granting extension of time requests by WorldCell Solutions, LLC, Mediacom Communications Corporation, Virginia Everywhere, LLC, James Valley Cooperative Telephone Company, and NE Colorado Cellular, Inc. d/b/a Viaero Wireless); *Protecting Against National Security Threats to the Communications Supply Chain Through FCC Programs*, WC Docket No. 18-89, Order, DA 23-1016 at 1, para. 1 (WCB Oct. 27, 2023) (granting extension of time requests of Point Broadband Fiber Holding, LLC and SI Wireless, LLC).

<sup>201</sup> RWA NPRM Comments at 1.

<sup>202</sup> RWA NPRM Comments at 1, n.3 (acknowledging that “RWA members have received no specific vendor estimates as to the actual cost of compliance”).

actual cost of compliance or specific impacts of such compliance on CMRS providers, naked claims that federal financial support is necessary in order for CMRS providers to comply with the Commission's 911 requirements lack merit. As noted above, if an individual CMRS provider encounters unique or unusual factual circumstances, it may seek a waiver under the Commission's waiver rules.<sup>203</sup>

51. CCA argues that a four-year timeline is needed to account for "levels of support the nation's smaller wireless carriers typically receive from device makers, technology vendors, and software service providers and with the continued, incremental progress of PSAP systems in all areas of the country to support the location-based routing of emergency communications."<sup>204</sup> However, CCA has not documented the need for a four-year timeline as opposed to twenty-four months to address the specific obstacles faced by these providers. Once nationwide CMRS providers complete their six-month deployment obligation, non-nationwide providers will have 18 months to engage with device makers, vendors, and consultants. In addition, as noted above, the timeline is not dependent on PSAPs making "incremental progress" to support location-based routing because PSAPs do not need to take any specific technical steps to be ready to receive location-based routed calls.

52. CCA and RWA also argue that non-nationwide CMRS providers should be afforded a four-year timeline because "AT&T required four years to deploy location-based routing."<sup>205</sup> We disagree. First, AT&T states that it was able to deploy location-based routing to virtually all PSAPs within six months, not four years as asserted by CCA and RWA.<sup>206</sup> Second, even if AT&T or other nationwide CMRS providers took additional time to plan early implementation of nationwide location-based routing across their networks, it does not follow that non-nationwide CMRS providers need the same amount of time *after* the nationwide CMRS providers have completed their implementations.<sup>207</sup> BRETSA notes that other providers are likely to require less time than AT&T to deploy location-based routing because "AT&T has already developed the solution and provided a roadmap for implementation of LBR."<sup>208</sup> In fact, the nationwide CMRS providers have already done critical work to enable location-based routing by adopting highly accurate handset-based location, which AT&T has confirmed "is available for location-based routing on the vast majority of iOS and Android devices."<sup>209</sup> The nationwide carriers have also validated that location-based routing can be used for the vast majority of wireless 911 calls and that it does not result in additional call delay or an increase in abandoned 911 calls.<sup>210</sup> We agree with iCERT that existing support for location-based routing by nationwide carriers "provides ample evidence that LBR will soon be ready for wider implementation."<sup>211</sup>

53. CCA also argues that non-nationwide CMRS providers need longer timelines to ensure network reliability and quality of service before undertaking network-wide location-based routing implementation.<sup>212</sup> Again, CCA fails to provide specific examples of how non-nationwide CMRS providers' network reliability and quality of service would be compromised by implementing location-

---

<sup>203</sup> 47 CFR § 1.925.

<sup>204</sup> CCA NPRM Comments at 3.

<sup>205</sup> RWA NPRM Reply at 3; *see also* CCA NPRM Comments at 2, 4-5 (citing AT&T PN Comments at 2-4).

<sup>206</sup> AT&T NPRM Comments at 3 ("AT&T was able to deploy location-based routing to virtually all PSAPs within a six-month timeframe.")

<sup>207</sup> *See* Intrado PN Comments at 10 ("AT&T's implementation model provides a roadmap to the other carriers.")

<sup>208</sup> BRETSA NPRM Reply at 13.

<sup>209</sup> AT&T PN Comments at 2.

<sup>210</sup> *Id.* at 3-4.

<sup>211</sup> iCERT NPRM Comments at 2.

<sup>212</sup> CCA NPRM Comments at 16, 19.

based routing within a 24-month timeline. CCA also asserts that non-nationwide CMRS providers may use “different LTE and 5G-NR network specifications” than the nationwide providers and that it will be challenging for non-nationwide CMRS providers to implement location-based routing given the “array of potentially viable standards any one of which might, over time, fail to achieve scale and fall behind the other standards in features, support, and adoption.”<sup>213</sup> We believe a 24 month timeline is sufficient to address these issues. As BRETSA notes, non-nationwide CMRS providers have not provided specific vendor estimates as to the actual cost to implement location-based routing.<sup>214</sup> We agree with BRETSA that nationwide CMRS providers have provided a path for implementing location-based routing, and there is no reason to delay implementation by non-nationwide CMRS providers beyond the two years afforded. We conclude that the considerable benefits of improved 911 routing should extend to all callers, including subscribers to non-nationwide CMRS providers’ services, and that delaying improved 911 routing by more than 24 months would be inequitable for these subscribers.

54. Some entities representing non-nationwide CMRS providers argue that location-based routing will provide minimal improvement in the areas which their members serve, and therefore that the Commission either should not require location-based routing or should further delay compliance with location-based routing rules for non-nationwide CMRS providers. CCA asserts that “location-based routing may not provide any meaningful improvement over the status quo at the cost of dangerously longer call set up times” for smaller CMRS providers that tend to serve less densely populated areas.<sup>215</sup> Alaska Telecom notes that Alaska’s unique situation of geography and low population areas means fewer misroutes and less benefit from location-based routing, such that “costs that carriers will bear to implement LBR on a short timescale will far outstrip the potential benefits.”<sup>216</sup> We acknowledge that the advantages of location-based routing in comparison to legacy E911 routing may not be uniform across all areas or across all CMRS providers. However, we agree with Intrado that “[e]ven in low misroute areas, LBR implementation will result in a significant reduction in misroutes compared to the current system of exclusively relying on tower-based routing.”<sup>217</sup> The benefits of improved routing should accrue to all 911 callers nationwide, across jurisdictions and CMRS providers, and 911 authorities have articulated a clear need for consistent routing technology across CMRS providers. We therefore decline to exempt or postpone location-based routing implementation on the basis that it may provide less benefit in some areas than others.

55. *Modification of Deadlines by Agreement.* We recognize that there may be some narrow scenarios in which individual PSAPs need additional time to facilitate location-based routing.<sup>218</sup> AT&T states that while it was able to deploy location-based routing to virtually all PSAPs within six months, “some PSAPs required special attention and more time.”<sup>219</sup> To provide flexibility for PSAPs that request

---

<sup>213</sup> *Id.* at 10-11.

<sup>214</sup> BRETSA NPRM Reply at 13.

<sup>215</sup> CCA NPRM Comments at 2-3. As discussed in Section III.A.4, the Commission’s location-based routing rules require providers to route on precise location information that is available at the network at time of routing, which renders moot the potential need for call holding.

<sup>216</sup> Alaska Telecom NPRM Reply at 2.

<sup>217</sup> Intrado NPRM Comments at 3 n.6.

<sup>218</sup> *See, e.g.*, T-Mobile NPRM Comments at 5 (stating that “in at least one instance, T-Mobile is aware that an emergency calling authority requested that another 911 vendor indefinitely suspend using LBR for 911 calls to its PSAPs because the vendor’s LBR implementation resulted in a greater number of 911 calls that required transfer to another PSAP”); AT&T PN Comments at 4 & n.3 (stating that “[a] few PSAPs are using unique applications of Emergency Services Numbers to implement internal routing solutions” and that AT&T is “working with these PSAPs to ensure [its] location-based routing solution meets their unique needs”).

<sup>219</sup> AT&T NPRM Comments at 3.

it, we adopt a rule allowing a PSAP and a CMRS provider to set, by mutual consent, deadlines to implement location-based routing in the PSAP's jurisdiction that are different from those otherwise established by the rules. For example, the parties may mutually agree to extend the provider's timeline for location-based routing implementation in the PSAP's jurisdiction. We emphasize that parties may not use this exception to delay implementation and deployment of location-based routing indefinitely. Accordingly, in the event of any agreement to an alternate time frame for implementing location-based routing, we require the CMRS provider to notify the Commission of the agreed-to dates within 30 days of the parties' agreement or 30 days from the effective date of the final rules, whichever is later.<sup>220</sup> The CMRS provider must subsequently notify the Commission of the actual date by which it comes into compliance with the location-based routing requirements, within 30 days of that actual date of compliance or 30 days from the effective date of the final rules, whichever is later.

## 2. Text-to-911

56. We require nationwide and non-nationwide CMRS providers to deploy and use location-based routing for RTT communications to 911 within 24 months from the effective date of the final rules adopted in this Order. This is a modification of the rules proposed in the *Notice of Proposed Rulemaking*, which would have required CMRS providers and all other covered text providers to deploy and use location-based routing for all 911 texts within 18 months.<sup>221</sup> We extend the compliance timeline from 18 to 24 months in order to align compliance timelines for RTT communications to 911 with the compliance timelines for non-nationwide providers to implement location-based routing for wireless 911 voice calls. In addition, we limit our rules to the routing of RTT communications to 911 by CMRS providers. We decline at this time to extend location-based routing requirements to SMS text messages to 911, both because industry has not yet developed standards for implementing location-based routing on SMS networks and to avoid requiring providers to retrofit legacy SMS networks. We similarly defer extending location-based routing requirements to interconnected text providers.

57. *Location-Based Routing for RTT.* We find that it is technologically feasible for CMRS providers to enable location-based routing for RTT communications. Because RTT is an IP-native service, RTT communications are processed on IP-based networks similarly to voice calls originating on IP-based networks.<sup>222</sup> According to NENA, an RTT session is "handled and routed the same way as a voice call and delivers location just as a voice call would."<sup>223</sup> We agree with NENA that our rules

---

<sup>220</sup> CMRS providers must file such notifications in PS Docket No. 18-64.

<sup>221</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15197, para. 33. The term "'covered text provider' includes all CMRS providers as well as all providers of interconnected text messaging services that enable consumers to send text messages to and receive text messages from all or substantially all text-capable U.S. telephone numbers, including through the use of applications downloaded or otherwise installed on mobile phones." 47 CFR § 9.10(q)(1).

<sup>222</sup> T-Mobile NPRM Comments at 11 & n.14.

<sup>223</sup> NENA NPRM Reply at 10. Unlike SMS text-to-911, which uses a Text Control Center for routing, "RTT uses the existing IP-based voice architecture." NENA, NENA PSAP Readiness for Real-Time Text (RTT) Information Document, NENA-INF-042.1-2021 at 10 (Jan. 20, 2021), [https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/nena-inf-042.1-2021\\_rtt\\_appv.pdf](https://cdn.ymaws.com/www.nena.org/resource/resmgr/standards/nena-inf-042.1-2021_rtt_appv.pdf) (*NENA RTT Information Document*). The RTT communication "enters the Common IMS Network via the Proxy/Emergency Call Session Control Functions (P/E-CSCF) which provide the routing functions." *NENA RTT Information Document* at 13. This is also how wireless 911 voice calls originating on IP-based networks are processed. See ATIS, *ATIS Standard for Implementation of 3GPP Common IMS Emergency Procedures for IMS Origination & ESI/Net/Legacy Selective Router Termination* at 24 (June 1, 2021), [https://www.techstreet.com/standards/atis-0700015-v005?product\\_id=2226711](https://www.techstreet.com/standards/atis-0700015-v005?product_id=2226711) (ATIS-0700015.v5) ("[The P-CSCF] receives the emergency call from the User Equipment via the Access Network. The P-CSCF detects that the call is an emergency call and forwards it to/toward the E-CSCF."). Then, "[t]he Common IMS Network will acquire location using the Location Retrieval Function (LRF) and Location Server (LS) and determine the routing using the Routing Determination Function

(continued....)

“should reflect this reality.”<sup>224</sup> In addition, because RTT resembles voice calling in that it is a real-time, two-way service, the user experience of RTT is likely to be similarly sensitive to the delays associated with misroutes. Given the technical similarities with processing voice calls originating on IP-based networks and strong support for implementing requirements for location-based routing for text-to-911 as a general matter, we adopt a requirement for location-based routing for RTT communications to 911 consistent with the requirements we adopt for wireless 911 voice calls originating on IP-based CMRS networks. In addition, commenters specifically support location-based routing for RTT communications.<sup>225</sup> CMRS providers urge the Commission to incentivize both PSAPs and CMRS providers to move toward next generation texting technologies such as RTT.<sup>226</sup> We find that these requirements will help to ensure that the benefits of location-based routing extend to RTT users as more CMRS providers implement RTT service. We note that this rule is not intended to expand CMRS providers’ existing obligations to deploy RTT capabilities to PSAPs beyond what is already required by the Commission.<sup>227</sup>

58. *Compliance Deadlines for Location-Based Routing for RTT.* We require CMRS providers to implement location-based routing for RTT within 24 months after the effective date of the final rules on location-based routing. This timeline is six months longer than the eighteen-month period the Commission proposed in the *Notice of Proposed Rulemaking* for all covered text providers to route all texts to 911.<sup>228</sup> Most of the comments received on timelines address 911 texts in general, without specifically addressing issues related to RTT implementation in particular.<sup>229</sup> Some commenters support

---

(RDF).” *NENA RTT Information Document* at 13. Again, this is also how wireless 911 voice calls originating on IP-based networks are processed. *See* ATIS-0700015.v5 at 24 (“The LRF obtains location information associated with the emergency call (by interacting with an LS, if necessary) and uses that location to acquire routing information for the emergency call from the RDF.”).

<sup>224</sup> NENA NPRM Reply at 10.

<sup>225</sup> T-Mobile NPRM Comments at 11 (stating that “stakeholders should focus their efforts on supporting more robust means of text-based communication with PSAPs, including RTT”); Verizon NPRM Comments at 5 (“Verizon’s planned LBR implementation for VoLTE will support real-time-text (RTT) 911 calls.”); NENA NPRM Reply at 9 (“The Commission’s rules should apply to end-to-end RTT calls regardless of NG9-1-1 capability.”); ATIS NPRM Comments at 3 (urging the Commission “to clarify that only providers of such next generation text solutions [as defined in ATIS and NENA standards] are required to use LBR”); *see also* CTIA NPRM Reply at 8.

<sup>226</sup> Verizon NPRM Comments at 6; T-Mobile NPRM Comments at 11.

<sup>227</sup> RTT transition obligations apply to “those entities that are involved in the provision of IP-based wireless voice communication service, and only to the extent that their services are subject to existing TTY technology support requirements under Parts 6, 7, 14, 20, or 64 of the Commission’s rules.” *RTT Order*, 31 FCC Red at 13576-77, para. 12. The Commission requires CMRS providers transmitting over an IP network that choose to enable the transmission and receipt of communications via RTT, in lieu of TTY technology, to and from any PSAP served by their network, to enable such service in a manner that fully complies with all applicable 911 rules. *Id.* at 13591-92, para. 43. PSAPs require special capabilities to receive RTT communications from CMRS providers. *Id.* at 13592, para. 43. We recognize that many PSAPs are not currently capable of supporting RTT communications and remain reliant on TTY technology to receive calls from people with disabilities. Texas 9-1-1 Entities NPRM Comments at 5; *see RTT Order* at 13592, para. 43; FCC, *What Public Safety Answering Points Should Know about Real-Time Text* at 2 (Oct. 2, 2018), [https://www.fcc.gov/sites/default/files/documents/events/fact\\_sheet\\_about\\_real-time\\_text\\_for\\_public\\_safety\\_answering\\_points.pdf](https://www.fcc.gov/sites/default/files/documents/events/fact_sheet_about_real-time_text_for_public_safety_answering_points.pdf).

<sup>228</sup> *See Notice of Proposed Rulemaking*, 37 FCC Red at 15197, para. 33.

<sup>229</sup> Verizon does comment on RTT specifically and distinguishes it from other 911 texting, with an indication that it may be easier for Verizon to implement RTT than SMS location-based routing. Verizon states that “[w]hile Verizon’s planned LBR implementation for VoLTE will support real-time-text (RTT) 911 calls, LBR for SMS is not feasible using our existing platforms and capabilities, and would require substantial network- and device-level changes and upgrades.” Verizon NPRM Comments at 5.



the originally proposed 18-month timeline for text-to 911,<sup>230</sup> while others support a shorter timeline.<sup>231</sup> NASNA suggests that “it may be more appropriate to apply the same implementation timeframes for 911 texts that are being applied to voice 911 calls.”<sup>232</sup> Other commenters urge that covered text providers be given a longer timeline to implement location-based routing. For example, Verizon notes that several parties echo its own comments regarding the need for a longer implementation period for 911 texts.<sup>233</sup> Verizon “expects that an implementation period of 18-24 months for a ‘best available location’ approach could be technically feasible, *provided that* the rules afford wireless providers flexibility in the location query methods and per-call thresholds governing whether precise versus coarse location is used for routing.”<sup>234</sup>

59. We conclude that a timeline of 24 months after the effective date of the rules is technically feasible for CMRS providers to implement location-based routing for RTT. We also believe that 24 months will provide sufficient time for both nationwide and non-nationwide CMRS providers to implement location-based routing for RTT. We decline to adopt a shorter timeline for nationwide CMRS providers and instead opt, consistent with the *Notice of Proposed Rulemaking*,<sup>235</sup> to apply the same timetable to all providers for implementation of location-based routing for RTT communications. Unlike for 911 voice calls, the extent to which nationwide CMRS providers have implemented location-based routing for RTT is not clear, though we note that T-Mobile and Verizon explicitly support this step.<sup>236</sup> In addition, few PSAPs have developed the capability to receive end-to-end RTT communications.<sup>237</sup> Since RTT remains in the early stages of development, we believe that a unified timeline for nationwide and non-nationwide CMRS providers is consistent with the approach in the Commission’s existing text-to-911 rules, which do not distinguish between nationwide and non-nationwide CMRS providers.<sup>238</sup> In addition, given that RTT uses call processing similar to that used for voice calls,<sup>239</sup> we anticipate that non-nationwide CMRS providers will be able to implement this capability on the same timeline as location-based routing for voice calls originating on IP-based networks. However, we encourage CMRS providers (nationwide or non-nationwide) to adopt location-based routing for RTT before the 24-month deadline if feasible.

---

<sup>230</sup> See, e.g., iCERT NPRM Comments at 2 (supporting 18-month timeline for all covered text providers, “without regard to service area”); NENA NPRM Comments at 1; AT&T NPRM Comments at 6 (supporting 18-month compliance timetable, but conditioned on PSAP request and readiness).

<sup>231</sup> APCO NPRM Comments at 3; NASNA NPRM Comments at 13; COPUC NPRM Comments at 8; APCO NPRM Comments at 3.

<sup>232</sup> NASNA NPRM Comments at 13.

<sup>233</sup> Verizon NPRM Reply at 2.

<sup>234</sup> Verizon NPRM Reply at 2; see also, e.g., RWA NPRM Comments at 3 (indicating smaller providers need more time to comply than larger providers, and requesting small rural providers be given 36 months from the effective date of the rules to implement text-to-911, “and then only if the PSAP is capable of handling the call routing”); Southern Linc NPRM Reply at 6-8 (stating that if Commission requires location-based routing for SMS-based texts to 911, nationwide CMRS providers should have at least 18-24 months from the effective date of the rules and non-nationwide CMRS providers should have an additional 12-18 months beyond that, in recognition of smaller carriers’ “additional challenges and resource constraints” and that a CMRS provider’s obligation to commence use should only be triggered by a valid request from the PSAP or other relevant authority).

<sup>235</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15197, para. 33.

<sup>236</sup> See T-Mobile NPRM Reply at 5; Verizon NPRM Reply at 5.

<sup>237</sup> Jackson, *APCO Speakers* (noting 911 officials stress the “nascent operation of RTT for emergency calling, as only a handful of PSAPs are using the technology at the moment”).

<sup>238</sup> See 47 CFR § 9.10(q)(1), (10).

<sup>239</sup> NENA NPRM Reply at 10.

60. *Location-based routing for SMS.* Some public safety commenters urge the Commission to require location-based routing for all texts to 911, including SMS, so that improved text routing is available to individuals who are deaf, hard of hearing, or have speech related disabilities, and to people in situations where the sound of a voice call would place them in peril.<sup>240</sup> We agree with public safety commenters that location-based routing could provide benefits to communities that rely on text messaging to contact 911. However, we decline to require location-based routing for SMS messages at this time because the record indicates that industry has not yet developed standards for implementing location-based routing on SMS networks and because of the potential cost of requiring covered text providers to retrofit legacy SMS networks.

61. In particular, commenters note that enabling location-based routing for SMS would require updates to the relevant technical standard, ATIS/TIA J-STD-110.<sup>241</sup> According to NENA, implementing standards-based SMS solutions would add at least two years for standards development, product development, and deployment.<sup>242</sup> T-Mobile, Alaska Telecom, and Verizon also note that implementing location-based routing for SMS would require potentially costly retrofitting of legacy SMS networks.<sup>243</sup> Verizon argues that enabling location-based routing for SMS “would require substantial upgrades of Short Message Service Center (SMSC) and Text Control Center (TCC) facilities . . . and device changes to enable the device to override security, privacy and other functions to access the caller’s device-level location information.”<sup>244</sup> In addition, Verizon argues that requiring location-based routing for SMS could impose duplicative cost and implementation burdens that would be unnecessary once a jurisdiction launches i3 NG911 capabilities.<sup>245</sup> We also note that some PSAPs remain incapable of receiving texts and that the volume of 911 texts is far smaller than volume of wireless 911 voice calls.<sup>246</sup> In light of these factors, we find that it would not serve the public interest to require CMRS providers to retrofit legacy SMS networks.

62. We recognize that the three nationwide CMRS providers are using non-standardized

---

<sup>240</sup> COPUC NPRM Comments at 8; BRETSA NPRM Reply at 8; NASNA NPRM Comments at 13. DISA also argues that location-based routing for text-to-911 could also decrease the response time for 911 texts originating outside the three-mile line off U.S. and Territorial shores. DISA NPRM Comments at 1.

<sup>241</sup> Verizon NPRM Comments at 5; Southern Linc NPRM Reply at 7; NENA NPRM Reply at 9, n.41; ATIS NPRM Comments at 3. ATIS/TIA J-STD-110.v002 defines the requirements, architecture, and procedures for text messaging to 911 emergency services using native wireless operator SMS capabilities for the existing and NG911 PSAPs. ATIS and Telecommunications Industry Association (TIA), *Joint ATIS/TIA Native SMS/MMS Text to 9-1-1 Requirements and Architecture Specification – Release 2* at sections 7, 8, and 9 (May 2015), <https://webstore.ansi.org/standards/atIS/std110> (ATIS/TIA J-STD-110.v002). In 2014, the Commission explained that “The scope of the J-STD-110 is limited to text messaging to 9-1-1 for native SMS capabilities, and it does not address support of text-to-911 for interconnected text services using ‘over-the-top’ SMS.” *T911 Second Report and Order*, 29 FCC Rcd at 9864, para. 39 n.106 (citing to a previous version of ATIS/TIA J-STD-110, Section 1.1).

<sup>242</sup> NENA NPRM Reply at 9.

<sup>243</sup> T-Mobile Notice of Proposed Rulemaking Reply at 6 (rec. Mar. 20, 2023) (T-Mobile NPRM Reply); Alaska Telecom NPRM Reply at 4; Verizon NPRM Comments at 5-6.

<sup>244</sup> *Id.*

<sup>245</sup> *Id.* at 6.

<sup>246</sup> As of November 2023, the Commission’s Text-to-911 Registry lists 3,026 PSAPs as text-capable. See FCC, PSAP Text-to-911 Readiness and Certification Registry, <https://www.fcc.gov/general/psap-text-911-readiness-and-certification-form>. In calendar year 2021, U.S. PSAPs received a combined total of 781,201 texts to 911 in comparison to 148,952,960 wireless 911 voice calls. Fourteenth Annual 911 Fee Report at 13-15, Table 3.

location-based routing techniques to route some SMS texts to 911 today.<sup>247</sup> We encourage all CMRS providers to deploy location-based routing for SMS messages voluntarily to the extent that their resources permit, and we intend to monitor the development of standards, products, and other advances affecting location-based routing for SMS text-to-911. However, we agree with NENA that “the Commission’s rules should not back the market into adopting non-standardized technologies for a legacy platform that the industry is actively working to phase out.”<sup>248</sup>

63. We decline to adopt commenters’ alternative proposal to require CMRS providers to route SMS text messages using “best available” location information. Instead of a tiered system, in which CMRS providers would use precise location information within a radius of 165 meters at a 90% confidence level and otherwise default to best available location information, these commenters suggest a requirement to route SMS text messages based on best available location information (i.e., there would be no requirement to use highly precise location information when it is available from the handset).<sup>249</sup> Intrado argues that, unlike wireless 911 voice calls to 911, for SMS “there is no fallback information available for text and no technologic way or need to implement LBR for text differently nor any means to apply a specific uncertainty/confidence requirement . . . .”<sup>250</sup> As with the proposed requirement to route text messages when available location information meets our accuracy and timeliness criteria, solutions that route using “best available” location information are still not standards-based. Therefore, we decline to require CMRS providers to implement non-standard location-based routing solutions for SMS text messages at this time. The Commission may reconsider if applicable standards are developed.

64. Under the Commission’s existing text-to-911 rules, “covered text providers must obtain location information sufficient to route text messages to the same PSAP to which a 911 voice call would be routed, unless the responsible local or state entity designates a different PSAP to receive 911 text messages . . . .”<sup>251</sup> The implementation of location-based routing, which uses more precise location information than the tower-based routing method, may change the PSAP to which a 911 voice call would otherwise be routed. We do not interpret this provision to require covered text providers to obtain the same precise location information for SMS or other non-RTT text messages that would be used for a voice call subject to the Commission’s location-based routing rules. Instead, this provision would continue to require covered text providers to obtain location information sufficient to route text messages (other than RTT) to the same PSAP to which a wireless 911 voice call would be routed using coarse location or other equivalent means, the routing technology in use at the time of adoption of this rule.<sup>252</sup>

65. *Location-based routing for other text-messaging platforms.* We decline to consider location-based routing for other types of text-messaging platforms, such as MMS platforms, at this time. To the extent that commenters discussed other text messaging platforms, such comments combined

---

<sup>247</sup> See AT&T PN Comments at 5 (describing AT&T’s location-based routing for text-to-911 implementation); T-Mobile July 26, 2023 *Ex Parte* at 3; Verizon Dec. 7, 2023 *Ex Parte* at 1. NENA also states “There are non-standards-based mechanisms for supporting location-based routing for interim text 156 which are available and in-use in the market today.” NENA NPRM Reply at 9.

<sup>248</sup> NENA NPRM Reply at 9.

<sup>249</sup> CTIA NPRM Comments at 7; Intrado NPRM Comments at 4; Verizon NPRM Reply at 2.

<sup>250</sup> Intrado NPRM Comments at 4.

<sup>251</sup> 47 CFR § 9.10(q)(10)(i).

<sup>252</sup> *T911 Second Report and Order*, 29 FCC Rcd. at 9874, para. 57 (“We require covered text providers to route texts to 911 using coarse location (cell ID and cell sector) or other equivalent means that allows the covered text provider to route a text to the appropriate PSAP.”).

arguments regarding SMS and MMS platforms.<sup>253</sup> As discussed in Section II, MMS platforms rely on many of the same functional network elements that would be used to process SMS messages. We therefore decline to consider requirements for location-based routing for MMS for the same reasons discussed in this section for SMS text. We also decline consideration of location-based routing for OTT platforms, as no commenter discussed OTT platforms.

### 3. Definitions

66. In the *Notice of Proposed Rulemaking*, the Commission proposed to define “location-based routing” as routing based on the location of the calling device rather than the location of network elements such as cell site or sector.<sup>254</sup> The Commission also proposed a definition of “device-based location information” and sought comment on whether the definition adequately encompasses current and future location technologies.<sup>255</sup> We adopt these definitions as proposed and find that they will add clarity to the rules while remaining flexible and allowing for the future evolution of new technologies. We defer consideration of the proposed definitions of other terms relating to IP delivery for NG911 networks to the separate NG911 transition proceeding in PS Docket No. 21-479.<sup>256</sup>

67. *Location-Based Routing.* The *Notice of Proposed Rulemaking* proposed to define “location-based routing” as:

The use of information on the location of a device, including but not limited to device-based location information, to deliver 911 calls and texts to point(s) designated by the authorized local or state entity to receive wireless 911 calls and texts, such as an Emergency Services Internet Protocol Network (ESInet) or PSAP, or to an appropriate local emergency authority.<sup>257</sup>

Most commenters addressing the issue, including NASNA, NENA, COPUC, and Alaska Telecom, support the proposed definition.<sup>258</sup> Alaska Telecom states that the proposed definition is flexible and “will give carriers, 911 vendors, and public safety entities the ability to invest time and resources into new and improved location technologies.”<sup>259</sup>

68. APCO and AT&T suggest that the definition avoid reference to “device-based location information” or to ESInets.<sup>260</sup> APCO states that it does not disagree with the assumption that ESInets may be a potential delivery point for 911 calls, but contends that “a simpler approach that does not

---

<sup>253</sup> See, e.g., GCI July 17, 2023 *Ex Parte* at 1 (“LBR for SMS/MMS text-to-911 would be much more difficult than for IP-originated wireless calls . . .”); NENA NPRM Reply at 8 (discussing that “interim text uses SMS/MMS for emergency text calls”); Intrado NPRM Comments at 4 (discussing “SMS/MMS design”).

<sup>254</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15198, para. 34.

<sup>255</sup> *Id.* at 15198, paras. 34-35.

<sup>256</sup> *NG911 Notice of Proposed Rulemaking* at \*20, para. 51. For example, commenters discussed definitions for the terms “NG911,” “IP-based 911” and “NG911-capable PSAPs,” which we believe would be better addressed in the NG911 proceeding so as to apply to a wider array of 911 originating service providers. See APCO NPRM Comments at 5; CTIA NPRM Comments at 8; Southern Linc NPRM Reply at 8-9; NENA NPRM Reply at 4-5, 7-8.

<sup>257</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15215, Appx. A; *accord id.* at 15198, para. 34.

<sup>258</sup> NASNA NPRM Comments at 14; COPUC NPRM Comments at 8; Alaska Telecom NPRM Reply at 4 (noting also that Alaska Telecom “believes that it is important that ‘location’ be limited to the autonomous location derived by the device, with accuracy based on what is coming from the device, not information derived by the carrier network”).

<sup>259</sup> Alaska Telecom NPRM Reply at 4.

<sup>260</sup> APCO NPRM Comments at 4; AT&T NPRM Comments at 8.

reference ESInets could avoid unintentional limitations.”<sup>261</sup> AT&T argues that identifying ESInets as end points that state or local 911 authorities can designate is outside the scope of the proceeding and unnecessary.<sup>262</sup> NENA and Alaska Telecom oppose narrowing the definition, and DISA and COPUC support including ESInets as an illustrative example.<sup>263</sup> Alaska Telecom states that “[t]he Commission’s proposed definition allows for technological development and improvement over time, in contrast to the changes suggested by APCO” to define “location-based routing” by reference to uncertainty and confidence metrics.<sup>264</sup>

69. We adopt the proposed definition in order to provide guidance to regulated entities on how to comply with our location-based routing rules. This definition of location-based routing does not extend to tower-based routing methodologies. We disagree with APCO that referring to ESInets in the rules as an illustrative example could unintentionally limit the location-based routing definition. APCO objects to referencing ESInets in the definition because “ESInets may or may not be capable of performing location-based routing.”<sup>265</sup> However, the term is used in the definition merely to identify ESInets as a potential delivery point for 911 voice calls and RTT communications, without any reference to the technical capabilities of ESInets. Including ESInets as an illustrative example clarifies that providers can use location-based routing to deliver 911 calls to ESInets, without precluding or limiting use of other network architectures and end points. We similarly disagree with the view that use of the term “device-based location information” in the definition is too limiting. Again, the term is included as an illustrative example rather than a technological restriction. Thus, location technologies that do not use device-based location information may also fall within the scope of the location-based routing definition.

70. *Device-Based Location Information.* The *Notice of Proposed Rulemaking* proposed to define “device-based location information” as “[i]nformation regarding the location of a device used to call or text 911 generated all or in part from on-device sensors and data sources.”<sup>266</sup> The Commission noted that this term is used in the existing rule on delivery of 911 text messages and that the proposed definition would also apply to that rule.<sup>267</sup> We conclude that this definition of “device-based location information” provides useful guidance to regulated entities for compliance with the location-based routing rules, while remaining flexible enough to account for future technological development. COPUC supports the definition proposed in the *Notice of Proposed Rulemaking*.<sup>268</sup> Several other

---

<sup>261</sup> APCO NPRM Comments at 4. APCO does not specifically identify what such “unintentional limitations” are, but cites to its discussion of “the current state of ESInet capabilities.” APCO NPRM Comments at 4, n.20. APCO asserts that “ESInets may or may not be capable of performing location-based routing after receiving the call from a wireless service provider. Thus, the NPRM’s consideration of ‘NG9-1-1 capabilities’ and ESInets as factors for the location-based routing requirements raises concerns. The Commission can and should adopt location-based routing requirements without considering ‘NG9-1-1’ progress or ESInet deployment.” *Id.* at 6.

<sup>262</sup> AT&T NPRM Comments at 8. However, AT&T also states that “individual states and PSAP authorities can designate ESInets as an endpoint for the delivery of 911 calls[,]” and “encourages the Commission . . . to confirm that states and local jurisdictions have this authority.” *Id.*

<sup>263</sup> NENA NPRM Reply at 6-7; Alaska Telecom NPRM Reply at 4; DISA NPRM Comments at 2; COPUC NPRM Comments at 5.

<sup>264</sup> Alaska Telecom NPRM Reply at 4 (footnote omitted).

<sup>265</sup> See APCO NPRM Comments at 4, 6.

<sup>266</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd 15215, Appx. A; *accord id.* at 15198, para. 34.

<sup>267</sup> *Id.* at 15198, para. 35 (citing 47 CFR § 9.10(q)(10)(i)).

<sup>268</sup> Alaska Telecom NPRM Reply at 4; COPUC NPRM Comments at 8.

commenters urge the Commission to ensure that the definition is flexible enough to encompass current and future technologies.<sup>269</sup> We find that the definition is sufficiently broad and flexible to meet this goal.

71. We also decline to adopt several suggestions from the record to modify the definition of “device-based location information.” AT&T supports “a definition of ‘device-based location information’ that is tied to timeliness and accuracy metrics . . . .”<sup>270</sup> However, the “device-based location information” definition is intended to describe a mechanism for deriving location information rather than determining the timeliness or accuracy of the information. In addition, we separately set forth timeliness and accuracy metrics elsewhere in the rules. DISA suggests adding language to indicate that the location is to be determined “at origination (setup) of [a] voice call.”<sup>271</sup> We decline to adopt this suggested change, as the issue of timeliness of the location information used for location-based routing is addressed in other rules we adopt today.<sup>272</sup>

#### 4. Timeliness and Accuracy of Location-Based Routing Information

72. We require CMRS providers to use location-based routing for wireless 911 voice calls and RTT communications to 911 when the location information available to the CMRS provider’s network at time of routing is ascertainable within a radius of 165 meters at a confidence level of at least 90%. We anticipate that a substantial percentage of wireless 911 voice calls and RTT communications to 911 will route on location information meeting the accuracy and timeliness threshold under the rules adopted in this Order. If location information meeting this threshold is not available at the time of routing, we require CMRS providers to use the “best available” location information for routing wireless 911 voice calls and RTT communications to 911. Such “best available” location information may include but is not limited to device-based location information that does not meet the accuracy threshold, tower-based location information (e.g., the centroid of the area served by the cell sector that first picks up the call), or other location information. The requirements we adopt today are those proposed in the *Notice of Proposed Rulemaking* with slight definitional modifications.<sup>273</sup>

##### a. Timeliness Threshold

73. As noted in the *Notice of Proposed Rulemaking*, location-based routing requires information about the caller’s location to be available quickly enough to enable the call to be routed without delaying the normal call set-up process.<sup>274</sup> We adopt the Commission’s proposal from the *Notice of Proposed Rulemaking* to require the use of location-based routing only if caller location information is available to the CMRS provider network at the time that the CMRS provider would otherwise route the call.<sup>275</sup> This timeliness threshold is intended to avoid delay in transmitting wireless

---

<sup>269</sup> AT&T NPRM Comments at 3-4 (citing Commission’s wording in the *Notice of Proposed Rulemaking*); see also Alaska Telecom NPRM Reply at 4 (supporting Commission’s proposed definition as allowing for technological development and improvement over time); NENA NPRM Reply at 4 (citing AT&T NPRM Comments at 3-4).

<sup>270</sup> AT&T NPRM Comments at 4.

<sup>271</sup> DISA NPRM Comments at 2.

<sup>272</sup> See Section III.A.4.

<sup>273</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd 15198-200, paras. 37-42.

<sup>274</sup> *Id.* at 15198-99, para. 38.

<sup>275</sup> For CMRS providers, “all 911 calls” include “those [911 calls CMRS providers] are required to transmit pursuant to subpart C of this part [9].” 47 CFR § 9.3. This definition therefore extends to texts, which are subject to 47 CFR § 9.10(q), a provision which resides in subpart C of part 9 of the Commission’s rules. In this *Report and Order*, we distinguish between 911 wireless voice calls, 911 texts, and RTT communications for the sake of precision. However, we preserve the language from the *Notice of Proposed Rulemaking* for the purposes of this paragraph.

911 voice calls and RTT communications to PSAPs.<sup>276</sup>

74. The record indicates that currently available technology is routinely capable of delivering location information to CMRS provider networks for wireless 911 voice calls and RTT communications to 911 in time for routing without delay.<sup>277</sup> Nationwide CMRS providers' implementations have demonstrated that obtaining such location in time for routing is feasible. Devices that are capable of producing high accuracy, low latency location for emergency calling are in wide use, and IP network technology supports rapidly obtaining such precise location estimates. The location-based routing deployments of AT&T,<sup>278</sup> T-Mobile,<sup>279</sup> and Verizon<sup>280</sup> demonstrate that precise location information can be made routinely available to CMRS providers' networks in time for routing wireless 911 voice calls. Both Android devices using ELS and iOS devices using HELO are capable of generating high accuracy, low latency location information in time to support 911 call routing.<sup>281</sup> Moreover, iOS and Android devices account for 99.62% of the U.S. device market, meaning that this capability is widely available to consumers.<sup>282</sup> Intrado states that 4G LTE and newer networks can obtain device-based location information, calculate confidence and uncertainty, and query the location server for PSAP routing instructions within the normal call set-up interval.<sup>283</sup> T-Mobile states that the "IP Multimedia Subsystem ('IMS') technology and advancement of device-based hybrid location solutions has enabled the use of a caller's estimated device location for call routing without delaying call set-up."<sup>284</sup>

75. Some commenters suggest that the Commission should require CMRS providers to route 911 calls within five seconds to "prevent a CMRS provider from holding onto a call for eight to ten

---

<sup>276</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15199, para. 39.

<sup>277</sup> See *id.* at 15199, para. 38 (citing Intrado PN Comments at 6, 8; Apple Sept. 24, 2019 *Ex Parte* at 2; and Android, *Emergency Location Service – How It Works*, <https://www.android.com/safety/emergency-help/emergency-location-service/how-it-works/> (last visited Nov. 9, 2023)); Verizon NPRM Comments at 6 (stating that RTT "will also benefit from the same routing improvements and advantages as i3 voice calls"); NENA NPRM Comments at 12 (stating that an RTT communication in NG911 "requires no special handling compared [to] a 'conventional' voice call").

<sup>278</sup> AT&T has used location-based routing for over 80% of all AT&T wireless calls. Intrado PN Comments at 2. Intrado further notes that AT&T's location-based routing solution provides location-based routing "without any impact to the timeline or call." Intrado PN Comments at 6.

<sup>279</sup> T-Mobile indicates that more than 95% of location estimates available at call routing on T-Mobile's network fall within the company's threshold, i.e. "300 meters with a confidence level of 90%." T-Mobile July 26, 2023 *Ex Parte* at 1.

<sup>280</sup> See Verizon July 13, 2023 *Ex Parte* at 1 ("To determine whether device-based hybrid location information provided by the device during a call is adequate for routing, Verizon uses an accuracy threshold of 200 meters maximum horizontal uncertainty with confidence of 90 percent.").

<sup>281</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15191, para. 16. See also Android, *Emergency Location Service - How It Works*, <https://www.android.com/safety/emergency-help/emergency-location-service/how-it-works/> (last visited Dec. 6, 2023) ("On average, ELS is able to get a first location 3-4 seconds after the call has started."); Android, *Emergency Location Service - Overview*, <https://www.android.com/safety/emergency-help/emergency-location-service/> (last visited Dec. 6, 2023) ("ELS works on over 99% of active Android devices running OS4.4 and up, with Google Play Services installed-no new hardware or activation required."); Apple Sept. 24, 2019 *Ex Parte* at 2 (indicating that device-based hybrid location is available from certain devices during call set-up and that location-based routing can be enabled on models 6s and later running iOS 13 and Apple Watch devices running watch OS 6).

<sup>282</sup> NGA 911 NPRM Comments at 2.

<sup>283</sup> Intrado PN Comments at 8.

<sup>284</sup> T-Mobile July 26, 2023 *Ex Parte* at 1.

seconds or even longer waiting for a location fix.”<sup>285</sup> We decline to adopt this requirement because doing so could incentivize CMRS providers to hold wireless 911 voice calls and RTT communications to 911 for the full five seconds when location information does not meet the threshold for accuracy, which could result in delays for wireless 911 voice calls and RTT communications to 911. The requirement that location information be available at time of routing, as the Commission stated in the *Notice of Proposed Rulemaking*, “is intended to avoid delay in transmitting 911 calls and texts because there would be no requirement to hold calls and texts for purposes of obtaining a routing fix.”<sup>286</sup> Intrado points out that deploying location-based routing under the Commission’s proposed framework “renders moot the potential need for call holding.”<sup>287</sup> We agree that the framework as adopted avoids introducing new delays for wireless 911 voice calls and RTT communications to 911. Conversely, if we were to set a maximum five-second time frame for routing, it could incentivize CMRS providers to hold calls and RTT communications at the network for the full five-second window to ensure routing based on “best available” location. This in turn could create delays in connecting callers to a PSAP and cause some callers to terminate their 911 calls. To avoid such adverse impacts, we decline to set a maximum time frame for routing wireless 911 voice calls or RTT communications to 911.

76. We also decline to specify, as suggested by DISA, that the location information used for routing be determined “at origination (setup) of [a] voice call.”<sup>288</sup> While we expect that location for most calls will be determined at origination, DISA’s proposal could inadvertently be too restrictive, if location were to arrive after the setup of a voice call but before routing. We believe it is sufficient to require only that location information be available at the time of call routing, regardless of when the location is determined.

77. NGA 911 asserts that a timeliness requirement “appears to leave a big gap in the implementation because a carrier may always be able to claim the information was not available at time of call routing.”<sup>289</sup> The record indicates, however, that CMRS providers are already deploying technology that routinely provides the required location information at the time of call routing with no delay. For example, Intrado states that in AT&T’s network, location information meeting the threshold is available in time to route wireless 911 voice calls 80% of the time, and that routing on the network “requires no call delay.”<sup>290</sup> We intend to monitor the deployment and use of location-based routing on CMRS provider networks with reporting requirements discussed in Section III.C. Should we learn that some CMRS providers are not taking full advantage of available technology that provides location-based routing information at the time of the call, we will consider whether additional measures are needed.

#### **b. Accuracy Threshold**

78. Turning to the required accuracy threshold for location-based routing, we adopt the requirement that CMRS providers use location-based routing to route wireless 911 voice calls and RTT

---

<sup>285</sup> NASNA NPRM Comments at 14; *see also* COPUC NPRM Comments at 6-7; iCERT NPRM Comments at 3 (“[W]e support the FCC’s proposal to require use of LBR when the wireless network provider can determine the location of the caller within the recommended five-second window. If the caller’s location is not available within this timeframe, the provider should use traditional cell site-based methods.”); *see also* BRETSA NPRM Reply at 14-15 (arguing that minimum hold times might increase the percentage of calls that can be routed on device-based hybrid location information where providers still operate 3G networks, or that 911 authorities may wish to participate in tests to determine whether holding calls would allow for additional calls on IP-based networks to be routed using location-based routing).

<sup>286</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15199, para. 39.

<sup>287</sup> Intrado NPRM Comments at 3.

<sup>288</sup> DISA NPRM Comments at 2.

<sup>289</sup> NGA 911 NPRM Comments at 4.

<sup>290</sup> Intrado PN Comments at 5, 9.



communications to 911 if the location information available at the time of routing identifies the horizontal location of the device within a radius of 165 meters at a confidence level of at least 90%. This requirement is consistent with the requirement the Commission proposed in the *Notice of Proposed Rulemaking*.<sup>291</sup>

79. We adopt the 165-meter threshold with a confidence level of at least 90% in light of the demonstrated efficacy of location-based routing using such a threshold and because this threshold provides enough flexibility to be compatible with nationwide CMRS providers' existing implementations of location-based routing. We believe that this location accuracy threshold will substantially reduce the number of misroutes associated with legacy E911 routing. AT&T has applied a location accuracy threshold with a radius of 165 meters at a confidence level of 90% in its own network.<sup>292</sup> Intrado states that location information meeting this location accuracy threshold is available to AT&T's network to route calls 80% of the time, and most calls route on information that identifies the location of the device within 50 meters.<sup>293</sup> As a result, AT&T's solution "provid[es] a more optimal route than sector-based routing for approximately 10% of all wireless 911 calls" and "[t]herefore, 10% of calls will be getting to the correct PSAP on the first try and will not require transfers from the neighboring PSAP."<sup>294</sup>

80. We agree with public safety entities and Intrado that it is imperative that we set an accuracy threshold that is realistic in light of existing technology while also providing room for future technological improvement.<sup>295</sup> APCO supports the proposed location accuracy threshold but remains open to an alternative that "strikes an appropriate balance between how often the device's location will be known quickly and accurately enough to use location-based routing rather than cell-sector based routing, and how effective the use of location-based routing will be at delivering the call to the correct ECC."<sup>296</sup> AT&T supports a location accuracy threshold "that the Commission believes would represent a significant improvement over cell-based routing methodologies."<sup>297</sup>

81. Some wireless industry commenters oppose the proposed location accuracy threshold and claim that additional flexibility is needed for providers to set individualized thresholds.<sup>298</sup> Verizon argues that a rigid location accuracy threshold is unnecessary to meet the Commission's public safety objectives and that any particular location accuracy threshold should at most serve as a safe harbor.<sup>299</sup> ATIS asserts that providers should "strive" but not be mandated to produce location information for

---

<sup>291</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15199, para. 40.

<sup>292</sup> Intrado PN Comments at 4.

<sup>293</sup> *Id.* at 9.

<sup>294</sup> AT&T PN at 4.

<sup>295</sup> APCO NPRM Comments at 2; Adams County et al. NPRM Comments at 3 ("The proposed confidence levels are acceptable, but ideally, over time, the radiuses and confidence levels in the proposed rule should be tightened so that 911 calls are routed more precisely."); BRETSA NPRM Comments at 8 ("Intrado has found that LBR from hybrid device location information will allow accurate routing of wireless 9-1-1 calls over 80 percent of the time using thresholds of 165 meters and a 90 percent confidence level. *The Commission should require national and regional wireless providers [to] implement LBR at the earliest possible time.*" (footnote omitted, citing Intrado PN Comments at 9)); Intrado NPRM Comments at 5.

<sup>296</sup> APCO NPRM Comments at 2.

<sup>297</sup> AT&T NPRM Comments at 4.

<sup>298</sup> CTIA NPRM Comments at 5; T-Mobile NPRM Comments at 10; Verizon NPRM Comments at 3; ATIS NPRM Comments at 3-4; *see also* Southern Linc NPRM Reply at 5-6 (agreeing with ATIS, T-Mobile, Verizon, and CTIA that it is premature to adopt specific metrics).

<sup>299</sup> Verizon NPRM Comments at 3-4.

purposes of routing within a radius of 300 meters or less at a confidence level of 90%.<sup>300</sup> ATIS also asserts that it is developing best practices for carriers to implement location-based routing,<sup>301</sup> and T-Mobile states that the Commission should wait for these best practices before requiring specific distance and confidence metrics for location-based routing.<sup>302</sup> We encourage ATIS to conclude any such efforts on a timeline that is consistent with the requirements adopted in this Order.

82. We conclude that a mandatory threshold is necessary. The accuracy threshold we set ensures that all CMRS providers will use location-based routing nationwide for 911 calls and RTT communications to 911 when location information at the time of routing meets a high accuracy standard. We also disagree that there is a need to wait for the development of best practices, as the location-based routing rules we adopt require CMRS providers to use this methodology when the location information available to the network is highly accurate, and further permit CMRS providers to use location-based routing methodologies in additional scenarios. We observe that the nationwide CMRS providers have all completed or are currently implementing location-based routing on their IP-based networks, and all use location-based routing to route wireless 911 voice calls when available location meets this mandatory threshold for precision.<sup>303</sup> While no best practices have currently been developed, CMRS providers' implementations indicate a practical consensus that location-based routing can consistently be used when location information meets this threshold. We therefore decline to condition compliance with these rules on the completion of best practices by ATIS. We encourage ATIS to develop best practices to promote optimal routing on CMRS providers' networks.

83. While we require CMRS providers to use location-based routing when available location information is within a 165-meter radius at a standardized 90% confidence level, we emphasize that CMRS providers may also use location-based routing when location information available at time of routing is less precise than the accuracy threshold we adopt. To this extent, we agree with Verizon that CMRS providers should have flexibility to identify "provider-optimized threshold range[s] to accommodate individual service providers' vendor capabilities and user device capabilities."<sup>304</sup> We therefore provide flexibility to providers to set their own thresholds for use of location-based routing at a radius exceeding 165 meters at a 90% confidence level. While AT&T uses the 165-meter accuracy threshold, Verizon and T-Mobile have implemented accuracy thresholds of 200 meters and 300 meters, respectively, with a standardized 90% confidence level.<sup>305</sup> This formulation provides flexibility for all three nationwide CMRS providers to continue applying their respective thresholds for determining when to use location-based routing for 911 calls and RTT communications to 911.

84. We confirm that the location accuracy threshold used for location-based routing of a radius of 165 meters at a confidence level of at least 90% would apply equally to both estimated civic address and coordinate-based location. We agree with NENA that a CMRS provider may have access to

---

<sup>300</sup> ATIS NPRM Comments at 4. We note that a location accuracy threshold with a radius of 300 meters would also be an acceptable location-based routing implementation under the rules we adopt today.

<sup>301</sup> ATIS NPRM Comments at 4.

<sup>302</sup> T-Mobile July 26, 2023 *Ex Parte* at 2; T-Mobile NPRM Reply at 3-4; T-Mobile NPRM Comments at 9; *see also* ATIS NPRM Comments at 4 ("[T]he Commission should defer to the recommendations regarding the feasibility of location accuracy from industry groups such as ATIS ESIF.").

<sup>303</sup> Verizon and T-Mobile also use location-based routing for less precise location estimates.

<sup>304</sup> Verizon NPRM Comments at 3.

<sup>305</sup> Intrado notes that AT&T's threshold is 165 meters at a 90% confidence level. Intrado PN Comments at 9. T-Mobile indicates that its threshold is 300 meters at a 90% confidence level. T-Mobile July 26, 2023 *Ex Parte* at 1. Verizon indicates that its threshold is 200 meters at a 90% confidence level. Verizon July 13, 2023 *Ex Parte* at 1.

an estimated civic address for a calling device that may be used for location-based routing.<sup>306</sup> Many fixed broadband Internet access devices, particularly those provided to the consumer by the broadband service provider, are permanently located at a civic (street) address, which is known to the network provider.<sup>307</sup> If a CMRS provider has access to either an estimated civic address or coordinate-based location that represents a horizontal location uncertainty level of the device within a radius of 165 meters at a confidence level of at least 90% and that location is available at time of routing, the CMRS provider must use such information to comply with the Commission's location-based routing rules.

**c. Default to Best Available Location Information**

85. In the *Notice of Proposed Rulemaking*, the Commission proposed that when location information does not meet one or both thresholds for accuracy and timeliness under our rules, CMRS and covered text providers would be required to route wireless 911 voice calls and texts to 911 based on the best location information available at the time the call is routed, which may include cell tower coordinates.<sup>308</sup> We adopt this requirement as proposed for CMRS providers' routing of wireless 911 voice calls and RTT communications to 911. We find that this approach allows flexibility for CMRS providers to determine the best available location information for routing when the available location information does not meet the thresholds for timeliness and accuracy.

86. Commenters generally support a flexible fallback approach to routing of calls and texts that do not meet the timeliness and accuracy thresholds for location-based routing.<sup>309</sup> As the Commission stated in the *Notice of Proposed Rulemaking*, a requirement to default to best available location information is consistent with ATIS-0500039, which assumes that the fallback for location-based routing should be cell sector routing "for cases wherein no position estimate is available in time to be used for [location-based routing] or the position estimates lack requisite accuracy."<sup>310</sup> This approach is also consistent with current CMRS provider deployments of location-based routing, which default to legacy E911 routing when location does not meet carriers' individually-set thresholds for accuracy and timely availability.<sup>311</sup> For scenarios in which available location information does not meet the accuracy or timeliness thresholds, we believe that the CMRS provider is best suited to make the determination of the location information that is most likely to support accurate call routing. Defaulting to best available location information when preferred location is unavailable is consistent with other Commission rules regarding the provision of location information with 911 calls. In these rules, the Commission requires

---

<sup>306</sup> NENA NPRM Comments at 3 (arguing that "location-based routing rules should apply equally to geodetic and civic locations known to the originating service provider").

<sup>307</sup> *Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission's Rules; Wireless E911 Location Accuracy Requirements; E911 Requirements for IP-Enabled Service Providers*, GN Docket No. 11-117, PS Docket No. 07-114, WC Docket No. 05-196, Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking, 26 FCC Rcd 10074, 10105 para. 92 (2011). Examples of scenarios in which the CMRS provider would have an estimated civic address include a caller connecting to the network using a Wi-Fi access point or femtocell. *See id.*

<sup>308</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15195-96, 15197, 15215, paras. 28, 30, Appx. A.

<sup>309</sup> Southern Linc NPRM Reply at 6 (To the extent available location information does not meet the requirements for timeliness or location accuracy for a particular 911 call, CMRS providers are in the best position to determine what kind of location information constitutes the "best available."); CTIA NPRM Comments at 4-5; Verizon NPRM Comments at 4 ("Verizon agrees that network-based routing will remain necessary as a fallback when available location information does not meet the relevant accuracy and confidence/uncertainty threshold. This approach serves 911 callers' needs as a large majority of calls using network-based routing will be as reliable as LBR."); DISA NPRM Comments at 2.

<sup>310</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15195-96, para 28; ATIS-0500039 at 14.

<sup>311</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15195-96, para 28; AT&T PN Comments at 4; T-Mobile PN Comments at 4; *see also* Verizon NPRM Comment at 4.

providers to supply highly precise location information when technically feasible but permits reliance on alternative location information when highly precise location information is not available.<sup>312</sup>

87. Some commenters argue that CMRS providers should be required to use tower-based routing when the device-based location information available to the network at the time of routing exceeds the threshold,<sup>313</sup> or that the Commission should limit tower-based routing to scenarios in which “no other option exists.”<sup>314</sup> We agree with CTIA and iCERT that location information that is less accurate than the proposed accuracy threshold but more accurate than cell sector, for example, device-based location information that arrives at the network in time for routing but exceeds the 165-meter threshold, could still enhance the likelihood of routing the call to the appropriate PSAP, and the rules we adopt today allow the use of such information for routing if it is the best available.<sup>315</sup>

88. We make minor modifications to the rule to clarify that the “best available location information” to the network at time of routing may take several forms. In the *Notice of Proposed Rulemaking*, the proposed rule stated that best available location information “may include the latitude/longitude of the cell tower.”<sup>316</sup> We emphasize that the Commission used the latitude/longitude of the cell tower only as an illustrative example and that this language was not intended to limit CMRS providers to only using cell tower coordinates as a default or fallback. Southern Linc states that the most effective way to minimize misroutes is to enable CMRS providers to route calls based on the best location information available at the time of the call, regardless of the technology or solution.<sup>317</sup> We agree. NENA states that the most appropriate geodetic location for each sector would be the centroid of the area served by each cell sector, instead of the coordinates of the cell tower.<sup>318</sup> We revise the proposed rule language to indicate that when information of a device’s location does not meet either one or both requirements for timeliness and accuracy, CMRS providers must route the wireless 911 voice calls or RTT communications to 911 based on the best available location information, which may include, but is not limited to, device-based location information that does not meet the timeliness and accuracy requirements, the centroid of the cell sector that first picks up the call, or other location information.

#### d. Validation

89. In the *Notice of Proposed Rulemaking*, the Commission sought comment on whether to require validation of location information for wireless 911 voice calls and texts to 911 for purposes of location-based routing and, if so, what validation steps CMRS and covered text providers should be required to take.<sup>319</sup> Some commenters support validation, citing concerns that 911 calls can be spoofed

---

<sup>312</sup> See, e.g., 47 CFR § 9.16(b)(3)(ii) (stating that “an on-premises non-fixed device associated with a multi-line telephone system shall provide to the appropriate PSAP automated dispatchable location, when technically feasible; otherwise, it shall provide dispatchable location based on end user manual update, or alternative location as defined in § 9.3”).

<sup>313</sup> Intrado NPRM Comments at 5 (“Intrado recommends that when the location information does not meet these timing/accuracy specifications, the proposed rules require fallback to tower-based routing rather than best available location information consistent with current CMRS deployments of LBR and industry standards.”); NASNA NPRM Comments at 12; COPUC NPRM Comments at 6.

<sup>314</sup> NASNA NPRM Comments at 12; COPUC NPRM Comments at 6.

<sup>315</sup> CTIA NPRM Comments at 5; iCERT NPRM Comments at 3.

<sup>316</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15215, Appx. A (emphasis added).

<sup>317</sup> Southern Linc NPRM Reply at 5.

<sup>318</sup> NENA NPRM Comments at 3-4.

<sup>319</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15200, para. 43.

or purposefully misrouted for swatting incidents.<sup>320</sup> However, AT&T states that in its experience, invalid location under location-based routing is “extremely rare.”<sup>321</sup> BRETSA contends that requiring validation would be counterproductive because “[v]alidating caller/device locations against cell-site (Phase I) location would appear to defeat the purpose of device-based LBR.”<sup>322</sup>

90. We decline to implement a validation requirement for the location information used by CMRS providers for routing at this time, as validation protocols are still evolving.<sup>323</sup> We will continue to monitor location information validation and will consider validation requirements for CMRS providers if such requirements become necessary. To aid in this monitoring, in the certification and reporting requirements discussed in Section III.C, we adopt requirements for CMRS to collect and report information on validation procedures they use with location-based routing.

### B. Delivery of Wireless 911 Calls and Texts to NG911 Networks

91. In the *Notice of Proposed Rulemaking*, the Commission proposed requiring CMRS and covered text providers to deliver 911 calls, texts, and associated routing information in IP format upon request of 911 authorities who have established the capability to accept NG911-compatible IP-based 911 communications.<sup>324</sup> In the subsequent *NG911 Notice of Proposed Rulemaking*, the Commission proposed similar requirements for wireline, interconnected Voice over Internet Protocol (VoIP), and Internet-based Telecommunications Relay Service (TRS) providers.<sup>325</sup> Several commenters express support for addressing IP delivery requirements for CMRS and covered text providers as part of a consolidated NG911 proceeding.<sup>326</sup>

92. We agree that consolidating similar issues and aligning requirements for NG911 services across different types of originating service providers will result in more consistent rules and avoid confusion among stakeholders.<sup>327</sup> Accordingly, we defer consideration of IP delivery for CMRS and covered text providers, including all associated proposals and issues raised in the *Notice of Proposed*

<sup>320</sup> NGA 911 NPRM Comments at 3; Adams County et al. NPRM Comments at 3.

<sup>321</sup> AT&T NPRM Comments at 4.

<sup>322</sup> BRETSA NPRM Reply at 10. BRETSA states that “[r]eference to the tower location for verification would simply invalidate the caller location in those cases in which the caller is located in a jurisdiction other than that in which the PSAP to which 9-1-1 calls received by the cell site are default routed. It would result in the very misrouting of the call LBR is being implemented to correct.” *Id.* at 11.

<sup>323</sup> Most commenters who address the issue oppose a validation requirement. *See, e.g.*, AT&T NPRM Comments at 4-5; T-Mobile NPRM Comments at 10; T-Mobile NPRM Reply at 4; Verizon NPRM Comments at 4; Verizon NPRM Reply at 2; ATIS NPRM Comments at 4-5; BRETSA NPRM Reply at I, 10-11.

<sup>324</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15189, 15201, 15202-03, paras. 4, 46, 51.

<sup>325</sup> *NG911 Notice of Proposed Rulemaking* at \*1, \*34, \*35, para. 2 & Appx. A.

<sup>326</sup> CTIA July 3, 2023 *Ex Parte* at 2; Intrado NPRM Comments at 2, 5-6; Texas 9-1-1 Entities NPRM Comments at 5-6 n.21; NENA NPRM Reply at 5 (“NENA supports Intrado’s request to initiate an NG9-1-1 proceeding to refresh the record on NG9-1-1.”); Verizon NPRM Reply at 5 (“[C]oupling LBR with a framework for i3-based NG911 implementation would promote more efficient deployment by minimizing redundant implementation of interim and i3 NG911-based LBR while also rewarding wireless providers that have diligently worked to support end-to-end i3-based NG911.”); *see also* GCI July 17, 2023 *Ex Parte* at 1 (“[A]ddressing any new requirements for IP delivery of wireless calls to PSAPs as part of the FCC’s larger NG911 proceeding will facilitate consistent rules across network types and will make compliance with any new rules more efficient and effective for all service providers.”); Alaska Telecom Association NPRM Comments at 8-9 (“[T]he FCC should address and align any new requirements for IP delivery of wireless calls to PSAPs proposed in the LBR proceeding (PS Docket No. 18-64) with any IP-delivery requirements adopted in this NG911 proceeding.”).

<sup>327</sup> CTIA July 3, 2023 *Ex Parte* at 2.

*Rulemaking*,<sup>328</sup> to the NG911 transition proceeding, PS Docket No. 21-479. We acknowledge the comments in the record of this proceeding regarding the Commission's proposals on this issue,<sup>329</sup> and we will address those comments in the NG911 proceeding.<sup>330</sup>

### C. Certification and Reporting Requirements

93. *Certification and Reporting Requirements.* In the *Notice of Proposed Rulemaking*, the Commission sought comment on whether it should implement any new data collections to assist in monitoring compliance with the proposed location-based routing rules.<sup>331</sup> The Commission also sought comment on what information providers should include and how frequently they should be required to report.<sup>332</sup> In addition, the Commission asked whether it should require providers to certify that they are in compliance with requirements for location-based routing.<sup>333</sup>

94. NASNA and COPUC support an information collection to assess compliance and implementation of location-based routing.<sup>334</sup> To help the Commission monitor compliance with the location-based routing requirements we adopt today, we adopt certain one-time certification and reporting requirements. Specifically, we require that within sixty days after CMRS providers' respective compliance deadlines, they must certify that they are in compliance with the location-based routing requirements applicable to them. As part of the certification, CMRS providers must substantiate compliance by identifying specific network architecture, systems, location validation,<sup>335</sup> and procedures used to comply with the location-based routing requirements. We also require CMRS providers on a one-time basis to collect and report aggregate data on the routing technologies used for live 911 calls in the locations specified for live 911 call location data in section 9.10(i)(3)(ii) of the Commission's rules. CMRS providers must collect these data for a thirty-day period beginning on the applicable compliance date. CMRS providers must file their certifications and reporting information in PS Docket No. 18-64. In addition, CMRS providers may request confidentiality for these materials under the Commission's confidentiality rules.<sup>336</sup>

95. CMRS providers must file the required certifications and live call data within 60 days after the compliance deadlines applicable to them under the location-based routing rules. This means that for voice calls to 911, a nationwide CMRS provider must file its certification and live call data within 60 days after the six-month deadline for deploying location-based routing technology on its IP-based networks, and a non-nationwide CMRS provider must file its certification and live call within 60 days after the 24-month deadline for deploying location-based routing technology on its IP-based

---

<sup>328</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15200-04, paras. 44-54.

<sup>329</sup> See, e.g., Intrado NPRM Comments at 2, 5-6; NASNA NPRM Comments at 15-16; COPUC NPRM Comments at 9-10; iCERT NPRM Comments at 4; Texas 9-1-1 Entities NPRM Comments at 5-6; NENA NPRM Comments at 1; MSCI NPRM Reply at 2-3; NENA NPRM Reply at 4; APCO NPRM Comments at 6-7; AT&T NPRM Comments at 7; T-Mobile NPRM Comments at 11-13; CTIA NPRM Comments at 3, 8; CTIA NPRM Reply at 2, 9-10; Southern Linc NPRM Reply at 8-9; BRETSA NPRM Reply at 16-17.

<sup>330</sup> Commenters who filed comments on this issue in the docket for this proceeding (PS Docket No. 18-64) do not need to re-file their comments in PS Docket No. 21-479.

<sup>331</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15204, para. 55.

<sup>332</sup> *Id.*

<sup>333</sup> *Id.*

<sup>334</sup> NASNA NPRM Comments at 16; COPUC NPRM Comments at 3, 9.

<sup>335</sup> As we discuss in Section III.A.4.d, we do not require validation of location information used for location-based routing. However, if providers perform any validation of routing location data, they should identify such practices as part of their certification.

<sup>336</sup> See 47 CFR § 0.459.

networks. In addition, all CMRS providers that have implemented the capability for RTT communications to 911 must file a certification within 60 days after the 24-month deadline for deploying a technology that supports location-based routing for RTT communications. We do not require live call data reporting for RTT communications to 911.

96. Under the one-time reporting requirement for live 911 calls, CMRS providers must collect and report on (1) the number and percentage of wireless 911 voice calls routed with device-based location information that meets the accuracy threshold we adopt in Section III.A.4 (i.e., within a radius of 165 meters or less at a confidence level of at least 90%); (2) the number and percentage of wireless 911 voice calls routed with device-based location information that exceeds that threshold (i.e., within a radius larger than 165 meters at a confidence level of 90%); and (3) the number and percentage of wireless 911 voice calls routed by tower-based routing. We believe that this information will help us evaluate each CMRS provider's deployment of location-based routing. We also encourage but do not require CMRS providers to include the number of device-based location results being discarded as invalid in their reports filed with the FCC.<sup>337</sup> To minimize the reporting burden on CMRS providers, we require them to collect and report on 911 routing methods for live 911 voice calls only once, only for the areas specified for live 911 call location data in section 9.10(i)(3)(ii) of the rules,<sup>338</sup> and only for a thirty-day period following specified compliance dates. As noted above, we do not require similar reporting for RTT communications to 911.

97. We believe that these limited data collections strike an appropriate balance between the public safety community's interest in greater transparency with respect to compliance and our goal of limiting the burden of responding to mandatory information collections, particularly for small entities. These limited information collections will promote transparency by ensuring that the public has a clear understanding of timelines for providers' implementations of location-based routing technology and the level of compliance with location-based routing rules. Moreover, they will promote accountability by requiring CMRS providers to show steps they are taking to ensure that wireless 911 voice calls and RTT communications to 911 are routed to the appropriate PSAP.

98. *Recurring Reporting Requirements.* The Commission also sought comment on whether it should adopt recurring or ongoing reporting requirements.<sup>339</sup> NASNA and COPUC support requiring CMRS providers to disclose on a recurring basis to the FCC how many 911 calls are routed by location-based routing and how many are routed using legacy E911 call routing.<sup>340</sup> NASNA and COPUC argue that "[t]his will allow the Commission to determine if certain carriers are resorting to default routing more frequently than others, which may prompt an investigation to determine if those carriers are making sufficient efforts to fully implement LBR."<sup>341</sup> RWA opposes recurring data collection and reporting requirements as "extremely burdensome" for small providers, although it suggests that the Commission could request performance data on a voluntary basis.<sup>342</sup> We believe that the one-time certification and reporting requirements we adopt herein will be sufficient for providers to demonstrate location-based routing implementation without posing an undue burden for providers, particularly small entities. Therefore, we decline to adopt ongoing reporting requirements.

---

<sup>337</sup> See NGA 911 NPRM Comments at 4.

<sup>338</sup> CMRS providers providing service in any of the Test Cities or portions thereof must collect and report aggregate data on the location technologies used for live 911 calls in those areas. 47 CFR § 9.10(i)(3)(ii). Non-nationwide CMRS providers are required to report from alternative areas as specified in 47 CFR § 9.10(i)(3)(ii)(D)-(E).

<sup>339</sup> See *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15204, para. 55.

<sup>340</sup> NASNA NPRM Comments at 16; COPUC NPRM Comments at 9.

<sup>341</sup> NASNA NPRM Comments at 16; COPUC NPRM Comments at 9.

<sup>342</sup> RWA NPRM Comments at 4.

99. *Privacy and Security.* The Electronic Privacy Information Center (EPIC) expresses concern about potential misuse of emergency location data and urges the Commission to clarify that the privacy and security requirements for dispatchable location and z-axis location data also apply to location-based routing data.<sup>343</sup> EPIC also urges the Commission to clarify the data use cases that fall within the scope of “911 purposes” and to allow the use of such data only for routing calls and dispatch assistance.<sup>344</sup> In particular, EPIC urges the Commission “to clarify that law enforcement cannot use 911 location data for investigative leads or for enforcement unrelated to the purpose of the 911 call.”<sup>345</sup> EPIC also asks the Commission to clarify that carriers are responsible for their third-party vendors’ collection, use, and disclosure of device-based location data.<sup>346</sup>

100. We agree that it is imperative for service providers to ensure the privacy and security of location-based routing information, and we adopt a rule clarifying that the Commission’s existing rules on the privacy and security of dispatchable location and z-axis information apply to information used for location-based routing. In particular, we require CMRS providers to certify that neither they nor any third party they rely on to obtain location information or associated data used for compliance with the location-based routing requirements will use such information or associated data for any non-911 purpose, except with prior express consent or as otherwise required by law. The certification also must state that the CMRS providers and any third parties they rely on to obtain location information or associated data used for compliance with the location-based routing requirements have implemented measures sufficient to safeguard the privacy and security of such information.<sup>347</sup> These requirements make clear that CMRS providers who work with third-party vendors in the context of location-based routing are responsible for ensuring that those vendors take appropriate measures to address privacy and security concerns.<sup>348</sup> The privacy and security certifications are due at the same time as the other location-based routing certifications (i.e., within 60 days after the compliance deadlines applicable to the CMRS providers under the location-based routing rules).

101. EPIC also asks the Commission to clarify how its privacy and security rules, including those governing using, disclosing, and permitting access to Customer Proprietary Network Information

---

<sup>343</sup> See Electronic Privacy Information Center (EPIC) Notice of Proposed Rulemaking Comments 6-7 (rec. Feb. 16, 2023) (EPIC NPRM Comments). The Commission’s data privacy and security requirements for dispatchable location and z-axis location information provide that prior to use of dispatchable location information or z-axis location information, respectively, to meet the location accuracy requirements, CMRS providers must certify that neither they nor any third party they rely on to obtain such location information will use such location information or associated data for any non-911 purpose, except with prior express consent or as otherwise required by law. 47 CFR § 9.10(i)(4)(iv)-(v). The certification must state that CMRS providers and any third party they rely on to obtain such location information will implement measures sufficient to safeguard the privacy and security of such location information. *Id.*

<sup>344</sup> EPIC NPRM Comments at 7.

<sup>345</sup> *Id.*

<sup>346</sup> *Id.* EPIC states that “[t]he location data market is a multi-billion-dollar industry. Like many other companies that collect location data, carriers have sold their customers’ information to data brokers who have then sold access to anyone willing to buy—from bounty hunters to the government. The disclosure and sale of location data has serious implications for equity because vulnerable people are most likely to be the targets of surveillance.” *Id.* at 3 (footnotes omitted).

<sup>347</sup> Under the definition we adopt today, location information used for location-based routing may include, but is not limited to, device-based location information.

<sup>348</sup> *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Sixth Report and Order and Order on Reconsideration, 35 FCC Rcd. 7752, 7777, at para. 57 (2020).



(CPNI), apply to device-based location data.<sup>349</sup> Section 222 of the Communications Act of 1934, as amended, requires CMRS providers, among others, to protect the confidentiality of location information and prohibits them from using, disclosing, or permitting access to location information without the customer's express prior authorization, but provides an exception for the provision of a customer's call location information to a PSAP or other emergency response authority in connection with a 911 call.<sup>350</sup> To help remove uncertainty for CMRS providers, we clarify that the obligations that apply to dispatchable location data also apply to location information used for location-based routing, including device-based location data.

102. We decline EPIC's request to clarify the definition of "911 purposes." We believe that the Commission's existing privacy protections for 911 location data are sufficiently clear, and that determining whether a particular use of location data is for "911 purposes" is likely to be a fact-specific inquiry best addressed on a case-by-case basis as the need arises. We decline to address the issue of law enforcement's ability to use 911 location data for investigative or law enforcement purposes, as this is an area outside the Commission's regulatory authority. We also decline EPIC's request to require CMRS and covered text providers to delete location data as outside the scope of this proceeding, as the *Notice of Proposed Rulemaking* did not propose or seek comment on requirements for data minimization.<sup>351</sup> We recognize data minimization as an important tool to protect the privacy and security of customers' information, and we encourage providers not to retain 911 location routing data longer than is necessary to fulfill the 911 purpose of the data or comply with applicable law.

103. *Per-Call Disclosure Requirements.* The Commission sought comment on whether to require CMRS providers to disclose to PSAPs or state or local 911 authorities the routing methodology used for each 911 call, although the Commission declined to propose such a requirement.<sup>352</sup> COPUC and BRETSA urge the Commission to require per-call disclosure. COPUC states that "[n]ot knowing whether the call was routed using LBR technology or default E911 methodology, the PSAP will have to follow up on every misrouted call to determine the cause of the misroute."<sup>353</sup> BRETSA states that routing methodology information can allow dispatchers to assess the likelihood that they need to transfer the call and the reliability of the caller location information.<sup>354</sup> However, T-Mobile and NENA argue that such a requirement is unnecessary.<sup>355</sup> T-Mobile asserts that the positioning technology used to route each call is not actionable for PSAPs and that in a full NG911 environment, positioning technology information will be available with each call.<sup>356</sup> NENA similarly states that NG911 system elements already "partly" meet the need for per-call information on routing mechanisms and that additional standards development is under way and should meet this need "in full."<sup>357</sup> In light of the forthcoming development of NG911 standards that will support disclosure of per-call routing methodology, we agree

---

<sup>349</sup> See EPIC NPRM Comments at 5-6. The Commission's privacy rules, including those governing the use, disclosure, and access to CPNI, are at 47 CFR §§ 64.2001-64.2011.

<sup>350</sup> 47 U.S.C. § 222(d)(4)(A).

<sup>351</sup> See EPIC NPRM Comments at 7-9.

<sup>352</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15196, para. 29.

<sup>353</sup> COPUC NPRM Comments at 7; *id.* (also stating that if a call "was routed using LBR and still was delivered to the wrong PSAP, that indicates the possibility of an error in the GIS dataset being used by the CMRS provider to determine the proper destination for the 911 call").

<sup>354</sup> BRETSA NPRM Reply at 3.

<sup>355</sup> AT&T NPRM Comments at 5; T-Mobile NPRM Comments at 8; T-Mobile NPRM Reply at 5-6; NENA NPRM Comments at 6 (stating that standards under development make such disclosure requirements unnecessary, but also stating that "[i]t is imperative that the positioning source for the 9-1-1 caller is provided with the call").

<sup>356</sup> See T-Mobile NPRM Reply at 5-6.

<sup>357</sup> NENA PN Reply at 5.

with T-Mobile and NENA that any incremental benefit from requiring such disclosures at this time would not outweigh the potential costs of this requirement.

#### D. Additional Proposals

104. Several commenters raised additional issues or proposals in response to the *Notice of Proposed Rulemaking*. We discuss each of these issues or proposals in turn below.

105. *Role of Next Generation Core Services (NGCS) providers.* NENA and T-Mobile indicate that the proposals in the *Notice of Proposed Rulemaking* regarding routing obligations and ESInets may leave a regulatory gap with respect to routing functions performed by ESInet administrators and next generation core services (NGCS) providers.<sup>358</sup> T-Mobile notes that once a carrier hands the 911 call over to the NGCS provider at the ESInet ingress point, the carrier cannot control how the call is routed, and the *Notice of Proposed Rulemaking* “does not contemplate that the NGCS provider is *also* required to use LBR when routing to the appropriate PSAP.”<sup>359</sup> T-Mobile urges the Commission to ensure that carriers do not “bear the burden of noncompliance” after the carrier routes the 911 call to ESInets.<sup>360</sup> Because the Commission only considered requirements for CMRS and covered text providers in the *Notice of Proposed Rulemaking*, we decline to consider the role of NGCS providers in routing at this time and defer to the NG911 transition proceeding in PS Docket No. 21-479 the consideration of NGCS providers’ responsibilities with regard to location-based routing and any related liabilities.

106. *2019 Wireline Forbearance Memorandum Opinion and Order.* We received a comment from Mr. Ronald R. Fenwick urging the Commission to revisit and revise a 2019 *Memorandum Opinion and Order* in another proceeding which granted price cap incumbent Local Exchange Carriers (LECs) forbearance from legacy regulatory obligations.<sup>361</sup> Mr. Fenwick asserts that the *Memorandum Opinion and Order* resulted in diminishing subscribers to traditional landline services, and that wireless customers are not properly apprised of the advantages of wireline service.<sup>362</sup> We decline to revisit the 2019 *Memorandum Opinion and Order*, which does not deal with wireless services and is therefore outside the scope of this proceeding.

107. *Calls and Texts Originating Outside the United States.* We received a comment from staff of the Defense Information Systems Agency (DISA) asking the Commission to consider location-based routing for 911 calls and texts originating outside the United States and its territories.<sup>363</sup> This request raises legal and policy issues that are beyond the scope of this proceeding.

108. *Location-Based Routing for VoIP.* We received a comment from DISA asking the Commission to apply location-based routing requirements to “landline-based VoIP 9-1-1 calls coming from Ethernet wired end instruments and connecting to the Public Switch Telephone Network using

---

<sup>358</sup> NENA NPRM Comments at 11 (“Under the proposal to establish an ESInet as a termination point for location, there may exist a gap in regulatory coverage. There may be a need to apply regulatory coverage to ESInet providers to ensure that calls and location are delivered through the ESInet all the way to the PSAP.”); T-Mobile NPRM Comments at 7 (asserting that there is a gap in the NPRM with respect to routing obligations for calls delivered to an ESInet and that “[t]his raises the question of where the burden of compliance rests if a call is misrouted in this scenario”).

<sup>359</sup> T-Mobile NPRM Comments at 7.

<sup>360</sup> *Id.*

<sup>361</sup> Fenwick NPRM Comments at 1 (citing *Petition of USTelecom for Forbearance Pursuant to 47 U.S.C. § 160(c) to Accelerate Investment in Broadband and Next-Generation Networks*, WC Docket No. 18-141, Memorandum Opinion and Order, 34 FCC Rcd 6503 (2019)).

<sup>362</sup> Fenwick NPRM Comments at 1.

<sup>363</sup> DISA NPRM Comments at 1-2.

Session Initiation Protocol (SIP) trunks from an IP-PBX.”<sup>364</sup> We note that in the Next Generation 911 proceeding (PS Docket. 21-479), the Commission proposed rules requiring interconnected VoIP providers to complete all translation necessary to deliver 911 calls, including associated location information, in the requested IP-based format to an ESInet or other designated point(s) that allow emergency calls to be answered.<sup>365</sup> We defer consideration of this issue to the Next Generation 911 proceeding.

### E. Promoting Digital Equity and Inclusion

109. As noted in the *Notice of Proposed Rulemaking*, the Commission is engaged in a continuing effort to advance digital equity for all,<sup>366</sup> including people of color, persons with disabilities, persons who live in rural or Tribal areas, and others who are or have been historically underserved, marginalized, or adversely affected by persistent poverty or inequality.<sup>367</sup> The *Notice of Proposed Rulemaking* invited comment on equity-related considerations and benefits, if any, that may be associated with the proposals and issues under consideration.<sup>368</sup> Specifically, the Commission sought comment on how its proposals may promote or inhibit advances in diversity, equity, inclusion, and accessibility.<sup>369</sup>

110. Several parties submitted comments on these issues. NENA states that location-based routing should be deployed regardless of a jurisdiction’s NG911 status and that “[i]t would be inequitable to restrict the life-saving benefits of location-based routing” only to those “with the good fortune of having an emergency in a convenient location” with NG911 capability.<sup>370</sup> As discussed in Section III.A.1.a, we are adopting rules today that require CMRS providers to implement location-based routing on their IP-based networks for wireless 911 voice calls nationwide, regardless of whether a particular jurisdiction has NG911 capability. These rules will help to ensure that location-based routing is available for wireless 911 voice calls nationwide and regardless of the service provider the caller has chosen.

111. NASNA notes that in the *Notice of Proposed Rulemaking*, the Commission sought comment not just on equity-related considerations, but also “on the degree to which funding and operating transitional facilities extend the timeline and add to the cost incurred by state and local 911 authorities to transition to NG911.”<sup>371</sup> NASNA believes that “these two issues are inextricably linked,”

---

<sup>364</sup> *Id.* at 3.

<sup>365</sup> *NG911 Notice of Proposed Rulemaking* at \*8, para. 21.

<sup>366</sup> Section 1 of the Communications Act of 1934 as amended provides that the FCC “regulat[es] interstate and foreign commerce in communication by wire and radio so as to make [such service] available, so far as possible, to all the people of the United States, without discrimination on the basis of race, color, religion, national origin, or sex.” 47 U.S.C. § 151.

<sup>367</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15205, para. 59. The term “equity” is used here consistent with Executive Order 13985 as the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality. *See* Exec. Order No. 13985, 86 Fed. Reg. 7009, Executive Order on Advancing Racial Equity and Support for Underserved Communities Through the Federal Government (Jan. 20, 2021).

<sup>368</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15205, para. 59.

<sup>369</sup> *Id.*

<sup>370</sup> NENA NPRM Comments at 5.

<sup>371</sup> NASNA NPRM Comments at 17 (quoting *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15234, para. 46).

and NASNA raises “the issues facing our members in providing equal access to 911 services to all citizens through local NG911 systems.”<sup>372</sup> Pointing to the *NG911 Notice of Proposed Rulemaking* comment record as well, NASNA urges that “the equity-access consideration for 911 at this point in time should begin at the network level in which 911 calls themselves are transported.”<sup>373</sup> NASNA states, “If all those calling or texting 911 do not have a consistent level of access to network functionality, we believe the gap in digital disparity in effective and reliable access to 911 across the country will widen all the more.”<sup>374</sup> Because NASNA’s comments regarding equity and access are more closely related to the NG911 proceeding than the instant proceeding, we defer consideration of these points to the NG911 proceeding.

112. COPUC advocates for applying the same implementation time frames for 911 texts that are being applied to wireless 911 voice calls (i.e., six months for nationwide CMRS providers and eighteen months for non-nationwide CMRS providers) as “a matter of equity for 911 users that rely on text-to-911.”<sup>375</sup> As discussed in Section III.A.2, at this time we decline to require location-based routing for text-to-911 services other than RTT communications to 911 in the absence of technical standards for location-based routing for SMS. However, we reiterate our commitment to monitoring the development of standards, products, and other advances affecting location-based routing for SMS text-to-911.

113. EPIC states that government entities, carriers, and others have misused location data to target individuals and groups, and says that “the lack of clear privacy and security safeguards would have a disproportionately negative impact on certain vulnerable groups.”<sup>376</sup> As discussed in Section III.C and consistent with certain of EPIC’s requests, we adopt a requirement applying the Commission’s existing rules on the privacy and security of dispatchable location and z-axis information to location-based routing information.<sup>377</sup>

114. In sum, we acknowledge the importance of the continuing effort to advance digital equity for all. We believe that the rules we adopt today, requiring CMRS providers to implement location-based routing on their IP-based networks for wireless 911 voice calls nationwide and requiring CMRS providers to implement location-based routing where they deploy RTT capabilities, will help to advance those goals.

## **F. Summary of Benefits and Costs for Location-Based Routing**

115. As we discuss below, the implementation of location-based routing has potential annual benefits of over \$173 billion in terms of reduced mortality and reduced call transfer burdens to PSAPs. We determine that the rules we adopt today, which will affect CMRS providers, will result in an industry-wide compliance cost of \$215 million.

### **1. Benefits of Location-Based Routing**

116. We believe that the Commission’s benefit assessment from the *Notice of Proposed Rulemaking* remains valid. The Commission estimated that implementation of location-based routing

---

<sup>372</sup> *Id.*

<sup>373</sup> *Id.* at 18.

<sup>374</sup> *Id.*

<sup>375</sup> COPUC NPRM Comments at 8; *see also* NENA NPRM Reply at 9 (concurring with NASNA’s equity comments on supporting location-based routing for text-to-911, but arguing that the Commission’s rules “should not back the market into adopting non-standardized technologies for a legacy platform” and encouraging only voluntary deployment of location-based routing for “interim” text-to-911).

<sup>376</sup> EPIC NPRM Comments at 1; *see id.* at 2, 8 (noting that Microsoft also raised similar privacy and security concerns in earlier comments in the instant proceeding).

<sup>377</sup> We address EPIC’s other requests in Section III.C.

would save 13,837 lives annually.<sup>378</sup> While the Commission did not attempt to place a value on human life, it relied on the U.S. Department of Transportation (DOT)'s valuation of a statistical life (VSL) of \$11.8 million from base year 2021.<sup>379</sup> The Commission estimated that the benefit of reduced mortality would be 13,837 x \$11.8 million or approximately \$163 billion, but stated that this estimate was conservative.<sup>380</sup> We received no comments on the estimated reduced mortality benefit. Using the latest VSL of \$12.5 million for base year 2022,<sup>381</sup> our new estimate of reduced mortality benefit is approximately \$173 billion for wireless voice calls to 911. At this time, we have no data on the number of RTT communications to 911 to estimate a benefit from this service,<sup>382</sup> but we anticipate that as RTT usage becomes more widespread, significant reduced mortality benefits will accrue.

117. The Commission sought specificity on the time and cost savings to PSAPs and state and local 911 authorities under the proposed rules.<sup>383</sup> While we received no specific figures in the record, BRETSA agrees that misrouting of 911 calls ties up resources at the PSAP to which the call was misrouted and delays receipt of the call at the PSAP that can dispatch first responders, while T-Mobile states that call transfers can delay emergency response and result in the loss of vital incident information including caller location.<sup>384</sup> The Commission estimated that with implementation of location-based routing, "1,368,000 calls would avoid the need for a transfer due to a misroute, reducing the response time for these calls by one minute."<sup>385</sup> This would result in a time savings of 22,800 hours annually for PSAPs, although NENA estimates that call transfers consume over 200,000 hours per year of excess 911

---

<sup>378</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15206-07, para. 61 & n.161.

<sup>379</sup> *Id.* at 15208, para. 62 (citing U.S. Department of Transportation, Departmental Guidance on Valuation of a Statistical Life in Economic Analysis (Mar. 4, 2022) (since updated May 1, 2023), <https://www.transportation.gov/office-policy/transportation-policy/revised-departmental-guidance-on-valuation-of-a-statistical-life-in-economic-analysis>).

<sup>380</sup> *Id.* (stating that the estimate does not include "the value of reduced human suffering and property destruction occurring due to a delayed arrival of first responders" or "the benefits of location-based routing for text messages").

<sup>381</sup> See U.S. Department of Transportation, *Departmental Guidance on Valuation of a Statistical Life in Economic Analysis* (effective May 1, 2023), <https://www.transportation.gov/office-policy/transportation-policy/revised-departmental-guidance-on-valuation-of-a-statistical-life-in-economic-analysis>.

<sup>382</sup> Forty states, the District of Columbia, and Puerto Rico reported receiving a total of 781,201 texts to 911 in 2021. Fourteenth Annual 911 Fee Report at 12, para. 14. This was the first annual report to include data on texts to 911.

<sup>383</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15208, para. 63.

<sup>384</sup> BRETSA NPRM Reply at I; T-Mobile NPRM Comments at 3.

<sup>385</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15206-07, para. 61 n.161. NENA estimates that 80% or more of the total calls to 911 annually are from wireless devices. NENA, *9-1-1 Statistics*, <https://www.nena.org/page/911Statistics> (last accessed Aug. 28, 2023). According to the National Association of State Emergency Medical Services Officials (NASEMSO), local Emergency Medical Services (EMS) agencies respond to nearly 28.5 million 911 dispatches each year. NASEMSO, National Association of State EMS Officials releases stats on local agencies, 911 Calls (Apr. 10, 2020), <https://www.ems1.com/ambulanceservice/articles/national-association-of-state-ems-officials-releases-stats-on-local-agencies-911-calls-LPQTHJrK2oIpxuR1/>. Assuming that 80% of these calls are from wireless devices yields an estimate of 22.8 million wireless calls for 911 dispatch annually. The Commission estimated that 12% of the wireless calls for dispatch (or 2,736,000 calls) would be misrouted. *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15206-07, para. 61 n.161 (citing Alliance for Telecommunications Industry Solutions (ATIS), Analysis of Predetermined Cell Sector Routing Outcomes Compared to Caller's Device Location, ATIS-0500039, at 4 (July 2, 2019) (ATIS-0500039), [https://access.atis.org/apps/group\\_public/document.php?document\\_id=48697](https://access.atis.org/apps/group_public/document.php?document_id=48697)). The Commission also estimated that location-based routing with a horizontal uncertainty value of 300 meters would resolve approximately 50% of these misroutes. *Id.* (citing ATIS-0500039 at 13). Accordingly, the Commission estimated that 1,368,000 calls would avoid the need for a transfer due to a misroute, reducing the response time for these calls by one minute. *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15206-07, para. 61 n.161.

professional labor.<sup>386</sup> We estimate the mean wage of 911 call operators to be \$25.04 per hour,<sup>387</sup> which leads to an estimated total labor cost of \$36.31 per hour after accounting for benefits.<sup>388</sup> We estimate that PSAPs would realize an annual savings benefit range of approximately \$0.8 million to \$7.3 million per year for wireless 911 voice calls.<sup>389</sup> We do not have sufficient data to estimate such a benefit for RTT, though we similarly anticipate that time and cost savings benefits for PSAPs will accrue for RTT as usage grows.

## 2. Costs of Implementation

118. In the *Notice of Proposed Rulemaking*, the Commission provided separate cost estimates for materials and labor.<sup>390</sup> The Commission sought comment on, *inter alia*, hardware, software, services, GIS, and testing;<sup>391</sup> provider costs and timelines necessary to work with OS-based location providers; costs for providers to implement the required software, hardware, and service upgrades to comply with proposed rules; and how many work-hours and what kind of workers would be required,<sup>392</sup> and planned or expended costs by providers that have implemented or plan to implement location-based routing.<sup>393</sup> RWA and BRETSA state that non-nationwide and smaller carriers have not determined actual costs.<sup>394</sup> We did not receive specific cost information to better inform the Commission's cost assessments. Commenters provided information about network elements, tasks, and burdens that would factor into costs; however, commenters generally discussed such factors in the context of seeking more time to comply rather than cost aspects.<sup>395</sup> RWA calls for additional time and federal funding to support carrier implementation of location-based routing and alleges that RWA members will not be able to comply with an unfunded mandate.<sup>396</sup> As discussed in Section III.A.1, we are increasing the timelines for non-nationwide CMRS providers to implement location-based routing for wireless 911 voice calls

<sup>386</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15186-87, para. 8 (citing NENA PN Comments at 4).

<sup>387</sup> The mean wage for Public Safety Telecommunicators in May 2022 was \$23.74 per hour. U.S. Bureau of Labor Statistics, *Occupational Employment and Wages, May 2022, 43-5031 Public Safety Telecommunicators* (Apr. 25, 2023), <https://www.bls.gov/oes/current/oes435031.htm>. The average hourly private wage increased by 5.5% according to the Bureau of Labor Statistics between May 2022 and August 2023, so to correct for inflation we increase the wage estimate by 5.5% to \$25.04 per hour. Federal Reserve Bank of St. Louis, *Average Hourly Earnings of All Employees, Total Private (CES0500000003)*, <https://fred.stlouisfed.org/series/CES0500000003> (last visited Oct. 10, 2023) (*Inflation Adjustment*).

<sup>388</sup> To account for benefits, we markup wages by 45%, which results in total hourly compensation of  $\$25.04 \times 145\% = \$36.31$ . According to the Bureau of Labor Statistics, as of June 2023, civilian wages and salaries averaged \$29.86/hour and benefits averaged \$13.39/hour. Total compensation therefore averaged  $\$29.86 + \$13.39$ , rounded to \$43.26. See Press Release, Bureau of Labor Statistics, *Employer Costs for Employee Compensation—June 2023* (Sept. 12, 2023), <https://www.bls.gov/news.release/pdf/eccc.pdf>. Using these figures, benefits constitute a markup of  $\$13.39/\$29.86 \sim 45\%$  (*Compensation Benefit Markup*).

<sup>389</sup> PSAPs would realize an annual savings benefit of 1,368,000 calls x 1 minute (0.0166 hours) x \$36.31, or over \$828,000 per year. Using NENA's estimate, PSAPs would realize a savings benefit of 200,000 hours x \$36.31, or approximately \$7.3 million per year.

<sup>390</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15210-11, paras. 71-72.

<sup>391</sup> *Id.* at 15208, para. 64.

<sup>392</sup> *Id.* at 15208-09, para. 65.

<sup>393</sup> *Id.* at 15209, para. 66.

<sup>394</sup> RWA NPRM Comments at 1, n.3; BRETSA NPRM Reply at ii.

<sup>395</sup> For example, CCA states that location-based routing implementation will be economically and practically infeasible in the proposed eighteen-month timeline for non-nationwide carriers, noting that a nationwide carrier took four years. CCA NPRM Comments at 11.

<sup>396</sup> RWA NPRM Comments at 1-2.

and RTT communications, and deferring consideration of location-based routing requirements for texts to 911 and requirements to deliver 911 calls and texts in IP-based format.

119. *Material Costs.* The Commission tentatively concluded that CMRS providers implement location-based routing at the PSAP level, while CMRS providers incur material costs on a per-PSAP basis.<sup>397</sup> The Commission estimated that the average material cost of software features or component upgrades for each CMRS provider would be \$10,000 per PSAP as an upper bound,<sup>398</sup> with an “implied material cost upper bound [of] approximately \$106 million.”<sup>399</sup> We received no comments to inform the Commission’s material cost estimate for CMRS providers to deploy location-based routing to PSAPs they serve. However, commenters identified core network elements necessary to implement location-based routing. Intrado states that carriers will need to implement geospatial routing capable Gateway Mobile Location Centers (GMLCs) so that routing decisions will occur within their networks.<sup>400</sup> CCA states that “[i]ncorporating location-based routing into the wireless ecosystem ... requires a carefully orchestrated series of changes that affects the wireless carriers’ device inventory, transport networks, and several aspects of the core network systems. These potentially include access and mobility management, data authentication, geospatial data repository functions, session management, and network security.”<sup>401</sup> CCA further states that carriers will need to “implement the array of device upgrades and non-standard, proprietary network solutions needed for location-based routing.”<sup>402</sup> RWA describes hardware and software modifications needed to implement location-based routing as a “massive expense,” and notes that member budgets for capital expenses are “already pared close to the bone.”<sup>403</sup>

120. We agree with commenters that providers have certain material costs associated with network core that are not necessarily dependent on the number of PSAPs they serve. We clarify, however, that the material costs that we calculated on a per-PSAP basis in the *Notice of Proposed Rulemaking* also include other costs that are not necessarily incurred at the PSAP. We agree that implementation costs of upgrading equipment or software can, for instance, involve changes to the network core. We also note that such costs vary with the size of the network that remains to be converted to location-based routing, especially if any equipment needs to be updated. We therefore chose the per-PSAP basis because we find it a convenient proxy of remaining network area. T-Mobile<sup>404</sup>

---

<sup>397</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15210, para. 70

<sup>398</sup> *Id.*

<sup>399</sup> *Id.* at 15210-11, para. 71. The Commission assumed no material costs for AT&T because it has already deployed location-based routing to its network. *Id.* at 15210, para. 71. The Commission stated (at the time of the *Notice of Proposed Rulemaking*) that it is unclear the extent to which Verizon plans to implement location-based routing, and did not estimate Verizon’s material costs. *Id.* at 15210-11, para. 71. The Commission found that T-Mobile has yet to implement location-based routing to 4,896 PSAPs, while non-nationwide CMRS providers collectively must upgrade 5,728 PSAPs, with any PSAP receiving service from usually one non-nationwide CMRS provider along with the nationwide CMRS providers. *Id.* at 15211, para. 71. The Commission found that T-Mobile and non-nationwide CMRS providers need to implement location-based routing for 10,624 PSAPs (4,896 + 5,728), at \$10,000 per PSAP, for a cost of approximately \$106 million. *Id.*

<sup>400</sup> Intrado NPRM Comments at 3. NENA defines a GMLC as “the point of interface between the GSM [Global Standard for Mobile Communications] wireless network and the Emergency Services Network. The GMLC retrieves, forwards, stores and controls position data associated with wireless callers. This includes the processing of location requests and updates (rebids).”

[https://kb.nena.org/wiki/GMLC/MLC\\_\(Gateway\\_Mobile\\_Location\\_Center\)](https://kb.nena.org/wiki/GMLC/MLC_(Gateway_Mobile_Location_Center)) (last accessed Sept. 7, 2023).

<sup>401</sup> CCA NPRM Comments at 2.

<sup>402</sup> *Id.*

<sup>403</sup> RWA NPRM Comments at 2.

<sup>404</sup> T-Mobile Reply at 2 & n.6.

and Verizon<sup>405</sup> report partial implementation of location-based routing based on the number of PSAPs. For providers with no known implementation, the number of their covered PSAPs serves as a proxy for the size of their entire network. We therefore continue to use the per-PSAP basis as a proxy for network size in our current material costs calculations. We note, additionally, that even if the per-PSAP cost that we use below were to double, the aggregate expected costs of our rules would fall well below the expected benefits.

121. The latest NENA data indicate that 5,748 PSAPs operate in the United States.<sup>406</sup> AT&T has already deployed location-based routing nationwide,<sup>407</sup> so our rules impose no additional material costs for AT&T. The Commission did not provide an estimate of T-Mobile's material costs in the *Notice of Proposed Rulemaking*. As of December, 2023, T-Mobile states that it has fully implemented location-based routing for 1,591 PSAPs, with an additional 596 PSAPs in progress.<sup>408</sup> Thus, T-Mobile must implement location-based routing to 3,561 remaining PSAPs. The Commission did not provide an estimate of Verizon's material costs in the *Notice of Proposed Rulemaking*, but Verizon states that it has "fully implemented LBR for 414 PSAPs; implementation is in progress for an additional 277 PSAPs."<sup>409</sup> Thus, the rules would impose no additional material costs for existing and planned deployments to Verizon for 691 PSAPs, which leaves 5,057 PSAPs remaining for Verizon to implement location-based routing. The remaining CMRS providers collectively must upgrade the full national set of 5,748 PSAPs, assuming no more than one remaining CMRS provider serving a particular PSAP.<sup>410</sup> Using the Commission's \$10,000 per PSAP upper bound in the *Notice of Proposed Rulemaking*, we estimate that CMRS providers collectively need to deploy location-based routing to a total of 14,366 PSAPs,<sup>411</sup> resulting in the implied material cost of approximately \$143.7 million.

122. *Labor Costs.* The Commission estimated that the labor cost per CMRS provider is \$366,600.<sup>412</sup> The Commission explicitly mentioned the tasks of installing equipment and running trials as part of this labor.<sup>413</sup> Commenters described other tasks such as internal planning, outreach, and testing.<sup>414</sup> Since these tasks do not involve materials but rather involve work burdens, we categorize them as labor costs for the purpose of this analysis.

---

<sup>405</sup> Verizon Dec. 7, 2023 *Ex Parte* at 1.

<sup>406</sup> NENA, *9-1-1 Statistics*, <https://www.nena.org/page/911Statistics> (last visited Dec. 15, 2023).

<sup>407</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15189, para. 12 (citing AT&T PN Comments at 4).

<sup>408</sup> T-Mobile Dec. 21, 2023 *Ex Parte* at 1.

<sup>409</sup> Verizon Dec. 7, 2023 *Ex Parte* at 1.

<sup>410</sup> See *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15211, para. 71 (citing FCC, *Mobile Deployment Form 477 Data* (Jul. 29, 2022), <https://www.fcc.gov/mobile-deployment-form-477-data> ("Staff analysis of Form 477 data suggests that when that when there is a fourth non-nationwide wireless provider in any particular location, it is usually the only one.")).

<sup>411</sup> We count 3,561 PSAPs remaining for T-Mobile, 5,057 PSAPs remaining for Verizon, and 5,748 PSAPs for the CMRS providers that have not yet begun to implement location-based routing.

<sup>412</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15211, para. 72 (estimating that the labor cost of employing software workers would be \$35.25 per hour; that the upper bound of the time to implement the upgrades with trials is 6 months (26 weeks), and workers have a forty hour work week, or 1,040 hours per worker; that ten simultaneous workers at a time on average is a generous upper bound, resulting in 10,400 labor hours per CMRS provider; and that the labor cost per CMRS provider is \$366,600).

<sup>413</sup> *Id.*

<sup>414</sup> CCA NPRM Comments at 3-5, CCA NPRM Reply at 5-6, CCA July 13, 2023 *Ex Parte* at 3, and 17-18, RWA NPRM Reply at 3.



123. *Labor Costs (i): Internal Planning.* CCA described CMRS providers' internal planning tasks prior to implementation of location-based routing, which we categorize under labor. CCA states that carriers will need to vet and select potentially appropriate technical location-based routing solutions, budget for related required procurements, and make related plans to allocate and prioritize necessary resources to the projects.<sup>415</sup> CCA states that "[t]he proposed rule would require carriers with IP-based networks to make major strategic decisions for their wireless networks" and "stand up project teams comprised of senior engineers and business leaders with specialized experience in network operations to assess the needs of the marketplace and review the state of technology development globally, nationally, and with respect to their individual network technologies."<sup>416</sup> CCA states that carriers will need to make "a candid assessment of existing network resources, the purposeful allocation of limited technical and business resources, and a successful matching of technology within the market to the unique features of that carrier's network systems and status within the product evolution lifecycle" and conduct "intensive" decision making.<sup>417</sup>

124. *Labor Costs (ii): Outreach.* Next, CCA described providers' outreach tasks, such as collaboration with network and handset vendors,<sup>418</sup> and work with device makers, technology vendors, and software service providers.<sup>419</sup> However, CCA notes that non-nationwide CMRS providers face challenges attracting attention and assistance from global and national vendors who are more responsive to larger clients.<sup>420</sup>

125. *Labor Costs (iii): Deployment.* Commenters provided few details of labor tasks associated with deployment, including equipment and device installation and upgrades.

126. *Labor Costs (iv): Testing.* Commenters described CMRS providers' testing tasks involved with location-based routing implementation. RWA states that providers will need to "test, modify, [and] perfect" location-based routing solutions.<sup>421</sup> CCA states that AT&T performed extensive lab testing, performance testing, trials at PSAPs, evaluation of results with its vendor Intrado, and additional PSAP testing.<sup>422</sup> CCA states that AT&T "confirm[ed] the metrics, obtain[ed] feedback from the PSAPs, and implement[ed] several proprietary changes."<sup>423</sup>

127. While the *Notice of Proposed Rulemaking* explicitly mentioned the tasks of installing equipment and running trials as part of its labor calculation, the estimate was not meant to be solely inclusive of all tasks.<sup>424</sup> According to Commission staff experience with typical network upgrades, team members will often work on tasks from multiple of the above categories of internal planning, outreach, deployment, and testing. The *Notice of Proposed Rulemaking* calculation assumes a large team of ten workers over a period of six months to account for the various phases of labor and shifting tasks amongst workers.

---

<sup>415</sup> CCA NPRM Reply at 5. The planning costs CCA cites include "identifying acceptance of the technical implementation." CCA NPRM Comments at 11.

<sup>416</sup> CCA NPRM Comments at 4.

<sup>417</sup> *Id.*

<sup>418</sup> *Id.* at 4-5.

<sup>419</sup> *Id.* at 3.

<sup>420</sup> CCA July 13, 2023 *Ex Parte* at 3; *see also* CCA NPRM Comments at 6, 17-18.

<sup>421</sup> RWA NPRM Reply at 3.

<sup>422</sup> CCA NPRM Comments at 4-5.

<sup>423</sup> *Id.* at 5.

<sup>424</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15211-12, para. 72.

128. Absent more specific data in the record on each task category, we rely on the Commission's labor cost estimation methodology per CMRS provider.<sup>425</sup> To better reflect the wide array of complex tasks, including internal network planning, that would need to be undertaken by highly-skilled and senior staff, we will assume a higher wage for the workers than that assumed in the *Notice of Proposed Rulemaking* because some of the tasks involved will have to be undertaken by senior staff. To the extent that less senior staff would be necessary to complete any of these tasks, we view the wage that we use as conservatively high. Using the Bureau of Labor Statistics 75<sup>th</sup> percentile wage for network engineers, we assume worker compensation to be \$81.29 per hour.<sup>426</sup> Marking up hourly compensation by 45% to account for benefits results in a total hourly compensation estimate of \$117.87.<sup>427</sup> Assuming that work is completed over 26 work-weeks of five, 8 work-hour days, and a team of 10, the aggregate upper bound of work-hours would 10,400 and the total cost of those work-hours would be \$1,225,853. While non-nationwide CMRS providers will have 24 months rather than six to implement location-based routing, smaller CMRS providers have constraints on the number of staff they can assign to any one project. In addition, while non-nationwide CMRS providers may take longer to implement location-based routing, assigning the same amount of work-time as nationwide CMRS providers represents both the spreading out of tasks over a longer period and an overestimate since non-nationwide CMRS providers have much smaller networks. Given that AT&T has already implemented location-based routing, we estimate the labor cost associated with implementation for network for the 56 remaining providers, plus T-Mobile and Verizon, to be \$71.1 million ( $\approx \$1,225,853 \times 58 \text{ providers} = \$71,099,474$ ).<sup>428</sup>

129. In addition to network costs, several commenters indicate that public safety-grade GIS data or shapefiles that precisely define PSAP boundaries should be developed or provided, though they differ on which parties should be responsible.<sup>429</sup> We agree with NENA that it is the responsibility of providers to maintain their own jurisdictional maps.<sup>430</sup> Accordingly, we assign the cost of maps to the providers. We anticipate that map costs will largely be labor to update already existing maps. To come up with a cost ceiling, we assume that every provider will need to update their maps, even though many providers likely have up-to-date maps. We anticipate that updating the map will only entail labor costs for mapping specialists to update maps. In the Supporting Document of Study Area Boundary Data Reporting in Esri Shapefile Format, the Office of Information and Regulatory Affairs estimates that it

---

<sup>425</sup> *Id.* (estimating that the labor cost of employing software workers would be \$35.25 per hour; that the upper bound of the time to implement the upgrades with trials is 6 months (26 weeks), and workers have a forty hour work week, or 1,040 hours per worker; that ten simultaneous workers at a time on average is a generous upper bound, resulting in 10,400 labor hours per CMRS provider; and that the labor cost per CMRS provider is \$366,600).

<sup>426</sup> The Bureau of Labor Statistics considers the title "computer network architect" to be synonymous with "network engineer." Bureau of Labor Statistics, *Computer Network Architects: What Computer Network Architects Do* (Sep. 12, 2023), <https://www.bls.gov/ooh/computer-and-information-technology/computer-network-architects.htm#tab-2>. To approximate the wages of senior network engineers, we use the 75<sup>th</sup> percentile of the hourly wage of computer network architects in May 2022, \$77.06 per hour. Bureau of Labor Statistics, *Occupational Employment and Wages, May 2022, 15-1241 Computer Network Architects* (Apr. 25, 2023), <https://www.bls.gov/oes/current/oes151241.htm>. After adjusting for wage inflation to August 2023, the wage increases to \$81.29 per hour. See *Inflation Adjustment*.

<sup>427</sup> See *Compensation Benefit Mark-up*.

<sup>428</sup> To the extent that T-Mobile and Verizon have already begun implementing location-based routing, this cost may be an overestimate.

<sup>429</sup> Intrado NPRM Comments at 3 (suggesting carriers and the PSAPs should develop GIS data); BRETSA NPRM Reply at ii (suggesting should develop state and local 911 authorities should develop GIS data); T-Mobile NPRM Comments at 6 (suggesting that PSAPs should provide shapefiles, though some PSAPs may not want to provide shapefiles because they consider such information confidential); see also CCOA NPRM Reply at 3; CTIA NPRM Reply at 3, 6-7 (agreeing with T-Mobile regarding the need for accurate shapefiles of PSAP boundaries).

<sup>430</sup> NENA Comments at 7.

takes an average of 26 hours for a data scientist to modify a shapefile.<sup>431</sup> We believe that 26 hours would be an upper bound of the time required for a party to update its maps. Given that the average wage rate is \$60.44/hour for data scientists in the telecommunications industry,<sup>432</sup> with a 45% markup for benefits,<sup>433</sup> we arrive at \$87.63 as the hourly compensation rate for a data scientist. We estimate an upper bound for the cost of map updating to be approximately \$134,000 ( $\approx \$87.63$  per hour  $\times$  26 hours  $\times$  59 providers = \$134,424.42).

130. In addition, the one-time certification of compliance with our requirements together with the submission of data on call percentages by routing methods will impose a one-time cost on CMRS providers. As this required information should be available to each provider internally, we anticipate work to compile this information to take no longer than a week of five business days. We believe that one network engineer would be sufficient to complete this task in this time frame, resulting in a total provider cost of 40 work-hours. Assuming the same hourly labor cost of network engineers as in the previous cost estimate for network implementation, the total cost of reporting is \$280,000 ( $\approx \$117.87$  per hour  $\times$  40 hours  $\times$  59 providers = \$278,173.20).

131. *Costs for State and Local 911 Authorities and PSAPs.* The Commission sought comment on costs to state and local 911 authorities.<sup>434</sup> Intrado and APCO state that PSAPs will not need to make changes to their networks or call handling systems.<sup>435</sup> We agree. Likewise, because we find that providers must maintain their own jurisdictional maps, we do not recognize any costs for state and local 911 authorities and PSAPs.

132. Because we are adopting location-based routing requirements for RTT, we also consider the costs for CMRS providers. Given that CMRS providers process and route RTT communications similarly to voice calls,<sup>436</sup> we assume that CMRS providers' material and labor costs to deploy location-based routing for RTT are included in our cost estimates above. As part of this analysis, we note that as of the release date of this *Report and Order*, we are aware of only a small number of PSAPs that are receiving RTT communications.

133. In sum, we estimate upper bounds of the costs that CMRS providers will bear to be material costs of \$143.7 million, network implementation costs of \$71.1 million, GIS costs of \$134 thousand, and certification costs of \$280 thousand. Altogether, the upper bound of costs is approximately \$215 million. However, we underscore that this cost is far outweighed by the benefits of over \$173 billion in terms of reduced mortality and call transfer time eliminated.

---

<sup>431</sup> See Office of Information and Regulatory Affairs, Office of Management and Budget Executive Office of the President, 2022 Study Area Boundary Data Reporting in Esri Shapefile Format DA 12-1777 and DA 13-282, Supporting Statement - OMB Control No. 3060-1181, at 5- paras. 12 (Feb. 15, 2022), [https://www.reginfo.gov/public/do/PRAViewDocument?ref\\_nbr=202202-3060-009](https://www.reginfo.gov/public/do/PRAViewDocument?ref_nbr=202202-3060-009); see also *Wireless Emergency Alerts, Amendments to Part 11 of the Commission's Rules Regarding the Emergency Alert System*, PS Docket Nos. 15-91, 15-94, Third Report and Order, FCC 23-88, at 37 (Feb. 27, 2013).

<sup>432</sup> The mean hourly wage for data scientists in the telecommunications industry in May 2022 is \$57.29. Bureau of Labor Statistics, *May 2022 National Industry-Specific Occupational Employment and Wage Estimates NAICS 517000 – Telecommunications* (Apr. 25, 2023), [https://www.bls.gov/oes/current/naics4\\_517000.htm](https://www.bls.gov/oes/current/naics4_517000.htm). After adjusting for wage inflation to August 2023, the wage increases \$60.44 per hour. See *Inflation Adjustment*.

<sup>433</sup> See *Compensation Benefit Mark-up*.

<sup>434</sup> *Notice of Proposed Rulemaking*, 37 FCC Rcd at 15208, para. 64.

<sup>435</sup> Intrado NPRM Comments at 3; APCO NPRM Comments at 3-4.

<sup>436</sup> NENA NPRM Reply at 9-10.

#### IV. PROCEDURAL MATTERS

134. *Regulatory Flexibility Act.* The Regulatory Flexibility Act of 1980, as amended (RFA),<sup>437</sup> requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.”<sup>438</sup> Accordingly, we have prepared a Final Regulatory Flexibility Analysis (FRFA) concerning the possible impact of the rule changes contained in this *Report and Order* on small entities. The FRFA is set forth in Appendix B.

135. *Paperwork Reduction Act of 1995 Analysis.* This document contains new information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. It will be submitted to the Office of Management and Budget (OMB) for review under section 3507(d) of the PRA.<sup>439</sup> OMB, the general public, and other federal agencies will be invited to comment on the new information collection requirements contained in this proceeding. In addition, we note that, pursuant to the Small Business Paperwork Relief Act of 2002,<sup>440</sup> we previously sought, but did not receive, specific comment on how the Commission might further reduce the information collection burden for small business concerns with fewer than 25 employees. The Commission does not believe that the new information collection requirements in section 9.10, paragraphs (s)(4) and (s)(5) will be unduly burdensome on small businesses. We describe impacts that might affect small businesses, which includes most businesses with fewer than 25 employees, in the FRFA in Appendix B.

136. *Congressional Review Act.* [The Commission will submit this draft Report & Order to the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, for concurrence as to whether this rule is “major” or “non-major” under the Congressional Review Act, 5 U.S.C. § 804(2).] The Commission will send a copy of this Report & Order to Congress and the Government Accountability Office pursuant to 5 U.S.C. § 801(a)(1)(A).

137. *People with Disabilities.* To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice).

138. *Additional Information.* For additional information on this proceeding, contact Rachel Wehr, [Rachel.Wehr@fcc.gov](mailto:Rachel.Wehr@fcc.gov) or 202-418-1138, Brenda Boykin, [Brenda.Boykin@fcc.gov](mailto:Brenda.Boykin@fcc.gov) or 202-418-2062, of the Public Safety and Homeland Security Bureau, Policy and Licensing Division.

#### V. ORDERING CLAUSES

139. Accordingly, IT IS ORDERED, pursuant to sections 1, 2, 4(i), 10, 201, 214, 222, 251(e), 301, 302, 303, 307, 309, 316, and 332, of the Communications Act of 1934, as amended, 47 U.S.C. §§ 151, 152(a), 154(i), 160, 201, 214, 222, 251(e), 301, 302a, 303, 307, 309, 316, 332; the Wireless Communications and Public Safety Act of 1999, Pub. L. No. 106-81, 47 U.S.C. §§ 615 note, 615, 615a, 615b; and section 106 of the Twenty-First Century Communications and Video Accessibility Act of 2010, Pub. L. No. 111-260, 47 U.S.C. § 615c, that this *Report and Order* IS ADOPTED.

---

<sup>437</sup> See 5 U.S.C. § 604. The RFA, 5 U.S.C. §§ 601-612. The RFA was amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>438</sup> 5 U.S.C. § 605(b).

<sup>439</sup> 44 U.S.C. § 3507(d).

<sup>440</sup> Pub. L. No. 107-198, 116 Stat. 729 (2002) (codified at 44 U.S.C. § 3506(c)(4)).

140. IT IS FURTHER ORDERED that the amendments to part 9 of the Commission's rules, as set forth in Appendix A, ARE ADOPTED, effective sixty (60) days after publication in the *Federal Register*. Compliance will not be required for paragraphs (s)(4) and (s)(5) of section 9.10 until after approval by the Office of Management and Budget. The Commission delegates authority to the Public Safety and Homeland Security Bureau to publish a document in the *Federal Register* announcing that compliance date and revising paragraph (s)(6) of section 9.10.

141. IT IS FURTHER ORDERED that the Commission's Office of the Secretary, Reference Information Center, SHALL SEND a copy of this *Report and Order*, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

142. IT IS FURTHER ORDERED that the Office of the Managing Director, Performance Program Management, SHALL SEND a copy of this *Report and Order* in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, 5 U.S.C. § 801(a)(1)(A).

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch  
Secretary

**Appendix A**  
**Final Rules**

The Federal Communications Commission amends part 9 of Title 47 of the Code of Federal Regulations as follows:

**PART 9 – 911 REQUIREMENTS**

1. The authority citation for part 9 continues to read as follows:

**Authority:** 47 U.S.C. 151–154, 152(a), 155(c), 157, 160, 201, 202, 208, 210, 214, 218, 219, 222, 225, 251(e), 255, 301, 302, 303, 307, 308, 309, 310, 316, 319, 332, 403, 405, 605, 610, 615, 615 note, 615a, 615b, 615c, 615a–1, 616, 620, 621, 623, 623 note, 721, and 1471, and Section 902 of Title IX, Division FF, Pub. L. 116–260, 134 Stat. 1182, unless otherwise noted.

2. Amend § 9.3 by adding the following:

**§ 9.3 Definitions.**

\* \* \* \* \*

*Device-Based Location Information.* Information regarding the location of a device used to call or text 911 generated all or in part from on-device sensors and data sources.

\* \* \* \* \*

*Location-Based Routing.* The use of information regarding the location of a device, including but not limited to device-based location information, to deliver 911 calls and real-time text communications to point(s) designated by the authorized local or state entity to receive wireless 911 voice calls and real-time text communications to 911, such as an Emergency Services Internet Protocol Network (ESInet) or PSAP, or to an appropriate local emergency authority.

\* \* \* \* \*

3. Amend § 9.10 by revising paragraph (a) and adding paragraph (s) to read as follows:

**§ 9.10 911 Service.**

(a) Scope of section. Except as described in paragraph (r) of this section, the following requirements of paragraphs (a) through (s) of this section are only applicable to CMRS providers, excluding mobile satellite service (MSS) operators, to the extent that they:

\* \* \* \* \*

(s) *Location-Based Routing Requirements.*

(1) *Wireless 911 voice calls.*

(i) By [INSERT DATE EIGHT MONTHS AFTER DATE OF FEDERAL REGISTER PUBLICATION], nationwide CMRS providers must deploy a technology that supports location-based routing for wireless 911 voice calls on their Internet Protocol-based networks (4G LTE, 5G, and subsequent generations of Internet Protocol-based networks) nationwide. At that time, nationwide CMRS providers must route all wireless 911 voice calls originating on their Internet Protocol-based networks pursuant to the requirements of paragraph (s)(3) of this section.

(ii) By [INSERT DATE TWENTY-SIX MONTHS AFTER DATE OF FEDERAL REGISTER PUBLICATION], non-nationwide CMRS providers must deploy a technology that supports location-based routing for wireless 911 voice calls on their Internet Protocol-based networks (4G LTE, 5G, and subsequent generations of Internet Protocol-based networks). At that time, non-nationwide CMRS providers must route all wireless 911 voice calls originating on their Internet Protocol-based networks pursuant to the requirements of paragraph (s)(3) of this section.

(2) *Real-time text communications to 911.* By [INSERT DATE TWENTY-SIX MONTHS AFTER DATE OF FEDERAL REGISTER PUBLICATION], CMRS providers must deploy a technology that supports location-based routing for real-time text communications to 911 originating on their Internet-Protocol-based networks (4G LTE, 5G, and subsequent generations of Internet Protocol-based networks). At that time, CMRS providers must route all real-time text communications to 911 originating on their Internet Protocol-based networks pursuant to the requirements of paragraph (s)(3) of this section.

(3) *Timeliness and Accuracy Threshold.*

(i) Notwithstanding requirements for confidence and uncertainty described in paragraph (j) of this section, CMRS providers must use location information that meets the following specifications for routing wireless 911 voice calls and real-time text communications to 911 under paragraphs (s)(1) and (2):

(A) The location information reports the horizontal location uncertainty level of the device within a radius of 165 meters at a confidence level of at least 90%; and

(B) The location information is available to the CMRS provider network at the time of routing the wireless 911 voice call or real-time text communication to 911.

(ii) When the location information does not meet either one or both of the requirements in paragraph (s)(3)(i)(A)-(B) of this section, CMRS providers must route the wireless 911 voice call or real-time text communication to 911 based on the best available location information, which may include but is not limited to device-based location information that does not meet the requirements in paragraph (s)(3)(i)(A)-(B) of this section, the centroid of the area served by the cell sector that first picks up the call, or other location information.

(4) *Certification and Reporting.* Within 60 days after each benchmark specified in paragraphs (s)(1)(i), (ii), and (2) of this section, CMRS providers must comply with the following certification and reporting requirements. CMRS providers must file certifications and other information pursuant to this paragraph (s)(4) in PS Docket No. 18-64.

(i) CMRS providers must:

(A) Certify that they are in compliance with the requirements specified in paragraphs (s)(1)(i), (ii), and (2) of this section applicable to them;

(B) Identify specific network architecture, systems, and procedures used to comply with paragraphs (s)(1)(i), (ii), and (2) of this section, including the extent to which the CMRS provider validates location information for routing purposes and the validation practices used in connection with this information; and

(C) Certify that neither they nor any third party they rely on to obtain location information or associated data used for compliance with paragraphs (s)(1)(i), (ii), or (2) of this section will use such location information or associated data for any non-911 purpose, except with prior express consent or as otherwise



required by law. The certification must state that the CMRS provider and any third parties it relies on to obtain location information or associated data used for compliance with paragraphs (s)(1)(i), (ii), or (2) of this section have implemented measures sufficient to safeguard the privacy and security of such location information or associated data.

(ii) CMRS providers also must:

(A) Collect and report aggregate data on the routing technologies used for all live wireless 911 voice calls in the locations specified for live 911 call location data in paragraph (i)(3)(ii) of this section for a thirty-day period which begins on the compliance date(s) specified in paragraphs (s)(1)(i) and (ii) of this section. CMRS providers must retain live wireless 911 voice call data gathered pursuant to this section for a period of 2 years. CMRS providers must collect and report the following data, expressed as both a number and percentage of the total number of live wireless 911 voice calls for which data is collected pursuant to this section:

(1) Live wireless 911 voice calls routed with location-based routing using location information that meets the timeliness and accuracy thresholds defined in paragraph (s)(3)(i)(A) and (B) of this section;

(2) Live wireless 911 voice calls routed with location-based routing using location information that does not meet the timeliness or accuracy thresholds defined in paragraph (s)(3)(i)(A) and (B) of this section;  
and

(3) Live wireless 911 voice calls routed using tower-based routing.

(5) *Modification of deadlines by agreement.* Nothing in this section shall prevent PSAPs and CMRS providers from establishing, by mutual consent, deadlines different from those established for CMRS provider compliance in paragraphs (s)(1)(i), (ii), and (2) of this section. The CMRS provider must notify the Commission of the dates and terms of the alternate time frame within 30 days of the parties' agreement or [INSERT DATE NINETY DAYS AFTER DATE OF FEDERAL REGISTER PUBLICATION], whichever is later. The CMRS provider must subsequently notify the Commission of the actual date by which it comes into compliance with the location-based routing requirements in

paragraphs (s)(1)(i), (ii), or (2) of this section within 30 days of that date or [INSERT DATE NINETY DAYS AFTER DATE OF FEDERAL REGISTER PUBLICATION], whichever is later. CMRS providers must file such notifications pursuant to this paragraph (s)(5) in PS Docket No. 18-64. The parties may not use this paragraph (s)(5) to delay compliance with paragraphs (s)(1)(i), (ii), or (2) of this section indefinitely.

(6) *Compliance dates.* Paragraphs (s)(4) and (5) of this section contain information collection and recordkeeping requirements. Compliance will not be required until after the completion of such review by the Office of Management and Budget that the Public Safety and Homeland Security Bureau deems necessary. The Commission will publish a document in the Federal Register announcing that compliance date and revising this paragraph (s)(6) accordingly.

## Appendix B

### Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),<sup>1</sup> an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Location-Based Routing for Wireless 911 Calls* Notice of Proposed Rulemaking (*Notice*) adopted in December 2022.<sup>2</sup> The Commission sought written public comment on the proposals in the *Notice*, including comments on the IRFA. No comments were filed addressing the IRFA. This Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.<sup>3</sup>

#### A. Need for, and Objectives of, the Final Rules

2. Technical limitations of legacy Enhanced 911 (E911) routing can result in a Commercial Mobile Radio Service (CMRS) provider routing a wireless 911 call to a Public Safety Answering Point (PSAP) other than the one designated by the relevant state or local 911 authority to receive calls from the actual location of the caller.<sup>4</sup> Misroutes can occur for several reasons, including when more than one PSAP is within the coverage area of a cell site or sector.<sup>5</sup> Such legacy tower-based routing results in approximately 12% of wireless 911 calls arriving at the incorrect PSAP for the caller's location.<sup>6</sup> When a 911 call is misrouted, the answering telecommunicator must transfer the call to the PSAP that has jurisdiction to dispatch aid to the 911 caller's location, resulting in confusion and an estimated delay of a minute or more in dispatch and response.<sup>7</sup> This delay can have deadly consequences.<sup>8</sup> In addition, misroutes consume time and resources for both the transferring PSAP and the receiving PSAP.<sup>9</sup> One national public safety organization estimates that these types of call transfers consume over 200,000 hours per year of excess 911 professional labor.<sup>10</sup>

3. In today's *Report and Order*, the Commission adopted rules and procedures to require CMRS providers to implement location-based routing for wireless 911 voice calls and real-time text (RTT) communications to 911 nationwide.<sup>11</sup> With location-based routing (LBR) as implemented under

---

<sup>1</sup> 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601–612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

<sup>2</sup> *Location-Based Routing for Wireless 911 Calls*, PS Docket No. 18-64, Notice of Proposed Rulemaking, 37 FCC Rcd 15183 (2022) (*Notice*).

<sup>3</sup> 5 U.S.C. § 604.

<sup>4</sup> *Notice*, 37 FCC Rcd at 15185, para. 7.

<sup>5</sup> *Id.* at 15186, para. 7 (citing Communications Security, Reliability and Interoperability Council (CSRIC) V, Working Group 1, Evolving 911 Services, Final Report – Task 2: 911 Location-Based Routing at 9 (2016), [https://transition.fcc.gov/bureaus/pshs/advisory/csric5/WG1\\_Task2\\_FinalReport\\_092016.docx](https://transition.fcc.gov/bureaus/pshs/advisory/csric5/WG1_Task2_FinalReport_092016.docx) (CSRIC V LBR Report)).

<sup>6</sup> Alliance for Telecommunications Industry Solutions (ATIS), Analysis of Predetermined Cell Sector Routing Outcomes Compared to Caller's Device Location, ATIS-0500039 (July 2, 2019), [https://access.atis.org/apps/group\\_public/document.php?document\\_id=48697](https://access.atis.org/apps/group_public/document.php?document_id=48697) (ATIS-0500039).

<sup>7</sup> See, e.g., APCO PN Comments at 2 & n.7; NENA Public Notice Comments at 4 (rec. July 11, 2022) (NENA PN Comments); Peninsula Fiber Network Public Notice Comments at 1 (rec. July 8, 2022).

<sup>8</sup> *Notice*, 37 FCC Rcd at 15187, para. 8 & n.21.

<sup>9</sup> *Id.* at 15186-87, para. 8.

<sup>10</sup> NENA PN Comments at 4 (rec. July 11, 2022); *Notice*, 37 FCC Rcd at 15186-87, para. 8.

<sup>11</sup> In the *Report and Order*, the Commission uses the term Commercial Mobile Radio Service (CMRS) provider to refer to providers of CMRS as defined in 47 CFR § 9.3 (“Commercial mobile radio service (CMRS)”). The

(continued....)

the Commission's rules, CMRS providers will use precise location information to route wireless 911 voice calls and RTT communications to 911 to the appropriate public safety answering point. For the millions of individuals seeking emergency assistance each year by wireless 911 voice call or RTT communication to 911, improving routing for these services will reduce emergency response time and save lives.

4. To facilitate the implementation of location-based routing for wireless 911 voice calls and RTT communications to 911, the Commission took the following actions:

- The Commission required CMRS providers to deploy location-based routing technology for wireless 911 voice calls and RTT communications to 911 on their Internet Protocol (IP)-based networks (i.e., 4G LTE, 5G, and subsequent generations of IP-based networks). The Commission also required CMRS providers to use location-based routing to route wireless 911 voice calls and RTT communications to 911 originating on their IP-based networks when location information meets certain thresholds for accuracy and timeliness. The Commission deferred consideration of proposals in the *Notice* concerning requirements for covered text providers<sup>12</sup> to implement location-based routing for other types of texts to 911, such as Short Message Service (SMS).
- The Commission required CMRS providers to use location-based routing for wireless 911 voice calls and RTT communications to 911 when caller location information available to the CMRS provider's network at time of routing is ascertainable within a radius of 165 meters at a confidence level of at least 90%. In the absence of these conditions, CMRS providers must use alternative routing methods based on "best available" location information, which may include but is not limited to device-based or tower-based location information.
- The Commission adopted the proposed six-month timeline for nationwide CMRS providers to implement location-based routing for wireless 911 voice calls and provided twenty-four months for implementation by non-nationwide CMRS providers.<sup>13</sup> In addition, the Commission provided 24 months for all CMRS providers to implement location-based routing for RTT communications to 911.
- The Commission required CMRS providers within 60 days of the applicable compliance deadlines to certify and submit evidence of compliance with location-based routing requirements and to certify the privacy of location information used for location-based routing. At that time, CMRS providers also must submit one-time live call data reporting specifying routing methodologies for calls in live call areas.
- The Commission deferred consideration of proposals and issues raised in the *Notice of Proposed Rulemaking* concerning IP-formatted delivery of wireless 911 voice calls, texts, and associated

---

Commission defines real-time text as "[t]ext communications that are transmitted over Internet Protocol (IP) networks immediately as they are created, e.g., on a character-by-character basis." 47 CFR § 9.3; see also 47 CFR pt. 67. In the *Report and Order*, the Commission uses the term "RTT communications" to refer to instances in which an RTT user initiates contact with 911, for consistency with our part 9 and part 67 rules. See 47 CFR §§ 9.10(c), 67.1(g), 67.2(c)(2).

<sup>12</sup> The Commission defines "covered text provider" as including "all CMRS providers as well as all providers of interconnected text messaging services that enable consumers to send text messages to and receive text messages from all or substantially all text-capable U.S. telephone numbers, including through the use of applications downloaded or otherwise installed on mobile phones." 47 CFR § 9.10(q)(1).

<sup>13</sup> The Commission defines a "[n]on-nationwide CMRS provider" for purposes of its part 9 rules as "[a]ny CMRS provider other than a nationwide CMRS provider." 47 CFR § 9.10 (i)(1)(v). A "[n]ationwide CMRS provider" for purposes of the Commission's part 9 rules is "[a] CMRS provider whose service extends to a majority of the population and land area of the United States." 47 CFR § 9.10 (i)(1)(iv).

routing information for consideration in the Commission’s pending Next Generation 911 (NG911) Transition docket (PS Docket No. 21-479, Facilitating Implementation of Next Generation 911 Services).<sup>14</sup>

**B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA**

5. There were no comments filed that specifically addressed the proposed rules and policies presented in the IRFA.

**C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration**

6. Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments.<sup>15</sup> The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

**D. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply**

7. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the rules adopted herein.<sup>16</sup> The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”<sup>17</sup> In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.<sup>18</sup> A “small business concern” is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.<sup>19</sup>

8. *Small Businesses, Small Organizations, Small Governmental Jurisdictions.* Our actions, over time, may affect small entities that are not easily categorized at present. We therefore describe, at the outset, three broad groups of small entities that could be directly affected herein.<sup>20</sup> First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the Small Business Administration’s (SBA) Office of Advocacy, in general a small business is an independent business having fewer than 500 employees.<sup>21</sup> These types of small

---

<sup>14</sup> See *Facilitating Implementation of Next Generation 911 Services (NG911)*, PS Docket No. 21-479, Notice of Proposed Rulemaking, FCC 23-47, 2023 WL 3946685 (June 9, 2023), <https://www.fcc.gov/document/fcc-proposes-action-expedite-transition-next-generation-911-0> (NG911 Notice).

<sup>15</sup> 5 U.S.C. § 604(a)(3).

<sup>16</sup> *Id.* § 604(a)(4).

<sup>17</sup> *Id.* § 601(6).

<sup>18</sup> *Id.* § 601(3) (incorporating by reference the definition of “small-business concern” in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies “unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register.”

<sup>19</sup> 15 U.S.C. § 632.

<sup>20</sup> See 5 U.S.C. § 601(3)-(6).

<sup>21</sup> See SBA, Office of Advocacy, “What’s New With Small Business?,”

<https://advocacy.sba.gov/wp-content/uploads/2023/03/Whats-New-Infographic-March-2023-508c.pdf>. (Mar. 2023)

businesses represent 99.9% of all businesses in the United States, which translates to 33.2 million businesses.<sup>22</sup>

9. Next, the type of small entity described as a “small organization” is generally “any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.”<sup>23</sup> The Internal Revenue Service (IRS) uses a revenue benchmark of \$50,000 or less to delineate its annual electronic filing requirements for small exempt organizations.<sup>24</sup> Nationwide, for tax year 2020, there were approximately 447,689 small exempt organizations in the U.S. reporting revenues of \$50,000 or less according to the registration and tax data for exempt organizations available from the IRS.<sup>25</sup>

10. Finally, the small entity described as a “small governmental jurisdiction” is defined generally as “governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”<sup>26</sup> U.S. Census Bureau data from the 2017 Census of Governments<sup>27</sup> indicate there were 90,075 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.<sup>28</sup> Of this number, there were 36,931 general purpose governments (county,<sup>29</sup> municipal, and town or township<sup>30</sup>) with populations of

---

<sup>22</sup> *Id.*

<sup>23</sup> See 5 U.S.C. § 601(4).

<sup>24</sup> The IRS benchmark is similar to the population of less than 50,000 benchmark in 5 U.S.C § 601(5) that is used to define a small governmental jurisdiction. Therefore, the IRS benchmark has been used to estimate the number of small organizations in this small entity description. See Annual Electronic Filing Requirement for Small Exempt Organizations – Form 990-N (e-Postcard), “Who must file,”

<https://www.irs.gov/charities-non-profits/annual-electronic-filing-requirement-for-small-exempt-organizations-form-990-n-e-postcard>. We note that the IRS data does not provide information on whether a small exempt organization is independently owned and operated or dominant in its field.

<sup>25</sup> See Exempt Organizations Business Master File Extract (EO BMF), “CSV Files by Region,” <https://www.irs.gov/charities-non-profits/exempt-organizations-business-master-file-extract-eo-bmf>. The IRS Exempt Organization Business Master File (EO BMF) Extract provides information on all registered tax-exempt/non-profit organizations. The data utilized for purposes of this description was extracted from the IRS EO BMF data for businesses for the tax year 2020 with revenue less than or equal to \$50,000 for Region 1-Northeast Area (58,577), Region 2-Mid-Atlantic and Great Lakes Areas (175,272), and Region 3-Gulf Coast and Pacific Coast Areas (213,840) that includes the continental U.S., Alaska, and Hawaii. This data does not include information for Puerto Rico.

<sup>26</sup> See 5 U.S.C. § 601(5).

<sup>27</sup> See 13 U.S.C. § 161. The Census of Governments survey is conducted every five (5) years compiling data for years ending with “2” and “7”. See also Census of Governments, <https://www.census.gov/programs-surveys/cog/about.html>.

<sup>28</sup> See U.S. Census Bureau, 2017 Census of Governments – Organization Table 2. Local Governments by Type and State: 2017 [CG1700ORG02], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. Local governmental jurisdictions are made up of general purpose governments (county, municipal and town or township) and special purpose governments (special districts and independent school districts). See also tbl.2. CG1700ORG02 Table Notes\_Local Governments by Type and State\_2017.

<sup>29</sup> See *id.* at tbl.5. County Governments by Population-Size Group and State: 2017 [CG1700ORG05], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 2,105 county governments with populations less than 50,000. This category does not include subcounty (municipal and township) governments.

<sup>30</sup> See *id.* at tbl.6. Subcounty General-Purpose Governments by Population-Size Group and State: 2017 [CG1700ORG06], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 18,729 municipal and 16,097 town and township governments with populations less than 50,000.

less than 50,000 and 12,040 special purpose governments—independent school districts<sup>31</sup> with enrollment populations of less than 50,000.<sup>32</sup> Accordingly, based on the 2017 U.S. Census of Governments data, we estimate that at least 48,971 entities fall into the category of “small governmental jurisdictions.”<sup>33</sup>

## A. Telecommunications Service Providers

### 1. Wireless Telecommunications Providers

11. Pursuant to 47 CFR § 9.10(a), the Commission’s 911 service requirements are only applicable to “CMRS providers, excluding mobile satellite service (MSS) operators, to the extent that they: (1) Offer real-time, two way switched voice service that is interconnected with the public switched network; and (2) Use an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. These requirements are applicable to entities that offer voice service to consumers by purchasing airtime or capacity at wholesale rates from CMRS licensees.”

12. Below, for those services subject to auctions, we note that, as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Also, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated.

13. *All Other Telecommunications.* This industry is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.<sup>34</sup> This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.<sup>35</sup> Providers of Internet services (e.g. dial-up ISPs) or Voice over Internet Protocol (VoIP) services, via client-supplied telecommunications connections are also included in this industry.<sup>36</sup> The SBA small business size standard for this industry classifies firms with annual receipts of \$35 million or less as small.<sup>37</sup> U.S. Census Bureau data for 2017 show that there were 1,079 firms in this industry that

---

<sup>31</sup> See *id.* at tbl.10. Elementary and Secondary School Systems by Enrollment-Size Group and State: 2017 [CG1700ORG10], <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 12,040 independent school districts with enrollment populations less than 50,000. See also tbl.4. Special-Purpose Local Governments by State Census Years 1942 to 2017 [CG1700ORG04], CG1700ORG04 Table Notes\_Special Purpose Local Governments by State\_Census Years 1942 to 2017.

<sup>32</sup> While the special purpose governments category also includes local special district governments, the 2017 Census of Governments data does not provide data aggregated based on population size for the special purpose governments category. Therefore, only data from independent school districts is included in the special purpose governments category.

<sup>33</sup> This total is derived from the sum of the number of general purpose governments (county, municipal and town or township) with populations of less than 50,000 (36,931) and the number of special purpose governments - independent school districts with enrollment populations of less than 50,000 (12,040), from the 2017 Census of Governments - Organizations tbls. 5, 6 & 10.

<sup>34</sup> See U.S. Census Bureau, *2017 NAICS Definition*, “517919 All Other Telecommunications,” <https://www.census.gov/naics/?input=517919&year=2017&details=517919>.

<sup>35</sup> *Id.*

<sup>36</sup> *Id.*

<sup>37</sup> See 13 CFR § 121.201, NAICS Code 517919 (as of 10/1/22, NAICS Code 517810).

operated for the entire year.<sup>38</sup> Of those firms, 1,039 had revenue of less than \$25 million.<sup>39</sup> Based on this data, the Commission estimates that the majority of “All Other Telecommunications” firms can be considered small.

14. *Advanced Wireless Services (AWS) - (1710–1755 MHz and 2110–2155 MHz bands (AWS-1); 1915–1920 MHz, 1995–2000 MHz, 2020–2025 MHz and 2175–2180 MHz bands (AWS-2); 2155–2175 MHz band (AWS-3); 2000–2020 MHz and 2180–2200 MHz (AWS-4)).* Spectrum is made available and licensed in these bands for the provision of various wireless communications services.<sup>40</sup> Wireless Telecommunications Carriers (except Satellite)<sup>41</sup> is the closest industry with a SBA small business size standard applicable to these services. The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>42</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.<sup>43</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>44</sup> Thus, under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small.

15. According to Commission data as December 2021, there were approximately 4,472 active AWS licenses.<sup>45</sup> The Commission’s small business size standards with respect to AWS involve eligibility for bidding credits and installment payments in the auction of licenses for these services. For the auction of AWS licenses, the Commission defined a “small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$40 million, and a “very small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$15 million.<sup>46</sup> Pursuant to these definitions, 57 winning bidders claiming status as small or very small businesses won 215 of 1,087 licenses.<sup>47</sup> In the most recent auction of AWS licenses 15 of 37 bidders qualifying for status

---

<sup>38</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Sales, Value of Shipments, or Revenue Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEREVFIRM, NAICS Code 517919, <https://data.census.gov/cedsci/table?y=2017&n=517919&tid=ECNSIZE2017.EC1700SIZEREVFIRM&hidePreview=false>.

<sup>39</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard. We also note that according to the U.S. Census Bureau glossary, the terms receipts and revenues are used interchangeably, see [https://www.census.gov/glossary/#term\\_ReceiptsRevenueServices](https://www.census.gov/glossary/#term_ReceiptsRevenueServices).

<sup>40</sup> See 47 CFR § 27.1(b).

<sup>41</sup> See U.S. Census Bureau, *2017 NAICS Definition, “517312 Wireless Telecommunications Carriers (except Satellite),”* <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>42</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>43</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPfirm, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPfirm&hidePreview=false>.

<sup>44</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>45</sup> Based on a FCC Universal Licensing System search on December 10, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, “Match only the following radio service(s)”, Radio Service = AD, AH, AT, AW; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

<sup>46</sup> See 47 CFR §§ 27.1002, 27.1102, 27.1104, 27.1106.

<sup>47</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auction 66: Advanced Wireless Services (AWS-1), Summary, Spreadsheets, <https://www.fcc.gov/sites/default/files/wireless/auctions/66/charts/66cls2.pdf>.



as small or very small businesses won licenses.<sup>48</sup>

16. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these services, at this time we are not able to estimate the number of licensees with active licenses that would qualify as small under the SBA's small business size standard.

17. *Competitive Local Exchange Carriers (LECs)*. Neither the Commission nor the SBA has developed a size standard for small businesses specifically applicable to local exchange services. Providers of these services include several types of competitive local exchange service providers.<sup>49</sup> Wired Telecommunications Carriers<sup>50</sup> is the closest industry with a SBA small business size standard. The SBA small business size standard for Wired Telecommunications Carriers classifies firms having 1,500 or fewer employees as small.<sup>51</sup> U.S. Census Bureau data for 2017 show that there were 3,054 firms that operated in this industry for the entire year.<sup>52</sup> Of this number, 2,964 firms operated with fewer than 250 employees.<sup>53</sup> Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 3,378 providers that reported they were competitive local exchange service providers.<sup>54</sup> Of these providers, the Commission estimates that 3,230 providers have 1,500 or fewer employees.<sup>55</sup> Consequently, using the SBA's small business size standard, most of these providers can be considered small entities.

18. *Incumbent Local Exchange Carriers (Incumbent LECs)*. Neither the Commission nor the SBA have developed a small business size standard specifically for incumbent local exchange carriers. Wired Telecommunications Carriers<sup>56</sup> is the closest industry with an SBA small business size standard.<sup>57</sup> The SBA small business size standard for Wired Telecommunications Carriers classifies firms having

---

<sup>48</sup> See *Auction of Advanced Wireless Services (AWS-3) Licenses Closes; Winning Bidders Announced for Auction 97*, Public Notice, DA-15-131, Attachments A-B, (Auction No. 97) (January 30, 2015).

<sup>49</sup> Competitive Local Exchange Service Providers include the following types of providers: Competitive Access Providers (CAPs) and Competitive Local Exchange Carriers (CLECs), Cable/Coax CLECs, Interconnected VOIP Providers, Non-Interconnected VOIP Providers, Shared-Tenant Service Providers, Audio Bridge Service Providers, Local Resellers, and Other Local Service Providers.

<sup>50</sup> See U.S. Census Bureau, *2017 NAICS Definition*, "517311 Wired Telecommunications Carriers," <https://www.census.gov/naics/?input=517311&year=2017&details=517311>.

<sup>51</sup> See 13 CFR § 121.201, NAICS Code 517311 (as of 10/1/22, NAICS Code 517111).

<sup>52</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFFIRM, NAICS Code 517311, <https://data.census.gov/cedsci/table?y=2017&n=517311&tid=ECNSIZE2017.EC1700SIZEEMPFFIRM&hidePreview=false>.

<sup>53</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>54</sup> Federal-State Joint Board on Universal Service, *Universal Service Monitoring Report at 26*, Table 1.12 (2022), <https://docs.fcc.gov/public/attachments/DOC-391070A1.pdf>.

<sup>55</sup> *Id.*

<sup>56</sup> See U.S. Census Bureau, *2017 NAICS Definition*, "517311 Wired Telecommunications Carriers," <https://www.census.gov/naics/?input=517311&year=2017&details=517311>.

<sup>57</sup> See 13 CFR § 121.201, NAICS Code 517311 (as of 10/1/22, NAICS Code 517111).

1,500 or fewer employees as small.<sup>58</sup> U.S. Census Bureau data for 2017 show that there were 3,054 firms in this industry that operated for the entire year.<sup>59</sup> Of this number, 2,964 firms operated with fewer than 250 employees.<sup>60</sup> Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 1,212 providers that reported they were incumbent local exchange service providers.<sup>61</sup> Of these providers, the Commission estimates that 916 providers have 1,500 or fewer employees.<sup>62</sup> Consequently, using the SBA's small business size standard, the Commission estimates that the majority of incumbent local exchange carriers can be considered small entities.

19. *Broadband Personal Communications Service.* The broadband personal communications services (PCS) spectrum encompasses services in the 1850-1910 and 1930-1990 MHz bands.<sup>63</sup> The closest industry with a SBA small business size standard applicable to these services is Wireless Telecommunications Carriers (except Satellite).<sup>64</sup> The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>65</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.<sup>66</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>67</sup> Thus under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small.

20. Based on Commission data as of November 2021, there were approximately 5,060 active licenses in the Broadband PCS service.<sup>68</sup> The Commission's small business size standards with respect to Broadband PCS involve eligibility for bidding credits and installment payments in the auction of licenses for these services. In auctions for these licenses, the Commission defined "small business" as an entity that, together with its affiliates and controlling interests, has average gross revenues not exceeding \$40 million for the preceding three years, and a "very small business" as an entity that, together with its

---

<sup>58</sup> *Id.*

<sup>59</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFI, NAICS Code 517311, <https://data.census.gov/cedsci/table?y=2017&n=517311&tid=ECNSIZE2017.EC1700SIZEEMPFI&hidePreview=false>.

<sup>60</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>61</sup> Federal-State Joint Board on Universal Service, Universal Service Monitoring Report at 26, Table 1.12 (2022), <https://docs.fcc.gov/public/attachments/DOC-391070A1.pdf>.

<sup>62</sup> *Id.*

<sup>63</sup> See 47 CFR § 24.200.

<sup>64</sup> See U.S. Census Bureau, *2017 NAICS Definition, "517312 Wireless Telecommunications Carriers (except Satellite)"*, <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>65</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>66</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFI, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFI&hidePreview=false>.

<sup>67</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>68</sup> Based on a FCC Universal Licensing System search on November 16, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = CW; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

affiliates and controlling interests, has had average annual gross revenues not exceeding \$15 million for the preceding three years.<sup>69</sup> Winning bidders claiming small business credits won Broadband PCS licenses in C, D, E, and F Blocks.<sup>70</sup>

21. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these, at this time we are not able to estimate the number of licensees with active licenses that would qualify as small under the SBA's small business size standard.

22. *Narrowband Personal Communications Services.* Narrowband Personal Communications Services (*Narrowband PCS*) are PCS services operating in the 901-902 MHz, 930-931 MHz, and 940-941 MHz bands.<sup>71</sup> PCS services are radio communications that encompass mobile and ancillary fixed communication that provide services to individuals and businesses and can be integrated with a variety of competing networks.<sup>72</sup> Wireless Telecommunications Carriers (*except Satellite*)<sup>73</sup> is the closest industry with a SBA small business size standard applicable to these services. The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>74</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.<sup>75</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>76</sup> Thus under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small.

23. According to Commission data as of December 2021, there were approximately 4,211 active *Narrowband PCS* licenses.<sup>77</sup> The Commission's small business size standards with respect to *Narrowband PCS* involve eligibility for bidding credits and installment payments in the auction of licenses for these services. For the auction of these licenses, the Commission defined a "small business" as an entity that, together with affiliates and controlling interests, has average gross revenues for the three

---

<sup>69</sup> See 47 CFR § 24.720(b).

<sup>70</sup> See Federal Communications Commission, Office of Economics and Analytics, Auctions, Auctions 4, 5, 10, 11, 22, 35, 58, 71 and 78, <https://www.fcc.gov/auctions>.

<sup>71</sup> See 47 CFR § 24.5.

<sup>72</sup> *Id.*

<sup>73</sup> See U.S. Census Bureau, *2017 NAICS Definition*, "517312 Wireless Telecommunications Carriers (*except Satellite*)," <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>74</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>75</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIEM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIEM&hidePrevious=false>.

<sup>76</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>77</sup> Based on a FCC Universal Licensing System search on December 10, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = CN; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

preceding years of not more than \$40 million.<sup>78</sup> A “very small business” is defined as an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than \$15 million.<sup>79</sup> Pursuant to these definitions, 7 winning bidders claiming small and very small bidding credits won approximately 359 licenses.<sup>80</sup> One of the winning bidders claiming a small business status classification in these *Narrowband PCS* license auctions had an active license as of December 2021.<sup>81</sup>

24. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these services, at this time we are not able to estimate the number of licensees with active licenses that would qualify as small under the SBA’s small business size standard.

25. *Offshore Radiotelephone Service.* This service operates on several UHF television broadcast channels that are not used for television broadcasting in the coastal areas of states bordering the Gulf of Mexico.<sup>82</sup> Wireless Telecommunications Carriers (*except* Satellite)<sup>83</sup> is the closest industry with a SBA small business size standard applicable to this service. The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>84</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.<sup>85</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>86</sup> Thus under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small. Additionally, based on Commission data, as of December 2021, there was one licensee with an active license in this

---

<sup>78</sup> See 47 CFR § 24.321(a)(1)-(2).

<sup>79</sup> *Id.*

<sup>80</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auction 41: Narrowband PCS, Summary, Closing Charts, License By Bidder, <https://www.fcc.gov/sites/default/files/wireless/auctions/41/charts/41cls2.pdf>; Auction 50: Narrowband PCS, Summary, Closing Charts, License By Bidder, <https://www.fcc.gov/sites/default/files/wireless/auctions/50/charts/50cls2.pdf>.

<sup>81</sup> Based on a FCC Universal Licensing System search on December 10, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, “Match only the following radio service(s)”, Radio Service = CN; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

<sup>82</sup> This service is governed by Subpart I of Part 22 of the Commission’s Rules. See 47 CFR §§ 22.1001-22.1037.

<sup>83</sup> See U.S. Census Bureau, 2017 NAICS Definition, “517312 Wireless Telecommunications Carriers (*except* Satellite),” <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>84</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>85</sup> See U.S. Census Bureau, 2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017, Table ID: EC1700SIZEEMPFIEM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIEM&hidePrevious=false>.

<sup>86</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

service.<sup>87</sup> However, since the Commission does not collect data on the number of employees for this service, at this time we are not able to estimate the number of licensees that would qualify as small under the SBA's small business size standard.

26. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.<sup>88</sup> Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.<sup>89</sup> The SBA small business size standard for this industry classifies businesses having 1,250 employees or less as small.<sup>90</sup> U.S. Census Bureau data for 2017 show that there were 656 firms in this industry that operated for the entire year.<sup>91</sup> Of this number, 624 firms had fewer than 250 employees.<sup>92</sup> Thus, under the SBA size standard, the majority of firms in this industry can be considered small.

27. *Rural Radiotelephone Service.* Neither the Commission nor the SBA have developed a small business size standard specifically for small businesses providing Rural Radiotelephone Service. Rural Radiotelephone Service is radio service in which licensees are authorized to offer and provide radio telecommunication services for hire to subscribers in areas where it is not feasible to provide communication services by wire or other means.<sup>93</sup> A significant subset of the Rural Radiotelephone Service is the Basic Exchange Telephone Radio System (BETRS).<sup>94</sup> Wireless Telecommunications Carriers (*except* Satellite),<sup>95</sup> is the closest applicable industry with a SBA small business size standard. The SBA small business size standard for Wireless Telecommunications Carriers (*except* Satellite) classifies firms having 1,500 or fewer employees as small.<sup>96</sup> For this industry, U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated for the entire year.<sup>97</sup> Of this total, 2,837 firms

---

<sup>87</sup> Based on a FCC Universal Licensing System search on December 10, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = CO; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

<sup>88</sup> See U.S. Census Bureau, *2017 NAICS Definition, "334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing,"* <https://www.census.gov/naics/?input=334220&year=2017&details=334220>.

<sup>89</sup> *Id.*

<sup>90</sup> See 13 CFR § 121.201, NAICS Code 334220.

<sup>91</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPfirm, NAICS Code 334220, <https://data.census.gov/cedsci/table?y=2017&n=334220&tid=ECNSIZE2017.EC1700SIZEEMPfirm&hidePreview=false>.

<sup>92</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>93</sup> 47 CFR § 22.99.

<sup>94</sup> BETRS is defined in 47 CFR §§ 22.757, 22.759.

<sup>95</sup> See U.S. Census Bureau, *2017 NAICS Definition, "517312 Wireless Telecommunications Carriers (except Satellite),"* <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>96</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>97</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPfirm, NAICS Code 517312,

(continued....)

employed fewer than 250 employees.<sup>98</sup> Thus under the SBA size standard, the Commission estimates that the majority of Rural Radiotelephone Services firm are small entities. Based on Commission data as of December 27, 2021, there were approximately 119 active licenses in the Rural Radiotelephone Service.<sup>99</sup> The Commission does not collect employment data from these entities holding these licenses and therefore we cannot estimate how many of these entities meet the SBA small business size standard.

28. *Wireless Communications Services.* Wireless Communications Services (WCS) can be used for a variety of fixed, mobile, radiolocation, and digital audio broadcasting satellite services. Wireless spectrum is made available and licensed for the provision of wireless communications services in several frequency bands subject to Part 27 of the Commission's rules.<sup>100</sup> Wireless Telecommunications Carriers (*except* Satellite)<sup>101</sup> is the closest industry with an SBA small business size standard applicable to these services. The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>102</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.<sup>103</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>104</sup> Thus under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small.

29. The Commission's small business size standards with respect to WCS involve eligibility for bidding credits and installment payments in the auction of licenses for the various frequency bands included in WCS. When bidding credits are adopted for the auction of licenses in WCS frequency bands, such credits may be available to several types of small businesses based average gross revenues (small, very small and entrepreneur) pursuant to the competitive bidding rules adopted in conjunction with the requirements for the auction and/or as identified in the designated entities section in Part 27 of the Commission's rules for the specific WCS frequency bands.<sup>105</sup>

30. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the

---

<https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPfirm&hidePreview=false>.

<sup>98</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>99</sup> Based on a FCC Universal Licensing System search on December 27, 2021.

<https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = CR; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

<sup>100</sup> See 47 CFR §§ 27.1 – 27.1607.

<sup>101</sup> See U.S. Census Bureau, *2017 NAICS Definition*, "517312 Wireless Telecommunications Carriers (*except* Satellite)," <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>102</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>103</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPfirm, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPfirm&hidePreview=false>.

<sup>104</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>105</sup> See 47 CFR §§ 27.201 – 27.1601. The Designated entities sections in Subparts D – Q each contain the small business size standards adopted for the auction of the frequency band covered by that subpart.

Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these services, at this time we are not able to estimate the number of licensees with active licenses that would qualify as small under the SBA's small business size standard.

31. *Wireless Telecommunications Carriers (except Satellite)*. This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves.<sup>106</sup> Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular services, paging services, wireless Internet access, and wireless video services.<sup>107</sup> The SBA size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>108</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms in this industry that operated for the entire year.<sup>109</sup> Of that number, 2,837 firms employed fewer than 250 employees.<sup>110</sup> Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 594 providers that reported they were engaged in the provision of wireless services.<sup>111</sup> Of these providers, the Commission estimates that 511 providers have 1,500 or fewer employees.<sup>112</sup> Consequently, using the SBA's small business size standard, most of these providers can be considered small entities.

32. *Wireless Telephony*. Wireless telephony includes cellular, personal communications services, and specialized mobile radio telephony carriers. The closest applicable industry with an SBA small business size standard is Wireless Telecommunications Carriers (except Satellite).<sup>113</sup> The size standard for this industry under SBA rules is that a business is small if it has 1,500 or fewer employees.<sup>114</sup> For this industry, U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated for the entire year.<sup>115</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>116</sup> Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there

---

<sup>106</sup> See U.S. Census Bureau, *2017 NAICS Definition, "517312 Wireless Telecommunications Carriers (except Satellite)"*, <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>107</sup> *Id.*

<sup>108</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>109</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIEM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIEM&hidePrevious=false>.

<sup>110</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>111</sup> Federal-State Joint Board on Universal Service, Universal Service Monitoring Report at 26, Table 1.12 (2022), <https://docs.fcc.gov/public/attachments/DOC-391070A1.pdf>.

<sup>112</sup> *Id.*

<sup>113</sup> See U.S. Census Bureau, *2017 NAICS Definition, "517312 Wireless Telecommunications Carriers (except Satellite)"*, <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>114</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>115</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIEM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIEM&hidePrevious=false>.

<sup>116</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

were 331 providers that reported they were engaged in the provision of cellular, personal communications services, and specialized mobile radio services.<sup>117</sup> Of these providers, the Commission estimates that 255 providers have 1,500 or fewer employees.<sup>118</sup> Consequently, using the SBA's small business size standard, most of these providers can be considered small entities.

33. *700 MHz Guard Band Licensees.* The 700 MHz Guard Band encompasses spectrum in 746-747/776-777 MHz and 762-764/792-794 MHz frequency bands. Wireless Telecommunications Carriers (*except* Satellite)<sup>119</sup> is the closest industry with a SBA small business size standard applicable to licenses providing services in these bands. The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>120</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.<sup>121</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>122</sup> Thus under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small.

34. According to Commission data as of December 2021, there were approximately 224 active 700 MHz Guard Band licenses.<sup>123</sup> The Commission's small business size standards with respect to 700 MHz Guard Band licensees involve eligibility for bidding credits and installment payments in the auction of licenses. For the auction of these licenses, the Commission defined a "small business" as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years, and a "very small business" an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.<sup>124</sup> Pursuant to these definitions, five winning bidders claiming one of the small business status classifications won 26 licenses, and one winning bidder claiming small business won two licenses.<sup>125</sup> None of the winning bidders claiming a small business status classification in these 700 MHz

---

<sup>117</sup> Federal-State Joint Board on Universal Service, Universal Service Monitoring Report at 26, Table 1.12 (2022), <https://docs.fcc.gov/public/attachments/DOC-391070A1.pdf>.

<sup>118</sup> *Id.*

<sup>119</sup> See U.S. Census Bureau, *2017 NAICS Definition*, "517312 Wireless Telecommunications Carriers (*except* Satellite)," <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>120</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>121</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIEM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIEM&hidePreview=false>.

<sup>122</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>123</sup> Based on a FCC Universal Licensing System search on December 14, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = WX; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

<sup>124</sup> See 47 CFR § 27.502(a).

<sup>125</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auction 33: Upper 700 MHz Guard Bands, Summary, Closing Charts, Licenses by Bidder, <https://www.fcc.gov/sites/default/files/wireless/auctions/33/charts/33cls2.pdf>, Auction 38: Upper 700 MHz Guard Bands, Summary, Closing Charts, Licenses by Bidder, <https://www.fcc.gov/sites/default/files/wireless/auctions/38/charts/38cls2.pdf>.



Guard Band license auctions had an active license as of December 2021.<sup>126</sup>

35. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these services, at this time we are not able to estimate the number of licensees with active licenses that would qualify as small under the SBA's small business size standard.

36. *Lower 700 MHz Band Licenses.* The lower 700 MHz band encompasses spectrum in the 698-746 MHz frequency bands. Permissible operations in these bands include flexible fixed, mobile, and broadcast uses, including mobile and other digital new broadcast operation; fixed and mobile wireless commercial services (including FDD- and TDD-based services); as well as fixed and mobile wireless uses for private, internal radio needs, two-way interactive, cellular, and mobile television broadcasting services.<sup>127</sup> Wireless Telecommunications Carriers (*except* Satellite)<sup>128</sup> is the closest industry with a SBA small business size standard applicable to licenses providing services in these bands. The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>129</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this industry for the entire year.<sup>130</sup> Of this number, 2,837 firms employed fewer than 250 employees.<sup>131</sup> Thus under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small.

37. According to Commission data as of December 2021, there were approximately 2,824 active Lower 700 MHz Band licenses.<sup>132</sup> The Commission's small business size standards with respect to Lower 700 MHz Band licensees involve eligibility for bidding credits and installment payments in the auction of licenses. For auctions of Lower 700 MHz Band licenses the Commission adopted criteria for three groups of small businesses. A very small business was defined as an entity that, together with its affiliates and controlling interests, has average annual gross revenues not exceeding \$15 million for the

---

<sup>126</sup> Based on a FCC Universal Licensing System search on December 14, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = WX; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

<sup>127</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auctions 44, 49, 60: Lower 700 MHz Band, Fact Sheet, Permissible Operations, <https://www.fcc.gov/auction/44/factsheet>, <https://www.fcc.gov/auction/49/factsheet>, <https://www.fcc.gov/auction/60/factsheet>.

<sup>128</sup> See U.S. Census Bureau, *2017 NAICS Definition*, "517312 Wireless Telecommunications Carriers (*except* Satellite)," <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>129</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

<sup>130</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIEM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIEM&hidePrevious=false>.

<sup>131</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>132</sup> Based on a FCC Universal Licensing System search on December 14, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = WY, WZ; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

preceding three years, a small business was defined as an entity that, together with its affiliates and controlling interests, has average gross revenues not exceeding \$40 million for the preceding three years, and an entrepreneur was defined as an entity that, together with its affiliates and controlling interests, has average gross revenues not exceeding \$3 million for the preceding three years.<sup>133</sup> In auctions for Lower 700 MHz Band licenses seventy-two winning bidders claiming a small business classification won 329 licenses,<sup>134</sup> twenty-six winning bidders claiming a small business classification won 214 licenses,<sup>135</sup> and three winning bidders claiming a small business classification won all five auctioned licenses.<sup>136</sup>

38. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these services, at this time we are not able to estimate the number of licensees with active licenses that would qualify as small under the SBA's small business size standard.

39. *Upper 700 MHz Band Licenses.* The upper 700 MHz band encompasses spectrum in the 746-806 MHz bands. Upper 700 MHz D Block licenses are nationwide licenses associated with the 758-763 MHz and 788-793 MHz bands.<sup>137</sup> Permissible operations in these bands include flexible fixed, mobile, and broadcast uses, including mobile and other digital new broadcast operation; fixed and mobile wireless commercial services (including FDD- and TDD-based services); as well as fixed and mobile wireless uses for private, internal radio needs, two-way interactive, cellular, and mobile television broadcasting services.<sup>138</sup> Wireless Telecommunications Carriers (*except* Satellite)<sup>139</sup> is the closest industry with a SBA small business size standard applicable to licenses providing services in these bands. The SBA small business size standard for this industry classifies a business as small if it has 1,500 or fewer employees.<sup>140</sup> U.S. Census Bureau data for 2017 show that there were 2,893 firms that operated in this

---

<sup>133</sup> See 47 CFR § 27.702(a)(1)-(3).

<sup>134</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auction 44: Lower 700 MHz Guard Bands, Summary, Closing Charts, Licenses by Bidder, <https://www.fcc.gov/sites/default/files/wireless/auctions/44/charts/44cls2.pdf>.

<sup>135</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auction 49: Lower 700 MHz Guard Bands, Summary, Closing Charts, Licenses by Bidder, <https://www.fcc.gov/sites/default/files/wireless/auctions/49/charts/49cls2.pdf>.

<sup>136</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auction 60: Lower 700 MHz Guard Bands, Summary, Closing Charts, Licenses by Bidder, <https://www.fcc.gov/sites/default/files/wireless/auctions/60/charts/60cls2.pdf>.

<sup>137</sup> See 47 CFR § 27.4.

<sup>138</sup> See Federal Communications Commission, Economics and Analytics, Auctions, Auction 73: 700 MHz Band, Fact Sheet, Permissible Operations, <https://www.fcc.gov/auction/73/factsheet>. We note that in Auction 73, Upper 700 MHz Band C and D Blocks as well as Lower 700 MHz Band A, B, and E Blocks were auctioned.

<sup>139</sup> See U.S. Census Bureau, 2017 NAICS Definition, "517312 Wireless Telecommunications Carriers (*except* Satellite)," <https://www.census.gov/naics/?input=517312&year=2017&details=517312>.

<sup>140</sup> See 13 CFR § 121.201, NAICS Code 517312 (as of 10/1/22, NAICS Code 517112).

industry for the entire year.<sup>141</sup> Of that number, 2,837 firms employed fewer than 250 employees.<sup>142</sup> Thus, under the SBA size standard, the Commission estimates that a majority of licensees in this industry can be considered small.

40. According to Commission data as of December 2021, there were approximately 152 active Upper 700 MHz Band licenses.<sup>143</sup> The Commission's small business size standards with respect to Upper 700 MHz Band licensees involve eligibility for bidding credits and installment payments in the auction of licenses. For the auction of these licenses, the Commission defined a "small business" as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years, and a "very small business" an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.<sup>144</sup> Pursuant to these definitions, three winning bidders claiming very small business status won five of the twelve available licenses.<sup>145</sup>

41. In frequency bands where licenses were subject to auction, the Commission notes that as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Further, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated. Additionally, since the Commission does not collect data on the number of employees for licensees providing these services, at this time we are not able to estimate the number of licensees with active licenses that would qualify as small under the SBA's small business size standard.

42. *Wireless Resellers.* Neither the Commission nor the SBA have developed a small business size standard specifically for Wireless Resellers. The closest industry with a SBA small business size standard is Telecommunications Resellers.<sup>146</sup> The Telecommunications Resellers industry comprises establishments engaged in purchasing access and network capacity from owners and operators of telecommunications networks and reselling wired and wireless telecommunications services (except satellite) to businesses and households.<sup>147</sup> Establishments in this industry resell telecommunications and they do not operate transmission facilities and infrastructure.<sup>148</sup> Mobile virtual network operators

---

<sup>141</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIRM, NAICS Code 517312, <https://data.census.gov/cedsci/table?y=2017&n=517312&tid=ECNSIZE2017.EC1700SIZEEMPFIRM&hidePreview=false>.

<sup>142</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>143</sup> Based on a FCC Universal Licensing System search on December 14, 2021, <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchAdvanced.jsp>. Search parameters: Service Group = All, "Match only the following radio service(s)", Radio Service = WP, WU; Authorization Type = All; Status = Active. We note that the number of active licenses does not equate to the number of licensees. A licensee can have one or more licenses.

<sup>144</sup> See 47 CFR § 27.502(a).

<sup>145</sup> See *Auction of 700 MHz Band Licenses Closes; Winning Bidders Announced for Auction 73*, Public Notice, DA-08-595, Attachment A, Report No. AUC-08-73-I (Auction 73) (March 20, 2008). The results for Upper 700 MHz Band C Block can be found on pp. 62-63.

<sup>146</sup> See U.S. Census Bureau, *2017 NAICS Definition, "517911 Telecommunications Resellers,"* <https://www.census.gov/naics/?input=517911&year=2017&details=517911>.

<sup>147</sup> *Id.*

<sup>148</sup> *Id.*

(MVNOs) are included in this industry.<sup>149</sup> Under the SBA size standard for this industry, a business is small if it has 1,500 or fewer employees.<sup>150</sup> U.S. Census Bureau data for 2017 show that 1,386 firms in this industry provided resale services during that year.<sup>151</sup> Of that number, 1,375 firms operated with fewer than 250 employees.<sup>152</sup> Thus, for this industry under the SBA small business size standard, the majority of providers can be considered small entities.

## 2. Equipment Manufacturers

43. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.<sup>153</sup> Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.<sup>154</sup> The SBA small business size standard for this industry classifies businesses having 1,250 employees or less as small.<sup>155</sup> U.S. Census Bureau data for 2017 show that there were 656 firms in this industry that operated for the entire year.<sup>156</sup> Of this number, 624 firms had fewer than 250 employees.<sup>157</sup> Thus, under the SBA size standard, the majority of firms in this industry can be considered small.

44. *Semiconductor and Related Device Manufacturing.* This industry comprises establishments primarily engaged in manufacturing semiconductors and related solid state devices.<sup>158</sup> Examples of products made by these establishments are integrated circuits, memory chips, microprocessors, diodes, transistors, solar cells and other optoelectronic devices.<sup>159</sup> The SBA small business size standard for this industry classifies entities having 1,250 or fewer employees as small.<sup>160</sup> U.S. Census Bureau data for 2017 show that there were 729 firms in this industry that operated for the

---

<sup>149</sup> *Id.*

<sup>150</sup> See 13 CFR § 121.201, NAICS Code 517911 (as of 10/1/22, NAICS Code 517121).

<sup>151</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPfirm, NAICS Code 517911, <https://data.census.gov/cedsci/table?y=2017&n=517911&tid=ECNSIZE2017.EC1700SIZEEMPfirm&hidePreview=false>.

<sup>152</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>153</sup> See U.S. Census Bureau, *2017 NAICS Definition*, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing,” <https://www.census.gov/naics/?input=334220&year=2017&details=334220>.

<sup>154</sup> *Id.*

<sup>155</sup> See 13 CFR § 121.201, NAICS Code 334220.

<sup>156</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPfirm, NAICS Code 334220, <https://data.census.gov/cedsci/table?y=2017&n=334220&tid=ECNSIZE2017.EC1700SIZEEMPfirm&hidePreview=false>.

<sup>157</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>158</sup> See U.S. Census Bureau, *2017 NAICS Definition*, “334413 Semiconductor and Related Device Manufacturing,” <https://www.census.gov/naics/?input=334413&year=2017&details=334413>.

<sup>159</sup> *Id.*

<sup>160</sup> See 13 CFR § 121.201, NAICS Code 334413.

entire year.<sup>161</sup> Of this total, 673 firms operated with fewer than 250 employees.<sup>162</sup> Thus under the SBA size standard, the majority of firms in this industry can be considered small.

**E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities**

45. The rules adopted in the *Report and Order* to implement location-based routing for wireless 911 voice calls and RTT communications to 911 will impose new or additional reporting, recordkeeping, and/or other compliance obligations on small entities. Small and other CMRS providers are required to certify their compliance with the applicable location-based routing requirements, and inform the Commission of the specific network architecture, systems, and location validation procedures used to comply with the location-based routing requirements. More specifically, the adopted rules require small and other CMRS providers, within 60 days after their respective deadlines, to deploy location-based routing on their IP-based networks, and submit a one-time certification with substantiating evidence of compliance with location-based routing requirements applicable to them as of the deadline. As part of the certification, small and other CMRS providers must: (i) substantiate compliance by identifying specific network architecture, systems, location validation,<sup>163</sup> and procedures used to comply with the location-based routing rules; (ii) collect and report aggregate information on the routing technologies for all live wireless 911 voice calls in the locations specified for live 911 call location data under the Commission's rule at 47 CFR § 9.10(i)(3)(ii);<sup>164</sup> and (iii) certify that location information used for location-based routing by service providers and third parties will only be used for valid 911 purposes.<sup>165</sup> Small and other CMRS providers can request confidential treatment of any information they submit in accordance with the Commission's confidentiality rules, and must file the required certification and compliance information in PS Docket No. 18-64.

46. In the *Notice*, the Commission sought comments on the proposals in this proceeding and requested cost and benefit information to help the Commission identify and evaluate relevant matters for small entities. Although several comments filed in response to the *Notice* discussed categories of potential expenses to comply with location-based routing requirements, and any related reporting and recordkeeping requirements, with some asserting that there would be a greater burden on smaller providers, these comments and the record as a whole do not contain detailed information on costs

---

<sup>161</sup> See U.S. Census Bureau, *2017 Economic Census of the United States, Selected Sectors: Employment Size of Firms for the U.S.: 2017*, Table ID: EC1700SIZEEMPFIEM, NAICS Code 334413, <https://data.census.gov/cedsci/table?y=2017&n=334413&tid=ECNSIZE2017.EC1700SIZEEMPFIEM&hidePreview=false>.

<sup>162</sup> *Id.* The available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that meet the SBA size standard.

<sup>163</sup> As discussed in Section III.C of the *Report and Order*, the Commission requires CMRS providers to elaborate on current location validation practices, if any, and describe the extent to which providers are validating location information for routing.

<sup>164</sup> For more detail on this requirement (e.g., the breakdown of required call routing data and length of time the testing record must be retained), see 47 CFR § 9.10(s)(4)(ii).

<sup>165</sup> Specifically, CMRS providers must certify that neither they nor any third party they rely on to obtain location information used for location-based routing will use such location information or associated data for any non-911 purpose, except with prior express consent or as otherwise required by law. The certification must state that CMRS providers and any third party they rely on to obtain location information used for location-based routing will implement measures sufficient to safeguard the privacy and security of such location information. See 47 CFR § 9.10(s)(4)(i)(C).

required for either small or large entities.<sup>166</sup> In fact, the Rural Wireless Association (RWA) and the Boulder Regional Emergency Telephone Service Authority (BRETSA) expressly indicated that neither non-nationwide nor small carriers have determined their implementation costs.<sup>167</sup> Moreover, while stating that “[t]he \$366,600 figure referenced in the *Notice* may be a conservative estimate,” RWA did not provide an alternative to the Commission’s estimate and noted that to date, RWA members have not received any specific vendor estimates regarding their actual cost of compliance.<sup>168</sup>

47. In the *Notice*, the Commission proposed an “upper bound” estimate for labor costs of \$366,600 per CMRS provider, and for material costs such as software features or component upgrades for each CMRS provider, of \$10,000 per PSAP.<sup>169</sup> In response to the comments we received, we clarify that material costs estimated in the NPRM are not limited to those incurred at the PSAP, but also in the network core, and that the per PSAP calculation is a proxy for the size of the network that remains to be converted to location-based routing. Using the Commission’s methodology in the *Notice of Proposed Rulemaking*, we estimate that CMRS providers collectively need to deploy location-based routing to a total of 14,366 PSAPs,<sup>170</sup> resulting in the implied material cost of approximately \$143.7 million.

48. Our total labor costs analysis added internal planning, outreach, and testing to the costs for equipment installation and conducting trials the Commission proposed and discussed in the *Notice*.<sup>171</sup> To better reflect the wide array of complex tasks that will be undertaken with highly-skilled and senior staff, we will assume a higher wage for the workers than that assumed in the *Notice* because some of the tasks involved will have to be undertaken by senior staff. Using the Bureau of Labor Statistics 75<sup>th</sup> percentile wage for network engineers, we assume worker compensation to be \$81.29 per hour.<sup>172</sup> Marking up hourly compensation by 45% to account for benefits results in a total hourly compensation

---

<sup>166</sup> See e.g., Competitive Carriers Association (CCA) Notice of Proposed Rulemaking Comments at 2 (rec. Feb. 16, 2023) (CCA NPRM Comments); CCA Notice of Proposed Rulemaking Reply at 4-5 & n.8 (rec. Mar. 20, 2023) (CCA NPRM Reply); Rural Wireless Association, Inc. (RWA) Notice of Proposed Rulemaking Comments at 1-2, 4 (rec. Feb. 16, 2023) (RWA NPRM Comments); RWA Notice of Proposed Rulemaking Reply at 2-3 (rec. Mar. 20, 2023) (RWA NPRM Reply).

<sup>167</sup> RWA NPRM Comments at 1, n.3; Boulder Regional Emergency Telephone Service Authority Notice of Proposed Rulemaking Reply at ii (rec. Mar. 20, 2023).

<sup>168</sup> RWA NPRM Comments at 1, & n.3.

<sup>169</sup> *Notice*, 37 FCC Rcd at 15210-12, paras. 70-73.

<sup>170</sup> We count 3,561 PSAPs remaining for T-Mobile, 5,057 PSAPs remaining for Verizon, and 5,748 PSAPs for the CMRS providers that have not yet begun to implement location-based routing.

<sup>171</sup> *Notice*, 37 FCC Rcd at 15210, para. 72. (The Commission estimated that the labor cost of employing software workers would be \$35.25 per hour, and the upper bound of the time to implement the upgrades with trials of 6 months (26 weeks). Work time was based on a 40 hour work week, or 1,040 hours per worker, allotting for ten simultaneous workers at a time on average resulting in generous upper bound of 10,400 labor hours per CMRS provider, at a labor cost per CMRS provider of \$366,600).

<sup>172</sup> The Bureau of Labor Statistics considers the title “computer network architect” to be synonymous with “network engineer.” Bureau of Labor Statistics, *Computer Network Architects: What Computer Network Architects Do* (Sep. 12, 2023), <https://www.bls.gov/ooh/computer-and-information-technology/computer-network-architects.htm#tab-2>. To approximate the wages of senior network engineers, we use the 75<sup>th</sup> percentile of the hourly wage of computer network architects in May 2022, \$77.06 per hour. Bureau of Labor Statistics, *Occupational Employment and Wages, May 2022, 15-1241 Computer Network Architects* (Apr. 25, 2023), <https://www.bls.gov/oes/current/oes151241.htm>. After adjusting for wage inflation to August 2023, the wage increases to \$81.29 per hour. See Federal Reserve Bank of St. Louis, *Average Hourly Earnings of All Employees, Total Private (CES0500000003)*, <https://fred.stlouisfed.org/series/CES0500000003> (last visited Oct. 10, 2023) (*Inflation Adjustment*).

estimate of \$117.87.<sup>173</sup> Assuming that work is completed over 26 work-weeks of five, eight work-hour days, and a team of 10, the aggregate upper bound of work-hours would 10,400 and the total cost of those work-hours would be \$1,225,853. While non-nationwide CMRS providers will have 24 months rather than six to implement location-based routing, smaller CMRS providers have constraints on the number of staff they can assign to any one project. In addition, while non-nationwide CMRS providers may take longer to implement location-based routing, assigning the same amount of work-time as nationwide CMRS providers represents both the spreading out of tasks over a longer period and an overestimate since non-nationwide CMRS providers have much smaller networks. Given that AT&T has already implemented location-based routing, we estimate the labor cost associated with implementation for network for the 56 remaining providers, plus T-Mobile and Verizon, to be \$71 million ( $\approx \$1,225,853 \times 58$  providers = \$71,099,474).

49. In addition to network costs, several commenters indicate that public safety-grade GIS data or shapefiles that precisely define PSAP boundaries should be developed or provided, though they differ on which parties should be responsible.<sup>174</sup> We agree with NENA that it is the responsibility of providers to maintain their own jurisdictional maps.<sup>175</sup> Accordingly, we assign the cost of maps to the providers. We anticipate that map costs will largely be labor to update already existing maps. To come up with a cost ceiling, we assume that every provider will need to update their maps, even though many providers likely have up-to-date maps. We anticipate that updating the map will only entail labor costs for mapping specialists to update maps. In the Supporting Document of Study Area Boundary Data Reporting in Esri Shapefile Format, the Office of Information and Regulatory Affairs estimates that it takes an average of 26 hours for a data scientist to modify a shapefile.<sup>176</sup> We believe that 26 hours would be an upper bound of the time required for a party to update its maps. Given that the average wage rate is \$60.44/hour for data scientists in the telecommunications industry,<sup>177</sup> with a 45% markup for benefits,<sup>178</sup> we arrive at \$87.63 as the hourly compensation rate for a data scientist. We estimate an upper bound for the cost of map updating to be approximately \$134 thousand ( $\approx \$87.63$  per hour  $\times$  26 hours  $\times$  59

---

<sup>173</sup> According to the Bureau of Labor Statistics, as of June 2023, civilian wages and salaries averaged \$29.86/hour and benefits averaged \$13.39/hour. See Press Release, Bureau of Labor Statistics, *Employer Costs for Employee Compensation—June 2023* (Sept. 12, 2023), <https://www.bls.gov/news.release/pdf/eccc.pdf>. Total compensation therefore averaged \$29.86 + \$13.39, rounded to \$43.26. *Id.* Using these figures, benefits constitute a markup of \$13.39/\$29.86, or about 45%. We therefore markup wages by 45% to account for benefits. In the *Report and Order*, we refer to the 45% markup as *Compensation Benefit Mark-up*. The *Compensation Benefit Mark-up* results in total hourly compensation of \$25.04  $\times$  145% = \$36.31.

<sup>174</sup> Intrado NPRM Comments at 3 (suggesting carriers and the PSAPs should develop GIS data); BRETSA NPRM Reply at ii (suggesting should develop state and local 911 authorities should develop GIS data); T-Mobile NPRM Comments at 6 (suggesting that PSAPs should provide shapefiles, though some PSAPs may not want to provide shapefiles because they consider such information confidential); see also CCOA NPRM Reply at 3; CTIA NPRM Reply at 3, 6-7 (agreeing with T-Mobile regarding the need for accurate shapefiles of PSAP boundaries).

<sup>175</sup> NENA Comments at 7.

<sup>176</sup> See Office of Information and Regulatory Affairs, Office of Management and Budget Executive Office of the President, 2022 Study Area Boundary Data Reporting in Esri Shapefile Format DA 12-1777 and DA 13-282, Supporting Statement - OMB Control No. 3060-1181, at 5- paras. 12 (Feb. 15, 2022), [https://www.reginfo.gov/public/do/PRAViewDocument?ref\\_nbr=202202-3060-009](https://www.reginfo.gov/public/do/PRAViewDocument?ref_nbr=202202-3060-009); see also *Wireless Emergency Alerts, Amendments to Part 11 of the Commission's Rules Regarding the Emergency Alert System*, PS Docket Nos. 15-91, 15-94, Third Report and Order, FCC 23-88, at 37 (Feb. 27, 2013).

<sup>177</sup> The mean hourly wage for data scientists in the telecommunications industry in May 2022 is \$57.29. Bureau of Labor Statistics, *May 2022 National Industry-Specific Occupational Employment and Wage Estimates NAICS 517000 – Telecommunications* (Apr. 25, 2023), [https://www.bls.gov/oes/current/naics4\\_517000.htm](https://www.bls.gov/oes/current/naics4_517000.htm). After adjusting for wage inflation to August 2023, the wage increases \$60.44 per hour. See *Inflation Adjustment*.

<sup>178</sup> See *Compensation Benefit Mark-up*.

providers = \$134,424.42).

50. In addition, the one-time certification of compliance with our requirements together with the submission of data on call percentages by routing methods will impose a one-time cost on CMRS providers. As this required information should be available to each provider internally, we anticipate work to compile this information to take no longer than a week of five business days. We believe that one network engineer would be sufficient to complete this task in this time frame, resulting in a total provider cost of 40 work-hours. Assuming the same hourly labor cost of network engineers as in the previous cost estimate for network implementation, the total cost of reporting is \$280,000 ( $\approx$  \$117.87 per hour  $\times$  40 hours  $\times$  59 providers = \$278,173.20).

51. Because we are adopting location-based routing requirements for RTT communications to 911, we also consider the costs for CMRS providers. Given that CMRS providers process and route RTT communications to 911 similarly to voice calls,<sup>179</sup> we assume that CMRS providers' material and labor costs to deploy location-based routing for RTT are included in our cost estimates above.

52. In sum, we estimate upper bounds of the costs that CMRS providers will bear to be material costs of \$143.7 million, network implementation costs of \$71.1 million, GIS costs of \$134 thousand, and certification costs of \$280 thousand. Altogether, the upper bound of costs is approximately \$215 million. We note that the three major CMRS providers (AT&T, T-Mobile, and Verizon) have already implemented location-based routing for wireless 911 voice calls nationwide, or are in the process of implementing it. Although some commenters argued that this progress by three major carriers will not necessarily translate into reduced costs and greater efficiency for smaller providers to implement location-based routing,<sup>180</sup> it appears that this progress by larger providers may have at least some measure of positive impact on implementation by smaller providers, such as by demonstrating potential implementation technologies and strategies although they may be required to hire professionals to fulfill their compliance obligations.

53. The important public safety benefits that will result from the requirements the Commission adopted in the *Report and Order* outweigh the associated implementation and compliance burdens for CMRS providers. The rule changes to implement nationwide location-based routing will significantly decrease misrouted wireless 911 calls and RTT communications to 911, reduce emergency response time, save lives, and save many PSAP personnel hours and resources lost in 911 transfers. Accordingly, these rule changes serve the public interest.

#### **F. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered**

54. The RFA requires an agency to provide “a description of the steps the agency has taken to minimize the significant economic impact on small entities . . . including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.”<sup>181</sup>

55. In the previous section we describe the significant public safety benefits to be achieved from requiring all CMRS providers to implement location-based routing for wireless 911 voice calls and RTT messages originating on IP-based networks on a nationwide basis. From the record in this proceeding, it appears to be technologically feasible for CMRS providers to implement location-based

---

<sup>179</sup> NENA Notice of Proposed Rulemaking Reply at 9-10 (rec. Mar. 20, 2023).

<sup>180</sup> See e.g., CCA NPRM Comments at 6, 10-11, 17-18.

<sup>181</sup> 5 U.S.C. § 604(a)(6).



routing for a significant percentage of wireless 911 voice calls and RTT messages.<sup>182</sup> In the *Report and Order* we expressly found that it is technologically feasible for all CMRS providers, nationwide and non-nationwide, to support location-based routing for a significant percentage of wireless 911 voice calls. The Commission considered comments advocating for a voluntary location-based routing approach to allow providers the flexibility which would take into account the differences in providers' networks, configurations and devices.<sup>183</sup> We found, however, that implementing location-based routing on a voluntary basis is not consistent with the Commission's goal of ensuring that location-based routing is available to all wireless 911 callers on a nationwide basis. Accordingly, the rules we adopt today in the *Report and Order* require both nationwide and non-nationwide CMRS providers to implement location based routing consistent with the proposals in the *Notice*.<sup>184</sup>

56. The Commission also considered a per-PSAP approach to implement location-based routing but determined that there could be uneven and inconsistent implementation in routing approaches between jurisdictions, and there was also a risk of 911 misroutes for jurisdictions that do not request location-based routing service. The Commission found that a per-PSAP approach was not consistent with its interest in facilitating improved routing of 911 voice calls, and was not in the public interest. Additionally, we determined this approach would impose unnecessary cost burdens on PSAPs to affirmatively request such service. The rules we adopted in the *Report and Order* were intended to be cost effective and minimally burdensome for small and other entities impacted by the rules. Below we discuss the specific steps the Commission has taken to minimize costs and reduce the economic impact for small entities, as well as various alternatives considered.

57. *Location-Based Routing Requirements.* Consistent with the Commission's proposal in the *Notice* and to reduce potential cost burdens for small and other wireless providers, our location-based routing rules apply only to wireless 911 voice calls and RTT communications originating on IP-based networks (i.e., 4G LTE, 5G, and subsequent generations of IP-based networks). The record indicated that while nationwide CMRS providers are in the process of retiring or have completed the retirement of circuit-switched, time-division multiplex (TDM) 2G and 3G networks, and some non-nationwide providers announced dates to sunset their 3G networks in 2022, the transition from these networks that are less compatible with location-based routing has not been fully completed. In the *Notice*, the Commission tentatively concluded that requiring location-based routing for 911 calls or texts originating on TDM-based networks would be unduly burdensome, especially for non-nationwide providers who would bear the greatest burden, even if given additional time to comply with such a requirement.<sup>185</sup> Moreover, although the Commission considered requiring location-based routing for all 911 calls, the Commission in the *Notice* ultimately proposed to require location-based routing only for 911 calls originating on IP-based networks, i.e., 4G LTE, 5G, and subsequently deployed IP-based networks. Today in the *Report and Order*, the Commission adopted this proposed rule which will minimize some burdens and economic impact for small entities, particularly those that are non-nationwide providers, due to the limited scope of the requirement.

58. Rather than imposing a rigid location-based routing requirement, the rules the Commission adopted today provide flexibility to small and other entities to route wireless 911 voice calls

---

<sup>182</sup> *Notice*, 37 FCC Rcd at 15203, paras. 52-53.

<sup>183</sup> CTIA NPRM Reply at 3; *see also* CCA NPRM Reply at 1-2.

<sup>184</sup> *Notice*, 37 FCC Rcd at 15192, para. 17.

<sup>185</sup> RWA NPRM Comments at 14. RWA concurs that requiring location-based routing for 911 calls originating on TDM networks would be unduly burdensome.

or RTT communications based on the best available location information (which may include cell tower coordinates or other information) when the location information available at time of routing does not meet either one or both of the rules' requirements for accuracy and timeliness. The Commission recognized the continued need for legacy E911 routing, at least as a fallback method, because accurate device location information is not available in all scenarios. Further, the Commission's requirement to default to best available location is consistent with the *ATIS-0700042* standard for location-based routing, which assumes that the fallback for location-based routing should be cell-sector routing for cases where no position estimate is available in time to be used for location-based routing, or the position estimates lack requisite accuracy.<sup>186</sup> Our requirement is also consistent with current CMRS provider deployments of location-based routing, which default to legacy E911 routing when location does not meet CMRS providers' standards of accuracy and timeliness.<sup>187</sup>

59. The *Report and Order* also adopted baseline requirements involving the accuracy and timeliness of location information used for location-based routing that are consistent with industry standards. Under the rules adopted, CMRS providers must use location-based routing only if the location information is available to the provider network at the time the wireless 911 voice call or RTT communication is routed, and the information identifies the caller's horizontal location with a radius of 165 meters at a confidence level of at least 90%. These metrics are consistent with AT&T's successful nationwide implementation of location-based routing, and received support as a model for other wireless carriers to implement location-based routing.<sup>188</sup> In addition, the rule's confidence metric is consistent with ATIS's recommendation that uncertainty values for location-based routing "be standardized to a 90% confidence for effective call handling."<sup>189</sup> When location information does not meet the baseline accuracy and timeliness requirements, the adopted requirements allow CMRS providers to instead route based on best available location information, which may include device-based location information that does not meet the accuracy threshold, the centroid of the area served by the cell sector that first picks up the call, or other location information. This will help to minimize any significant economic impact on small entities and other CMRS providers.

60. *Compliance Timelines.* The rules adopted in the *Report and Order* provide small and other providers flexibility in the compliance timelines to implement the location-based routing requirements, which should reduce the economic burden for small entities. The compliance timelines differ from those the Commission proposed in the *Notice*, which provided different deadlines for nationwide CMRS providers and non-nationwide CMRS providers to implement location-based routing on their IP-based networks when available location information meets requirements for accuracy and timeliness. To further reduce the burden on small entities in the rules adopted today, the Commission granted longer compliance timelines to non-nationwide CMRS providers than those proposed in the *Notice* and eliminated the requirements for covered text providers that are not CMRS providers. Specifically, non-nationwide CMRS providers (which includes a substantial number of small entities) are required to implement location-based routing for wireless 911 voice calls within 24 months from the

---

<sup>186</sup> *ATIS-0500039* at 14.

<sup>187</sup> AT&T PN Comments at 4 (stating that "[w]hen location was not available, the process defaults to using sector-based routing so that calls may be completed without excessive delay"); T-Mobile USA, Inc. (T-Mobile) Public Notice Comments at 4 (rec. July 11, 2022) (T-Mobile PN Comments) (stating that "T-Mobile's policy is to route a 911 call based on the cell-sector location if a routable, non-Phase I location estimate is not generated quickly enough").

<sup>188</sup> Intrado PN Comments at 2, 9.

<sup>189</sup> *ATIS-0500039* at 15.

effective date of the final rules, rather than 18 months as proposed in the *Notice*. Nationwide CMRS providers are required to implement location-based routing for wireless 911 voice calls within six months from the effective date of the final rules. For RTT, all CMRS providers are required to implement location-based routing for RTT messages where they implement RTT capability within 24 months from the effective date of the final rules, rather than the 12 months proposed in the *Notice*.

61. The Commission has also minimized any significant economic impact on small entities by limiting the requirement to implement location-based routing to operators of IP-based networks only when certain requirements are met. Small entities are not required to comply with the location-based routing requirement if they do not operate an IP-based network, or if the location information available on the IP-based network does not meet either one or both of the requirements for timeliness and accuracy, in which case, small entities may use the best available location information for routing. Small entities will further benefit from the Commission's adoption of provisions that allow PSAPs and CMRS providers to enter into agreements that establish an alternate timeframe for meeting the location-based routing requirements. The flexibility to negotiate an alternative timeframe that meets a CMRS provider's business and financial needs is a significant step by the Commission that could minimize the economic impact for small entities.

62. *Reporting and Certification Requirements.* The Commission considered the level of data collection, reporting, and certification, if any, that should be required from CMRS providers on location-based routing issues,<sup>190</sup> weighing the potential burden of such requirements on small and other entities against the need to ensure compliance with the rules. The Commission also considered not adopting a certification requirement. However, absent a certification requirement, the Commission and the public would have no insight into providers' implementation of location-based routing. Furthermore, the Commission's ability to easily determine whether carriers are in compliance would be limited. Another alternative the Commission evaluated was adopting periodic reporting requirements. However, such ongoing reporting requirements have the potential to overburden providers, particularly small entities. Therefore, the rules adopted today do not contain any periodic reporting requirements. We believe the one-time certification and live call data reporting requirement we adopt today will be sufficient for providers to demonstrate location-based routing implementation.<sup>191</sup> This limited data collection best balances the need for transparency on compliance with the limited ability of some providers, particularly small entities, to respond to mandatory data collections. The adopted certification requirement will also help provide important privacy and security protections, which we believe greatly outweigh any minor burden that this requirement might impose on small or other entities.

63. *Deferral of Certain Proposed Rules and Removal From This Rulemaking Proceeding.* In the *Report and Order*, the Commission deferred taking action on certain rules that were proposed in the *Notice*. Specifically, in the *Notice* the Commission proposed requiring covered text providers to implement location-based routing for all 911 texts originating on their IP-based networks when location information meets certain accuracy and timeliness requirements. In the *Report and Order* we required CMRS providers to deploy and use location-based routing only for RTT communications. We deferred action on requiring covered text providers to deploy and use location-based routing for other types of text messages to 911, such as Short Message Service (SMS). The Commission also proposed requiring CMRS and covered text providers to deliver 911 calls, texts, and associated routing information in IP format upon request of 911 authorities that have established the capability to accept NG911-compatible IP-based 911 communications. To align requirements for NG911 services amongst providers and avoid

---

<sup>190</sup> See *Notice*, 37 FCC Rcd at 15204, paras. 55-56.

<sup>191</sup> For details on the one-time certification and live call data reporting requirements, see 47 CFR § 9.10(s)(4).

confusion among stakeholders,<sup>192</sup> we deferred consideration of CMRS and covered text provider NG911 IP delivery requirements to the pending NG911 transition proceeding in PS Docket No. 21-479. Our deferral of the two proposed requirements above eliminated consideration of these rules from the current rulemaking proceeding. By eliminating these rules from the proceeding, the Commission has reduced the compliance costs for small entities and any related implementation burdens small entities may have incurred.

#### **G. Report to Congress**

64. The Commission will send a copy of the *Report and Order*, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.<sup>193</sup> In addition, the Commission will send a copy of the *Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Report and Order* and FRFA (or summaries thereof) will also be published in the Federal Register.<sup>194</sup>

---

<sup>192</sup> Letter from Christiaan Segura, Director, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, PS Docket Nos. 18-64, 21-479, at 2 (filed July 3, 2023).

<sup>193</sup> 5 U.S.C. § 801(a)(1)(A).

<sup>194</sup> 5 U.S.C. § 604(b).

**Appendix C****Entities Filing Comments, Replies, and *Ex Partes* to the 2022 Notice of Proposed Rulemaking**

Adams County E-911 Emergency Telephone Service Authority, Arapahoe County 911 Authority, and Jefferson County Emergency Communications Authority (Adams County et al.)

Alaska 9-1-1 Advisory Board

Alaska Telecom Association (Alaska Telecom)

Alliance for Telecommunications Industry Solutions (ATIS)

American Trauma Society (ATS)

Acadian Ambulance Service Inc.

Association of Public-Safety Communications Officials-International, Inc. (APCO)

AT&T Services, Inc (AT&T)

Boulder Regional Emergency Telephone Service Authority (BRETSA)

Colorado Council of Authorities, Inc. (CCOA)

Colorado Public Utilities Commission (COPUC)

Competitive Carriers Association (CCA)

Comtech Telecommunications Corp. (Comtech)

CTIA

Electronic Privacy Information Center (EPIC)

GCI Communications, Corp. (GCI)

Industry Council for Emergency Response Technologies, Inc. (iCERT)

Intrado Life & Safety (Intrado)

Jon Marcy, Kevin Brown, and John Holloway, Defense Information Systems Agency (DISA)

Joseph Lyons (Lyons)

Keith Johnson, System Chief, Loudoun County Combined Fire and Rescue System (LC-CFRS) and Nicole Pickrell, Deputy Chief, Loudoun County Fire-Rescue (LCFR) (Loudoun County)

Michigan State 911 Committee (Michigan State 911)

Motorola Solutions Connectivity, Inc.

National Association of State 911 Administrators (NASNA)

NENA: The 9-1-1 Association (NENA)

NGA 911, LLC (NGA 911)

Ronald R. Fenwick, Esq. (Fenwick)

Rural Wireless Association, Inc. (RWA)

Southern Communications Services, Inc. (Southern Line)

Texas 9-1-1 Alliance, Texas Commission on State Emergency Communications, and Municipal

Emergency Communications Districts Association (Texas 9-1-1 Entities)

TDIforAccess, Inc. (TDI)

T-Mobile USA, Inc. (T-Mobile)

Val Sprynczynatyk

Verizon

Voice on the Net Coalition (VON)