SGD LAB EXP - 1

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AIM :

Installation of Postgres, PostGIS and QGIS, pgAdmin.

THEORY:

Part 1. PostgreSQL

PostgreSQL, often referred to as Postgres, is an open-source relational database management system (RDBMS) known for its robustness, extensibility, and support for SQL standards. It is widely used for managing large datasets and supports advanced data types and indexing methods. Postgres also supports concurrency control, data integrity, and ACID (Atomicity, Consistency, Isolation, Durability) compliance, making it a popular choice for both small-scale and enterprise-level applications.

Part 2. PostGIS

PostGIS is an extension for PostgreSQL that adds support for geographic objects. It enables PostgreSQL to be used as a spatial database for geographic information systems (GIS). PostGIS provides spatial types, functions, and indexing that allow for the storage, query, and analysis of geospatial data. It is essential for applications requiring spatial queries, such as mapping, spatial analysis, and geographic data management.

Part 3. QGIS

QGIS (Quantum GIS) is an open-source geographic information system that allows users to visualize, manage, edit, and analyse geospatial data. It supports numerous vector, raster, and database formats and functionalities. QGIS provides a user-friendly interface with powerful tools for spatial data processing, map creation, and geospatial analysis, making it suitable for a wide range of applications from urban planning to environmental monitoring.

Part 4. pgAdmin

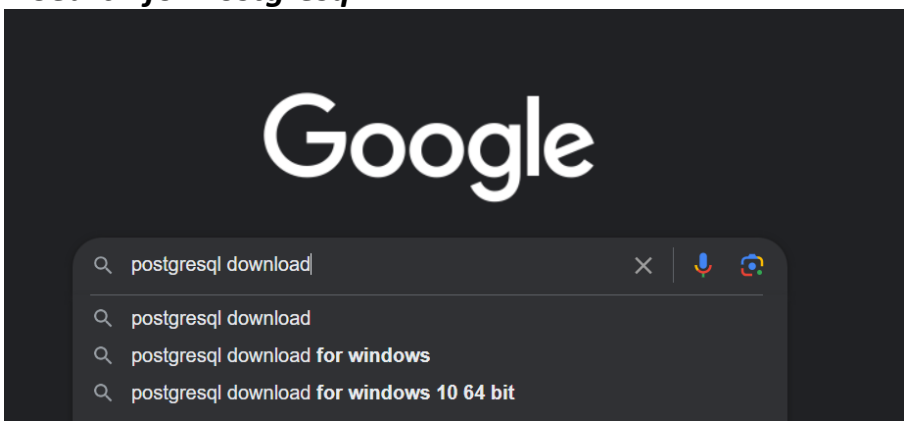
pgAdmin is an open-source graphical user interface (GUI) management tool for PostgreSQL. It provides a user-friendly interface to interact with the PostgreSQL database, allowing users to manage databases, run queries, and visualize data. pgAdmin is particularly useful for database administrators and developers who prefer a graphical interface over command-line operations. It also supports advanced features like query building, performance analysis, and database design.

Each of these software packages plays a crucial role in managing, analyzing, and visualizing geospatial data, making them indispensable tools for GIS professionals and data scientists.

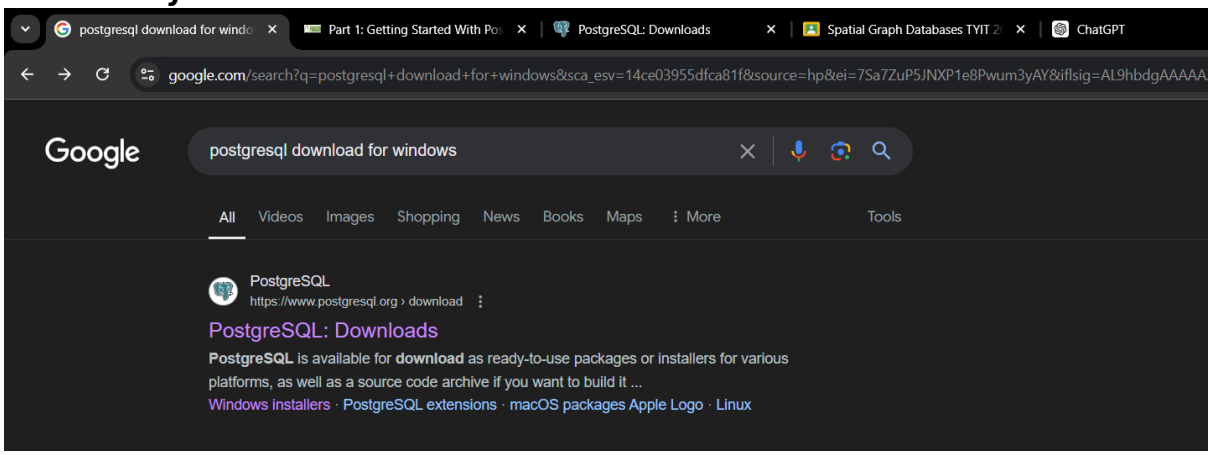
IMPLEMENTATION:

Part 1: Postgresql

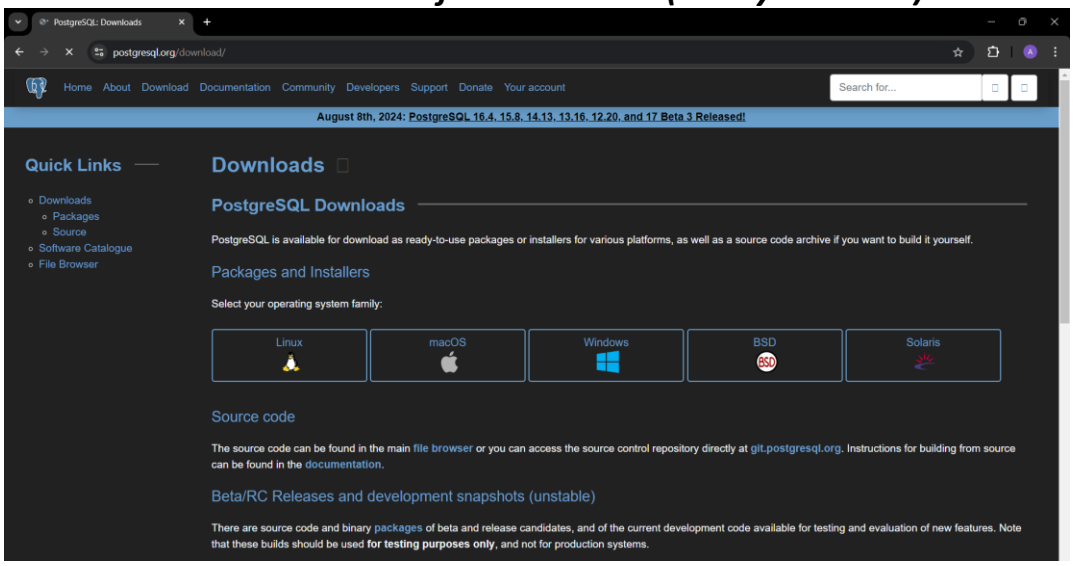
1.Search for Postgresql.



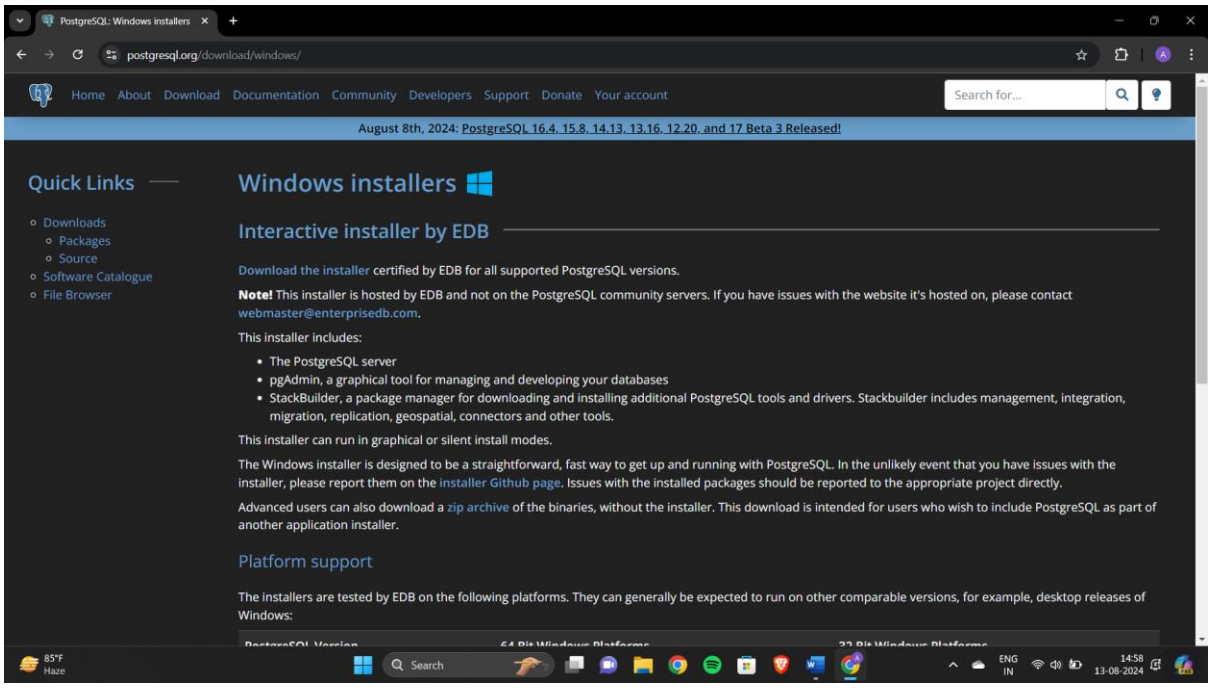
2.Click the first link.



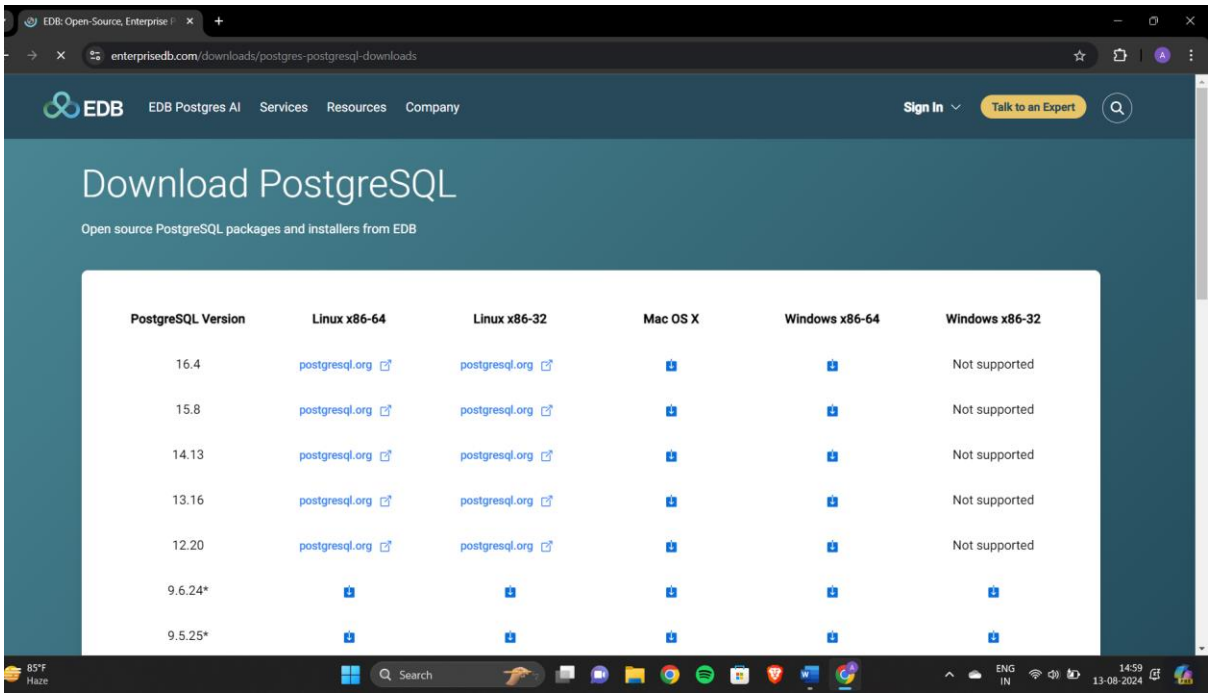
3.Choose the Windows icon for installation(on my machine).



4.We are redirected to this page.

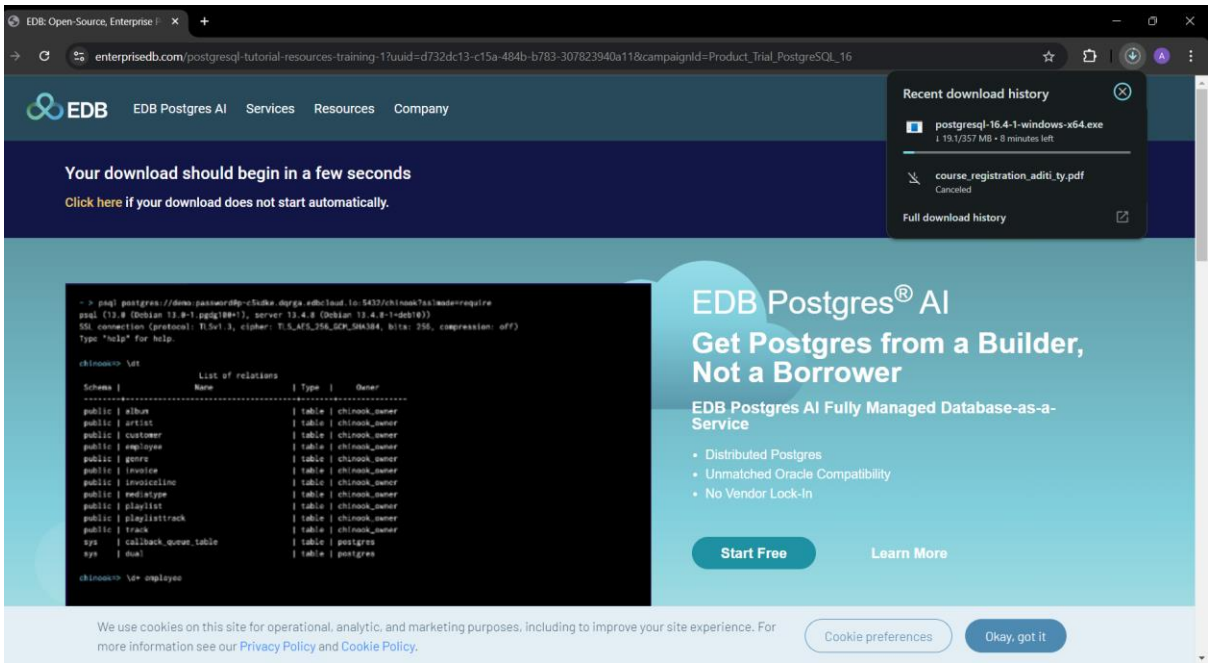


5. We click Download the installer and then are redirected here.

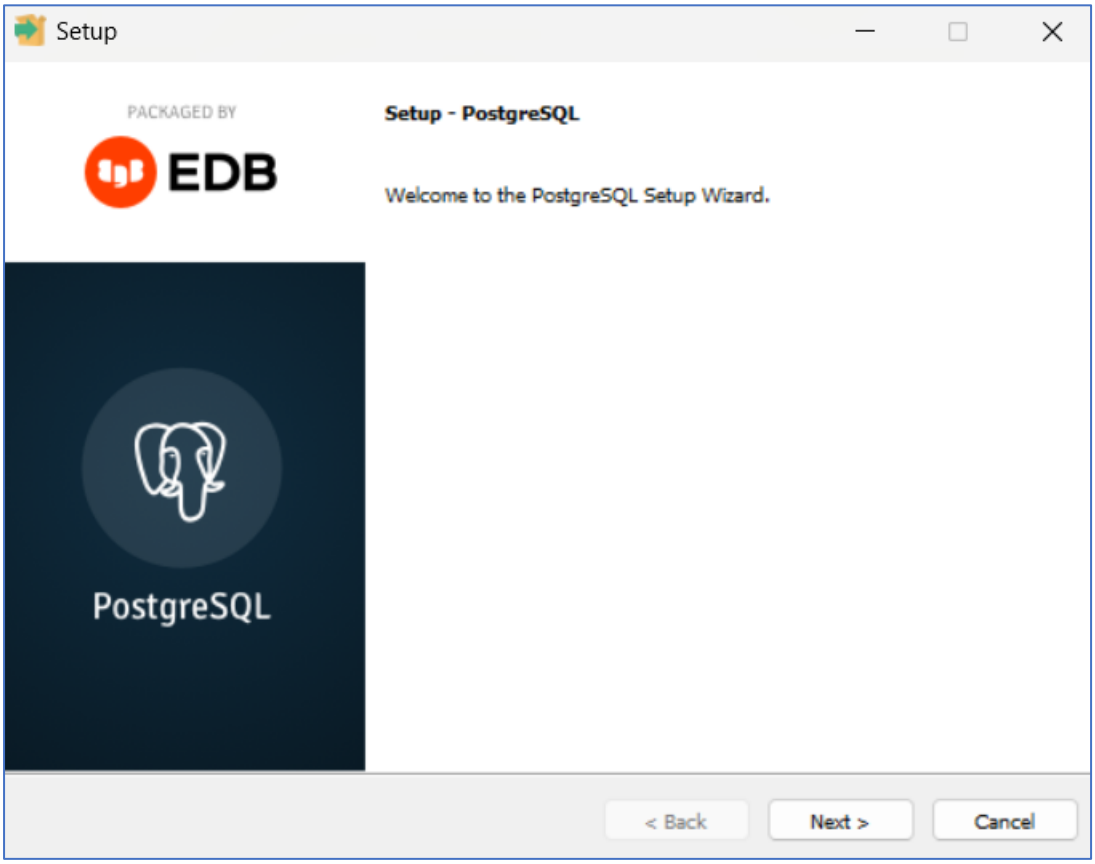


I installed 16.4 version for Windows x86-64.

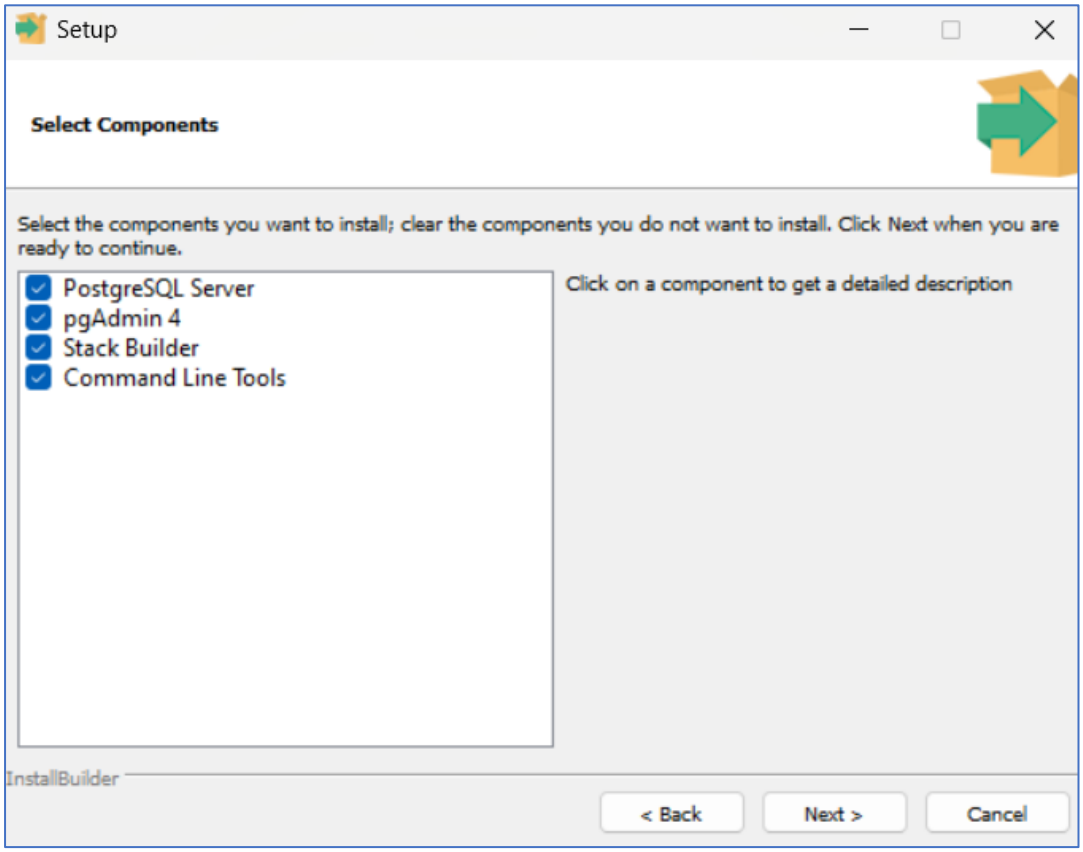
5.The downloading starts.

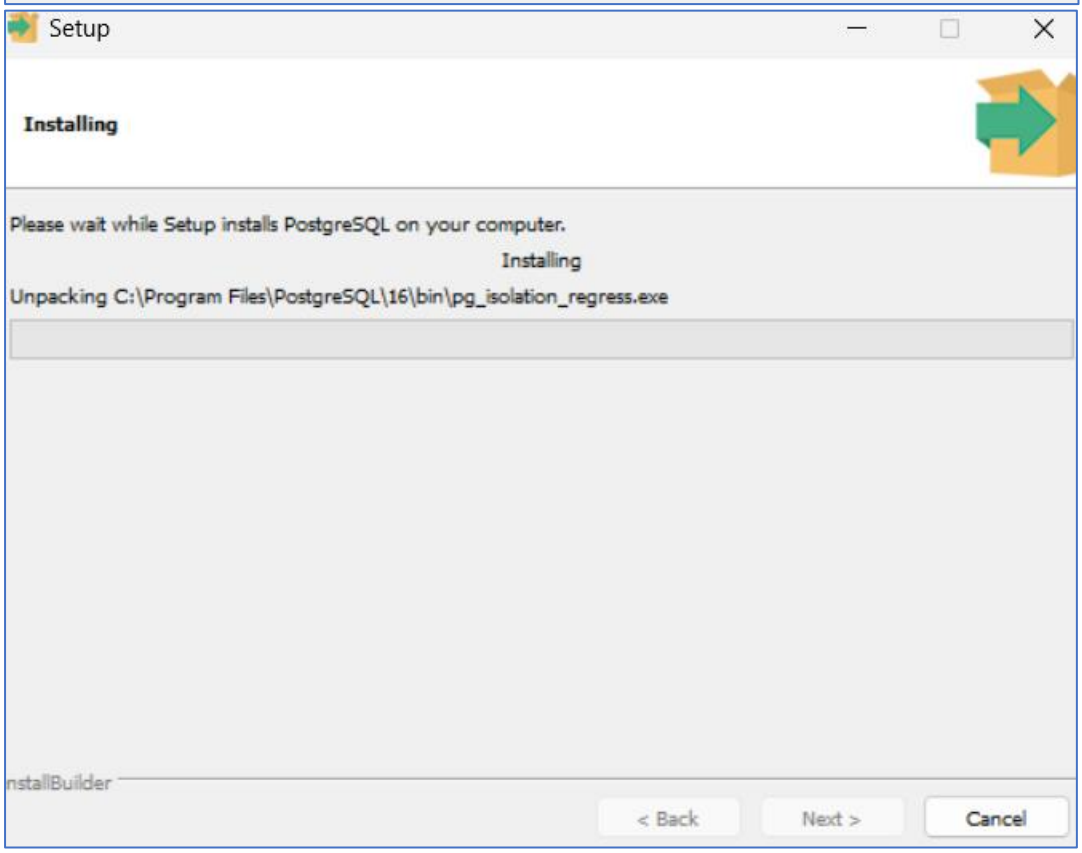


6. Downloaded.

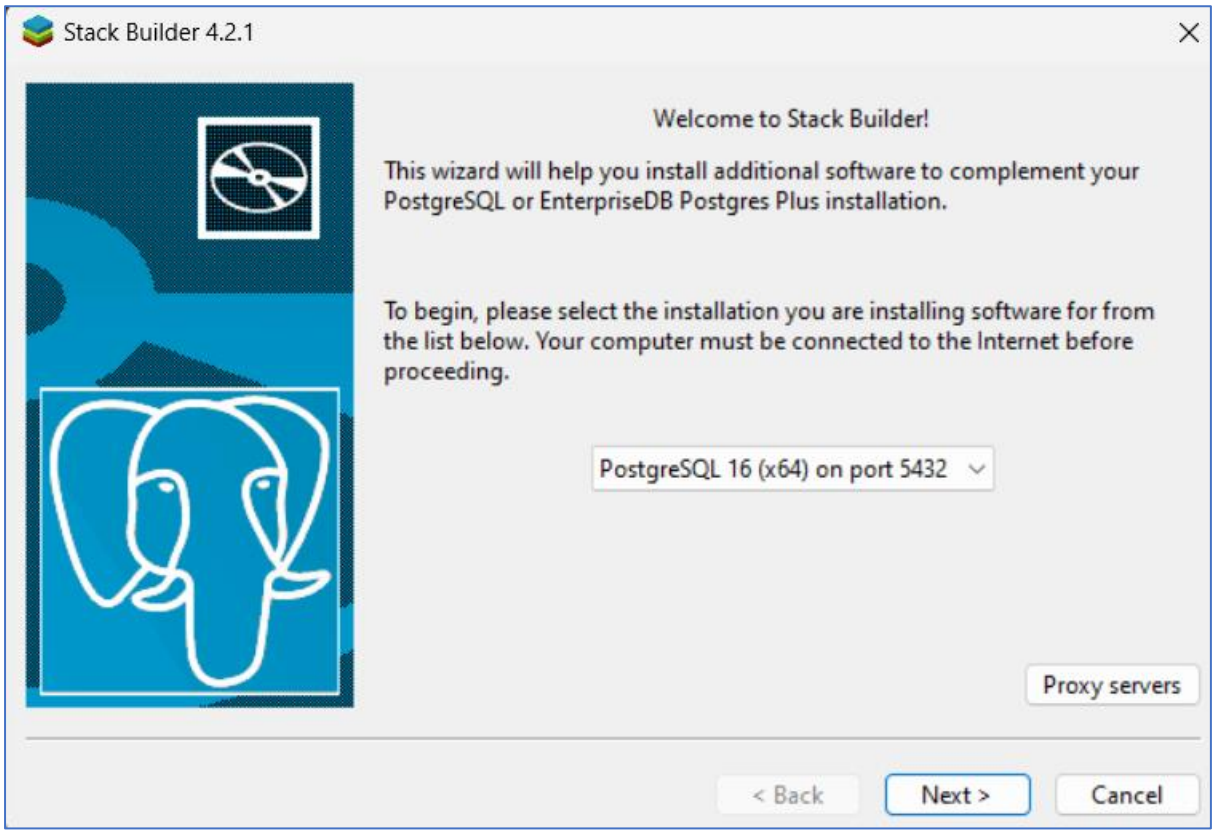


Setup: (default settings is already selected) and then We click Next.



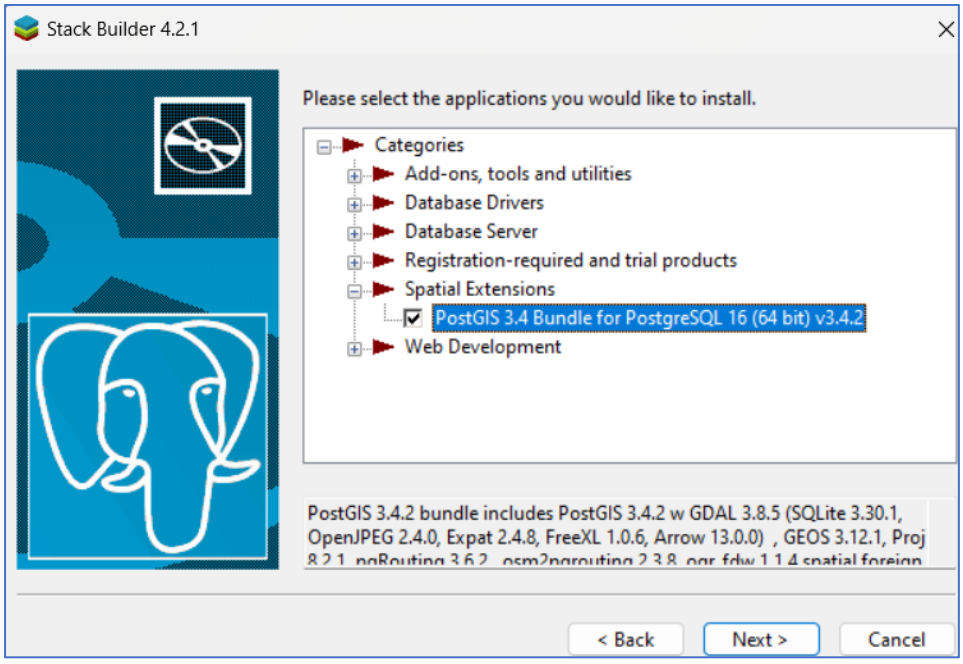


We use the Stack Builder to then install PostGIS.

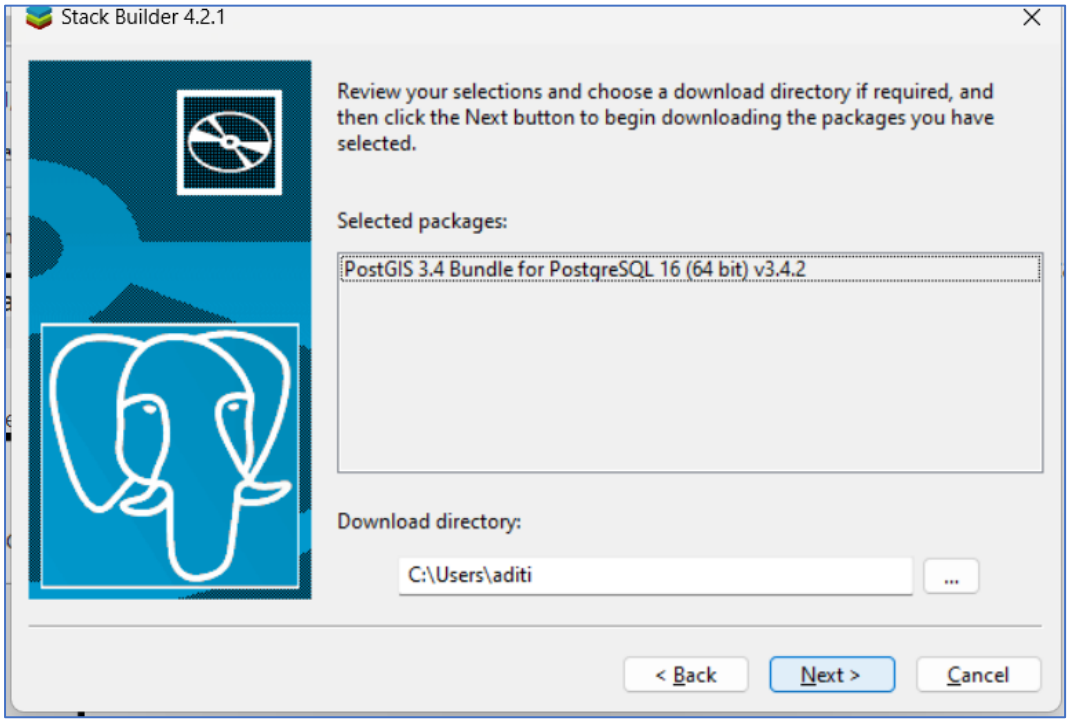


Part 2: PostGIS

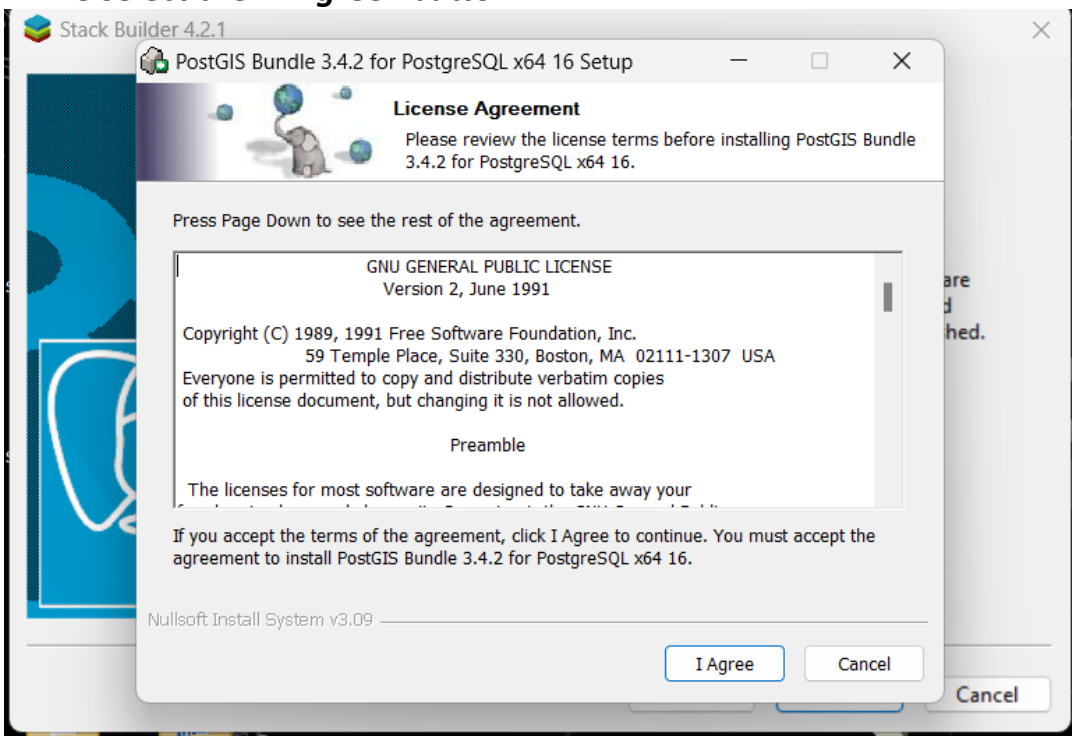
After reading documentation we have to install PostGIS using stackbuilder of postgresql only. We select PostGIS 3.4 under Spatial Extensions.



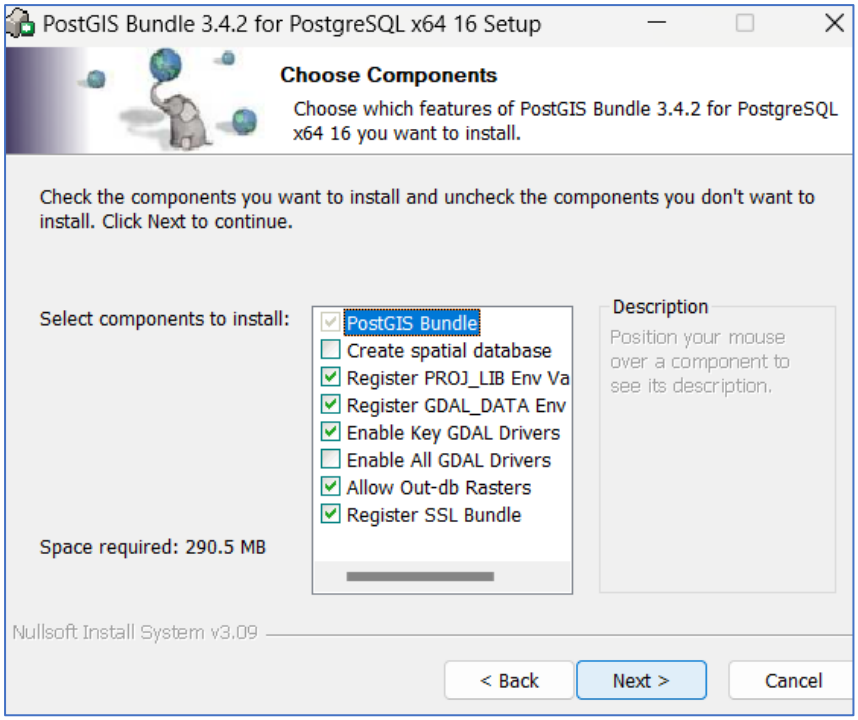
1.Select Next.



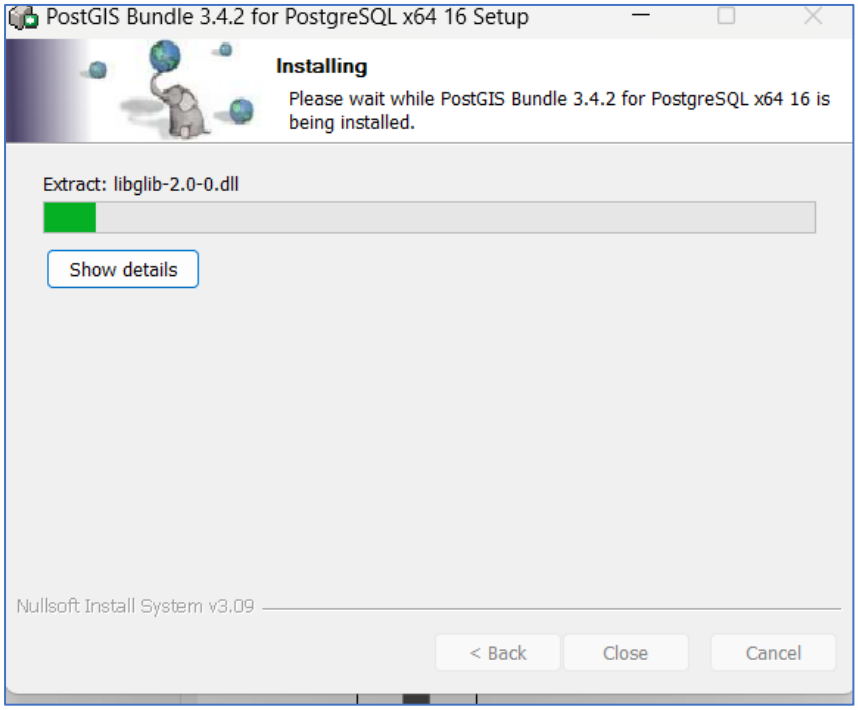
2. We select the "I Agree" button.

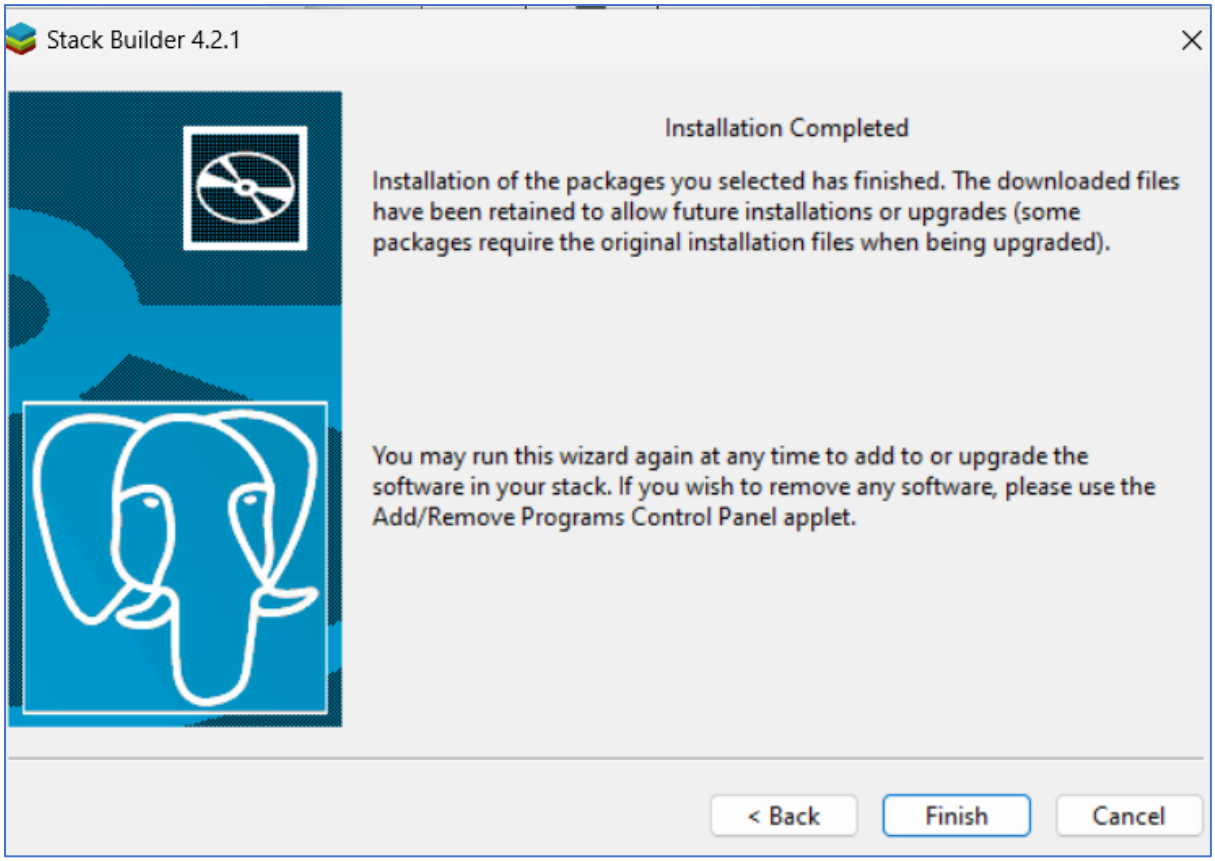


3. We select the "Next" button

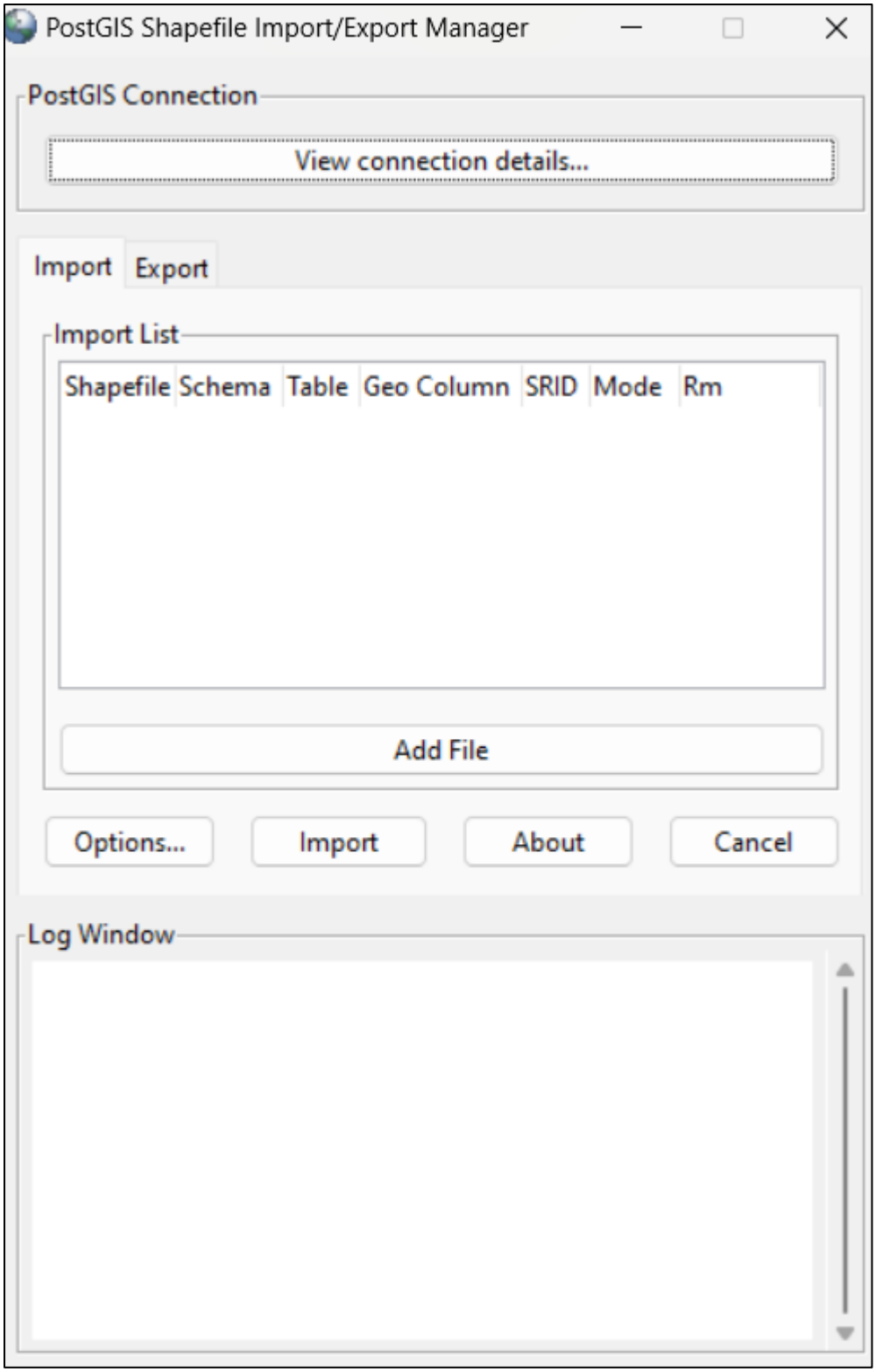


4. We select the "Next" button



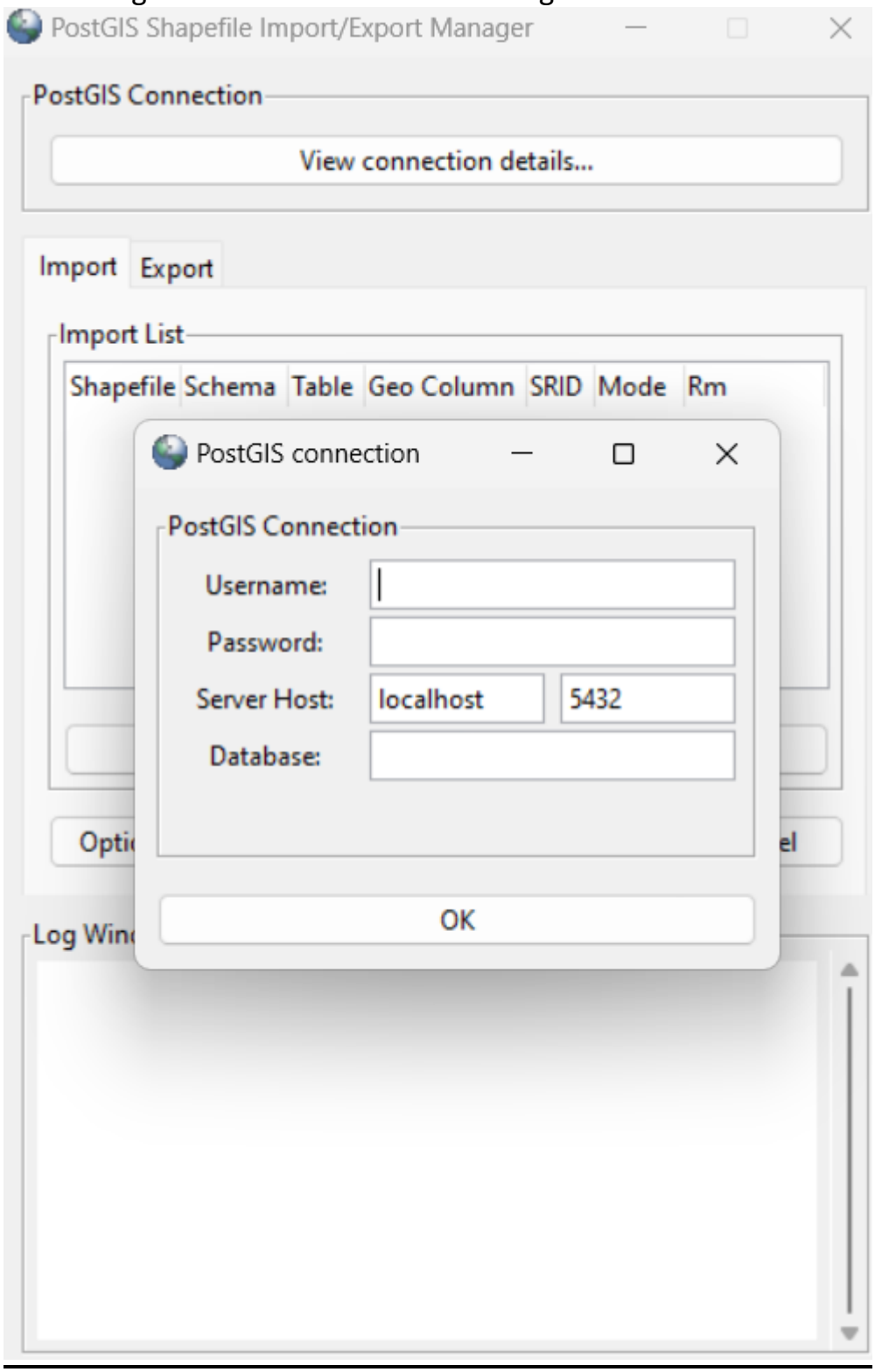


We select "Finish".

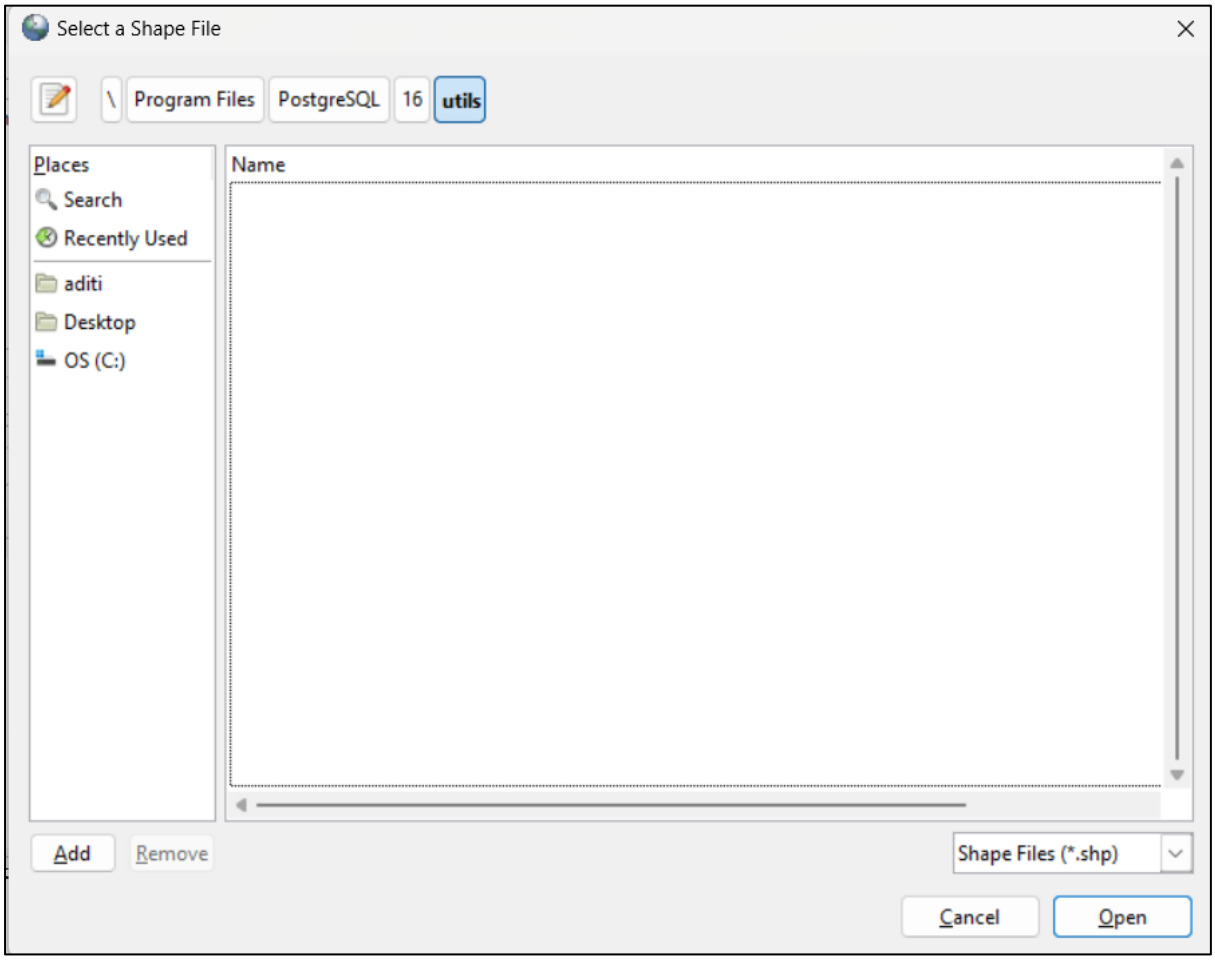


This is the final page that we get.

On clicking View connection details. We get :

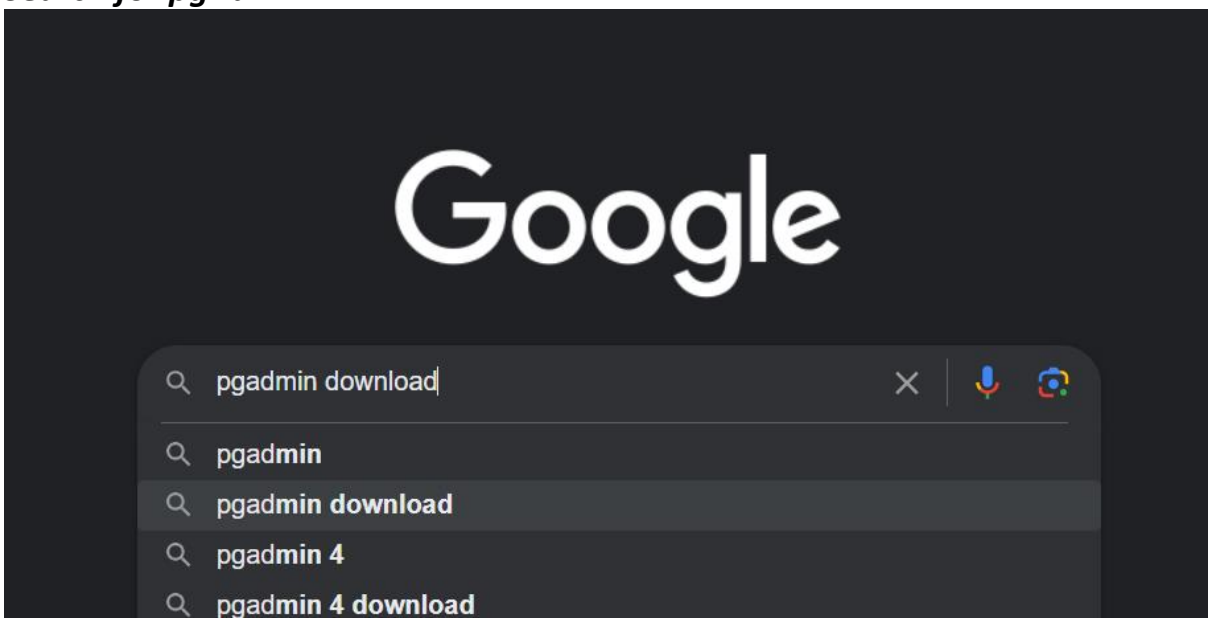


On clicking Add files . We get :

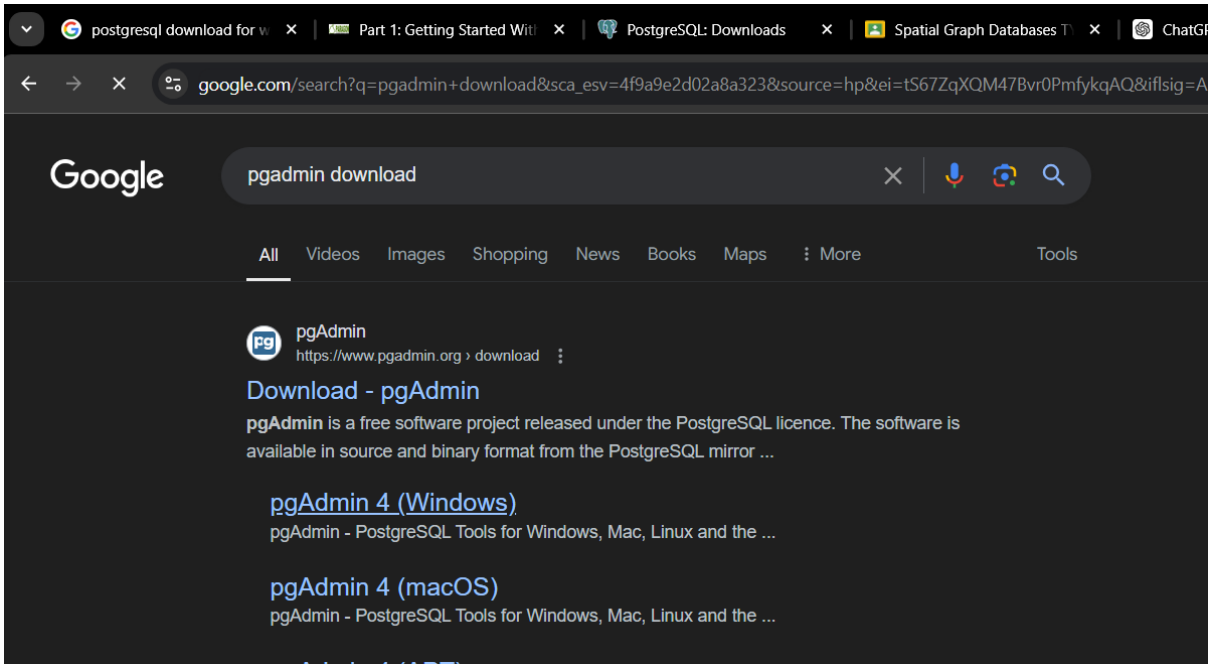


Part 3: pgAdmin

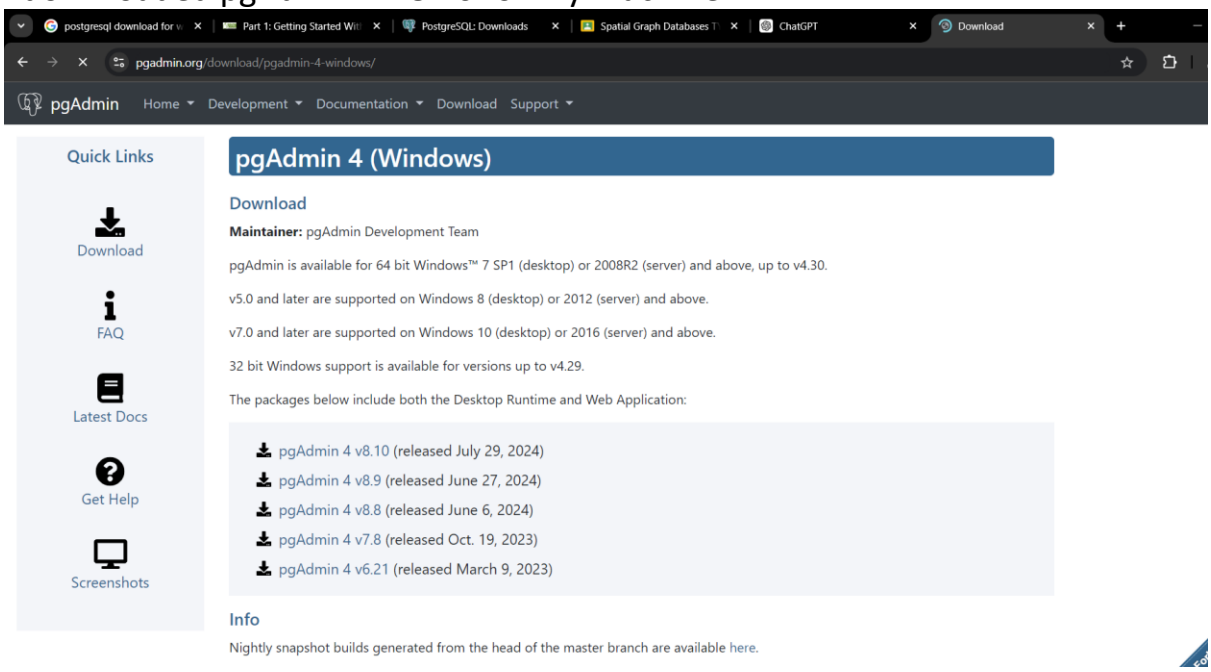
Search for pgAdmin.



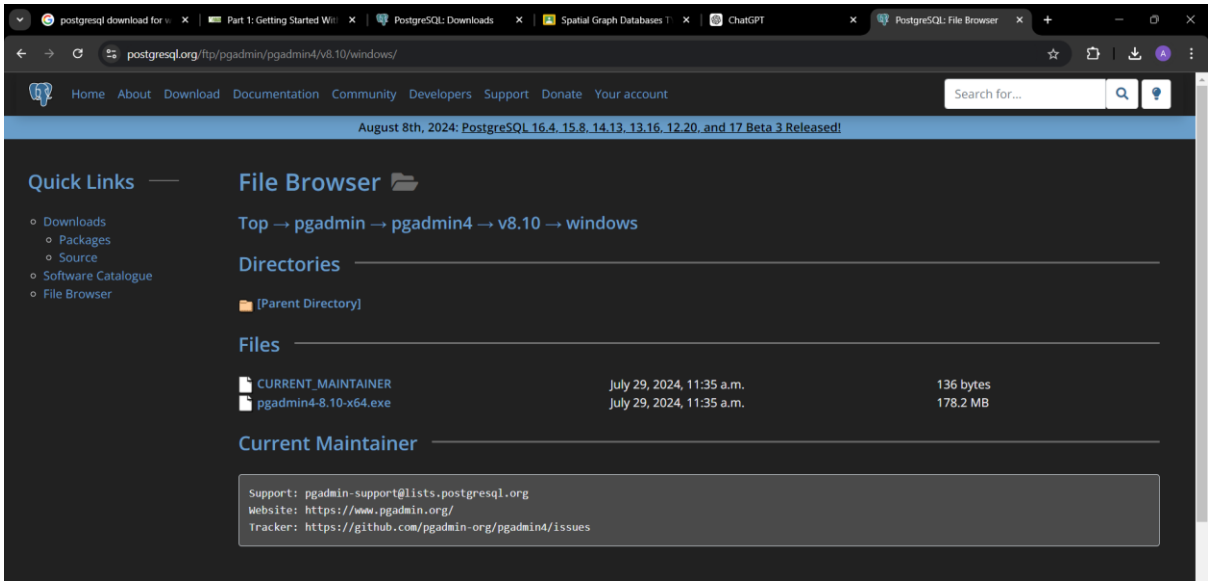
Click on 2nd click for windows download



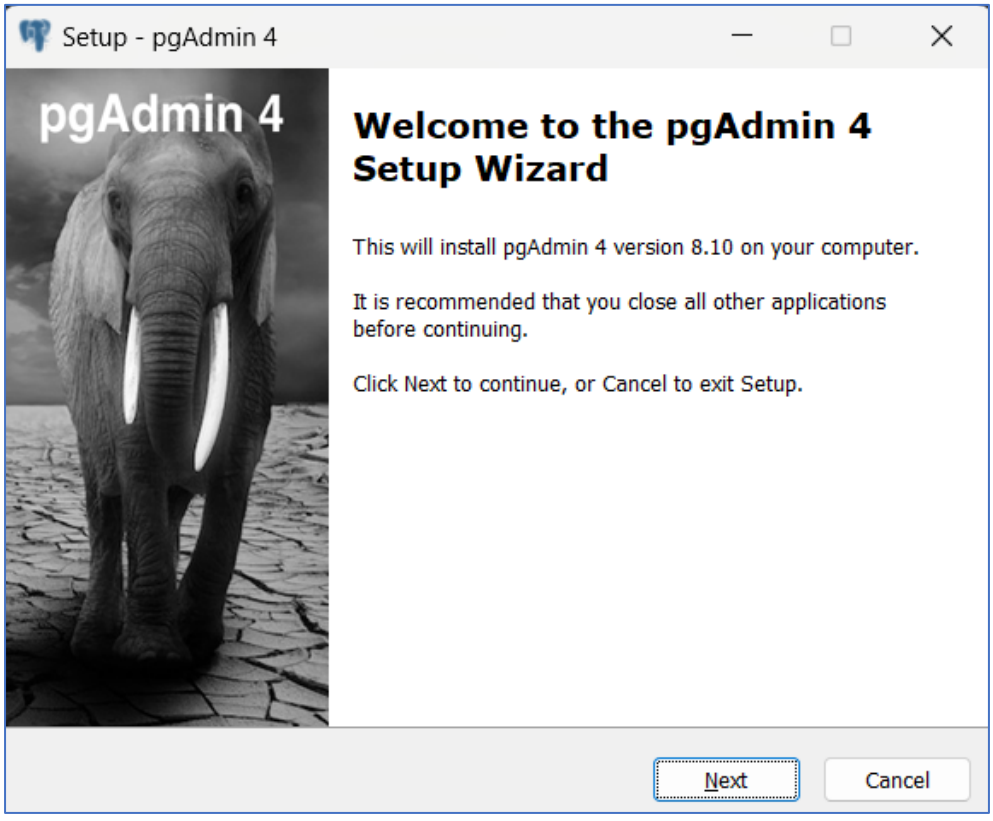
I downloaded pgAdmin 4 v8.10 for my machine.



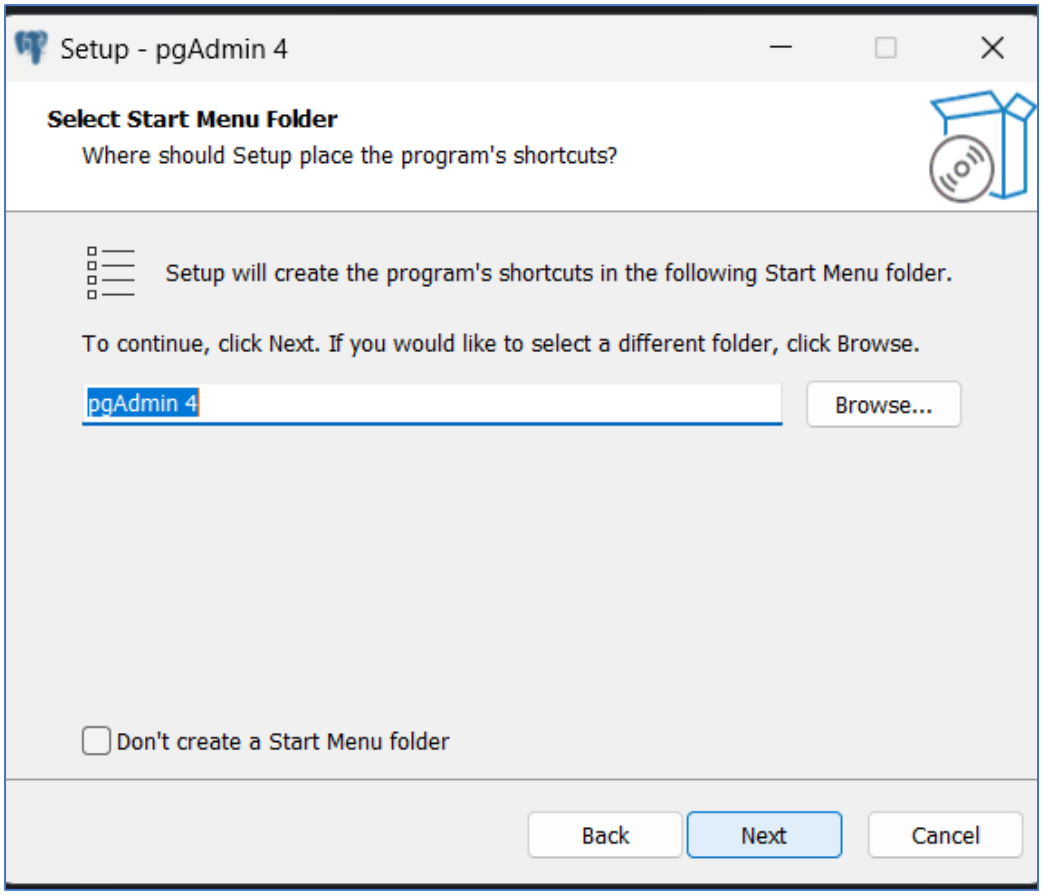
Download **pgadmin4-8.10-x64.exe**.
And we get directed to that page.



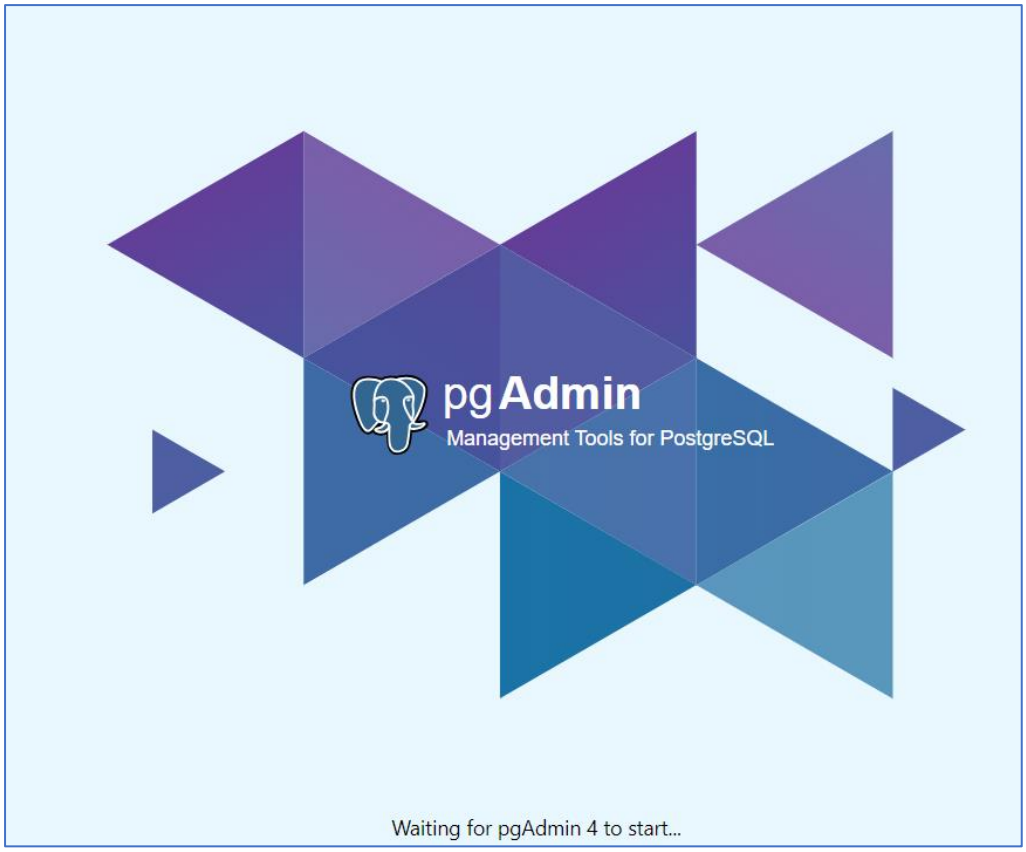
Setup of the same :



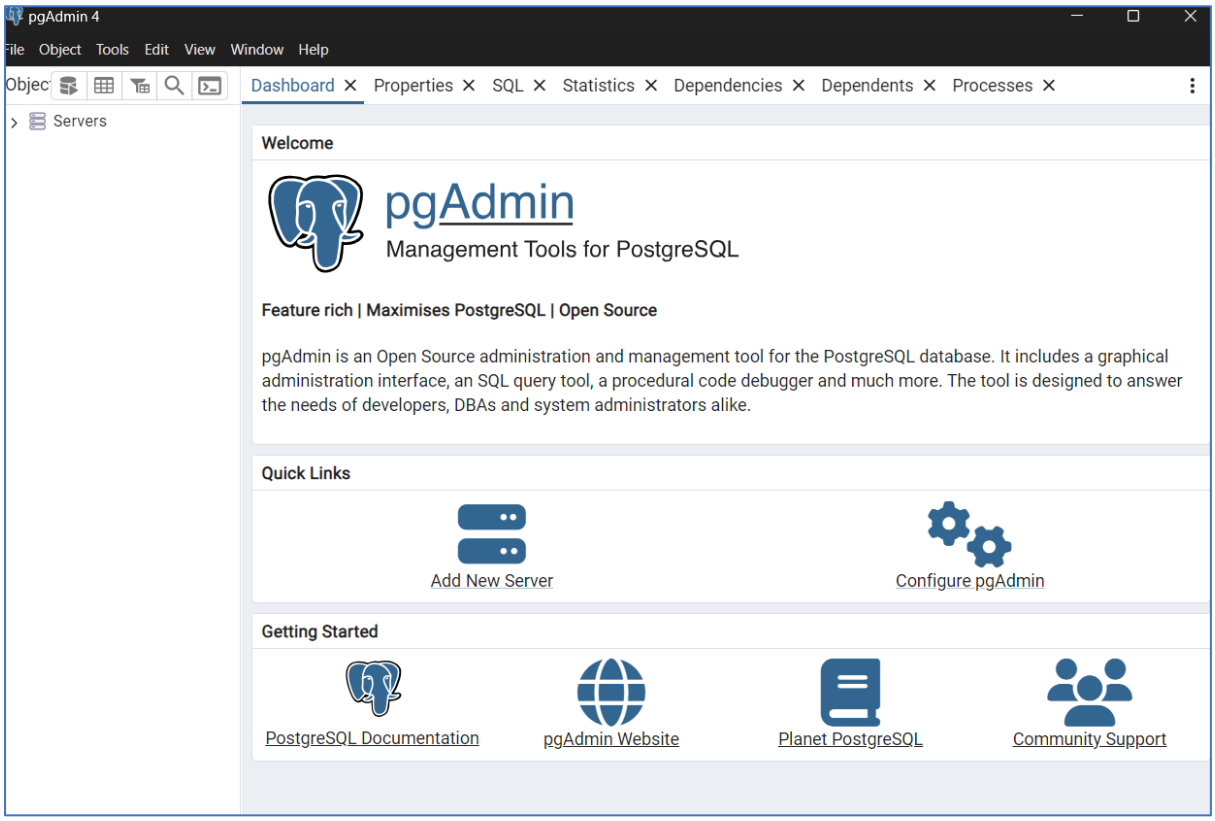
Press “Next”



It has now been downloaded.

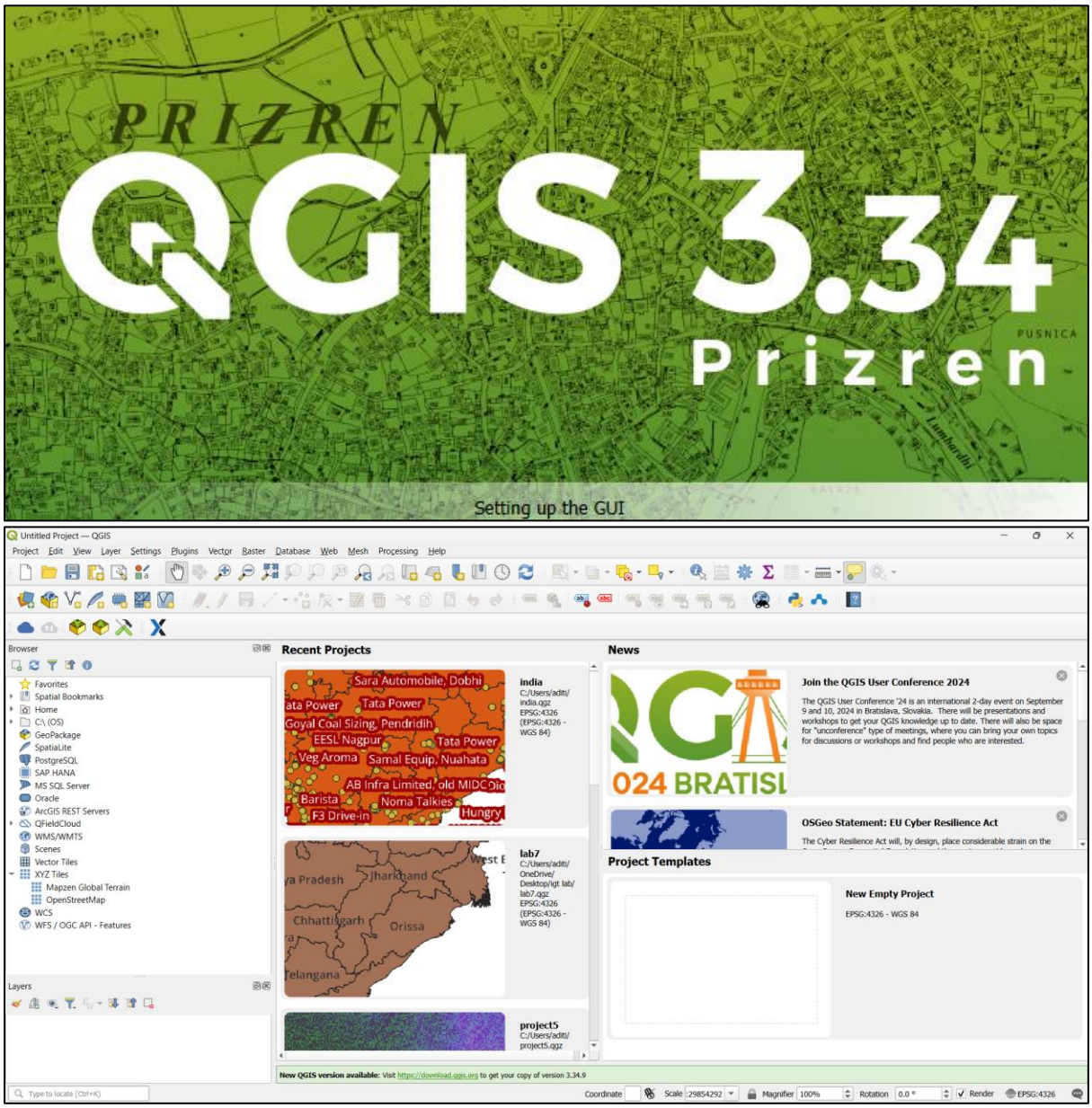


This is the interface



Part 4: QGIS

The software has already been installed.



QUERIES:

Question:

Ice cream entrepreneurs Jen have opened business and now need a database to track orders. When taking an order they record the customer's name, the details of the order such as the flavours and quantities of ice cream needed, the date the order is needed and the delivery address. Their database needs to help them answer two important questions:

1. Which orders are due to be shipped within the next two days?
2. Which flavours must be produced in greater quantities?

Implement a Database Design for the above scenario.

Creation Of Database and Insertion of Dummy Values:

```
CREATE TABLE Customers (
    CustomerID INT PRIMARY KEY,
    CustomerName VARCHAR(255) NOT NULL,
    Address TEXT NOT NULL
);
CREATE TABLE Orders (
    OrderID INT PRIMARY KEY,
    CustomerID INT REFERENCES Customers(CustomerID),
    OrderDate DATE NOT NULL,
    DeliveryDate DATE NOT NULL,
    OrderStatus VARCHAR(50) NOT NULL
);
CREATE TABLE Details (
    DetailID INT PRIMARY KEY,
    OrderID INT REFERENCES Orders(OrderID),
    IceCreamFlavour VARCHAR(255) NOT NULL,
    Quantity INT NOT NULL
);
```

```
INSERT INTO Customers (CustomerID, CustomerName, Address) VALUES
(1,'Aditi', 'Ice Cream Street, Juinagar'),
(2,'Paridhi', 'Frozen Desserts, Vadala');

INSERT INTO Orders VALUES
(1,1, '2024-08-19', '2024-08-20', 'Pending'),
(2,2, '2024-08-20', '2024-08-20', 'Delivered');

INSERT INTO Details (DetailID,OrderID, IceCreamFlavour, Quantity) VALUES
(101,1, 'Butterscotch', 1),
(102,1, 'Chocolate', 2),
(103,2, 'Strawberry', 1);
```

Queries used to retrieve the required data:

1. **Which orders are due to be shipped within the next two days?**

```
SELECT * FROM Orders
WHERE DeliveryDate BETWEEN CURRENT_DATE AND CURRENT_DATE + INTERVAL '2 days';
```

Output:

Data Output | Messages | Notifications

	orderid [PK] integer	customerid integer	orderdate date	deliverydate date	orderstatus character varying (50)
1	1	1	2024-08-19	2024-08-20	Pending
2	2	2	2024-08-20	2024-08-20	Delivered

2. **Which flavours must be produced in greater quantities?**

```
SELECT IceCreamFlavour, SUM(Quantity) as TotalQty
FROM Details
GROUP BY IceCreamFlavour
ORDER BY TotalQty DESC;
```

Output:

Data Output | Messages | Notifications

	icecreamflavour character varying (255)	totalqty bigint
1	Chocolate	2
2	Strawberry	1
3	Butterscotch	1

CONCLUDING REMARKS:

The installation of PostgreSQL, PostGIS, QGIS, and pgAdmin 4 equips you with a powerful suite of tools for managing, analyzing, and visualizing spatial and non-spatial data.

- **PostgreSQL** provides a robust, reliable database management system capable of handling complex data structures and large datasets, making it a solid foundation for various applications.

- **PostGIS** extends PostgreSQL's capabilities, enabling us to manage geospatial data with ease. This extension is essential for applications requiring advanced geographic information system (GIS) functionalities, such as spatial queries and analysis.

- **QGIS** offers a user-friendly, feature-rich platform for visualizing and analyzing geographic data, making it an indispensable tool for GIS professionals, planners, and researchers.

- **pgAdmin 4** serves as a powerful graphical interface for managing PostgreSQL databases, simplifying database administration tasks, query execution, and overall database management.

Together, these tools form a comprehensive environment for GIS and data management, allowing you to **efficiently store, query, analyse, and visualize both spatial and non-spatial data**.

With these installations, we are well-prepared to tackle a wide range of data-driven projects, from basic database management to advanced geospatial analysis. For applications like **medical scanning and imagery, satellite imaging, mapping locations** etc.