**OSI Model – Know each layer’s purpose**

The OSI (Open Systems Interconnection) model is a conceptual framework used to standardize and guide how different network protocols communicate and interact. It consists of seven distinct layers, each with specific functions and responsibilities. These layers work together to facilitate the efficient transmission of data across networks. Trying to elaborate each layer in simple language to get in depth understanding using HTTP protocol. Other protocol may have different task at 5th, 6th and 7th layers and can be explore

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| **OSI Model Layers** | **Purpose of each layer** |
| 7. Application | **Objective:** Convert decoded bits into application commands.  **Example:** The Presentation layer decodes bits and the application interprets these decoded characters (e.g., G, E, T) as the GET command, prompting the application to generate an appropriate response. |
| 6. Presentation | **Purpose- Decode bits**  **Example:**This layer decodes the bit using HTTP ASCII 8 bits decoding method into character or number |
| 5. Session | **Purpose- Maintained user session**  **Example:**it creates the communication session between the devices |
| 4. Transport | **Objective:** Enable service-to-service communication.  **Example:** In scenarios where multiple services are running or hosted on a device, it is essential to ensure that requests are directed to the correct service. The Transport layer achieves this by utilizing the concept of ports. Data packets contain port numbers that guide the request to the appropriate service. The source sends the request using an ephemeral port (a temporary port assignment), and the target service's port. The response is then sent back to the client on the same ephemeral port. |
| 3. Network | **Objective:** Ensure end-to-end delivery.  **Example:** This layer facilitates Layer 2 data traveling within a network to achieve its objective. It includes the source and destination IP addresses, ensuring that the request reaches the correct device. Given the vastness of networks and the numerous intermediate devices (hops) between the source and destination, each Layer 3 device, such as a router, maintains a routing table. This table directs the request towards the appropriate destination. |
| 2. Data link | **Objective:** Facilitate hop-to-hop data transfer.  **Example:** The Data Link Layer is responsible for receiving and transmitting bits to the Physical Layer, using technologies such as Network Interface Cards (NICs) or WiFi adaptors. This layer utilizes the Media Access Control (MAC) addresses of devices as identifiers to perform its tasks. Since the source device does not have the MAC address of the destination device by default (requests typically only include IP addresses and ports), the Address Resolution Protocol (ARP) process is initiated to obtain the MAC address of the next hop (device). In this manner, bits are transferred from one hop to another, ultimately reaching the destination device. |
| 1. Physical | **Objective:** Facilitate bit transmission.  **Example:** This layer is responsible for transmitting data (bits) from the source to the destination. It does so with the aid of other layers, which convert data into bits using the encoding process. Layer 1 devices that facilitate data transmission include Fiber, Cables, WiFi, Repeaters, Hubs, and Ethernet, among others |

Common Network protocols and ports that every IT aspirant should know

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| Protocol | Ports | Usage |
| SSH | 22 | SSH protocol is used establish secure remote access to the server |
| FTP | 21 | FTP protocol enables to transfer file from host to host over the network |
| HTTP | 80 | HTTP transfer data over the web |
| HTTPS | 443 | Secure data transfer over the web, it HTTP doesn’t have encryption however HTTPS encrypt data while transferring |
| DNS | 53 | DNS resolve the hostname into IP address. When someone tried to access any site for an example google.com, to access the google.com browser needs IP address. DNS check the IP address of the given URL or hostname in local host file, if it is found IP locally then it will show the response otherwise it follows path to find the IP  Root server >> Top level domain >> Name Server >> SOA and get the IP |
| SMTP | 25 | It is used to send the email |
| Nginx | 80/443 | Nginx is used as proxy server as well as load balancing purpose, its default port is 80/443 |
| Apache HTTP | 80/443 | This is a web server used to host the application and its default port is 80/443 |
| MYSQL Database | 3306 | MYSQL is a RDBMS server, it is used to store the transaction data and it uses port 3306 for the communication |
| Postgres | 5432 | Postgres is also RDBMS database There are used for OLTP |
| Jenkins | 8080 | Jenkins is a CICD tool, it is used to create the workflow to automate the CICD pipeline |
| SonarQube | 9000 | SonarQube, a code quality and security analysis tool, typically exposes its web interface on port 9000 |
| Grafana | 3000 | It is a Visualization and monitoring tool and it UI runs on 3000 port |
| POP3 | 10 | It is used to retrieve email from email Server by email client |
| IAMP | 143 | It works same like POP3 however email client can see their email on server itself without downloading |
| Telnet | 23 | It is used to check the service connection from one host to another host |