



# Managing Branch Sites

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This chapter contains the following sections:

- [Overview, page 5-1](#)
- [Workflow for Managing Branch Sites, page 5-4](#)
- [Bootstrapping Greenfield Devices, page 5-4](#)
- [Adding and Provisioning Greenfield Devices to the Branch Site, page 5-5](#)
- [Adding and Provisioning Brownfield Devices to the Branch Site, page 5-11](#)
- [Viewing Site Status Information, page 5-22](#)
- [Support for 4G/Cellular Technology for WAN Link, page 5-23](#)
- [4G-Cellular Support for MPLS Cloud, page 5-25](#)
- [Updating the WAN Bandwidth of a Provisioned Branch Site, page 5-26](#)
- [Updating the WAN IP Parameters of a Provisioned Branch Site, page 5-27](#)
- [Modifying the QoS Bandwidth Percentages for a Branch Site, page 5-29](#)

## Overview

After you have configured and set up the hub site, add devices to Cisco IWAN and provision them to the sites.

### Greenfield and Brownfield Devices

You can add and provision two types of devices:

- Greenfield Devices
  - Greenfield devices are brand new out-of-the-box routers.
  - Discovered by the Cisco Plug-n-Play (Cisco PnP) application.
  - No pre-existing configurations to synchronize with IWAN-based configuration, no configuration conflicts to address.

- **Brownfield Devices**
  - Brownfield devices belong to existing sites that are being added to Cisco IWAN.
  - Discovered by the Cisco APIC-EM application.
  - May have pre-existing configurations to synchronize with IWAN-based configuration.
  - While provisioning a brownfield device, the IWAN app performs a validation step to determine whether any configuration conflicts exist. If an error or warning is reported, correct the issue on the device and perform the validation again. See [Brownfield Validation Messages](#).

#### Deployment Requirements

- For both greenfield and brownfield devices, ensure that the device is added to the system using the WAN interface only.
- For successful deployment, the controller must be able to reach the device WAN interface before the deployment.

## IWAN App Operation with NAT

### Spoke Behind NAT

Use of network address translation (NAT) is supported for WAN links connected to public Internet clouds for all topologies—both for greenfield devices (using PnP discovery) and brownfield branch devices (discovered through APIC-EM). Both static NAT and dynamic NAT are supported.

For greenfield devices, the PnP application discovers the device if the device is reachable by APIC-EM, irrespective of whether there is a NAT router. Ensure that the device is reachable by APIC-EM.

For brownfield devices, discover the device using the external or public IP address.

To enable connections from Cisco APIC-EM to the NAT router during provisioning, enable port forwarding on the NAT router with following standard ports. This is required both for greenfield and brownfield devices.

- SSH—port 22
- Telnet—port 23
- SNMP—port 161

After the provisioning is complete and the branch devices are managed by Cisco APIC-EM using the loopback interface, you can optionally remove these configurations.



**Note**

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The NAT router is not managed by Cisco IWAN. Configure the NAT router manually.

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**Note**

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Spoke behind NAT supports many-to-one, many-to-many, and PAT translations. Many-to-one and PAT translations are the most common scenarios.

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### APIC-EM Behind NAT

The IWAN app supports network topologies in which the APIC-EM controller communicates with spoke (branch) sites through network address translation (NAT).

When setting up an APIC-EM-behind-NAT network, configure the NAT public IP address of the APIC-EM controller before provisioning any spoke sites. Configure the address in the following location:

IWAN app home page > **Configure Hub Site & Settings** > **System** tab > **IP Address** section

NAT/Proxy IP Address and Port 

\* APIC-EM behind NAT/Proxy  No  Yes

APIC-EM NAT/Proxy IP

Port Number

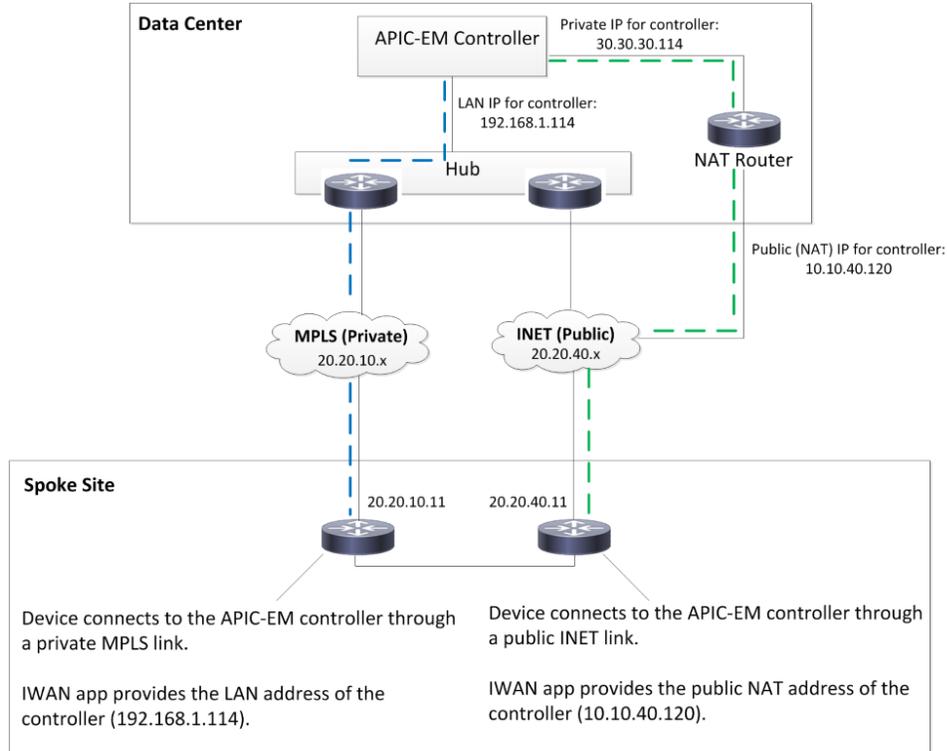
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### IWAN App Provides the NAT Public IP Address to Spoke Devices

Spoke devices that connect to the APIC-EM controller through a public link (such as INET) require the NAT public address of the controller.

- **Greenfield sites:** The PnP application automatically acquires the APIC-EM public NAT IP address. During provisioning, the IWAN app provides this address to the spoke devices that connect by public link.
- **Brownfield sites:** During provisioning, the IWAN app provides the manually configured NAT public IP address of the APIC-EM controller to the spoke devices that connect by public link.

**Note:** During provisioning, add a brownfield spoke site using its public link interface IP address, or its NAT public IP address (in the case of spoke-behind-NAT).



# Workflow for Managing Branch Sites

Table 5-1 Basic Workflow for Managing Branch Sites

No.	Task	Reference
1	Bootstrap devices discovered by the Cisco PnP application.	<a href="#">Bootstrapping Greenfield Devices, page 5-4</a>
2	Add devices to Cisco IWAN and then provision them to the sites.	<a href="#">Adding and Provisioning Greenfield Devices to the Branch Site, page 5-5</a> <a href="#">Adding and Provisioning Brownfield Devices to the Branch Site, page 5-11</a>
3	View the site status.	<a href="#">Viewing Site Status Information, page 5-22</a>

## Bootstrapping Greenfield Devices

You can bootstrap devices discovered by the Cisco PnP application. These are greenfield devices.

Use this procedure to download a bootstrap file.

### Procedure

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- Step 1** From the Cisco IWAN home page, click **Manage Branch Sites**. The Sites page opens.
  - Step 2** Click the **Bootstrap** tab. The bootstrap files that are available for download are displayed.
  - Step 3** From the Download column, click the download bootstrap icon to download the bootstrap file to a local directory on your computer. If required, you can use this file as a template to manually copy to the device so that PnP can call-home.

For details, see the *Cisco Open Plug-n-Play Agent Configuration Guide* at:

<http://www.cisco.com/c/en/us/td/docs/ios-xml/ios/pnp/configuration/xe-3e/pnp-xe-3e-book.html>.

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# Adding and Provisioning Greenfield Devices to the Branch Site

Use this procedure to add greenfield devices that are discovered by the Cisco PnP application and provision them to the branch site.



## Note

- Saving the configuration

Before you use the devices to provision the site, we recommend that you save the running configuration in flash or bootflash in the IWAN\_RECOVERY.cfg file so that you can restore the configuration if needed.

- VTY lines

There must be at least 16 VTY lines configured.

- Support for 4G/cellular interface

The IWAN app supports configuration of a 4G/cellular interface for Cisco ISR4000 Series routers at branch sites.

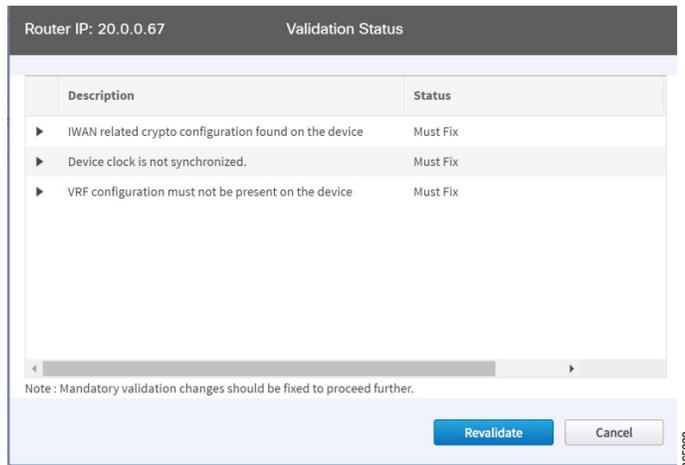
## Supported Connection Types

The IWAN app supports many types of routing and switching devices at branch sites, but support for some features is limited to specific types of devices. The following table describes supported connection types.

WAN connection type	Devices that support the connection type
Internet (including T1, E1, Ethernet)	All
MPLS	All
4G/cellular interface	Cisco ISR 4000 Series routers on MPLS link only

## Procedure

- Step 1** From the Cisco IWAN home page, click **Manage Branch Sites**. The Sites page opens.
- Step 2** Click the **Device(s)** tab. A list of unclaimed devices is displayed as shown in the following figure:



Field	Description
Checkbox	Click this checkbox to choose the unclaimed device for provisioning.
Serial Number	Serial number of the device.
IP Address	IP address of the device. <b>Note</b> If a NAT router is present, then the NAT IP address appears in this column.
Type	Type of device.
Site Name	Name of the site to which the device belongs. To edit the site name, double-click it, and then add the new name.
Host Name	Device host name.
Discovered By	Can be one of the following: <ul style="list-style-type: none"> <li>PNP—Discovered by the Cisco PnP application. This indicates a greenfield device.</li> <li>APIC—Discovered by the Cisco APIC-EM application. This indicates a brownfield device.</li> </ul>
Validation Status	Displays the following for greenfield devices: <ul style="list-style-type: none"> <li>N/A—Devices discovered by the Cisco PnP application.</li> </ul> Can be one of the following for brownfield devices: <ul style="list-style-type: none"> <li>Success—Devices successfully validated and ready for provisioning to the branch site. These devices are either discovered by the Cisco APIC-EM application or are manually added by clicking the <b>Add Device</b> tab.</li> <li>Failure—Devices that have must-fix errors. These devices are either discovered by the Cisco APIC-EM application or are manually added by clicking the <b>Add Device</b> tab.</li> <li>Warning—You can choose to ignore these errors or fix them. These devices are either discovered by the Cisco APIC-EM application or are manually added by clicking the <b>Add Device</b> tab.</li> </ul>

**Step 3** Select the checkbox next to the greenfield device(s) that you want to use, and then click the **Provision Site** tab. The Select Topology tab opens and displays the available topologies.

The available topology options depend on the network settings configured for the hub site on the IWAN app “Network wide settings” page. See the configuration of service provider count in [Configuring IP Address Pools, page 4-12](#) and the topology in [Configuring Service Providers, page 4-9](#).

Topology options may include:

- 1-link option: Requires hub router connected to one (1) WAN cloud
- 2-link option: Requires hub router connected to two (2) WAN clouds
- 3-link option: Requires hub router connected to three (3) WAN clouds



**Note** To determine if the device is brownfield or greenfield, look at the **Discovered By** column in the Add Devices page. PNP indicates that it is a greenfield device. APIC indicates that it is a brownfield device.



**Note** You can choose a maximum of two devices.



**Note** Greenfield and brownfield devices cannot be part of the same site.

**Step 4** Click the topology that is appropriate for your network. The L2/L3 options display.



**Note** The topology options that display are dependent on the number of devices you selected in Step 3.

**Step 5** Click the **L2** option. The Configure Topology page displays.



**Note** L3 is not supported on greenfield devices.

**Step 6** From the Configure Topology page, specify the following properties:

Field	Description
Site Name	Site name, which you can change if needed.
Site Location	Click <b>Set Geo</b> to specify the site location on a map. A map opens. Click on the site, the Site Location field is populated. Click anywhere outside the map to exit the map.
POP to Connect	Choose the preferred hub site for this branch site from the drop-down list.
Select WAN	Choose the WAN from the drop-down list.

**Step 7** Configure WAN settings for the branch device. Do the following:

- a. Click the + icon next to the WAN cloud. The Configure WAN Cloud dialog box opens. The WAN type selected in the previous step determines the fields that appear in the Configure WAN Cloud dialog box. (These fields differ, depending on the WAN type, such as T1, E1, Ethernet, or Cellular.)
- b. Enter the required properties, and click **Save**. The + icon next to the WAN cloud changes to a checkmark icon.
  - For a Public WAN, the Configure WAN Cloud dialog box displays the following fields.

Field	Description
WAN Type	Public
Interface Type	Type of interface. Values: T1, E1, Ethernet, Cellular
Interface	Choose the interface that connects to the WAN cloud from the drop-down list.
Connect to WAN	Connection method.
NAT Enabled	Check this option if NAT IP address is used.
NAT IP Address	Public IP address.
Enable	Choose one of the two radio buttons as appropriate: <ul style="list-style-type: none"> <li>• Static IP—When selected, the following additional fields display: WAN IP Address, WAN IP Mask, and WAN Gateway IP Address.</li> <li>• DHCP</li> </ul> <p><b>Note</b> This option is not shown if interface type is Cellular.</p>
Upload (Mbps)	Upload bandwidth (in Mbps).
Download (Mbps)	E1 interface—Preset bandwidth value of 3. T1 interface—Preset bandwidth value of 1.5. GigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 1000 TenGigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 9000 For interfaces of types other than E1, T1, GigabitEthernet, or TenGigabitEthernet, the default range will be: 0.1 to 9000 Mbps
Service Provider	Choose a service profile from the drop-down list. The drop-down list includes default and custom 8 Class service profiles that were configured in the Service Providers tab.

- For a Private non-MPLS WAN, the Configure WAN Cloud dialog box displays the following fields.

Field	Description
WAN Type	Private
Interface Type	Type of interface. Values: T1, E1, or Ethernet.
Interface	Choose an interface from the drop-down list.
Connect to WAN	Connection method.

CE IP Address	Customer Edge Server IP Address. This field is auto-populated if the interface has a static IP address already configured.  <b>Note</b> Depending on the number of links that you created when setting up the hub sites in the IWAN Aggregation Site, you might need to specify additional IP addresses for CE devices.
CE IP Mask	The mask of the CE IP address.
PE IP Address	Provider Edge Server IP Address. This field is auto-populated if the interface has an IP address and default gateway.
Download (Mbps)	E1 interface—Preset bandwidth value of 3. T1 interface—Preset bandwidth value of 1.5. GigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 1000 TenGigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 9000 For interfaces of types other than E1, T1, GigabitEthernet, or TenGigabitEthernet, the default range will be: 0.1 to 9000 Mbps
Service Provider	Choose a service profile from the drop-down list.  The drop-down list includes all default and custom service profiles (4 Class, 5 Class, 6 Class, and 8 Class) that were configured in the Service Providers tab.

- For an MPLS cloud, the Configure WAN Cloud dialog box displays the following fields.

Field	Description
WAN Type	Private
Interface	Choose an interface from the drop-down list.
Connect to WAN	MPLS
Upload (Mbps)	Upload bandwidth (Mbps)
Download (Mbps)	Download bandwidth (Mbps)
Service Provider	Choose a service profile from the drop-down list.  The drop-down list includes all default and custom service profiles (4 Class, 5 Class, 6 Class, and 8 Class) that were configured in the Service Providers tab.

**Step 8** Configure LAN settings. Do the following:

Displays the following for greenfield devices:

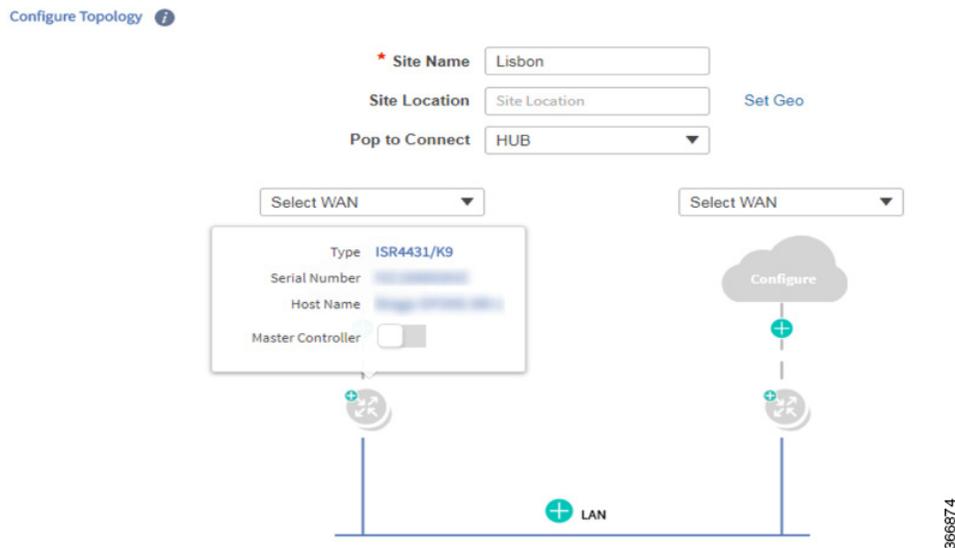


**Note** You can either create the LAN greenfield IP address pool during hub provisioning, or you can add it after hub provisioning for greenfield deployments. When the LAN greenfield IP address pool is not present, the system automatically uses the generic pool IP address.

- Click the + icon next to the LAN. If site specific IP address pools are configured for the site, the Configure VLAN dialog box opens.
- Enter the following properties, and click **Save**:

Field	Description
<b>LAN Interface</b>	
Site Interface	Enter or choose the LAN interface from the drop-down list.
<b>VLAN</b>	
VLAN Type	Enter or choose a VLAN type from the drop-down list. Default Values: Data, Guest, Voice & Video, or Wireless. To create a custom VLAN, click the + icon in the last VLAN, and then enter the name of the VLAN.
VLAN ID	Numeric value within the following ranges: 1 - 98; 100 - 1001; 1006 - 4094. You cannot duplicate a VLAN ID.
Total IPs	Number of hosts in the VLAN.

- Step 9** (During provisioning of a branch site with two routers) When provisioning a branch site with two routers, one of the two must be selected as master controller. To specify a device as the Master Controller (MC), hover the cursor over the device icon, then select the **Master Controller** switch in the pop-up.



- Step 10** From the Provisioning Sites page, click **Apply Changes**. The Provisioning Site Summary dialog box opens with a summary of the configuration.
- Step 11** Review the information, and then do one of the following:
- Click the **Apply Now** radio button, and then click **Submit**.
  - Click the **Schedule** radio button, specify a date and time to apply the site provisioning, and then click **Submit**.

**Note**

The **Apply Now** option does not check for validations in conflict with future scheduled workflows. You must reevaluate scheduled jobs based on the changes and update the jobs as required. If there is a conflict when the scheduled job is activated, it might fail to provision the site.

## Adding and Provisioning Brownfield Devices to the Branch Site

Use this procedure to add brownfield devices that are discovered by the Cisco APIC-EM application and provision them to the branch site.

Brownfield devices are not automatically displayed on the Devices tab. You must first add them to Cisco IWAN, and then provision them to the branch site.

**Tutorial Video**

[IWAN App Brownfield Branch Provisioning](#)

**Note**

- Saving the configuration

Before you use the devices to provision the site, we recommend that you save the running configuration in bootflash in the IWAN\_RECOVERY.cfg file so that you can restore the configuration if needed.

- VTY lines

There must be at least 16 VTY lines configured.

- SNMP

Devices that are configured with SNMP version 2 or version 3 can be used as branch devices.

- Support for 4G/cellular

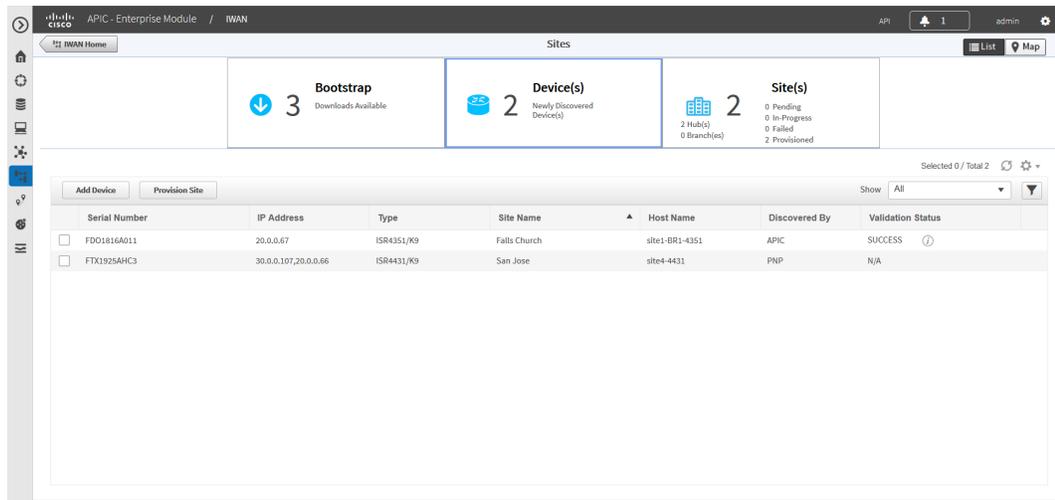
The IWAN app now supports configuration of a 4G/cellular interface at branch sites for: Cisco ISR4000 Series routers, Cisco 1000 Series Integrated Services Routers, Cisco 5000 Series Enterprise Network Compute System (ENCS)

The IWAN app supports many types of routing and switching devices at branch sites, but support for some features is limited to specific types of devices. The following table describes supported connection types.

WAN connection type	Devices that support the connection type
Internet (including T1, E1, Ethernet)	All
MPLS	All
4G/cellular	Cisco ISR4000 Series routers, Cisco 1000 Series Integrated Services Routers, Cisco 5000 Series Enterprise Network Compute System (ENCS)

## Procedure

- Step 1** From the Cisco IWAN home page, click **Manage Branch Sites**. The Sites page opens.
- Step 2** Click the **Device(s)** tab. The following page displays.

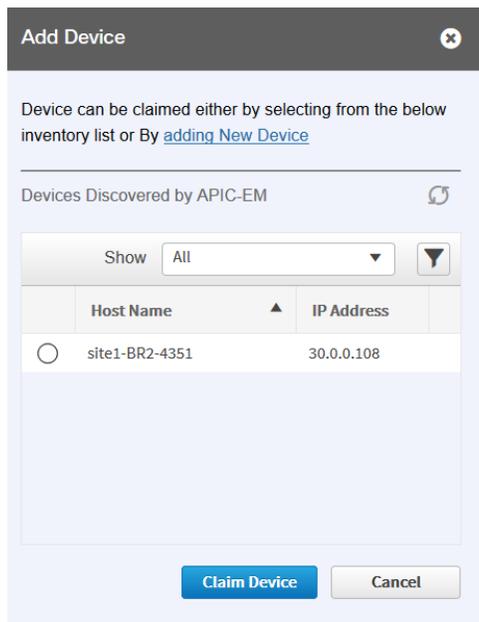


Serial Number	IP Address	Type	Site Name	Host Name	Discovered By	Validation Status
FDO1816A011	20.0.0.67	ISR4351/K9	Falls Church	site1-BR1-4351	APIC	SUCCESS
FTX1925AHC3	30.0.0.107,20.0.0.66	ISR4431/K9	San Jose	site4-4431	PNP	N/A

- Step 3** To add a brownfield device, click the **Add Device** tab. The Add Device dialog box opens and displays a list of devices discovered by the Cisco APIC-EM application as shown in the following figure:



**Note** Alternatively, you can add devices using the Cisco APIC-EM discovery feature.



Host Name	IP Address
<input type="radio"/> site1-BR2-4351	30.0.0.108

- Step 4** Do one of the following:

- Choose an existing Cisco APIC-EM discovered device—From the Devices Discovered by APIC-EM area, click the radio button next to the device you want to add to Cisco IWAN, and then click **Claim Device** (see figure above). The claimed device is added to the Devices page and is available for provisioning.
- Add a new device—Click **Adding New Device** (see figure above). The Add Device dialog box opens, where you specify the IP address for the new device and additional properties, as shown in the following figure and the table that follows, and then click **Add Device**.

The screenshot shows the 'Add Device' dialog box with the following fields and values:

- Router Management IP:** (Empty text field)
- SNMP:**
  - Version:** V2C (Dropdown menu)
  - Read Community:** (Empty text field)
  - Write Community:** (Empty text field)
- SNMP Retries and Timeout:**
  - Retries:** 3 (Text field)
  - Timeout (secs):** 10 (Text field)
- SSH/Telnet:**
  - Protocol:** ssh2 (Dropdown menu)
  - Username:** (Empty text field)
  - Password:** (Empty text field)
  - Enable Password:** (Empty text field)
  - Timeout (secs):** 300 (Text field)

Buttons at the bottom: **Add Device** (blue), **Cancel** (grey).

Field	Description
Router Management IP	IP address for the new device.  If you have a spoke device behind a NAT router and you want that NAT router to be the management router, enter the IP address of the NAT router in this field.
<b>SNMP</b>	
Version	SNMP version number.  Depending on the version number you choose, different properties display.
Read Community (Displayed if you chose SNMP V2C.)	SNMP V2C read community string.

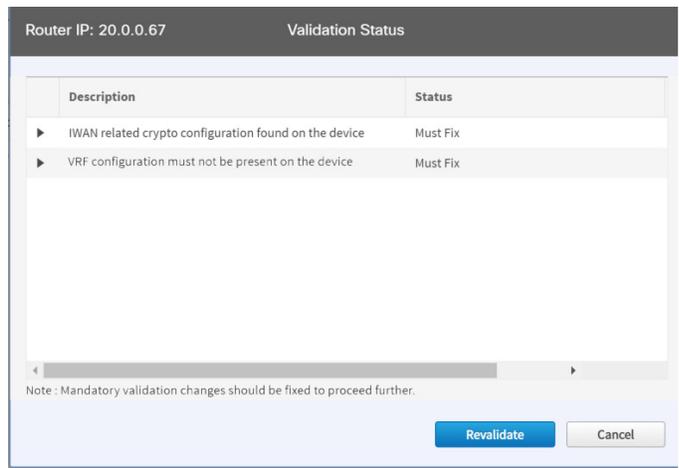
Field	Description
Write Community (Displayed if you chose SNMP V2C.)	(Optional) SNMP V2C write community string.
Mode (Displayed if you chose SNMP V3.)	Choose the mode from the drop-down list. Options are: <ul style="list-style-type: none"> <li>• Authentication and Encryption</li> <li>• No Authentication and No Encryption</li> <li>• Authentication and No Encryption</li> </ul>
Auth. Type (Displayed if you chose SNMP V3.)	Displayed if you chose Authentication and Encryption; or Authentication and No Encryption in the Mode field. Choose the authentication type from the drop-down list. Options are: <ul style="list-style-type: none"> <li>• HMAC-SHA</li> <li>• HMAC-MDS</li> </ul>
Username (Displayed if you chose SNMP V3.)	Displayed if you chose SNMP V3. The authentication username.
Auth. Password (Displayed if you chose SNMP V3.)	Displayed if you chose Authentication and Encryption; or Authentication and No Encryption in the Mode field. The password for the authentication username.
Encryption Type (Displayed if you chose SNMP V3.)	Displayed if you chose Authentication and Encryption in the Mode field. The encryption username.
Encryption Password (Displayed if you chose SNMP V3.)	Displayed if you chose Authentication and Encryption in the Mode field. The password for the encryption username.
<b>SNMP Retries and Timeout</b>	
Retries	Number of SNMP retries. Default: 3
Timeout (secs)	Number of seconds to wait before the system considers an SNMP request to have timed out. Default: 10
<b>SSH/Telnet</b>	
Protocol	Protocol used to communicate to the host (SSH or Telnet).
Username	SSH or Telnet username.
Password	SSH or Telnet password.
Enable Password	Enable password for the username.
Timeout (secs)	Number of seconds to wait before the system considers an SSH or Telnet request to have timed out.

The device is verified in the background to determine if the device is suitable for provisioning. The following occurs:

The Cisco IWAN app accesses the router and checks its configuration to determine if it has any configuration that might conflict with the Cisco IWAN app. This is called Brownfield Validation.

If the router does not have conflicting configurations, an orange icon appears on top of the device and the Configure Router Dialog opens.

If the router has conflicting configurations, the Validation Status dialog opens listing all the validation failures, as shown in the following figure:



- c. The validation status could be either Warning or Must Fix. Do the following:
  - If the validation status is Warning, you can fix it or ignore it.
  - If the validation status is Must Fix, remove the configurations suggested by the description, and then click **Revalidate**.

For information about the messages displayed in the Validation Status dialog box, see [Appendix A, “Brownfield Validation Messages.”](#)

**Step 5** From the Devices page, select the checkbox next to the brownfield device(s) that you want to provision for a site, and then click the **Provision Site** tab. The Select Topology tab opens and displays the available topologies.

The available topology options depend on the network settings configured for the hub site on the IWAN app “Network wide settings” page. See the configuration of service provider count in [Configuring IP Address Pools, page 4-12](#) and the topology in [Configuring Service Providers, page 4-9](#).

Topology options may include:

- 1-link option: Requires hub router connected to one (1) WAN cloud
- 2-link option: Requires hub router connected to two (2) WAN clouds
- 3-link option: Requires hub router connected to three (3) WAN clouds



**Note** To determine if the device is brownfield or greenfield, look at the **Discovered By** column in the Add Devices page. PNP indicates that it is a greenfield device. APIC indicates that it is a brownfield device.



**Note** You can choose a maximum of two devices.

**Step 6** Click the topology that is appropriate for your network. The L2/L3 options display.



**Note** The topology options that display are dependent on the number of devices you selected in Step 5.

**Step 7** Depending on the LAN site configuration, click the appropriate **L2/L3** option. The Configure Topology page displays.



**Note** If the VLAN on branch devices are on the same subnet, choose L2. If the VLAN on the branch devices are on different subnets, choose L3.

**Step 8** From the Configure Topology page, specify the following properties:

Field	Description
Site Name	Site name, which you can change if needed.
Site Location	Click <b>Set Geo</b> to specify the site location on a map. A map opens. Click on the site, the Site Location field is populated. Click anywhere outside the map to exit the map.
POP to Connect	Choose the hub that you specified in the IWAN Aggregation Site from the drop-down list.
Select WAN	Choose the WAN from the drop-down list.

**Step 9** Configure WAN settings for the branch device. Do the following:

- a. Click the + icon next to the WAN cloud. The Configure WAN Cloud dialog box opens. Depending on the WAN type you chose in Step 8, the fields that display in the Configure WAN Cloud dialog box change.
- b. Enter the required properties, and click **Save**. The + icon next to the WAN cloud changes to a checkmark icon.
  - For a Public WAN, the Configure WAN Cloud dialog box displays the following fields.

Field	Description
WAN Type	Public
Interface Type	Type of interface. Values: T1, E1, Ethernet, Cellular
Interface	Choose the interface that connects to the WAN cloud from the drop-down list.
Connect to WAN	Connection method.
NAT Enabled	Check this option if NAT IP address is used.
NAT IP Address	Public IP address.

Enable	<p>Choose one of the two radio buttons as appropriate:</p> <ul style="list-style-type: none"> <li>• Static IP—When selected, the following additional fields display: WAN IP Address, WAN IP Mask, and WAN Gateway IP Address.</li> <li>• DHCP</li> </ul> <p><b>Note</b> This option is not shown if interface type is Cellular.</p>
Upload (Mbps)	Upload bandwidth (in Mbps).
Download (Mbps)	<p>E1 interface—Preset bandwidth value of 3.</p> <p>T1 interface—Preset bandwidth value of 1.5.</p> <p>GigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 1000</p> <p>TenGigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 10000</p> <p>For interfaces of types other than E1, T1, GigabitEthernet, or TenGigabitEthernet, the default range will be: 0.1 to 10000 Mbps</p>
Service Provider	<p>Choose a service profile from the drop-down list.</p> <p>The drop-down list includes default and custom 8 Class service profiles that were configured in the Service Providers tab.</p>

- For a Private WAN, the Configure WAN Cloud dialog box displays the following fields.

Field	Description
WAN Type	Private
Interface Type	Type of interface. Values: T1, E1, or Ethernet.
Interface	Choose an interface from the drop-down list.
Connect to WAN	Connection method.
CE IP Address	<p>Customer Edge Server IP Address. This field is auto-populated if the interface has a static IP address already configured.</p> <p><b>Note</b> Depending on the number of links that you created when setting up the hub sites in the IWAN Aggregation Site, you might need to specify additional IP addresses for CE devices.</p>
CE IP Mask	The mask of the CE IP address.
PE IP Address	Provider Edge Server IP Address. This field is auto-populated if the interface has an IP address and default gateway.

Download (Mbps)	E1 interface—Preset bandwidth value of 3. T1 interface—Preset bandwidth value of 1.5. GigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 1000 TenGigabitEthernet interface—Select a bandwidth from the drop-down list or enter a value in the range: 0.1 to 10000 For interfaces of types other than E1, T1, GigabitEthernet, or TenGigabitEthernet, the default range will be: 0.1 to 10000 Mbps
Service Provider	Choose a service profile from the drop-down list. The drop-down list includes all default and custom service profiles (4 Class, 5 Class, 6 Class, and 8 Class) that were configured in the Service Providers tab.

- For an MPLS cloud, the Configure WAN Cloud dialog box displays the following fields.

Field	Description
WAN Type	Private
Interface	Choose an interface from the drop-down list.
Connect to WAN	MPLS
Upload (Mbps)	Upload bandwidth (Mbps)
Download (Mbps)	Download bandwidth (Mbps)
Service Provider	Choose a service profile from the drop-down list. The drop-down list includes all default and custom service profiles (4 Class, 5 Class, 6 Class, and 8 Class) that were configured in the Service Providers tab.

**Step 10** Configure LAN settings. Do the following:

Click the + icon next to the LAN. If you selected L2 topology and the LAN interface is a physical interface or a switchport interface, the Configure VLAN dialog box opens (see below). Choose the LAN interface from the drop-down list, and click **Save**.



**Note**

- If you selected a dual router topology, the common VLANs between devices are displayed.
- Make sure there are no site-specific IP address pools configured for brownfield sites.
- The VLAN information seen on the Configure VLAN dialog box is auto populated based on the LAN interface that you selected on the router.
- You cannot edit the auto populated information from the Configure VLAN interface dialog box.
- You can either create the LAN brownfield IP address pool during hub provisioning; or you can add it after hub provisioning for brownfield deployments. When the LAN brownfield IP address pool is not present, the system automatically creates site-specific pools for the brownfield devices.

Configure VLAN

LAN Interface

\* BR1-ISR.EXAMPLE.COM Interface GigabitEthernet0/0/2

\* BR2-ISR Interface GigabitEthernet0/0/1

VLAN

VLAN ID	IP Address	IP Mask
35	35.1.1.0	24
10	25.1.1.0	24

Save Cancel

365885

If you selected L3 topology, the following Configure VLAN dialog box opens as shown in the following figure. Do the following:

- Choose the LAN interface from the drop-down list. The IP address is automatically populated.

Configure VLAN

LAN Interface

\* SITE1-BR1-4351 Interface GigabitEthernet0/0/1

IP Address 20.0.0.67 / 8

Save Cancel

365873

- Click **Save**.
- If you have dual routers, choose the LAN interface for that device, and click **Save**.
- Click the + icon above Routing Configuration. The LAN Routing Configuration dialog box opens as shown in the following figure. Enter the properties and click **Save**.



**Note** VLANs are displayed per device.

LAN Routing Configuration

Site Prefix  /

Discovered

<input type="checkbox"/>	Subnet IP	Mask
<input type="checkbox"/>	25.1.1.0	24
<input type="checkbox"/>	35.1.1.0	24

\* Selected

<input type="checkbox"/>	Subnet IP	Mask
<input type="checkbox"/>	45.1.1.0	24
<input type="checkbox"/>	55.1.1.0	24

LAN Routing Protocol

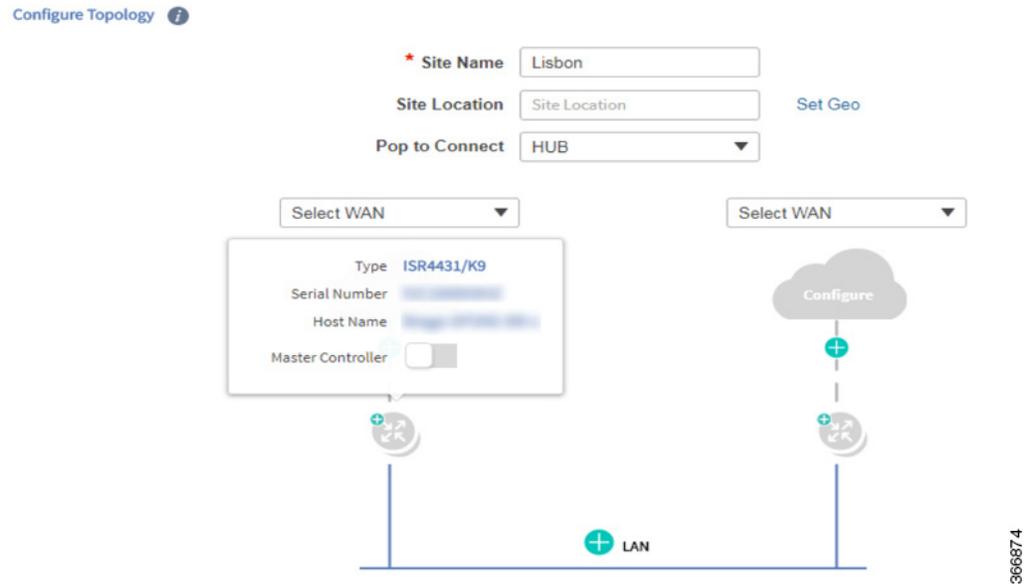
\* Routing Protocol

\* AS Number

365920

Field	Description
Site Prefix	Network prefixes auto-learned for the site.
Add Prefix button	Click this button to manually add additional site prefix.
Discovered Pane	Prefixes automatically discovered by Cisco IWAN.
Arrows	Click on the --> arrow to move the prefix from the Discovered pane into the Selected pane. Click on the <-- arrow to move the prefix from the Selected pane into the Discovered pane.
Selected Pane	List of selected prefixes.
<b>LAN Routing Protocol</b>	
Routing Protocol	Default routing protocol running on the devices. Can be: EIGRP or OSPF <b>Note</b> EIGRP and OSPF are supported routing protocols, which means that LAN-WAN redistribution is performed by Cisco IWAN. Cisco IWAN does not perform LAN-WAN redistribution for BGP protocol.
Area Number/AS Number	Depending on the routing protocol, enter the following: <ul style="list-style-type: none"> <li>Area number for OSPF.</li> <li>AS number for EIGRP.</li> </ul> <b>Note</b> For a dual router site, make sure that the area numbers for OSPF and the AS numbers for EIGRP are the same across both devices.

- Step 11** (During provisioning of a branch site with two routers) To specify a device as the Master Controller (MC), click the device icon and select the **Master Controller** switch in the pop-up.



- Step 12** From the Provisioning Sites page, click **Apply Changes**. The Provisioning Site Summary dialog box opens with a summary of the configuration.
- Step 13** Review the information and then do one of the following:
- Click the **Apply Now** radio button, and then click **Submit**.
  - Click the **Schedule** radio button, specify the date and time to apply the site provisioning, and then click **Submit**.



**Note** The **Apply Now** option does not check for validations in conflict with future scheduled workflows. You must reevaluate scheduled jobs based on the changes and update the jobs as required. If there is a conflict when the scheduled job is activated, it might fail to provision the site.

## Viewing Site Status Information

Use this procedure to view the information about the site and determine its overall status.

### Procedure

- Step 1** From the Cisco IWAN home page, click **Manage Branch Sites**. The Sites page opens.
- Step 2** Click the **Site(s)** tab. The following properties appear:

Field	Description
Health	Health of the hub and health of the site.
App Health	Application health for the hub. Prime credentials must be configured to view this information.
Site	Click the hub name or site name as appropriate to display the following details: <ul style="list-style-type: none"> <li>• Site status—Whether the site is provisioned.</li> <li>• Application status—Status of the application.</li> <li>• Alarms tab—If there are issues with the site, this tab provides information about the problem. In addition, the system also provides suggestions to troubleshoot and fix the problem.</li> <li>• Hub Topology or Site Topology tab—Topology of the site, including the site name, site location, and preferred POP. Hover on the devices and WAN clouds in the topology to get more details.</li> <li>• IP Address Allocation tab—List of devices, including the subnet mask and the IP address pool to which the device is allocated.</li> <li>• Application tab—Application usage on the site in a graphical format. The graph displays the following:               <ul style="list-style-type: none"> <li>– Various applications configured for the site.</li> <li>– Bandwidth usage for each application.</li> <li>– Statistical trend for each application.</li> </ul> </li> </ul>
Location	Location of the site.

Status	Whether the site is provisioned.
Action	<p>Can be one of the following:</p> <ul style="list-style-type: none"> <li>• Delete icon—Click to delete the site that has issues. See <a href="#">Deleting a Hub Site, page 9-5</a>, <a href="#">Deleting a Transit Hub Site, page 9-5</a>, or <a href="#">Deleting a Branch Site, page 9-6</a>.</li> <li>• Recovery icon—Option available if recovery for this site is possible. See <a href="#">Recovering a Cisco IWAN Site, page 9-4</a>.</li> <li>• Edit (pen) icon—Click to do the following: <ul style="list-style-type: none"> <li>– Add or delete site prefixes after hub provisioning. This option is only available for L3 brownfield sites. See <a href="#">Adding or Deleting Site Prefixes, page 9-8</a>.</li> <li>– Modify the QoS bandwidth percentage for a selected branch site. <a href="#">Modifying the QoS Bandwidth Percentages for a Branch Site, page 5-29</a>.</li> </ul> </li> </ul>

## Support for 4G/Cellular Technology for WAN Link

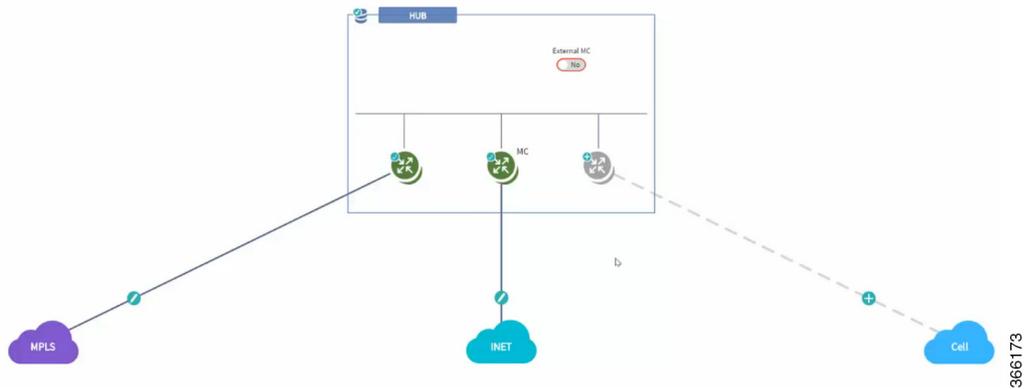
The IWAN app supports use of a 4G cellular connection by Cisco ISR 4000 Series routers at branch sites, as a WAN connection option.

### Example Scenario

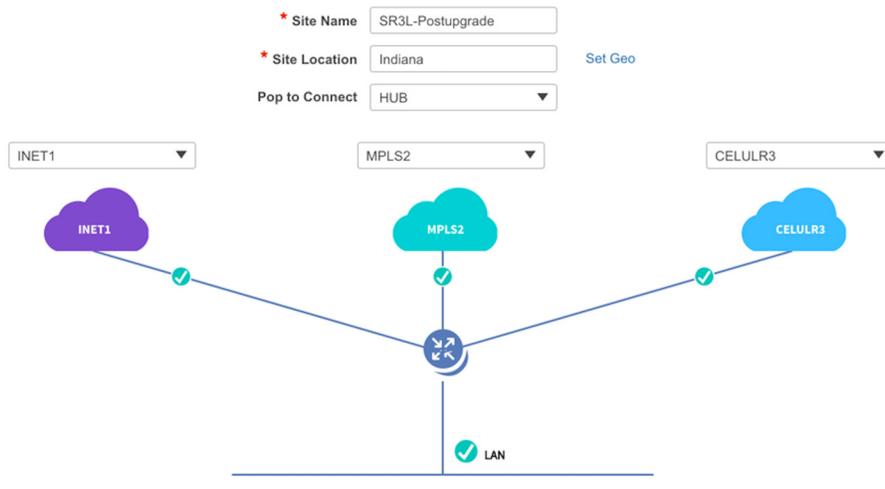
The full instructions for provisioning appear in the [Adding and Provisioning Greenfield Devices to the Branch Site, page 5-5](#) and [Adding and Provisioning Brownfield Devices to the Branch Site, page 5-11](#) sections. The following is a brief description of the provisioning steps for an example scenario using 4G connection for a WAN link:

#### Procedure

- 
- Step 1** In the **Configure Hub Site & Settings > Service Providers** tab, configure a services provider with a 4G cellular connection. Note that cellular connections must be configured with a WAN Type value of Public.
- Step 2** In the **Configure Hub Site & Settings > IWAN aggregation site** tab, connect a hub site device to the 4G cellular WAN in the graphical display of the topology.



- Step 3** On a branch site that includes a Cisco ISR 4000 Series device, connect the device to the 4G cellular WAN.
- On the Sites page, select the Device(s) tab. Select an unclaimed Cisco ISR 4000 Series device. This displays the Provisioning Site page.
  - At the Select Topology step, select a topology and click **Next**.
  - At the Select L2/L3 step, select an option and click **Next**.
  - At the Configure Topology step, click the plus-sign on the link between the device and one of the WAN "cloud" options. A Configure WAN Cloud pop-up opens. For each interface on the device, configure any necessary details and click **Save** to proceed to the next interface on the device. When the "Connect to WAN" field in the pop-up displays the name of the 4G cellular WAN, ensure that the Interface field is configured to "Cellular". Click **Save** to complete configuration of the WAN connections for the device. The Configure VLAN pop-up opens.
  - Configure the LAN or verify the existing settings and click Save. The Provisioning Site page appears, showing that the WAN connections for the branch device, including the 4G cellular WAN link. The WAN connections of the device appear as solid lines with a check icon on the line, indicating a valid configuration.



- Click **Apply Changes** to apply the configuration to the device. A Provisioning Site Summary page appears. The cellular WAN link appears in the summary.

## Notes and Limitations

### Greenfield devices

#### Supported topologies

- L2 greenfield single router two links
- L2 greenfield Single router three links
- L2 greenfield field dual router three links
- L2 greenfield Dual router dual link
- L2 greenfield Single router single link

#### Using cellular link for management interface

To use 4G cellular as a management interface on the IWAN app, ensure that the cellular interface is reachable from the APIC-EM controller.

### Brownfield devices

#### Supported topologies

- Brownfield L2/L3 Single router single link
- Brownfield L2/L3 Single router dual link
- Brownfield L2/L3 Single router 3 link
- Brownfield L2/L3 Dual router single link
- Brownfield L2/L3 Dual router three link

#### Using cellular link for management interface: Supported

To use 4G cellular as a management interface on the IWAN app, ensure that the cellular interface is reachable from the APIC-EM controller.

#### Hub WAN address connected to cellular cloud must be reachable

The hub WAN address connected to the cellular cloud must be reachable from the cellular branch device before provisioning.

## 4G-Cellular Support for MPLS Cloud

The IWAN App supports use of 4G-cellular WAN links on a private MPLS cloud.

- All topologies are supported.
- Any topology may include one 4G-cellular interface.

Day 0:

- [Adding and Provisioning Greenfield Devices to the Branch Site, page 5-5](#), step 7.
- [Adding and Provisioning Brownfield Devices to the Branch Site, page 5-11](#), step 9.

Day N:

- [Updating the WAN Bandwidth of a Provisioned Branch Site, page 5-26](#)

#### Limitations

- The 4G-cellular interface may be used for WAN clouds, not within a LAN.

## Updating the WAN Bandwidth of a Provisioned Branch Site

You can change the upload or download WAN bandwidth after a branch site is provisioned ("day N"). Also see [Updating the WAN Bandwidth of a Provisioned Hub Site, page 4-35](#).



#### Note

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Beginning with the IWAN App 1.5.0 release, a 4G interface can support an MPLS cloud.

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Valid bandwidth values depend on the interface type:

- TenGigabit interface: 0.1 to 10000 Mbps
- Gigabit interface: 0.1 to 1000 Mbps
- Cellular interface: 0.1 to 300 Mbps

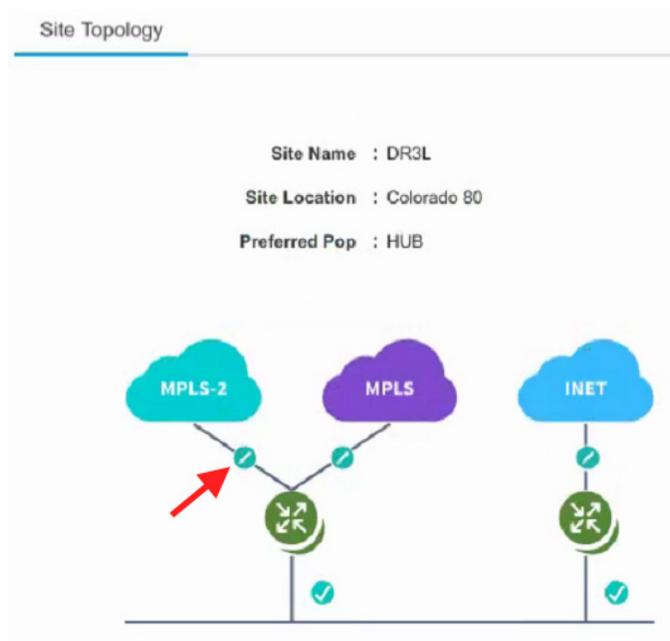
Use the following procedure to update the bandwidth settings.

#### Procedure

---

- Step 1** From the IWAN app home page, click **Set up Branch Sites**.
- Step 2** Click the **Sites** tab.
- Step 3** Click the pencil icon (Edit Site) for a spoke (branch) site. The Update Site dialog box opens.

- Step 4** In the Site Topology area, click the pencil icon on a WAN link. The Configure WAN Cloud parameters are displayed in the dialog box.



- Step 5** In the Upload or Download fields, enter new bandwidth values.

- Step 6** Click the **Update** button.

## Updating the WAN IP Parameters of a Provisioned Branch Site

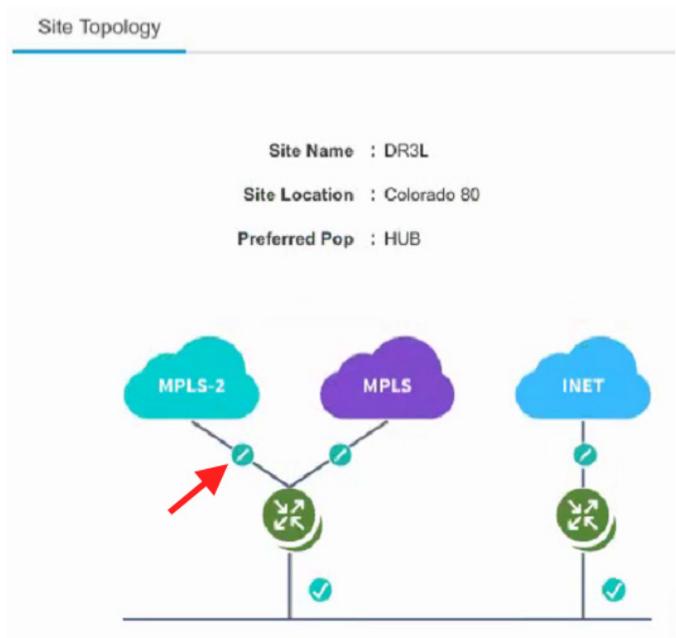
You can change the WAN IP, mask, or next hop settings for a spoke site even after it has been provisioned ("day N").

Use the following procedure to change the IP settings.

### Procedure

- Step 1** From the IWAN app home page, click **Set up Branch Sites**.
- Step 2** Click the **Sites** tab.
- Step 3** Click the pencil icon (Edit Site) for a spoke (branch) site. The Update Site dialog box opens.

**Step 4** In the Site Topology area, click the pencil icon on a WAN link.



The link settings appear in the dialog box. The available options depend on the type of WAN link.

**Step 5** Edit the IP address in or more of the following fields:

- CE IP Address: “Customer edge” IP address. This is the WAN IP address of the branch WAN link.
- CE IP Mask: “Customer edge” IP mask.
- PE IP Address: “Provider edge” IP. This is the gateway of the next hop for the WAN link.

**Step 6** Click the **Update** button.



**Note** To discard changes, click the **Reset** button.

If you enter a value for CE or PE IP address that is not reachable, the operation will succeed, but connectivity between the APIC-EM controller and the site will be lost. If this occurs, restore connectivity. The method for restoring connectivity depends on the specific network. Possible remedies include:

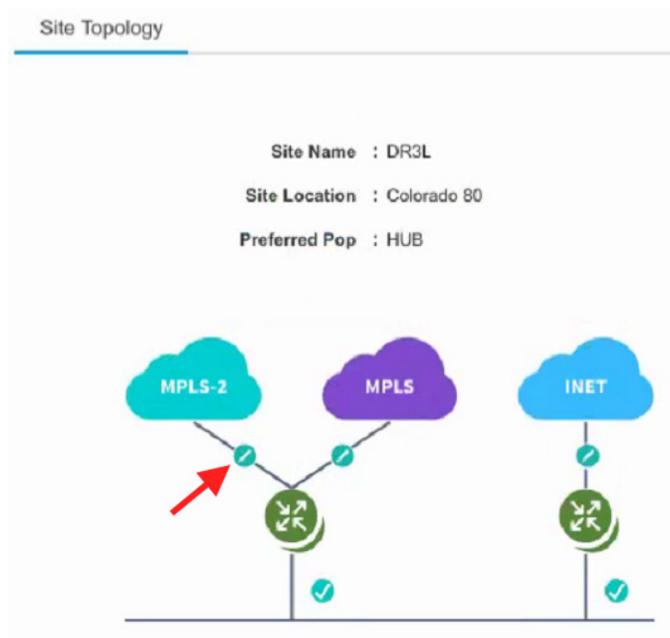
- If the site specified by the new IP address is not active, activate the site to enable connectivity.
- If a new IP address was specified in error, restore the previous IP address. This requires configuring the IP address value directly on the device (not through the IWAN app). Once complete, update the IWAN app with the new valid IP using the “Updating the WAN IP Parameters of a Provisioned Branch Site” procedure described in this section.

# Modifying the QoS Bandwidth Percentages for a Branch Site

You can modify the QoS bandwidth percentages for a branch site after the site is provisioned (Day N).

## Procedure

- Step 1** From the IWAN app home page, click **Set up Branch Sites**. The Sites page opens.
- Step 2** Click the **Sites** tab.
- Step 3** Click the pencil icon (Edit Site) for a branch site. The Update Site dialog box opens.
- Step 4** In the Site Topology area, click the pencil icon on a WAN link (link between router and cloud).



The Configure Link dialog box opens.

- Step 5** In the Configure Link dialog box, click the **Edit** (pencil) icon next to the Service Provider field. A dialog box opens, showing information for the specific service profile.
- Step 6** Modify the QoS bandwidth percentages as needed.
- Step 7** Click **Update**. The modified bandwidth percentages are applied to the WAN link.

