Lecture Notes

Internet and Networking Basics

Session Overview

You will be briefed about the basic concepts of the internet and networking. You will also get to learn the specific protocols and protocol models involved in networking. The session will also explain the idea of IP address and MAC address in accessing a website. Moreover, the concept of caching while browsing a website through a web browser will be discussed briefly in this module. It will cover accessing REST APIs with the help of Spring, CURL and POSTMAN. You will be introduced to the concepts of SSH and putty with the help of some practical examples. A brief introduction to the developer tools in the chrome browser will also be covered. Finally, you will get acquainted with the way to access IP addresses using the command prompt.

Basics of Networking

The Internet is nothing but a worldwide network of computers all of which work together. It is a global communication system that links thousands of individual networks. The Internet enables the transfer of messages through email, chat, video and so on, functioning as a medium to exchange information between two or more computers. The Internet can be considered to have two broader categories of devices: clients and servers. The machines which provide services to others are called servers, and those that consume such services are called clients. When you connect to the upGrad website, there are a host of machines working in the background to serve your request, which can be called servers. The machine from which you are trying to access the upGrad website is known as the client machine.

Internet Protocol (IP) address is a numerical label assigned to each device on a network accessing the Internet. The IP address helps in sending data/information to the specified computers on the network. IP addresses can be dynamic or static, depending on the Internet Service Providers (ISP). Let's learn more about IP addresses and the need for it in the following video. There are two kinds of IP addresses: IPv4 and IPv6. The range of the IPv4 addresses is usually represented in the dot-decimal notation, consisting of four decimal numbers, each ranging from 0 to 255, separated by dots.

Introduction to Essential Protocol Models

Network protocols are a set of rules that specify how to format, transmit and receive data so as to enable computer network devices ranging from servers and routers to endpoints to communicate regardless of the underlying differences in the infrastructures, designs or standards. Standardised network protocols help the computers communicate with each other effectively. Network protocols break extensive processes into various functions and tasks spread across different layers. The standard model for network protocol is known as Open Systems Interconnection (OSI) model, in which network protocols govern activities in each layer in a telecommunication exchange.

In general, the network protocol suites are structured using protocol stacks, which is a collection of series of layers. Each layer existing on both the sending and receiving hosts is designed for a specific purpose. A particular layer sitting on one machine will send or receive the same object, which the peer machine sends or receives. Each layer acts in parallel with a similar layer on the other host, acting independent of other layers. The OSI model is categorised into seven layers, such as Physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation layer and Application layer.

More on Protocol Models

The OSI model is a generalised protocol for networking communication within a family of networks. The TCP/IP is a suite of communication protocols used to interconnect network devices on the Internet. It combines several layers of the OSI protocol suite into a single layer and, hence, has only four layers, unlike the OSI protocol model. The topmost layer is known as the application layer, while the physical layer is the lowest.

There are some more common terminologies involved in the internet and networking business, such as HTTP, HTTPS, SSH, NTP and so on.

How Does a Website Work?

Whenever you type any web address, the desired page is loaded instantly. The web address you type is known as Uniform Resource Locator (URL). Then, the browser finds the page you requested with the help of cache, IP address and MAC address. Each URL will indicate a unique resource and the URL is handled by web servers. The URL contains various parts such as protocol, domain name, port, path, parameters and anchor.

Caching is nothing but a technique by which the copy of a given resource is stored and returned back when requested. It helps in faster loading of web pages by helping the browser to not download the content again while revisiting the same web pages. This eases the load on the server while improving the performance on the client side.

There is another term known as Domain Name System (DNS), which functions as a phonebook of the Internet. We access the Internet through domain names, like upgrad.com, youtube.com, etc. The web browsers will utilise the Internet Protocol (IP) address to match with the domain names to load the internet resources. The IP address will be easily sought with the help of caching, as discussed earlier.

Accessing APIs using Spring and POSTMAN

The REpresentational State Transfer, also known as REST, is an architectural style, which defines a set of rules used for creating web services. REST follows the principle of the client-server relationship and is a stateless and cacheable architectural style. An API is a kind of a 'service provider' of a website wherein you can request for a certain data, and the API can fetch that for you and show it to you.

1. You can request these 'service providers' (APIs) for some information, and they will display that for you.
2. An example of REST API in action would be when you search for a video on Youtube. You search for something and get a list of results from which you can choose the appropriate option.

Whenever you click on a particular website or URL, have you ever thought about where the data comes from?
1. The data is received from a particular server known as web-server.
2. The client (us) will be requesting the data from the server with the help of API. Once the request is received, the server will send the request to the client.
3. The REST API creates an object and sends it as a response to the client.

CURL is a command line tool used to transfer data from or to a server using any of the supported protocols. It is widely used in various household items such as television sets, routers, printers, audio equipment, mobile phones, tablets, set top boxes and media players to communicate with the servers. Apart from these, it is the backbone of various software applications for communicating through the Internet.

POSTMAN is an API client used to create, test and share API schemas or collections. POSTMAN is a collaboration platform for API development which helps you create and execute any REST and Simple Object Access Protocol (SOAP) APIs. It also helps in automating manual

tests and integrating them into the CI/CD pipeline to ensure that any code changes will not break the API in the production environment.

SSH and Chrome Developer Tools

Secure SHell (SSH) is a software package or a cryptographic network protocol that helps the network services to communicate with each other securely over an unsecured network. It is widely used in all data centres and in large enterprises. The SSH protocol makes use of the encryption to secure the connection between the client and the server, and all the network actions such as user authentication, commands, file transfers and so on are protected against cyber attacks. Google Chrome provides a set of in-built web developer tools used to edit pages on the fly and diagnose problems quickly.