DS 1300 - Introduction to Database Systems

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Database

What is a database?

Physical storage: A collection of files storing related data.

Logical: A collection of tables (or objects).

Examples of databases

Accounts database; payroll database; SMU's students database; Amazon's products database; airline reservation database.

Database Management System

What is a DBMS?

A complicated (and often expensive) piece of software typically running on a large (remote) server written by someone else that allows us to manage efficiently a large database and allows it to persist over long periods of time.

Examples of DBMS

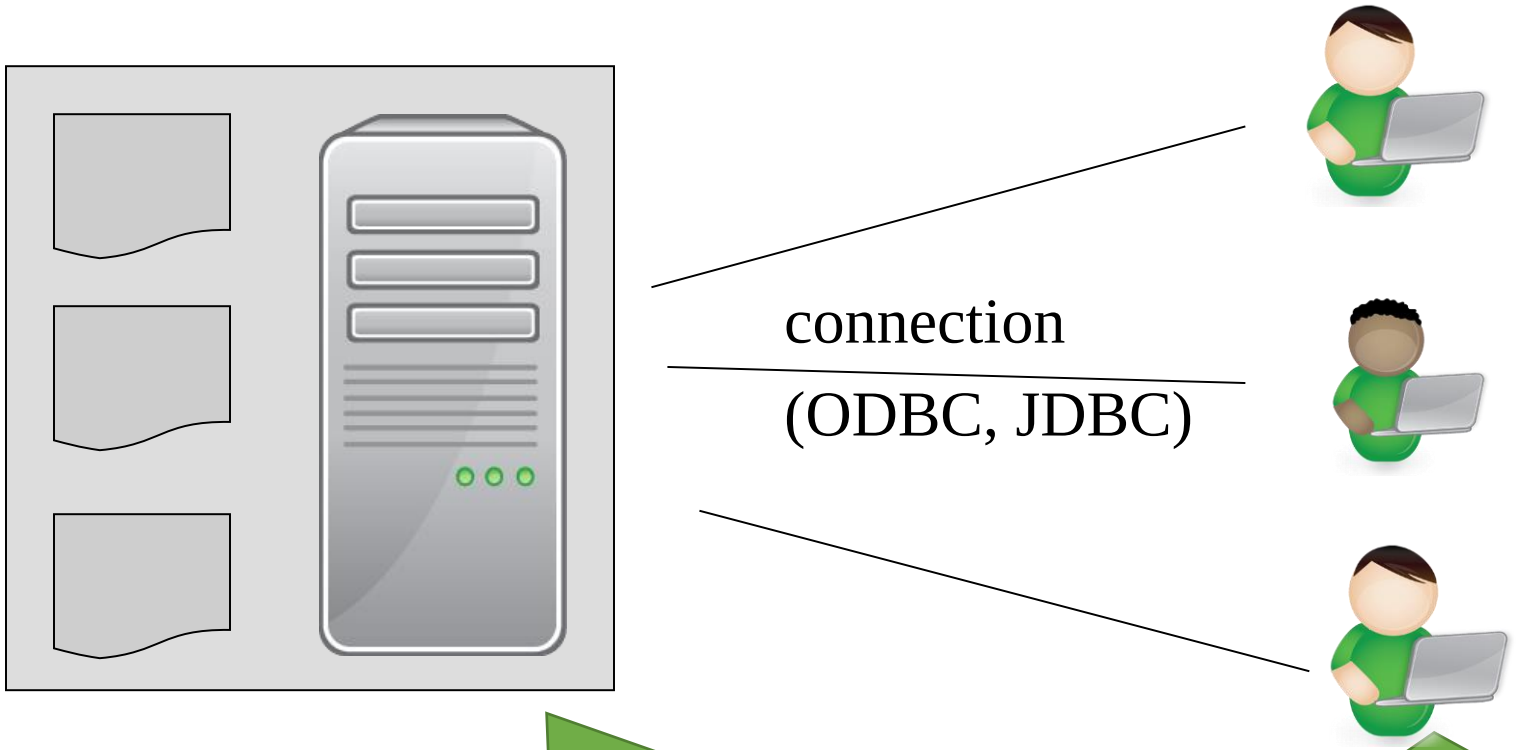
Commercial: DB2 (IBM), SQL Server (MS), Oracle, Sybase

Open Source: MySQL, Postgres, SQLite, …

Big Data: often NoSQL like MongoDB, Apache Cassandra, etc.

Architecture: Using a DMBS

"Client-server Architecture"



Operations: Query/Update

Assume we have a database
for movies and actors.

Simple query:

- In what year was ‘Star Wars’ produced?

Multi-table query:

- Find all movies with ‘Harrison Ford’
  (combine actor and movie tables)

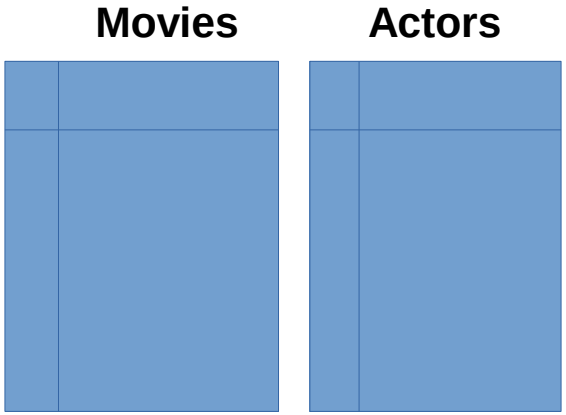
Complex query:

- For each actor, count her/his movies

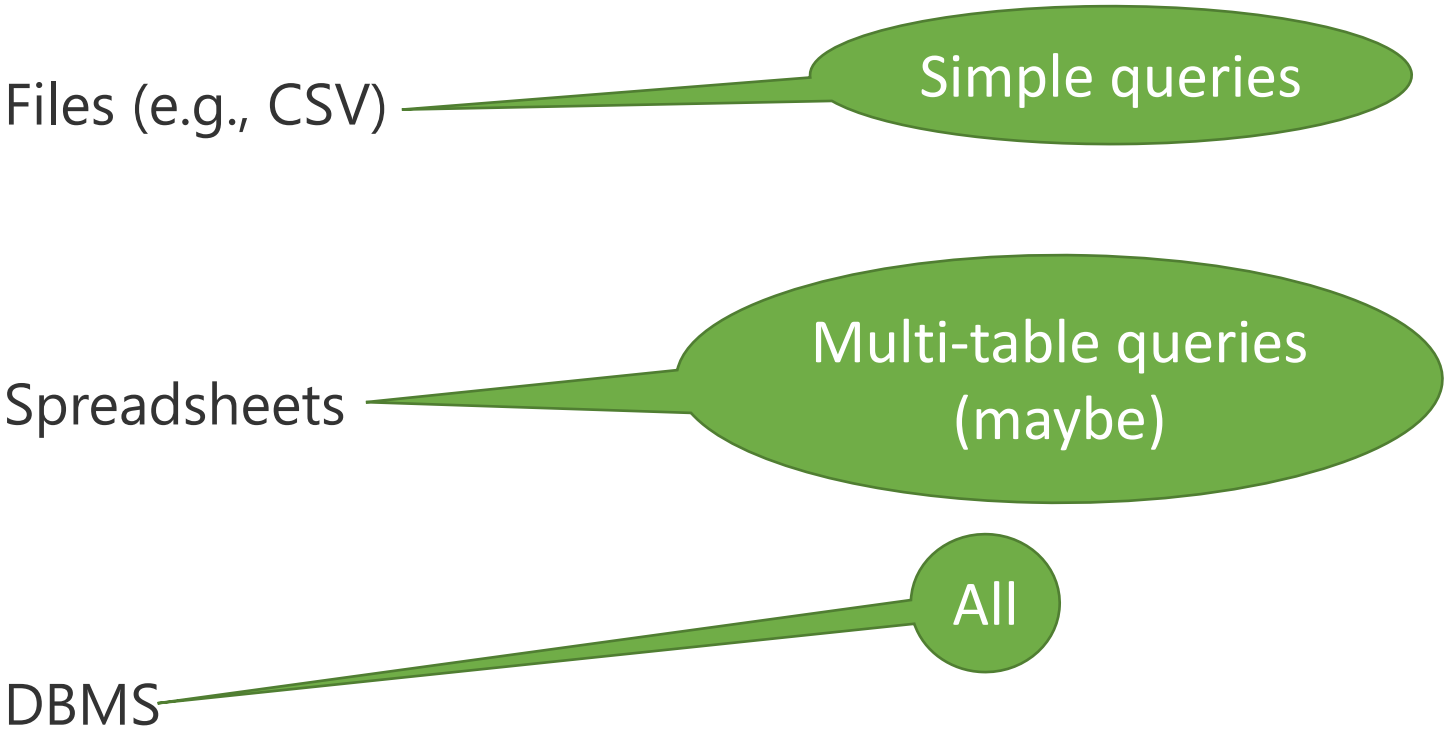
Updating:

- Insert a new movie;
  add an actor to a movie; etc

Tables:



Operations: Query/Update



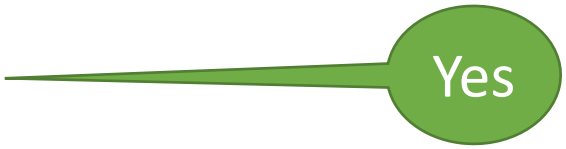
Updates: generally OK

Change the Structure of a DB

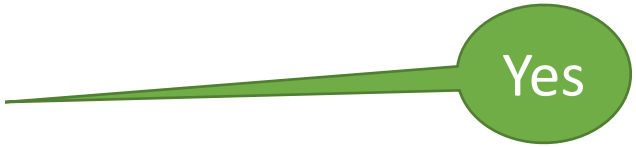
Add Address to each Actor

Files (e.g., CSV)

Spreadsheets



DBMS



Relational Data Base
= Collection of Tables

Actors:

id	fName	lName
15901	Harrison	Ford
. . .		

Movie_Actors:

id	mid
15901	130128
. . .	

Movies:

mid	Title	Year
130128	Star Wars	1977
. . .		

Create/Store Large Datasets

Use SQL to create and populate tables:

```
CREATE TABLE Actors (
   fName CHAR(30),
   lName CHAR(30),
   . . . )
```

```
INSERT INTO Actors
VALUES('Harrison', 'Ford', . . .)
```

Physical organization of the data is handled by DBMS

We focus on modeling the database!

Querying

Find all movies with 'Harrison Ford'

```
SELECT  title
FROM    Movies, Actors, Movie_Actors
WHERE   Actors.lname = 'Ford' and
        Actors.fname = 'Harrison' and
                Movies.mid = Movie_Actors.mid and
                Movie_Actors.id = Actors.id
```

What happens behind the scene ?

- The DBMS uses indices and optimizes automatically the query...

Change the Structure of a Table

Add *Address* to each Actor

```
ALTER TABLE Actor
      ADD address CHAR(50)
      DEFAULT ‘unknown’
```

What comes next?

1) Using a DBMS

2) Using SQL to Query Databases

3) Designing a Database