



EVEN MORE SQL!

Introduction to Database Systems

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IN THIS LECTURE

- More SQL Select
 - Aliases
 - ‘Self-joins’
 - Subqueries
 - IN, EXISTS, ANY, ALL
- For more information
 - Connolly and Begg Chapter 5
 - Ullman and Widom Chapter 6.3.

BUT FIRST...

Track

cID	Num	Title	Time	aID
1.	1	Violent	239	1
1	2	Every Girl	410	1
1.	3	Breather	217	1
1	4	Part of Me	279	1
2.	1	Star	362	1
2	2	Teaboy	417	2

CD

cID	Title	Price
1.	Mix	9.99
2.	Compilation	12.99

Artist

aID	Name
1.	Stellar
2.	Cloudboy

EXERCISE

- Find a list of the names of those artists who have a track on the CD with the title “Compilation”.

```
SELECT Name
FROM Artist, Track, CD
WHERE (Artist.aID = Track.aID) AND
      (Track.cID = CD.cID) AND
      (CD.Title = 'Compilation')
```

SQL SELECT OVERVIEW

SELECT

[DISTINCT | ALL] <column-list>

FROM <table-names>

[WHERE <condition>]

[GROUP BY <column-list>]

[HAVING <condition>]

[ORDER BY <column-list>]

([] - optional, | - or)

ALIASES

- Aliases rename columns or tables to

- Make names more meaningful

- Make names shorter and easier to type

- Resolve ambiguous names

- Two forms:

- Column alias

```
SELECT column  
      AS newName
```

- Table alias

```
SELECT ...  
      FROM table  
      AS newName
```

This 'AS' is optional, but Oracle doesn't accept it at all

EXAMPLE

Employee

ID	Name
123	John
124	Mary

WorksIn

ID	Dept
123	Marketing
124	Sales
124	Marketing

SELECT

E.ID AS empID,

E.Name, W.Dept

FROM

Employee E

WorksIn W

WHERE

E.ID = W.ID

EXAMPLE

SELECT

E.ID AS empID,

E.Name, W.Dept

FROM

Employee E

WorksIn W

WHERE

E.ID = W.ID

empID	Name	Dept
123	John	Marketing
124	Mary	Sales
124	Mary	Marketing

ALIASES AND 'SELF-JOINS'

Aliases can be used to copy a table, so that it can be combined with itself:

```
SELECT A.Name FROM
    Employee A,
    Employee B
WHERE A.Dept=B.Dept
      AND B.Name= 'Andy'
```

Employee

Name	Dept
John	Marketing
Mary	Sales
Peter	Sales
Andy	Marketing
Anne	Marketing

ALIASES AND SELF-JOINS

Employee A

A

Name	Dept
John	Marketing
Mary	Sales
Peter	Sales
Andy	Marketing
Anne	Marketing

Employee B

B

Name	Dept
John	Marketing
Mary	Sales
Peter	Sales
Andy	Marketing
Anne	Marketing

ALIASES AND SELF-JOINS

SELECT ... FROM Employee A, Employee B ...

A.Name	A.Dept	B.Name	B.Dept
John	Marketing	John	Marketing
Mary	Sales	John	Marketing
Peter	Sales	John	Marketing
Andy	Marketing	John	Marketing
Anne	Marketing	John	Marketing
John	Marketing	Mary	Sales
Mary	Sales	Mary	Sales
Peter	Sales	Mary	Sales
Andy	Marketing	Mary	Sales
Anne	Marketing	Mary	Sales

ALIASES AND SELF-JOINS

```
SELECT ... FROM Employee A, Employee B
WHERE A.Dept = B.Dept
```

A.Name	A.Dept	B.Name	B.Dept
John	Marketing	John	Marketing
Andy	Marketing	John	Marketing
Anne	Marketing	John	Marketing
Mary	Sales.	Mary	Sales
Peter	Sales.	Mary	Sales
Mary	Sales	Peter	Sales
Peter	Sales	Peter	Sales
John	Marketing	Andy	Marketing
Andy	Marketing	Andy	Marketing
Anne	Marketing	Andy	Marketing

ALIASES AND SELF-JOINS

```
SELECT ... FROM Employee A, Employee B
WHERE A.Dept = B.Dept AND B.Name = 'Andy'
```

A.Name	A.Dept	B.Name	B.Dept
John	Marketing	Andy	Marketing
Andy	Marketing	Andy	Marketing
Anne	Marketing	Andy	Marketing

ALIASES AND SELF-JOINS

```
SELECT A.Name FROM Employee A, Employee B
WHERE A.Dept = B.Dept AND B.Name = 'Andy'
```

A.Name
John
Andy
Anne

The result is the names of all employees who work in the same department as Andy.

SUBQUERIES

- A **SELECT** statement can be nested inside another query to form a subquery
- The results of the subquery are passed back to the containing query
- E.g. get the names of people who are in Andy's department:

```
SELECT Name  
FROM Employee  
WHERE Dept =  
(SELECT Dept  
FROM Employee  
WHERE Name= 'Andy' )
```

SUBQUERIES

```
SELECT Name
  FROM Employee
 WHERE Dept =
  (SELECT Dept
   FROM Employee
  WHERE
    Name= 'Andy' )
```

- First the subquery is evaluated, returning the value 'Marketing'
- This result is passed to the main query

```
SELECT Name
  FROM Employee
 WHERE Dept =
    'Marketing'
```

SUBQUERIES

- Often a subquery will return a **set of values** rather than a single value
- You can't directly compare a single value to a set
- Options
 - **IN** - checks to see if a value is in the set
 - **EXISTS** - checks to see if the set is empty or not
 - **ALL/ANY** - checks to see if a relationship holds for every/one member of the set

(NOT) IN

- Using **IN** we can see if a given value is in a set of values
- **NOT IN** checks to see if a given value is not in the set
- The set can be given explicitly or from a subquery

```
SELECT <columns>  
FROM <tables>  
WHERE <value>  
      IN <set>
```

```
SELECT <columns>  
FROM <tables>  
WHERE <value>  
      NOT IN <set>
```

(NOT) IN

Employee

Name	Department	Manager
John	Marketing	Chris
Mary	Marketing	Chris
Chris	Marketing	Jane
Peter	Sales	Jane
Jane	Management	

```
SELECT *
FROM Employee
WHERE Department IN
('Marketing' ,
'Sales' )
```

Name	Department	Manager
John	Marketing	Chris
Mary	Marketing	Chris
Chris	Marketing	Jane
Peter	Sales	Jane

(NOT) IN

Employee

Name	Department	Manager
John	Marketing	Chris
Mary	Marketing	Chris
Chris	Marketing	Jane
Peter	Sales	Jane
Jane	Management	

```
SELECT *  
FROM Employee  
WHERE Name NOT IN  
      (SELECT Manager  
        FROM Employee)
```


(NOT) IN

- First the subquery

```
SELECT Manager  
FROM Employee
```

- is evaluated giving

Manager
Chris
Chris
Jane
Jane

- This gives

```
SELECT *  
FROM Employee  
WHERE Name NOT  
IN ( 'Chris' ,  
      'Jane' )
```

Name	Department	Manager
John	Marketing	Chris
Mary	Marketing	Chris
Peter	Sales	Jane

(NOT) EXISTS

- Using **EXISTS** we see if there is at least one element in a set
- **NOT EXISTS** is true if the set is empty
- The set is always given by a subquery

```
SELECT  <columns>  
FROM    <tables>  
WHERE   EXISTS <set>
```

```
SELECT  <columns>  
FROM    <tables>  
WHERE   NOT EXISTS  
        <set>
```

(NOT) EXISTS

Employee

Name	Department	Manager
John	Marketing	Chris
Mary	Marketing	Chris
Chris	Marketing	Jane
Peter	Sales	Jane
Jane	Management	

```
SELECT *  
FROM Employee E1  
WHERE EXISTS (  
    SELECT * FROM  
        Employee E2  
    WHERE E2.Name =  
        E1.Manager)
```

ANY AND ALL

- ANY and ALL compare a single value to a set of values
- They are used with comparison operators like =, >, <, <>, >=, <=
- **A `val = ANY (set)` is true if there is at least one member of the set equal to the value**
- **`val = ALL (set)` is true if all members of the set are equal to the value**

ALL

Find the names of the employee(s) who earn the highest salary

Name	Salary
Mary	20,000
John	15,000
Jane	25,000
Paul	30,000

```
SELECT Name
FROM Employee
WHERE Salary >=
    ALL (
        SELECT Salary
        FROM Employee
        WHERE Dept= 'Marketing' )
```

ANY

Find the names of employee(s)
who earn more than someone
else

Name	Salary
Mary	20,000
John	15,000
Jane	25,000
Paul	30,000

```
SELECT Name
      FROM Employee
     WHERE Salary >
           ANY (
             SELECT Salary
             FROM Employee)
```


WORD SEARCHES

- Word Searches
 - Commonly used for searching product catalogues etc.
 - Want to be able to search by keyword
 - Want to be able to use word stemming for flexible searching
- For example: given a database of books,
 - Searching for “crypt” would return
 - “*Cryptonomicon*” by Neil Stephenson
 - “Applied *Cryptography*” by Bruce Schneier

WORD SEARCHES

- To do a word search we can keep
 - A table of items to be searched
 - A table of keywords
 - A linking table saying which keywords belong to which items

Items

itmID	itmTitle
-------	----------

Keywords

keyID	keyWord
-------	---------

ItemKey

itmID	keyID
-------	-------

WORD SEARCHES

To search we can use queries **LIKE**

```
SELECT * FROM Items
WHERE itmID IN (
    SELECT itmID FROM ItemKey
    WHERE keyID IN (
        SELECT keyID FROM Keywords
        WHERE keyWord LIKE 'crypt%' ) )
```

WORD SEARCHES

- Sometimes you need to search for a set of words
 - To find entries with all words you can link conditions with AND
 - To find entries with any of the words use OR

```
SELECT * FROM Items
WHERE itmID IN (
  SELECT itmID FROM ItemKey
  WHERE keyID IN (
    SELECT keyID FROM Keywords
    WHERE keyWord LIKE
      'word1%') )

AND

itmID IN (
  SELECT itmID FROM ItemKey
  WHERE keyID IN (
    SELECT keyID FROM Keywords
    WHERE keyWord LIKE
      'word2%') )
```

END

Thanks to Mohammad Tanhaei, Assistant Prof. at Ilam University

کوییز ۳

➤ جدول‌های زیر را در نظر بگیرید و به سوال پاسخ دهید:

جدول اخذ درس T

ID	CID	SID	Grade
1	2	893	10
2	3	893	11
3	3	901	10
...

دانشجو S

SID	Name
893	Moh
894	Nemat
901	Ali
....

جدول پیش‌نیازی P

ID	CID1	CID2
1	2	1
2	3	1
3	3	2
.....

درس C

CID	Name
1	DB
2	PL
3	SE
....

CID1 پیش‌نیاز CID2 است

➤ مطلوب است یک دستور SQL که لیست همه دانشجویانی که همه پیش‌نیازی‌های یک درس خاص انتخابی مانند DB را گذرانده‌اند