LABORATORY 05 - DATABASES AND NETWORK PROTOCOLS - CLOUD

Laboratory 5 corresponding to the second term

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NETWORK ARCHITECTURE AND SERVICES

GROUP 3

Bogotá DC, Colombia

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Lab No.05 - DATABASES AND NETWORK PROTOCOLS - CLOUD

Objectives

Continue learning the installation of basic software and the operation of network protocols. Install and configure base software - Web Servers.

Tools to be used

- Computers
- Internet access
- Virtualization software
- Wireshark

Introduction

In this laboratory, we focused on deepening our understanding of how fundamental IT infrastructure components are installed, configured, and integrated to support real-world business operations. Specifically, the exercise centered on the installation and configuration of the PostgreSQL Database Management System (DBMS) on a Linux Slackware virtual machine. This activity simulated a common enterprise environment, where physical and virtual servers coexist within complex network topologies, including wired and wireless connections managed through switches, routers, and other network devices. Our goal was to replicate the process an organization would follow to deploy a functional and secure database server capable of storing and organizing structured information for future use by various applications and services.

Through this lab, we continued to gain practical experience in managing not only software installation but also user configuration, database creation, and data insertion. We created personalized user accounts, ensuring each had access only to their respective databases, reinforcing the principle of access control and data isolation in multi-user environments. The databases designed in this activity focused on cataloging tourist sites in Colombia, which allowed us to apply database modeling concepts such as relational table design, foreign key constraints, and referential integrity. By following a structured installation and configuration process, we were able to understand how PostgreSQL interacts with the underlying operating system, manages data directories, and provides secure access through authentication mechanisms.

Moreover, this lab emphasized the importance of understanding how network protocols interact with database systems. In a corporate infrastructure, databases rarely operate in isolation; they are constantly communicating with other systems and services over the network. Therefore, learning about DNS, HTTP, and Ethernet protocols using Wireshark allowed us to observe the flow of communication between clients and servers in real time. This understanding bridges the gap between theoretical networking knowledge and practical system administration skills. In essence, the lab helped us strengthen our technical foundation for both database management and network communication—two pillars of modern information technology environments that ensure data accessibility, consistency, and reliability across systems.

Theoretical Framework

A Database Management System (DBMS) is specialized software designed to handle the definition, storage, retrieval, and management of data in a structured and efficient manner. PostgreSQL, in particular, is an advanced open-source relational DBMS that adheres to the relational model proposed by E.F. Codd. It supports the use of SQL (Structured Query Language) to define and manipulate data, ensuring consistency and integrity across large datasets. PostgreSQL's architecture allows multiple users to access the same data simultaneously through robust concurrency control mechanisms, while maintaining data accuracy and preventing conflicts. Its features, including role-based access control, transaction management, referential integrity, and strong data typing, make it a preferred choice for both academic and professional environments.

Within an enterprise infrastructure, the DBMS plays a crucial role in centralizing information and making it accessible to authorized users and applications. It acts as the backbone for various business operations such as customer management, inventory control, and financial reporting. Security and access control are fundamental aspects of database management, as they ensure that sensitive information remains protected against unauthorized access. PostgreSQL allows system administrators to define users, assign privileges, and enforce authentication through password-based or external verification mechanisms.

At the same time, databases are not isolated systems—they function within a larger network ecosystem that relies on communication protocols. Protocols such as DNS (Domain Name System), HTTP (Hypertext Transfer Protocol), and Ethernet govern how data travels between devices, ensuring it reaches the correct destination. DNS resolves human-readable names into IP addresses, HTTP facilitates the exchange of data between clients and web servers, and Ethernet defines the physical and data link layers for network communication. Using tools like Wireshark to analyze these protocols provides valuable insights into how applications and databases interact across the network, revealing message structures, request-response cycles, and latency factors.

Therefore, understanding both database management and network protocols is essential for system administrators and network engineers. The synergy between these two areas allows organizations to deploy reliable, scalable, and secure infrastructures capable of supporting the growing demand for data-driven services. Through this lab, we reinforced this integration, gaining practical experience that reflects the interconnected nature of modern computing environments.

Review of Network Protocols

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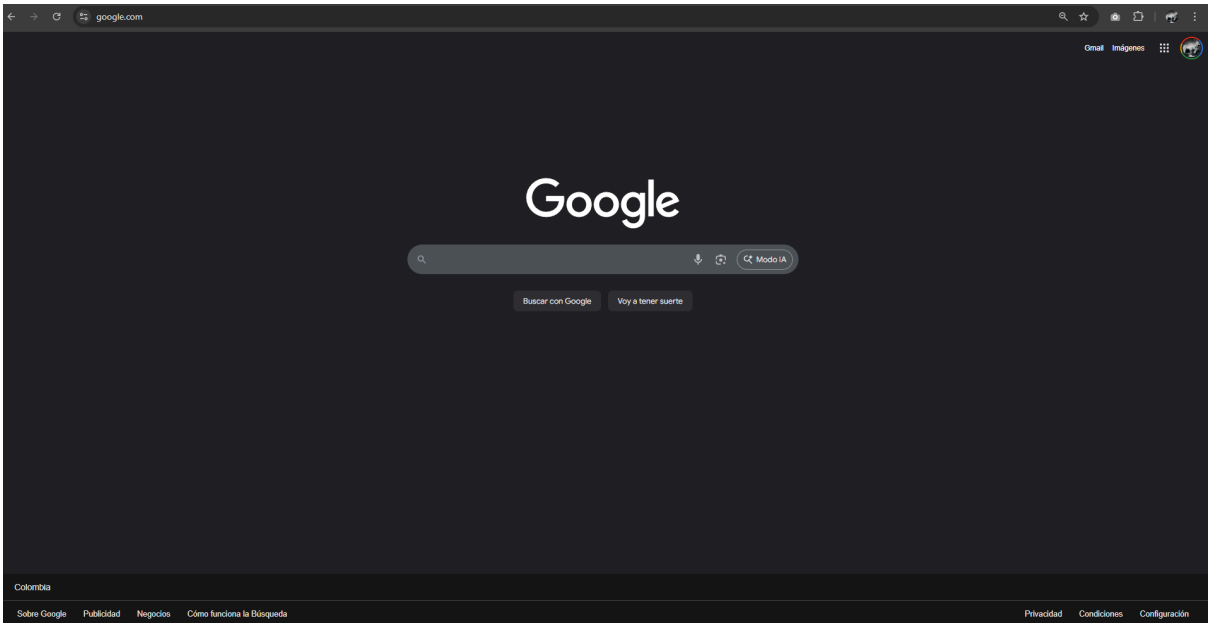
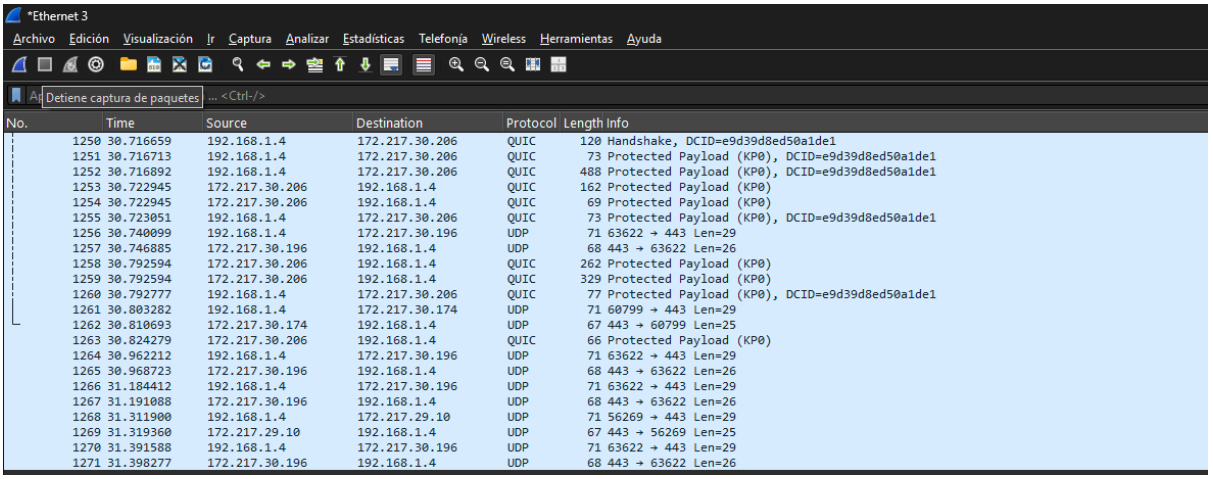
1. Review of DNS Messages

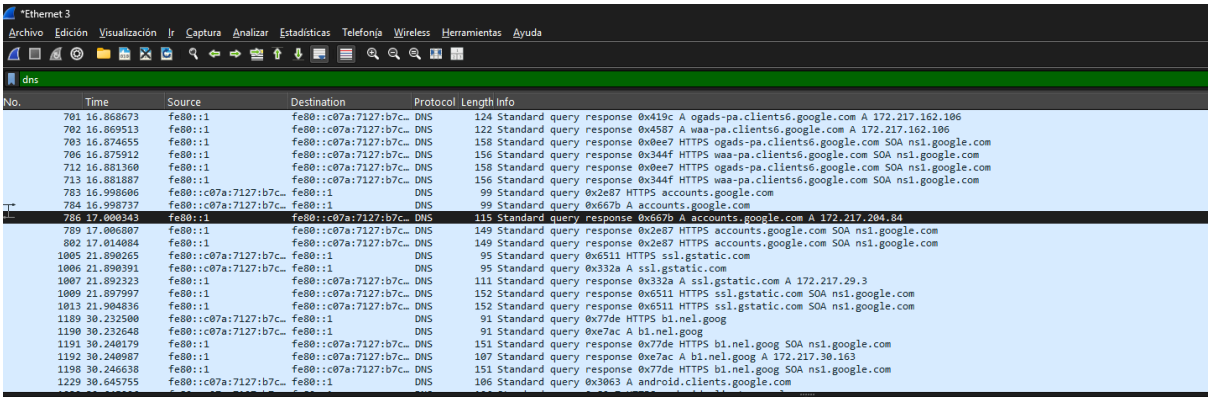
Using Wireshark, make a query to the webpage http://www.google.com/, filter DNS messages, and examine the name resolution. Identify the fields and explain each part.

The first thing we need to do is make the query to the webpage http://www.google.com/

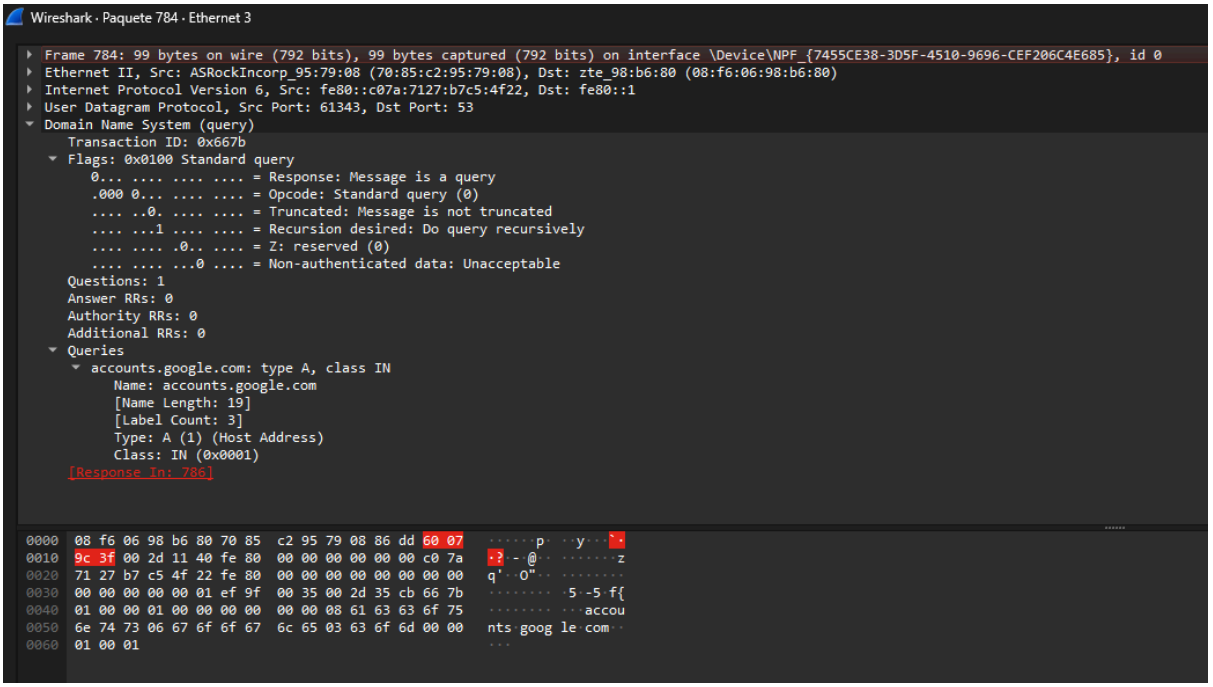


Then we have to start the packaging capture and after that we apply the dns filter to get all the queries about our request





Once we got all the packages displayed we have to click on one the number 784



In this part of the capture, we are looking at the details for the **Domain Name System (query)**. This is the packet your computer sent to *ask* for an address.

- **Transaction ID:** 0x667b

  Explanation: This is a unique identification number where the PC attaches it to the query so it can match the incoming answer to this specific question.

- **Flags:** Details shown when I expanded the option

  Explanation: The most important field here is Recursion desired: Do query recursively (1). Here is where the pc tells the DNS server, if it doesn't know the answer, find it for him

- **Questions:** 1

  Explanation: This simply indicates that this packet contains 1 question.

- **Queries:** This section contains the actual question itself

  Name: accounts.google.com

  Explanation: The exact domain name the pc wants to resolve.

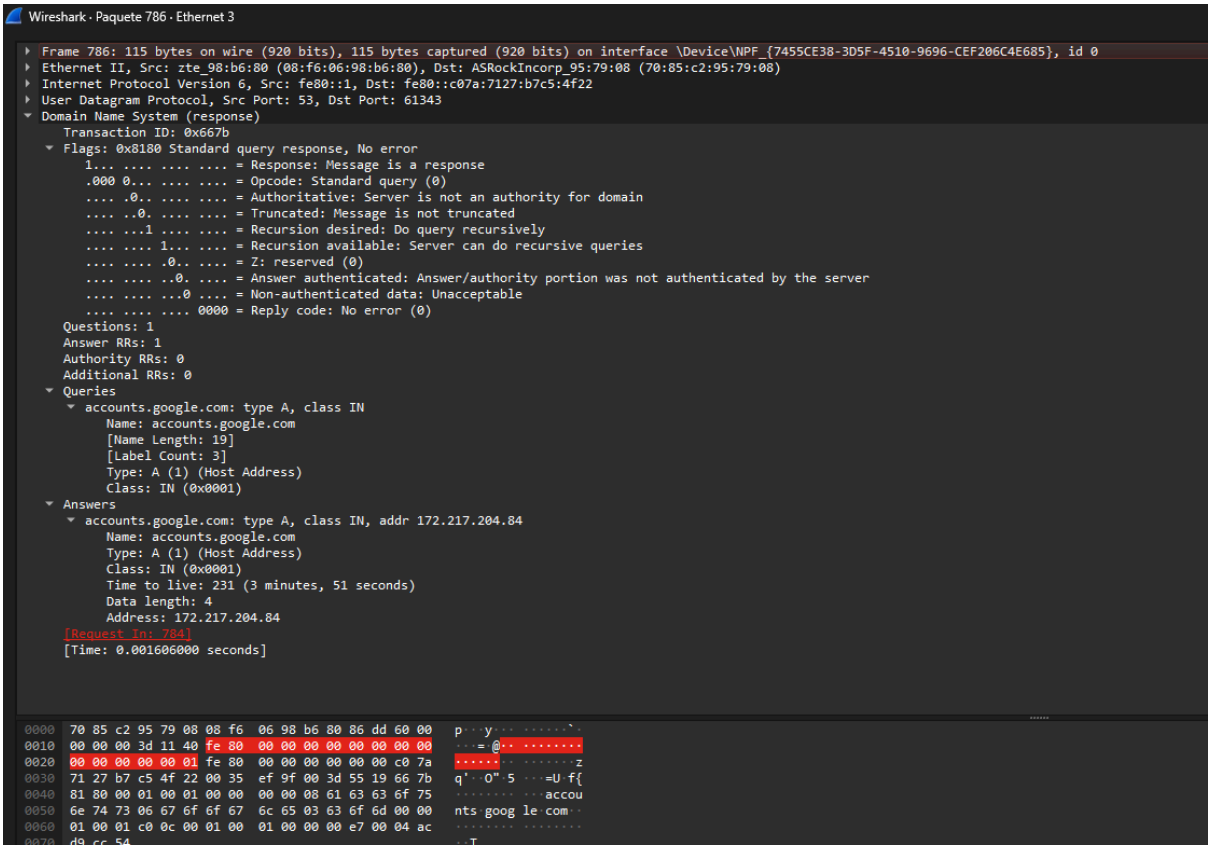
- **Type:** A (Address)

  Explanation: This indicates we are asking for an **IPv4 address**.

  Class: IN (Internet)

  Explanation: This is a standard field that almost always means "Internet."

  Now when we click on the number 786



Now we are looking at the **Domain Name System (response)** packet, this is the answwer the server sent back to the computer.

- **Transaction ID:** 0x667b

  Explanation: We notice this is **identical** to the query's ID because this is how the PC knows this is the answer to the question it asked in packet 784.

- **Flags:**

  Explanation: we will see new flags, like Message is a response confirming it's an answer and Recursion available, and this is how the server says that he can perform recursive LookUps

- **Questions:** 1

  Explanation: The server repeats the original question so we know what it is responding to.

- **Answers:**

  Explanation: Here is the "name resolution" we were looking for it says accounts.google.com: type A..

  Name: accounts.google.com This is the name that was resolved before

Type: A (The type of record being returned).

Time to live (TTL): 231 is the time in seconds

> **Explanation:** This tells the PC how long it can store this answer. If we need this IP again in the next 180 seconds, it won't have to ask the server again.

Data length: 4

> **Explanation:** The length of the IP address (an IPv4 address is 4 bytes).

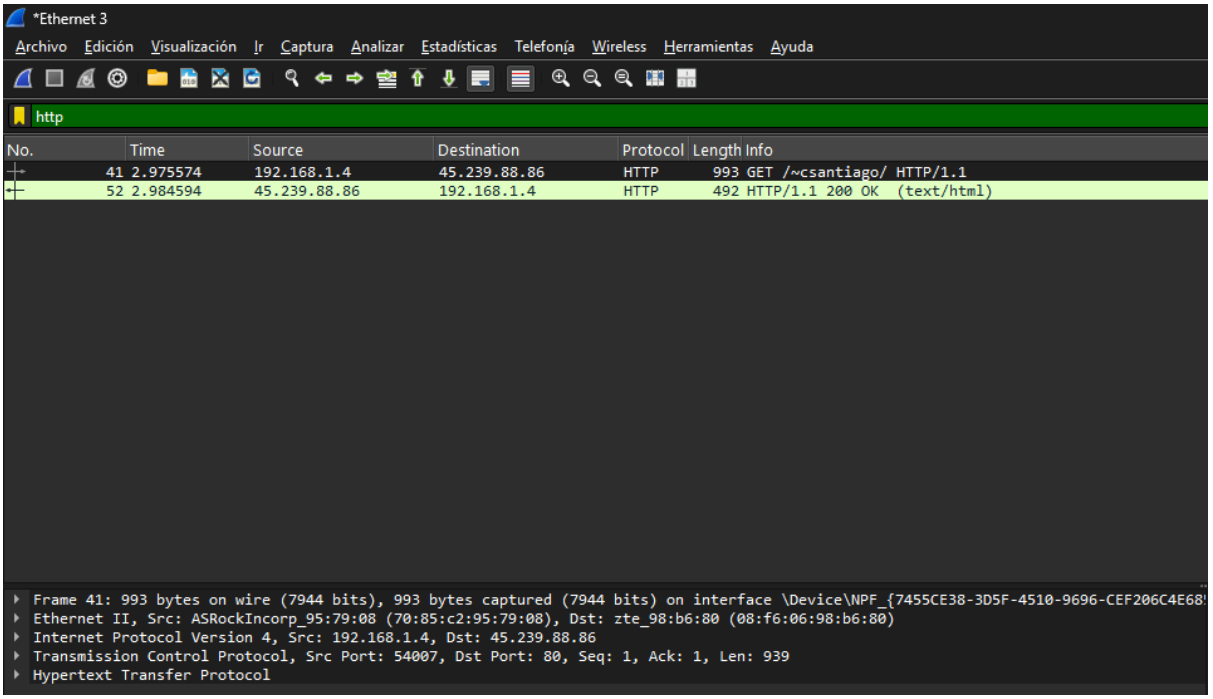
Address: 172.217.104.84

> **Explanation: This is the answer!** It is the IP address your browser will use to connect to the accounts.google.com server.

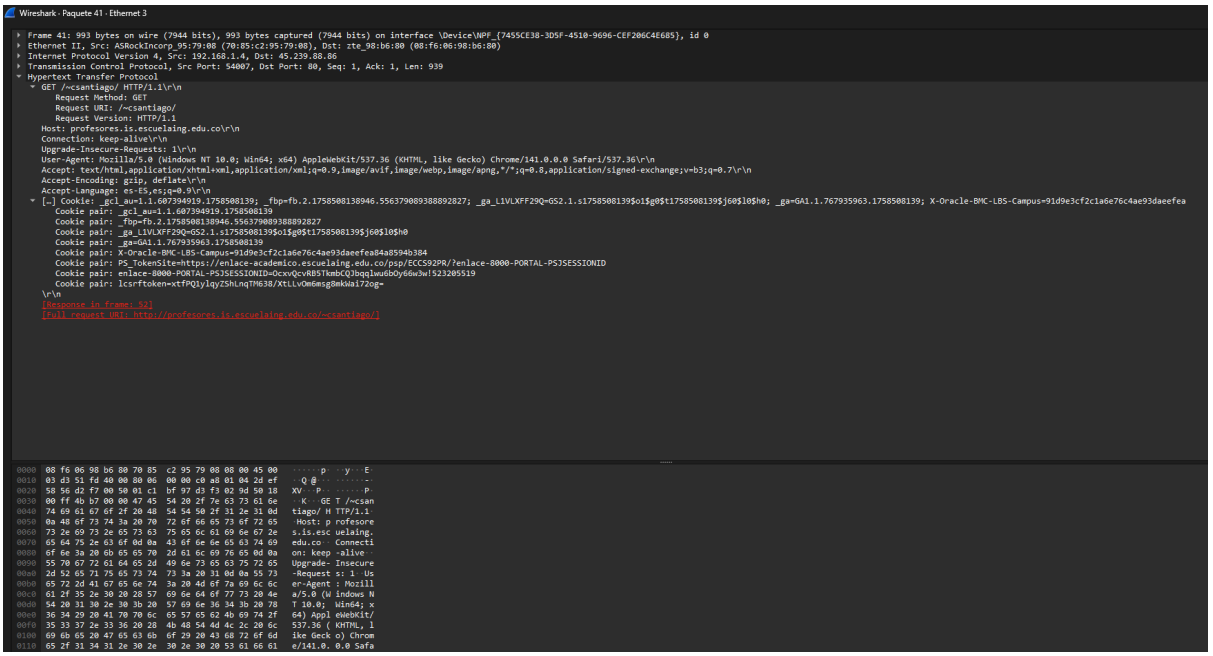
2. Review of HTTP Messages

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.

Here we do almost the same process , but we use http instead of dns filter



Then we click on the first package



- **Request Method:** GET

  Explanation: This defines the action the client wants the server to perform, GET method is used to retrieve a resource, such as an HTML file or an image

- **Request URI:** /~csantiago/

  Explanation: The Uniform Resource Identifier (URI). This specifies the path to the exact resource the client is requesting on the server.

- **Request Version:** HTTP/1.1

  Explanation: This indicates the version of the HTTP protocol being used for the communication, then both the client and server must support this version to understand each other.

- **Host:** profesores.is.escuelaing.edu.co

  Explanation: This header is essential. It specifies the domain name of the server the client wants to talk to so this allows a single server to manage and serve content for many different websites.

- **User-Agent:** Mozilla/5.0 (Windows NT 10.0; Win64; x64) …

  Explanation: A string that identifies the client software, it provides details

about the browser and the operating system, then some servers can use this information to send content optimized for that specific software.

- **Accept:** text/html,application/xhtml+xml,application/xml;q=0.9,...

  Explanation: This field lists the media types the client can understand, often with a quality value to indicate preference. Here the client is saying it prefers text/html above other formats.

- **Accept-Language:** es-ES,es;q=0.9

  Explanation: This tells the server the client's preferred languages, in order of priority, then the server can use this to send a version of the page in that language, if it is available, so in this case, the preference is "Spanish from Spain" (es-ES) and then any other Spanish (es).

- **Accept-Encoding:** gzip, deflate

  Explanation: This informs the server about the compression methods the client can handle, if the server supports it, it can "zip" the content before sending it, reducing the file size and speeding up the transfer. The client then decompresses it

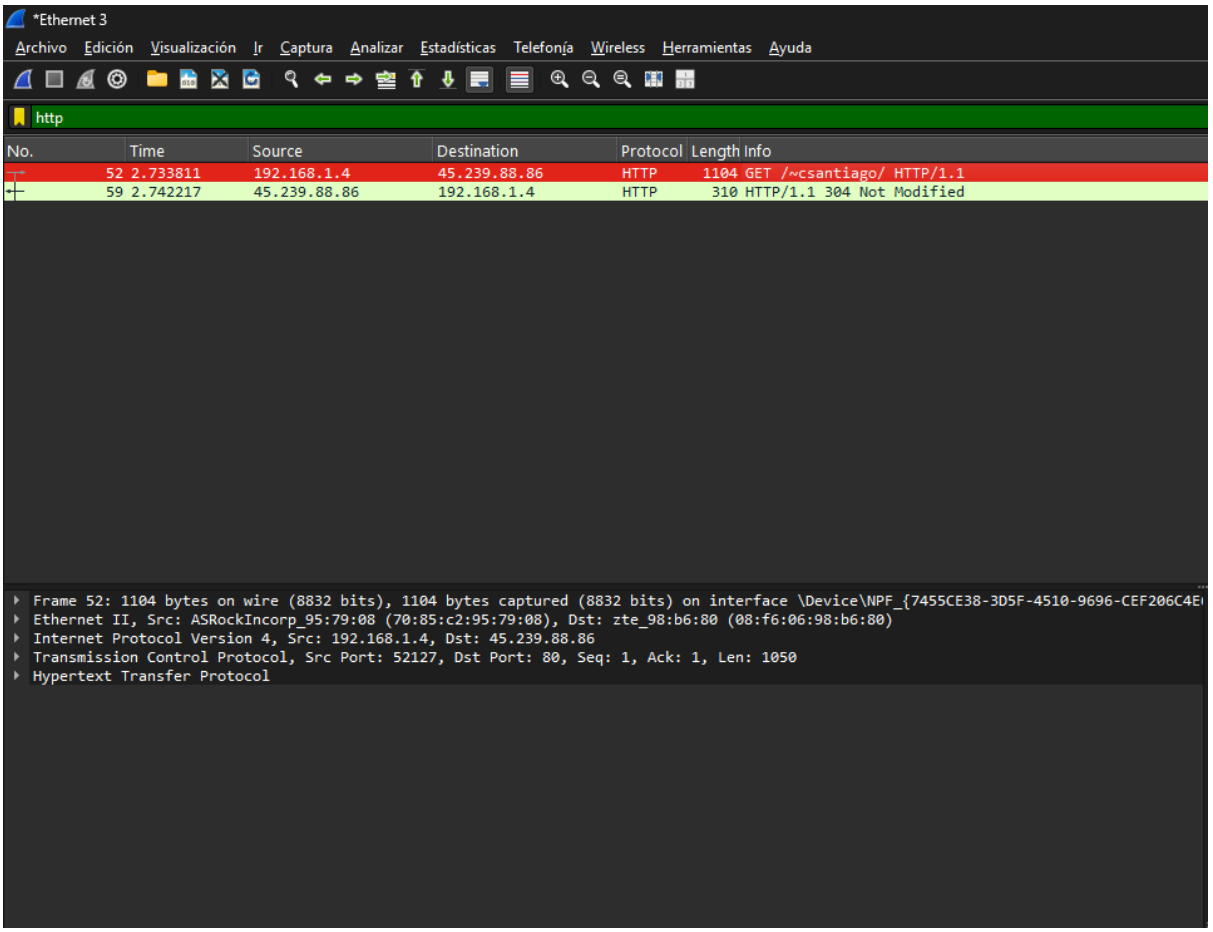
- **Cookie:** gcl_au=...; _ga=...;

  Explanation: This header contains data (like session IDs or tracking information) that the server has previously stored on the client. The client sends this data back with each request so the server can "remember" the client's state or identify it.

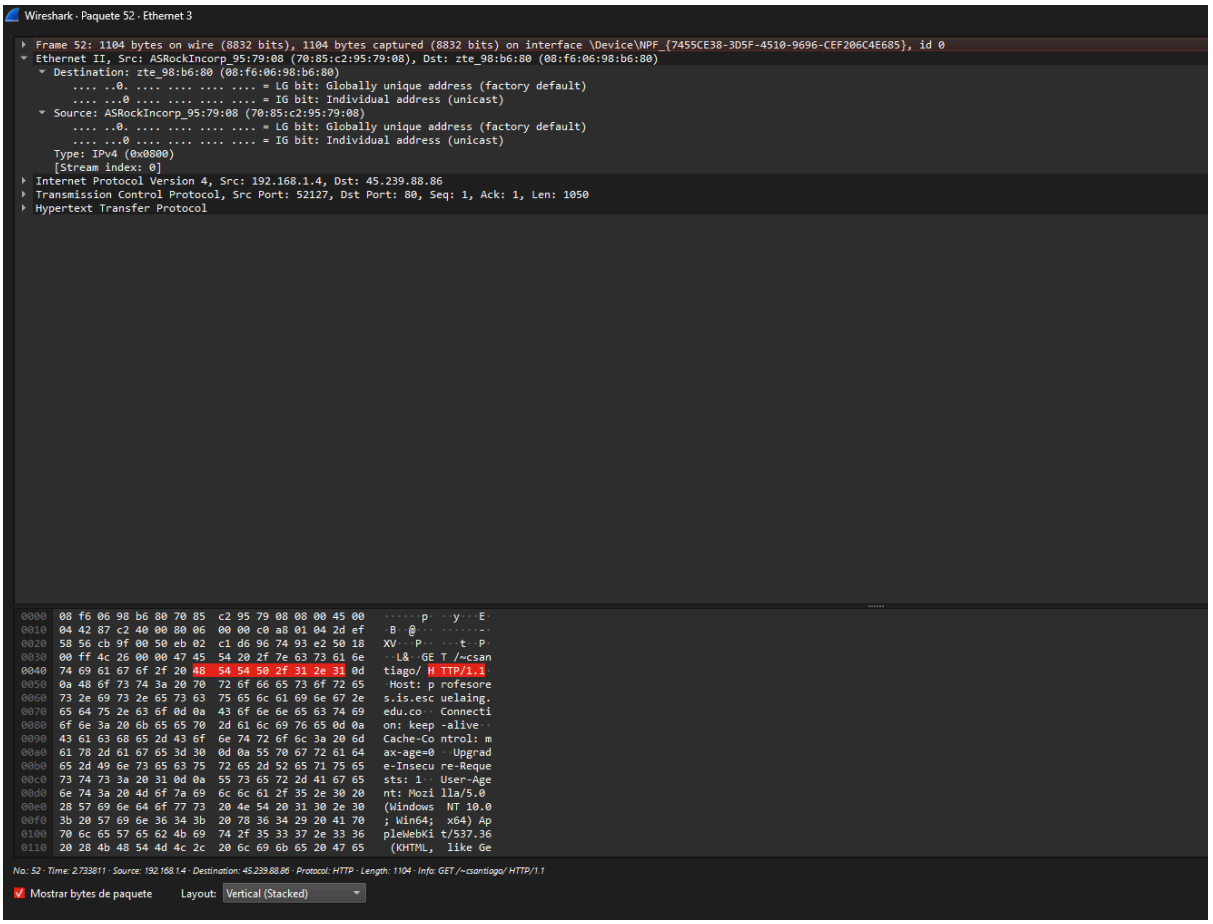
3. Review of Ethernet Frames

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.

Same as the previous step we still set the http filter



Then we click on the get,



- **Destination:** zte_98:b6:80 (00:f6:06:98:b6:80)

  Explanation: This is the destination MAC address. It is the physical hardware address of the network card that this frame is being sentto on the local network.

  IG bit: Globally unique address: This indicates the address is a standard, manufacturer-assigned MAC address.

  IG bit: Individual address: This indicates the frame is being sent to a single, specific device and is not a broadcast.

- **Source:** ASROCKIncorp_95:79:08 (70:85:c2:95:79:08)

  Explanation: This is the **source MAC address**. It is the physical hardware address of the network card that this frame is being sent from

- **Type:** IPv4 (0x0800)

  Explanation: This field identifies the protocol of the data inside the Ethernet frame. The code 0x0800 signals that the payload is an Internet Protocol

version 4 (IPv4) packet. This tells the receiving device to pass the data up to the network layer for IP processing.

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

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

We changed to the **/tmp** directory to use it as a temporary workspace for the PostgreSQL installation files.

```
root@aysrSlack:~# cd /tmp
root@aysrSlack:/tmp#
```

We downloaded the PostgreSQL SlackBuild script from the official SlackBuilds repository to automate the process of compiling and packaging PostgreSQL for Slackware.

```
root@aysrSlack:~# cd /tmp
root@aysrSlack:/tmp# wget https://slakcbuilds.org/slackbuilds/15.0/system/postgresql.tar.gz
--2025-10-14 10:29:39--  https://slakcbuilds.org/slackbuilds/15.0/system/postgresql.tar.gz
Resolving slakcbuilds.org (slakcbuilds.org)... failed: Name or service not known.
wget: unable to resolve host address ■slakcbuilds.org■
root@aysrSlack:/tmp# wget https://slackbuilds.org/slackbuilds/15.0/system/postgresql.tar.gz
--2025-10-14 10:29:55--  https://slackbuilds.org/slackbuilds/15.0/system/postgresql.tar.gz
Resolving slackbuilds.org (slackbuilds.org)... 66.85.79.67, 64:ff9b::4255:4f43
Connecting to slackbuilds.org (slackbuilds.org)|66.85.79.67|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 6860 (6.7K) [application/x-gzip]
Saving to: ■postgresql.tar.gz■

postgresql.tar.gz        100%[=================================>]   6.70K  --.-KB/s    in 0s

2025-10-14 10:29:56 (3.01 GB/s) - ■postgresql.tar.gz■ saved [6860/6860]

root@aysrSlack:/tmp#
```

We extracted the downloaded archive to access the SlackBuild script and related files needed for the installation.

```
root@aysrSlack:/tmp# tar -xvf postgresql.tar.gz
postgresql/
postgresql/doinst.sh
postgresql/slack-desc
postgresql/README
postgresql/postgresql.logrotate
postgresql/rc.postgresql.new
postgresql/postgresql.info
postgresql/setup.postgresql
postgresql/README.SBo
postgresql/postgresql.SlackBuild
root@aysrSlack:/tmp# cd postgresql
root@aysrSlack:/tmp/postgresql#
```

Now we entered the **postgresql** directory to prepare for the build process and downloaded the official PostgreSQL 14.19 source code from the PostgreSQL website, which the SlackBuild script requires to compile the program.

```
root@aysrSlack:/tmp/postgresql# wget https://ftp.postgresql.org/pub/source/v14.19/postgresql-14.19.t
ar.gz
--2025-10-14 10:35:39--  https://ftp.postgresql.org/pub/source/v14.19/postgresql-14.19.tar.gz
Resolving ftp.postgresql.org (ftp.postgresql.org)... 151.101.3.52, 151.101.67.52, 151.101.195.52, ..
.
Connecting to ftp.postgresql.org (ftp.postgresql.org)|151.101.3.52|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 29472149 (28M) [application/gzip]
Saving to: ■postgresql-14.19.tar.gz■

postgresql-14.19.tar.gz  100%[==================================>]  28.11M  3.69MB/s    in 7.2s

2025-10-14 10:35:47 (3.89 MB/s) - ■postgresql-14.19.tar.gz■ saved [29472149/29472149]

root@aysrSlack:/tmp/postgresql# _
```

We listed the files to verify that the PostgreSQL source file was successfully downloaded.

```
root@aysrSlack:/tmp/postgresql# ls | grep postgresql-14.19.tar.gz
postgresql-14.19.tar.gz
root@aysrSlack:/tmp/postgresql# _
```

We moved one directory level up to organize the workspace before continuing and downloaded the SlackBuild package again to ensure we had all the necessary files.

```
root@aysrSlack:/tmp# wget https://slackbuilds.org/slackbuilds/15.0/system/postgresql.tar.gz
--2025-10-14 10:44:44--  https://slackbuilds.org/slackbuilds/15.0/system/postgresql.tar.gz
Resolving slackbuilds.org (slackbuilds.org)... 66.85.79.67, 64:ff9b::4255:4f43
Connecting to slackbuilds.org (slackbuilds.org)|66.85.79.67|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 6860 (6.7K) [application/x-gzip]
Saving to: ■postgresql.tar.gz.1■

postgresql.tar.gz.1      100%[==================================>]   6.70K  --.-KB/s    in 0s

2025-10-14 10:44:44 (2.21 GB/s) - ■postgresql.tar.gz.1■ saved [6860/6860]

root@aysrSlack:/tmp#
```

We extracted the SlackBuild archive to access its contents and verify that everything was ready for building.

```
root@aysrSlack:/tmp# tar -xvf postgresql.tar.gz
postgresql/
postgresql/doinst.sh
postgresql/slack-desc
postgresql/README
postgresql/postgresql.logrotate
postgresql/rc.postgresql.new
postgresql/postgresql.info
postgresql/setup.postgresql
postgresql/README.SBo
postgresql/postgresql.SlackBuild
root@aysrSlack:/tmp# _
```

We listed the contents of **/tmp** to confirm that the PostgreSQL source and SlackBuild directories were correctly placed.

```
root@aysrSlack:/tmp# ls /tmp
postgresql/  postgresql.tar.gz  postgresql.tar.gz.1  prueba_cron.log
root@aysrSlack:/tmp# _
```

We moved the PostgreSQL source archive into the **postgresql** directory to maintain an organized structure before running the build script.

```
root@aysrSlack:/tmp# mv /tmp/postgresql.tar.gz /tmp/postgresql/
root@aysrSlack:/tmp# _
```

We created a new group and user called **postgres**, which PostgreSQL uses to run securely. We also created the directory **/var/lib/pgsql** and assigned ownership to the postgres user, since it will store the database data there.

```
root@aysrSlack:/tmp/postgresql# groupadd -g 209 postgres
root@aysrSlack:/tmp/postgresql# useradd -u 209 -g postgres -d /var/lib/pgsql -s /bin/bash postgres
root@aysrSlack:/tmp/postgresql# mkdir -p /var/lib/pgsql
root@aysrSlack:/tmp/postgresql# chown -R postgres:postgres /var/lib/pgsql
root@aysrSlack:/tmp/postgresql# _
```

We executed the **postgresql.SlackBuild** script to compile PostgreSQL from the source code and generate a Slackware package.

```
usr/share/postgresql-14/tsearch_data/
usr/share/postgresql-14/tsearch_data/danish.stop
usr/share/postgresql-14/tsearch_data/dutch.stop
usr/share/postgresql-14/tsearch_data/english.stop
usr/share/postgresql-14/tsearch_data/finnish.stop
usr/share/postgresql-14/tsearch_data/french.stop
usr/share/postgresql-14/tsearch_data/german.stop
usr/share/postgresql-14/tsearch_data/hungarian.stop
usr/share/postgresql-14/tsearch_data/hunspell_sample.affix
usr/share/postgresql-14/tsearch_data/hunspell_sample_long.affix
usr/share/postgresql-14/tsearch_data/hunspell_sample_long.dict
usr/share/postgresql-14/tsearch_data/hunspell_sample_num.affix
usr/share/postgresql-14/tsearch_data/hunspell_sample_num.dict
usr/share/postgresql-14/tsearch_data/ispell_sample.affix
usr/share/postgresql-14/tsearch_data/ispell_sample.dict
usr/share/postgresql-14/tsearch_data/italian.stop
usr/share/postgresql-14/tsearch_data/nepali.stop
usr/share/postgresql-14/tsearch_data/norwegian.stop
usr/share/postgresql-14/tsearch_data/portuguese.stop
usr/share/postgresql-14/tsearch_data/russian.stop
usr/share/postgresql-14/tsearch_data/spanish.stop
usr/share/postgresql-14/tsearch_data/swedish.stop
usr/share/postgresql-14/tsearch_data/synonym_sample.syn
usr/share/postgresql-14/tsearch_data/thesaurus_sample.ths
usr/share/postgresql-14/tsearch_data/turkish.stop
var/
var/lib/
var/lib/pgsql/
var/lib/pgsql/14/
var/lib/pgsql/14/data/
var/log/
var/log/setup/
var/log/setup/setup.postgresql

Slackware package /tmp/postgresql-14.19-x86_64-1_SBo.tgz created.

root@aysrSlack:/tmp/postgresql# _
```

We installed the generated PostgreSQL package using **installpkg**, making the database system available for use.

```
root@aysrSlack:/tmp/postgresql# installpkg /tmp/postgresql-14.19-x86_64-1_SBo.tgz
Verifying package postgresql-14.19-x86_64-1_SBo.tgz.
Installing package postgresql-14.19-x86_64-1_SBo.tgz:
PACKAGE DESCRIPTION:
# postgresql (object-relational database management system)
#
# PostgreSQL is an advanced object-relational database management
# system (ORDBMS) based on POSTGRES. With more than 15 years of
# development history, it is quickly becoming the de facto
# database for enterprise level open source solutions.
#
# Homepage: https://www.postgresql.org
#
Executing install script for postgresql-14.19-x86_64-1_SBo.tgz.
Package postgresql-14.19-x86_64-1_SBo.tgz installed.
root@aysrSlack:/tmp/postgresql#
```

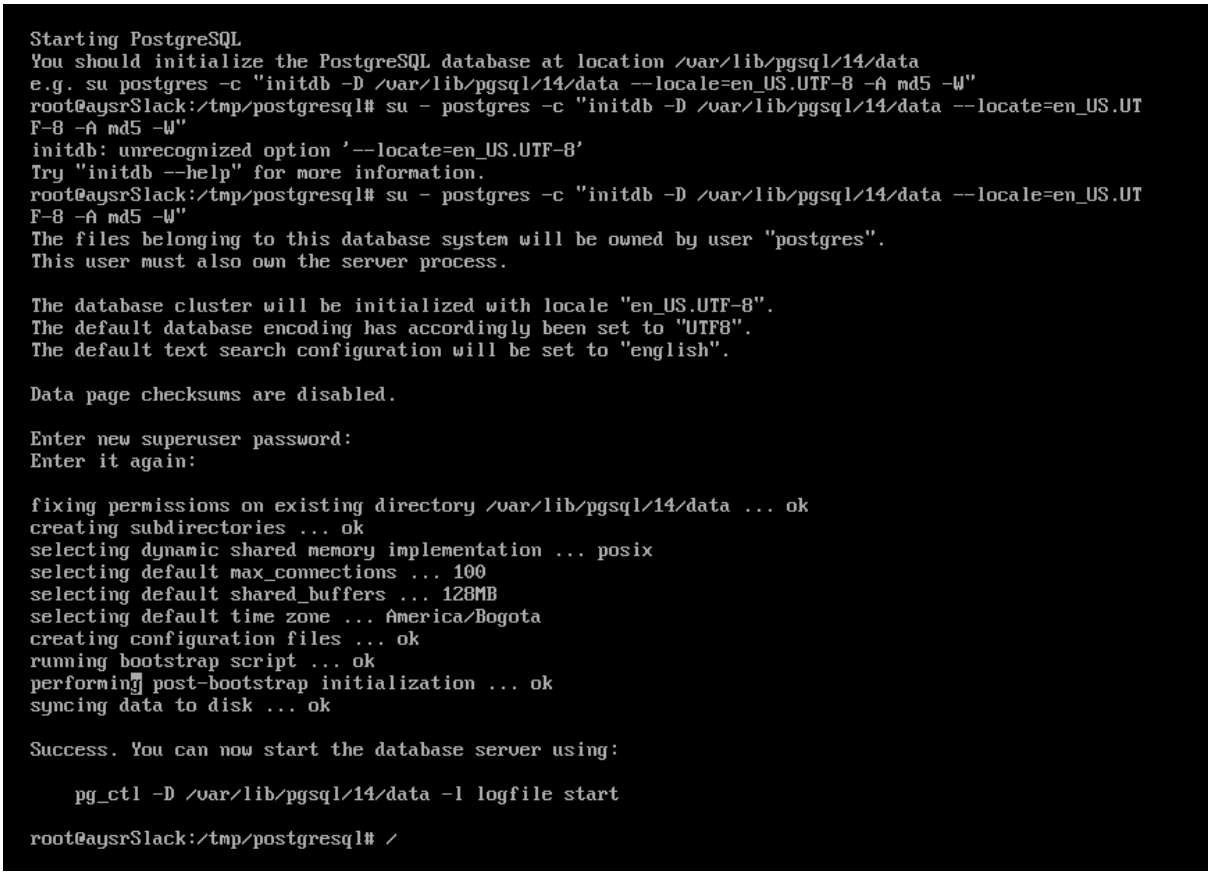
We switched to the **postgres** user to perform the database initialization and configuration tasks.

```
root@aysrSlack:/tmp/postgresql# su - postgres

Workers of the world, arise!  You have nothing to lose but your chairs.

postgres@aysrSlack:~$
```

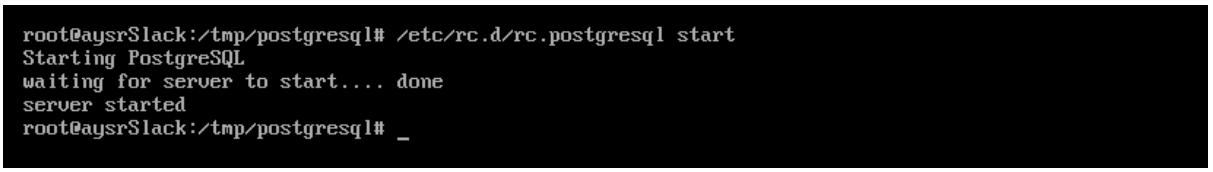
We initialized the PostgreSQL data directory using **initdb**, creating the internal file structure necessary for the database to operate.

```
postgres@aysrSlack:~$ initdb -D /var/lib/pgsql/data
The files belonging to this database system will be owned by user "postgres".
This user must also own the server process.

The database cluster will be initialized with locales
  COLLATE:  C
  CTYPE:    en_US.UTF-8
  MESSAGES: en_US.UTF-8
  MONETARY: en_US.UTF-8
  NUMERIC:  en_US.UTF-8
  TIME:     en_US.UTF-8
The default database encoding has accordingly been set to "UTF8".
The default text search configuration will be set to "english".

Data page checksums are disabled.

creating directory /var/lib/pgsql/data ... ok
creating subdirectories ... ok
selecting dynamic shared memory implementation ... posix
selecting default max_connections ... 100
selecting default shared_buffers ... 128MB
selecting default time zone ... America/Bogota
creating configuration files ... ok
running bootstrap script ... ok
performing post-bootstrap initialization ... ok
syncing data to disk ... ok

initdb: warning: enabling "trust" authentication for local connections
You can change this by editing pg_hba.conf or using the option -A, or
--auth-local and --auth-host, the next time you run initdb.

Success. You can now start the database server using:

    pg_ctl -D /var/lib/pgsql/data -l logfile start

postgres@aysrSlack:~$
```

We ran the initialization command again with additional parameters to specify the data path, locale, authentication method, and password for the postgres user. We used su - postgres -c "initdb -D /var/lib/pgsql/14/data --locale=en_US.UTF-8 -A md5 -W"



We started the PostgreSQL service using **/etc/rc.d/rc.postgresql start**, launching the database server and completing the installation process successfully.



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

We switched to the postgres user and accessed the PostgreSQL terminal to start managing roles and databases directly as the database administrator.(passwd: admin123)

```
root@aysrSlack:/tmp/postgresql# su - postgres

Zisla's Law:
        If you're asked to join a parade, don't march behind the elephants.

postgres@aysrSlack:~$ psql
Password for user postgres:
psql (14.19)
Type "help" for help.

postgres=# _
```

We created two roles, one for each student, giving them login credentials so they can access and manage their own databases independently.

```
postgres=# CREATE ROLE santiago WITH LOGIN PASSWORD '1234';
CREATE ROLE
postgres=# CREATE ROLE julian WITH LOGIN PASSWORD '1234';
CREATE ROLE
postgres=#
```

We listed all the roles in the system to confirm that both users were successfully created and have login permissions.

```
postgres=# \du
                                   List of roles
 Role name |                         Attributes                         | Member of
-----------+------------------------------------------------------------+-----------
 julian    |                                                            | {}
 postgres  | Superuser, Create role, Create DB, Replication, Bypass RLS | {}
 santiago  |                                                            | {}

postgres=#
```

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.

We created a separate database for each user and assigned ownership to their respective roles, ensuring that each student has exclusive control over their own database.

```
postgres=# CREATE DATABASE turismo_santiago OWNER santiago;
CREATE DATABASE
postgres=# CREATE DATABASE turismo_julian OWNER julian;
CREATE DATABASE
postgres=# _
```

We exited the PostgreSQL session and reconnected using the user "santiago" to start working inside his own database with his permissions.

```
postgres=# \q
postgres@aysrSlack:~$ psql -U santiago -d turismo_santiago -W
Password:
psql (14.19)
Type "help" for help.

turismo_santiago=>
```

We created three tables — departamentos, ciudades, and sitios_turisticos — establishing relationships between them using foreign keys to organize the data hierarchically and maintain referential integrity.

```
turismo_santiago=> CREATE TABLE departamentos (id SERIAL PRIMERY KEY, nombre VARCHAR(100) NOT NULL);
ERROR:  syntax error at or near "PRIMERY"
LINE 1: CREATE TABLE departamentos (id SERIAL PRIMERY KEY, nombre VA...
                                              ^
turismo_santiago=> CREATE TABLE departamentos (id SERIAL PRIMARY KEY, nombre VARCHAR(100) NOT NULL);
CREATE TABLE
turismo_santiago=> CREATE TABLE ciudades (id SERIAL PRIMARY KEY, nombre VARCHAR(100) NOT NULL, id_de
partamento INT REFERENCES departamentos(id));
CREATE TABLE
turismo_santiago=> CREATE TABLE sitios_turisticos (id SERIAL PRIMARY KEY, nombre VARCHAR(150) NOT NU
LL, descripcion TEXT, id_ciudad INT REFERENCES ciudades(id));
CREATE TABLE
turismo_santiago=> _
```

d. Insert data into the databases.

We inserted sample data into each table to simulate real information about departments, cities, and tourist sites, allowing us to test and validate the structure of the database.

```
turismo_santiago=> INSERT INTO departamentos (nombre) VALUES ('Antioquia'), ('Bolivar'), ('Cundinama
rca');
INSERT 0 3
turismo_santiago=> INSERT INTO ciduades (nombre, id_departamento) VALUES ('Medellin',1), ('Cartagena
',2), ('Bogota',3);
ERROR:  relation "ciduades" does not exist
LINE 1: INSERT INTO ciduades (nombre, id_departamento) VALUES ('Mede...
                    ^
turismo_santiago=> INSERT INTO ciudades (nombre, id_departamento) VALUES ('Medellin',1), ('Cartagena
',2), ('Bogota',3);
INSERT 0 3
turismo_santiago=> INSERT INTO sitios_turisticos (nombre, descripcion, id_ciudad) VALUES ('Parque Ar
vi', 'Reserva natural con senderos ecologicos en Medellin', 1);
INSERT 0 1
turismo_santiago=> INSERT INTO sitios_turisticos (nombre, descripcion, id_ciudad) VALUES ('Castillo
de San Felipe', 'Fuerte historico en Cartagena.', 2), ('Monserrate', 'Cerro con santuario y vista pa
noramica de Bogota.', 3);
INSERT 0 2
turismo_santiago=> _
```

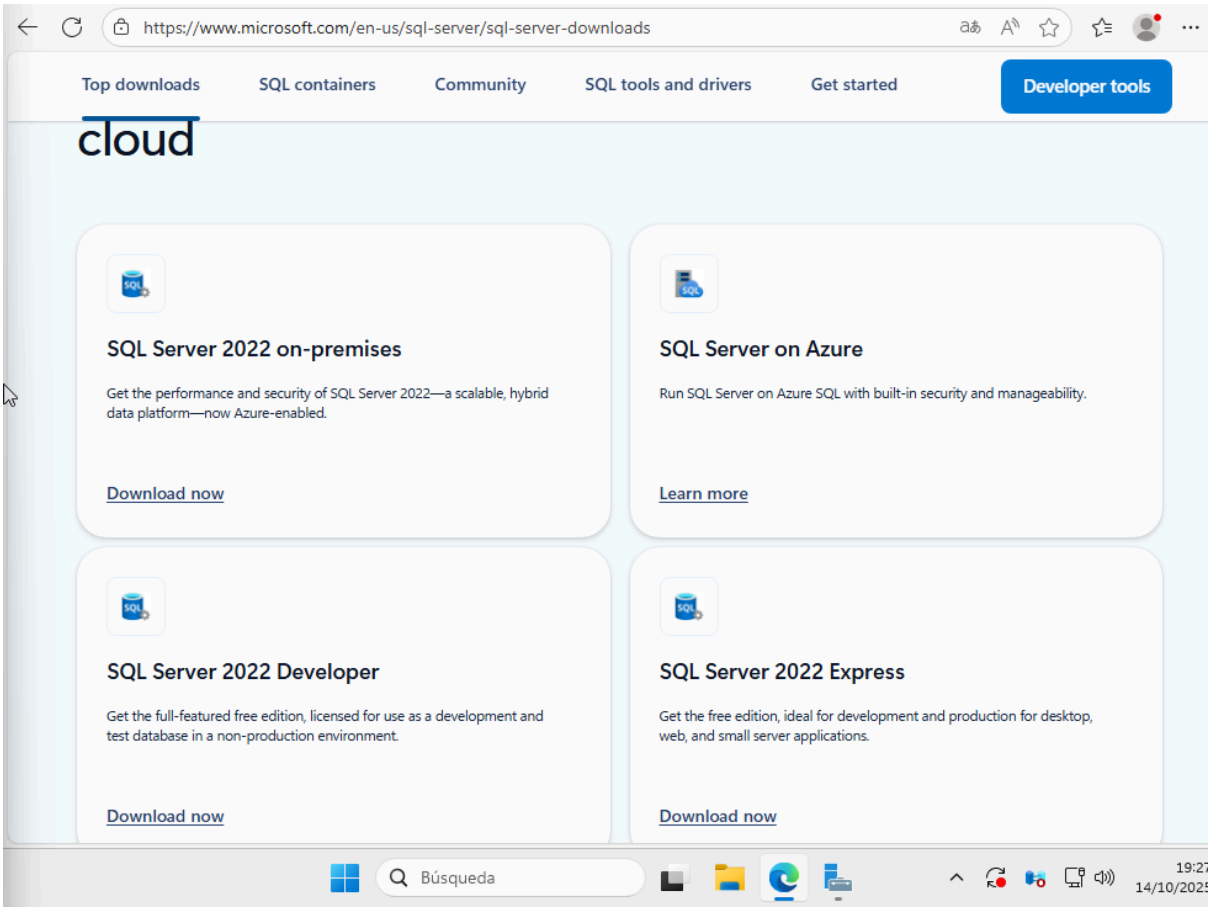
We selected all records from each table to verify that the data was inserted correctly and that the relationships between tables are functioning as expected.

```
turismo_santiago=> SELECT * FROM sitios_turisticos;
 id |         nombre          |                    descripcion                    | id_ciudad
----+-------------------------+---------------------------------------------------+-----------
  1 | Parque Arvi             | Reserva natural con senderos ecologicos en Medellin |         1
  2 | Castillo de San Felipe  | Fuerte historico en Cartagena.                    |         2
  3 | Monserrate              | Cerro con santuario y vista panoramica de Bogota. |         3
(3 rows)

turismo_santiago=> SELECT * FROM ciudades;
 id |  nombre   | id_departamento
----+-----------+-----------------
  1 | Medellin  |               1
  2 | Cartagena |               2
  3 | Bogota    |               3
(3 rows)

turismo_santiago=> SELECT * FROM departamentos;
 id |    nombre
----+--------------
  1 | Antioquia
  2 | Bolivar
  3 | Cundinamarca
(3 rows)

turismo_santiago=> S_
```

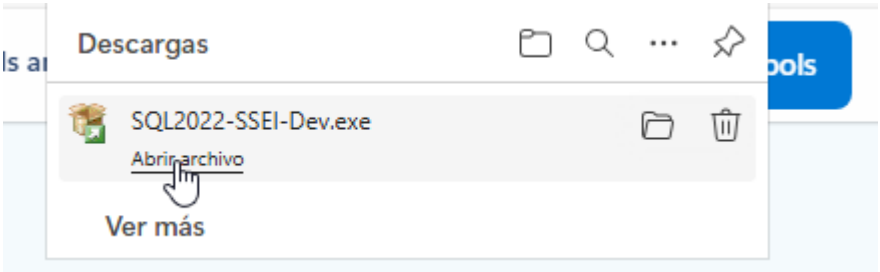
2. SQL Server - Windows Server

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

First, we go to the following link: https://www.microsoft.com/en-us/sql-server/sql-server-downloads, and we download **SQL Server Developer Edition**

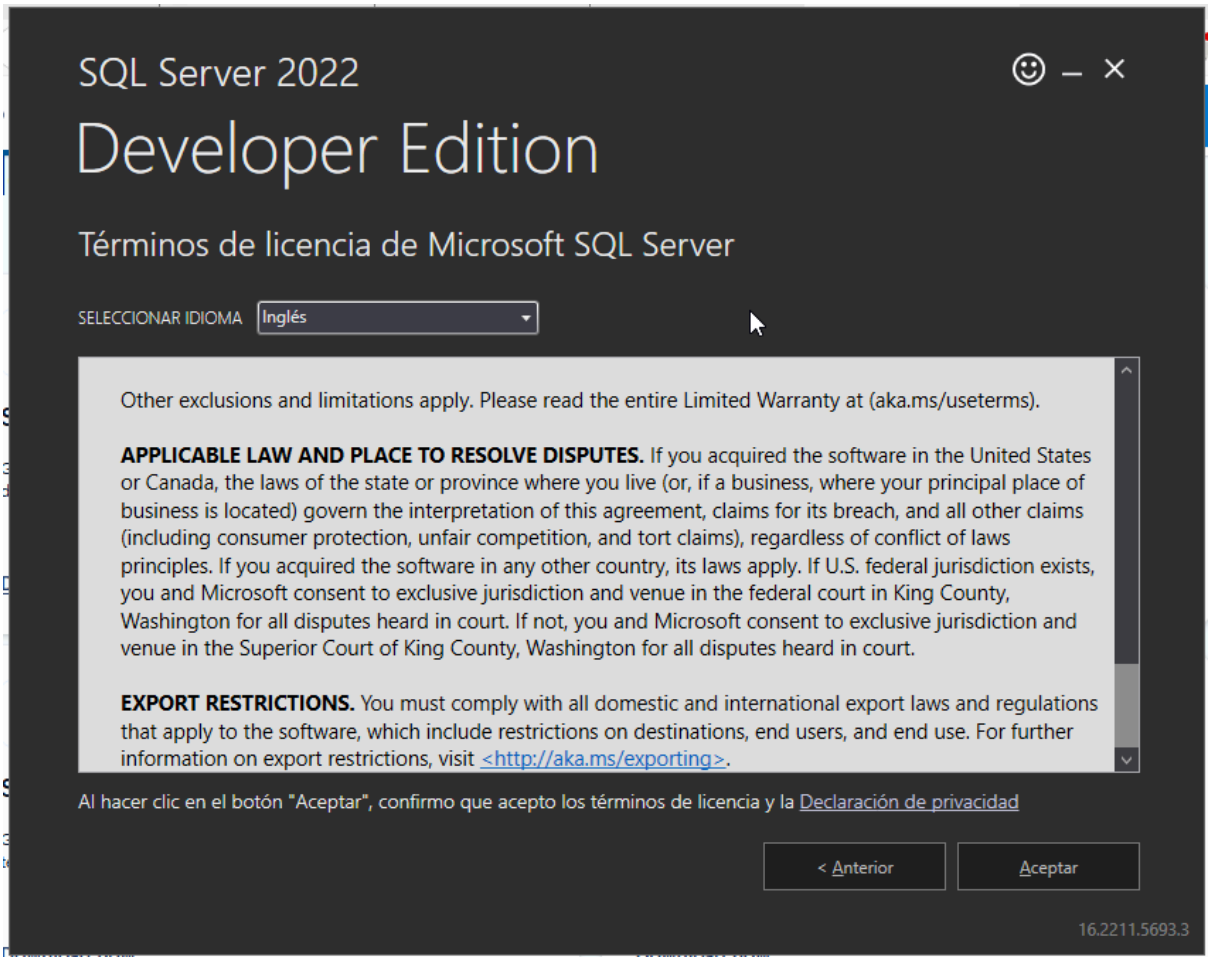


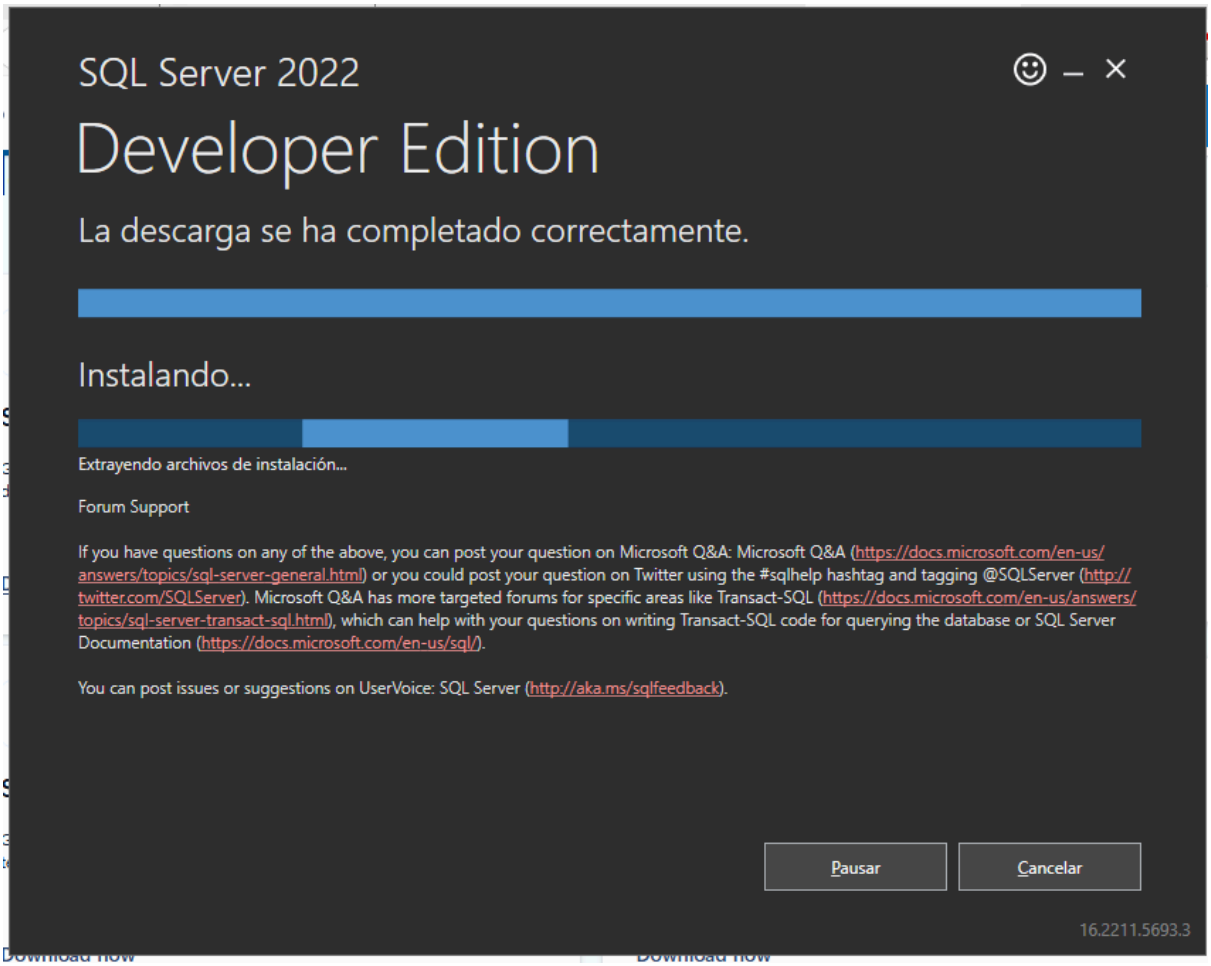
We run the .exe to start the installer



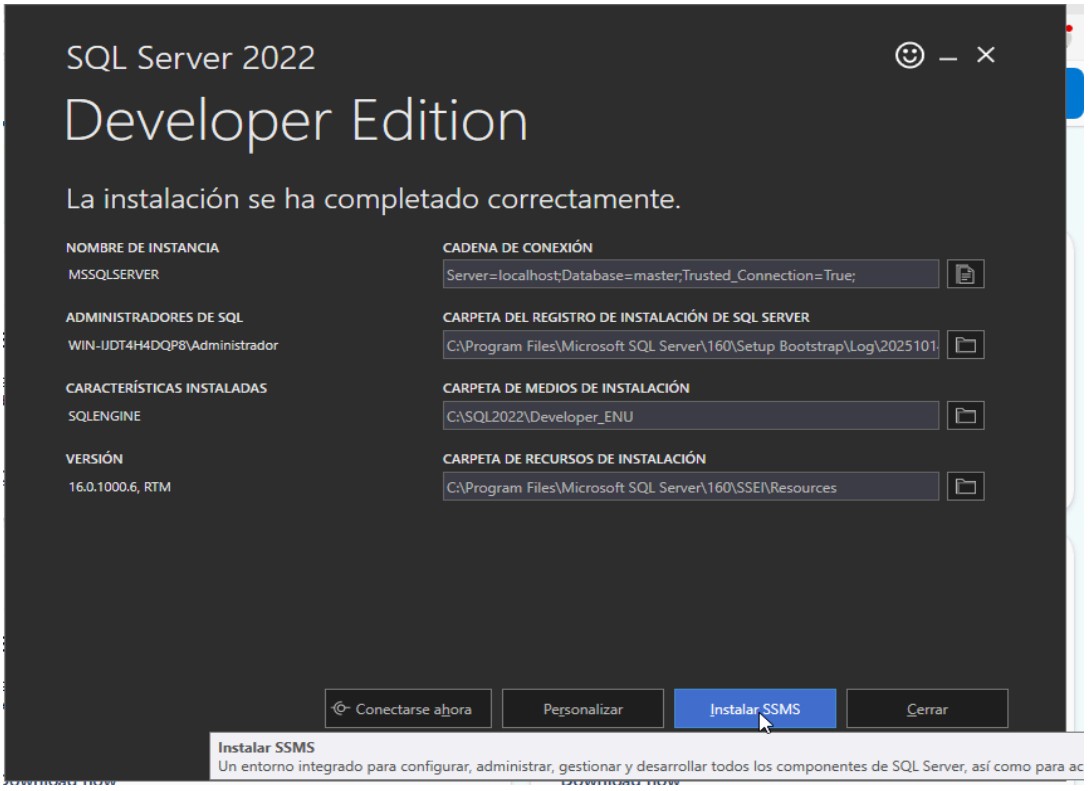
Select Basic or Custom for a more detailed installation.

We accept the terms, select the directory, and wait for the installation to complete.

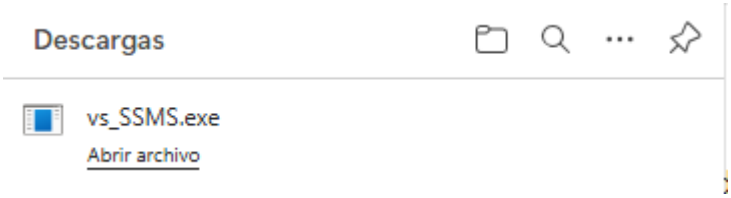


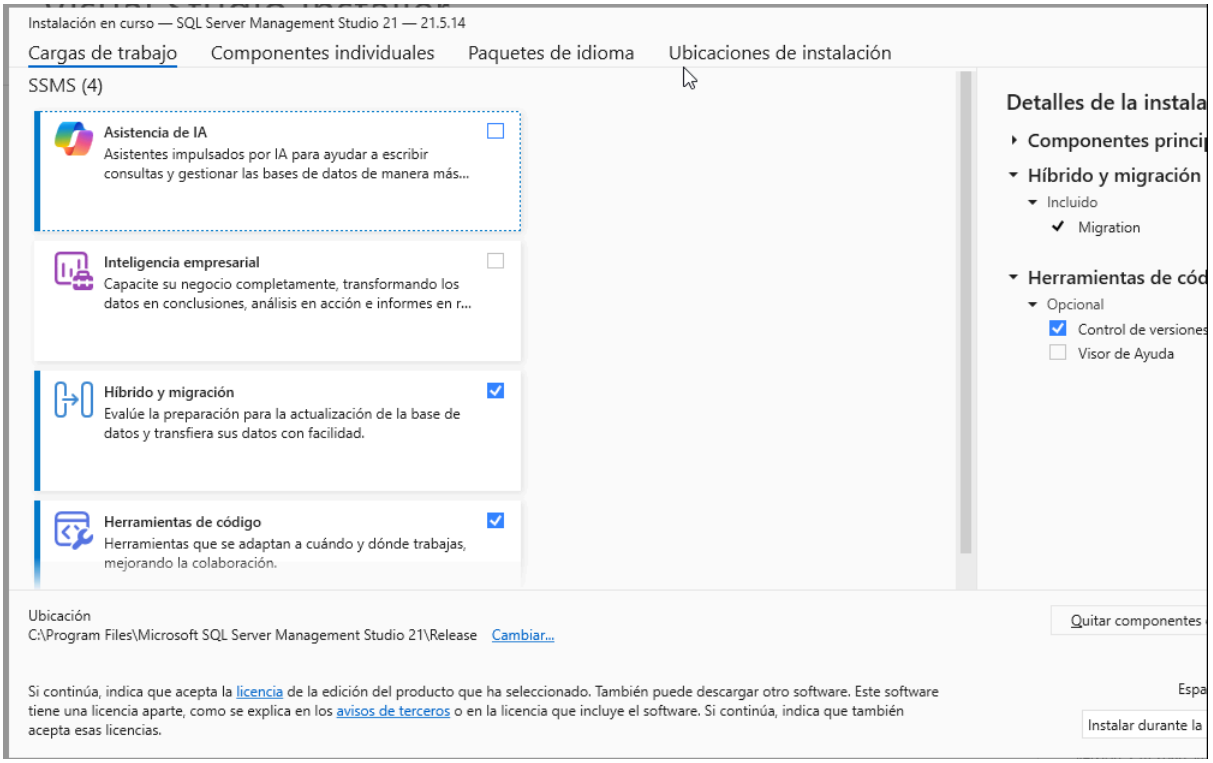


Finally, we download and install SSMS to be able to manage the server graphically.

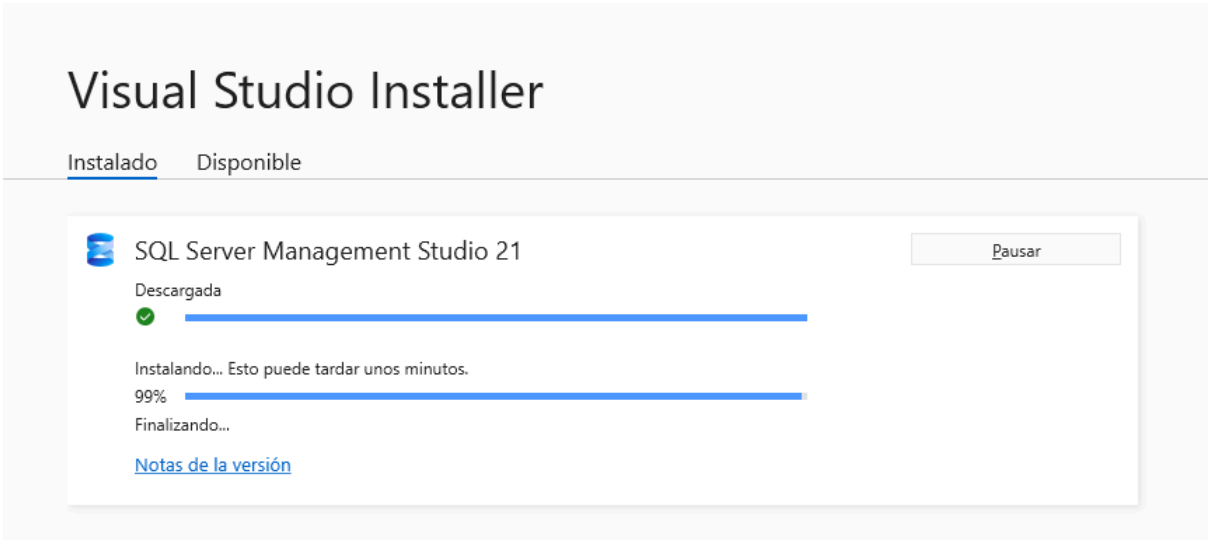


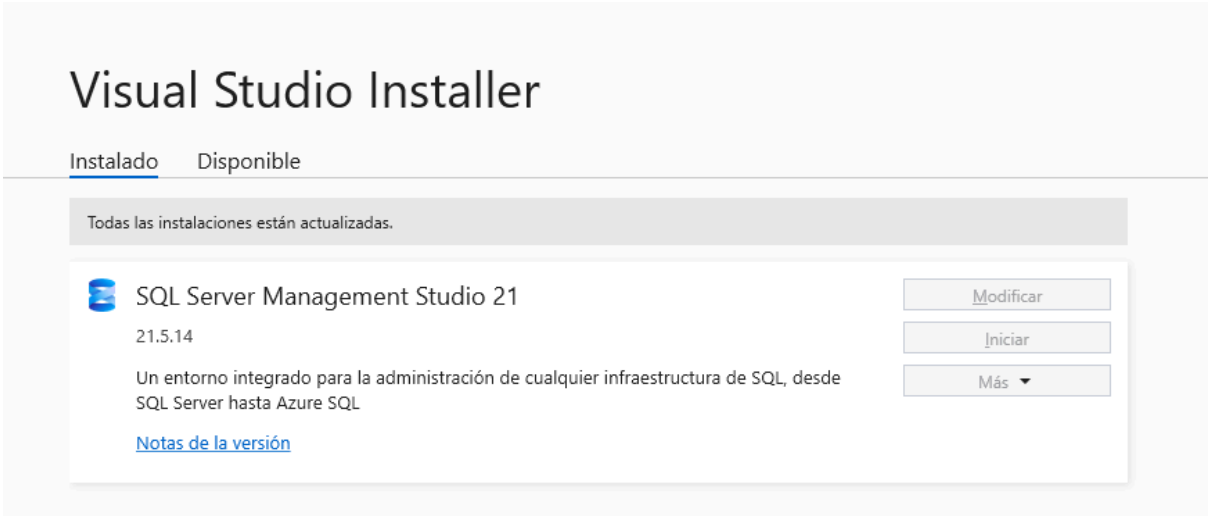

https://learn.microsoft.com/es-es/ssms/install/install?redirectedfrom=MSDN
Filtrar por título
Descargar e instalar
Descarga e instalación de la versión preliminar de SSMS 22
Seleccionar ubicación de instalación
Instalar con parámetros de línea de comandos
Ejemplos de parámetros de línea de comandos
Identificadores de carga de trabajo y componentes
Crear una instalación sin conexión
Instalar versiones en paralelo
Instalación de la documentación de ayuda local
Paso 2: Determinación de la versión de SQL Server Management Studio que se va a instalar
Decida qué versión de SSMS va a instalar. Las opciones más comunes son:
La versión más reciente de SQL Server Management Studio 21 hospedada en servidores de Microsoft. Para instalar esta versión, seleccione el vínculo siguiente, que descarga un instalador reducido o programa de arranque en su carpeta Descargas.
Descarga de SSMS 21
Si ya tiene instalado SQL Server Management Studio 21, puede instalar otra versión junto a esta.
Puede descargar un bootstrapper o instalador para una versión específica desde la página Historial de versiones y utilizarlo para instalar otra versión de SSMS.


Descargas
vs_SSMS.exe
Abrir archivo

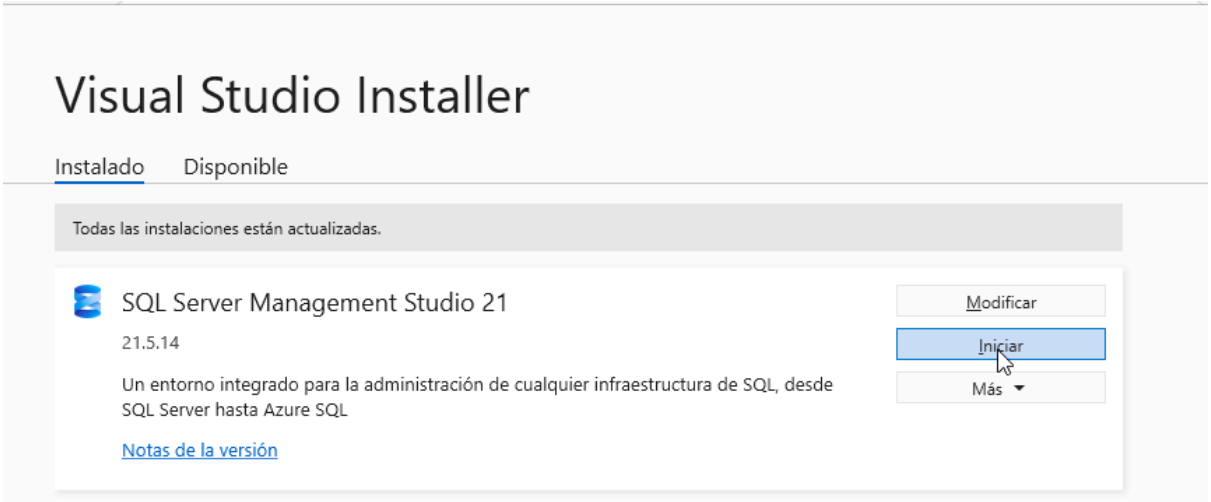

Instalación en curso — SQL Server Management Studio 21 — 21.5.14
Cargas de trabajo
Componentes individuales
Paquetes de idioma
Ubicaciones de instalación
SSMS (4)
Asistencia de IA
Asistentes impulsados por IA para ayudar a escribir consultas y gestionar las bases de datos de manera más...
Inteligencia empresarial
Capacite su negocio completamente, transformando los datos en conclusiones, análisis en acción e informes en r...
Híbrido y migración
Evalúe la preparación para la actualización de la base de datos y transfiera sus datos con facilidad.
Herramientas de código
Herramientas que se adaptan a cuándo y dónde trabajas, mejorando la colaboración.
Detalles de la instala
Componentes princi
Híbrido y migración
Incluido
Migration
Herramientas de cód
Opcional
Control de versiones
Visor de Ayuda
Ubicación
C:\Program Files\Microsoft SQL Server Management Studio 21\Release
Cambiar...
Quitar componentes
Si continúa, indica que acepta la licencia de la edición del producto que ha seleccionado. También puede descargar otro software. Este software tiene una licencia aparte, como se explica en los avisos de terceros o en la licencia que incluye el software. Si continúa, indica que también acepta esas licencias.
Instalar durante la

We wait for it to finish installing

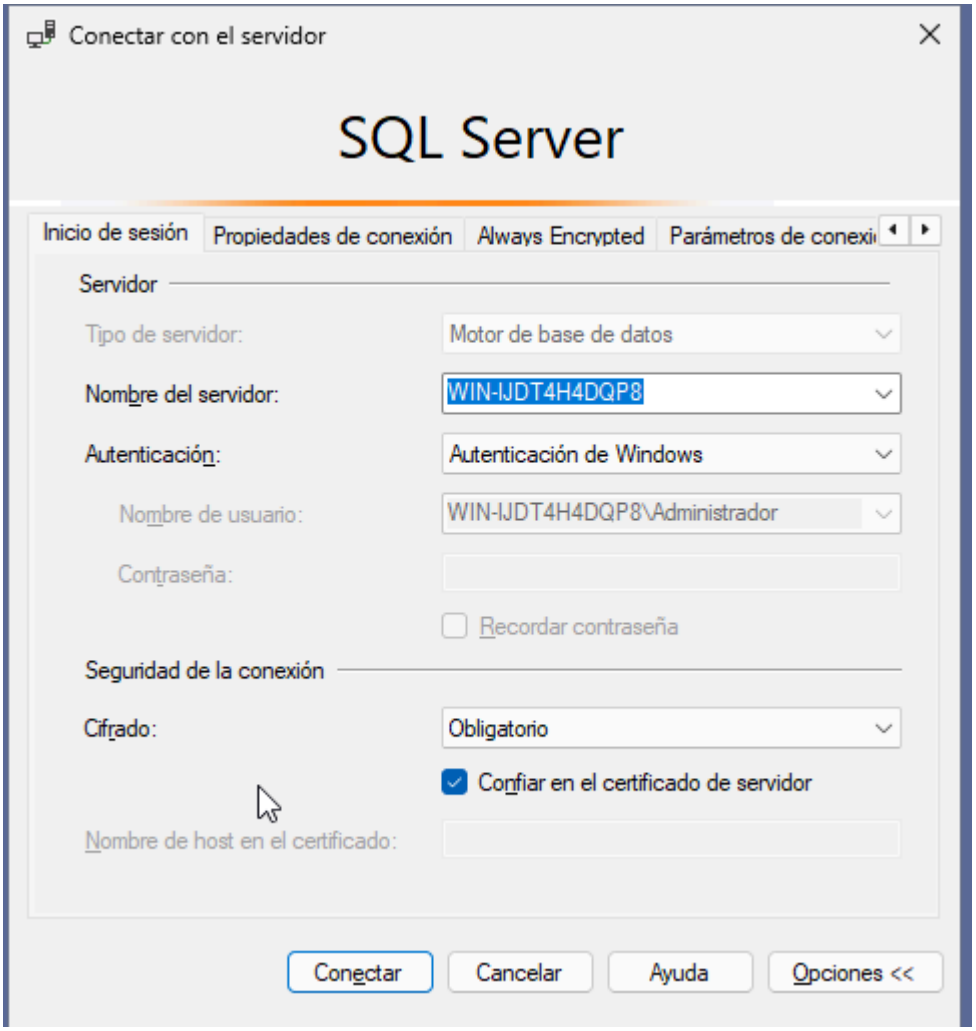




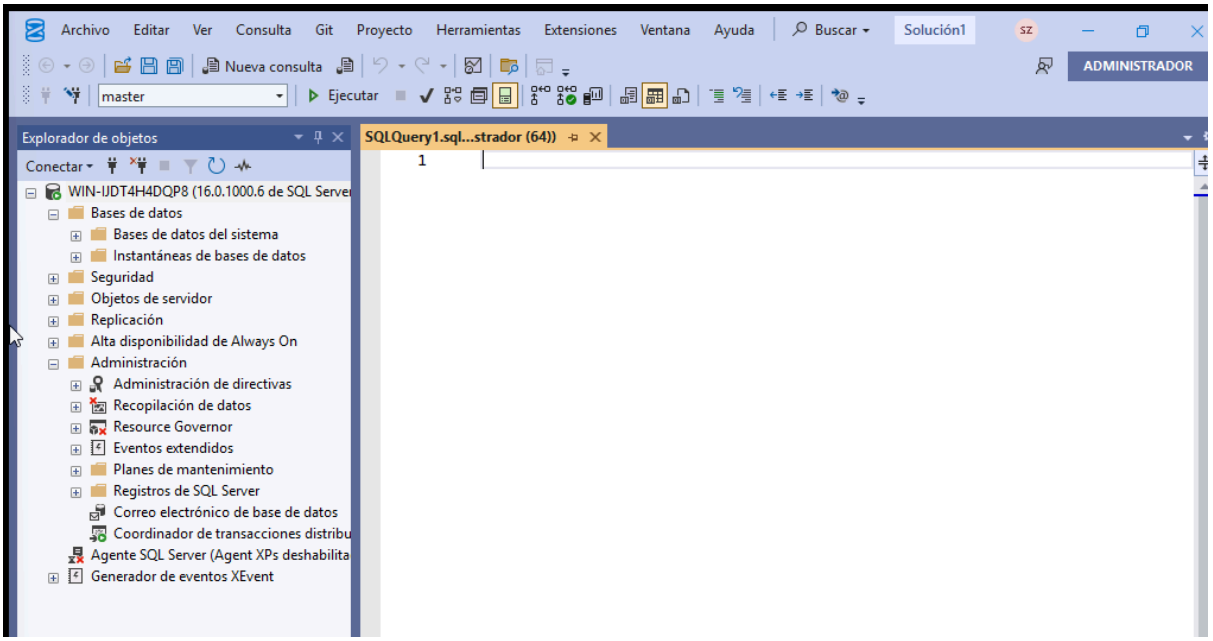
Then we click on Start



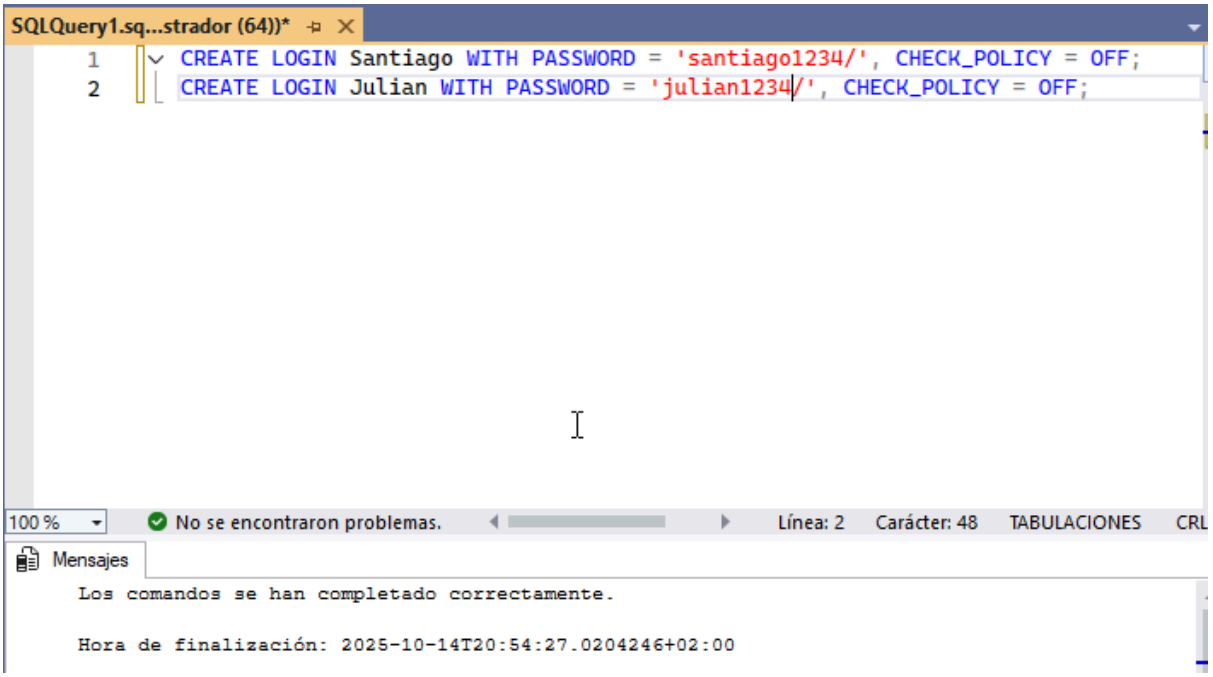
We log in with our school Microsoft account to start the connection. We mark on “Confiar en el certificado de servidor”



b. Create a user for each group member. Use the students' names as the username.
First, we open a new query window (right click on your server → New Query).

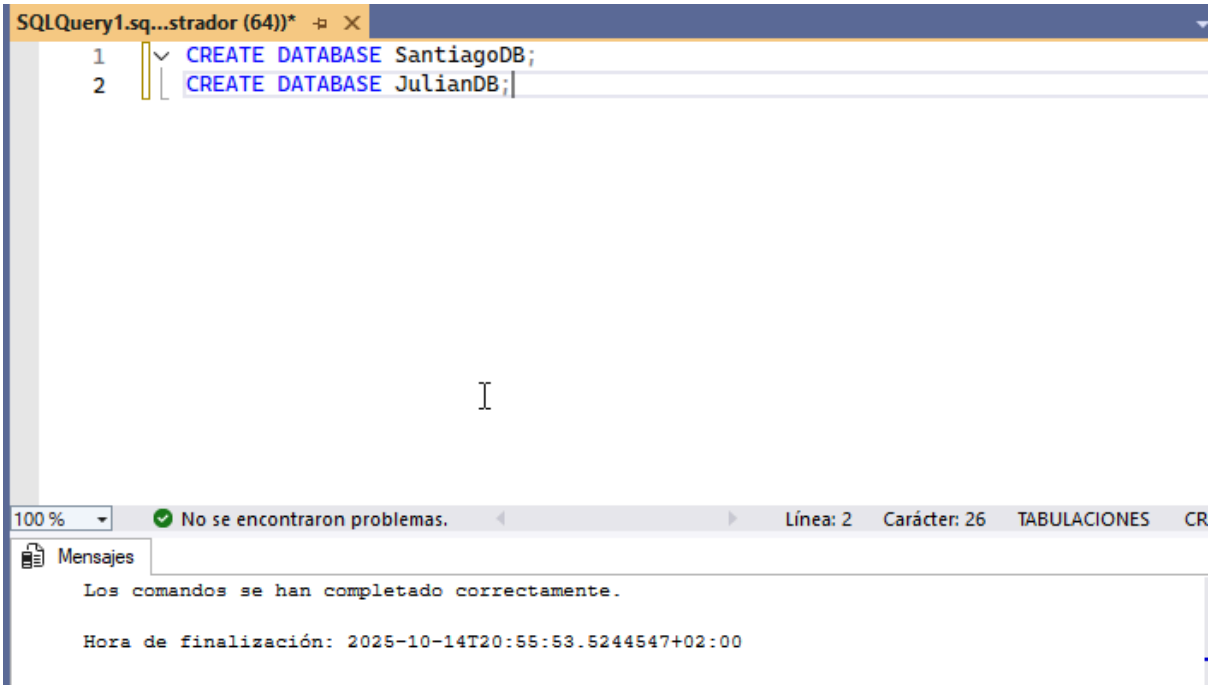


Create a user for each group member

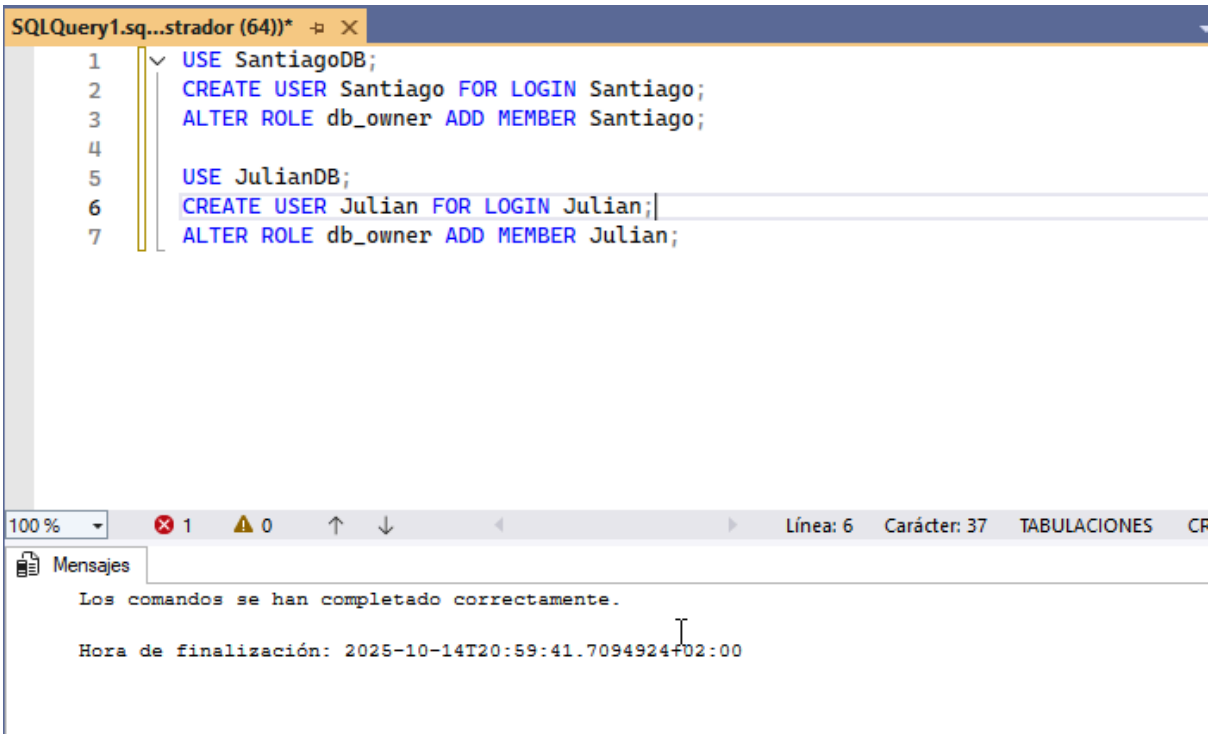


c. Create a database to organize your monthly activity schedule. The database must have at least 3 tables. Each student should have access only to their own database.

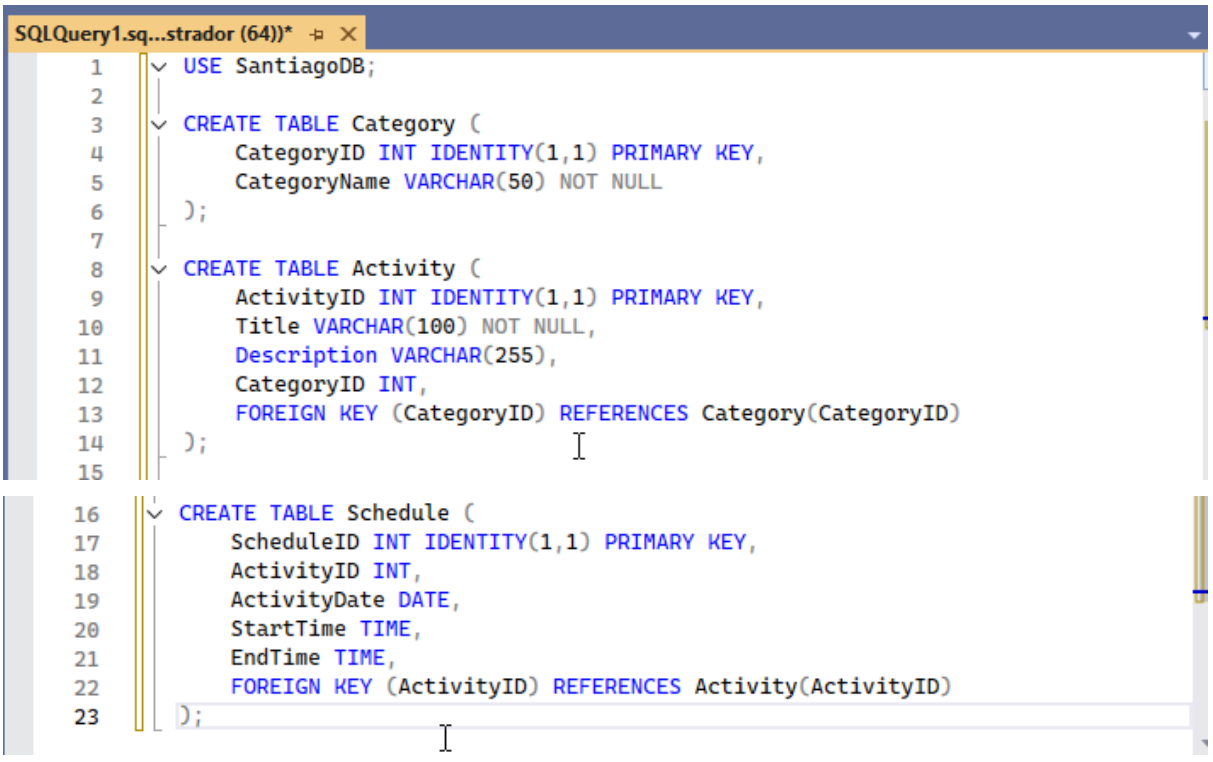
We created a database for each student



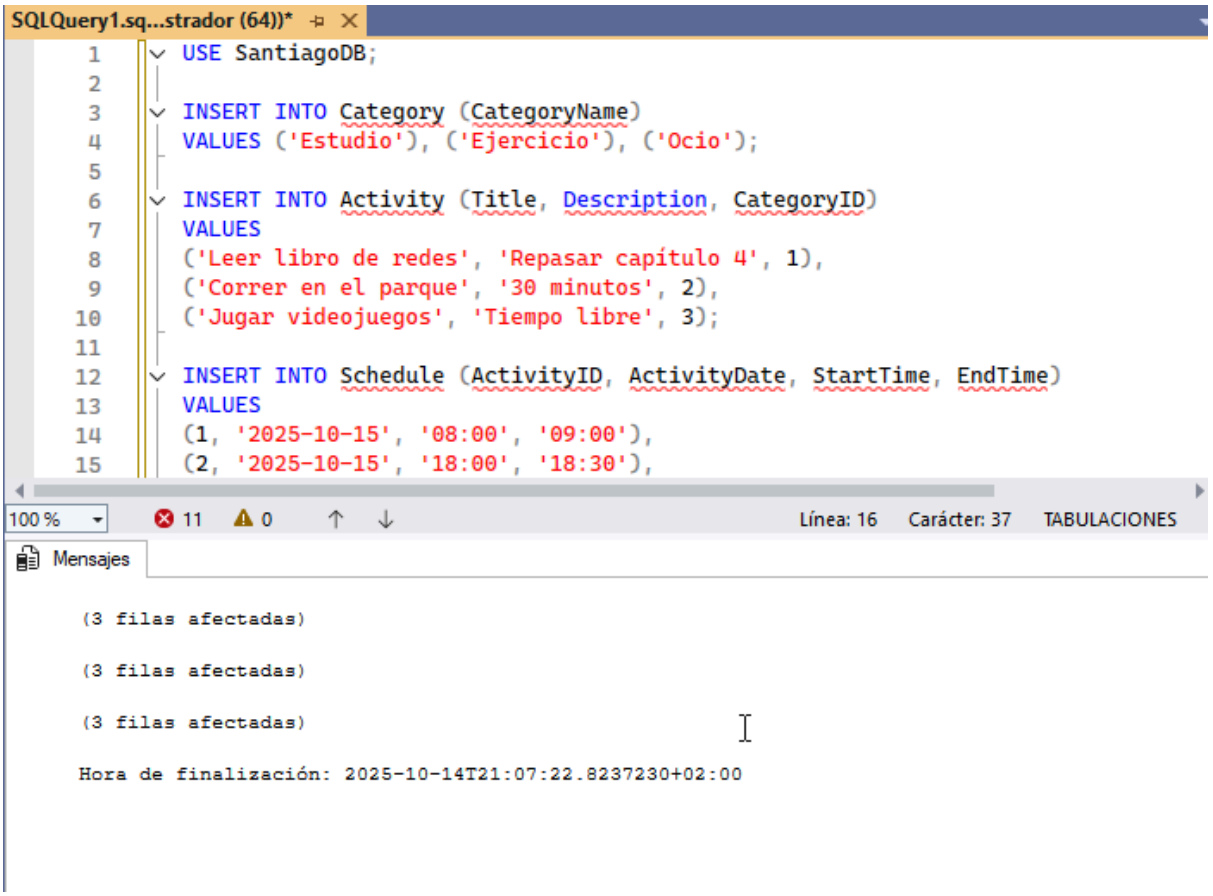
Assign access permissions only to your own database



Create the 3 tables to organize the monthly schedule



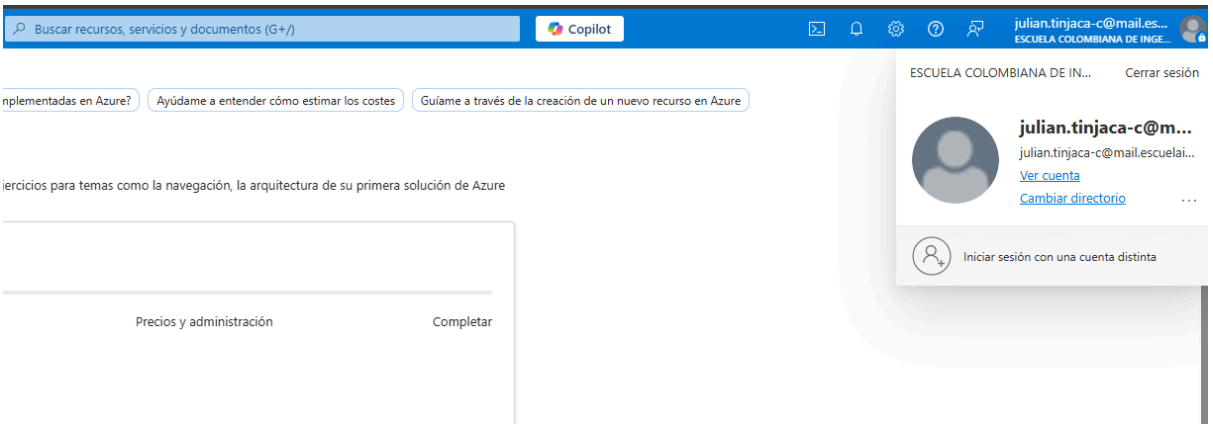
d. Insert data into the databases.



3. SQL Database - Microsoft Azure

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

We signed up with my 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?

Cloud computing is the delivery of IT services over the internet on a pay-as-you-go basis. Advantages of Azure (Cloud) versus on-premise infrastructure include cost, scalability, agility, and maintenance. The cloud uses an OpEx model instead of the large upfront CapEx of on-premise. Cloud is elastic, meaning you can add or remove resources in minutes, whereas on-premise scaling is slow and expensive. It also provides agility to deploy applications globally in minutes and offloads hardware maintenance to Microsoft.

- What types of services does Microsoft Azure offer (IaaS, PaaS, SaaS), and how do they differ from one another?

These are the three main service models, defining what you manage versus what the provider manages.

IaaS (Infrastructure as a Service) provides the basic building blocks. The provider manages the physical hardware, while we manage the operating system, data, and applications. An example is Azure Virtual Machines.

PaaS (Platform as a Service) provides a managed platform for development. The provider manages the servers and the operating system. some examples include Azure SQL Database and Azure App Service.

SaaS (Software as a Service) is a complete, ready to use application where the provider manages everything. We manage nothing, just use the software. Examples include Microsoft 365 and Gmail.

- What is the importance of regions and availability zones in Azure, and how do they affect service availability?

Their importance is about speed and reliability.

Regions let us place ourservices close to ourusers, which reduces latency (lag). They also help us comply with data laws that require data to stay in a specific country.

Availability Zones provide high availability. They are separate data centers in one region, so if one fails, our apps keeps running from another, preventing downtime

- What is the difference between vertical scaling and horizontal scaling in Azure, and when would you choose one over the other?

Vertical scaling means making a single server stronger, this could be more cpu or ram, which we would choose for monolithic applications like a traditional database.

Horizontal scaling means adding more servers to share the load, which is better for modern web apps that need high availability and massive scale.

- 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?

The main difference is security because Azure SQL Database enforces TLS encryption by default, so our connection is always secure, otherwise a local VM database often has TLS disabled on an internal network, meaning data might be sent unencrypted, which is a security risk

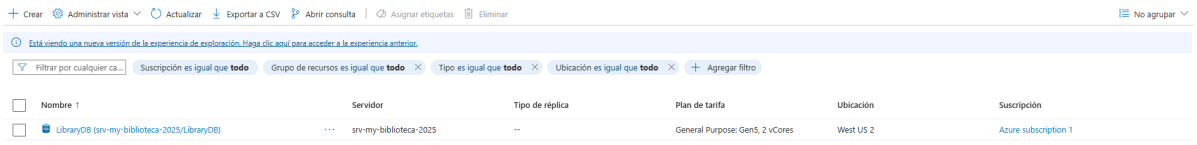
- From a transport layer perspective, how does the handling of TCP connections differ between a SQL database hosted on a local virtual machine and Azure SQL Database?

A local VM database has a direct TCP connection to the VM's specific IP and port.

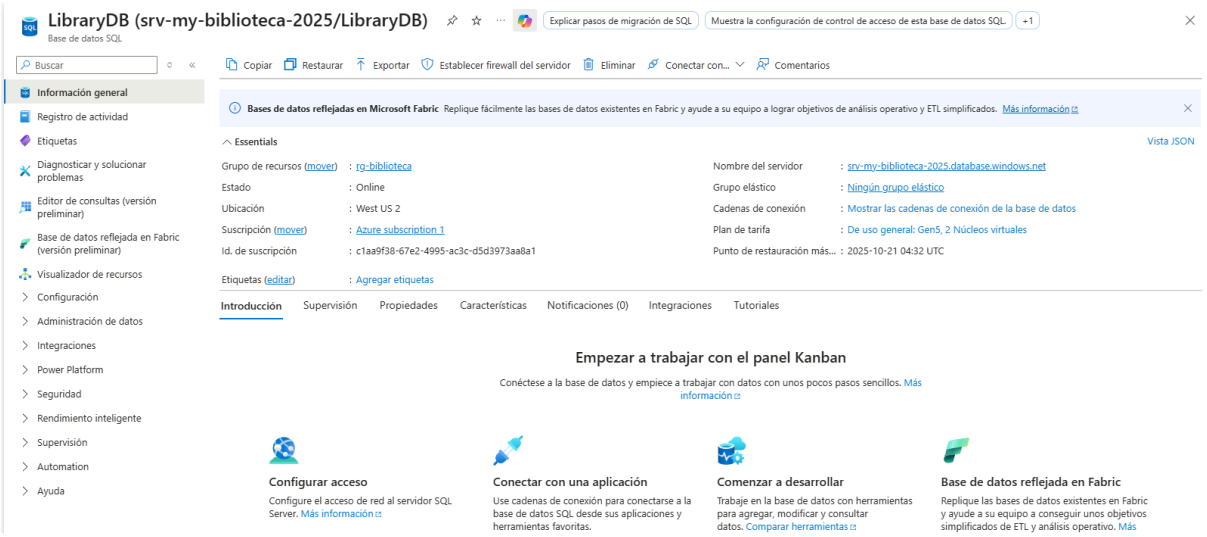
Azure SQL Database uses a gateway. We connect to the gateway first, which then redirects our TCP connection to the correct database server.

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

First we have to access the interface and then create the server and the database

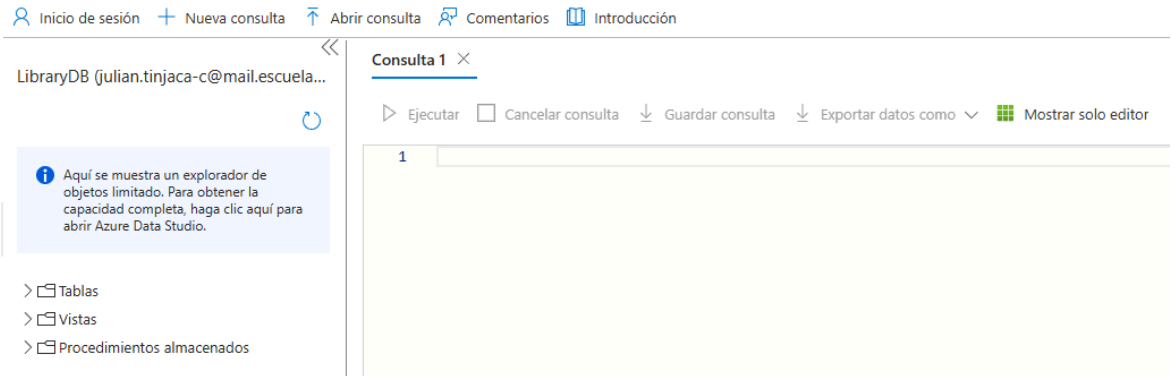


Once it is created we have to click on the query editor, there is where we create the tables and start to insert data



it asks us to log in with the user and password we created or with the institutional email, we log in with the user.

Here's the space to start manipulating the database



We start creating 3 tables


```sql
CREATE TABLE Authors (
    AuthorID INT PRIMARY KEY IDENTITY(1,1),
    FirstName NVARCHAR(100) NOT NULL,
    LastName NVARCHAR(100) NOT NULL,
    Email NVARCHAR(255) UNIQUE
);

CREATE TABLE Resources (
    ResourceID INT PRIMARY KEY IDENTITY(1,1),
    Title NVARCHAR(500) NOT NULL,
    ResourceType NVARCHAR(50) NOT NULL CHECK (ResourceType IN ('Book', 'Scientific Article')),
    PublicationDate DATE,
    ISSN_ISBN NVARCHAR(20) UNIQUE,
    Abstract NVARCHAR(MAX)
```

```sql
CREATE TABLE Resource_Authors (
    ResourceID INT NOT NULL,
    AuthorID INT NOT NULL,
    PRIMARY KEY (ResourceID, AuthorID),

    FOREIGN KEY (ResourceID) REFERENCES Resources(ResourceID) ON DELETE CASCADE,
    FOREIGN KEY (AuthorID) REFERENCES Authors(AuthorID) ON DELETE CASCADE
);
```

d. Insert data into the database.

Then we insert some data on the tables

```sql
INSERT INTO Authors (FirstName, LastName, Email) VALUES
('Gabriel', 'García Márquez', 'ggm@example.com'),
('Marie', 'Curie', 'mcurie@science.org'),
('Alan', 'Turing', 'turing@cs.com');

INSERT INTO Resources (Title, ResourceType, PublicationDate, ISSN_ISBN, Abstract) VALUES
('One Hundred Years of Solitude', 'Book', '1967-05-30', '978-0307474728', 'A foundational novel of magical realism.'),
('Radioactivity and New Transformations', 'Scientific Article', '1903-01-01', 'ISSN-1903-001', 'A key article on the discov
('On Computable Numbers', 'Scientific Article', '1936-05-28', 'ISSN-1936-002', 'The theoretical basis of modern computer sc

INSERT INTO Resource_Authors (ResourceID, AuthorID) VALUES
(1, 1),
(2, 2),
(3, 3);
```

We verify that everything we added to the database is working

Consulta 2

Ejecutar | Cancelar consulta | Guardar consulta | Exportar datos como | Mostrar solo editor

```
1  SELECT
2      R.Title,
3      R.ResourceType,
4      A.FirstName + ' ' + A.LastName AS Author
5  FROM
6      Resources AS R
7  INNER JOIN
8      Resource_Authors AS RA ON R.ResourceID = RA.ResourceID
9  INNER JOIN
10     Authors AS A ON RA.AuthorID = A.AuthorID;
```

Resultados | Mensajes

Buscar en elementos de filtro...

Title	ResourceType	Author
One Hundred Years of Solitude	Book	Gabriel García Márquez
Radioactivity and New Transformations	Scientific Article	Marie Curie
On Computable Numbers	Scientific Article	Alan Turing

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

https://youtu.be/HVzpy2ttcU0

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

It 's deleted now.

5. Other Database Engine Configurations

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.

On Linux Slackware(PostgreSQL)
First we check that the startup script exists

```
root@aysrSlack:~# ls -l /etc/rc.d/rc.postgresql
-rwxr-xr-x 1 root root 4983 Oct 14 11:03 /etc/rc.d/rc.postgresql*
root@aysrSlack:~#
```

We manually check that rc.postgresql works

```
root@aysrSlack:~# /etc/rc.d/rc.postgresql start
Starting PostgreSQL
waiting for server to start.... done
server started
root@aysrSlack:~#
```

You also need to verify that PostgreSQL responds.

```
root@aysrSlack:~# ps aux | grep postgres
postgres   1518  0.0  1.2 163612 19228 ?        Ss   09:22   0:00 /usr/lib64/postgresql/14/bin/postg
res -D /var/lib/pgsql/14/data -p 5432
postgres   1520  0.0  0.2 163612  3516 ?        Ss   09:22   0:00 postgres: checkpointer
postgres   1521  0.0  0.3 163612  5180 ?        Ss   09:22   0:00 postgres: background writer
postgres   1522  0.0  0.6 163612  8948 ?        Ss   09:22   0:00 postgres: walwriter
postgres   1523  0.0  0.5 164152  7592 ?        Ss   09:22   0:00 postgres: autovacuum launcher
postgres   1524  0.0  0.2  18348  3964 ?        Ss   09:22   0:00 postgres: stats collector
postgres   1525  0.0  0.3 164048  5900 ?        Ss   09:22   0:00 postgres: logical replication laun
cher
root       1539  0.0  0.1   3988  2100 tty1     S+   09:24   0:00 grep postgres
root@aysrSlack:~#
```

We edit /etc/rc.d/rc.local (as root) and add the line before the final line exit 0 (or if there is no exit 0, at the end of the file)

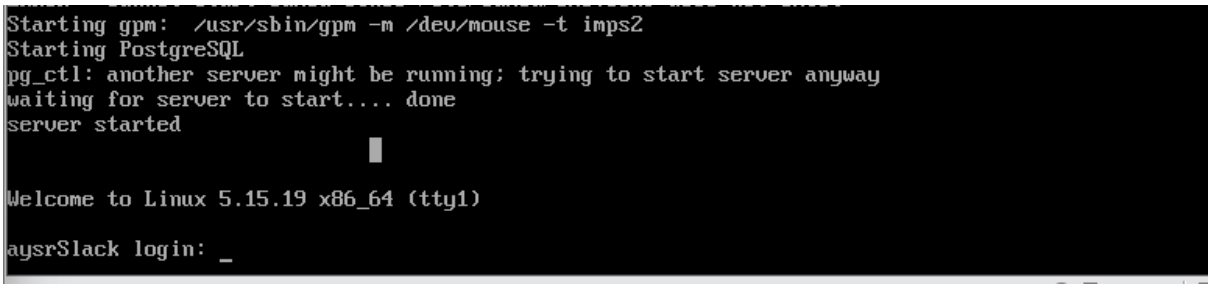
```
root@aysrSlack:~# nano /etc/rc.d/rc.local
```

```
  GNU nano 6.0                          /etc/rc.d/rc.local                          Modified
#!/bin/bash
#
# /etc/rc.d/rc.local:  Local system initialization script.
#
# Put any local startup commands in here.  Also, if you have
# anything that needs to be run at shutdown time you can
# make an /etc/rc.d/rc.local_shutdown script and put those
# commands in there.
if [ -x /etc/rc.d/rc.postgresql ]; then
        /etc/rc.d/rc.postgresql start
fi
```

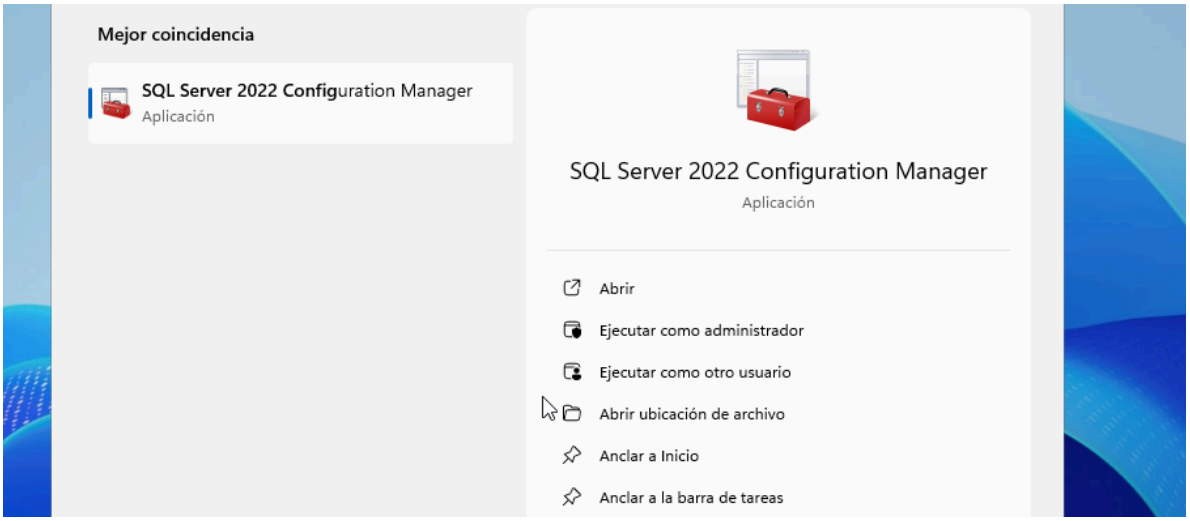
We save. Then, we must also verify that rc.local is executable.

```
root@aysrSlack:~# chmod +x /etc/rc.d/rc.local
root@aysrSlack:~# _
```

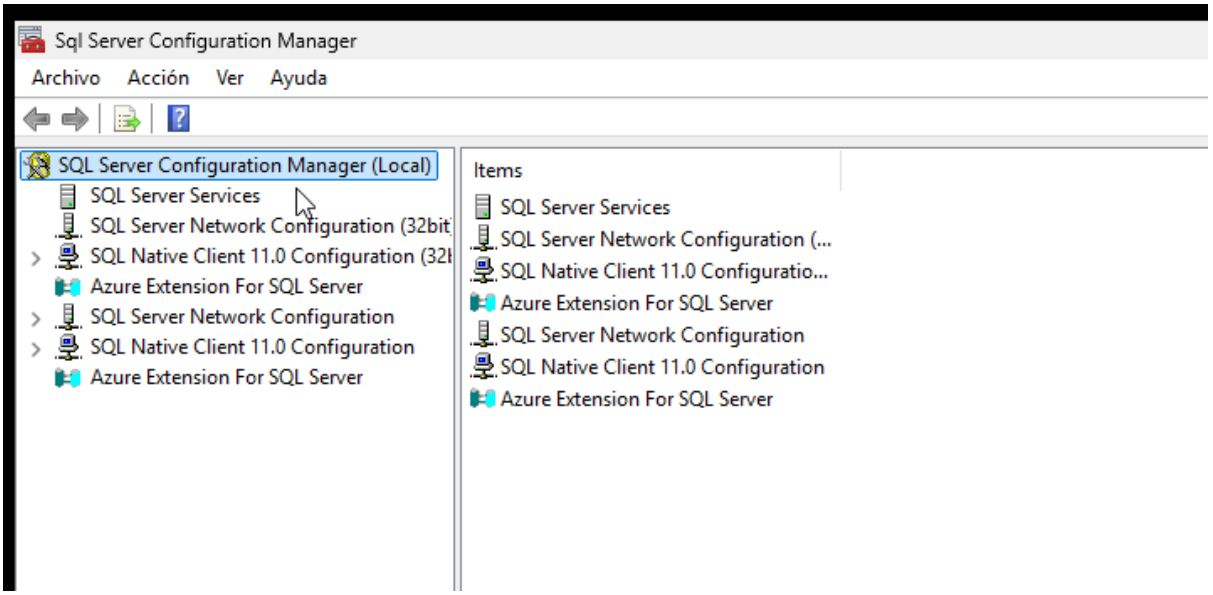
Upon restart we can see that the service started correctly



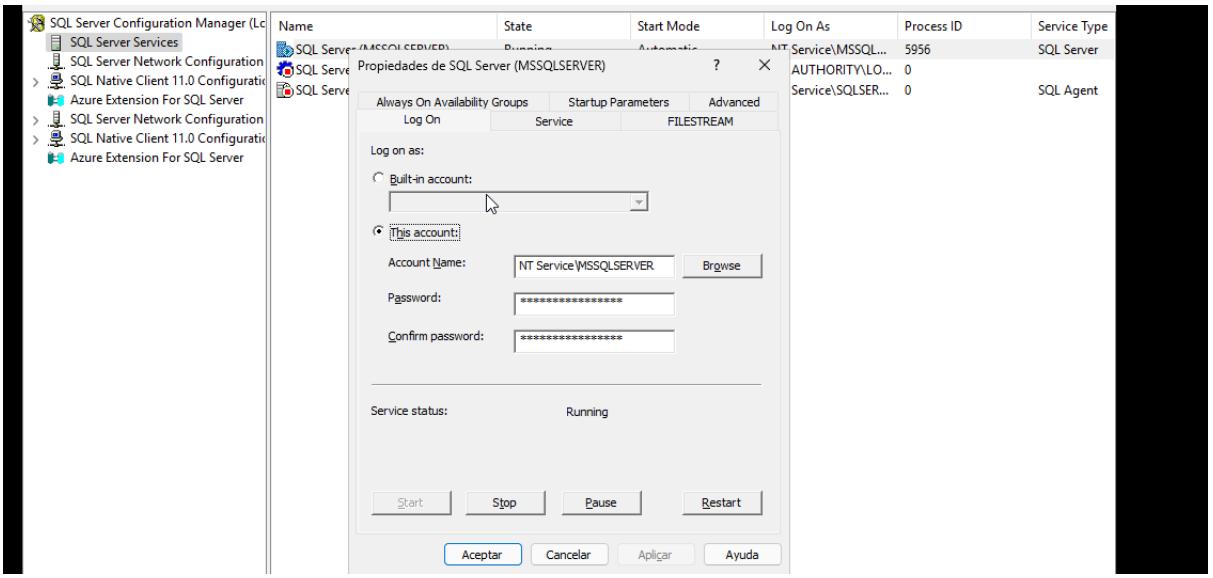
On Windows Server(SQL Server)
First, open the Start menu and search for SQL Server Configuration Manager.



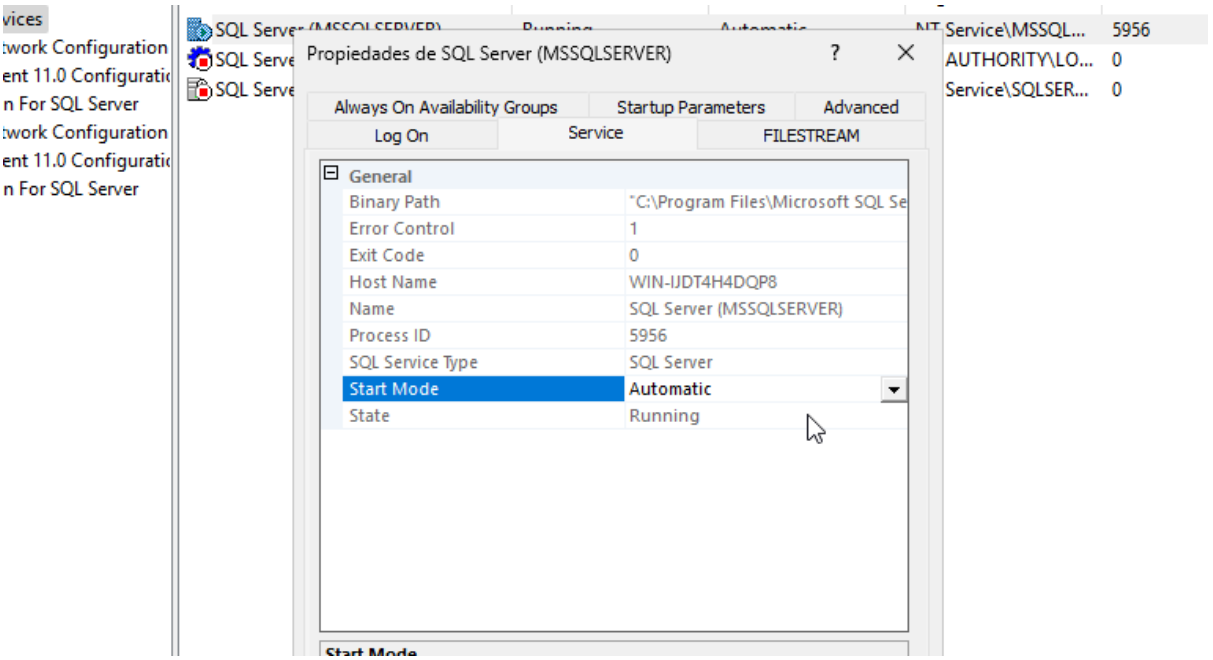
In the left pane, open SQL Server Services



We right click on SQL Server (MSSQLSERVER) → Properties.



In the Service tab, we look for Start Mode and change it to Automatic.

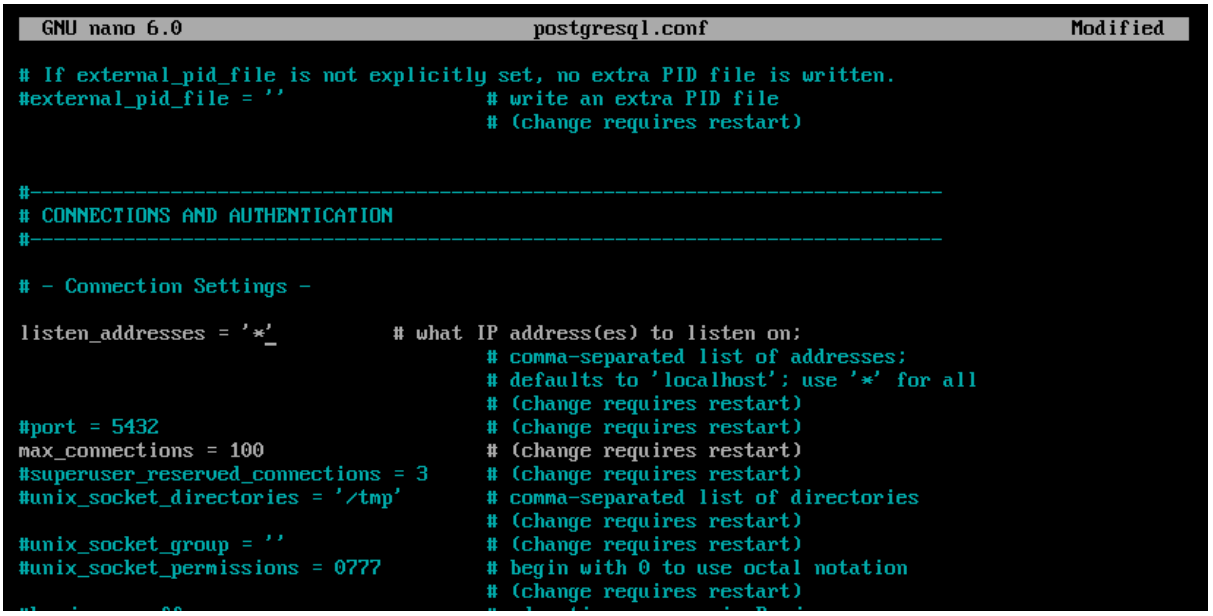


2. Using a database connection client (e.g., DBeaver), connect to your databases from a remote machine and view the table contents.

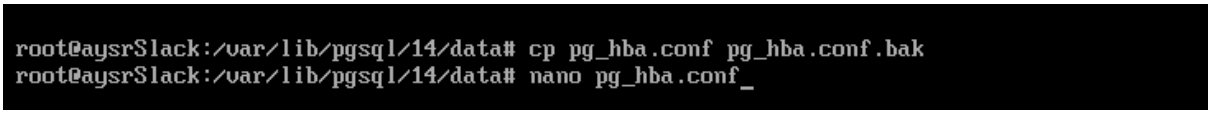
On Linux Slackware:
First, Edit postgresql.conf to allow remote listening

```
root@aysrSlack:~# cd /var/lib/pgsql/14/data
root@aysrSlack:/var/lib/pgsql/14/data# cp postgresql.conf.bak
cp: missing destination file operand after 'postgresql.conf.bak'
Try 'cp --help' for more information.
root@aysrSlack:/var/lib/pgsql/14/data# cp postgresql.conf postgresql.conf.bak
root@aysrSlack:/var/lib/pgsql/14/data#
```

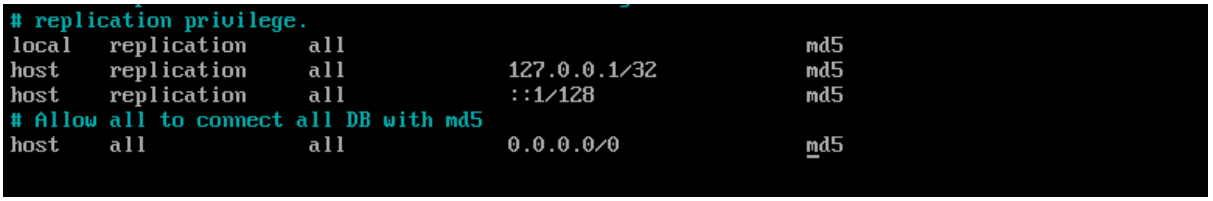
We look for the line #listen_addresses = 'localhost' and change it to: listen_addresses = '*'



We make a backup and edit pg_hba.conf

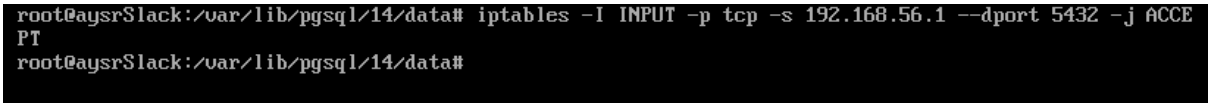


At the end we add a line to authenticate with MD5 password:



Then, restart PostgreSQL

Allow access from 192.168.56.1 (CLIENT IP)



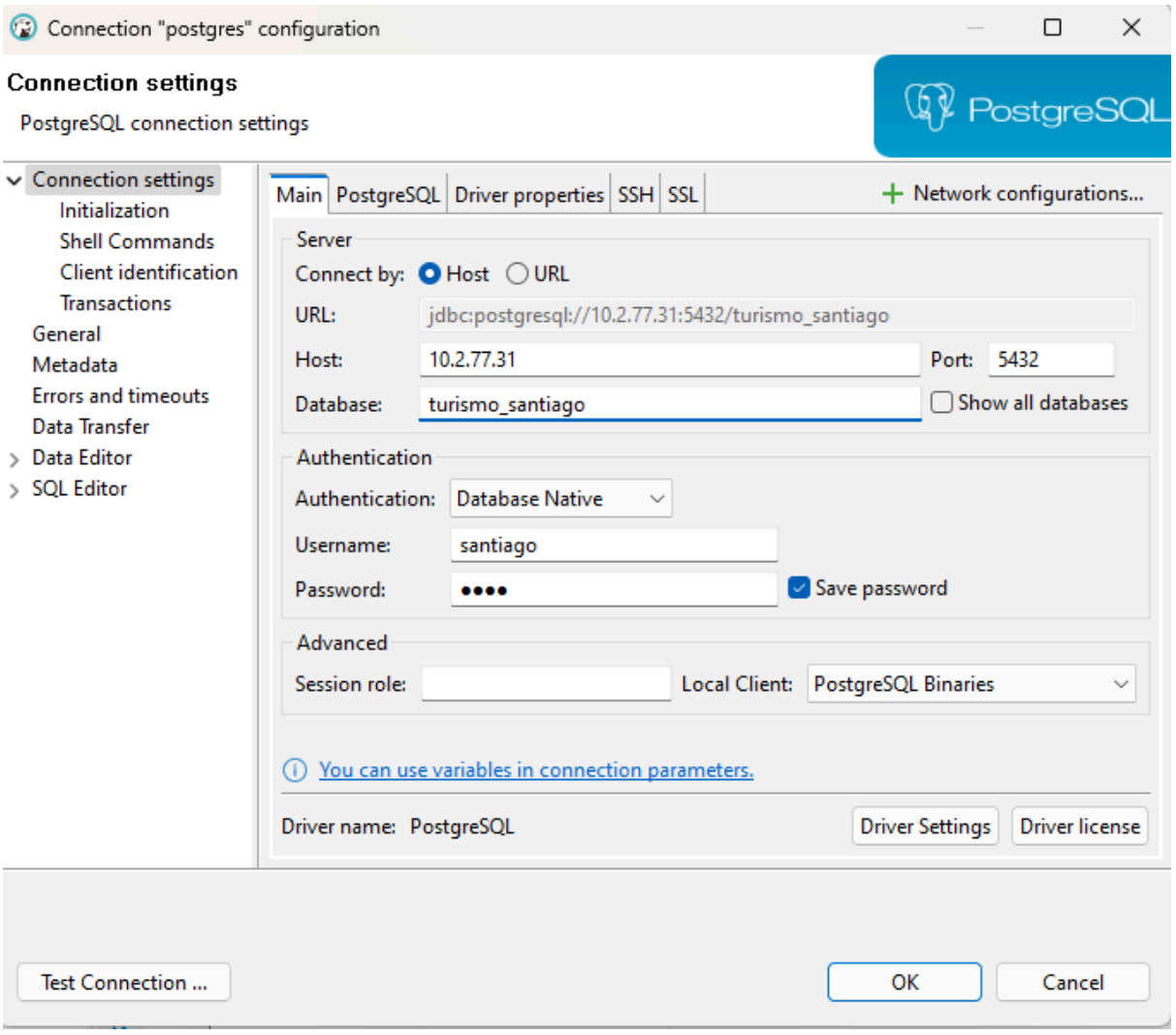
We keep the rules

```
root@aysrSlack:/var/lib/pgsql/14/data# iptables-save > /etc/iptables.rules
root@aysrSlack:/var/lib/pgsql/14/data# _
```

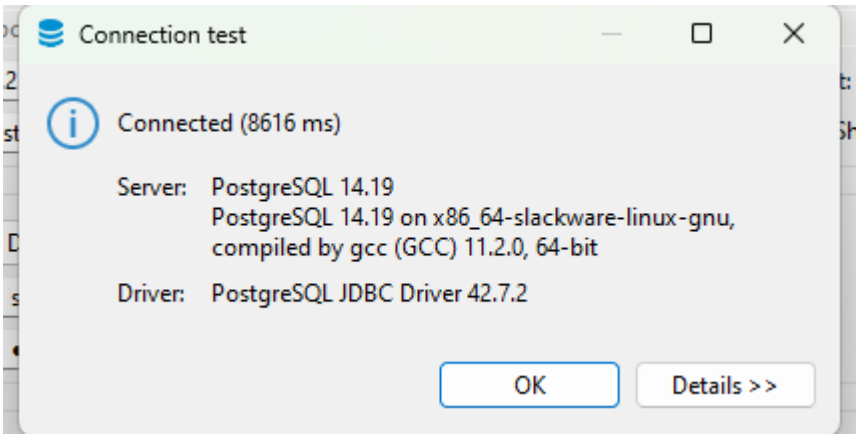
We verify that PostgreSQL is listening on port 5432

```
root@aysrSlack:/var/lib/pgsql/14/data# ss -ltnp | grep 5432
LISTEN 0      244                          0.0.0.0:5432       0.0.0.0:*    users:(("postgres",pid=
1538,fd=5))
LISTEN 0      244                             [::]:5432          [::]:*    users:(("postgres",pid=
1538,fd=6))
root@aysrSlack:/var/lib/pgsql/14/data# _
```

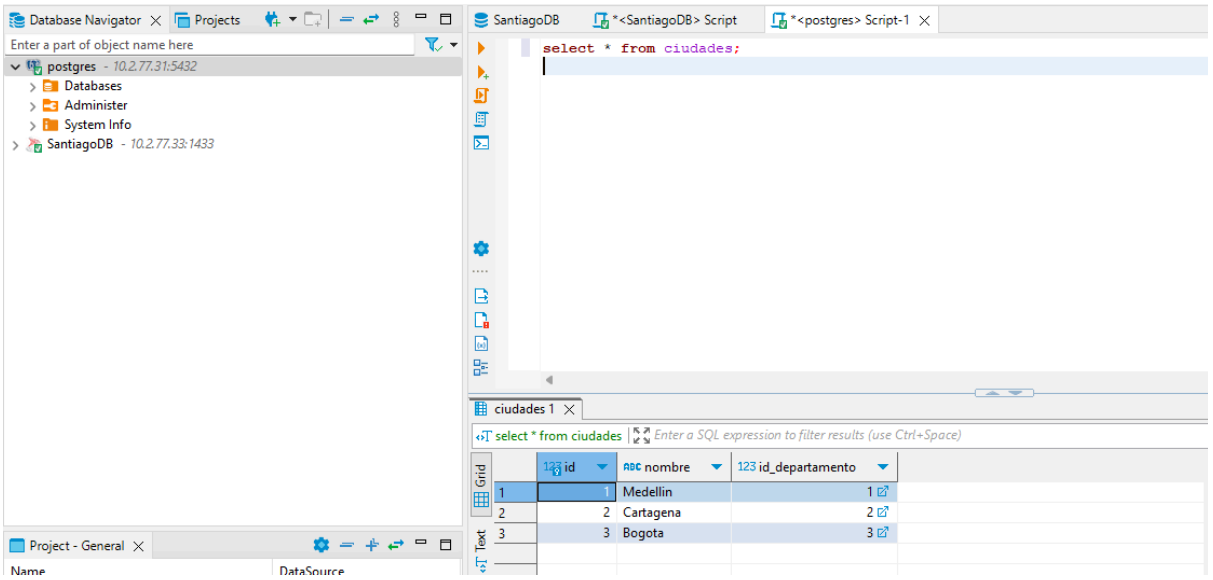
In DBeaver, choose PostgreSQL and fill out the form as follows:



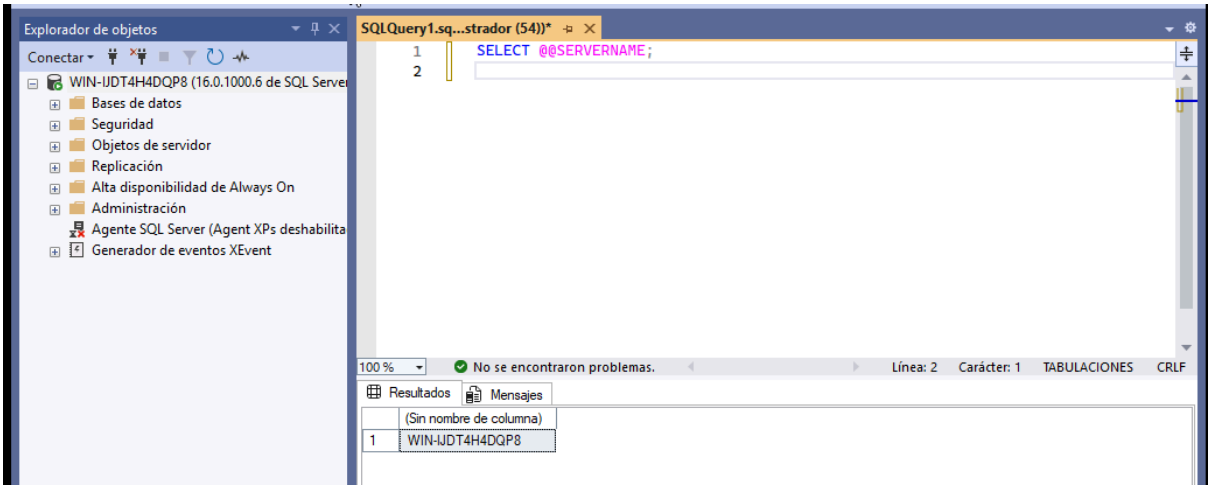
Press Test Connection and verify



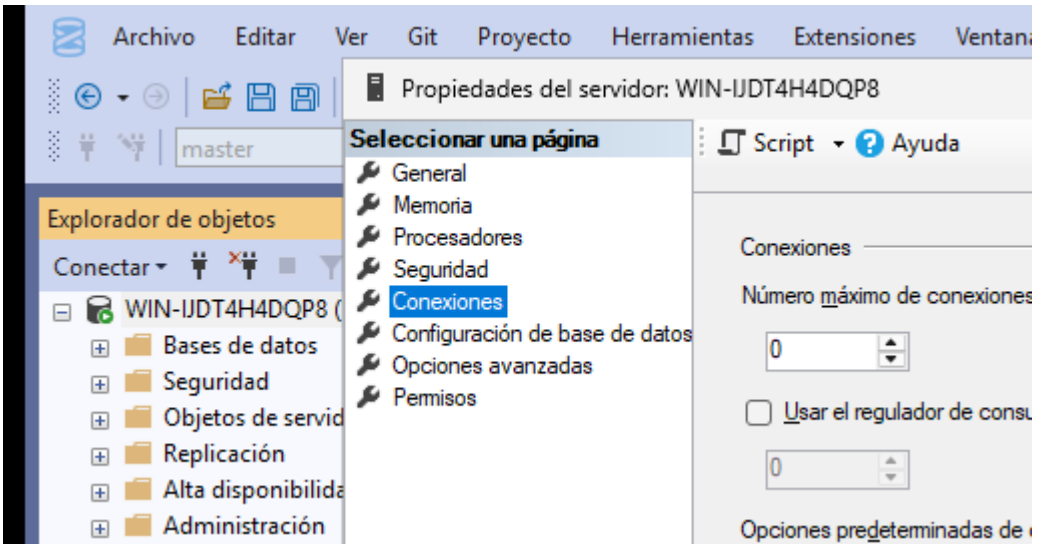
Then, we verify that it is working

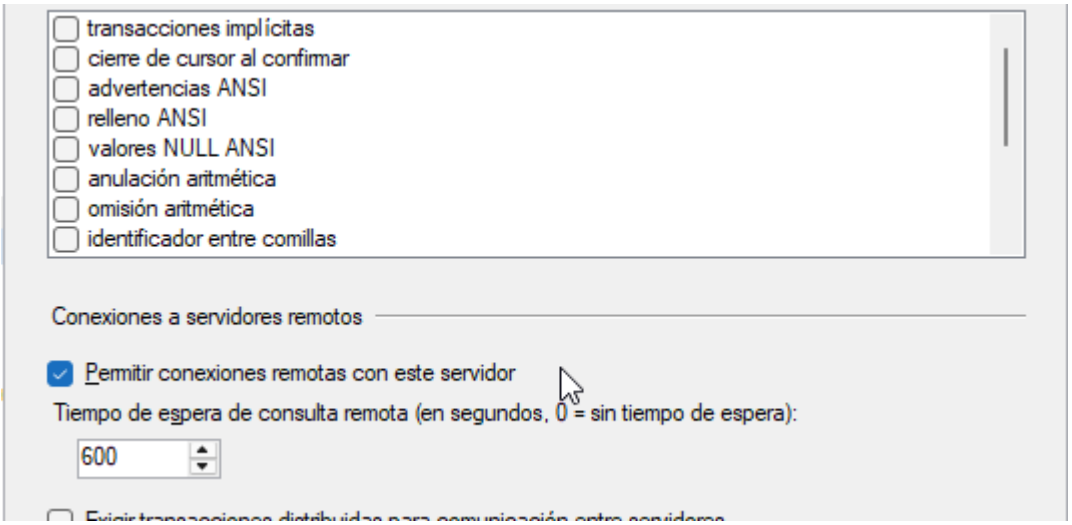


On Windows Server:
First we check which instance of SQL Server is being used, open SSMS and run: SELECT @@SERVERNAME; . We save that value, since it is the name of the server we are going to use in DBeaver.

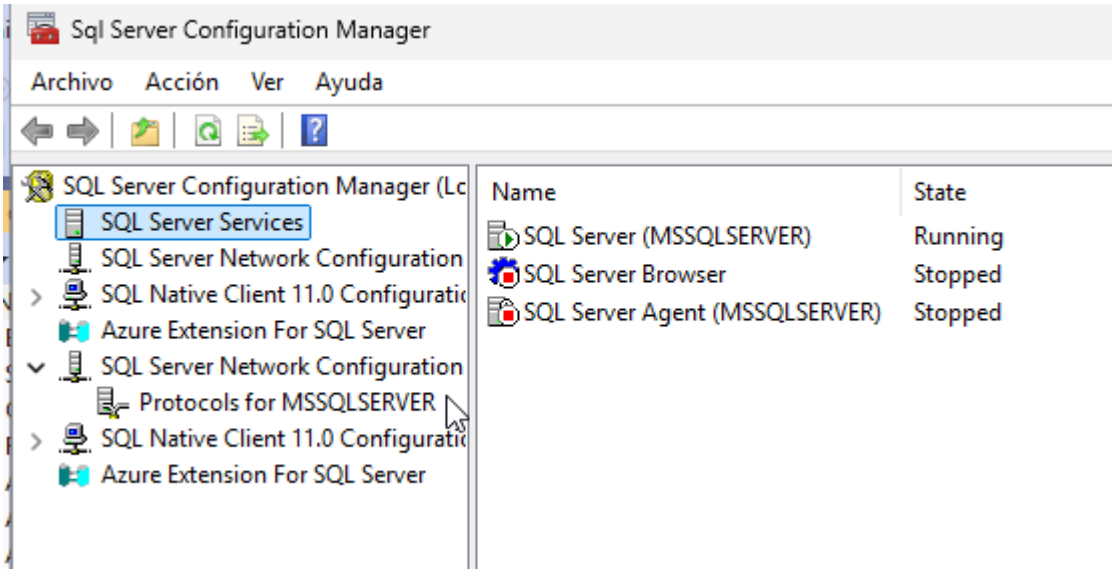


Now we enable remote connections in SQL Server. In SSMS, we connect as an administrator. Right-click the server name and click Properties. Then go to the Connections tab and select the checkbox: Allow remote connections to this server and click OK.

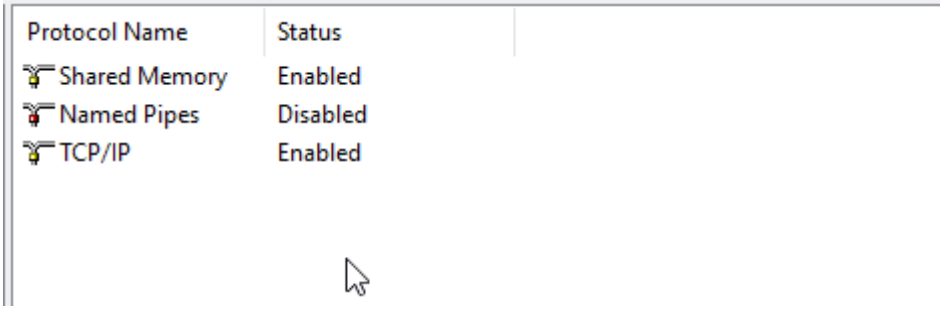




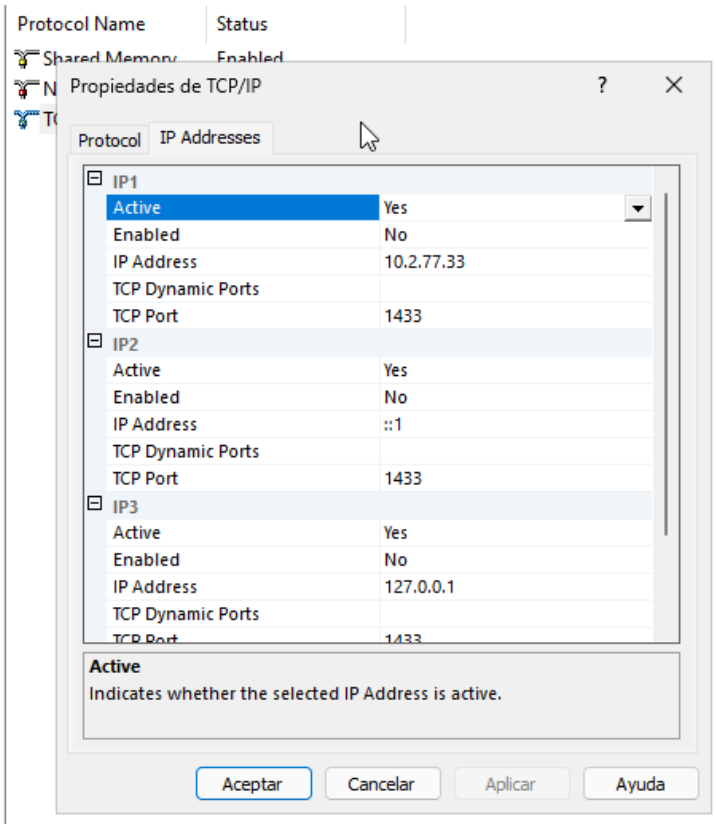
Let's go to SQL Server Configuration Manager, in the left panel, we go to: SQL Server Network Configuration and then Protocols for MSSQLSERVER



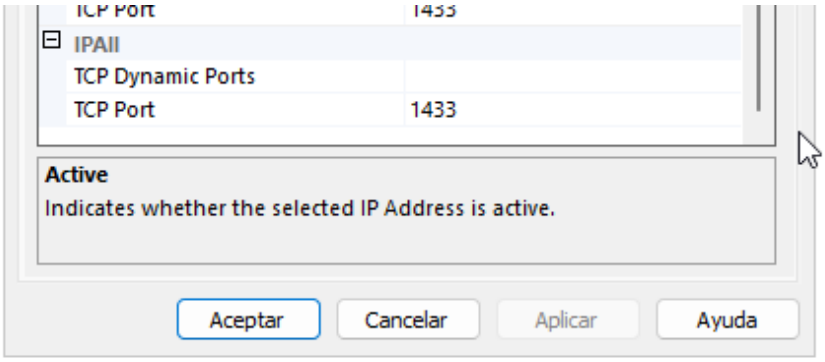
In the right panel, right-click on TCP/IP and click Enable.



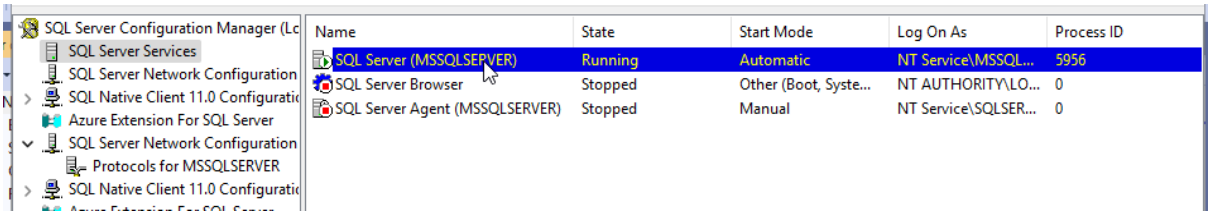
Then, we right-click again and go to Properties and go to the IP Addresses tab.



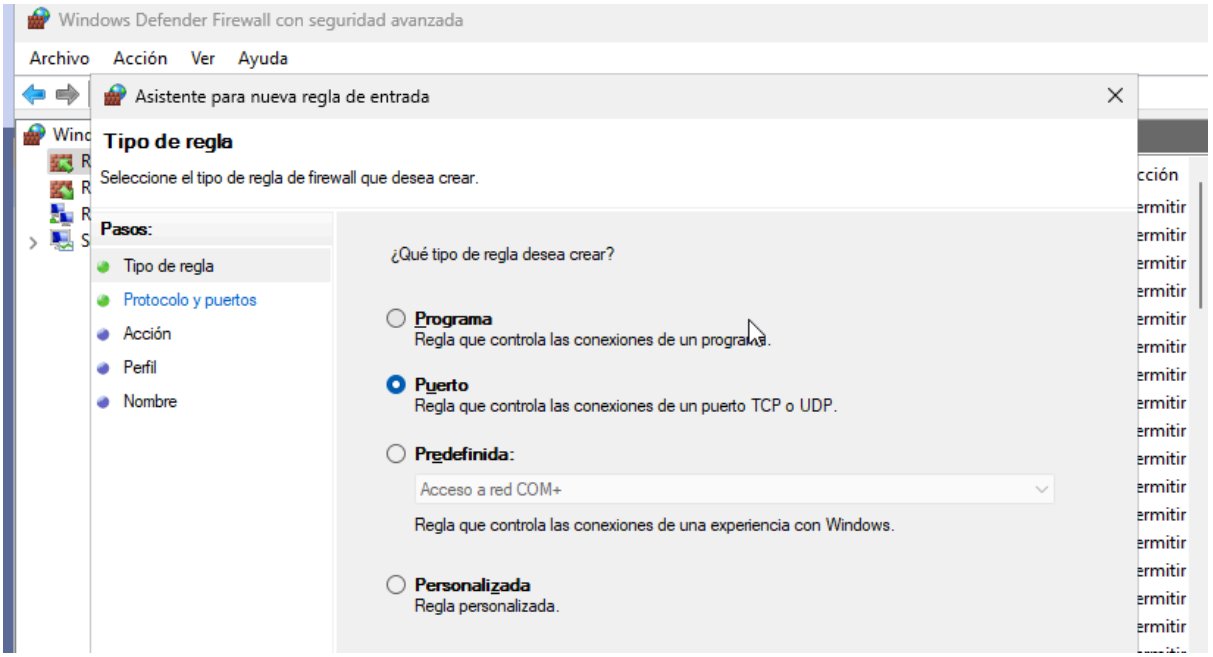
We download and make sure we have: TCP Port = 1433

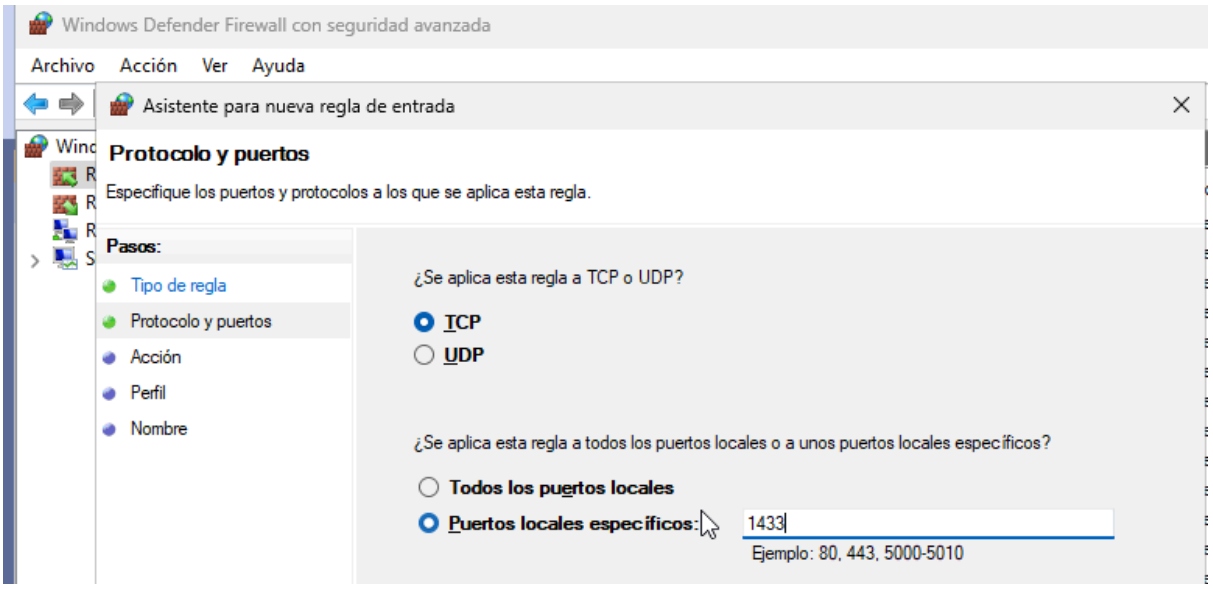


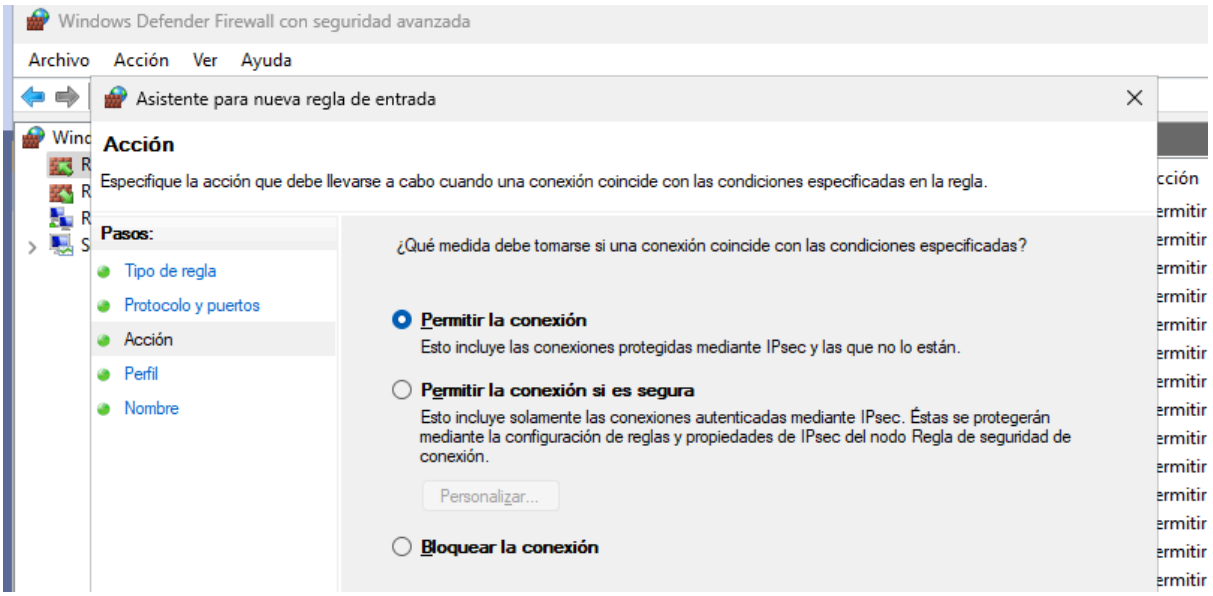
We restart the SQL Server service (right click → Restart).

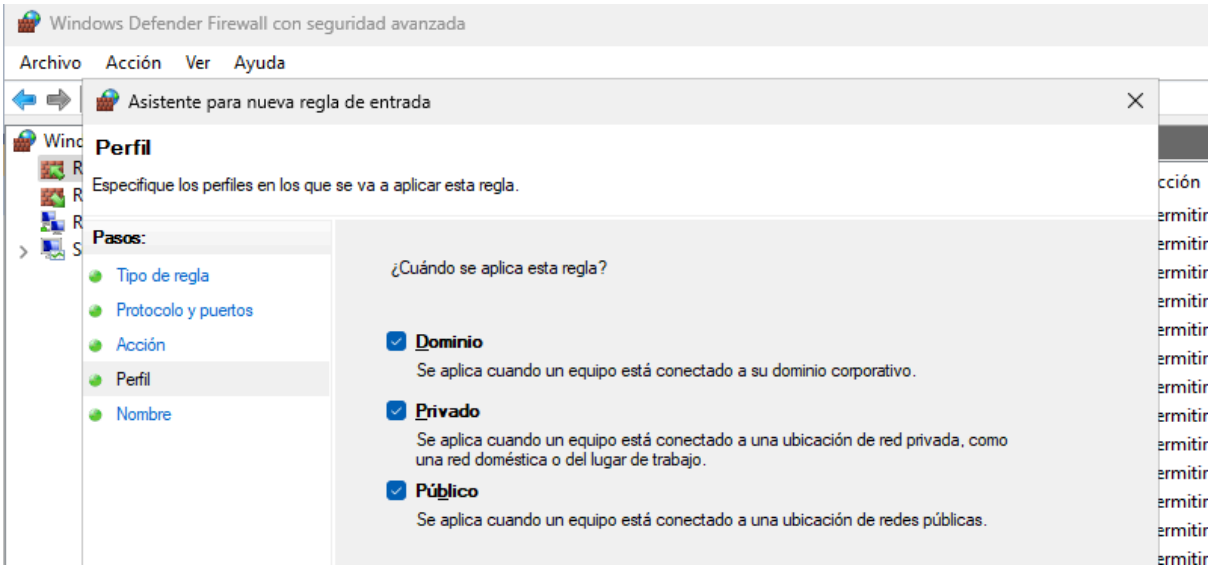


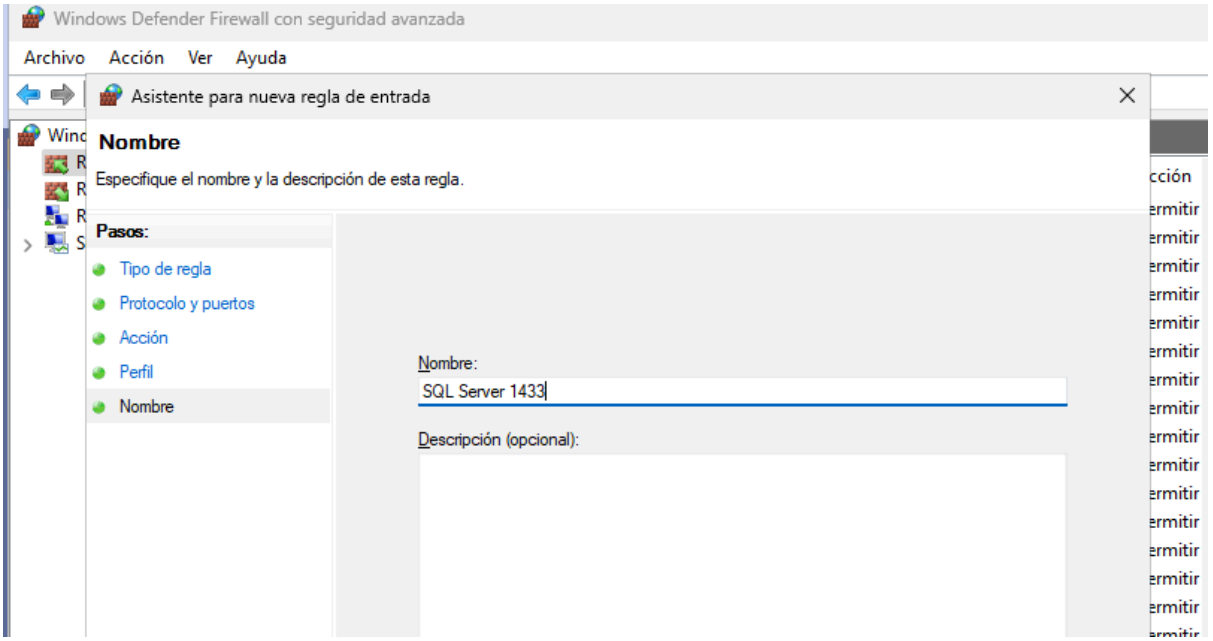
Now we allow port 1433 in the Windows firewall (Control Panel → System and Security → Windows Defender Firewall → Advanced settings.)
In the left bar, select Inbound Rules → New Rule. Fill in the fields as follows:


Windows Defender Firewall con seguridad avanzada
Archivo Acción Ver Ayuda
Asistente para nueva regla de entrada
Tipo de regla
Seleccione el tipo de regla de firewall que desea crear.
Pasos:
Tipo de regla
Protocolo y puertos
Acción
Perfil
Nombre
¿Qué tipo de regla desea crear?
Programa
Regla que controla las conexiones de un programa.
Puerto
Regla que controla las conexiones de un puerto TCP o UDP.
Predefinida:
Acceso a red COM+
Regla que controla las conexiones de una experiencia con Windows.
Personalizada
Regla personalizada.

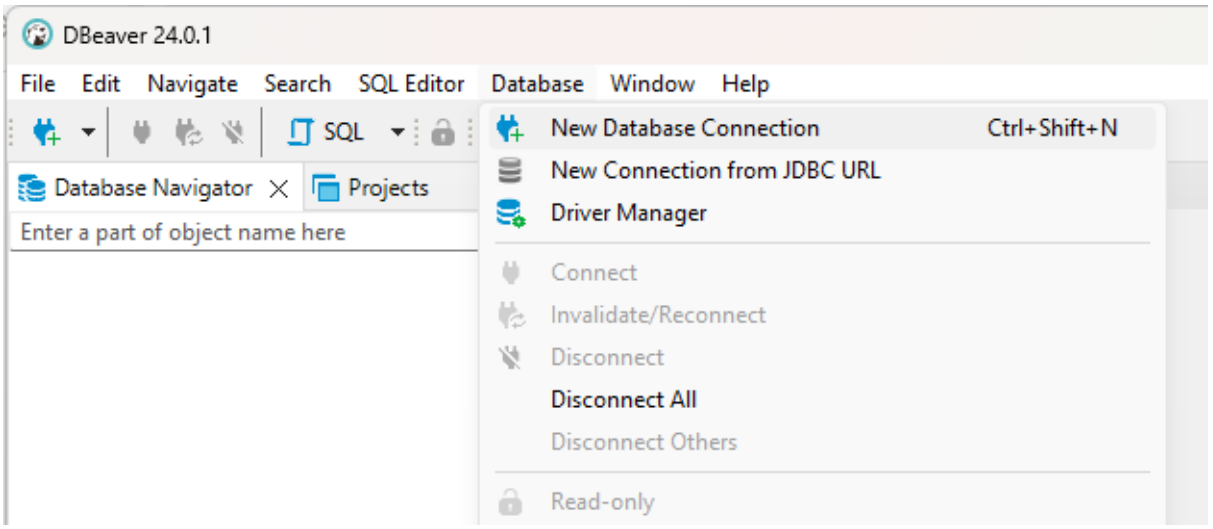

Windows Defender Firewall con seguridad avanzada
Archivo Acción Ver Ayuda
Asistente para nueva regla de entrada
Protocolo y puertos
Especifique los puertos y protocolos a los que se aplica esta regla.
Pasos:
Tipo de regla
Protocolo y puertos
Acción
Perfil
Nombre
¿Se aplica esta regla a TCP o UDP?
TCP
UDP
¿Se aplica esta regla a todos los puertos locales o a unos puertos locales específicos?
Todos los puertos locales
Puertos locales específicos:
1433
Ejemplo: 80, 443, 5000-5010


Windows Defender Firewall con seguridad avanzada
Archivo Acción Ver Ayuda
Asistente para nueva regla de entrada
Acción
Especifique la acción que debe llevarse a cabo cuando una conexión coincide con las condiciones especificadas en la regla.
Pasos:
Tipo de regla
Protocolo y puertos
Acción
Perfil
Nombre
¿Qué medida debe tomarse si una conexión coincide con las condiciones especificadas?
Permitir la conexión
Esto incluye las conexiones protegidas mediante IPsec y las que no lo están.
Permitir la conexión si es segura
Esto incluye solamente las conexiones autenticadas mediante IPsec. Éstas se protegerán mediante la configuración de reglas y propiedades de IPsec del nodo Regla de seguridad de conexión.
Personalizar...
Bloquear la conexión

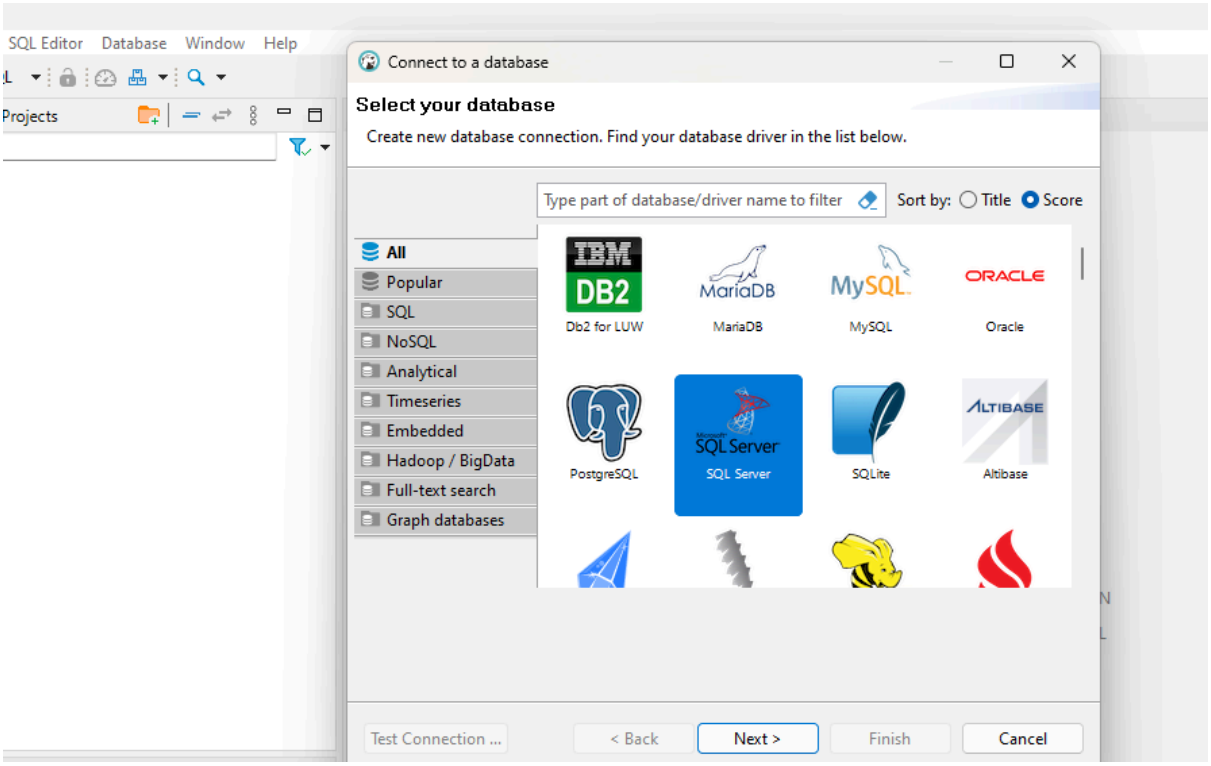




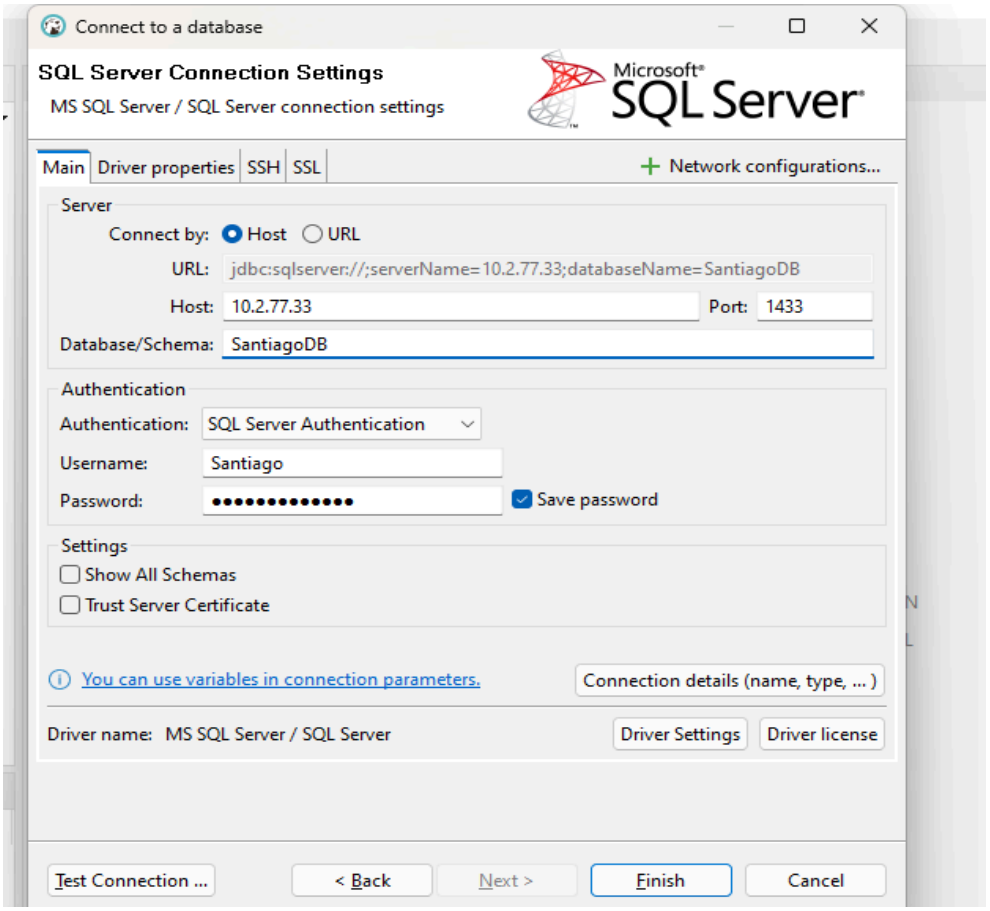
Open DBeaver. Click on New Database Connection.



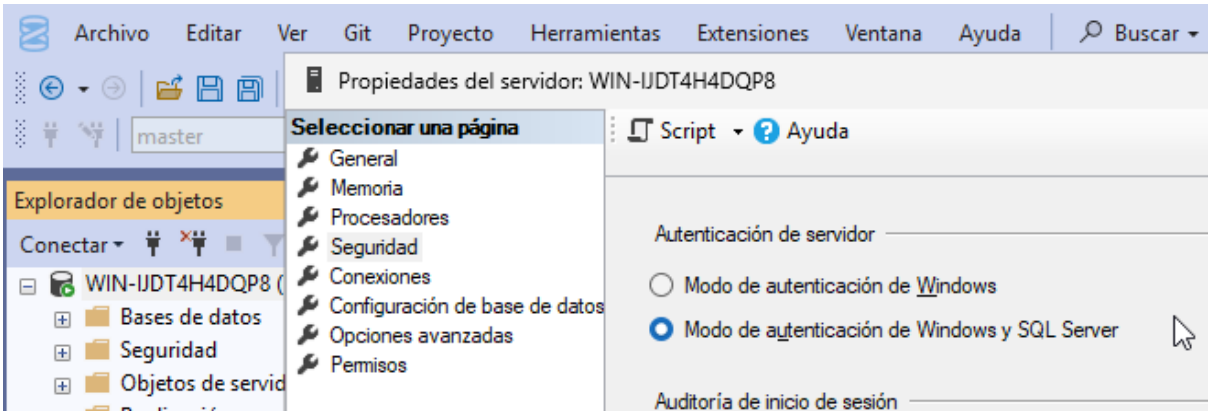
We choose SQL Server



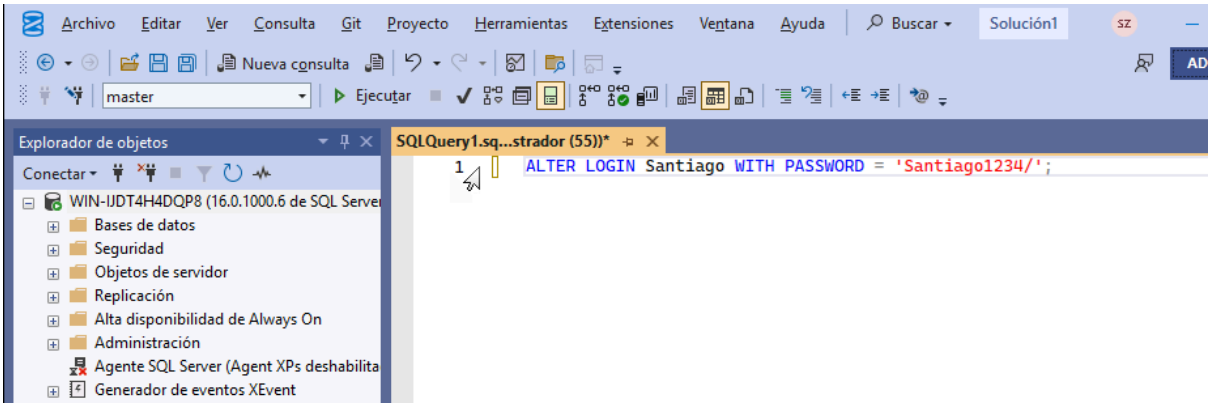
We fill out the form as follows and click on Test Connection.



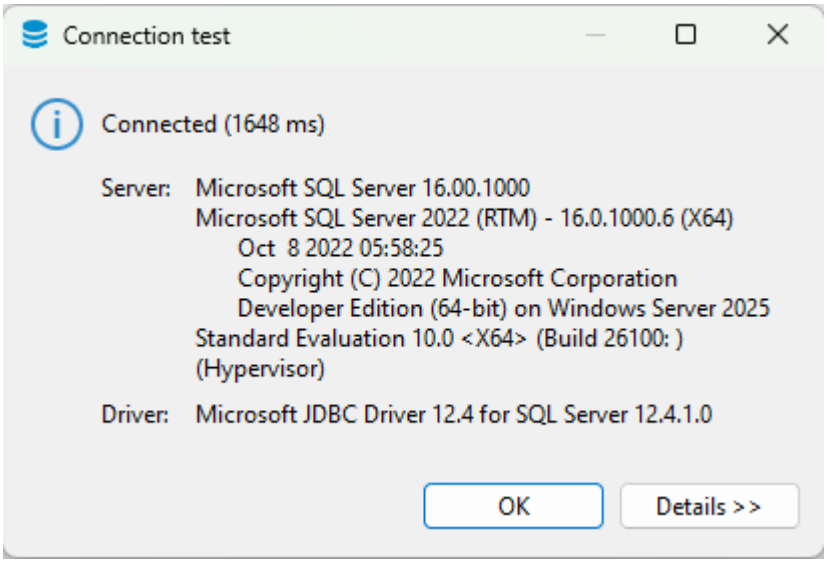
First, open SQL Server Management Studio (SSMS) and log in as Administrator (Windows Authentication). In Object Explorer, right-click your server → Properties. Go to the Security tab and select SQL Server and Windows Authentication mode. Then press OK and restart the server



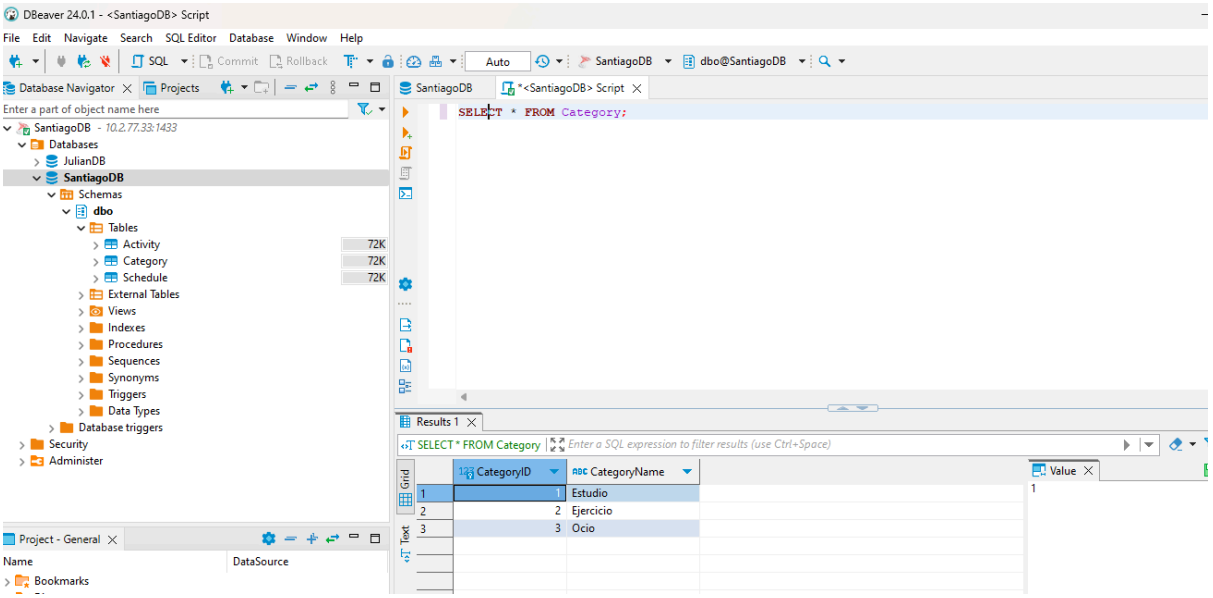
Execute this before test



Press Test Connection, if the connection was successful, the following will appear:



Then, we verify that the remote connection worked by making a query

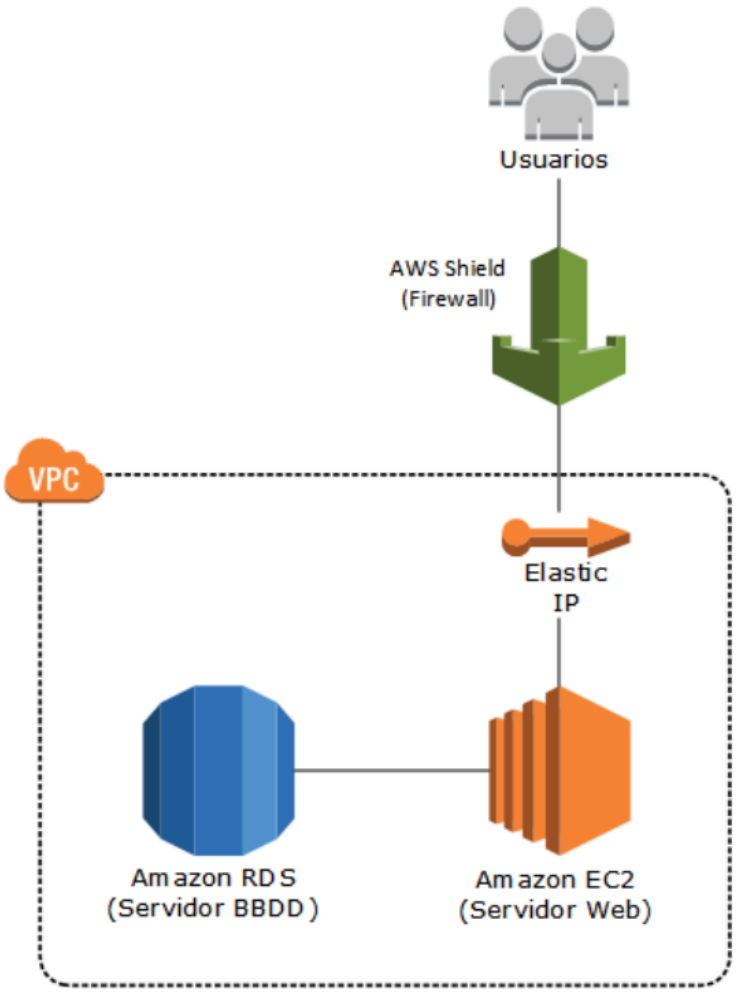

DBeaver 24.0.1 - <SantiagoDB> Script
File Edit Navigate Search SQL Editor Database Window Help
SQL Commit Rollback Auto SantiagoDB dbo@SantiagoDB
Database Navigator Projects
Enter a part of object name here
SantiagoDB - 10.2.77.33:1433
Databases
JulianDB
SantiagoDB
Schemas
dbo
Tables
Activity 72K
Category 72K
Schedule 72K
External Tables
Views
Indexes
Procedures
Sequences
Synonyms
Triggers
Data Types
Database triggers
Security
Administer
Project - General
Name
DataSource
Bookmarks
SantiagoDB
*<SantiagoDB> Script
SELECT * FROM Category;
Results 1
SELECT * FROM Category
Enter a SQL expression to filter results (use Ctrl+Space)
Grid
Text
CategoryID
CategoryName
1 Estudio
2 Ejercicio
3 Ocio
Value
1

Cloud - AWS - Base Software Installation

Part of the core platform of an organization's computational infrastructure involves web services, which can be hosted either within the company's data center or on a cloud server. These services store the organization's web pages and are accessed by various clients. In this lab, we will implement this service.

1. Cloud Web Service Installation

Amazon Elastic Compute Cloud (Amazon EC2) provides the most extensive and versatile computing platform, offering more than 500 instance types and the flexibility to choose the latest processors, storage options, networking, operating systems, and purchasing models, so you can tailor it to perfectly meet your workload requirements. For this lab, we will gain hands-on experience with Amazon Cloud by deploying an EC2 instance and installing a web server.



2. Research

a. What is an EC2 instance and what is it used for?

An Amazon EC2 (Elastic Compute Cloud) instance is a virtual server in the AWS cloud that provides resizable computing capacity. It is used to host applications, run workloads, perform data processing, or simulate environments without needing physical hardware.

b. What is a VPC, how should it be configured, and what best practices should be considered?
A Virtual Private Cloud (VPC) is a private network within AWS that allows you to isolate and control your resources. It should be configured with subnets, route tables, and security groups to ensure secure communication. Best practices include using private subnets for sensitive resources, enabling flow logs, and applying the principle of least privilege in access control.

c. How can I run multiple systems within an Amazon EC2 environment?
You can run multiple systems in an EC2 environment by launching multiple instances, each configured with its own operating system and applications. You can also use containerization tools like Docker or orchestration platforms like Kubernetes to manage multiple systems efficiently within the same infrastructure.

d. How quickly can I scale the capacity (both up and down) of an EC2 instance?
EC2 instances can scale up or down within minutes. Vertical scaling (changing instance type) can be done by stopping and modifying the instance, while horizontal scaling (adding or removing instances) can be automated using Auto Scaling Groups to adjust capacity dynamically based on demand.

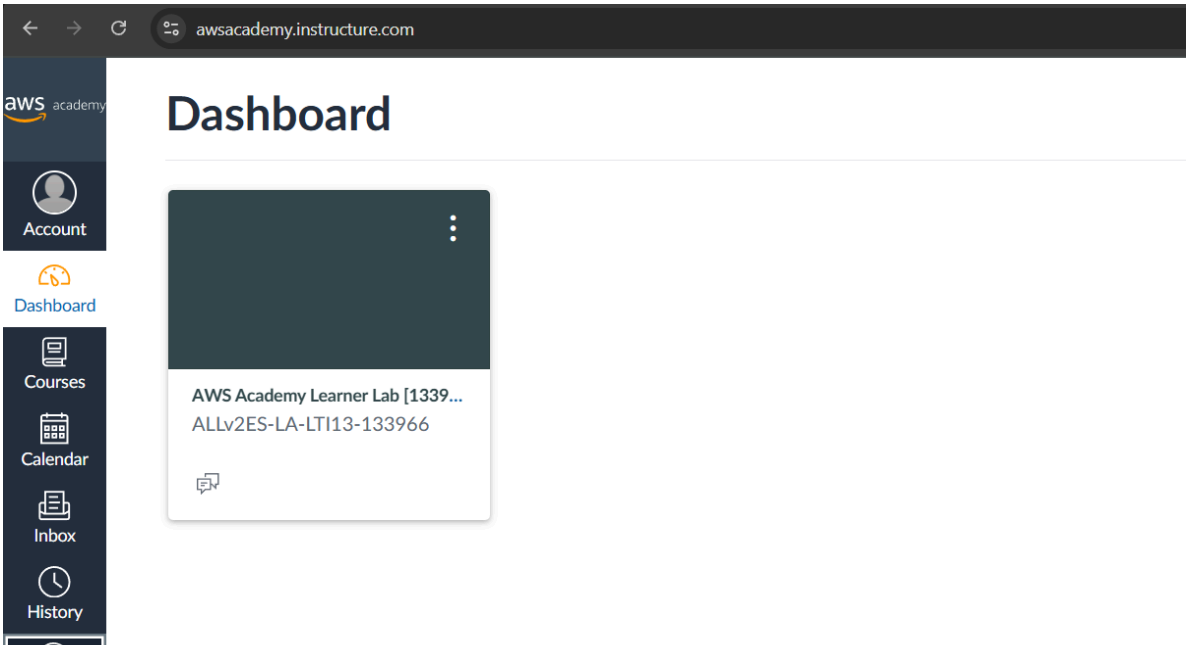
e. How does this service differ from standard hosting services?

Unlike traditional hosting, EC2 offers on-demand, scalable, and flexible infrastructure. You pay only for what you use, have full control over your operating system and configurations, and can automate scaling and deployment—something standard hosting services typically don’t provide.

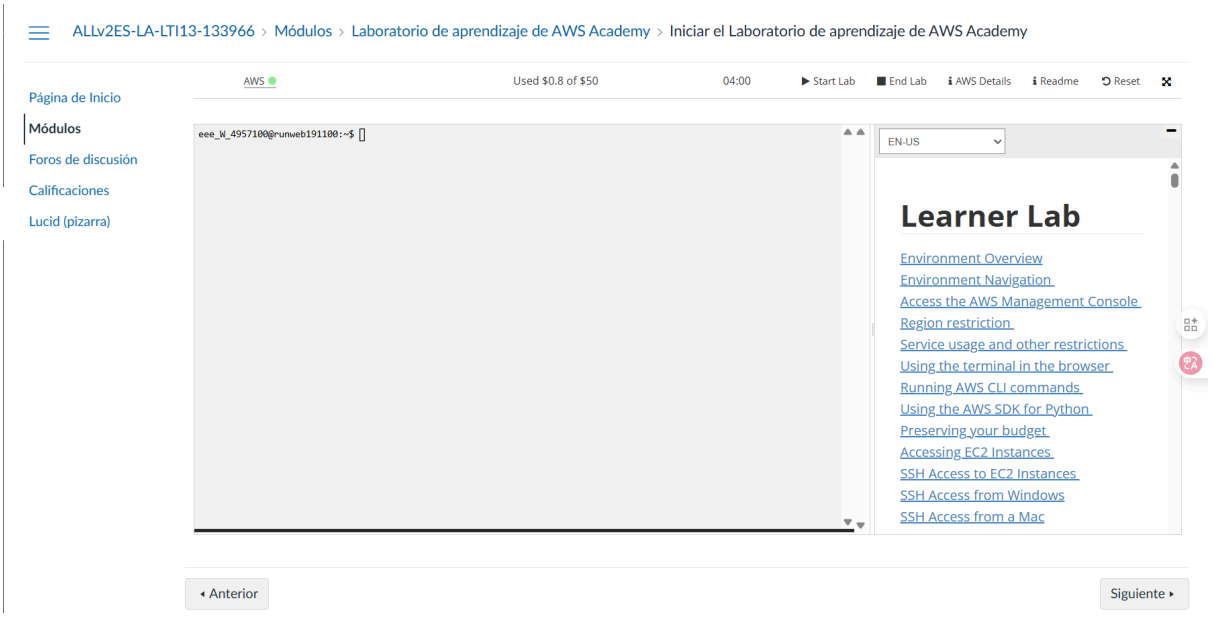
f. What is Amazon RDS?
Amazon RDS (Relational Database Service) is a managed service that simplifies the setup, operation, and scaling of relational databases in the cloud. It supports engines like MySQL, PostgreSQL, and Oracle, and handles tasks such as backups, patching, and replication automatically.

3. Configuration

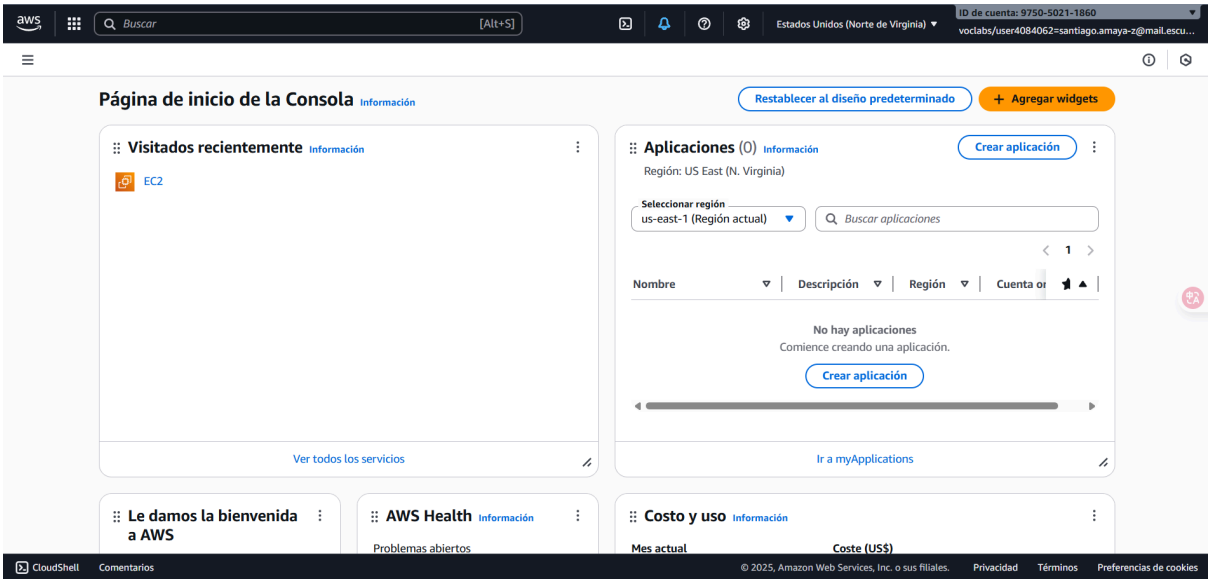
a. Log in to the AWS Management Console at awsacademy.instructure.com and locate Lab 5.



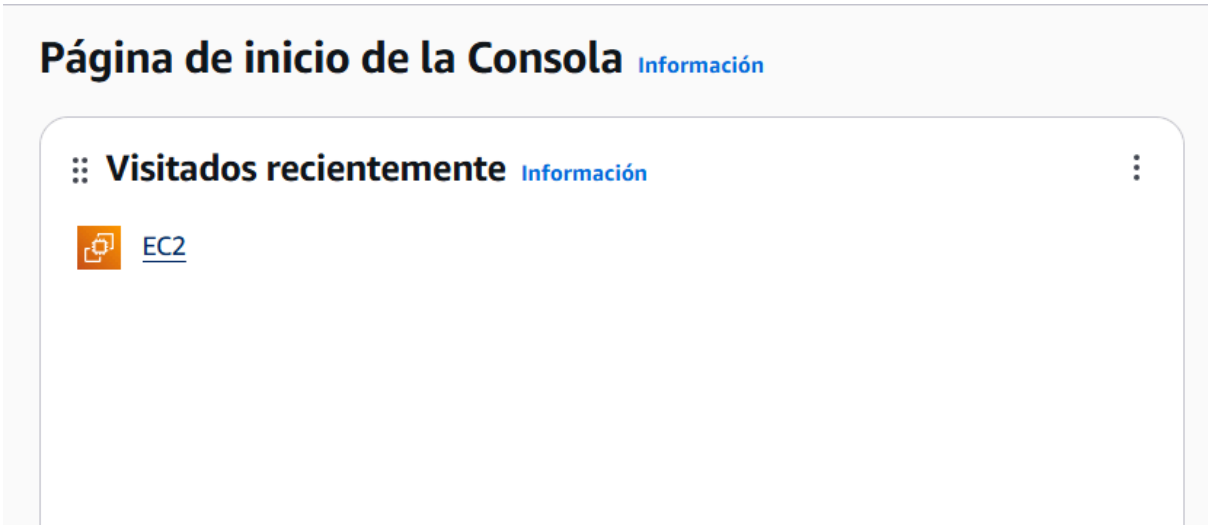
b. Navigate to the Modules section, click on ”Learner Lab”, accept the terms and conditions, and then click on “Start Lab.”



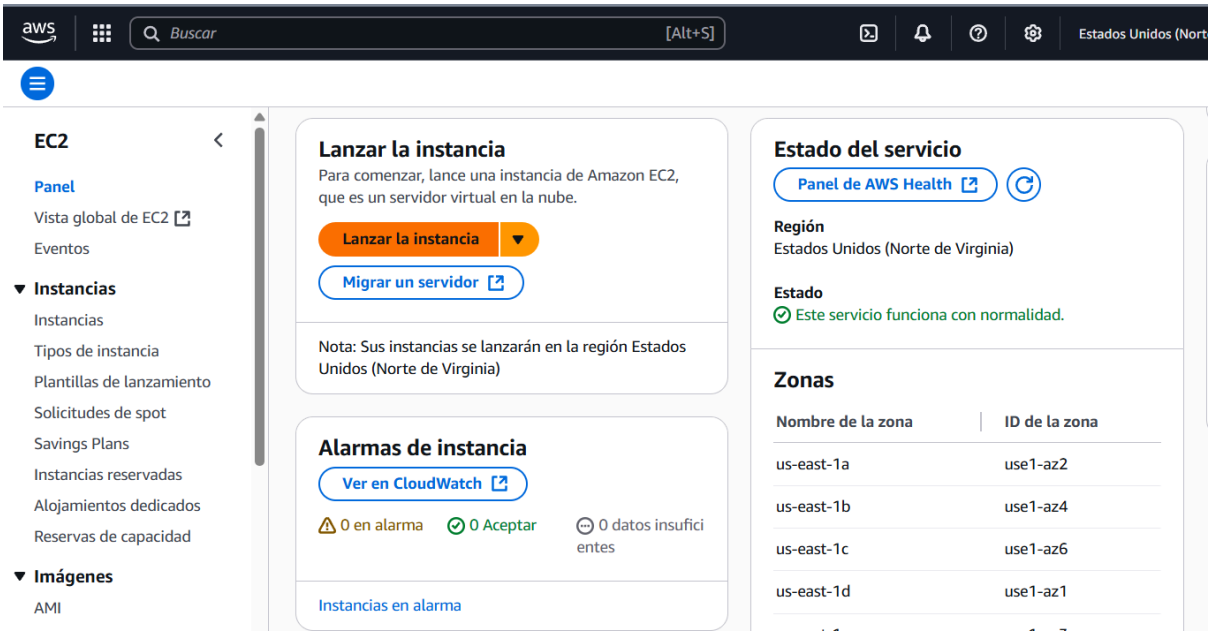
c. Once the lab loads, click the “AWS” button in the upper left corner to be redirected to the AWS Console.



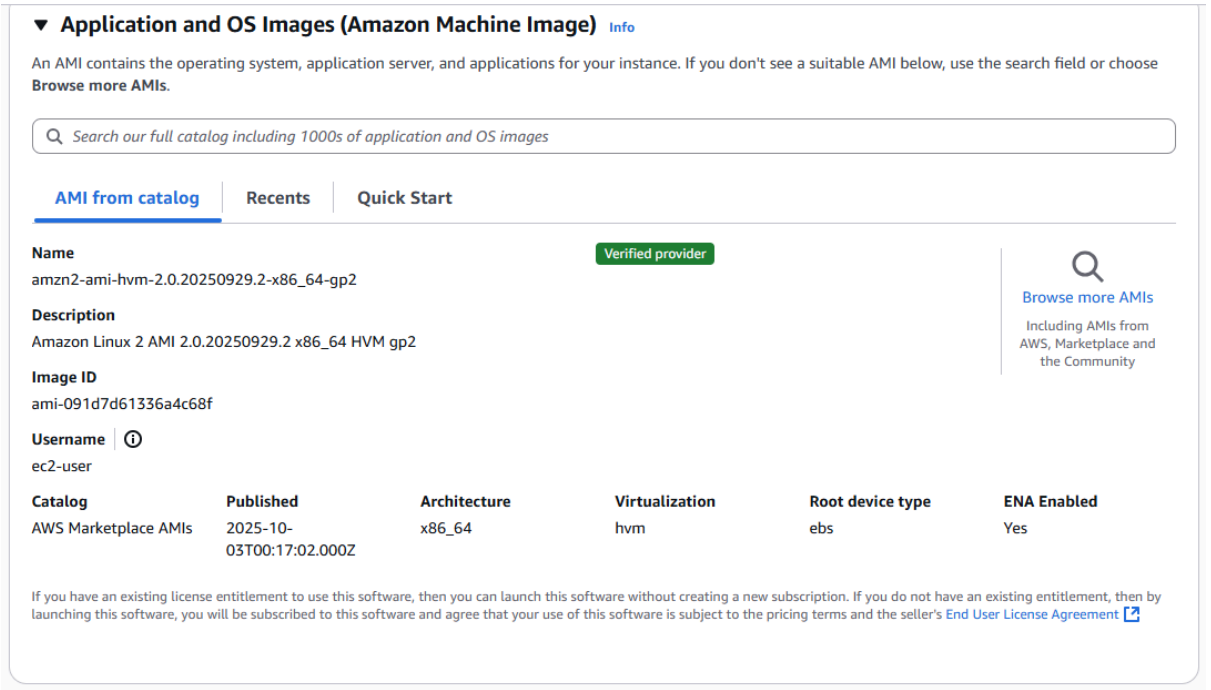
d. Click on EC2.



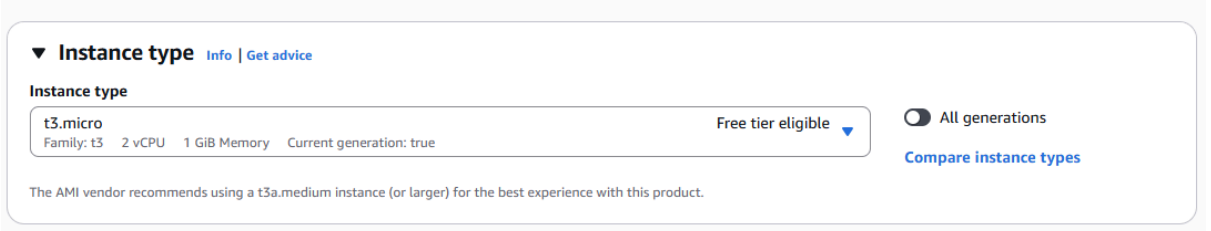
e. Select the EC2 Dashboard and then choose the “Launch Instance” option.



f. For this exercise, select the Amazon Linux 2 AMI.

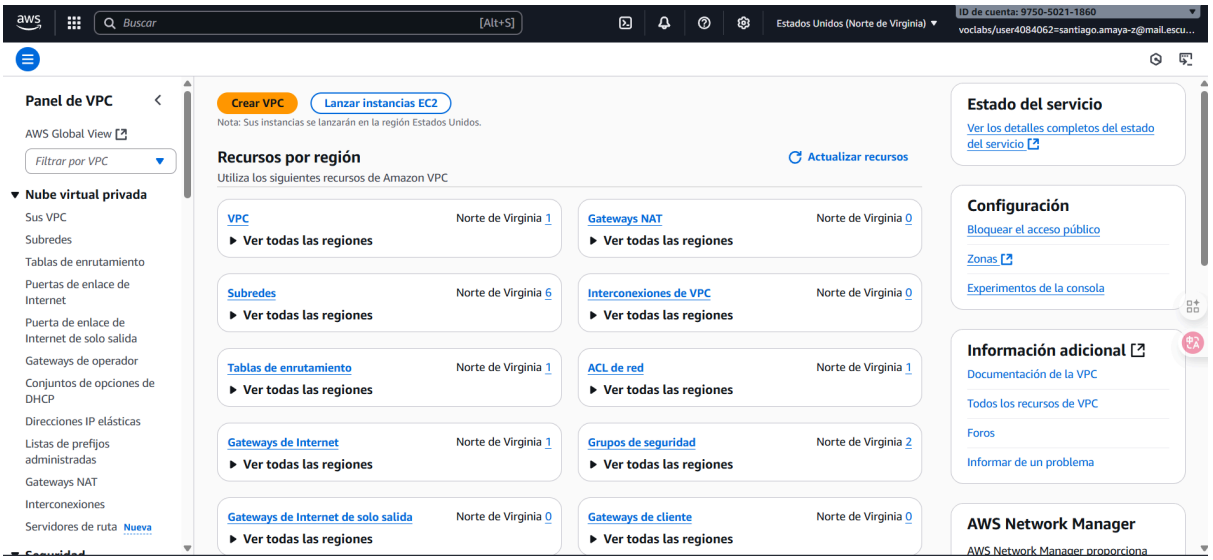


g. Choose the instance type t2.micro.
We can´t use t2.micro for this Linux 2 AMI, because this type is not supported by the selected AMI, instead we use t3.micro

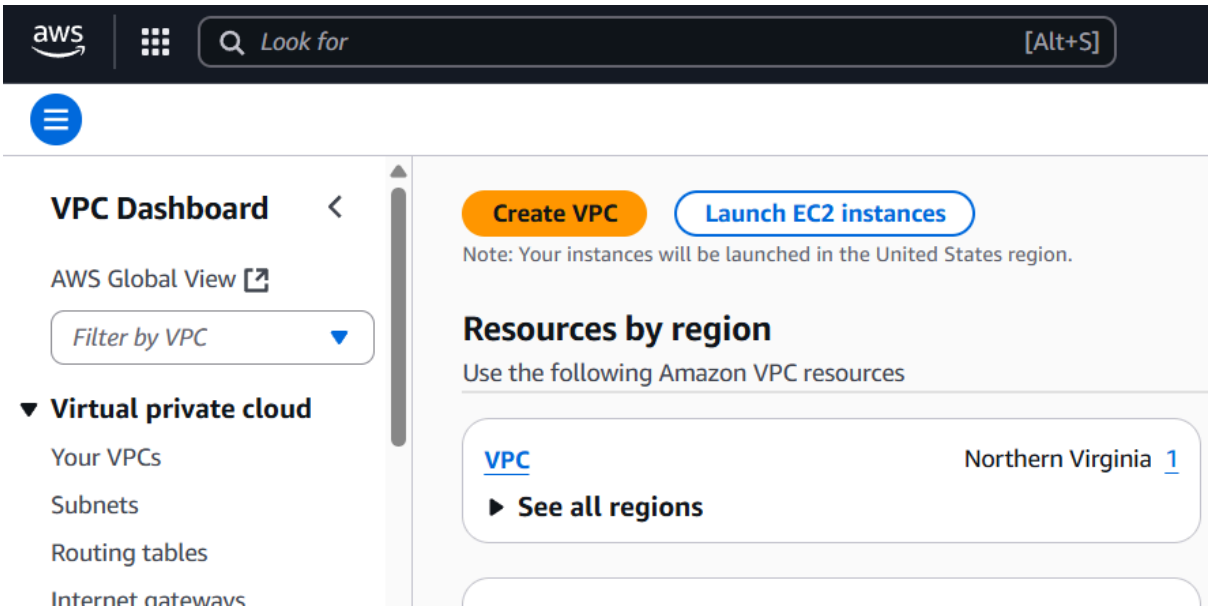


What are the different instance types available in Amazon EC2? Why do you think we chose t2.micro?
Amazon EC2 offers several instance types designed for different use cases, such as General Purpose, Compute Optimized, Memory Optimized, Storage Optimized, and Accelerated Computing. Each type provides a specific balance of CPU, memory, storage, and networking capacity. The t2.micro instance is often chosen because it is part of the free tier, low-cost, and suitable for small workloads or testing environments. It provides a good balance of performance and affordability for beginners or lightweight applications.

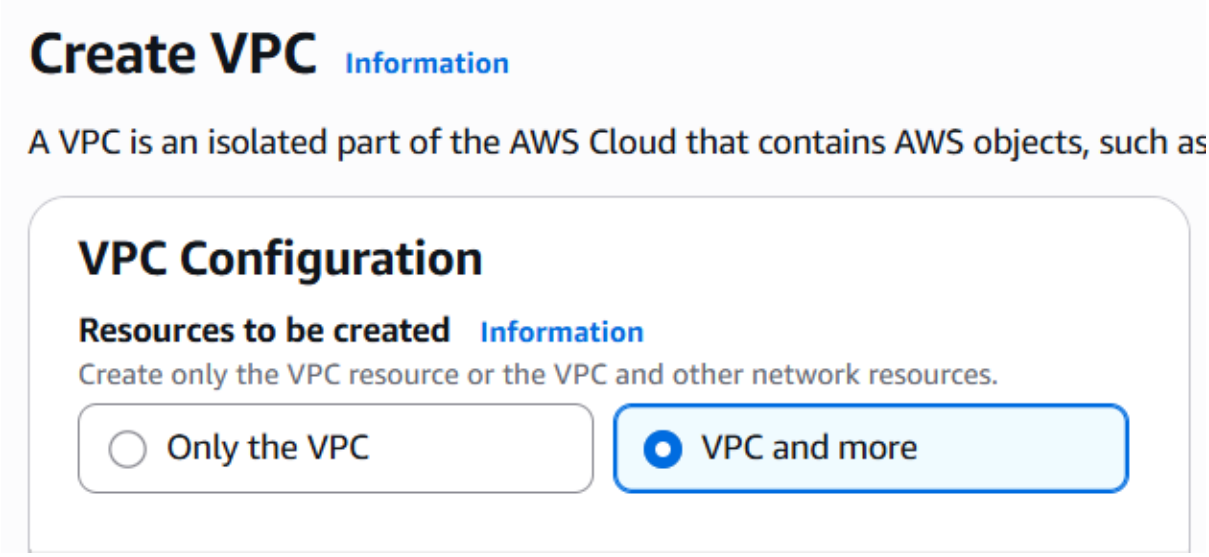
h. Consult the following documentation related to creating a VPC and create the VPC using the addresses provided by your instructor.
Open the Amazon VPC Console



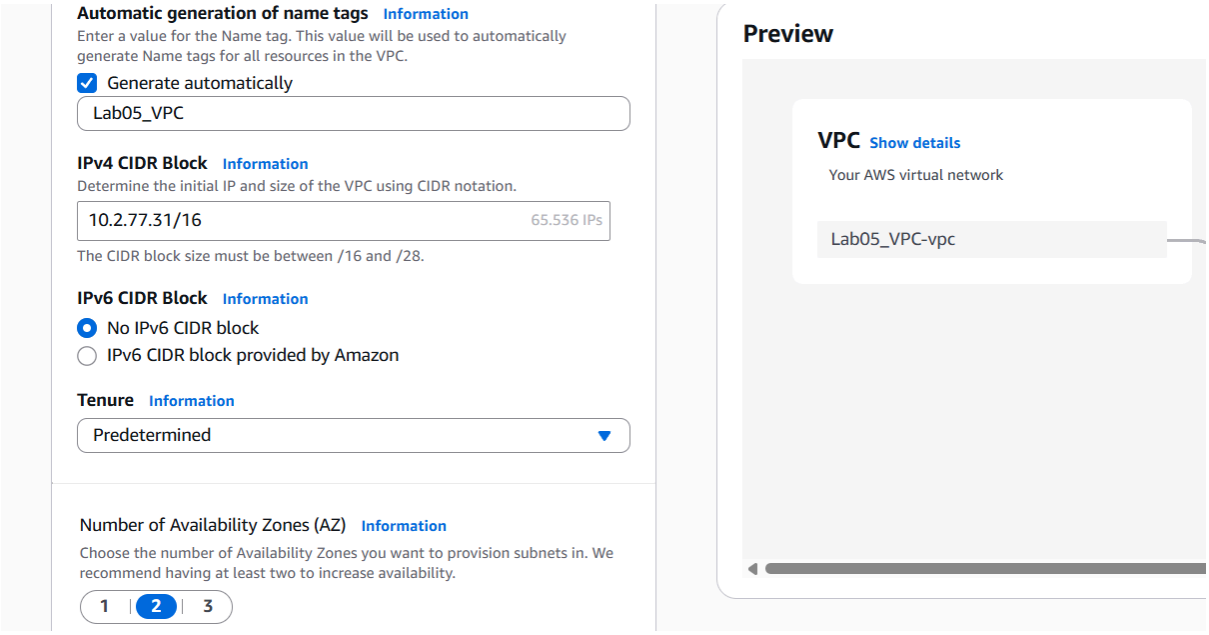
choose Create VPC

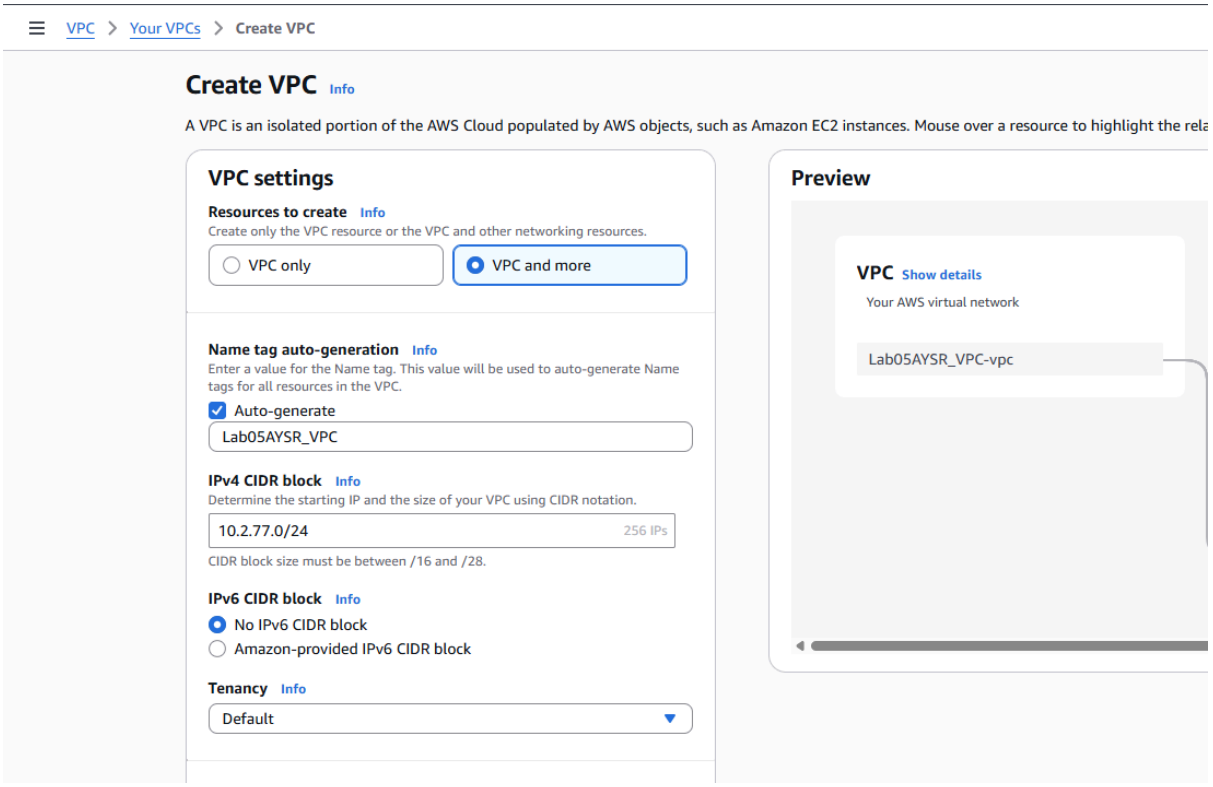


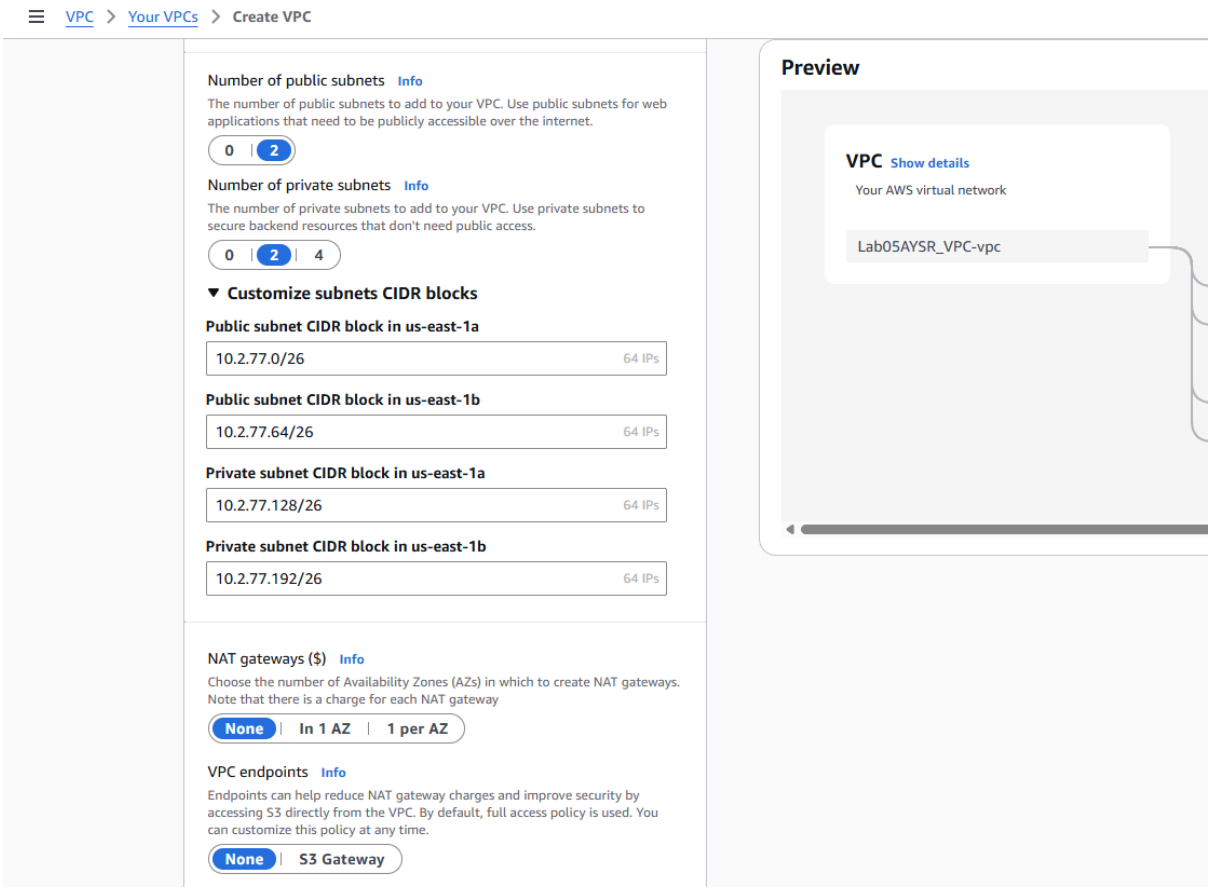
For resources to create under VPC setting, choose VPC and more

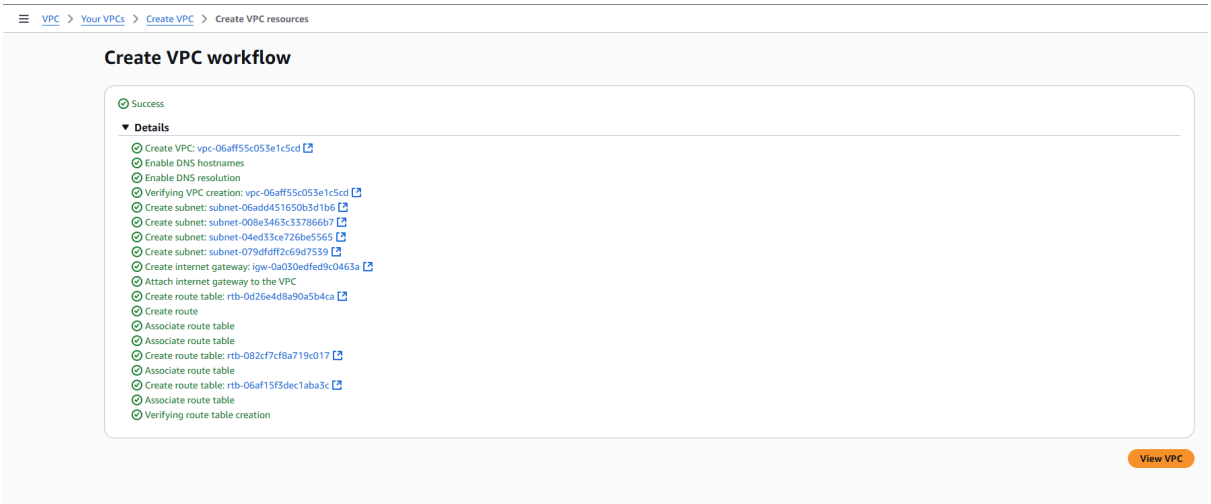


For the VPC settings, set as follows:



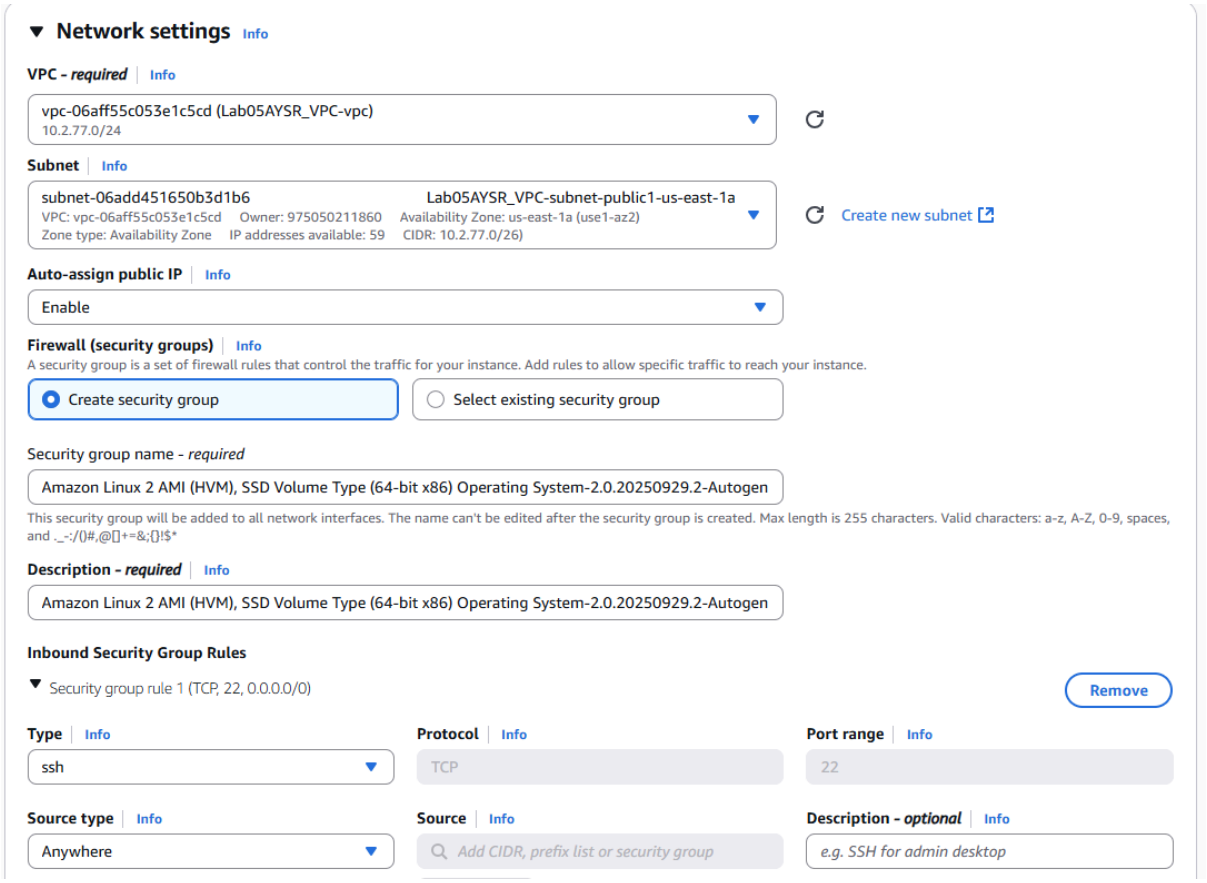

VPC > Your VPCs > Create VPC
Create VPC Info
A VPC is an isolated portion of the AWS Cloud populated by AWS objects, such as Amazon EC2 instances. Mouse over a resource to highlight the rela
VPC settings
Resources to create Info
Create only the VPC resource or the VPC and other networking resources.
VPC only
VPC and more
Name tag auto-generation Info
Enter a value for the Name tag. This value will be used to auto-generate Name tags for all resources in the VPC.
Auto-generate
Lab05AYSR_VPC
IPv4 CIDR block Info
Determine the starting IP and the size of your VPC using CIDR notation.
10.2.77.0/24
256 IPs
CIDR block size must be between /16 and /28.
IPv6 CIDR block Info
No IPv6 CIDR block
Amazon-provided IPv6 CIDR block
Tenancy Info
Default
Preview
VPC Show details
Your AWS virtual network
Lab05AYSR_VPC-vpc


VPC > Your VPCs > Create VPC
Number of public subnets Info
The number of public subnets to add to your VPC. Use public subnets for web applications that need to be publicly accessible over the internet.
0 | 2
Number of private subnets Info
The number of private subnets to add to your VPC. Use private subnets to secure backend resources that don't need public access.
0 | 2 | 4
Customize subnets CIDR blocks
Public subnet CIDR block in us-east-1a
10.2.77.0/26
64 IPs
Public subnet CIDR block in us-east-1b
10.2.77.64/26
64 IPs
Private subnet CIDR block in us-east-1a
10.2.77.128/26
64 IPs
Private subnet CIDR block in us-east-1b
10.2.77.192/26
64 IPs
NAT gateways ($) Info
Choose the number of Availability Zones (AZs) in which to create NAT gateways. Note that there is a charge for each NAT gateway
None | In 1 AZ | 1 per AZ
VPC endpoints Info
Endpoints can help reduce NAT gateway charges and improve security by accessing S3 directly from the VPC. By default, full access policy is used. You can customize this policy at any time.
None | S3 Gateway
Preview
VPC Show details
Your AWS virtual network
Lab05AYSR_VPC-vpc

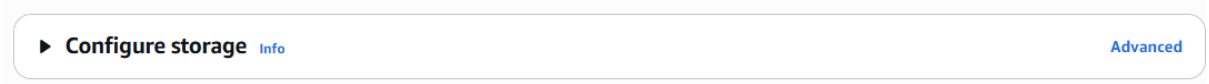


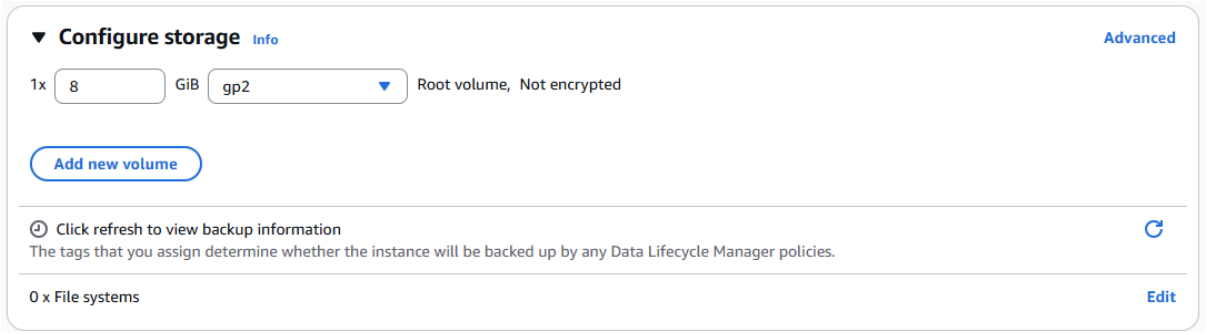
i. On the ”Configure Instance Details” page, set the values as specified in the previous step.

j. Under “Auto-assign Public IP,” select Enable.

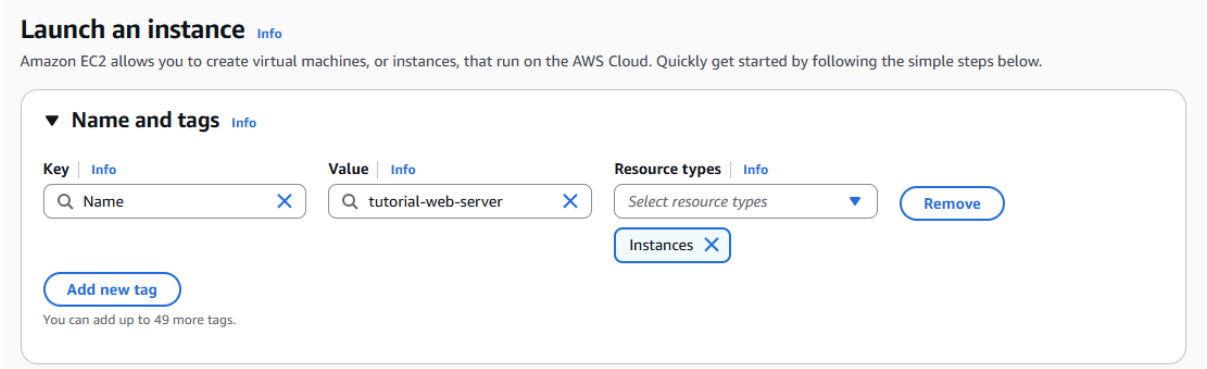


k. Click on “Next: Add Storage.”

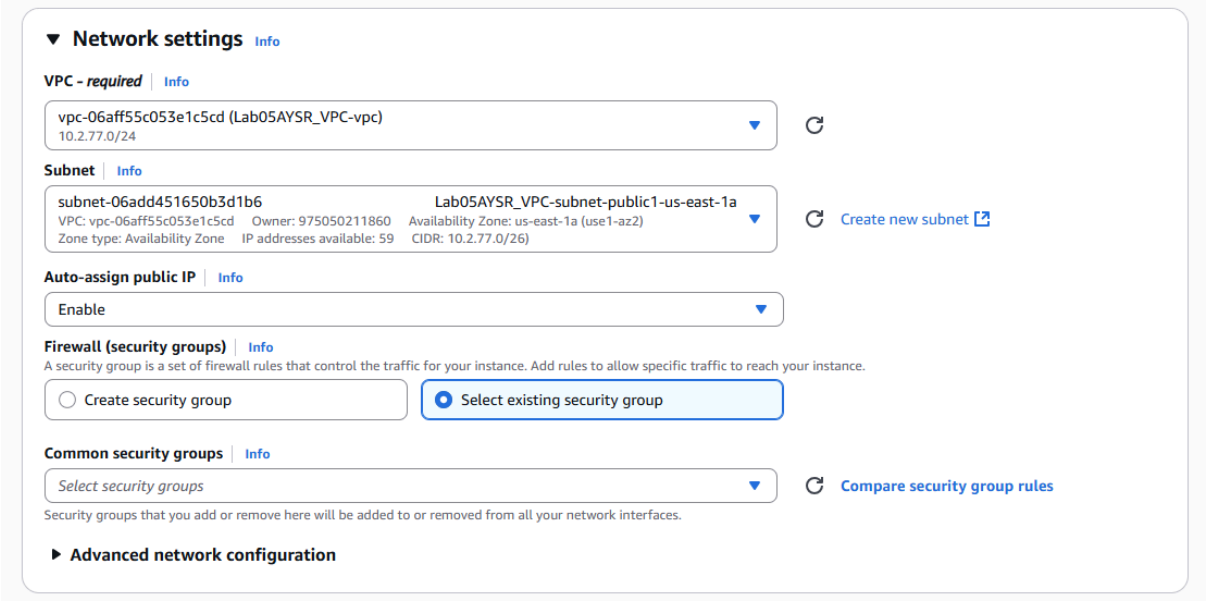




l. On the ”Add Storage” page, leave the default values and click “Next: Add Tags.”
m. On the ”Add Tags” page, click “Add Tag,” then enter Name for the Key and tutorial-web-server for the Value.

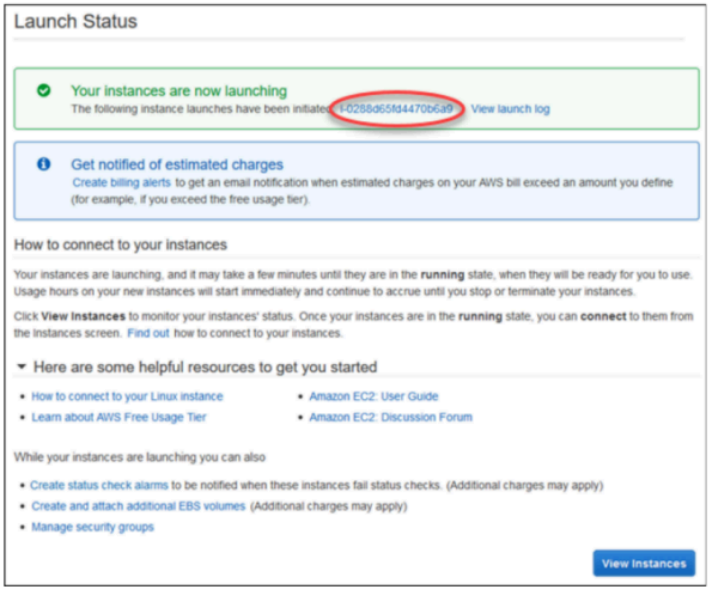


n. On the ”Configure Security Group” page, choose “Select an existing security group.”

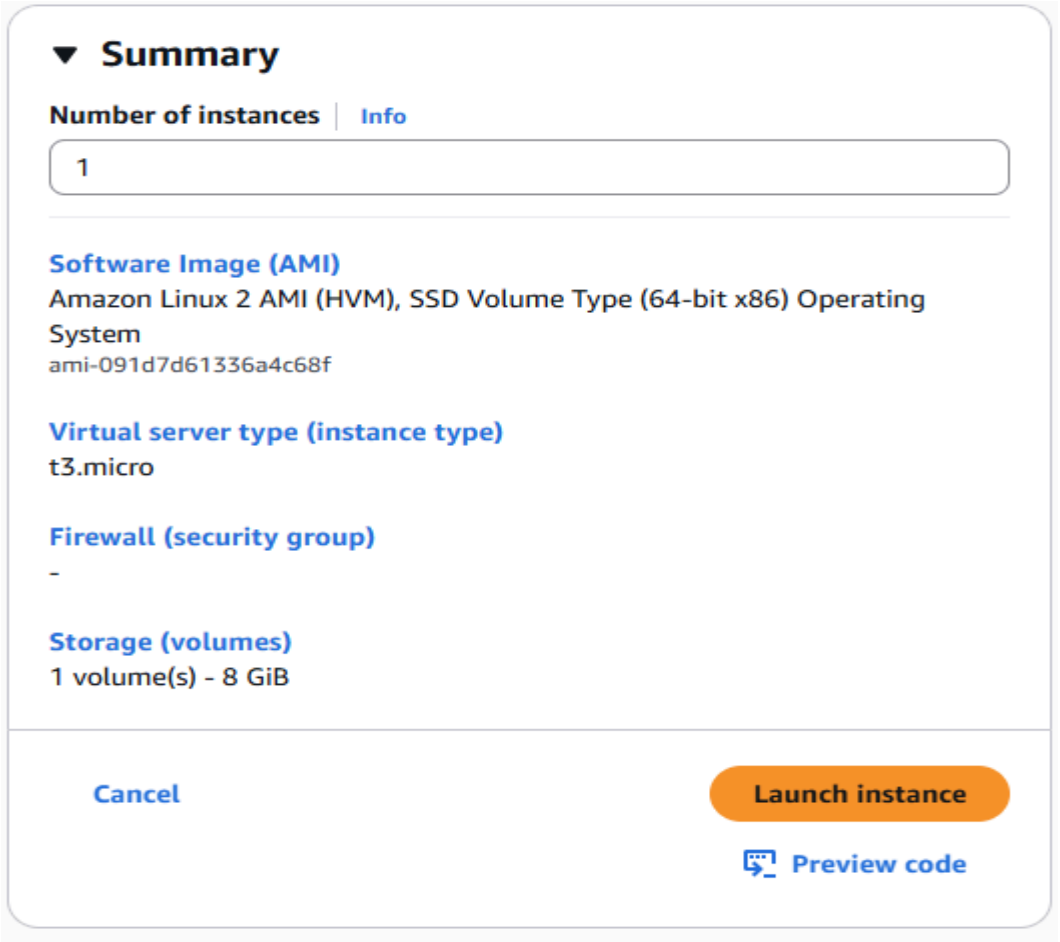


What are security groups, and what should be considered when creating a security group for a public web server?
Security groups in AWS act as **virtual firewalls** that control the **inbound and outbound traffic** to your EC2 instances. They define which types of network connections are allowed to reach your instance (inbound) and which can leave it (outbound).

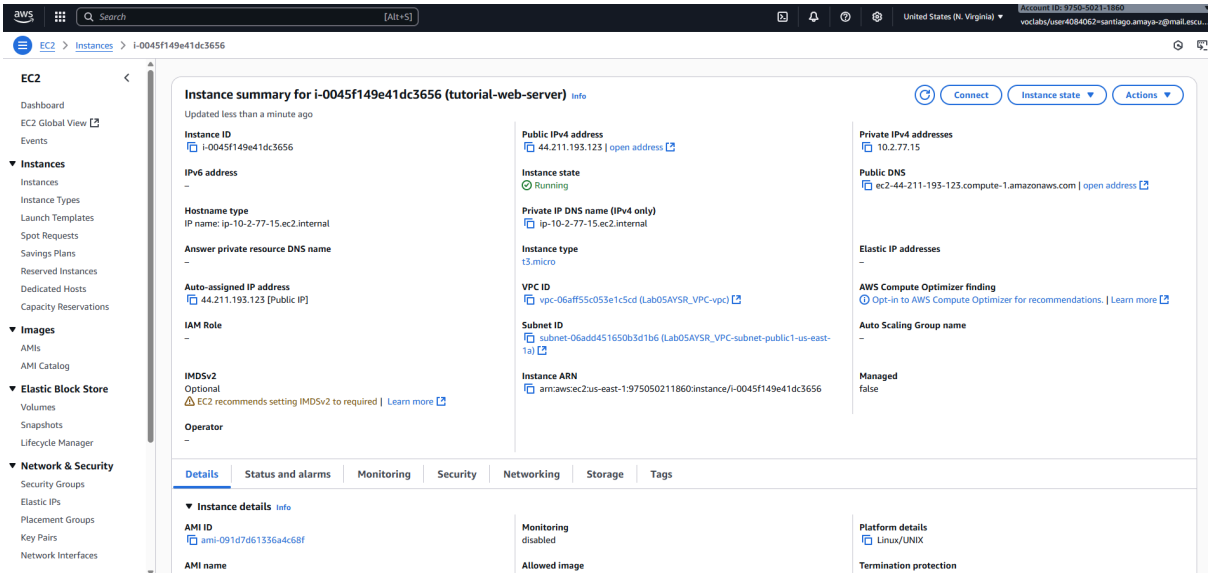
o. On the ”Review Instance Launch” page, verify your configuration and click “Launch.” Note: To launch an EC2 instance, click “Launch Instances.” On the ”Launch Status” page, note the identifier of the new EC2 instance (e.g., i-0288d65fd4470b6a9).



Result:

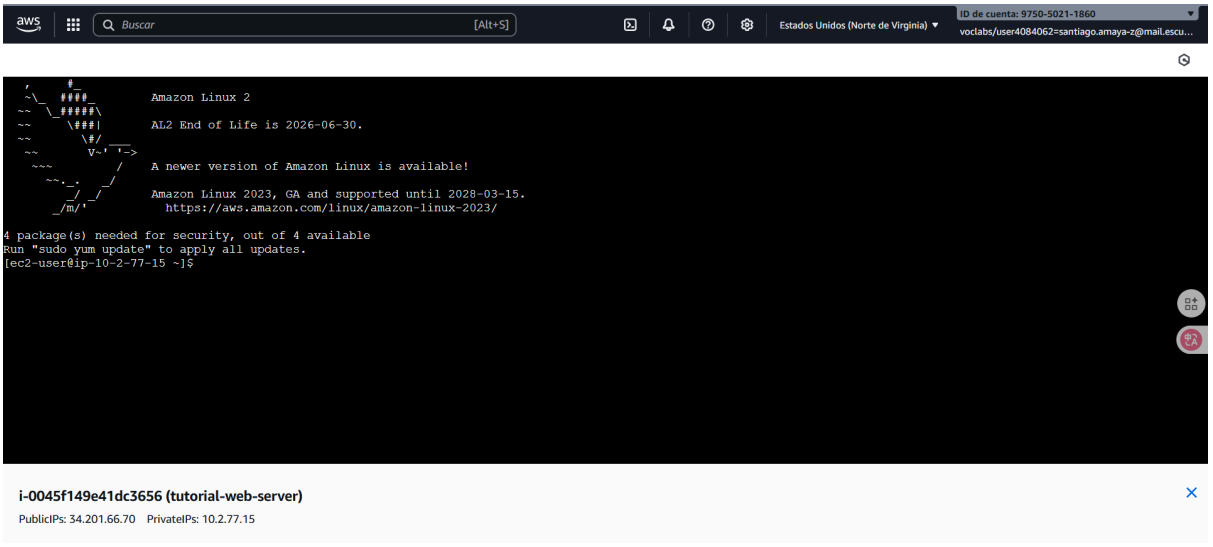


p. To locate the created instance, click on “View Instances.”



q. Install a web server on the newly created instance. Note: Refer to the instructions on how to connect to the instance in order to install the web service.

First, go to the EC2 Console:



Once in the console, we execute the command sudo yum update -y, to update system packages.

```
[ec2-user@ip-10-2-77-15 ~]$ sudo yum update -y
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core                                                                                                                     | 3.6 kB  00:00:00

Resolving Dependencies
--> Running transaction check
---> Package kernel.x86_64 0:4.14.355-280.698.amzn2 will be installed
---> Package openssl.x86_64 1:1.0.2k-24.amzn2.0.15 will be updated
---> Package openssl.x86_64 1:1.0.2k-24.amzn2.0.16 will be an update
---> Package openssl-libs.x86_64 1:1.0.2k-24.amzn2.0.15 will be updated
---> Package openssl-libs.x86_64 1:1.0.2k-24.amzn2.0.16 will be an update
---> Package python3-pip.noarch 0:20.2.2-1.amzn2.0.12 will be updated
---> Package python3-pip.noarch 0:20.2.2-1.amzn2.0.13 will be an update
--> Finished Dependency Resolution

Dependencies Resolved

==================================================================================================================================================
==
 Package                              Arch                              Version                                          Repository                   S
e
==================================================================================================================================================
==
Installing:
 kernel                               x86_64                            4.14.355-280.698.amzn2                           amzn2-core                  21
M
Updating:
 openssl                              x86_64                            1:1.0.2k-24.amzn2.0.16                           amzn2-core                 498
k
 openssl-libs                         x86_64                            1:1.0.2k-24.amzn2.0.16                           amzn2-core                 1.2
M
 python3-pip                          noarch                            20.2.2-1.amzn2.0.13                              amzn2-core                 2.0
M
```

```
Transaction Summary
==================================================================================================================================================
==
Install  1 Package
Upgrade  3 Packages

Total download size: 25 M
Downloading packages:
Delta RPMs disabled because /usr/bin/applydeltarpm not installed.
(1/4): openssl-1.0.2k-24.amzn2.0.16.x86_64.rpm                                                                                 | 498 kB  00:00:00

(2/4): openssl-libs-1.0.2k-24.amzn2.0.16.x86_64.rpm                                                                            | 1.2 MB  00:00:00

(3/4): python3-pip-20.2.2-1.amzn2.0.13.noarch.rpm                                                                              | 2.0 MB  00:00:00

(4/4): kernel-4.14.355-280.698.amzn2.x86_64.rpm                                                                                |  21 MB  00:00:00

--------------------------------------------------------------------------------------------------------------------------------------------------
--
Total                                                                                                                 72 MB/s |  25 MB  00:00:00

Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [                                                                                 ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##                                                                               ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [####                                                                             ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [######                                                                           ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [########                                                                         ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##########                                                                       ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [############                                                                     ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##############                                                                   ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [################                                                                 ] 1/
```

```
Running transaction
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [                                                                                 ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##                                                                               ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [####                                                                             ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [######                                                                           ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [########                                                                         ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##########                                                                       ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [############                                                                     ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##############                                                                   ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [################                                                                 ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##################                                                               ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [####################                                                             ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [######################                                                           ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#########################                                                        ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [###########################                                                      ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#############################                                                    ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [###############################                                                  ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#################################                                                ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [###################################                                              ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#####################################                                            ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#######################################                                          ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##########################################                                       ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [############################################                                     ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [##############################################                                   ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [################################################                                 ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [###################################################                              ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#####################################################                            ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#######################################################                          ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#########################################################                        ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [###########################################################                      ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#############################################################                    ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [###############################################################                  ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [#################################################################                ] 1/
  Updating    : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64 [###################################################################              ] 1/
```

```
7
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [                                                                                                  ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#                                                                                                 ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [##                                                                                                ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [###                                                                                               ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [####                                                                                              ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#####                                                                                             ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [######                                                                                            ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [######                                                                                            ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [########                                                                                          ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#########                                                                                         ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [##########                                                                                        ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [###########                                                                                       ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [############                                                                                      ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#############                                                                                     ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [##############                                                                                    ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [###############                                                                                   ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [################                                                                                  ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#################                                                                                 ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [##################                                                                                ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [###################                                                                               ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [####################                                                                              ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#####################                                                                             ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [######################                                                                            ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#######################                                                                           ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [########################                                                                          ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#########################                                                                         ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [##########################                                                                        ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [###########################                                                                       ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [############################                                                                      ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [#############################                                                                     ] 3/
  Updating   : python3-pip-20.2.2-1.amzn2.0.13.noarch [##############################                                                                    ] 3/
```

```
  Installing : kernel-4.14.355-280.698.amzn2.x86_64 [#################################################################################################################  ] 4/
  Installing : kernel-4.14.355-280.698.amzn2.x86_64                                                                                                        4/
7
  Cleanup    : python3-pip-20.2.2-1.amzn2.0.12.noarch                                                                                                      5/
7
  Cleanup    : 1:openssl-1.0.2k-24.amzn2.0.15.x86_64                                                                                                       6/
7
  Cleanup    : 1:openssl-libs-1.0.2k-24.amzn2.0.15.x86_64                                                                                                  7/
7
  Verifying  : kernel-4.14.355-280.698.amzn2.x86_64                                                                                                        1/
7
  Verifying  : python3-pip-20.2.2-1.amzn2.0.13.noarch                                                                                                      2/
7
  Verifying  : 1:openssl-libs-1.0.2k-24.amzn2.0.16.x86_64                                                                                                  3/
7
  Verifying  : 1:openssl-1.0.2k-24.amzn2.0.16.x86_64                                                                                                       4/
7
  Verifying  : 1:openssl-1.0.2k-24.amzn2.0.15.x86_64                                                                                                       5/
7
  Verifying  : python3-pip-20.2.2-1.amzn2.0.12.noarch                                                                                                      6/
7
  Verifying  : 1:openssl-libs-1.0.2k-24.amzn2.0.15.x86_64                                                                                                  7/
7

Installed:
  kernel.x86_64 0:4.14.355-280.698.amzn2


Updated:
  openssl.x86_64 1:1.0.2k-24.amzn2.0.16              openssl-libs.x86_64 1:1.0.2k-24.amzn2.0.16              python3-pip.noarch 0:20.2.2-1.amzn2.0.13


Complete!
[ec2-user@ip-10-2-77-15 ~]$
```

We install Apache httpd

```
[ec2-user@ip-10-2-77-15 ~]$ sudo yum install -y httpd
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core                                                                                                                   | 3.6 kB  00:00:00

Resolving Dependencies
--> Running transaction check
---> Package httpd.x86_64 0:2.4.65-1.amzn2.0.2 will be installed
--> Processing Dependency: httpd-filesystem = 2.4.65-1.amzn2.0.2 for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Processing Dependency: httpd-tools = 2.4.65-1.amzn2.0.2 for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Processing Dependency: /etc/mime.types for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Processing Dependency: httpd-filesystem for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Processing Dependency: mod_http2 for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Processing Dependency: system-logos-httpd for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Processing Dependency: libapr-1.so.0()(64bit) for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Processing Dependency: libaprutil-1.so.0()(64bit) for package: httpd-2.4.65-1.amzn2.0.2.x86_64
--> Running transaction check
---> Package apr.x86_64 0:1.7.2-1.amzn2.0.1 will be installed
---> Package apr-util.x86_64 0:1.6.3-1.amzn2.0.1 will be installed
--> Processing Dependency: apr-util-bdb(x86-64) = 1.6.3-1.amzn2.0.1 for package: apr-util-1.6.3-1.amzn2.0.1.x86_64
---> Package generic-logos-httpd.noarch 0:18.0.0-4.amzn2 will be installed
---> Package httpd-filesystem.noarch 0:2.4.65-1.amzn2.0.2 will be installed
---> Package httpd-tools.x86_64 0:2.4.65-1.amzn2.0.2 will be installed
---> Package mailcap.noarch 0:2.1.41-2.amzn2 will be installed
---> Package mod_http2.x86_64 0:1.15.19-1.amzn2.0.2 will be installed
--> Running transaction check
---> Package apr-util-bdb.x86_64 0:1.6.3-1.amzn2.0.1 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

================================================================================================================================================
==
 Package                                Arch                          Version                                  Repository                          Siz
e
```

```
Dependencies Resolved

================================================================================================================================================
==
 Package                                 Arch                            Version                                 Repository                          Siz
e
================================================================================================================================================
==
Installing:
 httpd                                   x86_64                          2.4.65-1.amzn2.0.2                      amzn2-core                         1.4
M
Installing for dependencies:
 apr                                     x86_64                          1.7.2-1.amzn2.0.1                       amzn2-core                         130
k
 apr-util                                x86_64                          1.6.3-1.amzn2.0.1                       amzn2-core                         101
k
 apr-util-bdb                            x86_64                          1.6.3-1.amzn2.0.1                       amzn2-core                          22
k
 generic-logos-httpd                     noarch                          18.0.0-4.amzn2                          amzn2-core                          19
k
 httpd-filesystem                        noarch                          2.4.65-1.amzn2.0.2                      amzn2-core                          25
k
 httpd-tools                             x86_64                          2.4.65-1.amzn2.0.2                      amzn2-core                          90
k
 mailcap                                 noarch                          2.1.41-2.amzn2                          amzn2-core                          31
k
 mod_http2                               x86_64                          1.15.19-1.amzn2.0.2                     amzn2-core                         149
k

Transaction Summary
================================================================================================================================================
==
Install  1 Package (+8 Dependent packages)
```

```
================================================================================================================================================
==
Install  1 Package (+8 Dependent packages)

Total download size: 1.9 M
Installed size: 5.3 M
Downloading packages:
(1/9): apr-1.7.2-1.amzn2.0.1.x86_64.rpm                                                                        | 130 kB  00:00:00

(2/9): apr-util-1.6.3-1.amzn2.0.1.x86_64.rpm                                                                   | 101 kB  00:00:00

(3/9): apr-util-bdb-1.6.3-1.amzn2.0.1.x86_64.rpm                                                               |  22 kB  00:00:00

(4/9): generic-logos-httpd-18.0.0-4.amzn2.noarch.rpm                                                           |  19 kB  00:00:00

(5/9): httpd-filesystem-2.4.65-1.amzn2.0.2.noarch.rpm                                                          |  25 kB  00:00:00

(6/9): httpd-2.4.65-1.amzn2.0.2.x86_64.rpm                                                                     | 1.4 MB  00:00:00

(7/9): httpd-tools-2.4.65-1.amzn2.0.2.x86_64.rpm                                                               |  90 kB  00:00:00

(8/9): mailcap-2.1.41-2.amzn2.noarch.rpm                                                                       |  31 kB  00:00:00

(9/9): mod_http2-1.15.19-1.amzn2.0.2.x86_64.rpm                                                                | 149 kB  00:00:00

------------------------------------------------------------------------------------------------------------------------------------------------
--
Total                                                                                          9.5 MB/s | 1.9 MB  00:00:00
```

```
Running transaction
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [                                                                                                   ] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [#########################                                                                          ] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [#####################################################                                              ] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [#################################################################################                      ] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [#############################################################################################          ] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [#########################################################################################################] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [#########################################################################################################] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64 [#########################################################################################################] 1/
  Installing : apr-1.7.2-1.amzn2.0.1.x86_64                                                                                                       1/
9
  Installing : apr-util-bdb-1.6.3-1.amzn2.0.1.x86_64 [                                                                                          ] 2/
  Installing : apr-util-bdb-1.6.3-1.amzn2.0.1.x86_64 [#############################################################################################    ] 2/
  Installing : apr-util-bdb-1.6.3-1.amzn2.0.1.x86_64 [#########################################################################################################] 2/
  Installing : apr-util-bdb-1.6.3-1.amzn2.0.1.x86_64                                                                                              2/
9
  Installing : apr-util-1.6.3-1.amzn2.0.1.x86_64 [                                                                                              ] 3/
  Installing : apr-util-1.6.3-1.amzn2.0.1.x86_64 [#################################                                                              ] 3/
  Installing : apr-util-1.6.3-1.amzn2.0.1.x86_64 [#########################################################                                      ] 3/
  Installing : apr-util-1.6.3-1.amzn2.0.1.x86_64 [#########################################################################################          ] 3/
  Installing : apr-util-1.6.3-1.amzn2.0.1.x86_64 [#########################################################################################          ] 3/
  Installing : apr-util-1.6.3-1.amzn2.0.1.x86_64 [#########################################################################################################] 3/
  Installing : apr-util-1.6.3-1.amzn2.0.1.x86_64                                                                                                  3/
9
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [                                                                                          ] 4/
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [#################################                                                          ] 4/
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [#################################################                                          ] 4/
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [#########################################################                                  ] 4/
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [#########################################################################                  ] 4/
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [#########################################################################################          ] 4/
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [#########################################################################################          ] 4/
  Installing : httpd-tools-2.4.65-1.amzn2.0.2.x86_64 [#########################################################################################          ] 4/
```

```
  Installing : httpd-2.4.65-1.amzn2.0.2.x86_64                                   9/
9
  Verifying  : apr-1.7.2-1.amzn2.0.1.x86_64                                      1/
9
  Verifying  : apr-util-bdb-1.6.3-1.amzn2.0.1.x86_64                             2/
9
  Verifying  : httpd-filesystem-2.4.65-1.amzn2.0.2.noarch                        3/
9
  Verifying  : httpd-tools-2.4.65-1.amzn2.0.2.x86_64                             4/
9
  Verifying  : mod_http2-1.15.19-1.amzn2.0.2.x86_64                              5/
9
  Verifying  : apr-util-1.6.3-1.amzn2.0.1.x86_64                                 6/
9
  Verifying  : mailcap-2.1.41-2.amzn2.noarch                                     7/
9
  Verifying  : generic-logos-httpd-18.0.0-4.amzn2.noarch                         8/
9
  Verifying  : httpd-2.4.65-1.amzn2.0.2.x86_64                                   9/
9

Installed:
  httpd.x86_64 0:2.4.65-1.amzn2.0.2

Dependency Installed:
  apr.x86_64 0:1.7.2-1.amzn2.0.1                 apr-util.x86_64 0:1.6.3-1.amzn2.0.1            apr-util-bdb.x86_64 0:1.6.3-1.amzn2.0.1

  generic-logos-httpd.noarch 0:18.0.0-4.amzn2    httpd-filesystem.noarch 0:2.4.65-1.amzn2.0.2   httpd-tools.x86_64 0:2.4.65-1.amzn2.0.2

  mailcap.noarch 0:2.1.41-2.amzn2                mod_http2.x86_64 0:1.15.19-1.amzn2.0.2

Complete!
[ec2-user@ip-10-2-77-15 ~]$
```

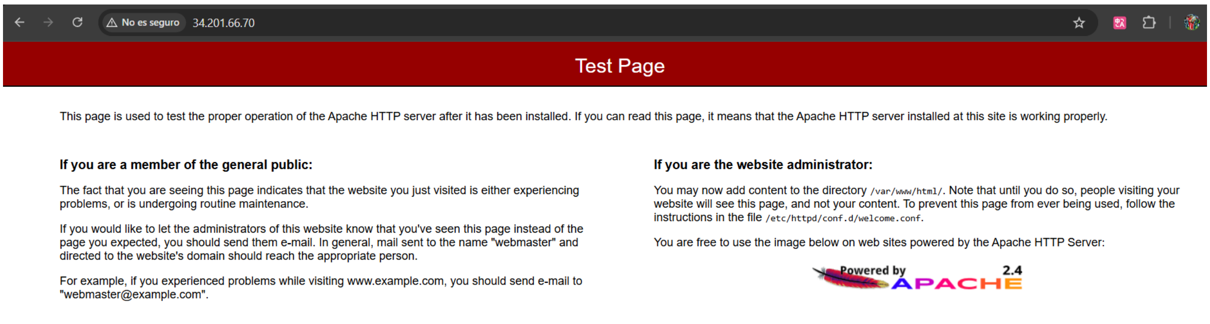
We activate and start the web service

```
[ec2-user@ip-10-2-77-15 ~]$ sudo systemctl enable httpd
Created symlink from /etc/systemd/system/multi-user.target.wants/httpd.service to /usr/lib/systemd/system/httpd.service.
[ec2-user@ip-10-2-77-15 ~]$ sudo systemctl start httpd
[ec2-user@ip-10-2-77-15 ~]$
```

Next, we check that the service is running

```
[ec2-user@ip-10-2-77-15 ~]$ sudo systemctl status httpd
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; enabled; vendor preset: disabled)
   Active: active (running) since Wed 2025-10-15 19:52:22 UTC; 1min 21s ago
     Docs: man:httpd.service(8)
 Main PID: 5835 (httpd)
   Status: "Total requests: 0; Idle/Busy workers 100/0;Requests/sec: 0; Bytes served/sec:   0 B/sec"
   CGroup: /system.slice/httpd.service
           ├─5835 /usr/sbin/httpd -DFOREGROUND
           ├─5836 /usr/sbin/httpd -DFOREGROUND
           ├─5837 /usr/sbin/httpd -DFOREGROUND
           ├─5855 /usr/sbin/httpd -DFOREGROUND
           ├─5860 /usr/sbin/httpd -DFOREGROUND
           └─5866 /usr/sbin/httpd -DFOREGROUND

Oct 15 19:52:22 ip-10-2-77-15.ec2.internal systemd[1]: Starting The Apache HTTP Server...
Oct 15 19:52:22 ip-10-2-77-15.ec2.internal systemd[1]: Started The Apache HTTP Server.
[ec2-user@ip-10-2-77-15 ~]$
```

Finally search http://34.201.66.70 and see the result that the web server is running correctly

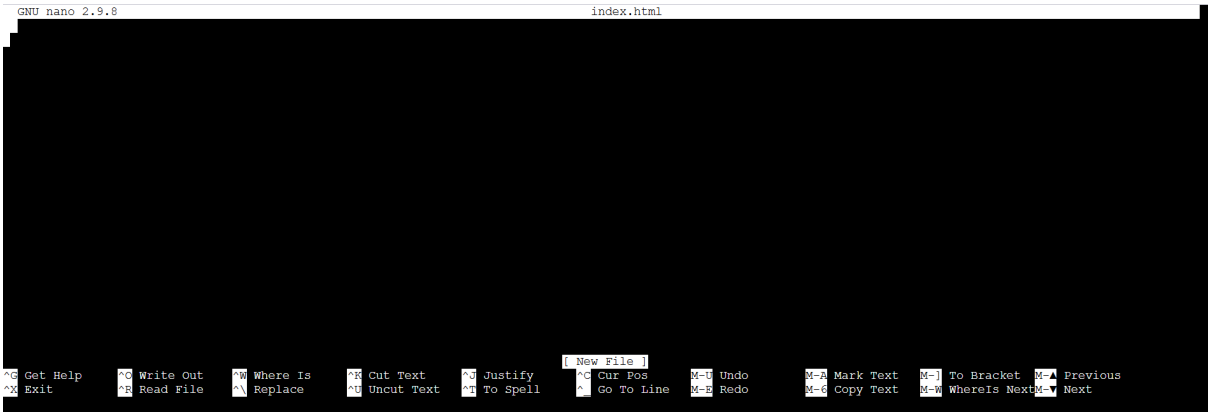


r. Finally, add content to the web server that connects to your Amazon database instance.

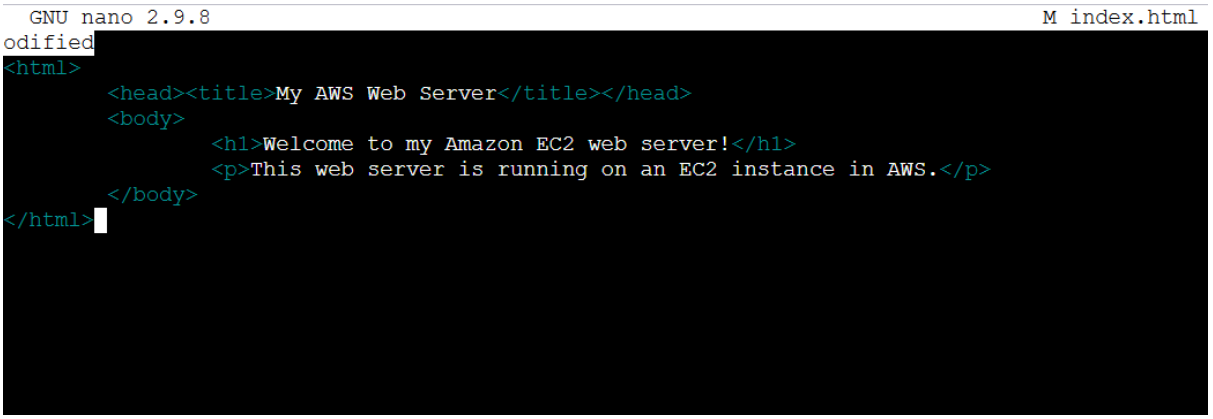
First we enter the site directory

```
[ec2-user@ip-10-2-77-15 ~]$ cd /var/www/html
[ec2-user@ip-10-2-77-15 html]$
```

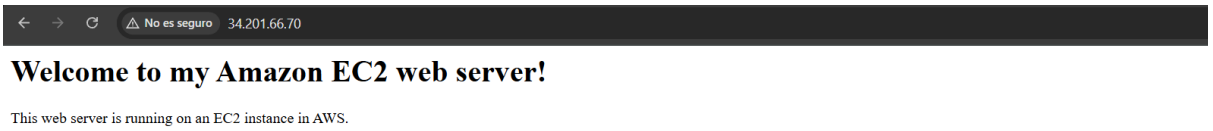
we create an index.html file



we add content to the file and save



We refresh the page to see the result



Welcome to my Amazon EC2 web server!

This web server is running on an EC2 instance in AWS.

Conclusions

This laboratory provided a comprehensive and practical understanding of how to install, configure, and manage one of the most essential components of any IT infrastructure: a database management system. Through the installation and setup of PostgreSQL on a Linux Slackware virtual machine, we not only learned the technical steps involved but also understood the underlying principles of system administration, user management, and data organization. Each phase of the process—from downloading the PostgreSQL package and configuring the system user "postgres," to initializing the data directory and starting the service—reinforced our understanding of how Linux interacts with database processes and how administrative control is established within multi-user environments.

Creating individual users for each group member allowed us to explore PostgreSQL's security and access control mechanisms, an essential aspect of database management in both academic and professional settings. By assigning ownership of databases to specific users, we ensured that each had isolated access to their respective data, reflecting best practices in real-world scenarios where data confidentiality and role-based permissions are critical. Furthermore, designing and populating a relational database containing tourist sites in Colombia gave us the opportunity to apply database modeling concepts, including primary and foreign keys, normalization, and relationships between entities. These concepts are fundamental to maintaining data consistency and preventing redundancy in structured datasets.

The insertion of real data into the created tables also gave us a hands-on perspective of how queries and transactions operate within a relational model. Executing SQL commands such as CREATE TABLE, INSERT and SELECT demonstrated the core operations of data definition, manipulation, and retrieval that form the foundation of modern database systems. Moreover, the use of PostgreSQL's command-line interface (psql) allowed us to interact directly with the DBMS, reinforcing the importance of command-line proficiency in server environments where graphical tools may not be available. This practical exposure not only improved our technical fluency but also enhanced our problem-solving skills when dealing with potential errors or configuration issues.

In addition, this exercise strengthened our understanding of how database systems integrate into broader networked infrastructures. The PostgreSQL server, like any networked service, relies on communication protocols and proper configuration to ensure connectivity, security, and reliability. The combination of database setup with prior Wireshark-based protocol analysis provided a holistic view of how data travels through layers of the network—from physical transmission to application-level interpretation. This reinforced the interdependence between networking and database management, highlighting how both must work seamlessly for systems to function efficiently in enterprise and cloud environments.

Ultimately, this lab bridged theoretical knowledge with practical experience, aligning concepts from operating systems, networking, and database theory into a cohesive and realistic application. By successfully completing the installation and configuration of PostgreSQL, we demonstrated the ability to deploy a fully functional database system from scratch, apply access control policies, model relational data structures, and insert and retrieve meaningful information. These competencies form the foundation for more advanced studies in system administration, networked applications, and cloud computing. The experience also emphasized the importance of precision, attention to detail, and documentation—key habits that define effective engineers and IT professionals in real-world environments.

Bibliography

PostgreSQL Global Development Group. (2024). *PostgreSQL 14 Documentation*. Retrieved from https://www.postgresql.org/docs/14/

SlackBuilds.org. (2024). *PostgreSQL SlackBuild Script for Slackware 15.0*. Retrieved from https://slackbuilds.org/repository/15.0/system/postgresql/

The Linux Documentation Project. (2024). *Introduction to Linux System Administration*. Retrieved from https://tldp.org/LDP/intro-linux/html/

The PostgreSQL Wiki. (2024). *PostgreSQL Installation on Linux*. Retrieved from https://wiki.postgresql.org/wiki/Detailed_installation_guides

Slackware Linux Project. (2024). *Official Slackware Linux Documentation*. Retrieved from https://docs.slackware.com/

DigitalOcean Community Tutorials. (2024). *How To Install and Use PostgreSQL on Linux*. Retrieved from https://www.digitalocean.com/community/tags/postgresql

Wireshark Foundation. (2024). *Wireshark User's Guide*. Retrieved from https://www.wireshark.org/docs/

GeeksforGeeks. (2024). *Introduction to Database Management Systems (DBMS)*. Retrieved from https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/

TutorialsPoint. (2024). *PostgreSQL – Create Database, Users and Tables*. Retrieved from https://www.tutorialspoint.com/postgresql/

IBM Knowledge Center. (2024). *Understanding Database Architecture and Security Concepts*. Retrieved from https://www.ibm.com/docs/en/