इरिसेट
नेटवर्क प्रयोगशाला
प्रयोग नं: एन डब्लू एल - 05

**IRISET**
**NETWORK LABORATORY**
**EXPERIMENT NO.: NWL-05**

नाम
Name : ----------

अनुक्रमांक
Roll No : ----------

प्राप्त अंक
Marks Awarded :

पाठ्यक्रम
Course : ----------

दिनांक
Date : ----------

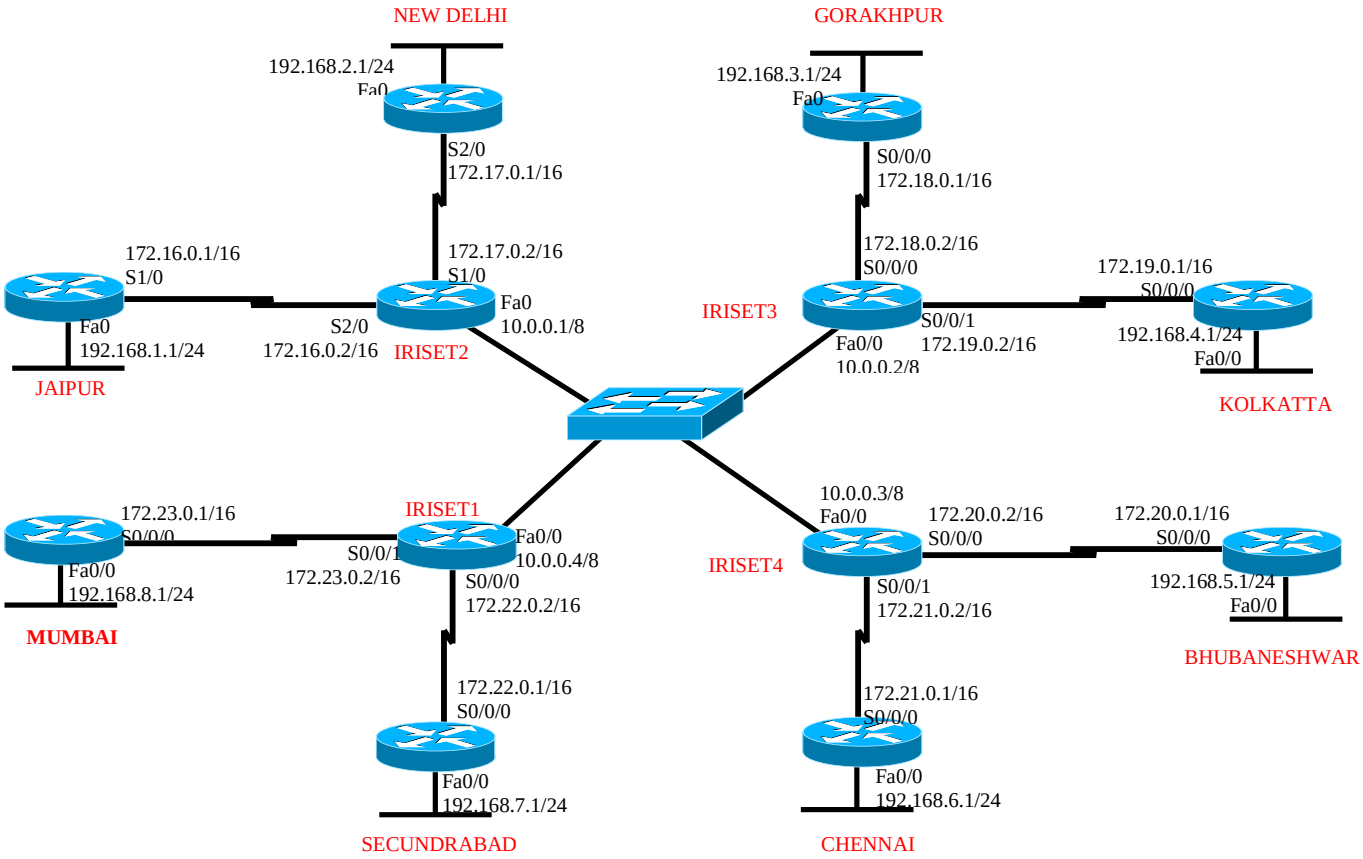
अनुदेशक का हस्ताक्षर :
Instructor Initial

Name of Experiment: **Configuration of Static & Dynamic routes**

## Object

Configure the Routes as per the network connectivity diagram shown below.

### Network Connectivity diagram






S0/0/1

## Introduction

Routing is the act of moving information across an inter network from a source to a destination.

## Routing:

1. Static Routing
2. Dynamic Routing

### 1. Static routing

In static routing the destination networks **(i.e. indirectly connected networks)** are defined manually, or statically. Network reachability in this case is not dependent on whether a destination is active or not, the static routes remain in the routing table, and traffic is still sent toward the specified destination.

## Apparatus Required

1. Desktop PC with NIC card
2. Patch card (straight cable, both ends terminated with RJ 45 connectors)
3. Router (CISCO 1845)
4. Null modem cable with connectors on both ends

## ***Procedure***

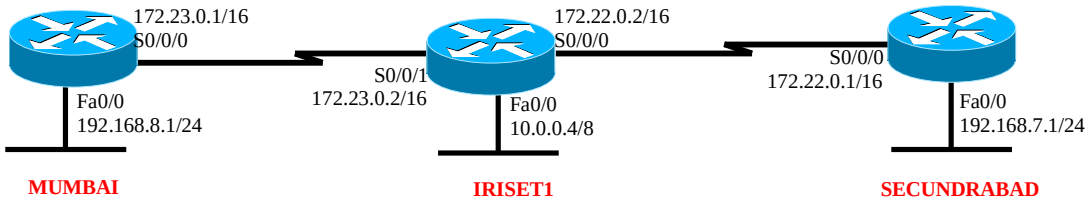
1. Configure the allotted PC with the respective IP address including its gateway (i.e. gateway is nothing but the Router's Ethernet port IP address) as shown in the connectivity diagram.
2. Telnet to the Router by click on **Start, Run** and type **cmd** in the Run dialog box and click on O.K.
3. In the Command prompt window, type
   C :/> *telnet <IP address of Router's Ethernet (gateway) interface>*
4. Enter the vty & enable password to log into Router
5. After successful log in, the Router prompt will be shown as **Router#**
6. Configure the WAN interfaces
7. Configure the static routes

## Static Routing (i.e. indirectly connected networks).

## Syntax:

Router#*config terminal*↵
Router(config)#*ip routing* ↵ [**Enables the Routing**]
Router(config)#*ip route <Destination Network ID><Destination network subnet mask>*
*<Next hop IP address>* ↵
**OR**
*<exit interface type<no.><slot no.><port no.>* ↵
Router(config)#*exit* ↵

***Destination N/W ID:*** *Network ID (of remote network)*
***Destination subnet mask:*** *subnet mask (of remote network)*
***Next hop address:*** *IP address of the Next Router interface (directly connected)*
***Exit interface type & number:*** *outgoing interface type and number (of your network)*




On MUMBAI

**Configuring Static Routes:**

MUMBAI>*en* ↵

MUMBAI#*config t* ↵

MUMBAI(config)#*ip routing* ↵

MUMBAI(config)#*ip route 10.0.0.0 255.0.0.0 S0/0/0* ↵

(OR)

*ip route 10.0.0.0 255.0.0.0 172.23.0.2* ↵

MUMBAI(config)#*ip route 172.22.0.0 255.255.0.0 S0/0/0* ↵

(OR)

*ip route172.22.0.0 255.255.0.0 172.23.0.2*↵

MUMBAI(config-if)# *ip route 192.168.7.0 255.255.255.0 S0/0/0* ↵

(OR)

*ip route192.168.7.0 255.255.255.0 172.23.0.2*↵

MUMBAI(config-if)#*exit* ↵

On IRISET1

**Configuring Static Routes:**

IRISET1>*en* ↵

IRISET1#*config t* ↵

IRISET1(config)#*ip routing* ↵

IRISET1(config)#*ip route 192.168.8.0 255.255.255.0 S0/0/1* ↵

(OR)

*ip route 192.168.8.0 255.255.255.0 172.23.0.1* ↵

IRISET1(config)#*ip route 192.168.7.0 255.255.255.0 S0/0/0* ↵

(OR)

*ip route192.168.7.0 255.255.255.0 172.22.0.1*↵

IRISET1(config-if)#*exit* ↵

On SECUNDRABAD

**Configuring Static Routes:**

SECUNDRABAD>*en* ↵

SECUNDRABAD#*config t* ↵

SECUNDRABAD(config)#*ip routing* ↵

SECUNDRABAD(config)#*ip route 10.0.0.0 255.0.0.0 S0/0/0* ↵

(OR)

*ip route 10.0.0.0 255.0.0.0 172.22.0.2* ↵

SECUNDRABAD(config)#*ip route 172.23.0.0 255.255.0.0 S0/0/0* ↵

(OR)

*ip route172.22.0.0 255.255.0.0 172.22.0.2*↵

SECUNDRABAD(config-if)# *ip route 192.168.8.0 255.255.255.0 S0/0/0* ↵

(OR)

*ip route192.168.7.0 255.255.255.0 172.22.0.2* ↵

SECUNDRABAD(config-if)#*exit* ↵

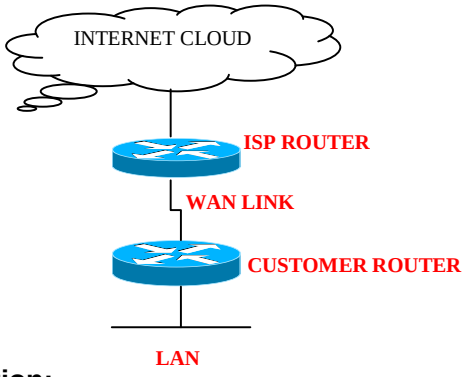
**Default routing**

It is also part of the static routing, a default route, is also known as the *gateway of last resort*, is the network route used by a router when no other known route exists for a given IP packet's destination address. All the packets for destinations not known by the router's routing table are sent to the default route. This default routing is invariably used in Internet, as in Internet we don't know the destination network

***Syntax:***

Router>*en*↵
Router#*config terminal* ↵
Router(config)#*ip routing* ↵
Router(config)#*ip route <0.0.0.0><0.0.0.0><Next hop IP address> or*
*<exit interface type<no.><slot no.><port no.>* ↵
Router(config)#*exit* ↵
Router(config)# *exit* ↵

***Destination N/W ID:*** *0.0.0.0 (any network)*
***Destination subnet mask:*** *0.0.0.0 (any mask)*
***Next hop address:*** *IP address of the Next Router interface (directly connected)*
***Exit interface type & number:*** *outgoing interface type and number (of your network)*




**Verification of Configuration:**

**Syntax**
Iriset1#*show ip route* ↵

E.g. **the Static Routing on IRISET1 Router is shown below**

IRISET1#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B – BGP, D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area, N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2, E1 - OSPF external type 1, E2 - OSPF external type 2, i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area, * - candidate default, U - per-user static route, o - ODR, P - periodic downloaded static route, Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, FastEthernet0/0
S 192.168.8.0/24 [1/0] via 172.23.0.1

**Saving the Configuration:**

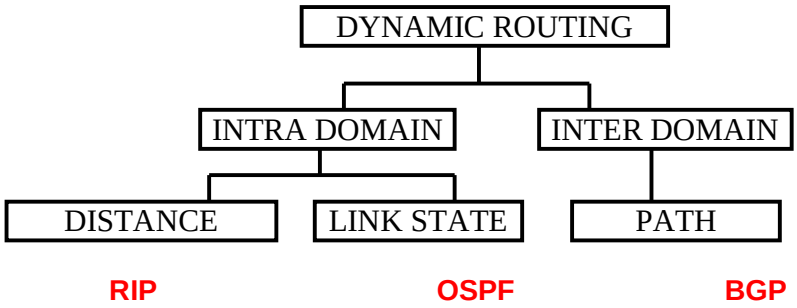
**Syntax**

Iriset1#*copy running-config startup-config* ↵
(OR)
Iriset1#*write memory* ↵
(OR)
Iriset1#*wr* ↵

[***Saves the running configuration into startup configuration***]

**2. Dynamic routing**

In dynamic routing the destination networks **(i.e. directly connected networks)** are defined using routing protocols. Network reachability in this case is dependent on the existence and state of the network. If a destination is down, the route disappears from the routing table, and traffic is not sent toward that destination.



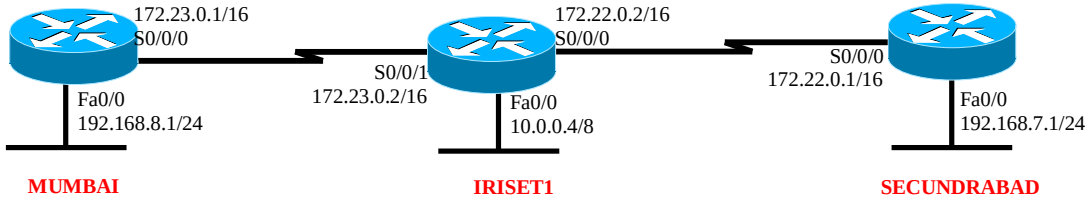

**RIP (routing information protocol)**

Routing Information Protocol (RIP) exchanges routing updates through broadcasting UDP packets. A router sends out routing updates every 30 seconds, which is called a notification. If a router does not receive any routing updates from another router within 180 seconds or more, the routing signal related to that router is disabled. If the router does not receive any routing updates within 240 seconds after this, the router will delete all routes related to that route from its routing table. RIP provides a metric, which is called a hop count, to scale different routing distances. Hop count is the number of routers passing through a route. The hop count of a directed network is 0, while the hop count of an unreachable network is 16.

Enable RIP and advertise the directly connected networks using the following commands.

**Syntax:**

Router>*en* ↵
Router#*config terminal* ↵
Router(config)#*ip routing*↵
Router (config)#*router rip* ↵ [**activates RIP**]
Router(config-rip)#*version 2* ↵ [**Version 2 supports classless network**]
Router(config-rip)#*network <Destination Network ID>* ↵
Router(config-rip)#*exit* ↵




On MUMBAI

**Configuring Dynamic Routes:**
**(Using RIP protocol)**

MUMBAI>*en* ↵
MUMBAI#*config t* ↵
MUMBAI(config)#*ip routing* ↵
MUMBAI(config)#*router RIP* ↵
MUMBAI(config-rip)#*version 2* ↵
MUMBAI(config-rip)#*network 192.168.8.0* ↵
MUMBAI(config-rip)# *network 172.23.0.0* ↵
MUMBAI(config-rip)#*exit* ↵

On IRISET1

**Configuring Dynamic Routes:**
**(Using RIP protocol)**

IRISET1>*en* ↵
IRISET1#*config t* ↵
IRISET1(config)#*ip routing* ↵
IRISET1(config)#*router RIP* ↵
IRISET1(config-rip)#*version 2* ↵
IRISET1(config-rip)#*network 10.0.0.0* ↵
IRISET1(config-rip)# *network 172.23.0.0* ↵
IRISET1(config-rip)# *network 172.22.0.0* ↵
IRISET1(config-rip)#*exit* ↵

On SECUNDRABAD

**Configuring Dynamic Routes:**
**(Using RIP protocol)**

SECUNDRABAD>*en* ↵
SECUNDRABAD#*config t* ↵
SECUNDRABAD(config)#*ip routing* ↵
SECUNDRABAD(config)#*router RIP* ↵
SECUNDRABAD(config-rip)#*version 2* ↵
SECUNDRABAD(config-rip)#*network 192.168.8.0* ↵
SECUNDRABAD(config-rip)# *network 172.23.0.0* ↵
SECUNDRABAD(config-rip)#*exit* ↵

**Verification of Configuration:**

**Syntax**
Iriset1#*show ip route* ↵

E.g. **The Routes on IRISET1 Router is shown below**

IRISET1#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B – BGP, D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area, N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2, E1 - OSPF external type 1, E2 - OSPF external type 2, i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area, * - candidate default, U - per-user static route, O - ODR, P - periodic downloaded static route,Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, FastEthernet0/0
R 192.168.8.0/24 [120/1] via 172.23.0.1, 00:00:24, serial0/0/1

**Saving the Configuration:**

**Syntax**
Iriset1#*copy running-config startup-config* ↵
(OR)
Iriset1#*write memory* ↵
(OR)
Iriset1#*wr* ↵

[***Saves the running configuration into startup configuration****]*

**OSPF (Open Shortest Path First protocol)**

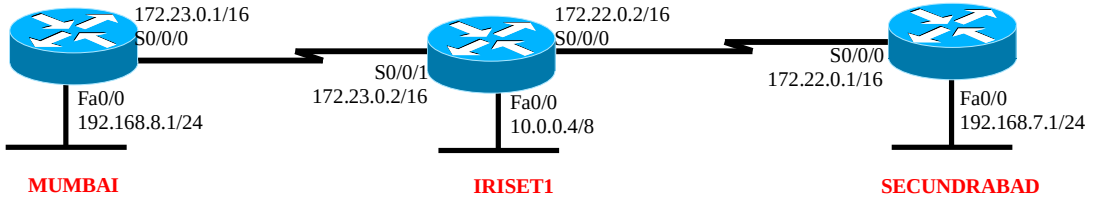
Open shortest path first (OSPF) exchanges routing updates through multicast IP address 224.0.0.5 called triggered updates, it uses Dijkstra algorithm. A router sends hello packets for every 10 seconds (does not sends complete Routing table). Faster convergence, flush time is 4 hello packets (i.e. 40 sec). OSPF uses metric called cost ($10^8$ / Bandwidth in bps).administrative distance is 110, UN limited hop count

Enable OSPF and advertise the directly connected networks using the following commands.

**Syntax:**

Router>*en* ↵
Router#*config terminal* ↵
Router#*ip routing* ↵
Router(config)#*router ospf <process ID>* ↵ [**activates OSPF**]
Router(config-ospf)#*network <Destination Network ID> <Wild card mask> Area <area no.>* ↵
Router(config-ospf)#*exit* ↵

***Process ID:*** *any number between 1 to 65535*
***Area number:*** *any number between 0 to 4.3 billion (Area 0 is called as backbone area)*
***Wild card mask:*** *Inverse mask (Global subnet mask – subnet mask)*




On MUMBAI

**Configuring Dynamic Routes:**
**(Using OSPF protocol)**

MUMBAI>*en* ↵
MUMBAI#*config t* ↵
MUMBAI(config)#*ip routing* ↵
MUMBAI(config)#*router OSPF 10* ↵
MUMBAI(config-ospf)#*network 192.168.8.0 0.0.0.255 area 100* ↵
MUMBAI(config-ospf)# *network 172.23.0.0 0.0.255.255 area 100* ↵
MUMBAI(config-ospf)#*exit* ↵

On IRISET1

**Configuring Dynamic Routes:**
**(Using OSPF protocol)**

IRISET1>*en* ↵
IRISET1#*config t* ↵
IRISET1(config)#*ip routing* ↵
IRISET1(config)#*router OSPF 20* ↵
IRISET1(config-ospf)#*network 10.0.0.0 0.255.255.255 area 100* ↵
IRISET1(config-ospf)# *network 172.23.0.0 0.0.255.255 area 100* ↵
IRISET1(config-ospf)# *network 172.22.0.0 0.0.255.255 area 100*
IRISET1(config-ospf)#*exit* ↵

On SECUNDRABAD

**Configuring Dynamic Routes:**
**(Using OSPF protocol)**

SECUNDRABAD>*en* ↵
SECUNDRABAD#*config t* ↵
SECUNDRABAD(config)#*ip routing* ↵
SECUNDRABAD(config)#*router OSPF 30* ↵
SECUNDRABAD(config-ospf)#*network 192.168.7.0 0.0.0.255 area 100* ↵
SECUNDRABAD(config-ospf)# *network 172.22.0.0 0.0.255.255 area 100* ↵
SECUNDRABAD(config-ospf)#*exit* ↵

**Verification of Configuration:**

**Syntax**

Iriset1#*show ip route* ↵

E.g. **The Routes on IRISET1 Router is shown below**

```
IRISET1#sh ip route
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route

Gateway of last resort is not set

C    10.0.0.0/8 is directly connected, FastEthernet0/0
O     192.168.8.0/24 [110/74] via 172.23.0.1, 00:00:34, serial0/0/1
```

**Saving the Configuration:**

**Syntax**

Iriset1#*copy running-config startup-config* ↵
(OR)
Iriset1#*write memory* ↵
(OR)
Iriset1#*wr* ↵

[***Saves the running configuration into startup configuration****]*

**Exercise:**

1. Explain the parameters used in static routing?

2. Explain the parameters used in Dynamic routing?

3. Where Static routing is preferred?

4. Explain the significance of inverse mask used in OSPF protocol?

5. Explain the significance of the command “ip routing”