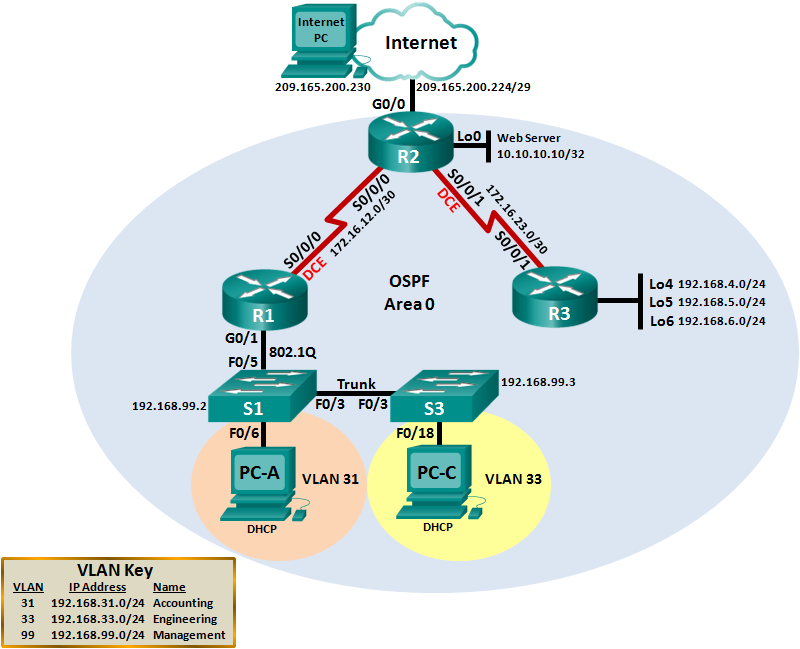
1. Lab 16 – Option #2 CCNA: Routing and Switching Essentials

Skills Assessment – Student Training Exam

Complete the assessment in Packet Tracer and document and fill in the blanks. Submit this file and the pka file in Week 8, Points will not be given for incomplete Steps. Every item in yellow should have a configuration/command from the work done on the Packet Tracer.

1. Topology



1. Assessment Objectives

Part 1: Initialize Devices

Part 2: Configure Device Basic Settings

Part 3: Configure Switch Security, VLANs, and Inter-VLAN Routing

Part 4: Configure OSPFv2 Dynamic Routing Protocol

Part 5: Implement DHCP and NAT

Part 6: Configure and Verify Access Control Lists (ACLs)

1. Scenario

In this Skills Assessment (SA) you will configure a small network. You will configure routers, switches, and PCs to support IPv4 connectivity, switch security, and inter VLAN routing. You will then configure the devices with OSPFv2, DHCP, and dynamic and static NAT. Access control lists (ACLs) will be applied for added security. You will test and document the network using common CLI commands throughout the assessment.

1. Required Packet Tracer Lab

* 3 Routers (Cisco 1941 with Cisco IOS Release 15.2(4)M3 universal image or comparable)
* 2 Switches (Cisco 2960 with Cisco IOS Release 15.0(2) lanbasek9 image or comparable)
* 3 PCs (Windows 7, Vista, or XP with terminal emulation program, such as Tera Term)
* Console cable to configure the Cisco IOS devices via the console ports
* Ethernet and Serial cables as shown in the topology

1. Initialize Devices
   1. Initialize and reload the routers and switches.

Erase the startup configurations reload the devices.

|  |  |
| --- | --- |
| Task | IOS Command |
| Erase the startup-config file on all routers. | erase startup-config |
| Reload all routers. | reload |
| Erase the startup-config file on all switches and remove the old VLAN database. | erase startup-config  delete vlan.dat |
| Reload both switches. | reload |
| Verify VLAN database is absent from flash on both switches. | show flash |

1. Configure Device Basic Settings
   1. Configure the Internet PC.

Configuration tasks for the Internet PC include the following (Refer to Topology for IP address information):

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| IP Address | 209.165.200.238 |
| Subnet Mask | 255.255.255.248 |
| Default Gateway | 209.165.200.233 |

* 1. Configure R1.

Configuration tasks for R1 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Disable DNS lookup | no ip domain-lookup |
| Router name | R1 |
| Encrypted privileged exec password | class |
| Console access password | cisco |
| Telnet access password | cisco |
| Encrypt the clear text passwords | Service password-encryption |
| MOTD banner | Unauthorized Access is Prohibited! |
| Interface S0/0/0 | Set the description  Set the Layer 3 IPv4 address. Use the first available address in the subnet.  Set the clocking rate to 128000  Activate Interface |
| Default route | Configure a default route out S0/0/0. |

**Note**:Do not configure G0/1 at this time.

* 1. Configure R2.

Configuration tasks for R2 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Disable DNS lookup | no ip domain-lookup |
| Router name | R2 |
| Encrypted privileged exec password | class |
| Console access password | cisco |
| Telnet access password | cisco |
| Encrypt the clear text passwords | Service password-encryption |
| Enable HTTP server | ip http server |
| MOTD banner | Unauthorized Access is Prohibited! |
| Interface S0/0/0 | Set the description  Set the Layer 3 IPv4 address. Use the next available address in the subnet.  Activate Interface |
| Interface S0/0/1 | Set the description  Set the Layer 3 IPv4 address. Use the first available address in the subnet.  Set clocking rate to 128000  Activate Interface |
| Interface G0/0 (Simulated Internet) | Set the Description  Set the Layer 3 IPv4 address. Use the first available address in the subnet.  Activate Interface |
| Interface Loopback 0 (Simulated Web Server) | Set the description.  Set the Layer 3 IPv4 address. |
| Default route | Configure a default route out G0/0. |

* 1. Configure R3.

Configuration tasks for R3 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Disable DNS lookup | no ip domain-lookup |
| Router name | R3 |
| Encrypted privileged exec password | class |
| Console access password | cisco |
| Telnet access password | cisco |
| Encrypt the clear text passwords | Service password-encryption |
| MOTD banner | Unauthorized Access is Prohibited! |
| Interface S0/0/1 | Set the description  Set the Layer 3 IPv4 address. Use the next available address in the subnet.  Activate Interface |
| Interface Loopback 4 | Set the Layer 3 IPv4 address. Use the first available address in the subnet. |
| Interface Loopback 5 | Set the Layer 3 IPv4 address. Use the first available address in the subnet. |
| Interface Loopback 6 | Set the Layer 3 IPv4 address. Use the first available address in the subnet. |
| Default route | Configure a default route out S0/0/1. | |

* 1. Configure S1.

Configuration tasks for S1 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Disable DNS lookup | no ip domain-lookup |
| Switch name | S1 |
| Encrypted privileged exec password | class |
| Console access password | cisco |
| Telnet access password | cisco |
| Encrypt the clear text passwords | Service password-encryption |
| MOTD banner | Unauthorized Access is Prohibited! |

* 1. Configure S3

Configuration tasks for S3 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Disable DNS lookup |  |
| Switch name | S3 |
| Encrypted privileged exec password | class |
| Console access password | cisco |
| Telnet access password | cisco |
| Encrypt the clear text passwords |  |
| MOTD banner | Unauthorized Access is Prohibited! |

* 1. Verify network connectivity.

Use the **ping** command to test connectivity between network devices.

Use the following table to methodically verify connectivity with each network device. Take corrective action to establish connectivity if a test fails:

|  |  |  |  |
| --- | --- | --- | --- |
| From | To | IP Address | Ping Results |
| R1 | R2, S0/0/0 | 172.16.1.2 | success |
| R2 | R3, S0/0/1 | 172.16.2.1 | success |
| Internet PC | Default Gateway | 209.165.200.233 | success |

1. Configure Switch Security, VLANS, and Inter VLAN Routing
   1. Configure S1.

Configuration tasks for S1 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Create the VLAN database | Use Topology VLAN Key table to create and name each of the listed VLANS. |
| Assign the management IP address. | Assign the Layer 3 IPv4 address to the Management VLAN. Use the IP address assigned to S1 in the Topology diagram. |
| Assign the default-gateway | Assign the first IP address in the subnet as the default-gateway. |
| Force trunking on Interface F0/3 | Use VLAN 1 as the native VLAN. |
| Force trunking on Interface F0/5 | Use VLAN 1 as the native VLAN. |
| Configure all other ports as access ports | Use the interface range command. |
| Assign F0/6 to VLAN 21 |  |
| Shutdown all unused ports. |  |

* 1. Configure S3.

Configuration tasks for S3 include the following:

|  |  |  |
| --- | --- | --- |
| Configuration Item or Task | Specification | |
| Create the VLAN database | Use Topology VLAN Key Table to create each of the listed VLANS. Name each VLAN. | |
| Assign the management IP address. | Assign the Layer 3 IPv4 address to the Management VLAN. Use the IP address assigned to S3 in the Topology diagram. | |
| Assign the default-gateway | Assign the first IP address in the subnet as the default-gateway | |
| Force trunking on Interface F0/3 | Use VLAN 1 as the native VLAN. |
| Configure all other ports as access ports | Use the interface range command. | |
| Assign F0/18 to VLAN 23 |  | |
| Shutdown all unused ports. |  | |

* 1. Configure R1.

Configuration tasks for R1 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Configure 802.1Q subinterface .21 on G0/1 | Description Accounting LAN  Assign VLAN 31.  Assign the first available address to this interface. |
| Configure 802.1Q subinterface .23 on G0/1 | Description Engineering LAN  Assign VLAN 33.  Assign the first available address to this interface. |
| Configure 802.1Q subinterface .99 on G0/1 | Description Management LAN  Assign VLAN 99.  Assign the first available address to this interface. |
| Activate Interface G0/1 |  |

* 1. Verify network connectivity.

Use the **ping** command to test connectivity between the switches and R1.

Use the following table to methodically verify connectivity with each network device. Take corrective action to establish connectivity if a test fails:

|  |  |  |  |
| --- | --- | --- | --- |
| From | To | IP Address | Ping Results |
| S1 | R1, VLAN 99 address | 192.168.99.1 | Success |
| S3 | R1, VLAN 99 address | 192.168.99.1 | Success |
| S1 | R1, VLAN 21 address | 192.168.21.1 | Success |
| S3 | R1, VLAN 23 address | 192.168.23.1 | success |

1. Configure OSPFv2 Dynamic Routing Protocol
   1. Configure OSPFv2 on R1.

Configuration tasks for R1 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| OSPF Process ID | 1 |
| Router ID | 1.1.1.1 |
| Advertise directly connected Networks | Use classless network addresses  Assign all directly connected networks to Area 0 |
| Set all LAN interfaces as passive |  |
| Change the default cost reference bandwidth to support Gigabit interface calculations | 1000 |
| Set the serial interface bandwidth | 128 Kb/s |
| Adjust the metric cost of S0/0/0 | Cost: 7500 |

* 1. Configure OSPFv2 on R2.

Configuration tasks for R2 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| OSPF Process ID | 1 |
| Router ID | 2.2.2.2 |
| Advertise directly connected Networks | Use classless network addresses  **Note:** Omit the G0/0 network. |
| Set the LAN (Loopback) interface as passive |  |
| Change the default cost reference bandwidth to allow for Gigabit interfaces | 1000 |
| Set the bandwidth on all serial interfaces | 128 Kb/s |
| Adjust the metric cost of S0/0/0 | Cost: 7500 |

* 1. Configure OSPFv2 on R3.

Configuration tasks for R3 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| OSPF Process ID | 1 |
| Router ID | 3.3.3.3 |
| Advertise directly connected Networks | Use classless network addresses  Assign interfaces to Area 0  Use a single summary address for the LAN (loopback) interfaces. |
| Set all LAN (Loopback) interfaces as passive |  |
| Change the default cost reference bandwidth to support Gigabit interface calculations | 1000 |
| Set the serial interface bandwidth | 128 Kb/s |

* 1. Verify OSPF information.

Verify that OSPF is functioning as expected. Enter the appropriate CLI command to discover the following information:

|  |  |
| --- | --- |
| Question | Response |
| What command will display all connected OSPFv2 routers? | Show ip ospf neighbor  Neighbor with id 3.3.3.3 and 1.1.1.1 were displayed |
| What command displays a summary list of OSPF interfaces that includes a column for the cost of each interface? | Show ip ospf interface-brief |
| What command displays the OSPF Process ID, Router ID, Address summarizations, Routing Networks, and passive interfaces configured on a router? | Show ip protocols |
| What command displays only OSPF routes? | show ip route osp |
| What command displays detail information about the OSPF interfaces, including the authentication method? | show ip osp interface |
| What command displays the OSPF section of the running-configuration? | Show running-config |

1. Implement DHCP and NAT for IPv4
   1. Configure R1 as the DHCP server for VLANs 31 and 33.

Configuration tasks for R1 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Reserve the first 20 IP addresses in VLAN 31 for static configurations |  |
| Reserve the first 20 IP addresses in VLAN 33 for static configurations |  |
| Create a DHCP pool for VLAN 31 | Name: ACCT  DNS-Server: 10.10.10.11  Domain-Name: ccna-sba.com  Set the default gateway. |
| Create a DHCP pool for VLAN 33 | Name: ENGNR  DNS-Server: 10.10.10.11  Domain-Name: ccna-sba.com  Set the default gateway. |

* 1. Configure Static and Dynamic NAT on R2.

Configuration tasks for R2 include the following:

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Create a local database with 1 user account | Username: **webuser**  Password: **cisco12345**  Privilege level: **15** |
| Enable HTTP server service |  |
| Configure the HTTP server to use the local database for authentication |  |
| Create a static NAT to the Web Server | Inside Global Address: **209.165.200.229** |
| Assign the inside and outside interface for the static NAT |  |
| Configure the dynamic NAT inside private ACL | Access List: 1  Allow the Accounting and Engineering networks on R1 to be translated.  Allow a summary of the LANs (loopback) networks on R3 to be translated. |
| Define the pool of usable public IP addresses | Pool Name: **INTERNET**  Pool of addresses include:  **209.165.200.225 – 209.165.200.228** |
| Define the dynamic NAT translation |  |

* 1. Verify DHCP and Static NAT.

Use the following tasks to verify that DHCP and Static NAT settings are functioning correctly. It may be necessary to disable the PC firewall for pings to be successful:

|  |  |
| --- | --- |
| Test | Results |
| Verify that PC-A acquired IP information from the DHCP server | Its correct |
| Verify that PC-C acquired IP information from the DHCP server | Its correct |
| Verify that PC-A can ping PC-C.  **Note**: It may be necessary to disable the PC firewall | success |
| Use a Web browser on the Internet PC to access the Web server (209.165.200.229). Login with Username: **webuser**, Password: **cisco12345** | It is connecting! success |

**Note**: Verification of dynamic NAT will be performed in Part 6.

1. Configure and Verify Access Control Lists (ACLs)
   1. Restrict access to VTY lines on R2.

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Configure a named access list to only allow R1 to telnet to R2. | ACL Name: **ADMIN-MGT** |
| Apply the named ACL to the VTY lines |  |
| Verify ACL is working as expected, |  |

* 1. Secure the network from Internet traffic.

|  |  |
| --- | --- |
| Configuration Item or Task | Specification |
| Configure an Extended ACL to:   * Allow Internet hosts WWW access to the simulated web server on R2 by accessing the static NAT address (209.165.200.229) that you configured in Part 3. * Prevent traffic from the Internet from pinging internal networks, while continuing to allow LAN interfaces to ping the Internet PC. | ACL No.: **101** |
| Apply ACL to the appropriate interface(s) |  |
| Verify ACL is working as expected | From the Internet PC:   * Ping PC-A (Pings should be unreachable.) * Ping PC-C (Pings should be unreachable.)   From R1, Ping the Internet PC (Pings should be successful.) |

* 1. Enter the appropriate CLI command needed to display the following:

|  |  |
| --- | --- |
| Command Description | Student Input (command) |
| Display the matches an access-list has received since the last reset. | show acces-lists |
| Reset access-list counters. | clear acces-lists counters |
| What command is used to display what ACL is applied to an interface and the direction that it is applied | show running-config |
| What command displays the NAT translations? | **Show ip nat translations**  **Note**: The translations for PC-A and PC-C were added to the table when the Internet PC attempted to ping these PCs in Step 2. Pinging the Internet PC from PC-A or PC-C will not add the translations to the table because of the way the Internet is being simulated on the network. |
| What command is used to clear dynamic NAT translations? | clear ip nat translation \* |

1. Router Interface Summary Table

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Router Interface Summary | | | | |
| Router Model | Ethernet Interface #1 | Ethernet Interface #2 | Serial Interface #1 | Serial Interface #2 |
| 1800 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 1900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2801 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/1/0 (S0/1/0) | Serial 0/1/1 (S0/0/1) |
| 2811 | Fast Ethernet 0/0 (F0/0) | Fast Ethernet 0/1 (F0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| 2900 | Gigabit Ethernet 0/0 (G0/0) | Gigabit Ethernet 0/1 (G0/1) | Serial 0/0/0 (S0/0/0) | Serial 0/0/1 (S0/0/1) |
| **Note**: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. There is no way to effectively list all the combinations of configurations for each router class. This table includes identifiers for the possible combinations of Ethernet and Serial interfaces in the device. The table does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface. | | | | |