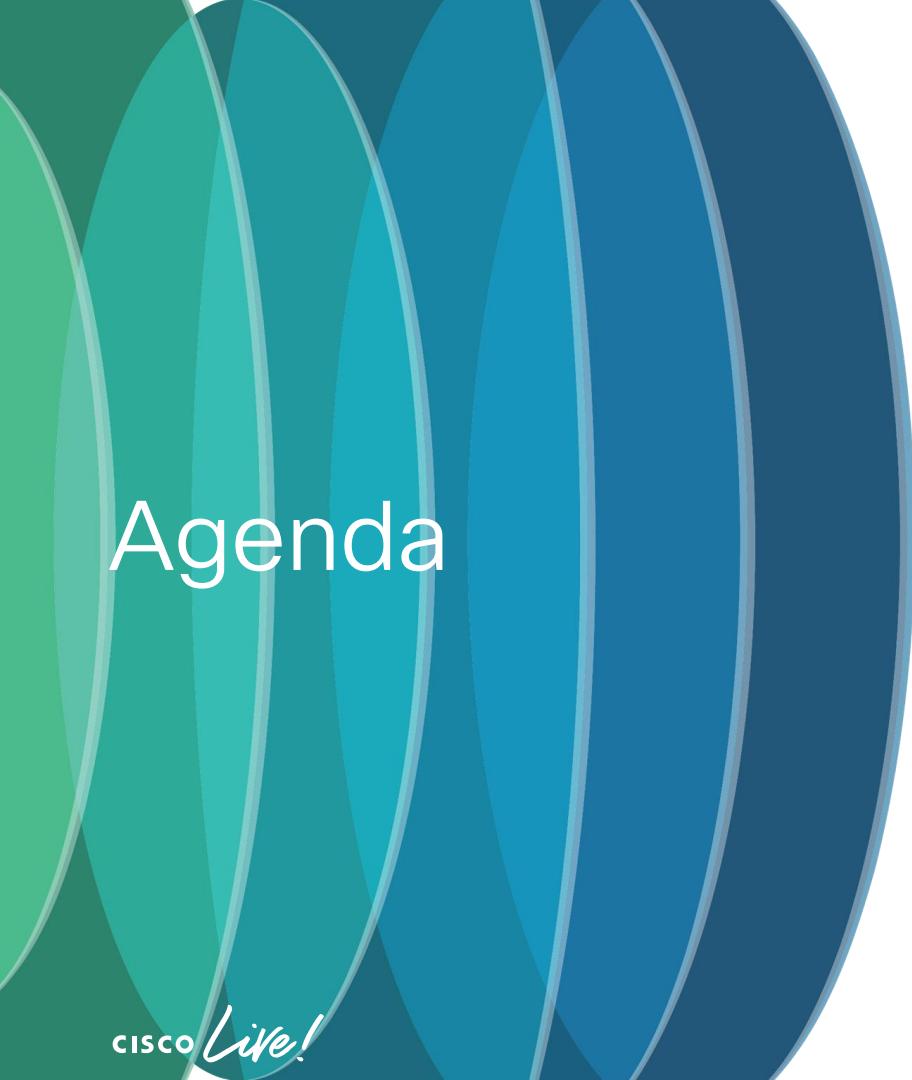




Solving Global WAN Challenges with Multi-Region Fabric

Jean-Marc Barozet – Principal Engineer
BRKENT-2609



The background of the slide features a large, stylized graphic composed of overlapping semi-circles in shades of green, teal, and blue, creating a wave-like pattern.

Agenda

- Multi Region Fabric – A Quick Look
- Large Enterprise Network Design with MRF
 - Defining Regions, Roles
 - Controllers
 - Using UX 2.0
 - Network Hierarchy Manager (NHM)
 - Migration
- Connecting Disjoint Transports
- Horizontal Scaling at your regional Hubs/Colos/PoPs
- Creating groups inside a region
- Software Defined Cloud Interconnect (SDCI)
- Key Takeaways

Webex App

Questions?

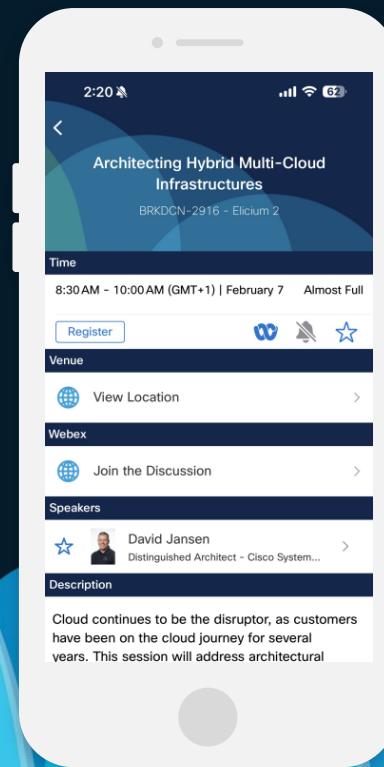
Use the Webex app to chat with the speaker after the session

How

- 1 Find this session in the Cisco Events mobile app
- 2 Click “Join the Discussion”
- 3 Install the Webex app or go directly to the Webex space
- 4 Enter messages/questions in the Webex space

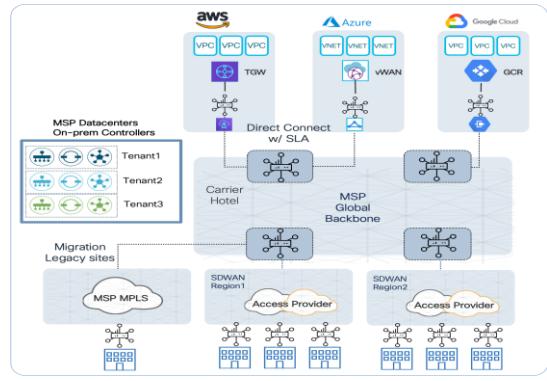
Webex spaces will be moderated by the speaker until February 28, 2025.

CISCO Live!

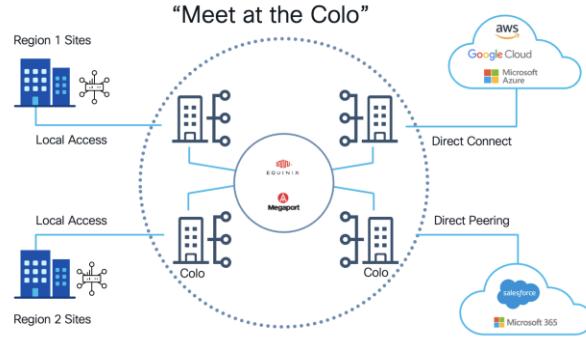


Multi Region Fabric A Quick Look

Typical WAN Design Blueprint



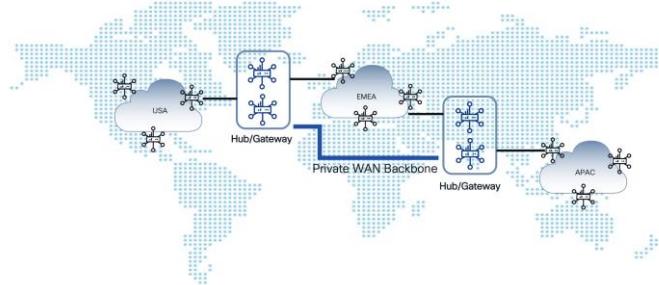
MSP Mid-mile



SDCI Mid-mile

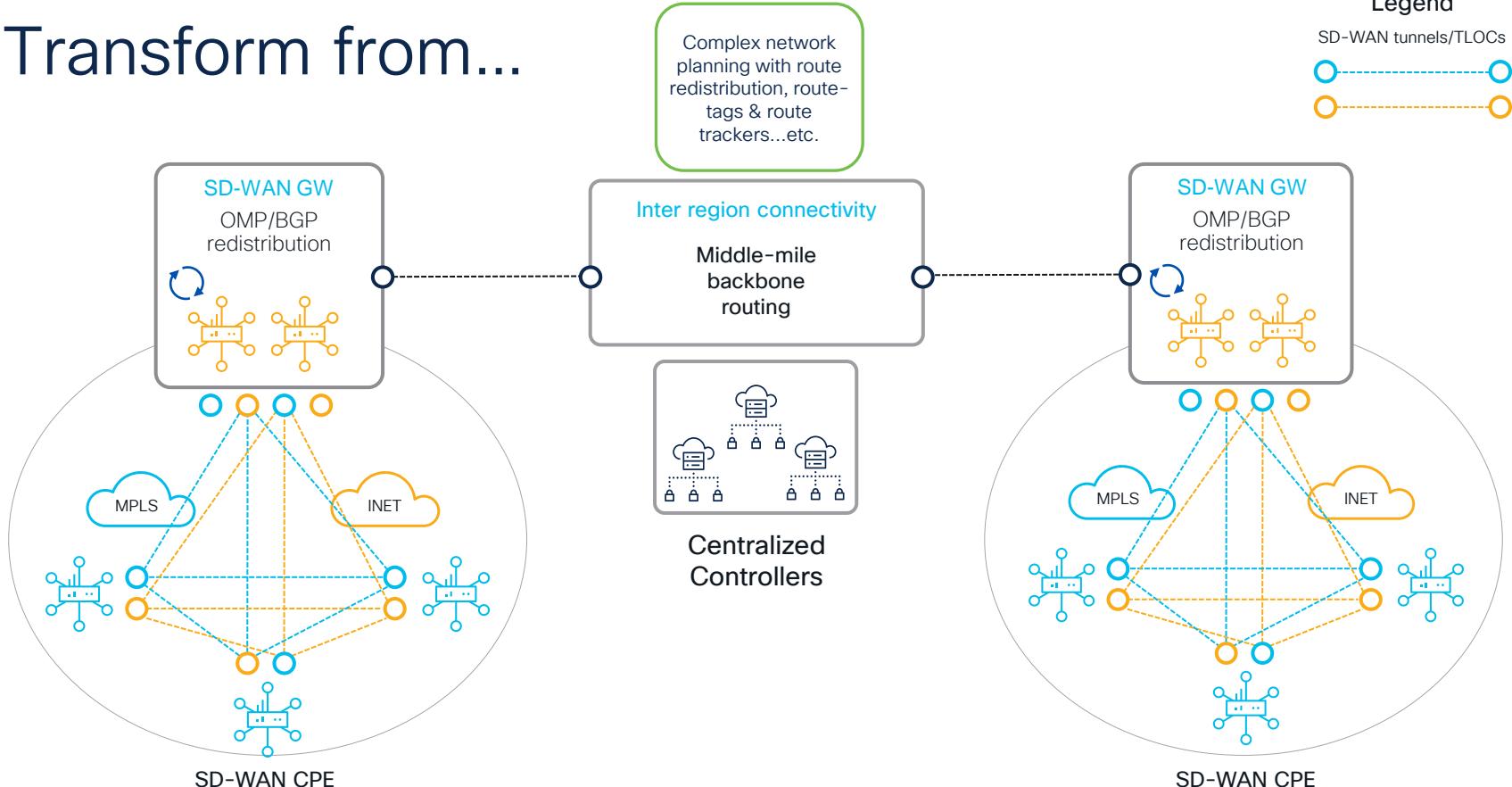


CSP Mid-mile

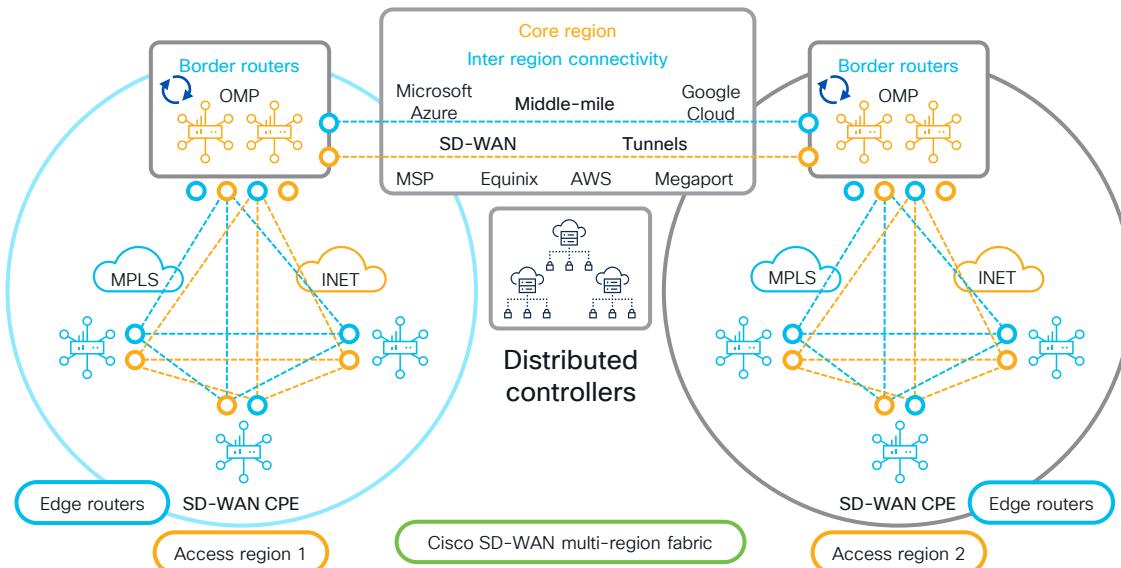


Private/ENT Mid-mile

Transform from...



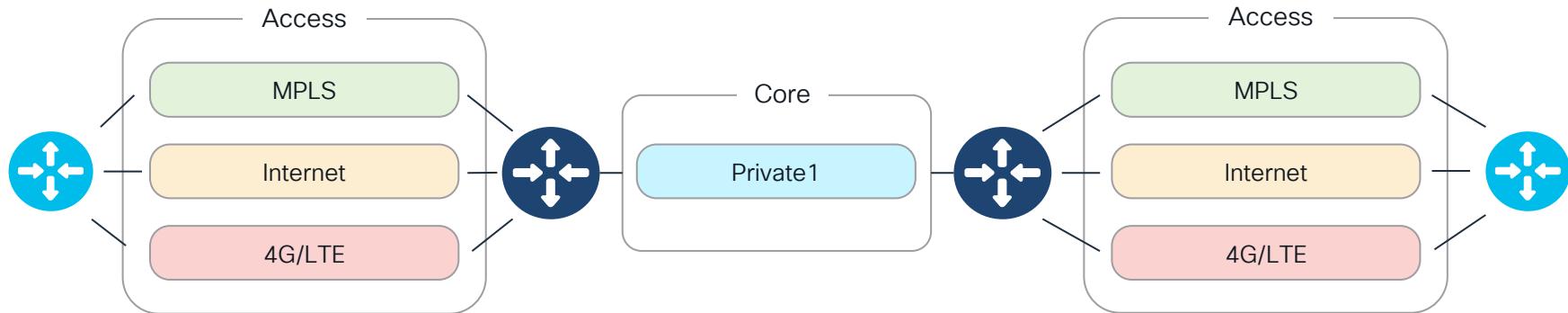
To Cisco SD-WAN multi-region fabric



- Eliminate lengthy global network policies
- Automatic hop-by-hop inter-region routing
- Scalable design
- Simpler redundancy planning
- Flexible architecture to cater to dynamic network needs
- Operationally easier to deploy and manage

SD-WAN evolved for any middle-mile topology

Multi-Region Fabric (MRF)



2-level customer overlay

- Regions
- Border routers

Simple user view

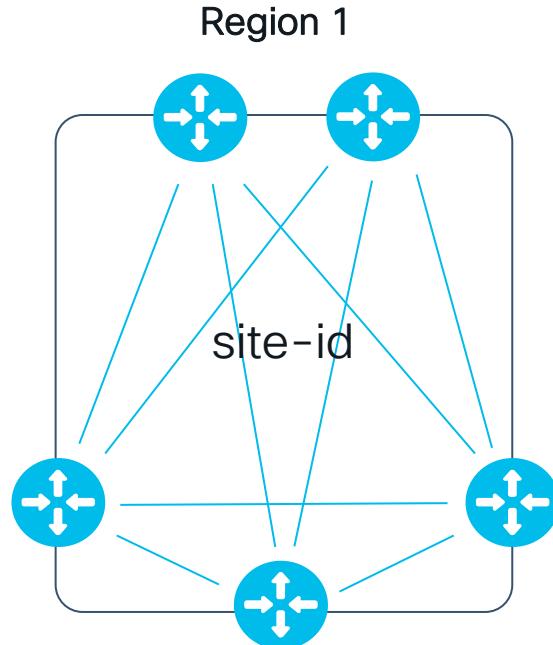
- Intent based configuration
- No control policies needed

Foundational capability for SDCI/Multi-cloud SD-WAN

- Highly scalable
- High network resiliency
- IP forwarding
- No traffic blackholes
- No routing loops

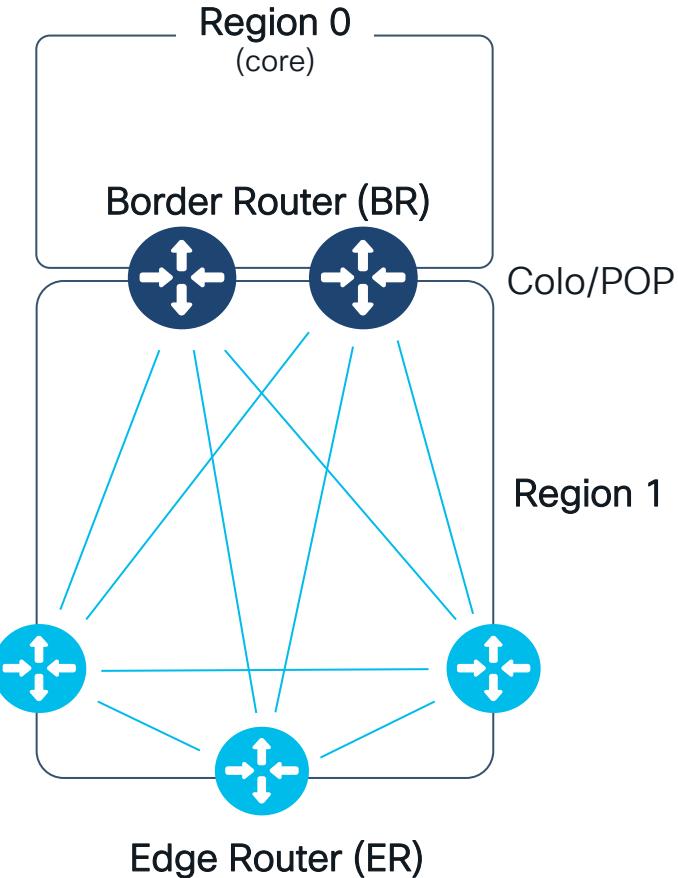
Regions

- Break down the network into groups, based on geo/nature of access needed at sites/nature of services needed by sites or other such parameters
- Access Regions
 - Flexibility and Scaling – mesh/partial mesh/hub and spoke within a region
- Core Region (region 0)
 - Core must be fully meshed (IP reachability)
- Tunnels contained within regions – potentially use smaller branch routers with lower tunnel capabilities



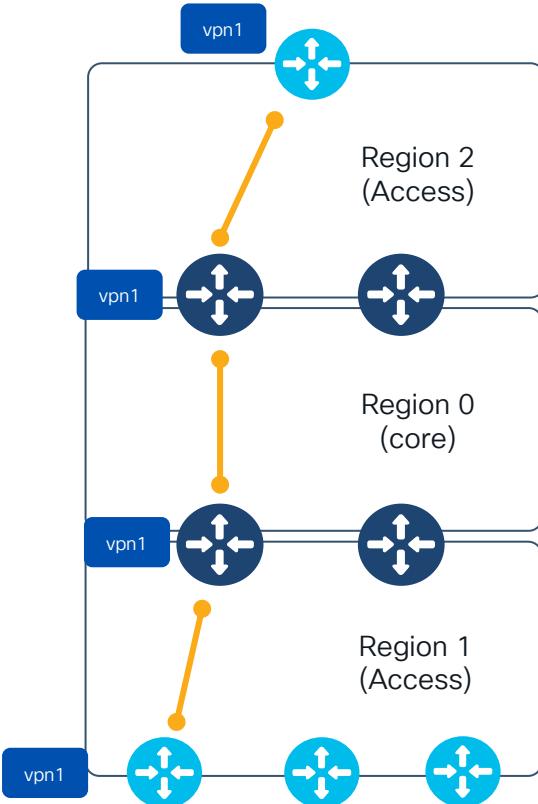
Roles

- Edge Router
 - Default role
 - Control Channel to access SD-WAN Controller
- Border Routers:
 - Connect access region to core region
 - Attached to one access region and core
 - Control channel to core SD-WAN Controller(s) and Access SD-WAN Controller(s)
 - Global reachability via multiple Border Routers in every Region



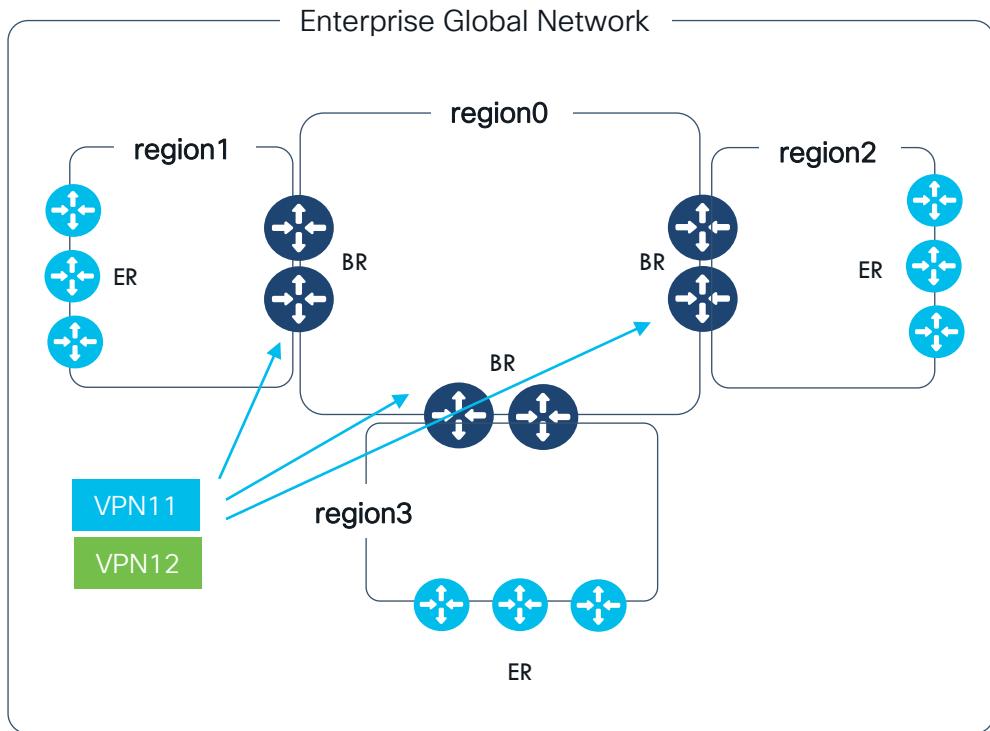
IP Forwarding

- 2-Layer Architecture
- SD-WAN tunnels limited to regions
- Hop by Hop tunnels
- Decrypt/Encrypt on all nodes along the path
- IP Lookup and Forwarding per node
- Requires Service VPN on intermediate nodes (Border Routers)
- Mix of encapsulation is possible GRE in core/access
Example: IPsec on access region and GRE on core



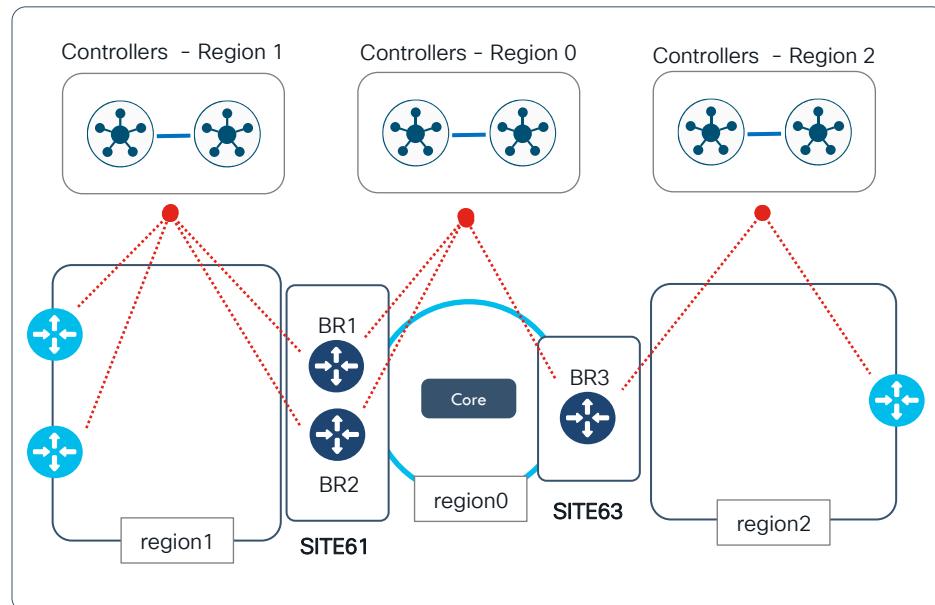
IP Forwarding: Border Routers

- Border Routers connected to Core Region and **ONE** access region
- Transport interfaces can optionally be shared between access and core
- **Must define Service VPNs**
- Announce routes from Core to access and Access to Core
- By default, routers have Edge role



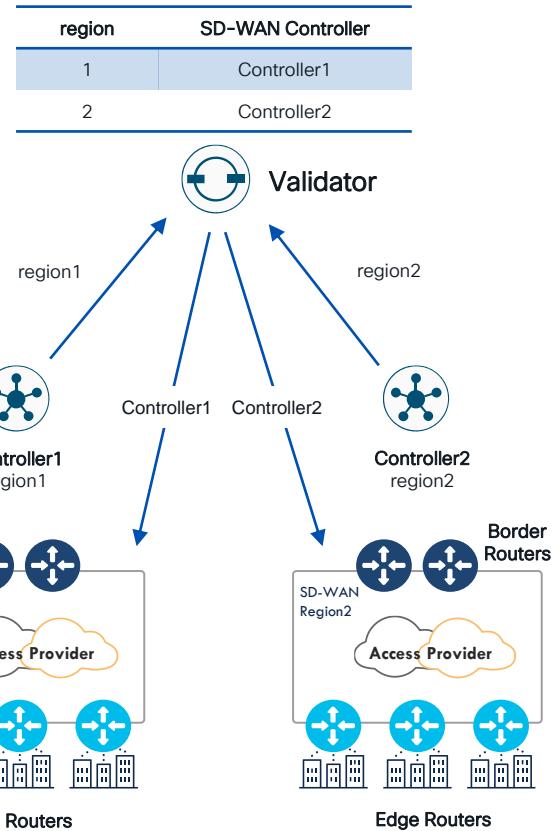
Distributed SD-WAN Controllers

- Controllers become regional
 - **No full mesh** between regions Controllers
 - Controllers for region0 cannot be shared with any access region
 - Edge Routers connected to region Controllers
 - Border Routers connected to Region 0 Controllers and Access Region Controllers
-
- Allow for reasonably horizontal growth in number of edge routers and mitigate the path scale requirements

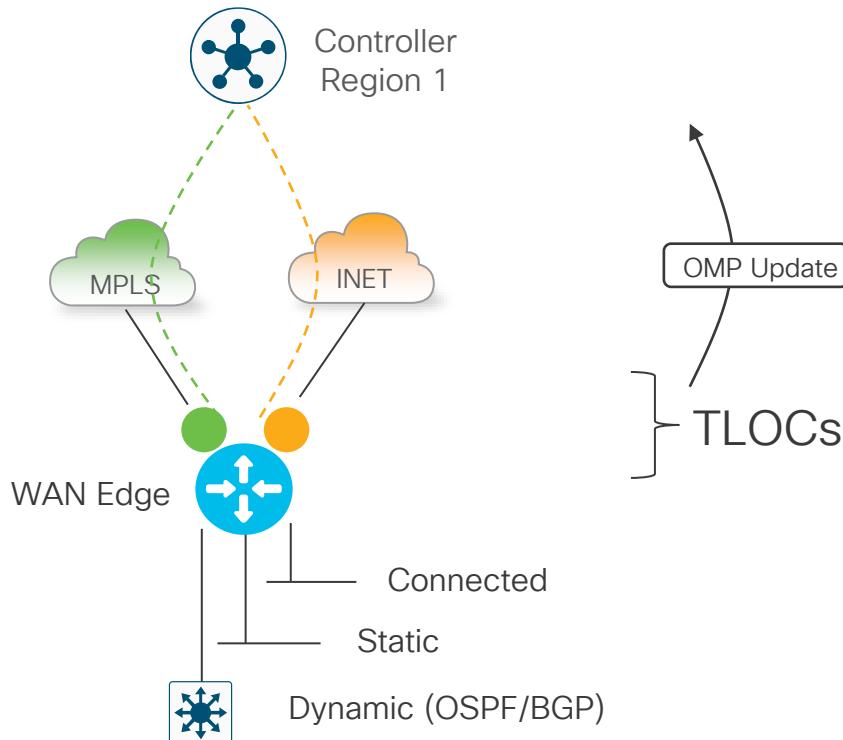


SD-WAN Validator remains global

- Controllers are configured with Region IDs in which they operate
- Controllers register their configured region IDs with Validators. Thus Validator is aware of list of Controller instances that are responsible for a given region(s).
- Validator responds to ER/BR Register requests with list of Controllers that is filtered by match of Region ID between ER/BR and the Controllers. Edge routers and border routers peer only with Controllers in their matching region
- Edge Router
 - The Edge router requests Validator about Controllers that are in the region-id across all its tlocs
 - Validator responds to the edge with only the filtered list of Controllers



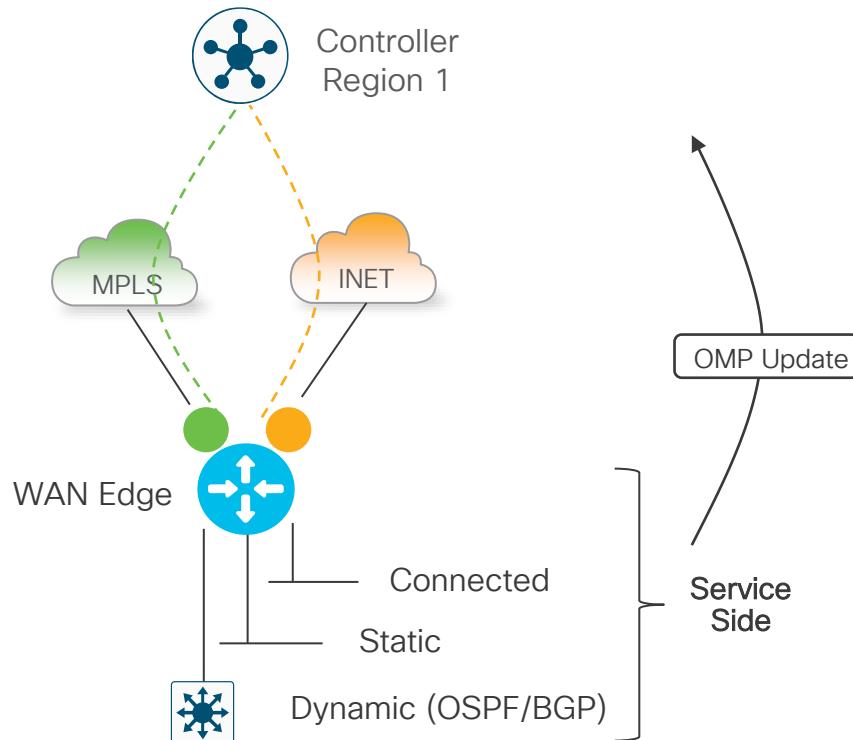
Overlay Routing: TLOCs



- Routes connecting locations to physical networks
- Advertised to SD-WAN controllers
- Most prominent attributes:
 - encap-spi
 - encap-auth
 - encap-encrypt
 - public-ip
 - public-port
 - private-ip
 - private-port
 - bfd-status
 - site-id
 - **region-id**
 - tag
 - preference
 - weight

```
show sdwan omp tlocs
```

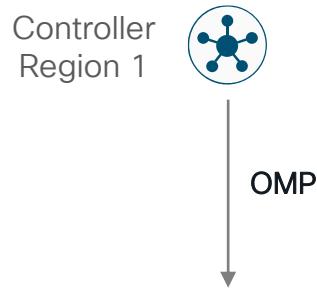
Overlay Routing: VPN Routes



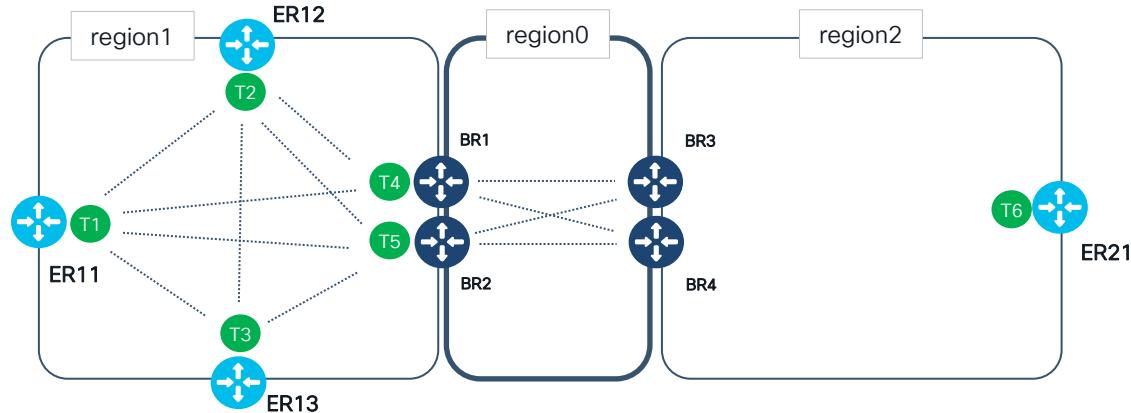
- Routes learnt from local service side
- Advertised to SD-WAN controllers
- Most prominent attributes:
 - originator (system-ip)
 - tloc
 - site-id
 - preference
 - affinity-group
 - affinity-preference-order
 - region-id**
 - vpn-id
 - tag
 - preference
 - origin-proto
 - origin-metric

`show sdwan omp routes`

Building the topology - Tunnels

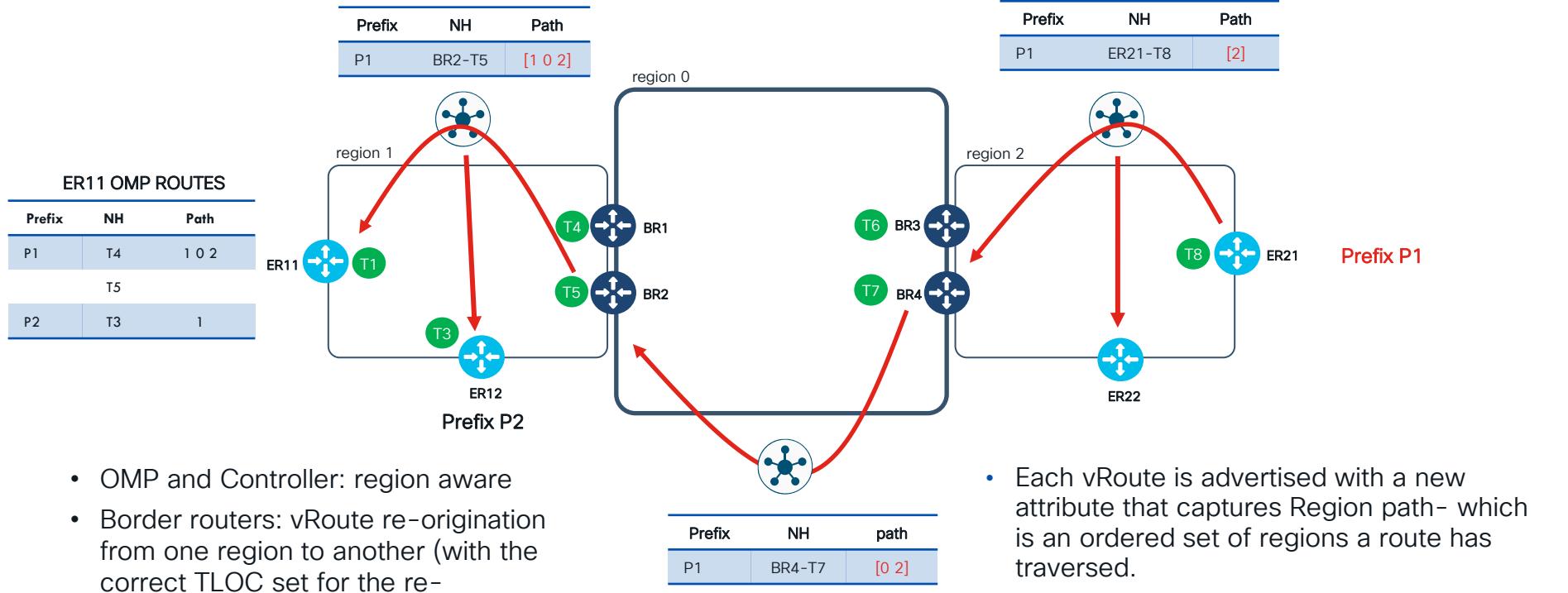


TLOC	FROM	REGION
T2	ER12	1
T3	ER13	1
T4	BR1	1
T5	BR2	1



- Controller advertises only intra-region TLOCs to WAN Edge
 - Spoke has only TLOCs from the same region
 - Border Node has TLOCs from edge region and core
- Region-id used to restrict tunnels between WAN Edge devices in the same region
- Full mesh within region

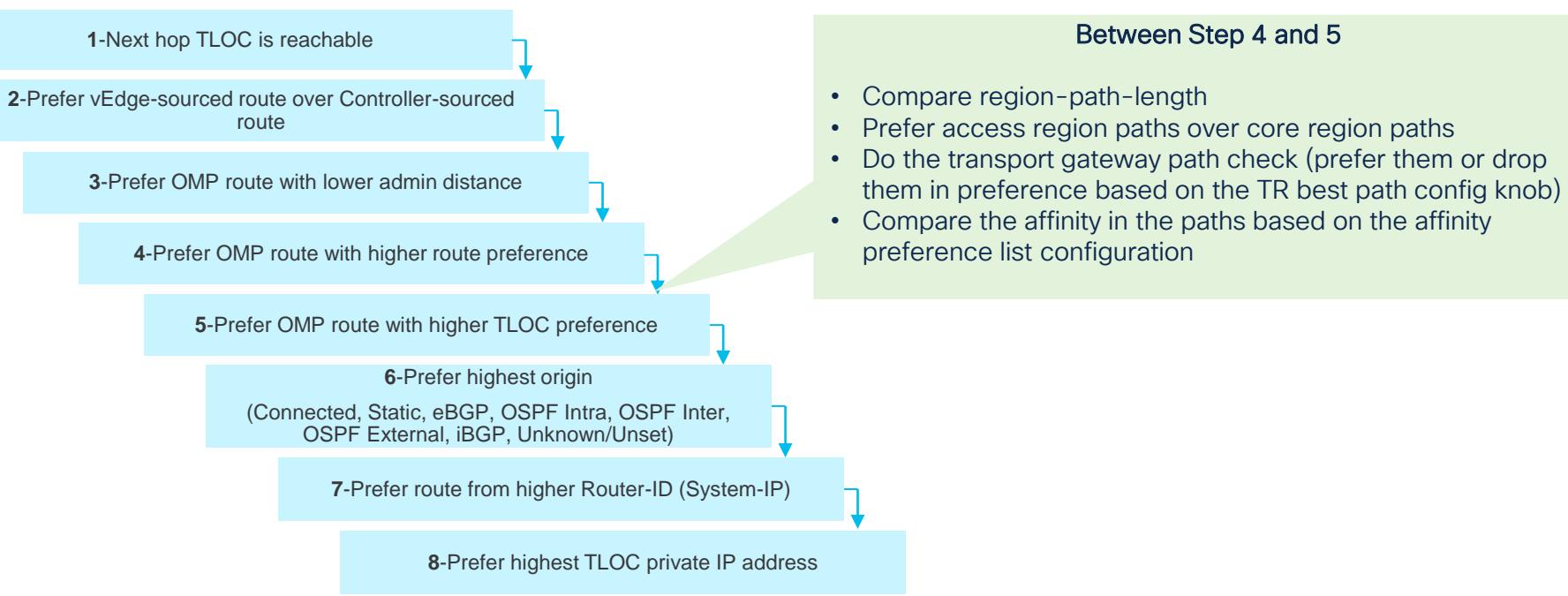
Building the topology - Routes



- OMP and Controller: region aware
- Border routers: vRoute re-origination from one region to another (with the correct TLOC set for the re-originated route)

- Each vRoute is advertised with a new attribute that captures Region path- which is an ordered set of regions a route has traversed.
- Re-originated routes are withdrawn if the connectivity goes down. This helps prevent blackholing scenarios.

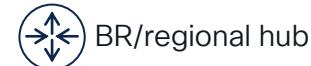
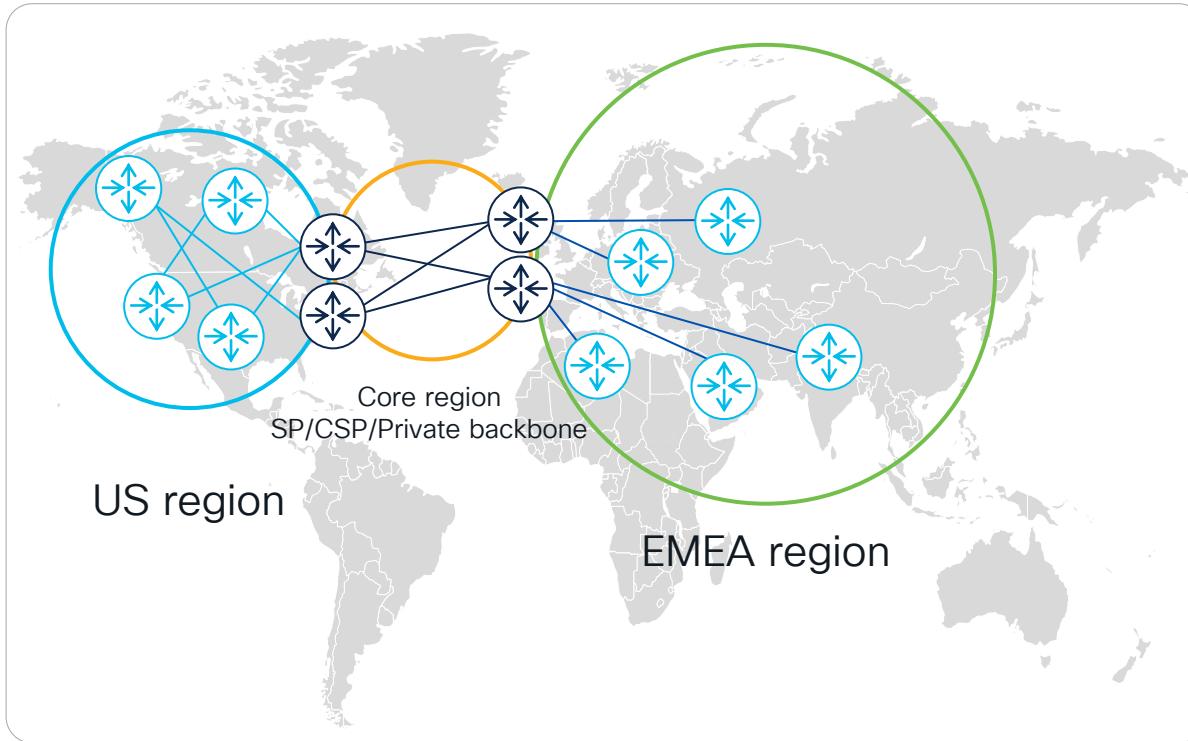
OMP Best-Path Algorithm (New)



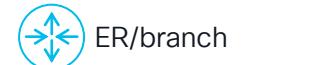
Large Enterprise Network Design with MRF



Large Enterprise Use Case



BR/regional hub

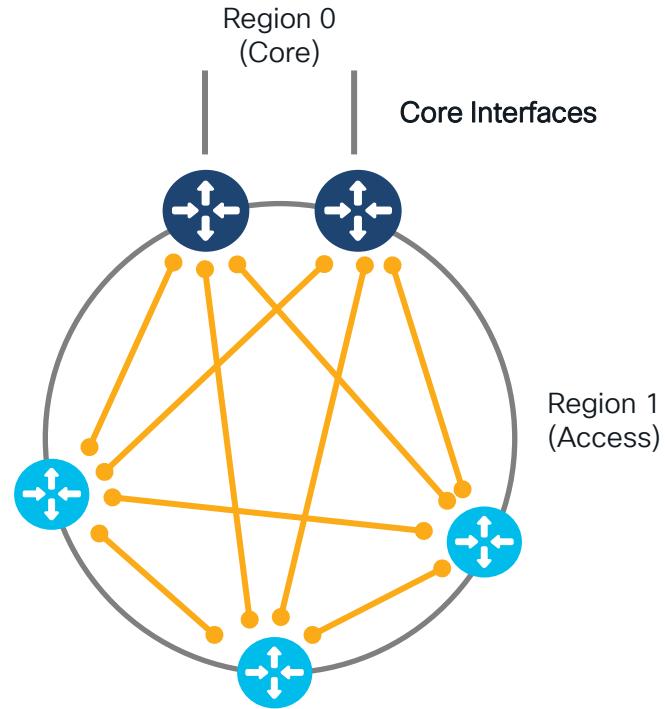


ER/branch

- Intuitive user-defined site grouping. E.g. based on geo
- Auto restrict overlay tunnels between regions
- Different topologies per region
- Mix access transports across regions
- Scale up control-plane per region(s)

Routers in a Region

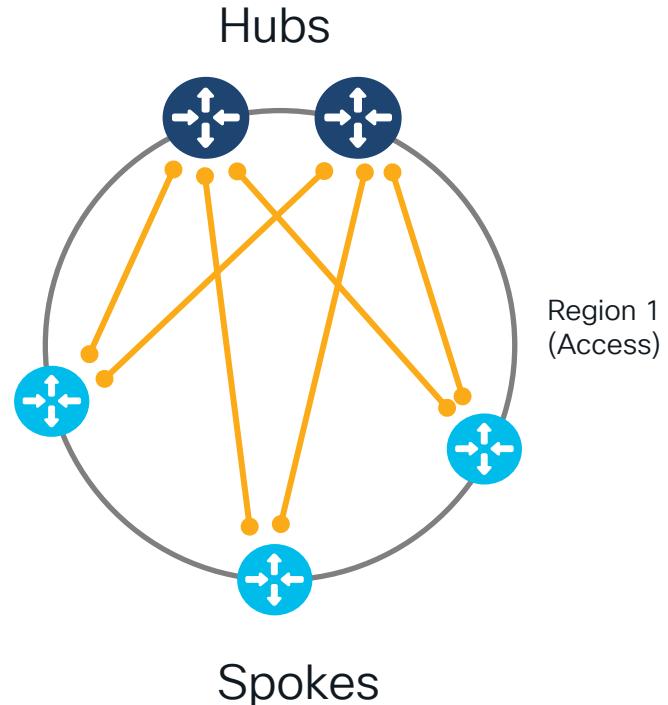
- Intuitive user-defined site grouping. E.g. based on geo
- Finer grouping using TLOC groups
- By default: full mesh between all devices in the same region
- Can change to Hub and Spoke or any topology based on Control Plane Policies
- Different topologies per region
- Mix access transports across regions



- Define Region Number
- Define Device roles
- Configure core interfaces

Hub and Spoke

- Topology (tunnels, routing) configuration with Control Plane policies
 - TLOC policies => control tunnel setup
 - Routing policies => control prefix next-hop
- Hub and spoke to Border Routers is a common setup
- Minimize the number of tunnels
- Potentially use smaller branch routers with lower tunnel capabilities
- Configure Transport Gateway to support disjoint WAN transport (see later)



Intent-based Hub and Spoke Topology

SD-WAN Router

SD-WAN Controller

Option to configure device site-type as spoke site

Option to configure topology, where you can enable hub-and-spoke topology

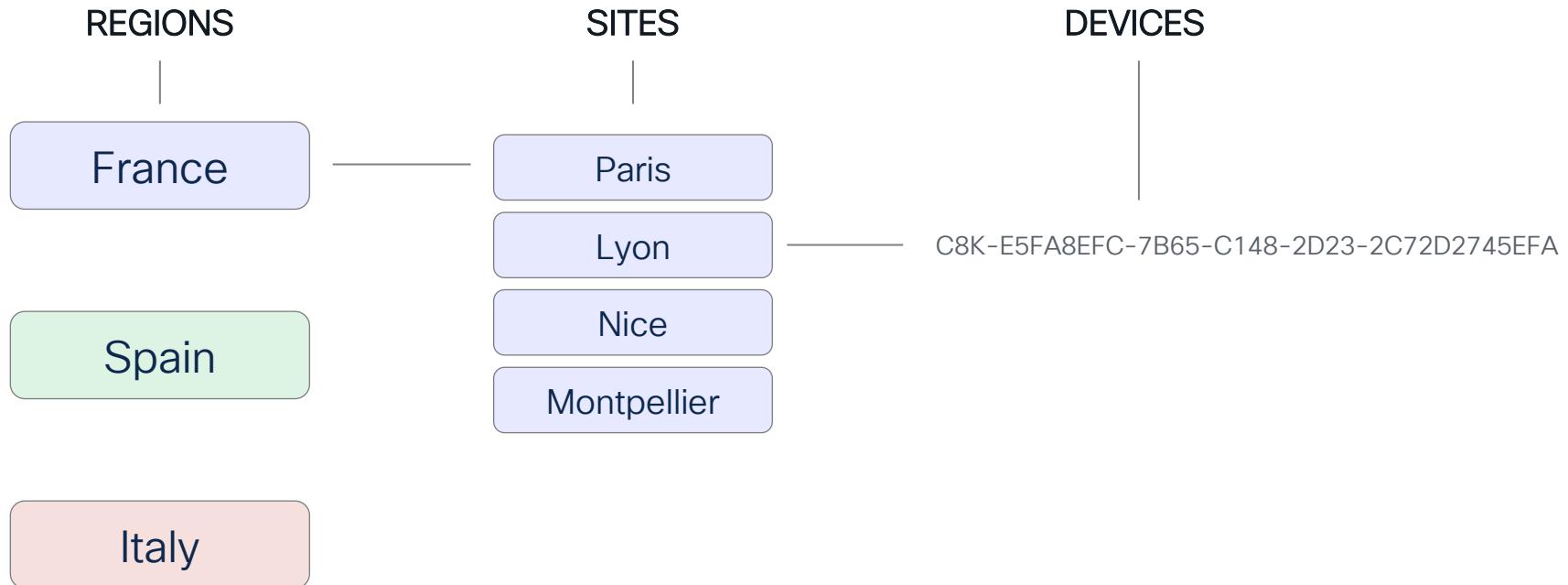
- Further simplify configuration
- Avoids complex use of control plane policies, filters etc
- Combination of Transport Gateway(TGW) and introduction of a new knob on the SD-WAN Controller configuration
- Device configuration instead of Control Plane policies

Using UX 2.0

Define Topology with
Network Hierarchy
Manager



Network Hierarchy Manager



Monitor All Sites ▾

Overview Devices Applications Security Multicloud Tunnels Logs

Control Components

1 Validator	2 Controller	1 Manager
-------------	--------------	-----------

WAN Edges

5 Reachable	0 Unreachable
-------------	---------------

Certificate Status

0 Warning	0 Invalid
-----------	-----------

Licensing

0 Assigned	5 Unassigned
------------	--------------

Reboot

0 Last 24 hrs

24 Hours ▾

Site Health Fair Performing Sites ▾



View Details

Site name	Usage (GB)
Nice	0
Madrid	0
Barcelona	0
Marseille	0
Lyon	0

Current Previous 24 hrs

Tunnel Health Latency (ms) ▾ Poor Tunnels ▾



View Details

Tunnel	Latency (ms)
Edge1:private1-Edge2:pr...	0

Current Previous 24 hrs

WAN Edge Health CPU Load (%) ▾ Fair Devices ▾



View Details

Host / site name	CPU Load (%)
Edge2 Marseille	20.18 Current 19.87 Previous 24 hrs
Edge1 Lyon	19.72 Current 19.73 Previous 24 hrs
Edge3 Barcelona	18.95 Current 19.04 Previous 24 hrs
Edge5 Madrid	18.80 Current 18.67 Previous 24 hrs
Edge4 Nice	18.71 Current 18.69 Previous 24 hrs

Application Health Poor Performing Applications ▾



View Details

Feedback 

Go to:
Configuration > Network Hierarchy



Catalyst SD-WAN

Configuration

- Configuration Groups
- Policy Groups
- Network Hierarchy** (highlighted with a red box)
- Topology
- Service Insertion
- Application Catalog
- Configuration Catalog

Devices

- WAN Edges
- Control Components

Cloud OnRamp

- Cloud OnRamp for SaaS
- Cloud OnRamp for Multicloud

Maintenance

Sites ▾

Name	Usage
Site 1	0
Site 2	0
Site 3	0
Site 4	0
Site 5	0

Certificates

WAN Edges Manager

5 Reachable

Monitor

Configuration

Analytics

Workflows

Tools

Reports

Maintenance

Administration

Explore

Search

Global (1 of 1 nodes)

SITE_111

Global

Global node for network hierarchy

Type: GLOBAL

[Pools](#)[Collectors](#)[Multi Region Fabric \(MRF \)](#)[External Services](#)

Search Table

Add Pool

Name	Description	Type	Used	Actions
GLOBAL_REGION	WAN Region pool for GLOBAL node	region	0.00%	...
GLOBAL_SITE	Site pool for GLOBAL node	site	< 0.01%	...
2 Records		Items per page:	25	1 - 2 of 2 < < > >

Feedback

Monitor

Search

⊕ Global (1 of 1 nodes)

SITE_111

Configuration

Analytics

Workflows

Tools

Reports

Maintenance

Administration

Explore

Global

Global node for network hierarchy

Type: GLOBAL

Pools

Collectors

Multi Region Fabric (MRF)

External Services

- Use Multi-Region Fabric (MRF) to divide your SD-WAN network into smaller, logically distinct, and easier to manage WAN regions where each WAN region may have its own WAN transports, configurations and policies.
- Optionally, interconnect these WAN regions via a shared inter-region network – the core region. Configure your regional hub routers as SD-WAN border routers (BRs) to enable connectivity between WAN regions, via the core region.
- Update your SD-WAN Controllers' configurations to ensure that they are assigned to serve all the WAN regions and core region.

To enable inter-region routing, via SD-WAN Border Routers and core region.

Multi-Region Fabric Routing



Multi Region Fabric cannot be disabled but all the configuration related to that can be removed manually.

Enable MRF



Monitor



Configuration



Analytics



Workflows



Tools



Reports



Maintenance



Administration



Explore

Search

Global (2 of 2 nodes)

Core Region

SITE_111

Global

Add Node

Add Site

Global node for network hierarchy

Type: GLOBAL

Add Pool

Search Table

Add Pool

Name	Description	Type	Used	Actions
GLOBAL_REGION	WAN Region pool for GLOBAL node	region	0.00%	...
GLOBAL_SITE	Site pool for GLOBAL node	site	< 0.01%	...
2 Records				

Items per page:

25

1 - 2 of 2

< < > >

Define your topology
regions
sites



Monitor

 Search

Global (2 of 2 nodes)

Global

Global node for network hierarchy

Type: GLOBAL



Configuration



Analytics



Workflows



Tools



Reports



Maintenance



Administration



Explore

CISCO Live!

Add Node

Type

Group

Group

WAN Region

Parent

Global

Description (optional)

Description

Cancel

Add

Select region

Feedback

- Monitor
- Configuration
- Analytics
- Workflows
- Tools
- Reports
- Maintenance
- Administration
- Explore

Add Node

Type

WAN Region

Name

Name

Description (optional)

Description

Parent

Global

Assign Controllers

Once controllers are assigned to serve one or more WAN regions, only sites that are part of those WAN regions can communicate with those controllers. Controllers using only Device Templates are listed here.

Controllers (2)

Search Table

0 selected

<input type="checkbox"/>	Host Name	Site Name	WAN Region	System IP	Managed By	Device Status
<input type="checkbox"/>	Controller01	SITE_100		100.0.0.101	Template controller_basic	In Sync
<input type="checkbox"/>	Controller02	SITE_100	France	100.0.0.102	Template controller_basic	In Sync

Items per page: 25 1–2 of 2 | < < > >|

Cancel

Add

Enter your region parameters

You can select a controller to add to that new region

Monitor

Search

Global (6 of 6 nodes) ▾

Core Region

France >

Configuration

Bulk API Node Creation

Type: WAN Region

WAN Region ID: 1

Assigned Controllers : Controller02

Feedback

Controller assigned to region 1

The screenshot shows the Cisco Catalyst SD-WAN interface. On the left, there's a vertical navigation bar with icons for Monitor, Configuration (selected), Analytics, Workflows, Tools, Reports, Maintenance, Administration, and Explore. The main pane displays a 'France' region configuration under 'WAN Region ID: 1'. A red box highlights the 'Assigned Controllers : Controller02' text. A blue callout bubble with a red arrow points to this text, containing the text 'Controller assigned to region 1'.



Monitor



Configuration



Analytics



Workflows



Tools



Reports



Maintenance



Administration



Explore

Search

Global (12 of 12 nodes)

Core Region

France

Lyon

Marseille

Nice

Paris

Italy

Milan

Rome

Spain

Barcelona

Madrid

Global

Global node for network hierarchy

Type: GLOBAL

Pools

Collectors

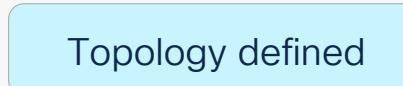
Multi Region Fabric (MRF)

External Services

Search Table

Add Pool

Name	Description	Type	Used	Actions
GLOBAL_REGION	Region pool for GLOBAL node	region	4.76%	...
GLOBAL_SITE	Site pool for GLOBAL node	site	< 0.01%	...
2 Records				Items per page: 25 < < > >



Topology defined

Monitor

Configuration

Analytics

Workflows

Tools

Reports

Maintenance

Administration

Explore

 Search

Global (12 of 12 nodes) ▾

Core Region

France

Lyon

Marseille

Nice

Paris

Italy

Milan

Rome

Spain

Barcelona

Madrid

Nice

Type: SITE

Site ID: 3

Associated Devices: 1

Devices

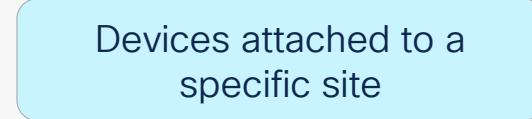
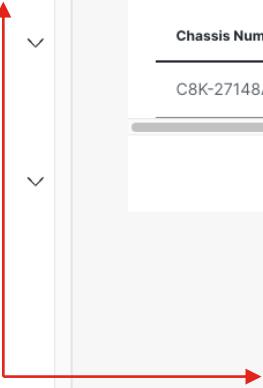
Devices (1)

 Search Table

Chassis Number	Site Name	Hostname	Tags	Config Locked	Managed By	Device S
C8K-27148AFE-7160-69D3-ACC5-F77560530D63	Nice	Edge3	-	Yes	Config-Group edge_basic	In Sync

Items per page: 25

1 - 1 of 1

Devices attached to a specific site

Workflows





Monitor	Configure your WAN with smart configuration group(s). Use recommended settings to get the WAN up and running quickly.	We detected the following Service Chain Configurations. Select one from below to start instantiating.	Define and configure a Service Chain for cloud, SDCI, campus, data center.	Configure your WAN with smart SD-Routing Config. Use recommended settings to get the WAN up and running quickly.
Configuration				
Analytics				
Workflows	Create NGFW Policy Use this workflow to configure your security policy.	Create NFV Configuration Group As a Network Architect create a device-independent NFV design for rapid deployment on Cisco's uCPE devices.	Configure Teleworker Devices Get secure access to your corporate network from the comfort of your home	Create Cellular Gateway Group Enable high-speed 5G or LTE WAN connectivity with Cisco Catalyst Cellular Gateway
Tools				
Reports	Configure UC Voice Configure Cisco Unified Communications (UC) voice services for supported routers.	Create WAN regions and assign controllers Divide the SD-WAN fabric into smaller, easier to manage networks a.k.a WAN regions. Assign Controllers to WAN regions for enhanced scalability, redundancy and fault tolerance.	Quick Connect Onboard your devices.	Deploy Configuration Group Push configuration to devices in your WAN
Maintenance				
Administration				
Explore				

Create WAN regions and assign controllers

Divide the SD-WAN fabric into smaller, easier to manage networks a.k.a WAN regions. Assign Controllers to WAN regions for enhanced scalability, redundancy and fault tolerance.

Create Regions

Monitor

Configuration

Analytics

Workflows

Tools

Reports

Maintenance

Administration

Explore

Configure your WAN with smart configuration group(s). Use recommended settings to get the WAN up and running quickly.

We detected the following Service Chain Configurations. Select one from below to start instantiating.

Define and configure a Service Chain for cloud, SDG, campus, data center.

Configure your WAN with smart SD-Route Config. Use recommended settings to get the WAN up and running quickly.

Create WAN regions and assign controllers

Divide the SD-WAN fabric into smaller, easier to manage networks a.k.a WAN regions. Assign controllers to WAN regions for enhanced scalability, redundancy and fault tolerance. Minimum of 1 controller recommended.

Proceed only if prerequisites are met-

1. Controllers are managed by SD-WAN Manager and should be configured using device templates.
2. Site configurations are managed via Configuration Groups.
3. Software version is above 17.9 on the edge devices.

Let's Do It

Don't show this to me again



Feedback

Attach Service Chain to SD-WAN Router

Attach Service Chain to SD-WAN Router

Deploy Policy Group

Push configuration to devices in your WAN

Firmware Upgrade

Upgrade the module firmware with the latest image.

Software Upgrade

Upgrade your devices with the latest IOS XE SD-WAN image.



Configuration



Workflows



Reports



Administration



← Workflow Library

Create WAN regions and assign controllers

1 Define intent (Optional)

2 Assign controller

3 Define Network Hierarchy

4 Summary

Define intent

WAN Region 0

WAN Region

Type WAN Region Name

WAN Region

Type WAN Region Name

**+ Add WAN Region** Connect WAN Regions

i Core region will be auto created and Border Routers will be needed when WAN regions are connected.



Follow the steps until completion



Exit

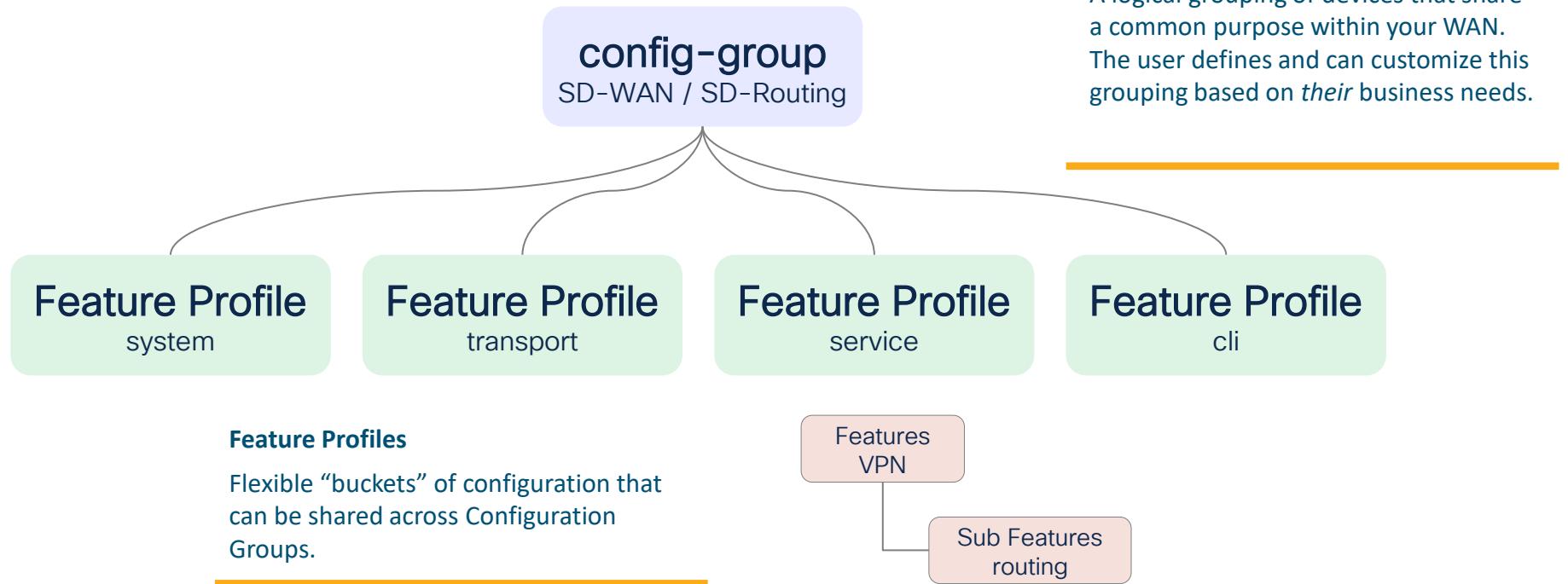
Next

Using UX 2.0

Create Configuration
Groups



Configuration Group Support



EDGE ROUTER

Monitor

Configuration

Analytics

Workflows

Tools

Reports

Maintenance

Administration

Explore

Configuration Groups

SD-WAN

← Configuration Groups 4

System Profile 4

Transport & Management Profile 4

Policy Profile 1

Service Profile 3

CLI Add-on Profile 3

UC Voice Profile 0

→

Q Search

Last Updated

Status

Create Configuration Group

Export Import

Name	Type	Profile	Provisioning Status In Sync Devices / Associated Devices	Origin	Updated By	Last Updated On	Actions
JMB_SDWAN_Border	Single Router	5	2 / 2	user	admin	Jan 27, 2025	
JMB_SDWAN_edge	Single Router	5	3 / 3	user	admin	Jan 27, 2025	
edge_basic	Single Router	5	0 / 0	user	jmb	Jan 24, 2025	
JMB_Controller	Single Router	3	0 / 0	user	jmb	Dec 5, 2024	

Configuration Group for Edge Router
Unfold to see definition



Configuration Groups

SD-WAN

[← Configuration Groups 4](#) [System Profile 4](#) [Transport & Management Profile 4](#) [Policy Profile 1](#) [Service Profile 3](#) [CLI Add-on Profile 3](#) [UC Voice Profile 0](#) →

Search

Last Updated

Status

Create Configuration Group

Export

Import

Name	Type	Profile	Provisioning Status In Sync Devices / Associated Devices	Origin	Updated By	Last Updated On	Actions
------	------	---------	---	--------	------------	-----------------	---------

JMB_SDWAN_Border	Single Router	5	● 2 / 2	user	admin	Jan 27, 2025	⋮
------------------	---------------	---	---------	------	-------	--------------	---

JMB_SDWAN_edge	SD-WAN Edge Router	○	Updated by admin	Updated Jan 27, 2025	⋮	^
----------------	--------------------	---	------------------	----------------------	---	---

Type: Single Router

System Profile

JMB_SDWAN_system

Transport & Management Profile

JMB_SDWAN_edge_wan

Policy Profile (optional)

Default_Policy_Object_Profile

Service Profile (optional)

JMB_SDWAN_edge_lan

CLI Add-on Profile (optional)

JMB_SDWAN_cli

+ Add Profile

Deployment

Associated ○ 3 devices

Provisioning ● 0 out of sync

Deploy

edge_basic	Single Router	5	● 0 / 0	user	jmb	Jan 24, 2025	⋮
------------	---------------	---	---------	------	-----	--------------	---

JMB_Controller	Single Router	3	● 0 / 0	user	jmb	Dec 5, 2024	⋮
----------------	---------------	---	---------	------	-----	-------------	---

Feedback

BORDER DEVICE

Configuration Groups

SD-WAN

← Configuration Groups 4

System Profile 4

Transport & Management Profile 4

Policy Profile 1

Service Profile 3

CLI Add-on Profile 3

I →

Search

Last Updated

Status

Create Configuration Group

Export

Import

Name	Type	Profile	Provisioning Status In Sync Devices / Associated Devices	Origin	Updated By	Last Updated On	Actions
JMB_SDWAN_Border	Single Router	5	🟡 0 / 0	user	admin	Jan 24, 2025	
JMB_SDWAN_edge	Single Router	5	⚠️ 0 / 3	user	admin	Jan 24, 2025	
edge_basic	Single Router	5	🟢 1 / 1	user	jmb	Jan 24, 2025	
JMB_Controller	Single Router	3	🟡 0 / 0	user	jmb	Dec 5, 2024	

Configuration Group for Border Router
Unfold to see definition

Configuration Groups

SD-WAN

← Configuration Groups 4

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Policy Profile 1

Service Profile 3

CLI Add-on Profile 3

I →

Search

Last Updated

Status

Create Configuration Group

Export

Import

Name	Type	Profile	Provisioning Status	Origin	Updated By	Last Updated On	Actions
------	------	---------	---------------------	--------	------------	-----------------	---------

In Sync Devices / Associated Devices

JMB_SDWAN_Border SD-WAN Border Router

Updated by admin

Updated Jan 24, 2025

⋮ ⌂

Type: Single Router

System Profile

JMB_SDWAN_Border_system

Transport & Management Profile

JMB_SDWAN_Border_wan

Policy Profile (optional)

Default_Policy_Object_Profile

Service Profile (optional)

JMB_SDWAN_Border_lan

CLI Add-on Profile (optional)

JMB_SDWAN_Border_JMB_SDWAN_cli

+ Add Profile

Deployment

Associated + Add

Provisioning N/A

Deploy

System Profile

Transport Profile

Service Profile

Edit

[← Configuration Groups \(JMB_SDWAN_Border - System Profile\)](#)

JMB_SDWAN_Border_system [Edit](#)

DEVICE SOLUTION
SD-WANMODIFIED BY
AdminLAST UPDATED
Jan 24, 2025 04:27:32SHARED
1 Group

Search



Add New Feature

Profile Features

Logging

edge_basic_logging

OMP

edge_basic_omp

Global

edge_basic_global

BFD

edge_basic_bfd

Basic

edge_basic_system

AAA

edge_basic_aaa

Add Feature

Banner

Flexible Port Speed

NTP

Remote Access

CA Certificate

Fabric Security

SNMP

Performance Monitoring

Multi-Region Fabric

IPv4-Device-Access-Policy

IPv6-Device-Access-Policy

Add MRF Feature



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Explore

← Configuration Groups (JMB_SDWAN_E)

JMB_SDWAN_E

DEVICE SOLUTION SD-WAN MODIF Admin

Q Search

Profile Features

- Multi-Region Fabric: Select Multi-Region Fabric
- OMP: edge_basic_omp
- BFD: edge_basic_bfd
- AAA: edge_basic_aaa

Basic Settings

Role (optional)

Border Router

Advanced

Enable Migration Mode to Multi-Region Fabric (optional)

<system default>

Define role



Feedback

Back No Changes Made

Cancel Save

50

[← Configuration Groups \(JMB_SDWAN_Border - System Profile\)](#)

JMB_SDWAN_Border_system [Edit](#)

DEVICE SOLUTION
SD-WANMODIFIED BY
AdminLAST UPDATED
Jan 24, 2025 04:37:49SHARED
1 Group

Q Search

**Add New Feature**

Profile Features

Multi-Region Fabric

MRF_Border

Logging

edge_basic_logging

OMP

edge_basic_omp

BFD

edge_basic_bfd

AAA

edge_basic_aaa

Global

edge_basic_global

Basic

edge_basic_system

MRF Feature Configured**Add Feature**

- « Global
- « Banner
- « Flexible Port Speed
- « NTP
- « Remote Access
- « CA Certificate
- « Fabric Security
- « SNMP
- « Performance Monitoring
- « Multi-Region Fabric
- « IPV4-Device-Access-Policy
- « IPV6-Device-Access-Policy

Feedback



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SD-WAN

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Transport & Management Profile 4

Policy Profile 1

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CLI Add-on Profile 3

I →



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Export

Import



Name	Type	Profile	Provisioning Status In Sync Devices / Associated Devices	Origin	Updated By	Last Updated On	Actions
------	------	---------	---	--------	------------	-----------------	---------

JMB_SDWAN_Border

SD-WAN Border Router

Updated by admin

Updated Jan 24, 2025

Type: Single Router

System Profile

JMB_SDWAN_Border_system

Transport & Management Profile

JMB_SDWAN_Border_wan

Policy Profile (optional)

Default_Policy_Object_Profile

Service Profile (optional)

JMB_SDWAN_Border_lan

CLI Add-on Profile (optional)

JMB_SDWAN_Border_cli

[+ Add Profile](#)**Deployment**Associated [+ Add](#)

Provisioning N/A

[Deploy](#)

Feedback

[Edit Transport Profile](#)

CISCO Live!



Monitor



Configuration



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Explore

JMB_SDWAN_Border_wan [Edit](#)

DEVICE SOLUTION
SD-WAN

MODIFIED BY
Admin

LAST UPDATED
Jan 24, 2025 04:27:52

SHARED
1 Group

Q Search



Add New Feature

Transport VPN

edge_basic_vpn0

Ethernet Interface

edge_basic_vpn0_private1

Ethernet Interface

edge_basic_vpn0_inet

Ethernet Interface

edge_basic_vpn0_mpls

Interface that connects to
the core (region 0)



Feedback

← Configuration Groups (JMB_SDWAN_E)

Ethernet Interface

DEVICE SOLUTION | MODIF
SD-WAN Admin

STUN

SNMP

Transport VPN

edge_basic_vpn0

Ethernet Interface edge_basic_vpn0

Ethernet Interface edge_basic_vpn1

Ethernet Interface edge_basic_vpn2

Encapsulation

Encapsulation (1)

Encapsulation	Preference	Weight	Action
ipsec	<input type="radio"/>	<input type="radio"/> 1	<input type="button" value="Edit"/> <input type="button" value="Delete"/>

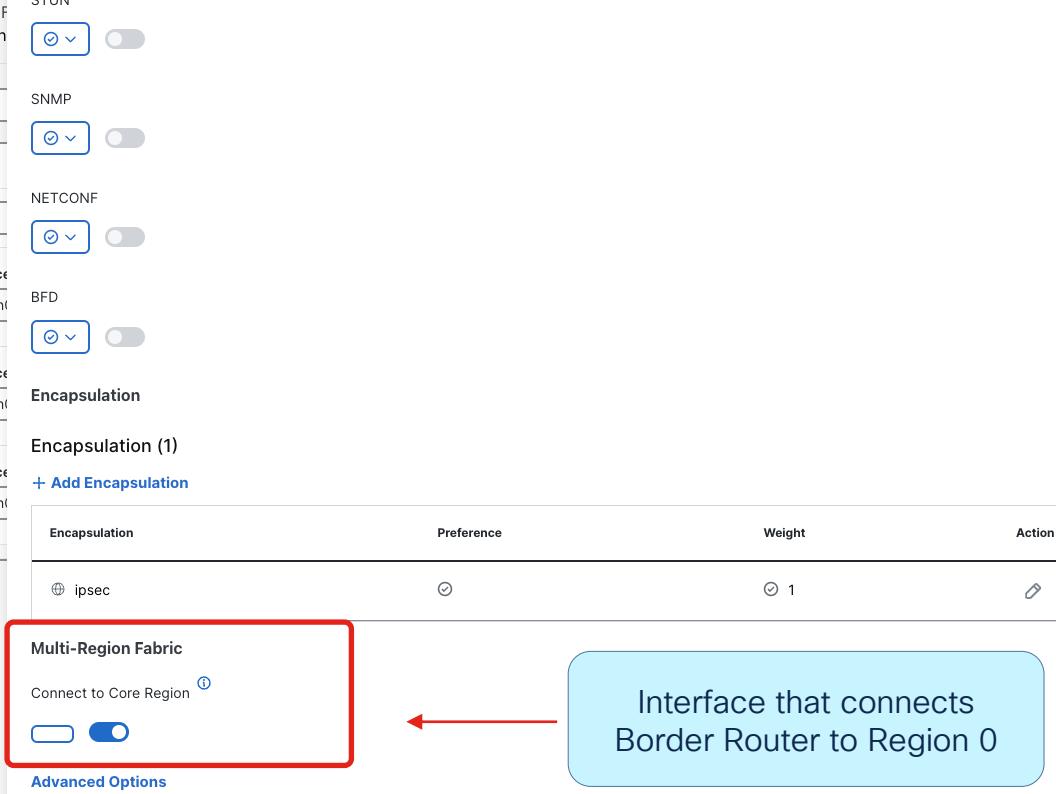
Multi-Region Fabric

Connect to Core Region

Advanced Options No Changes Made

Feedback 

Interface that connects Border Router to Region 0



Workflows



In Progress (2)

Search all Workflows

Monitor

Configuration

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Library All

Pick the Create Configuration Group workflow

Create Configuration Group

Configure your WAN with smart configuration group(s). Use recommended settings to get the WAN up and running quickly.

Instantiate Service Chain

We detected the following Service Chain Configurations. Select one from below to start instantiating.

Define and Configure Service Chain

Define and configure a Service Chain for cloud, SD-Cloud, campus, data center.

Create SD-Routing Config

Configure your WAN with smart SD-Routing Config. Use recommended settings to get the WAN up and running quickly.

Create NGFW Policy

Use this workflow to configure your security policy.

Create NFV Configuration Group

As a Network Architect create a device-independent NFV design for rapid deployment on Cisco's uCPE devices.

Configure Teleworker Devices

Get secure access to your corporate network from the comfort of your home.

Create Cellular Gateway Group

Enable high-speed 5G or LTE WAN connectivity with Cisco Catalyst Cellular Gateway

In Progress (2)

Search all Workflows

Create Security

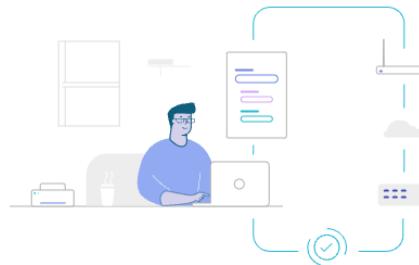
Create Configuration

Create Configuration Group

Configuration Groups begin with smart default settings prepopulated

- Goal is to provide a straight-forward method to configure devices
- Flow touches on the Cisco Catalyst SD-WAN Global, WAN and LAN configurations

Note: This flow provides freedom to skip any sections you are not interested in or adopt pre-defined Cisco best networking templates where you see fit.

**Let's Do It** Don't show this to me again

Create NGFW Policy

Use this workflow to configure your security policy.

Create NFV Configuration Group

As a Network Architect create a device-independent NFV design for rapid deployment on Cisco's uCPE devices.

Configure Teleworker Devices

Get secure access to your corporate network from the comfort of your home

Create Cellular Gateway Group

Enable high-speed 5G or LTE WAN connectivity with Cisco Catalyst Cellular Gateway

Create Configuration Group

1 Create Configuration Group

2 Site Configurations

3 Additional Features

4 Summary

Create Configuration Group

We'll guide you through the required settings to quickly configure your WAN. We'll also recommend smart defaults along the way.

Name

ex: EastCoastBranches

Description (optional)

ex: Intended for East Coast location

Follow the steps until completion



Cancel

Next

Using UX 2.0

Deploy Router
Configuration



NETWORK HIERARCHY MANAGER

Monitor

Search

Global (12 of 12 nodes) ▾

Core Region

France

Lyon

Marseille

Nice

Italy

Milan

Rome

Paris

Spain

Barcelona

Madrid

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Marseille

Auto-Generated Site

Type: SITE

Site ID: 2

Associated Devices: 1

Devices

Devices (1)



Search Table

Chassis Number	Site Name	Hostname	Tags	Config Locked	Managed By
C8K-D4CE7174-5261-7E6F-91EA-4926BCF4C2DD	Marseille	Edge2	-	Yes	Config-Group JMB_SDWAN_edge

Items per page: 25

1 - 1 of 1

< < > >>

Edge Router in Marseille

Monitor

Global (12 of 12 nodes) ▾

Core Region

France

Lyon

Marseille

Nice

Italy

Milan

Rome

Paris

Spain

Barcelona

Madrid

Nice

Type: SITE

Site ID: 4

Associated Devices: 1

Devices

Devices (1)

Chassis Number	Site Name	Hostname	Tags	Config Locked	Managed By	Device Status
C8K-3188FA44-8A8A-8392-0E4B-0DA5A445C10B	Nice	Edge4	-	Yes	Config-Group JMB_SDWAN_Border	In Sync

Items per page: 25 ▾ 1 - 1 of 1 |< < > >|

Border Router in Nice

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Configuration Groups

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System Profile 4

Transport & Management Profile 4

Policy Profile 1

Service Profile 3

CLI Add-on Profile 3

UC Voice Profile 0

→

Q Search

Last Updated

Status

Create Configuration Group

Export Import

Name	Type	Profile	Provisioning Status In Sync Devices / Associated Devices	Origin	Updated By	Last Updated On	Actions
JMB_SDWAN_Border	Single Router	5	2 / 2	user	admin	Jan 27, 2025	
JMB_SDWAN_edge	Single Router	5	3 / 3	user	admin	Jan 27, 2025	
edge_basic	Single Router	5	0 / 0	user	jmb	Jan 24, 2025	
JMB_Controller	Single Router	3	0 / 0	user	jmb	Dec 5, 2024	

 Configuration Group for Edge Router
Unfold to see definition



Configuration Groups

SD-WAN

[← Configuration Groups 4](#) [System Profile 4](#) [Transport & Management Profile 4](#) [Policy Profile 1](#) [Service Profile 3](#) [CLI Add-on Profile 3](#) [UC Voice Profile 0](#) →

Search

Last Updated

Status

Create Configuration Group

Export

Import

Name	Type	Profile	Provisioning Status In Sync Devices / Associated Devices	Origin	Updated By	Last Updated On	Actions
------	------	---------	---	--------	------------	-----------------	---------

JMB_SDWAN_Border	Single Router	5	● 2 / 2	user	admin	Jan 27, 2025	⋮
------------------	---------------	---	---------	------	-------	--------------	---

JMB_SDWAN_edge	SD-WAN Edge Router	○		Updated by admin	Updated Jan 27, 2025	⋮
----------------	--------------------	---	--	------------------	----------------------	---

Type: Single Router

System Profile

JMB_SDWAN_system

Transport & Management Profile

JMB_SDWAN_edge_wan

Policy Profile (optional)

Default_Policy_Object_Profile

Service Profile (optional)

JMB_SDWAN_edge_lan

CLI Add-on Profile (optional)

JMB_SDWAN_cli

+ Add Profile

Deployment

Associated ○ 3 devices

Provisioning ● 0 out of sync

Deploy

Click to display associated devices

edge_basic	Single Router	5	● 0 / 0	user	jmb	Jan 24, 2025	⋮
------------	---------------	---	---------	------	-----	--------------	---

JMB_Controller	Single Router	3	● 0 / 0	user	jmb	Dec 5, 2024	⋮
----------------	---------------	---	---------	------	-----	-------------	---

- Monitor
- Configuration
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Associated Devices

[← Configuration](#)[Search](#)[Search](#)[Global \(8 of 12 nodes\) ▾](#)[Name](#)[Unassigned](#)[France](#)[Lyon](#)[Marseille](#)[Nice](#)[Spain](#)[Barcelona](#)[Madrid](#)[JMB_SDWAN](#)[Type: Single R](#)[System Pro](#)[JMB_SDWAN](#)[Policy Prof](#)[Default_F](#)[CLI Add-on](#)[JMB_SDWAN](#)[+ Add Profil](#)[edge_basic](#)[JMB_Control](#)

Devices (20)

[Search Table](#)3 selected [Add and Edit Rules](#)As of: Jan 27, 2025 10:30 AM [↻](#)

Chassis Numbers	Site Name	Hostname	Tags	Config Locked	System IP	Site ID
<input checked="" type="checkbox"/> C8K-3D1A8960-6E76-532C-DA93-50626FC5797E	Lyon	Edge1	-	Yes	10.0.0.1	1
<input checked="" type="checkbox"/> C8K-D4CE7174-5261-7E6F-91EA-4926BCF4C2DD	Marseille	Edge2	-	Yes	10.0.0.2	2
<input checked="" type="checkbox"/> C8K-27148AFE-7160-69D3-ACC5-F77560530D63	Barcelona	Edge3	-	Yes	10.0.0.3	5
<input type="checkbox"/> C8K-3188FA44-8A8A-8392-0E4B-0DA5A445C10B	Nice	Edge4	-	Yes	10.0.0.4	4
<input type="checkbox"/> C8K-3A3DD488-D04F-3204-90F5-2E754FD14877	Madrid	Edge5	-	Yes	10.0.0.5	3
<input type="checkbox"/> C8K-5BAF9C99-7676-401F-9DFE-B1A3BEBD644B	-	-	-	No	-	-
<input type="checkbox"/> C8K-4A88C7BA-BC26-2009-F933-641392D21AB5	-	-	-	No	-	-
<input type="checkbox"/> C8K-C38D156C-34E4-909A-15BB-96D0E9D0E808	-	-	-	No	-	-
<input type="checkbox"/> C8K-40C0CCFD-9EA8-2B2E-E73B-32C5924EC79B	-	-	-	No	-	-
<input type="checkbox"/> C8K-E94D7B88-4B9E-3323-C6C3-F29079FAAC3B	-	-	-	No	-	-
<input type="checkbox"/> C8K-B5EE117E-1210-C396-EC41-D3DA64D6A51A	-	-	-	No	-	-
<input type="checkbox"/> C8K-83E4B5EE-52AC-075F-B5E4-0050110680F3	-	-	-	No	-	-
<input type="checkbox"/> C8K-D4D8222C-26DA-83D1-EFA8-EAA6C881AFBF	-	-	-	No	-	-
<input type="checkbox"/> C8K-5E6700EE-DE0E-91D0-ED4A-6E00720A0AEB	-	-	-	No	-	-

[Cancel](#)[Save](#)

Configuration Groups

SD-WAN

← Configuration Groups 4

System Profile 4

Transport & Management Profile 4

Policy Profile 1

Service Profile 3

CLI Add-on Profile 3

UC Voice Profile 0

→

Search

Last Updated

Status

Create Configuration Group

Export

Import

Name	Type	Profile	Provisioning Status In Sync Devices / Associated Devices	Origin	Updated By	Last Updated On	Actions
JMB_SDWAN_Border	Single Router	5	● 2 / 2	user	admin	Jan 27, 2025	⋮
JMB_SDWAN_edge	SD-WAN Edge Router	○		Updated by admin	Updated Jan 27, 2025	⋮	^
<p>Type: Single Router</p> <p>System Profile JMB_SDWAN_system ○ ○</p> <p>Transport & Management Profile JMB_SDWAN_edge_wan ○ ○</p> <p>Policy Profile (optional) Default_Policy_Object_Profile ○ ○</p> <p>Service Profile (optional) JMB_SDWAN_edge_lan ○ ○</p> <p>CLI Add-on Profile (optional) JMB_SDWAN_cli ○ ○</p> <p>+ Add Profile</p>							
<div style="border: 2px solid red; padding: 10px;"><p>Deployment</p><p>Associated ○ 3 devices</p><p>Provisioning ● 0 out of sync</p><p>Deploy</p></div> <div style="background-color: #e0f2ff; border-radius: 10px; padding: 10px; margin-top: 10px;"><p>Click to deploy</p></div>							
edge_basic	Single Router	5	● 0 / 0	user	jmb		⋮
JMB_Controller	Single Router	3	● 0 / 0	user	jmb	Dec 5, 2024	⋮



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Explore

Deploy Configuration Group



Select Devices to Deploy

Select the devices below to deploy

 Search Global (5 of 12 nodes) ▾ France ▾ Lyon Marseille Spain ▾ Barcelona

Edge Devices (3)

 Search Table

2 selected

Chassis Numbers	Site Name	Hostname	System IP	Tags	Last Con
<input checked="" type="checkbox"/> C8K-27148AFE-7160-69D3-ACC5-F77560530D63	Barcelona	Edge3	10.0.0.3	None	Jan 27, 2024
<input type="checkbox"/> C8K-3D1A8960-6E76-532C-DA93-50626FC5797E	Lyon	Edge1	10.0.0.1	None	Jan 27, 2024
<input checked="" type="checkbox"/> C8K-D4CE7174-5261-7E6F-91EA-4926BCF4C2DD	Marseille	Edge2	10.0.0.2	None	Jan 27, 2024

Items per page: 25 ▾

1 – 3 of 3

[Cancel](#)[Next](#)

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1

Add and Review Device Configuration

We've autogenerated minimal configurations to make it easier for you to bring up your devices.
Modify them as needed and directly edit the table to add System IP and Site IDs.

2

3

Region pre-selected
from NHM

 Search

Global

Spain

Barcelona

France

Marseille

Chassis Number:Edge2 - C8K-D4CE7174-5261-7E6F-91EA-4926BCF4C2DD

JMB_SDWAN_system (system)

[Import](#) [Export](#)

2 Optional

edge_basic_system (basic)

System IP

10.0.0.2

Host Name

Edge2

Site Id

2

Dual Stack IPv6 Default (...)

False

Region (optional)

France

edge_basic_aaa (aaa)

aaa_password

[Cancel](#)[Review](#)[Back](#)[Next](#)



Monitor

Deploy Configuration Group



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Explore

Summary

Please review the details.

Selected Devices (2) [Preview CLI](#) [Edit Device List](#)

Q Search Table

Device ID	System IP	Host Name	Site Id	Dual Stack IPv6 Default	Rollback Timer (sec)	Ref
C8K-D4CE7174-5261-7E6F-91EA-4926BCF4C2DD	10.0.0.2	Edge2	2	false	300	Fra
C8K-27148AFE-7160-69D3-ACC5-F77560530D63	10.0.0.3	Edge3	5	false	300	Sp

2 Records

Items per page: 25

1 - 2 of 2

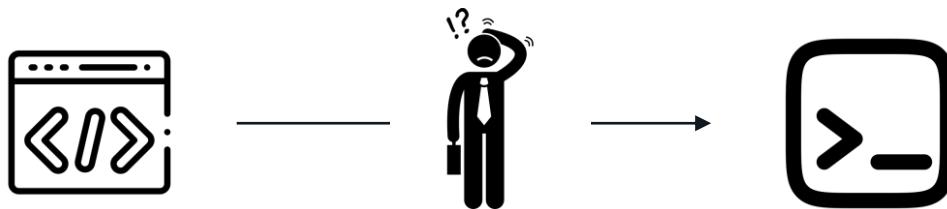
|< < > >|

[Cancel](#)

[Back](#)

[Deploy](#)

Wait ... You still want to see the CLI right?



Deploy Configuration Group

Monitor



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Explore

Summary

Please review the details.

Selected Devices (2)

[Preview CLI](#)[Edit Device List](#)

Search Table

Device ID	System IP	Host Name	Site Id	Dual Stack IPv6 Default	Rollback Timer (sec)	Ref
C8K-D4CE7174-5261-7E6F-91EA-4926BCF4C2DD	10.0.0.2	Edge2	2	false	300	Fra
C8K-27148AFE-7160-69D3-ACC5-F77560530D63	10.0.0.3	Edge3	5	false	300	Sp

2 Records

Items per page: 25

1 - 2 of 2

Check CLI .. just in case ☺

[Cancel](#)[Back](#)[Deploy](#)

Configuration can't be easier ...

Core - Controller01

```
system  
region 0
```

Access - Controller02

```
system  
region 1 2 3
```

- Dedicated Controller for core
- OMP session will not come up if core Controller shared with access region

Edge Router - Edge1

```
system  
system-ip 1.1.1.11  
overlay-id 1  
site-id 1  
region 1  
!  
role edge-router  
!  
sdwan  
interface GigabitEthernet1  
tunnel-interface  
color biz-internet  
exit  
exit
```

- All Transport Interfaces in access region

Border Router - Edge4

```
system  
site-id 4  
region 1  
role border-router  
!  
sdwan  
interface GigabitEthernet1  
tunnel-interface  
encapsulation ipsec  
color biz-internet  
!  
[snip]  
!  
interface GigabitEthernet3  
tunnel-interface  
encapsulation ipsec  
region core  
color private1  
!
```

- Do not forget to configure service VPNs if you want to receive and re-advertise routes

Border Routers



Configuration Groups

SD-WAN

[← Configuration Groups 4](#)[System Profile 4](#)[Transport & Management Profile 4](#)[Policy Profile 1](#)[Service Profile 3](#)[CLI Add-on Profile 3](#) →

Q Search

Last Updated

Status

Create Configuration Group

Export

Import

Name

Type

Profile

Provisioning Status

In Sync Devices / Associated Devices

Origin

Updated By

Last Updated On

Actions

JMB_SDWAN_Border

SD-WAN Border Router

Updated by admin

Updated Jan 27, 2025

Type: Single Router

System Profile

JMB_SDWAN_Border_system

Transport & Management Profile

JMB_SDWAN_Border_wan

Policy Profile (optional)

Default_Policy_Object_Profile

Service Profile (optional)

JMB_SDWAN_Border_Jan

CLI Add-on Profile (optional)

JMB_SDWAN_Border_cli

Deployment

Associated 2 devices

Provisioning 0 out of sync

Deploy

[+ Add Profile](#)

Configure VPN

JMB_SDWAN_edge

Single Router

5

3 / 3

user

admin

Jan 27, 2025

Rows per page

10

<

1

>

Go to:

1

/ 1



16



← Configuration Groups (JMB_SDWAN_Border - Service Profile)

JMB_SDWAN_Border_lan [Edit](#)

DEVICE SOLUTION
SD-WANMODIFIED BY
AdminLAST UPDATED
Jan 27, 2025 08:40:46SHARED
[1 Group](#) Search[Add New Feature](#)

Service VPN

 [Edit](#) [Delete](#)

Ethernet Interface

 [Edit](#) [Delete](#)[Feedback](#)
[Configure VPN](#)[Back](#)

No Changes Made



Monitor



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Explore

← Configuration Groups (JL)

JMB_SDWAN

DEVICE SOLUTION

SD-WAN

Search

Service VPN

edge_basic_vpn1

Ethernet Interface

edge_basic

Service VPN

Name

edge_basic_vpn1

Description (optional)

Do not modify!

Basic Configuration

DNS

Host Mapping

Advertise OMP

Route

More

VPN



1

Description



VPN 1

OMP Admin Distance IPv4



<SYSTEM DEFAULT>

OMP Admin Distance IPv6



<SYSTEM DEFAULT>

 Enable SDWAN Remote Access

Back

No Changes M

Cancel Save

Feedback

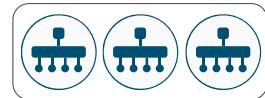
What About Controllers?



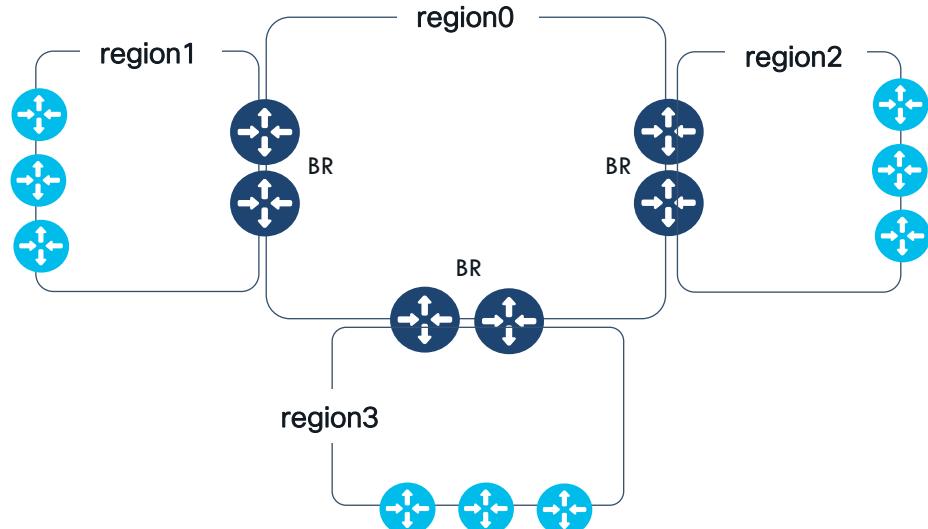
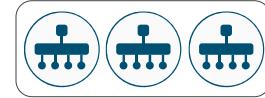
SD-WAN Manager (vManage)

- Connected to ALL devices in the SD-WAN Overlay
- Check recommendations with or without Application Intelligence Engine (SAIE)
- Ensure connectivity to controllers
- Cloud hosted or On Prem

SD-WAN Manager
(active)



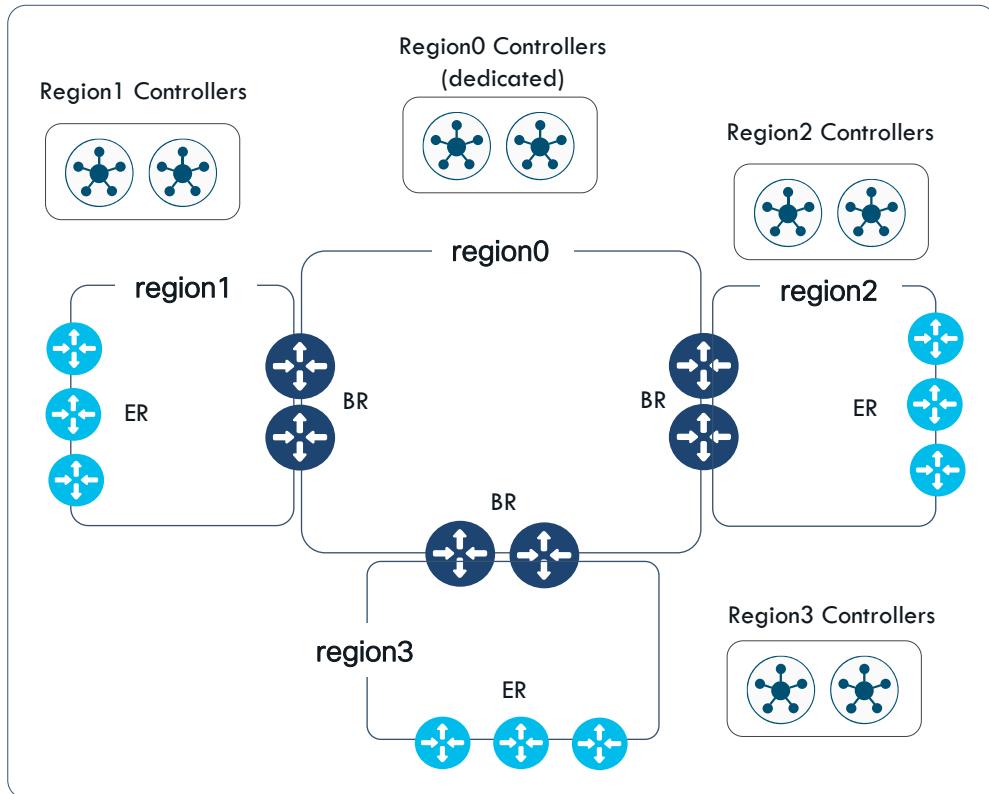
SD-WAN Manager
(backup/DR)



<https://www.cisco.com/c/en/us/td/docs/routers/sdwan/release/notes/compatibility-and-server-recommendations/ch-server-recs-20-12-combined.html>

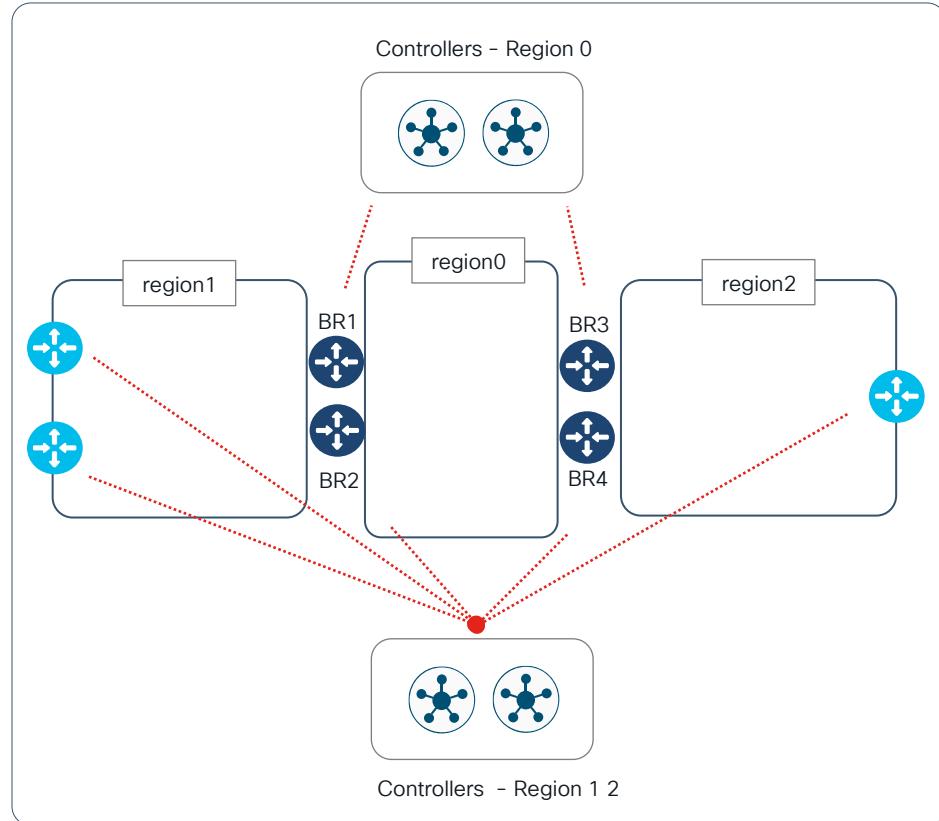
SD-WAN Controllers (vSmarts)

- Dedicated Controllers for Core (region 0)
- Controllers for access regions (Shared Controllers as an option)



Shared Controllers

- Same Controller can serve multiple access regions
- Controller for region0 cannot be shared with any access region
- Controller with some partial overlapping regions is not supported.
 - ~~vs1: [1, 2, 3], vs2: [1, 2, 4]~~

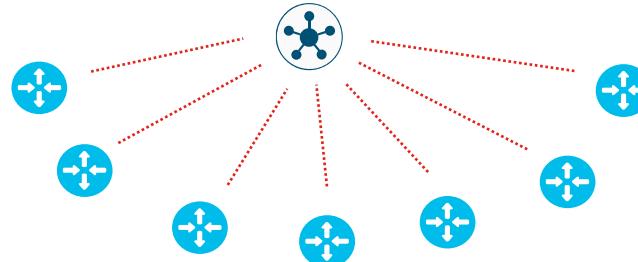


SD-WAN Controller Scaling based on Regions

Number of devices matters

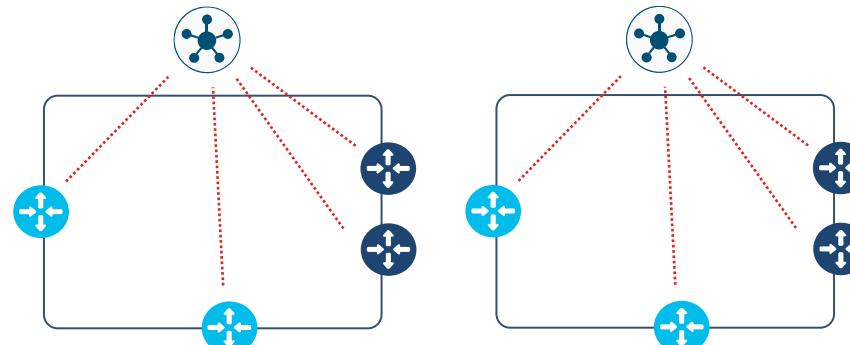
Flat

- All devices connected
- Rib-out – replicate prefixes to all routers



Per region Controller

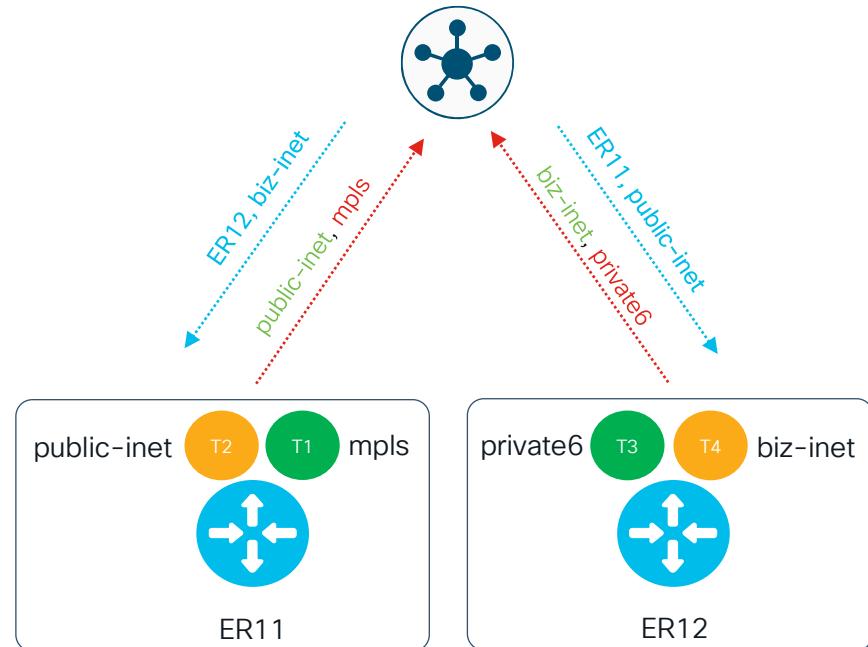
- Lower number of devices connected per region, per Controller
- Lower number of next-hops/paths per prefix per VPN



- Number of prefixes in
- Replicated to devices connected to region Controllers

Smart Path Filtering

- By default, Controllers send paths of all available TLOC colors (WAN transports) to the edge routers, regardless if the receiving edges have those TLOCs (transports) or not
- **Improvement:**
 - Pick paths which an edge router will require vs don't require, thereby optimizing path received on devices and help in scale without using policy constructs
 - By default:
 - All public colors/transports are assumed to be compatible/reachable
 - Private colors of the same name are assumed compatible
 - User can override



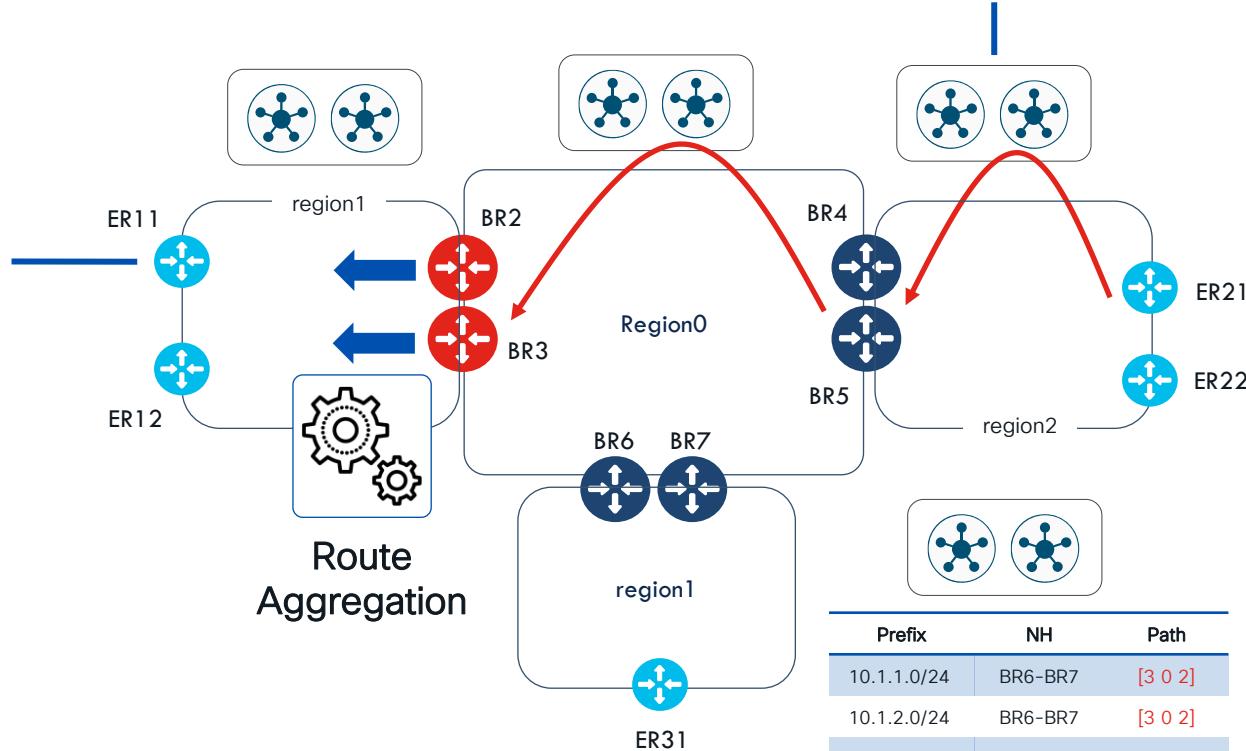
Route Aggregation

ER11 OMP ROUTES		
Prefix	NH	Path
10.1.1.0/24	BR2	1 0 2
10.1.1.0/24	BR3	1 0 2
10.1.2.0/24	BR2	1 0 2
10.1.2.0/24	BR3	1 0 2
10.1.3.0/24	BR2	1 0 2
10.1.3.0/24	BR2	1 0 2



Route Aggregation

Prefix	NH	Path
10.1.0.0/16	BR2	1 0 2
10.1.0.0/16	BR3	1 0 2



Catalyst SD-WAN

Description: Border Routers

DEVICE SOLUTION: sdwan MODIFIED BY: jbarozet LAST UPDATED: Jan 25, 2024 02:52:15

Feature Profiles Associated Devices

Associated Profiles (4) ↗

- > System Profile: Border_Basic Shared: 1 Groups Actions ↓
- > Transport & Management Profile: Border_WAN Shared: 1 Groups Actions ↓
- < Service Profile: Border_LAN Shared: 1 Groups Actions ↓

Search Table

Add Feature

Type	Feature Name	Description	Sub-Feature	Actions
VPN	VPN11	LAN VPN	-	...
VPN	VPN_11	LAN Interface	-	View Details

1 Record Items per page: 25 1–100

Service VPN template

Associate Sub Feature Add Sub Feature

Edit Feature Delete Feature

Catalyst SD-WAN

Description: Border Routers

DEVICE SOLUTION: sdwan MODIFIED BY: jbarozet LAST UPDATED: Jan 25, 2024 02:52:15

Feature Profiles Associated Devices

Edit Service VPN Feature

LAN Service VPN

Name*: VPN11 Description: LAN VPN

Basic Configuration DNS Host Mapping Advertise OMP Route Service More

OMP Advertise IPv4 (1)

Add OMP Advertise IPv4

Protocol	Route Policy	IPv4 Prefix List	Action
aggregate		1	

Feedback

OMP Advertise IPv6

Add OMP Advertise IPv6

Protocol	Route Policy	IPv6 Prefix List	Action
			There is no data.

Cancel Save

Cisco Catalyst SD-WAN

Description: Border Routers

DEVICE SOLUTION: sdwan MODIFIED BY: jbarozet LAST UPDATED: Jan 25, 2024 02:52:15

Feature Profiles Associated Devices

Edit Service VPN Feature

Name*: VPN11 Description: LAN Service VPN

OMP Advertise

Add OMP Advertise

Protocol: aggregate

OMP Advertise

Add OMP Advertise

Protocol:

Edit Service VPN Feature

LAN Service VPN

Edit OMP Advertise IPv4

Protocol*: aggregate

New Aggregate

Aggregate Only: Applied to Region*: access

Network Address*: 10.0.0.0 Subnet Mask*: 255.0.0.0

Cancel Update

Feedback

CISCO Live!

Monitoring

Monitor

Monitor

All Sites

Overview

Devices

Applications

Security

Multicloud

Tunnels

Logs

Configuration

Analytics

Workflows

Tools

Reports

Maintenance

Admin

Explore

30 Minutes

Search



As of: Jan 27, 2025 12:56 PM

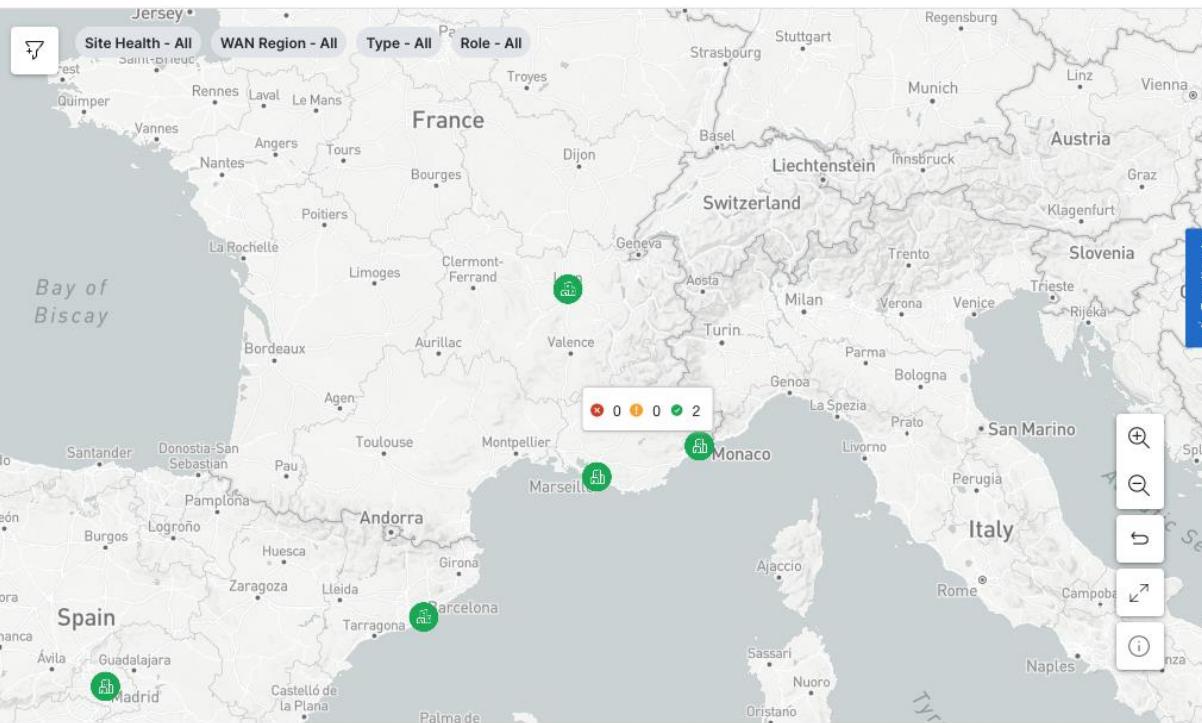
Topology Views

Map

WAN Region

Site Health 0 0 6

Tunnel Health 0 0 18

Topology Map

Monitor

All Sites

Monitor

Configuration

Analytics

Workflows

Tools

Reports

Maintenance

MRF Regions

Explore

Overview

Devices

Applications

Security

Multicloud

Tunnels

Logs



Global Region View

30 Minutes

As of: Jan 27, 2025 10:55 AM

Topology Views

Map WAN Region

X

Site Health

Name

Italy 0 0 0

France 0 0 3

Spain 0 0 2

Tunnel Health

Name

0 0 0

Spain 0 0 12

Spain 0 0 4

Italy

0

Border

France

1

Border

2

Edge

Check details

Core Region

Spain

1

Border

1

Edge





Monitor

All Sites

Overview

Devices

Applications

Security

Multicloud

Tunnels

Logs



Monitor



Configuration



Analytics



Workflows



Tools



Reports



Maintenance



Administration



Explore

30 Minutes

Site Health (3)

Search Table

Site Name	Site Health	Devices Health	Tunnels Health	Apps Health	Apps Usage
Lyon				-	20.23 KB
Marseille				-	0 B
Nice				-	0 B

Items per page: 8

1 - 3 of 3

 France 0 0 **12** Spain 0 0 **4** 

Monitor All Sites

Overview Devices Applications Security Multicloud Tunnels Logs



Configuration

Analytics

Workflows

Tools

Reports

Maintenance

Administration

Explore

SD-WAN Tunnels SIG/SSE Tunnels

24 Hours

SD-WAN Tunnels (18)

Monitor hop-by-hop tunnels

Export

Search Table

As of: Jan 27, 2025 11:33 AM

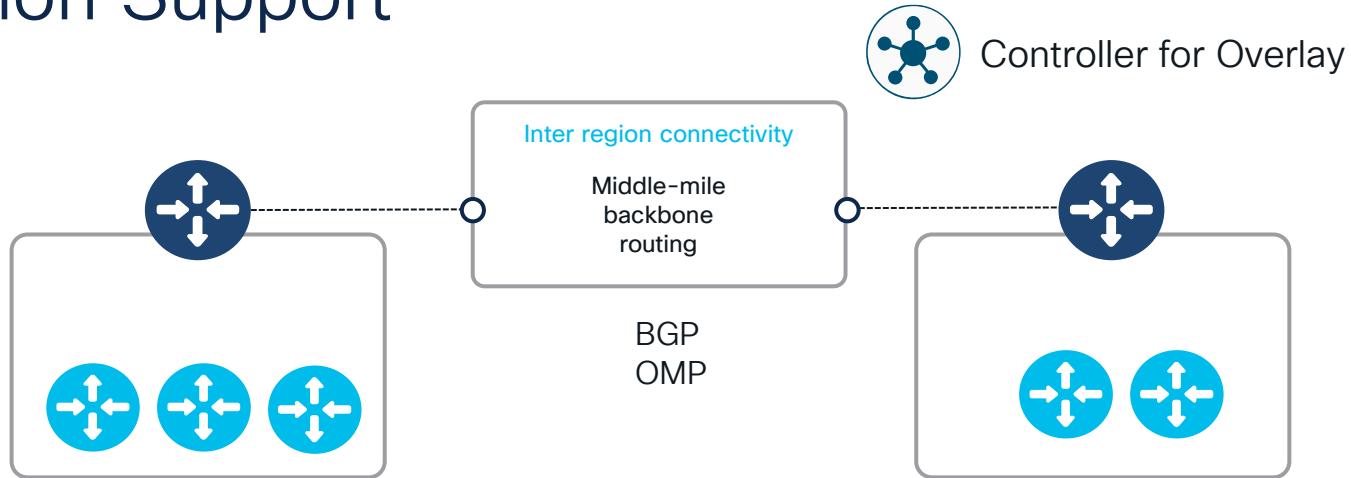
Tunnel Endpoints	Health	State	QoE	Avg. Latency (ms)	Avg. Loss (%)	Avg. Jitter (ms)	Local IP	Remote IP	Action
Edge2:biz-internet-Edge4:biz-internet			10.00	1.00	0.00	0.00	10.0.0.2	10.0.0.4	
Edge1:mpls-Edge4:mpls			10.00	1.00	0.00	0.00	10.0.0.1	10.0.0.4	
Edge4:biz-internet-Edge2:biz-internet			10.00	1.00	0.00	0.00	10.0.0.4	10.0.0.2	
Edge1:mpls-Edge2:mpls			10.00	1.00	0.00	0.00	10.0.0.1	10.0.0.2	
Edge4:mpls-Edge2:mpls			10.00	1.00	0.00	0.00	10.0.0.4	10.0.0.2	
Edge4:biz-internet-Edge1:biz-internet			10.00	1.00	0.00	0.00	10.0.0.4	10.0.0.1	
Edge1:biz-internet-Edge2:biz-internet			10.00	1.00	0.00	0.00	10.0.0.1	10.0.0.2	
Edge2:biz-internet-Edge1:biz-internet			10.00	1.00	0.00	0.00	10.0.0.2	10.0.0.1	

Feedback

Migrating to MRF



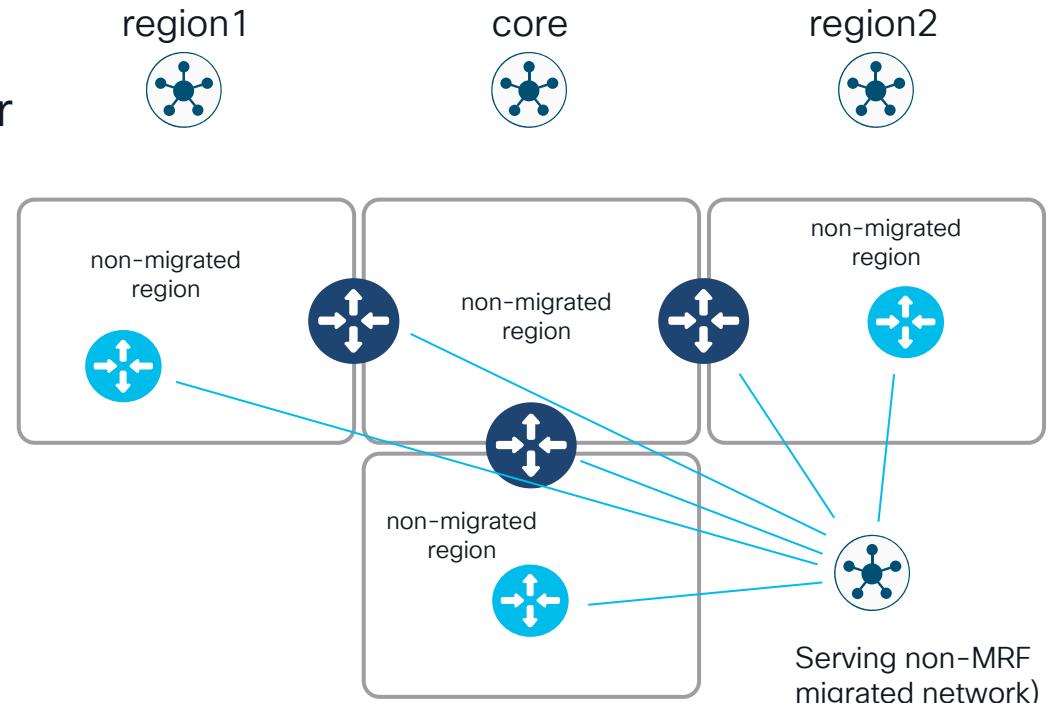
Migration Support



- There are many existing SD-WAN deployments that have the concept of a region, but it is achieved indirectly using complex control policies or by using BGP in the core and doing mutual redistribution between BGP and OMP on the border routers
- In addition to the operational complexity of these networks, some of them are also vulnerable to traffic blackholing scenarios since they don't react to dynamic network events

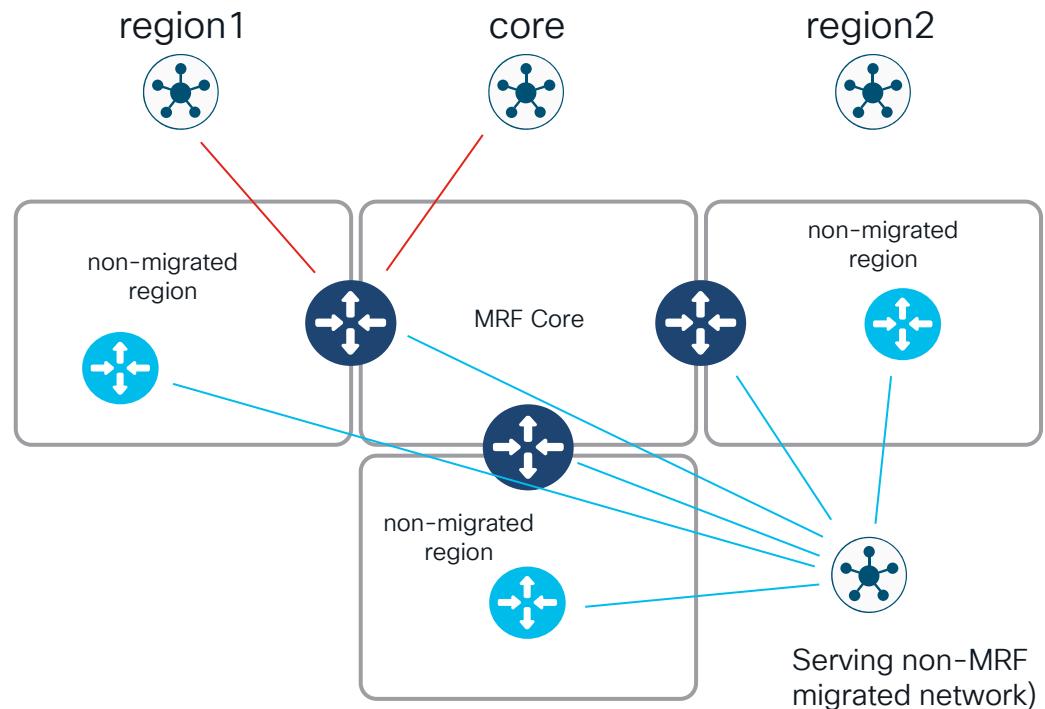
Migration Support – Add Controllers

- Keep existing (default) controller
- Add controllers for regions



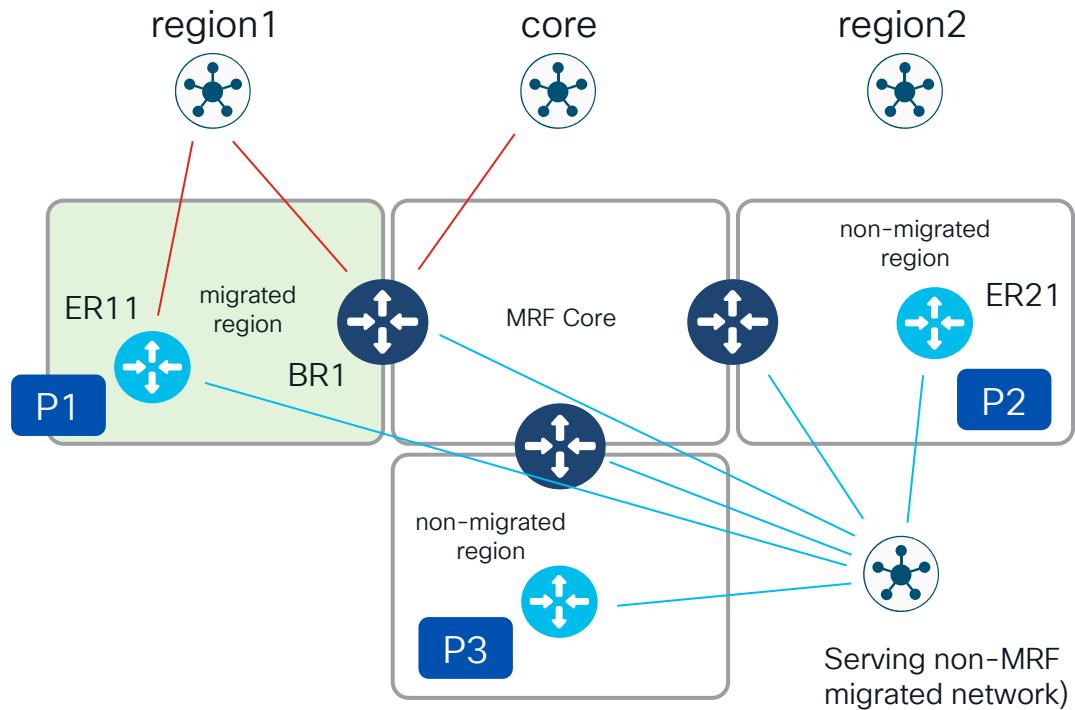
Migration Support – Migrate Core

- Enable migration mode on all BR and Edge routers
- Enable region/role/core tloc on BRs



Migration Support – Migrate Access Regions

- Enable region on edges
- **Keep your existing control plane policies until migration to MRF is fully completed**
- Migrated regions
 - Routes advertised to region controller AND default controller
- Non migrated regions
 - Routes advertised to default controller



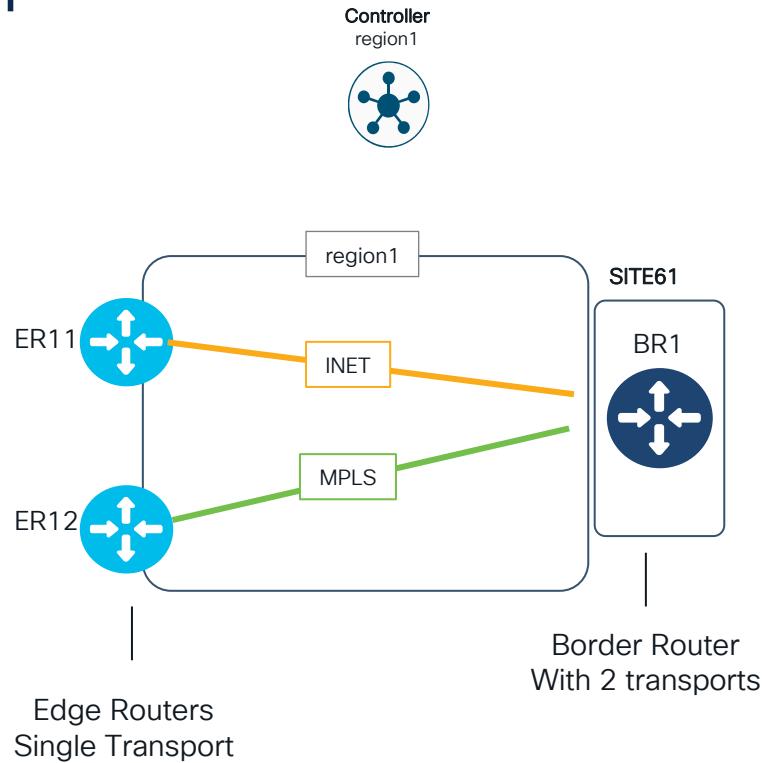
Connecting Disjoint WAN Transports in a given Region

Dis-Joint Transport Problem

Use Case

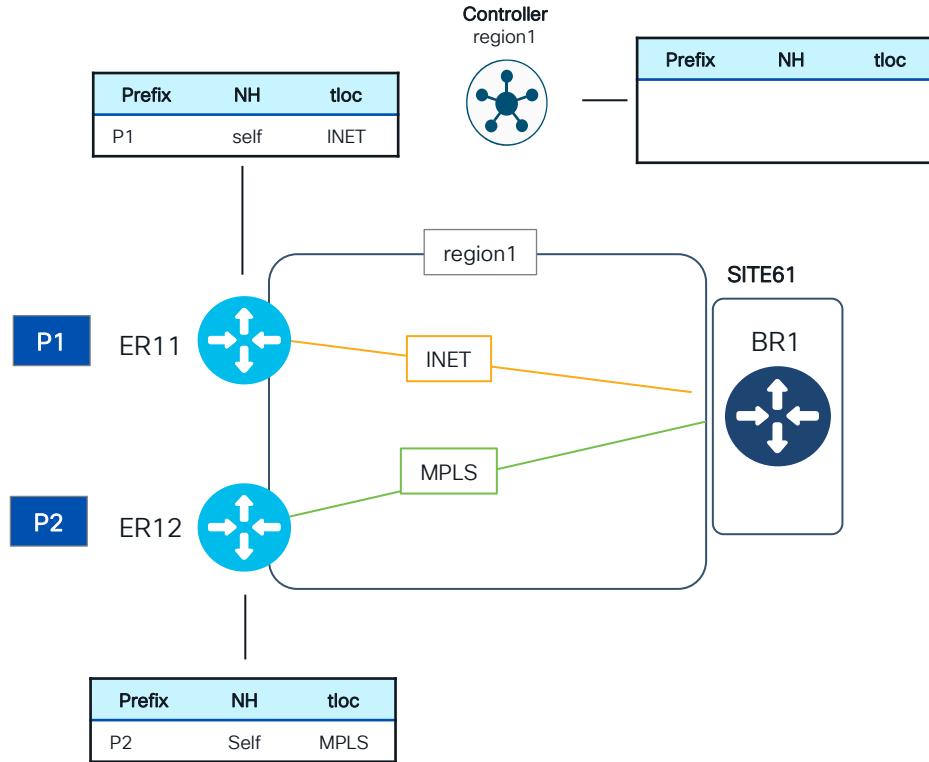
- Single Branch sites connected to separate transports
- Connect them using a Hub or Gateway
- Dynamic / Automated

- By default,
Controller reflects route with next hop
TLOC of originator
- Ability to change this behavior by
modifying TLOC to set it for central hub
(BR1)



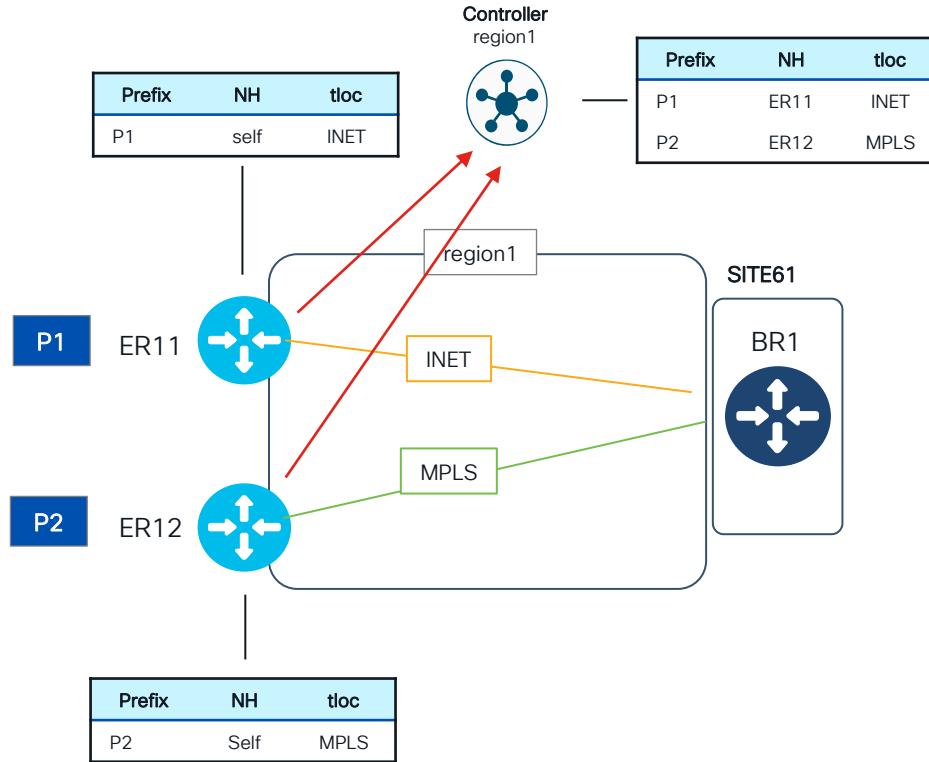
Dis-Joint Transport Problem

VPN subnets



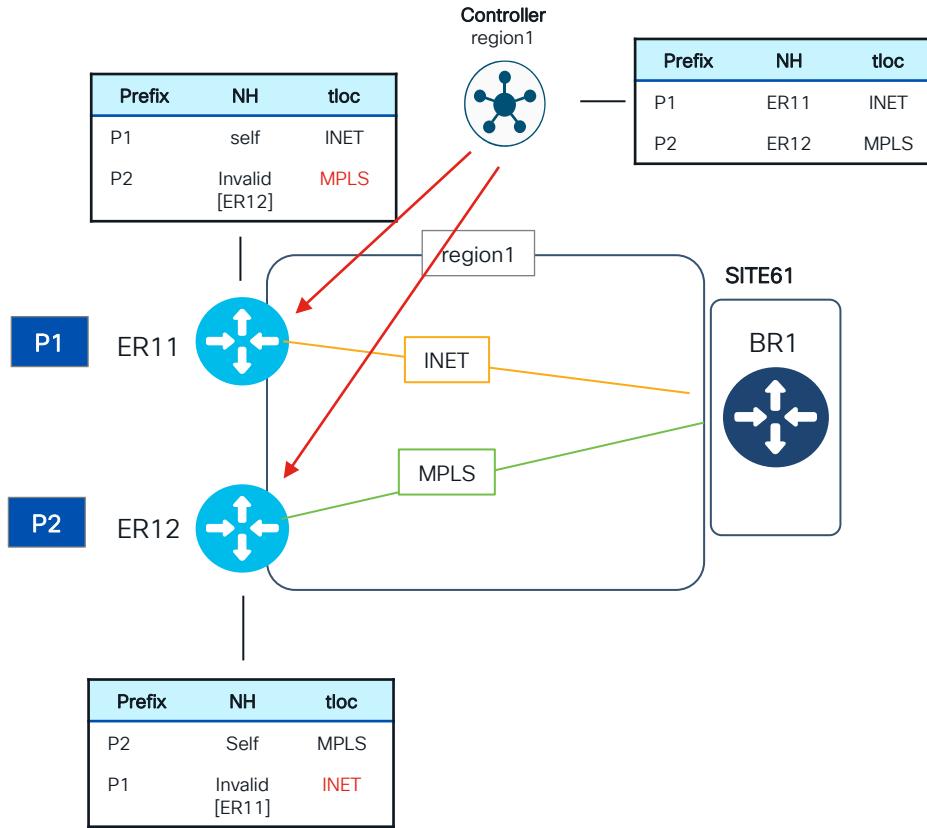
Dis-Joint Transport Problem

OMP updates to controller



Dis-Joint Transport Problem

Controller sends OMP routes and tlocs to edge routers

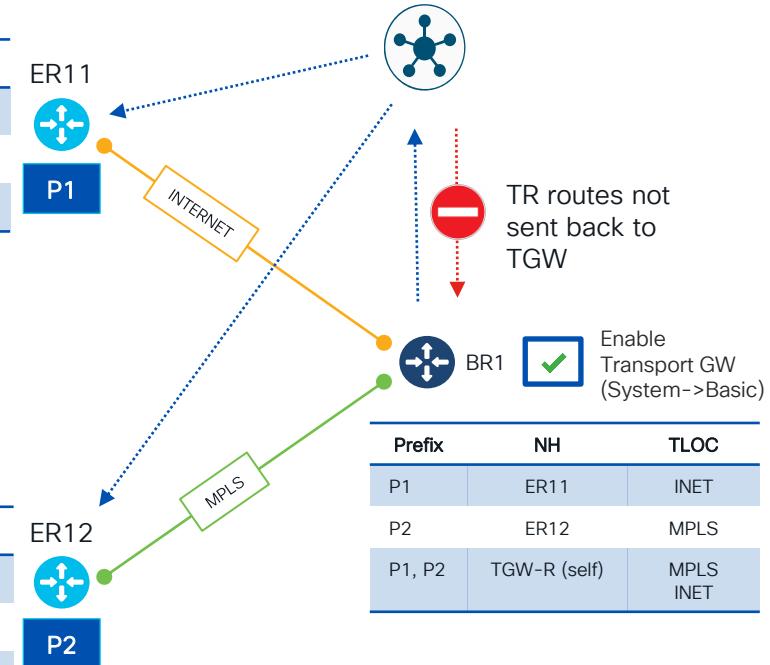


Introducing Transport Gateway

- Simple easy check knob
- No need of control policies
- Works both on ER and BR
- Automatically withdraw routes, avoids blackholing
- ECMP with Multiple TRs within region
- Access region only, i.e no re-origination to/from core
- IOS-XE only

Prefix	NH	TLOC
P2	Invalid [ER12]	MPLS
P2	Valid [BR1]	INET
P2	Invalid [BR1]	MPLS

Prefix	NH	TLOC
P1	Invalid [ER11]	INET
P1	Valid [BR1]	MPLS
P1	Invalid [BR1]	INET



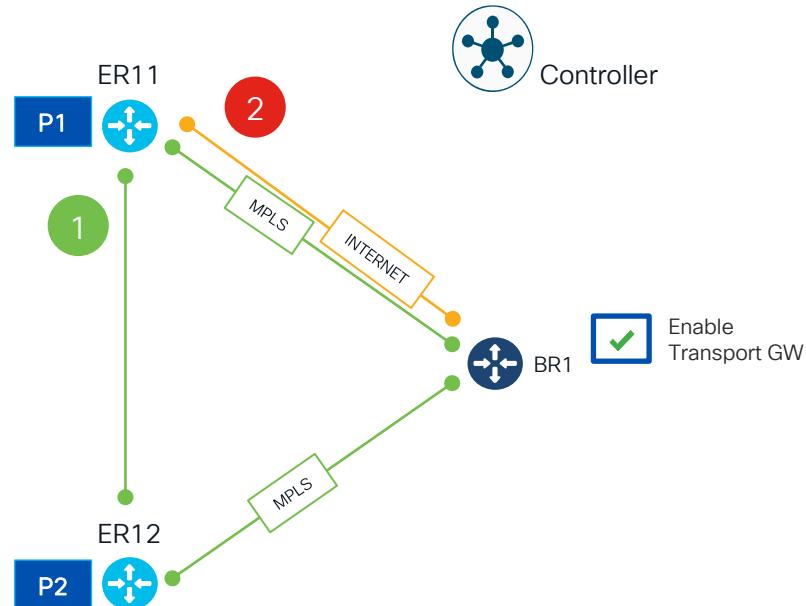
Controller learns via capability-exchange which node is working as a transit-router

Transport Gateway

Direct Tunnels vs Transport Gateway

- Default routing
 - ER11 dual transport (INET + MPLS)
 - ER12 single transport (MPLS)

- ER11 Routing Table
 - DIRECT = P2 nexthop **ER12** tloc **mpls**
 - INDIRECT = P2 nexthop **BR1** tloc **internet**
- ▶ PREFER DIRECT (Default)

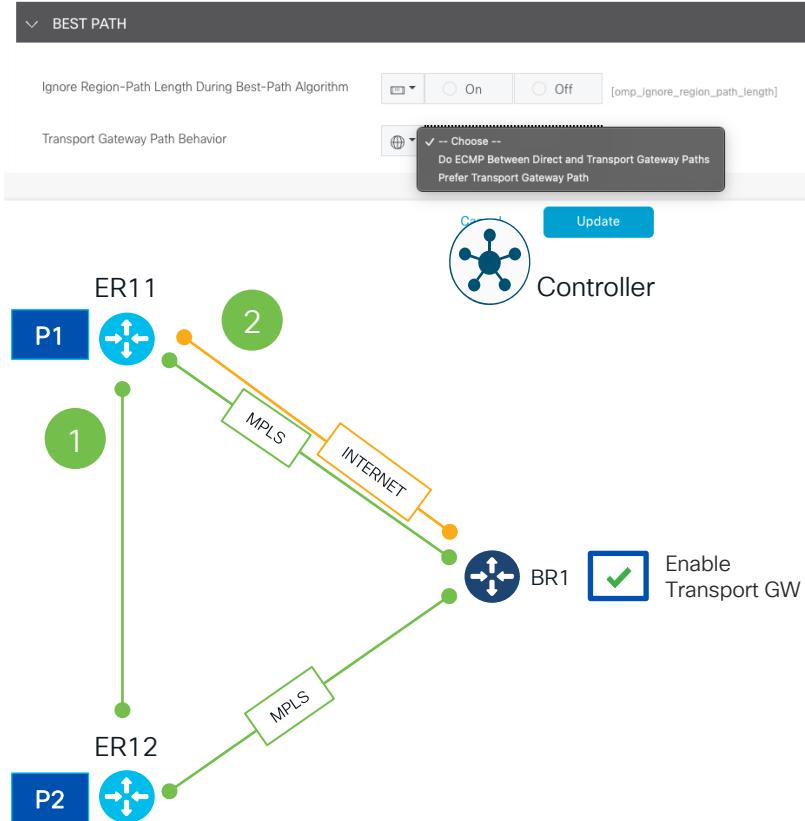


Transport Gateway

Direct Tunnels vs Transport Router

- ER11 dual transport (INET + MPLS)
- ER12 single transport (MPLS)
- OMP KNOB:
 - ECMP Direct and TR
 - Prefer TR

- ER11 Routing Table
 - DIRECT = P2 nexthop **ER12** tloc **mpls**
 - INDIRECT = P2 nexthop **BR1** tloc **internet**
- ▶ PREFER DIRECT (Default)
- ▶ OR ECMP
- ▶ OR PREFER TR



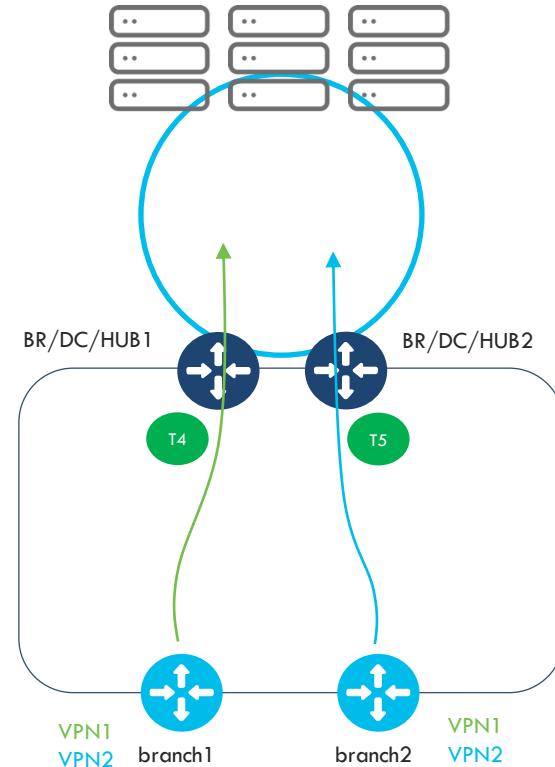
Horizontal Scaling at your regional hubs/Colo/PoPs



Border Routers Horizontal Scaling- Use-case

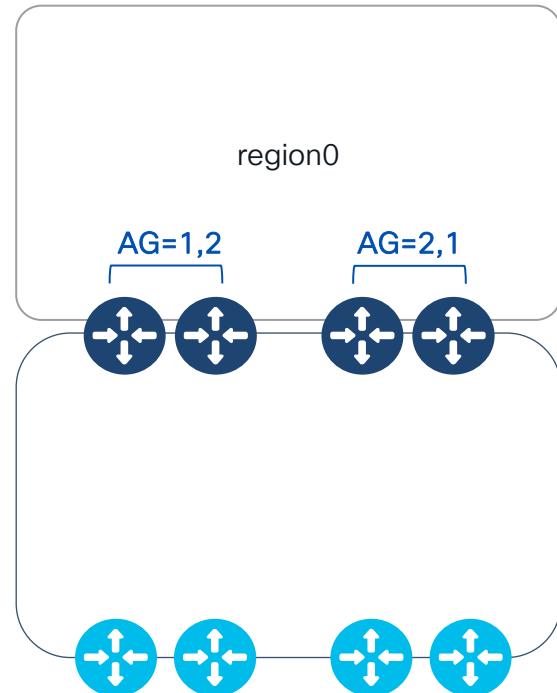
Use Case

- Horizontally scale Border Routers
- Automated based on intent configuration
- Controller intelligently pin branches to relevant BR/DC/HUB without using policies



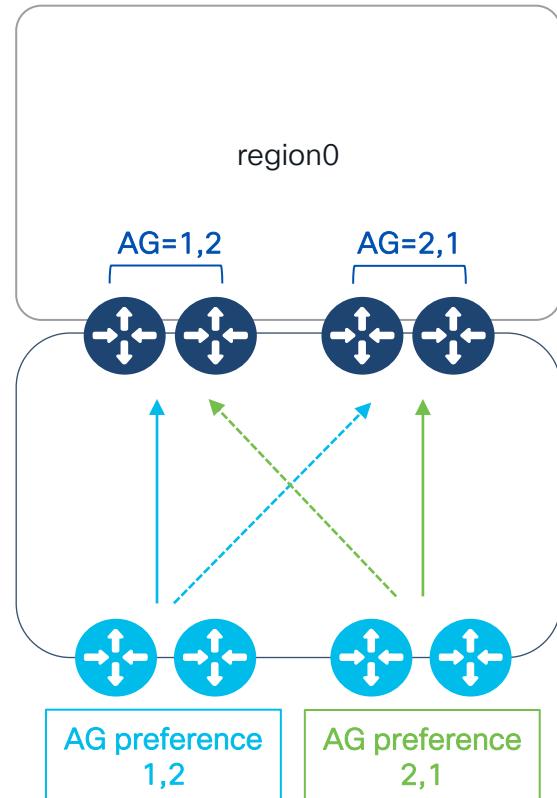
Introducing Affinity Groups

- Router affinity groups can help with capacity planning and load balancing
- Direct traffic from a device to specific routers when more than one router is available for a next hop
- Affinity groups (AG) are defined as a list of numbers (from 1 to 63).
- Border Routers:
 - Assign Border Routers to primary Affinity Group and fallback
 - This could be any router, but BR is a common choice



Introducing Affinity Groups Preference

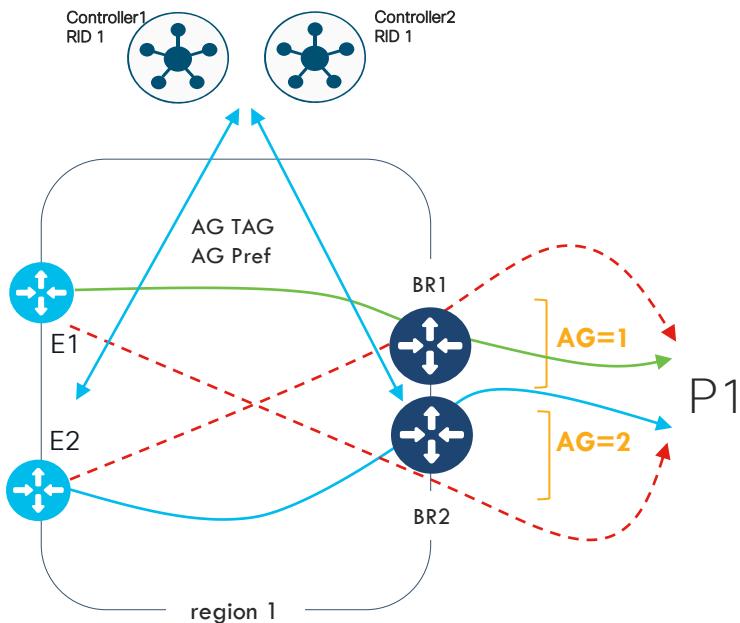
- Define the **priority order** for selecting the **next hop** router using a list of affinity group IDs.
- Configured under the system settings on the Edge Router or per TLOC
- Edge Routers with AG preference=1,2 will prefer to build tunnels and forward traffic to BRs with AG=1,2
- If BRs serving AG=1,2 go down, then branches fallback to BRs serving AG=2,1
- Control policy should allow matching based on AG or AG-list



Affinity Groups

AG pref=1,2			
Pfx	Next Hop	AG	State
P1	BR1	AG1	ACTIVE
P1	BR2	AG2	BACKUP

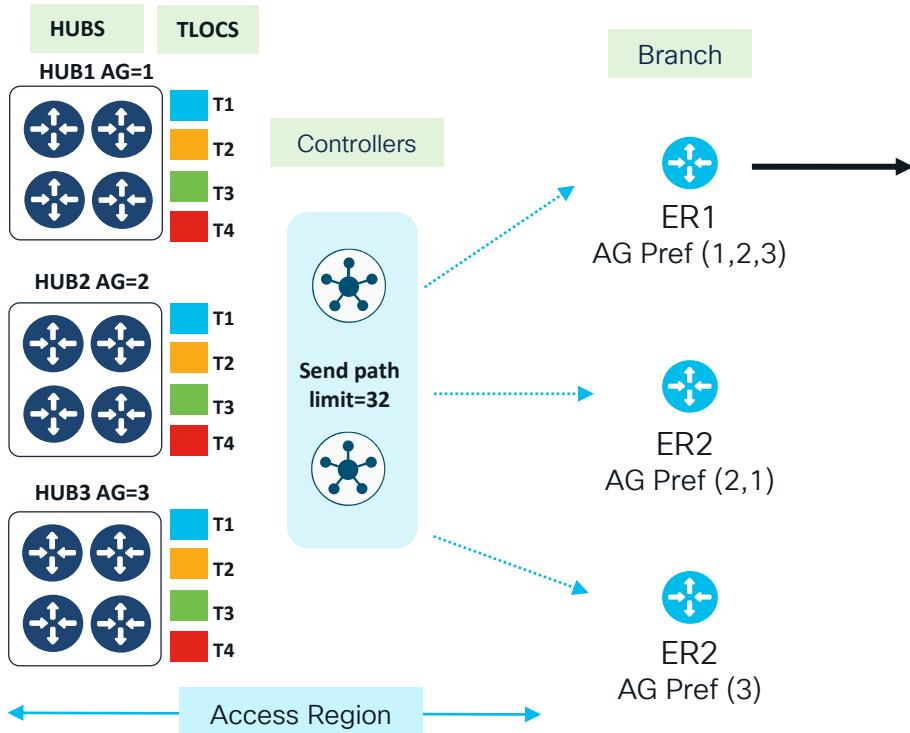
AG pref=2,1			
Pfx	Next Hop	AG	State
P1	BR2	AG2	ACTIVE
P1	BR1	AG1	BACKUP



- Device communicates Affinity group and preference to Controller during OMP peering.
 - Controller by default ignores affinity values and propagates the routes to all the edges with affinity tags
- Device gets all the routes based on configured affinity Pref and installs them in order of preference for forwarding.
 - Backup path is installed only when all the path with primary affinity groups are gone
 - Routes with no affinity configured will also be allowed if its not competing with any affinity for the same routes.
- Can configure multiple affinity preference
- Optional knob on Controller to filter only routes with affinity which devices is configured with.

Routes to Peer Devices – Before 20.9

Common Prefix



Branch

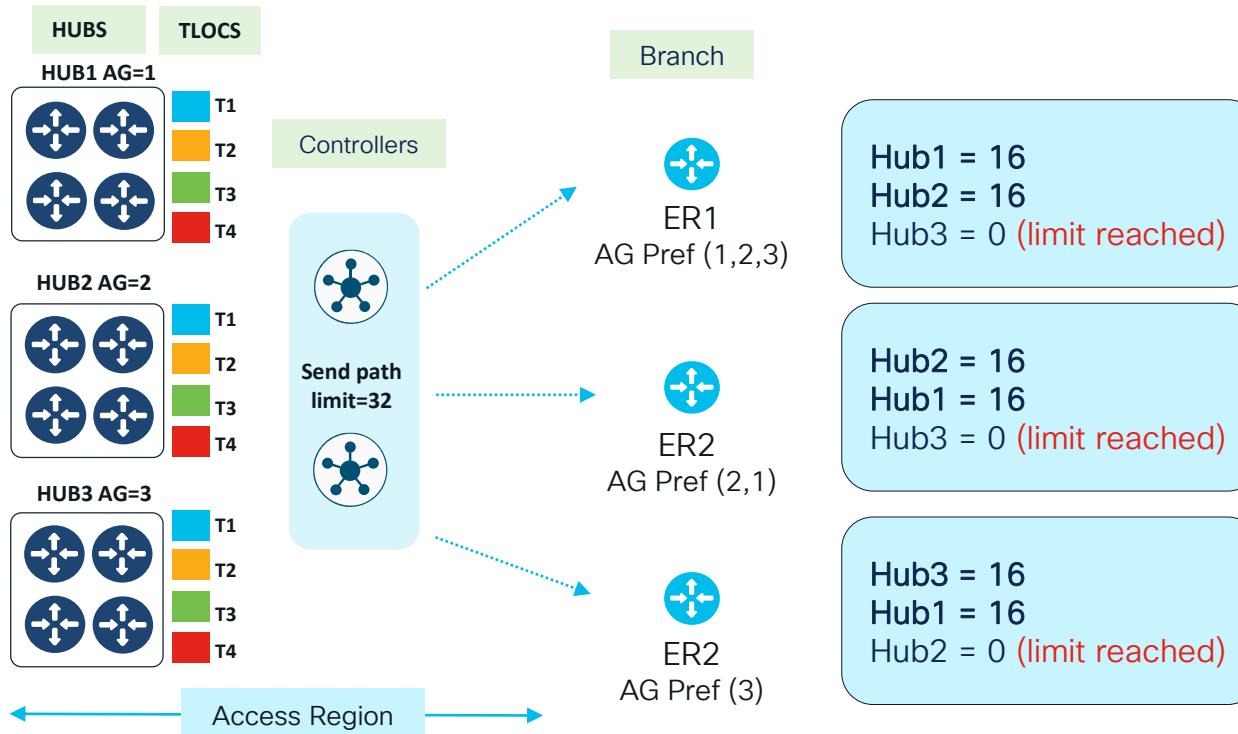
Hub2 = 16
Hub3 = 16
Hub3 = 0
(limit reached)

ER1 wants
HUB1= Preferred
HUB2= Backup
HUB3= Tertiary

There is a chance ER1
cannot get HUB1 routes in
best 32

Prioritization of Routes to Peer Devices

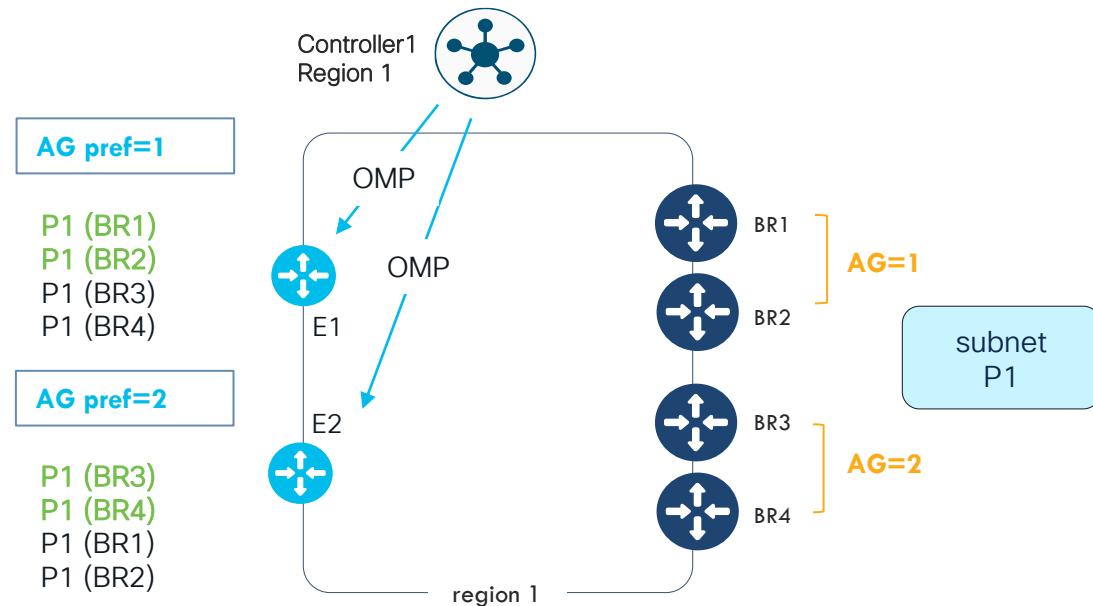
Common Prefix



New data structure to store all these paths such that during advertising of these paths, controller will always send **all of the most preferred paths first**

Filtering out paths Configured with AG

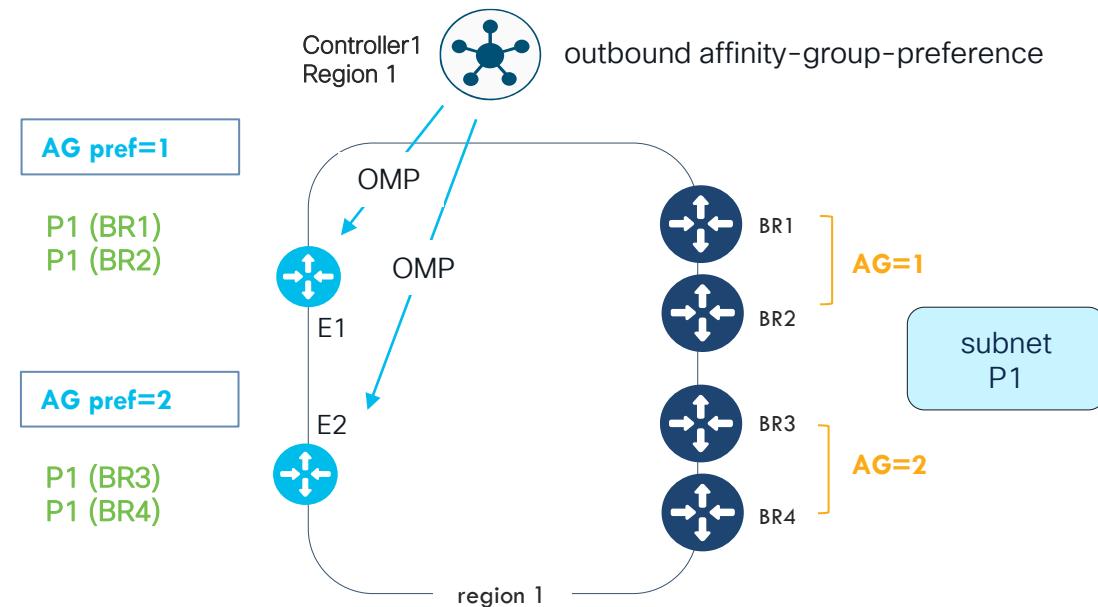
Out path filtering NOT configured



Filtering out paths Configured with AG

Out path filtering configured

- you can configure Cisco Catalyst SD-WAN to enable routers to connect only to routers that are on their affinity list
- SD-WAN Controllers provide each device in the region with only the routes to routers in their affinity list, or routers that have no affinity group assignment

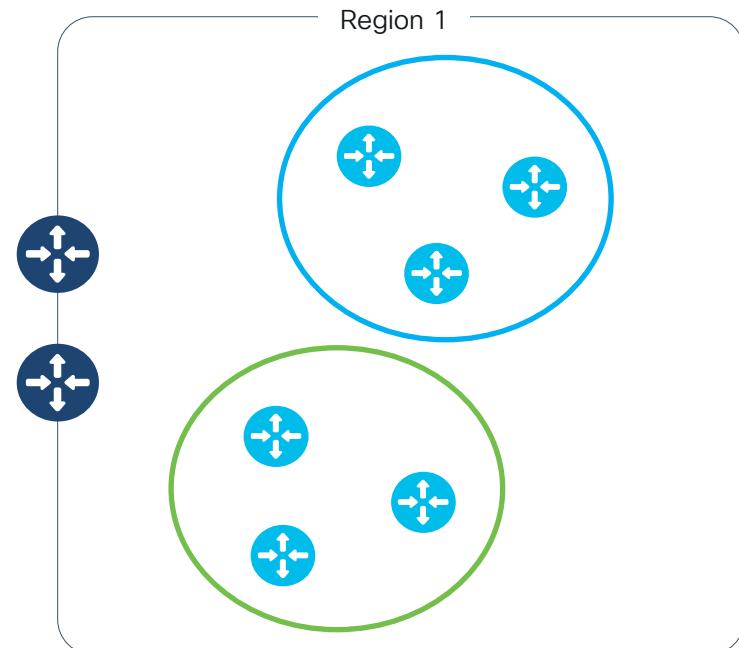


Creating Groups inside Regions

Expanding Affinity Group usage

Creating groups of devices in a Region

- Need for smaller groups inside a region
- Admin use case or low-end routers supporting a low number of tunnels
- Affinity Group can be leveraged
- Simple configuration



Toolbox

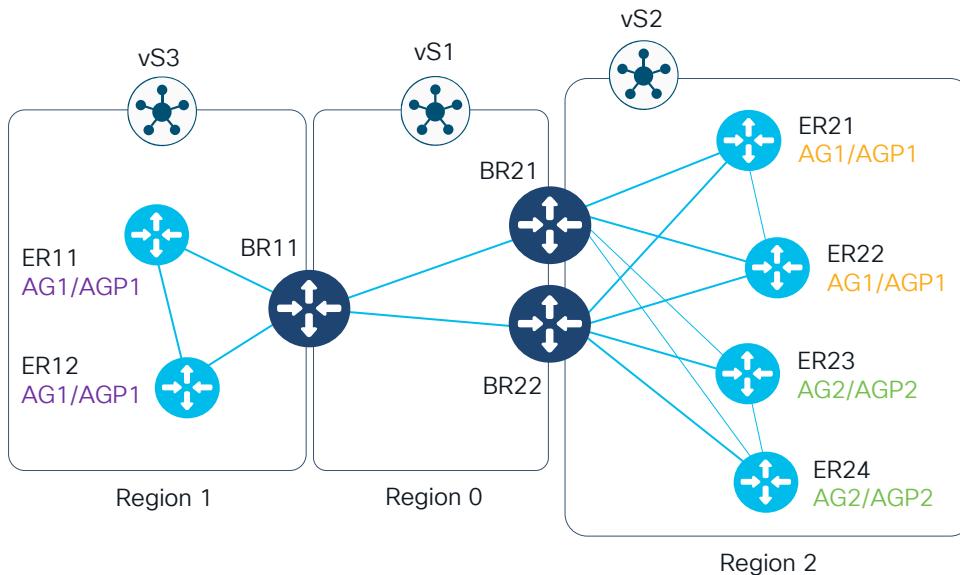


Affinity Groups

Affinity Group Preference

Tunnel Group

Using Affinity Groups



- All vS are set with outbound affinity-group-preference

- BR are not configured with AGP/AGP

- Edge routers are configured with AG and AGP

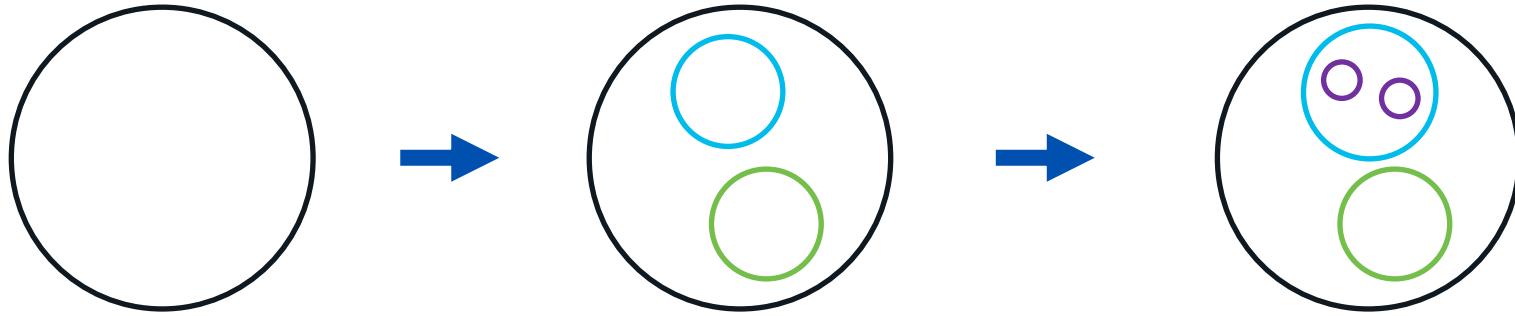
tunnels

- AG1/AGP1 Edge Routers (Region 2) build BFD between each other and to the BR/TGW (same for AG2/AGP2)
- AG1/AGP1 Edge Routers (Region 2) and AG2/AGP2 cEdges (Region 2) don't build BFD

routes

- AG1/AGP1 Edge Routers (Region 2) have direct routes to each other (same for AG2/AGP2)
- AG1/AGP1 Edge Routers (Region 2) have routes to AG2/AGP2 via BR21 and BR22, thanks to TGW setting (same for AG2/AGP2)

Adding tunnel-group to the mix

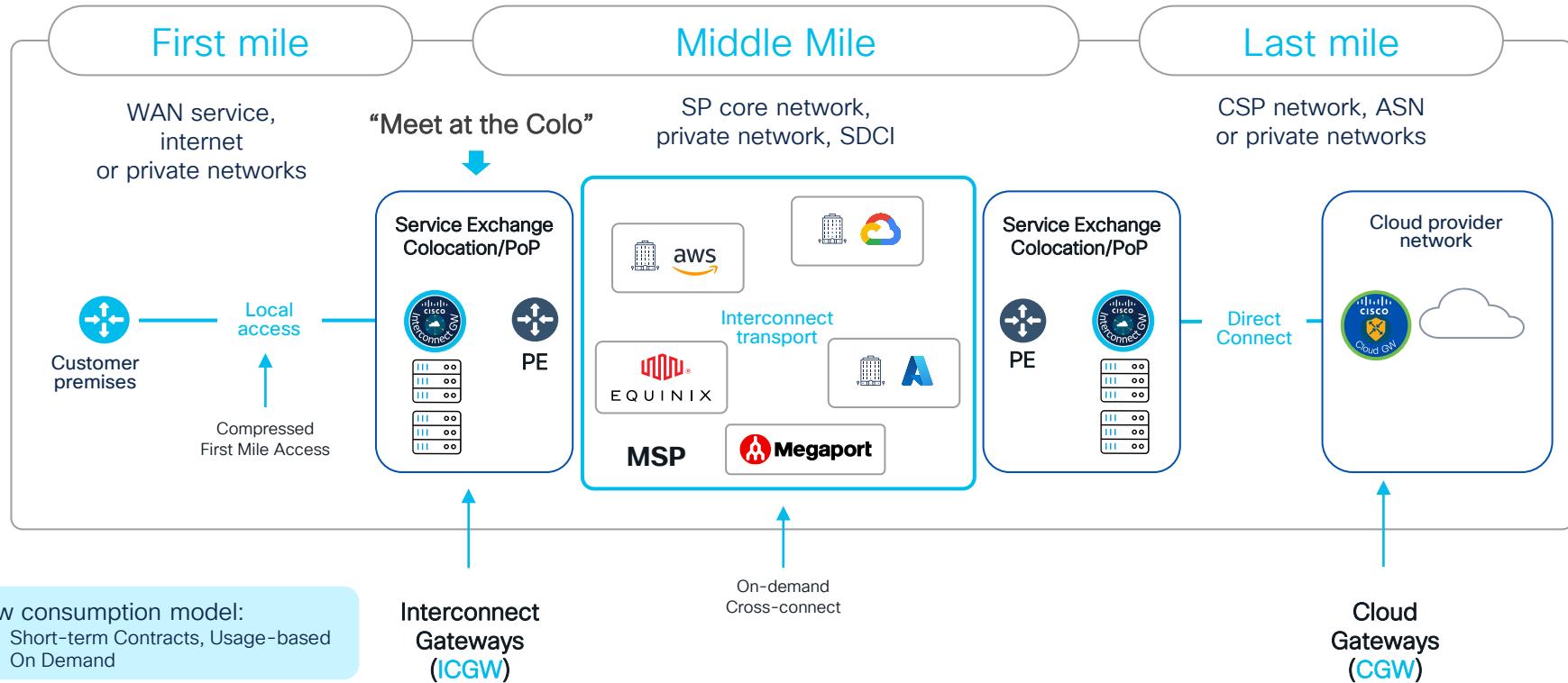


- Fine grain topology control within the grouping described above via Tunnel Groups (TG)
 - Within group AG1/AGP1, define a subset of Edge Routers with TG1, another subset of Edge routers with TG2
-
- Devices/TLOCs with TG=1 mesh with one another
 - Devices/TLOCs with TG=2 mesh with one another
 - Devices/TLOCs with TG=1 do not mesh with Devices/TLOCs that have TG=2

Leverage an SDCI backbone

SDCI: Software Defined Cloud Interconnect

WAN is Evolving to a Service Exchange



Leverage Cisco Assets for Network Cloud Offer



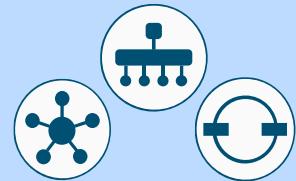
Cisco Interconnect Gateway (ICGW) - SD-WAN

- Cloud Delivered Network Service
- On-demand SD-WAN and VPN aggregation as-a-service
- On-demand WAN Core Networking backbone
- On-demand Cloud Peering: Cloud Direct Connect, SaaS Optimization, M365, Webex, CloudSec integration



Cisco Cloud Gateway (CGW) - SD-WAN

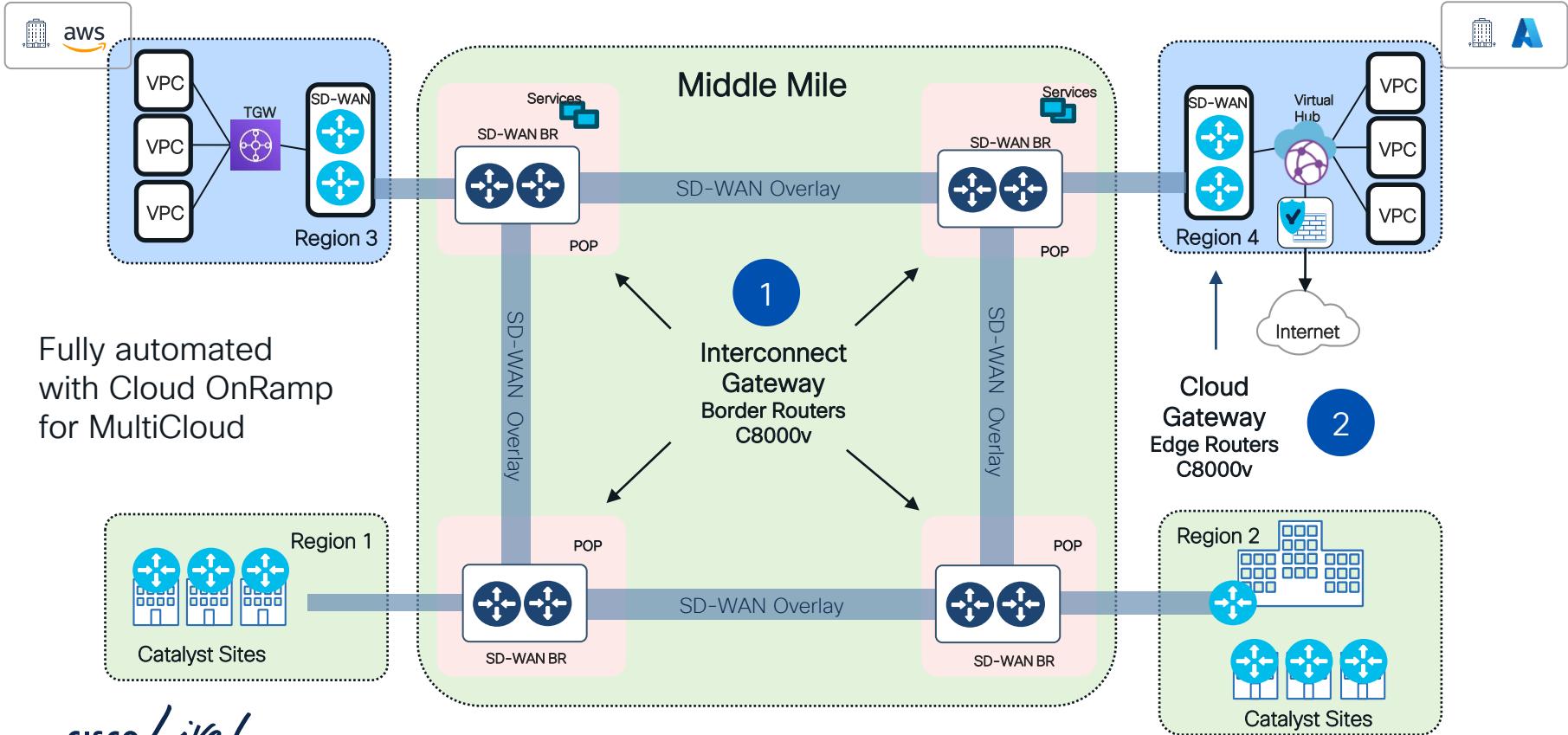
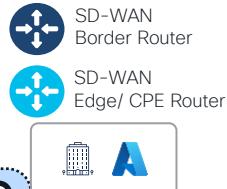
- Cisco SD-WAN and VPN endpoints at the Cloud Edge
- Deep cloud-native integrations
- Single Policy domain across WAN, cloud and VPCs
- Advanced Cloud Networking: backbone networking, service mesh, multi-region access, Segmentation, Identity-based secure access



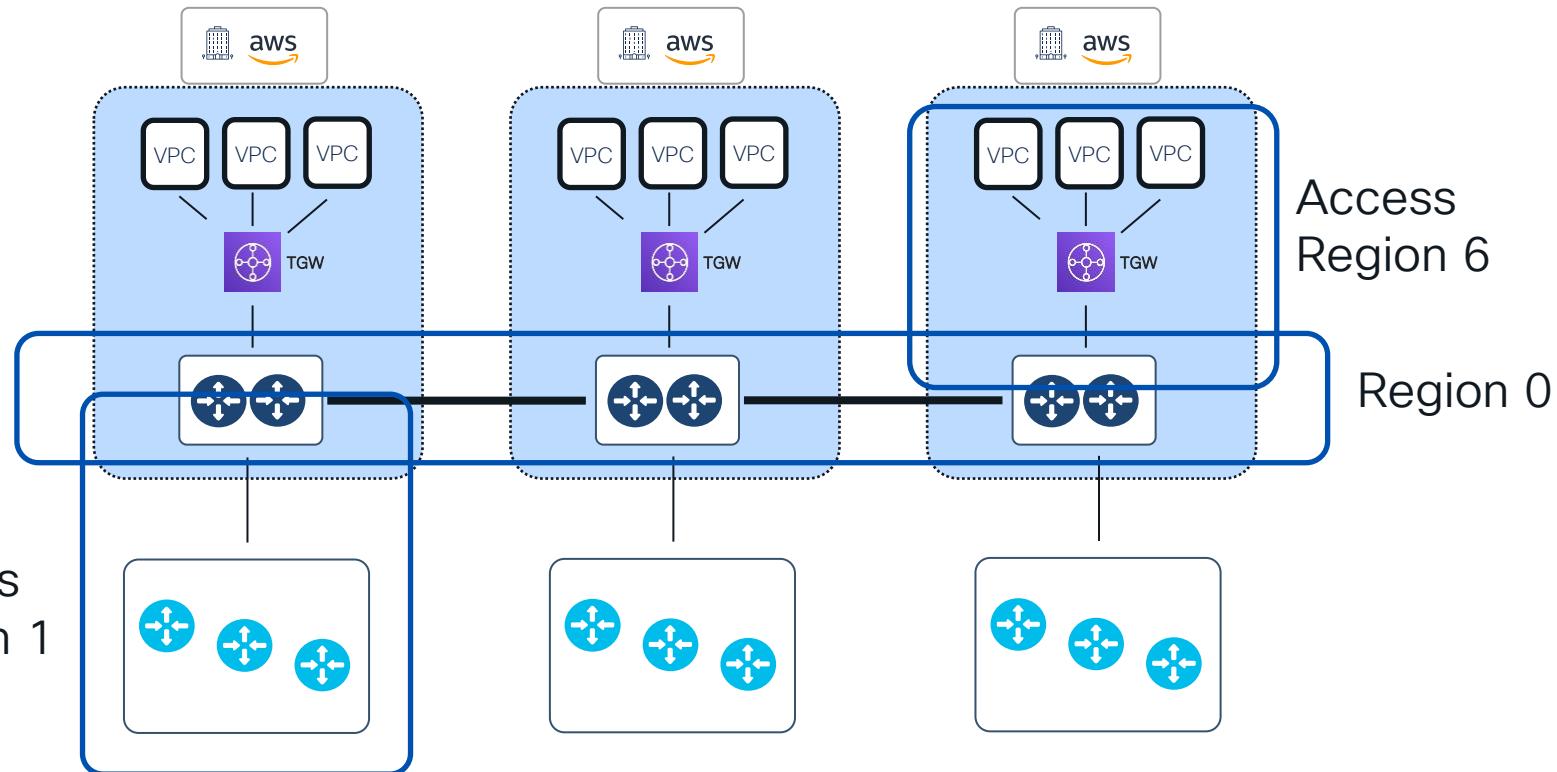
Cisco SD-WAN & Multi-cloud Service Controllers

- API-based Orchestration
- Cloud and SDCI API support
- Rich Cloud DX support
- On-demand SD-WAN Fabric
- Intent-based workflows
- Normalized Cloud Operations
- Visibility & Assurance

MRF with SDCI – Megaport or Equinix



MRF with Cloud Providers



Configuration : Create ICGW/CGW

Cisco SD-WAN Select Resource Group Configuration - Cloud onRamp for Multicloud

Cloud OnRamp For Multicloud > Interconnect Gateway Management > View Interconnect Gateway

Interconnect Provider: MEGAPORT

Gateway Name: ICMP-MP-WEST

Description (optional):

Account Name: Diptish5-Megaport-Acc

Location: Equinix SE2, Seattle, WA, USA : Seattle

Network Hierarchy Site: SITE_10000

UUID: C8K-3B8C911F-F342-6F42-6F2E-177E11B5693B

Instance Settings: Default

Multi Region Fabric Settings:

MRF Role: Border

Transport Gateway: Enabled

Site ID

MRF role of ICGW/CGW

Transport Gateway option for ICGW only

Key Takeaways

Multi Region Fabric - Key takeaway

Scalability and Performance

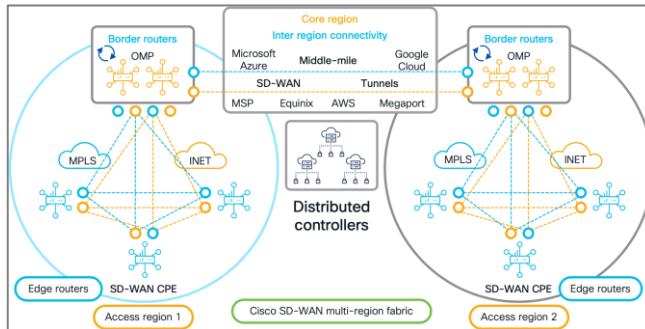
Enhances network performance and scalability by efficiently connecting multiple regions, ensuring optimal application performance across a distributed enterprise network

Simplified Management

Streamlines network management and operations through centralized control, reducing complexity and allowing for consistent policy enforcement across all regions

Enhanced Security

Provides robust security features with end-to-end encryption and segmentation, protecting data as it traverses the network while maintaining high-speed connectivity.



Multi-Region Fabric – the journey Cisco Catalyst SD-WAN

17.10

- Support for **sub-regions**
 - Ability to share BRs
 - Ability to failover across BRs
- **OMP enhancements**
 - Transport Gateway best path logic (introduced ‘site-type’)
 - OMP RIBout policy caching (scale)

17.11

- OMP route aggregation support at BR and TR
- **Smart filtering of paths** between Controller and Edges (color-based)
- **Affinity-groups** support for service-insertion/chain
- Ability to set **affinity-groups** dynamically **via policy**
- OMP RIBout scale ENH

17.12

- Automatic **flow symmetry**
 - Service Fabric
- **On-demand tunnels** with TR
- **Intent-based hub-spoke** topologies
- Controller peer scale ENH

17.13

- Management Region
- UX 2.0 Improvements
- NHM improvements
- Region-based view of Global Topology

Multi-Region Fabric – the journey Cisco Catalyst SD-WAN

17.15

- Monitoring improvements
- Guided Workflow for initial setup
- Policy2.0 support
- Enhanced troubleshooting experience via NWPI

17.16

- E2E/x-region SD-WAN tunnel health monitoring

Roadmap

- Centralized policy push optimizations for per-region Controllers
- Enable intra-region BR-local communication between BRs

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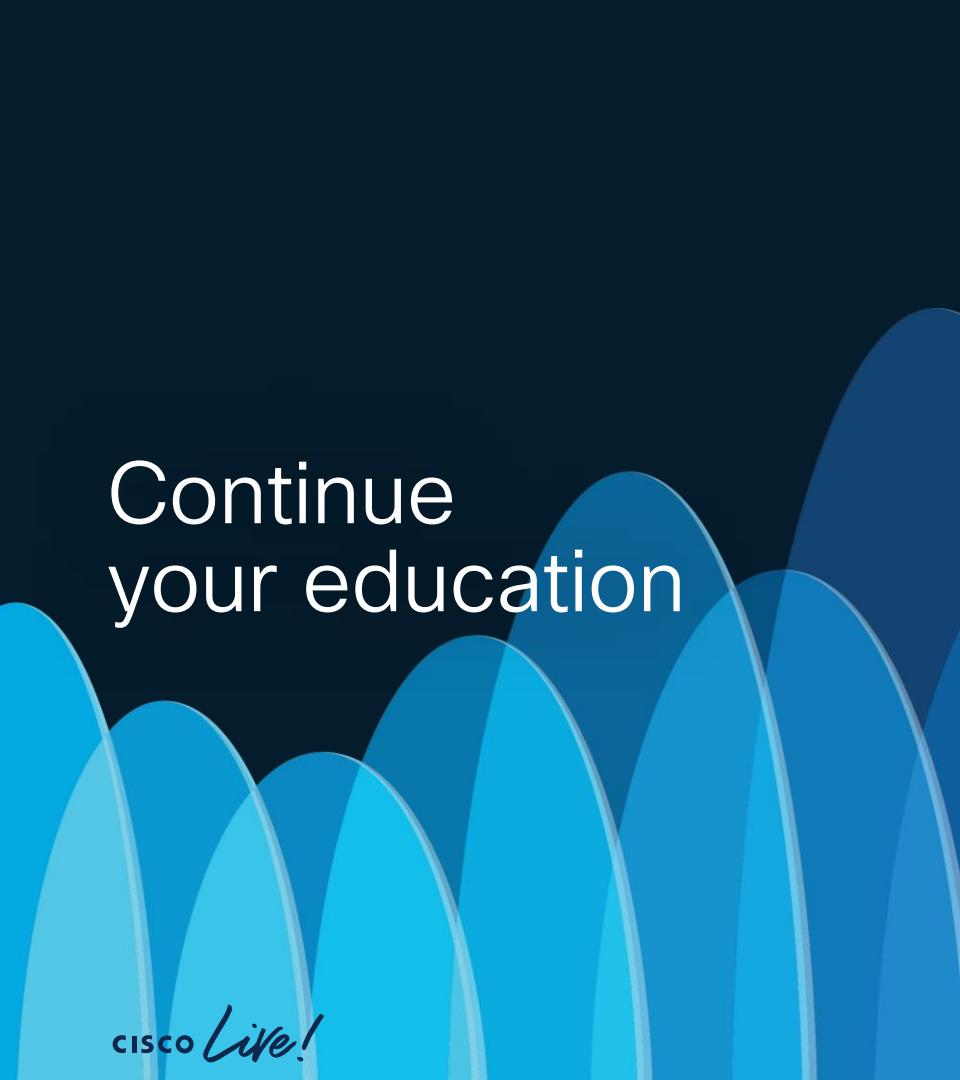
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Thank you

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