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

In the Matter of	)	
	)	
Service Rules for the 698-746, 747-762 and 777-792 MHz Bands	)	WT Docket No. 06-150
	)	
	)	
Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band	)	PS Docket No. 06-229
	)	
	)	
Amendment of Part 90 of the Commission's Rules	)	WP Docket No. 07-100

REPLY COMMENTS OF ALCATEL-LUCENT

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REPLY COMMENTS OF ALCATEL-LUCENT

Alcatel-Lucent replies to comments submitted in response to the Commission's Fourth Further Notice of Proposed Rulemaking in the above-captioned proceeding, seeking to create an effective technical framework for ensuring deployment and operation of a nationwide interoperable public safety broadband network ("PSBN").[1]

I. INTRODUCTION AND SUMMARY

The record in this proceeding demonstrates that there is overwhelming support for moving forward to deploy a nationwide interoperable PSBN. As Alcatel-Lucent stated in its Comments, there are many technically feasible and legitimate network architectures that could serve the needs of public safety. As such, the Commission should first determine the desirable governance model for administering the PSBN (*i.e.*, a single nationwide body, several regional bodies, etc.). The governance model will drive the choice of an appropriate

[1] *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band; Amendment of Part 90 of the Commission's Rules*, Third Report and Order and Fourth Further Notice of Proposed Rulemaking (rel. Jan. 26, 2011) ("*Fourth Further Notice*").

network architecture that will in turn put all interested parties in a better position to move forward with implementation of the chosen architecture.

Although there are a number of technically feasible choices for network architecture, there were certain proposals made in the initial comments that are not advisable. For example, suggestions advocating a network architecture with hundreds of networks would be problematic. As discussed further below, such a scheme could add to the substantial expense of building and operating the PSBN and would complicate network interoperability. Moreover, Alcatel-Lucent opposes any solutions that are not supported by established technical standards. 3GPP standards provide the foundation for achieving the goal of a nationwide PSBN via various potential network architectures (including a network-of-networks approach or through use of a single or multiple geographically distributed cores across the United States).

Alcatel-Lucent supports an open standards process for developing technology for the PSBN. While Alcatel-Lucent recognizes the need for proprietary solutions that differentiate vendors through value-added products and services, proprietary technology should not be allowed to jeopardize interoperability or functionality. The 3GPP standards process strikes the correct balance by allowing innovation while guarding against the types of proprietary solutions that can ultimately impede interoperability and functionality of the nationwide network. For similar reasons, Alcatel-Lucent opposes proprietary requirements for hand-off and roaming that are not supported by 3GPP. With respect to applications, Alcatel-Lucent agrees that defining standardized virtual private network ("VPN") protocols should be an early priority in order to ensure various public safety applications are interoperable. As further discussed below, the Commission should encourage simultaneous support for IPv4 and IPv6, and the Commission should not mandate intra-domain security.

Alcatel-Lucent recognizes the importance of interoperability testing and has engaged in substantial testing of its LTE public safety equipment at the National Institute of Standards and Technology ("NIST"), as the Commission required in its 2010 *Waiver Order*, permitting 21 public safety entities conditional authority to pursue early deployment of broadband networks within their jurisdictions.[2] The NIST testing is rigorous. The Commission should not take any actions that would disadvantage those vendors who have engaged in such early efforts at NIST to make the PSBN a reality.

As a final matter, the record makes clear that use of the PSBN by federal users should be encouraged. In addition, the public interest would be served by utility and critical infrastructure entities (collectively "CII") having access to the public safety broadband spectrum as secondary users. The comments submitted make clear that access by CII is permissible under Section 337 of the Communications Act.

II. ESTABLISHING A GOVERNANCE MODEL IS CRUCIAL TO DECIDING THE TECHNICAL DETAILS OF NETWORK ARCHITECTURE

As Alcatel-Lucent stated in its Comments, there are various network architectures that would be technically feasible for a nationwide interoperable PSBN, from a single geo-redundant core and single, nationwide public land mobile network identifier ("PLMN id") to as many as 50 or more PLMN ids – one for each state or major city. Because there is substantial flexibility from a technical perspective, Alcatel-Lucent respectfully submits that the key to choosing the network architecture is to first determine the preferred governance model for the public safety network.

In other words, if the Commission determines that administration of the public safety network should be overseen on a state-by-state basis, that would potentially require each state to have its own PLMN id. In contrast, if the PSBN is ultimately administered on a

[2] *See Requests for Waiver of Various Petitions to Allow the Establishment of 700 MHz Public Safety Broadband*

national or regional level that aggregates several states, that likely would counsel for a different, possibly smaller, number of PLMN ids. There are, of course, technically superior ways to implement a particular architecture, but it is premature to focus on the details of implementation of any particular architecture when the question of governance model remains unsettled. Therefore, Alcatel-Lucent urges the Commission to determine the governance model first, so that the parties then have a basic framework within which to consider strategies for implementation.

Notwithstanding that there are a range of viable governance and system architecture options, there are certain architectures proposed in the initial comments that are not advisable. For example, IPWireless Inc.'s ("IPWireless's") and Motorola Solutions Inc.'s ("Motorola's") proposal to deploy hundreds of individual networks does not appear practical.[3] Such a dispersed network architecture fails to recognize the cost of operating LTE networks that are significantly more sophisticated than today's P25 communications networks, and the LTE networks require more specialized expertise to maintain and implement. For example, substantial expertise is needed to manage the required interfaces to provide seamless roaming between the larger number of neighboring networks that would result from a larger number of LTE networks. Therefore, a widely dispersed network core (*i.e.*, one that goes much beyond 50 cores) would likely be problematic from a cost and personnel perspective, which ultimately could impede network performance.

In that same vein, in its advocacy for a highly dispersed network, IPWireless erroneously argues against any concept of a single core network and/or backbone network for public safety.[4] IPWireless incorrectly claims that a single core could create a single point of failure, increase backhaul transmission costs, risk failure in a major disaster when it is needed

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Networks, 25 FCC Rcd 5154, ¶¶ 60-61 (2010) (*"Waiver Order*").

[3] Comments of IPWireless Inc. 9-10; Motorola Solutions Inc. at 4.

[4] Comments of IPWireless Inc. at 6.

most, and potentially slow the prompt rollout of networks.[5] Experience demonstrates these concerns are unfounded. Many commercial service providers are successfully using the strategy of a single core that is geographically distributed over a small number of sites. This single core architecture does not create a single point of failure because of the geographic redundancy and diverse connectivity deployed in such networks. Furthermore, commercial providers are able to mitigate against increased backhaul transmission costs by deploying local serving gateways ("SGW") and packet data network gateways ("PDN-GW").

Certain other architecture proposals are problematic, and should not be adopted, because they call for solutions that are not supported by any standards. The Commission already has determined, "given the overwhelming record," that it "will require that all networks deployed in the 700 MHz public safety broadband spectrum adopt LTE, specifically at least 3GPP Standard E-UTRA Release 8 and associated [Evolved Packet Core]."[6] Consistent with the Commission's finding, Alcatel-Lucent urges the Commission to reject proposals that are not supported by 3GPP standards. For example, Harris Corporation's ("Harris's") proposed strategy to have distributed local home subscriber server ("HSS") for sub-region traffic, but roll the content up to a centralized HSS,[7] is a network architecture not supported by standards. As such, Harris's proposal should not be considered for public safety networks.

It also bears mentioning that, for a single PLMN id architecture, Alcatel-Lucent does not agree with Motorola's position that the single PLMN id in the hybrid scheme would be a "virtual" PLMN id.[8] Use of a virtual PLMN id requires a proprietary approach for the user equipment, and – as pointed out by Motorola[9] – is not supported by 3GPP

[5] *Id.*

[6] *Fourth Further Notice*, ¶ 10.

[7] Comments of Harris Corporation at 9.

[8] Comments of Motorola Solutions Inc., Technical Appendix at 11.

[9] *Id.*

standards. Therefore, a use of a "virtual" PLMN id should not be adopted. Instead, for the hybrid PLMN id framework, Alcatel-Lucent supports a "traditional" nationwide PLMN id that leverages the Multiple Operator Core Network ("MOCN") and Gateway Core Network ("GWCN") capabilities defined in 3GPP TS 23.401, Section 4.3.11 and further specified in 3GPP TS 23.251.

III. THE COMMISSION SHOULD ENSURE AN OPEN STANDARDS PROCESS THAT AVOIDS ANTI-COMPETITIVE PROPRIETARY SOLUTIONS

Alcatel-Lucent cautions the Commission against allowing manufacturers or service providers to build into their products proprietary layers that lock in customers to a single solution. The Commission already has intimated that proprietary technologies could pose "dangers" to interoperability, and sought comment on those potential dangers.[10] Alcatel-Lucent respectfully submits that the risks of allowing proprietary technologies extend beyond the ability to interoperate. Propriety technologies could potentially impede competition and raise costs to public safety by, among other things, raising barriers to public safety organizations switching to new solutions over time that may be able to offer greater value.

There is wide agreement that an open standards process is essential to optimizing innovation and competition in the public safety network.[11] In fact, at outset of this proceeding the Commission noted the recognized benefits of open standards, including increased competition, reduced costs, and broader dissemination of equipment.[12] To implement an open standards process, Alcatel-Lucent continues to recommend the Commission consider the OMB Circular No. A-119 consensus standards process for developing public safety specific functionalities and capabilities outside of the 3GPP

[10] *Fourth Further Notice*, ¶ 28.

[11] *See, e.g.,* Comments of IPWireless Inc. at 7; Comments of Harris Corporation at 12; Comments of Nokia Siemens Networks US LLC at 6.

standardization process. In addition, LTE, today, is being rolled-out commercially and has cross-licensing practices that are creating a competitive environment that has not been available in the past when deploying public safety networks. Thus, Alcatel-Lucent believes that adoption of open standards via an open consensus process will allow for participation by public safety and vendors and the use of cross-licensing practices that are essential to ensuring increased competition in the public safety marketplace.

Moreover, 3GPP standards facilitate the types of innovation that allow vendors to add value and differentiate their offerings in an open process that protects interoperability and competition. Where 3GPP standardizes interfaces related to functionality and interoperability, those standards must be followed. The open standards process, presided over by 3GPP, will ensure that proprietary standards serve to add value to the PSBN, not impede innovation and raise costs to public safety organizations. 3GPP has served as the forum for setting such standards for public safety LTE to this point, and it should continue to be looked to as the appropriate forum for continuing to set standards for public safety LTE.

IV. 3GPP ROAMING AND HANDOFF STANDARDS SHOULD BE FOLLOWED

Alcatel-Lucent reiterates its position that standards for handoff and roaming between public safety LTE networks and between public safety LTE and commercial LTE networks should be covered by existing 3GPP standards. The Commission should reject roaming standards developed outside the 3GPP process. For example, Alcatel-Lucent disagrees with Layer 2 Connections, LLC's proposal to define and mandate that roaming handoff – whether intra-system or inter-system – be defined explicitly as requiring a "Make-Before-Break" seamless transition.[13] The 3GPP standards today define how handoff across

[12] *Fourth Further Notice,* ¶ 27.

[13] Comments of Layer 2 Connections, LLC at 15.

different networks is achieved, and we urge the Commission to not vary from those standards.

V. STANDARDIZATION OF VPN PROTOCOLS SHOULD BE A PRIORITY

In its Comments, Alcatel-Lucent agreed with the NPSTC Broadband Task Force Report's finding that VPN access should be among the applications that should be clearly defined for early deployment in the nationwide PSBN. Alcatel-Lucent further agrees with IPWireless's view for the need of standardization of VPN Protocols used in the public safety network.[14] As IPWireless notes, "access to public safety *applications* will not be interoperable unless there is standardization of VPN protocols used, and agreed user authentication policies / governance."[15] Moreover, such standardization should facilitate interactions between the VPN equipment and the LTE network to assure the quality of service features provided by LTE can be leveraged when using a VPN. Thus, Alcatel-Lucent supports early standardization of VPN access.

VI. THE COMMISSION SHOULD ENCOURAGE SIMULTANEOUS SUPPORT FOR IPV4 AND IPV6 NETWORKS

The record in this proceeding confirms that the Commission should not mandate an all IPv6 network.[16] LTE has been designed to support IPv4 and IPv6 at the same time, and contemplates migration from IPv4 to IPv6 in the 3GPP messages and procedures. For all-IP LTE transport, the simplest solution is to have dual-stack LTE core networks hence, avoiding the costly conversion from one format to another. This is available from all network equipment manufacturers by default. In this way, the LTE IP nodes at the edge of

[14] Comments of IPWireless Inc. at 17 (emphasis in original).

[15] *Id.*

[16] *See* Comments of Nokia Siemens Networks US LLC at 10; Comments of Ericsson Inc at 9-10.

the network (eNodeB and public safety applications) can migrate to IPv6 at the pace dictated by the services supported at the edge of the dual-stack network.

VII. INTRA-DOMAIN SECURITY SHOULD NOT BE MANDATED

Alcatel-Lucent believes that intra-domain security is warranted in some cases, but that use of intra-domain security solutions should not be mandated by the Commission. The use of IPsec tunnels between the eNodeB and the Evolved Packet Core termination is necessary to define a secure perimeter irrespective of the link type. For example, microwave encryption is not sufficient for secure connectivity since only the physical layer is protected, leaving the IP layer exposed in segments where wireline transport is used. For network inter-connectivity security, the standard GSMA IR.77 is obsolete and is based on old and non-secure approaches. Instead, Alcatel-Lucent recommends the use of 3GPP TS 33.310 release 9 where the complete set for inter-domain and intra-domain network layer security standards are specified (with mention to ciphers, protocol profiles, key management using X.509 digital certificates and methods of authentication). Such specifications are more in line with modern and secure Internet methods and approaches.

VIII. ANY TESTING REQUIREMENTS SHOULD INCORPORATE SUBSTANTIAL TESTING EFFORTS ALREADY UNDERTAKEN

Two key aspects of testing are conformance testing of the LTE infrastructure and interoperability testing. Self-certification of the LTE infrastructure equipment against conformance testing is the most appropriate approach to ensuring that equipment will work properly when deployed. The PSBN should benefit from *all* testing done by vendors on behalf of their commercial customers, including all integration testing, feature testing, network level testing, etc.

For interoperability testing, commercial standards, such as 3GPP, and commercial systems have been at the forefront, thus enabling – from the outset – domestic

and international roaming. In that regard, Alcatel-Lucent asserts that roaming interfaces, which are key to interoperability between multiple vendors' equipment, should be the focus of interoperability testing. While commercial service providers typically require this testing to be done in the providers' test labs, this is not a viable approach for public safety. Therefore, the Commission has positioned NIST as the entity to perform interoperability testing. In its 2010 *Waiver Order*, the Commission mandated public safety jurisdictions to deploy systems of vendors that participate actively in the ongoing NIST/Public Safety Communications Research ("PSCR") public safety LTE program.[17] It is on that basis, and in good faith, that Alcatel-Lucent remains the only vendor with a full end-to-end LTE system consisting of 4 eNode-Bs and a full core deployed in NIST/PSCR labs. Over the last six months, Alcatel-Lucent's LTE equipment has undergone a battery of tests according to NIST specifications.

Alcatel-Lucent respectfully suggests that the Commission establish a funding mechanism to ensure such testing continues to take place through NIST. Moreover, the Commission should not take any actions with respect to testing that would disadvantage Alcatel-Lucent or other vendors or waiver recipients that have moved forward with testing at NIST. The NIST testing is rigorous and should be considered sufficient under any future testing regime. Any other result could slow deployment of waiver recipient networks, which would be to the overall detriment of roll-out of the nationwide PSBN.

IX. ACCESS BY FEDERAL AND CII SERVES THE PUBLIC INTEREST

The record demonstrates that federal users should be permitted to use the PSBN.[18] As Alcatel-Lucent noted in its Comments, federal first responders will provide an

[17] *Waiver Order* at ¶¶ 60-61.

[18] *See, e.g.,* Comments of the National Public Safety Telecommunications Council at 21-22; Comments of the Public Safety Spectrum Trust at 22-23; Comments of the Minnesota Department of Public Safety, Division of Emergency Communication Networks at 11-12.

increase in the demand for devices on the PSBN and will make it more attractive for device equipment vendors to participate in the solution. Furthermore, in advocating for federal use of the PSBN the Minnesota Department of Public Safety asserts:

> One of the most significant routine barriers to public safety interoperability is the lack of a single frequency band for all of public safety and the lack of a single technology standard for public safety wireless voice systems. . . . Were all public safety users – state, federal, local, and others – on the same frequency band and using the same wireless air interface standard, this barrier to interoperability may be completely eliminated.[19]

The administrative and technical details of federal use can be determined once the PSBN governance model is chosen.

The record similarly supports CII access to the 700 MHz public safety broadband spectrum on a secondary basis, as such access will enhance coordination during emergencies and, importantly, spread the costs for building the public safety broadband network.[20] The Public Safety Spectrum Trust recognizes:

> Network user eligibility should include local, tribal, state and federal governmental entities that are not considered public safety core users, as well as health care, transportation and critical infrastructure industry entities (*e.g.*, utilities), as long as core public safety agencies (*e.g.*, police, fire and emergency medical services) are in control of and manage priority access.[21]

Indeed, the Commission indicated in the NPRM that there would be significant benefits from CII access to 700 MHz spectrum.[22] As the Los Angeles Regional Interoperable Communications System Authority ("LA-RICS") explains in its comments, "Catastrophic events require the participation of utilities and critical infrastructure entities, along with

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[19] Comments of the Minnesota Department of Public Safety, Division of Emergency Communication Networks at 11-12.

[20] *See, e.g.,* Comments of the Los Angeles Regional Interoperable Communications System Authority ("LA RICS") at 5; Comments of Alcatel-Lucent at 24-28; Comments of the State of New Mexico at 9-15; *see generally* Comments of the Utilities Telecom Council; Comments of the Edison Electric Institute; Comments of the Southern Company Services, Inc.

[21] Comments of the Public Safety Spectrum Trust at 22.

[22] *NPRM* at ¶ 135.

police, fire and EMS in order to respond to and recover from emergency events."[23] Furthermore, the record demonstrates that the Commission has ample authority to permit use of public safety broadband spectrum by CII. The legislative history of Section 337, the plain language of the statute and the Commission's own prior rulings show that Section 337 of the Act permits CII access to the public safety spectrum.[24]

X. CONCLUSION

For the forgoing reasons, the Commission should take actions to achieve an interoperable nationwide PSBN as recommended by Alcatel-Lucent in its Comments and Reply Comments in this proceeding.

Respectfully submitted,

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[23] Comments of LA RICS at 5; *see also* Comments of APCO at 10 ("[M]uch of what utilities do does involve the safety of life, health or property, and interoperability with utilities is often essential for the protection of life, health or property.").

[24] *See* Comments of Alcatel-Lucent at 24-28; Comments of the State of New Mexico at 9-15; Comments of the Edison Electric Institute at 7-11; Comments of the Utilities Telecom Council at 6-39; Comments of the Southern Company at 11-21.