**Lab 3: Verifying Network Connectivity**

**(Ping, Traceroute, Show Commands)**

**🎯 Objective**

* Verify basic connectivity between hosts and routers
* Use ping, traceroute, and key show commands for troubleshooting
* Understand how switches learn MAC addresses

**🧱 Topology Overview**

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[PC1] --- [Switch1] --- [Router] --- [Switch2] --- [PC2]

**🌐 IP Addressing Table**

| **Device** | **Interface** | **IP Address** | **Subnet Mask** | **Default Gateway** |
| --- | --- | --- | --- | --- |
| PC1 | NIC | 192.168.1.10 | 255.255.255.0 | 192.168.1.1 |
| Router | G0/0 | 192.168.1.1 | 255.255.255.0 | — |
| Router | G0/1 | 192.168.2.1 | 255.255.255.0 | — |
| PC2 | NIC | 192.168.2.10 | 255.255.255.0 | 192.168.2.1 |

**🛠 Step-by-Step Configuration & Testing**

**🔹 1. Configure Router Interfaces**

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Router> enable

Router# configure terminal

Router(config)# interface g0/0

Router(config-if)# ip address 192.168.1.1 255.255.255.0

Router(config-if)# no shutdown

Router(config)# interface g0/1

Router(config-if)# ip address 192.168.2.1 255.255.255.0

Router(config-if)# no shutdown

**🔹 2. Configure PCs**

On **PC1 and PC2**, go to:  
**Desktop > IP Configuration** and set:

**PC1:**

* IP: 192.168.1.10
* Subnet: 255.255.255.0
* Gateway: 192.168.1.1

**PC2:**

* IP: 192.168.2.10
* Subnet: 255.255.255.0
* Gateway: 192.168.2.1

**🔹 3. Verify Interface Status**

bash

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Router# show ip interface brief

Confirm both interfaces are:

* Assigned IPs
* Status: up / up

**🔹 4. Test Ping**

**From PC1 (Command Prompt):**

bash

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ping 192.168.1.1 ← (Router G0/0)

ping 192.168.2.1 ← (Router G0/1)

ping 192.168.2.10 ← (PC2)

**From Router:**

bash

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ping 192.168.1.10 ← (PC1)

ping 192.168.2.10 ← (PC2)

**From PC2:**

bash

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ping 192.168.1.10 ← (PC1)

**🔹 5. Use Traceroute**

**From PC1:**

bash

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tracert 192.168.2.10

**From Router:**

bash

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traceroute 192.168.2.10

Should show 1 hop (the router) unless more devices are added.

**🔹 6. Use Show Commands**

**On Router:**

bash

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show ip interface brief ← Interface summary

show ip route ← View routing table

show arp ← ARP table (MAC/IP mapping)

show running-config ← Current config

**On Switches:**

bash

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show mac address-table ← Shows learned MACs and ports

show vlan brief ← Show VLAN info

show interfaces status ← Show port link status

**🎯 Learning Goals**

✅ Understand how to verify connectivity  
✅ Learn how switches dynamically build MAC tables  
✅ Practice key troubleshooting commands  
✅ Reinforce IP addressing and gateway concepts

**🔍 Optional – Use Simulation Mode**

* Switch Packet Tracer to **Simulation Mode**
* Ping between PCs
* Watch **ARP, ICMP Echo, and Echo Reply** packets move between devices
* Use "Capture/Forward" to step through each hop

**✅ Checklist Before Finishing**

| **Task** | **Done?** |
| --- | --- |
| IPs and gateways configured | ✅ |
| Router interfaces are up | ✅ |
| Successful pings | ✅ |
| Traceroute shows correct hops | ✅ |
| Show commands display expected info | ✅ |
| Switches learned MACs | ✅ |

**Output**

Router#ping 192.168.2.4

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.2.4, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 0/5/11 ms

Router#ping 192.168.1.4

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.1.4, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 6/6/6 ms

Router#sh ip int br

Interface IP-Address OK? Method Status Protocol

GigabitEthernet0/0/0 192.168.1.4 YES manual up up

GigabitEthernet0/0/1 192.168.2.4 YES manual up up

GigabitEthernet0/0/2 unassigned YES unset administratively down down

Vlan1 unassigned YES unset administratively down down

Router#sh ip ro

Codes: L - local, 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, E - EGP

i - IS-IS, 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

192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.1.0/24 is directly connected, GigabitEthernet0/0/0

L 192.168.1.4/32 is directly connected, GigabitEthernet0/0/0

192.168.2.0/24 is variably subnetted, 2 subnets, 2 masks

C 192.168.2.0/24 is directly connected, GigabitEthernet0/0/1

L 192.168.2.4/32 is directly connected, GigabitEthernet0/0/1

Router#sh arp

Protocol Address Age (min) Hardware Addr Type Interface

Internet 192.168.1.4 - 00E0.8FA8.8D01 ARPA GigabitEthernet0/0/0

Internet 192.168.1.10 13 0000.0C27.4DC3 ARPA GigabitEthernet0/0/0

Internet 192.168.2.4 - 00E0.8FA8.8D02 ARPA GigabitEthernet0/0/1

Internet 192.168.2.10 13 0001.C942.9B5B ARPA GigabitEthernet0/0/1

Router#sh run

Building configuration...

Current configuration : 672 bytes

!

version 16.6.4

no service timestamps log datetime msec

no service timestamps debug datetime msec

no service password-encryption

!

hostname Router

!

!

!

ip cef

no ipv6 cef

!

!

!

spanning-tree mode pvst

!

interface GigabitEthernet0/0/0

ip address 192.168.1.4 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/0/1

ip address 192.168.2.4 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/0/2

no ip address

duplex auto

speed auto

shutdown

!

interface Vlan1

no ip address

shutdown

!

ip classless

!

ip flow-export version 9

!

!

line con 0

!

line aux 0

!

line vty 0 4

login

!

!

!

End

Switch#sh mac address-table

Mac Address Table

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Vlan Mac Address Type Ports

---- ----------- -------- -----

1 0000.0c27.4dc3 DYNAMIC Fa0/1

1 00e0.8fa8.8d01 DYNAMIC Fa0/2