Configure WWAN

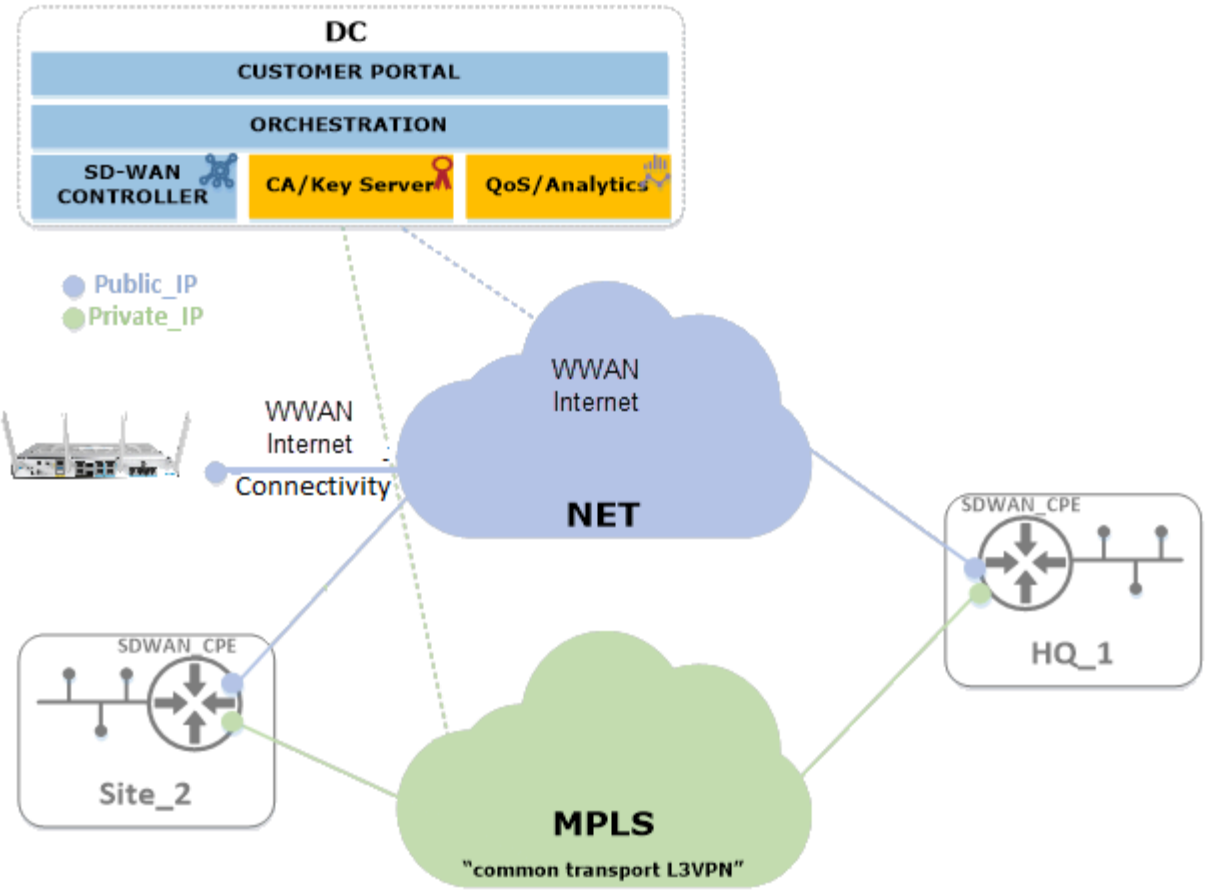
For supported software information, click here.

You can configure wireless WAN (WWAN) broadband services on a Versa Operating System™ (VOS™) device in a branch, to provide wireless connectivity to the internet. WWAN functionality is useful when a branch does not have a wired connection to the internet. You can use the WWAN services on a VOS device that has a built-in WWAN chip or that has an external USB modem, or you can connect an Android mobile phone using a USB port (referred to as *tethering*).

The term *WWAN interfaces* refers to LTE, 4G, and 5G interfaces.

Note that in Releases 21.2 and earlier, the Director GUI refers to WWAN interfaces as LTE interfaces.

The following figure shows three branches that have wireless connections to the internet. Two of the branches have wired connections to a private MPLS network and wireless connections to the internet. One of the branches has only a wireless connection to the internet.



Configure WWAN

To configure WWAN interfaces on a VOS device, you do the following:

- Obtain an WWAN link.
- Configure a WAN interface to use for WWAN.
- Configure WWAN interface properties.

Obtain a WWAN Link

Before you configure a WWAN interface, ensure that the VOS device has an internal modem or that you have an external dongle for the VOS device.

If you are using an internal modem:

- Ensure that the SIM card is activated and working.
- Ensure that the antennas are connected.

If you are using an external dongle:

- Ensure that the SIM card is activated and working.

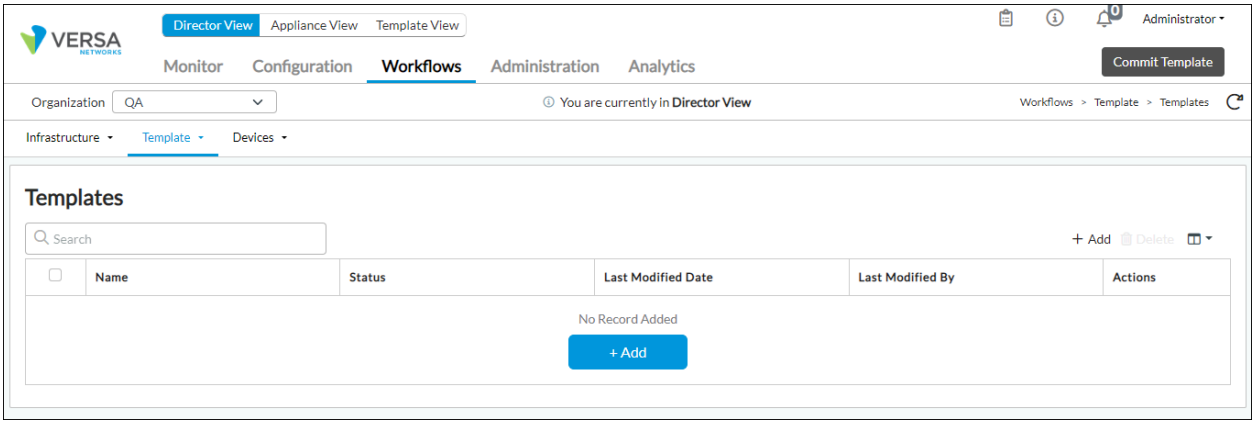
The VOS device automatically detects the dongle or SIM card, and it then retrieves its IP address.

Configure a WAN Interface To Use for WWAN

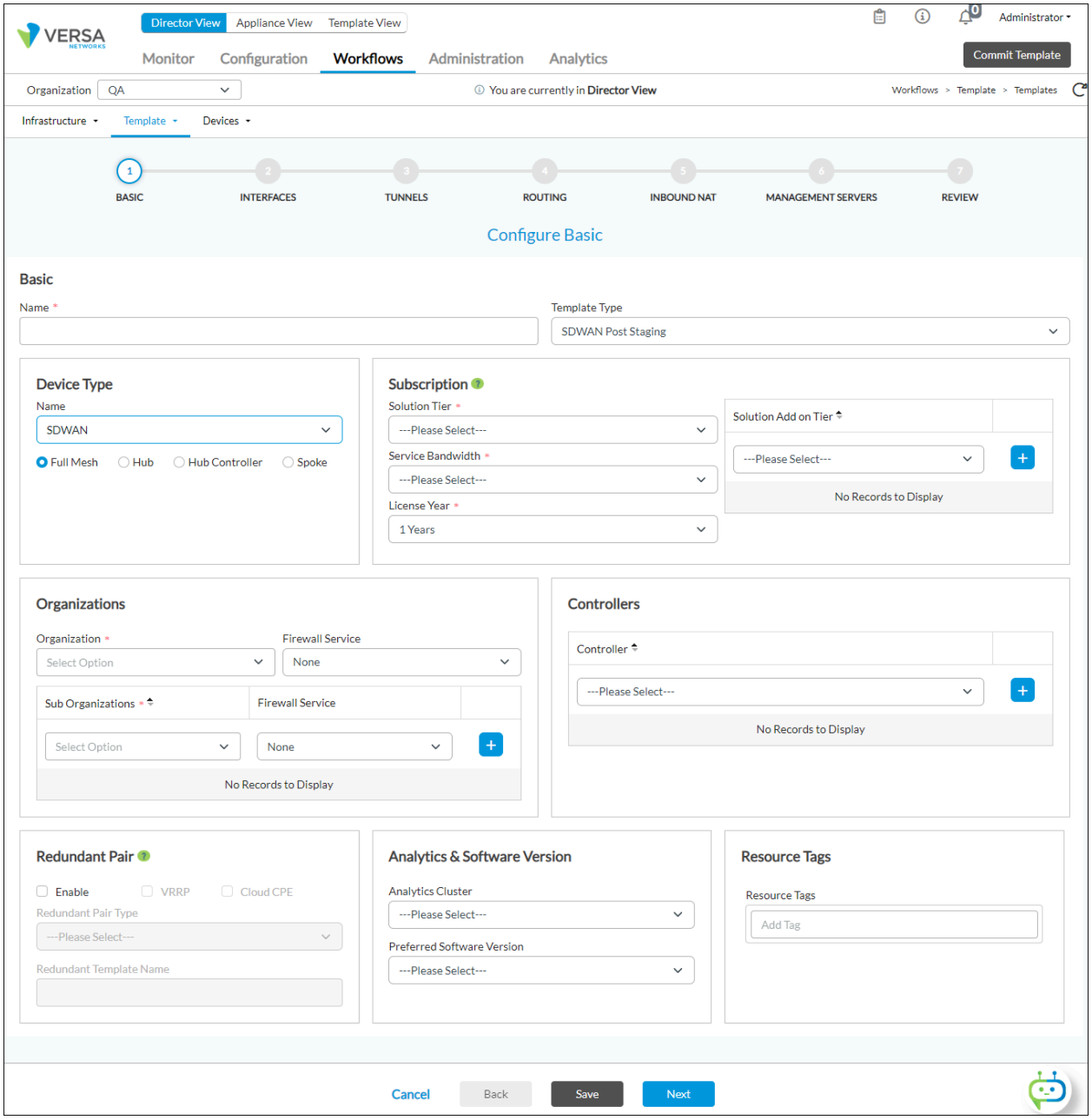
To set up WWAN services, you first configure a WWAN interface for LTE, 4G, or 5G service on a VOS WAN port, either by creating a Workflow or by modifying an existing interface. For each WAN port, you can configure up to four WWAN interfaces. Two of these interfaces can be internal, that is, for a built-in WWAN module, and two can be external, that is, for a dongle. The WWAN interfaces are automatically assigned sequential port numbers from 100 (for the first interface) through 103 (for the fourth interface). All WWAN interfaces have a single unit, which is unit 0. WWAN interfaces cannot have subinterfaces (unit numbers other than 0).

To create a Workflow template for a WWAN WAN interface, follow the steps below. This procedure describes how to configure an interface with WWAN-specific features. For information about configuring other interface features, see Create Device Templates in the Configure Basic Features article.

1. In Director view:
   a. Select the Workflows tab in the top menu bar.
   b. Select Template > Templates in the horizontal menu bar. The table in the main pane lists the existing templates.
   c. Click the + Add icon to create a template for WWAN interfaces.



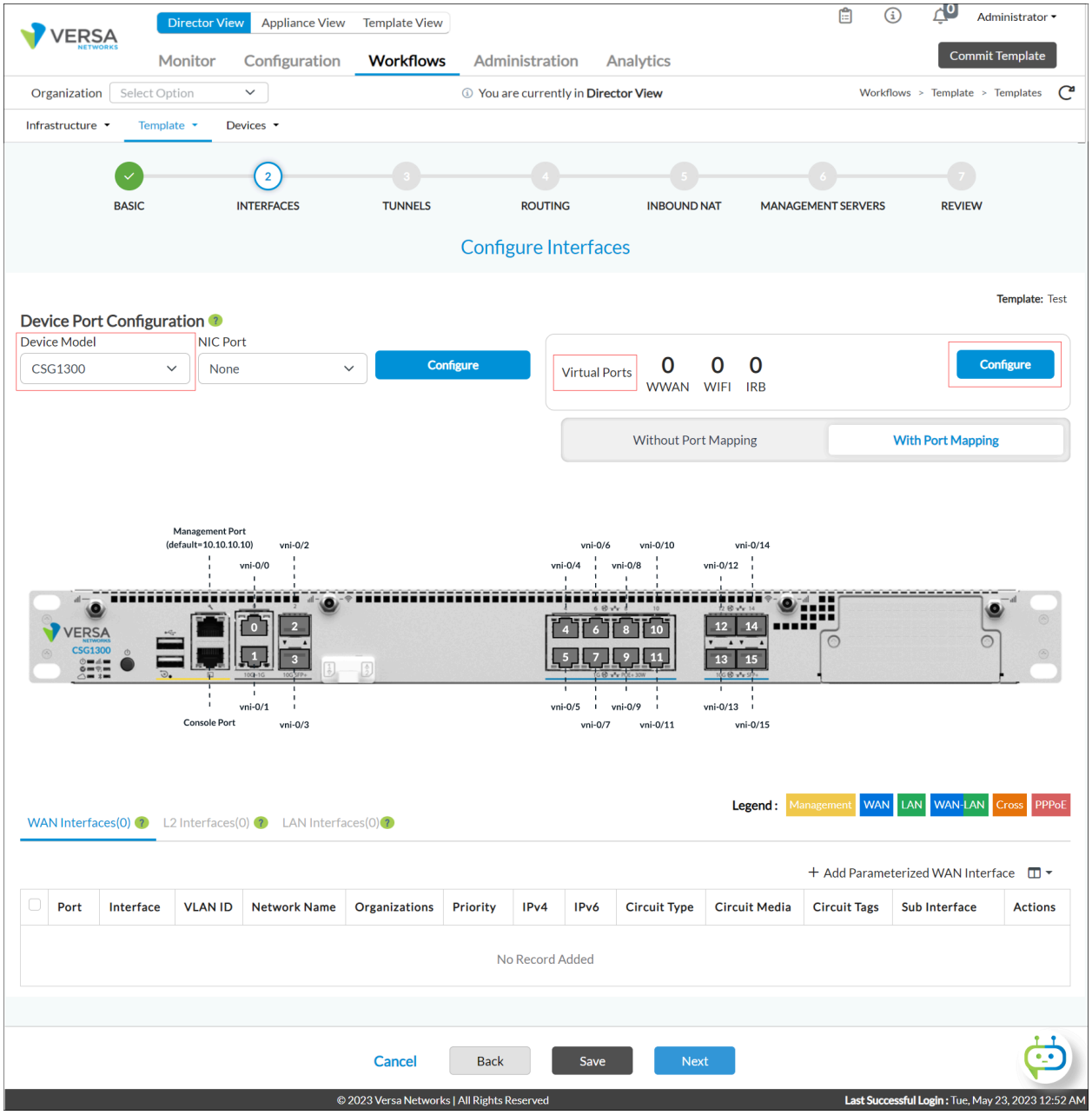
   d. The Create Template popup window displays. For the seven tabs on this popup window, provide configuration information, as described in the following steps. Required information is indicated with a red asterisk. Click Next to move to the next tab in sequence and Back to move to the previous tab, or select a tab to move directly to its window.
2. In the Basic tab, configure basic interface properties. Enter information for the following fields.



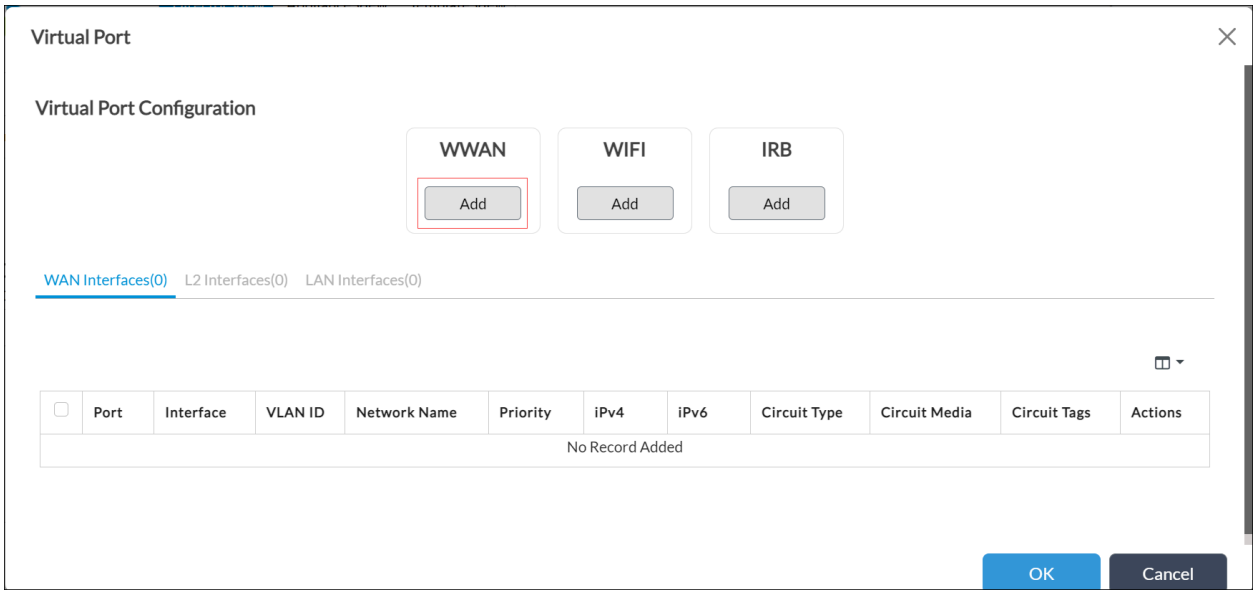
Field	Description
Name (Required)	Enter a name for the template. *Value:* Text string from 1 through 255 characters *Default:* None
Template Type (Required)	Select the template type SD-WAN Post-Staging.
Device Type	Select the device type based on the solution tier: ◦ vCPE—For routing tiers (ProNet, Net Pro, Advanced Routing) or security tiers (NGFW, UTM). ◦ SD-WAN—For Prime SD-WAN, Prime Secure, Premier Secure, and Premier Elite SD-WAN. If you select SD-WAN, select the topological role of the VOS device: ◦ Full Mesh—Click for a device in a full-mesh topology. This is the default. ◦ Hub—Click to have the device be a hub in a hub-and-spoke topology. If you select this device type, the Region field is enabled. Select the region. ◦ Hub Controller—Click to have the device act as a hub and a Controller for the spokes. Selecting this device type enables the Region and Staging fields. Select the region. ◦ Spoke—Click to have the device be a spoke in a hub-and-spoke topology. Selecting this device type enables the Spoke Group field. Select the name of the spoke group. For more information, see Create an SD-WAN Spoke Group. *Default:* Full Mesh
Subscription (Group of Fields)	
◦ Solution Tier (Required)	Select the solution tier that corresponds to the license that the device is using.
◦ Service Bandwidth (Required)	Select the bandwidth to use for solution tier that corresponds to the license that the device is using.
◦ License Year (Required)	Select the validity period for the license.
◦ Solution Add-On Tier	Select a solution tier for the post-staging template and click the Add icon.

Organizations (Group of Fields)	
◦ Organization (Required)	Select the organization to which the template applies.
◦ Firewall Service	Select the type of security protocol to be implemented in the template: ◦ NGFW (next-generation firewall) ◦ SFW (stateful firewall)
◦ Suborganizations (Required)	For full-mesh and hub device types, select the name of the suborganization associated with the template.
Controllers	For full-mesh and hub device types, select name of the controller associated with the template and click the Add icon.
Redundant Pair (Group of Fields)	
◦ Enable	Click to create a redundant template. You should create a redundant pair when active-active redundancy is required.
◦ VRRP	Click to enable VRRP.
◦ Cloud CPE	Click to enable cloud-based solutions.
◦ Redundant Pair Type	Select redundant pair type.
◦ Redundant Template Name	Enter the name of the redundant template.
Analytics and Software Version (Group of Fields)	
◦ Analytics Cluster	Select an analytics cluster.
◦ Preferred Software Version	Select the preferred version of the software that should be deployed on Versa Director. The preferred software version applies to zero-touch provisioning (ZTP). During ZTP, Versa Director upgrades a branch to the preferred version, if applicable. The preferred version can be backward compatible for up to two previous VOS versions.
Resource Tags	(For Releases 22.1.1 and later.) Enter the RBAC resource permission tag name.

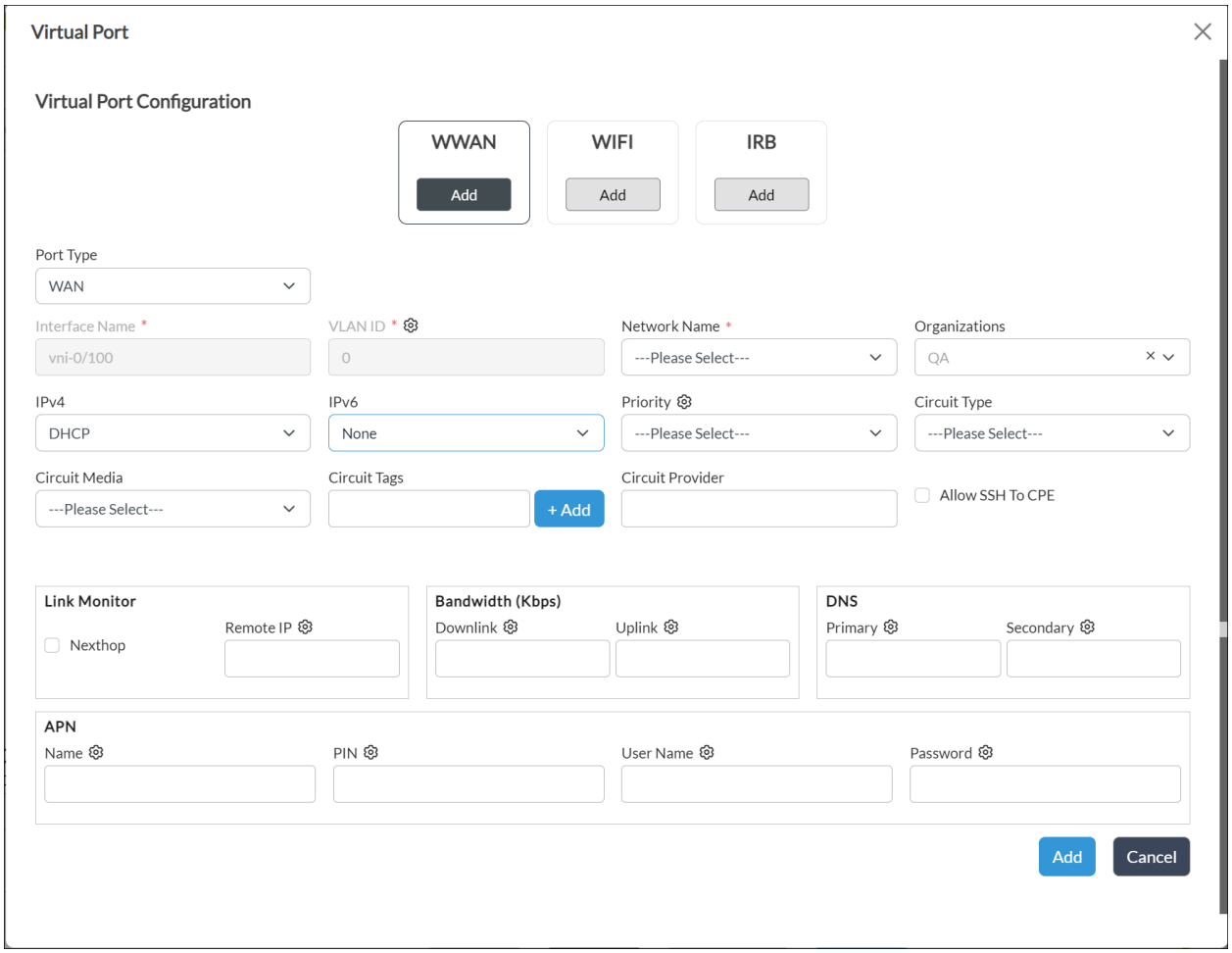
3. Click Next. In the Configure Interfaces screen, select a model from the Device Model drop-down list. In the Virtual Ports box, click Configure. This example uses a CSG1300 device.

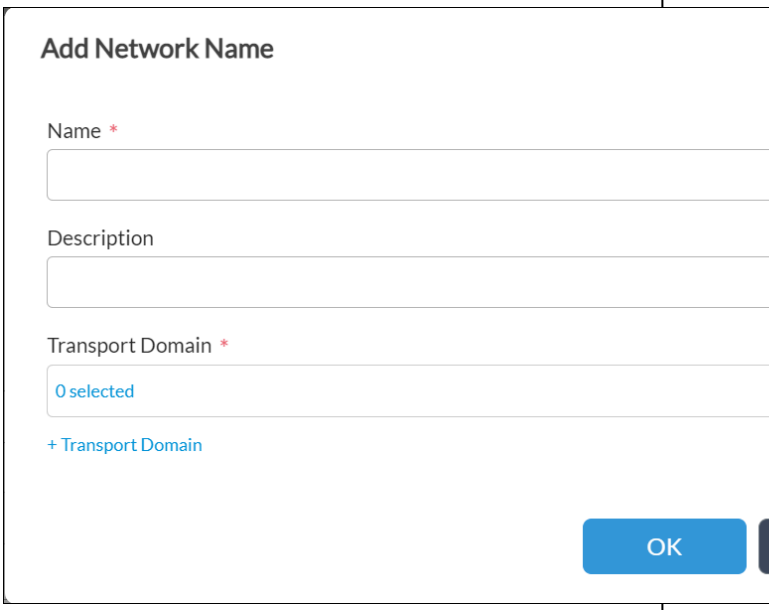


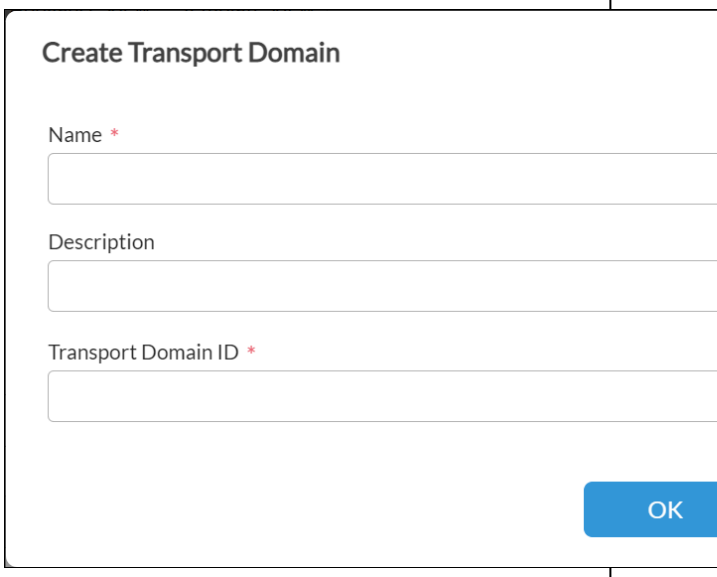
4. In the Virtual Port screen, click Add in the WWAN box to configure WWAN (for LTE, 4G, or 5G) on the SD-WAN. You can create up to four WWANs on the WAN interface.



5. Enter configuration information for each WAN interface. For each WWAN instance, the device automatically assigns a port number, which is a value from 100 through 103.



Field	Description
◦ Port Type	By default, the port type is WAN.
◦ Interface Name (Required)	Prepopulated with the vni interface and subinterface numbers based on the port you select in the Device Port Configuration box.
◦ VLAN ID (Required)	Enter the VLAN identifier for the subinterfaces. To parameterize the VLAN ID, click the Parameterize icon.
◦ Network Name (Required)	Select the network to which the WAN interface connects. To create a new network name, click + Add New in the network name drop-down list. In the Add Network Name popup window, enter the following information and then click OK.  ◦ Name (Required)—Enter a name for the WAN interface. ◦ Description—Enter an interface description ◦ Transport Domain (Required)—Click to select the transport domain: ▪ Internet ▪ MPLS

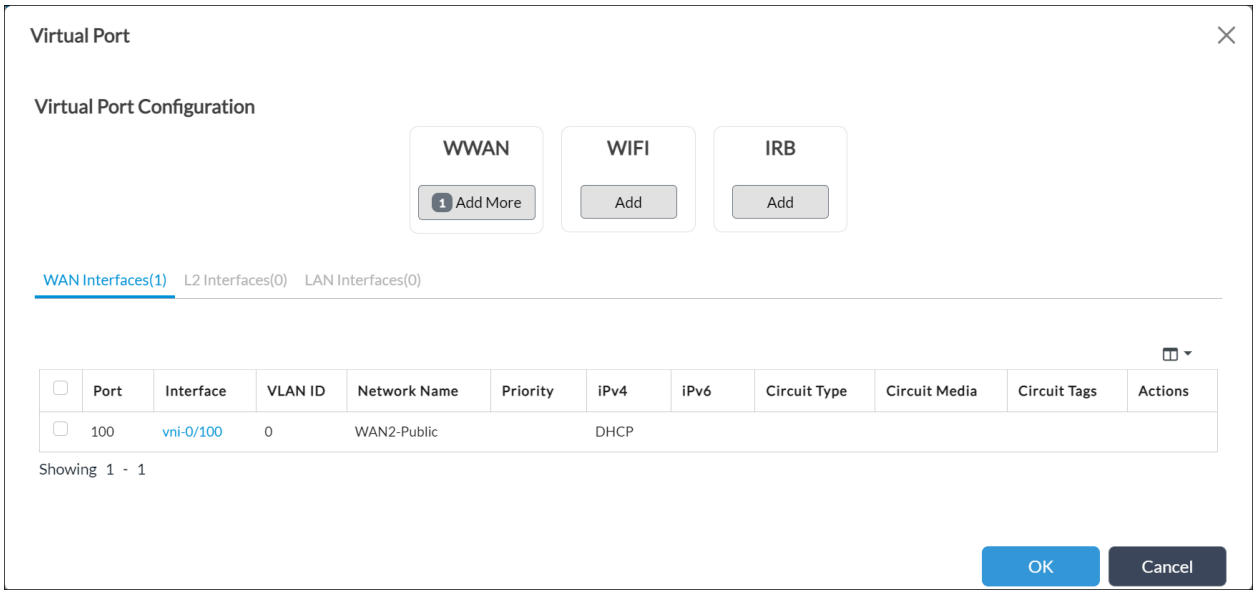
Field	Description
	◦ To create a transport domain, click + Transport Domain and enter the following information:  ▪ Name— (Required) Enter a transport domain name. ▪ Description—Enter a transport domain description. ▪ Transport Domain ID —(Required) Enter a transport domain ID.
◦ Organizations	Select the organization to which the WWAN interface belongs.
◦ IPv4	Use IPv4 addressing on the WAN interface: ◦ None ◦ Static—Use static IP address. When you select Static, a bind-data variable for the interface's static address is automatically generated in the template. ◦ DHCP—Use DHCP to obtain an IP address. The WWAN interfaces are configured as DHCP only.
◦ IPv6	Use IPv6 addressing on the WAN interface:

Field	Description
	◦ None ◦ Static—Use static IP address. When you select Static, a bind-data variable for the interface's static address is automatically generated in the template. ◦ DHCP—Use DHCP to obtain an IP address.
◦ Priority	Select a number for the link priority for WAN traffic. A default forwarding profile is automatically created that is based on the WAN circuit priority. If you do not assign a priority, the WAN interface is added to the default forwarding profile, but it has no circuit priority. *Range:* 1 through 8 *Default:* None To parameterize the priority, click the  Parameterize icon.
◦ Circuit Type	Select the access circuit type: ◦ Broadband ◦ IP ◦ MPLS
◦ Circuit Media	Select physical medium used by the access circuit: ◦ Cable ◦ DSL ◦ Ethernet ◦ LTE ◦ T1 ◦ T3
◦ Circuit Tag	Enter a text list of circuit tags and, then click the  Add icon.

Field	Description
◦ Circuit Provider	Enter the access circuit service provider's name.
◦ Allow SSH to CPE	Click to allow SSH sessions to the CPE device on the underlay IP address of WAN interface.
Link Monitor (Group of Fields)	
◦ Next Hop	Click to enable link monitoring for next-hop reachability.
◦ Remote IP	Enter a remote IP address for remote IP reachability through this WAN link to detect link failures. To parameterize the remote IP, click the Parameterize icon.
Bandwidth (Group of Fields)	
◦ Downlink	Enter the bandwidth available on the link for downloading data, in kilobytes per second (Kbps). To parameterize the downlink, click the Parameterize icon. *Range:* 1 through 10000000 Kbps *Default:* None
◦ Uplink	Enter the bandwidth available on the link for uploading data, in kilobytes per second (Kbps). To parameterize the uplink, click the Parameterize icon. *Range*: 1 through 10000000 Kbps *Default*: None
DNS (Group of Fields)	
◦ Primary	Enter the primary DNS server. To parameterize the primary DNS, click the Parameterize icon.

Field	Description
◦ Secondary	Enter the secondary DNS server. To parameterize the secondary DNS, click the Parameterize icon.
Access Point Name (APN) (Group of Fields)	
◦ Name	Enter the APN that you received from your service provider. To parameterize the APN name, click the Parameterize icon.
◦ Pin	For a USB modem that is locked with a pin, enter a pin number. To parameterize the pin, click the Parameterize icon.
◦ Username	Enter the username provided by the service provider to use to access the wireless WAN. This username is used when a CDMA modem prompts for a username. To parameterize the username, click the Parameterize icon.
◦ Password	Enter the password provided by the service provider to access the wireless WAN. This password is used when a CDMA modem prompts for a password. Click Show/Hide to view the new password. To parameterize the password, click the Parameterize icon.

6. Click the Add Add icon to add the WWAN interface (for LTE, 4G, or 5G service), and then click OK.

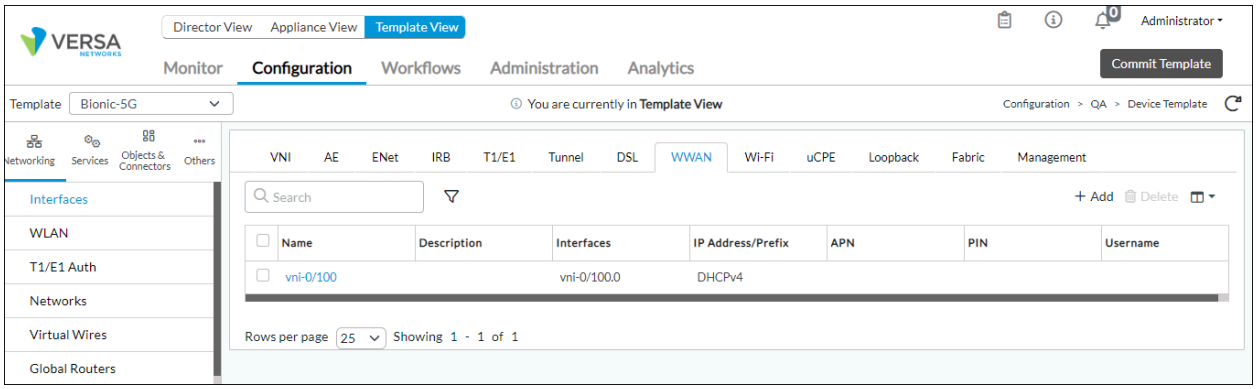


7. Configure other interface features as desired. Layer 2 and LAN interfaces do not apply to WWAN interfaces.
8. Click Create/Recreate to deploy the workflow template.

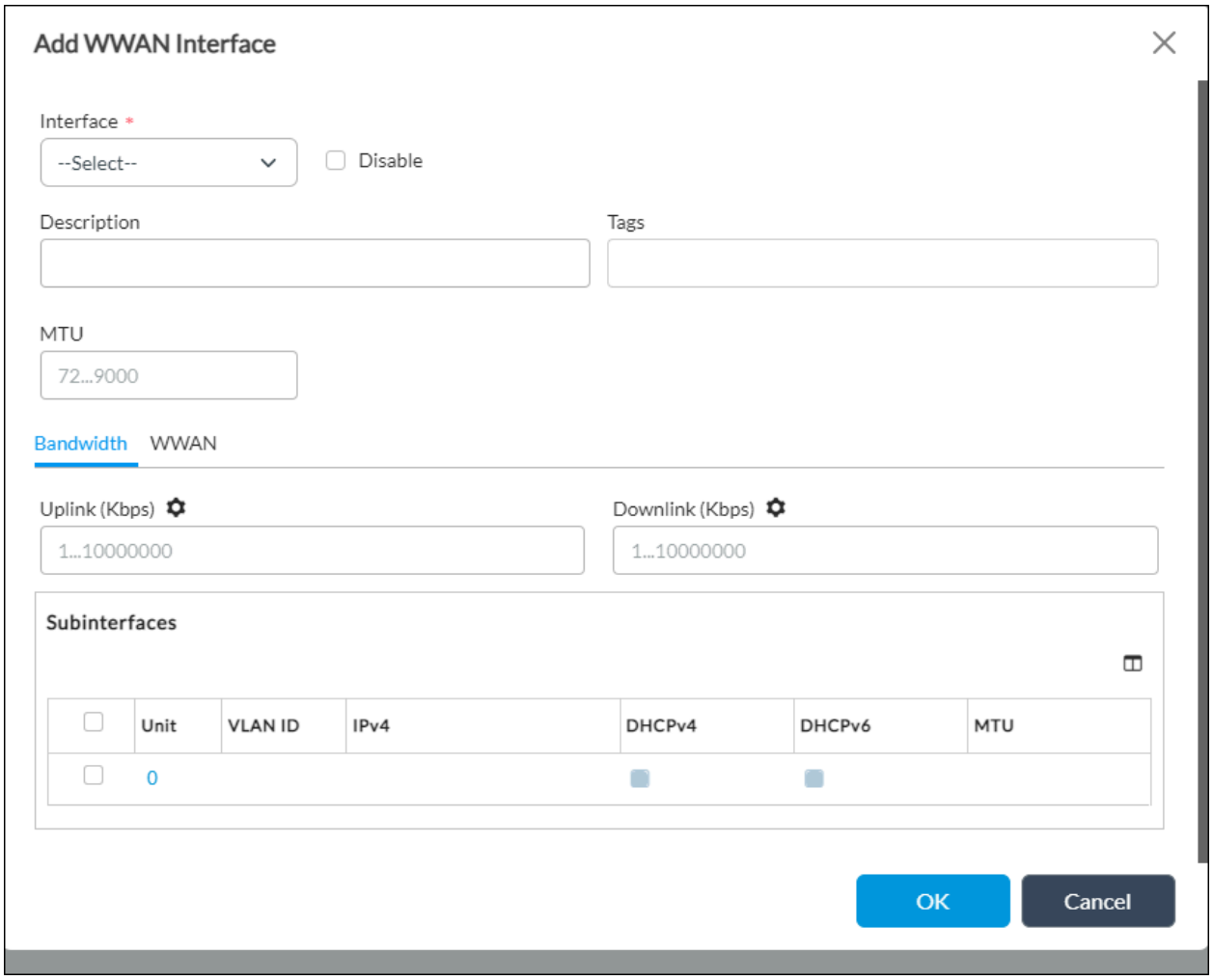
Configure WWAN Interface Properties

You configure WWAN interface properties for LTE, 4G, or 5G service in a post-staging template.

1. In Director view:
   a. Select the Configuration tab in the top menu bar.
   b. Select Templates in the horizontal menu bar.
   c. Select an organization in the left menu bar.
   d. Select a post-staging template from the main pane. The view changes to Appliance view.
2. Select the WWAN tab in the horizontal menu bar. The table in the main pane lists the existing interfaces.



3. Click the + Add icon to configure the WWAN interface properties. In the Add WWAN Interface popup window, enter information for the following fields.



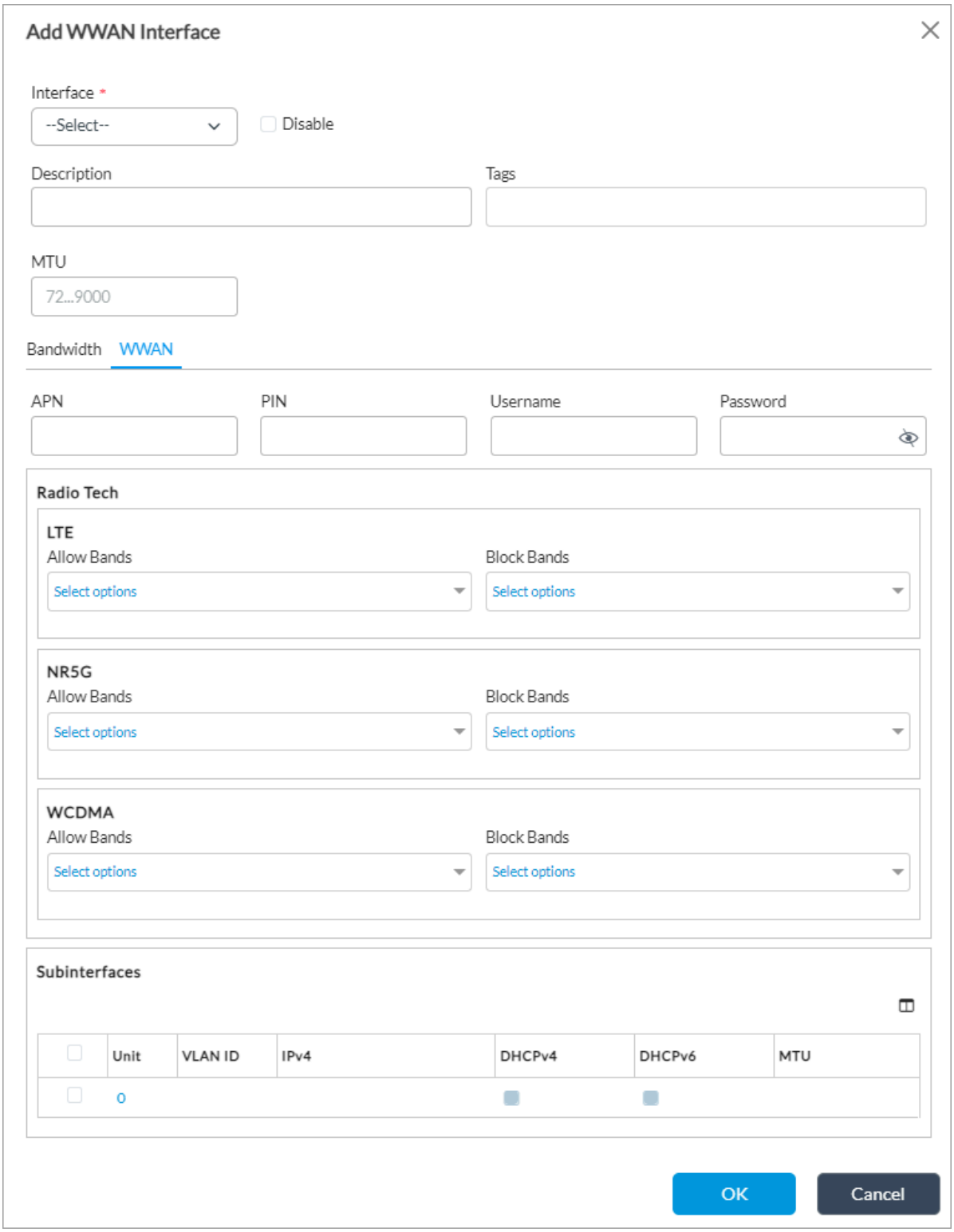
Field	Description
Interface (Required)	Select the interface on which to configure WWAN.
Disable	Click to not activate the WWAN interface after you configure it.
Description	Enter a text description for the interface. *Value:* Text string from 1 through 255 characters *Default:* None
Tags	Enter a text string or phrase to associate with the interface. Tags allow you to locate an WWAN interface when you perform a filtered search of all interfaces. *Value:* Text string from 1 through 255 characters *Default:* None
MTU	Enter the maximum transmission unit (MTU) size, in bytes, of the largest packet that the port can receive or transmit.
Subinterfaces	WWAN interfaces cannot have subinterfaces (unit numbers other than 0).

4. Select the Bandwidth tab, and enter information for the following fields.

Field	Description
Autoconfiguration	Click to enable autoconfiguration.
URI	Enter the URI of the website to use for autoconfiguration.
Uplink	Enter the maximum available bandwidth of the link while uploading data, in kilobytes per second (Kbps). The maximum available bandwidth is a function of the Ethernet card in the device. For example, a 1-GB Ethernet card can support a maximum uplink speed of 1 GB. To parameterize the uplink speed, click the Parameterize icon. If you configure SD-WAN traffic steering, this value is used by the selection connection method that selects how to forward a traffic flow when multiple available WAN paths have the highest priority. For more information, see Configure SD-WAN Traffic Steering. Note that this value does not affect the CoS (QoS) configuration on the interface. *Range*: 1 through 10000000 Kbps *Default*: None
Downlink	Enter the maximum available bandwidth of the link while downloading data, in kilobytes per second (Kbps). The maximum available bandwidth is a function of the Ethernet card in the device. For example, a 1-GB Ethernet card can support a maximum downlink speed of 1 GB. To parameterize the downlink speed, click the Parameterize icon. If you configure SD-WAN traffic steering, this value is used by the selection connection method that selects how to forward a traffic flow when multiple available WAN paths have the highest priority. For more information, see Configure SD-WAN Traffic Steering. Note that this value does not affect the CoS (QoS) configuration on the interface. *Range*: 1 through 10000000 Kbps *Default*: None

5. To configure the WWAN to use when the modem fails to connect automatically, select the WWAN tab, and enter

information for the following fields.



Field	Description
APN	Enter the access point name (APN) that you received from your service provider. To parameterize the APN, click the Parameterize icon.
PIN	For a USB modem that is locked with a PIN, enter the PIN number. To parameterize the PIN, click the Parameterize icon.
Username	Enter the username provided by the service provider to use to access the wireless WAN. This username is used when a CDMA modem prompts for username.
Password	Enter the password provided by the service provider to use to access the wireless WAN. This password is used when a CDMA modem prompts for password.
Radio Technologies (Group of Fields)	(For Releases 22.1.4 and later.) Allow or block specific sets of bands associated with radio technologies on the modem.
◦ LTE	Select the LTE modem bands: ◦ Allow Bands—Select the bands to allow for LTE. ◦ Block Bands—Select the bands to block for LTE.
◦ NR5G	Select the NR5G bands: ◦ Allow Bands—Select the bands to allow for NR5G. ◦ Block Bands—Select the bands to block for NR5G.
◦ WCDMA	Select the WCDMA bands: ◦ Allow Bands—Select the bands to allow for WCDMA . ◦ Block Bands—Select the bands to block for WCDMA.
Subinterfaces	Select a subinterface and enter values for the following parameters:

	◦ Unit—Enter the unit number of the subinterface. ◦ VLAN ID—Enter the virtual LAN ID. *Range:* 0 through 4094 ◦ IPv4—Enter the maximum transmission unit size, in bytes, of largest protocol data unit (PDU) that the port can receive or transmit. ◦ DHCPv4—Click to use DHCPv4 to obtain an address for the subinterface. ◦ DHCPv6—Click to use DHCPv6 to obtain an address for the subinterface. ◦ MTU—Enter the maximum transmission unit size, in bytes, of largest protocol data unit the post can receive or transmit in bytes.

6. Click OK.

Use WWAN for Staging

To use WWAN for staging, specify the **–w** option with the staging script. In this option, specify the VNI number to use for staging. To use vni-100 on the WAN for WWAN and DHCP, run the staging.py staging script with the **–w 100 –d** options. The following example uses vni-100:

```
[admin@Internet-Box: ~]# staging.py -w 100 -d
Commit complete.
```

When running the staging script, you can also indicate the APN configuration parameters, such as username, password, and PIN:

```
[admin@Internet-Box: ~] # cd /opt/versa/scripts/
[admin@Internet-Box: scripts] # ./staging.py --help
Please execute with sudo
[admin@Internet-Box: scripts] # sudo ./staging.py --help
[sudo] password for admin:
usage: staging.py [-h] [-l LOCAL_ID] [-r REMOTE_ID] [-n SERIAL_NUMBER]
                  [-c CONTROLLER] [-c6 CONTROLLER6] [-t {staging,prestaging}]
                  [-w
{0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,4
                  [-v VLAN] [-s STATIC] [-s6 STATIC6] [-g GATEWAY]
                  [-g6 GATEWAY6] [-d] [-d6] [-a] [-gt GLOBAL_TENANT_ID]
                  [-lk LOCAL_PSK] [-rk REMOTE_PSK] [-p] [-pu PPPOE_USER]
                  [-pp PPPOE_PASSWORD] [-ps PPPOE_SERVICE]
                  [-pa PPPOE_ACCESS_CONCENTRATOR] [-wu WWAN_USER]
                  [-wp WWAN_PASSWORD] [-wapn WWAN_APN] [-wpin WWAN_PIN]

Setup branch staging config

optional arguments:
```

```
  -h, --help            show this help message and exit
  -l LOCAL_ID, --local-id LOCAL_ID
                        Local id-string/email
  -r REMOTE_ID, --remote-id REMOTE_ID

.
.
.

wu WWAN_USER, --wwan_user WWAN_USER
                        wwan username
  -wp WWAN_PASSWORD, --wwan-password WWAN_PASSWORD
                        wwan password
  -wapn WWAN_APN, --wwan-apn WWAN_APN
                        wwan apn name
  -wpin WWAN_PIN, --wwan-pin WWAN_PIN
                        wwan simpin
.
.
.
-wpin WWAN_PIN, --wwan-pin WWAN_PIN
                        wwan simpin
```

Stage the device using URL-based ZTP or a staging script.

- If you use URL-based ZTP, ZTP automatically tries all the available interfaces on the device.
- If you use the staging script, specify the options **–w 100 –d**. The **–w** option specifies WAN port 100, and so the WWAN interface vni-0/100 is used for the WAN transport. The **–d** option uses DHCP to retrieve an IP address for the WAN link.

Verify the WWAN Configuration

To check the WWAN interface:

1. Display detailed information from the service provider:

```
admin@LTE-Branch2-cli> show interfaces detail vni-0/100.0

Interface: vni-0/100.0
  Tenant               : 2
  Vlan-Id              : 0
  Administrative status : up
  Operational status    : up
  Protocols Down        : n/a
  Interface index       : 1061
  Interface Role        : external
  MAC address           : 02:aa:bb:cc:dd:01
  IP address            : [ 100.90.234.63/25 ]
  Obtained from DHCP    : True
  DHCP Server IP        : 100.90.234.64
  DHCP Lease Time       : 2018-04-17 13:49:11
```

```
DHCP Lease Expiry     : 2018-04-17 15:49:11
Name Server 1 Address : 198.224.173.135
Name Server 2 Address : 198.224.174.135
Routing instance      : LTE-Transport-VR (11)
Host interface        : wwanusb0
MTU                   : 1500
Duplex / Speed        : full-duplex / 1Gbps
  RX packets:14937  errors:0
  RX bytes:4739180
  TX packets:29012  errors:0
  TX bytes:8375223
```

2. Display the status of the WWAN interface:

```
admin@versa-VOS-cli>  show interfaces wwan status brief
INTERFACE  INTERFACE                    CONNECTION  VENDOR
PRODUCT
NAME       STATUS         HW STATUS       STATUS      ID      ID      HW VENDOR NAME         HW
MODEL NAME                 IMEI
-------------------------------------------------------------------------------------------------------------------------------------------
vni-0/100  Configured      Modem Detected  Connected   1199    9071    Sierra Wireless, Inc.  Sierra_
Wireless_MC7455_Qualco  359072060692577
vni-0/101  Not configured
vni-0/102  Not configured
vni-0/103  Not configured
```

3. Display the status of the WWAN interface's carrier:

```
admin@LTE-Branch2-cli> show interfaces wwan status carrier-brief | tab
INTERFACE                    CURRENT
OPERATOR                                                                RX       TX
NAME       STATE      NUMBER      TECH     SIGNAL  RSSI         RSRQ         RSRP          SNR       ID
OPERATOR NAME     ADDRESS        PREFIX  GATEWAY       DNS            UPTIME  BYTES    BYTES
-------------------------------------------------------------------------------------------------------------------------------------------
-------------------------------------------------------------------
vni-0/100  connected  6692686037  lte      65      '-73.00' dBm  '-10.00' dB  '-103.00' dBm  '4.40' dB
311480    Verizon Wireless  100.90.234.63  25      100.90.234.64  198.224.173.135  3720    4543528
7404415
vni-0/
101
vni-0/
102
vni-0/103
```

4. Display location information about the WWAN interface:

```
admin@versa-VOS-cli> show interfaces wwan status cell-location
                             TRACKING
INTERFACE                      AREA      GLOBAL
NAME       MCC  MNC  NETWORK NAME      CODE      CELL ID
-----------------------------------------------------------
vni-0/100  311  480  Verizon Wireless  7942      7975180
vni-0/101
vni-0/102
```

```
vni-0/103
```

5. Display the status of WWAN interface lte-info vni-0/100:

```
admin@Dual-LTE-Branch2-cli> show interfaces wwan status lte-info vni-0/100
interfaces wwan status lte-info vni-0/100
band                        B4
bandwidth                    "15 Mhz"
ant0-rssi                   -72
ant0-rsrp                   "-99 dBm"
ant1-rssi                   -70
ant1-rsrp                   "-93 dBm"
rx-channel                   2075
tx-channel                   20075
serving-cell-id              0513FB16
serving-physical-cell-id      172
serving-snr                  15
serving-rsrq                -9.7
serving-rsrp                -93.9
serving-rssi                -65.7
neighbour1-physical-cell-id  285
neighbour1-rsrq              -19.5
neighbour1-rsrp               108.2
neighbour1-rssi              -77.9
carrier-aggregation          "NOT ASSIGNED"
[ok][2021-06-09 17:51:34]
admin@Dual-LTE-Branch2-cli>
```

Monitor and Analyze WWAN Interface Operation

This section describes how to monitor the operation of WWAN interfaces for LTE, 4G, or 5G service from the Director GUI and how to analyze the operation of WWAN interfaces from an Analytics node.

WWAN network signal level and performance are measured by the following signals:

- Reference Signal Received Power (RSRP)
- Reference Signal Received Quality (RSRQ)
- Received Signal Strength Indicator (RSSI)
- Signal to Interference-and-Noise Ratio (SINR)

The following tables provide value ranges for these signal measurements so that you can determine the signal strength and quality of the VOS WWAN modem.

The following tables provide approximate values for these signals so that you can determine whether the VOS WWAN modem has excellent signal strength or quality (shown in green on the Director Monitor screen), good signal strength or quality (shown in yellow), fair to poor strength or quality (shown in orange), or no signal (shown in red).

RSRP	Signal Strength	Color in Director and Analytics	Description
≥ –80 dBm	Excellent	Green	Strong signal with maximum data speeds
–80 dBm to –90 dBm	Good	Yellow	Strong signal with good data speeds
–90 dBm to –100 dBm	Fair to poor	Orange	Reliable data speeds may be attained, but marginal data with drop-outs is possible. As this value approaches –100 dBm, performance will drop drastically.
≤ –100 dBm	No signal	Red	Disconnection.

RSRQ	Signal Strength	Color in Director and Analytics	Description
≥ –10 dB	Excellent	Green	Strong signal with maximum data speeds
–10 dB to –15 dB	Good	Yellow	Strong signal with good data speeds
–15 dB to –20 dB	Fair to poor	Orange	Reliable data speeds may be attained, but marginal data with drop-outs is possible. As this value approaches –20 dB, performance will drop drastically.
≤ –20 dB	No signal	Red	Disconnection.

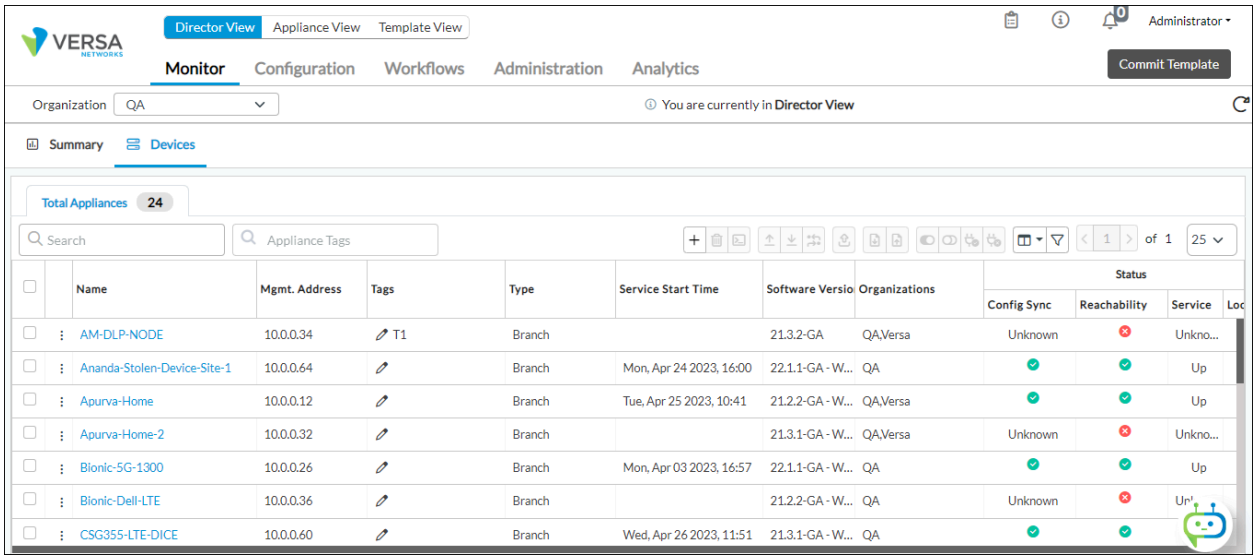
RSSI	Signal Strength	Color in Director and Analytics	Description
≥ –65 dBm	Excellent	Green	Strong signal with maximum data speeds
–65 dBm to –75 dBm	Good	Yellow	Strong signal with good data speeds
–75 dBm to –85 dBm	Fair	Orange	Fair but useful, fast, and reliable data speeds may be attained, but marginal data with dropouts is possible.
–85 dBm to –95 dBm	Poor	Orange	Performance will drop drastically.
≤ –95 dBm	No signal	Red	Disconnection.

SINR	Signal Strength	Color in Director and Analytics	Description
≥ 20 dB	Excellent	Green	Strong signal with maximum data speeds
0 dB to 13 dB	Fair to poor	Orange	Reliable data speeds may be attained, but marginal data with drop-outs is possible. As this value approaches 0, performance will drop drastically.
≤ 0 dB	No signal	Red	Disconnection.
13 dB to 20 dB	Good	Yellow	Strong signal with good data speeds

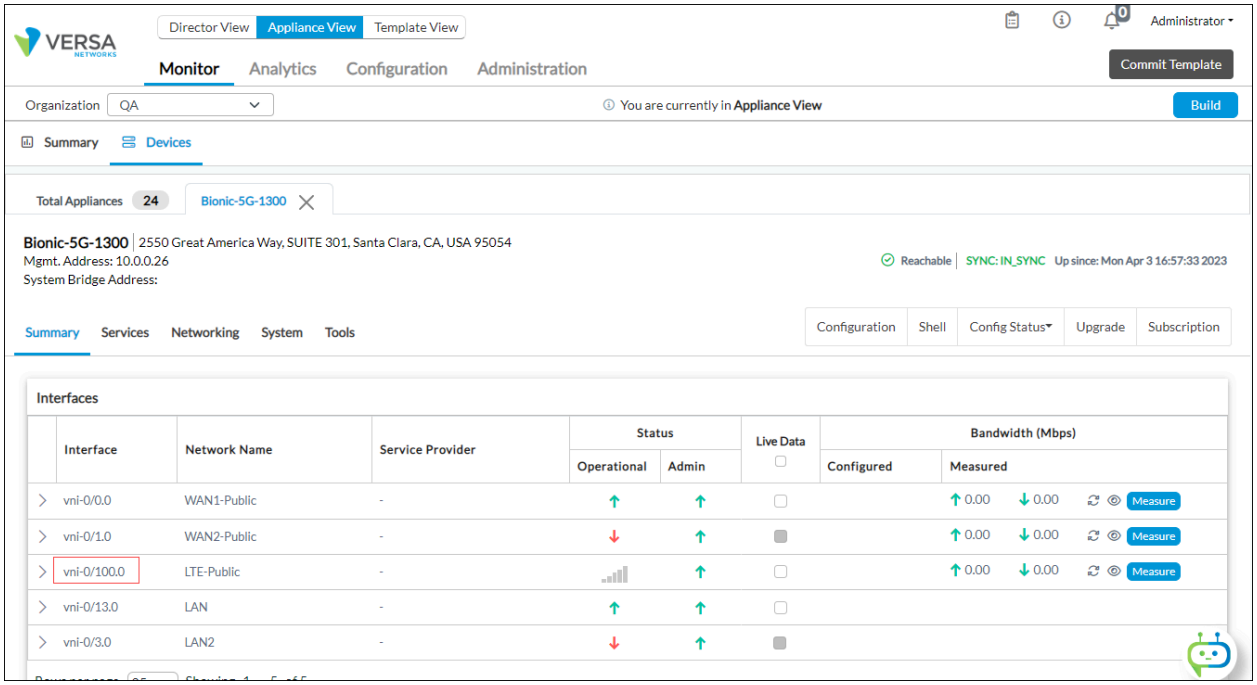
Monitor WWAN Interface Operation

To monitor the operation of a WWAN interface for LTE, 4G, or 5G:

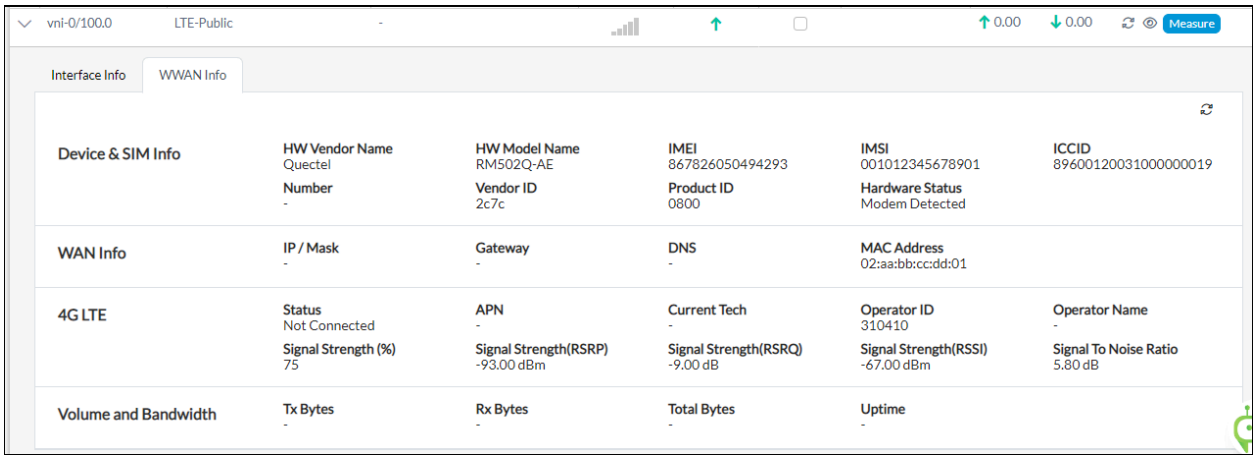
1. In Director view, select the Monitor tab in the top menu bar.
2. Select the Devices tab in the horizontal menu bar and select a device. The view changes to Appliance view.



3. In the device details pane, select the Summary tab in the horizontal menu bar, and then select a WWAN interface to view the WWAN interface status and signal strength.



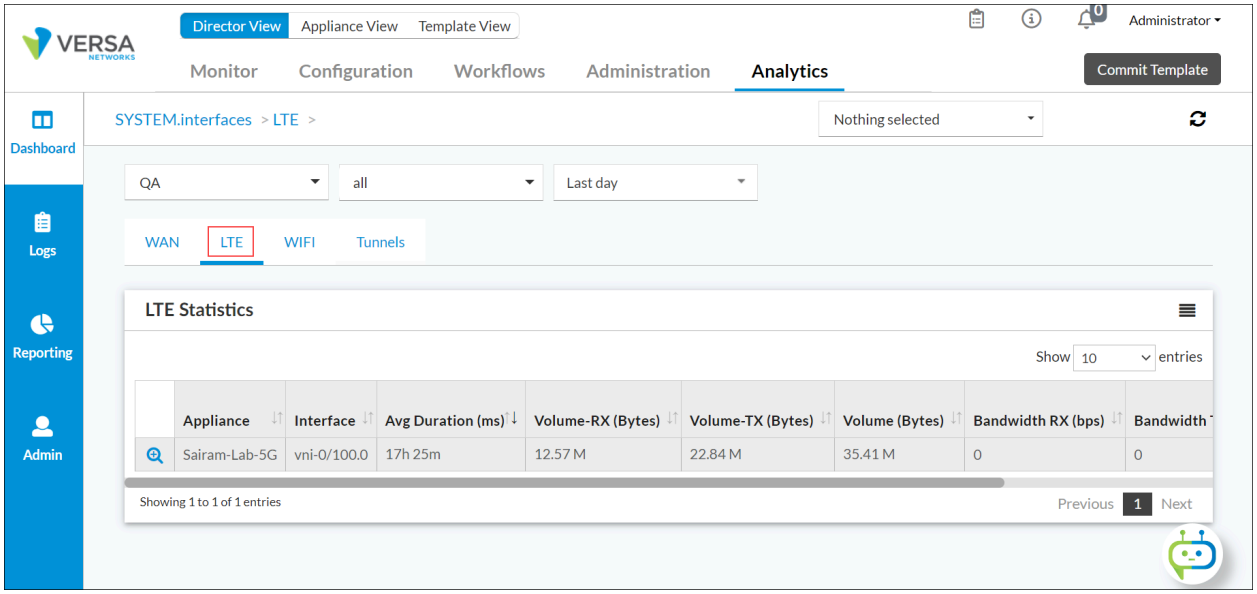
4. Click WWAN Info tab to display information about the WWAN interfaces for LTE, 4G, or 5G service. The table in the main pane displays operational information about the WWAN interface, including the signal strength and network information.



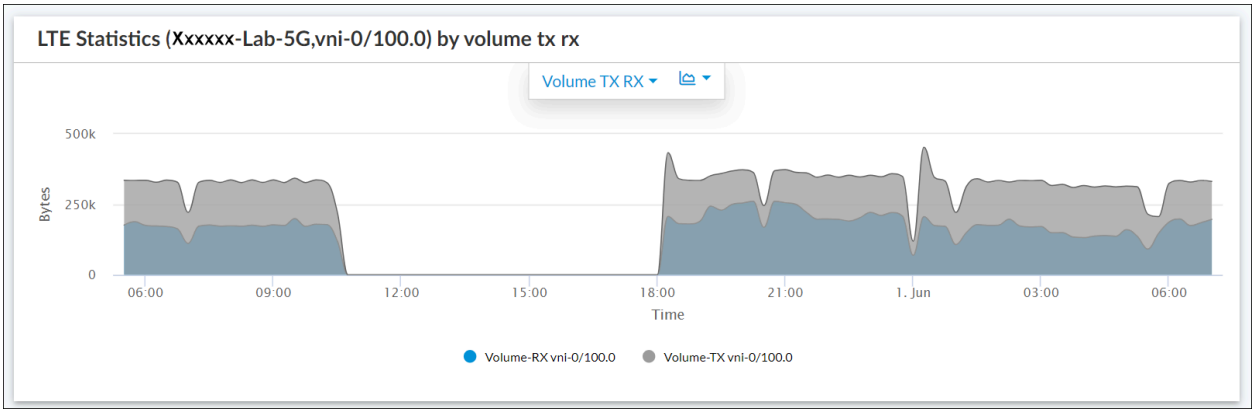
Analyze LTE Interface Operation

To view analysis information about the operation of an LTE interface:

1. In Director view, select the Analytics tab in the top menu bar.
2. Select Dashboards > System > Interfaces in the left menu bar.
3. Click the LTE Interfaces tab to view statistics about the LTE interfaces.



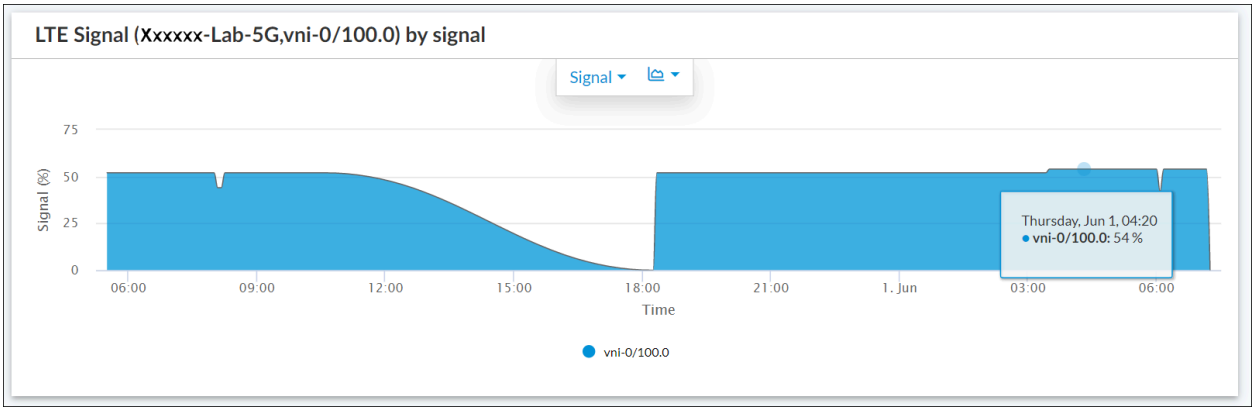
4. Click the  icon to view detailed LTE interface statistics.
   a. Transmit and receive volume and LTE signal strength



- Click the Volume TX RX drop-down list to select the view type. The view type can be one of the following:
  - Volume TX RX
  - Volume RX
  - Volume TX
  - Total Bandwidth
  - Bandwidth TX RX

- Click the Chart drop-down list to select the current graphical data representation. The format can be Area, Bar, Line, Scatter, or Stacked Bar.

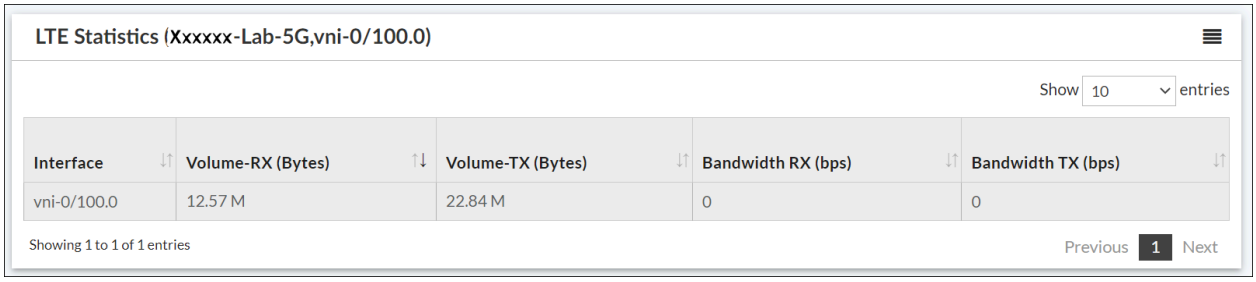
b. RSRP of the LTE signal



- Click the Signal drop-down list to select the view type. The view type can be one of the following:
  - Signal
  - RSSI
  - SNR
  - RSRP
  - RSRQ

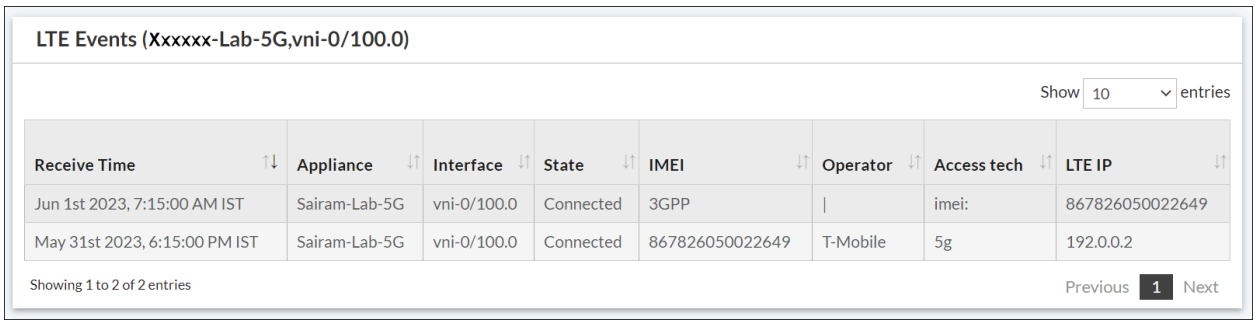
- Click the Chart drop-down list to select the current graphical data representation. The format can be Area, Bar, Line, Scatter, or Stacked Bar.

c. LTE statistics

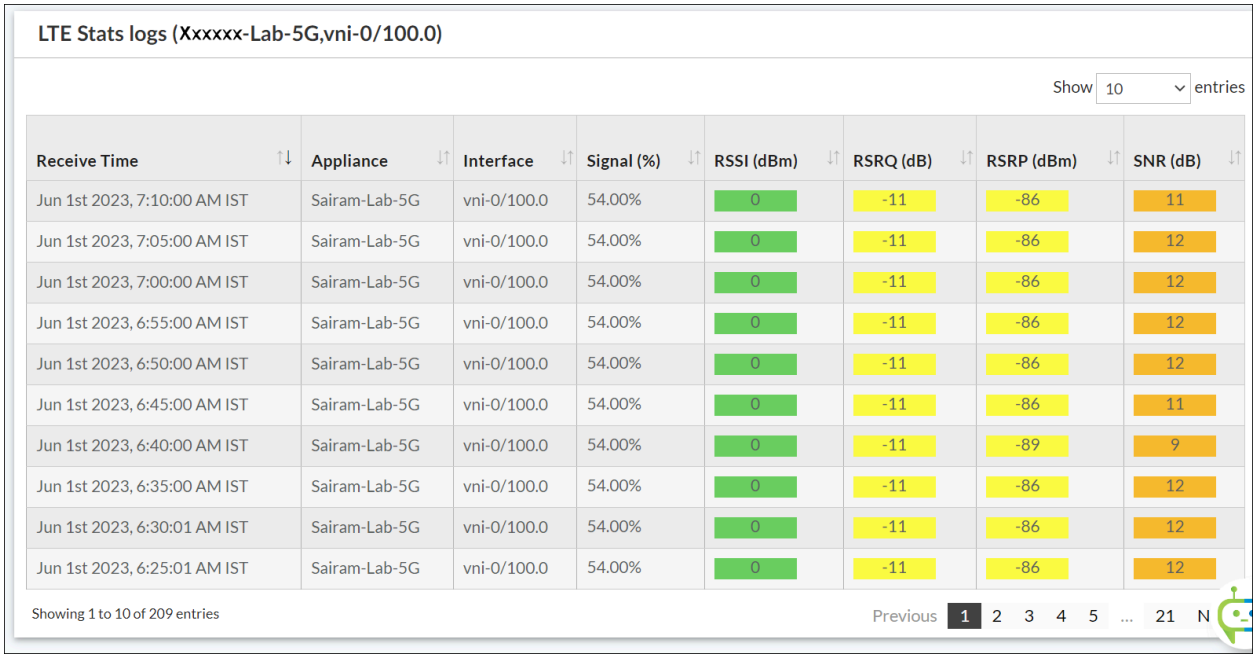


- Click the Chart Menu icon and click Copy, CSV, or PDF to copy or to save the information as CSV or PDF file.

d. LTE events



e. LTE statistics logs



Troubleshoot WWAN Interfaces

1. Display information about all the connected USB devices on the VOS device:

```
[admin@LTE-Branch2: ~] # usb-devices
T:  Bus=01 Lev=00 Prnt=00 Port=00 Cnt=00 Dev#=  1 Spd=480 MxCh= 8
D:  Ver= 2.00 Cls=09(hub  ) Sub=00 Prot=00 MxPS=64 #Cfgs=  1
P:  Vendor=1d6b ProdID=0002 Rev=04.04
S:  Manufacturer=Linux 4.4.0-116-generic ehci_hcd
S:  Product=EHCI Host Controller
S:  SerialNumber=0000:00:16.0
C:  #Ifs= 1 Cfg#= 1 Atr=e0 MxPwr=0mA
I:  If#= 0 Alt= 0 #EPs= 1 Cls=09(hub  ) Sub=00 Prot=00 Driver=hub
T:  Bus=01 Lev=01 Prnt=01 Port=00 Cnt=01 Dev#=  2 Spd=480 MxCh= 4
D:  Ver= 2.00 Cls=09(hub  ) Sub=00 Prot=01 MxPS=64 #Cfgs=  1
P:  Vendor=8087 ProdID=07db Rev=00.03
C:  #Ifs= 1 Cfg#= 1 Atr=e0 MxPwr=0mA
I:  If#= 0 Alt= 0 #EPs= 1 Cls=09(hub  ) Sub=00 Prot=00 Driver=hub
T:  Bus=01 Lev=02 Prnt=02 Port=02 Cnt=01 Dev#=  3 Spd=480 MxCh= 0
D:  Ver= 2.10 Cls=00(>ifc ) Sub=00 Prot=00 MxPS=64 #Cfgs=  1
P:  Vendor=1199 ProdID=9071 Rev=00.06
S:  Manufacturer=Sierra Wireless, Incorporated
S:  Product=Sierra Wireless MC7455 Qualcomm® Snapdragon\u2122 X7 LTE-A
S:  SerialNumber=LQ70964668031020
C:  #Ifs= 5 Cfg#= 1 Atr=a0 MxPwr=500mA
I:  If#= 0 Alt= 0 #EPs= 2 Cls=ff(vend.) Sub=ff Prot=ff Driver=option
/usr/bin/usb-devices: line 79: printf: a: invalid number
I:  If#= 0 Alt= 0 #EPs= 3 Cls=ff(vend.) Sub=ff Prot=ff Driver=qmi_wwan
I:  If#= 2 Alt= 0 #EPs= 3 Cls=ff(vend.) Sub=00 Prot=00 Driver=option
I:  If#= 3 Alt= 0 #EPs= 3 Cls=ff(vend.) Sub=00 Prot=00 Driver=option
I:  If#= 8 Alt= 0 #EPs= 3 Cls=ff(vend.) Sub=ff Prot=ff Driver=qmi_wwan
```

2. Monitor the modem manager. In the **–m** option, specify the modem number, which is a value from 0 through 3.

```
[admin@versa-VOS: ~] # mmcli -m 0
/org/freedesktop/ModemManager1/Modem/0 (device id 'a1ae475e8d9be21d63bfa19db19837d2595742f3')
  -------------------------
  Hardware |   manufacturer: 'Sierra Wireless, Incorporated'
           |          model: 'MC7455'
           |       revision: 'SWI9X30C_02.24.05.06 r7040 CARMD-EV-FRMWR2 2017/05/19 06:23:09'
           |      supported: 'gsm-umts
           |                  lte
           |                  gsm-umts, lte'
           |        current: 'gsm-umts, lte'
           |   equipment id: '359072060692577'
  -------------------------
  System   |         device: '/sys/devices/pci0000:00/0000:00:16.0/usb1/1-1/1-1.3'
           |        drivers: 'option1, qmi_wwan'
           |         plugin: 'Sierra'
           |   primary port: 'cdc-wdm0'
           |          ports: 'ttyUSB0 (qcdm), ttyUSB2 (unknown), cdc-wdm0 (qmi), cdc-wdm1 (qmi), wwan0 (net),
wwan1 (net)'
  -------------------------
```

```
Numbers  |          own : '4086184766'
-------------------------
Status   |         lock: 'sim-pin2'
         | unlock retries: 'sim-pin (3), sim-pin2 (3), sim-puk (10), sim-puk2 (10)'
         |          state: 'connected'
         |    power state: 'on'
         |    access tech: 'lte'
         | signal quality: '55' (recent)
-------------------------
Modes    |     supported: 'allowed: 2g, 3g, 4g; preferred: none'
         |       current: 'allowed: 2g, 3g, 4g; preferred: none'
-------------------------
Bands    |     supported: 'u2100, u1800, u1900, u17iv, u850, u900, eutran-ii, eutran-iv, eutran-v, eutran-xiii'
         |       current: 'u2100, u1800, u1900, u17iv, u850, u900, eutran-ii, eutran-iv, eutran-v, eutran-xiii'
-------------------------
IP       |    supported: 'ipv4, ipv6, ipv4v6'
-------------------------
3GPP     |          imei: '359072060692577'
         |  enabled locks: 'none'
         |    operator id: '311480'
         |  operator name: 'VZW'
         |   subscription: 'unknown'
         |   registration: 'home'
-------------------------
SIM      |         path: '/org/freedesktop/ModemManager1/SIM/0'
-------------------------
Bearers  |         paths: '/org/freedesktop/ModemManager1/Bearer/3'
```

3. Ensure that the SIM card is activated and working:
   - Check with the service provider to ensure that the SIM card is activated.
   - Check the status information to ensure that it shows that the SIM card is connected and enabled.
   - Ensure that the 3GPP information shows the operator ID. If the operator name is not displayed, configure the APN to enable the interface:

```
admin@VOS-cli(config)% set interfaces vni-0/100 wwan apn vzwinternet
[ok][2018-03-12 11:10:31]
[edit]
admin@VOS-cli(config)% commit
Commit complete.
```

4. To display the WWAN interface status on the VOS device, issue the following command:

```
admin@versa-VOS-cli(config)% run show interfaces wwanstatus brief
INTERFACE NAME  INTERFACE STATUS CONNECTION  VENDOR PRODUCT NAME STATUS HW
STATUS ID ID  HW VENDOR NAME HW MODEL NAME IMEI
-------------------------------------------------------------------------------------------------------------------------
vni-0/100 Configured Modem Detected  Connected   1199 9071  Sierra Wireless, Inc. Sierra_Wireless_
MC7455_Qualco  359072060692577
vni-0/101  Not configured
vni-0/102  Not configured
vni-0/103  Not configured
```

Supported Software Information

Releases 20.2 and later support all content described in this article, except:

- Release 21.2.1 adds support for configuring uplink and downlink bandwidth on subinterfaces or units, for adaptive shaping, and for configuring IPv6.
- In Releases 22.1.1, LTE interfaces are renamed to WWAN interfaces; add support for Resource Tag field.
- Release 22.1.4 adds support to allow or block sets of bands associated with specific radio technologies on the modems.

Additional Information

Configure Basic Features
Configure Interfaces
Configure Layer 2 Forwarding
Configure SD-WAN Traffic Steering