

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.

Group name: mike

Group members: Anish Girijashivaraj, Shohel Ahamad, Slobodan Kocovski

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. 0x0806 Address Resolution Protocol
4. The last two fields in the Address Resolution protocol are reserved for the protocol address of the intended receiver.

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:

1. Cable length 20 meters

100MBps = 100 Million bits per second

For 1 bit the time will be

$(1 \text{ second} / 100 \text{ Million bits per second}) = 0.00000001 \text{ seconds.}$

There are 1000000000 nanoseconds in one second, so we get 10 nanoseconds for one bit of transaction.

The speed of light is 299792458 meters per second = electromagnetic waves.

So, in 100MBit cable, 1 bit will travel

$(299 \ 792 \ 458 \text{ meters} / 1 \text{ second}) * (10 \text{ nanoseconds}) = 2.99792458 \text{ meters in one clock cycle .}$

So, to travel 20 meters it will take

$(20 * 10) / 2.99792458 = 66.71 \text{ nanoseconds}$

2. Cable length 20 meters

10MBps = 10 Million bits per seconds

For 1 bit the time will be

$(1 \text{ second} / 10 \text{ Million bits per second}) = 0.0000001 \text{ seconds}$

There are 1000000000 nanoseconds in one second, so we get 100 nanoseconds for one bit of transaction.

The speed of light is 299792458 Million meters per second = electromagnetic waves. So, in 10 MBps, 1 bit will travel

$(299 \ 792 \ 458 \text{ meters} / 1 \text{ second}) * (100 \text{ Nano Second}) = 29.9792458 \text{ meters in one clock cycle.}$

So, to travel 20 meters it will take

$(20 * 100) / 29.9792458 = 66.71 \text{ Nano Second.}$

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. *tracert*
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. The *% packet loss* if at all it happened after sending 100 packets.
 - a) Home network:
0% Package loss after sending 100 packages (ping -n 100 www.wikipedia.org)

```

C:\> Command Prompt
Reply from 2620:0:862:ed1a::1: time=23ms
Reply from 2620:0:862:ed1a::1: time=22ms
Reply from 2620:0:862:ed1a::1: time=33ms
Reply from 2620:0:862:ed1a::1: time=27ms
Reply from 2620:0:862:ed1a::1: time=24ms
Reply from 2620:0:862:ed1a::1: time=27ms
Reply from 2620:0:862:ed1a::1: time=26ms
Reply from 2620:0:862:ed1a::1: time=24ms
Reply from 2620:0:862:ed1a::1: time=26ms
Reply from 2620:0:862:ed1a::1: time=26ms
Reply from 2620:0:862:ed1a::1: time=24ms
Reply from 2620:0:862:ed1a::1: time=24ms
Reply from 2620:0:862:ed1a::1: time=31ms
Reply from 2620:0:862:ed1a::1: time=26ms
Reply from 2620:0:862:ed1a::1: time=26ms
Reply from 2620:0:862:ed1a::1: time=25ms
Reply from 2620:0:862:ed1a::1: time=104ms
Reply from 2620:0:862:ed1a::1: time=28ms
Reply from 2620:0:862:ed1a::1: time=30ms
Reply from 2620:0:862:ed1a::1: time=29ms
Reply from 2620:0:862:ed1a::1: time=41ms
Reply from 2620:0:862:ed1a::1: time=23ms
Reply from 2620:0:862:ed1a::1: time=38ms
Reply from 2620:0:862:ed1a::1: time=22ms

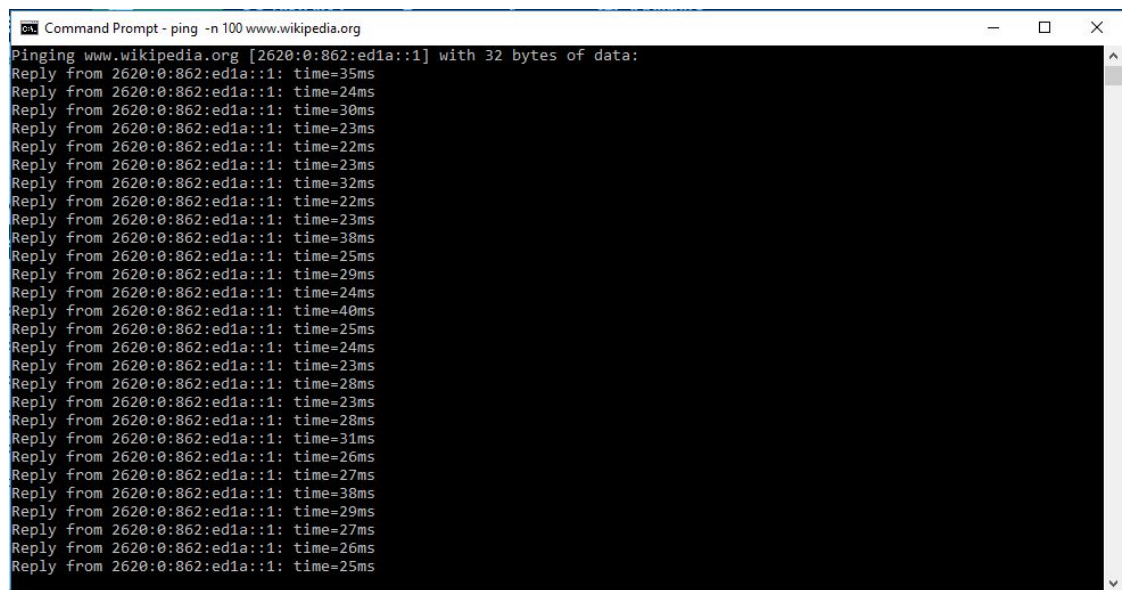
Ping statistics for 2620:0:862:ed1a::1:
    Packets: Sent = 100, Received = 100, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 21ms, Maximum = 139ms, Average = 30ms

```

- b) University's network:
0% Package loss after sending 100 packages (ping -n 100 www.wikipedia.org)

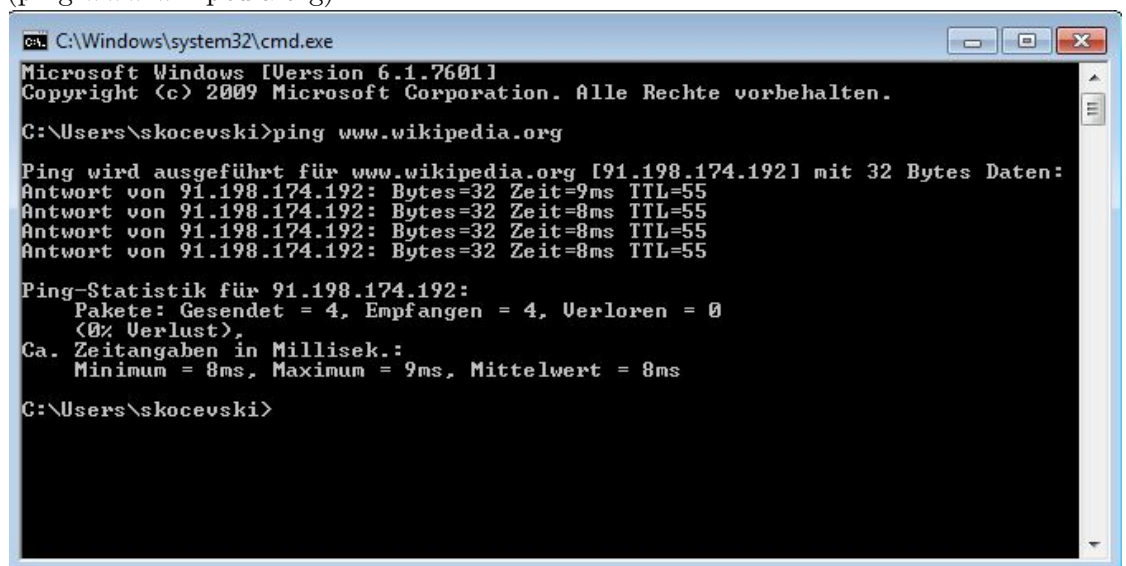
[illegible]

2. Size of the packet sent to Wikipedia server
 - a) Home network:
Size of the package sent to `www.wikipedia.org` is 32bytes (ping `www.wikipedia.org`)



```
Command Prompt - ping -n 100 www.wikipedia.org
Pinging www.wikipedia.org [2620:0:862:ed1a::1] with 32 bytes of data:
Reply from 2620:0:862:ed1a::1: time=35ms
Reply from 2620:0:862:ed1a::1: time=24ms
Reply from 2620:0:862:ed1a::1: time=30ms
Reply from 2620:0:862:ed1a::1: time=23ms
Reply from 2620:0:862:ed1a::1: time=22ms
Reply from 2620:0:862:ed1a::1: time=23ms
Reply from 2620:0:862:ed1a::1: time=32ms
Reply from 2620:0:862:ed1a::1: time=22ms
Reply from 2620:0:862:ed1a::1: time=23ms
Reply from 2620:0:862:ed1a::1: time=38ms
Reply from 2620:0:862:ed1a::1: time=25ms
Reply from 2620:0:862:ed1a::1: time=29ms
Reply from 2620:0:862:ed1a::1: time=24ms
Reply from 2620:0:862:ed1a::1: time=40ms
Reply from 2620:0:862:ed1a::1: time=25ms
Reply from 2620:0:862:ed1a::1: time=24ms
Reply from 2620:0:862:ed1a::1: time=23ms
Reply from 2620:0:862:ed1a::1: time=28ms
Reply from 2620:0:862:ed1a::1: time=23ms
Reply from 2620:0:862:ed1a::1: time=28ms
Reply from 2620:0:862:ed1a::1: time=31ms
Reply from 2620:0:862:ed1a::1: time=26ms
Reply from 2620:0:862:ed1a::1: time=27ms
Reply from 2620:0:862:ed1a::1: time=38ms
Reply from 2620:0:862:ed1a::1: time=29ms
Reply from 2620:0:862:ed1a::1: time=27ms
Reply from 2620:0:862:ed1a::1: time=26ms
Reply from 2620:0:862:ed1a::1: time=25ms
```

- b) University's network: Size of the package sent to www.wikipedia.org is 32bytes (ping www.wikipedia.org)



```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. Alle Rechte vorbehalten.

C:\Users\skocevski>ping www.wikipedia.org

Ping wird ausgeführt für www.wikipedia.org [91.198.174.192] mit 32 Bytes Daten:
Antwort von 91.198.174.192: Bytes=32 Zeit=9ms TTL=55
Antwort von 91.198.174.192: Bytes=32 Zeit=8ms TTL=55
Antwort von 91.198.174.192: Bytes=32 Zeit=8ms TTL=55
Antwort von 91.198.174.192: Bytes=32 Zeit=8ms TTL=55

Ping-Statistik für 91.198.174.192:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0
    (0% Verlust),
    Ca. Zeitangaben in Millisek.:
        Minimum = 8ms, Maximum = 9ms, Mittelwert = 8ms

C:\Users\skocevski>
```

3. IP address of your machine and the Wikipedia server
- a) Home network: (ping www.wikipedia.org)
The IP address of wikipedia.org server is [2620:0:862:ed1a::1]

```
Command Prompt
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\Slobodan>ping wikipedia.org

Pinging wikipedia.org [2620:0:862:ed1a::1] with 32 bytes of data:
Reply from 2620:0:862:ed1a::1: time=28ms
Reply from 2620:0:862:ed1a::1: time=21ms
Reply from 2620:0:862:ed1a::1: time=46ms
Reply from 2620:0:862:ed1a::1: time=23ms

Ping statistics for 2620:0:862:ed1a::1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 21ms, Maximum = 46ms, Average = 29ms

C:\Users\Slobodan>
```

The IP address of local machine is 192.168.0.6

```
Command Prompt

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 3:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Ethernet adapter Ethernet 3:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::4d2c:6263:3bfc:ec7a%7
    Autoconfiguration IPv4 Address. . : 169.254.236.122
    Subnet Mask . . . . . : 255.255.0.0
    Default Gateway . . . . . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : home
    IPv6 Address. . . . . : 2a02:810b:440:8134:7d02:2544:431:4f94
    Temporary IPv6 Address. . . . . : 2a02:810b:440:8134:38fb:c939:67ca:2ccb
    Link-local IPv6 Address . . . . . : fe80::7d02:2544:431:4f94%2
    IPv4 Address. . . . . : 192.168.0.6
    Subnet Mask . . . . . : 255.255.255.0
```

- b) University's network: (ping www.wikipedia.org)
The IP address of wikipedia.org server is 91.198.174.192

```
C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. Alle Rechte vorbehalten.

C:\Users\skocevski>ping www.wikipedia.org

Ping wird ausgeführt für www.wikipedia.org [91.198.174.192] mit 32 Bytes Daten:
Antwort von 91.198.174.192: Bytes=32 Zeit=8ms TTL=55
Antwort von 91.198.174.192: Bytes=32 Zeit=9ms TTL=55
Antwort von 91.198.174.192: Bytes=32 Zeit=8ms TTL=55
Antwort von 91.198.174.192: Bytes=32 Zeit=8ms TTL=55

Ping-Statistik für 91.198.174.192:
    Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0
    (0% Verlust),
    Ca. Zeitangaben in Millisek.:
    Minimum = 8ms, Maximum = 9ms, Mittelwert = 8ms

C:\Users\skocevski>
```

The IP address of local machine is 141.26.67.198

```
C:\Windows\system32\cmd.exe

Windows-IP-Konfiguration

Ethernet-Adapter LAN-Verbindung:

    Verbindungsspezifisches DNS-Suffix: uni-koblenz.de
    Verbindungslokale IPv6-Adresse . . : fe80::f829:82fe:f3b2:5f66%11
    IPv4-Adresse . . . . . : 141.26.67.198
    Subnetzmaske . . . . . : 255.255.248.0
    Standardgateway . . . . . : 141.26.64.9

Tunneladapter 6T04 Adapter:

    Verbindungsspezifisches DNS-Suffix: uni-koblenz.de
    IPv6-Adresse . . . . . : 2002:8d1a:43c6::8d1a:43c6
    Standardgateway . . . . . : 2002:c058:6301::1
                                2002:c058:6301::c058:6301

Tunneladapter isatap.uni-koblenz.de:

    Medienstatus. . . . . : Medium getrennt
    Verbindungsspezifisches DNS-Suffix: uni-koblenz.de

C:\Users\skocevski>
```

4. Query Time for DNS query of the above url.
 - a) Home network:
Query time for DNS query of www.wikipedia.org: 17msec (dig www.wikipedia.org)


```
Command Prompt
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\Slobodan>dig www.wikipedia.org

;; <<>> Dig 9.9.5-W1 <<>> www.wikipedia.org
;; global options: +cmd
;; Got answer:
;; ->HEADER<- opcode: QUERY, status: NOERROR, id: 47450
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

;; QUESTION SECTION:
;www.wikipedia.org.                IN      A

;; ANSWER SECTION:
www.wikipedia.org.                192     IN      A      91.198.174.192

;; Query time: 17 msec
;; SERVER: 192.168.0.1#53(192.168.0.1)
;; WHEN: Sun Oct 30 20:31:31 Central European Standard Time 2016
;; MSG SIZE rcvd: 51

C:\Users\Slobodan>
```

b) University's network

Query time for DNS query of www.wikipedia.org: 15msec (dig www.wikipedia.org)

```
Command Prompt

;; ANSWER SECTION:
www.wikipedia.org.                270     IN      A      91.198.174.192

;; AUTHORITY SECTION:
org.                             168009  IN      NS      a0.org.afiliias-nst.info.
org.                             168009  IN      NS      a2.org.afiliias-nst.info.
org.                             168009  IN      NS      d0.org.afiliias-nst.org.
org.                             168009  IN      NS      c0.org.afiliias-nst.info.
org.                             168009  IN      NS      b0.org.afiliias-nst.org.
org.                             168009  IN      NS      b2.org.afiliias-nst.org.

;; ADDITIONAL SECTION:
a0.org.afiliias-nst.info. 168009  IN      A      199.19.56.1
a0.org.afiliias-nst.info. 168009  IN      AAAA   2001:500:e::1
a2.org.afiliias-nst.info. 168009  IN      A      199.249.112.1
a2.org.afiliias-nst.info. 168009  IN      AAAA   2001:500:40::1
b0.org.afiliias-nst.org. 168009  IN      A      199.19.54.1
b0.org.afiliias-nst.org. 168009  IN      AAAA   2001:500:c::1
b2.org.afiliias-nst.org. 168009  IN      A      199.249.120.1
b2.org.afiliias-nst.org. 168009  IN      AAAA   2001:500:48::1
c0.org.afiliias-nst.info. 168009  IN      A      199.19.53.1
c0.org.afiliias-nst.info. 168009  IN      AAAA   2001:500:b::1
d0.org.afiliias-nst.org. 168009  IN      A      199.19.57.1
d0.org.afiliias-nst.org. 168009  IN      AAAA   2001:500:f::1

;; Query time: 15 msec
;; SERVER: 141.26.64.60#53(141.26.64.60)
;; WHEN: Wed Nov 02 08:16:33 Central European Standard Time 2016
;; MSG SIZE rcvd: 464
```

5. Number of *Hops* in between your machine and the server.

a) Home network:

It took 9 Hops to get to the www.wikipedia.org server (tracert www.wikipedia.org)

```

Command Prompt

Tracing route to www.wikipedia.org [2620:0:862:ed1a::1]
over a maximum of 30 hops:

  1    2 ms    10 ms    3 ms    compalhub.home [2a02:810b:440:8134:5667:51ff:fe73:cce6]
  2    *      *      *      Request timed out.
  3   17 ms   17 ms   13 ms   2a02:8100:6:2::106:111
  4   37 ms   20 ms   15 ms   2a02:8100:6:2::c:18e
  5    *      *      *      Request timed out.
  6   25 ms   23 ms   20 ms   2a02:8100:4:2::1499
  7    *      34 ms   32 ms   2a02:8100:4:2::14ae
  8   31 ms   33 ms   43 ms   ae2.cr2-esams.wikimedia.org [2001:7f8:1::a504:3821:1]
  9   25 ms   23 ms   23 ms   text-lb.esams.wikimedia.org [2620:0:862:ed1a::1]

Trace complete.

```

b) University's network:

It took 11 Hops to get to the www.wikipedia.org server (tracert www.wikipedia.org)

```

C:\Windows\system32\cmd.exe
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. Alle Rechte vorbehalten.

C:\Users\skocevski>tracert www.wikipedia.org

Routenverfolgung zu www.wikipedia.org [91.198.174.192] über maximal 30 Abschnitte:

  1    *      *      <1 ms   winroute.uni-koblenz.de [141.26.64.9]
  2    1 ms   <1 ms   <1 ms   g-uni-ko-1.rlp-net.net [217.198.241.129]
  3    1 ms   <1 ms   <1 ms   g-hbf-ko-1.rlp-net.net [217.198.240.69]
  4    2 ms   2 ms    2 ms    217.198.247.117
  5   47 ms   48 ms   47 ms   g-interxion-1.rlp-net.net [217.198.240.13]
  6    4 ms   2 ms    2 ms    rlfra3.core.init7.net [80.81.192.67]
  7   10 ms   10 ms   10 ms   rlams1.core.init7.net [77.109.128.154]
  8   11 ms   10 ms   10 ms   rlams2.core.init7.net [77.109.128.146]
  9   19 ms   9 ms    9 ms    gw-wikimedia.init7.net [77.109.134.114]
 10    8 ms   8 ms    8 ms    ae1-403.cr2-esams.wikimedia.org [91.198.174.254]
 11    8 ms   8 ms    8 ms    text-lb.esams.wikimedia.org [91.198.174.192]

Ablaufverfolgung beendet.

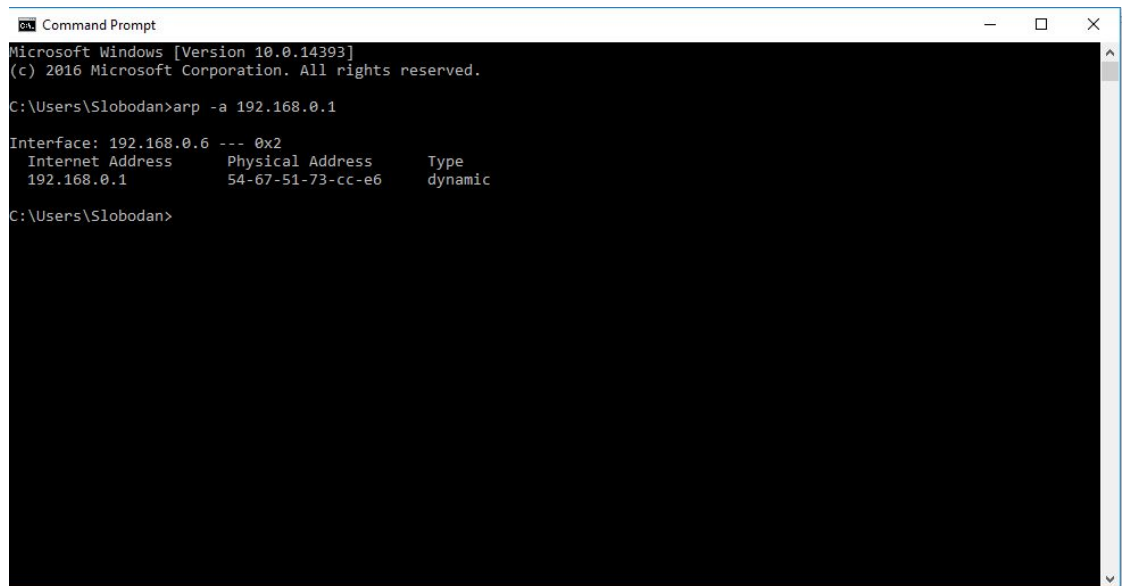
C:\Users\skocevski>

```

6. MAC address of the device that is acting as your network gateway

a) Home network:

MAC address of the network gateway device:54-67-51-73-cc-e6



```
Command Prompt
Microsoft Windows [Version 10.0.14393]
(c) 2016 Microsoft Corporation. All rights reserved.

C:\Users\Slobodan>arp -a 192.168.0.1

Interface: 192.168.0.6 --- 0x2
    Internet Address      Physical Address      Type
    192.168.0.1           54-67-51-73-cc-e6    dynamic

C:\Users\Slobodan>
```

b) University's network:

MAC address of the network gateway device D4-3D-7E-F1-97-18



```
C:\Windows\system32\cmd.exe
uni-koblenz.de

Ethernet-Adapter LAN-Verbindung:

Verbindungsspezifisches DNS-Suffix: uni-koblenz.de
Beschreibung. . . . . : Realtek PCIe GBE Family Controller
Physikalische Adresse . . . . . : D4-3D-7E-F1-97-18
DHCP aktiviert. . . . . : Ja
Autokonfiguration aktiviert . . . : Ja
Verbindungslokale IPv6-Adresse . . : fe80::f829:82fe:f3b2:5f66%11<Bevorzugt>
IPv4-Adresse . . . . . : 141.26.67.198<Bevorzugt>
Subnetzmaske . . . . . : 255.255.248.0
Lease erhalten. . . . . : Montag, 31. Oktober 2016 06:30:16
Lease läuft ab. . . . . : Montag, 31. Oktober 2016 19:04:12
Standardgateway . . . . . : 141.26.64.9
DHCP-Server . . . . . : 141.26.64.70
DHCPv6-IAID . . . . . : 265567614
DHCPv6-Client-DUID. . . . . : 00-01-00-01-1D-11-83-AF-D4-3D-7E-F1-97-18

DNS-Server . . . . . : 141.26.64.60
                      141.26.64.61
                      141.26.64.1
                      141.26.64.2
NetBIOS über TCP/IP . . . . . : Aktiviert
```

4 Simple Python Programming (10 Points)

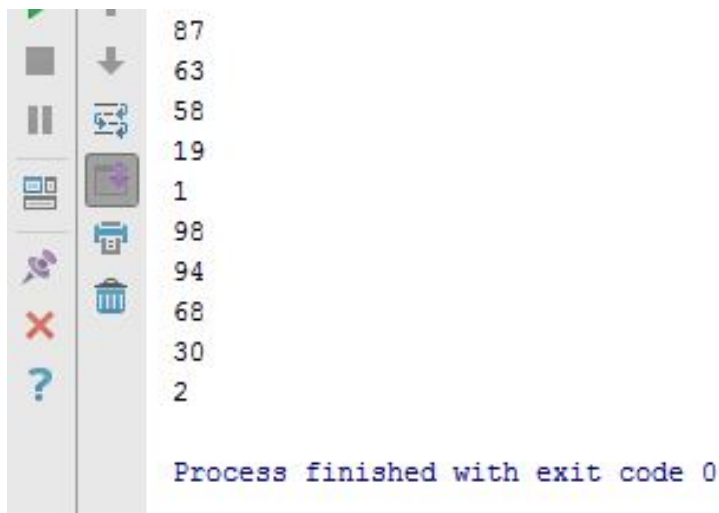
Write a simple python program that does the following:

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.

Answers:

1.

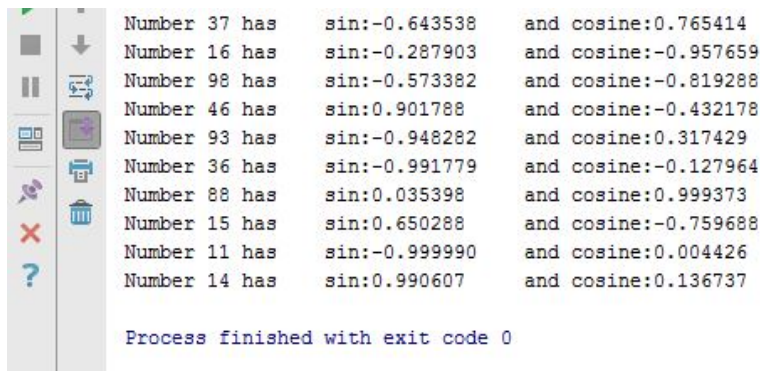
```
import random
x = 0
while (x < 10):
    print(random.randint(0, 99))
    x += 1
```



2.

```
import math
import random
x = 0
while (x < 10):
    y = random.randint(0, 99)
    s = math.sin(y)
    c = math.cos(y)
```

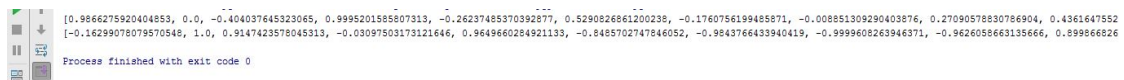
```
print("Number %d has sin:%f and cosine:%f" % (y, s, c))
x += 1
```



```
Number 37 has sin:-0.643538 and cosine:0.765414
Number 16 has sin:-0.287903 and cosine:-0.957659
Number 98 has sin:-0.573382 and cosine:-0.819288
Number 46 has sin:0.901788 and cosine:-0.432178
Number 93 has sin:-0.948282 and cosine:0.317429
Number 36 has sin:-0.991779 and cosine:-0.127964
Number 88 has sin:0.035398 and cosine:0.999373
Number 15 has sin:0.650288 and cosine:-0.759688
Number 11 has sin:-0.999990 and cosine:0.004426
Number 14 has sin:0.990607 and cosine:0.136737

Process finished with exit code 0
```

```
3. from matplotlib import pyplot as plt
import math
import random
x = 0
sin = []
cosin = []
while (x < 10):
y = random.randint(0, 99)
s = math.sin(y)
c = math.cos(y)
sin.insert(x, s)
cosin.insert(x, c)
x += 1
print(sin)
print(cosine)
```

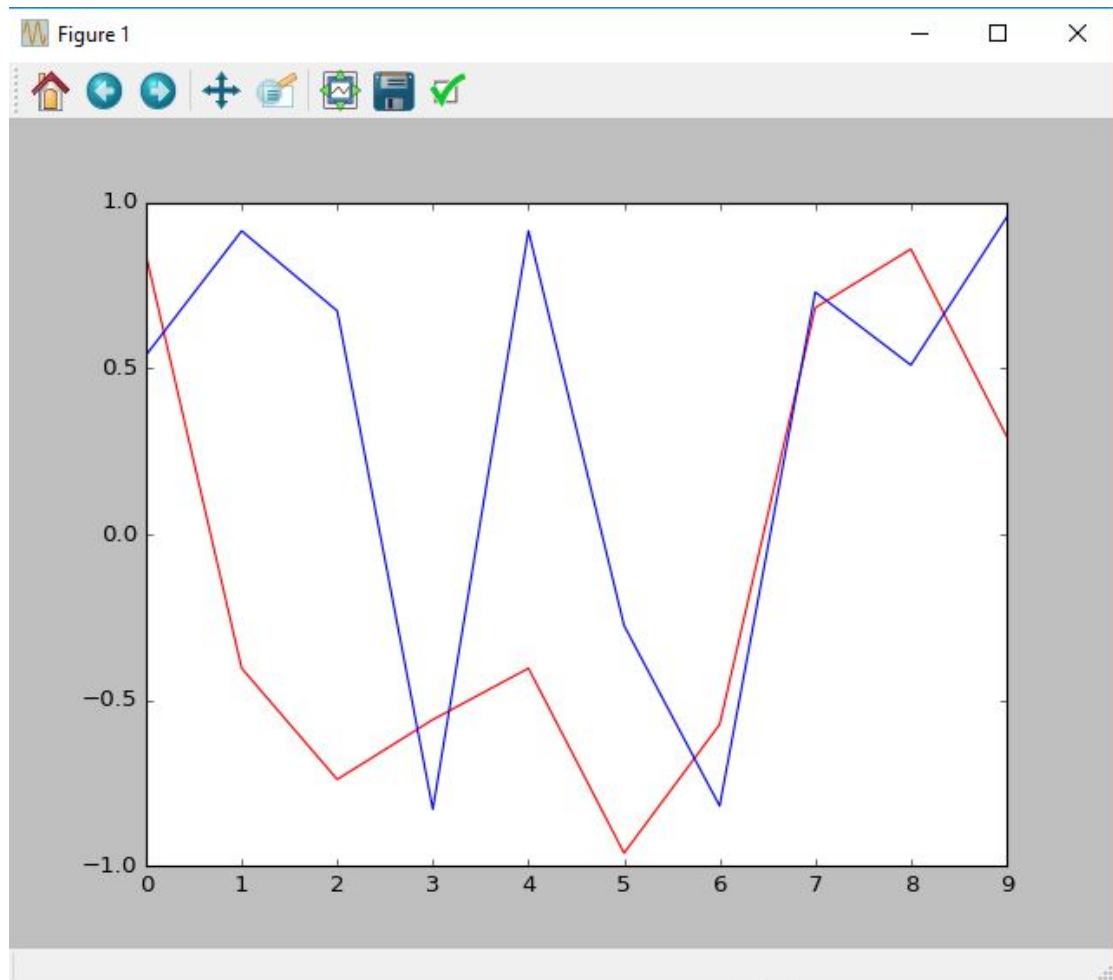


```
[0.9866275920404853, 0.0, -0.404037645323065, 0.9995201585807313, -0.26237485370392877, 0.5290826861200238, -0.1760756199485871, -0.008851309290403876, 0.27090578830786904, 0.4361647552
[-0.16299078079570548, 1.0, 0.9147423578045313, -0.03097503173121646, 0.9649660284921133, -0.8485702747846052, -0.9843766433940419, -0.9999608263946371, -0.9626058663135666, 0.899866826

Process finished with exit code 0
```

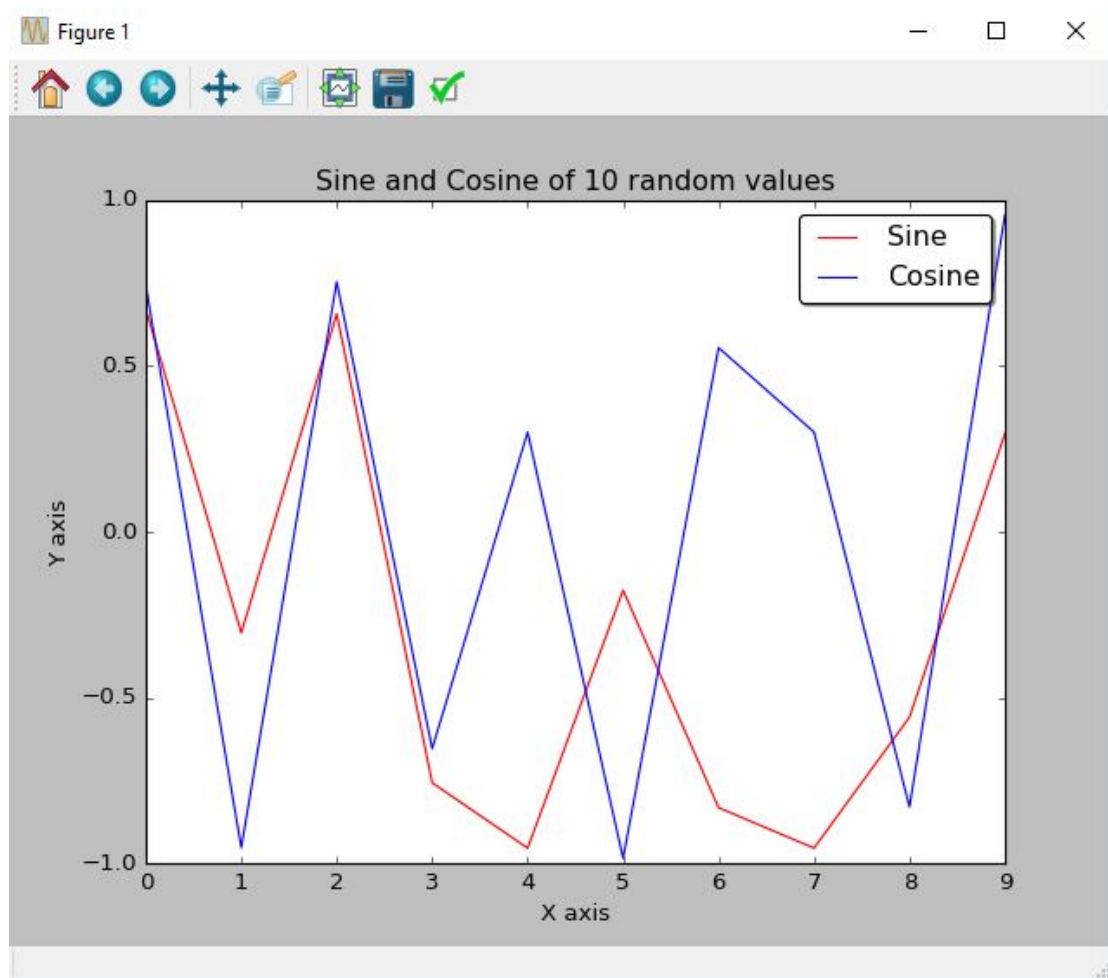
```
4. from matplotlib import pyplot as plt
import math
import random
x = 0
sin = []
cosin = []
while (x < 10):
y = random.randint(0, 99)
s = math.sin(y)
c = math.cos(y)
```

```
sin.insert(x, s)
cosin.insert(x, c)
x += 1
plt.plot(sin, color="red")
plt.plot(cosin, color="blue")
plt.show()
```



```
5. from matplotlib import pyplot as plt
import math
import random
x = 0
sin = []
cosin = []
while (x < 10):
    y = random.randint(0, 99)
```

```
s = math.sin(y)
c = math.cos(y)
sin.insert(x, s)
cosin.insert(x, c)
x += 1
plt.plot(sin, color="red", label="Sine")
plt.plot(cosin, color="blue", label="Cosine")
plt.title('Sine and Cosine of 10 random values')
plt.ylabel('Y axis')
plt.xlabel('X axis')
plt.legend( shadow=True, fancybox=True)
plt.show()
```



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

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