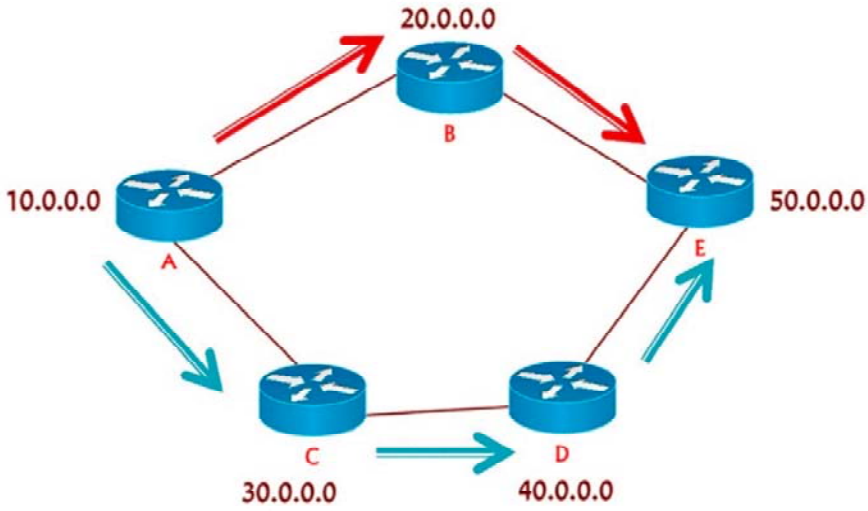
Routing

- Forwarding of packets from one network to another network .
- choosing the best path from the routing table.



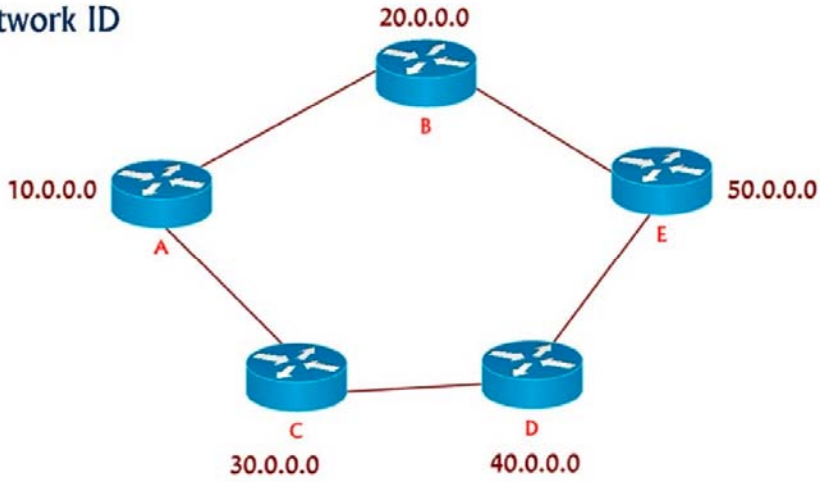
Best path selection is based on the type of routing we are using (static /Dynamic)

Types of Routing

1. Static Routing
2. Default Routing
3. Dynamic Routing

Static Routing

- Best path is configured manually by Administrator
- Mandatory need of Destination Network ID
- It is Secure & fast



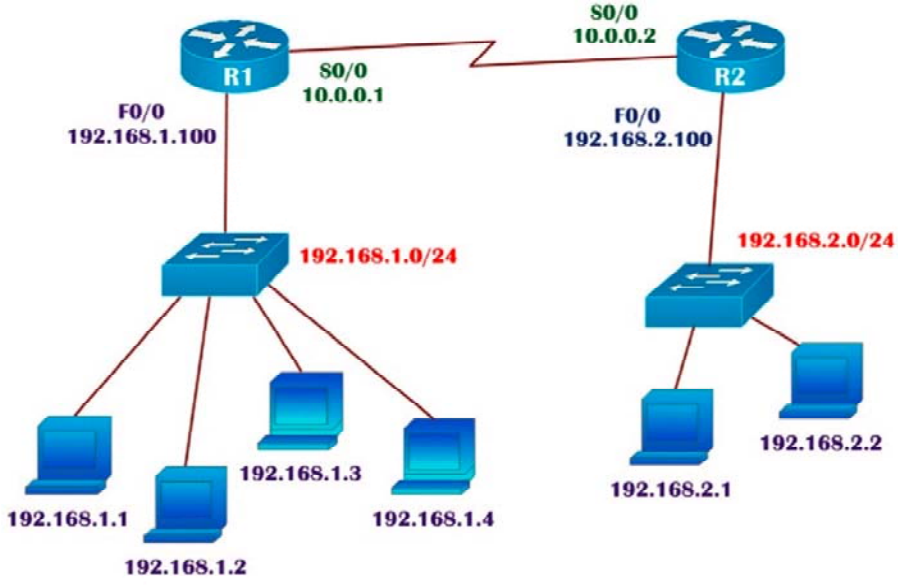
Disadvantages

- Everything to manually
- Used for small network.
- Network change effect complete network.

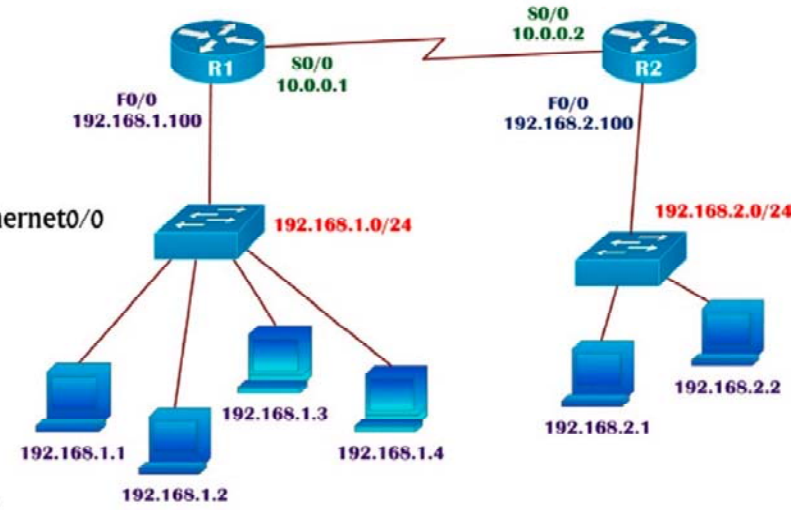
Configuring Static Route

Router(config)#

ip route <Destination Network ID> <Destination Subnet Mask> <Next-hop IP address >



Verification before static Routing



R-1#show ip route

C 10.0.0.0/8 is directly connected, Serial0/0

C 192.168.1.0/24 is directly connected, FastEthernet0/0

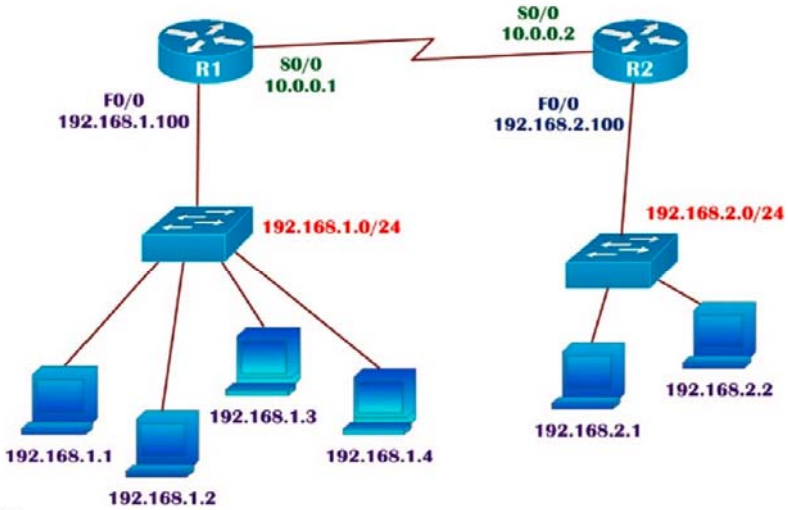
PC>ping 192.168.2.1

Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.1.100: Destination host unreachable.
Reply from 192.168.1.100: Destination host unreachable.
Reply from 192.168.1.100: Destination host unreachable.
Reply from 192.168.1.100: Destination host unreachable.

Static Routing – 2 routers

R-1(config)# ip route 192.168.2.0 255.255.255.0 10.0.0.2



R-1#sh ip route

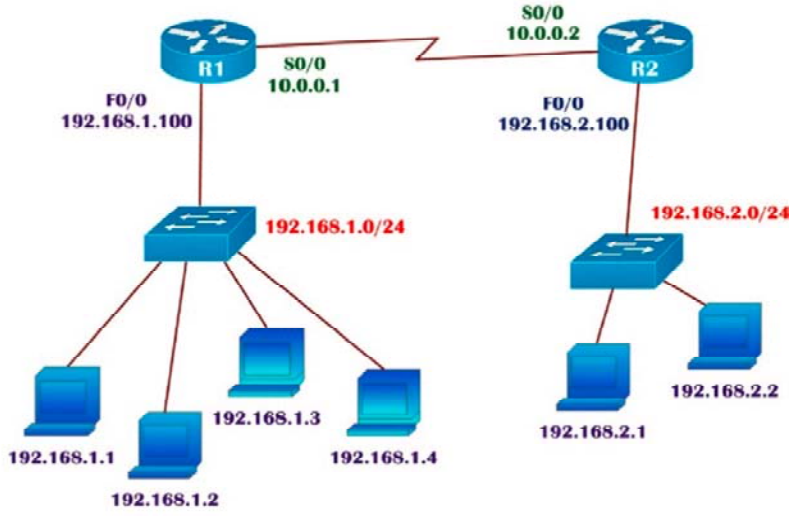
Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, Serial0/0

C 192.168.1.0/24 is directly connected, FastEthernet0/0

S 192.168.2.0/24 [1/0] via 10.0.0.2

R-2(config)#ip route 192.168.1.0 255.255.255.0 10.0.0.1



R-2#show ip route

Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, Serial0/0

S 192.168.1.0/24 [1/0] via 10.0.0.1

C 192.168.2.0/24 is directly connected, FastEthernet0/0

Ping & tracert

PC>ping 192.168.2.1

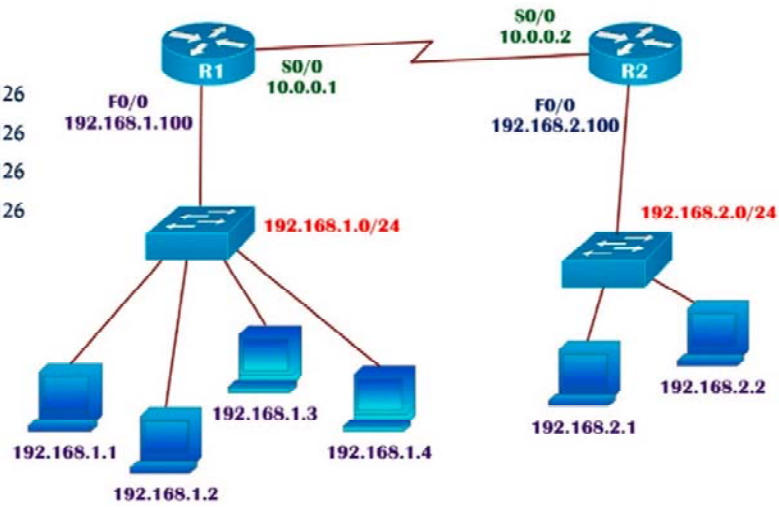
Pinging 192.168.2.1 with 32 bytes of data:

Reply from 192.168.2.1: bytes=32 time=20ms TTL=126

Reply from 192.168.2.1: bytes=32 time=20ms TTL=126

Reply from 192.168.2.1: bytes=32 time=21ms TTL=126

Reply from 192.168.2.1: bytes=32 time=21ms TTL=126

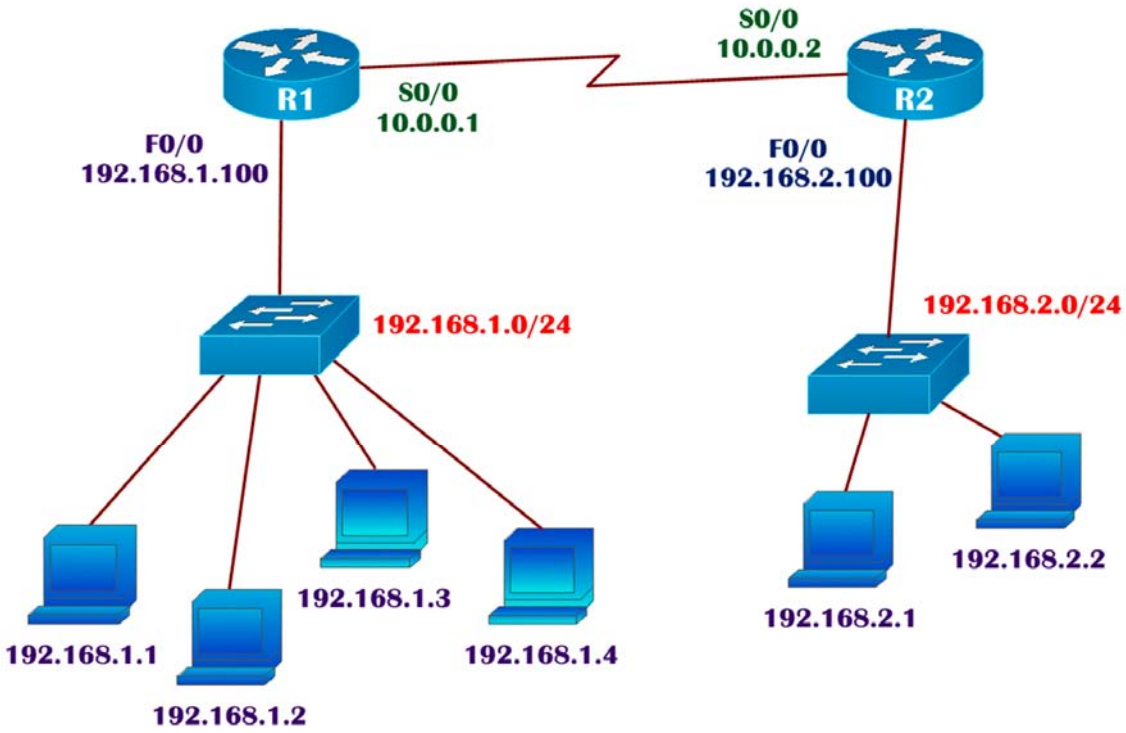


PC>tracert 192.168.2.1

Tracing route to 192.168.2.1 over a maximum of 30 hops:

1	44 ms	9 ms	10 ms	192.168.1.100
2	13 ms	13 ms	12 ms	10.0.0.2
3	17 ms	22 ms	20 ms	192.168.2.1

LAB: STATIC ROUTING



TASK:

- Configure Static routing
- Verify Routing table and reachability between the LAN's (using PING and TRACE commands)

R-1#show ip route

Gateway of last resort is not set

C 10.0.0.0/8 is directly connected, Serial0/0

C 192.168.1.0/24 is directly connected, FastEthernet0/0

R-2#show ip route

Gateway of last resort is not set

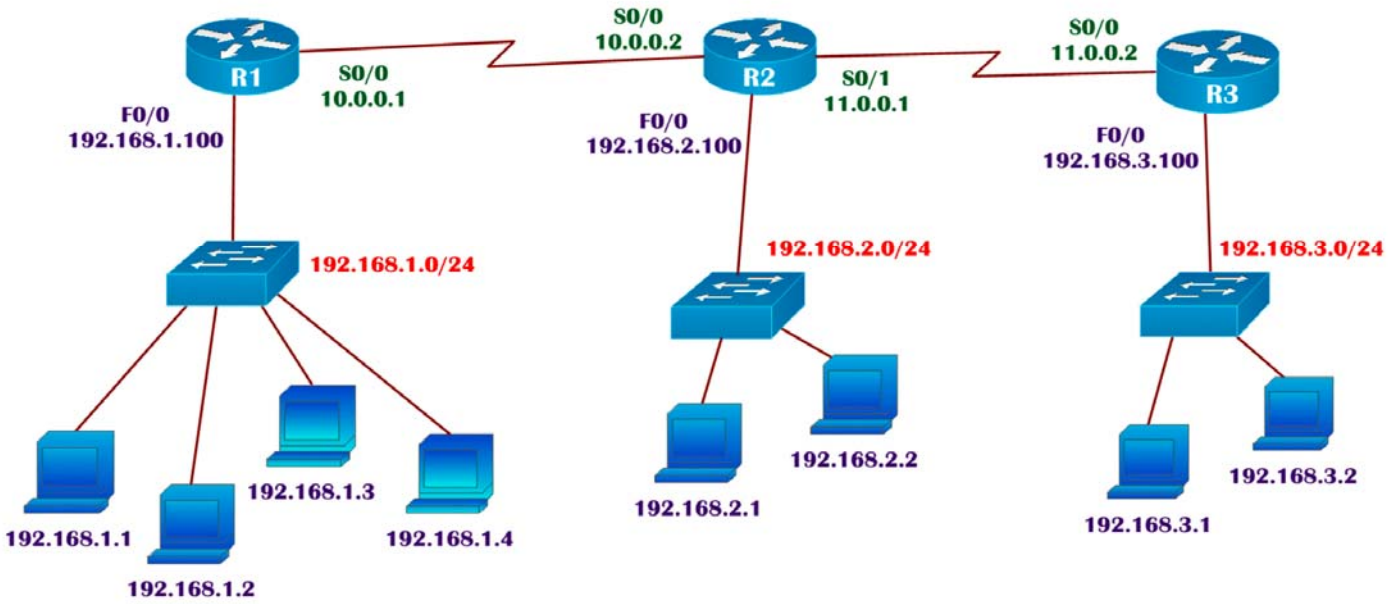
C 10.0.0.0/8 is directly connected, Serial0/0

C 192.168.2.0/24 is directly connected, FastEthernet0/0

NOTE:

- The above routing table displays only the networks which are directly connected
- By default router don't know about the networks which are not directly connected and that the reason there is no reachability between the two LAN's
- So to provide reachability we need to implement any type of the routing

LAB: STATIC ROUTING USING THREE ROUTERS



TASK:

- Configure Static routing
- Verify Routing table and reachability between the LAN's (using PING and TRACE commands)

R-1#sh ip route

Gateway of last resort is not set
C 10.0.0.0/8 is directly connected, Serial0/0
C 192.168.1.0/24 is directly connected, FastEthernet0/0

R-2#sh ip route

Gateway of last resort is not set
C 10.0.0.0/8 is directly connected, Serial0/0
C 11.0.0.0/8 is directly connected, Serial0/1
C 192.168.2.0/24 is directly connected, FastEthernet0/0

R-3#sh ip route

Gateway of last resort is not set
C 11.0.0.0/8 is directly connected, Serial0/0
C 192.168.3.0/24 is directly connected, FastEthernet0/0

Router- 1

R-1(config)# **ip route** 192.168.2.0 255.255.255.0 10.0.0.2

R-1(config)# **ip route** 192.168.3.0 255.255.255.0 10.0.0.2

R-1(config)# **ip route** 11.0.0.0 255.0.0.0 10.0.0.2

Router – 2

R-2(config)# ip route 192.168.1.0 255.255.255.0 10.0.0.1

R-2(config)# ip route 192.168.3.0 255.255.255.0 11.0.0.2

Router – 3

R-3(config)# ip route 192.168.2.0 255.255.255.0 11.0.0.1

R-3(config)# ip route 192.168.1.0 255.255.255.0 11.0.0.1

R-3(config)# ip route 10.0.0.0 255.0.0.0 11.0.0.1

Routing lookup

R-1#sh ip route

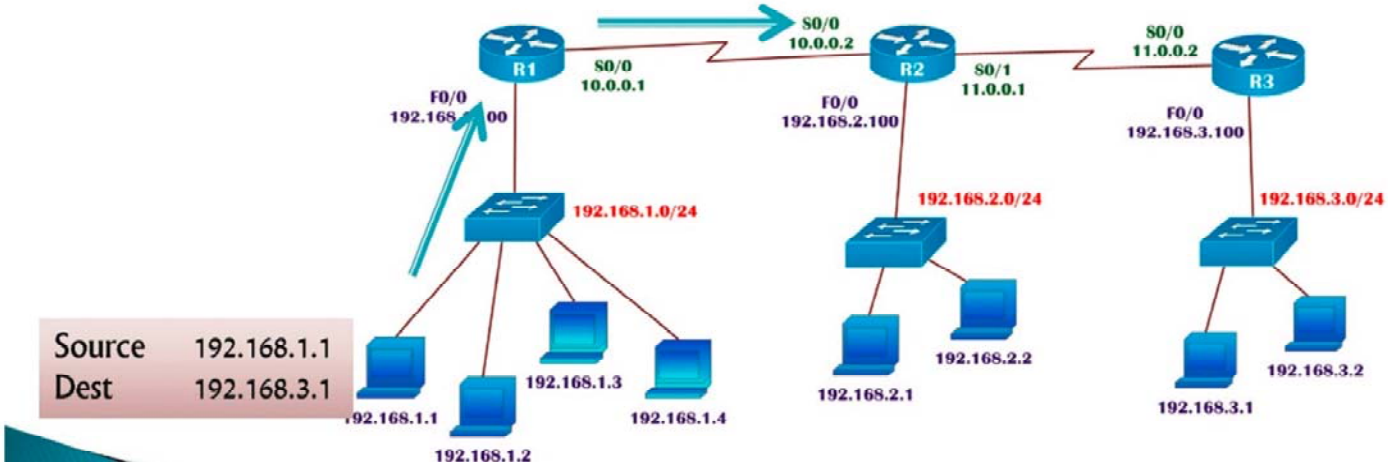
C 10.0.0.0/8 is directly connected, Serial0/0

S 11.0.0.0/8 [1/0] via 10.0.0.2

C 192.168.1.0/24 is directly connected, FastEthernet0/0

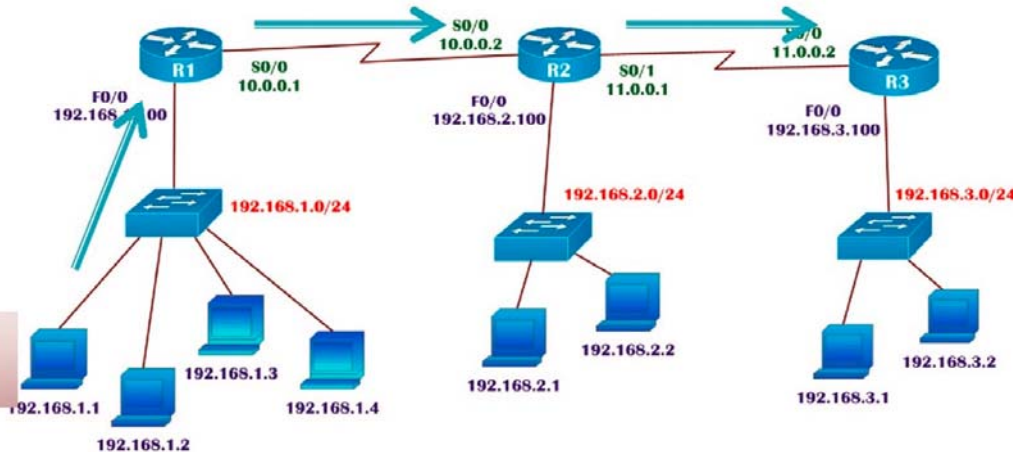
S 192.168.2.0/24 [1/0] via 10.0.0.2

S 192.168.3.0/24 [1/0] via 10.0.0.2



R-2#sh ip route

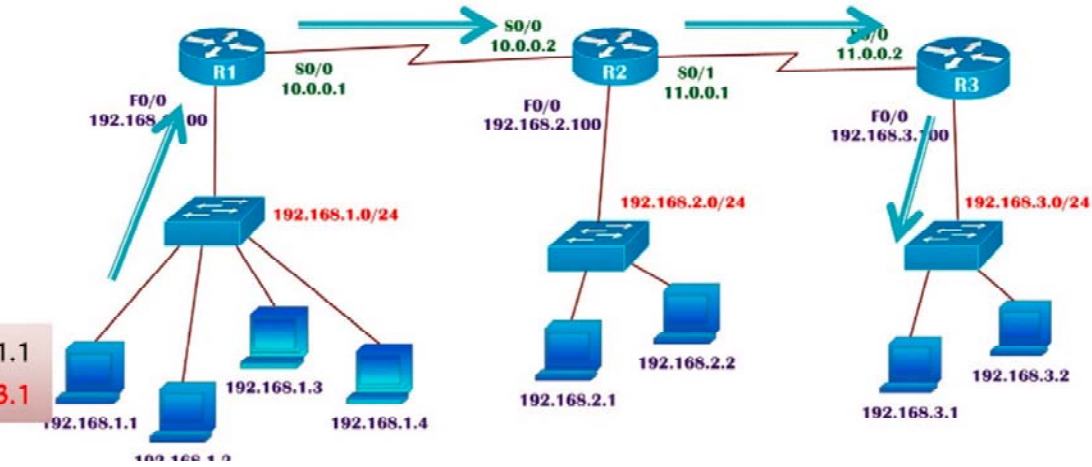
C 10.0.0.0/8 is directly connected, Serial0/0
C 11.0.0.0/8 is directly connected, Serial0/1
S 192.168.1.0/24 [1/0] via 10.0.0.1
C 192.168.2.0/24 is directly connected, FastEthernet0/0
S 192.168.3.0/24 [1/0] via 11.0.0.2



Source 192.168.1.1
Dest 192.168.3.1

R-3#sh ip route

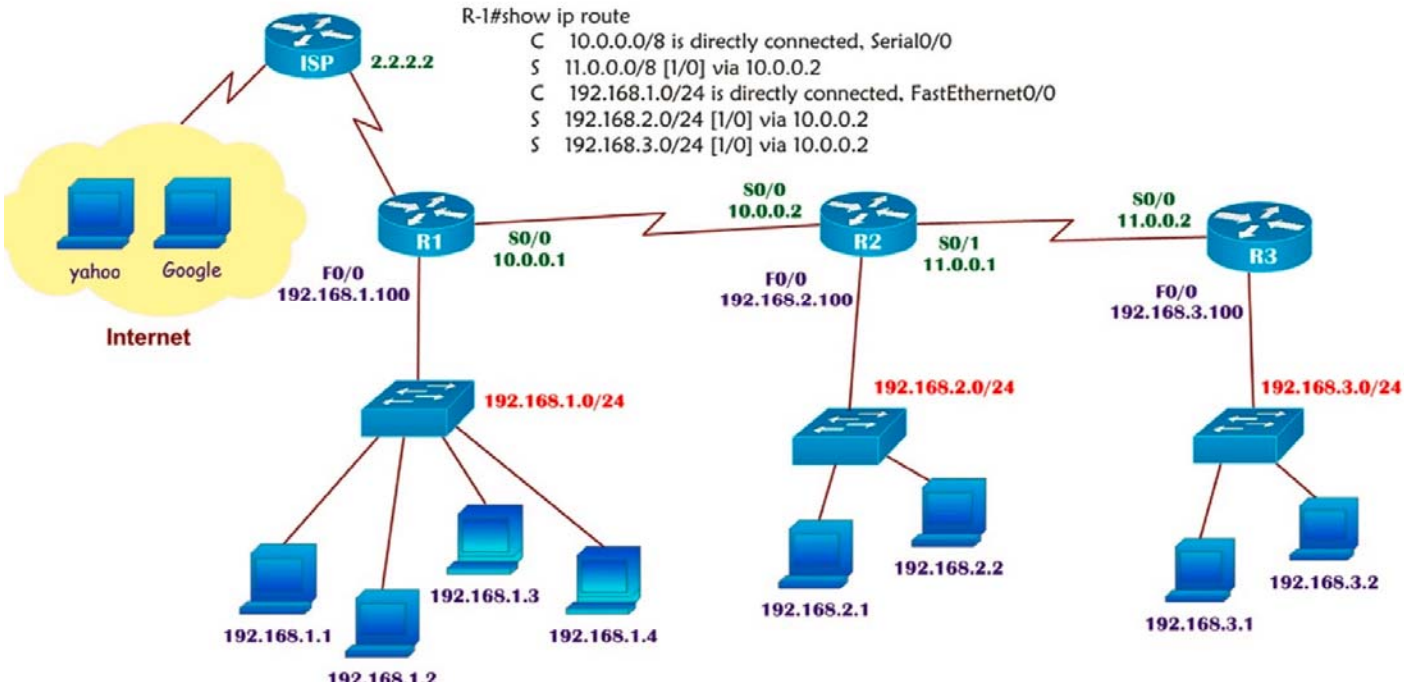
S 10.0.0.0/8 [1/0] via 11.0.0.1
C 11.0.0.0/8 is directly connected, Serial0/0
S 192.168.1.0/24 [1/0] via 11.0.0.1
S 192.168.2.0/24 [1/0] via 11.0.0.1
C 192.168.3.0/24 is directly connected, FastEthernet0/0



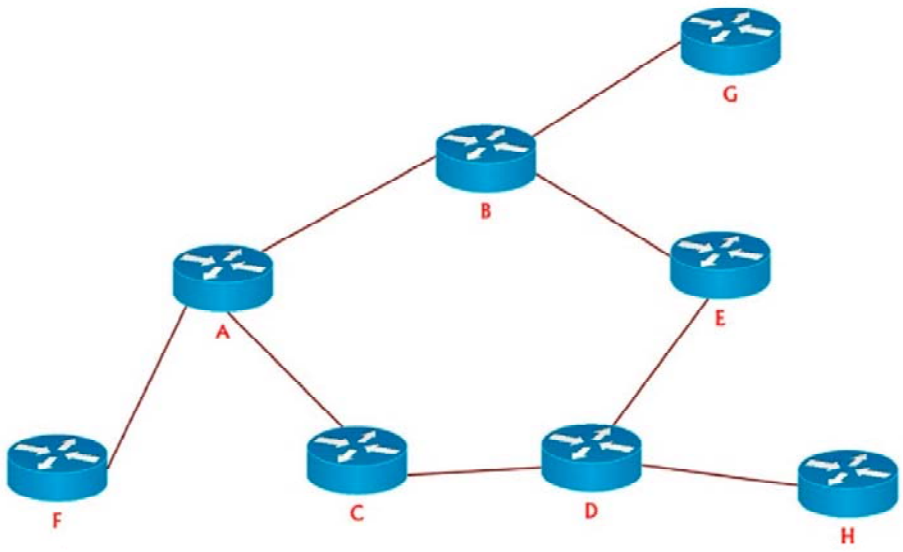
Source 192.168.1.1
Dest 192.168.3.1

Default Routing

Used to route traffic for unknown destinations (internet)



Also can be used at end locations.(optional)



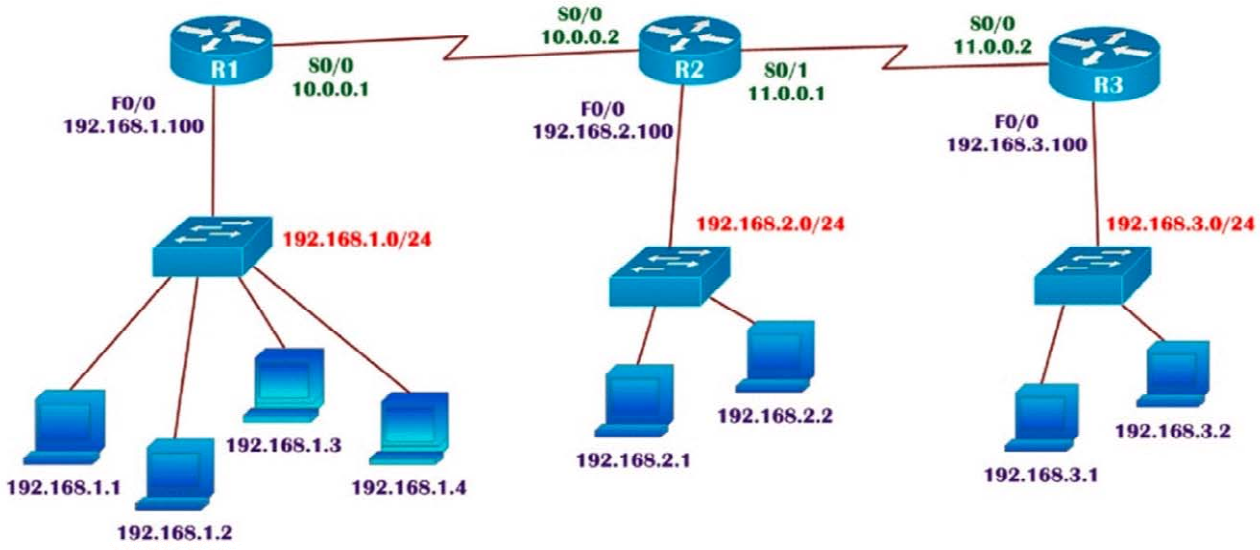
Default Routing (contd)

- It is the last preferred routing
- Default routes help in reducing the size of your routing table.
- R-1(config)#ip route 0.0.0.0 0.0.0.0 10.0.0.2

LAB: Verifying Default Route

Task:

- Design topology
- Basic IP addressing (up up)
- R1 and R3 configured with default routes (common next-hop for all destinations)
- R2 using static routing



R-1(config)#**ip route** 0.0.0.0 0.0.0.0 10.0.0.2

R-2(config)#**ip route** 192.168.1.0 255.255.255.0 10.0.0.1

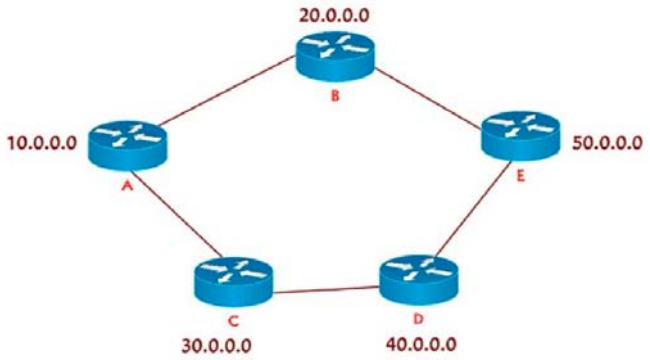
R-2(config)#**ip route** 192.168.3.0 255.255.255.0 11.0.0.2

R-3(config)# **ip route** 0.0.0.0 0.0.0.0 11.0.0.1

Dynamic Routing

RIP, EIGRP, OSPF

Dynamic Routing



Advantages of Dynamic over static :

- No need of manual configuration (unlike static routing)
- Learns about other networks via advertisements (of directly connected networks)
- Automatically select the best route. (builds routing table)
- Updates the topology changes dynamically.
- No need to know the destination networks. (others network)
- Administrative work is reduced
- Applicable for large organizations.

Types of Dynamic Routing Protocols

- **Distance Vector Protocol**
- **Link State Protocol**
- **Hybrid Protocol**

Types of Dynamic Routing Protocols

Distance Vector	Link State	Hybrid (Advance Distance vector)
Works with Bellman Ford algorithm	Works with Dijkstra algorithm	Works with DUAL algorithm
Periodic updates	Incremental updates Link state updates	Incremental updates
Full Routing tables are exchanged	Missing routes are exchanged	Missing routes are exchanged
Classful routing protocol	Classless routing protocol	Classless routing protocol
Updates are through broadcast	Updates are through multicast	Updates are through multicast
Example: RIP v1, RIPv2, IGRP	Example : OSPF, IS-IS	Example : EIGRP
Less overhead	More overhead	Less overhead
Easy to configure	Difficult to configure	Easy to configure