

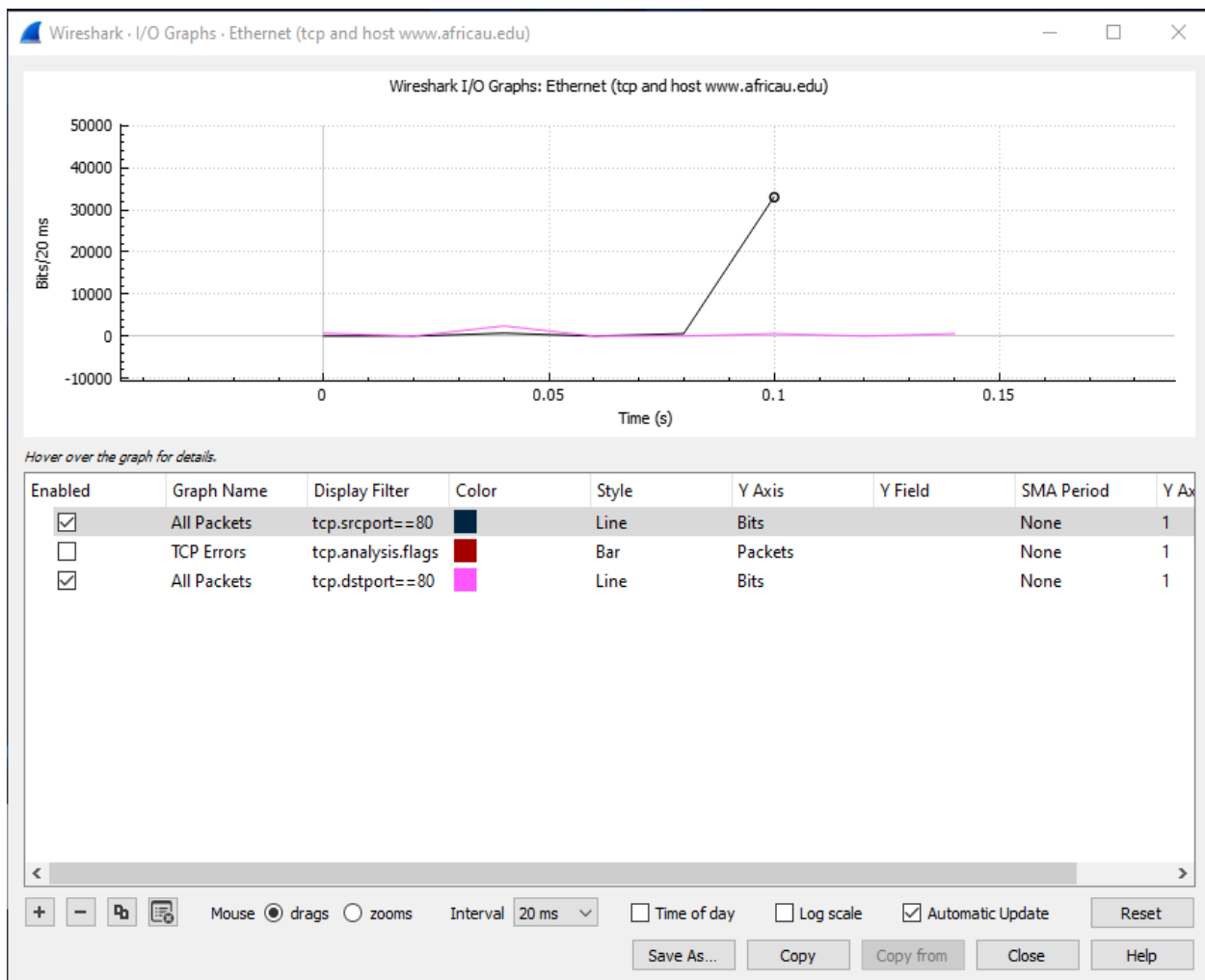
## 3<sup>η</sup> Εργασία δίκτυα υπολογιστών

### Συντελεστές:

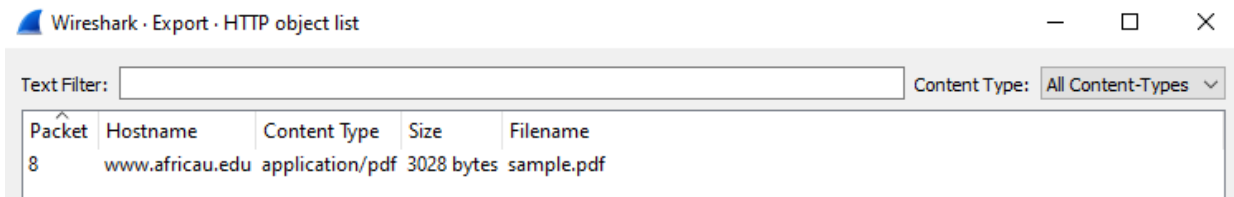
- 1) Παντελής-Ορέστης Σταυρόπουλος(3180175)
- 2) Ιωάννης Μακρίδης(3180100)
- 3) Καρλής Κωνσταντίνος(3190077)

### Άσκηση 1:

- 1.1 Ο ρυθμός λήψης δεδομένων όταν η σύνδεση TCP λειτουργεί καλά είναι 3.3Mbps (3πακέτα στη προκειμένη περίπτωση γιατί το αρχείο ήταν μόνο 3MB και επομένως ~32000bits)



1.2 Αρχικά πηγαίνοντας file->export file->http βλέπουμε το μέγεθος του pdf που μεταφέρθηκε:



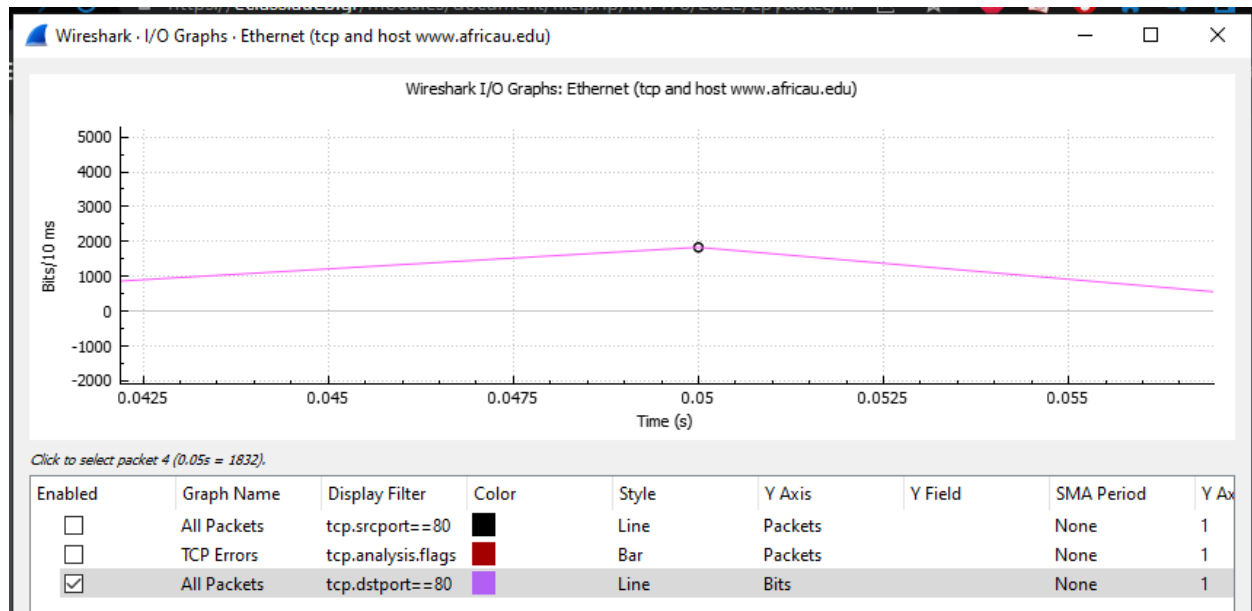
Σύνολο ~3MB.

Το payload (ωφέλιμο φορτίο) είναι 3903 bytes χωρισμένο σε 3 πακέτα όπως βλέπουμε παρακάτω:

```
▼ [3 Reassembled TCP Segments (3903 bytes): #6(1360), #7(1360), #8(1183)]
  [Frame: 6, payload: 0-1359 (1360 bytes)]
  [Frame: 7, payload: 1360-2719 (1360 bytes)]
  [Frame: 8, payload: 2720-3902 (1183 bytes)]
  [Segment count: 3]
  [Reassembled TCP length: 3903]
  [Reassembled TCP Data: 485454502f312e3120323030204f4b0d0a4461746553a205765642c203235204d61792032...
```

άρα αξιοποιείτε ~30% της ταχύτητας για κάθε πακέτο.

1.3 Γύρω στο 0.185Mbps το payload είναι μόνο 155 bytes στο 4ο πακέτο της καταγραφής.



1.1 Το επόμενο θα έχει επίσης X αριθμό ACK  
FRAME 6

```
> Frame 6: 1434 bytes on wire (11472 bits), 1434 bytes captured (11472 bits) on interface \De
> Ethernet II, Src: D\WnetTec_9a:1d:e0 (98:3b:67:9a:1d:e0), Dst: ASUS\TekC_82:36:b2 (0c:9d:92:8
> Internet Protocol Version 6, Src: 2606:4700:3030::ac43:94d7 (2606:4700:3030::ac43:94d7), Ds
▼ Transmission Control Protocol, Src Port: 80, Dst Port: 61846, Seq: 1, Ack: 156, Len: 1360
    Source Port: 80
    Destination Port: 61846
    [Stream index: 0]
    [Conversation completeness: Complete, WITH_DATA (47)]
    [TCP Segment Len: 1360]
    Sequence Number: 1 (relative sequence number)
    Sequence Number (raw): 2828509036
    [Next Sequence Number: 1361 (relative sequence number)]
    Acknowledgment Number: 156 (relative ack number)
    Acknowledgment number (raw): 3763954435
    0101 .... = Header Length: 20 bytes (5)
```

FRAME 7

```

> Frame 7: 1434 bytes on wire (11472 bits), 1434 bytes captured (11472 bits) on interface \Devic
> Ethernet II, Src: DwnetTec_9a:1d:e0 (98:3b:67:9a:1d:e0), Dst: ASUSTekC_82:36:b2 (0c:9d:92:82:
> Internet Protocol Version 6, Src: 2606:4700:3030::ac43:94d7 (2606:4700:3030::ac43:94d7), Dst:
▼ Transmission Control Protocol, Src Port: 80, Dst Port: 61846, Seq: 1361, Ack: 156, Len: 1360
    Source Port: 80
    Destination Port: 61846
    [Stream index: 0]
    [Conversation completeness: Complete, WITH_DATA (47)]
    [TCP Segment Len: 1360]
    Sequence Number: 1361 (relative sequence number)
    Sequence Number (raw): 2828510396
    [Next Sequence Number: 2721 (relative sequence number)]
    Acknowledgment Number: 156 (relative ack number)
    Acknowledgment number (raw): 3763954435
    0101 .... = Header Length: 20 bytes (5)

```

FRAME 8 etc ..

```

> Frame 8: 1257 bytes on wire (10056 bits), 1257 bytes captured (10056 bits) on interface \Devic
> Ethernet II, Src: DwnetTec_9a:1d:e0 (98:3b:67:9a:1d:e0), Dst: ASUSTekC_82:36:b2 (0c:9d:92:82:
> Internet Protocol Version 6, Src: 2606:4700:3030::ac43:94d7 (2606:4700:3030::ac43:94d7), Dst:
▼ Transmission Control Protocol, Src Port: 80, Dst Port: 61846, Seq: 2721, Ack: 156, Len: 1183
    Source Port: 80
    Destination Port: 61846
    [Stream index: 0]
    [Conversation completeness: Complete, WITH_DATA (47)]
    [TCP Segment Len: 1183]
    Sequence Number: 2721 (relative sequence number)
    Sequence Number (raw): 2828511756
    [Next Sequence Number: 3904 (relative sequence number)]
    Acknowledgment Number: 156 (relative ack number)
    Acknowledgment number (raw): 3763954435
    0101 .... = Header Length: 20 bytes (5)

```

## Άσκηση 2:

a) Το φίλτρο σύλληψης ήταν host 192.168.1.232



b) Το φίλτρο απεικόνισης ήταν dns

The screenshot shows the Wireshark interface with the 'dns' filter applied. The packet list pane displays a table of captured packets. The details pane shows the selected packet's structure, including 'Standard query query' and 'PTR 53.0.24.10.in-addr.arpa'.

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

c) Τα ονόματα και το μήκος είναι τα εξής.

Checksum:0xcd1f ➔ 2 bytes

Length:49 ➔ 2 bytes

Destination Port:53 ➔ 2 bytes

Source Port:53206 ➔ 2 bytes

Wi-Fi

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 35: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0

> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)

> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53

> User Datagram Protocol, Src Port: 53206, Dst Port: 53

Source Port: 53206

Destination Port: 53

Length: 49

Checksum: 0xcd1f [unverified]

[Checksum Status: Unverified]

[Stream index: 5]

> [Timestamps]

UDP payload (41 bytes)

> Domain Name System (query)

```
0000 a4 91 b1 ed cf d6 7c 2a 31 f0 25 d0 08 00 45 00 .....|* 1 %...E-
0010 00 45 f3 d4 00 00 80 11 00 00 c0 a8 01 e8 0a 18 -E.....
0020 00 35 cf d6 00 35 00 31 00 01 00 01 00 00 01 -S...S...
0030 00 00 00 00 00 00 02 35 33 01 30 02 32 34 02 31 .....S 3 0.24.1
0040 30 07 69 6e 2d 61 64 64 72 04 61 72 70 61 00 00 0-in-add r.arpa-
0050 0c 00 01 .....
```

Details at: [https://www.wireshark.org/docs/ug/wiug\\_html\\_chunked/ChAdChecksums.html](https://www.wireshark.org/docs/ug/wiug_html_chunked/ChAdChecksums.html) (udp.checksum: 2 byte(s))

Packets: 165 · Displayed: 10 (6.1%)

Profile: Default

Wi-Fi

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 35: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0

> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)

> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53

> User Datagram Protocol, Src Port: 53206, Dst Port: 53

Source Port: 53206

Destination Port: 53

Length: 49

Checksum: 0xcd1f [unverified]

[Checksum Status: Unverified]

[Stream index: 5]

> [Timestamps]

UDP payload (41 bytes)

> Domain Name System (query)

```
0000 a4 91 b1 ed cf d6 7c 2a 31 f0 25 d0 08 00 45 00 .....|* 1 %...E-
0010 00 45 f3 d4 00 00 80 11 00 00 c0 a8 01 e8 0a 18 -E.....
0020 00 35 cf d6 00 35 00 31 cd 1f 00 01 01 00 00 01 -S...S...
0030 00 00 00 00 00 00 02 35 33 01 30 02 32 34 02 31 .....S 3 0.24.1
0040 30 07 69 6e 2d 61 64 64 72 04 61 72 70 61 00 00 0-in-add r.arpa-
0050 0c 00 01 .....
```

Length in octets including this header and the data (udp.length: 2 byte(s))

Packets: 165 · Displayed:

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 35: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0  
> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)  
> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53  
v User Datagram Protocol, Src Port: 53206, Dst Port: 53  
Source Port: 53206  
Destination Port: 53  
Length: 49  
Checksum: 0xcd1f [unverified]  
[Checksum Status: Unverified]  
[Stream index: 5]  
> [Timestamps]  
UDP payload (41 bytes)  
> Domain Name System (query)

```
0000 a4 91 b1 ed cf d6 7c 2a 31 f0 25 d0 08 00 45 00 .....|* 1-%...E-
0010 00 45 f3 d4 00 00 80 11 00 00 c0 a8 01 e8 0a 18 .E.....
0020 00 35 cf d6 00 35 00 31 cd 1f 00 01 01 00 00 01 .5..5.1 .....
0030 00 00 00 00 00 00 02 35 33 01 30 02 32 34 02 31 .....5 3-0-24-1
0040 30 07 69 6e 2d 61 64 64 72 04 61 72 70 61 00 00 0-in-add r-arpa-
0050 0c 00 01 ...
```

Destination Port (udp.dstport) 2 byte(s)

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 35: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0

> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)

> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53

> User Datagram Protocol, Src Port: 53206, Dst Port: 53

Source Port: 53206

Destination Port: 53

Length: 49

Checksum: 0xcd1f [unverified]

[Checksum Status: Unverified]

[Stream index: 5]

> [Timestamps]

UDP payload (41 bytes)

> Domain Name System (query)

```
0000 a4 91 b1 ed cf d6 7c 2a 31 f0 25 d0 08 00 45 00 .....|* 1 %...E-
0010 00 45 f3 d4 00 00 80 11 00 00 c0 a8 01 e8 0a 18 ..E.....
0020 00 35 cf d6 00 35 00 31 cd 1f 00 01 01 00 00 01 ..5..5.1.....
0030 00 00 00 00 00 00 02 35 33 01 30 02 32 34 02 31 .....5 3 0 24 1
0040 30 07 69 6e 2d 61 64 64 72 04 61 72 70 61 00 00 0-in-add r-arpa-
0050 0c 00 01 ...
```

Source Port (udp.srcoor) 2 byte(s)

Packets: 16



d) Το συνολικό μέγεθος της επικεφαλίδας UDP είναι 8 Bytes.

The image shows a Wireshark packet capture of a DNS query. The packet list shows a DNS query from 192.168.1.232 to 10.24.0.53. The packet details pane shows the User Datagram Protocol (UDP) section, which is highlighted. The UDP section shows the source port as 53206 and the destination port as 53. The UDP payload is 41 bytes, and the total length of the packet is 83 bytes. The packet bytes pane shows the raw data of the packet, with the first 8 bytes highlighted in blue, indicating the UDP header.

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 35: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0  
> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)  
> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53  
✓ User Datagram Protocol, Src Port: 53206, Dst Port: 53  
Source Port: 53206  
Destination Port: 53  
Length: 49  
Checksum: 0xcd1f [unverified]  
[Checksum Status: Unverified]  
[Stream index: 5]  
> [Timestamps]  
> UDP payload (41 bytes)  
> Domain Name System (query)

0000 a4 91 b1 ed cf d6 7c 2a 31 f0 25 d0 08 00 45 00 .....|\* 1%...E-  
0010 00 45 f3 d4 00 00 80 11 00 00 c0 a8 01 e8 0a 18 -E.....  
0020 00 35 cf d6 00 35 00 31 cd 1f 00 01 01 00 00 01 -S...5-1-..  
0030 00 00 00 00 00 00 02 35 33 01 30 02 32 34 02 31 .....5 3-0-24-1  
0040 30 07 69 6e 2d 61 64 64 72 04 61 72 70 61 00 00 0-in-addr-r-arpa-..  
0050 0c 00 01 .....

User Datagram Protocol (udp) 8 byte(s)

e) Το μέγιστο μέγεθος τμήματος UDP που μπορεί να μεταφερθεί από ένα πακέτο IP είναι 17.

The image shows a Wireshark packet capture of a DNS query. The packet list shows a DNS query from 192.168.1.232 to 10.24.0.53. The packet details pane shows the User Datagram Protocol (UDP) section, which is highlighted. The UDP section shows the source port as 53206 and the destination port as 53. The UDP payload is 41 bytes, and the total length of the packet is 83 bytes. The packet bytes pane shows the raw data of the packet, with the first 8 bytes highlighted in blue, indicating the UDP header.

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

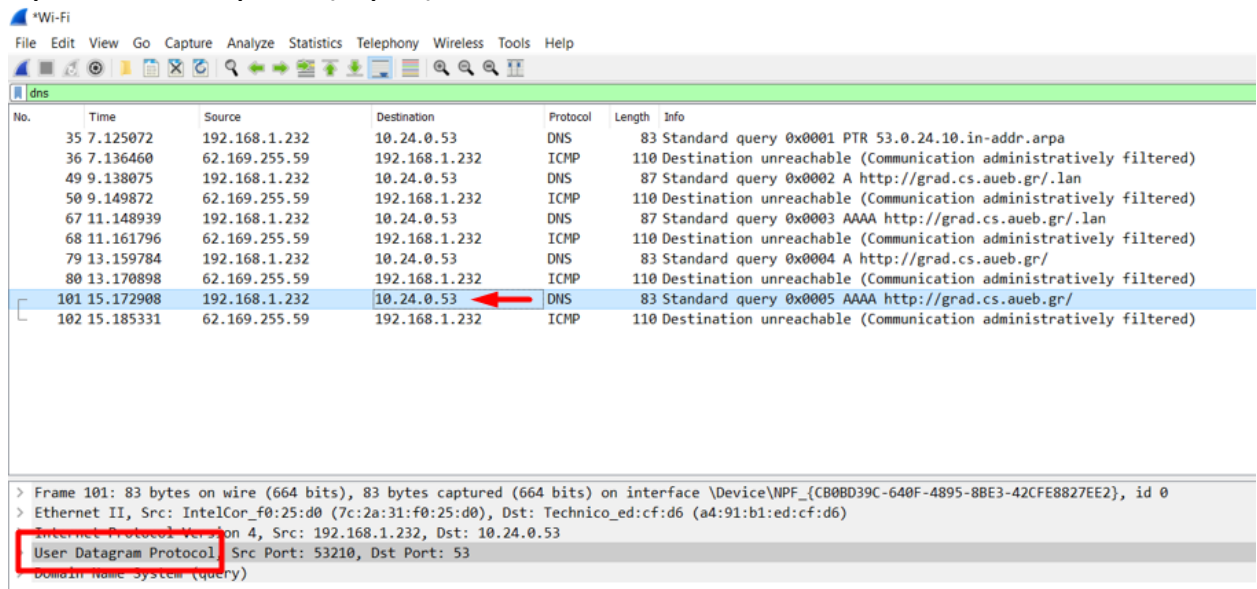
Total Length: 69  
Identification: 0xf3d4 (62420)  
> Flags: 0x00  
...0 0000 0000 0000 = Fragment Offset: 0  
Time to Live: 128  
Protocol: UDP (17)  
Header Checksum: 0x0000 [validation disabled]  
[Header checksum status: Unverified]  
Source Address: 192.168.1.232  
Destination Address: 10.24.0.53  
✓ User Datagram Protocol, Src Port: 53206, Dst Port: 53  
Source Port: 53206  
Destination Port: 53  
Length: 49  
Checksum: 0xcd1f [unverified]

f) –

g) Το πεδίο μήκος της επικεφαλίδας UDP εκφράζει τον αριθμό των Bytes που περιλαμβάνουν την επικεφαλίδα UDP και τα δεδομένα ωφέλιμου φορτίου UDP.

h) Ένα UDP datagram έχει θεωρητικό όριο 65.535 Bytes(επικεφαλίδα 8 bytes +65.527 bytes δεδομένων).Ωστόσο,το πραγματικό όριο για το μήκος δεδομένων το οποίο επιβάλλεται απο το υποκείμενο πρωτόκολλο IPv4,είναι 65.507 bytes(65.535 bytes – 8 bytes επικεφαλίδα UDP-20 bytes επικεφαλίδα IP).

i) Παρατηρούμε πως σε όλα τα DNS Packets χρησιμοποιείται ως πρωτόκολλο μεταφοράς το UDP.



Wireshark capture of DNS traffic. The packet list shows a DNS query (No. 101) and an ICMP response (No. 102). The packet details pane shows the structure of the DNS query, including the User Datagram Protocol (UDP) section.

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

Frame 101: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{C80BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0  
> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)  
> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53  
User Datagram Protocol, Src Port: 53210, Dst Port: 53  
domain name system (query)

\*Wi-Fi

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 79: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0

> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)

> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53

> User Datagram Protocol, Src Port: 53209, Dst Port: 53

> Domain Name System (query)

\*Wi-Fi

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 67: 87 bytes on wire (696 bits), 87 bytes captured (696 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0

> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)

> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53

> User Datagram Protocol, Src Port: 53208, Dst Port: 53

> Domain Name System (query)

Wi-Fi

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 49: 87 bytes on wire (696 bits), 87 bytes captured (696 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0

> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)

> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53

> User Datagram Protocol, Src Port: 53207, Dst Port: 53

> Domain Name System (query)

dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

> Frame 35: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface \Device\NPF\_{CB0BD39C-640F-4895-8BE3-42CFE8827EE2}, id 0

> Ethernet II, Src: IntelCor\_f0:25:d0 (7c:2a:31:f0:25:d0), Dst: Technico\_ed:cf:d6 (a4:91:b1:ed:cf:d6)

> Internet Protocol Version 4, Src: 192.168.1.232, Dst: 10.24.0.53

> User Datagram Protocol, Src Port: 53206, Dst Port: 53

> Domain Name System (query)

j) Η διεύθυνση IP του εξυπηρετητή DNS είναι 10.24.0.53

dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125072	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

...0 0000 0000 0000 = Fragment Offset: 0

Time to Live: 128

Protocol: UDP (17)

Header Checksum: 0x0000 [validation disabled]

[Header checksum status: Unverified]

Source Address: 192.168.1.232

Destination Address: 10.24.0.53

▼ User Datagram Protocol, Src Port: 53206, Dst Port: 53



1) Στο πρωτόκολλο εφαρμογής DNS αντιστοιχεί η θύρα 53.

Wi-Fi

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125972	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

Time to Live: 127  
 Protocol: UDP (17)  
 Header Checksum: 0x7af6 [validation disabled]  
 [Header checksum status: Unverified]  
 Source Address: 192.168.1.232  
 Destination Address: 10.24.0.53

User Datagram Protocol Src Port: 53206, Dst Port: 53  
 Source Port: 53206

Wi-Fi

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dns

No.	Time	Source	Destination	Protocol	Length	Info
35	7.125972	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0001 PTR 53.0.24.10.in-addr.arpa
36	7.136460	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
49	9.138075	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0002 A http://grad.cs.aueb.gr/.lan
50	9.149872	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
67	11.148939	192.168.1.232	10.24.0.53	DNS	87	Standard query 0x0003 AAAA http://grad.cs.aueb.gr/.lan
68	11.161796	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
79	13.159784	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0004 A http://grad.cs.aueb.gr/
80	13.170898	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)
101	15.172908	192.168.1.232	10.24.0.53	DNS	83	Standard query 0x0005 AAAA http://grad.cs.aueb.gr/
102	15.185331	62.169.255.59	192.168.1.232	ICMP	110	Destination unreachable (Communication administratively filtered)

Protocol: UDP (17)  
 Header Checksum: 0x0000 [validation disabled]  
 [Header checksum status: Unverified]  
 Source Address: 192.168.1.232  
 Destination Address: 10.24.0.53

User Datagram Protocol Src Port: 53206, Dst Port: 53  
 Source Port: 53206  
 Destination Port: 53

### Άσκηση 3:

α) Το φίλτρο απεικόνισης που χρησιμοποιήσαμε είναι το http.

No.	Time	Source	Destination	Protocol	Length	Info
1442	7.329...	192.168.1.3	195.251.248.252	HTTP	570	GET / HTTP/1.1
1708	8.745...	195.251.248.252	192.168.1.3	HTTP	1487	HTTP/1.1 200 OK (text/html)
1861	9.760...	192.168.1.3	195.251.248.252	HTTP	542	GET /favicon.ico HTTP/1.1
1864	9.778...	195.251.248.252	192.168.1.3	HTTP	537	HTTP/1.1 302 Found (text/html)
1874	9.832...	192.168.1.3	195.251.248.252	HTTP	542	GET /index.html HTTP/1.1
1879	9.864...	195.251.248.252	192.168.1.3	HTTP	357	HTTP/1.1 200 OK (text/html)
1882	9.873...	192.168.1.3	195.251.248.252	HTTP	542	GET /favicon.ico HTTP/1.1
1887	9.886...	195.251.248.252	192.168.1.3	HTTP	537	HTTP/1.1 302 Found (text/html)
1891	9.901...	192.168.1.3	195.251.248.252	HTTP	542	GET /index.html HTTP/1.1
1894	9.916...	195.251.248.252	192.168.1.3	HTTP	357	HTTP/1.1 200 OK (text/html)

β) Και στις 2 περιπτώσεις η έκδοση που χρησιμοποιείται είναι η HTTP 1.1

1891	9.901...	192.168.1.3	195.251.248.252	HTTP	542	GET /index.html HTTP/1.1
1894	9.916...	195.251.248.252	192.168.1.3	HTTP	357	HTTP/1.1 200 OK (text/html)

> Frame 1891: 542 bytes on wire (4336 bits), 542 bytes captured (4336 bits) on interface \Device\NPF\_{848AD208-291C-417B-993C-112}

> Ethernet II, Src: LCfCHeFe\_29:d2:fe (98:fa:9b:29:d2:fe), Dst: zte\_af:16:9b (c0:fd:84:af:16:9b)

> Internet Protocol Version 4, Src: 192.168.1.3, Dst: 195.251.248.252

> Transmission Control Protocol, Src Port: ng-umds (1690), Dst Port: http (80), Seq: 1, Ack: 1, Len: 488

> Hypertext Transfer Protocol

> GET /index.html HTTP/1.1\r\n

[Expert Info (Chat/Sequence): GET /index.html HTTP/1.1\r\nRequest Method: GETRequest URI: /index.htmlRequest Version: HTTP/1.1

1891	9.901...	192.168.1.3	195.251.248.252	HTTP	542	GET /index.html HTTP/1.1
1894	9.916...	195.251.248.252	192.168.1.3	HTTP	357	HTTP/1.1 200 OK (text/html)

> Frame 1894: 357 bytes on wire (2856 bits), 357 bytes captured (2856 bits) on interface \Device\NPF\_{848AD208-291C-417B-993C-112}

> Ethernet II, Src: zte\_af:16:9b (c0:fd:84:af:16:9b), Dst: LCfCHeFe\_29:d2:fe (98:fa:9b:29:d2:fe)

> Internet Protocol Version 4, Src: 195.251.248.252, Dst: 192.168.1.3

> Transmission Control Protocol, Src Port: http (80), Dst Port: ng-umds (1690), Seq: 1453, Ack: 489, Len: 303

> [2 Reassembled TCP Segments (1755 bytes): #1893(1452), #1894(303)]

> Hypertext Transfer Protocol

> HTTP/1.1 200 OK\r\n

[Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\nResponse Version: HTTP/1.1Status Code: 200[Status Code Description: OK]Response Phrase: OK

γ) Ο πλοηγός ιστού δηλώνει μόνο την αγγλική γλώσσα.

1891	9.901...	192.168.1.3	195.251.248.252	HTTP	542	GET /index.html HTTP/1.1
1894	9.916...	195.251.248.252	192.168.1.3	HTTP	357	HTTP/1.1 200 OK (text/html)

> Frame 1891: 542 bytes on wire (4336 bits), 542 bytes captured (4336 bits) on interface \Device\NPF\_{848AD208-291C-417B-993C-112}

> Ethernet II, Src: LCfCHeFe\_29:d2:fe (98:fa:9b:29:d2:fe), Dst: zte\_af:16:9b (c0:fd:84:af:16:9b)

> Internet Protocol Version 4, Src: 192.168.1.3, Dst: 195.251.248.252

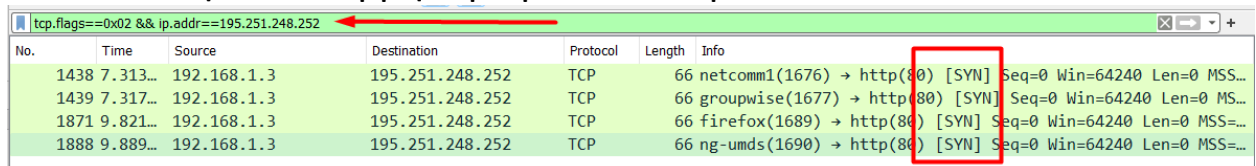
> Transmission Control Protocol, Src Port: ng-umds (1690), Dst Port: http (80), Seq: 1, Ack: 1, Len: 488

> Hypertext Transfer Protocol

> GET /index.html HTTP/1.1\r\n

Host: pages.cs.aueb.gr\r\nConnection: keep-alive\r\nUser-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/101.0.4951.64 Safari/537.36\r\nAccept: image/webp,image/apng,image/svg+xml,image/\*,\*/\*;q=0.8\r\nReferer: http://grad.cs.aueb.gr/\r\nAccept-Encoding: gzip, deflate\r\nAccept-Language: en-US,en;q=0.9\r\nCookie: \_ga=GA1.2.1808393138.1647724461; \_gid=GA1.2.1097292456.1653672537; \_gat\_gtag\_UA\_139395773\_1=1\r\n

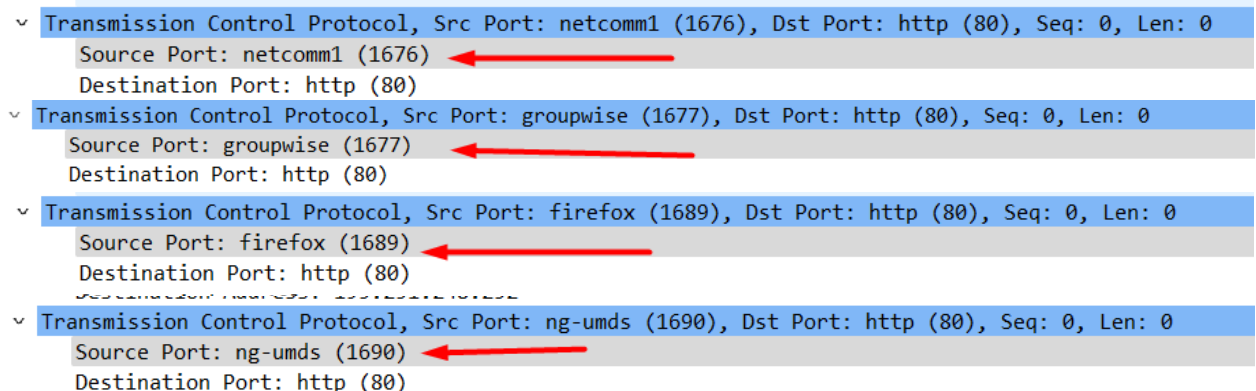
d) Για να παραμείνουν τα πρώτα τμήματα tcp των τριπλών χειραψιών που διεξήχθησαν στον [www.aueb.gr](http://www.aueb.gr) και δηλαδή στον [www.grad.cs.aueb.gr](http://www.grad.cs.aueb.gr) χρησιμοποιούμε το φίλτρο `tcp.flags==0x02 && ip.addr==195.251.248.252`. Με το πρώτο κομμάτι κρατάμε μόνο τα syn κομμάτια και με το 2<sup>ο</sup> ελέγχουμε για την διεύθυνση του aueb την οποία βρήκαμε με nslookup.



No.	Time	Source	Destination	Protocol	Length	Info
1438	7.313...	192.168.1.3	195.251.248.252	TCP	66	netcomm1(1676) → http(80) [SYN] Seq=0 Win=64240 Len=0 MSS=...
1439	7.317...	192.168.1.3	195.251.248.252	TCP	66	groupwise(1677) → http(80) [SYN] Seq=0 Win=64240 Len=0 MSS=...
1871	9.821...	192.168.1.3	195.251.248.252	TCP	66	firefox(1689) → http(80) [SYN] Seq=0 Win=64240 Len=0 MSS=...
1888	9.889...	192.168.1.3	195.251.248.252	TCP	66	ng-umds(1690) → http(80) [SYN] Seq=0 Win=64240 Len=0 MSS=...

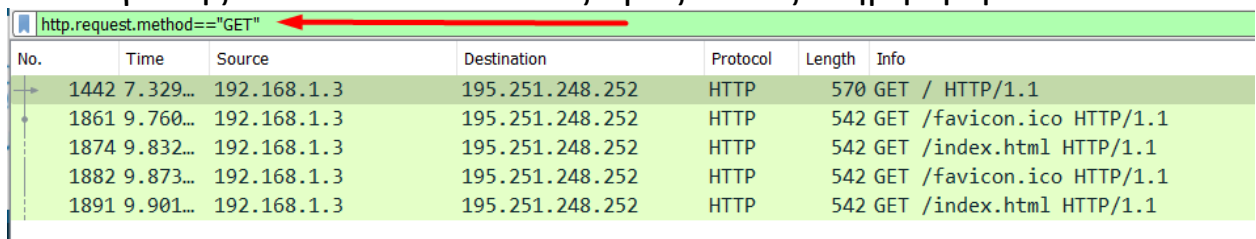
Έγιναν 4 συνδέσεις και οι θύρες πηγής ήταν οι εξής:

- i) Netcomm1(1676)
- ii) Groupwise(1677)
- iii) Firefox(1689)
- iv) Ng-umds(1690)



Transmission Control Protocol, Src Port: netcomm1 (1676), Dst Port: http (80), Seq: 0, Len: 0
Source Port: netcomm1 (1676)
Destination Port: http (80)
Transmission Control Protocol, Src Port: groupwise (1677), Dst Port: http (80), Seq: 0, Len: 0
Source Port: groupwise (1677)
Destination Port: http (80)
Transmission Control Protocol, Src Port: firefox (1689), Dst Port: http (80), Seq: 0, Len: 0
Source Port: firefox (1689)
Destination Port: http (80)
Transmission Control Protocol, Src Port: ng-umds (1690), Dst Port: http (80), Seq: 0, Len: 0
Source Port: ng-umds (1690)
Destination Port: http (80)

e) Το φίλτρο απεικόνισης είναι το `http.request.method=="GET"`. Ο υπολογιστής απέστειλε 5 εντολές προς τον εξυπηρετητή ιστού.



No.	Time	Source	Destination	Protocol	Length	Info
1442	7.329...	192.168.1.3	195.251.248.252	HTTP	570	GET / HTTP/1.1
1861	9.760...	192.168.1.3	195.251.248.252	HTTP	542	GET /favicon.ico HTTP/1.1
1874	9.832...	192.168.1.3	195.251.248.252	HTTP	542	GET /index.html HTTP/1.1
1882	9.873...	192.168.1.3	195.251.248.252	HTTP	542	GET /favicon.ico HTTP/1.1
1891	9.901...	192.168.1.3	195.251.248.252	HTTP	542	GET /index.html HTTP/1.1

f) Τα πεδία των τμημάτων με τα οποία αποστέλλεται το περιεχόμενο της σελίδας είναι το GET request, ο host, τα agent-

browsers μέσω των οποίων υποστηρίζεται ο παραπομπός, το encoding, η γλώσσα και τα cookies.

```
▼ Hypertext Transfer Protocol
> GET /index.html HTTP/1.1\r\n
Host: pages.cs.aueb.gr\r\n
Connection: keep-alive\r\n
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/101.0.4951.64 Safari/537.36 Edg\r\n
Accept: image/webp,image/apng,image/svg+xml,image/*,*/*;q=0.8\r\n
Referer: http://grad.cs.aueb.gr/\r\n
Accept-Encoding: gzip, deflate\r\n
Accept-Language: en-US,en;q=0.9\r\n
> Cookie: _ga=GA1.2.1888393138.1647724461; _gid=GA1.2.1897292456.1653672537; _gat_gtag_UA_139395773_1=1\r\n
\r\n
[Full request URI: http://pages.cs.aueb.gr/index.html]
[HTTP request 1/1]
[Response in frame: 1879]
```

- g) Ο sequence number είναι ο αριθμός byte του πρώτου byte δεδομένων στο πακέτο TCP που αποστέλλεται. Ο ACK είναι ο αριθμός σειράς του επόμενου byte που αναμένει να λάβει ο δέκτης.

Για παράδειγμα, το πρώτο πακέτο http που στέλνει ο αποστολέας περιέχει sequence number και ACK ίσο με 1 αφού ξεκινάει να στέλνει πακέτα και επομένως χρησιμοποιεί το relative sequence number 1 και παράλληλα αναμένει να λάβει το πρώτο Byte από τον παραλήπτη για την συνέχεια της διαδικασίας.

Αφού λάβει την αναμενόμενη απάντηση συνεχίζει με το νέο sequence number που είναι ανάλογο του πρώτου Byte του νέου κομματιού που θα αποστείλει και το νέο ACK για το νέο αριθμό του byte που αναμένει για να συνεχίσει την επικοινωνία. Με τον ίδιο τρόπο συνεχίζεται η διαδικασία μέχρι να σταλθούν επιτυχώς όλα τα πακέτα.



```
> Frame 1442: 570 bytes on wire (4560 bits), 570 bytes captured (4560 bits) on interface \Device\NPF_{848AD208-291C-417B-993C-1128BAE...
> Ethernet II, Src: host.docker.internal (98:fa:9b:29:d2:fe), Dst: speedport.ip (c0:fd:84:af:16:9b)
> Internet Protocol Version 4, Src: host.docker.internal (192.168.1.3), Dst: cs1ab252.cs.aueb.gr (195.251.248.252)
▼ Transmission Control Protocol, Src Port: 1676, Dst Port: 80, Seq: 1, Ack: 1, Len: 516
  Source Port: 1676
  Destination Port: 80
  [Stream index: 32]
  [Conversation completeness: Complete, WITH_DATA (31)]
  [TCP Segment Len: 516]
  Sequence Number: 1 (relative sequence number) ←
  Sequence Number (raw): 3208181050
  [Next Sequence Number: 517 (relative sequence number)]
  Acknowledgment Number: 1 (relative ack number) ←
  Acknowledgment number (raw): 879260562
  0101 .... = Header Length: 20 bytes (5)
  > Flags: 0x018 (PSH, ACK)
  Window: 516
  [Calculated window size: 132096]
  [Window size scaling factor: 256]

> Frame 1861: 542 bytes on wire (4336 bits), 542 bytes captured (4336 bits) on interface \Device\NPF_{848AD208-291C-417B-993C-1128BAE...
> Ethernet II, Src: host.docker.internal (98:fa:9b:29:d2:fe), Dst: speedport.ip (c0:fd:84:af:16:9b)
> Internet Protocol Version 4, Src: host.docker.internal (192.168.1.3), Dst: cs1ab252.cs.aueb.gr (195.251.248.252)
▼ Transmission Control Protocol, Src Port: 1676, Dst Port: 80, Seq: 517, Ack: 8694, Len: 488
  Source Port: 1676
  Destination Port: 80
  [Stream index: 32]
  [Conversation completeness: Complete, WITH_DATA (31)]
  [TCP Segment Len: 488]
  Sequence Number: 517 (relative sequence number) ←
  Sequence Number (raw): 3208181566
  [Next Sequence Number: 1005 (relative sequence number)]
  Acknowledgment Number: 8694 (relative ack number) ←
  Acknowledgment number (raw): 879269255
  0101 .... = Header Length: 20 bytes (5)
  > Flags: 0x018 (PSH, ACK)
  Window: 516
  [Calculated window size: 132096]
  [Window size scaling factor: 256]
```

h) Οι εικόνες είναι τα αρχεία με την κατάληξη .ico .Δεν έρχονται απο την ίδια διεύθυνση IP ενώ τα html αρχεία έρχονται απο το pages.cs.aueb.gr οι εικόνες προέρχονται απο το grad.cs.aueb.gr.

Wireshark · Export · HTTP object list

Text Filter: Content Type: All Content-Types

Packet	Hostname	Content Type	Size	Filename
1708	grad.cs.aueb.gr	text/html	39 kB	\
1864	grad.cs.aueb.gr	text/html	219 bytes	favicon.ico ←
1879	pages.cs.aueb.gr	text/html	3099 bytes	index.html
1887	grad.cs.aueb.gr	text/html	219 bytes	favicon.ico ←
1894	pages.cs.aueb.gr	text/html	3099 bytes	index.html

i) Δεν υπάρχει γραμμή IF-MODIFIED-SINCE.Ο Κωδικός κατάστασης που επιστρέφει ο εξυπηρετητής ως απόκριση στο μήνυμα αυτό είναι 200.

http matches "if-modified-since"

No.	Time	Source	Destination	Protocol	Length	Info
-----	------	--------	-------------	----------	--------	------

No.	Time	Source	Destination	Protocol	Length	Info
2721	13.01...	192.168.1.3	195.251.248.252	HTTP	495	GET / HTTP/1.1
2762	14.37...	195.251.248.252	192.168.1.3	HTTP	1487	HTTP/1.1 200 OK (text/html)
2764	14.43...	192.168.1.3	195.251.248.252	HTTP	443	GET /external/testimonialrotator/testimonialrotator.css HTTP/1.1

```

Time to Live: 57
Protocol: TCP (6)
Header Checksum: 0x3e67 [validation disabled]
[Header checksum status: Unverified]
Source Address: 195.251.248.252
Destination Address: 192.168.1.3
> Transmission Control Protocol, Src Port: http (80), Dst Port: 9504 (9504), Seq: 7261, Ack: 442, Len: 1433
> [6 Reassembled TCP Segments (8693 bytes): #2756(1452), #2757(1452), #2758(1452), #2760(1452), #2761(1452), #2762(1433)]
< Hypertext Transfer Protocol
  < HTTP/1.1 200 OK\r\n
    < [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
    < Response Version: HTTP/1.1
    < Status Code: 200
    < [Status Code Description: OK]
    < Response Phrase: OK

```

- j) Σε αυτή την περίπτωση τρέχουμε μία πιο δυναμικά μεταβαλλόμενη σελίδα όπως την <http://www.eun.org/>. Δεν υπάρχει γραμμή IF-MODIFIED-SINCE.Ο κωδικός κατάστασης που επιστρέφει ο εξυπηρετητής ως απόκριση στο μήνυμα είναι 200.

No.	Time	Source	Destination	Protocol	Length	Info
109	5.133...	192.168.1.3	188.65.218.163	HTTP	491	GET / HTTP/1.1
153	5.493...	188.65.218.163	192.168.1.3	HTTP	1186	HTTP/1.1 200 OK (text/html)
155	5.531...	192.168.1.3	188.65.218.163	HTTP	605	GET /html/css/main.css?browserId=other&themeId=eun_WAR_corporate&themeId=main&languageId=en_GB&b=6101&t=1333360784000 HTTP/1.1

```

> Internet Protocol Version 4, Src: 188.65.218.163, Dst: 192.168.1.3
> Transmission Control Protocol, Src Port: http (80), Dst Port: 17761 (17761), Seq: 16927, Ack: 438, Len: 1132
> [13 Reassembled TCP Segments (18058 bytes): #139(1452), #140(1452), #141(1452), #142(1452), #144(1452), #145(954), #146(1452), #147(1452), #148(1452), #149(1452), #151(1452), #152(1452), #153(1132)]
< Hypertext Transfer Protocol
  < HTTP/1.1 200 OK\r\n
    < [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
    < Response Version: HTTP/1.1
    < Status Code: 200
    < [Status Code Description: OK]
    < Response Phrase: OK

```

- κ) Ο κωδικός που επιστρέφει είναι 200.

No.	Time	Source	Destination	Protocol	Length	Info
2113	10.26...	192.168.1.3	195.251.248.252	HTTP	569	GET / HTTP/1.1
2197	11.69...	195.251.248.252	192.168.1.3	HTTP	1487	HTTP/1.1 200 OK (text/html)
2741	12.66...	192.168.1.3	195.251.248.252	HTTP	541	GET /favicon.ico HTTP/1.1

```

Time to Live: 57
Protocol: TCP (6)
Header Checksum: 0xcb56 [validation disabled]
[Header checksum status: Unverified]
Source Address: 195.251.248.252
Destination Address: 192.168.1.3
> Transmission Control Protocol, Src Port: http (80), Dst Port: 16298 (16298), Seq: 7261, Ack: 516, Len: 1433
> [6 Reassembled TCP Segments (8693 bytes): #2189(1452), #2190(1452), #2191(1452), #2195(1452), #2196(1452), #2197(1433)]
< Hypertext Transfer Protocol
  < HTTP/1.1 200 OK\r\n
    < [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
    < Response Version: HTTP/1.1
    < Status Code: 200
    < [Status Code Description: OK]
    < Response Phrase: OK

```

Στο πρώτο πακέτο απάντησης δεν εμφανίζεται η επιλογή last-modified για να δούμε πότε τροποποιήθηκε τελευταία φορά.

No.	Time	Source	Destination	Protocol	Length	Info
2113	10.26...	192.168.1.3	195.251.248.252	HTTP	569	GET / HTTP/1.1
2197	11.69...	195.251.248.252	192.168.1.3	HTTP	1487	HTTP/1.1 200 OK (text/html)

[Window size scaling factor: 128]  
Checksum: 0x101f [unverified]  
[Checksum Status: Unverified]  
Urgent Pointer: 0  
> [Timestamps]  
> [SEQ/ACK analysis]  
TCP payload (1433 bytes)  
TCP segment data (1433 bytes)  
> [6 Reassembled TCP Segments (8693 bytes): #2189(1452), #2190(1452), #2191(1452), #2195(1452), #2196(1452), #2197(1433)]  
▼ Hypertext Transfer Protocol  
▼ HTTP/1.1 200 OK\r\n

> [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]  
Response Version: HTTP/1.1  
Status Code: 200  
[Status Code Description: OK]  
Response Phrase: OK  
Date: Mon, 30 May 2022 18:46:40 GMT\r\n
Server: Apache\r\n
X-Powered-By: PHP/5.3.3-7+squeeze19\r\n
Vary: Accept-Encoding\r\n
Content-Encoding: gzip\r\n
> Content-Length: 8433\r\n
Keep-Alive: timeout=15, max=100\r\n
Connection: Keep-Alive\r\n
Content-Type: text/html\r\n
\r\n
[HTTP response 1/3]  
[Time since request: 1.435130000 seconds]

l) Δεν υπάρχει γραμμή με πεδίο Set-Cookie.

m) Υπάρχει γραμμή με πεδίο cookie και η τιμή της είναι η εξής:

No.	Time	Source	Destination	Protocol	Length	Info
2113	10.26...	192.168.1.3	195.251.248.252	HTTP	569	GET / HTTP/1.1
2197	11.69...	195.251.248.252	192.168.1.3	HTTP	1487	HTTP/1.1 200 OK (text/html)
2741	12.66...	192.168.1.3	195.251.248.252	HTTP	541	GET /favicon.ico HTTP/1.1
2747	12.67...	195.251.248.252	192.168.1.3	HTTP	537	HTTP/1.1 302 Found (text/html)

> Frame 2741: 541 bytes on wire (4328 bits), 541 bytes captured (4328 bits) on interface \Device\NPF\_{848AD208-291C-417B-993C-112BBAECD017}, id 0  
> Ethernet II, Src: LCFHeFe\_29:d2:fe (98:fa:9b:29:d2:fe), Dst: zte\_af:16:9b (c0:fd:84:af:16:9b)  
> Internet Protocol Version 4, Src: 192.168.1.3, Dst: 195.251.248.252  
> Transmission Control Protocol, Src Port: 16298 (16298), Dst Port: http (80), Seq: 516, Ack: 8694, Len: 487  
▼ Hypertext Transfer Protocol  
▼ GET /favicon.ico HTTP/1.1\r\n

> [Expert Info (Chat/Sequence): GET /favicon.ico HTTP/1.1\r\n]  
[GET /favicon.ico HTTP/1.1\r\n]  
[Severity level: Chat]  
[Group: Sequence]  
Request Method: GET  
Request URI: /favicon.ico  
Request Version: HTTP/1.1  
Host: grad.cs.aueb.gr\r\n
Connection: keep-alive\r\n
User-Agent: Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/101.0.4951.64 Safari/537.36 Edg/101.0.1210.53\r\n
Accept: image/webp,image/apng,image/svg+xml,image/\*,\*/\*;q=0.8\r\n
Referer: http://grad.cs.aueb.gr/\r\n
Accept-Encoding: gzip, deflate\r\n
Accept-Language: en-US,en;q=0.9\r\n
Cookie: \_ga=GA1.2.125084367.1653931222; \_gid=GA1.2.1984048853.1653931222; \_gat\_gtag\_UA\_139395773\_1=1\r\n
\r\n
[Full request URI: http://grad.cs.aueb.gr/favicon.ico]  
[HTTP request 2/3]  
[Prev request in frame: 2113]  
[Response in frame: 2747]  
[Next request in frame: 2767]

## Άσκηση 4:

- Άσκηση 1:

$$\rho = 2.5 \text{ Mbytes/sec}$$

$$M = 3.5 \text{ Mbytes/sec}$$

$$L = 350 \text{ Mbytes}$$

S: Διάρκεια ριπής

B: Χωρητικότητα κουβά

a)  $B_{\text{ελ}} = S * (M - \rho)$

Ο ρυθμός μετάδοσης στον σύνδεσμο είναι 3.5 Mbytes/sec. Προκειμένου να μεταδοθούν 350 Mbytes ο χρόνος που απαιτείται είναι ο εξής.

$$S = L / M = 350 \text{ Mbytes} / 3.5 \text{ Mbytes/sec} = 100 \text{ sec}$$

Ο μέγιστος επιτρεπτός ρυθμός μετάδοσης στο δίκτυο είναι 2,5 Mbytes/sec

Άρα, ο κουβάς γεμίζει με ρυθμό  $(M - \rho) = (3.5 - 2.5) = 1$  Mbyte/sec. Για να μην συμβεί απώλεια δεδομένων η χωρητικότητα που πρέπει να έχει ο κουβάς είναι  $B_{\text{ελ}} = S * (M - \rho) = 100 * 1 = 100 \text{ Mbytes}$ .

b) Έστω ότι η χωρητικότητα του κουβά είναι  $B = 200 \text{ MB}$ .

Για να μεταδοθούν τα 350 MB χρειαζόμαστε πάλι τον ίδιο χρόνο  $S = 100 \text{ sec}$ .

Εφόσον έχουμε την ίδια ριπή των 350 MB έχουμε

$$B = S * (M - \rho) \Leftrightarrow 200 = 100 * (3.5 - \rho) \Leftrightarrow \rho = 1.5 \text{ Mbytes/sec.}$$

Δηλαδή, αλλάζει ο μέγιστος επιτρεπτός ρυθμός μετάδοσης στο δίκτυο από 2,5 Mbytes/sec  $\rightarrow$  1,5 Mbytes/sec.

Με αυτά τα δεδομένα ο κουβάς θα αδειάσει σε χρόνο ίσο με  $200 / 1.5 = 133.333 \text{ sec}$ .

c) Με τα αρχικά δεδομένα της εκφώνησης η μεγαλύτερη χρονική διάρκεια της ριπής από τον υπολογιστή ώστε να μην έχουμε απώλεια δεδομένων είναι η εξής:

$$B = S * (M - \rho) \Leftrightarrow 200 = S * 1 \Leftrightarrow S = 200 \text{ sec}$$

- Άσκηση 2:

Η μέγιστη διάρκεια ριπής εξόδου όταν η αποστολή των δεδομένων γίνεται με τα στοιχεία της εκφώνησης και ο κουβάς είναι γεμάτος.

$$S=B/(M-p) \Leftrightarrow S=1/(50-10) \Leftrightarrow S=0.025 \text{ sec}=25\text{msec}$$

Τα δεδομένα που έχω στείλει με ρυθμό 50Mbyte/sec σε 0,025 sec είναι 1.25Mbytes.

Τα δεδομένα που πρέπει συνολικά να σταλούν είναι  $50\text{Mbytes/sec} * 40\text{msec}=50*0.04=2\text{Mbytes}$ .

Επομένως,, τα  $2-1.25=0,75\text{MBytes}$  θα σταλούν με ρυθμό 10Mbytes/sec και θα χρειαστούν  $0,75/10*2=0,0375 \text{ sec}$ .

Άρα,ο συνολικός χρόνος μετάδοσης είναι  $0,025+0,0375=0,0625 \text{ sec}$ .

Αρχικά,εφόσον ο ρυθμός που στέλνονται τα δεδομένα στο δίκτυο είναι μεγαλύτερος απο τον ρυθμό που εισέρχονται τα κουπόνια στον κουβά τότε κάποια στιγμή θα αδειάσει ο κουβάς δηλαδή μετα απο 0,025sec.

Ετσι,μέχρι να αρχίζει πάλι να τροφοδοτεί τον κουβά για να μπορεί να μεταδώσει θα περάσουν 0,0375sec στα οποία θα έχει στείλει και τα εναπομείναντα δεδομένα που έπρεπε να σταλούν αυτη την φορά με ρυθμό 10Mbytes/sec δηλαδή με τον ρυθμό που γεμίζει ο κουβάς.