Lesson Plan 01, ISTA-420

Introduction, T-SQL Fundamentals

August 7, 2017

1 Class Discussion — Overview of Databases

1.1 Database environment

1.1.1 management

The primary purpose of a database is to store *knowledge* for the ultimate purpose of converting that knowledge into *information*. Managers aren't intereted in data, but information, and the job of a database professional is to extract data from a database in order to furnish information to the user.

1.1.2 machine

The machine has storage (the hard drive), memory (RAM), and computational capabilities (CPU). A database professional must understand how to use the computational power of the machine to perform his assigned tasks.

1.1.3 theory

Relational databases have a very strong mathematical foundation. In essence, a database professional is a mathematician, usinmg relational algebra to do his job. Don't worry, we don't use numbers!

1.1.4 tools

A database professional uses a number of different tools. Microsoft tools include SSMS, SSIS, SSRS, and SSAS. Reporting tools include Business Objects, Tableau, and Spotfire. Programming tools may include C#, Java, Python, R, and JavaScript.

1.1.5 interface

SQL Server uses SSMS as an interface. Not only do you need to understand SQL and SQL Server, you also need to understand how to use the interface.

1.1.6 language

Microsoft has extended SQL and has named its version Transact-SQL. The SQL programming language is called PL/SQL. In addition, Microsoft uses PowerShell as an administrative scripting language. Also, different disciplines have different terminology, such as rows and columns, records and fields, subjects and variables, etc.

1.2 Prerequisites

1.2.1 knowledge domain

A database contains data (knowledge) relevant to a specific task. You must have some proficiency in the knowledge domain of that task. If you work for a bank, you must know something about banking!

1.2.2 relational algebra

Structured Query Language has a mathematical basis. When you write SQL, you are actually doing algebra, but you are using symbols rather than numbers.

2 In Class Exercises — An Example Database

2.1 Using the CLI

How to use the command line interrface to invoke the database.

2.2 Using internal database commands

How to use the internal commands the database provides.

2.3 Executing SQL statements

How to write and execute simple SQL commands.

2.4 SQL helps

Some useful references and resources for understanding and learning SQL.

3 Graded Labs — Writing and Executing SQL Scripts

3.1 Using the Northwind database

The Northwind database is one that Microsoft used to train people how to use Access. You can find information about Northwind online.

3.2 Examining the schema of tables

Before you start using any database, you must understand the data the database contains, how the data is structured, and the relationshuip between the tables.

3.3 Writing simple queries

You will write and execute queries from scripts, and redirect the output to text files. You will join two or more tables, filter data by given parameters, and sort data by specific variables. You are not expected to understand these queries (yet!) — just to run then and understand the output.

3.4 Creating a database

In this exercise, you will create a database, create one or more tables, and execute queries on the database. You deliverable will be the text file containing the output of your queries.

4 Homework

4.1 Readings

Read Chapter 1, pages 1 – 26, *T-SQL Fundamentals*.

4.2 Discussion Questions

1. Give an informal definition of *database* as used in the expression "relational database management system."
2. Give an informal definition of *database* as used in the expression "Human Resources database."
3. Give an informal definition of *entity integrity*.
4. Give an informal definition of *referential integrity*.
5. What is a *relation* as defined in the textbook? A one word answer to this question is sufficient.
6. Is this table in first normal form? Why or why not? If it is not, how would you change it?

```
create table faculty (
    facID int primary key,
    facName text,
    facCreds text);
```

facID	facName	facCreds
1	Alan Alda	BA, MA
2	Bridgette Bardot	BS, MS, PhD
3	Casey Cason	AA, BBA, MBA, DEd

7. Is this table in second normal form? Why or why not? If it is not, how would you change it?

```
create table pets (
    ownerID int primary key,
    petID int primary key,
    ownerFirstName text,
    ownerLastName text,
    petName text,
    petType text);
```

ownerID	petID	ownerFirstName	ownerLastName	petName	petType
1	1	Dom	Delouise	Rex	German Shepherd
1	2	Dom	Delouise	Lacy	Border Collie
2	3	Emilio	Estevez	Midnight	Persian Cat

8. Is this table in third normal form? Why or why not? If it is not, how would you change it?

```
create table friends (
    friendID int primary key,
    friendName text,
    friendStreet text,
    friendCity text,
    friendState text,
    friendZip text);
```

ID	FirstName	LastName	Street	City	State	Zip
1	Fred	Flintstone	123 Rock Quarry Rd	Bedrock	GA	31905
2	Greta	Garbo	456 Starlit Ave	Paris	FL	30019
3	Harry	Houdini	789 Hidden Glen Lane	Alcatraz	CA	00000

9. What is an *OLTP database*? What operations is it optimized for?
10. What is a *star schema*? What operations is it optimized for?

4.3 Exercises

1. Install SQL Server Express on a personal computer. See the appendix of the book, Getting Started, if you run into problems. Please, *please* check the system requirements before you do this. You cannot install SQL Server on a hand held device or an internet appliance. This may take a couple of hours but you can read the text book while you are waiting.

2. Install SQL Server Management Studio on a personal computer. See the cautions above. This may take a long time as well.

3. (In class) We will be downloading and installing the database the text uses. Read the Introduction. This can be obtained from `http://aka.ms/T-SQLFund3e/downloads`.