

# Lecture 2: Beginning SQL

Monday, January 25, 2015

## Agenda for today

- Class Demo: Oracle set up for Mac using Virtual Box (Yuming)
- Brief overview of relational database systems
- SQL: Chapter 3 in Murach textbook

## Market shares

From 2011 Gartner report:

- Oracle: 48% market with \$11.7BN in sales
- IBM: 20% market with \$4.8BN in sales
- Microsoft: 17% market with \$4.0BN in sales
- Other Vendors: 5.8% market with \$1.3BN in sales

## Basic concepts

- Relational model
- Relation / Entity / Table
- Field / Attribute / Column
- Row / Tuple / Record
- Cell / Value
- Primary key
- Composite primary key
- Foreign key
- Constraint

# The Vendors table in the Accounts Payable schema

Primary key

Attributes

VENDOR_ID	VENDOR_NAME	VENDOR_ADDRESS1	VENDOR_ADDRESS2	VENDOR_CITY
1	1 US Postal Service	Attn: Supt. Window Services	PO Box 7005	Madison
2	2 National Information Data Ctr	PO Box 96621	NULL	Washington
3	3 Register of Copyrights	Library Of Congress	NULL	Washington
4	4 Jobtrak	1990 Westwood Blvd Ste 260	NULL	Los Angeles
5	5 Newbrige Book Clubs	3000 Cindel Drive	NULL	Washington
6	6 California Chamber Of Commerce	3255 Ramos Cir	NULL	Sacramento
7	7 Towne Advertiser's Mailing Svcs	Kevin Minder	3441 W Macarthur Blvd	Santa Ana
8	8 BFI Industries	PO Box 9369	NULL	Fresno
9	9 Pacific Gas & Electric	Box 52001	NULL	San Francisco
10	10 Robbins Mobile Lock And Key	4669 N Fresno	NULL	Fresno
11	11 Bill Marvin Electric Inc	4583 E Home	NULL	Fresno
12	12 City Of Fresno	PO Box 2069	NULL	Fresno
13	13 Golden Eagle Insurance Co	PO Box 85826	NULL	San Diego
14	14 Expedata Inc	4420 N. First Street, Suite 108	NULL	Fresno

Tuples

## Tables Explained

- A tuple = a record
- A table = a set of records
- The schema of a table is the table name and attributes
- A key is an attribute whose value is unique (by convention, we underline the key)

# The columns of the Invoices table

The screenshot shows the Oracle SQL Developer interface with the 'Table AP.INVOICES@ap' selected. The 'Columns' tab is active, displaying a table with 10 columns. The left pane shows the database structure with 'Tables (Filtered)' expanded to show 'INVOICES' and its columns. The bottom status bar indicates 'ap | AP | INVOICE'.

	COLUMN_NAME	DATA_TYPE	NULLABLE	DATA_DEFAULT	COLUMN_ID	COMMENTS
1	INVOICE_ID	NUMBER	No	(null)	1 (null)	
2	VENDOR_ID	NUMBER	No	(null)	2 (null)	
3	INVOICE_NUMBER	VARCHAR2 (50 BYTE)	No	(null)	3 (null)	
4	INVOICE_DATE	DATE	No	(null)	4 (null)	
5	INVOICE_TOTAL	NUMBER (9,2)	No	(null)	5 (null)	
6	PAYMENT_TOTAL	NUMBER (9,2)	Yes	0	6 (null)	
7	CREDIT_TOTAL	NUMBER (9,2)	Yes	0	7 (null)	
8	TERMS_ID	NUMBER	No	(null)	8 (null)	
9	INVOICE_DUE_DATE	DATE	No	(null)	9 (null)	
10	PAYMENT_DATE	DATE	Yes	(null)	10 (null)	

## Common data types

- CHAR, VARCHAR2
- NUMBER
- FLOAT
- DATE
- BLOB, CLOB



## Constraint types

- NOT NULL constraint
- Unique constraint
- Primary and foreign key constraint
- Check constraint

# The relationship between two tables

Primary key

VENDOR_ID	VENDOR_NAME	VENDOR_ADDRESS1
113	114 Postmaster	Postage Due Technician
114	115 Roadway Package System, Inc	Dept La 21095
115	116 State of California	Employment Development Dept
116	117 Suburban Propane	2874 S Cherry Ave
117	118 Unocal	P.O. Box 860070
118	119 Yesmed, Inc	PO Box 2061
119	120 Dataforms/West	1617 W. Shaw Avenue
120	121 Zylka Design	3467 W Shaw Ave #103
121	122 United Parcel Service	P.O. Box 505820
122	123 Federal Express Corporation	P.O. Box 1140

INVOICE_ID	VENDOR_ID	INVOICE_NUMBER	INVOICE_DATE	INVOICE_TOTAL
29	29	123 4-314-3057	02-MAY-14	13.75
30	30	94 203339-13	02-MAY-14	17.5
31	31	123 2-000-2993	03-MAY-14	144.7
32	32	89 125520-1	05-MAY-14	95
33	33	123 1-202-2978	06-MAY-14	33
34	34	110 0-2436	07-MAY-14	10976.06
35	35	123 1-200-5164	07-MAY-14	63.4
36	36	110 0-2060	08-MAY-14	23517.58
37	37	110 0-2058	08-MAY-14	37966.19
38	38	123 963253272	09-MAY-14	61.5

Foreign key

## Relationships between tables

- One-to-many relationship
- One-to-one relationship
- Many-to-many relationship

## Principle of data independence

- Physical data independence
- Logical data independence

Examples:

- Adding / dropping a column
- Adding / dropping an index

# SQL Introduction

Standard language for querying and manipulating data

Structured Query Language

Many standards out there:

- ANSI SQL
- SQL92 (a.k.a. SQL2)
- SQL99 (a.k.a. SQL3)
- Vendors support various subsets of these
- What we discuss is common to all of them

## **Data Manipulation Language (DML) statements**

- SELECT
- INSERT
- UPDATE
- DELETE

## **Data Definition Language (DDL) statements**

- CREATE USER, TABLE, SEQUENCE, INDEX
- ALTER USER, TABLE, SEQUENCE, INDEX
- DROP USER, TABLE, SEQUENCE, INDEX
- GRANT
- REVOKE

# The simplified syntax of the SELECT statement

```
SELECT select_list  
FROM table_source  
[WHERE search_condition]  
[ORDER BY order_by_list]
```

## The four clauses of the SELECT statement

- SELECT
- FROM
- WHERE
- ORDER BY

# A simple SELECT statement

```
SELECT *  
FROM invoices
```

	INVOICE_ID	VENDOR_ID	INVOICE_NUMBER	INVOICE_DATE	INVOICE_TOTAL	PAYMENT_TOTAL	CREDIT_TOTAL
1	1	34	QP58872	25-FEB-14	116.54	116.54	0
2	2	34	Q545443	14-MAR-14	1083.58	1083.58	0
3	3	110	P-0608	11-APR-14	20551.18	0	1200
4	4	110	P-0259	16-APR-14	26881.4	26881.4	0

(114 rows selected)



## A SELECT statement that projects and sorts

```
SELECT invoice_number, invoice_date, invoice_total  
FROM invoices  
ORDER BY invoice_total
```

	INVOICE_NUMBER	INVOICE_DATE	INVOICE_TOTAL
1	25022117	24-MAY-14	6
2	24863706	27-MAY-14	6
3	24780512	29-MAY-14	6
4	21-4748363	09-MAY-14	9.95

(114 rows selected)

# A SELECT statement with no duplicate rows

```
SELECT DISTINCT vendor_city, vendor_state  
FROM vendors  
ORDER BY vendor_city
```

	VENDOR_CITY	VENDOR_STATE
1	Anaheim	CA
2	Ann Arbor	MI
3	Auburn Hills	MI
4	Boston	MA
5	Brea	CA

(53 rows selected)

## A SELECT statement that retrieves a calculated value

```
SELECT invoice_id, invoice_total,  
       (credit_total + payment_total) AS total_credits  
FROM invoices  
WHERE invoice_id = 17
```

	INVOICE_ID	INVOICE_TOTAL	TOTAL_CREDITS
1	17	356.48	356.48