



Department of Computer Science and Engineering
Islamic University of Technology (IUT)
A subsidiary organ of OIC

Laboratory Report 05

CSE 4512: Computer Networks Lab

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Section: 2(A)

Semester: 5th

Academic Year: 2023-24

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Title: IPv6 Addressing, SPAN, and Switch Port Security

Objective:

1. Describe the concept of IPv6
2. Describe the concept of port mirroring
3. Describe the concept of Switch Port Security
4. Explain the importance of Switch Port Security in securing an organization
5. Configure IPv6 addressing scheme in a network topology
6. Implement port mirroring using Cisco Switch Port Analyzer (SPAN)
7. Configure Switch Port Security in CISCO devices
8. Create a Secure Trunk
9. Secure Unused Switchports
10. Implement Port Security

Devices/ Software Used:

1. Cisco Packet Tracer

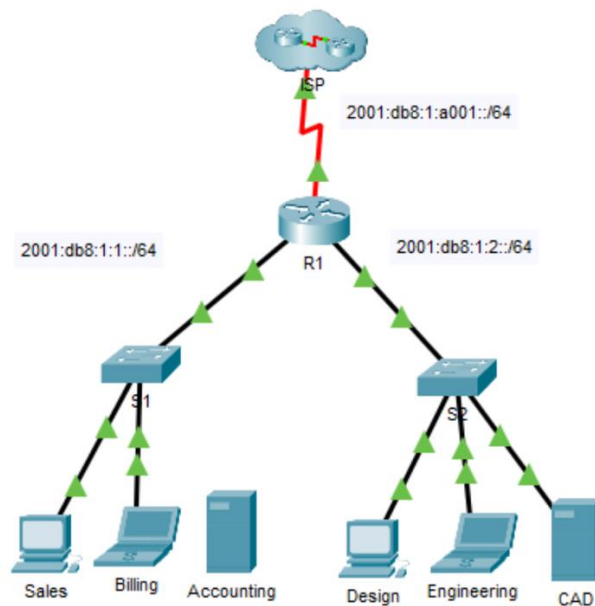
Theory:

Internet Protocol version 6, or IPv6, is the successor to IPv4 or Internet Protocol version 4. In the nineties, it became evident that IPv4 could not accommodate the explosion of connected devices on the internet.

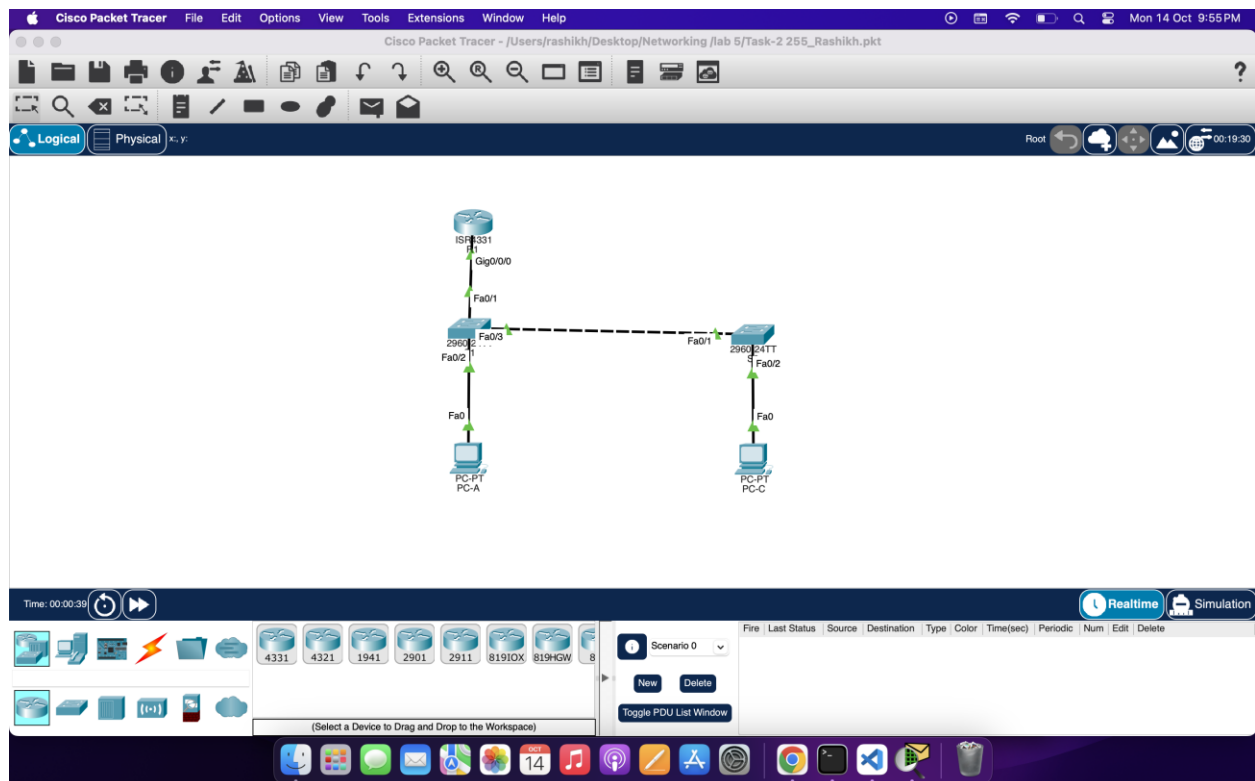
Diagram of the experiment:

(Provide screenshot(s) of the final network topology. Make sure to label the network components.)

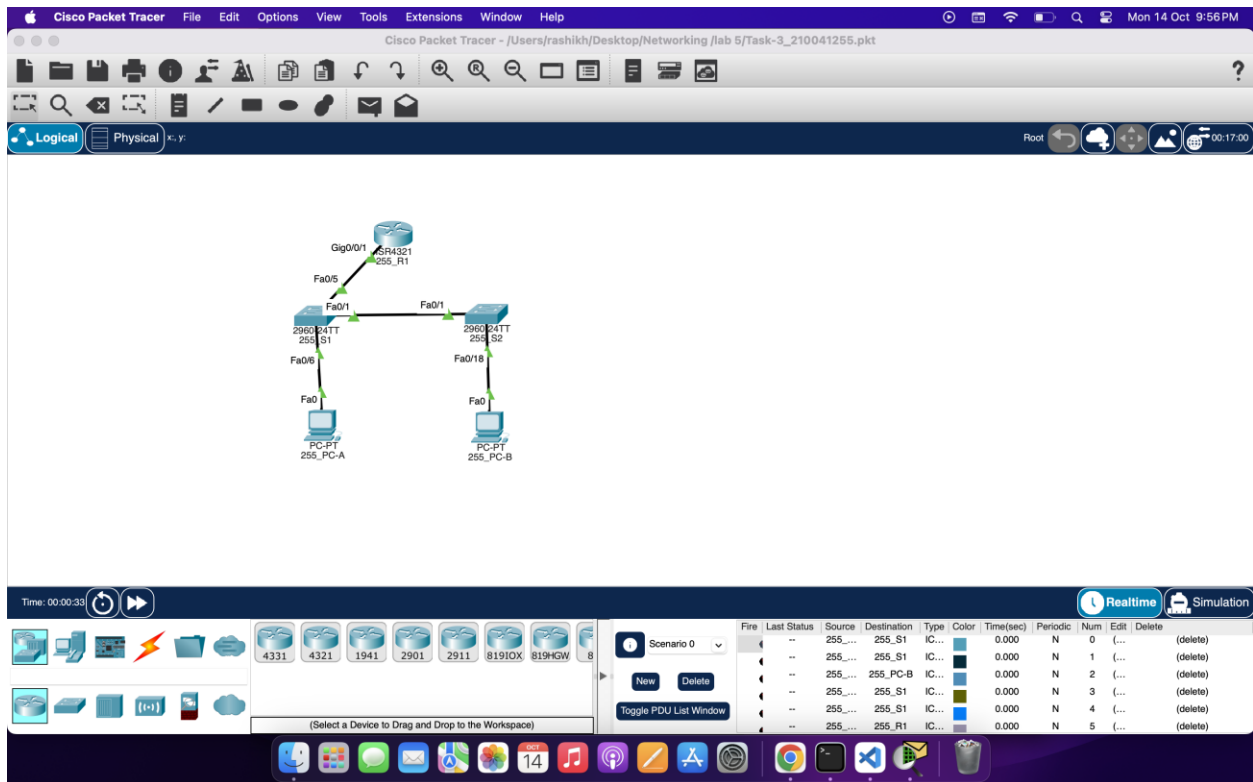
Task #01:



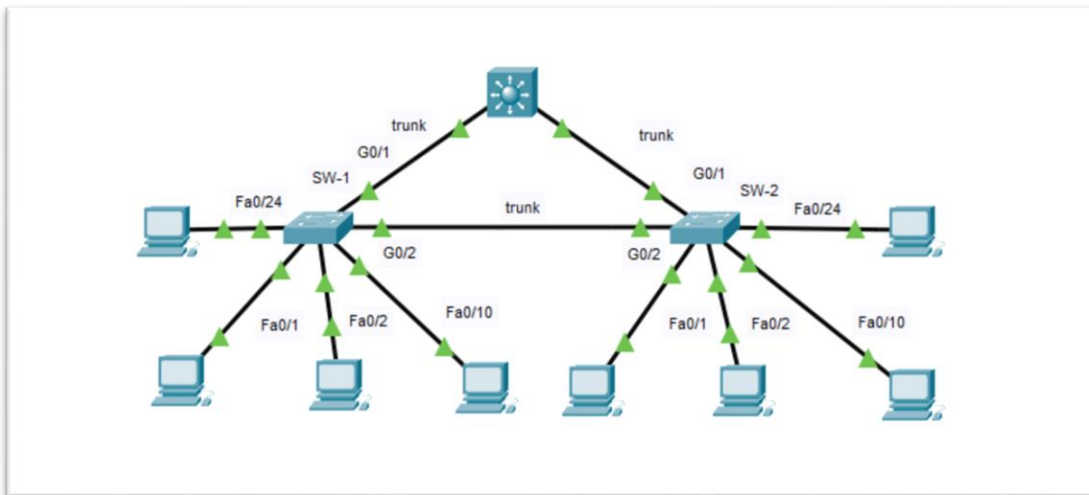
Task #02:



Task #03:



Task #04:



Working Procedure:

(Explain in brief how you completed the tasks. Provide necessary screenshots of the commands used for each task.)

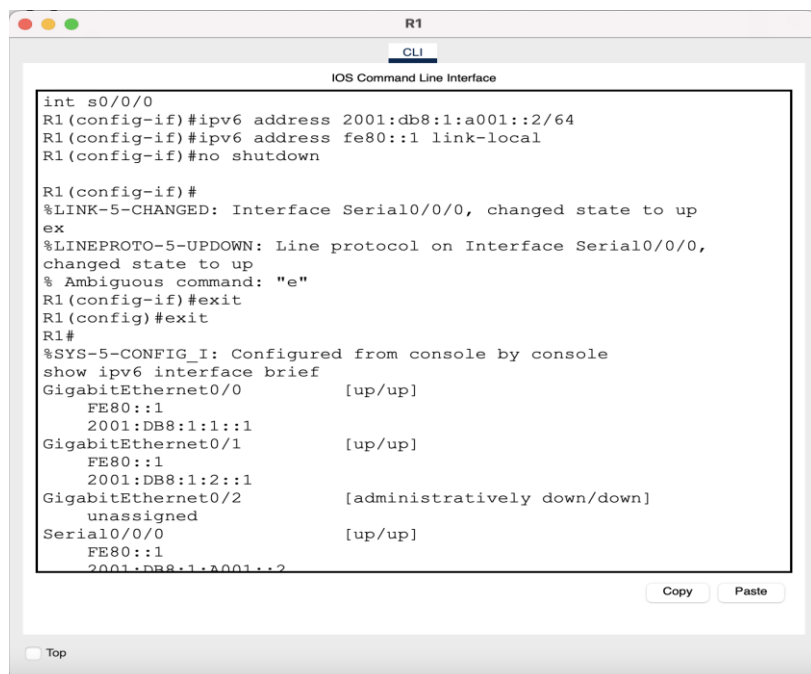
TASK #01:

For this task, I followed the instructions in the pka file:

1. Configure the ipv6 addressing on the router:

```
int s0/0/0
R1(config-if)#ipv6 address 2001:db8:1:a001::2/64
R1(config-if)#ipv6 address fe80::1 link-local
R1(config-if)#no shutdown

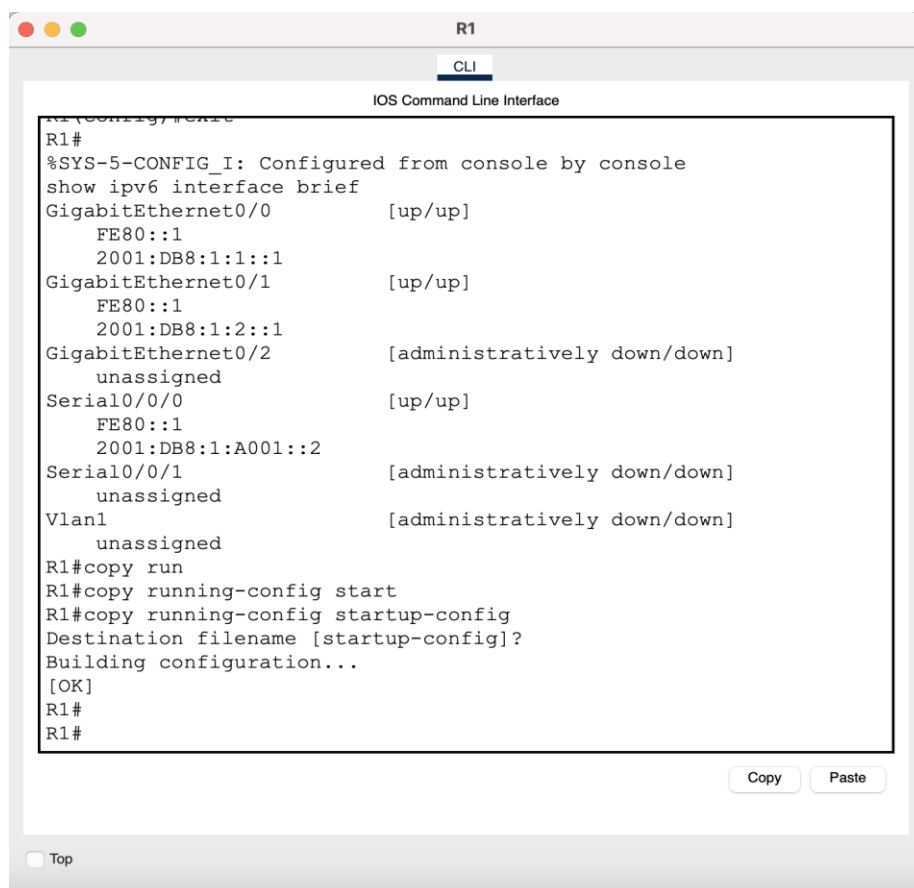
R1(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
ex
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0,
changed state to up
% Ambiguous command: "e"
R1(config-if)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
show ipv6 interface brief
GigabitEthernet0/0      [up/up]
    FE80::1
    2001:DB8:1:1::1
GigabitEthernet0/1      [up/up]
    FE80::1
    2001:DB8:1:2::1
GigabitEthernet0/2      [administratively down/down]
    unassigned
Serial0/0/0             [up/up]
    FE80::1
    2001:DB8:1:A001::2
```



A screenshot of a network device terminal window titled 'R1'. The terminal shows the configuration of a serial interface with IPv6 addresses and the status of various interfaces. The output of the 'show ipv6 interface brief' command is as follows:

```
int s0/0/0
R1(config-if)#ipv6 address 2001:db8:1:a001::2/64
R1(config-if)#ipv6 address fe80::1 link-local
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
ex
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0,
changed state to up
% Ambiguous command: "e"
R1(config-if)#exit
R1(config)#exit
R1#
%SYS-5-CONFIG_I: Configured from console by console
show ipv6 interface brief
GigabitEthernet0/0          [up/up]
    FE80::1
    2001:DB8:1:1::1
GigabitEthernet0/1          [up/up]
    FE80::1
    2001:DB8:1:2::1
GigabitEthernet0/2          [administratively down/down]
    unassigned
Serial0/0/0                  [up/up]
    FE80::1
    2001:DB8:1:A001::2
```



A screenshot of a network device terminal window titled 'R1'. The terminal shows the configuration of a switch and the saving of the configuration. The output of the 'show ipv6 interface brief' command is as follows:

```
R1#
%SYS-5-CONFIG_I: Configured from console by console
show ipv6 interface brief
GigabitEthernet0/0          [up/up]
    FE80::1
    2001:DB8:1:1::1
GigabitEthernet0/1          [up/up]
    FE80::1
    2001:DB8:1:2::1
GigabitEthernet0/2          [administratively down/down]
    unassigned
Serial0/0/0                  [up/up]
    FE80::1
    2001:DB8:1:A001::2
Serial0/0/1                  [administratively down/down]
    unassigned
Vlan1                        [administratively down/down]
    unassigned
R1#copy run
R1#copy running-config start
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
R1#
```

2. Configure IPv6 on the switches:

IOS Command Line Interface

```
Switch>enable
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S3
S3(config)#no ip domain-lookup
S3(config)#enable secret class
S3(config)#line consol 0
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#line vty 0 15
S3(config-line)#password cisco
S3(config-line)#login
S3(config-line)#exit
S3(config)#vlan 1
S3(config-vlan)#int vlan 1
S3(config-if)#ip address 192.168.1.3 255.255.255.0
S3(config-if)#no shutdown

S3(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed
state to up
exit
S3(config)#exit
S3#
```

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IOS Command Line Interface

```
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)#ip default
S3(config)#ip default-gateway 192.168.1.1
S3(config)#
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
copy run
S3#copy running-config start
S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#
S3#
```

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```
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S3(config)#ip default
S3(config)#ip default-gateway 192.168.1.1
S3(config)#
S3(config)#exit
S3#
%SYS-5-CONFIG_I: Configured from console by console
copy run
S3#copy running-config start
S3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S3#
S3#
```

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IOS Command Line Interface

```
Switch>enable
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname S1
S1(config)#no ip domain-lookup
S1(config)#enable secret class
S1(config)#line consol 0
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#line vty 0 15
S1(config-line)#password cisco
S1(config-line)#login
S1(config-line)#exit
S1(config)#vlan 1
S1(config-vlan)#int vlan 1
S1(config-if)#ip address 192.168.1.2 255.255.255.0
S1(config-if)#no shutdown

S1(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed
state to up
exit
S1(config)#ip default
S1(config)#ip default-gateway 192.168.1.1
```

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```
S1(config)#ip default
S1(config)#ip default-gateway 192.168.1.1
S1(config)#
S1(config)#exit
S1#
%SYS-5-CONFIG_I: Configured from console by console
copy run
S1#copy running-config start
S1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S1#
S1#
%LINK-5-CHANGED: Interface FastEthernet0/5, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/5,
changed state to up
```

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User Access Verification

Password:

S1>enable

Password:

S1#conf t

Enter configuration commands, one per line. End with CNTL/Z.

S1(config)#monitor session 1 source interface f0/5

S1(config)#mointor session 1 destination interface f0/6

^

% Invalid input detected at '^' marker.

S1(config)#monitor session 1 destination interface f0/6

S1(config)#telnet 192.168.1.1

^

% Invalid input detected at '^' marker.

S1(config)#exit

S1#Telnet 192.168.1.1

Trying 192.168.1.1 ...

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

Open

Copy

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☐ Top

Open

User Access Verification

Password:

% Password: timeout expired!

[Connection to 192.168.1.1 closed by foreign host]

S1#

S1 con0 is now available

Press RETURN to get started.

Copy

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Design

Desktop

Programming

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

Subnet Mask

Default Gateway

0.0.0.0

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

2001:DB8:1:2::2

/

64

Link Local Address

FE80::230:A3FF:FE02:76B

Default Gateway

FE80::1

DNS Server

802.1X

Use 802.1X Security

Authentication

MD5

Username

Password

Top

Accounting

Desktop

Programming

IP Configuration

IP Configuration

☐ DHCP

☒ Static

IPv4 Address

Subnet Mask

Default Gateway

0.0.0.0

DNS Server

0.0.0.0

IPv6 Configuration

☐ Automatic

☒ Static

IPv6 Address

2001:db8:1:1::4 / 64

Link Local Address

FE80::201:C7FF:FE83:3CED

Default Gateway

fe80::1

DNS Server

802.1X

☐ Use 802.1X Security

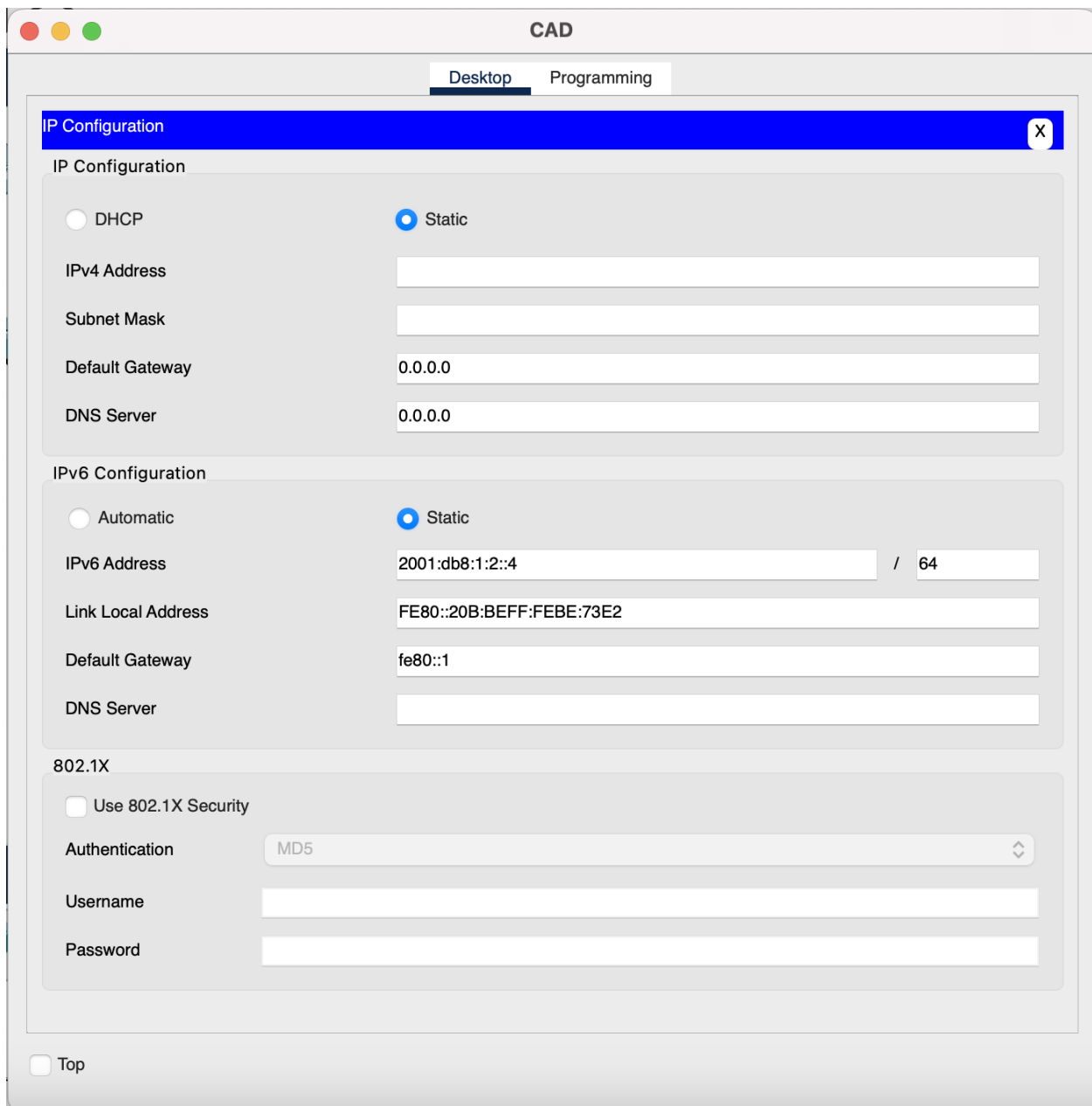
Authentication

MD5

Username

Password

☐ Top



Billing

Desktop

Programming

IP Configuration

X

Interface

FastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

Subnet Mask

Default Gateway

0.0.0.0

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

2001:db8:1:1::3

/

64

Link Local Address

Default Gateway

fe80::1

DNS Server

802.1X

Use 802.1X Security

Authentication

MD5

Username

Password

Top

Engineering

DesktopProgramming

IP Configuration

X

InterfaceFastEthernet0

IP Configuration

DHCP

Static

IPv4 Address

Subnet Mask

Default Gateway

0.0.0.0

DNS Server

0.0.0.0

IPv6 Configuration

Automatic

Static

IPv6 Address

2001:db8:1:2::3

/

64

Link Local Address

Default Gateway

fe80::1

DNS Server

802.1X

Use 802.1X Security

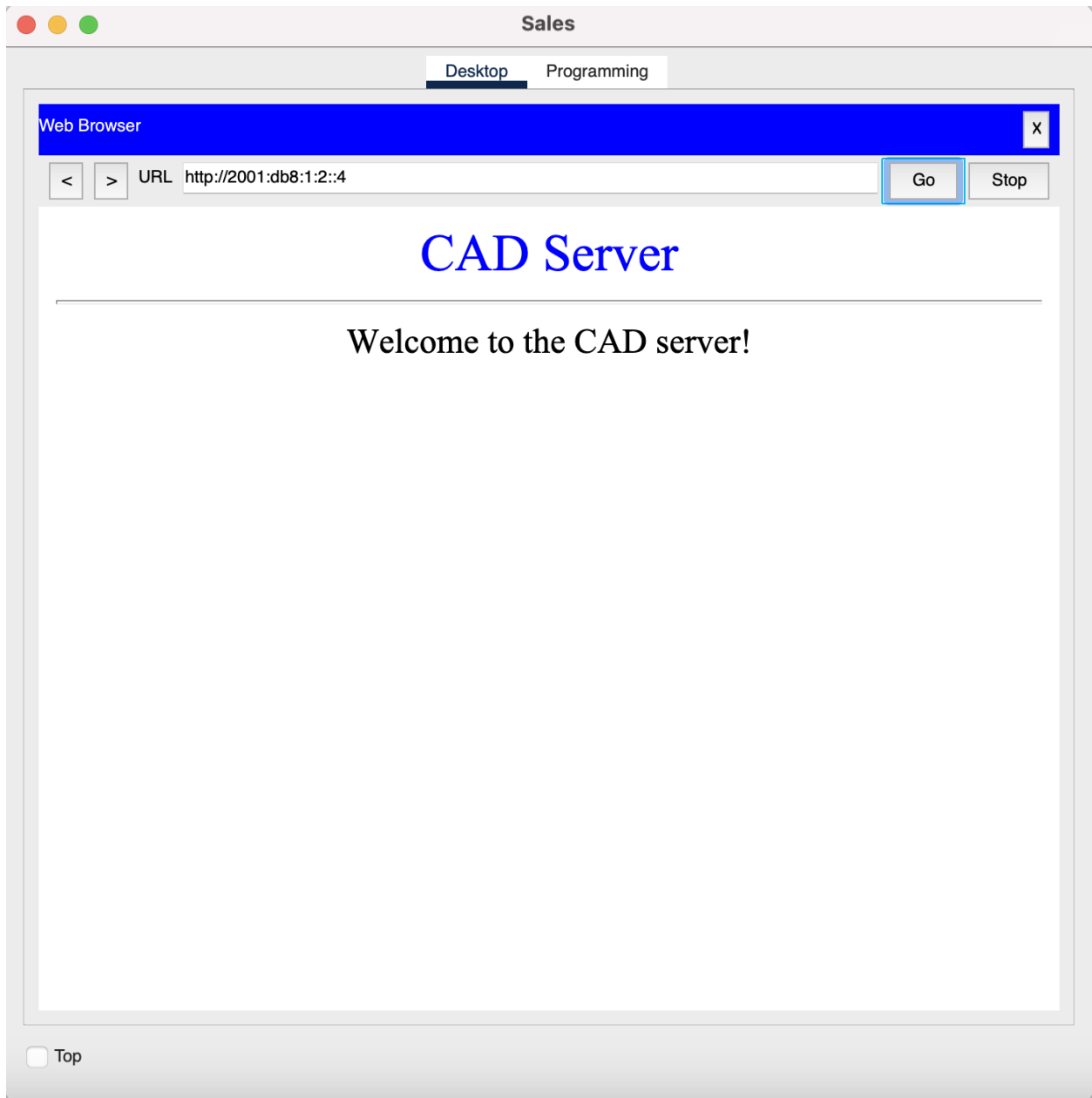
Authentication

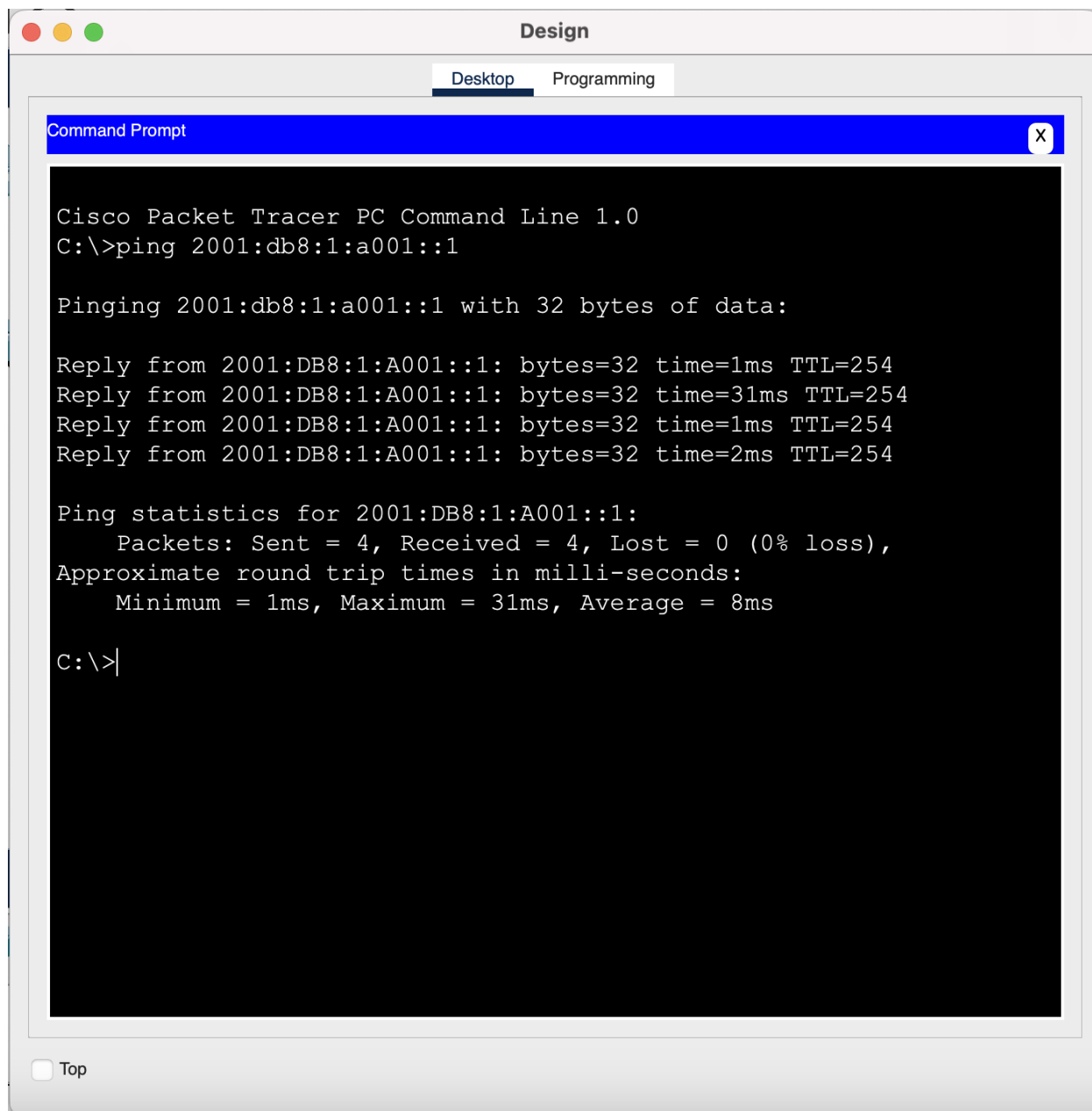
MD5

Username

Password

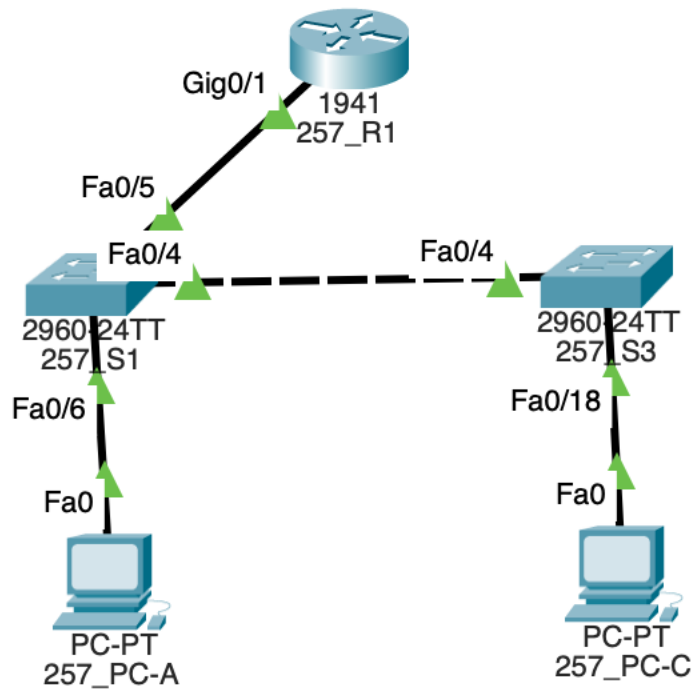
Top





TASK #02:

1. Build the network:



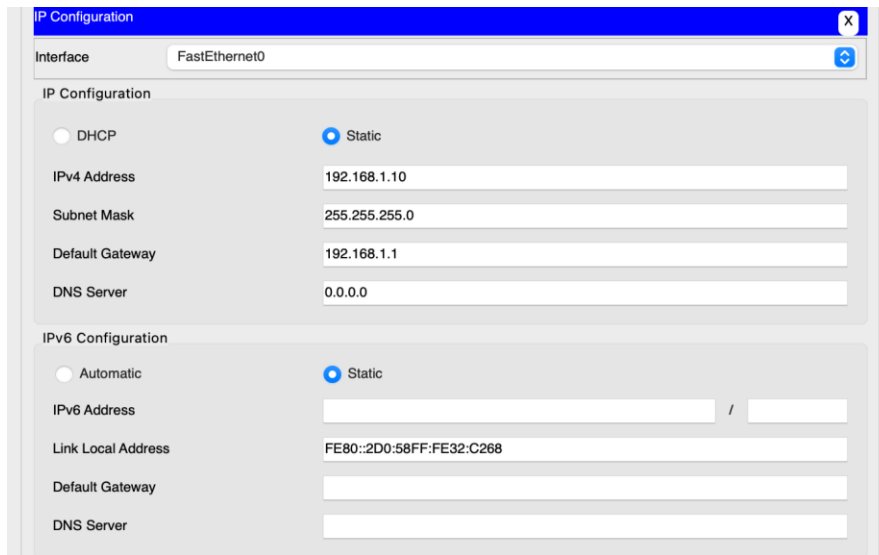
2. Configure PC hosts:

The screenshot shows the 'IP Configuration' window for the PC. The 'Interface' is set to 'FastEthernet0'. Under 'IP Configuration', the 'Static' radio button is selected. The fields are filled with the following values:

Field	Value
IPv4 Address	192.168.1.254
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
DNS Server	0.0.0.0

Under 'IPv6 Configuration', the 'Static' radio button is also selected. The fields are filled with the following values:

Field	Value
IPv6 Address	
Link Local Address	FE80::2E0:F9FF:FE8C:25B0
Default Gateway	
DNS Server	



IP Configuration

Interface: FastEthernet0

IP Configuration

☐ DHCP ☒ Static

IPv4 Address: 192.168.1.10

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.1

DNS Server: 0.0.0.0

IPv6 Configuration

☐ Automatic ☒ Static

IPv6 Address: /

Link Local Address: FE80::2D0:58FF:FE32:C268

Default Gateway:

DNS Server:

3. After giving the router and switches the basic configuration:

```
S1(config)#monitor session 1 source interface f0/5  
S1(config)#monitor session 1 destination interface f0/6  
S1(config)#
```

IPv4	IPv6	Misc
<input type="checkbox"/> ARP	<input type="checkbox"/> BGP	<input type="checkbox"/> DHCP
<input type="checkbox"/> DNS	<input type="checkbox"/> EIGRP	<input type="checkbox"/> HSRP
<input checked="" type="checkbox"/> ICMP	<input type="checkbox"/> OSPF	<input type="checkbox"/> RIP

Edit ACL Filters

```
S1#
%SYS-5-CONFIG_I: Configured from console by console
Telnet 192.168.1.1
Trying 192.168.1.1 ...Open

User Access Verification

Password:
Password:
R1>!!
```

```
R1#ping 192.168.1.10
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 192.168.1.10, timeout is 2  
seconds:
```

```
.!!!!
```

```
Success rate is 80 percent (4/5), round-trip min/avg/max = 0/0/0  
ms
```

```
R1#ping 192.168.1.10
```

```
Type escape sequence to abort.
```

```
Sending 5, 100-byte ICMP Echos to 192.168.1.10, timeout is 2  
seconds:
```

```
!!!!!
```

```
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0  
ms
```

TASK #03:

1. Configure router:


```
Router>enable
Router#conf t'
      ^
% Invalid input detected at '^' marker.
```

```
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#hostname R1
R1(config)#no ip domai
R1(config)#no ip domain look
R1(config)#no ip domain lookup
R1(config)#enbale secret class
      ^
% Invalid input detected at '^' marker.
```

```
R1(config)#enable secret class
R1(config)#line consol 0
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#line vty 0 4
R1(config-line)#password cisco
R1(config-line)#login
R1(config-line)#exit
R1(config)#exit
R1#
```

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

copy run

R1#copy running-config start

R1#copy running-config startup-config

Destination filename [startup-config]?

Building configuration...

[OK]

R1#

R1#conf t

Enter configuration commands, one per line. End with CNTL/Z.

R1(config)#int g0/0/1

R1(config-if)#ip address 192.168.10.1 255.255.255.0

R1(config-if)#

R1(config-if)#no shutdown

R1(config-if)#

%LINK-5-CHANGED: Interface GigabitEthernet0/0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0/1, changed state to up

exit

R1(config)#exit

R1#

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

show ip

R1#show ip interface

R1#show ip interface brief

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0/0	unassigned	YES	unset	administratively down	down
GigabitEthernet0/0/1	192.168.10.1	YES	manual	up	up
Vlan1	unassigned	YES	unset	administratively down	down

R1#

2. Configure switches:

```
Switch>
Switch>enable
Switch#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#hostname S2
S2(config)#enable secret class
S2(config)#line consol 0
S2(config-line)#password cisco
S2(config-line)#login
S2(config-line)#line vty 0 15
S2(config-line)#password cisco
S2(config-line)#login
S2(config-line)#exit
S2(config)#exit
S2#
%SYS-5-CONFIG_I: Configured from console by console
copy run
S2#copy running-config start
S2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S2#
S2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S2(config)#no ip domain lookup
S2(config)#vlan 10
S2(config-vlan)#int vlan 10
```

3. Configure vlans:

```
S2(config)#no ip domain lookup
S2(config)#vlan 10
S2(config-vlan)#int vlan 10
S2(config-if)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up
ip address 192.168.10.202 255.255.255.0
S2(config-if)#no shutdown
S2(config-if)#
S2(config-if)#vlan 333
S2(config-vlan)#name Native
S2(config-vlan)#vlan 999
S2(config-vlan)#name ParkingLot
```

```

S2(config-if)#int f0/1
S2(config-if)#switchport mode trunk
S2(config-if)#switchport trunk native vlan
%CDP-4-NATIVE_VLAN_MISMATCH: Native VLAN mismatch discovered on FastEthernet0/1 (1), with S1 FastEthernet0/1 (333).
333
S2(config-if)#exit
S2(config)#exit
S2#
%SYS-5-CONFIG_I: Configured from console by console
show interface trunk

```

Port	Mode	Encapsulation	Status	Native vlan
Fa0/1	on	802.1q	trunking	333


```

Port      Vlans allowed on trunk
Fa0/1     1-1005

Port      Vlans allowed and active in management domain
Fa0/1     1,10,333,999

Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1     10,999

```

4. Configure access ports and disable unused ports:

```

Port      Vlans in spanning tree forwarding state and not pruned
Fa0/1     10,999

```

```

S2#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
S2(config)#ip default-gateway 192.168.10.1
S2(config)#vlan 10
S2(config-vlan)#name Management
S2(config-vlan)#int vlan 10
S2(config-if)#ip address 192.168.10.201 255.255.255.0
S2(config-if)#no shutdown
S2(config-if)#ip address 192.168.10.202 255.255.255.0
S2(config-if)#no shutdown
S2(config-if)#
S2(config-if)#int f0/1
S2(config-if)#switchport nonegotiate
S2(config-if)#int f0/18
S2(config-if)#switchport mode access
S2(config-if)#switchport access vlan 10
S2(config-if)#interface range f0/2-17 , f0/19-24, g0/1-2
S2(config-if-range)#switchport mode access
S2(config-if-range)#switchport access vlan 999
S2(config-if-range)#shutdown

```

show interfaces status

Port	Name	Status	Vlan	Duplex	Speed	Type
Fa0/1		connected	trunk	auto	auto	10/100BaseTX
Fa0/2		disabled	999	auto	auto	10/100BaseTX
Fa0/3		disabled	999	auto	auto	10/100BaseTX
Fa0/4		disabled	999	auto	auto	10/100BaseTX
Fa0/5		disabled	999	auto	auto	10/100BaseTX
Fa0/6		disabled	999	auto	auto	10/100BaseTX
Fa0/7		disabled	999	auto	auto	10/100BaseTX
Fa0/8		disabled	999	auto	auto	10/100BaseTX
Fa0/9		disabled	999	auto	auto	10/100BaseTX
Fa0/10		disabled	999	auto	auto	10/100BaseTX
Fa0/11		disabled	999	auto	auto	10/100BaseTX
Fa0/12		disabled	999	auto	auto	10/100BaseTX
Fa0/13		disabled	999	auto	auto	10/100BaseTX
Fa0/14		disabled	999	auto	auto	10/100BaseTX
Fa0/15		disabled	999	auto	auto	10/100BaseTX
Fa0/16		disabled	999	auto	auto	10/100BaseTX
Fa0/17		disabled	999	auto	auto	10/100BaseTX
Fa0/18		connected	10	auto	auto	10/100BaseTX
Fa0/19		disabled	999	auto	auto	10/100BaseTX
Fa0/20		disabled	999	auto	auto	10/100BaseTX
Fa0/21		disabled	999	auto	auto	10/100BaseTX

S2#show vlan

VLAN	Name	Status	Ports
1	default	active	
10	Management	active	Fa0/18
333	Native	active	
999	ParkingLot	active	Fa0/2, Fa0/3, Fa0/4, Fa0/5 Fa0/6, Fa0/7, Fa0/8, Fa0/9 Fa0/10, Fa0/11, Fa0/12, Fa0/13 Fa0/14, Fa0/15, Fa0/16, Fa0/17 Fa0/19, Fa0/20, Fa0/21, Fa0/22 Fa0/23, Fa0/24, Gig0/1, Gig0/2
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

VLAN	Type	SAID	MTU	Parent	RingNo	BridgeNo	Stp	BrdgMode	Trans1	Trans2
1	enet	100001	1500	-	-	-	-	-	0	0
10	enet	100010	1500	-	-	-	-	-	0	0
333	enet	100333	1500	-	-	-	-	-	0	0

5. Document and implement port security features:

Before config:

```
show port-security interface f0/18
Port Security           : Enabled
Port Status             : Secure-up
Violation Mode          : Protect
Aging Time              : 60 mins
Aging Type              : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses   : 2
Total MAC Addresses     : 0
Configured MAC Addresses : 0
Sticky MAC Addresses    : 0
Last Source Address:Vlan : 0000.0000.0000:0
Security Violation Count : 0
```

After config:

```
S2#show port-security interface f0/18
Port Security           : Enabled
Port Status             : Secure-up
Violation Mode          : Protect
Aging Time              : 60 mins
Aging Type              : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses   : 2
Total MAC Addresses     : 1
Configured MAC Addresses : 0
Sticky MAC Addresses    : 1
Last Source Address:Vlan : 0000.0C7A.4EA4:10
Security Violation Count : 0
```

```
S2#show port-security address
      Secure Mac Address Table
```

Vlan	Mac Address	Type	Ports	Remaining Age (mins)
10	0000.0C7A.4EA4	SecureSticky	Fa0/18	-

```
Total Addresses in System (excluding one mac per port) : 0
Max Addresses limit in System (excluding one mac per port) : 1024
```

TASK #04:

Observation:

*(Your observation with the screenshots of **show ...** commands)*

Challenges (if any):