

Nastavni predmet RAČUNALNE MREŽE_3H

Naslov cjeline Djelovanje u mrežnom sloju

Naslov jedinice Vježba 2: Osnovna analiza mrežnog prometa

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Priprema za vježbu

1. **ARP (Address Resolution Protocol)** je protokol koji se koristi za mapiranje IP adresa na MAC adrese unutar lokalne mreže. Služi za otkrivanje MAC adresa drugih uređaja kako bi se omogućilo slanje okvira na odgovarajuće odredište.
2. **ICMP (Internet Control Message Protocol)** je protokol koji se koristi za razmjenu kontrolnih poruka i obavještenja između računala u mreži. Služi za dijagnostiku i upravljanje mrežom te omogućava informiranje o greškama i dostupnosti u mreži.
3. Naredba **ping** se koristi za provjeru dostupnosti računala ili uređaja u mreži putem ICMP zahtjeva. Šalje ICMP "echo request" pakete ciljnom uređaju i očekuje "echo reply" pakete kao odgovor. Koristi se za testiranje povezanosti i latencije u mreži.

Izvođenje vježbe

1. Zadatak

Povezati dva susjedna računala odgovarajućim kabelom te uspostaviti P2P spoj.

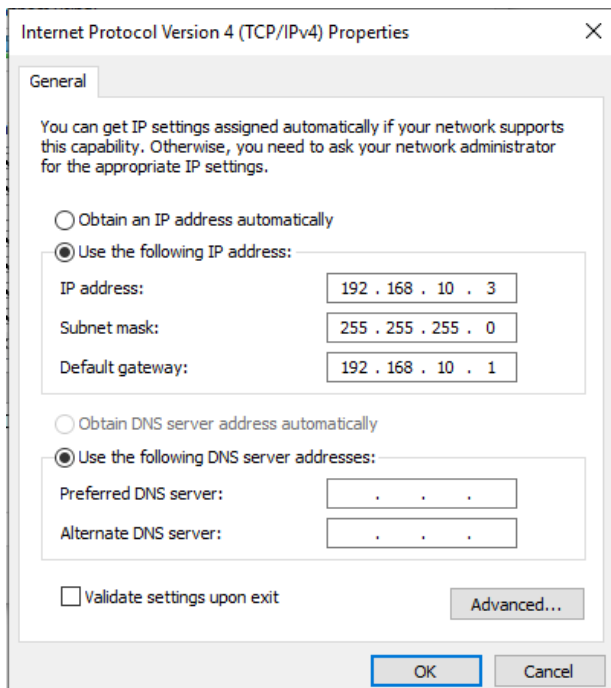
Topologija:



2. Zadatak

Konfigurirati računala za rad u mreži, pri čemu koristiti adresnu shemu prema tablici:

Oznaka na shemi	PC1	PC2
Naziv radne stanice	WSx	WSy
IP adresa	192.168.10.2	192.168.10.3
Subnet maska	255.255.255.0	255.255.255.0
Default Gateway	192.168.10.1	192.168.10.1



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Windows IP Configuration

Host Name . . . . . : WS4_LAB_2_3
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Ethernet:

Connection-specific DNS Suffix . :
Description . . . . . : Realtek PCIe GBE Family Controller
Physical Address. . . . . : 70-85-C2-D4-AA-2D
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::3020:de3e:b879:3c4b%4(Preferred)
IPv4 Address. . . . . : 192.168.10.3(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Default Gateway . . . . . : 192.168.10.1
DHCPv6 IAID . . . . . : 40928706
DHCPv6 Client DUID. . . . . : 00-01-00-01-25-1F-98-A1-70-85-C2-D4-AA-2D
DNS Servers . . . . . : fec0:0:0:ffff::1%1
                       fec0:0:0:ffff::2%1
                       fec0:0:0:ffff::3%1
NetBIOS over Tcpi. . . . . : Enabled
```

3. Zadatak

a. Wireshark je uhvatio točno 36 okvira

No.	Time	Source	Destination	Protocol	Length	Info
10	2.589794	192.168.10.3	192.168.10.255	NBNS	92	Name query NB NASTAVNICOLB23<00>
17	3.343022	192.168.10.3	192.168.10.255	NBNS	92	Name query NB NASTAVNICOLB23<00>
21	4.107426	192.168.10.3	192.168.10.255	NBNS	92	Name query NB NASTAVNICOLB23<00>
23	4.579803	192.168.10.3	192.168.10.255	NBNS	92	Name query NB WS12_LAB_2_3<00>
30	5.329322	192.168.10.3	192.168.10.255	NBNS	92	Name query NB WS12_LAB_2_3<00>
33	6.094059	192.168.10.3	192.168.10.255	NBNS	92	Name query NB WS12_LAB_2_3<00>
9	3.344451	192.168.10.3	192.168.10.255	NBNS	92	Name query NB WS1_LAB_2_3<00>
8	1.099212	192.168.10.3	192.168.10.255	NBNS	92	Name query NB WS1_LAB_2_3<00>
22	4.454071	fe80::3020:de3e:b87...::ff02::1:2	ff02::1:2	DHCPv6	153	Solicit: XID: 0x758798 CID: 00010001251f98a17085c2d4aa2d
18	3.357133	fe80::1deb:f9c9:47f...::ff02::1:2	ff02::1:2	DHCPv6	153	Solicit: XID: 0xc2be2e CID: 00010001251f95ca7085c2ce9b92
11	2.598334	192.168.10.3	224.0.0.251	MDNS	81	Standard query 0x0000 A NASTAVNICOLB23.local, "QI" question
12	2.598592	fe80::3020:de3e:b87...::ff02::fb	ff02::fb	MDNS	101	Standard query 0x0000 A NASTAVNICOLB23.local, "QI" question
19	3.592321	192.168.10.3	224.0.0.251	MDNS	81	Standard query 0x0000 A NASTAVNICOLB23.local, "QI" question
20	3.592551	fe80::3020:de3e:b87...::ff02::fb	ff02::fb	MDNS	101	Standard query 0x0000 A NASTAVNICOLB23.local, "QI" question
24	4.580255	192.168.10.3	224.0.0.251	MDNS	78	Standard query 0x0000 A WS12_LAB_2_3.local, "QI" question
25	4.580681	fe80::3020:de3e:b87...::ff02::fb	ff02::fb	MDNS	98	Standard query 0x0000 A WS12_LAB_2_3.local, "QI" question
31	5.579844	192.168.10.3	224.0.0.251	MDNS	78	Standard query 0x0000 A WS12_LAB_2_3.local, "QI" question
32	5.580177	fe80::3020:de3e:b87...::ff02::fb	ff02::fb	MDNS	98	Standard query 0x0000 A WS12_LAB_2_3.local, "QI" question
5	0.584765	192.168.10.3	224.0.0.251	MDNS	77	Standard query 0x0000 A WS1_LAB_2_3.local, "QI" question
6	0.585000	fe80::3020:de3e:b87...::ff02::fb	ff02::fb	MDNS	97	Standard query 0x0000 A WS1_LAB_2_3.local, "QI" question
1	0.000000	fe80::3020:de3e:b87...::ff02::1:3	ff02::1:3	LLMNR	91	Standard query 0x1255 A WS1_LAB_2_3
2	0.000179	192.168.10.3	224.0.0.252	LLMNR	71	Standard query 0x1255 A WS1_LAB_2_3
13	2.591346	fe80::3020:de3e:b87...::ff02::1:3	ff02::1:3	LLMNR	95	Standard query 0x190f A NASTAVNICOLB23
14	2.591626	192.168.10.3	224.0.0.252	LLMNR	75	Standard query 0x190f A NASTAVNICOLB23
15	3.010757	fe80::3020:de3e:b87...::ff02::1:3	ff02::1:3	LLMNR	95	Standard query 0x190f A NASTAVNICOLB23
16	3.010937	192.168.10.3	224.0.0.252	LLMNR	75	Standard query 0x190f A NASTAVNICOLB23
26	4.581427	fe80::3020:de3e:b87...::ff02::1:3	ff02::1:3	LLMNR	92	Standard query 0xfcf1c A WS12_LAB_2_3
27	4.581712	192.168.10.3	224.0.0.252	LLMNR	72	Standard query 0xfcf1c A WS12_LAB_2_3
28	5.002070	fe80::3020:de3e:b87...::ff02::1:3	ff02::1:3	LLMNR	92	Standard query 0xfcf1c A WS12_LAB_2_3
29	5.002262	192.168.10.3	224.0.0.252	LLMNR	72	Standard query 0xfcf1c A WS12_LAB_2_3
35	6.581204	AsrockIn_ce:9b:92	Broadcast	ARP	60	Who has 192.168.10.1? Tell 192.168.10.2
4	0.381305	AsrockIn_d4:aa:2d	Broadcast	ARP	42	Who has 192.168.10.1? Tell 192.168.10.3
7	0.912337	AsrockIn_d4:aa:2d	Broadcast	ARP	42	Who has 192.168.10.1? Tell 192.168.10.3
9	1.099957	AsrockIn_d4:aa:2d	Broadcast	ARP	42	Who has 192.168.10.1? Tell 192.168.10.3
34	6.395052	AsrockIn_d4:aa:2d	Broadcast	ARP	42	Who has 192.168.10.1? Tell 192.168.10.3
36	6.910483	AsrockIn_d4:aa:2d	Broadcast	ARP	42	Who has 192.168.10.1? Tell 192.168.10.3

b. Oznake protokola na tim okvirima su: **NBNS, DHCPv6, MDNS, LLMNR, ARP**

c. **ARP** – komunikacijski protokol kojim se dobiva fizička adresa na lokalnoj mreži iz poznate mrežne adrese

NBNS – protokol za name resolution; protokol je jednak kao i LLMNR, ali koristi UDP paket umjesto multicast paketa. Preteživači se njime koriste nakon što korištenje LLMNR protokola nije uspjelo.

d:

ARP paket request:

Ethernet II, Src: AsrockIn_d4:aa:2d (70:85:c2:d4:aa:2d), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

▼ Address Resolution Protocol (request)

Hardware type: Ethernet (1)

Protocol type: IPv4 (0x0800)

Hardware size: 6

Protocol size: 4

Opcode: request (1)

Sender MAC address: AsrockIn_ce:9b:92 (70:85:c2:ce:9b:92)

Sender IP address: 192.168.10.2

Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)

Target IP address: 192.168.10.1

ARP paket reply

Ethernet II, Src: AsrockIn_d4:aa:2d (70:85:c2:d4:aa:2d), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

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Hardware type: Ethernet (1)
Protocol type: IPv4 (0x0800)
Hardware size: 6
Protocol size: 4
Opcode: request (1)
Sender MAC address: AsrockIn_d4:aa:2d (70:85:c2:d4:aa:2d)
Sender IP address: 192.168.10.3
Target MAC address: 00:00:00_00:00:00 (00:00:00:00:00:00)
Target IP address: 192.168.10.1
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e. Odredišna MAC adresa prvog Ethernet okvira kod ARP protokola će biti "broadcast" (FF:FF:FF:FF:FF:FF) jer se ARP zahtjev šalje svim uređajima u mreži kako bi se pronašla odgovarajuća MAC adresa.

4. Zadatak

a. 8 su ICMP echo i reply paketa , 4 odgovora i 4 zahtjeva

b. Naredba ping pokreće ICMP protokol.

c. ICMP je sastavni dio IP protokola.

d. IP paket je enkapsuliran u Ethernet okvir.

e/f. Internet Protocol Version 4, Src: 192.168.10.2, Dst: 192.168.10.3

g/h.

Ethernet II, Src: AsrockIn_ce:9b:92 (70:85:c2:ce:9b:92), Dst: AsrockIn_d4:aa:2d (70:85:c2:d4:aa:2d)

i. IPv4 0x0800 označava IPv4 paket dok 0x0806 označava ARP paket

▼ Ethernet II, Src: AsrockIn_d4:aa:2d (70:85:c2:d4:aa:2d), Dst: AsrockIn_ce:9b:92 (70:85:c2:ce:9b:92)
> Destination: AsrockIn_ce:9b:92 (70:85:c2:ce:9b:92)
> Source: AsrockIn_d4:aa:2d (70:85:c2:d4:aa:2d)
Type: IPv4 (0x0800)

j. Veličina IP adrese je 4 bajta, a MAC adrese 6 bajta.

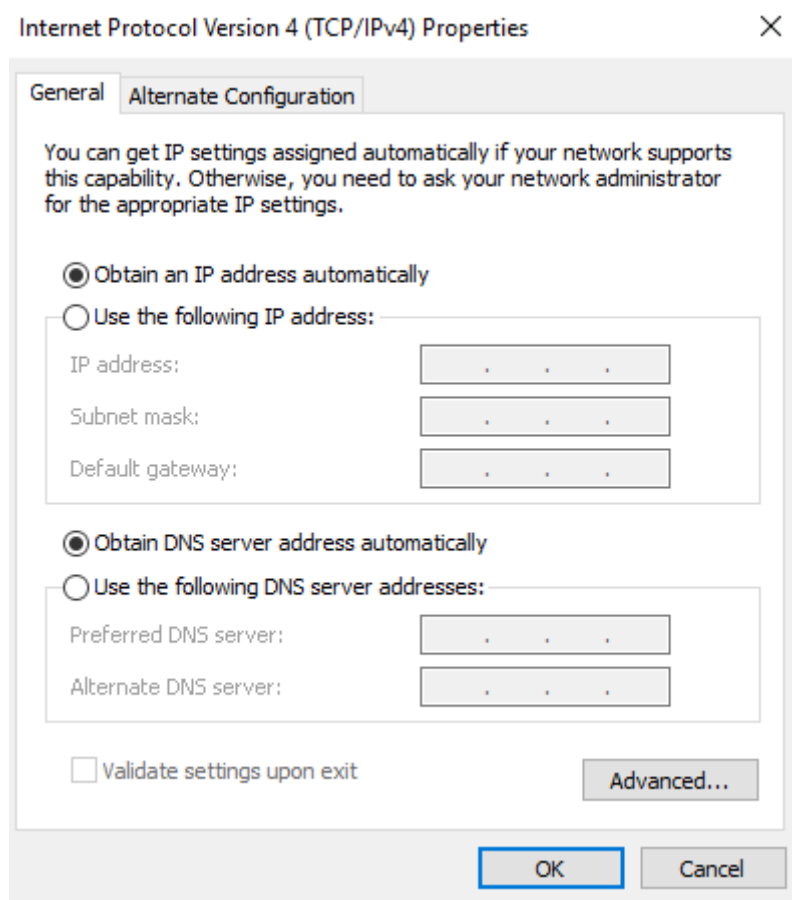
k. Veličina IP paketa je 60 bajta.

l. Veličina podataka u IP paketu je 40 zato što Total Length – header length = 60-20=40

m.

36	7.782645	192.168.10.2	192.168.10.3	ICMP	74 Echo (ping) reply	id=0x0001, seq=985/55555, ttl=128 (request in 35)
40	8.797249	192.168.10.2	192.168.10.3	ICMP	74 Echo (ping) reply	id=0x0001, seq=986/55811, ttl=128 (request in 39)
50	9.801246	192.168.10.2	192.168.10.3	ICMP	74 Echo (ping) reply	id=0x0001, seq=987/56067, ttl=128 (request in 49)
56	10.817259	192.168.10.2	192.168.10.3	ICMP	74 Echo (ping) reply	id=0x0001, seq=988/56323, ttl=128 (request in 55)
35	7.782396	192.168.10.3	192.168.10.2	ICMP	74 Echo (ping) request	id=0x0001, seq=985/55555, ttl=128 (reply in 36)
39	8.796966	192.168.10.3	192.168.10.2	ICMP	74 Echo (ping) request	id=0x0001, seq=986/55811, ttl=128 (reply in 40)
49	9.800897	192.168.10.3	192.168.10.2	ICMP	74 Echo (ping) request	id=0x0001, seq=987/56067, ttl=128 (reply in 50)
55	10.816977	192.168.10.3	192.168.10.2	ICMP	74 Echo (ping) request	id=0x0001, seq=988/56323, ttl=128 (reply in 56)

5. Zadatak



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Windows IP Configuration

Host Name . . . . . : WS4_LAB_2_3
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Ethernet adapter Ethernet:

Connection-specific DNS Suffix . :
Description . . . . . : Realtek PCIe GBE Family Controller
Physical Address. . . . . : 70-85-C2-D4-AA-2D
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::3020:de3e:b879:3c4b%4(Preferred)
Default Gateway . . . . . :
DHCPv6 IAID . . . . . : 40928706
DHCPv6 Client DUID. . . . . : 00-01-00-01-25-1F-98-A1-70-85-C2-D4-AA-2D
DNS Servers . . . . . : fec0:0:0:ffff::1%1
                       fec0:0:0:ffff::2%1
                       fec0:0:0:ffff::3%1
NetBIOS over Tcpi. . . . . : Enabled
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