Lab No. 05 - Databases and Network Protocols

Objective

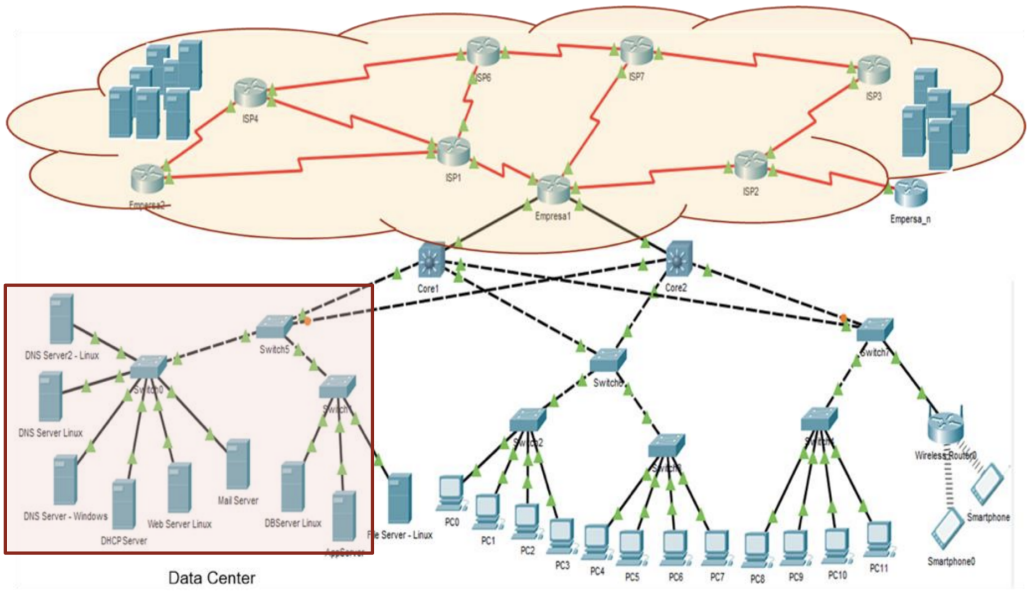
Continue learning the installation of basic software and the operation of network protocols.

Tools to be used

- Computers
- Internet access
- Virtualization software
- Wireshark

Introduction

We are continuing to work within a company's infrastructure, which typically includes various IT services. This infrastructure features both wired and wireless user workstations and servers (both physical and virtualized), all connected through switches (Layer 2 and Layer 3), wireless equipment, and routers connecting them to the Internet. Cloud infrastructures are also common, provisioning resources as needed by the organization. The servers may host services such as web, DNS, email, databases, storage, and applications, among others.



In this part of the lab, we will focus on continuing to set up our servers.

Review of Network Protocols

1. Review of DNS Messages

[For groups of 1, 2, and 3 students]

Using **Wireshark**, make a query to the webpage http://www.google.com/, filter DNS messages, and examine the name resolution. Identify the fields and explain each part.

2. Review of HTTP Messages

[For groups of 1, 2, and 3 students]

Using **Wireshark**, make a query to the webpage http://profesores.is.escuelaing.edu.co/~csantiago/ , filter the messages, and examine the HTTP message header. Identify the fields and explain each part.

3. Review of Ethernet Frames

[For groups of 1, 2, and 3 students]

Using **Wireshark**, make a query to the webpage http://profesores.is.escuelaing.edu.co/~csantiago/ , filter the `GET` messages and examine the Ethernet frame header. Identify the fields and explain each part.

Base Software Installation

Another key component of basic IT infrastructure is database management systems (DBMS). These DBMS can be hosted either in a company's datacenter or on a cloud server. They store structured data for the organization and are used by different applications supporting business operations.

1. PostgreSQL - Linux Slackware

[For groups of 1, 2, and 3 students]

a. Install the PostgreSQL DBMS on a virtual machine running Linux Slackware.

b. Create a user for each group member. Use the students' names as the username.

c. Create a database to store information about tourist sites in Colombia you wish to visit. The database must have at least 3 tables. Each student should have access only to their own database.

d. Insert data into the databases.

2. SQL Server - Windows Server

[For groups of 1, 2, and 3 students]

a. Install the SQL Server DBMS on a virtual machine running Windows Server.

b. Create a user for each group member. Use the students' names as the username.

c. Create a database to organize your monthly activity schedule. The database must have at least 3 tables. Each student should have access only to their own database.

d. Insert data into the databases.

3. SQL Database - Microsoft Azure

[For groups of 1, 2, and 3 students]

a. Go to https://azure.microsoft.com/en-us/pricing/purchase-options/azure-account/ and log in with your institutional email.

b. Once logged into the **Azure** portal, explore the available services.

- What is cloud computing, and what are some of the advantages of using a platform like Microsoft Azure compared to an on-premise infrastructure?
- What types of services does Microsoft Azure offer (IaaS, PaaS, SaaS), and how do they differ from one another?
- What is the importance of regions and availability zones in Azure, and how do they affect service availability?
- What is the difference between vertical scaling and horizontal scaling in Azure, and when would you choose one over the other?
- How does using technologies like TLS (Transport Layer Security) on the transport layer affect accessing Azure SQL Database compared to a local virtual machine database?
- From a transport layer perspective, how does the handling of TCP connections differ between a SQL database hosted on a local virtual machine and Azure SQL Database?

c. Use the Azure SQL Database service to manage records of books and scientific articles. The database must have at least 3 tables.

d. Insert data into the database.

e. Record a video (no longer than 5 minutes) demonstrating the connection to the database, the created tables, and the inserted data.

f. Delete all resources created for the database (including the database itself) to avoid additional costs and depletion of available credits.

4. PostgreSQL - Linux Solaris

[For groups of 3 students]

a. Install the PostgreSQL DBMS on a virtual machine running Linux Solaris.

b. Create a user for each group member. Use the students' names as the username.

c. Create a database to manage TV series you watch. The database must have at least 3 tables. Each student should have access only to their own database.

d. Insert data into the databases.

5. Other Database Engine Configurations

[For groups of 1, 2, and 3 students]

1. On the servers where you installed the database engines, configure the operating system so that the database engines automatically start when the OS boots.
2. Using a database connection client (e.g., DBeaver), connect to your databases from a remote machine and view the table contents.

Present your results to your professor.