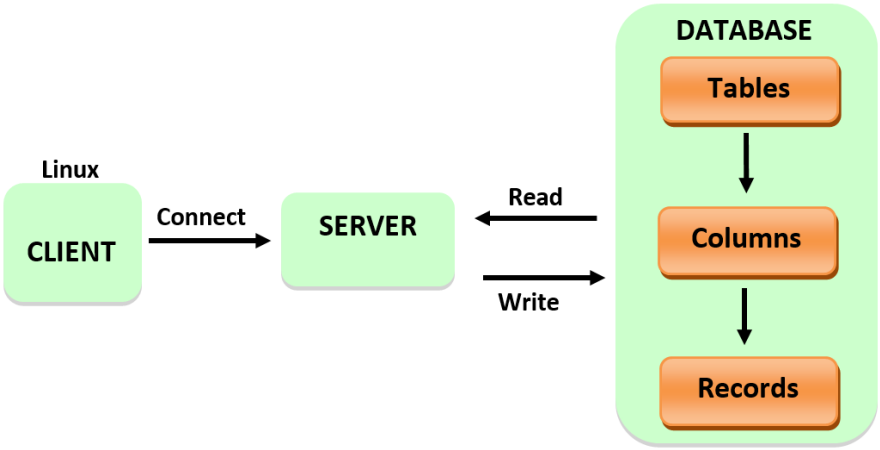
C++ to PostgreSQL Tutorial

Authors: Shuli Li and Jeff Terrell

Introduction

PostgreSQL is a powerful, open source object-relational database system. It has more than 15 years of active development and a proven architecture that has earned it a strong reputation for reliability, data integrity, and correctness. It runs on all major operating systems, including Linux, UNIX (AIX, BSD, HP-UX, SGI IRIX, Mac OS X, Solaris, Tru64), and Windows. It is fully ACID compliant, has full support for foreign keys, joins, views, triggers, and stored procedures (in multiple languages). It includes most SQL:2008 data types, including INTEGER, NUMERIC, BOOLEAN, CHAR, VARCHAR, DATE, INTERVAL, and TIMESTAMP. It also supports storage of binary large objects, including pictures, sounds, or video. It has native programming interfaces for C/C++, Java, .Net, Perl, Python, Ruby, Tcl, ODBC.



Client

PostgreSQL is available integrated with the package management on most Linux platforms. It provides proper integration with the operating system, including automatic patching and other management functionality, which makes it the recommended way to install PostgreSQL.
Used Linux based on future project requirements (NUC)

Library

libpq is Chosen to be used, it's already included in postgresql installation. Convenient.
libpq is the C application programmer's interface to PostgreSQL. libpq is a set of library functions that allow client programs to pass queries to the PostgreSQL backend server and to receive the results of these queries.
To build (i.e., compile and link) a program using libpq you need to do all of the following things: include the libpq-fe.h header file:

```
#include <libpq-fe.h>
```

How C++ interfaces to PostgreSQL:

Connect:

- Connection to database:

Execute:

- (write) create a table
- (write) create columns in the table
- (write) create records into the columns
- (read) fetch records from columns
- (write) erase records from table

Disconnect:

- Drop table from connection

Prerequisites:

- PostgreSQL 9.1 & related packages
- pgAdmin III (used to verify operations performed in test programs)

Setup:

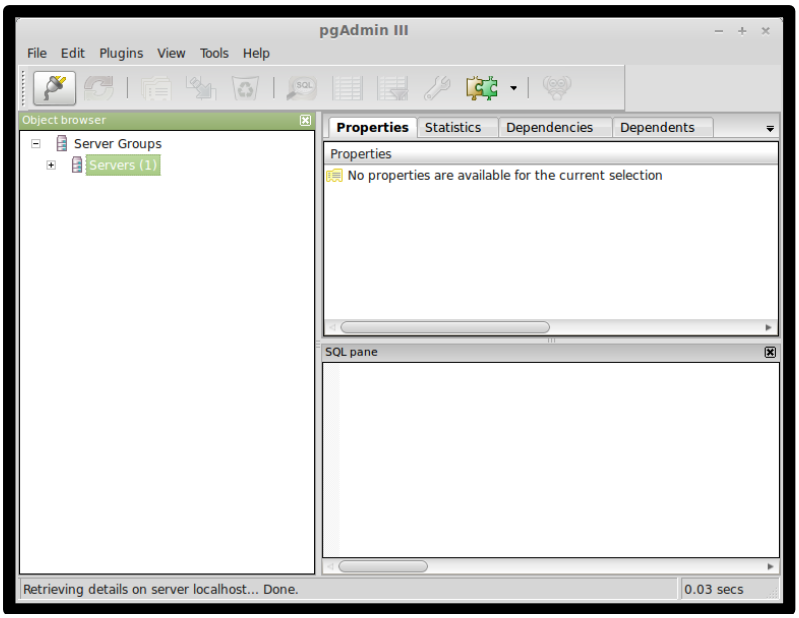
1. Enter the following in Terminal:

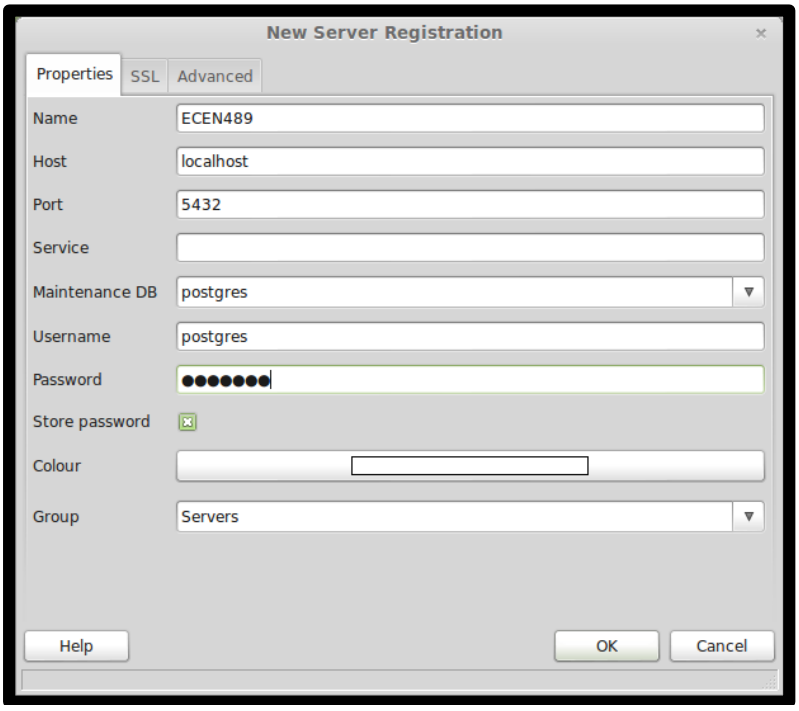
   sudo apt-get install postgresql-9.1 postgresql-client postgresql-client-9.1 postgresql-client-common postgresql-common postgresql-contrib postgresql-contrib-9.1

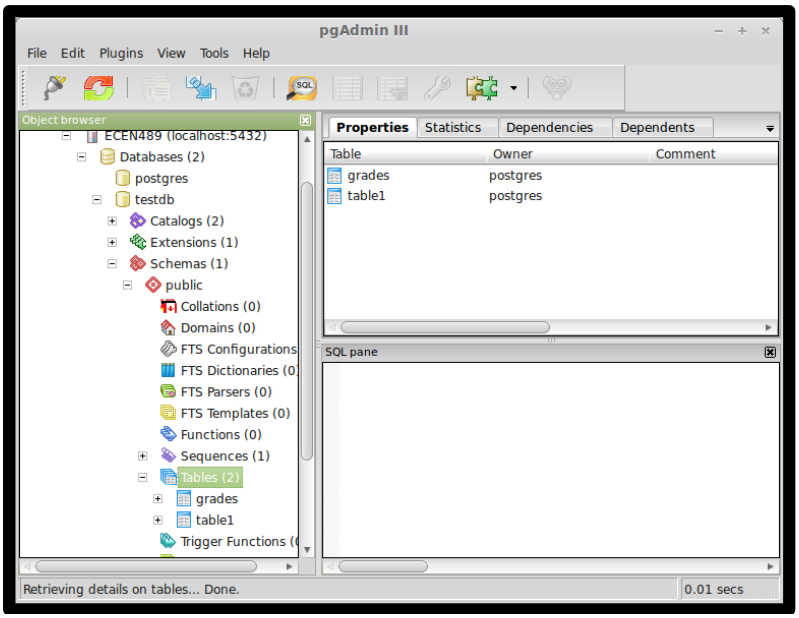
2. Add connection to server in pgAdmin III:

   File → Add Server…

   Name: ECEN489
   Host: localhost (running off of own IP)
   Port: 5432
   Username: postgres
   Password: test123


pgAdmin III
File Edit Plugins View Tools Help
Object browser
Server Groups
Servers (1)
Properties Statistics Dependencies Dependents
Properties
No properties are available for the current selection
SQL pane
Retrieving details on server localhost... Done.
0.03 secs

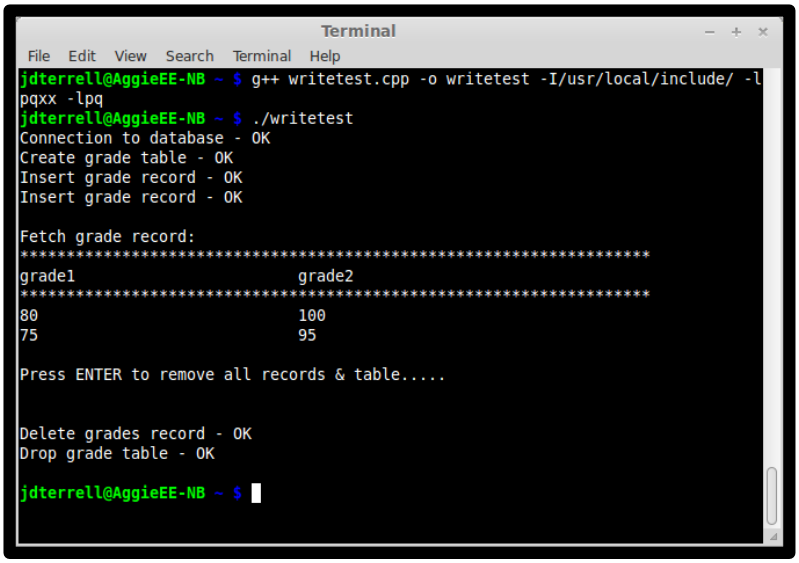

New Server Registration
Properties SSL Advanced
Name ECEN489
Host localhost
Port 5432
Service
Maintenance DB postgres
Username postgres
Password
Store password
Colour
Group Servers
Help
OK
Cancel



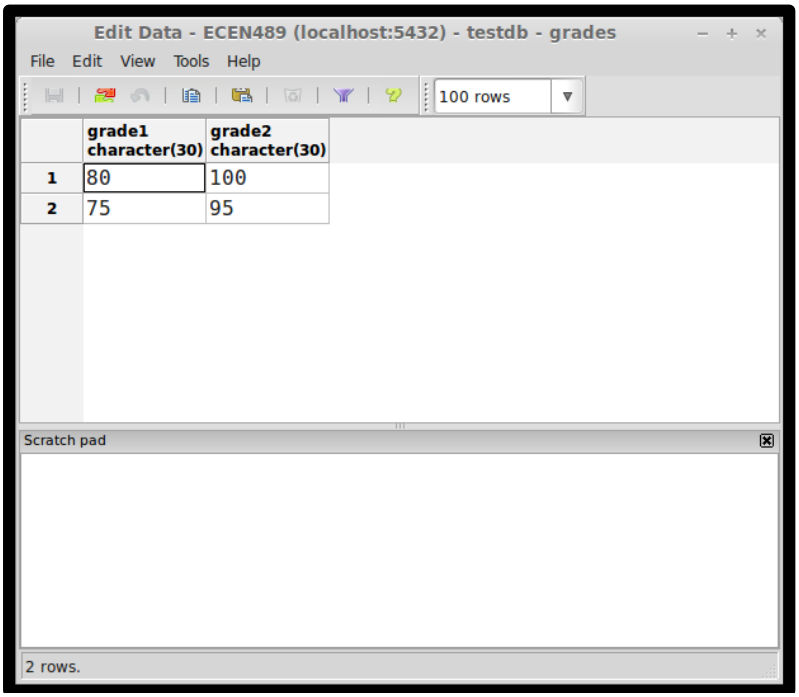
Sample Program #1:

- Create new table and store some data

Source file: [writetest.cpp]
Sample output:



Before the table is deleted…I used pgAdmin to verify the data:

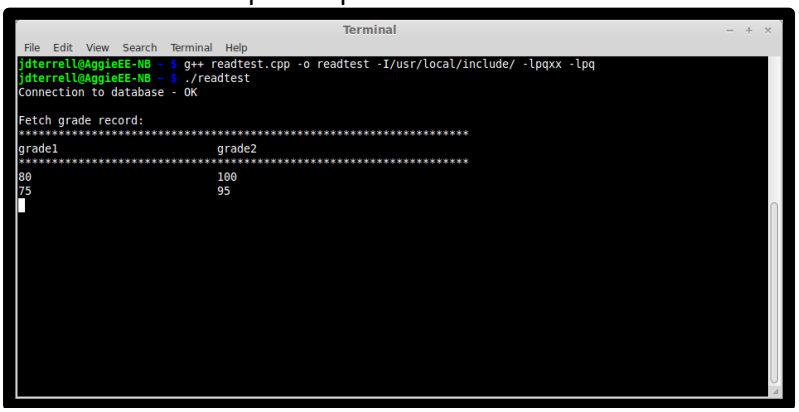


Sample Program #2:

- Read from existing table

  Source file: [readtest.cpp]

  Sample output:



FAQ:

Where can I find more information on PostgreSQL and libpq?

PostgreSQL: http://www.postgresql.org/docs/9.1/interactive/index.html
libpq: http://www.postgresql.org/docs/9.1/interactive/libpq.html

What if I want to create a database using the library?

Creating a database is a simple CREATE DATABASE SQL statement, same as any other libpq operation. You must connect to a temporary database (usually template1) to issue the CREATE DATABASE, then disconnect and make a new connection to the database you just created.

Sources/Additional Resources:

http://www.linux.com/community/blogs/133-general-linux/562240-postgresql-c-tutorial

http://www.askyb.com/cpp/c-postgresql-example/

http://www.linuxjournal.com/content/accessing-postgresql-cc