SQL (1)

William Wang

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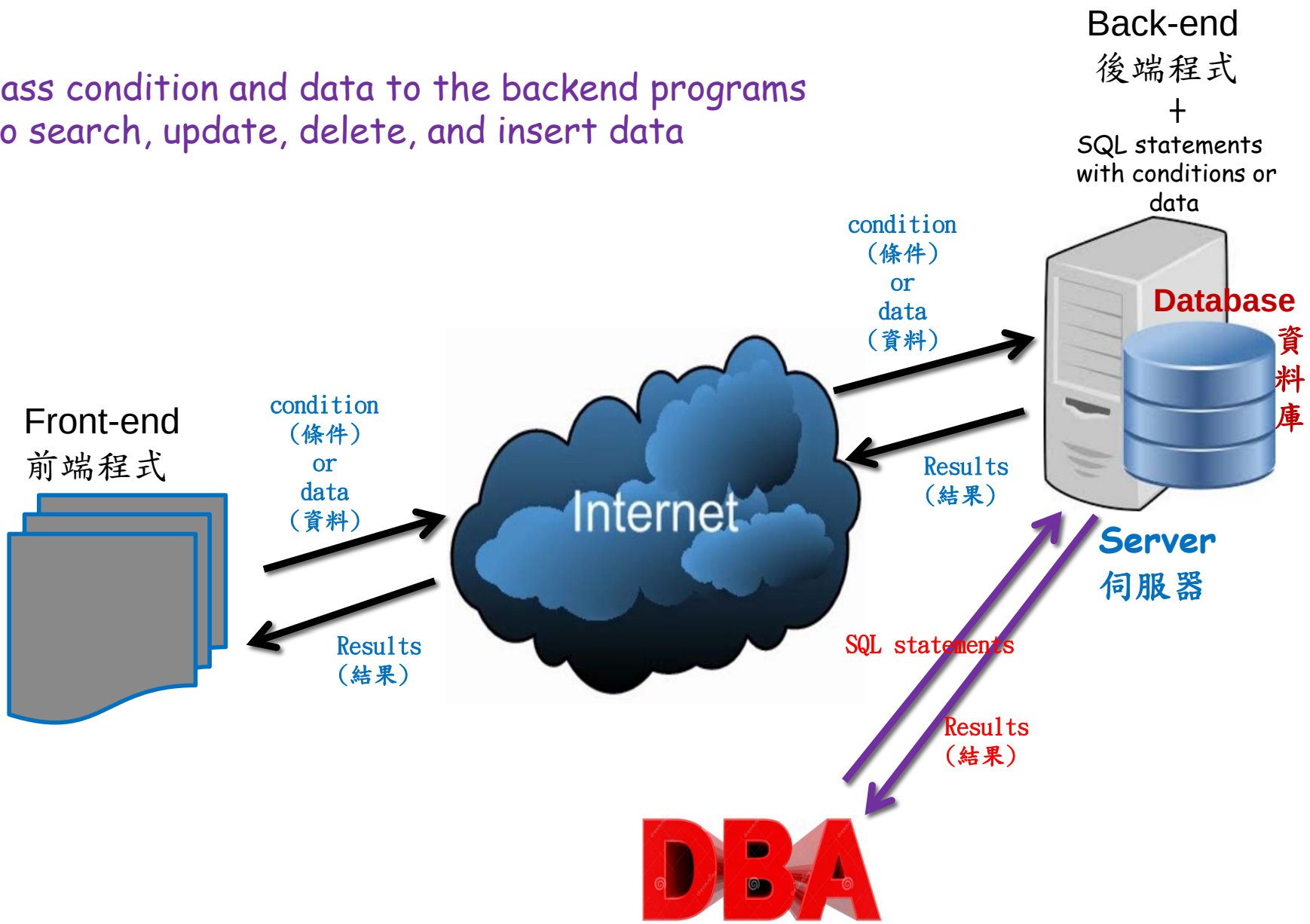
Why SQL Statements

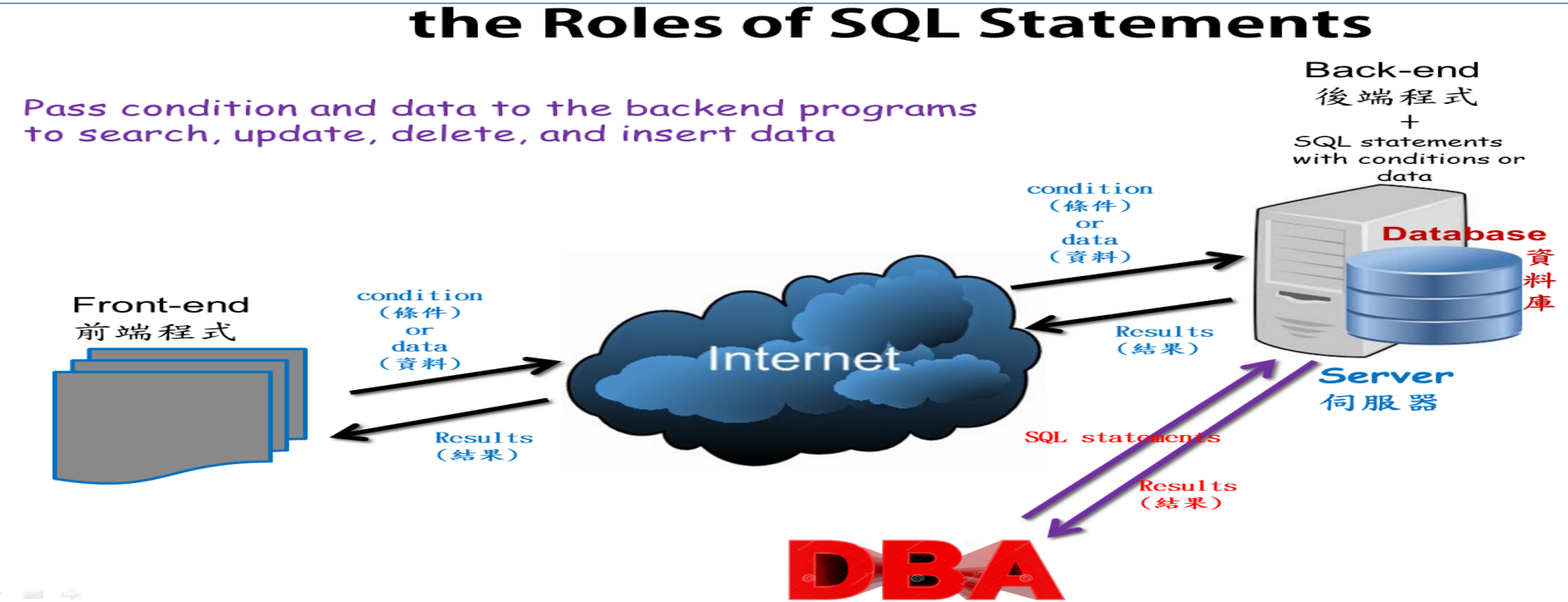
the Roles of SQL Statements

Pass condition and data to the backend programs to search, update, delete, and insert data

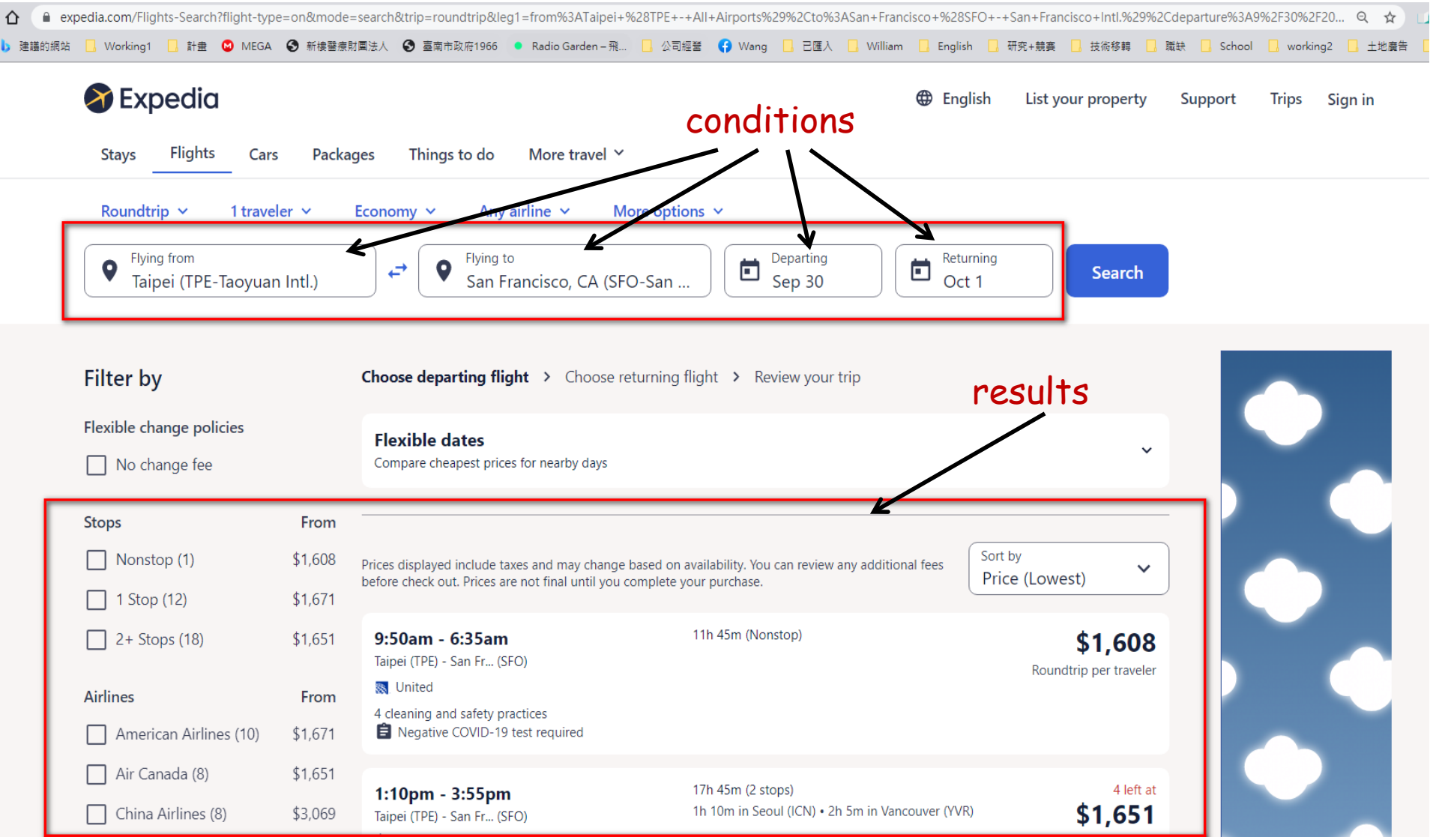


SQL – DML(Data Manipulation Language)

- DML has 4 basic data manipulation
  - Search data with condition
  - Update data with condition
  - Delete data with condition
  - Insert data with condition



Air Ticket Booking System



SQL

- Structured Query Language, commonly known as SQL, is a standard programming language for relational databases. Despite being older than many other types of code, it is the most widely implemented database language.
- Structured Query Language:為結構化查詢語言. 是一種特定目的程式語言，用於管理與存取關聯式資料庫管理系統（RDBMS）
- SQL is pronounced **"sequel"** (/ˈsiːkwəl/).

SQL Statements

https://dev.mysql.com/doc/refman/8.0/en/dynindex-statement.html
https://www.1keydata.com/tw/sql/sql-length.html

SQL Database Schema

- We define SQL Schema as **a logical collection of database objects**. A user owns that owns the schema is known as schema owner. It is a useful mechanism to segregate database objects for different applications, access rights, managing the security administration of databases. (在資料庫內資料物件(含資料表)的設計))

➔ Please import ksu_db0914.sql

SQL SELECT

- Simple Syntax:

  SELECT “column names" FROM “table names";

```
SELECT Store_Name FROM Store_Information;
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store_Name
Los Angeles
San Diego
Los Angeles
Boston

SELECT DISTINCT

- Simple Syntax:

  SELECT DISTINCT “column names“ FROM “table names";

```
SELECT DISTINCT Store_Name FROM Store_Information;
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store_Name
Los Angeles
San Diego
Boston

SQL WHERE

- Simple syntax:

SELECT “column names“ FROM “table names“ WHERE “conditions";

```
SELECT Store_Name
FROM Store_Information
WHERE Sales > 1000;
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store_Name
Los Angeles

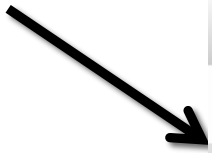
Copy ?

. Copy the structure and data of table Store_Information to a new table Store_Information_1

How ?

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08



Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Update data

```
UPDATE store_information SET Store_Name = "San Francisco" WHERE Sales = 300;
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	2019-10-05
San Diego	250	2019-10-07
San Francisco	300	2019-10-08
Boston	700	2019-10-08

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

SQL AND OR

- **Simple syntax:**

SELECT “column names“ FROM “table names“ WHERE
(“condition“ [AND|OR] “condition“)+;

```
SELECT Store_Name
FROM Store_Information
WHERE Sales > 1000
OR (Sales < 500 AND Sales > 275);
```

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

Store_Name
Los Angeles
San Francisco

SQL IN

- Simple syntax:

SELECT “column names“ FROM “table names“
WHERE “column name" IN (‘value 1', ‘value2', ...);

```
SELECT *
FROM Store_Information
WHERE Store_Name IN ('Los Angeles', 'San Diego');
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07

SQL Between

- Simple syntax:

SELECT “column names“ FROM “table names"
WHERE “column name" BETWEEN ‘value 1' AND ‘value 2';

```
SELECT * FROM Store_Information WHERE Txn_Date BETWEEN '1999-01-06' AND '1999-01-10';
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

Store_Name	Sales	Txn_Date
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

Wildcard

- Here are some examples showing different LIKE operators with '%' and '_' wildcards:

LIKE Operator	Description
WHERE CustomerName LIKE 'a%'	Finds any values that starts with "a"
WHERE CustomerName LIKE '%a'	Finds any values that ends with "a"
WHERE CustomerName LIKE '%or%'	Finds any values that have "or" in any position
WHERE CustomerName LIKE '_r%'	Finds any values that have "r" in the second position
WHERE CustomerName LIKE 'a__%'	Finds any values that starts with "a" and are at least 2 characters in length
WHERE ContactName LIKE 'a%o'	Finds any values that starts with "a" and ends with "o"

SQL LIKE

- Simple syntax:

SELECT “column names“ FROM “table names“ WHERE “coulmn name" LIKE “pattern”;

```
SELECT *
FROM Store_Information
WHERE store_name LIKE '%AN%';
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08

SQL ORDER BY

- Simple syntax:

SELECT “column names“ FROM “table names“

[WHERE “conditions"]
ORDER BY “column name" [ASC, DESC];

```
SELECT Store_Name, Sales, Txn_Date
FROM Store_Information
ORDER BY Sales DESC;
```

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

Store_Name	Sales ▼ 1	Txn_Date
Los Angeles	1500	1999-01-05
Boston	700	1999-01-08
San Francisco	300	1999-01-08
San Diego	250	1999-01-07

SQL Aggregate Functions

- An aggregate function allows you to perform a calculation on a set of values to return a single scalar value. We often use aggregate functions with the GROUP BY and HAVING clauses of the SELECT statement. The following are the most commonly used SQL aggregate functions:
  - AVG – calculates the average of a set of values.
  - COUNT – counts rows in a specified table or view.
  - MIN – gets the minimum value in a set of values.
  - MAX – gets the maximum value in a set of values.
  - SUM – calculates the sum of values.

SQL AVG

- Simple syntax:
  SELECT AVG(“column name") FROM “table name";

```
SELECT AVG(Sales) FROM Store_Information;
```
1

Store_Information 1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

AVG(Sales)
687.5000

?

AVG(Sales)
687.5

SQL COUNT

- Simple syntax:

  SELECT COUNT(“column name") FROM “table names";

```
SELECT count(Store_Name) FROM store_information_1 WHERE store_name is not null;
```

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

COUNT (Store_Name)
4

SQL MAX

- Simple syntax:

  SELECT MAX(“column name") FROM “table names";

```
SELECT MAX (Sales) FROM Store_Information; _1
```

Store_Information _1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

MAX (Sales)
1500

SQL MIN

- Simple syntax:

  SELECT MIN(“column name") FROM “table names";

```
SELECT MIN (Sales) FROM Store_Information;_1
```

Store_Information _1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

MIN (Sales)
250

SQL SUM

- Simple syntax:

  SELECT SUM(“column name") FROM “table names";

```
SELECT SUM (Sales) FROM Store_Information;_1
```

Store Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

SUM (Sales)
2750

SQL GROUP BY - 1

- Simple syntax:

  SELECT “column name 1", SUM(“column 2") FROM “tablenames" GROUP BY “column name 1";

```
SELECT Store_Name, SUM(Sales)
FROM Store_Information_1
GROUP BY Store_Name;
```

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store_Name	SUM(Sales)
Los Angeles	1800
San Diego	250
Boston	700

SQL GROUP BY - 2

- Simple syntax:

  SELECT “column name 1", SUM(“column 2") FROM “tablenames" GROUP BY “column name 1";

```
SELECT Store_Name, SUM(Sales), Sales
FROM store_information_1
GROUP BY Store_Name;
```

✘

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store_Name	SUM(Sales)	Sales
Boston	700	700
Los Angeles	1800	1500
San Diego	250	250

Right syntax + wrong semantic SQL ➔ wrong output

SQL HAVING

- SELECT “column name 1", SUM(“column name 2")
  FROM “table names"
  GROUP BY “column name1“
  HAVING (condition of aggregation function);

```
SELECT Store_Name, SUM(Sales)
FROM Store_Information _1
GROUP BY Store_Name
HAVING SUM(Sales) > 1500;
```

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store_Name	SUM(Sales)
Los Angeles	1800

What is the difference between
where clause and having clause?

Alias for table name and column name

- Simple syntax:

  SELECT “tableAlias".“column name“ “column alias"
  FROM “tablename" “tableAlias";

```
SELECT A1.Store_Name Store, SUM(A1.Sales) "Total Sales" FROM Store_Information_1 A1 GROUP BY A1.Store_Name;
```

Store_Information _1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store	Total Sales
Boston	700
Los Angeles	1800
San Diego	250

Us *As* for Alias usage

- Simple syntax:

  SELECT “tableAlias”.“columnname1” as “columnAlias”
  FROM “table name" “tableAlias";

```
SELECT A1.Store_Name as Store,
       SUM(A1.Sales) as 'Total Sales'
FROM Store_Information_1 as A1
GROUP BY A1.Store_Name;
```

Store_Information 1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Store	Total Sales
Boston	700
Los Angeles	1800
San Diego	250

Table Joins

Table Joins

- Table Joins in MySQL by using
  - where clause. It also can is used with SQL where conditions.
  - no where clause. However, it does not mean you cannot use where clause for SQL where conditions. (Inner join/ Outer join)

Table Join using where - 1 (Before grouping by)

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

Geography A1

region_name	store_name
East	Boston
West	Los Angeles
West	Los Angeles
West	San Diego

Store_Information_1 A2

store_name	sales
Boston	700
Los Angeles	1500
Los Angeles	300
San Diego	250

```
SELECT A1.Region_Name REGION, SUM(A2.Sales) SALES
FROM Geography A1, Store_Information_1  A2
WHERE A1.Store_Name = A2.Store_Name
GROUP BY A1.Region_Name;
```

REGION	SALES
East	700
West	2050

Right syntax + right semantic SQL

Table Join using where - 2

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

(Before grouping by)

Geography A1		Store_Information_1 A2	
region_name	store_name	store_name	sales
East	Boston	Boston	700
West	Los Angeles	Los Angeles	1500
West	Los Angeles	Los Angeles	300
West	San Diego	San Diego	250

```
SELECT A1.Region_Name REGION, SUM(A2.Sales) SALES, A1.store_name
FROM Geography A1, Store_Information_1  A2
WHERE A1.Store_Name = A2.Store_Name
GROUP BY A1.Region_Name;
```

The logic answer are ok on this case due to where!

REGION	SALES	store_name
East	700	Boston
West	2050	Los Angeles

Right syntax + wrong semantic SQL ➔ possible wrong output

Table Join using where - 3

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

(Before grouping by)

Geography A1		Store_Information_1 A2	
region_name	store_name	store_name	sales
East	Boston	Boston	700
West	Los Angeles	Los Angeles	1500
West	Los Angeles	Los Angeles	300
West	San Diego	San Diego	250

```
SELECT A1.Region_Name REGION, SUM(A2.Sales) SALES, A1.store_name
FROM Geography A1, Store_Information_1 A2
WHERE A1.Store_Name = A2.Store_Name
GROUP BY A1.Region_Name, A1.store_name;
```

REGION	SALES	store_name
East	700	Boston
West	1800	Los Angeles
West	250	San Diego

Right syntax + right semantic SQL

Table Join using where - 4

(Before grouping by)

Geography A1

region_name	store_name
East	Boston
West	Los Angeles
West	Los Angeles
West	San Diego

Store_Information_1 A2

store_name	sales
Boston	700
Los Angeles	1500
Los Angeles	300
San Diego	250

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08

```
SELECT A1.Region_Name REGION, SUM(A2.Sales) SALES , A1.store_name
FROM Geography A1, Store_Information_1  A2
WHERE (A1.store_name = A2.Store_Name) AND
      (A1.Region_Name like "%W%")
GROUP BY A1.Region_Name, A1.store_name;
```

REGION	SALES	store_name
West	1800	Los Angeles
West	250	San Diego

Right syntax + right semantic SQL

Table Join without **where** clause

- Inner Join - Inner Join clause basically **creates a output by combining rows that have matching values in two tables or more than two tables**. This join is based on a logical relationship (or a common field) between the tables and is used to retrieve data that appears in both tables. ← The inner join matches each row in one table with every row in other tables and allows you to query rows that contain columns from both tables.

- Outer Joins – The SQL outer join **returns all rows from both the participating tables which satisfy the join condition along with rows which do not satisfy the join condition**. ← Outer joins, on the other hand, are for finding records that may not have a match in the other table. As such, you have to specify **which side** of the join is allowed to have a missing record.

- Outer Joins -
  - LEFT JOIN and RIGHT JOIN are shorthand for LEFT OUTER JOIN and RIGHT OUTER JOIN
  - Left Outer Join would get us all the records from the left table regardless of whether or not they have a match in the right table
  - Full Outer join – MySQL does not support full outer join so far! However,…..
- What is the difference between join and where?
  - One difference is that the **first option hides the intent by expressing the join condition in the where clause**. The second option, where the join condition is written out is more clear for the user reading the query. It shows the exact intent of the query. ← statement presentation's problem!

Inner Join - 1

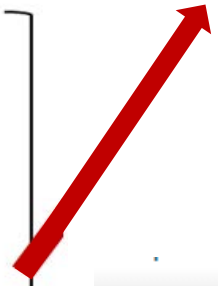
```
SELECT A1.Region_Name, A1.store_name, A0.Store_Name, A0.Sales
FROM Geography A1
INNER JOIN Store_Information  A0
  ON A1.store_name = A0.Store_Name
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08



Region_Name	store_name	Store_Name	Sales
West	Los Angeles	Los Angeles	1500
West	San Diego	San Diego	250
East	Boston	Boston	700

Inner Join - 2

- This join has the same answer as the one on page 34 without group by.

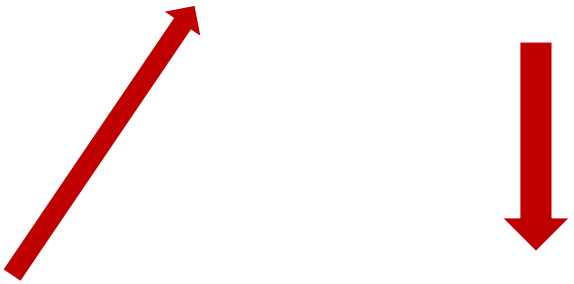
```
SELECT A1.Region_Name, A1.store_name, A3.Store_Name, A3.Sales
FROM Geography A1
INNER JOIN Store_Information_1  A3
  ON A1.store_name = A3.Store_Name
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08



Region_Name	store_name	Store_Name	Sales
West	Los Angeles	Los Angeles	1500
West	San Diego	San Diego	250
West	Los Angeles	Los Angeles	300
East	Boston	Boston	700

Inner Join

- This join has the same answer as the one on page 34 when romoving SUM().

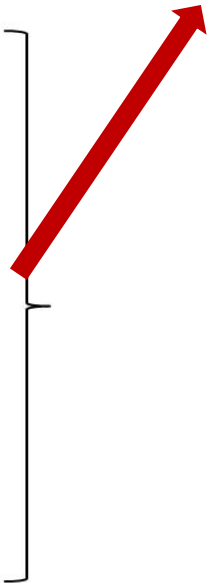
```
SELECT A1.Region_Name REGION, SUM(A2.Sales) SALES
FROM Geography A1
INNER JOIN Store_Information_1  A2
      ON A1.store_name = A2.Store_Name
GROUP BY A1.Region_Name;
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information_1

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
Los Angeles	300	1999-01-08
Boston	700	1999-01-08



REGION	SALES
East	700
West	2050

Left outer Join

Left Outer Join would get us all the records from the left table regardless of whether or not they have a match in the right table

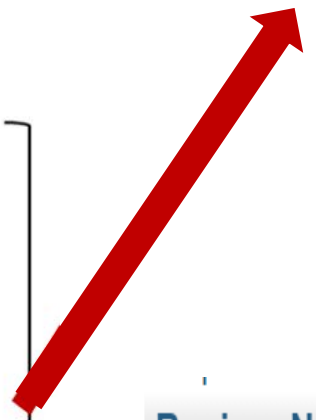
```
SELECT A1.Region_Name, A1.store_name, A5.Store_Name,  A5.Sales
FROM Geography A1
LEFT JOIN Store_Information  A5
     ON A1.store_name = A5.Store_Name
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08



Region_Name	store_name	Store_Name	Sales
West	Los Angeles	Los Angeles	1500
West	San Diego	San Diego	250
East	Boston	Boston	700
East	New York	*NULL*	*NULL*

Right outer Join

Right Outer Join would get us all the records from the right table regardless of whether or not they have a match in the left table

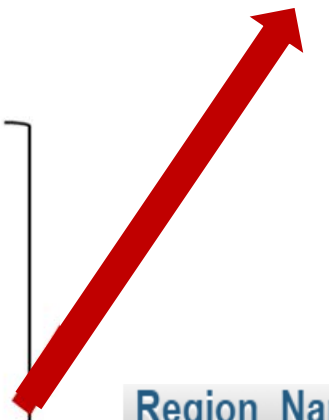
```
SELECT A1.Region_Name, A1.store_name, A5.Store_Name,  A5.Sales
FROM Geography A1
RIGHT JOIN Store_Information  A5
     ON A1.store_name = A5.Store_Name
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Store_Information

Store_Name	Sales	Txn_Date
Los Angeles	1500	1999-01-05
San Diego	250	1999-01-07
San Francisco	300	1999-01-08
Boston	700	1999-01-08

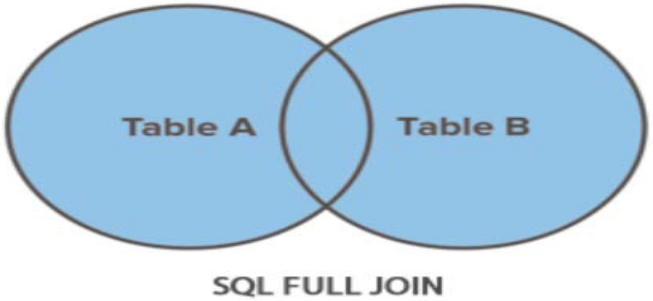


Region_Name	store_name	Store_Name	Sales
East	Boston	Boston	700
West	Los Angeles	Los Angeles	1500
West	San Diego	San Diego	250
NULL	*NULL*	San Francisco	300

Full Outer Join

- MySQL does not support full outer join out of the box, unlike other databases such as PostgreSQL, and SQL Server. So you will need to do a full outer join using a combination of other join types such as LEFT JOIN ad RIGHT JOIN that are supported in MySQL.

```
SELECT * FROM t1
LEFT JOIN t2 ON t1.id = t2.id
UNION ALL
SELECT * FROM t1
RIGHT JOIN t2 ON t1.id = t2.id
WHERE t1.id IS NULL
```



SQL FULL JOIN

- The above query will also return duplicate rows, if any. If you don't want duplicate records in full outer join, use the following query instead.

```
SELECT * FROM t1
LEFT JOIN t2 ON t1.id = t2.id
UNION
SELECT * FROM t1
RIGHT JOIN t2 ON t1.id = t2.id
```

```sql
SELECT A1.Region_Name, A1.store_name, A5.Store_Name,  A5.Sales
FROM Geography A1
LEFT JOIN Store_Information  A5
     ON A1.store_name = A5.Store_Name
UNION
SELECT A1.Region_Name, A1.store_name, A5.Store_Name,  A5.Sales
FROM Geography A1
RIGHT JOIN Store_Information  A5
     ON A1.store_name = A5.Store_Name
```

Region_Name	store_name	Store_Name	Sales
West	Los Angeles	Los Angeles	1500
West	San Diego	San Diego	250
East	Boston	Boston	700
East	New York	*NULL*	*NULL*

Region_Name	store_name	Store_Name	Sales
East	Boston	Boston	700
West	Los Angeles	Los Angeles	1500
West	San Diego	San Diego	250
NULL	*NULL*	San Francisco	300

Region_Name	store_name	Store_Name	Sales
West	Los Angeles	Los Angeles	1500
West	San Diego	San Diego	250
East	Boston	Boston	700
East	New York	*NULL*	*NULL*
NULL	*NULL*	San Francisco	300

Other Functions used in SQL statements

CONCATENATION

- Simple syntax:

  CONCAT(String 1, String 2, String 3, ...)

```
SELECT CONCAT(Region_Name, Store_Name)
FROM Geography
WHERE Store_Name = 'Boston';
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

CONCAT(Region_Name, Store_Name)
EastBoston

SUBSTRING

- Simple syntax:

  SUBSTR (string, position)

```
SELECT SUBSTR(Store_Name, 3)
FROM Geography
WHERE Store_Name = 'Los Angeles';
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

SUBSTR(Store_Name, 3)
s Angeles

SUBSTRING

- Simple syntax:

  SUBSTR (string, position)

```
SELECT SUBSTR(Store_Name,2,4)
FROM Geography
WHERE Store_Name = 'San Diego';
```

Geography

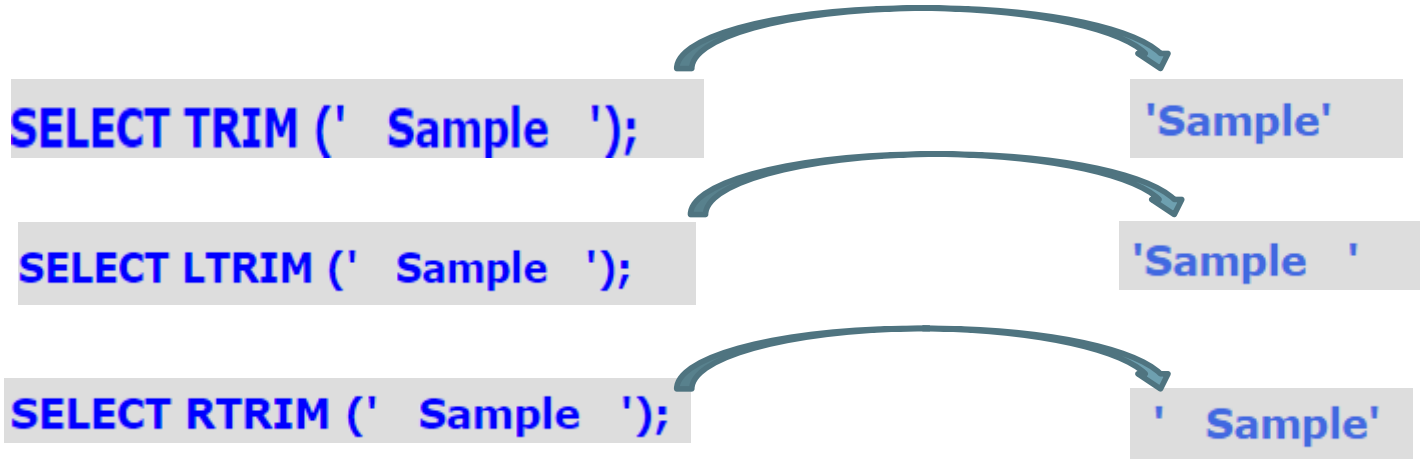
Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

SUBSTR(Store_Name,2,4)
an D

TRIM()

- Simple syntax: remove spaces

TRIM() LTRIM() RTRIM()



LENGTH()

- Simple syntax:

  Length(string)

```
SELECT Length (Store_Name)
FROM Geography
WHERE Store_Name = 'Los Angeles';
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

```
11
```

LENGTH()

- Simple syntax:

  Length(string)

```
SELECT Region_Name, Length (Region_Name)
FROM Geography;
```

Geography

Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

Region_Name	Length(Region_Name)
East	4
East	4
West	4
West	4

REPLACE()

- Simple syntax:

  Replace (column name, string2, string3)

```
SELECT REPLACE (Region_Name, 'ast', 'astern')
FROM Geography;
```

Geography

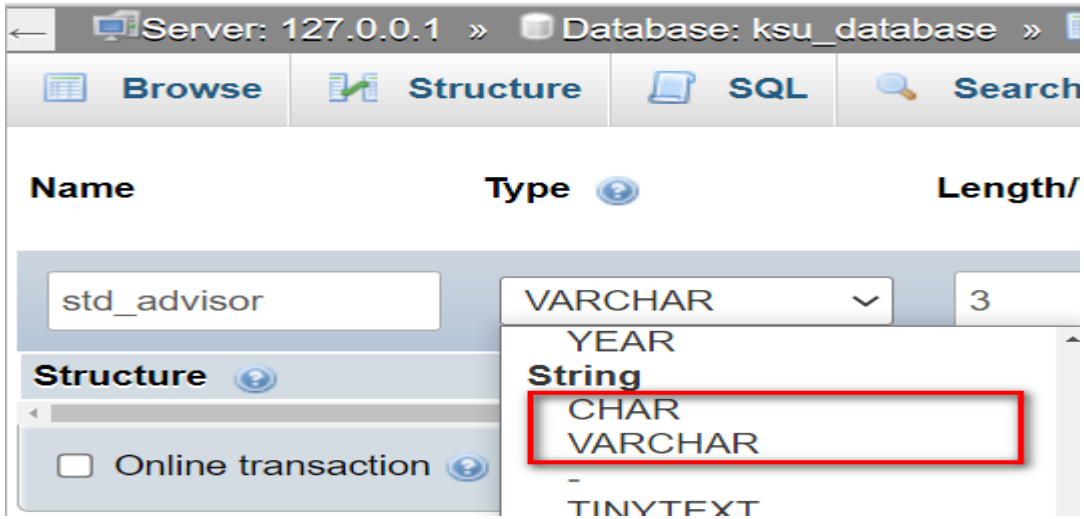
Region_Name	store_name
East	Boston
East	New York
West	Los Angeles
West	San Diego

REPLACE (Region_Name, 'ast', 'astern')
Eastern
Eastern
West
West

Varchar *v.s.* Char

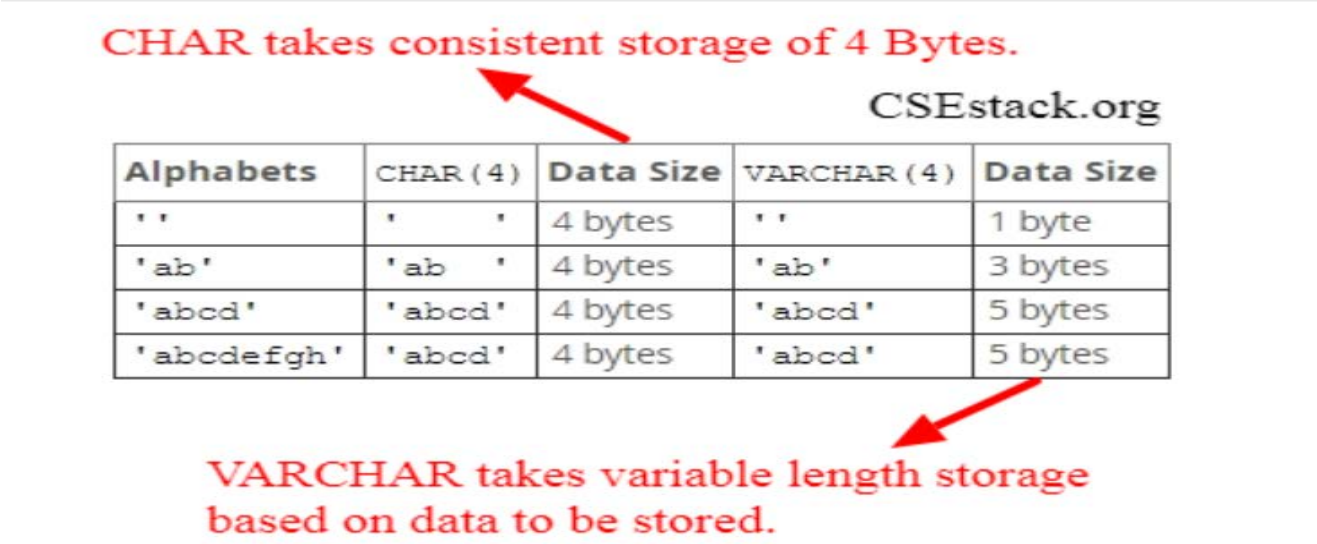
Char v.s. Varchar

- A CHAR field is a fixed length, and VARCHAR is a variable length field. Both of them are string types for column.
- This means that the storage requirements are different - a CHAR always takes the same amount of space regardless of what you store, whereas the storage requirements for a VARCHAR vary depending on the specific string stored.



Difference Between CHAR and VARCHAR

- The main difference between the two types is the way they are used to store the data.
- When you assign any data type to the column while creating an SQL table, each value in the column belongs to the same data type. In the case of CHAR and VARCHAR types, data are stored in character string format.



Alphabets	CHAR(4)	Data Size	VARCHAR(4)	Data Size
''	' '	4 bytes	''	1 byte
'ab'	'ab '	4 bytes	'ab'	3 bytes
'abcd'	'abcd'	4 bytes	'abcd'	5 bytes
'abcdefgh'	'abcd'	4 bytes	'abcd'	5 bytes

Which does give better performance?

- CHAR data type values are faster to access as it has fixed column size and SQL engine can jump to the next page by calculating the fixed size.
- It is good to take advantage of CHAR performance up to a certain extent. We cannot ignore, CHAR may waste some storage space by saving small string length data into the big chunk of fixed size storage. It is suggested that by some articles, **up to the length of 20 characters, CHAR is useful over VARCHAR.** ← However, depend on what the semantic idea to a column? And How many data tuples would be stored in the column. For example,
  - design a column for first name
  - design a column for last name
  - design a column for address
  - design a column for sex
- If use InnoDB Engine, suggest to use varchar instead of char type based on semantic idea to a column.

p.s. how about varchar2? It treats empty as null and is an Oracle standard.

Table Creation and Constraints

https://dev.mysql.com/doc/refman/8.0/en/dynindex-statement.html
https://www.1keydata.com/tw/sql/sql-length.html

CREATE TABLE

- Simple syntax:

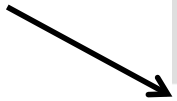
  Create table “table name” (

  “column name_1” column’s type,

  …..);

- A table can be created when it is not existed.

```
CREATE TABLE Customer
    (First_Name char(50),
    Last_Name char(50),
    Address char(50),
    City char(50),
    Country char(25),
    Birth_Date datetime
    );
```



#	Name	Type	Collation	Attributes	Null	Default
1	First_Name	char(50)	latin1_swedish_ci		Yes	*NULL*
2	Last_Name	char(50)	latin1_swedish_ci		Yes	*NULL*
3	Addr	char(50)	latin1_swedish_ci		Yes	*NULL*
4	City	char(50)	latin1_swedish_ci		Yes	*NULL*
5	Country	char(25)	latin1_swedish_ci		Yes	*NULL*
6	Birth_Date	datetime			Yes	*NULL*

Remove Table

- Remove an existed table by using

  drop table “table name”

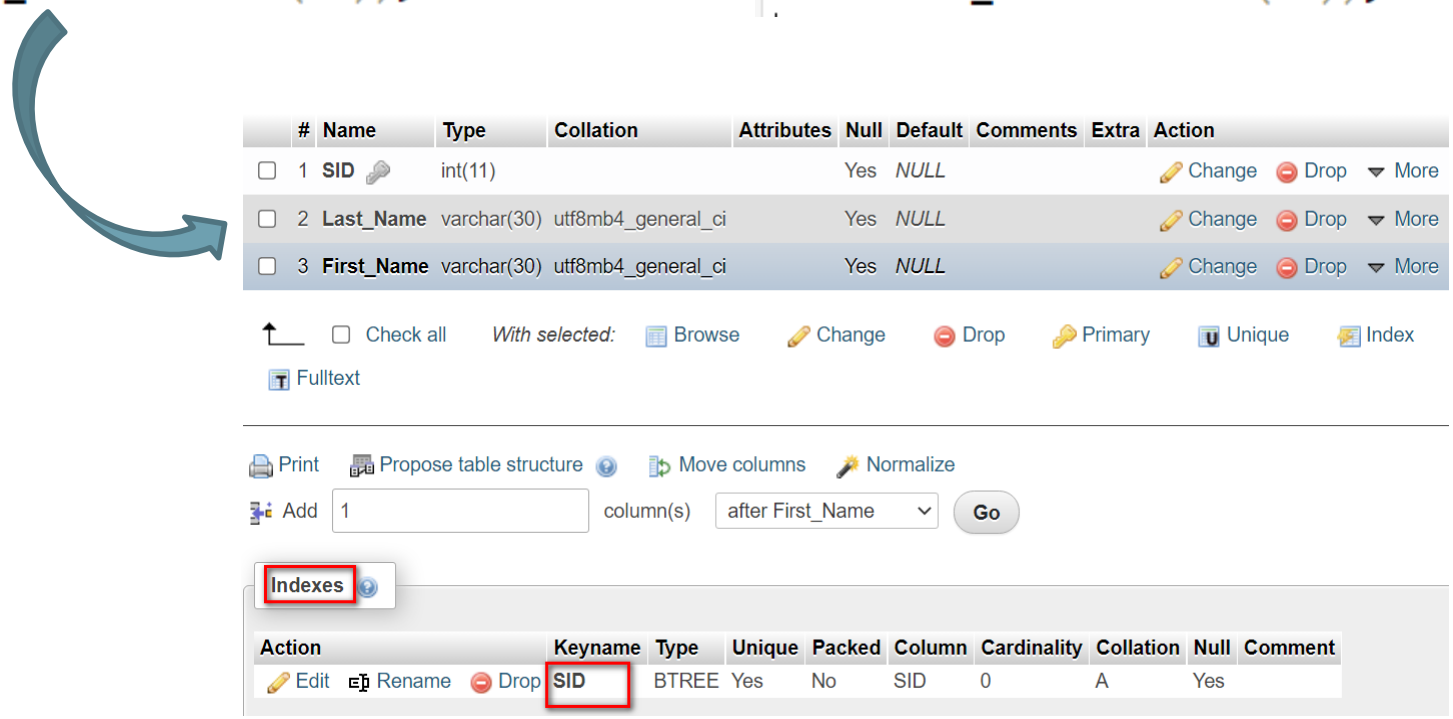
Constraint – unique

- The SID column is setup with the UNIQUE constraint.

```
CREATE TABLE Customer_1
    (SID integer UNIQUE  KEY,
    Last_Name varchar (30),
    First_Name varchar(30));
```

or

```
CREATE TABLE Customer_4
    (SID integer UNIQUE,
    Last_Name varchar (30),
    First_Name varchar(30));
```



Constraint – unique

- The value of SID column needs to be checked..

```
CREATE TABLE Customer_2
  (SID integer CHECK (SID > 0),
   Last_Name varchar (30),
   First_Name varchar(30));
```

Add a new column

- Add a new column in an existing table

```
ALTER TABLE Customer ADD Gender char(1);
```

Name	Type
First_Name	char(50)
Last_Name	char(50)
Addr	char(50)
City	char(50)
Country	char(25)
Birth_Date	datetime
Gender	char(1)

Change a column name

- Change an existing column name

```
ALTER TABLE Customer CHANGE Addr  Addr_new   char(50);
```

Name	Type
First_Name	char(50)
Last_Name	char(50)
Addr	char(50)
City	char(50)
Country	char(25)
Birth_Date	datetime
Gender	char(1)

Name	Type
First_Name	char(50)
Last_Name	char(50)
Addr_new	char(50)
City	char(50)
Country	char(25)
Birth_Date	datetime
Gender	char(1)

Modify a column's structure

- Modify a column's structure

```
ALTER TABLE Customer MODIFY Addr_new varchar(30);
```

Name	Type
First_Name	char(50)
Last_Name	char(50)
Addr_new	char(50)
City	char(50)
Country	char(25)
Birth_Date	datetime
Gender	char(1)

Name	Type
First_Name	char(50)
Last_Name	char(50)
Addr_new	varchar(30)
City	char(50)
Country	char(25)
Birth_Date	datetime
Gender	char(1)

Drop an existing column when no data

```
ALTER TABLE Customer DROP Gender;
```

Name	Type	Collation
First_Name	char(50)	latin1_swedish_ci
Last_Name	char(50)	latin1_swedish_ci
Addr_new	varchar(30)	latin1_swedish_ci
City	char(50)	latin1_swedish_ci
Country	char(25)	latin1_swedish_ci
Birth_Date	datetime	

The End