



# Introduction to Database Systems: CS312 A Small Database System

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# All Types of Data!

## Data Models

Types of  
bases

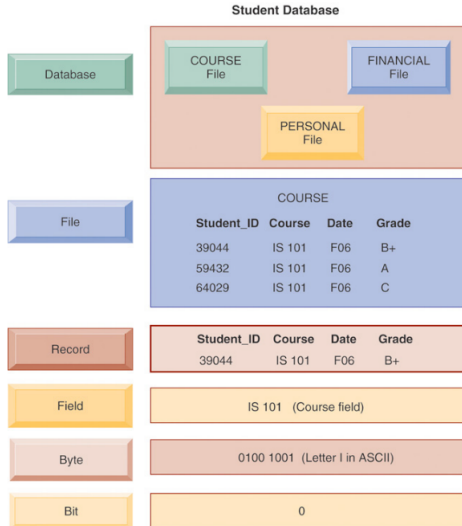
Our FIRST  
DB in  
SQLite3

Data to add

Create table

Schema

Consider  
this...



# A Database, Simply

Data Models

Types of  
bases

Relational Models

Our FIRST  
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Consider  
this...

ID	Dept	RoomNum
JJ	CS	105
OBC	CS	104
AM	CS	106
GK	CS	108
PL	CS	110
DW	CS	112

- The entire database fits into one table.
- Is the *Department* column unnecessary?

# A Database, Not-So-Simply

Data Models

Types of  
bases

Relational Models

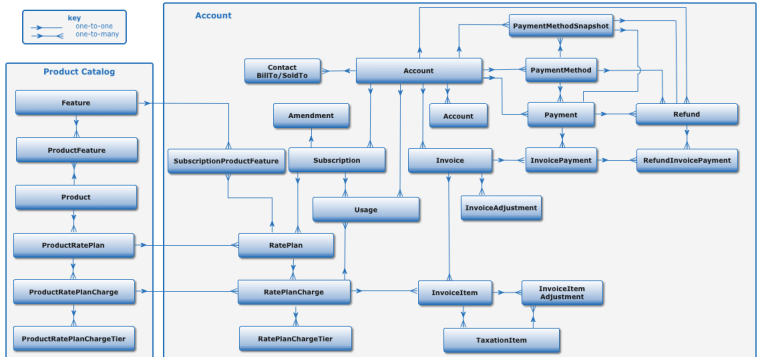
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- The entire database is made up of many tables.
- A table must be connected to the others *in some way*.



# Relational Models: A single table

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## Relational model (Chapter 2)

Example of tabular data in the relational model

<i>ID</i>	<i>name</i>	<i>dept_name</i>	<i>salary</i>
22222	Einstein	Physics	95000
12121	Wu	Finance	90000
32343	El Said	History	60000
45565	Katz	Comp. Sci.	75000
98345	Kim	Elec. Eng.	80000
76766	Crick	Biology	72000
10101	Srinivasan	Comp. Sci.	65000
58583	Califieri	History	62000
83821	Brandt	Comp. Sci.	92000
15151	Mozart	Music	40000
33456	Gold	Physics	87000
76543	Singh	Finance	80000

(a) The *instructor* table

- Each field of a row is an “observation”
- Rows are a series of “observations”
- Each column contains the same type of information for “observation”

# Specific information for each table

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(a) The *instructor* table

<i>dept_name</i>	<i>building</i>	<i>budget</i>
Comp. Sci.	Taylor	100000
Biology	Watson	90000
Elec. Eng.	Taylor	85000
Music	Packard	80000
Finance	Painter	120000
History	Painter	50000
Physics	Watson	70000

(b) The *department* table

- Two tables containing *specific* types of data

# Specific information for each table

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this...

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JJ	CS	105
OBC	CS	104
AM	CS	106
GK	CS	108
PL	CS	110
DW	CS	112
MC	GEO	209
RO	GEO	203
SR	GEO	001
SS	GEO	201
KT	GEO	204

ID	Tea	Sandwich
JJ	1	Ruban
OBC	1	PBJ
AM	1	Chicken
GK	1	Chicken
PL	0	Ruban
DW	0	PBJ
MC	1	Ruban
RO	0	PBJ
SR	1	Ruban
SS	1	Ruban
KT	1	Ruban

- Two tables containing *specific* types of data, using the same ID on a row
- Each table organizes non-redundant information, but needs a way to connect a row to the rest of the base (i.e., the common *ID* column serves as a primary key).

# We've got it!

Data Models

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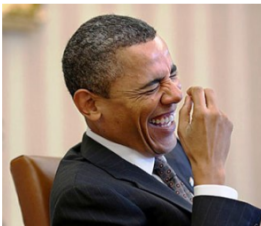
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## Great!!

- Let's build a small-sized database using SQLite3!!



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Consider  
this...



- Pronounced “ess-que-el” stands for *Structured Query Language*.
- Used to communicate with a database.
- According to ANSI (American National Standards Institute), it is the standard language for relational database management systems.
- The standard computer language for relational database management and data manipulation.
  - Used to query, insert, update and modify data

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this...

## Command

```
$sqlite3
```

You should see this

SQLite version 3.11.0 2016-02-15 17:29:24

Enter ".help" for usage hints.

Connected to a transient in-memory database.

Use ".open FILENAME" to reopen on a persistent database.

```
sqlite>
```

# We are going to build this database

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RO	GEO	203
SR	GEO	001
SS	GEO	201
KT	GEO	204

- Our database will contain this same ordering of data

# Data and its Schema

We need to tell SQLite3 where to contain the data

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## Data

- Only three columns in our base:
  - 1 ID: up to four chars in size
  - 2 Dept: up to four chars
  - 3 RoomNum: up to 3 chars
- Plenty of space for as many rows as we want:
  - 1 Limited by memory

# Make a General Table

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Consider  
this...

## Pseudo code

```
CREATE TABLE table_name (  
    column1 datatype,  
    column2 datatype,  
    column3 datatype  
    ...  
);
```

## Example

```
CREATE TABLE People_I_Know (  
    PersonID int,  
    LastName varchar(255),  
    FirstName varchar(255),  
    Address varchar(255),  
    City varchar(255)  
);
```

# Schema

Start by telling Sqlite3 where to contain the data

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Consider  
this...

Create database called *dept.sqlite3*

```
$sqlite3 dept.sqlite3
```

```
CREATE TABLE department(  
    ID varchar(4),  
    Dept varchar(4),  
    RoomNum varchar(3)  
);
```

- We create a table called *department* to contain our data
- In fact, we have created a container in memory for this task
- Note: *attribute<sub>1</sub>* varchar(*n*)
  - declaration of the size of string (*n*) contained by entry called, *attribute<sub>1</sub>*
- Why are there differing sizes of *varchars* in the code?

# After table is created

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Consider  
this...

Check that the table has been created

```
sqlite> .tables  
department
```

Insert some data as a *tuple*

```
INSERT INTO department VALUES (  
    "OBC",  
    "CP",  
    "104"  
);
```

Check that the data was placed in the table

```
sqlite> select * from department;  
OBC|CS|104
```

Exit and save your database

```
.exit
```

# Consider this...

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# THINK

Can you populate your base by adding more data?

Can you also check that the data was stored in the table?