PERSONAL REPORT

VASILE MIHAI GLODICI

Class: CB 13

Student Number: 4538528

Date: October - November 2021

Version: 1.4

Revision Table

Version 1	Finished Week 7 exercises. Added Info about myself.
Version 1.1	Finished Week 8 exercises.
Version 1.2	Finished Week 9 exercises. Added Network Diagram
Version 1.3	Finished Week 10 exercises. Fixed wrong answer from Week 8 and modified the Network Diagram.
Version 1.4	Added cover page and changed the Information about myself. Added conclusion and personal refraction.
Version 1.5	Improved Design and added changes to “Info about myself” and “Conclusion”.

Introduction About Student

As an aspiring Cyber Security or Infrastructure specialist, I have applied to Fontys University of Applied Sciences because my research indicates that the Information & Communication Technology programme will provide me with the best preparation to enter this field.

Since I have built, troubleshot, and overclocked my first Computer Setup at the age of 15, my passion for research in this field has grown immensely. I am a fast learner always trying to explore new aspects of computer science, putting them into practice while guiding or helping others.

Solving other people’s technical problems is what I enjoy doing the most, for instance: fixing performance issues, hardware compatibility, common errors and difficulties, but also learning about complex subjects such as how computers handle instructions, virtualization, data privacy, software development, web security (Tor, VPNs, Footprinting) and many more fascinating topics, making me a suitable candidate in the ICT field of study.

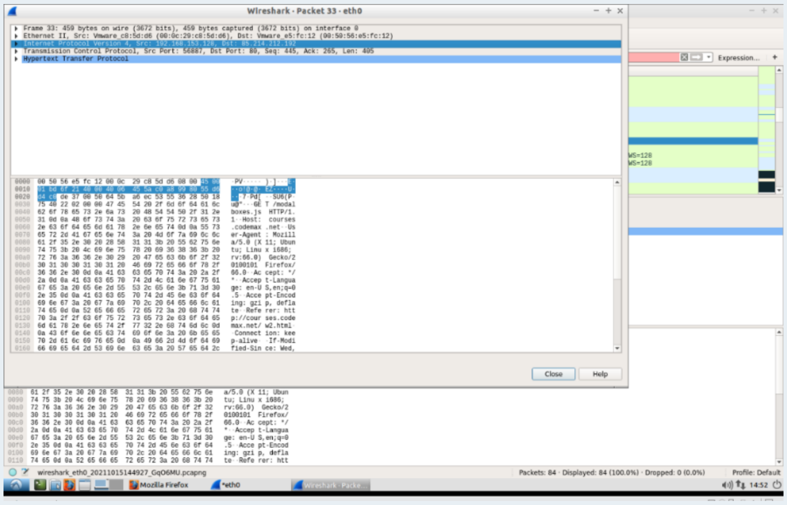
I also enjoy playing videogames with my friends, either competitively or casually, in both the virtual reality and desktop environments.
Early exposure to videogames influenced my decision to pursue a career in the technological field.

I feel that my enthusiasm for research in the ICT field will balance out the work required to become an expert, despite the fact that I don't have much prior professional understanding of mathematics and programming from school.

Assignment Week 7

- What is the source and destination MAC address of this HTTP packet?

➢ Source MAC address: 00:0c:29:c8:5d:fc:12
➢ Destination MAC address: 00:50:56:e5:fc:12



Wireshark · Packet 33 · eth0

```
▸ Frame 33: 459 bytes on wire (3672 bits), 459 bytes captured (3672 bits) on interface 0
▸ Ethernet II, Src: Vmware_c8:5d:d6 (00:0c:29:c8:5d:d6), Dst: Vmware_e5:fc:12 (00:50:56:e5:fc:12)
▸ Internet Protocol Version 4, Src: 192.168.153.128, Dst: 85.214.212.192
▸ Transmission Control Protocol, Src Port: 56887, Dst Port: 80, Seq: 445, Ack: 265, Len: 405
▸ Hypertext Transfer Protocol
```

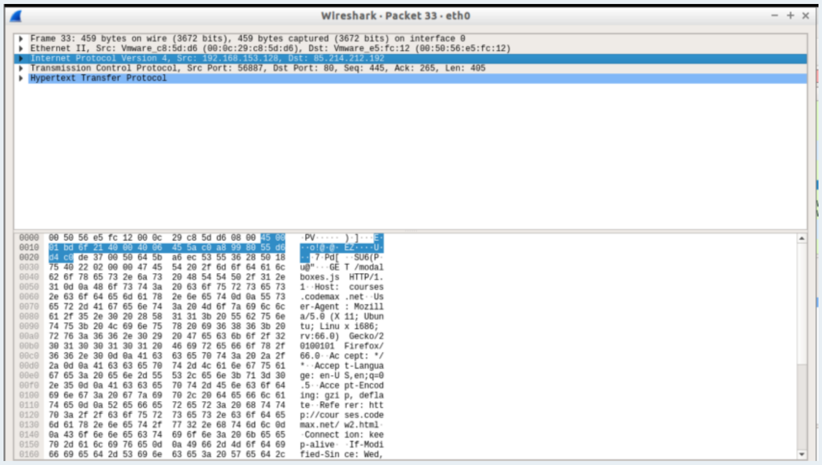
```
0000  00 50 56 e5 fc 12 00 0c  29 c8 5d d6 08 00 45 00   ·PV····· )·]···E·
0010  01 bd 6f 21 40 00 40 06  45 5a c0 a8 99 80 55 d6   ··o!@·@· EZ····U·
0020  d4 c0 de 37 00 50 64 5b  a6 ec 53 55 36 28 50 18   ···7·Pd[ ··SU6(P·
0030  75 40 22 02 00 00 47 45  54 20 2f 6d 6f 64 61 6c   u@"···GE T /modal
0040  62 6f 78 65 73 2e 6a 73  20 48 54 54 50 2f 31 2e   boxes.js  HTTP/1.
0050  31 0d 0a 48 6f 73 74 3a  20 63 6f 75 72 73 65 73   1··Host:  courses
0060  2e 63 6f 64 65 6d 61 78  2e 6e 65 74 0d 0a 55 73   .codemax .net··Us
0070  65 72 2d 41 67 65 6e 74  3a 20 4d 6f 7a 69 6c 6c   er-Agent : Mozill
0080  61 2f 35 2e 30 20 28 58  31 31 3b 20 55 62 75 6e   a/5.0 (X 11; Ubun
0090  74 75 3b 20 4c 69 6e 75  78 20 69 36 38 36 3b 20   tu; Linu x i686;
00a0  72 76 3a 36 36 2e 30 29  20 47 65 63 6b 6f 2f 32   rv:66.0)  Gecko/2
00b0  30 31 30 30 31 30 31 20  46 69 72 65 66 6f 78 2f   0100101  Firefox/
00c0  36 36 2e 30 0d 0a 41 63  63 65 70 74 3a 20 2a 2f   66.0··Ac cept: */
00d0  2a 0d 0a 41 63 63 65 70  74 2d 4c 61 6e 67 75 61   *··Accep t-Langua
00e0  67 65 3a 20 65 6e 2d 55  53 2c 65 6e 3b 71 3d 30   ge: en-U S,en;q=0
00f0  2e 35 0d 0a 41 63 63 65  70 74 2d 45 6e 63 6f 64   .5··Acce pt-Encod
0100  69 6e 67 3a 20 67 7a 69  70 2c 20 64 65 66 6c 61   ing: gzi p, defla
0110  74 65 0d 0a 52 65 66 65  72 65 72 3a 20 68 74 74   te··Refe rer: htt
0120  70 3a 2f 2f 63 6f 75 72  73 65 73 2e 63 6f 64 65   p://cour ses.code
0130  6d 61 78 2e 6e 65 74 2f  77 32 2e 68 74 6d 6c 0d   max.net/ w2.html·
0140  0a 43 6f 6e 6e 65 63 74  69 6f 6e 3a 20 6b 65 65   ·Connect ion: kee
0150  70 2d 61 6c 69 76 65 0d  0a 49 66 2d 4d 6f 64 69   p-alive· ·If-Modi
0160  66 69 65 64 2d 53 69 6e  63 65 3a 20 57 65 64 2c   fied-Sin ce: Wed,
```

```
0080  61 2f 35 2e 30 20 28 58  31 31 3b 20 55 62 75 6e   a/5.0 (X 11; Ubun
0090  74 75 3b 20 4c 69 6e 75  78 20 69 36 38 36 3b 20   tu; Linu x i686;
00a0  72 76 3a 36 36 2e 30 29  20 47 65 63 6b 6f 2f 32   rv:66.0)  Gecko/2
00b0  30 31 30 30 31 30 31 20  46 69 72 65 66 6f 78 2f   0100101  Firefox/
00c0  36 36 2e 30 0d 0a 41 63  63 65 70 74 3a 20 2a 2f   66.0··Ac cept: */
00d0  2a 0d 0a 41 63 63 65 70  74 2d 4c 61 6e 67 75 61   *··Accep t-Langua
00e0  67 65 3a 20 65 6e 2d 55  53 2c 65 6e 3b 71 3d 30   ge: en-U S,en;q=0
00f0  2e 35 0d 0a 41 63 63 65  70 74 2d 45 6e 63 6f 64   .5··Acce pt-Encod
0100  69 6e 67 3a 20 67 7a 69  70 2c 20 64 65 66 6c 61   ing: gzi p, defla
0110  74 65 0d 0a 52 65 66 65  72 65 72 3a 20 68 74 74   te··Refe rer: htt
```

wireshark_eth0_20211015144927_GqO6MU.pcapng   Packets: 84 · Displayed: 84 (100.0%) · Dropped: 0 (0.0%)   Profile: Default

- What is the source and destination IP address of this HTTP packet?

➢ Source IP address: 192.168.153.128
➢ Destination IP address: 85.214.212.192



Wireshark · Packet 33 · eth0

```
▸ Frame 33: 459 bytes on wire (3672 bits), 459 bytes captured (3672 bits) on interface 0
▸ Ethernet II, Src: Vmware_c8:5d:d6 (00:0c:29:c8:5d:d6), Dst: Vmware_e5:fc:12 (00:50:56:e5:fc:12)
▸ Internet Protocol Version 4, Src: 192.168.153.128, Dst: 85.214.212.192
▸ Transmission Control Protocol, Src Port: 56887, Dst Port: 80, Seq: 445, Ack: 265, Len: 405
▸ Hypertext Transfer Protocol
```

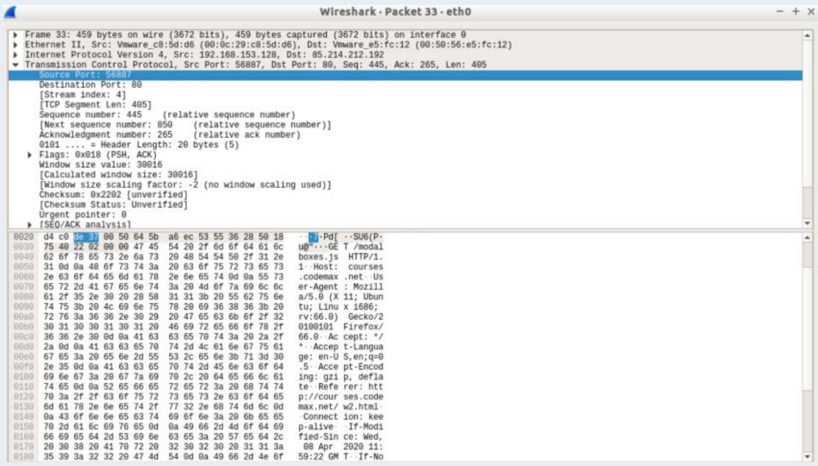
```
0000  00 50 56 e5 fc 12 00 0c  29 c8 5d d6 08 00 45 00   ·PV····· )·]···E·
0010  01 bd 6f 21 40 00 40 06  45 5a c0 a8 99 80 55 d6   ··o!@·@· EZ····U·
0020  d4 c0 de 37 00 50 64 5b  a6 ec 53 55 36 28 50 18   ···7·Pd[ ··SU6(P·
0030  75 40 22 02 00 00 47 45  54 20 2f 6d 6f 64 61 6c   u@"···GE T /modal
0040  62 6f 78 65 73 2e 6a 73  20 48 54 54 50 2f 31 2e   boxes.js  HTTP/1.
0050  31 0d 0a 48 6f 73 74 3a  20 63 6f 75 72 73 65 73   1··Host:  courses
0060  2e 63 6f 64 65 6d 61 78  2e 6e 65 74 0d 0a 55 73   .codemax .net··Us
0070  65 72 2d 41 67 65 6e 74  3a 20 4d 6f 7a 69 6c 6c   er-Agent : Mozill
0080  61 2f 35 2e 30 20 28 58  31 31 3b 20 55 62 75 6e   a/5.0 (X 11; Ubun
0090  74 75 3b 20 4c 69 6e 75  78 20 69 36 38 36 3b 20   tu; Linu x i686;
00a0  72 76 3a 36 36 2e 30 29  20 47 65 63 6b 6f 2f 32   rv:66.0)  Gecko/2
00b0  30 31 30 30 31 30 31 20  46 69 72 65 66 6f 78 2f   0100101  Firefox/
00c0  36 36 2e 30 0d 0a 41 63  63 65 70 74 3a 20 2a 2f   66.0··Ac cept: */
00d0  2a 0d 0a 41 63 63 65 70  74 2d 4c 61 6e 67 75 61   *··Accep t-Langua
00e0  67 65 3a 20 65 6e 2d 55  53 2c 65 6e 3b 71 3d 30   ge: en-U S,en;q=0
00f0  2e 35 0d 0a 41 63 63 65  70 74 2d 45 6e 63 6f 64   .5··Acce pt-Encod
0100  69 6e 67 3a 20 67 7a 69  70 2c 20 64 65 66 6c 61   ing: gzi p, defla
0110  74 65 0d 0a 52 65 66 65  72 65 72 3a 20 68 74 74   te··Refe rer: htt
0120  70 3a 2f 2f 63 6f 75 72  73 65 73 2e 63 6f 64 65   p://cour ses.code
0130  6d 61 78 2e 6e 65 74 2f  77 32 2e 68 74 6d 6c 0d   max.net/ w2.html·
0140  0a 43 6f 6e 6e 65 63 74  69 6f 6e 3a 20 6b 65 65   ·Connect ion: kee
0150  70 2d 61 6c 69 76 65 0d  0a 49 66 2d 4d 6f 64 69   p-alive· ·If-Modi
0160  66 69 65 64 2d 53 69 6e  63 65 3a 20 57 65 64 2c   fied-Sin ce: Wed,
```

Assignment Week 7

- What is the source and destination port of this HTTP packet?
- Provide a screenshot to prove it.

➢ Source port: 56887

➢ Destination port: 80

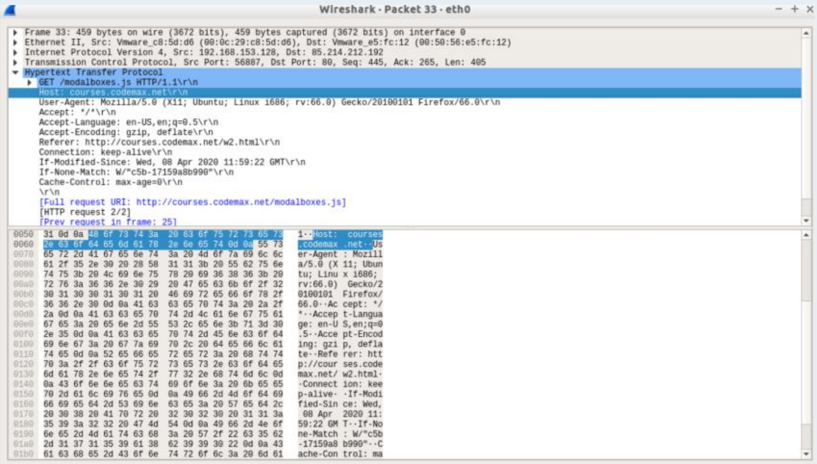


```
▸ Frame 33: 459 bytes on wire (3672 bits), 459 bytes captured (3672 bits) on interface 0
▸ Ethernet II, Src: Vmware_c8:5d:d6 (00:0c:29:c8:5d:d6), Dst: Vmware_e5:fc:12 (00:50:56:e5:fc:12)
▸ Internet Protocol Version 4, Src: 192.168.153.128, Dst: 85.214.212.192
▾ Transmission Control Protocol, Src Port: 56887, Dst Port: 80, Seq: 445, Ack: 265, Len: 405
     Source Port: 56887
     Destination Port: 80
     [Stream index: 4]
     [TCP Segment Len: 405]
     Sequence number: 445    (relative sequence number)
     [Next sequence number: 850    (relative sequence number)]
     Acknowledgment number: 265    (relative ack number)
     0101 .... = Header Length: 20 bytes (5)
   ▸ Flags: 0x018 (PSH, ACK)
     Window size value: 30016
     [Calculated window size: 30016]
     [Window size scaling factor: -2 (no window scaling used)]
     Checksum: 0x2202 [unverified]
     [Checksum Status: Unverified]
     Urgent pointer: 0
   ▸ [SEQ/ACK analysis]
```

```
0020  d4 c0 de 37 00 50 64 5b  a6 ec 53 55 36 28 50 18   ···7·Pd[ ··SU6(P·
0030  75 40 22 02 00 00 47 45  54 20 2f 6d 6f 64 61 6c   u@"···GE T /modal
0040  62 6f 78 65 73 2e 6a 73  20 48 54 54 50 2f 31 2e   boxes.js  HTTP/1.
0050  31 0d 0a 48 6f 73 74 3a  20 63 6f 75 72 73 65 73   1··Host:  courses
0060  2e 63 6f 64 65 6d 61 78  2e 6e 65 74 0d 0a 55 73   .codemax .net··Us
0070  65 72 2d 41 67 65 6e 74  3a 20 4d 6f 7a 69 6c 6c   er-Agent : Mozill
0080  61 2f 35 2e 30 20 28 58  31 31 3b 20 55 62 75 6e   a/5.0 (X 11; Ubun
0090  74 75 3b 20 4c 69 6e 75  78 20 69 36 38 36 3b 20   tu; Linu x i686;
00a0  72 76 3a 36 36 2e 30 29  20 47 65 63 6b 6f 2f 32   rv:66.0)  Gecko/2
00b0  30 31 30 30 31 30 31 20  46 69 72 65 66 6f 78 2f   0100101  Firefox/
00c0  36 36 2e 30 0d 0a 41 63  63 65 70 74 3a 20 2a 2f   66.0··Ac cept: */
00d0  2a 0d 0a 41 63 63 65 70  74 2d 4c 61 6e 67 75 61   *··Accep t-Langua
00e0  67 65 3a 20 65 6e 2d 55  53 2c 65 6e 3b 71 3d 30   ge: en-U S,en;q=0
00f0  2e 35 0d 0a 41 63 63 65  70 74 2d 45 6e 63 6f 64   .5··Acce pt-Encod
0100  69 6e 67 3a 20 67 7a 69  70 2c 20 64 65 66 6c 61   ing: gzi p, defla
0110  74 65 0d 0a 52 65 66 65  72 65 72 3a 20 68 74 74   te··Refe rer: htt
0120  70 3a 2f 2f 63 6f 75 72  73 65 73 2e 63 6f 64 65   p://cour ses.code
0130  6d 61 78 2e 6e 65 74 2f  77 32 2e 68 74 6d 6c 0d   max.net/ w2.html·
0140  0a 43 6f 6e 6e 65 63 74  69 6f 6e 3a 20 6b 65 65   ·Connect ion: kee
0150  70 2d 61 6c 69 76 65 0d  0a 49 66 2d 4d 6f 64 69   p-alive· ·If-Modi
0160  66 69 65 64 2d 53 69 6e  63 65 3a 20 57 65 64 2c   fied-Sin ce: Wed,
0170  20 30 38 20 41 70 72 20  32 30 32 30 20 31 31 3a    08 Apr  2020 11:
0180  35 39 3a 32 32 20 47 4d  54 0d 0a 49 66 2d 4e 6f   59:22 GM T··If-No
```

- What is the host name of this HTTP Get packet?
- Provide a screenshot below with the Wireshark snapshot and highlight the host.

➢ Host name: courses.codemax.net\r\n



```
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▸ Internet Protocol Version 4, Src: 192.168.153.128, Dst: 85.214.212.192
▸ Transmission Control Protocol, Src Port: 56887, Dst Port: 80, Seq: 445, Ack: 265, Len: 405
▾ Hypertext Transfer Protocol
   ▸ GET /modalboxes.js HTTP/1.1\r\n
     Host: courses.codemax.net\r\n
     User-Agent: Mozilla/5.0 (X11; Ubuntu; Linux i686; rv:66.0) Gecko/20100101 Firefox/66.0\r\n
     Accept: */*\r\n
     Accept-Language: en-US,en;q=0.5\r\n
     Accept-Encoding: gzip, deflate\r\n
     Referer: http://courses.codemax.net/w2.html\r\n
     Connection: keep-alive\r\n
     If-Modified-Since: Wed, 08 Apr 2020 11:59:22 GMT\r\n
     If-None-Match: W/"c5b-17159a8b990"\r\n
     Cache-Control: max-age=0\r\n
     \r\n
     [Full request URI: http://courses.codemax.net/modalboxes.js]
     [HTTP request 2/2]
     [Prev request in frame: 25]
```
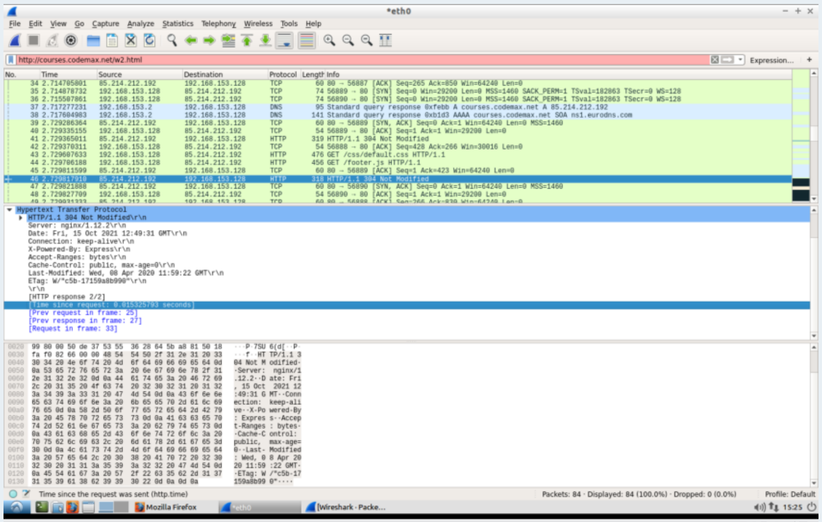

```
0050  31 0d 0a 48 6f 73 74 3a  20 63 6f 75 72 73 65 73   1··Host:  courses
0060  2e 63 6f 64 65 6d 61 78  2e 6e 65 74 0d 0a 55 73   .codemax .net··Us
0070  65 72 2d 41 67 65 6e 74  3a 20 4d 6f 7a 69 6c 6c   er-Agent : Mozill
0080  61 2f 35 2e 30 20 28 58  31 31 3b 20 55 62 75 6e   a/5.0 (X 11; Ubun
0090  74 75 3b 20 4c 69 6e 75  78 20 69 36 38 36 3b 20   tu; Linu x i686;
00a0  72 76 3a 36 36 2e 30 29  20 47 65 63 6b 6f 2f 32   rv:66.0)  Gecko/2
00b0  30 31 30 30 31 30 31 20  46 69 72 65 66 6f 78 2f   0100101  Firefox/
00c0  36 36 2e 30 0d 0a 41 63  63 65 70 74 3a 20 2a 2f   66.0··Ac cept: */
00d0  2a 0d 0a 41 63 63 65 70  74 2d 4c 61 6e 67 75 61   *··Accep t-Langua
00e0  67 65 3a 20 65 6e 2d 55  53 2c 65 6e 3b 71 3d 30   ge: en-U S,en;q=0
00f0  2e 35 0d 0a 41 63 63 65  70 74 2d 45 6e 63 6f 64   .5··Acce pt-Encod
0100  69 6e 67 3a 20 67 7a 69  70 2c 20 64 65 66 6c 61   ing: gzi p, defla
0110  74 65 0d 0a 52 65 66 65  72 65 72 3a 20 68 74 74   te··Refe rer: htt
0120  70 3a 2f 2f 63 6f 75 72  73 65 73 2e 63 6f 64 65   p://cour ses.code
0130  6d 61 78 2e 6e 65 74 2f  77 32 2e 68 74 6d 6c 0d   max.net/ w2.html·
0140  0a 43 6f 6e 6e 65 63 74  69 6f 6e 3a 20 6b 65 65   ·Connect ion: kee
0150  70 2d 61 6c 69 76 65 0d  0a 49 66 2d 4d 6f 64 69   p-alive· ·If-Modi
0160  66 69 65 64 2d 53 69 6e  63 65 3a 20 57 65 64 2c   fied-Sin ce: Wed,
0170  20 30 38 20 41 70 72 20  32 30 32 30 20 31 31 3a    08 Apr  2020 11:
0180  35 39 3a 32 32 20 47 4d  54 0d 0a 49 66 2d 4e 6f   59:22 GM T··If-No
0190  6e 65 2d 4d 61 74 63 68  3a 20 57 2f 22 63 35 62   ne-Match : W/"c5b
01a0  2d 31 37 31 35 39 61 38  62 39 39 30 22 0d 0a 43   -17159a8 b990"··C
01b0  61 63 68 65 2d 43 6f 6e  74 72 6f 6c 3a 20 6d 61   ache-Con trol: ma
```

Assignment Week 7

- Find the HTTP Response belonging to the HTTP Get packet.
- How much time elapsed between the HTTP Get and HTTP response?

➢ Time elapsed: 0.015325793



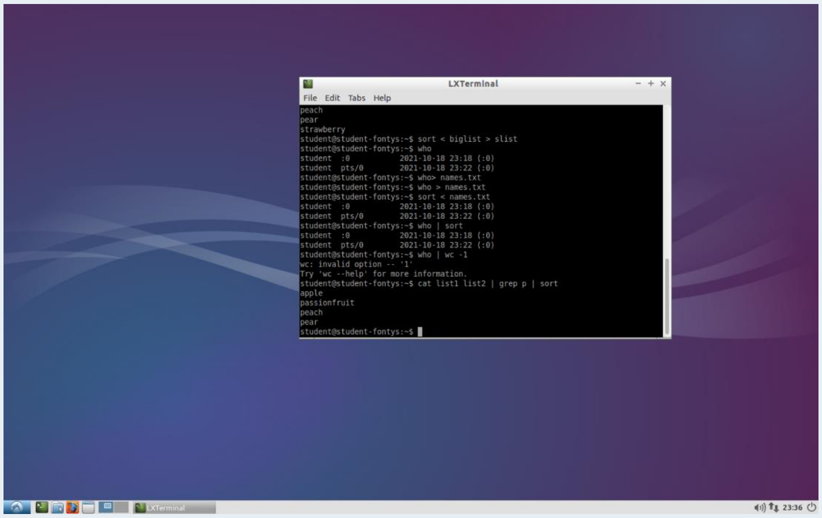
*eth0
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
http://courses.codemax.net/w2.html
Expression… +

```
No.  Time         Source           Destination      Protocol Length Info
  34 2.714705801  85.214.212.192   192.168.153.128  TCP       60 80 → 56887 [ACK] Seq=265 Ack=850 Win=64240 Len=0
  35 2.714878732  192.168.153.128  85.214.212.192   TCP       74 56889 → 80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=182863 TSecr=0 WS=128
  36 2.715507861  192.168.153.128  85.214.212.192   TCP       74 56890 → 80 [SYN] Seq=0 Win=29200 Len=0 MSS=1460 SACK_PERM=1 TSval=182863 TSecr=0 WS=128
  37 2.717277231  192.168.153.2    192.168.153.128  DNS       95 Standard query response 0xfebb A courses.codemax.net A 85.214.212.192
  38 2.717604983  192.168.153.2    192.168.153.128  DNS      141 Standard query response 0xb1d3 AAAA courses.codemax.net SOA ns1.eurodns.com
  39 2.729286364  85.214.212.192   192.168.153.128  TCP       60 80 → 56889 [SYN, ACK] Seq=0 Ack=1 Win=64240 Len=0 MSS=1460
  40 2.729335155  192.168.153.128  85.214.212.192   TCP       54 56889 → 80 [ACK] Seq=1 Ack=1 Win=29200 Len=0
  41 2.729365011  85.214.212.192   192.168.153.128  HTTP     319 HTTP/1.1 304 Not Modified
  42 2.729370311  192.168.153.128  85.214.212.192   TCP       54 56888 → 80 [ACK] Seq=428 Ack=266 Win=30016 Len=0
  43 2.729607633  192.168.153.128  85.214.212.192   HTTP     476 GET /css/default.css HTTP/1.1
  44 2.729786188  192.168.153.128  85.214.212.192   HTTP     456 GET /footer.js HTTP/1.1
  45 2.729811599  85.214.212.192   192.168.153.128  TCP       60 80 → 56889 [ACK] Seq=1 Ack=423 Win=64240 Len=0
  46 2.729817910  85.214.212.192   192.168.153.128  HTTP     318 HTTP/1.1 304 Not Modified
  47 2.729821888  85.214.212.192   192.168.153.128  TCP       60 80 → 56890 [SYN, ACK] Seq=0 Ack=1 Win=64240 Len=0 MSS=1460
  48 2.729827709  192.168.153.128  85.214.212.192   TCP       54 56890 → 80 [ACK] Seq=1 Ack=1 Win=29200 Len=0
  49 2.729931333  85.214.212.192   192.168.153.128  TCP       60 80 → 56888 [ACK] Seq=266 Ack=830 Win=64240 Len=0

▾ Hypertext Transfer Protocol
  ▸ HTTP/1.1 304 Not Modified\r\n
    Server: nginx/1.12.2\r\n
    Date: Fri, 15 Oct 2021 12:49:31 GMT\r\n
    Connection: keep-alive\r\n
    X-Powered-By: Express\r\n
    Accept-Ranges: bytes\r\n
    Cache-Control: public, max-age=0\r\n
    Last-Modified: Wed, 08 Apr 2020 11:59:22 GMT\r\n
    ETag: W/"c5b-17159a8b990"\r\n
    \r\n
    [HTTP response 2/2]
    [Time since request: 0.015325793 seconds]
    [Prev request in frame: 25]
    [Prev response in frame: 27]
    [Request in frame: 33]

0020  99 80 00 50 de 37 53 55  36 28 64 5b a8 81 50 18   ···P·7SU 6(d[··P·
0030  fa f0 82 66 00 00 48 54  54 50 2f 31 2e 31 20 33   ···f··HT TP/1.1 3
0040  30 34 20 4e 6f 74 20 4d  6f 64 69 66 69 65 64 0d   04 Not M odified·
0050  0a 53 65 72 76 65 72 3a  20 6e 67 69 6e 78 2f 31   ·Server:  nginx/1
0060  2e 31 32 2e 32 0d 0a 44  61 74 65 3a 20 46 72 69   .12.2··D ate: Fri
0070  2c 20 31 35 20 4f 63 74  20 32 30 32 31 20 31 32   , 15 Oct  2021 12
0080  3a 34 39 3a 33 31 20 47  4d 54 0d 0a 43 6f 6e 6e   :49:31 G MT··Conn
0090  65 63 74 69 6f 6e 3a 20  6b 65 65 70 2d 61 6c 69   ection:  keep-ali
00a0  76 65 0d 0a 58 2d 50 6f  77 65 72 65 64 2d 42 79   ve··X-Po wered-By
00b0  3a 20 45 78 70 72 65 73  73 0d 0a 41 63 63 65 70   : Expres s··Accep
00c0  74 2d 52 61 6e 67 65 73  3a 20 62 79 74 65 73 0d   t-Ranges : bytes·
00d0  0a 43 61 63 68 65 2d 43  6f 6e 74 72 6f 6c 3a 20   ·Cache-C ontrol: 
00e0  70 75 62 6c 69 63 2c 20  6d 61 78 2d 61 67 65 3d   public,  max-age=
00f0  30 0d 0a 4c 61 73 74 2d  4d 6f 64 69 66 69 65 64   0··Last- Modified
0100  3a 20 57 65 64 2c 20 30  38 20 41 70 72 20 32 30   : Wed, 0 8 Apr 20
0110  32 30 20 31 31 3a 35 39  3a 32 32 20 47 4d 54 0d   20 11:59 :22 GMT·
0120  0a 45 54 61 67 3a 20 57  2f 22 63 35 62 2d 31 37   ·ETag: W /"c5b-17
0130  31 35 39 61 38 62 39 39  30 22 0d 0a 0d 0a         159a8b99 0"····
```

Time since the request was sent (http.time)

Packets: 84 · Displayed: 84 (100.0%) · Dropped: 0 (0.0%)   Profile: Default

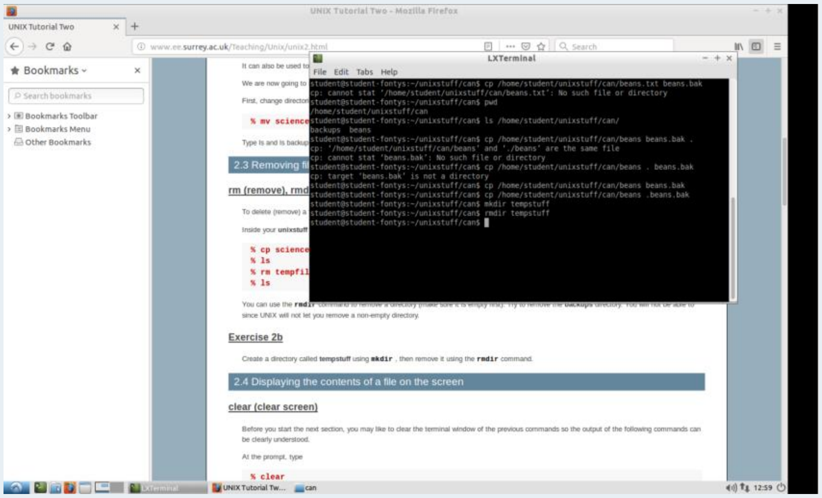
Linux tutorial 3.4:



```
peach
pear
strawberry
student@student-fontys:~$ sort < biglist > slist
student@student-fontys:~$ who
student  :0           2021-10-18 23:18 (:0)
student  pts/0        2021-10-18 23:22 (:0)
student@student-fontys:~$ who> names.txt
student@student-fontys:~$ who > names.txt
student@student-fontys:~$ sort < names.txt
student  :0           2021-10-18 23:18 (:0)
student  pts/0        2021-10-18 23:22 (:0)
student@student-fontys:~$ who | sort
student  :0           2021-10-18 23:18 (:0)
student  pts/0        2021-10-18 23:22 (:0)
student@student-fontys:~$ who | wc -1
wc: invalid option -- '1'
Try 'wc --help' for more information.
student@student-fontys:~$ cat list1 list2 | grep p | sort
apple
passionfruit
peach
pear
student@student-fontys:~$ 
```

Assignment Week 8

2a and 2b UNIX Tutorial Two



UNIX Tutorial Two - Mozilla Firefox

www.ee.surrey.ac.uk/Teaching/Unix/unix2.html

LXTerminal

```
student@student-fontys:~/unixstuff/can$ cp /home/student/unixstuff/can/beans.txt beans.bak
cp: cannot stat '/home/student/unixstuff/can/beans.txt': No such file or directory
student@student-fontys:~/unixstuff/can$ pwd
/home/student/unixstuff/can
student@student-fontys:~/unixstuff/can$ ls /home/student/unixstuff/can/
backups  beans
student@student-fontys:~/unixstuff/can$ cp /home/student/unixstuff/can/beans beans.bak .
cp: '/home/student/unixstuff/can/beans' and './beans' are the same file
cp: cannot stat 'beans.bak': No such file or directory
student@student-fontys:~/unixstuff/can$ cp /home/student/unixstuff/can/beans . beans.bak
cp: target 'beans.bak' is not a directory
student@student-fontys:~/unixstuff/can$ cp /home/student/unixstuff/can/beans beans.bak
student@student-fontys:~/unixstuff/can$ cp /home/student/unixstuff/can/beans .beans.bak
student@student-fontys:~/unixstuff/can$ mkdir tempstuff
student@student-fontys:~/unixstuff/can$ rmdir tempstuff
student@student-fontys:~/unixstuff/can$ 
```

since UNIX will not let you remove a non-empty directory.

Exercise 2b

Create a directory called **tempstuff** using **mkdir** , then remove it using the **rmdir** command.

2.4 Displaying the contents of a file on the screen

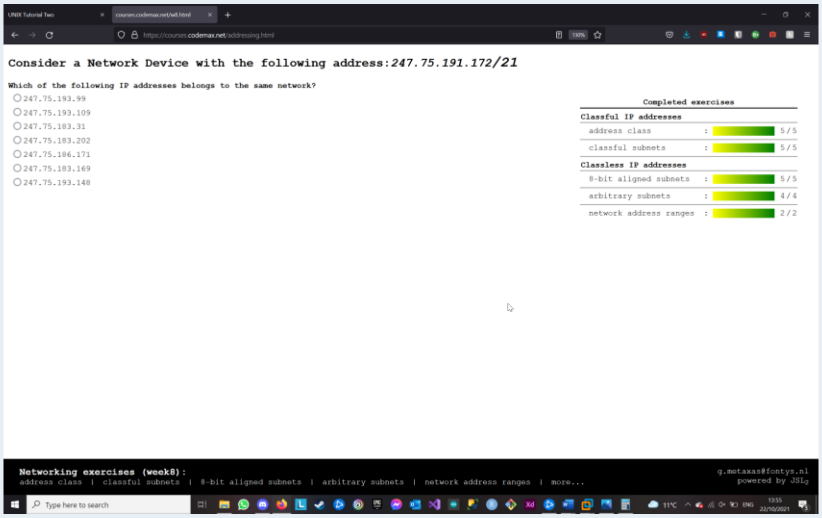
clear (clear screen)

Before you start the next section, you may like to clear the terminal window of the previous commands so the output of the following commands can be clearly understood.

At the prompt, type

```
% clear
```

Codemax Week 8



https://courses.codemax.net/addressing.html

Consider a Network Device with the following address: *247.75.191.172/21*

Which of the following IP addresses belongs to the same network?

○ 247.75.193.99
○ 247.75.193.109
○ 247.75.183.31
○ 247.75.183.202
○ 247.75.186.171
○ 247.75.183.169
○ 247.75.193.148

Completed exercises

Classful IP addresses		
address class	:	5 / 5
classful subnets	:	5 / 5
Classless IP addresses		
8-bit aligned subnets	:	5 / 5
arbitrary subnets	:	4 / 4
network address ranges	:	2 / 2

Networking exercises (week8):
address class | classful subnets | 8-bit aligned subnets | arbitrary subnets | network address ranges | more...

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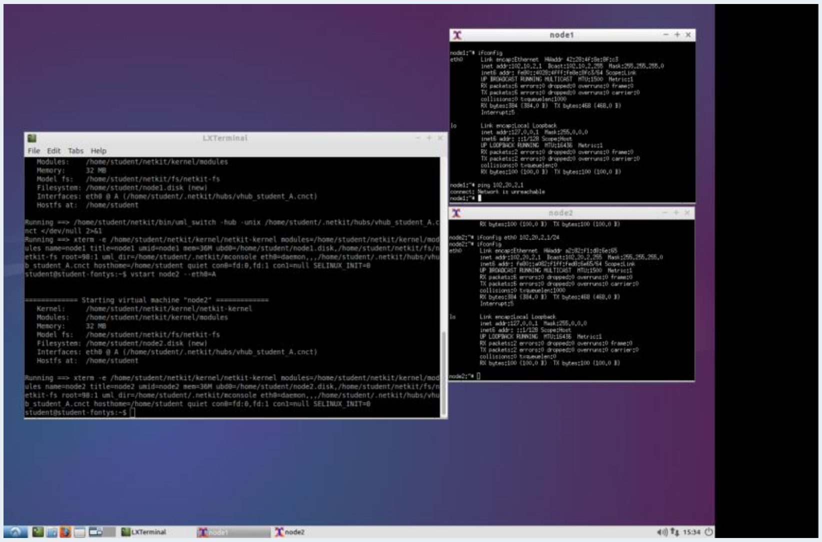
Assignment Week 8

- Task 2: Build A Simple Netkit Network

1. What is the result of the ping? Can you explain it? Provide a screenshot.

➢ The Ping command results in an error because both networks are class C (first 3 bytes determine the network), but the addresses are different (10 and 20) and can’t reach each other without a direct link.



```
   Modules:    /home/student/netkit/kernel/modules
   Memory:     32 MB
   Model fs:   /home/student/netkit/fs/netkit-fs
   Filesystem: /home/student/node1.disk (new)
   Interfaces: eth0 @ A (/home/student/.netkit/hubs/vhub_student_A.cnct)
   Hostfs at:  /home/student

Running ==> /home/student/netkit/bin/uml_switch -hub -unix /home/student/.netkit/hubs/vhub_student_A.c
nct </dev/null 2>&1
Running ==> xterm -e /home/student/netkit/kernel/netkit-kernel modules=/home/student/netkit/kernel/mod
ules name=node1 title=node1 umid=node1 mem=36M ubd0=/home/student/node1.disk,/home/student/netkit/fs/n
etkit-fs root=98:1 uml_dir=/home/student/.netkit/mconsole eth0=daemon,,,/home/student/.netkit/hubs/vhu
b_student_A.cnct hosthome=/home/student quiet con0=fd:0,fd:1 con1=null SELINUX_INIT=0
student@student-fontys:~$ vstart node2 --eth0=A


============== Starting virtual machine "node2" ==============
   Kernel:     /home/student/netkit/kernel/netkit-kernel
   Modules:    /home/student/netkit/kernel/modules
   Memory:     32 MB
   Model fs:   /home/student/netkit/fs/netkit-fs
   Filesystem: /home/student/node2.disk (new)
   Interfaces: eth0 @ A (/home/student/.netkit/hubs/vhub_student_A.cnct)
   Hostfs at:  /home/student

Running ==> xterm -e /home/student/netkit/kernel/netkit-kernel modules=/home/student/netkit/kernel/mod
ules name=node2 title=node2 umid=node2 mem=36M ubd0=/home/student/node2.disk,/home/student/netkit/fs/n
etkit-fs root=98:1 uml_dir=/home/student/.netkit/mconsole eth0=daemon,,,/home/student/.netkit/hubs/vhu
b_student_A.cnct hosthome=/home/student quiet con0=fd:0,fd:1 con1=null SELINUX_INIT=0
student@student-fontys:~$
```

```
node1:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 42:28:4f:8e:8f:c3
          inet addr:102.10.2.1  Bcast:102.10.2.255  Mask:255.255.255.0
          inet6 addr: fe80::4028:4fff:fe8e:8fc3/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6 errors:0 dropped:0 overruns:0 frame:0
          TX packets:6 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:384 (384.0 B)  TX bytes:468 (468.0 B)
          Interrupt:5

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:100 (100.0 B)  TX bytes:100 (100.0 B)

node1:~# ping 102.20.2.1
connect: Network is unreachable
node1:~#
```

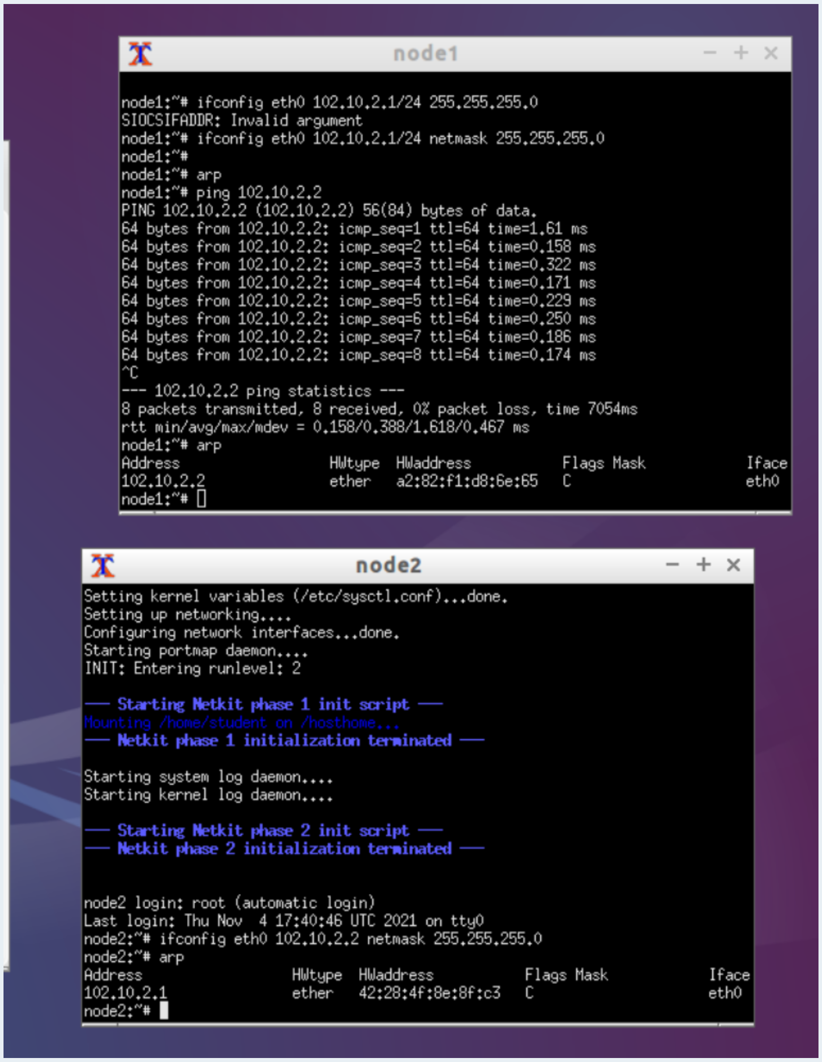
```
          RX bytes:100 (100.0 B)  TX bytes:100 (100.0 B)

node2:~# ifconfig eth0 102.20.2.1/24
node2:~# ifconfig
eth0      Link encap:Ethernet  HWaddr a2:82:f1:d8:6e:65
          inet addr:102.20.2.1  Bcast:102.20.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a082:f1ff:fed8:6e65/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:6 errors:0 dropped:0 overruns:0 frame:0
          TX packets:6 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:384 (384.0 B)  TX bytes:468 (468.0 B)
          Interrupt:5

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:16436  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:100 (100.0 B)  TX bytes:100 (100.0 B)

node2:~#
```

2. Look at the ARP entries of your Node1 and Node2. Which ARP entries are there?

➢ ARP command shows the connections of node1 and node2 now.

C)

1. Provide a screenshot of your configuration and successful ping.



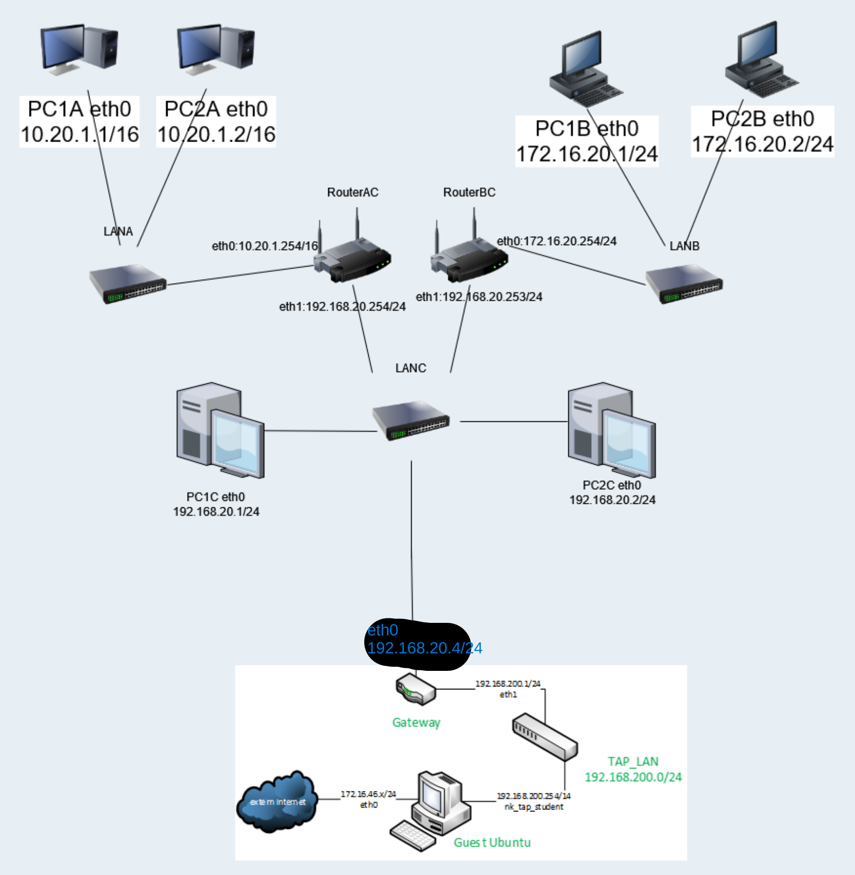
```
node1:~# ifconfig eth0 102.10.2.1/24 255.255.255.0
SIOCSIFADDR: Invalid argument
node1:~# ifconfig eth0 102.10.2.1/24 netmask 255.255.255.0
node1:~#
node1:~# arp
node1:~# ping 102.10.2.2
PING 102.10.2.2 (102.10.2.2) 56(84) bytes of data.
64 bytes from 102.10.2.2: icmp_seq=1 ttl=64 time=1.61 ms
64 bytes from 102.10.2.2: icmp_seq=2 ttl=64 time=0.158 ms
64 bytes from 102.10.2.2: icmp_seq=3 ttl=64 time=0.322 ms
64 bytes from 102.10.2.2: icmp_seq=4 ttl=64 time=0.171 ms
64 bytes from 102.10.2.2: icmp_seq=5 ttl=64 time=0.229 ms
64 bytes from 102.10.2.2: icmp_seq=6 ttl=64 time=0.250 ms
64 bytes from 102.10.2.2: icmp_seq=7 ttl=64 time=0.186 ms
64 bytes from 102.10.2.2: icmp_seq=8 ttl=64 time=0.174 ms
^C
--- 102.10.2.2 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7054ms
rtt min/avg/max/mdev = 0.158/0.388/1.618/0.467 ms
node1:~# arp
Address                  HWtype  HWaddress           Flags Mask            Iface
102.10.2.2               ether   a2:82:f1:d8:6e:65   C                     eth0
node1:~# 
```

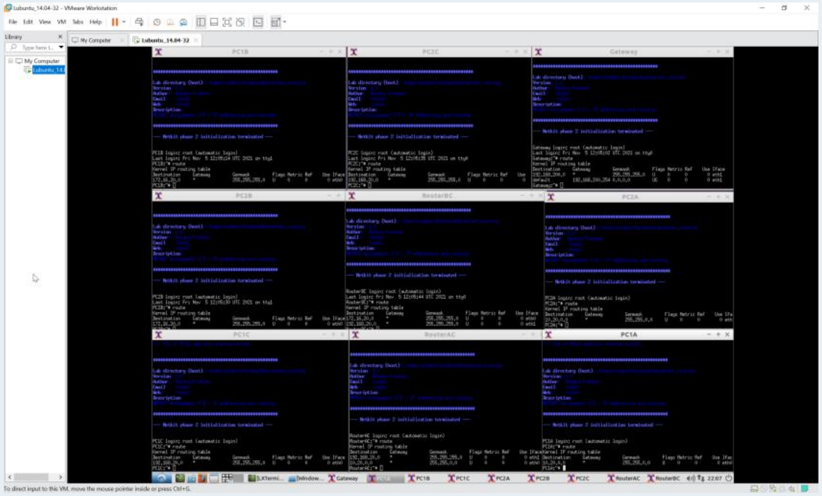
```
Setting kernel variables (/etc/sysctl.conf)...done.
Setting up networking....
Configuring network interfaces...done.
Starting portmap daemon....
INIT: Entering runlevel: 2

--- Starting Netkit phase 1 init script ---
Mounting /home/student on /hosthome...
--- Netkit phase 1 initialization terminated ---

Starting system log daemon....
Starting kernel log daemon....

--- Starting Netkit phase 2 init script ---
--- Netkit phase 2 initialization terminated ---


node2 login: root (automatic login)
Last login: Thu Nov  4 17:40:46 UTC 2021 on tty0
node2:~# ifconfig eth0 102.10.2.2 netmask 255.255.255.0
node2:~# arp
Address                  HWtype  HWaddress           Flags Mask            Iface
102.10.2.1               ether   42:28:4f:8e:8f:c3   C                     eth0
node2:~# 
```

2. After successful ping ARP entries of both nodes should be changed. Provide a screenshot of the new ARP situation and explain it. What is the command to clear the ARP cache again?

- The only difference is that there is a new IP address stored in ARP Cache. Command to clear is arp -d <ipadress>.

Task 3: Configuring Network




Lubuntu_14.04-32 - VMware Workstation
File Edit View VM Tabs Help
Library
My Computer
Lubuntu_14.04-32
To direct input to this VM, move the mouse pointer inside or press Ctrl+G.
LXTermi...
[Window...
Gateway
PC1B
PC1C
PC2A
PC2B
PC2C
RouterAC
RouterBC
22:07

PC1B

```
PC1B login: root (automatic login)
Last login: Fri Nov  5 12:05:14 UTC 2021 on tty1
PC1B:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     *               255.255.255.0   U     0      0        0 eth0
PC1B:~# 
```

PC2C

```
PC2C login: root (automatic login)
Last login: Fri Nov  5 12:05:35 UTC 2021 on tty0
PC2C:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use
192.168.20.0    *               255.255.255.0   U     0      0        0
PC2C:~# 
```

Gateway

```
Gateway login: root (automatic login)
Last login: Fri Nov  5 12:05:02 UTC 2021 on tty0
Gateway:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.200.0   *               255.255.255.0   U     0      0        0 eth1
default         192.168.200.254 0.0.0.0         UG    0      0        0 eth1
Gateway:~# 
```

PC2B

```
PC2B login: root (automatic login)
Last login: Fri Nov  5 12:05:30 UTC 2021 on tty1
PC2B:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     *               255.255.255.0   U     0      0        0 eth0
```

RouterBC

```
RouterBC login: root (automatic login)
Last login: Fri Nov  5 12:05:44 UTC 2021 on tty0
RouterBC:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     *               255.255.255.0   U     0      0        0 eth0
192.168.20.0    *               255.255.255.0   U     0      0        0 eth1
```

PC2A

```
PC2A login: root (automatic login)
PC2A:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Ifa
10.20.0.0       *               255.255.0.0     U     0      0        0 eth
PC2A:~# 
```

PC1C

```
PC1C login: root (automatic login)
PC1C:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.20.0    *               255.255.255.0   U     0      0        0 eth0
PC1C:~# 
```

RouterAC

```
RouterAC login: root (automatic login)
RouterAC:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.20.0    *               255.255.255.0   U     0      0        0 eth1
10.20.0.0       *               255.255.0.0     U     0      0        0 eth0
RouterAC:~# 
```

PC1A

```
PC1A login: root (automatic login)
PC1A:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.20.0.0       *               255.255.0.0     U     0      0        0 eth0
PC1A:~# 
```

- ➢ Every node can ping any device that is on the same network route (network IP).

E.g.: PC1A can ping PC2A and RouterAC but it can’t ping PC1B without a route.

Assignment Week 8

Task 4: CIDR IP Addressing Exercises

1. Suppose we have IP address 122.33.196.145/24

- Network Address 122.33.196.0
- Broadcast Address 122.33.196.255
- Subnet Mask 255.255.255.0

2. Suppose we have IP address 163.249.223.229/25

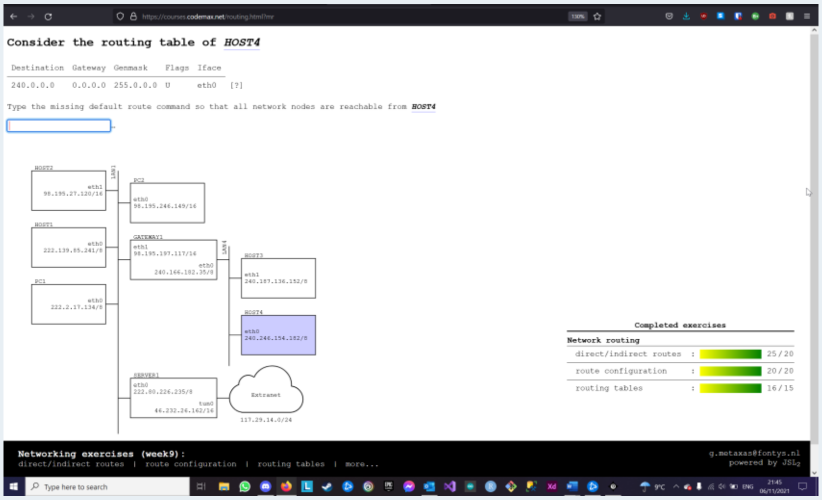
- Network Address 163.249.223.128
- First Host 163.249.223.129
- Last Host 163.249.223.254
- Broadcast Address 163.249.223.255

Assignment Week 9

IP Routing

Task 1A: Online exercises

- Complete all the online exercises in the following URL and provide a screenshot as evidence: https://courses.codemax.net/w9.html



https://courses.codemax.net/routing.html?mr

Consider the routing table of *HOST4*

Destination	Gateway	Genmask	Flags	Iface	
240.0.0.0	0.0.0.0	255.0.0.0	U	eth0	[?]

Type the missing default route command so that all network nodes are reachable from ***HOST4***

Completed exercises

Network routing

direct/indirect routes	:	25 / 20
route configuration	:	20 / 20
routing tables	:	16 / 15

Networking exercises (week9):
direct/indirect routes | route configuration | routing tables | more...

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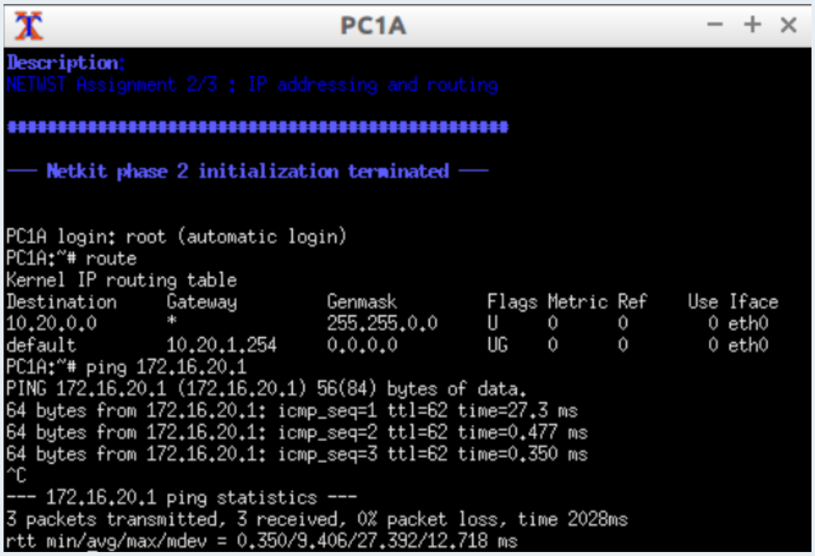
Task 1B: A bit more complex network: Part 2

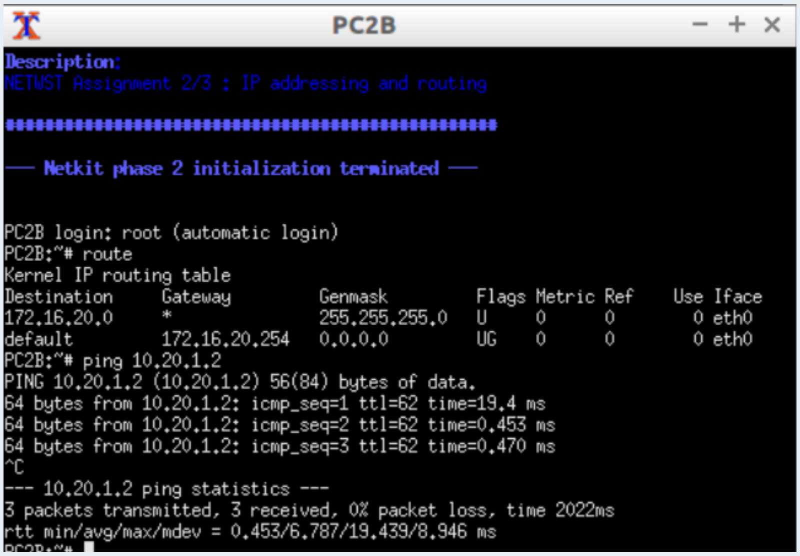
- Provide screenshots of the following pings:

1. PC1A to PC1B



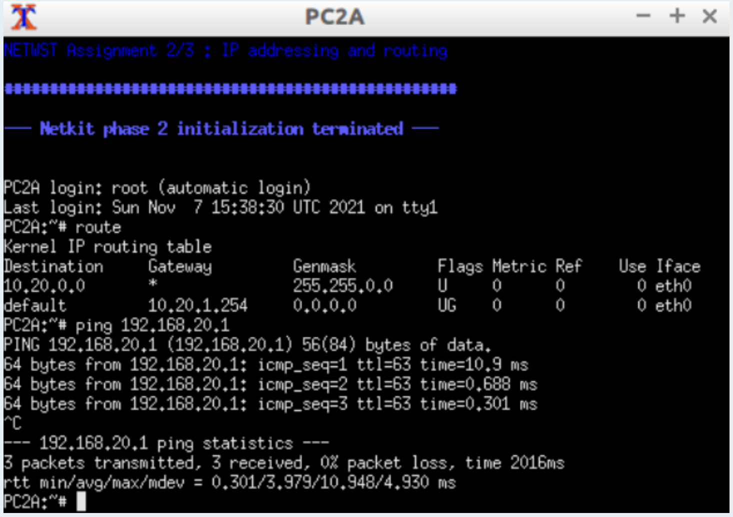
```
Description:
NETWST Assignment 2/3 : IP addressing and routing

##################################################

--- Netkit phase 2 initialization terminated ---

PC1A login: root (automatic login)
PC1A:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.20.0.0       *               255.255.0.0     U     0      0        0 eth0
default         10.20.1.254     0.0.0.0         UG    0      0        0 eth0
PC1A:~# ping 172.16.20.1
PING 172.16.20.1 (172.16.20.1) 56(84) bytes of data.
64 bytes from 172.16.20.1: icmp_seq=1 ttl=62 time=27.3 ms
64 bytes from 172.16.20.1: icmp_seq=2 ttl=62 time=0.477 ms
64 bytes from 172.16.20.1: icmp_seq=3 ttl=62 time=0.350 ms
^C
--- 172.16.20.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2028ms
rtt min/avg/max/mdev = 0.350/9.406/27.392/12.718 ms
```

2. PC2B to PC2A



```
Description:
NETWST Assignment 2/3 : IP addressing and routing

################################################

--- Netkit phase 2 initialization terminated ---


PC2B login: root (automatic login)
PC2B:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     *               255.255.255.0   U     0      0        0 eth0
default         172.16.20.254   0.0.0.0         UG    0      0        0 eth0
PC2B:~# ping 10.20.1.2
PING 10.20.1.2 (10.20.1.2) 56(84) bytes of data.
64 bytes from 10.20.1.2: icmp_seq=1 ttl=62 time=19.4 ms
64 bytes from 10.20.1.2: icmp_seq=2 ttl=62 time=0.453 ms
64 bytes from 10.20.1.2: icmp_seq=3 ttl=62 time=0.470 ms
^C
--- 10.20.1.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2022ms
rtt min/avg/max/mdev = 0.453/6.787/19.439/8.946 ms
PC2B:~#
```

3. PC2A to PC1C

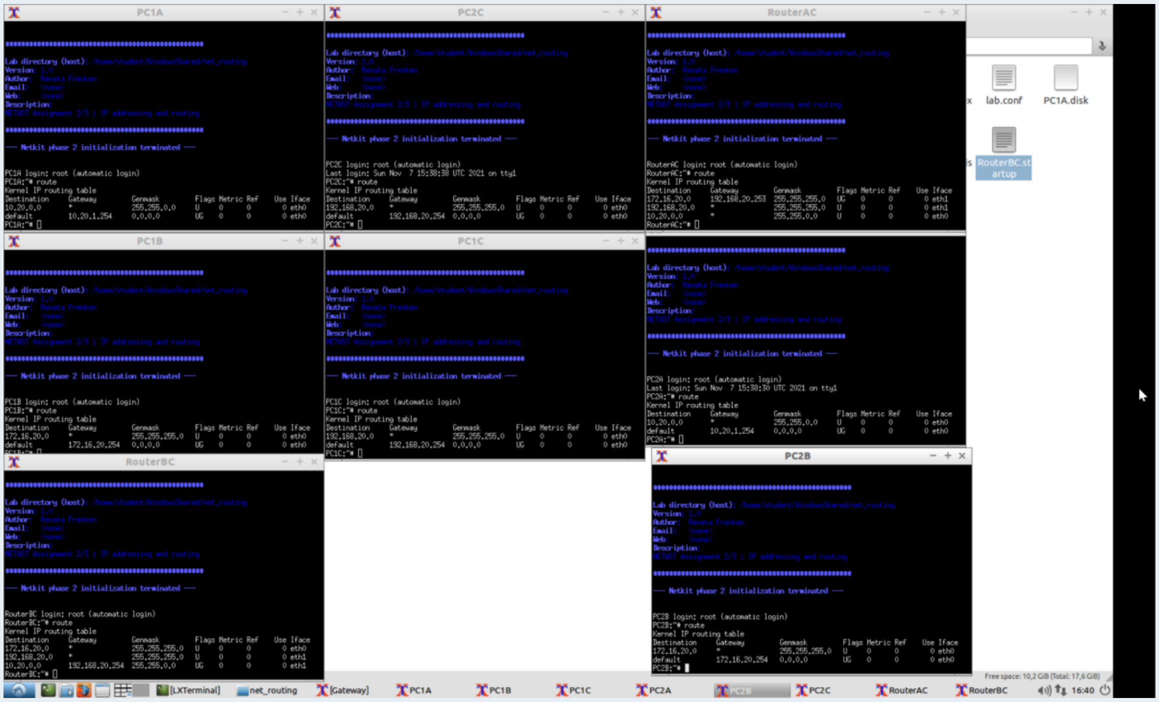


```
NETWST Assignment 2/3 : IP addressing and routing

################################################

--- Netkit phase 2 initialization terminated ---


PC2A login: root (automatic login)
Last login: Sun Nov  7 15:38:30 UTC 2021 on tty1
PC2A:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.20.0.0       *               255.255.0.0     U     0      0        0 eth0
default         10.20.1.254     0.0.0.0         UG    0      0        0 eth0
PC2A:~# ping 192.168.20.1
PING 192.168.20.1 (192.168.20.1) 56(84) bytes of data.
64 bytes from 192.168.20.1: icmp_seq=1 ttl=63 time=10.9 ms
64 bytes from 192.168.20.1: icmp_seq=2 ttl=63 time=0.688 ms
64 bytes from 192.168.20.1: icmp_seq=3 ttl=63 time=0.301 ms
^C
--- 192.168.20.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2016ms
rtt min/avg/max/mdev = 0.301/3.979/10.948/4.930 ms
PC2A:~#
```

Assignment Week 9

- **Give a list of all nodes where you had to adjust the routing tables and the screenshots of their configured routing tables.**

➢ Every node was adjusted (except the gateway). We gave each pc the router in their network as a default gateway. Router AC was also given a network route with the B nodes and vice versa (routerBC to PC1/2A with the router AC as a gateway).



```
Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

PC1A login: root (automatic login)
PC1A:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.20.0.0       *               255.255.0.0     U     0      0        0 eth0
default         10.20.1.254     0.0.0.0         UG    0      0        0 eth0
PC1A:~# 
```

```
Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

PC2C login: root (automatic login)
Last login: Sun Nov  7 15:38:38 UTC 2021 on tty1
PC2C:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.20.0    *               255.255.255.0   U     0      0        0 eth0
default         192.168.20.254  0.0.0.0         UG    0      0        0 eth0
PC2C:~# 
```

```
Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

RouterAC login: root (automatic login)
RouterAC:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     192.168.20.253  255.255.255.0   UG    0      0        0 eth1
192.168.20.0    *               255.255.255.0   U     0      0        0 eth1
10.20.0.0       *               255.255.0.0     U     0      0        0 eth0
RouterAC:~# 
```

```
************************************************************

Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

PC1B login: root (automatic login)
PC1B:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     *               255.255.255.0   U     0      0        0 eth0
default         172.16.20.254   0.0.0.0         UG    0      0        0 eth0
PC1B:~# 
```

```
************************************************************

Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

PC1C login: root (automatic login)
PC1C:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
192.168.20.0    *               255.255.255.0   U     0      0        0 eth0
default         192.168.20.254  0.0.0.0         UG    0      0        0 eth0
PC1C:~# 
```

```
************************************************************

Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

PC2A login: root (automatic login)
Last login: Sun Nov  7 15:38:30 UTC 2021 on tty1
PC2A:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.20.0.0       *               255.255.0.0     U     0      0        0 eth0
default         10.20.1.254     0.0.0.0         UG    0      0        0 eth0
PC2A:~# 
```

```
************************************************************

Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

RouterBC login: root (automatic login)
RouterBC:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     *               255.255.255.0   U     0      0        0 eth0
192.168.20.0    *               255.255.255.0   U     0      0        0 eth1
10.20.0.0       192.168.20.254  255.255.0.0     UG    0      0        0 eth1
RouterBC:~# 
```

```
************************************************************

Lab directory (host): /home/student/WindowsShared/net_routing
Version: 1.0
Author:  Renata Frenken
Email:   <none>
Web:     <none>
Description:
NETWST Assignment 2/3 : IP addressing and routing

************************************************************

--- Netkit phase 2 initialization terminated ---

PC2B login: root (automatic login)
PC2B:~# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
172.16.20.0     *               255.255.255.0   U     0      0        0 eth0
default         172.16.20.254   0.0.0.0         UG    0      0        0 eth0
PC2B:~# 
```

Task 2 (Optional): Access the outside world

- Configure your network in such a way that you can reach a node on Internet.
- To prove your correct configuration, you should be able to ping a host like 8.8.8.8 (Google DNS server) from any node on your network.
- Provide screenshots of the following ping:

➢ PC1A to 8.8.8.8:

Failed to finish it and explanation is in the personal refraction.

➢ PC1B to 8.8.8.8:

Assignment Week 10

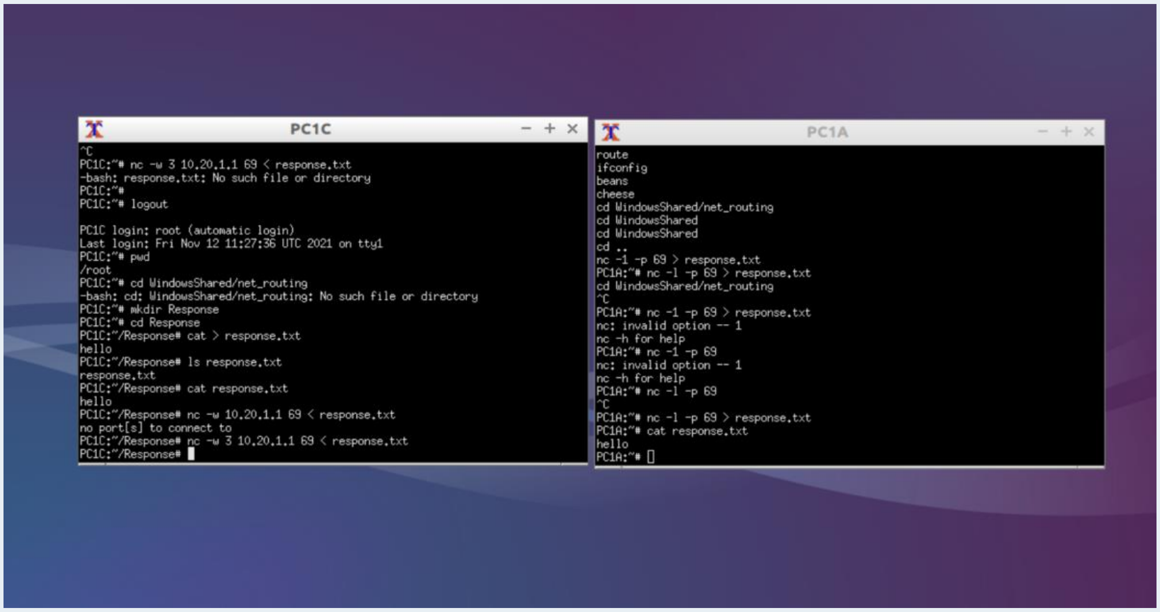
Task 1: TCP in Netcat

- To listen to the TCP connections, go to one of your simulated nodes (e.g.PC1A) and issue the following command: nc –l –p <port_nr>This will make netcat listen to port number that you have specified in port_nr and accept connections.

Note: Any port number would be ok, as long as it is not used by another application.

- To establish a TCP connection, you can issue the following command from another simulated node (e.g. PC1C)
- nc <IP address of the “listening” node> <port_nr of the “listening node”>This will make a TCP connection with the listening netcat instance.Now you can chat from one netcat instance to the another. Try it out!Your task:
- Netcat can also be used to copy the contents of a file from one place (file, folder, computer) to another. Find out how and try it out.Provide screenshots of the sending and receiving command
- Provide screenshots of the sending and receiving command:

- Provide screenshots of the sending and receiving command:



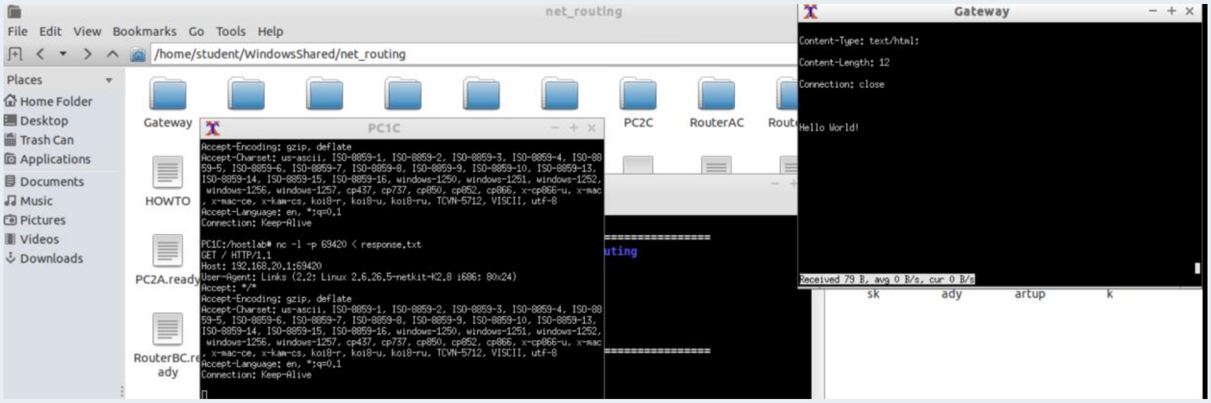
PC1C

```
^C
PC1C:~# nc -w 3 10.20.1.1 69 < response.txt
-bash: response.txt: No such file or directory
PC1C:~#
PC1C:~# logout

PC1C login: root (automatic login)
Last login: Fri Nov 12 11:27:36 UTC 2021 on tty1
PC1C:~# pwd
/root
PC1C:~# cd WindowsShared/net_routing
-bash: cd: WindowsShared/net_routing: No such file or directory
PC1C:~# mkdir Response
PC1C:~# cd Response
PC1C:~/Response# cat > response.txt
hello
PC1C:~/Response# ls response.txt
response.txt
PC1C:~/Response# cat response.txt
hello
PC1C:~/Response# nc -w 10.20.1.1 69 < response.txt
no port[s] to connect to
PC1C:~/Response# nc -w 3 10.20.1.1 69 < response.txt
PC1C:~/Response# █
```

PC1A

```
route
ifconfig
beans
cheese
cd WindowsShared/net_routing
cd WindowsShared
cd WindowsShared
cd ..
nc -1 -p 69 > response.txt
PC1A:~# nc -l -p 69 > response.txt
cd WindowsShared/net_routing
^C
PC1A:~# nc -1 -p 69 > response.txt
nc: invalid option -- 1
nc -h for help
PC1A:~# nc -1 -p 69
nc: invalid option -- 1
nc -h for help
PC1A:~# nc -l -p 69
^C
PC1A:~# nc -l -p 69 > response.txt
PC1A:~# cat response.txt
hello
PC1A:~# ▯
```

- Netcat can also be used to copy the contents of a file from one place (file, folder, computer) to another. Find out how and try it out.
- Provide screenshots of the sending and receiving command.



PC1C

```
Accept-Encoding: gzip, deflate
Accept-Charset: us-ascii, ISO-8859-1, ISO-8859-2, ISO-8859-3, ISO-8859-4, ISO-88
59-5, ISO-8859-6, ISO-8859-7, ISO-8859-8, ISO-8859-9, ISO-8859-10, ISO-8859-13,
ISO-8859-14, ISO-8859-15, ISO-8859-16, windows-1250, windows-1251, windows-1252,
 windows-1256, windows-1257, cp437, cp737, cp850, cp852, cp866, x-cp866-u, x-mac
, x-mac-ce, x-kam-cs, koi8-r, koi8-u, koi8-ru, TCVN-5712, VISCII, utf-8
Accept-Language: en, *;q=0.1
Connection: Keep-Alive

PC1C:/hostlab# nc -l -p 69420 < response.txt
GET / HTTP/1.1
Host: 192.168.20.1:69420
User-Agent: Links (2.2; Linux 2.6.26.5-netkit-K2.8 i686; 80x24)
Accept: */*
Accept-Encoding: gzip, deflate
Accept-Charset: us-ascii, ISO-8859-1, ISO-8859-2, ISO-8859-3, ISO-8859-4, ISO-88
59-5, ISO-8859-6, ISO-8859-7, ISO-8859-8, ISO-8859-9, ISO-8859-10, ISO-8859-13,
ISO-8859-14, ISO-8859-15, ISO-8859-16, windows-1250, windows-1251, windows-1252,
 windows-1256, windows-1257, cp437, cp737, cp850, cp852, cp866, x-cp866-u, x-mac
, x-mac-ce, x-kam-cs, koi8-r, koi8-u, koi8-ru, TCVN-5712, VISCII, utf-8
Accept-Language: en, *;q=0.1
Connection: Keep-Alive

▯
```

Gateway

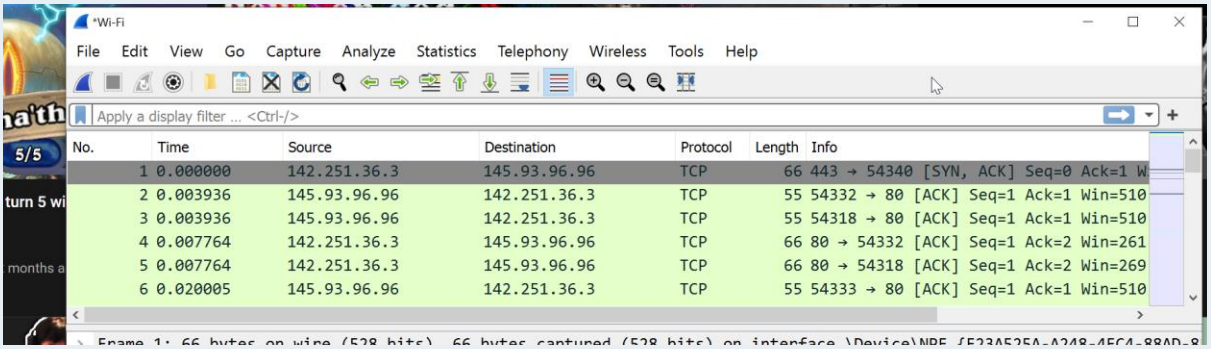
```
Content-Type: text/html;

Content-Length: 12

Connection: close


Hello World!







Received 79 B, avg 0 B/s, cur 0 B/s
```

Assignment Week 10

Task 2 TCP

- TCP is slower than UDP, but it ensures that no packages are lost, it does this by creating a handshake between the source and the receiver, both updating each other constantly of the packages sent and received.

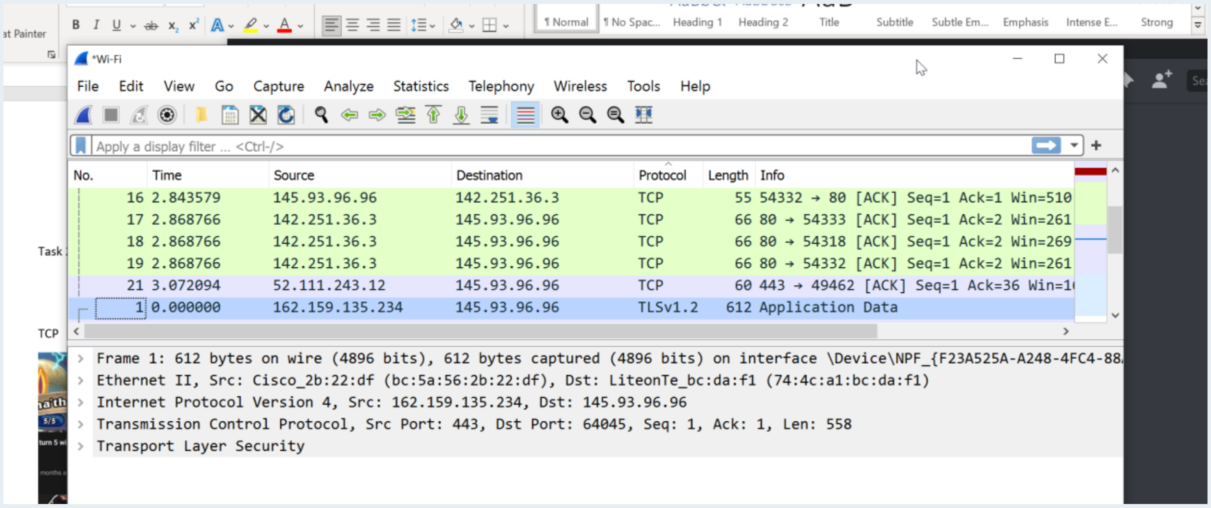
➢ 1st ss represents sniffing of a website.


*Wi-Fi
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help
Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	142.251.36.3	145.93.96.96	TCP	66	443 → 54340 [SYN, ACK] Seq=0 Ack=1 W
2	0.003936	145.93.96.96	142.251.36.3	TCP	55	54332 → 80 [ACK] Seq=1 Ack=1 Win=510
3	0.003936	145.93.96.96	142.251.36.3	TCP	55	54318 → 80 [ACK] Seq=1 Ack=1 Win=510
4	0.007764	142.251.36.3	145.93.96.96	TCP	66	80 → 54332 [ACK] Seq=1 Ack=2 Win=261
5	0.007764	142.251.36.3	145.93.96.96	TCP	66	80 → 54318 [ACK] Seq=1 Ack=2 Win=269
6	0.020005	145.93.96.96	142.251.36.3	TCP	55	54333 → 80 [ACK] Seq=1 Ack=1 Win=510

```
> Frame 1: 66 bytes on wire (528 bits), 66 bytes captured (528 bits) on interface \Device\NPF_{F23A525A-A248-4FC4-88AD-8
```

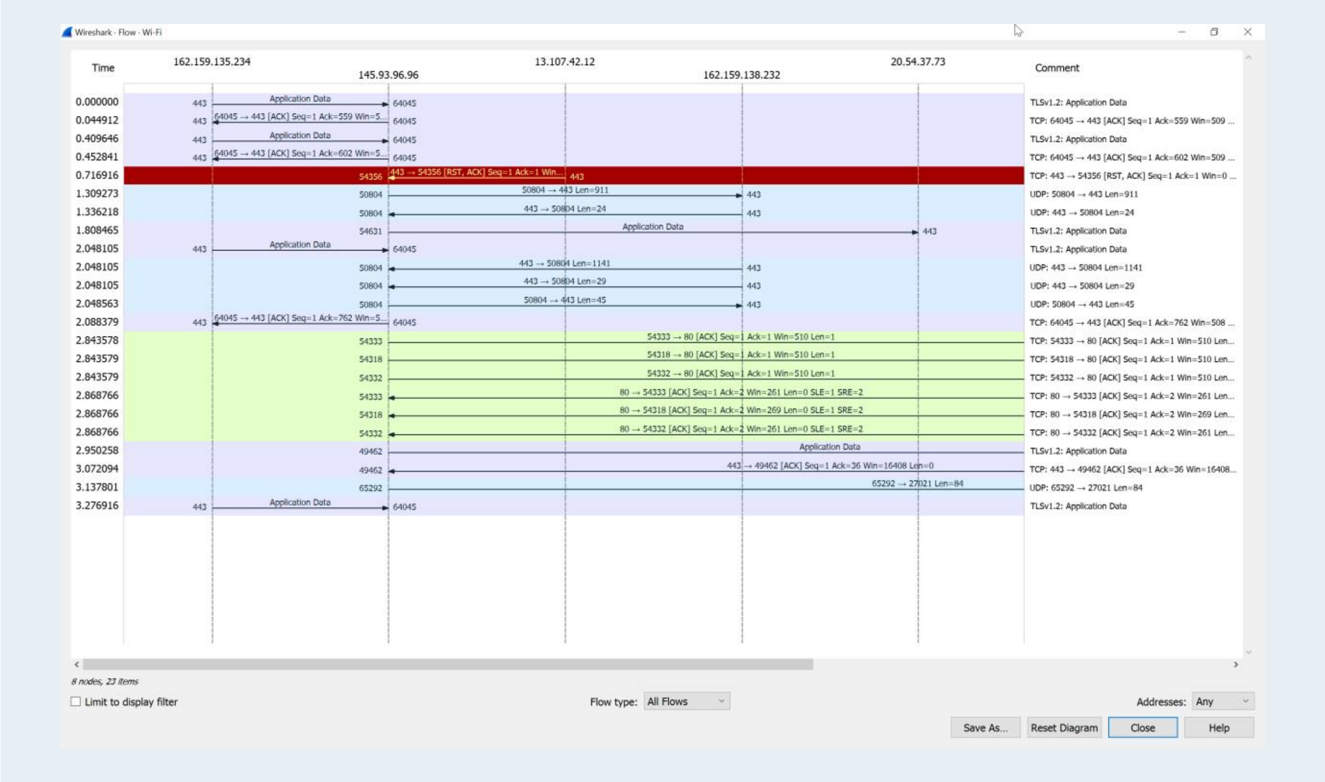
➢ 2nd represents sending a message through Discord.



No.	Time	Source	Destination	Protocol	Length	Info
16	2.843579	145.93.96.96	142.251.36.3	TCP	55	54332 → 80 [ACK] Seq=1 Ack=1 Win=510
17	2.868766	142.251.36.3	145.93.96.96	TCP	66	80 → 54333 [ACK] Seq=1 Ack=2 Win=261
18	2.868766	142.251.36.3	145.93.96.96	TCP	66	80 → 54318 [ACK] Seq=1 Ack=2 Win=269
19	2.868766	142.251.36.3	145.93.96.96	TCP	66	80 → 54332 [ACK] Seq=1 Ack=2 Win=261
21	3.072094	52.111.243.12	145.93.96.96	TCP	60	443 → 49462 [ACK] Seq=1 Ack=36 Win=1(
1	0.000000	162.159.135.234	145.93.96.96	TLSv1.2	612	Application Data

```
> Frame 1: 612 bytes on wire (4896 bits), 612 bytes captured (4896 bits) on interface \Device\NPF_{F23A525A-A248-4FC4-88
> Ethernet II, Src: Cisco_2b:22:df (bc:5a:56:2b:22:df), Dst: LiteonTe_bc:da:f1 (74:4c:a1:bc:da:f1)
> Internet Protocol Version 4, Src: 162.159.135.234, Dst: 145.93.96.96
> Transmission Control Protocol, Src Port: 443, Dst Port: 64045, Seq: 1, Ack: 1, Len: 558
> Transport Layer Security
```

Assignment Week 10



Time	Comment
0.000000	TLSv1.2: Application Data
0.044912	TCP: 64045 → 443 [ACK] Seq=1 Ack=559 Win=509 ...
0.409646	TLSv1.2: Application Data
0.452841	TCP: 64045 → 443 [ACK] Seq=1 Ack=602 Win=509 ...
0.716916	TCP: 443 → 54356 [RST, ACK] Seq=1 Ack=1 Win=0 ...
1.309273	UDP: 50804 → 443 Len=911
1.336218	UDP: 443 → 50804 Len=24
1.808465	TLSv1.2: Application Data
2.048105	TLSv1.2: Application Data
2.048105	UDP: 443 → 50804 Len=1141
2.048105	UDP: 443 → 50804 Len=29
2.048563	UDP: 50804 → 443 Len=45
2.088379	TCP: 64045 → 443 [ACK] Seq=1 Ack=762 Win=508 ...
2.843578	TCP: 54333 → 80 [ACK] Seq=1 Ack=1 Win=510 Len...
2.843579	TCP: 54318 → 80 [ACK] Seq=1 Ack=1 Win=510 Len...
2.843579	TCP: 54332 → 80 [ACK] Seq=1 Ack=1 Win=510 Len...
2.868766	TCP: 80 → 54333 [ACK] Seq=1 Ack=2 Win=261 Len...
2.868766	TCP: 80 → 54318 [ACK] Seq=1 Ack=2 Win=269 Len...
2.868766	TCP: 80 → 54332 [ACK] Seq=1 Ack=2 Win=261 Len...
2.950258	TLSv1.2: Application Data
3.072094	TCP: 443 → 49462 [ACK] Seq=1 Ack=36 Win=16408...
3.137801	UDP: 65292 → 27021 Len=84
3.276916	TLSv1.2: Application Data

Flowgraph of the 2nd TCP screenshot

- Explain what is happening during various stages (begin, middle, end) of the communication.
- Explain SYN, SYNACK and ACK.
- Explain the Len, Seq and Ack numbers.

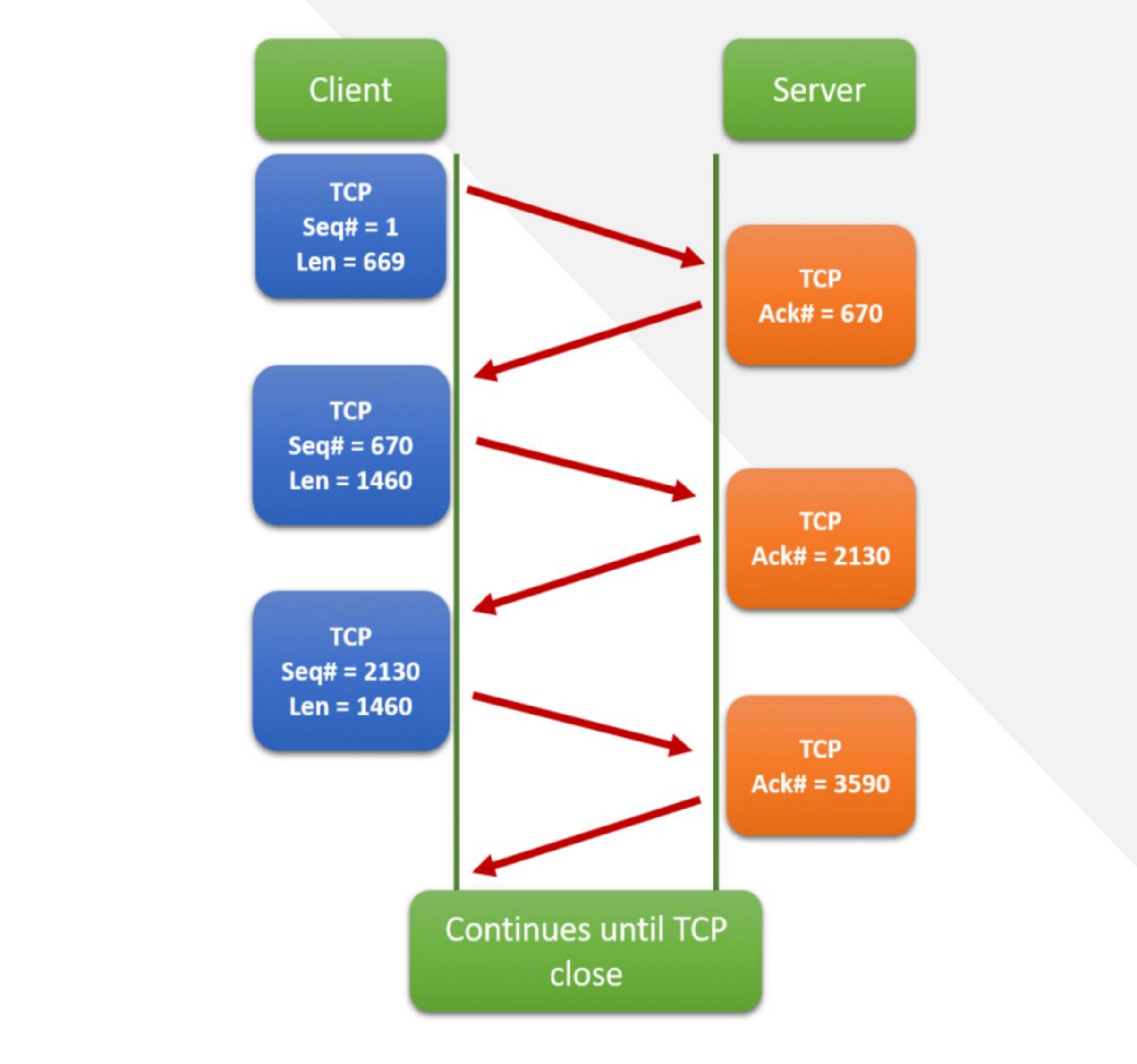
➢ Step 1 (SYN): the client wants to establish a connection with a server, so it sends a segment with SYN (Synchronize Sequence Number) which informs the server that the client is likely to start communication and with what sequence number it starts segments with.

➢ Step 2 (SYN + ACK): Server responds to the client request with SYN-ACK signal bits set. Acknowledgement (ACK) signifies the response of the segment it received and SYN signifies with what sequence number it is likely to start the segments with.

➢ Step 3 (ACK): In the final part client acknowledges the response of the server and they both establish a reliable connection with which they will start the actual data transfer.

Source: https://www.geeksforgeeks.org/tcp-3-way-handshake-process/

Assignment Week 10



- Seq#(sequence) refers to the current transfer package number.
- Len(length) is the size of the package.
- Ack#(acknowledge) confirms that data was received and adds the values of seq and Len, then sends them back.

Afterwards, the new received seq# is sent with a new length. This cycle repeats until all the packages were sent.

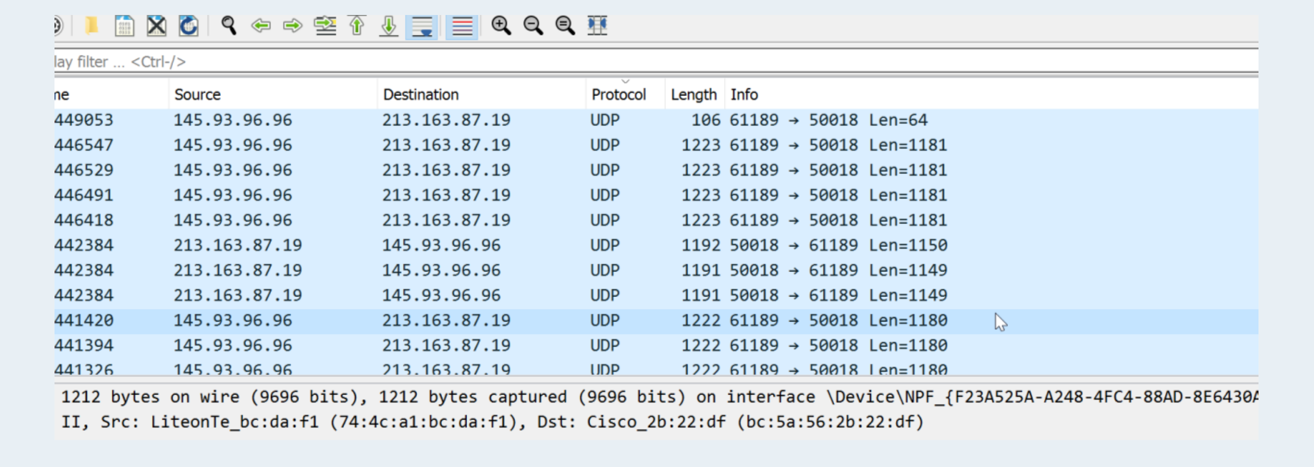
Source: https://madpackets.com/2018/04/25/tcp-sequence-and-acknowledgement-numbers-explained/

Assignment Week 10

Task 3 UDP

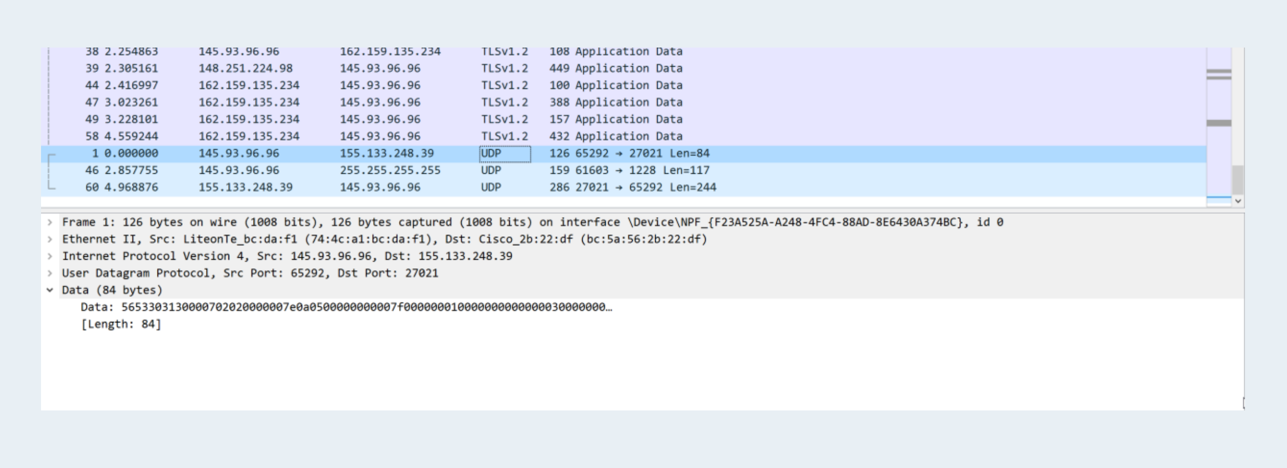
- UDP is used for fast transfer of packages, where losing some data shouldn’t matter too much.

➢ 1st screenshot is from making a video call.



```
ne      Source          Destination     Protocol  Length Info
449053  145.93.96.96    213.163.87.19   UDP        106 61189 → 50018 Len=64
446547  145.93.96.96    213.163.87.19   UDP       1223 61189 → 50018 Len=1181
446529  145.93.96.96    213.163.87.19   UDP       1223 61189 → 50018 Len=1181
446491  145.93.96.96    213.163.87.19   UDP       1223 61189 → 50018 Len=1181
446418  145.93.96.96    213.163.87.19   UDP       1223 61189 → 50018 Len=1181
442384  213.163.87.19   145.93.96.96    UDP       1192 50018 → 61189 Len=1150
442384  213.163.87.19   145.93.96.96    UDP       1191 50018 → 61189 Len=1149
442384  213.163.87.19   145.93.96.96    UDP       1191 50018 → 61189 Len=1149
441420  145.93.96.96    213.163.87.19   UDP       1222 61189 → 50018 Len=1180
441394  145.93.96.96    213.163.87.19   UDP       1222 61189 → 50018 Len=1180
441326  145.93.96.96    213.163.87.19   UDP       1222 61189 → 50018 Len=1180
1212 bytes on wire (9696 bits), 1212 bytes captured (9696 bits) on interface \Device\NPF_{F23A525A-A248-4FC4-88AD-8E6430A
II, Src: LiteonTe_bc:da:f1 (74:4c:a1:bc:da:f1), Dst: Cisco_2b:22:df (bc:5a:56:2b:22:df)
```

➢ 2nd screenshot is from playing a videogame.



```
38 2.254863   145.93.96.96      162.159.135.234   TLSv1.2   108 Application Data
39 2.305161   148.251.224.98    145.93.96.96      TLSv1.2   449 Application Data
44 2.416997   162.159.135.234   145.93.96.96      TLSv1.2   100 Application Data
47 3.023261   162.159.135.234   145.93.96.96      TLSv1.2   388 Application Data
49 3.228101   162.159.135.234   145.93.96.96      TLSv1.2   157 Application Data
58 4.559244   162.159.135.234   145.93.96.96      TLSv1.2   432 Application Data
 1 0.000000   145.93.96.96      155.133.248.39    UDP       126 65292 → 27021 Len=84
46 2.857755   145.93.96.96      255.255.255.255   UDP       159 61603 → 1228 Len=117
60 4.968876   155.133.248.39    145.93.96.96      UDP       286 27021 → 65292 Len=244

> Frame 1: 126 bytes on wire (1008 bits), 126 bytes captured (1008 bits) on interface \Device\NPF_{F23A525A-A248-4FC4-88AD-8E6430A374BC}, id 0
> Ethernet II, Src: LiteonTe_bc:da:f1 (74:4c:a1:bc:da:f1), Dst: Cisco_2b:22:df (bc:5a:56:2b:22:df)
> Internet Protocol Version 4, Src: 145.93.96.96, Dst: 155.133.248.39
> User Datagram Protocol, Src Port: 65292, Dst Port: 27021
v Data (84 bytes)
    Data: 565330313000070202000007e0a0500000000007f000000010000000000000030000000…
    [Length: 84]
```

Conclusion

We learned how to use and sniff packets through Wireshark, but also how to start network nodes in Netkit during the week 7 assignment.

We then proceeded to configure our Netkit lab in week 8. Started by creating a flowchart, including IP configuration commands in all startup files, and practicing writing IP addresses on the online exercises (CodeMax).

Then, in week 9, we set up our full Netkit lab so that devices could connect with each other.

We practised writing routing commands using online exercises and learnt about the 5 sorts of routes and when to use them.

Personal Refraction

Despite the fact that we did not complete all of the optional tasks, I will return to them because they are intriguing, particularly the DDOS (denial of service) attack activity.

I now appreciate the value of teamwork more, after Quinn (teammate) and I worked together, pushing and encouraging each other to complete the tasks.

While the online activities were not always very challenging, the information on the slides was at times perplexing. Especially because I did not have prior knowledge of configuring networks.

Because NetCat is an older application, finding commands was more difficult than expected. I had to resort to asking for help and feedback from classmates and IT experts. I did this by joining Networking Communities on Discord.

To save time, we wrote the IP configurations in the.startup files, but we experienced a lot of issues because we failed to give "Gateway" an IP address.

We struggled the first 2 weeks because there was so much new information, but after getting used to the Linux Terminal and NetKit, the following weeks became clearer.

I made the mistake of not uploading every change to Git, making loss of progress a possibility .

The exercises helped me prepare for my IEO study choice in the advanced period. Building the base for new information in this field.

Tried many solutions to get an internet connection to all networks, but failed in the end. Some of the things we tried are:

- tried adding a network route from Guest Lubuntu to the LANA and LANC network.
- added the Gateway as a default gateway from both routers.
-Furthermore, we tried adding a host route from guest to PC1A and vice versa.

The process was difficult at first, particularly Week 7 and 8, but it paid off in the end, making me more well versed in this sphere. The journey has also inspired me to try to use Linux as a daily driver.