



Configure Hub Site and Settings

This section describes setting up the network environment, which provides resources for routers at hub and branch sites. Later, you can provision branch routers using “Setup Branch Sites”.

Select each of the tabs below and complete the configuration tasks:

- [System, page 4-1](#)
- [Certified IOS Releases, page 4-4](#)
- [IP Address Pools, page 4-4](#)
- [Service Providers, page 4-9](#)
- [IWAN Aggregation Site, page 4-11](#)
- [Configure LAN Settings for the Data Center, page 4-20](#)

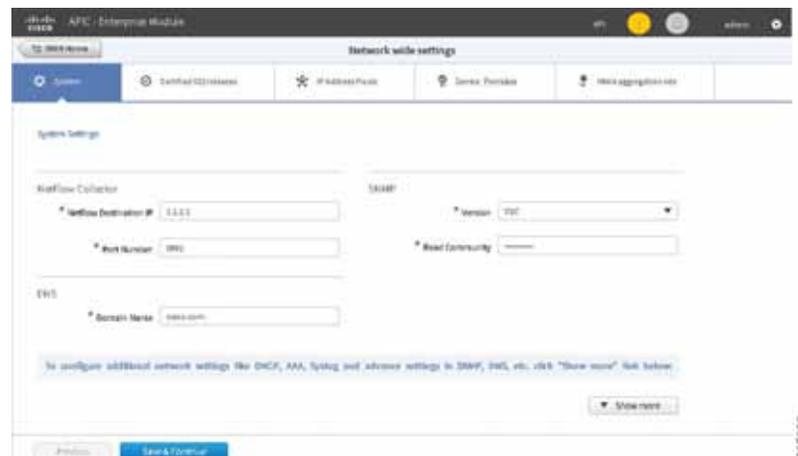


Note

The generic IP pool is used for overlay and loopback addresses. The generic IP pool is divided according to the number of remote sites and service providers as specified in the “IP Address Pools” tab. Please plan by understanding your future requirements by specifying the maximum number of service providers and remote sites they you plan to deploy. The IP address pool settings cannot be changed once specified.

System

Select the “System” tab.



Summary

Enter the global system settings in preparation for enabling both IWAN hubs and spokes.

Select each of the menu options within the “System” menu option to define settings for TACACS, SNMP, DNS, NTP, and Syslog servers.

Netflow Collector**Summary**

Enter an IP address for the Netflow collector. This is the IP address of a Netflow collector such as the LiveAction application. Application visibility and performance metrics are sent to the collector.

Field	Description
Netflow Destination IP	IP address of the NetFlow collector (server). Traffic is sent from the network devices to the Netflow collector; for example, Cisco Prime, or LiveAction.
Port Number	Port number of the NetFlow collector (server). Example: 2055.

DNS**Summary**

Enter a domain name and the IP address of a DNS primary server, used by network devices for SSH. The **ip domain-name** command is used to generate RSA keys. A secondary server can be specified for redundancy.

Field	Description
Domain name	The domain name. Example: cisco.com
Primary Server	Primary server IP address. Example: 192.0.2.1
Secondary Server	(Optional) Secondary server IP address. Example: 198.51.100.1

SNMP

Enter SNMP server details. Either the APIC-EM controller can act as an SNMP manager for managed network devices or a separate SNMP server can be specified to handle SNMP traps. SNMP settings determine the inventory from hub and remote site devices and these values are reflected in the configuration.

Click Show more for SNMP Retries and Timeout, to change the values for number of retries and timeout period.

Field	Description
Trap Destination IP	(Optional) IP address of the SNMP server. (If you do not enter an IP address, the Cisco IWAN application is used as an SNMP server.) Example: 10.10.10.10
Version	Software version of SNMP. Values: V2C, V3.
Read Community	SNMP read community. Example: "Public".
Write Community	(Optional) SNMP write community. Example: "Private".
Retries	Number of retries. Default 3.
Timeout (secs)	Timeout period. Default 10.

Syslog

You may enter the IP address of a third party syslog server, to which network devices send syslog messages.

Field	Description
Server IP	(Optional) Syslog server's destination IP address. The router will be configured to send Syslog messages to this server.

Authorization, Authentication, Accounting

Summary

TACACS is the only supported centralized Authentication, Authorization and Accounting (AAA) service for Cisco IWAN. If a TACACS server is provided, spoke devices will utilize TACACS for all management access to the spoke devices (SSH & HTTPS). Whether or not a TACACS service is provided, a local AAA user database is created on the spoke device, which can be used when TACACS is not available.

Cisco APIC-EM global credentials, if present, are used as default values for the local AAA user credentials, else local user credentials default to the username and password specified in global device credentials for branch routers or to the username and password entered while provisioning the hub. The enable password for device configuration mode is cisco123.

Enter an IP address and key for the AAA server.

Field	Description
IP Address	(Optional) IP address of AAA server (TACACS).
Key	(Optional) Key of AAA server.

DHCP

Enter the IP address of a DHCP server that provides client computers and other TCP/IP-based network devices with valid IP addresses.

Field	Description
External DHCP IP	(Optional) Destination IP address of DHCP server.

Where to Go Next

Select the “Service Providers” tab.

Certified IOS Releases

**Note**

If the routers already have the correct image loaded, selecting an image in Certified IOS Releases is optional.

For each of the router types (such as “ISR4431”) displayed in the window, you can specify a Cisco IOS image. To update the image for a router, click on the small “Up” icon of the router. After an image is uploaded it is ready to be pushed to the branch router later.

Where to go Next

Select the “Service Providers” tab.

IP Address Pools

Overview of IP Address Pools

IWAN application will automatically utilize IP addresses carved from the global enterprise IP Pool space. To support this functionality, one generic global IP pool must be defined for the IWAN application. Allocated out of this generic IP pool will be all the IPs required to provision hub and spoke device needs. This includes interface, LAN, VPN overlay and routing needs.

Optionally, one or more LAN IP pools may be defined to further refine the branch LAN side IP address space. These LAN IP pools will be used for LAN needs until exhausted and then if required, generic IP pool is leveraged.

**Note**

It is important to size the generic IP pool correctly for the long term needs of the IWAN site. VPN requirements dictate that subnets must be defined and allocated internally (up front) before any sites are provisioned. Therefore, once the site and service provider sizing is set, it is frozen for the life of the controller. Please plan accordingly for long term IWAN site requirements. For instance, it is best if you specify the service provider, keeping in mind, that you would require in future, depending on your requirements. There have been issues when service providers are added to the network without specifying the appropriate maximum number of service providers.

Optionally, site specific LAN (VLAN) requirements may be defined and prioritized over the generic global IP pools wherever specific IP addresses are required.

Site-Specific Profile

Site-specific profile is required only for preprovisioning LAN IP addresses on each site, else site-specific profile is optional. Preprovisioning allows you to define a site using the site name and device combination before devices are added to the unclaimed list. This is accomplished by matching the device serial number with the site name. VLAN definition for each site allows you to specific IP address pool ranges, else generic IP pools provides the required LAN IP addresses.

Branch Site-Specific Profile

You can preprovision specifications for the branch sites. A single or dual router site can be defined using device serial numbers and site name along with VLANs for the device. Thus, branch sites are available before the devices display in the site provisioning workflow under unclaimed devices. Defining the site and VLAN enables you to easily configure the devices when the devices are provisioned in the site provisioning workflow. When the devices are claimed and provisioned, the site provisioning workflow does not conflict with the existing site configuration and site name.

You can remove or edit any of the global IP address pools at any point until you click **Save & Continue**. However, you cannot modify the IP address pools after you have configured the IP address pools. For dual router branch, you must enter the Site Specific IP address pool for one device. You must specify the serial numbers for each device.



Caution

In Cisco IWAN Release 1.0, the two workflows are not completely integrated. It is up to you to ensure compatibility of site definition. The device and site association must match that in the site provisioning workflow.

Working on the IP Address Pool Tab

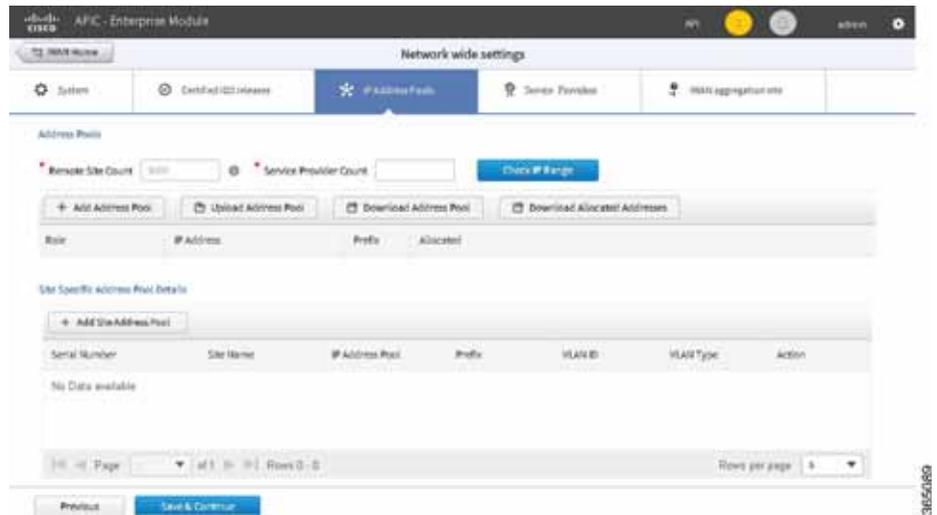


Note

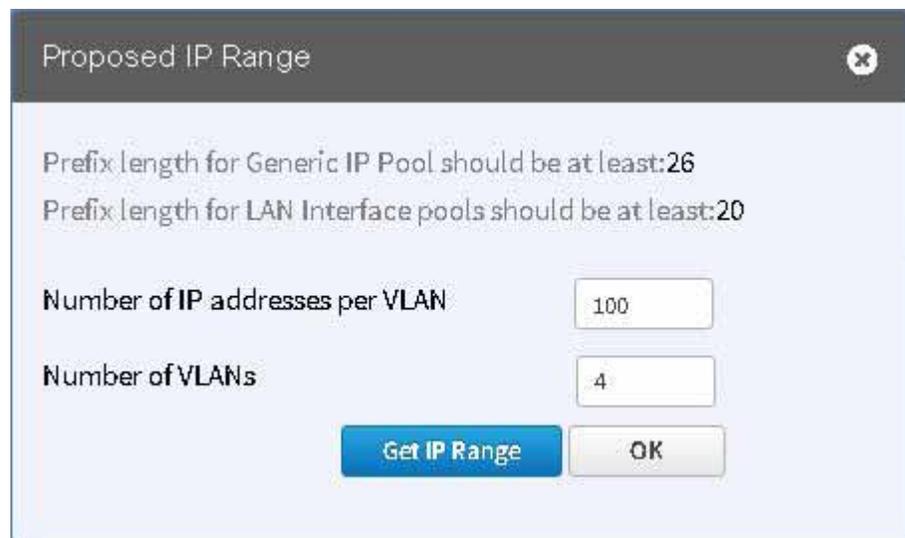
The generic IP pool is used for overlay and loopback addresses. The generic IP pool is divided according to the number of remote sites and service providers as specified in the “IP Address Pools” tab. Please plan by understanding your future requirements by specifying the maximum number of service providers and remote sites they you plan to deploy. The IP address pool settings cannot be changed once specified.

The **IP Address Pools** tab allows you to define the IP pool. Use **Check IP Range** button for suggestion on the minimum prefix needed for generic IP pool and LAN Interface IP pools. For better scalability, you can also export or import IP addresses via .csv file into the application. Upon import, existing targeted network sites are updated with the new VLAN information. If some sites need to utilize specific IP addresses on the VLANs, the IP addresses can either be specified using the options in the **IP Address Pools** tab or import IP addresses via a .csv file.

Step 1 Select the **IP Address Pools** tab.



- Step 2** To help size the global generic IP pools for your network, enter the long term maximum remote sites count and the number of unique service provider paths that you will require and click **Check IP Range**.



The IP prefix identified is the minimum IP pool suggested to support the expected network scale. Optionally, by entering the expected average number of hosts behind each VLAN per site, a prefix for the global LAN IP pools is also suggested. Additionally, this dialog also provides suggestion for the LAN side IP requirements.

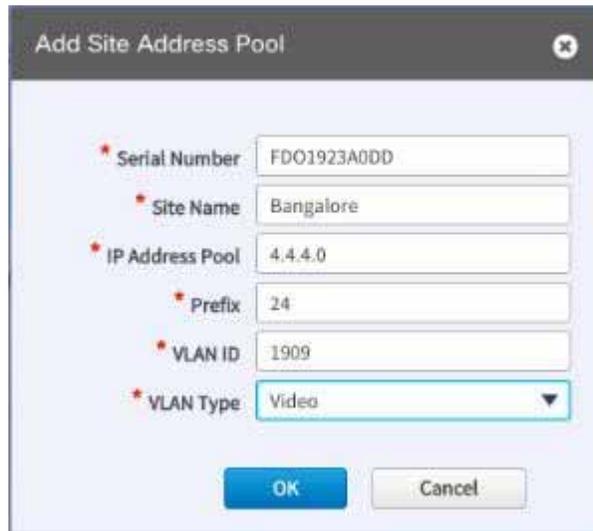
- Step 3** Click **OK**.
- Step 4** Click **Add Address Pool** to enter an IP address along with the suggested or greater prefix. The first range always defaults to the generic IP pool.

Field	Description
IP Address	IP Address for the IP pool. Example: 10.10.10.0

Prefix	CIDR prefix. Example:18
Allocated	Slider bar shows the percentage of the addresses in the pool that has been used by the IWAN application.



Step 5 Click **Site Address Pool** to enter an IP address and prefix based on the suggested sizing for a global LAN IP pool.



Step 6 Repeat this step as required to add additional LAN IP pools.

Field	Description
Serial Number	Serial number. Example: 123456
Site Name	Site name. Example: San Jose.
IP Address Pool	IP addresses for hosts in this VLAN. Example:192.168.99.0/24.
Prefix	Subnet mask for the IP address. Example: 24

VLAN ID	Range of values: 1–4094. Example: 2811. Note You cannot specify 99 as VLAN ID as 99 is assigned to transit VLAN.
VLAN Type	Enter a VLAN type or select a VLAN type from the dropdown menu. Values: Data, Guest, Voice and Video, Wireless.

The following restrictions apply when you enter a VLAN Type of your choice:

- The VLAN type value should not be more than 200 characters in length.
- The VLAN type should not include ? character.
- The allowed number of site-specific address pools is 20 entries per site.



Note

If you do not enter the VLAN details, the configuration information is pushed on the physical interface, which is autopopulated when configuring the LAN during branch provisioning. In such cases, the site is assumed to have no VLANs.

Site Details

Site Address Pool						
Serial No	Site Name	IP	Subnet	VLAN	VLAN Type	Action
123456	San Jose	10.0.0.15	16	123	Data	✗
654321	San Jose	10.0.0.89	16	982	Data	✗

Step 7 Optionally, click **Import CSV** or **Export CSV** to import or export profile based content. Use this step if you want quick processing for large number of site definitions.

The global IP pool, site and VLAN definitions can be imported or updated with **Import CSV** option. The global IP pool, site and VLAN definitions that were previously imported via file or defined via the IP Pool Address tab can be exported using **Export CSV** option. The export workflow provides a template for subsequent import requirements. The content is presented in .csv format and the default exported file name is Controller_Profile_DD-MM-YYYY.csv. These workflows support preprovisioning, scalable site definitions and specific VLAN & IP pool needs.

Step 8 Optionally, click **Export Allocated Addresses** to get a view of the actual usage of IP addresses in the controller on a per site or function basis.

This option provides insight for visibility, DHCP or debugging needs. The content is presented in .csv format and default exported file name is Controller_IP_Allocation_DD-MM-YYYY.csv.

Step 9 Click **Save and Continue** to accept the changes and proceed to the next tab.

Where to Go Next

Select the “Service Providers” tab.

Service Providers

Select the “Service Providers” tab to the type of links and the number of service providers. You can specify up to four links and four service providers. Of the four links, one link can be metered and public. You specify the gateway, interface details for the link in the **IWAN Aggregation Site** tab. After the hub and branches are configured, each link can be associated with a path preference when defining the application policies. For more information, see [“Define Application Policy” section on page 6-4](#).

Field	Description
WAN Label	WAN transport type. This should not be more than seven characters. Example: MPLS.
WAN Type	Two values: Private (MPLS) or Public (Internet).
Metered	Check this option for metered WAN. Leave unchecked for nonmetered WAN. Note One link can only be metered and the metered link is permitted on a public cloud.

Configure Service Providers

WAN Label	WAN Type	Metered	
INET	Public ▼	<input type="checkbox"/>	–
MPLS	Private ▼	<input type="checkbox"/>	–
INET2	Public ▼	<input type="checkbox"/>	– +

Available QoS models for Service Providers

Profile Name	Class Model	
Default 8-Class Model	8 Class	+ +
Default 6-Class Model	6 Class	+ +
Default 5-Class Model	5 Class	+ +
Default 4-Class Model	4 Class	+ +

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For MPLS facing WAN interface, a set of predefined Service Provider (SP) profiles are available. Select the profile that most closely matches the SP Service Level Agreement (SLA) for the branch sites. Egress QoS queuing will be applied on the WAN egress to fulfill the SP SLA.

Field	Description
Profile Name	Service provider profile or QoS model. Available service provider profiles/QoS models: Default 4-Class Model Default 5-Class Model Default 6-Class Model Default 8-Class Model
Class Model	Service provider's class model. Example: 4 Class

After you select a profile, the profile details appear in the right hand side of the window.

Example

In this example, for the 8 Class Model, 20% of the bandwidth is assigned to the Voice class, with the remaining bandwidth allocated as shown for the remaining classes.

8 Class Model				
Class Name	DSCP	Priority Class	SLA	
			(%) Bandwidth	(%) Remaining Bandwidth
VOICE	EF	<input checked="" type="checkbox"/>	20	
STREAMING-VIDEO	AF31			10
NET CTRL-MGMT	CS6			5
CALL-SIGNALING	AF41			4
SCAVENGER	CS1			1
INTERACTIVE-VIDEO	AF41			30
DEFAULT	0			25
CRITICAL-DATA	AF21			25

[Hide advanced](#)

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The following fields are shown for each class of data within a profile.

Field	Description
Class Name	Data class. Example: VOICE, CLASS1 DATA.
SLA	Service level agreement offered by a service provider for a class within this class model, expressed as a bandwidth value. Shows two parameters: “% Bandwidth” or “% Remaining Bandwidth

Click **Show Advanced**—shows the DSCP values for each class, and which of the classes is a priority class.

To add a new service profile, based on an existing service provider profile, click on the icon next to a class name. The Add Service Profile dialog box appears.

For the new service profile enter a value for Profile Name and click **Save**.

Click **Save and Continue** to proceed to the next tab.

Where to go Next

Select the “IWAN Aggregation Site” tab. See [IWAN Aggregation Site, page 4-11](#).

IWAN Aggregation Site

Select the “IWAN Aggregation Site” tab to configure the hub routers with their respective WAN clouds. A default hub aggregation side with two datacenters, routers and service providers is provided. You can add datacenters, routers, and service providers as required for your network. You can create a link by clicking on a router and dragging to a cloud or vice versa. You can also delete the datacenters, routers, service providers, and links if they are not required by hovering on the network, router or link and clicking “X.”

You can add up to two datacenters and add or delete a device or a link after the hub is provisioned. You can only modify the datacenter settings and devices before you click Apply Changes for the new datacenter that was added.

Coexistence of IWAN Sites and Non-IWAN Sites

This feature allows communication between non-IWAN sites with the newly enabled IWAN POP (Hub) and spoke sites for staged migration of network. The advantages of this feature are as follows:

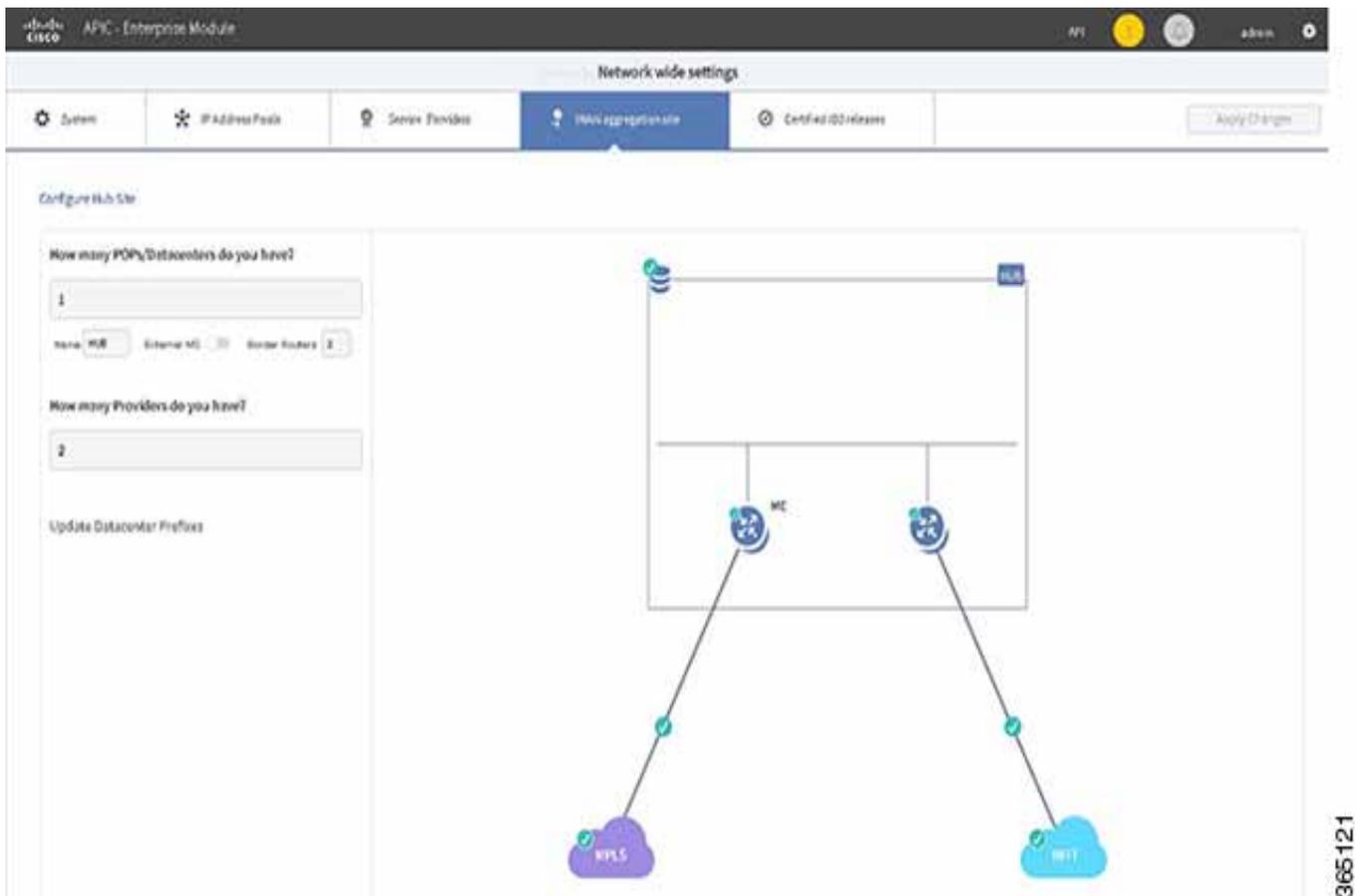
- Deploy IWAN on a few sites prior to full scale deployment
- Non-IWAN sites continue to communicate with hub and spoke routers that are IWAN enabled and vice-versa

Prerequisites for Enabling Support of Non IWAN Sites side-by-side with IWAN solution

The following configurations must be completed before starting the Cisco IWAN App on APIC-EM workflows:

- Define Cisco IWAN hub MPLS border router.

- On the hub router:
 - A loopback interface must be enabled on the border router. It is recommended that you specify a loopback IP address in the same subnet as the WAN interface.
 - A static route must be added with the existing MPLS-CE as the default gateway (before provisioning the hub with Cisco IWAN App workflows).
- On the existing MPLS-CE router:
 - The loopback IP on the IWAN MPLS border router must be advertised via BGP (or another routing protocol used for peering with MPLS provider) on the MPLS-CE router. The loopback IP must be reachable from all remote sites.



Effective with Cisco IWAN Release 1.1.0, you can have two hubs, two clouds and add more devices to the cloud, thereby enabling a multilink network. In other words, the multilink network can have two datacenters and each datacenter can have up to four devices with four links.

Heterogeneous WAN Sites

Effective with Cisco IWAN Release 2.0.0, you can perform the following for a provisioned site:

- Add WAN clouds and service providers in any order

- Add up to two MPLS or Internet links. The new links will not affect the existing device priority nor change the path preference.
- Connect hub devices to different service providers. Each device will be connected to only one service provider. Some branches can have a different set of paths than other branches.

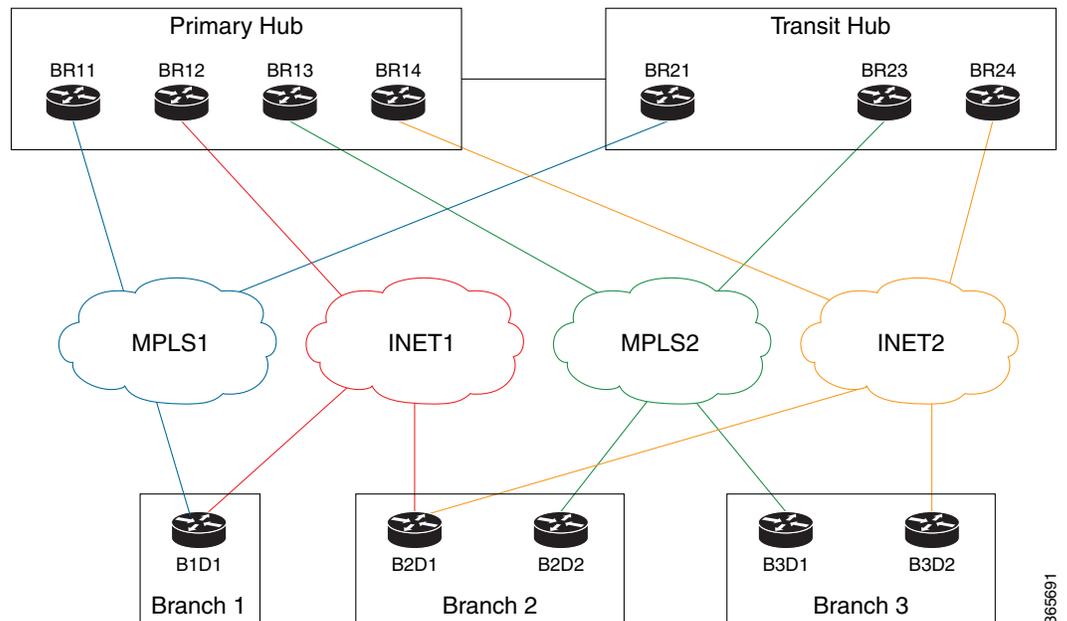


Note

The above changes cannot be performed when provisioning the site.

The following figure provides an example of heterogeneous topology with a primary hub, transit hub and different type of links (MPLS and Internet) to connect to the branch routers between the primary and transit hubs. In this topology, the transit hub is not connected to the primary hub.

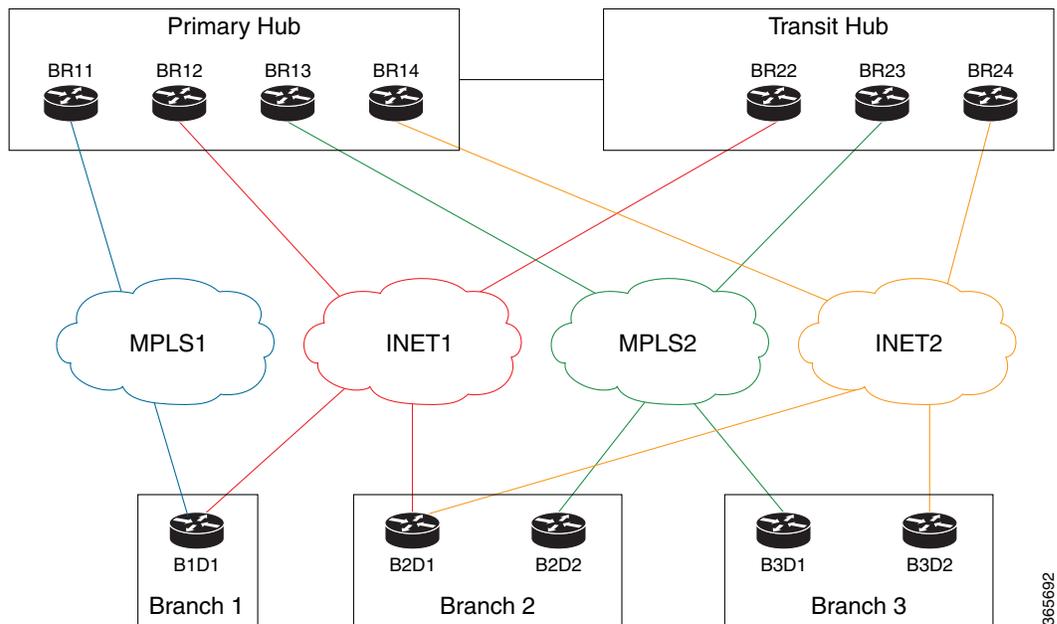
Figure 4-1 Transit Hub Connected to MPLS Link365591



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The following figure provides an example of heterogeneous topology with a primary hub, transit hub and different type of links (MPLS and Internet) to connect to the branch routers between the primary and transit hubs. In this topology, the transit hub is not connected to the primary hub.

Figure 4-2 Transit Hub Connected to Internet Link



Perform the following steps in the **IWAN Aggregation Site**:

-
- Step 1** Select the **IWAN Aggregation site** tab.
 - Step 2** Review the default topology. If you would like to enhance the topology by adding additional datacenters and links.
 - Step 3** Click **Add POP** to add an additional datacenter. A transit hub is added.



Note You can specify two datacenters (hub sites) only during provisioning. You can add or delete datacenters after hub provisioning. Therefore, if you choose one datacenter when configuring the hub, you can add another datacenter later. Similarly, if you added two datacenters when configuring the hub, you can delete the datacenter.

- Step 4** Optionally, you can rename the datacenter to name of your choice by selecting on the default datacenter name (TRANSIT-HUB-1).
- Step 5** Click **Add Border Router** to add border routers. You can also choose to add the border router to the hubs displayed on the page.

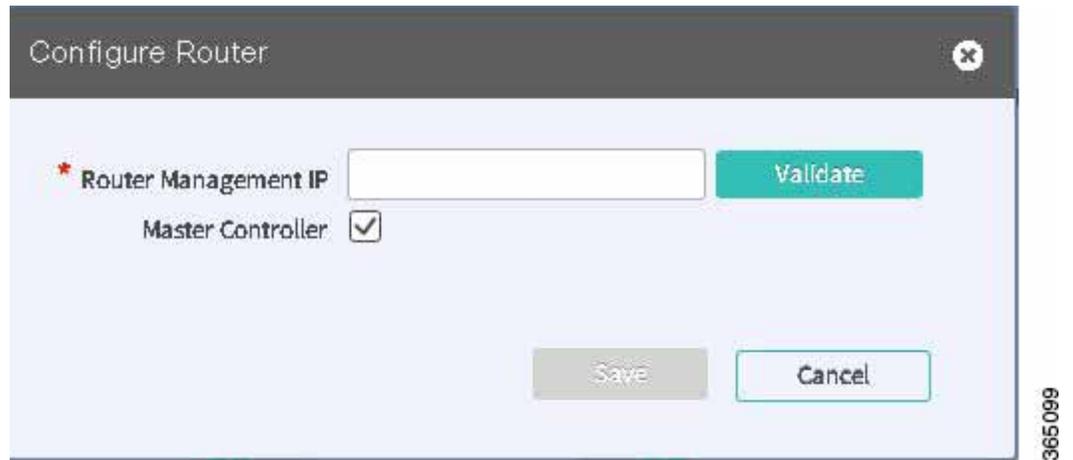


Note The Multilink feature allows you to add up to four border routers and connect the border routers via four links to the different service providers. You can also delete devices either from this page when provisioning the hub via the “IWAN Aggregation Site” tab or when provisioning the branch via the “Select Topology” tab.

- Step 6** Optionally, you can toggle **Yes** or **No** to assign the hub as an External MC.
- Step 7** Click “+” on the hub router. The **Configure Router** dialog box appears.
If you selected **Yes** for **External MC**, the following dialog appears.



If you selected **No** for **External MC**, the following dialog appears.



Field	Description
Router Management IP	Specify the management IP Address for the hub router. Example: 10.0.0.10
Default Gateway	Specify the default gateway. Example: 10.0.0.100
Master Controller	Designates the hub router as the master controller Note This field appears only if External MC is toggled No.

Step 8 Click **Validate**. The **Configure Router** dialog appears.



Note If the hub is not present in the inventory, proceed further, else proceed to step 12.

Configure Router ✕

* Router Management IP

Master Controller

▼ SNMP

* Version

* Read Community

Write Community

▶ SNMP Retries and Timeout

▼ SSH/Telnet

* Protocol

* Username

* Password

* Enable Password

* Timeout (secs)

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Field	Description
Router Management IP	IP address selected in step 1 above.
Master Controller	The check box checked in step 2 above, if this hub router is the master controller.
SNMP	
Version	Example: V2C.
Read Community	Example: Public.
Write Community	Example: Private.
SNMP Retries and Timeout	
Retries	Default: 3.
Timeout (secs)	Default: 10.
SSH Telnet	
Protocol	Example: ssh2.
Username	Example: admin.
Password	Example: pwordstrong.
Enable Password	Example: cisco.
Timeout (secs)	Example: 10.

The above credentials need to be entered only one time. The values are populated for the remaining hub devices in the system.

If you choose to populate values for the SSH Telnet, you must configure the following commands on the device:

ip domain name *name*

crypto key generate rsa modulus *modulus-size*. The modulus range is from 360 to 4096.

ip ssh version 2

You must retrieve the generated RSA key pair by using the **show crypto key mypubkey rsa** command to run the **ip ssh rsa keypair-name** *keypair-name* command with the retrieved key pair name. This forces SSH to use the generated RSA keypair for SSH.

Step 9 Click **Add Device**.

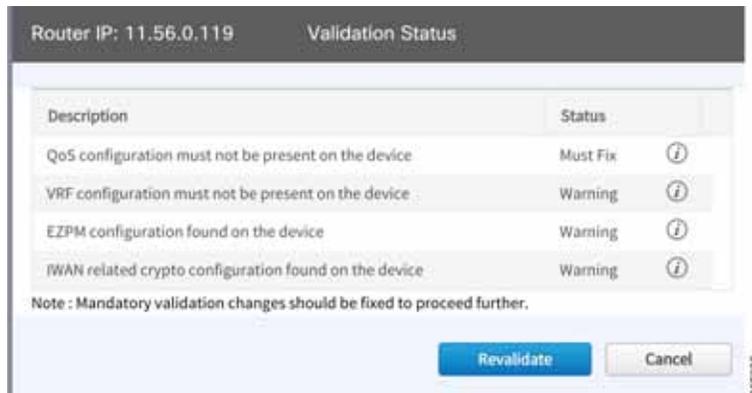
The device is verified in the background if the device is suitable for provisioning, and if there are errors or warnings, the **Validation Status** dialog appears displaying the validation errors or warnings. When the device is validated and ready for configuration, an orange icon with dotted lines appears.



This step is called Brownfield Validation, which indicates validation issues and the Validation Status dialog appears.

Step 10 Do one of the following:

- If the validation messages are warnings, you can choose **Ignore** or fix them.

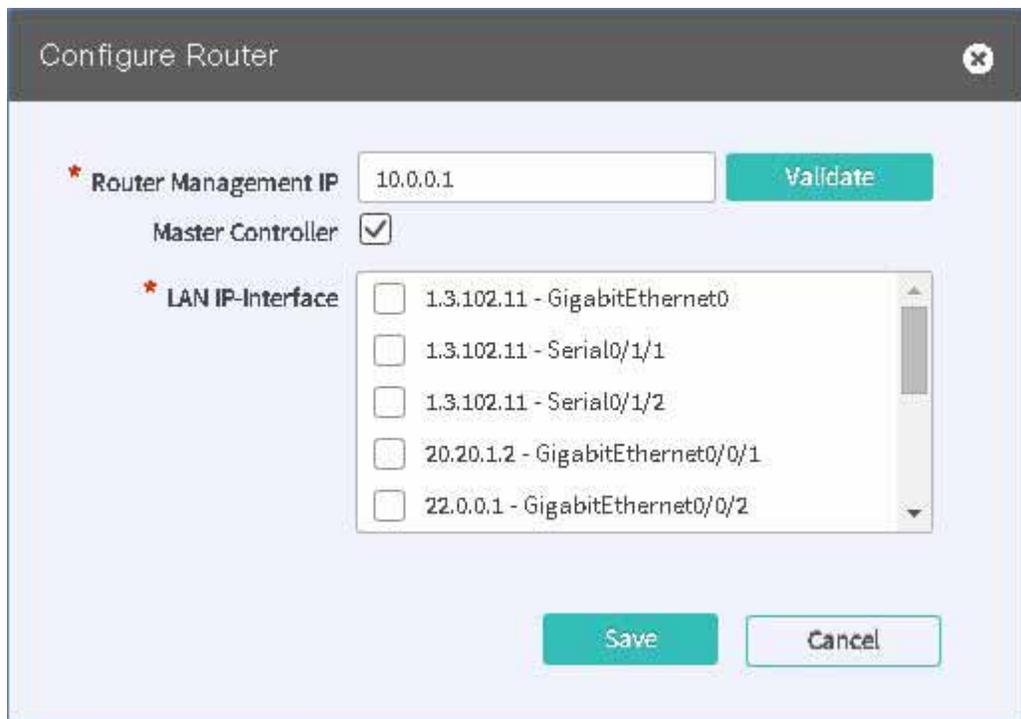


- If the messages are errors, select **Cancel**.

You must fix them via command line interface navigating to the router before proceeding further and follow from steps 5 to 7 and select **Revalidate**. For explanation about messages displayed in the Validation Status dialog, see [Appendix A, “Brownfield Validation Messages Description.”](#)

Step 11 The hub router is added to the inventory and the **Configure Router** dialog appears.

Step 12 Choose the LAN IP-Interface.



Step 13 Configure the other hub routers in a similar method.

Step 14 Click on the link to configure and specify the link in the **Configure Link** dialog box.

The following and the subsequent dialog appear depending on the WAN type that you specified while configuring the type in the **Service Provider** tab for a public and private link respectively.

Configure Link

* WAN Gateway 20.20.20.3

* WAN IP-Interface 20.20.20.1 - GigabitEthernet0/0/1

* Bandwidth (Mbps) 200.0

Save Cancel

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Configure Link

* WAN IP-Interface 20.20.20.1 - GigabitEthernet0/0/1

Enable Non IWAN Sites

Loopback IP-Interface

* Bandwidth (Mbps) 200

* Service Profile Default 6-Class Model

Save Cancel



Note Effective with Cisco IWAN Release 1.1, you can specify static IP addresses for DHCP links.

Perform this step for each link in the network.

Step 15 Select **Enable Non IWAN Sites** to enable communication between IWAN and non-IWAN sites to leverage the coexistence feature, as part of the MPLS configure link..

Step 16 Choose the loopback IP address in the **Loopback IP-Interface** drop down list.

Select the preprovisioned loopback interface from the dropdown list. This enables Cisco IWAN App to form a route of existing sites with new IWAN sites

**Note**

The loopback interface must already be configured on the MPLS router. The loopback interface is required to support co-existence between IWAN and non-IWAN sites and the loopback interface must be configured before adding the device to APIC-EM. It is recommended that you specify a loopback IP address in the same subnet as the WAN interface.

- Step 17** Click **Save**.
- Step 18** Click on the cloud, in this case, MPLS or Internet (Inet), to configure the WAN clouds via the **Configure Provider** dialog box.

The screenshot shows a 'Configure Provider' dialog box with the following configuration:

- WAN Type:** Private
- WAN Label:** MPLS
- Service Profile:** Default 8-Class Model

Buttons: Save, Cancel

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- Step 19** Click **Save** to add the device.

Where to go Next

Configure the LAN settings for the data center. See [Configure LAN Settings for the Data Center, page 4-20](#).

Configure LAN Settings for the Data Center

Perform this step to populate WAN subnets in LAN routing.

- Step 1** To configure LAN settings for a data center, click “+” next to “Configure LAN Settings, Datacenter”. The **Configure LAN** dialog appears.

The values for the fields (mentioned in the table below) **Routing Protocol**, **AS Number**, and **Datacenter Prefix** are collected from the devices and autopopulated for ease of configuration. The common (matching) AS numbers between the devices are displayed for each routing protocols. You can change the AS numbers on device, but it is not recommended that you do so. If your LAN routing protocol is BGP, and there are no matching AS numbers, the AS number field is grayed out and you must manually modify the LAN side routing in the device. This release does not support BGP with different AS numbers.

Step 2 Click **Save**.

Field	Description
Routing Protocol	This is the default routing protocol running on the hub routers. Example: EIGRP, OSPF, BGP
AS Number	AS Number or area number, depending on the routing protocol. Example: 5
Datacenter Prefix	IP address range for the data center, addresses behind the hub, specified as a prefix. Example: 10.3.0.3 / 8

If you select BGP as your routing protocol, you must select Advanced Setting to specify the IP addresses. This is not required if your routing protocol is EIGRP or OSPF.

Where to go Next

After specifying the DC LAN and WAN settings, click **Save & Continue** or select the “Certified IOS Releases” tab.

Configure Master Controller

To configure management controller settings, click “+” next to “Configure External Master Controller”. This is required if your topology uses external master controller.

**Note**

For a dedicated master controller, the device must be greenfield validated. No conflicting configuration with IWAN or dynamic routing protocols are supported for LAN and WAN.

In the **Router Management IP** textbox, enter the management IP address of the hub router and click **Validate**.

Enter values in the following fields and click **Save**.

Field	Description
Router Management IP	IP address selected above.
<i>SNMP</i>	
Version	Example: V2C.
Read Community	Example: Public.
Write Community	Example: Private.
<i>SNMP Retries and Timeout</i>	
Retries	Default: 3.
Timeout (secs)	Default: 10.
<i>SSH Telnet</i>	
Protocol	Example: ssh2.
Username	Example: admin.
Password	Example: pwordstrong.
Enable Password	Example: cisco.
Timeout (secs)	Example: 10.