

ISYS6508

Database System

Week 5

SQL: Data Definition

Database System A Practical Approach to Design, Implementation, and Management
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Chapter 7

Learning Objective

At the end of this semester, the student should be able to:

- Construct SQL that suit the problem



INTRODUCTION TO SQL

Objectives to SQL

Ideally, a database language should allow a user to :

- Create the database and relation structures;
- Perform basic data management task such as insertion, modification, deletion from data relation;
- Perform both simple and complex queries.

Component of SQL

SQL is an example of transform-oriented language. As a language, the ISO SQL standard has 2 major component :

- A Data Definition Language (DDL) for defining the database structure and controlling access to the data;
- A Data Manipulation Language (DML) for retrieving and updating data.

Why SQL Relatively Easy ?

- It is a nonprocedural language
- SQL is essentially free-format
- The commands structure is consists of standard English word
- SQL can be used by a range including database administrators, management personnel, application developer, etc.

History of SQL

- The history of relational model (and indirectly SQL) started in 1970 with publication of seminal paper by E.F Codd written during his work at IBM Research Lab.
- In 1974, D. Chamberlain also from IBM defined a language called Structure English Query Language (SEQUEL).
- In 1976, a revised version of SEQUEL was defined (SEQUEL/2). But the name changed into SQL.

History of SQL (cont)

- In 1976, IBM produced a prototype DBMS based on SEQUEL/2 called System R. Its most important result was the development of SQL.
- In the late 1970's, the databases system Oracle was produced.
- In early 1980's a standard for SQL was defined.
- In 1990's ISO standard for SQL was formalized.

The Importance and Terminology of SQL

- SQL is the first and so far the only standard database language to gain wide acceptance.
- SQL is used in other standard and even influences the development of the other standard as a definitional tools.
- The ISO SQL standard doesn't use the formal term of relations, attributes and tuples, instead using the term tables, columns and rows. The presentation of SQL mostly use ISO terminology.



SQL COMMAND

How to write SQL Commands ?

A SQL statement consist of :

- Reserved word, a fixed part of SQL language.
- User define word, made up by user and represent the name of various database object.

Backus Naur Form (BNF) notation to define SQL statement

- Uppercase letter are used to represent reserved words and must be spelled exactly as shown.
- Lowercase letter are used to define user-define word.
- A vertical bar (|) indicates a choice among alternative.
- Curly braces ({}) indicate a required element.
- Square bracket ([]) indicate optional element.
- An ellipsis (...) is used to indicate optional repetition of an item zero or more times.

DDL Statement

In practice DDL statement are use to create database structure (the tables) and the access mechanism.

DML Statement

DML statement are used to populate and query the tables.

SQL DML statement are :

- SELECT, use to query data in database
- INSERT, use to insert data into a table
- UPDATE, use to update data in a table
- DELETE, use to delete data from a table



DATA DEFINITION

SQL DDL allows database object as schemas, domain, table views, and indexes to be created.

The main SQL DDL statements are :

CREATE SCHEMA		DROP SCHEMA
CREATE DOMAIN	ALTER DOMAIN	DROP DOMAIN
CREATE TABLE	ALTER TABLE	DROP TABLE
CREATE VIEW		DROP VIEW

These statement are used to create, change and destroy stuctures that make up the conceptual schema.

Although not covered by SQL standard, the following 2 statements are provided by many DBMS :

CREATE INDEX

DROP INDEX

Creating a Database

According to ISO standard, relation and other databases object exist in an environment. Among other things, each environment consist of one or more catalogs, and each catalogs consist of one or more schemas.

Create Database (cont)

- The schema definition definition statements has the following form :

CREATE SCHEMA [Name | AUTHORIZATION
CreatorIdentifier]

- A schema can be drop using DROP SCHEMA statement bellows :

DROP SCHEMA Name[RESTRICT | CASCADE]

Creating a Table

After created database now we can create the table structure for the base relations to be stored in database. Basic syntax for CREATE TABLE :

```
CREATE TABLE TableName
    [(columnName dataType [NOT NULL] [UNIQUE]
    [DEFAULT defaultValue] [CHECK (searchCondition)] [, ...])
    [PRIMARY KEY (listOfColumns),]
    [(UNIQUE (listOfColumns)) [, ...])
    [(FOREIGN KEY (listOfForeignKeyColumns)
    REFERENCES ParentTableName [(listOfCandidateKeyColumns)]
    [MATCH (PARTIAL | FULL)
    [ON UPDATE referentialAction]
    [ON DELETE referentialAction]] [, ...])
    [(CHECK (searchCondition)) [, ...])]
```

Creating Table (cont)

- Table constraint

The common clause to create table constraint is :

CONSTRAINT ConstraintName

Creating Table (cont)

Primary key

- The primary key clause specifies the column or columns that form primary key for the tables.
- It should be specified for every table created
- By default, NOT NULL is assumed for each column comprises the primary key.
- Only 1 primary key clause is allowed per table.
- SQL reject any INSERT or UPDATE operation that attempt to create duplicate row of primary key column.

Creating Table (cont)

The Foreign Key clause specifies a foreign key in the (child) table and the relationship it has to another (parent) table. This clause implement referential integrity constraint.

There can be as many FOREIGN KEY as required. The CHECK and CONSTRAINT clauses allows additional constraint to be defined.

ALTER TABLE

The definition of the ALTER TABLE statement in the ISO standard consist of six option to :

- Add new column to a table;
- Drop a column from a table;
- Add a new table constraint;
- Drop a table constraint;
- Set a default for a column;
- Drop a default for a column.

ALTER TABLE (cont)

The basic format of ALTER TABLE statement are:

```
ALTER TABLE TableName  
[ADD [COLUMN] columnName dataType [NOT NULL] [UNIQUE]  
[DEFAULT defaultOption] [CHECK (searchCondition)]]  
[DROP [COLUMN] columnName [RESTRICT | CASCADE]]  
[ADD [CONSTRAINT [ConstraintName]] tableConstraintDefinition]  
[DROP CONSTRAINT ConstraintName [RESTRICT | CASCADE]]  
[ALTER [COLUMN] SET DEFAULT defaultOption]  
[ALTER [COLUMN] DROP DEFAULT]
```

DROP TABLE

Over time, the structure of a table will change; new table will be created and some tables will no longer needed. We can remove a redundant table from the database using the DROP TABLE statement, which has the format :

DROP TABLE TableName [**RESTRICT** | **CASCADE**]

DROP TABLE (cont)

The DROP TABLE statement allow you to specify your action into :

- **RESTRICT**, The DROP operation is rejected if there any other object that depend for their existence upon the continued table to be dropped.
- **CASCADE**, the DROP operation proceeds and SQL automatically drop all dependent object.

NOTE : effect of CASCADE can be very extensive and should be carried out only with extreme caution.

CREATE INDEX

An index is a structure that provides accelerated access to the rows of a table based on the values of one or columns. The presence of an index can be significantly improve the performance of a query. The creation of indexes is not standard SQL. However, most dialects support at least the following capability :

```
CREATE [UNIQUE] INDEX IndexName  
ON TableName (columnName [ASC | DESC] [, . . .])
```

DROP INDEX

If we create an index for a base table and later decided we don't needed anymore we can use DROP INDEX statement to remove index from database. The format of DROP INDEX statement is :

DROP INDEX IndexName

Reference

Connolly, T., & Begg, C. (2015). Database System A Practical Approach to Design, Implementation, and Management 6th Edition. Pearson

Thank You