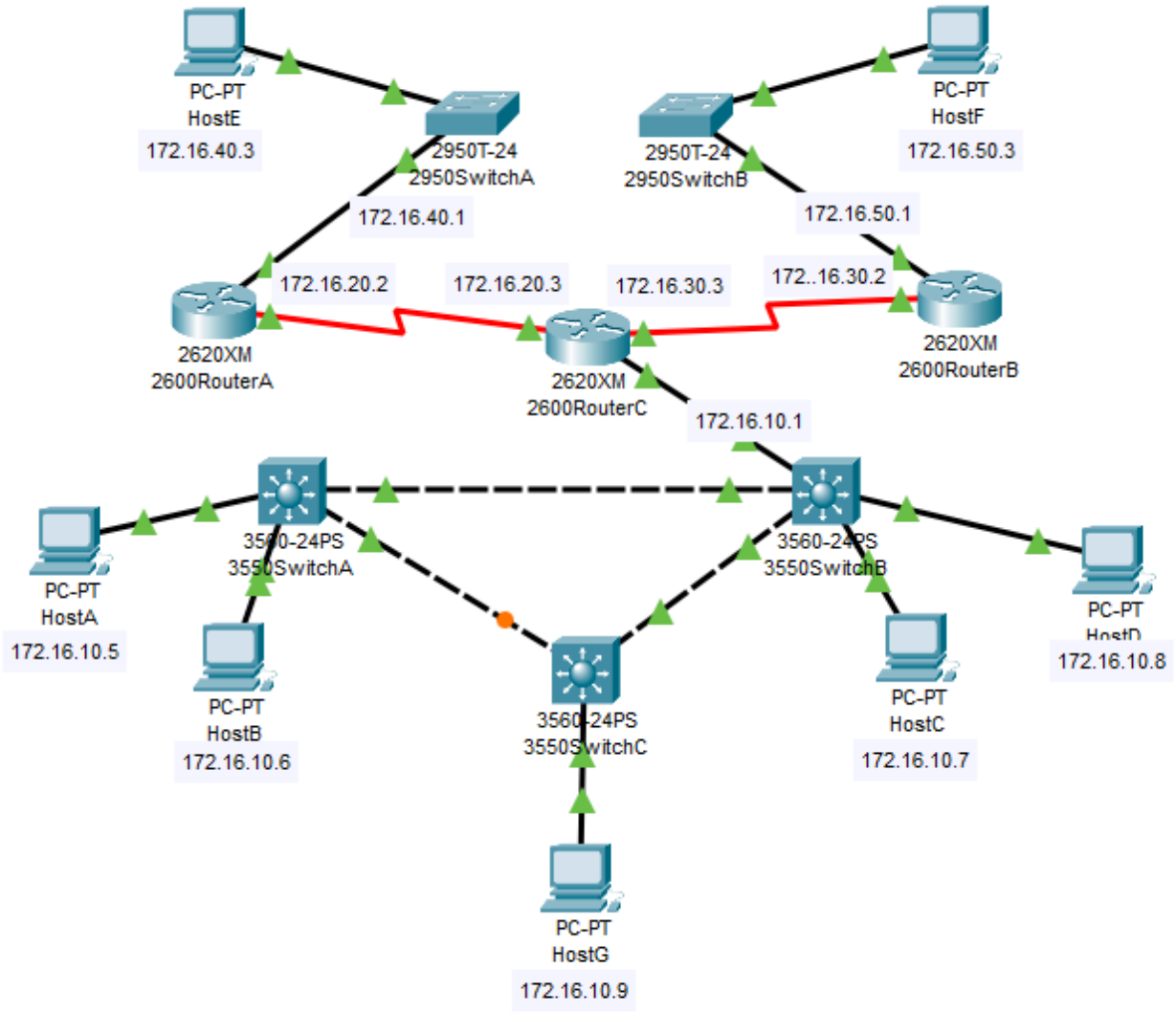
# Протоколы динамической маршрутизации

Используйте топологию из предыдущей лабораторной работы с дополнительным коммутатором.

Топология из предыдущей ЛР:




## Настройка RIP

1. Сначала удалим маршрут по умолчанию и проверим IP-таблицу - в ней должны быть только непосредственно подключенные сети.
   Для 2600A убираем статическую маршрутизацию сделану в ЛР2

```
2600A#config t
Enter configuration commands, one per line. End with CNTL/Z.
```

```
2600A(config)#no ip route 172.16.10.0 255.255.255.0 172.16.20.3
2600A(config)#no ip route 172.16.50.0 255.255.255.0 172.16.20.3
2600A(config)#exit
show ip route

     172.16.0.0/24 is subnetted, 2 subnets
C       172.16.20.0 is directly connected, Serial0/0
C       172.16.40.0 is directly connected, FastEthernet0/0
```

Аналогично для 2600B

```
2600B#configure terminal
2600B(config)#
2600B(config)#no ip route 172.16.10.0 255.255.255.0 172.16.30.3
2600B(config)#no ip route 172.16.40.0 255.255.255.0 172.16.30.3
```

2600C

```
2600C(config)#2600C(config)#
2600C(config)#
2600C(config)#no ip route 172.16.40.0 255.255.255.0 172.16.20.2
2600C(config)#no ip route 172.16.50.0 255.255.255.0 172.16.30.2
```

4. 5. 6. Включаем RIP

```
2600A(config)#
2600A(config)#router rip
2600A(config-router)#network 172.16.0.0
2600A(config-router)#
```

```
2600B#config t
Enter configuration commands, one per line. End with CNTL/Z.
2600B(config)#router rip
2600B(config-router)#network 172.16.0.0
2600B(config-router)#
```

```
2600C#config t
Enter configuration commands, one per line. End with CNTL/Z.
```

```
2600C(config)#router rip
2600C(config-router)#network 172.16.0.0
2600C(config-router)#^Z
```

2.4 Проверка RIP маршрутизации

2600A

```
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 5 subnets
R       172.16.10.0 [120/1] via 172.16.20.3, 00:00:20, Serial0/0
C       172.16.20.0 is directly connected, Serial0/0
R       172.16.30.0 [120/1] via 172.16.20.3, 00:00:20, Serial0/0
C       172.16.40.0 is directly connected, FastEthernet0/0
R       172.16.50.0 [120/2] via 172.16.20.3, 00:00:20, Serial0/0

2600A#
```

2600B

```
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 5 subnets
R       172.16.10.0 [120/1] via 172.16.30.3, 00:00:04, Serial0/0
R       172.16.20.0 [120/1] via 172.16.30.3, 00:00:04, Serial0/0
C       172.16.30.0 is directly connected, Serial0/0
R       172.16.40.0 [120/2] via 172.16.30.3, 00:00:04, Serial0/0
C       172.16.50.0 is directly connected, FastEthernet0/0

2600B#                                                                \
```

2600C

```
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 5 subnets
C       172.16.10.0 is directly connected, FastEthernet0/0
C       172.16.20.0 is directly connected, Serial0/0
C       172.16.30.0 is directly connected, Serial0/1
R       172.16.40.0 [120/1] via 172.16.20.2, 00:00:16, Serial0/0
R       172.16.50.0 [120/1] via 172.16.30.2, 00:00:18, Serial0/1

2600C#
```

4. На 2600A используйте команду debug ip rip чтобы увидеть апдейты принимаемые и посылаемые маршрутизатором.

```
2600A#debug ip rip
RIP protocol debugging is on
2600A#RIP: received v1 update from 172.16.20.3 on Serial0/0
172.16.10.0 in 1 hops
172.16.30.0 in 1 hops
172.16.50.0 in 2 hops
RIP: sending v1 update to 255.255.255.255 via FastEthernet0/0 (172.16.40.1)
RIP: build update entries
```

```
network 172.16.10.0 metric 2
network 172.16.20.0 metric 1
network 172.16.30.0 metric 2
network 172.16.50.0 metric 3
RIP: sending v1 update to 255.255.255.255 via Serial0/0 (172.16.20.2)
..
..
..
2600A#undebug all
All possible debugging has been turned off
```

6. Состояние таймеров протокола можно увидеть с помощью show ip protocols:

```
2600A#
2600A#show ip protocols
Routing Protocol is "rip"
Sending updates every 30 seconds, next due in 13 seconds
Invalid after 180 seconds, hold down 180, flushed after 240
Outgoing update filter list for all interfaces is not set
Incoming update filter list for all interfaces is not set
Redistributing: rip
..
..
..
```

7. Для просмотра конфигурации протоколов маршрутизации для каждого интерфейса, полезна команда:
   2600A#show protocols

```
2600C#show protocols
Global values:
Internet Protocol routing is enabled
FastEthernet0/0 is up, line protocol is up
Internet address is 172.16.10.1/24
Serial0/0 is up, line protocol is up
Internet address is 172.16.20.3/24
Serial0/1 is up, line protocol is up
Internet address is 172.16.30.3/24
```

2.5: Конфигурирование RIPv2 маршрутизации Для включения возможностей второй версии RIP, нужно выполнить команду version 2.

2600A

```
2600A#config t
Enter configuration commands, one per line.  End with CNTL/Z.
2600A(config)#router rip
2600A(config-router)#version 2
2600A(config-router)#^Z
```

2600B

```
2600B#config t
Enter configuration commands, one per line.  End with CNTL/Z.
2600B(config)#router rip
2600B(config-router)#version 2
2600B(config-router)#^Z
```

2600C

```
Enter configuration commands, one per line.  End with CNTL/Z.
2600C(config)#router rip
2600C(config-router)#version 2
2600C(config-router)#^Z
```

## Настройка OSPF

*Воспользовавшись знаниями из предыдущего параграфа об общих принципах настройки маршрутизации, замените RIP маршрутизацию на однозонный в Area 0 протокол OSPF*

Перед настройкой OSPF необходимо удалить ранее настроенную конфигурацию RIP с каждого маршрутизатора.

2600A

```
2600A#config t
2600A(config)#no router rip
2600A(config)#^Z
```

2600B

```
2600B#config t
2600B(config)#no router rip
2600B(config)#^Z
```

2600C

```
2600C#config t
2600C(config)#no router rip
```

```
2600C(config)#^Z
```

Конфигурация OSPF на каждом маршрутизаторе с использованием однозонной Area 0.
2600A

```
2600A(config)#config t
2600A(config)#router ospf 1
2600A(config-router)#network 172.16.40.0 0.0.0.255 area 0
2600A(config-router)#network 172.16.20.0 0.0.0.255 area 0
2600A(config-router)#^Z
2600A#
```

2600B

```
2600B#config t
2600B(config)#router ospf 1
2600B(config-router)#network 172.16.50.0 0.0.0.255 area 0
2600B(config-router)#network 172.16.30.0 0.0.0.255 area 0
2600B(config-router)#^Z
```

2600C

```
2600C#
2600C#config t
2600C(config)#router ospf 1
2600C(config-router)#network 172.16.10.0 0.0.0.255 area 0
2600C(config-router)#network 172.16.20.0 0.0.0.255 area 0
2600C(config-router)#network 172.16.30.0 0.0.0.255 area 0
```

Почему используется 0.0.0.255?
**0.0.0.255** — это маска подстановки (wildcard mask), которая показывает, какие биты IP-адреса нужно сравнивать, а какие можно игнорировать.

Маска подстановки — это **инверсная маска подсети**
- **0** - биты должны совпадать.
- **255** - биты можно игнорировать.

Проверка конфигурации OSPF

**Проверяем сам процесс OSPF а потом и соседей**

```
2600C# show ip ospf
Routing Process "ospf 1" with ID 172.16.30.3
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area BACKBONE(0)
Number of interfaces in this area is 3
Area has no authentication
SPF algorithm executed 3 times
Area ranges are
Number of LSA 3. Checksum Sum 0x02909b
Number of opaque link LSA 0. Checksum Sum 0x000000
Number of DCbitless LSA 0
Number of indication LSA 0
Number of DoNotAge LSA 0

Flood list length 0
```

```
2600C#show ip ospf neighbor

Neighbor ID Pri State Dead Time Address Interface
172.16.40.1 0 FULL/ - 00:00:39 172.16.20.2 Serial0/0
172.16.50.1 0 FULL/ - 00:00:34 172.16.30.2 Serial0/1
2600C#
```

Проверка OSPF маршрутизации с помощу `show ip route`
( O - OSPF )
2600A

```
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 5 subnets
O       172.16.10.0 [110/65] via 172.16.20.3, 00:11:17, Serial0/0
C       172.16.20.0 is directly connected, Serial0/0
O       172.16.30.0 [110/128] via 172.16.20.3, 00:11:17, Serial0/0
C       172.16.40.0 is directly connected, FastEthernet0/0
O       172.16.50.0 [110/129] via 172.16.20.3, 00:11:17, Serial0/0

2600A#
```

2600B

```
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 5 subnets
C       172.16.10.0 is directly connected, FastEthernet0/0
C       172.16.20.0 is directly connected, Serial0/0
C       172.16.30.0 is directly connected, Serial0/1
O       172.16.40.0 [110/65] via 172.16.20.2, 00:12:11, Serial0/0
O       172.16.50.0 [110/65] via 172.16.30.2, 00:12:01, Serial0/1

2600C#
```

2600C

```
Gateway of last resort is not set

     172.16.0.0/24 is subnetted, 5 subnets
C       172.16.10.0 is directly connected, FastEthernet0/0
C       172.16.20.0 is directly connected, Serial0/0
C       172.16.30.0 is directly connected, Serial0/1
O       172.16.40.0 [110/65] via 172.16.20.2, 00:07:02, Serial0/0
O       172.16.50.0 [110/65] via 172.16.30.2, 00:06:52, Serial0/1

2600C#
```

Проверяем связь между устройствами с помощью **ping**.

Например: HostA -> HostE

```
C:\>
C:\>
C:\>ping 172.16.40.3

Pinging 172.16.40.3 with 32 bytes of data:

Reply from 172.16.40.3: bytes=32 time=1ms TTL=126
Reply from 172.16.40.3: bytes=32 time=25ms TTL=126
Reply from 172.16.40.3: bytes=32 time=1ms TTL=126
Reply from 172.16.40.3: bytes=32 time=6ms TTL=126
```