CCNP Enterprise Network Troubleshooting Deep Dive

Get ready for your ENARSI exam!

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BRKCRT-2285

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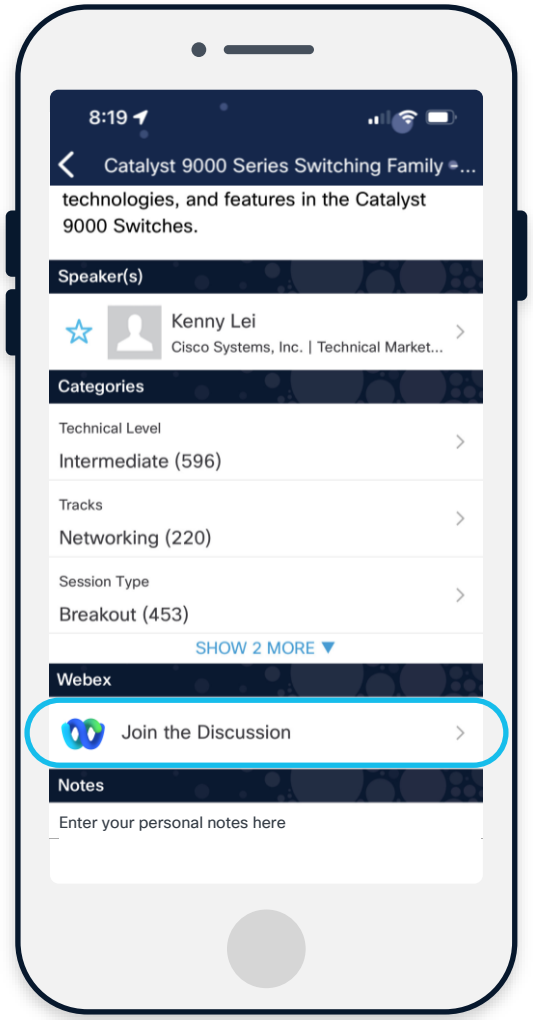

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Agenda

01 Troubleshooting then...and now

02 Troubleshooting Methodologies

03 Troubleshooting Case Studies

04 What's Next?

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Troubleshooting then... and now

From 2010 to 2020...

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Which three exams were required to achieve CCNP R&S between 2010 and 2020?

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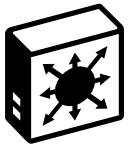
From 2010 to 2020...

ROUTE

SWITCH

TSHOOT



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How often did you take the TSHOOT exam?

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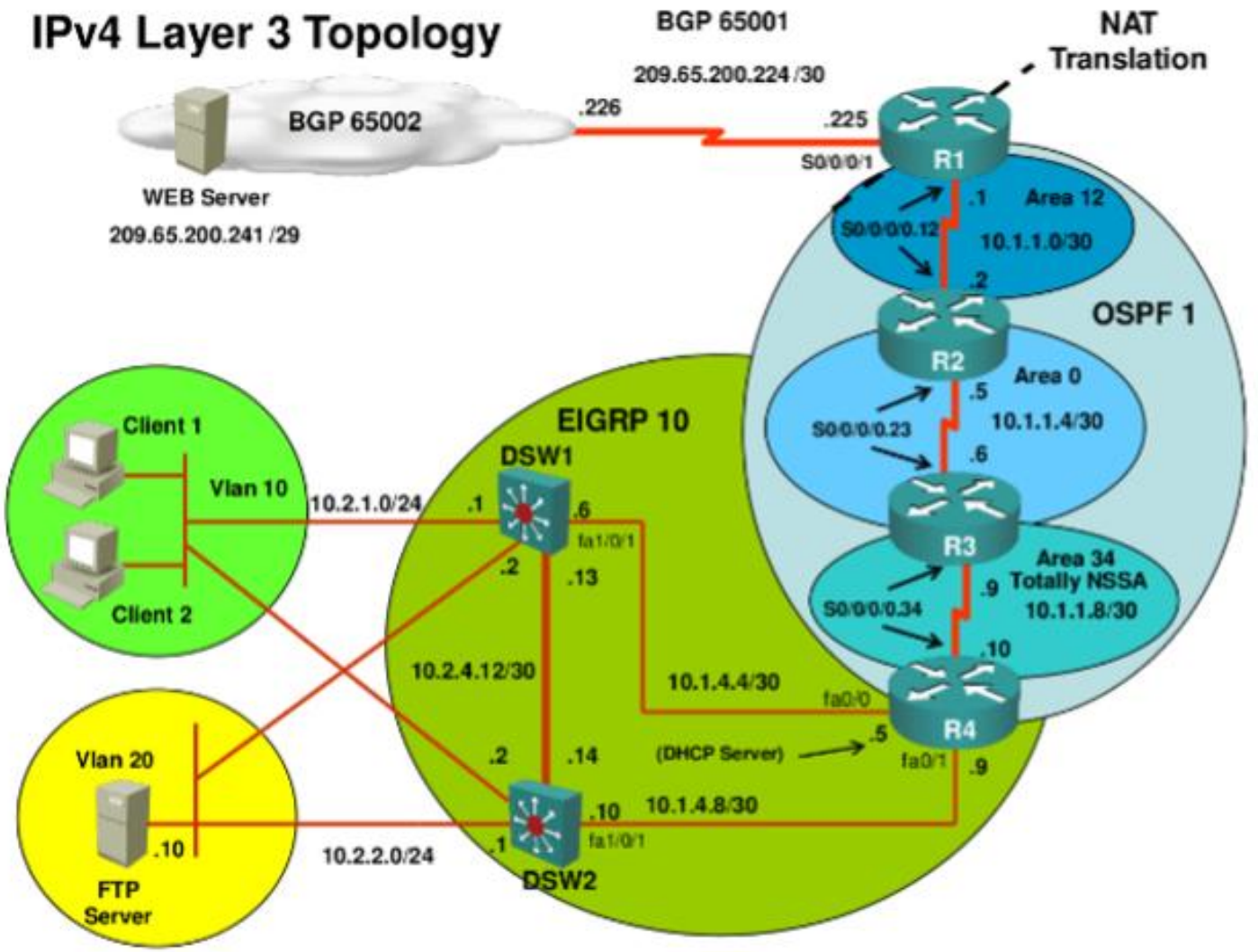
TSHOOT

- Where is the issue?
- What tech needs fixing?
- Which commands will fix the issue?



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Since 2020...

ENCOR

ENARSI

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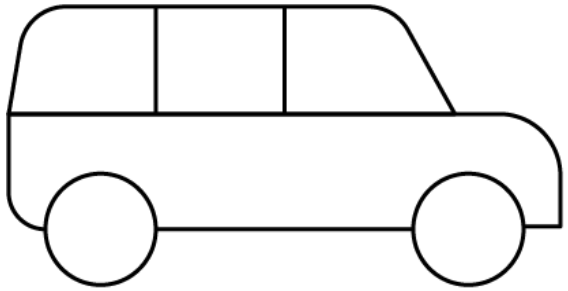
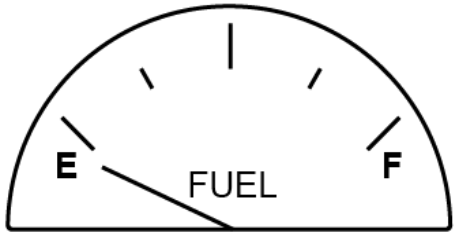
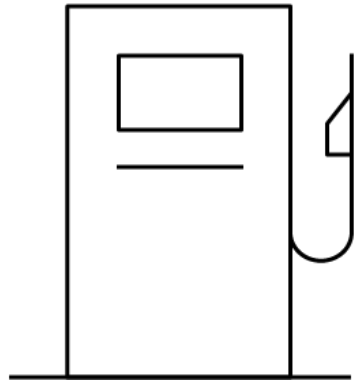
Troubleshooting Methodologies

What is Troubleshooting?

Problem → Diagnosis → Solution







- User reports problem
- Diagnose, fix, and document solution.

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Diagnostic Principles

Diagnosis is the process of identifying the cause of a problem.

The fundamental elements of this process:

- Gather information
- Analysis
- Elimination
- Propose hypotheses
- Testing

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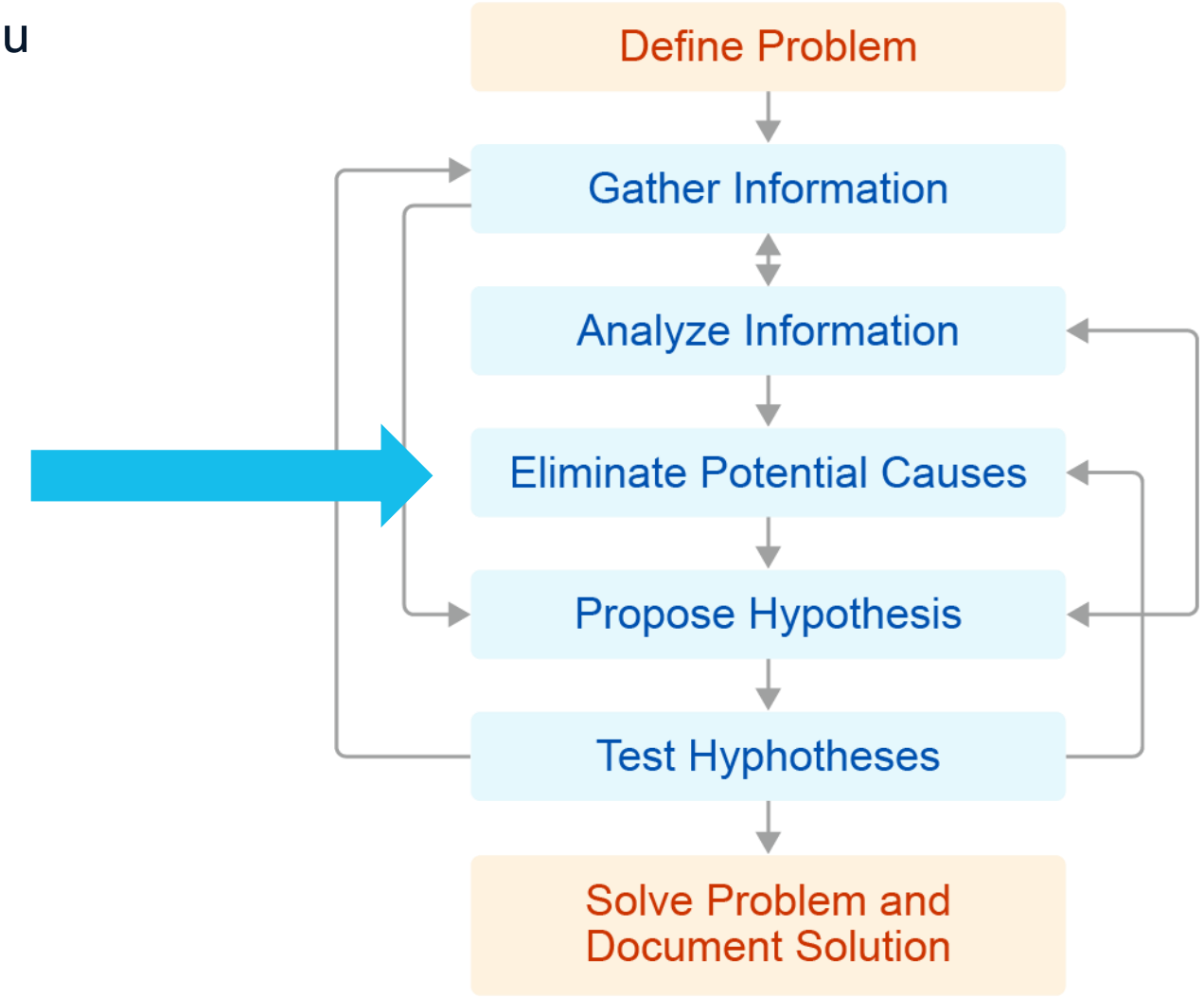
Troubleshooting Methods

The guiding principles determine how you move through the phases of the troubleshooting process.

The key to structured troubleshooting is elimination



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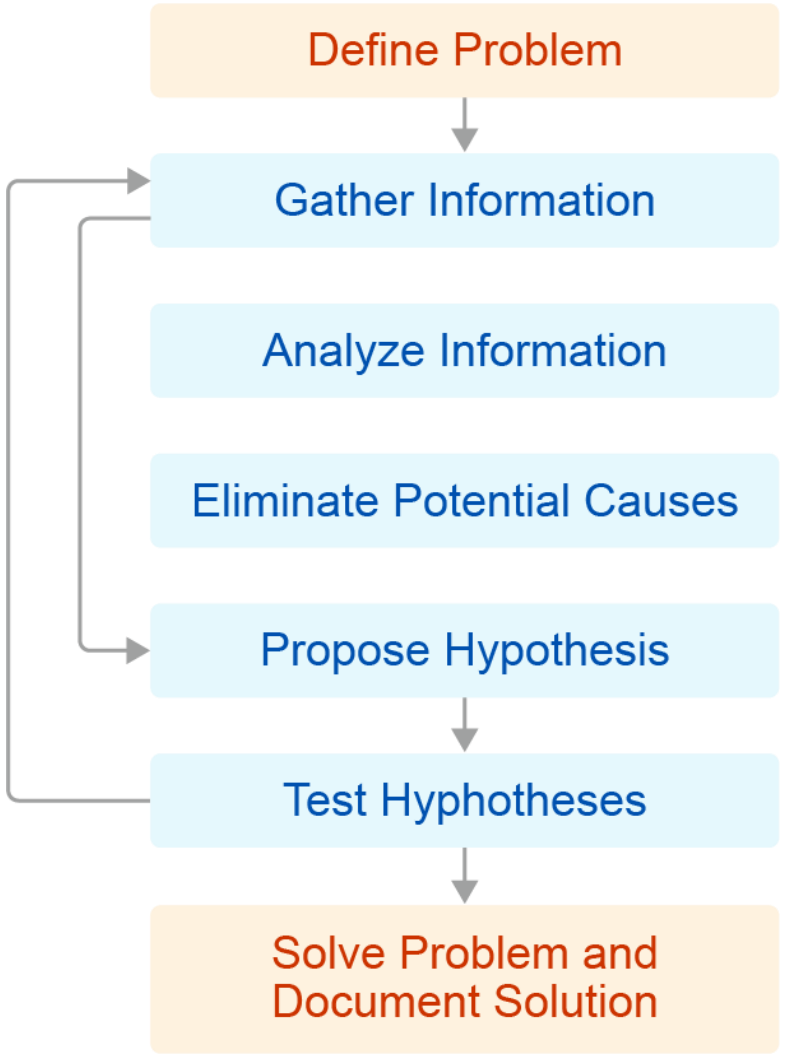
Structured Network Troubleshooting

The “Shoot-from-the-Hip” Method:

Minimal time is spent on gathering and analyzing data, and on eliminating possible causes.



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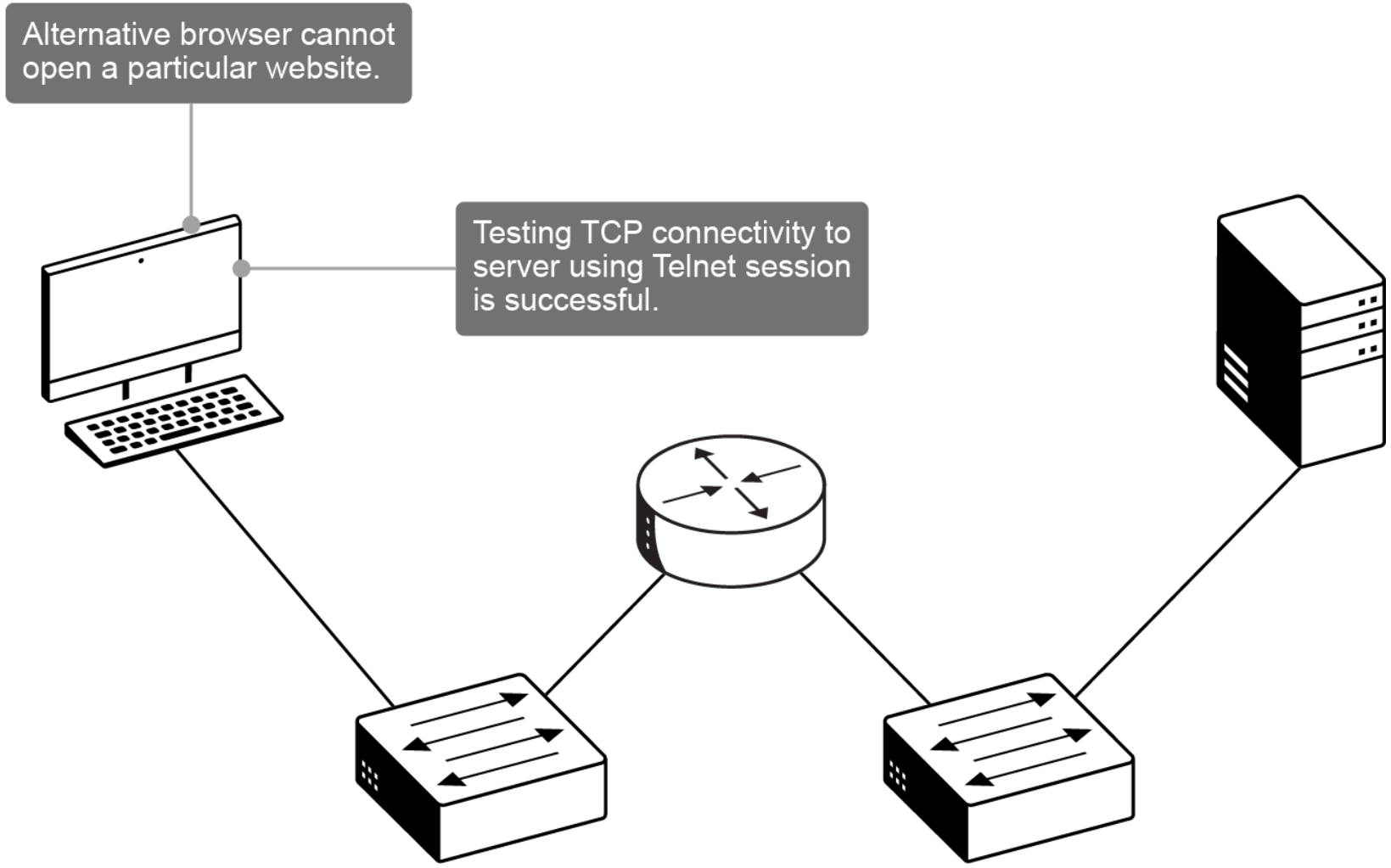
Top-Down Method



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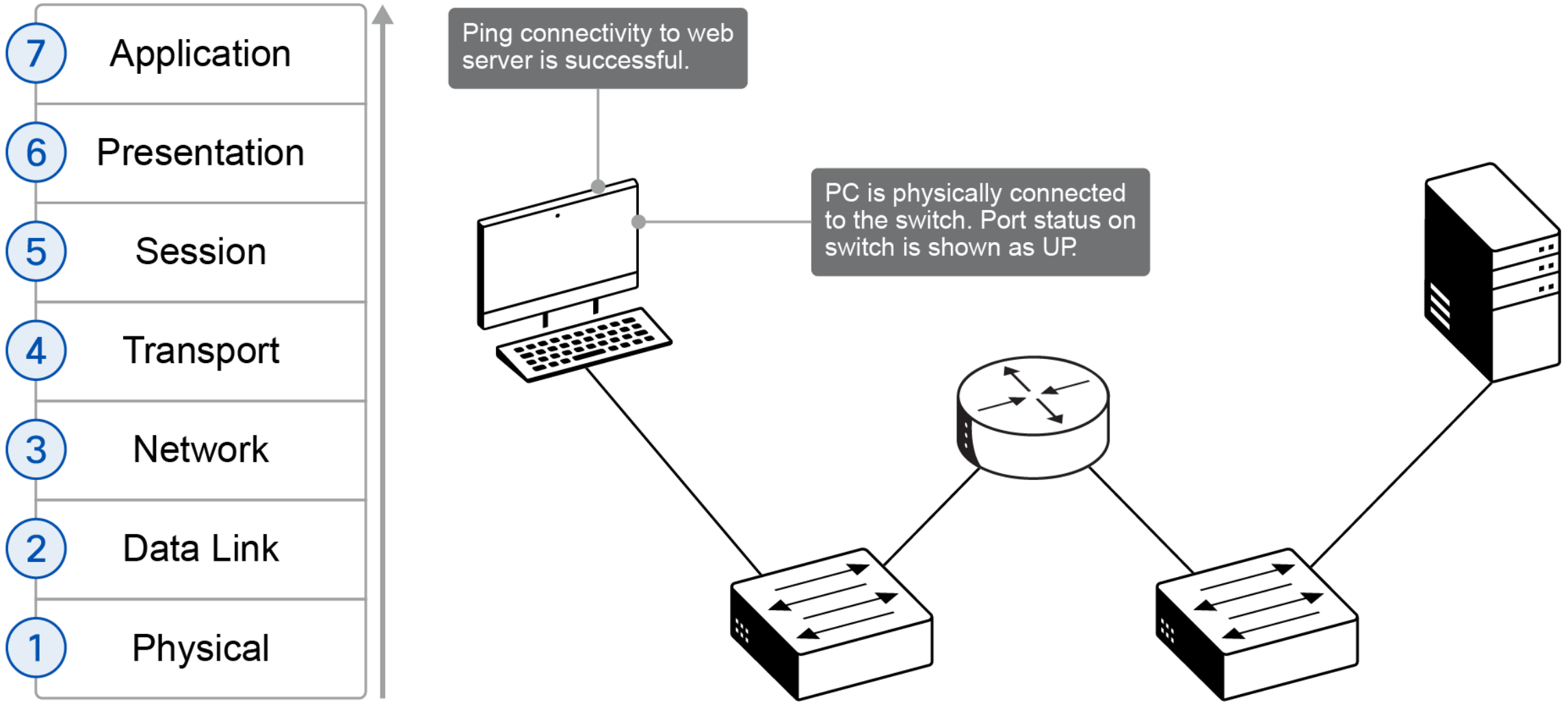
Bottom-Up Method



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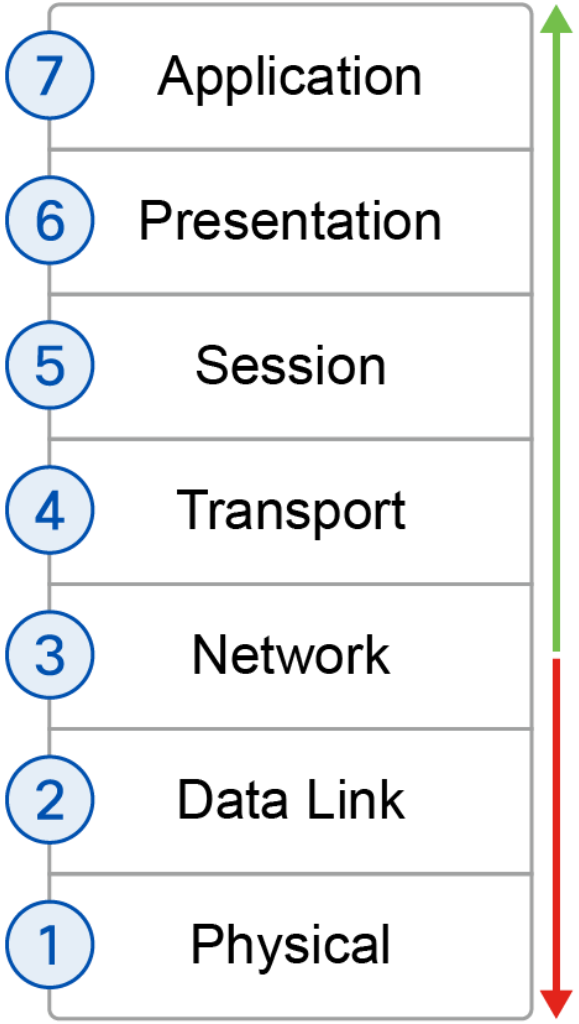
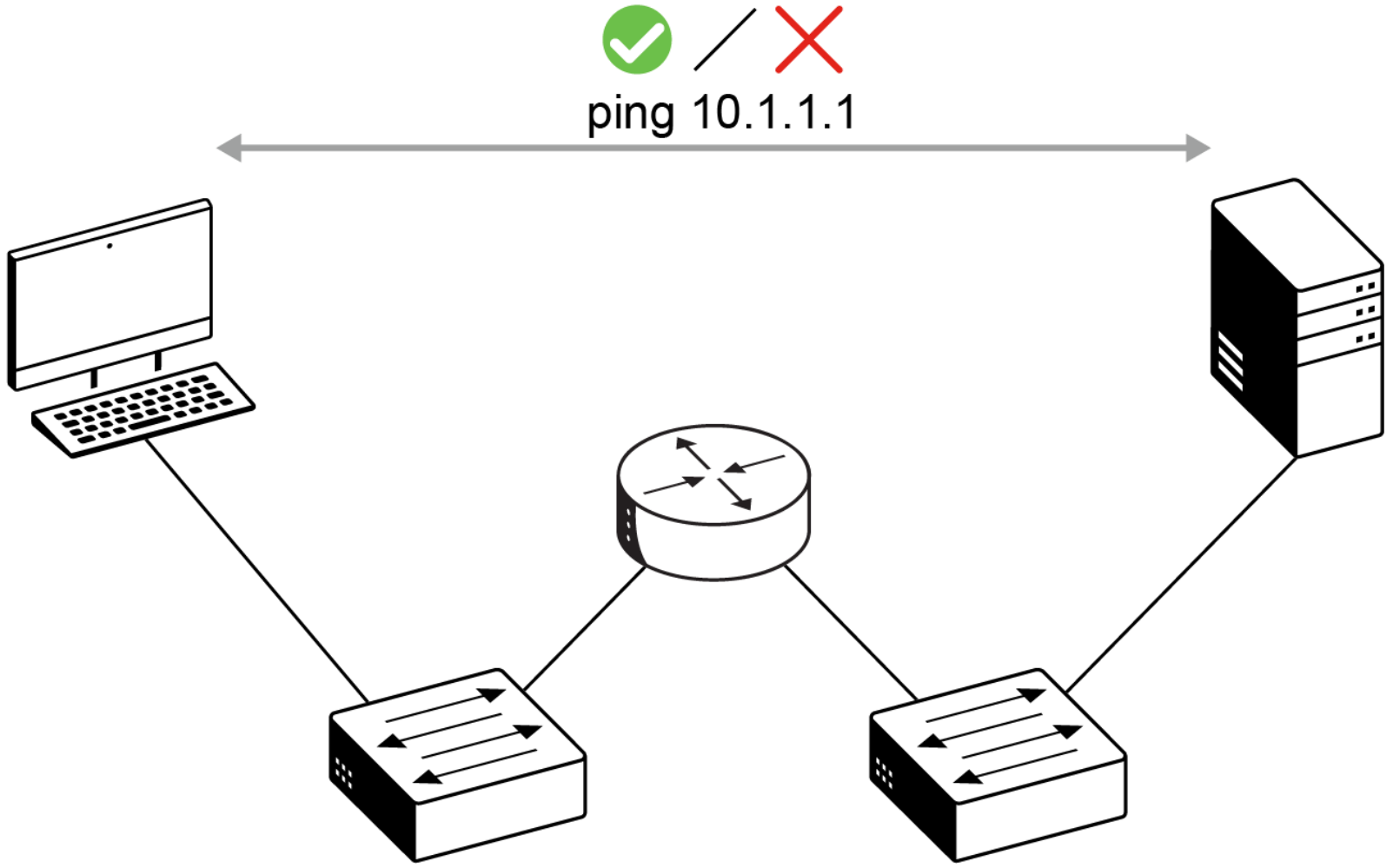
Divide-and-Conquer Method





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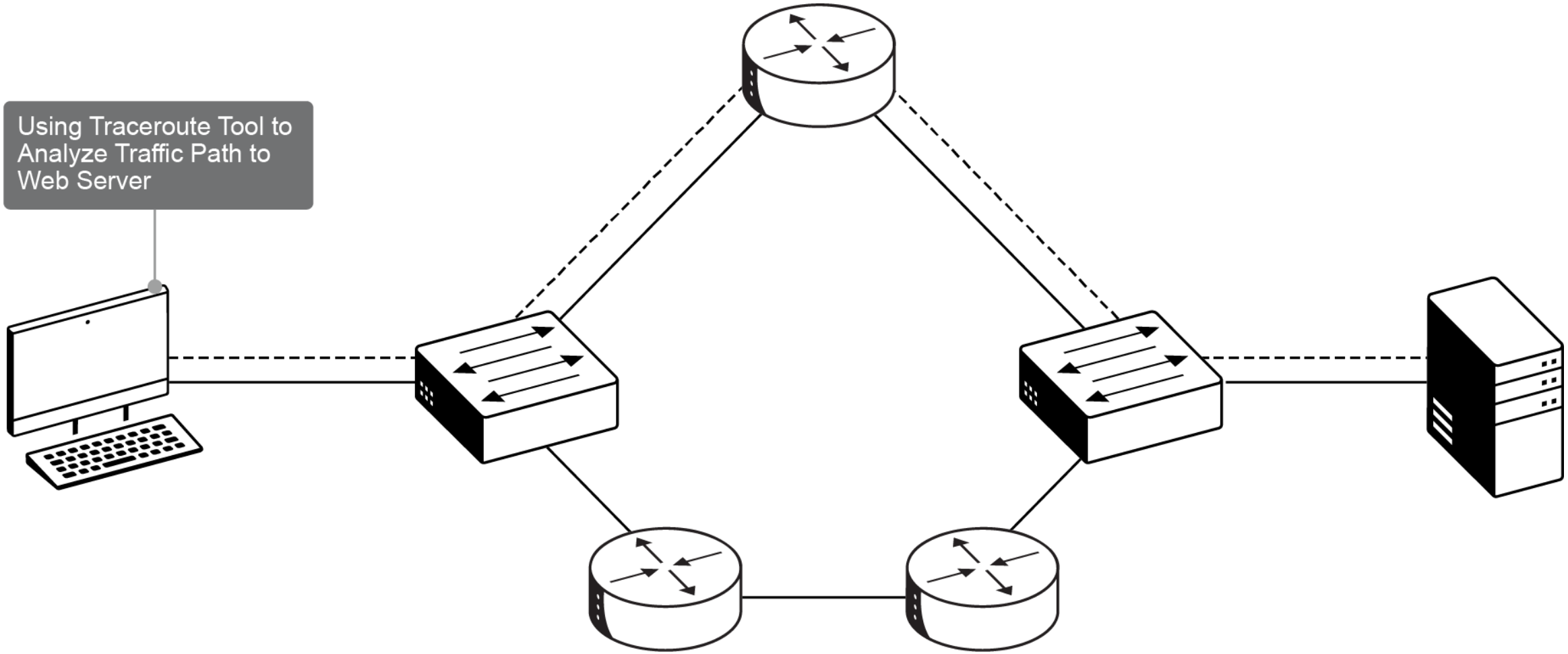
Following the Traffic Path



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Spot the Differences / Comparison Test

Branch1 can access the internet, but Branch2 cannot. Why?

```
Branch1# show ip route
<… output omitted …>
O*IA  0.0.0.0/0 [110/12] via 10.8.1.2, 4d01h, GigabitEthernet0/1
      10.0.0.0/8 is variably subnetted, 103 subnets, 4 masks
C        10.8.1.0/24 is directly connected, GigabitEthernet0/1
L        10.8.1.3/32 is directly connected, GigabitEthernet0/1


Branch2# show ip route
<… output omitted …>
     10.0.0.0/8 is variably subnetted, 103 subnets, 4 masks
C        10.8.2.0/24 is directly connected, GigabitEthernet0/1
L        10.8.2.3/32 is directly connected, GigabitEthernet0/1
```

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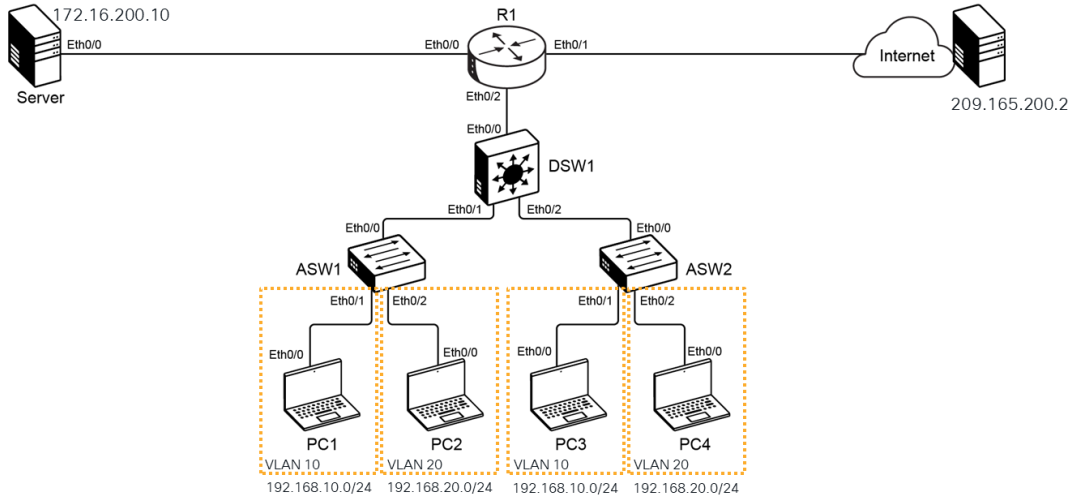
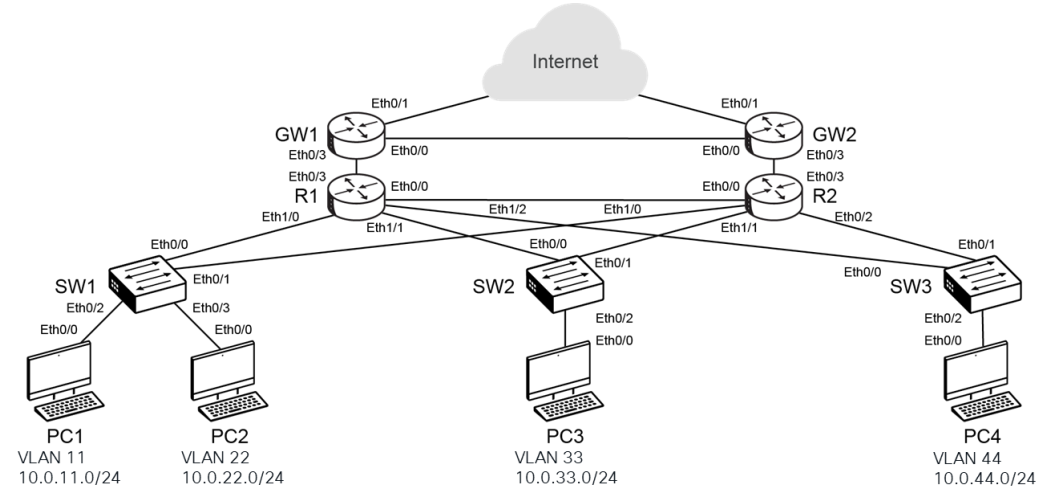
Troubleshooting Case Study

Overview

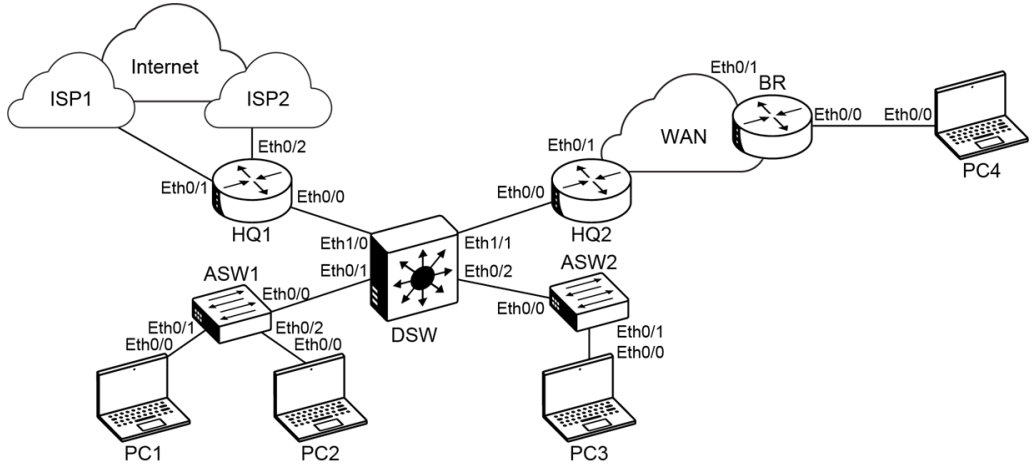
Topology 1 (5 tickets)



Topology 2 (3 tickets)



Topology 3 (2 tickets)



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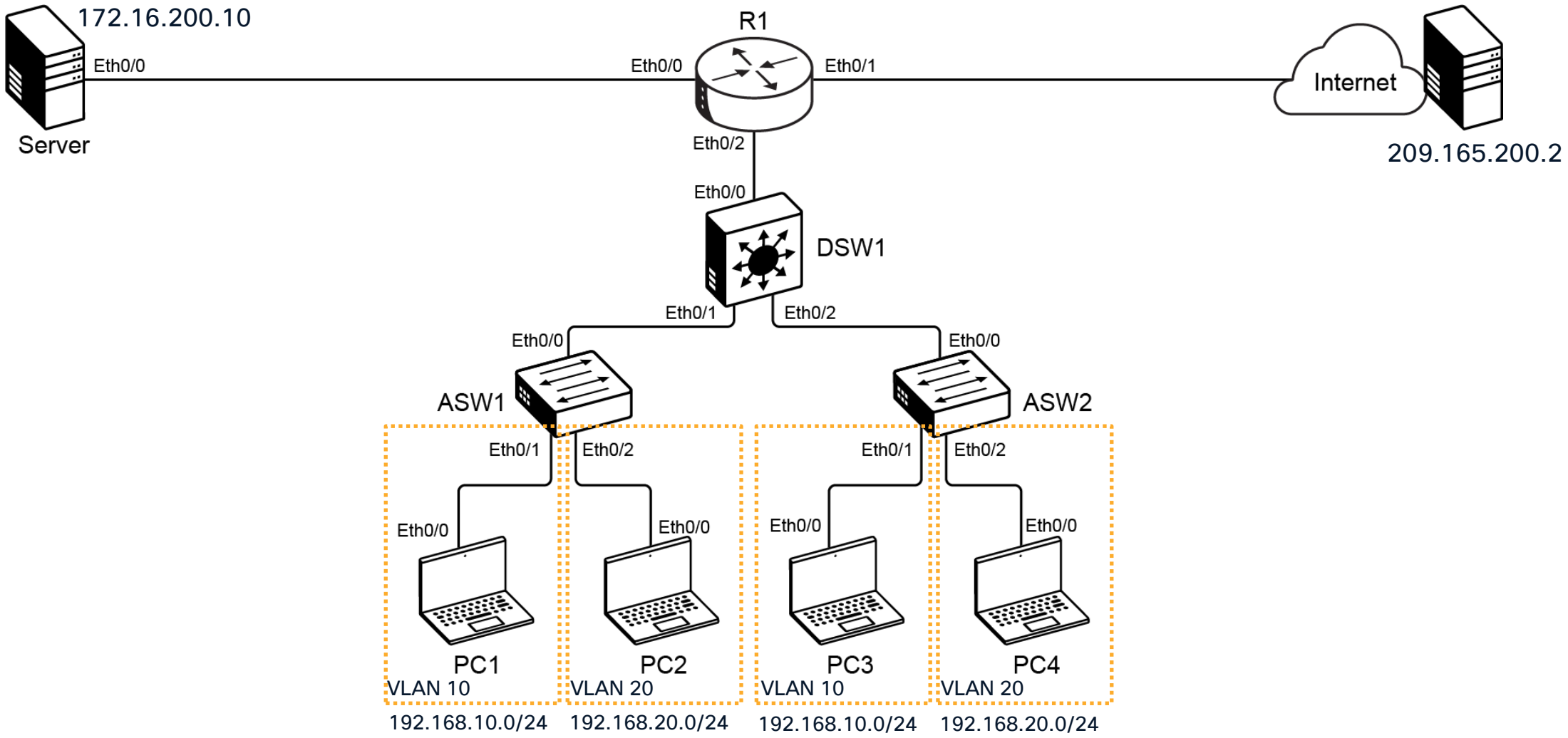
Troubleshooting Case Study: Topology 1

Network Topology



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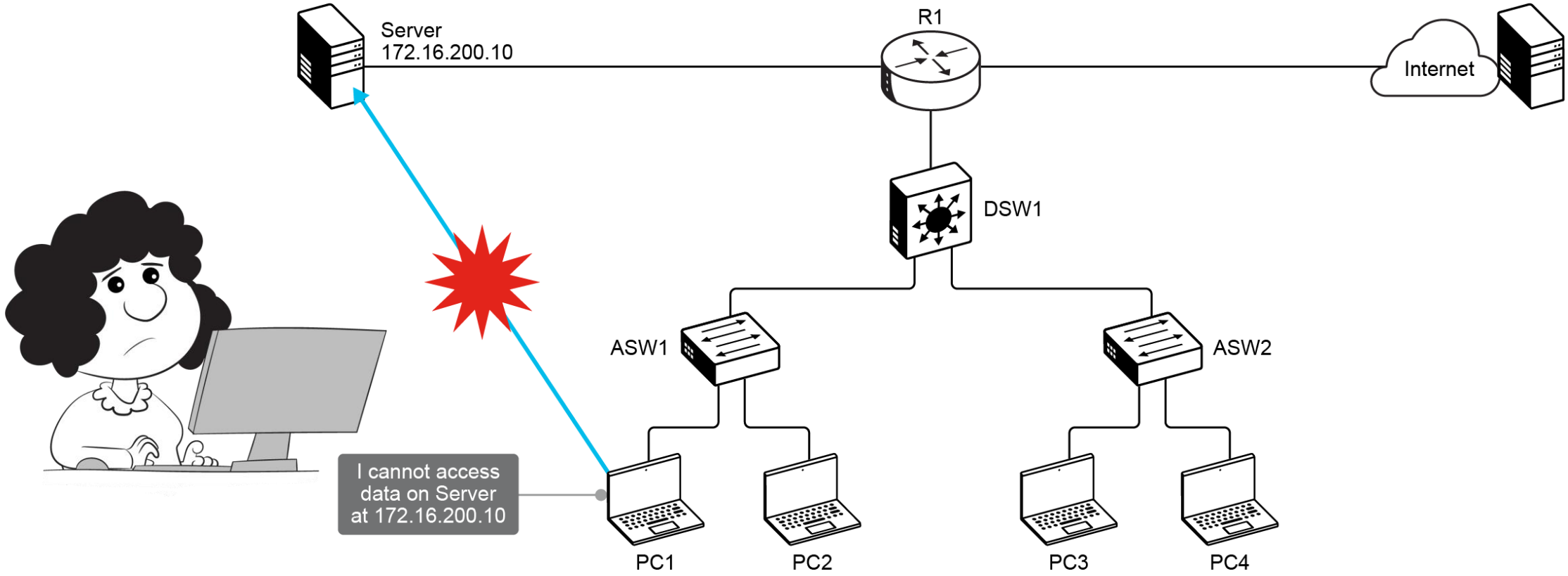
Ticket 1

PC1 Unable to Access Data on the Server

Kimberly, the user on PC1, cannot access data on the server at 172.16.200.10.



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Which solution is required to fix the issue for Ticket 1?

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Verifying the Problem

```
PC1# ping 172.16.200.10
% Unrecognized host or address, or protocol not running.
```

The ping to 172.16.200.10 is not successful.

Conclusion: The problem is confirmed. It is time to start troubleshooting.

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Troubleshooting Plan

Known facts:

- Client PC1 fails to contact the address 172.16.200.10.
- Client PC1 could contact 172.16.200.10 just a few days ago.
- The issue is completely internal to your network.

Plan:

- Find the problem using the “bottom-up” approach.
- Fix the problem and verify solution.

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Information Gathering

```
PC1# show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            unassigned      YES DHCP   up                    up
<... output omitted ...>
```

```
ASW1# show running-config interface ethernet 0/1
<… output omitted …>
interface Ethernet0/1
 description PC1
 switchport access vlan 10
 switchport mode access
<… output omitted …>
```

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Information Gathering and Proposing Hypothesis

```
ASW1# show interfaces description
Interface                      Status         Protocol Description
Et0/0                          up             up       trunk link to DSW1
<… output omitted …>


ASW1# show interface trunk

Port        Mode             Encapsulation  Status        Native vlan
Et0/0       on               802.1q         trunking      1

Port        Vlans allowed on trunk
Et0/0       1,20
<… output omitted …>
```

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Information Gathering and Proposing Hypothesis (Cont.)

```
DSW1# show interface trunk

Port        Mode             Encapsulation  Status        Native vlan
Et0/1       on               802.1q         trunking      1
Et0/2       on               802.1q         trunking      1

Port        Vlans allowed on trunk
Et0/1       1,10,20
Et0/2       1,10,20
<… output omitted …>
```

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Testing the Hypothesis

```
ASW1# configure terminal
ASW1(config)# interface ethernet 0/0

ASW1(config-if)# switchport trunk allowed vlan add 10


ASW1# show interface trunk
Port        Mode             Encapsulation  Status        Native vlan
Et0/0       on               802.1q         trunking      1

Port        Vlans allowed on trunk
Et0/0       1,10,20
<… output omitted …>
```

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Testing the Hypothesis (Cont.)

```
ASW1# show interface ethernet0/0 switchport
Name: Et0/0
Switchport: Enabled
Administrative Mode: trunk
Operational Mode: trunk
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: dot1q
<... output omitted ...>
Trunking Native Mode VLAN: 1 (default)
<... output omitted ...>
Trunking VLANs Enabled: 1,10,20
<... output omitted ...>
```

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Testing the Hypothesis (Cont.)

```
PC1# show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Ethernet0/0                192.168.10.5    YES DHCP   up                    up
<... output omitted ...>
```

```
PC1# ping 172.16.200.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.200.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 6/8/11 ms
```

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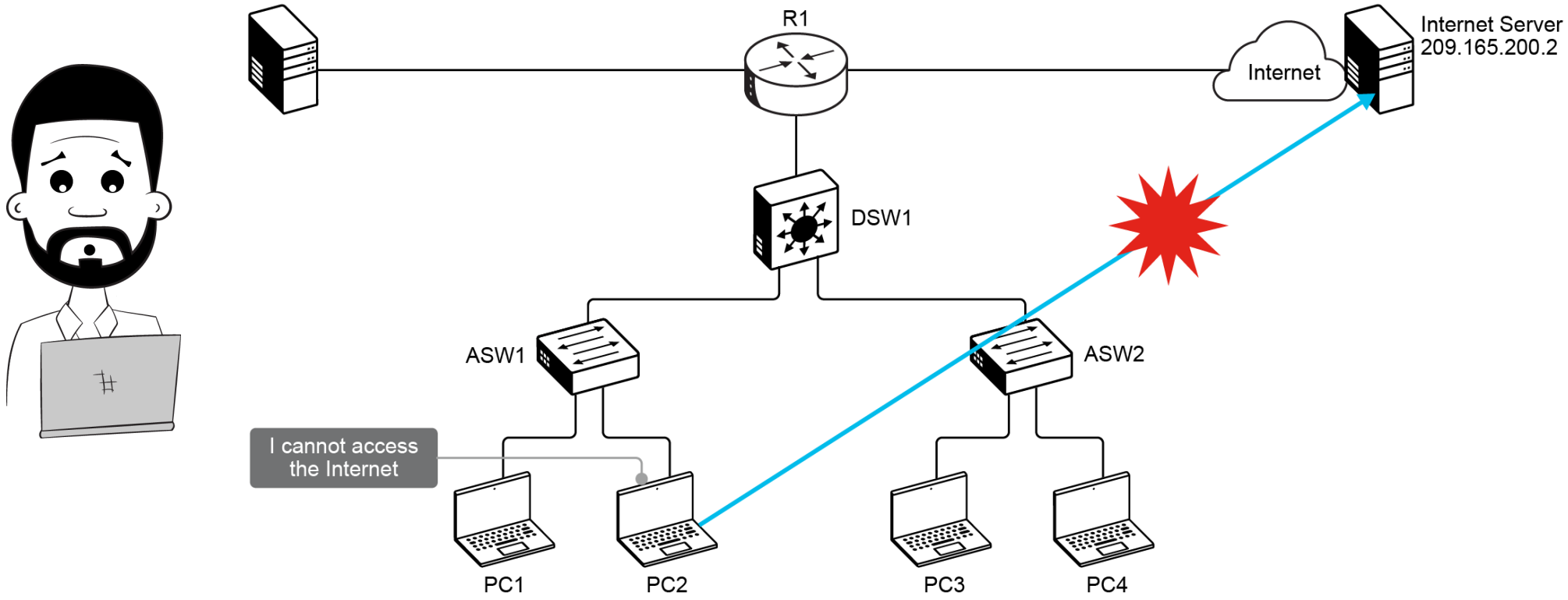
Ticket 2

PC2 Unable to Access the Internet

Andrew, the user on PC2, cannot access the Internet. He is trying to access the server at 209.165.200.2 which is now failing but was successful last week.



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Verifying the Problem

```
PC2# ping 209.165.200.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

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Troubleshooting Plan

Known facts:

- PC2 cannot access an Internet site, 209.165.200.2.
- PC2 was able to access 209.165.200.2 just a few days ago.

Plan:

- Find the problem. Start by verifying if PC2 is the only device that is not able to access the Internet site.
- Fix the problem and verify solution.

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Information Gathering

```
PC1# ping 209.165.200.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

```
PC4# ping 209.165.200.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.2, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

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Information Gathering and Eliminating Possible Causes

```
R1# ping 209.165.200.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 4/5/7 ms

R1# ping 192.168.20.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.20.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/6/8 ms
```

PC2

Conclusion: The problem is not the connection to the ISP, it is local.

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Information Gathering

```
R1# show ip nat statistics
Total active translations: 0 (0 static, 0 dynamic; 0 extended)
Outside interfaces:
  Ethernet0/1
Inside interfaces:
  Ethernet0/2
<... output omitted ...>
-- Inside Source
[Id: 1] access-list 1 interface Ethernet0/1 refcount 0
nat-limit statistics:
 max entry: max allowed 0, used 0, missed 0


R1# show interfaces description
Interface                      Status         Protocol Description
Et0/0                          up             up       link to SERVER
Et0/1                          up             up       link to INTERNET
Et0/2                          up             up       link to DSW1
<... output omitted ...>
```

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Information Gathering and Proposing the Hypothesis

```
R1# show access-lists 1
R1#


R1# show access-lists
Standard IP access list 21
    10 permit 192.168.0.0, wildcard bits 0.0.255.255
    20 permit 172.16.0.0, wildcard bits 0.0.255.255
```

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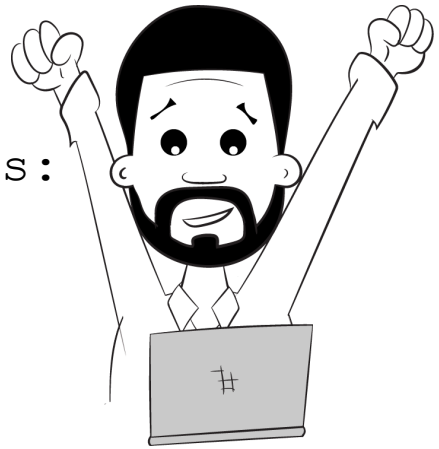
Testing the Hypothesis

```
R1(config)# no ip nat inside source list 1 interface Ethernet0/1 overload
R1(config)# ip nat inside source list 21 interface Ethernet0/1 overload

PC2# ping 209.165.200.2
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/4/8 ms

R1# show ip nat translations

Pro  Inside global     Inside local       Outside local      Outside global
icmp 209.165.200.1     192.168.20.2       209.165.200.2      209.165.200.2
```



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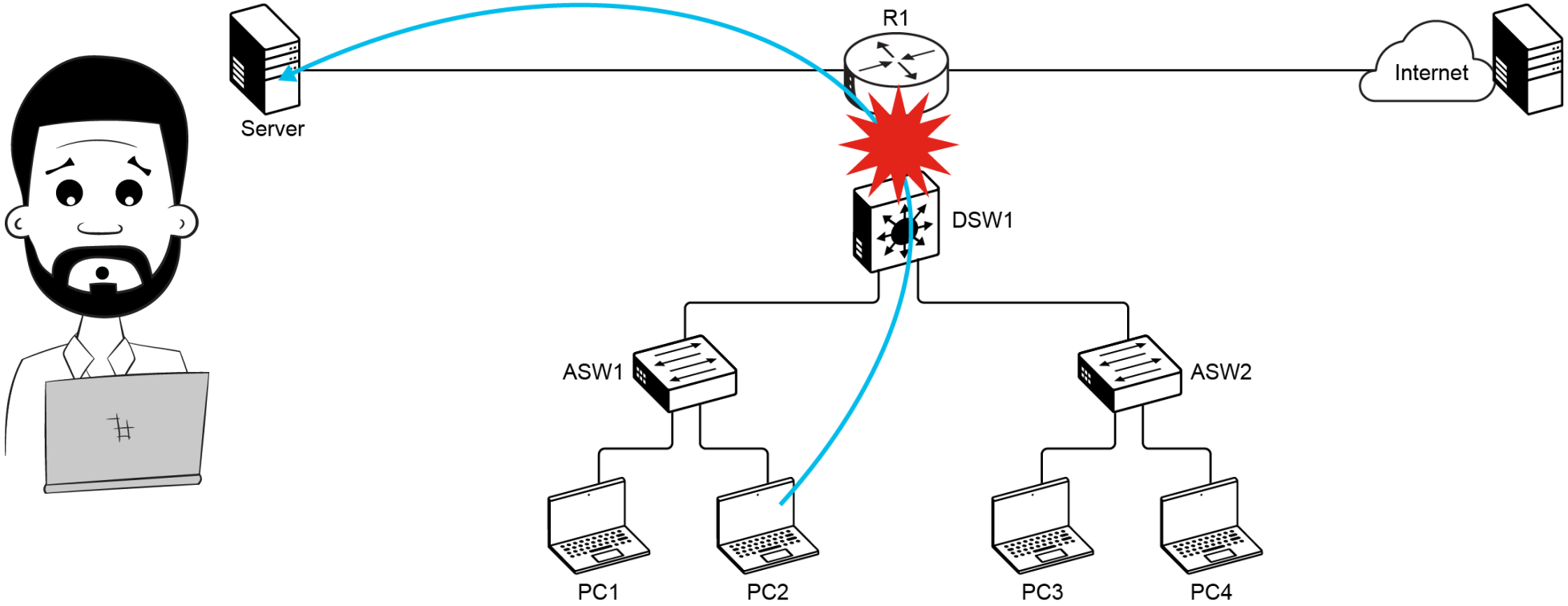
Ticket 3

PC2 Cannot Use SSH to Connect to the Internal Server

Andrew, the user on PC2, cannot SSH to the internal server.



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Which solution is required to fix the issue for Ticket 3?

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Verifying the Problem

```
PC2# ssh -l admin 172.16.200.10
% Destination unreachable; gateway or host down
```

```
SERVER# telnet 1.1.1.1 22
Trying 1.1.1.1, 22 ... Open
SSH-1.99-Cisco-1.25
```

Your colleague tried to configure a security feature where users could only establish an SSH session to the server (172.16.200.10), but nobody should be able to establish a session **from** the server. However, the feature is not functioning properly.

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Troubleshooting Plan

Known facts:

- SSH should work from PC2 to 172.16.200.10.
- SSH must ***not*** work from 172.16.200.10 to 1.1.1.1 (R1 Lo0)

Plan:

- Gather more information about the issue.
- Use the “follow the path” method to isolate the location of the problem.
- Fix the problem and verify the solution.

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Information Gathering

```
DSW1# telnet 172.16.200.10 22
Trying 172.16.200.10, 22 ...
% Destination unreachable; gateway or host down
```

```
R1# telnet 172.16.200.10 22
Trying 172.16.200.10, 22 ... Open
SSH-1.99-Cisco-1.25
```

The response is immediate–not a timeout–which implies a return TCP RST or ICMP packet.

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Information Gathering (Cont.)

```
PC2# debug ip icmp
ICMP packet debugging is on


PC2# telnet 172.16.200.10 22
Trying 172.16.200.10, 22 ...
% Destination unreachable; gateway or host down
PC2#
*Nov 26 08:36:03.197: ICMP: dst (192.168.20.2) administratively prohibited
unreachable rcv from 172.16.100.1
```

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Locating the Device

```
DSW1# show ip interface brief | exclude unass
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            172.16.100.2    YES NVRAM  up                    up
Loopback0              2.2.2.2         YES NVRAM  up                    up
Vlan10                 192.168.10.1    YES NVRAM  up                    up
Vlan20                 192.168.20.1    YES NVRAM  up                    up
```

```
R1# show ip interface brief | exclude unass
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            172.16.200.1    YES NVRAM  up                    up
Ethernet0/1            209.165.200.1   YES NVRAM  up                    up
Ethernet0/2            172.16.100.1    YES NVRAM  up                    up
Loopback0              1.1.1.1         YES NVRAM  up                    up
Loopback22             192.168.22.1    YES NVRAM  up                    up
```

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Locating the ACL

```
R1# show running-config | include ^interface|access-group
interface Loopback0
interface Loopback22
interface Ethernet0/0
 ip access-group 111 out
interface Ethernet0/1
interface Ethernet0/2
interface Ethernet0/3
```

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Analysing the ACL

```
R1# show access-list 111
Extended IP access list 111
    10 permit tcp 192.168.0.0 0.0.255.255 host 172.16.200.10 eq 22 established

R1# show interface description
Interface  Status   Protocol Description
Et0/0      up       up       link to SERVER
Et0/1      up       up       link to INTERNET
Et0/2      up       up       link to DSW1
<... output omitted ...>
```

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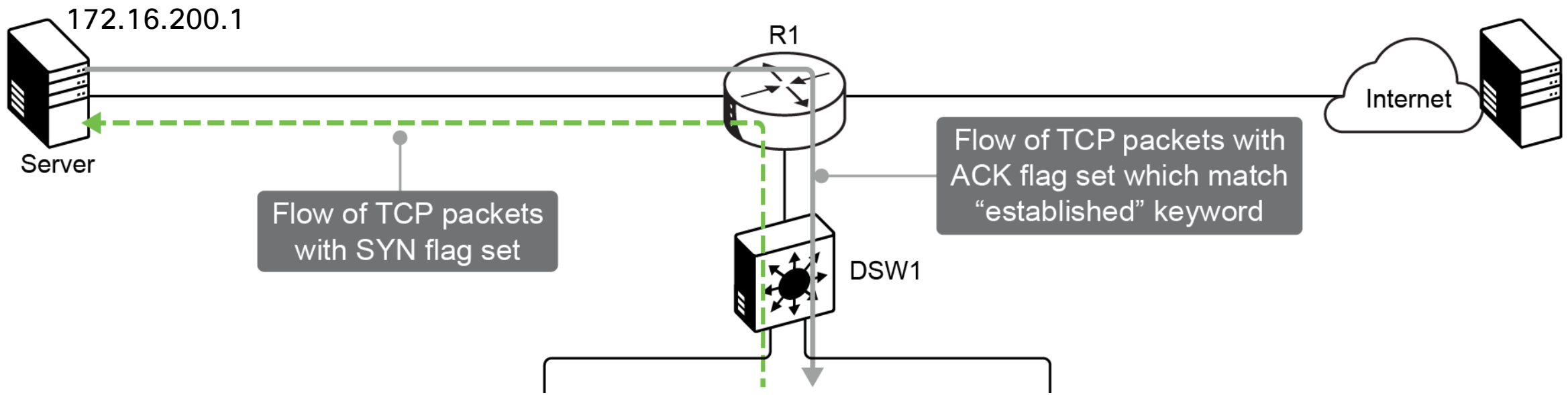
Designing a Solution



Conclusions:

- You must permit SYN packets from 192.168.0.0/16 to 172.16.200.10.
- You must permit ACK packets from 172.16.200.10 to 192.168.0.0/16.
- ACL must be turned around to match "established" packets correctly.
- Source, and destination addresses must be swapped and ACL applied inbound.

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Deploying the Solution

```
R1# show access-list 111
Extended IP access list 111
    10 permit tcp 192.168.0.0 0.0.255.255 host 172.16.200.10 eq 22 established
```

```
R1(config)# ip access-list extended 111
R1(config-ext-nacl)# no 10
R1(config-ext-nacl)# permit tcp host 172.16.200.10 eq 22 192.168.0.0 0.0.255.255
established
R1(config-ext-nacl)# exit
```

```
R1(config)# interface ethernet 0/0
R1(config-if)# no ip access-group 111 out
R1(config-if)# ip access-group 111 in
```

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Testing the Hypothesis

```
PC2# telnet 172.16.200.10 22
Trying 172.16.200.10, 22 ... Open
SSH-1.99-Cisco-1.25
```

```
SERVER# telnet 1.1.1.1 22
Trying 1.1.1.1, 22 ...
% Destination unreachable; gateway or host down
```

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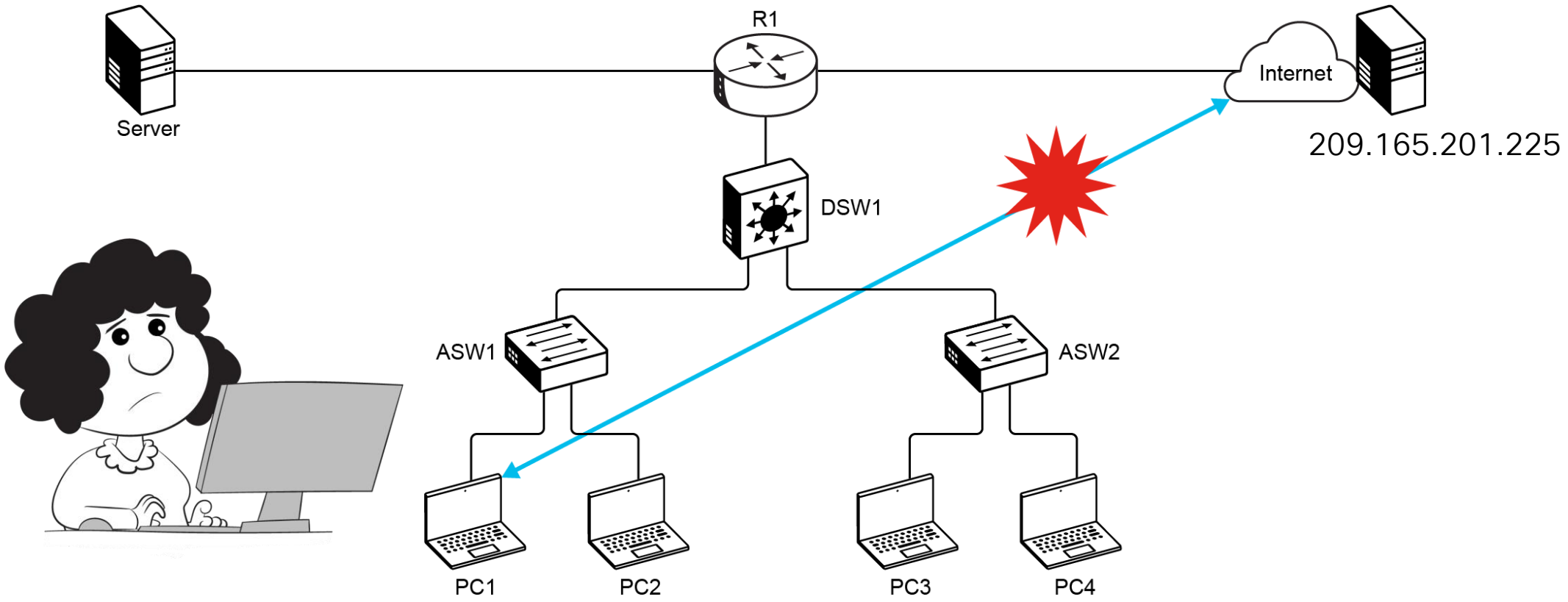
Ticket 4

PC1 Unable to Access the Internet Host

Kimberly, the user on PC1, cannot access the Internet. Kimberly is trying to connect to one specific host on the Internet.



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Which solution is required to fix the issue for Ticket 4

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Verifying the Problem

```
PC1# ping 209.165.201.225
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.201.225, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

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Troubleshooting Plan

Known facts:

- PC1 cannot access the Internet.
- Specifically, the client fails to contact the address 209.165.201.225.

Plan:

- Use the “follow-the-path” method to isolate the location of the problem.
- Fix the problem and verify solution.

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Information Gathering

```
PC1# traceroute 209.165.201.225
Type escape sequence to abort.
Tracing the route to 209.165.201.225
VRF info: (vrf in name/id, vrf out name/id)
  1 192.168.10.1 2 msec 2 msec 8 msec
  2 172.16.100.1 9 msec 7 msec 10 msec
  3 172.16.100.2 3 msec 5 msec 2 msec
  4 172.16.100.1 8 msec 2 msec 8 msec
  5 172.16.100.2 4 msec 8 msec 8 msec
  ...
```

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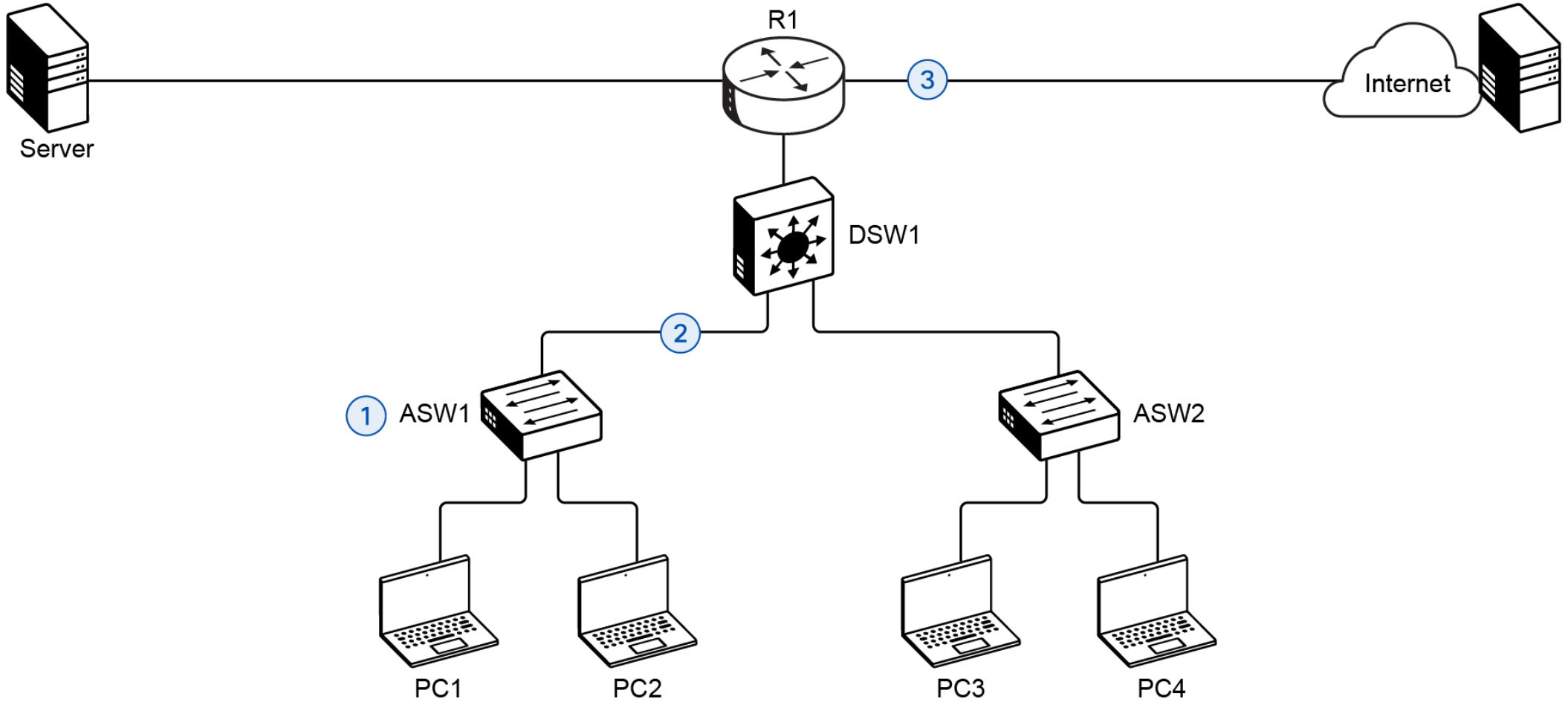
Information Gathering and Proposing the Hypothesis



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Testing the Hypothesis – Routing Loop?

```
DSW1# show ip interface brief | exclude unass
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            172.16.100.2    YES NVRAM  up                    up
Loopback0              2.2.2.2         YES NVRAM  up                    up
Vlan10                 192.168.10.1    YES NVRAM  up                    up
Vlan20                 192.168.20.1    YES NVRAM  up                    up

R1# show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            172.16.200.1    YES NVRAM  up                    up
Ethernet0/1            209.165.200.1   YES NVRAM  up                    up
Ethernet0/2            172.16.100.1    YES NVRAM  up                    up
Ethernet0/3            unassigned      YES NVRAM  up                    up
Loopback0              1.1.1.1         YES NVRAM  up                    up
Loopback22             192.168.22.1    YES NVRAM  up                    up
```

Hop 3

Hop 1

Hop 2

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Information Gathering

```
DSW1# show ip route
<... output omitted ...>
O*E2  0.0.0.0/0 [110/1] via 172.16.100.1, 2d05h, Ethernet0/0
      2.0.0.0/32 is subnetted, 1 subnets
C        2.2.2.2 is directly connected, Loopback0
      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.100.0/24 is directly connected, Ethernet0/0
L        172.16.100.2/32 is directly connected, Ethernet0/0
      192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.10.0/24 is directly connected, Vlan10
L        192.168.10.1/32 is directly connected, Vlan10
      192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C        192.168.20.0/24 is directly connected, Vlan20
L        192.168.20.1/32 is directly connected, Vlan20
O E2  192.168.22.0/24 [110/20] via 172.16.100.1, 2d05h, Ethernet0/0
```

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Information Gathering (Cont.)

```
R1# show ip route
 <... output omitted ...>
S*    0.0.0.0/0 [1/0] via 209.165.200.2
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      172.16.0.0/16 is variably subnetted, 4 subnets, 3 masks
<... output omitted ...>
L        209.165.200.1/32 is directly connected, Ethernet0/1
S     209.165.201.0/24 [1/0] via 172.16.100.2
```

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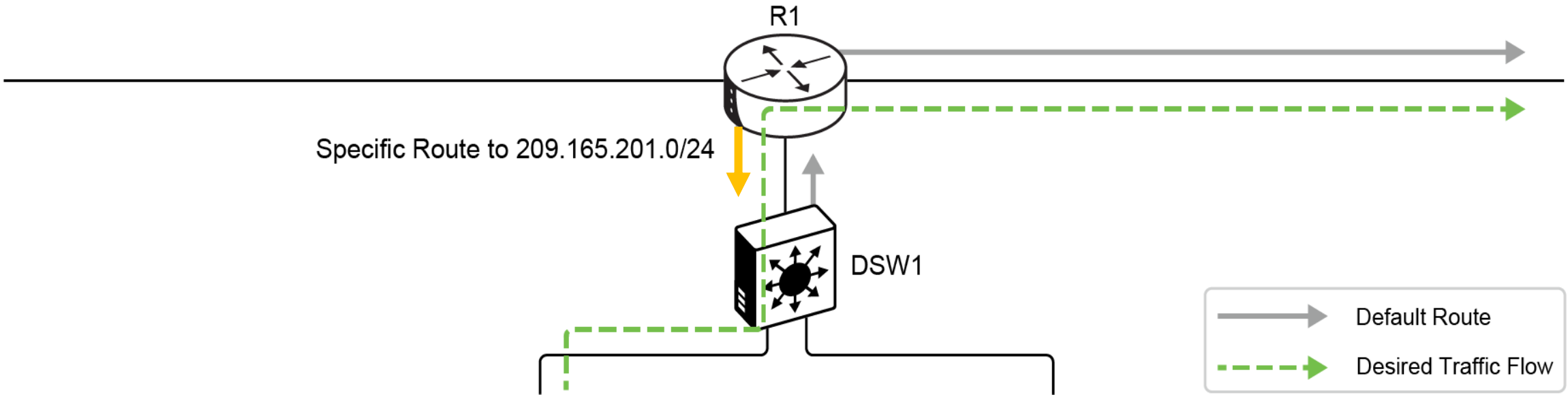
Proposing the Hypothesis



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Testing the Hypothesis

```
R1# show running-config | include route
 default-router 192.168.10.1
 default-router 192.168.20.1
router ospf 1
ip route 0.0.0.0 0.0.0.0 209.165.200.2
ip route 209.165.201.0 255.255.255.0 172.16.100.2
ipv6 route ::/0 2001:DB8:D1:A5:C8::2
ipv6 router rip RIPNG
R1#
```

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Testing the Hypothesis and Verification

```
R1# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)# no ip route 209.165.201.0 255.255.255.0 172.16.100.2
R1(config)#
```

```
PC1# ping 209.165.201.225
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.201.225, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 7/8/9 ms
```

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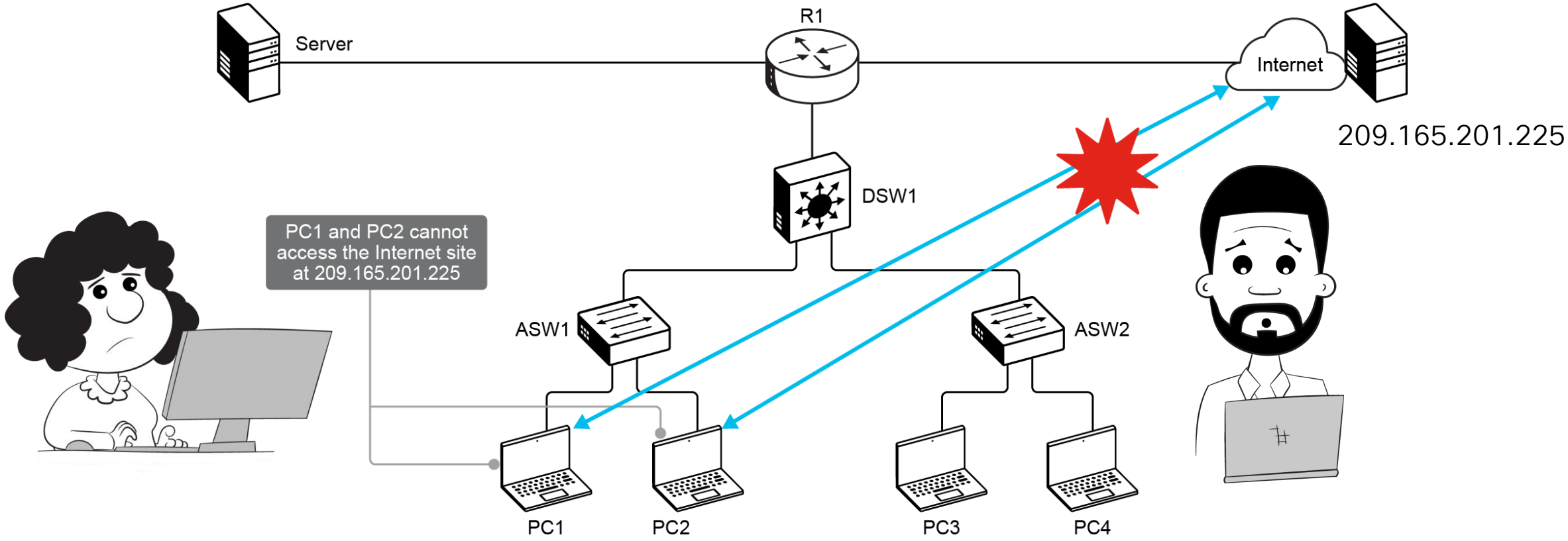
Ticket 5

PC1 and PC2 Cannot Ping the Internet Host

Kimberley and Andrew can’t access the Internet. Specifically, they are trying to connect to one host on the Internet.



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Which solution is required to fix the issue for Ticket 5?

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Verify the Problem

```
PC1# ping 209.165.201.225
% Unrecognized host or address, or protocol not running.

PC2# ping 209.165.201.225
% Unrecognized host or address, or protocol not running.
```

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Troubleshooting Plan

Known facts:

- PC1 and PC2 cannot access the Internet site at 209.165.201.225.

Plan:

- Check PC1 and PC2 for IP address assignment.
- Fix the problem and verify solution.

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Information Gathering

```
PC1# show ip interface brief
Interface              IP-Address      OK? Method Status     Protocol
Ethernet0/0            unassigned      YES DHCP   up         up
<... output omitted ...>
```

```
PC2# show ip interface brief
Interface              IP-Address      OK? Method Status     Protocol
Ethernet0/0            unassigned      YES DHCP   up         up
<... output omitted ...>
```

Possible next step: Check DHCP server (R1)

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Information Gathering (Cont.)

```
R1# show running-config | section dhcp
ip dhcp excluded-address 192.168.10.1
ip dhcp excluded-address 192.168.20.1
ip dhcp pool POOL-VLAN10
 network 192.168.10.0 255.255.255.0
 domain-name cisco.com
 default-router 192.168.10.1
 dns-server 172.16.250.10
 lease 7
ip dhcp pool POOL-VLAN20
 network 192.168.20.0 255.255.255.0
 domain-name cisco.com
 default-router 192.168.20.1
 dns-server 172.16.250.10
 lease 7
```

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Information Gathering (Cont.)

```
DSW1# show running-config interface vlan 10
<... output omitted ...>
interface Vlan10
 ip address 192.168.10.1 255.255.255.0
 ip helper-address 172.16.100.1
<... output omitted ...>
```

R1

```
DSW1# show running-config interface vlan 20
<... output omitted ...>
interface Vlan20
 ip address 192.168.20.1 255.255.255.0
 ip helper-address 172.16.100.1
<... output omitted ...>
```

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Information Gathering (Cont.)

```
R1# debug ip dhcp server packet
DHCP server packet debugging is on.

*Nov 25 22:17:44.660: DHCPD: DHCPDISCOVER received from client
0063.6973.636f.2d61.6162.622e.6363.3030.2e34.3430.302d.4574.302f.30 through
relay 192.168.10.1.
*Nov 25 22:17:44.660: DHCPD: Sending DHCPOFFER to client
0063.6973.636f.2d61.6162.622e.6363.3030.2e34.3430.302d.4574.302f.30
(192.168.10.4).

*Nov 25 22:18:21.310: DHCPD: DHCPDISCOVER received from client
0063.6973.636f.2d61.643d.622e.6363.3030.2e34.3430.302d.4574.122e.d1 through
relay 192.168.20.1.
*Nov 25 22:18:21.310: DHCPD: Sending DHCPOFFER to client
0063.6973.636f.2d61.643d.622e.6363.3030.2e34.3430.302d.4574.122e.d1
(192.168.20.2).
```

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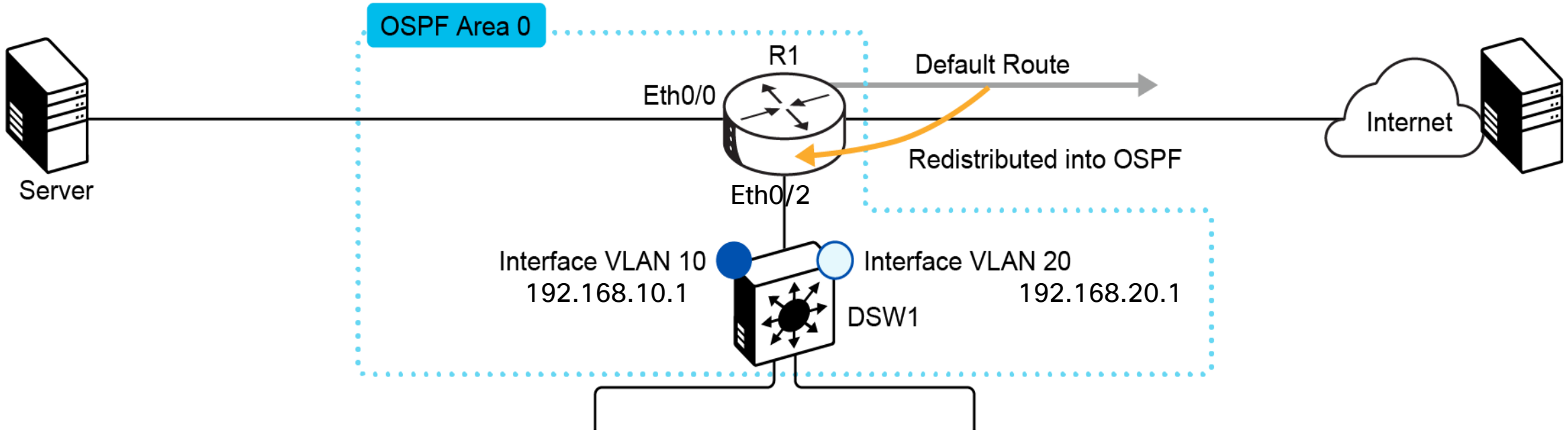
OSPF Routing Analysis



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Information Gathering and Hypothesis Proposal

```
R1# show ip route
<... output omitted ...>
Gateway of last resort is 209.165.200.2 to network 0.0.0.0
S*    0.0.0.0/0 [1/0] via 209.165.200.2
      1.0.0.0/32 is subnetted, 1 subnets
C        1.1.1.1 is directly connected, Loopback0
      172.16.0.0/16 is variably subnetted, 2 subnets, 2 masks
C        172.16.100.0/24 is directly connected, Ethernet0/2
L        172.16.100.1/32 is directly connected, Ethernet0/2
<... output omitted ...>


R1# show ip ospf neighbor
R1#
```

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Information Gathering and Hypothesis Proposal (Cont.)

```
R1# show ip protocols
<... output omitted ...>
  Routing on Interfaces Configured Explicitly (Area 0):
    Ethernet0/2
  Passive Interface(s):
    Ethernet0/0
    Ethernet0/1
    Ethernet0/2
  <... output omitted ...>

R1# show running-config | section ospf
 ip ospf 1 area 0
 router ospf 1
 redistribute connected
 passive-interface default
 default-information originate
```

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Testing Hypothesis

```
R1(config)# router ospf 1
R1(config-router)# no passive-interface ethernet 0/2
```

```
R1# show ip ospf neighbor
Neighbor ID     Pri   State           Dead Time   Address         Interface
2.2.2.2           1   FULL/DR         00:00:33    172.16.100.2    Ethernet0/2
```

```
R1# show ip route ospf
<... output omitted ...>
O     192.168.10.0/24 [110/11] via 172.16.100.2, 00:01:43, Ethernet0/2
O     192.168.20.0/24 [110/11] via 172.16.100.2, 00:01:43, Ethernet0/2
```

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Testing the Hypothesis and Verification

```
PC1# show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Ethernet0/0                192.168.10.4    YES DHCP   up                    up
<... output omitted ...>

PC1# ping 209.165.201.225
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.201.225, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/207/1004 ms
```

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Testing the Hypothesis and Verification (Cont.)

```
PC2# show ip interface brief
Interface                  IP-Address      OK? Method Status                Protocol
Ethernet0/0                192.168.20.2    YES DHCP   up                    up
<... output omitted ...>

PC2# ping 209.165.201.225
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.201.225, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 8/207/1004 ms
```

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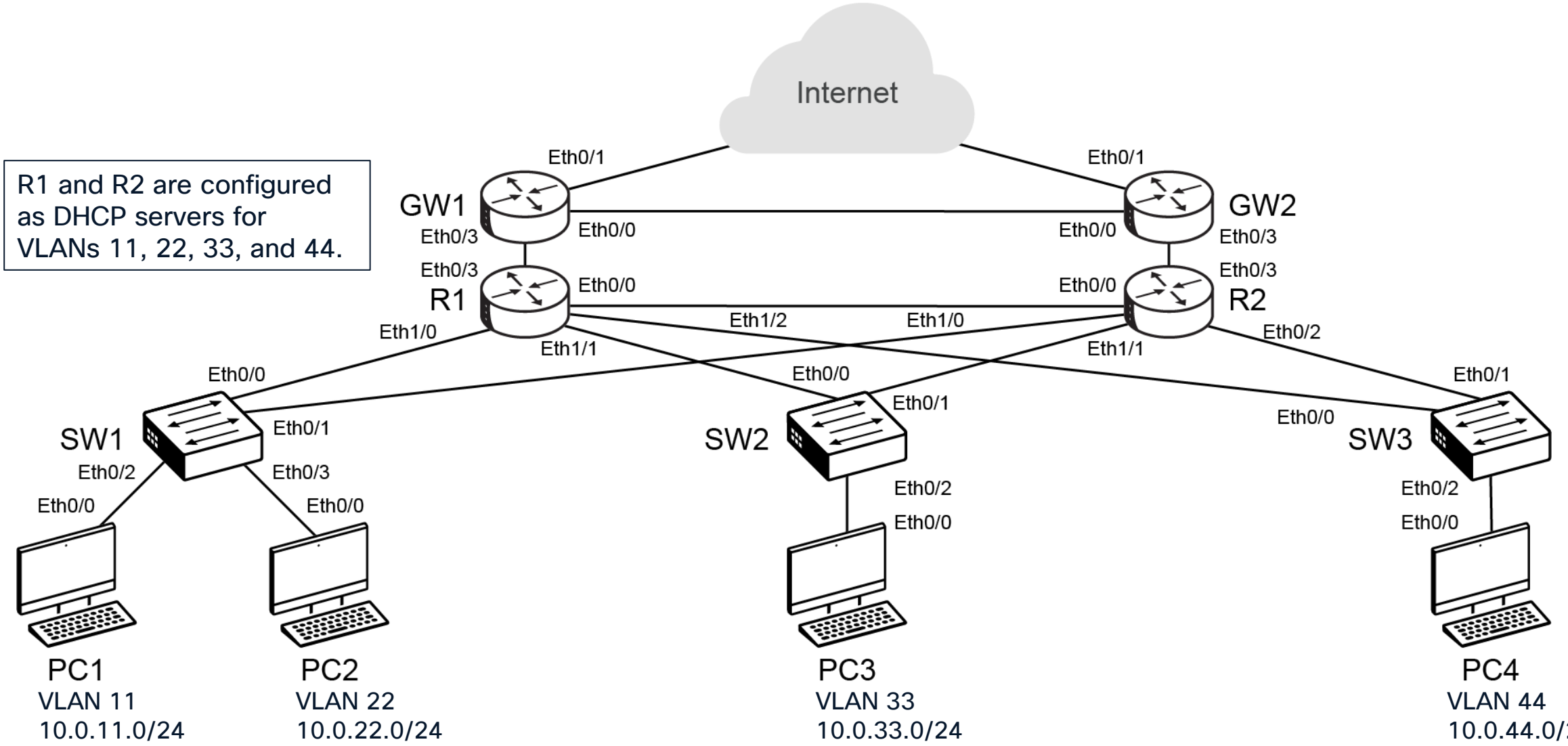
Troubleshooting Case Study: Topology 2

Network Topology

R1 and R2 are configured as DHCP servers for VLANs 11, 22, 33, and 44.



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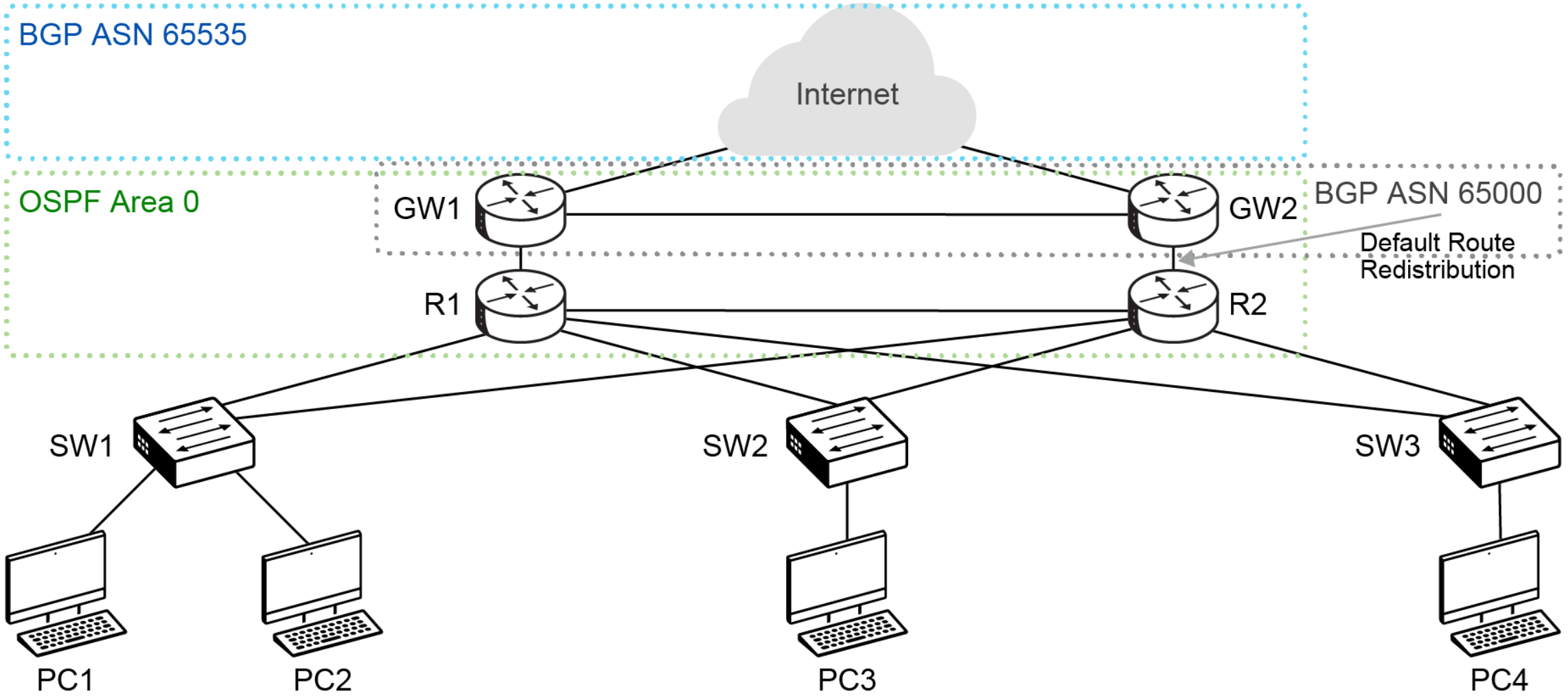
Network Topology (Cont.)



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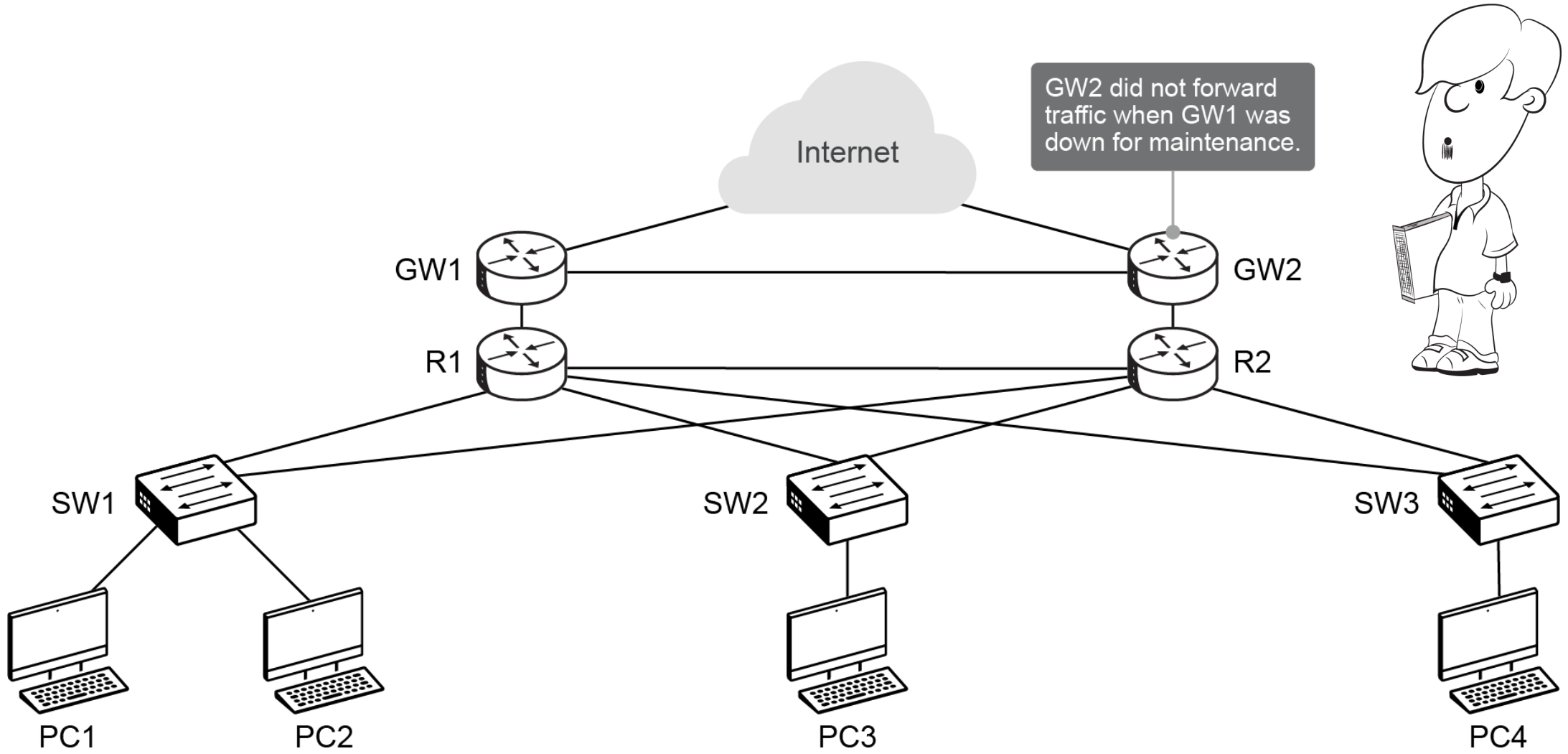
Ticket 6

GW2 Does Not Serve as the Backup to the Internet



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Verify the Problem

```
R1# show ip route
<... output omitted ...>
Gateway of last resort is 10.0.10.26 to network 0.0.0.0

O*E2  0.0.0.0/0 [110/1] via 10.0.10.26, 09:32:47, Ethernet0/3
      10.0.0.0/8 is variably subnetted, 14 subnets, 3 masks
<... output omitted ...>
```

Interface to GW1

```
R1# show ip ospf database
<... output omitted ...>
Type-5 AS External Link States

Link ID         ADV Router      Age         Seq#       Checksum Tag
0.0.0.0         209.165.200.1   420         0x80000012 0x000858 1
```

GW1

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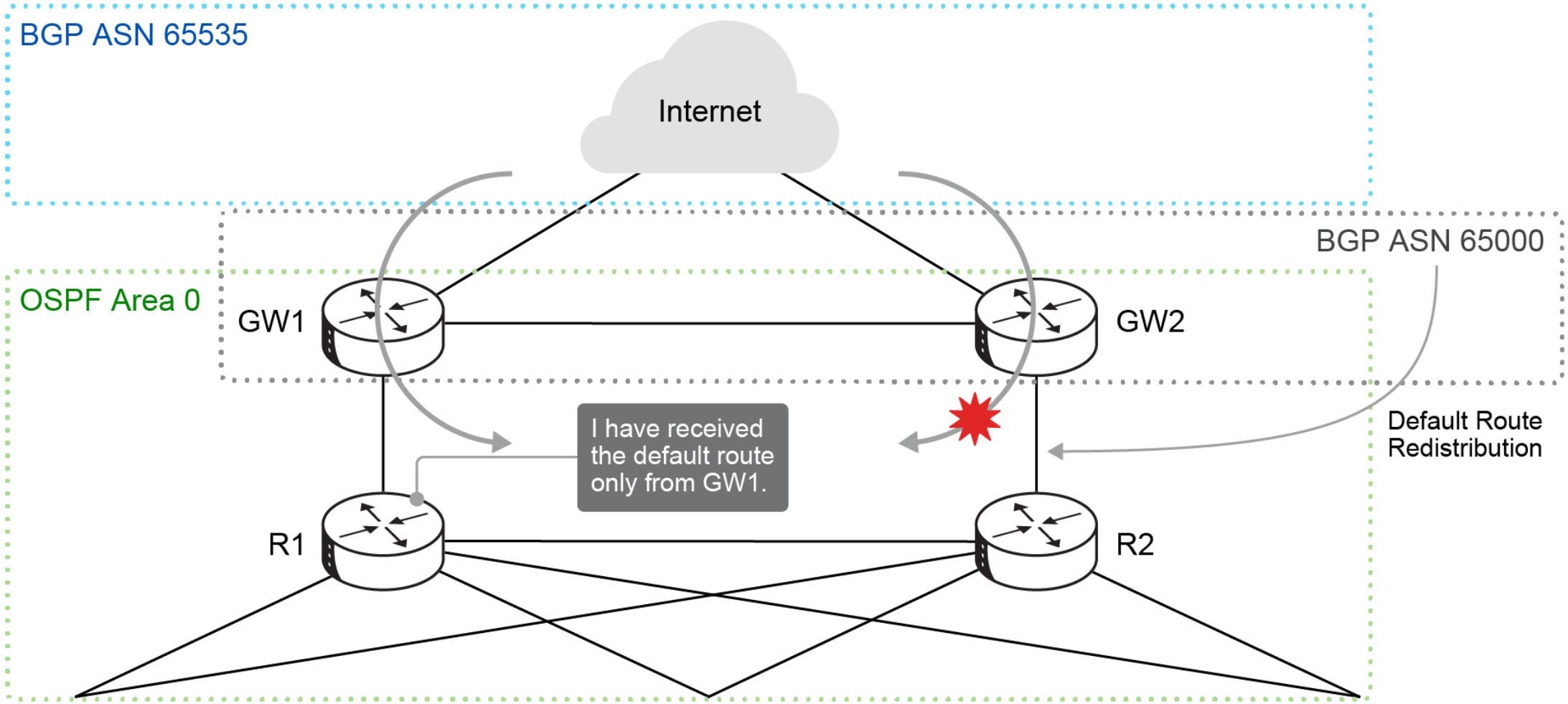
Analyzing the Information



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Troubleshooting Plan

Known facts:

- Routers R1 and R2 have only one default route in the OSPF database.
- Default routes should be redistributed from BGP to OSPF.

Plan:

- Identify the routing problem.
- Fix the problem and verify solution.

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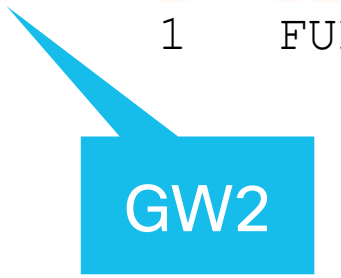
Information Gathering

```
R2# show ip ospf neighbor
Neighbor ID     Pri   State           Dead Time   Address         Interface
10.0.44.2         1   FULL/BDR        00:00:33    10.0.44.2       Ethernet1/2
10.0.44.2         1   FULL/BDR        00:00:35    10.0.33.2       Ethernet1/1
10.0.44.2         1   FULL/BDR        00:00:36    10.0.22.2       Ethernet1/0.22
10.0.44.2         1   FULL/BDR        00:00:31    10.0.11.2       Ethernet1/0.11
209.165.201.5     1   FULL/BDR        00:00:38    10.0.10.30      Ethernet0/3
10.0.44.2         1   FULL/BDR        00:00:37    10.0.10.21      Ethernet0/0
```



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Information Gathering (Cont.)

```
GW2>
*Nov 25 19:49:28.330: %BGP_SESSION-5-ADJCHANGE: neighbor 209.165.201.6 IPv4
Unicast topology base removed from session  BGP Notification sent
*Nov 25 19:49:38.201: %BGP-3-NOTIFICATION: sent to neighbor 209.165.201.6
passive 2/2 (peer in wrong AS) 2 bytes FFFF
*Nov 25 19:49:38.201: %BGP-4-MSGDUMP: unsupported or mal-formatted message
received from 209.165.201.6:
FFFF FFFF FFFF FFFF FFFF FFFF FFFF FFFF 0039 0104 FFFF 00B4 D1A5 C9E1 1C02 0601
0400 0100 0102 0280 0002 0202 0002 0246 0002 0641 0400 00FF FF
*Nov 25 19:49:38.620: %BGP-3-NOTIFICATION: sent to neighbor 209.165.201.6 active
2/2 (peer in wrong AS) 2 bytes FFFF
<... output omitted ...>
```

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Information Gathering (Cont.)

```
GW2# show ip bgp summary
<... output omitted ...>

Neighbor        V    AS  MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
10.0.10.33      4   65000    692     691        2    0    0  10:23:24        1
209.165.201.6   4   65335      2       2        1    0    0  00:00:02   Closing
```

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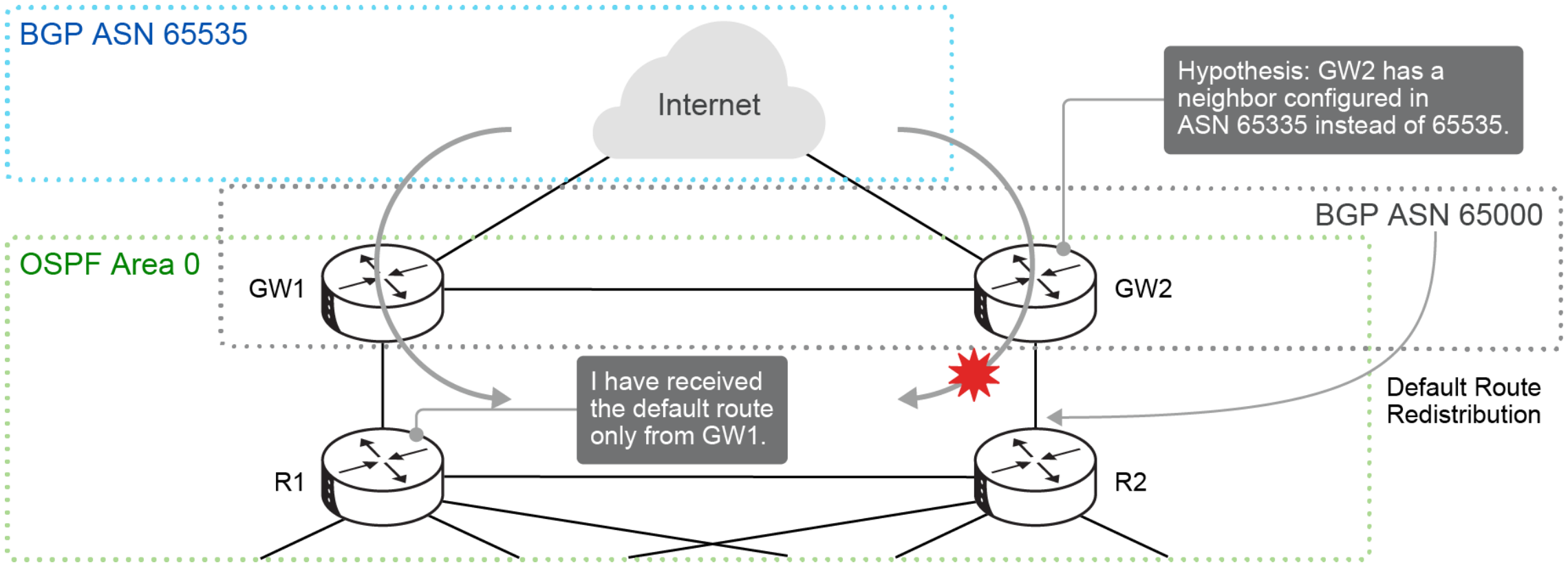
Proposing the Hypothesis



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Test Hypothesis and Implement Solution

```
GW2# show running-config | section bgp
router bgp 65000
 bgp log-neighbor-changes
 neighbor 10.0.10.33 remote-as 65000
 neighbor 10.0.10.33 next-hop-self
 neighbor 209.165.201.6 remote-as 65335


GW2(config)# router bgp 65000
GW2(config-router)# no neighbor 209.165.201.6 remote-as 65335
GW2(config-router)# neighbor 209.165.201.6 remote-as 65535
```

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Verify the Solution

```
GW2# show ip bgp summary
BGP router identifier 209.165.201.5, local AS number 65000
<... output omitted ...>
Neighbor        V    AS MsgRcvd MsgSent  TblVer  InQ OutQ Up/Down  State/PfxRcd
10.0.10.33      4  65000     757     755       3    0    0 11:21:40        1
209.165.201.6   4  65535       6       5       2    0    0 00:00:11        1
```

```
GW2# show ip route
<... output omitted ...>
B*    0.0.0.0/0 [20/0] via 209.165.201.6, 00:04:31
<... output omitted ...>
```

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Verify the Solution (Cont.)

```
R1# show ip ospf database
<... output omitted ...>
Type-5 AS External Link States
Link ID         ADV Router      Age         Seq#       Checksum Tag
0.0.0.0         209.165.200.1   1294        0x80000015 0x00025B 1
0.0.0.0         209.165.201.5   664         0x80000001 0x000B61 1
```

```
R2# show ip ospf database
<... output omitted ...>
Type-5 AS External Link States
Link ID         ADV Router      Age         Seq#       Checksum Tag
0.0.0.0         209.165.200.1   1401        0x80000015 0x00025B 1
0.0.0.0         209.165.201.5   770         0x80000001 0x000B61 1
```

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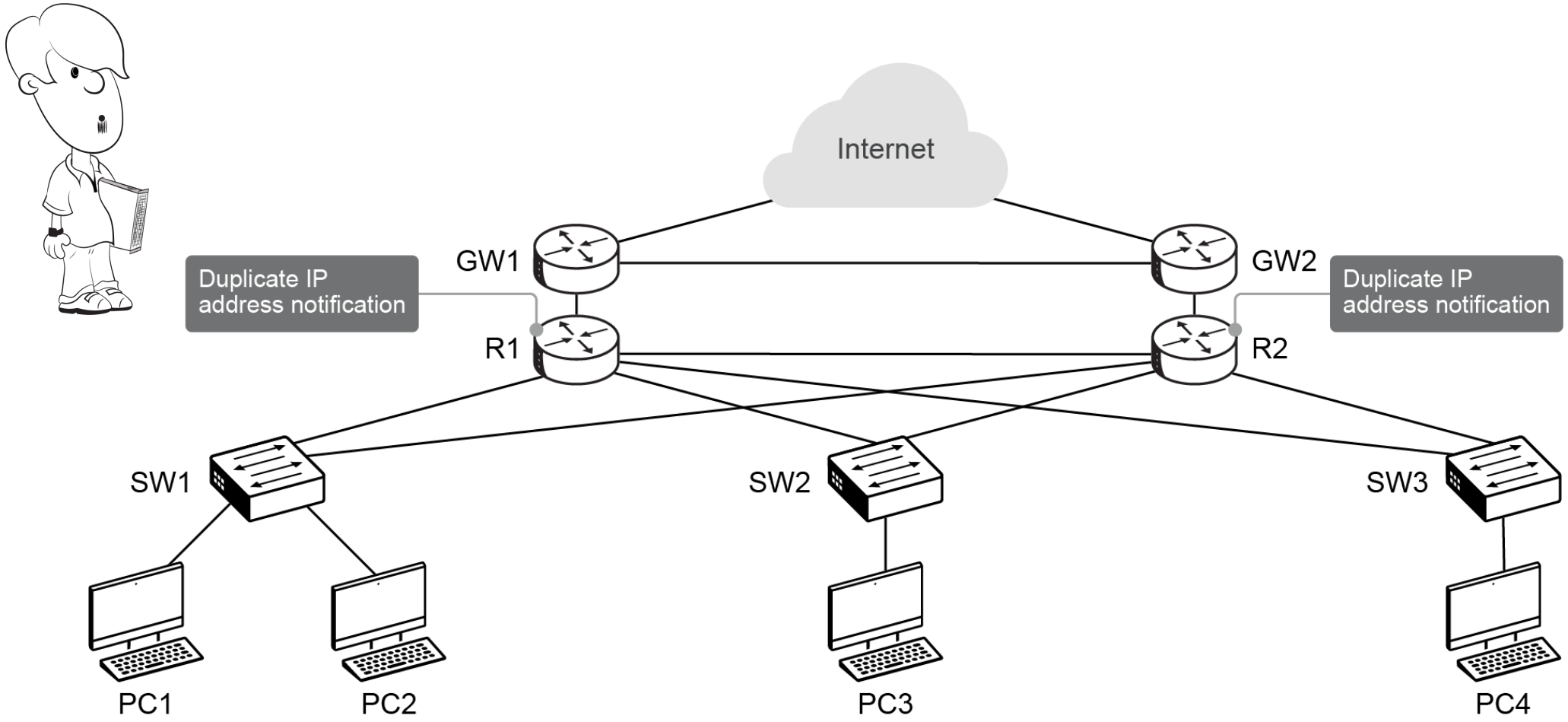
Ticket 7

Duplicate IP Addresses on Routers R1 and R2



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Which solution is required to fix the issue for Ticket 7?

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Verify the Problem

```
R1#
*Jan 15 21:53:06.934: %IP-4-DUPADDR: Duplicate address 10.0.33.1 on Ethernet1/1,
sourced by 0000.0c07.ac03


R2#
*Jan 15 21:53:35.932: %IP-4-DUPADDR: Duplicate address 10.0.33.1 on Ethernet1/1,
sourced by 0000.0c07.ac21
```

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Troubleshooting Plan

Known facts:

- The console messages indicate that there is a duplicate IP address problem in the network.
- The duplicate IP address is 10.0.33.1.
- Sources of the duplicate address are the devices with MAC addresses 0000.0c07.ac03 and 0000.0c07.ac21, which are HSRP format MAC addresses (0000.0c07.acXX).

Plan:

- Search for the duplicate address on R1 and R2.
- Remove the problematic IP address.
- Fix the problem and verify solution.

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Information Gathering

```
R1# show standby brief
<... output omitted ...>
Et1/1        33   110 P Active  local           unknown         10.0.33.1
Et1/2        44   110 P Active  local           10.0.44.3       10.0.44.1

R2# show standby brief
<... output omitted ...>
Et1/1         3   90  P Active  local           unknown         10.0.33.1
Et1/2        44   90  P Standby 10.0.44.2       local           10.0.44.1
```

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Information Gathering (Cont.)

```
R1# show running-config interface ethernet 1/1
interface Ethernet1/1
 ip address 10.0.33.2 255.255.255.0
 standby 33 ip 10.0.33.1
 standby 33 priority 110
 standby 33 preempt

R2# show running-config interface ethernet 1/1
interface Ethernet1/1
 ip address 10.0.33.3 255.255.255.0
 standby 3 ip 10.0.33.1
 standby 3 priority 90
 standby 3 preempt
end
```

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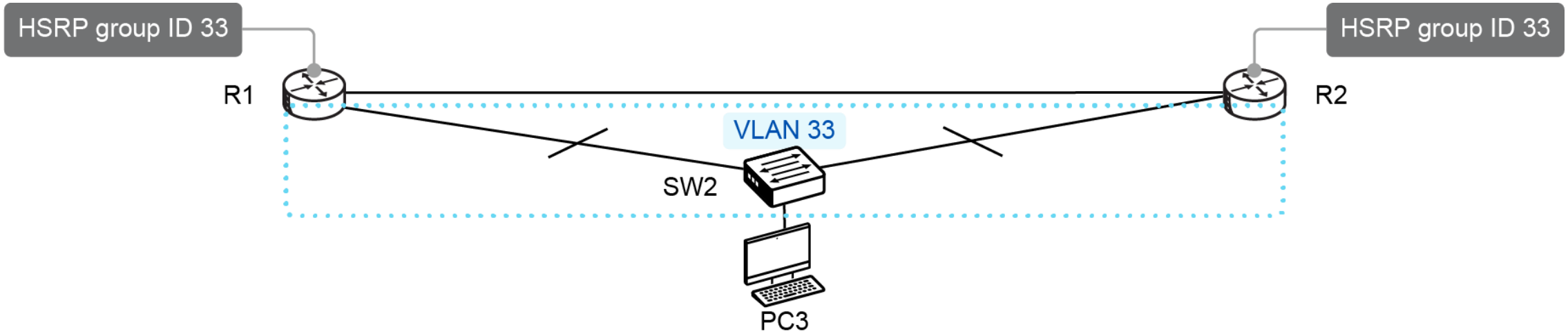
Analyze the Information



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Implement the Solution

```
R2(config)# interface ethernet 1/1
R2(config-if)# no standby 3 ip 10.0.33.1
*Jan 15 22:03:55.116: %HSRP-5-STATECHANGE: Ethernet1/1 Grp 3 state Active ->
Disabled
R2(config-if)# no standby 3 priority 90
R2(config-if)# no standby 3 preempt
R2(config-if)# standby 33 ip 10.0.33.1
R2(config-if)# standby 33 priority 90
R2(config-if)# standby 33 preempt
R2(config-if)#
*Jan 15 22:04:41.415: %HSRP-5-STATECHANGE: Ethernet1/1 Grp 33 state Speak ->
Standby
```

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Verification

```
R1# show standby e1/1
Ethernet1/1 - Group 33
  State is Active
    2 state changes, last state change 00:26:44
  Virtual IP address is 10.0.33.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 2.432 secs
  Preemption enabled
  Active router is local
  Standby router is 10.0.33.3, priority 90 (expires in 11.424 sec)
  Priority 110 (configured 110)
  Group name is "hsrp-Et1/1-33" (default)
```

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Verification (Cont.)

```
R2# show standby e1/1
Ethernet1/1 - Group 33
  State is Standby
    1 state change, last state change 00:00:22
  Virtual IP address is 10.0.33.1
  Active virtual MAC address is 0000.0c07.ac21
    Local virtual MAC address is 0000.0c07.ac21 (v1 default)
  Hello time 3 sec, hold time 10 sec
    Next hello sent in 1.424 secs
  Preemption enabled
  Active router is 10.0.33.2, priority 110 (expires in 8.704 sec)
  Standby router is local
  Priority 90 (configured 90)
  Group name is "hsrp-Et1/1-33" (default)
R2#
```

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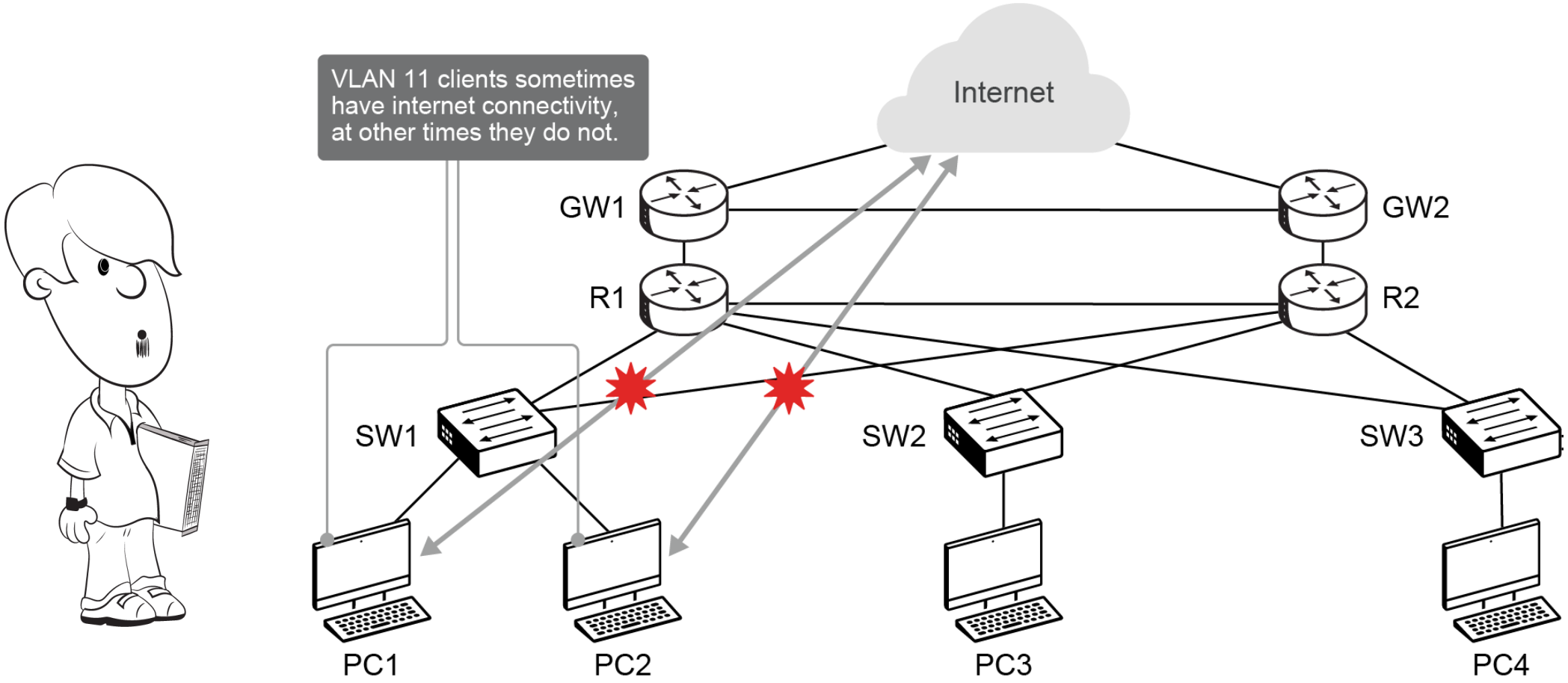
Ticket 8

Intermittent Connectivity for PCs 1 and 2



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Which solution is required to fix the issue for Ticket 8?

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Verifying the Problem

```
PC1# ping 209.165.201.225
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.201.225, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/202/1008 ms


PC2# ping 209.165.201.225
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.201.225, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/201/1005 ms
```

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Verifying the Problem (Cont.)

```
PC1# show ip route
Default gateway is 10.0.11.1
<... output omitted ...>
PC1# ping 10.0.11.1
<... output omitted ...>
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

```
PC2# show ip route
Default gateway is 10.0.11.1
<... output omitted ...>
PC2# ping 10.0.11.1
<... output omitted ...>
.....
Success rate is 0 percent (0/5)
```

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Verifying the Problem (Cont.)

```
PC1# show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.11.1               5  0007.b400.0101  ARPA   Ethernet0/0
Internet  10.0.11.13             -  aabb.cc00.1b00  ARPA   Ethernet0/0
```

```
PC2# show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.11.1               5  0007.b400.0102  ARPA   Ethernet0/0
Internet  10.0.11.129            -  aabb.cc00.1c00  ARPA   Ethernet0/0
```

GLBP MAC Address format: 0007.b400.XXYY
(where X is the GLBP group number and Y is the AVF number)

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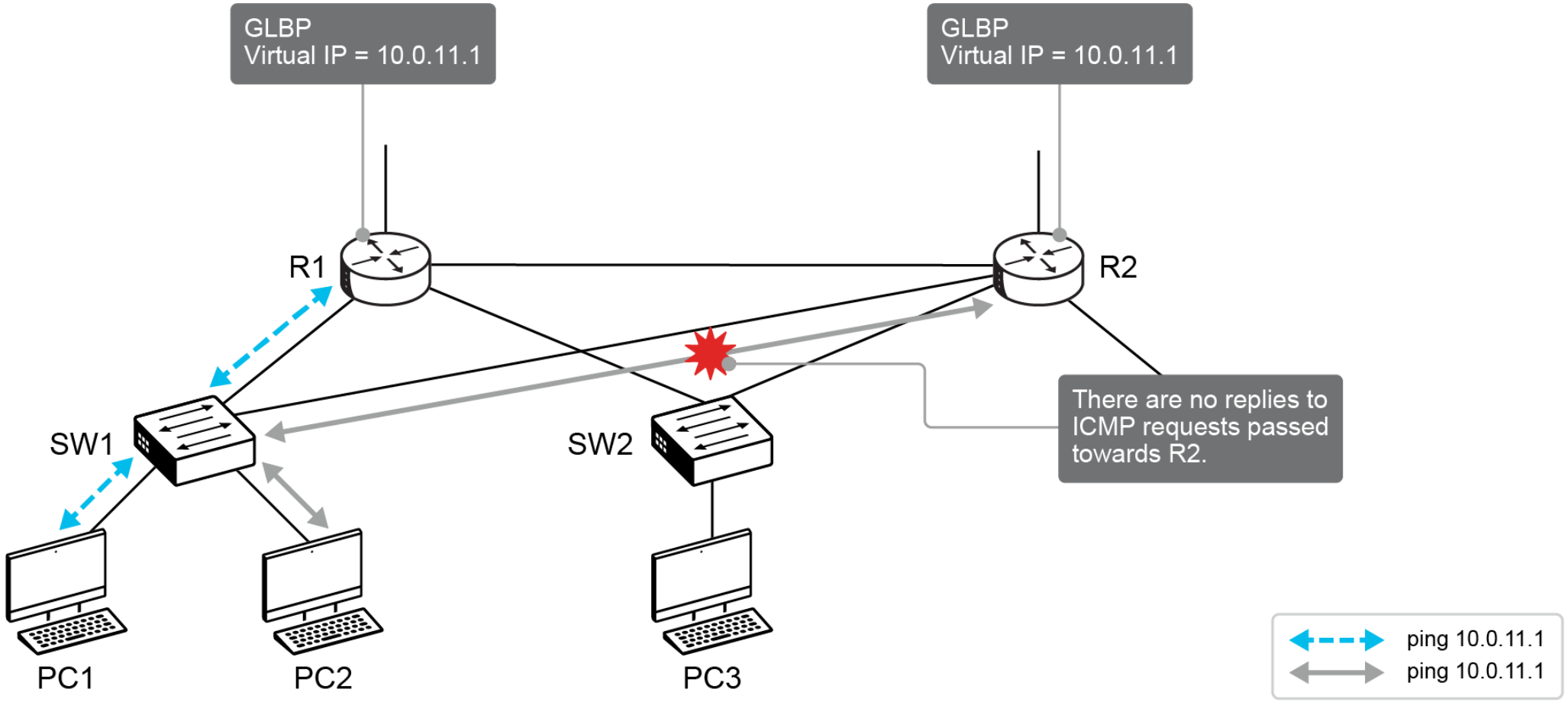
Verifying the Problem (Cont.)



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Verifying the Problem (Cont.)

```
R1(config)# internet ethernet 1/0.11
R1(config-subif)# shutdown

PC1# clear ip arp 10.0.11.1
PC1# ping 209.165.201.221
<... output omitted ...>
.....
Success rate is 0 percent (0/5)


PC1# show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.11.1              0   Incomplete      ARPA
Internet  10.0.11.13             -   aabb.cc01.c200  ARPA   Ethernet0/0
```

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Troubleshooting Plan

Known facts:

- Under normal network operation, VLAN 11 clients have internet connectivity.
- Problems were noticed only after GLBP was configured as the redundancy protocol.
- Simulation of the R1 failure recreates the problem.

Plan:

- Identify the problem. Start by verifying the GLBP protocol operational status.
- Fix the problem and verify solution.

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Information Gathering

```
R1# show glbp brief
Interface   Grp  Fwd Pri State  Address     Active router  Standby router
Et1/0.11    1    -   100 Active  10.0.11.1      local          10.0.11.3
Et1/0.11    1    1   -   Active  0007.b400.0101 local          -
Et1/0.11    1    2   -   Listen  0007.b400.0102 10.0.11.3      -
<... output omitted ...>
```

```
R2# show glbp brief
Interface   Grp  Fwd Pri State  Address      Active router  Standby router
Et1/0.11    1    -   90  Standby 10.0.11.11     10.0.11.2      local
Et1/0.11    1    1   -   Listen  0007.b400.0101 10.0.11.2      -
Et1/0.11    1    2   -   Active  0007.b400.0102 local          -
<... output omitted ...>
```

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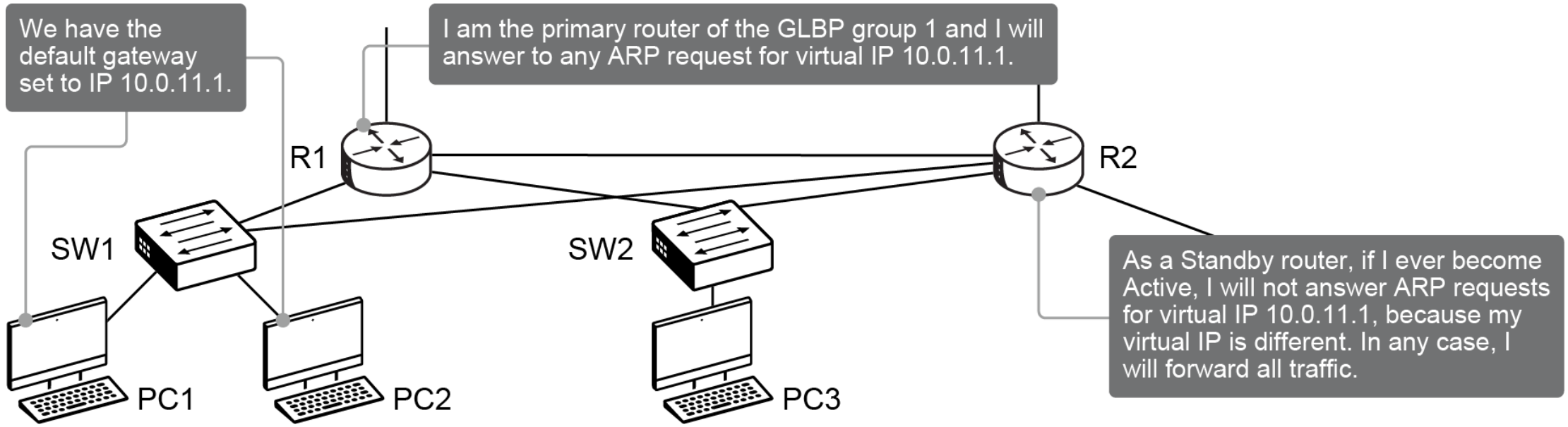
Analyzing the Information and Proposing a Hypothesis



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Testing the Hypothesis

```
R2(config-subif)# no glbp 1 ip 10.0.11.11
R2(config-subif)# do show glbp ethernet 1/0.11 | include IP address
 Virtual IP address is 10.0.11.1 (learnt)

R2(config-subif)# glbp 1 ip 10.0.11.1
R2(config-subif)# do show glbp ethernet 1/0.11 | include IP address
  Virtual IP address is 10.0.11.1
```

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Verifying the Solution

```
PC1# clear ip arp 10.0.11.1

PC1# show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.11.13             -   aabb.cc00.0100  ARPA   Ethernet0/0

PC1# ping 209.165.201.225
<... output omitted ...>
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/201/1002 ms


PC1# ping 10.0.11.1
<... output omitted ...>
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

PC1# show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.11.1               0   0007.b400.0101  ARPA   Ethernet0/0
Internet  10.0.11.13             -   aabb.cc00.0100  ARPA   Ethernet0/0
```

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Verifying the Solution (Cont.)

```
PC2# clear ip arp 10.0.11.1

PC2# show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.11.12             -   aabb.cc00.0200  ARPA   Ethernet0/0

PC2# ping 209.165.201.225
<... output omitted ...>
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/201/1002 ms


PC2# ping 10.0.11.1
<... output omitted ...>
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms

PC2# show arp
Protocol  Address          Age (min)  Hardware Addr   Type   Interface
Internet  10.0.11.1               0   0007.b400.0102  ARPA   Ethernet0/0
Internet  10.0.11.12             -   aabb.cc00.0200  ARPA   Ethernet0/0
```

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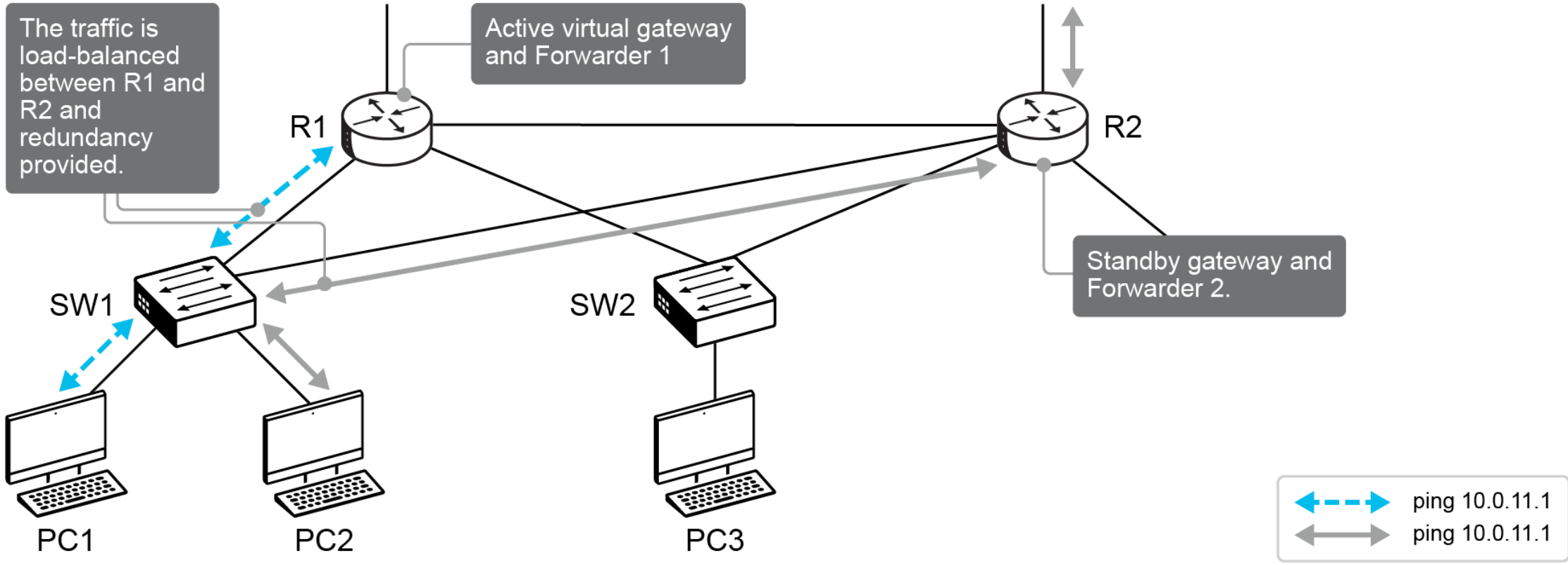
Verifying the Solution (Cont.)



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Verifying the Solution (Cont.)

```
R1# show glbp ethernet 1/0.11
Ethernet1/0.11 - Group 1
  State is Active
    <... output omitted ...>
  Standby is 10.0.11.3, priority 90 (expires in 8.864 sec)
<... output omitted ...>
  Forwarder 1
    State is Active
<... output omitted ...>
    Preemption enabled, min delay 30 sec
  Forwarder 2
    State is Listen
    MAC address is 0007.b400.0102 (learnt)
<... output omitted ...>
```

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Verifying the Solution (Cont.)

```
R2# show glbp ethernet 1/0.11
Ethernet1/0.11 - Group 1
  State is Standby
    <... output omitted ...>
  Active is 10.0.11.2, priority 100 (expires in 8.864 sec)
<... output omitted ...>
  Forwarder 1
    State is Listen
<... output omitted ...>

    MAC address is 0007.b400.0101 (learnt)

    Preemption enabled, min delay 30 sec
  Forwarder 2
    State is Active
<... output omitted ...>
```

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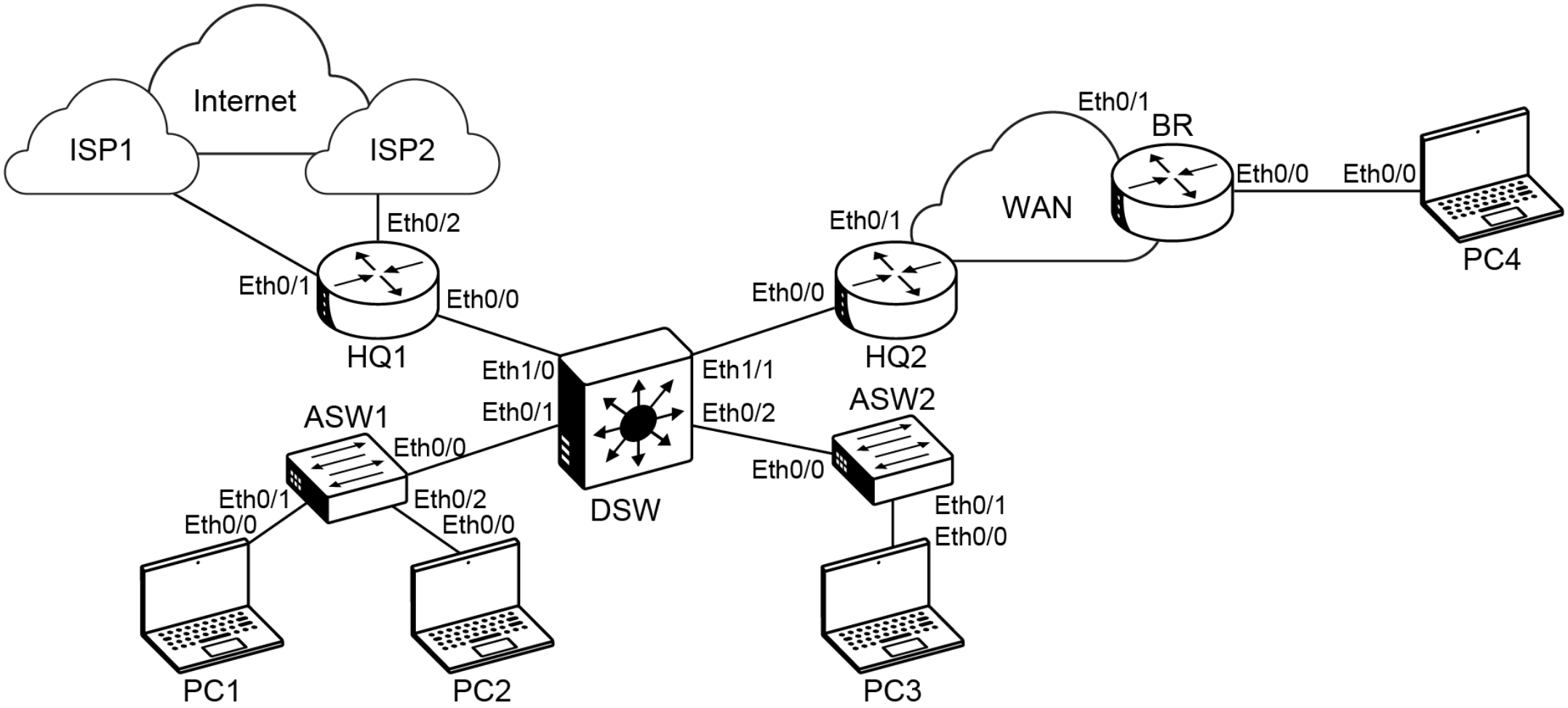
Troubleshooting Case Study: Topology 3

Network Topology



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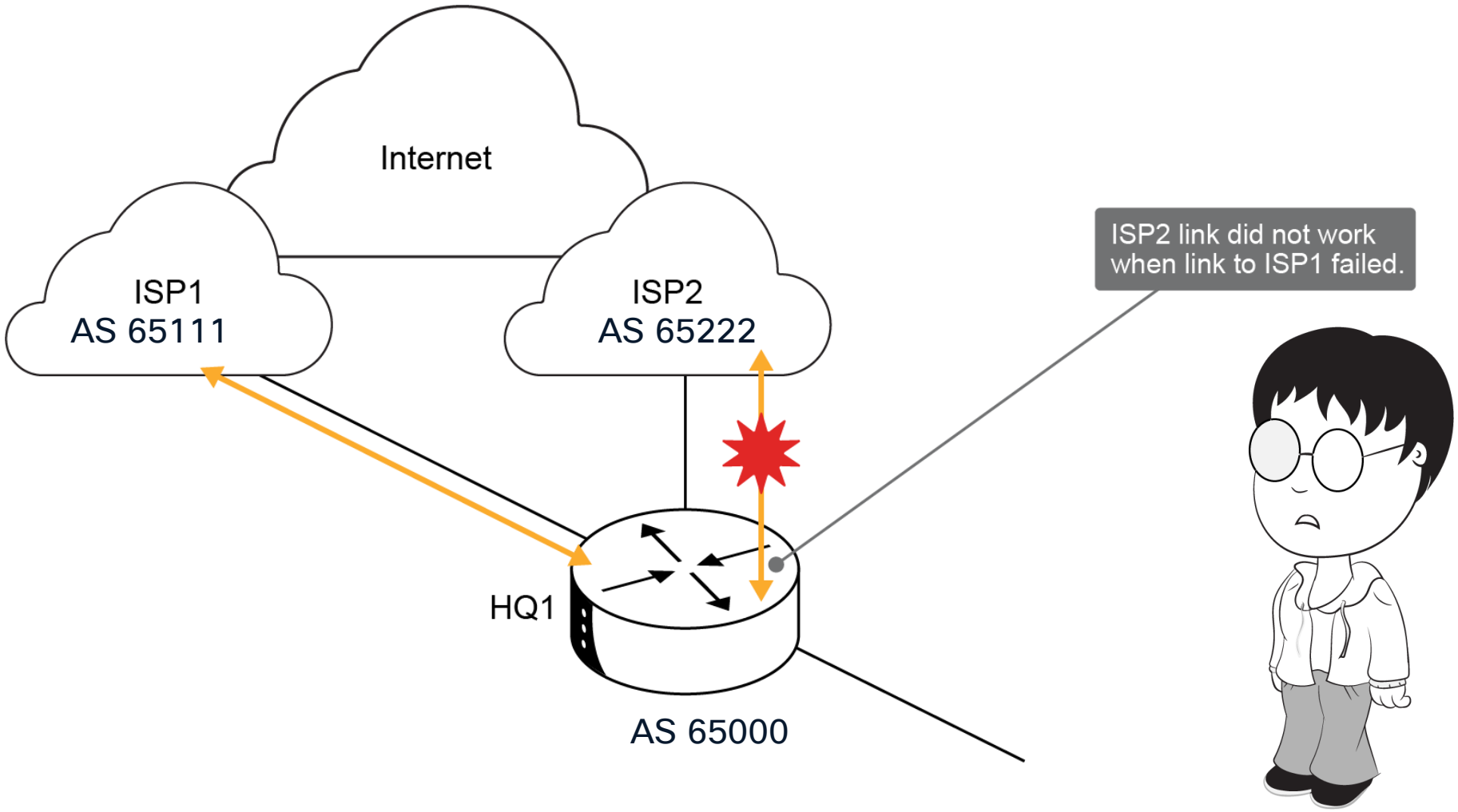
Ticket 9

ISP2 Not Serving as a Backup



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Which solution is required to fix the issue for Ticket 9

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Verifying the Problem

```
PC1> ping 209.165.200.129
<... output omitted ...>
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms

HQ1(config)# interface ethernet 0/1
HQ1(config-if)# shutdown


PC1> ping 209.165.200.129
<... output omitted ...>
Success rate is 0 percent (0/5)

HQ1(config)# interface ethernet 0/1
HQ1(config-if)# no shutdown
```

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Troubleshooting Plan

Known facts:

- Carrie did some testing this weekend and she noticed that if the link to ISP1 fails, the company is cut from the Internet.
- When ISP1 failed to provide an Internet connection, failover to the ISP2 was not successful.
- This condition is not acceptable because ISP2 should serve as a backup.

Troubleshooting plan:

- Start by checking the BGP neighbor relationship with ISP1 and ISP2.
- Fix the problem and verify solution.

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Information Gathering

```
HQ1# show ip protocols | section bgp
Routing Protocol is "bgp 65000"
<... output omitted ...>
Neighbor(s):
    Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
    209.165.200.5                           RouteOu
    209.165.201.5                           RouteOu
  Maximum path: 1
  Routing Information Sources:
    Gateway         Distance      Last Update
    209.165.200.5         20      06:53:08
  Distance: external 20 internal 200 local 200
```

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Information Gathering (Cont.)

```
HQ1# show ip bgp neighbors
BGP neighbor is 209.165.200.5,  remote AS 65111, external link
  BGP version 4, remote router ID 209.165.200.5
  BGP state = Established, up for 01:21:11
<... output omitted ...>
BGP neighbor is 209.165.201.5,  remote AS 65222, external link
  BGP version 4, remote router ID 0.0.0.0
  BGP state = Active
<... output omitted ...>
  No active TCP connection

HQ1# ping 209.165.201.5
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.201.5, timeout is 2 seconds:
.....
```

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Information Gathering (Cont.)

```
HQ1# show ip route 209.165.201.5
Routing entry for 209.165.201.4/30
  Known via "connected", distance 0, metric 0 (connected, via interface)
  Redistributing via eigrp 100
  Routing Descriptor Blocks:
  * directly connected, via Ethernet0/2
      Route metric is 0, traffic share count is 1
```

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Information Gathering and Proposing a Hypothesis

```
HQ1# show running-config
<... output omitted ...>
interface Ethernet0/1
 description ISP1
 ip address 209.165.200.6 255.255.255.252
 ip access-group 100 in
 ip nat outside
 ip inspect emigre out
 ip virtual-reassembly in
interface Ethernet0/2
 description ISP2
 ip address 209.165.201.6 255.255.255.252
 ip access-group 100 in
 ip nat outside
 ip inspect emigre out
<... output omitted ...>
```

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Testing the Hypothesis

```
HQ1# show access-lists 100
Extended IP access list 100
    10 permit tcp host 209.165.200.5 host 209.165.200.6 eq bgp (1090 matches)
    20 permit tcp host 209.165.200.5 eq bgp host 209.165.200.6
    30 permit tcp host 209.165.201.6 eq bgp host 209.165.201.5
    40 permit tcp host 209.165.201.6 host 209.165.201.5 eq bgp
```

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Implement the Solution

```
HQ1(config)# ip access-list extended 100
HQ1(config-ext-nacl)# no 30
HQ1(config-ext-nacl)# no 40
HQ1(config-ext-nacl)# permit tcp host 209.165.201.5 eq bgp host 209.165.201.6
HQ1(config-ext-nacl)# permit tcp host 209.165.201.5 host 209.165.201.6 eq bgp
*Feb 11 22:18:22.352: %BGP-5-ADJCHANGE: neighbor 209.165.201.5 Up
```

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Verifying the Solution

```
HQ1# show ip protocols | section bgp
Routing Protocol is "bgp 65000"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  IGP synchronization is disabled
  Automatic route summarization is disabled
  Neighbor(s):
    Address          FiltIn FiltOut DistIn DistOut Weight RouteMap
    209.165.200.5                             RouteOu
    209.165.201.5                             RouteOu
  Maximum path: 1
  Routing Information Sources:
    Gateway         Distance      Last Update
    209.165.201.5         20      00:02:28
    209.165.200.5         20      00:13:10
  Distance: external 20 internal 200 local 200
```

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Verifying the Solution (Cont.)

```
HQ1# show ip bgp summary
BGP router identifier 10.10.10.10, local AS number 65000
BGP table version is 10, main routing table version 10
9 network entries using 1332 bytes of memory
16 path entries using 1024 bytes of memory
15/9 BGP path/bestpath attribute entries using 2040 bytes of memory
14 BGP AS-PATH entries using 536 bytes of memory
0 BGP route-map cache entries using 0 bytes of memory
0 BGP filter-list cache entries using 0 bytes of memory
BGP using 4932 total bytes of memory
BGP activity 9/0 prefixes, 16/0 paths, scan interval 60 secs

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
209.165.200.5   4        65111      17       8       10    0    0 00:05:21        7
209.165.201.5   4        65222      14       5       10    0    0 00:00:45        8
```

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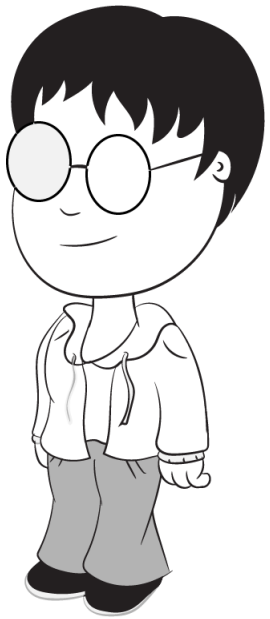
Verifying the Solution (Cont.)

```
HQ1(config)# interface ethernet 0/1
HQ1(config-if)# shutdown
```

```
PC1> ping 209.165.200.129
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.129, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/2 ms
```



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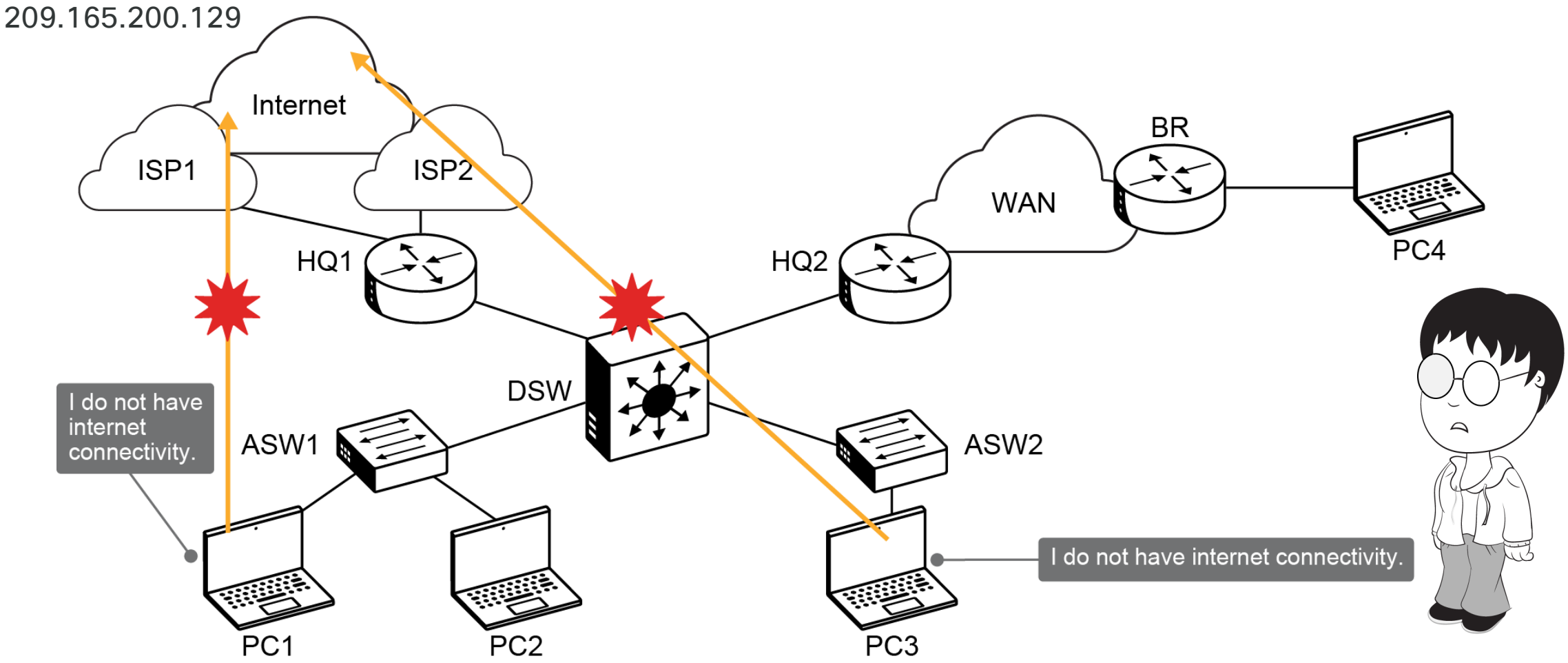
Ticket 10

No Internet Connectivity



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Which solution is required to fix the issue for Ticket 10?

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Verifying the Problem

```
PC1# ping 209.165.200.129
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.129, timeout is 2 seconds:
.....
Success rate is 0 percent (0/5)
```

```
HQ1# ping 209.165.200.129
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.129, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
HQ1#
```

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Troubleshooting Plan

Known facts:

- There is no connectivity to the Internet from PC1.
- You have connectivity to the Internet from the HQ1 router.

Plan:

- Find the problem using the "follow-the-path" approach
- Fix the problem and verify solution.

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Information Gathering

```
PC1# show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
Ethernet0/0            10.0.10.2       YES DHCP   up                    up
Ethernet0/1            unassigned      YES NVRAM  administratively down down
Ethernet0/2            unassigned      YES NVRAM  administratively down down
Ethernet0/3            unassigned      YES NVRAM  administratively down down

PC1# show ip route
Default gateway is 10.0.10.1

Host                  Gateway           Last Use    Total Uses  Interface
ICMP redirect cache is empty

PC1# ping 10.0.10.1
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.0.10.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/10 ms
```

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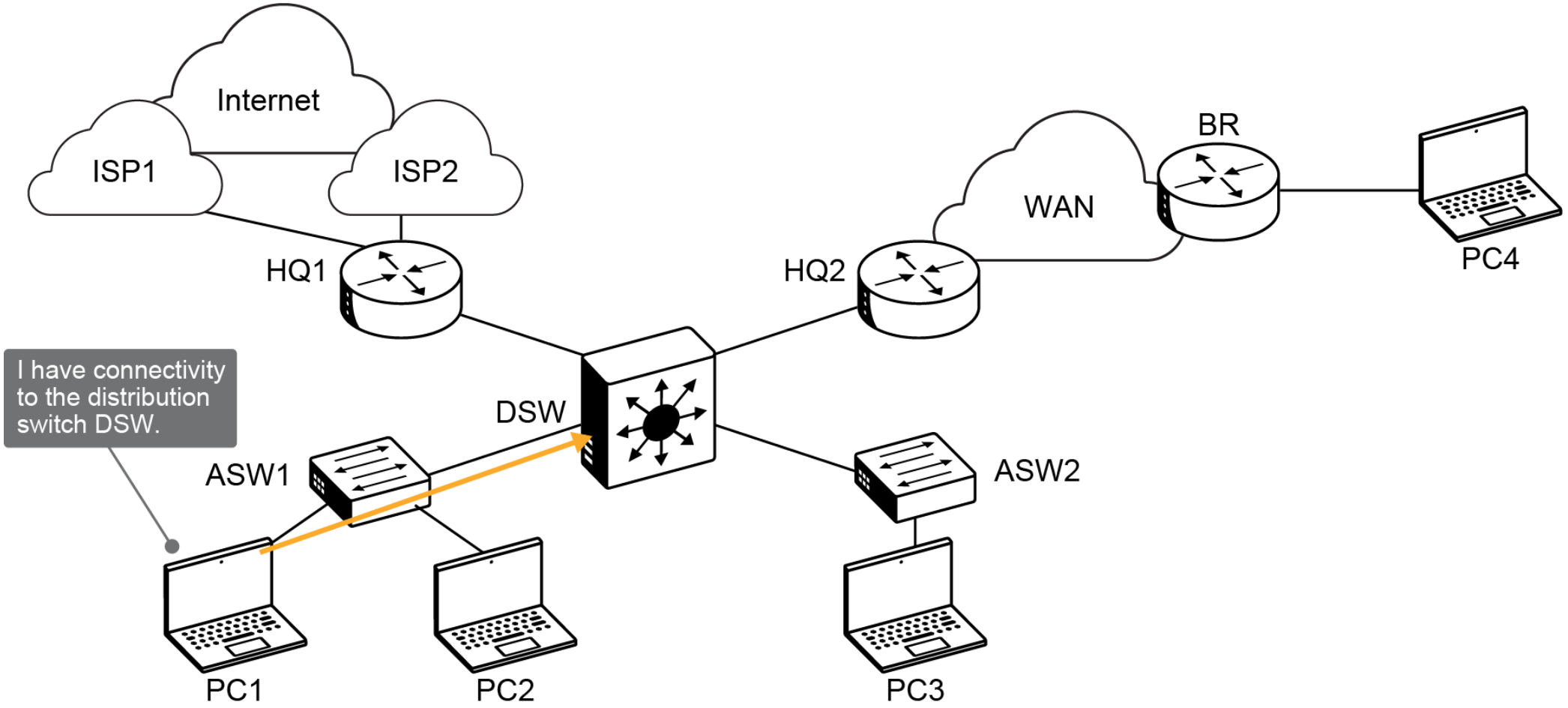
Information Gathering (Cont.)



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Information Gathering (Cont.)

```
DSW# ping 209.165.200.129
<... output omitted ...>
Success rate is 0 percent (0/5)


DSW# show ip route
<... output omitted ...>
Gateway of last resort is 10.1.0.7 to network 0.0.0.0

D*    0.0.0.0/0 [90/281600] via 10.1.0.7, 02:36:42, Ethernet1/0
<... Output omitted ...>
```

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Information Gathering (Cont.)

```
HQ1# show ip interface brief
Interface                  IP-Address      OK? Method Status
Protocol
Ethernet0/0                10.1.0.7        YES NVRAM  up                    up
Ethernet0/1                209.165.200.6   YES NVRAM  up                    up
Ethernet0/2                209.165.201.6   YES NVRAM  up                    up
<... output omitted ...>
```

```
PC1# ping 10.1.0.7
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 10.1.0.7, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

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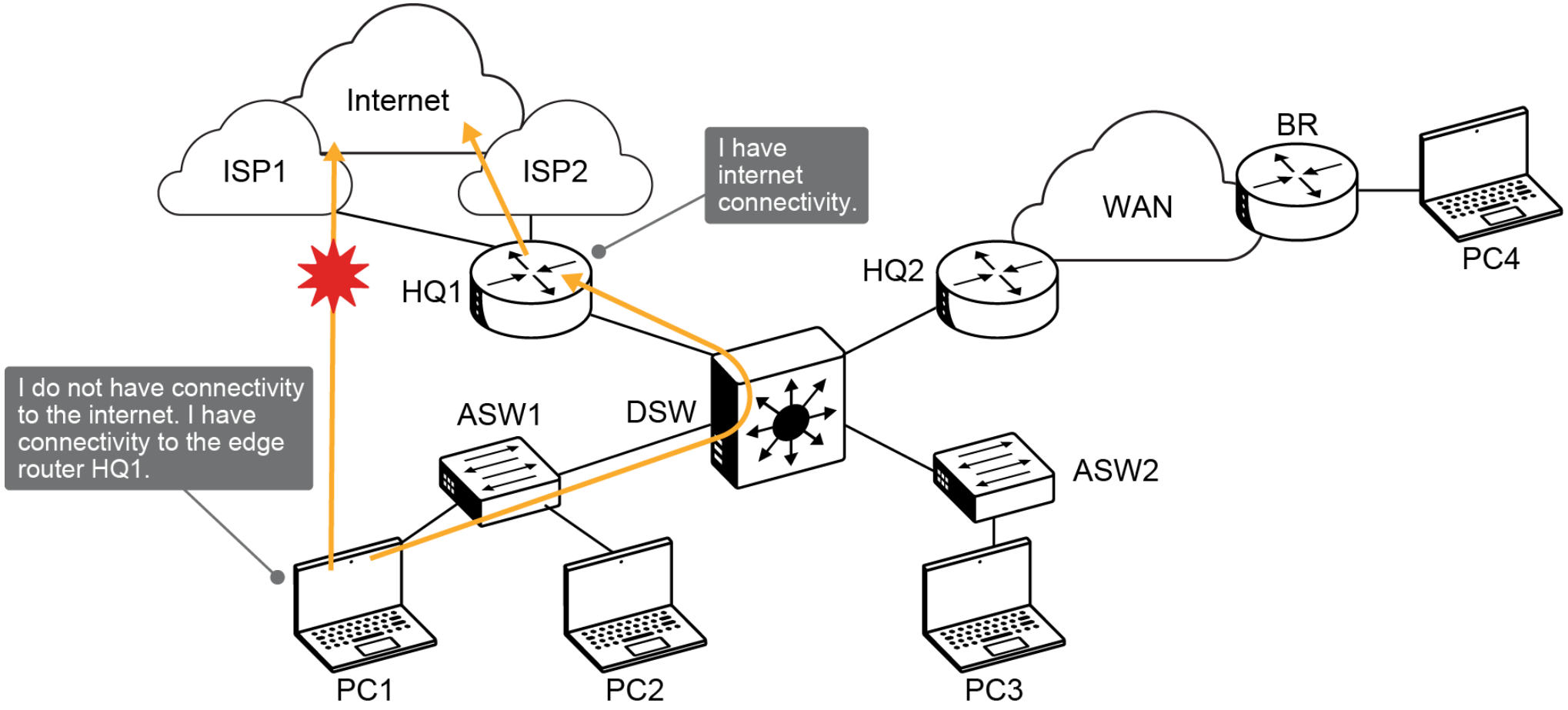
Analyzing the Information



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Information Gathering

```
HQ1# show ip route 209.165.200.129
Routing entry for 209.165.200.128/26
  Known via "bgp 65000", distance 20, metric 0
  Tag 65111, type external
  Last update from 209.165.200.5 02:37:31 ago
  Routing Descriptor Blocks:
  * 209.165.200.5, from 209.165.200.5, 02:37:31 ago
      Route metric is 0, traffic share count is 1
      AS Hops 6
      Route tag 65111
      MPLS label: none
```

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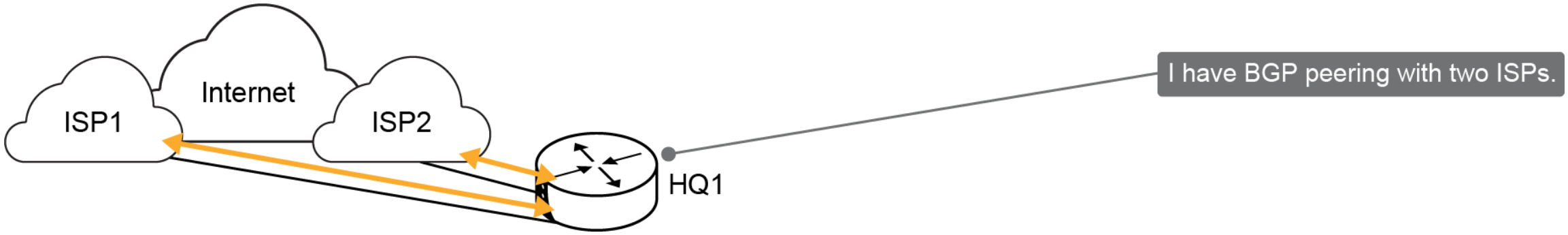
Information Gathering (Cont.)



Device	AS	IP Address	Neighbor	Next-Hop Address	Neighbor BGP AS
HQ1	65000	209.165.200.6	ISP1	209.165.200.5	65111
HQ2	65000	209.165.201.6	ISP2	209.165.201.5	65222

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Information Gathering (Cont.)

```
HQ1# show ip bgp summary
<... output omitted ...>

Neighbor        V           AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down
State/PfxRcd
209.165.200.5   4        65111     192     184       10    0    0 02:44:11
7
209.165.201.5   4        65222     190     183       10    0    0 02:44:08
7
```

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Information Gathering (Cont.)

```
HQ1# show ip bgp
<... Output omitted ...>

     Network             Next Hop            Metric LocPrf Weight Path
 r>  209.165.200.4/30    209.165.200.5            0             0 65111 i
 *>  209.165.200.128/26 209.165.200.5                          0 65111 65333 78 1012 48 126 i
 *                       209.165.201.5                          0 65222 65333 78 1012 48 126 i
 *>  209.165.200.192/27 209.165.200.5                          0 65111 65333 78 1012 31 i
 *                       209.165.201.5                          0 65222 65333 78 1012 31 i
 *>  209.165.200.248/29 0.0.0.0                  0         32768 i
<... Output omitted ...>
```

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Information Gathering (Cont.)

```
HQ1# show ip bgp 209.165.200.248/29
BGP routing table entry for 209.165.200.248/29, version 5
Paths: (1 available, best #1, table default)
  Not advertised to any peer
  Refresh Epoch 1
  Local
   0.0.0.0 from 0.0.0.0 (10.10.10.10)
   Origin IGP, metric 0, localpref 100, weight 32768, valid, sourced, local,
best


HQ1# show running-config | include 209.165.200.248
<... Output omitted ...>
ip nat pool NAT 209.165.200.248 209.165.200.249 netmask 255.255.255.248
ip route 209.165.200.248 255.255.255.248 Null0
<... Output omitted ...>
```

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Finding the Cause of the Problem and Analyzing Information

```
HQ1# show running-config | section bgp
router bgp 65000
 bgp router-id 10.10.10.10
 bgp log-neighbor-changes
 bgp redistribute-internal
 network 209.165.200.248 mask 255.255.255.248
 neighbor 209.165.200.5 remote-as 65111
 neighbor 209.165.200.5 distribute-list RouteOut out
 neighbor 209.165.201.5 remote-as 65222
 neighbor 209.165.201.5 distribute-list RouteOut out
```

```
HQ1# show ip access-lists RouteOut
Standard IP access list RouteOut
    10 deny   209.165.200.248, wildcard bits 0.0.0.7
```

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Testing the Hypothesis

```
HQ1(config)# ip access-list standard RouteOut
HQ1(config-std-nacl)# no 10
HQ1(config-std-nacl)# permit 209.165.200.248 0.0.0.7


HQ1# clear ip bgp *
HQ1#
Dec  2 11:42:05.854: %BGP-5-ADJCHANGE: neighbor 209.165.200.5 Down User reset
Dec  2 11:42:05.854: %BGP_SESSION-5-ADJCHANGE: neighbor 209.165.200.5 IPv4
Unicast topology base removed from session  User reset
Dec  2 11:42:05.868: %BGP-5-ADJCHANGE: neighbor 209.165.201.5 Down User reset
Dec  2 11:42:05.868: %BGP_SESSION-5-ADJCHANGE: neighbor 209.165.201.5 IPv4
Unicast topology base removed from session  User reset
Dec  2 11:42:06.751: %BGP-5-ADJCHANGE: neighbor 209.165.200.5 Up
Dec  2 11:42:06.753: %BGP-5-ADJCHANGE: neighbor 209.165.201.5 Up
```

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Testing the Hypothesis (Cont.)

```
HQ1# show ip bgp 209.165.200.248/29
BGP routing table entry for 209.165.200.248/29, version 5
Paths: (1 available, best #1, table default)
  Advertised to update-groups:
     2
  Refresh Epoch 1
  Local
    0.0.0.0 from 0.0.0.0 (10.10.10.10)
      Origin IGP, metric 0, localpref 100, weight 32768, valid, sourced, local,
best

HQ1# ping 209.165.200.129 source ethernet 0/0
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.129, timeout is 2 seconds:
Packet sent with a source address of 10.1.0.7
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
```

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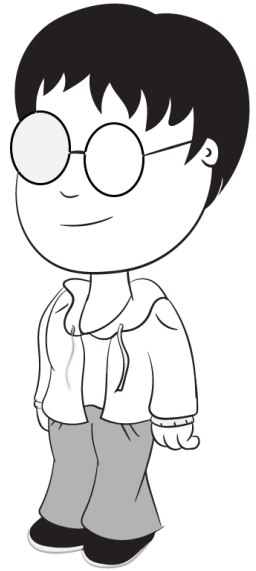
Verify the Solution

```
PC1# ping 209.165.200.129
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 209.165.200.129, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/1/1 ms
PC1#
```



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BGP Transit Area

```
R1# show running-config | section as-path|bgp
ip as-path access-list 1 ^$

router bgp 1
 neighbor 209.165.201.111 filter-list 1 out
 neighbor 209.165.200.222 filter-list 1 out
```

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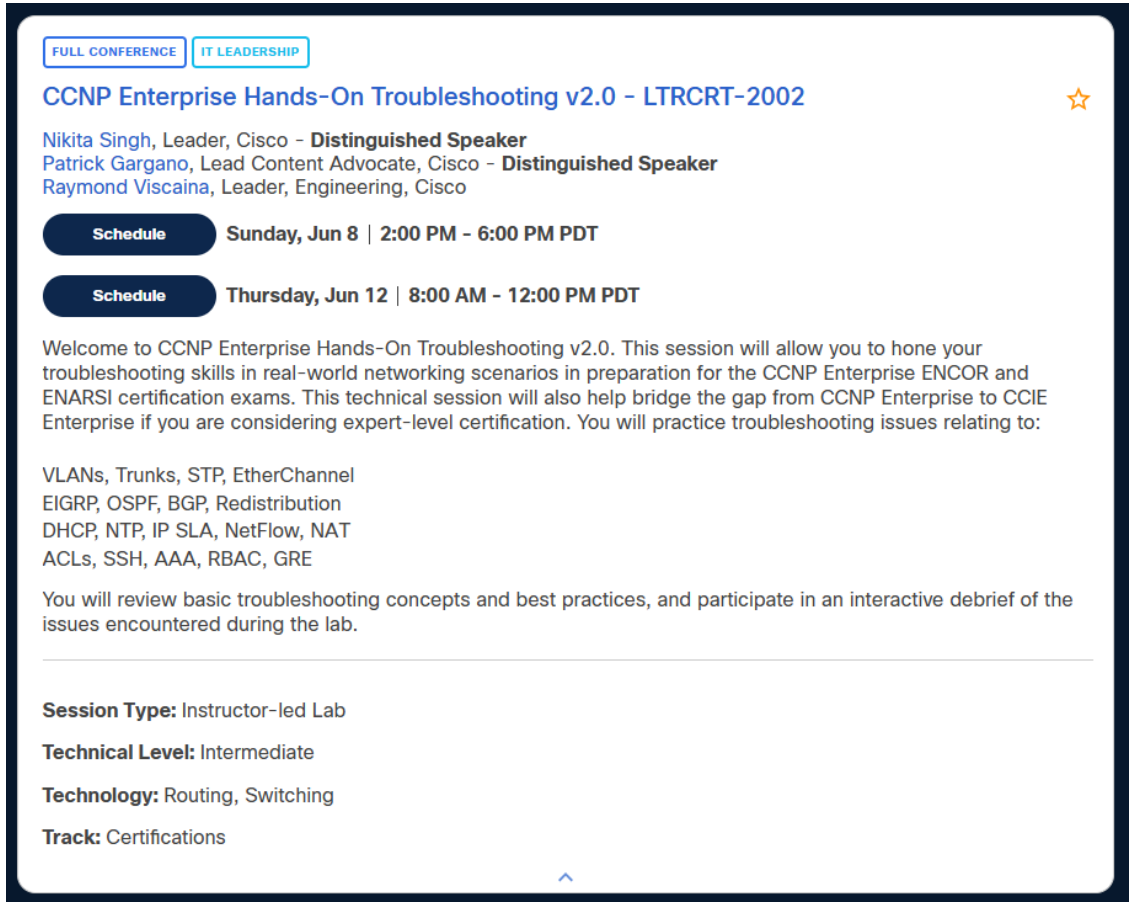

Walk-in Labs

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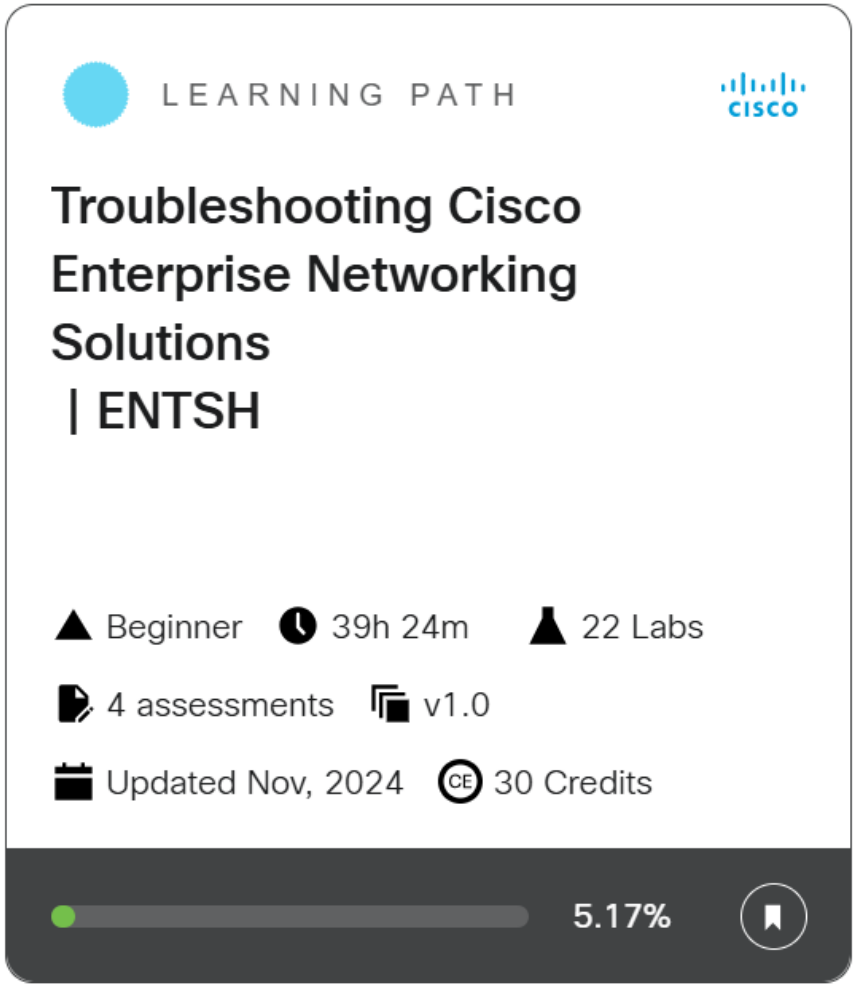

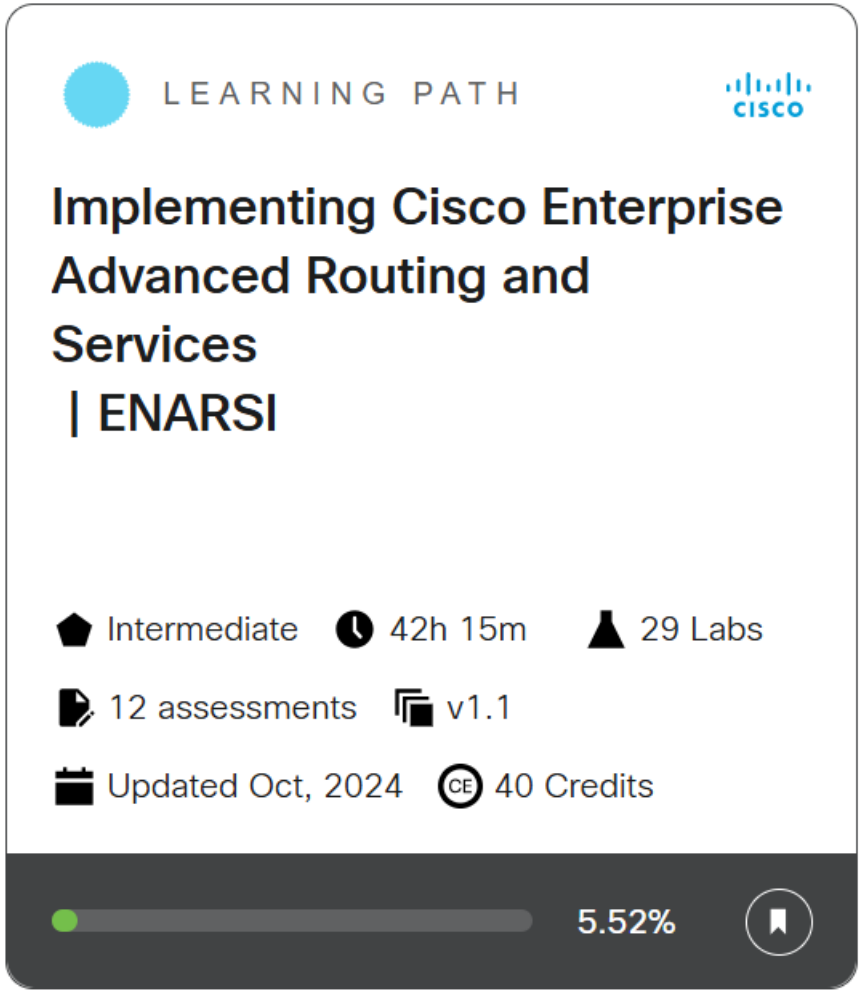

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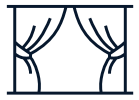

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