Practical 1

Implement IP SLA (IP Service Level Agreement)

Steps to Perform:

Step 1: Take 2 Routers of c7200, give the name '**R1**' to the first router and give the name '**ISP**' to the second router.

Step 2: Now we will connect both the routers with the Serial cable, so we will use Serial1/0 to connect with router R1 and Serial1/0 to connect with router ISP.

After connecting both the routers successfully start the nodes.

Step 3: Now right click on router R1 and select the console option, after that Configure the router R1 using commands.

Step 4: After configuring the router R1, now we will add IP Address and Subnet mask to router R1.

Step 5: Now right click on router ISP and select the console option, after that Configure the router ISP using commands.

Step 6: After configuring the router ISP, now we will add IP Address and Subnet mask to router ISP.

Step 7: Now we will connect the router ISP to the Web server using 'int loopback 0' command.

Step 8: After connecting router ISP to the web server,

Now we will add IP Address and Subnet mask to web server.

(Now we have successfully connected the Routers to Web server.)

Practical- 2

Implement IPV4 ACLs

1. Standard

2. Extended

Step 1:

1) Take Three Router of 1841 and name them as R1, R2 and R3.
2) Take Two Switches of 2960 and give name S1 and S2.
3) Take Two Machine and name them as PC-A and PC-B.

Step 2:

1) Now Connect R1 to R2 with Serial Cable 0/0/1 to Serial Cable 0/0/1.
2) Now Connect R1 to R3 with Serial Cable 0/0/2 to Serial Cable 0/0/1.
3) Now Connect R2 to S1 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
4) Now Connect R3 to S2 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
5) Now Connect S1 to PC-A with Fast Ethernet 0/2 to Fast Ethernet 0.
6) Now Connect S2 to PC-B with Fast Ethernet 0/2 to Fast Ethernet 0/1.

Step 3:

1) Now Click On PC-A go to desktop click on IP Config and IP address and Subnet mask to it.
2) Same goes for PC-B.
3) Click On R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
4) Same step goes for R2 and R3.
5) Click S1 go to CLI command and configure and IP Address and Subnet mask to the switch.
6) Same process goes for S2.

Practical 3

A. Implement SPAN technology

B. Implement SNMP & syslog

C. Implement flexible NetFlow

A. Implement SPAN technology

Step to Perform:

Step 1: (Required Resources)

1) Take 2 Machines and named them as PC-1 & PC-2.
2) Now take 1 Switch of 2960 and name it as S1.

Step 2:

1) Now Connect PCI to Switch S with Fast Ethernet o cable to Fast Ethernet 0/1 able.
2) Now connect switch S1, to PC-2 with Fast Ethernet 0/2 cable to Fast Ethernet 0.

(Wait for few seconds it will turn into green light)

Step 3: Click on Switch S1 and go to the CLI Commands and Configure the switch S1.

B. Implement SNMP & syslog

Step 1:

1) Take 1 Machine and give name PC-1 to it.
2) Then take 1 Switch of 2960 and give name S1 to it.
3) Take 2 Routers of 1841 and name them R1 and R2.

Step 2:

1) Connect PC-1 to switch S1 with Fast Ethernet 0 to Fast Ethernet 0/1 cable.
2) Then Connect switch S1 to Router R1 with Fast Ethernet 0/2 to Fast Ethernet 0/0 cable.
3) Then Connect switch S1 to Router R2 with Fast Ethernet 0/3 to Fast Ethernet 0/0 cable.

(Wait for few seconds it will turn into green light.)

Step 3:

1) Now click on device PC-1 go to desktop click on IP Config and add IP Address and Subnet mask to it.
2) click on R1 go to Config and select the Fast Ethernet 0/0, after that add the IP Address and Subnet Mask to it and turn it ON.
3) Same Goes for router R2.

Step 4:

1) After configuring the connection between the router and switches, take a packet and try to make it flow.
2) Then click on R1 and go to the CLI Commands and configure the router R1.

C. Implement flexible NetFlow

Step 1:

1) Let us take 1 Server and name it as Server1.
2) Take 1 router of 1841 and give name R1 to it.
3) Take 1 switch of 2960 and give name S1 to it.
4) Take 1 machine and name it as PC-1.

Step 2:

1) Now let we connect those networks with dotted crossover line.
2) First Server1 connect to router R1 with Fast Ethernet 0/0 to Fast Ethernet 0/0 cable.
3) Then connect router R1 to switch S1 with cable Fast Ethernet 0/1 to Fast Ethernet 0/1 cable.
4) Then connect switch S1 to PC-1 with Fast Ethernet 0/2 to Fast Ethernet 0 cable.

(Wait for few seconds it will turn into green light.)

Step 3:

1) Now click on PC-1 go to the desktop and click on IP Config and add IP Address and subnet mask to it.
2) Click on R1 go to Config and select the Fast Ethernet 0/0 cable, after that add the IP Address and Subnet mask to it and turn it ON.
3) Then click on server1 go to the desktop and add IPv4 Address and Subnet Mask to it.
4) Click on R1 go to Config and select the Fast Ethernet 0/1, after that add IPv4 Address and Subnet mask to it and turn it ON.

5) Then click on R1 and go to the CLI Commands and configure the router.

(After Configuring the connection between the server1 and PC-1 take a packet and try to make it flow.)

Practical 4

1. **Implement GRE Tunnel**
2. **Implement VTP**
3. **Implement NAT**

4.1. Implement GRE Tunnel

Step 1:

1) Take Three Router of 1841 and name them as R1, R2 and R3.
2) Take Two Switches of 2960 and give name S1 and S2.
3) Take 4 Machine and name them as PC-1 and PC-2 and PC-3 andPC-4.

Step 2:

1) Now Connect R1 to R2 with Fast Ethernet 0/1 to Fast Ethernet 0/1.
2) Now Connect R2 to S1 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
3) Now Connect S1 to PC-1 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
4) Now Connect S1 to PC-2 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
5) Now Connect R1 to R3 with Fast Ethernet 0/1 to Fast Ethernet 0/1.
6) Now Connect S2 to PC-3 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
7) Now Connect S2 to PC-4 with Fast Ethernet 0/2 to Fast Ethernet 0/1.

Step 3:

1) Click On R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Same step goes for R2 and R3.
3) Click On S1 and go to CLI command and configure and add IP Address and Subnet mask to it.
4) Same step goes for S2.
5) Click On PC-1 and go to CLI command and configure and add IP Address and Subnet mask to it.
6) Same step goes for PC-2 and PC-3 and PC-4.

4.2. Implement VTP

Step 1:

1) Take 4 Switches of 2960 and name them S1, S2, S3 and S4.

Step 2:

1) Now Connect S1 to S2 with Fast Ethernet 0/1 to Fast Ethernet 0/1.

2) Now Connect S1 to S3 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
3) Now Connect S3 to S4 with Fast Ethernet 0/2 to Fast Ethernet 0/1.

Step 3:

1) Click On S1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Click On S2 and go to CLI command and configure and add IP Address and Subnet mask to it.
3) Click On S3 and go to CLI command and configure and add IP Address and Subnet mask to it.
4) Click On S4 and go to CLI command and configure and add IP Address and Subnet mask to it.

4.3.Implement NAT

Step 1:

1) Take 2 Routers 1841 and name them as R1 and R2.
2) Take 2 Switches of 2960 and give name S1 and S2.
3) Take 4 Machine and name them as PC-1 and PC-2.
4) Take Server and name them as Server1.

Step 2:

1) Now Connect R1 to R2 with Fast Ethernet 0/1 to Fast Ethernet 0/1.
2) Now Connect R1 to S1 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
3) Now Connect S1 to PC-1 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
4) Now Connect S1 to PC-2 with Fast Ethernet 0/3 to Fast Ethernet 0/1.
5) Now Connect S2 to Server1 with Fast Ethernet 0/2 to Fast Ethernet 0/1.

Step 3:

1) 1.Click On R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) 2.Click On R2 and go to CLI command and configure and add IP Address and Subnet mask to it.
3) 3.Click On S1 and go to CLI command and configure and add IP Address and Subnet mask to it.
4) 4.Click On S2 and go to CLI command and configure and add IP Address and Subnet mask to it.
5) 5.Click On PC-1 and go to CLI command and configure and add IP Address it.
6) Click On PC-2 and go to CLI command and configure and add IP Address and Subnet mask to it.

Practical 5

Implement Inter-VLAN Routing

Steps to Perform:

Step 1:(Required Resources**)**

1) Take 1 Router of 1841 and give name **R1** to it.
2) Now take 2 Switches of 2960 and give name **S1** and **S2** to them.
3) And last take 2 Machines and give name **PC-A** and **PC-B** to them.

Step 2:

1) Now connect router R1 to switch S1 with Fast Ethernet fa0/0 cable to Fast Ethernet f0/1 cable.
2) Now connect switch S1 to switch S2 with Fast Ethernet fa0/2 cable to Fast Ethernet f0/1 cable.
3) Now connect switch S1 to PC-A with Fast Ethernet fa0/3 cable to Fast Ethernet fa0 cable.
4) Now connect switch S2 to PC-B with Fast Ethernet fa0/2 cable to Fast Ethernet fa0 cable.

Step 3:

1) Now click on device PC-A, go to Desktop click on IP Config and add IP Address and Subnet mask to it.
2) Now click on device PC-B, go to Desktop click on IP Config and add IP Address and Subnet mask to it.

Step 4: Click on switch S1 and go to CLI commands and Configure the switch S1 and add IP Address and subnet mask to it.

Step 5: Click on switch S2 and go to CLI commands and Configure the switch S2 and add IP Address and subnet mask to it.

Step 6: Click on router R1 and go to CLI commands and Configure the router R1 and add IP Address and subnet mask to it.

PRACTICAL 6

Observe STP Topology Changes and Implement RSTP

1. Implement Advanced STP Modifications and Mechanisms

2. Implement MST

Step to Perform:

Step 1: (Requirement)

1) Take 2 Multiport Switch of 3650 name them as D1 and D2.
2) Then take 1 normal Switch of 2960 and name it as A1.

Step 2:

1) Now connect D1 to D2 with Giga Ethernet 1/0/1 to Giga Ethernet 1/0/1 cable.
2) Now connect D1 to A1 with Giga Ethernet 1/0/5 to Fast Ethernet 0/1 cable.
3) Once Again make same connection between D1 to A1 just for backup with Giga Ethernet 1/0/6 to Fast Ethernet 0/2.

Step 3:

1) Now connect D2 to A1 with Giga Ethernet 1/0/5 to Fast Ethernet 0/3 cable.
2) Once Again make same connection between D2 to A1 just for backup with Giga Ethernet 1/0/6 to Fast Ethernet 0/4.

Step 4:

1) Now Double click on D1, go to the physical and there you will find Power Switch Just Drag that switch in Physical Device and close window.
2) Now Double click on D2, go to the physical and there you will find Power Switch Just Drag that switch in Physical Device and close window.

Step 5: Click on D1 and go to the CLI command and Configure and add IP Address to the multiport switch D1**.**

Step 6: Click on D2 and go to the CLI command and Configure and add IP Address to the multiport switch D2.

Step 7: Click on A1 and go to the CLI command and Configure and add IP Address to the switch A1.

Practical 7

1. Implement Ether Channel

2. Tune and Optimize Ether Channel Operations

Step 1: (Requirement)

Take 3 Switches of 2960 and name it as S1, S2 and S3.

Step 2: Configure the basic Switch setting.

1) Now connect switch S1 to S2 with Giga Ethernet 0/1 to Giga Ethernet 0/1 cable.
2) Once again Connect switch S1 to S2 with Giga Ethernet 0/2 to Giga Ethernet 0/2 cable.
3) Then Connect S1 to S3 with Fast Ethernet 0/21 to Fast Ethernet 0/21 cable.
4) Once again Connect S1 to S2 with Fast Ethernet 0/22 to Fast Ethernet 0/22 cable.
5) Then Connect S2 to S3 with Fast Ethernet 0/23 to Fast Ethernet 0/23 cable.
6) Once again Connect S2 to S3 with Fast Ethernet 0/24 to Fast Ethernet 0/24 cable.

Step 3:

1) Click on S1 and go to CLI command and Configure the Switch S1.
2) Similarly Configure the Switch S2 and Switch S3.

Practical 8

OSPF Implementation

1. Implement Single-Area OSPFv2.

2. Implement Multi-Area OSPFv2.

3. OSPFv2 Route Summarization and Filtering.

4. Implement Multiarea OSPFv3.

8.1. Implement Single-Area OSPFv2.

Step 1:

1) Take 2 routers of 1841 and give name R1 and R2.
2) Take 2 switches of 2960 and give name as s1 and s2.

Step 2:

1) now connect R1 to S1 with Fast Ethernet 0/0 to Fast Ethernet 0/0.
2) now connect S1 to S2 with Fast Ethernet 0/1 to Fast Ethernet 0/0.
3) now connect S2 to R2 with Fast Ethernet 0/1 to Fast Ethernet 0/0.

Step 3:

1) Click on R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Click on R2 and go to CLI command and configure and add IP Address and Subnet mask to it.
3) Click on S1 and go to CLI command and configure and add IP Address and Subnet mask to it.
4) Click on S2 and go to CLI command and configure and add IP Address and Subnet mask to it.

8.2. Implement Multi-Area OSPFv2.

Step 1:

1) Take 3 routers of 1841 and give name R1, R2 and R3.

Step 2:

1) now connect R1 to R2 with Fast Ethernet 0/0 to Fast Ethernet 0/0.
2) now connect R1 to R3 with Fast Ethernet 0/01to Fast Ethernet 0/0.

Step 3:

1) Click On R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Click On R2 and go to CLI command and configure and add IP Address and Subnet mask to it.
3) Click On R3 and go to CLI command and configure and add IP Address and Subnet mask to it.

8.3. OSPFv2 Route Summarization and Filtering.

Step 1:

1) Take 3 routers of 1841 and give name R1, R2 and R3.

Step 2:

1) now connect R1 to R2 with Fast Ethernet 0/0 to Fast Ethernet 0/0.
2) now connect R1 to R3 with Fast Ethernet 0/01to Fast Ethernet 0/0.
3) now connect R2 to R32with serial cable 0/ 0/1 to serial cable 0/0/1.
4) now connect R2 to R32with serial cable 0/ 0/2 to serial cable 0/0/2.

Step 3:

1) Click On R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Click On R2 and go to CLI command and configure and add IP Address and Subnet mask to it.
3) 1. Click On R3 and go to CLI command and configure and add IP Address and Subnet mask to it.

8.4. Implement Multiarea OSPFv3.

Step 1:

1) 1.Take 3 routers of 1841 and give name R1, R2 and R3.
2) 2.Take 1 server and give name server1.

Step 2:

1) Now connect R1 to R2 with Fast Ethernet 0/0 to Fast Ethernet 0/0.
2) Then now connect R1 to R3 with Fast Ethernet 0/1to Fast Ethernet 0/0.
3) Then connect R3 to server1 with Fast Ethernet 0/1to Fast Ethernet 0/0.

Step 3:

1) Click On R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Click On R2 and go to CLI command and configure and add IP Address and Subnet mask to it.
3) Click On R3 and go to CLI command and configure and add IP Address and Subnet mask to it.

Step 4:

1) Click on server1 go to Config and add IPv6 Address and gateway.

Practical 9

Implement MP-BGP Communities

1. Implement MP-BGP

Step 1:

1) Take Three Router of 1841 and name them as R1, R2 and R3.

Step 2:

1) Now Connect R2 to R1 with Fast Ethernet 0/1 to Fast Ethernet 0/1 cable.
2) Now Connect R2 to R3 with Fast Ethernet 0/2 to Fast Ethernet 0/1 cable.
3) Now Connect R1 to R3 with Serial Cable 0/0/1 to Serial Cable 0/0/1.
4) Now Connect R1 to R3 with Serial Cable 0/0/2 to Serial Cable 0/0/2.

Step 3:

1) Click On R1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Click On R2 and go to CLI command and configure and add IP Address and Subnet mask to it.
3) Click On S1 and go to CLI command and configure and add IP Address and Subnet mask to it.
4) Click On S2 and go to CLI command and configure and add IP Address and Subnet mask to it.

Practical 10

Implement IPsec Site-to-Site VPNs

1. Implement GRE over IPsec Site-to-Site VPNs

2. Implement VRF Lite Steps to Perform

Step 1: (Required Resources)

1) Take 3 Routers of 1941 and name them as R1, R2 and R3.
2) Take 3 Switches of 2960-24TT and name them as S1, S2 and S3.
3) Take 3 Machine of PC-PT and name them PC-A, PC-B and PC-C.

Step 2: Now connect router R1 to router R2 with serial cable 0/0/0 to serial cable 0/0/1. And also connect Router R2 to router R3 with serial cable 0/0/1 to serial cable 0/0/0.

Step 3: Lets connect PC-A to switch S1 with Fast Ethernet0 to Fast Ethernet0/1 cable. Now connect switch S1 to router R1 with Fast Ethernet0/2 to Fast Ethernet0/0 cable.

Step 4: Now connect PC-B to Switch S2 with Fast Ethernet0 to Fast Ethernet0/1 cable. And also connect switch S2 to router R2 with Fast Ethernet0/2 to Fast Ethernet0/0.

Step 5: Now connect router R3 to switch S3 with Fast EthernetFa0/0 to Fast Ethernet0/2 cable. And also connect Switch S3 to PC-C with Fast Ethernet0/1 to Fast Ethernet0 cable.

Practical 11

Simulating SDN with

1. **OpenDaylight SDN Controller with the Mininet Network Emulator.**
2. **OFNet SDN network emulator**

Step 1:

1) Take Three Switches of 2960 and name them as S1, S2 and S3.
2) Take 3 Machine and name them as PC-1 and PC-2 and PC-3.

Step 2:

1) Now Connect S2 to S1 with Fast Ethernet 0/1 to Fast Ethernet 0/1.
2) Now Connect S2 to S3 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
3) Now Connect S2 to PC-2 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
4) Now Connect S3 to PC-3 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
5) Now Connect S1 to PC-1 with Fast Ethernet 0/2 to Fast Ethernet 0/1.

Step 3:

1) Click On S1 and go to CLI command and configure and add IP Address and Subnet mask to it.
2) Click On S2 and go to CLI command and configure and add IP Address and Subnet mask to it
3) Click On S3 and go to CLI command and configure and add IP Address and Subnet mask to it.
4) Click On PC-1 and go to CLI command and configure and add IP Address and Subnet mask to it.
5) Click On PC-2 and go to CLI command and configure and add IP Address and Subnet mask to it.
6) Click On PC-3 and go to CLI command and configure and add IP Address and Subnet mask to it.

Practical 12

Simulating Open Flow Using Mininet

Step 1:

1) Take 4 Switches of 2960 and give name S1 and S2.
2) Take Server and name them as Server1.

Step 2:

1) Now Connect Server1 to S1 with Fast Ethernet 0/1 to Fast Ethernet 0/1.
2) Now Connect Server1 to S3 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
3) Now Connect Server1 to S2 with Fast Ethernet 0/2 to Fast Ethernet 0/1.
4) Now Connect S3 to S4 with Fast Ethernet 0/2 to Fast Ethernet 0/1.

Step 3:

1) S1 is connected to Host H3, H4, H6.
2) S3 is connected to Host H8 and H7.
3) S2 is connected to Host H1, H5 and H2.
4) S4 is connected to Host H9 and H10.