Introduction to Web Science

Assignment 1

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The main objective of this assignment is for you to use different tools with which you can understand the network that you are connected to or you are connecting to in a better sense. These tasks are not always specific to "Introduction to Web Science". For all the assignment questions that require you to write a code, make sure to include the code in the answer sheet, along with a separate python file. Where screen shots are required, please add them in the answers directly and not as separate files.

1 Ethernet Frame (5 Points)

Ethernet Frame is of the given structure:

Preamble	Destination MAC address	Source MAC address	Type/Length	User Data	Frame Check Sequence (FCS)
8	6	6	2	46 - 1500	4

Figure 1: Ethernet Frame Structure

Given below is an Ethernet frame without the Preamble and the Frame Check Sequence.

```
00 27 10 21 fa 48 00 13     10 e8 dd 52 08 06 00 01
08 00 06 04 00 01 00 13     10 e8 dd 52 c0 a8 02 01
00 00 00 00 00 00 c0 a8     02 67
```

Find:

1. Source MAC Address
2. Destination MAC Address
3. What protocol is inside the data payload?
4. Please mention what the last 2 fields hold in the above frame.

Answer:

1. 00 13 10 e8 dd 52
2. 00 27 10 21 fa 48
3. Address Resolution Protocol (ARP)
4. Target Hardware Address (THA), Target Protocol Address (TPA)

2 Cable Issue (5 Points)

Let us consider we have two cables of 20 meters each. One of them is in a 100MBps network while the other is in a 10MBps network. If you had to transfer data through each of them, how much time it would take for the first bit to arrive in each setting? (For your calculation you can assume that the speed of light takes the same value as in the videos.) Please provide formulas and calculations along with your results.

Answer Propagation delay is equal to d / s where d is the distance and s is the wave propagation speed. (See the videos)

$$\begin{aligned} d &= 20m \\ s &= 30 * 10^8 m/s \\ t &= d/s \\ t &= 20/300000000 \\ t &= 6,66666666667 * 10^{-8} \end{aligned} \tag{1}$$

3 Basic Network Tools (10 Points)

Listed below are some of the commands which you need to ”google” to understand what they stand for:

1. *ipconfig / ifconfig*
2. *ping*
3. *traceroute*
4. *arp*
5. *dig*

Consider a situation in which you need to check if `www.wikipedia.org` is reachable or not. Using the knowledge you gained above to find the following information:

1. The *% packet loss* if at all it happened after sending 100 packets.
2. *Size* of the packet sent to *Wikipedia* server
3. *IP address* of your machine and the *Wikipedia* server
4. *Query Time* for DNS query of the above url.
5. Number of *Hops* in between your machine and the server
6. MAC address of the device that is acting as your network gateway.

Do this once in the university and once in your home/dormitory network. With your answers, you must paste the screen shots to validate your find.

Answer:

1. At the UNI: The percentage of packets lost is 4% percent.

```
Ping statistics for 91.198.174.192:
    Packets: Sent = 100, Received = 96, Lost = 4 (4% loss),
Approximate round trip times in milli-seconds:
    Minimum = 9ms, Maximum = 100ms, Average = 19ms
PS C:\Users\Daniel>
```

   At home: 2% packet loss

```
--- wikipedia.org ping statistics ---
100 packets transmitted, 98 packets received, 2.0% packet loss
round-trip min/avg/max/stddev = 34.177/40.920/101.371/8.227 ms
Igors-MacBook-Pro:~ igorfedotov$
```

2. Packet size is 32 bytes

```
Pinging wikipedia.org [91.198.174.192] with 32 bytes of data:
```

   At home, packet size stays the same

```
Pinging wikipedia.org [2620:0:862:ed1a::1] with 32 bytes of data:
```

```
Igors-MacBook-Pro:~ igorfedotov$ ping -c 100 wikip
PING wikipedia.org (91.198.174.192): 56 data bytes
```

For OSX the packet size it 56 bytes

3. Wikipedia IP is 91.198.174.192(IPv4) and 2620:0:862:ed1a::1 (IPv6). My IP is 141.26.178.33

```
Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : uni-koblenz.de
   Link-local IPv6 Address . . . . . : fe80::c9b5:2f11:69c7:fc79%4
   IPv4 Address. . . . . . . . . . . : 141.26.178.33
   Subnet Mask . . . . . . . . . . . : 255.255.240.0
   Default Gateway . . . . . . . . . : 141.26.176.1
```

At home my IP is 192.168.2.116 (local ip)

```
Wireless LAN adapter Wi-Fi:

   Connection-specific DNS Suffix  . : Speedport_W_724V_01011603_00_008
   IPv6 Address. . . . . . . . . . . : 2003:74:e04:13c3:c9b5:2f11:69c7:fc79
   Temporary IPv6 Address. . . . . . : 2003:74:e04:13c3:25c8:573:4a68:b0e7
   Link-local IPv6 Address . . . . . : fe80::c9b5:2f11:69c7:fc79%4
   IPv4 Address. . . . . . . . . . . : 192.168.2.116
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : fe80::1%4
                                       192.168.2.1
```

4. Query time is 42 milliseconds

```
C:\Users\vujke
λ dig www.wikipedia.org

; <<>> DiG 9.11.0 <<>> www.wikipedia.org
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 28778
;; flags: qr rd ra ad; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;www.wikipedia.org.             IN      A

;; ANSWER SECTION:
www.wikipedia.org.      363     IN      A       91.198.174.192

;; Query time: 42 msec
;; SERVER: 192.168.2.1#53(192.168.2.1)
;; WHEN: Tue Nov 01 18:28:06 Central Europe Standard Time 2016
;; MSG SIZE  rcvd: 62
```

5. At uni: number of hops is 11

```
Tracing route to wikipedia.org [91.198.174.192]
over a maximum of 30 hops:

  1     *       87 ms     *     wlanrouter.uni-koblenz.de [141.26.176.1]
  2     2 ms     1 ms     1 ms  g-uni-ko-1.rlp-net.net [217.198.241.129]
  3     4 ms     1 ms     1 ms  g-hbf-ko-1.rlp-net.net [217.198.240.69]
  4     2 ms     2 ms     2 ms  g-hbf-mz-2.rlp-net.net [217.198.240.21]
  5     3 ms     2 ms     2 ms  g-interxion-1.rlp-net.net [217.198.240.13]
  6     5 ms     2 ms     2 ms  r1fra3.core.init7.net [80.81.192.67]
  7    13 ms    11 ms    12 ms  r1ams1.core.init7.net [77.109.128.154]
  8    13 ms    11 ms    11 ms  r1ams2.core.init7.net [77.109.128.146]
  9    10 ms     9 ms     9 ms  gw-wikimedia.init7.net [77.109.134.114]
 10    11 ms     9 ms     9 ms  ae1-403.cr2-esams.wikimedia.org [91.198.174.254]
 11     9 ms     8 ms     9 ms  text-lb.esams.wikimedia.org [91.198.174.192]
```

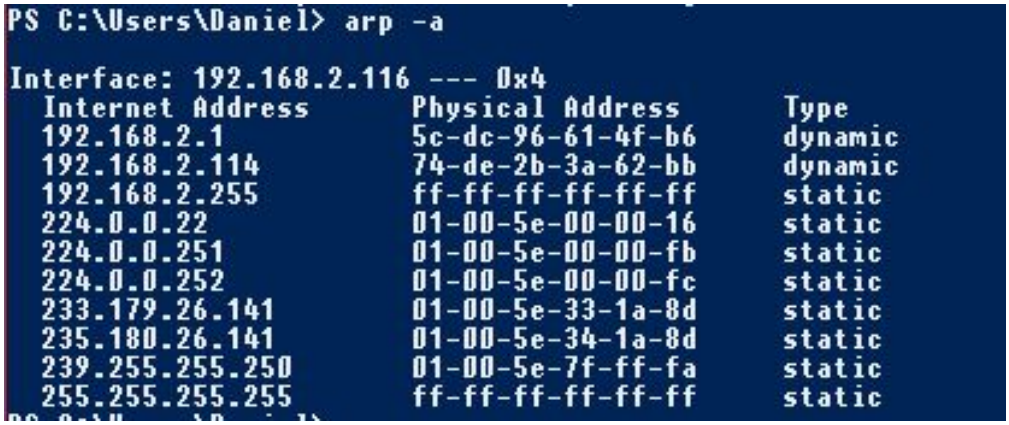
At home: 9

```
traceroute to wikipedia.org (91.198.174.192), 64 hops max, 72 byte packets
 1  * * *
 2  * * *
 3  83-169-176-38-isp.superkabel.de (83.169.176.38)  15.774 ms  29.853 ms  12.09
0 ms
 4  ip5886c1ca.dynamic.kabel-deutschland.de (88.134.193.202)  20.538 ms  17.805
ms  19.723 ms
 5  ip5886eb58.dynamic.kabel-deutschland.de (88.134.235.88)  24.040 ms  20.071 m
s  17.649 ms
 6  ip5886ca35.dynamic.kabel-deutschland.de (88.134.202.53)  27.781 ms  30.434 m
s  26.075 ms
 7  ip5886cac1.dynamic.kabel-deutschland.de (88.134.202.193)  51.998 ms  37.845
ms  30.279 ms
 8  ae2.cr2-esams.wikimedia.org (80.249.209.176)  40.850 ms  33.596 ms  34.838 m
s
 9  text-lb.esams.wikimedia.org (91.198.174.192)  41.230 ms  33.559 ms  46.499 m
s
Igors-MacBook-Pro:~ igorfedotov$
```

6. At Uni : MAC 14-18-77-45-b1-bd

```
Interface: 141.26.178.33 --- 0x4
  Internet Address      Physical Address      Type
  141.26.176.1          14-18-77-45-b1-bd     dynamic
  141.26.178.164        40-f3-08-d0-95-c4     dynamic
  141.26.180.2          0c-8b-fd-66-15-52     dynamic
  141.26.180.185        74-da-38-6e-3c-63     dynamic
  141.26.181.35         08-ed-b9-c1-7a-4f     dynamic
  141.26.182.16         10-0b-a9-7f-5c-84     dynamic
  141.26.183.191        40-e2-30-40-38-38     dynamic
  141.26.188.83         76-c6-d7-38-cc-da     dynamic
  141.26.190.94         a0-a8-cd-16-95-0e     dynamic
  141.26.191.237        c0-d9-62-4f-04-5b     dynamic
  141.26.191.255        ff-ff-ff-ff-ff-ff     static
  224.0.0.2             01-00-5e-00-00-02     static
  224.0.0.22            01-00-5e-00-00-16     static
  224.0.0.251           01-00-5e-00-00-fb     static
  224.0.0.252           01-00-5e-00-00-fc     static
  224.0.0.253           01-00-5e-00-00-fd     static
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

At home: MAC 5c-dc-96-61-4f-b6


PS C:\Users\Daniel> arp -a
Interface: 192.168.2.116 --- 0x4
Internet Address Physical Address Type
192.168.2.1 5c-dc-96-61-4f-b6 dynamic
192.168.2.114 74-de-2b-3a-62-bb dynamic
192.168.2.255 ff-ff-ff-ff-ff-ff static
224.0.0.22 01-00-5e-00-00-16 static
224.0.0.251 01-00-5e-00-00-fb static
224.0.0.252 01-00-5e-00-00-fc static
233.179.26.141 01-00-5e-33-1a-8d static
235.180.26.141 01-00-5e-34-1a-8d static
239.255.255.250 01-00-5e-7f-ff-fa static
255.255.255.255 ff-ff-ff-ff-ff-ff static

4 Simple Python Programming (10 Points)

Write a simple python program that does the following:

1. Generate a random number sequence of 10 values between 0 to 90.
2. Perform `sine` and `cosine` operation on numbers generated.
3. Store the values in two different arrays named SIN & COSIN respectively.
4. Plot the values of SIN & COSIN in two different colors.
5. The plot should have labeled axes and legend.

Important Notes

Submission

- Solutions have to be checked into the github repository. Use the directory name `groupname/assignment1/` in your group's repository.
- The name of the group and the names of all participating students must be listed on each submission.
- Solution format: all solutions as *one* PDF document. Programming code has to be submitted as Python code to the github repository. Upload *all* `.py` files of your program! Use `UTF-8` as the file encoding. *Other encodings will not be taken into account!*
- Check that your code compiles without errors.
- Make sure your code is formatted to be easy to read.
  - Make sure you code has consistent indentation.
  - Make sure you comment and document your code adequately in English.
  - Choose consistent and intuitive names for your identifiers.
- Do *not* use any accents, spaces or special characters in your filenames.

Acknowledgment

This latex template was created by Lukas Schmelzeisen for the tutorials of "Web Information Retrieval".