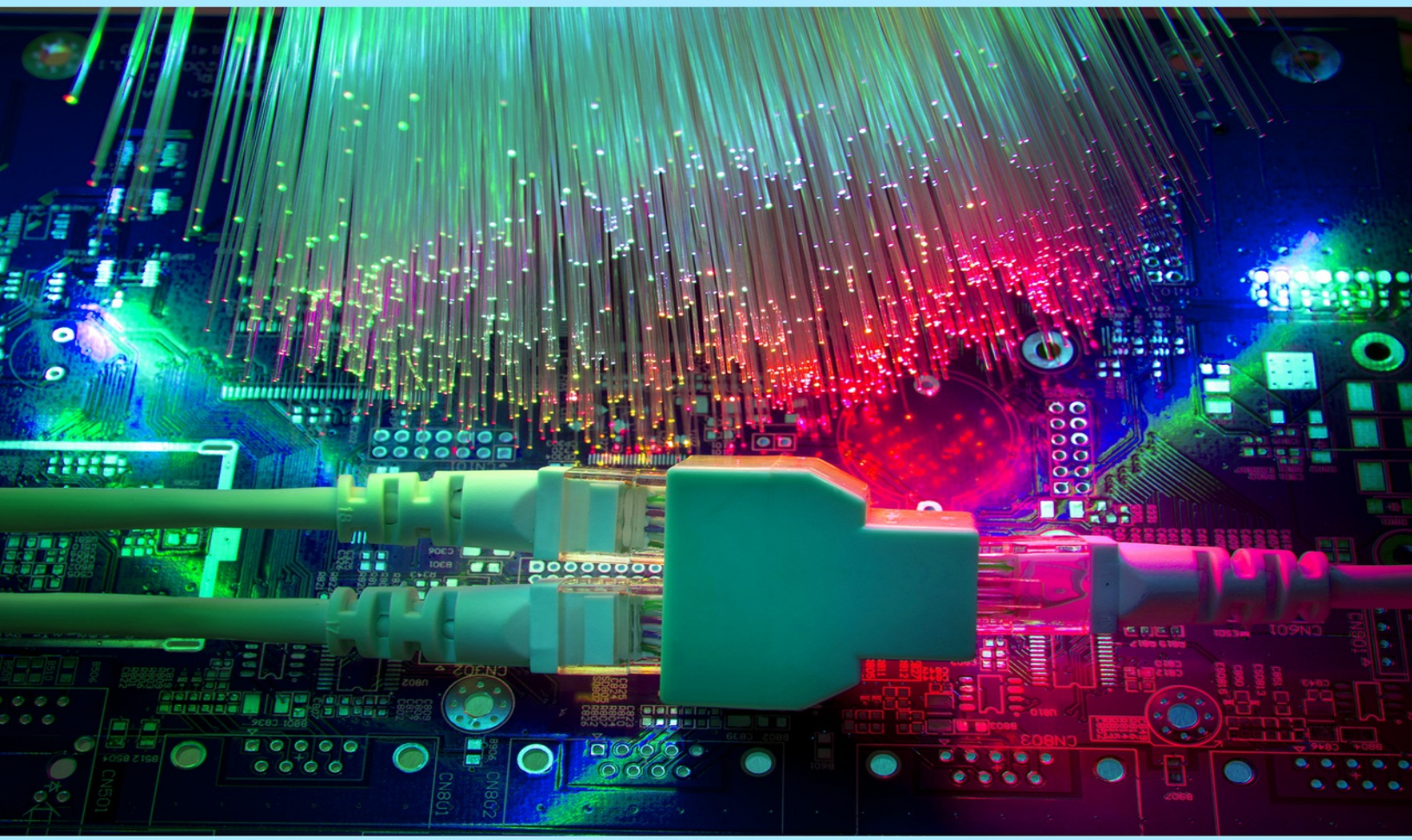
Cisco CCNA Command Guide

Advanced Methods and Strategies to Learn CISCO CCNA



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Introduction

This book on CISCO CCNA is a command guide to assist you in your studies regarding CCNA certification. This book contains proven steps and strategies on how to prepare for the exam. You can use this guide for self-study and on-the-job training. You can use the commands, the hints to make your networking easier for you. The book is small and smart enough to be your pocket guide. Whenever you encounter a problem, you can use this book as a reference guide to tackle the problem and manage it effectively. Unlike some big heavy textbooks, this book is packed up with to-the-point commands to help you learn and prepare in a short time.

Your strategy to prepare for the CCNA exam might be different from that of the other students. You might work through your preparation in a different style. You might have been equipped with the basic skills unlike your peers. Your knowledge, skills, experience, and learning potential will affect how you study for the exam. I have kept all the possible variations in my view when I wrote this book. All the commands are explained in the text format, unlike tables that are hard to read and understand. The simple text format makes this book different from the other books, and it also helps the reader better understand the concepts behind the commands. It does not matter what your background is; the book will help you effectively learn Cisco CCNA. Students like to make sure they learn a topic by heart. To make it possible, they scan many books and notes and research on the internet. However, as the information is scattered over different mediums and platforms, they get extremely confused. This lands them in trouble while they are close to their exams. In this book, you will find all the relevant information neatly ordered. The topics are written coherently. I have added all the commands in a concise manner to help readers grasp the concept. These features will boost your confidence. Once you have a proper knowledge base, you can practice the commands to take the exam. A solid knowledge base will allow you to make out what topics you need to research in an in-depth manner.

The book is organized into chapters, explaining separate topics to make the reading process easy and fun. I have tried to keep the book as less jumbled up as I can. To achieve that purpose, I have used bullet points to explain each command so you can better understand each of them. The chapters also contain troubleshooting commands to help you manage the errors that come

along the way. I encourage you to move on to the first chapter and start the learning process.

Chapter One: Cisco Devices

The chapter walks you through the requisite information and commands needed to connect rollover cables to the switch or router. The chapter also spans around the determination of the terminal settings and setup of LAN connections. I have explained different categories in bullets to give you a clear understanding.

Cable Types

You must ensure that the cabling is properly done or you might trigger problems before you even start. See the following pattern.

- If your device A contains a computer COM port and device B contains the console of switch or router, you should use the rollover cable.
- If your device A contains computer NIC and device B contains the switch or hub, you should use the straight-through cable.
- If your device A contains computer NIC and device B also contains computer NIC, you should use the crossover cable.
- If your device A contains computer NIC and device B also contains computer NIC, you should use the rollover cable.
- If your device A contains a switch or hub port and device B contains Router's Ethernet port, you should use the straight-through cable.
- If your device A contains a switch or hub port and device B also contains a switch or hub port, you should use the crossover cable. Also, don't forget to check for the uplink button to defeat this.
- If your device A contains a router's Ethernet port and device B also contains a router's Ethernet port, you should use the crossover cable.
- If your device A contains a router's serial port and device B also contains a router's serial port, you should use the Cisco serial DCE/DTE cable.

- If your device A contains a computer NIC and device B contains the router's Ethernet port, you should use the crossover cable.

Different cables have different pinout systems. See the following patterns.

Crossover Cable: Pin 1 – Pin 3, Pin 2 – Pin 6, Pin 3 – Pin 1, Pin 4 – Pin 4, Pin 5 – Pin 5, Pin 6 – Pin 2, Pin 7 – Pin 7, Pin 8 – Pin 8

Straight-Through Cable: Pin 1 – Pin 1, Pin 2 – Pin 2, Pin 3 – Pin 3, Pin 4 – Pin 4, Pin 5 – Pin 5, Pin 6– Pin 6, Pin 7 – Pin 7, Pin 8 – Pin 8

Rollover Cable: Pin 1 – Pin 8, Pin 2 – Pin 7, Pin 3 – Pin 6, Pin 4 – Pin 5, Pin 5 – Pin 4, Pin 6 – Pin 3, Pin 7 – Pin 2, Pin 8 – Pin

LAN Connections

- If the connection or port is Ethernet, the port type will be RJ-45. You must connect it to an Ethernet hub or Ethernet switch through cable RJ-45.
- If the connection or port is TI/EI WAN, the port type will be RJ-48C/CA81A. You must connect it to EI or TI network through rollover cable.
- If the connection or port is a console, the port type will be 8-pin. You must connect it to a computer COM port through rollover cable.
- If the connection or port is AUX, the port type will be 8-pin. You must connect it to the Modem through cable RJ-45.
- If the connection or port is BRI U WAN, the port type will be RJ-49C/CA11A. You must connect it to an ISDN network exchange (PINX) through cable RJ-45.
- If the connection or port is BRI S/T, the port type will be RJ-48C/CA81A. You must connect it to an NTI device or private integrated network exchange (PINX) through cable RJ-45.

The Difference Between 568A and 568B Cables

Two standards have been released by EIA/TIS group about the UTP wiring. These are dubbed as 568A and 568B. 568B is a bit newer and it is the standard. The difference between the two standards is due to the pin

assignments and not based on the type of colors. The 568A standard is greatly compatible with the United States' Universal Service Order Codes (USOC) standards for the telephonic infrastructure and the voice connections. In both standards, the orange and blue pairs are at the center four pins therefore these colors tend to match closely with the 568A. It is best practice to use 568A for new installations and 568B for the existing installations. Now let us analyze the 568A and 568B standards.

568A Standard

- Pin 1 of white or green color will pair with 3. Its description is RecvData +.
- Pin 2 of green color will pair with 3. Its description is RecvData -.
- Pin 3 of white or orange color will pair with 2. Its description is TxData +.
- Pin 4 of blue color will pair with 1. Its description is 'Unused'.
- Pin 5 of white or green color will pair with 1. Its description is 'Unused'.
- Pin 6 of orange color will pair with 2. Its description is TxData -.
- Pin 7 of white or brown color will pair with 4. Its description is Unused.
- Pin 8 of brown color will pair with 5. Its description is Unused.

568B Standard

- Pin 1 of white or orange color will pair with 2. Its description is TxData +.
- Pin 2 of orange color will pair with 2. Its description is TxData +.
- Pin 3 of white or green color will pair with 3. Its description is RecvData +.
- Pin 4 of blue color will pair with 1. Its description is Unused.
- Pin 5 of white or blue color will pair with 1. Its description is Unused.

- Pin 6 of green color will pair with 3. Its description is RecvData -.
- Pin 7 of white or brown color will pair with 4. Its description is Unused.
- Pin 8 of brown color will pair with 4. Its description is Unused.

The odd pin numbers always belong to the striped wires.

Command Line Interface

To enhance efficiency, Cisco IOS software has provided the users with some shortcuts to enter the most used commands.

- The command Router>enable is the same as Router>enab and Router>en. When you enter the short form of the commands, it is fine as long as you have no confusion.
- The command Router#configure terminal can be used interchangeably with Router#config t.
- You also can use the tab key to execute the commands. The command Router#sh + Tab key is the same as Router#show.

The question mark plays an important role in executing commands. You can use the question mark to see what you can do with the command and its parameters.

Question Mark

- The command Router#? will list all the commands that are available in the present command mode.
- The command

Router#c?

clear clock

will list all the available choices that tend to start with c.

- The command

Router#c1?

clear clock

will list all the available choices that will start with cl.

- The command

Router#clock ?

set

will list all the available choices that reveal all the subcommands that are linked to this command. It also sets the date and time of the system.

- The command Router#c? set 20:40:00 17 August 2020 ? + Enter key will confirm that you have configured the data and time of the system.
- The command Router# will show there is no incomplete command message or error message and that the command was executed successfully.

Miscellaneous Commands

- There is an enable command you can use to move the user. The command Router>enable Router# will move the user to the privileged mode.
- The command Router#exit or Router>exit allows the user to log off on the system.
- The command Router(config-if)#exit Router(config)# will move the user back to level one.
- The command Router(config)#exit Router# will also move the user back to level one.
- The command Router#disable Router> will move a user from the privileged mode to the user mode. It is known as the disable command.
- The command Router#logout has the same function to perform as exit. It is known as the logout command.
- The command Router#setup will take the user to the startup mode right at the command line. It is labeled as the setup mode and you

will see an answer in the square brackets. If this is what you want, you should go on and press the Enter key. If you want to end the setup process at any point, you can enter Ctrl + C to shut down the interfaces and return to the user-mode Router>. The setup mode can never be used for the router's configuration as it only performs the basics. You can turn on the IGRP or RIPv1 but not the EIGRP or OSPF and you cannot make ACLs or enable the NAT.

Keyboard Usages

You can use different keyboard commands during the editing process. There will be many tasks that you will repeatedly be using. To make it possible, the Cisco IOS Software allows you to use different keyboard combinations to make the process highly efficient.

- You can use the carrot symbol ^ over the 6 key on the keyboard to locate the mistake you might have made while entering the command.
- You can enter ctrl + a on the keyboard to move the cursor from where it is to the start of the line.
- You can enter ctrl + b on the keyboard to move the cursor from where it is to the back by one word.
- You can enter ctrl + b or the left arrow on the keyboard to move the cursor from where it is to back by one character.
- You can enter ctrl + e on the keyboard to move the cursor from where it is to the end of the line.
- You can enter Esc + f on the keyboard to move the cursor from where it is to a forward point by one word.
- You can enter Ctrl + f or the right arrow on the keyboard to move the cursor from where it is to a forward point by one character.
- You can enter $ that is above the 4 key on the keyboard to indicate that you have scrolled the line toward the left side.
- You can enter Router#terminal no editing to turn off the ability to use the keyboard shortcuts of the previous session.

- You can enter Router#terminal editing to re-enable the enhanced editing mode.

You can scroll through the history by the following commands.

- You can enter Ctrl + P or the up arrow on the keyboard to recall the commands that you have used in the past and that are a part of history. You will be able to use them in the backward sequence. You will see the most recent command.
- You can enter Ctrl + P or the up arrow on the keyboard to recall the commands that you have used in the past and that are a part of history. You will be able to use them in the backward sequence. You will see the most recent command.
- You can enter Ctrl + n or the down arrow on the keyboard to return the commands that you have used most recently.
- You can enter terminal history size *number* to set the total number of commands that reside in the buffer and that the router can recall. For example, Router#terminal history size 30 will recall the last 30 commands that are in the buffer. Similarly, the command Router#no terminal history size 25 will set the history buffer coming back to the last ten commands. This is the default view of the command line. The history size command helps provide the function as that of the terminal history size command.

You can apply some show command to scan the information about the command line interface and the systems.

- The command Router#show version will display the requisite information about the present IOS.
- The command Router#show history will display all the commands you have used in the command line interface history.
- The command Router#flash version will display the requisite information about the flash memory of the system.

The last line of output from the show version tells us what the configuration register has been set up to.

Chapter Two: Commands for the Configuration of the Router

This chapter will walk you through the commands and information about the configuration of a router. You will learn how to set up the names, interfaces, passwords, host tables, and save the configurations. The router mode commands are as under.

Router Modes Commands

There are different router modes that you may experience while you are navigating through the command line. All the commands do not work in all modes. If you type something in a command and you know it is correct but you get an error instead, you should recheck if the mode you are working in is right.

- The command Router> reflects the user mode.
- The command Router# reflects the privileged mode.
- The command Router(config)# reflects the global configuration mode.
- The command Router(config-if)# reflects the interface mode.
- The command Router(config-subif# reflects the subinterface mode.
- The command Router(config-line)# reflects the line mode.
- The command Router(config-router)# reflects the router configuration mode.

Configuration of the Name of the Router

You can use this command both on switches and routers.

- The command Router(config)#hostname Cisco reflects the router configuration mode.

Global Configuration Mode

- The command Router> reflects that the limited view of the configuration mode cannot introduce any changes in the mode.
- The command Router# reflects that the user can see how the configuration process is going on and that they can make the changes they need.
- The command Router#config t will take you to the router configuration mode. Once you execute the command, you will see the following prompt Router(config)# which indicates that you are allowed to introduce the changes in the configuration of the system.

Commands for the Configuration of Passwords

You can use the following commands both on switches and routers. There is a variety of commands that you can use for the purpose.

- The command Router(config)#enable password cisco will allow you to set the enable password.
- The command Router(config)#enable secret class will allow you to set the enable secret password.
- The command Router(config-line)#login will allow you to enter the console-line mode. It will also fix the console-line mode passed to the console. It also enables the system to check the password at the login time.
- The command Router(config-line)#password console will allow you to enter the console-line mode. It will also fix the console-line mode passed to the console. It also enables the system to check the password at the login time.
- The command Router(config)#line con 0 will allow you to enter the console-line mode. It will also fix the console-line mode passed to the console. It also enables the system to check the password at the login time.
- The command Router(config)#line vty 0 4 will allow you to pop into the vty mode for the five vty lines. This command will help you set the vty password to the telmet. You also can enable

password checking at the time of login.

- The command Router(config-line)#login will enable the password checking at the time of login.
- The command Router(config-line)#password telmet will help you set the vty password to the telmet.
- The command Router(config)#line aux 0 will land you in the auxiliary line mode.
- The command Router(config-line)#password backdoor will help you to change the auxiliary line mode password into backdoor.

The enable secret password is usually encrypted by default. However, the enable password is usually not. The recommended practice should be that you must not use the enable password. You should only make use of the enable password to configure the router. If you do so, you will defeat the usage of encryption. Also, you cannot set the enable password and enable secret password to the same password. This will defeat the encryption.

Password Encryption Commands

- The command Router(config)# service password-encryption will help you set up and apply weak encryption to your passwords.
- The command Router(config)#no service password-encryption will block password encryption on your system.
- The command Router(config)#enable password cisco will set up the password to cisco.
- The command Router(config)#password cisco will continue with the passwords that you set up.

The show Commands

There are a bunch of show commands that allow you to see different statistics and numbers in the system.

- The command Router#show ? will let you see the show commands that are available in the system.
- The command Router#show interfaces will let you see the

statistics for all the interfaces in the system.

- The command Router#show interface serial 0 will let you see the statistics for special interfaces such as Serial 0.
- The command Router#show clock will display the exact time on the device.
- The command Router#show users will let you see all the users have been connected to the device.
- The command Router#show history will let you see the history of different commands used the level of edit.
- The command Router#show controllers serial 0 will let you see the statistics of the interface hardware. These statistics will display if the rate of the clock is set and the cable is DTE or unattached.
- The command Router#show hosts will let you see the local host-to-IP addresses. You will see the names and the addresses of different hosts on the network to which you have been connected.
- The command Router#show version will let you see all the information related to the loaded version of the software concerned.
- The command Router#show running-config will let you see the configuration that is presently running inside the RAM.
- The command Router#show startup-config will let you see the configuration that is saved on the NVRAM.
- The command Router#show flash will let you see all the information that is related to the Flash memory.
- The command Router#show protocols will let you see the status of the configured layer that has 3 protocols.
- The command Router#show arp will let you see all the ARP table.

Interface Names

Remembering the names of the interfaces is one of the biggest problems that administrators might face. Each router has a different interface name. The

market is replete with many Cisco devices that are being used in the production networks in the present day. Some administrators get confused due to these interface names. You can use the command router#show ip interface brief to see which type of interface is on your computer.

Router mode: 2501. The slot number or port location is on board. The port or slot type is Ethernet. The slot numbering range is labeled as an interface-type number. An example of this interface is ethernet0(e0).

Router mode: 2501. The slot number or port location is on board. The port or slot type can be Serial. The slot numbering range is labeled as an interface-type number. An example of this interface is serial0 (sO) & s1.

Router mode: 2514. The slot number or port location is on board. The port or slot type is Ethernet. The slot numbering range is labeled as an interface-type number. An example of this interface is e0 & e1.

Router mode: 1721. The slot number or port location is on board. The port or slot type is FastEthernet. The slot numbering range is labeled as an interface-type number. An example of this interface is fastethernet0()(fa0).

Router mode: 2514. The slot number or port location is slot 0. The port or slot type is WAC (WIN Interface Card) (Serial). The slot numbering range is labeled as an interface-type number. An example of this interface is s0 & s1.

Router mode: 1760. The slot number or port location is on board. The port or slot type is Fast Ethernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is fa0/0.

Router mode: 1760. The slot number or port location is slot 0. The port or slot type is WIC/VIC (Voice Interface Card). The slot numbering range is labeled as interface-type 0/port. An example of this interface is s0/0 & s0/1 and v0/0 & v0/1.

Router mode: 1760. The slot number or port location is slot 1. The port or slot type is WIC/VIC. The slot numbering range is labeled as interface-type 1/port. An example of this interface is s1/0 & s1/1 and v1/0 & v1/1.

Router mode: 1760. The slot number or port location is slot 2. The port or slot type is VIC. The slot numbering range is labeled as interface-type 2/port. An example of this interface is v2/0 & v2/1.

Router mode: 1760. The slot number or port location is slot 3. The port or

slot type is VIC. The slot numbering range is labeled as interface-type 3/port. An example of this interface is v3/0 & v3/1.

Router mode: 2610. The slot number or port location is on board. The port or slot type is Ethernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is e0/0.

Router mode: 2610. The slot number or port location is slot 0. The port or slot type is WIC (Serial). The slot numbering range is labeled as interface-type 0/port. An example of this interface is s0/0 & s0/1.

Router mode: 2611. The slot number or port location is on board. The port or slot type is Ethernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is e0/0 & e0/1.

Router mode: 2611. The slot number or port location is slot 0. The port or slot type is WIC (Serial). The slot numbering range is labeled as interface-type 0/port. An example of this interface is s0/0 & s0/1.

Router mode: 2620. The slot number or port location is on board. The port or slot type is FastEthernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is fa0/0.

Router mode: 2620. The slot number or port location is slot 0. The port or slot type is WIC (Serial). The slot numbering range is labeled as interface-type 0/port. An example of this interface is s0/0 & s0/1.

Router mode: 2621. The slot number or port location is on board. The port or slot type is FastEthernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is fa0/0 & fa0/1.

Router mode: 2621. The slot number or port location is slot 0. The port or slot type is WIC (Serial). The slot numbering range is labeled as interface-type 0/port. An example of this interface is s0/0 & s0/1.

Router mode: 1841. The slot number or port location is on board. The port or slot type is FastEthernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is fa0/0 & fa0/1.

Router mode: 1841. The slot number or port location is slot 0. The port or slot type is HWIC/WIC/VWIC. The slot numbering range is labeled as interface-type 0/port. An example of this interface is s0/0/0& s0/0/1.

Router mode: 1841. The slot number or port location is slot 1. The port or slot type is HWIC/WIC/VWIC. The slot numbering range is labeled as interface-type 0/port. An example of this interface is s0/1/0& s0/1/1.

Router mode: 2801. The slot number or port location is on board. The port or slot type is FastEthernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is fa0/0& fa0/1.

Router mode: 2801. The slot number or port location is slot 0. The port or slot type is VIC/VWIC(voice only). The slot numbering range is labeled as interface-type 0/slot/port. An example of this interface is voice0/0/0& voice0/0/3.

Router mode: 2801. The slot number or port location is slot 1. The port or slot type is HWIC/WIC/VWIC. The slot numbering range is labeled as interface-type 0/slot/port. The examples of this interface are 0/1/0-0/1/3(this is single-wide HWIC) and 0/1/1-0/1/7 (this is double-wide HWIC).

Router mode: 2801. The slot number or port location is slot 2. The port or slot type is WIC/VIC/VWIC. The slot numbering range is labeled as interface-type 0/slot/port. An example of this interface is 0/2/0- 0/2/3.

Router mode: 2801. The slot number or port location is slot 3. The port or slot type is HWIC/WIC/VWIC. The slot numbering range is labeled as interface-type 0/slot/port. An example of this interface is 0/3/0- 0/3/3 for single-wide HWIC and o/3/0- 0/3/7 for double-wide HWIC.

Router mode: 2811. The slot number or port location is built into the front of the chassis. The port or slot type is USB. The slot numbering range is labeled as an interface-type port. An example of this interface is usb0& usb1.

Router mode: 2811. The slot number or port location is built into the back of the chassis. The port or slot type is FastEthernet Gigabit Ethernet. The slot numbering range is labeled as interface-type 0/port. An example of this interface is fa0/0& fa0/1 gi0/0& gi0/1.

Router mode: 2811. The slot number or port location is built into slot 0. The port or slot type is HWIC/HWIC-D/WIC/VWIC/VIC. The slot numbering range is labeled as interface-type 0/slot/port. An example of this interface is s0/0/0& s0/0/1 fa0/0/0& 0/0/1.

Router mode: 2811. The slot number or port location is built into slot 1. The

port or slot type is HWIC/HWIC-D/WIC/VWIC/VIC. The slot numbering range is labeled as interface-type 0/slot/port. An example of this interface is s0/1/0& s0/1/1 fa0/1/0& 0/1/1.

Router mode: 2811. The slot number or port location is at NME slot. The port or slot type is NM/NME. The slot numbering range is labeled as interface-type 1/port. An example of this interface is gi1/0& gi1/1 s1/0& s1/1.

Navigation Through Interfaces

With the help of a few commands, you can easily navigate through the interfaces. Some commands are as under:

- The command Router(config)#int s0 will let you move to the S0 mode of the interface.
- The command Router(config-if)#exit will let you move from the S0 mode of the interface to E0 mode. After that you will reach the following stage Router(config)#int e0 .
- The command Router(config)#int e0 shows that you have entered the E0 interface. When you are done with a command, you will see Router(config-if)# that is a prompt and that does not change.

Configuring Interfaces

You can configure any kind of interface with the help of the following commands.

- The command Router(config)#int s0/0 will let you move from your current interface to the Serial 0/0 mode interface.
- The command Router(config-if)#clock rate 56000 will let you assign a set clock rate for the interface you are in.
- The command Router(config-if)#description Link to ISP will explain the optional descriptor of the link.
- The command Router(config-if)#no shut will let you turn on the interface.
- The command Router(config-if)#ip address 192.168.10.1

255.255.255.0 will let you assign the subnet mask and address to the interface.

- The command Router(config)#int fa0/0 will let you move from your current interface to the Fast Ethernet 0/0 mode interface.
- The command Router(config-if)#description Accounting LAN will let you view your link's optional descriptor.
- The command Router(config-if)#ip address 192.168.20.1 255.255.255.0 will let you assign subnet masks and addresses to your current interface.
- The command Router(config-if)#int fa0/0 will let you move from your current interface to the Fast Ethernet 0/0 mode interface.
- The command Router(config-if)#no shut w ill let you turn on the interface.

You can use the clock rate command only on the serial interface that possesses a DCE cable that is plugged right into it. There ought to be a clock rate that is set on each serial link in between the routers. It is of least importance as to which router has been plugged with the DCE cable or which interface has got the cable plugged into it. The Serial 0 on the one router can be plugged into Serial 1 on some other router.

Some Miscellaneous Commands

- The command Router(config)#banner motd # You are inside a secure system. Unauthorized persons are not allowed. # is used to create banner messages and the character # is a delimiting character. The delimiting character must engulf the banner message that you want to convey. You can make it as long you want to. However, you should make sure that you do not include the # character in the body of the message or disrupt the command.
- The command Router(config)#clock timezone EST +5 w ill let you set the time zone that will be displayed on the interface.
- The command Router(config)#ip host (hostname) w ill let you assign the host ' s name to your IP address. After you have made

the assignment, you can use the host ' s name instead of the IP address when you are trying to ping or Telnet to the address.

- The command Router(config)#no ip domain-lookupw ill let you turn off the domain in an effort to resolve any kind of unrecognized command to the name of the local host.
- Enter the command Router(config)#line con 0. Then enter the command Router(config-line)#nexec-timeout 0 0. It will let you set the time limit when your console will automatically log off. You can set the time to 0 0 (minutes seconds). This means that your console will never log off. This command works well for a lab because the console is not going to log out soon. Bad security is lethal in the real world.
- The command Router#copy run start w ill let you save your running-config to any kind of local NVRAM.
- The command Router#copy run tffp w ill let you save your running-config from a remote location to TFTP server.
- You can always have the option to erase the configurations from the system. The command Router#erase start w ill let you do that.

Basic Router Configuration

You can configure your router in a short time by pursuing the following steps.

- The command Router>en will allow you to enter the privileged mode from the basic user mode.
- You have to set the time first. The command Router#clock set 15:30:00 20 Oct 2020 will allow you to enter the privileged mode from the basic user mode.
- It is time to start the configuration mode. The command Router#config t w ill allow you to enter the global configuration mode.
- The command Router(config)#hostname Georgiaw ill allow you to set the name of the router to Georgia. You can set the name of the router to other cities than Georgia.

- The next step is turning off the name resolution. The command Georgia(config)#no ip domain-lookup w ill allow you to turn off the name resolution on the unrecognized commands.
- Now you can create a banner for your router just like the one we created in the past section. The command Georgia(config)#banner motd # You have entered the Georgia router. There will be no entry for unauthorized users. # will allow you to set up the banner.
- Now you can set up the time zone. The command Georgia(config)#clock timezone EST +5 will allow you to set it to the Eastern Standard Time (+5 to UTC).
- The next step in the router configuration is setting up the secret password on cisco. The command Georgia(config)#enable secret cisco allows you to enable the secret password on cisco. Moving forward you can set up encryption on your router password as well. The command Georgia(config)#service password-encryption will allow you to set up weak encryption on the password.
- The command Georgia(config)#line con 0 will allow you to enter the line console mode.
- The command Georgia(config-line)#logging will allow you to block unsolicited interruption to your commands.
- The command Georgia(config-line)#password class will allow you to set the password to class.
- The command Georgia(config-line)#login will allow you to turn on the password checking at the login.
- The command Georgia(config-line)#line aux 0 will allow you to shift to the system's line auxiliary mode.
- The next step once again is to set the password to class. The command Georgia(config-line)#password class will allow you to set the password to class.
- The command Georgia(config-line)#login will allow you to set up password checking at the point of login.

- This is the step toward setting up the global configuration mode. The command Georgia(config)#no service password-encryption will allow you to turn off any existing encryption on the password.
- The next step is to shift the system to Fast Ethernet mode. The command Georgia(config)#int fa 0/0 will allow you to shift to Fast Ethernet 0/0 mode.
- Now you can set up a locally significant description on the interface. The command Georgia(config-if)#desc Engineering LAN will allow you to set up your interface's locally significant description.
- The command Georgia(config-if)#ip address (write the address number here) will allow you to assign an IP address to your interface. It also assigns a subnet mask to your interface as well.
- The command Georgia(config-if)#no shut will allow you to turn on your interface.
- The command Georgia(config-if)#int s0/0 will allow you to move toward the Serial 0/0 mode.
- The command Georgia(config-if)#desc Link to Belfast Router will set up your interface's local description.
- The command Georgia(config-if)#ip address (address number) will assign your IP address and also the subnet mask to your interface.
- The command Georgia(config-if)#clock rate 5000 will allow you to set the clock rate.
- The next command Georgia(config-if)#no shut will switch on your interface.
- The command Georgia(config-if)#exit will allow you to come back to the global configuration mode.
- The command Georgia(config-if)#clock rate 5000 will allow you to set the clock rate.
- The command Georgia(config)#ip host belfast (address number) will allow you to set the local host's name to the IP address.

- The command Georgia(config)#exit will take you back toward the privileged mode.
- The command Georgia#copy run start will take your configurations to the NVRAM.

Chapter Three: Networking and Routing Concepts

This chapter will walk you through the basic concepts of networking and routing in cisco. The administrative distance is an important aspect in networking and routing. There are some default administrative distances (AD) in the world of cisco, which are as under:

- The administrative distance for the connected interface is 0.
- The administrative distance for the static route is 1.
- The administrative distance for the internal EIGRP is 90.
- The administrative distance for the EIGRP summary route is 5.
- The administrative distance for the external border gateway protocol (eBGP) is 20.
- The administrative distance for the internal BGP(iBGP) is 200.
- The administrative distance for the external EIGRP is 170.
- The administrative distance for the Interior Gateway Routing Protocol (IGRP) is 100.
- The administrative distance for the Intermediate System-to-Intermediate System (IS-IS) Protocol is 115.
- The administrative distance for the RIP is 120.
- The administrative distance for the unknown is 255.

Change the Default Settings of the Administrative Distance

You can use some commands to change the OSPF route's administrative distance from the default settings with the help of the following commands.

- The command Georgia(config)#router ospf 1 will let you kick off the process of OSPF routing.
- The command Georgia(config-router)#distance 85 will let you change the OSPF distance from 110 to 85.
- The command Georgia(config-router)#distance 85 192.168.10.2

0.0.0.0 will let you apply the administrative distance of 85 to the OSPF routes that you receive from 192.169.10.2. This newly assigned administrative distance will be locally significant, and other routers will use the default administrative distance.

- The command Georgia(config-router)#distance 103 172.16.10.2 0.0.0.0 will let you change the OSPF distance from 110 to 103 for all the routes that come through 182.16.10.2.
- The command Georgia(config-router)#distance 85 172.16.20.0 0.0.0.255 2 will let you change the distance from 110 to 85 for all the routes that match ACL 2.
- The command Georgia(config-router)#exit will bring you back to the mode of global configuration.
- The command Georgia(config)#access-list 2 permit 192.168.30.0 0.0.0.255 will let you create the ACL that will help you understand which route will have an administrative distance of 85. You can use a named ACL and replace its number with the ACL name that is usually in command.

Permanent Keywords

The command Georgia(config)#ip route 192.168.50.0 255.255.255.0 serial0/0/0/0 permanent will let you create a static route that you cannot remove from the table even if you have shut down the interface. In the absence of a permanent keyword in the static route statement, the static route will stand removed, if your interface that is specified in the command moves down. An interface that is down will trigger the directly connected network and the associated static routes to get deleted from the table. When the interface is back up, the routes will definitely be returned. When you have added a permanent keyword to a static route statement, you will keep the static routes in the table even if the interface goes down. The interface remains down but the routes remain in the table. Its benefit is that when the interface gets back up, little need is usually left for the reprocessing of the static routes. This saves time and also the power that is usually consumed on processing.

IPv6 Address Assignment to Interface

You can use a bunch of commands for the assignment of different types of Ipv6 addresses to your interface.

- The command Georgia(config)#ipv6 unicast-routing will allow you to turn on the forwarding of the IPv6 unicast datagrams on a global scale across the router.
- The command Georgia(config)#interface gigabitetehernet0/0 will allow you to shift on to the configuration mode of your interface.
- The command Georgia(config-if)#ipv6 enable will allow you to kick off an IPv6 link-local address's automatic configuration process. It also enables the processing of IPv6 processing on your interface. The link-local address can be used to communicate with the nodes present on the same link.
- The command Georgia(config-if)#ipv6 address autoconfig will allow the router to configure itself automatically with the help of a link-local address. It does this with the help of a stateless auto configuration process.
- The command Georgia(config-if)#ipv6 address 2001::1/64 will allow you to configure a kind of global IPv6 address on your interface. It also lets you start the IPv6 processing on your interface. If you happen to add the global IPv6 address to your interface before you enter the ipv6 enable command, you will see witness the creation of a link-local address. In the end, the IPv6 will stand enabled on your interface.
- The command Georgia(config-if)#ipv6 unnumbered type/number will specify the unnumbered interface. It will enable IPv6 processing on your interface. The global IPv6 address of your interface that is usually specified by type/number will only be used as a source address for the packets that are sent from your interface.

Chapter Four: Deciphering RIP, IGRP & EIGRP

This chapter will walk you through the commands and information that are concerned with the optional and mandatory commands for the configuration of the Routing Information Protocol (RIP). I will also explain the commands that are linked to the configuration of RIP Version 2 (RIP-2).

First of all, I will explain how you can turn and off the ip classless.

- The command Georgia(config)#ip classless will direct IOS to process the packets that are destined for the unknown subnet toward the top supernet route. Usually, you do not have to enable this command in cisco as it is enabled by default in interfaces.
- The command Georgia(config)#no ip classless will undo what you have done with the help of the previous command.

RIP Routing

- The command Georgia(config)#router rip will help you to enable RIP.
- The command Georgia(config-router)#network w.x.y.z is usually a network number of a directly connected network that you are looking forward to advertise.

If you happen to advertise a subnet, there will be no error message, because the router will convert that subnet into a classful address.

The above mentioned commands are mandatory. What you will see next will be the optional commands.

- The command Georgia(config)#no router rip will let you switch off the RIP routing process.
- The command Georgia(config-router)#no network w.w.w.w will let you remove the network mentioned in the command from the RIP process. This is easy and fun. You can simply name the network in the command and do away with it in no time.
- The command Georgia(config-router)#passive-interface s0/0 will

let you lock the RIP updates so that they cannot be sent out of your interface.

- The command Georgia(config-router)#ip split-horizon will let you enable the split.
- The command Georgia(config-router)#no ip split-horizon will let you turn off your split horizon. The split horizon is usually on by default settings.
- The command Georgia(config-router)#neighbor x.x.x.x will let you define a neighbor to share your information.
- The command Georgia(config-router#timera basic 30 90 180 270 360 will let you change the timers of your RIP. You can update the timer at 30 seconds. The timer will turn invalid in 90 seconds and the hold-down timer is at 180. The flush timer is at 270 and the sleep timer is at 360 seconds.
- The command Georgia(config-router)#default-information originate will let you generate some default routes in the RIP.

RIP Version 2 Commands

- The command Georgia(config-router)#version 2 will let you tune the system as such that the RIP will only send and receive the RIP-2 packets in a global setting.
- The command Georgia(config-if)#ip rip send version 1 will let you send only the RIP-1 packets.
- The command Georgia(config-if)#ip rip send version 2 will let you send only the RIP-2 packets.
- The command Georgia(config-if)#ip rip send version 1 2 will let you send only the RIP-1 packets and RIP-2 packets.
- The command Georgia(config-if)#ip rip receive version 1 will let you receive only the RIP-1 packets.
- The command Georgia(config-if)#ip rip receive version 2 will let you receive only the RIP-2 packets.

- The command Georgia(config-if)#ip rip receive version 1 2 will let you receive only the RIP-1 packets and RIP-2 packets.

Troubleshooting Problems

The commands that you can use to troubleshoot problems are as under:

- The command Georgia#debug ip rip will let you see the entire RIP activity. The results will be displayed in real time.
- The command Georgia#show ip rip database will let you see the contents of the database of RIP.

Mandatory Commands for RIP Version 2

- The command Georgia(config)#router rip will let you switch on the RIP routing process. You can use the same command for RIP Version as well.
- The command Georgia(config-router)#version 2 will let you switch on Version 2 of your routing process. Version 1 is default.
- The command Georgia(config-router)#network y.y.y.y will let you advertise the network that has been mentioned.

Optional Commands for RIP Version 2

- The command Georgia(config-router)#no version 2 will let you change the version back to the previous one that is RIP-1
- The command Georgia(config-router)#version 1 will let you change the RIP routing back to RIP-1.
- The command Georgia(config-router)#no auto-summary will let you summarize different networks. The RIP-2 summarizes different networks at the boundary namely classful. The command tends to turn off the autosummarization process.
- The command Georgia(config-router)#auto-summary will let you enable the autosummarization process again at the boundary namely classful.

IGRP

In the following section, I will give the details of different mandatory and optional commands that are related to Interior Gateway Routing Protocol (IGRP).

- The command Georgia(config)#router igrp will enable the routing process related to IGRP. IGRP routing uses autonomous system. The process ought to match other routers that will share the routing updates to make sure that the communication takes place.
- The command Georgia(config-router)#network x.x.x.x will let you advertise the network. The x.x.x.x is the name of the network that is directly connected and that you are looking forward to advertise.

You only have to advertise the classful network. You are not required to advertise a subnet. If you advertise a subnet, you will see no error message, because the router is likely to automatically convert the subnet into the address of a classful network.

Mandatory Commands for IGRP

There are few mandatory commands for IGRP routing. They are listed as under:

- The command Georgia(config)#no router igrp (enter number here) will let you disable the entire process of IGRP routing.
- The command Georgia(config-router)#no network x.x.x.x will let you remove the named network from the process of IGRP routing.
- The command Georgia(config-router)#bandwidth a will set up the bandwidth of the interface to a kilobit so that IGRP is allowed to make an improved routing decision.
- The command Georgia(config-router)#variance a will let the IGRP take on the unequal-cost routes.

The bandwidth command is also used for metric calculations. It will not change the performance of the interface.

Troubleshooting

You can use two commands to troubleshoot if an issue pops up in the middle of the operations.

- The command Georgia#debug ip igrp events will let you see the IGRP events in the real time.
- The command Georgia#debug ip igrp transactions will let you see the IGRP updates that exist in between the routers.

EIGRP

This section will explain how to configure EIGRP, verify EIGRP, autosummarize EIGRP, and troubleshoot EIGRP.

Configuring EIGRP

- The command Georgia(config)#router eigrp 100 will turn on process 100 of EIGRP, an autonomous system (AS) number. This can be a number in between 1 and 65535. All the routers in AS ought to use a similar AS number.
- The command Georgia(config-router)#network 10.0.0.0 will specify which network must advertise in EIGRP.
- The command Georgia(config-router)#eigrp log-neighbor-changes will log any kind of changes that happen to one of the EGRIP neighbors.
- The command Georgia(config-router)#no network 10.0.0.0 will allow you to remove the same network from EIGRP process.
- The command Georgia(config-router)#bandwidth a will allow you to set up the bandwidth of your interface to a kilobit. This allows the EIGRP to make an improved and beneficial routing decision. You only can use the bandwidth command to perform the metric calculations. This usually does not change the performance of your interface.

Auto-summarization

- The command Georgia(config-router)#no auto-summary will allow you to switch off the feature of auto-summarization. You will be able to summarize the networks, by default, at the boundary of the classful. The command Georgia(config-router)#int fa 0/0 is also a part of the auto-summarization process.
- The command Georgia(config-if)#ip summary-address eigrp 100 10.10.0.0 255.255.0.0 will allow you to enable the manual summarization process on your interface. This will be for the given mask and address.

EIGRP offers the facility to summarize different networks automatically at the boundary namely classful. If a network is poorly designed and is packed up with discontinuous subnets, it could create connectivity problems, especially if you leave the summarization feature open. There may be two routers that advertise the same network. However, the original intention can be the advertising of two different networks. In this situation, you should switch off the feature of auto-summarization and use the ip summary-address in its place. You can manually summarize what you have to do.

Verifying EIGRP

- The command Georgia#show ip eigrp neighbors will allow you to see the neighbor table.
- The command Georgia#show ip eigrp neighbors detail will allow you to see the contents of the same table.
- The command Georgia#show ip eigrp topology will allow you to see the table for topology.
- The command Georgia#show ip eigrp int 100 will allow you to see the data regarding running process 100 of interfaces.
- The command Georgia#show ip eigrp s 0/0 will allow you to see the information for a particular interface.
- The command Georgia#show ip eigrp interfaces will allow you to see the data that pertains to each interface.
- The command Georgia#show ip eigrp traffic will allow you to see the type of packets sent or received and the numbers.

Troubleshooting

You can use the following commands to troubleshoot a problem that pops up along the way.

- The command Georgia#debug eigrp fam will allow you to see the actions/events that are related to the DUAL FSM.
- The command Georgia#debug eigrp neighbor will allow you to see the actions/events that are connected to EIGRP neighbors.
- The command Georgia#debug eigrp packet will allow you to see the actions/events that are connected to the packets of EIGRP.

RIP Next Generation

In this section, I will explain how you can implement RIPng on your routers.

- The command Georgia(config)#ipv6 unicast-routing will allow you to enable to spread the IPv6 unicast datagrams across the router globally.
- The command Georgia(config)#interface serial0/0/0 will allow you to shift to the interface's configuration mode.
- The command Georgia(config-if)#ipv6 tip tower enable will allow you to create the process named tower. It also enables the RIPng on your interface. The RIPng processes are shorter and smarter than the processes of RIPv1 and RIPv2. In RIPng, you do not have to create RIP routing processes with the help of the router rip command. Also, you do not have to use the network command for the specification of your interfaces on which you will run RIP. In RIPng, these processes are created and done away with automatically on your interface. All it takes is the ipv rip name enable command. The name of the process should not be misspelled. If you misspell it, you will create a second process that carries the misspelled name. The name of the routing process need not match between the neighboring routers.
- The command Georgia(config)#ipv6 router rip tower will allow you to create a process named tower. It also takes you to the configuration mode of the router.

- The command Georgia(config-router)#maximum-paths 2 will allow you to define how many equal-cost routes there will be that are supported by RIPng. The number of paths may range between 1 and 64. The default number here is 64.
- The command Georgia(config-if)#ipv6 rip tower default-information originate will reveal the default route and other RIPng routes.
- The command Georgia(config-if)#ipv6 rip tower default-information only will reveal the default route. One difference is that this command will hide the other RIPng routes.

Troubleshooting RIPng

When you are using the debug command for RIPng, it is likely to affect the router performance adversely. It may even trigger a reboot in the router. Therefore, you should always stay cautious when you are using this command. You must never leave the debugging process open. You may use it long enough to collect the information and once you have harvested the information, you must immediately disable it with the undebug command. I will continue to use the router name Georgia in the following example as well. Here is the rundown of the commands for troubleshooting in RIPng.

- The command Georgia#clear ipv6 rip will help you to delete the routes from the IPv6 RIP table. It will also delete the routes from the IPv6 table as well.
- The command Georgia#clear ipv6 route * will let you delete all the routes that exist in the IPv6 routing table.
- The command Georgia#clear ipv6 route 2001:db8:c18:3: :/64 will let you clear a specific route from the IPv6 table.
- The command Georgia#clear ipv6 interface will let you see the status of all the interfaces that have been configured for IPv6.
- The command Georgia#clear ipv6 routing will let you see the debug messages related to the updates of the IPv6 routing table and the routing cache updates.
- The command Georgia#clear ipv6 traffic will let you reset the

IPv6 traffic counters.

- The command Georgia#clear ipv6 packet will let you see the debug messages that are for the IPv6 packets.
- The command Georgia#clear ipv6 rip will let you see the debug messages for the transactions regarding IPv6 RIP routing.
- The command Georgia#show ipv6 route rip will let you see the present routes for RIPng in the IPv6 table.
- The command Georgia#show ipv6 route will let you see the present status of the IPv6 table.
- The command Georgia#show ipv6 rip next-hops will let you see the processes of RIPng. It also displays the next-hop processes that are running under each major process.
- The command Georgia#show ipv6 tip database will let you see the database of the RIPng processes. Even if more than two processes are running in the system, this command will show all the databases.
- The command Georgia#show ipv6 rip will let you see the information about the present process.
- The command Georgia#show ipv6 protocols will let you see the protocols and the present state of all the IPv6 protocol processes.
- The command Georgia#show ipv6 neighbors will let you see the IPv6 neighbor discovery information.
- The command Georgia#show ipv6 traffic will let you see the statistics that are related to IPv6 traffic.
- The command Georgia#show ipv6 route summary will let you see the short form of the IPv6 table.
- The command Georgia#show ipv6 routers will let you see the advertisement data for the IPv6 router.

IPv6 Ping

If you are looking forward to diagnosing the basic connectivity in a network with the help of IPv6, you may enter the Ping command that can be seen

below.

Georgia#ping ipv6 2001:db8: :3/64

In the next section, I will shed light on the characters that you will see and their meaning and understand how to read the symbols.

- The character ! means that there is an indication of some replies.
- The character. means that a network has an error that timed out while the network was waiting for a reply.
- The character ? means that there is some kind of unknown error.
- The character @ means that there is some kind of unknown reason.
- The character T means that the time has already been exceeded.
- The character R means that there is a serious problem with the parameter.
- The character P means that the port is already unreachable.
- The character N means that the network has been unreachable and is beyond scope.
- The character H means that the host of the network is not reachable.
- The character B means that there is a packet that is too big.
- The character A means that the network is administratively unreachable. It also means that a kind of access control list (ACL) tends to block the network traffic.

Chapter Five: Open Shortest Path Protocol (OSPF)

This chapter will walk you through the commands related to the Open Shortest Path First (OSPF). You will navigate through the commands regarding the configuration of single-area OSPF, the use of wildcard masks in OSPF areas, and the configuration of single-area OSPF such as cost metrics and loopback interfaces, timers, authentication, and propagation of default tone. You will also learn about the commands to verify OSPF and the troubleshooting of issues that pop up along the way.

Mandatory Commands for OSPF

- The command Georgia(config)#router ospf 123 will allow you to turn on the OSPF process number 123. The process ID can be anywhere between 1-65535. Its ID is not in any way linked to OSPF area.
- The command Georgia(Config)#network 172.16.10.0 0.0.0.255 area 0 will allow you to advertise the interfaces. OSPF does not advertise networks however it does advertise interfaces. It will use a wildcard mask that will determine which interface it has to advertise. The interfaces that belong to the address 172.16.10.x will be placed into Area 0. The process ID number of a router need not match the process ID number of other routers. Unlike Enhanced IGRP (EIGRP) and Interior Gateway Routing Protocol (IGRP), matching the number across the existing routers does not ensure adjacencies' formation.

When it is compared with the IP address of a computer, a wildcard mask will identify how addresses will be matched for the placement into a particular area.

A zero (0) inside a wildcard mask means checking the corresponding bit inside the address to have an exact match. A one (1) inside a wildcard means ignorance of the corresponding bit for the address. Here are some uses of wildcard masks for OSPF.

- The command Georgia(config-router)#network 72.16.10.1 0.0.0.0 area 0 will allow you to put an interface that has an address

172.16.10.1 in Area 0.

- The command Georgia(config-router)#network 72.16.10.0 0.0.255.255 area 0 will allow you to put your interface that has an address 172.16.x.x in Area 0.
- The command Georgia(config-router)#network 0.0.0.0 255.255.255.255 area 0 will allow you to put your interface with any address in Area 0.

Optional Commands for OSPF

The first commands on the line are for loopback interfaces.

- The command Georgia(config)#interface 1o0 will allow you to shift from your current interface to the virtual interface that is Loopback 0.
- The command Georgia(config-if)#ip address 192.168.100.1 255.255.255.255 will allow you to assign an IP address to your interface. You can choose any IP address that fulfills your requirements. The loopback interfaces always remain up and up. They do not go down unless you manually shut them down, which is why loopback interfaces are considered wonderful for using OSPF router ID.

The following commands will help you modify the OSPF cost metrics.

- The command Georgia(config)#int s 0/0 will allow you to modify the metrics.
- The command Georgia(config-if)#bandwidth 256 will allow you to change the bandwidth of the network. You can change it to 128. OSPF will also recalculate the cost of the link.
- The command Georgia(config-if)#ip ospf cost 1690 will allow you to change the cost figure to the value of 1690. The link's cost is generally determined by the division of the reference bandwidth by interface bandwidth. The default bandwidth can be a number from 1-10,000,000. It is generally measured in kilobits. The cost is a number between 1-65,535.

Authentication

- The command Georgia(config)#router ospf 456 will allow you to kick off the authentication process.
- The next command on the line is Georgia(config-router)#area 0 authentication will allow you to turn on the process of simple authentication. You can send in the password in clear text.
- The command Georgia(config-router)#exit will allow you to exit the authentication process.
- The next command to enter in the interface is Georgia(config)#int fa0/0.
- The command Georgia(config-if)#ip ospf authentication-key jasmine will allow you to set the password for your authentication process to jasmine. You can choose any other word to set the password. You can also make it more complex so that it defies any cracking attempts.

MD5 Authentication

- The command Georgia(config)#router ospf 456 will allow you to kick off the process of authentication using MD5.
- The command Georgia(config-router)#area 0 authentication message-digest will allow you to enable the authentication process with MD5 password encryption.
- The command Georgia(config-router)#exit will allow you to exit the process at any time.
- The next command on the line is Georgia(config-router)#int fa 0/0 .
- The command Georgia(config-if)#ip ospf message-digest-key 1 md5 jasmine will allow you to encrypt the password that you have filled in the interface. In the command 1 is the key-id. This value remains the same. The key and password must remain the same for any neighboring router.

Timers

- The command Georgia(config-if)#ip ospf hello-interval timer 30 will allow you to change the Hello interval to 30 seconds. You can change the timing as per your custom requirements.
- The command Georgia(config-if)#ip ospf dead-interval 90 will allow you to change the dead interval to 90 seconds. You can fill it in with any other amount of seconds.

Default Route

- The command Georgia(config)#ip route 0.0.0.0 0.0.0.0 s0/0 will allow you to create a default route in the system. After you have entered the abovementioned command, you can fill in the system with the following command Georgia(config)#router ospf 1 to further the process of creating default routes.
- The command Georgia(config-router)#default-information-originate will allow you to set the default route so that it can be propagated across the OSPF routers.

OSPF Configuration Verification

- The command Georgia#show ip protocol will allow you to see the parameters for different protocols that are running on the routers.
- The command Georgia#show ip route will allow you to see the full IP routing tables.
- The command Georgia#show ip ospf will allow you to see the basic information of the network.
- The command Georgia#show ip ospf interface will allow you to see the information about OSPF because the same is related to all the interfaces that exist on the system.
- The command Georgia#show ip ospf int fa 0/0 will allow you to see the OSPF information for the interface titled fa 0/0.

- The command Georgia#show ip ospf neighbor will allow you to see the list of all the OSPF neighbors and their respective states.
- The command Georgia#show ip ospf neighbor detail will allow you to see all the neighbors' detailed lists in the network system.
- The command Georgia#show ip ospf database will allow you to see the contents of the OSPF database.

Troubleshooting Process

- The command Georgia#clear ip route * will allow you to clear the routing table. It forces the users to rebuild the table. In that way, the problem is automatically killed.
- The command Georgia#clear ip route x.x.x.x will allow you to clear a specific route to the network x.x.x.x.
- The command Georgia#clear ip ospf counters will allow you to clear and reset the OSPF counters.
- The command Georgia#clear ip ospf process will allow you to reset the OSPF process. This forces the OSPF to recreate the neighbors, routing tables and databases. This is how the problem is tackled and erased completely from the system.
- The command Georgia#debug ip ospf events will allow you to see OSPF events in the system. This is how you can correct any problem that pops up along the way.
- The command Georgia#debug ip ospf packets will allow you to see the OSPF packets.
- The command Georgia#debug ip ospf adj will allow you to see different states of OSPF.

Chapter Six: Open Shortest Path Protocol (OSPF) Single Area and Multiarea Configuration

This chapter will walk you through the configuration processes of single area OSPF and multiarea OSPF. I will explain each configuration process by neatly stating the step-by-step commands.

Single Area OSPF Configuration

The configuration of a single area OSPF system comprises the following steps.

- The command Router>en is the first step to kick off the configuration process.
- The command Router #config t is the second step. It will land you in the configuration mode.
- The command Router(config)#no ip domain-lookup will allow you to turn off the DNS queries so that the spelling mistakes will never allow you to slow down.
- The command Router(config)#hostname Georgia will allow you to set up the name of the host.
- The command Georgia(config)#line con 0 is the next step on the line.
- The command Georgia(config-line)#logging sync will allow you to list the commands that are interrupted by the console messages and append them to a new line.
- The command Georgia(config-line)#exit will is the next step on the line.
- The command Georgia(config)#int fa 0/0 will allow you to set up Fast Ethernet.
- The command Georgia(config-if)#ip add 172.16.10.1 255.255.255.0 will allow you to set up the system's IP address.
- The command Georgia(config-if)#no shut is the step for the

configuration.

- The command Georgia(config-if)#int s0/0 is the next step.
- The command Georgia(config-if)#ip add 172.16.20.1 255.255.255.0 will allow you to set up and add another IP address for the system.
- The command Georgia(config-if)#clock rate 56000 will allow you to set up and connect the DCE cable to your interface.
- The next command to enter the system is Georgia(config-if)#no shut.
- The command Georgia(config-if)#exit will allow you to exit the previous state.
- The command Georgia(config)#route ospf 1 will allow you to turn on the OSPF process 1.
- The command Georgia(config-router)#net 172.16.10.0.0.0.255 area 0 will allow you to pair up any interface that has an address of 172.10.10.x with area 0.
- The command Georgia(config-router)#net 172.16.20.0.0.0.255 area 0 will allow you to pair up any interface that has an address of 172.16.10.x with area 0.
- The command Georgia(config-router)#Ctrl + Z is the second last command to apply for the configuration process.
- The command Georgia#copy run start will finish the configuration process.

Multi-area OSPF

OSPF uses different types of messages. A few of them are given as under. Each OSPF packet is packed up inside an IP header.

- The first type of OSPF messages is named Hello. The message is used to discover the neighbors and it also builds the adjacencies that are between them.
- The second type of OSPF messages is named Database

description (DBD). The message is used to check for the synchronization of the database between the routers.

- The third type of OSPF messages is named Link-state request (LSR). The message is used to request specific link-state advertisements (LSAs) from a different router.
- The fourth type of OSPF messages is named Link-state update(LSU). The message is used to send off the specifically requested LSAs.
- The fifth type of OSPF messages is named Link-state acknowledgment (LSAck). The message is used to acknowledge the different types of packets.

LSA Types

In the next section, I will explain the different types of LSA that the OSPF uses. LSAs are considered as the building blocks of the OSPF link-state database (LSDB). LSAs act as database records. They describe the topology of the OSPF network area.

- The first type of LSA is Router LSA. It describes the router link state to area. It remains flooded in a single area.
- The second type of LSA is Network LSA. Designated routers generate this type. It is also flooded in a single area.
- The third type of LSA is Summary LSA. This type is used by area Border Router (ABR). It is also used to harvest information that is collected from one area. It also summarizes it for a different area.
- The fourth type of LSA is ASBR summary LSA. It tends to inform the OSPF domain on how to approach the ASBR.
- The fifth type of LSA is Autonomous system LSA. Its description is that ASBR generates it. These types of LSAs describe the routes to the destinations that are generally external to the systems that operate autonomously.
- The sixth type of LSA is Group membership LSA. Its description is that it is used in multicast OSPF apps. Multicast apps or MOSPF apps have been deprecated.

- The seventh type of LSA is NSSA external link entry LSA. Its description is it is used in the special types of areas are known as not-so-stubby-area (NSSA). It tends to advertise the external routes in the NSSA.
- The eighth type of LSA is Link-local LSA for OSPFv3. Its description is that it yields information about the link-local addresses in addition to displaying a list of IPv6 addresses on the link. It is generally not supported by Cisco.
- The ninth type of LSA is Opaque LSA. This LSA is reserved for future usage.
- The tenth type of LSA is Opaque LSA. This LSA is reserved for future usage.
- The eleventh type of LSA is Opaque LSA. This LSA is reserved for future usage.

OSPF Configuration

There are a few steps involved in the configuration process of OSPF. The steps are given below.

- The command Georgia(config)#router ospf 555 will allow you to initiate the OSPF process 555. The ID can be a positive integer between 1 and 65,535. The process ID is never related to the OSPF area. The process ID distinguishes one process from another one inside of the device.

- The command Georgia(config-router)#network 172.16.10.0 0.0.0.0255 area 0 will allow you to use the wildcard mask to determine which interfaces you can advertise. Any interface that has an address of 172.16.10.x will run the OSPF. It can also be put into area 0.

- The command Georgia(config-router)#log-adjacency-changes

detail will allow you to configure routers to some syslog messages whenever there is some change of state inside the OSPF neighbors.

You can use different wildcard masks with OSPF areas. When you compare it with an IP address, a wildcard mask will help you locate what addresses will be matched up to run the OSPF and also be placed inside a particular area.

- The zero(0) in the wildcard mask means checking the corresponding bit within the address to make a perfect match.
- The one(1) in the wildcard mask means ignorance of the corresponding bit within the address.

The following commands will do the trick for you.

- The command Georgia(config-router)# network 172.16.0.1 0.0.0.0 area 0 will allow you to confirm that any interface that possesses the address 172.16.10.1 will run OSPF and will also be placed inside area 0.
- The command Georgia(config-router)# network 172.16.0.0 0.0.255.255 area 0 will allow you to confirm that any interface that possesses the address 172.16.y.y will run OSPF and will also be placed inside area 0.
- The command Georgia(config-router)# network 0.0.0.0 255.255.255.255 area 0 will allow you to confirm that any interface that any possesses address type will run OSPF and will also be placed inside area 0.

Multiarea OSPF Configuration

Georgia Router:

- The command Router> enable will allow you to shift to the privileged mode.

- The command Router#configure terminal will allow you to shift to the global configuration mode.
- The command Router(config)#hostname Georgia will allow you to set up the name of the router.
- The command Georgia(config)#interface loopback0 will allow you to enter the mode of the loopback interface.
- The command Georgia(config-if)#ip address (enter ip address here) will allow you to assign the IP address and the netmask to the network.
- The command Georgia(config-if)#description Router ID will allow you to set up a locally significant description.
- The command Georgia(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia(config)#ip route 0.0.0.0 0.0.0.0 10.1.0.2 fastethernet0/1 will allow you to create a default route. If you use the next-hop address and exit interface on a Fast Ethernet interface, you will be able to prevent the recursive look-ups within the routing table.
- The command Georgia(config)#ip route 11.0.0.0 0.0.0.0 null0 will allow you to create a kind of static route to the null interface. This example shows you the routes that represent some remote simulated destination.
- The command Georgia(config)#ip route 12.0.0.0 0.0.0.0 null0 will allow you to create a kind of static route to the null interface. This example shows you the routes that represent some remote simulated destination.
- The command Georgia(config)#ip route 13.0.0.0 0.0.0.0 null0 will allow you to create a kind of static route to the null interface. This example shows you the routes that represent some remote simulated destination.
- The command Georgia(config)#router ospf1 will allow you to kick off OSPF 1.

- The command Georgia(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface with the IP address 172.16.y.y will operate OSPF it will also be put in area 0.
- The command Georgia(config-router)#default-information originate will allow you to set up the default route that must be propagated to the OSPF routers.
- The command Georgia(config-router)#redistribute static will allow you to redistribute the OSPF process's static routes. This will turn the router into Georgia because the static routes are usually not a part of OSPF. The definition of Georgia is a router that usually sits in between OSPF and the static routing process.
- The command Georgia(config-router)#exit will take you back to the global configuration mode.
- The command Georgia(config)#exit will allow you to get back to the privileged mode.
- The command Georgia#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia1 Router:

- The command Router> enable will allow you to shift to the privileged mode.
- The command Router#configure terminal will allow you to shift to the global configuration mode.
- The command Router(config)#hostname Georgia1 will allow you to set up the name of the router.
- The command Georgia1(config)#interface loopback0 will allow you to enter the mode of the loopback interface.
- The command Georgia1(config-if)#ip address (enter ip address here) will allow you to assign the IP address and the netmask to the network.
- The command Georgia1(config-if)#description Router ID will allow you to set up a locally significant description.

- The command Georgia1(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia1(config-if)#interface fastethernet0/1 will allow you to shift back to the interface configuration mode.
- The command Georgia1(config-if)#ip ospf priority 200 will set up the priority for BDR and DR election processes. The router is likely to win and become the DR.
- The command Georgia1(config-if)#no shutdown will allow you to shift back to the interface mode.
- The command Georgia1(config-if)#exit will allow you to reenter the global configuration mode.
- The command Georgia1(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia1(config)#ip route 0.0.0.0 0.0.0.0 10.1.0.2 fastethernet0/1 will allow you to create a default route. If you use next-hop address and exit interface on a Fast Ethernet interface, you will be able to prevent the recursive look-ups within the routing table.
- The command Georgia1(config-router)#network 172.16.1.0 0.0.0.255 area 0 will ensure that the interface that has the IP address 172.16.1.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#network 172.16.51.1 0.0.0.0 area 51 will ensure that the interface that has the IP address 172.16.51.1 will operate OSPF and it will also be put in area 51.
- The command Georgia1(config-router)#exit will take you back to the global configuration mode.
- The command Georgia1(config)#exit will allow you to get back to the privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia2 router:

- The command Router> enable will allow you to shift to the privileged mode.
- The command Router#configure terminal will allow you to shift to the global configuration mode.
- The command Router(config)#hostname Georgia2 will allow you to set up the name of the router.
- The command Georgia2(config)#interface loopback0 will allow you to enter the mode of the loopback interface.
- The command Georgia2(config-if)#ip address (enter ip address here) will allow you to assign the IP address and the netmask to the network.
- The command Georgia2(config-if)#description Router ID will allow you to set up a locally significant description.
- The command Georgia2(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia2(config-if)#interface fastethernet0/0 will allow you to shift back to the interface configuration mode.
- The command Georgia2(config-if)#ip ospf priority 100 will set up the priority for BDR and DR election processes. The router is likely to win and become the DR.
- The command Georgia2(config-if)#no shutdown will allow you to shift back to the interface mode.
- The command Georgia2(config-if)#exit will allow you to reenter the global configuration mode.
- The command Georgia2(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia2(config)#ip route 0.0.0.0 0.0.0.0 10.1.0.2 fastethernet0/1 will help you create a default route. If you use next-hop address and exit interface on a Fast Ethernet interface, you will be able to prevent the recursive look-ups within the

routing table.

- The command Georgia2(config-router)#network 172.16.1.0 0.0.0.255 area 0 will ensure that the interface that has the IP address 172.16.1.y will operate OSPF and it will also be put in area 0.
- The command Georgia2(config-router)#network 172.16.10.14 0.0.0.3 area 1 will ensure that the interface with the IP address 172.16.10.4—7 will operate OSPF it will also be put in area 1.
- The command Georgia2(config-router)#area 1 stub will allow you to make area 1 stub area. The LSA type 4 and 5s are usually blocked. They are generally not sent into area 1. Usually, a default route is placed into the stub area. It points to Georgia1.
- The command Georgia2(config-router)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#exit will allow you to get back to the privileged mode.
- The command Georgia2#copy running-config startup-config will allow you to save your network configuration to NVRAM.

GeorgiaInt Router:

- The command Router> enable will allow you to shift to the privileged mode.
- The command Router#configure terminal will allow you to shift to the global configuration mode.
- The command Router(config)#hostname GeorgiaInt will allow you to set up the name of the router.
- The command GeorgiaInt(config)#interface loopback0 will allow you to enter the mode of loopback interface.
- The command GeorgiaInt(config-if)#ip address (enter ip address here) will allow you to assign the IP address and the netmask to the network.
- The command GeorgiaInt(config-if)#description Router ID will

allow you to set up a description that is locally significant.

- The command GeorgiaInt(config-if)#exit will allow you to shift back to the global configuration mode.
- The command GeorgiaInt(config-if)#exit will allow you to reenter the global configuration mode.
- The command GeorgiaInt(config)#router ospf1 will allow you to kick off OSPF 1.
- The command GeorgiaInt(config-router)#network 172.16.0.0 0.0.255.255 area 1 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command GeorgiaInt(config-router)#area 1 stub will allow you to make area 1 stub area.
- The command GeorgiaInt(config-router)#exit will take you back to the global configuration mode.
- The command GeorgiaInt(config)#exit will allow you to get back to the privileged mode.
- The command GeorgiaInt#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Loopback Interfaces

- The command Georgia(config)#interface loopback0 will allow you to create a type of virtual interface named Loopback 0. It then shifts the router to the configuration mode of the interface.
- The command Georgia(config-if)#ip address (Ip address) will allow you to assign an IP address to your interface. The loopback interfaces are all the time up. They do not go down unless you shut them down manually. This is why loopback interfaces are great for usage as OSPF router ID.

Router ID

- The command Georgia(config)#router ospf 1 will allow you to kick off process 1.
- The command Georgia(config-router)#router-id 10.1.1.1 will allow you to set up the router ID and fix it to 10.1.1.1. If you use the command on the OSPF router process that is active already, the new router ID will be used at the next reload. It will also be used for the manual restart of the OSPF process.
- The command Georgia(config-router)#no router-id 10.1.1.1 will allow you to remove your static router ID from the process of configuration. If you use the command on the ODPF router process that is active already, the old router ID will be used at the upcoming reload or at the manual restart of the OSPF process.

If you want to choose the router ID at the point of the initialization of the OSPF process, the router will use the following criteria in a particular order.

- You should use the router ID that is specified in the command regarding the router-id ip address.
- You should use the highest IP address among the active loopback interfaces that present are on the router.
- You should use the highest IP address among the active nonloopback interfaces that are present on the router.

DR/BDR Elections

- The command Georgia(config)#interface fastethernet0/0 will allow you to enter into the interface's configuration mode.
- The command Georgia(config-if)#ip ospf priority 100 will allow you to change the priority of the ospf interface to 100. You can set the priority at any figure between 0 and 255. The priority of 0 will make the router ineligible to create a designated router (DR). The highest priority will win the election and become the DR. The one that comes at the second slot will win the position of BDR. If all the routers on a network have the same priority, there will be a tie. You can break up a tie by the highest router ID. The default setting for the priorities is set at 1.

Passive Interfaces

- The command Georgia(config)#router ospf 1 will allow you to kick off the OSPF process 1.
- The command Georgia(config-router)#network 172.16.10.0 0.0.0.255 area 0 will allow you to put the interface with the address 172.16.10.y into area 0.
- The command Georgia(config-router)#passive-interface fastethernet0/0 will disable the process of sending OSPF packets on your interface.
- The command Georgia(config-router)#passive-interface default will disable the process of sending OSPF packets on all the interfaces in the system.
- The command Georgia(config-router)#no passive-interface serial 0/0/1 will enable the process of sending OSPF packets to interface serial0/0/1. That's how it allows the neighbor adjacencies to formulate.

Cost Metrics

- The command Georgia(config)#interface will land you in the mode of configuration of your interface.
- The command Georgia(config-if)#bandwidth 256 will let you change the bandwidth of your network. If you change it, the OSPF will allow you to recalculate the link cost.

Configuration: OSPF Single Area

In the following section, I will show network topology for single-area OSPF. I will state all the relevant commands to single-area OSPF.

Georgia1 router:

- The command Georgia1(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia1(config-router)#network 172.16.10.0

0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.

- The command Georgia1(config-router)#network 172.16.20.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#<CTRL> z will take you back to the network system's privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia2:

- The command Georgia1(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia1(config-router)#network 172.16.10.0. 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#<CTRL> z will take you back to the network system's privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia3:

- The command Georgia1(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia1(config-router)#network 172.16.40.2 0.0.0.0 area 0 will ensure that the interface that has the IP address 172.16.40.2 will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#network 172.16.50.1 0.0.0.0 area 0 will ensure that the interface that has the IP address 172.16.50.1 will operate OSPF and it will also be put in area 0.

- The command Georgia1(config-router)#<CTRL> z will take you back to the network system's privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

OSPF Single Area Configuration

I will use three routers and set up the commands accordingly.

Georgia:

- The command Georgia(config)#router ospf1 will allow you to initiate the OSPF 1 process.
- The command Georgia(config-router)#network 172.16.10.0 0.0.0.255 area 0 will ensure that the interface that has the IP address 172.16.10.y will operate OSPF and it will also be put in area 0.
- The command Georgia(config-router)#network 172.16.20.0 0.0.0.255 area 0 will ensure that the interface with the IP address 172.16.20.y will operate OSPF it will also be put in area 0.
- The command Georgia(config)#<CTRL> z will allow you to get back to the privileged mode.
- The command Georgia#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia1:

- The command Georgia1(config)#router ospf1 will allow you to initiate the OSPF 1 process.
- The command Georgia1(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface with the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config)#<CTRL> z will allow you to get back to the privileged mode.
- The command Georgia1#copy running-config startup-config will

allow you to save your network configuration to NVRAM.

Georgia3:

- The command Georgia3(config)#router ospf1 will allow you to initiate the OSPF 1 process.
- The command Georgia3(config-router)#network 172.16.40.2 0.0.0.0 area 0 will ensure that the interface with the IP address 172.16.40.2 will operate OSPF and it will also be put in area 0.
- The command Georgia3(config)#<CTRL> z will allow you to get back to the privileged mode.
- The command Georgia3#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Chapter Seven: Open Shortest Path Protocol (OSPF) Area and Network Types

This chapter will walk you through the OSPF area types and network types. You will learn the commands for different areas and networks related to OSPF.

OSPF Special Area Types

In this section, I will explain the different areas of OSPF. Generally, they are four in total. Stub areas, totally stubby area, totally NSSA and not-so-stubby areas (NSSAs) are the four major categories discussed in this section.

Stub Areas

- The command ABR (config)#router ospf 1 will kick off the OSPF process 1.
- The command ABR (config-router)#network 172.16.10.0 0.0.0.255 area 0 will allow you to confirm that any interface that possesses the address 172.16.10.y will run OSPF and will also be placed inside area 0.
- The command ABR (config-router)#network 172.16.20.0 0.0.0.255 area 51 will allow you to confirm that any interface that possesses the address 172.16.20.y will run OSPF and will also be placed inside area 51.
- The command ABR (config-router)#area 51 stub will allow you to label area 51 as the stub area.
- The command ABR (config-router)#area 51 default-cost 10 will explain the cost of the default router sent into the stub area. The default value is 1. This is considered an optional command and you can use it at will.
- The command ABR (config)#router ospf 1 will allow you to kick off the OSPF process 1.
- The command Internal(config-router)#network 172.16.20.0 0.0.0.255 area 51 will allow you to confirm that any interface that

possesses the address 172.16.20.y will run OSPF and will also be placed inside area 51.

- The command Internal(config-router)#area 51 stub will label area 51 as the stub area. That's how the shift in area is made possible. All the routers inside the stub area ought to be configured with area x stub command.

Totally Stubby Areas

- The command ABR (config)#router ospf 1 will kick off the OSPF process 1.
- The command ABR (config-router)#network 172.16.10.0 0.0.0.255 area 0 will allow you to confirm that any interface that possesses the address 172.16.10.y will run OSPF and will also be placed inside area 0.
- The command ABR (config-router)#network 172.16.20.0 0.0.0.255 area 51 will allow you to confirm that any interface that possesses the address 172.16.20.y will run OSPF and will also be placed inside area 51.
- The command ABR (config-router)#area 51 stub no-summary will allow you to label area 51 as the totally stub area.
- The command ABR (config)#router ospf 1 will allow you to kick off the OSPF process 1.
- The command ABR (config-router)#network 172.16.20.0 0.0.0.255 area 51 will allow you to confirm that any interface that possesses the address 172.16.20.y will run OSPF and will also be placed inside area 51.
- The command ABR (config-router)#area 51 stub will label area 51 as the stub area. That's how the shift in area is made possible. As all the internal routers in the particular area are configured with area x nssa command, the ABR router is configured with area x nssa no-summary command

Not-So-Stubby Areas

- The command ABR (config)#router ospf 1 will kick off the OSPF process 1.
- The command ABR (config-router)#network 172.16.10.0 0.0.0.255 area 0 will allow you to confirm that any interface that possesses the address 172.16.10.y will run OSPF and will also be placed inside area 0.
- The command ABR (config-router)#network 172.16.20.0 0.0.0.255 area 1 will allow you to confirm that any interface that possesses the address 172.16.20.y will run OSPF and will also be placed inside area 1.
- The command ABR (config-router)#area 1 nssa will allow you to label area 1 as the no-so-stubby-area.
- The command Internal(config)#router ospf 1 will allow you to initiate the OSPF process 1.
- The command Internal(config-router)#network 172.16.20.0 0.0.0.255 area 1 will allow you to confirm that any interface that possesses the address 172.16.20.y will run OSPF and will also be placed inside area 1.
- The command Internal(config-router)#area 1 nssa will label area 1 as the not-so-stubby-area.

Totally NSSA

- The command ABR (config)#router ospf 1 will kick off the OSPF process 1.
- The command ABR (config-router)#network 172.16.10.0 0.0.0.255 area 0 will allow you to confirm that any interface that possesses the address 172.16.10.y will run OSPF and will also be placed inside area 0.
- The command ABR (config-router)#network 172.16.20.0 0.0.0.255 area 11 will allow you to confirm that any interface that possesses the address 172.16.20.y will run OSPF and will also be placed inside area 11.

- The command ABR (config-router)#area 11 nssa no-summary will allow you to label area 11 as the totally nssa.
- The command Internal(config)#router ospf 1 will allow you to kick off the OSPF process 1.
- The command Internal(config-router)#network 172.16.20.0 0.0.0.255 area 11 will allow you to confirm that any interface that possesses the address 172.16.20.y will run OSPF and will also be placed inside area 11.
- The command Internal(config-router)#area 11 nssa will label area 11 as NSSA. As all the internal routers in the particular area are configured with area x nssa command, the ABR router is configured with area x nssa no-summary command.

OSPF Network Types

The OSPF network types ought to be described as a Cisco proprietary or as RFC complaint.

Full-Mesh Frame Relay: NBMA for Physical Interfaces

- The command Georgia(config)#router ospf 1 will let you start the OSPF process 1.
- The command Georgia(config-router)#neighbor 10.1.1.2 will let you identify the neighboring router.
- The command Georgia(config-router)#exit will let you get back to the network system's mode of global configuration.
- The command Georgia(config)#interface serial0/0/0 will let you switch to the mode of interface configuration.
- The command Georgia(config-if)#encapsulation frame-relay will let you enable the frame relay on your interface.
- The command Georgia(config-if)#ip address (ip address) will let you assign a particular IP address as well as a netmask to your interface.
- The command Georgia(config-if)#ip ospf network non-broadcast will let you define the OSPF nonbroadcast network type. This is

known as the default on the physical interfaces.

- The command Georgia(config-if)#frame-relay map ip 10.1.1.2.100 will let you map out a remote IP address to the data-link connection identifier (DLCI) 100.
- The command Georgia(config-if)#frame-relay map ip 10.1.1.3 200 will let you map out a remote IP address to DLCI 200. When you are using the neighbor command, it will allow for the OSPF router to trade routing information in the absence of multicasts. Instead, you can use unicasts to the IP address that is manually entered.

Broadcast on the Physical Interfaces

- The command Georgia(config)#interface serial0/0/0 will let you switch to the mode of interface configuration.
- The command Georgia(config-if)#encapsulation frame-relay will let you enable the frame relay on your interface.
- The command Georgia(config-if)#ip address (ip address) will let you assign a particular IP address as well as a netmask to your interface.
- The command Georgia(config-if)#ip ospf network non-broadcast will let you define the OSPF nonbroadcast network type. This is known as the default on the physical interfaces.
- The command Georgia(config-if)#frame-relay map ip 10.1.1.2.100 will let you map out a remote IP address to the data-link connection identifier (DLCI) 100.
- The command Georgia(config-if)#frame-relay map ip 10.1.1.3 200 will let you map out a remote IP address to DLCI 200. When you are using the neighbor command, it will allow for the OSPF router to trade routing information in the absence of multicasts. Instead, you can use unicasts to the IP address that is manually entered.
- The command Georgia(config-if)#no shutdown will let you enable your interface.

- The command Georgia(config-if)#network 10.1.1.0 0.0.0.255 area 0 will let you confirm that any interface that possesses the address 10.1.1.y will run OSPF and will also be placed inside area 0.

Point-to-Multipoint Networks

- The command Georgia(config)#interface serial0/0/0 will let you switch to the mode of interface configuration.
- The command Georgia(config-if)#encapsulation frame-relay will let you enable the frame relay on your interface.
- The command Georgia(config-if)#ip address (ip address) will let you assign a particular IP address as well as a netmask to your interface.
- The command Georgia(config-if)#ip ospf network point-to-multipoint will let you change the type of the network to point-to-multipoint network.
- The command Georgia(config-if)#exit will take you back to the mode of global configuration.
- The command Georgia(config)#router ospf 1 will let you start the OSPF process 1.
- The command Georgia(config-if)#network 10.1.1.0 0.0.0.255 area 0 will let you confirm that any interface that possesses the address 10.1.1.y will run OSPF and will also be placed inside area 0.
- The command Georgia(config-if)#neighbor 10.1.1.2 will let you detect the neighbor router.
- The command Georgia(config-if)#exit will take you back to the mode of global configuration.
- The command Georgia(config)#interface serial0/0/0 will let you switch to the mode of interface configuration.
- The command Georgia(config-if)#ip ospf network point-to-multipoint non-broadcast will let you create and enter a point-to-

multipoint network mode that is non-broadcast as well. The point-to-multipoint non-broadcast mode is a kind of Cisco extension to RFC-compliant mode. The neighbors in the network ought to be manually defined in this specific mode. The BDRs/DR will not be used in this specific mode. The point-to-multipoint non-broadcast mode can be used in some special cases in which neighbors are not supposed to be discovered automatically.

Point-to-Point Networks

- The command Georgia(config)#interface serial0/0/0 will let you switch to the mode of interface configuration.
- The command Georgia(config-if)#encapsulation frame-relay will let you enable the frame relay on your interface.
- The command Georgia(config-if)#no shutdown will let you enable your interface.
- The command Georgia(config)#interface serial0/0/0.300 point-to-point will let you create a subinterface 300 and make it onwards a point-to-point network. This is a kind of default mode.
- The command Georgia(config-subif)#ip address (ip address) will let you assign a particular IP address as well as a netmask to your interface.
- The command Georgia(config-subif)#frame-relay interface-dlci 300 will let you map out and assign the DLCI 300 to your subinterface.
- The command Georgia(config-subif)#interface serial0/0/0.400 point-to-point will let you define and create subinterfaces 400 and make them point-to-point networks.
- The command Georgia(config-subif)#ip address (ip address) will let you assign a particular IP address as well as a netmask to your interface.
- The command Georgia(config-subif)#frame-relay interface-dlci 400 will let you map out and assign DLCI 400 to your subinterface.

- The command Georgia(config-subif)#exit will take you back to the mode of interface configuration.
- The command Georgia(config-if)#exit will take you back to the mode of global configuration.

OSPF and NBMA Topology

The broadcast mode of OSPF will have partial or full mesh NBMA preferred topology. The subnet address will remain the same while the hello timer will be 10 seconds. The adjacency will be automatic, DR/BDR elected and the network will be cisco.

The nonbroadcast mode of OSPF will have partial or full mesh NBMA preferred topology. The subnet address will remain the same while the hello timer will be 30 seconds. The adjacency will be manual configuration and DR/BDR elected, and the network will be RFC.

The point-to-multipoint mode of OSPF will have partial or star mesh NBMA preferred topology. The subnet address will remain the same while the hello timer will be 30 seconds. The adjacency will be automatic, DR/BDR elected and the network will be RFC.

The point-to-point multipoint nonbroadcast mode of OSPF will have partial or full mesh NBMA preferred topology. The subnet address will remain the same while the hello timer will be 30 seconds. The adjacency will be manual configuration and DR/BDR elected, and the network will be cisco.

The point-to-point mode of OSPF will have partial or full mesh NBMA preferred topology. The subnet address will be different for all the interfaces while the hello timer will be 10 seconds. The adjacency will be automatic, DR/BDR elected and the network will be cisco.

OSPF and NBMA Networks

In the following section, I will explain how you can configure OSPF on the NBMA network by using the following commands. In the network, there will be four routers that will be connected to a frame relay. Each router will have a set of commands to run the network effectively.

Georgia1 Router:

- The command Georgia1(config)#interface serial0/0/0 will allow

you to enter the configuration mode.

- The command Georgia1(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia1(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia1(config-if)#frame-relay map ip (enter ip address here) 50 will allow you to map out a remote IP address to the local DLCI 50.
- The command Georgia1(config-if)#frame-relay map ip (enter ip address here) 51 will allow you to map out a remote IP address to the local DLCI 51.
- The command Georgia1(config-if)#frame-relay map ip (enter ip address here) 52 will allow you to map out a remote IP address to the local DLCI 52.
- The command Georgia1(config-if)#ip ospf priority 10 will allow you to change your OSPF interface priority into 10.
- The command Georgia1(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia1(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia1(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia1(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#neighbor 172.16.2.2 will allow you to identify the neighbor to Georgia1. In this case the neighbor is Georgia2.
- The command Georgia1(config-router)#neighbor 172.16.2.3 will

allow you to identify the neighbor to Georgia1. In this case the neighbor is Georgia3.

- The command Georgia1(config-router)#neighbor 172.16.2.4 will allow you to identify the neighbor to Georgia1. In this case the neighbor is Georgia4.
- The command Georgia1(config-router)#exit will take you back to the global configuration mode.
- The command Georgia1(config)#exit will allow you to get back to the privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia2 Router:

- The command Georgia2(config)#interface serial0/0/0 will allow you to enter the configuration mode.
- The command Georgia2(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia2(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia2(config-if)#frame-relay map ip (enter ip address here) 50 will allow you to map out a remote IP address to the local DLCI 50.
- The command Georgia2(config-if)#frame-relay map ip (enter ip address here) 150 will allow you to map out a remote IP address to the local DLCI 150.
- The command Georgia2(config-if)#frame-relay map ip (enter ip address here) 150 will allow you to map out a remote IP address to the local DLCI 150.
- The command Georgia2(config-if)#ip ospf priority 0 will allow you to change your OSPF interface priority into 0.

- The command Georgia2(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia2(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia2(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia2(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia2(config-router)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#exit will allow you to get back to the privileged mode.
- The command Georgia2#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia3 router:

- The command Georgia3(config)#interface serial0/0/0 will allow you to enter the configuration mode.
- The command Georgia3(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia3(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia3(config-if)#frame-relay map ip 172.16.2.1 151 will allow you to map out a remote IP address to the local DLCI 151.
- The command Georgia3(config-if)#frame-relay map ip 172.16.2.2 151 will allow you to map out a remote IP address to the local DLCI 151.

- The command Georgia3(config-if)#frame-relay map ip 172.16.2.1 151 will allow you to map out a remote IP address to the local DLCI 151.
- The command Georgia3(config-if)#ip ospf priority 0 will allow you to change your OSPF interface priority into 0.
- The command Georgia3(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia3(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia3(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia3(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia3(config-if)#ip ospf priority 0 will allow you to change your OSPF interface priority into 0.
- The command Georgia3(config-router)#exit will take you back to the global configuration mode.
- The command Georgia3(config)#exit will allow you to get back to the privileged mode.
- The command Georgia3#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia4 router:

- The command Georgia4(config)#interface serial0/0/0 will allow you to enter the configuration mode.
- The command Georgia4(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia4(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask

to the system.

- The command Georgia4(config-if)#frame-relay map ip 172.16.2.1 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.2 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.3 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#ip ospf priority 0 will allow you to change your OSPF interface priority into 0.
- The command Georgia3(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia4(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia4(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia4(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia4(config-router)#exit will take you back to the global configuration mode.
- The command Georgia4(config)#exit will allow you to get back to the privileged mode.
- The command Georgia4#copy running-config startup-config will allow you to save your network configuration to NVRAM.

OSPF and Broadcast Networks

Just like the NBMA network, we will use four routers to build a broadcast network. I will explain in detail the commands that are required to build and

configure the network system.

Georgia 1:

- The command Georgia1(config)#interface serial0/0/0 will allow you to enter the configuration mode.
- The command Georgia1(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia1(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia1(config-if)#ip ospf network broadcast will allow you to switch your network's type from default nonbroadcast to the broadcast.
- The command Georgia1(config-if)#ip ospf priority 10 will allow you to change your OSPF interface priority into 10 for DR and BDR election process.
- The command Georgia1(config-if)#frame-relay map ip 172.16.2.1 50 will allow you to map out a remote IP address to the local DLCI 50.
- The command Georgia1(config-if)#frame-relay map ip 172.16.2.1 51 will allow you to map out a remote IP address to the local DLCI 51.
- The command Georgia1(config-if)#frame-relay map ip 172.16.2.1 52 will allow you to map out a remote IP address to the local DLCI 52.
- The command Georgia1(config-if)#no shut will allow you to enable your interface on the network.
- The command Georgia1(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia1(config)#router ospf1 will allow you to kick off OSPF 1.

- The command Georgia1(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#exit will take you back to the global configuration mode.
- The command Georgia1(config)#exit will allow you to get back to the privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia2 router:

- The command Georgia2(config)#interface serial0/0/0 will allow you to enter the configuration mode.
- The command Georgia2(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia2(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia2(config-if)#ip ospf network broadcast will allow you to switch your network's type from default nonbroadcast to the broadcast.
- The command Georgia1(config-if)#ip ospf priority 0 will allow you to change your OSPF interface priority into 0 for DR and BDR election process.
- The command Georgia2(config-if)#frame-relay map ip 172.16.2.1 150 will allow you to map out a remote IP address to the local DLCI 150.
- The command Georgia2(config-if)#frame-relay map ip 172.16.2.2 150 will allow you to map out a remote IP address to the local DLCI 150.
- The command Georgia2(config-if)#frame-relay map ip

172.16.2.3 150 will allow you to map out a remote IP address to the local DLCI 150.

- The command Georgia2(config-if)#no shut will enable your interface on the network.
- The command Georgia2(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia2(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia2(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia2(config-router)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#exit will allow you to get back to the privileged mode.
- The command Georgia2#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia3 router:

- The command Georgia3(config)#interface serial0/0/0 will allow you to enter the configuration mode.
- The command Georgia3(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia3(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia3(config-if)#ip ospf network broadcast will allow you to switch your network's type from default nonbroadcast to the broadcast.
- The command Georgia3(config-if)#ip ospf priority 0 will allow

you to change your OSPF interface priority into 0 for DR and BDR election process.

- The command Georgia3(config-if)#frame-relay map ip 172.16.2.1 151 will allow you to map out a remote IP address to the local DLCI 151.
- The command Georgia3(config-if)#frame-relay map ip 172.16.2.2 151 will allow you to map out a remote IP address to the local DLCI 151.
- The command Georgia3(config-if)#frame-relay map ip 172.16.2.4 151 will allow you to map out a remote IP address to the local DLCI 151.
- The command Georgia3(config-if)#no shut will allow you to enable your interface on the network.
- The command Georgia3(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia3(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia3(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia3(config-router)#exit will take you back to the global configuration mode.
- The command Georgia3(config)#exit will allow you to get back to the privileged mode.
- The command Georgia3#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia4 router:

- The command Georgia4(config)#interface serial0/0/0 will allow you to enter the configuration mode.
- The command Georgia4(config-if)#encapsulation frame-relay

will allow you to enable the Frame Relay Encapsulation on the network.

- The command Georgia4(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia4(config-if)#ip ospf network broadcast will allow you to switch your network's type from default nonbroadcast to the broadcast.
- The command Georgia4(config-if)#ip ospf priority 0 will allow you to change your OSPF interface priority into 0 for DR and BDR election process.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.1 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.2 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.3 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#no shut will allow you to enable your interface on the network.
- The command Georgia4(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia4(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia4(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia4(config-router)#exit will take you back to the global configuration mode.

- The command Georgia4(config)#exit will allow you to get back to the privileged mode.
- The command Georgia4#copy running-config startup-config will allow you to save your network configuration to NVRAM.

OSPF and Point-to-Multipoint Networks

Georgia1 router:

- The command Georgia1(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.
- The command Georgia1(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia1(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia1(config-if)#ip ospf network point-to-multipoint will allow you to switch your network's type from default nonbroadcast to point-to-multipoint.
- The command Georgia1(config-if)#frame-relay map ip 172.16.2.2 50 will allow you to map out a remote IP address to the local DLCI 50.
- The command Georgia1(config-if)#frame-relay map ip 172.16.2.3 51 will allow you to map out a remote IP address to the local DLCI 51.
- The command Georgia1(config-if)#frame-relay map ip 172.16.2.4 52 will allow you to map out a remote IP address to the local DLCI 52.
- The command Georgia1(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia1(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia1(config)#router ospf1 will allow you to

kick off OSPF 1.

- The command Georgia1(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#exit will take you back to the global configuration mode.
- The command Georgia1(config)#exit will allow you to get back to the privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia2 router:

- The command Georgia2(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.
- The command Georgia2(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia2(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia2(config-if)#ip ospf network point-to-multipoint will allow you to switch your network's type from default nonbroadcast to point-to-multipoint.
- The command Georgia2(config-if)#frame-relay map ip 172.16.2.1 150 will allow you to map out a remote IP address to the local DLCI 150.
- The command Georgia2(config-if)#frame-relay map ip 172.16.2.3 150 will allow you to map out a remote IP address to the local DLCI 150.
- The command Georgia2(config-if)#frame-relay map ip 172.16.2.4 150 will allow you to map out a remote IP address to the local DLCI 150.

- The command Georgia2(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia2(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia2(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia2(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia2(config-router)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#exit will allow you to get back to the privileged mode.
- The command Georgia2#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia3 router:

- The command Georgia3(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.
- The command Georgia3(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia3(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia3(config-if)#ip ospf network point-to-multipoint will allow you to switch your network's type from default nonbroadcast to point-to-multipoint.
- The command Georgia3(config-if)#frame-relay map ip 172.16.2.1 151 will allow you to map out a remote IP address to the local DLCI 151.

- The command Georgia3(config-if)#frame-relay map ip 172.16.2.2 151 will allow you to map out a remote IP address to the local DLCI 151.
- The command Georgia3(config-if)#frame-relay map ip 172.16.2.4 151 will allow you to map out a remote IP address to the local DLCI 151.
- The command Georgia3(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia3(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia3(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia3(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia3(config-router)#exit will take you back to the global configuration mode.
- The command Georgia3(config)#exit will allow you to get back to the privileged mode.
- The command Georgia3#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia4 router:

- The command Georgia4(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.
- The command Georgia4(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia4(config-if)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.

- The command Georgia4(config-if)#ip ospf network point-to-multipoint will allow you to switch your network's type from default nonbroadcast to point-to-multipoint.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.2 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.2 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#frame-relay map ip 172.16.2.2 152 will allow you to map out a remote IP address to the local DLCI 152.
- The command Georgia4(config-if)#no shutdown will allow you to enable your interface on the network.
- The command Georgia4(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia4(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia4(config-router)#network 172.16.0.0. 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia4(config-router)#exit will take you back to the global configuration mode.
- The command Georgia4(config)#exit will allow you to get back to the privileged mode.
- The command Georgia4#copy running-config startup-config will allow you to save your network configuration to NVRAM.

OSPF and Point-to-Point Networks By Using Subinterfaces

The following section is packed up with commands to build a four router network of OSPF and point-to-point networks. There will be commands for four routers in the following example. You can build and configure the

network by using the following commands.

Georgia1 router:

- The command Georgia1(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.
- The command Georgia1(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia1(config-if)#no shutdown will allow you to start your interface.
- The command Georgia1(config-if)#interface serial 0/0/0.50 point-to-point will allow you to make a subinterface.
- The command Georgia1(config-subif)#description Link to Georgia2 will allow you to create a locally significant interface description.
- The command Georgia1(config-subif)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia1(config-subif)#frame-relay interface-dlci 50 will allow you to assign a DLCI to subinterface.
- The command Georgia1(config-subif)#exit will allow you to shift back to the interface configuration mode.
- The command Georgia1(config-if)#interface serial 0/0/0.51 point-to-point will allow you to make a subinterface.
- The command Georgia1(config-subif)#description Link to Georgia3 will allow you to create a locally significant interface description.
- The command Georgia1(config-subif)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia1(config-subif)#frame-relay interface-dlci 51 will allow you to assign a DLCI to subinterface.

- The command Georgia1(config-subif)#exit will allow you to shift back to the interface configuration mode.
- The command Georgia1(config-if)#interface serial 0/0/0.52 point-to-point will allow you to make a subinterface.
- The command Georgia1(config-subif)#description Link to Georgia4 will allow you to create a locally significant interface description.
- The command Georgia1(config-subif)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia1(config-subif)#frame-relay interface-dlci 52 will allow you to assign a DLCI to subinterface.
- The command Georgia1(config-subif)#exit will allow you to shift back to the interface configuration mode.
- The command Georgia1(config-if)#exit will allow you to shift back to the global configuration mode.
- The command Georgia1(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia1(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia1(config-router)#exit will take you back to the global configuration mode.
- The command Georgia1(config)#exit will allow you to get back to the privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia 2:

- The command Georgia2(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.

- The command Georgia2(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia2(config-if)#no shutdown will allow you to start your interface.
- The command Georgia2(config-if)#interface serial 0/0/0.150 point-to-point will allow you to make a subinterface.
- The command Georgia2(config-subif)#description Link to Georgia1 will allow you to create a locally significant interface description.
- The command Georgia2(config-subif)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia2(config-subif)#frame-relay interface-dlci 150 will allow you to assign a DLCI to subinterface.
- The command Georgia2(config-subif)#exit will allow you to shift back to the interface configuration mode.
- The command Georgia2(config)#exit will allow you to shift back to the global configuration mode.
- The command Georgia2(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia2(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia2(config-router)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#exit will allow you to get back to the privileged mode.
- The command Georgia2#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia3 router:

- The command Georgia3(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.
- The command Georgia3(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia3(config-if)#no shutdown will allow you to start your interface.
- The command Georgia3(config-if)#interface serial 0/0/0.151 point-to-point will allow you to make a subinterface.
- The command Georgia3(config-subif)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia3(config-subif)#frame-relay interface-dlci 151 will allow you to assign a DLCI to subinterface.
- The command Georgia3(config-subif)#exit will allow you to shift back to the interface configuration mode.
- The command Georgia3(config)#exit will allow you to shift back to the global configuration mode.
- The command Georgia3(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia3(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia3(config-router)#exit will take you back to the global configuration mode.
- The command Georgia3(config)#exit will allow you to get back to the privileged mode.
- The command Georgia3#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia4:

- The command Georgia2(config)#interface serial0/0/0 will allow you to enter the interface's configuration mode.
- The command Georgia2(config-if)#encapsulation frame-relay will allow you to enable the Frame Relay Encapsulation on the network.
- The command Georgia2(config-if)#no shutdown will allow you to start your interface.
- The command Georgia2(config-if)#interface serial 0/0/0.150 point-to-point will allow you to make a subinterface.
- The command Georgia2(config-subif)#description Link to Georgia1 will allow you to create a locally significant interface description.
- The command Georgia2(config-subif)#ip address (enter ip address here) will allow you to assign a particular IP address and netmask to the system.
- The command Georgia2(config-subif)#frame-relay interface-dlci 150 will allow you to assign a DLCI to subinterface.
- The command Georgia2(config-subif)#exit will allow you to shift back to the interface configuration mode.
- The command Georgia2(config)#exit will allow you to shift back to the global configuration mode.
- The command Georgia2(config)#router ospf1 will allow you to kick off OSPF 1.
- The command Georgia2(config-router)#network 172.16.0.0 0.0.255.255 area 0 will ensure that the interface that has the IP address 172.16.y.y will operate OSPF and it will also be put in area 0.
- The command Georgia2(config-router)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#exit will allow you to get back to the privileged mode.
- The command Georgia2#copy running-config startup-config will

allow you to save your network configuration to NVRAM.

OSPF for IPv6 on Interface

- The command Georgia(config)#ipv6 unicast-routing will let you enable the globally spread of IPv6 unicast datagrams across the router.
- The command Georgia(config)#interface fastethernet0/0 will let you switch to the mode for interface configuration.
- The command Georgia(config-if)#ipv6 address 2001:db8:0:1: :/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia(config-if)#ipv6 ospf 1 area 0 will let you enable the OSPFv3 process 1 across the interface. It also places the interface into area 0.
- The command Georgia(config-if)#ipv6 ospf priority 50 will let you assign a certain priority number to your interface, which you can use in the designated router election. You can set the priority number between 1 and 255. If you do not assign any number, the default digit 1 will be automatically set. The router with priority set up to 0 is not eligible to become a DR(BDR) or DR.
- The command Georgia(config-if)#ipv6 ospf cost 50 will allow you to assign the cost value 50 to the interface. The cost values may be any integer between 1 and 65,535.
- The command Georgia(config)#ospfv3 1 ipv6 will enable the OSPFv3 instance with 1. The address family will be IPv6 and area will be 0.
- The command Georgia(config)#ospfv3 1 ipv4 will enable the OSPFv3 instance with 1. The address family will be IPv4 and area will be 0.

OSPFv3 Address Families

- The command Georgia(config)#router ospfv3 1 will enable the

router configuration mode of OSPFv3 for IPv6 and IPv4 address families.

- The command Georgia(config-router)#address-family ipv6 unicast will enable the router configuration mode of OSPFv3 for IPv6 address family. You will be able to notice a prompt change in the interface.

OSPFv3 for IPv4

- The command Georgia(config)#router ospfv3 1 will enable the router configuration mode of OSPFv3 for IPv6 and IPv4 address families.
- The command Georgia(config-router)#address-family ipv4 unicast will enable the router configuration mode of OSPFv3 for IPv4 address family. You will be able to notice a prompt change in the interface.

OSPFv3 for IPv6

Georgia3 Router:

- The command Georgia3(config)#ipv6 unicast-routing will let you enable the globally spread of IPv6 unicast datagrams across the router.
- The command Georgia3(config)#interface fastethernet0/0 will let you switch to the mode for interface configuration.
- The command Georgia3(config-if)#ipv6 address 2001:db8:0:1: :3/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia3(config-if)#ipv6 ospf 1 area 1 will let you enable the OSPFv3 process across the interface. It also places the interface into area 1.
- The command Georgia3(config-if)#no shutdown will let you enable the interface of your network.

- The command Georgia3(config-if)#interface loopback0 will let you shift to the interface configuration mode.
- The command Georgia3(config-if)#ipv6 address 2001:db8:0:1::1/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia3(config-if)#ipv6 ospf 1 area 1 will let you enable the OSPFv3 process across the interface. It also places the interface into area 1.
- The command Georgia3(config-rtr)#router-id 3.3.3.3 will let you set up a router ID that is manually configured.
- The command Georgia3(config-if)#exit will take you back to the global configuration mode.
- The command Georgia3(config)#exit will allow you to get back to the privileged mode.
- The command Georgia3#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia2 router:

- The command Georgia2(config)#ipv6 unicast-routing will let you enable the globally spread of IPv6 unicast datagrams across the router.
- The command Georgia2(config)#interface fastethernet0/0 will let you switch to the mode for interface configuration.
- The command Georgia2(config-if)#ipv6 address 2001:db8:0:1::2/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia2(config-if)#ipv6 ospf 1 area 1 will let you enable the OSPFv3 process across the interface. It also places the interface into area 1.
- The command Georgia2(config-if)#no shutdown will let you enable the interface of your network.

- The command Georgia2(config-if)#interface loopback0 will let you shift to the interface configuration mode.
- The command Georgia2(config-if)#ipv6 address 2001:db8:0:1::1/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia2(config-if)#ipv6 ospf 1 area 1 will let you enable the OSPFv3 process across the interface. It also places the interface into area 1.
- The command Georgia2(config-rtr)#router-id 2.2.2.2 will let you set up a router ID that is manually configured.
- The command Georgia2(config-if)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#exit will allow you to get back to the privileged mode.
- The command Georgia2#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia1 Router:

- The command Georgia1(config)#ipv6 unicast-routing will let you enable the globally spread of IPv6 unicast datagrams across the router.
- The command Georgia1(config)#interface fastethernet0/0 will let you switch to the mode for interface configuration.
- The command Georgia1(config-if)#ipv6 address 2001:db8:0:1::1/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia1(config-if)#ipv6 ospf 1 area 1 will let you enable the OSPFv3 process across the interface. It also places the interface into area 1.
- The command Georgia1(config-if)#no shutdown will let you enable the interface of your network.

- The command Georgia1(config)#interface serial0/0 will let you switch to the mode for interface configuration.
- The command Georgia1(config-if)#ipv6 address 2001:db8:0:1::1/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia1(config-if)#ipv6 ospf 1 area 0 will let you enable the OSPFv3 process across the interface. It also places the interface into area 0.
- The command Georgia1(config-if)#clock rate 56000 will let you set up and assign the clock rate to your interface.
- The command Georgia1(config-if)#no shutdown will let you enable the interface of your network.
- The command Georgia1(config-if)#exit will take you back to the global configuration mode.
- The command Georgia2(config)#ipv6 router ospf 1 will allow you to shift to OSPFv3 configuration mode.
- The command Georgia2(config-rtr)#router-id 1.1.1.1 will let you set up a router ID that is manually configured.
- The command Georgia1(config-if)#exit will take you back to the global configuration mode.
- The command Georgia1(config)#exit will allow you to get back to the privileged mode.
- The command Georgia1#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Georgia4 Router:

- The command Georgia4(config)#ipv6 unicast-routing will let you enable the globally spread of IPv6 unicast datagrams across the router.
- The command Georgia4(config)#interface serial0/0 will let you switch to the mode for interface configuration.

- The command Georgia4(config-if)#ipv6 address 2001:db8:0:1::2/64 will let you configure the global IPv6 address across the interface and it also enables the IPv6 processing across the interface.
- The command Georgia4(config-if)#ipv6 ospf 1 area 0 will let you enable the OSPFv3 process across the interface. It also places the interface into area 0.
- The command Georgia4(config-if)#no shutdown will let you enable the interface of your network.
- The command Georgia4(config-if)#no shutdown will let you enable the interface of your network.
- The command Georgia4(config-if)#exit will take you back to the global configuration mode.
- The command Georgia4(config)#ipv6 router ospf 1 will allow you to shift to OSPFv3 configuration mode.
- The command Georgia4(config-rtr)#router-id 4.4.4.4 will let you set up a router ID that is manually configured.
- The command Georgia4(config-if)#exit will take you back to the global configuration mode.
- The command Georgia4(config)#exit will allow you to get back to the privileged mode.
- The command Georgia4#copy running-config startup-config will allow you to save your network configuration to NVRAM.

Verifying OSPF Configuration

- The command Georgia#show ip protocol will allow you to see all the parameters for all the protocols that have been running on a router.
- The command Georgia#show ip route will allow you to see the full IP routing table.
- The command Georgia#show ip route ospf will allow you to see

OSPF routes inside the routing table.

- The command Georgia#show ip route ospfv3 will allow you to see the routes for the OSPFv3 routes inside the routing table.
- The command Georgia#show ip ospf will allow you to see the basic information on OSPF's routing processes.
- The command Georgia#show ip ospf border-routers will allow you to see the information about the boundary and borders.
- The command Georgia#show ip ospf database will allow you to see the contents of the OSPF database.
- The command Georgia#show ip ospf database asbr-summary will allow you to see the LSAs of type 4.
- The command Georgia#show ip ospf database external will allow you to see the LSAs of type 5.
- The command Georgia#show ip ospf database nssa-external will allow you to see the external link states of NSSA.
- The command Georgia#show ip ospf database network will allow you to see the network LSAs.
- The command Georgia#show ip ospf database router self-origin will allow you to see the LSAs you have generated locally .
- The command Georgia#show ip ospf database summary will allow you to see a summary of the database of OSPF.
- The command Georgia#show ip ospf interface will allow you to see the OSPF information as it tends to relate to different interfaces.
- The command Georgia#show ip ospf interface fastethernet0/0 will allow you to see the information about the interface namely fastethernet 0/0 of OSPF.
- The command Georgia#show ip ospf neighbor will allow you to see the information about OSPF neighbors and their current states.
- The command Georgia#show ip ospf neighbor detail will allow you to see the list of the neighbors with all the relevant

information.

- The command Georgia#show ipv6 interface will allow you to see the information about the current status of interfaces that are configured for IPv6.
- The command Georgia#show ipv6 interface brief will allow you to see brief details of the interfaces that have been configured for IPv6.
- The command Georgia#show ipv6 neighbors will allow you to see the information about the IPv6 neighbor discovery cache.
- The command Georgia#show ipv6 ospf will allow you to see the information about the routing process of OSPFv4.
- The command Georgia#show ipv6 ospf border-routers will allow you to see the information about the routing table entries of internal OSPF.
- The command Georgia#show ipv6 ospf database will allow you to see the information about the database of OSPFv3.
- The command Georgia#show ipv6 ospf database-summary will allow you to see the information about each type of LSA's existence for all areas in the database.
- The command Georgia#show ipv6 ospf interface will allow you to see the information about the interface linked to OSPFv3.
- The command Georgia#show ipv6 ospf neighbor will allow you to see the information about the neighbors of OSPFv3.
- The command Georgia#show ipv6 ospf virtual-links will allow you to see the information about the present state and the parameters of the virtual links for OSPFv3.
- The command Georgia#show ipv6 protocols will allow you to see the information about the current state and the parameters of the routing protocol processes of IPv6.
- The command Georgia#show ipv6 route will allow you to see the information about the routing table for IPv6.
- The command Georgia#show ipv6 route summary will allow you

to see the summarized information about the routing table for IPv6.

- The command Georgia#show ipv6 routers will allow you to see the information about the router advertisement for IPv6. The information that pops up on the display is usually collected from the other routers.
- The command Georgia#show ipv6 traffic will allow you to see the information about the traffic on IPv6.
- The command Georgia#show ip ospf virtual-links will allow you to see the information about all the virtual links in the system.
- The command Georgia#show ospfv3 database will allow you to see the information about the database of OSPFv3.
- The command Georgia#show ospfv3 neighbor will allow you to see the information on the neighbors of OSPFv3. The information is displayed in a per-interface style to help the reader understand better.

Troubleshooting OSPF

- The command Georgia#clear ip route * will clear away the complete touting table. It will also force the user to rebuild the same.
- The command Georgia#clear ip route x.x.x.x will clear away the specific route for the network namely x.x.x.x. It can have a different name.
- The command Georgia#clear ipv6 route * will clear away all the routes for the IPv6 routing tables.
- The command Georgia#clear ipv6 traffic will help you reset the traffic counters for IPv6.
- The command Georgia#clear ip ospf counters will help you reset the OSPF counters.
- The command Georgia#clear ip ospf process will help you reset the entire process of OSPF. It also forces the OSPF to recreate the

neighbors, the routing table and the database.

- The command Georgia#clear ip ospf 3 process will help you reset the process 3 of OSPF. It also forces the OSPF to recreate the neighbors, the routing table and the database.
- The command Georgia#clear ipv6 ospf process will help you reset the entire process of OSPF. It also forces the OSPF to recreate the neighbors, the routing table and the database.
- The command Georgia#clear ipv6 ospf 3 process will help you reset the process 3 of OSPFv3. It also forces the OSPF to recreate the neighbors, the routing table and the database.
- The command Georgia#debug ipv6 ospf events will help you see all the events of OSPF.
- The command Georgia#debug ip ospf adj will help you see the debug messages that are related to the OSPF adjacency processes.
- The command Georgia#debug ipv6 ospf adj will help you see the debug messages that are related to the OSPF adjacency processes.
- The command Georgia#debug ipv6 packet will help you see the debug messages that are related to the IPv6 packets.
- The command Georgia#debug ip ospf packets will help you see all the OSPF packets.
- The command Georgia#debug ipv6 routing will let you see debug messages that are related to the IPv6 route cache updates and routing table updates.
- The command Georgia#undebug all will let you switch off the debugging commands.

Chapter Eight: Configuration of Switch

This chapter will walk you through the commands and information that are related to the configuration of switch. I will shed light on the hostnames, passwords, duplex and speed settings, interface descriptions and port security and I will explain each command and its purpose. The first on the line is the help command.

- The command switch>? will allow you to get help about different aspects of switches. The symbol ? works in the same manner as it does in a router.

Command Modes

- The command switch>enable lets you enter the user mode in the same way you do in a router.
- The command switch# will allow you to enter the privileged mode in the same way as you do in a router.
- The command switch>disable will allow you to leave the privileged mode in the same way as you do in a router.
- The command switch>exit will allow you to leave the user mode in the same way as you do in a router.

Command Verification

- The command switch#show version will allow you to see the information about the hardware and the software.
- The command switch#show interfaces will let you see the information about the configuration of interfaces and the status of the lines such as admin down, up/up and up/down.
- The command switch#show flash: will allow you to see the information about the flash memory. This feature is only available for the 2900/2950 series only.
- The command switch#show vlan will allow you to see the

information about the present configuration of VLAN.

- The command switch#show mac-address-table will allow you to see the information about the forwarding table of the present MAC address.
- The command switch#show post will allow you to see the information about the POST that is switch passed.
- The command switch#show controllers ethernet-controller will allow you to see the information about the Ethernet controller.
- The command switch#show start will allow you to see the information about the present level of configuration in NVRAM.
- The command switch#show running-config will allow you to see the information about the present configuration style in NVRAM.
- The command switch#show interface vlan1 will allow you to see the information about the settings of the virtual interfaces such as VLAN1 and the default interfaces such as VLAN on the system's switch.

Resetting Configuration

The following settings are for the 1900 series switches.

- The command 1900switch#delete vtp will allow you to remove the information about VLAN Trunking Protocol.
- The command 1900switch#delete nvram will allow you to reset the switch along the lines of the default settings.
- The command 1900switch>en will allow you to get back to the privileged mode.
- The command 1900switch#reload will allow you to restart your switch.

The following settings are for the 2900/2950 series switches.

- The command switch#delete flash:vlan.dat will allow you to delete the VLAN database from the system's flash memory.
- The command Switch#erase startup-config will allow you to

delete all the files from the NVRAM.

- The command S witch#reload will allow you to restart the switch.

Setting Hostnames

For 1900 series switches:

- The command #config t will allow you to start the process of setting up the hostnames.
- The command (config)#hostname AustinSwitch will allow you to set up the name of the switch. The method is the same as for the router. The interface will appear like the following: AustinSwitch(config)#.

For 2900/2950 series switches:

- The first command is Swtich#config t.
- The command Switch (config)#hostname AustinSwitch will allow you to set up the name of the switch. The method is the same as for the router. you will see the following in the next line: 2900Switch(config)#.

Setting passwords for 1900 Series Switches:

- The command AustinSwitch(config)#enable password level1 python will allow you to set up the user mode password to python.
- The command AustinSwitch(config)#enable password level15 python1 will allow you to set up the enable mode password to python1.
- The command AustinSwitch(config)#enable secret python2 will allow you to set up the enable secret password to python2.

Setting passwords in 2900/2950 series:

- The command AustinSwitch(config)#enable password python1 will allow you to set up the enable mode password to python1.
- The command AustinSwitch(config)#enable secret password python1 will allow you to set up the encrypted secret password to

python1.

- The command AustinSwitch(config)#line con 0 will allow you to enter the line console mode on the network.
- The command AustinSwitch(config-line)#login will allow you to set up and enable the passwords' checking process.
- The command AustinSwitch(config-line)#password python1 will allow you to set up the password to python1.
- The command AustinSwitch(config-line)#exit will allow you to exit the console.
- The command AustinSwitch(config-line)#line aux 0 will allow you to enter the line auxiliary mode.
- The command AustinSwitch(config-line)#login will allow you to set up and enable the checking of passwords.
- The command AustinSwitch(config-line)#password python1 will allow you to set up the enable mode password to python1.
- The command AustinSwitch(config-line)#exit will allow you to exit the line auxiliary mode.
- The command AustinSwitch(config-line)#line vty 0 4 will allow you to enter the line vty mode for all the virtual ports.
- The command AustinSwitch(config-line)#login will allow you to set up and enable the checking of the passwords.
- The command AustinSwitch(config-line)#exit will allow you to exit the line vty mode.

Setting IP Addresses

- The command AustinSwitch(config)#ip address (write ip address here) will allow you to set up the system's IP address and the mask to enable remote access to switch.

For 2900/2950 series:

- The command AustinSwitch(config)#ip address (write ip address

here) will allow you to set up the system's IP address and the mask to enable remote access to switch.

Interface Descriptions

- The command AustinSwitch(config-if)#description Finance VLAN will allow you to set up and add the description for your interfaces.

For 2900/2950 series switches:

- The command AustinSwitch(config-if)#int fa0/1 will allow you to enter the interface mode.
- The command AustinSwitch(config-if)#description Finance VLAN will allow you to set up and add the description for your interfaces.

Duplex Settings

- The command AustinSwitch(config)#int e0/1 w ill allow you to use e0/1 on the 2900/2950 series.
- The command AustinSwitch(config-if)#duplex full will allow you to force the full-duplex operation on your network.
- The command AustinSwitch(config-if)#duplex half will allow you to force the half-duplex operation on your network.
- The command AustinSwitch(config-if)#duplex auto will allow you to force the auto-duplex configuration on your network.

Duplex Settings for 2900/2950 series:

- The command AustinSwitch(config)#int fa0/1 will allow you to start the process.
- The command AustinSwitch(config-if)#speed 10 will allow you to force the 10-Mbps operation.
- The command AustinSwitch(config-if)#speed 100 will allow you to force the 100-Mbps operation.

- The command AustinSwitch(config-if)#speed auto will allow you to force the enabling of autospeed configuration.

Web-based Interface for Configuration Setting

- The command AustinSwitch(config)#ip http server will allow you to turn on the HTTP service on your network.
- The command AustinSwitch(config)#ip http port 80 will allow you to set the port for HTTP. You will have to turn off the port security reasons unless you have to use it to do some work.

MAC Address Management

- The command AustinSwitch#show mac-address-table will allow you to see the forwarding table for the present MAC address on the network system.
- The command AustinSwitch#clear mac-address-table will allow you to erase the entries of the forwarding table for the present MAC address on the network system.
- The command AustinSwitch#clear mac-address-table dynamic will allow you to delete only the dynamic entries from the forwarding table for the present MAC address on the network system.

Configuring Static MAC Addresses

- The command AustinSwitch(config)#mac-address-table permanent x.x.x e0/1 will allow you to set up the permanent address in the present MAC address table for your interface e 0/1.
- The command AustinSwitch#clear mac-address-table perm will allow you to delete all the permanent entries that you have made in the table.

For 2900/2950 series

- The command AustinSwitch(config)#mac-address-table static

x.x.x fa0/1 vlan 1 will allow you to set up the permanent address in the present MAC address table for your interface fa0/1 in VLAN 1.

- The command AustinSwitch(config)#no mac-address-table permanent x.x.x e0/1 will allow you to erase the permanent address in the present MAC address table for your interface e 0/1.

Port Security

- The command AustinSwitch(config-if)#port secure will allow you to set up security for the interface you are working in.
- The command AustinSwitch(config-if)#port secure max-mac-count 1 will allow you one MAC address in the table for the given interface.

For 2900 series:

- The command AustinSwitch(config)#int fa0/1 will allow you to set up the interface for working.
- The command AustinSwitch(config-if)#port security will allow you to set up the mode for security.
- The command AustinSwitch(config-if)#port secure max-mac-count 1 will allow you to set up only one mac address for the given interface.
- The command AustinSwitch(config-if)#port security action shutdown will allow you to shut down the port if it witnesses any kind of violation in the system.

For 2950 series:

- The command AustinSwitch(config)#int fa0/1 will allow you to set up the interface to start working in.
- The command AustinSwitch(config-if)#switchport port-security is the next command on the line.
- The command AustinSwitch(config-if)#switchport port-security mac-address sticky will allow you to initiate the process of

conversion of MAC addresses to secure and sticky addresses. The MAC address that is learned first will be accepted on the port.

- The command AustinSwitch(config-if)#switchport port-security maximum 1 will allow you to give one address for the interface.
- The command AustinSwitch(config-if)#switchport port-security violation shutdown will allow the port to shut down when it witnesses some kind of violation in the network system.

Port Security Violation

- The command AustinSwitch#show mac-address-table security will allow you to see the MAC address table that is packed up with the maximum security information.
- The command AustinSwitch#show port security will allow you to see the MAC address table that is packed up with the maximum security information.

2900 Switch Configuration

- The command s witch>en will allow you to enter the privileged mode of the system network.
- The command s witch#config t will allow you to enter the global configuration mode in the network.
- The command s witch(config)#no ip domain-lookup will turn off the DNS queries so that the spelling mistakes will keep you from slowing down in the midst of the process.
- The command s witch(config)#hostname AustinSwitch will allow you to set up the name of the host. You can choose the name you like for the system.
- The command AustinS witch(config)#enable secret python1 will allow you to set up the secret password to python1.
- The command AustinS witch(config)#line con 0 will allow you to enter the line console.

- The command AustinS witch(config-line)#logging synchronous will allow you to append different commands to the new line. The router information will not interrupt the sequence.
- The command AustinS witch(config-line)#login will allow the user to log in the console before he or she can use it.
- The command AustinS witch(config-line)#password python2 will allow you to set up the password to python2.
- The command AustinS witch(config-line)#exec-timeout 0 0 will allow the console not to log out of the system.
- The command AustinS witch(config-line)#exit will allow you to switch back to the global configuration mode.
- The command AustinS witch(config)#line aux 0 will allow you to switch to the line auxiliary mode in a network system.
- The command AustinS witch(config-line)#password python2 will allow you to change and set up the password to python2.
- The command AustinS witch(config-line)#exit will allow you to switch back to the global configuration mode.
- The command AustinS witch(config)#line vty 0 15 will allow you to switch back to the configuration mode for all the 16 vty ports at the same time.
- The command AustinS witch(config-line)#login will allow you to log in on the system to use the vty ports.
- The command AustinS witch(config-line)#password python2 will allow you to change and set up the password to python2.
- The command AustinS witch(config-line)#exit will allow you to switch back to the global configuration mode.
- The command AustinS witch(config)#ip default-gateway 192.168.1.1 will allow you to set up the gateway to default.
- The command AustinS witch(config)#int vlan 1 will allow you to switch back to the virtual interface VLAN 1.
- The command AustinS witch(config-if)#ip add (enter ip address

here) will allow you to set up the switch's IP address.

- The command AustinS witch(config-if)#no shut will allow you to switch on the virtual interface.
- The command AustinS witch(config-if)#int fa 0/1 will allow you to switch back to the interface fa 0/1.
- The command AustinS witch(config-if)#desc Link to Router will allow you to set up the local description.
- The command AustinS witch(config-if)#int fa 0/4 will allow you to switch back to the interface fa 0/4.
- The command AustinS witch(config-if)#desc Link to Workstation A will allow you to set up the interface's local description.
- The command AustinS witch(config-if)#port security will allow you to activate the system's port security.
- The command AustinS witch(config-if)#port security max-mac-count 1 will allow you to include one MAC address into the MAC table.
- The command AustinS witch(config-if)#port security action shutdown will allow you to turn off the port if multiple MAC addresses are reported in the system.
- The command AustinS witch(config-if)#int fa 0/8 will allow you to switch back to the interface fa 0/8.
- The command AustinS witch(config-if)#desc Link to Workstation B will allow you to set up the interface's local description.
- The command AustinS witch(config-if)#port security will allow you to activate the system's port security.
- The command AustinS witch(config-if)#port security max-mac-count 1 will allow you to include one MAC address into the MAC table.
- The command AustinS witch(config-if)#port security action shutdown will allow you to turn off the port if multiple MAC addresses are reported in the system.

- The command AustinS witch(config-if)#port security action shutdown will allow you to turn off the port if multiple MAC addresses are reported in the system.
- The command AustinS witch(config-if)#exit will allow you to switch back to the global configuration mode.
- The command AustinS witch(config)#exit will allow you to switch back to the privileged mode.
- The command AustinS witch#copy run start will allow you to save the configurations to NVRAM.

Spanning Tree Protocol

In this section, I will explain the concept of spanning-tree verification and the troubleshooting process.

Verifying Spanning-Tree Protocol

- The command AustinS witch#show spanning-tree brief will allow you to see the spanning-tree table for the switch.
- The command AustinS witch#show spanning-tree will allow you to see the spanning-tree table for the switch.
- The command AustinS witch#show spanning-tree int fa 0/17 will allow you to see the information on spanning-tree for the port fa 0/17.
- The command AustinS witch#show spanning-tree vlan y will allow you to see the information about the spanning-tree for a particular VLAN.
- The command AustinS witch#show spanning-tree {all} will allow you to see the information about the changes in the topology in spanning-tree.

Changing Spanning-tree Priority of the Switch

- The command AustinS witch(config)#spanning-tree priority 15 will allow you to set the priority at will. The number at the end of the command can be any in between 1 and 65535. A lower

number indicates a better chance of electing the root bridge. The default number for the priority is 32768.

- The command AustinS witch(config)#spanning-tree vlan 1 priority 15 will allow you to set the priority at will. The number at the end of the command can be any in between 1 and 65535. A lower number indicates a better chance of electing the root bridge. The default number for the priority is 32768.
- The command AustinS witch#spanning-tree vlan y root will allow you to shift the switch to root switch for VLAN y by dropping he priority to 24576 or less than the present root bridge.

Changing the Spanning Tree Cost

- The first command on the line is AustinSwitch#config t.
- The command AustinSwitch(config)#int fa 0/1 will allow you to start the interface.
- The command AustinSwitch(config)#spanning-tree cost y will allow you to set up the cost for the spanning tree to the specified value of y.

Changing Spanning Tree

- The command AustinSwitch(config)#int fa 0/1 will allow you to start the interface.
- The command AustinSwitch(config)#spanning-tree portfast will allow you to force the port to shift back to the forwarding state, without transitioning through the learning states, the blocking, and the listening processes. You can save about 50 seconds of the wait time by going through this process. This is the best command on the access ports that you will never be able to hook up to some other switch.

Portfast BPDU Guard Command

- The command AustinSwitch#config t will allow you to start the

configuration mode.

- The command AustinSwitch(config)#spanning-tree portfast bpduguard will allow you to enable the BPDU Guard for your network system's interfaces.
- The command AustinSwitch(config)#errdiable recovery cause bpduguard will allow the port to get re-enabled after setting up a recovery timer.
- The command AustinSwitch(config)#errdiable recovery interval 500 will allow the port to get re-enabled after setting up a recovery timer to 500 seconds. The default timer is 300 seconds.
- The command AustinSwitch(config)#show spanning-tree summary totals will allow you to verify whether the BPDU Guard remains enabled or not.
- The command AustinSwitch#show errdisable recovery will allow you to see the information about the errdisable recovery timer.

Configuration of EtherChannel

- The command AustinSwitch#config t will allow you to start the configuration mode.
- The command AustinSwitch(config)#int fa 0/11 will allow you to start the interface.
- The command AustinSwitch(config-if)channel-group y mode on will allow you to start the mode for channel groups. In the command, y is the total number of channel groups. It must watch the other interfaces.
- The command AustinSwitch(config)#int fa 0/12 will allow you to start the interface.
- The command AustinSwitch(config-if)channel-group y mode on will allow you to start the mode for channel groups. In the command, y is the total number of channel groups. It must watch the other interfaces.

Verification

- The command AustinSwitch#show etherchannel y detail will allow you to see comprehensive information about the ether channel.
- The command AustinSwitch#show etherchannel y port will allow you to see comprehensive information about the EtherChannel port.
- The command AustinSwitch#show etherchannel y port-channel will allow you to see comprehensive information about the port channel.
- The command AustinSwitch#show etherchannel y summary will allow you to see the one-line summary information about per channel-groups.

The EtherChannel may combine about two to eight parallel links of Ethernet. The 1900 switches need 9.00.03 or the later Enterprise Edition software, the 2900 switches need the IOS 11.2(8)SA or later versions and the 2950 switches need the IOS 12.0(5.2)WC(1). You can set up the auto mode, the desirable mode and the on mode.

The auto mode tells the switch to wait for the other switches to kick off the EtherChannel negotiations. If the auto mode is set on both sides, the EtherChannel will never be able to form. Both sides will keep waiting for the other side to initiate negotiations. The desirable mode tells the switch that it is willing to turn the EtherChannel on. The on mode tells the switch that it wants to form the Ether Channel.

Chapter Nine: VLAN

This chapter will walk you through the commands and information about the display of VLAN info, the creation of static VLANs, the assigning of the ports to the VLANs, and the assigning of the ports by using the range command.

Displaying VLANs

- The command AustinSwitch#show vlan will allow you to see the information about VLAN.
- The command AustinSwitch#show vlan-membership will allow you to see the information about VLAN ports.
- The command AustinSwitch#show vlan 2 will allow you to see the information about VLAN 2.

For 2900/2950 series:

- The command AustinSwitch#show vlan will allow you to see the information about VLAN status.
- The command AustinSwitch#show vlan brief will allow you to see the summarized information about VLAN.
- The command AustinSwitch#show vlan id 2 will allow you to see the information about VLAN 2 only
- The command AustinSwitch#show vlan name Mark will allow you to see the information about VLAN that is named Mark.

Static VLANs

- The command AustinSwitch#config t will allow you to start the configuration mode.
- The command AustinSwitch(config)#vlan 2 name John will allow you to create the VLAN 2 named John.
- The command AustinSwitch(config)#vlan 3 name John1 will allow you to create the VLAN 3 named John1.

For 2900 Series Switch:

- The command AustinSwitch#vlan database will allow you to enter the database mode.
- The command AustinSwitch(config)#vlan 2 name John will allow you to create the VLAN 2 named John.
- The command AustinSwitch(config)#vlan 3 name John1 will allow you to create the VLAN 3 named John1.
- The command AustinSwitch(vlan)#exit will allow you to apply the changes and then exit VLAN database mode.

For 2950 Series:

- The command AustinSwitch#config t will allow you to start the configuration mode.
- The command AustinSwitch(config)#vlan 10 will allow you to create VLAN 10. Also, you will enter the configuration mode for VLAN to have further definitions.
- The command AustinSwitch(config-vlan)#name John1 will allow you to name the vlan John1.
- The command AustinSwitch(config-vlan)#exit will allow you to exit and switch back to the global configuration mode.
- The command AustinSwitch(config)#vlan 20 will allow you to create VLAN 20. Also, you will enter the configuration mode for VLAN to have further definitions.
- The command AustinSwitch(config-vlan)#name John5 will allow you to name the vlan John5.
- The command AustinSwitch(config-vlan)#exit will allow you to exit and switch back to the global configuration mode.

Port Assigning to VLANS

- The command AustinSwitch#config t will allow you to start the configuration mode.

- The command AustinSwitch(config)#int e0/2 will allow you to shift to the interface mode.
- The command AustinSwitch(config-if)#vlan static 2 will allow you to assign the port to VLAN 2.
- The command AustinSwitch(config)#int e0/3 will allow you to shift to the interface mode.
- The command AustinSwitch(config-if)#vlan static 3 will allow you to assign the port to VLAN 3.
- The command AustinSwitch(config-if)#exit will allow you to exit the interface mode.
- At the end you will see the following: AustinSwitch(config-if)# .

For 2900/2950 Series:

- The command AustinSwitch#config t will allow you to start the configuration mode.
- The command AustinSwitch(config)#int fa0/2 will allow you to shift to the interface mode.
- The command AustinSwitch(config-if)#switchport mode access will allow you to turn the switchport mode to access.
- The command AustinSwitch(config-if)#switchport access vlan 2 will allow you to assign the port to VLAN 2.
- The command AustinSwitch(config)#int fa0/3 will allow you to shift to the interface mode.
- The command AustinSwitch(config-if)#switchport mode access will allow you to turn the switchport mode to access.
- The command AustinSwitch(config-if)#switchport access vlan 3 will allow you to assign the port to VLAN 3.
- The command AustinSwitch(config-if)#exit will allow you to exit the interface mode.
- At the end you will see the following: AustinSwitch(config-if)# .

Saving VLAN Configurations

- The command AustinSwitch#copy run start will allow you to save the running-config the NVRAM.

Erasing VLAN Configurations

- The command AustinSwitch#delete vtp will allow you to erase the VLAN information from switch and it also resets the VTP parameters to the default factory settings.

You also can use the following commands.

- The command AustinSwitch(config)#inf fa 0/2 will allow you to start the interface mode.
- The command AustinSwitch(config-if)#no vlan static 2 will allow you to erase the interface from VLAN2 and then places it back in the default VLAN 1.
- The command AustinSwitch(config-if)#exit will allow you to exit the interface mode.
- The command AustinSwitch(config-if)#no vlan 2 name John1 will allow you only to erase VLAN2 from the system's database.
- At the end you will see the following: AustinSwitch(config-if)# .

For 2900 series:

- The command AustinSwitch#config t will allow you to start the configuration mode.
- The command AustinSwitch(config)#inf fa 0/3 will allow you to start the interface mode.
- The command AustinSwitch(config-if)#no switchport access vlan 3 will allow you to erase the port from VLAN 3 and then places it back in the default VLAN 1.
- The command AustinSwitch(config-if)#exit will allow you to exit the interface mode.

- The command AustinSwitch(config)#exit will allow you to exit.
- The command AustinSwitch#vlan database will allow you to enter only the VLAN database of the system.
- The command AustinSwitch(vlan)#no vlan 3 will allow you only to erase VLAN 3 from the system's database.
- The command AustinSwitch(vlan)#exit will allow you to apply the changes and then exit the database mode.

Troubleshooting Process

- The command AustinSwitch#show vlan will allow you to see the information about the full VLAN database.
- The command AustinSwitch#show vlan brief will allow you to see the information about the database in a summarized manner.
- The command AustinSwitch#show vlan interfaces will allow you to see the information about the interfaces. This includes the information about the duplex settings and the speed as well.
- The command AustinSwitch#debug sw-vlan packets will allow you to see the information about the VLAN packets that a router received but it cannot support it.

VLAN Configuration Process

- The command s witch>en will allow you to enter the privileged mode.
- The command s witch#config t will allow you to enter the mode of global configuration.
- The command switch(config)# hostname AustinSwitch will allow you to set up the name for the host.
- The command AustinSwitch(config)#no ip domain-lookup will allow you to switch off the DNS entries checking on spelling mistakes.
- The command AustinSwitch(config)#enable secret jasmine will

allow you to set up the secret password to jasmine.

- The command AustinSwitch(config)#line con 0 will allow you to enter the console mode.
- The command AustinSwitch(config-line)#logging synchronous will ensure that the informational lines do not meddle with the command that you have entered.
- The command AustinSwitch(config-line)#password john1 will allow you to set up the password to john1.
- The command AustinSwitch(config-line)#exit will allow you to get back t the global configuration mode.
- The command AustinSwitch(config)#line vty 0 15 will allow you to enter the 16 vty modes. You will the same commands being applied to all lines.
- The command AustinSwitch(config-line)#login synchronous will allow you to challenge remote users to enter a password.
- The command AustinSwitch(config-line)#password john1 will allow you to set up the password to john1.
- The command AustinSwitch(config-line)#exit will allow you to get back t the global configuration mode.
- The command AustinSwitch(config)#ip default-gateway 192.168.1.1 will allow you to set up the switch's default gateway.
- The command AustinSwitch(config)#int vlan1 will allow you to enter the virtual interface VLAN1.
- The command AustinSwitch(config-if)#ip address 192.168.1.2 255.255.255.0 will allow you to set up your switch's IP address.
- The command AustinSwitch(config-if)#no shut will allow you to switch on the interface you are working in.
- The command AustinSwitch(config-if)#exit will allow you to get back to the global configuration mode.
- The command AustinSwitch#vlan database will allow you to enter into the VLAN database.

- The command AustinSwitch(vlan)# 10 name Rose will allow you to create VLAN 10.
- The command AustinSwitch(vlan)# 20 name Rosemary will allow you to create VLAN 20.
- The command AustinSwitch(vlan)# 30 name Jasmine will allow you to create VLAN 30.
- The command AustinSwitch(vlan)#exit will allow you to apply the information you have entered and exit the system.
- The command Austins witch#config t will allow you to enter the mode of global configuration.
- The command Austinswitch(config)#int fa0/2 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 10 will allow you to assign the port to VLAN 10.
- The command Austinswitch(config)#int fa0/3 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 10 will allow you to assign the port to VLAN 10.
- The command Austinswitch(config)#int fa0/4 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 10 will allow you to assign the port to VLAN 10.
- The command Austinswitch(config)#int fa0/5 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access

will allow you to set up the switchport mode to give access.

- The command Austinswitch(config-if)#switchport access vlan 20 will allow you to assign the port to VLAN 20.
- The command Austinswitch(config)#int fa0/6 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 20 will allow you to assign the port to VLAN 20.
- The command Austinswitch(config)#int fa0/7 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 20 will allow you to assign the port to VLAN 20.
- The command Austinswitch(config)#int fa0/8 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 10 will allow you to assign the port to VLAN 10.
- The command Austinswitch(config)#int fa0/9 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 30 will allow you to assign the port to VLAN 30.
- The command Austinswitch(config)#int fa0/10 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.

- The command Austinswitch(config-if)#switchport access vlan 30 will allow you to assign the port to VLAN 30.
- The command Austinswitch(config)#int fa0/11 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 30 will allow you to assign the port to VLAN 30.
- The command Austinswitch(config)#int fa0/12 will allow you to switch back to the interface mode.
- The command Austinswitch(config-if)#switchport mode access will allow you to set up the switchport mode to give access.
- The command Austinswitch(config-if)#switchport access vlan 30 will allow you to assign the port to VLAN 30.
- The command Austinswitch(config)#(enter the following keys on the keyboard: ctrl + z) will allow you to get back to the privileged mode.
- The command Austinswitch#copy run start will allow you to save the settings to NVRAM.

VTP Configuration

For 1900 series:

- The command Austinswitch1900(config)#vtp client will allow you to turn the switch to the mode namely VTP client.
- The command Austinswitch1900(config)#vtp server will allow you to turn the switch to mode namely default VTP server.
- The command Austinswitch1900(config)#vtp transparent will allow you to turn the switch to the mode namely VTP transparent.
- The command Austinswitch1900(config)#vtp domain SNAP will allow you to change the domain from the default to CNAP.
- The command Austinswitch1900(config)#vtp password john will

allow you to change the password.

For 2900 series:

- The command Austinswitch2900#vlan database will allow you to initiate the mode namely VLAN database.
- The command Austinswitch2900(vlan)#vtp client will allow you to turn the switch to mode namely client.
- The command Austinswitch2900(vlan)#vtp server will allow you to turn the switch to mode namely server.
- The command Austinswitch2900(vlan)#vtp transparent will allow you to turn the switch to the mode namely VTP transparent.
- The command Austinswitch2900(vlan)#vtp domain academy will allow you to change the domain to academy.
- The command Austinswitch2900(vlan)#vtp password john1 will allow you to change the password to john1.
- The command Austinswitch2900(vlan)#vtp v2-mode will allow you to turn the switch to the mode namely version 2 or v2.
- The command Austinswitch2900(vlan)#vtp pruning will allow you to turn on VTP pruning.
- The command Austinswitch2900(vlan)#vtp transparent will allow you to turn the switch to the mode namely VTP transparent.
- The command Austinswitch2900(vlan)#exit will allow you to implement the changes and then exit the mode.

For 2950 series

- The command Austinswitch2950#config t will allow you to enter the global configuration mode.
- The command Austinswitch2950(config)#vtp mode client will allow you to turn the switch to the mode namely VTP client.
- The command Austinswitch2950(config)#vtp server will allow you to turn the switch to mode namely default VTP server.

- The command Austinswitch2950(config)#vtp mode transparent will allow you to turn the switch to the mode namely VTP transparent.
- The command Austinswitch2950(config)#vtp domain academy will allow you to change the domain from the default to academy.
- The command Austinswitch2950(config)#vtp password john will allow you to change the password to john.
- The command Austinswitch2950(config)#vtp v2-mode will allow you to turn the switch to the mode namely version 2 or v2.
- The command Austinswitch2950(condig)#vtp pruning will allow you to turn on VTP pruning.

Configuration for 2900 Series

- The command s witch>en will allow you to enter the privileged mode.
- The command switch>config t will allow you to enter the configuration mode.
- The command switch(config)#hostname AustinSwitch2900 will allow you to set up the host name.
- The command AustinSwitch2900(config)#no ip domain-lookup will allow you to turn off the DNS resolution to avoid the waiting time to the DNS lookup for the spelling errors.
- The command AustinSwitch2900(config)#line con 0 will allow you to enter the line mode.
- The command AustinSwitch2900(config-line)#logging synchronous will allow you to append the command line to a new line. There will be no interruption from the information items.
- The command AustinSwitch2900(config-line)#exec-timeout 0 0 will allow you to stop the console session from getting timed out.
- The command AustinSwitch2900(config-line)#exit will allow you to line mode.

- The command AustinSwitch2900(config)#enable secret john will allow you to set up the secret password to the word john.
- The command AustinSwitch2900(config)#exit will allow you to exit the session.
- The command AustinSwitch2900#vlan database will allow you to enter the database mode.
- The command AustinSwitch2900(vlan)#vlan 10 name Rose will allow you to create a VLAN 10 named Rose.
- The command AustinSwitch2900(vlan)#vlan 20 name Rose1 will allow you to create a VLAN 10 named Rose1.
- The command AustinSwitch2900(vlan)#vlan 30 name Rose2 will allow you to create a VLAN 10 named Rose2.
- The command AustinSwitch2900(vlan)#vtp server will allow you to turn your switch into the VTP server.
- The command AustinSwitch2900(vlan)#vtp domain academy will allow you to assign the domain name academy to the server.
- The command AustinSwitch2900(vlan)#exit will allow you to exit the VTP server mode after applying all the system's necessary changes.
- The command AustinSwitch2900#config t will allow you to enter the configuration mode once again.
- The command AustinSwitch2900(config)#int vlan1 will allow you to initiate vlan1.
- The command AustinSwitch2900(config-if)#ip add (enter ip address here) will allow you to enter and add the ip address to the network .
- The command AustinSwitch2900(config-if)#no shutdown is the next command on the line.
- The last command is AustinSwitch2900(config-if)#exit. It will exit the configuration mode.
- The command AustinSwitch2900(config)#ip default-gateway

192.168.1.1 will allow you to set the ip default-gateway.

- The command AustinSwitch2900(config)#int fa 0/1 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#desc Trunk Link to Corp Router will allow you to link the system to the CORP router.
- The command AustinSwitch2900(config-if)#switchport mode trunk will allow you to create trunk link.
- The command AustinSwitch2900(config-if)#switchport trunk encapsulation dotiq w ill allow you to set up the encapsulation to the DotIQ.
- The command AustinSwitch2900(config-if)#int fa 0/2 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 10 will allow you to assign VLAN 10 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa 0/3 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 10 will allow you to assign VLAN 10 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa 0/4 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 10 will allow you to assign VLAN 10 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).

- The command AustinSwitch2900(config-if)#int fa 0/5 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 20 will allow you to assign VLAN 20 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa 0/6 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 20 will allow you to assign VLAN 20 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa0/7 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 20 will allow you to assign VLAN 20 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa0/8 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 20 will allow you to assign VLAN 20 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa0/8 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 20 will allow you to assign VLAN 20 a separate port.

- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa0/9 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 20 will allow you to assign VLAN 20 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa0/10 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 30 will allow you to assign VLAN 30 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa0/11 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 30 will allow you to assign VLAN 30 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2900(config-if)#int fa0/12 will allow you to initiate the interface.
- The command AustinSwitch2900(config-if)#switchport access vlan 30 will allow you to assign VLAN 30 a separate port.
- The command AustinSwitch2900(config-if)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- Now enter the following command AustinSwitch2900(config-if)#

(enter Ctrl + Z on the keyboard).

- The command AustinSwitch2900#copy run start w ill allow you to save the configuration of the system to NVRAM.

Configuration for 2950 Series

- The command s witch>en will allow you to enter the privileged mode.
- The command switch>config t will allow you to enter the configuration mode.
- The command switch(config)#hostname AustinSwitch2950 will allow you to set up the host name.
- The command AustinSwitch2950(config)#no ip domain-lookup will allow you to turn off the DNS resolution to avoid the waiting time to the DNS lookup for the spelling errors.
- The command AustinSwitch2950(config)#line con 0 will allow you to enter the line mode.
- The command AustinSwitch2950(config-line)#logging synchronous will allow you to append the command line to a new line. There will be no interruption from the information items.
- The command AustinSwitch2950(config-line)#exec-timeout 0 0 will allow you to stop the console session from getting timed out.
- The command AustinSwitch2950(config-line)#exit will allow you to line mode.
- The command AustinSwitch2950(config)#enable secret john will allow you to set up the secret password to the word john.
- The command AustinSwitch2950(config)#vlan 10 will allow you to create a VLAN 10.
- The command AustinSwitch2950(config-vlan)#name Rose will allow you to name the vlan Rose.
- The command AustinSwitch2950(config-vlan)#vlan 20 will allow you to create a VLAN 20.

- The command AustinSwitch2950(config-vlan)#name Rose1 will allow you to name the vlan Rose1.
- The command AustinSwitch2950(config-vlan)#vlan 30 will allow you to create a VLAN 30.
- The command AustinSwitch2950(config-vlan)#vlan 30 name Rose2 will allow you to name the vlan Rose2.
- The command AustinSwitch2950(config-vlan)#exit will allow you to vlan mode.
- The command AustinSwitch2950(config)#vtp server will allow you to convert your switch into the VTP server.
- The command AustinSwitch2950(config)#vtp domain academy will allow you to assign the domain name academy to the server.
- The command AustinSwitch2950(config)#int vlan1 will allow you to initiate vlan1.
- The command AustinSwitch2950(config-if)#ip add (enter ip address here) will allow you to enter and add the ip address to the network .
- The command AustinSwitch2950(config-if)#no shutdown is the next command on the line.
- The last command is AustinSwitch2900(config-if)#exit. It will exit the configuration mode.
- The command AustinSwitch2950(config)#ip default-gateway 192.168.1.1 will allow you to set the ip default-gateway.
- The command AustinSwitch2950(config)#int fa 0/1 will allow you to initiate the interface.
- The command AustinSwitch2950(config-if)#desc Trunk Link to Corp Router will allow you to link the system to the CORP router.
- The command AustinSwitch2950(config-if)#switchport mode trunk will allow you to create trunk link.
- The command AustinSwitch2950(config-if)#int range fa 0/2 - 4

will allow you to initiate the interface.

- The command AustinSwitch2950(config-if-range)#switchport access vlan 10 will allow you to assign VLAN 10 a separate port.
- The command AustinSwitch2950(config-if-range)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2950(config-if-range)#int range fa 0/5 - 6 will allow you to initiate the interface.
- The command AustinSwitch2950(config-if-range)#switchport access vlan 20 will allow you to assign VLAN 20 a separate port.
- The command AustinSwitch2950(config-if-range)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- The command AustinSwitch2950(config-if-range)#int range fa 0/9 - 12 will allow you to initiate the interface.
- The command AustinSwitch2950(config-if-range)#switchport access vlan 10 will allow you to assign VLAN 10 a separate port.
- The command AustinSwitch2950(config-if-range)#spanning-tree portfast w ill allow you to transition the port to the forwarding state inside the Spanning Tree Protocol (STP).
- Now enter the following command AustinSwitch2900(config-if)# (enter Ctrl + Z on the keyboard).
- The command AustinSwitch2900#copy run start w ill allow you to save the configuration of the system to NVRAM.

Conclusion

Now that you have made it to the end of the book, I hope you are better prepared for your next exam. The book has equipped you with the technicalities of the subject. I recommend that you give it a second read to clear the concepts in a better way. I also recommend that you keep the books as a pocketbook to use it on the go. You can also use it to note down references whenever you are stuck on a command. The next step is to practice what you have learned. Memorizing the commands is not easy. It takes determination, sweat and the will to read them again and again, and memorize the commands.

I hope you have found the book highly useful and effective for your learning program. I do not claim that you will learn everything in the first go. Instead, I encourage you to read it at least twice to have a clear picture of all the commands that I have given in the book. I hope that with commitment, you will be able to understand the subject in a better way.

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