Tutorial for PostgreSQL and pgAdmin

This document provides important details about using PostgreSQL in this course. PostgreSQL is a powerful, open-source DBMS supporting a substantial part of the SQL standard. Many organizations use PostgreSQL in major information systems. This tutorial demonstrates installation of PostgreSQL on Windows 11 and usage of the pgAdmin client software to execute SQL statements. This tutorial initially uses the latest stable versions of PostgreSQL (14.4) and pgAdmin (4) for Windows in July 2022.

1. Installation

You can download various versions of PostgreSQL from the organization's website (https://www.postgresql.org/) as shown in Figure 1. Select the **Download →** button to open the download page (Figure 2).

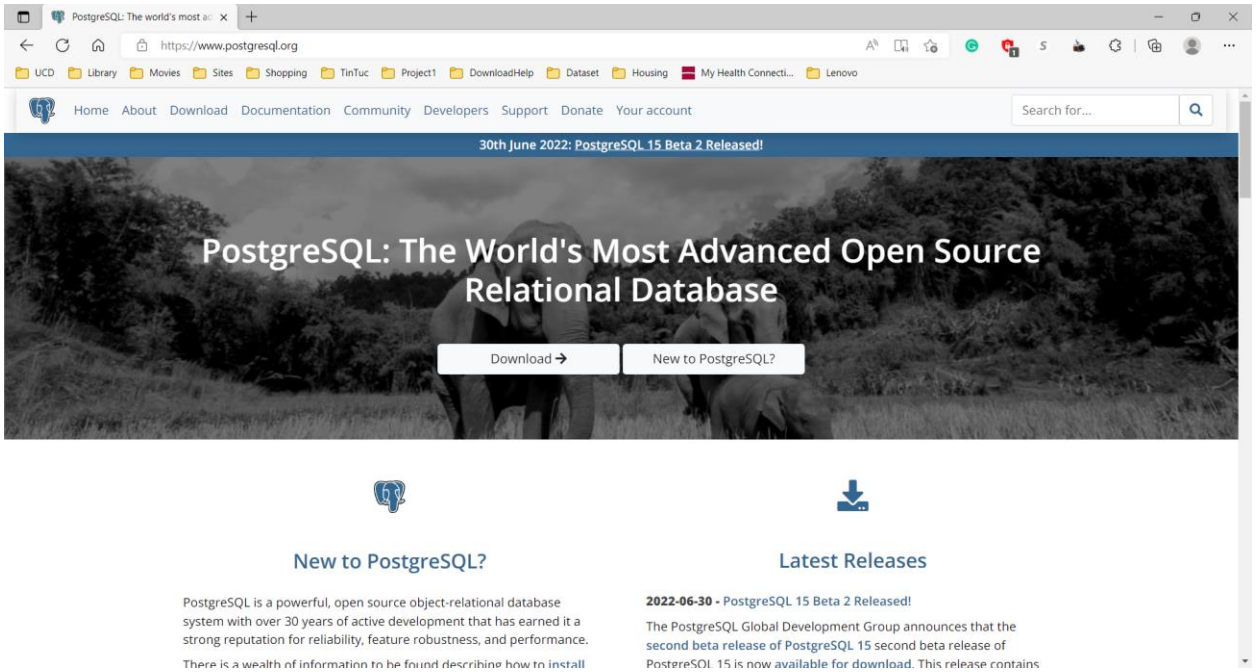

Figure 1: Home Page

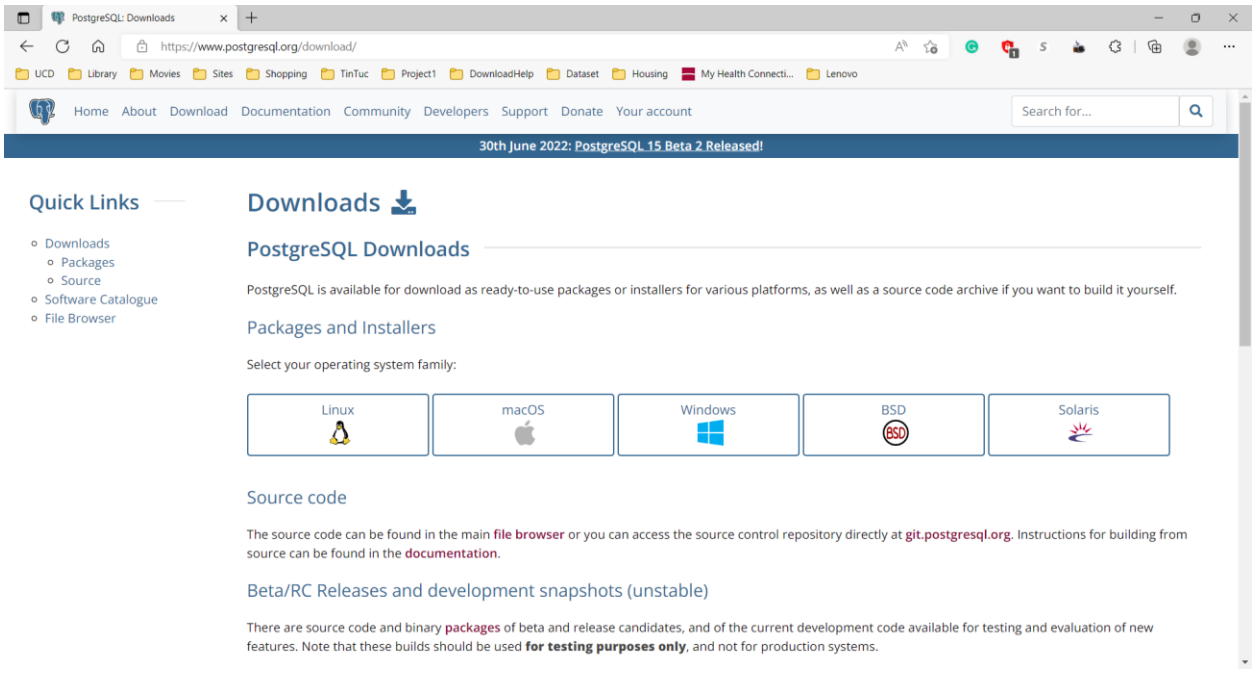

Figure 2: Download Page

Select the appropriate operating system to start the download process. This tutorial demonstrates the installation of PostgreSQL for Windows 11 so Windows was selected. The Windows Installers page (Figure 3) shows the PostgreSQL versions supported on Windows 11.

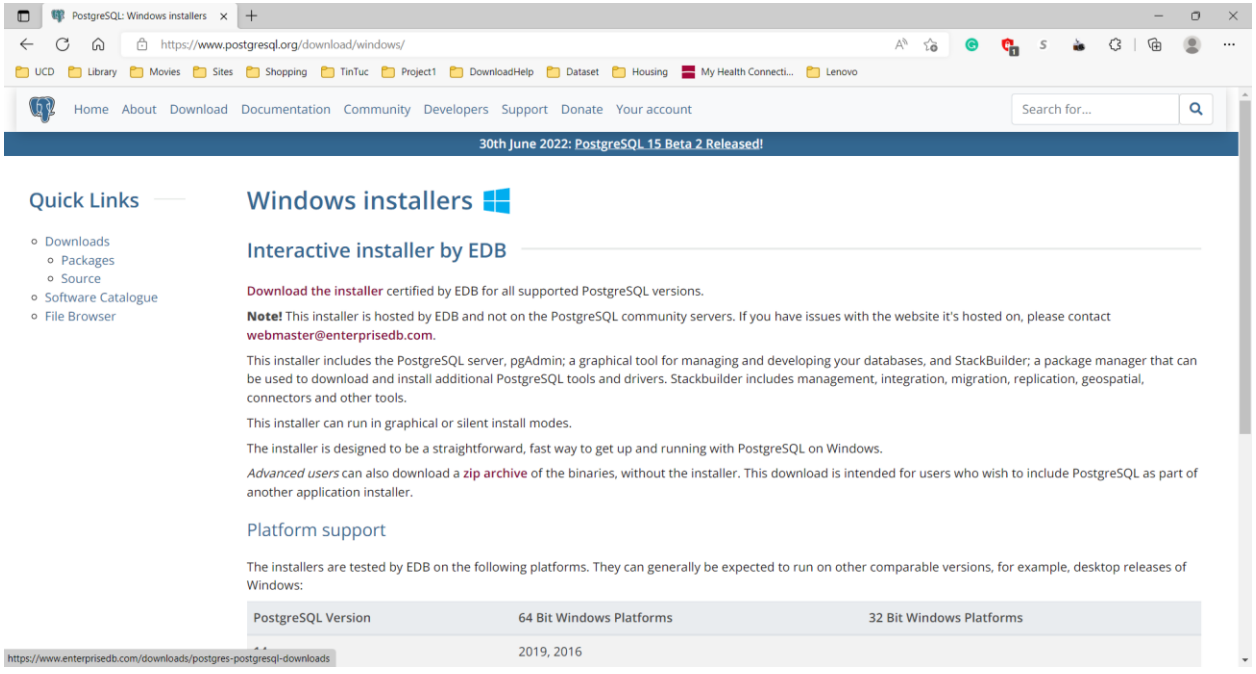

Figure 3: Download Page for Windows

Click the **Download the Installer** link to open the EDB page for Windows PostgreSQL installers (Figure 4), then select the version to download. In this tutorial, select Windows x86-64. The installer should be begun downloading. Keep the installation file if asked (Figure 5)

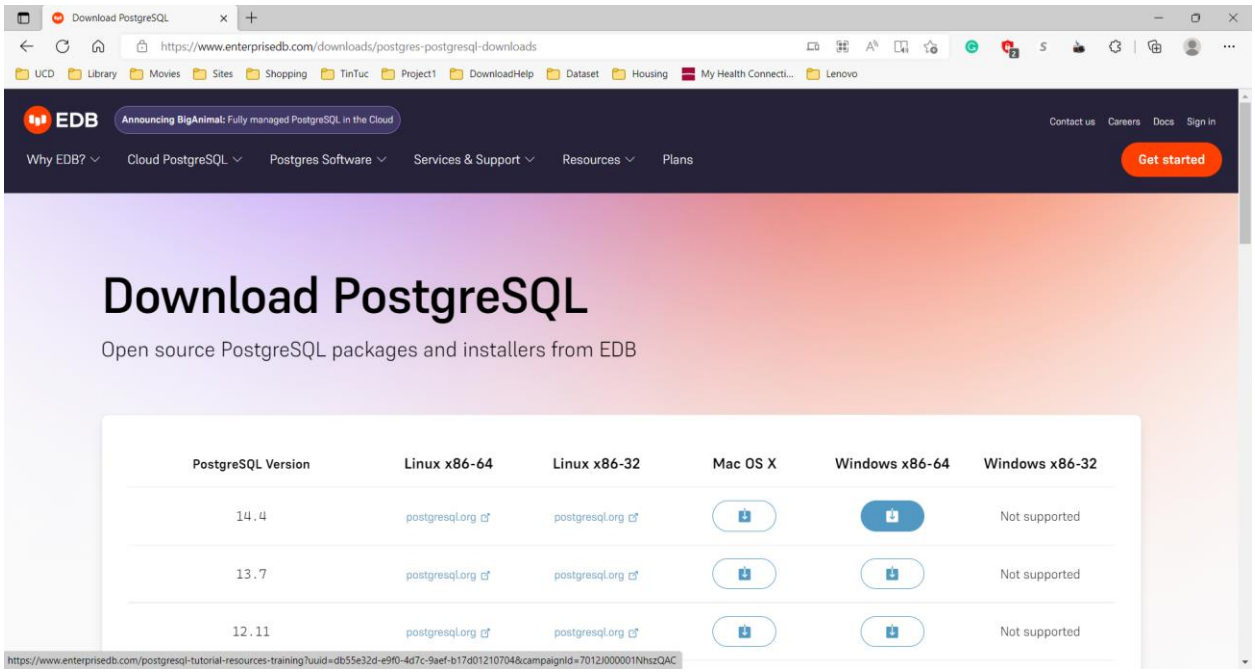

Figure 4: EDB Windows Installer Page for PostgreSQL

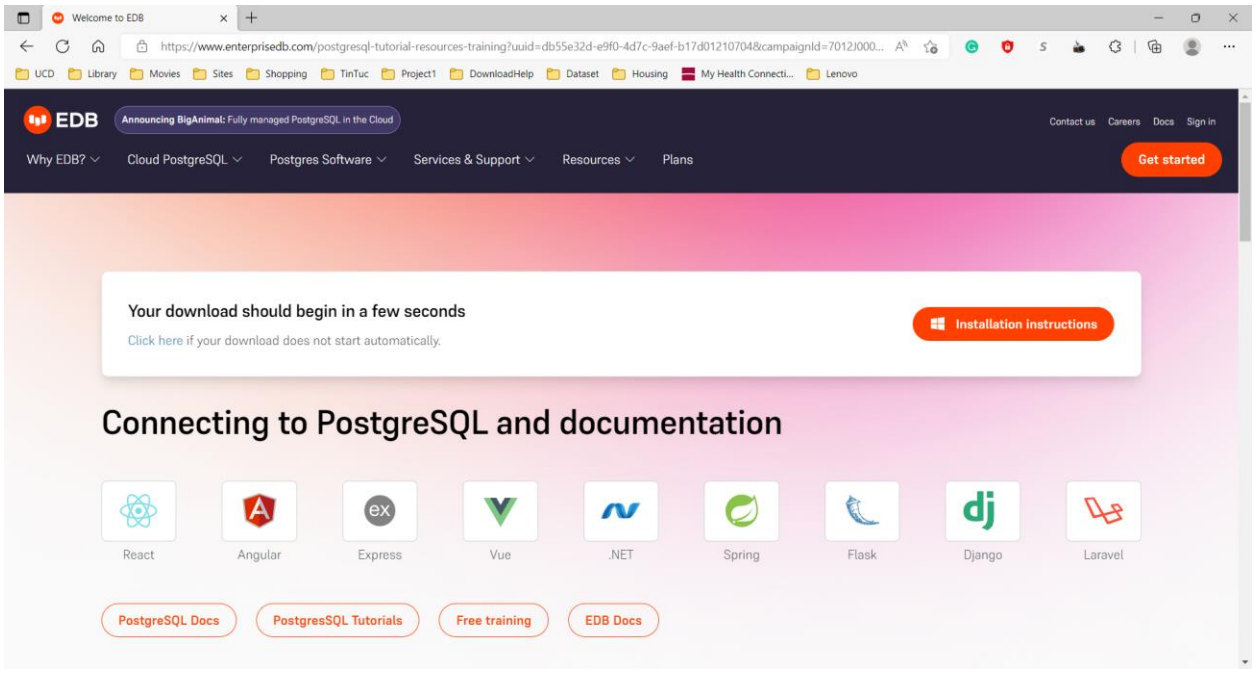

Figure 5: Download Page

After downloading completes, you can start the installation by double clicking the .exe file (postgresql-14.4-1-windows-x64.exe in this tutorial). Let the installer take control (respond yes) to begin installation. Select Next > for the first installation window (Figure 6). In the next window, choose the installation folder (Figure 7). Follow the remaining installation windows (Figures 8 to 16) to complete the installation. In the Password window (Figure 9), you must enter a password for the superuser (postgres). You must remember this password as you will need to use the password when starting PostgreSQL. After the last installation window (Figure 15), you can skip the Stack Builder additional installation by clicking the Cancel button (Figure 16). You can use Stack Builder later if you want to install other components.

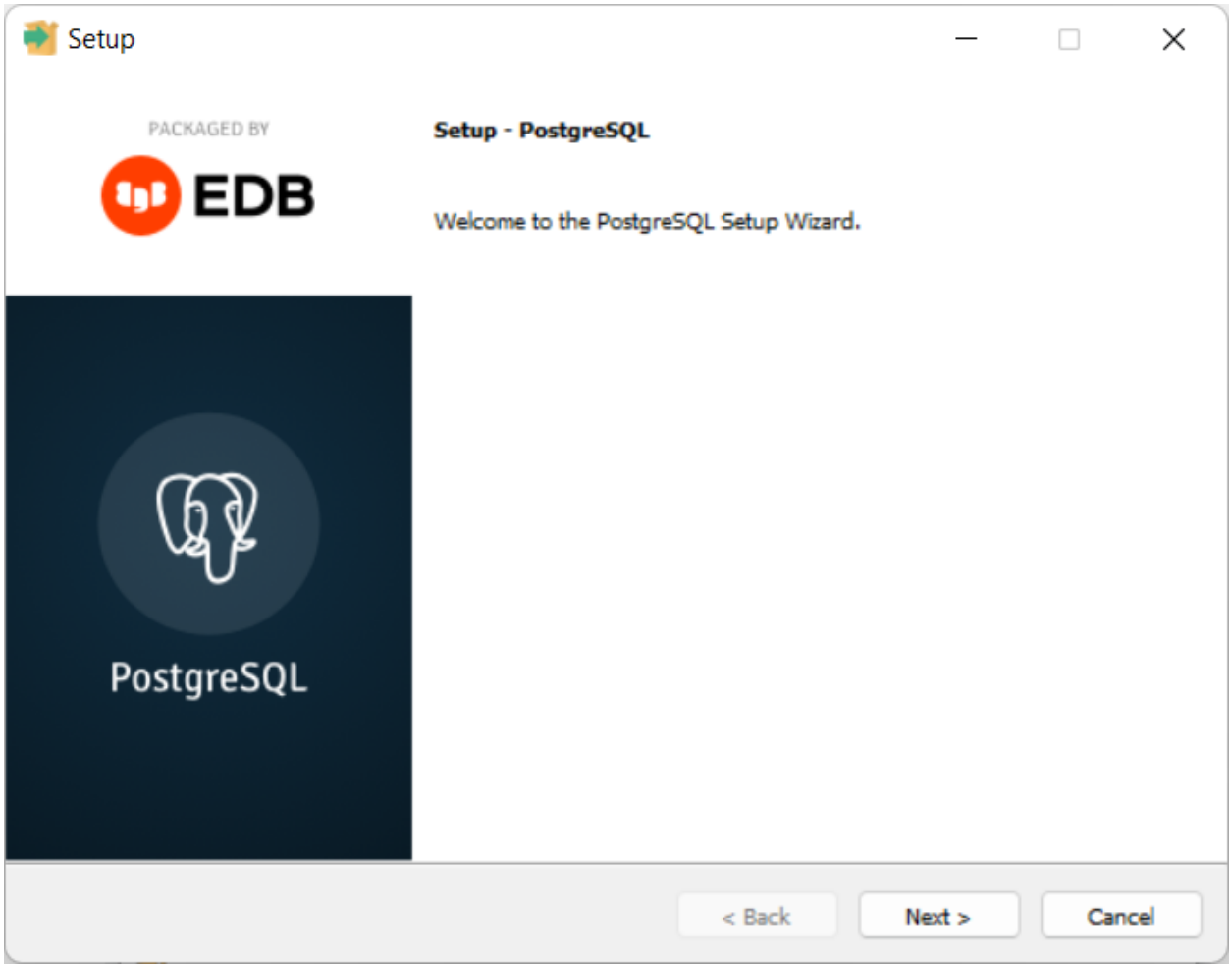

Figure 5: First Installation Window for PostgreSQL

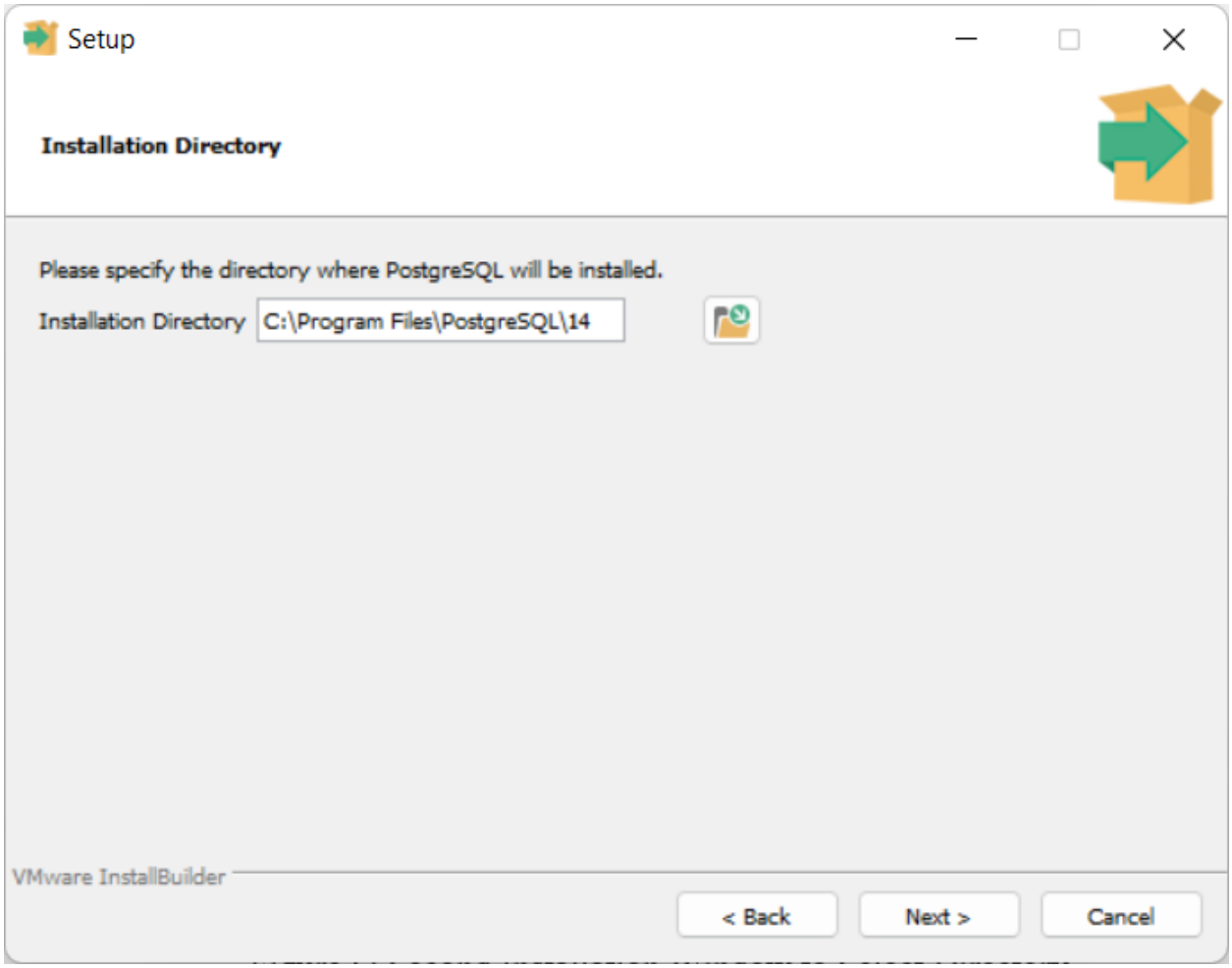

Figure 6: Second Installation Window to Select Directory

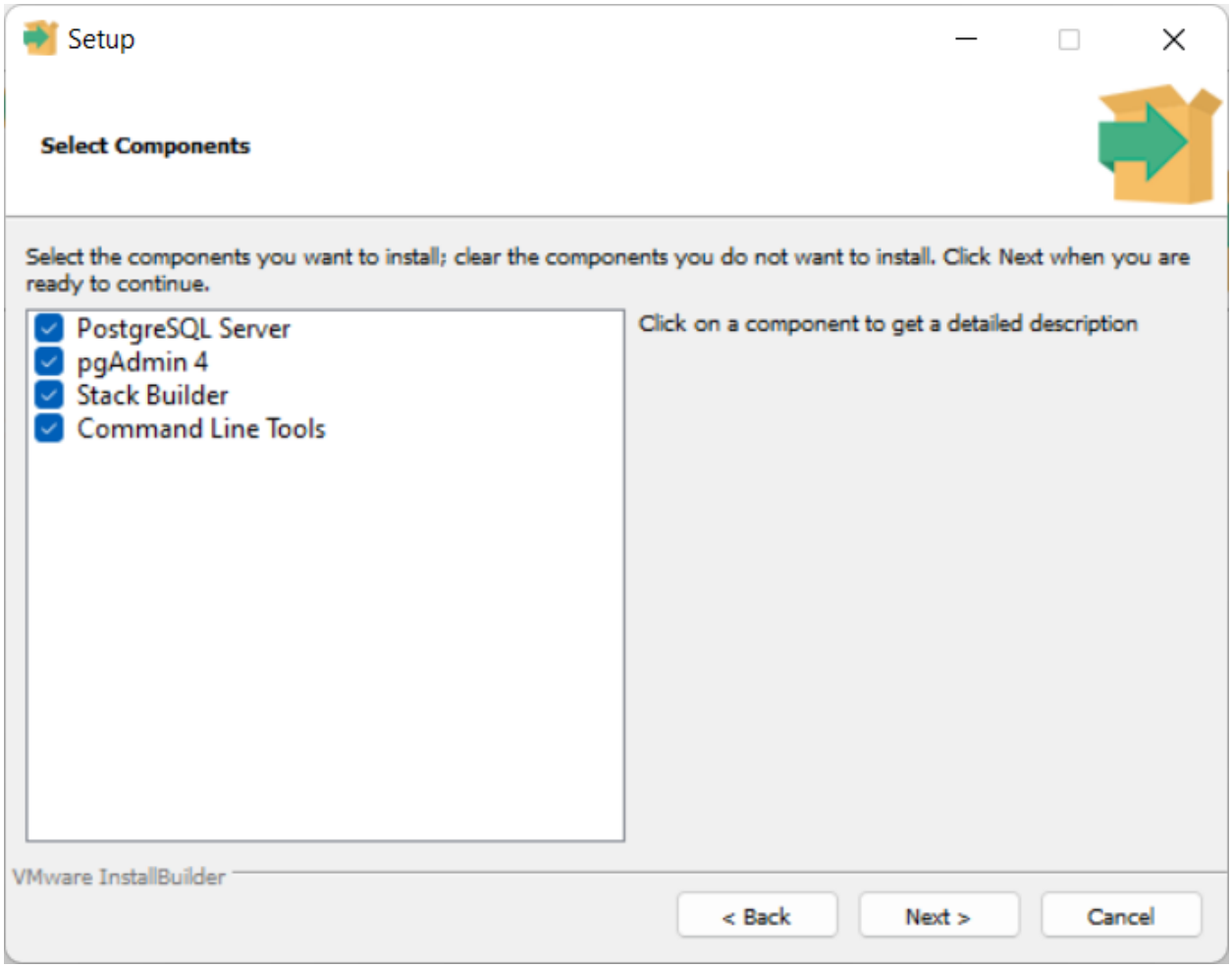

Figure 7: Third Installation Window to Select Components

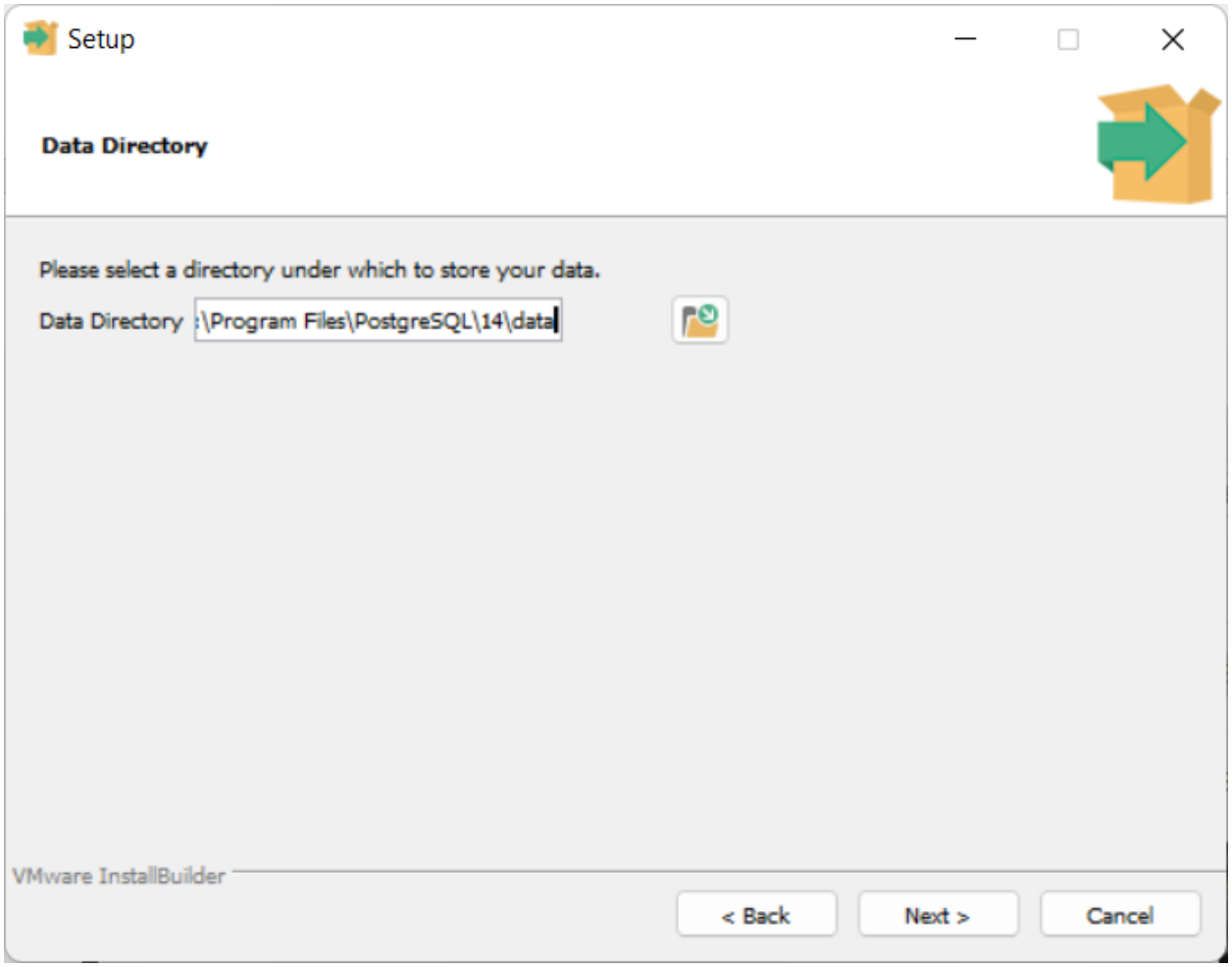

Figure 8: Fourth Installation Window to Select Data Directory

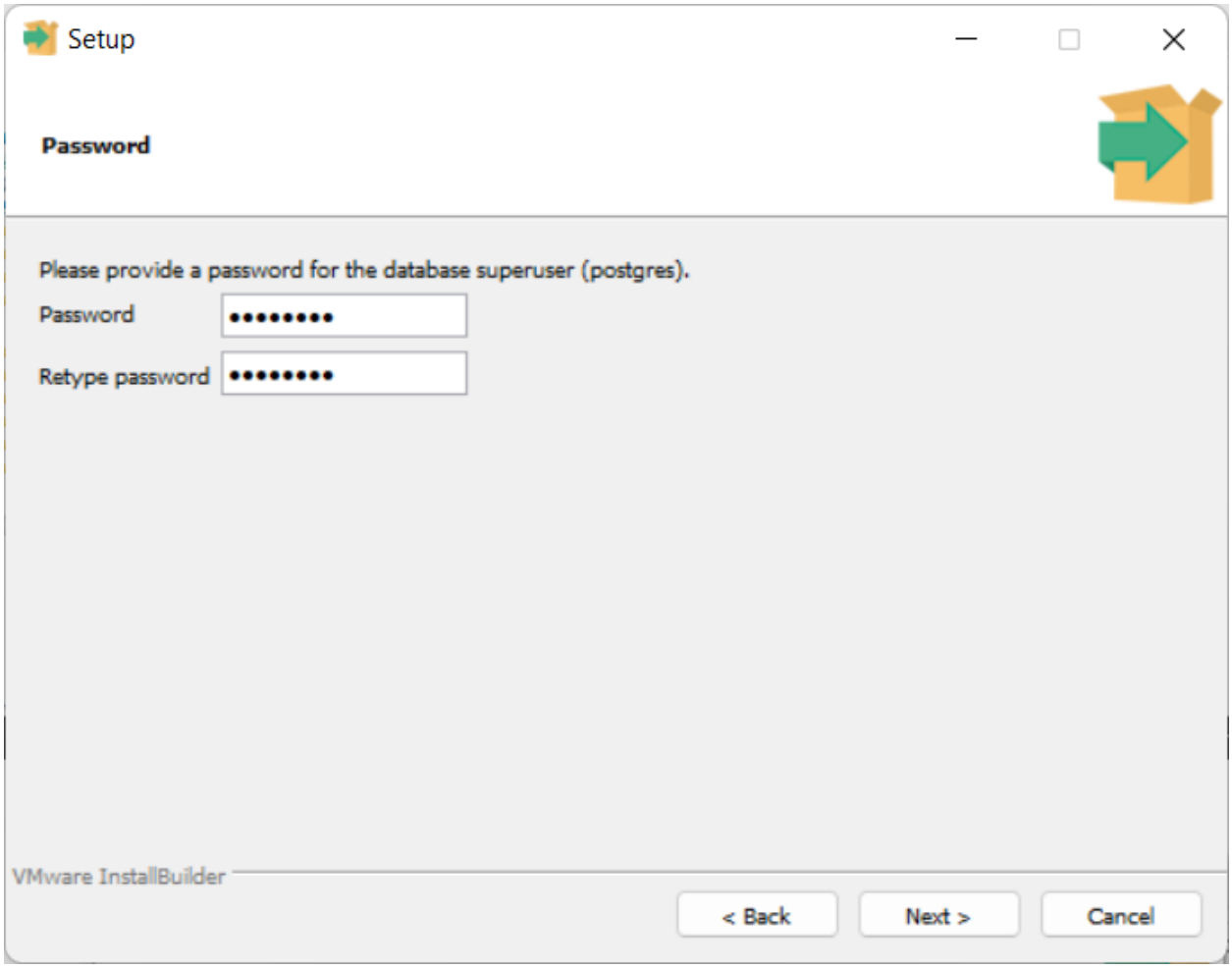

Figure 9: Fifth Installation Window to Enter Superuser Password

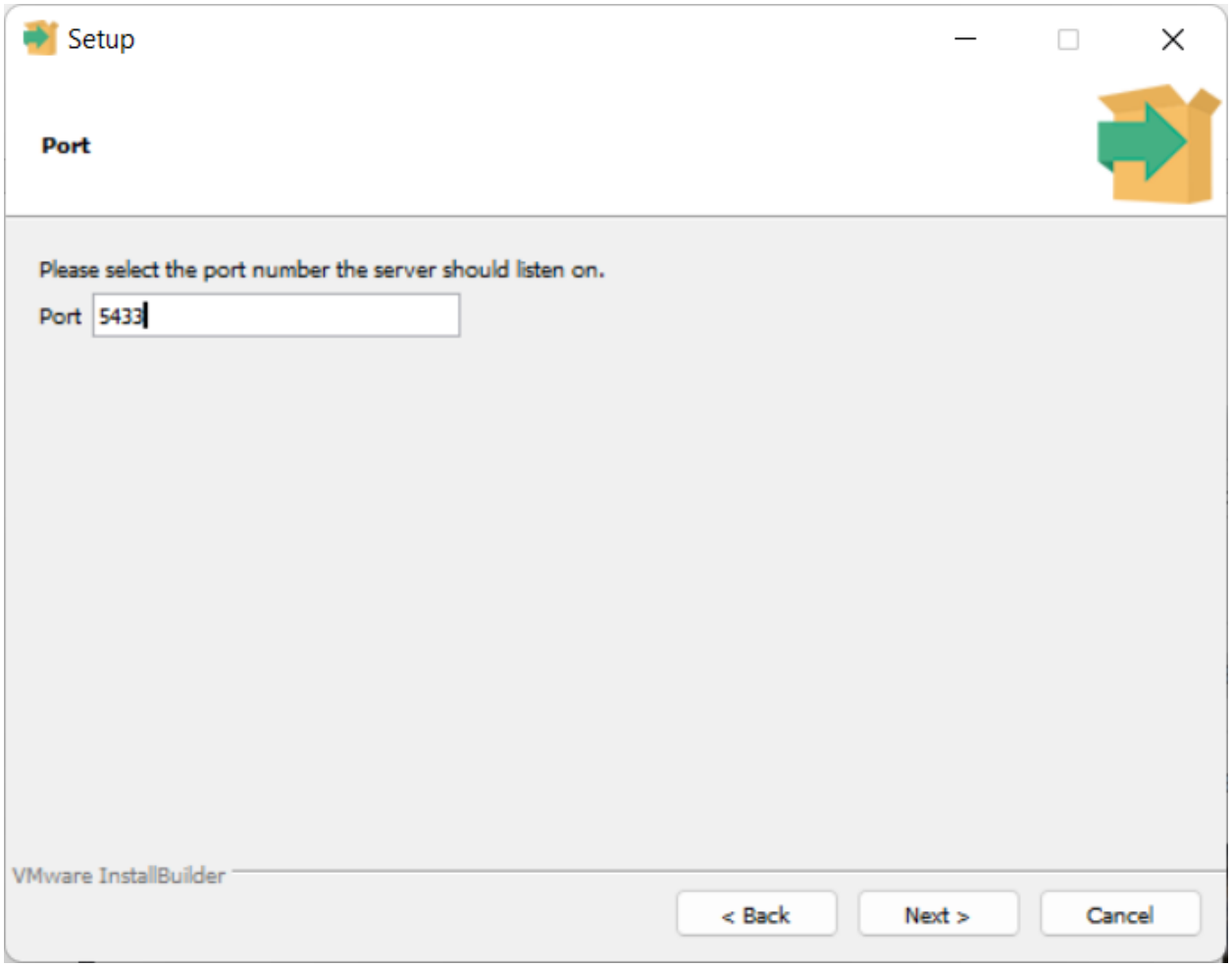

Figure 10: Sixth Installation Window to Enter Port

Note: The port number will be needed to create connections to PostgreSQL server. You should remember this for later usages.

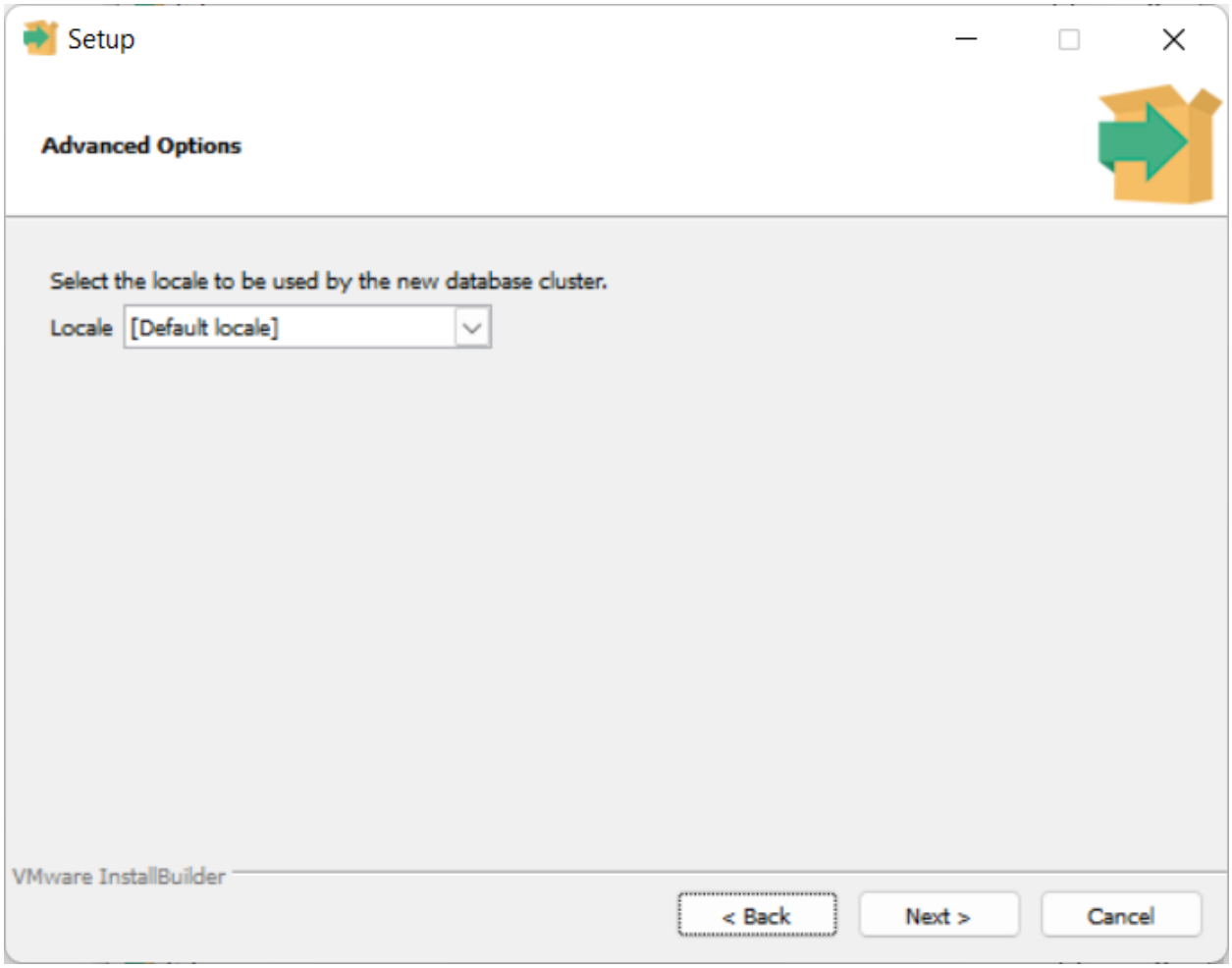

Figure 11: Seventh Installation Window to Enter Locale

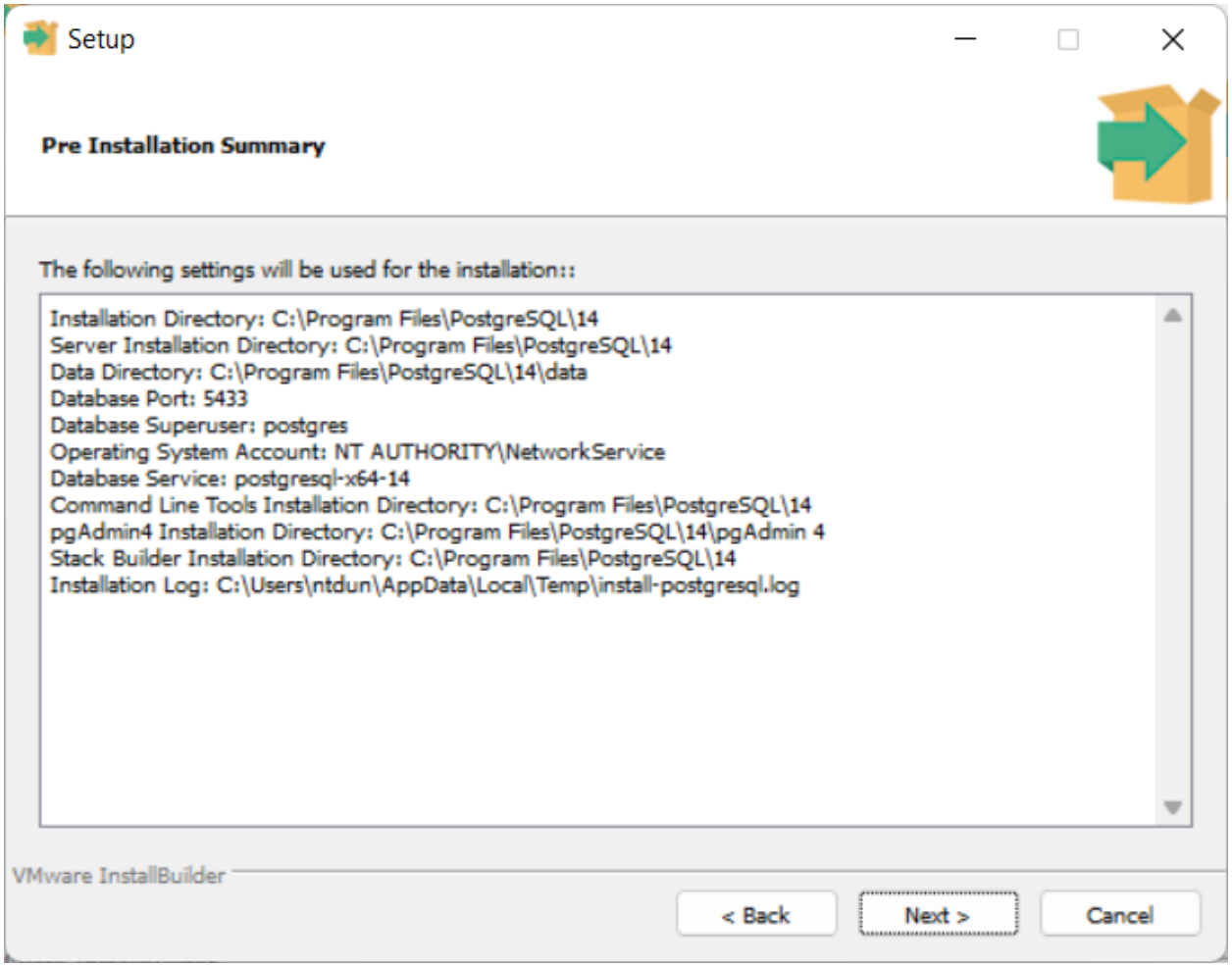

Figure 12: Eigth Installation Window to View Installation Summary

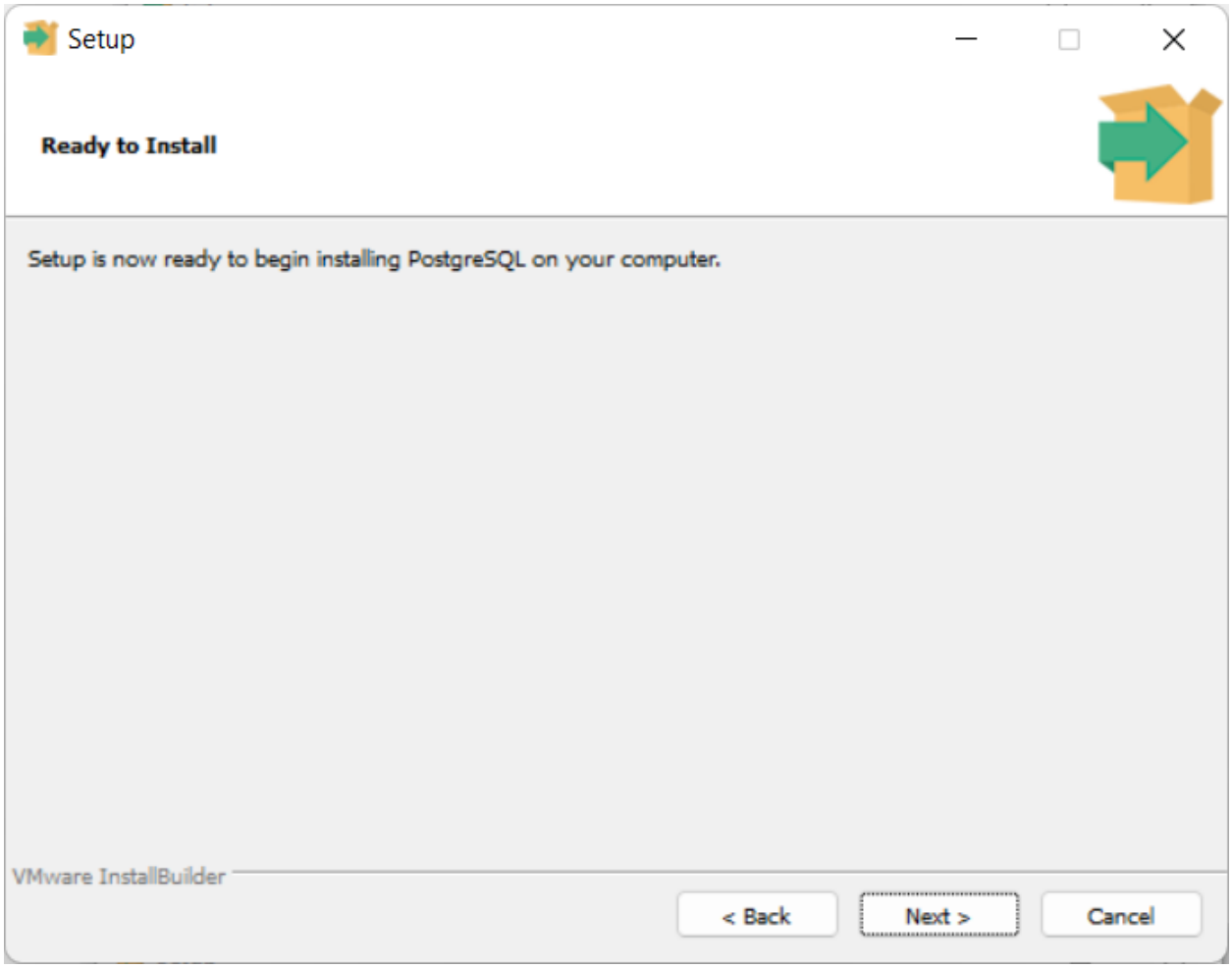

Figure 13: Ninth Installation Window to Start Installation

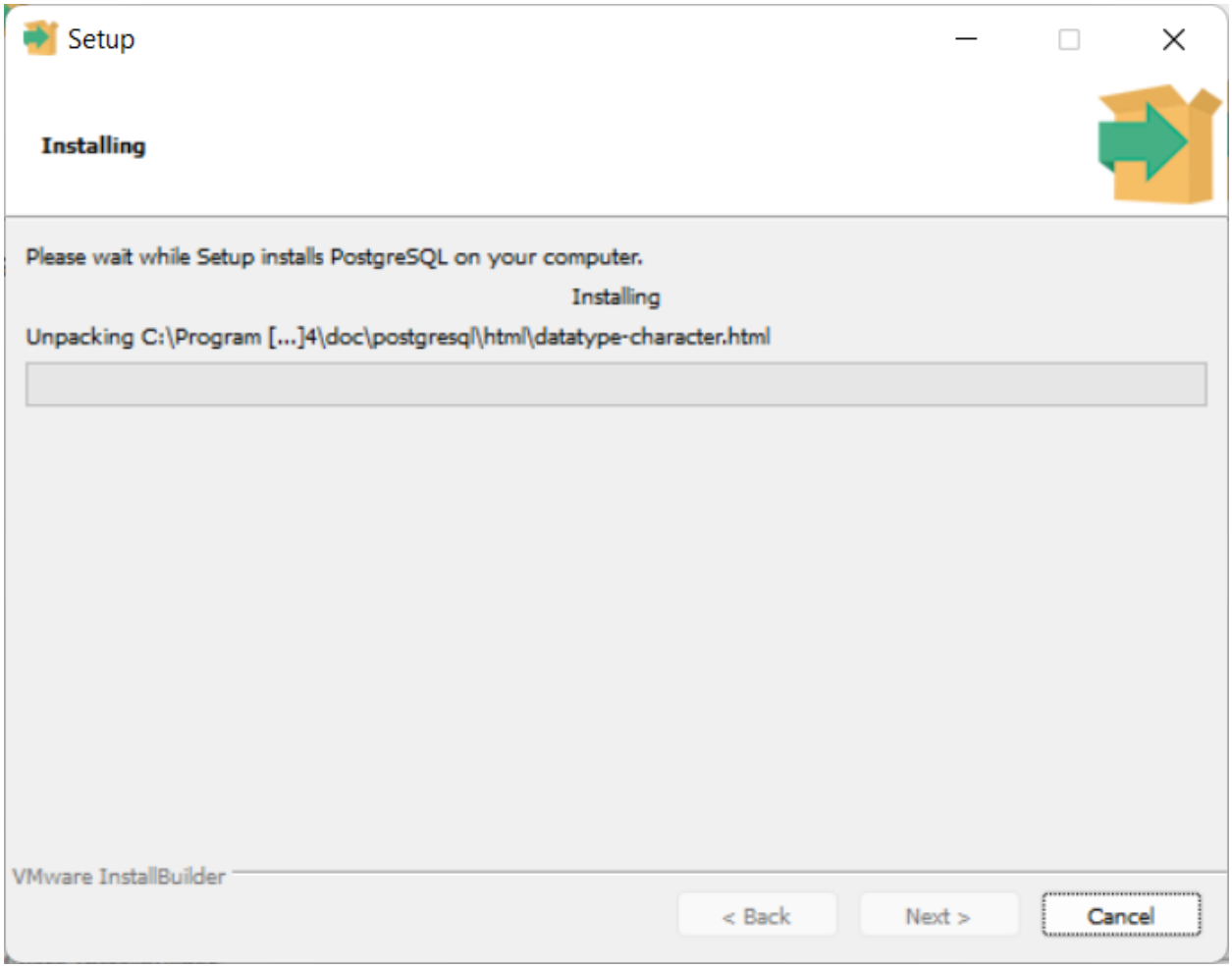

Figure 14: Create Folders and Extract Files

Figure 15: Completing the PostgreSQL Setup Wizard. (You can uncheck here)

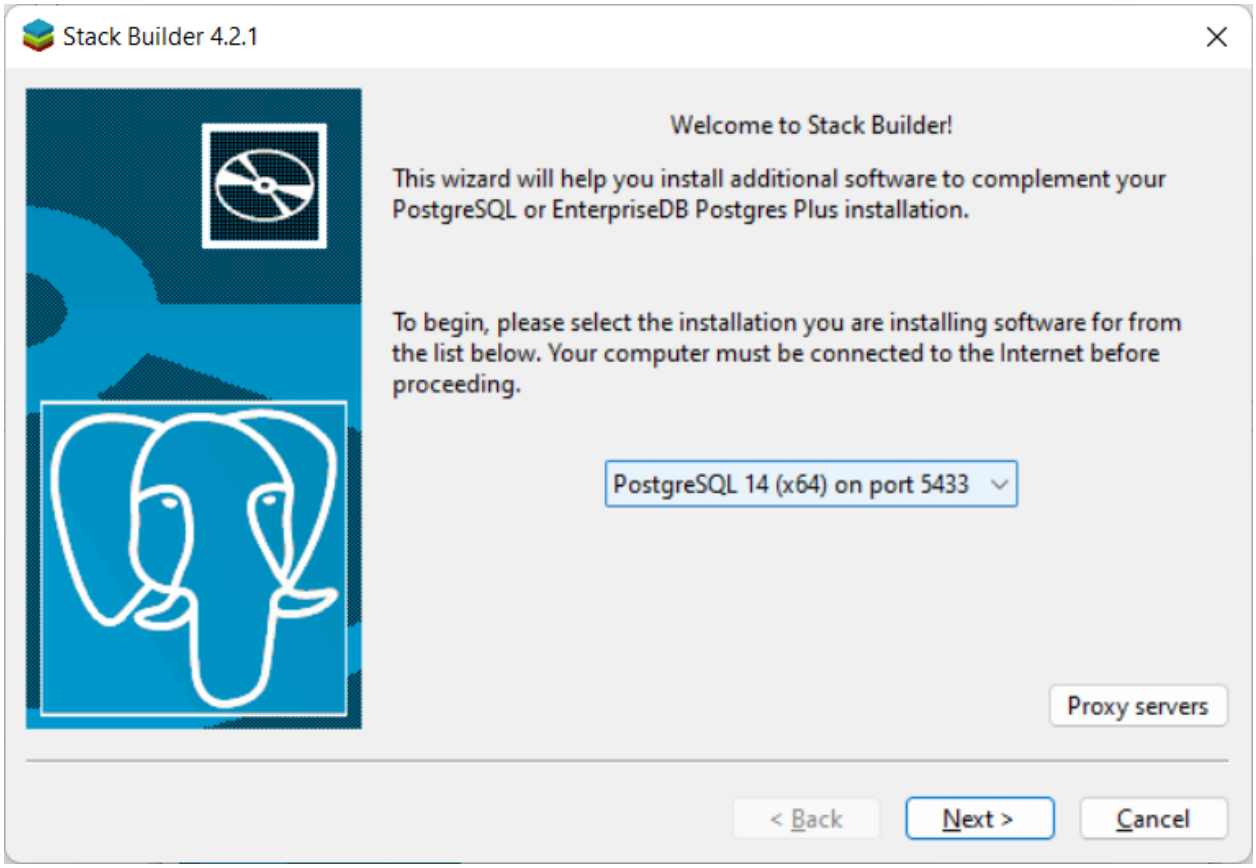

Figure 16: Stack Builder Installation Window (Cancel)

2. Creating and Connecting to a Database using pgAdmin

After installation, you can use pgAdmin, the PostgreSQL client, to create and connect to databases. Start pgAdmin by typing pgAdmin in search box and click on pgAdmin in the result (Figure 17) or browse to pgAdmin in PostgreSQL 14 folder and click on it (Figure 18)

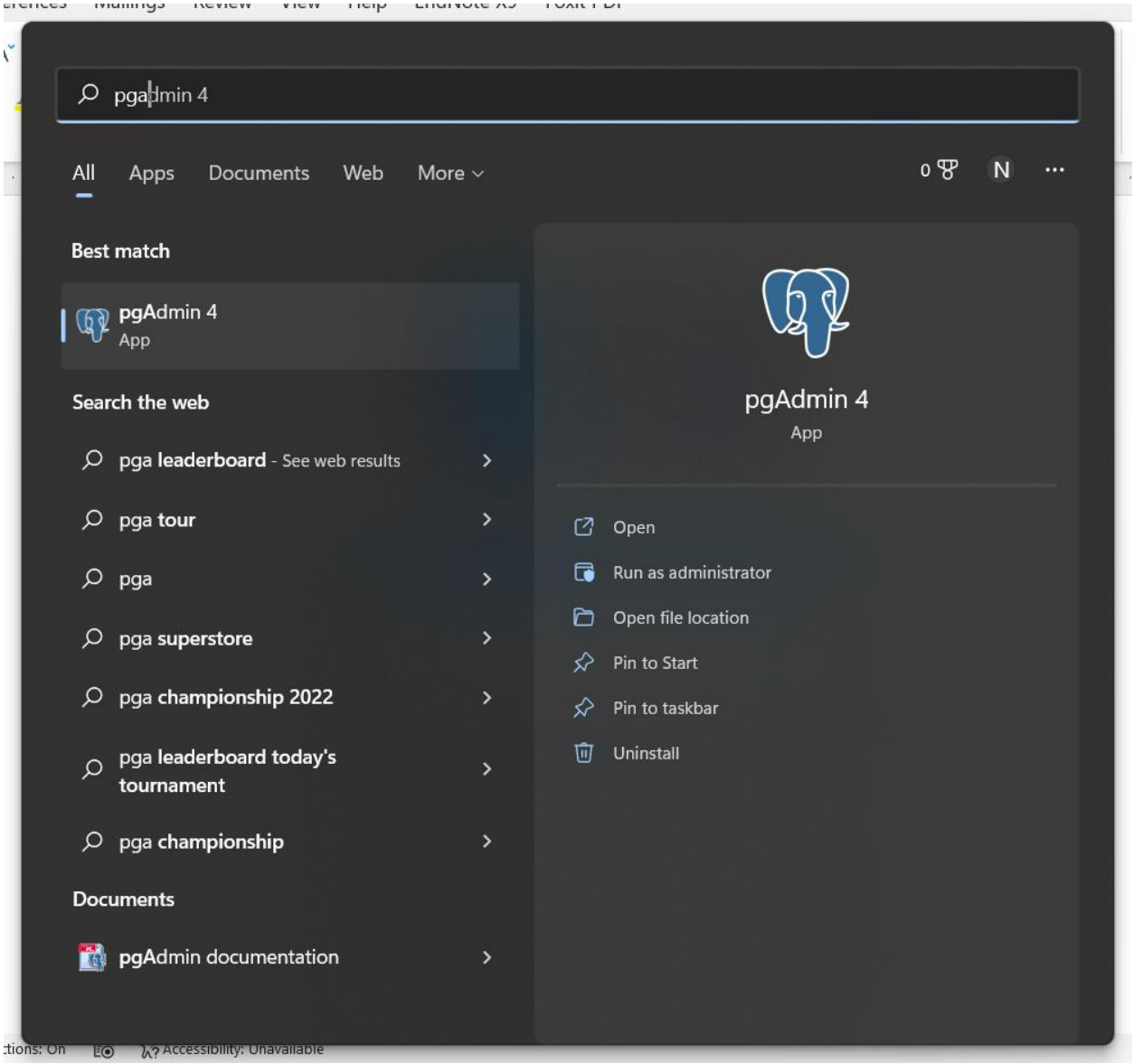

Figure 17: Search and Select pgAdmin from Window Start Search Box

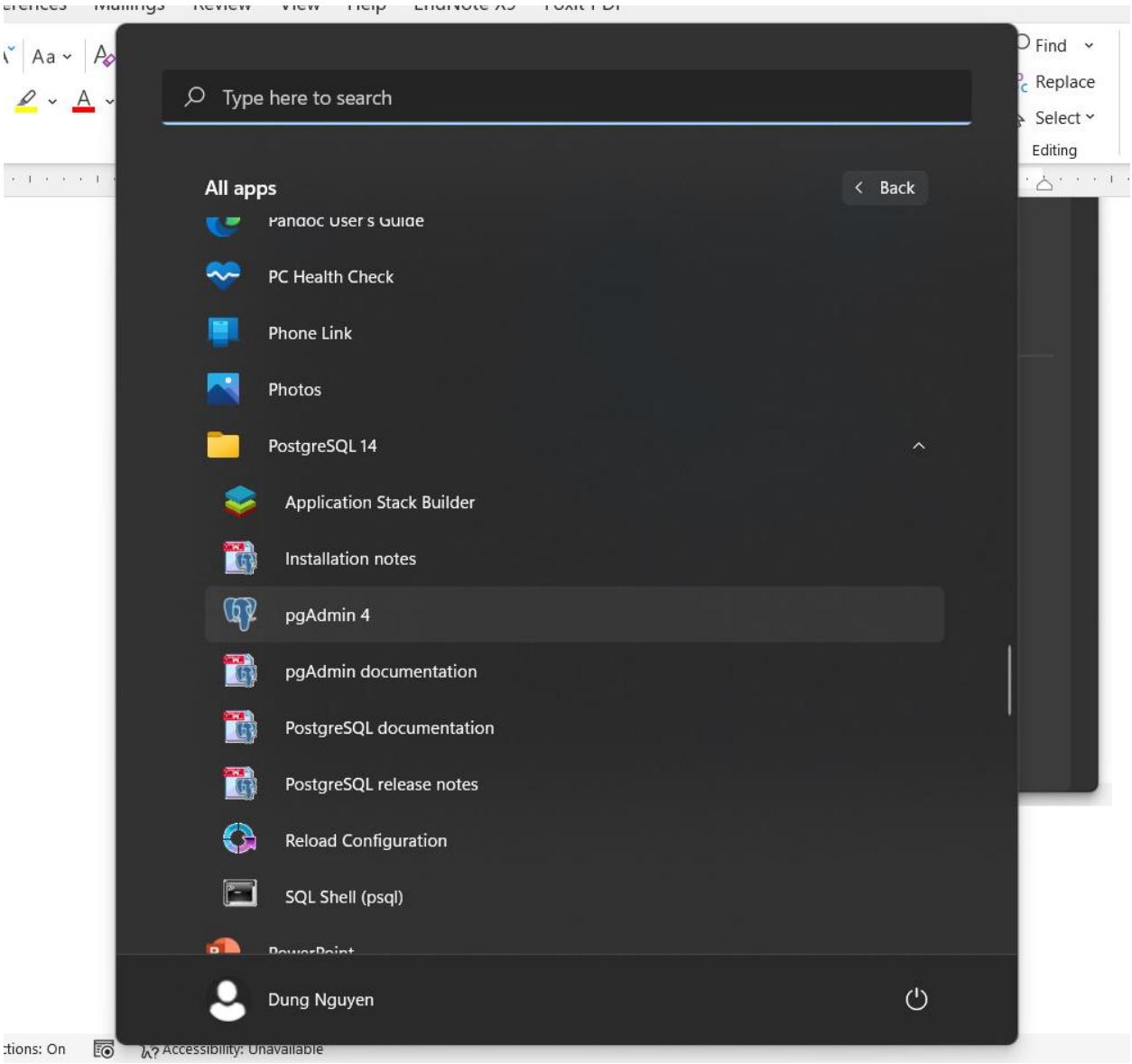

Figure 18: Selecting pgAdmin in the Windows Program List

You can create a short cut to pgAdmin by dragging the pgAdmin icon to the desktop, so you can quickly open it later. Starting pgAdmin window will appear when you click on pgAdmin.

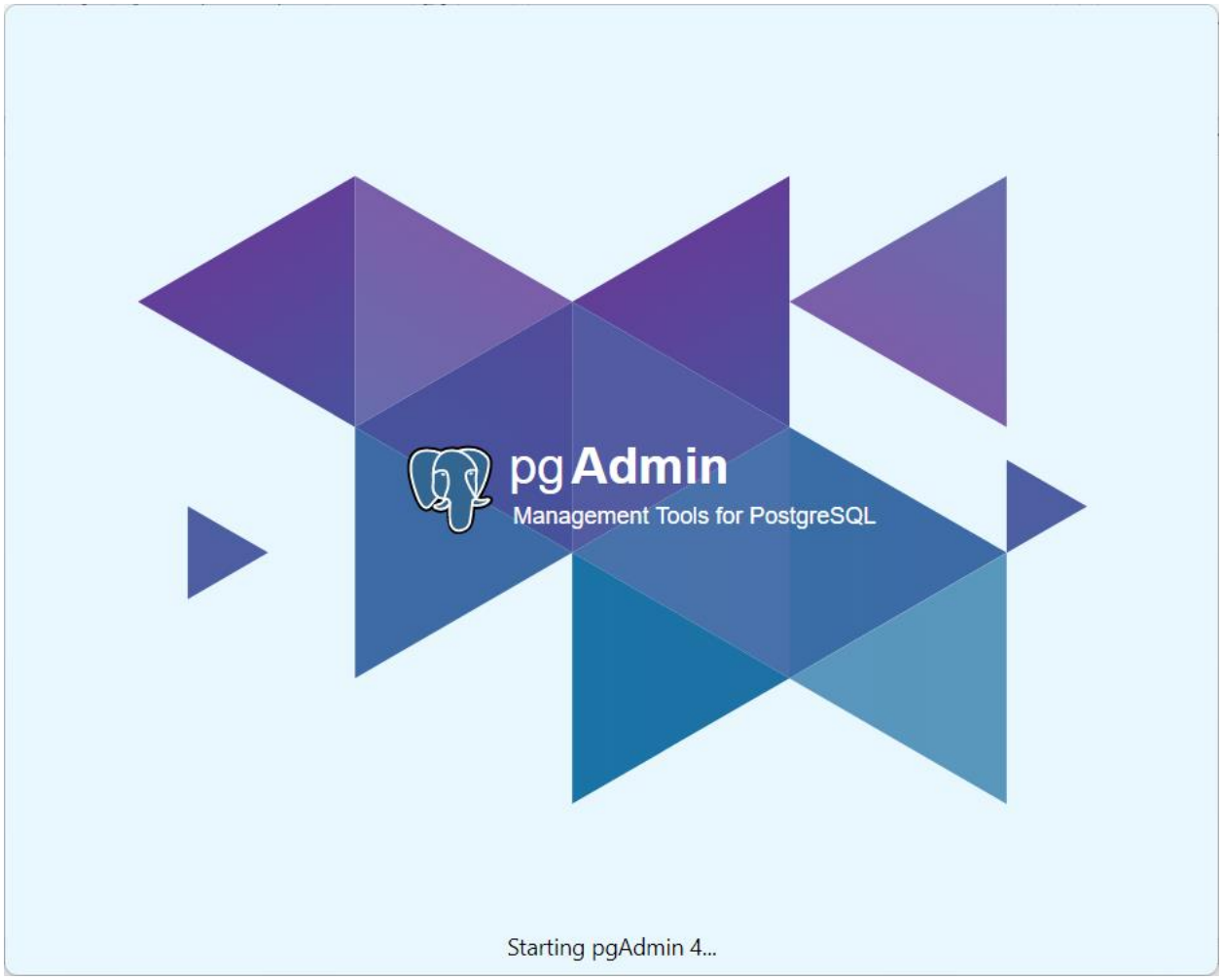

Figure 19: pgAdmin Starting Window

After pgAdmin begins, you need to enter the master password that you provided in the installation process (Figure 20). After entering the password, pgAdmin opens with the Servers object without expansion (Figure 21). After you expand the Servers object, you need to provide the master password again (Figure 22). You can check save so that you do not need to enter password for later access. After the Servers object expands, you can expand the Databases object and Schemas object inside the Databases object (Figure 23).

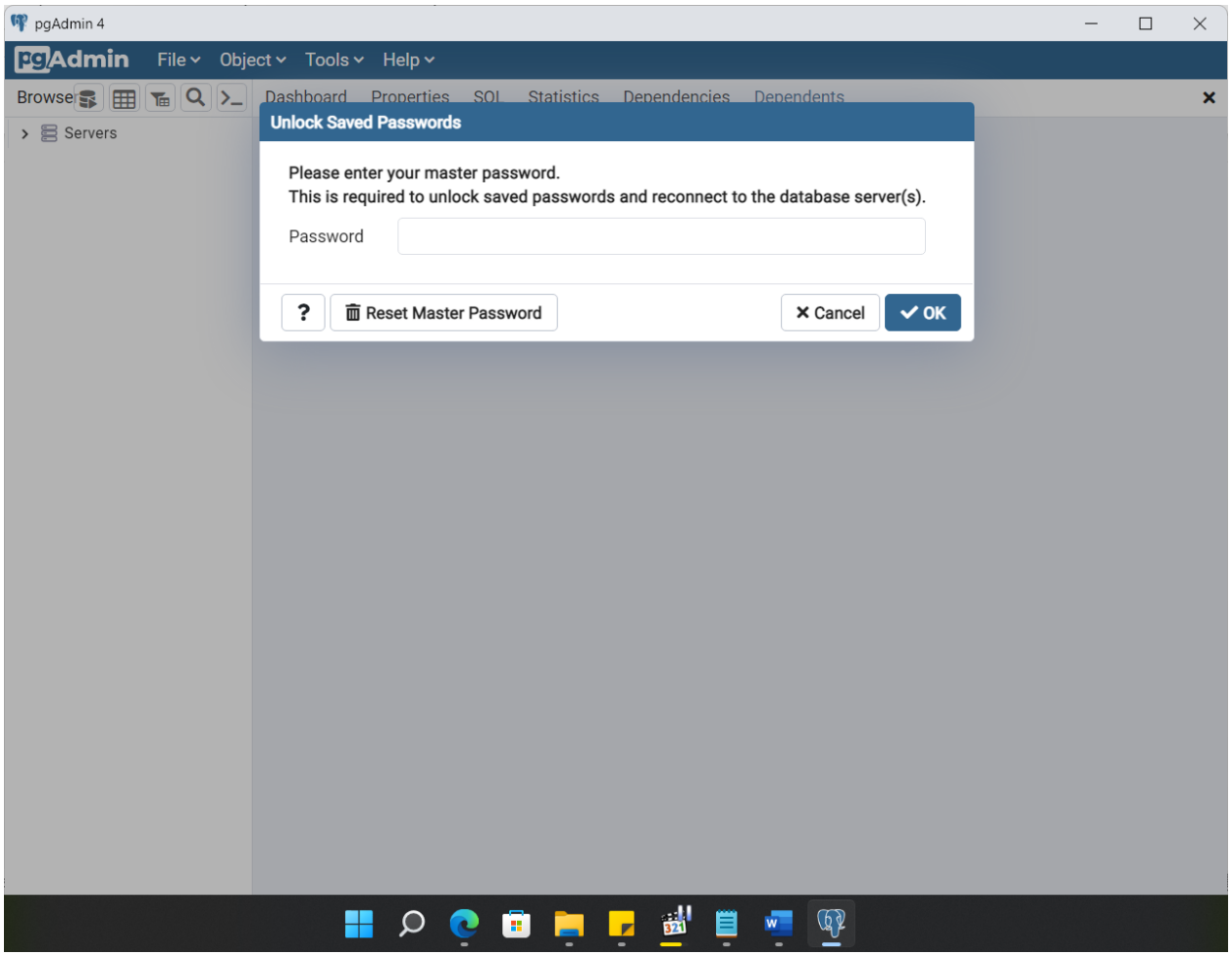

Figure 20: Enter Master Password Window

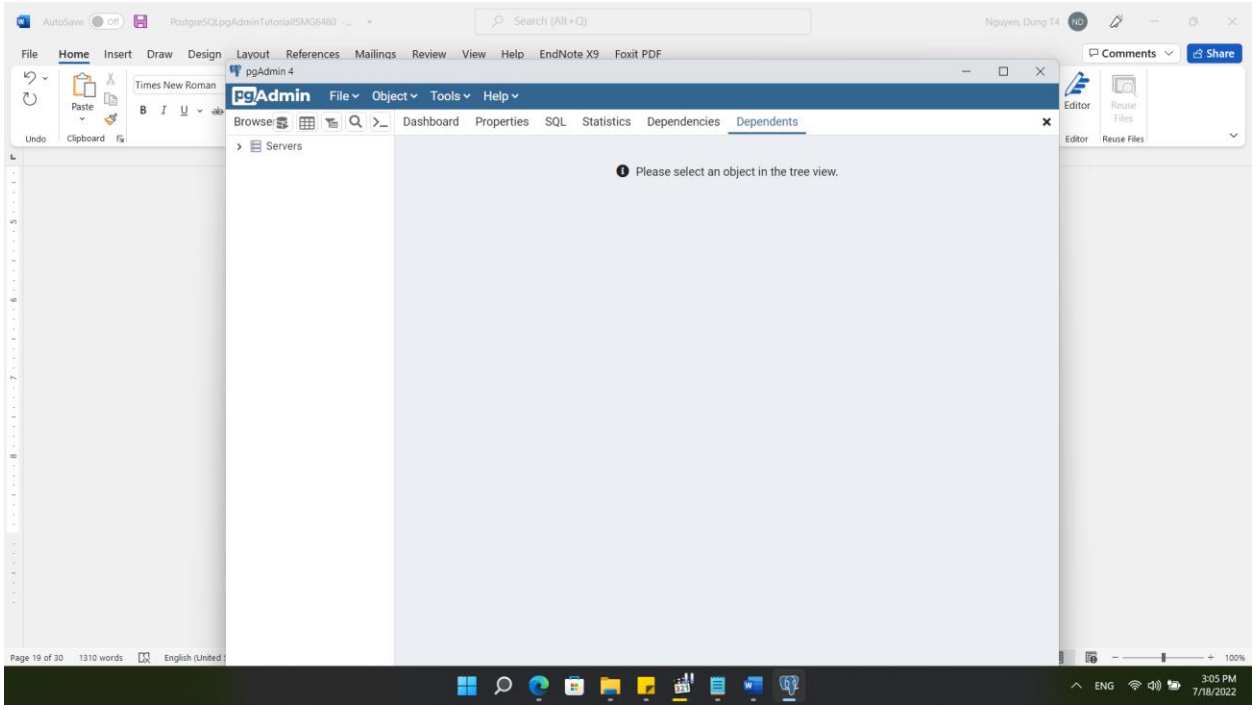

Figure 21: pgAdmin Showing the Servers Object without Expansion

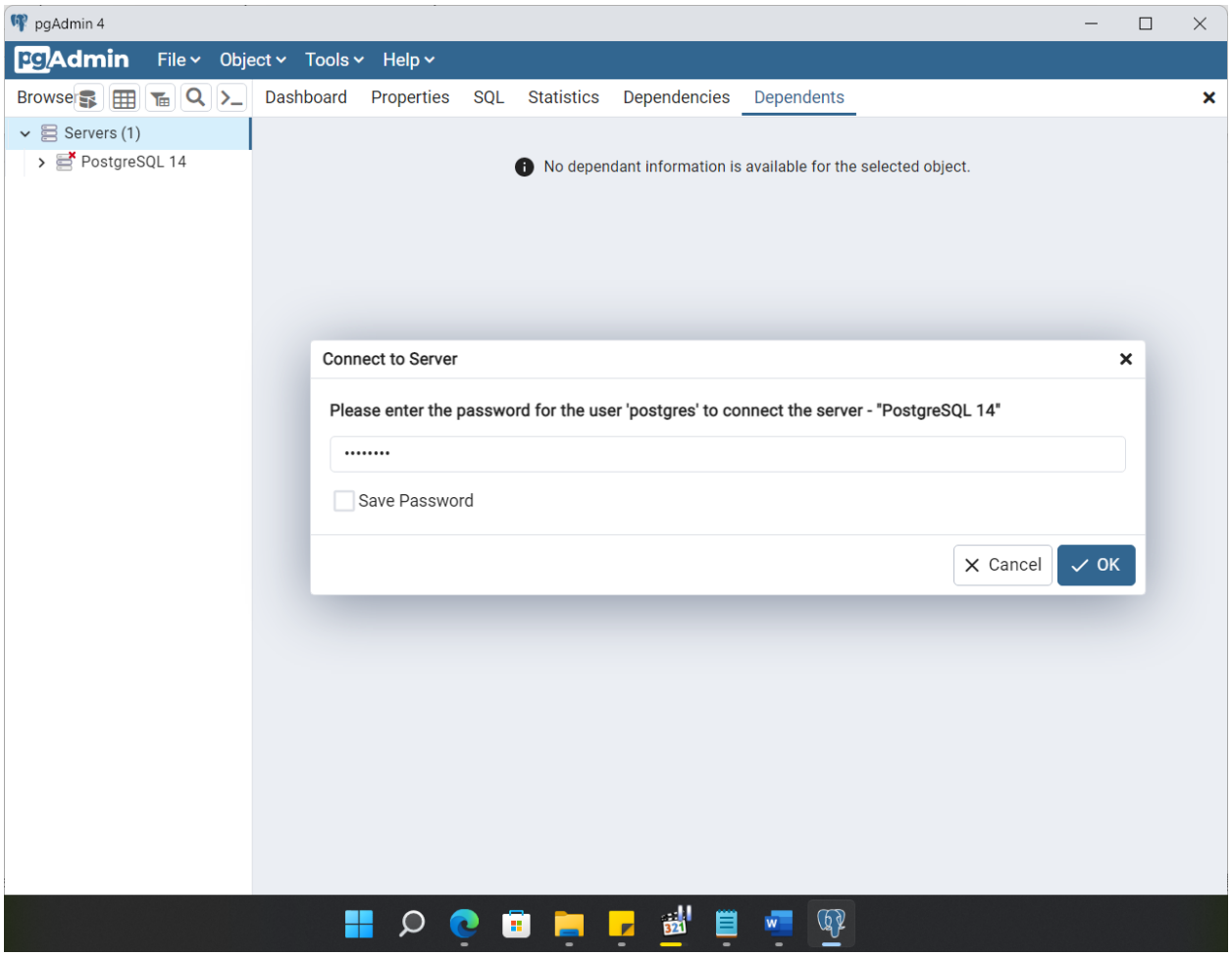

Figure 22: Enter Password for Open Servers

The remainder of this tutorial uses pgAdmin connected to a PostgreSQL 14 database server, the latest version in July 2022. pgAdmin 4 seems to work identically with PostgreSQL 12 and 13 database servers.

Although you can use the default postgres database to execute SQL statements, I recommend creating separate databases for each database used in the course. With separate databases, you will not have conflicts among common table names in the course databases. Follow these steps to create a new database for the university database tables and then connect to the new database so that you can enter SQL statements to create and populate tables.

- Right click on the Databases (1) object inside the PostgreSQL 14 object (Figure 24). Select Create -> Database …
- Enter the database name (UnivDB) and click the Save button (Figure 25). The window will be closed, and you will see the notification to show the database was successfully connected. (Figure 26)
- Expand the Databases object to see the StoreSales database (Figure 27).

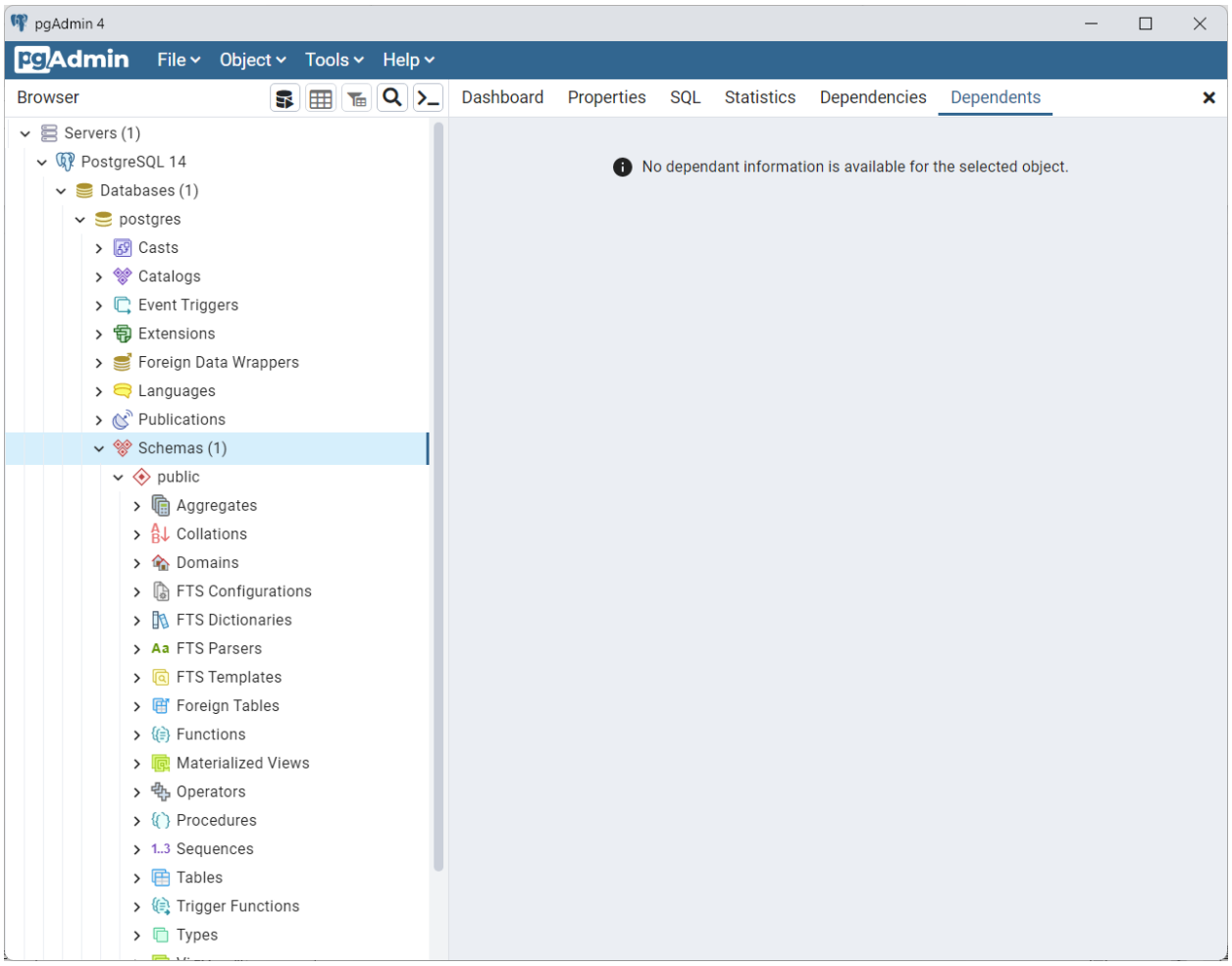

Figure 23: Expansion of Databases and Schemas Objects

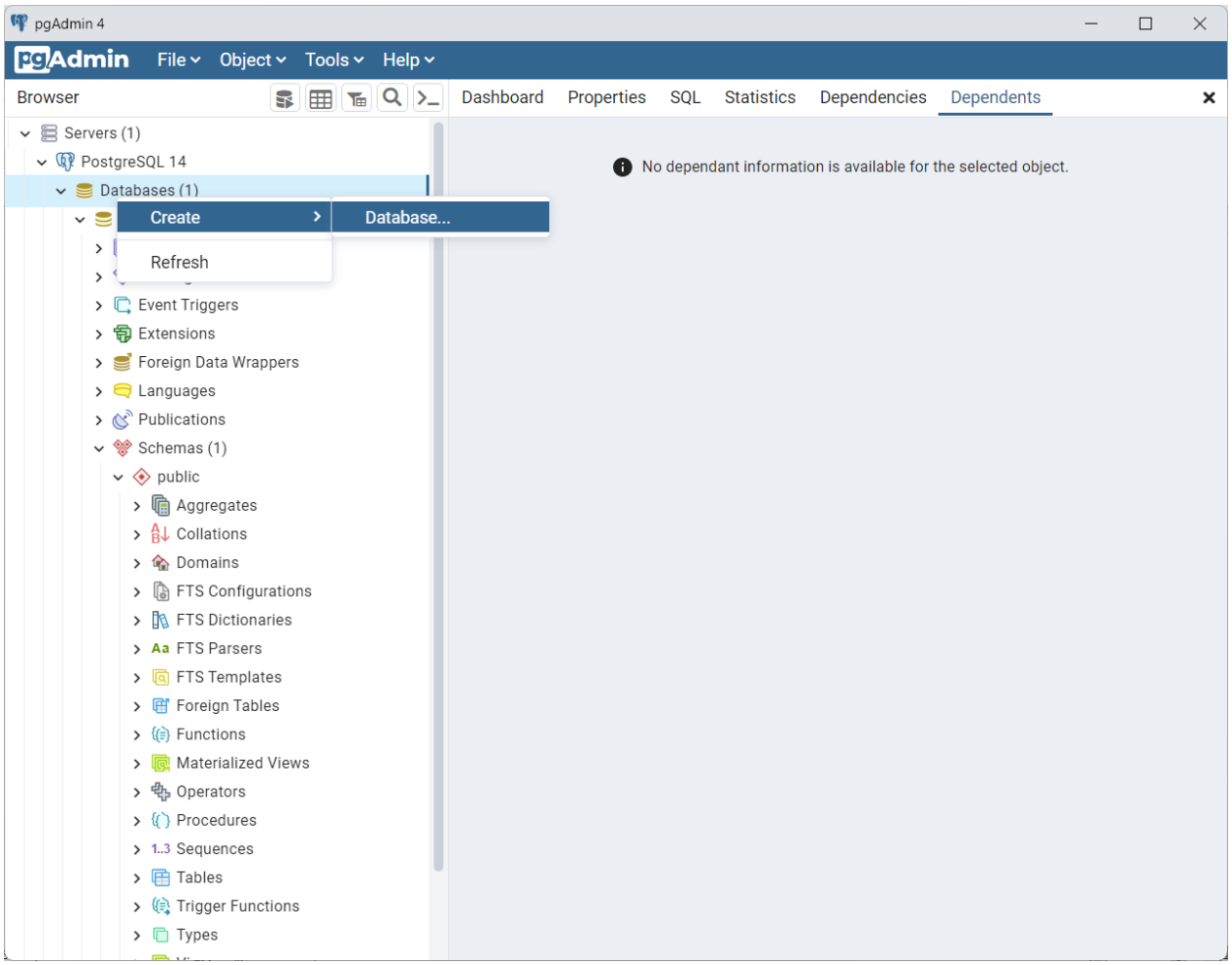

Figure 24: Create New Database

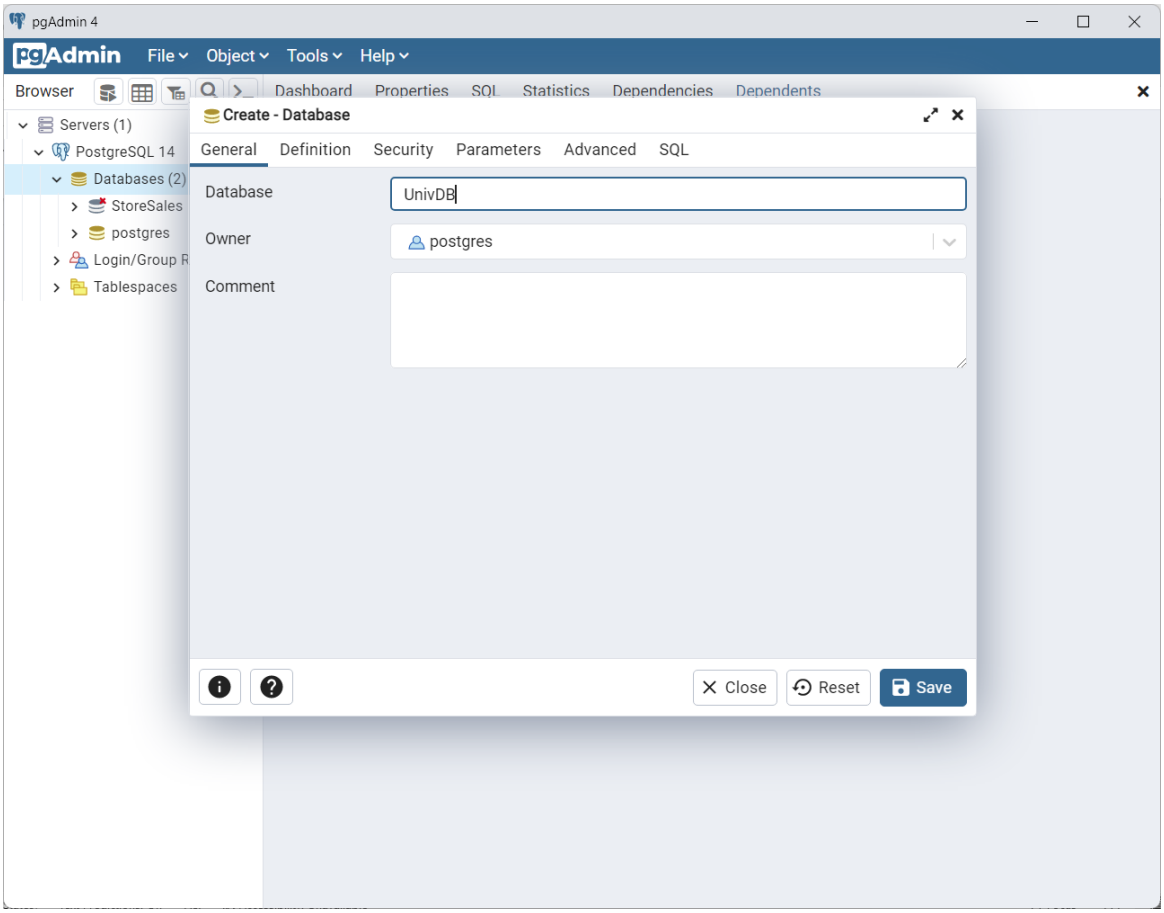

Figure 25: Enter Database Name Window

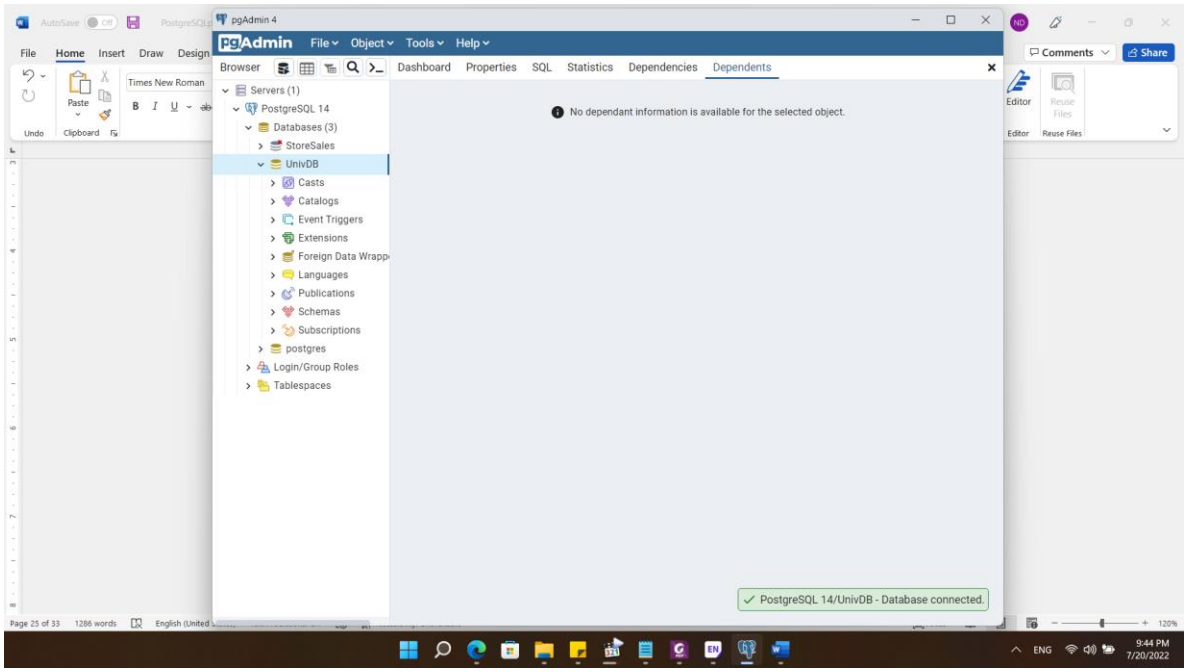

Figure 26: Connect to New Database

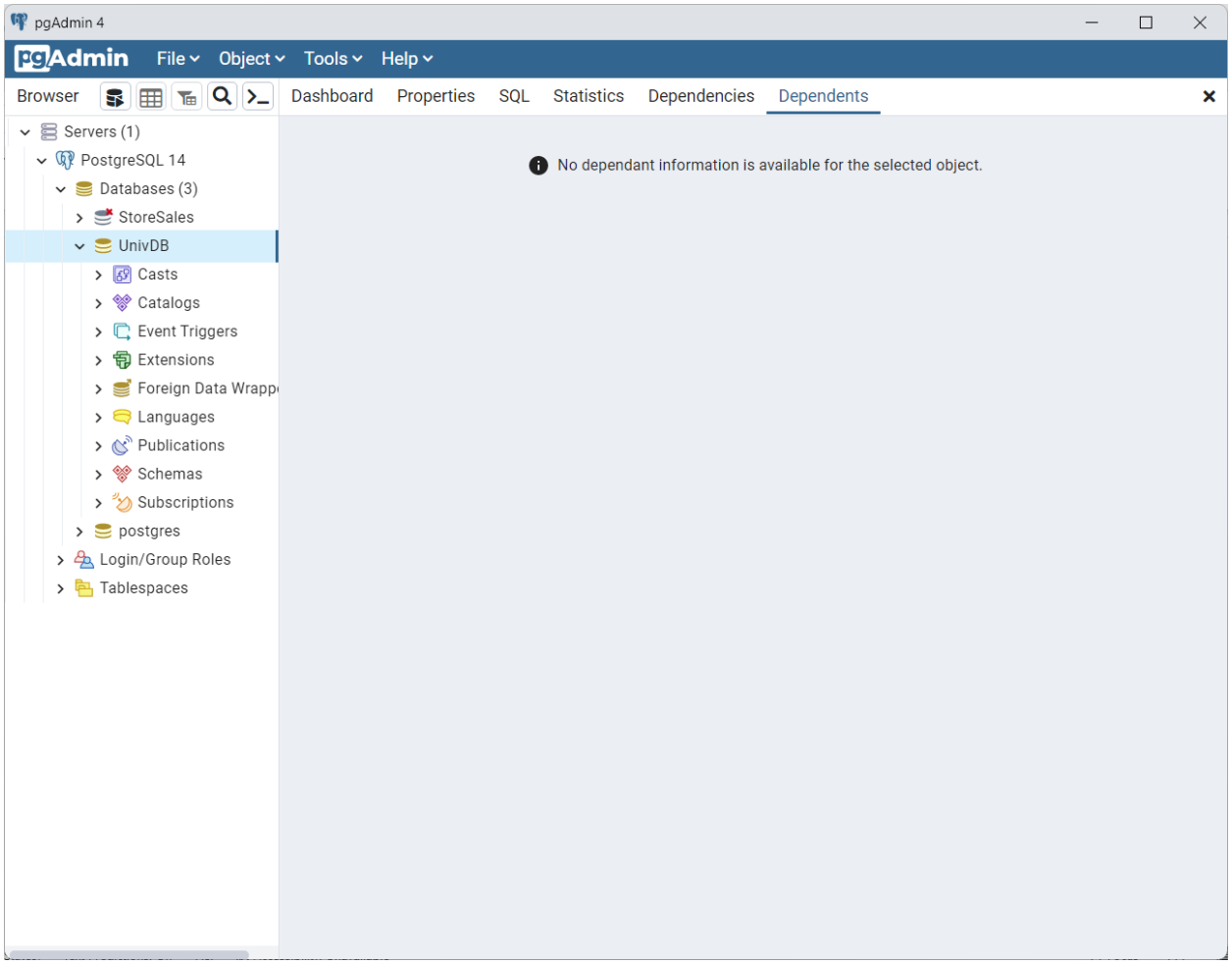

Figure 27: Expanded Databases Object Showing UnivDB Database

3. Executing SQL Statements

pgAdmin provides the Query Tool to enter and execute SQL statements. You open the Query Tool for each database in which you want to execute SQL statements. Follow these steps to create and populate the university database tables. For other databases, you can create the database as described in the previous section and the use the Query Tool to execute SQL statements.

- Expand the UnivDB object (Figure 28). The click the Query Tool () to open the Query Window for the UnivDB database. Alternatively, you can right click on the UnivDB object and select Query Tool.
- The Query Window opens showing a new panel (top right) for the UnivDB database (Figure 29). Make sure the database name (in red boxes) is correct
- Copy and paste the CREATE statements for the University Database. You can find these statements in Module 2 Lecture Notes page. Click the Run button () to execute the statements (Figure 30).
- Use the Clear Query (Figure 31) in Edit menu  . Respond Yes to the prompt about discarding the current changes in the Query Window (Figure 32)
- Copy and paste the INSERT statements for the University Database. You can find these statements in the Module 3 Lecture Notes. Click the Run button to execute the statements (Figure 33).
- Expand the Tables object (Figure 34) to see the list of tables created.
- You can count the rows to verify the execution of the INSERT statements. Right click the *Student* table and select Count Rows (Figure 35).

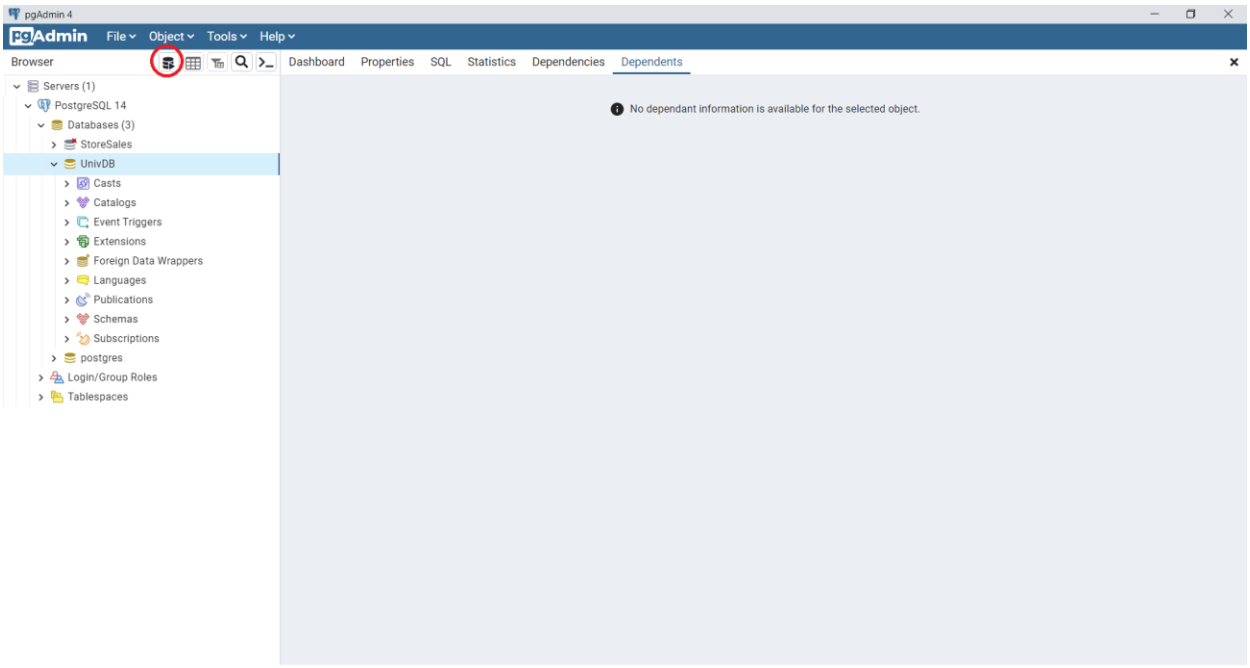

Figure 28: Expanded UnivDB Object Showing Query Tool Button

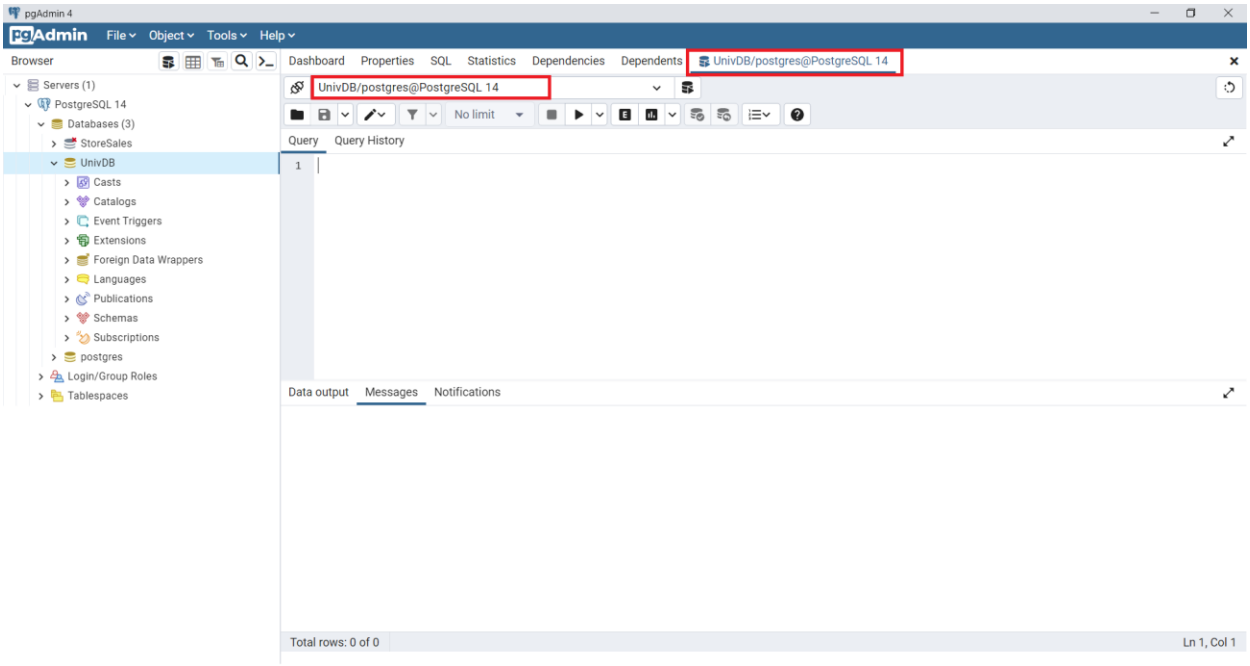

Figure 29: Expanded UnivDB Object with Query Editor Window

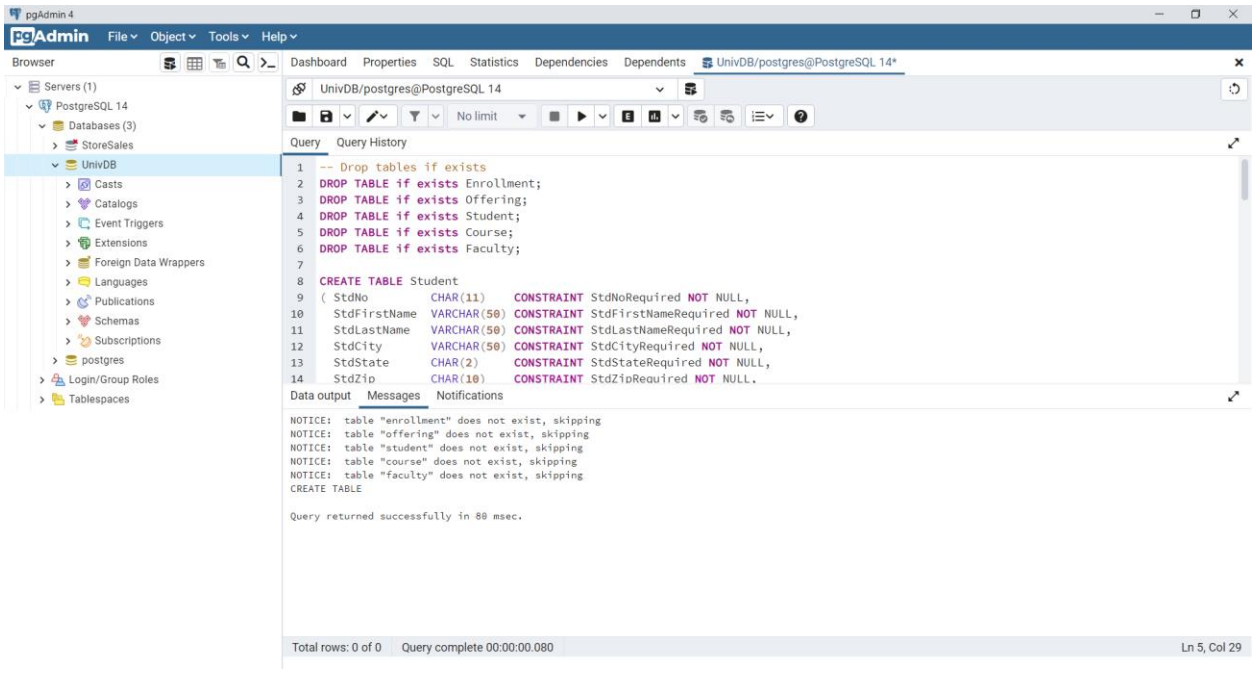

Figure 30: Query Editor Window with Executed SQL Statements to Create Tables

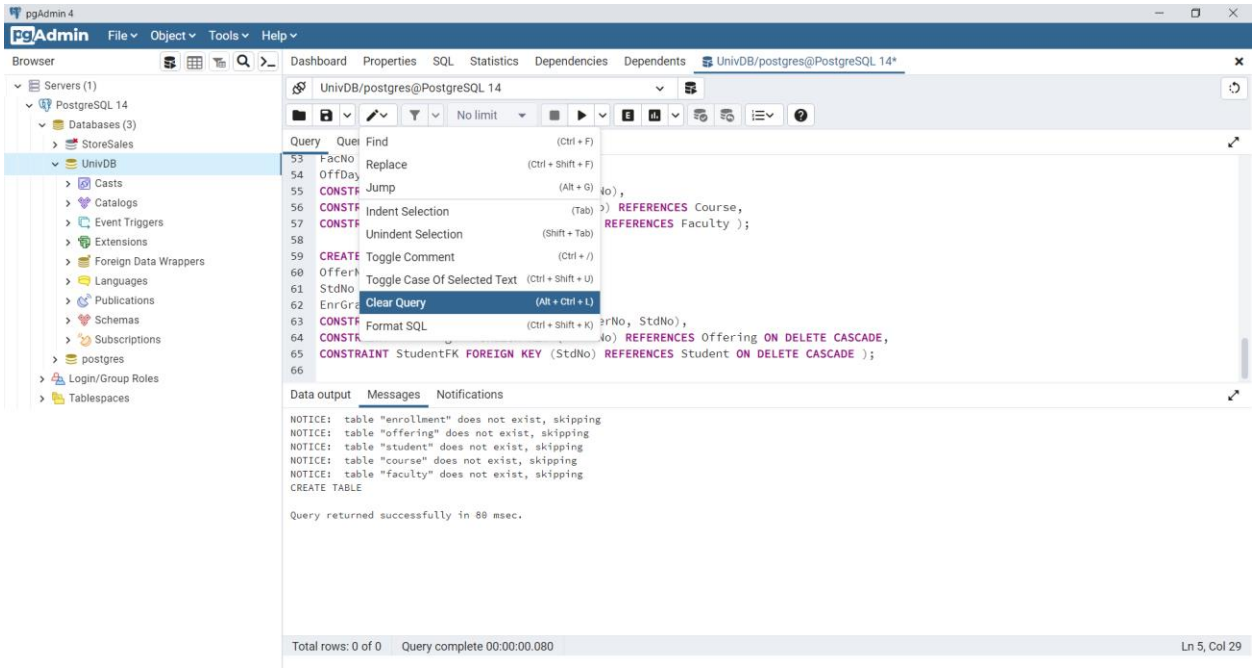

Figure 31: Clear Query Window Selection

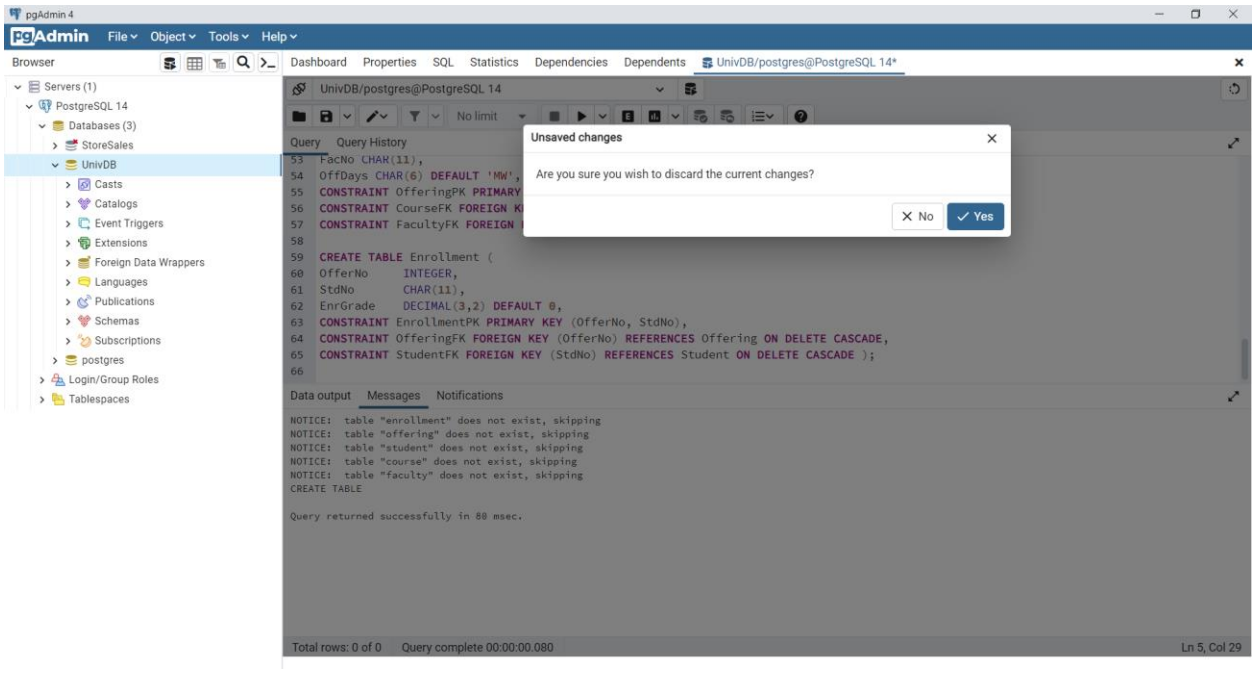

Figure 32: Selecting Yes to Clear Query Window

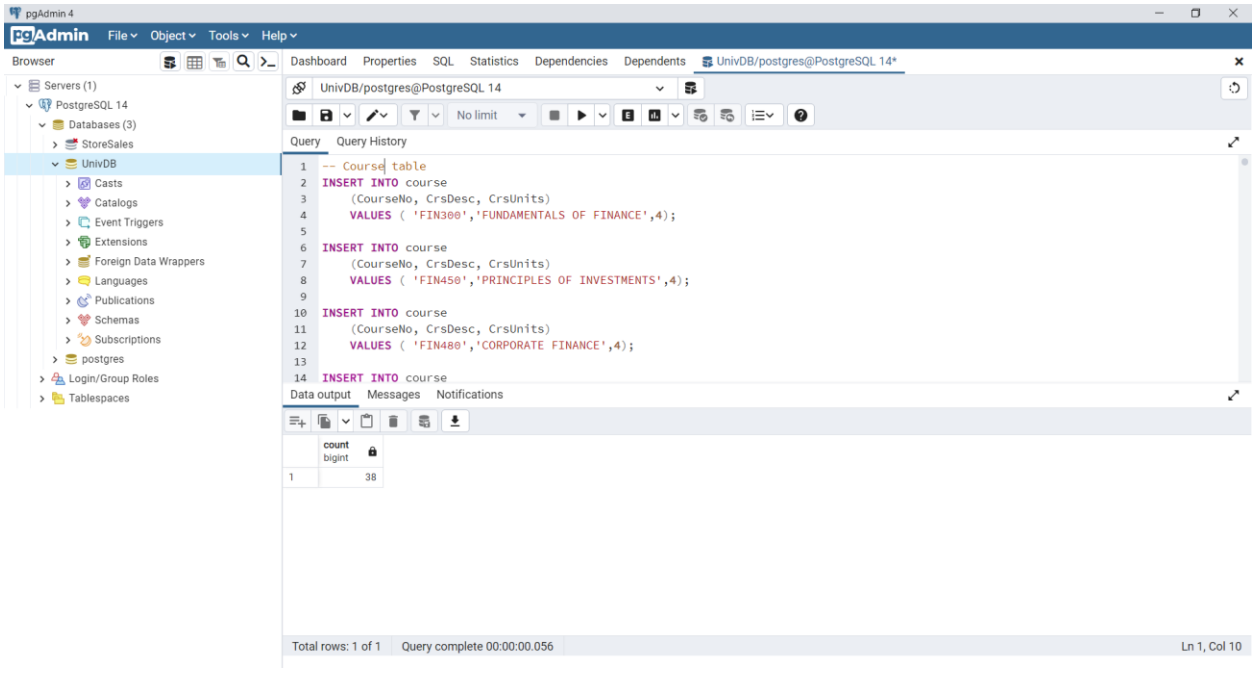

Figure 33: Query Editor Window with Executed SQL Statements to Populate Tables

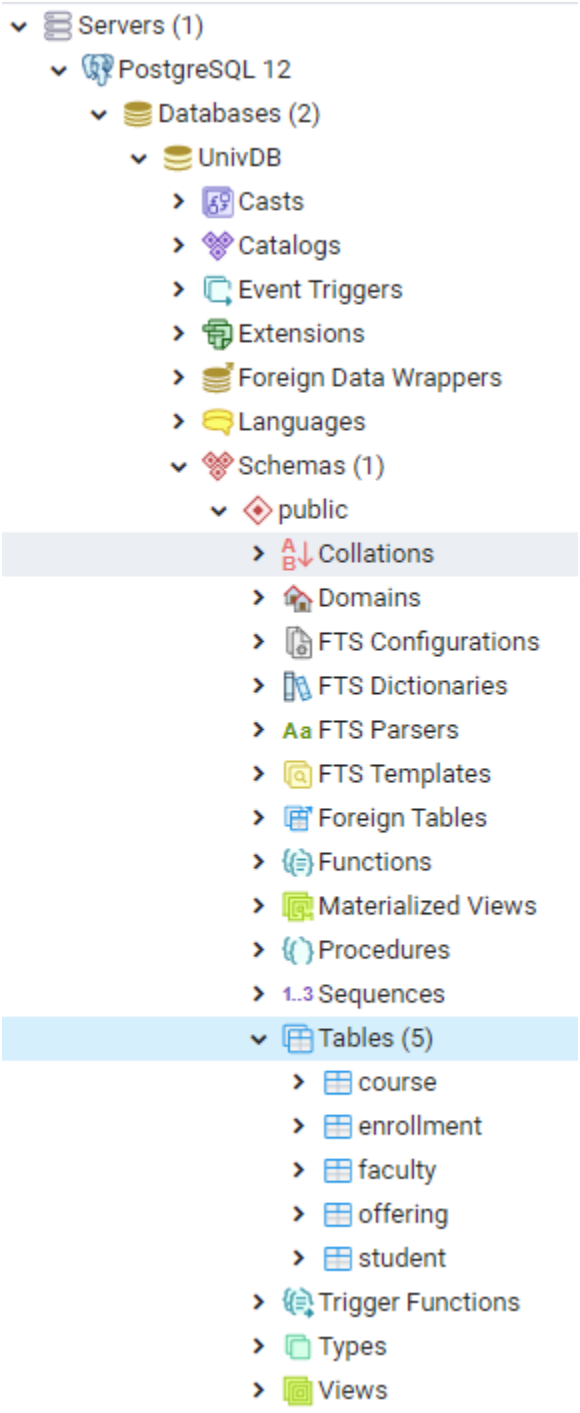

Figure 34: Expansion of Tables Object in the UnivDB Database

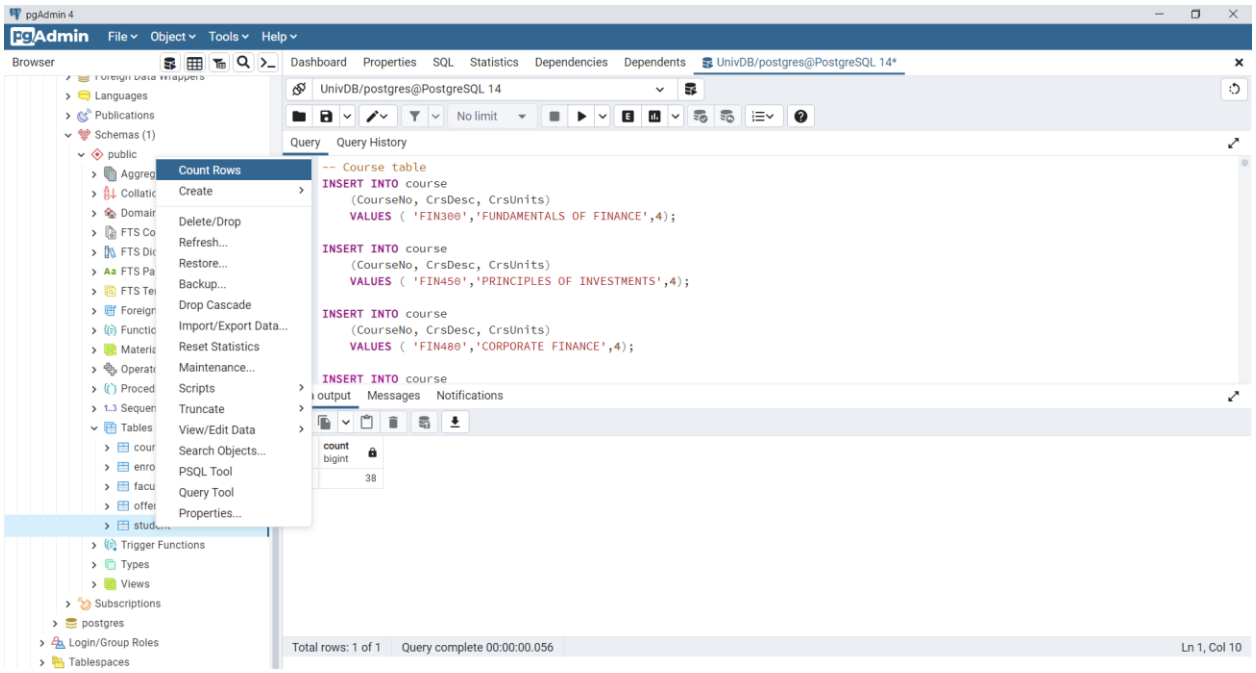

Figure 35: Counting Rows Selection for the *Student* Table

4. Using pgAdmin for Assignments

After completing this tutorial, you should be confident to use pgAdmin for work on SQL assignments. To use pgAdmin, you should open pgAdmin, expand the database that you previously created, and open the Query Tool for the database to execute SQL statements. If you have not created the database used in the assignment, lecture class, or lab class, you should follow the steps to create and populate a new database before executing SQL statements for the assignment or course examples.