

SQL Basics

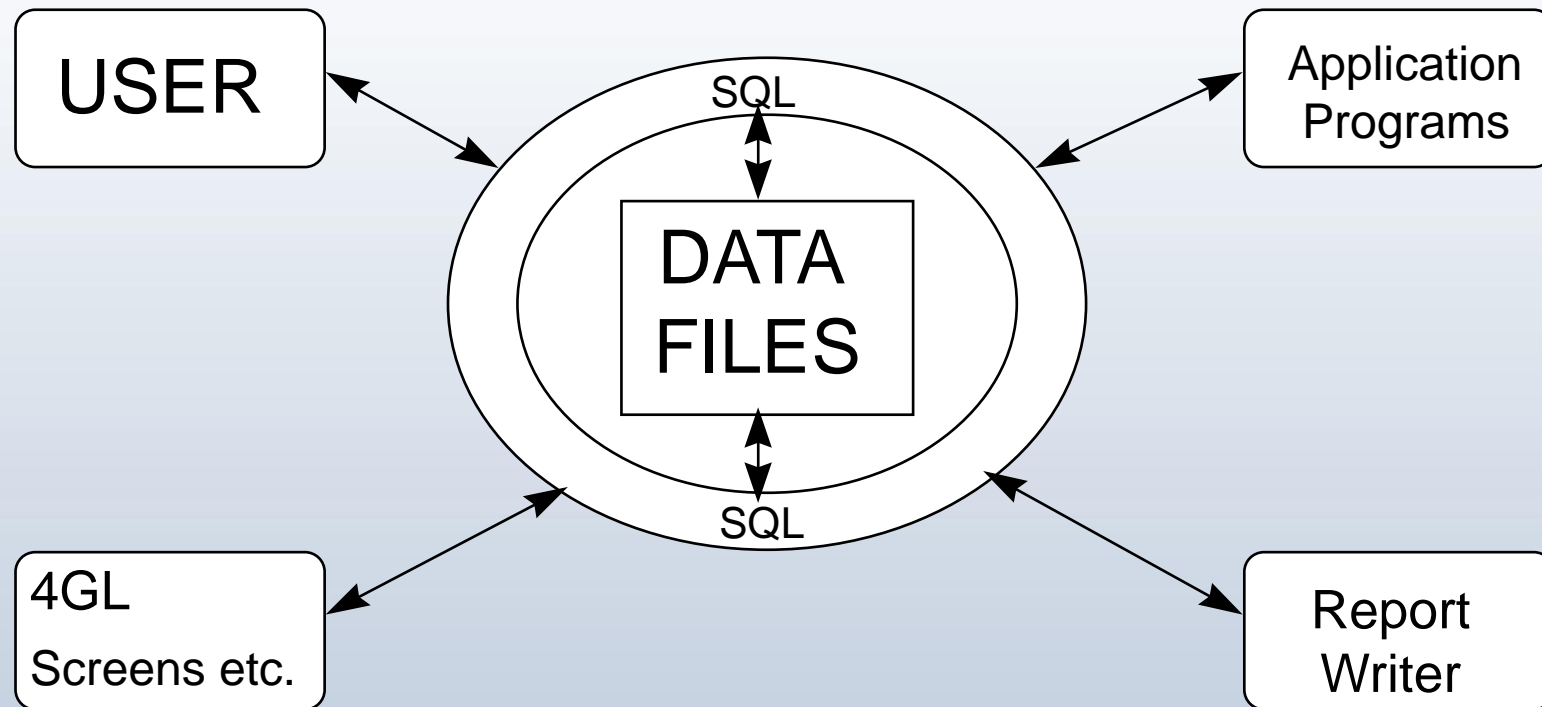
Business Data Management and Analytics

**Contributions by Arthur Adamopoulos and
Vince Bruno**

Structured Query Language

- A complete interface language for a database system.
 - Data Definition
ie. Creating & Defining files, fields etc.
 - Data Manipulation
ie. Inserting, Updating & Deleting records
 - Data Extraction
ie. Getting data from the database (queries).

Structure of SQL Database Interface



Relational Databases & SQL

- Table / Relation

columns / fields / attributes

Num	Surname	Given	Sex	Mem
123	Smith	Fred	M	Y
145	Smith	Mary	F	Y
236	Nguyen	Trung	M	N
378	Papadopo	Harry	M	N

rows / tuples / records

values

Primary Key

SQL Tables - ERD

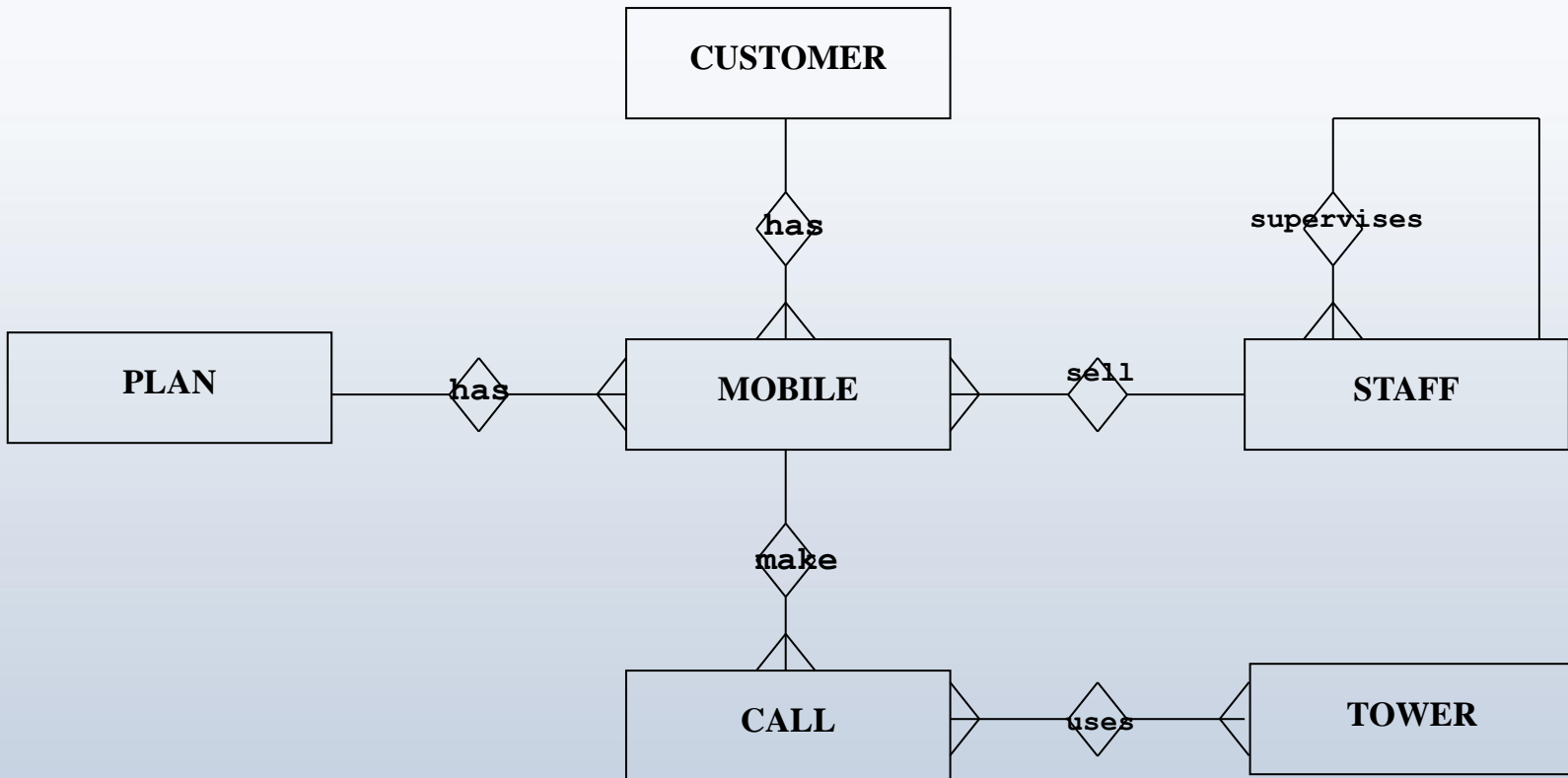


Table – CUSTOMER


	Name	Datatype	Size	Scale	Required
	CUSTOMERID	INT	10	0	<input checked="" type="checkbox"/>
	SURNAME	VARCHAR	40	0	<input type="checkbox"/>
	GIVEN	VARCHAR	40	0	<input type="checkbox"/>
	DOB	DATETIME	19	0	<input type="checkbox"/>
	SEX	CHAR	1	0	<input type="checkbox"/>
	PHONE	VARCHAR	20	0	<input type="checkbox"/>
	ADDRESS	VARCHAR	40	0	<input type="checkbox"/>
	SUBURB	VARCHAR	40	0	<input type="checkbox"/>
	STATE	VARCHAR	40	0	<input type="checkbox"/>
	POSTCODE	VARCHAR	10	0	<input type="checkbox"/>

Table - MOBILE



	Name	Datatype	Size	Scale	Required
	MOBILEID	INT	10	0	<input checked="" type="checkbox"/>
	PHONENUMBER	VARCHAR	20	0	<input type="checkbox"/>
	BRANDNAME	VARCHAR	40	0	<input type="checkbox"/>
	JOINED	DATETIME	19	0	<input type="checkbox"/>
	CANCELLED	DATETIME	19	0	<input type="checkbox"/>
	PLANNAME	VARCHAR	20	0	<input type="checkbox"/>
	PHONECOLOUR	VARCHAR	20	0	<input type="checkbox"/>
	CUSTOMERID	INT	10	0	<input type="checkbox"/>
	STAFFID	INT	10	0	<input type="checkbox"/>

Table - STAFF

	Name	Datatype	Size	Scale	Required
	STAFFID	INT	10	0	<input checked="" type="checkbox"/>
	SURNAME	VARCHAR	40	0	<input type="checkbox"/>
	GIVEN	VARCHAR	40	0	<input type="checkbox"/>
	DOB	DATETIME	19	0	<input type="checkbox"/>
	SEX	CHAR	1	0	<input type="checkbox"/>
	JOINED	DATETIME	19	0	<input type="checkbox"/>
	RESIGNED	DATETIME	19	0	<input type="checkbox"/>
	ADDRESS	VARCHAR	50	0	<input type="checkbox"/>
	SUBURB	VARCHAR	30	0	<input type="checkbox"/>
	POSTCODE	VARCHAR	6	0	<input type="checkbox"/>
	PHONE	VARCHAR	15	0	<input type="checkbox"/>
	SUPERVISORID	INT	10	0	<input type="checkbox"/>
	COMMISSION	DOUBLE	22	0	<input type="checkbox"/>
	RATEPERHOUR	DOUBLE	22	0	<input type="checkbox"/>

Some Simple Queries

```
SELECT SURNAME, GIVEN  
FROM CUSTOMER;
```

Surname	Given
RAJOO	THINH MINH
PHONGWATCHARARUK	JERZY MIROSLAW
CHOW	SOW LIM

```
SELECT surname, given, suburb, dob  
FROM customer;
```

Surname	Given	Suburb	DOB
RAJOO	THINH MINH	WINDSOR	1938-05-31 ...
PHONGWATCHARARUK	JERZY MIROSLAW	WERRIBEE	1951-09-30 ...
CHOW	SOW LIM	MT WAWFRI	1943-01-23

Some Simple Queries

SELECT SEX

FROM CUSTOMER;

Sex
M
M
F
M
F
F
F
F

SELECT DISTINCT SEX

FROM CUSTOMER;

Sex
M
F

Simple Sorting Queries

- Ascending order

```
SELECT SURNAME, GIVEN  
FROM CUSTOMER  
ORDER BY SURNAME;
```

Surname	Given
ABBOTT	DAVID ALAN
ABBOTT	RUSSELL EDWARD
ABELA	VENUS
ABERTON	MALCOLM FELIX
ABERTON	SARAH JANE
ABRAHAM	JASON ROBERT
ABRAHAM	IAN STUART

Simple Sorting Queries

- Descending order

SELECT surname, given, rateperhour

FROM staff

ORDER BY rateperhour DESC;

Surname	Given	RatePerHour
VELLA	SARATH AJITH L	22.21
HILTON	HARRY RODNEY E	18.83
SUMMERS	TED	18.75
MARZELLA	PATRICK MICHAEL	17.87
PORTELLI	CATHERINE MARY	17.7
SCANLON	MICHAEL JOHN	16.89

Multiple Sort Fields

```
SELECT Surname, Given  
FROM customer  
ORDER BY SURNAME, GIVEN;
```

Surname	Given
ABBOTT	DAVID ALAN
ABBOTT	RUSSELL EDWARD
ABELA	VENUS
ABERTON	MALCOLM FELIX
ABERTON	SARAH JANE
ABRAHAM	IAN STUART
ABRAHAM	JASON ROBERT

- Rows are initially sorted by the first sort field.
- Those rows with the same value in the first sort field are then sorted between themselves using the second sort field.

Change Column Headings

```
SELECT surname as "Last_Name"  
FROM customer;
```

Add following for sorting:

- ORDER BY 1;
- ORDER BY "Last_Name";

Last_Name
THINH MINH RAJOO
JERZY MIROSLAW PHONGWATCHARARUK
SOW LIM CHOW
TONY LIVERIADIS
JANE SAMARAWICKRAMA
ELIZABETH JANE GILTRAP
CATHERINE RAE BINDEVIS

SELECT ... WHERE

- In order to select specific records from the resulting output of a SELECT clause you can do this with WHERE.

```
SELECT SURNAME, GIVEN, SEX, SUBURB, DOB  
FROM staff  
WHERE suburb = 'NORTHCOTE';
```

Surname	Given	Sex	Suburb	DOB
SUMMERS	TED	M	NORTHCOTE	1958-08-0...
KNOL	VINCENZO	F	NORTHCOTE	1943-09-1...

Selection Criteria

- All the usual comparison operators.
ie. = < > <= >= <>
- Usual compound operators.
ie. AND OR and NOT
- Brackets can be used:
NOT(((cond1) AND (cond2)) OR cond3)

SELECT ... WHERE

- Show all male customers in
NORTHCOTE born before 1940.

```
SELECT SURNAME, GIVEN, SEX, SUBURB, DOB  
FROM customer  
WHERE suburb = 'NORTHCOTE' AND sex = 'M'  
AND year(dob) < 1940;
```

Surname	Given	Sex	Suburb	DOB
MAVEN	PHILIPPE CHRISTIAN	M	NORTHCOTE	1931-03-14 ...
DETTMANN	DOMENICO	M	NORTHCOTE	1936-11-12 ...
HEENAN	ANTHONY JAMES	M	NORTHCOTE	1928-09-04 ...
WHYTLAW	RAYMOND MYLES	M	NORTHCOTE	1939-01-01 ...

Wildcards

```
SELECT SURNAME  
FROM CUSTOMER  
WHERE SURNAME LIKE 'SA%';
```

```
SELECT SURNAME  
FROM CUSTOMER  
WHERE SURNAME LIKE '%TH';
```

```
SELECT SURNAME  
FROM CUSTOMER  
WHERE SURNAME LIKE '%ARK%';
```

Surname
SAMARAWICKRAMA
SANDHU
SARGEANT
SAYKAO
SANGHVI
SANDFORD

Surname
PARK
PARK
CLARKSON
BARKER
CLARK
SHARKEY
PARK
PARKER
PARKER

Surname
COATH
SMITH
SMITH
SMITH
HEATH
SMITH
SMITH
SMITH
SMITH
HORVATH
HEATH
SMITH

Selection Criteria Shortcuts

```
SELECT SURNAME, POSTCODE  
FROM CUSTOMER  
WHERE POSTCODE BETWEEN 3000 AND 3008;
```

```
SELECT SURNAME  
FROM CUSTOMER  
WHERE SUBURB IN ('KEW', 'LALOR', 'ALBURY');
```

```
SELECT SURNAME, GIVEN, ADDRESS  
FROM STAFF  
WHERE SUPERVISORID IN (1,2,3);
```

Surname	Postcode
BENHAM	3008
NGUYEN	3002
CUSINATO	3003
GREIMAS	3008
MAYHEW	3004
TAYLOR	3004
PERIN	3004
LIU	3000
COWLEY	3000
PHONGWAT...	3000
FOLINO	3000
MACKAY	3008

Selection and Dates

- Want a specific date:
SELECT phonenum, joined
FROM mobile
WHERE joined = '1998-07-22';

PhoneNumber	Joined
411110143	1998-07-22
413734061	1998-07-22
410525959	1998-07-22

- Want a specific month, need to use function to extract month:
SELECT surname, dob
FROM customer
WHERE date_format(dob, '%M') = 'August';
- Date Patterns: %Y, %M, %D – others?

Surname	DOB
MOODIE	1954-08-18
ZILIC	1950-08-17
VOSS	1945-08-15
BENSON	2022-08-18
MOLONY	1968-08-10
LAL	1956-08-20
HILFERMAN	1957-08-10

Selection and Time

- Want a specific time:
SELECT phonenum, calltime
FROM calls
WHERE calltime = '19:02:29';

PhoneNumber	CallTime
94266228	19:02:29
413656824	19:02:29
99001854	19:02:29

- Want a specific hour, need to use function to extract hour:
SELECT phonenum, calltime
FROM calls
WHERE time_format(calltime, '%i') = '11';

PhoneNumber	CallTime
97734585	01:11:39
93619381	10:11:50
93263566	18:11:39
411867025	01:11:38

- Time Patterns: %H, %i, %S – others?

NULL operator

- A field is NULL if it is empty.
- NULL is different to an empty string!
- NOT version also possible

```
SELECT surname, given, joined, resigned  
FROM staff  
WHERE resigned IS NULL;
```

Surname	Given	Joined	Resigned
HILTON	HARRY RODNEY E	1996-10-18 ...	<NULL>
KNOL	VINCENZO	1997-07-21 ...	<NULL>
SCANLON	MICHAEL JOHN	1997-03-18 ...	<NULL>

Query Calculations

- Queries can use arithmetic calculations and built in functions. Eg. Operators: + - * / () = < >

```
SELECT surname, given, rateperhour * 36 * 2  
FROM staff;
```

Surname	Given	rateperhour * 36 * 2
VELLA	SARATH AJITH L	1599.12
MARZELLA	PATRICK MICHAEL	1286.64
HILTON	HARRY RODNEY E	1355.76
JAMIESON	TERRENCE IAN	736.56
SANDERS	RICHARD ANTHONY	1153.44
SUMMERS	TED	1350.0
KNIGHT	VINCENTO	825.12

Query Calculations

- Queries can use multiple field in the calculation.

```
SELECT *, (ConnectFee + PeakFee * 5) As 5minute_peak_call_cost  
FROM plan;
```

PlanName	ConnectFee	PeakFee	OffPeakFee	WeekendFee	5minute_peak_call_cost
Yes10	1.00	1.05	0.90	0.85	6.25
Yes20	1.20	0.75	0.65	0.55	4.95
Yes30	1.50	0.55	0.50	0.45	4.25
Yes40	1.75	0.45	0.42	0.40	4.00
Weekender	2.50	1.00	1.00	0.10	7.50
FreeStyle	3.95	0.50	0.50	0.50	6.45

Query Calculations

- Arithmetic calculations can be placed anywhere a field can be used.

```
SELECT surname, given,  
       (rateperhour * 36 ) as weekly  
FROM staff  
WHERE rateperhour * 36 > 600;
```

surname	given	weekly
VELLA	SARATH AJITH L	799.56
MARZELLA	PATRICK MICHAEL	643.32
HILTON	HARRY RODNEY E	677.88
SUMMERS	TED	675
PORTELLI	CATHERINE MARY	637.2
SCANLON	MICHAEL JOHN	608.04

Simple function*

- Arithmetic calculations and functions can be placed anywhere a field can be used.

TRUNCATE(number, decimals) – removes decimal places.

```
SELECT surname, given,  
       truncate(rateperhour * 36,1) as weekly
```

```
FROM staff
```

```
WHERE rateperhour * 36 > 600;
```

surname	given	weekly
VELLA	SARATH AJITH L	799.5
MARZELLA	PATRICK MICHAEL	643.3
HILTON	HARRY RODNEY E	677.8
SUMMERS	TED	675.0
PORTELLI	CATHERINE MARY	637.1
SCANLON	MICHAEL JOHN	608.0

Functions*

- System variables can be used in place of field names.
SYSDATE() - Current System Date
DATEDIFF(date1, date2) – difference in days btw two dates
TRUNCATE(number, decimals) – removes decimal places.

SELECT surname, given,
truncate(datediff(sysdate(), dob)/365.25 ,0) as age

FROM customer;

Surname	Given	age
RAJOO	THINH MINH	70
PHONGWATCHARARUK	JERZY MIROSLAW	57
CHOW	SOW LIM	65
LIVERIADIS	TONY	55
SAMARAWICKRAMA	JANE	70
GILTRAP	ELIZABETH JANE	75
BINDEVIS	CATHERINE RAE	73
QUAH	VICKI	80

Concatenation Queries*

```
SELECT concat(surname, ', ', given)
FROM customer;
```

concat(surname, ', ', given)
RAJOO, THINH MINH
PHONGWATCHARARUK, JERZY MIROSLAW
CHOW, SOW LIM
LIVFRIADIS TONY

```
SELECT concat(concat(surname, ', ', given), ' - ', suburb)
FROM STUDENT;
```

concat(concat(surname, ', ', given), ' - ', suburb)
RAJOO, THINH MINH - WINDSOR
PHONGWATCHARARUK, JERZY MIROSLAW - WERRIBEE
CHOW, SOW LIM - MT WAVERLEY
LIVFRIADIS TONY - BENTLEIGH

Note: Concatenation can be with fields and/or string literals.

Concatenation Queries*

- Concatenation using function “concat” is peculiar to MySQL.
- Oracle uses || (two vertical bars)
eg. Select surname || ',' || given from customer;
- Access uses & (ampersand)
eg. Select surname & ',' & given from customer;
- No standard

Summary

- Basic building blocks of a query

SELECT [DISTINCT] field1, field2, ...

FROM table

WHERE condition1 OR condition2 AND condition3

ORDER BY field1 [DESC], field2 [DESC], ...