Backend Development

The New Oil

Learning Objectives

- Why Databases ?
- DB Structure
- MySQL & PhpMyAdmin
- Data Manipulation Language (DML)
- DML using PHP
- Data Definition Language (DDL) in PHP
- JOINs

Types of ‘The New Oil’

STRUCTURED DATA

UNSTRUCTURED DATA

Why Databases ?

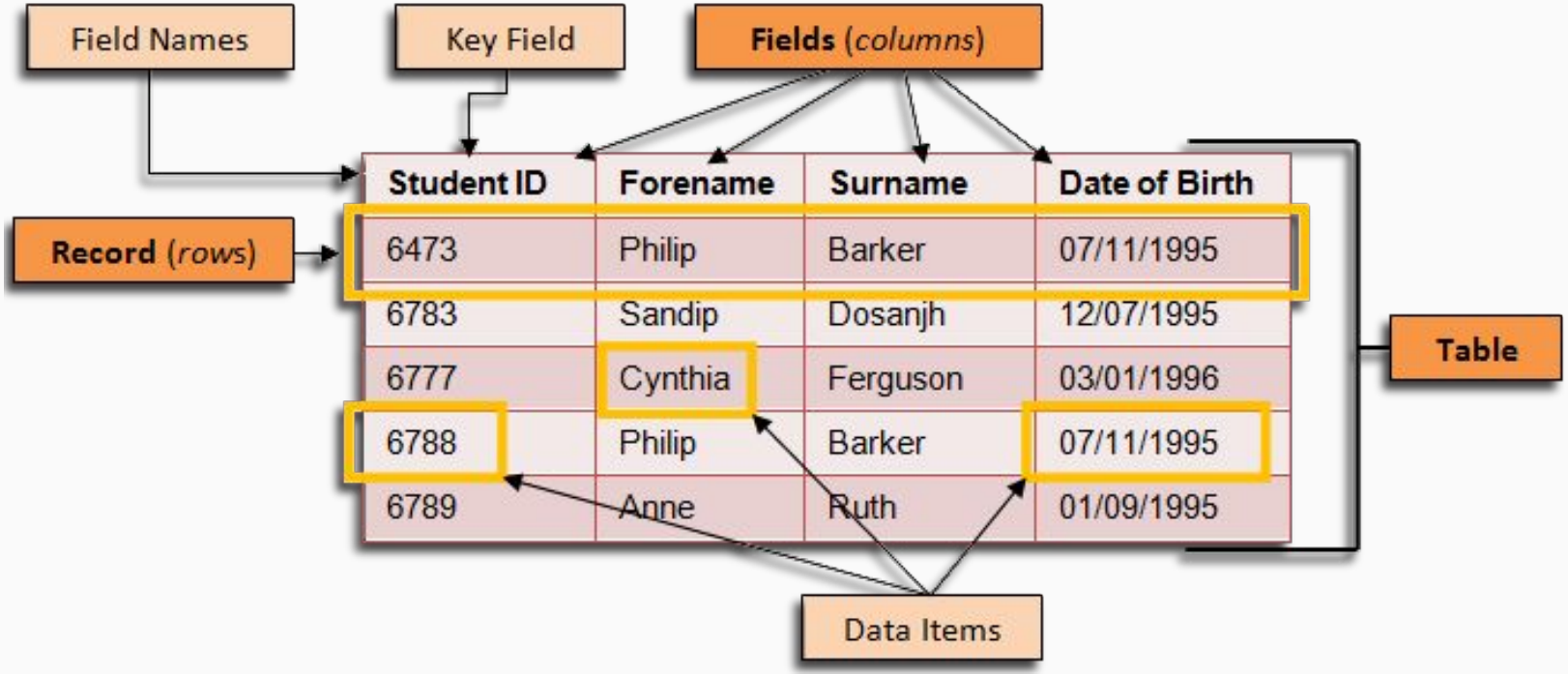
- Why don’t we just use files? A file for each (user, book, product, etc..)
  - Retrieving multiple files will cost time because HDDs & SSDs are relatively slow
- Why not just group data together? (i.e. each 50 product in a file)
  - What if concurrent files needed ? (i.e. you want to get products with ids: 1, 51, 101
- Why not just collect the same entities together ? (all users in one file)
  - RIP Software Optimization (searching for a piece of data in millions of characters, sorting, counting) processing text is usually slower compared to processing numbers

Why Databases ?

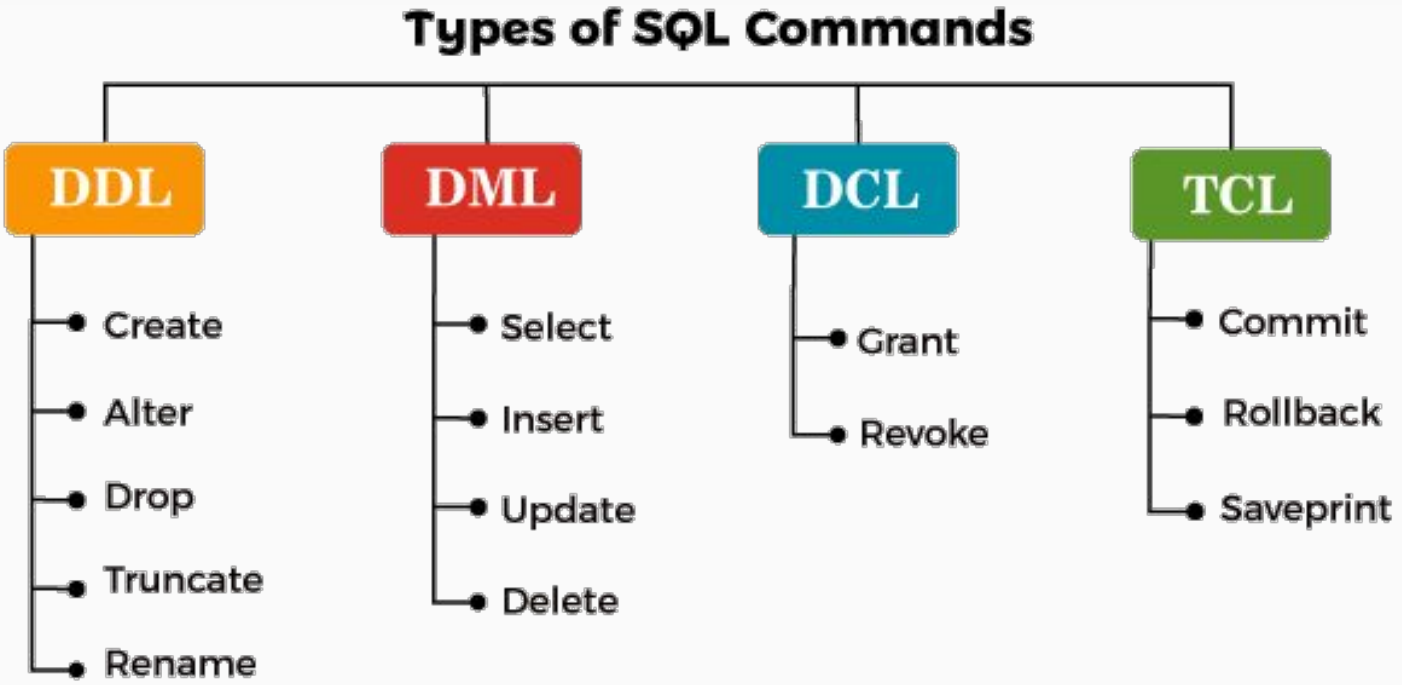
Solution

- Use one file to store all entities
- Use data structures to efficiently store & access data
- Create a programming language to apply queries on data
- Create a compiler to understand the language (queries).
- Create a system that handles queries (do transactions, fetch results)
- Create a GUI, backup service, concurrency control, ….
- That’s a Database Management System (DBMS) (such as MySQL)

Database Structure



SQL


Types of SQL Commands
DDL
Create
Alter
Drop
Truncate
Rename
DML
Select
Insert
Update
Delete
DCL
Grant
Revoke
TCL
Commit
Rollback
Saveprint

SQL

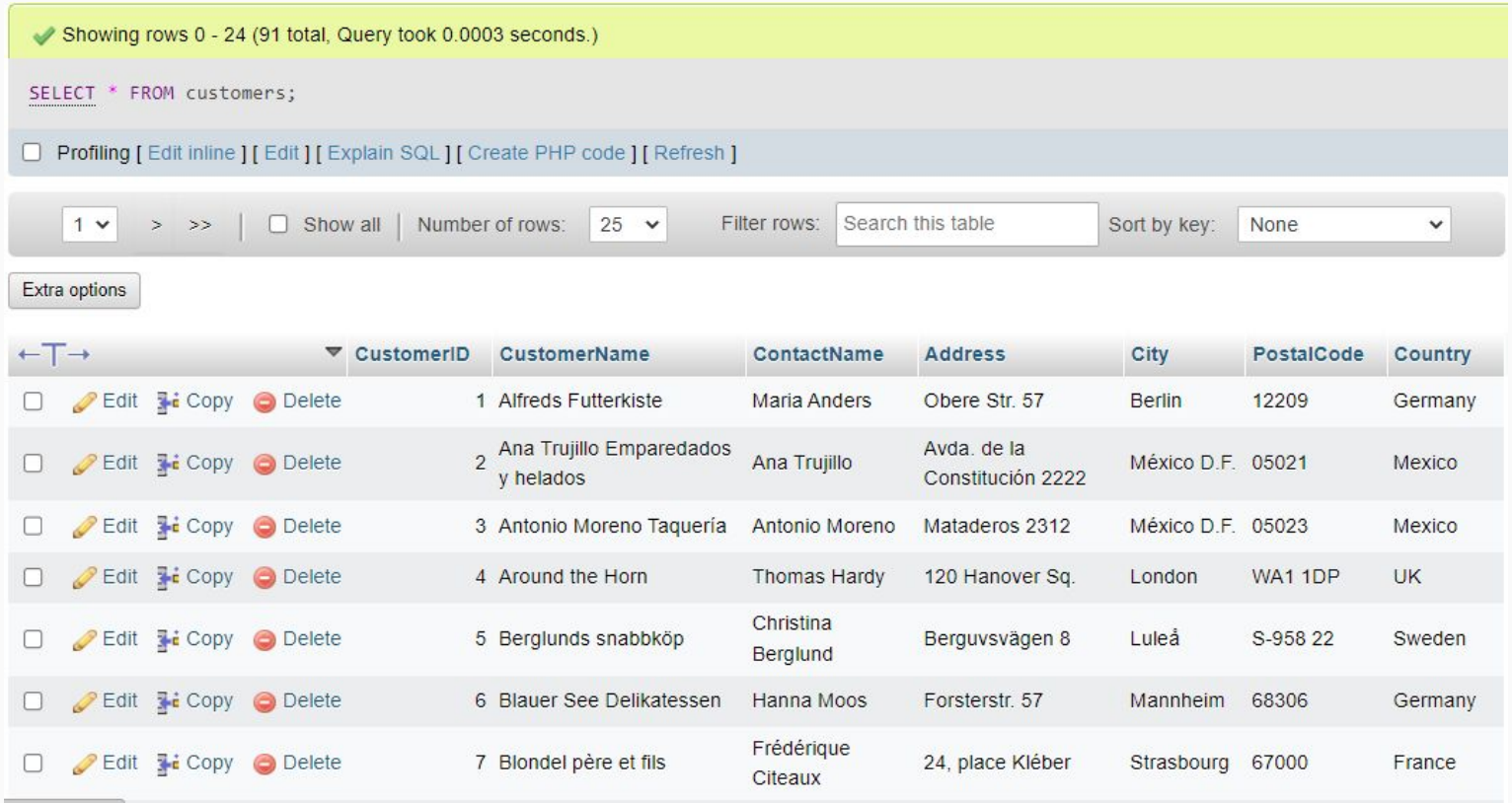
- SELECT [columns or *] FROM [table name]
  - SELECT * FROM users
- SELECT [cols or *] FROM [table] WHERE [condition]
  - SELECT * FROM users WHERE id = 5 OR age > 20 AND username <> “ahmed”;
- SELECT DISTINCT [col] FROM [table]
  - SELECT DISTINCT country FROM customers

SQL - Conditions

=	Equal to
<>	Not Equal to
>= <= > <	Gt Lt G L
IS NULL	Column value is null
IS NOT NULL	Column value is not null
LIKE “%”	String start%contains%ends with
BETWEEN x AND y	Column value between x and y

SQL - SELECT

- SELECT * FROM customers



Showing rows 0 - 24 (91 total, Query took 0.0003 seconds.)

```
SELECT * FROM customers;
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

1 > >> | Show all | Number of rows: 25 Filter rows: Search this table Sort by key: None

Extra options

←T→	CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
Edit Copy Delete	1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
Edit Copy Delete	2	Ana Trujillo Emparedados y helados	Ana Trujillo	Avda. de la Constitución 2222	México D.F.	05021	Mexico
Edit Copy Delete	3	Antonio Moreno Taquería	Antonio Moreno	Mataderos 2312	México D.F.	05023	Mexico
Edit Copy Delete	4	Around the Horn	Thomas Hardy	120 Hanover Sq.	London	WA1 1DP	UK
Edit Copy Delete	5	Berglunds snabbköp	Christina Berglund	Berguvsvägen 8	Luleå	S-958 22	Sweden
Edit Copy Delete	6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
Edit Copy Delete	7	Blondel père et fils	Frédérique Citeaux	24, place Kléber	Strasbourg	67000	France

SQL - SELECT

- SELECT * FROM customers WHERE country = ‘Germany’

CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
1	Alfreds Futterkiste	Maria Anders	Obere Str. 57	Berlin	12209	Germany
6	Blauer See Delikatessen	Hanna Moos	Forsterstr. 57	Mannheim	68306	Germany
17	Drachenblut Delikatessend	Sven Ottlieb	Walserweg 21	Aachen	52066	Germany
25	Frankenversand	Peter Franken	Berliner Platz 43	München	80805	Germany
39	Königlich Essen	Philip Cramer	Maubelstr. 90	Brandenburg	14776	Germany
44	Lehmanns Marktstand	Renate Messner	Magazinweg 7	Frankfurt a.M.	60528	Germany
52	Morgenstern Gesundkost	Alexander Feuer	Heerstr. 22	Leipzig	04179	Germany
56	Ottilies Käseladen	Henriette Pfalzheim	Mehrheimerstr. 369	Köln	50739	Germany
63	QUICK-Stop	Horst Kloss	Taucherstraße 10	Cunewalde	01307	Germany
79	Toms Spezialitäten	Karin Josephs	Luisenstr. 48	Münster	44087	Germany
86	Die Wandernde Kuh	Rita Müller	Adenauerallee 900	Stuttgart	70563	Germany

SQL - SELECT

- SELECT DISTINCT Country FROM customers;

Country
Germany
Mexico
UK
Sweden
France
Spain
Canada
Argentina

SQL - SELECT

- SELECT Country, COUNT(Country) FROM customers GROUP BY Country

Country	COUNT(Country)
Argentina	3
Austria	2
Belgium	2
Brazil	9
Canada	3
Denmark	2
Finland	2
France	11
Germany	11
Ireland	1
Italy	3

SQL - SELECT

- SELECT CustomerName FROM customers WHERE CustomerName LIKE ‘A%’

CustomerName
Alfreds Futterkiste
Ana Trujillo Emparedados y helados
Antonio Moreno Taquería
Around the Horn

SQL - SELECT

- SELECT CustomerName FROM customers WHERE CustomerName LIKE '%a'

CustomerName
Antonio Moreno Taquería
Centro comercial Moctezuma
Godos Cocina Típica
Que Delícia
Queen Cozinha
Wellington Importadora
Wilman Kala

SQL - SELECT

- SELECT CustomerName FROM customers WHERE CustomerName LIKE '%z%'

CustomerName
Centro comercial Moctezuma
Lazy K Kountry Store
Magazzini Alimentari Riuniti
Queen Cozinha
Toms Spezialitäten

SQL - SELECT

- SELECT * FROM orders WHERE OrderDate BETWEEN "1997-01-01" AND "1997-01-07";

OrderID	CustomerID	EmployeeID	OrderDate	ShipperID
10400	19	1	1997-01-01	3
10401	65	1	1997-01-01	1
10402	20	8	1997-01-02	2
10403	20	4	1997-01-03	3
10404	49	2	1997-01-03	1
10405	47	1	1997-01-06	1
10406	62	7	1997-01-07	1
10407	56	2	1997-01-07	2

SQL - INSERT INTO

- INSERT INTO students(id, name, age, gender)

  VALUES (5, “Mostafa Ahmed”, 25, “male”);

id	name	age	gender
1	Ahmed Sayed	20	male
2	Maram Mahmoud	21	female
3	Mazen Mohamed	22	male
4	Yara Hassan	23	female
5	Mostafa Ahmed	25	male

SQL - INSERT INTO

- UPDATE students SET age = 26 WHERE id = 5;

id	name	age	gender
5	Mostafa Ahmed	26	male

SQL - INSERT INTO

- DELETE FROM students WHERE id = 5;

id	name	age	gender
1	Ahmed Sayed	20	male
2	Maram Mahmoud	21	female
3	Mazen Mohamed	22	male
4	Yara Hassan	23	female

SQL - INNER JOIN

Teachers

id	name
1	Salah Bakr
2	Abdullah Riyad
3	Salma Fouad
4	Mohsen Rabah
5	Hassanen Elgibaly

Courses

id	title	teacher_id
1	Math	1
2	English	2
3	Biology	3
4	Chemistry	4
5	Programming	5
6	Psychology	3
7	Philosophy	5

SQL - INNER JOIN

- SELECT * FROM teachers JOIN courses ON teachers.id = courses.teacher_id

id	name	salary	hired_at	id	title	teacher_id
1	Salah Bakr	5000	2016-09-13	1	Math	1
2	Abdullah Riyad	6000	2015-09-09	2	English	2
3	Salma Fouad	7000	2014-09-16	3	Biology	3
4	Mohsen Rabah	3000	2019-09-23	4	Chemistry	4
5	Hassanen Elgibaly	4000	2018-09-13	5	Programming	5
3	Salma Fouad	7000	2014-09-16	6	Psychology	3
5	Hassanen Elgibaly	4000	2018-09-13	7	Philosophy	5

SQL - INNER JOIN

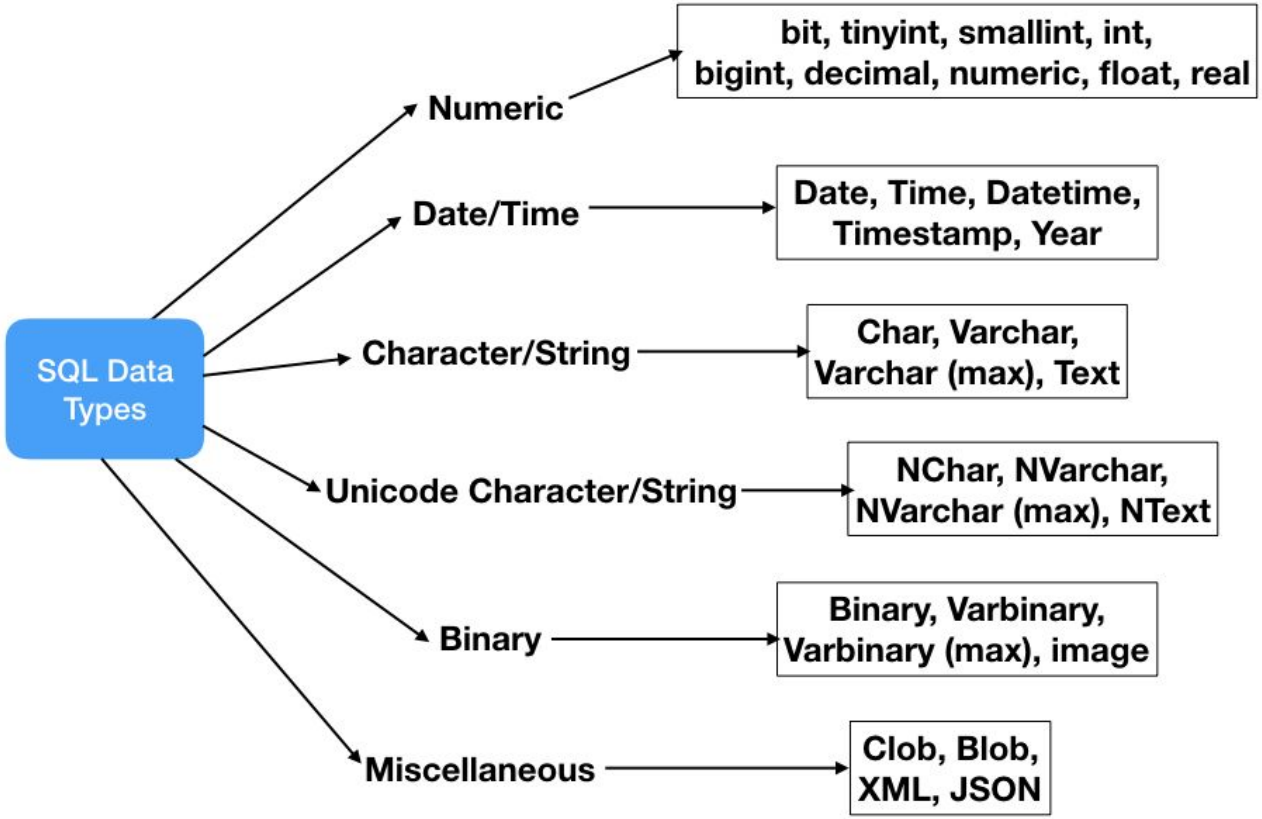
- SELECT teachers.name, courses.title FROM teachers JOIN courses ON teachers.id = courses.teacher_id

name	title
Salah Bakr	Math
Abdullah Riyad	English
Salma Fouad	Biology
Mohsen Rabah	Chemistry
Hassanen Elgibaly	Programming
Salma Fouad	Psychology
Hassanen Elgibaly	Philosophy

SQL - INNER JOIN

- SELECT teachers.name, courses.title FROM teachers JOIN courses ON teachers.id = courses.teacher_id WHERE teacher.id = 3

name	title
Salma Fouad	Biology
Salma Fouad	Psychology


SQL Data Types
Numeric
bit, tinyint, smallint, int, bigint, decimal, numeric, float, real
Date/Time
Date, Time, Datetime, Timestamp, Year
Character/String
Char, Varchar, Varchar (max), Text
Unicode Character/String
NChar, NVarchar, NVarchar (max), NText
Binary
Binary, Varbinary, Varbinary (max), image
Miscellaneous
Clob, Blob, XML, JSON

SQL - Data Definition Language (DDL)

- CREATE DATABASE mydb;

```
CREATE TABLE users (
  id INT AUTO_INCREMENT PRIMARY KEY,
  username VARCHAR(121) NOT NULL,
  email VARCHAR(121) NOT NULL,
  password VARCHAR(121) NOT NULL,
  created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
  updated_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP ON UPDATE CURRENT_TIMESTAMP
```