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ATTORNEYS AT LAW

October 29, 2019

Ex Parte

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: Wireless E911 Location Accuracy Requirements; PS Docket No. 07-114

Dear Ms. Dortch:

On October 25th, 2019, Rob Mayor,* Maria Kirby, Kumar Chhokra, and Trey Forgety of Apple Inc. and Rob Carter and I on behalf of Apple met with FCC Chief Technology Officer Eric Burger and David Furth, Erika Olsen,* Alex Espinoza,* Nellie Foosaner, Kenneth Carlberg, Dr. Rasoul Safavian, and John Evanoff of the Public Safety and Homeland Security Bureau. We met at the Bureau's request to discuss Apple's views regarding the progress of wireless E911 location accuracy technologies and the likelihood of achieving potential performance metrics the Commission is currently considering.

As a threshold matter, Apple noted that it is committed to advancing the state of the art in emergency calling location capability. It has and will continue to invest and innovate in technologies and approaches that provide our customers with devices that offer reliable and granular location accuracy, and reliable battery performance in the emergency situations where such performance matters most, while protecting privacy.

To design policies that support this innovation, it is important to recognize that emergency calling location capabilities originated with permanently fixed landline telephones whose locations could be accurately conveyed—including information relevant to vertical location—in a non-probabilistic manner. In contrast, E911 location for mobile wireless communications devices is inherently probabilistic and can accurately be represented only with clear and non-zero uncertainties. Wireless E911 location accuracy obligations must reflect this fundamental distinction.

Moreover, vertical location capabilities must be implemented at large scale and under real-world operational constraints without negatively impacting the user. It is important to recognize this so that policymakers have accurate information on which to set expectations and

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* participated via teleconference

adopt rules. Although the wireless industry has been working hard on vertical location solutions and will continue to do so, commitments or guarantees about performance in real-world situations in meeting specific vertical location criteria in 2021 are not supported by the facts on the ground. Nevertheless, in order to respond to the Bureau's inquiries regarding vertical location, Apple offered the following observations.

National Emergency Address Database. Apple has expressed serious reservations about the technical viability of the NEAD approach to its carrier partners and public safety organizations. However, Apple indicated to carriers that it would be willing to support the NEAD approach upon credible demonstrations that doing so would provide improved location performance for Apple's users and the public safety community. Unfortunately, that showing has not been made. Instead, NEAD test results made public earlier this year confirmed three fundamental flaws with the NEAD approach:

- The NEAD only yielded "fixes" of any kind (accurate or inaccurate) for 82.6% of test calls, even when including the least-challenging suburban and rural morphologies.
- The NEAD approach returned confident-but-wrong "DL2" addresses almost as often as it returned correct addresses: In testing, the NEAD reported a compliant "DL2" fix 18.8% of the time. However, 45.7% of those fixes were not, in fact, DL2, reporting at least a wrong apartment/office/unit, and sometimes even the wrong building. Moreover, this type of error occurred "across all morphologies and building types."
- Adding more Wi-Fi AP data to the system is unlikely to fix these problems. As the ATIS Report explains, fixing these yield issues and false positive errors would require more Wi-Fi AP data than is ever likely to be available in the real world, and far more than the Commission's rules require in order for the NEAD to satisfy carriers' initial Dispatchable Location requirements—potentially even requiring "100% provisioning density" to solve the problem.[1]

In a broader sense, any "Dispatchable Location" approach to wireless E911 location determination will encounter these types of issues. The engineering and practical limits are similar across the civic address domain—RF and sensor physics, estimation theory, the density and availability of signal sources (e.g., GPS, Wi-Fi, and Bluetooth), and a lack of detailed and current information on the precise interior structure of most buildings all severely constrain what is possible to achieve in this general approach. Accordingly, confirming an address with a caller or searching more than one address in both the horizontal and vertical dimensions will almost always be required.

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[1] *See* Letter from Matthew Gerst, Vice President, Regulatory Affairs, CTIA to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, Attachment B, E911 Location Test Bed Dispatchable Location Summary Report at 10, 15, 19 (filed Apr. 26, 2019) ("ATIS Report").

Coordinate-based z-axis determination. Unlike the NEAD and other approaches predicated on achieving zero-uncertainty "Dispatchable Location" for mobile devices, improvements in coordinate-based z-axis approaches can provide a path forward on 3D location. Apple cautioned, however, that vertical location accuracy performance requirements should be evaluated in the context of solutions that must be implemented at large scale, subject to real-world operational considerations, and for their impact on consumer privacy.

First, the z-axis estimation approaches under consideration by industry and tested in the CTIA testbed do not necessarily mean that a ± 3 meter accuracy metric is achievable by April 2021 in real-world circumstances. This is because errors of ± 3 meters or less were obtained only under conditions that deviate significantly from realistic user patterns and constraints.[2] Specifically, power and connectivity conditions in the testbed were not representative of real-world use.[3] The only testbed results obtained without implicating one or more of these problems fell short of the ± 3 meter metric.

In addition, the Commission should avoid approaches that would create unacceptable incursions into personal privacy by requiring a user's device to repeatedly connect to proprietary third-party servers and disclose sensitive location information even when the user has not initiated a 911 call.

Technologies that depend on the deployment of new infrastructure in every major city to achieve even less-stringent performance metrics also raise significant questions about the viability of the tested approaches. And even if such approaches could be implemented, they are unlikely to provide z-axis location information for users outside the small number of markets where infrastructure deployment and maintenance are likely to be economically viable. In contrast, rules enabling solutions that can provide z-axis data with clear uncertainty information for all users and all PSAPs would better serve the public interest. The Commission should not endorse an approach that will leave some communities behind.

Apple also observed that providing the "floor level" information alongside a z-axis estimate would necessarily require information on the geodetic position of floors and knowledge of the labels applied to individual floors (e.g., "mezzanine", "courtyard"), but that Apple was not aware of any sources for this information. Moreover, it was unclear how uncertainty information could be effectively conveyed under such a regime. Significantly, both horizontal and vertical uncertainty would be relevant to floor level information, as buildings implement floor levels in different ways.

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[2] *See* 9-1-1 Location Technologies Test Bed, LLC, Report on Stage Z, PS Docket No. 07-114 at 49-50, 121-122 (filed Aug. 3, 2018).

[3] *See, e.g., id*. at 50.

Finally, Apple noted that its Hybridized Emergency Location (HELO) solution has offered z-axis estimates and uncertainties beginning in 2013, and those estimates have been consumed by carriers since its first adoption in 2015. For the reasons set forth above, Apple did not make predictions about HELO z-axis location performance in 2021. However, Apple did commit to improving the overall X/Y and Z performance of its devices with each iteration of hardware and software, and to participating in a CTIA z-axis test campaign by the end of 2020.

Pursuant to the Commission's rules, a copy of this notice is being filed electronically in the above-referenced docket. If you require any additional information, please contact the undersigned.

Sincerely,

/s/ Paul Margie

Paul Margie
Counsel for Apple Inc.

cc: meeting participants