

# **COMPUTER NETWORKS**

## **Project Report**

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**Team - 10**

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## **Cisco Packet tracer:**

It is a tool to develop the virtual simulation of any kind of topology or network working. It helps us to actually configure the routers, switches and all other network devices using CLI (Command line interface).

## **What is VLAN:**

VLAN helps in limiting the access in a network to specified users by dividing the network into isolated segments. This creates a feeling that the users are in separate network even though they are present in same network.

VLANs allow network administrators to group hosts together even if the hosts are not directly connected to the same network switch. (That's how we designed topology).

## **Problem Description:**

- Building A Topology for a company(organization) with 3 branches and each having 3 departments.
- The departments may or may not present under same network switch, so we will be using INTER VLAN routing under IEEE 802.1Q encapsulation method.
- We will provide DHCP server for allotting IP address to the newly placed end-devices in the network. And we will provide an internal DNS server for demonstrating that a local website used within a company cannot be accessed outside the network.

## **Topology Design:**

We will be having 3 VLANs in a network namely with Ids x.x.10.0, x.x.20.0 and x.x.30.0(for simplicity).

## VLAN Table:

### VLAN TABLE

#### NETWORK 1

VLAN ID	VLAN NAME	NETWORK ADDRESS	PORT ASSIGNMENT
10	Dept1	192.168.10.0/24	FA0/1-S1, FA0/1-S2, FA0/1-8-S3
20	Dept2	192.168.20.0/24	FA0/2-S1, FA0/2-S2, FA0/9-16-S3
30	Dept3	192.168.30.0/24	FA0/1-S1, FA0/1-S2, FA0/17-24-S3

#### NETWORK 2

VLAN ID	VLAN NAME	NETWORK ADDRESS	PORT ASSIGNMENT
10	Dept1	50.152.10.0/24	FA0/1-S1, FA0/1-S2, FA0/1-S3
20	Dept2	50.152.20.0/24	FA0/2-S1, FA0/2-S2, FA0/2-S3
30	Dept3	50.152.30.0/24	FA0/1-S1, FA0/1-S2, FA0/1-S3

#### NETWORK 3

VLAN ID	VLAN NAME	NETWORK ADDRESS	PORT ASSIGNMENT
10	Dept1	144.186.10.0/24	FA0/1-S1, FA0/1-S2, FA0/1-S3
20	Dept2	144.186.20.0/24	FA0/2-S1, FA0/2-S2, FA0/2-S3
30	Dept3	144.186.30.0/24	FA0/1-S1, FA0/1-S2, FA0/1-S3

## IP Addresses:

### Network 1

DEVICE	INTERFACE	IP	SM	DG
DHCP	NIC	192.168.100.220	255.255.255.0	192.168.100.193
HTTP	NIC	192.168.100.221	255.255.255.0	192.168.100.193
DNS	NIC	192.168.100.222	255.255.255.0	192.168.100.193
R1	G0/1	192.168.100.193	255.255.255.0	-
	G0/0.10	192.168.10.1	255.255.255.0	-
	G0/0.20	192.168.20.1	255.255.255.0	-
	G0/0.30	192.168.30.1	255.255.255.0	-
	Se0/1/0	192.168.1.1	255.255.255.0	-

Range of end-devices for:

VLAN 10: 192.168.10.10 - 192.168.10.254

VLAN 20: 192.168.20.10 - 192.168.20.254

VLAN 30: 192.168.30.10 - 192.168.30.254

### Network 2

DEVICE	INTERFACE	IP	SM	DG
DHCP	NIC	193.168.100.220	255.255.255.0	193.168.100.193
HTTP	NIC	193.168.100.221	255.255.255.0	193.168.100.193
DNS	NIC	193.168.100.222	255.255.255.0	193.168.100.193
R1	G0/1	193.168.100.193	255.255.255.0	-
	G0/0.10	50.152.10.1	255.255.255.0	-
	G0/0.20	50.152.20.1	255.255.255.0	-
	G0/0.30	50.152.30.1	255.255.255.0	-
	Se0/1/0	192.168.1.2	255.255.255.0	-
	Se0/1/1	192.168.2.1	255.255.255.0	-

Range of end-devices for:

VLAN 10: 50.152.10.10 - 50.152.10.254

VLAN 20: 50.152.20.10 - 50.152.20.254

VLAN 30: 50.152.30.10 - 50.152.30.254

### Network 3

DEVICE	INTERFACE	IP	SM	DG
DHCP	NIC	194.168.100.220	255.255.255.0	194.168.100.193
HTTP	NIC	194.168.100.221	255.255.255.0	194.168.100.193
DNS	NIC	194.168.100.222	255.255.255.0	194.168.100.193
R1	G0/1	194.168.100.193	255.255.255.0	-
	G0/0.10	144.186.10.1	255.255.255.0	-
	G0/0.20	144.186.20.1	255.255.255.0	-
	G0/0.30	144.186.30.1	255.255.255.0	-
	Se0/1/0	192.168.2.2	255.255.255.0	-

Range of end-devices for:

VLAN 10: 144.186.10.10 - 144.186.10.254

VLAN 20: 144.186.20.10 - 144.186.20.254

VLAN 30: 144.186.30.10 - 144.186.30.254

## Routing Table:

### Router 1

Network	Mask	Next Hop
50.152.10.0/24	255.255.255.0	192.168.1.0
50.152.20.0/24	255.255.255.0	192.168.1.0
50.15.30.0/24	255.255.255.0	192.168.1.0
144.186.10.0/24	255.255.255.0	192.168.1.0
144.186.20.0/24	255.255.255.0	192.168.1.0
144.186.30.0/24	255.255.255.0	192.168.1.0

### Router 2

Network	Mask	Next Hop
192.168.10.0/24	255.255.255.0	192.168.1.0
192.168.20.0/24	255.255.255.0	192.168.1.0
192.168.30.0/24	255.255.255.0	192.168.1.0
144.186.10.0/24	255.255.255.0	192.168.2.0
144.186.20.0/24	255.255.255.0	192.168.2.0
144.186.30.0/24	255.255.255.0	192.168.2.0

### Router3

Network	Mask	Next Hop
50.152.10.0/24	255.255.255.0	192.168.2.0
50.152.20.0/24	255.255.255.0	192.168.2.0
50.15.30.0/24	255.255.255.0	192.168.2.0
192.168.10.0/24	255.255.255.0	192.168.2.0
192.168.20.0/24	255.255.255.0	192.168.2.0
192.168.30.0/24	255.255.255.0	192.168.2.0

## Router configurations:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/0.10
Router(config-subif)#encap dot1Q 10
Router(config-subif)#ip addr 192.168.10.1 255.255.255.0
Router(config-subif)#int g0/0.20
Router(config-subif)#encap dot1Q 20
Router(config-subif)#ip addr 192.168.20.1 255.255.255.0
Router(config-subif)#int g0/0.30
Router(config-subif)#encap dot1Q 30
Router(config-subif)#ip addr 192.168.30.1 255.255.255.0
Router(config-subif)#exit
Router(config)#int g0/0
Router(config-if)#no shutdown

Router(config-if)#
%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 GigabitEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.10, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to up

%LINK-5-CHANGED: Interface GigabitEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up

Router(config-if)#
```

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int g0/1
Router(config-if)#ip addr 192.168.100.193 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%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-if)#
```

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#ip de
Switch(config)#ip default-gateway 192.168.100.193
Switch(config)#
```

### Service enabling from DHCP Server:

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip hel
Router(config)#int g0/0.10
Router(config-subif)#ip hel
Router(config-subif)#ip help
Router(config-subif)#ip helper-address 192.168.100.220
Router(config-subif)#int g0/0.20
Router(config-subif)#ip helper-address 192.168.100.220
Router(config-subif)#int g0/0.30
Router(config-subif)#ip helper-address 192.168.100.220
Router(config-subif)#
```

---

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int se0/1/0
Router(config-if)#ip addr 192.168.1.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#copy run start
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
```

```
Router>en
Router#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#ip route
% Incomplete command.
Router(config)#ip route 50.152.10.1 255.255.255.0 192.168.2.1
%Inconsistent address and mask
Router(config)#ip route 50.152.10.0 255.255.255.0 192.168.2.1
Router(config)#ip route 50.152.20.0 255.255.255.0 192.168.2.1
Router(config)#ip route 50.152.30.0 255.255.255.0 192.168.2.1
Router(config)#
```



```

Router>enable
Router#
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#ip route 144.186.10.0 255.255.255.0 192.168.1.0
Router(config)#ip route 144.186.20.0 255.255.255.0 192.168.1.0
Router(config)#ip route 144.186.30.0 255.255.255.0 192.168.1.0
Router(config)#

```

#### Switch – 1:

```

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Dept1
Switch(config-vlan)#vlan 20
Switch(config-vlan)#name Dept2
Switch(config-vlan)#vlan 30
Switch(config-vlan)#name Dept3
Switch(config-vlan)#int fa0/1
Switch(config-if)#swi mo acc
Switch(config-if)#swi acc vlan 10
Switch(config-if)#int fa0/2
Switch(config-if)#swi mo acc
Switch(config-if)#swi acc vlan 20
Switch(config-if)#int fa0/3
Switch(config-if)#swi mo acc
Switch(config-if)#swi acc vlan 30
Switch(config-if)#

```

#### Switch – 2:

```

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Dept1
Switch(config-vlan)#vlan 20
Switch(config-vlan)#name Dept2
Switch(config-vlan)#vlan 30
Switch(config-vlan)#name Dept3
Switch(config-vlan)#int fa0/1
Switch(config-if)#swi mo acc
Switch(config-if)#swi acc vlan 10
Switch(config-if)#int fa0/2
Switch(config-if)#swi mo acc
Switch(config-if)#swi acc vlan 20
Switch(config-if)#int fa0/3
Switch(config-if)#swi mo acc
Switch(config-if)#swi acc vlan 30
Switch(config-if)#

```

### Switch – 3:

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Dept1
Switch(config-vlan)#vlan 20
Switch(config-vlan)#name Dept2
Switch(config-vlan)#vlan 30
Switch(config-vlan)#name Dept3
Switch(config-vlan)#int range fa0/1-8
      ^
% Invalid input detected at '^' marker.

Switch(config-vlan)#int range fa0/1-8
      ^
% Invalid input detected at '^' marker.

Switch(config-vlan)#exit
Switch(config)#int range fa0/1-8
Switch(config-if-range)#swi mo acc
Switch(config-if-range)#swi acc vlan 10
Switch(config-if-range)#int range fa0/9-16
Switch(config-if-range)#swi mo acc
Switch(config-if-range)#swi acc vlan 20
Switch(config-if-range)#int range fa0/17-24
Switch(config-if-range)#swi mo acc
Switch(config-if-range)#swi acc vlan 30
Switch(config-if-range)#
```

### Central Switch:

```
Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#vlan 10
Switch(config-vlan)#name Dept
Switch(config-vlan)#vlan 20
Switch(config-vlan)#vlan 10
Switch(config-vlan)#name Dept1
Switch(config-vlan)#vlan 20
Switch(config-vlan)#name Dept2
Switch(config-vlan)#vlan 30
Switch(config-vlan)#name Dept3
Switch(config-vlan)#int range fa0/1-3
Switch(config-if-range)#swi mo tru

Switch(config-if-range)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/3, changed state to up

Switch(config-if-range)#|
```

```

Switch>en
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int g0/1
Switch(config-if)#swi mo tru

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

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

Switch(config-if)#

```

### DHCP Table of Network 1:

Pool Name	Default Gateway	DNS Server	Start IP Address	Subnet Mask	Max User	TFTP Server	WLC Address
Network3	192.168.30.1	192.168.100.222	192.168.30.15	255.255.255.0	241	0.0.0.0	0.0.0.0
Network2	192.168.20.1	192.168.100.222	192.168.20.15	255.255.255.0	241	0.0.0.0	0.0.0.0
serverPool	192.168.10.1	192.168.100.222	192.168.10.15	255.255.255.0	241	0.0.0.0	0.0.0.0

In the similar way the remaining two branches are done.

### Concepts we learnt:

1. Building a network
2. Concept of Sub-netting
3. Necessity of VLAN
4. Configuration of router, switches
5. Connecting two networks with routers

### Conclusions:

This network arrangement can be used for many organizations, not restricted to one kind of company.