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March 15, 2018

Mr. Joel Taubenblatt
Deputy Bureau Chief
Wireless Telecommunications Bureau
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: *Proposal of Fairspectrum LLC for Certification as a SAS Administrator; Request for Supplemental Information (GN Docket 15-319)*

Dear Mr. Taubenblatt:

Fairspectrum LLC ("Fairspectrum") hereby responds to the Letter ("RFI") dated February 21, 2018,[1] in which the Wireless Telecommunications Bureau of the Federal Communications Commission ("FCC") requested supplemental information regarding proposal ("Application") of Fairspectrum LLC for Certification as a SAS Administrator[2]. Fairspectrum appreciates the opportunity to respond to the RFI. This response repeats each question posed in the Letter and provides Fairspectrum response. The response content is updated in the Fairspectrum Application and the sections, where the updates are located, are marked in this response. For example, "Section References" in bold in this response indicates that the text below "Section References" has been added to the section References in the Application.

1. Please include an affirmation that Fairspectrum will comply with all applicable international agreements (§ 96.53(n))

Section References
47 C.F.R.§ 96.53 Spectrum access system purposes and functionality.
Section 8 Affirmation to comply
Fairspectrum affirms that it will comply with all applicable international agreements (§96.53(n)).

2. Please explain in detail how the SAS will communicate with CBSD proxies in required information exchanges. (pgs. 12-14) (§ 96.57(b))
Section 1.2 Registering, authenticating, and authorizing
A Domain Proxy may represent a number of CBSDs according to WINNF-16-S-0016[3] or its latest version (WINNF-TS-0016[4]). When the Domain Proxy represents a number of CBSDs, TLS mutual authentication is

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[1] Letter from Joel Taubenblatt, Deputy Bureau Chief, Wireless Telecommunications Bureau to Barlow Keener, Legal Advisor of Fairspectrum LLC dated February 21, 2018.
[2] Application of Fairspectrum LLC to be designated as a Spectrum Access System Administrator in FCC Electronic Comment Filing System (ECFS) on May 25, 2017.
[3] WINNF-16-S-0016 Version 1.0.1. 22 December 2016. SAS to CBSD Technical Specification.
[4] WINNF-TS-0016 Version 1.2.1. 3 January 2018. SAS to CBSD Technical Specification.

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carried out between the SAS and the Domain Proxy. A successful authentication is prerequisite for all SAS-CBSD and SAS - Domain Proxy procedures. If there is a Domain Proxy and the Domain Proxy is performing bulk CBSD registration, the Domain Proxy aggregates registration information for multiple CBSDs. The Domain Proxy sends an array of RegistrationRequest objects to the SAS which represents the aggregated CBSD registration information. Upon reception of the array of RegistrationRequest objects, the SAS initiates registration for each CBSD. The SAS responds with an array of RegistrationResponse objects, each containing a registration response to a CBSD. A Domain Proxy correlates the response objects with request objects using the JSON array object order. JSON arrays are ordered sequences; as such, a multiple request message or multiple response message contains an ordered sequence of objects. Domain Proxies, SASs and CBSDs preserve array ordering. SASs receiving a message having an array of request objects shall responds with an array of response objects in which the order of the response objects is exactly matched to the order of the request objects.[5]

3. Please affirm that except as set forth in Section 96.15, there will be no authorization of the operation of CBSDs within protection zones. ((§ 96.57(d)))
Section 11 Interference protection methods
Fairspectrum SAS does not authorize operation of CBSDs within Protection Zones except as set forth in §96.15.

4. Will the SAS require CBSD's to confirm the frequency ranges used? If so, please describe the process in detail. (Pgs. 14-15) (§ 96.59(a)(3))
Section 11.3 Assigning frequencies
When the SAS sends the available frequencies and other operating parameters to CBSD in spectrumInquiryResponse message, the CBSD has to confirm the willingness to use a specific set of operating parameters, including the frequency range in GrantRequest message according to § 96.59. spectrumInquiryRequest contains a field inquiredSpectrum, which describes the spectrum for which the CBSD seeks information on spectrum availability. spectrumInquiryResponse contains a field availableChannel, which is an array describing the channels that are available for the CBSD. After receiving the spectrumInquiryResponse, the CBSD has to send a grantRequest message. The message contains operationFrequencyRange describing a contiguous frequency subset of from the availableChannel field in the received spectrumInquiryResponse. Before being allowed to transmit, CBSD has to carry out a successful heartbeat procedure for the specific grant.[5]

5. Describe in detail the process by which Fairspectrum will acquire and store the necessary and appropriate information from the Commission's databases, including PAL assignments. Further, Fairspectrum must confirm that its database will synchronize with the current Commission databases at least once a day. (p. 16) (§ 96.63(b))
Section 1.5 Providing functionality to administrate SAS
The Fairspectrum SAS will be technically capable of directly interfacing with any necessary FCC database containing information required for the proper operation of an SAS according to § 96.55. The Fairspectrum SAS server processing environment has a software client, e.g. https client, ftps client, or scp client, which is

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[5] WINNF-TS-0016 Version 1.2.1. 3 January 2018. SAS to CBSD Technical Specification.

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configured with the selected authentication credentials, like shared secret, client certificate, or user name and password. The FCC database access client software has a timing mechanism implemented either in the client software itself or in the operating system e.g. as cron task. The timing mechanism is scheduled to synchronize with the FCC databases at least once a day. The FCC database access client software downloads the new files from the FCC database. It carries out a necessary amount of consistency checks about the data. If there are inconsistencies, the synchronization process is aborted and the system administrator is alerted to study the issues. Otherwise, the data on the SAS server is synchronized with the FCC database downloaded data. Depending on the type of data, pre-processing of the data may be carried out before it is taken into account in the SAS-CBSD communication. Regular backups are created also for the FCC data on the Fairspectrum SAS server, so that the previous version of the data can be restored in the case of errors. The Fairspectrum SAS filesystem is encrypted. The servers and data storages are located on Amazon AWS (or alternatively on Microsoft Azure) cloud service in the US. The data is stored as original files in the filesystem, in tables in the database, and in backup files. Temporarily, small and specific parts of the data may be stored for debugging, error solving, or development purposes on the hard disks of the developers and system administrators.

6. Please provide details regarding PAL leasing.
For example, what process will be in place to:
Please not that PAL leasing is not required by the rules. However, if Fairspectrum plans to offer leasing immediately after certification, it must provide the additional details requested above or clarify that it does not plan to offer leasing immediately.
a. Verify that the lessee is on the certification list; (p. 29) (§ 96.66(a)(1))
b. Acquire and store the lease notification information; (§ 96.66(b)(2))
c. Verify that the lease will not result in the lessee holding more than the 40 megahertz of Priority Access spectrum in a given License Area; (§ 96.66(a)(3))
d. Verify that the area to be leased is within the Priority Access Licensee's Service Area and outside of the Priority Access Licensee's PAL Protection Area; and (§ 96.66(a)(4))
e. Provide confirmation to licensee and lessee whether the notification has been received and verified. (§ 96.66(a)(5))
Section References
47 C.F.R. § 1.9046 Special provisions related to spectrum manager leasing in the Citizens Broadband Radio Service.
47 C.F.R. § 96.66 Spectrum access system responsibilities related to priority access spectrum manager leases.
Section 1.7 PAL leasing
Fairspectrum will accept leasing notifications fulfilling the rules set in CFR § 96.66. Fairspectrum verifies that the lessee is on the certification list as required in § 1.9046. Fairspectrum establishes a process for acquiring and storing the lease notification information and synchronizing this information, including information about the expiration, extension, or termination of leasing arrangements, with the Commission databases at least once a day. Fairspectrum verifies that the lease will not result in the lessee holding more than the 40 megahertz of Priority Access spectrum in a given License Area. Fairspectrum verifies that the area to be leased is within the Priority Access Licensee's Service Area and outside of the Priority Access Licensee's PAL Protection Area. Fairspectrum provides confirmation to licensee and lessee whether the notification has been received and verified. During the

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period of the lease and within the geographic area of a lease, Fairspectrum shall treat any CBSD operated by the lessee the same as a similarly situated CBSDs operated by the lessor for frequency assignment and interference mitigation purposes.[6]

7. Please affirm that the Fairspectrum SAS will allow CBSDs to operate within areas that may cause interference to FSS earth station, above the levels described in (§ 96.17(a) and (b), provided that the licensee of the FSS earth station and the authorized user of the CBSD mutually agree on such operation and the terms of any such agreement are provided to Fairspectrum. (§ 96.17(e))

Section 11.3 FSS and GWBL protection

Fairspectrum does not allow CBSDs to operate within areas that may cause interference to FSS earth station above the levels described in § 96.17(a) and (b), provided that the licensee of the FSS earth station and the authorized user of the CBSD mutually agree on such operation and the terms of any such agreement are provided to Fairspectrum according to § 96.17(e).

If applicable, please provide any additional information and updates to your original proposal, even if not specifically requested in the above questions. If your proposal incorporates industry standards, recommendations or guidelines, please provide reference to the relevant specific technical document(s) and discuss whether your proposal includes modifications, including proprietary methods or solutions.

Cover letter

Release 1 is expected to be used by the time of first certifications. -> Release 1 will be used by the time of first certifications.

At the time of this application on May 25, 2017, all Release 1 specifications are not available. -> At the time of this updated application on Mar 9, 2019, all Release 1 specifications are available.

Removed: WINNF-15-S-0112 is referred as three versions 2.0.0, 2.5.8, and 3.0.0, which are the public version, the working document, and Release 1.0, respectively.

Removed: Wireless Innovation Forum, older, publicly available versions (May 22, 2017),

Footer

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References

WINNF-15-S-0112   V3.0.0 Operational and Functional Requirements.

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WINNF-TS-0112   V1.4.1 CBRS Operational and Functional Requirements. Working Document. 16 January 2018. Available at:

https://workspace.winnforum.org/higherlogic/ws/public/download/5116/WINNF-TS-0112-V1.4.1%20CBRS%20Operational%20and%20Functional%20Requirements.pdf

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[6] §96.66   Spectrum access system responsibilities related to priority access spectrum manager leases.

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WINNF-TS-0065   Version 1.1.0. 26 July 2017. CBRS Communications Security Technical Specification. Available at https://workspace.winnforum.org/higherlogic/ws/public/download/4486/WINNF-TS-0065-V1.1.0%20CBRS%20Communications%20Security%20Technical%20Specification.pdf.

WINNF-15-S-0071   Version 1.0.0. 21 June 2016. CBRS Operational Security Technical Specification.
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WINNF-TS-0071   Version 1.0.0. 26 July 2017. CBRS Operational Security Technical Specification. Available at https://workspace.winnforum.org/higherlogic/ws/public/download/4487/WINNF-TS-0071-V1.0.0%20CBRS%20Operational%20Security.pdf.

WINNF-16-S-0016   V2.0.0 SAS to CBSD Protocol Specification.
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WINNF-TS-0096   Version 1.2.0 SAS-SAS Protocol Specification. 22 October 2017. Available at https://workspace.winnforum.org/higherlogic/ws/public/download/4813/WINNF-TS-0096-V1.2.0%20SAS-SAS%20Protocol%20Technical%20Specification.pdf.

WINNF-16-S-0061   V1.0.0 SAS Test and Certification Specification.
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WINNF-TS-0061   Version 1.1.0 WG4 SAS Test and Certification Specification. 26 January 2018. Available at https://workspace.winnforum.org/higherlogic/ws/public/download/5637/WINNF-TS-0061-V1.1.0%20-%20WG4%20SAS%20Test%20and%20Certification%20Spec.pdf.

WINNF-17-S-XXXX   V1.0.0 CBSD Test and Certification Specification. (First version not yet available)
->
WINNF-TS-0122   V1.0.0 CBRS CBSD Test and Certification Specification. 19 December 2017. Available at

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WINNF-16-S-0245   Version 1.0.0. 3 April 2017. Operations for Citizens Broadband Radio Service (CBRS): Priority Access License (PAL) Database Technical Specification.
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WINNF-17-S-0022   Version 1.0.0. 24 April 2017. CBRS PKI Certificate Policy. Available at https://workspace.winnforum.org/higherlogic/ws/public/download/4061/WINNF-17-S-0022%20v1.0.0%20CBRS%20PKI%20Certificate%20Policy.pdf.
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WINNF-TS-0247   V1.0.0 CBRS Certified Professional Installer Accreditation. 18 October 2017. Available at https://workspace.winnforum.org/higherlogic/ws/public/download/4797/WINNF-TS-0247-V1.0.0%20CPI%20Accreditation%20Standard.pdf.

Removed: Section Wireless Innovation Forum, older, publicly available versions (May 22, 2017),

Section 2.1 Key Personnel

Mr. Franklin Reynolds is the CTO of Fairspectrum LLC. Franklin has over 30 years of experience as a contributor and a leader of Research and Development teams, including 6 years at the Open Software Foundation Research Institute where he worked on distributed operating systems and 11 years at Nokia Research where most of his work was on self-organizing distributed systems. His current interests include the development and operation of scalable, highly available distributed systems. He has written papers and articles on smartphones, secure distributed systems, and free software. He has five software patents.

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Yours Respectfully,

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