

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)
)
Wireless E911 Location Accuracy Requirements) PS Docket No. 07-114

REPLY COMMENTS OF SPRINT CORPORATION

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I. INTRODUCTION AND SUMMARY

Sprint Corporation (“Sprint”) hereby submits these reply comments in response to the Federal Communications Commission’s (“FCC” or “Commission”) Third Further Notice of Proposed Rulemaking in the above-referenced proceeding.¹ Sprint supports the goal of improved 9-1-1 service for consumers and has been actively evaluating potential location accuracy technologies. The location accuracy proposals outlined in the Third FNPRM, however, are not achievable using current technology and there is little support, other than unverified vendor claims, for the assertion that the technology will be available in the near future.

Even if a new technological solution can be found, the standards work, network infrastructure and handset development necessary to implement such a new technology will take much longer than the timeframes outlined in the Third FNPRM. For these reasons, the Commission should refrain from adopting the location accuracy requirements outlined in the Third FNPRM.

¹ Wireless E-911 Location Accuracy Requirements, *Third Further Notice of Proposed Rulemaking*, 29 FCC Rcd 2374 (2014) (“Third FNPRM”).

Industry is investigating technologies that are already in use for purposes other than 9-1-1 location accuracy, such as WiFi and Bluetooth, for use in dispatching emergency services. These technologies promise to move the industry closer to a “dispatchable address” for 9-1-1 calls made within a building. There will, however, be complexities associated with utilizing these technologies and, in order to resolve these challenges, collaboration with all stakeholders will be essential. The Commission should focus on resolving these issues rather than pursuing increasingly unrealistic parameters for the provision of latitude and longitude indoors.

Finally, a few commenters urge the Commission to adopt a Time-to-First-Fix (“TTFF”) requirement that is less than 30 seconds. Requiring shorter TTFF, however, is likely to reduce accuracy. While new technologies may ultimately be developed that will allow a shorter TTFF, it is premature to impose a shorter interval given today’s technology. TTFF is based upon multiple variables that are outside of the control of CMRS carriers and TTFF should remain at 30 seconds until new technologies are adopted.

II. DISCUSSION

A. The record demonstrates that vendor technologies being developed for indoor location accuracy do not currently satisfy the Commission’s proposals in all required morphologies.

As numerous commenters have discussed, the technology to meet the Commission’s proposed requirements in all morphologies is not currently available.² The data from the *CSRIC Indoor Location Test Bed Report* indicated that none of the vendors whose solutions were tested were capable of meeting the proposed requirement of 50 meters for 67 percent of all 9-1-1 calls

² Cisco Comments at 3; Qualcomm Comments at 1; T-Mobile Comments at 10-11; Verizon Comments at 15; Mobile Future and Competitive Carriers Association at 1-2; CTIA Comments at 6.

from indoors in all four of the representative morphologies where testing was performed.³ Cisco correctly observes that, “Unfortunately, the test bed established that, despite vendor claims, no tested technology is capable of satisfying the proposed indoor accuracy requirements today in all environments.”⁴ Qualcomm expresses similar concerns: “The *FNPRM* fails to appreciate the fact that no commercially available positioning technology can meet the Commission’s proposed requirements today, and, even if there were something available, it would not be feasible for a ubiquitous industry build-out within a two to three year period.”⁵

While some commenters assert there are multiple technologies available to meet the Commission’s proposals⁶, only three technologies were tested as part of the CSRIC III test bed process and the others are supported by little more than vendor claims. Of the three technologies tested in the CSRIC III test bed, one was not yet commercially available nationwide and two of the participating technologies could not be tested as they would be deployed in a provider’s network to provide an end-to-end E9-1-1 location solution.⁷ A year later, NextNav’s technology is still not commercially available nationwide.⁸ Polaris, one of the vendors whose technology was tested as part of the CSRIC III test bed, recognizes no single technology can meet the aggressive benchmarks proposed in the Third FNPRM and proposes a multi-layered approach.⁹

³ Third FNPRM at Par. 16, referencing CSRIC III WG3, Indoor Location Test Bed Report (Mar. 14, 2013), available at http://transition.fcc.gov/bureaus/pshs/advisory/csric3/CSRIC_III_WG3_Report_March_%202013_ILTestBedReport.pdf (“*CSRIC Indoor Location Test Bed Report*”).

⁴ Cisco Comments at 3.

⁵ Qualcomm Comments at 1.

⁶ NextNav Comments at 6; True Position Comments at 6-7.

⁷ Third FNPRM at Par. 14 and Par. 93.

⁸ As of the Comment filing deadline NextNav stated that, “Construction of comprehensive network capability in most urban markets would require 15-18 months to substantially complete, with initial deployment likely focused on the largest urban markets where the need is greatest and existing technologies have proven to be inadequate.” NextNav Comments at 10.

⁹ Polaris Comments at 3.

Polaris also recognizes the challenges associated with providing vertical location information.¹⁰ Qualcomm, another participant in the CSRIC III process, recommends that, "... the FCC should not issue any indoor location rules until the performance of all technically and economically viable positioning technologies is accurately characterized and carriers' reasonable deployment plans are taken into account."¹¹

True Position was not tested as part of the CSRIC III process, but submitted test results with its comments filed in this proceeding. As True Position acknowledges, that test area of Wilmington, DE, did not include dense urban or rural environments.¹² In addition, True Position's technology does not address the proposed vertical accuracy requirement.

Notably, the technology vendors who have indicated they have, or will soon have, technology available to meet the requirements have not provided end-to-end plans for how their technology would be rolled out to meet the requirements. Each technology brings with it unique underlying assumptions and associated costs. Until those details are fully described by the technology vendors, carriers will not be able to evaluate specific technologies.

NextNav argues that the CSRIC LBS Report supports adoption of increased accuracy standards. While the CSRIC III LBS report helped to identify additional technologies that could be used to improve indoor location accuracy, there was no test bed analysis and data developed as part of that report and, ultimately the CSRIC LBS report recommended the establishment of a subsequent test bed trial to evaluate future technologies, such as WiFi, GLONASS and U-TDOA for LTE.¹³ The CSRIC LBS Report recognized that vendor claims still needed to be validated

¹⁰ Polaris Comments at 6-7.

¹¹ Qualcomm Comments at 7.

¹² True Position Comments at 8.

¹³ CSRIC III WG3, Leveraging LBS and Emerging Location Technologies for Indoor Wireless E911, at 17 (Mar. 14, 2013), *available at*

through subsequent stages of the test bed.¹⁴ It is not sufficient for the industry to rely on “expected near-term improvements” and statements regarding “expected future performance,” as NextNav recommends. Actual data regarding technology performance must be available and should be evaluated in the context of a test bed similar to the test bed utilized by CSRIC III.

The proposed timeframes outlined in the Third FNPRM are unrealistic based on additional work that would need to occur prior to carriers being able to deploy any new indoor location accuracy technology.¹⁵ As a number of commenters have discussed, before any technology can be deployed by carriers, standards work will need to be completed.¹⁶ Technology will then need to be incorporated into devices and software. T-Mobile correctly observes, “Only after new standards are developed can they be implemented into equipment and software; indeed, most telecommunications manufacturers will not even consider the inclusion of non-standardized technologies into their devices and network equipment.”¹⁷ Commenters recognize that where handset modifications are needed to address indoor location accuracy requirements, it will take time for modified handsets to reach high penetration levels.¹⁸ NextNav, whose proposed technology relies in part on handset modifications recognizes that, “...sufficient time will be needed for consumers to purchase indoor location-capable handsets as a part of their customary transition to new and better devices.”¹⁹

With respect to the proposed vertical or z-axis requirements specifically, only one vertical location accuracy technology was tested as part of the CSRIC III test bed. Some

http://transition.fcc.gov/bureaus/pshs/advisory/csric3/CSRIC_III_WG3_Report_March_%202013_LeveragingLBS.pdf (“CSRIC LBS Report”) at pg. 2.

¹⁴ CSRIC LBS Report at pg. 19.

¹⁵ CTIA Comments at 8-9; NTCA Comments at 3; T-Mobile Comments at 18-20.

¹⁶ T-Mobile Comments at 19; NTCA Comments at 3.

¹⁷ T-Mobile Comments at 19.

¹⁸ T-Mobile Comments at 3-4, 19; NextNav Comments at 13-14.

¹⁹ NextNav Comments at 13.

commenters suggest that vendor presentations and the CSRIC LBS report indicate the Commission can expect multiple indoor vertical location technologies to achieve similar accuracy consistent with the Commission's requirements.²⁰ There is not sufficient data on the record, however, to indicate multiple technologies will soon be available to meet the Commission's proposals. As discussed above, the CSRIC LBS Report identified potential technologies but did not evaluate these technologies in a test bed. To the extent z-axis technology solutions use barometric pressure sensors, there are potential issues that must be considered and addressed. As Sprint discussed in its comments, using barometric pressure sensors for z-axis information presents challenges because of the impact weather conditions and changes in building pressure can have on these sensors.²¹ Other commenters have highlighted similar concerns.²²

A number of commenters have argued that before the Commission imposes any requirements, an independent test bed should verify that compliant technology solutions are available.²³ Sprint strongly supports this approach. Each technology vendor should demonstrate its solution through the independent test bed. A report using a consistent reporting format should then be issued summarizing each vendor's solution. The report should address aspects of the proposed technology such as the impact on devices (hardware, software), impact on the carrier network, impact on the E9-1-1 service provider, impact on PSAPs, stated accuracy (vertical and horizontal), stated confidence estimate, confidence estimate for the same latitude, longitude and altitude, the accuracy dependencies, TTFF, and the need for calibration and re-calibration.

²⁰ NextNav Comments at 17.

²¹ Sprint Comments at 7-8.

²² T-Mobile Comments at 13-14; Qualcomm Comments at 13; AT&T Comments at 15.

²³ Verizon Comments at 22; Mobile Future and Competitive Carriers Association Comments at 3; CTIA Comments at 13.

Numerous commenters have observed that attempting to impose aspirational regulatory mandates before the technology is available will result in the same problems associated with Phase II deployment.²⁴ The Information Technology Industry Council (“ITI”) correctly observes, “Placing too much reliance on the promises of a few vendors runs the risk of a repeat of the E911 phase II situation and does not serve the public interest in a smooth rollout of secure reliable location accuracy technology.”²⁵ Similarly, Qualcomm argues that, “The Commission should heed the stark lessons of the Phase II E911 rulemaking process and base any future indoor location accuracy rules upon wireless position location technology that has been demonstrated to work in all types of environments and ubiquitously, not on unsupported claims and promises made by technology vendors.”²⁶ Sprint shares these concerns and agrees that by proposing to adopt indoor location accuracy requirements now, before compliant technologies have been shown to be available, the Commission risks repeating the challenges associated with Phase II deployment.

B. A number of technologies that are currently in use for purposes other than 9-1-1 location accuracy hold promise in the area of indoor location accuracy and should be explored further.

A number of technologies that have already been deployed hold promise in the area of indoor location accuracy and should be considered as part of this proceeding. For example, Cisco discusses the commercial demand for indoor location technology and the fact that location availability in WiFi enabled devices has become widespread and argues that utilizing this information could place dispatchable address information in the hands of public safety sooner

²⁴ Qualcomm Comments at 12; Verizon Comments at 6; Mobile Future and Competitive Carriers Association Comments at 2-3; CTIA Comments at 10-13.

²⁵ Information Technology Industry Council Comments at 5.

²⁶ Qualcomm Comments at 12.

than the approach outlined in the NPRM.²⁷ Multiple commenters reference WiFi access point data and Bluetooth beacons as important potential sources for indoor location information.²⁸ DAS, small cells, and femtocells also hold promise.²⁹ Ultimately, as other commenters have suggested, a hybrid approach that incorporates multiple technologies, may be necessary to produce the most accurate indoor location information.³⁰ Sprint agrees with Qualcomm that, “For purposes of this rulemaking, there is no question that the FCC should consider the capabilities of all indoor positioning technologies including their ability to be ubiquitously deployed successfully, timely, and cost-effectively by wireless carriers before the agency institutes rules for E911 indoor location accuracy.”³¹

There are unique issues associated with using these existing technologies that will need to be considered, and these will need to be factored into any associated compliance timelines. Cisco outlines a number of these concerns, and proposed solutions, in its Comments.³² Sprint discussed some of the issues associated with commercial location based services (“cLBS”) in its initial Comments filed in this proceeding.³³ For example, Sprint pointed out that the quality, reliability and redundancy built into the existing voice 9-1-1 service model for location information was not built into commercial location services, and attempting to impose the same level of quality, reliability and redundancy standards on commercial location services would be a

²⁷ Cisco Comments at 4.

²⁸ Qualcomm Comments at 8; AT&T Comments; T-Mobile Comments at 9; Intrado Comments at 11; Verizon Comments at 11.

²⁹ Ericsson Comments at 4; Verizon Comments at 31; AT&T Comments at 4; ITI Comments at 5-6; iPosi Comments at 7; Intrado Comments at 9.

³⁰ TCS Comments at 19.

³¹ Qualcomm Comments at 6-7.

³² Cisco Comments at 9-10.

³³ Sprint Comments at 13-14.

time-consuming and costly endeavor.³⁴ In addition, with current commercial location services, a user is capable of disabling GPS location services on the device and there is currently no “override” that exists on most carrier handsets.³⁵ The CSRIC LBS report also outlined similar concerns related to the use of cLBS for 9-1-1 purposes.³⁶ Another factor that will impact the accuracy associated with location information provided via certain types of devices, including small cells, femtocells, Bluetooth beacons, and WiFi hotspots, is whether those devices can be moved by the user.³⁷ In addition, as discussed further herein, a database will need to be developed to catalog the addresses of these devices and there will need to be a way of ensuring addresses are updated as devices are moved.

The existing technologies discussed above should also be assessed in a test bed environment, as some commenters have suggested.³⁸ The test bed developed for CSRIC III, which was primarily designed for evaluating radio frequency measurement mechanisms, would need to be modified to include unique performance metrics for these technologies.

C. Moving toward a “dispatchable address” has been suggested and should be explored, while taking into account the complexities involved and the need for involvement by all stakeholders.

Multiple commenters have suggested moving toward a “dispatchable address.”³⁹ As Intrado discusses, “While significant financial investment can be made to marginally increase indoor X,Y accuracy, if the X,Y coordinate is not accurate enough to locate which door the emergency caller is behind, there is little additional value to the first responder.”⁴⁰ AT&T makes

³⁴ *Id.*

³⁵ *Id.*

³⁶ CSRIC LBS Report.

³⁷ See Qualcomm Comments at 8; Rx Networks Comments at 5.

³⁸ T-Mobile Comments at 9.

³⁹ Intrado Comments at 2-5; AT&T Comments at 1-2; Cisco Comments at 4; Verizon Comments at 10.

⁴⁰ Intrado Comments at 4.

a similar argument: “Rather than wasting scarce resources on incremental improvements in location accuracy that will not be appreciably more effective than the data we are presently generating, the Commission should focus on providing public safety with what it needs, a dispatchable address, especially since forcing providers to near-term solutions would significantly delay implementation of a dispatchable-address solution.”⁴¹ Public safety has indicated a preference for dispatchable address information.⁴² According to APCO, “Of course, 50 meters is still far from the level of accuracy generally needed for a dispatchable address (providing floor, room number, *etc.*), and will not be useful in every situation, so it cannot be the end of the progression towards improved location accuracy.”⁴³ If public safety’s ultimate goal is to have a dispatchable address that will allow first responders to knock on the door where the actual emergency is occurring, it may be a better use of the industry’s time and limited resources to work toward this goal rather than pursuing incremental improvements. The proposed benchmarks outlined in the NPRM will not necessarily move public safety any closer to the goal of a receiving a dispatchable address. Ultimately the goal of providing a dispatchable address may be attainable, however, by utilizing existing technologies such as WiFi and Bluetooth location information.

Moving in the direction of providing a dispatchable address should be explored. There will be complex issues associated with such an effort, but it is possible to address and overcome these complexities through cooperation and collaboration by all stakeholders, including carriers and public safety. One of the biggest complexities associated with moving toward a dispatchable address will be the development of a database that ties technology infrastructure to civic

⁴¹ AT&T Comments at 1-2.

⁴² NASNA Comments at 5; APCO Comments at 3-4.

⁴³ APCO Comments at 3-4.

addresses. A national database will need to be developed and populated so that WiFi “hotspots” and Bluetooth beacons are cataloged and associated with a dispatchable address. Developing this type of database is outside the scope of CMRS carriers’ normal business operations. Any such database would need to be developed with involvement of multiple stakeholders. There will also be important administrative issues associated with any such database, including who would develop, own and maintain the database. In addition, distinguishing between trusted and non-trusted sources will be a significant undertaking for the administrator of such a database.

In addition to database development work, carriers may also need to engage in network development work associated with routing in order to enable emergency services to query the dispatchable address from an entity not currently in the call path.⁴⁴ With respect to the handset, handset manufactures will need to enable the handset to search for Bluetooth or WiFi 9-1-1 call data. Standards development work will also be needed to include Bluetooth beacon identification information and MAC addresses for WiFi hotspots. Assuming that a dispatchable address could be provided in the future, providing a dispatchable address will not eliminate uncertainty. There will always be some measure of uncertainty, which will need to be calculated and communicated to PSAPs, and they will need to address this uncertainty factor through appropriate processes and procedures.

D. The burden should not fall on CMRS carriers alone to develop technologies that can address the need for improved indoor location accuracy.

As Cisco aptly argues, “Although CMRS carriers should remain an important part of the process, they should not bear sole responsibility for generating location data for PSAPs. 911 Service Providers, such as TCS and Intrado, now should play a more critical role aggregating data from various sources, such as location technologies used by CMRS carriers, commercial

⁴⁴ While Secure User Plane (“SUPL”) routing standards already allow for such a query, some carrier networks, including Sprint’s CDMA network, are control plane rather than SUPL.

location-based services, WiFi access points, and smartphone applications that generate location fixes.”⁴⁵ T-Mobile makes a similar argument: “To attain truly actionable indoor location requires buy-in and development from all stakeholders – not just wireless carriers, but also public safety, handset manufacturers, location technology vendors, mobile operating system providers, state and local governments who regulate building codes, and, perhaps most critically premises owners.”⁴⁶ Sprint agrees and raised similar concerns in its initial Comments, including the need to involve the building industry.⁴⁷

The National Association of State 911 Administrators (“NASNA”) suggests that perhaps the model building codes maintained by the International Code Council (“ICC”) should require beacon locator technology to be included in building design.⁴⁸ This suggestion demonstrates the innovative thinking that is needed to address the issues related to providing indoor location information, and Sprint supports this and similar suggestions that have been made in this proceeding.⁴⁹ Beacon systems could be integrated into building fire alarm systems. Fire alarm standards could be updated to include these beacons and local fire codes updated to include the new regulations. There would be benefits to this approach since fire alarm and sensor power issues would be addressed. Useful, relevant information could be transmitted when a fire alarm is reported (for example, information regarding where the fire was reported/detected). In theory all building structures of all uses and types could have this technology added to all accessible spaces, except perhaps for abandoned buildings. This would also promote the development of

⁴⁵ Cisco Comments at 6.

⁴⁶ T-Mobile Comments at 2.

⁴⁷ Sprint Comments at 17-19.

⁴⁸ NASNA Comments at 5.

⁴⁹ AT&T Comments at 3-4; Intrado Comments at 11-12.

beacons specifically designed for public safety organizations' needs instead of other purposes such as wireless coverage enhancement.

E. The Commission should not adopt a Time-to-First-Fix requirement that is less than 30 seconds.

Numerous commenters support the proposal to give carriers 30 seconds to generate an initial location fix and argue in favor of including only calls lasting 30 seconds or more in yield calculations.⁵⁰ A few commenters, however, urge the Commission to adopt a Time-to-First-Fix (“TTFF”) requirement that is less than 30 seconds.⁵¹ The TTFF should remain at 30 seconds. The CSRIC III Working Group 3 considered the 30 second TTFF requirement as part of the Outdoor Location Accuracy Report issued in March 2012 and recognized that 30 seconds is the *de facto* standard for maximum latency in E9-1-1 location delivery.⁵² The CSRIC III Working group III used the 30 second TTFF timeframe as the benchmark for the CSRIC III Indoor Location Accuracy Test Bed.⁵³ There are multiple variables outside of the control of CMRS carriers that affect the TTFF, such as the number of satellites that are visible and atmospheric conditions. In addition, when turning on location for any call, a device takes time to acquire the necessary satellites to determine location, and many consumers disable location services and only turn them on when needed. Since a 9-1-1 call will automatically trigger the location services to look for satellites, anything less than the 30 seconds currently included in ATIS standards may result in fewer and less accurate location fixes for consumers trying to contact public safety.

⁵⁰ AT&T Comments at 34-35; CTIA Comments at 18-19; NextNav Comments at 41-44; NTCA Comments at 6-7; T-Mobile Comments at 21.

⁵¹ True Position Comments at 20-21; CALNENA Comments at 1.

⁵² CSRIC III Working Group 3 Outdoor Location Accuracy Final Report (March 14, 2012), Section 4.2, page 12, *available at* <http://transition.fcc.gov/bureaus/pshs/advisory/csric3/CSRIC-III-WG3-Final-Report.pdf>

⁵³ CSRIC Indoor Location Test Bed Report, Section 7.6.1, page 37.

F. PSAP readiness is a key component to the success of any indoor location accuracy proposals.

As a number of commenters have discussed, there is no clear indication that public safety would be able to translate z-axis information into building/floor locations.⁵⁴ As Motorola Mobility observes, “Just as industry is not ready to deploy vertical location information on a widespread basis, the public safety community is not prepared to receive it.”⁵⁵ Some commenters suggest that it will not be difficult to make vertical location information available to PSAPs for their use.⁵⁶ Although, many of the standards used in the routing and delivery of 9-1-1 calls today allow for an optional field to support altitude information, this does not necessarily mean that PSAPs will be able to immediately use this information or associate this information with a specific location. NextNav has not demonstrated how vertical height would be converted into a floor location. A trusted source will need to convert the measured altitude into a meaningful calculation, taking into account varying floor heights. The validity of this data would need to be tested, since most public safety responders are not set-up to utilize the data today. NextNav recognizes there are no databases currently implemented to convert measured height to floor level for individual buildings, but suggests looking to building and altitude information that is available from providers such as Google (Google Earth in 3D building mode), Pictometry Inc., and others.⁵⁷ There have been no studies, however, to examine whether these databases meet the quality, coverage and availability required by the PSAPs. In addition, PSAPs may incur licensing fees associated with accessing this building information.

⁵⁴ AT&T Comments at 17; T-Mobile Comments at 10; Rural Wireless Association at 4; CTIA Comments at 20; Verizon Comments at 26; Qualcomm Comments at 17.

⁵⁵ Motorola Mobility Comments at 15.

⁵⁶ NextNav at 20-21.

⁵⁷ NextNav Comments at 22.

Not all PSAPs are set up to receive vertical information. This was discussed in the CSRIC LBS Report: “Also, the data formats supported by PSAPs will also need to evolve. For example, some PSAPs are now incapable of receiving Z-height, and Z-height uncertainty. Moreover, the PSAPs’ GIS databases would also need to support Z-height. Therefore, they would need to update their equipment to support this.”⁵⁸ As with horizontal location information, vertical location information will have an associated uncertainty value. Since the vertical measurement technology is likely to be different from the horizontal measurement technology, it will have an independent uncertainty value. All PSAP interfaces and PSAP operational procedures may not support presentation of vertical location uncertainty information.

III. CONCLUSION

Sprint supports ongoing industry efforts to work toward improving 9-1-1 location accuracy. The Commission should not, however, move forward with the proposed requirements outlined in the Third FNPRM, particularly since available 9-1-1 location accuracy technology has not been shown to meet the proposed requirements in all morphologies. All technology options should be explored and evaluated before the Commission takes further regulatory action and moving in the direction of a “dispatchable address” should be considered further.

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⁵⁸ CSRIC LBS Report at pg. 15.