Department of Computer science & Engineering

CS588 System Lab

Assignment Report Group 6

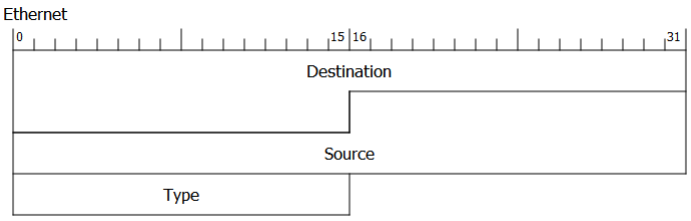
Assignment 2

Contents

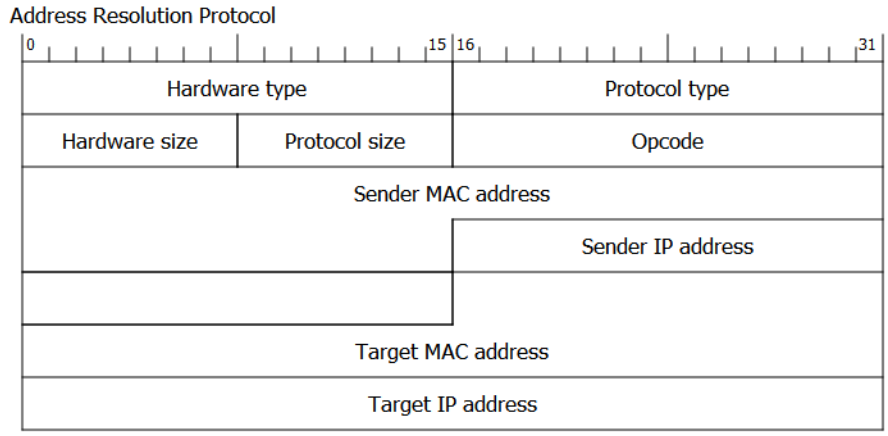
1 Question 1

1.1 Data Link Layer

1.1.1 Ethernet

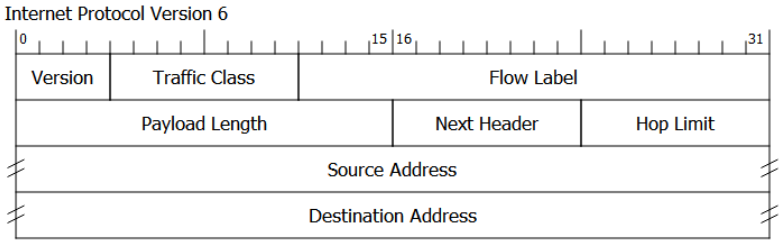


1.1.2 Address Resolution Protocol (ARP)

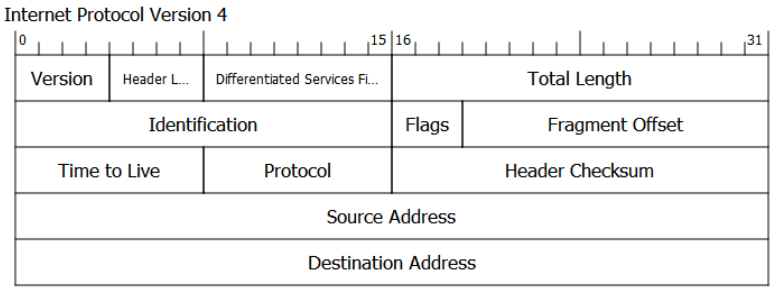


1.2 Network Layer

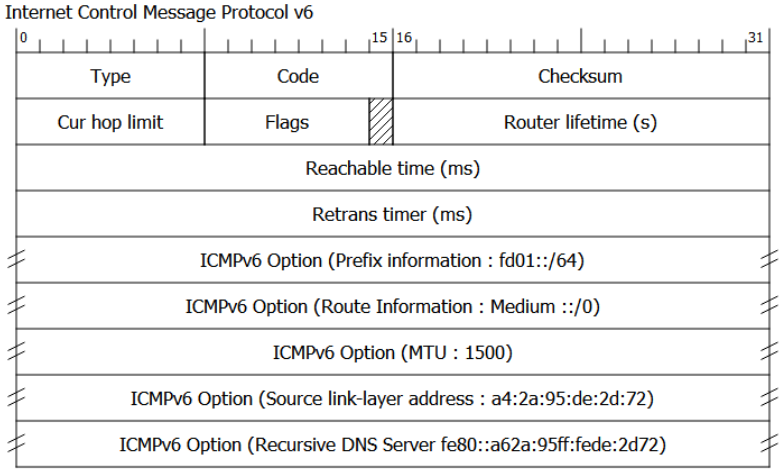
1.2.1 IPv4



1.2.2 IPv6

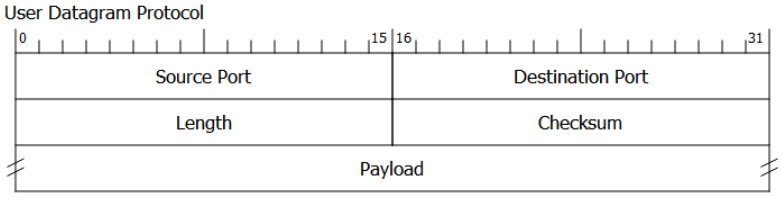


1.2.3 ICMPv6

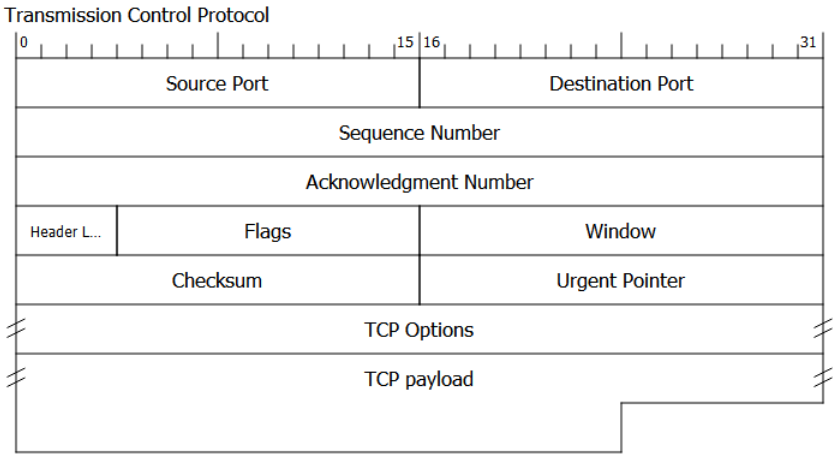


1.3 Transport Layer

1.3.1 UDP

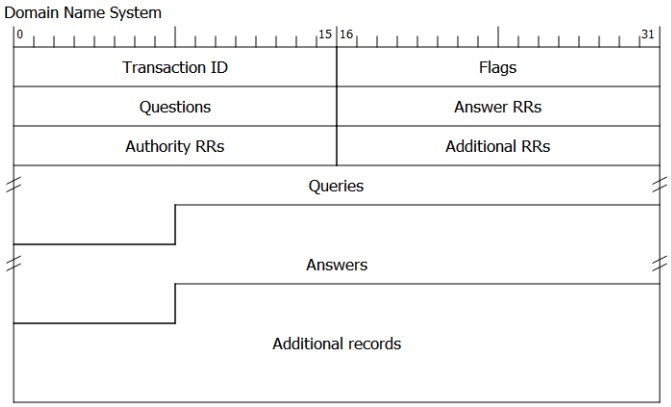


1.3.2 TCP

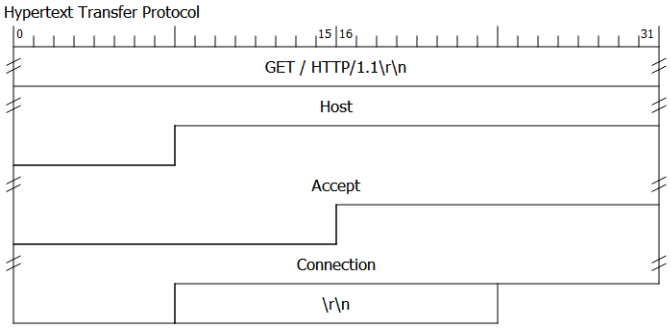


1.4 Application Layer

1.4.1 DNS



1.4.2 HTTP



2 Question 2

2.1 Ethernet and ARP

	Device	IP Address	MAC address
1	Wifi Router	192.168.0.1	a4:2a:95:de:2d:72
2	Client(Laptop)	192.168.0.158	dc:f5:05:dc:e0:99

```
Address Resolution Protocol (reply)
    Hardware type: Ethernet (1)
    Protocol type: IPv4 (0x0800)
    Hardware size: 6
    Protocol size: 4
    Opcode: reply (2)
    Sender MAC address: ayush-TUF-Gaming-FX505DD-FX505DD.iitg.ac.in (dc:f5:05:dc:e0:99)
    Sender IP address: ayush-TUF-Gaming-FX505DD-FX505DD.iitg.ac.in (192.168.0.158)
    Target MAC address: dlinkrouter.iitg.ac.in (a4:2a:95:de:2d:72)
    Target IP address: dlinkrouter.iitg.ac.in (192.168.0.1)
```

2.2 DNS

```
Domain Name System (response)
    Transaction ID: 0xea57
  > Flags: 0x8180 Standard query response, No error
    Questions: 1
    Answer RRs: 4
    Authority RRs: 0
    Additional RRs: 1
  v Queries
    > secure-media.hotstarext.com: type A, class IN
  v Answers
    > secure-media.hotstarext.com: type CNAME, class IN, cname wildcard.hotstarext.com.edgesuite.net
    > wildcard.hotstarext.com.edgesuite.net: type CNAME, class IN, cname a1993.dscf1.akamai.net
    > a1993.dscf1.akamai.net: type A, class IN, addr 180.149.61.138
    > a1993.dscf1.akamai.net: type A, class IN, addr 180.149.61.144
  > Additional records
    [Request In: 17]
    [Time: 0.121502000 seconds]
```

2.3 IPv4 and TCP

In this mostly all content is served by the hotstar server address(a1965.dscw80.akamai.net) and uses https as protocol. So all video streaming is done using tcp as transport layer. client mainly uses port 47792 and also uses other port as 47788.

	Attribute	Value
1	Server IP	49.44.118.91
2	Client IP	192.168.0.158
3	Server port	443 (Https)
4	Client Port	47792 , 47788

3 Question 3 and 4

Most of the content in served by the same server. It uses https protocol for communication on port 443. All communication is done using TCP as transport layer. UDP is used only for application layer protocols such as DNS(Domain Name System).
DNS converts a hostname (such as www.example.com) into a IP address (such as 192.168.1.1). SO first step is to get IP address from DNS server.

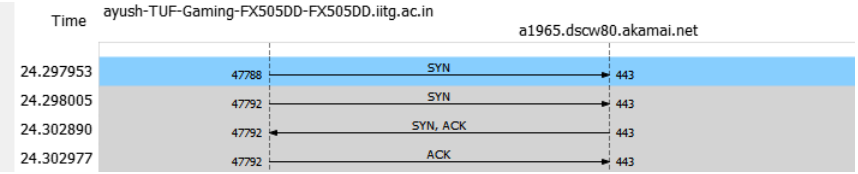


Figure 1: Handshake in TCP

Server gets changed if movie is changed or sometimes if audio language is changed (Fig2). IP address are dynamic, so even domain name is same but IP gets changed as shown in fig 4.

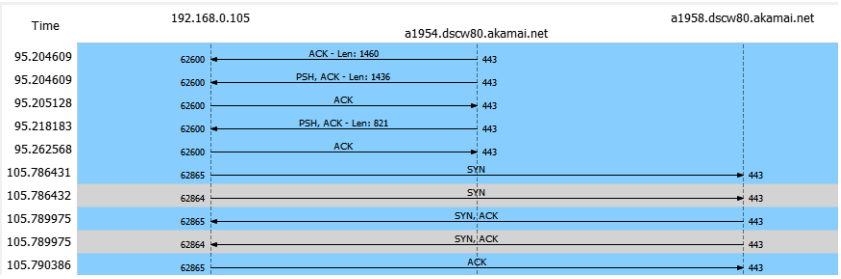


Figure 2: Server change

Ethernet · 9 | IPv4 · 67 | IPv6 · 3 | TCP · 614 | UDP · 71

Address A	Address B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration	Bits/s A → B	Bits/s B → A
192.168.0.105	49.44.50.8	121,433	115.852 MiB	41,081	2.150 MiB	80,352	113.702 MiB	9.627992	103.0758	170.880 KiB	8.825 MiB
192.168.0.105	49.44.118.214	72,045	68.601 MiB	24,196	1.266 MiB	47,849	67.334 MiB	105.786431	66.9562	154.901 KiB	8.045 MiB
192.168.0.105	49.44.118.197	70,353	66.925 MiB	23,840	1.257 MiB	46,513	65.667 MiB	192.906742	49.8891	206.458 KiB	10.530 MiB
192.168.0.105	49.44.50.10	30,659	29.281 MiB	10,330	556.961 KiB	20,329	28.737 MiB	261.273361	22.5650	197.460 KiB	10.188 MiB

Figure 3: Trace 2

Play/Pause functionality does not cause any communication as it is handled at client side only. Subtitles changing does not change the server.

4 Question 5

4.1 Trace 1

Throughput	1286 KB/s
RTT	0.000270426 s
Packet size	1113.08 B
No of Packet Lost	217
No of Packet Sent	488821
No of UDP Packets	744
No of TCP Packets	386314
Tx Packets	144453
Rx Packets	344282
No of response received w.r.t one request sent(TX/Rx)	2.3833496016

4.2 Trace 2

Throughput	529 KB/s
RTT	0.014947601 s
Packet size	946.48 B
No of Packet Lost	4
No of Packet Sent	12553
No of UDP Packets	90
No of TCP Packets	12463
Tx Packets	4369
Rx Packets	8184
No of response received w.r.t one request sent(TX/Rx)	1.87319752804

5 Question 6

Server gets changed only if movie we are watching is changed and sometimes it gets changed even if audio language is changed.

Ethernet · 9 | IPv4 · 67 | IPv6 · 3 | TCP · 614 | UDP · 71

Address A	Address B	Packets	Bytes	Packets A → B	Bytes A → B	Packets B → A	Bytes B → A	Rel Start	Duration	Bits/s A → B	Bits/s B → A
192.168.0.105	49.44.50.8	121,433	115.852 MiB	41,081	2.150 MiB	80,352	113.702 MiB	9.627992	103.0758	170.880 KiB	8.825 MiB
192.168.0.105	49.44.118.214	72,045	68.601 MiB	24,196	1.266 MiB	47,849	67.334 MiB	105.786431	66.9562	154.901 KiB	8.045 MiB
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192.168.0.105	49.44.50.10	30,659	29.281 MiB	10,330	556.961 KiB	20,329	28.737 MiB	261.273361	22.5650	197.460 KiB	10.188 MiB

Figure 4: Trace 2