01 Lab 1

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SQL definition

SQL

Structured Query Language

Database

A representation of data that can be read and written to and is often stored separately from any application that uses the data

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DBMS

Software system manages database

MySQL, PostgreSQL, Oracle Database (PLSQL), Microsoft SQL server, SQLite

RDBMS

Relational database management system

Data control language (DCL)

Control access to the database

GRANT
REVOKE

Types of query language

Transaction control language (TCL)

BEGIN TRANSACTION

COMMIT
ROLLBACK
SAVEPOINT

Data definition language (DDL)

Define and set up the database

CREATE
ALTER
DROP

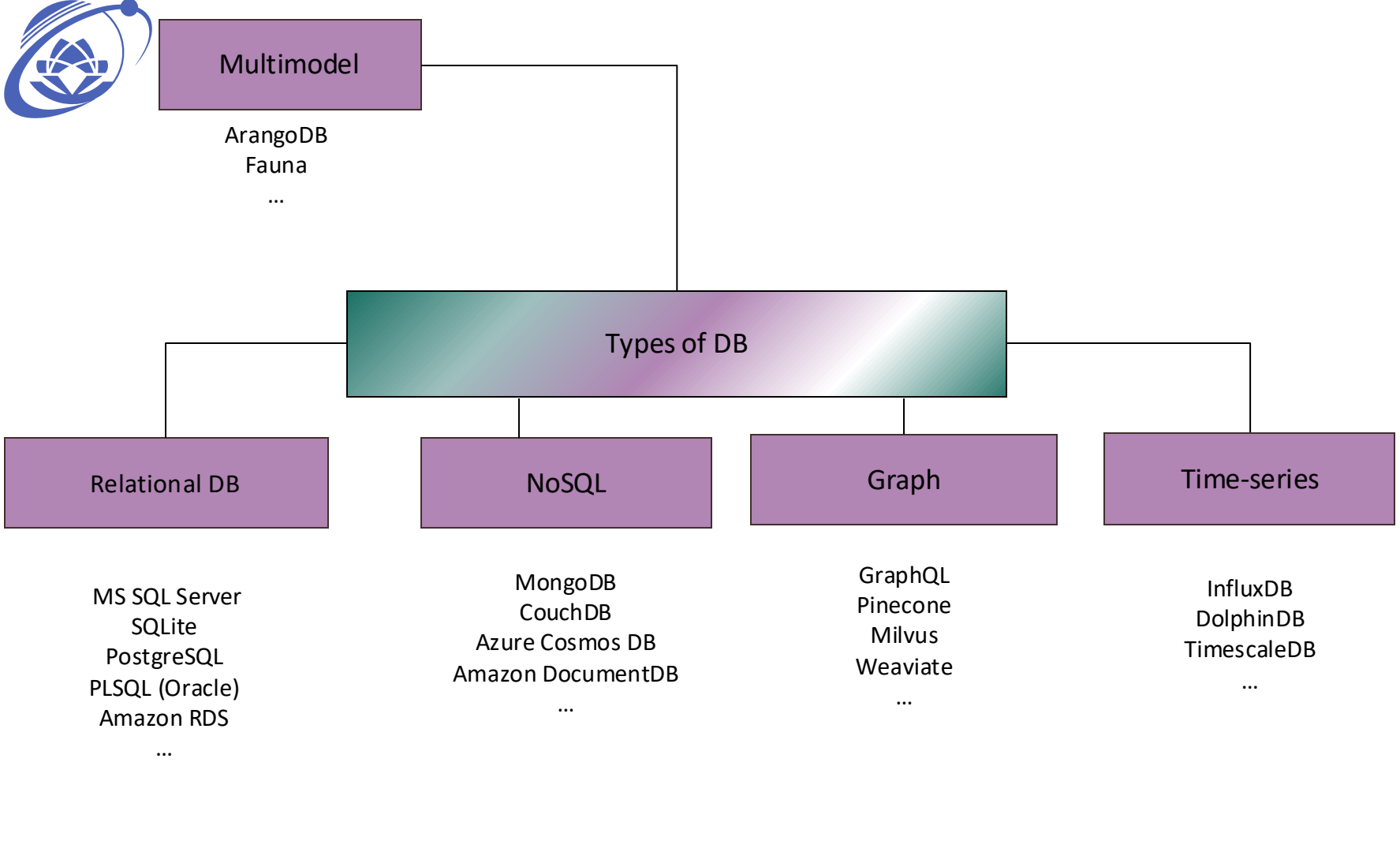
Data manipulation language (DML)

Maintain and use the database

INSERT
DELETE
UPDATE

Data query language (DQL)

SELECT


Multimodel
ArangoDB
Fauna
...
Types of DB
Relational DB
MS SQL Server
SQLite
PostgreSQL
PLSQL (Oracle)
Amazon RDS
...
NoSQL
MongoDB
CouchDB
Azure Cosmos DB
Amazon DocumentDB
...
Graph
GraphQL
Pinecone
Milvus
Weaviate
...
Time-series
InfluxDB
DolphinDB
TimescaleDB
...

Convention - Line break and indent

```
create table `Client` (ClientId char(36) primary key, FirstName varchar(50)
not null, LastName varchar(50) not null, BirthDate date null, Address
varchar(256) null, City varchar(100) null, StateAbbr char(2) null, PostalCode
varchar(10) null, foreign key fk_Client_StateAbbr (StateAbbr) references
State(StateAbbr));
```

```
CREATE TABLE `Client` (
    ClientId CHAR(36) PRIMARY KEY,
    FirstName VARCHAR(50) NOT NULL,
    LastName VARCHAR(50) NOT NULL,
    BirthDate DATE NULL,
    Address VARCHAR(256) NULL,
    City VARCHAR(100) NULL,
    StateAbbr CHAR(2) NULL,
    PostalCode VARCHAR(10) NULL,
    FOREIGN KEY fk_Client_StateAbbr (StateAbbr)
        REFERENCES State(StateAbbr)
);
```

Convention notice

1. Semicolon (;) is used at the end of each statement. (T-SQL is not used semicolon).
2. Keyword needs to use LETTER CASE
3. Commas (,) separate objects in a series

SQL Syntax and Structure

SHOW DATABASES;

List of available databases in current RDBMS

SHOW customers;

USE DATABASE;

Tell the RDBMS which database you want to use.

USE customers;

DESCRIBE DATABASES;

Show all information of databases (Field, Type…)

DESCRIBE customers;

SQL Datatype

- Numeric

Data Type	Signed Range	Unsigned Range	Storage Required
TINYINT	-128 through 127	0 through 255	1 byte
SMALLINT	-32,768 through 32,767	0 through 65,535	2 bytes
MEDIUMINT	-8,388,608 through 8,388,607	0 through 16,777,215	3 bytes
INT	-2,147,483,648 through 2,147,483,647	0 through 4,294,967,295	4 bytes

Data Type	Storage Required
FLOAT	4 bytes
DOUBLE	8 bytes
DECIMAL	Varies based on precision

- String

Data type	Description
CHAR(size)	A fixed-length field that can hold up to 255 characters
VARCHAR(size)	A variable-length field that can store up to 65,535 characters
TINYTEXT	A field with a maximum length of 255 characters
MEDIUMTEXT	A field with a maximum length of 16,777,215 characters
LONGTEXT	A field with a maximum length of 4,294,967,295 characters

- Date/Time

Data type	Description
DATE	A date. Default format: YYYY-MM-DD.
DATETIME	A date and time combination. Default format: YYYY-MM-DD hh:mm:ss.
TIMESTAMP	A timestamp. Default format: YYYY-MM-DD hh:mm:ss.
TIME	A time. Default format: hh:mm:ss.
YEAR	A year in four-digit format.

Create and manipulate database

Creating a Database

1. Connect to the database management system (DBMS)
2. Use the **CREATE DATABASE** statement to create a new database

```
CREATE DATABASE bookstore;
```

Creating Tables and Specifying Data Types

```
CREATE TABLE Name (
Column_name Data_type,
…
);
CREATE TABLE customers (
customer_id INT,
first_name VARCHAR(50),
last_name VARCHAR(50),
email VARCHAR(100)
);
```

Modifying table

```
ALTER TABLE customers
ADD COLUMN phone_number VARCHAR(20);
```

Modifying column

```
ALTER TABLE customers
ALTER COLUMN email SET NOT NULL;
```

Drop column

```
ALTER TABLE customers
DROP COLUMN phone_number;
```

Insert data into table

```
INSERT INTO customers (customer_id, first_name, last_name, email) VALUES (01, ‘Thien’, ‘Ly’, ‘jack@Trinhmusic.com');
```

Update and delete data

```
UPDATE customers SET email = ‘FiveMillion@Trinhmusic.com'
WHERE customer_id = 1;

DELETE FROM customers
WHERE customer_id = 1;
```

Retrieve column

SELECT * FROM table_name; → Retrieve all
SELECT * FROM customers;

SELECT column_1, column_2, … FROM table_name; → Retrieve specific column
SELECT first_name, last_name FROM customers;

Retrieve column with condition

```
SELECT column_1, column_2, …
FROM table_name,
WHERE condition;
```

```
SELECT *
FROM customers,
WHERE city=“Ho Chi Minh city”;
```

WHERE OPERATOR

Expression	Usage	Example
=	Equals	
!=, <>	Not equals	
>,>=,<,<=,		
AND	Both conditions must be true	
OR	One condition must be true	
IN	Match a list of values	
NOT IN	Not in a list of values	
BETWEEN	Value is in range	
LIKE	Match any sequence of character	LIKE ‘Th%’

Retrieve column with multiple condition

```
SELECT column_1, column_2, …
FROM table_name,
WHERE condition_1 AND condition_2;
```

```
SELECT *
FROM customers,
WHERE city=“Ho Chi Minh city” AND age>20;
```

Sorting data with ORDER BY

```
SELECT column_1, column_2,…
FROM table_name,
ORDER BY column_1[ASC|DSC], column 2
[ASC|DSC],…

SELECT *
FROM customers,
ORDER BY first_name ASC, last_name ASC;
```

Limit results

```
SELECT column_1, column_2,…
FROM table_name,
LIMIT count;

SELECT *
FROM customers,
LIMIT 5;
```

REFERENCES

[1]. Unimelb Database Systems (INFO20003)
[2]. Weiss, K. A., & Balti, H. (2023). *Job ready SQL*. [ISBN: 978-1-394-18105-6].
[3]. Elmasri, R., Navathe, S. B., Elmasri, R., & Navathe, S. B. (2015). Fundamentals of Database Systems. In *Advances in Databases and Information Systems* (Vol. 139). Pearson.

Thanks!

Do you have any questions?

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