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SQL Part 3

Database Systems & Information Modelling INFO90002.

Week 5 - SQL

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This Lecture Objectives

Extending your knowledge
Query Nesting, Comparison Operators, EXISTS, NOT EXISTS, VIEWS

- DML
  - Query nesting
  - Subquery
  - Views
- DCL
  - Data Control Language

How to think about SQL
- Problem Solving

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Query Nesting

Complex queries

Query Nesting

SQL provides the ability to *nest* subqueries

A nested query is simply another select query you write to produce a table set

- Remember that all select queries return a table set of data

A common use of subqueries is to perform set tests

- Set membership, set comparisons

Sub-Query Comparison Operators

IN / NOT IN

- Used to test whether the attribute is IN/NOT IN the subquery list

ANY

- True if any value returned meets the condition

ALL

- True if all values returned meet the condition

EXISTS

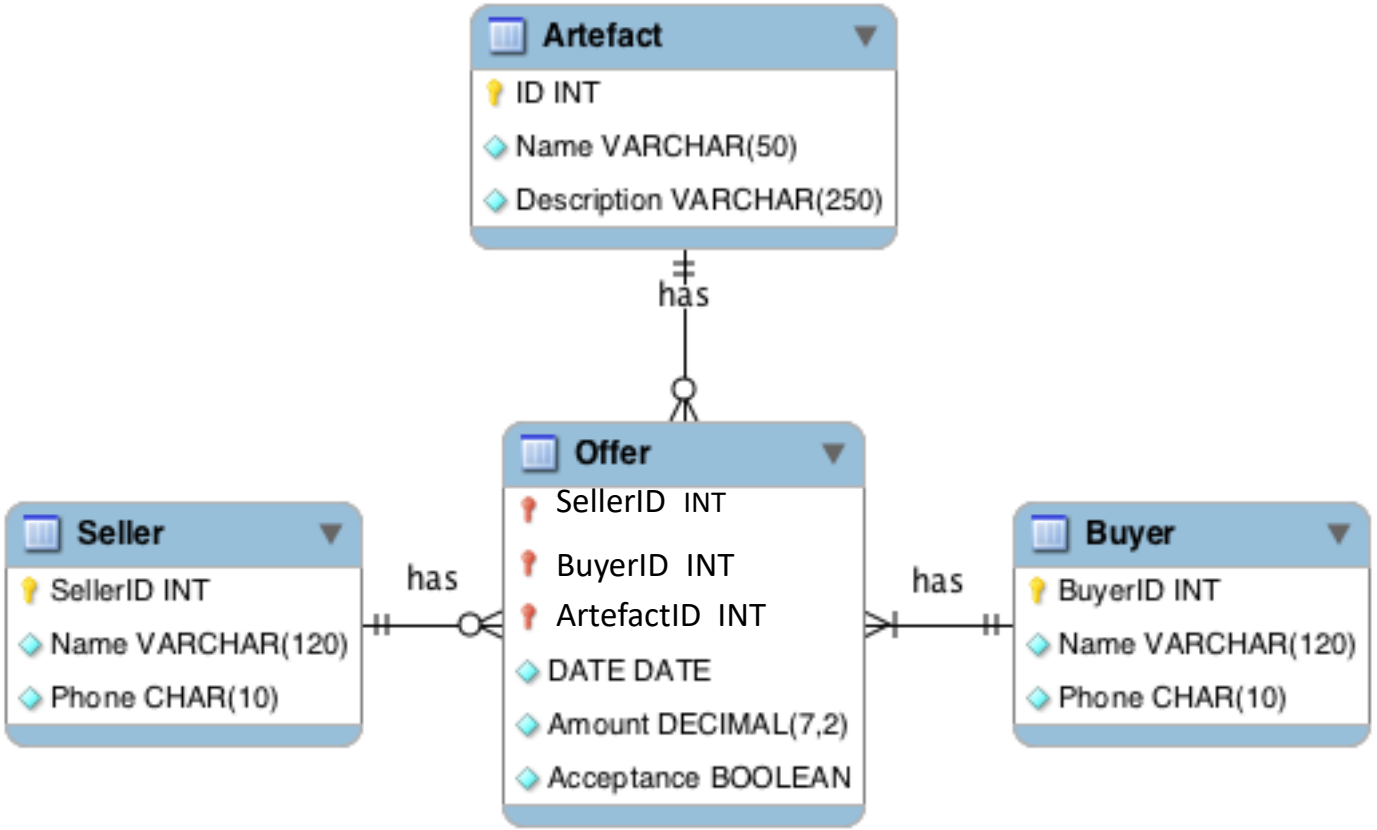
- True if the subquery returns one or more records

For more info:

- https://www.w3schools.com/sql/sql_any_all.asp
- https://www.w3schools.com/sql/sql_exists.asp

General help with SQL: https://www.w3schools.com/sql/ (great tutorial)

Auction Bids – Physical Model



Tables

Seller

SellerID	Name	Phone
1	Ann	0509 123 321
2	Bill	0518 234 432
3	Carol	02 8344 4777

Artefact

ID	Name	Description
1	Vase	Ming Vase H50cm W30cm
2	Sketch	Early Modern Dutch School
3	Pot	CopperUS 18th Century

Buyer

BuyerID	Name	Phone
1	Maggie	0539 335 577
2	Nigel	0519 434 389
3	Olga	13 24 35

Offer

SellerID	BuyerID	ArtefactID	OfferDate	Ammount	Acceptance
1	1	1	2012-06-20	81223.23	0
1	1	2	2012-06-20	82223.23	0
2	2	1	2012-06-20	1995.50	0
2	2	2	2012-06-20	2300.15	0

Example: Subquery

List the BuyerID, Name and Phone number for all bidders on artefact 1

```
1 •  SELECT *
2    FROM Buyer
3    WHERE buyerID IN
4         (SELECT BuyerID
5          FROM Offer
6          WHERE artefactid = 1);
```

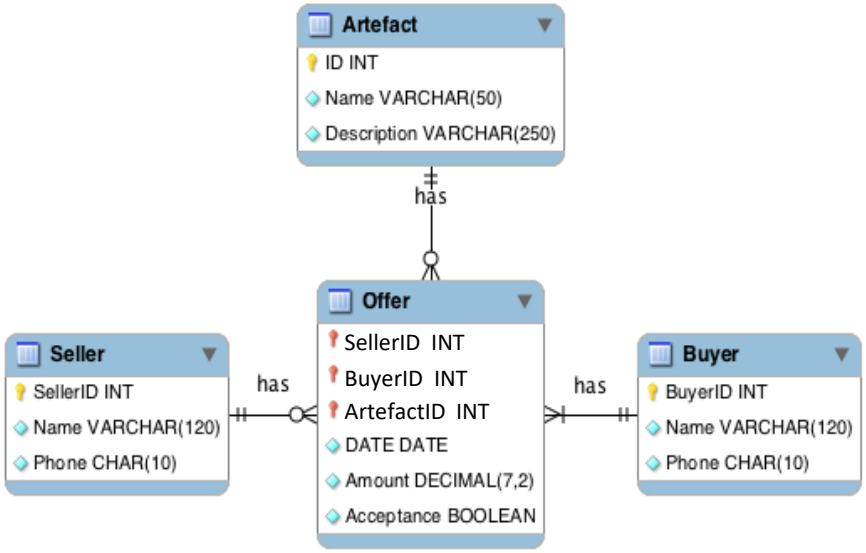
BuyerID	Name	Phone
1	Maggie	0539 335 577
2	Nigel	0519 434 389

More examples using subqueries

Which Artefacts don't have any offers made on them

```
SELECT *
FROM artefact
WHERE ID NOT IN
     (SELECT artefactid
      FROM offer);
```

	ID	Name	Description
▶	3	Pot	CopperUS 18th Century



Exercise

Which Buyers haven't made a bid for the "Pot" Artefact ?

```
select *
from Buyer
where buyerID not in
      (select buyer ID
       from offer
       where artefactID in
```

Exercise – Solution

- Which buyer haven't made a bid for the "Pot" Artefact ?

```
SELECT *
FROM buyer
WHERE buyerID NOT IN
     (SELECT BuyerID
      FROM offer
      WHERE artefactID IN
           (SELECT ID
            FROM artefact
            WHERE name = 'Pot'));
```

1	Maggie	0539 335 577
2	Nigel	0519 434 389
3	Olga	13 24 35

This or That? Writing better queries

- Do we need to use IN? Is there another way…
- List the BuyerID, Name and Phone number for all bidders on artefact 1

```
SELECT *
FROM Buyer
WHERE BuyerID IN
    (SELECT BuyerID
    FROM Offer
    WHERE ArtefactID = 1)
```

Is equal to:

```
SELECT *
FROM Buyer
NATURAL JOIN Offer
WHERE ArtefactID = 1
```


This is a more efficient way

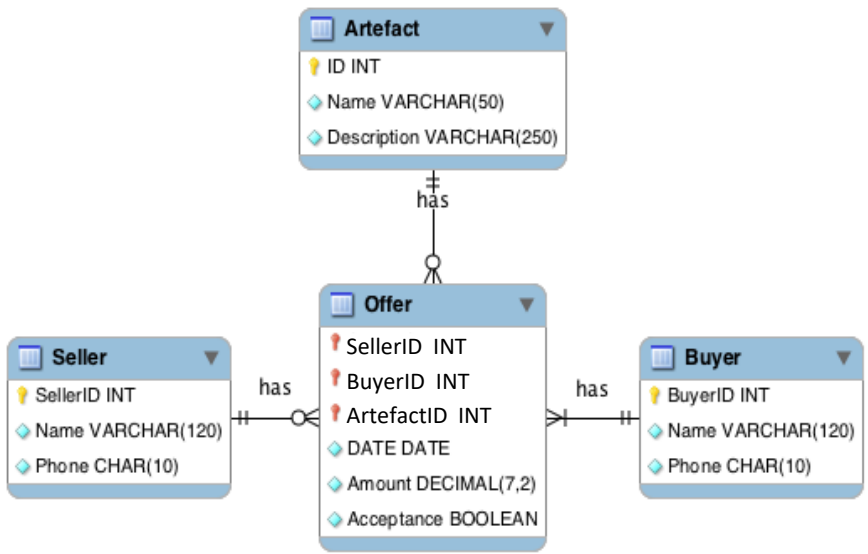
EXISTS - example

Returns true if the subquery returns one or more records

Example: *List the BuyerID, Name and Phone number for all bidders on artefact 1*

```
SELECT * FROM Buyer
WHERE EXISTS
    (SELECT * FROM Offer
     WHERE Buyer.BuyerID = Offer.BuyerID
     AND ArtefactID = 1)
```

BuyerID	Name	Phone
1	Maggie	0333333333
2	Nicole	0444444444



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Views

SQL DDL and DML

Views

Any relation that is not in the physical models, but is made available to the “user” as a virtual relation is called a view.

Views are good because:

- They help hide the query complexity from users
- They help hide data from users (e.g. data users are not authorised to see)
  - Different users use different views

    Prevents customers from seeing quantities in stock or original purchase price of an item, for instance
  - One way of improving database security

Syntax:

CREATE VIEW nameofview **AS** validsqlstatement

Once a view is defined,

- its definition is stored in the database (not the data, but metadata – schema information)
- it can be used just like any other table
- Every time shows up-to-date data

Create View Example

```
CREATE VIEW EmpPay AS
SELECT   Employee.ID, Employee.Name, DateHired,
         EmployeeType, HourlyRate AS Pay
         FROM Employee INNER JOIN Hourly
         ON   Employee.ID = Hourly.ID
UNION
SELECT   Employee.ID, Employee.Name, DateHired,
         EmployeeType, AnnualSalary  AS Pay
         FROM Employee INNER JOIN Salaried
         ON   Employee.ID = Salaried.ID
UNION
SELECT   Employee.ID, Employee.Name, DateHired,
         EmployeeType, BillingRate  AS Pay
         FROM Employee INNER JOIN Consultant
         ON     Employee.ID = Consultant.ID;
```

CREATE VIEW example

```
CREATE VIEW v_DEPT_SALARY AS
SELECT department.departmentid, department.name, sum(employee.salary)
AS DEPTSAL
FROM department
INNER JOIN employee
ON department.departmentid = employee.departmentid
GROUP BY department.departmentid, department.name;
```

Using a View

```
SELECT * FROM EmpPay;
```

Output | Snippets | Query 1 Result | Lecture7.sql R

ID	Name	DateHired	EmployeeType	Pay
3	Alice	2012-12-02	H	23.43
4	Alan	2010-01-22	H	29.43
1	Sean	2012-02-02	S	92000.00
2	Linda	2011-06-12	S	92300.00
5	Peter	2010-09-07	C	210.00
6	Rich	2012-05-19	C	420.00

```
SELECT * FROM EmpPay
    WHERE EmployeeType = "H" OR EmployeeType = "C"
```

Output | Snippets | Query 1 Result | Lecture7.sql Result

Fetched 4 records. Duration: 0.000 sec, fetc

ID	Name	DateHired	EmployeeType	Pay
3	Alice	2012-12-02	H	23.43
4	Alan	2010-01-22	H	29.43
5	Peter	2010-09-07	C	210.00
6	Rich	2012-05-19	C	420.00

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Data Control Language

SQL DCL

Data Control Language / Other Commands

beyonds the subject

DCL

- Users and permissions

  CREATE USER, **DROP USER**
  GRANT, **REVOKE**
  SET PASSWORD

Other Commands

- Database administration

  BACKUP TABLE, **RESTORE TABLE**
  ANALYZE TABLE

- Miscellaneous

  DESCRIBE **tablename**
  USE **db_name**

They are typically called ‘Database Administration Statements’

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How to think like SQL...

SQL DDL and DML

How to Think like SQL

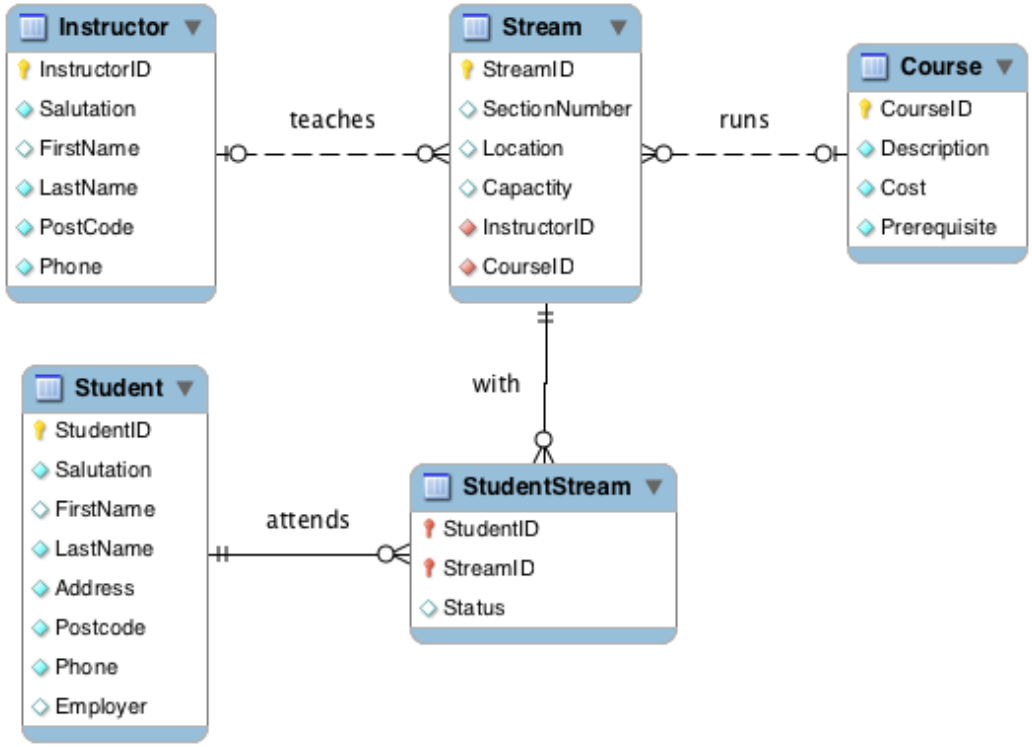
It's going to be critical for you to think like SQL to handle the queries you will need to write…

Hopefully the following discussion will help you in this endeavour:

1. USE the database design as a MAP to help you when you are formulating queries
2. USE the structure of the SELECT statement as a template
3. FILL out parts of the SELECT structure and BUILD the query

Let's try it!

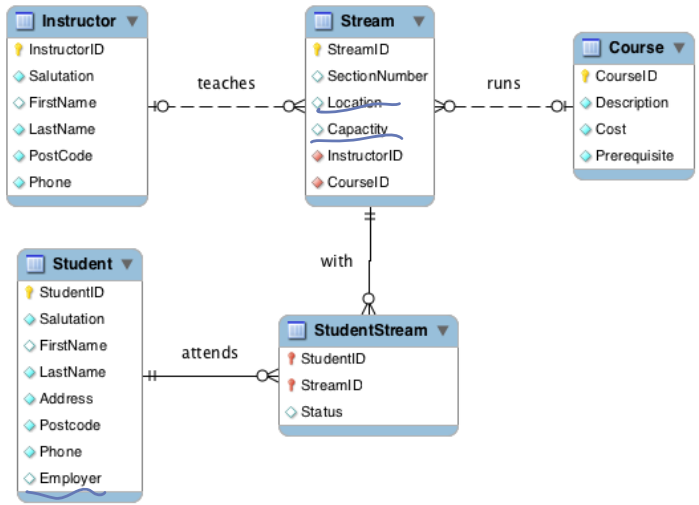
Example



Example: *Which employers employ students who are doing a course in locations where the capacity is greater than 20 persons, and what are those locations?*

How to approach writing queries

Which employers employ students who are doing a course in locations where the capacity is greater than 20 persons, and what are those locations?



What is the query asking for:

- Which fields & tables:
  - F: Employer, Location, Capacity
  - T: Student, Stream, StudentStream
- But only if the capacity > 20 (condition)

Lets try to use the structure of the SELECT statement now:

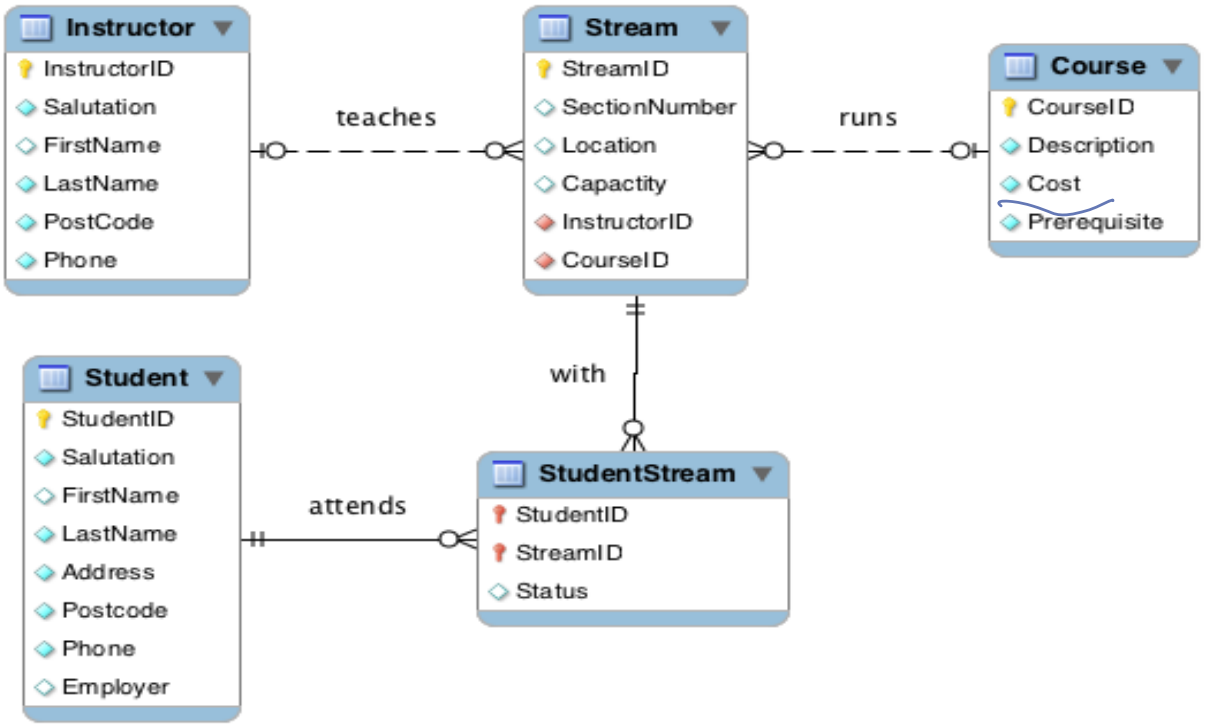
```
SELECT Employer, Location, Capacity
FROM Student
NATURAL JOIN StudentStream
NATURAL JOIN Stream
WHERE Capacity > 20;
```

logic correct but don't use this

```
SELECT Employer, Location, Capacity
FROM Student
INNER JOIN StudentStream
ON Student.StudentID = StudentStream.StudentID
INNER JOIN Stream
ON StudentStream.StreamID = Stream.StreamID
WHERE Capacity > 20;
```

Exercise (your turn)

What is the phone number of the instructor who teaches a course that costs over $10000 attended by studentID 202.



SQL Video

A very good overview of SQL:

https://www.youtube.com/watch?v=uRdIdd-UkTc&index=7&list=PLdQddgMBv5zHcEN9RrhADq3CBColhY2hl

(It runs for 90+ minutes so for viewing in your own time)

LeetCode

trouble shooting

What's examinable

- **You need to know how to write SQL**
  - **DML**
  - **DDL**

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Thank you