SPOTO CCIE LAB RS V5.0 H3 CFG Solution

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修订记录				
修订日期	**修订人**	**版本号**	**审核人**	**修订说明**
2017-10-11	Lambert	1.0	Lambert	Publish
2017-10-23	Lambert	1.1	Lambert	Update Questions, Outputs and Solutions
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2017-12-3	Lambert	1.5	Lambert	Update Solution and Initial configuration, we can pass

CONTENTS

section 3.1

```
R3#show ip bgp vpnv4 vrf HollyMaya
BGP table version is 57, local router ID is 100.0.0.3
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 65001:3 (default for vrf HollyMaya)
 * i 0.0.0.0          100.0.0.4                0    100      0 65002 29999 i
 *>                   100.10.0.2                            0 65001 19999 i
 *>  10.1.0.0/16      100.10.0.2               0             0 65001 i
 *>i 10.2.0.0/16      100.0.0.4                0    100      0 65002 i
 *                    100.10.0.2                            0 65001 65002 i
 *>  10.3.0.0/16      100.10.0.2                            0 65001 65003 i
 *   10.4.0.0/16      100.10.0.2                            0 65001 10001 65004 i
 *>i                  100.0.0.6                0    100      0 65004 65004 i
 *>i 10.5.0.0/16      100.0.0.5                0    100      0 65005 i
 *>  10.6.0.0/16      100.10.0.2                            0 65001 65100 65006 i
 *>i 10.7.0.0/16      100.0.0.4                0    100      0 65002 ?
 *                    100.10.0.2                            0 65001 65002 ?
 *>i 10.100.100.100/32
                      100.0.0.6                0    100      0 65004 65004 ?
 *>  100.10.0.0/30    0.0.0.0                  0         32768 ?
 *>i 100.20.0.0/30    100.0.0.4                0    100      0 ?
 *>i 100.40.0.0/30    100.0.0.6                0    100      0 ?
 *>i 100.50.0.0/30    100.0.0.5                0    100      0 ?
 *>i 100.100.100.100/32
                      100.0.0.6                0    100      0 65004 65004 ?
 *>i 172.16.100.0/24  100.0.0.6                0    100      0 65004 65004 ?
 *>i 172.16.200.0/30  100.0.0.6                0    100      0 65004 65004 ?
```

```
R4#show ip bgp vpnv4 vrf HollyMaya
BGP table version is 59, local router ID is 100.0.0.4
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, m multipath, b backup-path, f RT-Filter,
              x best-external, a additional-path, c RIB-compressed,
Origin codes: i - IGP, e - EGP, ? - incomplete
RPKI validation codes: V valid, I invalid, N Not found

     Network          Next Hop            Metric LocPrf Weight Path
Route Distinguisher: 65002:4 (default for vrf HollyMaya)
 * i 0.0.0.0          100.0.0.3                0    100      0 65001 19999 i
 *>                   100.20.0.2                            0 65002 29999 i
 *>i 10.1.0.0/16      100.0.0.3                0    100      0 65001 i
 *                    100.20.0.2                            0 65002 65001 i
 *>  10.2.0.0/16      100.20.0.2               0             0 65002 i
 *>i 10.3.0.0/16      100.0.0.3                0    100      0 65001 65003 i
 *                    100.20.0.2                            0 65002 65001 65003 i
 *>i 10.4.0.0/16      100.0.0.6                0    100      0 65004 65004 i
 *>i 10.5.0.0/16      100.0.0.5                0    100      0 65005 i
 *>i 10.6.0.0/16      100.0.0.3                0    100      0 65001 65100 65006 i
 *                    100.20.0.2                            0 65002 65001 65100 65006 i
 *>  10.7.0.0/16      100.20.0.2                            0 65002 ?
 *>i 10.100.100.100/32
                      100.0.0.6                0    100      0 65004 65004 ?
 *>i 100.10.0.0/30    100.0.0.3                0    100      0 ?
 *>  100.20.0.0/30    0.0.0.0                  0         32768 ?
 *>i 100.40.0.0/30    100.0.0.6                0    100      0 ?
 *>i 100.50.0.0/30    100.0.0.5                0    100      0 ?
 *>i 100.100.100.100/32
                      100.0.0.6                0    100      0 65004 65004 ?
 *>i 172.16.100.0/24  100.0.0.6                0    100      0 65004 65004 ?
 *>i 172.16.200.0/30  100.0.0.6                0    100      0 65004 65004 ?
```

section 5.3

Verify:

```
SW111#show ipv6 dhcp pool
DHCPv6 pool: VLAN2001
  Address allocation prefix: 2001:DB8:10:1:201::/104 valid 172800 preferred 86400 (1 in use, 0 c
onflicts)
  DNS server: 2001:CC:1E:1::1
  Domain name: hollymaya.org
  Active clients: 1
```


Section 1 Layer 2 Technologies

Section 1.1: LAN Access

The following requirements were pre-configured.

- VTP is turned off in all switches.

- All required VLAN, including access-ports configuration in all relevant switches are provisioned.
- All required SVI interfaces in all relevant switches (including IP address and subnet mask) are provisioned.

Configure the network in all sites as per the following requirements:

- Access-ports must immediately transition to the forwarding state upon link up, as long as they do not receive a BPDU. Use the minimal number of commands per switch to enable this feature.
- If an access-port receives a BPDU, it must automatically shutdown. Use the minimal number of commands per switch to enable this feature.
- Ports that were shutdown must attempt to automatically recover after 10 minutes.
- None of the switches may generate a TC when any of access ports goes down.

Solution:

SW100/101/110/111/200/201/210/211/300/301/310/400/401/410/500/501/510/600

(All of the switches)

spanning-tree portfast edge default

spanning-tree portfast edge bpduguard default

errdisable recovery cause bpduguard

errdisable recovery interval 600

!--There is no switch in Home network on the real exam, so you don’ t care the switch at there.--!

Section 1.2: LAN Distribution

Configure the headquarters' network, as well as the large and medium office networks as per the following requirements:

- All trunks must always use dot1Q encapsulation.
- Negotiation of trunking protocol must be disabled in all switches.
- Distribution switches (SW300, SW301, SW400, SW401, SW500, SW501) must initiate etherchannel negotiation using LACP.
- Access switches (SW310, SW410, SW510) must never initiate etherchannel negotiation.
- Configure layer 2 etherchannels' number as shown in the "Diagram 1: Main topology" and "Diagram 5: Layer 2 Connections" (that is, use only Po1 and/or Po2).
- Ensure that all ports included in etherchannels are effectively in use and bundled in the expected channel.
- Access switches must see similar output as shown below:

```
SW310#show etherchannel summary
Flags:  D - down        P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

        A - formed by Auto LAG


Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
1      Po1(SU)         LACP      Et2/0(P)    Et2/1(P)
2      Po2(SU)         LACP      Et2/2(P)    Et2/3(P)
```

Solution:

SW300/400/501

interface range e2/0-1

shutdown

switchport trunk encapsulation dot1q

switchport mode trunk

switchport nonegotiate

channel-group 1 mode active

!

interface Port-channel1

switchport trunk encapsulation dot1q

switchport mode trunk

switchport nonegotiate

SW301/401/500

interface range e2/2-3

shutdown

switchport trunk encapsulation dot1q

switchport mode trunk

switchport nonegotiate

channel-group 2 mode active

!

interface Port-channel2

switchport trunk encapsulation dot1q

switchport mode trunk

switchport nonegotiate

SW310/410/510

interface range e2/0-1

shutdown

switchport trunk encapsulation dot1q

switchport mode trunk

switchport nonegotiate

```
 channel-group 1 mode passive
!
interface range e2/2-3
 shutdown
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport nonegotiate
 channel-group 2 mode passive
!
interface range Port-channel1-2
 switchport trunk encapsulation dot1q
 switchport mode trunk
 switchport nonegotiate
```

SW300/400/501/310/410/510

```
interface range e2/0-1
 no shutdown
```

SW301/401/500/310/410/510

```
interface range e2/2-3
 no shutdown
```

!--If EtherChannel can’ t go up, you can use mode “on” when in practice. --!

Verify:

```
SW310#show etherchannel summary
Flags:  D - down        P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
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        d - default port

        A - formed by Auto LAG


Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
1      Po1(SU)         LACP      Et2/0(P)    Et2/1(P)
2      Po2(SU)         LACP      Et2/2(P)    Et2/3(P)
```

```
SW410#show etherchannel summary
Flags:  D - down        P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

        A - formed by Auto LAG


Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
1      Po1(SU)         LACP      Et2/0(P)    Et2/1(P)
2      Po2(SU)         LACP      Et2/2(P)    Et2/3(P)

SW510#show etherchannel summary
Flags:  D - down        P - bundled in port-channel
        I - stand-alone s - suspended
        H - Hot-standby (LACP only)
        R - Layer3      S - Layer2
        U - in use      N - not in use, no aggregation
        f - failed to allocate aggregator

        M - not in use, minimum links not met
        m - not in use, port not aggregated due to minimum links not met
        u - unsuitable for bundling
        w - waiting to be aggregated
        d - default port

        A - formed by Auto LAG


Number of channel-groups in use: 2
Number of aggregators:           2

Group  Port-channel  Protocol    Ports
------+-------------+-----------+-----------------------------------------------
1      Po1(SU)         LACP      Et2/0(P)    Et2/1(P)
2      Po2(SU)         LACP      Et2/2(P)    Et2/3(P)
```

Section 1.3: LAN Resiliency: Spanning-Tree

Configure the headquarters' network as per the following requirements:

- SW300 must be the spanning-tree root bridge and must maintain a single Spanning-Tree instance for the following VLANS: 2000, 2002, 2004, 2006, 2008 (use instance number 2).
- SW301 must be the spanning-tree root bridge and must maintain a single Spanning-Tree instance for the following VLANS: 2001, 2003, 2005, 2007, 2009 (use instance number 1).
- All other VLANS, except 3001, must share the default Spanning-Tree instance.
- Ensure that interface E0/2 of SW300 and SW301 is a dot1q trunk and that it switches frames for VLAN 3001 only.
- SW300, SW301 and SW310 must not have any blocked ports for any access VLAN (i.e. 2000-2009).
- SW310 must have the least chance of being elected the root bridge for any VLAN.
- None of the three switches may run more than four instances of Spanning-Tree at any point in time.

Solution:

SW300/301/310

spanning-tree mode mst

spanning-tree mst configuration

instance 1 vlan 2001, 2003, 2005, 2007, 2009

instance 2 vlan 2000, 2002, 2004, 2006, 2008

instance 3 vlan 3001

SW300

interface Ethernet0/2

switchport trunk allowed vlan 3001

switchport trunk encapsulation dot1q

switchport mode trunk

!

spanning-tree mst 2 priority 0

SW301

interface Ethernet0/2

switchport trunk allowed vlan 3001

switchport trunk encapsulation dot1q

switchport mode trunk

!

spanning-tree mst 1 priority 0

SW310

spanning-tree mst 0-4094 priority 61440

Verify:

```
SW300#show spanning-tree mst 1

##### MST1    vlans mapped:   2001,2003,2005,2007,2009
Bridge        address aabb.cc02.9000  priority      32769 (32768 sysid 1)
Root          address aabb.cc02.a000  priority      1     (0 sysid 1)
              port    Po1             cost          2000000   rem hops 18

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po1              Root FWD 1000000   128.65   P2p

SW300#show spanning-tree mst 2

##### MST2    vlans mapped:   2000,2002,2004,2006,2008
Bridge        address aabb.cc02.9000  priority      2     (0 sysid 2)
Root          this switch for MST2

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po1              Desg FWD 1000000   128.65   P2p
SW301#show spanning-tree mst 1

##### MST1    vlans mapped:   2001,2003,2005,2007,2009
Bridge        address aabb.cc02.a000  priority      1     (0 sysid 1)
Root          this switch for MST1

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po2              Desg FWD 1000000   128.65   P2p

SW301#show spanning-tree mst 2

##### MST2    vlans mapped:   2000,2002,2004,2006,2008
Bridge        address aabb.cc02.a000  priority      32770 (32768 sysid 2)
Root          address aabb.cc02.9000  priority      2     (0 sysid 2)
              port    Po2             cost          2000000   rem hops 18

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Po2              Root FWD 1000000   128.65   P2p
```

```
SW310#show spanning-tree mst 1

##### MST1    vlans mapped:   2001,2003,2005,2007,2009
Bridge        address aabb.cc02.b000  priority      61441 (61440 sysid 1)
Root          address aabb.cc02.a000  priority      1     (0 sysid 1)
              port    Po2             cost          1000000   rem hops 19

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Et1/0            Desg FWD 2000000   128.5    Shr Edge
Et1/1            Desg FWD 2000000   128.6    Shr Edge
Et1/2            Desg FWD 2000000   128.7    Shr Edge
Et1/3            Desg FWD 2000000   128.8    Shr Edge
Po1              Desg FWD 1000000   128.65   P2p
Po2              Root FWD 1000000   128.66   P2p
SW310#show spanning-tree mst 2

##### MST2    vlans mapped:   2000,2002,2004,2006,2008
Bridge        address aabb.cc02.b000  priority      61442 (61440 sysid 2)
Root          address aabb.cc02.9000  priority      2     (0 sysid 2)
              port    Po1             cost          1000000   rem hops 19

Interface        Role Sts Cost      Prio.Nbr Type
---------------- ---- --- --------- -------- --------------------------------
Et0/0            Desg FWD 2000000   128.1    Shr Edge
Et0/1            Desg FWD 2000000   128.2    Shr Edge
Et0/2            Desg FWD 2000000   128.3    Shr Edge
Et0/3            Desg FWD 2000000   128.4    Shr Edge
Po1              Root FWD 1000000   128.65   P2p
Po2              Desg FWD 1000000   128.66   P2p
```


Configure all access switches in both datacenter networks (SW110. SW111, SW210, SW211) as per the following requirements:

- Use 32-bit based values for default port path costs.
- All four switches must use the default value for their interface cost.

Solution:

SW110/SW111/SW210/SW211

spanning-tree pathcost method long

Verify:

```
SW110#show spanning-tree pathcost method
Spanning tree default pathcost method used is long

SW111#show spanning-tree pathcost method
Spanning tree default pathcost method used is long

SW210#show spanning-tree pathcost method
Spanning tree default pathcost method used is long

SW211#show spanning-tree pathcost method
Spanning tree default pathcost method used is long
```


Section 1.4: WAN Switching Technologies

Configure the home router R70 as per the following requirements:

- The Ethernet WAN link must rely on a Layer 2 protocol that supports authentication and Layer 3 protocol negotiation.
- The service provider expects that R70 completes a three-way handshake by providing the expected response of a challenge requested.
- R70 must use the hostname "R70" and password "CCIE" (without quotes).
- R70 must receive an IP address from R8 and must install a default route pointing to 201.99.8.8.
- Ensure that R70 can successfully ping 8.8.8.8, which is located in the ISP#2 cloud.

- You are not allowed to configure any static route in R70 in order to achieve the previous requirements.
- Use the pre-configured Dialer1 interface as appropriate.

Solution:

R70

```
interface Dialer1
 ip address negotiated
 ip mtu 1492
 encapsulation ppp
 dialer pool 1
 ppp chap hostname R70
 ppp chap password 0 CCIE
 ppp ipcp route default
!
interface Ethernet0/0
 no ip address
 pppoe enable group global
 pppoe-client dial-pool-number 1
```

Verify:

```
R70#show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Ethernet0/0                unassigned      YES manual up                    up
Ethernet0/1                192.168.0.1     YES manual up                    up
Ethernet0/2                unassigned      YES unset  administratively down down
Ethernet0/3                unassigned      YES unset  administratively down down
Dialer1                    201.99.70.2     YES IPCP   up                    up
Virtual-Access1            unassigned      YES unset  up                    up
Virtual-Access2            unassigned      YES unset  up                    up

R70#show ip route
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP, l - LISP
       a - application route
       + - replicated route, % - next hop override

Gateway of last resort is 8.8.8.8 to network 0.0.0.0

S*    0.0.0.0/0 [1/0] via 8.8.8.8
      8.0.0.0/32 is subnetted, 1 subnets
C        8.8.8.8 is directly connected, Dialer1
      192.168.0.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.0.0/24 is directly connected, Ethernet0/1
L        192.168.0.1/32 is directly connected, Ethernet0/1
      201.99.70.0/32 is subnetted, 1 subnets
C        201.99.70.2 is directly connected, Dialer1

R70#ping 8.8.8.8
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```