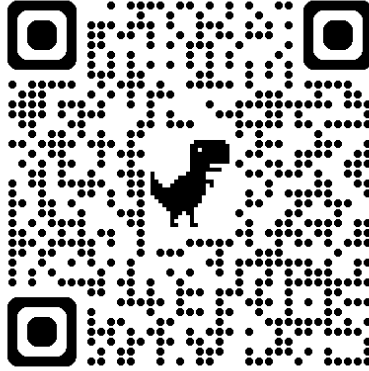


CISCO Home Lab



Link to Documentation, all Screenshots and packet tracer files on Github.

1. VLAN Configuration with Inter-VLAN Routing

Implementation:

- Created two VLANs on the switch (VLAN 10 and VLAN 20).
- Assigned PC0 to VLAN 10 and PC1 to VLAN 20.
- Configured router sub-interfaces:
 - g0/0.10 → 192.168.10.1 (encapsulation dot1Q 10)
 - g0/0.20 → 192.168.20.1 (encapsulation dot1Q 20)
- Connected router and switch using trunk port on g0/0.

Issue:

- PC0 could not ping PC1.

Resolution:

- Verified switch trunk configuration using 'show interfaces trunk'.
- Used 'switchport mode trunk' and corrected encapsulation.
- Ensured each PC had proper gateway and subnet mask.

Screenshots:

- VLANs created on switch

```
Switch#
%SYS-5-CONFIG_I: Configured from console by console
show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	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, Fa0/18, Fa0/19 Fa0/20, Fa0/21, Fa0/22, Fa0/23 Fa0/24, Gig0/1, Gig0/2
10	VLAN10	active	Fa0/2
20	VLAN20	active	Fa0/3
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

```
Switch#show ip interface brief
```

Interface	IP-Address	OK?	Method	Status	Protocol
FastEthernet0/1	unassigned	YES	manual	up	up
FastEthernet0/2	unassigned	YES	manual	up	up
FastEthernet0/3	unassigned	YES	manual	up	up
FastEthernet0/4	unassigned	YES	manual	down	down
FastEthernet0/5	unassigned	YES	manual	down	down
FastEthernet0/6	unassigned	YES	manual	down	down
FastEthernet0/7	unassigned	YES	manual	down	down
FastEthernet0/8	unassigned	YES	manual	down	down
FastEthernet0/9	unassigned	YES	manual	down	down
FastEthernet0/10	unassigned	YES	manual	down	down
FastEthernet0/11	unassigned	YES	manual	down	down
FastEthernet0/12	unassigned	YES	manual	down	down
FastEthernet0/13	unassigned	YES	manual	down	down
FastEthernet0/14	unassigned	YES	manual	down	down
FastEthernet0/15	unassigned	YES	manual	down	down
FastEthernet0/16	unassigned	YES	manual	down	down
FastEthernet0/17	unassigned	YES	manual	down	down
FastEthernet0/18	unassigned	YES	manual	down	down
FastEthernet0/19	unassigned	YES	manual	down	down
FastEthernet0/20	unassigned	YES	manual	down	down
FastEthernet0/21	unassigned	YES	manual	down	down
FastEthernet0/22	unassigned	YES	manual	down	down
FastEthernet0/23	unassigned	YES	manual	down	down
FastEthernet0/24	unassigned	YES	manual	down	down
GigabitEthernet0/1	unassigned	YES	manual	down	down
GigabitEthernet0/2	unassigned	YES	manual	down	down
Vlan1	unassigned	YES	manual	administratively down	down

```
Switch#
```

-Successful ping between devices

Physical x 445, y 628

2960-TT Switch0

2911 Router0

PC-PT PC0

PC-PT PC1

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time<1ms TTL=127
Reply from 192.168.10.10: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.10.10:
    Packets: Sent = 2, Received = 2, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

Control-C
^C
C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

Reply from 192.168.20.10: bytes=32 time=2ms TTL=128
Reply from 192.168.20.10: bytes=32 time=4ms TTL=128
Reply from 192.168.20.10: bytes=32 time=3ms TTL=128
Reply from 192.168.20.10: bytes=32 time=4ms TTL=128

Ping statistics for 192.168.20.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 4ms, Average = 3ms

C:\>
```

Logical Physical x 64, y 252

2960-TT Switch0

2911 Router0

PC-PT PC0

PC-PT PC1

PC0

Physical Config Desktop Programming Attributes

Command Prompt

```
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 6ms, Average = 2ms

C:\>ping 192.168.20.10

Pinging 192.168.20.10 with 32 bytes of data:

Reply from 192.168.20.10: bytes=32 time<1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127
Reply from 192.168.20.10: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.20.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 192.168.10.10: bytes=32 time=51ms TTL=128
Reply from 192.168.10.10: bytes=32 time=24ms TTL=128
Reply from 192.168.10.10: bytes=32 time=20ms TTL=128
Reply from 192.168.10.10: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 51ms, Average = 23ms

C:\>
```

2. Inter-VLAN Routing Using Router-on-a-Stick

Implementation:

- Configured router interface g0/0 with sub-interfaces for each VLAN.
- Assigned appropriate encapsulation and IP addresses.
- Trunked the switch port connected to router.

Issue:

- Clients still could not communicate.

Resolution:

- Port on switch connected to router was not trunked.
- Configured switchport as a trunk and verified.
- Restarted PCs and verified successful ping.

Screenshots:

- Sub-interface config (Router)

```
Router>show ip interface brief
Interface          IP-Address      OK? Method Status              Protocol
GigabitEthernet0/0 unassigned      YES unset    up                  up
GigabitEthernet0/0.10 192.168.10.1   YES manual  up                  up
GigabitEthernet0/0.20 192.168.20.1   YES manual  up                  up
GigabitEthernet0/1    unassigned      YES unset    administratively down down
GigabitEthernet0/2    unassigned      YES unset    administratively down down
Vlan1                unassigned      YES unset    administratively down down
```

- Vlan output on switch

```
show vlan brief
```

VLAN	Name	Status	Ports
1	default	active	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, Fa0/18, Fa0/19 Fa0/20, Fa0/21, Fa0/22, Fa0/23 Fa0/24, Gig0/1, Gig0/2
10	HR	active	Fa0/2
20	IT	active	Fa0/3
1002	fddi-default	active	
1003	token-ring-default	active	
1004	fddinet-default	active	
1005	trnet-default	active	

```
Switch#show interfaces trunk
```

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

Port	Vlans allowed on trunk
Fa0/1	1-1005

Port	Vlans allowed and active in management domain
Fa0/1	1,10,20

Port	Vlans in spanning tree forwarding state and not pruned
Fa0/1	1,10,20

- Ping between VLANs

```
Pinging 192.168.20.1 with 32 bytes of data:

Reply from 192.168.20.1: bytes=32 time=2ms TTL=255
Reply from 192.168.20.1: bytes=32 time<1ms TTL=255
Reply from 192.168.20.1: bytes=32 time<1ms TTL=255
Reply from 192.168.20.1: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 2ms, Average = 0ms
```

3. Port Security on a Cisco Switch

Implementation:

- Enabled port security on fa0/2.
- Set maximum MAC addresses to 1.
- Enabled sticky MAC learning.
- Connected PC0 to secure port.

Issue:

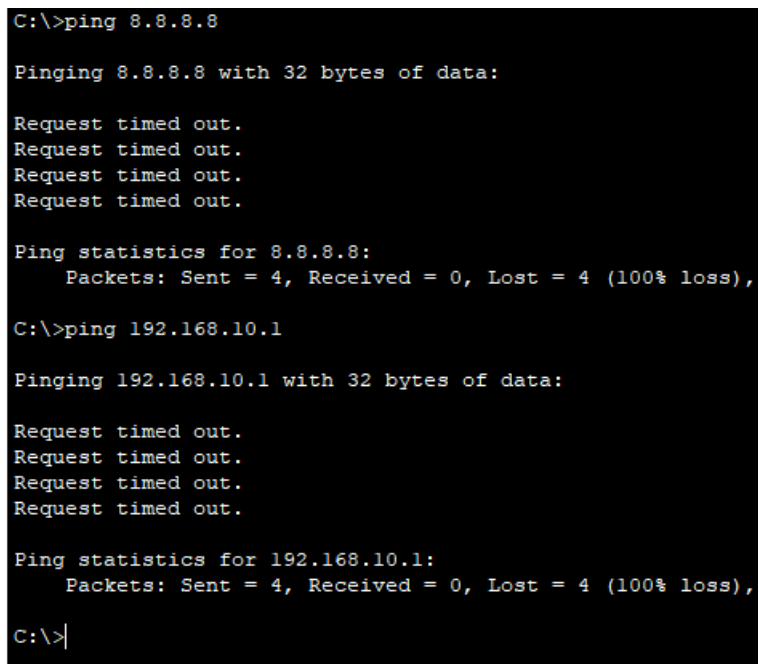
- No violation detected when swapping devices.

Resolution:

- Verified configuration with 'show port-security interface fa0/2'.
- Switched mode to 'shutdown' for clear violation.
- Observed shutdown of port on unauthorized connection.

Screenshots:

- Unauthorized PC attempt



```
C:\>ping 8.8.8.8

Pinging 8.8.8.8 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 8.8.8.8:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>|
```

- Port shutdown evidence

```
Switch#show port-security interface fa0/2
Port Security          : Enabled
Port Status            : Secure-up
Violation Mode         : Restrict
Aging Time             : 0 mins
Aging Type             : Absolute
SecureStatic Address Aging : Disabled
Maximum MAC Addresses  : 1
Total MAC Addresses    : 1
Configured MAC Addresses : 0
Sticky MAC Addresses   : 1
Last Source Address:Vlan : 0030.F2EC.1D32:10
Security Violation Count : 4
```


4. DHCP Server on a Router (Dynamic IP Allocation)

Implementation:

- Configured DHCP on router with appropriate pool and excluded gateway.
- Enabled g0/0 interface and connected to switch.

Issue:

- PC received APIPA address (169.254.x.x).

Resolution:

- Identified router was connected to wrong port on switch.
- Moved to correct VLAN access port and verified IP assignment.

Screenshots:

- Router DHCP config

```
Router(config)#ip dhcp pool VLAN10
Router(dhcp-config)#network 192.168.10.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.10.1
Router(dhcp-config)#dns-server 8.8.8.8
Router(dhcp-config)#ip dhcp excluded-address 192.168.10.1 192.168.10.10
```

- PC IP config

```
C:\>ipconfig

FastEthernet0 Connection:(default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .: FE80::290:21FF:FEC9:7381
    IPv6 Address . . . . .: ::
    IPv4 Address . . . . .: 192.168.10.11
    Subnet Mask . . . . .: 255.255.255.0
    Default Gateway . . . . .: ::
                                   192.168.10.1
```

```
FastEthernet0 Connection:(default port)

    Connection-specific DNS Suffix...:
    Link-local IPv6 Address . . . . .: FE80::20C:85FF:FEA8:B475
    IPv6 Address . . . . .: ::
    IPv4 Address . . . . .: 192.168.10.12
    Subnet Mask . . . . .: 255.255.255.0
    Default Gateway . . . . .: ::
                                   192.168.10.1
```

5. Access Control Lists (ACLs) – One-Way Traffic Control

Implementation:

- Configured two subnets on a router:
- Gig0/0 → 192.168.1.1 (for PC1)
- Gig0/1 → 192.168.2.1 (for PC0)
- Connected two PCs via separate switches to each router interface:
- PC1 → Switch0 → Router0 (Gig0/0)
- PC0 → Switch1 → Router0 (Gig0/1)
- Assigned static IP addresses to PCs:
- PC1: 192.168.1.10 /24, Gateway 192.168.1.1
- PC0: 192.168.2.10 /24, Gateway 192.168.2.1

Objective:

- Allow PC1 to access PC0, but block PC0 from accessing PC1.

ACL Configuration:

```
access-list 100 deny ip 192.168.2.0 0.0.0.255 192.168.1.0 0.0.0.255
```

```
access-list 100 permit ip any any
```

```
interface gig0/1
```

```
ip access-group 100 in
```

Issues Encountered:

- PCs could not ping each other initially.
- Router interfaces showed as administratively down.
- Switch ports were not forwarding.

Resolutions:

- Brought up router interfaces using 'no shutdown'.
- Verified cabling and corrected physical connections.
- Used 'show ip interface brief' and 'show interfaces status' to troubleshoot.

Screenshots:

- Router ACL configuration

```

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#access-list 100 deny ip 192.168.2.0 0.0.0.255 192.168.1.0 0.0.0.255
Router(config)#access-list 100 permit ip any any
Router(config)#
Router(config)#interface gig0/1
Router(config-if)#ip access-group 100 in
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/0
Router(config-if)#
Router(config-if)#exit
Router(config)#interface GigabitEthernet0/1
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
show ip interface brief

```

Interface	IP-Address	OK?	Method	Status	Protocol
GigabitEthernet0/0	192.168.1.1	YES	manual	administratively down	down
GigabitEthernet0/1	192.168.2.1	YES	manual	administratively down	down
GigabitEthernet0/2	unassigned	YES	unset	administratively down	down
Vlan1	unassigned	YES	unset	administratively down	down

```

Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface g0/0
Router(config-if)#no shutdown

Router(config-if)#exit
Router(config)#interface g0/1
Router(config-if)#no shutdown

Router(config-if)#exit
Router(config)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

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

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

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1, changed state to up
Router(config)#

```

```

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.2.1: Destination host unreachable.
Reply from 192.168.2.1: Destination host unreachable.
Reply from 192.168.2.1: Destination host unreachable.
Reply from 192.168.2.1: Destination host unreachable.

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>

```

6. Spanning Tree Protocol (STP) – Loop Prevention in Switch Topology

Implementation:

- Connected three Cisco switches (Switch0, Switch1, Switch2) in a triangle topology to intentionally create a Layer 2 loop.
- Each switch was connected to the other two using straight-through cables.
- PCs were optionally connected to each switch for testing.

STP Objective:

- Prevent broadcast storms and Layer 2 loops using the Spanning Tree Protocol.

Verification:

- Used 'show spanning-tree' on all switches to:
- Identify root bridge
- Observe forwarding/blocking ports

Optional:

- Forced root bridge with:

spanning-tree vlan 1 priority 4096

Issues:

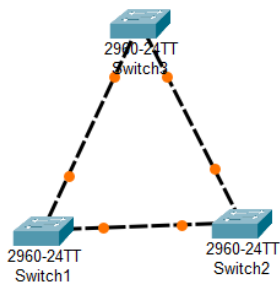
- Confused by blocked ports initially.
- Learned STP convergence delay and role assignment.

Resolutions:

- Waited for convergence.
- Manually changed priority to control root election.

Screenshots:

- Topology diagram



- spanning-tree outputs

```
Switch>show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.973A.EE26
             Cost        19
             Port        1(FastEthernet0/1)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address     0004.9A29.BC92
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface                Role Sts Cost      Prio.Nbr Type
-----
Fa0/2                    Desg FWD 19        128.2    P2p
Fa0/1                    Root FWD 19        128.1    P2p
Switch1
```

```
Switch2/
Switch>show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.973A.EE26
             Cost        19
             Port        1(FastEthernet0/1)
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address     00E0.A3A9.3AEC
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface                Role Sts Cost      Prio.Nbr Type
-----
Fa0/1                    Root FWD 19        128.1    P2p
Fa0/2                    Altn BLK 19        128.2    P2p
Switch>
```

```
Switch>show spanning-tree
VLAN0001
  Spanning tree enabled protocol ieee
  Root ID    Priority    32769
             Address     0001.973A.EE26
             This bridge is the root
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec

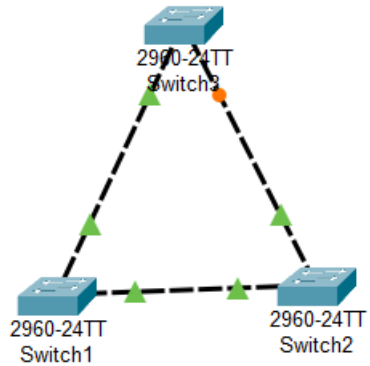
  Bridge ID  Priority    32769 (priority 32768 sys-id-ext 1)
             Address     0001.973A.EE26
             Hello Time  2 sec  Max Age 20 sec  Forward Delay 15 sec
             Aging Time  20

Interface                Role Sts Cost      Prio.Nbr Type
-----
Fa0/2                    Desg FWD 19        128.2    P2p
Fa0/1                    Desg FWD 19        128.1    P2p
Switch>
```

- Port status views

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#spanning-tree vlan 1 priority 4096
Switch(config)#
```

-After



Troubleshooting & Lessons Learned

Trunking:

- Verified with 'show interfaces trunk'
- Applied 'switchport mode trunk' where needed

ACLs:

- Confirmed blocking from correct subnet with directional testing

STP:

- Understood the importance of convergence time and priority values

DHCP:

- Resolved wrong port issue by tracing cabling and switch interfaces

Port Security:

- Set mode to shut down for immediate enforcement of violations

Screenshots:

- Provide visuals under each section as per the screenshot suggestions included