BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, DC 20554

In the Matter of	)	
	)	
Proposals from Entities Seeking to Be	)	GN Docket No. 15-319
Spectrum Access System Administrators and	)	
Environmental Sensing Capability Operators	)	
In the 3550-3700 MHz Band	)	
	)	
Amendment of the Commission's Rules with	)	GN Docket No. 12-354
Regard to Commercial Operations	)	
In the 3550-3650 MHz Band	)	

Application of Sony Corporation to Serve
As A Spectrum Access System Administrator

Introduction

Sony Corporation ("Sony")[1] respectfully submits the following application to serve as the administrator of a spectrum access system ("SAS"), consistent with the requirements of the 3.5 GHz Order[2] and SAS Administrator Public Notice.[3]

Sony pledges to commit its resources to the timely creation and operation of a SAS within the parameters specified by the Commission, and has the internal expertise necessary to do so. In December 2015, Sony was selected by OFCOM to serve as one of four TV white spaces database operators in the United Kingdom. Sony has supported the efficient use of spectrum

[1] Sony Corporation is a leading manufacturer of audio, video, game, communications, and information technology products for the consumer and professional markets.
[2] Amendment to the Commission's Rules with Regard to Commercial Operations in the 3550 to 3650 MHz Band, GN Docket No. 12-354, Report and Order, FCC 15-47, 30 FCC Rcd 3959, 80 FR 34119 (Apr. 21, 2015) ("3.5 GHz Order").
[3] *Public Notice*, GN Docket No. 15-319, Wireless Telecommunications Bureau and Office of Engineering and Technology Establish Procedure and Deadline for Filing Spectrum Access System (SAS) Administrator(s) and Environmental Sensing Capability (ESC) Operator(s) Applications, DA 15-246 (Dec. 16, 2015) ("SAS Administrator Public Notice").

for both unlicensed operation and licensed operation worldwide, and is pleased to be able to support the Commission's efforts to enable innovative wireless services and expand broadband access for millions of Americans.

As required by the Order and Public Notice, and consistent with guidance published by the Wireless Innovation Forum,[4] the Sony SAS will:

- Determine the available frequencies at a given geographic location and assign them to CBSDs;
- Determine the maximum permissible transmission power level for CBSDs at a given location and communicate that information to the CBSDs;
- Register and authenticate the identification information and location of CBSDs;
- Enforce exclusion and protection zones, including any future changes to such Zones, to ensure compatibility between CBRS users and incumbent federal operations;
- Communicate with ESCs and ensure that CBSDs operate in a manner that does not interfere with federal users;
- Ensure that CBSDs protect non-federal incumbent users consistent with the rules;
- Protect Priority Access Licensees from impermissible interference from other CBRS users;
- Facilitate coordination between GAA users to promote a stable spectral environment;
- Ensure secure and reliable transmission of information between the SAS, ESC, and CBSDs;
- Provide an approved ESC with any sensing information reported by CBSDs if available;
- Protect Grandfathered Wireless Broadband Licensees until the end of the grandfather period;
- Facilitate coordination and information exchange between SASs.

The following describes in detail how Sony proposes to provide these features.

[4] Requirements for Commercial Operation in the U.S. 3550-3750 MHz Citizens Broadband Radio Service, WINNF-15-S-0112-V1.0.0 CBRS Operational and Functional Requirements.

General information

1. Sony Expertise and Capabilities

Sony has the substantial engineering, technical experience, and resources necessary to build and operate a SAS, and employs many researchers, engineers and technical experts in wireless communication area. Sony also serves on the steering group of the Spectrum Sharing Committee of the Wireless Innovation Forum. The Connectivity Technology Development Department of Sony's R&D Platform System R&D Group, based in Tokyo, will have the ultimate responsibility for development of the SAS, and plans to designate a portion of the day-to-day operational responsibilities to employees of a Sony subsidiary located in the United States.

In 2015, Sony was chosen by OFCOM to serve as one of four TV white space database operators in the United Kingdom.[5] That system is currently operational, and as a result of that experience, Sony has gained a comprehensive knowledge of the technical parameters for managing wireless spectrum allocations.

In addition, Sony is a large public company whose financial statements are a matter of public record. It has sufficient funds and access to capital to develop and operate the proposed SAS for a five-year term. At present, Sony intends to operate the SAS for a minimum of five years after being designated an administrator, as contemplated by the Commission's rules. In the unlikely event that circumstances require Sony to discontinue operating the SAS, all

[5] Wireless Telegraphy (White Space Devices) (Exemption) Regulations 2015, Section 2.17 (made 18th December 2015), available at http://stakeholders.ofcom.org.uk/binaries/spectrum/whitespaces/regulations-2015/Statement_on_LE_regulations_draft_FINAL.pdf (last visited Apr. 6, 2016).

resources will be securely transferred to a qualified successor entity, and operations shall not be discontinued.

Consistent with the Commission's goal of encouraging the rapid development of 3.5 GHz devices and services, Sony hopes to keep user costs as low as possible and as such does not plan to charge per-query fees for use. Sony will work with the Commission to develop an acceptable business model, should it become necessary to do so. If fees are ultimately required, one possible approach would be to charge a to per-unit device registration fee.

2. Technical Requirements

a. Overview

Sony proposes to provide all of the basic functional architecture for the SAS, including data repository, device registration, determination of available frequencies and maximum permissible transmission power levels, and query process. Set forth below is a description of how each of these key functions will operate and interact, including the interfaces and protocols to be used by CBSDs to communicate with the SAS. The proposed SAS architecture is depicted in Figure 1.

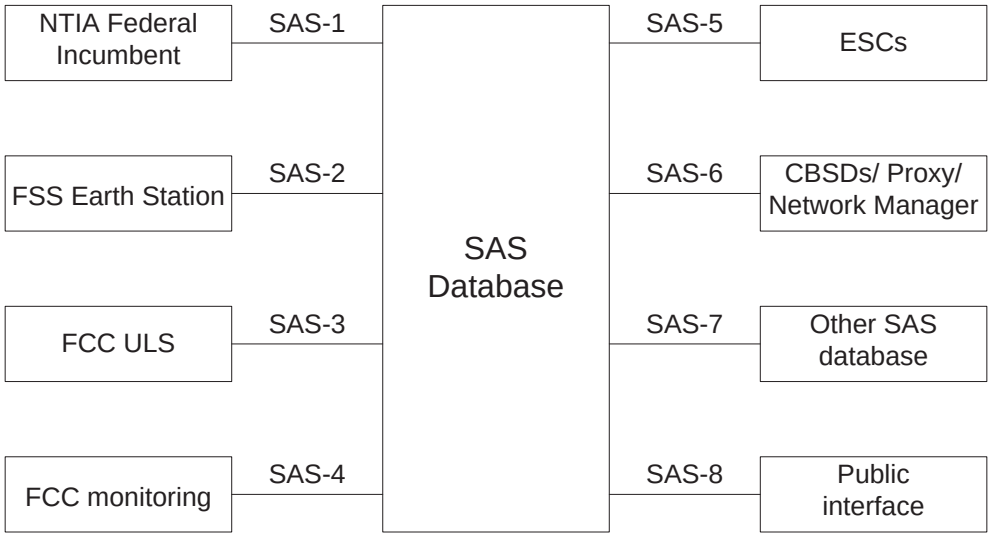


Figure 1: Proposed SAS architecture

The following is a description of how the Sony SAS will operate and interact with other elements of the 3.5 GHz environment. Sony anticipates that connections between its SAS and other federal databases can be established quickly and that contacts with these databases will occur at least once per day. Connections with other SASs and ESCs will occur more frequently.

i. Repository and registration functions.

The Sony SAS will perform the necessary repository and registration functions through support for five interfaces with various government or third-party data sources. The first, SAS-1, will directly connect to the NTIA list of exclusion zones for federal incumbent users.[6] It will do so using the standard https protocol or any other protocol designated by the NTIA. The Sony SAS will support three interfaces with the FCC. SAS-2 and SAS-3 will directly connect to the Protected Fixed Satellite Service Earth Station database,[7] and to the Commission's Universal

[6] Available at https://ntia.doc.gov/category/3550-3650-mhz (last visited April 6, 2016).
[7] Available at https://fcc.gov/cbrs-protected-fss-sites (last visited April 6, 2016).

Licensing System,[8] respectively. SAS-4 will enable communications between the Commission and Sony, to allow the Commission to obtain information about individual CBSDs or to direct the suspension of operations for one or more CBSDs. Finally, using the SAS-5 interface, the Sony SAS will support communications with all relevant environmental sensing capability ("ESC") operators.

ii. Query functions

When a CBSD enrolls with the Sony SAS, the registrant will be prompted to enter all required location and contact information using the applicable interface. Upon query by a CBSD or proxy/network manager (through SAS-6), the SAS first will establish that the device is registered, and then determine the available frequencies at the CBSD's location, using the applicable interference protection requirements and the information obtained from the NTIA and FCC web sites, the FCC ULS, and any relevant ESCs. The SAS will then return a list of available frequencies and allowed power levels to the CBSD. The SAS will facilitate coordination among Priority Access Licensees ("PALs"), and between PALs and General Authorized Access ("GAA") users, by obtaining PAL licensing data from the FCC ULS using the SAS-3 interface, or from other SASs using the SAS-7 interface described below. In addition, the Sony SAS will check for proximity of a registered CBSD to the Canadian and Mexican borders where operations may be subject to current and future international agreements.

[8] Available at https://wireless.fcc.gov/uls/ (last visited Apr. 6, 2016).

iii. Synchronization

The Sony SAS will support an interface, SAS-7, for the exchange of information with other SASs, and will cooperate with other SAS administrators to standardize a single, common interface for universal implementation.

iv. Public access interface

As required by Commission rules, the Sony SAS will provide a web interface, SAS-8, to enable public access to all non-Federal and non-proprietary information.

b. Secure Communications

The Sony SAS will support secure communications with CBSDs, ESCs, and other SASs. Sony will operate a public key infrastructure ("PKI") to enable authentication with the SAS, and will present a certificate signed by a well-known certificate authority to validate this authentication. When connecting to the Sony SAS, a CBSD will be required to authenticate itself through the use of a shared secret, which the CBSD will create when it initially establishes an account. The exact process of creating this shared secret will be at the operational discretion of Sony, although a common username and password system may be used. Sony anticipates that SAS administrators will standardize both the interface (SAS-6) and the security protocols for communication between a CBSD and a SAS, and that all CBSDs and SASs will support that common interface.

This CBSD-to-SAS interface, as well as the SAS-to-ESC (SAS-5) and SAS-to-SAS (SAS-7) interfaces, will require transport layer security to guarantee the integrity and authentication of

data. More specifically these interfaces will likely use Transport Layer Security ("TLS"), and the Sony SAS will implement the TLS client and server functionality.

c. Proposed propagation model

Sony currently plans to follow the propagation model specified in ITU-R P/452-15, but may adopt a different model if other SAS operators decide to use an alternative based on information gathered during the trial stage.

d. Maintenance and Updates

Sony will monitor its SAS and interfaces using standard methods for its chosen software and firmware, will apply all mandatory and optional security updates, and will update the underlying operating system whenever such updates are made available. In addition, Sony will build in the capability of upgrading the SAS in response to new or changed requirements from the Commission. Sony may deliver software and firmware updates directly to CBSDs, if such updates are made available by the software or firmware provider.

SAS-Specific Information

1. Security and Access

Sony proposes to protect the information collected in its SAS from unauthorized access and corruption by following industry-standard best practices, which will include:

i. Data replication across multiple secure locations to ensure uninterrupted access in the event of natural disaster, accident, or attack;
ii. Permitting internal access to the SAS operations and content on a "need-to-know" basis only;

iii. Use of all available security features offered by the cloud-services provider that will host the Sony SAS, including intrusion detection and monitoring;
iv. Anti-malware detection software on file servers and personal computers;
v. Denial of service protections.

Sony will provide the Commission with password-protected access and a web-based user interface that will enable the Commission to obtain information directly from the Sony SAS without requiring any additional involvement by Sony. This interface will also allow the Commission to discontinue operation of individual CBSDs.

2. Interference Protection

To resolve interference between and among CBRS users and/or incumbent users, the Sony SAS will synchronize with the NTIA Federal Incumbent database, the FCC Fixed Satellite Service database, and the FCC Universal Licensing System, at least once every 24 hours to identify the geographic boundaries of all required exclusion zones. For incumbent operations in the 3550 – 3650 MHz bands, the Sony SAS will enforce these exclusion zones until one or more ESCs are approved and used by at least one SAS, thereby allowing these spaces to act as "protection zones," in accordance with section 96.67 of the Commission's rules. Thereafter, the Sony SAS will authorize Class A CBSD operations within these protection zones when an approved ESC has communicated the presence of a signal from an incumbent federal system. Within 60 seconds after the ESC communicates that it has detected a signal from a Federal system, the Sony SAS shall either suspend operations by the CBSD or relocate those operations to another unoccupied frequency, and then shall confirm this suspension or relocation.

Similarly, the Sony SAS shall refuse to authorize CBSD operations in an 80 kilometer radius around the federal radiolocation sites specified in 47 C.F.R. § 90.1331. It will maintain these exclusion zones until the approval of one or more ESCs. The Sony SAS will then authorize CBSD operations within these zones, unless an ESC provides information about the presence of incumbent operations, at which point the Sony SAS will either relocate or suspend the CBSD operations.

The Sony SAS will protect FSS earth stations authorized to operate in the 3600-3650 MHz and the 3700-4200 MHz bands, as identified in the Commission's FSS database, and will not authorize CBSD operations within these locations. If, however, the licensee of an FSS earth station and the authorized user of a CBSD mutually agree to allow CBSD operations within the exclusion zone for the FSS earth station, the Sony SAS will honor the terms of this agreement.

The Sony SAS will enforce exclusion zones for incumbent grandfathered wireless broadband licensees operating in the 3650 – 3700 MHz band, provided that these licensees have maintained a registration in the Commission's ULS. The SAS will continue this protection until the last grandfathered license has expired, at which point it will enforce the protection criteria for similarly situated facilities as specified in Section 96.17 of the Commission's rules.

3. Communication and Coordination

a. SAS-SAS and SAS-ESC Communication and Synchronization

The Sony SAS will support an interface for the exchange of information with other SASs, and will cooperate with other SAS administrators to standardize a single, common version of

this interface for universal implementation.[9] The Sony SAS will regularly exchange CBSD information with other SASs. However, additional study and collaboration among SAS administrators is required before specifying a process for synchronization among SASs.

Similarly, Sony anticipates cooperating with ESC operators and other SAS administrators to develop a process for communication between SASs and ESCs. This process should include the development of a standardized common interface for such communications.

b. Communications Between the Sony SAS and CBSDs

i. Pre-registration Requirements

Before communications between the Sony SAS and a CBSD can occur, CBSD operators will need to perform certain registrations, which will enable the Sony SAS to authenticate the CBSD requesting access, and will provide the Sony SAS with the information necessary for proper operation. These registrations include:

- CBRS user registration – the operator of one or more CBSDs must register with the Sony SAS and obtain a unique user ID and PIN or password for use during operations;
- PAL rights management and PAL ID registration – PAL CBSDs must provide the Sony SAS with the PAL ID number and security credentials that authenticate the claim to a PAL license;
- Device parameter registration – during the CBSD registration process, a CBSD must provide certain device parameters, such as the: 1) make, model and version; 2) out-of-band/spurious emission mask; 3) Adjacent Channel Leakage Ratio; 4) radio access technology; and 5) maximum conducted power;
- Professional installation registration – professional installers may, in some instances, need to provide information that may not be known by the CBSD itself or by the CBSD manufacturer or vendor, such as the CBSD installation location and antenna parameters.

[9] Sony will expects that SAS providers will standardize implementations based on the exchange message definitions and SAS exchange protocol specified in WINNF-16-P-0003-1.0.0 SAS to SAS Interface Technical Report-B.

ii. SAS discovery

The Sony SAS will support static methods for discovery by CBSDs, whereby the SAS connection information is either preinstalled into the CBSD or entered by the CBSD operator or user. The Sony SAS may also support dynamic provisioning, leveraging existing protocols like Domain Name System and Dynamic Host Control Protocol to provide the SAS connection information.

iii. CBSD Registration

Subject to the successful completion of the pre-registration requirements and SAS discovery process described above, individual CBSDs would be allowed to register with the Sony SAS using the following procedure:

a. The CBSD authenticates with the Sony SAS and provides all required device identity and user identity information, including user ID, FCC ID, serial number, manufacturer, call sign, category, maximum number of grants, air interface technology, geo-location, antenna parameters;

b. If the user and the CBSD are successfully authenticated, the CBSD registers with the Sony SAS and provides its CBSD parameters to the SAS including device type, device name, location information, and other device specific information;

c. If the CBSD completes registration, the Sony SAS will inform the CBSD, and the CBSD may then initiate a spectrum request.

iv. CBSD Spectrum Request

A CBSD will obtain its channel assignment and transmission power limits from the Sony SAS using the following process:

a. The CBSD initiates a spectrum inquiry request to the Sony SAS and provides its PAL ID if applicable;

b. The SAS provides CBSD information on available channels;

c. The CBSD sends a grant request, which includes the proposed channel or channels, and proposed peak transmission power, to the SAS;

d. The SAS performs a more-detailed channel interference assessment to determine whether the channel proposed by the CBSD is acceptable.

e. If so, the request is granted, and the SAS response contains the granted frequency, bandwidth and duration the grant is valid.

The CBSD must periodically query the Sony SAS to validate whether the initial the grant remains in effect or whether the SAS must reassign a new channel and/or power level. If the CBSD loses connectivity to the SAS, it must assume any existing grant is invalid, and must immediately cease transmitting.

v. CBSD Spectrum Return

When a CBSD's need for its allocated spectrum ends, or when the duration of its spectrum grant expires, the CBSD must contact the Sony SAS to relinquish that spectrum. If the CBSD continues to require spectrum access, it must submit a new spectrum request.

vi. SAS Spectrum Revocation or Reassignment

When the Sony SAS needs to revoke the spectrum allocated to a CBSD, in order to reassign some or all of that spectrum to a higher-priority user requiring access to the assigned spectrum, the Sony SAS will use the following procedures.

a. The Sony SAS will notify the CBSD that a higher priority user requires access to the spectrum assigned;

b. As part of this notification, the Sony SAS may include a new spectrum assignment for the CBSD to use, if one is available;

c. Upon receipt of the notification, the CBSD must immediately cease use of the allocated spectrum allowing the higher priority user access;

d. If the Sony SAS provides the CBSD with a replacement frequency assignment, the CBSD must move to that assignment and begin using that spectrum. If the Sony SAS does not provide the CBSD a new frequency assignment, the CBSD may request a new spectrum assignment as necessary.

4. Third-Party Involvement

Sony will perform all SAS functions, but will likely contract with a third-party cloud-services provider to meet any necessary storage, server, and communications needs.

5. Dynamic Use Case Scenarios

Sony will use the calculation methodologies specified in section 5.2.3 of ECC Report 186 for protection of federal incumbents, FSS earth stations, grandfathered wireless service providers, and PAL users. This protection will extend over all available channels of every CBSD operating outside of a protection zone. The calculation methodologies in ECC Report 186 take into account aggregate co-channel interference, adjacent blocking, and out-of-band emissions.

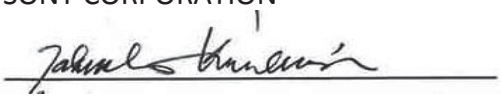
Sony will enable coexistence among CBSDs operating as GAA by implementing methodologies specified in IEEE Std. 802.19.1-2014 and ETSI EN 303 145 V.1.2.1. These methodologies take into account aggregate interference from other CBSDs.

Conclusion

Based on the foregoing, Sony requests authorization to serve as a Spectrum Access System Administrator for operations in the 3550-3700 MHz Band. Sony has the resources and technical expertise necessary to provide this service, and believes that the proposed design of its SAS, as specified in this application, meets all Commission requirements.

Respectfully Submitted,

SONY CORPORATION



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May 13, 2016

Affirmations

1. I, Takushi Kunihiro, am General Manager, Connectivity Technology Development Dept., Innovative Technology Development Division, R&D Platform System R&D Group, Sony Corporation, submitter of the foregoing "Application of Sony Corporation to Serve As A Spectrum Access System Administrator."

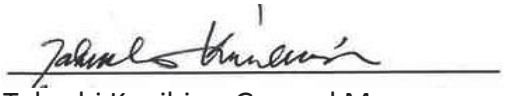
2. I hereby affirm that, if chosen to serve as a spectrum access system ("SAS") administrator, Sony Corporation will comply with all applicable Commission rules, enforcement mechanisms, and procedures.

3. I hereby affirm that, consistent with section 96.55 of the Commission's rules, a Sony SAS would only retain records and information or instructions received regarding federal transmissions from an Environmental Sensing Capability ("ESC") operator in accordance with information retention policies established as part of the ESC approval process.

4. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on April 15, 2016

SONY CORPORATION



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