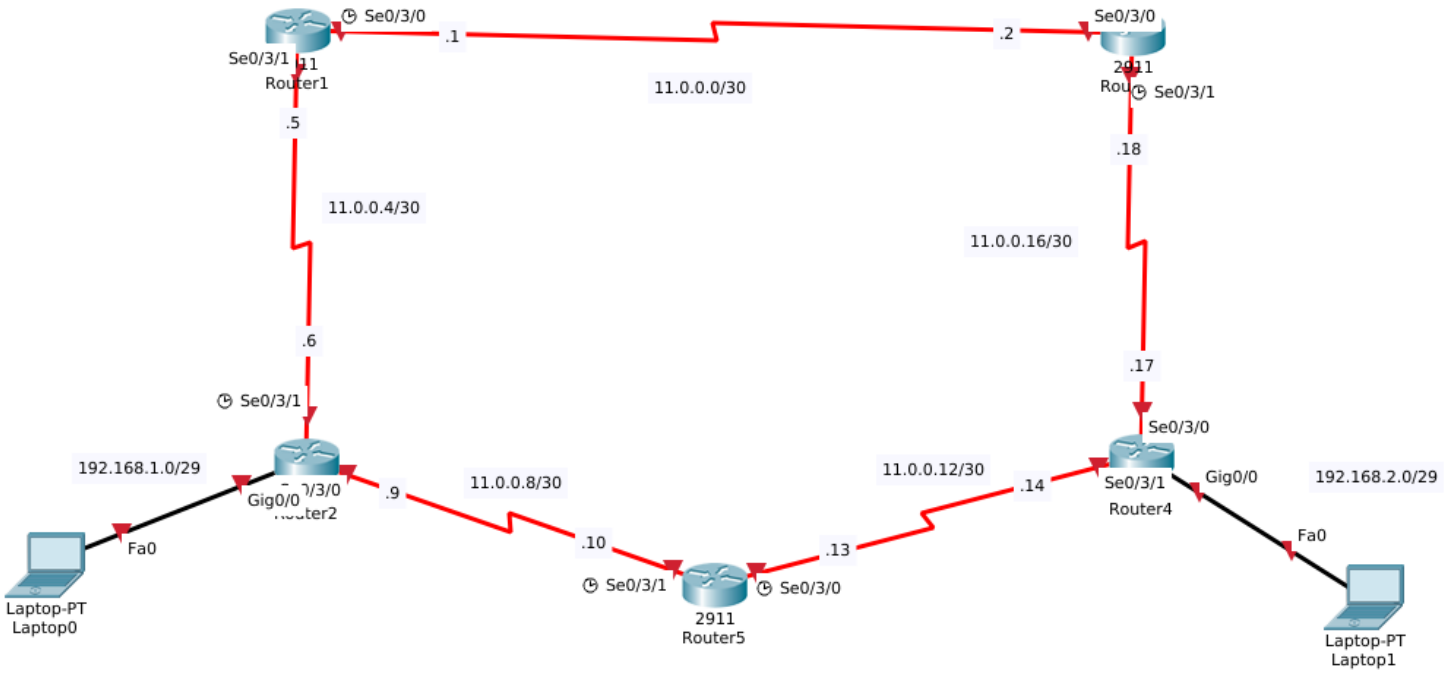
Configuring Router:

Types:

i. Static & Default Routing
ii. Dynamic Routing
- RIP (Routing Information Protocol)
- EIGRP (Enhanced Interior Gateway Routing Protocol)
- OSPF (Open Shortest Path First)



Static (S) Routing Configuration :

For R1:

```
config t
int se0/3/0
ip add 11.0.0.1 255.255.255.252
no shut
exit

int se0/3/1
ip add 11.0.0.5  255.255.255.252
no shut
end
wr

config t
ip route 11.0.0.18 255.255.255.252 11.0.0.2
ip route 11.0.0.16 255.255.255.252 11.0.0.2
ip route 11.0.0.12 255.255.255.252 11.0.0.2
ip route 11.0.0.12 255.255.255.252 11.0.0.6
ip route 11.0.0.8 255.255.255.252 11.0.0.6
ip route 11.0.0.8 255.255.255.252 11.0.0.2
ip route 11.0.0.16 255.255.255.252 11.0.0.6
do wr
end
wr
```

For R2:

```
config t
int se0/3/0
ip add 11.0.0.9 255.255.255.252
no shut
exit
int se0/3/1
ip add 11.0.0.6 255.255.255.252
no shut
exit
```

```
 int gig0/0
 ip add 192.168.1.1 255.255.255.248
 no shut
 exit
end
config t
ip route 11.0.0.0 255.255.255.252 11.0.0.5
ip route 11.0.0.0 255.255.255.252 11.0.0.10
ip route 11.0.0.16 255.255.255.252 11.0.0.10
ip route 11.0.0.16 255.255.255.252 11.0.0.5
ip route 11.0.0.12 255.255.255.252 11.0.0.5
ip route 11.0.0.12 255.255.255.252 11.0.0.10
do wr
end
wr
```

For R3 :

```
 config t
 int se0/3/1
 ip add 11.0.0.18 255.255.255.252
 no shut
 exit
 int se0/3/0
 ip add 11.0.0.2 255.255.255.252
 no shut

ip route 11.0.0.4 255.255.255.252 11.0.0.1
ip route 11.0.0.4 255.255.255.252 11.0.0.17
ip route 11.0.0.8 255.255.255.252 11.0.0.17
ip route 11.0.0.8 255.255.255.252 11.0.0.1
ip route 11.0.0.12 255.255.255.252 11.0.0.1
ip route 11.0.0.12 255.255.255.252 11.0.0.17
do wr
end
wr
```

For R4:

```
config t
int se0/3/0
ip add 11.0.0.17 255.255.255.252
exit
int se0/3/1
ip add 11.0.0.14 255.255.255.252
no shut
exit
int gig0/0
ip add 192.168.2.1 255.255.255.248
no shut
end
wr
```

```
config t
ip route 11.0.0.0 255.255.255.252 11.0.0.18
ip route 11.0.0.0 255.255.255.252 11.0.0.13
ip route 11.0.0.4 255.255.255.252 11.0.0.13
ip route 11.0.0.4 255.255.255.252 11.0.0.18
ip route 11.0.0.8 255.255.255.252 11.0.0.18
ip route 11.0.0.8 255.255.255.252 11.0.0.13
do wr
end
wr
```

For R5 :

```
config t
int se0/3/1
ip add 11.0.0.10 255.255.255.252
no shut
exit
```

```
int se0/3/0
 ip add 11.0.0.13 255.255.255.252
 no shut
 end
 wr


 config t
 ip route 11.0.0.4 255.255.255.252 11.0.0.9
 ip route 11.0.0.4 255.255.255.252 11.0.0.14
 ip route 11.0.0.0 255.255.255.252 11.0.0.14
 ip route 11.0.0.0 255.255.255.252 11.0.0.9
 ip route 11.0.0.16 255.255.255.252 11.0.0.9
 ip route 11.0.0.16 255.255.255.252 11.0.0.14
 end
 wr
```

Static [Default (S*)] Routing Configuration :

For R1 :

```
config t
 ip route 0.0.0.0 0.0.0.0 11.0.0.2
 ip route 0.0.0.0 0.0.0.0  11.0.0.6
 do wr
 end
 wr
```

For R2 :

```
config t
ip route 0.0.0.0 0.0.0.0 11.0.0.5
ip route 0.0.0.0 0.0.0.0 11.0.0.10
end
wr
```

For R3 :

```
config t
ip route 0.0.0.0 0.0.0.0 11.0.0.1
ip route 0.0.0.0 0.0.0.0 11.0.0.17
end
wr
```

For R4 :

```
config t
ip route 0.0.0.0 0.0.0.0 11.0.0.13
ip route 0.0.0.0 0.0.0.0 11.0.0.18
end
wr
```

For R5 :

```
config t
ip route 0.0.0.0 0.0.0.0 11.0.0.9
ip route 0.0.0.0 0.0.0.0 11.0.0.14
end
wr
```


Routing Information Protocol (RIP) Configuration :

Description :

- ***RIP use Bellman-Ford algorithm.***
- ***Rip decides its path(route) according to hop.***
- ***Maximum hop of for communination is 15. Greater than 15 hop is unreachable.***
- ***Admin Distance (AD):***

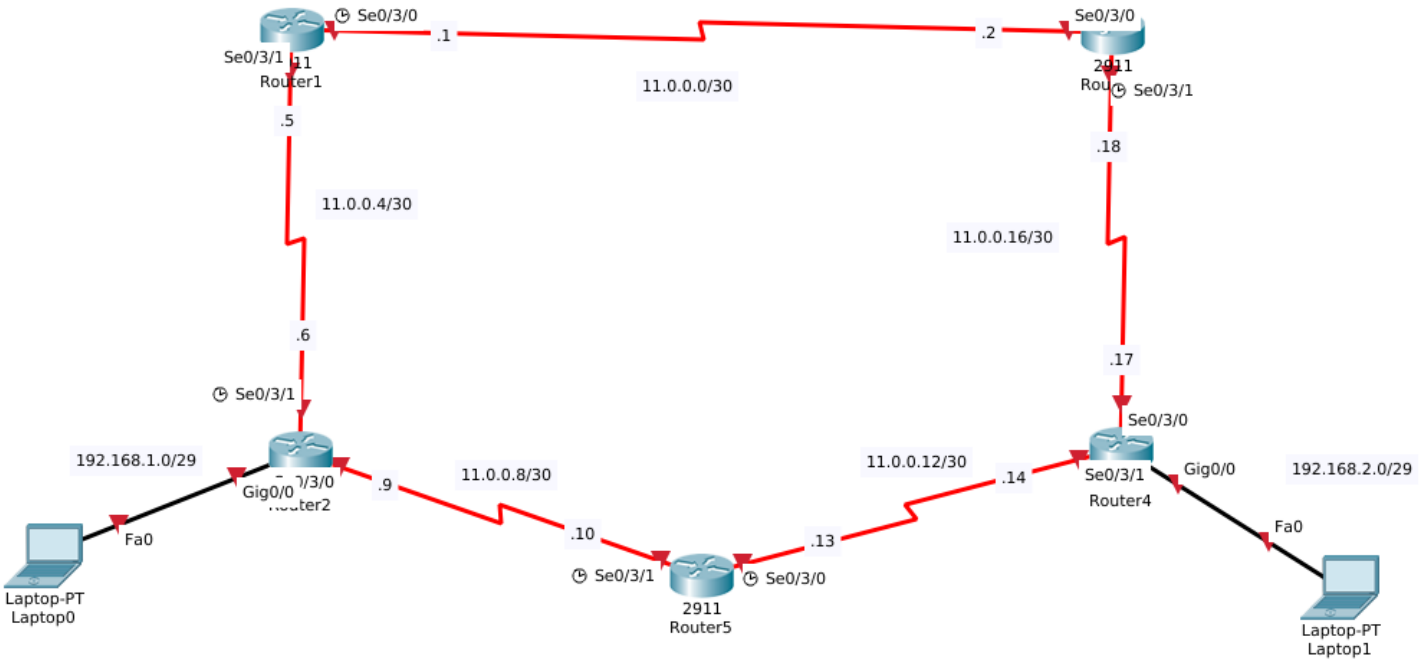
Directly connected value =0
RIP =120

- *Rip have 2 version that is version 1(classful) & version 2(classless)*
- *Version 1 broadcast the ip (one to all)*
- *version 2 multicast which is for only rip v2 at normal routing.*
- *In default auto-summary is applied. So no auto-summary is compulsory in command.*
- *It means by default it accepts or applied classful subnetting so to initiate classless subnetting features no auto-summary is done.*
-
- *Command :*

enable
configure Terminal
router rip
version 1/2
network <NID>
no auto-summary
do wr
end
wr

- *Trobleshooting :*

show ip protocols
show ip rip database
show ip route rip
debug ip rip { database | events }



For R1 :

config t
router rip
version 2
network 11.0.0.4
network 11.0.0.8
no auto-summary
do wr
end
wr

For R2 :

```
config t
router rip
version 2
network 11.0.0.0
network 11.0.0.4
no auto-summary
do wr
end
wr
```

-

For R3 :

```
config t
router rip
version 2
network 11.0.0.0
network 11.0.0.16
no auto-summary
do wr
end
wr
```

For R4 :

```
config t
router rip
version 2
network 11.0.0.16
network 11.0.0.12
no auto-summary
do wr
end
wr
```

For R5 :

```
config t
router rip
version 2
network 11.0.0.8
network 11.0.0.12
no auto-summary
do wr
end
wr
```

Enhanced Interior Gateway Routing Protocol (EIGRP) Configuration :

- ***EIGRP used Diffuse Update Algorithm (DUAL) .***
- ***Reported distance is the metric for a route advertised by a neighbor.***
- ***Feasible distance is the distance advertised by a neighbor plus the cost to get to that neighbor.***
- ***Here first feasible distance (FD) is created of each possible path and decides the best path according to less fisible distance and that path is set in routing table.***
- ***If certain FD path is gone down then immediately next suitable FD is connected and that path is reset in the routing table.***
- ***If FD of different path is equal then load balancing is done.***
- ***5 Metric component :***
  - ***Bandwidth***
  - ***Delay***
  - ***Reliability***
  - ***Load***
  - ***Maximum Transfer unit (MTU).***
- ***The internal Administrative Distance (AD) of EIGRP is 90.***

- ***The external Administrative Distance is 170.***
- ***It is Distance vector Routing Protocol.***
- ***Routing decision depend upon other router .***
- ***Loop can occur through neighbouring router.***

- ***Command :***
  enable
  configure Terminal
  router eigrp <Autonomous system number(0-65535)
  network <NID>
  no auto-summary
  do wr
  end
  wr
- ***Trobleshoting :***
  show ip eigrp interfaces
  show ip eigrp neighbors
  show ip eigrp traffic
  clear ip eigrp neighbors
  debug ip eigrp [packet | neighbors]

<u>For R1 :</u>

config t
router eigrp 1
network 11.0.0.4
network 11.0.0.8
no auto-summary
do wr
end
wr

For R2 :

```
config t
router eigrp 1
network 11.0.0.0
network 11.0.0.4
no auto-summary
do wr
end
wr
```

For R3 :

```
config t
router eigrp 1
network 11.0.0.0
network 11.0.0.16
no auto-summary
do wr
end
wr
```

For R4 :

```
config t
router eigrp 1
network 11.0.0.16
network 11.0.0.12
no auto-summary
do wr
end
wr
```

For R5 :

```
config t
router eigrp 1
network 11.0.0.8
network 11.0.0.12
no auto-summary
do wr
end
wr
```

Open Shortest Path First (OSPF) Configuration :

- ***OSPF is open standard that support all vendor.***
- ***OSPF uses Dijkstra algorithm.***
- ***Its Administrative Distance is 110.***
- ***Its is link state Routing protocol.***
- ***Routing decision of each router depends on itself router.***
- ***No chance of loop.***
- ***All router has same database on routing table.***
- ***OSPF have cost 64 in serial cable and 1 in Giga ethernet cable and loopback.***
- ***The network type for serial interface is point to piont.***
- ***The network type for ethernet interface is Broadcast .***
- ***The network type for loopback interface is loopback.***
- ***OSPF includes Basic process of seven stages :***
  - ***Down Stage :***
    when Router is initiated as OSPF 1 ,initially it is in down stage.
  - ***Init Stage :***
    When all ip is set of certain topology, it goes through init stage.
  - ***Two way stage :***
    In this stage neighbourship is done between each router.
  - ***Exstrat Stage :***

In this stage, having higher no. of NID takes priority for decision.

- ***Exchange Stage :***

Here, database is send according to initial stage decision.

- ***Loading Stage :***
- ***Full Stage :***

Router have synchronized database.

- ***Commands :***

en
configure Terminal
router ospf process id (1-65535)
network <NID> <wildcard mask> <area id>
do wr
end
wr

- ***Trobleshoting :***

show ip [route | protocols]
show ip ospf border-routers
show ip ospf interface
show ip ospf virtual-links
show ip ospf neighbor debug ip ospf […]

<u>For R1 :</u>

```
config t
router ospf 1
network 11.0.0.4 0.0.0.3 area 0
network 11.0.0.8 0.0.0.3 area 0
do wr
end
wr
```

For R2 :

```
config t
router ospf 1
network 11.0.0.0 0.0.0.3 area 0
network 11.0.0.4 0.0.0.3 area 0
do wr
end
wr
```

For R3 :

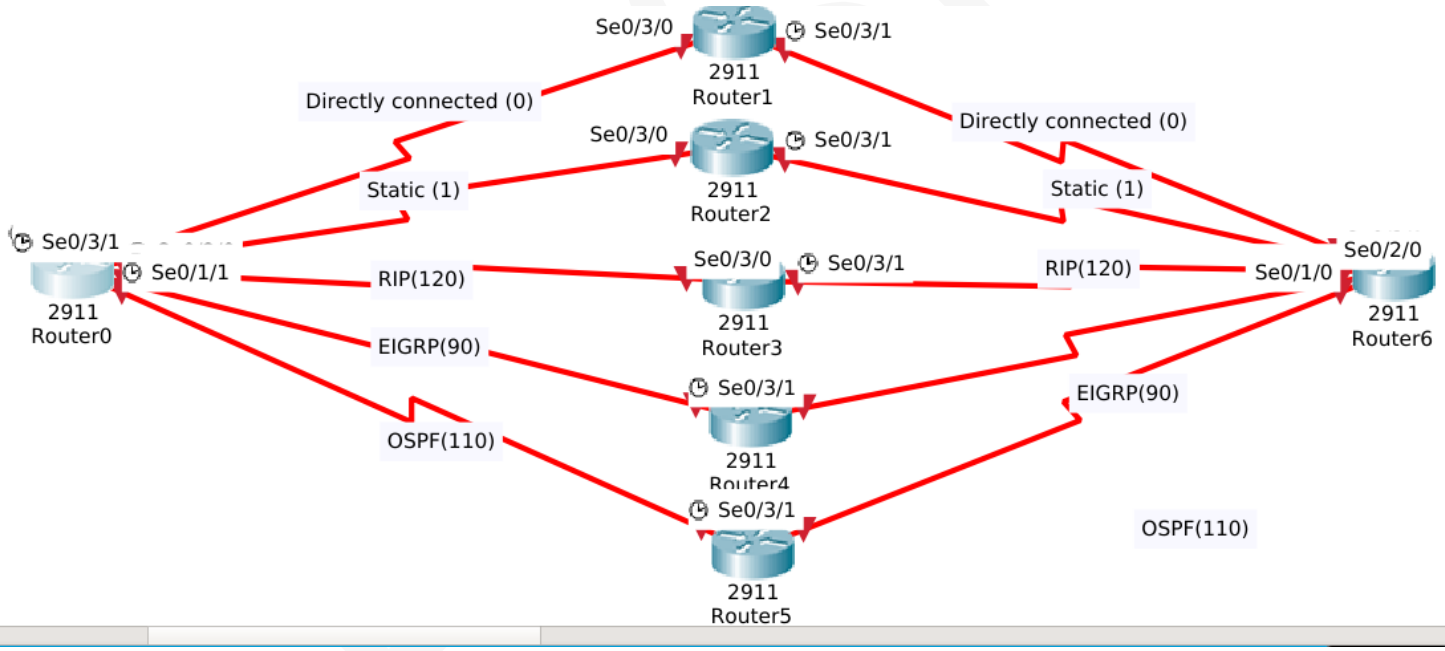
```
config t
router ospf 1
network 11.0.0.0 0.0.0.3 area 0
network 11.0.0.16 0.0.0.3 area 0
do wr
end
wr
```

For R4 :

```
config t
router ospf 1
network 11.0.0.12 0.0.0.3 area 0
network 11.0.0.16 0.0.0.3 area 0
do wr
end
wr
```

For R5 :

config t
router ospf 1
network 11.0.0.8 0.0.0.3 area 0
network 11.0.0.12 0.0.0.3 area 0
do wr
end
wr



Attributes	RIP	EIGRP	OSPF
Type	Distance Vector	Distance Vector	Link-State
Algorithm	Bellman-Ford	DUAL	Dijkstra
AD	120	I/E-AD=90/170	110
Metric	Hop count (max15)	BW,DELAY,RelBILITY,LOAD,MTU	Cost (Bandwidth)
Standard	RFCs 2080,2453	Cisco proprietary	RFC 2328, 2740
Protocols	IPV4, IPV6	IP, IPX,Appletalk	IP
Transport	UDP	IP/88	IP/89
Authentication	Plaintext, MD5	MD5	Plaintext, MD5
Multicast IP	224.0.0.9/FF02::9	224.0.0.10	
AIISPF Address	…….	……..	224.0.0.5
AIIDR Address	……..	……	221.0.0.6
Hello timers	…….	5/60	……...
Hold Timers	…….	15/180	……...