

PW 6: Open Shortest Path First (OSPF) and Access Control List (ACL)

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Objective

The goal is to practice the basic commands of OSPF and standard ACLs. In this lab you will:

1. Configure IP addresses on hosts and routers.
2. Verify connectivity between hosts in the same subnet.
3. Enable OSPF on routers (R1 and R2) in area 0 using a single network command.
4. Verify OSPF neighbor relationships and routing between hosts in different subnets.
5. Configure standard ACLs to filter traffic based on the following requirements:
 - Permit packets from S1 going to the subnet of hosts A and B.
 - Deny packets from S2 going to the subnet of hosts A and B.
 - Permit packets from S2 going to the subnet of host C.
 - Deny packets from S1 going to the subnet of host C.

Lab Topology and IP Addressing

IP Addressing Plan

- **Hosts and Routers:**
 - a. **Host A:** IP 10.1.1.1/24, Gateway: 10.1.1.3
 - b. **Host B:** IP 10.1.1.2/24, Gateway: 10.1.1.3
 - c. **R1's G0/0:** IP 10.1.1.3/24
 - d. **Host C:** IP 10.3.3.3/25, Gateway: 10.3.3.1
 - e. **R1's G0/1:** IP 10.3.3.1/25
 - f. **S1:** IP 10.2.2.1/24, Gateway: 10.2.2.3
 - g. **S2:** IP 10.2.2.2/24, Gateway: 10.2.2.3
 - h. **R2's G0/0:** IP 10.2.2.3/24
 - i. **R1's S0/3/0:** IP 10.4.4.1/30
 - j. **R2's S0/3/0:** IP 10.4.4.2/30

Initial Connectivity Verification

Before configuring routing, verify that you can ping the following within the same subnet:

- From Host A to Host B
- From Host C to R1's G0/1 interface
- From S1 to S2
- From R1's S0/3/0 interface to R2's S0/3/0 interface

Note: At this stage, hosts in different subnets cannot ping each other because the routers do not have any routing entries.

Part 1: IP Address and Interface Configuration

Configuration Examples for R1 and R2 Interfaces

R1's G0/0:

```
Router> enable
Router# configure terminal
Router(config)# interface g0/0
Router(config-if)# ip address 10.1.1.3 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# end
```

Listing 1: Configure R1's G0/0

R1's G0/1:

```
Router# configure terminal
Router(config)# interface g0/1
Router(config-if)# ip address 10.3.3.1 255.255.255.128
Router(config-if)# no shutdown
Router(config-if)# end
```

Listing 2: Configure R1's G0/1

R1's S0/3/0:

```
Router# configure terminal
Router(config)# interface s0/3/0
Router(config-if)# ip address 10.4.4.1 255.255.255.252
Router(config-if)# no shutdown
Router(config-if)# end
```

Listing 3: Configure R1's S0/3/0

R2's G0/0:

```
Router> enable
Router# configure terminal
Router(config)# interface g0/0
Router(config-if)# ip address 10.2.2.3 255.255.255.0
Router(config-if)# no shutdown
Router(config-if)# end
```

Listing 4: Configure R2's G0/0

R2's S0/3/0:

```
Router# configure terminal
Router(config)# interface s0/3/0
Router(config-if)# ip address 10.4.4.2 255.255.255.252
Router(config-if)# no shutdown
Router(config-if)# end
```

Listing 5: Configure R2's S0/3/0

(Hosts A, B, C, S1 and S2 are configured on end devices with the given IPs, subnet masks, and gateways.)

Part 2: Enabling OSPF

On R1 and R2 (Single Command Configuration)

On both routers, enable OSPF in area 0 using one network command that encompasses all interfaces:

```
Router# configure terminal
Router(config)# router ospf 1
Router(config-router)# network 10.0.0.0 0.255.255.255 area 0
Router(config-router)# end
```

Listing 6: Enable OSPF on R1

```
Router# configure terminal
Router(config)# router ospf 1
Router(config-router)# network 10.0.0.0 0.255.255.255 area 0
Router(config-router)# end
```

Listing 7: Enable OSPF on R2

Verification: On both R1 and R2, verify that the OSPF neighbor relationship has been established:

```
Router# show ip ospf neighbor
```

Listing 8: Show OSPF Neighbors

After OSPF is configured, the routers will exchange routing information, and you should now be able to ping between hosts in different subnets, for example:

- From Host A to Host C.
- From Host C to S1.
- From Host A to S1.

Part 3: Configuring ACLs

Requirements:

- **Permit** packets from S1 going to the subnet of hosts A and B.
- **Deny** packets from S2 going to the subnet of hosts A and B.

- **Permit** packets from S2 going to the subnet of host C.
- **Deny** packets from S1 going to the subnet of host C.

Implementation on R1:

1. On R1, apply an outbound ACL on interface G0/0 to filter traffic destined for the subnet of hosts A and B. **Note:** In this lab, we assume S1 (IP 10.2.2.1) is allowed and S2 (IP 10.2.2.2) is not.
2. Apply an outbound ACL on R1's G0/1 to filter traffic destined for the subnet of host C (subnet: 10.3.3.128/25).

ACL Configuration on R1:

```
! Define ACL 1: Permit S1 (10.2.2.1) for subnets of hosts A and B (10.1.1.0/24)
Router# configure terminal
Router(config)# access-list 1 permit 10.2.2.1

! Define ACL 2: Permit S2 (10.2.2.2) for subnet of Host C (10.3.3.128/25)
Router(config)# access-list 2 permit 10.2.2.2

! Apply ACL 1 outbound on interface G0/0
Router(config)# interface g0/0
Router(config-if)# ip access-group 1 out
Router(config-if)# exit

! Apply ACL 2 outbound on interface G0/1
Router(config)# interface g0/1
Router(config-if)# ip access-group 2 out
Router(config-if)# exit
Router(config)# end
```

Listing 9: Configure ACLs on R1

Verification after ACL Configuration:

- From S1, you should be able to ping hosts A and B but not host C.
- From S2, you should be able to ping host C but not hosts A and B.

Conclusion

In this exercise, you have:

1. Configured IP addresses for hosts and routers as per the given plan.
2. Verified connectivity within the same subnet.
3. Enabled OSPF across all interfaces on R1 and R2 with a single network command, forming neighbor relationships and enabling inter-subnet routing.
4. Configured standard ACLs to filter traffic according to specified requirements.
5. Verified the ACL effects by testing connectivity between subnets.

This lab exercise provides practical experience with basic OSPF configuration and standard ACLs on Cisco routers.