

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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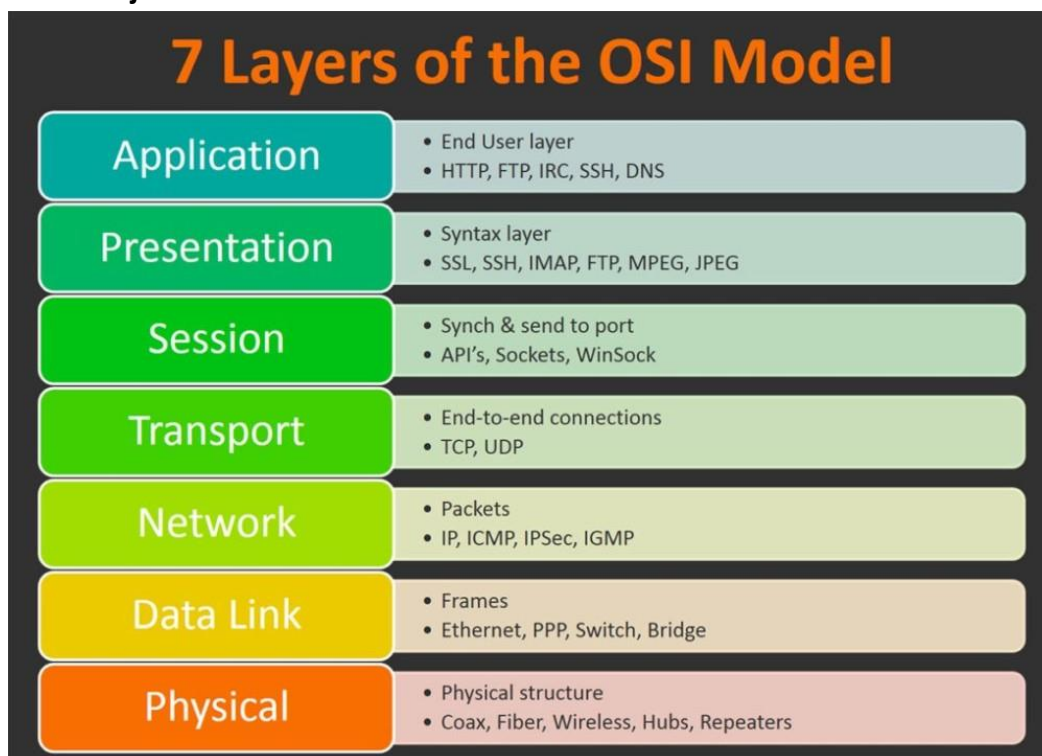
## CILJ VJEŽBE

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



✓

### 2. Definiraj enkapsulaciju.

Postupak pakiranja podataka, od 7. sloja prema 1. sloju, u oblik pogodan za prijenos komunikacijskim vezama naziva se enkapsulacija. Odvija se na uređaju koji šalje podatke (izvor).

✓

### 3. Za svaki od slojeva napiši najvažnije protokole

↑ Slika gore ↑ ✓

## IZVOĐENJE VJEŽBE

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

### 1. zadatak

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

The screenshot shows the Wireshark interface with a capture of HTTP traffic. The main pane displays a list of packets, with packet 3663 selected. The packet details pane shows the structure of the frame:

- > Frame 3663: 693 bytes on wire (5544 bits), 693 bytes captured (5544 bits) on interface 0
- > Ethernet II, Src: AsrockIn\_ce:9b:a8 (70:85:c2:ce:9b:a8), Dst: Routerbo\_a6:8c:7f (74:4d:28:a6:8c:7f)
- > Internet Protocol Version 4, Src: 192.168.50.24, Dst: 193.198.184.158
- > Transmission Control Protocol, Src Port: 51384, Dst Port: 80, Seq: 2982, Ack: 255453, Len: 639
- > Hypertext Transfer Protocol

The status bar at the bottom indicates: Packets: 12566 · Displayed: 105 (0.8%) · Dropped: 0 (0.0%) · Profile: Default

b. pronaći protokol koji na transportnom sloju enkapsulira web stranicu ✓TCP

Seq	Time	Source	Destination	Protocol	Length	Info
2598	8.163099	193.198.184.158	192.168.50.24	HTTP	649	HTTP/1.1 200 OK (JPEG JFIF image)
2599	8.163127	192.168.50.24	193.198.184.158	TCP	54	51382 → 80 [ACK] Seq=1791 Ack=38652 Win=262656 Len=0
2600	8.163333	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=4532 Ack=1726 Win=18176 Len=1460 [TCP seq
2601	8.163333	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=5992 Ack=1726 Win=18176 Len=1460 [TCP seq
2602	8.163365	192.168.50.24	193.198.184.158	TCP	54	51384 → 80 [ACK] Seq=1726 Ack=7452 Win=262656 Len=0
2603	8.163562	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=7452 Ack=1726 Win=18176 Len=1460 [TCP seq
2604	8.163562	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=8912 Ack=1726 Win=18176 Len=1460 [TCP seq
2605	8.163584	192.168.50.24	193.198.184.158	TCP	54	51384 → 80 [ACK] Seq=1726 Ack=10372 Win=262656 Len=0
2606	8.163782	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=10372 Ack=1726 Win=18176 Len=1460 [TCP si
2607	8.163782	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=11832 Ack=1726 Win=18176 Len=1460 [TCP si
2608	8.163807	192.168.50.24	193.198.184.158	TCP	54	51384 → 80 [ACK] Seq=1726 Ack=13292 Win=262656 Len=0
2609	8.164006	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=13292 Ack=1726 Win=18176 Len=1460 [TCP si
2610	8.164006	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=14752 Ack=1726 Win=18176 Len=1460 [TCP si
2611	8.164029	192.168.50.24	193.198.184.158	TCP	54	51384 → 80 [ACK] Seq=1726 Ack=16212 Win=262656 Len=0
2612	8.164225	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=16212 Ack=1726 Win=18176 Len=1460 [TCP si
2613	8.164225	193.198.184.158	192.168.50.24	TCP	54	51384 → 80 [ACK] Seq=17672 Ack=1726 Win=18176 Len=1460 [TCP si
2614	8.164225	193.198.184.158	192.168.50.24	HTTP	381	HTTP/1.1 200 OK (JPEG JFIF image)
2615	8.164250	192.168.50.24	193.198.184.158	TCP	54	51384 → 80 [ACK] Seq=1726 Ack=19132 Win=262656 Len=0
2616	8.164445	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=4648 Ack=1746 Win=18176 Len=1460 [TCP seq
2617	8.164661	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=6108 Ack=1746 Win=18176 Len=1460 [TCP seq
2618	8.164661	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=7568 Ack=1746 Win=18176 Len=1460 [TCP seq
2619	8.164691	192.168.50.24	193.198.184.158	TCP	54	51385 → 80 [ACK] Seq=1746 Ack=9028 Win=262656 Len=0
2620	8.164886	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=9028 Ack=1746 Win=18176 Len=1460 [TCP seq
2621	8.164886	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=10488 Ack=1746 Win=18176 Len=1460 [TCP si
2622	8.164909	192.168.50.24	193.198.184.158	TCP	54	51385 → 80 [ACK] Seq=1746 Ack=11948 Win=262656 Len=0
2623	8.165109	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=11948 Ack=1746 Win=18176 Len=1460 [TCP si
2624	8.165109	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=13408 Ack=1746 Win=18176 Len=1460 [TCP si
2625	8.165131	192.168.50.24	193.198.184.158	TCP	54	51385 → 80 [ACK] Seq=1746 Ack=14868 Win=262656 Len=0
2626	8.165326	193.198.184.158	192.168.50.24	TCP	54	51385 → 80 [ACK] Seq=14868 Ack=1746 Win=18176 Len=1460 [TCP si
2627	8.165342	192.168.50.24	193.198.184.158	TCP	54	51385 → 80 [ACK] Seq=1746 Ack=16328 Win=262656 Len=0

c. kako se zove PDU na transportnom sloju?

SEGMENT ✓

2. zadatak

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

b. Kako se zove PDU na mrežnom sloju? PAKET ✓

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

> Internet Protocol Version 4, Src: 193.198.184.158, Dst: 192.168.50.24

d. Pročitati i komentirati ostala polja zaglavlja jednog od paketa

```

Internet Protocol Version 4, Src: 193.198.184.158, Dst: 192.168.50.24
  0100 .... = Version: 4
  .... 0101 = Header Length: 20 bytes (5)
  > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
  Total Length: 635
  Identification: 0x42da (17114)
  > Flags: 0x4000, Don't fragment
  Time to live: 55
  Protocol: TCP (6)
  Header checksum: 0x917d [validation disabled]
  [Header checksum status: Unverified]
  Source: 193.198.184.158
  Destination: 192.168.50.24
  
```

Source - izvorisna ip adresa

Destination - ip adresa koja prima podatke

TTL - time to live - koliko je dugo paket ostao živ tj. Broj skokova koji ograničava životni vijek podataka

Total length – velicina tog podatka u bitovima

Protocol – TCP – vrsta protokola koja je koristena na transportnom sloju

✓

3. zadatak

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

ETHERNET FRAME ✓

b. napiši ishodišnu i odredišnu MAC adresu mrežnih kartica ✓

Ethernet II, Src: Routerbo\_a6:8c:7f (74:4d:28:a6:8c:7f), Dst: AsrockIn\_ce:9b:a8 (70:85:c2:ce:9b:a8)

> Destination: AsrockIn\_ce:9b:a8 (70:85:c2:ce:9b:a8)

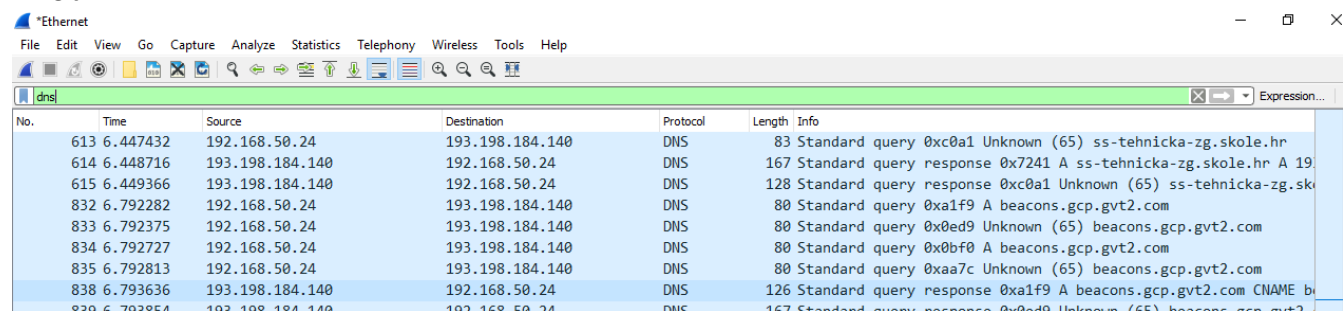
> Source: Routerbo\_a6:8c:7f (74:4d:28:a6:8c:7f)

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 ✓

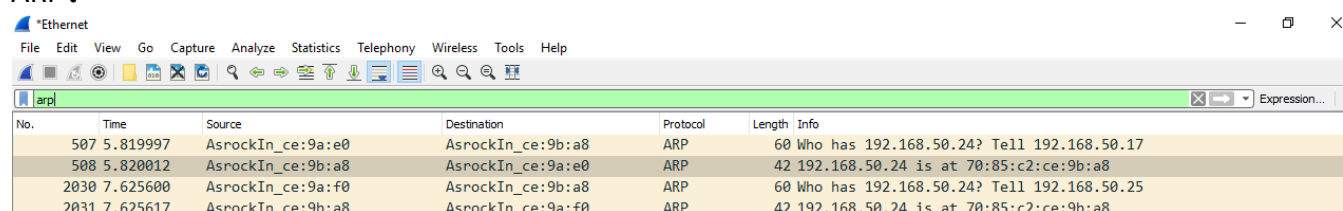


The screenshot shows a Wireshark capture of DNS traffic. The filter is set to 'dns'. The packet list pane shows several DNS queries and responses. The first query is for 'ss-tehnicka-zg.skole.hr' from source 192.168.50.24 to destination 193.198.184.140. Subsequent packets show responses and further queries for 'beacons.gcp.gvt2.com'.

No.	Time	Source	Destination	Protocol	Length	Info
613	6.447432	192.168.50.24	193.198.184.140	DNS	83	Standard query 0xc0a1 Unknown (65) ss-tehnicka-zg.skole.hr
614	6.448716	193.198.184.140	192.168.50.24	DNS	167	Standard query response 0x7241 A ss-tehnicka-zg.skole.hr A 193.198.184.140
615	6.449366	193.198.184.140	192.168.50.24	DNS	128	Standard query response 0xc0a1 Unknown (65) ss-tehnicka-zg.skole.hr
832	6.792282	192.168.50.24	193.198.184.140	DNS	80	Standard query 0xa1f9 A beacons.gcp.gvt2.com
833	6.792375	192.168.50.24	193.198.184.140	DNS	80	Standard query 0x0ed9 Unknown (65) beacons.gcp.gvt2.com
834	6.792727	192.168.50.24	193.198.184.140	DNS	80	Standard query 0x0bf0 A beacons.gcp.gvt2.com
835	6.792813	192.168.50.24	193.198.184.140	DNS	80	Standard query 0xaa7c Unknown (65) beacons.gcp.gvt2.com
838	6.793636	193.198.184.140	192.168.50.24	DNS	126	Standard query response 0xa1f9 A beacons.gcp.gvt2.com CNAME beacons.gcp.gvt2.com
839	6.793854	193.198.184.140	192.168.50.24	DNS	167	Standard query response 0x0ed9 Unknown (65) beacons.gcp.gvt2.com

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

#### ARP ✓



The screenshot shows a Wireshark capture of ARP traffic. The filter is set to 'arp'. The packet list pane shows several ARP requests and responses. The first request is for '192.168.50.24' from source AsrockIn\_ce:9a:e0 to destination AsrockIn\_ce:9b:a8. Subsequent packets show responses and further requests for '192.168.50.25'.

No.	Time	Source	Destination	Protocol	Length	Info
507	5.819997	AsrockIn_ce:9a:e0	AsrockIn_ce:9b:a8	ARP	60	Who has 192.168.50.24? Tell 192.168.50.17
508	5.820012	AsrockIn_ce:9b:a8	AsrockIn_ce:9a:e0	ARP	42	192.168.50.24 is at 70:85:c2:ce:9b:a8
2030	7.625600	AsrockIn_ce:9a:f0	AsrockIn_ce:9b:a8	ARP	60	Who has 192.168.50.24? Tell 192.168.50.25
2031	7.625617	AsrockIn ce:9b:a8	AsrockIn ce:9a:f0	ARP	42	192.168.50.24 is at 70:85:c2:ce:9b:a8

Nakon obavljenih zadataka u ovoj vježbi učenik će znati samostalno (ili uz manju pomoć zabilješki):

- pratiti i analizirati promet na vezi kroz slojeve OSI modela sa programom za praćenje protokola