

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

In the Matter of	)	
Amendment of the Commission’s Rules with	)	DA 15-1426
Regard to Commercial Operations in the	)	
3550-3650 MHz Band	)	
	)	GN Docket No. 15-319
	)	
	)	GN Docket No. 12-354
	)	

To: Marlene H. Dortch  
Office of the Secretary, Federal Communications Commission

**COMSEARCH PROPOSAL  
TO BE DESIGNATED AS A  
SPECTRUM ACCESS SYSTEM ADMINISTRATOR AND  
ENVIRONMENTAL SENSING CAPABILITY OPERATOR**

In response to the above-mentioned Public Notice (notice)<sup>1</sup> from the Wireless Telecommunications Bureau and the Office of Engineering and Technology issued December 16, 2015, Comsearch, a CommScope company hereby submits a proposal to develop and manage an independent Spectrum Access System and Environmental Access System.

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<sup>1</sup> See *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*, GN Docket No. 15-319 (DA 15-1426) (Public Notice) 30 FCC Rcd 14170 (2015); *Report and Order And Second Further Notice of Proposed Rulemaking*, (Order) GN Docket No. 12-354, 30 FCC Rcd 3959, 80 FR 34119 (2015); and *Second Report and Order and Order on Reconsideration*, (2<sup>nd</sup> R&O), FCC-16-55 (2016).

## 1. Introduction

Our response to the Public Notice will demonstrate that Comsearch is indeed capable of developing and maintaining a Spectrum Access System (SAS) and Environmental Sensing Capability (ESC) as outlined in the Commission's and NTIA's related proceedings<sup>2</sup>. Based upon our long-standing background in spectrum management, our history of developing and maintaining some of the largest and most accurate commercial telecommunications databases, our strength and corporate breadth, our position of neutrality throughout the wireless industry, and our approach to the database development coupled with our reputation as described in our response below, we firmly believe we are qualified to develop and deliver SAS and ESC services.

We note that the technical requirements for developing and operating a SAS and ESC are currently being created within the Spectrum Sharing Committee (SSC) of the Wireless Innovation Forum (WInnForum). The WInnForum has become the *de facto* multi-stakeholder organization creating the standards and guidelines for developing and certifying the end-to-end SAS and ESC ecosystem. Indeed, we believe a substantial majority of 3.5 GHz stakeholders are participating in the WInnForum SSC including U.S. Government and DoD representatives and observers; wireless carriers; equipment manufacturers; prospective SAS and ESC providers and others.

Through several Working Groups and Task Groups, the SSC is addressing architectures and operational requirements for the SAS and ESC, interoperability, protocols, security, and testing

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<sup>2</sup> *Id.* See also, Letter from Paige R. Adkins, Assoc. Administrator, NTIA OSM to Julius P. Knapp, Chief, FCC OET, RE: *Commercial Operations in the 3550-3650 MHz Band (GN Docket No. 12-354)*, and, NTIA Technical Report 16-521, *Using On-Shore Detected Radar Signal Power for Interference Protection of Off-Shore Radar Receivers*, March, 2016.

and certification. WinnForum have provided several updates and comments to the Commission regarding the work and progress on creating the appropriate standards and guidelines.<sup>3</sup>

Comsearch is an active voting member of the WinnForum, and a charter member of the SSC. We participate on the Steering Committee, each of the Working Groups, most of the Task Groups, and we co-chair the Task Group dealing with information sharing among SASs.

The work in the WinnForum SSC is foundational and critical to the ultimate success of the SAS and ESC ecosystem. We expect to incorporate most of the WinnForum recommendations and guidelines, and our SAS and ESC proposal has been developed accordingly.

However, we also note that much of the work to create these recommendations and guidelines is still under discussion and development, and has not yet been published. Accordingly, as we address the Commission's questions in the Public Notice, we refer to the associated WinnForum work in the abstract. As the WinnForum publishes approved recommendations and guidelines, we will assuredly include the Commission.

We are confident we possess the requisite experience and expertise to develop and manage a SAS and ESC as detailed within this proposal. As the Commission requires additional detail to supplement our assertions and descriptions, we will provide any supplemental detail upon request.

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<sup>3</sup> See generally WinnForum ex parte filings, GN Docket 12-354 on Feb 25, 2015; Sep. 17, 2015; Nov. 3, 2015; Dec. 3, 2015; Jan. 27, 2016; Feb. 17, 2016; and Mar. 31, 2016.

## 2. Company Background

Comsearch ([www.comsearch.com](http://www.comsearch.com)) has been a leading provider of spectrum management and wireless engineering products and services since 1977. We have developed industry-standard interference analysis and mitigation processes and procedures, and we maintain state-of-the-art software and comprehensive databases used in the design of complex wireless systems. Our commercial and government customers rely on us for innovative, yet cost-effective solutions to the challenges posed by 21<sup>st</sup> century wireless deployments. Our long history of focusing on customer care combined with our engineering expertise plus our software and database development capabilities are the reasons we have thousands of loyal customers representing virtually every sector of the telecommunications industry.

Headquartered in Ashburn, Virginia, Comsearch interacts regularly with the Federal Communications Commission (Commission) and the National Telecommunications and Information Administration (NTIA), and actively participates in various industry groups such as the WinnForum, the National Spectrum Management Association (NSMA), the Telecommunications Industry Association (TIA), and the Institute of Electrical and Electronics Engineers (IEEE) to develop rules, industry recommendations, and standards that promote the efficient use of the radio spectrum. A Comsearch staff member also participates on and co-chairs the Commerce Spectrum Management Advisory Committee (CSMAC). Comsearch attends and participates in ITU study group meetings related to propagation modeling, spectrum management and interference analysis. We have personnel who participate in COST (European Cooperation in Science and Technology), specifically, COST-231: Information and Communication Technologies.

Comsearch Government Solutions, LLC (CGS) provides innovative engineering services and products to all spectrum users across the U.S. federal government. Accrediting decades of expertise in spectrum management, CGS supports critical government missions in the areas of national defense, public safety, and homeland security. CGS maintains a Secret Facility Clearance, and most of CGS employees have either Secret or Top Secret security clearances. CGS personnel work either directly or indirectly with the U.S. Navy.

Comsearch is a business unit within the Integrated Solutions/CommScope Mobility Solutions division of CommScope (NASDAQ: COMM). CommScope helps companies around the world design, build and manage their wired and wireless networks. Our vast portfolio of network infrastructure includes some of the world's most robust and innovative wireless and fiber optic solutions. Our solutions can be found in the largest buildings, venues and outdoor spaces; in data centers and buildings of all shapes, sizes and complexity; at wireless cell sites; in telecom central offices and cable headends; in FTTx deployments; and in airports, trains, and tunnels.

Our wireless products, solutions and services are tailored to increase network speed, flexibility and reliability. We are the leading wireless infrastructure provider to the most advanced LTE networks, building upon more than 75 years of involvement in every evolution of wireless communication. In just the past five years, we have completed 10,000 site installation projects in North America alone, delivering an integrated approach to network development that includes project management, technical design and development, and installation.

CommScope provides an extensive range of In-Building Wireless and Distributed Coverage and Capacity Solutions (DCCS). We are a recognized world leader in infrastructure solutions for communications networks, and our product lines are an integral aspect of CommScope's network

infrastructure solution. Our DCCS solutions can be found in some of the most notable and prominent locations throughout the world, for example:

- The Burj Khalifa in Dubai, the world's tallest building,
- State-of-the-art consumer and emergency services coverage for Madison Square Garden in New York City,
- The 57 kilometers of the Gotthard Base Tunnel,
- AT&T Stadium (formerly Cowboys Stadium),
- Dubai International Airport

Our broadband solutions help customers increase bandwidth; maximize existing capacity; improve network performance; enable simple technology migration; and deploy more revenue-generating services. For over 40 years, the CommScope brand has represented a long tradition of reliable solutions, service and support for broadband networks.

In data centers and buildings, our solutions help customers manage energy, space, productivity, availability and capacity with greater efficiency. With a long history of innovation that started with Bell Labs, our industry-leading SYSTIMAX® connectivity solutions set the standard and drives the evolution of data networks for our customers and partners.

CommScope has a strong R&D tradition and approximately 9,800 patents and patent applications worldwide. Over the last decade, we have invested more than \$1.2 billion on research and development.

CommScope's senior leaders are deeply experienced in the communications infrastructure industry, with a strong track record of financial discipline and ability to manage through economic cycles.

Our size, reach, expertise and operational precision position us to enable the future of communications around the globe. CommScope serves customers in more than 100 nations with more than 25,000 employees through a wide variety of wireless and connectivity solutions. CommScope reported total revenue in 2015 of over \$3.8B.

Our background speaks to a uniquely rounded, yet deep capability to collaborate, develop, and manage a SAS and ESC as outlined in the Commission's rules.

### **Comsearch Neutrality**

We will provide a neutral and independent solution to SAS and ESC services. With an active customer base numbering in the thousands, we cannot and do not favor any customer or group of consumers, communications service provider, industry segment or technology. All CommScope employees must read, acknowledge and follow our corporate Code of Ethics and Business Conduct, and must undergo regular Legal Compliance and Code of Conduct training. As noted below Comsearch provides several services as an FCC-authorized service provider or contractor. We are required through Memoranda of Understanding or contract agreements to provide these services on a non-discriminatory basis. As a U.S. Government contractor, all cleared CGS personnel receive initial security training and sign standard government security forms prior to any classified access. CGS employees also receive annual refresher security training.

Comsearch categorically states that we will provide our SAS and ESC services in a non-discriminatory and neutral basis.

### **3. Past Performance and Technical Experience**

Comsearch has developed numerous software products to address the engineering challenges of network planning, spectrum management, and spectrum administration. Our software teams

utilize object-oriented design patterns using primarily C/C++, Java, and JavaScript on virtualized SELinux/Redhat and Windows platforms. Our Spring Framework-based web applications are developed on the Tomcat Servlet container and are deployed in conjunction with the Apache web server. Engineering applications incorporate GIS technologies and both industry standard and proprietary analysis algorithms. We have extensive experience in designing and maintaining databases across a variety of database platforms including Oracle, Sybase, and Microsoft Access.

We maintain a full-time staff of trained database technicians and our databases are recognized throughout the industry and by the Commission as being highly accurate and complete. The following are some of the Comsearch software and database products that support the wireless telecommunications industry.

### **TV White Space Database Administration**

Comsearch is an FCC-authorized TV White Space (TVWS) Database Administrator<sup>4</sup>. As such, we have been an active participant throughout the TVWS proceedings, and collaborated with the other FCC-approved database administrators to establish the White Space Database Administrator Group (WSDBA Group).<sup>5</sup> The WSDBA Group continues to meet regularly to

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<sup>4</sup> See *Office of Engineering and Technology Invites Proposals from Entities Seeking to be Designated TV Band Device Database Managers*, ET Docket No. 04-186 (DA 09-2479) (Public Notice) 23 FCC Rcd 16807 (2008), and *Second Report and Order and Memorandum Opinion and Order*, (Order) ET Docket No. 04-186, ET Docket No. 02-380, 23 FCC Rcd 16807 (2008).

<sup>5</sup> The White Space Database Administrator Group consists of eight FCC conditionally-designated database administrators (Comsearch, Frequency Finder, Inc., Google Inc., LS Telcom AG, Microsoft Corporation, Neustar, Inc., Spectrum Bridge, Inc., iconnectiv), and was formed to (1) establish and maintain a database interoperability specification, (2) to support development of a device to database API specification, and (3) to address technical and operational issues as they arise that affect the operation of database administrators and work with the FCC at achieve resolution.

address issues related to operation of the respective TVWS databases regarding data exchange, consistency in calculation results and interaction with the Commission.

Comsearch was one of seven leading technology companies to join forces to facilitate the timely creation and operation of a white space database system.<sup>6</sup> Comsearch participated in meetings with OET staff as part of the White Space Database Group.<sup>7</sup> We also met with OET staff to discuss requirements related to a white space database.<sup>8</sup> In addition, we had numerous meetings and discussions with all key stakeholders including protected incumbents and device manufacturers.

As part of our extensive active customer base, Comsearch works closely with many of the protected entities including numerous broadcasters, TV station owners, cable companies, land mobile licensees, and end users of wireless microphones. Accordingly, our existing associations with these key stakeholders positions have helped us to promote involvement among incumbent users and facilitate interaction with the database.

### **70-80-90 GHz Link Registration Database ([www.gigabitlink.com](http://www.gigabitlink.com))**

In a proceeding similar to the selection of SAS/ESC service providers, Comsearch was selected as a database manager for the 70-80-90 GHz (70 – 90 GHz) Service.<sup>9</sup> The specific

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<sup>6</sup> White Space Database Group Press Release, Feb 4, 2009. Founding members of the White Spaces Database Group include Comsearch, Dell, Google Inc., HP, Microsoft Corporation, Motorola Inc., and NeuStar.

<sup>7</sup> *Ex parte* visits on January 29, 2009 and March 13, 2009.

<sup>8</sup> *Ex parte* visits on January 29, 2009 and Sept. 23, 2009

<sup>9</sup> See *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, WT Docket No. 02-146, 18 FCC Rcd 23318 (2003); *Wireless Telecommunications Bureau Opens Filing Window For Proposals To Develop And Manage Independent Database Of Site Registrations By Licensees In The 71-76 GHz, 81-86 GHz and 92-95 GHz Bands* (DA 04-672) (70-90 GHz Public Notice), and Comsearch Proposal To Develop And Manage A Database Of Site Registrations In The 71-76 GHz, 81-86 GHz and 92-95 GHz Bands (March 26, 2004); (see also [http://wireless.fcc.gov/services/index.htm?job=service\\_home&id=millimeter\\_wave](http://wireless.fcc.gov/services/index.htm?job=service_home&id=millimeter_wave))

requirements detailed in the Commission’s Public Notice for Database Managers are listed below<sup>10</sup>:

***“Database Manager duties and responsibilities.*** Pursuant to the *Report and Order*, the Database Managers [are] required to:

- develop, manage and use a single link registration database—to be shared with all Database Managers if WTB selects more than one during this filing window or in the future—which will serve as a clearinghouse and repository of current and historical link information for all registered non-Federal Government links;
- make all Database Manager services available to all parties on a first-come, first-served and non-discriminatory basis;
- ensure that non-Federal Government links are coordinated with Federal Government operations through NTIA’s planned automated coordination mechanism, and promptly notify the licensee when a link submission receives a green- or yellow-light response from NTIA;<sup>11</sup>
- verify that individual link registrations are compliant with Part 17 of our rules and, if required, properly registered on the Commission’s Antenna Structure Registration Database;
- update the link registration database based on FCC actions on ULS affecting licenses in these bands, such as registration deletion, or license expiration, renewal, transfer or assignment;
- add or delete link information to the database based upon review and processing of link submissions from licensees on a non-discriminatory, first-come, first-served basis;
- withdraw unconstructed and deleted links from the database, modify the database when it is determined that a licensee has not met construction and loading requirements, and maintain documentation of such actions (with notice to WTB for links also registered in ULS);
- maintain a complete and accurate history of all links;

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<sup>10</sup> 70-90 GHz Public Notice *Id.*

<sup>11</sup> A "green light" response will indicate that the link is coordinated with the Federal Government; a "yellow light" response will indicate a potential for interference to Federal Government or certain other operations. *See generally* 47 C.F.R. § 2.106 (US388, US389). In the case of a "yellow light," the licensee must file an application for the requested link with the Commission, which in turn will submit the application to the IRAC for individual coordination. *See Report and Order*, 18 FCC Rcd at 23341-43 ¶¶ 52, 54, 58.

- administer the formal interference protection procedures, based upon “first-in-time” information recorded in the database;<sup>12</sup>
- provide NTIA, FCC and all interested parties access to the database at all times;
- establish, at a minimum, the following report capabilities/utilities for NTIA and FCC:
  - ability to query on basic link elements such as licensee name, FCC call sign, registration number, transmit coordinates and transmit frequency or frequency band;
  - ability to query and retrieve all link registrations associated with a specific licensee or FCC call sign;
  - ability to retrieve all link registrations within a specified geographic area;
  - ability to retrieve all link registrations filed or accepted within a specified time period;
  - ability to retrieve or request a report of all links removed or deleted from the database within a specified time period;
  - provide automated interface or reports as required by NTIA to allow them to maintain an accurate and complete database;
  - upon request, a complete download of the registration database in a format specified by FCC;
  - ability to provide other reports to NTIA and FCC and respond to information requests as necessary;
- enter into a Memorandum of Understanding (MOU) with the United States Government memorializing its duties and responsibilities, and agreeing to serve a five-year term, which could be renewed by the Commission.”

Comsearch satisfied all requirements in our submission sufficient to be selected as a database manager.<sup>13</sup> We subsequently signed the MOU, and led development of the effort to address the requirements above, specifically regarding interaction with the Commission and NTIA, and sharing registration data in real-time with other database administrators. As of April 2016, there have been over 14,000 link transactions, with Comsearch having managed the majority.

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<sup>12</sup> See *id.* at 23343 ¶ 58 (once notified of an interference complaint, Database Manager must identify the problem link and notify the later-registered licensee that it must accept or resolve (as applicable) any identified interference immediately).

<sup>13</sup> See *Allocations and Service Rules for the 71-76 GHz, 81-86 GHz, and 92-95 GHz Bands*, WT Docket No. 02-146, DA 04-3151, (70-90 GHz Order), 19 FCC Rcd. 20524 (2004)

Comsearch renewed the MOU with the Commission effective December, 2014.

**Wireless Medical Telemetry Service ([www.wmtssearch.com](http://www.wmtssearch.com))**

In 2000, the Commission established the Wireless Medical Telemetry Service (WMTS) bands in response to growing concerns about interference from new digital television transmitters, low power television transmitters, and private land mobile radio equipment.<sup>14</sup> The Commission subsequently designated the American Society for Healthcare Engineering (ASHE) of the American Hospital Association as the frequency coordinator to create and maintain a database of deployed WMTS systems.<sup>15</sup> Comsearch was selected by ASHE as their technical partner to provide database management and frequency coordination support for WMTS. In choosing Comsearch, ASHE recognized our expertise with spectrum management, including interference resolution and design of interactive web-based database and engineering tools.

Comsearch provides a broad range of support to ASHE and its members including:

- development of a device registration database,
- creation of a web-based front end to enter deployment data, perform frequency searches, and receive coordination results,
- ongoing administration of the system,
- customer support,
- coordination with the Radio Astronomy service,
- coordination with the NTIA for government radar,
- coordination with the land mobile radio community for certain deployments in the 1.4 GHz band, and

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<sup>14</sup> See *Amendment Of Parts 2 And 95 Of The Commission's Rules To Create A Wireless Medical Telemetry Service*, ET Docket 99-255, PR Docket 92-235 (WMTS Order), 15 FCC Rcd 11206 (2000)

<sup>15</sup> See *Amendment of Parts 2 and 95 of the Commission's Rules to Create a Wireless Medical Telemetry Service, "Designated the American Society for Health Care Engineering of the American Hospital Association to serve as the frequency coordinator for the Wireless Medical Telemetry Service"*, ET Docket 99-255, 16 FCC Rcd 4543 (2001)

- advocacy support to ASHE to ensure compliance with FCC rules and registration requirements.

The ASHE WMTS registration database has enjoyed over 15 years of successful operation. As of May, 2016, over 3,600 hospitals in the United States have registered in the WMTS database with over 10,600 total deployments<sup>16</sup> representing 16 WMTS equipment manufacturers.<sup>17</sup>

### **CTIA AWS Cost-sharing Clearinghouse**

In making spectrum available for Advanced Wireless Services (AWS), the FCC rules require the new AWS licensees to pay the costs associated with relocating the legacy systems operating in the 2.1 GHz band.<sup>18</sup> This spectrum-clearing effort has created a situation in which licensees paying for and coordinating the relocation of incumbent systems were also removing an obstacle to market for direct competitors in the same geographical area. Similar to the way they addressed the situation for Personal Communications Systems (PCS) in the shared 1.9 GHz band, the Commission established a cost-sharing process for AWS. The process called for a clearinghouse to administer the cost-sharing process. Thus, the concept of the AWS Cost-sharing Clearinghouse was employed by the Commission to distribute the financial burden of incumbent relocation fairly and promote a more rapid deployment of Advanced Wireless Services.

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<sup>16</sup> Several hospitals have multiple WMTS deployments.

<sup>17</sup> This is noteworthy considering the amount of consolidation that has occurred among WMTS equipment manufacturers.

<sup>18</sup> See *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, ET Docket No. 00-258, WT Docket No. 02-353 (AWS Service Rules), 21 FCC Rcd 4473 (2006).

Through a Public Notice process, the Commission requested proposals to act as a clearinghouse administrator to perform cost-sharing administrative, monitoring and notification tasks.<sup>19</sup> In response to this Public Notice, CTIA – The Wireless Association<sup>®</sup> contracted with Comsearch and submitted a proposal for consideration in the role of clearinghouse administrator.<sup>20</sup> The Commission subsequently designated CTIA as a cost-sharing clearinghouse administrator, and CTIA formed the CTIA Spectrum Clearinghouse, LLC.<sup>21</sup>

The CTIA Spectrum Clearinghouse, LLC is tasked with the identification and notification of cost-sharing obligations in the AWS and Mobile Satellite Service (MSS) spectrum band.

Specific requirements include:

- develop databases to accommodate incumbent relocation data and AWS and MSS deployment data,
- permit web-based upload of above-mentioned data,
- perform error checking and data verification,
- perform cost-sharing proximity tests and interference analyses,
- identify and notify of cost-sharing triggers,
- track obligation payments,
- provide detailed reports,
- develop processes and procedures for administration,
- address dispute resolution,
- hold regular user meetings, and
- provide ongoing support for users.

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<sup>19</sup> See *WTB opens Filing window for proposals to develop and manage the clearinghouse that will administer the relocation cost sharing plan for licensees in the 2.1 GHz band*, WT Docket No. 02-353, ET Docket No. 00-258, 21 FCC Rcd 6616 (2006)

<sup>20</sup> CTIA—The Wireless Association<sup>®</sup> Clearinghouse Plan, July 17, 2006

<sup>21</sup> See *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems Service Rules for Advanced Wireless Services In the 1.7 GHz and 2.1 GHz Bands* (DA 07-1120) (ET Docket No. 00-258, WT Docket No. 02-353) (March 8, 2007) 22 FCC Rcd 4680

In their semi-annual report for the period covering July 1, 2015 through December 31, 2015, CTIA Spectrum Clearinghouse, LLC recorded a total of 1749 microwave links relocated with an aggregate amount paid of \$323,390,599, averaging \$184,990 per link.<sup>22</sup> During this period, the Clearinghouse identified cost-sharing instances totaling nearly \$29 million dollars of reimbursement opportunities and notified the affected licensees accordingly.

### **Comsearch General Consulting and Data Products**

Comsearch offers an extensive array of data and engineering solutions and consulting. We have been gathering data for close to 40 years on microwave, broadcast, satellite, PCS and cellular networks from an abundance of sources. We verify, update and manage our extensive databases daily, and have amassed one of the largest and most accurate private collections of engineering data in the telecommunications industry. Comsearch engineers rely upon these databases to perform thousands of interference analyses and frequency assignments per month.

We have a dedicated team of wireless data experts that provide technical data and maps for point-to-point microwave, satellite earth stations, AM, FM, and TV contours, Multiple Address Systems (MAS), Broadband Radio Service (BRS) systems, and more. In addition to the data mentioned above, our comprehensive databases contain data on telecom sites, antennas and patterns, radios and radio filter curves, and station owners, and comprise over half a million records.

Comsearch also provides technical consulting for a wide range of spectrum management projects. For example, when the Commission established service rules for the 700 MHz to

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<sup>22</sup> See *Report Of The CTIA Spectrum Clearinghouse, LLC*, February 1, 2016.

support next-generation wireless services<sup>23</sup>, we supported our customers with a suite of products that identified and plotted all TV incumbents, calculated interference between TV transmitters and mobile devices, and helped to design networks to meet build-out requirements. All of these products and services require frequent downloads of the CDBS database and TV contours from the Commission.

Comsearch also downloads, processes and streamlines all types of ULS data for a wide variety of spectrum management needs. We use Private Land Mobile Radio Service (PLMRS) data to help plan regional and state interoperability networks in the 700 and 800 MHz public safety bands. We perform risk assessment studies for hospitals in the 460-470 MHz PLMRS band to determine if wireless medical telemetry networks will be impacted by private land mobile radio systems. Our SpectrumView<sup>SM</sup> and AuctionPlanner<sup>TM</sup> products provide nationwide and market-based licensee and geographic data and maps for wireless carriers and auction bidders.

We also provide technical data and maps for point-to-point microwave, satellite earth stations, MAS, 38 GHz, BRS, AWS, 700 MHz, 3650 MHz, Local Multipoint Distribution Systems (LMDS), Digital Electronic Message Service (DEMS) and more. Our custom deliverables can include a roll-up of specific technical information such as equipment or antenna type, transmit power, path length, etc. Other information that is typically provided includes detailed antenna, equipment, tower location, and licensee contact information. This data is used

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<sup>23</sup> See *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, (WT Docket No. 06-150, CC Docket No. 94-102, WT Docket No. 01-309, WT Docket No. 03-264, WT Docket No. 06-169), 22 FCC Rcd 15289 (2007).

to support competitive analysis, FCC filings, requests for rulemaking, and other regulatory concerns.

### **Deployment of Sensing Networks**

CommScope has experience developing and deploying large RF sensing networks in the form of E911 geolocation support. This system, which was initially called Geometrix<sup>®</sup>, then GeoLENS<sup>®</sup> was CommScope's solution for providing wireless caller location data to support E911 regulatory and location-enabled value-added services needs for GSM cellular networks. We deployed multiple such networks with up to approximately 10,000 sites per network. Some of these networks were in operation for over 10 years.

Comsearch has operated sensing nodes and networks throughout our history. However, over the last five years, we have deployed and operated several spectrum sensing receiver nodes and networks. These installations have supported a number of various applications to include monitoring of Federal assets with respect to the AWS-3 auction and re-banding initiatives, airborne measurements to determine mobile carriers uplink (mobile to base station) power levels at various altitudes, long-term monitoring at a commercial carriers' base stations to determine the potential impact of Federal systems transmissions on a base station, and numerous drive testing projects to measure real-time signal levels over multiple frequency ranges.

### **Comsearch Participation in the Wireless Innovation Forum (WInnForum)**

The WInnForum have established themselves early in this proceeding as the *de facto* multi-stakeholder organization to grapple with the myriad issues associated with requirements, security, protocols and testing/certifying a SAS and ESC. Comsearch is an active voting member of the WInnForum, and a charter member of the SSC. We participate on the Steering

Committee, each of the Working Groups, most of the Task Groups, and we co-chair the Task Group dealing with information sharing among SASs.

#### **4. Other Relevant Experience**

In addition to the experience discussed above, Comsearch has a wealth of additional relevant experience as outlined below:

##### **iQ·linkXG®**

iQ·linkXG is a commercial software tool that supports the complete analysis, frequency planning, and administration of terrestrial microwave networks. It was developed using Qt, a cross-platform application and UI framework that allows the software to be installed directly on multiple operating systems including UNIX servers and PCs. iQ·linkXG is designed to provide engineers with a full suite of capabilities in an efficient, multi-user platform that performs the necessary tasks involved in the design, frequency engineering, and administrative record-keeping of point-to-point and point-to-multi-point microwave systems. iQ·linkXG is a trusted, proven product that has been used for almost 20 years to design and manage some of the world's largest microwave networks. The tool can handle the planning of any size network, from a handful of links, to well over 50,000. Operating atop an extensive Oracle database, iQ·linkXG is used to design and maintain the fixed networks of some of the largest telecom service providers in the world. The tool has been used to design over 250,000 links worldwide.

## **iQ·clearXG™**

iQ·clearXG is a commercial software tool that provides a comprehensive solution for spectrum sharing and relocation analysis between AWS and incumbent systems in the 2.1 and 1.7 GHz bands. The 2.1 GHz microwave incumbent data is updated from our comprehensive proprietary database. We process the 1.7 GHz microwave and mobile data as updates are provided to us from NTIA. iQ·clearXG was built from the framework of Comsearch's proven iQ·clear® spectrum sharing tool for the 1.9 GHz PCS band. iQ·clear was used extensively by nearly every PCS operator in the nation to plan and rollout PCS systems. Building on this foundation, we developed iQ·clearXG for the interference analysis requirements specific to AWS. iQ·clearXG™ provides a graphical representations of predicted interference scenarios allowing users to make more informed decisions for mitigating interference.

## **Comsearch Interactive Solutions**

Throughout our history, we have developed and maintained over 200 programs in support of our domestic frequency coordination and spectrum management services. Comsearch Interactive Solutions provides web-based access to a host of applications that help our engineers and customers to design, engineer, maintain, and license a wireless network. Our website ([www.comsearch.com](http://www.comsearch.com)) allows access to our comprehensive and proprietary microwave and satellite earth station databases, engineering analysis tools, and GIS products. These applications are continuously updated and enhanced to promote efficiency, accuracy and improved business processes.

## **3650 MHz Quick Look**

Comsearch developed a free search tool for the 3650-3700 MHz Wireless Broadband Service to help broadband licensees efficiently manage their spectrum usage, and at the same time, protect incumbent users in the band. Our tool leverages the Commission's 3650 MHz ULS data in addition to our own databases to provide information about other users. We download and analyze 3650 MHz registration data from the Commission on a daily basis, and have processed data on almost 48,000 site registrations. The 3650 MHz Quick-Look determines if a base station is within close proximity to:

- other 3650 MHz Wireless Broadband Service systems,
- grandfathered earth stations,
- adjacent-channel C-band earth stations,
- adjacent-channel radar systems, and
- federal Radiolocation stations.

The quick look map interface allows users to quickly assess the spectrum environment in their area of interest in order to help avoid potential harmful interference.

## **ULS Express<sup>SM</sup>**

ULS Express is a web-based, interactive, FCC Form 601 point-to-point microwave application filing system. ULS Express significantly streamlines the application process by automatically populating over 90% of the Form 601 application with prior coordination data, and submitting the application directly to the Commission through a batch filing process. Batch filing enables us to process hundreds of microwave applications at once.

In 2000, Comsearch underwent rigorous testing with the Commission to obtain their approval for the submission of the electronic batch filings through ULS Express. During our testing period, we identified several key issues with the format of these batch filings as well as ULS license and application data which required various modifications to the ULS and electronic batch file formats. Through this effort we have developed an ongoing and productive rapport with Commission staff and their software and database support resources.

Our ULS Express uses a process to create and transmit the electronic batch filings that includes extracting the ULS licensed data along with prior coordination data. We have implemented validation into our web product to eliminate filing errors. We employ similar validation used by the Commission as well as validation proprietary to Comsearch based on our vast knowledge of microwave filings. We transfer this data using Secure Hypertext Transfer Protocol (HTTPS) from our system to the Commission. The same secure protocol is used to retrieve the Commission's response file for each batch filing which we then pass along to our customers. Since March 2001, we have submitted via electronic batch transfer over 16,000 applications.

### **MAS Express<sup>SM</sup>**

MAS Express is an interactive, web-based application that allows the user to quickly and easily identify and assess Multiple Address Service (MAS) spectrum availability, assign frequencies, and prepare documentation to obtain FCC licensing. MAS Express offers a detailed analysis that sorts channels based on operational compatibility with other MAS systems and allows a licensee to assign optimum frequencies to their MAS system. The analysis results include detailed information on every MAS system operating on the co- and adjacent-channel frequencies within a search radius. MAS Express also provides the documents that the

Commission requires to obtain a license after the frequencies are selected. Comsearch engineers and customers have used MAS Express to analyze over thousands of sites.

## **Security**

For all of our web-based interactive solutions described above, Comsearch employs an intensive user authentication and access control process. The authentication process communicates via HTTPS using Java cryptography for account management and credit card processing. Among other features, access control includes product permissions, product access limits – per query, daily, and monthly. Our websites along with the software and hardware are assessed for security vulnerabilities periodically by our IT Security Assessment Division located in Illinois and North Carolina.

## **5. Comsearch Approach to Spectrum Access System Duties and Responsibilities**

Comsearch is able to perform all of the duties and responsibilities of the SAS and ESC administrator outlined in the Public Notice and listed below. To help clarify our response, we have numbered each requirement from the Public Notice. In each case we have included a statement of compliance and discussion of our approach.

*1-1) A detailed description of the scope of the functions that the SAS and/or ESC would perform.*

Comsearch will perform all of the required functions described in 47 C.F.R. §§96.55, 96.57, 96.59, 96.61, 96.63, and 96.67. These required functions are listed below:

**Comsearch Compliance Statements**

<b>Requirements from FCC Rules</b>	<b>Comsearch Response</b>
<b>96.55 - Information Gathering and Retention</b>	
(a) The SAS shall maintain current information on registered CBSDs, the geographic locations and configuration of protected FSS locations as set forth in section 96.17, and the federal Incumbent User Exclusion Zones and Protection Zones.	Comsearch shall perform this function.
(1) For registered CBSDs, such information shall include all information required by section 96.39 and 96.45.	Comsearch shall perform this function.
(2) SAS Administrators must make all information necessary to effectively coordinate operations between and among CBSDs available to other SAS Administrators.	Comsearch shall perform this function.
(3) SAS Administrators must make CBSD registration information available to the general public, but they must obfuscate the identities of the licensees providing the information for any public disclosures.	Comsearch shall perform this function.
(4) For non-federal Incumbent Users, the SAS shall maintain a record of the location of protected earth stations as well as the all registration information required by section 96.17.	Comsearch shall perform this function.
(b) The SAS shall maintain records not pertaining to federal Incumbent User transmissions for at least 60 months.	Comsearch shall perform this function.
(c) The SAS shall only retain records of information or instructions received regarding federal Incumbent User transmissions from the ESC in accordance with information retention policies established as part of the ESC approval process.	Comsearch shall perform this function.
(d) The SAS shall be technically capable of directly interfacing with any necessary FCC database containing information required for the proper operation of an SAS.	Comsearch shall perform this function.
(e) The SAS shall process and retain acknowledgements by all entities registering CBSDs that they understand the risk of possible interference from federal Incumbent User radar operations in the band.	Comsearch shall perform this function.
<b>96.57 – Registration, Authentication, and Authorization of Citizens Broadband Radio Service Devices</b>	
(a) An SAS must register, authenticate, and authorize operations of CBSDs consistent with this rule part.	Comsearch shall perform this function.
(b) CBSDs composed of a network of base and fixed stations may employ a subsystem for aggregating and communicating all required information exchanges between the SAS and CBSDs.	Comsearch shall accommodate this function.
(c) An SAS must also verify that the FCC identifier (FCC ID) of any CBSD seeking access to its services is valid prior to authorizing it to begin providing service. A list of devices with valid FCC IDs and the FCC IDs of those devices is to be obtained from the Commission's Equipment Authorization System.	Comsearch shall perform this function.

<b>Requirements from FCC Rules</b>	<b>Comsearch Response</b>
(d) An SAS must not authorize operation of CBSDs within Protection Zones except as set forth in section 96.15.	Comsearch shall perform this function.
<b>96.59 - Frequency Assignment</b>	
(a) An SAS must determine the available and appropriate channels/frequencies for CBSDs at any given location using the information supplied by CBSDs, including location, the authorization status and operating parameters of other CBSDs in the surrounding area, information communicated by the ESC, other SASs, and such other information necessary to ensure effective operations of CBSDs consistent with this part. All such determinations and assignments shall be made in a non-discriminatory manner, consistent with this part.	Comsearch shall perform this function.
(1) Upon request from the Commission or a CBSD, an SAS must confirm whether frequencies are available in a given geographic area.	Comsearch shall perform this function.
(2) Upon request from the Commission, an SAS must confirm that CBSDs in a given geographic area and frequency band have been shut down or moved to another available frequency range in response to information received from the ESC.	Comsearch shall perform this function.
(3) If an SAS provides a range of available frequencies or channels to a CBSD, it may require that CBSD to confirm which channel or range of frequencies it will utilize.	Comsearch shall accommodate this function.
(b) Consistent with the requirements of 96.25, an SAS shall assign geographically contiguous PALs held by the same Priority Access Licensee to the same channels in each geographic area, where feasible. The SAS shall also assign multiple channels held by the same Priority Access Licensee to contiguous frequencies within the same License Area, where feasible.	Comsearch shall perform this function.
(c) An SAS may temporarily assign PALs to different channels (within the frequency range authorized for Priority Access use) to protect Incumbent Access Users or if necessary to perform its required functions.	Comsearch shall accommodate this function.
<b>96.61 – Security</b>	
(a) An SAS must employ protocols and procedures to ensure that all communications and interactions between the SAS and CBSDs are accurate and secure and that unauthorized parties cannot access or alter the SAS or the information it sends to a CBSD.	Comsearch shall perform this function.
(b) Communications between CBSDs and an SAS, between an ESC and an SAS, between individual CBSDs, and between different SASs, must be secure to prevent corruption or unauthorized interception of data. An SAS must be protected from unauthorized data input or alteration of stored data.	Comsearch shall perform this function.
(c) An SAS must verify that the FCC identification number supplied by a CBSD is for a certified device and must not provide service to an uncertified device.	Comsearch shall perform this function.

Requirements from FCC Rules	Comsearch Response
<b>96.63 – Spectrum Access System Administrators</b>	
<p>The Commission will designate one or more SAS Administrators to provide nationwide service. The Commission may, at its discretion, permit the functions of an SAS, such as a data repository, registration, and query services, to be divided among multiple entities; however, it shall designate one or more specific entities to be an SAS Administrator responsible for coordinating the overall functioning of an SAS and providing services to operators in the Citizens Broadband Radio Service. Each SAS Administrator designated by the Commission must:</p>	
(a) Maintain a regularly updated database that contains the information described in section 96.55.	Comsearch shall perform this function.
(b) Establish a process for acquiring and storing in the database necessary and appropriate information from the Commission's databases, including PAL assignments, and synchronizing the database with the current Commission databases at least once a day to include newly licensed facilities or any changes to licensed facilities.	Comsearch shall perform this function.
(c) Establish and follow protocols and procedures to ensure compliance with the rules set forth in this part, including the SAS functions set forth in section 96.53, <i>et seq.</i>	Comsearch shall perform this function.
(d) Establish and follow protocols and procedures sufficient to ensure that all communications and interactions between the SAS, ESC, and CBSDs are accurate and secure and that unauthorized parties cannot access or alter the SAS or the information transmitted from the SAS to CBSDs.	Comsearch shall perform this function.
(e) Provide service for a five-year term. This term may be renewed at the Commission's discretion.	Comsearch shall accommodate this requirement.
(f) Respond in a timely manner to verify, correct or remove, as appropriate, data in the event that the Commission or a party brings a claim of inaccuracies in the SAS to its attention. This requirement applies only to information that the Commission requires to be stored in the SAS.	Comsearch shall perform this function.
(g) Securely transfer the information in the SAS, along with the IP addresses and URLs used to access the system, and a list of registered CBSDs, to another approved entity in the event it does not continue as the SAS Administrator at the end of its term. It may charge a reasonable price for such conveyance.	Comsearch shall accommodate this requirement.
(h) Cooperate to develop a standardized process for coordinating operations with other SASs, avoiding any conflicting assignments, maximizing shared use of available frequencies, ensuring continuity of service to all registered CBSDs, and providing the data collected pursuant to section 96.55.	Comsearch shall perform this function.

<b>Requirements from FCC Rules</b>	<b>Comsearch Response</b>
(i) Coordinate with other SAS Administrators including, to the extent possible, sharing information, facilitating non-interfering use by CBSDs connected to other SASs, maximizing available General Authorized Access frequencies by assigning PALs to similar channels in the same geographic regions, and other functions necessary to ensure that available spectrum is used efficiently consistent with this part.	Comsearch shall perform this function.
(j) Provide a means to make non-federal non-proprietary information available to the public in a reasonably accessible fashion in conformity with these rules.	Comsearch shall perform this function.
(k) Ensure that the SAS shall be available at all times to immediately respond to requests from authorized Commission personnel for any and all information stored or retained by the SAS.	Comsearch shall accommodate this requirement.
(l) Establish and follow protocols to respond to instructions from the President of the United States, or another designated Federal government entity, issued pursuant to 47 U.S.C. 606.	Comsearch shall accommodate this requirement.
(m) Establish and follow protocols to comply with enforcement instructions from the Commission.	Comsearch shall accommodate this requirement.
(n) Ensure that the SAS:	
(1) operates without any connectivity to any military or other sensitive federal database or system, except as otherwise required by this part; and	Comsearch shall accommodate this requirement.
(2) does not store, retain, transmit, or disclose operational information on the movement or position of any federal system or any information that reveals other operational information of any federal system that is not required by this part to effectively operate the SAS.	Comsearch shall accommodate this requirement.
<b>96.67 – Environmental Sensing Capability</b>	
(a) The primary purpose of the ESC is to facilitate coexistence of Citizens Broadband Radio Service users with federal Incumbent Users through signal sensing. An ESC will be operated by a non-governmental entity and, except as set forth below, will not rely on governmental agencies to affirmatively communicate information about the operations of incumbent radio systems.	Comsearch shall accommodate this requirement.
(b) An ESC may only operate after receiving approval by the Commission. Such approval shall be conditioned on meeting the requirements of this part and any other requirements imposed by the Commission. The Commission may revoke, modify, or condition ESC approval at its discretion.	Comsearch shall accommodate this requirement.
(c) An ESC must meet the following requirements:	
(1) Be managed and maintained by a non-governmental entity;	Comsearch is a non-governmental entity.

<b>Requirements from FCC Rules</b>	<b>Comsearch Response</b>
(2) Accurately detect the presence of a signal from a federal system in the 3550-3700 MHz band and adjacent frequencies using approved methodologies that ensure that any CBSDs operating pursuant to ESC will not cause harmful interference to federal Incumbent Users;	Comsearch shall perform this function.
(3) Communicate information about the presence of a signal from a federal Incumbent User system to one or more approved SASs;	Comsearch shall perform this function.
(4) Maintain security of detected and communicated signal information;	Comsearch shall perform this function.
(5) Comply with all Commission rules and guidelines governing the construction, operation, and approval of ESCs;	Comsearch shall accommodate this requirement.
(6) Ensure that the ESC shall be available at all times to immediately respond to requests from authorized Commission personnel for any information collected or communicated by the ESC; and	Comsearch shall accommodate this requirement.
(7) Ensure that the ESC operates without any connectivity to any military or other sensitive federal database or system and does not store, retain, transmit, or disclose operational information on the movement or position of any federal system or any information that reveals other operational information of any federal system that is not required by this part to effectively operate the ESC.	Comsearch shall accommodate this requirement.
(d) ESC equipment may be deployed in the vicinity of the Exclusion Zones and Protection Zones to accurately detect federal Incumbent User transmissions.	Comsearch understands this requirement.

*1-2) A demonstration that the prospective SAS Administrator or ESC operator possesses sufficient technical expertise to operate an SAS and/or ESC, including the qualifications of key personnel who will be responsible for operating and maintaining the SAS and/or ESC.*

As detailed in Sections 2 through 4 above, Comsearch demonstrates by substantial past performance and industry leadership that we possess sufficient technical expertise to operate a SAS and ESC.

The key personnel who will be responsible for operating and maintaining the SAS and ESC have the requisite experience and expertise by virtue of our previously mentioned past performance. We consider the specific qualifications of our key personnel to be company confidential and not disclosable in a public filing. We will gladly provide this information to the

Commission upon request.

*1-3) The prospective SAS Administrator or ESC operator must demonstrate that it is financially capable of operating an SAS and/or ESC for a five year term. The proposal must include a description of the prospective SAS Administrator or ESC operator's business structure including ownership information. To the extent that the proponent will rely on fees to support its operations, the proposal should also describe the fee collection process and the entities from which the fees will be collected.*

Section 2 details our financial capabilities and ownership, and demonstrates by virtue of nearly 40 years of operation, and by our corporate ownership, that we possess the requisite business structure to operate the SAS and ESC for a five-year term. While we will rely on fees to support our operations, we are still developing our business modelling for providing SAS and ESC services. We will provide this information to the Commission as we complete and approve our business models.

*1-4) A description of how data will be securely communicated between the SAS and its associated ESC and how quickly and reliably these communications will be accomplished.*

As noted previously, the SAS and ESC ecosystem are in early stages of development. As Comsearch advances in creating our SAS and ESC solutions, we will implement security procedures and protocols consistent with an enterprise service sufficient to interface and work our broad potential SAS and ESC customer base. However, we address several Commission questions on security in the questions below.

As a participant in the WinnForum, we will likely implement data transmission security protocols suggested by the published WinnForum recommendations. To the extent we deviate from these requirements, we will inform the Commission.

We will be able to implement these protocols to meet customer need with appropriate reliability, either as recommended by WInnForum or required by customers.

1-5) Technical diagrams showing the architecture of the SAS and/or ESC and a detailed description of how each function operates and how each function interacts with the other functions.

Early in our discussions, WInnForum developed a SAS functional architecture based upon the Commission’s nominal architecture presented in the Order.<sup>24</sup> Figure 1 below shows the SAS functional architecture as developed in WInnForum and presented to the FCC.<sup>25</sup>

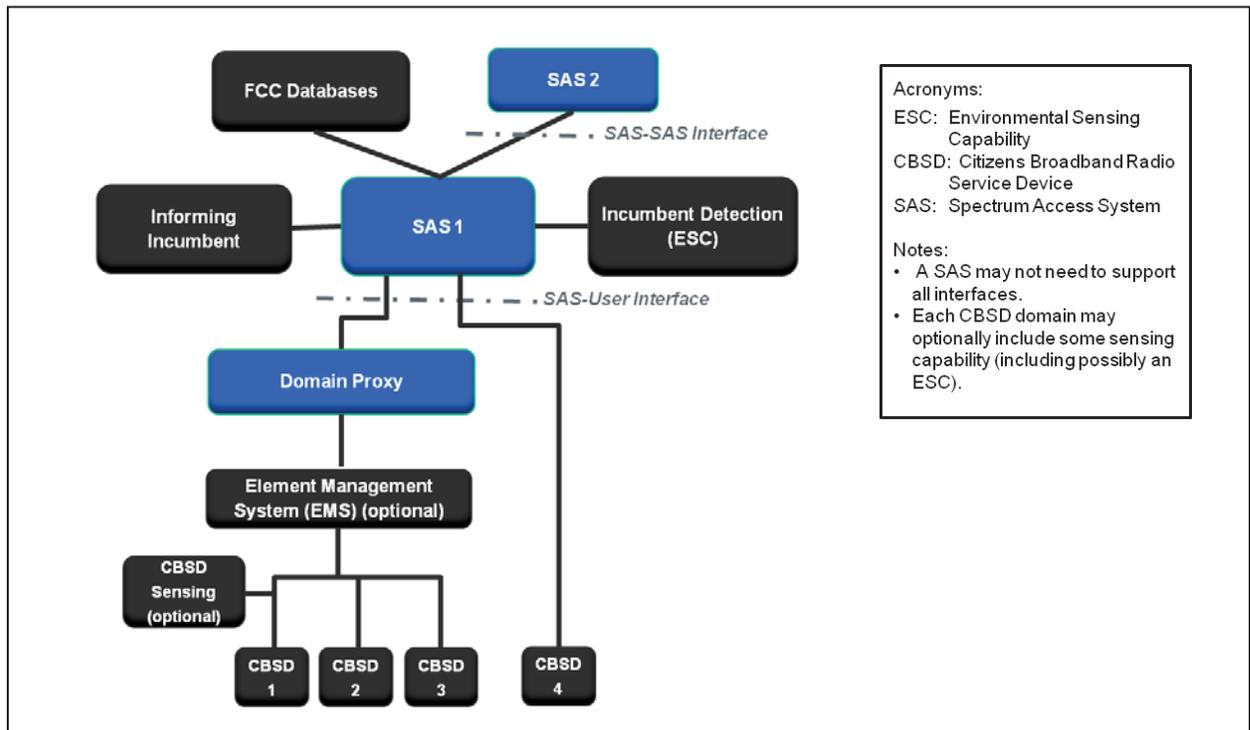


Figure 1: WInnForum SAS Functional Architecture

<sup>24</sup> See *Order* at Figure 3.

<sup>25</sup> See WInnForum *ex parte*, September 17, 2015

Comsearch intends to implement an architecture similar to the WINnForum recommendation. We will provide detailed descriptions of how each function operates and how each function interacts with the other functions upon approval and publication within the WINnForum and upon our internal review and approval.

The ESC architecture is still under development within the WINnForum. We will provide more information and detail on the ESC architecture and interaction of functions upon approval and publication within the WINnForum and upon our internal review and approval.

*1-6) A description of the propagation model and any other assumptions that the prospective SAS Administrator or ESC operator proposes to use to model operations and facilitate coordination in the band.*

The Commission has made clear in the 2<sup>nd</sup> R&O that it prefers that SAS providers use common propagation models and assumptions.<sup>26</sup> We note that the WINnForum will be addressing these issues within the Working Groups and will likely develop recommendations for propagation and related assumptions. We will provide more detail on our approach to modelling as the WINnForum work progresses and as we develop our SAS and ESC systems.

However, throughout our history, Comsearch has been at the forefront of propagation modelling, interference analysis and frequency coordination. We have personnel who participate in COST (European Cooperation in Science and Technology), specifically, COST-231: Information and Communication Technologies where existing propagation models are studied and improved, and new models are developed and tested. For the 3.5 GHz band in support of small cell deployment, we have developed a non-line-of-sight (nLOS) propagation model. The

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<sup>26</sup> See for example 2<sup>nd</sup> R&O at ¶¶ 138 and 188.

Comsearch nLOS model is based upon existing propagation models, but models the effect of trees and buildings slightly differently based upon antenna heights at or below the local clutter. We are in the process of performing propagation tests to help verify the model's propagation predictions. We will also rely upon our experience as described herein to model operations and facilitate coordination in the band.

*1-7) A description of the methods that will be used to update software and firmware and to expeditiously identify and address security vulnerabilities.*

Methods to update software and firmware are under discussion and development within the WinnForum. We participate in these discussions, and will study the appropriate recommendations upon completion and upon collaboration with stakeholders as necessary. We will provide more detail on our approach to updating software and firmware, including addressing associated security concerns.

*1-8) An affirmation that the prospective SAS Administrator and/or ESC operator (and its respective SAS and/or ESC) will comply with all of the applicable rules as well as applicable enforcement mechanisms and procedures.*

Comsearch hereby affirms that we will comply with all of the applicable Commission rules and applicable enforcement mechanisms and procedures associated with being a SAS and ESC administrator.

*2-1) A detailed description of how the SAS will retain, secure, and verify information from CBSDs (including location data), licensees, associated ESCs, and other SASs.*

Many of the methods for retaining, securing, and verifying information from CBSDs, licensees, associated ESCs, and other SASs are being developed within the WinnForum. As

stated previously, we will incorporate the appropriate verification and security procedures as required. We will provide more detail to the Commission upon request.

*2-2) A demonstration that the SAS will be capable of resolving various sources of interference between and among Citizens Broadband Radio Service users and/or Incumbent users.*

Comsearch includes among our existing customer base all of the Incumbent Users within the 3.5 GHz band including the U.S. Navy, FSS licensees and 3650 MHz Wireless Broadband Service licensees. In addition, we believe that to the extent we follow the Commission's rules, recommendations from the WinnForum, and our own expertise and best practices, incidences of interference among stakeholders will be rare.

We expect that demonstration of this requirement will be addressed through the Commission's SAS certification procedures. Therefore, we will demonstrate this capability at that time. We will provide more detail to the Commission upon request.

*2-3) A description of how the SAS will ensure that non-federal FSS earth stations and grandfathered 3650-3700 MHz licensees are protected from harmful interference consistent with the rules.*

Protection of these Incumbent Users will be effected through strict adherence to the Commission's rules<sup>27</sup>, incorporation of the appropriate WinnForum recommendations, and successful completion of the Commission's SAS, ESC and CBSD certification process.

As described above, Comsearch has one of the most accurate databases on FSS incumbents, and we also work closely with the licensees in the 3650 MHz Wireless Broadband Service. In

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<sup>27</sup> See 47 C.F.R. §§96.17 & 96.21.

addition to adopting the protection criteria described in the rules with detailed recommendations in the WinnForum (which includes incorporating protection zones, use of the FCC-provided databases and regular incumbent updating of data), we may elect to augment the datasets using our proprietary data bases as an additional verification of interference protection.

*2-4) A description of how coordination will be effectuated (e.g., through data synchronization) between multiple SASs, if multiple SASs are authorized, and how quickly this synchronization of data will be accomplished.*

SAS-SAS communication and data-synchronization are being addressed in the WinnForum. However, as one of ten FCC-designated TV White Space Database Administrators, the majority of us collaborated under a self-formed White Space Database Administrator (WSDBA) Group to establish and maintain a database interoperability specification.<sup>28</sup> The WSDBA Group continues to meet to address issues such as rules changes and operational considerations.

Consistent with our experience noted above and our participation with the WinnForum, we will establish the appropriate procedures for SAS-SAS communication and data-synchronization. We will provide more detail on our approach as WinnForum recommendations address and as we develop our SAS and ESC systems.

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<sup>28</sup> See generally *ex parte* filings by the White Space Database Administrator Group (ex. <http://apps.fcc.gov/ecfs/comment/view?id=6016844663>)

*2-5) If the prospective SAS Administrator will not be performing all SAS functions, it must provide information on the entities operating other functions and the relationship between itself and these other entities. In particular, it must address how the Commission can ensure that all of the requirements for SAS Administrators in Part 96, subpart F are satisfied when SAS functions are divided among multiple entities, including a description of how data will be transferred among these various related entities and SASs, if multiple SASs are authorized, and the expected schedule of such data transfers (i.e., real-time, once an hour, etc.).*

Comsearch intends to perform all database functions as required in Part 96, subpart F.

*2-6) A description of the methods (e.g., interfaces, protocols) that will be used by: (1) CBSDs to communicate with the SAS; (2) the SAS to communicate with CBSDs; (3) the SAS to communicate with other SASs; and, if applicable, (4) the SAS to communicate with one or more ESCs. The prospective SAS Administrator must also describe the procedures, if any, which it plans to use to verify that a CBSD can properly communicate with the SAS.*

The communications and verifications methods mentioned above are being developed within the WinnForum. To the extent feasible and appropriate, we plan to incorporate the WinnForum recommendations.

Comsearch employs technical expertise to integrate any type of security protocol for retaining, securing, and verifying information from CBSDs, licensees, associated ESCs, and other SASs. There are many secure protocols that can be deployed, and our approach will safeguard the integrity of the database, web servers, and network. The specific security methods that meet the device manufacturer and our database requirements have yet to be determined. We will deploy security methods that meet industry standards.

We will provide more detail as we develop our SAS and ESC system.

*2-7) An affirmation that, consistent with section 96.55 of the Commission's rules, the SAS will only retain records and information or instructions received regarding federal transmissions from the ESC in accordance with information retention policies established as part of the ESC approval process.*

Comsearch hereby affirms that we will comply with section 96.55 of the Commission's rules, and that our SAS will only retain records and information or instructions received regarding federal transmissions from the ESC in accordance with information retention policies established as part of the ESC approval process.

*2-8) A description of the security methods that the prospective SAS Administrator plans to use to ensure that unauthorized parties cannot access or alter the SAS or otherwise corrupt the operation of the SAS in performing its intended functions, consistent with the Commission's rules.*

The security methods mentioned above are being developed within the WinnForum. To the extent feasible and appropriate, we plan to incorporate the WinnForum recommendations.

Comsearch has implemented multilayered security methodology for protecting our Internet Gateway (i.e., ingress and egress). Our IT Security Policy and Standards define technology and techniques used as part of its protection methodology. We employ technologies such as, but not limited to, firewalls, intrusion protection, and information loss prevention.

As an example, we employ the following security methods to protect our existing database systems and associated interactions:

- Database communication with other database providers can be handled real time using Web Services with a protocol such as SOAP. Each database provider is required to identify themselves using certificate authentication, encrypted account login, and account password over secured Web Services. We log each transaction received noting the specific database provider, timestamp and the other pertinent

information. If an unknown database provider attempts to breach using Web Services, our security will flag and refuse the receipt of information.

- The encrypted data transfer between device and database includes, but is not limited to, device identifier, manufacturer identifier, location coordinates and a shared secret. Appropriate security protocols are used to ensure that an unknown device and/or party cannot access the database or perform a denial of service attack.
- The device passes the shared secret to the database and the database transmits the appropriate authentication response for the shared secret along with channel availability list back to the device. All communications between device and database are recorded in the database.
- If the database determines the device is not authorized based on the shared secret, manufacturer identifier and device identifier, an error is returned to the device. All failures are carefully reviewed to identify, track, and report to the FCC and manufacturers any and all improper activity from a user, database manager and/or device.
- Logging onto the Web Server for registrations of fixed and manufacturer device information is handled by our proprietary account security methods. These methods include SSL encryption on the web server with 128bit encryption in database storage. We have implemented an account lock down policy to prohibit the user from attempting login hacks. If a user attempts to login three times unsuccessfully, the account will automatically be locked. A notification of the account specifics and date-time of login attempts will be sent to the account owner

and the database administrator. All account passwords will expire at a predetermined time and must be changed by the account owner. We also prohibit use of proper words/names and the user must include alpha numeric characters. A password cannot be repeated.

- All database activity is tracked using proprietary mechanisms already in use with our other product lines. The tracking mechanism provides a history of all requests via Web Services with other database providers, user web sessions and device-database activity.
- Existing back up/recovery policy includes off-site storage, redundant server/hardware, disk mirroring, monthly patch upgrades, routine database diagnostics, redundant power supply, daily database and system backups and physical disaster/recovery documentation.
- Our IT Security and Risk Management group performs periodic security assessments. These assessments occur over physical, technical, human resources and application security areas.
- All development follows strict policies ensuring discrepancy/bug tracking, source control, resolution documentation and thorough unit regression testing.

We will provide more detail as we develop our SAS/ESC system.

*2-9) Descriptions of dynamic use-case scenarios for how the SAS will manage and assign spectrum resources to ensure that geographically and spectrally adjacent operations are coordinated consistent with the Commission's rules. Use case scenarios should include the methodology and protection approach for cases of radio interference due to adjacent blocking, out-of-band emissions, and aggregate co-channel interference. Describe how multiple SASs will coordinate the calculation of aggregate interference for protecting Incumbent users and Priority Access licensees.*

The dynamic use-case scenarios mentioned above are being addressed within the WinnForum. To the extent feasible and appropriate, we plan to incorporate the WinnForum recommendations in our SAS/ESC system. We will provide more detail as we advance in our development.

*2-10) A description of the methods that the SAS will use to make information stored or retained by the SAS available in response to a request from authorized Commission personnel.*

The FCC-SAS interface is being addressed within the WinnForum. However, our approach will be similar to our TVWS offering as outlined below with the following functionalities:

- We will provide a secure web-based interface to allow the FCC access to data stored in the database.
- We will allow the FCC to request removal or modification of data from the database through email or the web-based interface.
- We will allow the FCC to request additional information such as reports on a custom basis.

FCC-designated personnel can create an account and will be provided with a unique login and password. Each FCC account will be established with special permissions allowing access to data. Comsearch will provide FCC with a central point of contact to address any web or data related issues.

We will provide more detail as we develop our SAS and ESC system.

## **6. Comsearch Approach to Environmental Sensing Capability Duties and Responsibilities**

As described above, we have extensive experience developing and deploying sensing and monitoring nodes and networks. We expect to leverage our experience and expertise throughout CommScope to deploy and bring online our ESC network including approval by the Commission, NTIA and DoD.

The WinnForum is also developing recommendations for ESC development, deployment, protocols and security. To the extent feasible and appropriate, we plan to incorporate the WinnForum recommendations.

*3-1) A description of the methods (e.g., interfaces, protocols) that will be used by the ESC to communicate with the SAS. It must include a description of the security methods or protocols that will be used to ensure that unauthorized parties cannot access or alter the ESC or otherwise corrupt the operation of the ESC in performing its intended functions.*

The WinnForum is also developing recommendations for the ESC to communicate with the SAS. To the extent feasible and appropriate, we plan to incorporate the WinnForum recommendations. We will provide more detail as we develop ESC design and network approach.

*3-2) A description of the sensing methodology it will use to detect federal transmissions and determine that the spectrum needs to be evacuated. This description must include a detailed description of the type of sensors to be used (i.e., infrastructure or device based), the sensing architecture to be employed, the sensing thresholds, any processing of sensor data, sensor sensitivity, and sensor resiliency to receiver front-end saturation and burn-out. The prospective ESC operator must also provide a description of the safeguards that will be used to “ensure that the ESC does not store, retain, transmit, or disclose operational information on the movement or position of any federal system or any information that reveals other operational information of any federal system that is not required to effectively operate the ESC by Part 96.*

The WinnForum is also developing recommendations for the ESC sensor network and ecosystem. In addition, we are currently developing our approach to signal detection, sensor protection and resiliency, data safeguarding and retention, and operational assurance. To the extent feasible and appropriate, we plan to incorporate the WinnForum recommendations. We will provide more detail as we develop ESC design and network approach.

*3-3) A description of the methods (e.g., interfaces, protocols) that will be used by sensors to communicate with the ESC and the procedures, if any, that it plans to use to verify that all sensors can communicate with the ESC in a timely and secure manner. It must include a description of the security methods or protocols that will be used to ensure that unauthorized parties cannot access or alter the ESC or individual sensors or otherwise corrupt the operation of the ESC in performing its intended functions.*

The WinnForum is also developing recommendations for the ESC sensor communications. In addition, we are currently developing our approach to inter-sensor communication and security. To the extent feasible and appropriate, we plan to incorporate the WinnForum recommendations. We will provide more detail as we develop ESC design and network approach.

## 7. Conclusion

As detailed throughout our proposal, Comsearch has the extensive technical capability, expertise and past performance to develop, test, certify and run a nationwide SAS and ESC system and network consistent with the Commission's rules.

Through our extensive and diverse customer base, plus our government contracting and security requirements, we will have the neutrality essential to provide SAS and ESC services on a non-discriminatory basis across the entire marketplace.

Our participation within the WinnForum will help to ensure that our SAS and ESC solution is compliant with the appropriate industry-developed and recognized standards, recommendations and guidelines. We believe this will help with approval and ultimate certification of our SAS and ESC solution.

Respectfully Submitted,

/s/ H. Mark Gibson

H. Mark Gibson  
Director, Regulatory Policy  
Comsearch, a CommScope Company  
19700 Janelia Farm Boulevard  
Ashburn, Virginia 20147

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