## CSC 443 – Data Base Management Systems

Lecture 6 – SQL As A Data Definition Language

## Basic SQL

• SQL language

Considered one of the major reasons for the commercial success of relational databases

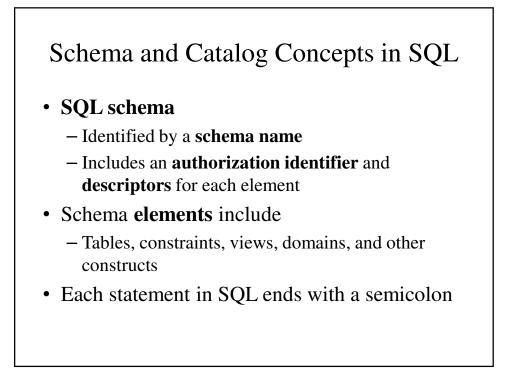
• SQL

#### - Structured Query Language

- Statements for data definitions, queries, and updates (both DDL and DML)
- Core specification Core of the language found in all implementations
- Plus specialized extensions added in various implementations

## SQL Data Definition and Data Types

- Terminology:
  - **Table**, **row**, and **column** used for relational model terms relation, tuple, and attribute
- CREATE statement
  - Main SQL command for data definition



## Schema and Catalog Concepts in SQL (continued)

- CREATE SCHEMA statement - CREATE SCHEMA COMPANY;
- Catalog
  - Named collection of schemas in an SQL environment
- SQL environment
  - Installation of an SQL-compliant RDBMS on a computer system

# The CREATE TABLE Command in SQL

- Specify a new relation
  - Provide name
  - Specify attributes and initial constraints
- Can optionally specify schema:
  - CREATE TABLE COMPANY. EMPLOYEE ...
    - or
  - CREATE TABLE EMPLOYEE ...

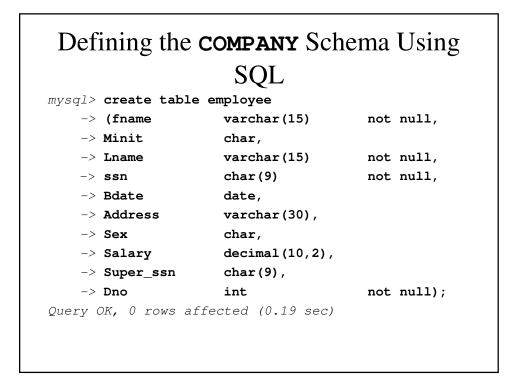
# The CREATE TABLE Command in SQL (continued)

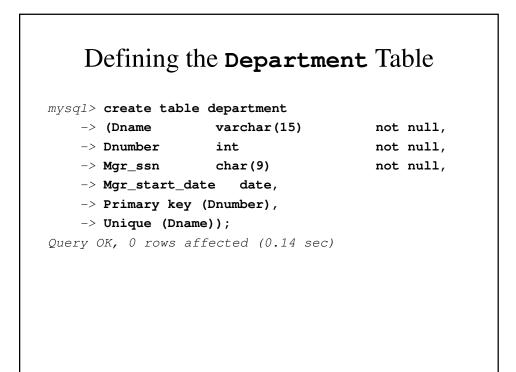
#### • Base tables (base relations)

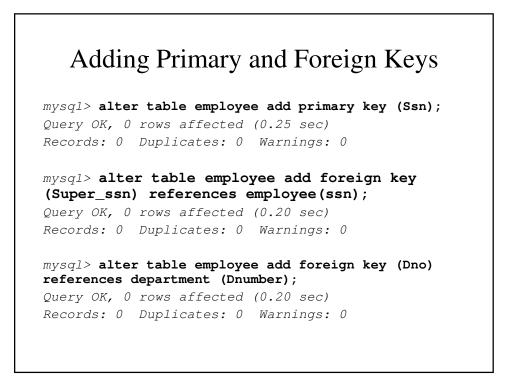
 Relation and its tuples are actually created and stored as a file by the DBMS

#### • Virtual relations

- Created through the CREATE VIEW statement





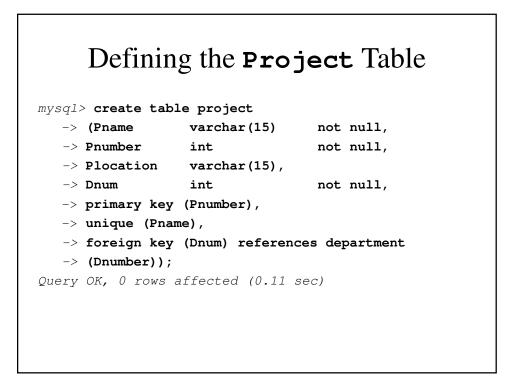


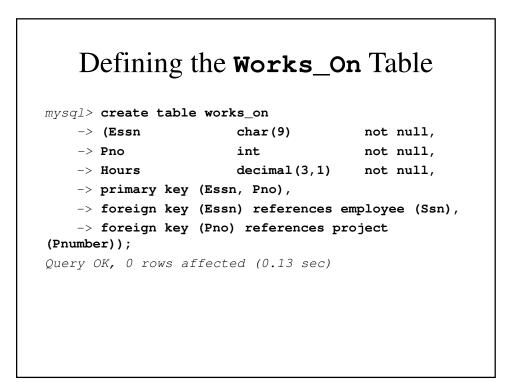
## Adding a Foreign Key

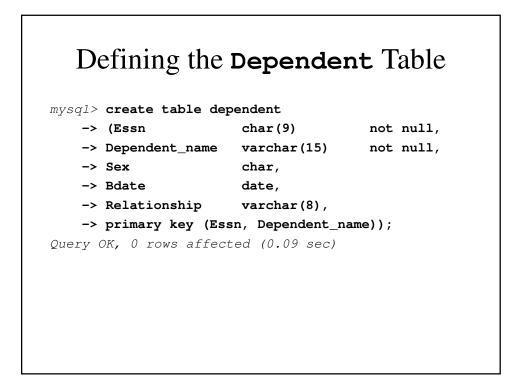
mysql> alter table department add foreign key
(Mgr\_ssn) references employee (Ssn );

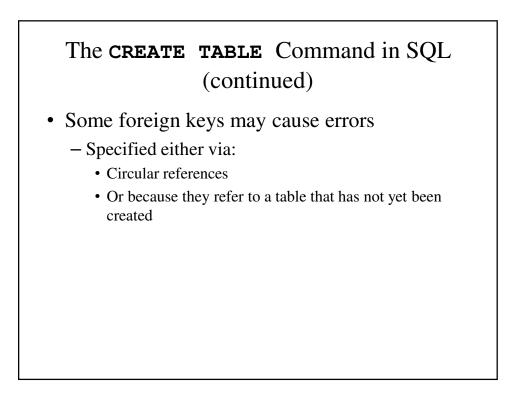
Query OK, 0 rows affected (0.27 sec) Records: 0 Duplicates: 0 Warnings: 0

# principal functions functions functions functions functions for the function fu









# Attribute Data Types and Domains in SQL

#### • Basic data types

- Numeric data types
  - Integer numbers: INTEGER, INT, and SMALLINT
  - Floating-point (real) numbers: FLOAT or REAL, and DOUBLE PRECISION
- Character-string data types
  - Fixed length: CHAR(n), CHARACTER(n)
  - Varying length: VARCHAR(n), CHAR VARYING(n), CHARACTER VARYING(n)

# Attribute Data Types and Domains in SQL (continued)

- Boolean data type
  - Values of TRUE or FALSE or NULL
- DATE data type
  - Ten positions
  - Components are YEAR, MONTH, and DAY in the form YYYY-MM-DD

# Attribute Data Types and Domains in SQL (continued)

• Domain

- Name used with the attribute specification
- Makes it easier to change the data type for a domain that is used by numerous attributes
- Improves schema readability
- Example:
  - CREATE DOMAIN SSN\_TYPE AS CHAR(9);

## **INSERT** Instruction

mysql> insert into employee values ('John', 'X', 'Jones', '222334444','1960-03-15', '3010 Broadway, New York, NY', 'M', 52000, '333445555', 5); Query OK, 1 row affected (0.08 sec)

mysql>

• This may not work if there are foreign key constraints - this can be corrected by using the command

Set foreign\_key\_checks = 0;

#### Load File

mysql> load data local infile 'Data.txt' into table
employee;
Query OK, 1 row affected, 1 warning (0.08 sec)

Records: 1 Deleted: 0 Skipped: 0 Warnings: 1

• The file must be located in the home directory of mysql (which is in

C:\Program Files\MySQL\MySQL Server 5.5\bin

This may not work on Panther because of the permission settings.

# The State for the COMPANY Relational Database

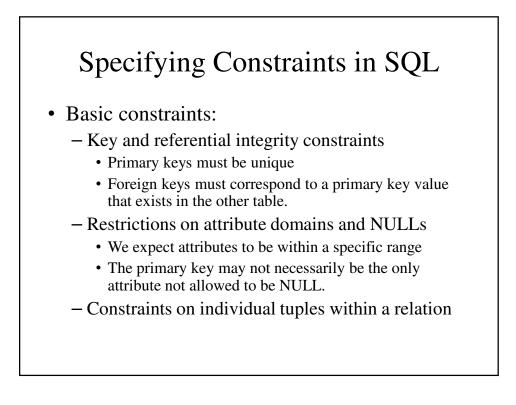
Fname	Minit Lname Ssn Bdate Address		Address	Sex	Salary	Super_ssn	Dno			
John	В	Smith	123456789	1965-01-09	731 Fondren, Houston, TX		30000	3334455555	5	
Franklin	Т	Wong	333445555	1955-12-08	638 Voss, Houston, TX	М	40000	888665555	5	
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4	
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4	
Ramesh	К	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	М	38000	333445555	5	
Joyce	Α	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	3334455555	5	
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	М	25000	987654321	4	
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	м	55000	NULL	1	

#### DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date			
Research	5	333445555	1988-05-22			
Administration	4	987654321	1995-01-01			
Headquarters	1	888665555	1981-06-19			

Dnumber	Diocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

		D	. 1	/	. •		1\			
		Dat	tabase (	(CO	ntinu	ec	1)			
VORKS ON				PI	ROJECT					
Essn	Pno	Hours		Γ	Pname	Pnu	mber	Plocat	tion	Dnum
123456789	1	32.5			ProductX		1	Bellaire		5
123456789	2	7.5			ProductY		2	Sugarland		5
666884444	3	40.0			ProductZ		3	Housto	n	5
453453453	1	20.0			Computerization	6 8	10	Staffor	d	4
453453453	2	20.0			Reorganization		20	Housto	n	1
333445555	2	10.0			Newbenefits		30	Staffor	d	4
333445555	3	10.0								· · · ·
333445555	10	10.0	DEPENDENT							
333445555	20	10.0	Essn	Dependent name		Sex	Bdate		Relationship	
999887777	30	30.0	333445555	Alice		F	1986-04-05		Daughter	
999887777	10	10.0	333445555	Theodore		M	1983-10-25		Son	
987987987	10	35.0	333445555	Joy		F	1958-05-03		Spouse	
987987987	30	5.0	987654321	Abner		М	1942-02-28		Spouse	
987654321	30	20.0	123456789	Michael		M	1988-01-04		Son	
987654321	20	15.0	123456789	Alice		F	1988-12-30		Dau	ghter
888665555	20	NULL	123456789	Elizabeth		F	1967-05-05		Spo	use



## Specifying Attribute Constraints and Attribute Defaults

- NOT NULL
  - **NULL** is not permitted for a particular attribute
- Default value
  - -DEFAULT <value>
- CHECK clause
  - Dnumber INT NOT NULL CHECK (Dnumber > 0 AND Dnumber < 21);

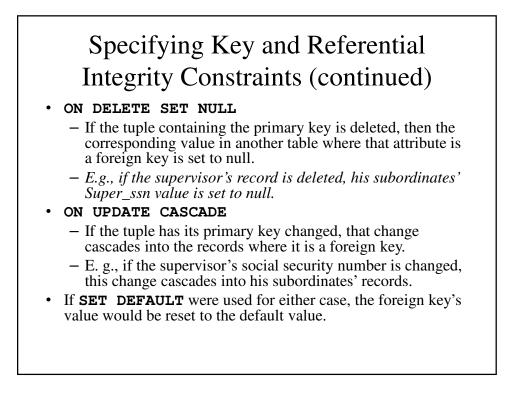
## Specifying Key and Referential Integrity Constraints

- **PRIMARY KEY** clause
  - Specifies one or more attributes that make up the primary key of a relation
  - Dnumber INT PRIMARY KEY;
- UNIQUE clause
  - Specifies alternate (secondary) keys
  - Dname VARCHAR(15) UNIQUE;

## Specifying Key and Referential Integrity Constraints (continued)

#### • FOREIGN KEY clause

- Default operation: reject update on violation
- Attach referential triggered action clause
  - Options include SET NULL, CASCADE, and SET DEFAULT
  - Action taken by the DBMS for SET NULL or SET DEFAULT is the same for both ON DELETE and ON UPDATE
  - CASCADE option suitable for "relationship" relations



## Giving Names to Constraints

#### • Keyword **CONSTRAINT**

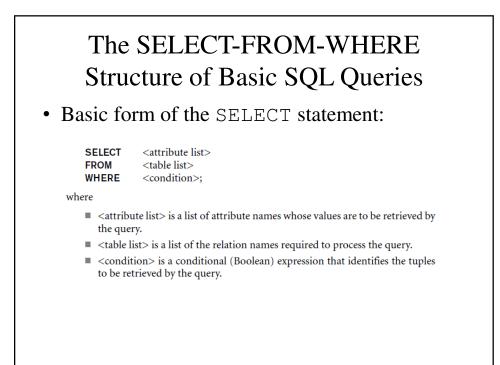
- Name a constraint
- It is used to identify a particular constraint if the constraint must be dropped later and replaced with another constraint.

## Specifying Constraints on Tuples Using CHECK

- CHECK clauses at the end of a CREATE TABLE statement
  - Apply to each tuple individually
  - CHECK (Dept\_create\_date <=
     Mgr\_start\_date);</pre>

## Basic Retrieval Queries in SQL

- **SELECT** statement
  - One basic statement for retrieving information from a database
- SQL allows a table to have two or more tuples that are identical in all their attribute values
  - Unlike relational model
  - Multiset or bag behavior



#### The SELECT-FROM-WHERE Structure of Basic SQL Queries (continued)

• Logical comparison operators

-=, <, <=, >, >=, and <>

- Projection attributes
  - Attributes whose values are to be retrieved
- Selection condition
  - Boolean condition that must be true for any retrieved tuple

