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Assignment - 05

* **Problem Statement :-** Using a network simulator configure
  1. VLAN, dynamic trunk protocol and spanning tree protocol
  2. OSPF - Explore neighbourship conditions and requirements
  3. NAT, dynamic and static along with PAT.

* **Theory :-**

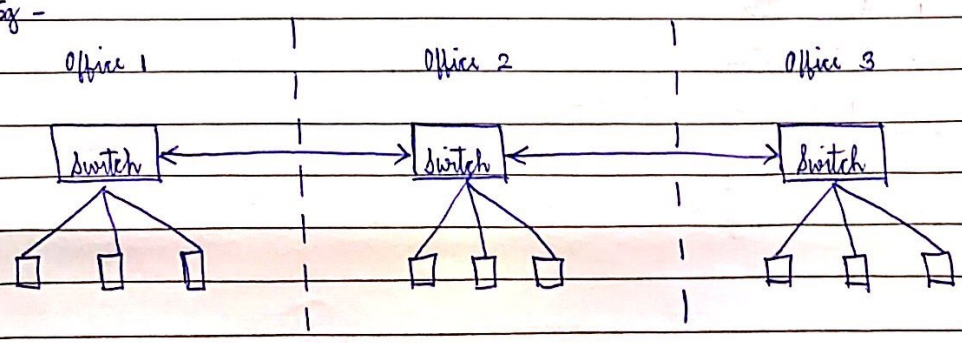
- **VLAN →**

VLAN is a logical grouping of network devices. When we create a VLAN we actually break a large broadcast domain into smaller domains. Consider VLAN as a subnet.

Same as two different subnets cannot communicate with each other without a router, two different VLANs also require a router to communicate.

Advantages of VLAN -
1. Solve broadcast problem
2. Reduce size of broadcast domains
3. Allow us to add additional layer of security
4. Make device management easier.
5. Allow us to implement logical grouping of devices by function instead of by location.

Eg -



Types of VLAN membership -

1. Static :

It is the most common and secure method. In this method we manually assign VLAN for switch port. VLANs configured in this way are usually known as port based VLANs.

2. Dynamic :

In dynamic method, VLANs are assigned to ports automatically depending on the connected devices. In this method we have configured one switch from the network as a server. This server contains the policies and is known as VMPS.

- OSPF →

OSPF stands for Open Shortest Path First. It is a routing protocol for IP. It uses the link state routing algorithm and falls in the group of interior gateway protocol.

OSPF routers share routing information only with neighbours. It uses hello packets to discover neighbours in segments. A hello packet contains some essential configuration values that must be same on both the routers on which we want to build an OSPF relationship.

The neighbourship requirements are -

1. Area ID
2. Authentication
3. Hello and dead intervals
4. Stub flag
5. MTU size

OSPF states are -

1. Down state
2. Attempt / Init state
3. Two ways state
4. Exstart state
5. Exchange state
6. Loading state
7. Full state

OSPF Metric Cost -

Logically a packet will face more overhead in crossing a 56 Kbps serial link than crossing a 100 Mbps ethernet link. OSPF uses this logic to calculate this cost

$$\text{Cost} = \text{Reference bandwidth} / \text{Interface bandwidth}_{\text{bps}}$$

- NAT →

There are several situations where we need address translations such as a network which does not have sufficient public IP addresses want to connect with the internet; two networks which have same IP address want to merge due to security reasons, so as to hide internet IP.

4 Basic terms used in NAT -

1. Inside local IP address :

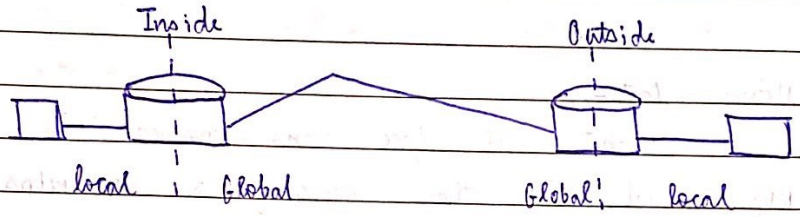
Before translation → source IP address located inside the local network

2. Inside global IP address :

After translation → source IP located outside the local network.

3. Outside global IP address :
Before translation → destination IP address located outside the remote network.

4. Outside local IP address :
After Translation → destination IP address located inside the remote network.



Types of NAT-

1. Static :
We manually assign each inside local IP with inside global IP. Since it is one to one mapping we need exactly same number of IP addresses on both sides.

2. Dynamic :
In this type, a pool of IPs is given and the mapping is done

- PAT →
A single inside IP address is mapped with multiple inside local IP addresses using the source port address. This is known as port address translation.

* Conclusion :- Hence we have implemented VLAN, OSPF and NAT in packet tracer.