



Nastavni predmet	RAČUNALNE MREŽE_3H
Naslov cjeline	Djelovanje u mrežnom sloju
Naslov jedinice	Vježba 1: Enkapsulacija podataka kroz slojeve OSI modela

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Učenik će znati samostalno analizirati enkapsulaciju protokola kroz slojeve OSI modela.

PRIPREMA ZA VJEŽBU

U pisanoj formi odgovori na slijedeća pitanja:

1. Nacrtaj OSI model

7	Application Layer	Human-computer interaction layer, where applications can access the network services
6	Presentation Layer	Ensures that data is in a usable format and is where data encryption occurs
5	Session Layer	Maintains connections and is responsible for controlling ports and sessions
4	Transport Layer	Transmits data using transmission protocols including TCP and UDP
3	Network Layer	Decides which physical path the data will take
2	Data Link Layer	Defines the format of data on the network
1	Physical Layer	Transmits raw bit stream over the physical medium

2. Definiraj enkapsulaciju.

Postupak pakiranja podataka, od 7. sloja prema 1. sloju, u oblik pogodan za prijenos komunikacijskim vezama

3. Za svaki od slojeva napiši najvažnije protokole

1. Aplikacijski-SMTP
2. Prezentacijski-HTTPS
3. Sesijski-PPTP
4. Transportni-TCP, UDP
5. Mrežni-IP, ARP, ICMP
6. Podatkovni- PPP, IEEE 802.2

7. Fizički-Bluetooth,Ethernet

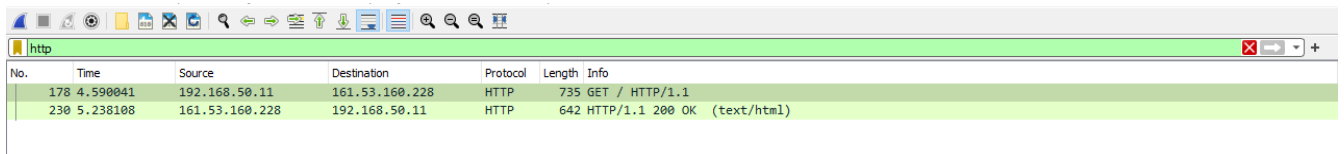
IZVOĐENJE VJEŽBE

- Pokrenuti program za praćenje protokola Wireshark
- Odabrati mrežnu karticu na kojoj će se pratiti promet podataka
- Pokrenuti praćenje prometa na mrežnoj kartici
- Pokrenuti web preglednik i pozvati stranicu po želji
- Nakon što se web stranica učita, zaustaviti praćenje prometa

1. zadatak

- a. pronaći protokol na aplikacijskom sloju koji sudjeluje u prijenosu web stranice

http



No.	Time	Source	Destination	Protocol	Length	Info
178	4.590041	192.168.50.11	161.53.160.228	HTTP	735	GET / HTTP/1.1
230	5.238108	161.53.160.228	192.168.50.11	HTTP	642	HTTP/1.1 200 OK (text/html)

- b. pronaći protokol koji na transportnom sloju enkapsulira web stranicu

TCP protokol

```
> Frame 178: 735 bytes on wire (5880 bits), 735 bytes captured (5880 bits) on interface \De
> Ethernet II, Src: ASRockIn_ce:9c:24 (70:85:c2:ce:9c:24), Dst: Routerbo_a6:8c:7f (74:4d:28
√ Internet Protocol Version 4, Src: 192.168.50.11, Dst: 161.53.160.228
  0100 .... = Version: 4
  ... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
  Total Length: 721
  Identification: 0x0180 (384)
  > 010. .... = Flags: 0x2, Don't fragment
  ...0 0000 0000 0000 = Fragment Offset: 0
  Time to Live: 128
  Protocol: TCP (6)
  Header Checksum: 0xc1d9 [validation disabled]
  [Header checksum status: Unverified]
  Source Address: 192.168.50.11
  Destination Address: 161.53.160.228
  > Transmission Control Protocol, Src Port: 49832, Dst Port: 80, Seq: 1, Ack: 1, Len: 681
  > Hypertext Transfer Protocol
```

- c. kako se zove PDU na transportnom sloju?

Segment

```
Source Port: 49832
Destination Port: 80
[Stream index: 5]
[Conversation completeness: Incomplete, DATA (15)]
[TCP Segment Len: 681]
Sequence Number: 1 (relative sequence number)
Sequence Number (raw): 1654636574
[Next Sequence Number: 682 (relative sequence number)]
Acknowledgment Number: 1 (relative ack number)
Acknowledgment number (raw): 1351728221
0101 .... = Header Length: 20 bytes (5)
> Flags: 0x018 (PSH, ACK)
Window: 1026
[Calculated window size: 262656]
[Window size scaling factor: 256]
Checksum: 0x3c04 [unverified]
[Checksum Status: Unverified]
Urgent Pointer: 0
> [Timestamps]
> [SEQ/ACK analysis]
```

2. zadatak

- a. koji protokol na mrežnom sloju enkapsulira segmente s transportnog sloja?

IP

- ▼ Ethernet II, Src: ASRockIn_ce:9c:24 (70:85:c2:ce:9c:24), Dst: Routerbo_a6:8c:7f (74:4d:28:a6:8c:7f)
 - > Destination: Routerbo_a6:8c:7f (74:4d:28:a6:8c:7f)
 - > Source: ASRockIn_ce:9c:24 (70:85:c2:ce:9c:24)
 - Type: IPv4 (0x0800)

- b. Kako se zove PDU na mrežnom sloju?

Paket

- ▼ Encapsulation type: Ethernet (1)
 - Arrival Time: Sep 15, 2023 09:31:30.003297000 Central European Daylight [Time shift for this packet: 0.000000000 seconds]
 - Epoch Time: 1694763090.003297000 seconds [Time delta from previous captured frame: 0.000000000 seconds]
 - [Time delta from previous displayed frame: 0.648067000 seconds]

- c. Napiši ishodišnu i odredišnu IP adresu paketa koji nosi web stranicu

```
Source Address: 192.168.50.11
Destination Address: 161.53.160.228
```

- d. Pročitati i komentirati ostala polja zaglavlja jednog od paketa

- ▼ Internet Protocol Version 4, Src: 161.53.160.228, Dst: 192.168.50.11
 - 0100 = Version: 4
 - 0101 = Header Length: 20 bytes (5)
 - > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
 - Total Length: 628
 - Identification: 0xc83d (51261)
 - ▼ 010. = Flags: 0x2, Don't fragment
 - 0... = Reserved bit: Not set
 - .1.. = Don't fragment: Set
 - ..0. = More fragments: Not set
 - ...0 0000 0000 0000 = Fragment Offset: 0
 - Time to Live: 55
 - Protocol: TCP (6)
 - Header Checksum: 0x4479 [validation disabled]
[Header checksum status: Unverified]
 - Source Address: 161.53.160.228
 - Destination Address: 192.168.50.11
 - > Transmission Control Protocol, Src Port: 80, Dst Port: 49832, Seq: 17521, Ack: 682, Len: 13
 - > [13 Reassembled TCP Segments (18108 bytes): #213(1460). #214(1460). #215(1460). #217(1460)

Vrijeme življenja je 55 i to je vrijednost vremena za koje je paket i dalje prisutan („živi“) Imamo našu odredišnu adresu i source adresu stranice. Zastava DF označuje da se ne fragmentira, prvi bit je uvijek stavljen na 0.

Protokol je TCP

3. zadatak

- a. zapiši naziv okvira u koji je enkapsuliran paket na drugom sloju OSI modela

ethernet II

- b. napiši ishodišnu i odredišnu MAC adresu mrežnih kartica

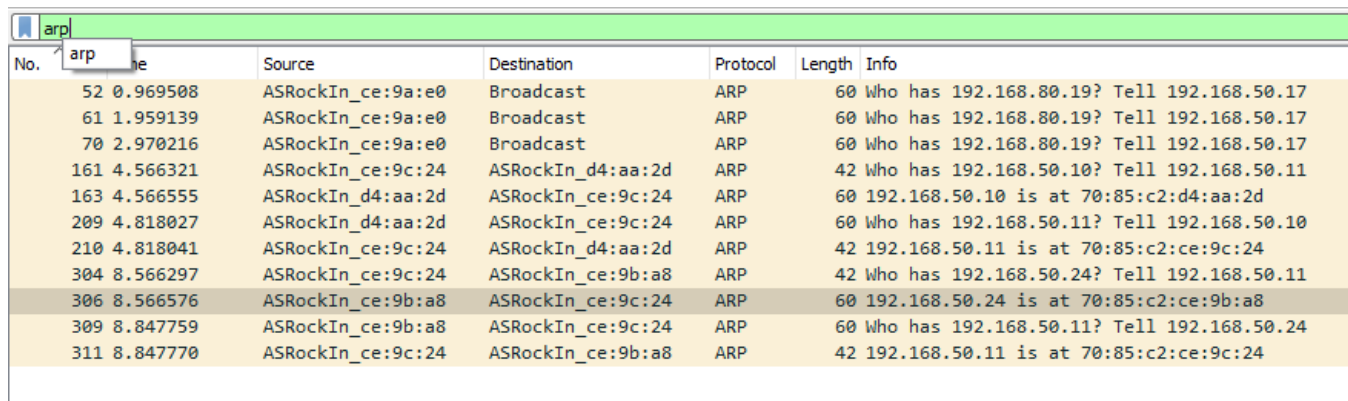
- ▼ Ethernet II, Src: ASRockIn_ce:9c:24 (70:85:c2:ce:9c:24), Dst: Routerbo_a6:8c:7f (74:4d:28:a6:8c:7f)
 - > Destination: Routerbo_a6:8c:7f (74:4d:28:a6:8c:7f)
 - > Source: ASRockIn_ce:9c:24 (70:85:c2:ce:9c:24)
 - Type: IPv4 (0x0800)

4. zadatak

- a. pronaći protokol na aplikacijskom sloju koji je sudjelovao u traženju odredišne IP adrese za zadano ime web stranice

DNS

- b. pronaći protokol koji vraća određenu fizičku adresu (MAC adresu) za određenu IP adresu mrežne kartice (veza fizičke i logičke adrese)



The screenshot shows a network traffic capture tool window titled 'arp'. The window displays a list of network packets with the following columns: No., Time, Source, Destination, Protocol, Length, and Info. The packets are ARP requests and responses between various IP addresses and MAC addresses.

No.	Time	Source	Destination	Protocol	Length	Info
52	0.969508	ASRockIn_ce:9a:e0	Broadcast	ARP	60	Who has 192.168.80.19? Tell 192.168.50.17
61	1.959139	ASRockIn_ce:9a:e0	Broadcast	ARP	60	Who has 192.168.80.19? Tell 192.168.50.17
70	2.970216	ASRockIn_ce:9a:e0	Broadcast	ARP	60	Who has 192.168.80.19? Tell 192.168.50.17
161	4.566321	ASRockIn_ce:9c:24	ASRockIn_d4:aa:2d	ARP	42	Who has 192.168.50.10? Tell 192.168.50.11
163	4.566555	ASRockIn_d4:aa:2d	ASRockIn_ce:9c:24	ARP	60	192.168.50.10 is at 70:85:c2:d4:aa:2d
209	4.818027	ASRockIn_d4:aa:2d	ASRockIn_ce:9c:24	ARP	60	Who has 192.168.50.11? Tell 192.168.50.10
210	4.818041	ASRockIn_ce:9c:24	ASRockIn_d4:aa:2d	ARP	42	192.168.50.11 is at 70:85:c2:ce:9c:24
304	8.566297	ASRockIn_ce:9c:24	ASRockIn_ce:9b:a8	ARP	42	Who has 192.168.50.24? Tell 192.168.50.11
306	8.566576	ASRockIn_ce:9b:a8	ASRockIn_ce:9c:24	ARP	60	192.168.50.24 is at 70:85:c2:ce:9b:a8
309	8.847759	ASRockIn_ce:9b:a8	ASRockIn_ce:9c:24	ARP	60	Who has 192.168.50.11? Tell 192.168.50.24
311	8.847770	ASRockIn_ce:9c:24	ASRockIn_ce:9b:a8	ARP	42	192.168.50.11 is at 70:85:c2:ce:9c:24

ARP