

Before the Federal Communications Commission

IN THE MATTER OF

WIRELESS E911 LOCATION ACCURACY REQUIREMENTS

and

E911 REQUIREMENTS FOR IP-ENABLED SERVICE PROVIDERS

*ON FURTHER NOTICE OF PROPOSED RULEMAKING
AND NOTICE OF INQUIRY*

**COMMENTS OF THE
NATIONAL EMERGENCY NUMBER ASSOCIATION**

JAMES HOBSON
Attorney

TELFORD E. FORGETY, III
*Attorney
Regulatory Counsel*

*MILLER & VAN EATON
1155 Conn. Ave. N.W.
Washington, DC 20036*

*NENA
4350 N. Fairfax Dr.
Arlington, VA 22203
(703) 812-4600*

CONTENTS

Comments	1
I. In Response to the Further Notice of Proposed Rulemaking.....	2
A. The Commission should promulgate rules for the periodic review of location accuracy requirements.	3
B. The Commission should establish uniform requirements for the delivery and meaning of location uncertainty and confidence metrics.....	4
C. The Commission should establish a framework for harmonized positioning requirements.	7
D. Compliance testing requirements should mirror the environments and circumstances under which mobile users reasonably expect to access emergency services through 9-1-1.	8
E. Testing schedules should be sufficiently flexible to accommodate changing environmental factors while ensuring full access to 9-1-1 services.	8
F. Delivery of vertical-axis position information should be permitted for currently-deployed networks and devices and required for future-generation networks and devices, under uniform standards.....	11

II

G. The Commission should establish rules to ensure that a wireless subscriber’s location can be determined to a minimum degree of accuracy while roaming on any compatible network. 12

II. In Response to the *Notice of Inquiry* 13

A. The Commission should cautiously extend relevant 9-1-1 and E9-1-1 requirements to all VoIP providers that enable users to terminate calls to the PSTN..... 13

B. In the future, some form of Automatic Location Determination should be mandatory for all portable or nomadic VoIP devices and applications. 13

C. The Commission should collaborate with industry to develop a comprehensive suite of automatic location determination tools for NG9-1-1 traffic. 15

D. Relevant 9-1-1 and E9-1-1 service requirements should extend to all appropriate services, devices, and applications. 16

Conclusion..... 16

Before the Federal Communications Commission

PS Docket № 07-114 – WC Docket № 05-196

IN THE MATTER OF

WIRELESS E911 LOCATION ACCURACY REQUIREMENTS

and

E911 REQUIREMENTS FOR IP-ENABLED SERVICE PROVIDERS

ON FURTHER NOTICE OF PROPOSED RULEMAKING

AND NOTICE OF INQUIRY

COMMENTS OF THE NATIONAL EMERGENCY NUMBER ASSOCIATION

The National Emergency Number Association (NENA) respectfully submits the following comments in response to the *Further Notice of Proposed Rulemaking and Notice of Inquiry* adopted by the Commission on September 23rd, 2010, in the above-captioned proceedings.

COMMENTS

NENA commends the Commission for undertaking this proceeding to refresh the record on the capabilities of and requirements for location technologies in wireless networks and devices. Locating individuals in times of distress is critically important to the protection of life and property. By ensuring the accuracy and timely delivery of location information to Public Safety Answering Points (PSAPs), the Commission has done much to improve the safety and security of the American public. NENA encourages the Commission to build upon the

foundation of existing regulations to ensure the continuous improvement of wireless location accuracy, delivery timeliness, and data uniformity, being mindful of the need to balance reasonable consumer expectations with real-world technological capabilities and public safety operational flexibility. At the same time, NENA recognizes that the various E9-1-1 related proceedings undertaken since 1994 have at times generated significant complexity for PSAPs and carriers alike. NENA therefore encourages the Commission to approach any final rules with a keen eye toward simplicity and uniformity.

Equally important, the Notice of Inquiry adopted in this proceeding affords the Commission an opportunity to address several thorny issues that will continue to plague the marketplace without clear and consistent regulatory guidance. Voice-over-internet-protocol or VoIP services present unique issues across the pantheon of contexts (static, nomadic/portable, mobile) in which they can be used. In today's mobile environment, consumers are capable of downloading VoIP apps that offer no 9-1-1 capabilities. In addition, some VoIP providers reside outside the United States or its territories, further complicating the imposition of regulatory requirements. Thus it is particularly appropriate that *

I. In Response to the Further Notice of Proposed Rulemaking

Given the rapid pace of technological advancement seen in the wireless telecommunications industry, it is appropriate for the Commission to periodically solicit comment on the state-of-the art in wireless location technologies, and NENA thanks the Commission for its diligence in this regard. Wireless location determination is particularly important as the security it provides can significantly improve the lives of persons with communicative disabilities who may not always be capable of communicating their location by voice.

Though not itself a supplier of location technologies, NENA operates technical and operational development committees comprised of volunteers from public safety agencies, telecommunications firms, government agencies. These committees create consensus standards and developmental documents, some of which may be relevant to the Commission's work as it considers revising rules for wireless location accuracy. In addition, NENA participates in the FCC-created Communications Security, Reliability, and Interoperability Council, and recommends that any rules adopted by the Commission incorporate the pertinent conclusions of that body.

While each new generation of positioning technology brings with it the promise of improved accuracy and more advanced features, technological promises must be evaluated under the harsh light of real-world practice in deployed networks, consumer devices, and PSAPs. Consequently, it is incumbent upon the Commission to ensure that any proposed positioning solution can meet uniform minimum standards for location accuracy, timeliness, and performance. To ensure that current and future networks, devices, and applications meet such standards, NENA proposes the following:

A. The Commission should promulgate rules for the periodic review of location accuracy requirements.

Since the Commission last addressed location accuracy requirements for wireless services, the market for mobile handsets and the technology available to wireless carriers have undergone significant evolution. Against this background it should not be surprising that consumer expectations about the level of location accuracy have also increased. While advanced handsets and networks now implement a multitude of complementary positioning techniques, there remains a significant gap between the level of location accuracy that can be presented to subscribers and the level that can be transmitted to PSAP call takers. This gap is partly a conse-

quence of decisions during the deployment of previous-generation wireless networks and partly a consequence of real-world limitations on the performance of positioning systems. The former problem can and likely will be addressed with the deployment of advanced “4G” networks, while the latter may be addressed partly by future technological advances.

As these advances continue, it is appropriate that the Commission periodically review the state of deployed and available positioning technologies and update the location accuracy rules to reflect the level of accuracy that is practically achievable with current-generation technology and to spur the development of higher-accuracy technologies for future generations of wireless networks and handsets. In particular, NENA recommends that the Commission establish rules tying the periodicity of its review to the announced roll-out periods of commercial networks, currently 4-6 years. Further, in undertaking its periodic review, the Commission should seek to balance the needs of first responders with reasonable consumer expectations, the real-world performance of available positioning technologies, and the commercial reasonableness of deploying technologies capable of achieving a given level of precision. Finally, the Commission should include within its periodic review the uniform requirements for delivery of position error and confidence data recommended below.

B. The Commission should establish uniform requirements for the delivery and meaning of location uncertainty and confidence metrics.

Alongside the currently-available latitude and longitude coordinates, some deployed (and likely *all* future) networks, as well as many advanced handsets, are capable of reporting an estimate of the uncertainty in the reported position and the level-of-confidence with which the actual location of the caller may be expected to lie within the reported error circle. These metrics could be tremendously useful for PSAP call takers and dispatch-

ers as they guide first responders to the location of a caller. In dense urban environments, for example, a 10m diameter error circle could indicate a particular apartment or office, while a 50m circle could leave significant ambiguity as to which *building* a caller was located within. Likewise, a position reported with high confidence could allow responders to narrow the field of search and thus reduce the required search time and the number of responders required and thereby the cost of responding to a given call, while a position reported with low confidence might indicate the need for additional responders to search a wider area.

1. *Within the near future, carriers should be required to meet more rigorous requirements for uncertainty and confidence.*

Given the potential for such data to improve the speed and reduce the cost of response, we recommend that the Commission promulgate a rule at § 20.18(h)(3) allowing the delivery of estimated location accuracy and confidence to PSAPs alongside the currently-required latitude and longitude. We submit this permissively-worded recommendation for two reasons: First, not all current-generation positioning technologies are capable of delivering estimated positioning error and confidence data, necessitating a reasonable transition period before rules requiring such data could become mandatory. Second, updating PSAP systems to accept such data and training call takers and responders to understand and use it will take time, money, and other resources. Ultimately, however, the delivery of such data should become mandatory for all wireless providers, once it is commercially feasible to supply.

NENA considers it possible that, within the two-year period provided for wireless carrier compliance with this regulation under the *Second Report and Order*, the mandatory 1σ (~68%) confidence level can be increased based on reduced uncertainties in most location determinations. Although the Commission has previously

cited the consensus of “AT&T and other carriers” that a 1 σ confidence level is appropriate at this time, that benchmark is not binding in § 20.18(h)(3), and NENA asks the Commission to consider whether and when a higher confidence level should be mandated as positioning technologies continue to improve. For example, responders with access to a location having a probable circular error of 50m at 90% confidence or 20m at 68% confidence will have an effectively-bounded 2D search field in most environments.

2. *Uniform standards for delivery and meaning of data are critical to usability in PSAPs.*

Different location technologies in use today generate differing forms of confidence and uncertainty measurements which can cause interpretation issues in PSAPs. This in turn can affect real-time decision-making on caller location and response methods. Without uniformity it is possible and even likely that the information delivered by different carriers will arrive in differing formats and with significant, if sometimes subtle, differences in meaning. Such differences complicate the training of call takers and the day-to-day operation of PSAPs, impose unnecessary costs on local public safety agencies, and can reduce the speed and efficiency with which response services are delivered. As networks and devices capable of delivering position uncertainty and confidence data are deployed, NENA considers it critical that the Commission establish a *uniform* standard for the delivery of such information to PSAPs and for the meaning of the data delivered.

Although there have been multiple previous attempts to standardize confidence and uncertainty metrics and interpretations, the nature of the statistical problems in this area, the deployed base of often disparate hardware (even within a single carrier’s network), and the lack of a clear mandate for uniformity have impeded progress. The use of geodetic shape data to enable visual representations of accuracy and confidence to call

takers and responders represents one visionary solution to this problem, but limitations of the location data transport process, including ALI data formats, prohibits use of such data in the present E9-1-1 environment. Because technological capabilities which could enable geodetic data transmission – such as expanded data-handling protocols proposed in the NENA NG9-1-1 reference design – will not be fully implemented in the near-term, it is appropriate for the Commission to adopt interim standards for delivery and meaning of uncertainty and confidence metrics, and NENA urges the Commission to do so at this time.

C. The Commission should establish a framework for harmonized positioning requirements.

The current regulatory framework for wireless ALI developed at a time when network-based positioning technology was relatively novel and GNSS receivers had not yet achieved widespread consumer adoption. The bifurcated standard (for network- and handset-based technologies) adopted by the Commission represented a reasonable compromise between cost, capability, and technological agnosticism. Though the technical and market conditions that led to that compromise have not yet wholly abated, NENA considers it important that the Commission begin to clearly lay out a regulatory vision for achieving a single, harmonized location accuracy standard.

Harmonizing location accuracy regulations will provide immediate benefits to PSAPs and carriers alike. For PSAPs, a single standard would reduce training costs and improve the speed and efficiency of response by eliminating subtle differences in the meaning and reliability of location data presented to call takers and shared with responders. For carriers, a single standard would ensure a level competitive playing field and reduce compliance testing costs where multiple positioning technologies are deployed within a single network.

NENA recognizes that achieving this vision of unified location accuracy requirements will take considerable time and resources. Ultimately, however, it is in the best interest of consumers, the public safety community, wireless carriers, and positioning technology vendors.

D. Compliance testing requirements should mirror the environments and circumstances under which mobile users reasonably expect to access emergency services through 9-1-1.

As the Commission considers modifying its compliance testing rules, NENA recommends that the Commission regularly examine OET Bulletin 71 to ensure that it remains current with existing location technologies and services. NENA does recognize that there are more and more wireless-only households, which may prompt a need for new indoor/outdoor testing to more accurately reflect consumer trends in the use of mobile devices. At this time, however, NENA lacks sufficient quantitative information to recommend a particular fraction of testing that should be conducted indoors. NENA is aware that the Association of Public Safety Communicators (APCO) has that at least 30% of test calls be made indoors. NENA urges the commission to give APCO's proposal thoughtful consideration.

Testing in a variety of environments would provide useful data to allow both carriers and PSAPs to understand the capabilities, benefits, limitations, and drawbacks of deployed positioning technologies. Results of this type of testing should be used for informational purposes

E. Testing schedules should be sufficiently flexible to accommodate changing environmental factors while ensuring full access to 9-1-1 services.

NENA supports periodic testing of wireless carrier compliance with the Commission's location accuracy rules.

Such testing is the PSAP's only real assurance that emergency services personnel will be able to locate callers in times of distress. NENA is mindful, however, that compliance testing is an expensive and burdensome process for carriers. Consequently, NENA recommends that the Commission adopt a reasonable baseline interval for compliance testing, along with two mechanisms, described below, that would trigger limited localized testing outside the regular cycle. Finally, NENA also recommends that the Commission require carriers to share the results of their compliance tests with relevant PSAPs and state 9-1-1 offices, subject to appropriate confidentiality requirements.

1. The baseline compliance testing interval should be five years.

First and second generation wireless networks were deployed over the course of decades and their compatible handsets designed for long service lives. More recently, third generation network technologies were pushed deep into carriers' networks over the course of only 5-7 years. Further, according to public statements by wireless carriers, "4G" technology will be deployed nation-wide in less than 5 years. Since 2007, the rapid progress in network capabilities has been matched with unprecedented increases in processing power and on-board sensing capabilities in wireless handsets. At the same time, handset replacement cycles have declined to 2-4 years. Clearly the pace of innovation is accelerating.

Extrapolating from the data above, it would be tempting to project these trends into the future, anticipating ever-faster network deployments and ever more powerful handsets. Practically, however, the deployment speed of networks will continue to be constrained by the time required to manufacture, transport, and install equipment as well as the carriers' need to earn a return on their capital investments. Taken together, the trends in network capabilities and deployment schedules and the commercial needs of carriers imply a nat-

ural period for compliance testing of no less than once every five years. NENA therefore recommends that the Commission establish a baseline testing period of once per lustrum and require carriers to coordinate with local PSAPs and State 9-1-1 offices, as appropriate.

2. *In PSAP service areas for which Phase II service capabilities have been deployed, new or upgraded base stations should undergo compliance testing before entering revenue service.*

As wireless networks increasingly replace traditional wireline networks, the density of cell sites and sectors is increasing rapidly. In many areas of the country, however, PSAPs and carriers have already implemented the Phase II location accuracy requirements. NENA is concerned that the current rules could permit carriers to delay testing of location accuracy for newly-deployed base stations (or sectors) in these areas for up to six months. This risks the creation of “islands” where E9-1-1 Phase II level service is unavailable to consumers who have a reasonable expectation of service. To avoid this problem, NENA recommends that the Commission require carriers to test the wireless location functionality of any new or upgraded base station or sector prior to placing it in revenue service.¹ The required testing should be limited to the service area of the new or upgraded base station, and should be designed as limited in technical scope as possible while assuring compliance with Phase II location accuracy requirements.

¹ To prevent an unduly burdensome outcome, NENA recommends that the Commission provide a limited exception to both triggering mechanisms if the next in-cycle compliance tests are scheduled to be completed within a reasonable time.

3. *Material changes to the wireless operational environment within a PSAP service area should trigger localized out-of-cycle testing.*

NENA recognizes that the mere passage of time may have little effect on the accuracy of wireless location determinations. Environmental changes, however, such as new construction or shifts in population density or demographics may impact such determinations significantly by, *inter alia*, raising the RF noise floor or introducing multipath effects. Where such changes occur, carriers should be required to conduct limited, localized tests to ensure that the level of location accuracy within the affected area has not degraded.

4. *Carriers should be required to share test results with relevant PSAPs and State 9-1-1 offices, subject to stringent confidentiality provisions.*

In order to foster collaboration between carriers and public safety agencies and improve PSAPs' understanding situational awareness, NENA recommends that compliance testing data be provided to relevant PSAPs and state 9-1-1 offices, if extant. Recognizing the potential for differing interpretations, consumer confusion, and competitive harms should such data be publicly disclosed, however, NENA also recommends that the Commission subject such data to stringent confidentiality protections.

F. Delivery of vertical-axis position information should be permitted for currently-deployed networks and devices and required for future-generation networks and devices, under uniform standards.

While vertical information would be critically important to PSAPs and first responders, carriers ability to transmit vertical ("z-axis") location information and PSAPs ability to receive, process, and display this additional data field using existing hardware and software are limited. Recently, z-axis location data has become an area

of interest for both industry groups and public safety organizations. With PSAPS in the beginning stages of the transition to NG9-1-1, it may be appropriate for the commission to address z-axis requirements in the context of a deployed NG9-1-1 system.

NENA is aware, however, that it will be several years before NG9-1-1 PSAPs are operational nationwide. Assuming commercially deployed positioning technologies can supply z-axis location data, it may be appropriate for PSAPs in major urban or high-risk areas to implement z-axis technology on a shorter timescale. NENA urges commission to bear these considerations in mind as it examines potential short- and long-term rules for the determination and delivery of vertical location information.

G. The Commission should establish rules to ensure that a wireless subscriber's location can be determined to a minimum degree of accuracy while roaming on any compatible network.

A key benefit of wireless services is to enable connectivity while traveling throughout the country. No single carrier, however, is yet capable of providing service throughout the United States on its own network. Consequently, it is reasonable to expect that subscribers will frequently use mobile devices in roaming environments, employing a carrier other than their own to originate or terminate wireless traffic. Inevitably, some roaming customers will encounter emergency situations requiring public safety response. When that happens, it is critical that 9-1-1 calls are delivered quickly to the correct PSAP and that adequate, accurate location information is delivered to the PSAP along with the call.

As noted above, it appears that carriers are now migrating to network-assisted GNSS positioning solutions, though not all carriers have yet adopted this technology. For consumers, the rapid progress in network and handset capabilities has already created greater expect-

tations for wireless caller location, and there is no indication that these expectations are diminished while roaming on compatible networks. To ensure that the needs of the public safety community and the reasonable expectations of consumers NENA recommends that the commission seek input from carriers on how best to ensure that E9-1-1 calls in a roaming environment are completed.

II. In Response to the *Notice of Inquiry*

A. The Commission should cautiously extend relevant 9-1-1 and E9-1-1 requirements to all VoIP providers that enable users to terminate calls to the PSTN.

While NENA recognizes that extending 9-1-1 and E9-1-1 requirements to a larger set of VoIP providers is fraught with technical, operational, and jurisdictional challenges, it is a moral imperative that can no longer be ignored. It is entirely reasonable for consumers to expect that services which allow outbound calling to the PSTN will properly route calls to 9-1-1, and NENA believes that this is indeed the expectation held by the overwhelming majority of VoIP users. NENA therefore recommends that the Commission consult closely with industry to begin fashioning workable 9-1-1 and E9-1-1 rules for PSTN-terminating VoIP providers.

B. In the future, some form of Automatic Location Determination should be mandatory for all portable or nomadic VoIP devices and applications.

Although NENA lacks quantitative figures, there is a wealth of anecdotal evidence that PSAPs frequently receive calls routed incorrectly due to a failure of nomadic VoIP systems to update user locations. In an extreme example, one local PSAP received a VoIP call from a U.S. military installation in South Korea that was

routed on the basis of the caller's pre-deployment address. This call illustrates the potentially gargantuan impact on response time and effectiveness when a user's registered location is in a different PSAP jurisdiction. Automatic location determination (ALD) to support internet based VoIP users would essentially solve this problem, at least for domestically originated calls.

Beyond erroneous location reporting problems, there is also evidence that callers sometime intentionally falsify location information. This type of subterfuge is difficult if not impossible to detect and can negatively impact the safety and security of the public by diverting resources away from legitimate emergency calls or directing attention away from the scene of a crime. Even when fraudulent calls are detected, it is technically and logistically difficult to locate the perpetrator. Automatic location determination could reduce or eliminate this malicious practice and thereby reduce wasted call-taker time and first responder resources.

One means of implementing ALD would be to require access providers to provide location data to VoIP devices and applications. Another would be to mandate the inclusion of positioning technologies such as GNSS receivers in portable or nomadic VoIP devices. Regardless of the positioning technology adopted, however, the fundamental imperative is to swiftly locate a 9-1-1 caller, properly route the call to the relevant PSAP, and deliver the caller's location to the call taker.

To meet the basic needs and expectations of consumers and public safety alike, NENA supports a requirement for *some* form of automatic location determination for nomadic or portable VoIP devices and applications. However, much additional study and development will be necessary both in industry and within the public safety community before any ALD solution can be implemented. As this work progresses, NENA urges the Commission to closely engage with all parties to ensure that any final ALD rules are operationally effective and commercially viable.

C. The Commission should collaborate with industry to develop a comprehensive suite of automatic location determination tools for NG9-1-1 traffic.

NG9-1-1 provides expanded handling capabilities for location and location uncertainty information as well as improved call routing functions based on that information. For example, the expanded data bandwidth and functional designs within NENA's NG9-1-1 reference model are designed to enable improvements in the location determination and provisioning processes of Originating Service Providers (OSPs) and Access Providers. In addition, these improvements allow NG9-1-1 calls and their associate data payloads to be processed, routed, and interactively managed within and between PSAPs and other emergency entities.

None of these benefits will be realized, however, if Originating Service Providers and Access Providers do not take full advantage of NG9-1-1's expanded capabilities, or if PSAPs do not deploy NG9-1-1 compatible equipment and software. With respect to location determination in particular, it is imperative that some method of automatic location determination be available for any NG9-1-1 data source, regardless of the network, device, or application from which it originates. Providing this ALD service across the wide array of originating devices, networks, and applications that consumers already enjoy will, however, be challenging.

In order to meet the challenge of providing adequate and accurate location determination for NG9-1-1 service requests, it is important that the Commission quickly begin a close collaboration with carriers, device manufacturers, and application developers as well as the PSAP and first responder community. For some NG9-1-1 traffic such as voice "calls," traditional location determination methods and position transmission processes will have ready analogues. For others, such as instant messaging, standards may take time to develop.

Only with sustained engagement between regulators, industry, and public safety, can these important new communications technologies become replacements for the critical public lifeline represented by current 9-1-1 voice technology.

D. Relevant 9-1-1 and E9-1-1 service requirements should extend to all appropriate services, devices, and applications.

As for PSTN-terminating VoIP providers discussed above, NENA believes that all services, devices, and applications by which a consumer could reasonably expect to reach emergency services providers should be required to meet the same functional standards as traditional wireline and wireless voice providers. Additionally, NENA urges the commission not to permit communications providers to shirk these obligations by merely “disclosing” a lack of support for 9-1-1. Again, concerted effort will be required among affected parties to achieve this objective. NENA believes, however, that regulatory encouragement in this regard can reap significant benefits in the medium term.

CONCLUSION

NENA again thanks the Commission for undertaking these thoughtful and well-scoped proceedings and looks forward to engaging in further dialog with other interested parties during the reply comment period.

TELFORD E. FORGETY, III
Attorney

JANUARY 2011