tcp

No.	Time	Source	Destination	Protocol	Lengtl	Info
367	0.908359	172.20.10.1	172.20.10.10	DNS	75	Standard query response 0x59dd HTTPS play.google.com
368	0.908359	172.20.10.1	172.20.10.10	DNS	91	Standard query response 0xc3db A play.google.com A 142.250.201.14
418	1.787906	172.20.10.3	224.0.0.251	MDNS	87	Standard query 0x0000 PTR _spotify-connect._tcp.local, "QM" question
419	1.787906	fe80::8065:9dff:fec_	ff02::fb	MDNS	107	Standard query 0x0000 PTR _spotify-connect._tcp.local, "QM" question
426	1.849228	172.20.10.10	2.18.40.161	UDP	144	62252 → 443 Len=102
432	1.946262	172.20.10.10	172.20.10.1	DNS	94	Standard query 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com
434	2.080324	172.20.10.1	172.20.10.10	DNS	204	Standard query response 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com CNAME kv801.prod.do.dsp.mp.microsoft.c_
436	2.097136	172.20.10.3	239.255.255.250	SSDP	167	M-SEARCH * HTTP/1.1
439	2.153107	2.18.40.161	172.20.10.10	UDP	69	443 → 62252 Len=27
442	2.185258	172.20.10.10	2.18.40.161	UDP	74	62252 → 443 Len=32
447	2.248105	2.18.40.161	172.20.10.10	UDP	1292	443 → 62252 Len=1250
448	2.248635	2.18.40.161	172.20.10.10	UDP	661	443 → 62252 Len=619
449	2.248635	2.18.40.161	172.20.10.10	UDP	100	443 → 62252 Len=58
450	2.248635	2.18.40.161	172.20.10.10	UDP	1016	443 → 62252 Len=974
451	2.248793	2.18.40.161	172.20.10.10	UDP	64	443 → 62252 Len=22
455	2.249890	172.20.10.10	2.18.40.161	UDP	73	62252 → 443 Len=31

```
∨ Internet Protocol Version 4, Src: 2.18.40.161, Dst: 172.20.10.10
     0100 .... = Version: 4
     .... 0101 = Header Length: 20 bytes (5)
   > Differentiated Services Field: 0x00 (DSCP: CS0, ECN: Not-ECT)
     Total Length: 55
     Identification: 0x32c9 (13001)
   > 000. .... = Flags: 0x0
     ...0 0000 0000 0000 = Fragment Offset: 0
     Time to Live: 52
     Protocol: UDP (17)
     Header Checksum: 0x731c [validation disabled]
     [Header checksum status: Unverified]
     Source Address: 2.18.40.161
     Destination Address: 172.20.10.10
     [Stream index: 8]
 > User Datagram Protocol, Src Port: 443, Dst Port: 62252
 > Data (27 bytes)
```

```
0000   1c bf c0 aa 31 85 56 62   e2 a0 15 64 08 00 4
0010   00 37 32 c9 00 00 34 11   73 1c 02 12 28 a1 a
0020   0a 0a 01 bb f3 2c 00 23   4f a3 5e ec 2b ea 9
0030   2b a3 27 e1 66 5e 0a 15   25 24 b2 39 57 f4 d
0040   8d eb db b1 7c
```

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tcp

No.	Time	Source	Destination	Protocol	Lengtl	Info
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426	1.849228	172.20.10.10	2.18.40.161	UDP	144	62252 → 443 Len=102
432	1.946262	172.20.10.10	172.20.10.1	DNS	94	Standard query 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com
434	2.080324	172.20.10.1	172.20.10.10	DNS	204	Standard query response 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com CNAME kv801.prod.do.dsp.mp.microsoft.c_
436	2.097136	172.20.10.3	239.255.255.250	SSDP	167	M-SEARCH * HTTP/1.1
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451	2.248793	2.18.40.161	172.20.10.10	UDP	64	443 → 62252 Len=22
455	2.249890	172.20.10.10	2.18.40.161	UDP	73	62252 → 443 Len=31

    Source Address: 2.18.40.161
    Destination Address: 172.20.10.10
    [Stream index: 8]
✓ User Datagram Protocol, Src Port: 443, Dst Port: 62252
    Source Port: 443
    Destination Port: 62252
    Length: 35
    Checksum: 0x4fa3 [unverified]
    [Checksum Status: Unverified]
    [Stream index: 5]
    [Stream Packet Number: 2]
  ˃ [Timestamps]
    UDP payload (27 bytes)
✓ Data (27 bytes)
    Data: 5eec2bea9c4e2ba327e1665e0a152524b23957f4da3e8debdbb17c
    [Length: 27]

```
0000   1c bf c0 aa 31 85 56 62   e2 a0 15 64 08 00 45
0010   00 37 32 c9 00 00 34 11   73 1c 02 12 28 a1 a0
0020   0a 0a 01 bb f3 2c 00 23   4f a3 5e ec 2b ea 9c
0030   2b a3 27 e1 66 5e 0a 15   25 24 b2 39 57 f4 da
0040   8d eb db b1 7c
```

tcp

No.	Time	Source	Destination	Protocol	Lengtl	Info
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418	1.787906	172.20.10.3	224.0.0.251	MDNS	87	Standard query 0x0000 PTR _spotify-connect._tcp.local, "QM" question
419	1.787906	fe80::8065:9dff:fec_	ff02::fb	MDNS	107	Standard query 0x0000 PTR _spotify-connect._tcp.local, "QM" question
426	1.849228	172.20.10.10	2.18.40.161	UDP	144	62252 → 443 Len=102
432	1.946262	172.20.10.10	172.20.10.1	DNS	94	Standard query 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com
434	2.080324	172.20.10.1	172.20.10.10	DNS	204	Standard query response 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com CNAME kv801.prod.do.dsp.mp.microsoft.c_
436	2.097136	172.20.10.3	239.255.255.250	SSDP	167	M-SEARCH * HTTP/1.1
439	2.153107	2.18.40.161	172.20.10.10	UDP	69	443 → 62252 Len=27
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447	2.248105	2.18.40.161	172.20.10.10	UDP	1292	443 → 62252 Len=1250
448	2.248635	2.18.40.161	172.20.10.10	UDP	661	443 → 62252 Len=619
449	2.248635	2.18.40.161	172.20.10.10	UDP	100	443 → 62252 Len=58
450	2.248635	2.18.40.161	172.20.10.10	UDP	1016	443 → 62252 Len=974
451	2.248793	2.18.40.161	172.20.10.10	UDP	64	443 → 62252 Len=22
455	2.249890	172.20.10.10	2.18.40.161	UDP	73	62252 → 443 Len=31

```
     Header Checksum: 0x731c [validation disabled]
     [Header checksum status: Unverified]
     Source Address: 2.18.40.161
     Destination Address: 172.20.10.10
     [Stream index: 8]
∨ User Datagram Protocol, Src Port: 443, Dst Port: 62252
     Source Port: 443
     Destination Port: 62252
     Length: 35
     Checksum: 0x4fa3 [unverified]
     [Checksum Status: Unverified]
     [Stream index: 5]
     [Stream Packet Number: 2]
  ⟩  [Timestamps]
     UDP payload (27 bytes)
  ⟩ Data (27 bytes)
```

```
0000   1c bf c0 aa 31 85 56 62   e2 a0 15 64 08 00 45
0010   00 37 32 c9 00 00 34 11   73 1c 02 12 28 a1 a
0020   0a 0a 01 bb f3 2c 00 23   4f a3 5e ec 2b ea 9
0030   2b a3 27 e1 66 5e 0a 15   25 24 b2 39 57 f4 d
0040   8d eb db b1 7c
```

Part 4: Comparing TCP and UDP by filling in the following tables. Save your work (e.g., in an MS Word document), and upload it to your online git repo.

Task 1: Fill in the following table and provide reasons.

	TCP or UDP	Reasons
Reliability and Connection Establishment	TCP	connection-oriented, ensures reliable delivery
Data Integrity and Ordering	TCP	guarantees data integrity using checksums and error correction, maintains the correct order of data by using sequence numbers, If a packet is lost, TCP will retransmit it

Task 2: Identify the use Cases and Performance of TCP and UDP.

	TCP	UDP
Use cases	Web Browsing (HTTP/HTTPS),File Transfers Remote Access , Database Connections	Live Streaming,Online Gaming,VoIP Calls,DNS Lookups,IoT & Sensor Networks
Performance	Reliable,Slower,Connection-Oriented Consumes More Resources	Fast,Unreliable,Connectionless,Low Resource Consumption.

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tcp

No.	Time	Source	Destination	Protocol	Lengtl	Info
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418	1.787906	172.20.10.3	224.0.0.251	MDNS	87	Standard query 0x0000 PTR _spotify-connect._tcp.local, "QM" question
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426	1.849228	172.20.10.10	2.18.40.161	UDP	144	62252 → 443 Len=102
432	1.946262	172.20.10.10	172.20.10.1	DNS	94	Standard query 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com
434	2.080324	172.20.10.1	172.20.10.10	DNS	204	Standard query response 0x0a83 A kv801.prod.do.dsp.mp.microsoft.com CNAME kv801.prod.do.dsp.mp.microsoft.c…
436	2.097136	172.20.10.3	239.255.255.250	SSDP	167	M-SEARCH * HTTP/1.1
439	2.153107	2.18.40.161	172.20.10.10	UDP	69	443 → 62252 Len=27
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455	2.249890	172.20.10.10	2.18.40.161	UDP	73	62252 → 443 Len=31

```
> Frame 439: 69 bytes on wire (552 bits), 69 bytes captured (552 bits) on interface \Device\NPF_{2C747494-BFD4-4122-9CCD-158396F4DD20}, id 0
v Ethernet II, Src: 56:62:e2:a0:15:64 (56:62:e2:a0:15:64), Dst: ChongqingFug_aa:31:85 (1c:bf:c0:aa:31:85)
  > Destination: ChongqingFug_aa:31:85 (1c:bf:c0:aa:31:85)
  > Source: 56:62:e2:a0:15:64 (56:62:e2:a0:15:64)
    Type: IPv4 (0x0800)
    [Stream index: 0]
> Internet Protocol Version 4, Src: 2.18.40.161, Dst: 172.20.10.10
> User Datagram Protocol, Src Port: 443, Dst Port: 62252
> Data (27 bytes)
```

```
0000  1c bf c0 aa 31 85 56 62  e2 a0 15 64 08 00 45
0010  00 37 32 c9 00 00 34 11  73 1c 02 12 28 a1 ac
0020  0a 0a 01 bb f3 2c 00 23  4f a3 5e ec 2b ea 9…
0030  2b a3 27 e1 66 5e 0a 15  25 24 b2 39 57 f4 d…
0040  8d eb db b1 7c
```

Step 5: Compare the simplicity of UDP headers with TCP headers.

UDP headers are small and simple (only 4 fields, 8 bytes in total).
No sequence numbers, acknowledgments, or connection setup.

TCP headers are more complex (minimum 20 bytes, up to 60 bytes).
TCP provides error checking, flow control, and connection management.