Web Databases.

Powerful systems can be built, e.g. as follows:

JavaScript embedded in HTML (handles the interaction with the user on the client computer).

Sends the form data you entered through CGI (Common Gateway Interface) to a program on the server. CGI invokes a Java Program.

The Java Program accesses the ORACLE Database through JDBC (Java Database Connectivity).

Results from Oracle with HTML tags added by the Java program are sent (through CGI) to the Client.

At the client the generated HTML files are displayed in the Web browser.

See how the Java/JDBC/Oracle part works.

See how the JavaScript/HTML/CGI part works.

We will now see that there are many alternative technologies for EVERY step of the way.

This part of the lecture is based on:

Integrating Web Sites and Databases
Mike Morrison, Joline Morrison and Anthony Keys
Communications of the ACM, Volume 45, Number 9 (September 2002), pp. 81-86.

Reasons for connection DB Web:
- E-commerce systems
- Use of intranets for company databases

DATA-BASED WEB PAGES: Web pages that are deriving some of their contents from databases.

2 Ways to generate a D-B Web Page:
- By clicking on a link (no user input).
- By filling in fields in a form and clicking a submit button (user input).
Even when clicking on a link, the displayed data is different at different times (usually). Imagine a link to a stock price page.

When user input is provided it is entered into an HTML form. The submit button then sends the form data to the Web server.

There are two major techniques:

1) Server-Side Processing
2) Client-Side Processing

These techniques interact. In many systems both are used together.

Server-Side Processing
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The Web server receives a request. Server side program accesses the database and wraps the result data into HTML tags which are sent by the server to the client and displayed on the browser.

1) Compiled Server-Side programs:

An independent (from the Web server) executable (i.e., compiled) program is executed. It stores results with HTML tags in Server memory. The Web server picks the results up there and sends them to the client/browser/user.

Can be written in many languages. Java, C++, VB.

Programs communicate with the Web server using a protocol such as CGI (Common Gateway Interface).

a) CGI Programs (in all languages) have a well known problem: Every request causes a new invocation of the program. Thus, many copies of the same program may sit in memory. Until the server runs out of memory.

All modern technologies have solved this problem. One version of the program serves many requests. CGI itself has also been improved. (E.g. FastCGI or Persistent CGI).

Compiled programs are fast but require more effort to write and recompile.

Other techniques besides CGI:
b) ASP.NET. Microsoft product. Not compatible with old ASP scripts.

c) Java Servlets

2) Server-side Scripts (interpreted programs)

Here the communication is between the Web server and the Interpreter. Interpreted programs RUN slower, but you don't have to wait for them to be compiled. Most commonly used interpreted languages/systems:

a) Perl (Practical Extraction and Report Language)

Very complex and powerful syntax.

b) Active server pages (ASP)

c) Cold Fusion. Adobe product.
Code is directly embedded in an HTML page.

d) PHP. Apache Software foundation.
Looks like simplified version of Perl.

The Web server knows which interpreter to run, because of file extensions: .cfm, .pl, .asp, etc.

3) Hybrids

Hybrids are trying to combine the speed of compiled programs with the ease of use of interpreted scripts.

A hybrid program is not compiled UNTIL it is called for the first time. When it is called it is compiled and executed. The next time it is called, the executable is already there and is used.

a) ASP.NET (Yes, it's possible here too). But typically it is used compiled.

b) Java Server Pages (JSP). SUN Microsystems. (Now owned by Oracle.) Requires relatively big programming effort. (JavaBeans have to be written.)

Client-Side Processing
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Client-Side programs execute directly on
the client (YOUR Computer). Some are able to access the
server database (Java applets), others are not
(JavaScript and VBScript).

1) Downloadable programs. (Compiled)

These are Java Applets. Program is downloaded
from the Server and executed at the client.
The program has access to the database, but
not to local files at the client (for
security reasons.)

Unfortunately, different browsers handle
Applets differently. Thus, in practice not
so good.

2) Client Side Scripts

These cannot directly access data on the Server
side. However, they are good for checking
user input before sending it to the Server
and performing sophisticated interface
behaviors.

Code is directly embedded in the HTML code,
between special tags.

a) JavaScript

Most popular scripting language. SUN.

There is a microsoft version called JScript.

b) VBScript. Microsoft.