



Module 2 Day 1

Introduction to Databases

File I/O

- Persistence: We were able to save and load program state
- Read in, update data, write out
- However:
 - We could not easily “share” the data among many users
 - We could not easily locate one small piece of the file and update only that
 - E.g, Just complete one task. We had to write them all back out.
 - What if we had a lot of data?
 - What if I had tasks that I had completed over the past year. I’d have to load all that data just to find the current tasks
 - What if we stored tasks for thousands of users? How would we find mine?

Database Management Systems - DBMS

- Special software specifically designed to manage data
- Handles very large amounts of data
- Shared access
- Quick retrieval and update
- Security
- Data Integrity – constraints and transactions
- Various types of DBMS
 - Relational, No-SQL, OO, Hierarchical, Analytical

Relational DBMS

- Microsoft SQL Server, PostgreSQL, Oracle, MySQL, DB2
- SQL – Structured Query Language
 - To define database structure
 - To Create, Read, Update and Delete data
 - To manage data access
- **Table** - Stores all the data for a specific type of entity (e.g., a Car)
- **Column** - Represents a data field (make, model, year)
- **Row** - represents a single entity ('Honda', 'CRV', 2005)
- Think spreadsheet

Relational DBMS Structure

Application (SSMS or C# program)



Order Management Database

Customer Id	Name	Email
12344	Sam Malone	smalone@gmail.com
12345	Diane Chambers	chambers312@acme.net
12346	Norm Pederson	Norm!@acme.net

Order Id	Customer Id	Total
100	12345	\$45.34
101	12345	\$134.56
103	12344	\$201.99

World Database

Country Code	Name	Population
USA	United States	278357000
DEU	Germany	82164700
ZMB	Zambia	9169000

City Id	Name	Country
3793	New York	USA
3794	Los Angeles	USA
3795	Chicago	USA

Server instance

SQL Server Column Data Types

- char, varchar, nchar, nvarchar
- int, decimal, bigint, money
- float
- date, datetime
- bit
- <https://docs.microsoft.com/en-us/sql/t-sql/data-types/data-types-transact-sql?view=sql-server-2016>

SQL Server / C# Data Types

- <https://docs.microsoft.com/en-us/dotnet/framework/data/adonet/sql-server-data-type-mappings>

SQL Server	C#		SQL Server	C#
bit	bool		char/nchar	string
date	DateTime		datetime	DateTime
decimal	decimal		float	double
int	int		money	decimal
ntext/text	string		nvarchar/ varchar	string
tinyint	byte			

Structured Query Language - SQL

- *Declarative* language (C# is *imperative*)
- DDL – Data Definition Language
 - Create Table, Create Index, Create Constraint, Alter Table
- DML – Data Manipulation Language
 - **C**reate, **R**ead, **U**ppdate and **D**eleete data
 - Create – Insert
 - Read – Select
 - Update – Update
 - Delete – Delete
- DCL – Data Control Language
 - Used for controlling access to data

SELECT – Read Data

- `SELECT` column1, column 2... | `*`
 `FROM` table
 `WHERE` search_condition1 `AND` | `OR` search_condition2...
 `ORDER BY` column3, column4...
- `WHERE` search condition
 - `=`, `<>`, `!=`, `>`, `>=`, `<`, `<=`
 - `IN` (values / select), `NOT IN` (...)
 - `BETWEEN` value1 `AND` value2 (this is inclusive)
 - `IS NULL`, `IS NOT NULL`
 - `LIKE` 'search string' ([see docs](#))
- `AS` 'Col-Name'
- `DISTINCT`, `TOP` nnn
- `CAST` / `CONVERT` ([see docs](#))

SQL Server Management Studio

- Launching SSMS
- What you see:
 - Current database
 - Object Explorer
 - Query windows
 - Results window
- Creating a database from the UI
- Creating a database from a script
- Running one or many queries – Select / F5 / Execute
- Comments --



Let's
Code