1.264 Lecture 11

SQL: Basics, SELECT

Please start SQL Server before each class

Download Lecture11CreateDB.sql from Web site; open it in SQL Svr Mgt Studio
This class: Upload your .sql file from the exercises after class
Next class: Murach chapter 7. Exercises due after class
Reminder: Solutions to exercises are posted in the evening after each class

Building a database

- When building a database by loading data based on a data model:
  - It may build well, which usually means you found the real business rules
  - It may build with some errors, which usually means you have the real business rules but the data is sloppy
  - It may build with many errors, which usually means that you were told the business rules people wish to have or think they have, not the ones they actually use
- It's often useful to get some sample data and browse it while building the data model

SQL

- Structured query language (SQL) used for
  - Data definition (DDL): tables and views (virtual tables). These are the basic operations to convert a data model to a database
  - Data manipulation (DML): user or program can INSERT, DELETE, UPDATE or retrieve (SELECT) data.
  - Data integrity: referential integrity and transactions. Enforces keys (primary and foreign)
  - Access control: security
  - Data sharing: by concurrent users
- Not a complete language like Java, Visual Basic or C++
  - SQL is sub-language of about 30 statements
  - Embedded in another language or tool for database access
  - SQL has several inconsistencies; NULLs are problematic
  - Portable across operating systems and somewhat among vendors
  - Declarative language, not procedural

Things that vary among SQL implementations

- Error codes
- Data types supported (dates/times, currency, string/text variations)
- System tables, about the structure of the database itself
- Interactive SQL
- Programming interface: no vendor follows the standard
- Dynamic SQL, used for report writers and query tools
- Implementer-defined variations within the standard
- Database initialization, opening and connection
- Whether case matters (upper, lower case)

SQL SELECT

- **SELECT constructed of clauses to get columns and rows from one or more tables or views. Clauses must be in order:**
  - **SELECT *columns/attributes***
  - **INTO *new table***
  - ***FROM table or view***
  - ***WHERE specific rows or a join is created***
  - **GROUP BY *grouping conditions (columns)***
  - **HAVING *group-property (specific rows)***
  - ***ORDER BY ordering criterion ASC | DESC***

Example tables

Orders

OrderNbr	Cust	Prod	Qty	Amt	Disc
1	211	Bulldozer	7	$31,000.00	0.2
2	522	Riveter	2	$4,000.00	0.3
3	522	Crane	1	$500,000.00	0.4

Customers

CustNbr	Company	CustRep	CreditLimit
211	Connor Co	89	$50,000.00
522	AmaratungaEnterprises	89	$40,000.00
890	Feni Fabricators	53	$1,000,000.00

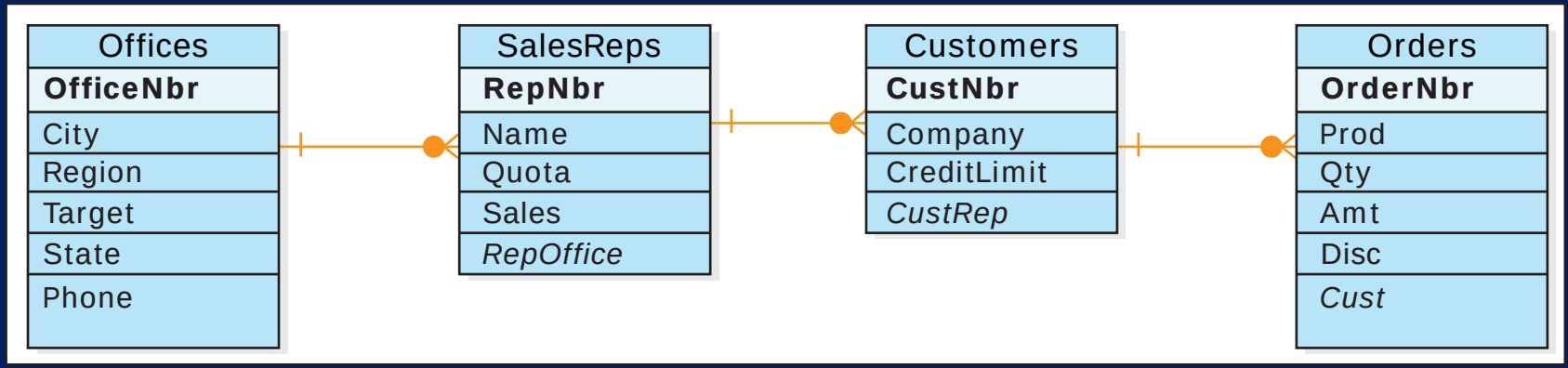
SalesReps

RepNbr	Name	RepOffice	Quota	Sales
53	Bill Smith	1	$100,000.00	$0.00
89	Jen Jones	2	$50,000.00	$130,000.00

Offices

OfficeNbr	City	State	Region	Target	Sales	Phone
1	Denver	CO	West	$3,000,000.00	$130,000.00	970.586.3341
2	New York	NY	East	$200,000.00	$300,000.00	212.942.5574
57	Dallas	TX	West	$0.00	$0.00	214.781.5342

Example data model



Columns with the same meaning usually have the same name in different tables. We give them different names here so we don't have to say tablename.columnname, e.g. Orders.OrderNbr

Using SQL Server and Management Studio

- Your SQL Server database engine should start by default when your system starts
- Start SQL Server Management Studio (SSMS) from Start->Programs->MS SQL Server 2012
- Open Lecture11CreateDB.sql with SSMS in Windows Explorer
  - Download the .sql file from the web site first
- Select 'Execute' from toolbar
  - Database MIT1264 will be created and data inserted for exercises during this class
- Review Lecture11CreateDB.sql
  - Creates tables, relationships, keys, inserts data
  - IDENTITY means auto-number

Exercise 1 SQL queries: SELECT

- Click ‘New Query’ in SSMS; type these statements:
- List the sales reps
  - SELECT Name, Sales, Quota FROM SalesReps
- Find the amount each rep is over or under quota
  - SELECT Name, Sales, Quota, (Sales-Quota) FROM SalesReps
- Find the slackers
  - SELECT Name, Sales, Quota, (Sales-Quota) FROM SalesReps WHERE Sales < Quota

RepNbr	Name	RepOffice	Quota	Sales
53	Bill Smith	1	$100,000.00	$0.00
89	Jen Jones	2	$50,000.00	$130,000.00

Exercise 2 SQL queries: insert, delete, update

- Find the average sale
  - SELECT AVG(Amt) FROM Orders;
- Find the average sale for a customer
  - SELECT AVG(Amt) FROM Orders WHERE Cust = 211;
- Add an office
  - INSERT INTO Offices (OfficeNbr, City, State, Region, Target, Sales, Phone) VALUES ('55', 'Dallas','TX','West', 200000, 0, '214.333.2222');
- Delete a customer
  - DELETE FROM Customers WHERE Company = 'Connor Co';
  - (Syntax is valid but command will fail due to referential integrity)
- Exercise: Create (insert) a new order and delete it
  - Omit OrderNbr in INSERT because it's auto-generated
- Raise a credit limit
  - UPDATE Customers

    SET CreditLimit = 75000 WHERE Company = 'Amaratunga Enterprises';

Exercise 3: SELECT * and duplicates

- Select all columns (fields)
  - SELECT * FROM Offices;
- Duplicate rows: query will get two instances of ‘West’
  - SELECT Region FROM Offices;
- Select, but eliminate duplicates:
  - SELECT DISTINCT Region FROM Offices;
- Exercise:
  - Find the greatest positive difference between sales and target

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