

Introduction to Web Science

Assignment By Group "Charlie"

Rinku Chowdhury

216101118

M.Rauf Qureshi

216100729

Shreya Chatterjee

216100848

Institute of Web Science and Technologies

Department of Computer Science

University of Koblenz-Landau

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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. **Source MAC Address** is 00 13 10 e8 dd 52
2. **Destination MAC Address** is 00 27 10 21 fa 48
3. **As the Ether-type is 0x 08 06 ,hence the protocol is Advance Resolution Protocol (ARP) inside the data payload.**
4. **The Address Resolution Protocol is a request and reply protocol that runs encapsulated by the line protocol. The principal packet structure of ARP packets comprise 9 fields which hold 28 bytes. The last 2 fields are Target hardware address (6 bytes) and Target IP address (4 bytes) respectively. Considering the given frame, target hardware address holds 00 00 00 00 00 00 and Target IP address is c0 a8 02 67.**

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. For 100MBps network using cables of 20 meters For the first bit to arrive it would take $(10 \times 20) / 3 = 66.67$ nanoseconds
2. For 10MBps network using cables of 20 meters For the first bit to arrive it would take $(100 \times 20) / 30 = 66.67$ nanoseconds

Explanation: For 100 MBit it takes 10 nanoseconds to transfer 1 bit of information to a distance of 3 meters. In contrast, it takes 100 ns for 1 bit with the 10Mbit to reach almost 30 meters. The speed at which electrical signals can travel and limited as a percentage of the speed of light.

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. Home network:

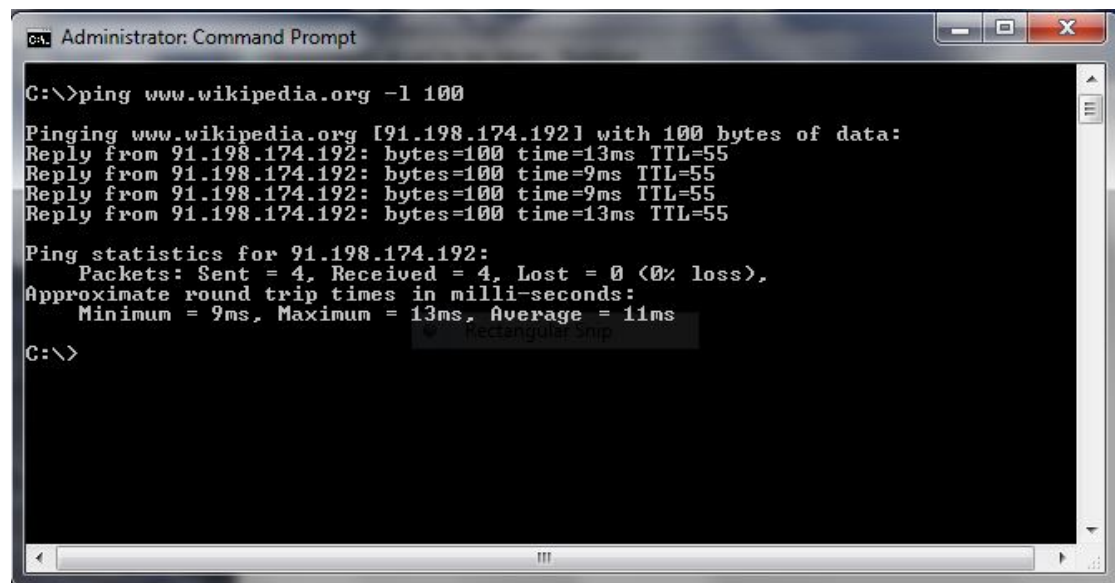
1.0% Package loss after sending 100 packages (ping -c 100 www.wikipedia.org)

```
64 bytes from 91.198.174.192: icmp_seq=96 ttl=60 time=140.880 ms
64 bytes from 91.198.174.192: icmp_seq=97 ttl=60 time=161.523 ms
64 bytes from 91.198.174.192: icmp_seq=98 ttl=60 time=135.065 ms
64 bytes from 91.198.174.192: icmp_seq=99 ttl=60 time=119.108 ms
```

```
--- www.wikipedia.org ping statistics ---
100 packets transmitted, 99 packets received, 1.0% packet loss
round-trip min/avg/max/stddev = 106.680/154.456/352.016/59.898 ms
computer:~ Avinash$
```

University network:

0% Package loss after sending 100 packages (ping www.wikipedia.org -1 100)



```
C:\>ping www.wikipedia.org -l 100

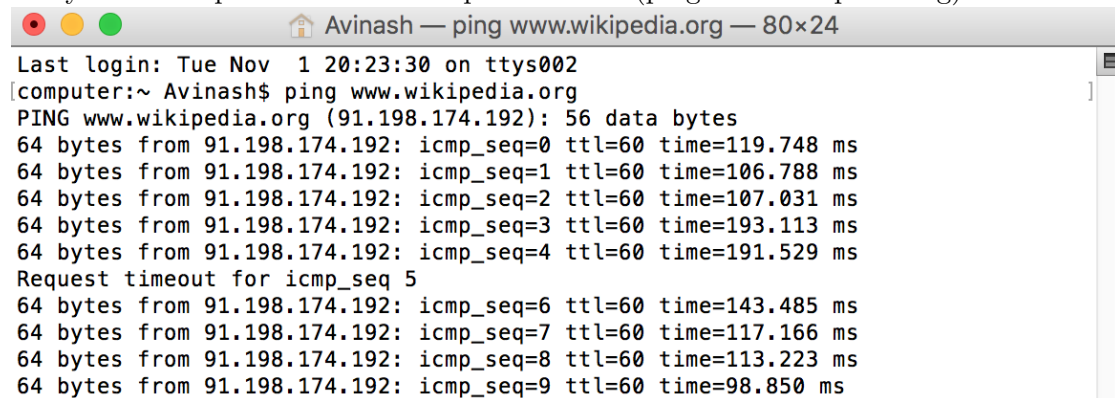
Pinging www.wikipedia.org [91.198.174.192] with 100 bytes of data:
Reply from 91.198.174.192: bytes=100 time=13ms TTL=55
Reply from 91.198.174.192: bytes=100 time=9ms TTL=55
Reply from 91.198.174.192: bytes=100 time=9ms TTL=55
Reply from 91.198.174.192: bytes=100 time=13ms TTL=55

Ping statistics for 91.198.174.192:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 9ms, Maximum = 13ms, Average = 11ms

C:\>
```

2.Home network:

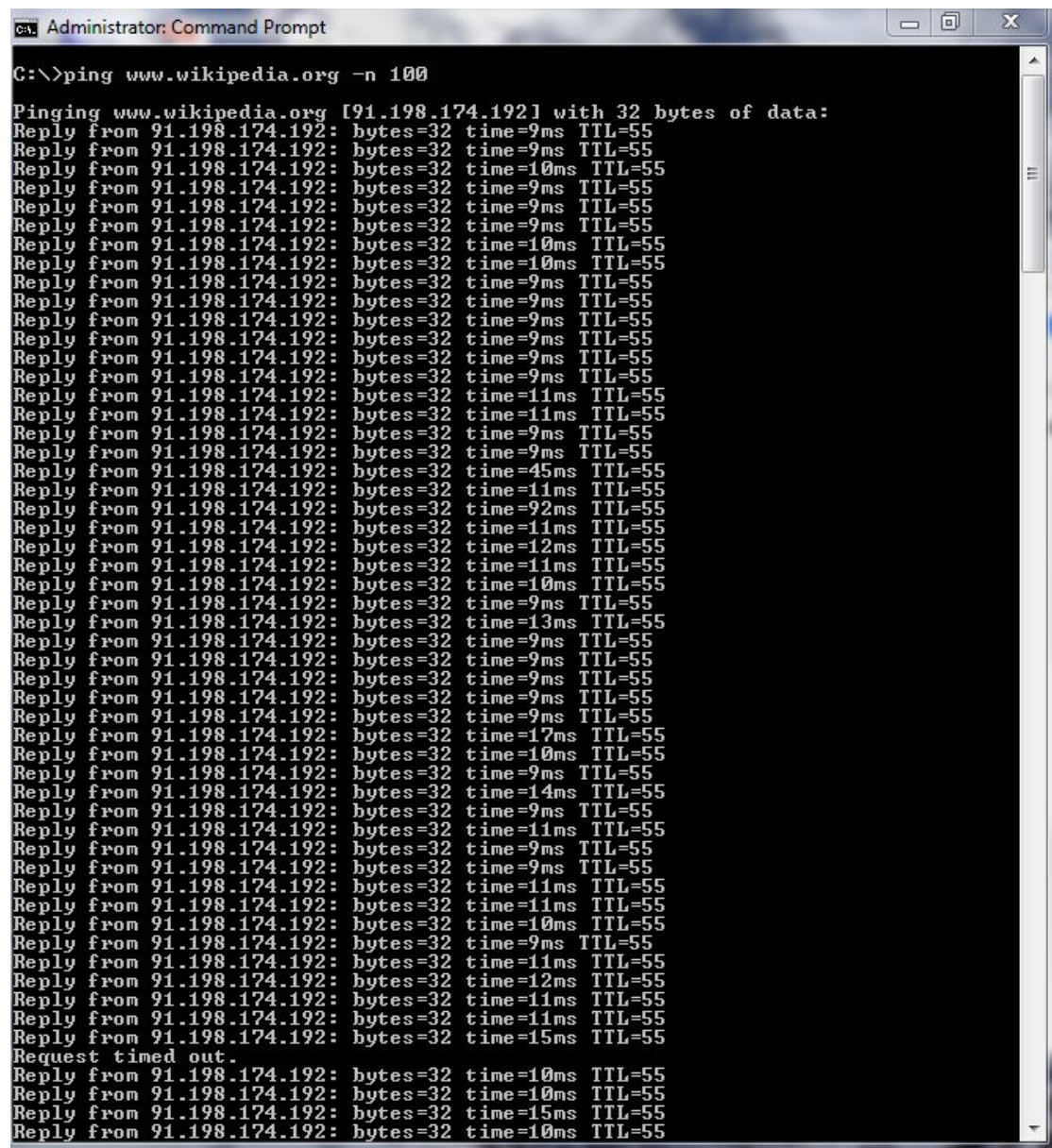
56 bytes size of packet sent to Wikipedia server. (ping www.wikipedia.org)



```
Last login: Tue Nov 1 20:23:30 on ttys002
computer:~ Avinash$ ping www.wikipedia.org
PING www.wikipedia.org (91.198.174.192): 56 data bytes
64 bytes from 91.198.174.192: icmp_seq=0 ttl=60 time=119.748 ms
64 bytes from 91.198.174.192: icmp_seq=1 ttl=60 time=106.788 ms
64 bytes from 91.198.174.192: icmp_seq=2 ttl=60 time=107.031 ms
64 bytes from 91.198.174.192: icmp_seq=3 ttl=60 time=193.113 ms
64 bytes from 91.198.174.192: icmp_seq=4 ttl=60 time=191.529 ms
Request timeout for icmp_seq 5
64 bytes from 91.198.174.192: icmp_seq=6 ttl=60 time=143.485 ms
64 bytes from 91.198.174.192: icmp_seq=7 ttl=60 time=117.166 ms
64 bytes from 91.198.174.192: icmp_seq=8 ttl=60 time=113.223 ms
64 bytes from 91.198.174.192: icmp_seq=9 ttl=60 time=98.850 ms
```

University network:

32 bytes size of packet sent to Wikipedia server. (ping www.wikipedia.org)



```
Administrator: Command Prompt
C:\>ping www.wikipedia.org -n 100

Pinging www.wikipedia.org [91.198.174.192] with 32 bytes of data:
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=45ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=92ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=12ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=13ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=17ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=14ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=12ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=11ms TTL=55
Reply from 91.198.174.192: bytes=32 time=15ms TTL=55
Request timed out.
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=15ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
```

3.Home network: The IP address of local machine is 192.168.2.107 (ifconfig)and wiki server is 91.198.174.192 (nslookup www.wikipedia.org)

```
Avinash — -bash — 80x24
Last login: Tue Nov  1 20:27:30 on ttys001
computer:~ Avinash$ ifconfig |grep inet
    inet6 ::1 prefixlen 128
    inet 127.0.0.1 netmask 0xff000000
    inet6 fe80::1%lo0 prefixlen 64 scopeid 0x1
    inet6 fe80::62f8:1dff:feb6:9046%en0 prefixlen 64 scopeid 0x4
    inet 192.168.2.107 netmask 0xffffffff broadcast 192.168.2.255
    inet6 fe80::f834:9eff:fe14:dfa7%awdl0 prefixlen 64 scopeid 0x8
computer:~ Avinash$

Avinash — -bash — 80x24
Last login: Tue Nov  1 20:28:07 on ttys002
computer:~ Avinash$ nslookup www.wikipedia.org
Server:      192.168.2.1
Address:     192.168.2.1#53

Non-authoritative answer:
Name:   www.wikipedia.org
Address: 91.198.174.192
```

University network: The IP address of local machine is 141.26.180.103 and wiki server is 91.198.174.192

```
Administrator: Command Prompt
C:\>ipconfig

Windows IP Configuration

Wireless LAN adapter Wireless Network Connection:

    Connection-specific DNS Suffix  . : uni-koblenz.de
    Link-local IPv6 Address . . . . . : fe80::341f:b3b4:a9b5:dab1%12
    IPv4 Address. . . . . : 141.26.180.103
    Subnet Mask . . . . . : 255.255.240.0
    Default Gateway . . . . . : 141.26.176.1

Ethernet adapter Local Area Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : uni-koblenz.de

Tunnel adapter isatap.uni-koblenz.de:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : uni-koblenz.de

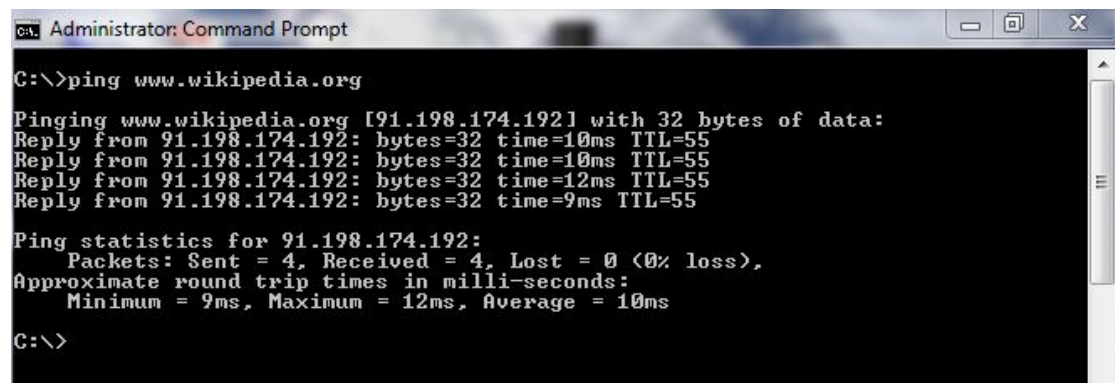
Tunnel adapter Teredo Tunneling Pseudo-Interface:

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

Tunnel adapter 6T04 Adapter:

    Connection-specific DNS Suffix  . : uni-koblenz.de
    IPv6 Address. . . . . : 2002:8d1a:b467::8d1a:b467
    Default Gateway . . . . . : 2002:c058:6301::c058:6301

C:\>
```



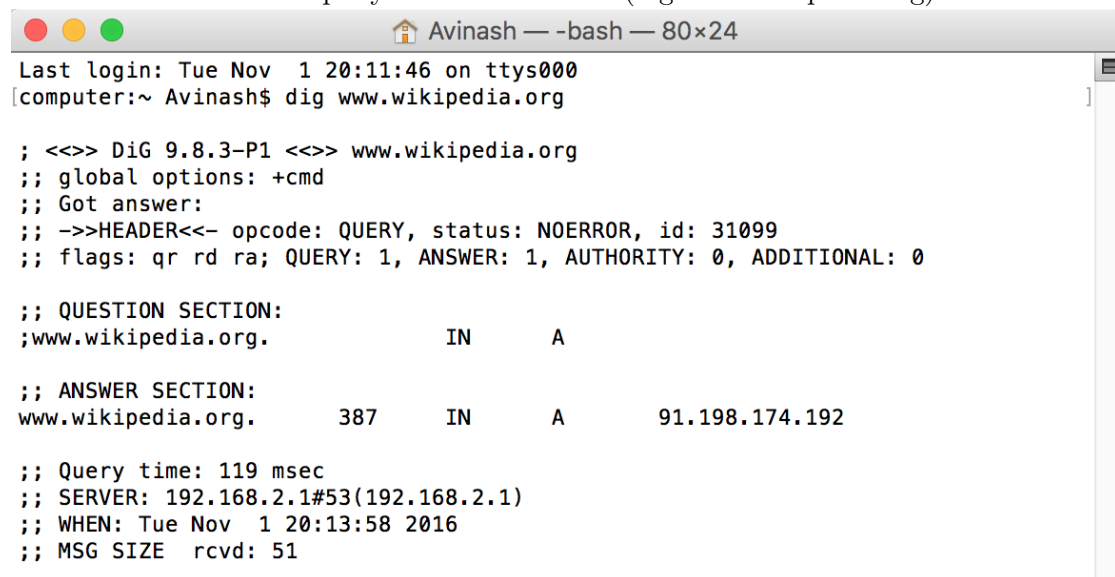
```
Administrator: Command Prompt
C:\>ping www.wikipedia.org

Pinging www.wikipedia.org [91.198.174.192] with 32 bytes of data:
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=10ms TTL=55
Reply from 91.198.174.192: bytes=32 time=12ms TTL=55
Reply from 91.198.174.192: bytes=32 time=9ms TTL=55

Ping statistics for 91.198.174.192:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 9ms, Maximum = 12ms, Average = 10ms

C:\>
```

4. Home network: DNS query time is 119 msec. (dig www.wikipedia.org)



```
Avinash — -bash — 80x24
Last login: Tue Nov  1 20:11:46 on ttys000
[computer:~ Avinash$ dig www.wikipedia.org

; <<>> DiG 9.8.3-P1 <<>> www.wikipedia.org
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 31099
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 0

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

;; ANSWER SECTION:
www.wikipedia.org.      387     IN      A      91.198.174.192

;; Query time: 119 msec
;; SERVER: 192.168.2.1#53(192.168.2.1)
;; WHEN: Tue Nov  1 20:13:58 2016
;; MSG SIZE rcvd: 51
```

University network: DNS query time is 15msec


```
Command Prompt
;; ANSWER SECTION:
www.wikipedia.org. 599 IN A 91.198.174.192

;; AUTHORITY SECTION:
org. 160626 IN NS b0.org.afiliias-nst.org.
org. 160626 IN NS b2.org.afiliias-nst.org.
org. 160626 IN NS a0.org.afiliias-nst.info.
org. 160626 IN NS c0.org.afiliias-nst.info.
org. 160626 IN NS d0.org.afiliias-nst.org.
org. 160626 IN NS a2.org.afiliias-nst.info.

;; ADDITIONAL SECTION:
a0.org.afiliias-nst.info. 160626 IN A 199.19.56.1
a0.org.afiliias-nst.info. 160626 IN AAAA 2001:500:e::1
a2.org.afiliias-nst.info. 160626 IN A 199.249.112.1
a2.org.afiliias-nst.info. 160626 IN AAAA 2001:500:40::1
b0.org.afiliias-nst.org. 160626 IN A 199.19.54.1
b0.org.afiliias-nst.org. 160626 IN AAAA 2001:500:c::1
b2.org.afiliias-nst.org. 160626 IN A 199.249.120.1
b2.org.afiliias-nst.org. 160626 IN AAAA 2001:500:48::1
c0.org.afiliias-nst.info. 160626 IN A 199.19.53.1
c0.org.afiliias-nst.info. 160626 IN AAAA 2001:500:b::1
d0.org.afiliias-nst.org. 160626 IN A 199.19.57.1
d0.org.afiliias-nst.org. 160626 IN AAAA 2001:500:f::1

;; Query time: 15 msec
;; SERVER: 141.26.64.60#53(141.26.64.60)
;; WHEN: Mon Oct 31 15:19:45 Central European Standard Time 2016
;; MSG SIZE rcvd: 464
```

5. Home network : 6 hops (traceroute www.wikipedia.org)

```

computer:~ Avinash$ traceroute www.wikipedia.org
traceroute to www.wikipedia.org (91.198.174.192), 64 hops max, 52 byte packets
 1 easy.box.local (192.168.2.1)  1.930 ms  1.989 ms  1.751 ms
 2 dslb-088-074-008-001.088.074.pools.vodafone-ip.de (88.74.8.1)  20.090 ms  21.009 ms  20.057 ms
 3 * * *
 4 * 188.111.171.220 (188.111.171.220)  92.176 ms  101.568 ms
 5 92.79.212.201 (92.79.212.201)  108.859 ms *
   92.79.212.193 (92.79.212.193)  201.271 ms
 6 145.254.2.217 (145.254.2.217)  168.036 ms
   145.254.2.233 (145.254.2.233)  167.968 ms
   145.254.2.217 (145.254.2.217)  169.430 ms
 7 * * *
 8 * * *
 9 * * *
10 * * *
11 * * *
12 * * *
13 * * *
14 * * *
15 * * *
16 * * *
17 * * *
18 * * *
19 * * *
20 * * *
21 * * *
22 * * *
23 * * *
24 * * *
25 * * *
26 * * *
27 * * *
28 * * *
29 * * *
30 * * *
31 * * *
32 * * *
33 * * *

```

University network : 11 hops(tracert www.wikipedia.org)

```

ca. Administrator: Command Prompt
C:\>tracert www.wikipedia.org

Tracing route to www.wikipedia.org [91.198.174.192]
over a maximum of 30 hops:
  1      7 ms      *      <1 ms    wlanrouter.uni-koblenz.de [141.26.176.1]
  2      1 ms      1 ms     1 ms    g-uni-ko-1.rlp-net.net [217.198.241.129]
  3      2 ms      1 ms     1 ms    g-hbf-ko-2.rlp-net.net [217.198.247.69]
  4     10 ms      2 ms     2 ms    g-hbf-mz-1.rlp-net.net [217.198.240.105]
  5      2 ms      2 ms     2 ms    g-interxion-1.rlp-net.net [217.198.240.9]
  6      4 ms      4 ms     2 ms    rlfra3.core.init7.net [80.81.192.67]
  7     12 ms     11 ms    14 ms    rlams1.core.init7.net [77.109.128.154]
  8     12 ms     11 ms    11 ms    rlams2.core.init7.net [77.109.128.146]
  9      9 ms      9 ms     9 ms    gw-wikimedia.init7.net [77.109.134.114]
 10      9 ms     13 ms     9 ms    ae1-403.cr2-esams.wikimedia.org [91.198.174.254]
 11     16 ms      9 ms    10 ms    text-lb.esams.wikimedia.org [91.198.174.192]

Trace complete.
C:\>

```

6. Home and University network : mac address of the device that is acting as net-

work gateway is 90:00:4E:CF:A9:D7 (ipconfig)

```
Administrator: Command Prompt

C:\>ipconfig /all

Windows IP Configuration

Host Name . . . . . : Shreya-U010
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No

Wireless LAN adapter Wireless Network Connection:

Connection-specific DNS Suffix . :
Description . . . . . : Atheros AR9285 Wireless Network Adapter
Physical Address. . . . . : 90-00-4E-CF-A9-D7
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::341f:b3b4:a9b5:dab1%12(Preferred)
IPv4 Address. . . . . : 192.168.1.100(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Tuesday, November 01, 2016 8:57:44 PM
Lease Expires . . . . . : Wednesday, November 02, 2016 8:57:44 PM
Default Gateway . . . . . : fe80::acfb:4dff:fe72:b2f6%12
                          192.168.1.1
DHCP Server . . . . . : 192.168.1.1
DHCPv6 Iaid . . . . . : 361758798
DHCPv6 Client DUID. . . . . : 00-01-00-01-15-BD-86-EF-78-84-3C-E2-FC-10

DNS Servers . . . . . : 192.168.1.1
                          0.0.0.0
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Local Area Connection:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . : uni-koblenz.de
Description . . . . . : Realtek PCIe GBE Family Controller
Physical Address. . . . . : 78-84-3C-E2-FC-10
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes

Tunnel adapter isatap.uni-koblenz.de:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft ISATAP Adapter
Physical Address. . . . . : 00-00-00-00-00-00-E0
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . : Yes

Tunnel adapter Teredo Tunneling Pseudo-Interface:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Teredo Tunneling Pseudo-Interface
Physical Address. . . . . : 00-00-00-00-00-00-E0
```

```
Administrator: Command Prompt

C:\>ipconfig /all

Windows IP Configuration

    Host Name . . . . . : Shreya-UAIO
    Primary Dns Suffix . . . . . :
    Node Type . . . . . : Hybrid
    IP Routing Enabled. . . . . : No
    WINS Proxy Enabled. . . . . : No
    DNS Suffix Search List. . . . . : uni-koblenz.de

Wireless LAN adapter Wireless Network Connection:

    Connection-specific DNS Suffix . : uni-koblenz.de
    Description . . . . . : Atheros AR9285 Wireless Network Adapter
    Physical Address. . . . . : 90-00-4E-CF-A9-D7
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes
    Link-local IPv6 Address . . . . . : fe80::341f:b3b4:a9b5:dab1%12(Preferred)
    IPv4 Address. . . . . : 141.26.180.103(Preferred)
    Subnet Mask . . . . . : 255.255.240.0
    Lease Obtained. . . . . : Tuesday, November 01, 2016 8:26:25 PM
    Lease Expires . . . . . : Tuesday, November 01, 2016 9:13:55 PM
    Default Gateway . . . . . : 141.26.176.1
    DHCP Server . . . . . : 141.26.64.71
    DHCPv6 Iaid . . . . . : 361758798
    DHCPv6 Client DUID. . . . . : 00-01-00-01-15-BD-86-EF-78-84-3C-E2-FC-10

    DNS Servers . . . . . : 141.26.64.60
                           141.26.64.61
                           141.26.64.2
                           141.26.64.1
                           141.26.64.2
    NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Local Area Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . : uni-koblenz.de
    Description . . . . . : Realtek PCIe GBE Family Controller
    Physical Address. . . . . : 78-84-3C-E2-FC-10
    DHCP Enabled. . . . . : Yes
    Autoconfiguration Enabled . . . . : Yes

Tunnel adapter isatap.uni-koblenz.de:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix . : uni-koblenz.de
    Description . . . . . : Microsoft ISATAP Adapter
    Physical Address. . . . . : 00-00-00-00-00-00-E0
    DHCP Enabled. . . . . : No
    Autoconfiguration Enabled . . . . : Yes

Tunnel adapter Teredo Tunneling Pseudo-Interface:

    Media State . . . . . : Media disconnected
```

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.

Answer :

```
import matplotlib.pyplot as plt
import numpy as np
import random as rn

x=set()
for m in range(0,10):
    x.add(rn.randint(0,90))
x=sorted(x)
m=list(x)

ySin = np.sin(m)
yCos = np.cos(m)

#Set title and plot the graph, set red color for Sin and Blue for Cos
plt.title('Sin and Cos functions')
plt.plot(x, ySin,'r' ,x,yCos,'b')

# Get plot axis and change y axis limits
x1,x2,y1,y2 = plt.axis()
plt.axis((x1,x2,-2,2))

#Add labels, legend and show the graph
plt.xlabel('X - Axis')
plt.ylabel('Y - Axis')
plt.legend(['Sine', 'Cosine'])
plt.show()
```

Important Notes

Submission

- Solutions have to be checked into the github repository. Use the directory name `groupname/assignmentBy Group "Charlie"/` 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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