

# **Lab Manual for Computer Communication and Networking**

## **Lab No. 2**

### **Diagnostic Utilities of Networks**

# BAHRIA UNIVERSITY KARACHI CAMPUS

## Department of Software Engineering

### COMPUTER COMMUNICATION AND NETWORKS

#### LAB EXPERIMENT # 2

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#### Diagnostic Utilities of a Network

##### OBJECTIVE:

- To learn about and practice some of the Diagnostic Utilities for use with computer networks.

##### THEORY:

Following table gives the descriptions of different diagnostic Utilities

Diagnostics Utility	Functions
IPCONFIG	Verifies a TCP/IP configuration, including DHCP, DNS, and WINS server addresses.
FINGER	Retrieves system information from a remote computer that supports the TCP/IP Finger service.
NSLOOKUP	Examines entries in the DNS Computerbase that pertain to a host or domain.
HOSTNAME	Returns the local computer's hostname for authentication.
NETSTAT	Displays protocol statistics and the current state of TCP/IP connections.
Route	Views or modifies the local routing table
Tracert	Verifies the route used from the local host to a remote host.

#### PING

##### Objective:

Verify connections to a remote computer or computers

## **Theory:**

The ping command verifies connections to remote computer or computers, by sending ICMP echo packets to the computer and listening for echo reply packets. Ping waits for up to 1 second for each packet sent and prints the number of packets transmitted and received. Each received packet is validated against the transmitted message. By default, four echo packets containing 64 bytes of Computer (a periodic uppercase sequence of alphabetic characters) are transmitted.

You can use the ping utility to test both the computer name and the IP address of the computer. If the IP address is verified but the computer name is not, you may have a name resolution problem. In this case, be sure that the computer name you are querying is in either the local HOSTS file or in the DNS Computerbase.

The Ping stands for Packet Internet Groper.

## **Parameters:**

***-t***

Pings the specified computer until interrupted.

***-a***

Resolve addresses to computer names.

***-n count***

Sends the number of ECHO packets specified by count. The default is 4.

***-l length***

Sends ECHO packets containing the amount of Computer specified by length. The default is 64 bytes; the maximum is 8192.

***-f***

Sends a Do Not Fragment flag in the packet. The packet will not be fragmented by gateways on the route.

***-i ttl***

Sets the Time to Live field to the value specified by TTL.

***-v tos***

Sets the Type of Service field to the value specified by TOS.

***-r count***

Records the route of the outgoing packet and the returning packet in the Record Route field. A minimum of 1 and a maximum of 9 computers may be specified by count.

***-s count***

Specifies the timestamp for the number of hops specified by count.

***-j computer-list***

Routes packets via the list of computers specified by computer-list. Consecutive computers may be separated by intermediate gateways (loose source routed). The maximum number allowed by IP is 9.

***-k computer-list***

Routes packets via the list of computers specified by computer-list. Consecutive computers may not be separated by intermediate gateways (strict source routed). The maximum number allowed by IP is 9.

***-w timeout***

Specifies a timeout interval in milliseconds.

***destination-list***

Specifies the remote computers to ping.

## IPCONFIG

### Theory

This diagnostic command displays all current TCP/IP network configuration values. This command is of use on systems running DHCP, allowing users to determine which TCP/IP configuration values have been configured by DHCP.

ipconfig [/all | /renew [adapter] | /release [adapter]]

### Parameters:

***all***

Produces a full display. Without this switch, ipconfig displays only the IP address, subnet mask, and default gateway values for each network card.

***renew [adapter]***

Renews DHCP configuration parameters. This option is available only on systems running the DHCP Client service. To specify an adapter name, type the adapter name that appears when you use ipconfig without parameters.

***release [adapter]***

Releases the current DHCP configuration. This option disables TCP/IP on the local system and is available only on DHCP clients. To specify an adapter name, type the adapter name that appears when you use ipconfig without parameters.

With no parameters, the ipconfig utility presents all the current TCP/IP configuration values to the user, including IP address and subnet mask. This utility is especially useful on systems running DHCP, allowing users to determine which values have been configured by DHCP.

## NSLOOKUP

This diagnostic tool displays information from Domain Name System (DNS) name servers. Before using this tool, you should be familiar with how DNS works. Nslookup is available only if the TCP/IP protocol has been installed.

*nslookup [-option ...] [computer-to-find | - [server]]*

## **Modes**

Nslookup has two modes: *interactive* and *non-interactive*.

If you only need to look up a single piece of Computer, use non-interactive mode. For the first argument, type the name or IP address of the computer to be looked up. For the second argument, type the name or IP address of a DNS name server. If you omit the second argument, the default DNS name server will be used.

If you need to look up more than one piece of Computer, you can use interactive mode. Type a hyphen (-) for the first argument and the name or IP address of a DNS name server for the second argument. Or, omit both arguments (the default DNS name server will be used).

## **Nslookup Commands**

Nslookup: finger

Connects with the finger server on the current computer. The current computer is defined when a previous lookup for a computer was successful and returned address information (see the set querytype=A command).

***finger [username] [> filename] | [>> filename]***

Nslookup: ls

Lists information for a DNS domain. The default output contains computer names and their IP addresses. (When output is directed to a file, hash marks are printed for every 50 records received from the server.)

***ls [option] dnsdomain [> filename] | [>> filename]***

## **NSLOOKUP Syntax**

*Nslookup [-option ...] [computer-to-find | - [server]]*

## **To use NSLOOKUP in command mode**

- ◆ At a command prompt, modify the properties so that it has a screen buffer size of 50  
Use the Layout property page to do this
- ◆ If the command prompt is not full-screen, press ALT+ENTER

## **Nslookup hostx**

Where hostx is a host in your domain. NSLOOKUP will return the IP address of the computer hostx because the information is stored in the DNS Computerbase.

- ◆ Exit the command prompt

## **HOSTNAME**

It returns the local computer host name.

## **TRACERT**

Verifies the route used from the local host to a remote host.

## **IFCONFIG**

### **SYNOPSIS**

```
ifconfig [interface]
ifconfig interface [atype] options | address ...
```

### **DESCRIPTION**

Ifconfig is used to configure the kernel-resident network interfaces. It is used at boot time to set up interfaces as necessary. After that, it is usually only needed when debugging or when system tuning is needed. If no arguments are given, ifconfig displays the status of the currently active interfaces. If a single interface argument is given, it displays the status of the given interface only; if a single -a argument is given, it displays the status of all interfaces, even those that are down. Otherwise, it configures an interface down.

### **OPTIONS**

#### ***interface***

The name of the interface. This is usually a driver name followed by a unit number, for example eth0 for the first Ethernet interface up. This flag causes the interface to be activated. It is implicitly specified if an address is assigned to the interface down. This flag causes the driver for this interface to be shut down.

**Who** - It shows who is logged on.

**-m** Same as 'who am i'.

**-q, --count**

Print only the login names and the number of users logged on. Overrides all other options.

**-s** Ignored; for compatibility with other versions of who.

### **Lab Assignments:**

- Run the following commands on the command prompt of your PCs and attach snapshots of the result:
  - i. ping www.google.com
  - ii. tracert www.yahoo.com
  - iii. ping -i 6 www.facebook.com, did you receive the correct reply? If not, explain why.
  - iv. nslookup www.live.com, did you result show 'Non-authoritative answer'? If yes, explain what does it indicate, you are advised to browse the internet to attain this answer.
- Differentiate between Ping and PathPing commands.
- Find all Active/ Used IP addresses on your network.
- How to verify connection with remote computer?

### **NOTE:**

The commands must be run on the command prompt and clear snapshots with headings must be attached with proper numbering. Answers to the other questions must be given on a separate sheet, typed or handwritten with proper numbering. Any other formats apart from the above will not be entertained.

**Solution: -**

**Question 1(Commands): -**

- 1) Ping [www.google.com](http://www.google.com)

```
Pinging www.google.com [142.250.201.132] with 32 bytes of data:
Reply from 142.250.201.132: bytes=32 time=18ms TTL=116
Reply from 142.250.201.132: bytes=32 time=17ms TTL=116
Request timed out.
Reply from 142.250.201.132: bytes=32 time=17ms TTL=116

Ping statistics for 142.250.201.132:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 17ms, Maximum = 18ms, Average = 17ms
```

## 2) `tracert` [www.yahoo.com](http://www.yahoo.com)

```
Tracing route to new-fp-shed.wg1.b.yahoo.com [87.248.100.215]
over a maximum of 30 hops:

  0  <1 ms    <1 ms    <1 ms    10.10.0.1
  1  2 ms     1 ms     2 ms     bimcs.edu.pk [111.68.108.81]
  2  4 ms     1 ms     1 ms     172.31.253.21
  3  1 ms     1 ms     <1 ms    tw129-static237.tw1.com [119.63.129.237]
  4  9 ms     1 ms     1 ms     110.93.252.190
  5  *        2 ms     *        tw255-static230.tw1.com [110.93.255.230]
  6  *        130 ms   126 ms   213.144.176.232
  7  129 ms   129 ms   129 ms   ae23.franco31.fra.seabone.net [195.22.211.48]
  8  122 ms   *        123 ms   ge-1-3-0.pat1.dee.yahoo.com [80.81.192.115]
  9  136 ms   136 ms   *        ae-3.pat1.frz.yahoo.com [209.191.112.17]
 10  155 ms   155 ms   154 ms   ae-2.pat1.iry.yahoo.com [209.191.112.54]
 11  154 ms   *        154 ms   et-1-1-2.msr1.ir2.yahoo.com [66.196.65.19]
 12  154 ms   154 ms   *        lo0.fab3-1-gdc.ir2.yahoo.com [77.238.190.4]
 13  154 ms   154 ms   154 ms   usw1-1-lbc.ir2.yahoo.com [77.238.190.106]
 14  152 ms   153 ms   152 ms   media-router-fp73.prod.media.vip.ir2.yahoo.com [87.248.100.215]

Trace complete.
```

## 3) `ping -i 6` [www.facebook.com](http://www.facebook.com)

```
Pinging star-mini.c10r.facebook.com [157.240.227.35] with 32 bytes of data:
Reply from 110.93.255.230: TTL expired in transit.
Reply from 110.93.255.230: TTL expired in transit.
Reply from 110.93.255.230: TTL expired in transit.
Reply from 110.93.255.230: TTL expired in transit.

Ping statistics for 157.240.227.35:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
```

**Reason:** - The ping was not successful because we have mentioned the less number of TTL (in `-i` parameter) than the value required by [www.facebook.com](http://www.facebook.com).

## 4) `nslookup` [www.live.com](http://www.live.com)



```
Server: bukcad.bukc.edu.pk
Address: 10.10.0.3

Non-authoritative answer:
Name: a-0010.a-msedge.net
Addresses: 2620:1ec:c11::212
           204.79.197.212
Aliases: www.live.com
          outlook-fd-0010.live.com
```

**Reason:** - Nslookup gives the non-authoritative answer because our domain is not authorized to access the ip address of www.live.com

**Question 2: -**

**Ans:-**

Ping command sends the signal to the specified domain to test if it can connect to our domain or not while pathping prints the ip addresses of the router from which it passes (like tracert command).

**Question 3: -**

**Ans: -**

Ipconfig /all lists all the active ip addresses active on our pc. An example execution of ipconfig is as follows: -

## Windows IP Configuration

Host Name . . . . . : NCMS-SDL-046  
Primary Dns Suffix . . . . . :  
Node Type . . . . . : Hybrid  
IP Routing Enabled. . . . . : No  
WINS Proxy Enabled. . . . . : No  
DNS Suffix Search List. . . . . : ns.bugw.local

### Ethernet adapter PdaNet Broadband Connection:

Media State . . . . . : Media disconnected  
Connection-specific DNS Suffix . :  
Description . . . . . : PdaNet Broadband Adapter  
Physical Address. . . . . : 02-50-F2-3E-39-0C  
DHCP Enabled. . . . . : Yes  
Autoconfiguration Enabled . . . . : Yes

### Ethernet adapter Ethernet 4:

Connection-specific DNS Suffix . : ns.bugw.local  
Description . . . . . : Intel(R) Ethernet Connection (11) I219-LM  
Physical Address. . . . . : 50-81-40-7B-0F-DA  
DHCP Enabled. . . . . : Yes  
Autoconfiguration Enabled . . . . : Yes  
Link-local IPv6 Address . . . . . : fe80::a593:c9ea:d69c:9554%14(Preferred)  
IPv4 Address. . . . . : 10.10.3.246(Preferred)  
Subnet Mask . . . . . : 255.255.252.0  
Lease Obtained. . . . . : Thursday, October 6, 2022 11:45:10 AM  
Lease Expires . . . . . : Friday, October 7, 2022 11:45:03 AM  
Default Gateway . . . . . : fe80::16d6:4dff:fe36:f882%14  
10.10.0.1  
DHCP Server . . . . . : 192.168.8.8  
DHCPv6 IAID . . . . . : 525369664  
DHCPv6 Client DUID. . . . . : 00-01-00-01-29-12-8F-82-18-60-24-AC-BC-C1  
DNS Servers . . . . . : 10.10.0.3  
NetBIOS over Tcpip. . . . . : Enabled

### Ethernet adapter VMware Network Adapter VMnet1:

Connection-specific DNS Suffix . :  
Description . . . . . : VMware Virtual Ethernet Adapter for VMnet1  
Physical Address. . . . . : 00-50-56-C0-00-01  
DHCP Enabled. . . . . : No  
Autoconfiguration Enabled . . . . : Yes  
Link-local IPv6 Address . . . . . : fe80::3405:a2bf:3797:f891%17(Preferred)  
IPv4 Address. . . . . : 192.168.183.1(Preferred)  
Subnet Mask . . . . . : 255.255.255.0  
Default Gateway . . . . . :  
DHCPv6 IAID . . . . . : 402673750  
DHCPv6 Client DUID. . . . . : 00-01-00-01-29-12-8F-82-18-60-24-AC-BC-C1  
DNS Servers . . . . . : fec0:0:0:ffff::1%1  
fec0:0:0:ffff::2%1  
fec0:0:0:ffff::3%1  
NetBIOS over Tcpip. . . . . : Enabled

### Ethernet adapter VMware Network Adapter VMnet8:

Connection-specific DNS Suffix . :  
Description . . . . . : VMware Virtual Ethernet Adapter for VMnet8  
Physical Address. . . . . : 00-50-56-C0-00-08  
DHCP Enabled. . . . . : Yes  
Autoconfiguration Enabled . . . . : Yes

```

Link-local IPv6 Address . . . . . : fe80::b53f:46c4:de8f:1677%10(Preferred)
IPv4 Address. . . . . : 192.168.40.1(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : Thursday, October 6, 2022 11:51:38 AM
Lease Expires . . . . . : Thursday, October 6, 2022 1:21:39 PM
Default Gateway . . . . . :
DHCP Server . . . . . : 192.168.40.254
DHCPv6 IAID . . . . . : 419450966
DHCPv6 Client DUID. . . . . : 00-01-00-01-29-12-8F-82-18-60-24-AC-BC-C1
DNS Servers . . . . . : fec0:0:0:ffff::1%1
                       : fec0:0:0:ffff::2%1
                       : fec0:0:0:ffff::3%1
Primary WINS Server . . . . . : 192.168.40.2
NetBIOS over Tcpip. . . . . : Enabled

```

**Question 4: -**

**Ans: -**

**Ping** command helps us in testing if two remote computers are connected to each other and can send signals to each other. An example execution of ping is as follows: -

```

Pinging www.google.com [142.250.201.132] with 32 bytes of data:
Reply from 142.250.201.132: bytes=32 time=18ms TTL=116
Reply from 142.250.201.132: bytes=32 time=17ms TTL=116
Request timed out.
Reply from 142.250.201.132: bytes=32 time=17ms TTL=116

Ping statistics for 142.250.201.132:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 17ms, Maximum = 18ms, Average = 17ms

```

**TIME BOXING:**

Activity Name	Activity Time	Total Time
Instruments Allocation + Setting up Lab	10 mints	10 mints
Walk through Theory & Tasks (Lecture)	60 mints	60 mints
Implementation & Practice time	90 mints	80 mints
Evaluation Time	20 mints	20 mints
	Total Duration	180 mints

**Teacher Signature:** \_\_\_\_\_

**Student Registration No:** \_\_\_\_\_