Microsoft | Innovation & Policy Center

April 18, 2011

EX PARTE

Mr. Julius P. Knapp
Chief, Office of Engineering and Technology
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

> Re: *Request to Submit Database Administrator Proposal*
>   *ET Docket No. 04-186*

Dear Julie:

Microsoft Corporation applauds the Federal Communications Commission, and in particular the Office of Engineering and Technology, for its substantial work over the last few weeks to begin enabling white spaces database operations.[1] The Commission's enthusiasm for white spaces and commitment to bring these services to the American public is being matched by industry. As a result of the Commission's actions, established enterprises and new entrants alike have accelerated their work with Microsoft, which brings us closer every day to delivering white spaces applications and services to consumers.

As the Commission is aware, Microsoft has played an active role in white spaces database development. For example, Microsoft is a founding member of the *ad hoc* White Spaces Database Group convened to assist the Commission in laying the foundation for the white spaces database architecture.[2] In addition, a prototype white spaces database developed by Microsoft Research powers the country's first urban white spaces-based network on Microsoft's Redmond, WA campus.[3] And Microsoft also participates in

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[1]   *See, e.g., Unlicensed Operation in the TV Broadcast Bands*, Order, 26 FCC Rcd. 554 (2011) ("Database Administrator Order"); *Public Notice*, Office of Engineering and Technology to Conduct Workshop for TV Bands Device Database Managers on March 10, 2011, ET Docket No. 04-186 (Mar. 1, 2011). *See also Public Notice,* Office of Engineering and Technology Invites Proposals from Entities Seeking to be Designated TV Band Device Database Managers, ET Docket No. 04-186 (Nov. 25, 2009) ("Database Administrator Public Notice").

[2]   *See* Database Administrator Public Notice at 2, fn. 7.

[3]   *See, e.g.,* Todd Shields, *Microsoft Tests Super-Size Wireless Hot Spot in TV Gaps*, Bloomberg (Sep. 13, 2010), http://www.bloomberg.com/news/2010-09-12/microsoft-tests-super-size-wireless-hot-spot-in-tv-channel-gaps.html.

various efforts to develop technology standards and certification programs for devices utilizing white spaces spectrum.

Significantly, Microsoft increasingly fields questions from others in our industry about a range of issues relating to database solutions in a production environment. After careful consideration, Microsoft has determined that submitting an application to become a database manager would enable it to assist its customers in bringing many white spaces applications to market quickly and efficiently. Accordingly, Microsoft respectfully requests that OET permit it to join the other entities conditionally designated as white spaces database managers as OET begins the process of establishing the final database operating parameters.[4]

As the Commission's rules make clear, OET enjoys wide discretion to act on database administration issues, including designating individual database managers.[5] Importantly, OET has determined that "it is in the public interest to have multiple parties developing business models [for white spaces databases]."[6] Indeed, OET conditionally accepted each of the nine database proposals submitted in response to its original public notice in 2009.[7]

Microsoft is eager to contribute to the Commission's efforts to get white spaces databases up and running in the near future, and designation as a database provider will improve our ability to do this. This is the case because, in addition to its investment in research specific to white spaces, Microsoft has substantial experience with commercial database operations in general. Many of Microsoft's most successful offerings include "software plus services" features that enable computing and communication devices to interact with cloud-based resources. Those services, in turn, require scalable, secure, and reliable database systems. Microsoft designs and operates database systems that support applications ranging from cloud-based email and other productivity tools, to Internet search, to online gaming, social networking, and access to audio and video content.

Conditionally designating Microsoft as a white spaces database manager also would not slow the Commission's work to finalize database operations. Microsoft has been following OET's efforts closely, participated in the first Database Device Manager Workshop, and is committed to send representatives to future OET meetings. Of course, Microsoft also intends to abide by the Commission's requirements for database managers.[8]

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[4]   *See generally* Database Administrator Order.

[5]   *See* 47 CFR § 0.241(h) ("The Chief [of the Office of Engineering and Technology] is delegated authority to develop specific methods that will be used to designate TV bands database managers").

[6]   Database Administrator Order, 26 FCC Rcd. at 556.

[7]   *Id*. at 557-8.

[8]   *See generally* Attachment A.

Microsoft therefore requests that OET accept the attached demonstration of Microsoft's fitness as a database administrator (designated as Attachment A) and that it designate Microsoft as such an administrator after providing interested parties with an opportunity to comment on this attachment. If you have any questions, please do not hesitate to contact the undersigned.

Respectfully submitted,

_/s/ Paul Garnett_____   _/s/ Paula Boyd_____

Paul Garnett   Paula Boyd
Director, Interoperability & Standards   Director, Government & Regulatory
                                          Affairs

Attachment

Attachment A

In the Matter of

Unlicensed Operation in the TV Broadcast Bands   ET Docket No. 04-186

PROPOSAL BY MICROSOFT CORPORATION
TO SERVE AS A WHITE SPACES DATABASE ADMINISTRATOR

Paula Boyd
Director, Government & Regulatory
Affairs
MICROSOFT CORPORATION
901 K Street NW
11th Floor
Washington, DC 20001

Paul Garnett
Director, Interoperability & Standards

Ranveer Chandra
Researcher
MICROSOFT CORPORATION
One Microsoft Way
Redmond, WA 98052

April 18, 2011

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I.   INTRODUCTION.

Microsoft Corporation appreciates the opportunity to submit an application to the

Federal Communications Commission's ("FCC's" or "Commission's") Office of Engineering

and Technology ("OET") to designate Microsoft as a white spaces database administrator.[1] As

the Commission is aware, Microsoft has long supported unlicensed access to the vacant TV

bands, and shares the Commission's vision that devices using this spectrum will enable a wide

range of innovative wireless applications and devices for businesses and consumers.[2]

Microsoft has researched and developed white spaces technologies for several years

through its Networking Over White Spaces ("KNOWS") project.[3] This project led to the design

and implementation of the country's first urban white spaces-based network on Microsoft's

Redmond, WA campus.[4] In addition, KNOWS research efforts have resulted in published papers

on white spaces on topics ranging from efficient spectrum sharing to wireless network security.[5]

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[1]   Microsoft submits this application in accordance with applicable Commission rules and the
      Commission's Public Notice soliciting proposals from prospective database managers. *See
      Public Notice*, Office of Engineering and Technology Invites Proposals from Entities
      Seeking to be Designated TV Band Device Database Managers, ET Docket No. 04-186
      (Nov. 25, 2009) ("Public Notice"). As the Commission's rules make clear, OET enjoys wide
      discretion to act on database administration issues, including designating individual database
      managers. *See* 47 CFR § 0.241(h) ("The Chief is delegated authority to develop specific
      methods that will be used to designate TV bands database managers").

[2]   *See News Release,* FCC Frees Up Vacant TV Airwaves for "Super Wi-Fi" Technologies, ET
      Docket Nos. 03-280 and 04-186 (Sept. 23, 2010).

[3]   *See generally* Microsoft Research, Networking Over White Spaces (KNOWS), at
      http://research.microsoft.com/en-us/projects/knows/.

[4]   *See, e.g.,* Todd Shields, *Microsoft Tests Super-Size Wireless Hot Spot in TV Gaps*,
      Bloomberg (Sep. 13, 2010), http://www.bloomberg.com/news/2010-09-12/microsoft-tests-
      super-size-wireless-hot-spot-in-tv-channel-gaps.html.

[5]   *See, e.g.,* O. Fatemieh *et al.*, *Using Classification to Protect the Integrity of Spectrum
      Measurements in White Space Networks*, 18th Annual Network & Distributed System
      Security Symposium (NDSS), Internet Society (Feb. 2011) at
      http://research.microsoft.com/pubs/141605/cusp.pdf; P. Bahl *et al*., *White Spaces Networking
      with Wi-Fi like Connectivity*, *ACM SIGCOMM (Best Paper Award)*, Association for

Significantly, Microsoft has already developed a functional prototype white spaces database to facilitate KNOWS research and experimentation.[6] As Commissioner Baker recognized in her keynote address at last year's White Spaces Summit, these efforts have helped "to advance the feasibility of accessing the TV White Spaces."[7] In addition, Microsoft is a member of the *ad hoc* White Spaces Database Group convened to assist the Commission in laying the foundation for white spaces database architecture.[8] Microsoft is also participating in various efforts to develop technology standards and certification programs for devices utilizing white spaces spectrum.

Microsoft now seeks to leverage its knowledge and capabilities to serve as a white spaces database administrator, providing a comprehensive service that exceeds the Commission's functionality requirements.[9] Microsoft's qualifications and information regarding the details of Microsoft's proposed database are set forth below.

Computing Machinery, Inc.,(Aug. 2009) at http://research.microsoft.com/pubs/80952/whitefi.pdf; T. Moscibroda *et al.*, *Load-Aware Spectrum Distribution in Wireless LANs,* IEEE Communications Society (Oct. 2008), at http://research.microsoft.com/pubs/73425/APSpectrumDistribution.pdf.

[6] *See* Microsoft Research WhiteFiService, A research platform to plan your white space network, at http://whitespaces.msresearch.us.

[7] Remarks of Commissioner Meredith Attwell Baker, *Maintaining a Spotlight on TV White Spaces Progress*, TV White Spaces Summit (June 15, 2010).

[8] Public Notice at 2, fn. 7.

[9] See TV Bands Database Administrator Workshop, FCC Office of Engineering and Technology Presentation at 4 (Mar. 10, 2011) ("OET Workshop Presentation"), available at http://www.fcc.gov/oet/whitespace/TVbdaw-pptslides-3-10-11.pdf (the FCC "is interested in ensuring consistent, reliable and secure implementation of database functions").

II. MICROSOFT WILL PROVIDE A COMPREHENSIVE WHITE SPACES DATABASE SOLUTION.

A. Microsoft Will Provide the Required Database Functions.

Microsoft intends to provide the entire suite of the database functions identified by the Commission, including managing a data repository, performing calculations to determine available channels, and registering fixed unlicensed devices and licensed services not listed in the Commission's databases.[10] Microsoft will not rely on other entities to perform any of the database functions.[11] The FCC's *Public Notice* requests a description of the database system architecture, including the operation of each proposed database function.[12] The data repository, registration, query, and synchronization processes depicted in the following diagram are described in greater detail below.[13]

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[10] *See generally* Public Notice; *Unlicensed Operation in the TV Broadcast Bands*, Order, 26 FCC Rcd. 554 (2011) ("Database Administrator Order"); *Operation in the TV Broadcast Bands*, Second Memorandum Opinion and Order, 25 FCC Rcd. 18661 (2010) ("Second MO&O").

[11] Public Notice at 2 (Question 4) (requesting database applicants to specify whether they will offer all, or a subset, or database functionality).

[12] *Id*. at 2 (Question 3).

[13] The Database architecture is based on the requirements set forth in the white spaces Second Report and Order and Second Memorandum Opinion and Order. *See generally Operation in the TV Broadcast Bands*, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd. 16807 (2008) ("Second R&O"); Second MO&O.

Figure 1: Proposed TV White Spaces Database Architecture
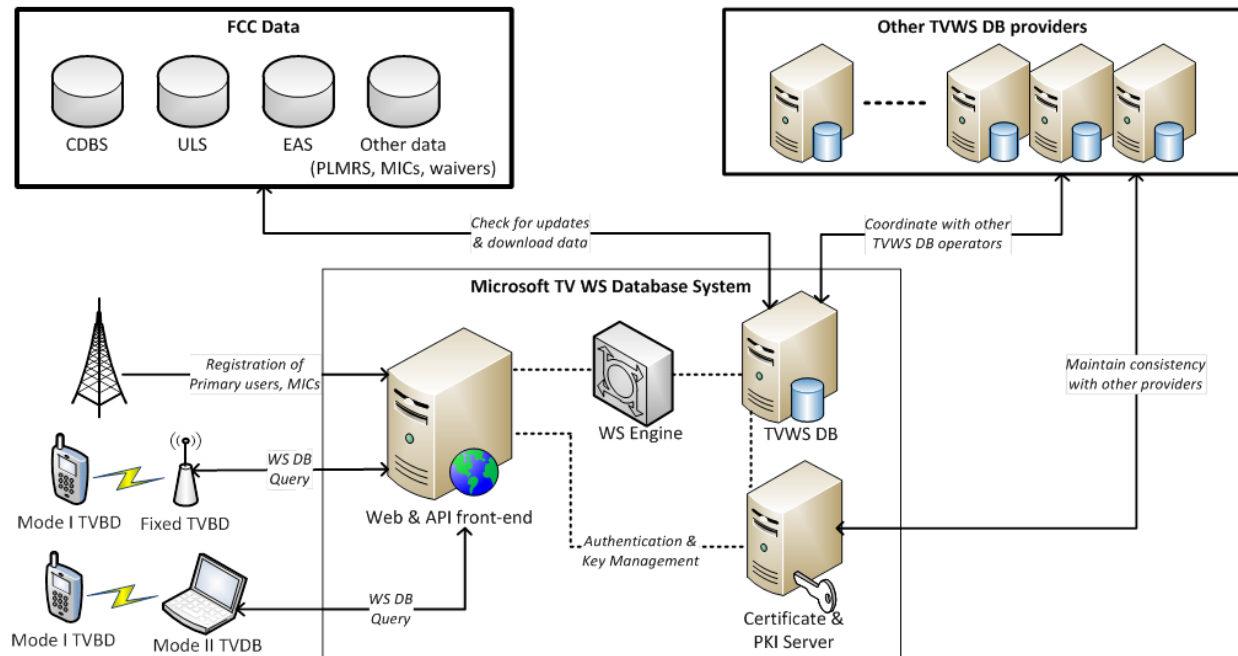
Data Repository

The FCC's white spaces rules require databases to contain information about protected services from several different sources.[14] Much of this information will come from FCC databases, as illustrated at the top of *Figure 1*. These databases include the Consolidated Database System (CDBS), Universal Licensing System (ULS), and Equipment Authorization system (EAS). In addition, the FCC has made available – or will make available – other information, including PLMRS waiver sites, cable head end and translator receive sites for which the FCC has granted a waiver of the 80 km distance limit, and event site listings for eligible unlicensed wireless microphone locations determined after a period of public comment.[15]

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[14] *See* Public Notice at 2 (Question 2) (requesting description of data repository functions).

[15] *See, e.g.*, OET Workshop Presentation at 22. In the case of permitted unlicensed wireless microphone registrations, the Commission will make those locations available to database administrators after opportunity for public comment. *See* Second MO&O, 25 FCC Rcd. at 18675-6.

Microsoft will obtain data about these services from the FCC according to the various access methods established by OET. Finally, the white spaces rules require inclusion of information about services to be protected that are registered with individual database providers rather than recorded in Commission databases.[16] Services that register directly with the Microsoft database are described below, while services that register with another white spaces database provider will be accommodated by synchronizing the Microsoft database with the other providers through methods developed in concert with OET.

Data Registration Process

The FCC requests information about registration of services that are not listed in FCC databases.[17] Such locations include fixed white spaces devices, MVPD head ends, and eligible licensed wireless microphone locations. Microsoft will provide capability to register and coordinate this information with other database providers. Registration will be accomplished through a web interface, with additional details of the data registration process implementation to be determined once standards are established for data format inputs. Microsoft is committed to working with the Commission and other database providers to determine a common framework for accepting data inputs that will facilitate sharing this information.

Query Process

As illustrated in *Figure 1*, Fixed and Mode II devices will communicate with the database through a query process. This process will include operations that return a list of available channels based on the type of device and geographic coordinates provided. Microsoft has the capability to support multiple interfaces and protocols to enable various white spaces devices to communicate with the database. For example, the experimental "WhiteFi" database developed

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[16]   47 C.F.R. §§ 15.715(a), 15.713(b)(2).

[17]   Public Notice at 2 (Question 2).

by the KNOWS project already supports several APIs to respond to query requests with message formatting defined using XML.[18] Microsoft has openly shared these APIs, and researchers at several universities, including Harvard, MIT, Rice, and the University of Illinois at Urbana-Champaign, have used Microsoft's WhiteFi database via these query processes. Microsoft will support similar API functionality in a production database consistent with OET requirements.

For the production white spaces database, Microsoft will determine available channels using the service contours and distance calculations set forth in the Commission's rules.[19] The database will respond with a list of available channels at that location. In addition, Microsoft's WhiteFi database already implements several different propagation models and incorporates detailed terrain information obtained from NASA to determine optimum channel usage. Microsoft intends to implement similar capabilities in the production database as an additional value-added feature, and can easily support different propagation models in the event that the Commission changes its rules to accommodate other methods of determining protection for incumbent licensed services. However, the ultimate determination of channel availability will always be made consistent with the FCC's rules, and Microsoft anticipates that all database providers with access to the same information will return the same list of available channels in response to a query request.[20]

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[18] Operations currently supported by the Microsoft Research WhiteFi database include AllIncumbents, GetBuildNumber, GetSpectrumMap, Process, ProcessTransmitter, Update DB, and WSAnalyze. *See* Microsoft Research, WhiteFiService driver descriptions, at http://whitespaces.msresearch.us/WSWeb/driver.asmx.

[19] *See* 47 C.F.R. § 15.712.

[20] Microsoft will obtain approval from the FCC prior to making any changes to its channel availability methodology. *See* OET Workshop Presentation at 48.

B. **Microsoft Will Support Synchronization of Data between Multiple Databases.**

Each database designated by the FCC will have the ability to register protected services whose information is not available from Commission databases.[21] Accordingly, Microsoft will cooperate with the other designated database administrators to develop a process for providing the data it collects regarding these facilities on a timely basis, including cable television head ends and DBS receive sites; Class A television receive sites; low-power television station receive sites; television translator station receive sites; sites where licensed low-power auxiliary stations such as wireless microphones and wireless-assist video devices are used and their schedule for operation; and fixed TV band device registrations.[22]

Because the Commission has designated multiple database providers, the FCC's rules require a standardized process for database coordination and synchronization.[23] Microsoft is committed to working with OET and other database providers to define a common structure for data exchange. This structure should include the ability to preserve information about the original database that registered a protected entity in the event that a registration is in error.

C. **Microsoft Will Ensure that Database Communications Are Secure.**

The FCC asks database applicants to demonstrate that unauthorized parties cannot access the database, and that communications among devices and databases will be secure.[24] Microsoft will ensure that communications among white spaces devices and white spaces databases, as well as communications among multiple databases, are authorized. Microsoft will also ensure that its database will provide reliable, continuous service.

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[21] *See* 47 C.F.R. §§ 15.715(c), 15.713(b)(2).

[22] *See id.*

[23] 47 C.F.R. § 15.715(l).

[24] *See* Public Notice at 2; Database Administrator Order, 26 FCC Rcd. at 556-7, 559.

The Microsoft database will provide channel availability information only to certified devices whose eligibility is determined by querying the Equipment Authorization System database as required in Section 15.713(a)(1) of the Commission's rules.[25] This functionality will also enable the database to deny channel availability information to devices no longer approved by OET. A separate authentication mechanism will be used to allow authorized users (*e.g.* licensed wireless microphone operators) to input location information into the database.

In addition, Microsoft will work with other database administrators to ensure that synchronization among databases is implemented securely. Microsoft notes that efforts to determine recommended approaches for secure interoperability using transport options such as Secure FTP or web services are already well underway.[26]

Finally, Microsoft will provide reliable database service by following best practices for continuance of database operations. These solutions include geo-distributing the service using multiple servers, implementing backup servers that replicate the database functionality, deploying intrusion provision systems, taking measures to prevent/minimize denial-of-service attacks, creating an architecture to route requests to different servers in the event a server is unavailable, performing off-site backups of record information, and providing physical safeguards such as hosting servers in secure locations with back-up power supplies.

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[25]   47 C.F.R. § 15.713(a)(1).

[26]   *See* White Space Database Administrators Group, Workshop presentation at 10 (Mar. 10, 2011), at http://www.fcc.gov/oet/whitespace/WhiteSpaceDBAFCCPresentation-3-10-11.pdf.

**III.   MICROSOFT POSSESSES SUFFICIENT TECHNICAL EXPERTISE TO ADMINISTER A WHITE
SPACES DATABASE AND HAS A VIABLE BUSINESS PLAN TO OPERATE A DATABASE
FOR A FIVE-YEAR TERM.**

Microsoft has the technical expertise necessary to administer a white spaces database and
the capability to operate the database for the required term.[27] Microsoft is a worldwide leader in
creating software, online services, hardware, and other solutions that help people work, play and
communicate. Many of Microsoft's most successful offerings include "software plus services"
features that enable computing and communication devices to interact with cloud-based
resources. Those services, in turn, require scalable, secure, and reliable database systems.
Microsoft designs and operates database systems that support applications ranging from cloud-
based email and other productivity tools, to Internet search, to online gaming, social networking,
and access to audio and video content.

With respect to white spaces experience, Microsoft has received multiple authorizations
in the Experimental Radio Service to develop and demonstrate white spaces applications
through the KNOWS project.[28] These experiments are supported by Microsoft's "WhiteFi"
experimental database described above. Microsoft has developed and refined this database for
over a period of 20 months. Microsoft has substantial experience deploying operational products
and services based on research and development of advanced technologies.

Microsoft also has the ability and resources to operate a production database for the five-
year term required by the Commission's rules.[29] Microsoft is a public company, and its financial

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[27]   *See* Public Notice at 2 (Question 1) (requesting information on applicants' technical expertise
and business plan).

[28]   *See, e.g.*, Experimental Radio Service authorization call signs WF2XBT, WF2XQL,
WE9XUO.

[29]   47 C.F.R. § 15.715(h).

information is in the public record.[30] Microsoft generates revenue by developing, manufacturing,

licensing, and supporting a wide range of software products and services for many different

types of computing devices; by designing and selling hardware and accessories; and from usage

fees and advertising associated with providing software, services, and content over the Internet.

Microsoft's long history of diversified financial success and its ability to leverage its

financial and technical resources will enable it to successfully operate the database for the

required term. Microsoft will work with the Commission to set forth a more granular database

business model if the Commission determines that it is necessary for database managers to do so.

IV.   MICROSOFT WILL ABIDE BY THE OTHER REQUIREMENTS IDENTIFIED BY THE COMMISSION.

The Commission has requested commitments from database administrators regarding

certain aspects of database operation.[31] Microsoft will comply with these requirements. First,

Microsoft agrees to make the database services that enable compliance with the white spaces

rules available to all unlicensed white spaces device users on a non-discriminatory basis,[32] and

agrees that it will not use its capacity as a database administrator to engage in any discriminatory

or anti-competitive practices, or any practices that may compromise user privacy.[33]

Second, Microsoft will provide any information contained in the database to the

Commission and remove information from the database upon direction from the Commission.[34]

Microsoft will make APIs available to the FCC and/or allow authenticated web-based access

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[30]   *See* Microsoft Corporation, Investor Relations, at
http://www.microsoft.com/investor/default.aspx.

[31]   *See generally* Database Administrator Order.

[32]   47 C.F.R. § 15.715(g).

[33]   Database Administrator Order, 26 FCC Rcd. at 560.

[34]   47 C.F.R. § 15.713(i).

depending on FCC requirements to enable administrative access. Microsoft will provide FCC

access to information used to determine channel availability along with access to log records.

Microsoft will also include the capability to respond to specific inquiries, as well as bulk

downloads of relevant data, consistent with OET requirements.

Third, Microsoft will make all information that the rules require to be contained in a

white spaces database publicly available.[35] This information includes FCC database records,

MVPD receive sites, TV translator and low-power receive sites, wireless assist video devices,

and eligible unlicensed wireless microphones.

Finally, Microsoft will cooperate with all other measures that OET deems necessary to

ensure compliance with the Commission's rules.[36] Microsoft initially designates Paul Garnett

and Ranveer Chandra as its responsible parties who will represent Microsoft at OET workshops

and ensure compliance with the conditions set forth by OET.[37]

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[35]   Database Administrator Order, 26 FCC Rcd. at 556.

[36]   *Id*. at 560.

[37]   *Id*.

V.   CONCLUSION.

Microsoft believes that the television white spaces represent an extraordinary opportunity to leverage previously underutilized spectrum to bring broadband and other services to Americans. Microsoft is pleased to present its database proposal to the Commission and looks forward to utilizing its knowledge and experience to provide a comprehensive white spaces database solution.

Respectfully submitted,

__/s/ Paula Boyd_____   __/s/ Paul Garnett_____

Paula Boyd   Paul Garnett
Director, Government & Regulatory   Director, Interoperability & Standards
Affairs
MICROSOFT CORPORATION   Ranveer Chandra
901 K Street NW   Researcher
11th Floor   **MICROSOFT CORPORATION**
Washington, DC 20001   One Microsoft Way
                                                   Redmond, WA 98052

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