




The bridge to possible

# How to Prepare for the CCNP Enterprise Adv-Routing Concentration Certification

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BRKCRT-2016

CISCO *Live!*

#CiscoLive

# Cisco Webex App

## Questions?

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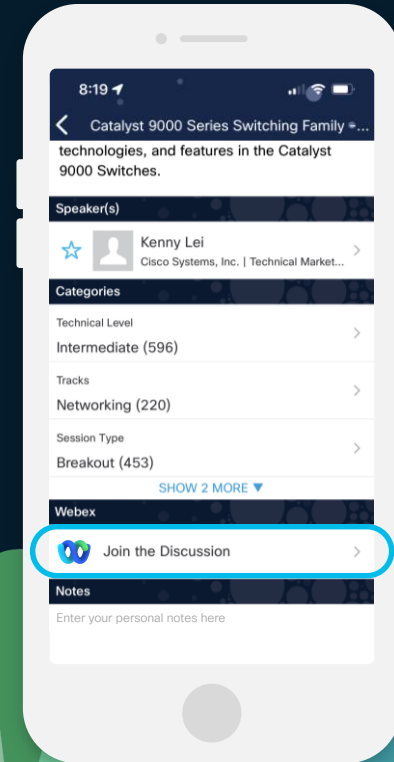
## How

- 1 Find this session in the Cisco Live 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 June 7, 2024.

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<https://ciscolive.ciscoevents.com/ciscolivebot/#BRKCRT-2016>

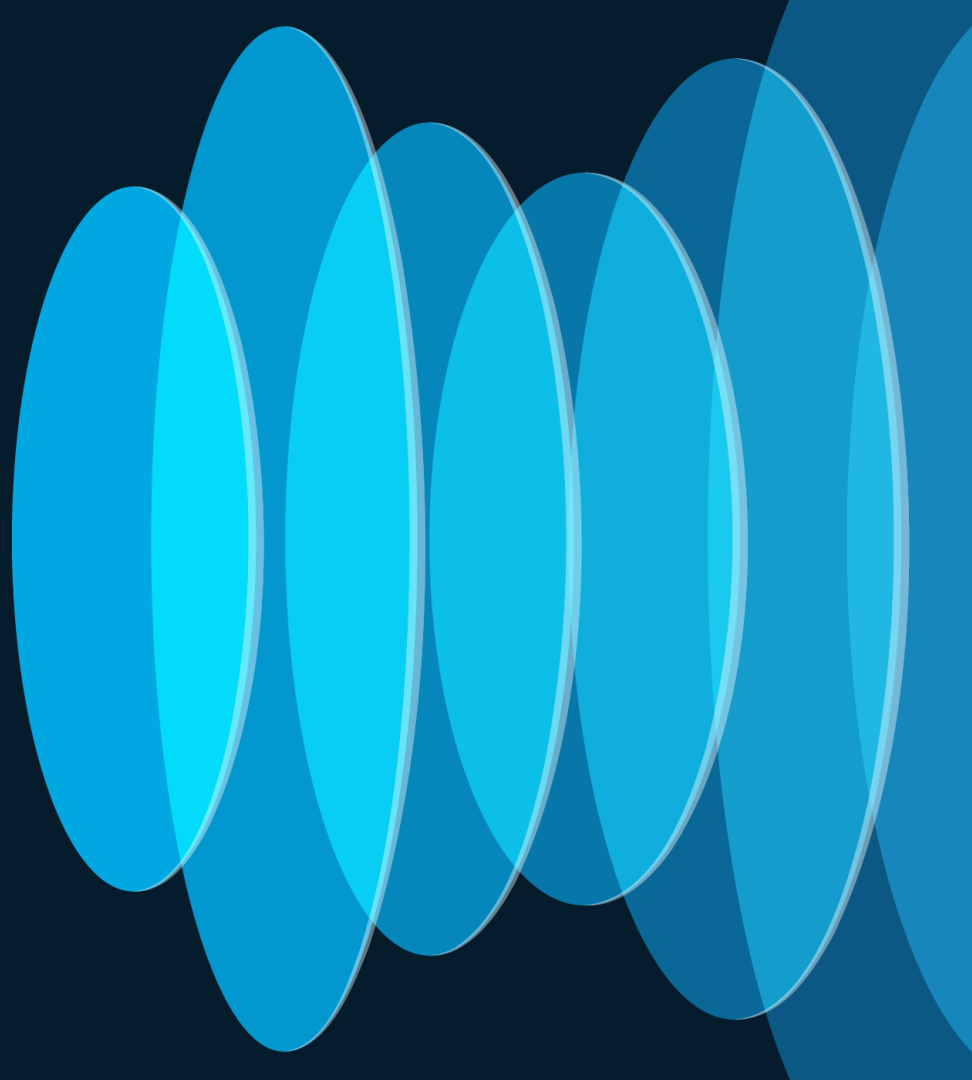




# Agenda

- Value of the Cisco Certification
- CCNP Enterprise Certifications
- Understand the Adv-Routing Blueprint
- Technology depth
- What to expect (Sample questions)
- Learning Resources and Roadmap
- Q&A

# Value of the Cisco Certification





# Benefits of Cisco Certification

- ✓ More attractive to hiring companies and existing managers
- ✓ Ability to gain a higher salary
- ✓ Keeps you in sync with changing technology

The benefits of certification are real:

**37%** of respondents received a salary increase after earning their credentials<sup>1</sup>.

---

**58%** of those who earned a pay increase were rewarded within three months of getting certified, and **83% were rewarded** within six months.

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**81%** of employers' associate IT certification holders with increased quality and value of work contribution<sup>1</sup>.

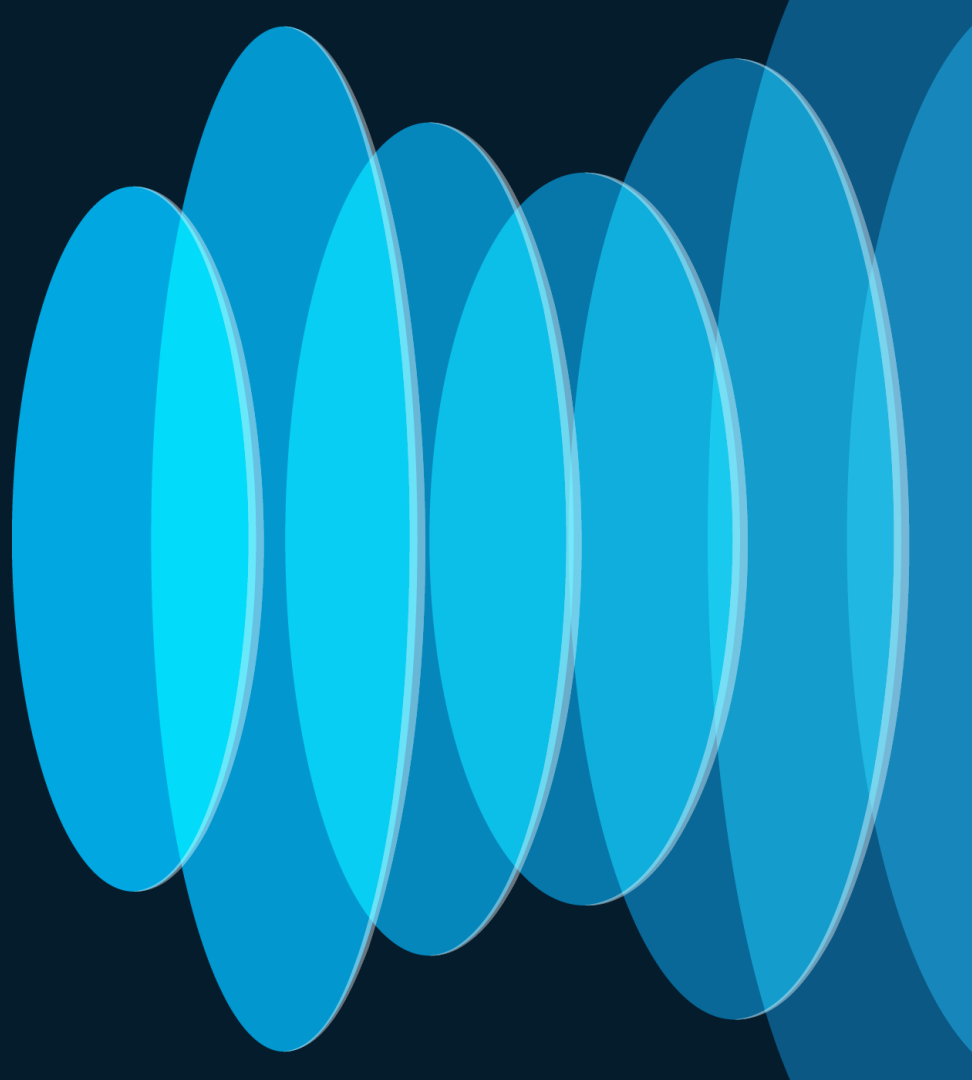
Cisco Certifications are time-honored proof you know what you're doing. Plus, they're ANSI and NIST certified, which means they're industry certs with greater value in the marketplace.

<sup>1</sup> [Pearson VUE 2023 Value of IT Certification](#)

# Certified employees are valued assets

- Certification shortlists candidates for a job
- Gives confidence to the employer to bring a candidate in, meaning, in most cases, it gets you an interview 😊
- Positions a job seeker for skills to a job match
- Represents a job seeker virtually through a resume/LinkedIn prescreening

# CCNP Enterprise Certifications

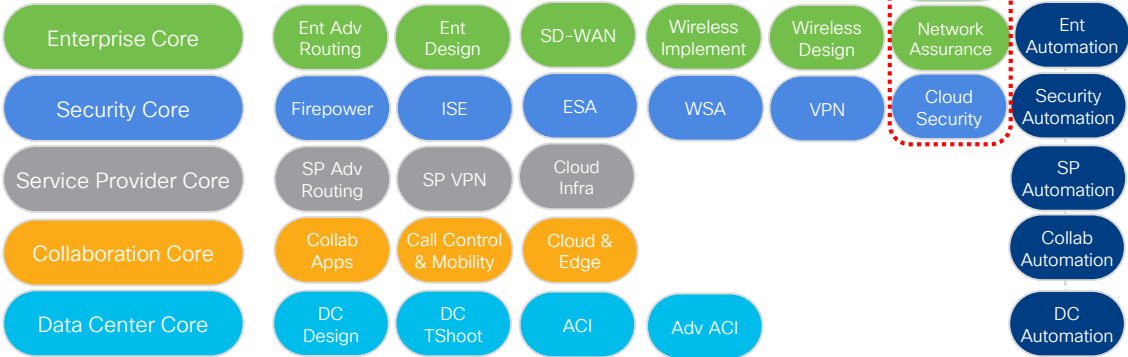


# Cisco Career Certifications

## One Exam

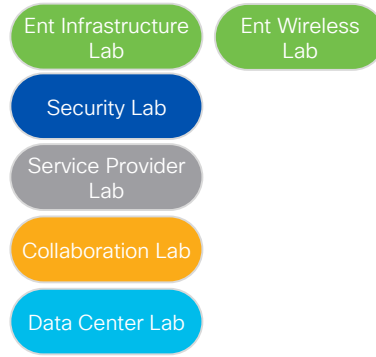
CCNA

## Two Exams: Core + 1 Concentration



Multicloud Certs

## Core + Lab



## One Exam

DevNet Associate

## Two Exams: Core + 1 Concentration



## Core + Lab



## One Exam

CyberOps Associate

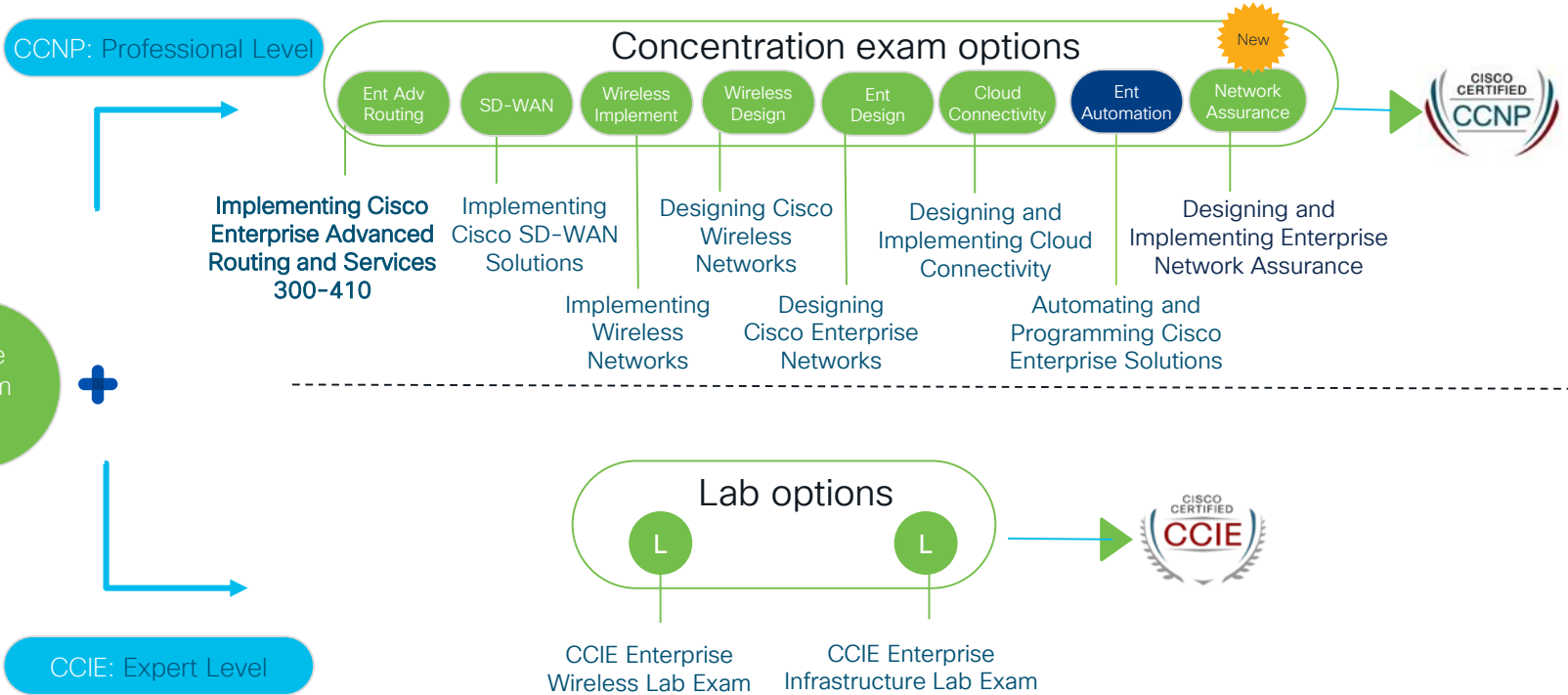
## Two Exams: Core + 1 Concentration



## CyberOps Expert

Future Offering

# Cisco Enterprise certification track



# Cisco Certifications Roadmap

Here are some helpful hints to help you manage your certification journey:

- Check the Release Notes section listed on the Certification Roadmap tables for specific updates to your exam.
- Sign up for the Cisco Certification Roadmap newsletter for the latest exam info updates.
- If you have questions, check the Cisco Learning Network Community forum that corresponds to your certification of interest, or contact our team of experts.

We want you to succeed, and we're here to help!

## Data Center & Collaboration

Q1: Review/Job Task Analysis  
Q2: New blueprints published  
Q3: Updated exam go live

## Security & CyberOps

Q4: Review/Job Task Analysis  
Q1: New blueprints published  
Q2: Updated exam go live



## Enterprise & DevNet

Q2: Review/Job Task Analysis  
Q3: New blueprints published  
Q4: Updated exam go live

## CCNA & Service Provider

Q3: Review/Job Task Analysis  
Q4: New blueprints published  
Q1: Updated exam go live

### How it works:

1. Cisco **reviews** each technology on the same quarterly schedule each year to make sure our exams align with the latest Cisco technologies.
2. We **announce** blueprint changes 3-6 months in advance along with revised exam topics and release notes, if applicable.
3. We **publish** the updated exam 3-6 months after the exam blueprint publication, if applicable.

*Dates shown reflect Cisco's fiscal year calendar.*

Q1: August-October, Q2: November-January, Q3: February-April, Q4: May-July

[www.cisco.com/go/CertRoadmap](http://www.cisco.com/go/CertRoadmap)

**CISCO** Live!

- Annual, iterative, agile model
- Cadence-based systemic approach
- Align with rapid technology evolution
- Ensure relevancy for today
- Prepare for the future
- Add new technologies
- Remove obsolete technologies
- Predictable cadence for planning

# 300-410 ENARSI Exam Blueprint

[300-410 ENARSI Blueprint Ver 1.1 Release Notes](#)

[https://learningcontent.cisco.com/documents/marketing/exam-topics/CCNP\\_Enterprise\\_v1.1\\_Release\\_Notes.pdf](https://learningcontent.cisco.com/documents/marketing/exam-topics/CCNP_Enterprise_v1.1_Release_Notes.pdf)

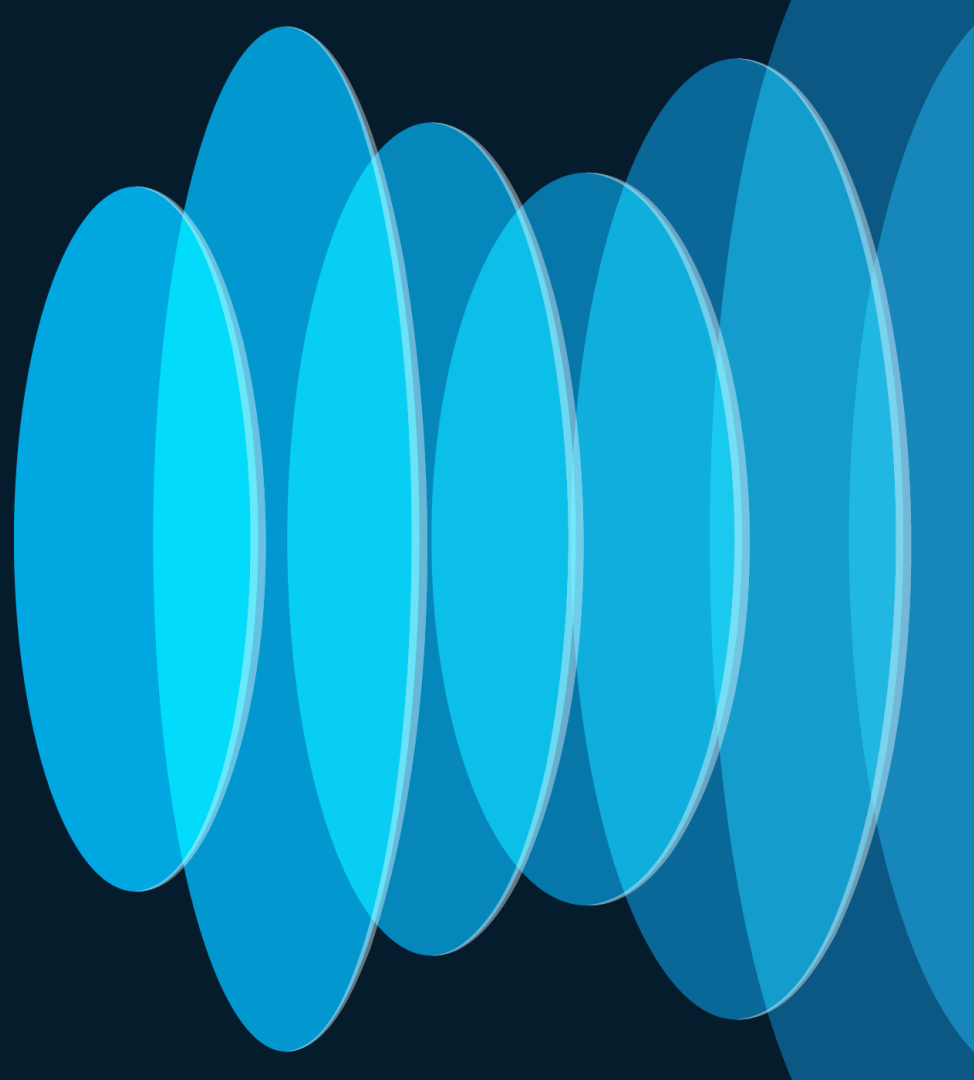
[Cisco Certification Roadmaps](#)

<https://learningnetwork.cisco.com/s/cisco-certification-roadmaps?tabset-07517=1&tabset-72da6=1>

[300-410 ENARSI Blueprint](#)

<https://learningnetwork.cisco.com/s/enarsi-exam-topics>

# Understand the Adv-Routing Blueprint



# Implementing Cisco Enterprise Advanced Routing and Services

Exam Blueprint

300-410

Domain / Weight

Four major areas of knowledge

- |                            |     |
|----------------------------|-----|
| 1. Layer 3 Technologies    | 35% |
| 2. VPN Technologies        | 20% |
| 3. Infrastructure Security | 20% |
| 4. Infrastructure Services | 25% |

# 300-410 ENARSI Ver 1.1 Exam Blueprint Release Notes

## 300-410 Implementing Cisco Enterprise Advanced Routing and Services

v1.0		v1.1	
1.9	Troubleshoot EIGRP (classic and named mode)	1.9	Troubleshoot EIGRP (classic and named mode; VRF and global)
1.9.a	Address families (IPv4, IPv6)	1.9.a	Address families (IPv4, IPv6)
1.9.b	Neighbor relationship and authentication	1.9.b	Neighbor relationship and authentication
1.9.c	Loop-free path selections (RD, FD, FC, successor, feasible successor, stuck in active)	1.9.c	Loop-free path selections (RD, FD, FC, successor, feasible successor, stuck in active)
1.9.d	Stubs	1.9.d	Stubs
1.9.e	Load balancing (equal and unequal cost)	1.9.e	Load balancing (equal and unequal cost)
1.9.f	Metrics	1.9.f	Metrics
1.11	Troubleshoot BGP (Internal and External)	1.11	Troubleshoot BGP (Internal and External; unicast and VRF-Lite)
1.11.a	Address families (IPv4, IPv6)	1.11.a	Address families (IPv4, IPv6)
1.11.b	Neighbor relationship and authentication (next-hop, mulithop, 4-byte AS, private AS, route refresh, synchronization, operation, peer group, states and timers)	1.11.b	Neighbor relationship and authentication (next-hop, mulithop, 4-byte AS, private AS, route refresh, synchronization, operation, peer group, states and timers)
1.11.c	Path preference (attributes and best-path)	1.11.c	Path preference (attributes and best-path)
1.11.d	Route reflector (excluding multiple route reflectors, confederations, dynamic peer)	1.11.d	Route reflector (excluding multiple route reflectors, confederations, dynamic peer)
1.11.e	Policies (inbound/outbound filtering, path manipulation)	1.11.e	Policies (inbound/outbound filtering, path manipulation)

# 300-410 ENARSI Ver1.1

# Exam Blueprint

## 1.0 Layer 3 Technologies

35% ^

- 1.1 Troubleshoot administrative distance (all routing protocols)
- 1.2 Troubleshoot route map for any routing protocol (attributes, tagging, filtering)
- 1.3 Troubleshoot loop prevention mechanisms (filtering, tagging, split horizon, route poisoning)
- 1.4 Troubleshoot redistribution between any routing protocols or routing sources
- 1.5 Troubleshoot manual and auto-summarization with any routing protocol
- 1.6 Configure and verify policy-based routing
- 1.7 Configure and verify VRF-Lite
- 1.8 Describe Bidirectional Forwarding Detection
- 1.9 Troubleshoot EIGRP (classic and named mode; VRF and global)
  - 1.9.a Address families (IPv4, IPv6)
  - 1.9.b Neighbor relationship and authentication
  - 1.9.c Loop-free path selections (RD, FD, FC, successor, feasible successor, stuck in active)
  - 1.9.d Stubs
  - 1.9.e Load balancing (equal and unequal cost)
  - 1.9.f Metrics
- 1.10 Troubleshoot OSPF (v2/v3)
  - 1.10.a Address families (IPv4, IPv6)
  - 1.10.b Neighbor relationship and authentication
  - 1.10.c Network types, area types, and router types
    - 1.10.c.i Point-to-point, multipoint, broadcast, nonbroadcast
    - 1.10.c.ii Area type: backbone, normal, transit, stub, NSSA, totally stub
    - 1.10.c.iii Internal router, backbone router, ABR, ASBR
    - 1.10.c.iv Virtual link
  - 1.10.d Path preference

- 1.11 Troubleshoot BGP (Internal and External, unicast, and VRF-Lite)
  - 1.11.a Address families (IPv4, IPv6)
  - 1.11.b Neighbor relationship and authentication (next-hop, multihop, 4-byte AS, private AS, route refresh, synchronization, operation, peer group, states and timers)
  - 1.11.c Path preference (attributes and best-path)
  - 1.11.d Route reflector (excluding multiple route reflectors, confederations, dynamic peer)
  - 1.11.e Policies (inbound/outbound filtering, path manipulation)

## 2.0 VPN Technologies

20% v

## 3.0 Infrastructure Security

20% v

## 4.0 Infrastructure Services

25% v

The above topics are likely to be included on the **300-410 ENARSI** exam. The topics are subject to change at any time to reflect the latest technologies aligned to Cisco's products.

Don't be scared...



Be prepared



# Deciphering the Blueprint:

## Implementing Cisco Enterprise Advanced Routing and Services (300-410)

35% 1.0 Layer 3 Technologies — Domain

1.10 Troubleshoot OSPF (v2/v3) — Task

Domain  
Weight

1.10.a Address families (IPv4, IPv6) — Subtask

1.10.b Neighbor relationship and authentication

1.10.c Network types, area types, and router types

1.10.c (i) Point-to-point, multipoint, broadcast, nonbroadcast — Subtask

1.10.c (ii) Area type: backbone, normal, transit, stub, NSSA, totally stub

1.10.c (iii) Internal router, backbone router, ABR, ASBR

1.10.c (iv) Virtual link

1.7 Configure and verify VRF-Lite — Task

1.8 Describe Bidirectional Forwarding Detection — Task

# Blueprint Verbs

Describe

Configure

Troubleshoot

Depth of Knowledge



# Types of questions



Multiple choice

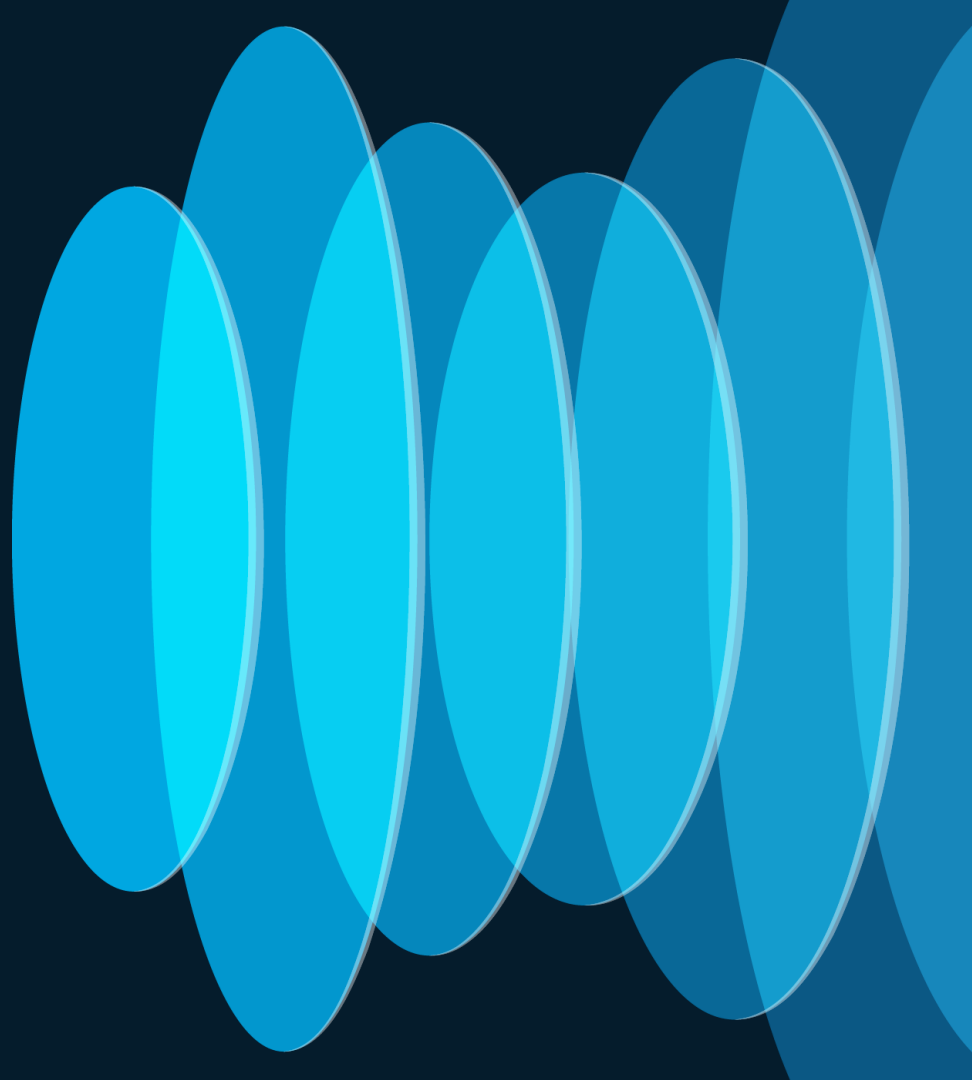


Drag and drop



Performance-based Lab question

# Technology Depth

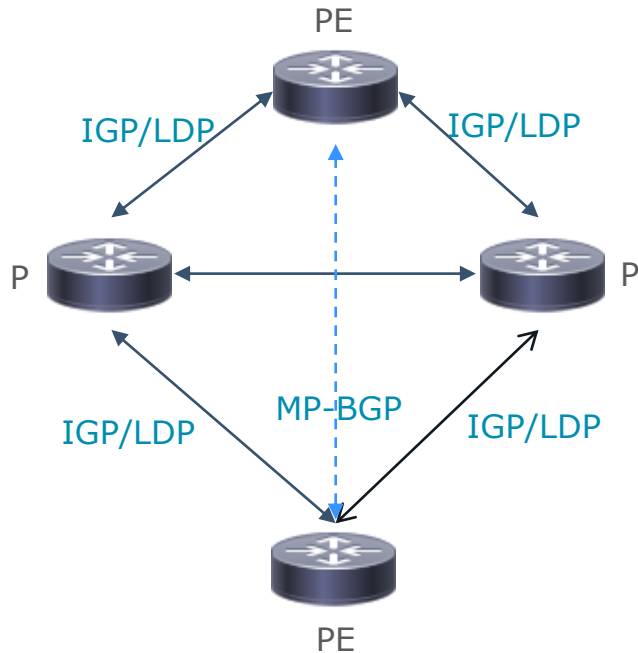


## Tasks

### Sample Tasks on Multiple Domains

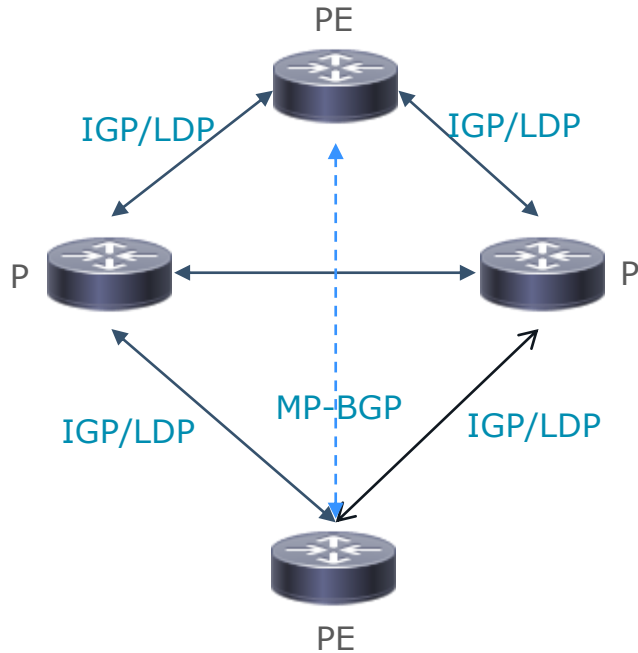
- 2.1 Describe MPLS operations (LSR, LDP, label switching, LSP)
- 1.6 Configure and verify VRF-Lite
- 1.7 Configure and verify Policy-based Routing
- 1.4 Troubleshoot redistribution between any routing protocols or routing sources
- 1.10 Troubleshoot OSPF (v2/v3)
  - 1.10.d Path preference

## 2.1 Describe MPLS operations (LSR, LDP, label switching, LSP)



- Labeling inside MPLS cloud between P (LSR) and PE (Edge-LSR)
- PE-P-PE, P-P communication
- Customer to PE (CE-PE)
- PE carrying multiple customer routes communicate among them keeping segregation between customers
- Customers with overlapping IP addresses communicate and carry routes between PE-CE
- Advanced- TE (RSVP)

## 2.1 Describe MPLS operations (LSR, LDP, label switching, LSP)

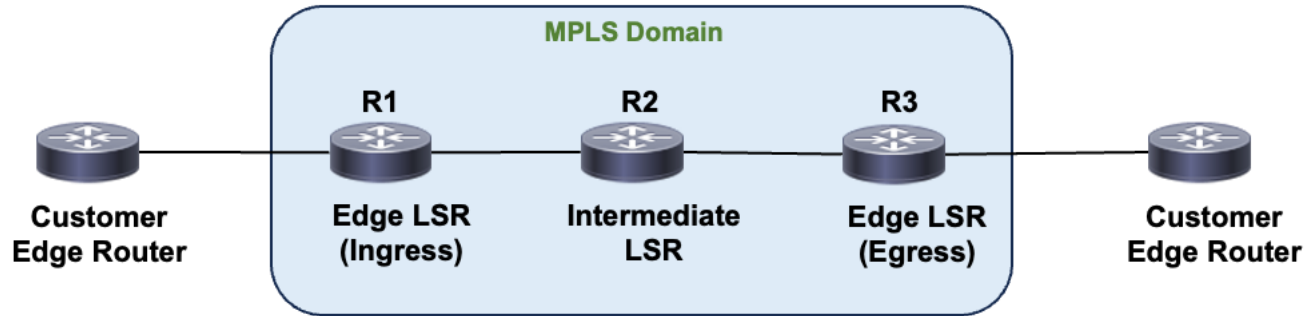


- IGP is used to build an end-to-end layer 3 network and LDP is used to establish hop-by-hop forwarding between LSRs using labels
- LDP distributes labels for prefixes advertised by unicast routing protocols
- BGP to support VPNs and establish communication between a set of sites using the same criteria (customer) – Label mapping info carried as part of NLRI (Network Layer Reachability Information)
- Forwarding plane consists of label imposition, swapping, and disposition – Regardless of the control plane (BGP, LDP, RSVP)

## 2.1 Describe MPLS operations (LSR, LDP, label switching, LSP)

**Ingress LSRs** receive a packet that still needs to be labeled, insert a label (stack) in front of the packet, and send the packet on a data link.

**Egress LSRs** receive a labeled packet, remove the label, and send the packet on a data link.



**Intermediate LSRs** receive an incoming labeled packet, perform an operation on the packet, switch the packet, and send the packet on the correct data link.

## 2.1 Describe MPLS operations (LSR, LDP, label switching, LSP)

- IP CEF (default)
- Enable MPLS globally or at the interface level
- LDP 32 bit (4 byte)
- Labels (Max 3 --> VPN, IGP, TE) (Max 12 bytes)
- MPLS MTU 1512
- Push, SWAP, Pull
- Avoid double lookup by Penultimate hop popping or PHP by LSR before LER
- [https://www.cisco.com/c/en/us/td/docs/routers/ios/config/17-x/mpls/b-mpls/m\\_mp-mpls-cisco-rtrs.html](https://www.cisco.com/c/en/us/td/docs/routers/ios/config/17-x/mpls/b-mpls/m_mp-mpls-cisco-rtrs.html)

# 1.6 Configure and verify VRF-Lite

- Allows overlapping IP addresses on the same router using VRF
- Address-family aware VRF-Lite must use *address-family ipv4/ipv6* under the VRF definition
- Show ip route must use vrf aware show command to display routing i.e. *show ip route vrf cust\_A*
- Dynamic routing is supported over VRF-Lite e.g. EIGRP, OSPF, BGP
- When using OSPF, *capability vrf-lite* must be configured under *router ospf* command.
- [https://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst9500/software/release/17-1/configuration\\_guide/rtnng/b\\_171\\_rtnng\\_9500\\_cg/configuring\\_vrf\\_lite.html](https://www.cisco.com/c/en/us/td/docs/switches/lan/catalyst9500/software/release/17-1/configuration_guide/rtnng/b_171_rtnng_9500_cg/configuring_vrf_lite.html)

# 1.7 Configure and verify Policy-based Routing

- Identify traffic to be routed through specific requirements rather than default CEF exit
- Create a *route-map* for the required traffic
- Set next-hop using *set ip next-hop ip-address [ip-address]* OR *set ip default next-hop ip-address [ip-address]*
- Apply the policy map on the interface using *ip policy route-map map-tag* command
- The **set ip next-hop** and **set ip default next-hop** commands are similar but have a different order of operation. Configuring the **set ip next-hop** command causes the system to first use policy routing and then use the routing table. Configuring the **set ip default next-hop** command causes the system to first use the routing table and then the policy-route-specified next hop.
- [https://www.cisco.com/c/en/us/td/docs/routers/ios/config/17-x/ip-routing/b-ip-routing/m\\_iri-pbr.html](https://www.cisco.com/c/en/us/td/docs/routers/ios/config/17-x/ip-routing/b-ip-routing/m_iri-pbr.html)

# 1.4 Troubleshoot redistribution between any routing protocols or routing sources

(Redistributing OSPF into BGP)

- OSPF intra-area and inter-area routes (internal) are redistributed by default if no keyword is mentioned with the redistribute OSPF command
- OSPF external routes must be defined in the match statement on the redistribute command
- Both External type-1 and type-2 must be matched to redistribute both types
  - redistribute OSPF 1 match internal external
  - redistribute OSPF 1 match internal external 1 external 2
- To redistribute all OSPF routes, internal external type-1, and type-2 routes must be matched on the redistribute OSPF command under BGP
- <https://www.cisco.com/c/en/us/support/docs/ip/border-gateway-protocol-bgp/5242-bgp-ospf-redis.html>

# 1.4 Troubleshoot redistribution between any routing protocols or routing sources

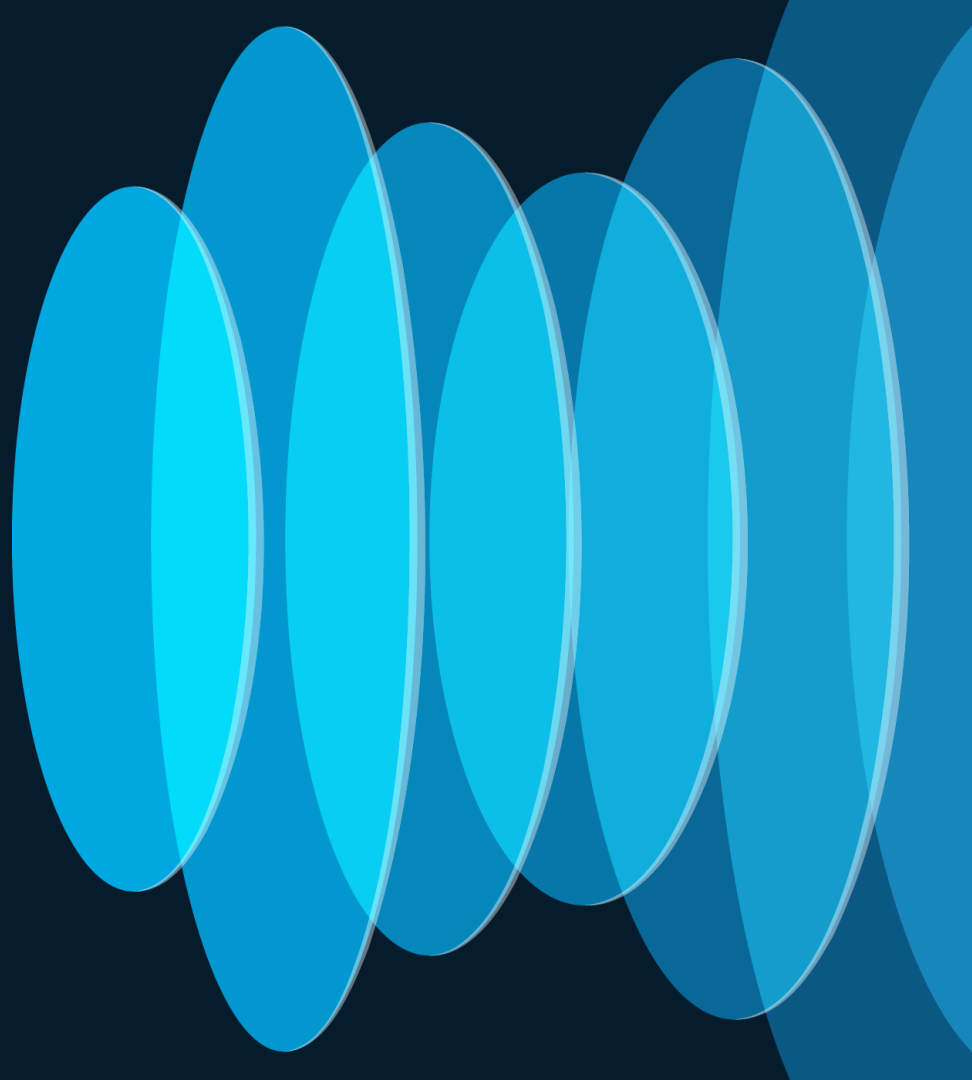
(Redistributing EIGRP)

- EIGRP uses five different variables to calculate the metric
- Redistribute routes do not have these parameters, and this causes irregularities in the route setting.
- To improve performance – set a **default metric** when redistributing routes.  
Example Router(config-router)#**default-metric 10000 100 255 100 1500**
- A redistributed static route takes precedence over the summary route
  - a static route has an admin distance of 1
  - The EIGRP summary route has an admin distance of 5
- <https://www.cisco.com/c/en/us/support/docs/ip/enhanced-interior-gateway-routing-protocol-eigrp/8606-redist.html>

# 1.10.d Troubleshoot OSPF (v2/v3) (Path preference)

- Routes in the same area are called intra-area routes O.
- Routes crossing an ABR (between areas) are called inter-area routes (IA).
- Routes from an ASBR or from other protocols to OSPF are external routes. There are two types of external routes; E1 and E2.
- The cost of an E2 route is always the external cost, irrespective of the interior cost to reach that route. An E1 route cost is the addition of the external cost and the internal cost used to reach that route.
- Multiple routes to the same destination are preferred in the following order: intra-area (O), inter-area (O IA), external E1, external E2.
- <https://www.cisco.com/c/en/us/support/docs/ip/open-shortest-path-first-ospf/7039-1.html>

# What to Expect (Sample Questions)



## Tasks

### Sample Tasks on Multiple Domains

- 2.1 Describe MPLS operations (LSR, LDP, label switching, LSP)
- 1.6 Configure and verify VRF-Lite
- 1.7 Configure and verify Policy-based Routing
- 1.4 Troubleshoot redistribution between any routing protocols or routing sources
- 1.10 Troubleshoot OSPF (v2/v3)
  - 1.10.d Path preference

# Multiple Choice

## Task

2.1 Describe MPLS operations (LSR, LDP, label switching, LSP)

<https://app.sli.do/event/g7n2kkM958A9zXxLZSywbh>



## Question

Which protocols does a P router use to transfer VPN traffic between PE routers in an MPLS network?

- A. OSPF and MP-BGP
- B. OSPF and LDP
- C. LDP and MP-BGP
- D. LDP and RSVP

slido



Which protocols does a P router use to transfer VPN traffic between PE routers in an MPLS network?

① Start presenting to display the poll results on this slide.

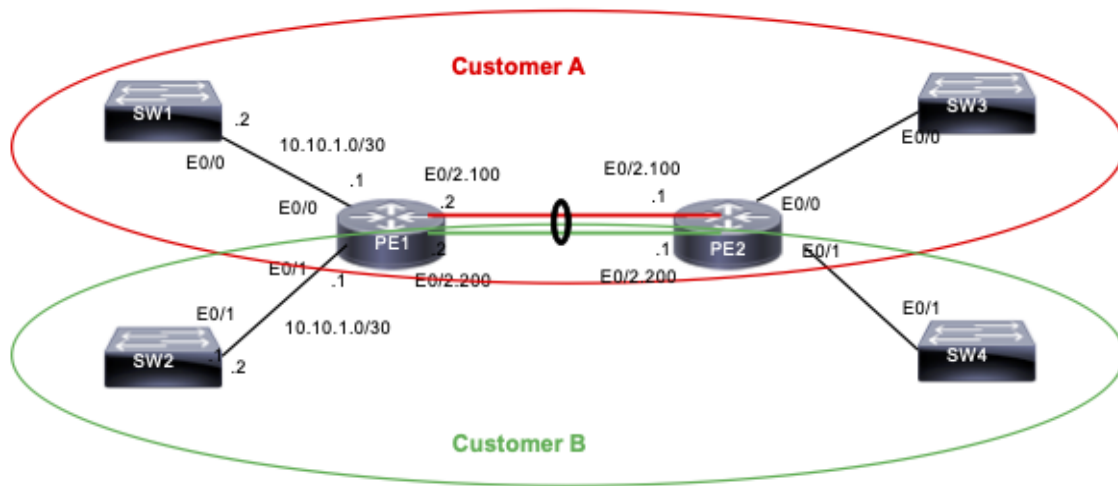
# Multiple Choice

Task

Question

1.7 Configure and verify VRF-Lite

Refer to the exhibit. An engineer is required to configure overlapping IP addresses (10.10.1.1/30) for multiple customers on a Customer Edge (CE) router for IPv4 and IPv6. Which configuration is required to connect customer A (Cust\_A) on the PE1 router for IPv4, assuming PE2 and remote Cust\_A devices are configured properly?



# Multiple Choice

## Task

### 1.7 Configure and verify VRF-Lite

<https://app.sli.do/event/g7n2kkM958A9zXxLZSywbh>



**A** vrf definition Cust\_A  
rd 10:1  
!  
interface Ethernet0/0  
description Cust\_A  
vrf forwarding Cust\_A  
ip address 10.10.1.1  
255.255.255.252

**B** vrf definition Cust\_A  
!  
interface Ethernet0/0  
description Cust\_A  
ip vrf forwarding Cust\_A  
ip address 10.10.1.1  
255.255.255.252

**C** vrf definition Cust\_A  
!  
address-family ipv4  
!  
interface Ethernet0/0  
description Cust\_A  
ip vrf forwarding Cust\_A  
ip address 10.10.1.1  
255.255.255.252

**D** vrf definition Cust\_A  
!  
address-family ipv4  
!  
interface Ethernet0/0  
description Cust\_A  
vrf forwarding Cust\_A  
ip address 10.10.1.1  
255.255.255.252

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Which configuration is required to connect customer A (Cust\_A) on the PE1 router for IPv4, assuming PE2 and remote Cust\_A routers are configured properly?

① Start presenting to display the poll results on this slide.

# Multiple Choice

Task

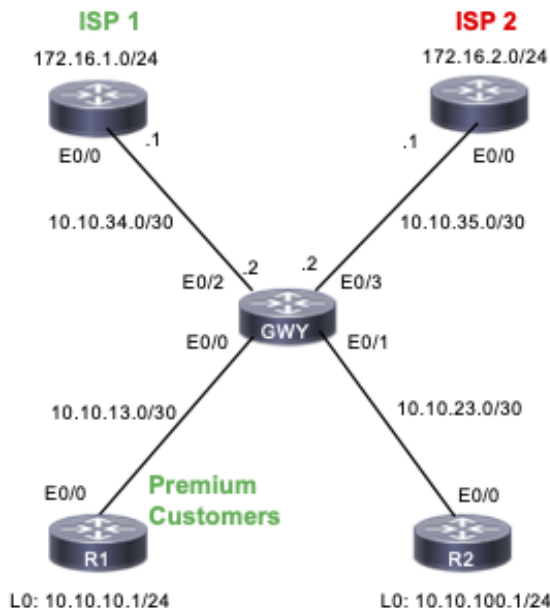
Question

1.6 Configure and verify policy-based routing

<https://app.sli.do/event/g7n2kkM958A9zXxLZSywbh>



Refer to the exhibit. An engineer is required to direct all premier customers to ISP1 regardless of the routes in the routing table. Which configuration meets the requirement?



# 1.6 Configure and verify policy-based routing

Contd.

**A** access-list 1 permit ip 10.10.10.0 255.255.255.0  
!  
interface e0/0  
  ip policy route-map premium\_cust  
!  
route-map premium\_cust permit 10  
  match ip address 1  
  set ip default next-hop 10.10.34.1  
!  
ip route 172.16.1.0 255.255.255.0 10.10.35.1  
ip route 172.16.2.0 255.255.255.0 10.10.34.1

**B** access-list 1 permit ip 10.10.10.0 255.255.255.0  
!  
interface e0/0  
  ip policy route-map premium\_cust  
!  
route-map premium\_cust permit 10  
  match ip address 1  
  set ip default next-hop 10.10.34.1  
!  
ip route 172.16.1.0 255.255.255.0 10.10.35.1  
ip route 0.0.0.0 255.255.255.0 10.10.34.1

**C** access-list 1 permit ip 10.10.10.0 255.255.255.0  
!  
interface e0/0  
  ip policy route-map premium\_cust  
!  
route-map premium\_cust permit 10  
  match ip address 1  
  set ip next-hop 10.10.34.1  
!  
ip route 172.16.1.0 255.255.255.0 10.10.35.1  
ip route 172.16.2.0 255.255.255.0 10.10.34.1

**D** access-list 1 permit ip 10.10.10.0 255.255.255.0  
!  
interface e0/1  
  ip policy route-map premium\_cust  
!  
route-map premium\_cust permit 10  
  match ip address 1  
  set ip next-hop 10.10.34.1  
!  
ip route 172.16.1.0 255.255.255.0 10.10.35.1  
ip route 172.16.2.0 255.255.255.0 10.10.34.1



slido



Which configuration meets the requirement?

① Start presenting to display the poll results on this slide.

# Multiple Choice

## Task

1.4 Troubleshoot redistribution between any routing protocols or routing sources.

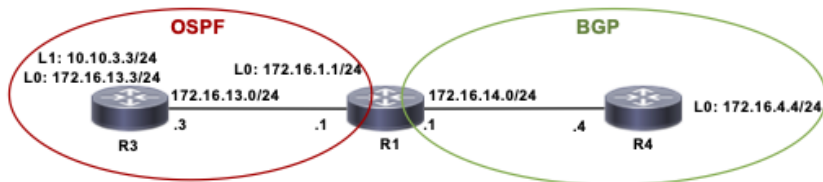
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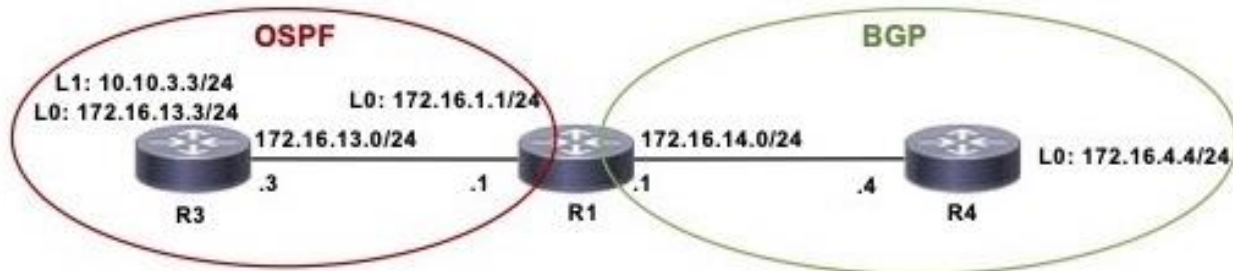


## Question

Refer to the exhibit. An engineer redistributes OSPF into BGP, but not all the routes are redistributed. Which action resolves the issue on R1 with minimum configuration?

- A. Configure /32 network statement under BGP for R3 Loopback1.
- B. Configure metric with the redistribute command to advertise external routes.
- C. Configure route map to redistribute OSPF internal and external routes into BGP.
- D. Configure to match OSPF internal external routes with the redistribute command.





```
R1#sh run | s bgp
router bgp 65000
  bgp log-neighbor-changes
  redistribute ospf 1
  neighbor 172.16.14.4 remote-as 65000
```

```
R1#sh ip ro
Gateway of last resort is not set
```

```
10.0.0.0/24 is subnetted, 1 subnets
O E2 10.10.3.0 [110/20] via 172.16.13.3, 00:15:47, Ethernet0/1
172.16.0.0/16 is variably subnetted, 8 subnets, 2 masks
C 172.16.1.0/24 is directly connected, Loopback0
O 172.16.3.3/32 [110/11] via 172.16.13.3, 00:15:47, Ethernet0/1
B 172.16.4.0/24 [200/0] via 172.16.14.4, 00:00:53
C 172.16.13.0/24 is directly connected, Ethernet0/1
C 172.16.14.0/24 is directly connected, Ethernet0/2
R1#
```

```
R1#sh ip bgp nei 172.16.14.4 advertised-routes
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*> 172.16.1.1/32	0.0.0.0	0	32768	?	
*> 172.16.3.3/32	172.16.13.3	11	32768	?	
*> 172.16.13.0/24	0.0.0.0	0	32768	?	
*> 172.16.14.0/24	0.0.0.0	0	32768	?	

```
Total number of prefixes 4
```

```
R4#sh ip bgp
```

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i 172.16.1.0/24	172.16.14.1	0	100	0	?
*>i 172.16.3.3/32	172.16.13.3	11	100	0	?
*> 172.16.4.0/24	0.0.0.0	0	32768		i
*>i 172.16.13.0/24	172.16.14.1	0	100	0	?

```
R4#
```

slido



Which action resolves the issue on R1 with minimum configuration?

① Start presenting to display the poll results on this slide.

# Multiple Choice

## Task

## Question

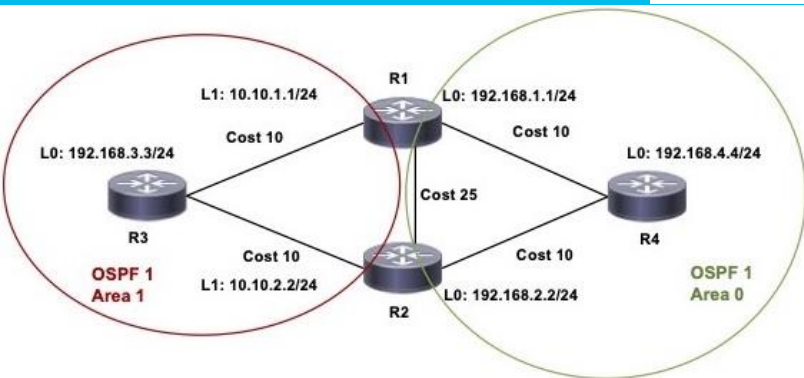
### 1.10 Troubleshoot OSPF (v2/v3) 1.10.d Path preference

<https://app.sli.do/event/g7n2kkM958A9zXxLZSywbh>



Refer to the exhibit. The network 10.10.1.1 on R1 reaches network 10.10.2.2 on R2 through the link to R3 instead of the directly connected link between R1 and R2. Which action resolves the issue?

- A. Reduce OSPF link cost to 10 between R1 and R2 in area 0.
- B. Increase OSPF link cost to 20 between R1 and R3 in area 1.
- C. Move link between R1 and R2 to area 1 with OSPF link cost to 10.
- D. Change OSPF link type to point-to-point with a link cost of 10 between R1 and R2.

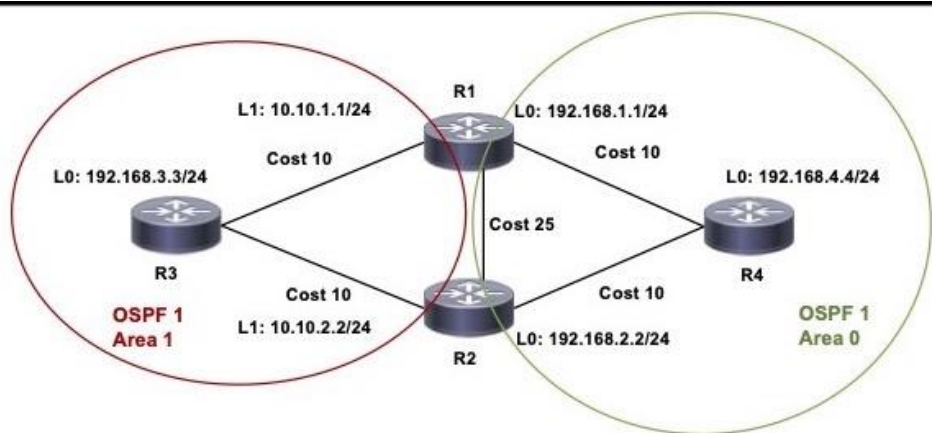


slido



Which action resolves the issue?

① Start presenting to display the poll results on this slide.



R1#sh ip route ospf  
Gateway of last resort is not set

```

10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
O   10.10.2.2/32 [110/21] via 192.168.13.3, 00:03:52, Ethernet0/1
192.168.2.0/32 is subnetted, 1 subnets
O   192.168.2.2 [110/11] via 192.168.12.2, 00:03:16, Ethernet0/0
192.168.3.0/32 is subnetted, 1 subnets
O   192.168.3.3 [110/11] via 192.168.13.3, 00:03:52, Ethernet0/1
192.168.4.0/32 is subnetted, 1 subnets
O   192.168.4.4 [110/11] via 192.168.14.4, 00:03:52, Ethernet0/2
O   192.168.23.0/24 [110/20] via 192.168.13.3, 00:03:52, Ethernet0/1
O   192.168.24.0/24 [110/20] via 192.168.14.4, 00:03:52, Ethernet0/2
    [110/20] via 192.168.12.1, 00:03:16, Ethernet0/0
  
```

```

R1#trace 10.10.2.2 source 10.10.1.1
Type escape sequence to abort.
Tracing the route to 10.10.2.2
VRF info: (vrf in name/id, vrf out name/id)
 1 192.168.13.3 1 msec 0 msec 0 msec
 2 192.168.23.2 0 msec * 2 msec
R1#
  
```

R2#sh ip route ospf  
Gateway of last resort is not set

```

10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
O   10.10.1.1/32 [110/21] via 192.168.23.3, 00:08:03, Ethernet0/2
192.168.1.0/32 is subnetted, 1 subnets
O   192.168.1.1 [110/11] via 192.168.12.1, 00:07:28, Ethernet0/0
192.168.3.0/32 is subnetted, 1 subnets
O   192.168.3.3 [110/11] via 192.168.23.3, 00:08:33, Ethernet0/2
192.168.4.0/32 is subnetted, 1 subnets
O   192.168.4.4 [110/11] via 192.168.24.4, 00:08:33, Ethernet0/1
O   192.168.13.0/24 [110/20] via 192.168.23.3, 00:08:33, Ethernet0/2
O   192.168.14.0/24 [110/20] via 192.168.24.4, 00:08:33, Ethernet0/1
    [110/20] via 192.168.12.1, 00:07:28, Ethernet0/0
  
```

```

R2#trace 10.10.1.1 source 10.10.2.2
Type escape sequence to abort.
Tracing the route to 10.10.1.1
VRF info: (vrf in name/id, vrf out name/id)
 1 192.168.23.3 1 msec 0 msec 1 msec
 2 192.168.13.1 1 msec * 1 msec
R2#
  
```

# New Performance-Based Lab Exam Items

<https://blogs.cisco.com/learning/new-performance-based-lab-exam-items-build-opportunities>

Lablet - Candidate Name

Time Remaining 01:29:28

Comment

1 of 1

Topology Tasks Guidelines

Topology Diagram

```
DSW1>enable
DSW1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
DSW1(config)#*z
DSW1#
*Apr 13 17:13:59.776: %SYS-5-CONFIG_I: Configured from console by console
DSW1#show ip int br
Interface IP-Address OK? Method Status Protocol
Ethernet0/0 unassigned YES unset up up
Ethernet0/1 unassigned YES unset up up
Ethernet0/2 unassigned YES unset up up
Ethernet0/3 unassigned YES unset up up
Vlan10 unassigned YES unset administratively down down
Vlan110 unassigned YES unset administratively down down
Vlan210 unassigned YES unset administratively down down
Vlan900 unassigned YES unset administratively down down
DSW1#]
```

Exam Info

# New Performance-Based Lab Exam Items Demo

(Contd.)

The screenshot displays a web-based interface for a lab exam. At the top, there are three tabs: 'Guidelines', 'Topology', and 'Tasks'. The 'Guidelines' tab is selected and highlighted with an orange underline. Below the tabs, the 'Guidelines' section contains a heading and a paragraph of introductory text, followed by a bulleted list of instructions. To the right of the guidelines is a terminal window with a dark background. The terminal has a header with four tabs: 'GWY', 'CE', 'Cust\_A', and 'Cust\_B', and a 'SP' label. The 'GWY' tab is selected. The terminal content shows the prompt 'GWY>' followed by a cursor.

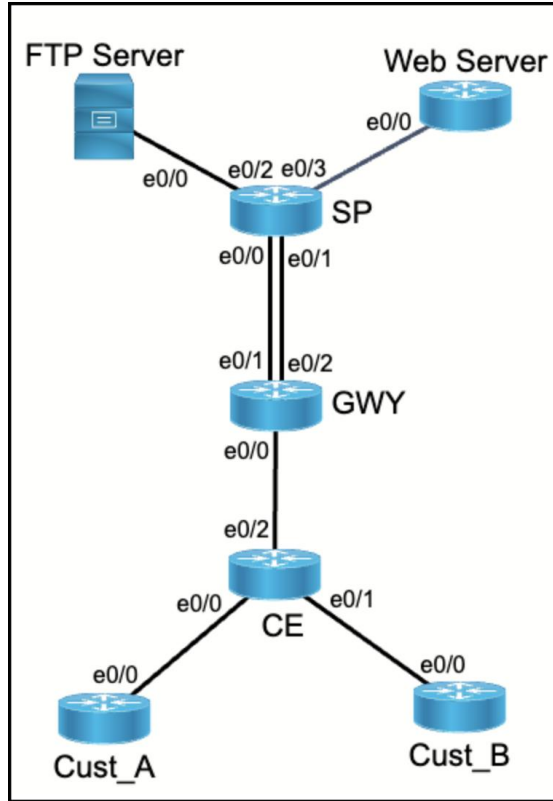
Guidelines

This is a lab item in which tasks will be performed on virtual devices.

- Refer to the **Tasks** tab to view the tasks for this lab item.
- Refer to the **Topology** tab to access the device console(s) and perform the tasks.
- Console access is available for all required devices by clicking the device icon or using the tab(s) above the console window.
- All necessary preconfigurations have been applied.
- Do not change the enable password or hostname for any device.
- **Save your configurations** to NVRAM before moving to the next item.
- Click **Next** at the bottom of the screen to submit this lab and move to the next question.
- When **Next** is clicked, the lab closes and cannot be reopened.

GWY>

# New Performance-Based Lab Exam Items Demo

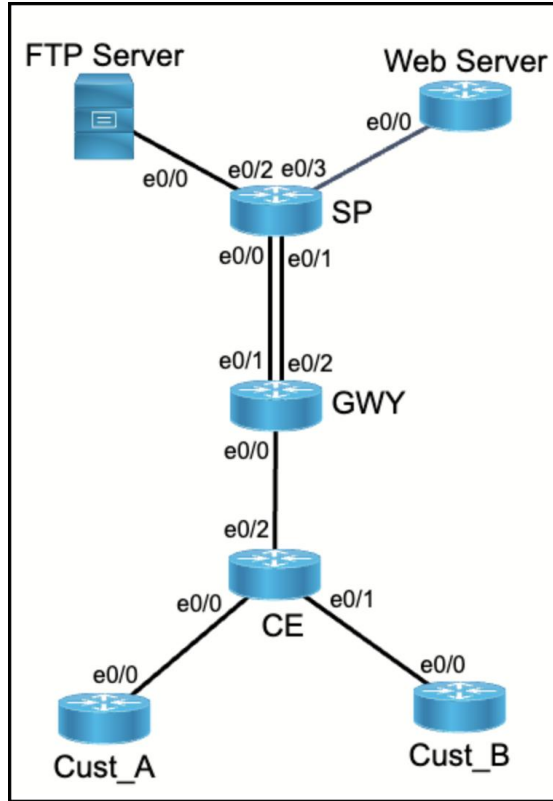


Configure the routers for each customer to meet these requirements:

1. Configure CE router interfaces facing Cust\_A and Cust\_B routers with IP address 10.10.1.1/30 and should be able to support IPv6 if required. Use "Cust\_A" and "Cust\_B" as variables for any related configuration.
2. Configure CE router interfaces for Cust\_A and Cust\_B to ping the corresponding interface IP address on the GWY router. Configure static routes to reach Cust\_A loopback 0 and Cust\_B loopback 0. Configure default routes for Cust\_A to reach FTP Server and Cust\_B to reach Web Server without introducing dynamic routing. Do not change IP addresses or dot1q configurations on interfaces connecting GWY and CE routers.

# New Performance-Based Lab Exam Items Demo

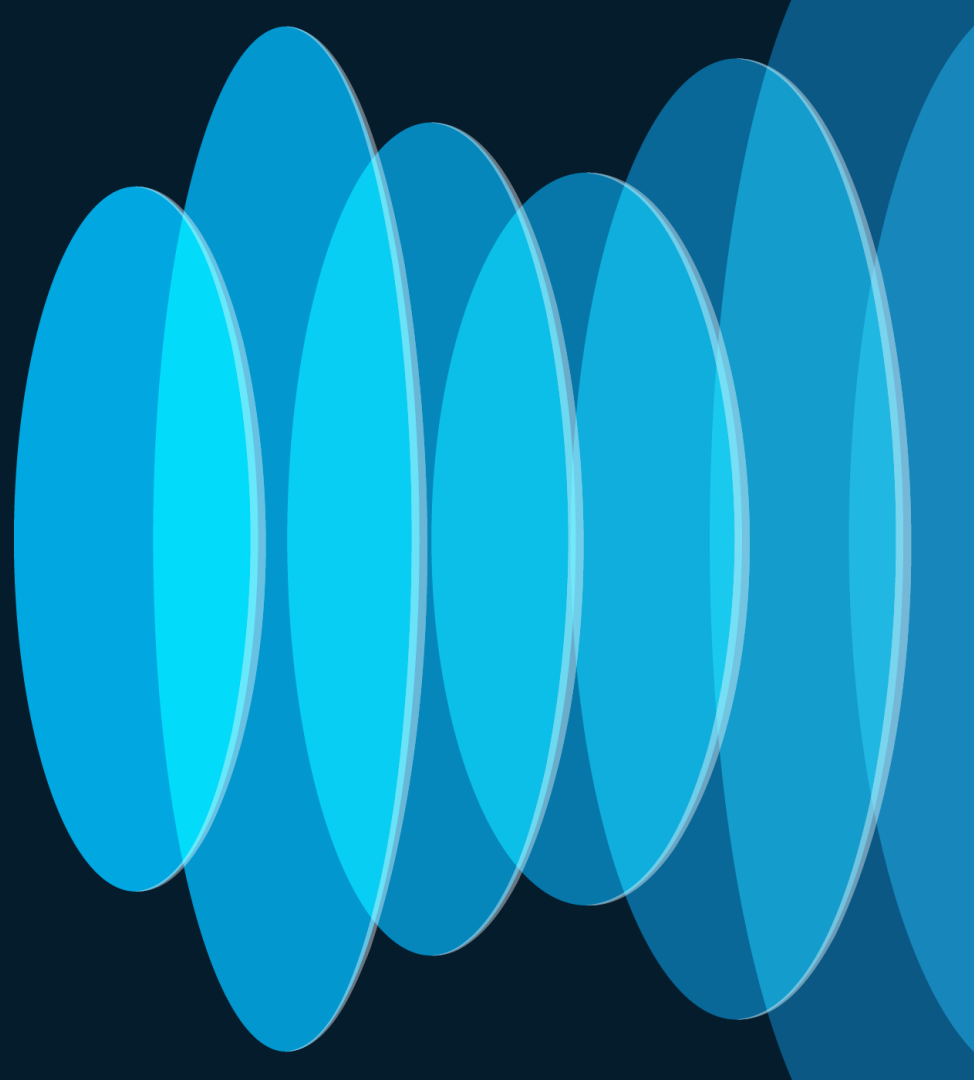
(Contd.)



Configure the routers for each customer to meet these requirements (Contd.):

3. Configure the GWY router so that Cust\_A always uses next-hop 10.10.10.2 to reach FTP Server (192.168.10.1). Do not add, remove, or modify preconfigured static routes to achieve results. Verify the results using extended ping from loopback0 to FTP Server on Cust\_A router.
4. Configure GWY router so that Cust\_B always uses next-hop 10.10.20.2 for Web Server (192.168.20.1). Do not add, remove, or modify preconfigured static routes to achieve results. Verify the results using extended ping from loopback0 to Web Server on Cust\_B router.

# Learning Resources



# Learning Resources

- Cisco Learning Network Study Resources
- Cisco U
- Configure/Design/Study Guides
- Cisco Live On-Demand Sessions
- Webinars/Podcasts
- Sandboxes
- Cisco Press
- Training Videos

# Cisco Learning Network Study Resources

## Cisco Certification Exam Tutorial

Candidates can earn their Cisco certifications by completing specific requirements. During the exam, candidates may encounter different types of questions including multiple choice, drag & drop, and labs.

- Binary Learning Game
- CCIE Practice Labs
- Certification Blogs
- Cisco Certification Exam Tutorials
- Cisco Expert Prep Program
- Cisco Validated
- Learning and Certifications Podcasts
- Studying for Results
- Packet Tracer & Alternative Lab Solutions

The following video tutorial for Associate and Professional level exams will provide a demonstration of the various question types and how they function.

### Exam Tutorial for Associate and Professional Cisco Certifications



### Links

- Exam Learning Locator
- Cisco Learning Network Store
- Certification Tracking System
- Learning@Cisco Centralized Support

# Cisco Certification Exam Tutorial Videos

<https://learningnetwork.cisco.com/s/certification-exam-tutorials>

## Exam Tutorial for Associate and Professional Certifications





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<https://u.cisco.com/path/9>



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Learning Path Completion 1.79%

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- 2 Layer 3 Technologies - OSPF 7h 30m
- 3 Routing Manipulation 5h 30m
- 4 Layer 3 Technologies - BGP 9h
- 5 MPLS and VPN Technologies 5h 15m
- 6 Infrastructure Security and Services 8h

# Cisco U ENARSI Lab

<https://u.cisco.com/path/9>



Configuring VRF-Lite

- ▶ Introduction
- ▶ PE Router Routing Contexts
- ☰ VPN-Aware Routing Protocols
- ☰ VRF Table
- ☰ VRF-Lite Functionality
- ☰ Implement VRF-Lite
- ☰ Migration from Old to New Styl...
- ▶ Routing with VRF-Lite
- ▲ Configure Routing with VRF-Lite
- ▶ Course Wrap-up

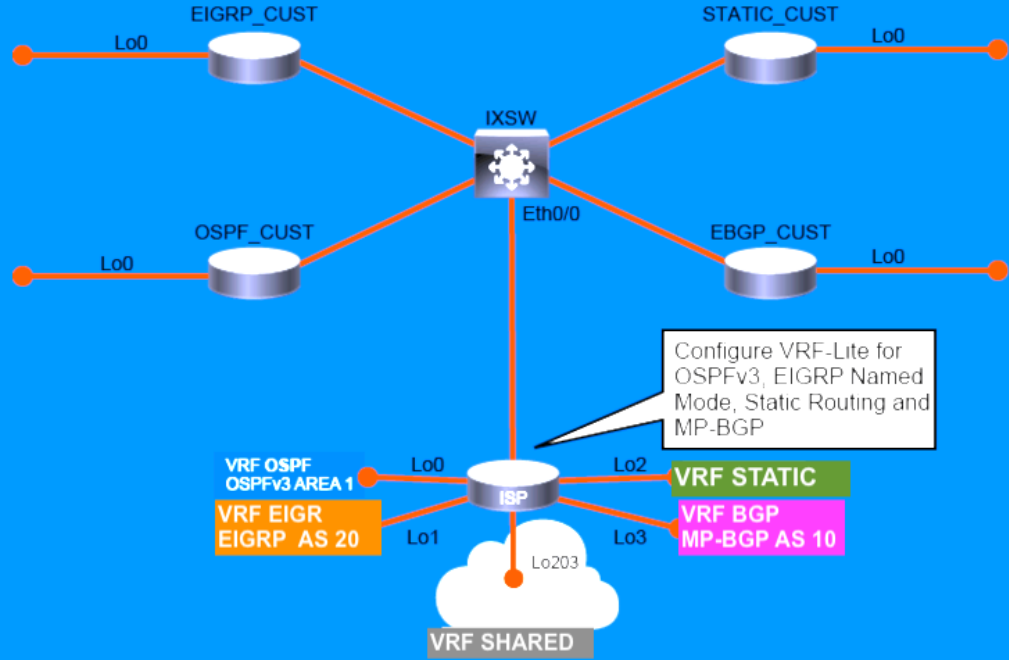
# Cisco U ENARSI – VRF-Lite Lab

[https://ondemandlearning.cisco.com/apollo-alpha/mc\\_enarsi10\\_17/pages/9](https://ondemandlearning.cisco.com/apollo-alpha/mc_enarsi10_17/pages/9)



Your configuration tasks are as follows:

- Define VRFs on the ISP router
- Assign interfaces to appropriate VRFs on the ISP router
- Enable VRF-Lite routing on the ISP router
- Configure inter-VRF route leaking on the ISP router



# ENARSI – VRF – Lite Lab

[https://ondemandlearning.cisco.com/apollo-alpha/mc\\_enarsi10\\_17/pages/9](https://ondemandlearning.cisco.com/apollo-alpha/mc_enarsi10_17/pages/9)



## Define VRFs on the ISP Router

In this task, you will create the following VRFs that will be used to isolate customer traffic on the ISP router.

VRF Name	Address Family	Parameters
OSPF	IPv4 and IPv6	—
EIGRP	IPv4 and IPv6	—
STATIC	IPv4 and IPv6	—
BGP	IPv4 and IPv6	RD 10:10 RT import 10:203 RT export 10:10
SHARED	IPv4	RD 10:203 RT import 10:10 RT export 10:203

### Step 1

[Show Me](#)

On ISP, configure the VRFs according to table above.

# ENARSI – VRF-Lite Lab

[https://ondemandlearning.cisco.com/apollo-alpha/mc\\_enarsi10\\_17/pages/9](https://ondemandlearning.cisco.com/apollo-alpha/mc_enarsi10_17/pages/9)



## Step 1

On ISP, configure the VRFs according to table above.

### Answer

```
ISP(config)# vrf definition OSPF
ISP(config-vrf)# address-family ipv4
ISP(config-vrf-af)# exit
ISP(config-vrf)# address-family ipv6
ISP(config-vrf-af)# exit
ISP(config-vrf)# exit
ISP(config)# vrf definition EIGRP
ISP(config-vrf)# address-family ipv4
ISP(config-vrf-af)# exit
ISP(config-vrf)# address-family ipv6
ISP(config-vrf-af)# exit
ISP(config-vrf)# exit
```

# Community – Study groups

The screenshot shows the Cisco Learning Network interface for the Enterprise Networking Certifications Study Group. At the top, the Cisco logo and 'The Cisco Learning Network' are displayed. Navigation links include Home, Certifications, Community, Learning Center, IT Careers, and Store. A search bar is located on the right. The page title is 'Enterprise Networking Certifications Study Group', with sub-tabs for Overview, Content, and People. A call to action bar prompts users to log in or join. A welcome message states: 'Welcome to the Enterprise Networking Technology track Study Group, the place on the Cisco Learning Network where you can ask questions, share ideas and connect with other members as you prepare for your Certification exams.' Below this are three icons: 'Join the Discussion Participate Now' (speech bubbles), 'Find People Connect Now' (handshake), and 'Member Created Documents View Now' (document). On the right, a 'Meet Your Community Managers' section features a profile for Karlo Bobiles with the text 'Connect with me!'.

# On-Demand Library

New Releases

Marquee Sessions

## Cisco Live On-Demand Library

[www.ciscolive.com](https://www.ciscolive.com)

<https://www.ciscolive.com/on-demand/on-demand-library.html>

Filters

Clear

"OSPF" ✕

Intermediate ✕

OSPF



11 sessions

### 2022 Melbourne

#### Troubleshooting Routing Protocols – BRKENT-2085



**Event:** 2022 Melbourne

[Julius Nasr](#), High Touch Engineer, Cisco Systems, Inc.

Routing protocols such as OSPF and BGP are still widely used in networks across the world, and if you work with any of these protocols then this session will help you in your journey. This intermediate session will assume you understand the...

[Show more](#)

### 2020 Digital

#### OSPF Deployment in Modern Networks – DGTL-BRKRST-2337



**Event:** 2020 Digital

[Nick Russo](#), TECHNICAL LEADER.CUSTOMER DELIVERY, Cisco Systems, Inc. – **Distinguished Speaker**

This session covers the OSPF topics relevant for modern networks. Join me as we analyze requirements, develop designs, implement features, and optimize performance by following a realistic business scenario. Together, we'll solve problems

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<https://learningnetwork.cisco.com>

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# DevNet Sandbox Cisco Modeling Labs Demo

<https://developer.cisco.com>

ALWAYS-ON

or

RESERVE

## Networking Sandbox Highlights

Version 2.0



### Cisco Modeling Labs Enterprise

Start your Network DevOps journey

#### RESERVATION SANDBOX

### Cisco Modeling Labs Enterprise

Cisco Modeling Labs is a tool for building virtual network simulations (or labs) for you to test out new topologies, protocols, and config changes; automate network tests via CI/CD pipeline integration; and learn new things about the cool world of networking. This sandbox provides access to a Cisco Modeling Labs system that can be used to explore the capabilities of the newest release of Cisco Modeling Labs Personal and Enterprise.



### Multi Domain

#### RESERVATION SANDBOX

### Multi Domain

This Sandbox was designed for developers to build applications and operational tools to manage the diverse set of platforms deployed across an enterprise. This Sandbox provides developers access to multiple domains and platforms, including Cisco HyperFlex, Cisco SD-WAN, Cisco Action Orchestrator, as well as open source tools like NetBox and GitLab.

Version 19.2



### Cisco SD-WAN Cloud-delivered overlay WAN architecture

#### RESERVATION SANDBOX

### Cisco SD-WAN

This sandbox consists a complete virtual SD-WAN environment and all of its components, that developers can utilize to develop, debug and test their sample SD-WAN applications. The developer can also interact with the SD-WAN API calls using a variety of REST clients such as POSTMAN.

# Cisco DevNet Sandbox (<https://developer.cisco.com/site/sandbox/>)

The screenshot displays the Cisco DevNet Sandbox Catalog interface. At the top, there are navigation links for 'Docs', 'Community', and a 'Launch Sandbox' button. The main content area is a grid of lab cards, each with a title, description, and a 'Launch' button. The cards include:

- Cisco Modeling Labs**: A tool for building virtual network simulations (or labs) for testing new topologies, protocols, and config changes. It includes a 'Networking' tag.
- AppDynamics On-Prem Platform**: Provides an environment to explore base technical knowledge related to application performance management and concepts around this technology. It includes a 'Full-Stack Observability' tag.
- NSO**: This sandbox lab provides access to explore the APIs for NSO network automation packages in your networks. It includes 'Networking' and 'NSO' tags.
- ACI Simulator**: Provides a developer environment to design, develop, and test using the ACI RESTful APIs over http/https with XML and JSON encodings. It includes 'Data Center' and 'ACI' tags.
- Collaboration 14.0**: Pre-configured Cisco Unified Collaboration v14 on-premise sandbox, including Cisco Unified Communications Manager Pub/Sub, Cisco IM & Presence, Cisco Unity Connection, and Windows 201... It includes a 'Collaboration' tag.
- Cisco Control Center**: The Control Center sandbox provides access to explore the capabilities of the newest release of Cisco Modeling Labs Personal and Enterprise. It includes 'IoT' and 'Cisco Control Center' tags.
- Catalyst SD-WAN**
- Edge Intelligence - IoT Operations Dashboard**
- Cisco Catalyst Center**

A modal window titled 'Cisco Modeling Labs' is open, showing 'Instructions' and 'More Info' tabs. The 'Instructions' tab is active, displaying a 'Table of Contents' with links for 'Overview', 'Access Details', and 'VPN Access'. The 'Overview' section describes the tool and provides details about the simulated network topology, including nodes like 'inside-host01' (Ubuntu server) and 'inside-host02' (Alpine Linux workstation).

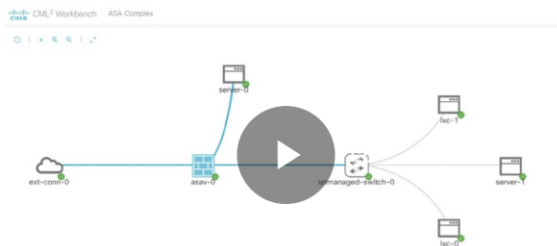
# Cisco DevNet Sandbox Cisco Modeling Labs

<https://www.cisco.com/c/en/us/products/cloud-systems-management/modeling-labs/index.html>

## Cisco Modeling Labs

Cisco Modeling Labs is our premier platform for network simulation. With an easy-to-use HTML5 UI and a comprehensive API, Cisco Modeling Labs makes it fun to design, test, troubleshoot, and learn.

[Overview](#) [Licensing](#) [Get started](#)



## Welcome to the world of network simulation

Cisco Modeling Labs is an on-premise network simulation tool that runs on workstations and servers. With Cisco Modeling Labs, you can quickly and easily simulate Cisco and non-Cisco networks, using real Cisco images. This gives you highly reliable models for designing, testing, and troubleshooting. Compared to building out real-world labs, Cisco Modeling Labs returns results faster, more easily, and for a fraction of the cost.

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[Watch video \(1:05\) >](#)

# Questions?



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- Attend the interactive education with DevNet, Capture the Flag, and Walk-in Labs
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