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Login to netacad.com and launch the course for MCHS CyberPatriot.

19 Modules corresponde to ITN, RSE, or SEC chapters of other courses.

(Round 1: PT on Modules 1-7; Quiz on 3-7	ITN 1,2,3,7,8; RSE 1,2,3
(Round 2: PT on Modules 1-12; Quiz on 8-12	+ RSE 4,5,6,7,8
(State Round: PT on Modules 1-15; Quiz on 13-15	+ RSE 9,10,11
(Semifinal Round: PT on Modules 1-19; Quiz on 16-19	+ SEC 2,3,8,9

See notes below for a summary of the commands used on switches and routers.

Recommended PT exercises:

Round 1:

ITN

2.1.4.6 - basic commands

2.2.3.4 - Initial switch settings

2.3.2.5 - Basic Connectivity

2.4.1.2 - skills integration

7.4.1.2 - skills integration

RSE

1.3.1.3 - basic security and settings

2.2.1.4 - SSH

2.2.4.9 - Port Security

2.3.1.2 - skills integration port security

3.2.1.7 - VLAN

3.2.2.4 - Trunks

3.2.4.7 - troubleshoot VLAN

3.2.4.8 - troubleshoot VLAN 2

3.4.1.2 - skills integration VLAN

Round 2: All of Round 1 plus:

RSE

4.1.1.8 - how to use PC tools to explore a network (ipconfig, tracert, nslookup)

4.1.3.5 - ip addressing

4.1.4.5 - configure network

5.1.3.6 - Router on a stick inter-VLAN routing

5.2.2.4 - Troubleshoot inter-VLAN routing

5.4.1.2 - skills integration

6.2.2.4 - Static routes

6.4.1.5 - Route summary

6.4.1.6 - Route summary 2

6.4.3.4 - Floating static route

6.5.2.3 - Troubleshoot static routes

6.6.1.2 - skills integration static routes

To configure Laptops and servers, click on the devices, then use the DESKTOP menu, then click the IP ADDRESS icon

Configure SWITCHES:

Note: after typing the beginning of a command, you can hit tab to finish it.

Note: you can type ? at any place to see a list of available commands, options, etc.

Different modes use different prompts:

User mode hostname >

enable

Privileged mode hostname #

configure terminal

Global config mode hostname (config)

interface <name of interface>

Interface mode hostname (config-if)

line <name of a line> hostname (config line)

? - will show you available commands in each mode

? - will also show available options as you begin each command: example> enable ?

type "exit" to leave current mode and go up 1 mode

To see current configuration:

#show running-config

To set the hostname:

#hostname

Securing level 1 user mode:

To configure the Console line:

router(config)#line con 0

router(config-line)#password <password>

router(config-line)#login (enables password checking) only used in securing lines

router(config-line)#end or exit

To configure the Telnet lines:

router(config)#line vty 0 15 (all 16 lines)

router(config-line)#password <password>

router(config-line)#login (enables password checking) only used in securing lines

router(config-line)#end or exit

To configure the Aux line:

router(config)#line aux 0

router(config-line)#password <password>

router(config-line)#login (enables password checking) only used in securing lines

router(config-line)#end or exit

Securing level 2 privileged mode:

enable password [password] (stores as text)

enable secret [password] (stores as MD5)

service password-Encryption (encrypts ALL passwords)

To set the banner when logging in:

#banner motd "warning"

#copy running-config startup-config

or write memory

or write

or wr

To configure interfaces with ip addresses, and bring line up:

(config)#interface vlan 1

or

(config)#interface Fa0/0

or

(config)#int G0/0

ip address 154.120.20.29 255.255.255.0 <- must include netmask

no shutdown (brings line up)

To set default-gateway:

```
(config)#ip default-gateway 192.168.1.1
```

All switches will have a vlan1. Adding an IP address allows you to connect to the switch remotely via telnet or ssh.

TO configure the vlan1 interface:

```
interface vlan1
```

```
ip address 172.16.10.62 255.255.255.192
```

```
ip default-gateway 172.16.10.1
```

```
no shutdown
```

To configure with ipv6:

```
ipv6 address 2001:DB8:CAFE:2::1/64
```

```
ipv6 address FE80::1 link-local
```

```
ipv6 enable
```

To ASSIGN a VLAN to Interface port:

```
interface FastEthernet1/1
```

```
switchport access vlan 1
```

SSH (more secure than telnet)

RSE 2.2.1.1

Set the domain name to cisco.com and generate the 1024 bit rsa key.

```
S1(config)# ip domain-name cisco.com
```

```
S1(config)# crypto key generate rsa
```

The name for the keys will be: S1.cisco.com

Choose the size of the key modulus in the range of 360 to 4096 for your General Purpose Keys. Choosing a key modulus greater than 512 may take a few minutes.

How many bits in the modulus [512]: 1024

% Generating 1024 bit RSA keys, keys will be non-exportable...

[OK] (elapsed time was 4 seconds)

```
S1(config)#
```

*Mar 1 02:20:18.529: %SSH-5-ENABLED: SSH 1.99 has been enabled

Create a local user 'admin' with the password 'ccna'. Set all vty lines to use ssh and local login for remote connections. Exit out to global configuration mode.

```
S1(config)# username admin secret ccna
```

```
S1(config)# line vty 0 15
```

```
S1(config-line)# transport input ssh
```

```
S1(config-line)# login local
```

```
S1(config-line)# end
```

```
S1#
```

%SYS-5-CONFIG_I: Configured from console by console

Configure S1 to use SSH 2.0.

```
S1(config)# ip ssh version 2
```

```
S1(config)#
```

You successfully configured SSH on all VTY lines.

Secure unused ports:

RSE 2.2.4.1

Use shutdown command to turn off unused ports

Use interface range f0/3 - 12

Port Security:

RSE 2.2.4.3

S3(config)#int f0/6

S3(config-if)#switchport port-sec

S3(config-if)#switchport port-sec max 2

S3(config-if)#switchport port-sec violation restrict

S3(config-if)#switchport port-security mac-address sticky

NTP:

RSE 2.2.4.8

R1(config)# ntp master 1

R2(config)# ntp server 10.1.1.1

show ntp status

VLANs:

RSE 3.2.1

Create more VLANs:

config t

vlan 10

name Students

exit

vlan 20

name Faculty

exit or end

To Delete Vlan:

no vlan 20

TO verify config:

```
#show vlans brief
```

```
#show ip interface brief
```

To Assign ports to a VLAN:

```
config t
```

```
interface f0/1
```

```
switchport mode access (turns the port into a non-trunk, access port)
```

```
switchport access vlan 2
```

OR use a range:

```
interface range f0/1-6
```

```
interface range fastethernet1/1 - 2
```

```
switchport mode access
```

```
switchport access vlan 2
```

```
interface range fastethernet1/3 - 4
```

```
switchport access vlan 3
```

```
exit
```

To Remove vlan from an interface port:

```
int f0/1
```

```
no switchport access vlan
```

```
#show vlan brief
```

```
#show interfaces <g0/1> switchport
```

```
#show interfaces vlan
```

```
#show interfaces status
```


Trunks: RSE 3.2.2.1

```
config t
```

```
interface f0/1
```

```
switchport mode trunk (disables Dynamic Trunk Protocol DTP. Hard sets it to trunk)
```

```
switchport trunk encapsulation dot1q
```

To set native vlan:

```
switchport trunk native vlan 88
```

To assign allowed VLANs on trunks:

```
switchport trunk allowed vlan 10, 20, 30
```

To verify config:

```
#show interfaces trunk
```

```
#show interface g0/1 switchport (verify if in trunk mode)
```

```
#show interfaces switchport
```

Reset trunk: RSE 3.2.2.2

```
int f0/1
```

```
no switchport trunk allowed vlan
```

```
no switchport trunk native vlan
```

```
end
```

```
show interfaces f0/1 switchport
```

Return port to Access mode: RSE 3.2.2.2

```
interface f0/1
```

```
switchprt mode access
```

end

show interfaces f0/1 switchport

Troubleshooting VLAN and Trunks: RSE 3.2.4

Routers: RSE 4

same basic setup as switches.

int g0/0

description Link to LAN1 <- can add a description to an interface

To add a loopback interface:

interface loopback 0

ip address 10.0.0.1 255.255.255.0

To check config:

show ip interface brief

show ip route

show running-config interface g0/0

show interface g0/0

show ip interface g0/0

show history

while in config: do show ip route | begin Gateway (begins at word Gateway)

RSE 5:

Router on a stick (for less than 50 vlans)

Uses sub-interfaces on same physical link

Configure the switch's port to the router as a trunk

ROUTER:

enable

configure terminal

interface fastethernet0/0

ip address 192.168.1.1 255.255.255.0

no shutdown

interface fastethernet0/0.2 <- vlan # by convention

encapsulation dot1q 2 <- vlan #

ip address 192.168.2.1 255.255.255.0

interface fastethernet0/0.3

encapsulation dot1q 3

ip address 192.168.3.1 255.255.255.0

exit

exit

show ip interface brief

show interfaces

show vlans

show ip route

from a PC, use tracert to see what route the traffic takes

Example: C:/tracert 10.10.10.1

5.3.1.3 - 5.3.1.5

An SVI is a virtual interface that is configured within a multilayer switch

Routed ports are used for point-to-point links.

To configure routed ports, use the no switchport

A switch can function as a Layer 3 device and route between VLANs and a limited number of static routes. The Cisco Switch Database Manager (SDM) provides multiple templates.

```
#show sdm prefer
```

```
(config)#sdm prefer ?
```

```
(config)#do reload
```

Summary 5.4.1.3

RSE6 Routing:

Static - manually add routes to build routing table

Dynamic - uses protocols to build routing table

classful addressing was a very wasteful addressing scheme. A better network addressing solution had to be developed. For this reason, Classless Inter-Domain Routing (CIDR) was introduced in 1993.

Classless Inter-Domain Routing (CIDR) and the variable-length subnet mask (VLSM) methods. CIDR and VLSM have helped conserve the IPv4 address space using subnetting and summarization techniques.

Note: For point-to-point interfaces, you can use static routes that point to the exit interface or to the next-hop address. For multipoint/broadcast interfaces, it is more suitable to use static routes that point to a next-hop address.

```
show ip route static | begin Gateway
```

Default static route:

```
ip route 0.0.0.0 0.0.0.0 [ip or exit-intf]
```

```
ip route 172.31.0.0 255.255.255.0 172.31.1.193
```

```
ip route 172.31.1.196 255.255.255.252 172.31.1.193
```

```
ip route 172.31.1.128 255.255.255.192 172.31.1.193
```

```
R1#show ip route
```

Gateway of last resort is not set

172.31.0.0/16 is variably subnetted, 7 subnets, 5 masks

```
S   172.31.0.0/24 [1/0] via 172.31.1.193
C   172.31.1.0/25 is directly connected, GigabitEthernet0/0
L   172.31.1.1/32 is directly connected, GigabitEthernet0/0
S   172.31.1.128/26 [1/0] via 172.31.1.193
C   172.31.1.192/30 is directly connected, Serial0/0/0
L   172.31.1.194/32 is directly connected, Serial0/0/0
S   172.31.1.196/30 [1/0] via 172.31.1.193

C   172.31.0.0/24 is directly connected, GigabitEthernet0/0
L   172.31.0.1/32 is directly connected, GigabitEthernet0/0
S   172.31.1.0/25 [1/0] via 172.31.1.194
C   172.31.1.192/30 is directly connected, Serial0/0/0
L   172.31.1.193/32 is directly connected, Serial0/0/0
C   172.31.1.196/30 is directly connected, Serial0/0/1
L   172.31.1.197/32 is directly connected, Serial0/0/1
```

Static Route:

```
S* 0.0.0.0/0 [1/0] via 172.31.1.197
```

6.3.3.5

VLSM allows the use of different masks for each subnet. After a network address is subnetted, those subnets can be further subnetted. VLSM is simply subnetting a subnet. VLSM can be thought of as sub-subnetting.

6.4.1.3 Summary Static route

Calculate ip and subnet mask

Add a static route

Floating static routes are static routes that have an administrative distance greater than the administrative distance of another static route or dynamic routes. They are very useful when providing a backup to a primary link, as shown in the figure.

By default, static routes have an administrative distance of 1, making them preferable to routes learned from dynamic routing protocols.

Troubleshooting routes:

ping

tracert

show ip route

show ip interface brief

show cdp neighbors detail

Summary 6.6.1.3

RSE7 Dynamic Routing

Static routing has pros and cons

Dynamic routing has pros and cons

Dynamic routing uses protocols to share routing table updates with other devices

Sharing all info about all networks can take time. Routing protocols can be rated based on the speed to convergence; the faster the convergence, the better the routing protocol. Generally, older protocols,

such as RIP, are slow to converge, whereas modern protocols, such as EIGRP and OSPF, converge more quickly. In contrast to distance vector routing protocol operation, a router configured with a link-state routing protocol can create a complete view or topology of the network by gathering information from all of the other routers.

To enable RIP routing for a network:

```
(config)#router rip
```

```
(config-router)#network network-address
```

To enable RIP v2:

```
(config)#router rip
```

```
(config-router)#version 2
```

To see which protocols are running:

```
show ip protocols
```

```
show ip route
```

To modify the default RIPv2 behavior of automatic summarization, use the

```
(config-router)#no auto-summary
```

in the router configuration mode command

Use the command

```
(config-router)#passive-interface g0/0
```

to prevent the transmission of routing updates through a router interface, but still allow that network to be advertised to other routers

To propagate a default route:

```
(config-router)#default-information originate
```

OSPF uses link state routing:

Pros and Cons 7.4.3.1

(config-router)#router ospf 10

Reading a routing table 7.5.2.1

Summary 7.6.1.2

RSE8

Open Shortest Path First (OSPF) is a link-state routing protocol that was developed as a replacement for the distance vector routing protocol, RIP. RIP was an acceptable routing protocol in the early days of networking and the Internet. However, RIP's reliance on hop count as the only metric for determining best route quickly became problematic. Using hop count does not scale well in larger networks with multiple paths of varying speeds. OSPF has significant advantages over RIP in that it offers faster convergence and scales to much larger network implementations.

OSPF is a classless routing protocol that uses the concept of areas for scalability.

Configuring an OSPF Router ID:

(config)#router ospf 10

(config-router)#router-id 1.1.1.1

(config-router)#end

If router-id is changed, need to reset router or use this command:

#clear ip ospf process

#show ip protocols

To Assign an interface to an OSPF area:

Calculate subnet mask and wildcard mask

Use the 8.2.2.3

Use the

#show ip ospf neighbor

command to verify that the router has formed an adjacency with its neighboring routers.

#show ip ospf interface brief

OSPFv3 for ipv6 8.3.1

Summary 8.4.1.3