Postgres 1
Postgres

• Object Relational Database Management System
• Implements most of the SQL standard
• Has many extension
• www.postgresql.org
• Runs on a variety of operating systems including Mac OS X and Windows
Postgres

- On Macs look at Postgres.app
- On both Windows and Macs you might want to also install pgadmin.
Postgres

• We will look at only a few Postgres features
Postgres psql

• Interactive terminal front end to Postgres
• SQL commands
• Meta-Commands
PsqI Meta-Commands

• \connect
  – Connect to a database

• \list
  – List available databases

• \i
  – Execute commands from a file
psql Meta-Commands

• \d
  – List tables in the current database

• \conninfo
  – Information on the current database

• \cd
  – Set the current working directory
    • Useful for the \i command but not the copy command
psql Meta-Commands

• \h
  – Help for an SQL command

• \?
  – Help for meta-commands

• \!
  – Execute command in shell

• \q
  – Quit psql
Implement the Library Database in psql

- Creates
- loadTables
  - Copy command
- Psql commands
• CREATE TABLE Author(aid int primary key, first VARCHAR(30), last VARCHAR(30));
• CREATE TABLE Book(booknum int primary key, title VARCHAR(50), pages int);
• CREATE TABLE Library(libnum int primary key, capacity int);
• CREATE TABLE Writes(aid int references Author(aid), booknum int references Book(booknum), percent int, primary key(aid, booknum));
• CREATE TABLE Copy(copynum int primary key, booknum int references Book(booknum), price decimal(8,2), libnum int references Library(libnum));
loadTables

• copy author from '/Users/gendreau/classes/spring17/cs464/SQLReview/author.txt' delimiter ' | ';

• copy book from '/Users/gendreau/classes/spring17/cs464/SQLReview/book.txt' delimiter ' | ';

• copy writes from '/Users/gendreau/classes/spring17/cs464/SQLReview/writes.txt' delimiter ' | ';

• copy library from '/Users/gendreau/classes/spring17/cs464/SQLReview/library.txt' delimiter ' | ';

• copy copy from '/Users/gendreau/classes/spring17/cs464/SQLReview/copies.txt' delimiter ' | '
Implement Library Database

toms-air:SQLReview gendreau$ psql

gendreau=# create database cs464lib;
CREATE DATABASE
gendreau=# \list

List of databases

<table>
<thead>
<tr>
<th>Name</th>
<th>Owner</th>
<th>Encoding</th>
<th>Collate</th>
<th>Ctype</th>
<th>Access privileges</th>
</tr>
</thead>
<tbody>
<tr>
<td>book</td>
<td>gendreau</td>
<td>UTF8</td>
<td>en_US.UTF-8</td>
<td>en_US.UTF-8</td>
<td></td>
</tr>
<tr>
<td>cs464lib</td>
<td>gendreau</td>
<td>UTF8</td>
<td>en_US.UTF-8</td>
<td>en_US.UTF-8</td>
<td></td>
</tr>
</tbody>
</table>

...
Implement Library Database

gendreau=# `connect cs464lib`
You are now connected to database "cs464lib" as user "gendreau".
cs464lib=# `cd`
cs464lib=# `! pwd` /Users/gendreau
cs464lib=# `cd classes/spring17/cs464/SQLReview`
cs464lib=# `! pwd` /Users/gendreau/classes/spring17/cs464/SQLReview
cs464lib=# `i creates`
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
Implement Library Database

cs464lib=# \d

List of relations

<table>
<thead>
<tr>
<th>Schema</th>
<th>Name</th>
<th>Type</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>public</td>
<td>author</td>
<td>table</td>
<td>gendreau</td>
</tr>
<tr>
<td>public</td>
<td>book</td>
<td>table</td>
<td>gendreau</td>
</tr>
<tr>
<td>public</td>
<td>copy</td>
<td>table</td>
<td>gendreau</td>
</tr>
<tr>
<td>public</td>
<td>library</td>
<td>table</td>
<td>gendreau</td>
</tr>
<tr>
<td>public</td>
<td>writes</td>
<td>table</td>
<td>gendreau</td>
</tr>
</tbody>
</table>

(5 rows)
Implement Library Database

cs464lib=# \d author
  Table "public.author"
  
<table>
<thead>
<tr>
<th>Column</th>
<th>Type</th>
<th>Modifiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>aid</td>
<td>integer</td>
<td>not null</td>
</tr>
<tr>
<td>first</td>
<td>character varying(30)</td>
<td></td>
</tr>
<tr>
<td>last</td>
<td>character varying(30)</td>
<td></td>
</tr>
</tbody>
</table>

Indexes:
  "author_pkey" PRIMARY KEY, btree (aid)

Referenced by:
  TABLE "writes" CONSTRAINT "writes_aid_fkey" FOREIGN KEY (aid) REFERENCES author(aid)
Implement Library Database

cs464lib=# \i loadTables
COPY 18
COPY 16
COPY 19
COPY 8
COPY 475
Implement Library Database

cs464lib=# select * from author;
aid | first  | last
-----+-------------+-----------
 1 | Jane     | Austen
 2 | Mark     | Twain
 3 | James    | Joyce
 4 | Herman   | Melville
 5 | Franz    | Kafka
 6 | Leo      | Tolstoy
 7 | Joseph   | Conrad
 8 | Tom      | Paine
 9 | Isaiah   | Berlin
10 | John     | Bell
11 | Moshe    | Machover
...
18 | George   | Eliot
(18 rows)
cs464lib=# \q
toms-air:SQLReview gendreau$
Implement Library Database
Add space_available function

create or replace function space_available(lib integer)
returns integer AS $$
Declare
cap integer;
used integer;
avail integer;
Begin
select L.capacity into cap
from library L
where L.libnum = lib;

select count(copynum) into used
from copy C
where C.libnum = lib;

avail := cap - used;
return avail;
End;
$$ Language plpgsql;
Implement Library Database
Use Space Available Function

cs464lib=# select space_available(libnum) from library;
space_available
-------------
  21
  42
  12
  88
 131
  28
  13
  25
(8 rows)
Implement Library Database
Add check_full trigger

create or replace function check_full() returns trigger AS $$
Declare
    avail integer;
Begin
    avail = space_available(NEW.libnum);
    if avail = 0 then
        raise exception '% is full', NEW.libnum;
        return null;
    end if;

    return NEW;
End;
$$ Language plpgsql;

create trigger check_full before insert on copy
    for each row execute procedure check_full();
Implement Library Database check_full prevents a copy being added to a full library

```sql
cs464lib=# insert into copy (copynum, booknum, price, libnum) values (477, 16, 30.00, 9);
ERROR: 9 is full
```