

TEHNIČKA ŠKOLA RUĐERA BOŠKOVIĆA

Zagreb, Getaldićeve 4

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Statičko usmjeravanje

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Zagreb, siječanj 2025.

PRIPREMA ZA VJEŽBU

1. Na koji način se informacije o putanji do odredišta unose u usmjerničku tablicu kod statičkog usmjeravanja?

- Informacije o putanji do odredišta ručno unosi administrator mreže.

2. Kako izgleda sintaksa za konfiguraciju statičke rute? Objasni na primjeru!

- Statička ruta može se u IPv4 konfigurirati na dva načina: tako da se navede naziv izlaznog priključka usmjernika koji se konfigurira ili tako da se navede IP adresa ulaznog priključka u prvi sljedeći usmjernik na putu prema odredišnoj mreži.

I. način:

- Router(config)#ip route x.x.x.x x.x.x.x naziv_izlaznog_priključka
- gdje se umjesto x.x.x.x x.x.x.x upisuje IP adresa mreže i mrežna maska odredišne mreže u kojoj se paket usmjerava
- **primjer** (R1 -> R2):
 - R1(config)#ip route 172.16.30.0 255.255.255.0 s0/0/0/0
 - usmjernik R1 predaje pakete na svoje serijsko sučelje s0/0/0/0, koje je povezano s usmjernikom R2
- u slučaju zamjene uređaja nekim drugim čije je serijsko sučelje drugog naziva, zahtijeva ponovnu konfiguraciju ruta

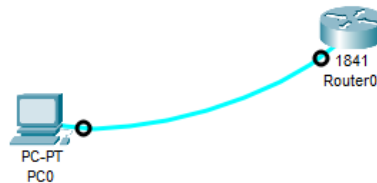
II. način:

- Router(config)#ip route x.x.x.x x.x.x.x y.y.y.y
- gdje su x.x.x.x x.x.x.x IP adresa mreže i mrežna maska odredišne mreže u koju se paket usmjerava, a y.y.y.y adresa prvog ulaznog sučelja susjednog usmjernika na koje dolazi IP paket na svojem putu prema odredišnoj mreži
- **primjer** (R1 -> R2):
 - R1(config)#ip route 172.16.30.0 255.255.255.0 172.16.20.2
 - usmjernik R1 predaje pakete na IP adresu ulaznog sučelja prvog usmjernika (172.16.20.2)

IZVOĐENJE VJEŽBE

Temeljna konfiguracija:

1. Spojiti usmjernik R1 sa računalom u ulozu terminala, rollover kabelom, kao na slici.



Bits Per Second = 9600
Data Bits = 8
Parity = None
Stop Bits = 1
Flow Control = None

2. Usmjernik koji prvi puta konfiguriramo trebao bi se nalaziti u početnom (defaultnom) stanju. Kako bismo bili potpuno sigurni da je tako, potrebno je izvršiti brisanje NVRAM-a od mogućih tragova prijašnjih konfiguracija

```
Router>ena
Router#erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#reload
Proceed with reload? [confirm]
System Bootstrap, Version 12.3(8r)T8, RELEASE SOFTWARE (fc1)
Initializing memory for ECC
..
C1841 processor with 524288 Kbytes of main memory
Main memory is configured to 64 bit mode with ECC enabled

Readonly ROMMON initialized

Self decompressing the image :
##### [OK]
```

3. U privilegiranom ili u korisničkom modu pored prompta ukucajte kombinaciju slova koju IOS ne razumije (npr. svoje ime).

```
Router>ivan
Translating "ivan"...domain server (255.255.255.255)
% Unknown command or computer name, or unable to find computer address
Router>|
```

Da biste to izbjegli potrebno je u globalnom konfiguracijskom modu ukucati slijedeće naredbu: RB(config)#no ip domain-lookup.

```
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#|
```

Provjerite da li ovo funkcionira.

- Funkcionira.

- a) Pohraniti izvršene konfiguracije: Router# copy running-config startup-config

```
Router>ena
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#|
```

- b) Odspojiti terminal, isključiti ruter prekidačem (kartica Physical), a zatim sve ponovno spojiti. Da li su sve postavke na ruteru zadržane?

```
Router>ena
Router#show running-config
Building configuration...

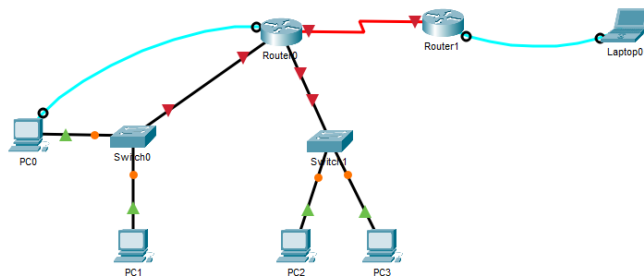
Current configuration : 556 bytes
!
version 12.4
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
!
!
!
!
!
no ip cef
no ipv6 cef
!
!
--More--
```

Spremljene postavke usmjerivača su zadržane.

Statičko usmjeravanje:

Uređaj	Adresa fastethernet sučelja	Oznaka sučelja	Mrežna maska	Oznaka Serijskog sučelja	Tip serijskog sučelja	Adresa serijskog sučelja	Mrežna maska	Default gateway
R1	192.168.20.193	0/0	255.255.255.192	S2/0	DCE	172.16.30.1	255.255.255.252	
	192.168.80.65	1/0	255.255.255.192					
R2				S2/0	DTE	172.16.30.2	255.255.255.252	
PC1	192.168.20.194							192.168.20.193
PC2	192.168.20.195							192.168.20.193
PC3	192.168.80.66							192.168.80.65
PC4	192.168.80.67							192.168.80.65

1. U PT-u spoji uređaje prema zadanoj topologiji i izvrši temeljnu konfiguraciju usmjernika, koristeći spojena računala kao terminale (rollover kabel). Na R2 također dodaj terminal radi konfiguracije.



Temeljna konfiguracija usmjernika R1

```
Router>ena
Router#erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#exit
```

```
Router>ena
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R1
R1(config)#
```

Temeljna konfiguracija usmjernika R2

```
Router>ena
Router#erase startup-config
Erasing the nvram filesystem will remove all configuration files! Continue? [confirm]
[OK]
Erase of nvram: complete
%SYS-7-NV_BLOCK_INIT: Initialized the geometry of nvram
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#no ip domain-lookup
Router(config)#end
Router#
```

```
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname R2
R2(config)#
```

2. Konfiguriraj sučelja na usmjerniku R1 i R2, koristeći priloženu tablicu adresa.

R1

```
R1(config)#interface Serial2/0
R1(config-if)#no shutdown
R1(config-if)#ip address 172.16.30.1 255.255.255.252
R1(config-if)#exit
```

```
R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 192.168.20.193 255.255.255.192
R1(config-if)#no shutdown

R1(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

R1(config-if)#
R1(config-if)#exit
R1(config)#interface FastEthernet1/0
R1(config-if)#ip address 192.168.80.65 255.255.255.192
R1(config-if)#no shutdown

R1(config-if)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up
```

```
R1#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R1#
```

R2

```
R2#
R2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#interface Serial2/0
R2(config-if)#no shutdown
R2(config-if)#ip address 192.16.30.2 255.255.255.252
R2(config-if)#exit
```

```
R2#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
R2#exit
```

3. Pinganjem provjeri da li postoji povezanost između računala u jednoj i drugoj Ethernet mreži. Rezultate zapiši u bilježnicu.

PC0

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.20.194
Subnet Mask	255.255.255.192
Default Gateway	192.168.20.193
DNS Server	0.0.0.0

PC1

IP Configuration		
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static	This address is already used in the network.
IPv4 Address	192.168.20.195	
Subnet Mask	255.255.255.192	
Default Gateway	192.168.20.193	
DNS Server	0.0.0.0	

PC2

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.80.66
Subnet Mask	255.255.255.192
Default Gateway	192.168.80.65
DNS Server	0.0.0.0

PC3

IP Configuration	
<input type="radio"/> DHCP	<input checked="" type="radio"/> Static
IPv4 Address	192.168.80.67
Subnet Mask	255.255.255.192
Default Gateway	192.168.80.65
DNS Server	0.0.0.0

ping PC0 -> PC2

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.80.66

Pinging 192.168.80.66 with 32 bytes of data:

Request timed out.
Reply from 192.168.80.66: bytes=32 time<1ms TTL=127
Reply from 192.168.80.66: bytes=32 time<1ms TTL=127
Reply from 192.168.80.66: bytes=32 time=1ms TTL=127

Ping statistics for 192.168.80.66:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>|
```

Povezani su!

4. Pinganjem provjeri dohvatljivost default gatewaya za svaku mrežu. Rezultate zapiši u bilježnicu.

```
C:\>ping 192.168.20.193

Pinging 192.168.20.193 with 32 bytes of data:

Reply from 192.168.20.193: bytes=32 time<1ms TTL=255
Reply from 192.168.20.193: bytes=32 time<1ms TTL=255
Reply from 192.168.20.193: bytes=32 time<1ms TTL=255
Reply from 192.168.20.193: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.20.193:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.80.65

Pinging 192.168.80.65 with 32 bytes of data:

Reply from 192.168.80.65: bytes=32 time<1ms TTL=255
Reply from 192.168.80.65: bytes=32 time<1ms TTL=255
Reply from 192.168.80.65: bytes=32 time<1ms TTL=255
Reply from 192.168.80.65: bytes=32 time<1ms TTL=255

Ping statistics for 192.168.80.65:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

Dohvatljivo je!

5. Pinganjem sa bilo kojeg računala provjeri dohvatljivost serijskog sučelja S2/0 usmjernika R2 (iz naredbenog retka -cmd). Obrazloži rezultat pinganja.

```
C:\>ping 172.16.30.2

Pinging 172.16.30.2 with 32 bytes of data:





Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 172.16.30.2:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

Zbog ne-konfigurirane statičke rute pristup usmjernik R2 nije moguće uspješno ping-at.

6. U simulation modu uputi ICMP paket sa bilo kojeg računala na R1, a zatim na R2. Opiši što se je dogodilo. Zbog čega ICMP request dohvaća R2, ali se reply ne vraća natrag?

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit	Delete
	In Progress	PC0	Router0	ICMP		0.000	N	0	(edit)	(delete)
	In Progress	PC0	Router1	ICMP		0.000	N	1	(edit)	(delete)

Ne vraća se natrag, jer R2 ne zna konfiguraciju mreže.

7. Naredbom show ip route na usmjernicima R1 i R2 provjeri stanje ruting tablice. Ispiši koje su mreže navedene u tablici.

```
R1>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, 1 subnets
C      172.16.30.0 is directly connected, Serial2/0
192.168.20.0/26 is subnetted, 1 subnets
C      192.168.20.192 is directly connected, FastEthernet0/0
192.168.80.0/26 is subnetted, 1 subnets
C      192.168.80.64 is directly connected, FastEthernet1/0
R1>
```

```
R2>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

192.16.30.0/30 is subnetted, 1 subnets
C      192.16.30.0 is directly connected, Serial2/0
R2>
```

8. Konfiguriraj statičku rutu na R2.

```
R2(config)#ip route 192.168.20.192 255.255.255.192 172.16.30.1
R2(config)#ip route 192.168.80.64 255.255.255.192 172.16.30.1
R2(config)#
```

9. Naredbom show ip route na oba usmjernika provjeri stanje usmjerničkih tablica. Ispiši koje su mreže navedene u tablici.

```
R1>
R1>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, 1 subnets
C      172.16.30.0 is directly connected, Serial2/0
192.168.20.0/26 is subnetted, 1 subnets
C      192.168.20.192 is directly connected, FastEthernet0/0
192.168.80.0/26 is subnetted, 1 subnets
C      192.168.80.64 is directly connected, FastEthernet1/0
R1>
```

```

R2>
R2>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, 1 subnets
C       172.16.30.0 is directly connected, Serial2/0
    192.168.20.0/26 is subnetted, 1 subnets
S       192.168.20.192 [1/0] via 172.16.30.1
    192.168.80.0/26 is subnetted, 1 subnets
S       192.168.80.64 [1/0] via 172.16.30.1

R2>|

```

10. Pinganjem provjeri povezanost sa usmjernikom R2 sa jedne i druge Ethernet mreže. Kakav je rezultat pinganja iz naredbenog retka (cmd), a kakav upućivanjem ICMP paketa u simulation modu?

```

C:\>ping 172.16.30.2

Pinging 172.16.30.2 with 32 bytes of data:

Reply from 172.16.30.2: bytes=32 time=10ms TTL=254
Reply from 172.16.30.2: bytes=32 time=1ms TTL=254
Reply from 172.16.30.2: bytes=32 time=1ms TTL=254
Reply from 172.16.30.2: bytes=32 time=1ms TTL=254

Ping statistics for 172.16.30.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 1ms, Maximum = 10ms, Average = 3ms

C:\>|

```

Rezultat je uspješan!