Usman Institute of Technology

Department of Computer Science

Course Code: CS222

Course Title: Data Communication & Computer Networks

Fall 2022

Lab 01

Objective:

This practical performance exposes the students to some of the diagnostic commands that are utilized to diagnose/troubleshoot the problems.

Student Information

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Assessment

Marks Obtained	
Remarks	
Signature	

Department of Computer Science
CS222 – Data Communication & Computer Networks

Lab 01

Instructions

- Come to the lab in time. Students who are late more than 20 minutes, will not be allowed to attend the lab.
- Students have to perform the examples and exercises by themselves.
- Lab work must be submitted on the same day it is performed.

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1. Objective

This practical performance exposes the students to some of the diagnostic commands that are utilized to diagnose/troubleshoot the problems.

2. Labs Descriptions

1. Tracert : It is a utility that can be used to determine the route and hop count to a destination n. Example of tracert is shown below:

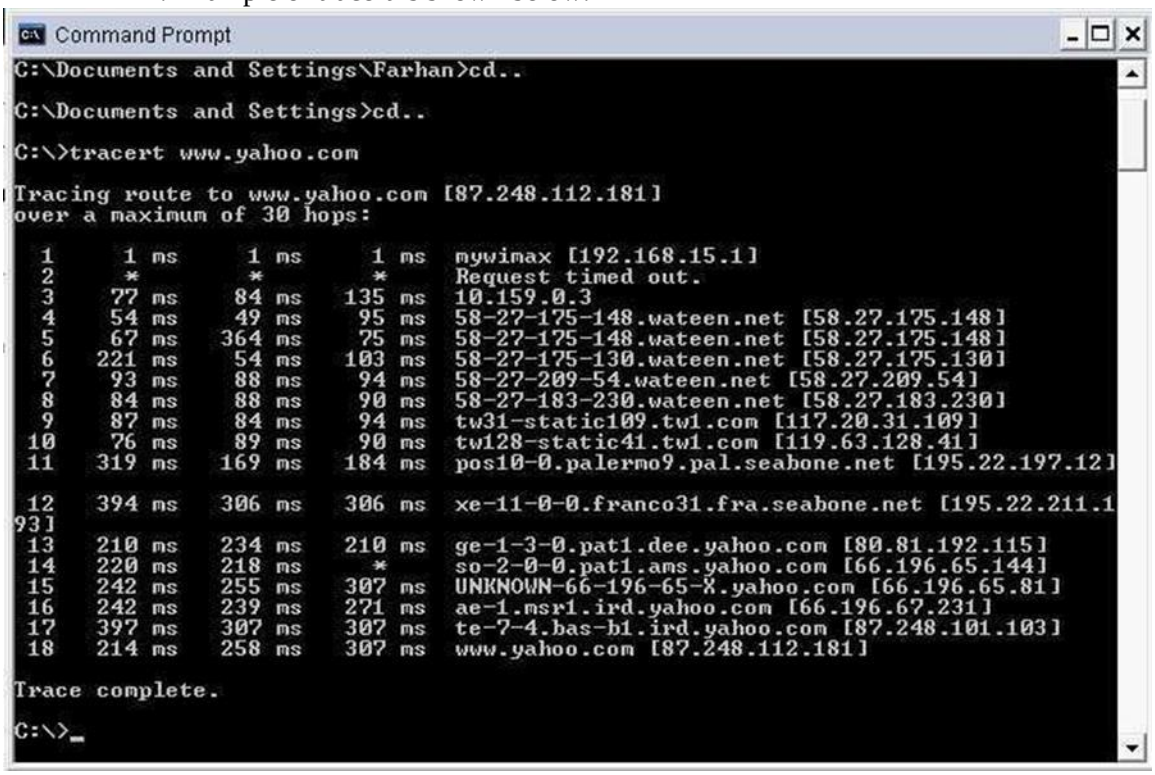

Figure 1: Tracert command being used to depict the hops required to reach the destination

Figure 2: Tracert command used with IP address instead of domain name

2. PING:

PING stands for "Packet Internet Groper" and it is a diagnostic tool that is used to check whether a host is reachable or not. Target can be either a name or IP address.

Syntax:
Ping www.uit.edu

Ping ip address (you can mention ip address instead of domain name)

Ping ip address or Domain name –n number of packets you want to sent

Ping –a ip address.(will first resolve ip to its domain name)

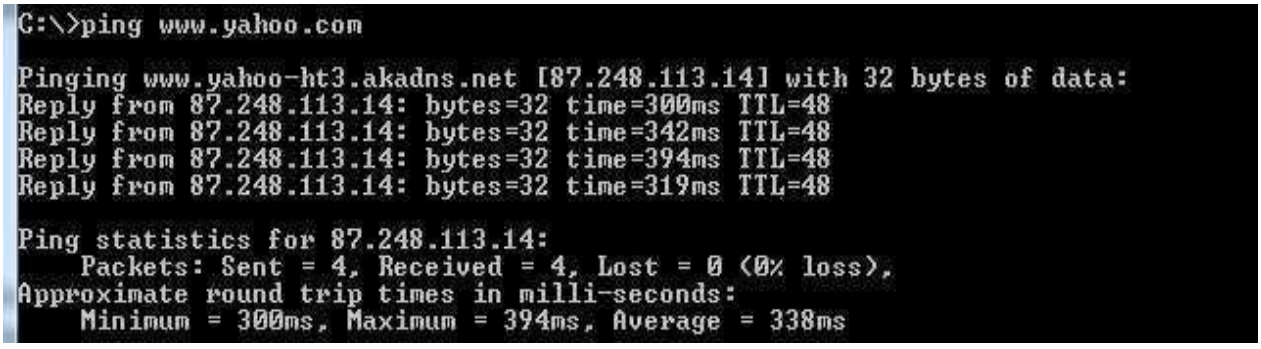

Figure 3: PING using domain name

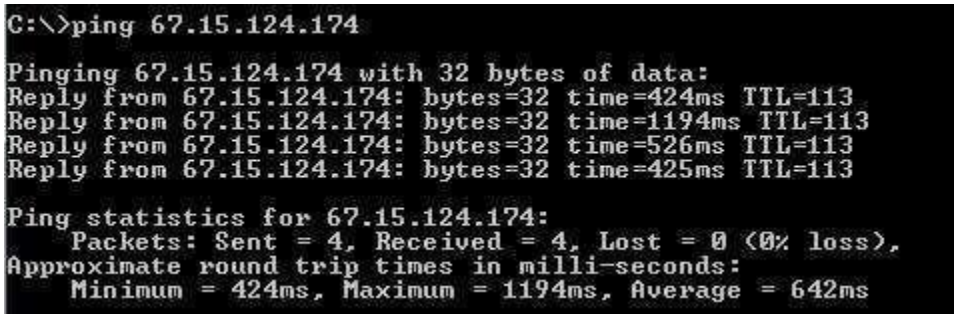

Figure 4: PING using IP Address

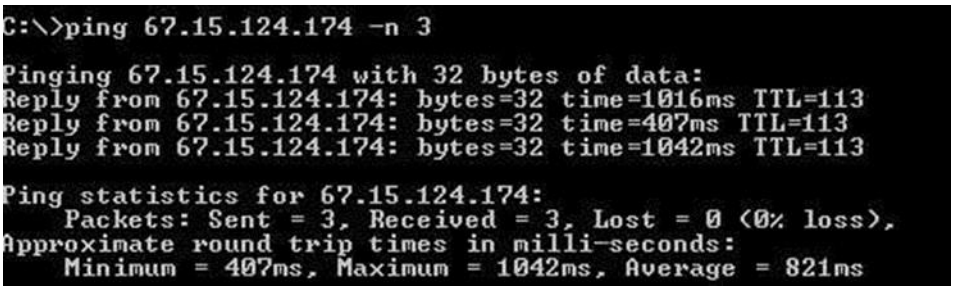

Figure 5: PING using IP Address and specifying number of packets.

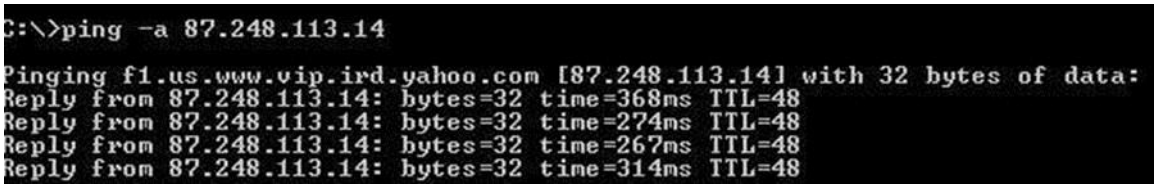

Figure 6: PING using a variant -a will yield domain name associated with IP and rest is same as above.

3. ARP

ARP is “Address Resolution Protocol”. It is used to resolve IP address to MAC address.

arp –a (will show a list of relevant IP addresses and their corresponding MAC addresses)

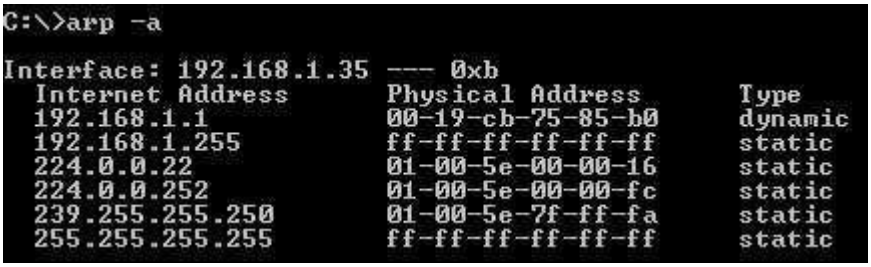

Figure 7: arp with -a variant can show IP and Corresponding MAC address

4. NETSTAT

This command gives you information about transport protocols (TCP and UDP) and their present state like close or listening etc.

Netstat –a Shows the status of port along with the devices local address and the address with which communication is being done.

Netstat -e will yield Ethernet statistics that is number of bytes sent and received

Netstat -r To see routing table information and interface detail use following command

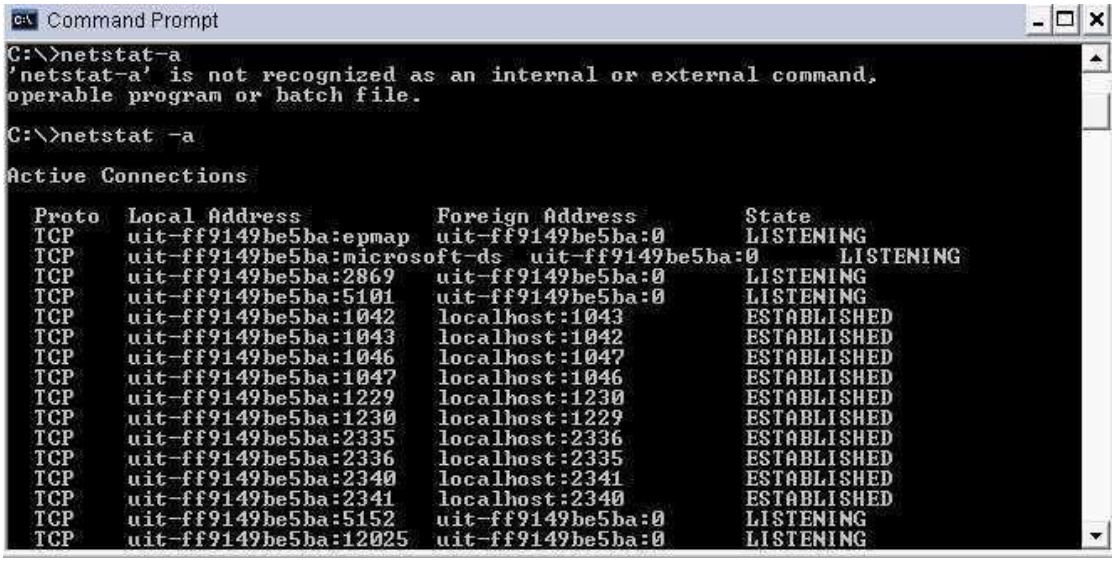

Figure 8: netstat with -a variant can show IP and Corresponding MAC address

```
   ESTABLISHED
          The socket has an established connection.
   SYN_SENT
          The socket is actively attempting to establish a connection.
   SYN_RECV
          A connection request has been received from the network.
   FIN_WAIT1
          The socket is closed, and the connection is shutting down.
   FIN_WAIT2
          Connection is closed, and the socket is waiting for a shutdown
from the remote end.
   TIME_WAIT
          The socket is waiting after close to handle packets still in the
network.
   CLOSE The socket is not being used.
   CLOSE_WAIT
          The remote end has shut down, waiting for the socket to close.
   LAST_ACK
          The remote end has shut down, and the socket is closed. Waiting
for acknowledgement.
   LISTEN The  socket is listening for incoming connections.  Such sockets
are  not  included  in  the  output  unless  you   specify   the
          --listening (-l) or --all (-a) option.
   CLOSING
          Both  sockets are shut down but we still don't have all our data
sent.
   UNKNOWN
          The state of the socket is unknown
```

Figure 9: Depicting the different status of ports

```
C:\>netstat -e
Interface Statistics

                           Received            Sent

Bytes                     8924224          2033196
Unicast packets             12668            11912
Non-unicast packets          1148             1456
Discards                        0                0
Errors                          0                4
Unknown protocols               0
```

Figure 10: Showing Ethernet statistics that is number of bytes sent and received

```
C:\>netstat -r
===========================================================================
Interface List
 11 ...00 1f 3a 8a 21 55 ......Atheros AR5007EG Wireless Network Adapter
  1 ...........................Software Loopback Interface 1
 15 ...00 00 00 00 00 00 00 e0  isatap.{CD9D2BF2-669B-4AE0-8A5B-F702AC7DB067}
 16 ...00 00 00 00 00 00 00 e0  isatap.zyxel.com
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0    192.168.1.1    192.168.1.35     25
        127.0.0.0        255.0.0.0        On-link       127.0.0.1    306
        127.0.0.1  255.255.255.255        On-link       127.0.0.1    306
  127.255.255.255  255.255.255.255        On-link       127.0.0.1    306
      192.168.1.0    255.255.255.0        On-link    192.168.1.35    281
     192.168.1.35  255.255.255.255        On-link    192.168.1.35    281
    192.168.1.255  255.255.255.255        On-link    192.168.1.35    281
        224.0.0.0        240.0.0.0        On-link       127.0.0.1    306
        224.0.0.0        240.0.0.0        On-link    192.168.1.35    281
  255.255.255.255  255.255.255.255        On-link       127.0.0.1    306
  255.255.255.255  255.255.255.255        On-link    192.168.1.35    281
===========================================================================
```

Figure 11: To see routing table information and interface detail use following command

5. Nslookup

   Nslookup utility is used to test and troubleshoot domain name servers. Nslookup has two modes. Interactive mode enables you to query name servers for information about hosts and domains, or to print a list of hosts in a domain. Non- interactive mode prints only the name and requested details for one host or domain. Non-interative mode is useful for a single query.

   To enter the interactive mode of Nslookup, type nslookup without any arguments at a command prompt, or use only a hypen as the first argument and specify a domain name server in the second. The default DNS name server will be used if you don't enter anything for the second argument.

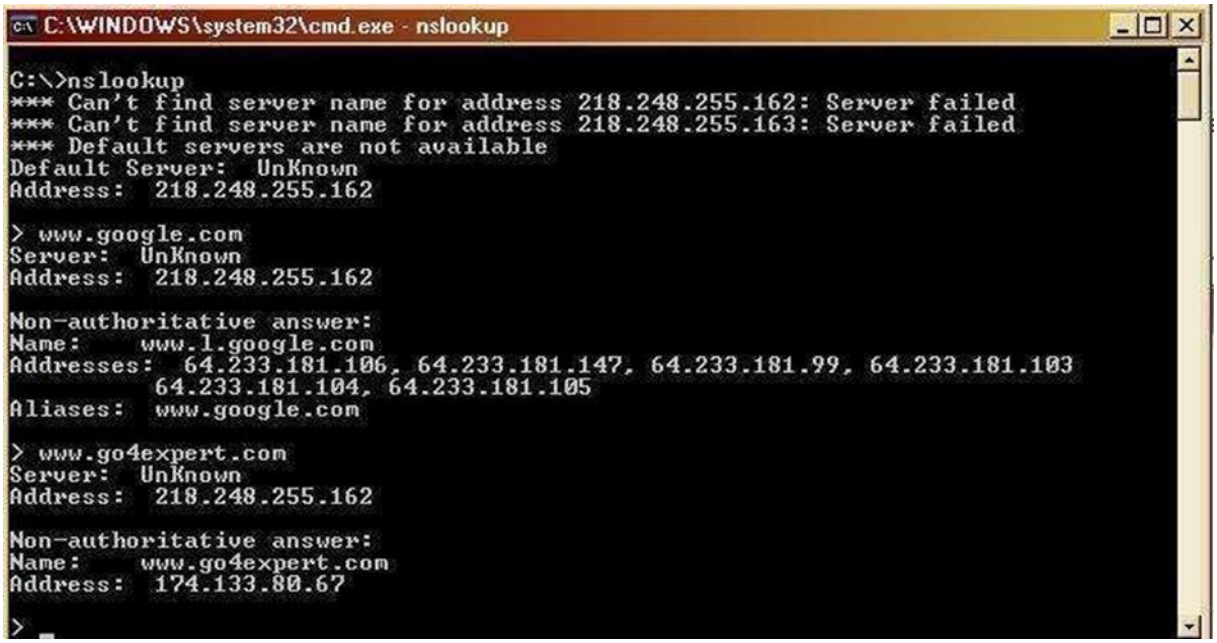

Figure 12: nslookup command being used.

To use non-interactive mode, in the first argument, enter the name or IP address of the computer you want to look up. In the second argument, enter the name or IP address of a domain name server. The default DNS name server will be used if you don't enter anything for the second argument.

Figure 13: nslookup being used with domain name

6. Ftp

Transfers files to and from a computer running a File Transfer Protocol (FTP) server service such as Internet Information Services. Ftp can be used interactively or in batch mode by processing ASCII text files. Syntax

ftp [-v] [-d] [-i] [-n] [-g] [-s:FileName] [-a] [-w:WindowSize] [-A] [Host]

Parameters

-v : Suppresses the display of FTP server responses.

-d : Enables debugging, displaying all commands passed between the FTP client and FTP server.

-i : Disables interactive prompting during multiple file transfers.

-n : Suppresses the ability to log on automatically when the initial connection is made.

-g : Disables file name globbing. Glob permits the use of the asterisk (*) and question mark (?) as wildcard characters in local file and path names.

-s: FileName : Specifies a text file that contains ftp commands. These commands run automatically after ftp starts. This parameter allows no spaces. Use this parameter instead of redirection (<).

-a : Specifies that any local interface can be used when binding the FTP data connection.

-w: WindowSize : Specifies the size of the transfer buffer. The default window size is 4096 bytes.

-A : Logs onto the FTP server as anonymous.

Host : Specifies the computer name, IP address, or IPv6 address of the FTP server to which to connect. The host name or address, if specified, must be the last parameter on the line.

/? : Displays help at the command prompt.

FTP sub commands

Put	Copies a file on your local host to the foreign host.
Get	Display the name of the current working directory
Block	Sets the data transfer mode to block mode
Open	Opens a connection to a foreign host.
Pwd	Displays the name of the active working directory on the foreign host.
Bye	Leaves the FTP command environment

Table1: FTP commands

Lab tasks

Task 01: Explore the syntax **"ipconfig"** and **"winipcfg".** Note down your observations?

Ipconfig itself gives the basic network information of your computer, /all shows detailed info, /renew renews every adapter, /allcompartments shows info about all compartments, adding /all after / allcompartments

Provides even firther detailed info, /renew <> * renews connection with the matc provided /release *<>* releases connection with the match.

Winipcfg is a discontinued command/exe that was available in windows 95, 98, ME and NT. it ptoduces same result to that produced with ipconfig /all

Task 02: Answer following questions

1) State the size of MAC address both in Bytes and Bits
   6 Bytes and 6*8 = 48 Bits

2) Differentiate between IP and MAC address
   Mac address is a physical address allocated to every device on its manufacture while IP address is used to identify a device over a network

3) What is a gateway
   Gateway is like a boundary of the network which manages inflows and outflows from and to the network.

4) What is the purpose of loop-back address?
   It is used for testing and development purposes over your localhost. From its name its clear that we send the packets and they will loopback and received by our own address

5) PING stands for Packet Internet Groper.

6) What is the difference between ipconfig and ipconfig/all commands?
   Ipconfig gives the information about the network of your computer while ipconfig/all displays the basic information as well as additional information about DNS server, DHCP server etc.

7) Explore Nbtstat and finger command and explain its purpose.

Nbtstat is a TCP/IP utility that displays current TCP/IP connections and statistics using NetBIOS over TCP/IP (NetBT). It helps troubleshoot NetBIOS name resolution issues

Finger command provides information about a usrs who are currently logged in. It provides general info about the users like their login name their username, login time, idle time etc

Task 03: execute the tasks mentioned in the manual and observe the output

```
Z:\>tracert www.yahoo.com

Tracing route to new-fp-shed.wg1.b.yahoo.com [98.137.11.164]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  172.16.32.100
  2    11 ms     1 ms     2 ms  103.4.93.49.pern.pk [103.4.93.49]
  3     2 ms     1 ms     1 ms  172.31.240.64
  4     1 ms     1 ms     1 ms  tw129-static237.tw1.com [119.63.129.237]
  5     1 ms     1 ms     1 ms  110.93.252.146
  6     7 ms     2 ms     1 ms  tw255-static164.tw1.com [110.93.255.164]
  7   124 ms   122 ms   122 ms  tw255-static175.tw1.com [110.93.255.175]
  8   124 ms   124 ms   124 ms  ge-1-3-0.pat1.dee.yahoo.com [80.81.192.115]
  9     *      116 ms   116 ms  ae-0.pat2.dez.yahoo.com [209.191.112.7]
 10   125 ms   125 ms   125 ms  ae-3.pat2.frz.yahoo.com [209.191.112.25]
 11   210 ms   211 ms   210 ms  ae-11.pat1.dce.yahoo.com [209.191.64.24]
 12   216 ms   217 ms   217 ms  ae-14.pat2.che.yahoo.com [209.191.64.39]
 13     *      245 ms   244 ms  209.191.68.1
 14     *      263 ms   269 ms  ae-8.pat2.gqb.yahoo.com [209.191.64.234]
 15   283 ms   276 ms   269 ms  et-1-0-0.msr1.gq1.yahoo.com [66.196.67.101]
 16   261 ms   261 ms   261 ms  et-0-0-0.clr1-a-gdc.gq2.yahoo.com [98.136.158.181]
 17   269 ms   269 ms   269 ms  lo0.fab5-1-gdc.gq2.yahoo.com [98.136.159.243]
 18   263 ms   269 ms     *     usw1-1-lbc.gq2.yahoo.com [98.136.158.192]
 19   263 ms   263 ms   263 ms  media-router-fp73.prod.media.vip.gq1.yahoo.com [98.137.11.164]

Trace complete.

Z:\>
```

```
Z:\>tracert 67.15.124.174

Tracing route to ev1s-67-15-124-174.theplanet.com [67.15.124.174]
over a maximum of 30 hops:

  1    <1 ms    <1 ms    <1 ms  172.16.32.100
  2    <1 ms    <1 ms    <1 ms  static-225-97-24-103.ebonenet.com [103.24.97.225]
  3    63 ms    39 ms    29 ms  172.19.21.201
  4   121 ms    89 ms    58 ms  172.18.1.29
  5   126 ms   102 ms   149 ms  khi77.pie.net.pk [202.125.137.148]
  6     *        *        *     Request timed out.
  7   106 ms   175 ms   244 ms  10.253.4.24
  8   306 ms   193 ms   304 ms  36351.sgw.equinix.com [27.111.228.69]
  9   112 ms   338 ms     *     ae5.cbs01.eq01.sng02.networklayer.com [169.45.19.172]
 10   300 ms   281 ms   283 ms  ae0.cbs01.eq01.tok01.networklayer.com [169.45.19.182]
 11   271 ms   288 ms     *     ae8.cbs02.eq01.tok01.networklayer.com [169.53.16.146]
 12   386 ms   390 ms     *     a.12.2da9.ip4.static.sl-reverse.com [169.45.18.10]
 13   267 ms   267 ms   307 ms  ae0.cbs02.cs01.lax01.networklayer.com [50.97.17.86]
 14   357 ms   343 ms   337 ms  ec.10.35a9.ip4.static.sl-reverse.com [169.53.16.236]
 15   277 ms   266 ms   265 ms  ae2.cbs01.dr01.dal04.networklayer.com [169.45.18.6]
 16     *        *        *     Request timed out.
 17     *        *        *     Request timed out.
 18     *        *        *     Request timed out.
 19     *        *        *     Request timed out.
 20     *        *        *     Request timed out.
 21     *        *        *     Request timed out.
 22     *        *        *     Request timed out.
 23     *        *        *     Request timed out.
 24     *        *        *     Request timed out.
 25     *        *        *     Request timed out.
 26     *        *        *     Request timed out.
 27     *        *        *     Request timed out.
 28     *        *        *     Request timed out.
 29     *        *        *     Request timed out.
 30     *        *        *     Request timed out.

Trace complete.
```

```
Z:\>ping www.yahoo.com

Pinging new-fp-shed.wg1.b.yahoo.com [98.137.11.163] with 32 bytes of data:
Reply from 98.137.11.163: bytes=32 time=263ms TTL=49
Reply from 98.137.11.163: bytes=32 time=264ms TTL=49
Reply from 98.137.11.163: bytes=32 time=263ms TTL=49
Reply from 98.137.11.163: bytes=32 time=263ms TTL=49

Ping statistics for 98.137.11.163:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 263ms, Maximum = 264ms, Average = 263ms

Z:\>_
```

```
Z:\>ping 67.15.124.174

Pinging 67.15.124.174 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 67.15.124.174:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

```
Z:\>ping 67.15.124.174 -n 3

Pinging 67.15.124.174 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 67.15.124.174:
    Packets: Sent = 3, Received = 0, Lost = 3 (100% loss),
```

```
Z:\>ping -a 87.248.113.14

Pinging et23-1.bas1-1-edg.amb.yahoo.com [87.248.113.14] with 32 bytes of data:
Reply from 87.248.113.14: bytes=32 time=149ms TTL=56
Reply from 87.248.113.14: bytes=32 time=123ms TTL=56
Reply from 87.248.113.14: bytes=32 time=124ms TTL=56
Reply from 87.248.113.14: bytes=32 time=175ms TTL=56

Ping statistics for 87.248.113.14:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 123ms, Maximum = 175ms, Average = 142ms
```

```
Z:\>arp -a

Interface: 192.168.40.1 --- 0x8
  Internet Address      Physical Address      Type
  192.168.40.255        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
  239.193.8.251         01-00-5e-41-08-fb     static
  239.193.9.252         01-00-5e-41-09-fc     static
  239.242.6.7           01-00-5e-72-06-07     static
  239.255.255.250       01-00-5e-7f-ff-fa     static

Interface: 172.16.34.21 --- 0xc
  Internet Address      Physical Address      Type
  172.16.32.7           00-0c-29-d5-26-69     dynamic
  172.16.32.8           00-0c-29-e4-60-13     dynamic
  172.16.32.11          00-0c-29-b4-38-f6     dynamic
  172.16.32.26          00-0c-29-a7-05-93     dynamic
  172.16.32.27          00-0c-29-e3-48-83     dynamic
  172.16.32.100         00-09-0f-09-00-03     dynamic
  172.16.32.200         98-90-96-a7-83-4f     dynamic
  172.16.33.1           34-17-eb-cb-88-21     dynamic
  172.16.33.6           34-17-eb-b3-05-27     dynamic
  172.16.33.30          34-17-eb-a4-11-3b     dynamic
  172.16.33.37          34-17-eb-a6-ba-89     dynamic
  172.16.33.43          34-17-eb-b3-51-01     dynamic
  172.16.33.44          78-45-c4-30-25-a0     dynamic
  172.16.33.45          34-17-eb-a6-b8-9e     dynamic
  172.16.33.51          34-17-eb-a4-11-1e     dynamic
  172.16.33.57          34-17-eb-b3-d9-75     dynamic
  172.16.33.64          98-90-96-ce-af-a3     dynamic
  172.16.33.66          e8-de-27-01-ff-af     dynamic
  172.16.33.99          34-17-eb-b4-33-65     dynamic
  172.16.34.1           88-51-fb-68-be-31     dynamic
  172.16.34.4           10-60-4b-5e-f9-af     dynamic
  172.16.34.8           74-46-a0-a6-9a-f4     dynamic
```

```
Z:\>netstat -a

Active Connections

  Proto  Local Address          Foreign Address        State
  TCP    0.0.0.0:80             cl4-21:0               LISTENING
  TCP    0.0.0.0:135            cl4-21:0               LISTENING
  TCP    0.0.0.0:444            cl4-21:0               LISTENING
  TCP    0.0.0.0:445            cl4-21:0               LISTENING
  TCP    0.0.0.0:903            cl4-21:0               LISTENING
  TCP    0.0.0.0:913            cl4-21:0               LISTENING
  TCP    0.0.0.0:3073           cl4-21:0               LISTENING
  TCP    0.0.0.0:5040           cl4-21:0               LISTENING
  TCP    0.0.0.0:7680           cl4-21:0               LISTENING
  TCP    0.0.0.0:49664          cl4-21:0               LISTENING
  TCP    0.0.0.0:49665          cl4-21:0               LISTENING
  TCP    0.0.0.0:49666          cl4-21:0               LISTENING
  TCP    0.0.0.0:49667          cl4-21:0               LISTENING
  TCP    0.0.0.0:49668          cl4-21:0               LISTENING
  TCP    0.0.0.0:49669          cl4-21:0               LISTENING
  TCP    0.0.0.0:49672          cl4-21:0               LISTENING
  TCP    0.0.0.0:49674          cl4-21:0               LISTENING
  TCP    0.0.0.0:52626          cl4-21:0               LISTENING
  TCP    127.0.0.1:3306         cl4-21:0               LISTENING
  TCP    127.0.0.1:30523        cl4-21:0               LISTENING
  TCP    127.0.0.1:49682        cl4-21:0               LISTENING
  TCP    127.0.0.1:49785        cl4-21:0               LISTENING
  TCP    127.0.0.1:56522        cl4-21:0               LISTENING
  TCP    172.16.34.21:139       cl4-21:0               LISTENING
```

```
Z:\>netstat -e
Interface Statistics

                           Received            Sent

Bytes                    1706880945        97853084
Unicast packets             1060875          565990
Non-unicast packets         1988990           17119
Discards                        760               0
Errors                            0               0
Unknown protocols                 0
```

```
Z:\>netstat -r
===========================================================================
Interface List
 12...88 51 fb 70 b2 ab ......Intel(R) 82579LM Gigabit Network Connection
  8...00 50 56 c0 00 01 ......VMware Virtual Ethernet Adapter for VMnet1
 13...00 50 56 c0 00 08 ......VMware Virtual Ethernet Adapter for VMnet8
  1...........................Software Loopback Interface 1
===========================================================================

IPv4 Route Table
===========================================================================
Active Routes:
Network Destination        Netmask          Gateway       Interface  Metric
          0.0.0.0          0.0.0.0    172.16.32.100     172.16.34.21    281
        127.0.0.0        255.0.0.0         On-link         127.0.0.1    331
        127.0.0.1  255.255.255.255         On-link         127.0.0.1    331
  127.255.255.255  255.255.255.255         On-link         127.0.0.1    331
      172.16.32.0    255.255.240.0         On-link      172.16.34.21    281
     172.16.34.21  255.255.255.255         On-link      172.16.34.21    281
    172.16.47.255  255.255.255.255         On-link      172.16.34.21    281
     192.168.40.0    255.255.255.0         On-link      192.168.40.1    291
     192.168.40.1  255.255.255.255         On-link      192.168.40.1    291
   192.168.40.255  255.255.255.255         On-link      192.168.40.1    291
     192.168.93.0    255.255.255.0         On-link      192.168.93.1    291
     192.168.93.1  255.255.255.255         On-link      192.168.93.1    291
   192.168.93.255  255.255.255.255         On-link      192.168.93.1    291
        224.0.0.0        240.0.0.0         On-link         127.0.0.1    331
        224.0.0.0        240.0.0.0         On-link      172.16.34.21    281
        224.0.0.0        240.0.0.0         On-link      192.168.93.1    291
        224.0.0.0        240.0.0.0         On-link      192.168.40.1    291
  255.255.255.255  255.255.255.255         On-link         127.0.0.1    331
  255.255.255.255  255.255.255.255         On-link      172.16.34.21    281
  255.255.255.255  255.255.255.255         On-link      192.168.93.1    291
  255.255.255.255  255.255.255.255         On-link      192.168.40.1    291
===========================================================================
Persistent Routes:
  Network Address          Netmask  Gateway Address  Metric
          0.0.0.0          0.0.0.0    172.16.32.100  Default
===========================================================================
```

```
C:\Users\ADMIN>nslookup blurryface.netlify.app
Server:  UnKnown
Address:  192.168.1.1

Non-authoritative answer:
Name:    blurryface.netlify.app
Addresses:  2406:da18:880:3802:bc32:fc44:302b:aad2
          2406:da18:880:3801:52c7:4593:210d:6aae
          3.0.239.142
          34.124.149.177
```