

Relational Databases, SQL and ADO.NET in 75 minutes

Relational Databases

- Data is organized into tables with rows and columns
- A row is a single instance of a record
- Columns are the attributes of a record
- Tables can be linked in relationships

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Keys / Indexes

- Keys are columns or groups of columns that are "indexed" to make find / sorting them faster
- Index can be unique or allow duplicates
- One key (one or more columns) can be "primary," must be unique

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Organizing data (schema)

- How data (tables, rows, columns) are organized in a database is its "schema"
- Data is organized best when it is organized in a "normal form"
 - You will be given existing tables so understanding normal forms is not necessary
 - Please take CS 584 for more information

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Relationships

- Only type of relationship discussed here is a "link" where rows / records in two tables share a common column / attribute
- Table 1: UID, Name
- Table 2: UID, Grade1
UID, Grade2 etc.
- Find Joe's name and grades where the UID in both tables refers to Joe.

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SQL

- Structured Query Language
- A few words that impact your life every day
- We will focus on 4 commands
 - Select
 - Insert
 - Update
 - Delete

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Quotation

- Specifying data in SQL commands are very fragile with respect to use of quotation marks
- If specifying SQL commands from a program use "parameterized" arguments to avoid the problem
- Parameterized arguments are discussed later

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select

- Select columns from tables where certain conditions are true plus some options
- Select all columns, all records:
 - `select * from t;`
- Select all columns, some records
 - `select * from t where age > 21;`
- Select all columns, some records, w/ options
 - `select * from t where age > 21 order by lastname;`

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select

- Select some columns
 - `select firstname, lastname from t;`
- Select on more than one condition
 - `select * from t where age > 21 and age < 75;`
- Usual logical operators for conditions
- String columns can be pattern matched
 - `select firstname where firstname like "%th%";`

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select

- Select (and summarize) by group
 - `select count(state), state from t group by state;`
- Select unique values
 - `select distinct state from t order by state;`
- See:
 - <http://dev.mysql.com/doc/refman/5.1/en/sql-syntax.html>

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Selecting from more than one table - Join

- There are several types of joins. We only look at the "inner join" (simply use "." between table names)
- Cross product of two tables (hopefully) limited by some constraint
 - `select id, name, ordernumber from customers, orders where customers.id = orders.customerid order by id;`
- If there is a column with the same name in two tables, you must disambiguated explicitly

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insert

- `insert into tbl set columnname=value;`
- Multiple columns can be set separated by ","
- Value can be "default" if column has a default
- If there is a collision of a "unique" key, an error results
- Use "ignore" syntax if you don't care
 - `insert ignore into t set id=29;`
- See <http://dev.mysql.com/doc/refman/5.1/en/insert.html>

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update

- update [ignore] tbl set id=9 where id=8
- Multiple columns may be set separated by “,”
- Compound “where” conditions may be used
- Note the optional “ignore” if you are changing a key value that is supposed to be unique and a collision occurs
- See <http://dev.mysql.com/doc/refman/5.1/en/insert.html>

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delete

- delete [ignore] from tbl where id=9;
- Don't leave out the where condition unless you want to delete all records (not in this class)
- Note optional “ignore” to ignore errors
- Multiple where conditions may be specified
- See <http://dev.mysql.com/doc/refman/5.1/en/delete.html>

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ADO.NET

- Active Data Objects for .NET
- Object oriented wrapper to database methods and data structures
- We will use ODBC version of methods
 - Open Database Connectivity
 - Independent of database backend

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Typical flow

- Define connection – the connection string
- Open the connection
- Issue commands, receive / transmit data
- Close the connection

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Connection string

- MySQL version
 - DRIVER={MySQL ODBC 3.51 Driver};
 - SERVER=oberon.cs.wisc.edu;
 - PORT=3400;
 - DATABASE=databaseName;
 - USER=username;
 - PASSWORD=myPassword;
 - OPTION=3;"
 - One long string
- Each of you will get your own copy of the database

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{MySQL ODBC 3.51 Driver};

- Refers to the MySQL connector which must be installed on your system
- Will be preloaded on instructional machines
- Found here:
 - <http://dev.mysql.com/downloads/connector/odbc/3.51.html>

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