Use of Route Command to test performance of the given network and Configuration of Point to Point Network

Pratik Tawde[1], Prerana Jalgaonkar[2], Samidha Shinde[3], Sheetal Bhosale[4]

[1] Lecturer, Electronics and Telecommunication Engineering, Vidyalankar Polytechnic, Maharashtra, India

[2,3,4] Lecturer, Information Technology, Vidyalankar Polytechnic, Maharashtra, India

ABSTRACT

The tracert command is a Command prompt command that shows several details about the path that a packet takes from the source computer to the destination computer. Student will be able to use route command or trace route command. This is the practical significance of this paper. The competency and practical skills of this paper are to be able to trace travelling route of transmitted message or data packet and to be able to modify entries of routing table.

Keyword: - IP address, route command, data packet

1. INTRODUCTION

Route command is only available if the TCP/IP protocol is installed as a component in the properties of a network adapter. Route command displays or modifies the computer's routing table information. For a typical computer that has a single network interface and is connected to a local area network (LAN) that has a router, the routing table is pretty simple. If user facing trouble in accessing other computers or other networks, user can use the route command to investigate bad entry that affect in the computer's routing table.

For a computer with more than one interface and that's configured to work as a router, the routing table is often a major source of trouble. Setting up the routing table properly is a key part of configuring a router to work. Earlier tracert command is used to trace the travel of packet from source to destination over a network. This command is capable to modify routing table entries hence the route command is established. To display the routing table

(both IPv4 and IPv6) in Windows, use the route print command. Route command syntax finds and displays following information

 For each entry in the routing table, five items of information are listed:

1.The destination IP address , this is the address of the destination subnet, and must be interpreted in the context of the subnet mask.

2.The subnet mask that must be applied to the destination address to determine the destination subnet

3.The IP address of the gateway to which traffic intended for the destination subnet will be sent

4.The IP address of the interface through which the traffic will be sent to the destination subnet

5.The metric, which indicates the number of hops required to reach destinations via the gateway

2. ROUTE COMMAND SYNTAX

route [-f] [-p] [-4|-6] [Command [Destination] [mask Netmask] [Gateway] [metric Metric]] [if Interface]]
Most of the times this command syntax is used with print option like

Route print command syntax
route print [-f] [-p] [-4|-6] [Command [Destination] [mask Netmask] [Gateway] [metric Metric]] [if Interface]] >

This will create a text file with the name that user can observe following:

Interface list:	IPv6 Route Table:
IPv4 Route Table:	Active Routes:
Active Routes:	Persistent Routes:
Persistent Routes:	

2.1 Route Command Parameters

Parameters [edit]
-f: Clears the routing table
-p: The route is added to the Windows Registry and is used to initialize the IP routing table whenever the TCP/IP protocol is started (only when used with the add command)
Command: The command to run (add, change, delete, print)
-4: Force using IPv4
-6: Force using IPv6
Destination: Network destination of the route mask Netmask:
The netmask (subnet mask) associated with the network destination
Gateway: The forwarding or next hop IP address over which the set of addresses defined by the network destination and subnet mask are reachable
metric Metric: Integer cost metric (ranging from 1 to 9999) for the route
if Interface: The index of the interface over which the destination is reachable
/?: Command help

Fig. : output screen of command c:\>route –f –p -4

Fig. : Output screen of command c:\>route –f –p -6

Fig.: Output screen of command
c:\> Route –f –p command add - -4
destination 192.168.1.4 mask netmask 255.255.255.0

Fig.: Output screen of command
c:\> Route –f –p command add - -4 destination
192.168.1.4 mask netmask 255.255.255.0 if interface

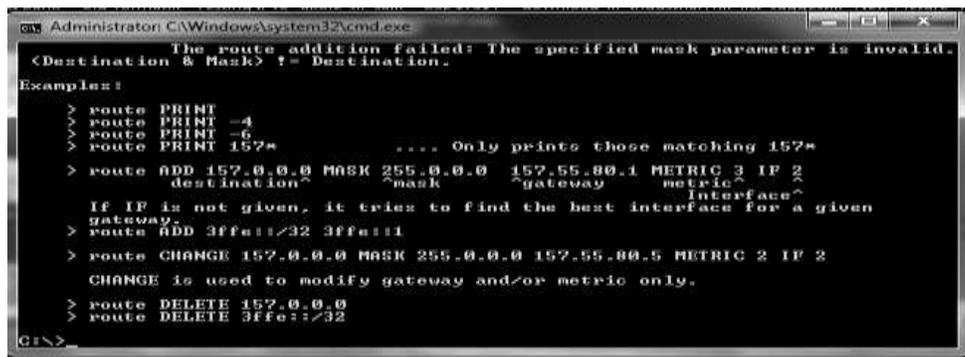| Item	Description
-d	This option prevents tracert from resolving IP addresses to hostnames, often resulting in much faster results.
-hMaxHops	This tracert option specifies the maximum number of hops in the search for the target. If you do not specify MaxHops, and a target has not been found by 30 hops, tracert will stop looking.

Fig.: Output screen of command C:\>Route –p –f -4 command 192.168.1.25 mask netmask metric metric

```
============================================================
Interface List
 62...a4 17 31 e3 d6 fc ......Bluetooth Device (Personal Area Network) #2
 56...26 17 31 e3 d6 fb ......Microsoft Virtual WiFi Miniport Adapter
 55...a4 17 31 e3 d6 fb ......Qualcomm Atheros AR9485WB-EG Wireless Network
Adapter #2
 53...30 f9 ed ce 97 01 ......Realtek PCIe GBE Family Controller #2
  1...........................Software Loopback Interface 1
 95...00 00 00 00 00 00 00 e0 Microsoft ISATAP Adapter #4
 59...00 00 00 00 00 00 00 e0 Microsoft Teredo Tunneling Adapter
 83...00 00 00 00 00 00 00 e0 Microsoft ISATAP Adapter #49
============================================================
IPv4 Route Table
============================================================
Active Routes:
  None
Persistent Routes:
  None

============================================================
IPv6 Route Table
============================================================
Active Routes:
  None
Persistent Routes:
  None
```

Output screen of command C:\>Route print 198*

2.2 Tracert Command Syntax

tracert [**-d**] [**-h** *MaxHops*] [**-w** *TimeOut*] [**-4**] [**-6**] *target* [/**?**]
The availability of certain tracert command switches and other tracert command syntax may differ from operating system to operating system.

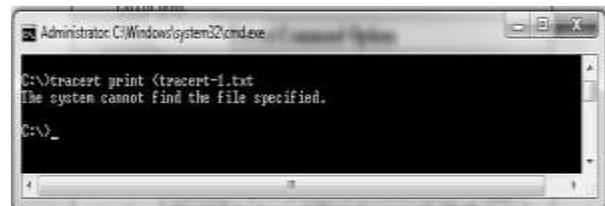Fig.: Output screen of command C:\>tracert /? Help

Fig.: Understanding The Tracert

3. TRACERT COMMAND OPTIONS

Item	Description
-wTimeOut	You can specify the time, in milliseconds, to allow each reply before timeout using this tracert option.
-4	This option forces tracert to use IPv4 only.
-6	This option forces tracert to use IPv6 only.
target	This is the destination, either an IP address or hostname.
/?	Use the help switch with the tracert command to show detailed help about the command's several options.

Following part of route command is only to bring awareness to students about the options for modification of routing table. (Suggested not to execute these commands as it may modify current table which create problem in accessing network. Modifying the routing table, Besides displaying the routing table, the route command also lets you modify it by adding, deleting, or changing entries.

Warning: User need to carefully use this command If you mess up the routing table, your computer may not be able to communicate with anyone.

The **command** option specifies one of the six commands in this table:

Table : Commands for modification of routing table

Command	Definition
print	Prints a route
add	Adds a route
delete	Deletes a route
change	Modifies an existing route
destination	Specifies the computer to send command
mask subnetmask	Specifies a subnet mask to be associated with this route entry (default subnet mask is 255.255.255.255)

3.1 Syntax for the route command for adding,deleting or changing a route entry

route [-p] command dest [mask subnet] gateway [-if interface]
The following list describes each of the route command's parameters:
- -p: Makes the entry persistent. If you omit -p, the entry will be deleted the next time you reboot. (Use this only with add commands.)
- command: Add, delete, or change.
- dest: The IP address of the destination subnet.
- mask subnet: The subnet mask. If you omit the subnet mask, the default is 255.255.255.255, meaning that the entry will apply only to a single host rather than a subnet. You usually want to include the mask.
- gateway: The IP address of the gateway to which packets will be sent.
- -if interface: The IP address of the interface through which packets will be sent. If your computer has only one network interface, you can omit this.

Suppose that your network has a second router that serves as a link to another private subnet, 192.168.2.0 (subnet mask 255.255.255.0). The interface on the local side of this router is at 192.168.1.200.

Examples
In order to view the entire contents of the IP routing table, issue the route print command.
In order to add a persistent route to the destination 10.19.0.0 with the subnet mask of 255.255.0.0 and the next hop address of 10.10.0.1, issue the route -p add 10.19.0.0 mask 255.255.0.0 10.10.0.1 command.
In order to view the routes in the IP routing table that begin with "172.", issue the route print 172.* command.
In order to delete all routes in the IP routing table that begin with "172.", issue the route delete 172.* command.

Additional Commands for route:
1.Syntax to ADD a static route entry
2.C:\>route -p add 192.168.2.0 mask 255.255.255.0 192.168.1.200
3.Syntax to CHANGE the IP address of the router to 192.168.1.222.
4.C:\>route change 192.168.2.0 mask 255.255.255.0 192.168.1.222
5.Syntax to DELETE the entry:
C:\>route delete 192.168.2.0
(If you omit the mask from a route change com command, the command changes the mask to 255.255.255.255!)

3.2 Commands need to type on Command Execution of commandprompt
Route command **command**
route [-f] [-p] [-4|-6] [Command [Destination] [mask Netmask] [Gateway] [metric Metric]] [if Interface]]
    Tracert Command Syntax
    tracert [-*d*] [-*h* MaxHops] [-*w* TimeOut] [-*4*] [-*6*] target [/*?*]

The availability of certain tracert command switches and other tracert command **syntax** may differ from operating system to operating system.

Actual execution of commands used in laboratory

Fig.: Execution of route print command

Execution of route print command (Win-NT Active routes)

Example -1:

Tracert Command Examples

tracert 192.168.1.1

In the above example, the tracert command is used to show the path from the networked computer on which the tracert command is being executed to a network device, in this case a router on a local network, that's assigned the 192.168.1.1 IP address.

The result displayed on screen will look something like this:

Tracing route to 192.168.1.1

over a maximum of 30 hops

1 <1 ms <1 ms <1 ms 192.168.1.254

2 <1 ms <1 ms <1 ms 192.168.1.1

Trace complete.

In this example, you can see that tracert found a network device using the IP address of192.168.1.254, let's say a network switch, followed by the destination, 192.168.1.1, the router.

tracert www.google.com

Example -2:

Using the tracert command as shown above, we're asking tracert to show us the path from the local computer all the way to the network device with the hostname www.google.com.

Tracing route to www.l.google.com [209.85.225.104]

over a maximum of 30 hops:

1 <1 ms <1 ms <1 ms 10.1.0.1

2 35 ms 19 ms 29 ms 98.245.140.1

3 11 ms 27 ms 9 ms te-0-3.dnv.comcast.net [68.85.105.201]

...

….

….

13 81 ms 76 ms 75 ms 209.85.241.37

14 84 ms 91 ms 87 ms 209.85.248.102

15 76 ms 112 ms 76 ms iy-f104.1e100.net [209.85.225.104]

Trace complete

In above example tracert identified fifteen network devices including our router at 10.1.0.1 and all the way through to the target of www.google.com which we now know uses the public IP address of 209.85.225.104.

Note that: excluded hops 4 through 12 above just to keep the example simple. If you were executing a real tracert, those results would all show up on screen.

tracert -h 3 lifewire.com > z:\tracertresults.txt

In this last example of the tracert command in Windows, we're using *-h to limit the hop count to 3,* but instead of displaying the results in Command Prompt, we'll use the > redirection operator to send it all to a TXT **tracert -h 3 lifewire.com > z:\tracertresults.txt**
file located on *Z:*, an external hard drive
Here are some example results of this last command:
Tracing route to lifewire.com [151.101.66.114]
over a maximum of 3 hops:
1 <1 ms <1 ms <1 ms testwifi.here [192.168.86.1]
2   1 ms   1 ms <1 ms 192.168.1.1
3 17 ms 16 ms 17 ms giantwls-64-71-222-1.giantcomm.net [64.71.222.1]
Trace complete.
Tracert Related Commands

3.3 Practical Significance of Point to Point Network

In telecommunications, a point-to-point connection refers to a communications connection between two communication endpoints or nodes. An example is a telephone call, in which one telephone is connected with another, and what is said by one caller can only be heard by the other. This is contrasted with a point-to-multipoint or broadcast connection, in which many nodes can receive information transmitted by one node. Other examples of point-to-point communications links are leased lines, microwave radio relay and two-way radio.

Point-to-Point (PPP) protocol is useful in the WAN. PPP is configured with its options like quality and load balancing on numerous links; PPP is also configured in authentication and concluded with verification and troubleshooting of PPP.

PPP is used in computer networking and computer architecture refer to a wire or any other connection that links only two computers or circuits, as opposed to other network topologies such as buses or crossbar switches which can connect many communications devices.

3.4 Asynchronous Transmission
Transmitting & Receiving devices maintain their own internal clocks. They do not synchronize their clocks.
Each frame is sent separately. Each frame begins with a start bit & ends with a stop bit. A extra bit called parity bit maybe added for error detection.

3.5 Synchronous Transmission
Transmitting device provides clocking May use separate channel that is dedicated to the clock. Resists timing errors better than Asynchronous because the transmitter & receiver use the same clock Can transmit large blocks of data.

4. PPP LAYER FUNCTION

In order to move data between any two nodes or routers, a data path must be established, and flow control procedures must be in place to ensure delivery of data. This is also true in the WAN environment and is accomplished by using WAN protocols such as Point-to-Point Protocol.
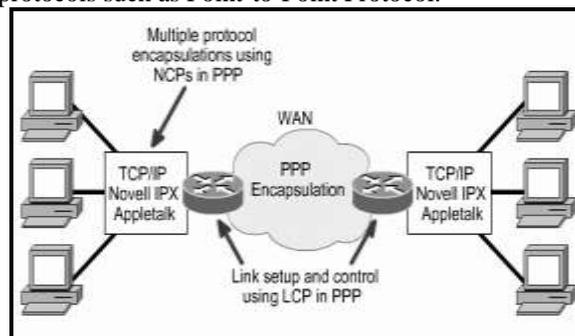

Fig.: PPP Encapsulation

4.1 Functions of PPP

- Control of data link setup
- Provides for dynamic assignment of IP addresses
- Network protocol multiplexing
- Link configuration and link quality testing

- Error detection
- Negotiation options for capabilities such as network-layer address negotiation and   data compression negotiations

4.2 PPP Components
- Encapsulating datagrams over serial links. (Point-to-point links)
- A Link Control Protocol (LCP) for establishing, configuring, and testing the data-link connection.

A family of Network Control Protocols (NCPs) for establishing and configuring different network-layer protocols. (TCP/IP, IPX AND APPLETALK)
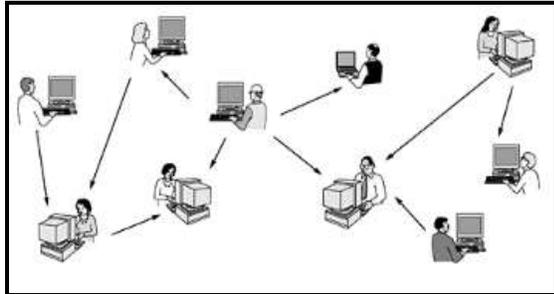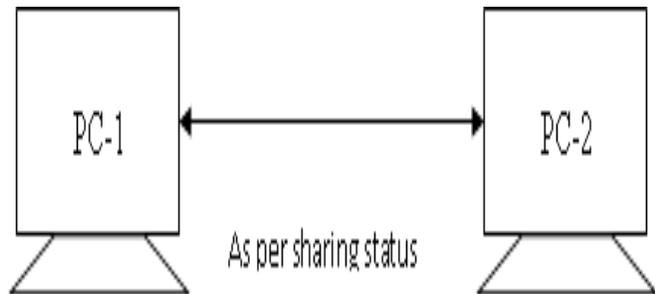

Fig.: Point to Point system Connection

Point to point Connection between two PCs (PC-1 and PC-2

Point to point connection of Computers using Cross-over cable between PC-1 and PC2

Point to point connection of Computers using straight cable PC-1 and PC-2

4.3 Procedure
Procedure for point to point (PPP) connection of two computers using Cross cable:
1. Get one LAN cable (CAT-5/CAT6) having standard colour coding having RJ-45 connectors at both the ends
2. Connect two personal computers (PC) using this cable at network patch cord socket on back panel of PC.
3. Switch ON both PCs. (PC-1 and PC-2)

For PC-1
1. Go to start Menu--- Setting in windows -- Network /Internet options and click on Change adaptor Option.
2. Select Ethernet – make it enabled Then right-click on the ICON and select Properties.
3. Then in that select (Double click) on IPV4 (TCP/IP) and click on Properties

Fig.: Internet Protocol (TCP/IP) P:roperties - setting IP address

4. Automatic setting of IP:
5. Use Manual IP Address:
(Student may select PC IP address of their choice as per available IP   addresses**)**
Remove all other options Or set following sample addresses as follows.

IP address	**192.168.10.71**
Subnet Mask	**255.255.255.0**
Default Gateway	**192.168.10.1 of Router.**

Now share one document or folder from Desktop of PC-1.
1. Select one document from desktop of PC-1
2. Select File/Folder go to share option.
3. Set/ use Give access to option then right click on file/folder and select specific people------select Everyone and press ADD button.
4. That IP is available.
5. We can change permission levels as (Read--Read/Write—Remove)
6. Now press Share.
7. Click on Next.
8. Do you want to Turn on network discovery & file . Show for all public network.
9. Select YES to SHARE.And NO to restrict.
   That will appear the document in the new list and press done.

Establish similar setting in PC-2 also. Need to confirm changes reflected for PC-2
1. Now go to PC-2.
2. It will ask for User Id and Password.
3. Now select PC-1 and go to Control panel and select Network and Internet
4. Then select Network sharing Center – HomeGroup / Home/ Workgroup..
5. Select Advance Sharing Setting option.(for Windows-7 Select Public folder share Turn ON sharing of EVERYONE -(For Windows-7 select Read-Write)
6. Turn off password prefetched setting
7. Then SAVE changes
8. Now PC-1 will get Access of the PC-2 now.

To check connectivity of PC-1 and PC-2. By using PING command. At Run command prompt in start menu.

On command prompt: Give the following command
C:\ PING 192.168.10.71
Or \\ 192.168.10.71
User shows USER and DESKTOP .By double clicking on file
Alternative procedure to understand Point to Point configuration
Using CISCO Packet Tracer-Version 5 onwards (Freeware). OPTIONAL
1. After downloading and installing the setup file automatically opens on PC.
2. Icon appeared /launched on desktop.

Procedure to create connection of different computer network topologies using Cisco Packet Tracer.

1.After opening Cisco Packet Tracer we obtain network component menu such as Switch, routers, hubs, wireless devices, connections END devices like PC security components etc.
2.Now start creating actual networking of components and specification.
Network-1: Peer to Peer connection using two computers.
1. Select/drop Two PCs / END devices connect.
2. Draw connection between these two PCs using connector.
3. Select PC-1 , double-click on it IPV4 setting appears on screen.
4. Set IP address(i.e. 192.168.10.2)
5. Select PC-2 , double-click on it IPV4 setting appears on screen.
6. Set its different IP address. (i.e. 192.168.10.3) Take care that the IP address shall be from same range only.
To Test the connectivity of network(using CISCO) on screen

Fig.: Diagram of Pont to point connection using CISCO Packet Tracer

5. CONCLUSIONS

Thus we have configured PPP network and used route commands to test performance of given network.

6. REFERENCE

[1]   https://en.wikipedia.org/wiki/Route_(command)
[2]   https://sourcedaddy.com/networking/using-route-command.html
[3]   https://www.lifewire.com/tracert-command-2618101
[4]   https://sourcedaddy.com/networking/using-route-command.html
[5]   https://sourcedaddy.com/networking/using-tracert-command.html
[6]   Technical Support & Documentation - Cisco Systems
[7]   http://ecomputernotes.com/computernetworkingnotes/switching/point-to-point-protocol As on 28 July 2019
[8]   http://ecomputernotes.com/computernetworkingnotes/switching/ppp-phases as on 28 July 2019

BIOGRAPHY OF FIRST AUTHOR

Myself Prof.Pratik Tawde,lecturer at Vidyalankar Polytechnic,Wadala and best-selling author in the area of communication for engineering diploma. I am also shouldering the responsibility of exam coordinator and controller of examination as well as Assistant Editor of IJAET and Member of IAENG.
I am having 9 years of experience and professional certification course in wireless Maintenance Technology:TCWMP.
Secured highest marks in the subject of Milimeter wave communication system of Masters of EXTC.
Workshop and Training program Attended:20
Publication,Seminars and conferences:10
Author for following subjects:BEL,MIC,DCO,WMN,CND.ONS