

**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
)	

REPLY COMMENTS OF ROSUM CORPORATION

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

Advances in location technology can bring industry closer to the Commission's goal of PSAP-level compliance.

In its Report and Order released September 11, 2007,¹ the Commission described a five-year time horizon over which carriers must reach PSAP-level E911 compliance by September 2012. This Order is predicated upon the fundamental assumption that location technology performance in currently problematic areas can and will be improved. Rosum commends the Commission for its prompt and decisive action to improve the performance of E911 solutions.

Numerous comments have indicated concern on the part of industry that no one location determination solution exists that will deliver E911 compliance at the PSAP level.² One commenter has submitted corroborative engineer testimony to this end.³ This is likely true – all location solutions, be they RF or IP or network-based (both cellular and VoIP) or even self-provisioning, have their shortcomings. However, what is clear is that substantive advances have been made since the Commission's initial ruling on Wireless E911, and that they continue to be made. Rosum urges the Commission to take a pragmatic stance - to create a regulatory framework that will lead to substantive improvement in E911 performance, and not to take the all-or-nothing, binary view shown in some comments.

The bulk of comments on the current docket have focused largely on incumbent solutions in these two categories: handset-based GPS, and network-based UTDOA. This is a natural reflection of market reality and a reflection of the Commission's initial decision to create a

¹ See FCC News Release "FCC Clarifies Geographic Area Over Which Wireless Carriers Must Meet Enhanced 911 Location Accuracy Requirements", released September 11, 2007.

² See Sprint Nextel Comments at 6, filed August 20, 2007; Qualcomm comments at 3, filed August 20, 2007; T-Mobile Comments at 3, filed August 20, 2007.

³ See Qualcomm Comments at 2, filed September 4, 2007

bifurcated regime with two solution categories – network-based, and handset-based. The Commission itself has noted that this ruling was not technology-neutral, in that it created a “lower standard for only one technology”.⁴

In its previous comment, Rosum noted that this bifurcation could be artificial in light of new RF capabilities and multi-mode devices.⁵ New industry product offerings such as femtocells (home base stations) are another example – cellular calls are routed over a network access provider’s network, usually DSL or cable. The network access provider may be a separate company, without a billing relationship with the customer whose data, or 9-1-1 call, it is routing over its network.

In issuing the current 07-114 docket, and its Report and Order of September 11, the Commission has made the judgment that E911 solutions deployed today can and must be improved. It is generally agreed by all participants in the docket that network-based solutions are most challenged in rural areas, and handset-based solutions are most challenged in urban areas with poor line of sight to the sky. Multiple comments from the location technology sector indicate that performance improvements in both of these areas are possible today.⁶

The five-year phase-in of PSAP-level compliance testing will serve to expose the strengths and weaknesses of incumbent E911 location determination solutions. What is missing, and what is at the heart of Section III.B of the PS 07-114 docket, is a recommendation of how improve the capabilities of solutions shown to be non-compliant. Rosum recommends that the Commission

⁴ See PS Docket No. 07-114, in the Matter of Wireless E911 Location Accuracy Requirements, at 5

⁵ See Rosum Corporation comments at 7, filed August 14, 2007.

⁶ Ibid; see TruePosition and Polaris Wireless comments, filed August 20, 2007

specifically define the performance problems it is trying to solve, and then define desired performance attributes. The Commission should focus its analysis on those areas generally acknowledged across industry to be most problematic – again, performance of network-based solutions in areas with sparse cell site deployments or “string of pearls” deployments, and performance of handset-based solutions in urban areas. APCO’s Project LOCATE report is a useful starting point for this analysis.⁷

Hybrid solutions will be more robust than “single-input” solutions.

Rosum agrees with the assessment that hybrid location solutions are indeed more robust than those using a single signal source. Rosum has already proven this in practice with its hybridization of TV+GPS-based positioning. Rosum seconds the comment that use of non-correlated location inputs will create a solution less susceptible to single points of failure.⁸ Rosum adds that this premise is at the heart of its work in the defense industry. As stated in its previous comment, 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”.⁹

⁷ See Final Report of APCO Project Locate, April 2007.
http://www.locatemodelcities.org/documents/LOCATE_Final_Report.pdf

⁸ See Polaris Wireless comment at 5, filed August 20, 2007.

⁹ See Rosum Corporation comment at 7, filed August 14, 2007.

Handset upgrades are an integral part of the cellular industry's business model.

Some comments have shown concerns about any decision by the Commission that would necessitate handset upgrades, due to the time required to develop, verify, deploy and market new handsets.¹⁰ This process can indeed take 18 to 24 months.

Rosum notes that a two-year upgrade cycle is a standard part of carriers' business model. Subscribers are typically offered discounts on a new handset at the end of a two-year service contract. This mitigates subscriber churn and also is a means to deliver enhanced capabilities to subscribers, which in turn can maintain or increase subscriber ARPU. As such, it can be said that a biannual handset upgrade cycle is an integral part of the cellular industry's business model and a natural vehicle by which new capabilities, such as improved E911 capability, can be delivered to customers.

Rosum also notes that one comment indicates integration of UTDOA and GPS data at the network level would require 18 months.¹¹ This is approximately the same time as is required to introduce a new handset. As such, handset-based enhancements may not require a substantively different time-to-market than creation of handset / network hybrid solutions.

While handset upgrades are a fundamental part of the cellular industry's business model, this model is not yet present in interconnected VoIP services. As the Commission considers adding automatic location capability to nomadic interconnected VoIP services, it should consider how

¹⁰ See Polaris Wireless comment at 9, filed August 20, 2007.

¹¹ See TruePosition comment at 5, filed August 20, 2007.

best to address incumbent VoIP customers who already have purchased their customer premise equipment, typically an analog terminal adapter.

One comment cited network end point-based solutions as a means of delivering automatic location capability for VoIP E911 calls.¹² This capability does indeed exist today and is used to respond to CALEA requests. However, Rosum notes that this method is typically not used in real-time, and usually requires expensive transaction costs to query the network. Other IP-based solutions, such as those proposed by the Internet Engineering Task Force (IETF), are indeed promising; however, they remain years from being deployable.

As noted previously, network end point-based solutions also pose a customer ownership issue. The network access provider may be a separate company, without a billing relationship with the customer placing the 9-1-1 call. Further, getting access to network end points may engender the same difficulties encountered in getting access to the selective router during the initial rollout of E911 for interconnected VoIP services. This delayed VoIP E911 rollout in some geographies. This may be an issue requiring Commission involvement.

One comment indicated the Commission, by its tentative conclusion that nomadic interconnected VoIP services must employ an automatic location technology with accuracy on a par with CMRS services, “shoots too low”.¹³ Nomadic VoIP service is indeed, at present, largely portable, not mobile, and as such the use scenario does differ from the true mobility offered by CMRS services. However, VoIP services are indeed becoming more mobile, as indicated by the recent

¹² See Vonage America comment at 6, filed August 20, 2007.

¹³ See NENA comment at 11, filed August 20, 2007.

growth in mobile WiMax services. Further, there may be cases where the customer is indeed fixed in one location, but may not know his address, or may not be able to self-provide it through a browser or over the phone with a call taker, or simply may have forgotten to update it.

As such, while automatic location capability on a par with that required by CMRS services may be seen as not as precise as that deliverable through self-provisioning, it will still be of clear benefit to consumers.

Additional information on use of broadcast TV signals for position location and timing.

In this reply comment, Rosum also submits additional information on use of TV for position location and timing for telecommunications assets.

(1) Indoor power levels of TV signals relative to cellular, GPS, and WiMax signals.

Rosum, after an exhaustive survey of broadcast “signals of opportunity”¹⁴, elected to utilize broadcast television signals for position location due to multiple characteristics of TV signals that make it a natural resource for indoor and urban-area position location. Those include: (1) high-power signals, with kilowatt or megawatt ERP commonplace; (2) low frequency signals, which are designed for delivery of broadcast content through walls; (3) frequency-diverse broadcasts, with multiple broadcast channels coming from one transmitter, thus mitigating dependence on a single signal source; (4) horizontally oriented signals, which are ideal for passing through office or residential wall and windows, as opposed to through multiple floors of steel and concrete from above, like GPS.

¹⁴ Generally defined as opportunistic use of RF transmitters for position location and navigation. Examples include TV, FM, pager towers, cell sites, VOR, even GPS jammers.

The diagram below provides information on the signal power of TV relative to three other signal sources: cellular, GPS, and WiMax. Power levels are shown in dB relative to TV.

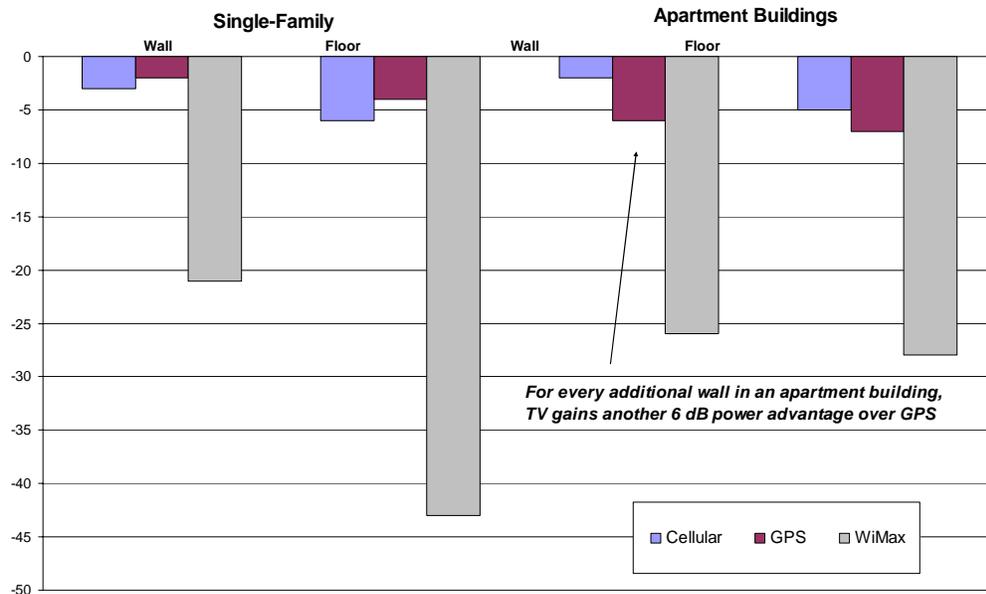


Figure 1: Marginal power of cellular, GPS and WiMax as compared to TV in indoor settings. Source: NIST Construction Automation Program Report No. 3, Electromagnetic Signal Attenuation in Construction Materials, National Institute of Standards and Technology, October 1997.

Rosum submits this information on relative indoor power levels as evidence of signals that can be used to improve indoor solution availability from a cold start, be it for Wireless, Interconnected VoIP, or femtocells.

(2) Further information on PSAP-level compliance testing.

In its previous comment, Rosum submitted information on results of E911 compliance testing conducted by third-party testing provider.¹⁵ The table below summarizes the results of that testing. 50% of test calls were placed indoors to match actual consumer calling patterns. Tests were conducted at 30 sites per PSAP, 15 indoors, and 15 outdoors. All units are in meters.

¹⁵ See Rosum Corporation comment at 5, filed August 14, 2007.

PSAP	Environment	Cumulative Results			Compliance	
		50% CEP	67% CEP	95% CEP	Handset	Network
Nashua, NH	Rural / Suburban	23	31	66	Yes	Yes
Needham, MA	Rural / Suburban / Urban	27	33	63	Yes	Yes
Santa Clara, CA	Suburban / Urban	28	36	65	Yes	Yes
Washington, DC	Urban / Dense Urban	37	49	86	Yes	Yes
Edison, NJ	Suburban / Urban	38	50	83	Yes	Yes

Table 1: Summary of Third-Party PSAP Compliance Testing

Testing spanned five PSAPs in five states with a variety of environments, ranging from rural to suburban to urban to dense urban.

(3) Side-by-side testing with high-sensitivity GPS.

Rosum also submits the results of side-by-side testing conducted in August 2007 with a broadly deployed high-sensitivity GPS solution. All tests were conducted indoors, inside buildings of varying construction. A Rosum receiver and a GPS receiver were placed next to each other.

Site	Location	Construction	TV 67% CEP	GPS 67% CEP
Pizza Hut	Santa Clara, CA	Easy	39m	66m
Mexicali Grill	Santa Clara, CA	Easy	26m	54m
Diesel Store	Santa Clara, CA	Moderate	75m	Failed
Hilton Hotel	Santa Clara, CA	Difficult	32m	2396m
City Hall Coffee Shop	Santa Clara, CA	Difficult	46m	Failed
Montgomery BART Station	San Francisco, CA	Extreme (underground)	54m	Failed

Table 2: Results of side-by-side testing of Rosum TV-positioning with high-sensitivity GPS.

(4) Information on the cost of TV RF tuners.

A number of comments have indicated concerns that handset upgrades to enhance E911 performance may be costly. Here Rosum presents general market information on the cost and capabilities of TV tuner components. TV tuners can be broken into two parts: RF tuner and demodulator. The cost of TV RF tuners in volume is held to be between \$2 and \$2.50. Demodulator costs are typically similar, between \$2 and \$3. TV-positioning does not require demodulation and thus requires only the RF tuner to function.

By comparison, the ASP of wireless GPS solutions broadly available today is between \$6 and \$7. Further, the cost of adding TV RF tuners pales in comparison to that already incurred during the rollout of UTDOA solutions. One comment notes that the cellular industry has already spent billions of dollars on developing and maintaining E911 systems.¹⁶

For mobile devices already designed for TV reception, Rosum can be embedded using only software. Rosum is currently in two developments to embed its positioning capability in TV-capable mobile devices.

Rosum commends the Commission for its action to enhance the E911 location determination capabilities available to consumers. Questions about this comment may be directed to the undersigned.

Respectively submitted,

/s/ Skip Speaks

Skip Speaks
Chief Executive Officer
Rosum Corporation
301 North Whisman Road
Mountain View, CA 94043

Jon Metzler
Business Development Director
Rosum Corporation

Jim Green
Counsel to Rosum
Mercury Strategies, LLC.

¹⁶ See CTIA comment at 2, filed August 20, 2007.