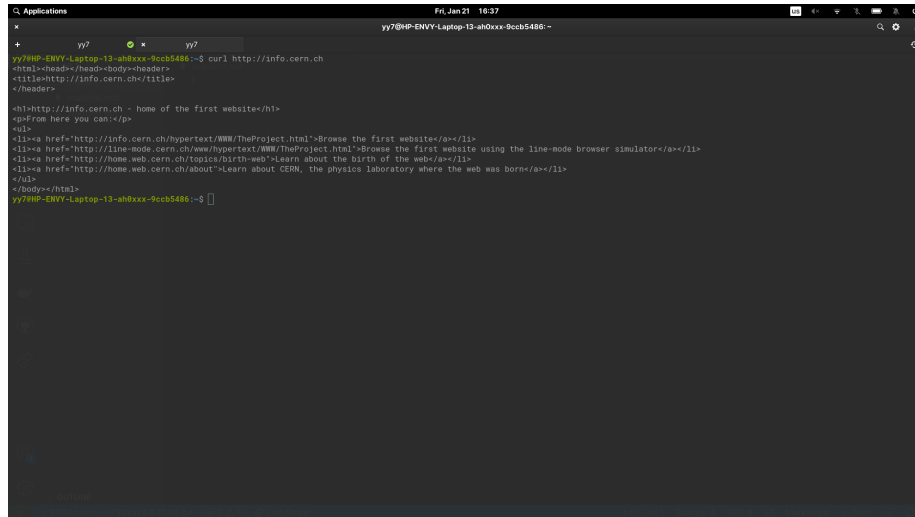


Task 1



```
Applications
Fri, Jun 21 16:37
yy7@HP-ENVY-Laptop-13-ah0xxx-9c0b5486: ~
$ curl http://info.cern.ch
<html><head></head><body><header>
<title>http://info.cern.ch/</title>
</header>
<h1>http://info.cern.ch - home of the first website</h1>
<p>From here you can:</p>
<ul>
<li><a href="http://info.cern.ch/hypertext/WWW/TheProject.html">Browse the first website</a></li>
<li><a href="http://line-mode.cern.ch/www/hypertext/WWW/TheProject.html">Browse the first website using the line-mode browser simulator</a></li>
<li><a href="http://home.web.cern.ch/topics/birth-web">Learn about the birth of the web</a></li>
<li><a href="http://home.web.cern.ch/about">Learn about CERN, the physics laboratory where the web was born</a></li>
</ul>
</body></html>
yy7@HP-ENVY-Laptop-13-ah0xxx-9c0b5486: ~$
```

Task 2

Generally persistent connections make requests in parallel, whereas non-persistent connection make requests one by one.

But in the given example both persistent and non-persistent connections receive similar packages.

The command for persistent connection

```
$ curl http://info.cern.ch -H "Connection: keep-alive" -H "Keep-Alive: timeout=5, max=100"
```

receives the following packages

Applications Fri, Jan 21 16:57 Capturing from wlan1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Filter: dns || ip.src == 188.184.21.108 || ip.addr == 188.184.21.108

No.	Time	Source	Destination	Protocol	Length	Info
1	0.00000000	18.91.54.148	18.99.137.31	DNS	83	Standard query 88d674 A info.cern.ch OPT
2	0.00000000	18.91.54.148	18.99.137.31	DNS	123	Standard query response 88d674 A info.cern.ch CNAME webaf706.cern.ch A 188.184.21.108 OPT
3	0.00355018	18.99.137.31	18.91.54.148	DNS	123	Standard query response 88d674 A info.cern.ch CNAME webaf706.cern.ch A 188.184.21.108 OPT
4	0.00518413	18.99.137.31	18.91.54.148	DNS	123	Standard query response 88d674 A info.cern.ch CNAME webaf706.cern.ch A 188.184.21.108 OPT
5	0.005789705	18.91.54.148	188.184.21.108	TCP	74	44262 → 88 [SYN] Seq=0 Min=64248 Len=0 MSS=1460 SACK_PERM=1 TSval=2457608976 TSecr=0 W=128
6	0.075094807	188.184.21.108	18.91.54.148	TCP	74	88 → 44262 [SYN, ACK] Seq=0 Ack=1 Win=28968 Len=0 MSS=1418 SACK_PERM=1 TSval=2756125662 TSecr=
7	0.075172195	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [ACK] Seq=1 Ack=3 Min=64256 Len=0 TSval=2457608939 TSecr=2756125662
8	0.075338070	18.91.54.148	188.184.21.108	HTTP	161	GET / HTTP/1.1
9	0.146732026	188.184.21.108	18.91.54.148	TCP	66	88 → 44262 [ACK] Seq=1 Ack=96 Min=29056 Len=0 TSval=2756125732 TSecr=2457608939
10	0.145935727	188.184.21.108	18.91.54.148	HTTP	944	HTTP/1.1 200 OK (text/html)
11	0.145976930	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [ACK] Seq=86 Ack=979 Min=63480 Len=0 TSval=2457609110 TSecr=2756125733
12	0.146290487	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [FIN, ACK] Seq=90 Ack=979 Min=64128 Len=0 TSval=2457609119 TSecr=2756125733
13	0.146047095	188.184.21.108	18.91.54.148	TCP	66	88 → 44262 [FIN, ACK] Seq=879 Ack=96 Min=29056 Len=0 TSval=2756125733 TSecr=2457608939
14	0.146710425	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [ACK] Seq=97 Ack=880 Min=64128 Len=0 TSval=2457609111 TSecr=2756125733
15	0.220932559	188.184.21.108	18.91.54.148	TCP	66	88 → 44262 [ACK] Seq=888 Ack=97 Min=29056 Len=0 TSval=2756125802 TSecr=2457609119

Frame 2: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface wlan1, id 0
 Ethernet II, Src: IntelCor_b7:03:4c (14:4f:b8:b7:03:4c), Dst: Routerbo_ac:1a:f5 (48:8f:5a:ac:1a:f5)
 Internet Protocol Version 4, Src: 18.91.54.148, Dst: 18.99.137.31
 User Datagram Protocol, Src Port: 57485, Dst Port: 53
 Domain Name System (query)
 Transaction ID: 0x88d6
 Flags: 0x0100 Standard query
 Questions: 1

Number of queries in packet (dns.count.queries), 2 bytes Packets: 17 - Displayed: 15 (86.2%) Profile: Default

The command for non-persistent connection

```
$ curl http://info.cern.ch -H "Connection: close"
```

receives the following packages

Applications Fri, Jan 21 16:57 Capturing from wlan1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Filter: dns || ip.src == 188.184.21.108 || ip.addr == 188.184.21.108

No.	Time	Source	Destination	Protocol	Length	Info
1	0.00000000	18.91.54.148	18.99.137.31	DNS	83	Standard query 88d674 A info.cern.ch OPT
2	0.00000000	18.91.54.148	18.99.137.31	DNS	123	Standard query response 88d674 A info.cern.ch CNAME webaf706.cern.ch A 188.184.21.108 OPT
3	0.00355018	18.99.137.31	18.91.54.148	DNS	123	Standard query response 88d674 A info.cern.ch CNAME webaf706.cern.ch A 188.184.21.108 OPT
4	0.00518413	18.99.137.31	18.91.54.148	DNS	123	Standard query response 88d674 A info.cern.ch CNAME webaf706.cern.ch A 188.184.21.108 OPT
5	0.005789705	18.91.54.148	188.184.21.108	TCP	74	44262 → 88 [SYN] Seq=0 Min=64248 Len=0 MSS=1460 SACK_PERM=1 TSval=2457608976 TSecr=0 W=128
6	0.075094807	188.184.21.108	18.91.54.148	TCP	74	88 → 44262 [SYN, ACK] Seq=0 Ack=1 Win=28968 Len=0 MSS=1418 SACK_PERM=1 TSval=2756125662 TSecr=
7	0.075172195	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [ACK] Seq=1 Ack=3 Min=64256 Len=0 TSval=2457608939 TSecr=2756125662
8	0.075338070	18.91.54.148	188.184.21.108	HTTP	161	GET / HTTP/1.1
9	0.146732026	188.184.21.108	18.91.54.148	TCP	66	88 → 44262 [ACK] Seq=1 Ack=96 Min=29056 Len=0 TSval=2756125732 TSecr=2457608939
10	0.145935727	188.184.21.108	18.91.54.148	HTTP	944	HTTP/1.1 200 OK (text/html)
11	0.145976930	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [ACK] Seq=133 Ack=979 Min=30080 Len=0 TSval=2756146893 TSecr=2457609260
12	0.146290487	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [ACK] Seq=133 Ack=979 Min=63480 Len=0 TSval=2457609271 TSecr=2756146894
13	0.146047095	188.184.21.108	18.91.54.148	TCP	66	88 → 44262 [FIN, ACK] Seq=879 Ack=133 Win=30080 Len=0 TSval=2756146894 TSecr=2457609260
14	0.146710425	18.91.54.148	188.184.21.108	TCP	66	44262 → 88 [ACK] Seq=888 Ack=133 Min=30080 Len=0 TSval=2756146894 TSecr=2457609271
15	0.220932559	188.184.21.108	18.91.54.148	TCP	66	88 → 44262 [ACK] Seq=888 Ack=133 Min=30080 Len=0 TSval=2756146894 TSecr=2457609271

Frame 3: 83 bytes on wire (664 bits), 83 bytes captured (664 bits) on interface wlan1, id 0
 Ethernet II, Src: IntelCor_b7:03:4c (14:4f:b8:b7:03:4c), Dst: Routerbo_ac:1a:f5 (48:8f:5a:ac:1a:f5)
 Internet Protocol Version 4, Src: 18.91.54.148, Dst: 18.99.137.31
 User Datagram Protocol, Src Port: 32996, Dst Port: 53
 Domain Name System (query)
 Transaction ID: 0x44fe
 Flags: 0x0100 Standard query
 Questions: 1

Number of queries in packet (dns.count.queries), 2 bytes Packets: 19 - Displayed: 15 (78.9%) Profile: Default

Task 3

The command

```
$ curl https://www.google.com/
```

did not give any HTML packets. This is because the connection is secure and encrypted

Applications Fri, Jan 21 17:00 *wfo1

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter...

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000000	10.91.54.148	10.90.137.31	DNS	85	Standard query 8x922f A www.google.com OPT
2	0.000393538	10.91.54.148	10.90.137.31	DNS	85	Standard query 8x385f AAAA www.google.com OPT
3	0.000500005	10.91.54.148	10.91.54.148	DNS	113	Standard query response 0x322f A www.google.com cname forcasafesearch.google.com A 216.239.38.120
4	0.000529387	10.91.54.148	10.91.54.148	DNS	143	Standard query response 0x385f AAAA www.google.com cname forcasafesearch.google.com AAAA 2001:
5	0.000531006	10.91.54.148	216.239.38.120	TCP	74	45720 → 443 [SYN] Seq=0 Win=64240 Len=0 MSG=1488 SACK_PERM=1 TSOV=1807224624 TS=0 W=120
6	0.002748907	216.239.38.120	10.91.54.148	TCP	74	443 → 45720 [ACK] Seq=0 Ack=1 Win=65536 Len=0 MSG=1418 SACK_PERM=1 TSOV=1807224624 TS=0 W=120
7	0.004332780	10.91.54.148	216.239.38.120	TCP	66	45720 → 443 [ACK] Seq=1 Ack=1 Win=64256 Len=0 TSOV=1807224631 TS=0 W=120
8	0.006169074	10.91.54.148	216.239.38.120	TLSv1.3	583	Client Hello
9	0.006980646	216.239.38.120	10.91.54.148	TCP	66	443 → 45720 [ACK] Seq=1 Ack=518 Win=66816 Len=0 TSOV=1807223916 TS=0 W=120
10	0.103958783	216.239.38.120	10.91.54.148	TLSv1.3	2862	Server Hello, Change Cipher Spec
11	0.103962359	10.91.54.148	216.239.38.120	TCP	66	45720 → 443 [ACK] Seq=518 Ack=5787 Win=61568 Len=0 TSOV=1807224632 TS=0 W=120
12	0.103958870	216.239.38.120	10.91.54.148	TCP	177	[TCP Previous segment not captured] 443 → 45720 [ACK] Seq=4560 Ack=518 Win=66816 Len=111
13	0.104000009	10.91.54.148	216.239.38.120	TCP	70	[TCP Seq. Acc. (len)] 45720 → 443 [ACK] Seq=518 Ack=5787 Win=61568 Len=0 TSOV=1807224633 TS=0 W=120
14	0.103959041	216.239.38.120	10.91.54.148	TCP	1484	[TCP Dur. of Seq=1] 443 → 45720 [ACK] Seq=7297 Ack=518 Win=66816 Len=1309 TSOV=1807223911 TS=0
15	0.103952473	10.91.54.148	216.239.38.120	TCP	66	45720 → 443 [ACK] Seq=518 Ack=4580 Win=60160 Len=0 TSOV=1807224633 TS=0 W=120
16	0.103952480	10.91.54.148	216.239.38.120	TLSv1.3	146	Change Cipher Spec, Application Data
17	0.103957905	10.91.54.148	216.239.38.120	TLSv1.3	181	Application Data, Application Data
18	0.103952237	10.91.54.148	216.239.38.120	TLSv1.3	181	Application Data
19	0.103954682	10.91.54.148	216.239.38.120	TLSv1.3	128	Application Data
20	0.141395330	216.239.38.120	10.91.54.148	TLSv1.3	788	Application Data, Application Data
21	0.141375561	10.91.54.148	216.239.38.120	TCP	66	45720 → 443 [ACK] Seq=780 Ack=4948 Win=63488 Len=0 TSOV=1807224610 TS=0 W=120
22	0.141371741	10.91.54.148	216.239.38.120	TLSv1.3	87	Application Data
23	0.141322071	216.239.38.120	10.91.54.148	TLSv1.3	87	Application Data
24	0.141347002	10.91.54.148	216.239.38.120	TCP	66	45720 → 443 [ACK] Seq=821 Ack=4979 Win=64128 Len=0 TSOV=1807224611 TS=0 W=120
25	0.141280041	216.239.38.120	10.91.54.148	TCP	66	443 → 45720 [ACK] Seq=4978 Ack=780 Win=66816 Len=0 TSOV=1807223958 TS=0 W=120

Number of queries in packet (dns.count.queries), 2 bytes

Packets: 67. Displayed: 67 (100.0%)

Profile: Default