The Application and Transport layers

Outline

This unit will help in understanding the importance and characteristics of the Application and Transport Layers. Commonly used protocols at the application layer will also be discussed.

Learning Outcomes

- Distinguish between TCP and UDP protocols.
- Identify the commonly used application layer protocols.
- Explain the purpose of the Application, presentation and session layers of the OSI model.

Week 11 & 12: In-class presentation on The Application, Presentation and Session Layers

Let us learn about the top three layers by using the below link:

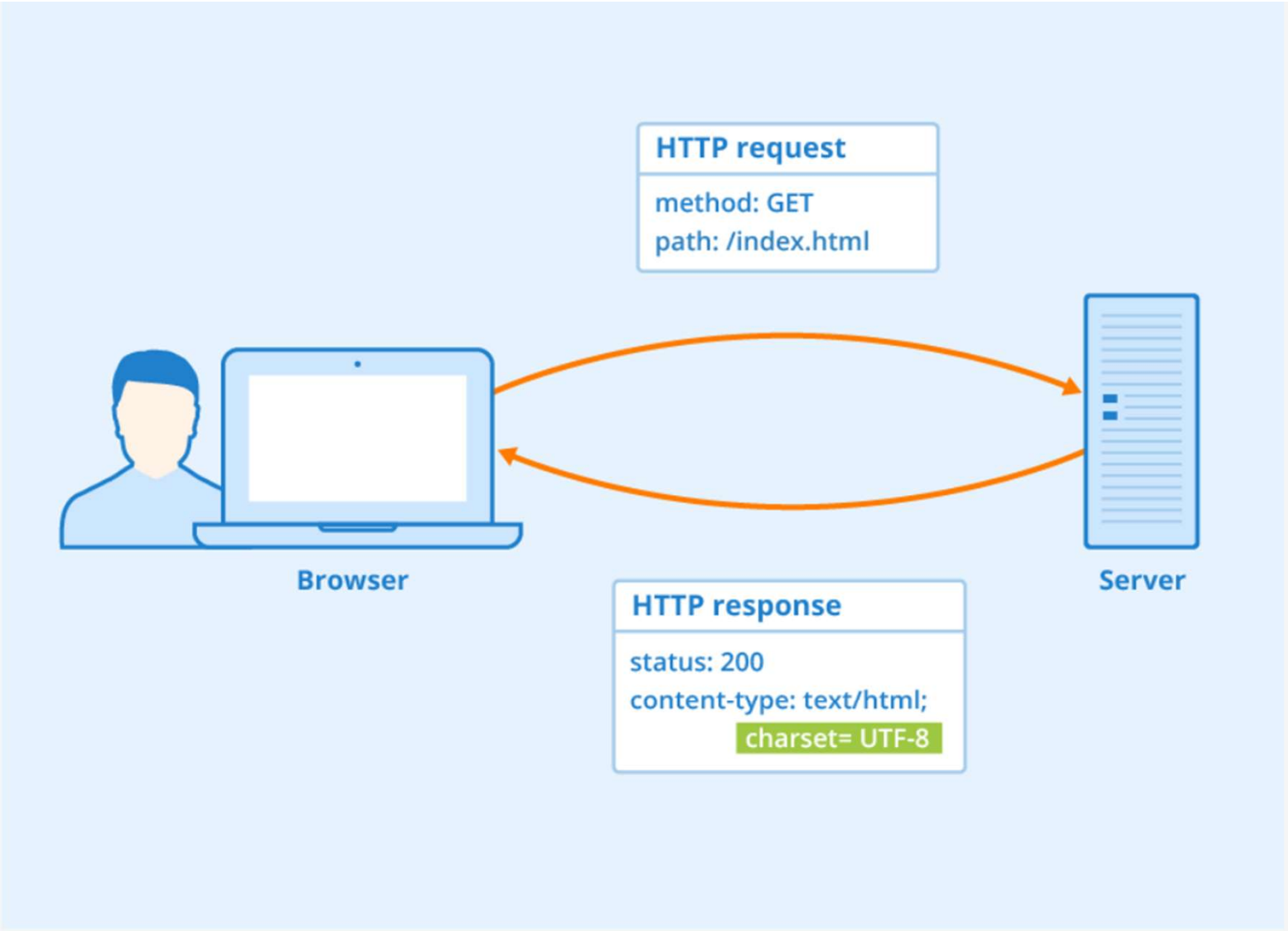
https://youtu.be/WGPyY0LVX5Y

HTTP

The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems.

HTTP is the foundation of data communication for the World Wide Web. Hypertext is structured text that uses logical links (hyperlinks) between nodes containing text. HTTP is the protocol to exchange or transfer hypertext.

HTTP functions as a request–response protocol in the client–server computing model. A web browser, for example, may be the client and an application running on a computer hosting a web site may be the server. The client submits an HTTP request message to the server. The server, which provides resources such as HTML files and other content, or performs other functions on behalf of the client, returns a response message to the client.



Domain Name System

The Domain Name System (DNS) is a hierarchical decentralized naming system for computers, services, or any resource connected to the Internet or a private network.It

associates various information with domain names assigned to each of the participating entities.

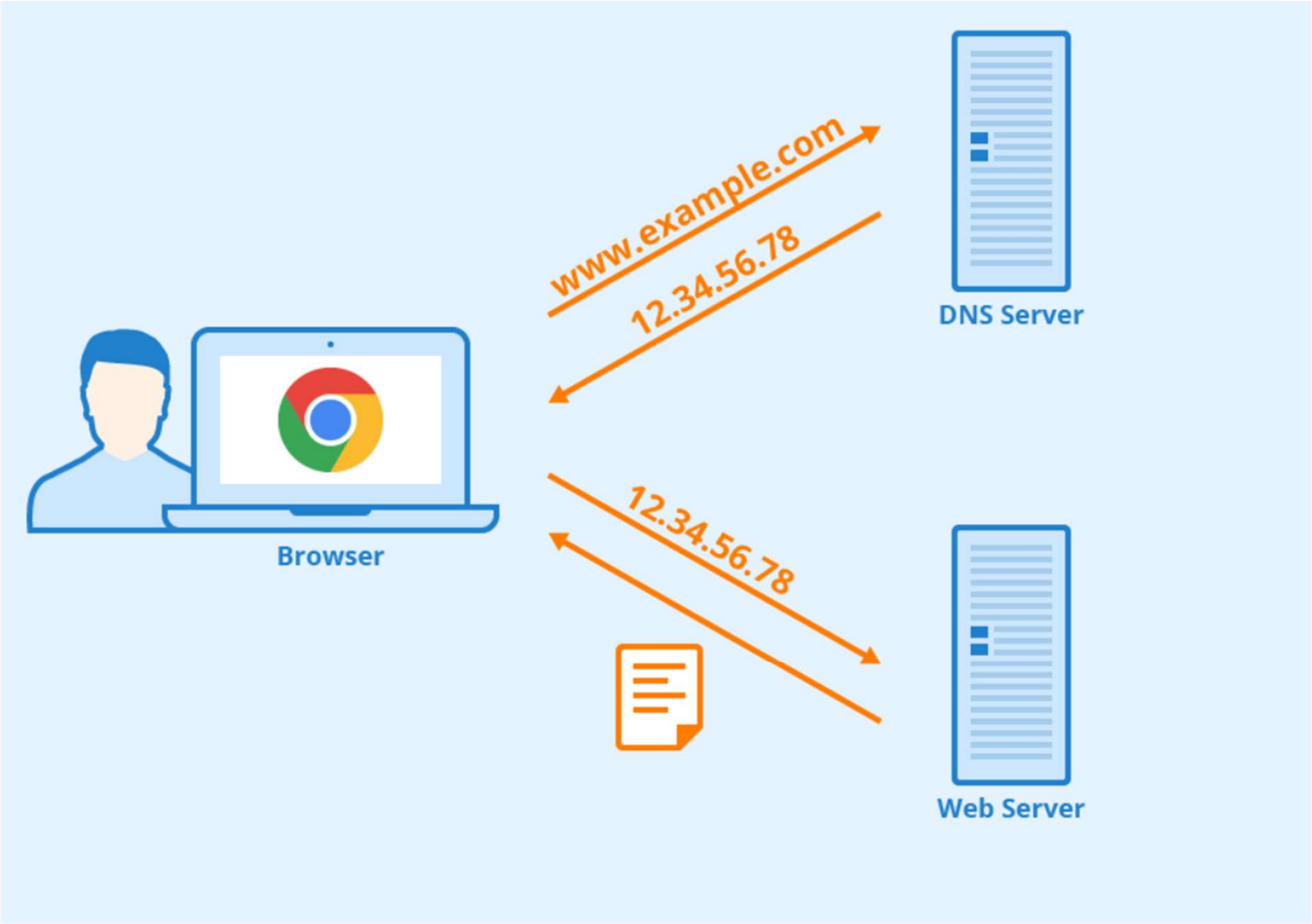
Most prominently, it translates more readily memorized domain names to the numerical IP addresses needed for the purpose of locating and identifying computer services and devices with the underlying network protocols.

By providing a worldwide, distributed directory service, the Domain Name System is an essential component of the functionality of the Internet.

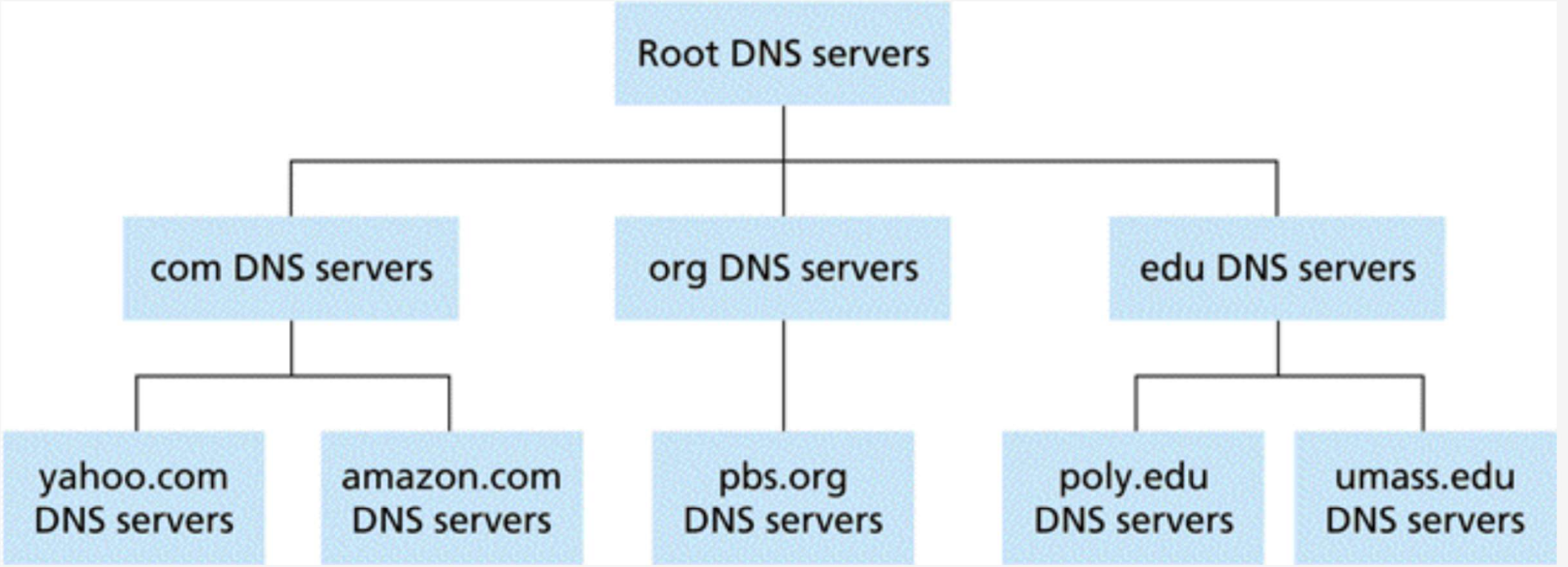
The Domain Name System delegates the responsibility of assigning domain names and mapping those names to Internet resources by designating authoritative name servers for each domain.

Network administrators may delegate authority over sub-domains of their allocated name space to other name servers.

This mechanism provides distributed and fault tolerant service and was designed to avoid a single large central database.



DNS Server Hierarchy



Simple Mail Transfer Protocol

The Simple Mail Transfer Protocol (SMTP) is used to transfer electronic mail from one user to another.

This task is done by means of email client software (User Agents) the user is using.

User Agents help the user to type and format the email and store it until internet is available.

When an email is submitted to send, the sending process is handled by Message Transfer Agent which is normally comes inbuilt in email client software.

Message Transfer Agent uses SMTP to forward the email to another Message Transfer Agent (Server side).

POP and IMAP protocols are used to retrieve emails.

File Transfer Protocol

The File Transfer Protocol (FTP) is a standard network protocol used to transfer computer files between a client and server on a computer network.

FTP is built on a client-server model architecture and uses separate control and data connections between the client and the server.

FTP users may authenticate themselves with a clear-text sign-in protocol, normally in the form of a username and password, but can connect anonymously if the server is configured to allow it.

For secure transmission that protects the username and password, and encrypts the content, FTP is often secured with SSL/TLS (FTPS).

SSH File Transfer Protocol (SFTP) is sometimes also used instead, but is technologically different.

Dynamic Host Configuration Protocol

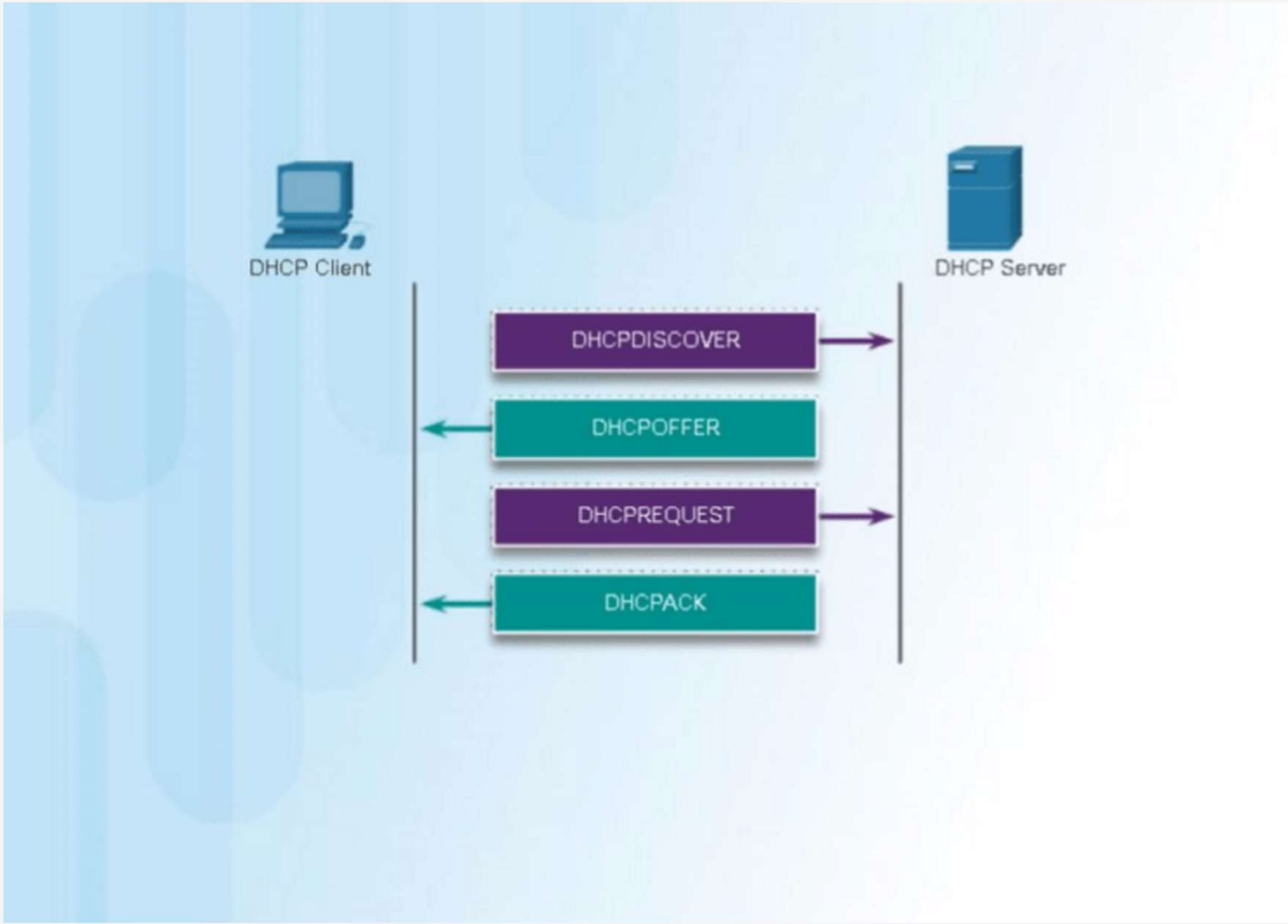
When a host is first configured as a DHCP client, it does not have an IPv4 address, subnet mask or default gateway.

It obtains this information from a DHCP server, either on the local network or one located at the ISP.

The DHCP server is configured with a range, or pool, of IPv4 addresses that can be assigned to DHCP clients.

The DHCP server may be located on another network.

DHCP clients are still able to obtain IPv4 addresses as long as the routers in-between are configured to forward DHCP requests.



Week 12: In-class Activity on DNS lab

Open the command prompt in your computer and ping www.google.com

What do you observe?

Type nslookup and search again for www.google.com

Do you obtain the same IP address?

Why can the IP address for www.google.com be different for different users?

The Transport layer

Let us learn about the transport layer:

https://youtu.be/TZK1CDG-Zyc

Well-known port numbers

Port Number	Protocol	Application
20	TCP	File Transfer Protocol (FTP) - Data
21	TCP	File Transfer Protocol (FTP) - Control
22	TCP	Secure Shell (SSH)
23	TCP	Telnet
25	TCP	Simple Mail Transfer Protocol (SMTP)
53	UDP, TCP	Domain Name Service (DNS)
67	UDP	Dynamic Host Configuration Protocol (DHCP) - Server
68	UDP	Dynamic Host Configuration Protocol - Client
69	UDP	Trivial File Transfer Protocol (TFTP)
80	TCP	Hypertext Transfer Protocol (HTTP)
110	TCP	Post Office Protocol version 3 (POP3)
143	TCP	Internet Message Access Protocol (IMAP)
161	UDP	Simple Network Management Protocol (SNMP)
443	TCP	Hypertext Transfer Protocol Secure (HTTPS)