

SAS Deployment Guide

CloudCore OMC – Version 7.1.6 BaiBS_RTS_3.6.6 BaiBS_QRTB_2.6.2 BaiCE_BG_1.6.5.3 BaiCE_AP_2.4.7_NA

September 2021

Version 1.20

About This Document

This document is intended for operators who are utilizing the Citizens Broadband Radio Service (CBRS) spectrum and the shared Spectrum Access System (SAS). The information is targeted to the CBRS network operator and/or the Certified Professional Installer (CPI) and covers how to plan and deploy the SAS setup in the Baicells CBRS Service Devices (CBSDs). This document does not cover the background on CBRS commercialization, how to become a SAS vendor, or how to become a CPI, for which there are many industry websites, such as:

- Wireless Innovation Forum (WINNF): https://www.wirelessinnovation.org/information-documents
- CBRS Alliance (LTE-based OnGo): https://www.cbrsalliance.org/

Users of this document should already be familiar with and have some experience in deploying and using the Baicells equipment and software applications.

The information in this document is based on the following Baicells software versions:

- eNB: BaiBS_RTS_3.6.6 (Nova227 and Nova233)
- eNB: BaiBS_QRTB_2.6.2 (Neutrino430, Nova430, Nova430i, and Nova436Q)
- CPE: BaiCE_BG_1.6.5.3 (Atom-OD06H, -OD06L, -ID06B, -OD15)
- CPE: BaiCE_AP_2.4.7_NA (Atom-OD04H, -OD04L)
- OMC: Version 7.1.6

Terms used in this document or related to LTE are listed in alphabetical order and described in Acronyms & Abbreviations, which can be found at Baicells > Resources > *Documents*.

New in This Release

The following updates have been provided in this release:

- Added SAS-capable eNBs Nova430 and Nova430i.
- Updated SAS main log example (Figure 4-30) to show new *Log Names* column, which is used to display the SAS message procedure.
- Added procedures in section 4.4.1 for viewing device logs (step 13) and exporting device logs (step 14).
- Added information about General Authorized Access (GAA) and Priority Access License (PAL) channels (*section 4.2.1.3* and Figure 4-31).

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Support Resources

- **Documentation** Baicells product data sheets and technical manuals may be found at Baicells > Resources > *Documents*.
- Support Open a support ticket, process an RMA, and the Support Forum are at Baicells > Support.

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1. Overview

The Citizens Broadband Radio Service (CBRS) covers the once regulated 3.55-3.7 GHz band. The FCC freed up the previous military-only CBRS band for commercial use. CBRS officially launched in January 2020. The ability for operators to use CBRS provides an economical way for existing operators to increase coverage and capacity, and it provides a low-cost solution for start-up operators to enter the market. Not only does CBRS add available spectrum, it rivals current Wi-Fi networks due to its (a) propagation characteristics, and (b) planned design and support for next-generation mobility and 5G networks.

In terms of implementation, what makes CBRS especially different is the way the 3.55-3.7 GHz band may be accessed. CBRS commercialization is based on the concept of "shared" spectrum, where spectrum is dynamically assigned and released on an as-needed basis. Shared spectrum assignment is handled by Spectrum Access System (SAS) vendors. Currently Amdocs, CommScope, Federated Wireless, and Google are FCC Part 96 certified SAS vendors. To use the CBRS spectrum, the CBRS Service Devices (CBSD) such as the Baicells eNodeB (eNB) and user equipment also must go through certification. Certification will be an ongoing process as new products are introduced. All CBSDs must be installed by a Certified Professional Installer (CPI) in order to lawfully operate within the designated spectrum of CBRS.

The CBSD equipment must be configured to connect to a SAS vendor for band assignment. A CBSD transmits RF in the CBRS band and is subject to FCC rules. The SAS enforces the FCC rules. When the assigned band is no longer needed, SAS can free it up so that other users can operate in that band. A CBSD is served by a SAS either directly or through a Domain Proxy (DP). A DP is an aggregation point that interfaces with the SAS on behalf of all the devices behind it. The Baicells CBRS/SAS solution includes a DP. The Baicells eNodeB (eNB) uses DP to connect to the SAS by leveraging the existing connection with the Baicells Operations Management Console (OMC). All eNBs will need to connect to the OMC in order to connect to the SAS.

As a champion of CBRS commercialization for years, Baicells is ready to work with operators. Once you have your SAS vendor account and are approved to be a Baicells trial user, follow this guide to configure the eNB and user equipment, and associate your OMC account to your SAS account.

2. Reference Information

For certification, the CBSD equipment is categorized as shown in Table 2-1.

Device	Power	Max EIRP (dBm/10 MHz)	Max PSD (dBm/MHz)
End User Device (EUD)	23 dBm or 200mV	23	N/A
CAT A CBSD	30 dBm or 1W	30	20
CAT B CBSD	47 dBm or 50W	47	37

Table 2-1: CBSD Categories

The 'dBm/10 Mhz' means EIRP power density per 10 MHz in dBm. EIRP: Effective Isotropic Radiated Power PSD: Power Spectral Density

3. Preparation

3.1 SAS Account

You will need to create a SAS account directly with an approved SAS vendor for services to authorize transmission within the CBRS spectrum. Currently, the supported SAS administrators are Amdocs, CommScope, Federated Wireless, and Google.

3.2 Certified Professional Installer

You will need at least one CPI's credentials that will be entered in the configuration on the CBSD, DP, or SAS portal. Each SAS vendor provides their own GUI to assist you in using their SAS portal.

3.3 Equipment & Software

The following are the current Baicells eNB/CPE models and OMC software versions that support SAS.

	NOTE 1:The first generation (Gen 1) Baicells CPEs do not suppo	rt SAS.
•	ОМС	BaiOMC 7.1.6
•	Atom-OD04	BaiCE_AP_2.4.7_NA
•	Atom-OD06/ID06/OD15	BaiCE_BG_1.6.5.3
•	Neutrino430, Nova430, Nova430i, and Nova436Q	BaiBS_QRTB_2.6.2
•	Nova227/233	BaiBS_RTS_3.6.6

NOTE 2: Gen 1 CAT4 CPEs are now End Of Life (EOL).

NOTE 3: BaiOMC can be cloud-based (cloudcore.baicells.com) or local (private network).

4. Configuration

Reference: *CloudCore Configuration & Network Administration Guide, eNodeB Configuration Guide,* and *CPE Configuration Guide*. These three documents cover all Baicells GUIs/configuration menus.



Caution: Once you have an account with an approved SAS vendor and you enable SAS on the CBSD and in the OMC (DP), current users attached to the CBSD will be disconnected until the CBSD reaches transmission state with the SAS. Once the SAS authorizes the CBSD and it reaches transmission state, users will automatically reconnect.

NOTE 1: Throughout this document, the term CBSD can mean any of the following devices: eNB, CPE, Virtual eNB, and/or Virtual CPE. If a procedure is specific to one device type, it will be identified as such. The term Virtual eNB or Virtual CPE CBSD is used to describe any device you pre-configure for SAS operation that has not been registered with the OMC yet. When a virtual CBSD connects to the OMC for the first time, the device is moved from the virtual device tab into its respective 'regular' device tab listing. Device tabs are described in more detail in *section* **4.4**.

NOTE 2: Each SAS vendor provides their own GUI to assist you in using their SAS portal. NOTE 3: When SAS is enabled on the eNB, the standard BTS Info > Quick Setting for *Band*, *Bandwidth*, *Frequency*, and *Power modify* will become greyed out; the eNB will use the configuration based on the SAS settings response. However, you can configure your preferences for these settings by selecting a *Frequency Selection Logic*, which is described in detail in *section* 4.2.1.

NOTE 4: The GUI SAS fields vary slightly between RTS 3.6.6 and QRTB 2.6.2 software versions.

4.1 SAS Registration Options

The operator has three options for registering CBSDs with the SAS provider. The first two options use a Single-Step registration method, where all CBSD configuration is performed in the Baicells device GUIs or by using the OMC. Option three uses a Multi-Step registration method, where only the CBSD's basic information is configured using the OMC and then all other installation parameters are entered in the SAS portal. The following information provides more details:

NOTE 1: Regardless of which registration option you use, you must configure the CBSD's basic information for successful registration with SAS.

NOTE 2: For Option 3, when using the Multi-Step registration method, Baicells recommends that you upload all CBSD information in the SAS portal prior to enabling SAS on the CBSD. NOTE 3: The CPI must upload the certificate directly through the SAS portal.

• Option 1: Configure installation parameters directly in the CBSD GUI

The CPI certificate is uploaded directly to the CBSD, which effectively signs and encodes all installation parameters. The encoded CPI data is sent to the OMC (DP), which is then passed to the SAS during the registration request. It is not necessary to add the CBSD in the SAS portal when using this method. SAS settings are configured as follows:

- CBSD GUI: Set SAS Registration Type to Single-Step.
- OMC (DP): Select *Single-Step* and upload CPI certificate.

• Option 2: Configure installation parameters using the OMC (DP)

The installation parameters are entered using the OMC (DP) and signed by the CPI. It is not necessary to add the CBSD in the SAS portal when using this method. SAS settings are configured as follows:

- CBSD GUI: Set SAS Registration Type to Single-Step.
- OMC (DP): Select *Single-Step* and upload CPI certificate.

• Option 3: Configure installation parameters in the SAS portal

The installation parameters are entered directly in the SAS portal and signed by the CPI. Only the basic CBSD info (such as Category, User ID, and FCC ID) is entered on the CBSD. SAS settings are configured as follows:

- CBSD GUI: Set SAS Registration Type to Multi-Step.
- OMC (DP): Select *Multi-Step*.

For operators who have chosen Google as their SAS provider, there is a new OMC feature that allows you to export CBSD data directly onto the Google SAS portal when you are using the Multi-Step registration method. The export function is shown in Figure 4-1.

NOTE 1: Choose the Export to Google function only if Google is your SAS vendor. NOTE 2: Baicells is committed to working with all certified SAS vendors to support this type of functionality as it becomes available in order to assist you with SAS deployment activities.

Figure 4-1: Export to Google SAS Portal

ଜ ଜ	loudco	ore	C	MC	BOSS								😭 Cloud	Key:	Welcome,I
ø		dvance	SAS							Critical	l 199 \varTheta Majo	r 20 🛛 🔍 Minor 11	• Warning 0	Fis	ci (UTC-06:00)2021-06-11 16:32
(t)	eNB	CP	Е	Virtual eNB	Virt	ual CPE									Export
							× Q	SAS Enabled	3/46 Authori	zed 2/46	Grant-Suspended	0/46			000
				SAS Enabled $^{\oplus}$	¢	Serial Number $^{\oplus}$	c	ell Name 🌣	State ©	CPI State 🌣	Category	CBSD ID	Grants		Export
	1	V	0		00				Unregistered	error	в				Export to Google SAS
5	2		0		ત્ત્રે					missing	А				
	3		0		00				Unregistered	missing	A				
Ť	4		0		00					missing	А				
Ø	5		0						Unregistered	error	A				
	6		0	-	00					missing					
	7		0						Unregistered	error	А				
	ę		0		100				Transistered	ATTON	R				

4.2 CBSD Configuration

4.2.1 eNB Configuration

Follow the steps below to complete the eNB/CBSD configuration.

Prerequisites: Verify the management server URL is correct on the eNB GUI. Since the eNB uses a domain proxy (DP) method to connect to the SAS, an OMC connection is required.

- 1. Go to BTS Setting > Management Server:
 - a. For the CloudCore OMC, enter **baiomc.cloudapp.net:48080/smallcell/AcsService**.
 - b. For a Local OMC, enter the Local OMC server URL, e.g., xx.xx.xx:8080/smallcell/AcsService.
- 2. If using the CloudCore OMC, enter your unique CloudKey shown at the top of your CloudCore account window. (The CloudKey is not required for Local OMC).
- 3. If you choose to use the Single-Step registration type, have your CPI info and all antenna requirements ready to input before you start the configuration procedures.

4.2.1.1 Configure the CBSD SAS settings on eNB GUI

NOTE: With OMC 7.1.6 software, you can now configure and modify all the CBSD settings directly in the OMC if desired. Refer to *CloudCore Configuration & Network Administration Guide* for more information.

- 1. Go to LTE > SAS Settings (RTS 3.6.6 software) or LTE Setting > SAS Settings (QRTB 2.6.2 software).
- 2. SAS: Set to Enable (RTS 3.6.6 software) or ON (QRTB 2.6.2 software).
- 3. *SAS Registration Type*: For the field in this menu, simply select either *Single-Step* or *Multi-Step* from the drop-down list. The fields that display beneath the registration type will depend on which option you select. For RTS 3.6.6, refer to Figure 4-2 and Figure 4-3. For QRTB 2.6.2, refer to Figure 4-4, Figure 4-5, and Figure 4-6.

NOTE 3: HaloB-enabled eNBs operate as standalone entities and do not support mobility, so the *LTE* menu options change depending on the HaloB function setting. Therefore, as you are selecting the *SAS Settings* sub-menu from the *LTE* menu, you may notice differences between your eNB GUI and how the *LTE* menu is depicted in Figure 4-2, Figure 4-3, Figure 4-4, Figure 4-5, and Figure 4-6.

- 4. *Install Param Config*: Refer to Table 4-1 for each parameter's description to complete the SAS configuration in this menu.
- 5. *CPI info*: If you selected Single-Step method for registration type, enter the CPI ID, name, and installation information.

NOTE 1: More about each registration option (Single-Step or Mult-Step) is covered in *section* 4.1 and *section* 4.3.

NOTE 2: With the software update from QRTB 2.5.4 to QRTB 2.6.2, the "Channel Reuse" check box moved from the SAS Settings GUI to the Quick Setting GUI. See *section 4.2.1.3* for more information.

6. *CPI certstore*: If you selected Single-Step method for registration type, this section displays the CPI certification if it is already uploaded, and it provides an add/change function to upload or change the certificate here.

BTS Info	*	SAS Settings	
System	-	SAS	SAS Registration Type
Network	÷	Enable	Single-step 💌
BTS Setting	*		-
LTE			
LTE Freg/Cell		Install Param Config	
TD C Free (Coll		category	userld
TD-S Freq/Cell		В	baicells
GSM Freq/Cell			% & * * + - <u>/ ? ^ {</u> [] - string
Mahillin, Decemptor		fccld	latitude auto
Mobility Parameter		2AG32MBS110096	43.058333
Advanced		<pre>% & ' * + - / ? ^ () ~ string</pre>	
		longitude auto	height
SAS Settings	>	-89.467862	25
Spectrum Analyzer			
spectrumrunarjacer		heightType	indoorDeployment
UL PRB RSSI Report		AGL	Outdoor 💌
		17 Range: -5-30 Integer antennaDowntilt 0 Range: -90-90 Integer unit: degree callSign Range: 0-256 Characters A-Z a-z 0-9 ! # % & ' * + -/? ^ _{ } - string CPI info cpild Range: 0-256 Characters A-Z a-z 0-9 ! # % & ' * + -/? ^ _{ } - string cpild Range: 0-256 Characters A-Z a-z 0-9 ! # % & ' * + -/? ^ _{ } - string installCertificationTime auto 2020-06-05T13:53:17Z Range: yyyy-mm-ddThh:mm:ssZ	0 Range: 0-359 Integer unit: degree antennaBeamwidth 65 Range: 0-360 Integer unit: degree groupType INTERFERENCE_COORDINATION ▼ groupId cpiName Range: 0-256 Characters A-Z a-Z 0-9 ! # % & ' * + -/7 ^ _ () - space string
		CPI certstore M CPI certstore: M add/change CPI cert	issing

Figure 4-2: SAS Settings (RTS 3.6.6, Single-Step Registration)

Figure 4-3: SAS Settings (RTS 3.6.6, Multi-Step Registration)

BTS Info	*	SAS Settings	
System	*	242	SAS Registration Type
Network	-	Enable	Multi-step 💌
BTS Setting	*		
LTE			
LTE Freq/Cell		Install Param Config	
TD-S Freq/Cell		category	userld
GSM Freq/Cell		в	baicells
Mobility Parameter		fccld	Range: 0-256 Characters A-Z a-z 0-9 ! % & ' * + - / ? ^ _ (} ~ string Antenna Gain
Advanced		2AG32MBS110096	17
SAS Settings	>	Range: 0-19 Characters A-Z a-z 0-9 ! # % & ' * + - / ? ^ _ { } ~ string	Range: -5-30 Integer
Spectrum Analyzer		cansign	
UL PRB RSSI Report		Range: 0-256 Characters A-Z a-z 0-9 ! # % & ' * + - / ? ^ _ () - string	

Figure 4-4: SAS Settings (QRTB 2.6.2, Single-Step Registration in DC Mode) (1 of 2)

BTS Info	-	SAS Settings	
System		242	SAS Registration Type
Network	-	ON 💌	Single-step 🔹
BTS Setting	-		
LTE Setting			
Mobility Parameter		Install Param Config	
Advanced		category	userld
SAS Settings	>	в	baicells
Reboot		fccld	Range: 0-256 Digit A-Z a-z 0-9 ! # % & ' * + - / 2 ^ _ [] ~ string indoorDeployment
Logout		2AG32MBS3100196N	Outdoor
, , , , , , , , , , , , , , , , , , ,		Range: 0-19 Digit A-Z a-z 0-9 ! # % & ' * + - / ? ^ (]) - string eirpCapability	callSign
		Range:(-127)-47 unit: dBm/10MHz	Range: 0-256 Digit A-Z a-z 0-9 ! # % & ' * + - / ? ^ _ () ~ string
		groupid	•
		Cell1 Install Param Config	
		latitude auto	longitude auto
		0	0
		Range: -90 .000 000-90. 000 000	Range: -180. 000 000-180. 000 000
		height	heightType
		50	AGL
		Range: 0-300 unit: M	
		Antenna Gain	antennaAzimuth
		Antenna Gain 17	antennaAzimuth 90
		Antenna Gain 17 Range: -5-30 unit: db	antennaAzimuth 90 Range: 0-359 unit: degree
		Antenna Gain 17 Range: -5-30 unit: db antennaDowntilt	antennaAzimuth 90 Range: 0-359 unit: degree antennaBeamwidth

Figure 4-5: SAS Settings (QRTB 2.6.2, Single-Step Registration in DC Mode) (2 of 2)

	longitude auto
33.900192	-118.157989
	Range: -180. 000 000-180. 000 000
height	heightType
0	AGL
Range: 0-300 unit: M	
Antenna Gain	antennaAzimuth
17	270
Range: -5-30 unit: db	Range: 0-359 unit: degree
antennaDowntilt	antennaBeamwidth
1	65
Range: -90-90 unit: degree	Range: 0-360 unit: degree
CPI info	
cpild	cpiName
Range: 0-256 Digit A-Z a-z 0-9 ! # % & '	Range: 0-256 Digit A-Z a-z 0-9 ! # % &
installCertificationTime auto	
2021-04-09T14:53:24Z	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info installCertificationTime auto 2021-03-11T17:50:36Z	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info installCertificationTime auto 2021-03-11T17:50:36Z Range: yyyy-mm-ddThh:mm:ssZ	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info installCertificationTime auto 2021-03-11T17:50:36Z Range: yyyy-mm-ddThh:mm:ssZ	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info installCertificationTime auto 2021-03-11T17:50:36Z Range: yyyy-mm-ddThh:mm:ssZ	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info installCertificationTime auto 2021-03-11T17:50:36Z Range: yyyy-mm-ddThh:mm:ssZ	
2021-04-09T14:53:24Z Range: yyyy-mm-ddThh:mm:ssZ Cell2 CPI info installCertificationTime auto 2021-03-11T17:50:36Z Range: yyyy-mm-ddThh:mm:ssZ Save Cancel CPI certstore	

STS Info	SAS Settings	
System 🔻	SAS	SAS Registration Type
Network 👻	ON	Multi-step 💌
BTS Setting 🔹		
LTE Setting 🔺		
Mobility Parameter	Install Param Config	
Advanced	category	userId
SAS Settings	в	baicells
Reboot	fccld	Range: 0-256 Digit A-Z a-z 0-9 ! # % & ' * + - / ? ^ _ { } - string callSign
Logout	2AG32MBS3100196N	
	Range: 0-19 Digit A-Z a-z 0-9 ! # % & ' * + - / ? ^ _ (] } ~ string	Range: 0-256 Digit A-Z a-z 0-9 ! # % & ' * + - / ? ^ _ [] > - string
	Cell1 Install Param Config	
	Antenna Gain	
	17	
	Range: -5-30 unit: db	
	Cell2 Install Param Config	
	Antenna Gain	
	17	
	Range: -5-30 unit: db	

Figure 4-6: SAS Settings (QRTB 2.6.2, Multi-Step Registration in DC Mode)

4.2.1.2 Upload the CPI certificate on eNB GUI

The steps below are required to upload the CPI certificate before you can perform steps in *section 4.4*, which is where you register the CBSD with the SAS vendor. For RTS 3.6.6, see Figure 4-7. For QRTB 2.6.2, see Figure 4-8.

- 1. Go to System > CertStore.
- 2. *SAS CPI certstore*: If you will be using a p12 file format, select the check box, and enter a password. Choose *Select File*, and navigate to the certificate file. Select *Upload*. The file name appears in the *Certificate List* window.

*NOTE: Certificate file types supported are p12 and pem. One of the pem formats is pkcs8.

- If you select file type p12, you have to input a password.
- If you select file type pkcs8, you do not need a password.

Figure 4-7: Certificate Upload (RTS 3.6.6)

BTS Info	•	Certificate Upload		
System	-	CA Certificate:		
NTP		CA Certificate	Select File	
Upgrade		Equipment Certificate:		
Backup		Equipment Certificate	Select File	
Password		Certificate Key:		
Web		Certificate Key	Select File	
web		SAS CPI certstore:		
CertStore	>	SAS CPI certstore	Select File	Please enter the password
SNMP				
Network	*	Upload Cancel		
BTS Setting	-			
LTE	-	Castilizata List		
Reboot				
Logout				

Figure 4-8: Certificate Upload (QRTB 2.6.2)

BTS Info 👻		IPSec CA Certs	
System 🔺		CA Certificate	
NTP		Select File	
Upgrade			
Backup		Upload Cancel	
Password		Certificate List	
Diagnostics			
CertStore	>		
Network 🔻			
BTS Setting 💎		IPSec Certs	
LTE Setting		Equipment Certificate	
Reboot		Select File	
Logout		Italaad Carcel	
		uprodu Cancer	
		Certificate List	
		IPSec Private	
		Certificate Key	
		Select file	
		Upload Cancel	
		Cartificate List	
		COMPARE DA	
		SAS CPI	
		SAS CPI certistore	
		Select File p12 File	
		Upload Cancel	
		Certificate List	
		Certificate Name Option	
		-000192_2066113.p12	

4.2.1.3 Configure Quick Setting parameters on eNB GUI

The steps below are required to configure the eNB Quick Setting parameters. For RTS 3.6.6, see Figure 4-9. For QRTB 2.6.2, see Figure 4-10.

- 1. Go to BTS Info > Quick Setting.
- Legacy Mode: If you have CPEs that only support Bands 42 or 43, set the Legacy mode to "Enable" (RTS software) or "True" (QRTB software). The default value is "Disable" (RTS software) or "False" (QRTB software).
- 3. Frequency Selection Logic: By default, after sending a request for spectrum from the SAS, the DP selects the first channel available from the SAS's response. But operators can configure their preferred frequencies, channel bandwidth, and power by selecting a Frequency Selection Logic and entering the Preferred Bandwidth, Preferred Power, and Preferred Frequency. For example, if you choose Power, Frequency, Bandwidth for this setting, the DP uses power as the most important value to calculate CBRS channel selection.

Select one of the following to indicate the order of importance for the frequency selection logic:

- Frequency, Bandwidth, Power
- Frequency, Power, Bandwidth
- Bandwidth, Frequency, Power
- Bandwidth, Power, Frequency
- Power, Bandwidth, Frequency (default)
- Power, Frequency, Bandwidth
- 4. *Preferred Bandwidth*: Enter the preferred bandwidth for this eNB.
- Preferred Power: Enter the preferred power for this eNB. Preferred power is the total TX power (in dBm) being transmitted per carrier. For example, if it is desired for the eNB to emit 2W of power (2x1W) per carrier, then preferred power would be 33 (dBm).
- 6. *Preferred Frequency*: Enter the preferred frequency for this eNB. You can add more than one preferred frequency and set the priority of each. To add more preferred frequencies, click on the + (Add) icon, enter the value(s), and set the priority. If the eNB is a two-carrier eNB, enter the preferred frequency or frequencies for the Primary Cell (Pcell) and Secondary Cell (Scell).

NOTE 3: With the software update from QRTB 2.5.4 to QRTB 2.6.2, the "Channel Reuse" check box moved from the SAS Settings GUI to the Quick Setting GUI.

NOTE 4: For eNBs running QRTB 2.6.2 software, the "ChannelReuse" check box in the Preferred Frequency parameter displays when the eNB is set to Dual Carrier mode and the "Carrier Aggregation Enabled" check box is not checked in BTS Setting > Carrier Setting.

NOTE 5: For eNBs running QRTB 2.6.2 software, the Quick Setting GUI labels vary slightly depending on carrier setting (when set to Dual Carrier Mode) and if the "Carrier Aggregation

NOTE 1: When applying any changes to these preferred parameters, the DP will automatically relinquish the eNB's existing grant and restart the spectrum inquiry and grant procedure. NOTE 2: If you have purchased a Priority Access License (PAL), then when you are using the

frequency selection logic, the DP chooses that channel type instead of a General Authorized Access (GAA) channel. You can view SAS logs to verify the authorized channels in use. See *section 4.4.1* and Figure 4-31 for more information.

Enabled" check box is checked in BTS Setting > Carrier Setting. Labels are either "Cell1" and "Cell2" or "Pcell" and "Scell".

NOTE 5: SAS vendors recommend requesting grants before 12:00 AM or after 3:00 AM PST.

Figure 4-9: Quick Setting (RTS 3.6.6)

BTS Info 🔺	Quick Setting	
Basic Info Quick Setting	Duplex Mode	Legacy Mode
	Toomoae	Disable
System	Band	Bandwidth
Network 🔻	48 👻	10MHz 👻
RTS Setting		
Jis setting	Frequency	SubFrame Assignment
TE	55690(3595MHz)	1 (DL:UL = 2:2)
rehoot		
	Special SubFrame Patterns	PCI
ogout	7	64
	ECI (ECI=eNB_ID*256+Cell_ID)	Transmission interface binding(Non-
	67262143	IPSec)
	Range: 0-268435455	WAN
	S1 Connection Mode	TAC
	All	1
		Range: 0-65535
	RF Status	Power Modify
	Enable	2 💌 🗙 24dBm 💌
	PLMN Primary ▼ NotReseT ↓ Range: 5-6 Digit PLMN Primary ID PLMN Reserved 314030 Yes NotReserved 1	
	Frequency Selection Logic	Preferred Bandwidth
	Frequency,Bandwidth,Power	10MHz 👻
	Order of importance when selecting	
	Preferred Power	Preferred Frequency
	2 💌 🗙 24dBm 💌	3555MHz 🝷 🕂
		Frequency Priority 3595MHz 0 🔟 🔺 💙
	Order of Importance when selecting frequency. Preferred Power 2 • X 24dBm • Save Reset	Preferred Frequency 3555MHz Frequency Priority 3595MHz 0 M

Figure 4-10: Quick Setting (QRTB 2.6.2)

BTS Info 🔺			
Basic Info		Quick Setting	
Quick Cottin=		Duplex Mode	Cloud EPC
Quick setting	1	TUUMode	UN Y
System 🔻		Quick Interface Binding	Legacy Mode
Network 🔻		WAN	false
BTS Setting 🔹 🔻			- (
LTE Setting 🛛 👻		Frequency Selection Logic	10MHz
Reboot		Order of importance when selecting	
lassut		Preferred Power	Preferred FrequencyChannel Reuse
Logout		2 • × 30dbm •	Cell2 2550
			Frequency Priority
			3555:3555 0 🔟 🔺 🔻
		Cell1 Quick Setting	
		Band	Bandwidth
		48 👻	10 👻
		EARFCN	Frequency(MHz)
		55290 Range: 55290-56690	3000
		SubFrame Assignment	Special SubFrame Patterns
		1 (DL:UL = 2:2)	7 👻
		PCI	Cell ID
		70 Range: 0-503	135787604 Range: 0-268435455
		PLMN	TAC
		314030	1
		Range: 5-6 Digit	Range: 0-65535
		RF Status	Power Modify
		Urr C	2 • 2/abm •
		Coll2 Quick Sotting	
		Cellz Quick Setting	
		Band	Bandwidth
		40	10
		EARFCN	Frequency(MHz)
		55590	3585
		Range: 55290-56690	
		SubFrame Assignment	Special SubFrame Patterns
		$\Gamma(DLOL = 2.2)$	
		PCI	Cell ID
		75	135787605
		Range: 0-503	Range: 0-268435455
		PLMN	TAC
		Range: 5-6 Digit	Range: 0-65535
		RF Status	Power Modify
		OFF	2 × 27dbm ×
		Save	
		Cancel	



4.2.2 CPE Configuration

Follow the steps below in the order shown to complete the CPE/CBSD and OMC (DP) setup.

Prerequisites: Verify the management server URL is correct on CPE GUI. Since the CPE uses a domain proxy (DP) method to connect to the SAS, an OMC connection is required.

1. Go to System > TR-069, and ensure the ACS Address field has been entered correctly.

NOTE: The OMC functions as an Auto Configuration Server (ACS).

a. For the CloudCore OMC, enter

http://baiomc.cloudapp.net:48080/smallcell/AcsService.

- b. For a Local OMC, enter the Local OMC server URL, e.g., http://xx.xx.xx:8080/smallcell/AcsService.
- 2. If using the CloudCore OMC, enter your unique CloudKey shown at the top of your CloudCore account window. (The CloudKey is not required for Local OMC).

Perform the following steps to enable SAS operation on a certified CPE device (Figure 4-11):

NOTE 1: Before enabling SAS on the CPE, make sure you import your CBSD information on your SAS portal for the CPE. NOTE 2: With OMC 7.1.6 software, you can now configure and modify all the CBSD settings directly in the OMC if desired. Refer to *CloudCore Configuration & Network Administration Guide* for more information.

- 1. Go to System > SAS.
- 2. Enter the User ID provided by your SAS vendor.
- 3. Enter the operator's Call Sign in the *Call Sign* field. The range is 0 to 256 digits.

NOTE: The Call Sign is a unique company identifier that is issued by the FCC. The *Call Sign* field is not a mandatory requirement and can be left blank.

- 4. If this is an indoor CPE leave the default setting of A. If this is an outdoor CPE leave the default setting of B.
- 5. All the other fields will either be auto-filled based on the model of CPE you have or are the CPE SAS status indications.
- 6. Click on the *Enable* check box to enable SAS.
- 7. Click on SAVE & APPLY.

Figure 4-11: CPE SAS Settings

Bricells	
Status	SAS
Network	SAS
LTE	
Security	SAS Information
VPN	SAS Status Unregistered
System	Radio Status Disabled
NTP	Granted EIRP(10MHz) N/A
Account	
WEB Setting	
FTP Auto Upgrade	CAC Cathings
TR-069	SAS Settings
SNMP Restore/Update	SAS 🗹 Enable
Ping Watchdog	User ID
SAS	Call Sign ×
Diagnosis	Category 8
Reboot	FCC ID
Logout	Serial Number
<u> </u>	Radio Technology E_UTRA
	Antenna Gain 14 (-127 ~ 128 dBi)
	SAVE & APPLY

4.3 Domain Proxy (OMC) Configuration

Enable the SAS domain proxy (OMC)

- 1. Go to Advance > SAS and click on the *Settings* icon (Figure 4-12).
- 2. In the Settings pane that displays, enable "Auto Registration", and select the SAS provider you are using; then, click OK. The Settings pane closes.
- In Advance > SAS, all devices that have been or will be authorized to operate in SAS mode will be listed in device tabs labeled *eNB*, *CPE*, *Virtual eNB* and *Virtual CPE*. Select the desired device tab to view device details and register CBSDs.

NOTE: The OMC display defaults to the eNB device tab.

Figure 4-12 : OMC - Enable SAS



The CBSD-SAS connection setup progresses in the order shown below.





You can use the OMC query or advanced query functions (Figure 4-13) to search for a specific eNB device or to check active status.

NOTE: Refer to CloudCore Configuration & Network Administration Guide for more information about non-SAS-related searches you can perform.

Figure 4-13: Check eNB Active Status

ය ර	loudcore	омс	E	BOSS								😭 CloudKey:	Welcome, 🗸 🗸
ø	∃ Advance	/ SAS							Critical	154 😑 Major	20 🔍 Minor I	13 • Warning • E	FiSci (UTC-06:00)2021-06-08 10:24
(1)	eNB CI	PE Vir	ual eNB	Virtual CPE									
æ					* C) s	SAS Embled 4/44	Authorized	3/44	Grant-Suspended	0/44		0 8 8
	Serial Num	ber		Cell Name			Active Status						
							Active	^					
5							All						
۲	Query	Rese					Active						
æ	• 🗆	0				flue	Inactive		igned	в		. 3550-3570	10
12		~		1000			Tonenic	harmed		n			

There are two options from which you can choose to register the eNB and CPE CBSDs with SAS using the domain proxy (OMC) as described here.

- Choice 1 (Single-Step): Use the OMC to configure all the required parameters.
- Choice 2 (Multi-Step): Configure only the CBSD's basic information using the OMC, and • then use the SAS portal to configure the antenna installation parameters.

NOTE 1: Regardless of registration type you choose, you must configure the CBSD's basic for successful registration with SAS. NOTE 2: You must upload a CPI certificate (signature) to use Single-Step registration. NOTE 3: The OMC also supports virtual eNB and CPE CBSD registration. See section 4.4.2 for more information.

NOTE 4: See *section* 4.2.1.3 for information on configuring eNB preferred frequency settings.

4.4 Register CBSDs with SAS

4.4.1 Register eNBs and CPEs with SAS

The following procedure describes how to register eNB or CPE device types using the OMC to configure all the required parameters (Single-Step registration):

- 1. Identify all antenna requirements before starting procedure.
- 2. On the OMC, go to Advance > SAS.

```
NOTE 1: The OMC display defaults to the eNB device tab list and you can click on CPE device tab when needed.
NOTE 2: Each CBSD device row includes a Settings icon to left of row.
NOTE 3: All figures in this section show eNB GUIs because most of the SAS Setting parameters for eNB and CPE device types are the same.
```

3. Click the Settings icon on the left of the desired device to display its Settings window (Figure 4-14, Figure 4-15, and Figure 4-16).

ි ර	loudcore	OMC	BOSS			P CloudKey:	Welcome, 🗸 🗸
ø	■ Advance	/ SAS			Critical 15 Major 3	Minor 4 Warning 0 FiS	ci (UTC-06:00)2021-08-19 09:49
¢ţ»	Settings						
æ	a Pi	rocedure State					Logs
⋒			0	C	C	C	
6			Unregistered	Registered	Granted	Authorized	
۲			-	-			
Ø	h C	BSD Configuration	The following parameters are ma	ndatory for successful registration with SAS.			C Synchronize
	Pref	erred Settings					
	* Fre	equency Selection Logic	Power,Bandwidth,Frequency				
	• Lej	gacy Mode	Enable				
	* Pre	ferred Bandwidth	20M ~				
	* Pre	ferred Power	30 ~				
	Prefe	rred Frequency	Auto	(Limit of 15)			

Figure 4-14: Register CBSD with SAS (Page 1 of 3)



NOTE 1: The Synchronize icon can be used to immediately synchronize the eNB SAS settings with the OMC. One practical example for using this function is to upload a new CPI certificate from here by synchronizing with an eNB that has the certificate already loaded.

NOTE 2: Device logs can be viewed by clicking on the Logs icon. See step 12 and Figure 4-21 for more information.

Figure 4-15: Register CBSD with SAS (Page 2 of 3)

Basic Information		Air Intertace		8
CBSD Category	AB	Radio Technology	E_UTRA	
* User ID				
Call Sign		Group (Limit of 5)		Γ.
• FCC ID		Geoup Type	INTERFERENCE_COORDINX ∨	
* Serial Number		Group ID	mamber, letter and _	
Cell Name				
Antenna Gain	0			

Figure 4-16: Register CBSD with SAS (Page 3 of 3)

Installation P	arameter 🔘 When (he installation parameters are f	illed in and a CPI Signature is	generated below, Single-Step reg	istration will be used. If no CP	1 signature is generated, then 3	dubi-Step registration will be used instead.	8
Single-Step regi	stration is currently selected.							
• Antenna								
Deployment	Outdoor							
Longitude		Latitude		Height	0	HeightType	AGL	
Azimuth	0	Down Tilt	0	Gain	0	Bearwidth	0	
Professional I	Installer Data							
CPIID		CPI Name		Install Cert Time				
							Modify	
CPI Signatur	e Data							
OK	Cancel							

4. Configure the required preferred settings parameters, which may vary depending on CBSD device type.

NOTE: Set Legacy Mode to "Enable" if there are legacy CPEs that only support Bands 42 or 43.

5. Configure the required basic information parameters, which may vary depending on CBSD device type.

NOTE: The User ID is provided by your SAS vendor. The Call Sign is a unique company identifier issued by the FCC. You can configure the Call Sign, but it's not a mandatory requirement.

6. Configure the required air interface parameters (Radio Technology and Group). At this time, for Radio Technology you will see only E_UTRA and the field is greyed out. This identifies that

the eNB CBSD is using LTE technology. Currently, only INTERFERENCE_COORDINATION is used in the Group pane. SAS vendors will likely use CBSD groups in the future when General Authorized Access (GAA) coexistence is introduced.

 Configure or modify antenna parameters by clicking the "Modify" button and uploading your CPI certificate information (Figure 4-17).

	Advance / SAS							Critical 14	Major 3	Alien 4	Nitraine 0	0.22
) <u>≕</u>	Advance / SAG							Children 14	• Major 3		• warning •	Q FIS
) <u>Setti</u>	Single Step capit	testion is susceptive advected										
6	• Antenna	sustains currently selected.										
	Deployment	Outdoor										
2		00.467700	1.5.1	12.020104		1000			-			
3	Longitude	-89.407788	Latitude	43.058480	Height	1000	Heig	htType AMSL				
≥	Azimuth	90	Down Tilt	1	Gain	17	Bean	nvidth 65				
>	Professional I	Installer Data										
	CPI ID		CPI Name		Install (ert Time 2021-08	-18T19:42:22Z					
												10.00
												Modaly
	CPI Signatur	e Data										
											0	Clear
											[Clear
.6	OK	Cancel										Clear
.6	OK	Cancel									[Clear
.6	OK	Cancel									(Clear
.6	0К	Cancel										Clear
	OK	Cancel										Clear
	ox	Canol Install Parameter									×	Clear
.6	06	Canod Install Parameter									×	Clear
.6	06	Cancel Install Parameter Installion Parameter	eter								×	Clear
.6	OK	Cacod Install Parameter Installation Param • Antenna	ieter								×	Clear
.6	06	Canod Install Parameter Install Arameter Installation Param • Antenna	eter Ooste								×	Clear
1.6	OK	Canot Install Parameter Installation Param • Astenna Deployment	seter Indoor Outdo	or							×	Clear
.5	ox	Cancel Install Parameter Installation Param Antenna Deployment Longitude	seter Indoor Outdo -89.467788	or Latitude	43.058486	Height	1004	HeightType	AGL	AMSL	× ×	Clear
.5	α	Canod Install Parameter Install Parameter Installation Param • Antenna Deployment Longitude	ieter Indeor Outdo	or Latitude	43.058486	Height	1004	HeightType	AGL	AMSL)	Clear
	OK .	Curcel Install Parameter Install Parameter Installation Param Antenna Deployment Longitude Azimuth	ister Indeer Outdo -89.467788 90	or Latitude Down Tilt	43.058486	Height	1000	HeightType Beamwidth	AGL	AMSL) ×	Clear
	oc	Cancel Install Parameter Install Parameter Antenna Deployment Longitude Azimuth	etter Indoor Outdo -89.467788 90	or Latitude Down Tilt	43.058486	Height Gain	1000	HeightType Beamwidth	AGL 65	AMSL)	Clear
	OK	Cancel Install Parameter Install Parameter Antenna Deployment Longitude Azimuth	eter Indoor Outdo -89.467788 90	or Latitude Down Tilt	43.059496	Height Gain	1000	HeighType Beamwidth	AGL 65	AMSL) 	Clear
.5	OK	Cancel Install Parameter Install Parameter Antenna Deployment Longitude Azimuth CPI Info	eeter Indoor Outdo -89.467788 90	or Latitude Down Tilt	43.059486	Height Gain	1000	HeighType Beamwidth	AGL 65	AMSL	× •	Clear
1.6	00	Cancel Install Parameter Install Parameter Antenna Deployment Longitude Azimuth CP1 Info Notice:CP1	eter Indoor Outdo -89.467788 90	er Latitude Down Tilt either stored on cl	43.058486 1	Height Gain	1000	HeighrType Beamwidth	AGL 65	AMSL	× •	Clear
.6	05	Cucod Install Parameter Install Parameter Installation Param Antenna Deployment Longitude Azimuth CPI Info Notice:CPI	etter Indoor Outdo -89.467788 90	or Latitude Down Titt	43.058486 1	Height Gain	100 4	HeighrType Beamwidth	AGL 65	AMSL) 	Clear
6	CK	Cacot Install Parameter Install Parameter Installation Param Antenna Deployment Longitude Azimuth CPI Info CPI Info CPI Certificate	etter Indoor Oudo -89.407788 90 file and password is n Please select the file.	or Latitude Down Titt either stored on cl	43.058486 1 ient tor on the server. 122.PEM ☑ P12	Height Gain Password	100 q	HeightType Beamwidth	AGL 65	AMSL) 	Clear
6	OK	Cancel Install Parameter Install Parameter Installation Param Antenna Deployment Longitude Azimuth I CPI Info CPI Certificate	etter Indoor Outdo S9.457788 90 Elle and password is n Please select the file	or Latitude Down Tilt either stored on cl	43.058486 1 	Height Gain Password	100d	HeightType Beamwidth	AGL 65	AMSL	×	Clear
	OK	Cancel Install Parameter Install Parameter Installation Param Antenna Deployment Longitude Azimuth CPI Info ProtectCPI CPI Certificate CPI ID	seter Indoor Outdo -89.467788 90 file and password is n Plesse select the file	x Latitude Down Tilt either stored on cl	43.058486 1 	Height Gain Password	1000	HeighrType Beamwidth	AGL 65	AMSL	× •	Clear
6	00	Cucot Install Parameter Installation Param Antenna Deployment Longitude Azimuth CPI Info CPI Certificate CPI ID	seter Indoor Oudo -89.467788 90 Gle and password is n Plense select the file.	or Latitude Down Tilt either stored on cl	43.058486 1 	Height Gain Password	100	HeighrType Beamwidth	AGL 65	AMSL) 	Clex

Figure 4-17: Modify CBSD Antenna Parameters

- 8. Configure antenna installation parameters (Deployment, Longitude, Latitude, Height, HeightType, Azimuth, Down Tilt, Gain, and Beamwidth).
- 9. Click OK; then, click the X icon in upper right-hand side of screen to close Settings pane.
- 10. Check CBSD SAS connectivity (Figure 4-18): Go to Advance > SAS, click on the CBSD device tab in the upper left-hand side of screen, and confirm the CBSD is listed and connected by checking the following columns: SAS Enabled, Serial Number, and State.

Figure 4-18: Confirm CBSD SAS Connectivity

ର ଜ	loudco	ore	0	мс	BOSS								(P) Cloud	Key:	Welcome,	~
Ø	₫ /	Advance	SAS						•	Critical 172	 Major 	23 O Minor	10 • Warts	ng Ø Filifici	(UTC-06:00)2021-	05-07 14:17
619	eNB	СР	Е	Virtual eNB	Vir	tual CPE										
2							× Q	SAS Enabled	2/46	Authorized	1/46	Grant-Suspended	0/46		00	
				SAS Enabled	0	Serial Number	Cell	Name 0	State 0		CPI State 0	Category	CBSD ID		Grants	х
	6		0						Unregistere	d i	error	A				
ß	7		0								missing	A				
۲	8		0						Unregistere	d i	error	в				
6	9		0	-	۲						missing					
-	10		0		۲				Authorized		iet	в			3640-3660	
	11		0		۲						missing	в				
	12		0		۲						missing	в				
	13		0		۲						missing	A				
	14		0	-	0				Unregistere	d i	missing					
	15		0	-	۲						missing					
			~		-											

11. Check the CBSD's connection state by clicking on the Settings icon for the device you want to check and the Settings pane displays. You'll see a Procedure State diagram at the top of the Settings pane. If you hover over one of the Procedure State icon labels, you will get a drop-down menu to take action on *that* step of the connection setup process. In Figure 4-19, for example, the device is not registered yet and is shown as *Unregistered*. Another scenario would be if you've enabled SAS and want to manually request device registration using the Procedure State diagram rather than using the auto-registration option. When you hover over the *Unregistered* Procedure State icon label, the drop-down menu displays the action you perform at this point: *Register req*. Select this action to start the request. In Figure 4-20, for example, the device Procedure State shows *Authorized* and the drop-down menu displays two actions you can perform at this point: *Heartbeat req* and *Relinquishment req*.

Figure 4-19: Check CBSD Connection Details (Example 1, Unregistered)	Figure 4-19	: Check CBSD	Connection D	Details (Examp	ole 1, Unregistered)
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ଜର୍ଜ	oudcore OMC	BOSS			CloudKey	Welcome i 🗸
۵	Advance / SAS			Cenical 173 Major 22	Minor 11 Warning 0	FiSci (UTC-06:00)2021-05-07 15:34
610	Settings					
\$	Procedure State					0 8
⋒						
5		\odot				
		Unregistered Register req	Registered	Granted	Authorized	
۲	🛐 Install Params	De foliosies escentro su esclutio	or. for uncosofid existencies with \$3.5			G

Figure 4-20: Check CBSD Connection Details (Example 2, Authorized)

<u>ක</u>	loudcore	OMC	BOSS				👔 CloudKey:	Welcome, 🗸 🗸 🗸 🗸
Ø	Advance	r / SAS			Critical 173	Major 23	• Minor 11 • Warning 0	FiSci (UTC-06:00)2021-05-07 15:58
619	Settings							
ŝ	s P	rocedure State						0 8
◬								
ø			Ø		 General			
			Ollegistereo	Registered	Granicu		Heartbeat req	
0		utall Params	A 15-62-51	- 1			Relinquishment rec	

12. Access device logs by first selecting the eNB or CPE device tab on the upper left-hand side of screen to display the complete device list. Then, click the Settings icon on left of the desired device to display its Settings window. In the Settings window, click the Logs icon to display a log of all the key events that have occurred for the device since it was registered with SAS. Figure 4-21 shows an example of a device log with 12 total key events that have occurred for the selected device.

Notice the default setting for an initial device logs query doesn't include a specific date and time range. If you want to apply filters to view a sub-set of device logs online, see step 13. If you want to apply filters to export a sub-set of device logs to another file, see step 14.

ଜଟ	loudcore	омс	BOSS						P CloudKey:	Welcome,
Ø	E Advance	/ SAS					Critical 14 0 M	layer 3 @Maar 4	• Warning •	Filse (UTC-06-00)2021-08-19-15:37
e ₁ o	Settings									
8	s Pr	ocedure State	Logs					0 10	×	0 0
8			C Time Kange	Mart Time	and type				S	
~			Un Serial Number	CBSD ID	GRANT ID	State	Time(UTC)	Information	Authorized	
			1			Unregistered	2021-08-18 16:11:08	Send sas status success		
۲			2			Registered	2021-08-18 16:11:04	Deregistration is suc		0
	D CI	dSD Configuration	3			Registered	2021-08-18 16:11:03	Grant Relinquish is s		
	Profe	erred Settions	4				2021-08-18 16:07:51	Sas status is null		
	1 Pela	erreu setungs	5				2021-08-18 16:07:50	ERROR: Domain Po		
	* Freq	quency Selection Logic	6				2021-08-18 16:07:16	Sas status is null		
	17.00	any Made	7				2021-08-18 16:07:14	ERROR: Domain Po		
		a y oana					2021-08-17 18:36:19	ERROR: CBSD doe		
	* Pret	ferred Bandwidth					2021-06-17 22:01:53	Deregistration is suc	·	
			10				2021-06-17 22:01:52	Grant Relinquish is s		
	* Pref	ferred Power	50/page ~ <	> c				Total 12		
	Prefer	ned Frequency	1 3687 🔞							

Figure 4-21: Access Device Logs (All Key Events)

13. After accessing device logs (step 12), you can filter and view a sub-set of them online according to a preferred date and time range by performing the following steps:



NOTE 1: If you plan to export the device logs file instead of viewing online, we recommend applying the filters while using the Export function and not at this step. See step 14. NOTE 2: The time range you specify cannot exceed 7 calendar days (to the exact hour, minute, and second) or you will receive an error message.

NOTE 3: To configure a time range filter, you must first select a start and end date (step 13a through step 13c) before you can select an exact time interval (step 13d through step 13g).

a. Click in the Time Range field to display a calendar (Figure 4-22).

Figure 4-22: View Device Logs (Filter - Calendar Tool)

လ <mark>ာပာဝါဘ</mark> လူ	re OMC	BO	ss										Ŷ	CloudK	y:	• [Welcome	••••••	
ල ම A	dvance / SAS	Logs Time Range	Cli c x –	ck h	ner	e fi	irst	to	di	spl	ay c	ale	nd	ār [×]	0	TiSo :	(UTC-06.00)	1,20231 66-33 69-40	
<u>ଲ</u> (loudcore	OMC	BOSS													P	CloudKey	y: Welcome,	~
0	Advance / :	SAS											• 1	6 4	1	•	4 0	0 FiSci (UTC-06-00)2021-08	3334
@ ₁ 9	Settings																		
æ	S Proc	edure State	Logs	_												1	i ×	0	8
			Time Range	Start	head						>								
5	(<u> </u>	Seria	a «<		2021	Augus	st					2021	Septe	mber		>>	©	
	U	nregistered	1	Sun 25	Mon 26	Tue 27	Wed 28	Thu 29	Fri	Sat	Sur 29	Mon 30	Tue 31	Wed	Thu 2	Fri 3	Sat 4	Authorized	
-			2	1	2	3	4	5	6	7	5	6	7	8	9	10	11		
	🗊 СВЗ	D Configurati-	4	8	9	10	11	12	13	14	12	13	14	15	16	17	18	O	
			5	15	16	17	18	19	20	21	19	20	21	22	23	24	25		
	Preten	red Settings	6	22	23	24	25	26	27	28	26	27	28	29	30		3		
	* Freque	ency Selection Log	7	29	30	31	3		35	3	3			6			э.		
	OK	Can	8														-		
7.1.6	B. C.	100.0	9												DEM				

b. Without clicking anywhere else, click on a calendar day to select your preferred time range start date. Then, click on a second calendar day to select your preferred time range end date (Figure 4-23).

Notice the date range fields at the top of the calendar update to display the days you selected.

Figure 4-23: Viev	v Device Logs	(Filter -	Set Date	Range)
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ନ୍ଦ	cloudcore	омс	E	soss																		CoudKey:	Welcome, 🗸 🗸 🗸
0	⊒ Adı	nter/SAS															•		34	0.14	in 5 Olima 4	• Warring •	Film (UTC-66.000021-68-19-15-58
610	Settings																						
8	G	Procedure State	Ľ	Len																	13 គ	×	00
-			G	Time Ra	nge																	C)	
2			Un		Serial	2021	08 18		00	1.00.00			>	202	08 19		0	0.00.00			Information	Authorized	
0				1		<<		2021	Augu	at .						2021	Septe	mber		>>	Send sas status success	1	
0				2		Sun	Mon	Tie	Wed	Thu	Fri	Sat		Sus	Mon	Tse	Wed	The	Fri	Sat	Deregistration is suc		0
	6	CBSD Configuration	l.	3			28		28	29	34			29	30		1	2	3	4	Grant Relinquish is s		G
		Professed Settings		4		1	2	3	4	5	6	7		5	6	7	8	9	10	11	Sas status is cull		
		in the second		5			9	10	11	12	13	14		12	в	54	15	16	17	18	ERROR: Domain Po		
		Trequency Selection Logic		6		15	16	17	0	0	20	21		19	20	21	22	23	24	25	Sas status is cull		
		Legacy Mode		7		22	23	24	25	26	27	28		26	27	28	29	30			ERROR: Domain Po		
						29	30	31				1					3				ERROR: CBSD doe		
		Preferred Bandwadth		9																05	Deregistration is suc		
		Preferred Power		10		1		-					_					100	-	UK.	Seat Neinquit is s		
Γ				501	ape	1	2	e.													Total 12		
		Perferred Programmery		1 1447	- 10	El			Ċ.														
				1. 104.1		9																	

- c. If you want to set specific time intervals for the filter, see step 13d through step 13g. Otherwise, go to step 13h.
- d. Click on the start date time interval field to display the time set box (Figure 4-24), which contains three columns for setting hours, minutes, and seconds.

Figure 4-24: View Device Logs (Filter - Set Time Interval)

ය <mark>c</mark>	loudcore	OMC	BOSS													Ŧ) CloudK	ley:	- ×	Velcome	i v
0	E Advance	/ SAS	Logs							_						C ²	ē ×	0	FaSci (U		
619	Settings		Time Range	0	314	rt Time		- 1	End Time	_										-	
-	D P	rocedure State	Serial	2021-0	8-18		02:10:	28		>	2021-0	08-19		0	0.00.00						8
			1	≪ <		2021 A	00	08	26				2021	Septe	mber		>>				
		\odot —	2	Sun	Mon	Tue	01	09	27		Sus	Mon	Tue	Wed	Thu	Fri	Sat				
		Unregistered	3	25	26		02	10	28		29	30		1	2	3	4		Au	thorized	
۲			4	1	2	3	03	11	29		5	6	7	8	9	10	11				
6			5	8	9	10	04	12	30		12	13	14	15	16	17	18				
	🗊 C	BSD Configuration	6	15	16	17		с	incel Of	к	19	20	21	22	23	24	25			C	
	Pret	arred Cattings	7	22	23	24	25 2	6 27	28	T	26	27	28	29	30	1					
	Pite	erreu settings	8	29	30	31	1	1 3	4			4		6		1	9				
	* Fri	quency Selection Lop	9																		
			10											-	lear		OK				

e. Click in the first column, scroll to the hour you want and select it. Then, repeat the process to select minutes from the middle column and seconds from the third column, in that order.

NOTE: The time intervals can also be entered in the time interval fields instead of using the time set boxes, if you prefer. Make sure you enter the times using the format "hh:mm:ss" with colons separating each increment.

- f. Click OK in the time set box.
- g. Click on the end date time interval field to display its associated time set box. Repeat step 13e and step 13f to specify the end date time interval. Then proceed to step 13h.

h. Click OK in the main Logs window to apply the filters (Figure 4-25) or click CLEAR to make new selections.

ය ල්	loudcore	OMC	BOSS														T	CloudK	ey:	Welcom	ie, 🗸 🗸
0	E Advance	/ SAS												• 1	6 6	3	0	4 0	0 FaS		0)3021-08-25 15:01
619	Settings																				
			Logs														3	x 🗵			
) Pr	ocedure State	Time Range	2021-6	8-18		02	10:28			>	2021-0	08-19		0	4:30:10					
		0-	Serial	< د		2021	Augus	a			T			2021	Septe	mber		>>			
2		Unregistered	1	Sun	Mon	Tue	Wed	Thu	Fri	Sat		Sun	Mon	Tue	Wed	Thu	Fri	Sat		Authoriz	ed
۲			2		28		28	29	30			29	30		1	2	3	4			
0			3	1	2	3	4	5	6	7		5	6	7	8	9	10	11			0
	B CI	3SD Configurati	4	8	9	10	11	12	13	14		12	13	14	15	16	17	18			G
	Prefe	erred Settings	5	15	16	17	0	19	20	21		19	20	21	22	23	24	25			
	110	iii a secting.	6	22	23	24	25	26	27	28		26	27	28	29	30					
	* Free	prency Selection Log	7	29	30	31	3		3	4		3	1		6			9			
7.1.6	ок	Can	8												c	lear		OK			

Figure 4-25: View Device Logs (Filter - Apply Preferences)

- 14. After accessing device logs (step 12), you can filter and export a sub-set of them according to a preferred date and time range by performing the following steps:
 - a. Click on the Export icon in the Logs window (Figure 4-26).

Figure 4-26: Display Export Window

ଜର୍ଜ	loudcore	омс	BOSS							P CloudKey:	Welcome,
0	Advance	e / SAS						O Critical: 14 O M	liger 3 @ Maner 4	• Warning •	
619	Settings										
-	a n	rocedure State	ler.						12.0	×	00
			Logs							<u>^</u>	
-			G Time Range		Burt Tale	- Initiae				S	
			Un s	erial Number	CBSD ID	GRANT ID	State	Time(UTC)	Information	Authorized	
۲			1				Unregistered	2021-08-18 16 11:08	Send sas status success		
۲			2		0		Registered	2021-08-18 16:11:04	Deregistration is suc		0
	DC	BSD Configuration	3		ê.,		Registered	2021-08-18 16:11:03	Grant Relinquish is s		
	Post	ferred Settions	4		· .			2021-08-18 16:07:51	Sas status is mult		
		arris country	5		÷			2021-08-18 16:07:50	ERROR: Domain Po		
	- Te	represervy Selection Logic	6		2			2021-08-18 16:07:16	Sas status is mill		
	- Le	gacy Mode	7		÷			2021-08-18 16:07:14	ERROR: Domain Po		
			1		6.			2021-08-17 18:36:19	ERROR: CBSD doe		
	* Pos	derred Bandwidth	9		2			2021-06-17 22:01:53	Deregistration is suc		
	- De	effected Denser	10					2021-06-17 22:01:52	Grant Relinquish in s		
			50/page	~ <	> C				Total 12		
	Pode	med Frequency	1 3987	8							

Once the Export window displays, there are several different ways you can filter the device log file before exporting it. Use the export default date and time ranges (see step 14b), or export the log files according to your preferred date and time ranges (see step 14c), or export the log files for the current date and time only (see step 14d).

b. In the Export window that displays after you perform step 14a, notice the default (autofilled) Start Time and End Time fields that are displayed (Figure 4-27). The default ranges use the current calendar day and time to specify the End Time range. Likewise,

according to the maximum day range rule, the Start Time range is specified as 7 days prior to the End Time range, to the exact hour, minute, and second.

- (1) Click OK in the Export window to accept the default date and time range specified. Then, follow the prompts to complete the file export action.
- (2) If you want to change the dates to a preferred range, go to step 14c and follow the directions.
- (3) Click Cancel if you do not want to accept the deafault date and time range specified. This action will take you back to the device Log window.

Figure 4-27: Export Device Logs (Filter - Default Time Ranges)

me Range		Export		×
		Start Time		
Serial Nun	aber CBSD ID	③ 2021-08-12 15:44:36		
1		End Time		auccess
2		③ 2021-08-19 15:44:36		s suc
3				h is s
4				1
5				in Po
6		OK Cancel		1
7			2021-08-18 16:07:14	ERROR: Domain Po
8			2021-08-17 18:36:19	ERROR: CBSD does.
			2021-06-17 22:01:53	Deregistration is suc
9				

c. In the Export window that displays after you perform step 14a, configure your preferred date and time range for exporting device logs by performing the following steps:

NOTE: The time range you specify cannot exceed 7 calendar days (to the exact hour, minute, and second) or you will receive an error message.

(1) Click in the Start Time field to display a calendar (Figure 4-28). Notice the calendar has two fields: one is used to set the date and one is used to set the time.





- (2) Without clicking anywhere else, click on a calendar day to select your preferred time range start date. Notice the date range field at the top of the calendar updates to display the day you selected.
- (3) If you want to set a new time increment other than the time that displays on the calendar, click in the time interval field to display the time set box, which contains three columns for setting hours, minutes, and seconds.
- (4) Click in the first column, scroll to the hour you want and select it. Then, repeat the process to select minutes from the middle column and seconds from the third column, in that order.

NOTE: The time interval can also be entered in the time interval field instead of using the time set box, if you prefer. Make sure you enter the time using the format "hh:mm:ss" with colons separating each increment.

- (5) Click OK in the time set box.
- (6) If you want to select a preferred end date, click in the End Time field to display a calendar and use the same method to change it that you used to configure the start time in the previous step 14c(2) through step 14c(5). Then, proceed to step 14c(7).
- (7) Confirm the date and time ranges displaying in the Export window are set to your preferences and click OK in the Export window. Then, follow the prompts to complete the file export action.
- d. In the Export window that displays after you perform step 14a, you can export the files for the current date and time by performing the following steps:
 - (1) Click in the Start Time field to display a calendar. Notice the calendar shows, highlighted in a blue circle, the day identified in the original Start Time field.

- (2) Click on the current date in the calendar and notice the blue circle moves to highlight the day you selected.
- (3) Click NOW. The calendar closes and both the Start Time and End Time fields in the Export window update to display the current time and date (Figure 4-29).

Figure 4-29: Export Device Logs (Filter - Current Date and Time)

-												-
Time Range			Export								×	
			Start Tim	ie								
Seria	l Number	CBSD ID	③ 202	1-08-26 1	7:28:47							
1			2021-	08-26			17:28:47					suc
2			« <		202	Au	gust		>>			s s
3		_	Sun	Mon	Tue	Wed	Thu	Fri	Sat			h i
4			25	26	27	28	29		31			suc
5			1	2	3	4	5	6	7			trat
7			8	9	10	11	12	13	14	3 13:10:31	Deregistration	is s
8			15	16	17	18	19	20	21	3 13:10:30	Grant Relinqui	sh i
9			22	23	24	25	26	27	28	8 16:11:08	Send sas status	suc
10			29	30	31	1	2	3	4	8 16:11:04	Deregistration	is s
50/page	<	> C					Jow		OK		1	otal 20

- (4) Click OK in the Export window. Then, follow the prompts to complete the file export action.
- 15. View SAS logs by clicking on the Logs icon in the upper right-hand side of the main Advance > SAS window. The Logs and Virtual Logs tabs list all CBSD to SAS messages (Figure 4-30). The logs show information pertaining to CBSD <-> OMC (DP) <-> SAS communications, i.e., messages sent to and from SAS. The columns show the direction (to/from), the object (SAS, CBSD), the message sent or received, the CBSD involved, and the date and time* of the event. Under the Message column, use the drop-down arrow to view the actual code of a message. See section 4.4.2 for information regarding the Virtual Logs tab.

*NOTE: The time reported is in Coordinated Universal Time (UTC) format.



Figure 4-30: SAS Logs

Advance / SAS			Cra	ical 16 🗢 Major 3 👄 Minor 4	Warning 0 FiSci (UTC-06:00)2021-08-26.18:
CPE	Virtual eNB Virt	tual CPE			
		* Q	SAS Enabled 0/7 Authorized 0/7	Grant-Suspended 0/7	
					Logs
ogs Virtu	Logs				
CBED					
CBSD		۰u			6
From	To	Log Name	Message	CBSDs	Time (UTC) ©
1 SAS	DP	GrantResponse	("grantResponse": [("cbsdI 💌		2021-08-24 22:11:36
2 DP	SAS	GrantRequest	("grantRequest": [("cbsdld 💌		2021-08-24 22:11:34
3 SAS	DP	SpectrumInquiryResponse	("spectrum.lnquiryResponse •	-	2021-08-24 22:11:34
4 DP	SAS	SpectrumInquiryRequest	("spectrumInquiryRequest": 💌		2021-08-24 22:11:29
5 SAS	DP	RegisterResponse	("registrationResponse": [(2021-08-24 22:11:29
6 DP	SAS	RegisterRequest		×	2021-08-24 22:11:28
7 DP	CBSD	CBRS Config	{ "registrationResponse": [2021-08-23 16:09:47
8 SAS	DP	RegisterResponse	{ "cbudId": "]		2021-08-23 16:09:42
9 DP	SAS	RegisterRequest	"response"; (-	2021-08-23 16:09:41
10 DP	CBSD	CBRS Config	"sesponseCode": 0	-	2021-08-23 16:09:30
11 DP	CBSD	Update SAS state	2	-	2021-08-18 19:39:49
	758	GrantReporter	5		2021 02:10 10:20:00

16. Check "spectrumInquiryResponse" messages in the SAS logs (Figure 4-31) to verify the types of channels (GAA and/or PAL) being requested for use according to the frequency selection logic settings you selected in section 4.2.1.3.

NOTE: Currently, adjacent 20MHz PAL channels are not supported, but will be in a future software release.

Figure 4-31: Verify Authorized Channels in Use



4.4.2 Register Virtual eNBs and Virtual CPEs with SAS

The OMC also supports virtual CBSD registration with a mass data file importing function, which allows you to register the devices in your inventory with SAS in advance of putting the devices online and connecting to the OMC. Then, once the devices are online on the OMC (DP), they will immediately be authorized by SAS. The function works for both types of virtual CBSDs (virtual eNBs and virtual CPEs).

NOTE 1: Before beginning this procedure, we recommend creating your CBSD data file so it is ready to import to the OMC when you are prompted. Instructions are provided below to assist if you need help creating a CBSD data file.

NOTE 2: The procedures described below are common for both types of virtual CBSDs. In the figures, the Virtual eNBs are used as examples that apply to both types.

- 1. On the OMC, go to Advance > SAS.
- 2. Click on *Virtual eNB* tab or *Virtual CPE* tab, and click on the import icon to access the Import CBSDs pane (Figure 4-32).

NOTE: All the fields in this pane, as well as the associated files and certificates, are required for successful CBSD data file import.

Figure 4-32: Import Virtual CBSD Data File

6	loudcor	• (омс	BOSS									CloudKey!	Welcomes
0	표 AA	moe / SAS								Octional 172	• Major	22 O Mare 1	II O Warner O	Fider (UTC-06/00)2021-05-00 00
6,0	eNB	CPE	Virtual eNB	Virtual CPE										Import
					* Q	SAS Enabled		Ashorized		Grant-Suspender	4.9			000
			Serial Number 0	Coll Name 0	State	Category	CBSD II	•	6	raats	MAX	EIRP(dBm/MBz)	Frequency(MILt)	Grant Expire Time
8														
۲														
0														
														•
						1	import CBS	Ds						×
							Excel File			E	shraha	A Download Sa	mple Template	
							User ID							
							0.544	CPI fig and ensure	and in smithe	e street op diest wa	in the second			
							CPI Certif	licite		E	.912 PEM	P12 Passwor	d.	
							CRUD							
							CPI Name							
							_	_						
							08	Ca	od					-

- 3. Click on the blue arrow icon to upload the Excel file containing your CBSD data. If you need help creating a CBSD data file, proceed to step 4. If not, skip to step 5.
- 4. Click on the "Download Sample Template" link and open or save the .xlsx file; then, once the file opens, follow the instructions provided (Figure 4-33).

NOTE: Do not remove the template instruction page from the template file.

Figure 4-33: Download Sample Template

oudcore	OMC							CloudKey:	Welcome,	~
🖬 Advas	ce/SAS					Cotool 193	• Maper 21 •	Mane 10 @ Warring 0	(UTC-06.01)2323-08-02	11:21
NB (TPE Virtual e	NB Virtual CPE								
	and an I Call Name		* 0	SAS Embled 4	• Authorized	00 Grant Suspend	ed 00			0
			1211							- I
	Serial Namber	Coll Name +	Mate	Category C	RED ID	Grants	MAX Elioy(dBm/)	IBD Propancy(MBD)	Grant Expire Time	1
										- 1
										- 1
						1				- 1
	Import CBSDs				×					- 1
	Excel File	হ ল	tix 🗶 Downle	ad Sample Template						
	User ID					1				
	Notice CPI De and	pairwood is arither moved in client are on th	10550L							
	CPI Certificate	211	211M 🗾 P12 Pa	sewced						
- 1	-									
- 1	GHD									
- 1	CPI Name									
- 1										
- 1	-									
	C.	1.8001								
						1				
				↓						
			AutoSave (🗩 🖬 🌖 - 🤉	- 8	portCBSDFile-eNB - Read-C	nly - Excel 🔑 Sea	rch		
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			2 The C	ertified Professional	installer (CPI) is resp	ionsible for the accuracy of	Disclaimer f all the installation paran	seters entered in the CBRS tool.		
			3 How to 4 Go to	use CBSDs sheet						
			S Popul	ste all CBSDs						
			7 For	i ritual eNB CBSD, if u	ising DC type (only f	or 436Q), two CBSDs are re	quired to be filled out.			
			8	The Scell Serial Nu Preferred frequence	mber must be Pcell's cy format should be	s seriral number + "-2". 3600:3660, Keep the same	preferred frequency for I	oth Pcell and Scell CBSDs.		
			10 Mak	e sure that there is n	o space or other inv	isible characters in Serial N	lumber and FCC ID colum	ns.		
			12	r the reference on ba	ICHIS CESIO LINE.					
			13 Baic 14	Model	Part Number	Spec		FCC ID Antenn	Antenna CBSD Cate	pory
			15	Nova 436Q	M8531001	4x1W eNB	47	2AG32MB53100196N	B	
			16	Nova 233 Gen2	M851100 M851105	2x1W eN8	47	2AG32MB5110096N 2AG32MB5110596N	8	
			18	Nova 227	P852120	2x250mW eNB (13dBi)	40	2AG32P85212096N 13	65 B	-
			20	Atom OD06L	EG7010A-M11 EG7010C-M11	Cat6 CPE (14dBi)	37	2AG32EG7010CM1 11	70 B	
			21	Atom ID068	EG2013B-M11	Cat6 CPE (6dBi)	30	2AG32EG20138M116	360 A	-
			23	Atom OD04L	EG7035L	Cat4 CPE (14dBi)	37	2AG32EG7035L96 14	60 B	1
			24	Atom OD15G	EG8015G-M11	Cat15 CPE(18dbi)	44	2AG32EG8015GM1 18	26 B]
			26				Field description			
			27.	Serial Number : Se CRSD Name : Nam	rial Number of the d e of the device	levice.				
			29	CBSD Category : A	or B according to th	e CBRS device designation				

- 5. Input your User ID.
- 6. Click on the blue arrow icon to upload your CPI certificate.

```
NOTE: If your CPI certificate is p12 format, then your p12 password is required.
```

- 7. Input your CPI ID and CPI Name.
- 8. Click OK; then, click the X icon in upper right-hand side of screen to close the Import CBSDs pane.
- 9. Check Virtual CBSD SAS connectivity. Go to Advance > SAS, click on *Virtual eNB* tab or *Virtual CPE* tab, and confirm the Virtual CBSD is listed and connected by checking the following columns: *SAS Enabled, Serial Number*, and *State*.
- 10. Check the virtual CBSD's connection states. Go to Advance > SAS and click on Virtual eNB tab or Virtual CPE tab. Then, select the Settings icon on the left of the row for the virtual device you want to check and the Settings pane displays (Figure 4-34). You'll see a Procedure State diagram at the top of the Settings pane. If you hover over one of the Procedure State icon labels, you will get a drop-down menu to take action on *that* step of the connection setup process. In Figure 4-34, for example, the virtual device is not registered yet and is shown as Unregistered. Another scenario would be if you've enabled SAS and want to manually request device registration using the Procedure State diagram rather than using the auto-registration option. When you hover over the Unregistered Procedure State icon label, the drop-down menu displays the action you perform at this point: Register req. Select this action to start the request.

Figure 4-34: Check Virtual CBSD Connection Details



- 11. View SAS logs by clicking on the Logs icon in the upper right-hand side of the main Advance > SAS window. Two tabs are presented (*Logs* and *Virtual Logs*).
- 12. Click on *Virtual Logs* tab (Figure 4-35). The list of logs includes all request and response messages between the DP and SAS service, and instructions the DP assigns to the virtual CBSD.

÷	Advance / SAS				
Log	s Virtual Logs				
			Q		
	Message		CBSDs		Time (UTC) 🕀
1	Virtual CBSD move to CBS	•	120300007910D770400-	•	2020-12-14 21:18:22
2	Set parameters successful	•	12020002+01970P0021-	•	2020-12-14 20:28:28
3	Virtual CBSD move to CBS	7	******************	+	2020-12-14 20:28:22

Figure 4-35: Virtual Logs

13. Put the virtual devices online on the OMC (DP) to connect them to the network , and they are immediately authorized by SAS. The connected devices and associated data will then be moved from the *Virtual eNB* or *Virtual CPE* device tab into the "regular" *eNB* or *CPE* device tab.

4.5 Perform Actions on Multiple Devices Simultaneously

There are three actions you can perform on multiple eNBs and/or CPEs simultaneously:

- You can assign a User ID
- You can enable SAS
- You can disable SAS

```
NOTE: The actions described in this section can only be performed on same device types (eNBs or CPEs) and are not applicable to virtual devices.
```

Perform the following steps to assign a User ID (Figure 4-36):

- 1. Go to Advance > SAS.
- 2. Select the *eNB* or *CPE* device tab on upper left-hand side of the screen to display the eNB or CPE device list.
- 3. Click on the check box next to target device(s) or click the check box at column header to select all the devices in the list.
- 4. Click the "Settings" button that displays at the bottom of the page to open the Settings pane.
- 5. Input your User ID (required) and Call Sign (Optional).
- 6. Click OK.

Figure 4-36: Assign User ID to Multiple Devices Simultaneously

ର ଜ	loudco	ore	C	MC	BOSS									CloudKey:	Welcome. 🗸 🗸
0	=	Advance	SAS									Critical 194	Major 22 O Menor 12	• Warning 0	FiSci (UTC-06:00)2021-06-03 08:50
613	eNB	СР	E	Virtual eNB	Vir	tual CPE									
2		levial Nucl					× Q	SAS Enabled	4/44	Authoriz	zed 2/44	Grant-Suspended	0/44		000
				SAS Enabled		Serial Number ©	Cell	Name ©	State 0		CPI State	Category	CBSD ID	Grants	MAX EIRP(dBm/MHz)
	1		0		1	12020000051696P0367			Unregist	ered	error	в			
ß	2		0	CID	۲	12020000511696P0381	Labr	abs1100	Unregist	ered	error	в			
~	3		0		۲	120200005116A8P0096			Unregist	ered	missing	A			
	4		0		۲	120200005116A8P0394					missing	A			
0	5	0	0	0	۲	120200005116A8P0498			Unregist	ered	enor	А			
	6		0		۲	1202000068177KP0140					missing	A			
	7		0	C	۲	120200010717CJP0076	null		Unregist	ered	signed	в			
			0		69	120200010717CJP0389			Unregist	ered	error	в			
	9		0		۲	12020001071\$1CP0546	NC L	ab - Nova 227	Unregist	ered	error	в			
	10		0		۲	12020002401978P0021	null		Authoriz	red	signed	в	2AG32MBS3100196N/58d3a	3550-3570	37
	11		0		۲	120200027619APP0001-1					missing	в			
	12		0		۲	12020002912055T0026			Unregist	ered	error	A			
	13		0		۲	120300010220C3B0016					missing	в			
704	Seb	ected Devi	ices (²)	0									Set	ings SAS ON	SAS OFF Cancel

Perform the following steps to enable SAS (Figure 4-37):

NOTE: You should configure all the devices' installation parameters and upload to the SAS portal prior to enabling SAS on multiple devices.

- 1. Go to Advance > SAS.
- Select the *eNB* or *CPE* device tab on upper left-hand side of the screen to display the eNB or CPE device list.
- 3. Click on the check box next to target device(s) or click the check box at column header to select all the devices in the list.
- 4. Click the "SAS ON" button that displays at the bottom of the page to open the Confirm pane.
- 5. Click OK when prompted to enable SAS in the Confirm pane.

Figure 4-37: Enable SAS on MultipleDevices Simultaneously

ର ଜ	loudco	ore	0	MC	BOSS								CloudKey:	Welcome, 🗸 🗸 🗸
۵	= /	Advance	/ SAS						• 0	ritical 194	Major 22	Minor 12	• Warning 0	FiSei (UTC-06:00)2021-06-03 08:50
6.0	eNB	СР	E	Virtual eNB	Virt	ual CPE								
	S	erial Nurr				8	SAS Enabled	4/44 Authoriz	ed 2/44	Grant-Suspended	0/44			() 🛛 🕄
				SAS Enabled $^{\odot}$	٥	Serial Number $^{\odot}$	Cell Name ©	State ©	CPI State ©	Category	CBSD ID		Grants	MAX EIRP(dBm/MHz)
	1		0					Unregistered	error	в				
M	2		0		00			Unregistered	error	в				
۲	3		0		60			Unregistered	missing	А				
	4		0		•				missing	A				
8	5		0		•			Unregistered	error	A				
	6		0		•				missing	A				
	7		0					Unregistered	signed	В				
	8		0		••			Unregistered	error	в				
	10		0					Authorized	nimed	B			3550-3570	17
	10		0					Annoness	missing	в		_	3770-3770	57
	12		0				The	mintered	missing					
	13		0		0	Conf	īrm				× 👘			
704	Sele	ected Devi	ices (²)	Θ			Are you sure you w	ant to enable SA	\$2			Settin	gi SAS ON	SAS OFF Cancel
							ne you sure you w		OK	Cancel				

Perform the following steps to disable SAS (Figure 4-38):

- 1. Go to Advance > SAS.
- 2. Select the *eNB* or *CPE* device tab on upper left-hand side of the screen to display the eNB or CPE device list.
- 3. Click on the check box next to target device(s) or click the check box at column header to select all the devices in the list.
- 4. Click the "SAS OFF" button that displays at the bottom of the page to open the Confirm pane.
- 5. Click OK when prompted to disable SAS in the Confirm pane.

Figure 4-38: Disable SAS on MultipleDevices Simultaneously

ය ර	loudco	ore	С	MC	BOSS								CloudKey:	Welcome,
ø	⊒ A	Advance	SAS						•	Critical 194	Major 22	Minor 12	• Warning 0	FiSci (UTC-06:00)2021-06-03 08:50
619	eNB	CP	Е	Virtual eNB	Virt	ual CPE								
	S	erial Num					¥ Q SAS Enabled	4/44 Author	ized 2/44	Grant-Suspended	0/44			000
				SAS Enabled $^{\odot}$	۰	Serial Number 🔅	Cell Name	State ©	CPI State 🌣	Category	CBSD ID		Grants	MAX EIRP(dBm/MHz)
	1		0					Unregistered	error	в				
~	2		0		00			Unregistered	error	в				
	3		0		00			Unregistered	missing	А				
Ť	4		0		00				missing	А				
Ø	5		0		60			Unregistered	error	А				
	6		0		0				missing	А				
	7		0		00			Uaregistered	signed	в				
	8	ш	0		69			Unregistered	error	в				
	9		0		00			Unregistered	error	в				
	10		0		00			Authorized	signed	в	_		3550-3570	37
	11		0		60	D/SHIGHER			missing	В				
	12		0			Confir	n			×				
	13		0		•		_			~ ~				
704	Sele	ected Devi	ces (²)	0								Set	tings SAS O	N SAS OFF Cancel
						A	are you sure you want t	o disable SAS?	,		L			
								OF		ancel				
								0K		ancer				

4.6 SAS Installation Parameters

Table 4-1: eNB SAS Settings

NOTE: For eNBs running QRTB 2.6.2 in Dual Carrier Mode, the following parameters will be configured for both Cell1 and Cell2: latitude, longitude, height, heightType, antennaGain, antennaAzimuth, antennaDowntilt, antennaBeamwidth, and installCertificationTime.

Parameter	Description
SAS Settings	
SAS	Enable (ON)/Disable (OFF) the SAS function.
SAS Registration Type	Select Single-Step or Multi-Step method to register the eNB with the SAS
	vendor.
Install Param Config	
category	Either A or B according to the eNB's designation. See Table 4-3 for more
	information.
userid	Enter a user ID, which is provided by your SAS vendor and is associated with
	this SAS-enabled eNB. Range is 0 to 256 characters (using upper-case letters A-
	Z, lower-case letters a-z, and digits 0-9).
fccid	The eNB's FCC certification number.
latitude	Latitude of the eNB's location. Select auto to autofill the latitude based on GPS
	data; otherwise, enter the latitude.
longitude	Longitude of the eNB's location. Select auto to autofill the longitude based on
	GPS data; otherwise, enter the longitude.
height	Enter the antenna height, in meters. Range: 0-300 meters.
heightType	Only Above Ground Level (AGL) may be selected
indoorDeployment	Indicate whether the eNB is an Indoor or Outdoor (default) unit
eirpCapability (eNBs	Maximum Effective Isotropic Radiated Power that may be radiated from the
running QRTB software)	antenna. Range: -127 to 47 dB/10 MHz
Antenna Gain	Set the eNB's antenna gain. Range: -5 to 30 dBi.
antennaAzimuth	Enter the antenna azimuth, in degrees. Default is 180°. Range: 0 - 359°
antennaDowntilt	Enter the degrees of antenna downtilt. Default is 5°. Range: -90° to 90°.
antennaBeamwidth	Enter the degrees of antenna beamwidth. Default is 65°. Range: 0 - 360°.
callSign	Optional: Parameter that is useful to identify the PAL license under which the
	operator is deploying a CBSD. The parameter is not necessary to configure for
	the GAA spectrum (3550 – 3700 MHz). Range is 0 to 256 characters (using
	upper-case letters A-Z, lower-case letters a-z, and digits 0-9).
groupType	Optional: Only INTERFERENCE_COORDINATION may be selected at this time.
	Adding a Group is also optional at this time. CBSD grouping is currently not
	being used by SAS vendors, but will be used in the future when General
	Authorized Access (GAA) coexistence is introduced.



Parameter	Description						
groupID	Optional: You must enter a group ID if using a group type. You cannot leave the						
	groupID field blank when using a group type. Specify the group ID using letters,						
	numbers, or special characters. When you add the ID, it will be displayed						
	beneath this field.						
	groupType INTERFERENCE_COORDINATION groupId 1234						
CPI info							
cpild	Enter the Certified Professional Installer's identification number.						
cpiName	Enter the Certified Professional Installer's name. Use an underscore to separate						
	first name and last name; you cannot use a space in this field.						
installCertificationTime	Select "Auto" to automatically enter the date and time of installation: yyyy- mm-ddThh:mm:ssZ						
CPI certstore							
CPI certstore	Displays the CPI's certificate if it has been uploaded						
Missing	Indicates if the CPI certificate is missing						
add/change CPI cert	Select to upload or change the CPI certificate. You can also use the System >						
CertStore menu to upload the certificate.							

Table 4-2: CPE SAS Settings

Parameter	Description
SAS Settings	
SAS	Enable/Disable the SAS function.
User ID	Enter a user ID, which is provided by your SAS vendor, associated with this SAS-
	enabled CPE. Range is 0 to 256 characters (using upper-case letters A-Z, lower- case letters a-z, and digits 0-9).
Call Sign	Optional: Parameter that is useful to identify the PAL license under which the operator is deploying a CPE. The parameter is not necessary to configure for the GAA spectrum (3550 – 3700 MHz). Range is 0 to 256 characters (using upper-case letters A-Z, lower-case letters a-z, and digits 0-9).
Category	Either A or B according to the CPE's designation. See Table 4-3 for more information.
FCC ID	The CPE's FCC certification number, which is auto-filled based on CPE model.
Serial Number	The CPE's unique serial number.
Radio Technology	Auto-filled as "E_UTRA" and the field is greyed out. E_UTRA identifies that the CPE is using LTE technology.
Antenna Gain	Auto-filled based on CPE model and the field is greyed out.

Table 4-3: Balcells CBSD Product Information	Table 4-3: Baicells	CBSD	Product	Information
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Model	Part Number	Antenna Gain	Antenna Beamwidth	CBSD Category	FCC-Certified Maximum EIRP (10Mhz)	FCC Identification
eNB CBSDs						
Neutrino430	PBS31010	3	360	А	30	2AG32PBS31010
Nova227*	PBS2120	13	65	В	40	2AG32PBS212096N
Nova233 Gen1	MBS1100			В	47	2AG32MBS110096N
Nova233 Gen2	MBS1105			В	47	2AG32MBS110596N
Nova430	PBS3101SE			В	44	2AG32PBS3101SE
Nova430i	PBS3101S	13	65	В	40	2AG32PBS3101S
Nova436Q	MBS31001			В	47	2AG32MBS3100196N
CPE CBSDs						
Atom-OD04H	EG7035E	19	25	В	43	2AG32EG7035E96
Atom-OD04L	EG7035L	14	60	В	37	2AG32EG7035L96
Atom-ID06B	EG2013B-M11	6	360	А	30	2AG32EG2013BM11
Atom-OD06H	EG7010A-M11	14	25	В	40	2AG32EG7010AM11N
Atom-OD06L	EG7010C-M11	11	70	В	37	2AG32EG7010CM11N
Atom-OD15	EG8015G-M11	18	26	В	44	2AG32EG8015GM11

*NOTE: The Nova227 (PBS2120) has a 10-degree electrical down tilt.