Network

Definition

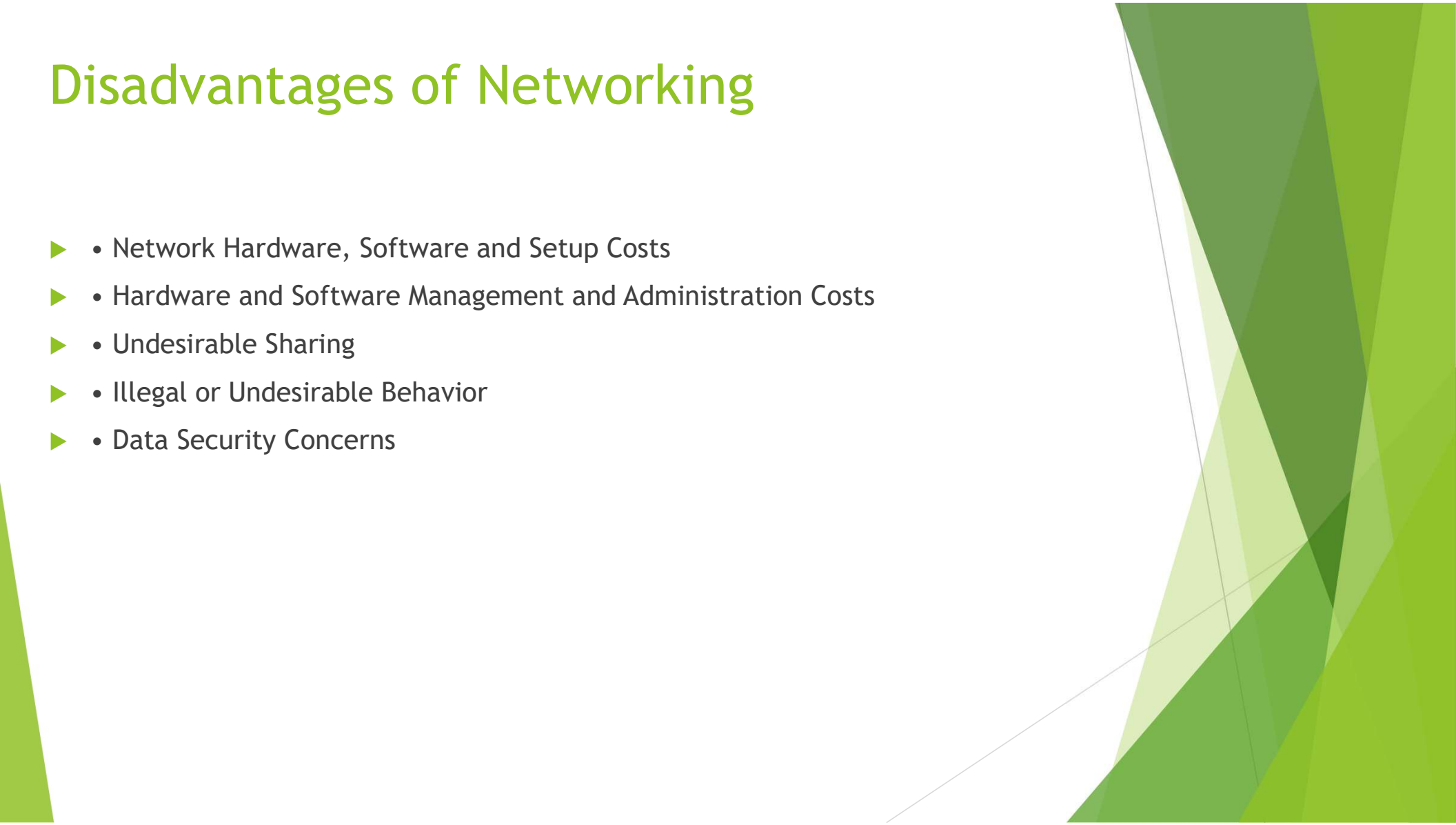
- A network is simply a collection of computers or other hardware devices that are connected together, either physically or logically, using special hardware and software, to allow them to exchange information and cooperate.
- Networking is the term that describes the processes involved in designing, implementing, upgrading, managing and otherwise working with networks and network technologies.

Advantages of Networking

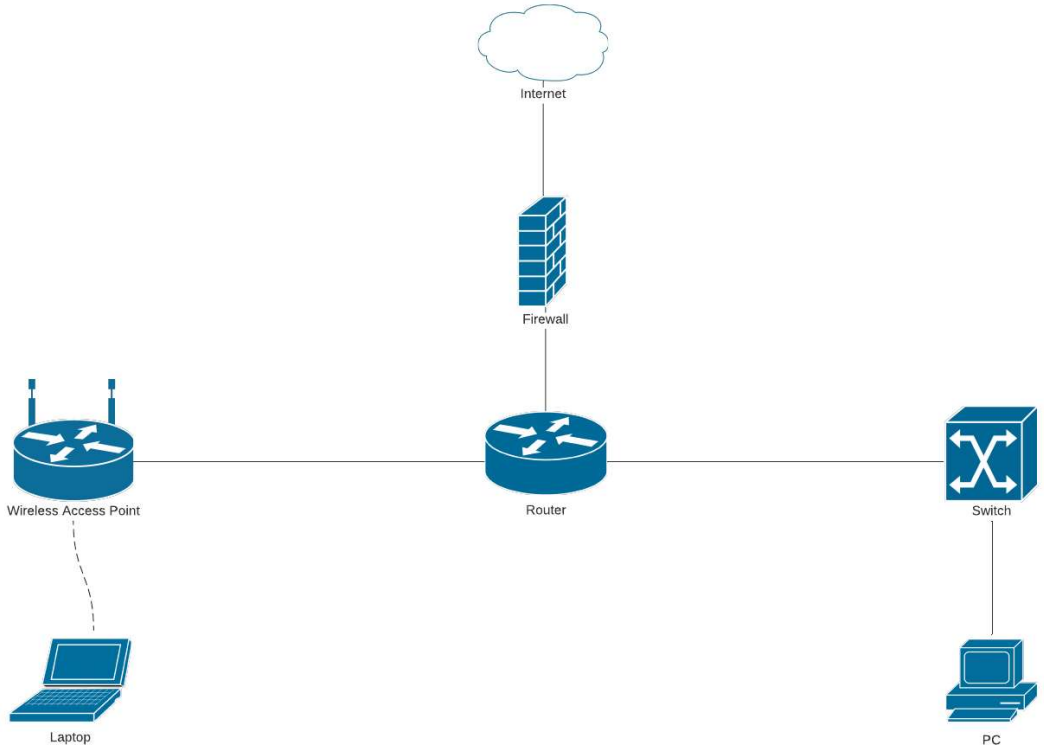
- • Connectivity and Communication
- • Data Sharing
- • Hardware Sharing
- • Internet Access
- • Internet Access Sharing
- • Data Security and Management
- • Performance Enhancement and Balancing
- • Entertainment

Disadvantages of Networking

- • Network Hardware, Software and Setup Costs
- • Hardware and Software Management and Administration Costs
- • Undesirable Sharing
- • Illegal or Undesirable Behavior
- • Data Security Concerns



Simple network diagram



Fundamental Network Classifications

- Local Area Networks (LANs):

  • **A local area network (LAN)** is a computer network covering a small geographic area, like a home, office, or group of buildings

- Wide Area Networks (WANs):

  • **Wide Area Network (WAN)** is a computer network that covers a broad area (i.e., any network whose communications links cross metropolitan, regional, or national boundaries). Or, less formally, a network that uses routers and public communications links

  • The largest and most well-known example of a WAN is the Internet.

  • WANs are used to connect LANs and other types of networks together, so that users and computers in one location can communicate with users and computers in other locations

- Metropolitan Area Network (MAN):

  • **A metropolitan area network (MAN)** is a network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large local area network (LAN) but smaller than the area covered by a wide area network (WAN). The term is applied to the interconnection of networks in a city into a single larger network (which may then also offer efficient connection to a wide area network). It is also used to mean the interconnection of several local area networks by bridging them with backbone lines. The latter usage is also sometimes referred to as a campus network.

Intranet and Internet Specifications

- Intranet: An intranet is a private network that is contained within an enterprise. It may consist of many interlinked local area networks and also use leased lines in the wide area network.

• An intranet uses TCP/IP, HTTP, and other Internet protocols and in general looks like a private version of the Internet. With tunneling, companies can send private messages through the public network, using the public network with special encryption/decryption and other security safeguards to connect one part of their intranet to another.

- Internet: is a worldwide system of computer networks - a network of networks in which users at any one computer can, if they have permission, get information from any other computer (and sometimes talk directly to users at other computers).

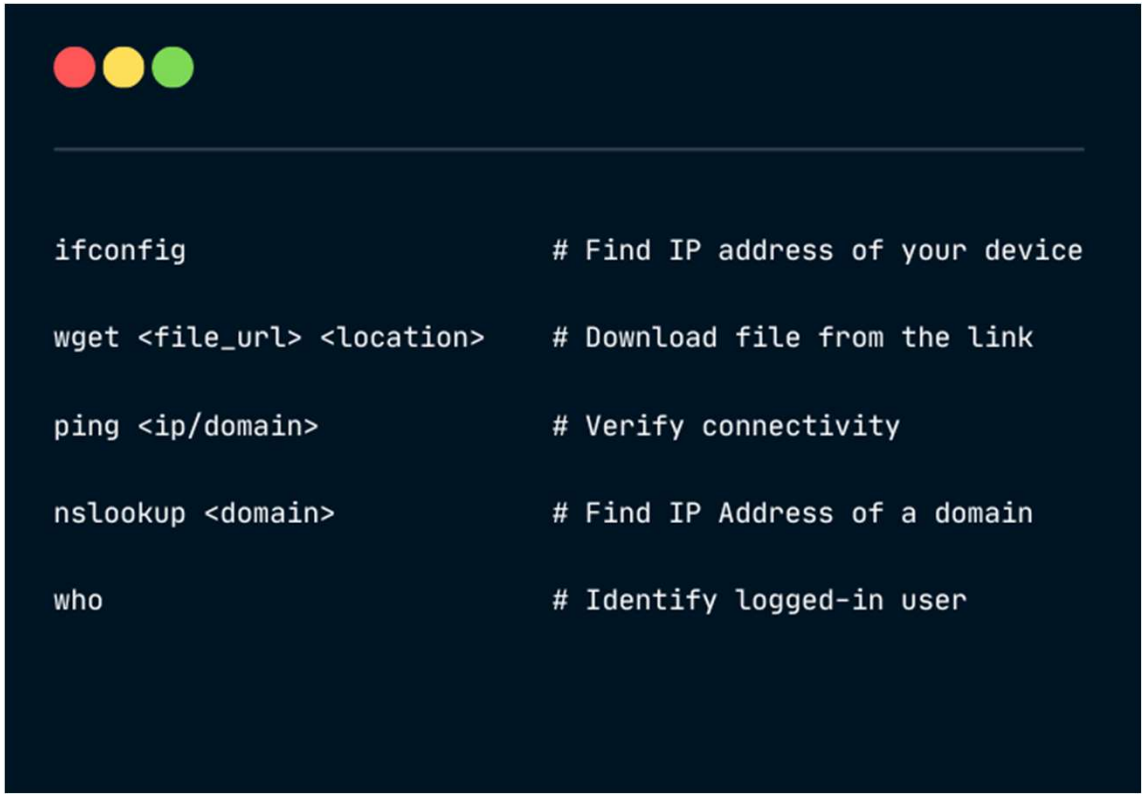
Network Protocols

1. **Transmission Control Protocol (TCP):** TCP is a popular communication protocol which is used for communicating over a network. It divides any message into series of packets that are sent from source to destination and there it gets reassembled at the destination.
2. **Internet Protocol (IP):** IP is designed explicitly as addressing protocol. It is mostly used with TCP. The IP addresses in packets help in routing them through different nodes in a network until it reaches the destination system. TCP/IP is the most popular protocol connecting the networks.
3. **User Datagram Protocol (UDP):** UDP is a substitute communication protocol to Transmission Control Protocol implemented primarily for creating loss-tolerating and low-latency linking between different applications.
4. **Post office Protocol (POP):** POP3 is designed for receiving incoming E-mails.
5. **Simple mail transport Protocol (SMTP):** SMTP is designed to send and distribute outgoing E-Mail.
6. **File Transfer Protocol (FTP):** FTP allows users to transfer files from one machine to another. Types of files may include program files, multimedia files, text files, and documents, etc.
7. **Hyper Text Transfer Protocol (HTTP):** HTTP is designed for transferring a hypertext among two or more systems. HTML tags are used for creating links. These links may be in any form like text or images. HTTP is designed on Client-server principles which allow a client system for establishing a connection with the server machine for making a request. The server acknowledges the request initiated by the client and responds accordingly.

TCP/IP vs OSI Model

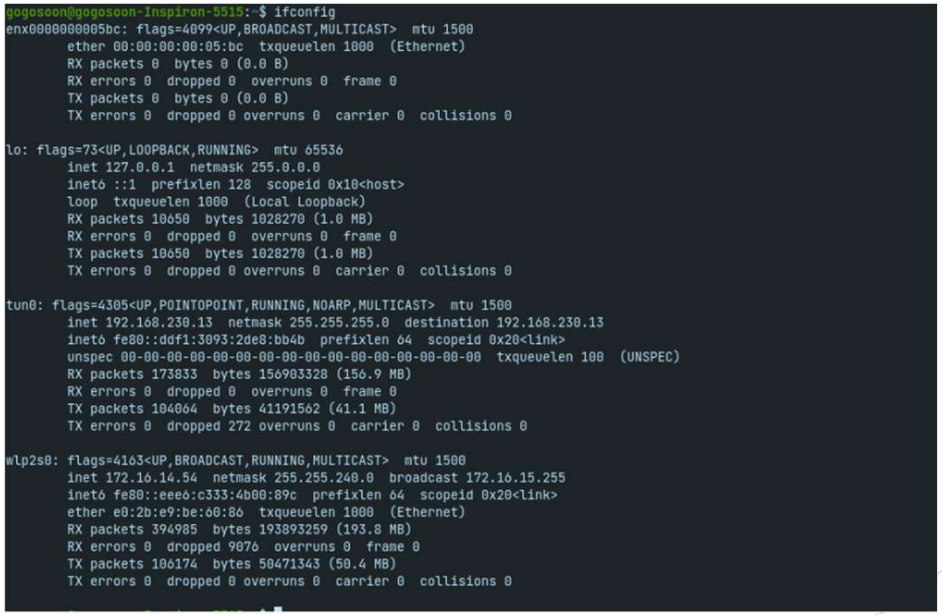
TCP/IP	OSI Model	Protocols
Application Layer	Application Layer	DNS - DHCP - FTP - HTTPS - LDAP - NTP - POP3 - RTP - RTSP - SSH - SIP - SMTP - Telnet - TFTP
	Presentation Layer	JPEG - MIDI - MPEG - PICT - TIFF
	Session Layer	NetBIOS - NFS - PAP - SCP - SQL - ZIP
Transport Layer	Transport Layer	TCP - UDP
Internet Layer	Network Layer	ICMP - IGMP - IPsec - IPv4 - IPv6 - IPX - RIP
Link Layer	Data Link Layer	ARP - ATM - CDP - FDDI - Frame Relay - HDLC - MPLS - PPP - STP - Token Ring
	Physical Layer	Bluetooth - Ethernet - DSL - ISDN - 802.11 - WiFi

Network in Linux (Commands)



What's an IP Address?

- IP stands for "Internet Protocol," which is the protocol (set of rules) governing how data are sent via the internet or a local network.
- An IP address is basically a unique address to identify a device on the internet or on a local network.
- To know your IP Address (Open Terminal) and type this command “ifconfig”
- **inet row in ifconfig**
- **inet** is the internet (IPv4) address assigned to that particular interface. It will be set by DHCP client.



- The first block starting with enx... (previously called eth0) is for Ethernet connection.

  Since, I have not connected an ethernet cable, it does not show any data.

```
enx0000000005bc: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        ether 00:00:00:00:05:bc  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

Ethernet block in ifconfig command

The block starting with lo is called LoopBack Interface.

This is a special interface that the system uses to communicate with itself.

```
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1000  (Local Loopback)
        RX packets 10650  bytes 1028270 (1.0 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 10650  bytes 1028270 (1.0 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

LoopBack Interface block in ifconfig command

The block starting with `tun0` is called Tunneling Interface.

It contains information about the VPN you are connected to.

```
tun0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST>  mtu 1500
        inet 192.168.230.13  netmask 255.255.255.0  destination 192.168.230.13
        inetó fe80::ddf1:3093:2de8:bb4b  prefixlen 64  scopeid 0x20<link>
        unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00  txqueuelen 100  (UNSPEC)
        RX packets 173833  bytes 156903328 (156.9 MB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 104064  bytes 41191562 (41.1 MB)
        TX errors 0  dropped 272 overruns 0  carrier 0  collisions 0
```

Tunnel Interface block in ifconfig command

The block starting with `wlp2s0` is called Wireless on PCI.

This is the main interface that is connected to the WIFI of your Local network.

```
wlp2s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet 172.16.14.54  netmask 255.255.240.0  broadcast 172.16.15.255
        inet6 fe80::eee6:c333:4b00:89c  prefixlen 64  scopeid 0x20<link>
        ether e0:2b:e9:be:60:86  txqueuelen 1000  (Ethernet)
        RX packets 394985  bytes 193893259 (193.8 MB)
        RX errors 0  dropped 9076  overruns 0  frame 0
        TX packets 106174  bytes 50471343 (50.4 MB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

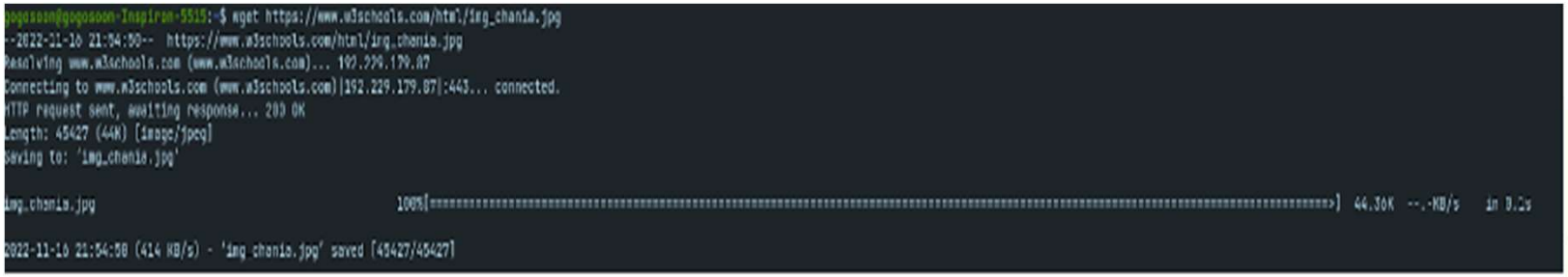
Wireless Interface block in ifconfig command

Download a File Using the Linux Terminal

The `wget` command is highly flexible and you can use it in scripts and cron jobs.

As `wget` is non-interactive, it can independently download resources in the background and does not require a user to be active or logged in.

Example:
The following command will download an image from the w3schools website, in your current folder: wget `https://www.w3schools.com/html/img_chania.jpg`



Command to download file using Linux Terminal

wget Contin.

- You can pass another argument to specify the destination folder where the file should be downloaded, like this:

- wget `https://www.w3schools.com/html/img_chania.jpg /home/user/downloads/pics/`

Find Out if Your System is Connected to the Internet Using a Terminal Command

- You can use the ping command to check your network connectivity. This command takes the URL or IP address as an argument and sends data packets to that specified address. Then it prints the response from the server with the transition time. It will print the response continuously until you cancel that process (with CTRL + C). Finally it will return the following details:

1. Minimum Time taken to receive a response
2. Average Time taken to receive a response
3. Maximum Time taken to receive a response

```
gogosoon@gogosoon-Inspiron-5515:~$ ping google.com
PING google.com(maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e)) 56 data bytes
64 bytes from maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e): icmp_seq=1 ttl=116 time=455 ms
64 bytes from maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e): icmp_seq=2 ttl=116 time=624 ms
64 bytes from maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e): icmp_seq=3 ttl=116 time=306 ms
64 bytes from maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e): icmp_seq=4 ttl=116 time=55.5 ms
64 bytes from maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e): icmp_seq=5 ttl=116 time=1131 ms
64 bytes from maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e): icmp_seq=6 ttl=116 time=935 ms
64 bytes from maa03s37-in-x0e.1e100.net (2404:6800:4007:822::200e): icmp_seq=7 ttl=116 time=37.6 ms
^C
--- google.com ping statistics ---
7 packets transmitted, 7 received, 0% packet loss, time 6023ms
rtt min/avg/max/mdev = 37.639/506.279/1130.545/387.766 ms, pipe 2
```

Sample output of ping command

Find the IP Address of a Website

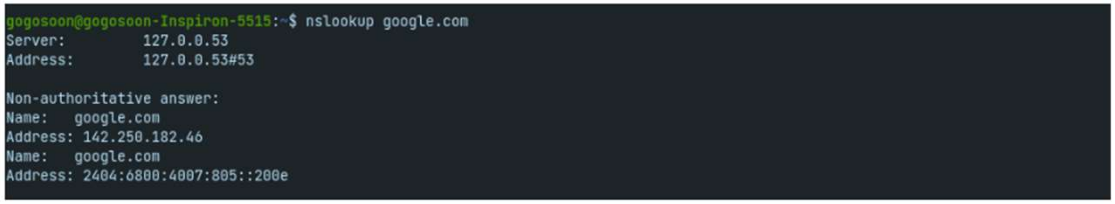
- **What is a DNS?**
- DNS stands for Domain Name System. Every website we use has a domain (for example google.com or freecodecamp.org). Each of these domain names will point to particular IP address of a server. DNS is basically a system that has a table that maps each domain with the IP address.

Use `nslookup` (stands for "Name Server Lookup") is a command to query the DNS server.

It is a network administration tool for querying the Domain Name System (DNS) to get the domain name or IP address mapping or any other specific DNS record.

System Admins and DevOps use it to troubleshoot DNS related issues.

Example:
nslookup `google.com`



Sample output of nslookup command

Know Which User is Logged-In

Linux supports multiple users and lets you manage those users.

Each time you can log in as a different user.

And you can use the who command to know which user you have been logged in as.

who

Terminal command to find Logged-In user in Linux Terminal

Questions

Thank You