

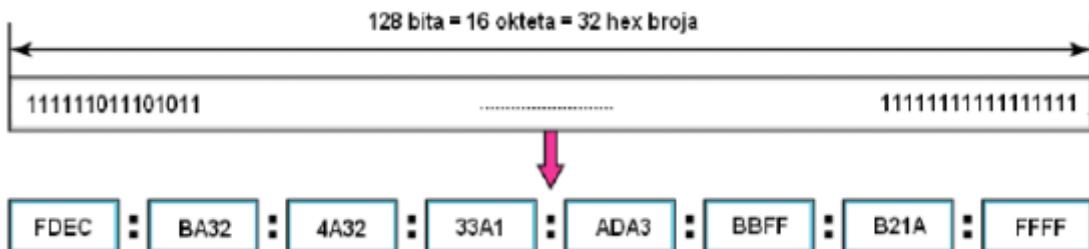
Nastavni predmet RAČUNALNE MREŽE_3F

Naslov cjeline **Djelovanje u mrežnom sloju**

Naslov jedinice Vježba 5: IPv6 adresiranje-**Ana Baćak i Ella Spivak**

PRIPREMA ZA VJEŽBU

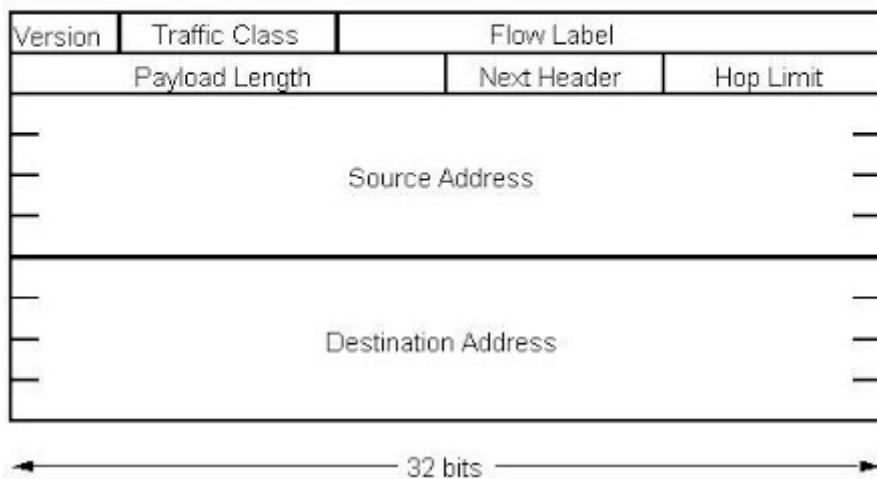
1. Na primjeru objasni format IPv6 adrese.



Veličina IPv6 adrese je 128 bitova.

2. Skiciraj IPv6 zaglavlje i objasni funkcije pojedinih polja.

The IPv6 Header



Verzija: polje dužine 4 bita (6 označava verziju IPv6)

Klasa prometa (engl. Traffic class): 4 bita, omogućava postavljanje željenog prioriteta pri uručivanju paketa, 16 mogućih vrsta (0-7 nije bitno kašnjenje, 8-15 u realnom vremenu)

Oznaka toka (engl. Flow label): 24 bita, s ishodišnom adresom čini jedinstveni broj koji označava pakete za posebno rukovanje kod usmjernika (npr. za VoIP)

Dužina podatka (engl. Payload lenght): duljna korisnog sadržaja

Sljedeće zaglavljje (engl. Next header):

- Označava koji tip zaglavlja slijedi odmah iza IPv6 zaglavlja (npr. TCP ili UDP)

Ograničenje broja skokova (engl. Hop limit):

- polje koje definira koliko usmjernika paket može proći prije nego bude uništen

- Broj od 8 okteta

- Slično TTL polju

Ishodišna adresa:

- 128 bitna adresa ishodišta paketa

Odredišna adresa:

- 128 bitna adresa odredišta paketa

Zaglavljje proširenja:

- Opcionalna polja koja slijede obvezno zaglavljje

- Osnovno zaglavljje uvijek je iste duljine

3. Ukratko objasni novosti koje donosi IPv6.

Puno veći adresni prostor, novi format zaglavlja, ugrađeni sustavi zaštite podataka, poboljšana podrška za kvalitetu usluge (engl. Quality of Service)

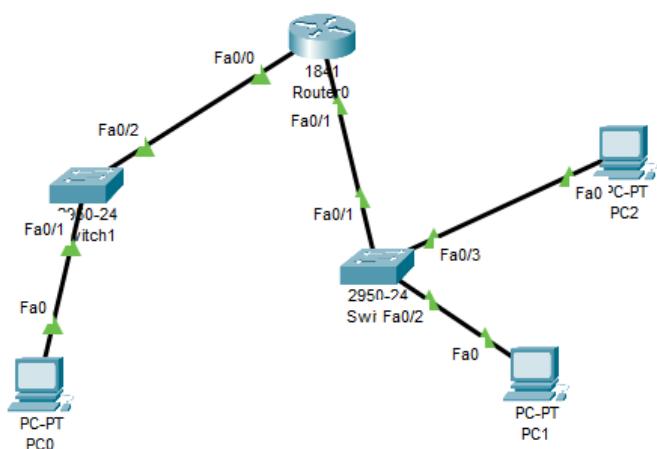
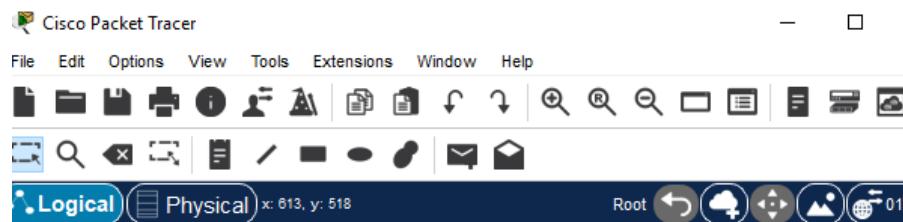
4. Objasni tipove jednoodredišnih IPv6 adresa.

Adresa na lokalnoj vezi (engl. link-local unicast address) – koriste se pri autokonfiguraciji mreže kako bi uređaji imali neku adresu za komunikaciju s usmjernikom. Prefiks FE80::/10

IZVOĐENJE VJEŽBE

Zadaci:

1. Formiraj mrežu prema prikazanoj topologiji.



Provjeri da li računala PC1 i PC2 imaju automatski konfiguirirane adrese na lokalnoj vezi (engl. link-local address). Pinganjem adrese na lokalnoj vezi, provjeri vezu između PC1 i PC2.

The screenshot shows a Cisco Packet Tracer interface for a device named 'PC1'. The 'Desktop' tab is selected. A terminal window titled 'Command Prompt' is open, displaying the output of a ping command. The command 'ping FE80::2E0:A3FF:FED6:D557' was entered, followed by the output of the ping operation. The output shows four replies from the target link-local address, indicating successful communication.

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping FE80::2E0:A3FF:FED6:D557

Pinging FE80::2E0:A3FF:FED6:D557 with 32 bytes of data:

Reply from FE80::2E0:A3FF:FED6:D557: bytes=32 time<1ms TTL=128
Reply from FE80::2E0:A3FF:FED6:D557: bytes=32 time=1ms TTL=128
Reply from FE80::2E0:A3FF:FED6:D557: bytes=32 time<1ms TTL=128
Reply from FE80::2E0:A3FF:FED6:D557: bytes=32 time<1ms TTL=128

Ping statistics for FE80::2E0:A3FF:FED6:D557:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>
```

2. Usmjernik podrazumijevano nema omogućeno korištenje protokola IPv6 i potrebna je konfiguracija istog. Konfigurirajte adresu na lokalnoj vezi za sučelje FastEthernet 0/0 na sljedeći način: Na isti način, konfigurirajte i adresu za sučelje FastEthernet 0/1. Koji je rezultat ovih akcija? Pinganjem sa računala PC1 i PC2 provjerite dostupnost ovih sučelja.

```
Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ipv6 unicast-routing
Router(config)#int fastethernet 0/1
Router(config-if)#ipv6 address FE80::1 link-local
Router(config-if)#no shut
Router(config-if)#
Router(config-if)#
Router(config-if)#exit
Router(config)#interface FastEthernet0/1
Router(config-if)#shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to administratively down

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
no shutdown
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#exit
Router(config)#exit
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ipv6 unicast-routing
Router(config)#int fastethernet 0/0
Router(config-if)#ipv6 address FE80::1 link-local
Router(config-if)#no shut

Router(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
```

Promjena line protocola na sučelju Fastethernet 0/0 i FastEthernet 0/1 na stanje "up" znači da je veza na tom sučelju aktivirana i omogućen je prijenos podataka.



PC2

Physical Config **Desktop** Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping FE80::2D0:BCFF:FE53:5E91

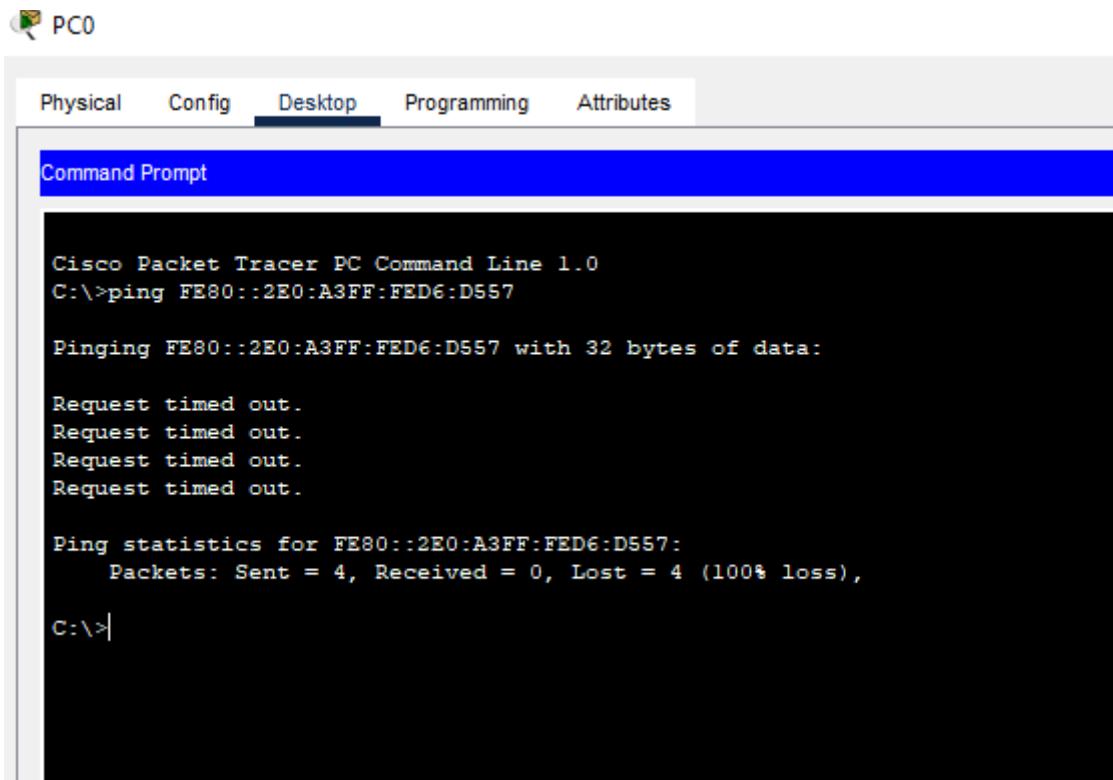
Pinging FE80::2D0:BCFF:FE53:5E91 with 32 bytes of data:

Reply from FE80::2D0:BCFF:FE53:5E91: bytes=32 time=5ms TTL=128
Reply from FE80::2D0:BCFF:FE53:5E91: bytes=32 time<1ms TTL=128
Reply from FE80::2D0:BCFF:FE53:5E91: bytes=32 time=1ms TTL=128
Reply from FE80::2D0:BCFF:FE53:5E91: bytes=32 time<1ms TTL=128

Ping statistics for FE80::2D0:BCFF:FE53:5E91:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 5ms, Average = 1ms

C:\>
```

3. Provjerite da li je konfiguirirana adresa na lokalnoj vezi računala PC0. Ukoliko jest, pinganjem provjerite dostupnost računala PC1 i PC2. Kakav je rezultat? Zašto?



The screenshot shows the Cisco Packet Tracer software interface. At the top, there is a menu bar with tabs: Physical, Config, Desktop, Programming, and Attributes. The 'Desktop' tab is currently selected. Below the menu is a blue header bar labeled 'Command Prompt'. The main area is a black terminal window displaying the output of a ping command. The text in the terminal is as follows:

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping FE80::2E0:A3FF:FED6:D557

Pinging FE80::2E0:A3FF:FED6:D557 with 32 bytes of data:

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

Ping statistics for FE80::2E0:A3FF:FED6:D557:
  Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
```

Rezultat je takav zato što mreže nisu povezane.

4. Kako bismo povezali obje mreže, potrebno je konfigurirati globalne adrese (engl. unicast global address). Za naše dvije mreže, koristit ćemo sljedeće adrese:

Mreža A: 2001:0DB8:AAAA:000A:0000:0000:0000:0000/64

Mreža B: 2001:0DB8:AAAA:000B:0000:0000:0000:0000/64

Kako bismo adrese ovih mreža napisali u skraćenom obliku?

Mreža A: 2001:DB8:AAAA:A::/64

Mreža B: 2001:DB8:AAAA:B::/64

Na već opisan način (u naredbi #ipv6 address izostavite link-local), konfigurirajte globalne adrese za sučelja FastEthernet 0/0 i FastEthernet 0/1, pridajući im prvu moguću adresu u pojedinoj mreži.

```
Router(config-if)#ipv6 unicast-routing
Router(config)#int fastethernet 0/0
Router(config-if)#ipv6 address 2001:0DB8:AAAA:000A:0000:0000:0000:0000/64
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#ipv6 unicast-routing
Router(config)#int fastethernet 0/1
Router(config-if)#ipv6 address 2001:0DB8:AAAA:000B:0000:0000:0000:0000/64
Router(config-if)#no shut
Router(config-if)#

```

Ctrl+F6 to exit CLI focus

5. Računalima statički dodijelite IPv6 adrese:

- mrežni dio adrese je prefiks lokalnog mrežnog segmenta
- host dio adrese je jednak host dijelu adrese na lokalnoj vezi
- IPv6 Gateway je FE80::1 za sva računala Pinganjem provjerite povezanost računala.

```
Router>ping 2001:DB8:AAAA:A:2D0:FFFF:FE39:6A99
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 2001:DB8:AAAA:A:2D0:FFFF:FE39:6A99, timeout is 2
seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/1 ms

```

Router>

Ctrl+F6 to exit CLI focus

Copy

Paste

Top

```
C:\>ping 2001:DB8:AAAA:B:2E0:A3FF:FED6:D559

Pinging 2001:DB8:AAAA:B:2E0:A3FF:FED6:D559 with 32 bytes of data:

Reply from 2001:DB8:AAAA:B:2E0:A3FF:FED6:D559: bytes=32 time<1ms TTL=127
Reply from 2001:DB8:AAAA:B:2E0:A3FF:FED6:D559: bytes=32 time<1ms TTL=127
Reply from 2001:DB8:AAAA:B:2E0:A3FF:FED6:D559: bytes=32 time=17ms TTL=127
Reply from 2001:DB8:AAAA:B:2E0:A3FF:FED6:D559: bytes=32 time<1ms TTL=127

Ping statistics for 2001:DB8:AAAA:B:2E0:A3FF:FED6:D559:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 17ms, Average = 4ms

C:\>
```

File