College Network using EIGRP

EIGRP Overview

EIGRP is a Cisco proprietary routing protocol loosely based on their original IGRP (Interior Routing Protocol). EIGRP is an advanced distance-vector routing protocol, it can only use it in an all-Cisco network, but EIGRP more than makes up for this deficiency by being easy to configure, fast, and reliable.

Like RIP, EIGRP is based on a distance vector algorithm that determines the best path to a destination. But EIGRP uses a more complex metric than RIP's simple hop count. The EIGRP metric is based on the minimum bandwidth and net delay along each possible path, which means that EIGRP can accommodate larger networks than RIP.

Cisco included so many useful features such as automatic two-way redistribution that make the migration from IGRP to EIGRP relatively straightforward.

EIGRP operates very efficiently over large networks. It achieves this efficiency in part by sending non-periodic updates. This means that, unlike RIP, EIGRP only distributes information about routes that have changed, and only when there is a change to report. The rest of the time, routers only exchange small "Hello" packets to verify that routing peers are still available. So, in a relatively stable network, EIGRP uses very little bandwidth. This is especially useful in WAN configurations.

It is also extremely efficient over LAN portions of a network. On each network segment, routers exchange routing information using multicast packets, which helps to limit bandwidth usage on segments that hold many routers.

Every router in an EIGRP network includes a topology table, which is a central feature of the DUAL algorithm. Every time a router receives a new piece of routing information from one of its neighbors, it updates the topology table. This helps to give it a reliable and up-to-date image of all of the connections in the network that are currently in use. Every destination subnet known to EIGRP appears in the topology table.

EIGRP includes many of the features such as Classless Inter-Domain Routing (CIDR) and Variable Length Subnet Masks (VLSM) that are needed in larger networks.

Features of EIGRP

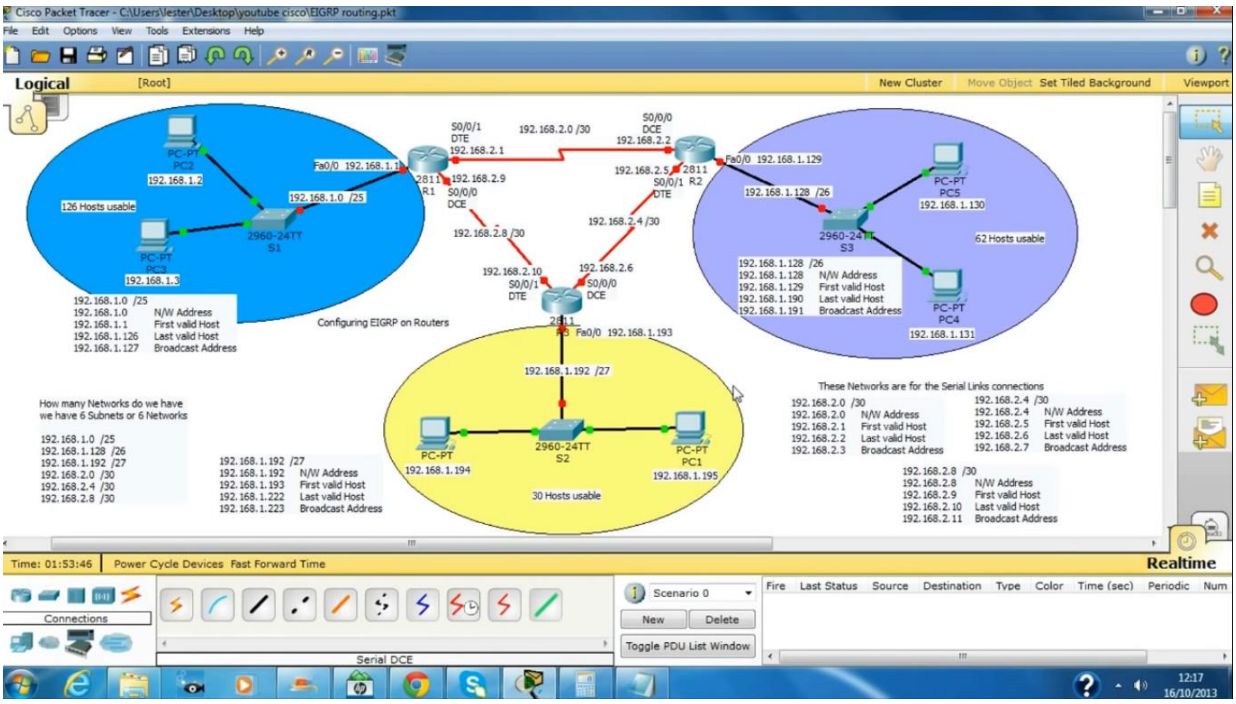
EIGRP is an advanced distance vector or hybrid routing protocol that includes the following features:

Rapid convergence: EIGRP uses the Diffusing Update Algorithm (DUAL) to achieve rapid convergence. A router that uses EIGRP stores all available backup routes for destinations so that it can quickly adapt to alternate routes. If no appropriate route or backup route exists in the local routing table, EIGRP queries its neighbors to discover an alternate route.
Reduced bandwidth usage: EIGRP does not make periodic updates. Instead, it sends partial updates when the path or the metric changes for that route. When path information changes, DUAL sends an update about only that link rather than about the entire table.
Classless routing: Because EIGRP is a classless routing protocol, it advertises a routing mask for each destination network. The routing mask feature enables EIGRP to support discontiguous subnetworks and variable-length subnet masks (VLSM).
Multiple network layer support: EIGRP supports AppleTalk, IP version 4 (IPv4), IP version 6 (IPv6), and Novell Internetwork Packet Exchange (IPX), which use protocol-dependent modules (PDM). PDMs are responsible for protocol requirements that are specific to the network layer.
Less overhead: EIGRP uses multicast and unicast rather than broadcast. As a result, end stations are unaffected by routing updates and requests for topology information.
Load balancing: EIGRP supports unequal metric load balancing, which allows administrators to better distribute traffic flow in their networks.
Easy summarization: EIGRP enables administrators to create summary routes anywhere within the network rather than rely on the traditional distance vector approach of performing classful route summarization only at major network boundaries.

Software used: cisco packet tracer

Procedure :

First create a network as shown in the below screenshot



To configure EIGRP on a network use the following command

```
Configuration:-
-----------------------------------------------
For class full addresses:-

R1>enable
R1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router eigrp 1
R1(config-router)#network <I.P address>
R1(config-router)#network <I.P address>
R1(config-router)#network <I.P address>
R1(config-router)#
R1(config-router)#exit
R1(config)#
R1#

R1#copy running-config startup-config


For class-less address:-


R1(config)#router eigrp 1
R1(config-router)#network <I.P address> <Wildcard mask>
R1(config-router)#network <I.P address> <Wildcard mask>
R1(config-router)#network <I.P address> <Wildcard mask>
R1(config-router)#no auto-summary
R1(config-router)#exit
R1(config)#
```

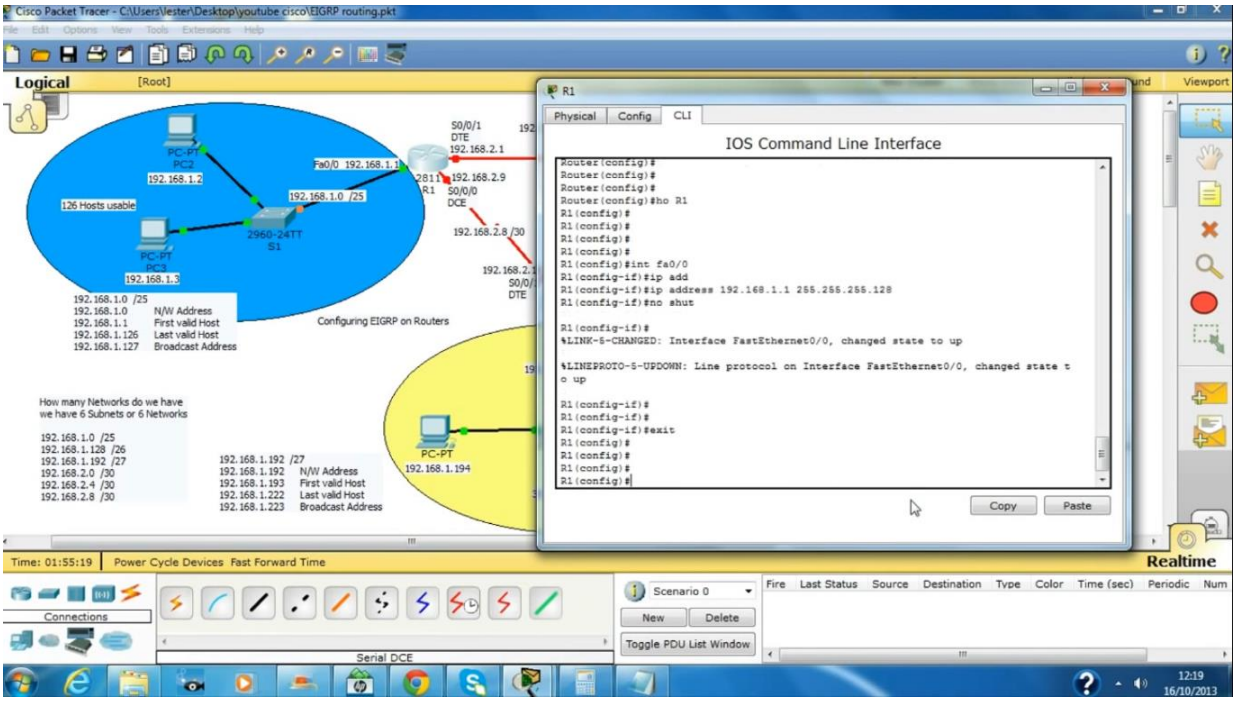
```
show ip eigrp neighbors : to ckeck neighbor table
show ip eigrp topology  : to check topology table
show ip route           : to check routing table
```

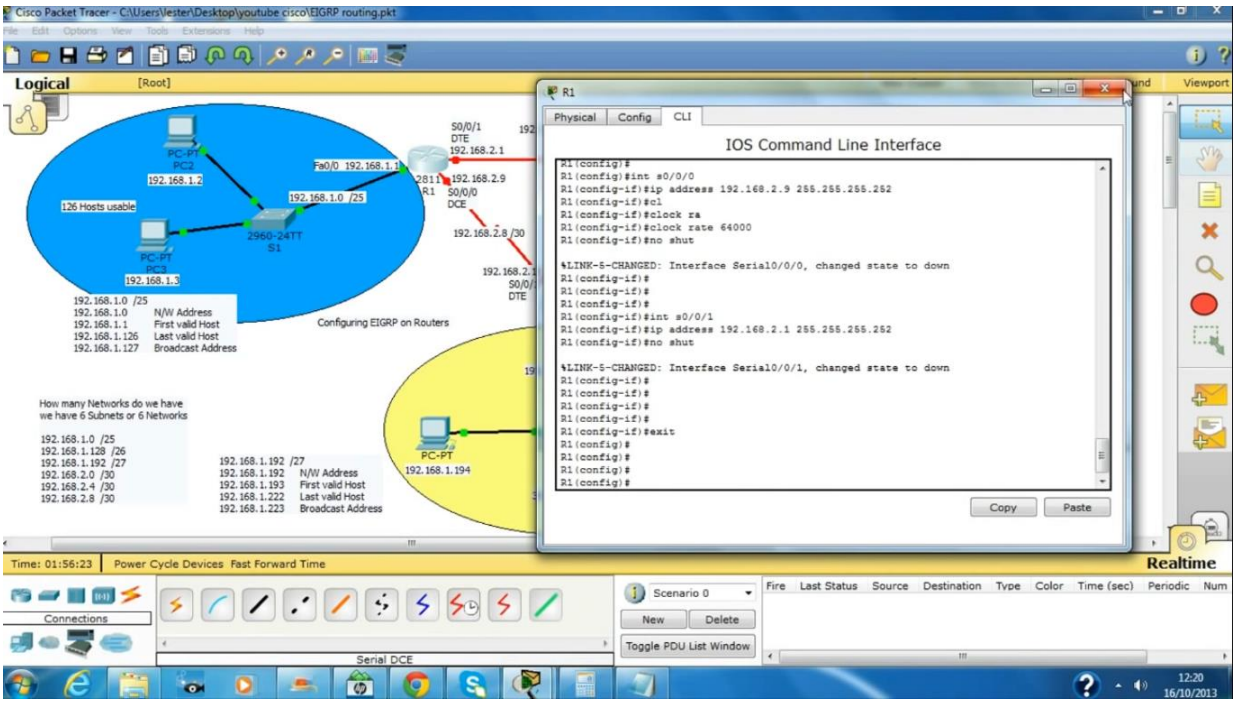
```
debug eigrp packets : to check hello events
```

debug ip rip : hello events in RIP

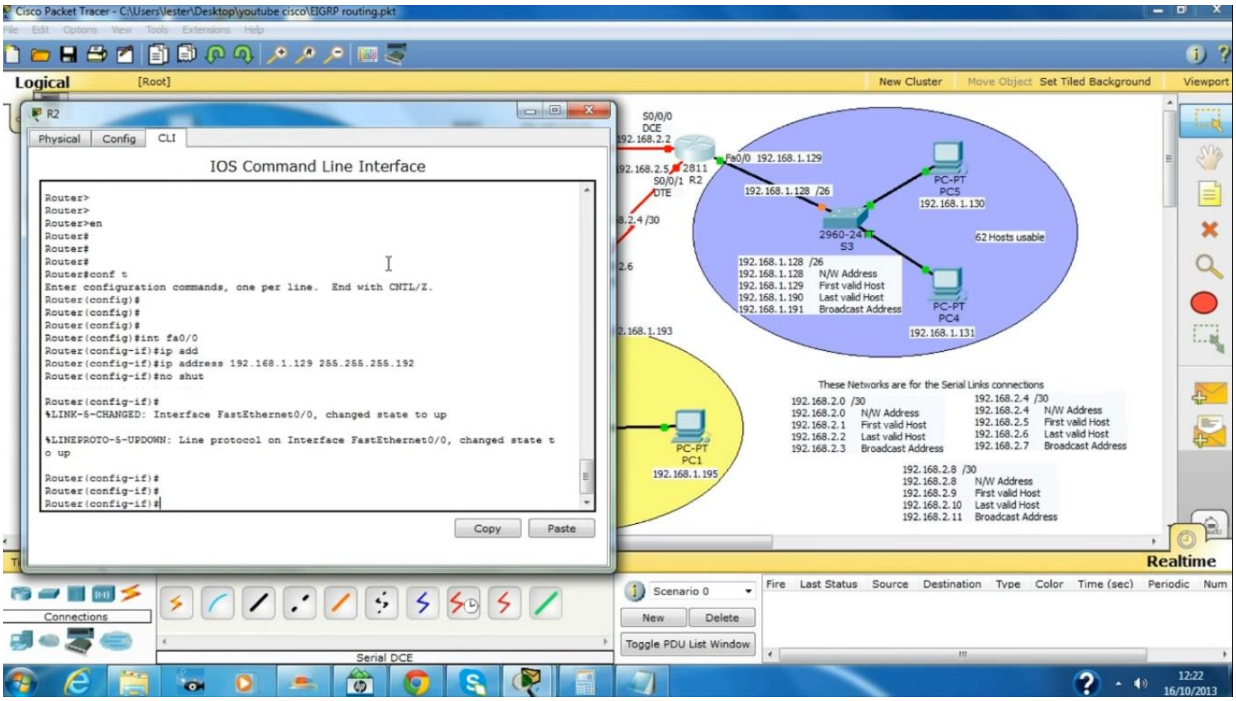
as shown in the above commands I have done the same in the below screen shots

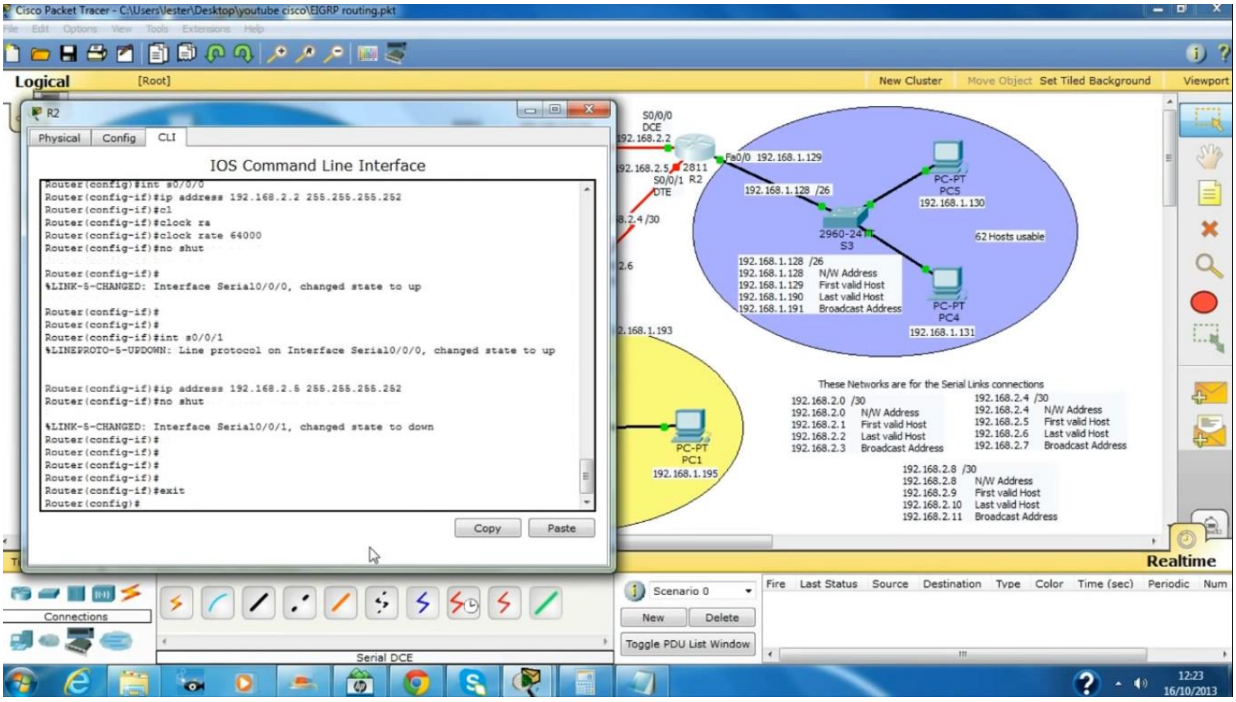
configuring the first router

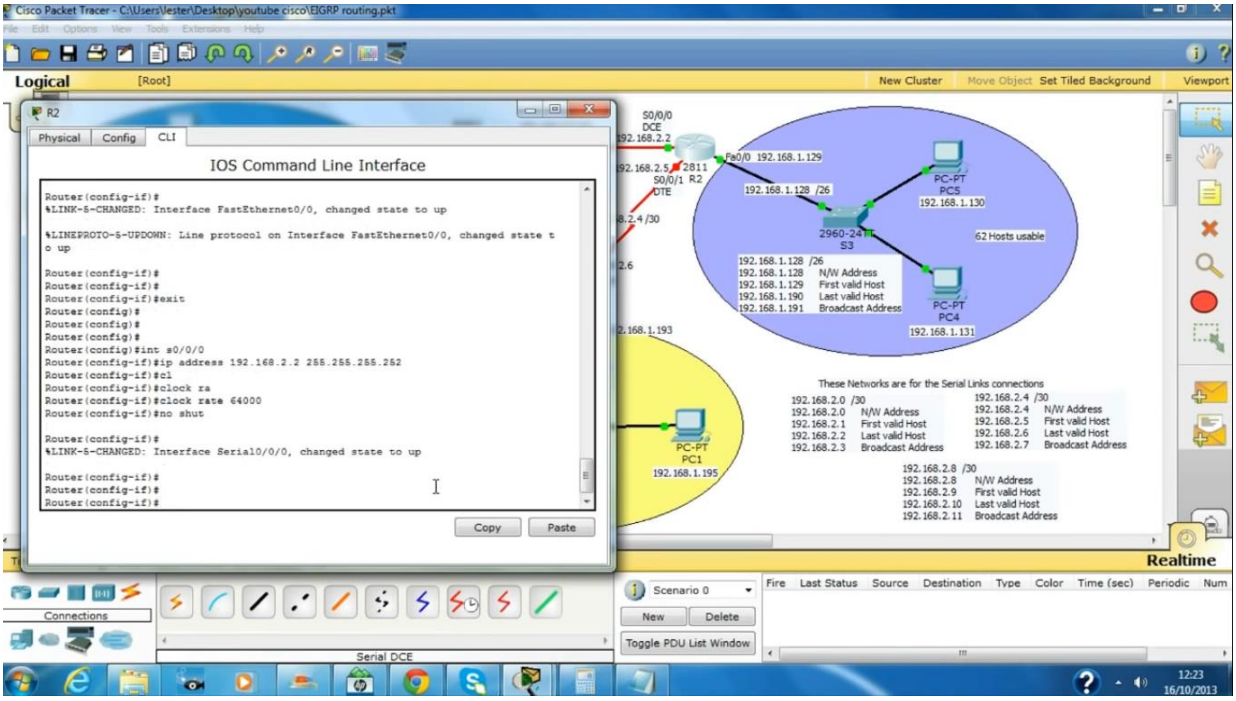




Now configuring second router as followes

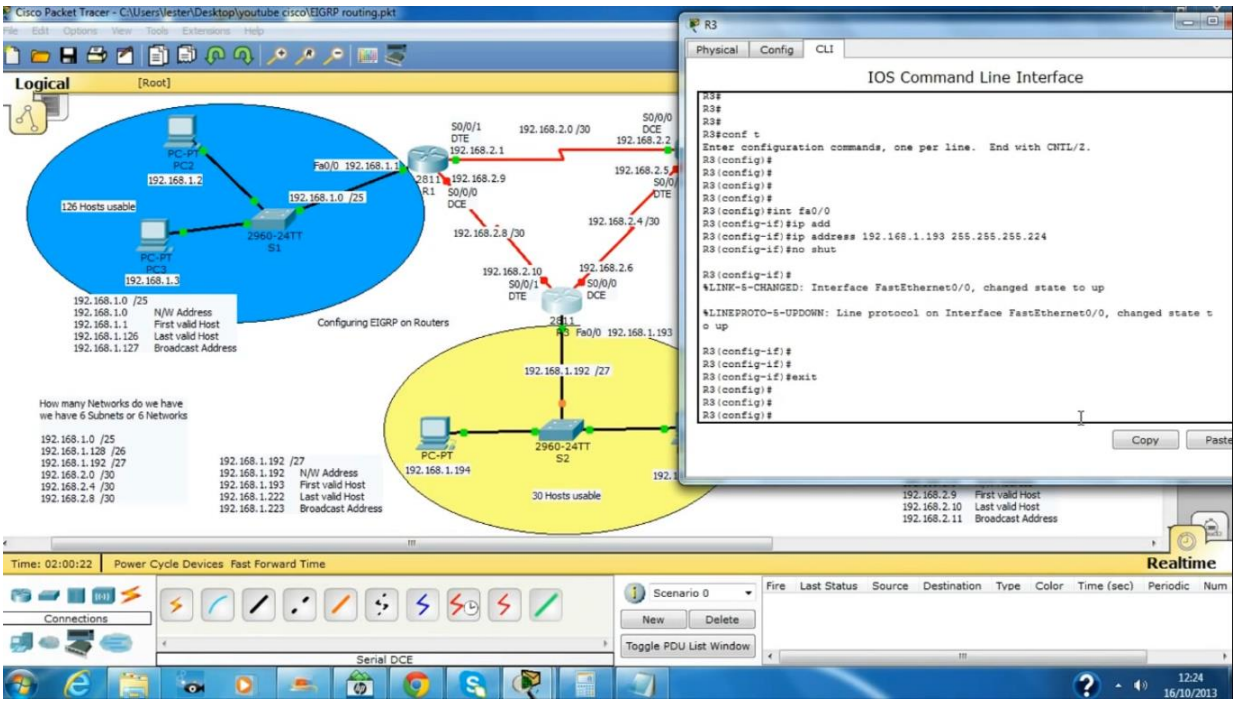


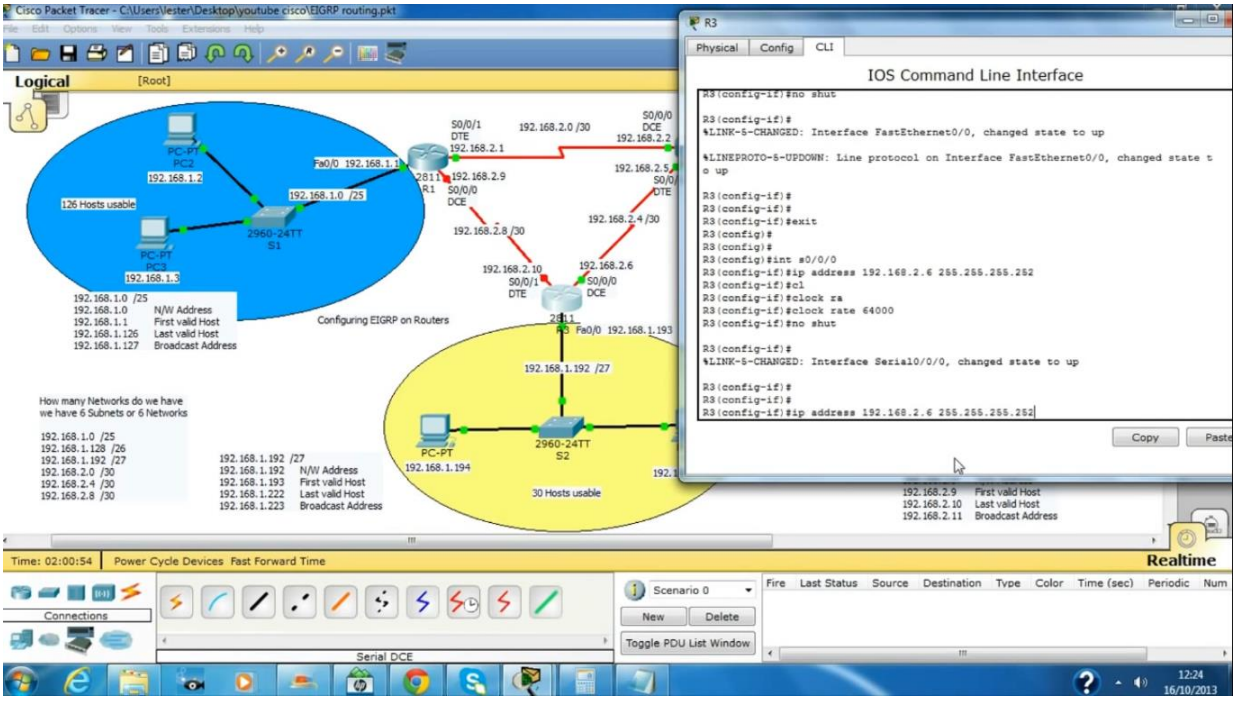


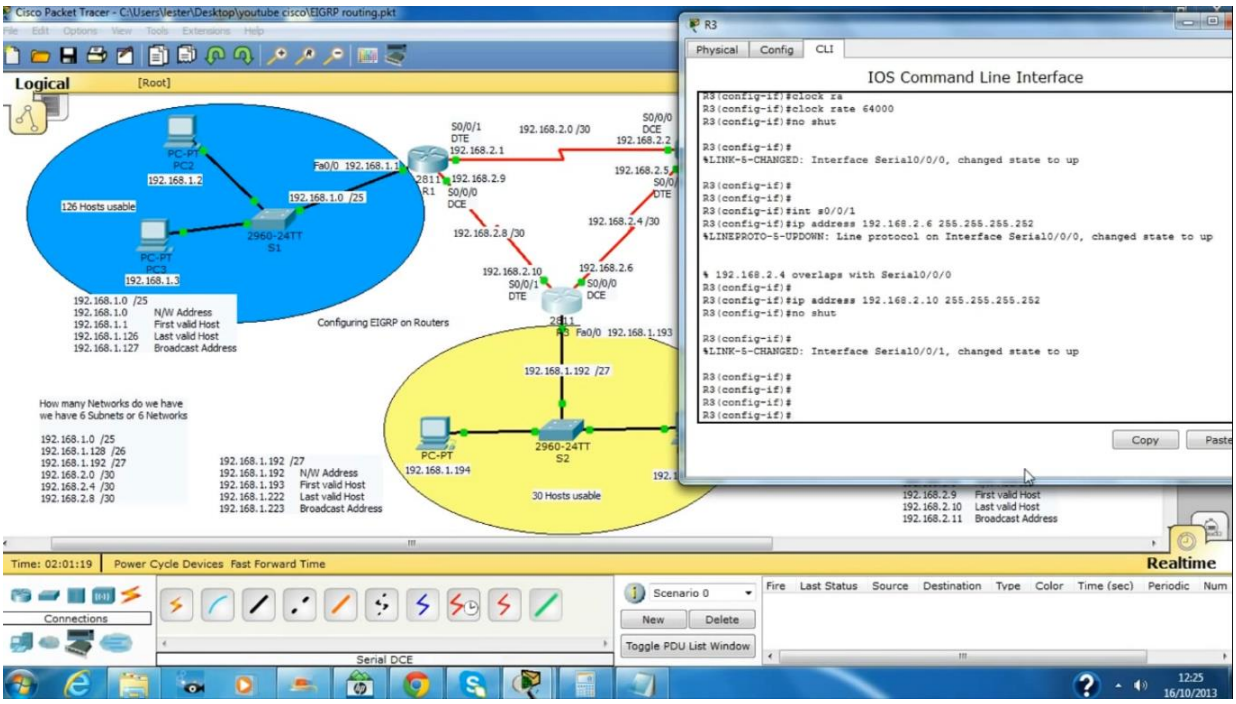


Now we are configuring the last router (R3)

It is also shown below

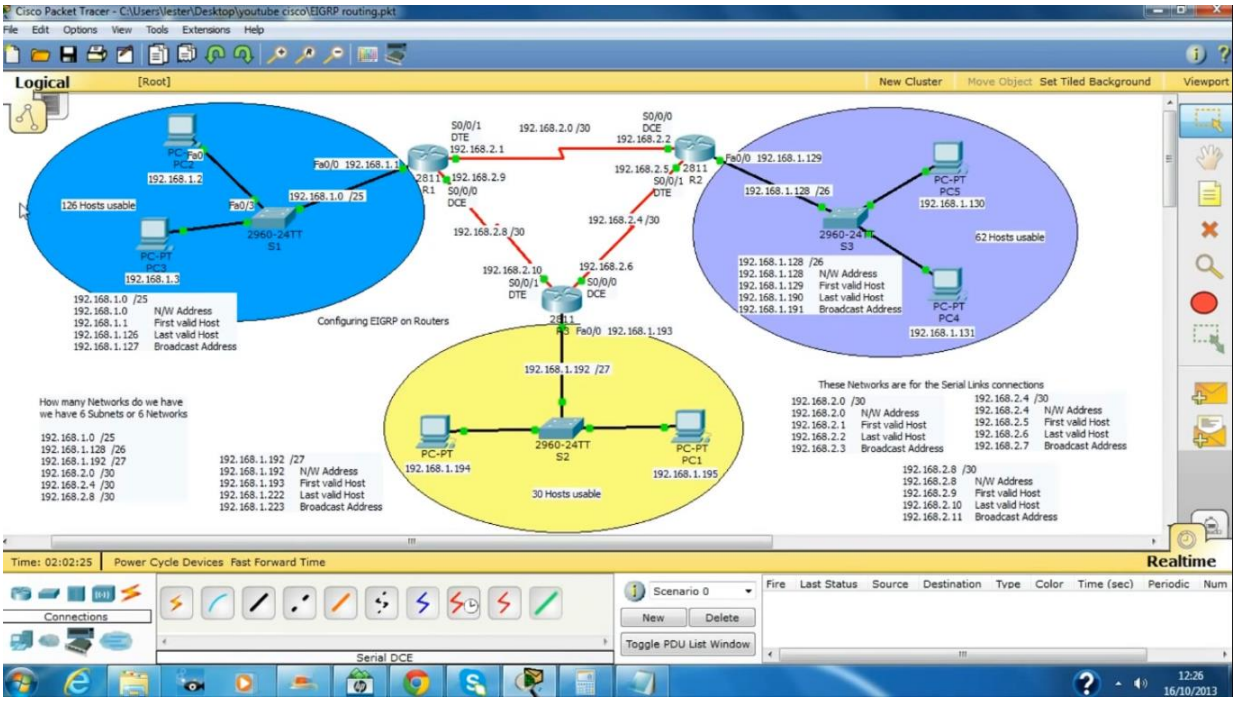

Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
R3
Physical
Config
CLI
IOS Command Line Interface
R3#
R3#
R3#
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#
R3(config)#
R3(config)#
R3(config)#
R3(config)#int fa0/0
R3(config-if)#ip add
R3(config-if)#ip address 192.168.1.193 255.255.255.224
R3(config-if)#no shut
R3(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#
R3(config-if)#
R3(config-if)#exit
R3(config)#
R3(config)#
R3(config)#
Copy
Paste
PC-PT PC2
192.168.1.2
PC-PT PC3
192.168.1.3
126 Hosts usable
2960-24TT S1
192.168.1.0 /25
Fa0/0 192.168.1.1
2811 R1
S0/0/1 DTE
192.168.2.1
192.168.2.0 /30
S0/0/0 DCE
192.168.2.2
192.168.2.9
192.168.2.5
192.168.2.8 /30
192.168.2.4 /30
192.168.2.10
192.168.2.6
2811 R3
Fa0/0 192.168.1.193
192.168.1.192 /27
PC-PT 192.168.1.194
2960-24TT S2
30 Hosts usable
192.168.1.0 /25
192.168.1.0 N/W Address
192.168.1.1 First valid Host
192.168.1.126 Last valid Host
192.168.1.127 Broadcast Address
Configuring EIGRP on Routers
How many Networks do we have
we have 6 Subnets or 6 Networks
192.168.1.0 /25
192.168.1.128 /26
192.168.1.192 /27
192.168.2.0 /30
192.168.2.4 /30
192.168.2.8 /30
192.168.1.192 /27
192.168.1.192 N/W Address
192.168.1.193 First valid Host
192.168.1.222 Last valid Host
192.168.1.223 Broadcast Address
192.168.2.9 First valid Host
192.168.2.10 Last valid Host
192.168.2.11 Broadcast Address
Time: 02:00:22
Power Cycle Devices Fast Forward Time
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time (sec) Periodic Num
12:24
16/10/2013


Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
R3
Physical
Config
CLI
IOS Command Line Interface
R3(config-if)#no shut
R3(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R3(config-if)#
R3(config-if)#
R3(config-if)#exit
R3(config)#
R3(config)#
R3(config)#int s0/0/0
R3(config-if)#ip address 192.168.2.6 255.255.255.252
R3(config-if)#cl
R3(config-if)#clock ra
R3(config-if)#clock rate 64000
R3(config-if)#no shut
R3(config-if)#
%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
R3(config-if)#
R3(config-if)#
R3(config-if)#ip address 192.168.2.6 255.255.255.252
Copy
Paste
PC-PT PC2
192.168.1.2
PC-PT PC3
192.168.1.3
126 Hosts usable
2960-24TT S1
192.168.1.0 /25
Fa0/0 192.168.1.1
2811 R1
S0/0/1 DTE
192.168.2.1
192.168.2.0 /30
S0/0/0 DCE
192.168.2.2
192.168.2.9
192.168.2.5
192.168.2.8 /30
192.168.2.4 /30
192.168.2.10
192.168.2.6
2811 R3
Fa0/0 192.168.1.193
192.168.1.192 /27
PC-PT 192.168.1.194
2960-24TT S2
30 Hosts usable
192.168.1.0 /25
192.168.1.0 N/W Address
192.168.1.1 First valid Host
192.168.1.126 Last valid Host
192.168.1.127 Broadcast Address
Configuring EIGRP on Routers
How many Networks do we have
we have 6 Subnets or 6 Networks
192.168.1.0 /25
192.168.1.128 /26
192.168.1.192 /27
192.168.2.0 /30
192.168.2.4 /30
192.168.2.8 /30
192.168.1.192 /27
192.168.1.192 N/W Address
192.168.1.193 First valid Host
192.168.1.222 Last valid Host
192.168.1.223 Broadcast Address
192.168.2.9 First valid Host
192.168.2.10 Last valid Host
192.168.2.11 Broadcast Address
Time: 02:00:54
Power Cycle Devices Fast Forward Time
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
Fire Last Status Source Destination Type Color Time (sec) Periodic Num
12:24
16/10/2013

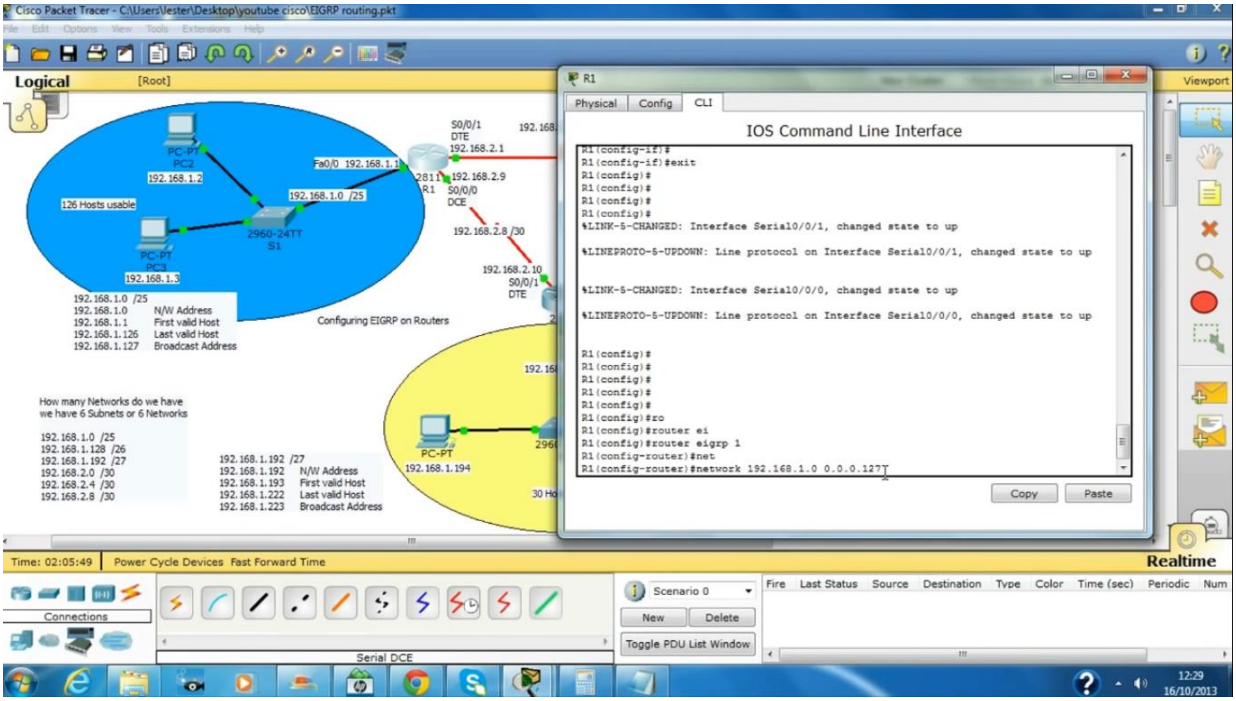


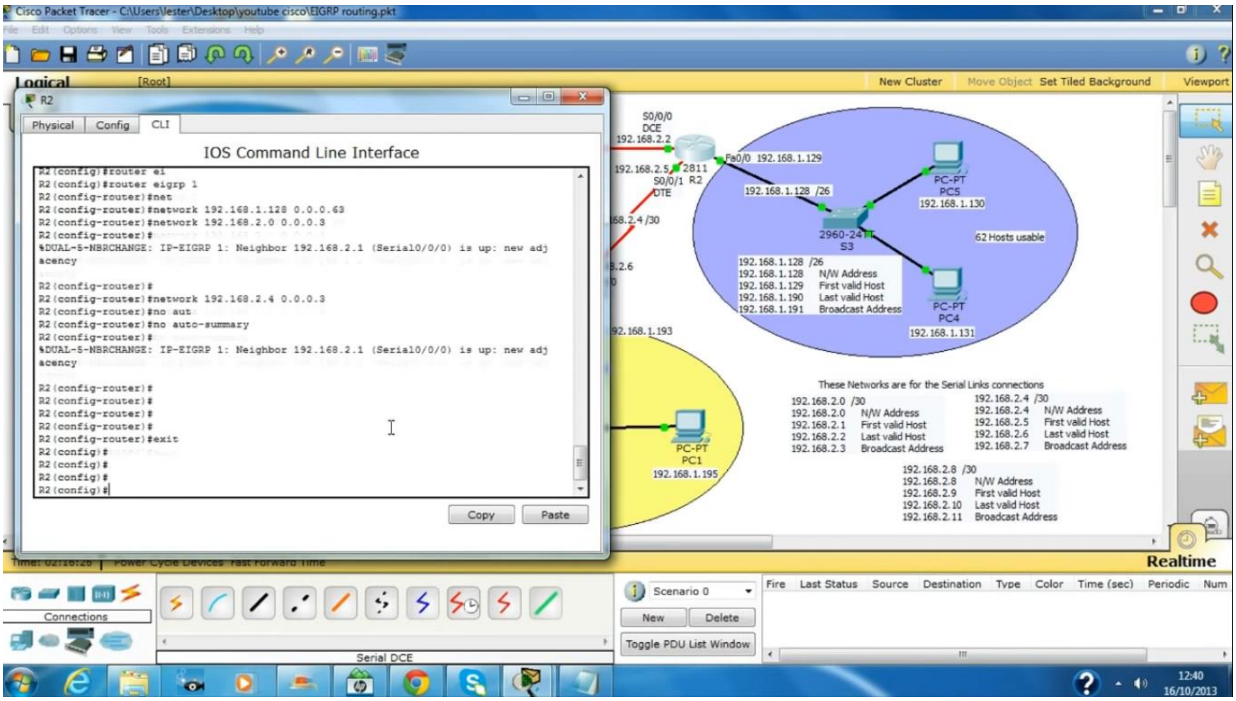
Now as you can see that all the connections are in green colour and we have successfully done

But the last step is we have to do EIGRP protocol

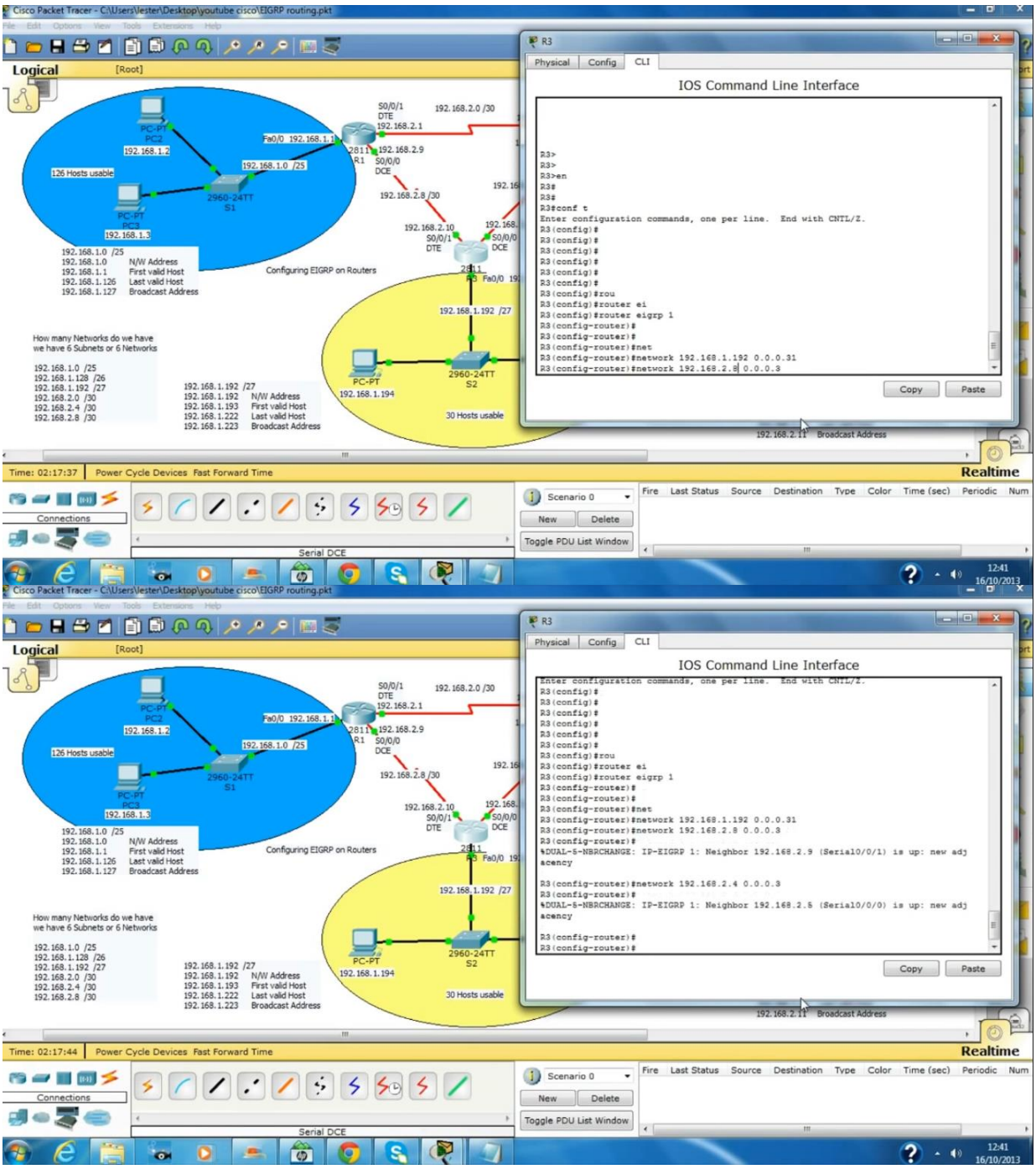


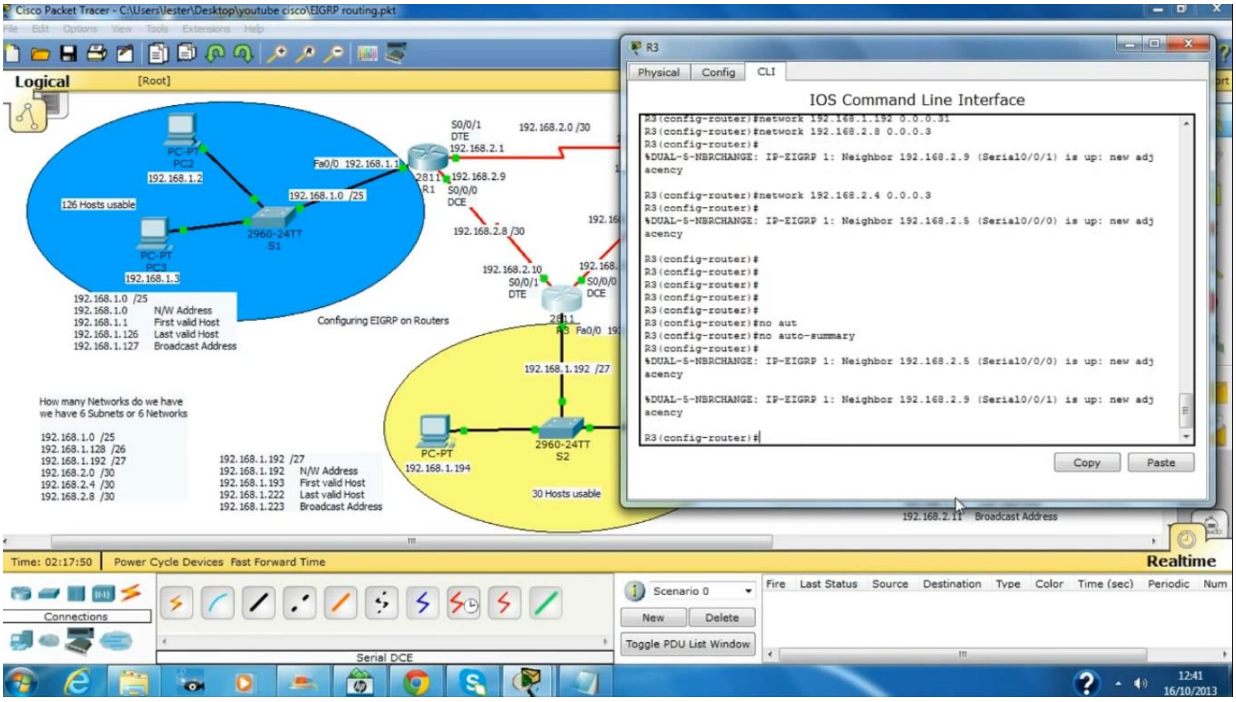
Configuring EIGRP for router 1





Configuring router 2 in EIGRP

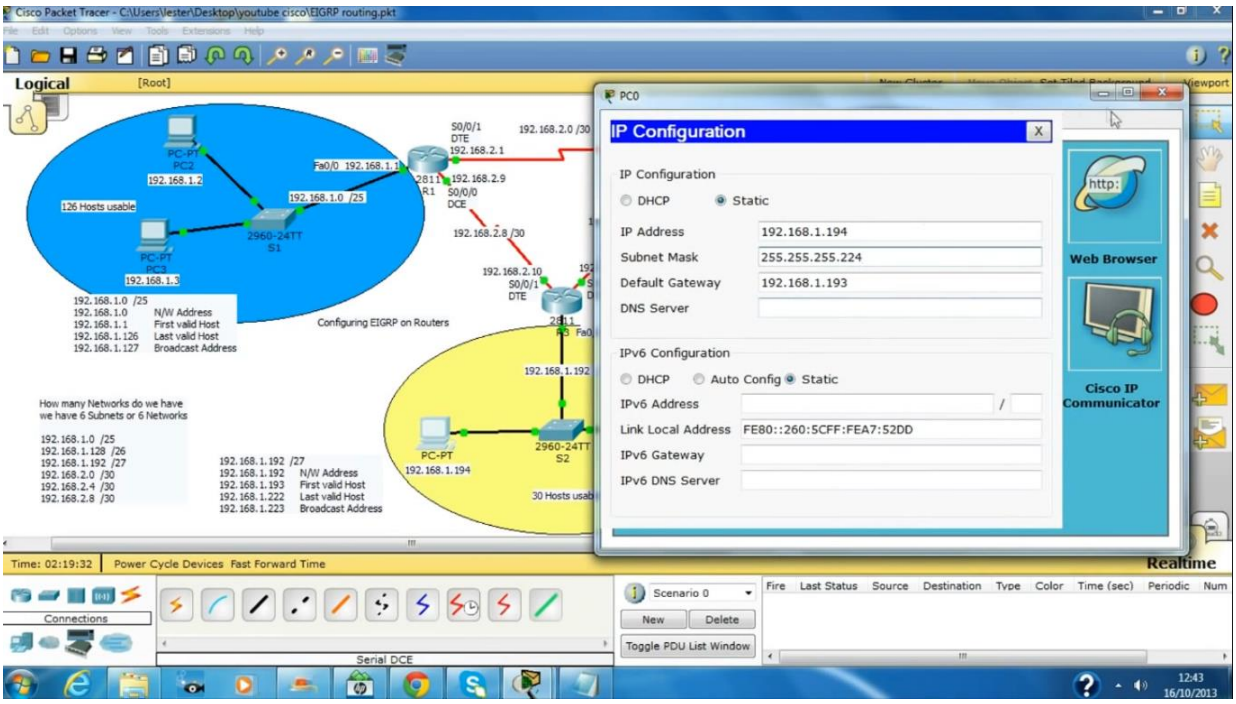

Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
R3
Physical
Config
CLI
IOS Command Line Interface
R3>
R3>
R3>en
R3#
R3#
R3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#
R3(config)#
R3(config)#
R3(config)#
R3(config)#
R3(config)#
R3(config)#rou
R3(config)#router ei
R3(config)#router eigrp 1
R3(config-router)#
R3(config-router)#
R3(config-router)#net
R3(config-router)#network 192.168.1.192 0.0.0.31
R3(config-router)#network 192.168.2.8 0.0.0.3
Copy
Paste
PC-PT PC2
192.168.1.2
PC-PT PC3
192.168.1.3
126 Hosts usable
192.168.1.0 /25
2960-24TT S1
Fa0/0 192.168.1.1
2811 R1
S0/0/1 DTE
192.168.2.1
192.168.2.0 /30
S0/0/0 DCE
192.168.2.9
192.168.2.8 /30
192.168.2.10
S0/0/1 DTE
S0/0/0 DCE
2811 R3
Fa0/0
192.168.1.192 /27
PC-PT
192.168.1.194
2960-24TT S2
30 Hosts usable
192.168.2.11 Broadcast Address
192.168.1.0 /25
192.168.1.0 N/W Address
192.168.1.1 First valid Host
192.168.1.126 Last valid Host
192.168.1.127 Broadcast Address
Configuring EIGRP on Routers
How many Networks do we have
we have 6 Subnets or 6 Networks
192.168.1.0 /25
192.168.1.128 /26
192.168.1.192 /27
192.168.2.0 /30
192.168.2.4 /30
192.168.2.8 /30
192.168.1.192 /27
192.168.1.192 N/W Address
192.168.1.193 First valid Host
192.168.1.222 Last valid Host
192.168.1.223 Broadcast Address
Time: 02:17:37
Power Cycle Devices Fast Forward Time
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time (sec)
Periodic
Num
12:41
16/10/2013
Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
R3
Physical
Config
CLI
IOS Command Line Interface
Enter configuration commands, one per line. End with CNTL/Z.
R3(config)#
R3(config)#
R3(config)#
R3(config)#
R3(config)#
R3(config)#
R3(config)#rou
R3(config)#router ei
R3(config)#router eigrp 1
R3(config-router)#
R3(config-router)#
R3(config-router)#net
R3(config-router)#network 192.168.1.192 0.0.0.31
R3(config-router)#network 192.168.2.8 0.0.0.3
R3(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 192.168.2.9 (Serial0/0/1) is up: new adj
acency
R3(config-router)#network 192.168.2.4 0.0.0.3
R3(config-router)#
%DUAL-5-NBRCHANGE: IP-EIGRP 1: Neighbor 192.168.2.5 (Serial0/0/0) is up: new adj
acency
R3(config-router)#
R3(config-router)#
Copy
Paste
PC-PT PC2
192.168.1.2
PC-PT PC3
192.168.1.3
126 Hosts usable
192.168.1.0 /25
2960-24TT S1
Fa0/0 192.168.1.1
2811 R1
S0/0/1 DTE
192.168.2.1
192.168.2.0 /30
S0/0/0 DCE
192.168.2.9
192.168.2.8 /30
192.168.2.10
S0/0/1 DTE
S0/0/0 DCE
2811 R3
Fa0/0
192.168.1.192 /27
PC-PT
192.168.1.194
2960-24TT S2
30 Hosts usable
192.168.2.11 Broadcast Address
192.168.1.0 /25
192.168.1.0 N/W Address
192.168.1.1 First valid Host
192.168.1.126 Last valid Host
192.168.1.127 Broadcast Address
Configuring EIGRP on Routers
How many Networks do we have
we have 6 Subnets or 6 Networks
192.168.1.0 /25
192.168.1.128 /26
192.168.1.192 /27
192.168.2.0 /30
192.168.2.4 /30
192.168.2.8 /30
192.168.1.192 /27
192.168.1.192 N/W Address
192.168.1.193 First valid Host
192.168.1.222 Last valid Host
192.168.1.223 Broadcast Address
Time: 02:17:44
Power Cycle Devices Fast Forward Time
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time (sec)
Periodic
Num
12:41
16/10/2013

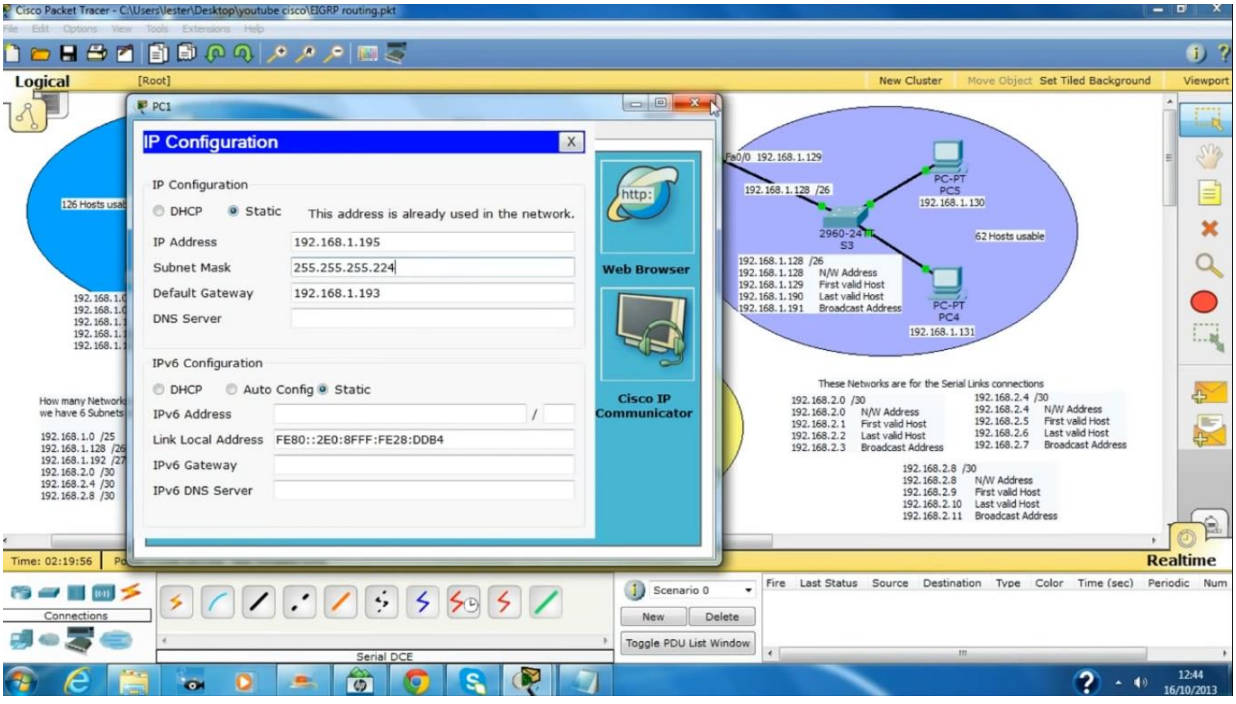


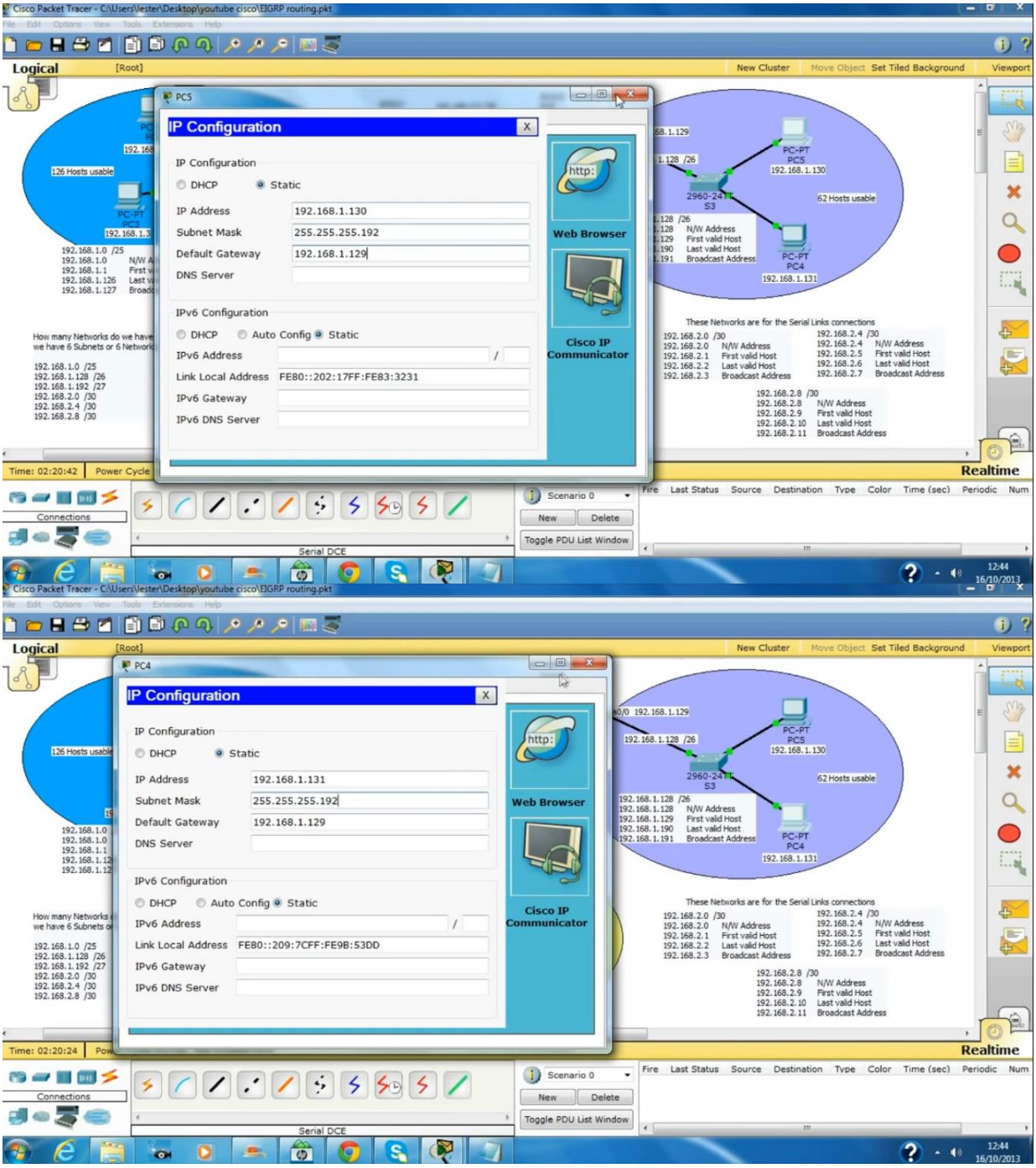
And do the same for other routers

If you want this in EIGRP version 2, Then simply write 2 in place of in above commands

Now we have successfully done with the routers, So now we have to configure ip addresses, subnetmasts and default gate way in computers


Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
PC0
IP Configuration
IP Configuration
DHCP
Static
IP Address 192.168.1.194
Subnet Mask 255.255.255.224
Default Gateway 192.168.1.193
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address FE80::260:5CFF:FEA7:52DD
IPv6 Gateway
IPv6 DNS Server
Web Browser
Cisco IP Communicator
126 Hosts usable
30 Hosts usable
Configuring EIGRP on Routers
Time: 02:19:32
Power Cycle Devices Fast Forward Time
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
12:43
16/10/2013

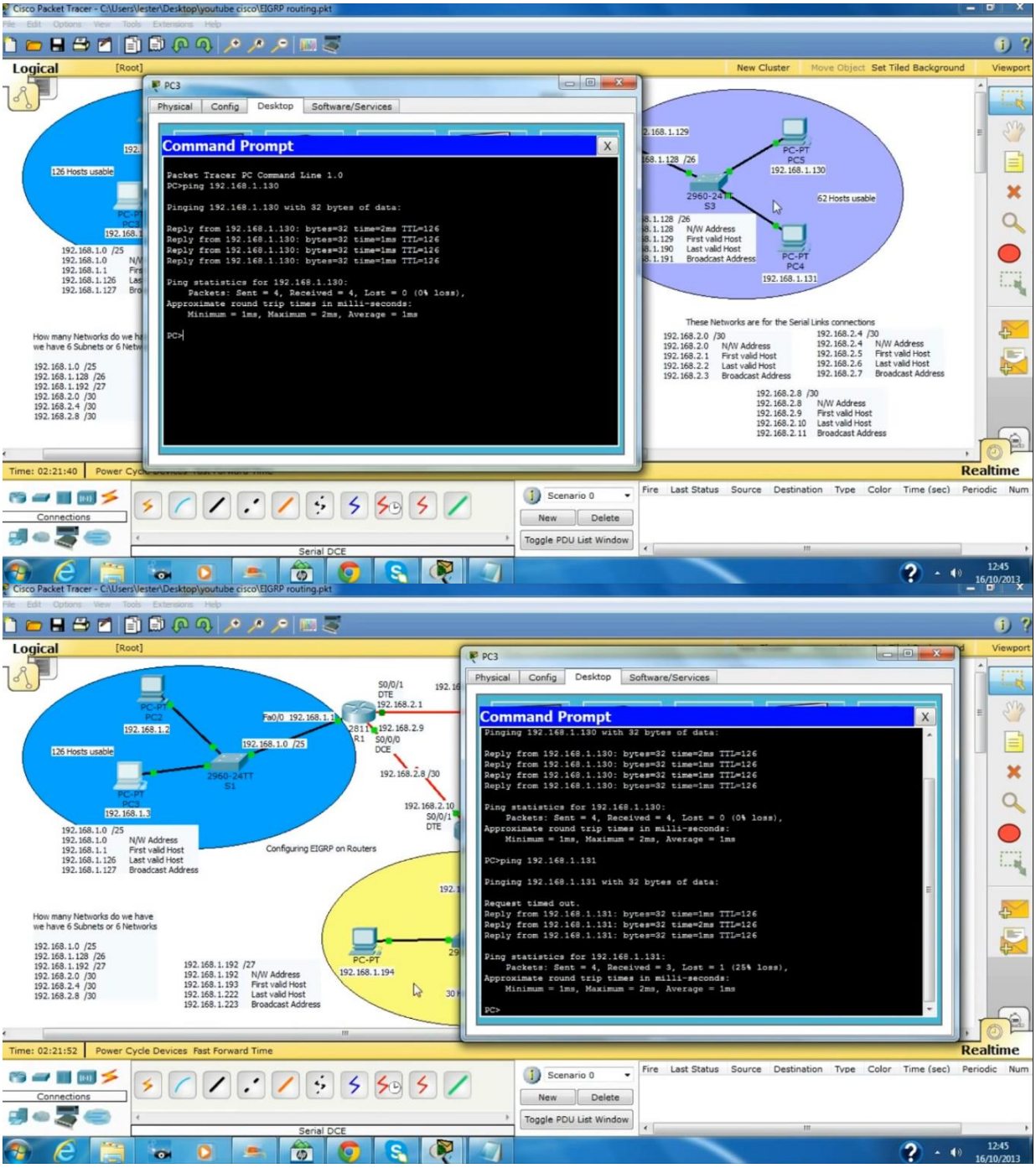

Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
New Cluster
Move Object
Set Tiled Background
Viewport
PC1
IP Configuration
IP Configuration
DHCP
Static
This address is already used in the network.
IP Address 192.168.1.195
Subnet Mask 255.255.255.224
Default Gateway 192.168.1.193
DNS Server
IPv6 Configuration
DHCP
Auto Config
Static
IPv6 Address
Link Local Address FE80::2E0:8FFF:FE28:DDB4
IPv6 Gateway
IPv6 DNS Server
Web Browser
Cisco IP Communicator
62 Hosts usable
These Networks are for the Serial Links connections
Time: 02:19:56
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
12:44
16/10/2013

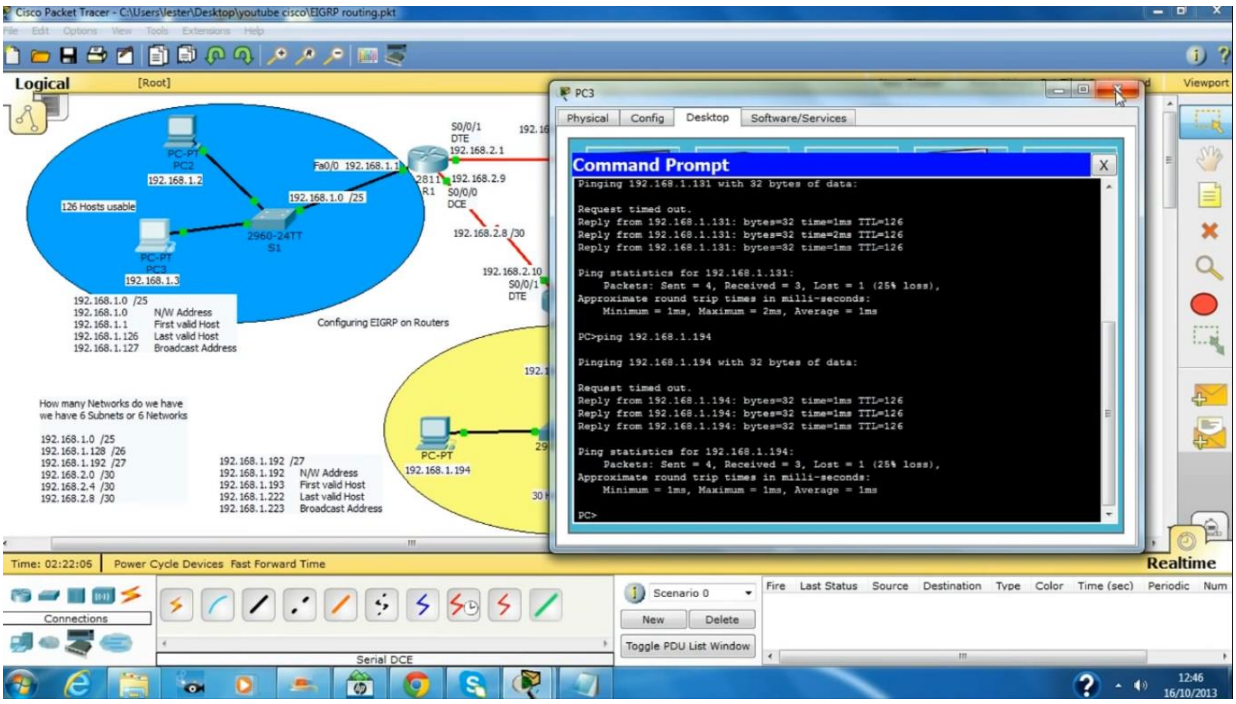


Now we have successfully completed.

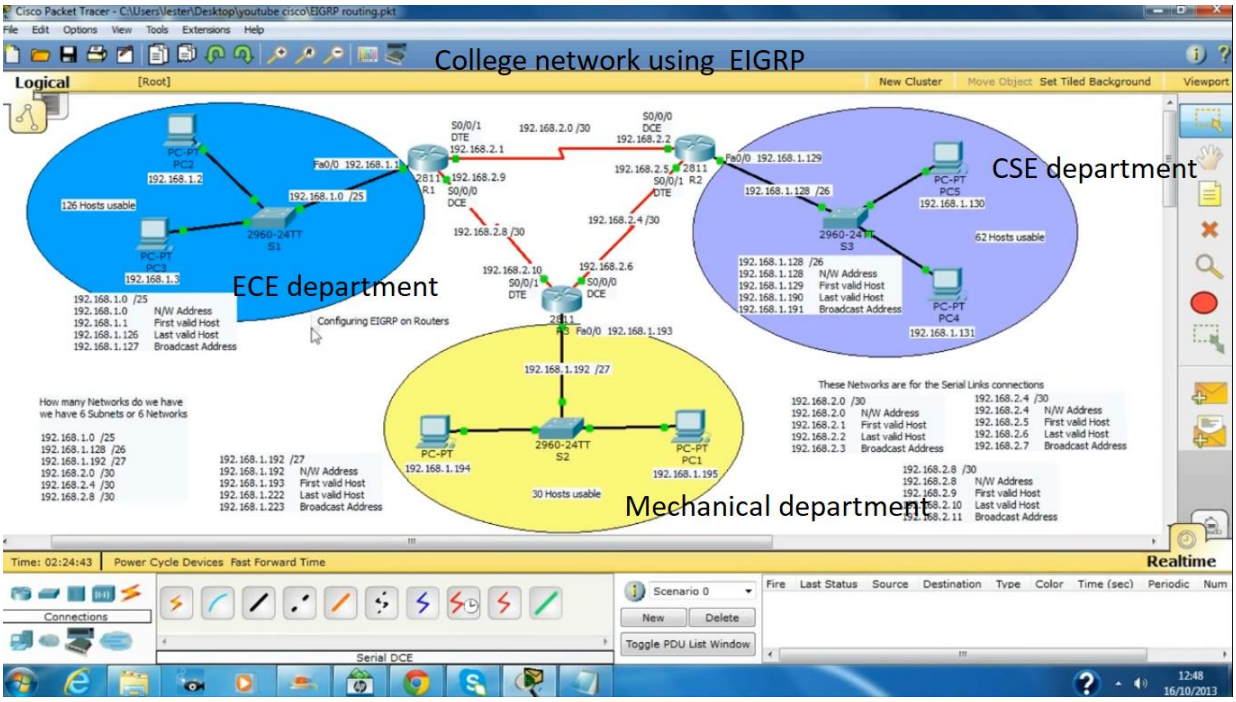
Now check wheather every thing were fine

So that I use ping to check connectivity between the computers


Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
PC3
Physical
Config
Desktop
Software/Services
Command Prompt
Packet Tracer PC Command Line 1.0
PC>ping 192.168.1.130
Pinging 192.168.1.130 with 32 bytes of data:
Reply from 192.168.1.130: bytes=32 time=2ms TTL=126
Reply from 192.168.1.130: bytes=32 time=1ms TTL=126
Reply from 192.168.1.130: bytes=32 time=1ms TTL=126
Reply from 192.168.1.130: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.1.130:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 2ms, Average = 1ms
PC>
126 Hosts usable
62 Hosts usable
192.168.1.0 /25
192.168.1.128 /26
192.168.1.192 /27
192.168.2.0 /30
192.168.2.4 /30
192.168.2.8 /30
How many Networks do we have
we have 6 Subnets or 6 Networks
These Networks are for the Serial Links connections
Time: 02:21:40
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
Fire
Last Status
Source
Destination
Type
Color
Time (sec)
Periodic
Num
12:45
16/10/2013
Cisco Packet Tracer - C:\Users\lester\Desktop\youtube cisco\EIGRP routing.pkt
Logical
[Root]
PC3
Physical
Config
Desktop
Software/Services
Command Prompt
Pinging 192.168.1.130 with 32 bytes of data:
Reply from 192.168.1.130: bytes=32 time=2ms TTL=126
Reply from 192.168.1.130: bytes=32 time=1ms TTL=126
Reply from 192.168.1.130: bytes=32 time=1ms TTL=126
Reply from 192.168.1.130: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.1.130:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 2ms, Average = 1ms
PC>ping 192.168.1.131
Pinging 192.168.1.131 with 32 bytes of data:
Request timed out.
Reply from 192.168.1.131: bytes=32 time=1ms TTL=126
Reply from 192.168.1.131: bytes=32 time=2ms TTL=126
Reply from 192.168.1.131: bytes=32 time=1ms TTL=126
Ping statistics for 192.168.1.131:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 1ms, Maximum = 2ms, Average = 1ms
PC>
126 Hosts usable
192.168.1.0 /25
192.168.1.128 /26
192.168.1.192 /27
192.168.2.0 /30
192.168.2.4 /30
192.168.2.8 /30
Configuring EIGRP on Routers
How many Networks do we have
we have 6 Subnets or 6 Networks
Time: 02:21:52
Power Cycle Devices Fast Forward Time
Realtime
Connections
Serial DCE
Scenario 0
New
Delete
Toggle PDU List Window
12:45
16/10/2013



So we get success!!!



As we cannot take every computer In a college network I took 2 computers in each department as our college has about 200 computers in every department I took 1/100th ratio of it and I have tried it in a cisco packet tracer

---END---