

SQL Workshop

Session 2

Thursday 18 July 2013

General Assembly

Roadmap

- Where are we
- Review
 - Homework and material
- Conceptual path of query writing
- Concepts of database organization
- Joins
- Subqueries
- More detailed conditions

So Far:

- We have tables, we write queries, we get another table back
- Oriented to basics as we showed that
 - We can do more with WHERE, GROUP BY, ORDER BY
 - Important, useful, boring

Next: Combine Tables, More Complicated Analysis

- JOIN one table with another
 - E.g., match records from one table with records from another
- Nest queries with one another
 - Use “subqueries” to generate values used in queries, or to run particular queries for each record in the returned table

Environment Stuff

- Learn about the databases and tables available to use
- Create new databases and tables
- Load new data
- Revise existing tables, remove or revise data
- Crucial, but boring

Deeper manipulations

- More about
 - Operators (greater than, less than, IN, etc)
 - Logical expressions (AND, OR)
 - Using functions to filter, group, reduce data
- Available functions

Exercise Review

Joins

A basic query:

```
SELECT
  student_id AS Student,
  AVG(score) AS Average,
  COUNT(score) AS "# of Tests"
FROM
  sampdb.score
GROUP BY
  student_id
ORDER BY
  Average DESC
```

- Returns each student's average

	Student	Average	# of Tests	
▶	1	48.0000	5	
	27	45.7500	4	
	5	42.8333	6	
	18	41.3333	6	
	17	41.2000	5	
	2	40.4000	5	
	11	39.8333	6	

- But can we get the student's name rather than their id?

Yes

```
SELECT
  st.name AS Name,
  scr.student_id AS Id,
  AVG(scr.score) AS Average,
  COUNT(scr.score) AS "# Tests"
FROM
  sampdb.score scr
INNER JOIN
  sampdb.student st
ON
  scr.student_id = st.student_id
GROUP BY
  scr.student_id
ORDER BY
  Average DESC
```

	Name	Id	Average	# Tests
▶	Megan	1	48.0000	5
	Carter	27	45.7500	4
	Abby	5	42.8333	6
	Max	18	41.3333	6
	Will	17	41.2000	5
	Josiah	2	40.4000	5

Breaking down the query

```
SELECT
  st.name AS      Name,
  scr.student_id AS Id,
  AVG(scr.score) AS Average,
  COUNT(scr.score) AS "# Tests"
FROM
  sampdb.score scr
INNER JOIN
  sampdb.student st
ON
  scr.student_id = st.student_id
GROUP BY
  scr.student_id
ORDER BY
  Average DESC
```

- A join combines rows from different tables
- The “ON” clause specifies conditions for combining records
 - Here, records with the same student_id value are combined into a single record
 - The SELECT clause still specifies which fields are displayed from that combined record
- INNER JOIN specifies which table to join data from
 - The addition of “scr” and “st” in the specification of tables provides alias values for reference by the other clauses
 - Without these the query wouldn’t know which table it should find a field in

Break Down Joins Still More

Two Really Simple Tables

- T1

i1	c1
1	a
2	b
3	c

- t2

i2	c2
2	c
3	b
4	a

Inner Join: All Rows Matched

- A simple inner join matches each row in one table with each row in the other
- So joining a 3 row table with a 3 row table produces a 9 row table
- Obviously we don't want all those rows

```
SELECT * FROM join_sample.t1 INNER  
JOIN join_sample.t2;
```

i1	c1	i2	c2
1	a	2	c
2	b	2	c
3	c	2	c
1	a	3	b
2	b	3	b
3	c	3	b
1	a	4	a
2	b	4	a
3	c	4	a

Limiting Inner Join Results

```
SELECT
  *
FROM
  join_sample.t1
INNER JOIN
  join_sample.t2
WHERE
  join_sample.t1.i1 = join_sample.t2.i2
;
```

i1	c1	i2	c2
1	a	2	c
2	b	2	c
3	c	2	c
1	a	3	b
2	b	3	b
3	c	3	b
1	a	4	a
2	b	4	a
3	c	4	a

i1	c1	i2	c2
2	b	2	c
3	c	3	b

Left Join

- Get all rows from the “left” table, each with that row from the “right” table that matches on the specified fields

```
SELECT
  *
FROM
  join_sample.t1
LEFT JOIN
  join_sample.t2
ON
  join_sample.t1.i1 = join_sample.t2.i2
;
```

i1	c1	i2	c2
1	a	NULL	NULL
2	b	2	c
3	c	3	b

Subqueries

Simple but clumsy

```
SELECT au_id, city  
  
FROM books.authors  
  
WHERE city IN  
  
(  
  
    'New York',  
  
    'San Francisco',  
  
    'Hamburg',  
  
    'Berkeley'  
  
);
```

- Uses the WHERE field IN [list] pattern that we have seen before
- Works, but must type four city names
 - List might be longer
 - List might be wrong
 - List might change
- How did we get those names in the first place?

Databases produce lists

```
SELECT city FROM books.publishers;
```

```
city  
New York  
San Francisco  
Hamburg  
Berkeley
```

- Now we have the right list, but we still have to type it.

Better to subquery

```
SELECT au_id, city  
  
FROM books.authors  
  
WHERE city IN  
  
(SELECT city FROM books.publishers);
```

- We let the database figure out the list
- If the data supporting the list changes – the query still works
- And we can expand the logic used to specify the list . . .

```
SELECT au_id, au_fname, au_lname, state  
  
FROM authors  
  
WHERE state IN  
  
(SELECT state  
  
FROM authors  
  
WHERE au_id = 'A04');
```

- Now we can introduce logic into our specification of the WHERE clause list

Subqueries inject query results into queries

```
SELECT au_id, city
```

```
FROM books.authors
```

```
WHERE city IN
```

```
(SELECT city FROM books.publishers);
```

Exploring Data Available

Exploring databases and tables

SHOW DATABASES

- Dull but important

Database
books
information_schema
join_sample
mysql
sampdb
test

SHOW TABLES IN books

Tables_in_books
au_orders
authors
dups
employees
empsales
hier
publishers
roadtrip
royalties
telephones
temps
time_series
title_authors
titles

Finding fields

DESCRIBE books.author

- 'Type' tells the database how to handle data in a field
 - For example, numbers, strings and dates all sort in different ways
- Null, Key and Default set controls on values entered into the table

Field	Type	Null	Key	Default	Extra
au_id	char(3)	NO	PRI	NULL	
au_fname	varchar(15)	NO		NULL	
au_lname	varchar(15)	NO		NULL	
phone	varchar(12)	YES		NULL	
address	varchar(20)	YES		NULL	
city	varchar(15)	YES		NULL	
state	char(2)	YES		NULL	
zip	char(5)	YES		NULL	

Setting and Changing These

- We will look at how to creating and loading these things
 - These values are set at table creation
 - They can be altered, but it takes some trouble

