

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

In the Matter of)	
)	
Wireless E911 Location Accuracy Requirements)	PS Docket No. 07-114
)	
Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems)	CC Docket No. 94-102
)	
Association of Public-Safety Communications Officials-International, Inc. Request for Declaratory Ruling)	
)	
911 Requirements for IP-Enabled Service Providers)	WC Docket No. 05-196

COMMENTS OF ROSUM CORPORATION

Rosum Corporation (“Rosum”) hereby responds to the above-captioned Notice of Proposed Rulemaking (“Notice”), in which the Federal Communications Commission requests comment regarding Wireless E911 Location Accuracy Requirements.

Rosum supports and applauds the Commission’s effort to improve the reliability and accuracy of E911 systems. In this comment, Rosum focuses on tentative

conclusions and proposals provided by the Commission in Section III.B, or the second phase, of the Notice. In doing so, Rosum references prior comments submitted in regards to Section III.A, or the first phase of this Notice, which solicits comments on whether the Commission should adopt a proposal by the Association of Public-Safety Communications Officials-International (APCO) that Wireless E911 Phase II accuracy and reliability be measured at the public safety answering point level. Rosum notes information provided in regards to Section III.B may be relevant to Section III.A.

About Rosum.

Rosum is a privately-held company based in Mountain View, California, in Silicon Valley. Rosum was founded in 2000 for the precise purpose of developing robust location technology that works indoors and in urban canyons, namely, where GPS-based solutions are most challenged. These are environments where multipath signals, which typically degrade the performance of Time-of-Arrival or Time Difference of Arrival (TOA/TDOA) based positioning systems such GPS or cellular UTDOA, are prevalent – indeed, where multipath can be assumed – and Rosum has developed pioneering signal processing techniques for the mitigation of signal multipath. As a result, Rosum is able to reliably and accurately position devices even in environments characterized by harsh multipath. Among Rosum’s founders and advisors are the original architects of the GPS constellation.

Rosum has developed and deployed location technology that utilizes broadcast television (TV) signals, both analog and digital, for position location. Rosum has also developed and deployed technology that combines signals (ranges) from TV transmitters and GPS satellites, for hybrid positioning that works where neither individual signal source would work as a standalone system. Indeed, TV and GPS are highly complementary signal sources – GPS is most effective in open sky and rural environments; TV transmitters, by virtue of being highly correlated with population density and broadband penetration, are most effectively used for position location in suburban and urban areas. The result is a system that is greater than the sum of its parts.

It should be noted that weaker signals can be used for position location than is required to demodulate picture. This allows them to be used at ranges of 50-100km from the transmitter, depending on power and terrain.

Rosum has also successfully positioned with other broadcast “signals of opportunity” such as analog FM signals, and has implemented hybrid positioning using TV and cellular systems. In general, Rosum specializes in positioning using terrestrial broadcast signals (TV / FM / DAB etc) and positioning using terrestrial broadcast signals combined with GPS signals.

TV infrastructure. The broadcast TV infrastructure is distributed and robust. Backup power is commonly found at the studio and transmitter. It is also highly correlated with population density and broadband availability. The TV infrastructure is already used for emergency services such as the Emergency Alert System (EAS). In some cases backup power may be funded by the Department of Homeland Security. The National Association of Broadcasters received presidential commendation after its role in preserving communications in the wake of the Gulf State hurricanes of 2005. In a public safety context, this distributed, redundant infrastructure makes it a highly valuable and reliable asset for information delivery and location determination.

Capabilities. In both testing and fielded applications, Rosum focuses on environments where GPS is most challenged – indoors, urban canyons, and parking structures. This effectively replicates wireless telephony use, as research is available that indicates the majority of wireless calls and wireless 9-1-1 calls are made from indoors¹.

Rosum categorizes itself as a subscriber terminal-based positioning technology and thus has held itself to the Phase II E911 accuracy requirements for handset-based solutions. Rosum notes that its customers often hold it to a higher accuracy standard than those promulgated by the Commission

¹ http://www.usatoday.com/money/industries/telecom/2007-04-22-e911-systems_n.htm

In 2004, the Network Reliability and Interoperability Council, in its NRIC VII Focus Group 1A final report², made the recommendation that 5% of test calls for OET-71 compliance testing be made from indoors “because no data currently exists that defines the actual number of wireless 9-1-1 calls made from indoors and because of practical limitations of location technologies currently deployed.” As indicated above, it has been asserted that the majority of wireless calls and wireless E911 calls are made from indoors³.

To address this trend, Rosum recently commissioned OET-71⁴ compliance testing to be conducted by a third-party testing firm. Tests were conducted in five PSAP jurisdictions in five states – Santa Clara, California; Nashua, New Hampshire; Edison, New Jersey; Washington DC; and Needham, Massachusetts. During these tests, roughly 50% of test calls were placed from indoor environments. Indoor sites were randomly selected based on methodologies published by the Alliance for Telecommunications Industry Solutions (ATIS), in its ATIS-05000111 guideline⁵. Having held itself to a standard far more stringent than NRIC VII, Rosum was still compliant with Phase II E911 requirements for handset-based solutions in all five PSAPs⁶. Further testing is ongoing.

² http://www.nric.org/meetings/docs/meeting_20051216/FG%201A_Dec%2005_Final%20Report.pdf

³ Press articles cite research by the Monitor Group, a consulting firm.

⁴ http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet71/oet71.pdf

⁵ http://www.atis.org/esif/_mem/Docs/ATIS-0500011.pdf

⁶ http://www.rosum.com/Rosum_PhaseIIE911_compliancerelease.pdf

The Commission should incorporate advances in location technologies and in hybrid location offerings in its analysis.

Hybrid solutions. The Commission has solicited comment on how location technologies have advanced since wireless E911 solutions were first adopted, and whether the “use of hybrid technologies that employ both handset- and network-based technologies” should impact its analysis. The Commission notes the use of A-GPS and AFLT as one example of a hybrid handset and network-based location technology offering.

Rosum agrees with the assessment that use of multiple location inputs can make a location determination system more robust, in part by being less susceptible to a single point of failure, in part because hybrid solutions can jointly be effective where neither individual input would work as a standalone. The decision to productize and deploy TV+GPS hybrid positioning was in large part driven by these two factors. Rosum adds that hybrid solutions need not necessitate substantive investment cost. Hybrid solutions can leverage components with their own commercial purpose within the device, such as TV RF components, or, at a minimum, with substantive commercial market economies of scale.

Rosum notes that other commenters, such as Polaris Wireless, Inc.,⁷ and TruePosition, Inc.⁸, also have noted the benefits of combining hybrid solutions.

Recognizing that understanding what new location determination capabilities are available is part of the Commission's goal in this solicitation, Rosum encourages the Commission to broaden the definition of "hybrid" beyond use of "network-based equipment with handset-based location technologies" to "use of multiple location inputs, either in standalone or in tandem, to determine position location". This is in part to acknowledge that multiple location inputs may reside off-device, i.e., in the "network", and/or multiple location inputs may reside on the device. TV signals combined with GPS signals are one example where both sets of ranges are measured at the subscriber terminal.

Further, the current handset versus network bifurcation may be somewhat forced, particularly in the case of multi-mode or multi-function devices. Are TV signals used by devices with TV reception capability network-based or handset-based? Are 802.11x signals network-based or handset-based? In a dual-mode (cellular / 802.11x) implementation, which network should be used? What if the network used for location determination doesn't belong to the service provider that provided the customer her subscriber terminal? Maintaining this bifurcation necessitates these

⁷ See Comments of Polaris Wireless, Inc., PS Docket No. 07-114, filed July 5, 2007.

⁸ See Comments of TruePosition, Inc., PS Docket No. 07-114, filed July 5, 2007.

questions. Also, as the Commission notes, maintaining this bifurcation may lead to confusion among consumers as to what accuracy to expect from their handset.

Further, doing away with this categorization may enable regulation to more nimbly adapt to always-evolving means of telecommunications. This is a notion embedded within the Commission's tentative conclusion to "establish a single location accuracy requirement irrespective of technology", a question Rosum addresses later in this filing.

As noted above, location technologies have indeed progressed in the seven years that have passed since OET-71 was issued. This is a function of market demand in commercial and government markets, and not just a function of regulation. For example, GPS-based solutions' shortcomings indoors and in urban canyons are widely acknowledged. Conversely network-based solutions' limitations in rural areas with sparse network topologies are also widely noted. The technology sector – both incumbents and new entrants, through use of either purpose-deployed signals (i.e., beacons or mesh networks for public safety) and signals of opportunity (TV, FM, DAB, WLAN) - has moved to address these gaps. In its analysis, the Commission should thoroughly gather information on what capabilities new solutions and enhanced incumbent solutions may possess. Further, analysis of capabilities should extend to include key considerations such as technology readiness, deployability, and cost.

The Commission should strive to enhance accuracy and availability in rural areas, indoors, and in urban areas.

The Commission has solicited comment on whether it should adopt a uniform accuracy standard, noting that it is “inclined to require that the uniform accuracy standard be at least as stringent as that currently in place for handset-based technologies”. Rosum encourages the Commission to examine the two sets of customers generally held to be most adversely impacted by incumbent solutions: urban/indoor customers of service providers providing handset-based (i.e., GPS) solutions; and rural customers of service providers utilizing network-based solutions (i.e., UDTOA). Handset-based solutions generally require line-of-sight to the sky, which may not be possible in urban areas; to meet the Commission’s accuracy standards, network-based solutions generally require denser network topographies than are available in rural environments.

Urban and suburban customers may spend an entire day without clear line-of-sight to the sky. As such, Rosum encourages the Commission to examine location technology options that enable real-time position location of customers, in indoor and urban settings, from a “cold start”, be they indoors or out. Rosum notes that

in its OET-71 compliance testing, all tests were done from a cold start, indoors and out.

With regards to rural customers, Rosum believes accuracies in keeping with those required of handset-based solutions can be delivered via hybrid location technology offerings.

Rosum notes that the rollout of handset-based technologies required handset upgrade cycles. Use of hybrid offerings would likely necessitate the same process. Upgrades and enhancements in the network also require time and resources to deploy. Should the Commission require upgrades in location determination capability or adherence to one common standard, Rosum recommends seeking stakeholder consensus as to when this would be feasible, through industry groups such as those formed following the WARN Act.

The Commission should create a regulatory framework that can adapt to new technology platforms.

The Commission has presented the tentative conclusion that “to the extent an interconnected VoIP service may be used in more than one location, providers must employ an automatic location technology that meets the same accuracy standards that apply to those CMRS services.” Rosum supports this conclusion.

Providers of interconnected VoIP services are to be commended for the rapid pace with which they responded to the Commission's VoIP 911 order. Some service providers even stopped marketing service in areas where they did not have ready access to 911 components, which is an act with tremendous business ramifications.

Currently VoIP subscribers self-provide their own address, which is stored in a database. With nomadic use, subscribers may not know the precise address of their new location, or may simply forget to update their address. Automatic location determination capability would be of substantive value to consumers in such a scenario.

The boundaries between landline, wireless and VoIP are blurring.

Rosum notes that there is a blurring of boundaries between landline, wireless, and VoIP. Against this backdrop, Rosum commends the Commission for attempting to move beyond reactive solutions, and specifically notes three trends.

- **The growth in wireless-only subscribers.** At present, some 10% of wireless subscribers are wireless-only. In some metropolitan areas, this is as high as 19%. This trend is most dramatic in younger demographics. For these customers, the wireless phone is the home phone. The boundary between wireless phone and home tethered phone, in terms of function, is thus

blurring, and the level of dependency on the wireless phone as a lifeline in case of emergency is thus growing.

- **The residential transition to VoIP.** By 2010, it is estimated that some 30 million residences will have transitioned to VoIP services.
- **Projected growth in use of “femtocells”.** Some 5 million home base stations or femtocells, used to improve cellular coverage in buildings with poor cellular coverage, are projected to ship within the US by 2010. These will require indoor location capability for activation and 9-1-1 purposes.

What is clear is that the boundaries that once clearly demarcated wireline, wireless, and VoIP telephony are now blurring. As such Rosum supports the Commission’s initiative in seeking create a future-ready, uniform standard.

Rosum supports the Commission’s goal to enhance the reliability and accuracy of E911 solutions, and also notes that this is a process to be undertaken thoughtfully. First and foremost, Rosum encourages the Commission to weigh heavily the interests of consumers of telecommunications services, i.e., those whose lives are most affected and hopefully enhanced by E911 solutions.

Respectively submitted,

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