

Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

In the Matter of )  
 )  
Model City for Demonstrating and Evaluating ) ET Docket No. 14-99  
Advanced Sharing Technologies )  
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**REPLY COMMENTS OF FEDERATED WIRELESS, Inc.**

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## Executive Summary

Federated Wireless, Inc. (formerly Allied Communications, LLC), a subsidiary of Allied Minds Federal Innovations, is headquartered in Boston, Massachusetts with offices in Reston, Virginia. Federated Wireless was founded in 2012 by globally recognized wireless and radio communication leaders to enable and commercialize technologies to unlock the enormous potential of dynamically shared spectrum resources.

We applaud the Federal Communications Commission's (FCC) ongoing efforts to advance spectrum experimentation and innovation, which include adopting streamlined rules for experimental licensing, and praise the National Telecommunications and Information Administration (NTIA) and National Institute of Standards and Technology (NIST) for taking steps to create the Center for Advanced Communications ("CAC") to facilitate federal spectrum sharing experiments and evaluations. We encourage these entities to proceed with the direction stated in the Public Notice ("PN") to establish a Model City according to the guidelines set forth in the PCAST report.<sup>1</sup>

The Public Notice ("PN") states that the purpose of the Model City includes the demonstration and evaluation of advanced spectrum sharing technologies across multiple bands, including public safety and selected federal bands. Federated Wireless proposes that the Model City test infrastructure include a commercial Federal Spectrum Access System (FSAS) to manage the registration and authorization of commercial experiments that impact public safety and federal bands. The envisioned commercial FSAS will protect sensitive system information while providing a simple automated method to authorize and manage spectrum experiments, including commercial experimental devices that conform to the General Authorized Access

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<sup>1</sup> PCAST, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth (rel. July 20, 2012) ("PCAST Report").

(GAA) device rules of the 3550-3650 MHz Further Notice of Proposed Rule Making ("FNPRM")<sup>2</sup>. These rules include location reporting, maximum power control, transmission power control, interference reporting, and transmission cessation. The proposed commercial FSAS could contribute to experiments conducted in the Model City using federal and public safety spectrum with observable, controllable impact to federal and public safety systems. The commercial FSAS infrastructure would greatly streamline and simplify the creation and execution of Model City experiments, facilitating experiments by commercial device researchers and developers, potential Spectrum Access System (SAS) administrators, and related public interest CAC spectrum sharing and system experiments. Further, many of the experiment regimes proposed during the Radio Experimentation proceedings (e.g., low power in band with protected users and "exclusive use" facilities) could be accommodated in this paradigm. However, we call for an abundance of caution in the formulation of the CAC role and mission, specifically with respect to its potential for unfair competition with the commercial sector, particularly with respect to competing with startup companies seeking to commercialize shared spectrum technology innovations.

In this filing, we describe the envisioned role of the commercial FSAS in the Model City, proposed requirements for operation of the commercial FSAS in the Model City, how Part 5 (Experimental Radio Service) regulations should be changed to accommodate the Model City commercial FSAS paradigm, and how the Model City commercial FSAS could be leveraged by CAC experiments. We advise that the rules preclude the CAC from providing FSAS products or services since in doing so the CAC would be competing with the commercial sector. As evidenced in numerous successful outsourcing programs, the public interest is better served by

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<sup>2</sup> FCC, Further Notice of Proposed Rule Making In the Matter of Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket 12-354, April 23, 2014.

outsourcing where essentially governmental functions are not involved, so we advise that the FSAS be outsourced for greater innovation and quicker market uptake than providing FSAS functions via the CAC.

**I. THE MODEL CITY INFRASTRUCTURE SHOULD INCLUDE A COMMERCIAL FSAS TO SIMPLIFY APPROVAL AND MANAGEMENT OF COMMERCIAL EXPERIMENTATION AND FACILITATE FEDERAL EXPERIMENTATION**

As wisely anticipated by the Commission in its modified experimental licensing rules,<sup>3</sup> providing greater flexibility to conduct multiple experiments without repeating the experiment application process will enhance innovation and shorten the time to market for new spectrum sharing technologies. But these rules adopt a more encumbered approval process for operation in protected federal and public safety bands, which is contrary to the goals for the Model City. For instance, the Public Notice ("PN") states that the purpose of the Model City includes the demonstration and evaluation of advanced spectrum sharing technologies across multiple bands, including public safety and selected federal bands.<sup>4</sup> Instead, the detailed technical parameters for experimentation in these federal bands would require experiment approval from the FCC and transmission approval from the Interdepartmental Radio Advisory Council (IRAC), both of which are time consuming processes. Supporting the Model City experiments would entail an order of magnitude greater fidelity of parameters and update rate than heretofore experienced by the FCC or IRAC. This is a problem as spectrum sharing with federal systems is the most unique spectrum sharing problem to be tackled by the Model City and will require technical and policy innovation.

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<sup>3</sup> See FCC, *Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules*, ET Docket No. 10-236, *Report and Order*, 28 FCC Rcd. 758 (Feb. 2013), available at [http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-13-15A1\\_Rcd.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-13-15A1_Rcd.pdf).

<sup>4</sup> PN, p. 1

To help streamline and manage the Model City experimentation approval process and to provide a mechanism for automatic protection of incumbent federal systems in the Model City, Federated Wireless proposes that the Model City test infrastructure include a commercial Federal Spectrum Access System (FSAS) that will manage the baseline operation of the experimental devices and will authorize and manage the technical parameters and dynamics of experimental Spectrum Access Systems (SAS) in the bands shared with federal systems. The following are key considerations to implementing this Federated Wireless proposal for the Model City.

- The FCC would authorize specific types of experimental radios for operation in spectrum shared with federal users. Briefly, these radios would be required to satisfy the rules for General Authorized Access (GAA) devices in the 3550 MHz band<sup>5</sup> in that they would be required to perform the following under control of a Model City SAS:
  - regularly report their location;
  - follow commands to adjust maximum transmission power, change operating frequency sets, and cease transmission;
  - measure spectrum occupancy and report interference levels.
- The FCC and NTIA would designate a commercial FSAS that would operate in a manner similar to the commercial FSAS proposed for use in collaborative spectrum sharing in the 3550 MHz band.<sup>6</sup> Specifically, the Model City commercial FSAS would have the following characteristics:
  - the Model City FSAS commercial personnel would collaborate with CAC, NTIA, NIST, Department of Defense (DoD), Department of Homeland Security (DHS),

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<sup>5</sup> See FCC FNPRM as applied to §96.31, §96.33, §96.35, §96.36, §96.37, §96.38

<sup>6</sup> See Reply Comments of Federated Wireless to Further Notice of Proposed Rule Making In the Matter of Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, Aug 15, 2014.

and FCC personnel to define and implement exclusion zones, receiver harm thresholds, and related protection mechanisms;

- the Model City commercial FSAS would provide interfaces to obfuscate frequency, power, and signal characteristics of federal incumbents available for Model City SAS implementations (experimental and dedicated) for incumbent systems; the commercial FSAS may provide unobfuscated information when deemed allowable by the associated protected user community commercial FSAS technical liaison points of contact, e.g., at DoD, DHS, and the Federal Bureau of Investigation (FBI).
- the Model City FSAS would provide interfaces accessible by NTIA / NIST personnel in the Center for Advanced Communications (CAC) that would facilitate experimentation with:
  - protection mechanisms and policies by adjusting the rules implemented by the commercial FSAS according to CAC-specified schedules that are flowed down by the commercial FSAS to operational details and dynamics needed for specific experiments within the CAC-specified framework.
  - novel spectrum sharing federal communications systems by accessing interference reports from the Model City GAA devices that are logged by the commercial FSAS.
- A dedicated Model City SAS that would implement the multi-SAS competitive functionality of the 3550 MHz band (extended to other bands) that would directly interface with the experimental Model City GAA devices to set maximum power levels, operating frequencies, enable / disable transmission, and collect

interference reports (forwarded to the commercial FSAS for CAC oversight) and other logging information.

The following clarifications provide further insight into this proposal:

- Model City devices not operating in the protected bands would not have to comply with the Model City GAA device rules.
- The commercial FSAS should test GAA devices to assure that their parameters for signal measurement, forwarding to the FSAS via competing SAS realizations and for control via FSAS commands through the competing SAS networks, are achieved on operationally effective time lines for federal incumbents and do not suffer from, e.g., the hidden node problem.
- The commercial FSAS should provide test sequences to competing SAS systems and should provide test results, findings, and recommendations to the FCC, NTIA, and CAC for governmental action such as SAS certification.
- Beyond complying with the minimum Model City GAA device functionality rules outlined above, researchers and developers making use of Model City GAA compliant devices should be free to experiment with their devices, protocols, and policies within the Model City geographic footprint.
- Other experimental Model City SAS implementations should be permitted as long as these implementations interface effectively to the commercial FSAS and meet the minimum operational requirements set out above. The Model City GAA devices would be free to choose which SAS to use based on collaboration agreements between Model City experimenters. The dedicated Model City SAS plus Model City commercial FSAS are provided to ensure a sufficient level of infrastructure for device experimentations

without harmful interference to federal, state, or local (e.g., emergency responder) communications.

- The Model City commercial FSAS and dedicated Model City SAS would remain under ultimate control of the FCC and NTIA and will be a key piece of experimental infrastructure. As such, their initial deployment should be funded out of spectrum relocation funds dedicated to supporting spectrum sharing experimentation and operational costs could be funded by Model City experimental licensing fees as set by the FCC.
- The Model City commercial FSAS should be funded in part by commercial entities conducting experiments in the Model City so that the commercial FSAS has financial responsibility to the commercial sector. Structuring fees so that the commercial FSAS is funded 60% commercially and not more than 40% by federal stakeholders including high interest stakeholders like the US Navy, FBI, etc., would balance market reality with national security to best achieve the public interest.

## **II. RECOMMENDATIONS FOR THE MODEL CITY COMMERCIAL FSAS**

Similar to the commercial FSAS proposed for enabling collaborative spectrum sharing with federal users in the 3550 MHz band<sup>7</sup>, the Model City commercial FSAS should be responsible for the technical and interpersonal interfaces to the federal, state, and local incumbent spectrum users and should act as the designated technical interface for assigning frequencies (e.g., channels within bands) and maximum power levels (per device, per antenna direction) to Model

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<sup>7</sup> Reply Comments of Federated Wireless to FNPRM, pp. 5-13.

City devices or experimental SASs in protected bands. Technical assignments by the commercial FSAS would be derived by the commercial FSAS from the Model City license parameters based on device locations, ID, and policies and information determined by the NTIA and related agencies (e.g., device locations, protection distances, allowable powers). The commercial FSAS would be responsible for achieving, first and foremost, fairness among competing commercial entities serviced by various Model City SAS entities. The commercial FSAS also orchestrates, validates, and, where necessary, provides technical tools (e.g., neural network signal categorization, improved network security) for appropriate obfuscation, for protecting sensitive information, and for providing the necessary interference protection guidance to any SAS experiments in the Model City. The commercial FSAS would provide synchronization and would centralize the ultimate responsibility for interference management and enforcement with federal incumbents while minimizing risk to national security.

The Model City FSAS requirements should include, at a minimum:

1. Personnel having Department of Defense (DoD) SECRET security clearances (or above) and having additional in-depth understanding of and access to more sensitive RF knowledge to enable the FSAS to manage and enforce the protection of federal incumbents on commercial industrial time lines.
2. Existing Research and Development agreement(s) with the DoD and other relevant agencies that enable rapid convergence on mechanisms to provide commercial use of unused DoD spectrum while obfuscating the sensitive details of incumbent capabilities and limitations.
3. Demonstrating a scalable SAS architecture having a secure Federal SAS instance orchestrating experimental SAS instances provided by multiple alternative commercial

entities and employing open interfaces in a way that promotes experimentation and research into SAS designs without risking the sacrifice of national security information.

4. Demonstrating the ability to ascertain the presence of incumbents and mitigate interference to incumbents through secure message exchange with a SAS (i.e., by commanding CBSD devices to cease use of channels) and with Model City devices that wish to communicate directly with the Model City FSAS.
5. Demonstrating the ability to record data necessary for audit and to analyze audit trails effectively with respect to commercial issues (e.g., who caused harmful interference to whom between competing commercial entities) and with respect to the public interest (e.g., what policies, implementations, and operations cause unacceptable degrees of risk to public safety, law enforcement, and other statutory obligations of the Model City taken as an entire system versus as the sum of its parts).

### **III. PROPOSED MODIFICATIONS TO FCC EXPERIMENTAL LICENSING RULES**

The Commission wisely adopted streamlined Experimental Licensing Rules (Part 5) to facilitate greater spectrum innovation and experimentation. But these rules adopt a more encumbered approval process for operation in protected federal and public safety bands, which are key bands for experimentation in the Model City. Herein, Federated Wireless proposes to streamline this process for Model City experimentation by use of a commercial FSAS for authorization and management of experiments in these protected bands in the Model City.

While many of the rules for Program Experimental Licenses could be applied to the Model City (which would then presumably be a designated Innovation Zone), the use of a commercial FSAS for delegated authorization of experimental devices should be accompanied by the following changes in the FCC experimental licensing rules to maximize innovation and streamlined experimentation in the Model City.

A new class of experimental license and Subpart to Rule 5 should be created to clearly declare that the existing experimental rules remain in-force outside of the Model City and that the new Subpart only applies in the Model City to protected bands. This class would largely duplicate the requirements of Subpart E with the following modifications.

- §5.303 (Frequencies), §5.304 (Area of Operation), and §5.308 (Stop Buzzer) should be modified to bring these rules in line with the device rules proposed for General Authorized Access use in the 3550-3650 MHz band<sup>8</sup>, specifically as they relate to reporting location, external control of maximum power, allowable frequencies of operation, and ceasing transmission.
- §5.53 (Station authorization required) should be modified to permit authorization in Model City areas by a recognized FSAS or experimental SAS under control of a commercial FSAS via authority delegated by the FCC.

In addition to streamlining experimentation in the Model City, modifying the Experimental Licensing rules to support a commercial FSAS controlled class would have the following benefits to the Experimental Licensing regime:

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<sup>8</sup> FCC, Further Notice of Proposed Rule Making In the Matter of Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket 12-354, April 23, 2014.

- Proposed experiments in restricted frequencies in the Model City under FSAS control would not have to be approved on a case-by-case basis; instead they would proceed via automated authorization by FSAS assuming prior device approval by the FCC.
- Classes of experiments proposed by Boeing and others that would have operated in restricted bands with reduced transmit power<sup>9</sup> could be permitted in the Model City and managed by the Model City FSAS without interference to protected federal and public safety systems.
- The "exclusive-use" facilities considered in the Experimental Licensing proceedings<sup>10</sup> could be managed in a manner consistent with the Contained Access Facilities proposed for the 3550-3650 MHz band FNPRM.

#### **IV. PROPOSED RELATIONSHIP OF FSAS WITH NTIA AND NIST CENTER FOR ADVANCED COMMUNICATIONS**

The PN indicated that the NTIA and OET “seek comment on how the Center for Advanced Communications (CAC) could work as an impartial facilitator with the federal and non-federal stakeholders and local governments to develop feasible test plans, minimize regulatory issues and constraints, monitor experimental deployments, and evaluate and report the test results”. NIST brings to the CAC a culture of technical oversight entailed in standards-setting. The NIST technical contributions as envisioned by OET and as realized by NIST therefore would be in-

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<sup>9</sup> Comments of Boeing to Notice of Proposed Rule Making in the Matter of Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules (ET Docket No. 10-236) and 2006 Biennial Review of Telecommunications Regulations - Part 2 Administered by the Office of Engineering and Technology (OET) (ET Docket No 06-155).

<sup>10</sup> Comments of Boeing.

depth, credible, and absolutely unbiased with respect to alternative implementations, clearly without competitive bias of any sort.

NTIA, on the other hand, has deployed its fee-for-use contract R&D agreement (CRADA) system by which NTIA competes with the commercial sector for commercial wireless technology business. Although the legal description of the CRADA presents the fee-for-use service in public interest terms as cost reimbursement, the commercial sector recognizes that all competition is competition regardless of how politely stated. In this case, NTIA competes for what it accurately terms Telecommunications Analysis (TA) services. As stated on their web page, “NTIA/ITS-ITS performs telecommunications research and develops application programs and software models for TA Services”.<sup>11</sup> Some might argue that NTIA should offer the software on a free download basis to US entities, e.g., as is the case with the GNU Radio community. NTIA therefore, from at least one legitimate perspective, appears to be willing to compete unfairly with alternatives offered by commercial sector entities such as startup companies offering innovative TA services but unable to price them as low as NTIA’s CRADA pricing. If NTIA were offering their services and software as a public service at no cost, e.g., in the same way that TV white space database companies do not charge to use their services, then NTIA’s contribution to the CAC would not be subject to question regarding motive or opportunity for unfair competition with commercial SAS offerings.

As a startup company offering TA services into the spectrum sharing market, Federated Wireless feels it is necessary to ask the CAC to take extra steps to avoid even the appearance of the CAC unfairly competing for TA services of any kind, but especially for SAS or SAS-like support to the Federal users, what Federated Wireless terms the Federal SAS. Specifically, we recommend that the CAC preclude itself from offering SAS services of any type whatsoever; we

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<sup>11</sup> See <http://www.its.bldrdoc.gov/cradas/its-fee-for-use-crada.aspx>.

recommend that the CAC preclude itself from offering any spectrum innovations whatsoever and that the CAC preclude its employees and contractors from filing patent applications on any wireless technology whatsoever during a term of tenure at the CAC or while supporting the CAC to any degree. Although the intent of NIST and NTIA informing the CAC may be strictly in the public interest, unfair competition with the commercial sector is a slippery slope calling for extreme caution lest the Government's obligation to not compete with the private sector be compromised. The Model City concept in particular calls for an abundance of caution in this regard.

In the Model City, the CAC might be expected to instrument and control the operation of all experimental federal and public safety systems. The CAC working in conjunction with the federal agencies and departments with systems in the Model City might be responsible for working with a commercial FSAS (or FSAS administrator) to define appropriate protection rules to be promulgated to commercial spectrum sharing entities (organizations and devices) and to be enforced by the FSAS. The CAC could then leverage a commercial FSAS to help facilitate its own experiments in the Model City as follows:

- Using the FSAS and the instrumentation of the protected systems, the CAC could perform experiments on different protection schemes and policies to assess their performance and viability; the CAC must assure that it does not compromise commercial intellectual property (IP) by replicating trade secret protection schemes or patents applied for, unfairly denying commercial entities the right to protection of IP; the CAC must assure that it does not favor NIST or other government inventions above those of the commercial sector; the CAC must conform to best NIST practices since its findings regarding protection schemes would be tantamount to standards setting.

- The results of the interference reports from the Model City GAA devices could be used by a commercial FSAS to help assess the interference impact of experimental federal systems on commercial devices; the CAC should work with commercial FSAS suppliers on an equal access basis within national security constraints. In order to promote competition, the CAC should provide sufficient resources, process, and procedure to work with qualified commercial FSAS suppliers, e.g., via not-for-fee CRADA or by joining as a third party to an existing CRADA between a commercial FSAS supplier and another federal agency such as the DoD, and the Defense Information Systems Agency (DISA).

## **VI. CONCLUSION**

For the foregoing reasons, Federated Wireless encourages the FCC and NTIA to continue making progress towards promoting and enabling experimentation with innovative spectrum technologies and policies. Incorporating a commercial FSAS into the Model City infrastructure with GAA rules for devices operating in protected Model City Spectrum would streamline experimentation by commercial and government entities while securely protecting critical wireless systems. Extending the FSAS proposed for collaborative coexistence management of 3550 MHz spectrum to the Model City will allow productive government-commercial spectrum sharing experimentation to quickly commence to drive comprehensive solutions to emerging spectrum challenges.

Respectfully submitted,

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