

CSE 414 Introduction to Data Management

Section 1: Introduction to SQLite

SQLite: What is it

- SQLite is a C library that implements a relational database management system (DBMS).
 - Simple, lightweight: good for embedded software
 - But does not provide all of the functionalities that other DBMSs do
- `sqlite3`: a standalone program that can run queries and manage an SQLite database

SQLite: How to Run it (1/2)

- On the Linux machines, or Mac:
 - Open a terminal, then run the command:
`sqlite3 [database]`
where "database" is the name of the database file you want to use.
 - WARNING: If you don't specify a database file, sqlite3 won't complain, but your data will be lost!

SQLite: How to Run it (2/2)

- On the Windows machines:
 - Open a Cygwin terminal, then proceed as if you were on Linux.
 - If that doesn't work, you may need to install the "sqlite3" Cygwin package from Cygwin Setup.
 - If *that* doesn't work, try downloading sqlite yourself.
- Download it yourself:
 - Get the "sqlite-shell" binary for your OS from:
<http://www.sqlite.org/download.html>
 - Extract "sqlite3" or "sqlite3.exe" from the archive and run it from a command line.

SQLite: Example

Class

| dept | number | title |
|------|--------|---|
| CSE | 378 | Machine Organization and Assembly Language |
| CSE | 451 | Introduction to Operating Systems |
| CSE | 461 | Introduction to Computer Communication Networks |

Teaches

| username | dept | number |
|----------|------|--------|
| zahorjan | cse | 378 |
| tom | cse | 451 |
| tom | cse | 461 |
| zahorjan | cse | 451 |
| zahorjan | cse | 461 |
| djw | cse | 461 |
| levy | cse | 451 |

Instructor

| username | fname | lname | started_on |
|----------|-------|-----------|------------|
| zahorjan | John | Zahorjan | 1985-01-01 |
| djw | David | Wetherall | 1999-07-01 |
| tom | Tom | Anderson | 1997-10-01 |
| levy | Hank | Levy | 1988-04-01 |

SQLite: Basic SQL statements

- **CREATE** - creates a new table
ex) `CREATE TABLE [table] (...);`
- **INSERT INTO** - inserts new data into a table
ex) `INSERT INTO [table] VALUES ([value1], [value2], ...);`
- **SELECT** - extracts data from a table
ex) `SELECT [column(s)] FROM [table_name];`
- **UPDATE** - updates data in a table
ex) `UPDATE FROM [table] SET ... WHERE ...;`
- **DELETE** - deletes data from a table
ex) `DELETE FROM [table] WHERE ...;`
*Note: Queries are case-insensitive in SQLite

SQLite: . Commands (Not SQL)

- `.help` - list other `.` commands
- `.header(s) ON/OFF` - show/hide column headers in query results
- `.mode [mode type]`- change how to separate the columns in each row/tuple (for better formatting)
- `.read [file name]` - read and execute SQL code from the given file
- `.separator [string]` - change the separator for output mode or importing files, i.e. `.separator ,`
- `.nullvalue [string]` - print the given string in place of NULL values
- `.import [file name] [table name]` - load the file to the table
 - be careful to set the separator correctly!
- `.show` - see how we have set our parameters
- `.exit` - exit from `sqlite3`

References:

<https://sqlite.org/cli.html> (SQLite Command Line Shell)

SQLite: SQL keyword, operator, etc

- WHERE clause - filter records
- AND, OR operator - filter records based on more than one condition
- LIKE operator - used in a WHERE clause to search for a specified pattern in a column
- AS - give an alias name to a table or a column
- Relational operators: =, >, >=, <, <=
- Special functions: DATE(...), LENGTH(string), SUBSTR(string, start index, end index), etc

References:

<http://www.sqlite.org/lang.html> (SQLite Syntax)

<http://www.w3schools.com/sql/default.asp> (w3school SQL tutorial)

SQLite: things to watch out for

- SQLite allows a key to be null
- Older versions of sqlite do not enforce FOREIGN KEY constraints.
 - Newer versions are opt-in at both compile time and runtime (with `PRAGMA FOREIGN_KEYS = ON`)
- SQLite ignores string length maximums or fixed string lengths: N in `VARCHAR(N)` or `CHAR(N)`
- SQLite does not have a separate data type for dates, times, or combined date and time.
 - Instead, these are represented as specially formatted strings; dates are represented as yyyy-mm-dd
- And many more as you will discover!

References:

<http://www.sqlite.org/lang.html> (SQLite Syntax)

<http://www.sqlite.org/datatype3.html> (SQLite Data type)

<http://www.w3schools.com/sql/default.asp> (w3school SQL tutorial)