

# PostgreSQL, pgAdmin, and psql

## PDBM 7.1–7.2

Dr. Chris Mayfield

Department of Computer Science  
James Madison University

Feb 15, 2022



**pgAdmin**

Management Tools for PostgreSQL

Starting pgAdmin4 server...

# What is PostgreSQL?

PostgreSQL



*“PostgreSQL is a powerful, open source object-relational database system. . .”*

*“. . . and has more than 30 years of active development on the core platform.”*

See <https://www.postgresql.org/about/>

Why are we using it instead of \_\_\_\_\_?

- ▶ It's arguably the most advanced open-source DBMS
- ▶ And it has many advantages for teaching and research
- ▶ <https://blog.panoply.io/postgresql-vs.-mysql>
- ▶ <https://www.2ndquadrant.com/en/postgresql/postgresql-vs-mysql/>

# Our (virtual) server

Host: `data.cs.jmu.edu`

- ▶ Only accessible from JMU network

## Hardware

- ▶ Intel Xeon Silver 4214 (4 cores)
- ▶ 8 GB RAM (plus 4 GB swap)
- ▶ 150 GB disk space (10/team)

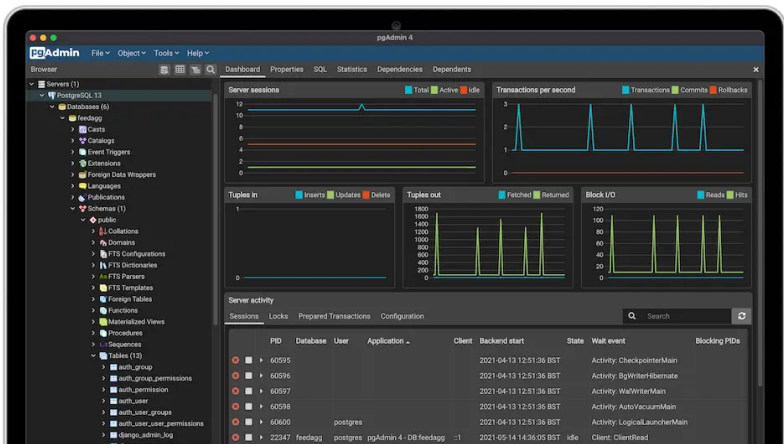
## Software

- ▶ Linux 4.15 / Ubuntu 18.04.6
- ▶ PostgreSQL 11.13 / pgAdmin 5.7



[https://en.wikipedia.org/wiki/Server\\_\(computing\)](https://en.wikipedia.org/wiki/Server_(computing))

# Demo of pgAdmin



Download here: <https://www.pgadmin.org/>

## Other GUI tools

There are *many* other tools:

- ▶ [https://wiki.postgresql.org/wiki/PostgreSQL\\_Clients](https://wiki.postgresql.org/wiki/PostgreSQL_Clients)

Some that I have used:

- ▶ Postbird <https://github.com/paxa/postbird>
- ▶ PSequel <http://www.psequel.com/> (macOS only)
- ▶ DBeaver <https://dbeaver.io/> (based on Eclipse)
- ▶ Squirrel <http://www.squirrelsql.org/> (uses JDBC)

# Structured Query Language

Tutorial about `LIKE`, `JOIN`, and `NULL`

# Some notes on SQL

Whitespace doesn't matter

- ▶ But indenting is strongly recommended
- ▶ All statements *should* end with a ';'

SQL is case-insensitive

- ▶ By convention, keywords are in CAPS
- ▶ PostgreSQL makes all names lowercase

Many keywords may be used as names

- ▶ Notice the `year` attribute →

```
CREATE TABLE movie (  
    id integer,  
    title text,  
    year integer,  
    genres text,  
    mpaa text,  
    budget text  
);
```

# Renaming with AS

- ▶ Use `AS` to rename columns or tables

```
SELECT m.title AS name
FROM movie AS m
WHERE m.year = 2000;
```

- ▶ Without `AS`, 2nd column would be named `split_part`

```
SELECT name, split_part(name, ',', 1) AS last_name
FROM person
LIMIT 10;
```



# Operators in SELECT/WHERE

Logical operators:

= <> < > <= >= NOT AND OR

```
SELECT title FROM movie
WHERE (year > 1970 OR season_nr < 3)
AND kind_id = 7;
```

<https://www.postgresql.org/docs/11/static/sql-syntax-lexical.html#SQL-PRECEDENCE>

Arithmetic operators:

+ - \* / % ^ ||/ ||/ ! !! @ & | # ~ << >>

<https://www.postgresql.org/docs/11/static/functions-math.html>

# Pattern matching in SQL

## Wildcards

- ▶ `_` = single character
- ▶ `%` = any substring

```
SELECT title FROM movie
WHERE title LIKE 'Star ____';
```

```
SELECT title FROM movie
WHERE title LIKE '%'%';
```

PostgreSQL also supports case-insensitive:

```
SELECT title FROM movie
WHERE title ILIKE 'incept%';
```

## SQL Exercises: imdb

Look for “Frozen” in the movie table

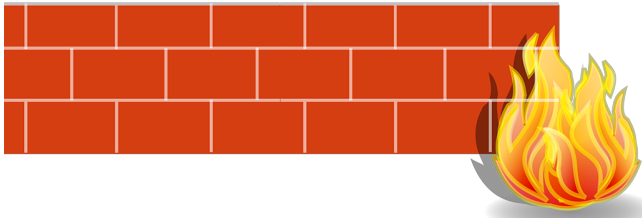
Only display movies after the year 2010

List all movies beginning with “Fro”

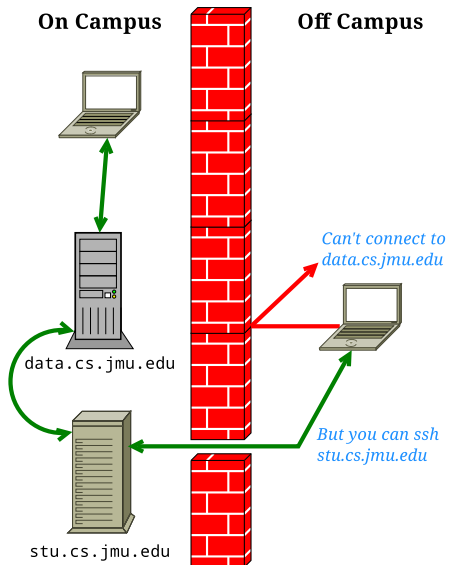
List unique titles starting with “Fro”



## Connecting to data.cs from Home



# Problem: JMU firewall



## Solution: SSH tunneling

From the command line:

```
ssh -L 5432:data.cs.jmu.edu:5432 student.cs.jmu.edu
```

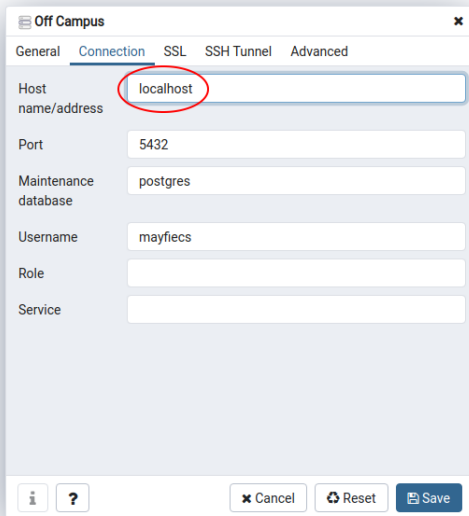
*“Forward local traffic on port 5432 to data.cs.jmu.edu:5432”*

Then use `localhost` as the host in pgAdmin on your machine

### On Windows/PuTTY:

- ▶ Connection > SSH > Tunnels
- ▶ Add new forwarded port:
  - ▶ Source port 5432
  - ▶ Destination `data.cs.jmu.edu:5432`
- ▶ Click Add; save profile, etc.

# pgAdmin from home

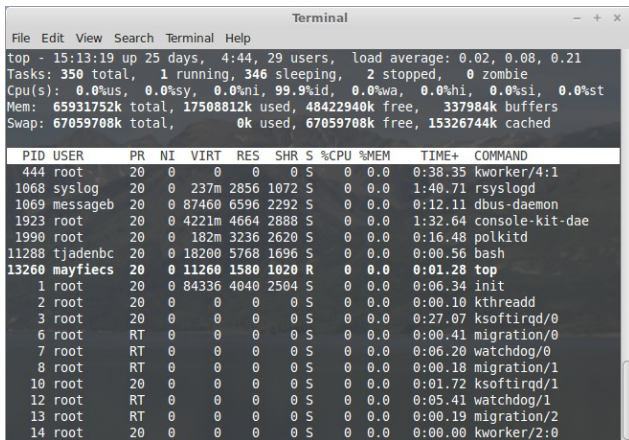


The screenshot shows the pgAdmin interface with the 'Connection' tab selected. The 'Host name/address' field is highlighted with a red circle and contains the text 'localhost'. Other fields include 'Port' (5432), 'Maintenance database' (postgres), 'Username' (mayfics), 'Role', and 'Service'. The bottom of the window features an information icon, a help icon, and buttons for 'Cancel', 'Reset', and 'Save'.

Field	Value
Host name/address	localhost
Port	5432
Maintenance database	postgres
Username	mayfics
Role	
Service	

# One more thing

- ▶ Some ISPs like to drop idle connections
- ▶ You can run `top` to keep traffic flowing



```
Terminal
File Edit View Search Terminal Help
top - 15:13:19 up 25 days, 4:44, 29 users, load average: 0.02, 0.08, 0.21
Tasks: 350 total, 1 running, 346 sleeping, 2 stopped, 0 zombie
Cpu(s): 0.0%us, 0.0%sy, 0.0%ni, 99.9%id, 0.0%wa, 0.0%hi, 0.0%si, 0.0%st
Mem: 65931752k total, 17508812k used, 48422940k free, 337984k buffers
Swap: 67059708k total, 0k used, 67059708k free, 15326744k cached

  PID USER      PR  NI  VIRT  RES  SHR  S %CPU  %MEM    TIME+  COMMAND
  444 root        20   0    0    0    0  S   0.0   0.0   0:38.35 kworker/4:1
 1068 syslog     20   0   237m 2856 1072  S   0.0   0.0   1:40.71 rsyslogd
 1069 messageb  20   0  87460 6596 2292  S   0.0   0.0   0:12.11 dbus-daemon
 1923 root        20   0  4221m 4664 2888  S   0.0   0.0   1:32.64 console-kit-dae
 1990 root        20   0   182m 3236 2620  S   0.0   0.0   0:16.48 polkitd
11288 tjadenbc   20   0  18200 5768 1696  S   0.0   0.0   0:00.56 bash
13260 mayfiets 20   0  11260 1580 1020  R   0.0   0.0   0:01.28 top
   1 root        20   0  84336 4040 2504  S   0.0   0.0   0:06.34 init
   2 root        20   0    0    0    0  S   0.0   0.0   0:00.10 kthreadd
   3 root        20   0    0    0    0  S   0.0   0.0   0:27.07 ksoftirqd/0
   6 root        RT   0    0    0    0  S   0.0   0.0   0:00.41 migration/0
   7 root        RT   0    0    0    0  S   0.0   0.0   0:06.20 watchdog/0
   8 root        RT   0    0    0    0  S   0.0   0.0   0:00.18 migration/1
  10 root        20   0    0    0    0  S   0.0   0.0   0:01.72 ksoftirqd/1
  12 root        RT   0    0    0    0  S   0.0   0.0   0:05.41 watchdog/1
  13 root        RT   0    0    0    0  S   0.0   0.0   0:00.19 migration/2
  14 root        20   0    0    0    0  S   0.0   0.0   0:00.00 kworker/2:0
```