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CCNA-Level Troubleshooting

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Introduction

When it comes to troubleshooting, there are a few common CCNA-level commands that you should be familiar with. To help tackle the problem in order, I like to keep the OSI layer in mind:

1. Confirm that layer 1 is okay before you start troubleshooting layer 2 problems
2. Make sure layer 2 is up before you start troubleshooting layer 3 problems
3. Check that the layer 3 addresses are set up correctly
4. Then start looking at routing protocols like RIP, OSPF, and EIGRP

First, let's look at our layer 1 and layer 2 status. My favorite command is **show ipint brief**. This command shows me layer 1 and layer 2 status, plus I can see the layer 3 address that has been keyed in.

If layer 1 is down, I would look into the cabling. Make sure your cables are properly seated, and that you are using the correct type (straight cable versus crossover).

If Layer 2 is down, then the common thing to look into would be the encapsulation type on your serial interfaces.

- Are you running the default Cisco Serial encapsulation HDLC? If so, is that the same thing that the other side is using? There could be a mismatch: maybe you have HDLC on one end and PPP or Frame-Relay on the other side.
- Or, it is possible that both sides are running PPP or Frame-Relay, but the parameters for that encapsulation are mismatched. The example would be authentication in PPP. (Type of authentication to be PAP or CHAP, and the password might be mismatch. Remember that passwords are case sensitive).
- Another example could be the **lmi-type,** if you are using Frame-Relay. For a very long time, the LMI auto sensing has worked for me. These days, if LMI has been manually keyed in for the interface I am using, I like to remove the LMI type and let the system auto-sense it.

Once you confirm the IP address on the interface, you might still not be out of the woods because your subnet mask might be an issue. You can use the Show ipint command to see the subnet mask keyed in. Since this is too much output to look at (unless you know to look just at the top of the output for the IP address and subnet mask), you can use the include parameter to only pull the line containing the IP address and subnet mask information. Take a look at this example.

```
Router>show ipint | inc Internet address
  Internet address is 1.1.1.1/24
Router>
```

OSPF

Once you have verified your IP addressing and the subnet mask values, its time to look at the routing protocols in use. Let's start with the scalable standards based IP routing protocol OSPF.

Before OSPF peering (neighbor) relationship can be established, certain parameters have to match. For example the hello-interval must match, the dead-interval must match (default dead interval in OSPF is four times the hello interval), authentication type (Type 0 – No Authentication, Type 1 – Clear Text, Type 2 – MD5), and the stub bit has to match too. Wow, that's a lot. The command **Show run | sec ospf** can be used to see many of these parameters we have been talking about.

```
Router#show run | sec ospf
ipospf hello-interval 1
ipospf dead-interval 3
routerospf 1
log-adjacency-changes
area 1 stub
area 1 range 2.0.0.0 255.0.0.0
summary-address 1.0.0.0 255.0.0.0
network 1.1.1.1 0.0.0.0 area 0
network 2.2.2.2 0.0.0.0 area 1
Router#
```

There are many other common commands that I like to explore when I am working with OSPF. I would recommend that you get more comfortable with these commands.

- **Show ipospf** - Shows you common things like the areas involved, number of interfaces in the areas, if authentication is being used, if stub is being used, and many other useful things
- **Show ipospfint** - Perfect command to focus on the interfaces configured with the network command. This is where I usually see that my network command has the wrong wildcard mask since the interface is not showing up. I would follow up with show ipint brief to see if the IP addresses on the interfaces are what I think they should be.
- **Show ipospfnei** – Great command, simple and to the point. Maybe there is no problem and you are seeing all neighbors.
- **Show ipospf database** – Different types of LSAs (great for CCNP level troubleshooting)
- **Show ip route ospf** – Shows OSPF routes only; shows me Intra Area Routes (O), Inter Area Routes (O IA), and External Routes (O E1 or O E2)

- **Show ipprot** - Shows the Administrative distance for the protocol, network statements with area number; whether this is a normal area or Stubby Area (or NSSA – Not So Stubby Area – CCNP topic) and other useful information.

EIGRP

The other scalable Cisco proprietary routing protocol out there is EIGRP. Before EIGRP peering (neighbor) relationship could be established certain parameters have to match. EIGRP AS number must match, EIGRP K-values that are in use must match (keep the default of K1=K3=1; K2=K4=K5=0), EIGRP authentication type (MD5), authentication key (password) and L3 network/subnetwork must also match. The commands that will help me see these parameters so I can troubleshoot these issues are:

- **Show ipprot** - Shows the k-values in use, Autonomous System Number, Administrative distance, redistribution settings, network numbers, and numerous other important components.
- **Show ipeigrpnei** - Shows who your neighbors are. Not seeing any neighbors is a bad thing. It tells you that either the other side is not configured yet or one of the parameters we talked about is a mismatch (may be as simple as the network statements).
- **Show run | sec eigrp** - Great command to see just what is configured in the EIGRP section (under router configuration mode) and other things like the EIGRP summary commands
- **Show ipeigrp top** - Shows you the topology table. Make sure the routes are Passive (shown by P on the left side of the output, A means Active and is not a good indication).
- **Show ip route eigrp** - This will show you the EIGRP learned routes. The legend of D indicates EIGRP routes. If it just shows D, it means Internal EIGRP routes (they have the administrative distance of 90). If it shows D EX,m it means External EIGRP routes (they have the administrative distance of 170). External routes indicate that they are redistributed routes into EIGRP from somewhere else.

RIP

The last routing protocol for CCNA-level troubleshooting is RIP. Again, as with the other protocols, be sure that your network statements are correct. Remember, unlike the other two protocols discussed earlier (OSPF and EIGRP), RIP currently doesn't support the use of wildcard masks. RIPv2 is a classless routing protocol, but for both versions of RIP you have to put in the classful network statements. If you enter the network command N**etwork 172.16.1.0** and then do the **Show run** command to verify your work, you will see that the system has turned your network entry into classful entry **Network 172.16.0.0**. All we mean by "RIPv2 is a classless routing protocol" is that it will send the prefix (subnet mask) information in its updates.

Common RIP-related commands to see and troubleshoot RIP issues/configuration are listed here.

- **Show run | sec rip ->** shows you if you have the "version 2" command to make it RIPv2 or not; of not, it's RIPv1 by default. It also shows you your network commands.
- **Show ipprot ->** shows you the network commands that are there for RIP (remember, classful network commands), passive-interface configuration on certain interfaces, Administrative distance value, and many other useful items beyond the scope of this white paper)
- **Show ip route rip ->** Shows you the RIP routes that have been learned and are in use on this router

All of these protocols can be configured to **not** send any information on specific interface/s using the passive-interface command. In EIGRP/OSPF, it will not allow you to form peering and, therefore, will not send/receive information. In RIP, it will stop you from sending but will still receive – unless both sides are set to do passive-interface.

Remember that in all routing protocols, like RIP, EIGRP, or OSPF, you might have all the required parameters correct, but if you have made a typo in the network command, it could break everything. We want to put in the networks that we are attached to. In OSPF and EIGRP, you can use the wildcard mask to hone in on specific addresses in the network section to run these protocols. We could easily make a mistake in the wildcard mask. I have seen people confuse the wildcard mask with subnet mask and get them incorrect.

There could be other OSPF/EIGRP related problems or affecting OSPF/EIGRP that are beyond the scope of the CCNA level of troubleshooting , such as MTU issues, or secondary addresses on the interfaces, or split-horizon issues that could bring some excitement in our troubleshooting life.

Switches

So far we have been talking about routing protocols, but even though the switching related to CCNA is very straight-forward (only dealing with Layer 2 switches like 2950 or 2960), it can sometimes cause problems

First, many students know that you don't have to create a VLAN before you assign the port to the VLAN. But, if you are new to this, here is a little review. You can create a VLAN by going to the global configuration mode and creating the VLAN using the **vlan** command. For example, if I wanted to create VLAN 4 and assign port fa 0/2 to it:

```
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 4
Switch(config-vlan)#exit
Switch(config)#intfa 0/2
Switch(config-if)#switchport mode access
Switch(config-if)#switchport access vlan 4
Switch(config-if)#end
Switch#
```

To verify that what we wanted to happen, really **did** happen, we use the command **Show vlan**.

Switch#show vlan

```
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------
1    default                           active    Fa0/1, Fa0/3, Fa0/4, Fa0/5
                                                 Fa0/6, Fa0/7, Fa0/8, Fa0/9
```

```
                                    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                    Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                    Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                    Fa0/22, Fa0/23, Fa0/24, Gig1/1
                                            Gig1/2
4    VLAN0004             active    Fa0/2
<output omitted>
```

As you can see, port **fa 0/2** is in VLAN 4. But you can skip the first step of creating a VLAN by just assigning the port to the VLAN. If the VLAN doesn't exist, the system will create it for you and then assign the port to it. Let's see what happens when I assign a port in VLAN 3 (which doesn't exist on this switch).

```
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#intfa 0/2
Switch(config-if)#switchport access vlan 3
% Access VLAN does not exist. Creating vlan 3
Switch(config-if)#end
Switch#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------
1    default                active       Fa0/1, Fa0/3, Fa0/4, Fa0/5
                                         Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                    Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                    Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                    Fa0/22, Fa0/23, Fa0/24, Gig1/1
                                            Gig1/2
3    VLAN0003                  active  Fa0/2
4    VLAN0004                  active
<output omitted>
```

As you can see, the system created the VLAN for you and assigned the port fa 0/2 in VLAN 3. Now, guess what would happen if you delete VLAN 3 without removing the port from the VLAN. Would it go back to the default VLAN 1?

```
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#no vlan 3
Switch(config)#end
```

```
Switch#
%SYS-5-CONFIG_I: Configured from console by console
Switch#show vlan
VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------
1    default                           active    Fa0/1, Fa0/3, Fa0/4, Fa0/5
                                                 Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                 Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                 Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                 Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                 Fa0/22, Fa0/23, Fa0/24, Gig1/1
                                                                 Gig1/2
4    VLAN0004                          active
<output omitted>
```

As you can see, that VLAN 3 is gone, but port fa 0/2 is NOT in VLAN 1. So, where is it if it's not even showing up in this list?

```
Switch#showintfa 0/2 switchport
Name: Fa0/2
Switchport: Enabled
Administrative Mode: static access
Operational Mode: down
Administrative Trunking Encapsulation: dot1q
Operational Trunking Encapsulation: native
Negotiation of Trunking: Off
Access Mode VLAN: 3 (Inactive)
<output omitted>
```

Now, we can see that the port is still in VLAN 3, which doesn't exist. It's an orphan port not belonging to any specific VLAN. So, remember to reassign the port to a different VLAN if you intend to delete the VLAN the port is in.

Summary

As you can see that there are many things that could go wrong, making it very exciting to play the game of troubleshooting routing protocols and VLANs.

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About the Author

Dheeraj (Raj) Tolani has been working with Global Knowledge as a contract instructor teaching various networking courses including CCNP track. He has been in the industry for over 18 years working with various technologies, including Cisco, Banyan Vines, Microsoft, and Novell. Dheeraj has worked as a consultant for various medical, financial, legal, government, and publishing companies. He runs a consulting company based in NYC providing IP integration solutions (www.rajtolani.com).