

Konfiguracija OSPF

Priprema za vježbu:

1) Koje su karakteristike protokola OSPF?

OSPF je interni protokol usmjernika koji usmjerava pakete unutar jednog autonomnog sustava

Koristi se informacijama o stanju veze za donošenje odluka o usmjeravanju, izvodeći izračune rute s pomoću algoritma *najkraći put* (SPF) (koji se također naziva Dijkstrin algoritam)

Svaki usmjernik koji pokreće OSPF preplavljuje oglase o stanju veze u cijelom AS-u ili području koji sadrži informacije o priključenim sučeljima tog usmjernika i metriku usmjeravanja

Kod OSPF protokola najvažniji faktor u metrici je propusnost, a ruta najveće propusnosti ima najmanju cijenu

2) Što je Wildcard maska?

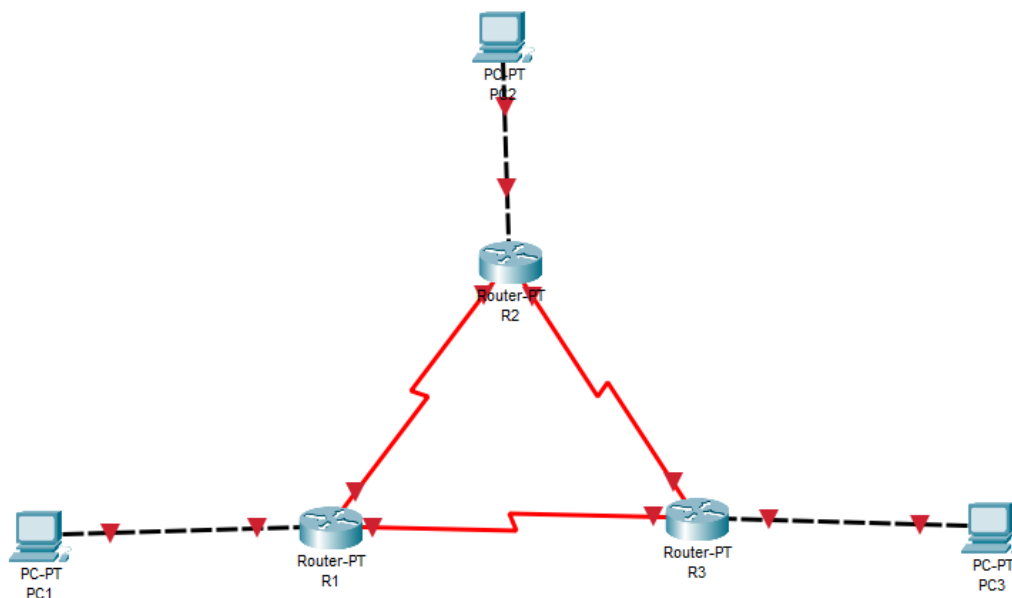
Wildcard maska je alat koji se koristi u mrežnom programiranju i konfiguraciji kako bi se odredilo koje dijelove IP adrese treba uzeti u obzir ili zanemariti

Wildcard maska se koristi u kombinaciji s IP adresom ili mrežnom adresom kako bi se odredilo koje bitove treba uspoređivati i koji bitovi se smatraju "promjenjivima" (wildcards). Bitovi s vrijednošću 0 u wildcard masci znače da se odgovarajući bitovi u IP adresi ili mrežnoj adresi moraju podudarati, dok bitovi s vrijednošću 1 znače da ti bitovi mogu biti bilo koje vrijednosti

Primjerice, ako imate IP adresu 192.168.1.0 i želite stvoriti wildcard masku koja će uzeti u obzir samo posljednji oktet, wildcard maska bi mogla izgledati ovako: 0.0.0.255. Ova maska znači da svi bitovi u posljednjem oktetu moraju biti jednaki onima u IP adresi, dok su svi preostali bitovi mogu biti bilo koje vrijednosti

Wildcard maske su često korištene u mrežnim uređajima za precizno definiranje pravila filtriranja prometa ili pristupa mrežnim resursima

Izvođenje vježbe:



Ruter	Adresa Fastethernet sučelja	Mrežna maska	Oznaka ser. sučelja	Tip ser. sučelja	Adresa serijskog sučelja	Mrežna maska	Default gateway
R1	10.10.10.1	255.255.255.240					
			S2/0	DCE	172.16.1.1	255.255.255.252	
			S3/0	DTE	172.16.1.6	255.255.255.252	
R2	192.168.10.1	255.255.255.0					
			S2/0	DTE	172.16.1.2	255.255.255.252	
			S3/0	DCE	172.16.1.9	255.255.255.252	
R3	10.10.20.1	255.255.255.248					
			S2/0	DCE	172.16.1.5	255.255.255.252	
			S3/0	DTE	172.16.1.10	255.255.255.252	
PC1	10.10.10.10	255.255.255.240					10.10.10.1
PC2	192.168.10.10	255.255.255.0					192.168.10.1
PC3	10.10.20.10	255.255.255.248					10.10.20.1

1) U PT-u spoji uređaje prema zadanoj topologiji i izvrši temeljnu konfiguraciju usmjernika, koristeći tab CLI u Packet Traceru.

2) Konfiguriraj sučelja na usmjernicima R1, R2 i R3, koristeći priloženu tablicu adresa i zabilješke s prethodnih vježbi, pri čemu voditi računa da su IP adrese izmijenjene.

Usmjernik R1:

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.10.10.1 255.255.255.240
Router(config-if)#no shutdown
```

```
Router(config)#interface serial 2/0
Router(config-if)#ip address 172.16.1.1 255.255.255.252
Router(config-if)#no shutdown
```

```
Router(config)#interface serial 3/0
Router(config-if)#ip address 172.16.1.6 255.255.255.252
Router(config-if)#no shutdown
```

Usmjernik R2:

```
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
Router(config-if)#no shutdown
```

```
Router(config)#interface serial 2/0
Router(config-if)#ip address 172.16.1.2 255.255.255.252
Router(config-if)#no shutdown
```

```
Router(config)#interface serial 3/0
Router(config-if)#ip address 172.16.1.9 255.255.255.252
Router(config-if)#no shutdown
```

Usmjernik R3:

```
Router(config)#interface fastethernet 0/0
Router(config-if)#ip address 10.10.20.1 255.255.255.248
Router(config-if)#no shutdown
```

```
Router(config)#interface serial 2/0
Router(config-if)#ip address 172.16.1.5 255.255.255.252
Router(config-if)#no shutdown
```

```
Router(config)#interface serial 3/0
Router(config-if)#ip address 172.16.1.10 255.255.255.252
Router(config-if)#no shutdown
```

3) Pinganjem provjeri da li postoji povezanost između PC1 i PC2.

```
Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Reply from 10.10.10.1: Destination host unreachable.
Reply from 10.10.10.1: Destination host unreachable.
Reply from 10.10.10.1: Destination host unreachable.
Reply from 10.10.10.1: Destination host unreachable.

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Nismo još konfigurirali protokol OSPF, zato PC1 ne može dohvatiti PC2

4) Pinganjem provjeri do koje razine povezanost postoji.

PC1 – usmjernik R1

```
C:\>ping 10.10.10.1

Pinging 10.10.10.1 with 32 bytes of data:

Reply from 10.10.10.1: bytes=32 time<lms TTL=255
Reply from 10.10.10.1: bytes=32 time<lms TTL=255
Reply from 10.10.10.1: bytes=32 time<lms TTL=255
Reply from 10.10.10.1: bytes=32 time<lms TTL=255

Ping statistics for 10.10.10.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

PC1 – usmjernik R2

```
C:\>ping 192.168.10.1

Pinging 192.168.10.1 with 32 bytes of data:

Reply from 10.10.10.1: Destination host unreachable.
Request timed out.
Reply from 10.10.10.1: Destination host unreachable.
Reply from 10.10.10.1: Destination host unreachable.

Ping statistics for 192.168.10.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

PC1 – usmjernik R3

```
C:\>ping 10.10.20.1

Pinging 10.10.20.1 with 32 bytes of data:

Reply from 10.10.10.1: Destination host unreachable.
Reply from 10.10.10.1: Destination host unreachable.
Reply from 10.10.10.1: Destination host unreachable.
Reply from 10.10.10.1: Destination host unreachable.

Ping statistics for 10.10.20.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

5) Naredbom show ip route na ruteru R1 provjeri stanje rutin tablice.

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

    10.0.0.0/28 is subnetted, 1 subnets
C       10.10.10.0 is directly connected, FastEthernet0/0
    172.16.0.0/30 is subnetted, 2 subnets
C       172.16.1.0 is directly connected, Serial2/0
C       172.16.1.4 is directly connected, Serial3/0

Router>
```

6) Konfiguriraj OSPF rutin prema sljedećim uputama čime će se omogućiti povezanost svih mreža.

Postupak konfiguracije OSPF rutinga:

1. Temeljna konfiguracija usmjernika – standardni postupak
2. Konfiguracija sučelja – standardni postupak

3. Konfiguracija OSPF

a) R1(config)#router ospf 1

- to je naredba koja pokreće ospf konfiguraciju (autonomni sustav AS = 1)

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 1
Router(config-router)#
```

b) R1(config-router)#network mrežna adresa wildcard maska područje

Instrukcija kojom se sučelje na kojem se nalazi mrežna adresa sa odgovarajućom wildcard maskom, osposobljava za rad sa OSPF rutinom. Riječ područje označava skup usmjernika koji predstavljaju određenu cjelinu unutar koje se ospf rutina koristi (obično započinjemo sa area 0).

```
Router(config-router)#network 10.10.10.0 0.0.0.15 area 0
Router(config-router)#network 172.16.1.0 0.0.0.3 area 0
Router(config-router)#network 172.16.1.4 0.0.0.3 area 0
```

7) Naredbom show ip route na svim usmjernicima provjeri stanje rutinske tablice.

Usmjernik R1:

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

10.0.0.0/28 is subnetted, 1 subnets
C    10.10.10.0 is directly connected, FastEthernet0/0
172.16.0.0/30 is subnetted, 2 subnets
C    172.16.1.0 is directly connected, Serial2/0
C    172.16.1.4 is directly connected, Serial3/0

Router>
```

Usmjernik R2:

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

172.16.0.0/30 is subnetted, 2 subnets
C    172.16.1.0 is directly connected, Serial2/0
C    172.16.1.8 is directly connected, Serial3/0
C    192.168.10.0/24 is directly connected, FastEthernet0/0

Router>
```

Usmjernik R3:

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

10.0.0.0/29 is subnetted, 1 subnets
C    10.10.20.0 is directly connected, FastEthernet0/0
172.16.0.0/30 is subnetted, 2 subnets
C    172.16.1.4 is directly connected, Serial2/0
C    172.16.1.8 is directly connected, Serial3/0

Router>
```

8) Postupak ponoviti na preostalim usmjernicima.

Usmjernik R2:

```
Router(config-router)#network 192.168.10.0 0.0.0.255 area 0
Router(config-router)#network 172.16.1.0 0.0.0.3 area 0
Router(config-router)#network 172.16.1.8 0.0.0.3 area 0
```

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

 10.0.0.0/28 is subnetted, 1 subnets
O   10.10.10.0 [110/65] via 172.16.1.1, 00:01:33, Serial2/0
 172.16.0.0/30 is subnetted, 3 subnets
C   172.16.1.0 is directly connected, Serial2/0
O   172.16.1.4 [110/128] via 172.16.1.1, 00:01:33, Serial2/0
C   172.16.1.8 is directly connected, Serial3/0
C   192.168.10.0/24 is directly connected, FastEthernet0/0

Router>
```

Usmjernik R3:

```
Router(config-router)#network 10.10.20.1 0.0.0.0 area 0
Router(config-router)#network 172.16.1.4 0.0.0.3 area 0
Router(config-router)#network 172.16.1.8 0.0.0.3 area 0
```

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

 10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
O   10.10.10.0/28 [110/65] via 172.16.1.6, 00:00:44, Serial2/0
C   10.10.20.0/29 is directly connected, FastEthernet0/0
 172.16.0.0/30 is subnetted, 3 subnets
O   172.16.1.0 [110/128] via 172.16.1.6, 00:00:18, Serial2/0
    [110/128] via 172.16.1.9, 00:00:18, Serial3/0
C   172.16.1.4 is directly connected, Serial2/0
C   172.16.1.8 is directly connected, Serial3/0
O   192.168.10.0/24 [110/65] via 172.16.1.9, 00:00:18, Serial3/0

Router>
```

9) Pinganjem provjeri povezanost između PC1, PC2 i PC3.

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.10.10.10

Pinging 10.10.10.10 with 32 bytes of data:

Reply from 10.10.10.10: bytes=32 time=6ms TTL=126
Reply from 10.10.10.10: bytes=32 time=12ms TTL=126
Reply from 10.10.10.10: bytes=32 time=15ms TTL=126
Reply from 10.10.10.10: bytes=32 time=27ms TTL=126

Ping statistics for 10.10.10.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 6ms, Maximum = 27ms, Average = 15ms

C:\>
```

```
C:\>ping 192.168.10.10

Pinging 192.168.10.10 with 32 bytes of data:

Request timed out.
Reply from 192.168.10.10: bytes=32 time=16ms TTL=126
Reply from 192.168.10.10: bytes=32 time=11ms TTL=126
Reply from 192.168.10.10: bytes=32 time=11ms TTL=126

Ping statistics for 192.168.10.10:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 11ms, Maximum = 16ms, Average = 12ms

C:\>
```

Topologija mreže:

