Introduction to Web Science

Assignment 1

Prof. Dr. Steffen Staab   René Pickhardt

staab@uni-koblenz.de   rpickhardt@uni-koblenz.de

Korok Sengupta

koroksengupta@uni-koblenz.de

Institute of Web Science and Technologies
Department of Computer Science
University of Koblenz-Landau

Submission until: November 2, 2016, 10:00 a.m.
Tutorial on: November 4th, 2016, 12:00 p.m.

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.

Team: **Papa**
Members:

1. Brigitte Aznar

2. Bonasmitha Behura

3. Ilia Tugushi

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
   00 13 10 e8 dd 52

2. Destination MAC Address
   00 27 10 21 fa 48

3. What protocol is inside the data payload?
   Address Resolution Protocol (08 06)

4. Please mention what the last 2 fields hold in the above frame.
   They refer to the Target hardware address and the Target protocol address

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.

for a 100Mb/s cable and for 10Mb/s

$$d = 20m$$

$$s = 300Mm/s$$

$$t = \frac{20m}{300Mm/s} = 6.66 * 10^-8 s$$

The time will be the same for both settings, because we are only considering the first bit, therefore even if the 100Mb/s network will finish sending the packet first, they will both send the first bit at the same time.

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*
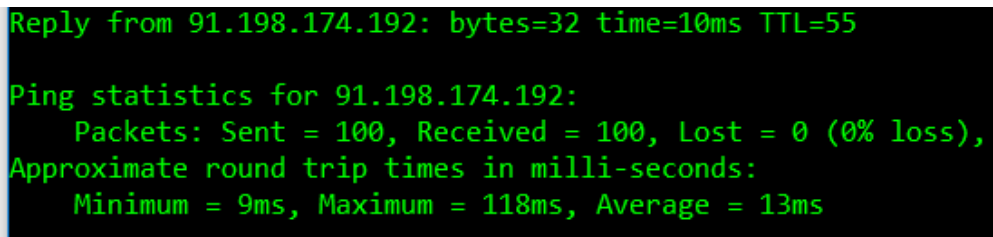2. *ping*
3. *traceroute*
4. *arp*
5. *dig*

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

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.

At university

1. 0% of package loss

2. 32 bytes package size

```
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55

Ping statistics for 91.198.174.192:
    Packets: Sent = 100, Received = 100, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 9ms, Maximum = 118ms, Average = 13ms
```

Figure 2: ping results for questions 1, 2 and 3

3. My IP address is 141.26.178.83 Wikipedia server is 91.198.174.192

Figure 3: ipconfig results

4. The DNS query took 46 msec.

Figure 4: Dig results

5. There are 11 Hops between my machine and the server

Figure 5: Traceroute results

6. The MAC address of the device is 14-18-77-455-b1-bd.

Figure 6: ARP results

At Home

1. 0% of package loss

2. 32 bytes package size

Figure 7: ping results for questions 1, 2 and 3

3. My IP address is 192.168.2.106 Wikipedia server is 91.198.174.192

Figure 8: ipconfig results

4. The DNS query took 46 msec.

Figure 9: Dig results

5. There are 8 Hops between my machine and the server

Figure 10: Traceroute results

6. The MAC address of the device is 5c-dc-96-61-4f-b6.

```
Interface: 192.168.2.106 --- 0x12
  Internet Address      Physical Address      Type
  192.168.2.1           5c-dc-96-61-4f-b6     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
  239.255.255.250       01-00-5e-7f-ff-fa     static
  255.255.255.255       ff-ff-ff-ff-ff-ff     static
```

Figure 11: ARP results

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.

```
 1: import random
 2: import math
 3: import matplotlib.pyplot as plt
 4: import matplotlib.patches as mpatches
 5:
 6:
 7: #Creating an array for sine and cosine
 8: COSIN = list()
 9: SIN   = list()
10:
11: #Creates 10 random numebrs between 1 and 90 and then order them
12: rand = random.sample(range(1,90),10)
13: rand.sort()
14:
15:
16: #Stores the result from sin and cosin values in their correspondant arrays
17: for val in rand:
18:     SIN.append(math.sin(val))
19:     COSIN.append(math.cos(val))
20:
21: #Plot the sin and cosine values against the random values generated
22: plt.plot(rand, SIN,'r-')
23: plt.plot(rand,COSIN,'b-')
24: #adds labels to the axis
25: plt.ylabel('cosin')
26: plt.xlabel('sin')
27: #generates legend
28: sin_legend = mpatches.Patch(color='red', label='Sin')
29: cos_legend = mpatches.Patch(color='blue', label='Cosin')
30: plt.legend(handles=[sin_legend, cos_legend],loc=5)
31: plt.show()
```

Python program available in this folder under the name

`papa_assignment1_4`
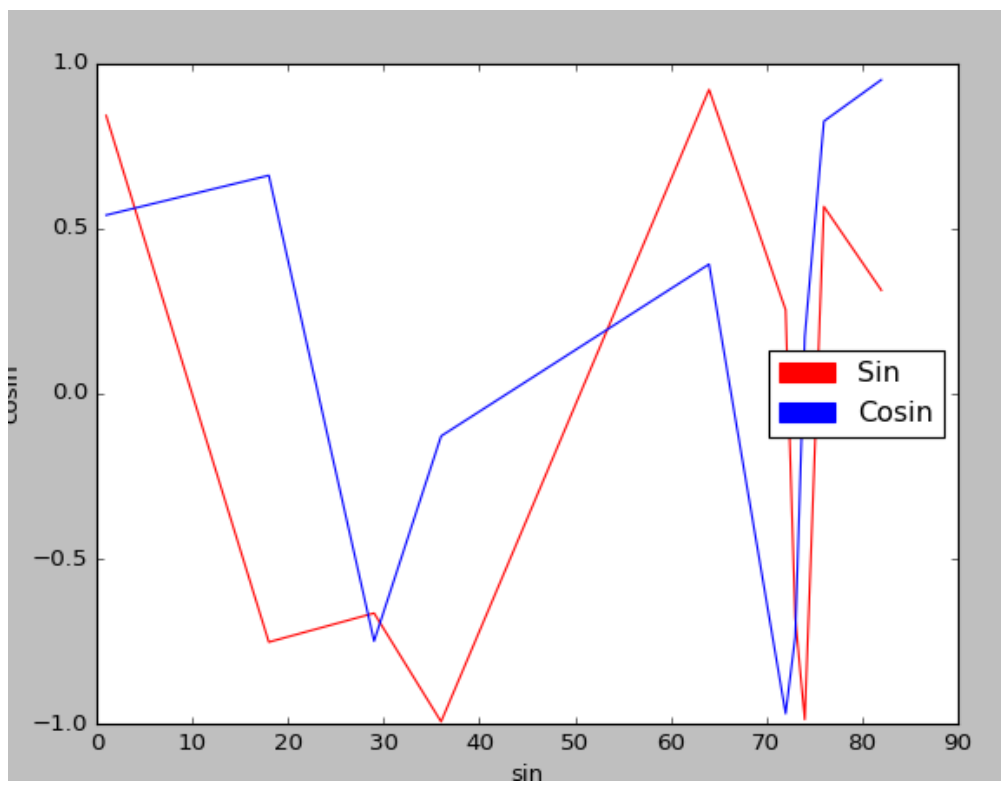
Figure 12: Plot result

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".