DATABASE METHODOLOGY

Stockholm University

Structured Query Language SQL

- Introduction
- SQL-DDL
- Insert/Update/Delete (SQL-DML)

SQL Introduction

- In this module you will learn introductory basics about SQL
  - Short overview of SQL
  - Very basic SQL-DDL (Data Definition Language)
    - How to create, alter, and drop tables
  - Insert – Update – Delete
    - SQL-DML (Data Manipulation Language)
    - How to populate a database with data
    - How to change and delete data

Introduction To SQL

- The standard language for relational databases
  - Evolving standard since 1992 (and *de facto* earlier)
- Basic objectives for database languages:

Create databases and the database objects

Perform insertions, deletions and updates to data

Define access rights to databases and database objects

- SQL is not a full-blown programming language
  - But SQL can be embedded in such languages

Introduction To SQL, cont.

- SQL has three sub parts/languages:

- **Data Definition Language (DDL)**
  - *Defining the database objects*
    - CREATE, ALTER, DROP
- **Data Manipulation Language (DML)**
  - *Working with the data*
    - SELECT, INSERT, UPDATE, DELETE
- **Data Control Language (DCL)**
  - *Controlling access to the database (objects)*
    - CREATE/DROP USER, GRANT, REVOKE
  - ***Not covered in this course:***

Create databases and the database objects

Perform insertions, deletions and updates to data

Define access rights to databases and database objects

Datatypes In SQL

TEXT TYPES

CHAR
VARCHAR
STRING
TEXT

NUMBER TYPES

NUMERIC
DECIMAL
INTEGER
SMALLINT
BIGINT
FLOAT
REAL
DOUBLE PRECISION

SOME OTHER USEFUL TYPES

BOOLEAN
DATE
TIME
TIMESTAMP (DATE + TIME)
CLOB (Character Large OBject)
BLOB (Binary Large OBject)
XML

Refer to your DBMS' help section, a course book, or SQL websites, if you wish to find out more about datatypes.

SQL-DDL: CREATE TABLE

Logical RDB Model

Dog(dogID, name, breed 0..1)

Cat(catID, name)

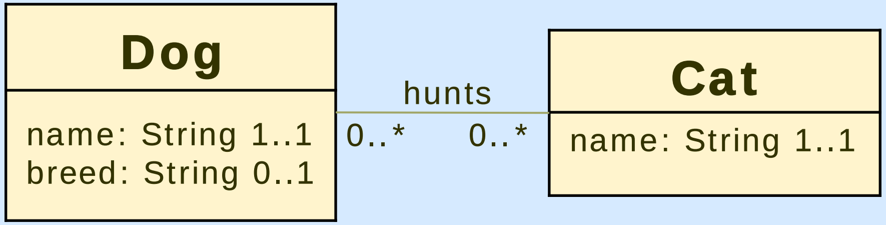
CatHunt(dog, cat)

CatHunt.dog is FK to Dog.dogID,

CatHunt.cat is FK to Cat.catID

Note: We introduced SKs in Dog and Cat,
since there were no UNIQUE attributes

Conceptual Model



First create tables *without* FKs…

```
CREATE TABLE Dog (
dogID INTEGER NOT NULL,
name STRING NOT NULL,
breed STRING,
PRIMARY KEY (dogID));
```

```
CREATE TABLE Cat (
catID INTEGER NOT NULL,
name STRING NOT NULL,
PRIMARY KEY (catID));
```

…then create tables *with* FKs

```
CREATE TABLE CatHunt (
dog INTEGER NOT NULL,
cat INTEGER NOT NULL,
PRIMARY KEY (dog, cat),
FOREIGN KEY (dog) REFERENCES Dog (dogID)
ON DELETE RESTRICT ON UPDATE CASCADE,
FOREIGN KEY (cat) REFERENCES Cat (catID)
ON DELETE RESTRICT ON UPDATE CASCADE);
```

SQL-DDL: ALTER TABLE, DROP TABLE

```
CREATE TABLE CatHunt (
dog INTEGER NOT NULL,
cat INTEGER NOT NULL,
PRIMARY KEY (dog, cat),
FOREIGN KEY (dog) REFERENCES Dog (dogID)
ON DELETE RESTRICT ON UPDATE CASCADE);
```

Now, let's say that we **forgot** to include the FK to Cat in CatHunt when we created the table! Then we can use the **ALTER TABLE** command.

```
ALTER TABLE CatHunt
ADD FOREIGN KEY (cat) REFERENCES Cat (catID)
ON DELETE RESTRICT ON UPDATE CASCADE;
```

And if there no longer is a need for the table CatHunt, we can use the **DROP TABLE** command to remove it totally from the database.

```
DROP TABLE CatHunt;
```

INSERT (SQL-DML)

Logical RDB Model
Dog(dogID, name, breed 0..1)
Cat(catID, name)
CatHunt(dog, cat)
CatHunt.dog is FK to Dog.dogID,
CatHunt.cat is FK to Cat.catID

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INSERT

- Adds one or more rows into a table using specified values.
  - *Another way is by using a SELECT clause – not part of this course!*

Basic syntax:

Values can be given to:

- *unnamed* columns in the column order of the table

```
INSERT INTO Dog VALUES (125,‘Karo’, NULL);
```

- *named* columns in any order

```
INSERT INTO Dog(name, breed, dogID)
VALUES (‘Fido’,‘Poodle’,271);
```

UPDATE (SQL-DML)

Logical RDB Model

Dog(dogID, name, breed 0..1)

Cat(catID, name)

CatHunt(dog, cat)

CatHunt.dog is FK to Dog.dogID,

CatHunt.cat is FK to Cat.catID

UPDATE

- Changes the value in one or more column(s) …
- in 0 or more row(s), depending on some condition(s), (if any)

Basic syntax:

```
UPDATE Cat SET name = ‘Pussy Galore’
WHERE catID = 2825;

UPDATE CatHunt SET cat = 2825
WHERE cat = 1777
AND dog = 125;
```

DELETE (SQL-DML)

Logical RDB Model

Dog(dogID, name, breed 0..1)

Cat(catID, name)

CatHunt(dog, cat)

CatHunt.dog is FK to Dog.dogID,

CatHunt.cat is FK to Cat.catID

DELETE

- Removes 0 or more row(s) in a table …
- depending on some condition(s), if any

Basic syntax:

```
DELETE FROM Dog WHERE breed = ‘Poodle’;

DELETE FROM CatHunt
WHERE cat = 2825
AND dog = 125;
```

SQL Introduction Summary

- So, in this module we talked about some introductory basics about SQL. We:
- gave a short overview of SQL and its parts
- talked about datatypes
- learnt the basic about SQL-DDL...
- and about how to insert, update, and delete data

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