# Practical No. 01

**AIM:** Create network with three routers with RIPv2 and each router associated network will have minimum three PC. Show connectivity.

**Steps to perform practical:**

Step 1 : Add 3 routers, 3 switches, end user clients to the switches.
Step 2 : Connect all the devices with straight through cable.
Step 3 : Add serial port devices in the routers in the router.
Step 4 : Give ip to each port of router

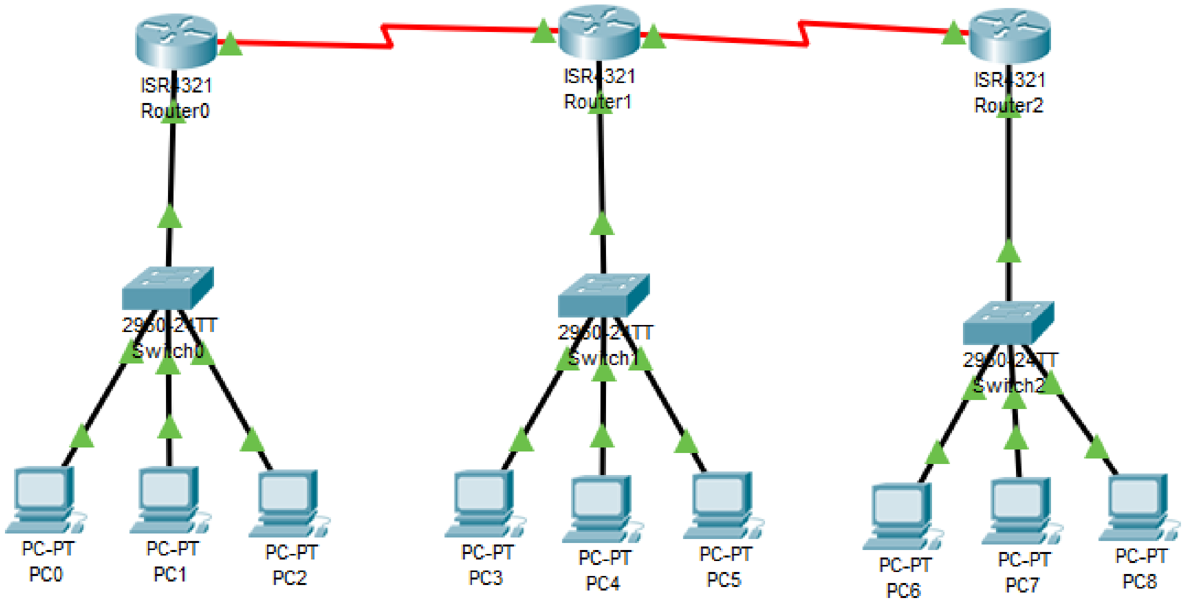
```
enable
configure terminal
interface gig0/0/0
ip address 192.168.10.1 255.255.255.0
no shutdown
exit
```

Step 5 : Set IP address, Subnet & Gateway for End User Client (manually in input boxes). Note that the gateway will be same as the routers IP.
Step 6 : Apply RIP to each of the router

```
configure terminal
router rip
network 192.168.10.0
network 192.168.40.0
exit
```

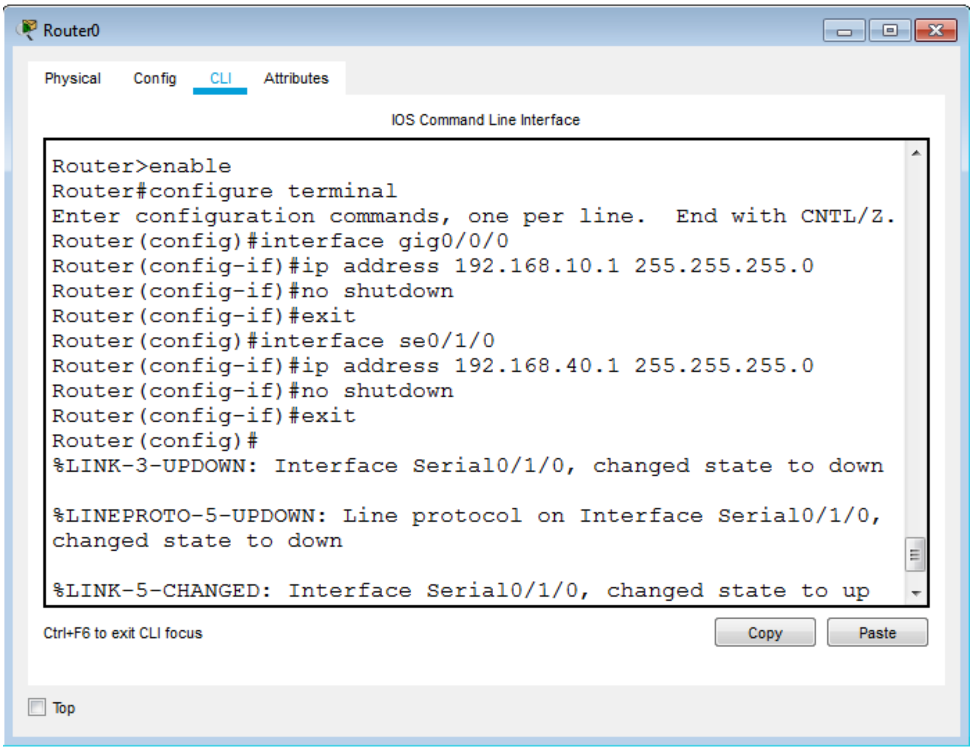
Step 7 : Go for (show ip route) command on each router.
Step 8 : Show connection between PC6 and PC0.
System > Desktop tab > Command Prompt > ping 192.168.10.2

**NETWORK TOPOLOGY:**



## i)Router Configuration:-

**Set IP addresses to routers :-**

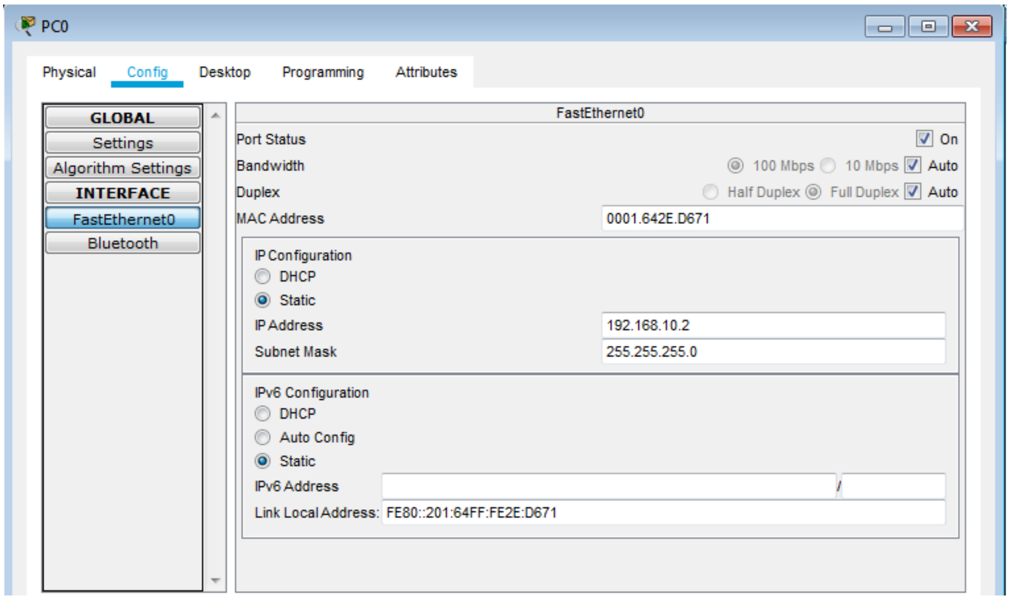


```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface gig0/0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface se0/1/0
Router(config-if)#ip address 192.168.40.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
%LINK-3-UPDOWN: Interface Serial0/1/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0,
changed state to down

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
```

Set IP addresses to all remaining routers as shown above.

## ii)End User Client Configuration :

**a)Set IP address to end user client :**



FastEthernet0

Port Status ☑ On

Bandwidth ● 100 Mbps ○ 10 Mbps ☑ Auto

Duplex ○ Half Duplex ● Full Duplex ☑ Auto

MAC Address 0001.642E.D671

IP Configuration

○ DHCP

● Static

IP Address 192.168.10.2

Subnet Mask 255.255.255.0

IPv6 Configuration

○ DHCP

○ Auto Config

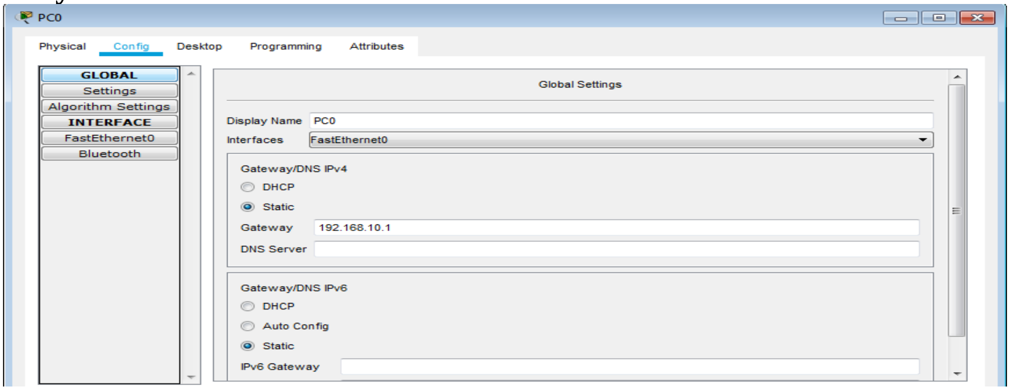
● Static

IPv6 Address /

Link Local Address: FE80::201:64FF:FE2E:D671

Set IP addresses to all remaining clients as shown above.

**b)Set Gateway to end user client:**



Global Settings

Display Name PC0

Interfaces FastEthernet0

Gateway/DNS IPv4

○ DHCP

● Static

Gateway 192.168.10.1

DNS Server

Gateway/DNS IPv6

○ DHCP

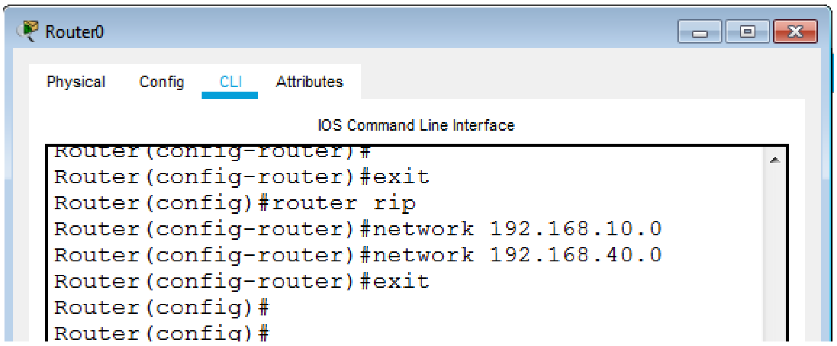
○ Auto Config

● Static

IPv6 Gateway

Set Gateways to all remaining end user client.

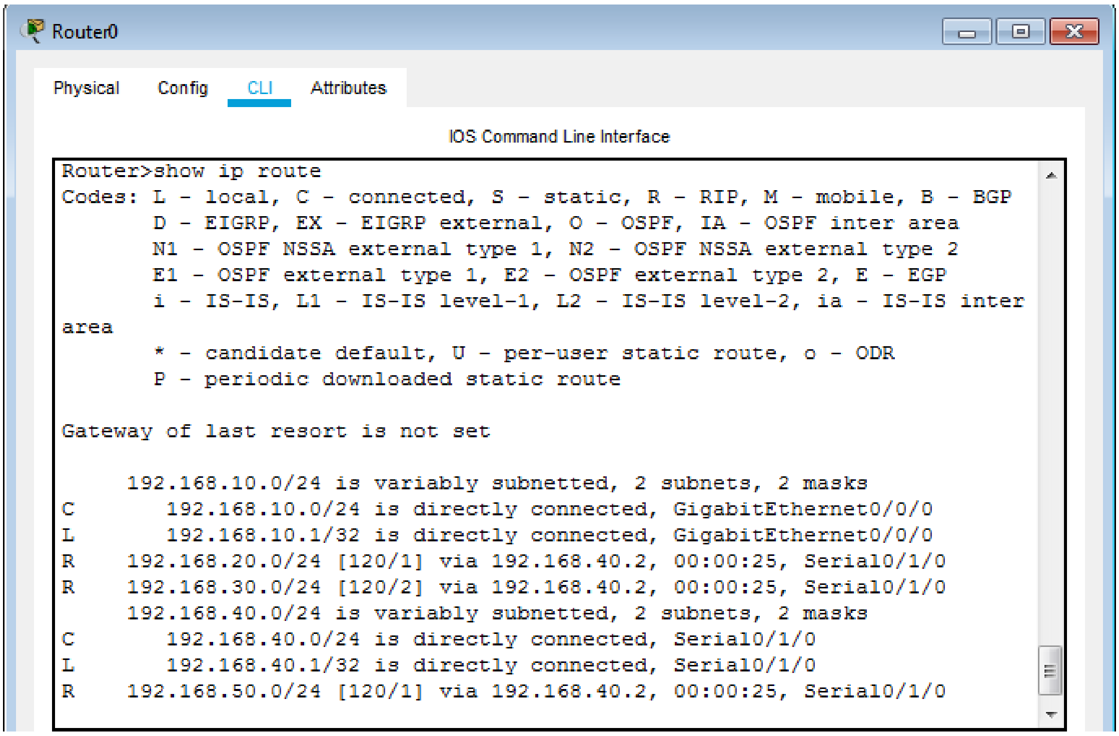
**Set RIP protocol to routers :**



```
Router(config-router)#
Router(config-router)#exit
Router(config)#router rip
Router(config-router)#network 192.168.10.0
Router(config-router)#network 192.168.40.0
Router(config-router)#exit
Router(config)#
Router(config)#
```

Set RIP protocol to all remaining routers as shown above.

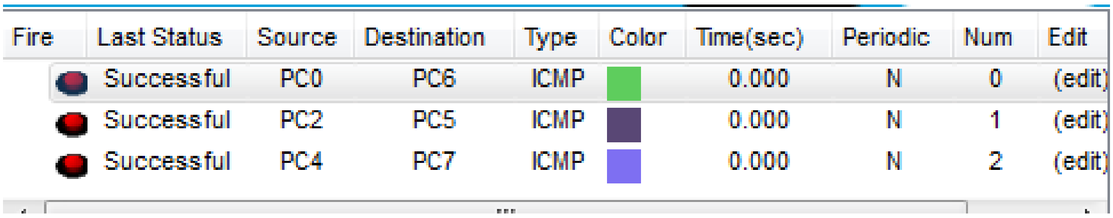
**Go for “show ip route” command for each router:**



```
Router>show ip route
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

     192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.10.1/32 is directly connected, GigabitEthernet0/0/0
R    192.168.20.0/24 [120/1] via 192.168.40.2, 00:00:25, Serial0/1/0
R    192.168.30.0/24 [120/2] via 192.168.40.2, 00:00:25, Serial0/1/0
     192.168.40.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.40.0/24 is directly connected, Serial0/1/0
L       192.168.40.1/32 is directly connected, Serial0/1/0
R    192.168.50.0/24 [120/1] via 192.168.40.2, 00:00:25, Serial0/1/0
```

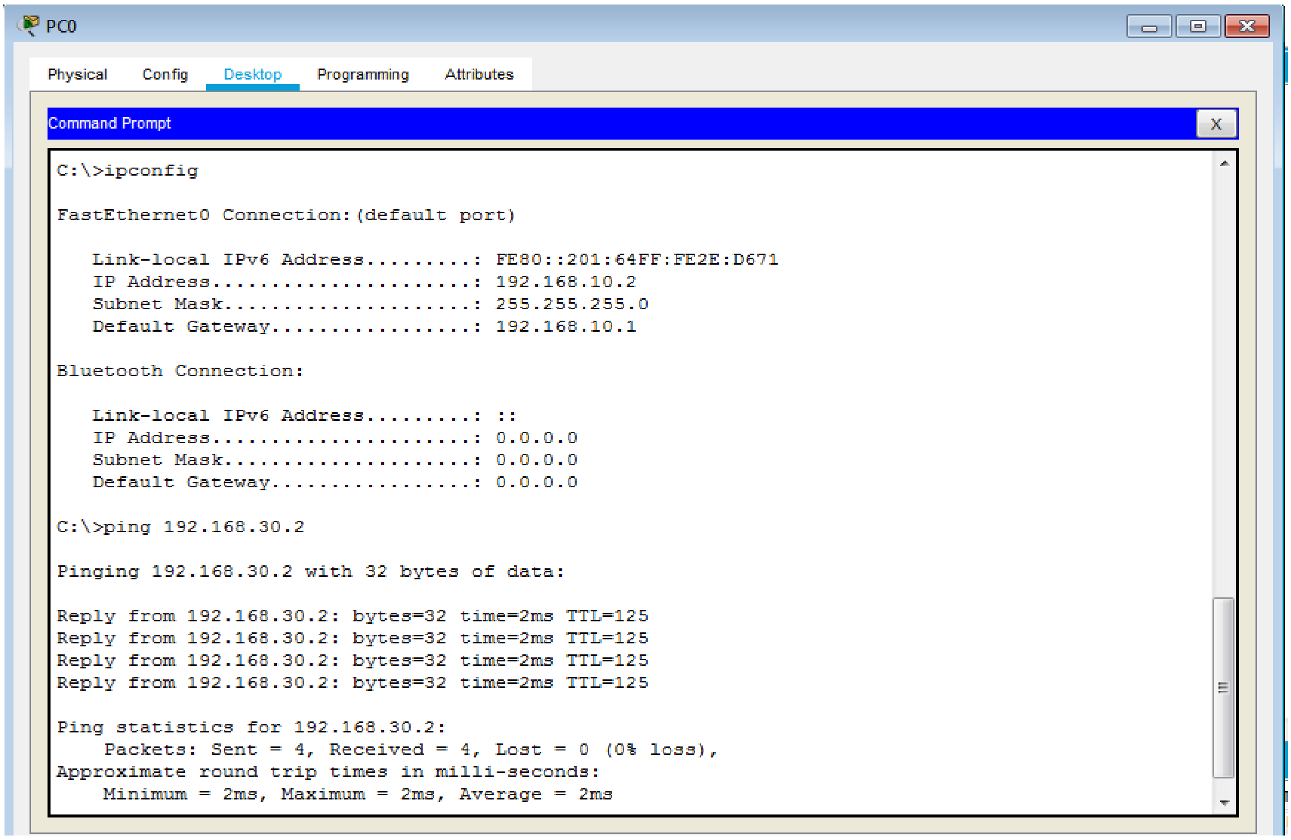
Show “show ip route” command for all remaining routers.

**Show Packet Tracing :**



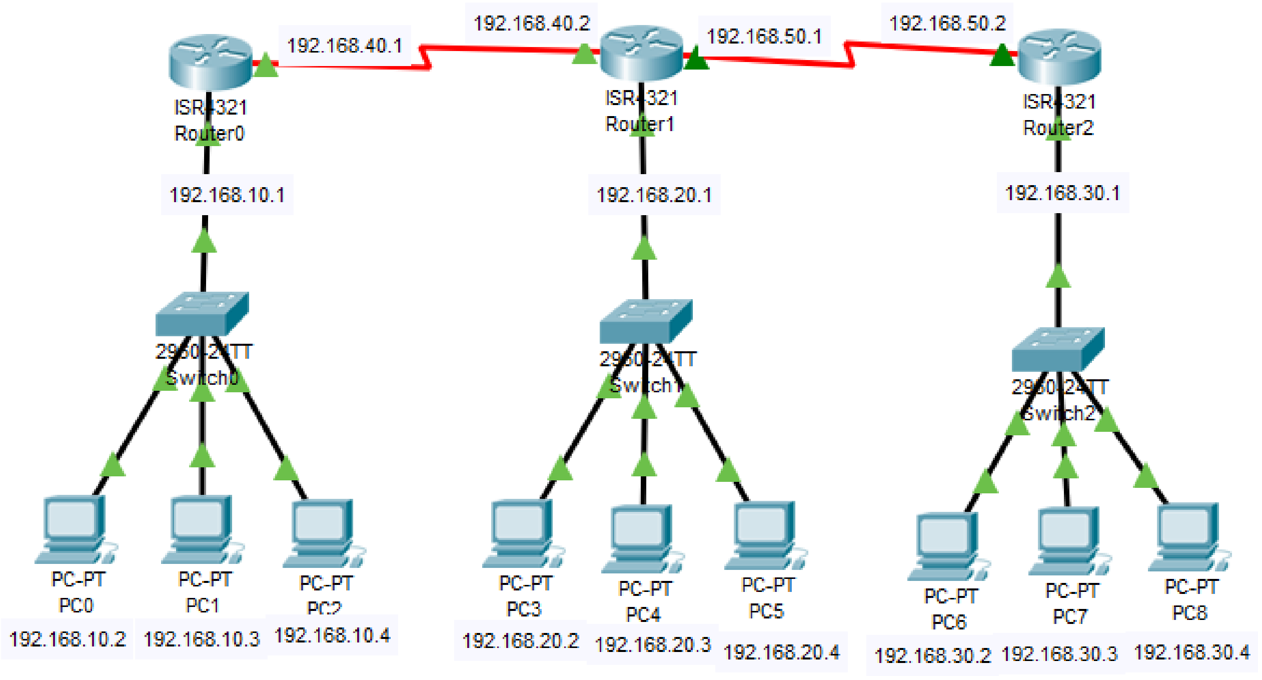
| Fire | Last Status | Source | Destination | Type | Color | Time(sec) | Periodic | Num | Edit |
|---|---|---|---|---|---|---|---|---|---|
| ● | Successful | PC0 | PC6 | ICMP | 🟩 | 0.000 | N | 0 | (edit) |
| ● | Successful | PC2 | PC5 | ICMP | 🟪 | 0.000 | N | 1 | (edit) |
| ● | Successful | PC4 | PC7 | ICMP | 🟪 | 0.000 | N | 2 | (edit) |

**Show Connection between PC0 to PC6:**



```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Link-local IPv6 Address.........: FE80::201:64FF:FE2E:D671
   IP Address......................: 192.168.10.2
   Subnet Mask.....................: 255.255.255.0
   Default Gateway.................: 192.168.10.1

Bluetooth Connection:

   Link-local IPv6 Address.........: ::
   IP Address......................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: 0.0.0.0

C:\>ping 192.168.30.2

Pinging 192.168.30.2 with 32 bytes of data:

Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.30.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 2ms, Average = 2ms
```

**FINAL TOPOLOGY:**



**Conclusion:** We have learnt to create RIPv2 with three routers as shown above.

## Practical No. 02

**AIM:** Create network with three routers with OSPF and each router associated network will have minimum three PC. Show connectivity.

**Steps to perform practical:**

Step 1 : Add 3 routers, 3 switches, end user clients to the switches.
Step 2 : Connect all the devices with straight through cable.
Step 3 : Add serial port devices in the routers in the router.
Step 4 : Give IP to each port of router

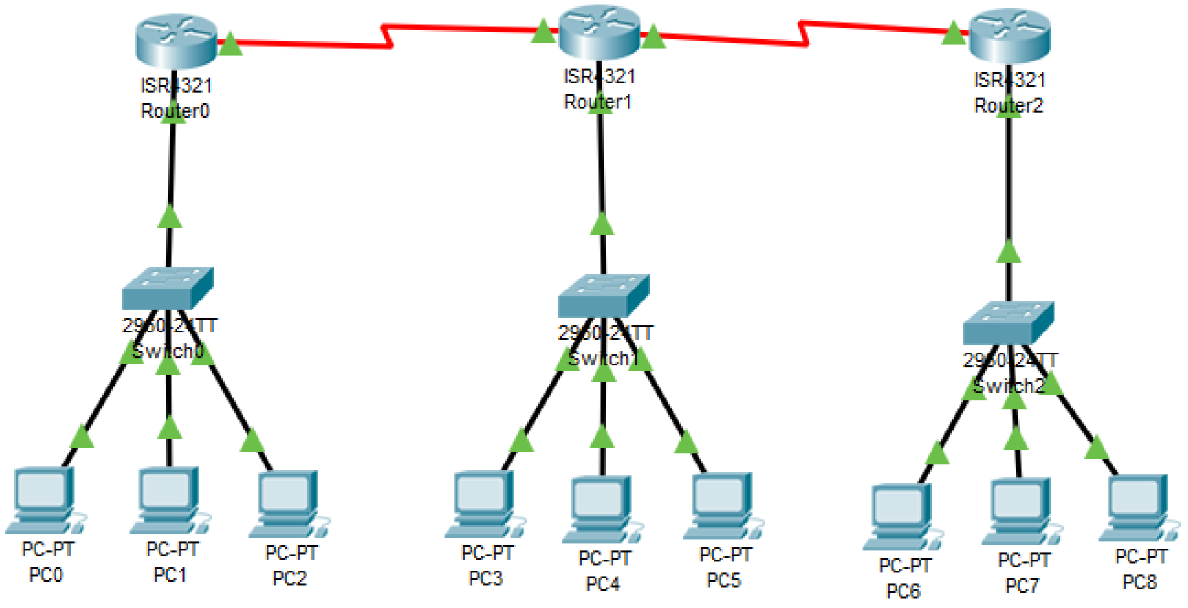
```
enable
configure terminal
interface gig0/0/0
ip address 192.168.10.1 255.255.255.0
no shutdown
exit
```

Step 5 : Set IP address, Subnet & Gateway for End User Client (manually in input boxes). Note that the gateway will be same as the routers IP.
Step 6 : Apply OSPF to each of the router

```
configure terminal
router ospf 100
network 192.168.10.0 0.255.255.255 area 0
network 192.168.40.0 0.255.255.255 area 0
exit
```

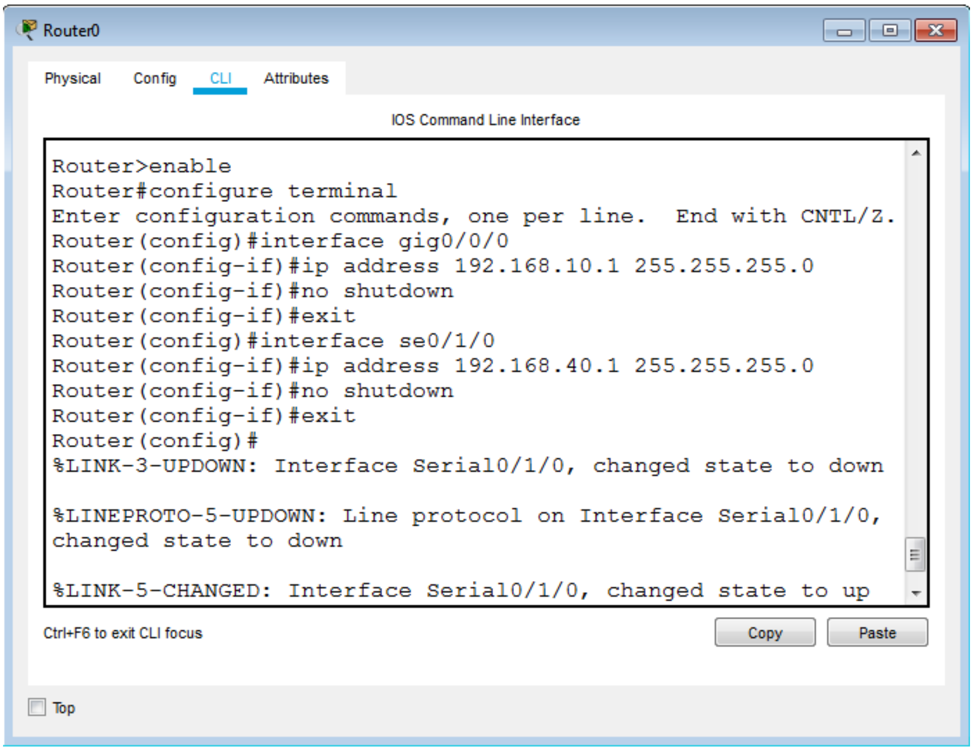
Step 7 : Go for (show ip route) command on each router.
Step 8 : Show connection between PC6 and PC0.
System > Desktop tab > Command Prompt > ping 192.168.10.2

**NETWORK TOPOLOGY:**



**i)Router Configuration:-**

**Set IP addresses to routers :-**

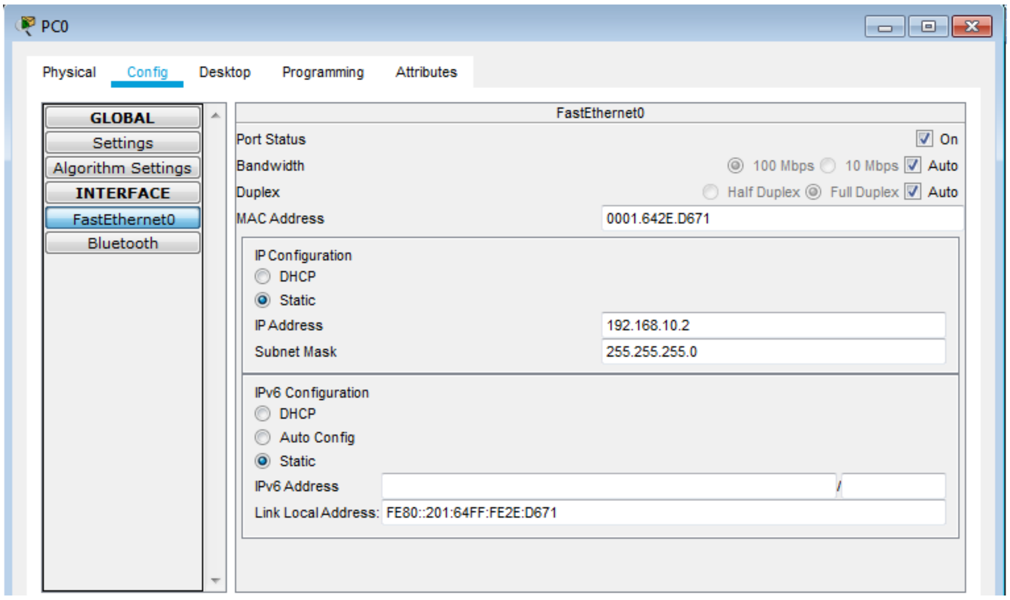


```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface gig0/0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface se0/1/0
Router(config-if)#ip address 192.168.40.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
%LINK-3-UPDOWN: Interface Serial0/1/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0,
changed state to down

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
```

Set IP addresses to all remaining routers as shown above.

**ii)End User Client Configuration :**

**a)Set IP address to end user client :**



FastEthernet0

Port Status ☑ On

Bandwidth ○ 100 Mbps ○ 10 Mbps ☑ Auto

Duplex ○ Half Duplex ● Full Duplex ☑ Auto

MAC Address 0001.642E.D671

IP Configuration

○ DHCP

● Static

IP Address 192.168.10.2

Subnet Mask 255.255.255.0

IPv6 Configuration

○ DHCP

○ Auto Config

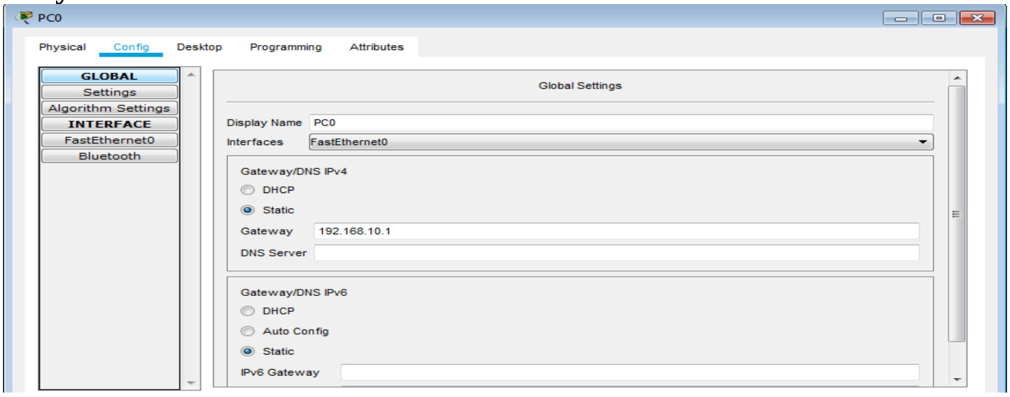
● Static

IPv6 Address /

Link Local Address: FE80::201:64FF:FE2E:D671

Set IP addresses to all remaining clients as shown above.

**b)Set Gateway to end user client:**



Global Settings

Display Name PC0

Interfaces FastEthernet0

Gateway/DNS IPv4

○ DHCP

● Static

Gateway 192.168.10.1

DNS Server

Gateway/DNS IPv6

○ DHCP

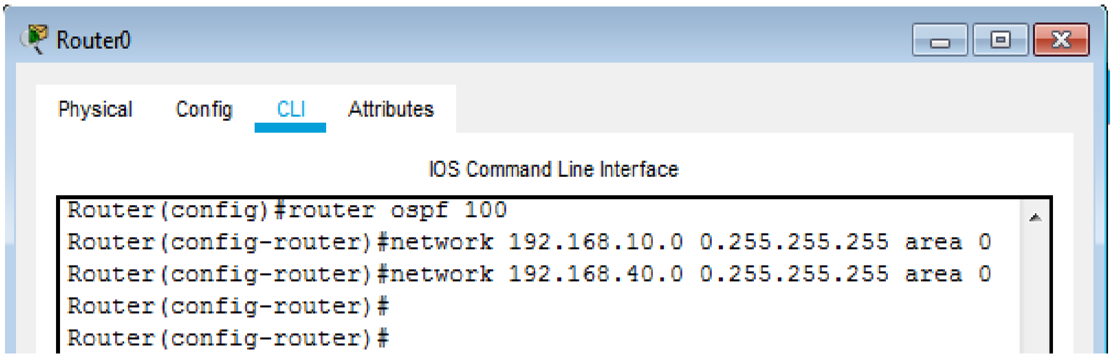
○ Auto Config

● Static

IPv6 Gateway

Set Gateways to all remaining end user client.

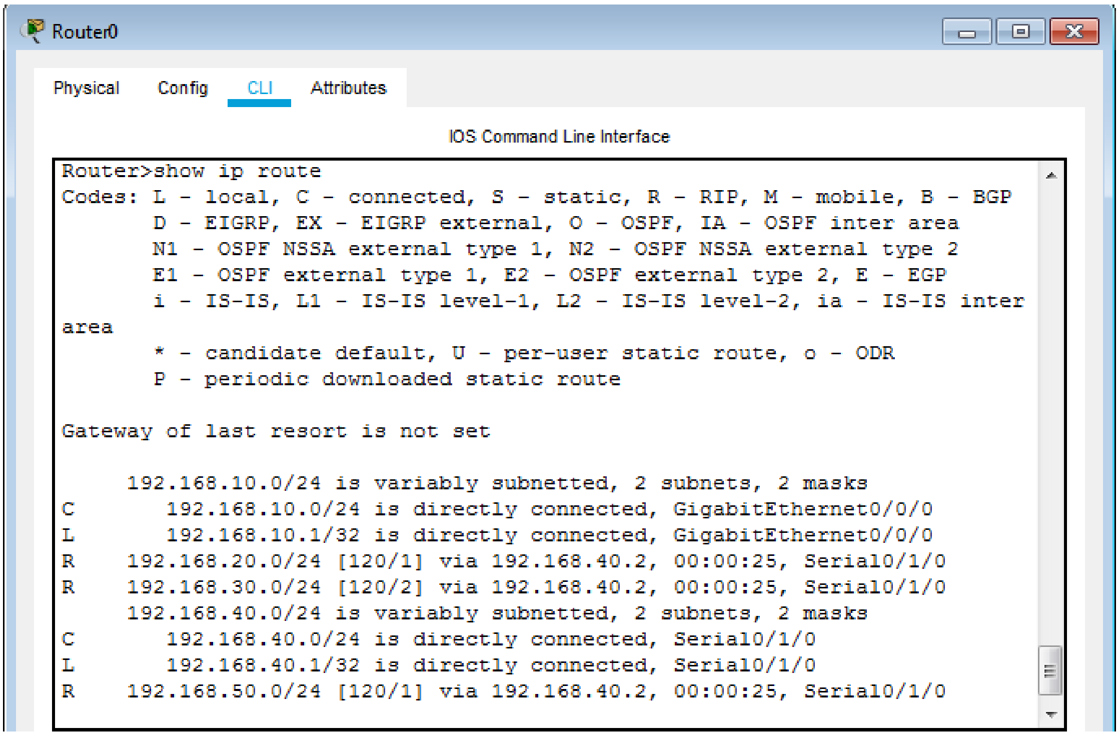
**Set OSPF protocol to routers :**



```
Router(config)#router ospf 100
Router(config-router)#network 192.168.10.0 0.255.255.255 area 0
Router(config-router)#network 192.168.40.0 0.255.255.255 area 0
Router(config-router)#
Router(config-router)#
```

Set OSPF protocol to all remaining routers as shown above.

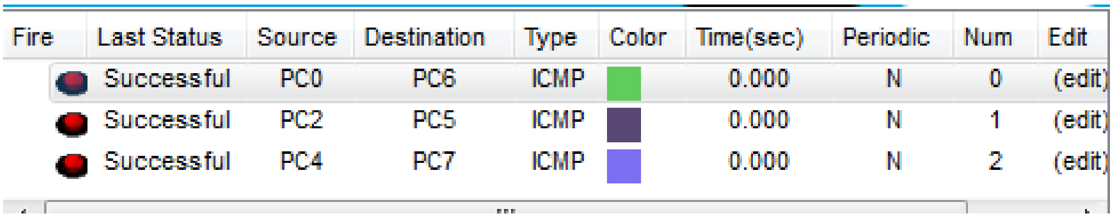
**Go for "show ip route" command for each router:**



```
Router>show ip route
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

     192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.10.1/32 is directly connected, GigabitEthernet0/0/0
R    192.168.20.0/24 [120/1] via 192.168.40.2, 00:00:25, Serial0/1/0
R    192.168.30.0/24 [120/2] via 192.168.40.2, 00:00:25, Serial0/1/0
     192.168.40.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.40.0/24 is directly connected, Serial0/1/0
L       192.168.40.1/32 is directly connected, Serial0/1/0
R    192.168.50.0/24 [120/1] via 192.168.40.2, 00:00:25, Serial0/1/0
```

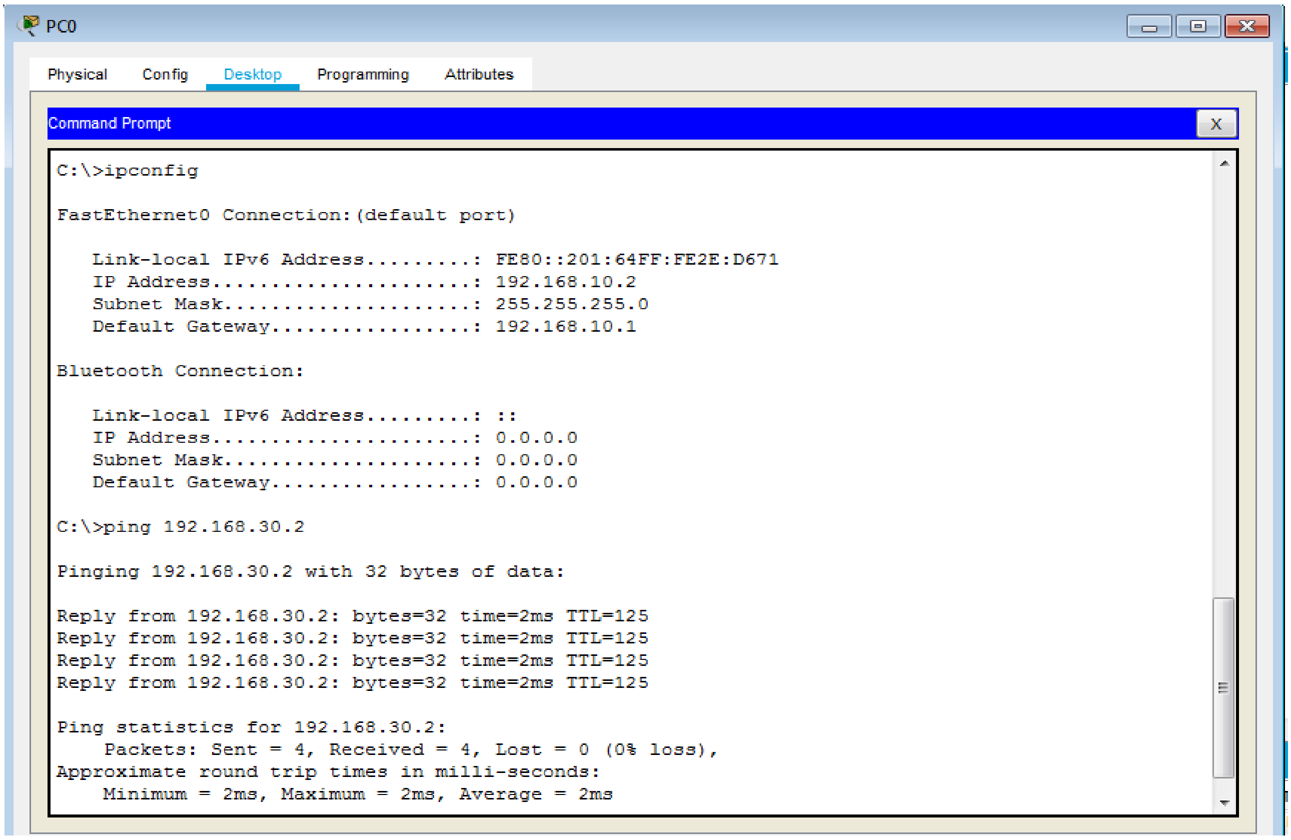
Show "show ip route" command for all remaining routers.

**Show Packet Tracing :**



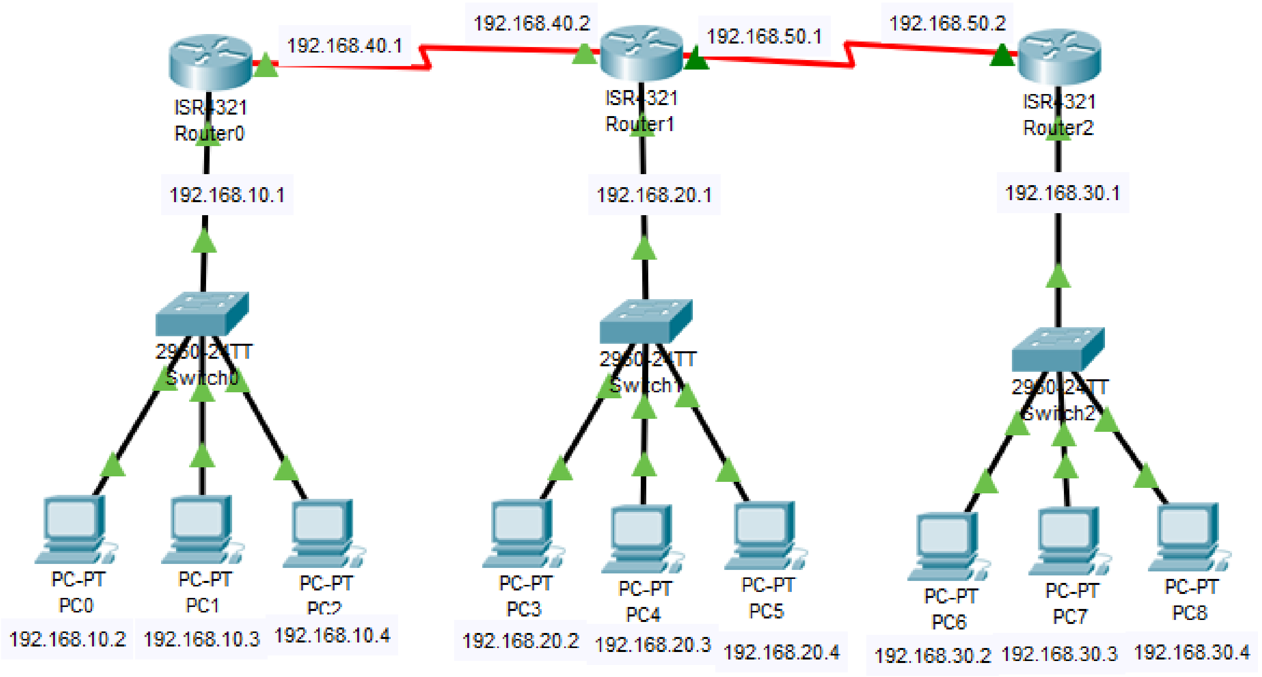
| Fire | Last Status | Source | Destination | Type | Color | Time(sec) | Periodic | Num | Edit |
|---|---|---|---|---|---|---|---|---|---|
| ● | Successful | PC0 | PC6 | ICMP | 🟩 | 0.000 | N | 0 | (edit) |
| ● | Successful | PC2 | PC5 | ICMP | 🟪 | 0.000 | N | 1 | (edit) |
| ● | Successful | PC4 | PC7 | ICMP | 🟪 | 0.000 | N | 2 | (edit) |

## Show Connection between PC0 to PC6:



```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Link-local IPv6 Address.........: FE80::201:64FF:FE2E:D671
   IP Address......................: 192.168.10.2
   Subnet Mask.....................: 255.255.255.0
   Default Gateway.................: 192.168.10.1

Bluetooth Connection:

   Link-local IPv6 Address.........: ::
   IP Address......................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: 0.0.0.0

C:\>ping 192.168.30.2

Pinging 192.168.30.2 with 32 bytes of data:

Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.30.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 2ms, Average = 2ms
```

## FINAL TOPOLOGY:



**Conclusion:-** We have learnt to create OSPF with three routers as shown above.

## Practical No. 03

**AIM:** Create network with three routers with BGP and each router associated network will have minimum three PC. Show connectivity.

**Steps to perform practical:**

Step 1 : Add 3 routers, 3 switches, end user clients to the switches.
Step 2 : Connect all the devices with straight through cable.
Step 3 : Add serial port devices in the routers in the router.
Step 4 : Give IP to each port of router

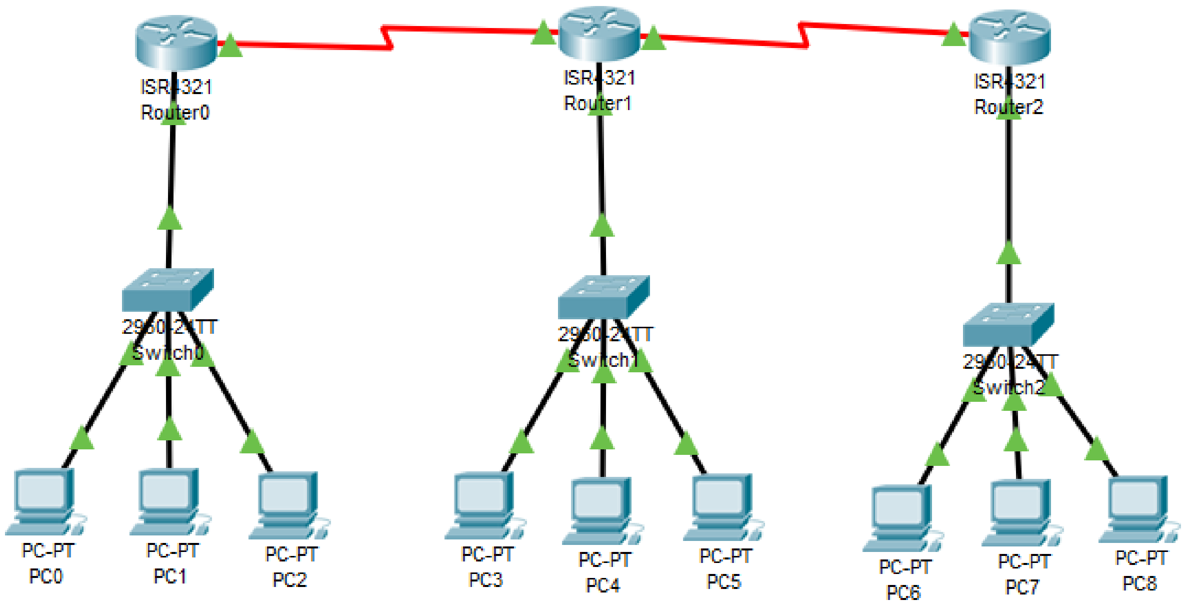
```
enable
configure terminal
interface gig0/0/0
ip address 192.168.10.1 255.255.255.0
no shutdown
exit
```

Step 5 : Set IP address, Subnet & Gateway for End User Client (manually in input boxes). Note that the gateway will be same as the routers IP.
Step 6 : Apply OSPF to each of the router

```
configure terminal
router bgp 100
neighbor 192.168.40.2 remote-as 200
network 192.168.10.0
network 192.168.40.0
exit
```

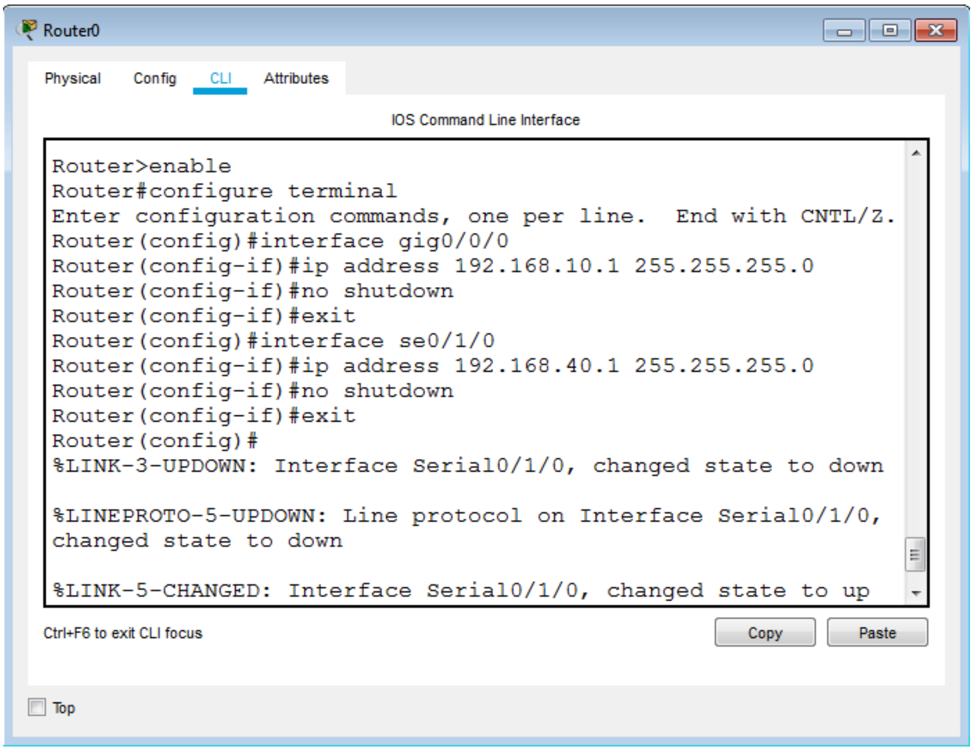
Step 7 : Go for (show ip route) command on each router.
Step 8 : Show connection between PC6 and PC0.
System > Desktop tab > Command Prompt > ping 192.168.10.2

**NETWORK TOPOLOGY:**



**i)Router Configuration:-**

**Set IP addresses to routers :-**



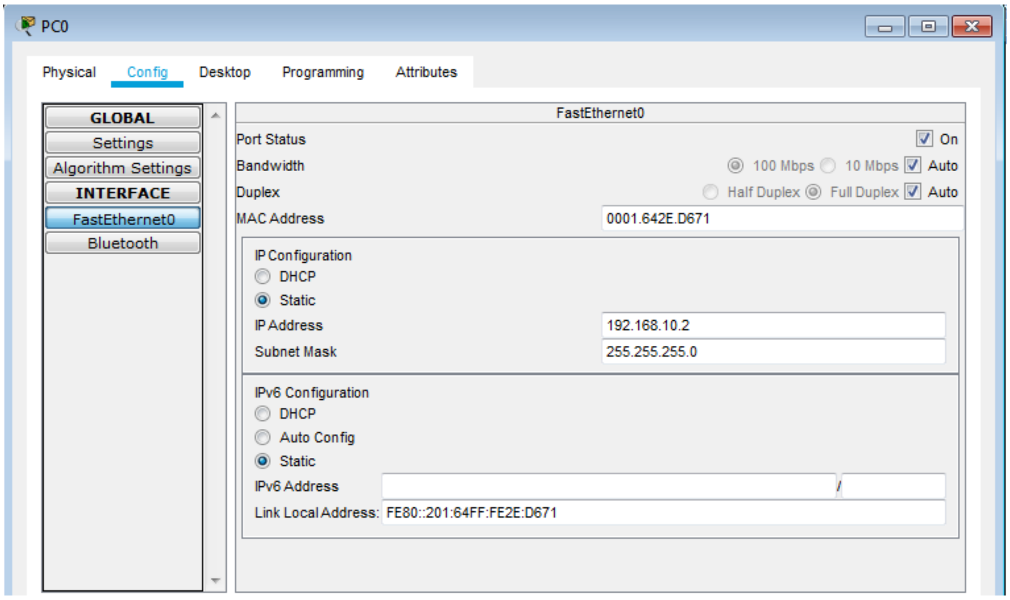
Router0

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#interface gig0/0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#interface se0/1/0
Router(config-if)#ip address 192.168.40.1 255.255.255.0
Router(config-if)#no shutdown
Router(config-if)#exit
Router(config)#
%LINK-3-UPDOWN: Interface Serial0/1/0, changed state to down

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/1/0,
changed state to down

%LINK-5-CHANGED: Interface Serial0/1/0, changed state to up
```

Set IP addresses to all remaining routers as shown above.

**ii)End User Client Configuration :**

**a)Set IP address to end user client :**



PC0

FastEthernet0

Port Status ☑ On

Bandwidth ● 100 Mbps ○ 10 Mbps ☑ Auto

Duplex ○ Half Duplex ● Full Duplex ☑ Auto

MAC Address 0001.642E.D671

IP Configuration

○ DHCP

● Static

IP Address 192.168.10.2

Subnet Mask 255.255.255.0

IPv6 Configuration

○ DHCP

○ Auto Config

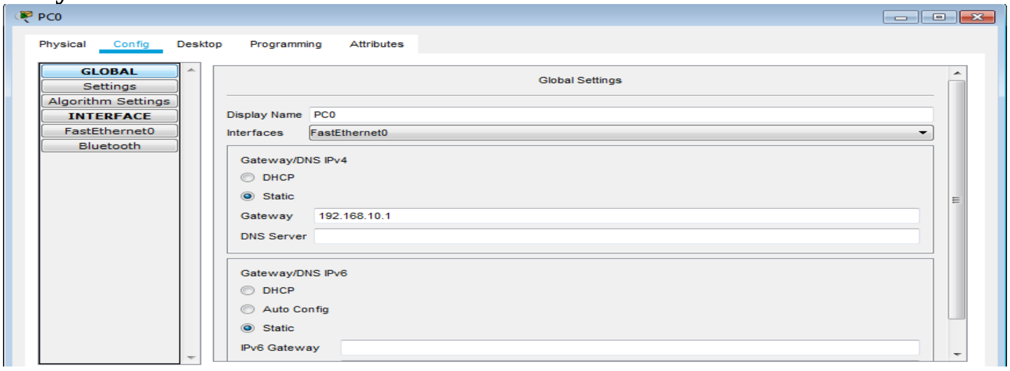
● Static

IPv6 Address /

Link Local Address: FE80::201:64FF:FE2E:D671

Set IP addresses to all remaining clients as shown above.

**b)Set Gateway to end user client:**



PC0

Global Settings

Display Name PC0

Interfaces FastEthernet0

Gateway/DNS IPv4

○ DHCP

● Static

Gateway 192.168.10.1

DNS Server

Gateway/DNS IPv6

○ DHCP

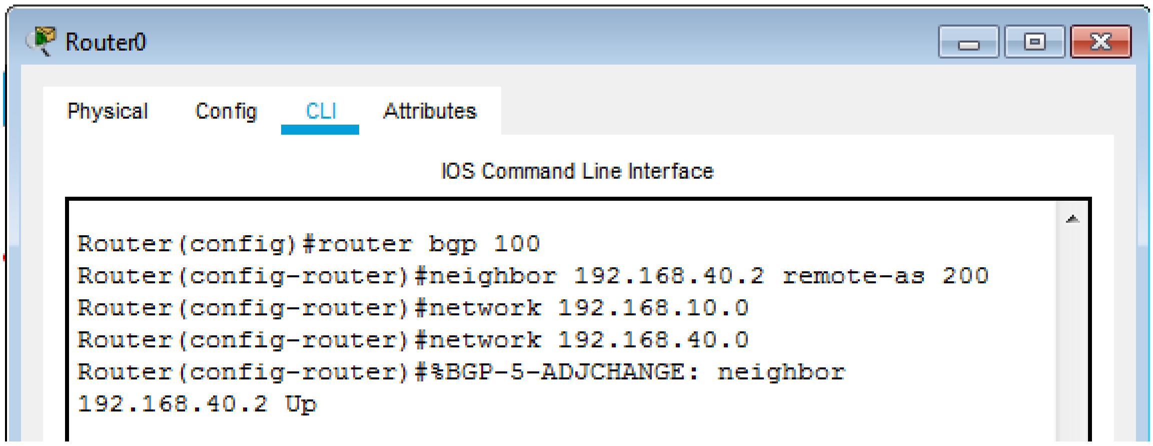
○ Auto Config

● Static

IPv6 Gateway

Set Gateways to all remaining end user client.

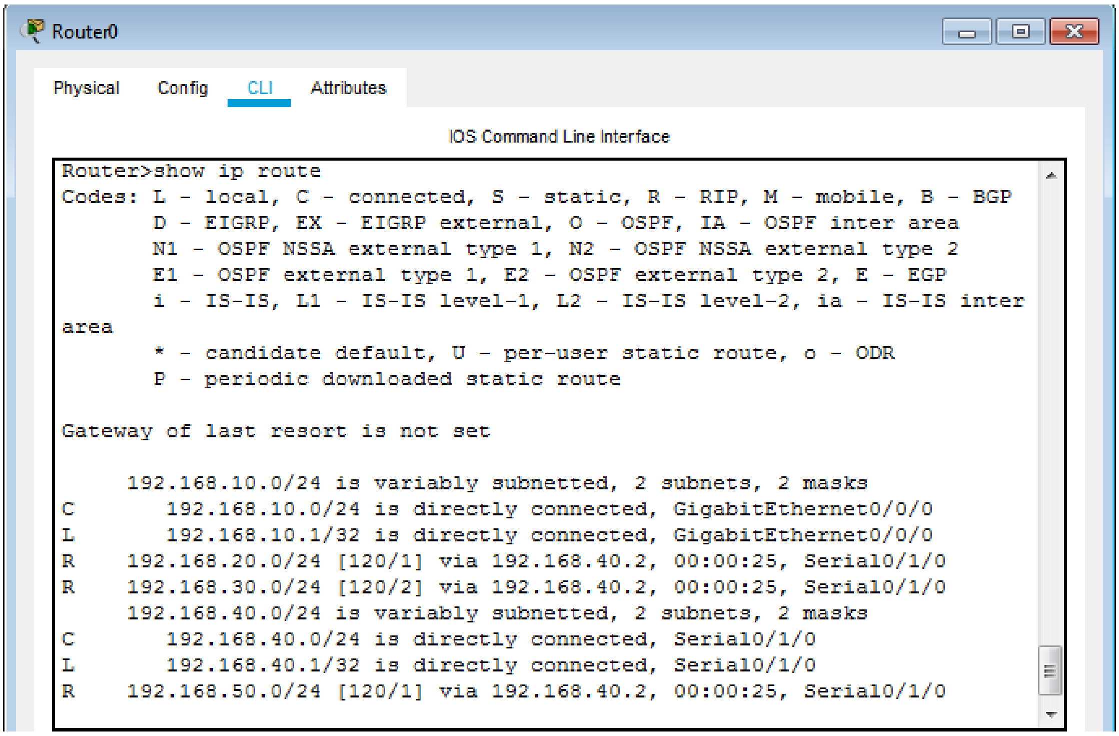
**Set BGP protocol to routers :**



```
Router(config)#router bgp 100
Router(config-router)#neighbor 192.168.40.2 remote-as 200
Router(config-router)#network 192.168.10.0
Router(config-router)#network 192.168.40.0
Router(config-router)#%BGP-5-ADJCHANGE: neighbor
192.168.40.2 Up
```

Set BGP protocol to all remaining routers as shown above.

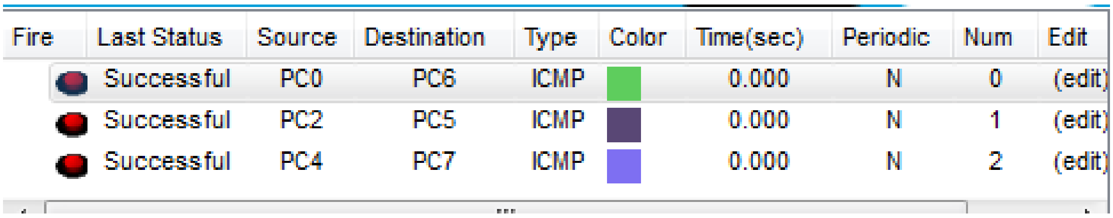
**Go for “show ip route” command for each router:**



```
Router>show ip route
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

     192.168.10.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.10.0/24 is directly connected, GigabitEthernet0/0/0
L       192.168.10.1/32 is directly connected, GigabitEthernet0/0/0
R    192.168.20.0/24 [120/1] via 192.168.40.2, 00:00:25, Serial0/1/0
R    192.168.30.0/24 [120/2] via 192.168.40.2, 00:00:25, Serial0/1/0
     192.168.40.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.40.0/24 is directly connected, Serial0/1/0
L       192.168.40.1/32 is directly connected, Serial0/1/0
R    192.168.50.0/24 [120/1] via 192.168.40.2, 00:00:25, Serial0/1/0
```

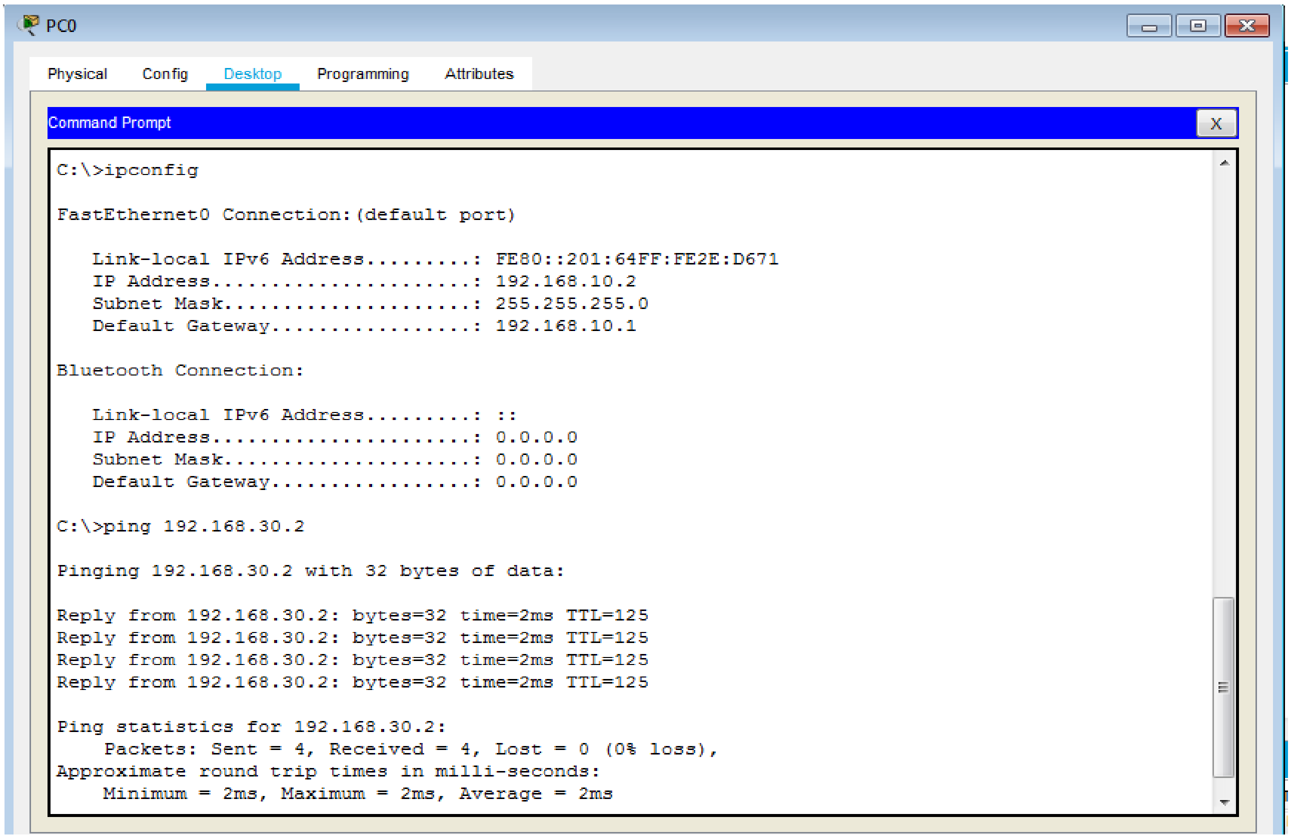
Show “show ip route” command for all remaining routers.

**Show Packet Tracing :**



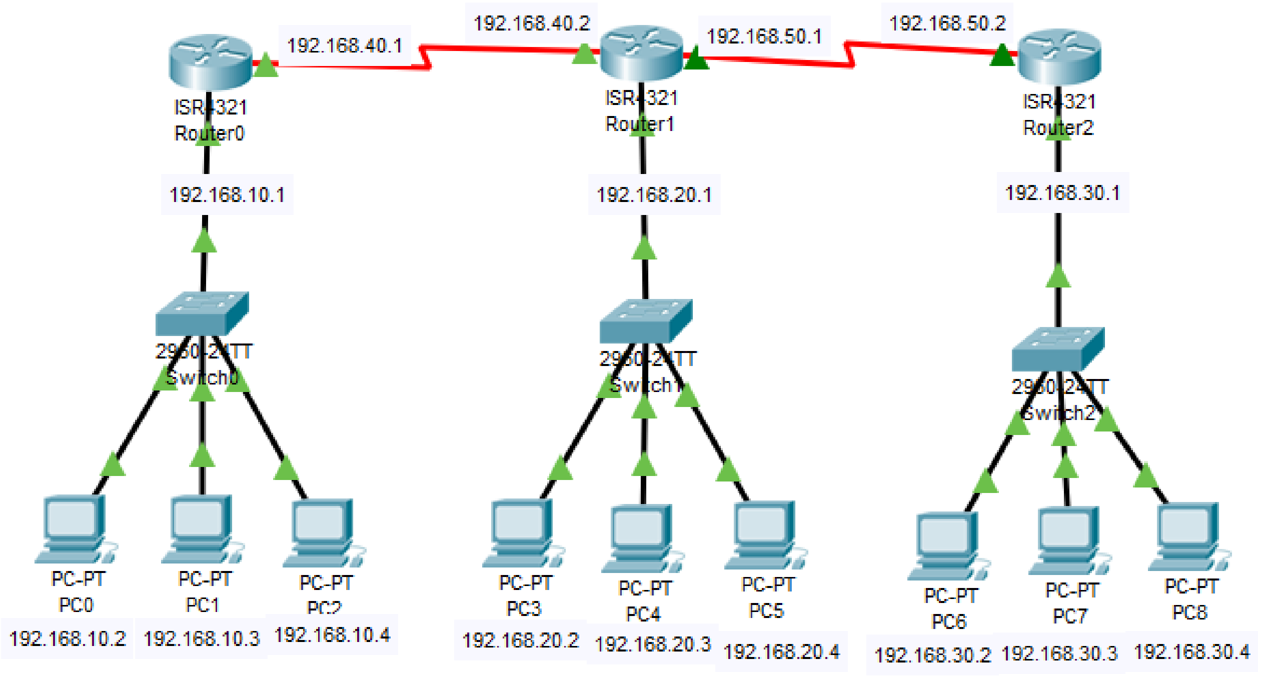
| Fire | Last Status | Source | Destination | Type | Color | Time(sec) | Periodic | Num | Edit |
|---|---|---|---|---|---|---|---|---|---|
| ● | Successful | PC0 | PC6 | ICMP | 🟩 | 0.000 | N | 0 | (edit) |
| ● | Successful | PC2 | PC5 | ICMP | 🟪 | 0.000 | N | 1 | (edit) |
| ● | Successful | PC4 | PC7 | ICMP | 🟪 | 0.000 | N | 2 | (edit) |

### Show Connection between PC0 to PC6:



```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Link-local IPv6 Address.........: FE80::201:64FF:FE2E:D671
   IP Address......................: 192.168.10.2
   Subnet Mask.....................: 255.255.255.0
   Default Gateway.................: 192.168.10.1

Bluetooth Connection:

   Link-local IPv6 Address.........: ::
   IP Address......................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: 0.0.0.0

C:\>ping 192.168.30.2

Pinging 192.168.30.2 with 32 bytes of data:

Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125
Reply from 192.168.30.2: bytes=32 time=2ms TTL=125

Ping statistics for 192.168.30.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 2ms, Average = 2ms
```

### FINAL TOPOLOGY:



**Conclusion:-** We have learnt to create BGP with three routers as shown above.

# Practical No. 04

**AIM:** Configure DHCP server and client for DHCP service.

**Steps to perform practical:**

Step 1 : Add router, switch and end user clients to the switches.
Step 2 : Connect all the devices with straight through cable.
Step 3 : Give IP to each port of router

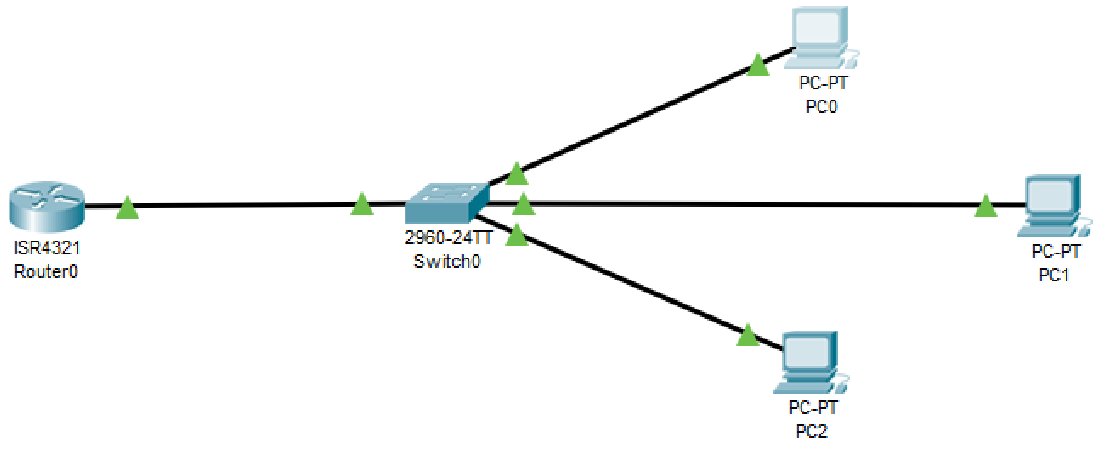
```
enable
configure terminal
interface gig0/0/0
ip address 192.168.10.1 255.255.255.0
no shutdown
exit
```

Step 4 : Apply DHCP to the router

```
configure terminal
ip dhcp pool pool_name
network 192.168.10.0 255.255.255.0
default-router 192.168.10.1
exit
ip dhcp excluded-address 192.168.10.2 192.168.10.10
exit
```

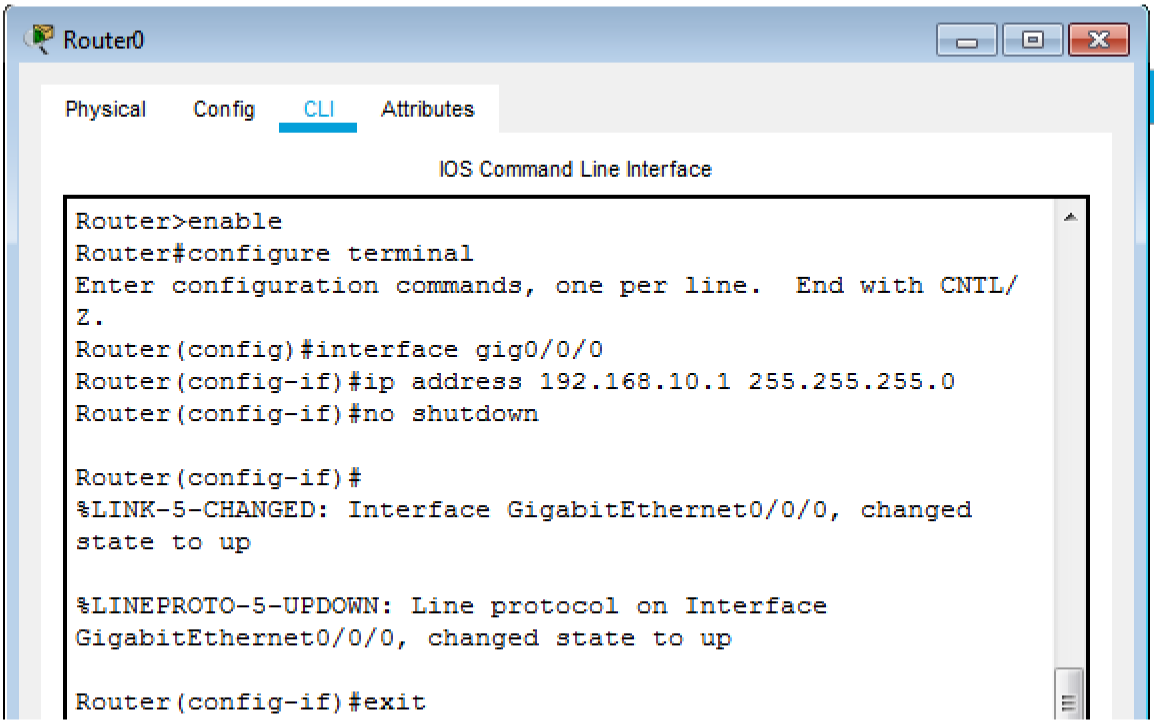
Step 5 : Show DHCP ip address to each end user clients.
System > Desktop tab > ip configuration > select dhcp.
DHCP automatically assign ip address to each client.

**NETWORK TOPOLOGY:**



**i)Router Configuration:-**

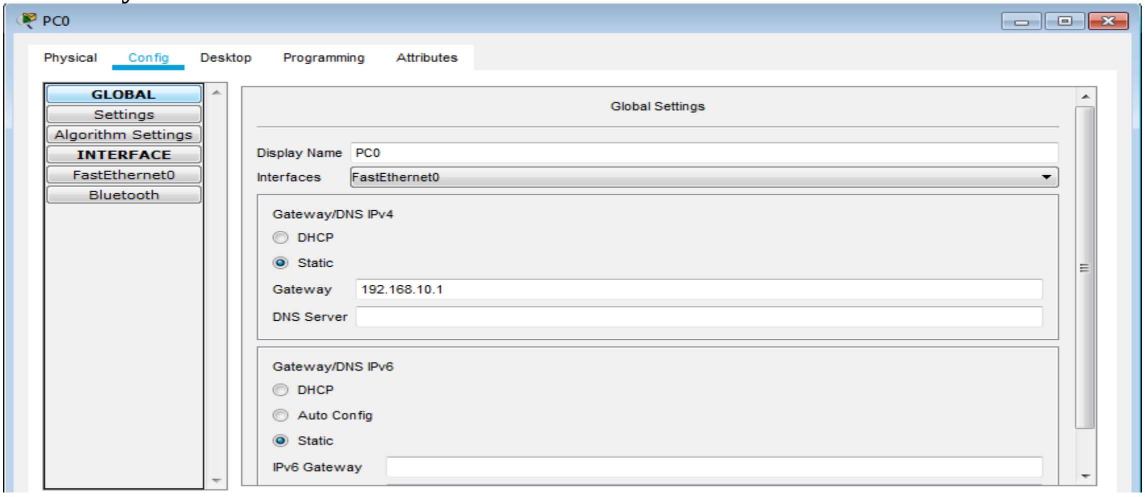
**Set IP addresses to routers :-**



```
Router>enable
Router#configure terminal
Enter configuration commands, one per line.  End with CNTL/
Z.
Router(config)#interface gig0/0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0/0, changed
state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet0/0/0, changed state to up

Router(config-if)#exit
```

**ii)End User Client Configuration :**

**a)Set Gateway to end user client:**



Global Settings

Display Name PC0

Interfaces FastEthernet0

Gateway/DNS IPv4

○ DHCP

● Static

Gateway 192.168.10.1

DNS Server

Gateway/DNS IPv6

○ DHCP

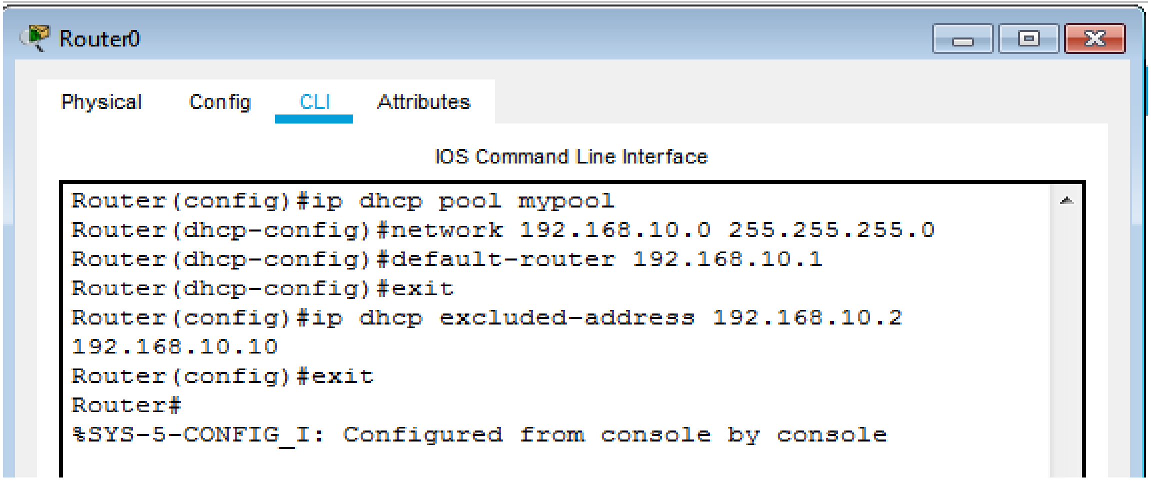
○ Auto Config

● Static

IPv6 Gateway

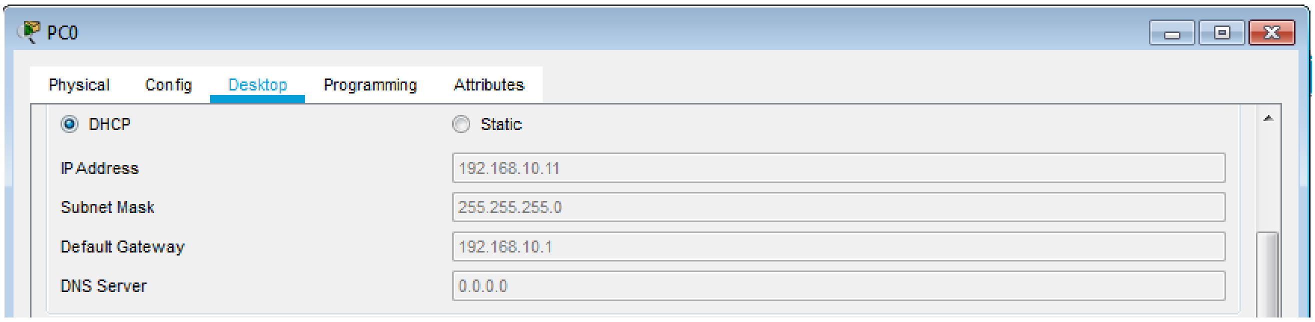
Set Gateways to all remaining end user client.

**Set DHCP protocol to routers :**



```
Router(config)#ip dhcp pool mypool
Router(dhcp-config)#network 192.168.10.0 255.255.255.0
Router(dhcp-config)#default-router 192.168.10.1
Router(dhcp-config)#exit
Router(config)#ip dhcp excluded-address 192.168.10.2
192.168.10.10
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console
```

**Show DHCP ip address to each end user clients.**

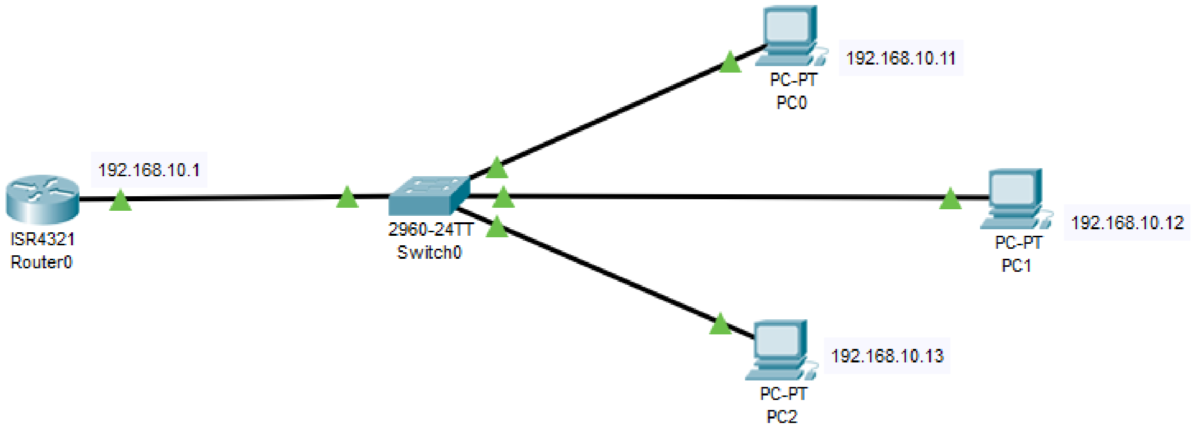


● DHCP ○ Static

IP Address: 192.168.10.11
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.10.1
DNS Server: 0.0.0.0

Show DHCP ip address to all remaining end user clients as shown above.

**FINAL TOPOLOGY:**

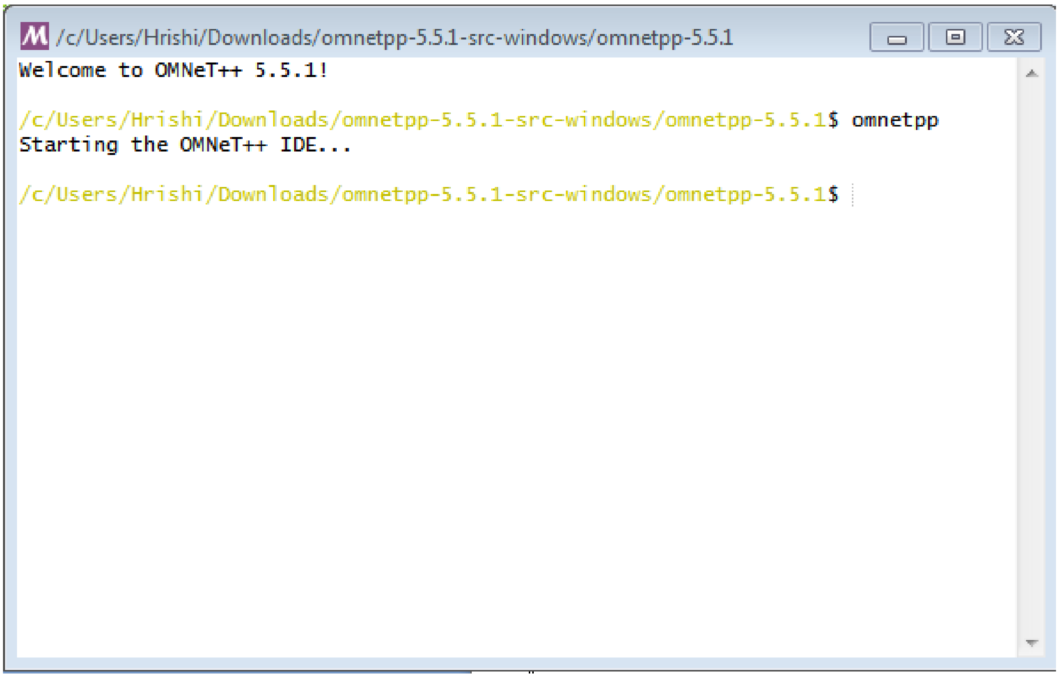


**Conclusion:-** We have learnt to create DHCP server with client service as shown above.

# Practical No. 05

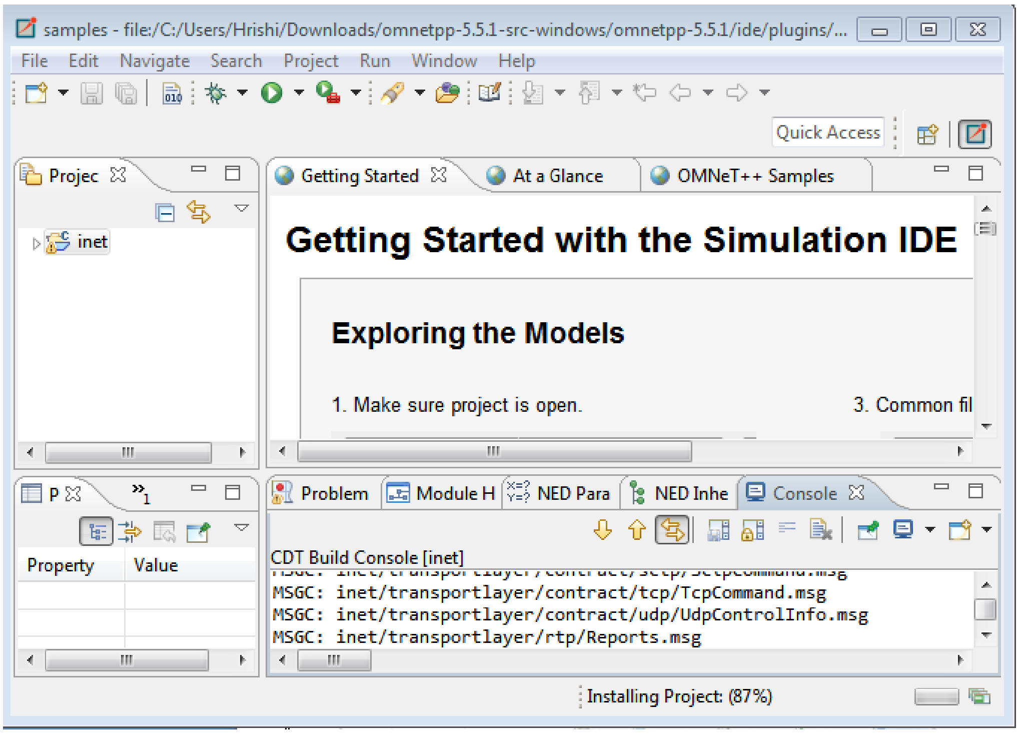
**AIM:** Create simple Adhoc network.

**Step 1:** Go to omnetpp-5.5.1 folder in which open “mingwenv” file, we get following window. Type “omnetpp” command to open omnet++ IDE.



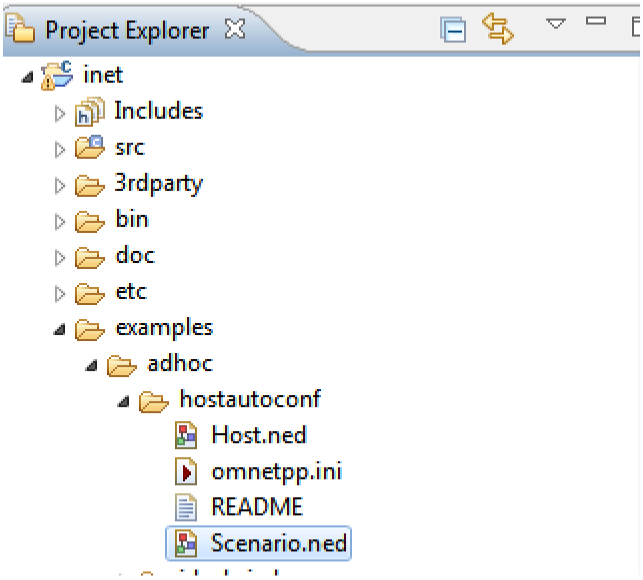
```
Welcome to OMNeT++ 5.5.1!

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$ omnetpp
Starting the OMNeT++ IDE...

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$
```

**Step 2:** after that command, following window will open.

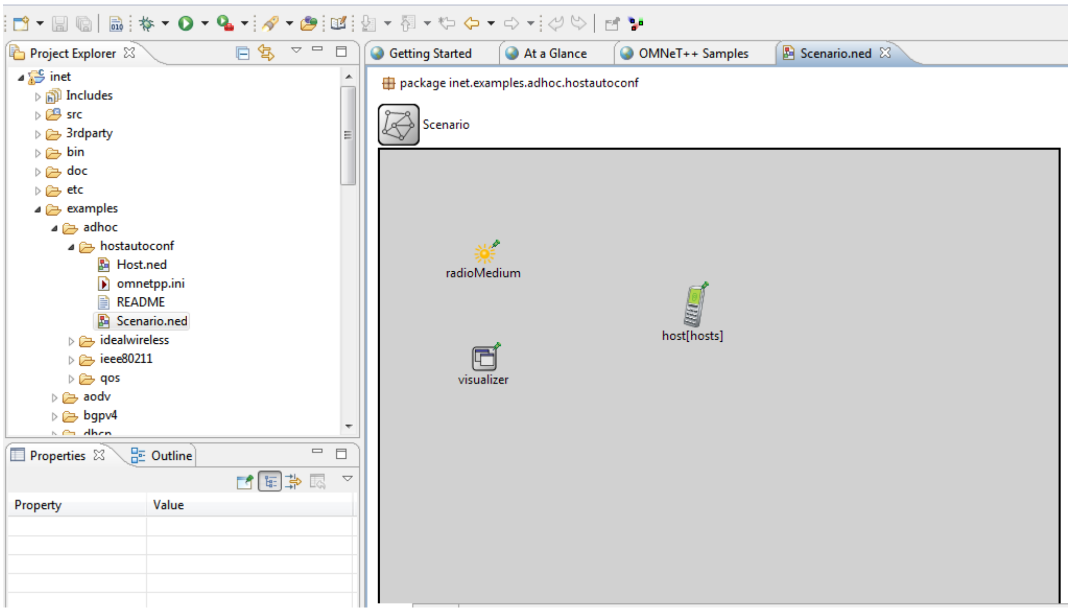

samples - file:/C:/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1/ide/plugins/...
File Edit Navigate Search Project Run Window Help
Quick Access
Projec
inet
Getting Started
At a Glance
OMNeT++ Samples
Getting Started with the Simulation IDE
Exploring the Models
1. Make sure project is open.
3. Common fil
P
Property
Value
Problem
Module H
NED Para
NED Inhe
Console
CDT Build Console [inet]
Installing Project: (87%)

```
MSGC: inet/transportlayer/contract/tcp/TcpCommand.msg
MSGC: inet/transportlayer/contract/udp/UdpControlInfo.msg
MSGC: inet/transportlayer/rtp/Reports.msg
```

**Step 3:** Go to project Explorer > inet > examples > Adhoc > Hostautoconf  and open Scenario.ned file.



**Scenario.ned:**



**Coding:**

**Scenario.ned:**

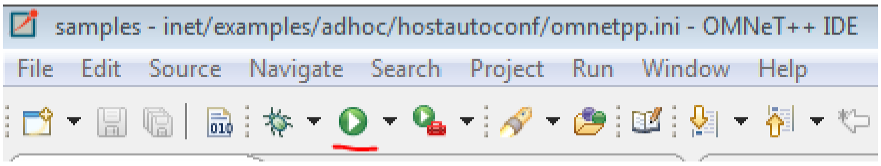
```
package inet.examples.adhoc.hostautoconf;
import inet.physicallayer.ieee80211.packetlevel.Ieee80211ScalarRadioMedium;
import inet.visualizer.contract.IIntegratedVisualizer;
network Scenario
{
    parameters:
        int hosts;
        @display("bgb=650,450");
    submodules:
        visualizer: <default("IntegratedCanvasVisualizer")> like IIntegratedVisualizer if
hasVisualizer() {
            parameters:
                @display("p=100,200;is=s");
        }
        radioMedium: Ieee80211ScalarRadioMedium {
            parameters:
                @display("p=100,100;is=s");
        }
        host[hosts]: Host {
            @display("p=300,150");
        }
}
```

**Omnetpp.ini:**

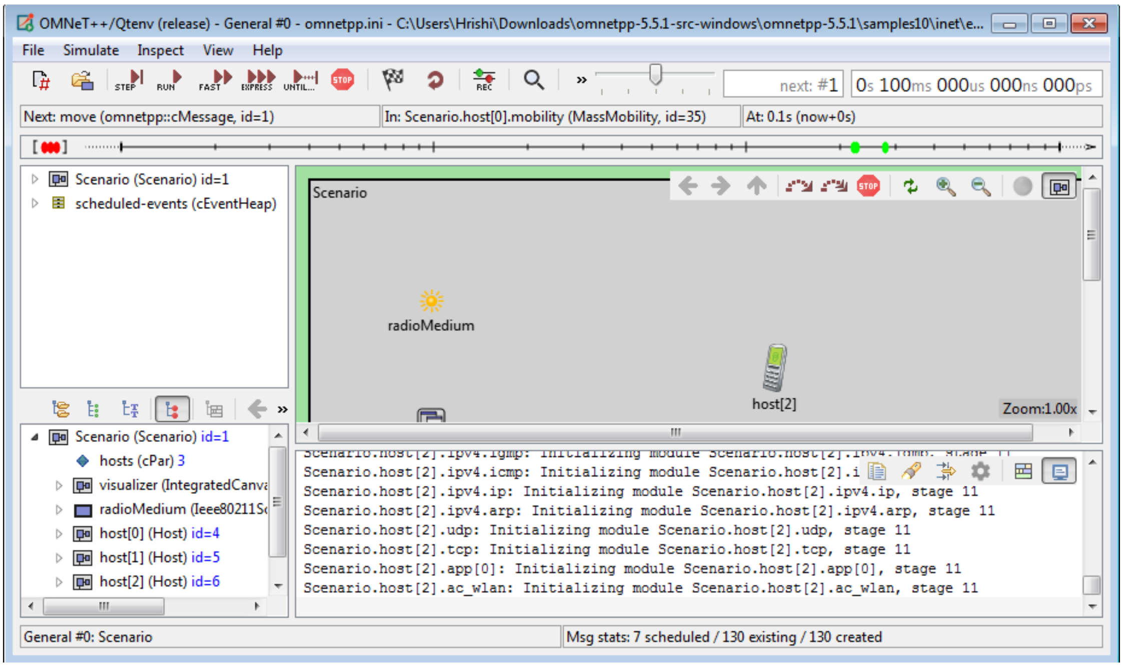
```
[General]
#debug-on-errors = true
#record-eventlog = true
network = Scenario
sim-time-limit = 60min
cmdenv-express-mode = true
*.hosts = 3
**.constraintAreaMinX = 0m
**.constraintAreaMinY = 0m
**.constraintAreaMinZ = 0m
**.constraintAreaMaxX = 600m
**.constraintAreaMaxY = 400m
**.constraintAreaMaxZ = 0m
# mobility
**.host*.mobility.typename = "MassMobility"
**.host*.mobility.initFromDisplayString = false
**.host*.mobility.changeInterval = truncnormal(2s, 0.5s)
**.host*.mobility.angleDelta = normal(0deg, 30deg)
**.host*.mobility.speed = truncnormal(20mps, 8mps)
**.host*.mobility.updateInterval = 100ms
**.host*.ac_wlan.interfaces = "wlan0"
# UdpBasicApp / UdpSink
**.host*.numApps = 1
**.app[0].typename = "UdpBasicApp"
**.app[0].destAddresses = "host[0]"
**.app[0].localPort = 9001
**.app[0].destPort = 9001
**.app[0].messageLength = 100B
**.app[0].startTime = uniform(10s, 30s)
**.app[0].sendInterval = uniform(10s, 30s)
# nic settings
**.wlan[*].bitrate = 2Mbps
**.wlan[*].mgmt.frameCapacity = 10
**.wlan[*].mac.retryLimit = 7
**.wlan[*].mac.dcf.channelAccess.cwMin = 7
**.wlan[*].mac.cwMinBroadcast = 31
**.wlan[*].radio.transmitter.power = 2mW
**.wlan[*].radio.receiver.sensitivity = -85dBm
```

```
**.wlan[*].radio.receiver.snirThreshold = 4dB
**.udpapp.*.vector-recording = true
**.vector-recording = true
```

**Step 4:** Click on Run button.


samples - inet/examples/adhoc/hostautoconf/omnetpp.ini - OMNeT++ IDE
File
Edit
Source
Navigate
Search
Project
Run
Window
Help

**Step 5:** After that following window will open.


OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\e...
File
Simulate
Inspect
View
Help
STEP
RUN
FAST
EXPRESS
UNTIL
STOP
REC
Scenario
radioMedium
host[2]
Zoom:1.00x

next: #1 0s 100ms 000us 000ns 000ps

Next: move (omnetpp::cMessage, id=1) | In: Scenario.host[0].mobility (MassMobility, id=35) | At: 0.1s (now+0s)

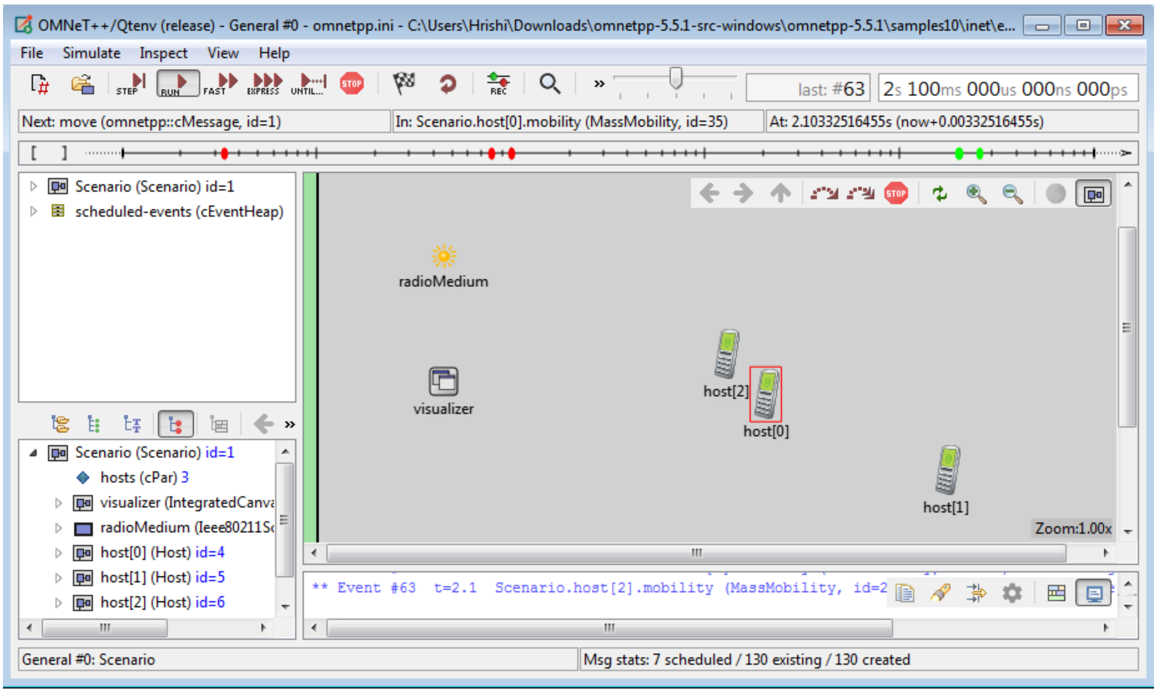
- Scenario (Scenario) id=1
- scheduled-events (cEventHeap)

- Scenario (Scenario) id=1
  - hosts (cPar) 3
  - visualizer (IntegratedCanva
  - radioMedium (Ieee80211Sc
  - host[0] (Host) id=4
  - host[1] (Host) id=5
  - host[2] (Host) id=6

```
Scenario.host[2].ipv4.igmp: Initializing module Scenario.host[2].ipv4.igmp, stage 11
Scenario.host[2].ipv4.icmp: Initializing module Scenario.host[2].i
Scenario.host[2].ipv4.ip: Initializing module Scenario.host[2].ipv4.ip, stage 11
Scenario.host[2].ipv4.arp: Initializing module Scenario.host[2].ipv4.arp, stage 11
Scenario.host[2].udp: Initializing module Scenario.host[2].udp, stage 11
Scenario.host[2].tcp: Initializing module Scenario.host[2].tcp, stage 11
Scenario.host[2].app[0]: Initializing module Scenario.host[2].app[0], stage 11
Scenario.host[2].ac_wlan: Initializing module Scenario.host[2].ac_wlan, stage 11
```

General #0: Scenario | Msg stats: 7 scheduled / 130 existing / 130 created

**Step 6:**Click on RUN.


OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\e...
File
Simulate
Inspect
View
Help
STEP
RUN
FAST
EXPRESS
UNTIL
STOP
REC
radioMedium
visualizer
host[2]
host[0]
host[1]
Zoom:1.00x

last: #63 2s 100ms 000us 000ns 000ps

Next: move (omnetpp::cMessage, id=1) | In: Scenario.host[0].mobility (MassMobility, id=35) | At: 2.10332516455s (now+0.00332516455s)

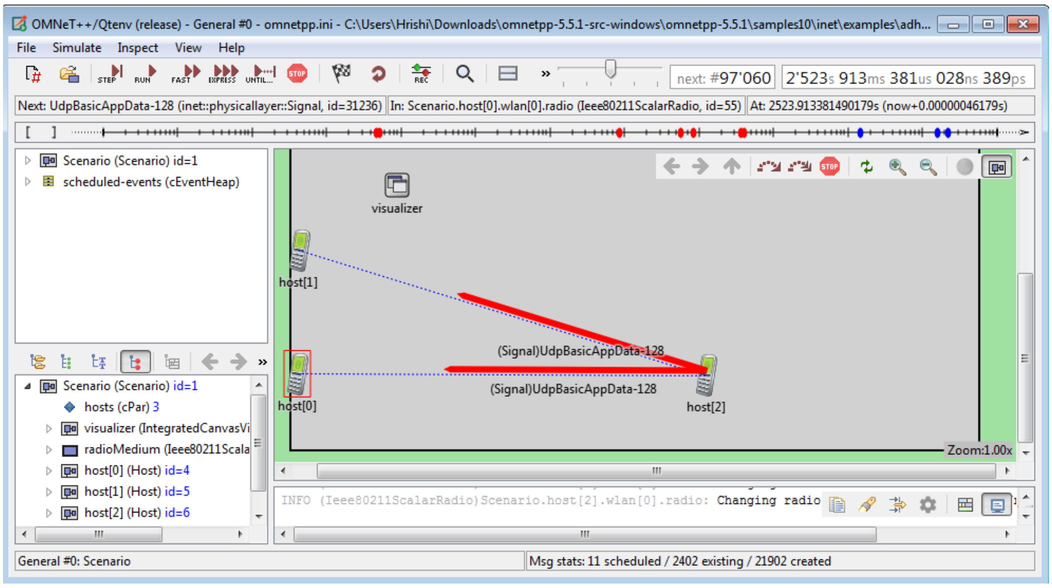
- Scenario (Scenario) id=1
- scheduled-events (cEventHeap)

- Scenario (Scenario) id=1
  - hosts (cPar) 3
  - visualizer (IntegratedCanva
  - radioMedium (Ieee80211Sc
  - host[0] (Host) id=4
  - host[1] (Host) id=5
  - host[2] (Host) id=6

```
** Event #63  t=2.1  Scenario.host[2].mobility (MassMobility, id=2
```

General #0: Scenario | Msg stats: 7 scheduled / 130 existing / 130 created

## OUTPUT:



OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\adh...

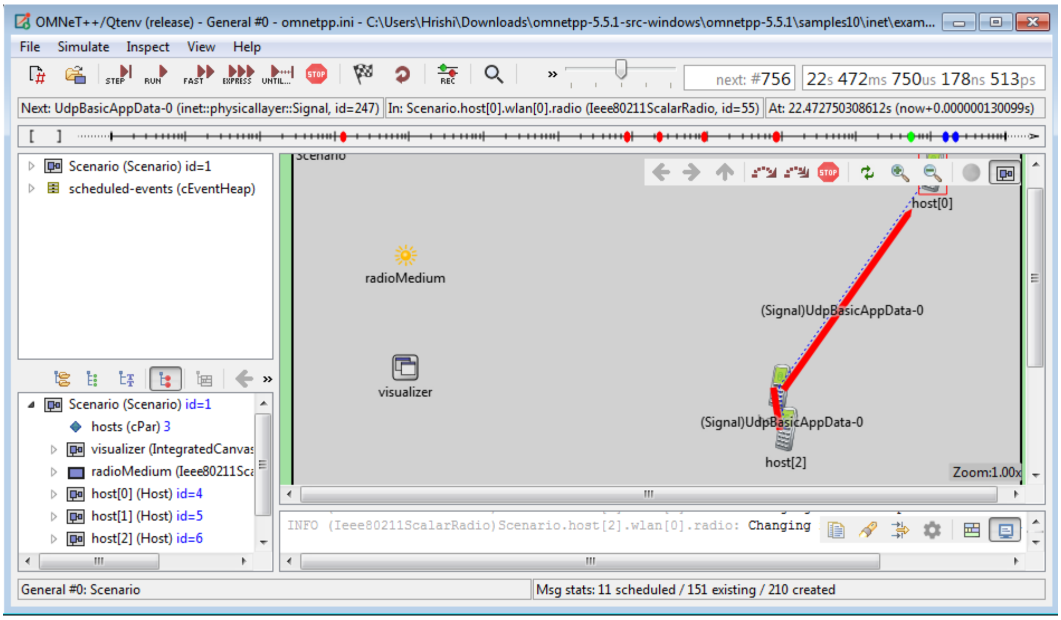
next: #97'060 2'523s 913ms 381us 028ns 389ps

Next: UdpBasicAppData-128 (inet::physicallayer::Signal, id=31236) In: Scenario.host[0].wlan[0].radio (Ieee80211ScalarRadio, id=55) At: 2523.913381490179s (now+0.00000046179s)

```
INFO (Ieee80211ScalarRadio)Scenario.host[2].wlan[0].radio: Changing radio
```

General #0: Scenario

Msg stats: 11 scheduled / 2402 existing / 21902 created



OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\exam...

next: #756 22s 472ms 750us 178ns 513ps

Next: UdpBasicAppData-0 (inet::physicallayer::Signal, id=247) In: Scenario.host[0].wlan[0].radio (Ieee80211ScalarRadio, id=55) At: 22.472750308612s (now+0.000000130099s)

```
INFO (Ieee80211ScalarRadio)Scenario.host[2].wlan[0].radio: Changing
```

General #0: Scenario

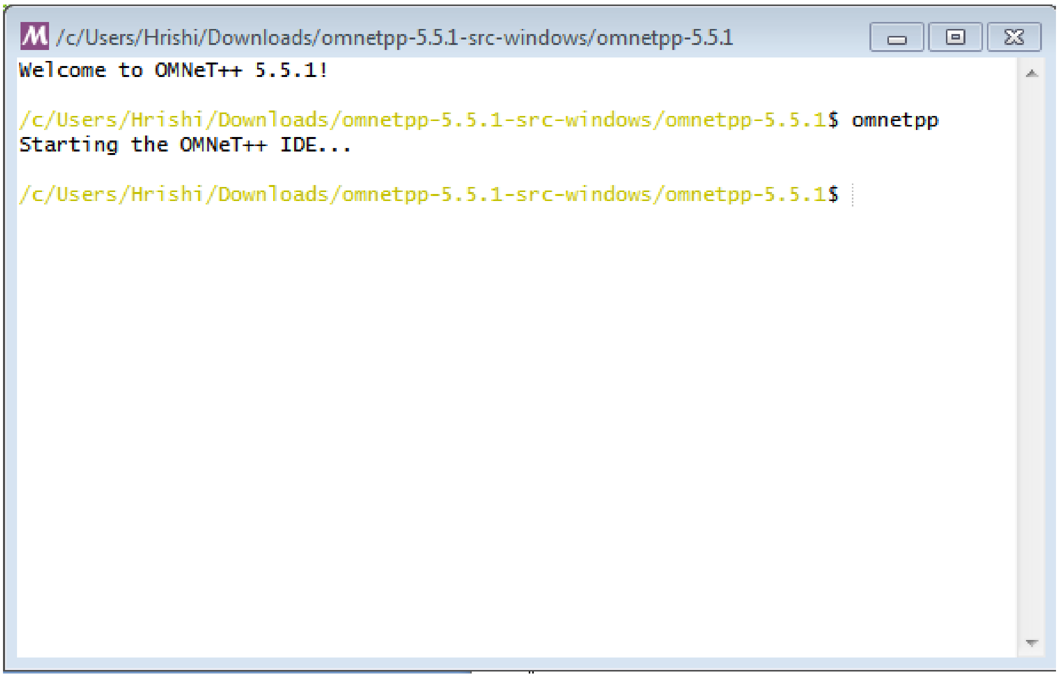
Msg stats: 11 scheduled / 151 existing / 210 created

**Conclusion:** We have learnt to create a simple ADHOC network.

## Practical No. 06

**AIM:** Create MANET simulation for AODVUU Network.

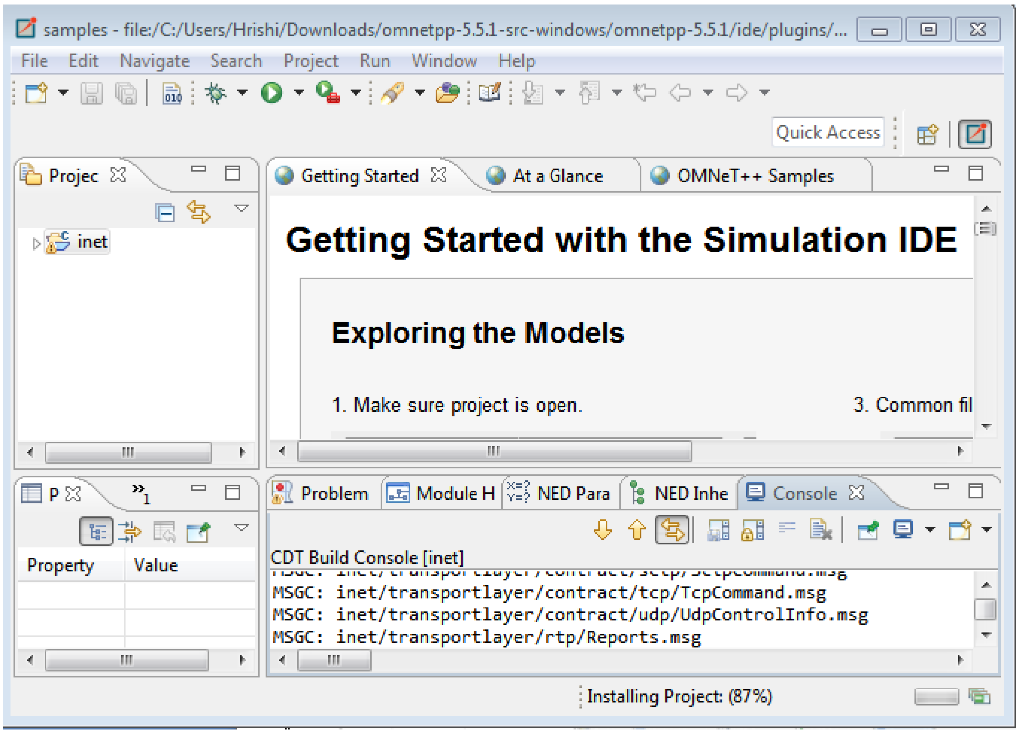
**Step 1:** Go to omnetpp-5.5.1 folder in which open "mingwenv" file, we get following window. Type "omnetpp" command to open omnet++ IDE.



/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1

```
Welcome to OMNeT++ 5.5.1!

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$ omnetpp
Starting the OMNeT++ IDE...

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$
```

**Step 2:** after that command, following window will open.



samples - file:/C:/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1/ide/plugins/...

Getting Started with the Simulation IDE

Exploring the Models

1. Make sure project is open.

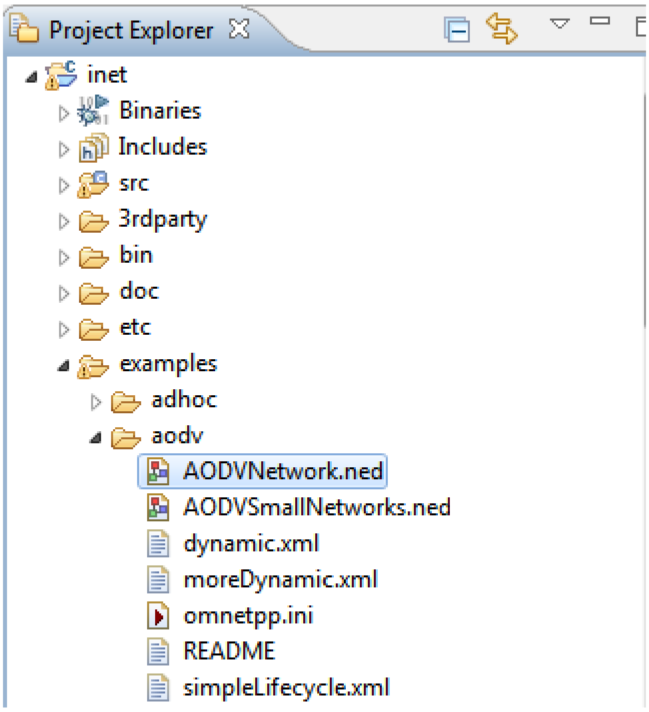
3. Common fil

CDT Build Console [inet]

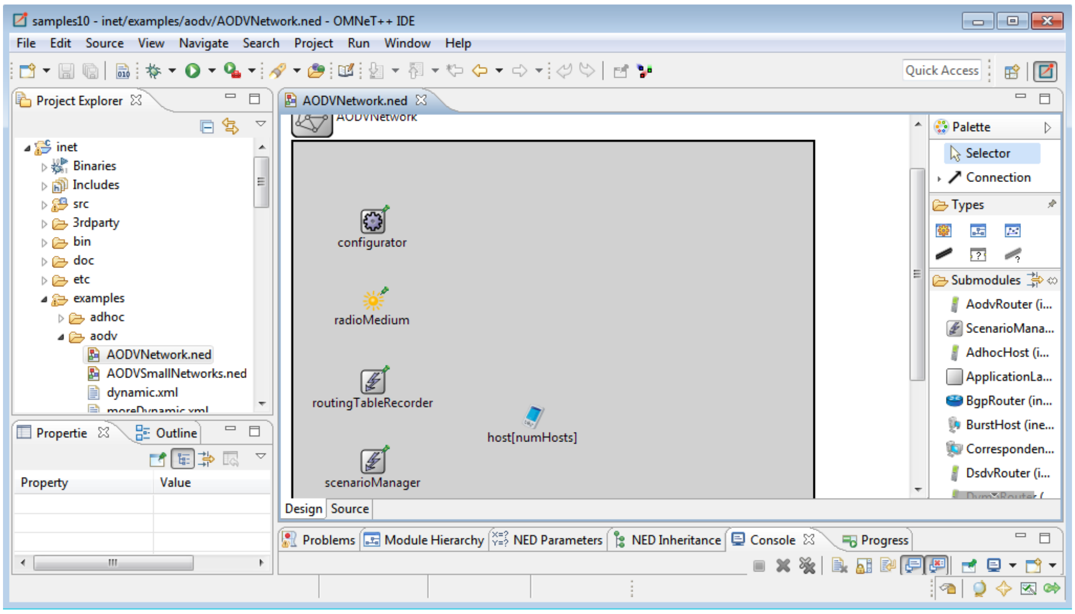
```
MSGC: inet/transportlayer/contract/tcp/TcpCommand.msg
MSGC: inet/transportlayer/contract/udp/UdpControlInfo.msg
MSGC: inet/transportlayer/rtp/Reports.msg
```

Installing Project: (87%)

**Step 3:** Go to project Explorer > inet > examples > aodv and open AODVNetwork.ned file.



**AODVNetwork.ned:**



**Coding:**

**AODVNetwork.ned:**

```
package inet.examples.aodv;
import inet.common.scenario.ScenarioManager;
import inet.networklayer.configurator.ipv4.Ipv4NetworkConfigurator;
import inet.networklayer.ipv4.RoutingTableRecorder;
import inet.node.aodv.AodvRouter;
import inet.physicallayer.unitdisk.UnitDiskRadioMedium;
```

```
network AODVNetwork
{
   parameters:
      int numHosts;
      @display("bgb=650,650");
   submodules:
      radioMedium: UnitDiskRadioMedium {
         parameters:
            @display("p=100,200;is=s");
      }
      configurator: Ipv4NetworkConfigurator {
         parameters:
            config = xml("<config><interface hosts='*' address='145.236.x.x'
netmask='255.255.0.0'/></config>");
            @display("p=100,100;is=s");
      }
      routingTableRecorder: RoutingTableRecorder {
         parameters:
            @display("p=100,300;is=s");
      }
      scenarioManager: ScenarioManager {
         parameters:
            script = default(xml("<scenario/>"));
            @display("p=100,400;is=s");
      }
      host[numHosts]: AodvRouter {
         parameters:
            @display("i=device/pocketpc_s;r=,,#707070");
      }
   connections allowunconnected:
}
```

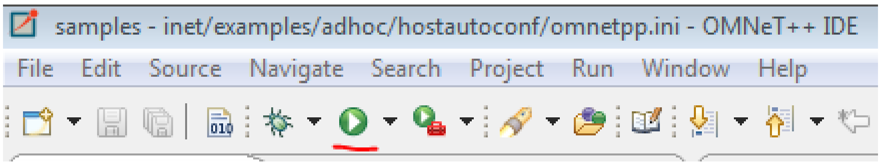
**Omnetpp.ini:**

```
[General]
network = AODVNetwork
#record-eventlog = true
num-rngs = 3
debug-on-errors = true
**.mobility.rng-0 = 1
**.wlan[*].mac.rng-0 = 2
# channel physical parameters
**.wlan[*].typename = "AckingWirelessInterface"
**.wlan[*].bitrate = 2Mbps
**.wlan[*].mac.headerLength = 20B
**.wlan[*].radio.typename = "UnitDiskRadio"
**.wlan[*].radio.transmitter.headerLength = 96b
**.wlan[*].radio.transmitter.communicationRange = 250m
**.wlan[*].radio.transmitter.interferenceRange = 0m
**.wlan[*].radio.transmitter.detectionRange = 0m
**.wlan[*].radio.receiver.ignoreInterference = true
*.numHosts = 20
# mobility
**.host[*].mobility.typename = "StationaryMobility"
```

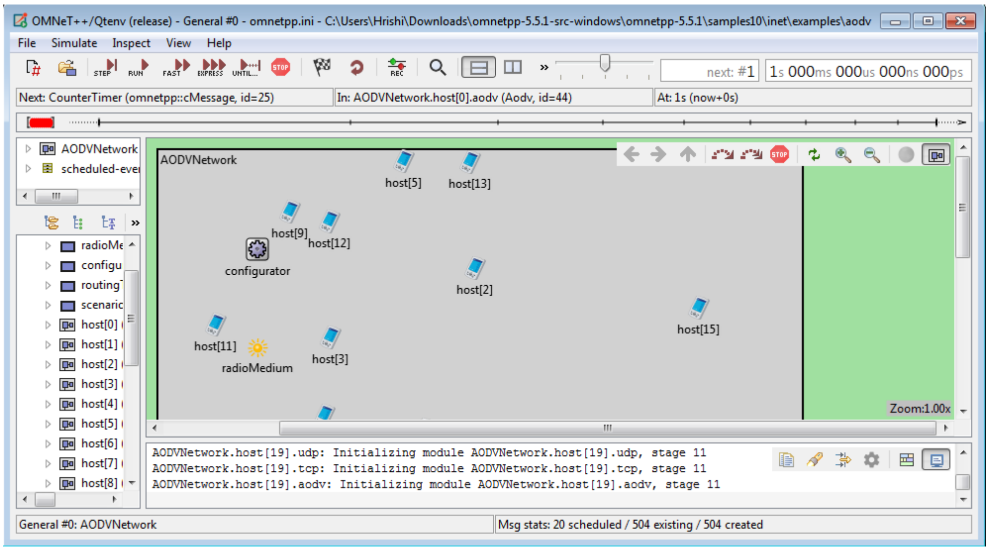
```
**.mobility.constraintAreaMinZ = 0m
**.mobility.constraintAreaMaxZ = 0m
**.mobility.constraintAreaMinX = 0m
**.mobility.constraintAreaMinY = 0m
**.mobility.constraintAreaMaxX = 600m
**.mobility.constraintAreaMaxY = 600m
# ping app (host[0] pinged by others)
*.host[0].numApps = 1
*.host[0].app[0].typename = "PingApp"
*.host[0].app[0].startTime = uniform(1s,5s)
*.host[0].app[0].printPing = true
# nic settings
**.wlan[*].bitrate = 2Mbps
**.wlan[*].mgmt.frameCapacity = 10
**.wlan[*].mac.retryLimit = 7
# lifecycle
**.hasStatus = true
[Config Static]
description = routing without mobility
*.host[*].wlan[*].radio.transmitter.communicationRange = 250m
*.host[0].app[0].destAddr = "host[1](ipv4)"
[Config IPv4SlowMobility]
description = two fixed communicating nodes with low speed mobile nodes
extends = Static
# mobility
**.aodv.activeRouteTimeout = 3s
**.host[2..20].mobility.typename = "MassMobility"
**.host[0].mobility.typename = "StationaryMobility"
**.host[1].mobility.typename = "StationaryMobility"
**.host[*].mobility.changeInterval = normal(5s, 0.1s)
**.host[*].mobility.angleDelta = normal(0deg, 30deg)
**.host[*].mobility.speed = normal(2mps, 0.01mps)
**.host[1].mobility.initialX = 600m
**.host[1].mobility.initialY = 600m
[Config IPv4ModerateFastMobility]
description = two fixed communicating nodes with moderate speed mobile nodes
extends = IPv4SlowMobility
# mobility
**.aodv.activeRouteTimeout = 2s
**.host[*].mobility.speed = normal(8mps, 0.01mps)
[Config IPv4FastMobility]
description = two fixed communicating nodes with high speed mobile nodes
extends = IPv4SlowMobility
# mobility
**.aodv.activeRouteTimeout = 1s
**.host[*].mobility.speed = normal(15mps, 0.01mps)
[Config Dynamic]
description = one node is shut down and restarted trigger route changes
extends = Static
*.host[*].hasStatus = true
*.scenarioManager.script = xmldoc("dynamic.xml")
[Config MoreDynamic]
description = some nodes are shut down trigger route changes
extends = Static
```

```
*.host[*].hasStatus = true
*.scenarioManager.script = xmldoc("moreDynamic.xml")
[Config SimpleRREQ]
description = demonstrates a single RREQ-RREP exchange
network = SimpleRREQ
# nic settings
**.wlan[*].radio.transmitter.communicationRange = 240m
**.sender.numApps = 1
**.sender.app[0].typename = "PingApp"
**.sender.app[0].startTime = uniform(1s,5s)
**.sender.app[0].printPing = true
**.sender.app[0].destAddr = "receiver(ipv4)"
[Config SimpleRREQ2]
description = demonstrates a single RREQ-RREP exchange with two intermediate nodes
extends = SimpleRREQ
network = SimpleRREQ2
[Config SimpleLifecycle]
description = demonstrates AODV's RERR mechanism when a node shuts down
extends = SimpleRREQ2
*.scenarioManager.script = xmldoc("simpleLifecycle.xml")
[Config ShortestPath]
description = demonstrates that AODV chooses the shorter path
network = ShortestPath
extends = SimpleRREQ
```

**Step 4:** Click on Run button.

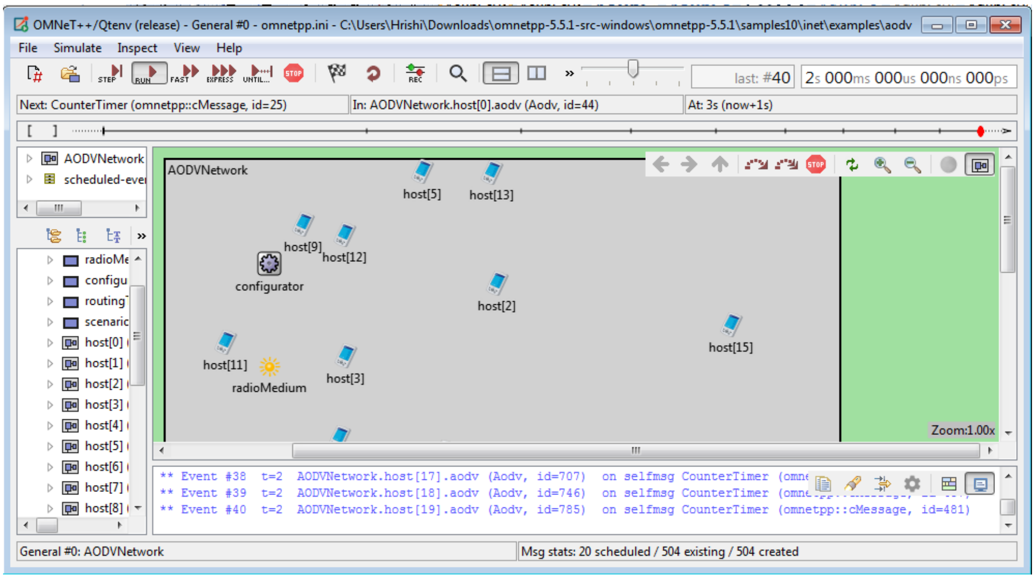

samples - inet/examples/adhoc/hostautoconf/omnetpp.ini - OMNeT++ IDE
File
Edit
Source
Navigate
Search
Project
Run
Window
Help

**Step 5:** After that following window will open.



```
AODVNetwork.host[19].udp: Initializing module AODVNetwork.host[19].udp, stage 11
AODVNetwork.host[19].tcp: Initializing module AODVNetwork.host[19].tcp, stage 11
AODVNetwork.host[19].aodv: Initializing module AODVNetwork.host[19].aodv, stage 11
```

**Step 6:**Click on RUN.


OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\aodv

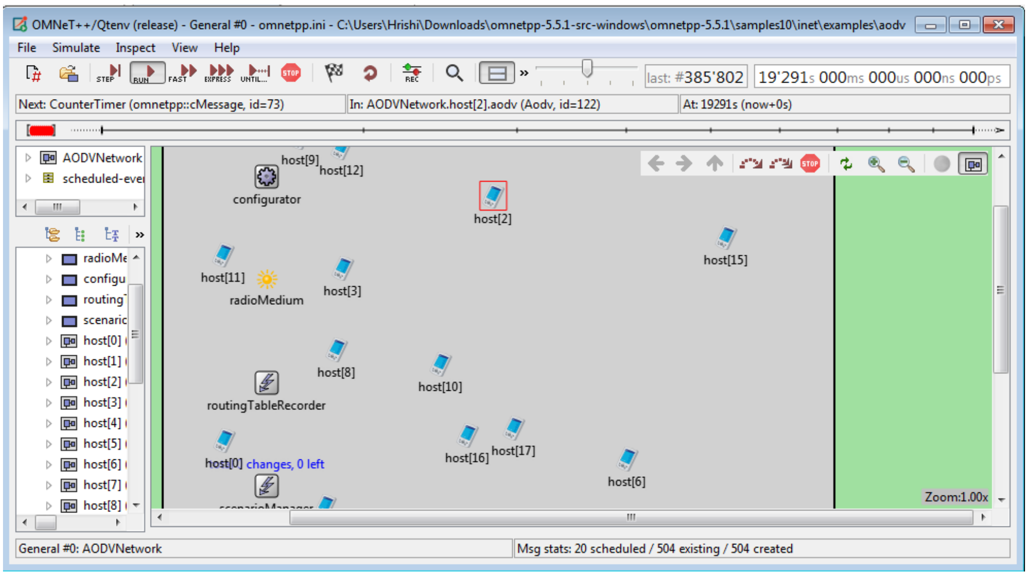
last: #40 2s 000ms 000us 000ns 000ps

Next: CounterTimer (omnetpp::cMessage, id=25) In: AODVNetwork.host[0].aodv (Aodv, id=44) At: 3s (now+1s)

```
** Event #38  t=2  AODVNetwork.host[17].aodv (Aodv, id=707)  on selfmsg CounterTimer (omne
** Event #39  t=2  AODVNetwork.host[18].aodv (Aodv, id=746)  on selfmsg CounterTimer (omne
** Event #40  t=2  AODVNetwork.host[19].aodv (Aodv, id=785)  on selfmsg CounterTimer (omnetpp::cMessage, id=481)
```

General #0: AODVNetwork Msg stats: 20 scheduled / 504 existing / 504 created

**OUTPUT:**


OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\aodv

last: #385'802 19'291s 000ms 000us 000ns 000ps

Next: CounterTimer (omnetpp::cMessage, id=73) In: AODVNetwork.host[2].aodv (Aodv, id=122) At: 19291s (now+0s)

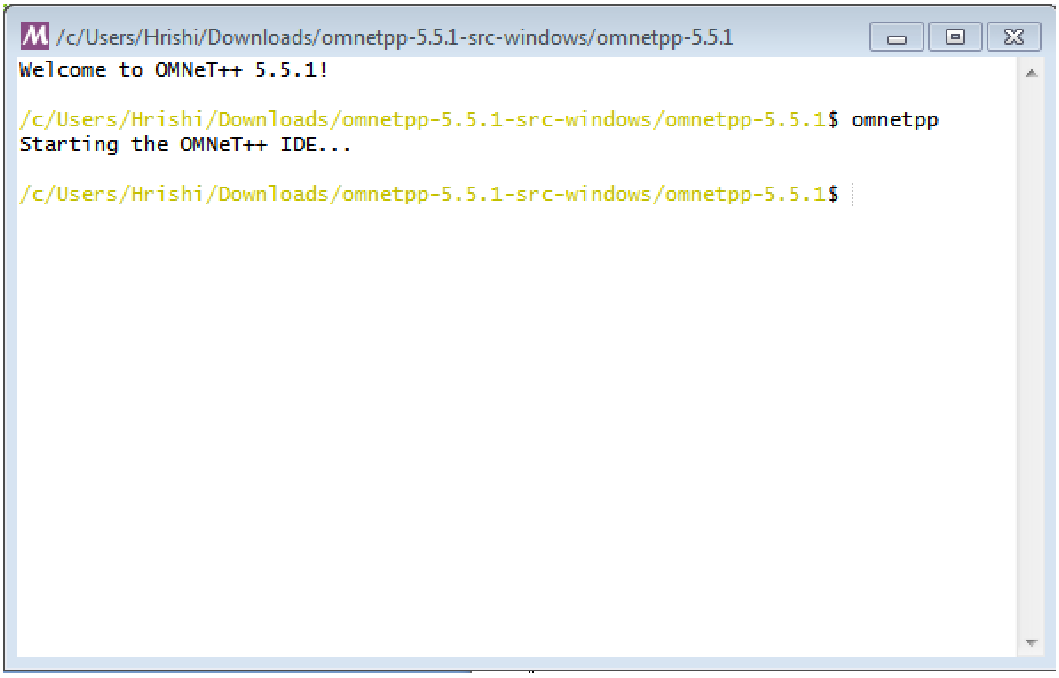
General #0: AODVNetwork Msg stats: 20 scheduled / 504 existing / 504 created

**Conclusion:** We have learnt to MANET simulation for AODVUU Network.

## Practical No. 07

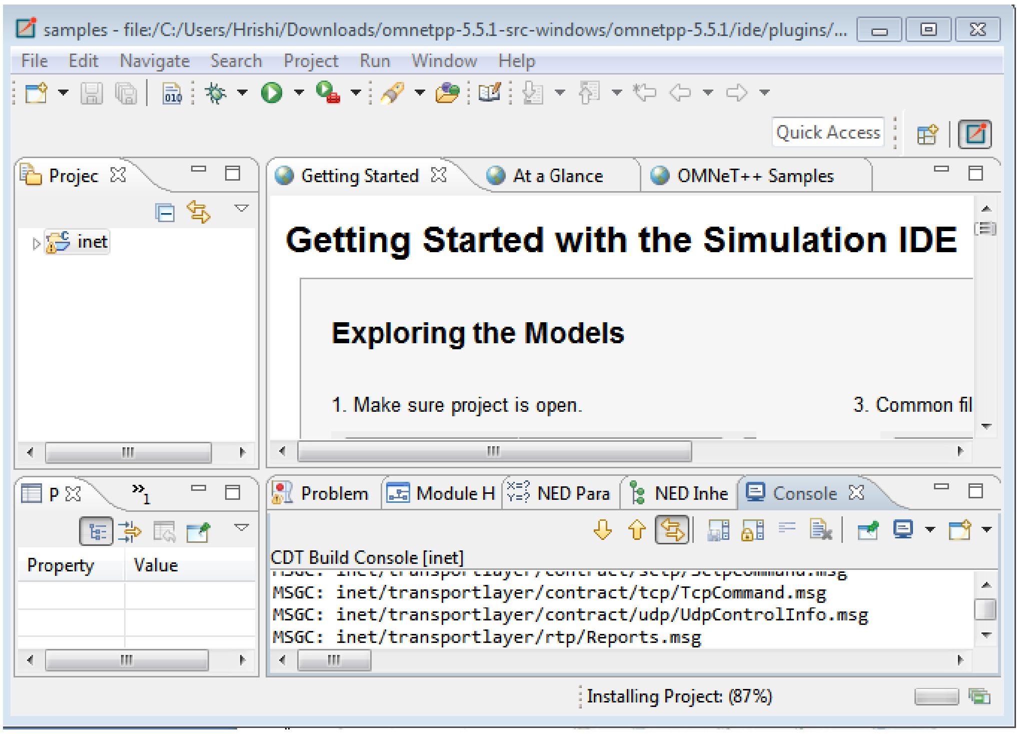
**AIM:** Create Single mobile network.

**Step 1:** Go to omnetpp-5.5.1 folder in which open “mingwenv” file, we get following window. Type “omnetpp” command to open omnet++ IDE.



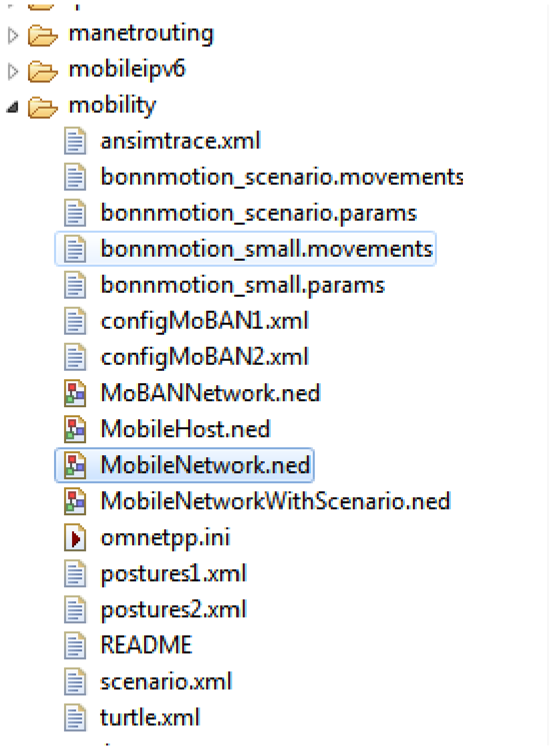
```
Welcome to OMNeT++ 5.5.1!

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$ omnetpp
Starting the OMNeT++ IDE...

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$
```

**Step 2:** after that command, following window will open.


samples - file:/C:/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1/ide/plugins/...
File Edit Navigate Search Project Run Window Help
Quick Access
Projec
inet
Getting Started
At a Glance
OMNeT++ Samples
Getting Started with the Simulation IDE
Exploring the Models
1. Make sure project is open.
3. Common fil
P
Property
Value
Problem
Module H
NED Para
NED Inhe
Console
Installing Project: (87%)

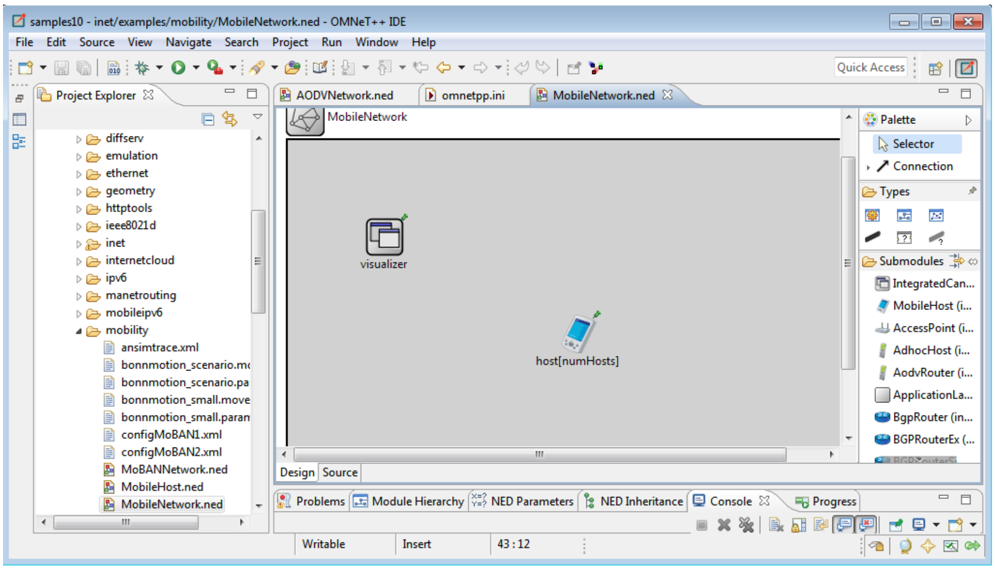
```
CDT Build Console [inet]
MSGC: inet/transportlayer/contract/sctp/SctpCommand.msg
MSGC: inet/transportlayer/contract/tcp/TcpCommand.msg
MSGC: inet/transportlayer/contract/udp/UdpControlInfo.msg
MSGC: inet/transportlayer/rtp/Reports.msg
```

**Step 3:** Go to project Explorer > inet > examples > mobility and open MobileNetwork.ned file.



manetrouting
mobileipv6
mobility
ansimtrace.xml
bonnmotion_scenario.movements
bonnmotion_scenario.params
bonnmotion_small.movements
bonnmotion_small.params
configMoBAN1.xml
configMoBAN2.xml
MoBANNetwork.ned
MobileHost.ned
MobileNetwork.ned
MobileNetworkWithScenario.ned
omnetpp.ini
postures1.xml
postures2.xml
README
scenario.xml
turtle.xml

**MobileNetwork.ned:**



**Coding:**

**MobileNetwork.ned:**

```
package inet.examples.mobility;
import inet.visualizer.integrated.IntegratedCanvasVisualizer;
network MobileNetwork{
    parameters:
        int numHosts;
        bool hasVisualizer = default(false);
        @display("bgb=600,400");
    submodules:
        visualizer: IntegratedCanvasVisualizer if hasVisualizer {
            parameters:
                @display("p=100,100");
        }
        host[numHosts]: MobileHost {
            parameters:
                @display("p=300,200;r=,,#707070");
        }
}
```

**Omnetpp.ini:**

```
[General]
#scheduler-class = "inet::cRealTimeScheduler" #so that speed appears realistic
#debug-on-errors = true
sim-time-limit = 10day
*.numHosts = 2
**.constraintAreaMinX = 0m
**.constraintAreaMinY = 0m
**.constraintAreaMinZ = 0m
**.constraintAreaMaxX = 600m
**.constraintAreaMaxY = 400m
**.constraintAreaMaxZ = 0m
**.updateInterval = 0.1s # test with 0s too, and let getCurrentPosition update the display string
from a test module
**.mobility.initFromDisplayString = false
[Config AnsimMobility]
network = MobileNetwork
**.host*.mobility.typename = "AnsimMobility"
**.host*.mobility.ansimTrace = xmldoc("ansimtrace.xml")
**.host*.mobility.nodeId = -1  #means "host module's index"
[Config BonnMotionMobility1]
network = MobileNetwork
description = "2 hosts"
**.host*.mobility.typename = "BonnMotionMobility"
**.host*.mobility.traceFile = "bonnmotion_small.movements"
**.host*.mobility.nodeId = -1  #means "host module's index"
[Config BonnMotionMobility2]
network = MobileNetwork
description = "100 hosts"
*.numHosts = 100
**.host*.mobility.typename = "BonnMotionMobility"
**.host*.mobility.traceFile = "bonnmotion_scenario.movements"
**.host*.mobility.nodeId = -1  #means "host module's index"
[Config ChiangMobility]
network = MobileNetwork
*.numHosts = 1
**.host*.mobility.typename = "ChiangMobility"
**.host*.mobility.stateTransitionUpdateInterval = 3s
**.host*.mobility.speed = 10mps
[Config CircleMobility1]
network = MobileNetwork
*.numHosts = 3
**.host*.mobility.typename = "CircleMobility"
```

```
**.host*.mobility.cx = 200m
**.host*.mobility.cy = 200m
**.host*.mobility.r = 150m
**.host*.mobility.speed = 40mps
**.host[0].mobility.startAngle = 0deg
**.host[1].mobility.startAngle = 120deg
**.host[2].mobility.startAngle = 240deg
[Config CircleMobility2]
network = MobileNetwork
*.numHosts = 3
**.host*.mobility.typename = "CircleMobility"
**.host[0].mobility.cx = 100m
**.host[1].mobility.cx = 300m
**.host[2].mobility.cx = 500m
**.host*.mobility.cy = 200m
**.host*.mobility.r = 150m
**.host*.mobility.speed = 40mps
**.host*.mobility.startAngle = 0deg
[Config GaussMarkovMobility]
network = MobileNetwork
*.numHosts = 1
**.host*.mobility.typename = "GaussMarkovMobility"
**.host*.mobility.alpha = 0.9
**.host*.mobility.speed = 10mps
**.host*.mobility.angle = 0deg
**.host*.mobility.variance = 40
**.host*.mobility.margin = 30m
[Config LinearMobility]
network = MobileNetwork
**.host*.mobility.typename = "LinearMobility"
**.host*.mobility.initFromDisplayString = false
**.host*.mobility.speed = 50mps
**.host*.mobility.angle = 30deg  # degrees
[Config LinearMobility01]
extends = LinearMobility
**.updateInterval = 0.1s
[Config LinearMobility1]
extends = LinearMobility
**.updateInterval = 1s
[Config LinearMobility10]
extends = LinearMobility
**.updateInterval = 10s
[Config LinearMobility100]
extends = LinearMobility
**.updateInterval = 100s
[Config LinearMobility1000]
extends = LinearMobility
**.updateInterval = 1000s
[Config MassMobility]
network = MobileNetwork
*.numHosts = 5
**.host*.mobility.typename = "MassMobility"
**.host*.mobility.initFromDisplayString = false
**.host*.mobility.changeInterval = truncnormal(2s, 0.5s)
```

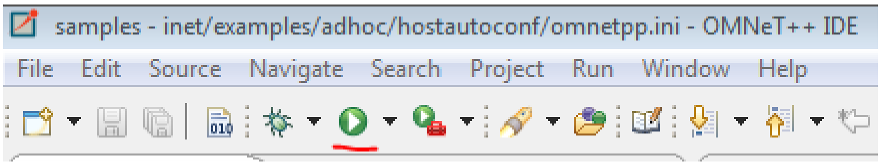
```
**.host*.mobility.angleDelta = normal(0deg, 30deg)
**.host*.mobility.speed = truncnormal(15mps, 5mps)
[Config MassMobilityWithScenario]
network = MobileNetworkWithScenario
*.numHosts = 5
**.host*.mobility.typename = "MassMobility"
**.host*.mobility.initFromDisplayString = false
**.host*.mobility.changeInterval = truncnormal(2s, 0.5s)
**.host*.mobility.angleDelta = normal(0deg, 30deg)
**.host*.mobility.speed = truncnormal(15mps, 5mps)
**.scenarioManager.script = xmldoc("scenario.xml")
[Config MoBANMobility1]
network = MoBANNetwork
**.constraintAreaMaxX = 1000m
**.constraintAreaMaxY = 1000m
**.constraintAreaMaxZ = 1000m
**.numNodes = 12
**.numMoBAN = 1
**.coordinator[*].postureSpecFile = xmldoc("postures1.xml")
**.coordinator[*].configFile = xmldoc("configMoBAN1.xml")
**.coordinator[*].useMobilityPattern = false
**.coordinator[0].mobilityPatternFile = "MoBAN_Pattern_in0.txt"
**.node[*].mobility.typename = "MoBanLocal"
**.node[*].mobility.coordinatorIndex = 0
[Config MoBANMobility2]
network = MoBANNetwork
**.constraintAreaMaxX = 1000m
**.constraintAreaMaxY = 1000m
**.constraintAreaMaxZ = 1000m
**.numNodes = 24
**.numMoBAN = 2
**.coordinator[*].postureSpecFile = xmldoc("postures1.xml")
**.coordinator[*].configFile = xmldoc("configMoBAN2.xml")
**.coordinator[*].useMobilityPattern = false
**.coordinator[*].mobilityPatternFile = ""
**.node[*].mobility.typename = "MoBanLocal"
**.node[0..11].mobility.coordinatorIndex = 0
**.node[12..23].mobility.coordinatorIndex = 1
[Config RandomWaypointMobility1]
description = "zero waitTime"
network = MobileNetwork
*.numHosts = 5
**.host*.mobility.typename = "RandomWaypointMobility"
**.host*.mobility.initFromDisplayString = false
**.host[0].mobility.speed = 10*uniform(20mps,50mps)
**.host*.mobility.speed = uniform(20mps,50mps)
[Config RandomWaypointMobility2]
description = "nonzero waitTime"
extends = RandomWaypointMobility1
**.host*.mobility.waitTime = uniform(3s,8s)
[Config RectangleMobility]
network = MobileNetwork
**.host*.mobility.typename = "RectangleMobility"
**.host*.mobility.constraintAreaMinX = 100m
```

```
**.host*.mobility.constraintAreaMinY = 100m
**.host*.mobility.constraintAreaMaxX = 500m
**.host*.mobility.constraintAreaMaxY = 300m
#**.host*.mobility.x1 = 100
#**.host*.mobility.y1 = 100
#**.host*.mobility.x2 = 500
#**.host*.mobility.y2 = 300
**.host[0].mobility.startPos = 0
**.host[1].mobility.startPos = 2.5
**.host[0].mobility.speed = 20mps
**.host[1].mobility.speed = -10mps
[Config StaticGridMobility]
network = MobileNetwork
*.numHosts = 20
**.host*.mobility.typename = "StaticGridMobility"
**.host*.mobility.marginX = 100m
**.host*.mobility.marginY = 100m
**.host*.mobility.numHosts = 20
[Config StationaryMobility]
network = MobileNetwork
*.numHosts = 3
**.host*.mobility.typename = "StationaryMobility"
# place it at a fixed position:
**.host[0].mobility.initialX = 50m
**.host[0].mobility.initialY = 200m
**.host[0].mobility.initFromDisplayString = false
# the second node is using the display string position (or placed randomly if position is not
present in display string)
**.host[1].mobility.initFromDisplayString = true
# place it at a random position:
**.host[2].mobility.initFromDisplayString = false
[Config TractorMobility]
network = MobileNetwork
*.numHosts = 1
**.host*.mobility.typename = "TractorMobility"
**.host*.mobility.x1 = 100m
**.host*.mobility.y1 = 100m
**.host*.mobility.x2 = 500m
**.host*.mobility.y2 = 300m
**.host*.mobility.rowCount = 4
**.host*.mobility.speed = 50mps
[Config TurtleMobility1]
network = MobileNetwork
description = "square"
*.numHosts = 1
**.host*.mobility.typename = "TurtleMobility"
**.host*.mobility.turtleScript = xmldoc("turtle.xml", "movements//movement[@id='1']")
[Config TurtleMobility2]
network = MobileNetwork
description = "two squares"
*.numHosts = 1
**.host*.mobility.typename = "TurtleMobility"
**.host*.mobility.turtleScript = xmldoc("turtle.xml", "movements//movement[@id='2']")
[Config TurtleMobility3]
```

```
network = MobileNetwork
description = "random waypoint"
*.numHosts = 2
**.host*.mobility.typename = "TurtleMobility"
**.host*.mobility.turtleScript = xmldoc("turtle.xml", "movements//movement[@id='3']")
[Config TurtleMobility4]
network = MobileNetwork
description = "mass+reflect"
*.numHosts = 2
**.host*.mobility.typename = "TurtleMobility"
**.host*.mobility.turtleScript = xmldoc("turtle.xml", "movements//movement[@id='4']")
[Config TurtleMobility5]
network = MobileNetwork
description = "mass+wrap"
*.numHosts = 2
**.host*.mobility.typename = "TurtleMobility"
**.host*.mobility.turtleScript = xmldoc("turtle.xml", "movements//movement[@id='5']")
[Config TurtleMobility6]
network = MobileNetwork
description = "mass+placerandomly"
*.numHosts = 2
**.host*.mobility.typename = "TurtleMobility"
**.host*.mobility.turtleScript = xmldoc("turtle.xml", "movements//movement[@id='6']")
[Config AttachedMobility]
network = MobileNetwork
description = "attached"
*.numHosts = 3
# mobility visualizer shows velocity and orientation
*.hasVisualizer = true
*.visualizer.mobilityVisualizer.moduleFilter = "**.mobility" # filter for host mobilities, ignore
mobility superposition elements
*.visualizer.mobilityVisualizer.displayMovementTrails = true
*.visualizer.mobilityVisualizer.displayOrientations = true
*.visualizer.mobilityVisualizer.displayVelocities = true
# other hosts are also moving around in a larger circle following host[0]
**.host[0].mobility.typename = "CircleMobility"
**.host[0].mobility.cx = 300m
**.host[0].mobility.cy = 200m
**.host[0].mobility.r = 150m
**.host[0].mobility.speed = 40mps
# other hosts are also moving around in a larger circle following host[0]
**.host[*].mobility.typename = "AttachedMobility"
**.host[*].mobility.mobilityModule = "^.^.host[0].mobility"
**.host[1].mobility.offsetX = 50m
**.host[1].mobility.offsetHeading = 90deg
**.host[2].mobility.offsetX = -50m
**.host[2].mobility.offsetHeading = -90deg
[Config SuperpositioningMobility]
network = MobileNetwork
description = "superpositioning"
*.numHosts = 8
# mobility visualizer shows velocity and orientation
*.hasVisualizer = true
```

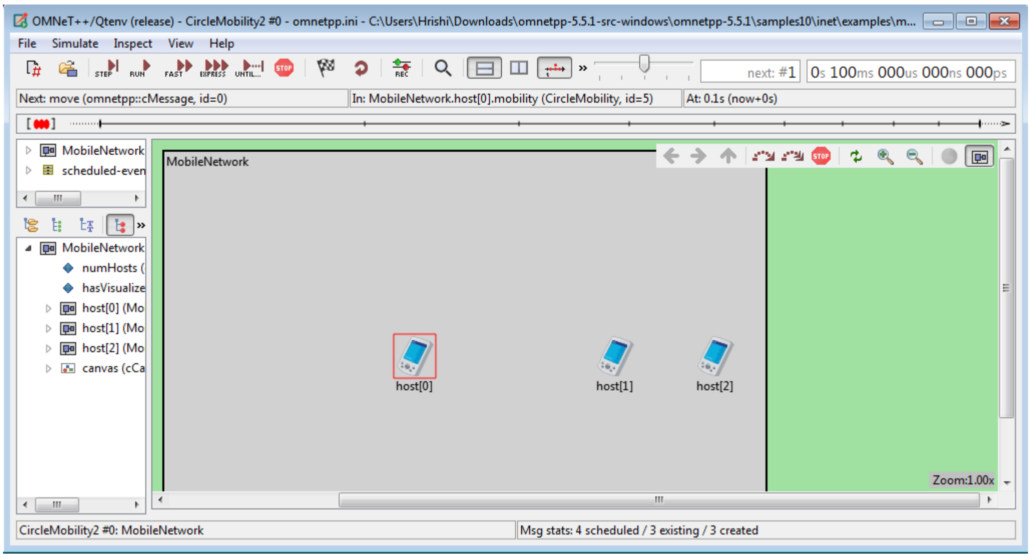
```
*.visualizer.mobilityVisualizer.moduleFilter = "**.mobility" # filter for host mobilities, ignore mobility superposition elements
*.visualizer.mobilityVisualizer.displayMovementTrails = true
*.visualizer.mobilityVisualizer.displayOrientations = true
*.visualizer.mobilityVisualizer.displayVelocities = true
# last host stays in the center of the scene
**.host[7].mobility.typename = "StationaryMobility"
**.host[7].mobility.initialX = 300m
**.host[7].mobility.initialY = 200m
**.host[7].mobility.initialZ = 0m
# other hosts move around the scene using mobility superpositon
**.host[*].mobility.typename = "SuperpositioningMobility"
**.host[*].mobility.numElements = 4
# other hosts are intiallly positioned in static concentric circles
**.host[*].mobility.element[0].typename = "StaticConcentricMobility"
**.host[*].mobility.element[0].subjectModule = "^.^"
**.host[*].mobility.element[0].numHosts = 7
# other hosts are also moving around in a larger circle following host[0]
**.host[0].mobility.element[1].typename = "CircleMobility"
**.host[0].mobility.element[1].faceForward = false
**.host[0].mobility.element[1].cx = 300m
**.host[0].mobility.element[1].cy = 200m
**.host[0].mobility.element[1].r = 150m
**.host[0].mobility.element[1].speed = 40mps
**.host[*].mobility.element[1].typename = "AttachedMobility" # other hosts follow the movement of the 2nd element of host[0]'s mobility superposition
**.host[*].mobility.element[1].mobilityModule = "^.^.^.host[0].mobility.element[1]"
# other hosts are also slightly moving randomly around their position in the group
**.host[*].mobility.element[2].typename = "MassMobility"
**.host[*].mobility.element[2].faceForward = false
**.host[*].mobility.element[2].initFromDisplayString = false
**.host[*].mobility.element[2].initialX = 0m
**.host[*].mobility.element[2].initialY = 0m
**.host[*].mobility.element[2].initialZ = 0m
**.host[*].mobility.element[2].constraintAreaMinX = 0m
**.host[*].mobility.element[2].constraintAreaMinY = 0m
**.host[*].mobility.element[2].constraintAreaMaxX = 50m # limiting the random movement
**.host[*].mobility.element[2].constraintAreaMaxY = 50m # limiting the random movement
**.host[*].mobility.element[2].changeInterval = truncnormal(2s, 1s)
**.host[*].mobility.element[2].angleDelta = normal(0deg, 30deg)
**.host[*].mobility.element[2].speed = truncnormal(10mps, 3mps)
# other hosts are facing towards the last host sitting in the center
**.host[*].mobility.element[3].typename = "FacingMobility"
**.host[*].mobility.element[3].initFromDisplayString = false
**.host[*].mobility.element[3].initialX = 0m
**.host[*].mobility.element[3].initialY = 0m
**.host[*].mobility.element[3].initialZ = 0m
**.host[*].mobility.element[3].sourceMobility = "^" # the superposition is the source
**.host[*].mobility.element[3].targetMobility = "^.^.^.host[7].mobility" # last host is the target
```

**Step 4:** Click on Run button.



samples - inet/examples/adhoc/hostautoconf/omnetpp.ini - OMNeT++ IDE

**Step 5:** After that following window will open.



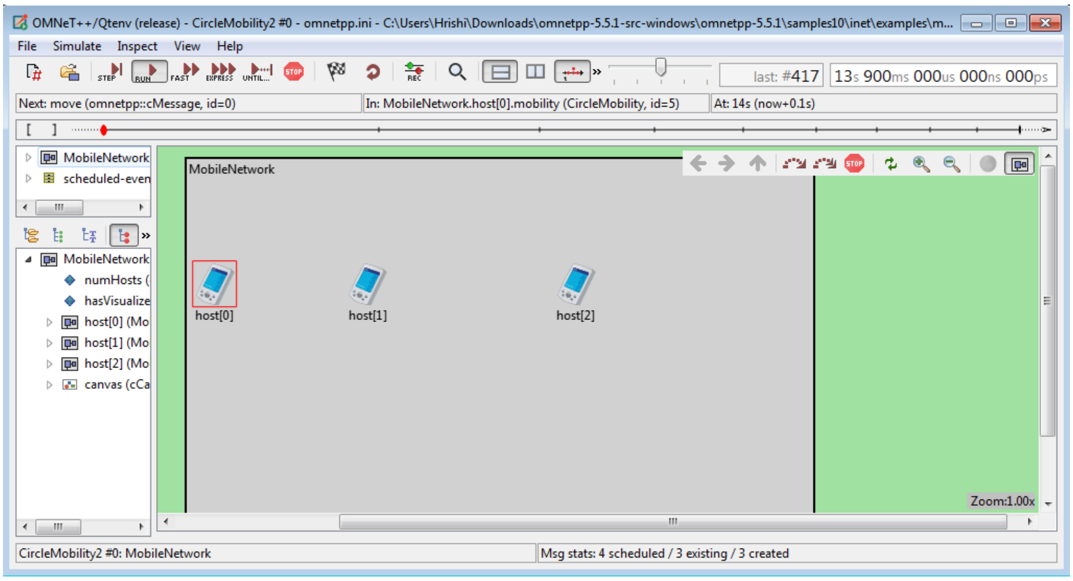
OMNeT++/Qtenv (release) - CircleMobility2 #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\m...

next: #1 | 0s 100ms 000us 000ns 000ps

Next: move (omnetpp::cMessage, id=0) | In: MobileNetwork.host[0].mobility (CircleMobility, id=5) | At: 0.1s (now+0s)

CircleMobility2 #0: MobileNetwork | Msg stats: 4 scheduled / 3 existing / 3 created

**Step 6:** Click on RUN.



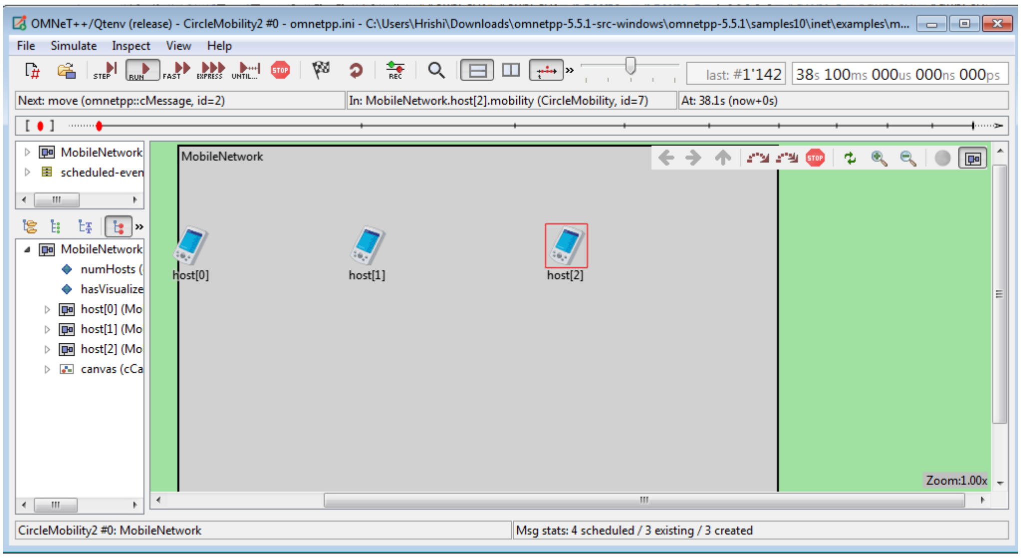
OMNeT++/Qtenv (release) - CircleMobility2 #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\m...

last: #417 | 13s 900ms 000us 000ns 000ps

Next: move (omnetpp::cMessage, id=0) | In: MobileNetwork.host[0].mobility (CircleMobility, id=5) | At: 14s (now+0.1s)

CircleMobility2 #0: MobileNetwork | Msg stats: 4 scheduled / 3 existing / 3 created

## OUTPUT:


OMNeT++/Qtenv (release) - CircleMobility2 #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\m...

last: #1'142

38s 100ms 000us 000ns 000ps

Next: move (omnetpp::cMessage, id=2)

In: MobileNetwork.host[2].mobility (CircleMobility, id=7)

At: 38.1s (now+0s)

CircleMobility2 #0: MobileNetwork

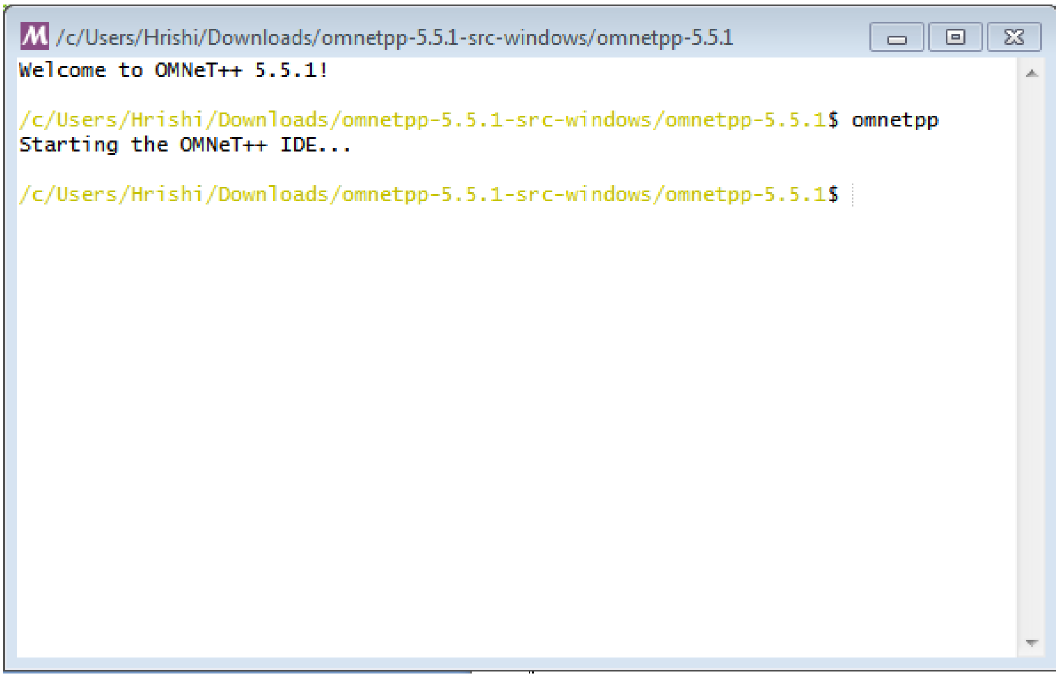
Msg stats: 4 scheduled / 3 existing / 3 created

**Conclusion:** We have learnt to create a simple Single mobile network.

# Practical No. 08

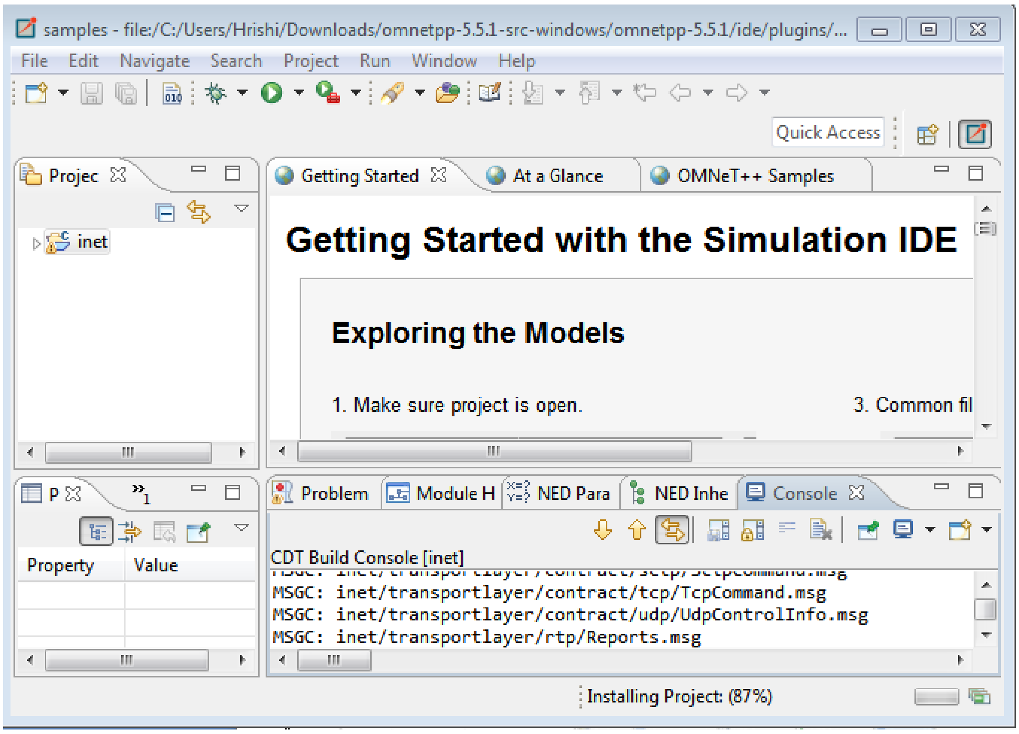
**AIM:** Create wireless network in OMNET++.

**Step 1:** Go to omnetpp-5.5.1 folder in which open “mingwenv” file, we get following window. Type “omnetpp” command to open omnet++ IDE.



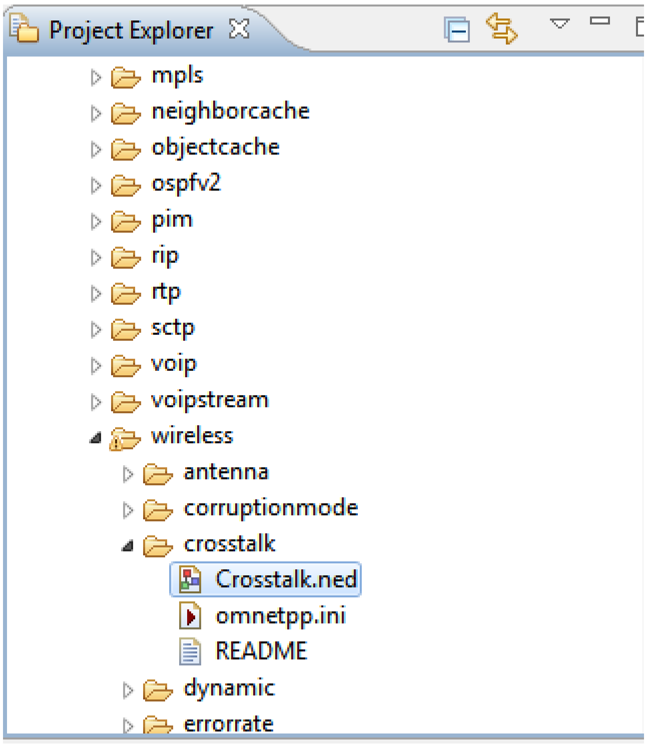
```
Welcome to OMNeT++ 5.5.1!

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$ omnetpp
Starting the OMNeT++ IDE...

/c/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1$
```

**Step 2:** after that command, following window will open.

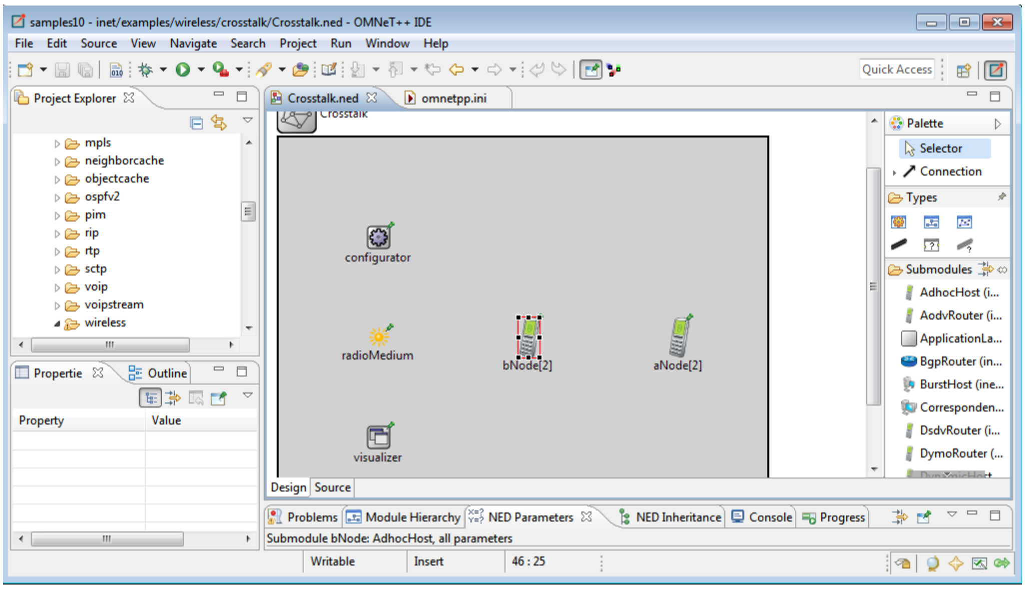

samples - file:/C:/Users/Hrishi/Downloads/omnetpp-5.5.1-src-windows/omnetpp-5.5.1/ide/plugins/...
File Edit Navigate Search Project Run Window Help
Quick Access
Projec
inet
Getting Started
At a Glance
OMNeT++ Samples
Getting Started with the Simulation IDE
Exploring the Models
1. Make sure project is open.
3. Common fil
P
Property
Value
Problem
Module H
NED Para
NED Inhe
Console
Installing Project: (87%)

```
CDT Build Console [inet]
MSGC:  inet/transportlayer/contract/tcp/TcpCommand.msg
MSGC:  inet/transportlayer/contract/udp/UdpControlInfo.msg
MSGC:  inet/transportlayer/rtp/Reports.msg
```

**Step 3:** Go to project Explorer > inet > examples > wireless > crosswalk and open Crosstalk.ned file.



## Crosstalk.ned:



Submodule bNode: AdhocHost, all parameters

## Coding:

## Crosstalk.ned:

```
package inet.examples.wireless.crosstalk;
import inet.networklayer.configurator.ipv4.Ipv4NetworkConfigurator;
import inet.node.inet.AdhocHost;
import inet.physicallayer.ieee80211.packetlevel.Ieee80211DimensionalRadioMedium;
import inet.visualizer.contract.IIntegratedVisualizer;
network Crosstalk
```

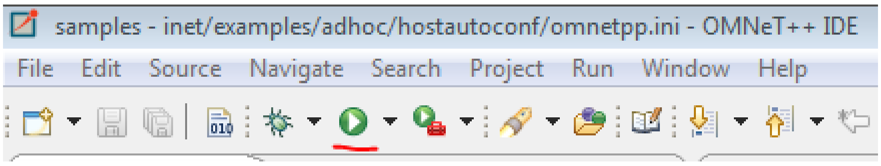
```
{
   parameters:
   submodules:
      visualizer: <default("IntegratedCanvasVisualizer")> like IIntegratedVisualizer if
hasVisualizer() {
         parameters:
            @display("p=100,300;is=s");
      }
      configurator: Ipv4NetworkConfigurator {
         parameters:
            @display("p=100,100;is=s");
      }
      radioMedium: Ieee80211DimensionalRadioMedium {
         parameters:
            @display("p=100,200;is=s");
      }
      aNode[2]: AdhocHost {
         parameters:
            @display("r=,,#707070;p=400,200");
      }
      bNode[2]: AdhocHost {
         parameters:
            @display("r=,,#707070;p=250,200");
      }
}
```

**Omnetpp.ini:**

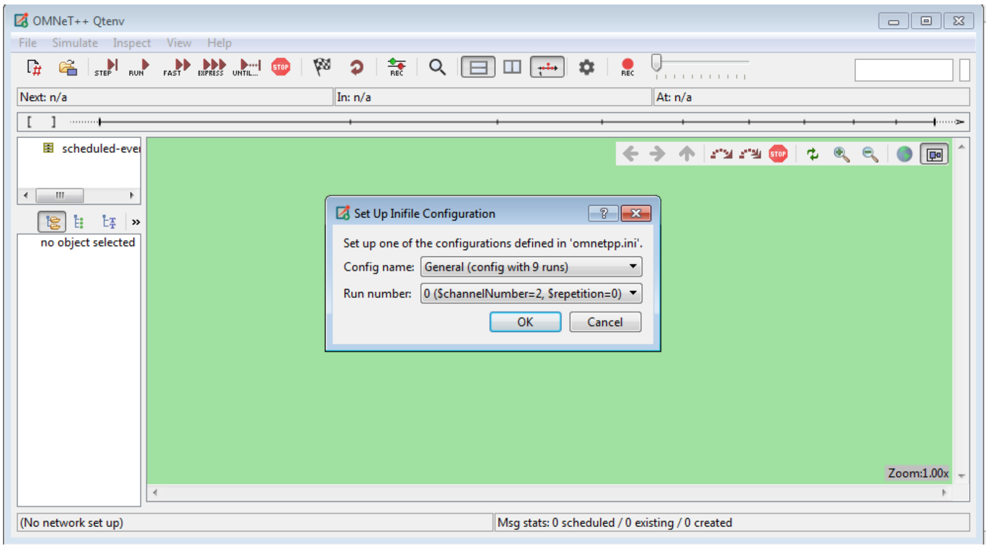
```
[General]
network = Crosstalk
#record-eventlog = true
sim-time-limit = 0.1s
seed-set = 1
**.constraintAreaMinX = 0m
**.constraintAreaMinY = 0m
**.constraintAreaMinZ = 0m
**.constraintAreaMaxX = 100m
**.constraintAreaMaxY = 100m
**.constraintAreaMaxZ = 0m
# mobility
*.*Node[*].mobility.typename = "StationaryMobility"
*.*Node[*].mobility.initFromDisplayString = false
# udp App
*.*Node[*].numApps = 1
*.*Node[0].app[0].typename = "UdpSink"
*.*Node[*].app[0].typename = "UdpBasicApp"
*.*Node[*].app[0].localPort = 100
*.*Node[*].app[0].destPort = 100
*.*Node[*].app[0].messageLength = 1250B
*.*Node[*].app[0].startTime = exponential(100us)
*.*Node[*].app[0].sendInterval = exponential(100us)
*.aNode[*].app[0].destAddresses = "aNode[0]"
*.bNode[*].app[0].destAddresses = "bNode[0]"
```

```
# nic
*.*Node[*].wlan[*].radio.typename = "Ieee80211DimensionalRadio"

# medium
*.radioMedium.backgroundNoise.dimensions = "time frequency"
# radio
*.*Node[*].wlan[*].radio.transmitter.bandwidth = 20 MHz
*.*Node[*].wlan[*].radio.receiver.bandwidth = 20 MHz
*.*Node[*].wlan[*].radio.transmitter.dimensions = "time frequency"
*.aNode[*].wlan[*].radio.channelNumber = 1
*.bNode[*].wlan[*].radio.channelNumber = ${channelNumber=2..10}
```

**Step 4:** Click on Run button.


samples - inet/examples/adhoc/hostautoconf/omnetpp.ini - OMNeT++ IDE
File Edit Source Navigate Search Project Run Window Help

**Step 5:** After that following window will open.


OMNeT++ Qtenv
File Simulate Inspect View Help
STEP RUN FAST EXPRESS UNTIL STOP REC
scheduled-eve
no object selected
Zoom:1.00x

Next: n/a

In: n/a

At: n/a

Set Up Inifile Configuration

Set up one of the configurations defined in 'omnetpp.ini'.

Config name: General (config with 9 runs)

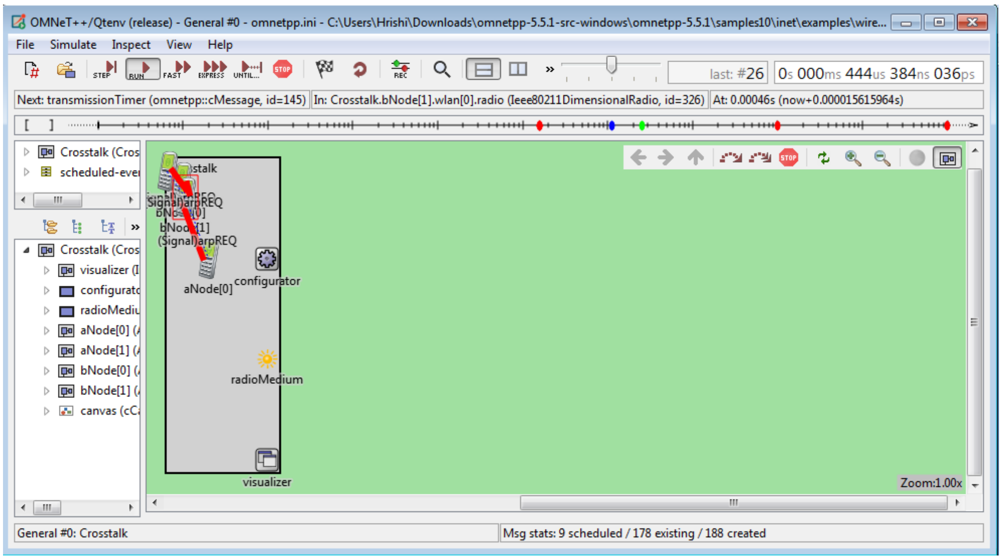
Run number: 0 ($channelNumber=2, $repetition=0)

OK Cancel

(No network set up)

Msg stats: 0 scheduled / 0 existing / 0 created

**Step 6:** Click OK and then Click on RUN.



OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\wire...

last: #26 0s 000ms 444us 384ns 036ps

Next: transmissionTimer (omnetpp::cMessage, id=145)

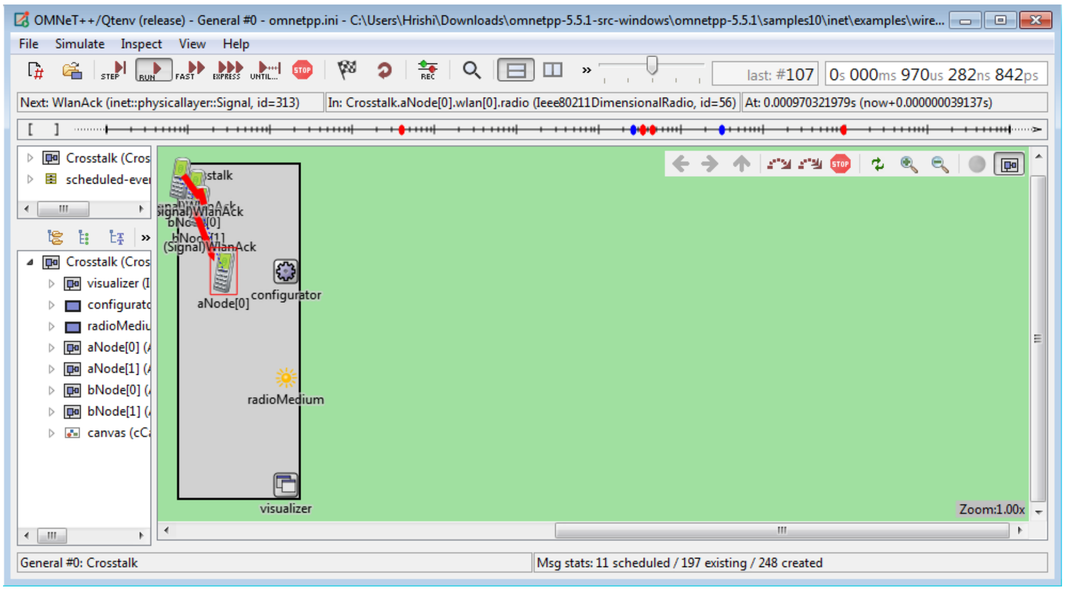
In: Crosstalk.bNode[1].wlan[0].radio (Ieee80211DimensionalRadio, id=326)

At: 0.00046s (now+0.000015615964s)

General #0: Crosstalk

Msg stats: 9 scheduled / 178 existing / 188 created

## OUTPUT:

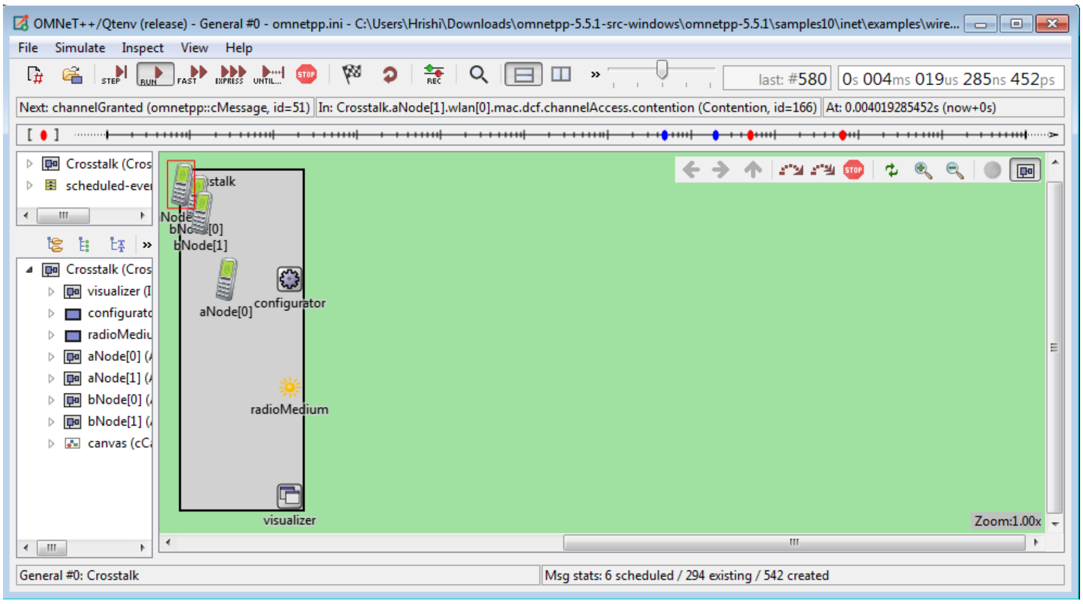


OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\wire...

last: #107 0s 000ms 970us 282ns 842ps

Next: WlanAck (inet::physicallayer::Signal, id=313) | In: Crosstalk.aNode[0].wlan[0].radio (Ieee80211DimensionalRadio, id=56) | At: 0.000970321979s (now+0.000000039137s)

General #0: Crosstalk | Msg stats: 11 scheduled / 197 existing / 248 created



OMNeT++/Qtenv (release) - General #0 - omnetpp.ini - C:\Users\Hrishi\Downloads\omnetpp-5.5.1-src-windows\omnetpp-5.5.1\samples10\inet\examples\wire...

last: #580 0s 004ms 019us 285ns 452ps

Next: channelGranted (omnetpp::cMessage, id=51) | In: Crosstalk.aNode[1].wlan[0].mac.dcf.channelAccess.contention (Contention, id=166) | At: 0.004019285452s (now+0s)

General #0: Crosstalk | Msg stats: 6 scheduled / 294 existing / 542 created

**Conclusion:** We have learnt to wireless network in OMNET++.