PYTHON AND SQL REVIEW

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HONR 490: Foundations of Geospatial Analytics

Fall 2021

PURDUE UNIVERSITY

Topics

- Installing required tools
  - PostgreSQL
  - PostGIS
  - Python dependencies
- Running PostgreSQL from your local machine
- Using PostgreSQL, PostGIS, GeoPandas, and Python
  - Basic PostGIS functionality

Installing Required Tools

1. Install and set up PostgreSQL
2. Install PostGIS
3. Configure PostgreSQL to run PostGIS
4. Run PostgreSQL
5. Install Python packages and dependencies
6. Execute PostGIS on geospatial data via Python

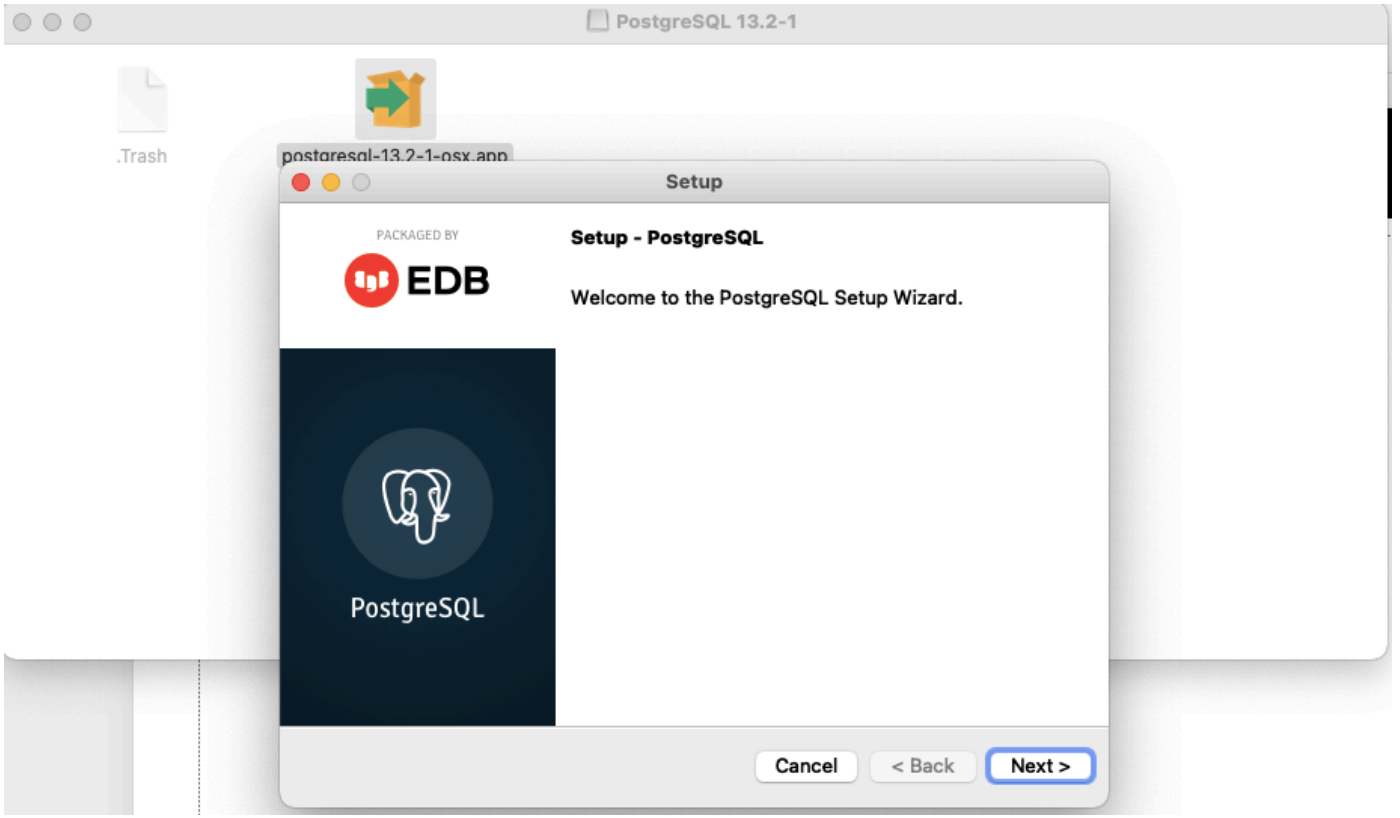
Install and Set up PostreSQL

- Download link: https://www.enterprisedb.com/downloads/postgres-postgresql-downloads

- Mac users:
  - brew install --cask postgres

Install and Set up PostreSQL

- Windows users, follow these steps. Mac users, seriously—use brew!



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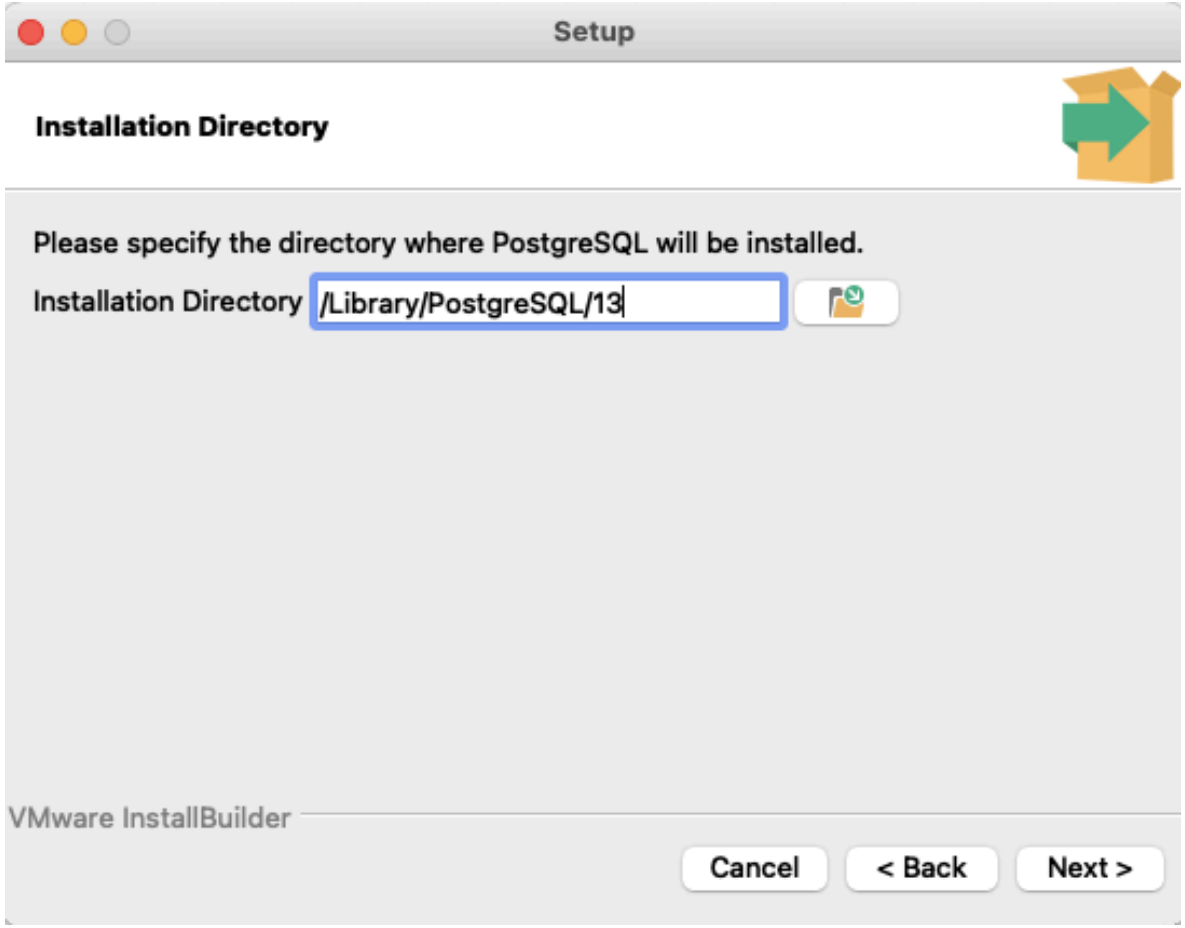

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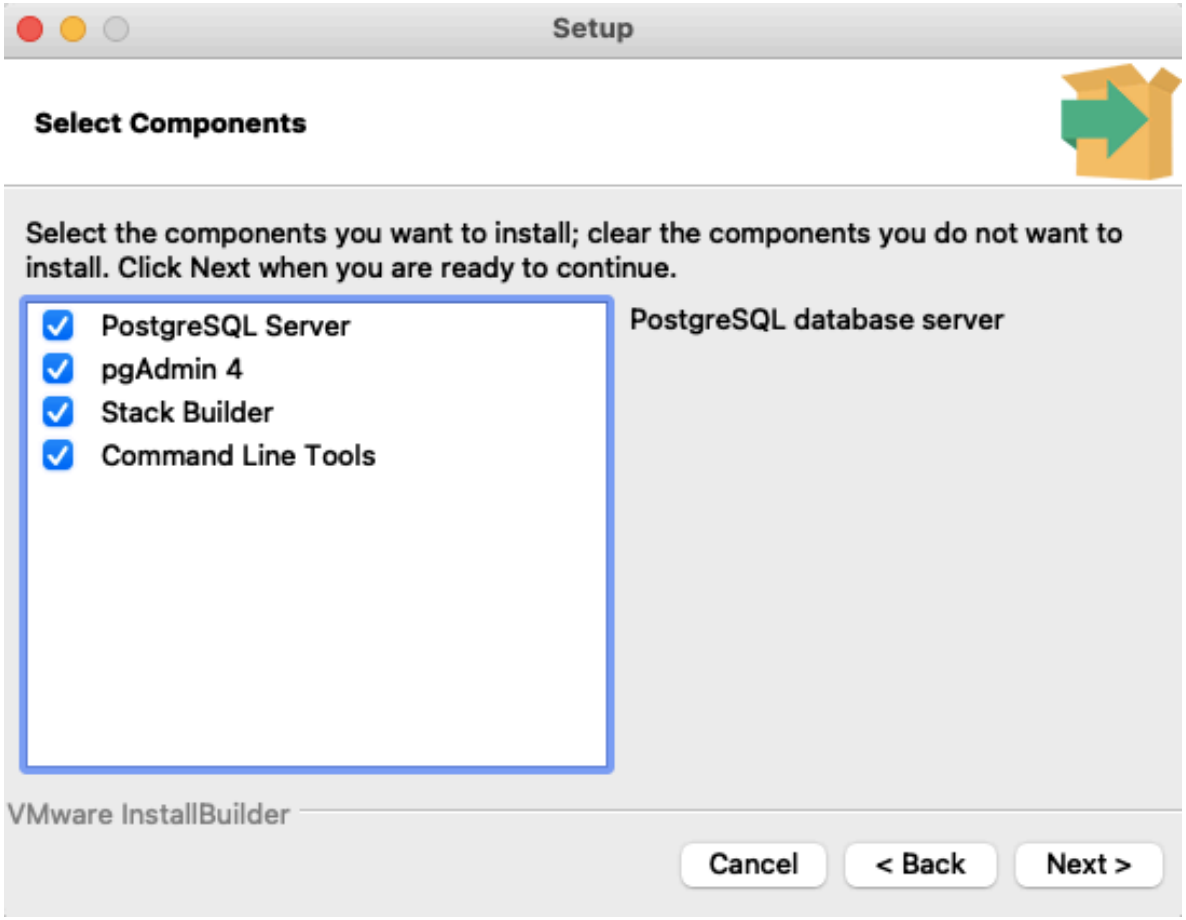

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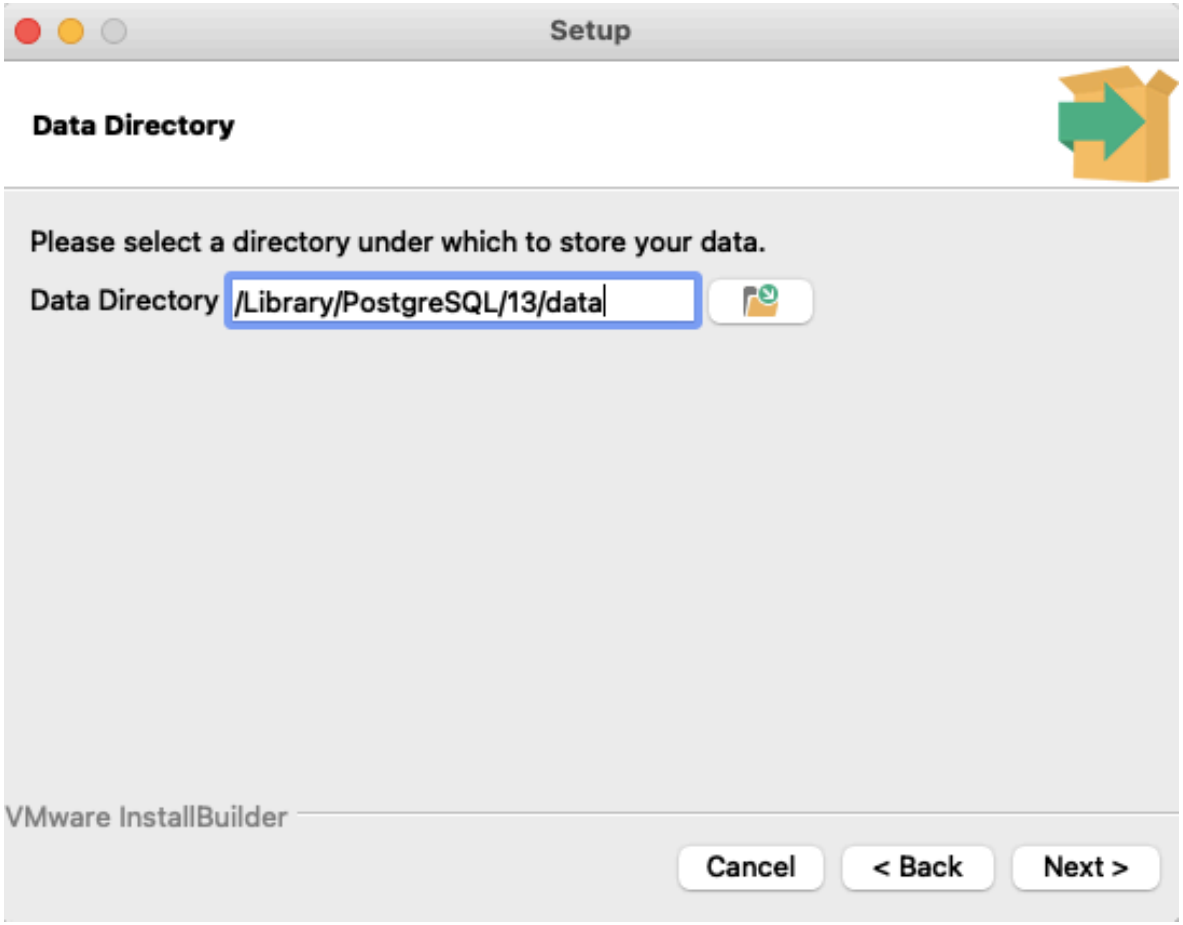
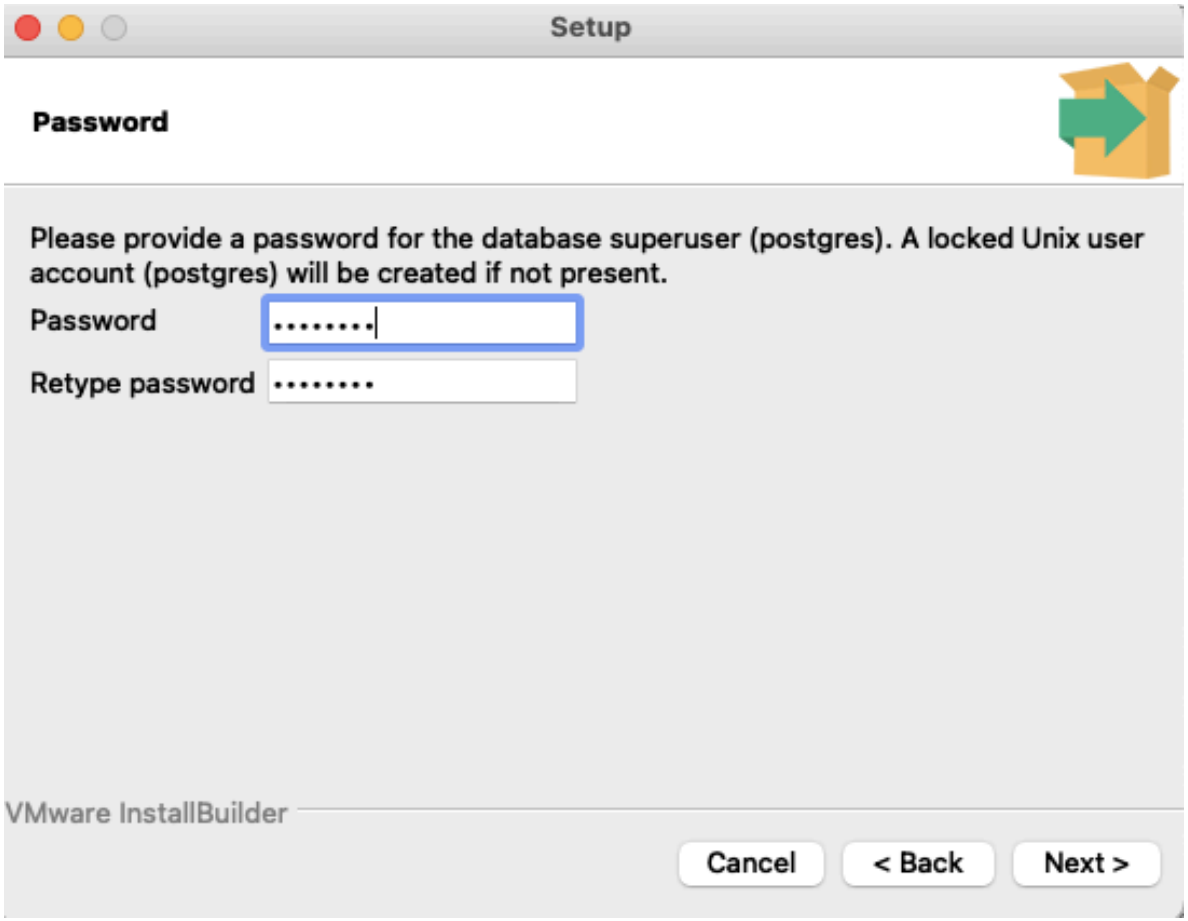


Install and Set up PostreSQL

- Password = postgres



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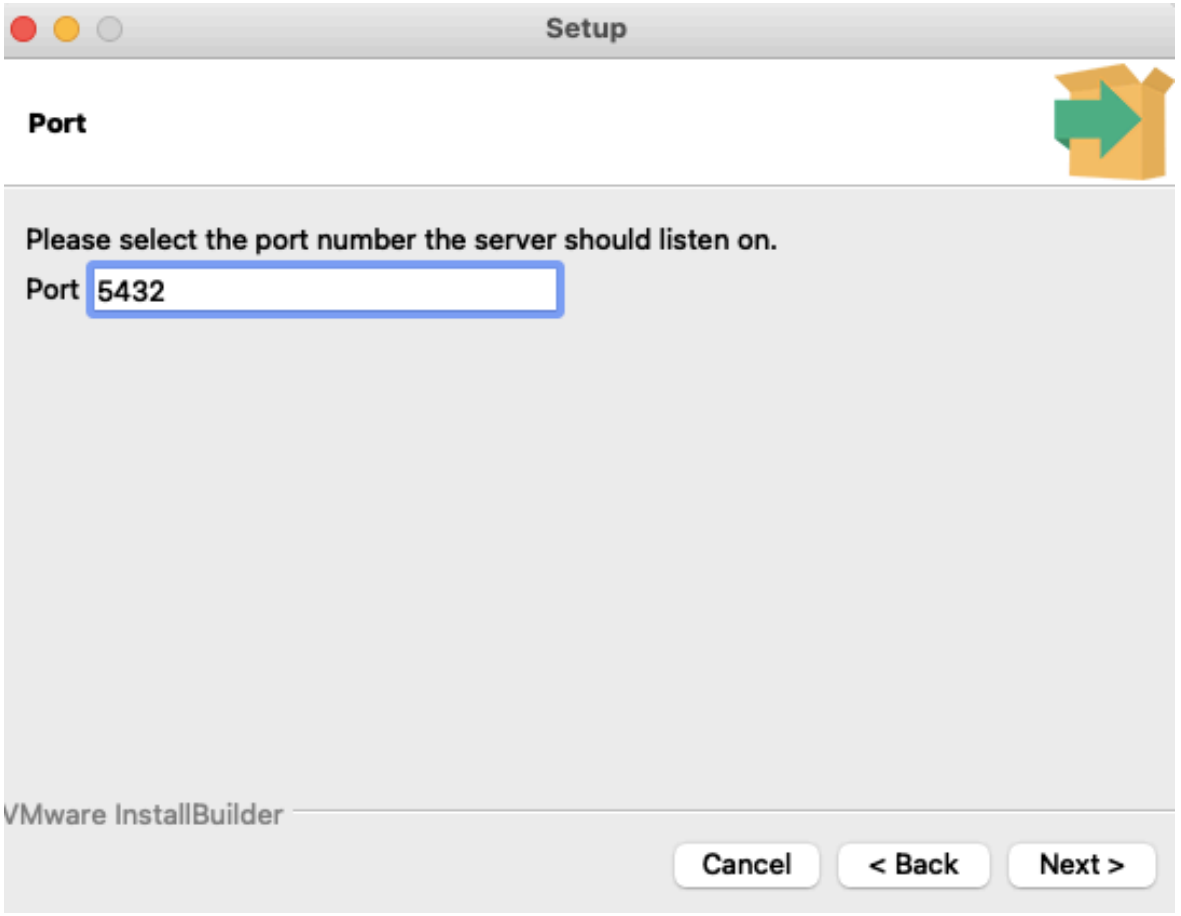

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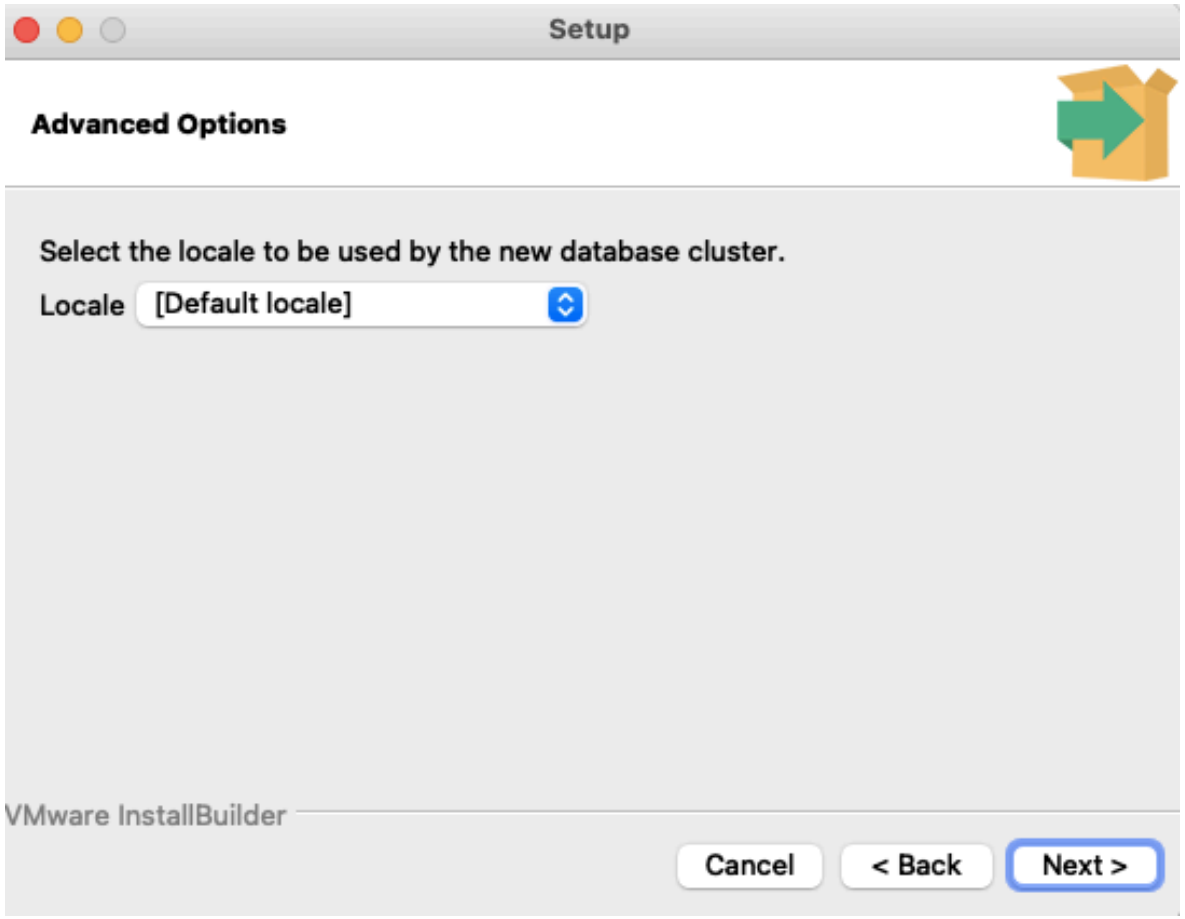

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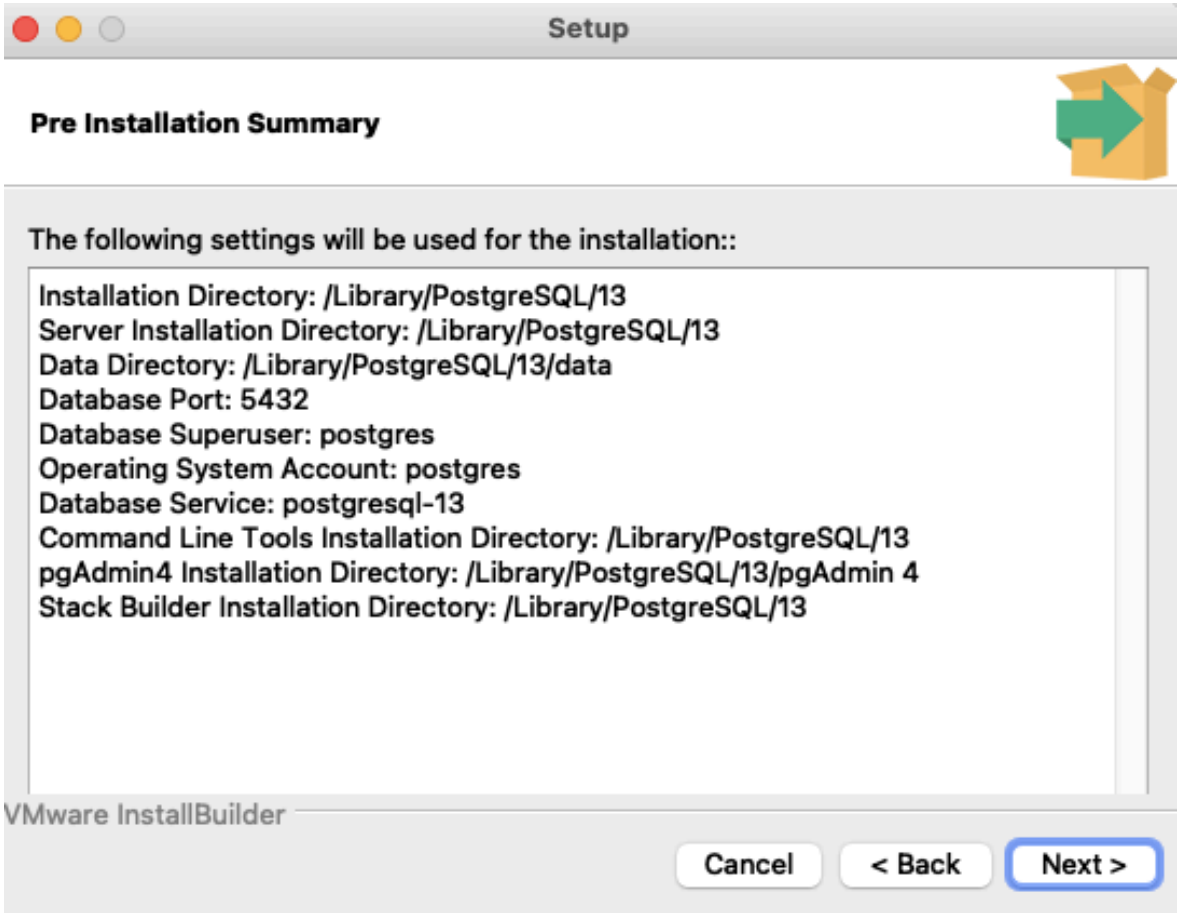

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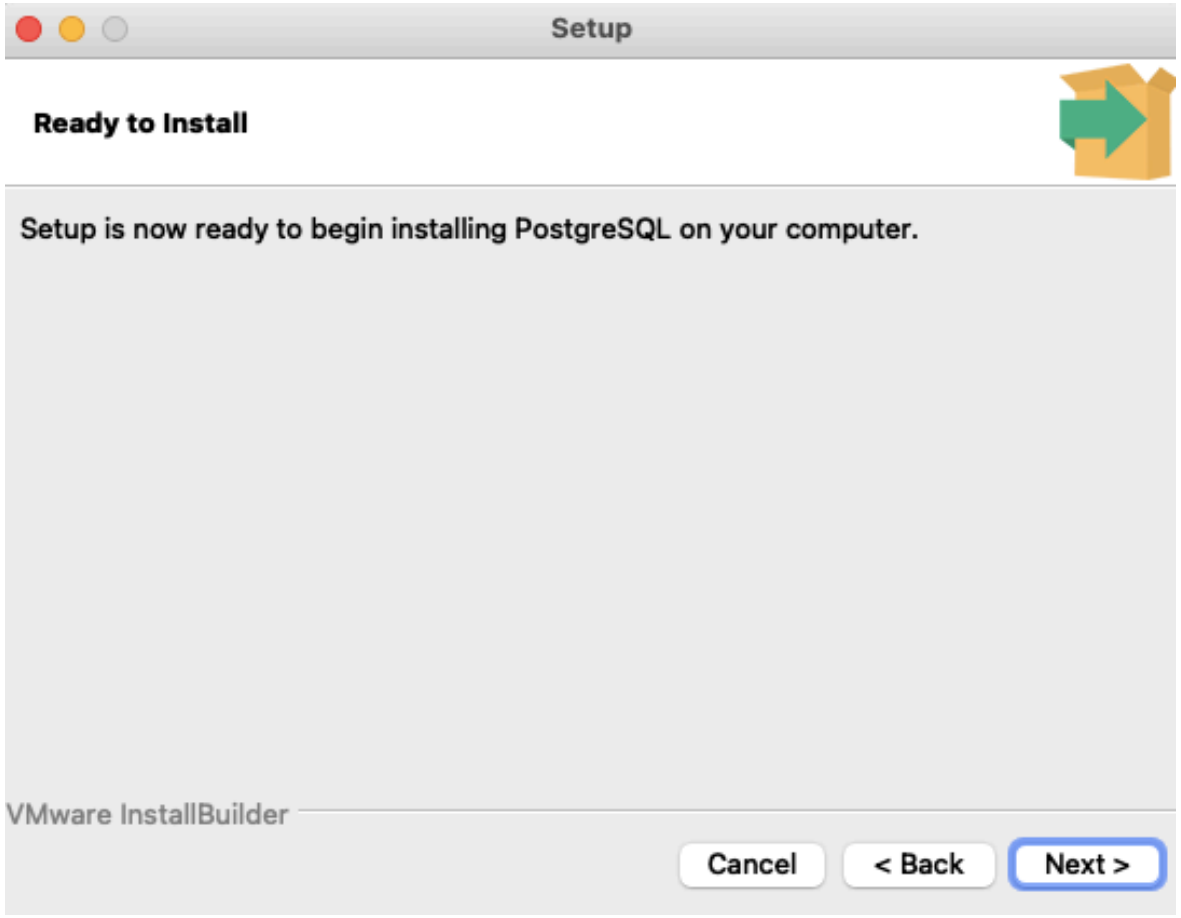

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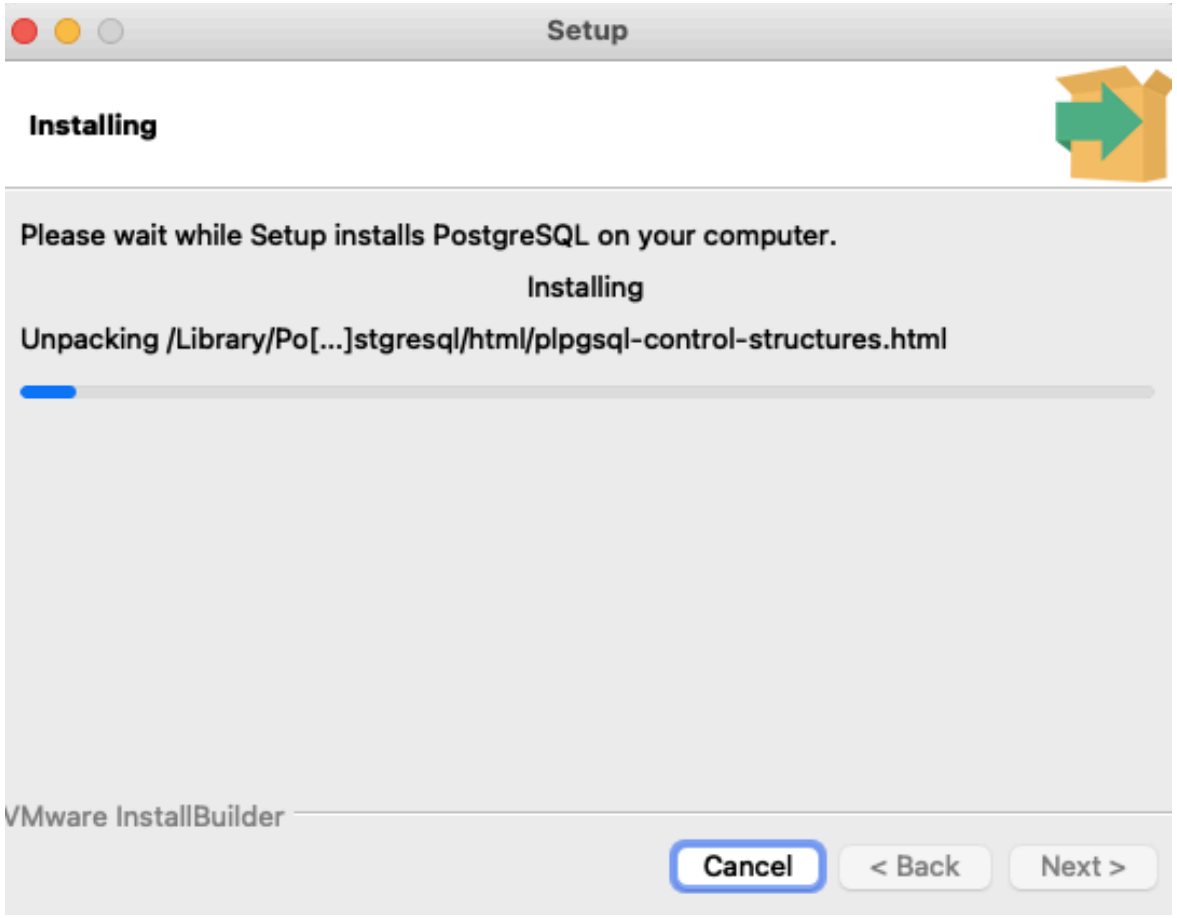


Install and Set up PostreSQL

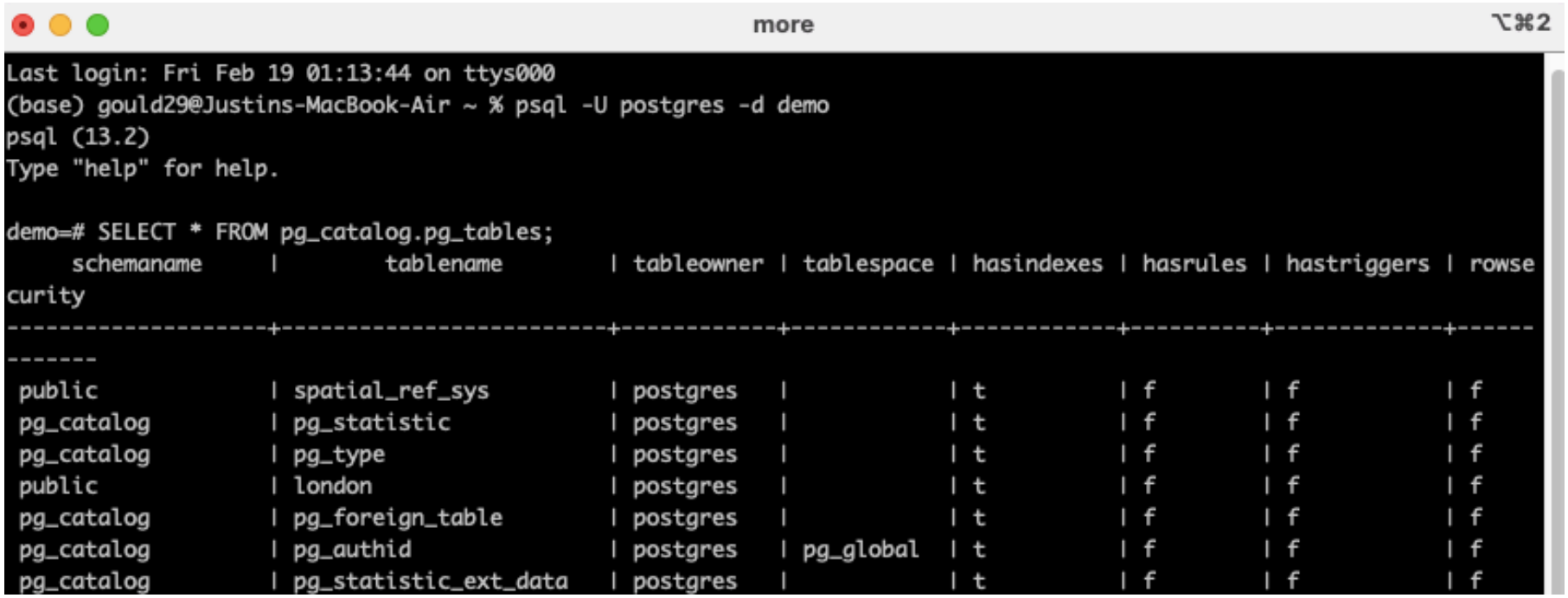
Restart your computer!

Install and Set up PostreSQL

- You can use PostgreSQL either via GUI (pgAdmin) or CLI (psql)
- To download and install pgAdmin: https://www.pgadmin.org/download/
- To use CLI (access psql) – **this is the preferred method**:
  - **On Windows:**
    - On Windows, you can find psql in the Program Files, and you should be able to launch it in a command prompt simply by clicking on it.
  - **On Mac:**
    - You should be able to run psql directly from a terminal of your choice. BE SURE TO SPECIFCY -U flag for postgres user

Install and Set up PostreSQL

- Mac users



Install and Set up PostreSQL

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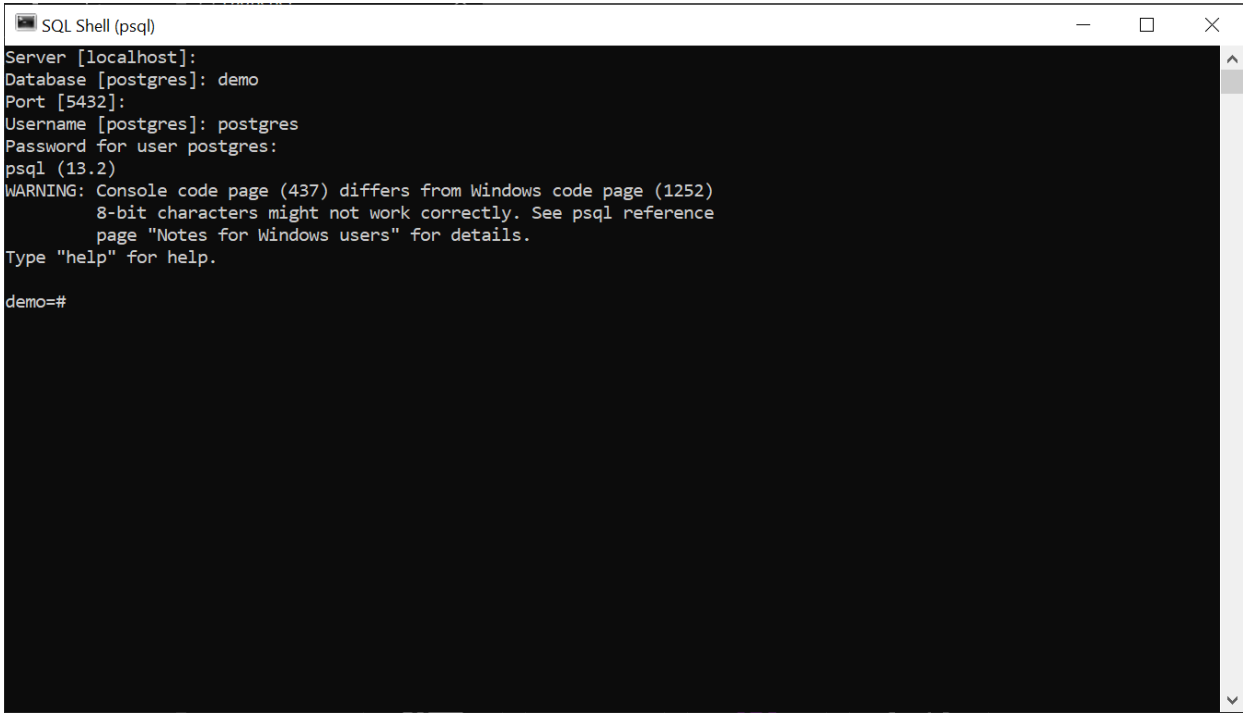


Install and Set up PostreSQL

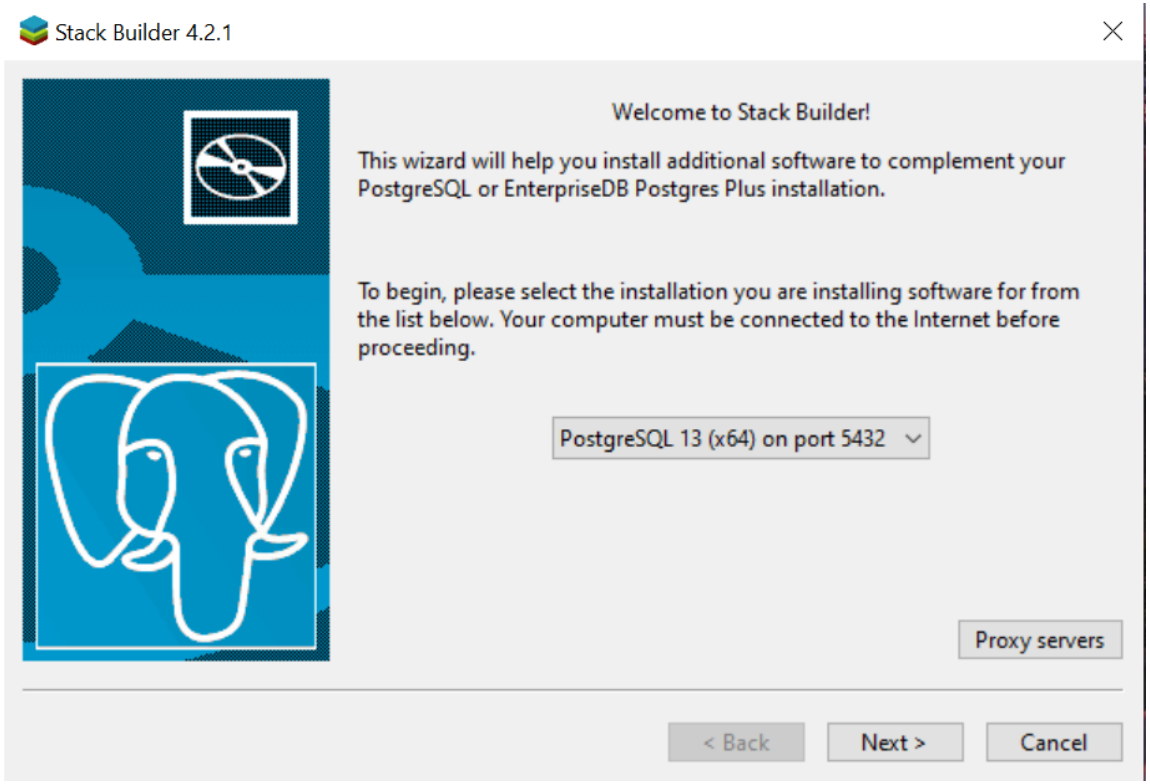
- To use default database (called postgres):
  - psql –U USERNAME
- Once you are “inside” the postgres database called “postgres”:
  - CREATE database NAME;
- Now, to use psql and connect to a specific database:
  - psql –U USERNAME –d DB_NAME
  - If you have a password, upon running, you will be asked to enter it

Install PostGIS

- Windows:
  - http://download.osgeo.org/postgis/windows/
  - Follow the instructions **exactly** or it will not work properly!
- Mac OSX:
  - brew install postgis

Install PostGIS

- The next slides are for our Windows friends!



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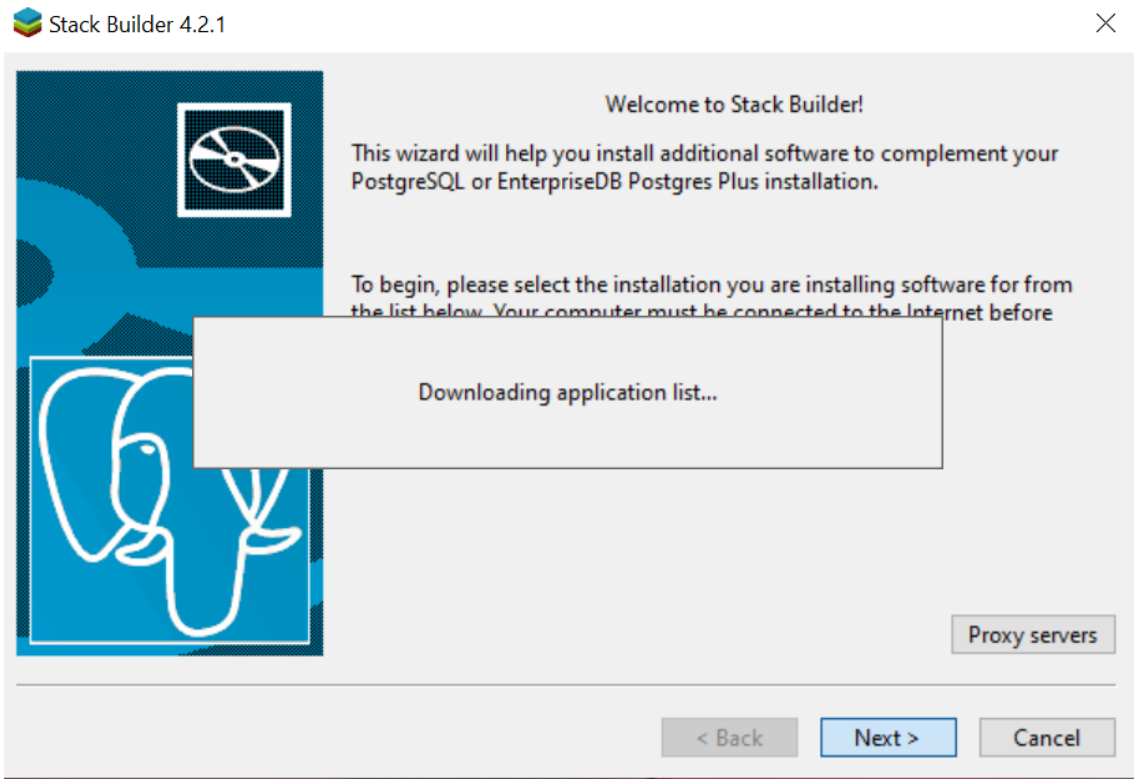

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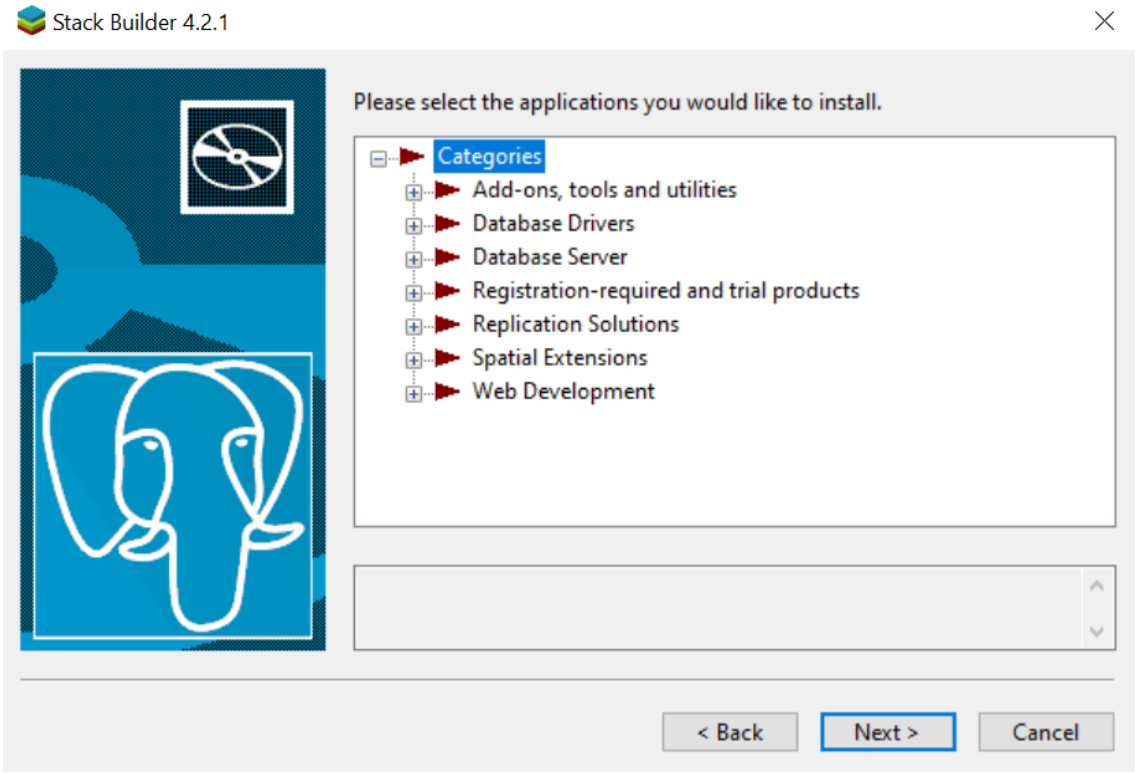

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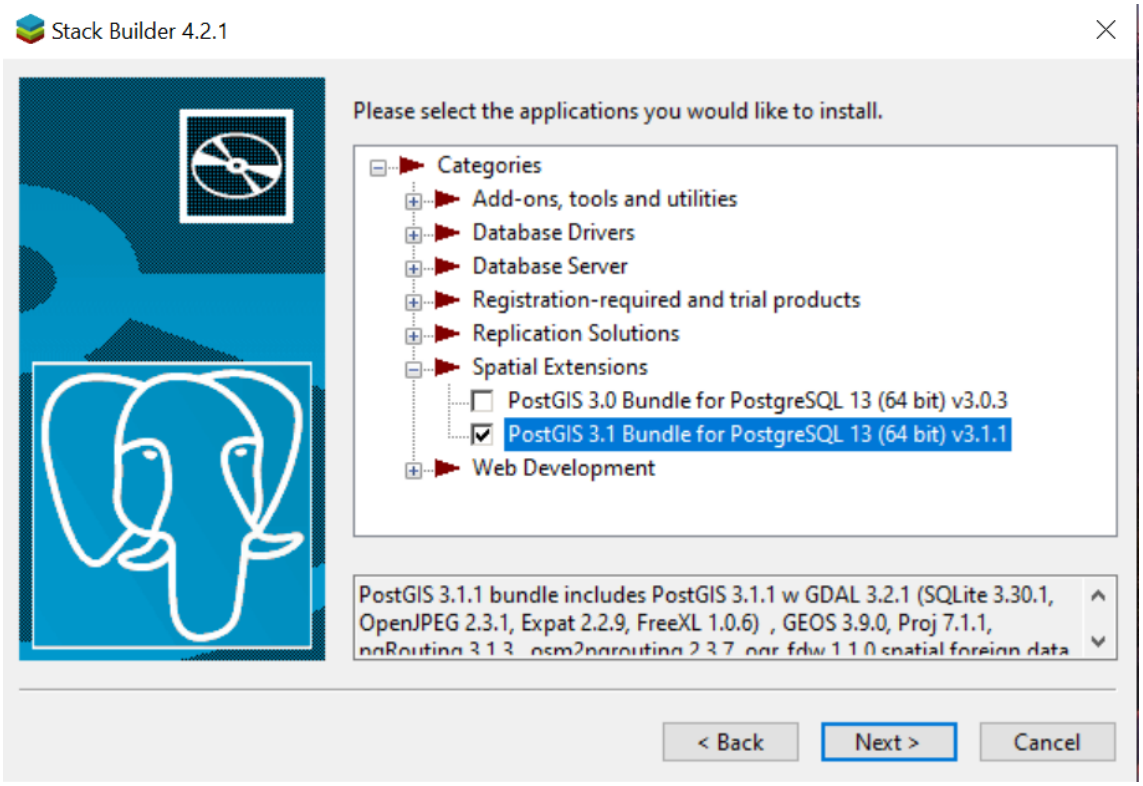

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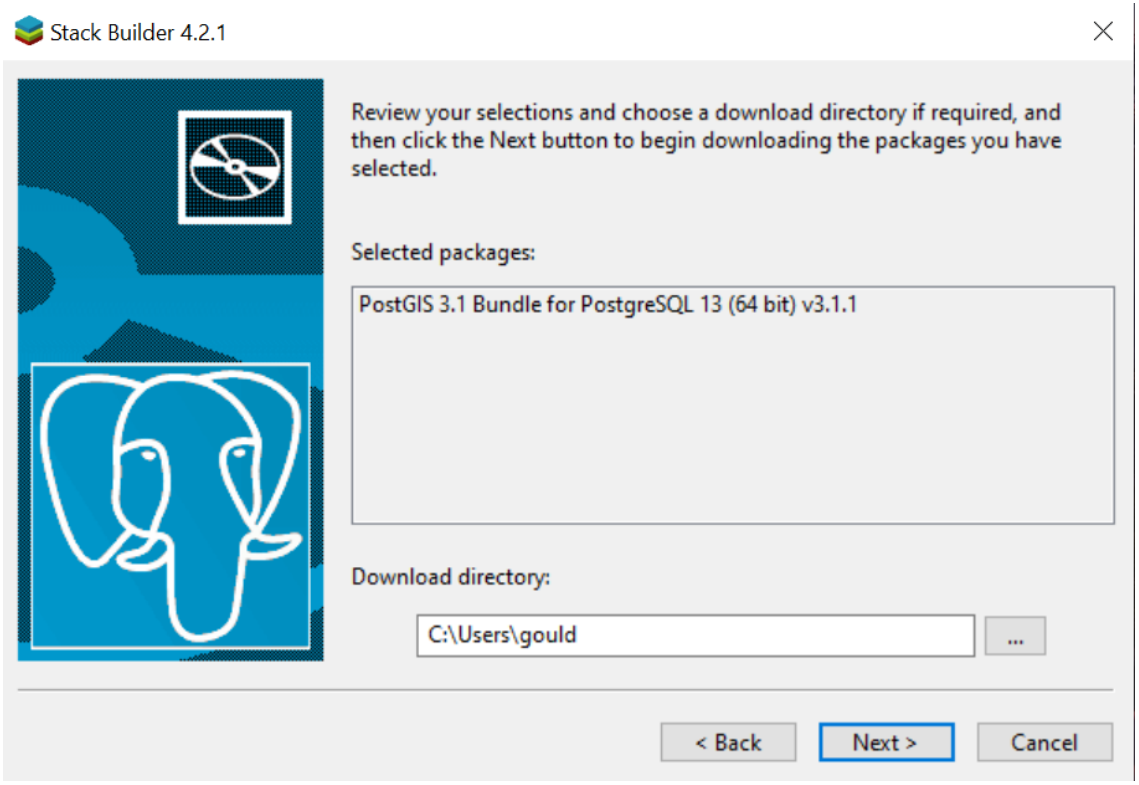

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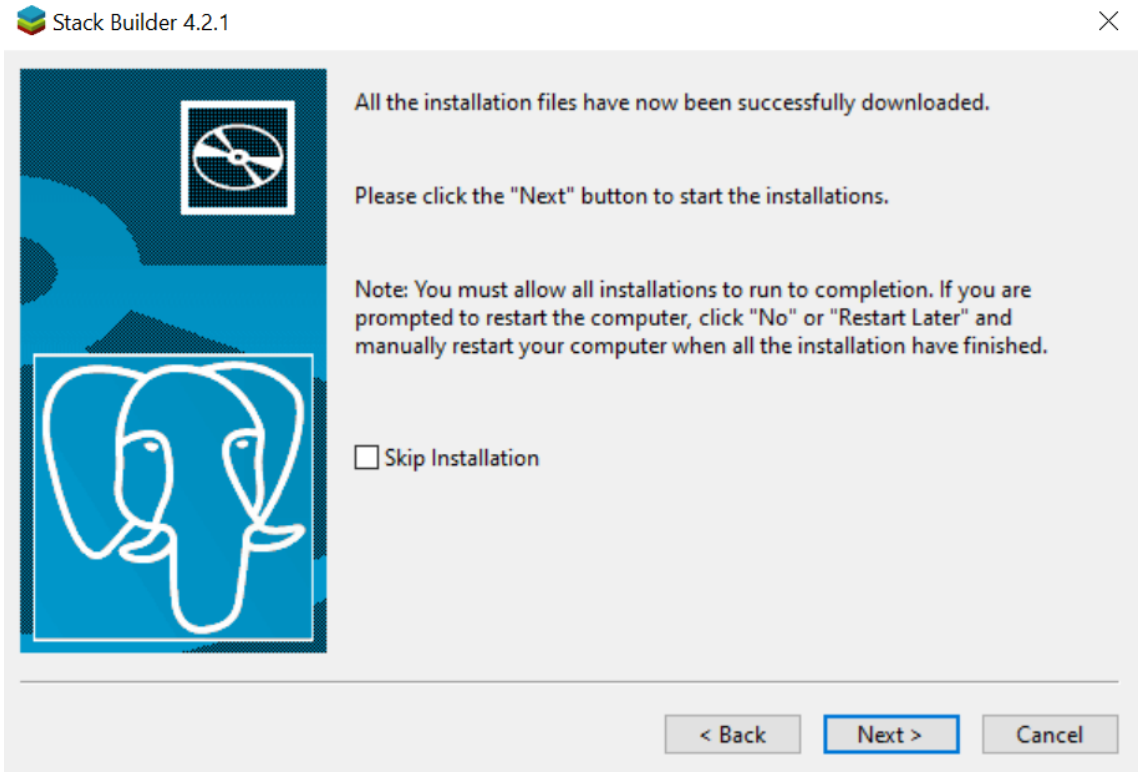

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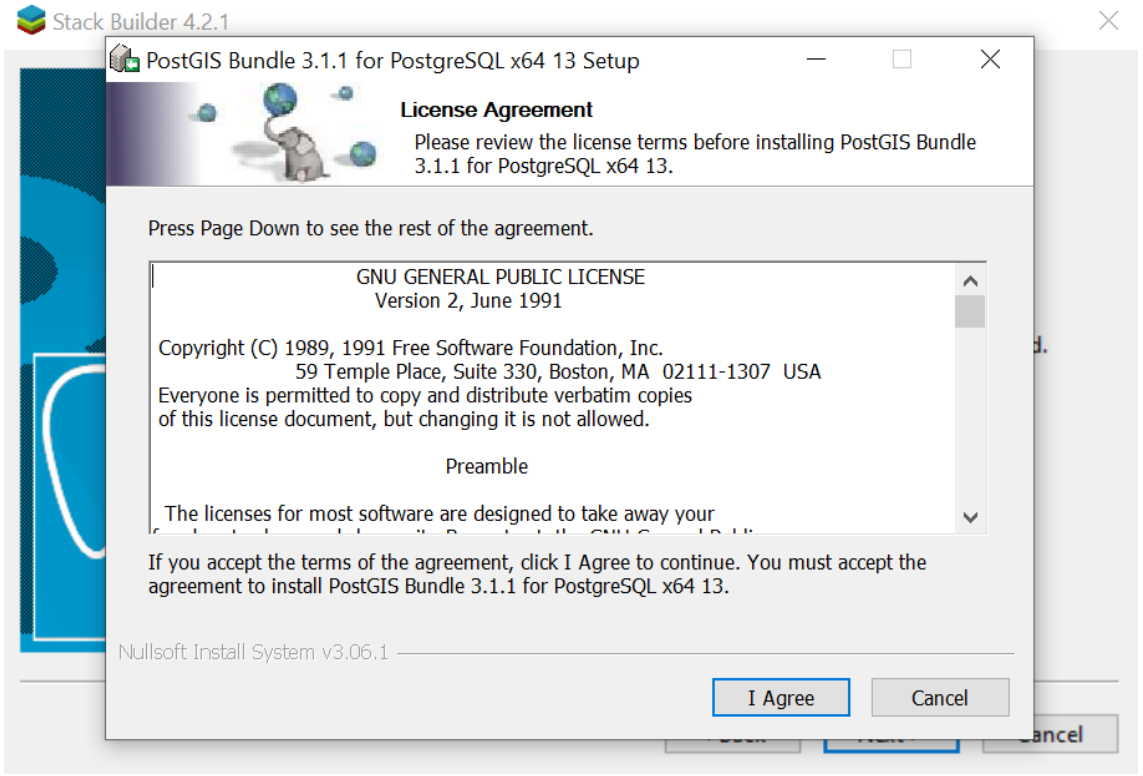

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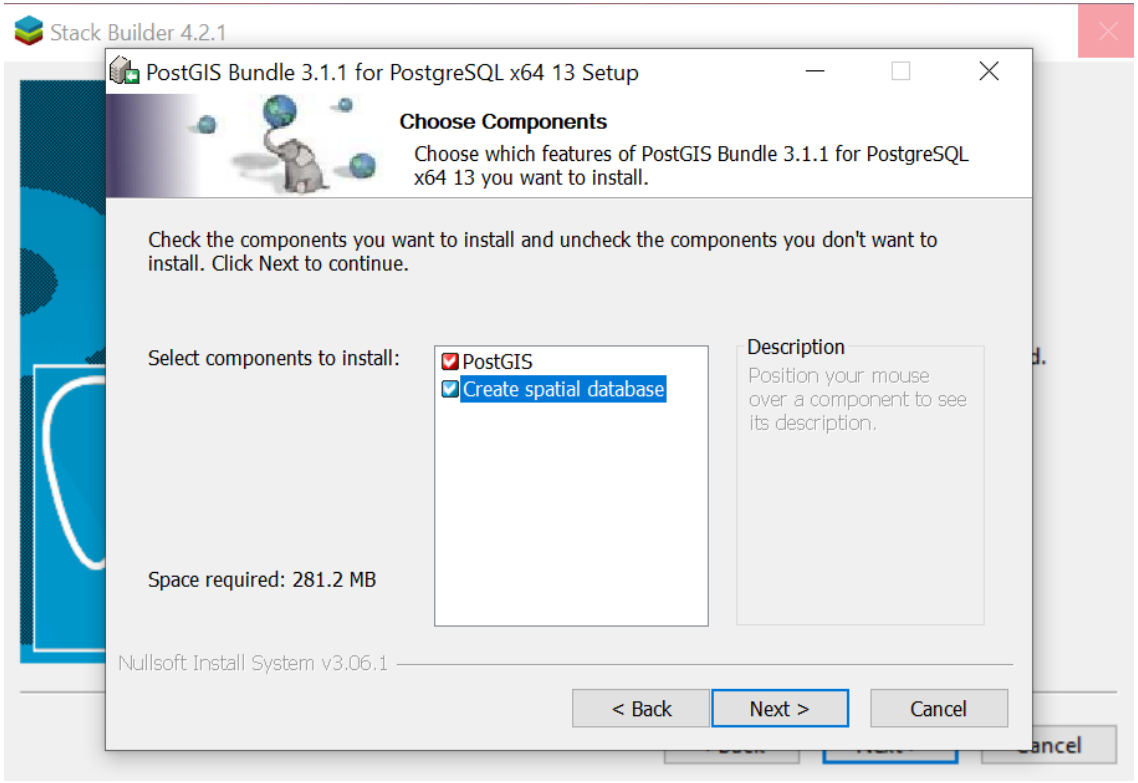

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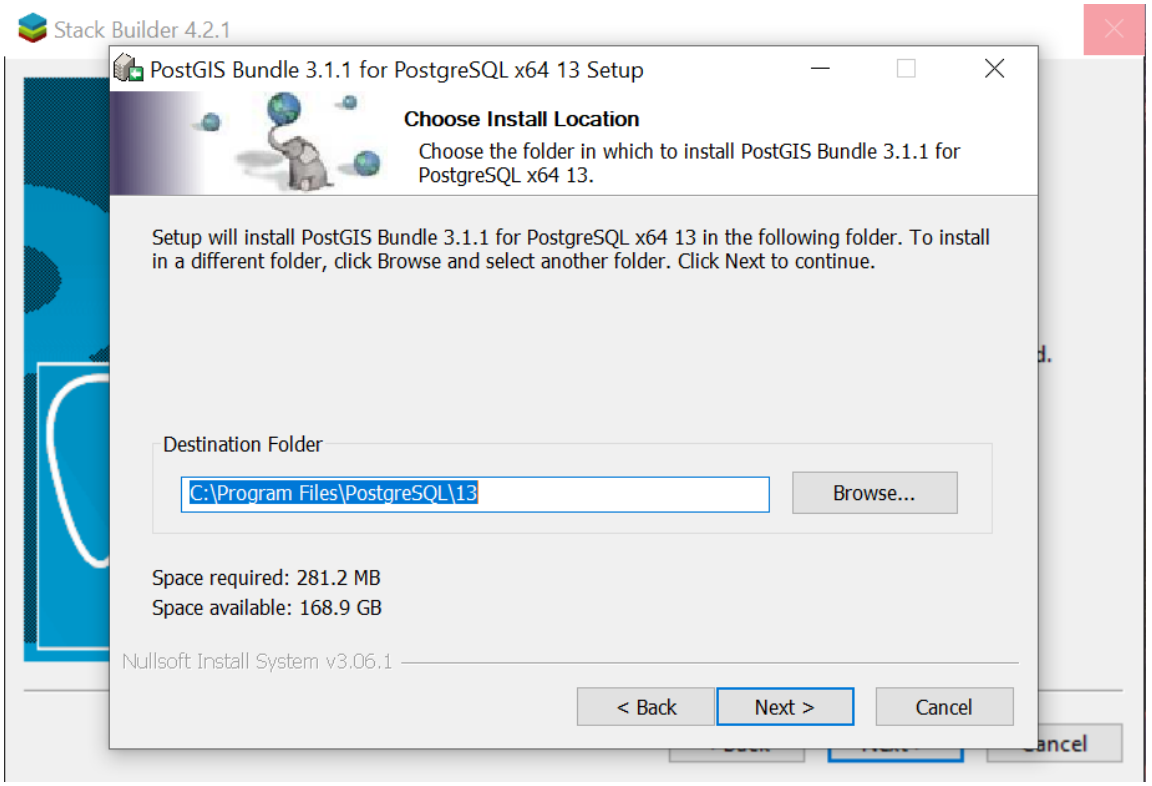

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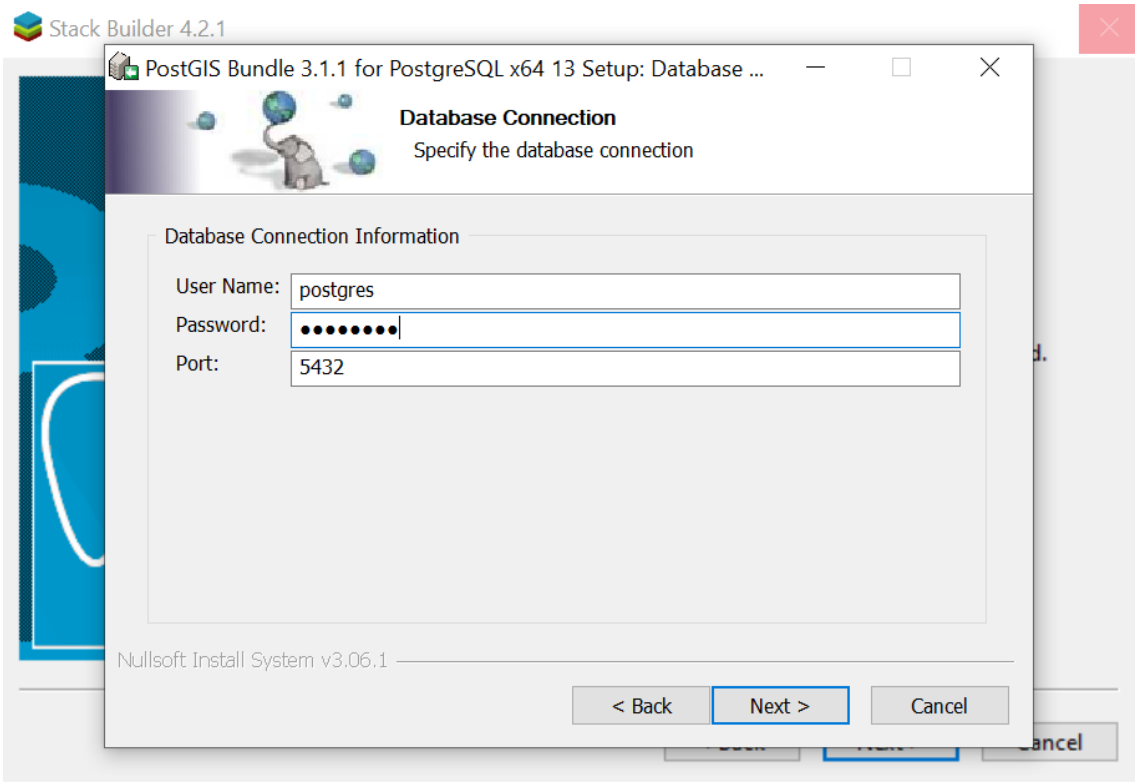

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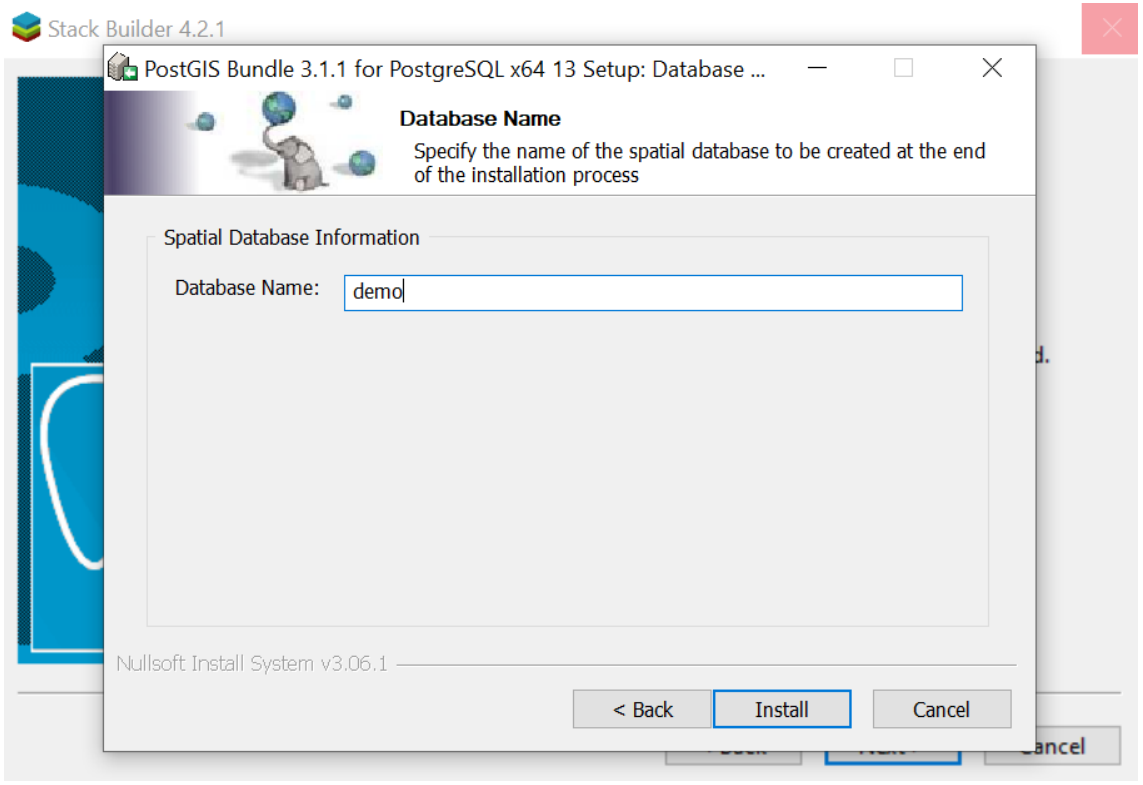

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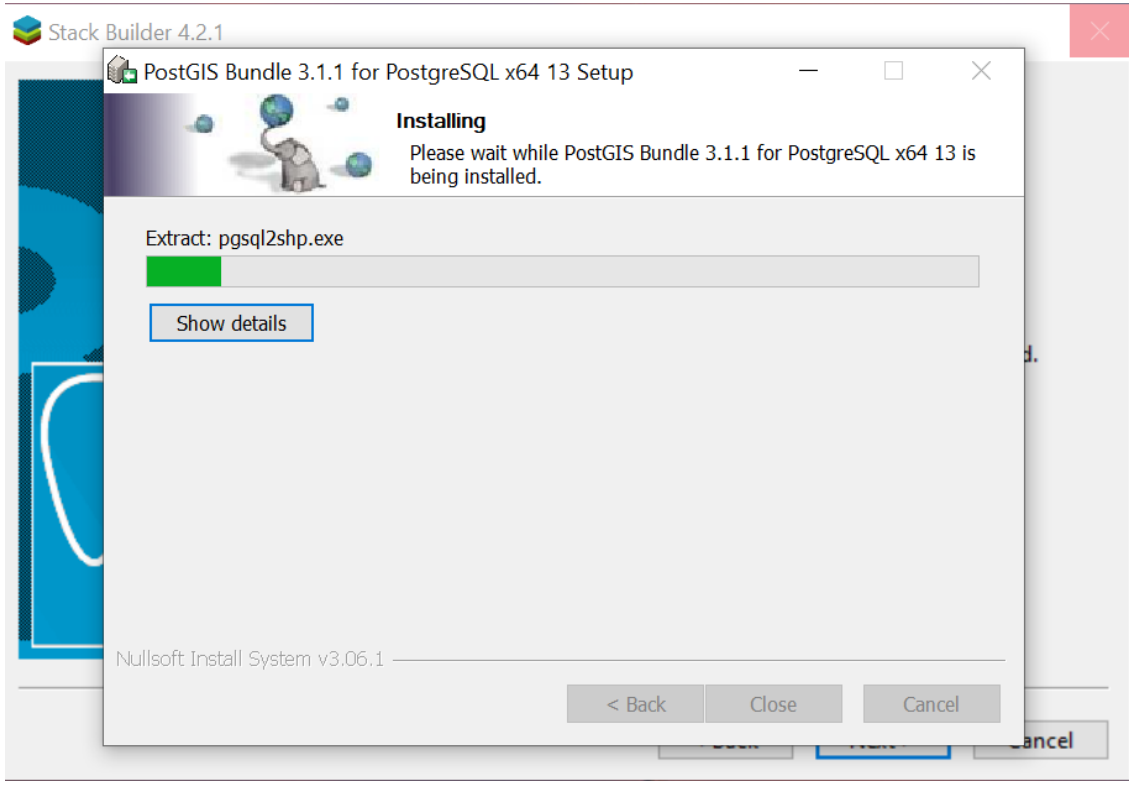

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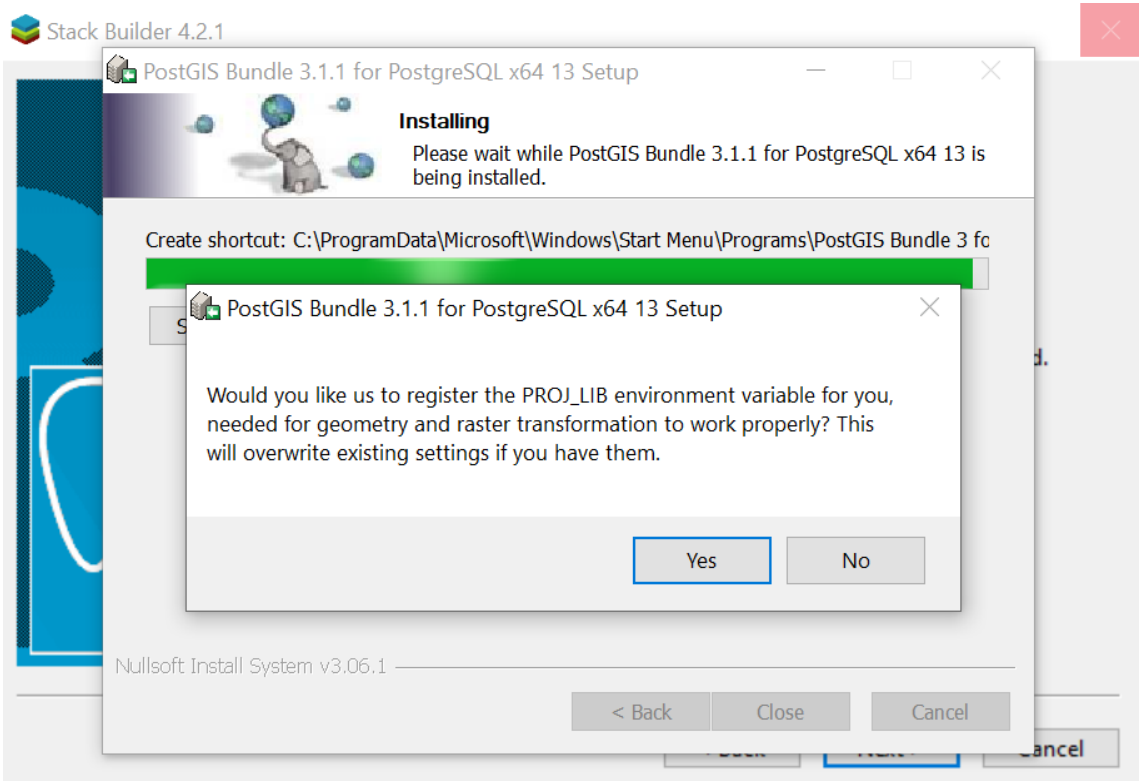

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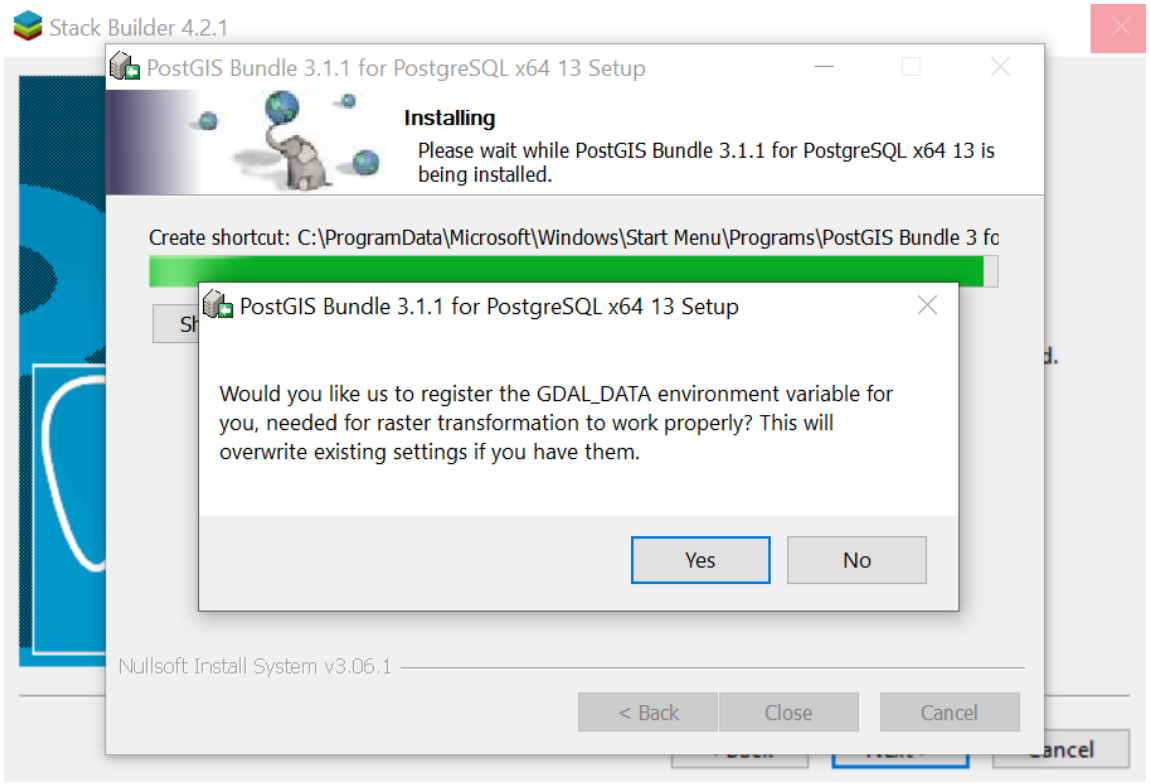

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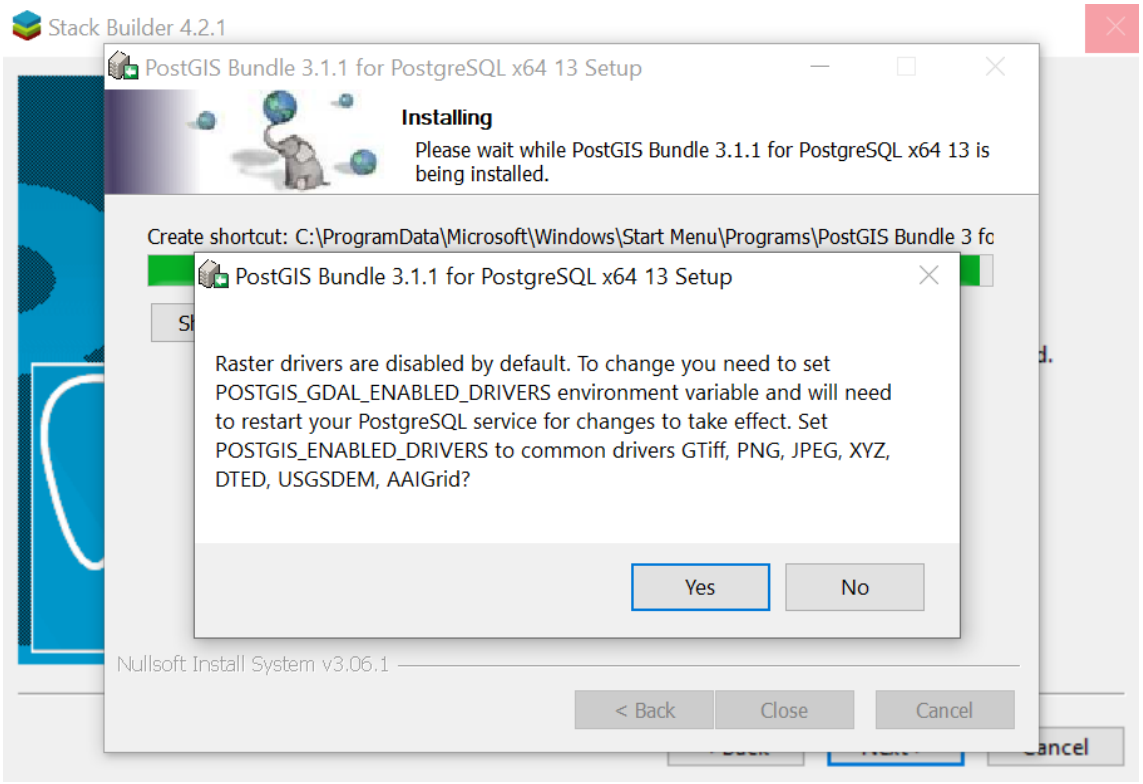

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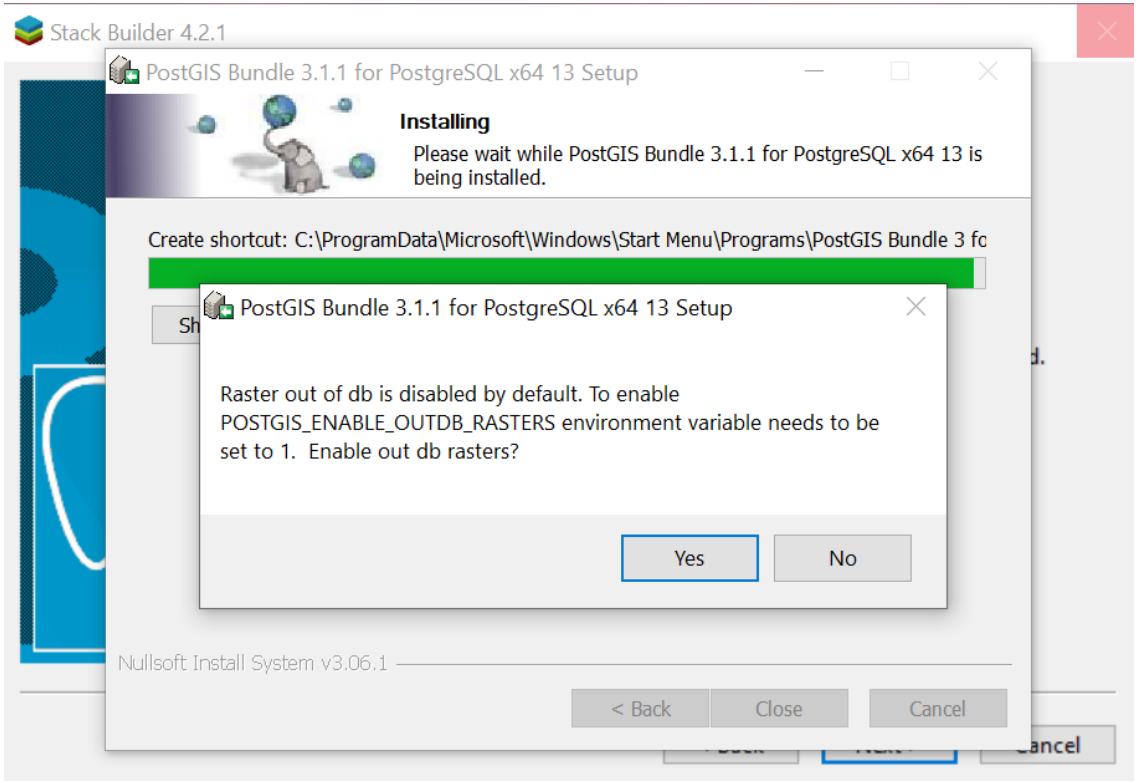

Install PostGIS

- **DO NOT INSTALL it in the database called postgres.**
- **Connect to your database with psql or PgAdmin. Run the following SQL. <u>You need only install the features you want</u>:**

```
-- Enable PostGIS (as of 3.0 contains just geometry/geography)
CREATE EXTENSION postgis;
-- enable raster support (for 3+)
CREATE EXTENSION postgis_raster;
-- Enable Topology
CREATE EXTENSION postgis_topology;
-- Enable PostGIS Advanced 3D
-- and other geoprocessing algorithms
-- sfcgal not available with all distributions
CREATE EXTENSION postgis_sfcgal;
-- fuzzy matching needed for Tiger
CREATE EXTENSION fuzzystrmatch;
-- rule based standardizer
CREATE EXTENSION address_standardizer;
-- example rule data set
CREATE EXTENSION address_standardizer_data_us;
-- Enable US Tiger Geocoder
CREATE EXTENSION postgis_tiger_geocoder;
```

Using PostgreSQL, PostGIS, GeoPandas, and Python

- We will do this via Jupyter notebook: https://github.com/gouldju1/honr490-foundations-of-geospatial-analytics/tree/master/Lectures/Week%204

- Python dependency (should have been handled when you created virtual environment, but):
  - `conda install --channel conda-forge geopandas`
  - `pip uninstall rtree`

- This link will become your best friend: https://postgis.net/docs/
  - Contains docs for all spatial SQL functions!
  - For example:
    - https://postgis.net/docs/ST_Area.html
    - https://postgis.net/docs/ST_Distance.html
    - https://postgis.net/docs/ST_Transform.html