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Introduction to SQL

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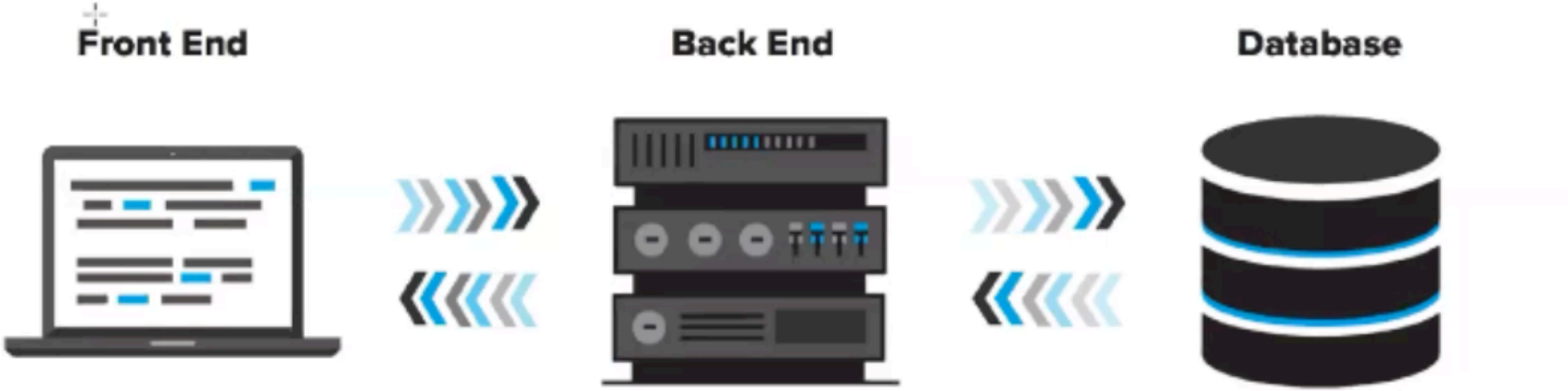
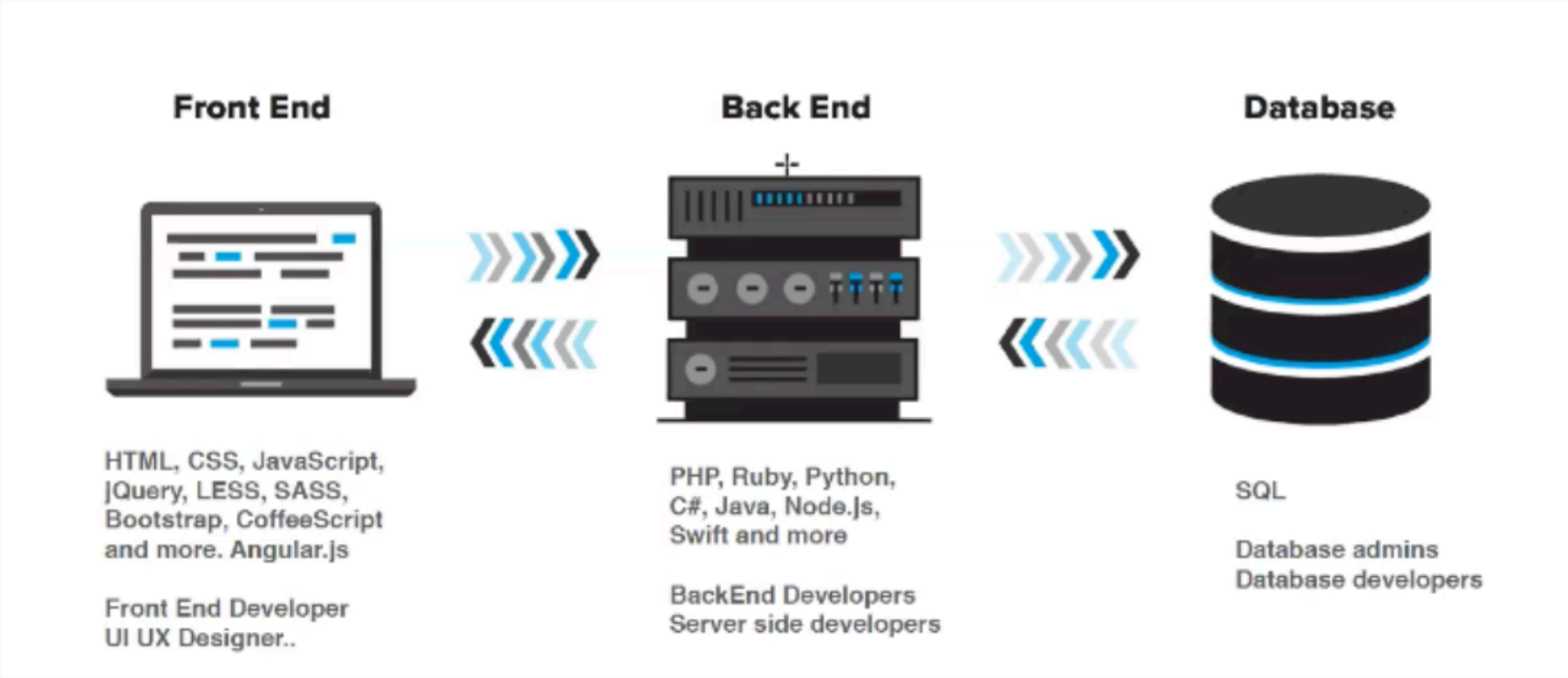
Web Application Architecture



Web Application Architecture



Web Application Architecture

Front End

Manual Tester
Black box test
Selenium + Java + Cucumber

Back End

API testing
API Testing Automation
RestAssured Library

Database

SQL
Database tester
Automate Database
Tests using Java JDBC

What is Data ?

- ☑ Piece of information

- ☑ For example Bank account
  - Account Number ->123
  - Account Type -> Checking
  - User First name -> John
  - Last name -> Smith
  - Balance ->100,000

What is Data ?

- ☑ All above data needs to be stored somewhere, where it is secure, easy to ready, fast to read, easy and fast to update.

- ☑ In databases we store data in an organized manner.

What is Database ?

- ☑ Database is a systematic collection of data.
- ☑ Databases support storage and manipulation of data.
- ☑ Databases make data management easy.

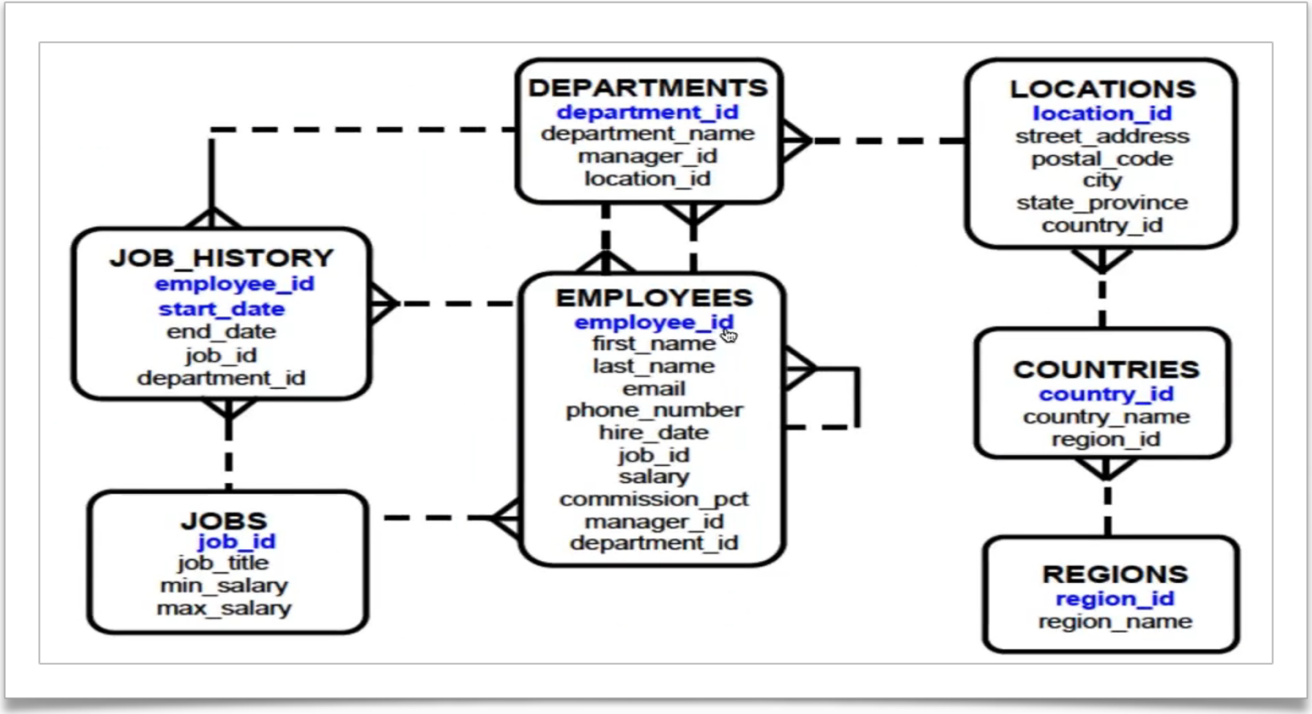
Relational Database

☑ Organize the data in a series of tables

Employee_ID	Employee_Name	Employee_Address	Employee_Salary
#007	John	VA	95k
#008	James	KY	100k
#009	Aaron	CA	105k
#010	Luckus	WA	110k

Relational Database

Tables are related to each other using Primary and Foreign keys



Relational Databases

Non Relational Database

- All Data are in Key & Value format

```
{
   first_name: 'Dexter',
   last_name: 'Lanas'
   city: 'Vancouver'
   location: [45.123,47.232],
   phones: [
      { phone_number: '111-111-1111',
        type: mobile,
        person_id: 1, ... },
      { phone_number: '444-444-4444',
        type: home,
        person_id: 1, ... },
      { phone_number: '777-777-7777',
        type: office,
        person_id: 1, ... },
   ]
}
```

Database Management System

- ☑ Creates, maintains and organizes the database
- ☑ Easier to manage the database
- ☑ Improves the availability of the information
- ☑ Does have backup system

RDBMS

- **RDBMS -->** Relational Database Management System.
- All RDBMS using SQL language
- **Relational Database -->** tables are related to each other using Primary and Foreign keys

WHAT IS SQL ?

What Is SQL ?

- ☑ SQL - > STRUCTURED QUERY LANGUAGE
- ☑ SQL is a language that is used to work with Databases and manipulate data.

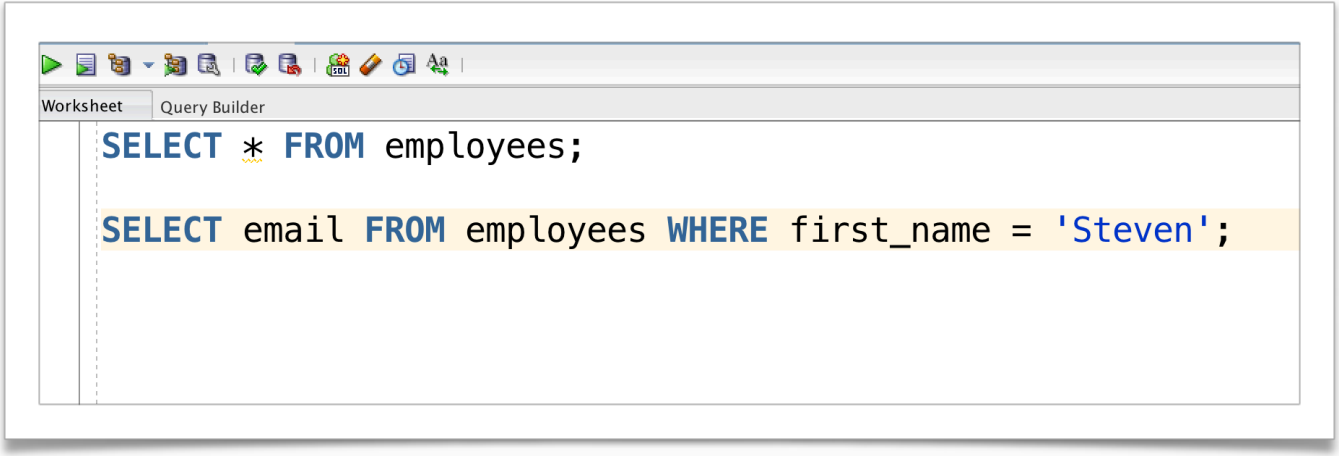
SQL

SQL is combined with four languages:

- Data Query Language(DQL)
- Data Definition Language (DDL)
- Data Control Language (DCL)
- Data Manipulation Language (DML):

What is Query in SQL ?

- ☑ A set of instructions
- ☑ Telling Database Management System that what we would like to do.



SQL

Data Types in Query

- Int & Integer: whole numbers
- Decimal: decimal numbers
- Varchar : String of text
- Date: 'YYYY-MM-DD'
- Timestamp: 'YYYY-MM-DD HH:MM:SS' -
- Boolean: true & false, Boolean expressions

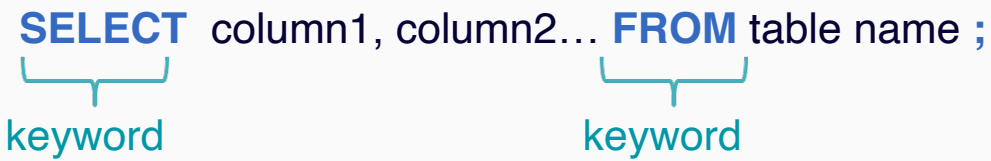
SQL STATEMENTS

SELECT STATEMENT

- First, we specify a list of columns in the table from which we want to query data in the **SELECT** statement.
- We use a comma between each column in case we want to query data from multiple columns.
- If we want to query data from all column, we can use an asterisk (*) as the shorthand for all columns.
- Second, we indicate the table name after the **FROM** keyword SQL language is case **INSENSITIVE**

SELECT STATEMENT

☑ The following illustrates the syntax of the **SELECT** statement:



SELECT STATEMENT SYNTAX

- **SELECT** * **FROM** TableName;
- **SELECT** ColumnName **FROM** TableName;
- **SELECT** ColumnName1, ColumnName2 ... **FROM** TableName;
- **SELECT** Column(s) **FROM** TableName1, TableName2 ;

SELECT DISTINCT STATEMENT

☑ The **DISTINCT** keyword can be used to return only distinct (different) values.

SELECT DISTINCT column1, column2… **FROM** table name **;**

Remove duplicate values

WHERE STATEMENT

- ☑ The **WHERE** clause appears right after the **FROM** clause of the SELECT statement.
- ☑ The conditions are used to filter the rows returned from the SELECT statement.
- ☑ SQL provides us with various standard operators to construct the conditions.

WHERE CLAUSE SYNTAX

```
SELECT column_1, column_2.. column_n
FROM table_name
WHERE conditions;
```

Applies filter to result

WHERE STATEMENT

WHERE STATEMENT OPERATORS

SELECT WHERE Statement

OPERATOR	DESCRIPTION
=	Equal
>	Greater than
<	Less than
>=	Greater than or equal
<=	Less than or equal
<> or !=	Not equal
AND	Logical operator AND
OR	Logical operator OR

BETWEEN STATEMENT

- ☑ We use the **BETWEEN** operator to match a value against a range of values.
  - For example;
    - Value **BETWEEN** low **AND** high

BETWEEN STATEMENT

- If the value is greater than or equal to the low value and less than or equal to the high value, the expression returns true, or vice versa.

- We can rewrite the **BETWEEN** operator by using the greater than or equal (>=) or less than or equal (<=) operators as the following statement:

  - value >= low **AND** value <= high

  value **BETWEEN** low **AND** high

Same statement

IN STATMENT

- We use the **IN** operator with the **WHERE** clause to check if a value matches any value in a list of values.

- The syntax of the **IN** operator is as follows:

  value **IN** (value l, value2,...)

IN STATEMENT

- The list of values is not limited to a list of numbers or strings but also a result set of a **SELECT** statement as shown in the following query:

- Value **IN** (SELECT value FROM tbl_name)

- Just like with **BETWEEN**, you can use **NOT** to adjust an **IN** statement **(NOT IN)**

ORDER BY STATEMENT

- The ORDER BY clause allows you to sort the rows returned from the SELECT statement in ascending or descending order based on criteria specified.
- The following illustrates the syntax of the SELECT statement:

```
SELECT column 1, column 2
 FROM table name
 ORDER BY column_1 ASC / DESC;
```

The column name we want order by

Which order we want ASC or DESC

LIKE STATEMENT

- ☑ Suppose the store manager asks you find an employee that he does not remember the name exactly.
- ☑ He just remembers that employee's first name begins with something like Jen.
- ☑ How do you find the exact employee that the store manager is asking?

LIKE STATEMENT

- ☑ You may find the employee in the employee table by looking at the first name column to see if there is any value that begins with Jen.

- ☑ It is kind of tedious because there are many rows in the customer table.

LIKE STATEMENT

- Fortunately, we can use the **LIKE** operator to as the following query:

```
SELECT first name, last name
FROM employee
WHERE first name LIKE 'Jen%';
```

Single Quotes

% = pattern matching(take whatever after Jen)

LIKE STATEMENT

- ☑ The query returns rows whose values in the first name column begin with Jen and may be followed by any sequence of characters.

- ☑ This technique is called pattern matching.

LIKE STATEMENT

☑ You construct a pattern by combining a string with wildcard characters and use the **LIKE** or **NOT LIKE** operator to find the matches.

- Percent (%) for matching any sequence of characters.
- Underscore (_) for matching any single character.

➡ **NOTE** : PostgreSQL provides the **ILIKE** operator, that acts exactly like the **LIKE** operator, except it values matches without case-sensitivity.

COUNT STATEMENT

- ☑ The **COUNT** function returns the number of input rows that match a specific condition of a query.

  How many departments do we have ?

COUNT STATEMENT

- The **COUNT** function returns the number of input rows that match a specific condition of a query.

  SELECT **COUNT(*)** FROM table name;

COUNT STATEMENT

- Similar to the **COUNT(*)** function, the **COUNT(column)** function returns the number of rows returned by a SELECT clause.

- However, it does not consider NULL values in the column.

COUNT STATEMENT

- ☑ We can also use **COUNT** with **DISTINCT**, for example;

- ☑ How many unique name we have ?

AGGREGATE FUNCTIONS

Performs the action for multiple rows at once and returns single result

1. MIN
2. MAX
3. AVG
4. SUM

MIN

- Checks all the rows and shows minimum one.

```
SELECT MIN(salary)
FROM employees;
```

Column Name

MAX

- Checks all the rows and shows maximum one.

```
SELECT MAX(salary)
FROM employees;
```

Column Name

AVG

☑ Add all rows and get average.

```
SELECT AVG(salary)
FROM employees;
```

Column Name

ROUND

☑ **ROUND** the result with given decimal.

```
SELECT ROUND(AVG(salary),2)
FROM employees;
```

SUM

☑ Add all rows and shows **SUM**

```
SELECT SUM(salary)
FROM employees;
```

Column Name

GROUP BY

- The **GROUP BY** clause divides the rows returned from the SELECT statement into groups.

- For each group, you can apply an aggregate function, for example:
  - calculating the sum of items
  - count the number of items in the groups.

GROUP BY

```
SELECT column_1, aggregate_function(column_2)
FROM table_name
GROUP BY column_1;
```

HAVING

- We often use the **HAVING** clause in conjunction with the **GROUP BY** clause to filter group rows that do not satisfy a specified condition.

```
SELECT column_1, aggregate_function(column_2)
FROM table_name
GROUP BY column_1;
HAVING condition(aggregate)
```

HAVING

- The **HAVING** statement sets the condition for group rows created by the GROUP BY clause after the GROUP BY clause applies while the **WHERE** clause sets the condition for individual rows before GROUP BY clause applies.

- This is the main difference between the **HAVING** and **WHERE** clauses.