

CCNA SRWE

## Lab 3

Team-No. 2

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SRWE Module Group Exams

1-9 (Switch Config, SSH, VLAN,

Trunk, STP, Etherchannel, .. refresh)

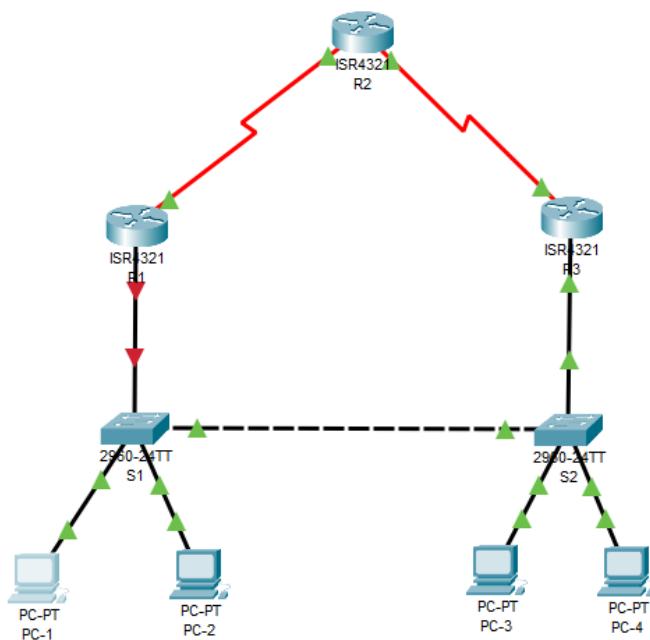
10-13 (LAN Security, WLAN)

14-16 (Static Routing)

### VLAN, Trunk Refresher

### Switch LAN Security

### Static Routing



## Homework

### Lab Instructions

Task 1 VLAN, Trunk Refresher

Task 2 Switch LAN Security

Task 3 Static Routing

### Deliverables and Due Dates

## Homework / Lab Preparation

### Part 1: Cisco IOS Basic Configuration Commands

- Read the **Lab Instructions** of this Lab
- Check the **IOS Command List**, provided for the Labs and review configuration commands.

### Part 2: Switch Security

#### a) Switch Port Security

Why should you switch-off all unused ports?

Layer 2 devices are the weakest link in a security infrastructure. Layer 2 attacks are some of the easiest for hackers to deploy but these threats can also be mitigated by securing the ports before the switch is deployed for production use. A simple method of security is to disable all unused ports on a switch.

Which command option helps not to edit each single interface?

The command to select a range of interfaces instead of single interface

S1(config)# interface range fa0/8 - 24

S1(config-if-range)# shutdown

For which type of switch port is it useful to limit the number of MAC addresses learned?

Port security can only be configured on manually configured access ports or manually configured trunk ports. By default, Layer 2 switch ports are set to dynamic auto (trunking on). Therefore, the port is configured with the switchport mode access interface configuration command.

Which 3 options do you have in case of violation to switch port security?

default: shutdown, w/ notification restrict, w/o notification protect)

#### b) Secured Switch Trunks

Why is DTP dangerous for trunk ports? DTP-Dynamic Trunking Protocol (Auto trunking)

How can you disable DTP on switch port f0/24?

```
S1 (config) # interface fa0/24
S1 (. . . )# switchport nonegotiate
```

Which other security means do you have on trunk ports? Name in minimum 2 options.

Manually enable the trunk link on a trunking port by using the switchport mode trunk command

Set the native VLAN to a VLAN other than VLAN 1 by using the switchport trunk native vlan vlan\_number command.

**c) Spanning Tree Security**

Describe how a man-in-the-middle attack on the STP protocol family can be performed.

Network attackers can manipulate the Spanning Tree Protocol (STP) to conduct an attack by spoofing the root bridge and changing the topology of a network. Attackers can make their hosts appear as root bridges; and therefore, capture all traffic for the immediate switched domain.

Configure STP security to prevent STP MITM attacks at switch access port F0/11.

```
S1(config)# int F0/11
S1(. . . )# spanning-tree portfast
           spanning-tree bpduguard enable
```

## Part 3: Static Routing

**a) Serial interface configuration**

Configure the serial interface s0/0/1 with IP address of 10.0.01 / 25 and a clock rate of 125 kHz (is DCE) and shut-on the interface..

```
R1(config)# int s0/0/1
R1(. . . )# ip address 10.0.0.1 255.255.255.128
R1(. . . )# no shutdown
R1(. . . )# clock rate 125000
```

**b) Static route configuration**

Configure a static recursive route to network 192.168.0.0 / 24 via next hop 192.168.11.1.

```
R1(config)# ip route 192.168.0.0 255.255.255.0 192.168.11.1
```

Configure a directly connected static route to network 192.168.0.0 / 24 via exit interface g0/0.

```
R1(config)# ip route 192.168.0.0 255.255.255.0 g0/0
```

Configure a static default route via the next hop address 192.168.21.1.

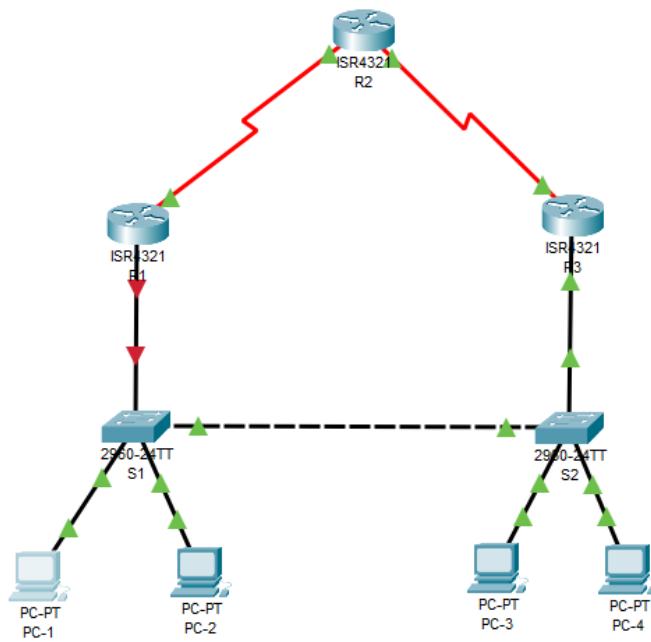
```
R1(config)# ip route 0.0.0.0 0.0.0.0 192.168.21.1
```

Display the IPv4 routing table.

```
R1# show ip route
```

## Task 1 – VLAN, Trunk Refresher

### Topology



### Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0/0.10	192.168.10.1	255.255.255.0	N/A
	G0/0/0.20	192.168.20.1	255.255.255.0	N/A
	G0/0/0.99	192.168.99.1	255.255.255.0	N/A
R3	G0/0/0.10	192.168.10.3	255.255.255.0	N/A
	G0/0/0.20	192.168.20.3	255.255.255.0	N/A
S1	VLAN99	192.168.99.101	255.255.255.0	192.168.99.1
S2	VLAN99	192.168.99.102	255.255.255.0	192.168.99.1
PC-1	NIC	192.168.10.11	255.255.255.0	192.168.10.1
PC-3	NIC	192.168.10.33	255.255.255.0	192.168.10.3
PC-2	NIC	192.168.20.22	255.255.255.0	192.168.20.1
PC-4	NIC	192.168.20.24	255.255.255.0	192.168.20.3

**VLAN Table**

Switch	VLAN Number	VLAN Name	Access Port Membership	Network
S1	10	Admin	Fa0/2	192.168.10.0/24
	20	Sales	Fa0/3	192.168.20.0/24
	99	Management	Fa0/1	192.168.99.0/24
S2	10	Admin	Fa0/2	192.168.10.0/24
	20	Sales	Fa0/3	192.168.20.0/24
	99	Management	Fa0/1	192.168.99.0/24

**Part 1: Build the Switched Network and Verify Connectivity****Step 1: Build topology in Packet Tracer.**

**COVID-19 Version:** Build topology in **Packet Tracer**. Use and re-label the following devices:

- Build the network with ISR4321 router, 2960 switches, and PCs in Packet Tracer. Rename the devices.
- Cable the network according to the topology with straight-through TP cables  and cross-over cables 
  - Ports F0/1 on both switches are interconnecting the switches
  - Port F0/2 and F0/3 connect PCs at switches S1 and S2
  - Port G0/1 of both switches connect to router R1 or router R3 respectively.
- Implement serial interfaces NIM-2T at each router, and connect these interfaces by serial cables. 
- We will use the CLI window of the network devices directly for configurations.

**Step 2: Configure PC hosts as shown in the topology and addressing table.**

- Configure IP address, net mask and default gateway for PC-1, PC-2, PC-3, and PC-4.

```
enable
configure terminal
hostname S1
no ip domain-lookup
enable secret class
exit

conf t

line console 0
password cisco
login
logging synchronous
service password-encryption
exit

copy run start

show run
```

**Step 3: Configure basic settings for each switch.**

- Disable DNS lookup.
- Configure device name
- Assign **class** as the privileged EXEC encrypted password.
- Assign **cisco** as the console password, enable login
- Configure **logging synchronous** to prevent console messages from interrupting.
- Configure password encryption
- Save your running configuration in the startup configuration.

## Part 2: Create VLANs and Assign Switch Ports

### Step 1: Create VLANs on the switches

- Create VLANs 10, 20, and 99 on S1 and S2 according to the VLAN assignment list.

```
S1(config)# int f0/2
```

```
S1(config-if)# switchport mode access
```

```
S1(config-if)# switchport access vlan 10
```

- Assign switch ports to a VLAN according to the VLAN Table.

### Step 3: Create SVI Interface for VLAN99

- Generate a switch IP address for the **Management VLAN 99** (virtual interface VLAN 99) on all switches according to the Addressing Table

```
S1(config)# interface vlan 99
```

```
S1(config-if)# ip address 192.168.99.101 255.255.255.0
```

### Step 4: Configure a Default Gateway on Switches

```
S1(config-if)# no shutdown
```

- Configure the **default gateway** for each switch according to the Addressing Table.

```
S1(config)# ip default-gateway 192.168.99.1
```

### Step 5: Check VLAN and Connectivity

- List your VLAN database on **S1 (show vlan brief)**.

Record, which switch ports are not in VLAN 1: **f0/2,f0/3,f0/1**

- Check your interfaces on switch **S2 (show ip interface brief)**.

Record the status of VLAN 99 interface: **Vlan99 192.168.99.102 YES manual up up**

- Check connectivity (ping) from S1 to S2 in VLAN 99. Connectivity (y/n)?

**yes**

## Part 3: Basic Configuration of Router R1

### Step 1: Configure basic settings of Router R1.

- Disable DNS lookup.
- Configure the device name as shown in the topology.
- Assign **class** as the privileged EXEC encrypted password.
- Assign **cisco** as the console password, enable login
- Configure **logging synchronous** to prevent console messages from interrupting.
- Configure password encryption
- Copy the running configuration to the startup configuration.

## Part 4: Trunk-Based Inter-VLAN Routing at Router R1

### Step 1: 802.1Q Trunk from Switch S1 to Router R1

```
S1(config)# interface g0/1
```

```
S1(config-if)# switchport mode trunk
```

```
S1(config-if)# switchport trunk allowed vlan 10,20,99
```

- Create a trunk on interface G0/1 of switch S1 and allow all VLANs 10,20, and 99 to be transmitted over the trunk.

### Step 2: Router Interfaces for all VLANs.

- For each VLAN in VLAN Table, create a sub-interface on R1 G0/0/0.ID, using the VLAN number as the sub-interface ID.

```
R1(config)# interface g0/0/0.10
```

```
R1(config-subif)# encapsulation dot1Q 10
```

- Finally, switch on the physical interface G0/0/0

```
R1(config-subif)# ip address 192.168.10.1 255.255.255.0
```

```
R1(config)# interface g0/0/0
```

```
R1(config-if)#no shut
```

**Step 3: Display Device Information**

- a. Issue the **show interfaces trunk** command to view the trunk mode on S1.

Record, which encapsulation is used on the trunk link at interface G0/1? **802.1q**

Which VLANs are allowed on the trunk? **10,20,99**

What is the native VLAN on your trunk? **1**

- b. List the subnets, which are routed at R1 (**show ip route**)
- C 192.168.10.0/24 is directly connected, GigabitEthernet0/0/0.10  
L 192.168.10.1/32 is directly connected, GigabitEthernet0/0/0.10  
192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks  
C 192.168.20.0/24 is directly connected, GigabitEthernet0/0/0.20  
L 192.168.20.1/32 is directly connected, GigabitEthernet0/0/0.20  
192.168.99.0/24 is variably subnetted, 2 subnets, 2 masks

**Step 4: Test Connectivity between VLANs** C 192.168.99.0/24 is directly connected, GigabitEthernet0/0/0.99

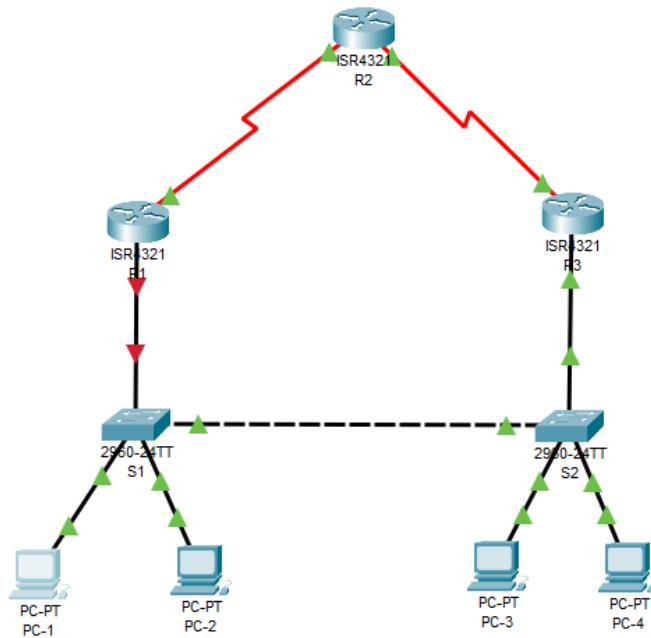
L 192.168.99.1/32 is directly connected, GigabitEthernet0/0/0.99

- a. Check connectivity (ping) from PC1 to router R1 in VLAN 10. Connectivity (y/n)? **yes**
- b. Check connectivity (ping) from PC1 to switch S1 in VLAN 99. Connectivity (y/n)? **yes**
- c. Check connectivity (ping) from PC1 to PC2 in VLAN 20. Connectivity (y/n)? **yes**

**Note:** Remove errors, if checks are not working.

## Task 2 – Switch LAN Security

### Topology



### Modified and Extended VLAN Table

Switch	VLAN Number	VLAN Name	Access Port Membership	Network
SW-1	10	Admin	Fa0/2	192.168.10.0/24
	20	Sales	Fa0/3	192.168.20.0/24
	99	Management	Fa0/24	192.168.99.0/24
	100	NativeVLAN	Unused	None
	999	BlackHole	All unused	None
SW-2	10	Admin	Fa0/2	192.168.10.0/24
	20	Sales	Fa0/3	192.168.20.0/24
	99	Management	Fa0/24	192.168.99.0/24
	100	NativeVLAN	Unused	None
	999	BlackHole	All unused	None

### Part 1: Switch Port Security

#### Step 1: Create all VLANs

- Extend the VLAN database with all VLANs of the Modified and Extended VLAN table.
- Create VLAN 100 and give it the name NativeVLAN on both switches.
- Create VLAN 999 and give it the name BlackHole on both switches.

**Step 2: New Access Ports for VLAN 99**

- Configure switch ports F0/24 of both switches S1 and S2 as access port to VLAN 99.

```
S1(config)# int f0/24
S1(config-if)# switchport mode access
S1(config-if)# switchport access vlan 99
```

**Step 3: Create Secure Trunks**

Recognize that interface Fa0/1 and G0/1 of both switches S1 and S2 are no longer access port, but will become trunk ports.

- Interface Fa0/1 on both switches and Interface G0/1 on switch S2 shall be static trunks now.

```
S1(config)#int f0/1
S1(config-if)#no switchport access vlan 10
S1(config-if)#end
```

- Remove F0/1 access port allocation (no switchport access vlan 10)
- Configure port Fa0/1 and G0/1 as static trunks.
- Allow only given VLANs on trunk.
- For all trunk interfaces on both switches **disable DTP negotiation**.
- Configure all trunk ports on both switches to use VLAN 100 as the native VLAN.

```
S1(config)#int f0/1 or g0/1
S1(config-if)# switchport mode trunk
S1(config-if)#int f0/1
S1(config-if)#switchport nonegotiate
S2(config)#int f0/1
```

- Change and extend configuration of interface G0/1 of switch S1 accordingly

```
S2(config-if)#switchport trunk native vlan
?
```

**Step 4: Secure Unused Switchports at switch S1.**

```
S1(config)#interface range FastEthernet0/4-23, int g0/2
```

```
S1(config-if-range)#shutdown
S1(config-if-range)#exit
```

- Shutdown all unused switch ports on S1.
- Move all unused switch ports to the BlackHole VLAN.
- List your VLAN database on **S1 (show vlan brief)**.

```
S1(config-if-range)#switchport access vlan 999
```

Record, which switch ports are in VLAN 1 now: **none**

**Step 5: Port Security at switch S1.**

**2,3,24**

```
S1(config)#interface range f0/2-3,f0/24
```

```
S1(config-if-range)#switchport mode access
```

- Activate port security on all active access ports on switch S1.
- Configure the active ports to allow a maximum of 4 MAC addresses to be learned.
- For port F0/2 on S1, statically configure the MAC address of the PC using port security.
- Configure each active access port, that it will automatically add the MAC addresses learned on the port to the running configuration.
- Configure the port security violation mode to drop packets from MAC addresses that exceed the maximum, generate a Syslog entry, but do not disable the ports.
- From PC2, ping router R1. Check Port Security Options at S1 interface F0/3 (**show port-security interface f0/3**).

If available, record the MAC address of PC2:

**0**

## Part 2: STP and DHCP Security

### Step 1: STP security with PortFast, and BPDU Guard.

- g. On switch S1
- 1) Enable PortFast on all the access ports that are in use. `S1(config)#int range f0/2-3, f0/24`  
`S1(config-if-range)#spanning-tree portfast`
  - 2) Enable BPDU Guard on all the access ports that are in use `S1(config-if-range)#spanning-tree bpduguard enable`

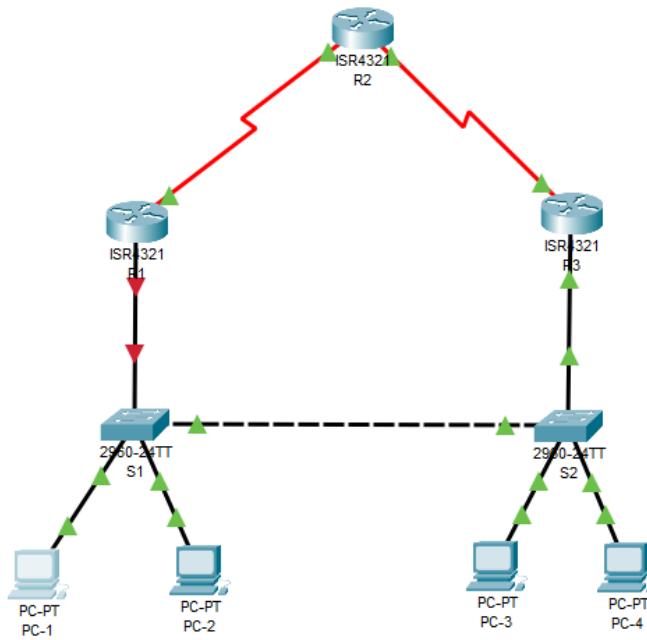
### Step 2: DHCP Snooping.

For exercise purposes, we configure DHCP snooping, although DHCP is not used in this Lab.

- h. On switch S1
- 1) Configure the trunk ports on S1 as trusted ports. `S1(config)#interface range f0/1, g0/1`  
`S1(config-if-range)#ip dhcp snooping trust`
  - 2) Limit the untrusted ports on S1 to five DHCP packets per second. `S1(config)#interface range f0/2-3,f0/24`  
`S1(config-if-range)#ip dhcp snooping limit rate 5`
- i. On switch S2, enable DHCP snooping globally and for VLANs 10, 20 and 99.
- `S2(config)#ip dhcp snooping`  
`S2(config)#ip dhcp snooping vlan 10,20,99`

## Task 3 – Static Routing

### Topology



### Extended Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
R1	G0/0/0.10	192.168.10.1	255.255.255.0	N/A
	G0/0/0.20	192.168.20.1	255.255.255.0	N/A
	G0/0/0.99	192.168.99.1	255.255.255.0	N/A
	S0/1/0 (DCE) DTE	10.1.1.1	255.255.255.252	N/A
R2	S0/1/0	10.1.1.2	255.255.255.252	N/A
	S0/1/1 (DCE)	10.2.2.2	255.255.255.252	N/A
	Lo1 (loopback)	209.165.200.225	255.255.255.224	N/A
R3	G0/0/0.10	192.168.10.3	255.255.255.0	N/A
	G0/0/0.20	192.168.20.3	255.255.255.0	N/A
	S0/0/1 s0/1/0	10.2.2.1	255.255.255.252	N/A
S1	VLAN99	192.168.99.101	255.255.255.0	192.168.99.1
S2	VLAN99	192.168.99.102	255.255.255.0	192.168.99.1
PC-1	NIC	192.168.10.11	255.255.255.0	192.168.10.1
PC-3	NIC	192.168.10.33	255.255.255.0	192.168.10.3
PC-2	NIC	192.168.20.22	255.255.255.0	192.168.20.1
PC-4	NIC	192.168.20.24	255.255.255.0	192.168.20.3

## Part 3: Basic Router Configuration

### Step 1: Configure basic settings for router R2 and R3.

- Disable DNS lookup.
- Configure device name
- Assign **class** as the privileged EXEC encrypted password.
- Assign **cisco** as the console password, enable login
- Configure **logging synchronous** to prevent console messages from interrupting.
- Configure password encryption
- Save your running configuration in the startup configuration.

```
R3(config)#int g0/0/0.10  
R3(config-subif)#encapsulation dot1Q 10
```

### Step 2: Configure G0/0/0 interface of router R3

```
R3(config-subif)#ip add 192.168.10.3 255.255.255.0  
R3(config-subif)#exit
```

- Configure all sub-interfaces of router R3 as listed in the Addressing Table.
- Switch-on interface G0/0/0. **R3(config)#int g0/0/0**  
**R3(config-subif)#no shut**

### Step 3: Configure serial interface at all routers

- Configure all serial interfaces at router R1, R2, and R3 as listed in the Addressing Table.
- Set clock rate to **125000** (125 kHz) for all DCE serial interfaces.  
Check interface type (DCE/DTE) (**show controller <serial interface>**)  
R1# configure terminal  
R2(config)# interface s0/1/1  
R2(config-if)# clock rate 125000
- Switch on serial interfaces
- Copy the running configuration to the startup configuration.

### Step 4: Configure Loopback interface at router R2

- Configure loopback interface Lo1 as listed in the Addressing Table.  
R2# configure terminal  
R2(config)# interface loopback 1
- Copy the running configuration to the startup configuration. R2(config-if)# ip address 10.0.0.1 255.255.255.0  
R2(config-if)# exit

### Step 5: Connectivity Check

- Check connectivity (ping) from R2 to router R1 (serial interface). Connectivity (y/n)? yes
- Check connectivity (ping) from R2 to router R3 (serial interface). Connectivity (y/n)? yes

**Note:** Remove errors, if checks are not working.

- At router R2 inspect the routing table.  
List the networks which are routed at R2:  
Which networks are missing in the routing table?  
10.0.0.0/8 is variably subnetted, 4 subnets, 2 masks  
C 10.1.1.0/30 is directly connected, Serial0/1/0  
L 10.1.1.2/32 is directly connected, Serial0/1/0  
C 10.2.2.0/30 is directly connected, Serial0/1/1  
L 10.2.2.2/32 is directly connected, Serial0/1/1  
209.165.200.0/24 is variably subnetted, 2 subnets, 2 masks  
C 209.165.200.224/27 is directly connected, Loopback1  
L 209.165.200.225/32 is directly connected, Loopback1

## Part 4: Static Route Configuration

### Step 1: Static Routing in router R1, and R3

Because there are remote networks for all routers, we must add routes in all routers.

- In router R1, configure a static default route to exit the serial interface. `ip route 0.0.0.0 0.0.0.0 s0/1/0`
- In router R3, configure a static default route to exit the serial interface. `ip route 0.0.0.0 0.0.0.0 s0/1/0`

### Step 2: Static Routing in router R2

- Configure a default route with exit to the loopback interface Lo1. `ip route 0.0.0.0 0.0.0.0 Loopback1`
- Configure a static route to all VLAN networks 192.168.xx.0 / 24 with next hop R1.

```
R2(config)#ip route 192.168.10.0 255.255.255.0 10.1.1.1
R2(config)#ip route 192.168.20.0 255.255.255.0 10.1.1.1
R2(config)#ip route 192.168.99.0 255.255.255.0 10.1.1.1
```

### Step 3: Verify connectivity.

- From PC1, you should be able to ping the serial interface of router R1, Successful (y/n)? `yes`
- From PC1, you should be able to ping the loopback interface of router R2, Successful (y/n)? `yes`
- From PC4, you should be able to ping the loopback interface of router R2, Successful (y/n)? `yes`

**Note:** Remove errors, if checks are not working.

### Step 4: Review routing path

```
C:\>tracert 209.165.200.225
```

- Traceroute from PC1 to the loopback interface of router R2.

List all interfaces to and from the loopback interface to record the routing path:  
`Tracing route to 209.165.200.225 over a maximum of 30 hops:
1 0 ms 0 ms 0 ms 192.168.10.1
2 0 ms 13 ms 23 ms 209.165.200.225
Trace complete.`

- Traceroute from PC4 to the loopback interface of router R2.

List all interfaces to and from the loopback interface to record the routing path.

```
C:\>tracert 209.165.200.225
```

```
Tracing route to 209.165.200.225 over a maximum of 30 hops:
```

Discuss, why the return path is different of the forwarding path.

```
1 0 ms 0 ms 0 ms 192.168.20.3
2 11 ms 11 ms 0 ms 209.165.200.225
```

```
Trace complete.
```

## Deliverables

### Lab Teams

This lab may be solved in teams of max. 3 students. All teams have to provide their deliverables in time.

Teams are grouped into 2 groups, which have different due dates and presentation dates.

### Module Group Exams

Each team member must solve the requested **Module Group Exams** before delivery date.

### Deliverables

Each teams delivers the following documents and files:

- One **PDF-File (.pdf)** with the completed **Homework and Instructions**.  
All tasks and questions must be answered.
- One **PacketTracer-File (.pka)** in PacketTracer Version 8 with your **final configuration**.
- One **Text-File in ASCII-Format (.txt, simple Text Editor)** with the **running configurations of Router R1, and Switch S1**.

### Due Dates

Group 1	Teams 1-10	Due Date
	Module Group Exams 10-13	18.4. - EOB
	Deliverable Upload	18.4. - EOB
	CCNA ZOOM Presentation	21.4. - 16:45 ff.
	Module Group Exams 14-16	2.5. - EOB

Group 2	Teams 11-20	Due Date
	Module Group Exams 10-13	25.4. - EOB
	Deliverable Upload	25.4. - EOB
	CCNA ZOOM Presentation	28.4. - 16:45 ff.
	Module Group Exams 14-16	2.5. - EOB

### SRWE Final Exam and Skill Test

all	SRWE Final Exam	5.5. – 16:45
all	SRWE Skill Test	5.5. - 18:15