Connecting the World:
A Brief Intro to Concepts of Web & Database Integration

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Our Topics

- What's a database?
- SQL
- Various databases
- Middleware
- Resources

What's a Database?

- "A collection of data arranged for ease and speed of search and retrieval." (American Heritage Dictionary of the English Language, 4th Edition)

- "One or more large structured sets of persistent data, usually associated with software to update and query the data. A simple database might be a single file containing many records, each of which contains the same set of fields where each field is a certain fixed width." (The Free On-line Dictionary of Computing)

A Simple Database

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@justpat.com

- This is a database table
- Columns identify each specific item of data
- Each row is a "record"
- You've probably done this with Excel, even though that's really not what a spreadsheet is for

What If We Want to Add Data?

Student ID	Student Name	ZIP	Email	OS
1001	Steve Smith	63112	steve@smith.com	Mac OS X
1002	Becky Barnes	63130	becky@barnes.com	Red Hat Linux 8.0
1003	Pat	63108	pat@justpat.com	Mandrake Linux 9.0

- Just add a column for operating systems, called "OS"
- So far, so good ... although our table is now including data (OS) that doesn't really relate to the other data (contact info)

A Problem Develops

Student ID	Student Name	ZIP	Email	OS	OS 2
1001	Steve Smith	63112	steve@smith.com	Mac OS X	Windows 2000
1002	Becky Barnes	63130	becky@barnes.com	Red Hat Linux 8.0	
1003	Pat	63108	pat@justpat.com	Mandrake Linux 9.0	

- Steve informs us that he uses two operating systems
- Now we need to add another column, "OS 2"
- Problems
  - We're adding columns that don't contain a lot of data
  - This table is not focused on one type of data

A Better Way: Relational Databases

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@justpat.com

Student ID	OS
1001	Mac OS X
1001	Windows 2000
1002	Red Hat Linux 8.0
1003	Mandrake Linux 9.0

- Two tables, related to each other through a shared unique data point: "Student ID"
- Each table focuses on one particular grouping of data

SQL

- "Structured Query Language"
- "An industry-standard language for creating, updating and, querying relational database management systems." (The Free On-line Dictionary of Computing)
- A common language most modern databases use to work with data

SQL Is Actually Pretty Easy

Here's a table named "Students"

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@justpat.com

- Given the SQL statement:
  SELECT Email FROM Students

- Produces:

steve@smith.com

becky@barnes.com

pat@justpat.com

More SQL

Here's a table named "Students"

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@justpat.com

- Given the SQL statement:
  SELECT Email,Student ID FROM Students

- Produces:
  steve@smith.com 1001
  becky@barnes.com 1002
  pat@justpat.com 1003

Yet More SQL

Here's a table named "Students"

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@justpat.com

- Given the SQL statement:
    INSERT INTO Students
    VALUES ('1004', 'Bob Jones', '63132', 'bob@bob.com')

- Produces:

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@justpat.com
1004	Bob Jones	63132	bob@bob.com

No More SQL, I Promise

Here's a table named "Students"

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@justpat.com

- Given the SQL statement:
  - UPDATE Students SET Email = 'pat@pat.com'
  - WHERE Student Name = 'Pat'

- Produces:

Student ID	Student Name	ZIP	Email
1001	Steve Smith	63112	steve@smith.com
1002	Becky Barnes	63130	becky@barnes.com
1003	Pat	63108	pat@pat.com

ACID

- Set of standards for rating database architecture
  - Atomicity
  - Consistency
  - Isolation
  - Durability
- The more ACID-compliant, the safer the data in the database

Database Capacities

- High End
  - Handle hundreds of tables, millions of records, and constant input & output
  - ACID-compliant
  - Examples: Oracle, IBM's DB2, Microsoft SQL Server, & Informix
- Mid-Tier
  - Not as robust as high end, but some co's use them for e-commerce
  - Examples: Firebird, MySQL, & PostgreSQL
- Personal or Departmental
  - Meant for one person or a small department
  - Connect to Web? Small intranet OK; anything else questionable
  - Examples: Microsoft Access & FileMaker Pro

Open Source Databases

- There are two popular open source databases
  - o MySQL ~ www.mysql.org
  - o PostgreSQL ~ www.postgresql.org
- Because they are open source ...
  - o All code is available
  - o They are constantly updated & improved
  - o Available for download at no cost
- They're great to learn with, and they're being used in large production Web sites today: Slashdot, Yahoo, Internet Movie Database

Middleware

- "Software that mediates between an application program and a network. It manages the interaction between disparate applications across the heterogeneous computing platforms." (The Free On-line Dictionary of Computing)

- "... a general term for any programming that serves to 'glue together' or mediate between two separate and often already existing programs." (searchwebservices.techtarget.com)

Something That Will Not Work
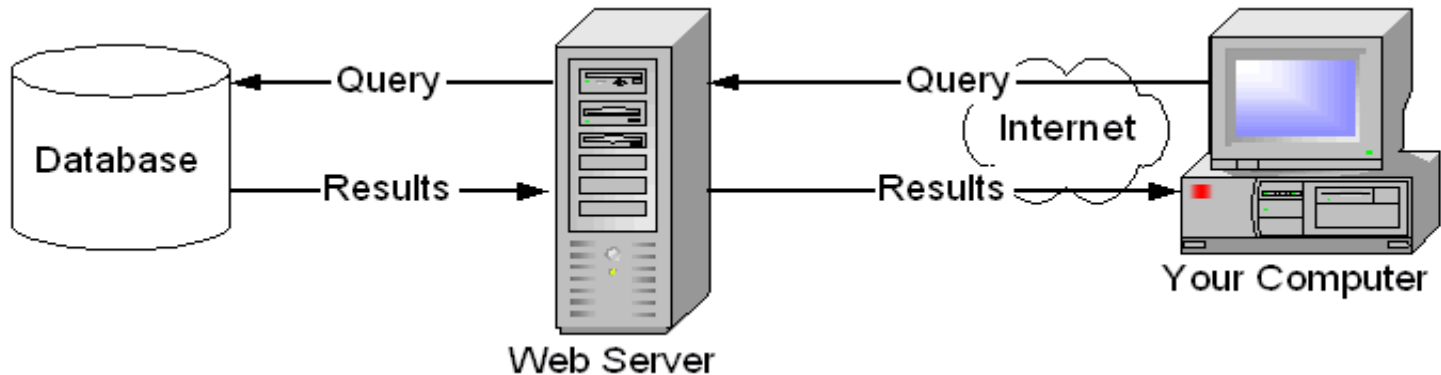
- Web servers cannot just "talk" to databases
- Web servers are pretty stupid: they just take requests for Web pages and images and respond

Middleware Saves the Day
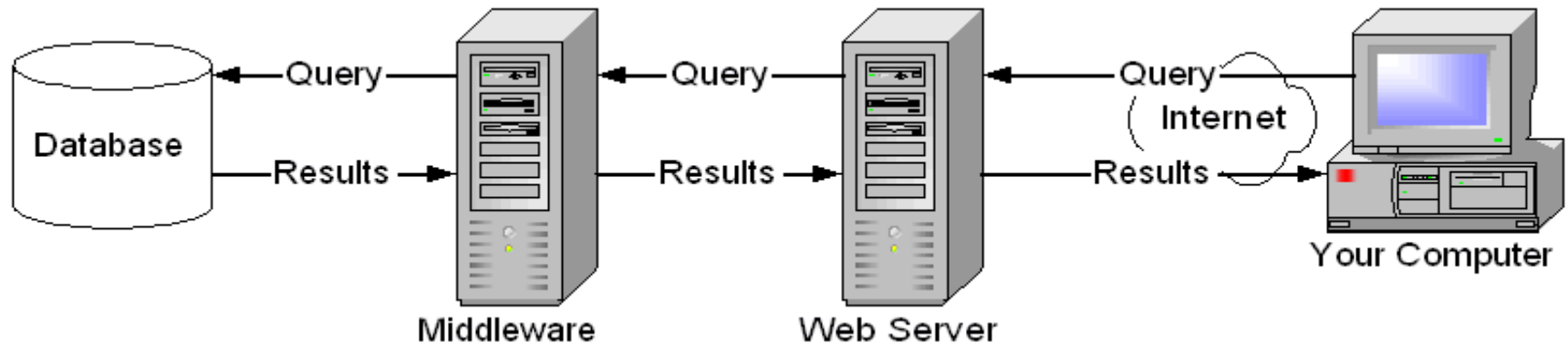
- Middleware mediates between Web server & database
  1. Web server passes your request for data to middleware
  2. Middleware crafts request in terms database can understand & queries database
  3. Database responds & sends data back to middleware
  4. Middleware formats data with HTML & sends result to Web server
  5. Web server sends resulting Web page to you

Middleware Examples

- Closed Source
  - Microsoft's ASP (Active Server Pages) technology
  - Macromedia's Cold Fusion
- Closed & Open: UserLand's Frontier/Manila
- Open Source
  - PHP (PHP Hypertext Preprocessing)
  - JSP (Java Server Pages)
  - Perl
  - Python
  - Zope (built with Python)

Monolithic Middleware

- Some systems are *monolithic* -- they encompass more than one function:
  - Userland Frontier/Manila is actually a Web server, Middleware, & a database
  - Zope is middleware, but it also contains a Web server
- In each case, you can pick & choose as you desire
  - For example, use Frontier for Middleware, but Apache for a Web server & mySQL for a database

Books

- *MySQL* by Paul DuBois
- *PHP and MySQL Web Development* by Luke Welling & Laura Thomson
- *The Web Wizard's Guide to PHP* by David Lash (see www.linuxjournal.com/article.php?sid=6507)
- *Build Your Own Database Driven Website Using PHP & MySQL* by Kevin Yank

Web Sites

- Developer Shed ~ www.devshed.com
- PHP/MySQL Tutorial ~ hotwired.lycos.com/webmonkey/programming/php/tutorials/tutorial4.html
- PHP/MySQL Tutorial ~ www.freewebmasterhelp.com/tutorials/phpmysql/
- Better yet, search Google for "PHP MySQL tutorial"

Thank You!

- Final thought: If you want to be successful, make money, & live a happy life developing Web-based applications, learn databases & middleware.

- Email me: scott@granneman.com
- Visit my Web site: www.granneman.com
- Read my blog: radio.weblogs.com/0100530
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