

# MySQL—Creating a Database

## Lecture 3

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# Multiple Tables

- Suppose that we wish to add to the database the information about the departments, the employees' dependents, and the various projects that the employees are working on.
- We need additional information
  - Department's name
  - Department's manager
  - Dependent's name
  - Dependent's sex
  - Dependent's birthday
  - Project's name
  - Project's department
  - Employees working on each project
  - No. of hours worked by employees on each project

# Relational Databases

- How should we incorporate this additional information into the database?

# Relational Databases

- To add all of those attributes to the Employees relation would violate the *limited redundancy* principle.
- All of the related data for each department and project would be repeated for each employee working on that project.
- Furthermore, all the related data for each employee would be repeated for each dependent of that employee.

# Relational Databases

- Clearly, the better solution is to create new tables of departments, projects, dependents, and works.

Employees

```
(  
    fname string,  
    lname string,  
    ssn string,  
    bdate date,  
    sex string,  
    salary float,  
    dept integer  
)
```

# Relational Databases

- Clearly, the better solution is to create new tables of departments, projects, dependents, and works.

Departments

```
(  
    dept integer,  
    dept_name string,  
    mgr_ssn string  
)
```

# Relational Databases

- Clearly, the better solution is to create new tables of departments, projects, dependents, and works.

```
Projects
(  
    proj integer,  
    proj_name string,  
    dept integer  
)
```



# Relational Databases

- Clearly, the better solution is to create new tables of departments, projects, dependents, and works.

Dependents

```
(  
    ssn string,  
    dep_name string,  
    dep_sex string,  
    dep_bdate date  
)
```

# Relational Databases

- Clearly, the better solution is to create new tables of departments, projects, dependents, and works.

Works

```
(  
    ssn string,  
    proj integer,  
    hours float  
)
```

# MySQL Commands

- MySQL commands may be issued through a command line or from within a program (e.g., C, C++, Java, PHP).
- When issued through the command line, all MySQL commands end with a semicolon.
- When using MySQL through a programming language such as C++, a complication is that the internal structure of MySQL relations does not match any of the built-in datatypes.
- What to do?

# Creating a Database

## Creating a Database

```
CREATE DATABASE db_name;
```

- The `CREATE DATABASE` command will create a database.
- This creates a database with the name *db\_name*, but it does not create any content.

# Creating a Database

## The Current Database

```
USE db_name;
```

- To work with a database, we execute the `USE` command to make it the current database.
- This makes `db_name` the current database.

# Creating Tables

## Creating a Table

```
CREATE TABLE table_name (attribute_list);
```

- The `CREATE TABLE` command will create a table (i.e., a relation) within a database.
- This creates the table *table\_name* with the attributes specified in *attribute\_list*.

# Creating Attributes

- To specify an attribute, we need to provide the name and the data type.
- These may be followed by a number of modifiers that we will introduce shortly.
- For example, the employees table will have seven attributes:
  - `fname` – first name
  - `lname` – last name
  - `ssn` – social security number
  - `bdate` – birthday
  - `sex` – sex
  - `salary` – salary
  - `dept` – department

# Creating Attributes

## Creating an Attribute

```
fname CHAR(20)
```

- The `fname` attribute could be described as `CHAR(20)`.
- This states that the value of `fname` is a character string of length 20.
- We could use `VARCHAR(20)`, which will store *up to* 20 characters.



# Creating Tables

## Creating a Table

```
CREATE TABLE employees
(
    fname VARCHAR(20),
    lname VARCHAR(20),
    ssn CHAR(9),
    bdate DATE,
    sex CHAR(1),
    salary DECIMAL(10, 2),
    dept TINYINT(4),
    PRIMARY KEY (ssn)
);
```

- The other tables may be defined similarly.

# Creating Tables

```
SHOW TABLES
```

```
SHOW TABLES;
```

```
+-----+  
| Tables_in_company |  
+-----+  
| employees          |  
+-----+
```

- We can now use the `SHOW TABLES` command to see what tables exist.

# Creating Tables

## DESCRIBE

```
DESCRIBE employees;
```

Field	Type	Null	Key	Default	Extra
fname	varchar(20)	NO		NULL	
lname	varchar(20)	NO		NULL	
ssn	char(9)	NO	PRI	NULL	
bdate	date	YES		NULL	
sex	char(1)	YES		NULL	
salary	decimal(10,2)	YES		NULL	
dept	tinyint(4)	NO	MUL	NULL	

- We can use the `DESCRIBE` command to see a detailed description of a table.

# MySQL Data Types

- Categories of data types
  - Integer
  - Fixed point
  - Floating point
  - Boolean
  - String
  - Time/Date
  - Generic

# Integer Types

- Standard integer types
  - `SMALLINT` - 2-byte integers.
  - `INT` - 4-byte integers.
- Extended integer types
  - `TINYINT` - 1-byte integers.
  - `MEDIUMINT` - 3-byte integers.
  - `BIGINT` - 8-byte integers.
- Each integer type may be either signed (default) or unsigned.

# Fixed-Point Types

- Standard fixed-point types
  - `DECIMAL` - Whole numbers up to 10 digits.
  - `DECIMAL(n)` - Whole numbers up to *n* digits.
  - `DECIMAL(n, d)` - Real numbers with *n* digits, *d* of which are after the decimal point.
- Fixed-point values are stored exactly.

# Floating-Point Types

- Standard floating-point types
  - `FLOAT` - 4-byte floating-point numbers.
  - `DOUBLE` - 8-byte floating-point numbers.
- Floating-point values are stored approximately.

# Boolean Types

- Standard boolean type
  - `BOOL` is equivalent to `TINYINT (1)`, i.e., a one-digit integer.
- The values `0` and `1` are interpreted as “false” and “true,” respectively.
- The symbols `FALSE` and `TRUE` are equivalent to `0` and `1`, respectively.



- Standard string types

- `CHAR (n)` - Exactly  $n$  characters ( $0 \leq n \leq 255$ ).
- `VARCHAR (n)` - Up to  $n$  characters ( $0 \leq n \leq 65535$ ).
- `BINARY (n)` - Exactly  $n$  bytes.
- `VARBINARY (n)` - Up to  $n$  bytes.
- `TEXT` - Arbitrary amount of character data.
- `BLOB` - Arbitrary amount of byte data.
- `ENUM` - Any one string from a specified list.
- `SET` - Any number of strings from a specified list.

# Assignment

- Visit the websites

- <http://dev.mysql.com/doc/refman/5.5/en/create-database.html>
- <http://dev.mysql.com/doc/refman/5.5/en/use.html>
- <http://dev.mysql.com/doc/refman/5.5/en/create-table.html>
- <http://dev.mysql.com/doc/refman/5.5/en/data-types.html>