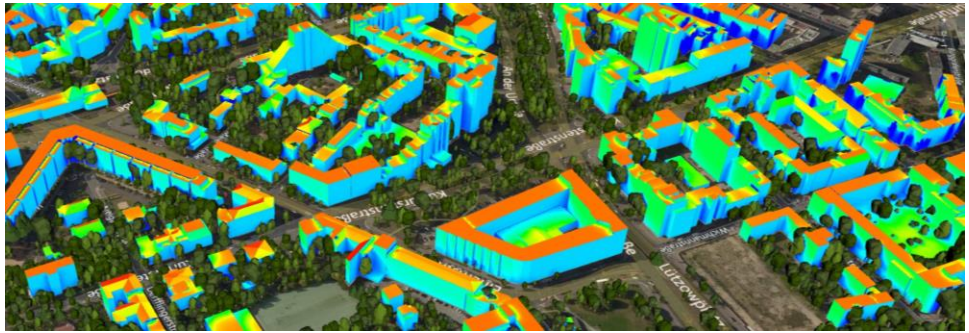
3D City Database 4.x (for PostgreSQL)

Quick installation guide for Ubuntu

CityGML

CityJSON



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Overview

Install required software

Set up the database

Connect to the database via the Importer/Exporter

Add additional database schemas (Optional)

Install ADE plug-ins (Optional)

Overview

Install required software

Set up the database

Connect to the database via the Importer/Exporter

Add additional database schemas (Optional)

Install ADE plug-ins (Optional)

Software requirements

Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

- **PostgreSQL**
  - See next slide for different download possibilities
- **PostGIS**
  - Often shipped as package together with your Linux distribution
  - https://postgis.net/documentation/getting_started/install_ubuntu/
- **pgAdmin**
  - https://www.pgadmin.org/download/pgadmin-4-apt/
- **Java 11 JDK or higher**
  - https://www.oracle.com/java/technologies/javase/jdk11-archive-downloads.html
- **CityGML 3D City Database Suite**
  - https://github.com/3dcitydb/3dcitydb-suite/releases
- **Google Earth Pro**
  - Optional, only if you want to export to KML/Collada
  - https://www.google.com/earth/versions/#download-pro
- **NodeJS**
  - Optional, needed only if you want to use the Web-map-client
  - https://github.com/nodesource/distributions

Software installation order

Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

1) **Install PostgreSQL** (different ways available)
   - Install **PostGIS**
   - Install **pgAdmin** (optional, but highly recommended)

2) **Install Java**
   - Required by the Importer/Exporter
   - https://www.oracle.com/java/technologies/javase/jdk11-archive-downloads.html

3) **Install the 3DCityDB Suite**
   - Execute the Java **.jar file**, it will start the installation process

4) **Install Google Earth**
   - Optional, installation procedure not covered in these slides

5) **Install NodeJS**
   - Optional, installation procedure not covered in these slides

PostgreSQL sources

Software required
Software install
Database setup
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You can install PostgreSQL on Ubuntu in different ways:

- **Using the packages available by default**
  - Each Ubuntu version comes with a "fixed" edition, supported throughout the lifetime of that Ubuntu version
    - For example, Ubuntu 22.04 is shipped with PostgreSQL 14.x
  - https://www.postgresql.org/download/linux/ubuntu/

- **PostgreSQL Apt Repository**
  - Here, more recent versions of PostgreSQL are also available
  - https://wiki.postgresql.org/wiki/Apt

PostgreSQL via Ubuntu packages

Software required
Software install
• **PostgreSQL**
• PostGIS
• pgAdmin
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

- **RECOMMENDED!** Unless you *really* need the latest version of PostgreSQL, this is the most straightforward way of installing it on your Ubuntu machine.
- These slides are based on the notes available at
  - https://www.postgresql.org/download/linux/ubuntu/
  - https://www.digitalocean.com/community/tutorials/how-to-install-postgresql-on-ubuntu-22-04-quickstart

- **Prerequisites:** you need a user with sudo privileges (or to login as root)

- The next steps must be carried out from a command console and are hightlighted in this way. You can simply copy & paste them (minor adjustments may be required)
- In these slides, some commands require Midnight Commander (mc) to edit some text files. However, you can use any other text editor
- If not already available, you can install Midnight Commander directly from the command console as follows

```
sudo apt install mc
```

PostgreSQL via Ubuntu packages

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
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Database setup
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ADE plug-ins
Further resources

Step 1: Refresh your server's local package index

```
sudo apt update
```

Step 2: Install the PostgreSQL, PostGIS and all dependent packages

```
sudo apt install postgresql postgresql-contrib postgis
```

For example, the default PostgreSQL version is version **14** in Ubuntu 22.04

- To check the **installed version**, you can run for example

```
sudo updatedb
locate bin/postgres
```

You should see something like this in the console (here: **14** stands for the installed version)

```
/usr/lib/postgresql/14/bin/postgres
```

- Check the **server port** (if required, change **14** to your installed version)

```
grep "port = " /etc/postgresql/14/main/postgresql.conf
```

The default port number is **5432**. If it is different, take note as you'll need it later

PostgreSQL via Ubuntu packages

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
• Java
• 3DCityDB Suite
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Further resources

Step 3: Start the PostgreSQL server

```
sudo systemctl start postgresql
```

Check whether the PostgreSQL server has been started correctly

```
sudo systemctl status postgresql
```

You should see something like this in the console:

```
● postgresql.service - PostgreSQL RDBMS
     Loaded: loaded (/lib/systemd/system/postgresql.service; enabled; vendor preset: enabled)
     Active: active (exited) since Tue 2024-01-30 17:12:23 CET; 18s ago
    Process: 3520 ExecStart=/bin/true (code=exited, status=0/SUCCESS)
   Main PID: 3520 (code=exited, status=0/SUCCESS)
        CPU: 1ms
```

Although not needed here, these are the complementary commands to stop the PostgreSQL server

```
sudo systemctl stop postgresql
```

and to disable the service (it won't start anymore automatically at boot)

```
sudo systemctl disable postgresql
```

PostgreSQL via Ubuntu packages

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
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Database setup
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Step 4: Change/set a secure password of user *postgres* that has been created by default upon installation and has database superuser privileges.
First, switch to the *postgres* user and load the psql client. **–p** is used for the **server port** (e.g. **5432**)

```
sudo -u postgres psql –p 5432
```

Then, from within psql, set the new password for user *postgres*

```
ALTER USER postgres PASSWORD 'write_here_your_new_robust_password';
```

Finally, exit psql

```
\q
```

Test whether you can connect as *postgres* user using the new password:

```
psql –U postgres –h localhost –p 5432
```

You should see something like this in the console:

```
psql (14.10 (Ubuntu 14.10-0ubuntu0.22.04.1))
SSL connection (protocol: TLSv1.3, cipher: TLS_AES_256_GCM_SHA384, bits: 256, compression: off)
Type "help" for help.

postgres=#
```

Again, exit psql:

```
\q
```

PostgreSQL via Ubuntu packages

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Software install
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Step 5: Enable the PostgreSQL service to start automatically at boot

```
sudo systemctl enable postgresql
```

Check that is has been correctly enabled

```
sudo systemctl is-enabled postgresql
```

NOTE BANE: The PostgreSQL server is now installed and running. There is at the moment only the default *postgres* user.

The additional (optional) steps to customise some server settings will be shown later on.

To add users and create databases, we will use the pgAdmin GUI (see later). Nevertheless, all these operations can be performed also directly from the console. Examples:

- https://www.digitalocean.com/community/tutorials/how-to-install-postgresql-on-ubuntu-22-04-quickstart
- https://www.postgresqltutorial.com/postgresql-getting-started/install-postgresql-linux/

PostgreSQL via Apt Repository

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
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ADE plug-ins
Further resources

- **ALTERNATIVELY** PostgreSQL can be installed from the **PostgreSQL Apt repository**., which contains up to the latest available version of PostgreSQL (and PostGIS).
- These slides are based on the notes available at
  - https://www.postgresql.org/download/linux/ubuntu/
  - https://wiki.postgresql.org/wiki/Apt

- **Prerequisites:** you need a user with sudo privileges (or to login as root)

- The next steps must be carried out from a command console and are hightlighted in this way. You can simply copy & paste them (minor adjustments may be required)
- In these slides, some commands require Midnight Commander (mc) to edit some text files. However, you can use any other text editor
- If not already available, you can install Midnight Commander directly from the command console as follows

```
sudo apt install mc
```

PostgreSQL via Apt Repository

Software required
Software install
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Step 1: Set up the Apt repository

```
sudo apt install -y postgresql-common
sudo /usr/share/postgresql-common/pgdg/apt.postgresql.org.sh
```

This will add the Apt repository to your package index depending on your machine and Ubuntu distribution

Step 2: Refresh your server's local package index

```
sudo apt update
```

You should see something like this in the console:

```
Hit:1 http://security.ubuntu.com/ubuntu jammy-security InRelease
Hit:2 https://deb.nodesource.com/node_14.x jammy InRelease
Hit:3 https://apt.postgresql.org/pub/repos/apt jammy-pgdg InRelease
Hit:4 http://it.archive.ubuntu.com/ubuntu jammy InRelease
Hit:5 http://it.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:6 http://it.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:7 https://ftp.postgresql.org/pub/pgadmin/pgadmin4/apt/jammy pgadmin4 InRelease
```

PostgreSQL via Apt Repository

Software required
Software install
• **PostgreSQL**
• **PostGIS**
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Step 3: Install the PostgreSQL, PostGIS and the dependent packages.

```
sudo apt install postgresql-16 postgis postgresql-16-postgis-3
```

Here we install version **16**, but you can choose another one (e.g. 14, 15, ...) and edit the command accordingly.

- To check the **installed version**, you can run for example

```
sudo updatedb
locate bin/postgres
```

You should see something like this in the console (here: **16** stands for the installed version)

```
/usr/lib/postgresqk/16/bin/postgres
```

- Check the **server port** (if required, change **16** to your installed version)

```
grep "port = " /etc/postgresql/16/main/postgresql.conf
```

The default port number is **5432**. If it is different, take note as you'll need it later

PostgreSQL via Ubuntu packages

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
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ADE plug-ins
Further resources

Step 4: Start the PostgreSQL server

```
sudo systemctl start postgresql
```

Check whether the PostgreSQL server has been started correctly

```
sudo systemctl status postgresql
```

You should see something like this in the console:

```
● postgresql.service - PostgreSQL RDBMS
     Loaded: loaded (/lib/systemd/system/postgresql.service; enabled; vendor preset: enabled)
     Active: active (exited) since Wed 2024-01-31 09:41:06 CET; 49min ago
   Main PID: 1200 (code=exited, status=0/SUCCESS)
        CPU: 1ms
```

Although not needed here, these are the complementary commands to stop the PostgreSQL server

```
sudo systemctl stop postgresql
```

and to disable the service (it won't start anymore automatically at boot)

```
sudo systemctl disable postgresql
```

PostgreSQL via Ubuntu packages

Software required
Software install
- **PostgreSQL**
- **PostGIS**
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- Java
- 3DCityDB Suite

Database setup
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ADE plug-ins
Further resources

Step 5: Change/set a secure password of user *postgres* that has been created by default upon installation and has database superuser privileges.
First, switch to the *postgres* user and load the psql client. **–p** is used for the **server port** (e.g. **5432**)

```
sudo -u postgres psql -p 5432
```

Then, from within psql, set the new password for user *postgres*

```
ALTER USER postgres PASSWORD 'write_here_your_new_robust_password';
```

Finally, exit psql

```
\q
```

Test whether you can connect as *postgres* user using the new password

```
psql –U postgres –h localhost –p 5432
```

You should see something like this in the console:

```
psql (16.1 (Ubuntu 16.1-1.pgdg22.04+1))
SSL connection (protocol: TLSv1.3, cipher: TLS_AES_256_GCM_SHA384, compression: off)
Type "help" for help.

postgres=#
```

Again, exit psql

```
\q
```

PostgreSQL via Ubuntu packages

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Step 6: Enable the PostgreSQL service to start automatically at boot

```
sudo systemctl enable postgresql
```

Check that is has been correctly enabled

```
sudo systemctl is-enabled postgresql
```

NOTE BANE: The PostgreSQL server is now installed and running. There is at the moment only the default *postgres* user.

The additional (optional) steps to customise some server settings will be shown later on.

To add users and create databases, we will use the pgAdmin GUI (see later). Nevertheless, all these operations can be performed also directly from the console. Examples:

- https://www.digitalocean.com/community/tutorials/how-to-install-postgresql-on-ubuntu-22-04-quickstart
- https://www.postgresqltutorial.com/postgresql-getting-started/install-postgresql-linux/

Customising PostgreSQL

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

In these slides, the following optional aspects will be covered:

1) Changing the default **server port** of PostgreSQL
2) Changing the default **data directory** of PostgreSQL

The procedure is the same, no matther which installation strategy has been followed. However, the commands may have to be slightly adapted depending on the installed version of PosgreSQL.

Customising PostgreSQL: server port

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
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Further resources

The default server port of PostgreSQL is 5432. However, it can be changed. All most important server settings are in file **postgresql.conf.**

Step 1: Stop the PostgreSQL server

```
sudo systemctl stop postgresql
```

Step 2: (If necessary) check the installed version of PostgreSQL

```
sudo updatedb
locate bin/postgres
```

You should see something like this in the console (here: **14** stands for the installed version)

```
/usr/lib/postgresql/14/bin/postgres
```

Step 3: (If necessary) locate the **postgresql.conf** file

```
locate main/postgresql.conf
```

You should see something like this in the console (again, **14** stands for the installed version):

```
/etc/postgresql/14/main/postgresql.conf
```

Customising PostgreSQL: server port

Software required
Software install
• **PostgreSQL**
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• Java
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Imp/Exp connection
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Further resources

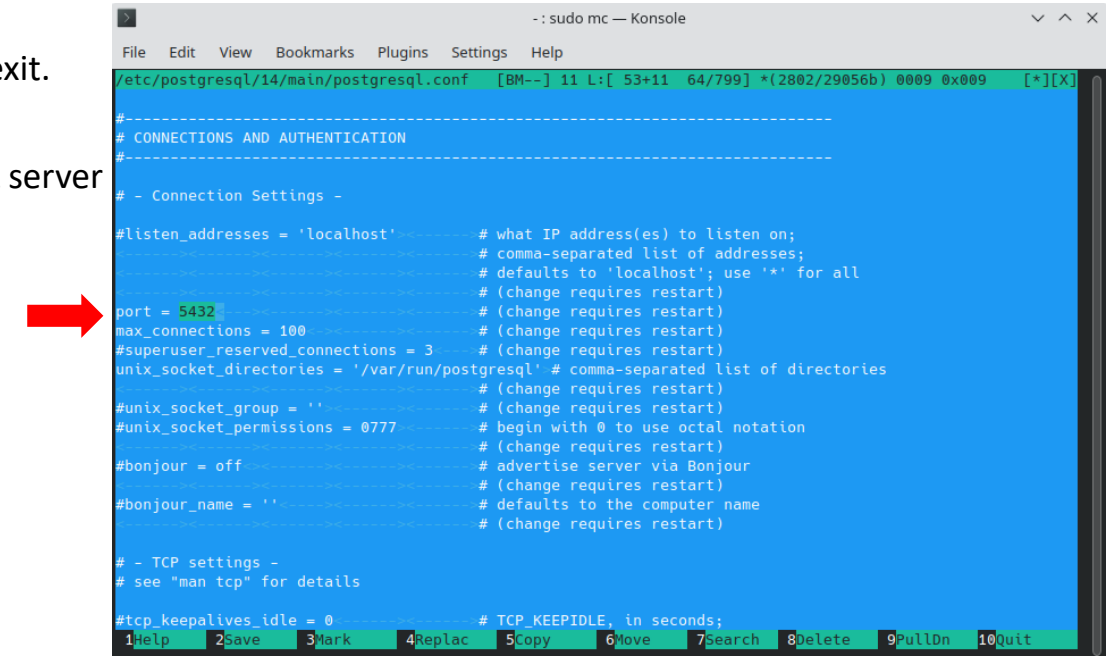
Step 4: Open and edit the **postgresql.conf** file. You can use whatever editor you prefer. For example, the Midnight Commander editor (mc). The **14** stands for the PostgreSQL version.

```
sudo mc -e /etc/postgresql/14/main/postgresql.conf
```

Scroll to the **Connection and Authentication** section.

You can edit the port number.

When you are done save and exit.



Step 5: Restart the PostgreSQL server

```
sudo systemctl start postgresql
```

Customising PostgreSQL: data directory

Software required
Software install
• **PostgreSQL**
• **PostGIS**
• pgAdmin
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

PostgreSQL stores all data in a default directory. However, it can be changed. All most important server settings are in the file **postgresql.conf**

Step 1: Stop the PostgreSQL server

```
sudo systemctl stop postgresql
```

Step 2: (If necessary) check the installed version of PostgreSQL

```
sudo updatedb
locate bin/postgres
```

You should see something like this in the console (here: **14** stands for the installed version)

```
/usr/lib/postgresql/14/bin/postgres
```

Step 3: (If necessary) locate the **postgresql.conf** file

```
locate main/postgresql.conf
```

You should see something like this in the console (again, **14** stands for the installed version):

```
/etc/postgresql/14/main/postgresql.conf
```

Customising PostgreSQL: data directory

Software required
Software install
- **PostgreSQL**
- **PostGIS**
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Database setup
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Step 4: Create and set up the new data directory. For example, in **/home/pg_data**

```
sudo mkdir /home/pg_data
sudo chown postgres:postgres /home/pg_data
sudo chmod 700 /home/pg_data
```

Step 5: Create a new database cluster in that directory. The **14** stands for the PostgreSQL version.

```
sudo -u postgres /usr/lib/postgresql/14/bin/initdb -D /home/pg_data
```

Step 6: Open and edit the **postgresql.conf** file. You can use whatever editor you prefer. For example, the Midnight Commander editor (mc).

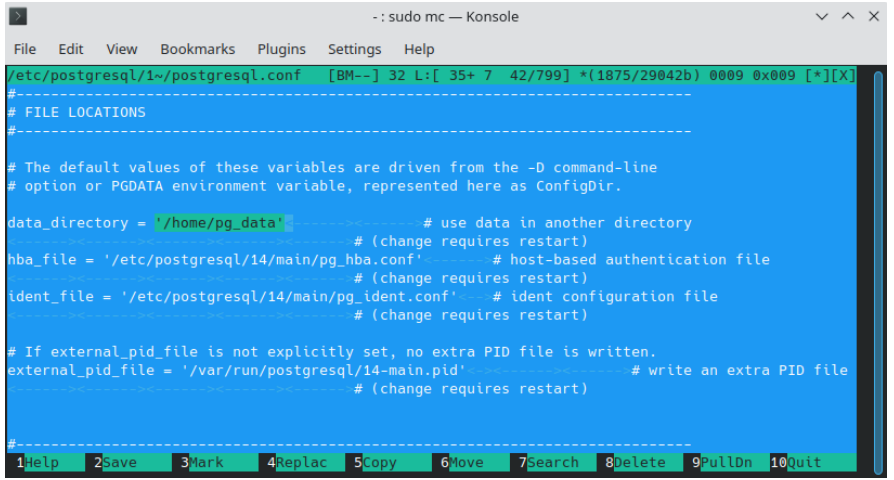
The **14** stands for the PostgreSQL version.

```
sudo mc -e /etc/postgresql/14/main/postgresql.conf
```

Scroll to the **File Locations** section.

You can edit the data directory.

When you are done save and exit.



Step 7: Restart the PostgreSQL server

```
sudo systemctl start postgresql
```

pgAdmin

Software required
Software install
• PostgreSQL
• PostGIS
• **pgAdmin**
• Java
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
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Further resources

Step 1: Setup the repository, Install the public key for the repository (if not done previously):

```
curl -fsS https://www.pgadmin.org/static/packages_pgadmin_org.pub | sudo gpg --dearmor -o /usr/share/keyrings/packages-pgadmin-org.gpg
```

Step 2: Create the repository configuration file:

```
sudo sh -c 'echo "deb [signed-by=/usr/share/keyrings/packages-pgadmin-org.gpg] https://ftp.postgresql.org/pub/pgadmin/pgadmin4/apt/$(lsb_release -cs) pgadmin4 main" > /etc/apt/sources.list.d/pgadmin4.list && apt update'
```

Step 3: Install pgAdmin4, only for desktop, only web mode, or both (choose one of the three)

```
sudo apt install pgadmin4-desktop
sudo apt install pgadmin4-web
sudo apt install pgadmin4
```

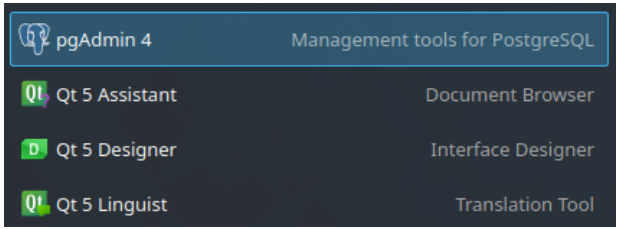
Step 4: if you installed pgadmin4-web, configure the webserver, :

```
sudo /usr/pgadmin4/bin/setup-web.sh
```

pgAdmin

Step 5a: Run pgAdmin directly from the Ubuntu GUI.

pgAdmin is reachable via the desktop menu as a normal application.



Step 5b: Run pgAdmin from the console

- Check where the **pgAdmin executable** has been installed

```
sudo updatedb
locate bin/pgadmin
```

You should see something like this in the console:

```
/usr/pgadmin4/bin/pgadmin4
```

- Then, pgAdmin can be run directly from the command console

```
/usr/pgadmin4/bin/pgadmin4 &
```

Please note: the **&** is optional. It will allow you to keep working also on the console.

Software required
Software install
• PostgreSQL
• PostGIS
• **pgAdmin**
• Java
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Further resources

Set up PostgreSQL from pgAdmin

Software required
Software install
• PostgreSQL
• PostGIS
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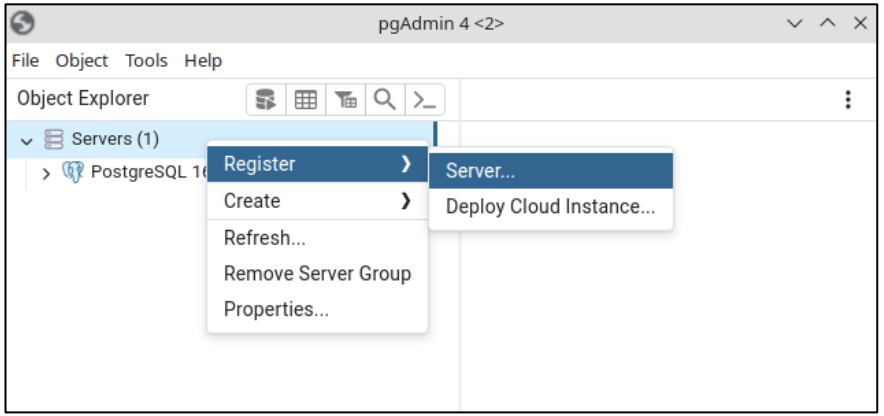
pgAdmin can be used to set up PostgreSQL, e.g. to

- Add/create database connections
- Add/create new database users
- Add/create new databases

However, first of all, a connection to the default "postgres" database must be established. Therefore:

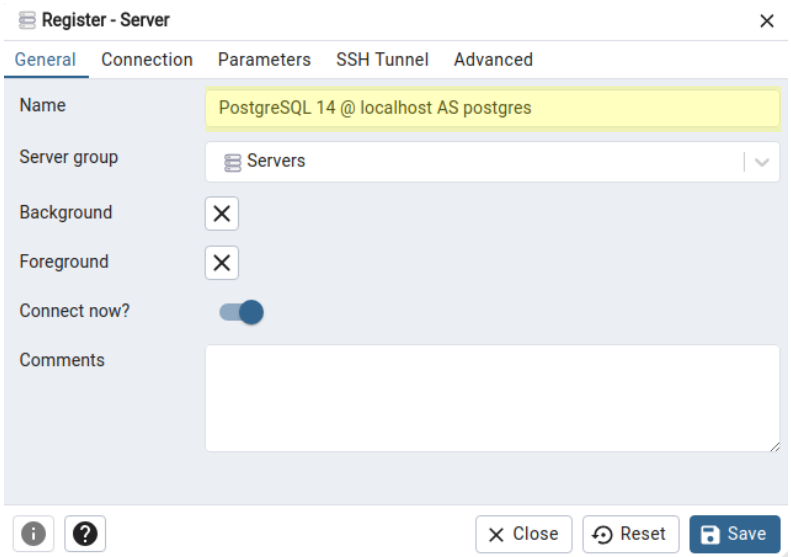
Step 1: Run pgAdmin

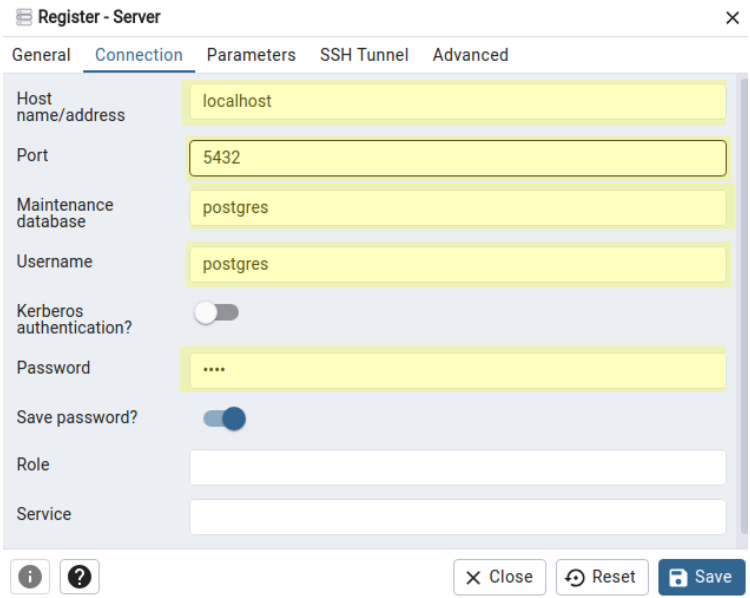
Step 2: With the mouse, right click on the "Servers" (see screenshot) and select Register\Server…



Set up PostgreSQL from pgAdmin

Step 3: Fill out the required fields using the connection parameters of user *postgres* to connect to the default database "postgres". The screenshots offer an example.





Software required
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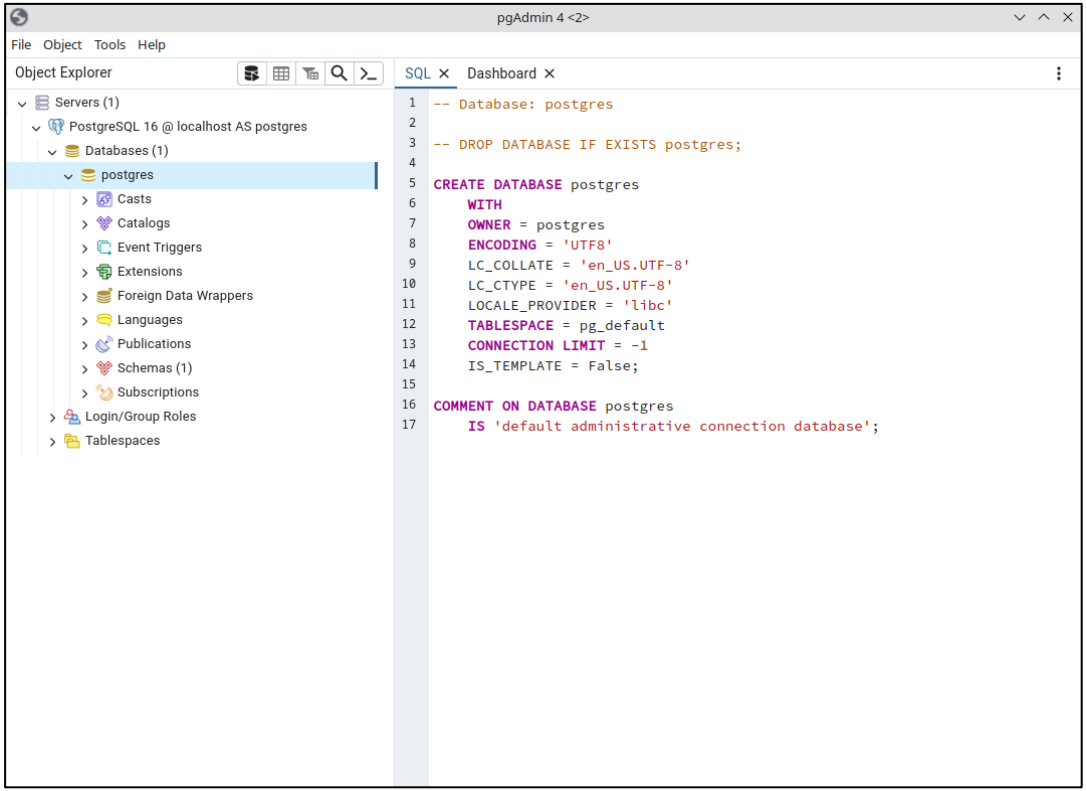
Set up PostgreSQL from pgAdmin

Step 4: From the newly created connection, you will be able to access the default "postgres" database. You can now add new users and create new databases (see next slides).



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Set up PostgreSQL from pgAdmin

Software required
Software install
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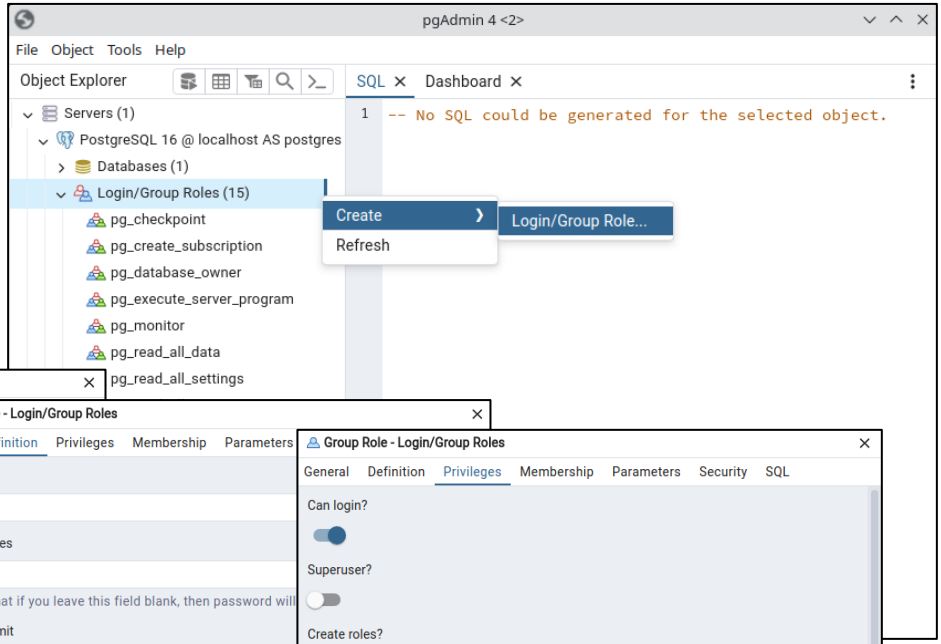
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

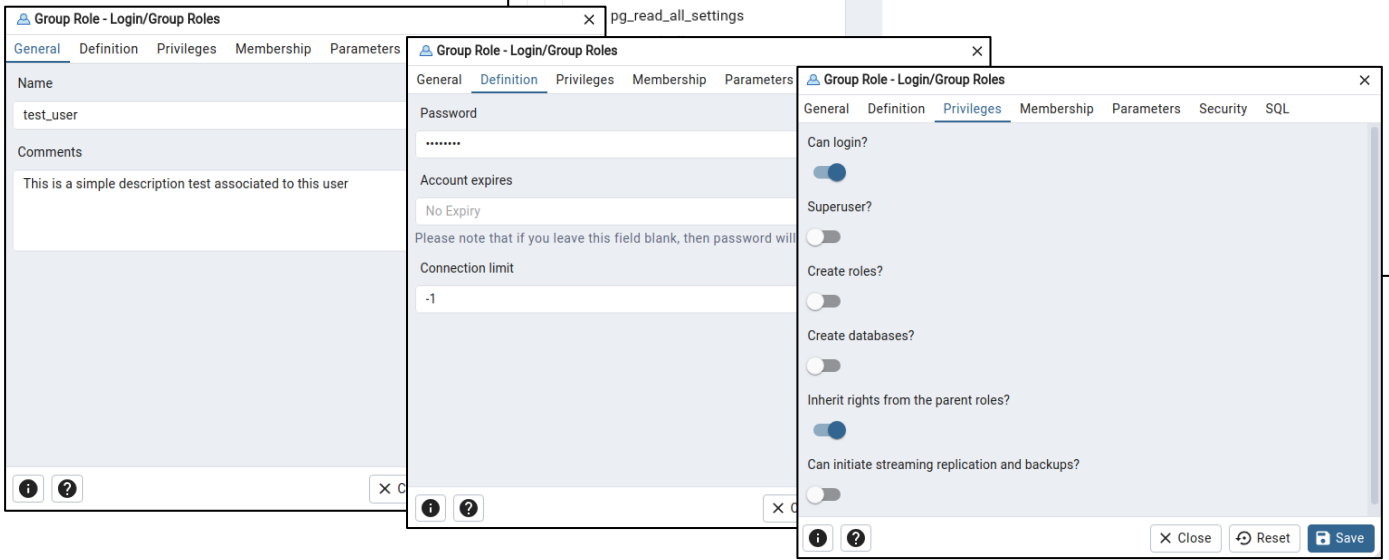
To add/create a **new database user**:

Step 1: Right click with the mouse in the Login/Group Roles and select Create/Group Role

Step 2: Set the user name, password, etc.

Step 3: Save! The new user will be added to the list





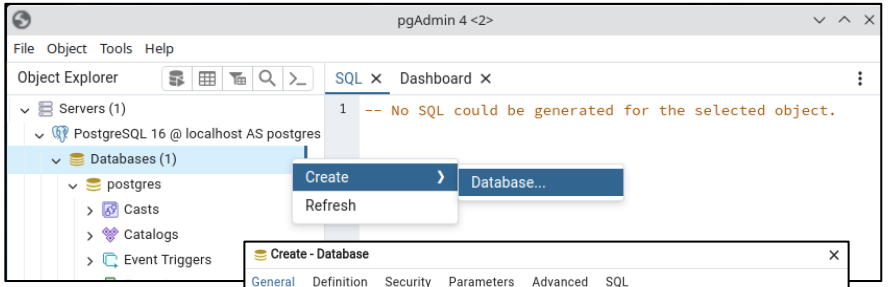
Set up PostgreSQL from pgAdmin

Software required
Software install
- PostgreSQL
- PostGIS
- **pgAdmin**
- Java
- 3DCityDB Suite

Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

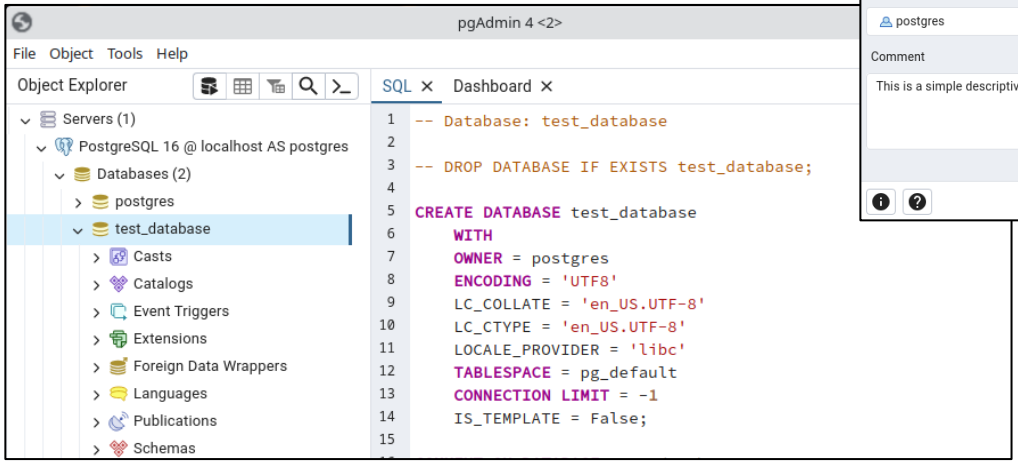
To add/create a **new database**:

Step 1: Right click with the mouse on Databases and select Create/Database…



Step 2: Fill out the form and set the database properties

Step 3: Save! The new database will be added to the list.



Java

Software required
Software install
• PostgreSQL
• PostGIS
• pgAdmin
• **Java**
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Java can be installed in Ubuntu using the prepackaged binaries via the usual apt commands. These slides show how to install the Open Java Development Kit (OpenJDK) v. 11.

The next steps are taken and adapted from: https://www.theserverside.com/blog/Coffee-Talk-Java-News-Stories-and-Opinions/How-do-I-install-Java-on-Ubuntu

Step 1: Refresh your server's local package index

```
sudo apt update
```

Step 2: Install the JDK

```
sudo apt install default-jdk
```

Step 3: Check that Java is installed and which version

```
java -version
```

You should see something like this in the console:

```
openjdk version "11.0.21" 2023-10-17
OpenJDK Runtime Environment (build 11.0.21+9-post-Ubuntu-0ubuntu122.04)
OpenJDK 64-Bit Server VM (build 11.0.21+9-post-Ubuntu-0ubuntu122.04, mixed mode, sharing)
```

Java

Software required
Software install
• PostgreSQL
• PostGIS
• pgAdmin
• **Java**
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
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Further resources

Step 4: Find out where apt installed Java on Ubuntu

```
update-alternatives --config java
```

You should see something like this in the console:

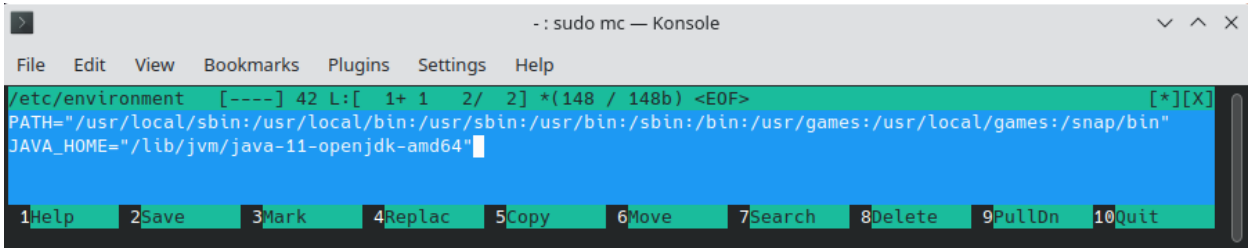
```
There is only one alternative in link group java (providing /usr/bin/java):
/usr/lib/jvm/java-11-openjdk-amd64/bin/java
Nothing to configure.
```

Step 5: Add JAVA_HOME to the environment. Open and edit /etc/**environment** file. You can use whatever editor you prefer. For example, the Midnight Commander editor (mc).

```
sudo mc -e /etc/environment
```

Paste the following line at the bottom of the file. Check that the string in red is the same as the one indicated in the previous point <u>but without /bin/java</u>.

JAVA_HOME="/lib/jvm/java-11-openjdk-amd64"



Java

Software required
Software install
• PostgreSQL
• PostGIS
• pgAdmin
• **Java**
• 3DCityDB Suite
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Step 6: Force the Ubuntu terminal to reload the environment configuration file

```
source /etc/environment
```

Step 7: Check that JAVA_HOME has been set

```
echo $JAVA_HOME
```

You should see something like this in the console:

```
/lib/jvm/java-11-openjdk-amd64
```

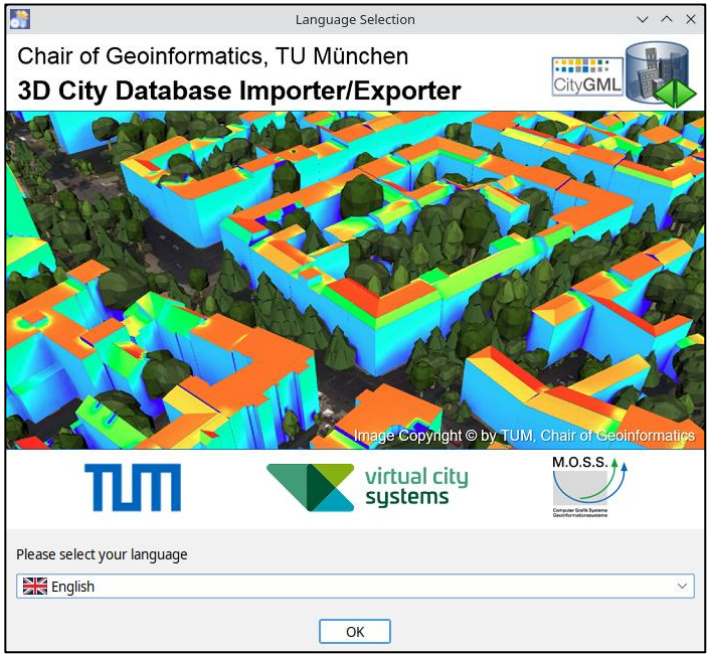
Done! ☺

3DCityDB Suite

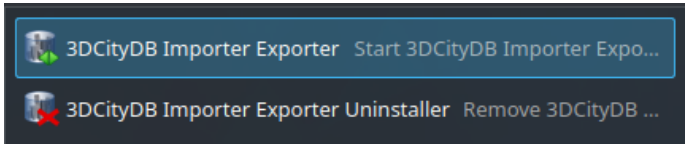
Once you have downloaded the **.jar** file of the 3DCityDB Suite you can launch the installer of the Importer/Exporter from the directory where the jar file is saved. For example:

```
java –jar 3DCityDB-Importer-Exporter-5.4.0-Setup.jar
```

Follow the installation instructions. The software will be generally installed in your home directory e.g. */home/giorgio/3DCityDB-Importer-Exporter*



Upon installation, the Importer/Exporter can be launched directly from the desktop menu



Or, alternatively, via the command console from within the installation directory:

```
./3DCityDB-Importer-Exporter &
```


Software required
Software install
• PostgreSQL
• PostGIS
• pgAdmin
• Java
• **3DCityDB Suite**
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Overview

Install required software

Set up the database

Connect to the database via the Importer/Exporter

Add additional database schemas (Optional)

Install ADE plug-ins (Optional)

Database setup

Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Procedure overview

1) In PostgreSQL (e.g. via the pgAdmin GUI)
   - Connect to the PostgreSQL server
   - Create a new empty database that will contain your 3D city model data
   - Add the extensions for PostGIS, PostGIS-raster, etc. to the empty database
   - See the next slides for details

2) From the 3DCityDB installation folder
   - Authorise the execution of the shell files using the following command from the command prompt:
     ```
     chmod u+x CREATE_DB.sh
     ```
   - Edit the **CONNECTION_DETAILS.sh** file and run the **CREATE_DB.sh** script to create the tables (and other objects) in the empty database you have created in the previous step
   - See the next slides for details

3) Connect to the database (e.g. via pgAdmin) just to check that you created the tables

4) Connect to the database from the 3DCityDB Importer/Exporter

Connecting to the database

Software required
Software install
Database setup
- **Database connection**
- Database creation
- Create tables etc.
- Check via pgAdmin

Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

- AFTER you have successfully installed PostgreSQL, you can access the database server via pgAdmin

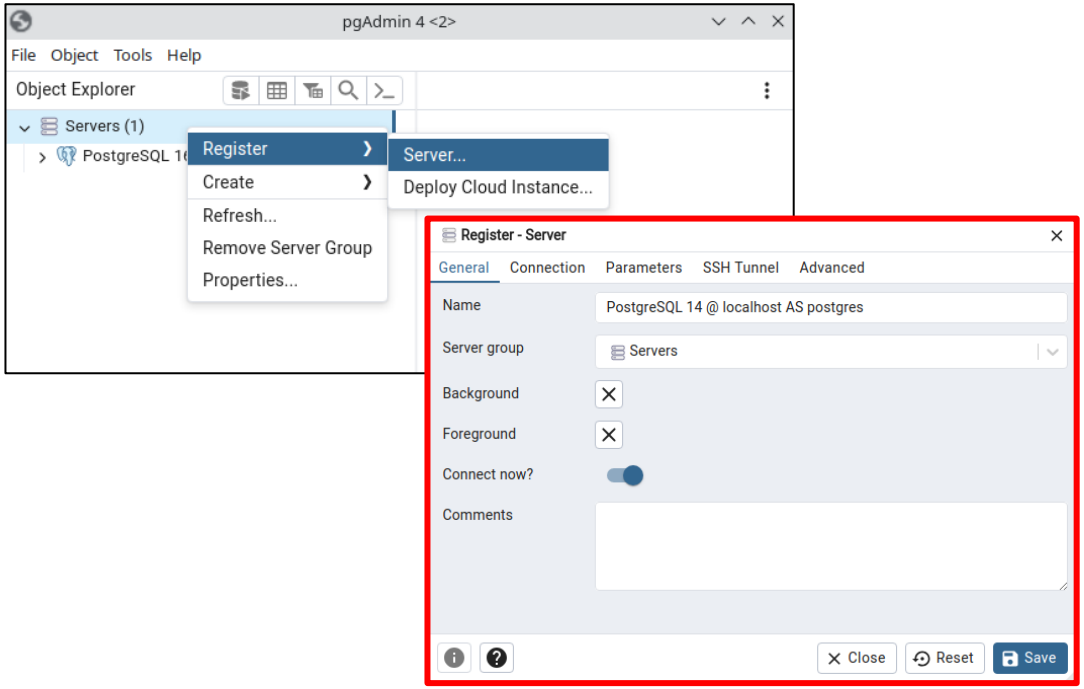
ALTERNATIVELY

- You do not have PostgreSQL installed on your own computer, but you know the connection parameters to connect to a remote server

- **In both cases**, you will need information about:
  - **Server name** or **IP address** ("localhost" if it is on your own computer)
  - **Database name** (generally "postgres" if it is on your own computer)
  - **Port** (generally 5432 if it is on your own computer)
  - **Username, Password** (e.g. the ones created before, see previous slides)

Connecting to the database from pgAdmin

- Create a (link to the) database server
  - You are actually creating a connection to the database server from pgAdmin
  - Click on menu Object\Create\Server **OR** right mouse-click\Create\Server and fill out the fields
  - **Please note:** this step may not be required if you already have a server connection established



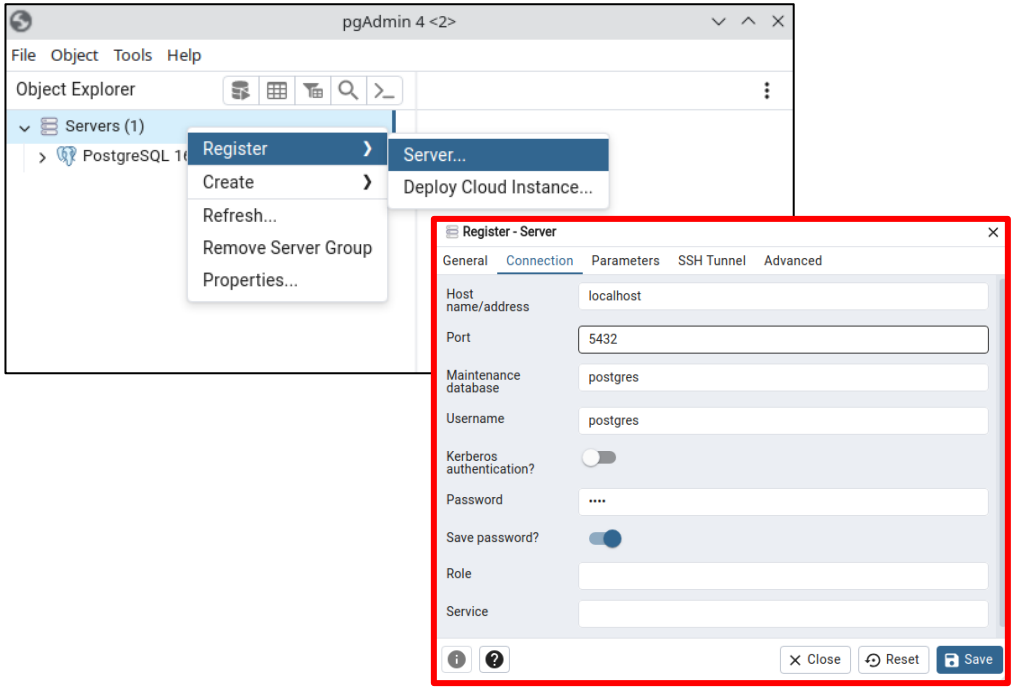
In the "General" tab, you simply add a name to identify your connection. Here, FOR EXAMPLE, the string is "PostgreSQL-12 on my PC".

Software required
Software install
Database setup
- **Database connection**
- Database creation
- Create tables etc.
- Check via pgAdmin

Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Connecting to the database from pgAdmin

- Create a (link to the) database server
  - You are actually creating a connection to the database server from pgAdmin
  - Click on menu Object\Create\Server **OR** right mouse-click\Create\Server and fill out the fields
  - **Please note:** this step may not be required if you already have a server connection established



In the "Connection" tab, you add the connection parameters

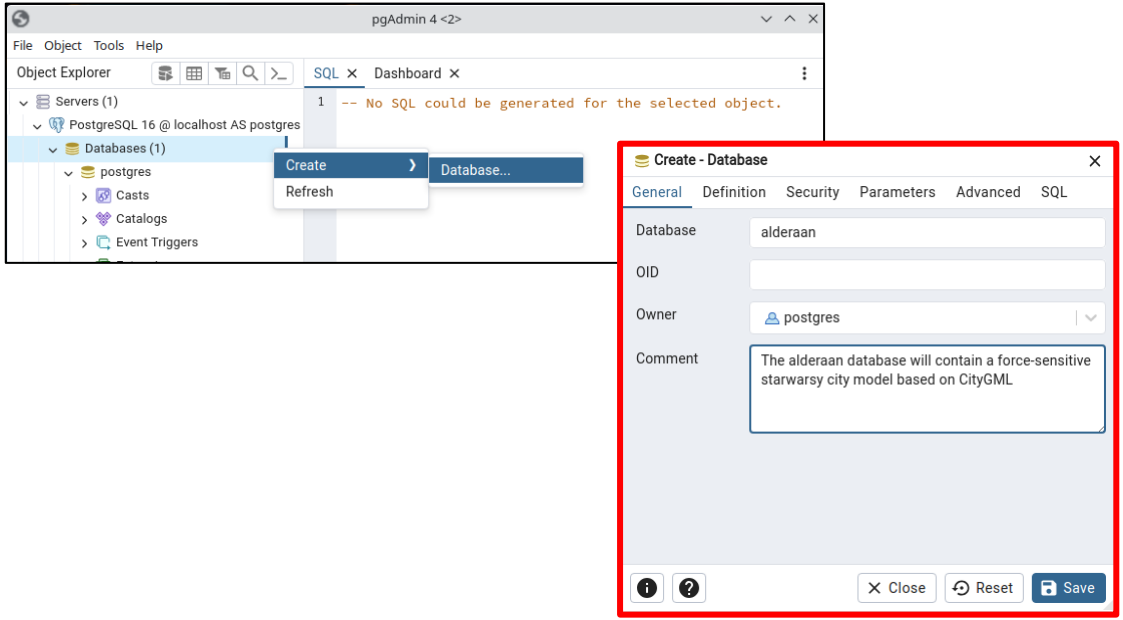
- Host name / IP address
- Port
- Database name
- Username
- Password

Software required
Software install
Database setup
- **Database connection**
- Database creation
- Create tables etc.
- Check via pgAdmin

Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Database creation

- Once you have created a connection, you must create the database that will contain your city model data
  - Click on menu Object\Create\Database **OR** right mouse-click\Create\Database and fill out the fields
  - Choose the name you want, ideally the name of the city



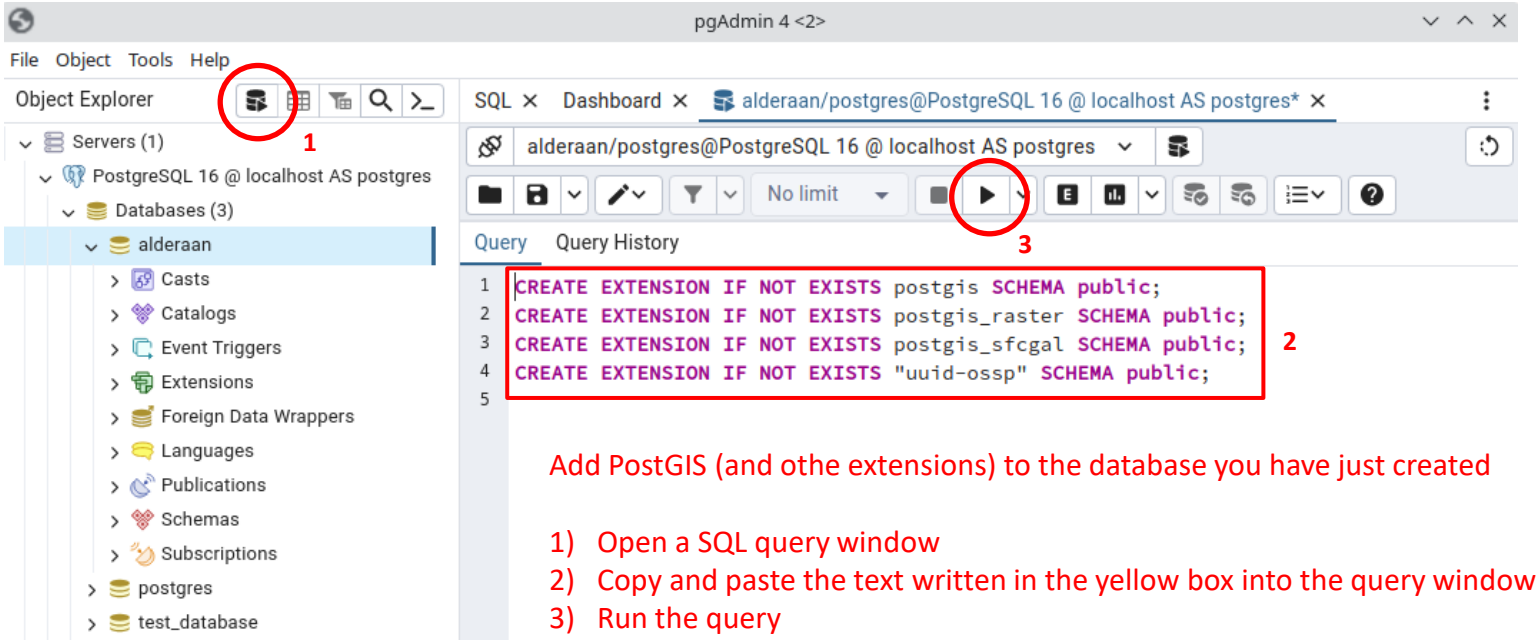
Here, **for example,** it is "alderaan", but you can choose any name you want

Best if you use only small letters!

Software required
Software install
Database setup
• Database connection
• **Database creation**
• Create tables etc.
• Check via pgAdmin
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Database creation

Software required
Software install
Database setup
• Database connection
• **Database creation**
• Create tables etc.
• Check via pgAdmin
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources



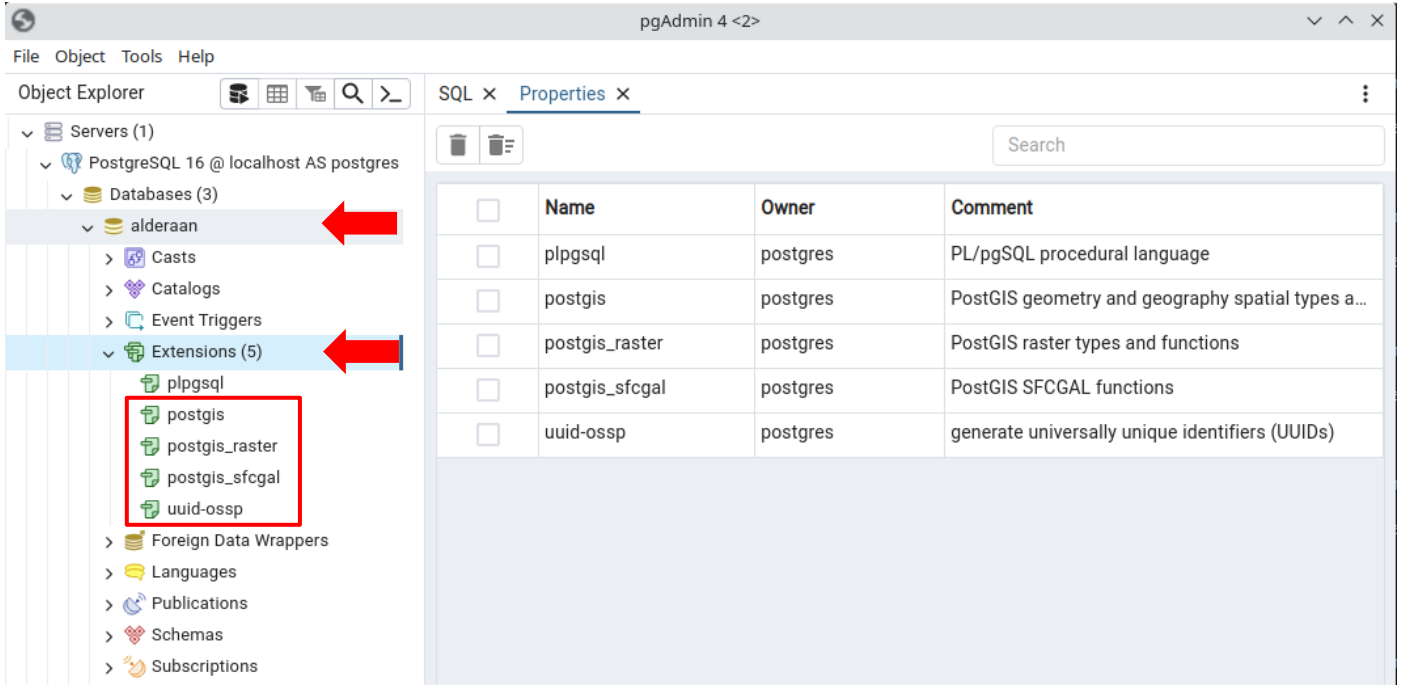
Add PostGIS (and othe extensions) to the database you have just created

1) Open a SQL query window
2) Copy and paste the text written in the yellow box into the query window
3) Run the query

```
CREATE EXTENSION IF NOT EXISTS postgis SCHEMA public;
CREATE EXTENSION IF NOT EXISTS postgis_raster SCHEMA public;
CREATE EXTENSION IF NOT EXISTS postgis_sfcgal SCHEMA public; -- optional, but good to have
CREATE EXTENSION IF NOT EXISTS "uuid-ossp" SCHEMA public; -- optional, but good to have
```

Database creation

- Check that you have correctly installed the extensions in your database
  - Open "Extensions" item in your database (e.g. "alderaan")
  - Check that the extensions are listed there (the "plpgsql" one is installed by default)



Software required
Software install
Database setup
• Database connection
• **Database creation**
• Create tables etc.
• Check via pgAdmin
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Create tables and other database objects

Software required
Software install
Database setup
• Database connection
• Database creation
• **Create tables etc.**
• Check via pgAdmin
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

NOTA BENE: The detailed installation guide can be found here:

https://3dcitydb-docs.readthedocs.io/en/latest/first-steps/index.html

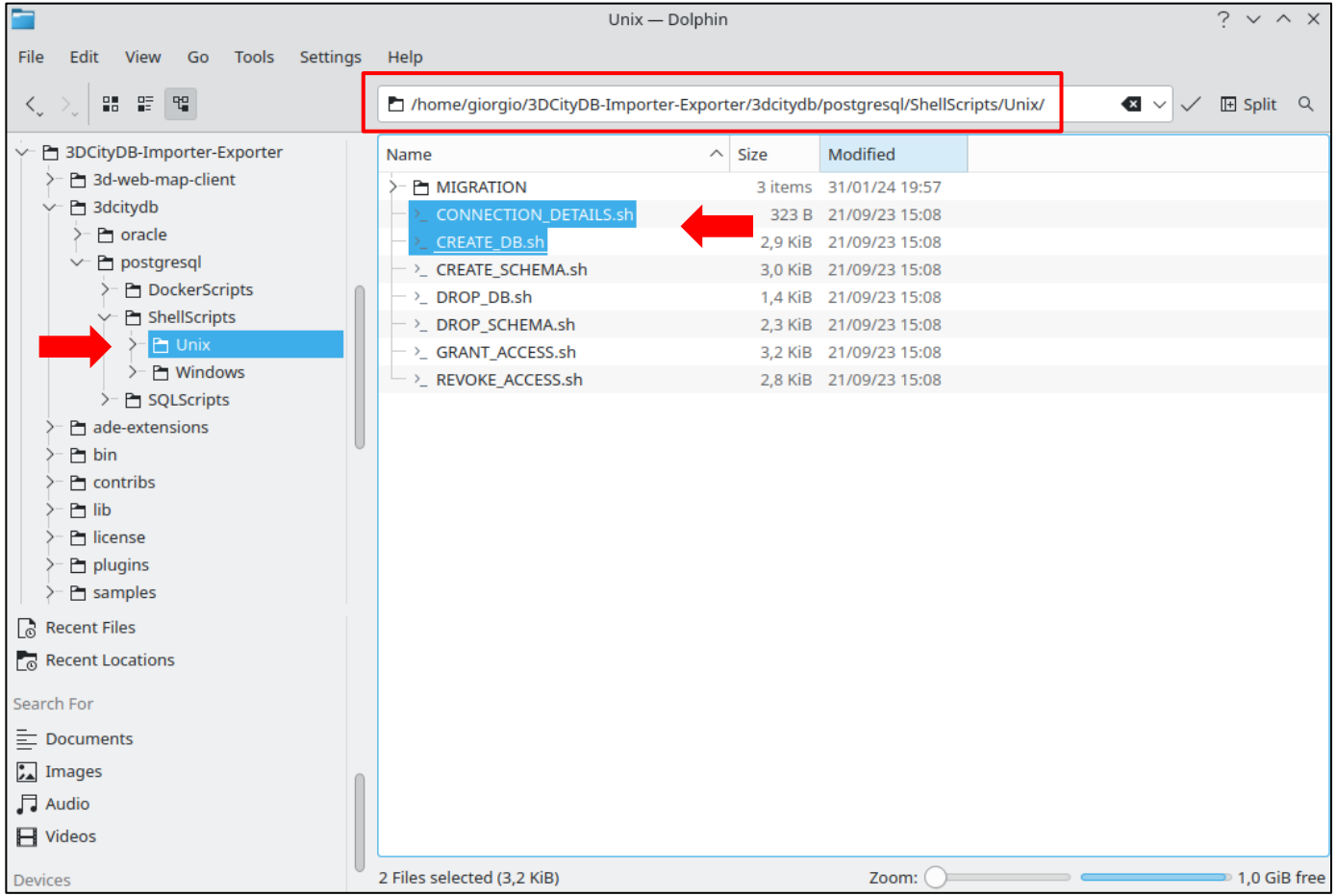
In the following slides, only the main points are presented

- Go to the **3DCityDB installation folder** and change to the 3dcitydb\postgresql\ShellScrips\Unix directory. It should look like in the next slides
  - Then, if not done previously:
    `chmod u+x CREATE_DB.sh`
    `chmod u+x DROP_DB.sh` (Only needed if you want to drop the database)
  - Open the **CONNECTION_DETAILS.sh** file in a text editor and insert your PostgreSQL connection details. For example, using Midnight Commander (or anything equivalent)
    `mc –e CONNECTION_DETAILS.sh`
  - Run the **CREATE_DB.sh**. Il will generate all needed database objects (schemas, tables, etc.)
    `./CREATE_DB.sh`

Create tables and other database objects

Software required
Software install
Database setup
- Database connection
- Database creation
- **Create tables etc.**
- Check via pgAdmin

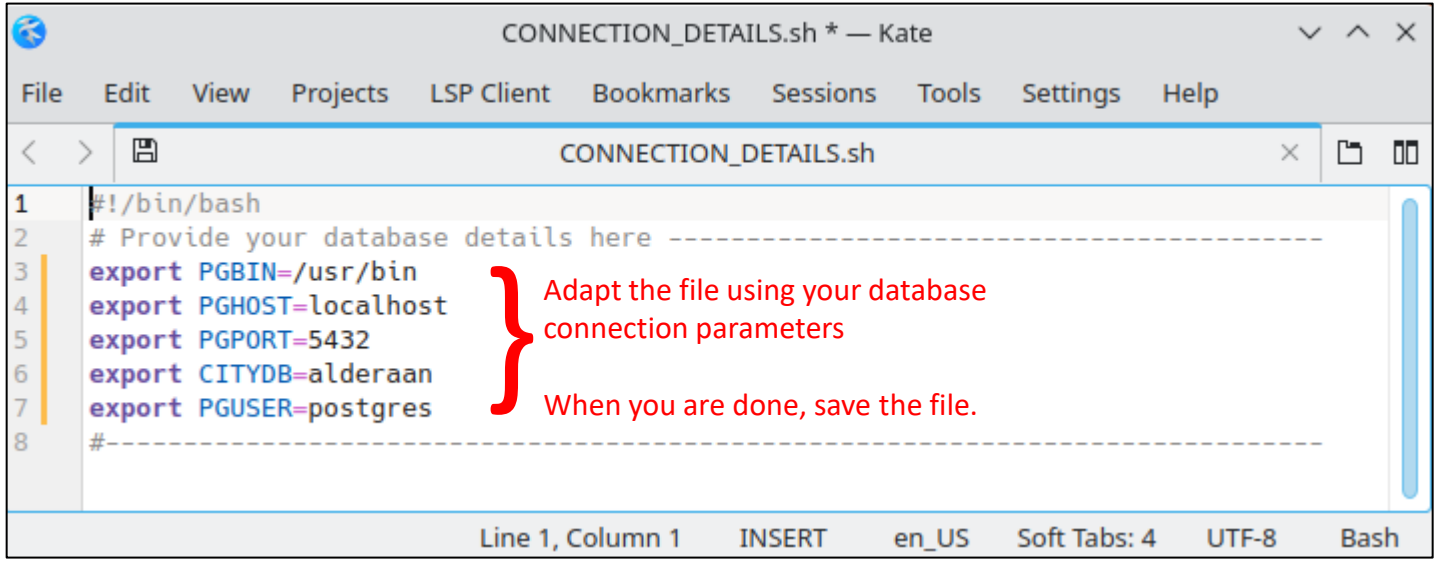
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources



Create tables and other database objects

Software required
Software install
Database setup
- Database connection
- Database creation
- **Create tables etc.**
- Check via pgAdmin

Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources



- The **PGBIN** variable contains the path to the psql executable. Depending on your PostgreSQL installation, it could be in other (but similar) locations.
- **PGHOST** is the IP address of the PostgreSQL server. If you are using the database on your own computer, you can write "localhost", otherwise you have to write the IP address of the server
- **PGPORT** is the port PostgreSQL is listening to. Generally, it is 5432 (this is the default value).
- **CITYDB** contains the name of the database that you have created before and that will contain the 3DCityDB tables, e.g. "alderaan"
- **PGUSER** contains the name of the user to connect to the database. On your local machine, you may use postgres. You will be asked the password during the installation process later.

Create tables and other database objects

Software required
Software install
Database setup
• Database connection
• Database creation
• **Create tables etc.**
• Check via pgAdmin
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Find out the EPSG codes that apply to your city or region.
If you do not know them, you can search for them here: https://epsg.org/

Here some examples:

- **Netherlands**
  - **Horizontal datum EPSG: 28992**
  - **Vertical datum EPSG: 5109**
  - (Will automatically create the GMLSrsName: **urn:ogc:def:crs,crs:EPSG::28992,crs:EPSG:5109**)
- **Trento (Italy)**
  - **Horizontal datum EPSG: 25832**
  - **Vertical datum EPSG: 5214**
  - (Will automatically create the GMLSrsName: **urn:ocg:def:crs,crs:EPSG::25832,crs:EPSG::5214**)
- **Vienna (Austria)**
  - **Horizontal datum EPSG: 31256**
  - **Vertical datum EPSG: 1267**
  - (Will automatically create the GMLSrsName: **urn:ocg:def:crs,crs:EPSG::31256,crs:EPSG::1267**)

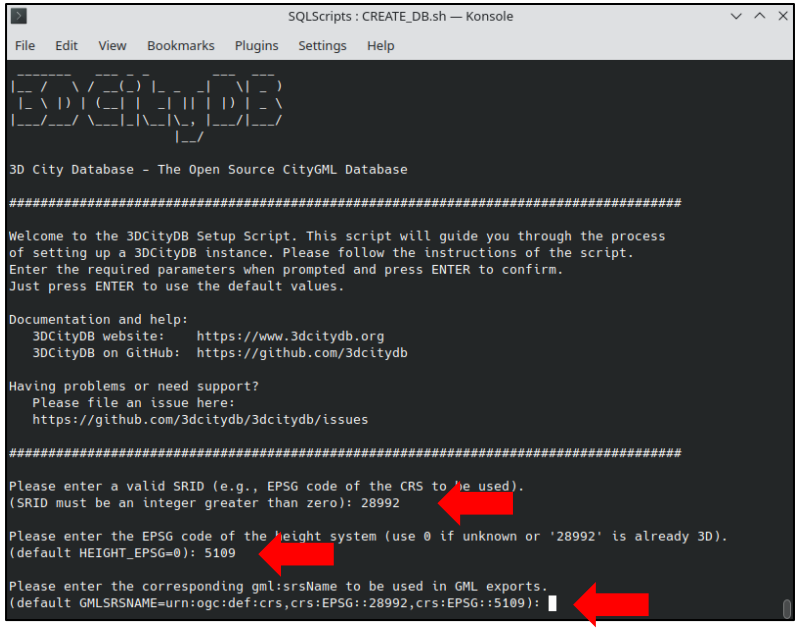
Create tables and other database objects

Software required
Software install
Database setup
• Database connection
• Database creation
• **Create tables etc.**
• Check via pgAdmin
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

- In the console, from the directory containing the **CREATE_DB.sh**, run it with

```
./CREATE_DB.sh
```

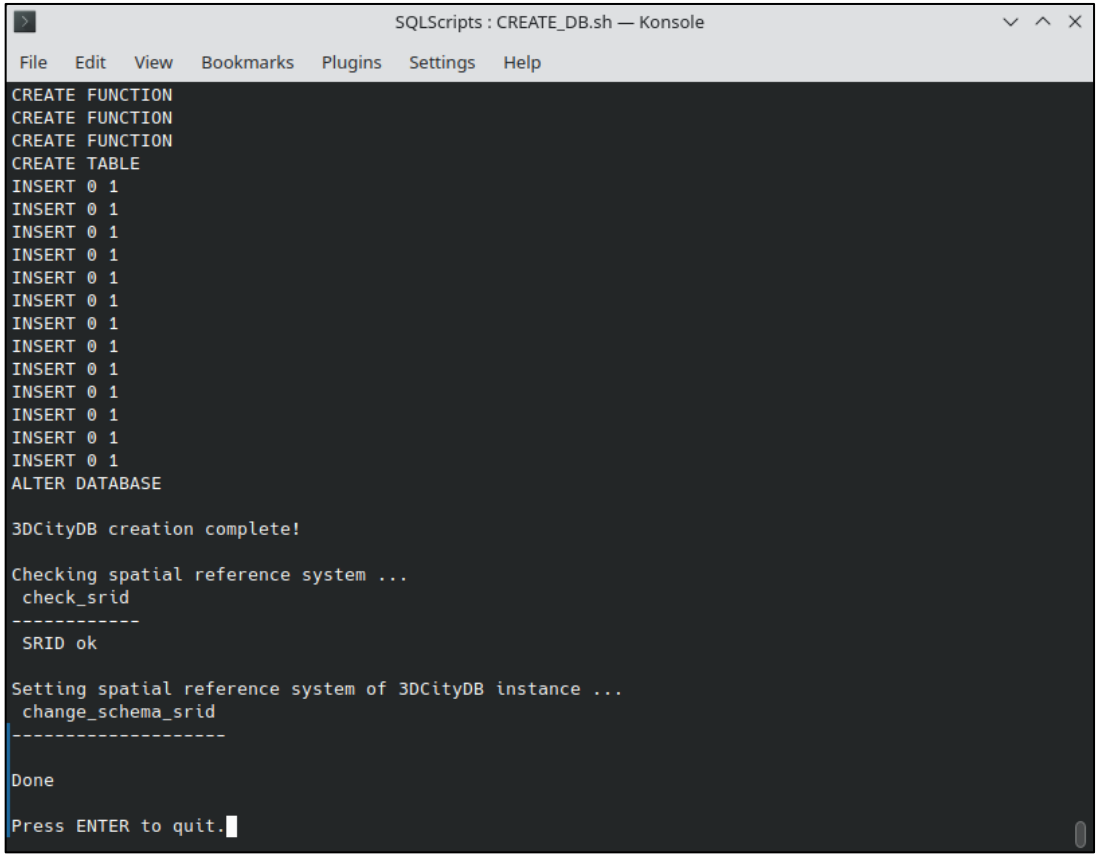
Set the EPSG codes for horizontal and vertical datum, as shown in the image here



- Then press enter, the GMLSRSNAME variable will be automatically generated (accept the proposed value) and the install script will start and install all tables, etc.

Create tables and other database objects

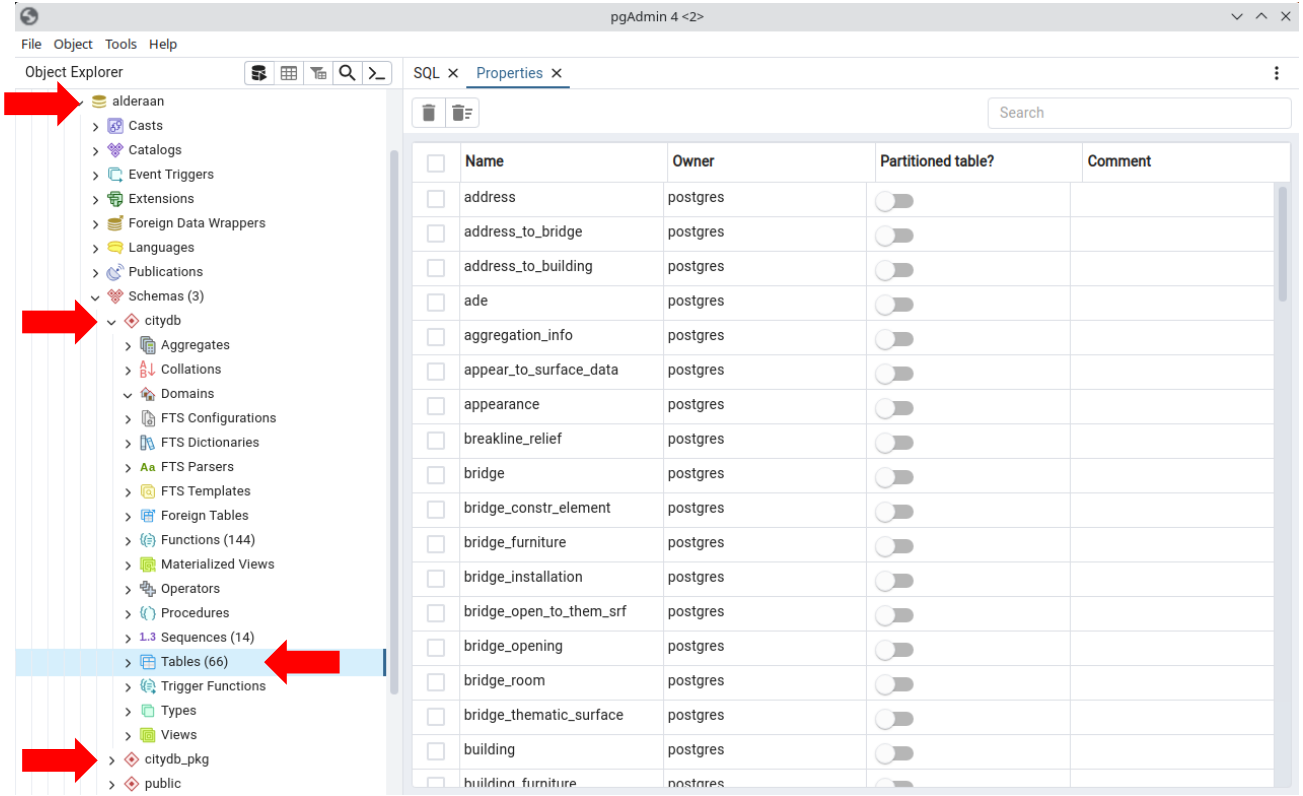
- Upon successful installation, you should get something like this



Software required
Software install
Database setup
• Database connection
• Database creation
• **Create tables etc.**
• Check via pgAdmin
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Check via pgAdmin

- Open pgAdmin and check that the **citydb** and **citydb_pkg** schemas are there. The **citydb** schema should contain 66 tables



Software required
Software install
Database setup
• Database connection
• Database creation
• Create tables etc.
• **Check via pgAdmin**
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Overview

Install required software

Set up the database

Connect to the database via the Importer/Exporter

Add additional database schemas (Optional)

Install ADE plug-ins (Optional)

Connecting to the database via Importer/Exporter

Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

- AFTER you have successfully installed PostgreSQL, you can access the database server via pgAdmin

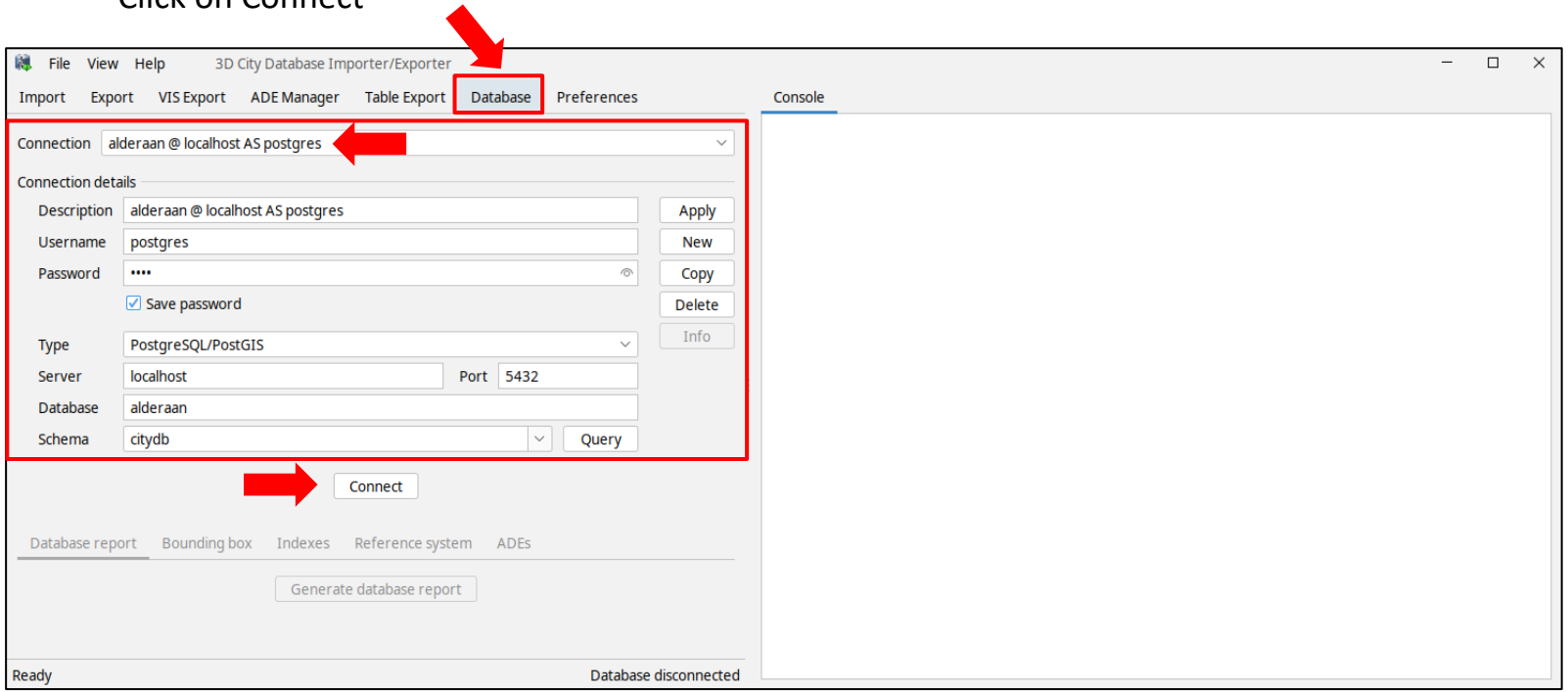
ALTERNATIVELY

- You do not have PostgreSQL installed on your own computer, but you know the connection parameters to connect to a remote server

- **In both cases**, you will need information about:
  - **Server name** or **IP address** ("localhost" if it is on your computer)
  - **Database name** (generally "postgres" if it is on your computer)
  - **Port** (generally 5432 if it is on your computer)
  - **Username, Password** (e.g. the ones created before if it is on your computer)

Connecting to the database via Importer/Exporter

- Launch the 3DCityDB Importer/Exporter, select the "Database" tab
  - The Description field contains a simple string to identify the connection
  - Fill out the remaining fields with the connection parameters
  - Click on Connect

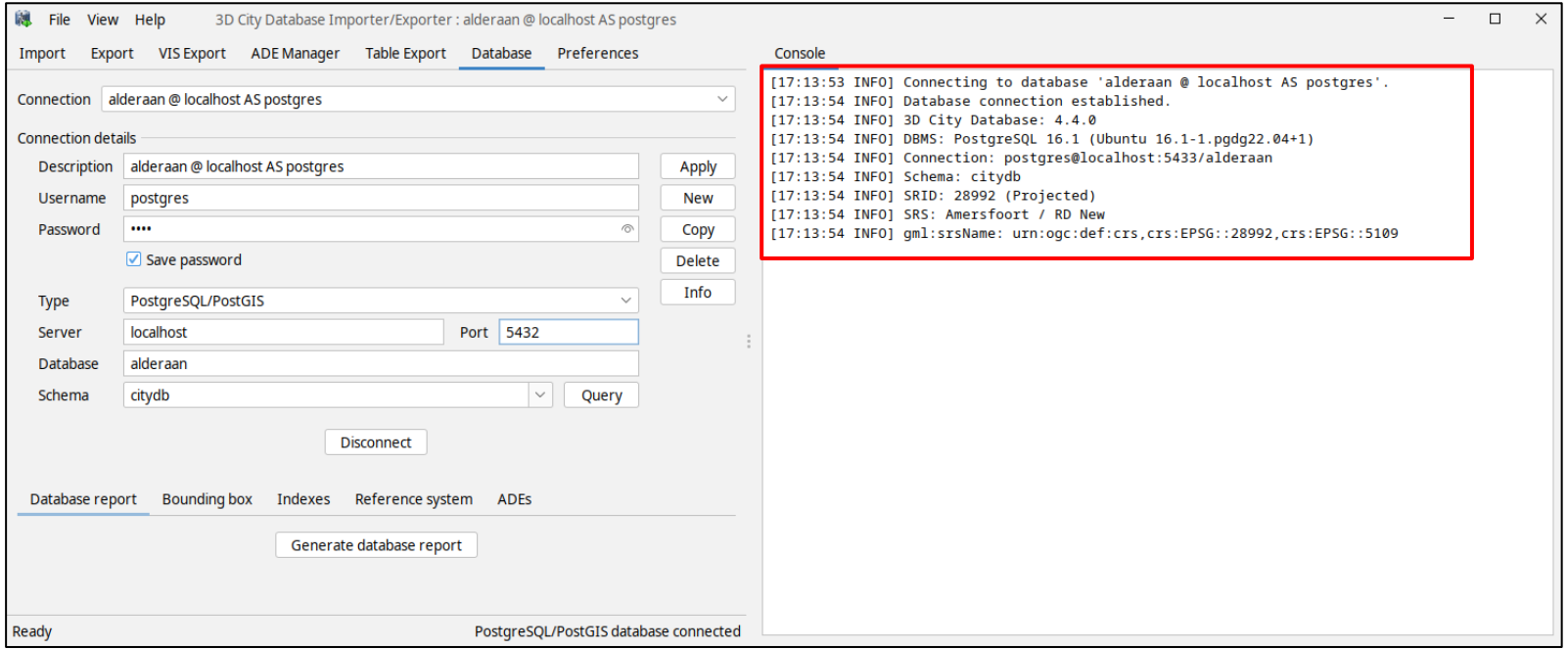


Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

Connecting to the database via Importer/Exporter

- Launch the 3DCityDB Importer/Exporter, select the "Database" tab
  - Upon successful connection, you will see the notification in the console

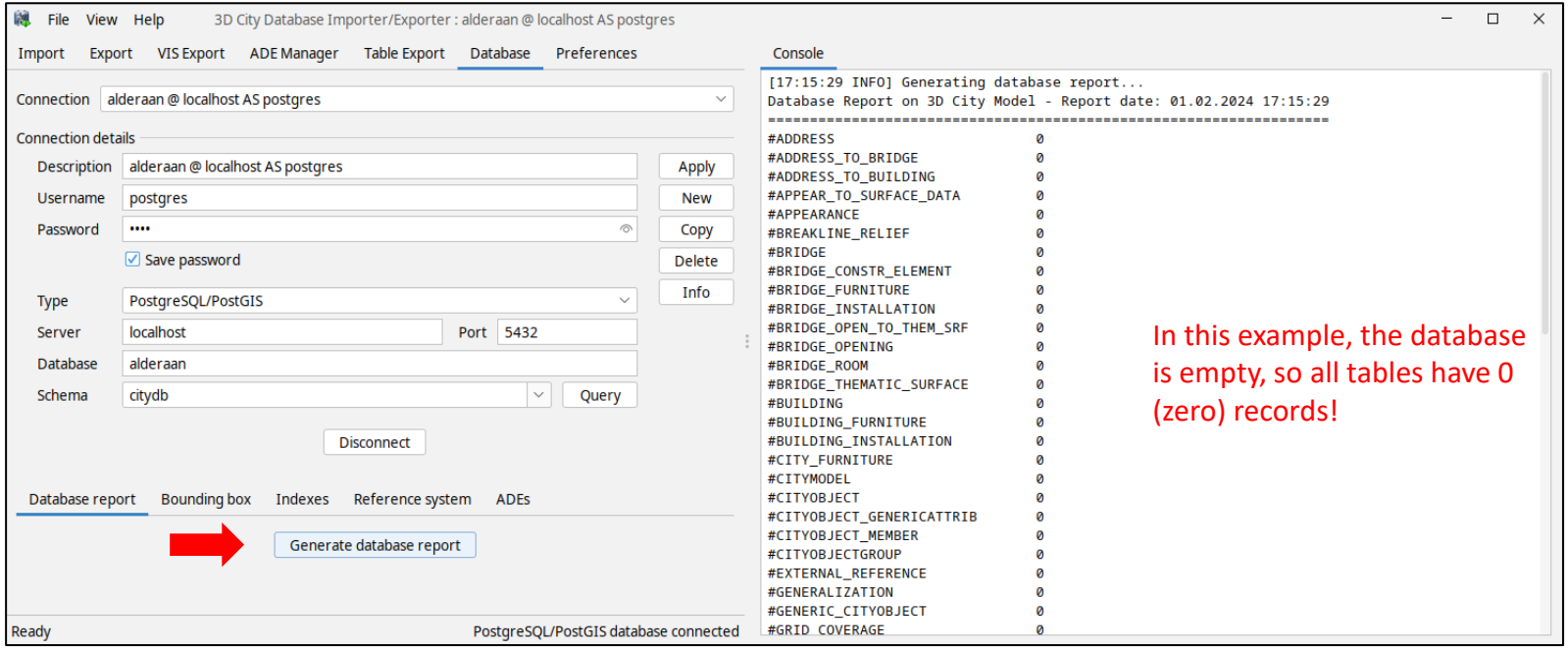
Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources



Connecting to the database via Importer/Exporter

- Launch the 3DCityDB Importer/Exporter, select the "Database" tab
  - You can optionally also **Generate a database report**
  - If starting from an empty database, it will simply show that all tables are empty! ☺

Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources



Overview

Install required software

Set up the database

Connect to the database via the Importer/Exporter

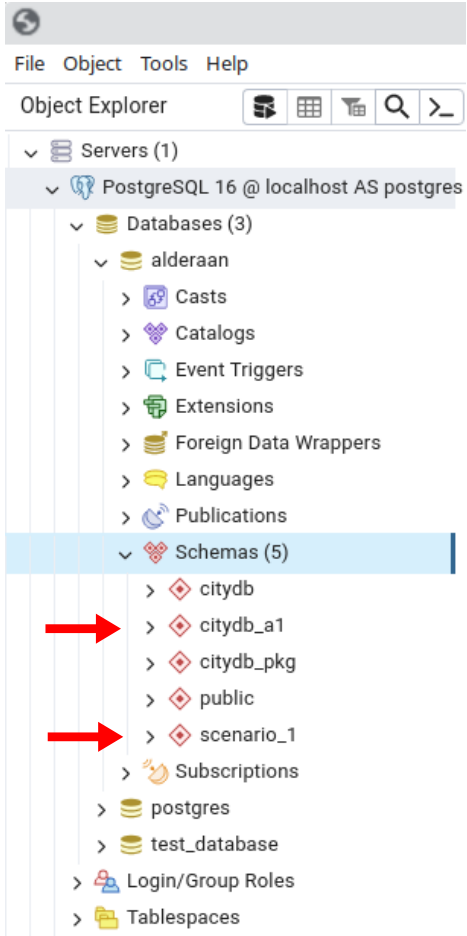
Add additional database schemas (Optional)

Install ADE plug-ins (Optional)

3D City Database: additional schemas

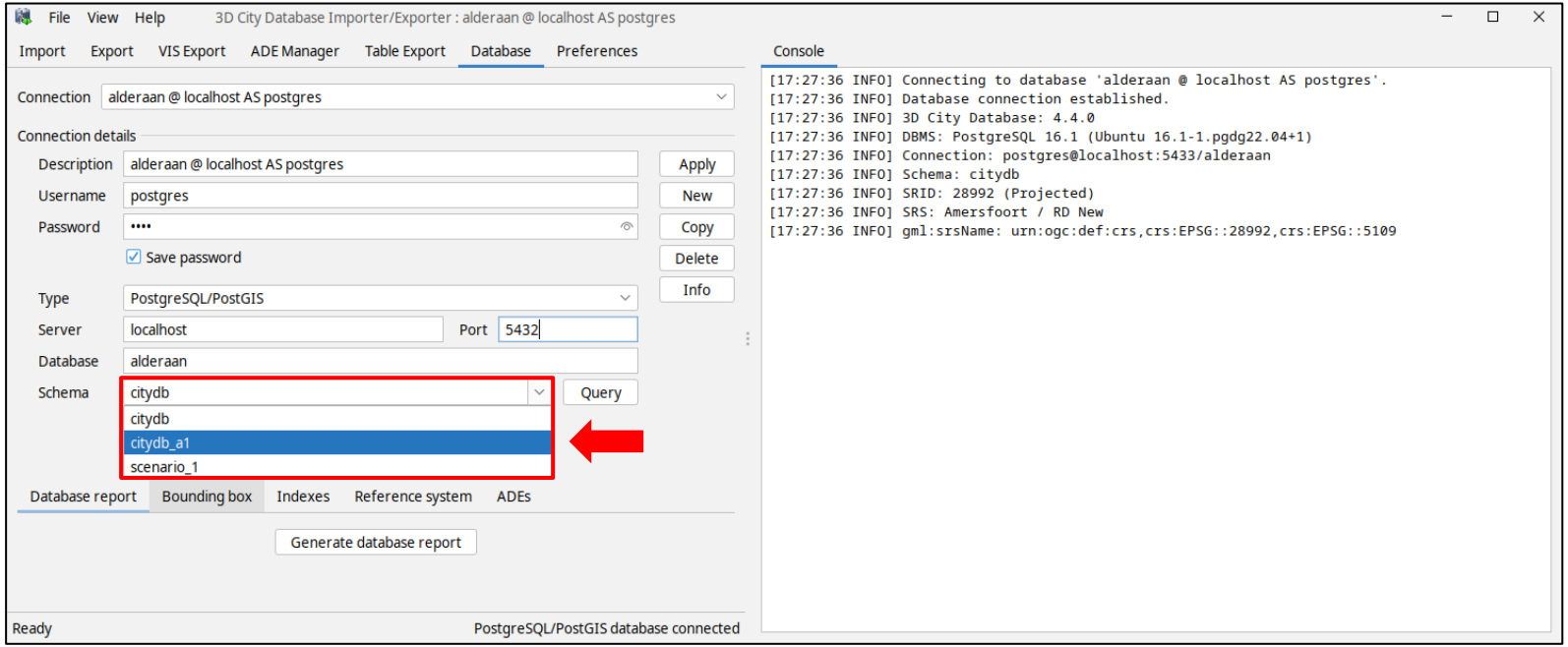
Software required
Software install
Database setup
Imp/Exp connection
Additional schemas
ADE plug-ins
Further resources

- **To add additional schemas** (OPTIONAL, besides the default citydb):
  - Go to the same directory where the citydb installation script are. In the command shell run
    ```
    chmod u+x CREATE_SCHEMA.sh
    chmod u+x DROP_SCHEMA.sh
    ```
  - Check the connection parameters in file **CONNECTION_DETAILS.sh** (should be the same as before)
  - Run the script
    ```
    ./CREATE_SCHEMA.sh
    ```
    You will be requested to enter the name of the additional schema (e.g. "citydb_a1", or "scenario_1", etc.)
  - You can choose any name you want, but try to use only small letters
  - The new schema and its contents will be added automatically. The new schema will have the same CRS of the citydb schema
  - You can repeat these steps and add more schemas to the same database. At the end you will have
    - The citydb schema and *n* additional schemas
    - Only one citydb_pkg schema



3D City Database: additional schemas

- When using the Importer/Exporter, you can choose which schema to use to import/export data from the GUI.



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Overview

Install required software

Set up the database

Connect to the database via the Importer/Exporter

Add additional database schemas (Optional)

Install ADE plug-ins (Optional)

ADE plugin installation

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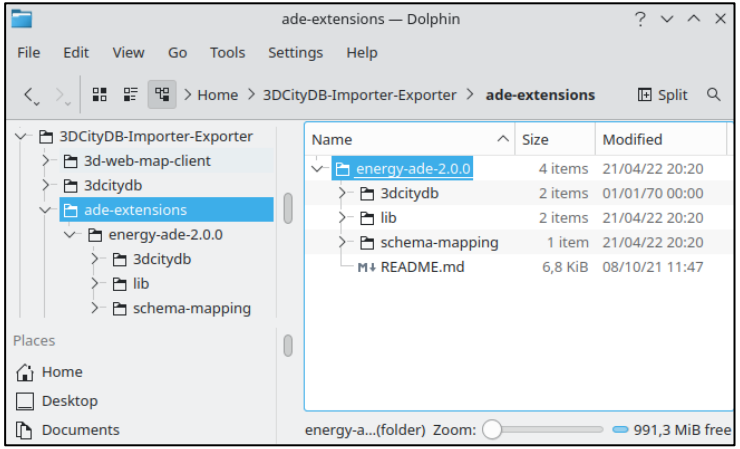
Please note: These slides refer to the Energy ADE plug-in for the 3DCityDB.

However, a similar procedure can be followed for other ADEs.

1) Download the **energy-ade-citydb** extension for the Importer/Exporter
   – https://github.com/3dcitydb/energy-ade-citydb/releases/

2) Unzip it in folder ade-extensions of your 3DCityDB install path

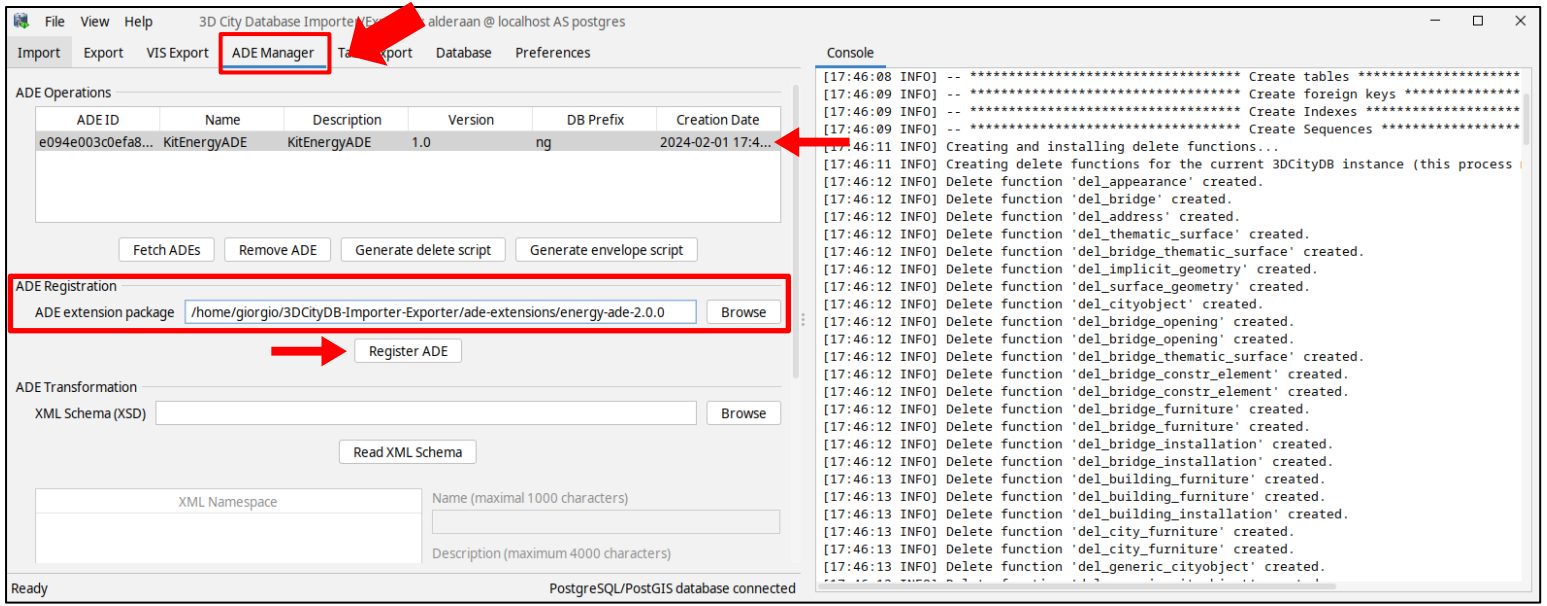


Detailed instructions available on-line

- https://3dcitydb-docs.readthedocs.io/en/latest/plugins/ade-manager/index.html

ADE plugin installation

- From the Importer/Exporter, connect to an existing 3DCityDB instance
  - In the "ADE extension package" add the path to the plug-in folder unzipped before
  - "Register" the ADE from the ADE Manager tab
  - The ADE will be added to the ADE list (and all tables, etc. will be added to the current schema)



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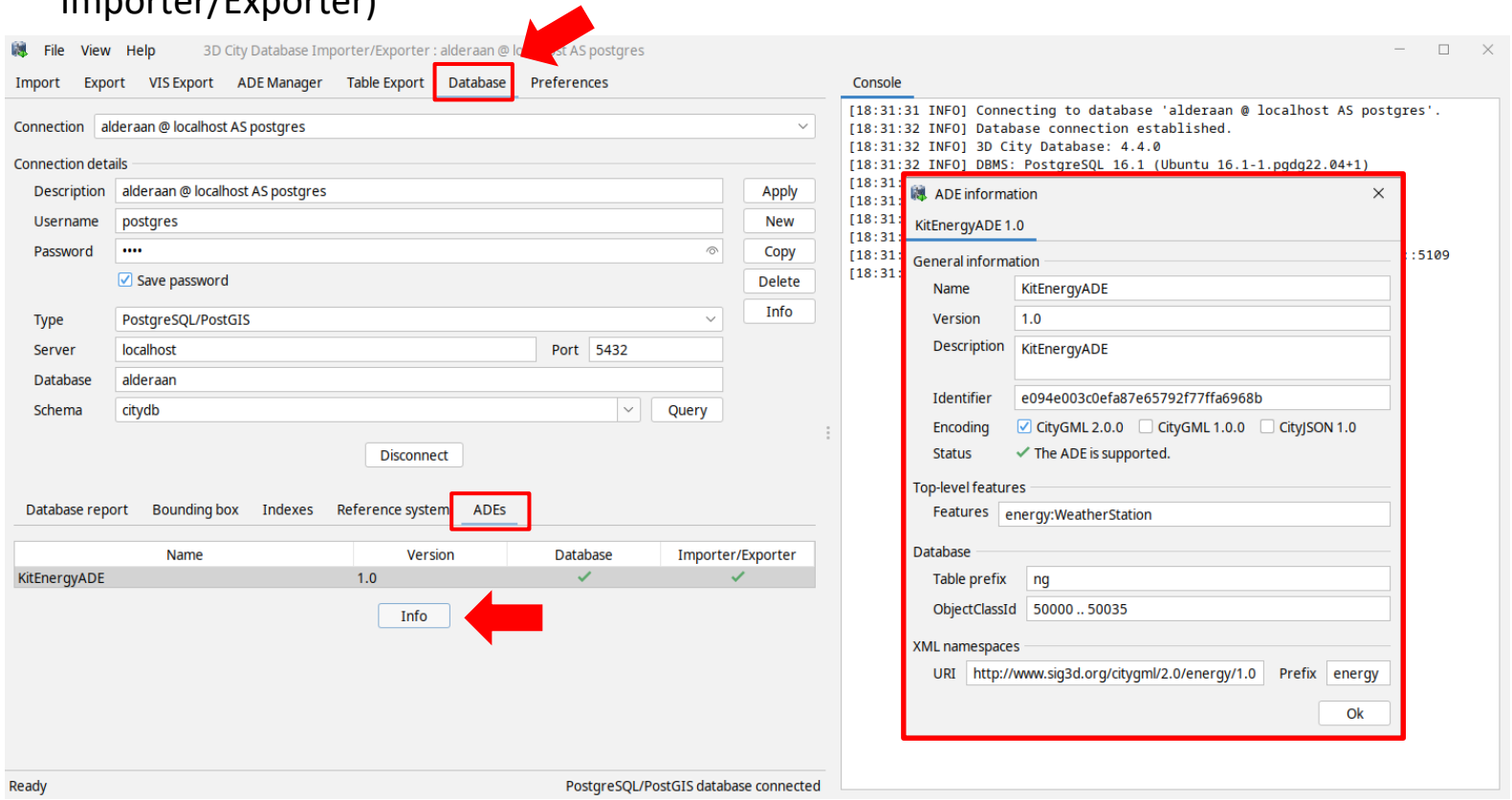
ADE plugin installation

- Check also in the database tab the ADEs properties (you may have to restart the Importer/Exporter)



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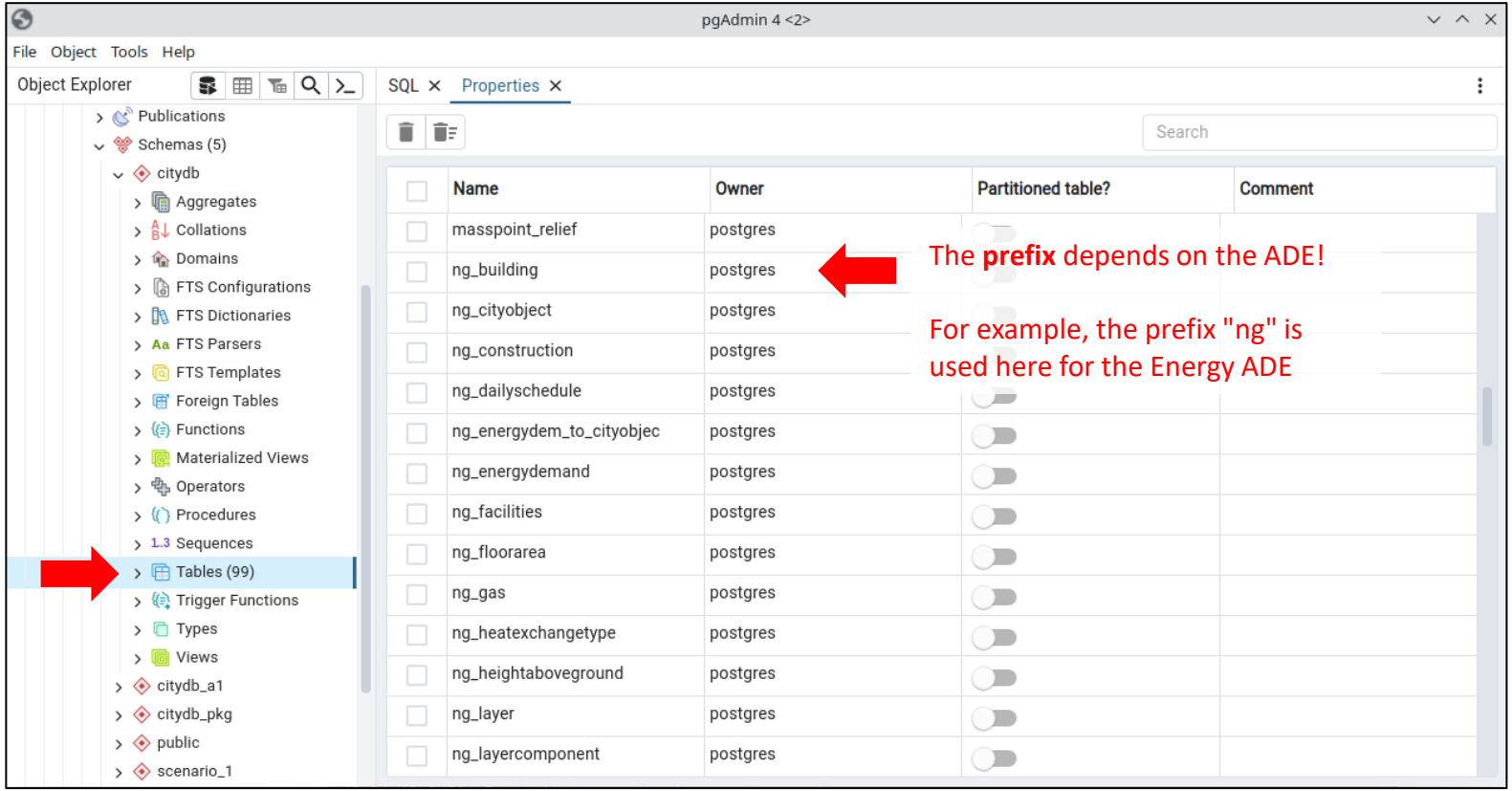
- Check in pgAdmin: new tables (and functions) with prefix "ng" have been added



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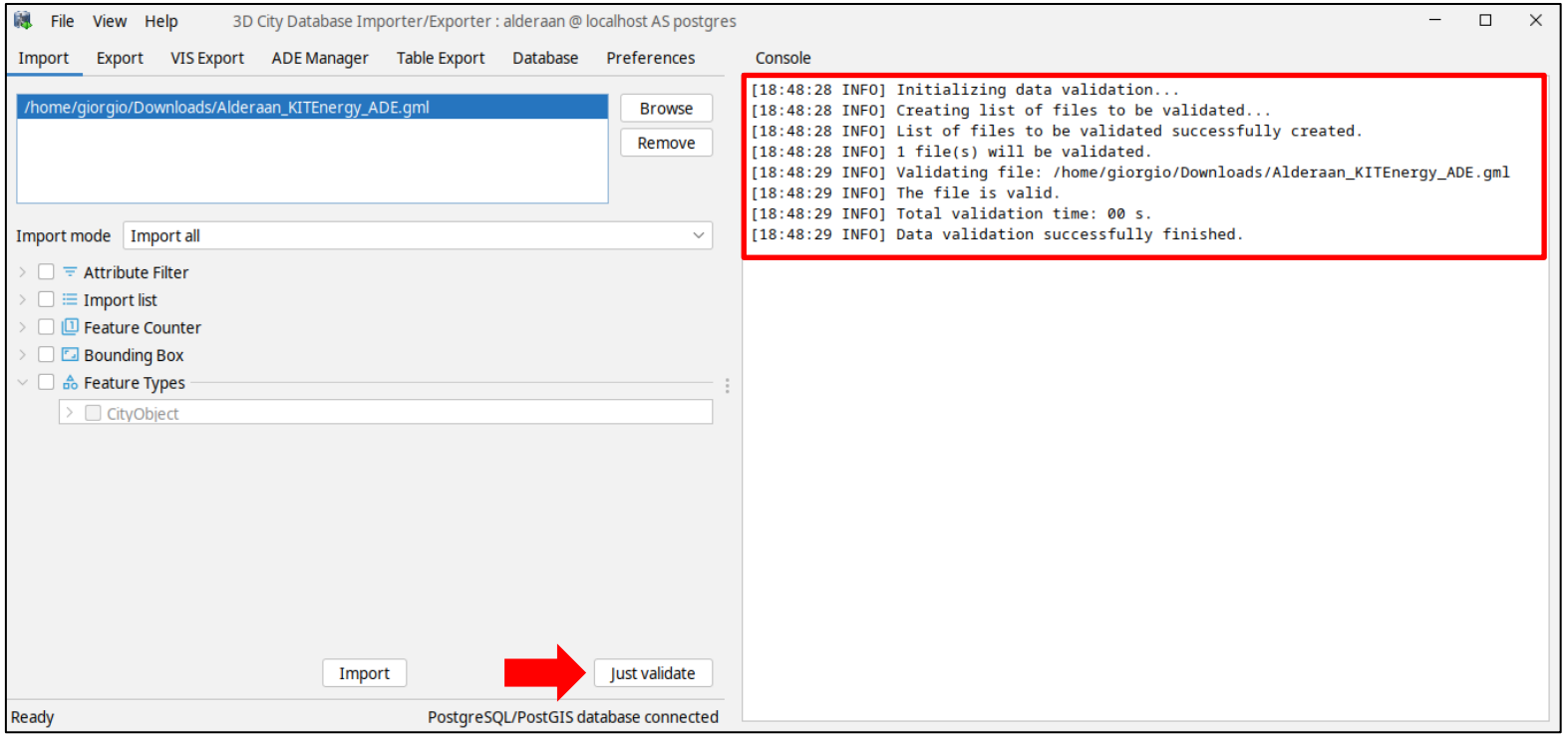
ADE data import

- To import ADE data into the extended 3DCityDB, the procedure is the same as with non-ADE data via the Import tab



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- Data export

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ADE data import

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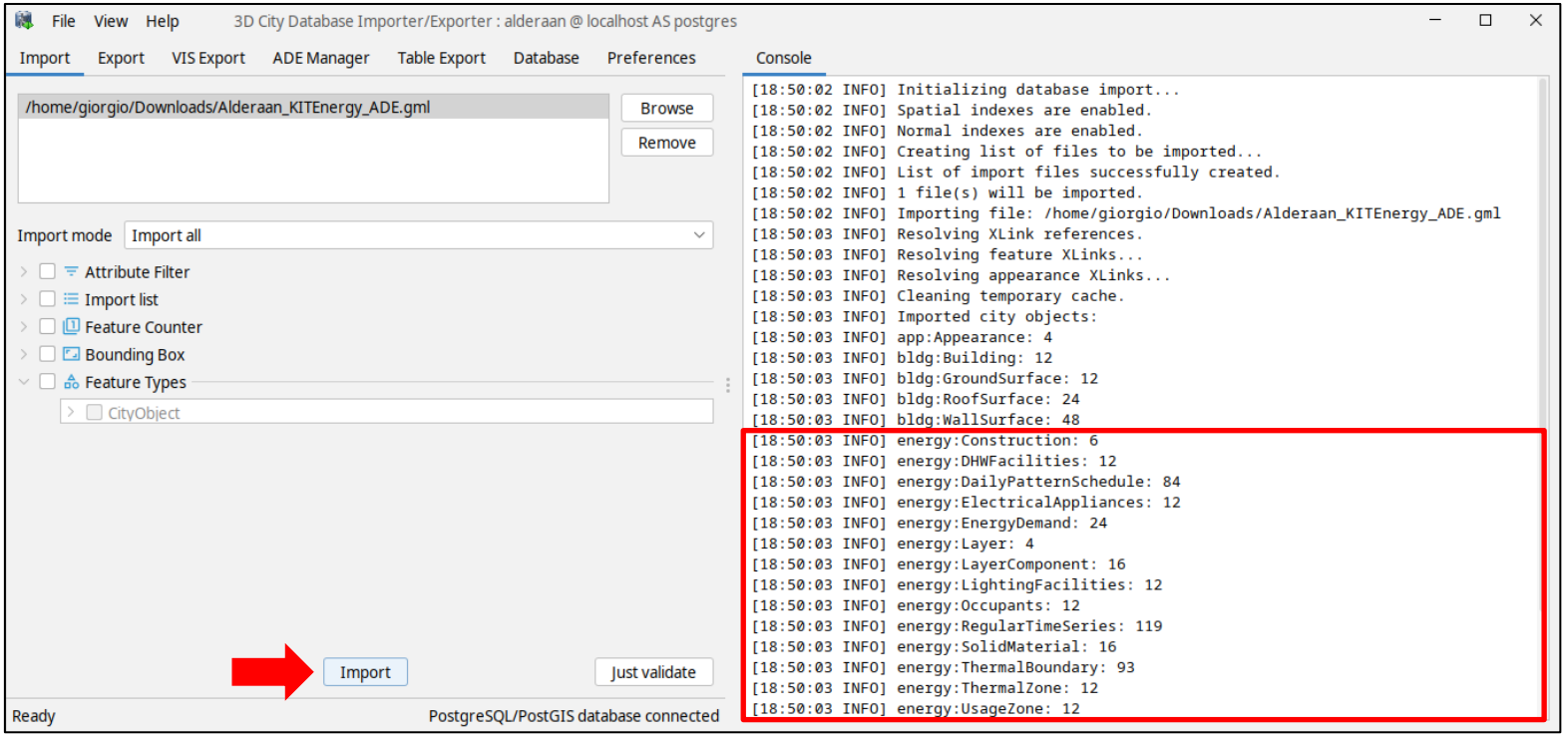

ADE data import

- Check also the database report in the database tab!

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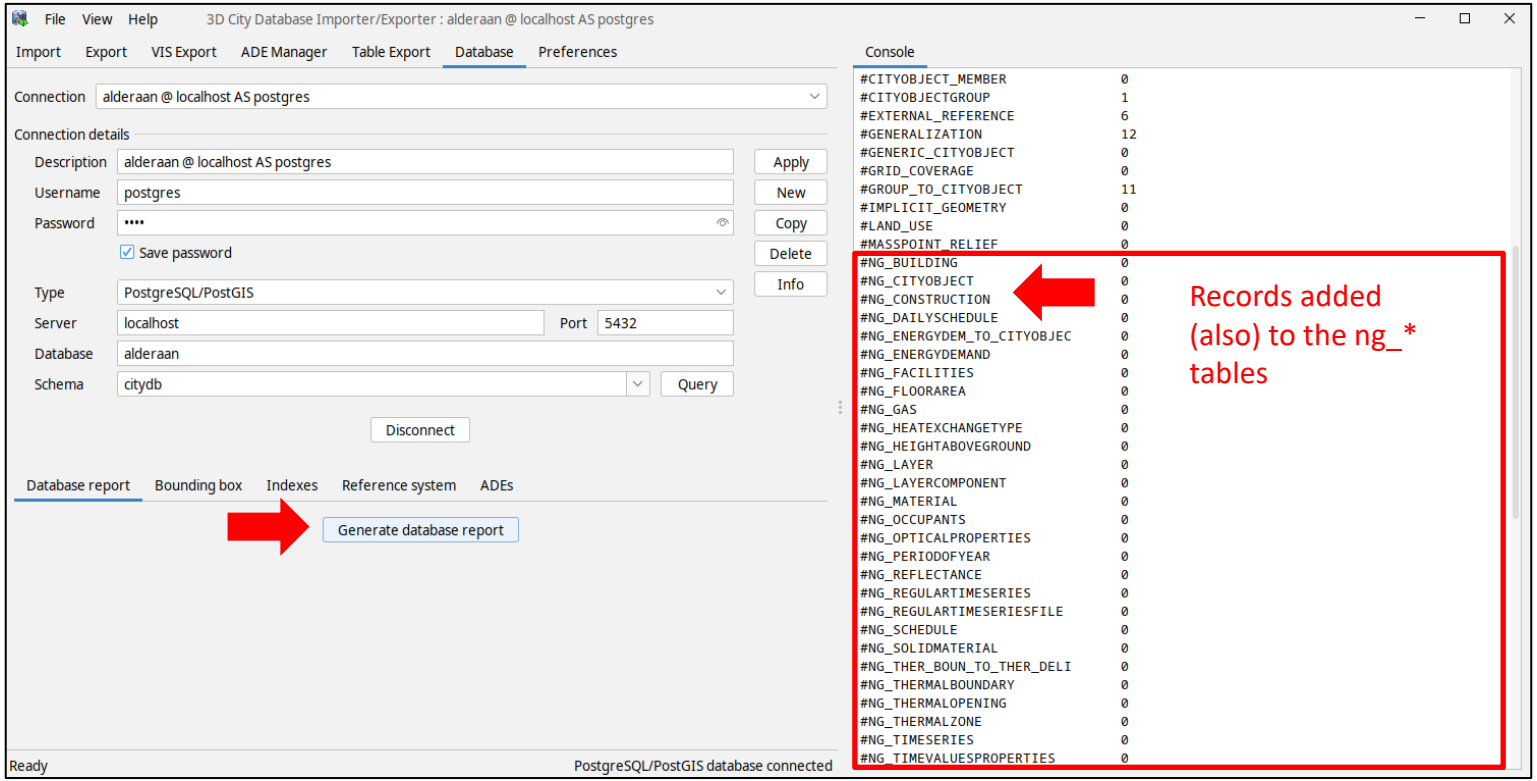
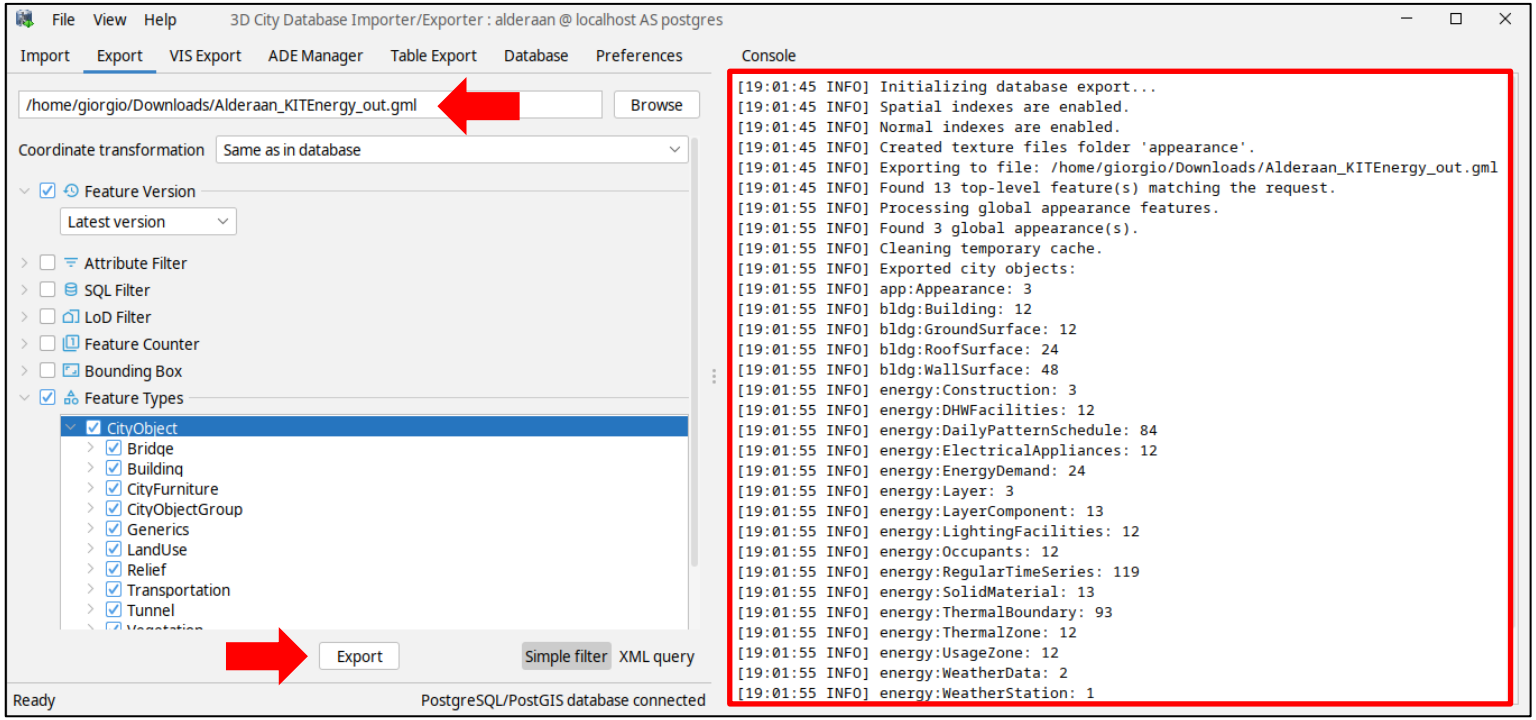


ADE data export

- Conceptually analogous to the procedure without ADE content. Simply choose what to export, and run the exporter!



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Further resources

- Fur further information, check the official 3DCityDB documentation regarding the installation procedure details

- **Online documentation**
  - https://3dcitydb-docs.readthedocs.io/en/latest/

- **Online tutorial by TU Munich**
  - https://github.com/3dcitydb/tutorials

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