

UNIVERZITET U SARAJEVU
ELEKTROTEHNIČKI FAKULTET

Zadaća 4

Predmet: Računarske mreže

DHCP

Za početak je obrisana računaru dodijeljena IP adresa komandom `sudo dhclient -r`. Izvršenjem komande `sudo dhclient wlan0` računar dobiva novu IP adresu od DHCP servera. Na sljedećoj slici su prikazane četiri faze DHCP protokola:

1	0.000000000	0.0.0.0	255.255.255.255	DHCP	342 DHCP Discover - Transaction ID 0x36082f23
2	0.029775000	Zte_4c:e0:d1	Broadcast	ARP	60 Who has 192.168.1.42? Tell 192.168.1.1
3	1.965833000	192.168.1.1	255.255.255.255	DHCP	590 DHCP Offer - Transaction ID 0x36082f23
4	1.966202000	0.0.0.0	255.255.255.255	DHCP	342 DHCP Request - Transaction ID 0x36082f23
5	1.980009000	192.168.1.1	255.255.255.255	DHCP	590 DHCP ACK - Transaction ID 0x36082f23

U fazi DHCP discover, računar broadcasta poruku čija je izvorišna adresa 0.0.0.0, odredišni port 67, a izvorišni 68:

```
▼ Internet Protocol Version 4, Src: 0.0.0.0 (0.0.0.0), Dst: 255.255.255.255 (255.255.255.255)
  ▼ User Datagram Protocol, Src Port: 68 (68), Dst Port: 67 (67)
```

S prethodne slike se također vidi da se kao protokol transportnog sloja koristi UDP. Nakon početne faze se od DHCP servera očekuje da ponudi računaru IP adresu. Međutim, na prvoj slici se vidi da server šalje ARP zahtjev s ciljem saznanja kome pripada IP adresa koju namjerava dodijeliti računaru. Kako ne dobiva odgovor, to računaru nudi adresu 192.168.1.42 putem DHCP Offer poruke, koja se također broadcasta. Dakle, izvorišna adresa ovog paketa je 192.168.1.1, a odredišna 255.255.255.255:

```
> Internet Protocol Version 4, Src: 192.168.1.1 (192.168.1.1), Dst: 255.255.255.255 (255.255.255.255)
▼ User Datagram Protocol, Src Port: 67 (67), Dst Port: 68 (68)
```

DHCP Request poruku broadcasta računar, pri čemu zahtijeva ponuđenu IP adresu koja je navedena u polju Options:

```
▼ Option: (50) Requested IP Address
  Length: 4
  Requested IP Address: 192.168.1.42 (192.168.1.42)
```

Na kraju server šalje DHCP ACK poruku:

5	1.980009000	192.168.1.1	255.255.255.255	DHCP	590 DHCP ACK
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ARP

Na slici je prikazan ARP zahtjev za MAC adresom uređaja s IP adresom 192.168.1.1 (default

gateway).

2.012697000	LiteonTe_23:98:05	Broadcast	ARP	42	Who has 192.168.1.1? Tell 192.168.1.42
2.014603000	Zte_4c:e0:d1	LiteonTe_23:98:05	ARP	42	192.168.1.1 is at 2c:95:7f:4c:e0:d1

U drugom redu je prikazan odgovor koji dobiva računar, odnosno MAC adresa default gatewaya - 2c957f4ce0d1.

DNS

DNS upit šalje računar DNS serveru da bi saznao IP adresu google servera. Dakle, izvorišna adresa je 192.168.1.42, a odredišna 217.75.192.10 (IP adresa Logosoft DNS servera).

63	7.139455000	192.168.1.42	217.75.192.10	DNS	74 Standard query 0x8318 A www.google.com
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DNS server odgovara sljedećom porukom:

66	7.161313000	217.75.192.10	192.168.1.42	DNS	226 Standard query response 0x8318 A 216.58.209.196
----	-------------	---------------	--------------	-----	---

Odredišna adresa je adresa računara, a sadrži adresu Google servera - 216.58.209.196.

Za saznavanje IP adrese ETF servera se šalje sljedeći DNS upit:

0.000000000	192.168.1.42	217.75.192.10	DNS	75 Standard query 0x3655 A www.etf.unsa.ba
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A kao odgovor se dobiva:

0.154110000	217.75.192.10	192.168.1.42	DNS	108 Standard query response 0x3655 A 80.65.65.71
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Dakle, IP adresa ETF servera je 80.65.65.71.

TCP

Sa Google web serverom se TCP konekcija uspostavlja na sljedeći način:

21	3.726210000	192.168.1.42	216.58.209.196	TCP	74 51895->80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=18431992 TSecr=0 WS=128
24	3.791160000	216.58.209.196	192.168.1.42	TCP	74 80->51895 [SYN, ACK] Seq=0 Ack=1 Win=42540 Len=0 MSS=1430 SACK_PERM=1 TSval=2210931659 TSecr=18431992 WS=128
25	3.791224000	192.168.1.42	216.58.209.196	TCP	66 51895->80 [ACK] Seq=1 Ack=1 Win=29312 Len=0 TSval=18432008 TSecr=2210931659

Dakle, u pitanju je three way handshake između računara s IP adresom 192.168.1.42, port 51895, sa web serverom na adresi 216.58.209.196, port 80. Na isti način se vrši TCP konekcija sa ETF serverom, koji se nalazi na adresi 80.65.65.71:

5	0.238603000	192.168.1.42	80.65.65.71	TCP	74	54871->80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=18443521 TSecr=0 WS=128
6	0.305798000	80.65.65.71	192.168.1.42	TCP	74	80->54871 [SYN, ACK] Seq=0 Ack=1 Win=5792 Len=0 MSS=1460 SACK_PERM=1 TSval=2905270179 TSecr=18443521 WS=128
7	0.305863000	192.168.1.42	80.65.65.71	TCP	66	54871->80 [ACK] Seq=1 Ack=1 Win=29312 Len=0 TSval=18443538 TSecr=2905270179

HTTP GET

HTTP GET paket se šalje sa adrese 192.168.1.42, port 51895, na adresu Google servera 216.58.209.196, port 80. Verzija HTTP protokola je 1.1:

26	3.791474000	192.168.1.42	216.58.209.196	HTTP	1185	GET / HTTP/1.1
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Sadržaj ovog paketa je sljedeći:

```

▼ Hypertext Transfer Protocol
> GET / HTTP/1.1\r\n
Host: www.google.com\r\n
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:37.0) Gecko/20100101 Firefox/37.0\r\n
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8\r\n
Accept-Language: en-US,en;q=0.5\r\n
Accept-Encoding: gzip, deflate\r\n
[truncated]Cookie: PREF=ID=bd9e7f3e280285e0:U=0ebe76455b8ee3db:FF=0:LD=en:TM=1420991040:LM=14
Connection: keep-alive\r\n

```

Dakle, u pitanju je host www.google.com. Na osnovu polja Connection zaključujemo da se traži perzistentna konekcija. U polju User-Agent vidimo da je korišten Mozilla/5.0 web preglednik i preferirani jezik je engleski (na osnovu polja Accept-Language).

Slično, za ETF server je HTTP GET zahtjev sljedeći:

8	0.306088000	192.168.1.42	80.65.65.71	HTTP	359	GET / HTTP/1.1
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Čiji je sadržaj:

```

▼ Hypertext Transfer Protocol
> GET / HTTP/1.1\r\n
Host: www.etf.unsa.ba\r\n
User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux x86_64; rv:37.0) Gecko/20100101 Firefox/37.0\r\n
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8\r\n
Accept-Language: en-US,en;q=0.5\r\n
Accept-Encoding: gzip, deflate\r\n
Connection: keep-alive\r\n
\r\n
[Full request URI: http://www.etf.unsa.ba/]
[HTTP request 1/1]
[Response in frame: 69]

```

Host je www.etf.unsa.ba. Korišteni browser je Mozilla/5.0, preferirani jezik engleski i zahtjeva se

perzistentna konekcija.

HTTP odgovori

Od Google web servera se dobiju sljedeći HTTP odgovori:

28	3.917248000	216.58.209.196	192.168.1.42	HTTP	991 HTTP/1.1 302 Found (text/html)
41	4.136746000	216.58.209.195	192.168.1.42	HTTP	655 HTTP/1.1 302 Found (text/html)

Sadržaj je:

```
▼ Hypertext Transfer Protocol
  > HTTP/1.1 302 Found\r\n
    - Location: http://www.google.ba/?gws_rd=cr&ei=e3hGVY6GFu0Zyg0iw4HgAg\r\n
    - Cache-Control: private\r\n
    - Content-Type: text/html; charset=UTF-8\r\n
    - Set-Cookie: _ga=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=www.google.com\r\n
    - Set-Cookie: _ga=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=.www.google.com\r\n
    - Set-Cookie: _ga=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=google.com\r\n
    - Set-Cookie: _ga=; expires=Mon, 01-Jan-1990 00:00:00 GMT; path=/; domain=.google.com\r\n
    - Date: Sun, 03 May 2015 19:35:23 GMT\r\n
    - Server: gws\r\n
    > Content-Length: 258\r\n
    - X-XSS-Protection: 1; mode=block\r\n
    - X-Frame-Options: SAMEORIGIN\r\n
    - Alternate-Protocol: 80:quic,p=1\r\n
    - \r\n
    - [HTTP response 1/1]
    - [Time since request: 0.125774000 seconds]
    - [Request in frame: 26]
  ▼ Line-based text data: text/html
    - <HTML><HEAD><meta http-equiv="content-type" content="text/html; charset=utf-8">\n
    - <TITLE>302 Moved</TITLE></HEAD><BODY>\n
    - <H1>302 Moved</H1>\n
    - The document has moved\n
    - <A HREF="http://www.google.ba/?gws_rd=cr&ei=e3hGVY6GFu0Zyg0iw4HgAg">here</A>.\r\n
    - </BODY></HTML>\r\n
```

Web server se predstavlja kao www.google.ba. Šalju se i četiri kolačića, a encoding je UTF-8.

Od ETF web servera se dobivaju sljedeći HTTP odgovori:

8	0.306088000	192.168.1.42	80.65.65.71	HTTP	359 GET / HTTP/1.1
78	1.242390000	192.168.1.42	80.65.65.71	HTTP	373 GET /favicon.ico HTTP/1.1

Sadržaj je:

```
▼ Hypertext Transfer Protocol
  > HTTP/1.1 200 OK\r\n
    - Date: Sun, 03 May 2015 19:36:09 GMT\r\n
    - Server: Apache/2.2.3 (CentOS)\r\n
    - X-Powered-By: PHP/5.1.6\r\n
    - Set-Cookie: fe_typo_user=4e60e65f03; path=/\r\n
    - Connection: close\r\n
    - Transfer-Encoding: chunked\r\n
    - Content-Type: text/html; charset=utf-8\r\n
    - \r\n
    - [HTTP response 1/1]
    - [Time since request: 0.834416000 seconds]
    - \[Request in frame: 8\]
  > HTTP chunked response
▼ Line-based text data: text/html
  - <!DOCTYPE html\r\n
  - \tPUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">\r\n
  - <html>\r\n
  - <head>\r\n
  - \t<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />\r\n
  - \r\n
```

Dakle, šalje se i kolačić i encoding je UTF-8.