

WELCOME NETWORKING

Cisco Certified Networking Associate(CCNA)

200-301

(9th Class)



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OSPF

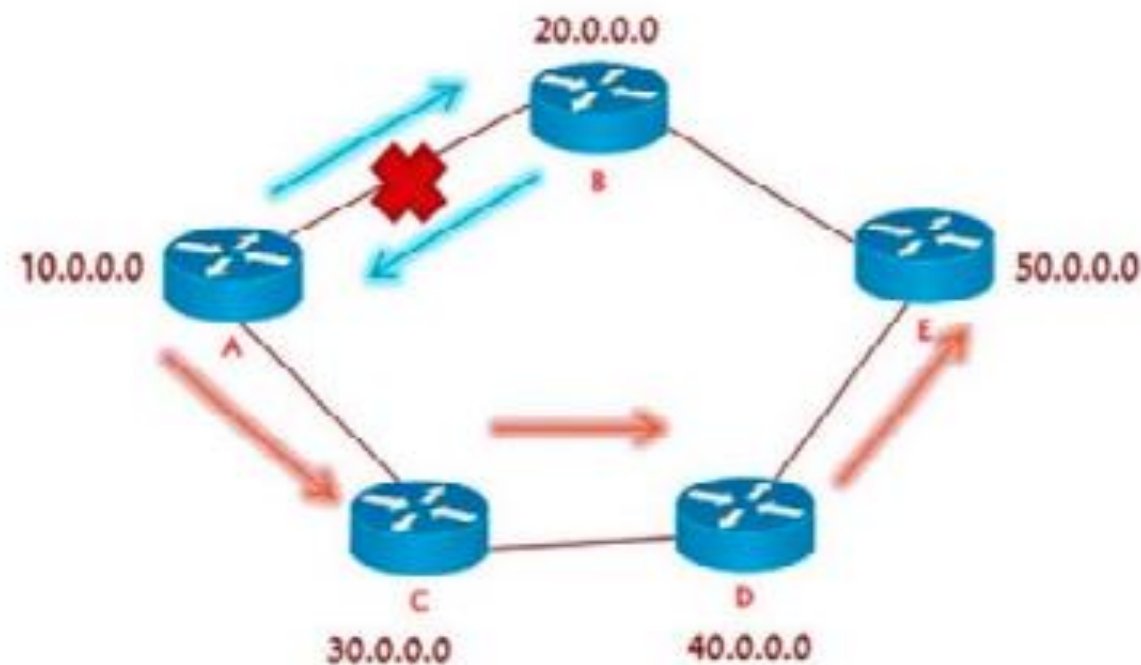
- ▶ OSPF stand for Open Shortest path first
- ▶ It's a link state protocol
- ▶ Standard protocol
- ▶ It uses SPF (shortest path first) or dijkistra algorithm
- ▶ Unlimited hop count
- ▶ Metric is cost ($\text{cost} = 10^8 / \text{B.W.}$)
- ▶ Administrative distance is 110
- ▶ It is a classless routing protocol (carry subnet-mask information & supports VLSM)
- ▶ Supports equal cost load balancing.

Basic OSPF process

Seven stages

1. Down
2. Init
3. 2 way
4. Exstart
5. Exchange
6. Loading
7. Full

OSPF Convergence



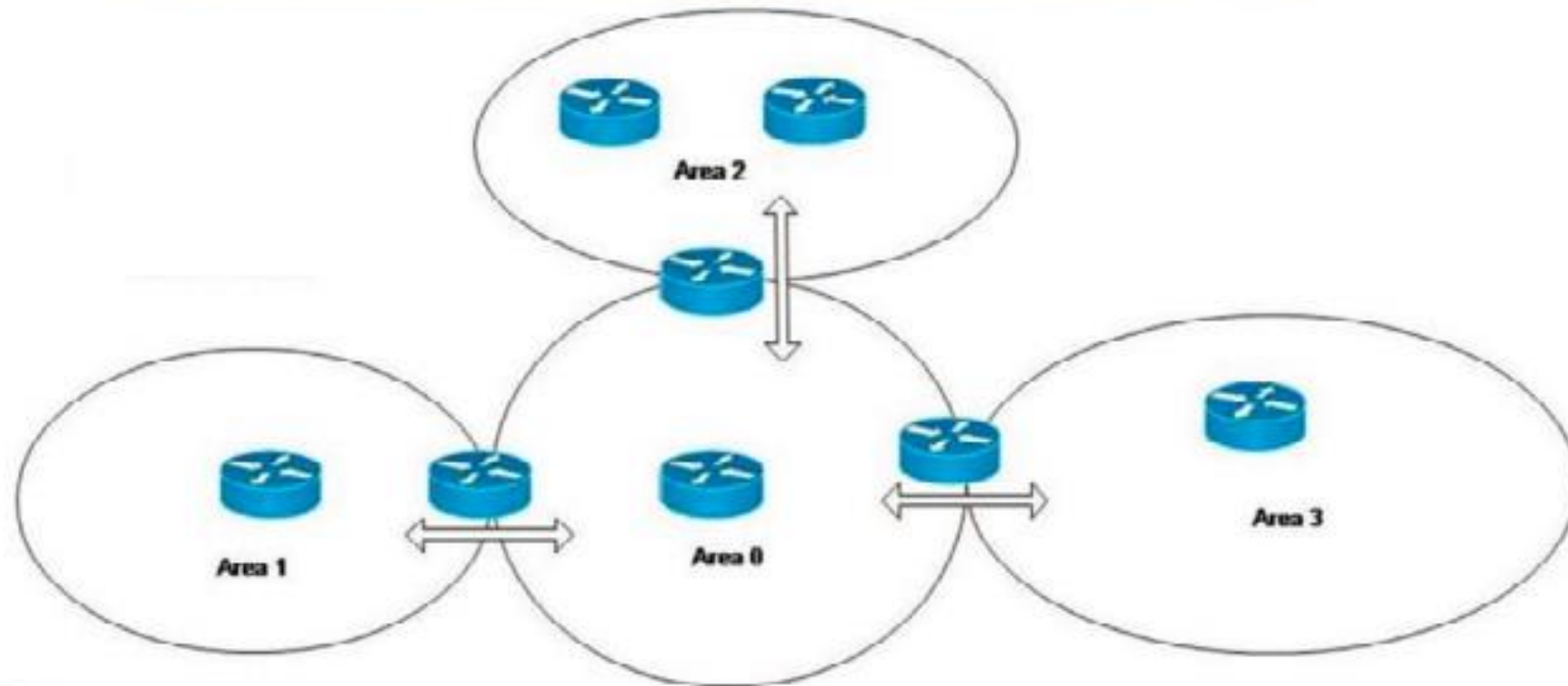
- ▶ Incremental updates
- ▶ Periodically send hello packets are sent every 10 seconds (dead – 40 sec)
- ▶ Convergence rate is fast (40 sec)

Concept of areas

- ▶ Area is logical grouping of Routers .
 - ▶ All the routers maintain same database with in the same Area.
 - ▶ Any change impact all the routers with the same area.
-
- ▶ Minimizes size of database
 - ▶ Restrict any changes with in that area. (not flood outside area)
 - ▶ Routers with in the same area participate in Algorithm

OSPF area design Rules

- ▶ Must have one area called as area 0 (its backbone area)
- ▶ All the non-backbone areas must connect to area 0. (Area 0 must be transit area)
- ▶ At least one Area Border Router (connecting two or more areas) .
- ▶ Interfaces of both routers facing must be in the same Area.



Advantages of OSPF

- Open standard
- No hop count limitations
- Faster convergence

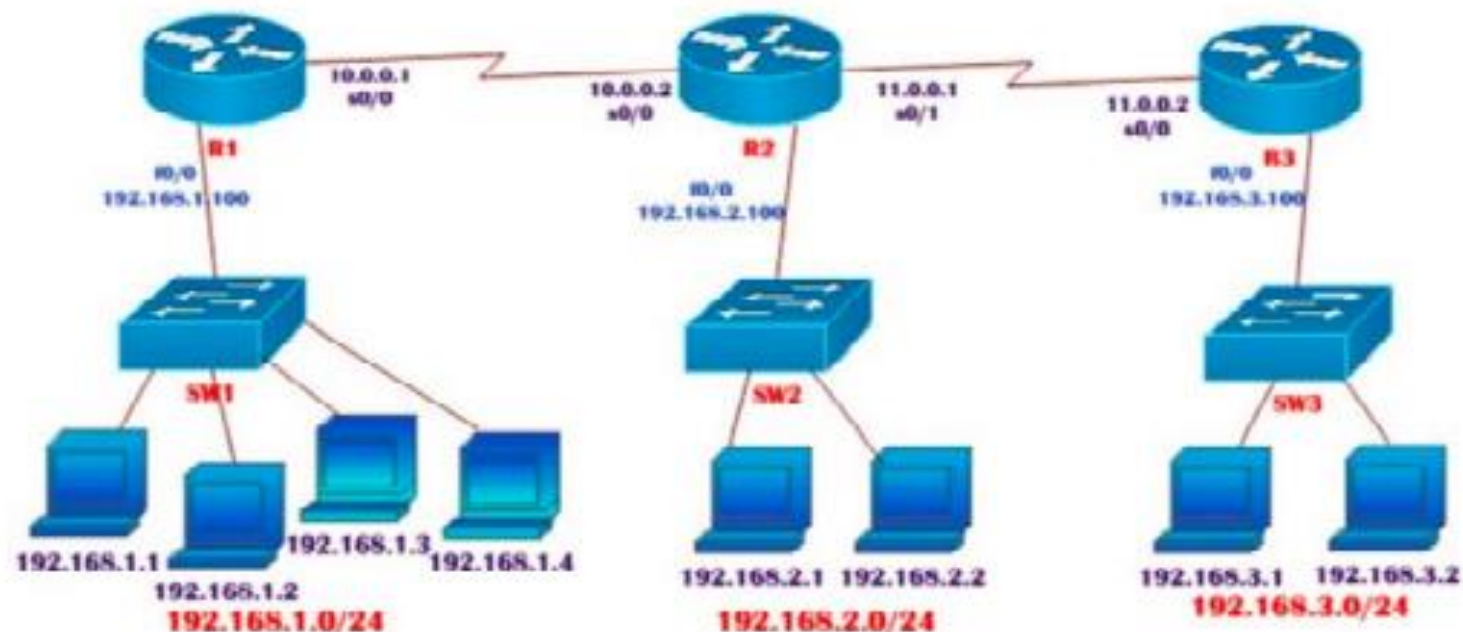
Disadvantages of OSPF

- Consume more CPU resources.
- Complex design rules

Configuring OSPF

(config)# **router ospf** <process ID>

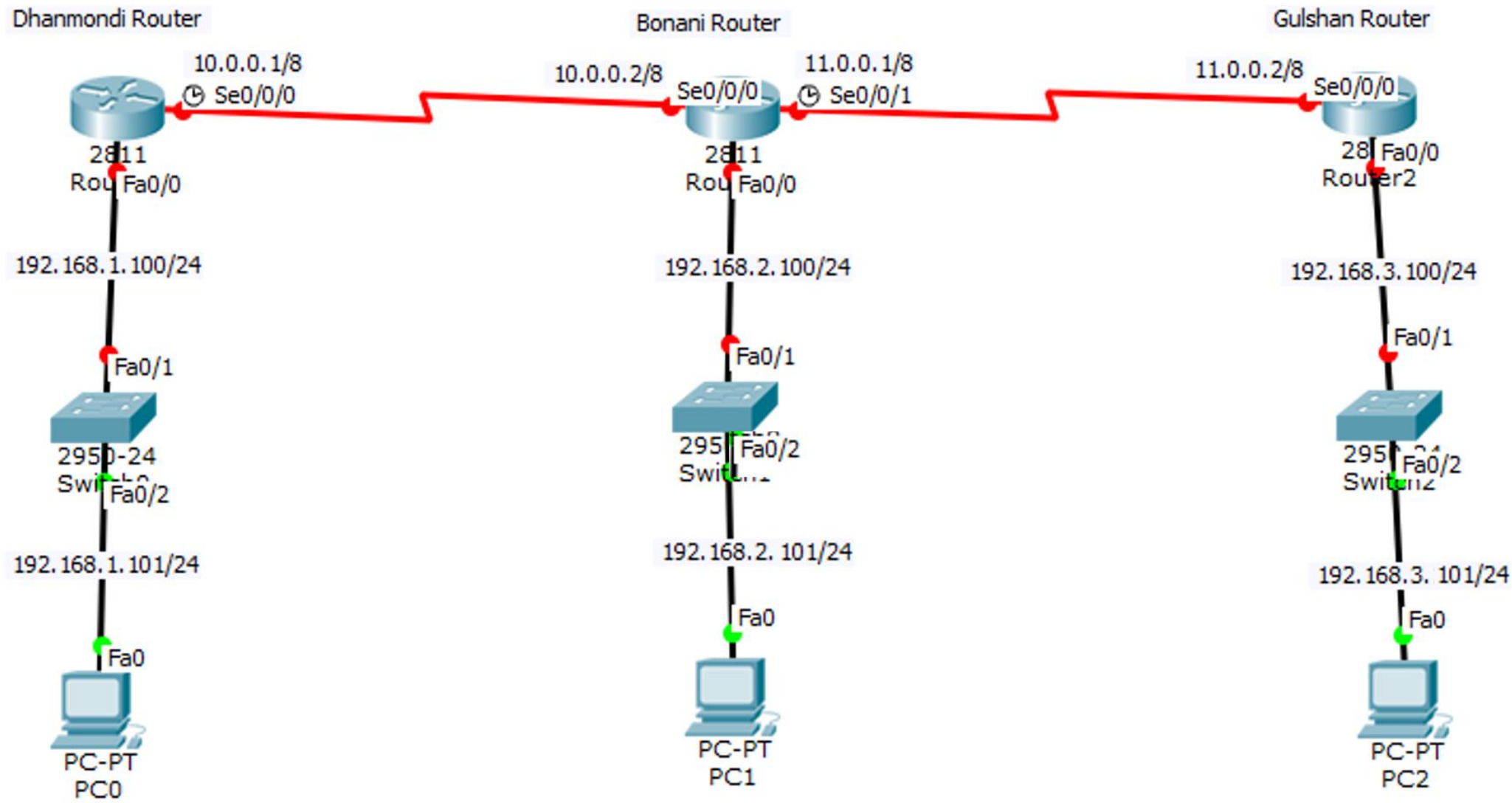
(config-router)# **network** <Network ID> <wildcard mask> **area** <area id>



- Process ID is a number used to identify an OSPF routing process on the router.
- Multiple OSPF processes can be started on the same router.
- The number can be any value between 1 and 65,535.

LAB: OSPF Single Area

Area 0



Step-1: সবার প্রথমে সকল রাউটারের Interface UP করে নিতে হবে।

1. Dhanmondi router

Continue with configuration dialog? [yes/no]: no

Router>enable

Router#configure terminal

Router(config)#interface serial 0/0/0

Router(config-if)#ip address 10.0.0.1 255.0.0.0

Router(config-if)#no shutdown

Router(config-if)#exit

Router(config)#interface fastEthernet 0/0

Router(config-if)#ip address 192.168.1.100 255.255.255.0

Router(config-if)#no shutdown

Router(config-if)#exit

2.Bonani Router

Continue with configuration dialog? [yes/no]: no

Router>enable

Router#configure terminal

Router(config)#interface serial 0/0/0

Router(config-if)#ip address 10.0.0.2 255.0.0.0

Router(config-if)#no shutdown

Router(config-if)#exit

Router(config)#interface fastEthernet 0/0

Router(config-if)#ip address 192.168.2.100 255.255.255.0

Router(config-if)#no shutdown

Router(config-if)#exit

Router(config)#interface serial 0/0/1

Router(config-if)#ip address 11.0.0.1 255.0.0.0

Router(config-if)#no shutdown

3.Gulshan Router

Continue with configuration dialog? [yes/no]: no

```
Router>enable
```

```
Router#configure terminal
```

```
Router(config)#interface serial 0/0/0
```

```
Router(config-if)#ip address 11.0.0.2 255.0.0.0
```

```
Router(config-if)#no shutdown
```

```
Router(config-if)#exit
```

```
Router(config-if)#interface fastEthernet 0/0
```

```
Router(config-if)#ip address 192.168.3.100 255.255.255.0
```

```
Router(config-if)#no shutdown
```

```
Router(config-if)#exit
```

Step-2: পরবর্তীতে প্রতিটি রাউটারে প্রবেশ করে Routing Lookup or OSPF Routing করতে হবে।

1. Dhanmondi router:

```
Router(config)#router ospf 1
```

```
Router(config-router)# network 192.168.1.0 0.0.0.255 area 0
```

```
Router(config-router)# network 10.0.0.0 0.255.255.255 area 0
```

2. Bonani router:

```
Router(config)#router ospf 1
```

```
Router(config-router)# network 10.0.0.0 0.255.255.255 area 0
```

```
Router(config-router)# network 192.168.2.0 0.0.0.255 area 0
```

```
Router(config-router)# network 11.0.0.0 0.255.255.255 area 0
```

3. Gulshan router:

Router(config)#router ospf 1

Router(config-router)# network 11.0.0.0 0.255.255.255 area 0

Router(config-router)# network 192.168.3.0 0.0.0.255 area 0

Step-3: পরবর্তীতে প্রতিটি রাউটারে প্রবেশ করে ip route করে দেখতে হবে যে, প্রতিটি রাউটারে Routing হয়েছে কিনা।

1. Dhanmondi router:

```
Router#show ip route
```

Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area

C 10.0.0.0/8 is directly connected, Serial0/0/0

O 11.0.0.0/8 [110/128] via 10.0.0.2, 00:03:57, Serial0/0/0

C 192.168.1.0/24 is directly connected, FastEthernet0/0

O 192.168.2.0/24 [110/65] via 10.0.0.2, 00:04:19, Serial0/0/0

O 192.168.3.0/24 [110/129] via 10.0.0.2, 00:02:37, Serial0/0/0

এখানে দেখা যাচ্ছে যে, O দিয়ে যা দেখা যাচ্ছে তা হলো OSPF Routing. আর C দিয়ে Interface ip গুলো দেখানো হয়েছে।

2. Bonani router:

Router#show ip route

C 10.0.0.0/8 is directly connected, Serial0/0/0

C 11.0.0.0/8 is directly connected, Serial0/0/1

O 192.168.1.0/24 [110/65] via 10.0.0.1, 00:03:41, Serial0/0/0

C 192.168.2.0/24 is directly connected, FastEthernet0/0

O 192.168.3.0/24 [110/65] via 11.0.0.2, 00:01:49, Serial0/0/1

3. Gulshan router:

Router#show ip route

O 10.0.0.0/8 [110/128] via 11.0.0.1, 00:00:19, Serial0/0/0

C 11.0.0.0/8 is directly connected, Serial0/0/0

O 192.168.1.0/24 [110/129] via 11.0.0.1, 00:00:19, Serial0/0/0

O 192.168.2.0/24 [110/65] via 11.0.0.1, 00:00:19, Serial0/0/0

C 192.168.3.0/24 is directly connected, FastEthernet0/0

Step-4: পরবর্তীতে প্রতিটি কম্পিউটারে প্রবেশ করে IP দিতে হবে।

1. Go to PCO => Click Desktop => Click IP Configuration

IP Address	192.168.1.101
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.100
DNS Servers	

পরবর্তীতে IP Address, Subnet Mask, Default Gateway (এটি হলো মূলত কম্পিউটার যে পোর্টের মাধ্যমে রাউটারের সাথে সংযুক্ত তার IP) দিয়ে উপরে Cross এ Click দিতে হবে।

2. Go to PC1 => Click Desktop => Click IP Configuration

IP Address	192.168.2.101
Subnet Mask	255.255.255.0
Default Gateway	192.168.2.100
DNS Server	

3. Go to PC2 => Click Desktop => Click IP Configuration

IP Address	192.168.3.101
Subnet Mask	255.255.255.0
Default Gateway	192.168.3.100

Step-5: পরবর্তীতে প্রতিটি কম্পিউটারে প্রবেশ করে ping দিয়ে Connectivity Check করতে হবে।

1. Go to PCO => Click Desktop => Click Command Prompt

```
PC>ping 192.168.2.101
```

Pinging 192.168.2.101 with 32 bytes of data:

Reply from 192.168.2.101: bytes=32 time=11ms TTL=128

Reply from 192.168.2.101 : bytes=32 time=0ms TTL=128

Reply from 192.168.2.101 : bytes=32 time=8ms TTL=128

Reply from 192.168.2.101 : bytes=32 time=8ms TTL=128

Ping statistics for 192.168.2.101 :

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 11ms, Average = 6ms.

যদি এইরকম আসে তাহলে আমি অন্য কম্পিউটারের সাথে সংযুক্ত আছি। আর সংযুক্ত না থাকলে Request Time Out আসবে।

1. Go to PCO => Click Desktop => Click Command Prompt

PC>ping 192.168.3.101

Pinging 192.168.3.101 with 32 bytes of data:

Reply from 192.168.3.101: bytes=32 time=11ms TTL=128

Reply from 192.168.3.101 : bytes=32 time=0ms TTL=128

Reply from 192.168.3.101 : bytes=32 time=8ms TTL=128

Reply from 192.168.3.101 : bytes=32 time=8ms TTL=128

Ping statistics for 192.168.3.101 :

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

2. Go to PC1 => Click Desktop => Click Command Prompt

```
PC>ping 192.168.1.101
```

Pinging 192.168.1.101 with 32 bytes of data:

Reply from 192.168.1.101: bytes=32 time=11ms TTL=128

Reply from 192.168.1.101 : bytes=32 time=0ms TTL=128

Reply from 192.168.1.101 : bytes=32 time=8ms TTL=128

Reply from 192.168.1.101 : bytes=32 time=8ms TTL=128

Ping statistics for 192.168.1.101 :

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 11ms, Average = 6ms.

```
PC>ping 192.168.3.101
```

Pinging 192.168.3.101 with 32 bytes of data:

Reply from 192.168.3.101: bytes=32 time=11ms TTL=128

Reply from 192.168.3.101 : bytes=32 time=0ms TTL=128

Reply from 192.168.3.101 : bytes=32 time=8ms TTL=128

Reply from 192.168.3.101 : bytes=32 time=8ms TTL=128

Ping statistics for 192.168.3.101 :

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 11ms, Average = 6ms.

3. Go to PC2 => Click Desktop => Click Command Prompt

```
PC>ping 192.168.1.101
```

Pinging 192.168.1.101 with 32 bytes of data:

Reply from 192.168.1.101: bytes=32 time=11ms TTL=128

Reply from 192.168.1.101 : bytes=32 time=0ms TTL=128

Reply from 192.168.1.101 : bytes=32 time=8ms TTL=128

Reply from 192.168.1.101 : bytes=32 time=8ms TTL=128

Ping statistics for 192.168.1.101 :

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 11ms, Average = 6ms.

PC>ping 192.168.2.101

Pinging 192.168.2.101 with 32 bytes of data:

Reply from 192.168.2.101: bytes=32 time=11ms TTL=128

Reply from 192.168.2.101 : bytes=32 time=0ms TTL=128

Reply from 192.168.2.101 : bytes=32 time=8ms TTL=128

Reply from 192.168.2.101 : bytes=32 time=8ms TTL=128

Ping statistics for 192.168.2.101 :

Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),

Approximate round trip times in milli-seconds:

Minimum = 0ms, Maximum = 11ms, Average = 6ms.



Thank
you