Data Definition

Chapter 7 - Objectives

- Data definition
- CREATE table statements
- Data types supported by SQL standard
- ALTER table statements
- Purpose of integrity enhancement feature of SQL
- Purpose of Views
- ISO transaction model
- Access Control

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Data Definition

- **SQL DDL allows database objects such as schemas, domains, tables, views, and indexes to be created and destroyed.**
- **Main SQL DDL statements are:**

CREATE SCHEMA	**DROP SCHEMA**
CREATE/ALTER DOMAIN	**DROP DOMAIN**
CREATE/ALTER TABLE	**DROP TABLE**
CREATE VIEW	**DROP VIEW**

- **Many DBMSs also provide:**

CREATE INDEX DROP INDEX

Data Definition

- Relations and other database objects exist in an *environment*.
- Each environment contains one or more *catalogs*, and each catalog consists of set of schemas.
- Schema is named collection of related database objects.
- Objects in a schema can be tables, views, domains, assertions, collations, translations, and character sets. All have same owner.

CREATE SCHEMA

```
CREATE SCHEMA [Name |
        AUTHORIZATION CreatorId ]
DROP SCHEMA Name [RESTRICT | CASCADE ]
```

- With RESTRICT (default), schema must be empty or operation fails.
- With CASCADE, operation cascades to drop all objects associated with schema in order defined above. If any of these operations fail, DROP SCHEMA fails.

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CREATE TABLE

```
CREATE TABLE TableName (
{colName dataType [NOT NULL] [UNIQUE]
[DEFAULT defaultOption] [CHECK searchCondition] [,...]}
[PRIMARY KEY (listOfColumns),]
{[UNIQUE (listOfColumns)] [,...]}
{[FOREIGN KEY (listOfFKColumns)
      REFERENCES ParentTableName [(listOfCKColumns)],
      [MATCH {PARTIAL | FULL}]
      [ON UPDATE referentialAction]
      [ON DELETE referentialAction ]
 ][,...]}
 {[CHECK (searchCondition)] [,...] });
```

CREATE TABLE

- **Creates a table with one or more columns of the specified *dataType*.**
- **With NOT NULL, system rejects any attempt to insert a null in the column.**
- **Can specify a DEFAULT value for the column.**
- **Primary keys should always be specified as NOT NULL.**
- **FOREIGN KEY clause specifies FK along with the referential action.**

CREATE TABLE - Staff

```
CREATE TABLE Staff (
    staffNo         CHAR(4) NOT NULL,
    fName           VARCHAR(50) NOT NULL,
    lName           VARCHAR(50) NOT NULL,
    position        VARCHAR(50) NOT NULL,
    sex             CHAR(1),
    DOB             DATE NOT NULL,
    salary          INT NOT NULL,
    branchNo        CHAR(4) NOT NULL,
    PRIMARY KEY (staffNo),
    FOREIGN KEY (branchNo) reference Branch(branchNo));
```

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ISO SQL Data Types

Table 6.1 ISO SQL data types.

Data type	Declarations			
boolean	BOOLEAN			
character	CHAR	VARCHAR		
bit	BIT	BIT VARYING		
exact numeric	NUMERIC	DECIMAL	INTEGER	SMALLINT
approximate numeric	FLOAT	REAL	DOUBLE PRECISION	
datetime	DATE	TIME	TIMESTAMP	
interval	INTERVAL			
large objects	CHARACTER LARGE OBJECT		BINARY LARGE OBJECT	

ISO SQL Data Types

- Boolean
  - TRUE, FALSE, UNKNOWN (NULL)
- Character
  - branchNo CHAR(4)
  - address VARCHAR(30)
- Numeric Data
  - Rooms SMALLINT (-32,767 to 32,767)
  - salary DECIMAL(7,2) (values upto 99,999.99)

ISO SQL Data Types

- Approximate
  - FLOAT, REAL, DOUBLE PRECISION
- Datetime data
  - DATE: YEAR, MONTH, DAY
  - TIME: HOUR, MINUTE, SECOND
  - TIMESTAMP: data and time
  - viewDate DATE

ISO SQL Data Types vs SQLite

Example Typenames From The CREATE TABLE Statement or CAST Expression	Resulting Affinity	Rule Used To Determine Affinity
INT INTEGER TINYINT SMALLINT MEDIUMINT BIGINT UNSIGNED BIG INT INT2 INT8	INTEGER	1
CHARACTER(20) VARCHAR(255) VARYING CHARACTER(255) NCHAR(55) NATIVE CHARACTER(70) NVARCHAR(100) TEXT CLOB	TEXT	2
BLOB *no datatype specified*	NONE	3
REAL DOUBLE DOUBLE PRECISION FLOAT	REAL	4
NUMERIC DECIMAL(10,5) BOOLEAN DATE DATETIME	NUMERIC	5

https://www.sqlite.org/datatype3.html

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ALTER TABLE

- Add a 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.

Example 7.2(a) - ALTER TABLE

Change Staff table by removing default of ‘Assistant’ for position column and setting default for sex column to female (‘F’).

```
ALTER TABLE Staff
        ALTER position DROP DEFAULT;

ALTER TABLE Staff
        ALTER sex SET DEFAULT ‘F’;
```

Example 7.2(b) - ALTER TABLE

Remove constraint from PropertyForRent that staff are not allowed to handle more than 100 properties at a time.

```
ALTER TABLE PropertyForRent
    DROP CONSTRAINT StaffNotHandlingTooMuch;
```

Add new column to Client table.

```
ALTER TABLE Client ADD prefNoRooms PRooms;
```

Not in SQLite

DROP TABLE

DROP TABLE TableName [RESTRICT | CASCADE]

e.g. DROP TABLE PropertyForRent;

- **Removes named table and all rows within it.**
- **With RESTRICT, if any other objects depend for their existence on continued existence of this table, SQL does not allow request.**
- **With CASCADE, SQL drops all dependent objects (and objects dependent on these objects).**

Dangerous!

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