ΔΙΚΤΥΑ ΕΠΙΚΟΙΝΩΝΙΩΝ ΑΣΚΗΣΗ 2

ΡΑΥΤΟΠΟΥΛΟΣ ΜΑΡΙΟΣ 3180163

1.

TCP πακέτα : 645 στο IPv6 , 2963 στο IPv4

UDP πακέτα: 2215 στο IPv6, 14 στο IPv4

2.

Ethernet · 5		IPv4 · 22	IPv6 · 34	TCP · 107	UDP · 122	
Address	Packets	Bytes	Tx Packets	Tx Bytes	Rx Packets	Rx Bytes
01:00:5e:00:00:fb	1	87	0	0	1	
01:00:5e:7f:ff:fa	5	1027	0	0	5	
20:e8:82:9b:49:f2	5,836	4434k	3,750	4113k	2,086	
7c:67:a2:84:67:dc	5,845	4435k	2,095	321k	3,750	
ff:ff:ff:ff:ff:ff	3	258	0	0	3	

ΓΙΑ ΤΗΝ ΠΡΩΤΗ ENDPOINTS ΤΟ ΑΝΤΙΣΤΟΙΧΟ screenshot

Ethernet II, Src: IntelCor_84:67:dc (7c:67:a2:84:67:dc), Dst: IPv4mcast_7f:ff:fa (01:00:5e:7f:ff:fa)

  Destination: IPv4mcast_7f:ff:fa (01:00:5e:7f:ff:fa)

  Source: IntelCor_84:67:dc (7c:67:a2:84:67:dc)

// ΤΑ ΙΔΙΑ ΧΡΗΣΙΜΟΠΟΙΟΥΝΤΑΙ ΚΑΙ ΣΤΗΝ ΔΕΥΤΕΡΗ//

TO SCREENSHOT ΤΗΣ ΤΡΙΤΗΣ ENDPOINTS

Ethernet II, Src: IntelCor_84:67:dc (7c:67:a2:84:67:dc), Dst: zte_9b:49:f2 (20:e8:82:9b:49:f2)

Destination: zte_9b:49:f2 (20:e8:82:9b:49:f2)

Source: IntelCor_84:67:dc (7c:67:a2:84:67:dc)

TO SCREENSHOT ΤΗΣ ΤΕΤΑΡΤΗΣ ENDPOINTS

Ethernet II, Src: zte_9b:49:f2 (20:e8:82:9b:49:f2), Dst: IntelCor_84:67:dc (7c:67:a2:84:67:dc)

Destination: IntelCor_84:67:dc (7c:67:a2:84:67:dc)

Source: zte_9b:49:f2 (20:e8:82:9b:49:f2)

ΓΙΑ ΤΗΝ ΠΕΜΠΤΗ ENDPOINTS

o.	Time	Source	Destination	Protocol	Lengtl	Info
167	13.509338	52.55.167.177	192.168.2.4	TLSv1.2	127	Application Data
168	13.550363	192.168.2.4	52.55.167.177	TCP	54	63858 → 443 [ACK] Seq=1 Ack=11451 Wi
169	13.804646	52.55.167.177	192.168.2.4	TLSv1.2	164	Application Data
170	13.845155	192.168.2.4	52.55.167.177	TCP	54	63858 → 443 [ACK] Seq=1 Ack=11561 Wi
171	14.095539	52.55.167.177	192.168.2.4	TLSv1.2	113	Application Data
172	14.136722	192.168.2.4	52.55.167.177	TCP	54	63858 → 443 [ACK] Seq=1 Ack=11620 Wi
173	14.187662	192.168.2.4	44.236.154.242	TLSv1.2	93	Application Data
174	14.411773	52.55.167.177	192.168.2.4	TLSv1.2	146	Application Data
175	14.414995	52.55.167.177	192.168.2.4	TLSv1.2	150	Application Data
176	14.415122	192.168.2.4	52.55.167.177	TCP	54	63858 → 443 [ACK] Seq=1 Ack=11808 Wi
177	14.430732	44.236.154.242	192.168.2.4	TCP	54	443 → 62390 [ACK] Seq=1 Ack=40 Win=1
178	14.430732	44.236.154.242	192.168.2.4	TLSv1.2	106	Application Data
179	14.471253	192.168.2.4	44.236.154.242	TCP	54	62390 → 443 [ACK] Seq=40 Ack=53 Win=
180	14.701303	52.55.167.177	192.168.2.4	TLSv1.2	142	Application Data
181	14.742238	192.168.2.4	52.55.167.177	TCP	54	63858 → 443 [ACK] Seq=1 Ack=11896 Wi
182	14.902551	192.168.2.4	192.168.2.255	UDP	86	57621 → 57621 Len=44
183	15.718058	52.55.167.177	192.168.2.4	TLSv1.2	118	Application Data

```
Frame 182: 86 bytes on wire (688 bits), 86 bytes captured (688 bits) on interface \Device\NPF_{1655BB77-EB1D-45F-
Ethernet II, Src: IntelCor_84:67:dc (7c:67:a2:84:67:dc), Dst: Broadcast (ff:ff:ff:ff:ff:ff)
  Destination: Broadcast (ff:ff:ff:ff:ff:ff)
    Address: Broadcast (ff:ff:ff:ff:ff:ff)
    .... ..1. .... .... .... .... = LG bit: Locally administered address (this is NOT the factory default)
    .... ...1 .... .... .... .... = IG bit: Group address (multicast/broadcast)
  Source: IntelCor_84:67:dc (7c:67:a2:84:67:dc)
    Address: IntelCor_84:67:dc (7c:67:a2:84:67:dc)
    .... ..0. .... .... .... .... = LG bit: Globally unique address (factory default)
    .... ...0 .... .... .... .... = IG bit: Individual address (unicast)
  Type: IPv4 (0x0800)
Internet Protocol Version 4, Src: 192.168.2.4, Dst: 192.168.2.255
User Datagram Protocol, Src Port: 57621, Dst Port: 57621
Data (44 bytes)
```

Ethernet II, Src: IntelCor_84:67:dc (7c:67:a2:84:67:dc), Dst: Broadcast (ff:ff:ff:ff:ff:ff)

  Destination: Broadcast (ff:ff:ff:ff:ff:ff)

  Source: IntelCor_84:67:dc (7c:67:a2:84:67:dc)

3.

ΣΤΟ IPv4 ΥΠΑΡΧΟΥΝ 22 ENDPOINTS. ΦΑΙΝΟΝΤΑΙ ΣΤΟ ΠΑΡΑΚΑΤΩ SCREEENSHOT

Ethernet · 5	IPv4 · 22	IPv6 · 34	TCP · 107	UDP · 122							
Address	Packets	Bytes	Tx Packets	Tx Bytes	Rx Packets	Rx Bytes	Country	City	AS Number	AS Organization
35.186.224.47	8	564	4	278	4	286	—	—	—	—
44.236.154.242	6	428	3	226	3	202	—	—	—	—
51.103.5.159	3	438	1	227	2	211	—	—	—	—
52.55.167.177	553	84k	327	72k	226	12k	—	—	—	—
52.113.205.26	3	175	2	120	1	55	—	—	—	—
52.113.205.238	7	1433	4	895	3	538	—	—	—	—
54.70.93.124	17	3469	9	758	8	2711	—	—	—	—
54.191.224.111	6	897	3	735	3	162	—	—	—	—
93.184.220.66	4	264	3	198	1	66	—	—	—	—
104.122.212.187	12	722	6	396	6	326	—	—	—	—
104.199.65.25	3	184	1	65	2	119	—	—	—	—
104.244.42.8	28	7900	16	5584	12	2316	—	—	—	—
140.82.113.25	8	553	5	332	3	221	—	—	—	—
151.101.2.167	4	247	2	139	2	108	—	—	—	—
192.168.2.1	5	390	0	0	5	390	—	—	—	—
192.168.2.4	2,977	2269k	1,113	108k	1,864	2161k	—	—	—	—
192.168.2.255	3	258	0	0	3	258	—	—	—	—
195.201.241.83	2,281	2164k	1,468	2078k	813	86k	—	—	—	—
199.232.54.167	16	978	8	542	8	436	—	—	—	—
199.232.58.214	4	242	2	132	2	110	—	—	—	—
224.0.0.251	1	87	0	0	1	87	—	—	—	—
239.255.255.250	5	1027	0	0	5	1027	—	—	—	—

ΣΤΟ IPv6 ΥΠΑΡΧΟΥΝ 34 ENDPOINTS. ΦΑΙΝΟΝΤΑΙ ΣΤΟ ΠΑΡΑΚΑΤΩ SCREENSHOT

Ethernet · 5	IPv4 · 22	IPv6 · 34	TCP · 107	UDP · 122							
Address	Packets	Bytes	Tx Packets	Tx Bytes	Rx Packets	Rx Bytes	Country	City	AS Number	AS Organization
2600:1901:1:c36::	40	9218	20	3104	20	6114	—	—	—	—
2600:9000:2045:f400:c:132:48e:f021	20	9325	11	7490	9	1835	—	—	—	—
2603:1026:301:54::2	3	235	2	160	1	75	—	—	—	—
2606:2800:234:59:254c:406:2366:268c	131	99k	80	91k	51	7673	—	—	—	—
2a00:1450:400:c00::bd	20	2325	10	1373	10	952	—	—	—	—
2a00:1450:400:c0a::bc	4	322	2	172	2	150	—	—	—	—
2a00:1450:4017:802::200d	36	15k	18	7834	18	7836	—	—	—	—
2a00:1450:4017:802::200e	50	24k	28	11k	22	13k	—	—	—	—
2a00:1450:4017:803::2004	43	23k	25	18k	18	5755	—	—	—	—
2a00:1450:4017:804::200e	736	619k	497	586k	239	33k	—	—	—	—
2a00:1450:4017:806::200e	681	746k	549	723k	132	22k	—	—	—	—
2a00:1450:4017:807::200a	29	14k	14	7016	15	7660	—	—	—	—
2a00:1450:4017:808::2003	55	19k	28	12k	27	7667	—	—	—	—
2a00:1450:4017:808::200a	27	11k	15	6903	12	4670	—	—	—	—
2a00:1450:4017:809::2001	27	13k	15	8409	12	4697	—	—	—	—
2a00:1450:4017:809::2002	26	11k	14	6540	12	4919	—	—	—	—
2a00:1450:4017:809::2003	26	10k	14	5774	12	4678	—	—	—	—
2a00:1450:4017:80a::2003	96	76k	59	70k	37	5605	—	—	—	—
2a00:1450:4017:80a::2006	22	10k	12	5589	10	4721	—	—	—	—
2a00:1450:4017:80a::200a	28	12k	16	6229	12	6427	—	—	—	—
2a00:1450:4017:80b::2005	4	322	2	172	2	150	—	—	—	—
2a00:1450:4017:80b::200a	31	14k	16	7221	15	6790	—	—	—	—
2a00:1450:4017:80c::200a	53	24k	28	16k	25	7834	—	—	—	—
2a00:1450:4017:80c::200e	57	32k	31	26k	26	6528	—	—	—	—
2a00:1450:4017:80c::2016	29	15k	16	10k	13	4750	—	—	—	—
2a01:111:f100:9001::1761:9472	6	654	2	242	4	412	—	—	—	—
2a02:859:f1:5a00:3d4d:beb:36f6:58b6	2,727	2136k	909	206k	1,818	1929k	—	—	—	—
2a02:26f0:c000::215:4522	8	649	4	351	4	298	—	—	—	—
2a03:2880:f028:16:face:b00c:0:3	294	243k	204	224k	90	18k	—	—	—	—
2a03:2880:f128:83:face:b00c:0:25de	81	47k	52	40k	29	6703	—	—	—	—
2a04:4e42:54::760	2	161	1	86	1	75	—	—	—	—
2a04:fa87:fffe::c000:4902	60	26k	32	22k	28	4239	—	—	—	—
fe80::1	139	30k	67	22k	72	7080	—	—	—	—
fe80::74f3:9462:82ca:8b86	137	29k	71	6994	66	22k	—	—	—	—

Τα ENDPOINTS αυτά δεν ταυτίζονται με τα ENDPOINTS του ETHERNET, καθώς αυτά αναφέρονται σε IP ενώ τα ENDPOINTS του ETHERNET αναφέρονται σε MAC.

4. ports από τον υπολογιστή στον DNS server (χρησιμοποιήθηκαν για τα αιτήματα)

Source Port	Destination Port
60271	53
57006	
51213	
59298	
63766	
61730	
54511	
61635	
50769	
51519	
54239	
50077	
65532	
64131	
54080	
60638	
57006	
58413	
53136	
60271	
54424	
51213	
55278	
62731	
49552	
56199	
55171	
54948	
60625	
61145	
64007	
55467	

ports από τον DNS server στον υπολογιστή (χρησημοποιήθηκαν για την απάντηση)

Source Port	Destination Port
53	60271
	57006
	51213
	59298
	63766
	61730
	54511
	61635
	50769
	51519
	54239
	50077
	65532
	64131
	54080
	60638
	57006
	58413
	53136
	60271
	54424
	51213
	55278
	62731
	49552
	56199
	55171
	54948
	60625
	61145
	64007
	55467

5.

```
' Domain Name System (query)
    Transaction ID: 0x70ed
  > Flags: 0x0100 Standard query
    Questions: 1
    Answer RRs: 0
    Authority RRs: 0
    Additional RRs: 0
  v Queries
    > play.google.com: type A, class IN
    [Response In: 32]
```

```
Domain Name System (response)
    Transaction ID: 0x70ed
>   Flags: 0x8180 Standard query response, No error
    Questions: 1
    Answer RRs: 1
    Authority RRs: 0
    Additional RRs: 0
∨   Queries
    >  play.google.com: type A, class IN
∨   Answers
    >  play.google.com: type A, class IN, addr 216.58.214.142
    [Request In: 30]
    [Time: 0.001765000 seconds]
```

To standard query και το standard query response έχουν το ίδιο transaction id .Επίσης η src
address του query έχει destination address το src address του response και η destination
address του response είναι ίδια με την src address του query

```
User Datagram Protocol, Src Port: 61730, Dst Port: 53
    Source Port: 61730
    Destination Port: 53
    Length: 41
    Checksum: 0xe5c7 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 1]
>   [Timestamps]
    UDP payload (33 bytes)
```

```
User Datagram Protocol, Src Port: 53, Dst Port: 61730
    Source Port: 53
    Destination Port: 61730
    Length: 57
    Checksum: 0xf4b6 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 1]
>   [Timestamps]
    UDP payload (49 bytes)
```

6. Υπάρχει συγκεκριμένο flag που λέγεται Authoritative. Ο name server δεν είναι authoritative στο συγκεκριμένο domain.

```
Domain Name System (response)
   Transaction ID: 0x88da
 ˅ Flags: 0x8180 Standard query response, No error
      1... .... .... .... = Response: Message is a response
      .000 0... .... .... = Opcode: Standard query (0)
      .... .0.. .... .... = Authoritative: Server is not an authority for domain
      .... ..0. .... .... = Truncated: Message is not truncated
      .... ...1 .... .... = Recursion desired: Do query recursively
      .... .... 1... .... = Recursion available: Server can do recursive queries
      .... .... .0.. .... = Z: reserved (0)
      .... .... ..0. .... = Answer authenticated: Answer/authority portion was not authenticated by the server
      .... .... ...0 .... = Non-authenticated data: Unacceptable
      .... .... .... 0000 = Reply code: No error (0)
   Questions: 1
   Answer RRs: 1
   Authority RRs: 2
   Additional RRs: 2
 ˅ Queries
   > book4book.gr: type A, class IN
```

7.
         Το όνομα www.book4book.gr είναι canonical name .

```
  Additional RR0: 0
˅ Queries
   ˅ www.book4book.gr: type AAAA, class IN
        Name: www.book4book.gr
        [Name Length: 16]
        [Label Count: 3]
        Type: AAAA (IPv6 Address) (28)
        Class: IN (0x0001)
˅ Answers
   ˅ www.book4book.gr: type CNAME, class IN, cname book4book.gr
        Name: www.book4book.gr
        Type: CNAME (Canonical NAME for an alias) (5)
        Class: IN (0x0001)
        Time to live: 3600 (1 hour)
        Data length: 2
        CNAME: book4book.gr
```

ME IP ADDRESS:

```
C:\Users\User>tracert www.book4book.gr

Tracing route to book4book.gr [195.201.241.83]
over a maximum of 30 hops:
```

8. Η ip address του book4book.gr == 195.201.241.83

Με το 3-way-handshake υλοποιείται η εγκαθίδρυση σύνδεσης.

1)SYN: δηλώνει με ποιον αριθμό ξεκινάνε τα segments.

2}SYN,ACK: δηλώνει την απάντηση στο segment που έχει σταλθεί με SYN και το SYN δηλώνει τον αριθμό που θα ξεκινήσει τα segments του ο server.

3)ACK: Ο χρήστης αναγνωρίζει την απάντηση του server πραγματοποιείται η σύνδεσή τους.

550 51.083854	192.168.2.4	195.201.241.83	TCP	66 63488 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
551 51.084428	192.168.2.4	195.201.241.83	TCP	66 63489 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
552 51.161597	195.201.241.83	192.168.2.4	TCP	66 80 → 63488 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1444 SACK_PERM=1 WS=128
553 51.161597	195.201.241.83	192.168.2.4	TCP	66 80 → 63489 [SYN, ACK] Seq=0 Ack=1 Win=29200 Len=0 MSS=1444 SACK_PERM=1 WS=128
554 51.161685	192.168.2.4	195.201.241.83	TCP	54 63488 → 80 [ACK] Seq=1 Ack=1 Win=131328 Len=0
555 51.161789	192.168.2.4	195.201.241.83	TCP	54 63489 → 80 [ACK] Seq=1 Ack=1 Win=131328 Len=0

1)

Το Syn είναι set και το ack unset. Είμαστε στο 1ο βήμα που στέλνεται από τον χρήστη τον αριθμό των segments.

```
Transmission Control Protocol, Src Port: 63489, Dst Port: 80, Seq: 0, Len: 0
    Source Port: 63489
    Destination Port: 80
    [Stream index: 25]
    [TCP Segment Len: 0]
    Sequence Number: 0    (relative sequence number)
    Sequence Number (raw): 1421027682
    [Next Sequence Number: 1    (relative sequence number)]
    Acknowledgment Number: 0
    Acknowledgment number (raw): 0
    1000 .... = Header Length: 32 bytes (8)
  ∨ Flags: 0x002 (SYN)
        000. .... .... = Reserved: Not set
        ...0 .... .... = Nonce: Not set
        .... 0... .... = Congestion Window Reduced (CWR): Not set
        .... .0.. .... = ECN-Echo: Not set
        .... ..0. .... = Urgent: Not set
        .... ...0 .... = Acknowledgment: Not set
        .... .... 0... = Push: Not set
        .... .... .0.. = Reset: Not set
      > .... .... ..1. = Syn: Set
        .... .... ...0 = Fin: Not set
        [TCP Flags: ··········S·]
    Window: 64240
    [Calculated window size: 64240]
    Checksum: 0x85ee [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
```

2Υπάρχει τιμή ack number, στα flags είναι set και στα δύο.

```
▶ Transmission Control Protocol, Src Port: 80, Dst Port: 63489, Seq: 0, Ack: 1, Len: 0
    Source Port: 80
    Destination Port: 63489
    [Stream index: 25]
    [TCP Segment Len: 0]
    Sequence Number: 0    (relative sequence number)
    Sequence Number (raw): 472244079
    [Next Sequence Number: 1    (relative sequence number)]
    Acknowledgment Number: 1    (relative ack number)
    Acknowledgment number (raw): 1421027683
    1000 .... = Header Length: 32 bytes (8)
  ▼ Flags: 0x012 (SYN, ACK)
        000. .... .... = Reserved: Not set
        ...0 .... .... = Nonce: Not set
        .... 0... .... = Congestion Window Reduced (CWR): Not set
        .... .0.. .... = ECN-Echo: Not set
        .... ..0. .... = Urgent: Not set
        .... ...1 .... = Acknowledgment: Set
        .... .... 0... = Push: Not set
        .... .... .0.. = Reset: Not set
      ▶ .... .... ..1. = Syn: Set
        .... .... ...0 = Fin: Not set
        [TCP Flags: ·······A··S·]
    Window: 29200
    [Calculated window size: 29200]
    Checksum: 0x133a [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
```

3) Το ack είναι set ενώ το syn όχι. Έχει πραγματοποιηθεί η σύνδεση και έχει αναγνωριστεί από τον server.

```
▼ Transmission Control Protocol, Src Port: 63489, Dst Port: 80, Seq: 1, Ack: 1, Len: 0
    Source Port: 63489
    Destination Port: 80
    [Stream index: 25]
    [TCP Segment Len: 0]
    Sequence Number: 1    (relative sequence number)
    Sequence Number (raw): 1421027683
    [Next Sequence Number: 1    (relative sequence number)]
    Acknowledgment Number: 1    (relative ack number)
    Acknowledgment number (raw): 472244080
    0101 .... = Header Length: 20 bytes (5)
  ▼ Flags: 0x010 (ACK)
        000. .... .... = Reserved: Not set
        ...0 .... .... = Nonce: Not set
        .... 0... .... = Congestion Window Reduced (CWR): Not set
        .... .0.. .... = ECN-Echo: Not set
        .... ..0. .... = Urgent: Not set
        .... ...1 .... = Acknowledgment: Set
        .... .... 0... = Push: Not set
        .... .... .0.. = Reset: Not set
        .... .... ..0. = Syn: Not set
        .... .... ...0 = Fin: Not set
        [TCP Flags: ·······A····]
    Window: 513
    [Calculated window size: 131328]
    [Window size scaling factor: 256]
    Checksum: 0xc40b [unverified]
    [Checksum Status: Unverified]
    Urgent Pointer: 0
```

9. To destination port για HTTP είναι 80. Ο server λαμβάνει αιτήματα από src port 80.

Source port	Destination Port
63849	80
63490	
63499	

Source port	Destination port
80	63849
	63490
	63499

10. Address get request: 195.201.241.83. Συνολικά ήταν 78 πακέτα.

Η άλλη διεύθυνση που στάλθηκαν είναι η 2a04:fa87:fffe::c000:4902

∨ HTTP Request Packets	83	0.0014	49.70%	0.0900	55.795
SEARCH	5	0.0001	6.02%	0.0100	0.000
GET	78	0.0013	93.98%	0.0900	55.795

11. Η version του browser: HTTP/1.1

```
∨ GET /widgets.js HTTP/1.1\r\n
  > [Expert Info (Chat/Sequence): GET /widgets.js HTTP/1.1\r\n]
    Request Method: GET
    Request URI: /widgets.js
    Request Version: HTTP/1.1
  Host: platform.twitter.com\r\n
```

Η version του SERVER: HTTP/1.1

```
Hypertext Transfer Protocol
∨ HTTP/1.1 200 OK\r\n
  ∨ [Expert Info (Chat/Sequence): HTTP/1.1 200 OK\r\n]
      [HTTP/1.1 200 OK\r\n]
      [Severity level: Chat]
      [Group: Sequence]
    Response Version: HTTP/1.1
    Status Code: 200
    [Status Code Description: OK]
    Response Phrase: OK
  Date: Sun, 13 Dec 2020 22:35:19 GMT\r\n
```

Το λογισμικό που χρησιμοποιεί ο server είναι Apache

```
' Hypertext Transfer Protocol
  >  HTTP/1.1 200 OK\r\n
     Date: Sun, 13 Dec 2020 22:35:21 GMT\r\n
     Server: Apache\r\n
     Last-Modified: Mon, 07 May 2012 21:54:46 GMT\r\n
     Accept-Ranges: bytes\r\n
  >  Content-Length: 958\r\n
     Keep-Alive: timeout=2, max=87\r\n
     Connection: Keep-Alive\r\n
     Content-Type: image/png\r\n
     \r\n
     [HTTP response 15/16]
```