



CCIE Service Provider Ops

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Business Development - Cisco Services EMEAR

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Agenda

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CCIE SP Operations: Overview

2

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Q&A



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Cisco Expo
2011

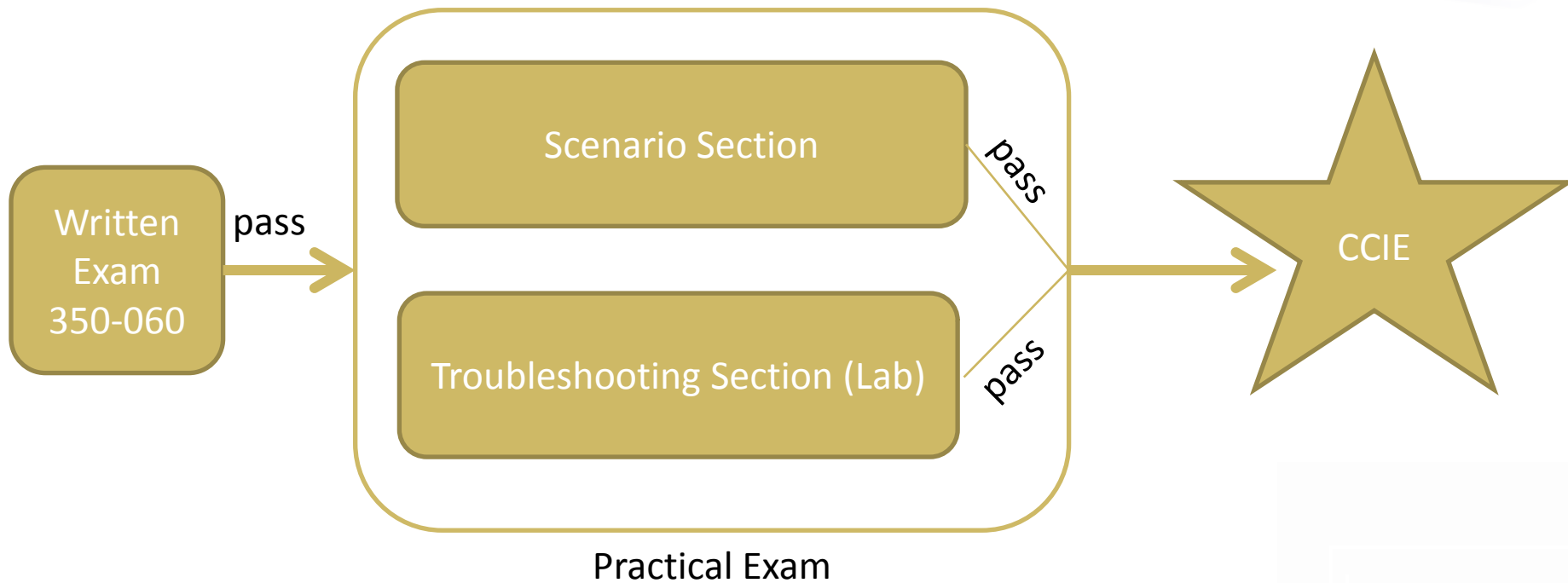
Disclaimer

- Not all the topics discussed today appear on every exam
- Due to time limitations, we're unable to discuss every feature and topic possible on the exam

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CCIE SP Operations Overview

Certification Process

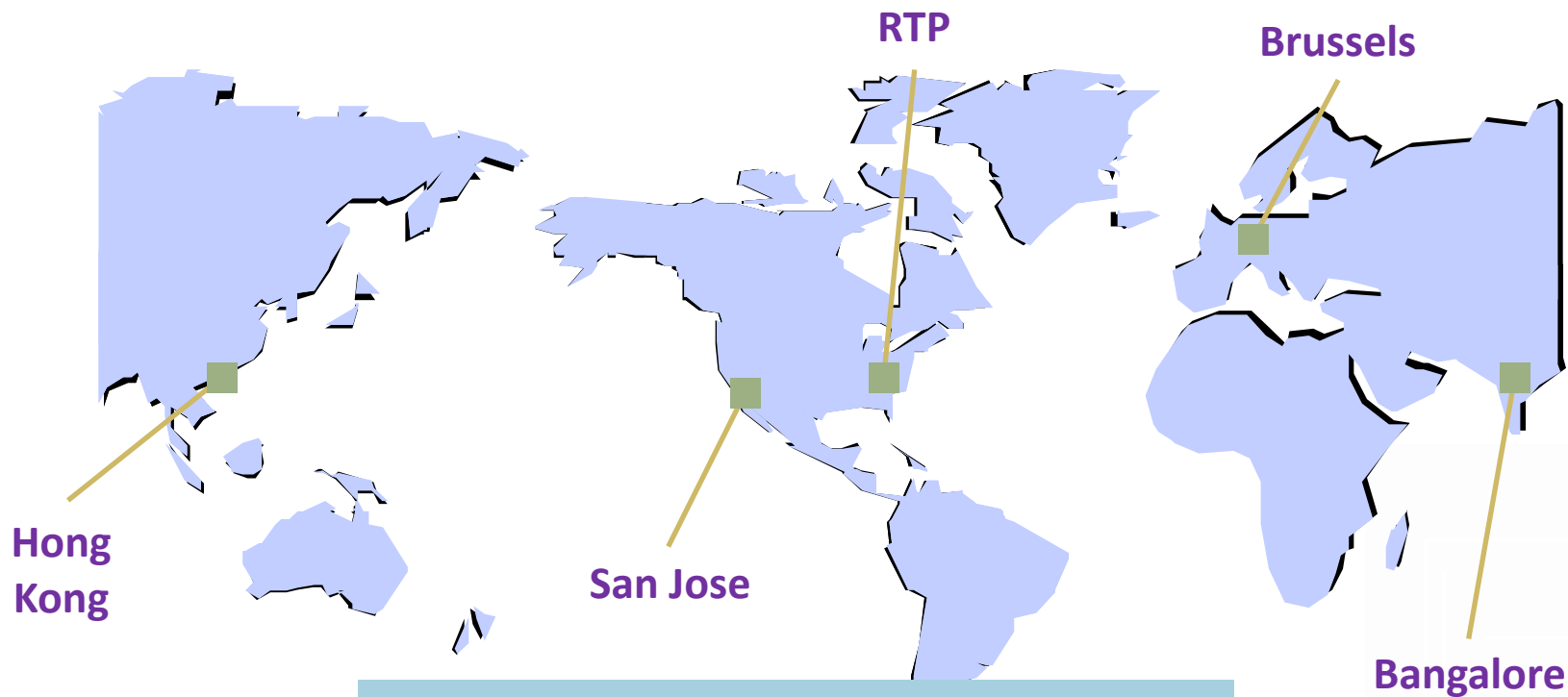


- Candidates will need to achieve minimum score on each section to pass the Practical exam.
- Candidates take both sections, independent of passing on the first section or not.
- Re-reads are not available for the CCIE SP Operations Practical exam.

Certification Process – Practical Exam

- Eight-hour exam to demonstrate expertise across two sections:
 1. Scenario section (3 hours)
 - Covers Technology, Process and NMS areas of expertise
 - 4 modules: Design, Implement, Operate, Optimize (PPDIOO framework)
 - Situation-based: Tier3 NOC engineer
 - Uses Multiple-choice, Drag&Drop, Charts question types
 - No “skip-question”, no “go back”
 - Self-scored, similar to the Written exam
 2. Troubleshooting section (5 hours)
 - Troubleshooting on Hardware
 - IOS and IOS XR
 - Traffic and route injection
 - Troubleshooting and configuration from command line
 - Grading:
 - Automatic tools aid proctors with simple grading tasks, but are never solely responsible for lab exam grading—proctors are
 - Points are awarded for working solutions only
 - Some incidents have multiple solutions

CCIE SP Operations – Lab Locations



CCIE Population Saudi Arabia : Total : 386	
R&S : 281	Security : 55
Voice : 12	SP: 38
SP Ops : 0	

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Differences Between CCIE SP and CCIE SP Operations

CCIE SP Operations – Job Role-based Approach

“The SP Operations CCIEs can apply their expert-level knowledge of networking, network management, and network operations processes to managing complex networks and network services, including capacity and performance. Furthermore, they should be able to proactively identify and resolve potential network problems in order to provide the highest quality network services to internal or external customers.”

Architecture Engineering			Network Operations				Network Engineering			
Capacity Planning Engineer	Infrastructure Architect	Solution Design Engineer	Advanced NOC Support Engineer Tier 3	NOC Support Engineer Technology Specialist	NOC Support Engineer Tier 2	NOC Support Technician Tier 1	Network Management Engineer	Field Engineer	Implementation Engineer	Security Engineer

Cisco SP Certifications Comparison

CCIE SP Operations

Practical Exam: Scenario and Troubleshooting sections

Job Role: Network Operations Support Engineer

Target Audience: SP Network Operations Center (NOC) personnel, Tier III – IV Support Engineers / Technicians

3 Major Areas:

- SP IP NGN technologies
- Management process framework (ITIL® v3)
- NMS tools

Target Skills: Troubleshooting, management processes (incident, fault, change, configuration, and performance)

CCIE SP

Lab Exam: Integrated Configuration and Troubleshooting

Job Role: Network Engineer

Target Audience: SP Core /Aggregation/Access Infrastructure Network Engineers, IP Backbone Engineers

Major Areas: SP IP NGN core/edge/access technologies

Target Skills: Design, implement, optimize and troubleshoot SP infrastructure and transport managed services

CCNP SP Operations

OFCN: Operational Foundations for Cisco Service Provider Core Networks

MSPRP: Maintaining Cisco Service Provider Routing Protocols

MSPVM: Maintaining Cisco Service Provider VPNs and MPLS Networks

MSPQS: Maintaining Cisco Service Provider Quality of Service

CCIP

ROUTE: Implementing Cisco IP Routing

QOS: Implementing Cisco Quality of Service

BGP: Configuring BGP on Cisco Routers

MPLS: Implementing Cisco MPLS

CCNA SP Operations

SSPO: Supporting Cisco Service Provider IP NGN Operations

ICND1: Interconnecting Cisco Networking Devices (Part 1)

CCIE SP Operations Blueprint

Major Skills	Area of expertise
Troubleshoot and fix network performance problems	Technology
Troubleshoot and fix reachability and transport problems within the network	Technology
Identify problems in implementation plans	Technology
Manage the network fault management system	Process
Manage operations processes	Process
Manage performance and capacity	NMS

Detailed checklist is posted on CLN:

<https://learningnetwork.cisco.com/docs/DOC-9705>

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CCIE SP Operations Process Overview

ITIL® v3 Functional Framework

- A set of publications suggesting best practices for managing IT services
- Contains codes of practice for quality management of IT services and infrastructure
- The most widely accepted approach to IT service management
- Five core areas:
 1. Service Strategy
 2. Service Design
 3. Service Transition
 4. Service Operations
 5. Continual Service Improvement

Certification Focuses on Two Components

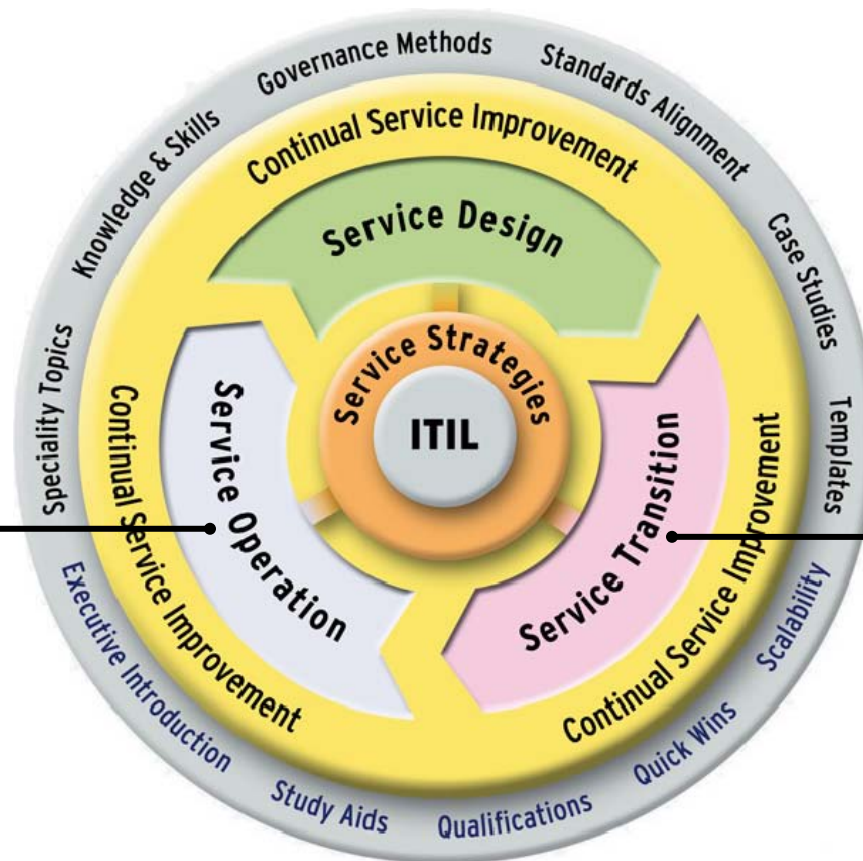
ITIL® v3 Lifecycle Framework

SERVICE OPERATION

- Incident Management
- Problem Management
- Event Fulfillment
- Access Management
- Request Management

SERVICE TRANSITION

- Transition Planning and Support
- Change Management
- Service Asset and Configuration Management
- Release and Deployment Management
- Service Validation and Testing
- Evaluation
- Knowledge Management



ITIL® v3 Service Management Service Operations

Service Processes	Brief Description
Incident Management	Handle unplanned interruptions
Problem Management	Problem resolution
Event Management	Handle alerts and notifications
Access Management	Provision of user access to services
Request Management	Handle requests from users

ITIL® v3 Service Management Service Transition

Service Processes	Brief Description
Transition Planning and Support	Transition services from design and development into production
Change Management	Agree on and control the service levels Understand business needs
Service Asset and Configuration Management	Ensure optimal use of IT
Release and Deployment Management	Control and plan the distribution of releases
Service Validation and Testing	Validate service integrity
Evaluation	Validate metrics for service have been met
Knowledge Management	Data, best practices, and qualified staff

Sample Process Written Exam Question 1

According to ITIL® v3 framework, which event category is applied when an OLA or SLA defined by the organization has been breached?

- a) Threshold
- b) Warning
- c) Exception
- d) Informational

Sample Process Written Exam Question 2

According to ITIL® v3 framework, which three are formula components used to determine the pain value level associated with the impact of an incident or problem on an organization? (Choose Three.)

- a) customer affected
- b) cost to the business
- c) timeline of events
- d) downtime duration
- e) event trigger
- f) sequence of events

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CCIE SP Operations Network Management Overview

What is Network Management?

- Network Management refers to the activities, methods, procedures, and tools that pertain to the operation, administration, maintenance, and provisioning of networked systems.
- Areas of interest include:
 - Operation—keeping the network (and the services that the network provides) up and running smoothly
 - Administration—keeping track of resources in the network and how they are assigned
 - Maintenance—performing repairs and upgrades
 - Provisioning—configuring resources in the network to support a given service
- Certification does not require detailed knowledge of specific Network Management tools.

Source: Wikipedia http://en.wikipedia.org/wiki/Network_management

The Five Facets of Proper Network Management

- Addresses the network management applications that reside upon the NMS.
- The OSI model categorizes five areas of function (FCAPS model).
 1. Fault
 2. Configuration
 3. Accounting
 4. Performance
 5. Security

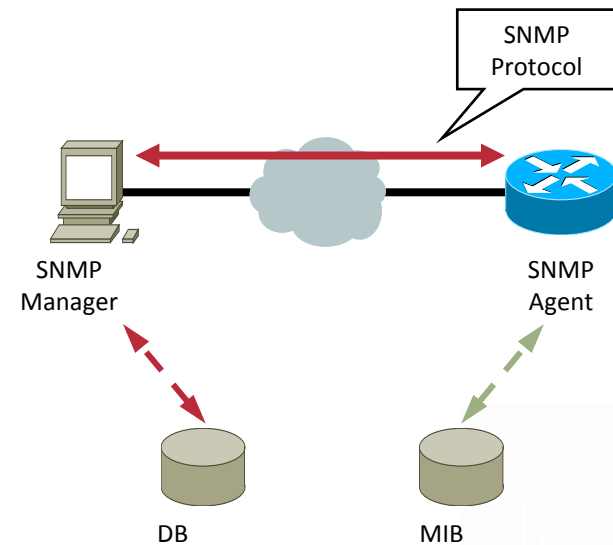


Syslog Management

- Syslog is a client/server protocol that proactively captures chronic issues affecting the network.
- Because of its verbose nature, Syslog must be implemented precisely.
 - Adequate thresholds and filters must be defined to generate actionable alerts based on the Syslog messages
 - Critical Syslog messages must be easily identified
 - The Syslog messages must be prioritized
- These requirements will be very customer-specific, due to the uniqueness of each organization's network deployment.
- Certification requires detailed understanding of syslog including each of its distinct fields.
 - Facility
 - Severity
 - Hostname
 - Timestamp
 - Message

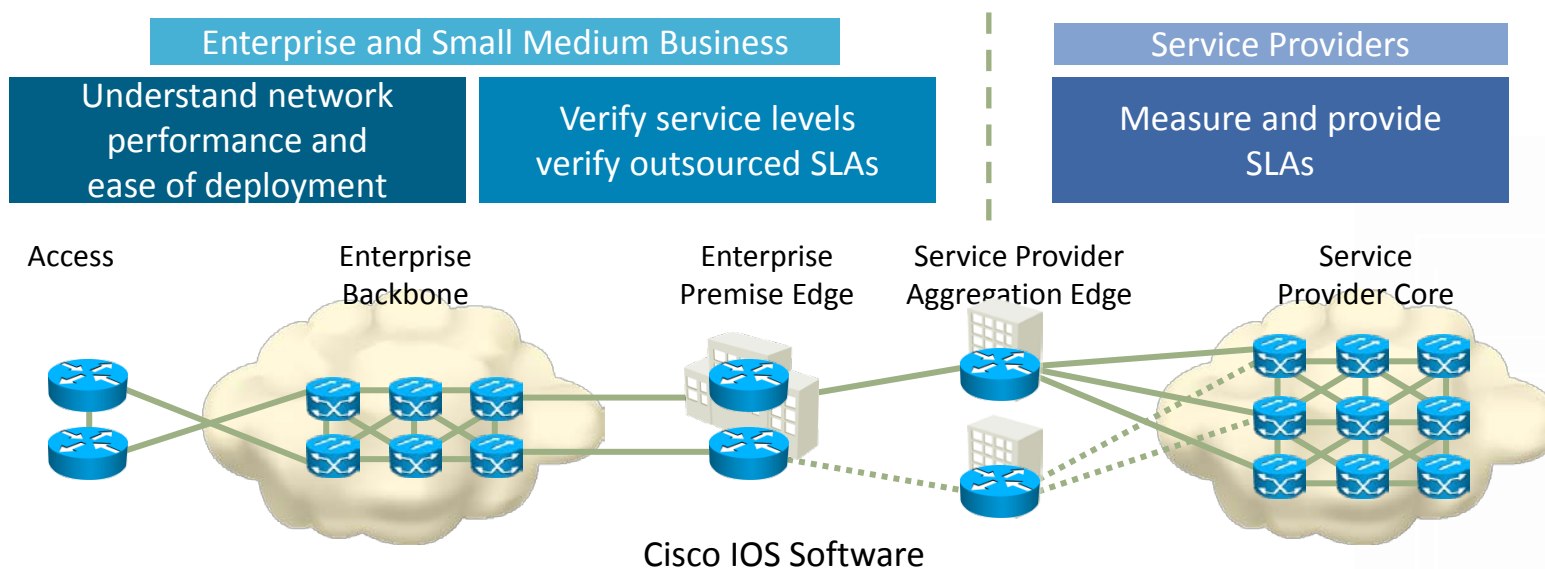
SNMP Protocol

- Protocol used to configure and monitor network elements with a management application
 - The Manager Aims to Provide Solutions for ISO's FCAPS
 - The agent is embedded in the device
 - The manager and the agent exchange management information using the SNMP protocol
- Certification requires detailed knowledge of SNMP and how it is used throughout the FCAPS model



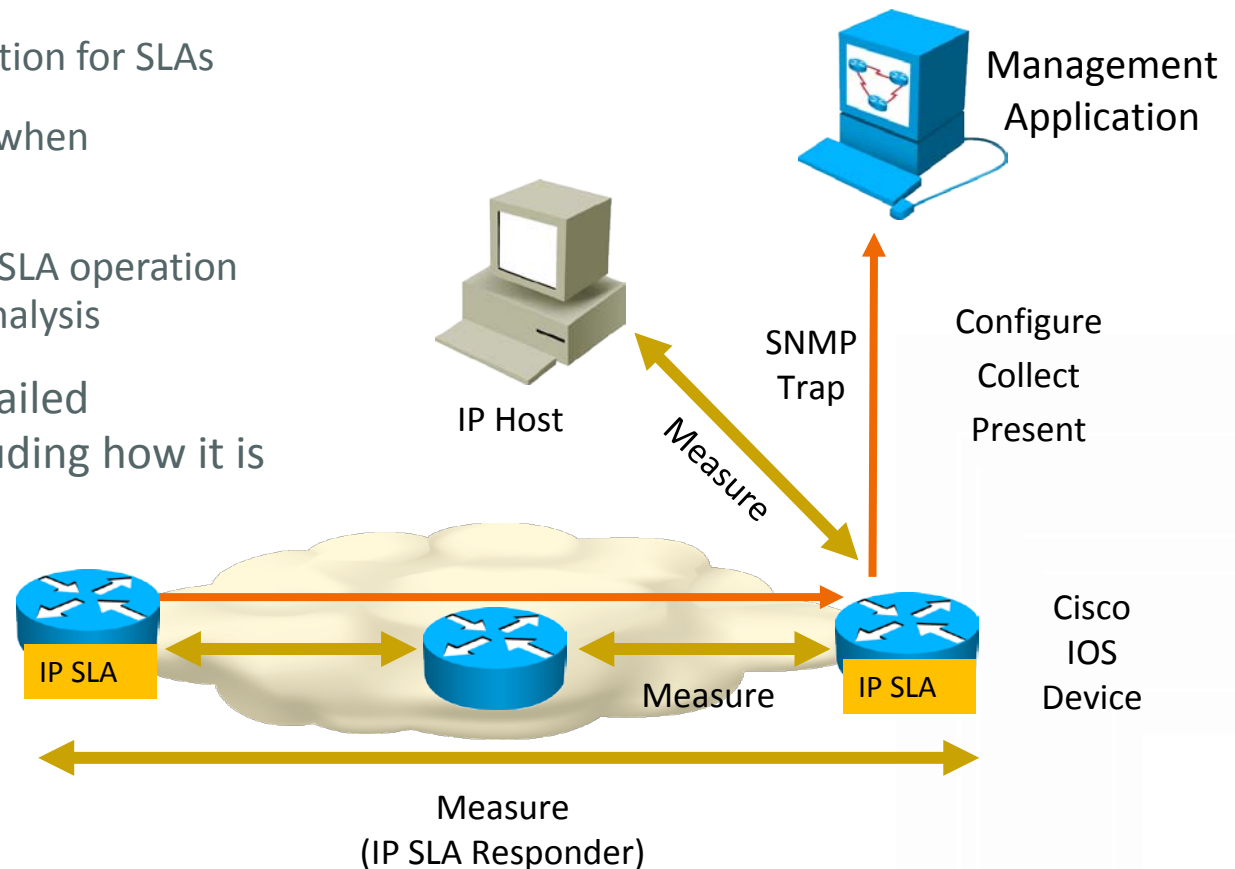
Cisco IP SLA

- Assures IP service levels
- Proactively verifies network operation
- Accurately measures network performance



How Does IP SLA Work?

- Hop-by-hop analysis and Edge-to-Edge measurement
- Proactive Notification
 - Robust threshold definition for SLAs
 - SNMP traps generated when SLA violated
 - Thresholds can trigger SLA operation activation for further analysis
- Certification requires detailed knowledge of IP SLA including how it is used in the network



Cisco IOS NetFlow – What is it?

- Developed and patented at Cisco® Systems in 1996
- NetFlow is the defacto standard for acquiring IP operational data
- Provides network and security monitoring, network planning, traffic analysis, and IP accounting
- Certification requires a detailed understanding of NetFlow technology

Network World article – NetFlow Adoption on the Rise

<http://www.networkworld.com/newsletters/nsm/2005/0314nsm1.html>



Information Found in NetFlow Data

- Who are my top N talkers? Which percentage?
- How many users are on the network at any given time? When will upgrades effect the least number of users?
- How long do my users surf?
- Where: which Internet sites do they use?
- Are users staying with in an acceptable usage policy?
- DOS attack detections!
- NetFlow is now the primary network accounting technology in the industry.

Sample NMS Written Exam Question

```
*Mar 6 22:48:34.452 UTC: %LINEPROTO-5-UPDOWN: Line protocol on  
Interface Loopback0, changed state to up
```

Refer to the exhibit. In the syslog message generated by a Cisco IOS device, what is the facility?

- a) UTC
- b) LINEPROTO**
- c) 5
- d) UPDOWN

Sample NMS Written Exam Question 2

How can IP SLA be used to troubleshoot a network issue?
(Choose Two.)

- a) It can identify route convergence times causing delays
- b) It can be configured with thresholds that can generate traps**
- c) It can obtain hop-by-hop performance information to identify bottlenecks**
- d) It can measure access-list failure attempts to identify information loss

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CCIE SP Operations Scenario Section

Scenario Section – What to Expect

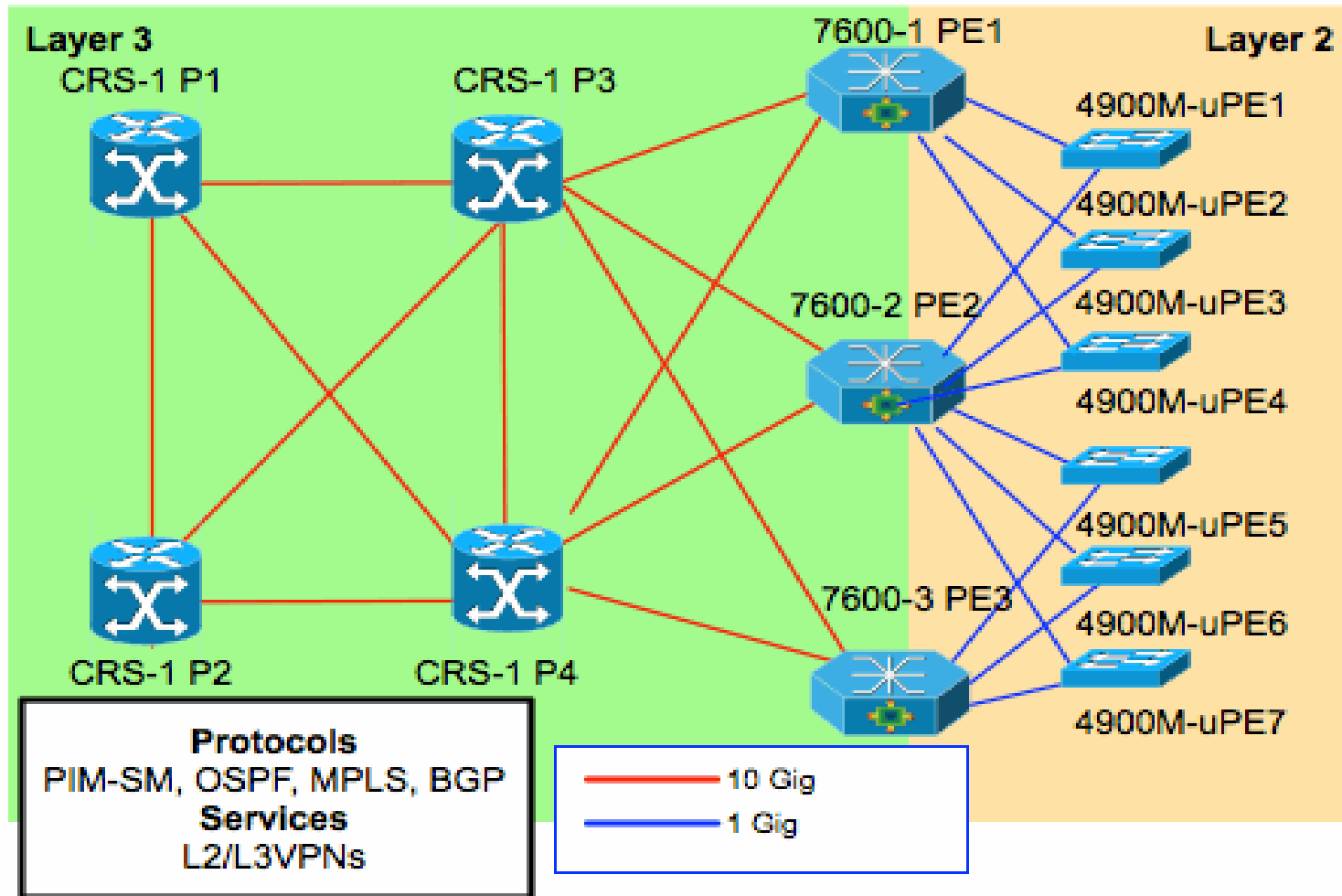
- **End-to-end Operations workflow (project)**
 - Network migration
 - New implementation
 - Customer requirement
- **You are the Senior NOC Engineer**
- **Stages of project**
 - Design
 - Implement
 - Operate
 - Optimize
- **Resources**
 - Network Diagram
 - Global Documents
 - Question-Specific Documents

Scenario Example – Overarching Objective

- **ISP X**
 - Residential triple play (voice, video and data) services
 - Business L2/L3VPN transport services

- **Assignment**
 - Migrate 7600 edge routers to ASR 9000
 - Hitless (no down time)
 - Continued support for all protocols, features and services
 - Priority 1 – Feature parity
 - Priority 2 – Optimization

Scenario Example – Topology Diagram



Scenario Example – Reference Documentation

- **Global Documents**
 - Operational Level Agreement
 - Service Description
 - Service Level Agreement

- **Question Specific Documents**
 - Device configuration, show command output
 - Performance graphs, traffic reports
 - Trouble Tickets, Incident reports
 - Feature descriptions
 - SNMP output, SNMP traps, and syslog messages
 - Internal process documents
 - Email correspondence
 - Device data sheets

Scenario: You Will Be Asked To...

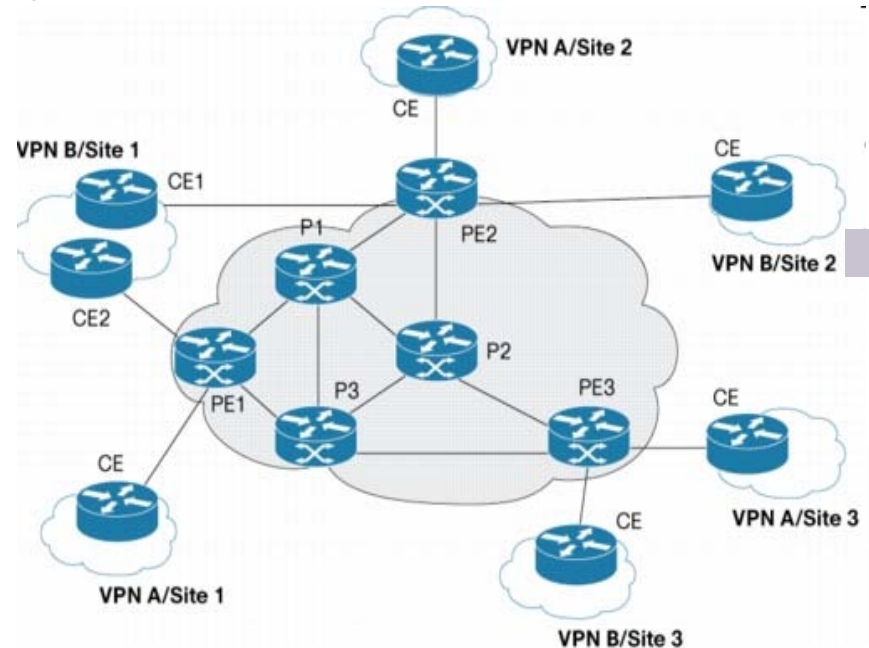
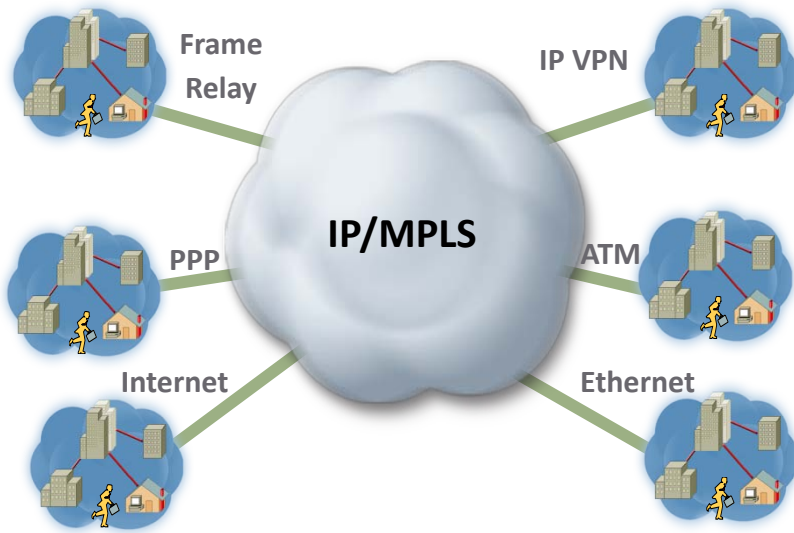
- **Design**
 - Process validation
 - Feature verification and test
 - Validate network design
 - Create Method of Procedure
 - Operations team enablement
- **Implement**
 - Migration windows
- **Operate**
 - Incidents
- **Optimize**
 - Analyze performance data
 - Operational Feasibility of ASR 9000 specific features

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CCIE SP Operations Technology Overview

IP NGN Service Provider Network

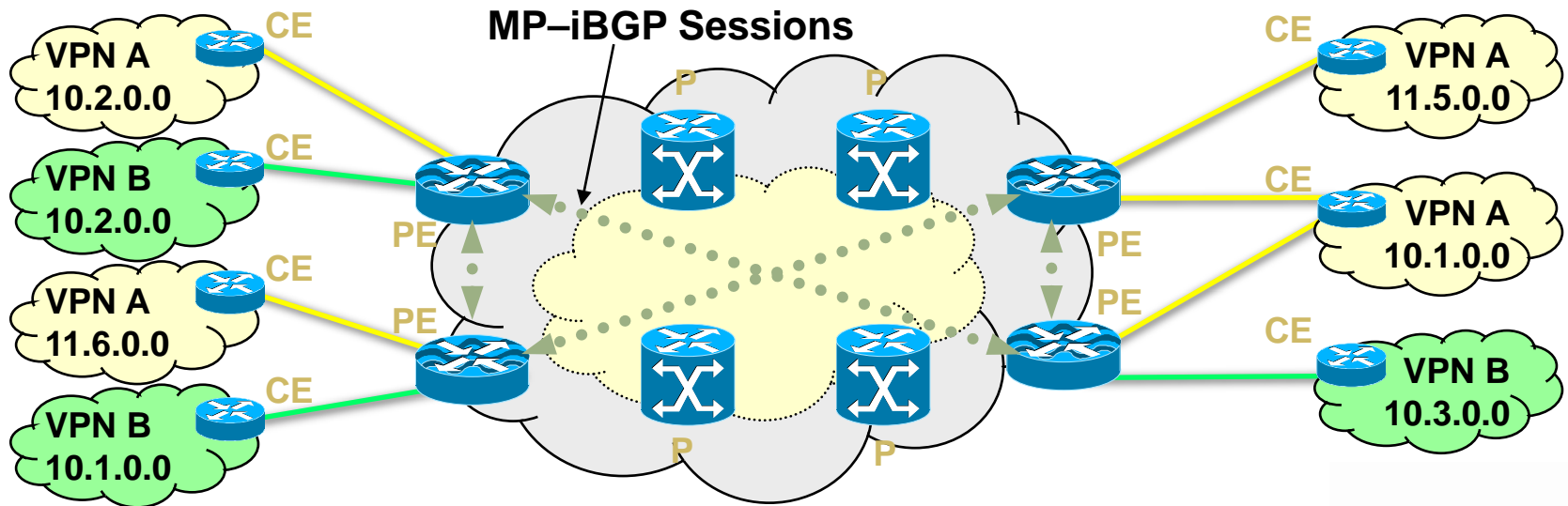
- Next Generation Networks are formed by three elements
- Infrastructure Convergence
- Service Convergence
- Network Simplification



Typical Protocols/Features:

VPLS, L2VPN, L3VPN Services
Multicast, BGP, MPLS, OSPF, ISIS, QOS, NAT
ACLs, LPTS, CoPP, MPP
PE-CE connection protocols
Inter-AS, CSC
L4 – L7 protocols

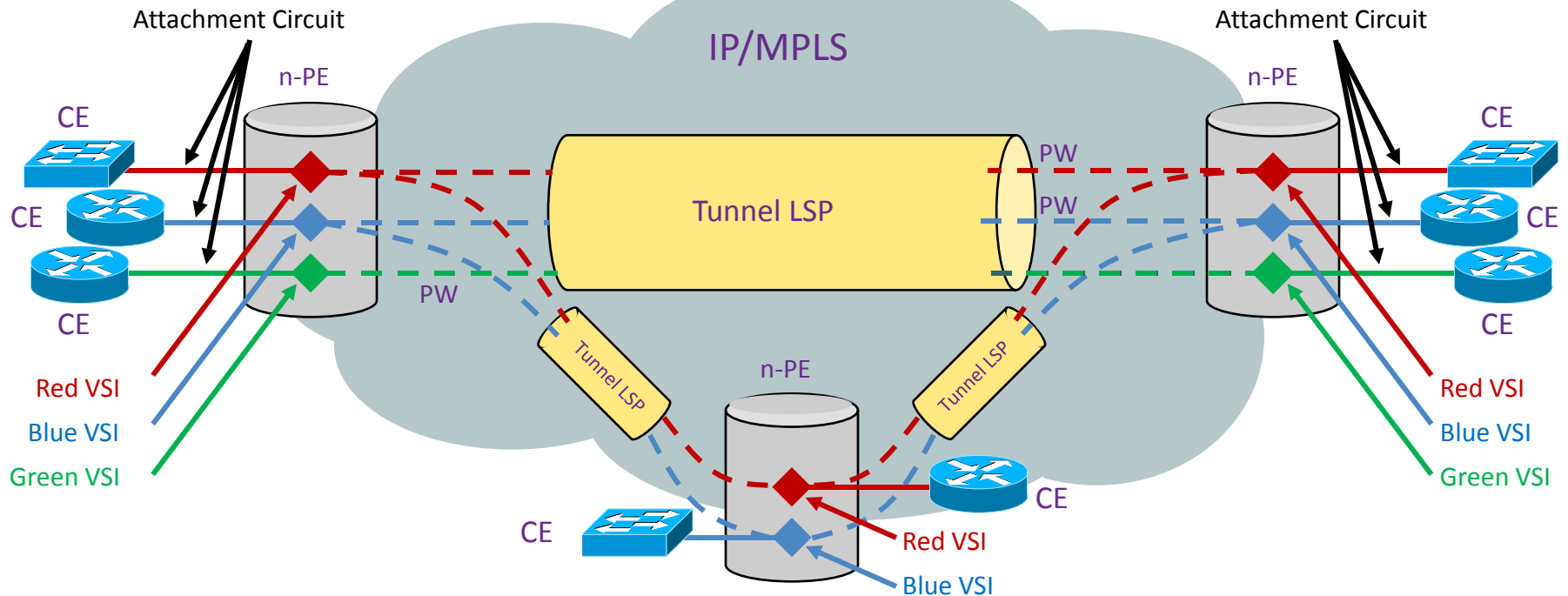
L3VPN



Five keys to make MPLS VPNs work:

1. MPLS Forwarding for label switching.
2. VPN Routing and Forwarding Instances (VRF).
3. Route Target to filter routes.
4. MP-BGP for routing updates (Ps typically don't run BGP).
5. Route Distinguisher to separate IP addresses.

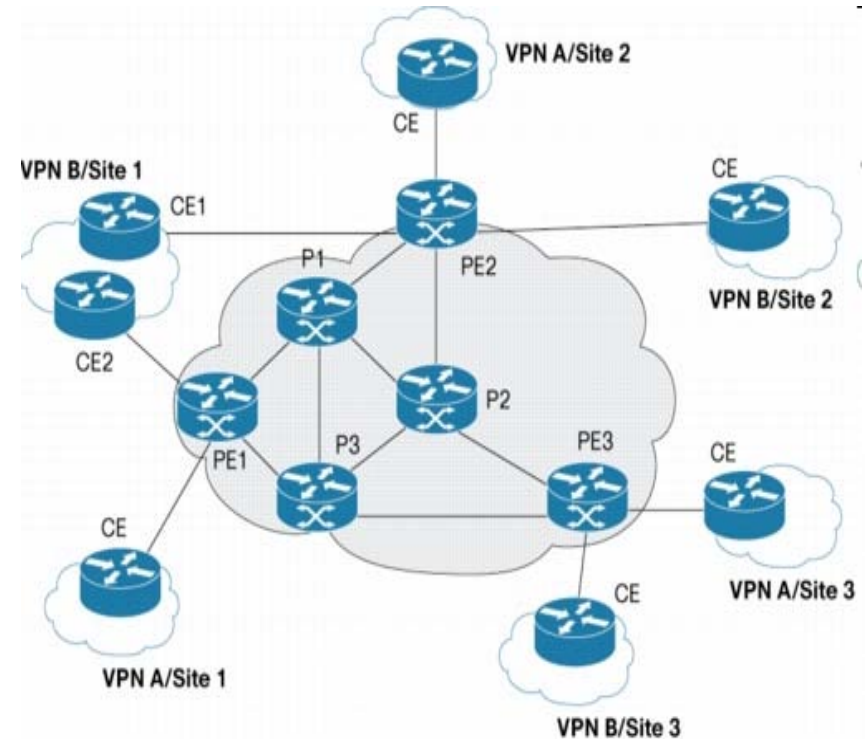
L2VPN/VPLS



- CE—Customer Edge Device; used to connect to the SP's network
- n-PE—Network facing-Provider Edge; acts as a gateway between the MPLS core and edge domain
- VSI/VFI—Virtual Switching/Forwarding Instance; describes an Ethernet bridge function within the n-PE; the VSI/VFI terminates the Pseudowire
- PW—Pseudowire; a PW connects two VSI's; Consists of a pair of MPLS uni-directional VC's
- AC—Attachment Circuit; a customer connection to the service provider; may be a physical port or Ethernet VLAN
- Tunnel LSP—Tunnel Label Switch Path is used to tunnel PW's between VSI's

Service Provider Concerns: Operational Perspective

- Device Up-time
- MTBF
- Bandwidth
- Packets per second
- Fast Convergence
- Network redundancy
- Hardware redundancy
- Maintenance



How to Approach the Technology: A Compilation of Common SP Issues

- IOS XR architecture
- Core security
- IOS XR vs. IOS
 - Inter-operational issues
 - Protocols and features
 - Management
 - Process distribution
 - Process management
 - Configuration



HINT!!!

**Understand how IOS
XR is unique.**

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CCIE SP Operations IOS XR Overview

IOS XR Characteristics

- Pre-emptive multi-tasking, multi-threaded
- Virtual Memory
 - Each process owns its own protected address space
- Message passing between processes
- Multiple Instances
- Distributed processing

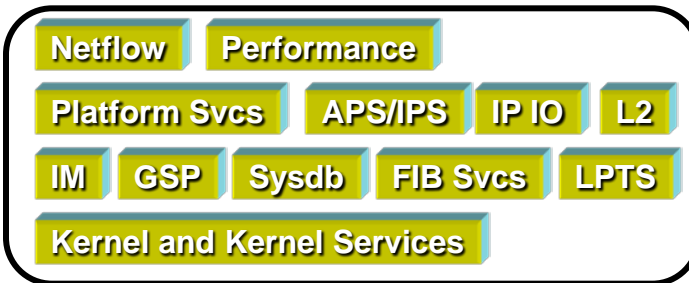
IOS XR Architecture — Physical View



RP/DRP



LINE CARD



FABRIC CARD



- Each node (RP, line card, shelf controller, fabric card) runs an independent copy of Kernel and Infrastructure services
- Processes and directory structure is unique to each node
- To show processes you must use the location keyword
 - show process location R/S/M
- Same is true for files

IOS XR HA Software Design Principles

NSR (GR), ISSU

**Separate Control and Data
Planes**

RP Redundancy Active/Standby Failover

Process Restart-ability: Active State Check pointing

**All subsystems: Separate Address Spaces
Memory faults affect only 1 process, recovery = restart process**

LPTS – Illustration

- DCoPP is an automatic, built in firewall for control plane traffic.
- Every Control and Management packet from the line card is rate limited in hardware to provide flood protection to the RP.

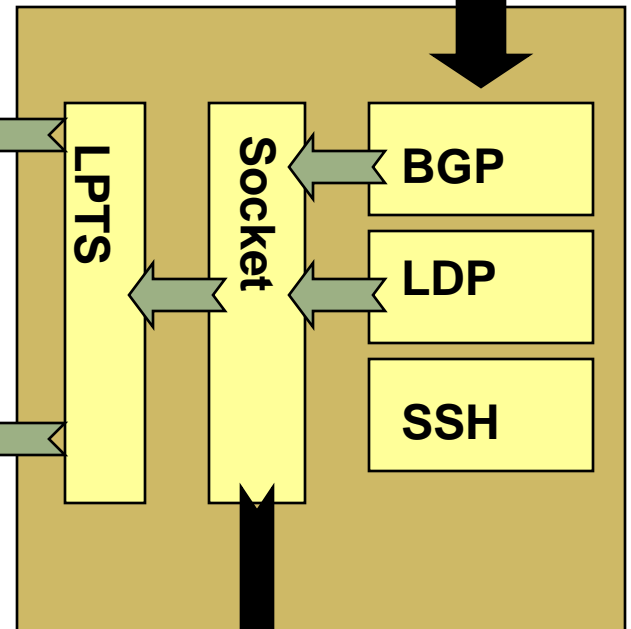
LC 1 IFIB TCAM HW Entries

Local	Port	Remote	Port	Rate	Priority
Any	ICMP	Any	Any	1000	low
Any	179	Any	Any	100	medium
Any	179	202.4.48.99	Any	1000	medium
202.4.48.1	179	202.4.48.99	2223	10000	medium
200.200.0.2	13232	200.200.48.99	55	100	medium

LC 2 IFIB TCAM HW Entries ...

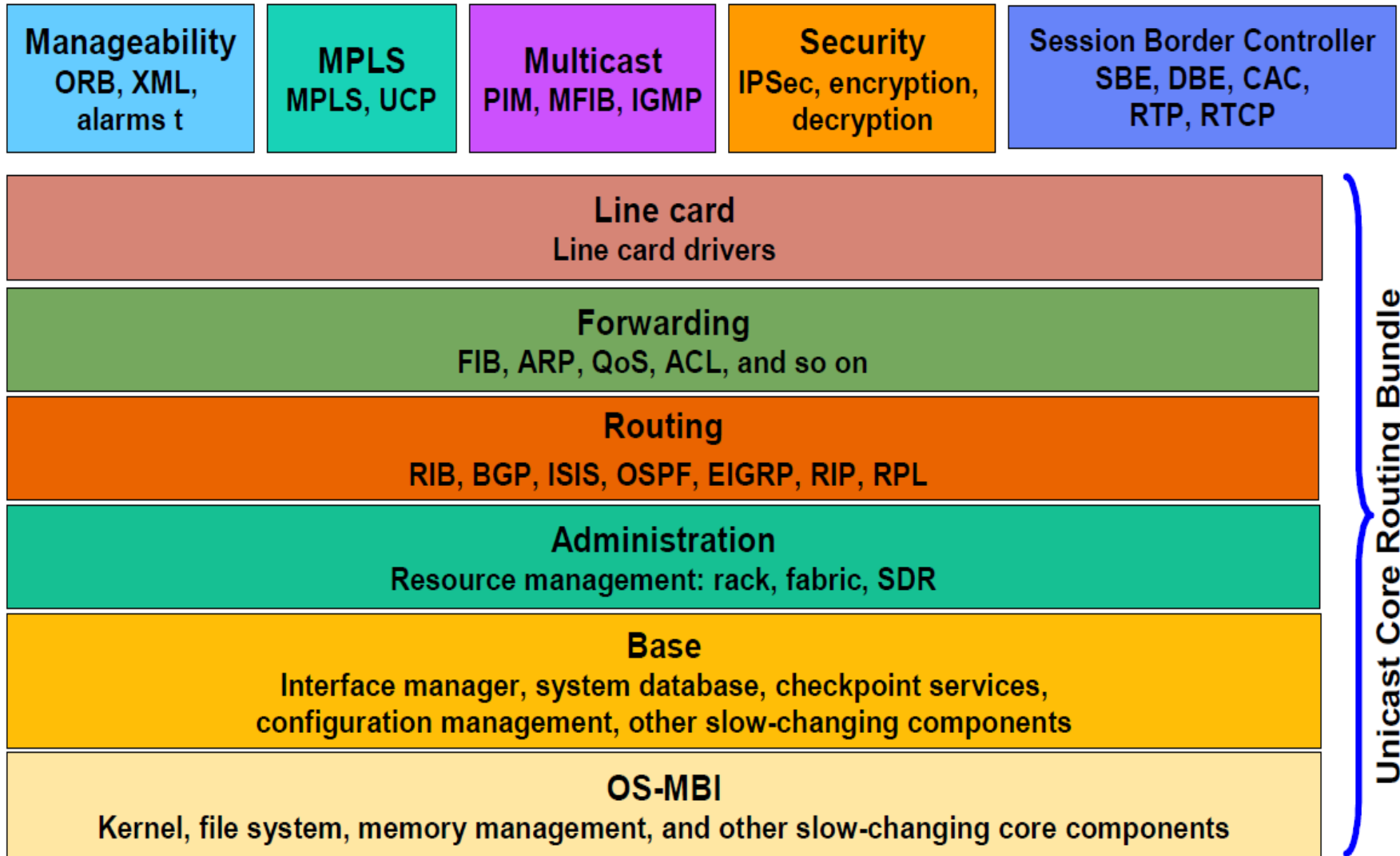
```
router bgp
  neighbor 202.4.48.99
  ttl_security
!
mpls ldp
...
!
```

ttl
255



TCP Handshake

IOS XR Software Packages



Show < > Trace Commands

- Many major functions proactively save some debugging information
 - a form of always-on debug
 - reduces the effort of reproducing the problem with debugging enabled
 - Stored circular buffer in shared memory so has limited history in very active processes
- Show Command *keyword* trace
 - When troubleshooting use the “?” to see if trace is available
 - tailf option follows the tail of the file for new entries

```
RP/0/RP1/CPU0:CRS1_1# show sysmgr trace tailf
May 19 23:33:17.912 sysmgr/global 0/RP1/CPU0 1# t1  SYSMGR_INIT jid=0 UNKNOWN
May 20 00:27:50.879 sysmgr/global 0/RP1/CPU0 4# t13 [unknown 0x10a/1] 0x00000005
May 20 05:02:59.839 sysmgr/global 0/RP1/CPU0 1# t11  FAILOVER jid=0 UNKNOWN
=====snip=====
```


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CCIE SP Operations Troubleshooting Section

Incident 1 – IOS XR Operations

Sample Incident

Device *X* should be generating syslog messages as follows. Determine why these syslogs are not seen:

20% remaining memory threshold is reached	---	Minor Alarm
10% remaining memory threshold is reached	---	Severe Alarm
5% remaining memory threshold is reached	---	Critical Alarm

This question is referring to a device in your lab running IOS XR.

Incident 1 – IOS XR Operations

Making Sense Out of the Incident

20% remaining memory threshold is reached --- Minor Alarm
10% remaining memory threshold is reached --- Severe Alarm
5% remaining memory threshold is reached --- Critical Alarm

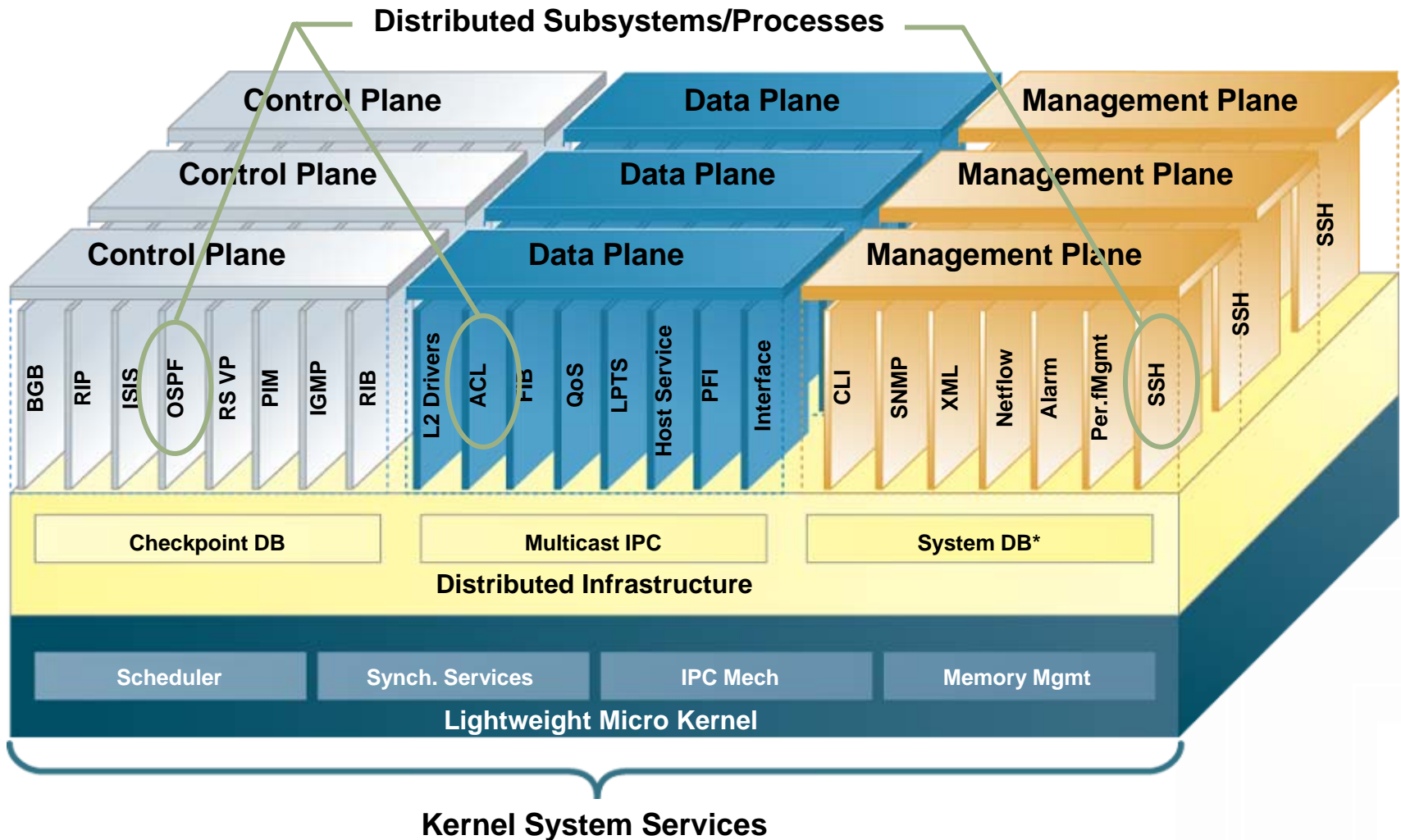
- Not memorizing commands
- The question mark is not the answer
- Think architecture of IOS XR
 - How is IOS XR different from IOS?
 - What are the processes of IOS XR?

HINT!!!

Since this is an IOS XR device there is a good chance there is an easy IOS XR specific answer.

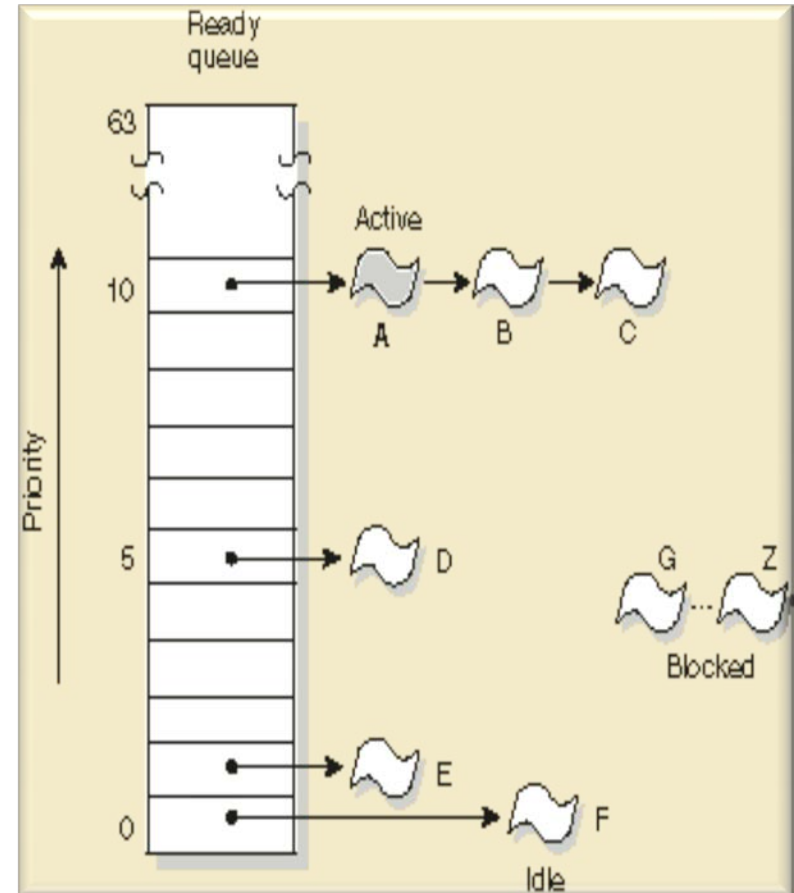
Incident 1 – IOS XR Operations

IOS XR Essentials



Incident 1 – IOS XR Operations Process Control

- Priority Range [0 – 63].
 - 0 = idle; 63 = highest
 - Routing protocols = 10
 - Mission critical > 10
 - Preemptive Multitasking
- 64 ready queues per priority.
- Threads are queued in FIFO per priority.
- What about high priority process hogs?



Incident 1 – IOS XR Operations Need for a Watchdog

Monitored resource	Action	
	Minor	Severe
CPU Hog	Restart the process except for persistent hog	
Persistent CPU Hog	After 20 secs, log a msg and reset the node after 30 sec	
Memory depletion	OOR Process Notification	OOR notification and kill processes
Disk Space	Syslog message	
Deadlock detection	Syslog message, Kill the processes involved	
Kernel Threads	Reset the Node	
Shared memory	Syslog providing the top 10 users of shared memory	
File descriptors	syslog	Kill process
QNET transport	Restart qnet	
Environment	Adjust fan speed and reset the node if too high	

Incident 1 – IOS XR Operations Watchdog threads

RP/0/RP1/CPU0:CRS1#show process

JID	TID	Stack	pri	state	TimeInState	HR:MM:SS:MSEC	NAME
89	2	40K	63	Nanosleep	0:00:00:0445	0:00:00:0014	wd-critical-mon
89	3	40K	11	Nanosleep	0:00:00:0053	0:00:00:0122	wd-critical-mon
89	4	40K	10	Nanosleep	0:00:00:0000	0:00:01:0149	wd-critical-mon
59	1	56K	10	Receive	0:00:00:0013	0:01:35:0296	dllmgr
59	2	56K	10	Nanosleep	0:00:59:0106	0:00:01:0231	dllmgr
59	3	56K	10	Receive	0:01:21:0202	0:00:12:0012	dllmgr
59	4	56K	10	Receive	2:53:02:0892	0:00:51:0269	dllmgr
59	5	56K	10	Receive	1:18:34:0182	0:00:48:0595	dllmgr
383	1	72K	10	Receive	1:52:58:0538	0:05:01:0249	qsm
383	4	72K	10	Receive	2172:47:52:0115	0:00:00:0004	qsm
383	5	72K	10	Receive	0:00:59:0302	0:00:00:0055	qsm
383	7	72K	10	Nanosleep	0:00:00:0135	0:00:02:0849	qsm
383	9	72K	10	Receive	1571:23:06:0745	0:01:25:0622	qsm
383	10	72K	10	Receive	0:00:00:0415	0:03:50:0668	qsm
159	1	20K	10	Receive	0:00:59:0218	0:00:00:0063	chkpt_proxy
79	1	48K	10	Receive	0:00:00:0017	0:00:07:0670	pkgfs
79	2	48K	10	Sigwaitinfo	2172:50:11:0223		

Incident 1 – IOS XR Operations

Now the Question Mark is Useful

RP/0/RP1/CPU0:host(config)#watchdog ?

monitor Watchdog monitor configurations

restart Watchdog restart configurations

threshold Watchdog threshold configuration

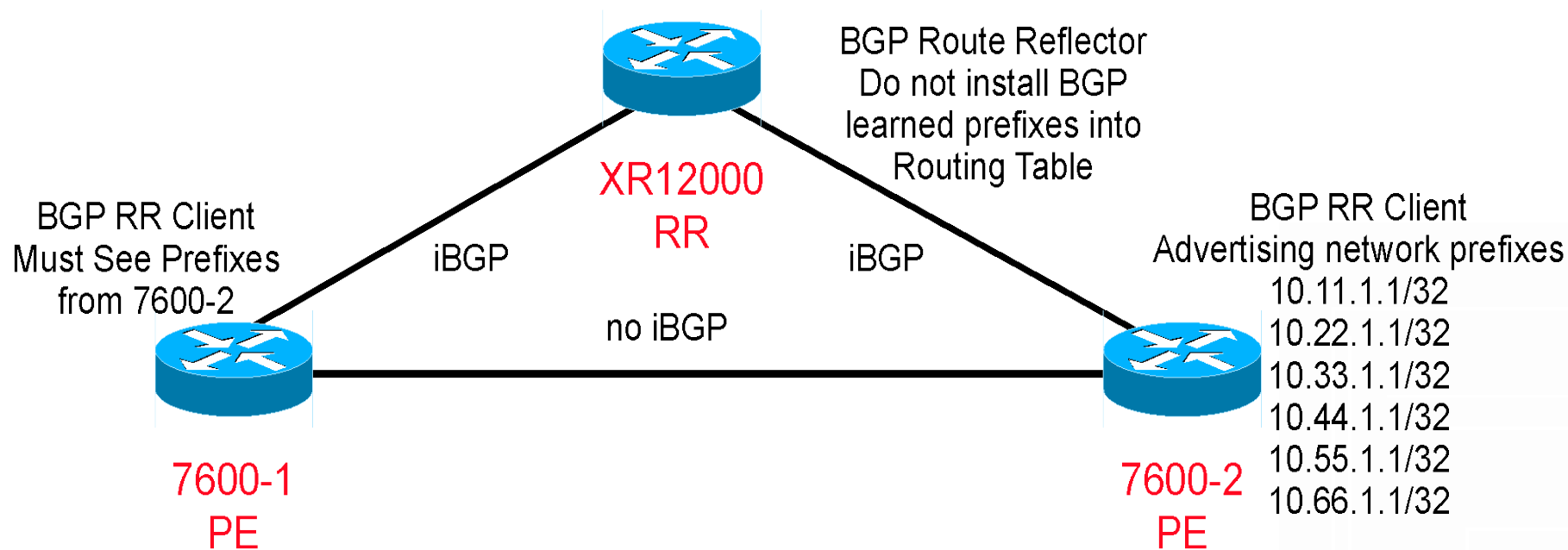
RP/0/RP1/CPU0:host(config)#watchdog threshold memory location 0/0/cpu0

minor 20 severe 10 critical 5

Incident 2 – SP Core Optimization

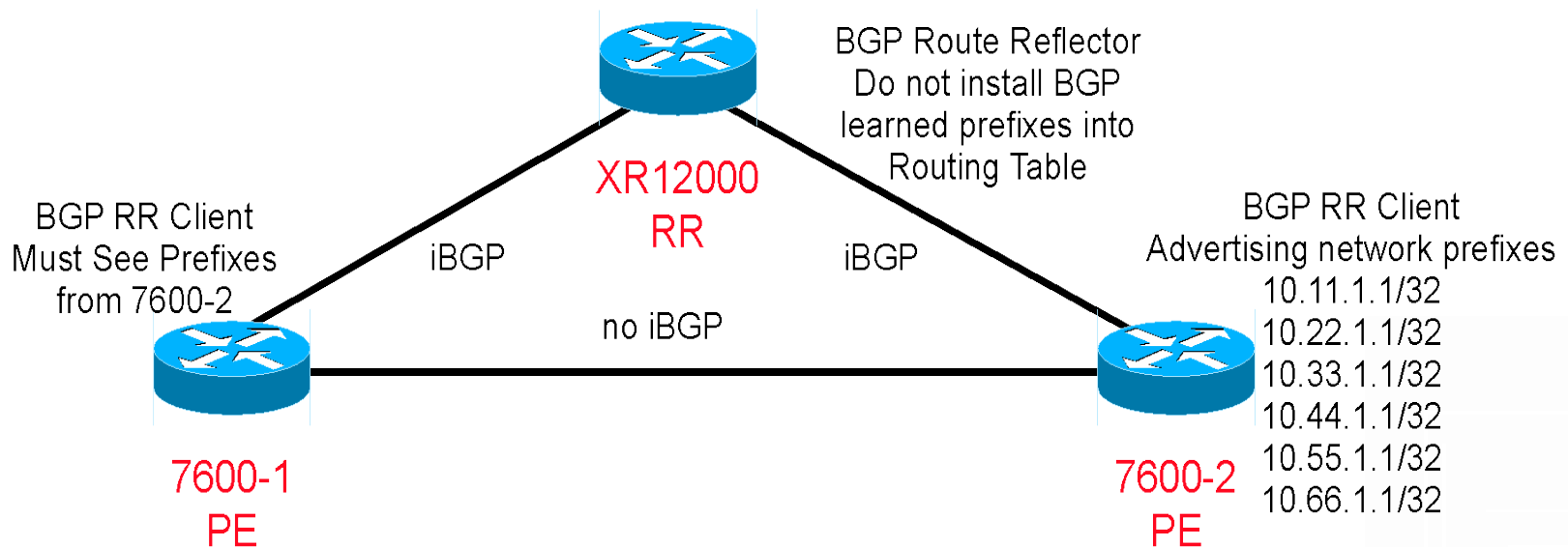
Sample Incident

The current implementation makes the RIB on the BGP route-reflector is too large. Ensure BGP learned prefixes do not enter the RIB.



Incident 2 – SP Core Optimization Making Sense Out of the Incident

The BGP Route Reflector is not in the data path. To save on processing and memory, BGP prefixes should not be installed in the RIB.



How do we prevent the RR from installing the routes into the RIB?

A common way of filtering routes is via a policy... route-policy?

We need a policy to prevent installing BGP prefixes into the routing table... a table-policy.

Incident 2 – SP Core Optimization

What do We Currently Have on the RR?

```
router bgp 65000
  bgp router-id 192.168.254.2
  address-family ipv4 unicast
  !
  neighbor-group iBGP
  remote-as 65000
  address-family ipv4 unicast
  route-reflector-client
  !
  !
  neighbor 192.168.253.1
  use neighbor-group iBGP
  update-source Loopback0
  !
  neighbor 192.168.253.2
  use neighbor-group iBGP
  update-source Loopback0
```

Incident 2 – SP Core Optimization

What Do the Tables Look Like?

XR12000-RR#show route bgp

```
B 10.11.1.1/32 [200/0] via 192.168.253.2, 00:29:52
B 10.22.1.1/32 [200/0] via 192.168.253.2, 00:29:52
B 10.33.1.1/32 [200/0] via 192.168.253.2, 00:29:52
B 10.44.1.1/32 [200/0] via 192.168.253.2, 00:29:52
B 10.55.1.1/32 [200/0] via 192.168.253.2, 00:29:52
B 10.66.1.1/32 [200/0] via 192.168.253.2, 00:29:52
```

7600-1-PE#show ip route bgp

```
B 10.11.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.22.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.33.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.44.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.55.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.66.1.1/32 [200/0] via 192.168.253.2, 00:29:46
```

Incident 2 – SP Core Optimization Trial and Error OR Documentation

- Route-policy applied to a neighbor?
- Route-policy language (RPL)?
- Wait, this is an XR device... a one-liner macro?
- Cisco Documentation ...
<http://www.cisco.com/cisco/web/psa/default.html?mode=prod>
- Search IOS XR > Configuration Guides > Routing guide for XR12000 3.9 > BGP > route-reflector ... at minimum you harden your understanding of how a RR operates ... we're on the right page.
- Search the page for **forwarding** or **routing** or **table** or **policy** or **RIB** or **install**.

Incident 2 – SP Core Optimization Jackpot!!!

Table Policy

The table policy feature in BGP allows you to configure traffic index values on routes as they are installed in the global **routing table**. This feature is enabled using the table-**policy** command and supports the BGP **policy** accounting feature.

Table policy also provides the ability to drop routes from the **RIB** based on match criteria. This feature can be useful in certain applications and should be used with caution as it can easily create a routing ‘black hole’ where BGP advertises routes to neighbors that BGP does not **install** in its global **routing table** and **forwarding table**.

Incident 2 – SP Core Optimization Updating the Config on the RR?

```
route-policy No_BGP_Routes  
  drop  
end-policy
```

```
router bgp 65000  
  bgp router-id 192.168.254.2  
  address-family ipv4 unicast  
  table-policy No_BGP_Routes  
!
```

Incident 2 – SP Core Optimization

Question Answered

XR12000-RR#show bgp

Network	Next Hop	Metric	LocPrf	Weight	Path
*>i10.11.1.1/32	192.168.253.2	0	100	0	i
*>i10.22.1.1/32	192.168.253.2	0	100	0	i
*>i10.33.1.1/32	192.168.253.2	0	100	0	i
*>i10.44.1.1/32	192.168.253.2	0	100	0	i
*>i10.55.1.1/32	192.168.253.2	0	100	0	i
*>i10.66.1.1/32	192.168.253.2	0	100	0	i

XR12000-RR#show route bgp

% No matching routes found

7600-1-PE#show ip route bgp

B 10.11.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.22.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.33.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.44.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.55.1.1/32 [200/0] via 192.168.253.2, 00:29:46
B 10.66.1.1/32 [200/0] via 192.168.253.2, 00:29:46

Learn. Connect.
Collaborate. *together.*

CCIE SP Operations Preparation

Exam Tips

- Use the Blueprint and Checklist on CLN to determine your experience and knowledge level in the major topic areas:

Blueprint: <https://learningnetwork.cisco.com/docs/DOC-6592>

Checklist: <https://learningnetwork.cisco.com/docs/DOC-9705>

- For areas of strength: practice for speed.
- For weaker areas: boost knowledge with preparation resources, then practice. Note the reading list materials are suggestions only.
- Read extensively and do not try to prepare for the Written and Practical exams at the same time. Pass the Written exam then start preparing for the Practical exam.
- You can use the CCNP SP Operations as a starting point to confirm your body of knowledge required for the CCIE, but do not limit your study to the material for the Professional certification.
- **Beware of rumors!**

Preparation Resources

- Training

OSPF, IS-IS & BGP: [Advanced Services: Cisco IOS XR Software Version 3.4.0 IPv4 Routing \(XIPV4R\)\(TRN-XIPV4R - 1.0\)](#)

IPv6, OSPFv3 & EIGRPv6: [Advanced Services: Cisco IOS XR IPv6 Routing for Service Providers \(XIPV6R\)\(TRN-XIPV6R - 3.5.2\)](#)

IOS-XR:

[Advanced Services: Cisco IOS XR Software Fundamentals for Network Operations \(TRN-XRFUND - 1\) Deploy, Maintain, & Troubleshoot Cisco IOS XR Software on the Cisco CRS & Cisco XR 12000 Router \(TRN-CRS12 - 1.0\)](#)

- White papers

Multicast: SSM, PIM-SM, MSDP, BSR, IPv6 multicast: [IP Multicast Technical Overview](#)

uRPF: [Understanding Unicast Reverse Path Forwarding](#)

Preparation Resources (Cont.)

Cisco Press Books

BGP:

Internet Routing Architectures, 2nd Edition
Cisco BGP-4 Command and Configuration Handbook
BGP Design and Implementation

High Availability (HA):

High Availability Network Fundamentals

IOS XR:

Cisco IOS XR Fundamentals

IS IS:

IS-IS Network Design Solutions

L2VPN (VPWS and VPLS):

Layer 2 VPN Architectures
Troubleshooting Virtual Private Networks (VPN)

L3VPN:

Comparing, Designing, and Deploying VPNs

MPLS & Traffic Engineering:

Traffic Engineering with MPLS
Advanced MPLS Design and Implementation
Building MPLS-Based Broadband Access VPNs
Definitive MPLS Network Designs
MPLS and VPN Architectures
MPLS and VPN Architectures, Volume II

Multicast - SSM, PIM-SM, MSDP, BSR, IPv6 multicast:

Interdomain Multicast Solutions Guide

Network attacks, Layers 2 and 3 infrastructure security, NAT:

Network Security Technologies and Solutions (CCIE Professional Development Series)
MPLS VPN Security
Cisco Access Control Security: AAA Administration Services
Cisco Network Security Troubleshooting Handbook
Network Security Architectures
Router Security Strategies: Securing IP Network Traffic Planes
Designing Network Security, 2nd Edition
Network Security Principles and Practices (CCIE Professional Development)

Network Management:

Network Management Fundamentals
Accounting and Performance Strategies

OSPF:

Cisco OSPF Command and Configuration Handbook
Troubleshooting IP Routing Protocols (CCIE Professional Development Series)

QoS: MQC, Netflow, IP SLA, NBAR (IOS):

End-to-End QoS Network Design: Quality of Service in LANs, WANs, and VPNs
IP Quality of Service

Preparation Resources (Cont.)

ITIL®v3 Core Service Management

ITIL Lifecycle Publication Suite Books

author: Office of Government Commerce

ISBN-10: 9780113310500

ISBN-13: 978-0113310500

- Service Strategy
- Service Design
- Service Operations
- Service Transitions
- Continual Service Improvements

Other Resources

- CCIE SP Operations on Cisco Learning Network
https://learningnetwork.cisco.com/community/certifications/ccie_sp_operations
- CCIE SP Operations Study Group
<https://learningnetwork.cisco.com/groups>
- Cisco Product Pages (former Cisco Documentation CD)
<http://www.cisco.com/web/psa/products/index.html>
- CCIE Customer support and FAQ
<http://www.cisco.com/go/certsupport>
- Cisco Press
<http://www.ciscopress.com>

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& enter a draw to win the latest

Cisco-Linksys E4200
Dual-Band Wireless-N Router !




Learn. Connect.
Collaborate. *together.*

Q&A

Thank you.



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