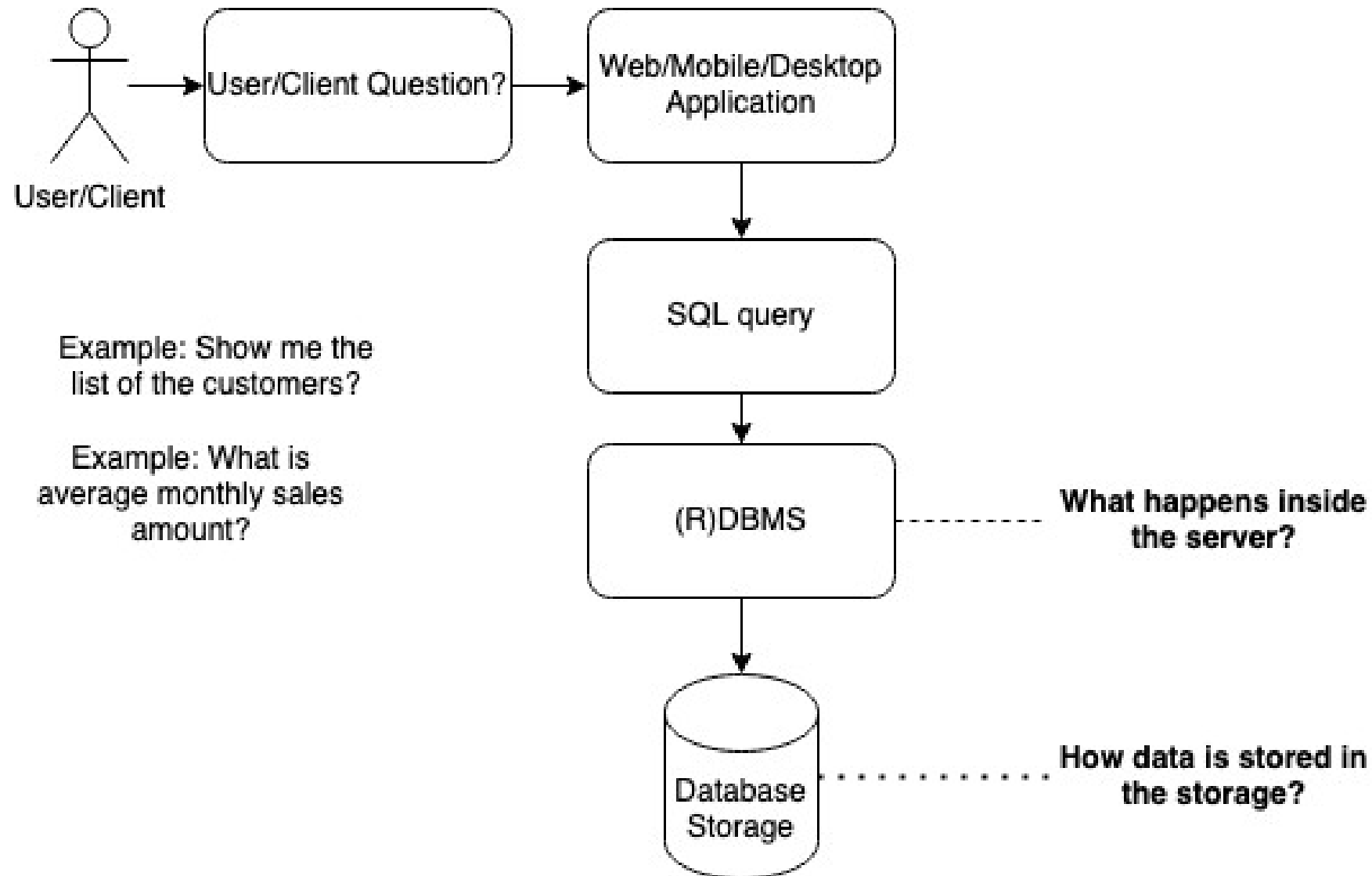


## Lecture 3. Data Modification Operations.

---



# Database Server Architecture Overview



# SQL and its categories (groups)

No Direct Access to Database Storage

Only via SQL language to interact with (R)DBMS to make it to retrieve the data.

- ~~Data Definition Language (DDL) – CREATE, DROP, ALTER (Chapter #2.3)~~
  - Queries to change table structures
- **Data Modification Language (DML) – INSERT, UPDATE, DELETE (Chapter #6.5)**
  - Queries to modify table content
- **Data Query Language (DQL) – SELECT**
  - Queries to retrieve table content

# INSERT new tuples

**INSERT INTO** table\_name (attribute\_name1, attribute\_name2)  
**VALUES** (value1, value2);

**INSERT INTO** table\_name **VALUES** (value1, value2);

## EXAMPLE QUESTION:

Add a customer who has the following information

(name: Azamat Zhomart, address: 7<sup>th</sup> street, phone: 777-123-4567, balance: 1000, market: Science)

and who is from Kazakhstan.

# UPDATE existing tuples

**UPDATE** table\_name

**SET** attribute\_name1 = value1, attribute\_name2 = value2;

**UPDATE** table\_name

**SET** attribute\_name1 = value1, attribute\_name2 = value2

**WHERE** attribute\_name1 > value3;

## EXAMPLE QUESTION:

Change Azamat's account balance to 5000.

# DELETE tuples

**DELETE FROM** table\_name;

**TRUNCATE TABLE** table\_name; – faster, no **WHERE** clause

**DELETE FROM** table\_name **WHERE** table\_name.attribute\_name > 1;

## EXAMPLE QUESTION:

Delete Azamat's profile from the database.

# Bulk/Batch Loading

Insert all the tuples from a file (e.g. CSV) into a relation.

No need to use **INSERT** for each tuple

- **.mode** “file\_type”
- **.separator** “,” or “|”, etc.
- **.import** file\_name\_and\_path table\_name

more info: <https://www.sqlite.org/cli.html>

# SQL and its categories (groups)

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  - Queries to change table structures
- ~~Data Modification Language (DML) – INSERT, UPDATE, DELETE (Chapter #6.5)~~
  - Queries to modify table content
- **Data Query Language (DQL) – SELECT (Chapter #6.1, 6.2, 6.3, 6.4)**
  - Queries to retrieve table content



ClientId	FirstName	LastName	Company	City	State	...
1	Will	Smith	UC Merced	Merced	CA	...
2	Alice	Robinson	UC Merced	Merced	CA	...
3	Mark	Zuckerberg	Facebook	San Jose	CA	...
...	...	...	...	...	...	...

People

ClientId	FirstName	LastName	CompanyID	CityID	StateID	...
1	Will	Smith	1	1	1	...
2	Alice	Robinson	1	1	1	...
3	Mark	Zuckerberg	2	2	1	...
...	...	...	...	...	...	...

Company

ID	Company
1	UC Merced
2	Facebook
...	...

City

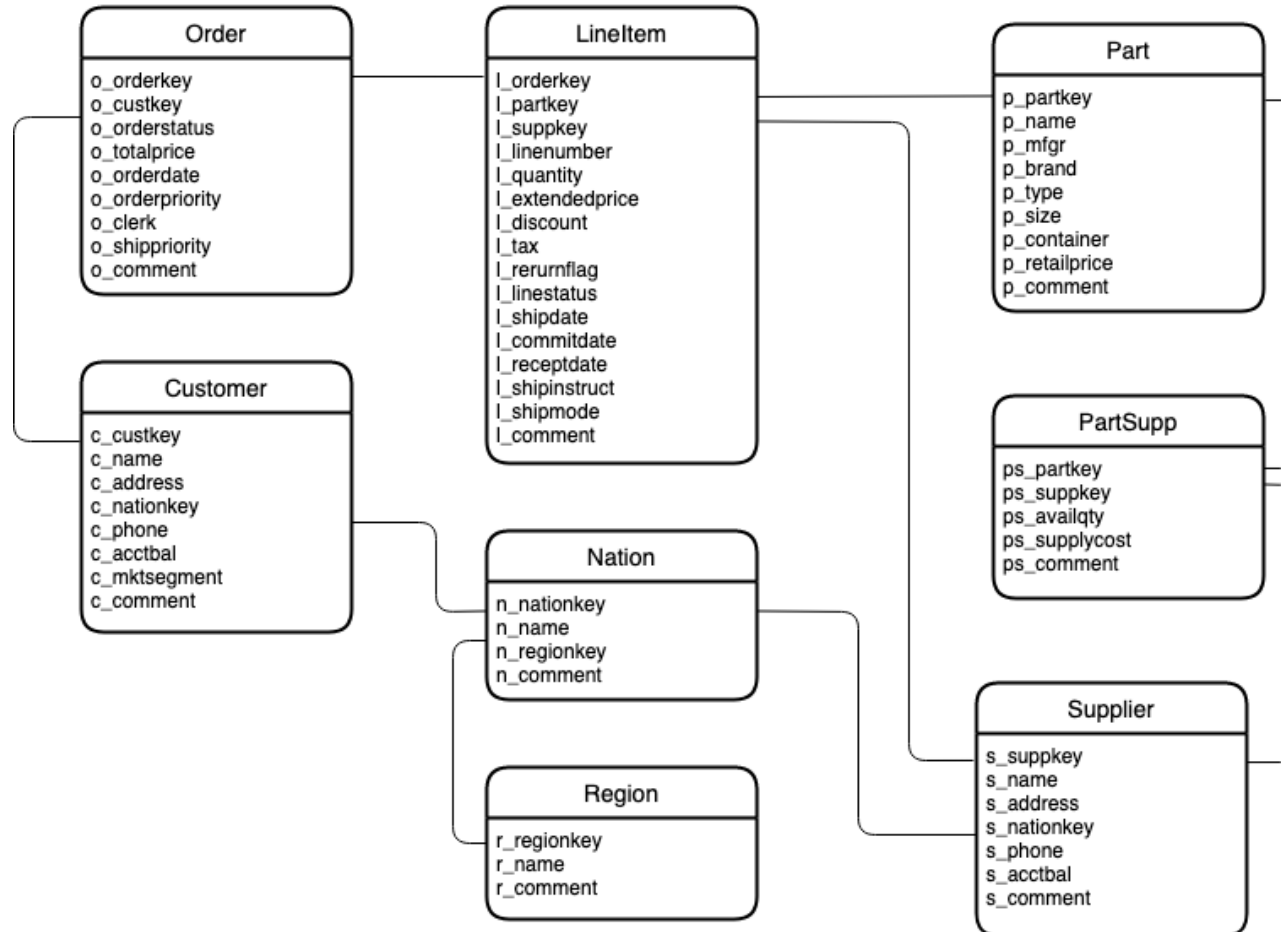
ID	City
1	Merced
2	San Jose
...	...

State

ID	State
1	CA
...	...

# Transaction Processing Performance Council ([TPC-H](#))

**TPCH dataset diagram**



# Input = Table(s) and Output = Table

T.a	T.b	T.c
1	2	3
3	4	6
8	5	4
7	4	3

S.a	S.d
1	1
3	8
8	1
7	1

Z.x	Z.k	T.c
0	2	3
7	9	6



T.a	T.b	T.c	S.d	Z.x	Z.k
1	2	3	1	0	2
3	4	6	8	7	9

# SQL Query Skeleton

```
SELECT result_table_schema          <----(output attributes = table)  
FROM input_tables  
[ WHERE table_predicates AND join_conditions ]  
[ GROUP BY grouping_attributes ]  
    [ HAVING aggregation_predicates ]  
[ ORDER BY sorting_attributes ]  
[ UNION | INTERSECT | EXCEPT ]
```

# Structured Query Language (aka. SQL)

Declarative language (abstraction)

Key words/operators on a single relation:

- Projection (SELECT)
- Selection (WHERE clause), predicates: AND, OR, LIKE, IN, ANY, ALL, etc.
- Aggregate: COUNT, MAX, MIN, AVG
- GROUP BY, SORT, LIMIT, DISTINCT, HAVING

# Queries on a Single Relation

**SELECT** result\_table

<----(*output attributes = table*)

**FROM** input\_tables;

# Reading materials and Lab assignments.

## **Book chapters:**

- Chapter 6 (6.1 to 6.5)

**Lab 2:** add/update/delete new rows and insert data in batch in SQLite.

## **Deadlines:**

- INF202 (Group1 – 22N): September 30, 2021
- INF202 (Group2 – 23N): October 1, 2021
- CSS206: October 2, 2021

# Conclusion

1/1 Abylaikhan str., Kaskelen  
040900 Almaty, Kazakhstan  
+7 727 307 95 65