

| **LAB 1 Understanding of basic networking commands** | |
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| **Objectives** | **After the lab student should be able to trouble shoot the basic networking connectivity issue using Command** |

| **Lab #1 Marks distribution:**   |  |  | **LR4=35** | **LR5=40** | **LR9=5** | **AR4=20** | | --- | --- | --- | --- | --- | --- | | **In-Lab Tasks** | **Task 1** | 20 | 10 | 5 | 20 | | **Task 2** | 15 | 20 | | **Task 3** |  | 10 | | **Total Marks** | **100** | | | | |   **Lab #1 Marks Obtained:**   |  |  | **LR4=35** | **LR5=40** | **LR9=5** | **AR4=20** | | --- | --- | --- | --- | --- | --- | | **In-Lab Tasks** | **Task 1** |  |  |  |  | | **Task 2** |  |  | | **Task 3** |  |  | | **Total Marks** |  | | | | | |
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| **In Lab Tasks** |  |
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| Task 1 |  |
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| **Checking your computer network connections settings.** |  |
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| When you set up or troubleshoot a network connection in a Windows PC, you have to access Network Connection screen to view and manage all your wired / wireless adapters. This exercise focuses on quickest way to open Network Connections in Windows PC, and discuss some of the feature of network connection setting |  |
| 1. In the search box on the taskbar, type **ncpa.cpl**, and then hit **Enter** and it will instantly open Network Connection screen. |  |
| 1. Observe how many connections are available. What are their different type, and why some have cross on them? Write down connections available and status in box below:  | If Bluetooth is “open”, the following can be observed: If Bluetooth is “closed”, this can be observed  From this we can observe that, there are “three” types of connection-types on this device.  **Ethernet, Wi-Fi and Bluetooth Network Connection.**  .  We can observe that some have “Cross” underneath the computer symbol and some don’t. On this Habib’s lab PC, I wasn’t connected to any Wi-fi so there was no connectivity between them, which was represented by a cross.  I, however, had connection from the LAN cable and as such there was no “cross” underneath it. . *As it was said that VMware connectivity is not important as I, the student, don’t have relevant knowledge, it was skipped in the explanation.* | | --- |  1. Double click on one of the enabled Connection. Note that the connection has two type of connectivity. IPV4 and IPV6. What are there status and what does they stand for?  | **IPV4:** Internet  **IPV6 :** No network access  IPV4 stands for “Internet Protocol version 4”  IPV6 stands for “Internet Protocol version 6” | | --- |  | 1. Click on the details button and fill the following parameters in the table for wired & wireless connection. | | --- | | | **Description** | **Wired** | **Wireless** | | --- | --- | --- | | **Physical Address** | ‎74-E6-E2-DA-44-B1 | ‎10-4A-7D-72-6A-14 | | **DHCP Enabled** | Yes | Yes | | **IPV4 Address** | 10.30.0.139 | 10.30.4.189 | | **IPV4 Subnet Mask** | 255.255.248.0 | 255.255.248.0 | | **IPV4 Default Gateway** | 10.30.0.30 | 10.30.0.30 | | **IPV4 DHCP Server** | 10.100.0.10 | 1.1.1.1 | | **IPV4 DNS Server** | 10.100.0.2, 10.100.0.1 | 10.100.0.2, 10.100.0.1 |   Table 1   | **Wired** | **Wireless** | | --- | --- | |  |  |  1. Click on properties of the network connection window and double click, internet protocol 4. Observe and note down how your PC is allocated IP (Automatic or manually). What are pros and cons of allocating IP manually & automatically? Mention at least 2 Pros & 2 Cons.  | Knowing that DHCP (Dynamic Host Configuration Protocol) Enabled is **YES**. We know that our PC was allocated IP **Automatically.** | | | | --- | --- | --- | |  | **Pros** | **Cons** | | [**Automatic**](https://www.rfwireless-world.com/Terminology/Advantages-and-Disadvantages-of-DHCP.html) | DHCP is pretty easy to implement and as it does automatic assignment of IP addresses, the manual configuration time of IP addresses can be heavily reduced.  Cases of duplicate and invalid IP addresses can be avoided. | The machine name does not change when new IP address is assigned.  Our Client will fail to access the network if DHCP (Dynamic Host Configuration Protocol) is not able to access the network in the absence of the DHCP server. | | [**Manually**](https://www.hitechwhizz.com/2021/09/advantages-and-disadvantages-drawbacks-benefits-of-static-ip-address.html.html.html) | The devices with Static IP addresses have considerably higher speeds for people who are using broadband network. People who are constantly and downloading files benefit from it the most.  The Security provided by having a static IP address is higher. | It is easier to track them by anyone as such your location can be compromised.  The cost associated with implementing the static IP address is always higher than the dynamic IP address aka “Automatic” | | |  |
| **Command Prompt Network configuration information**. |  | |
| 1. Use the Start menu to open the Command Prompt or write cmd in the start menu. |  | |
| 1. Type ipconfig in the command prompt window. Observe if the command is case sensitive or not?  | **No, the command is not case-sensitive** | | --- |  1. How many local connections can you observe? How many of these connections are disconnected and connected . Attach a screenshot.  | **If we disconnect our WI-FI, the “Wireless LAN adapter Wi-Fi” information changes to the following:**  **In the “top-most” screenshot, computer is connected to the ethernet and Wi-Fi** | | --- | |  | |
|  |  | |
| 1. For your connected media, Record the following internet connectivity information:  | **Connection Type** | Ethernet adapter Ethernet | | --- | --- | | **IP address** | 10.30.0.139 | | **Subnet Mask** | 255.255.248.0 | | **Default Gateway** | 10.30.0.30 |   **(Showing Ethernet connection)** |  | |
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| 1. Are the values the same, as the values obtained in task 1.  | **Yes they are!** | | --- | |  | |
| | Task 2 | | --- | |  | | **Basic Networking Commands:** | | 1. **Ping**     The ping is a network command used to test the ability of the source computer to reach a specified destination computer. It is a simple way to verify that a computer can communicate with another computer or network device.  The ping command operates by sending **Internet Control Message Protocol** (ICMP) **Echo Request messages** to the destination computer and waiting for a response. The receipt of corresponding Echo Reply messages are displayed, along with **round-trip times.** | | The syntax of ping command is as follow   1. Ping ip address (you can mention domain name for e.g. [www.google.com](http://www.google.com) instead of IP address)   Ping [www.google.com](http://www.google.com) and note down how many packets are sent & received?   | **4 Packets with each packet being of 32 bytes were sent to “www.google.com” . All were received back with no losses.** | | --- |  1. Type the IP address of Google in your browser. What is the response  | **It redirects me to the Google website!** | | --- |  1. ping -n count to google.com (where count is the number of packets you want to send). This option sets the number of ICMP Echo Requests to send, from 1 to 4294967295. Attach screenshot  |  | | --- |   *Ping the class fellow sitting next to you & send 2 ICMP packets. Attach screen shot*   | **As can be observed, I sent 2 packets to my friend. All 2 packets were successfully received by my friend with no packet loss!** | | --- |  1. Ping –l (Use this option to set the size, in [bytes](https://www.lifewire.com/the-difference-between-bits-and-bytes-816248), of the echo request packet from 32 to 65,500) \* Attach screen shot  | **I sent 10 packets to my friend! Each was of “65500 bytes” and all were successfully received by him with no packet loss.** | | --- |  | * Ping the IP address of default gateway by sending 128 byte echo packets. **Check this to RA.**  | **I am pinging my default gateway by sending 1 packet of 128 bytes.**    **Here we can observe that I sent 1, and successfully received it as well. The round trip took 1 millisecond.** | | --- | | | --- | --- | | | 1. Write down the response of the following:  | * Ping the IP address of the local host (your system or PC) and record your observation (how many packets are sent/received and what other parameters telling us?  | **4 packets were sent, none were lost, the maximum time a packet took was 1ms while on average it took less than <1 ms for us to ping our local host (my PC)** | | --- | | | --- | --- | |  |  1. Use the ping command to find the IP address of Habib University website and note down it in space below. Also, discuss the response. Why are you getting this response?  | IP address of Habib University is “**52.30.165.170**”  All our packets “timed out”. The reason they did is cause some websites have preventive measures to safeguard against a “DDOS attack”.  A DDOS attack is a malicious attempt to disrupt the normal traffic of a targeted network.  Like, someone can have it so that 1000s of computer ping millions of times by sending heavy data packages, which will slow down the website.  To prevent things like this, some people have it so that the website doesn’t reply back to “pings”. | | --- |  1. **Tracert**   The Tracert diagnostic utility determines the route taken to a destination by sending Internet Control Message Protocol (ICMP) echo packets with varying IP Time-to-Live (TTL) values to the destination. Each router along the path is required to decrement the TTL on a packet by at least 1 before forwarding it. When the TTL on a packet reaches 0, the router should send an "ICMP Time Exceeded" message back to the source computer.   1. Trace the route to Yahoo and Habib Site and write down your observations in box below: Attach the screen shot  | **Sending to Yahoo Website**    **Sending to Habib University** | | --- | | |  |

What does “over a maximum of 30 hops ” mean in your result? . why it is important to set TTL. Can you change the number of hops

| **It’s important to set a TTL just in case our packet gets stuck in a loop somewhere, where it is being exchanged around the X-number of routers where “X” is any real number. TTL prevents “data packets” from moving across the network indefinitely.** |
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Observe your above result of tracert. Can you explain what different columns and their numbers are showing?

| **First Column:** Showcases the number of hops it is current at.  **Second, Third and Fourth Column:** Tracert sends three data packages and sees all the routers that the data package goes through. They respectively represent different data packages, and the time represents how much time it took for them to hop from the previous router to this current one!  **Fifth Column:** shows the ip-address of the router it is hopping at. |
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What is the difference between ping and tracert?

| **Ping is a quick and easy way to tell whether the specified server is reachable or not. And how long will it take to send and receive data from that server.**  **Whereas,**  **Traceroute (tracert) finds the “exact” route taken to reach the server and time taken by each step (hop). It tells us about each “router” that the data packet had to go in the process of sending a packet.**    ***PING*** *TO “www.google.com”*    ***TRACERT*** *TO “*[*www.google.com*](http://www.google.com)*”*  **Answer was also referenced from** [**here.**](https://www.geeksforgeeks.org/difference-between-ping-and-traceroute/#:~:text=The%20main%20difference%20between%20Ping,by%20each%20step%20(hop).) |
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# Task 3 – Network Troubleshooting

Habib University has purchased server storage space from a company in the USA named Haltech INc, in order to store student grades. However, for two days, the Habib University IT team has been emailing Haltech INc that their server is responding very slowly, and the university is facing problems in storing and retrieving data. On the other end, Haltech Inc refuses to accept that there is any issue with their server. Being a network engineer and using the above commands, can you help to find the bottleneck

| **Using Traceroute (Tracert) command, we can find at which router there may lie a problem. Take the image below as an example. We know that on the “fifth” hop, there is alot of time-delay, which will obviously effect the subsequent hopping as they will naturally get delayed as well. We can then look into the relevant router and try to fix the problem. This big sudden time-delay is unnatural, but sometimes, this may indicate that there is a large distance between the two routers (the routers are in different continents) and there may be no problem within the router itself.**    [**source of the image.**](https://www.youtube.com/watch?v=up3bcBLZS74&ab_channel=PowerCertAnimatedVideos) |
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**Lab Evaluation Assessment Rubric**

**EE-424 Lab 1**

| **#** | **Assessment Elements** | **Level 1: Unsatisfactory**  **Points 0-1** | **Level 2: Developing**  **Points 2** | **Level 3: Good**  **Points 3** | **Level 4: Exemplary**  **Points 4** |
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| **LR2** | **Program/Code/ Simulation Model/ Network Model** | Program/code/simulation model/network model does not implement the required functionality and has several errors. The student is not able to utilize even the basic tools of the software. | Program/code/simulation model/network model has some errors and does not produce completely accurate results. Student has limited command on the basic tools of the software. | Program/code/simulation model/network model gives correct output but not efficiently implemented or implemented by computationally complex routine. | Program/code/simulation /network model is efficiently implemented and gives correct output. Student has full command on the basic tools of the software. |
| **LR4** | **Data Collection** | Measurements are incomplete, inaccurate and imprecise. Observations are incomplete or not included. Symbols, units and significant figures are not included. | Measurements are somewhat inaccurate and imprecise. Observations are incomplete or vague. Major errors are there in using symbols, units and significant digits. | Measurements are mostly accurate. Observations are generally complete. Minor errors are present in using symbols, units and significant digits. | Measurements are both accurate and precise. Data collection is systematic. Observations are very thorough and include appropriate symbols, units and significant digits and task completed in due time. |
| **LR5** | **Results & Plots** | Figures/ graphs / tables are not developed or are poorly constructed with erroneous results. Titles, captions, units are not mentioned. Data is presented in an obscure manner. | Figures, graphs and tables are drawn but contain errors. Titles, captions, units are not accurate. Data presentation is not too clear. | All figures, graphs, tables are correctly drawn but contain minor errors or some of the details are missing. | Figures / graphs / tables are correctly drawn and appropriate titles/captions and proper units are mentioned. Data presentation is systematic. |
| **LR9** | **Report** | All the in-lab tasks are not included in report. | Most of the tasks are included in report but are not well explained. All the necessary figures / plots are not included. | Good summary of most of the in-lab tasks is included in report. The work is supported by figures and plots with explanations. | Detailed summary of the in-lab tasks is provided. All tasks are included and explained well. Data is presented clearly including all the necessary figures, plots and tables. |
| **AR2** | **\*1Attendance** | Marked attendance and did not attend the lab or left very early. | Present but very late (31-60 minutes) or left early (31-60 minutes) without completing the tasks. | \*Present but late (15-30 minutes), or left early (30 minutes) without completing the tasks. | Present and entered the lab on time and left on time. |
| **AR4** | **\*Report Submission** | Late submission after 1 week and in between 2 weeks. | Late submission after 2 days and within a week. | Late submission after the lab timing and within 2 days of the due date. | Timely submission of the report and in the lab time. |