

Introduction to Web Applications

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SWE 432

**Design and Implementation of
Software for the Web**

Web Applications

- A web application uses enabling technologies to
 1. make web site contents dynamic
 2. allow users of the system to implement business logic on the server
- Web applications allow users to affect state on the server

A web application is a program deployed on the web

An enabling technology is a mechanism that makes web pages interactive and responsive to user input

Traditional Computing Use

A user works with software on her computer



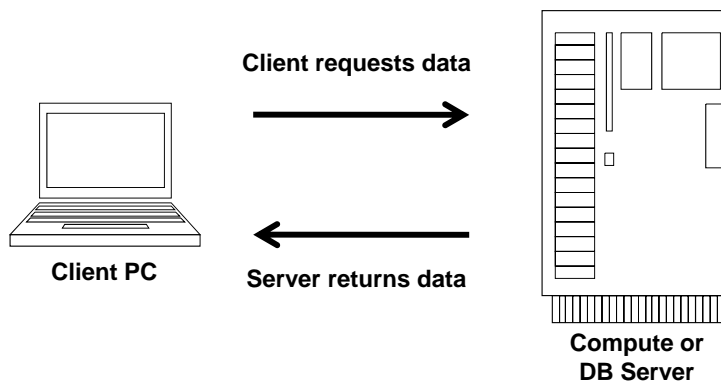
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3

Client – Server Computing

A user works with software or data on a separate computer called a *server*



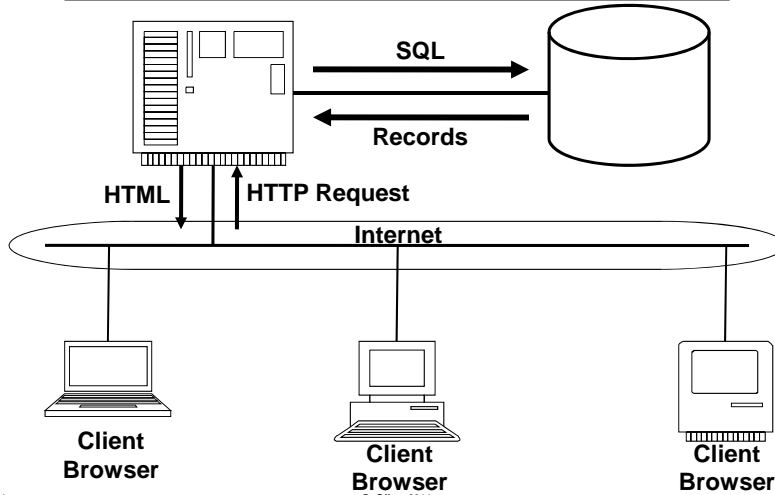
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Web Applications

Many users work with servers and databases that can be reached through the Internet with the HyperText Transfer Protocol



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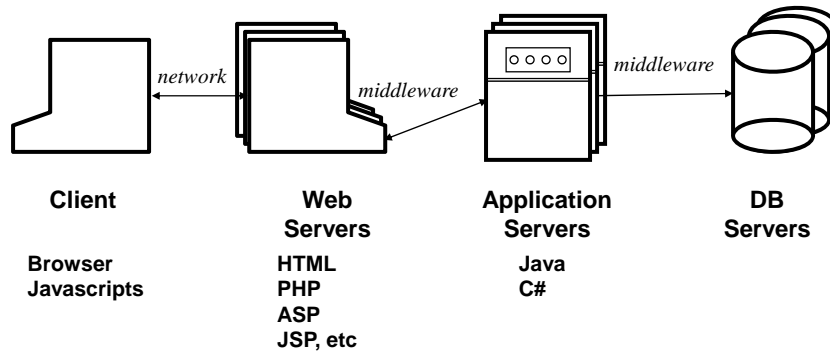
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N-Tier Web Architecture

Large web applications run on many computers that have to coordinate with each other.

Amazon and Netflix have *thousands* of servers.

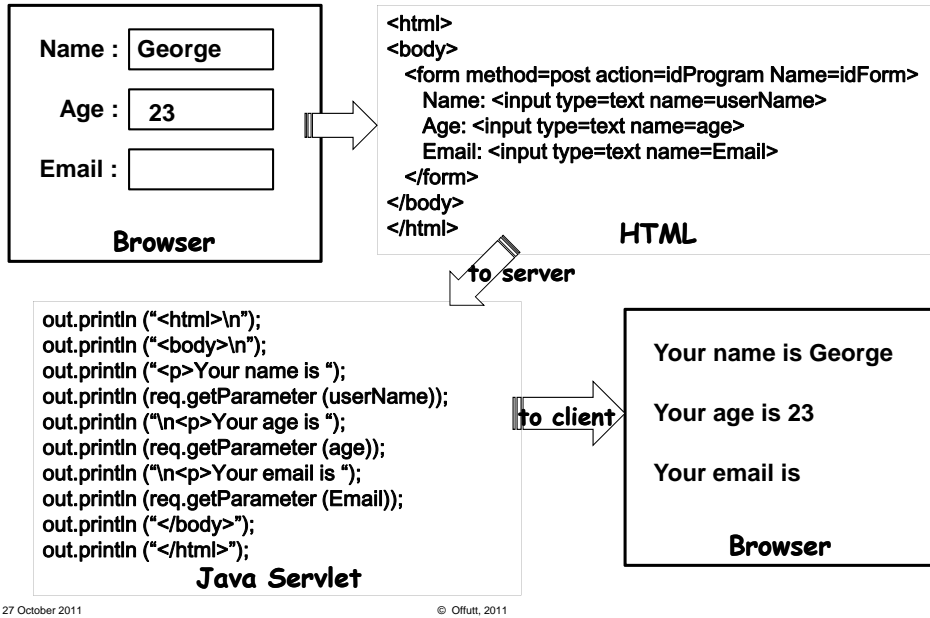


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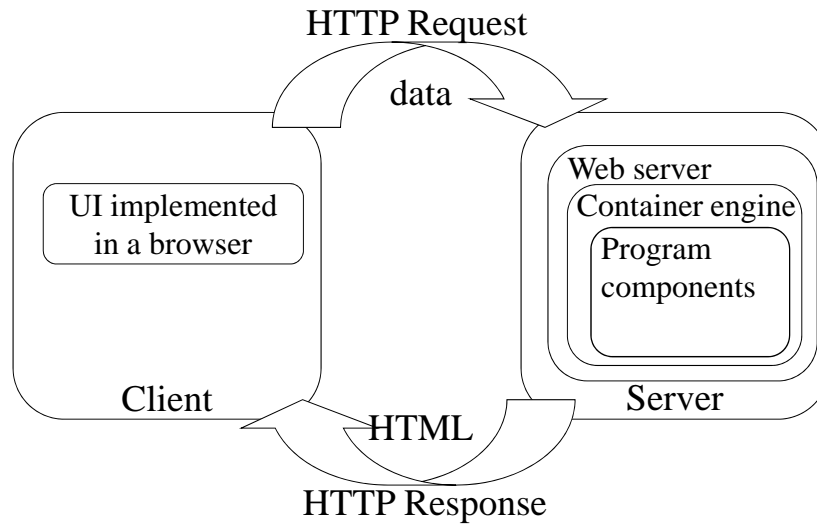
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6

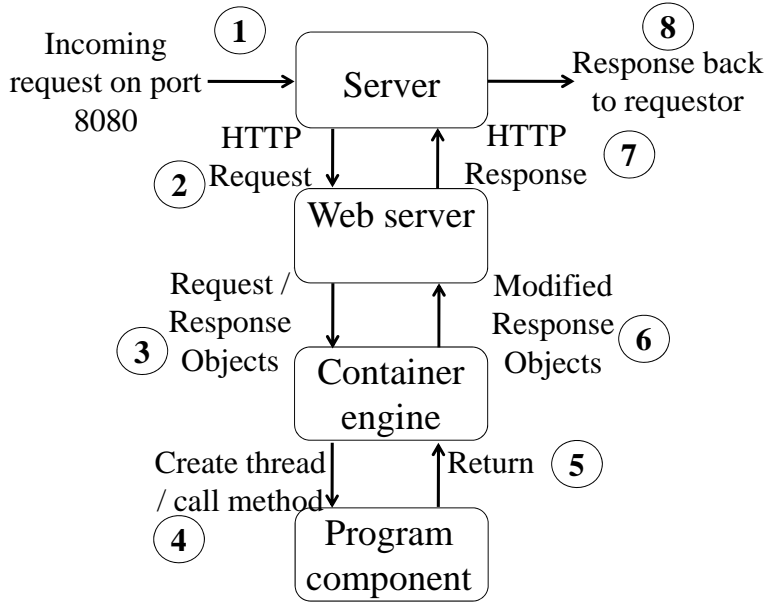
How the Software Works



Server Side Processing



Execution Overview

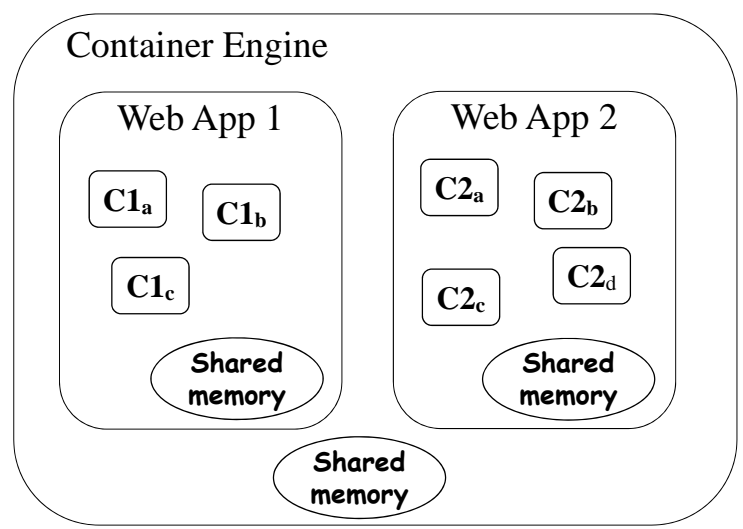


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Web Software Container Engine



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Session Management

- HTTP client-server communication is connectionless
 - As soon as the request is made and fulfilled, the connection is terminated
 - Communication is simple and resistant to network problems
- How can servers keep track of state of different clients?
 1. Session : A single coherent use of the system by the same user
 - Example : shopping carts
 2. Cookies : A string of characters that a web server places on a browser's client to keep track of a session
 - Usually used as an index into a table (dictionary) on the server
 - Most dictionaries expire after a period of time (15 to 30 minutes)

We will come back to this later ...

Enabling Technologies – CGI

- CGI : Common Gateway Interface allows clients to execute applications on the server
- The first enabling technology
- CGI applications usually reside in a special “safe” directory
- Can be written in any language; PERL was most common
- CGI apps typically :
 1. process data
 2. modify server state
 3. return information (usually an HTML page)

Enabling Technologies Problems with CGI

- Each and every execution of a CGI module requires a new process on the web server
- CGI posed some significant security risks
- CGI does not automatically provide session management services
- Perl is a difficult language in which to write large applications

Solution : Plug-ins on the Web server

Enabling Technologies Web Server Plug-ins

- A plug-in is an extension to a web server that allows a different program to handle certain types of requests
 - images, sound, video
 - compiled module applications
 - scripted page applications
- Plug-ins typically keep an active process as long as the web server is active

Enabling Technologies - Plug-ins

Compiled Modules

- Compiled modules are executable program components that the server uses
- Common compiled module application plug-ins :
 - Microsoft's .NET ASP
 - J2EE Java servlets
- Compiled modules are efficient and very effective
- They allow programmers to clearly separate the front-end from the back-end
 - Aids design
 - Complicates implementation

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Enabling Technologies - Plug-ins

Scripted Pages

- Scripted pages look like HTML pages that happen to process business logic
- Execution is on the server, not on the client
 - unlike JavaScripts
- They have HTML with program statements that get and process data
- JSPs are compiled and run as servlets
 - very clean and efficient
- PHP scripts are interpreted within the server

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16

Enabling Technologies - Plug-ins *Scripted Pages*

- Common scripted pages:
 - Adobe's ColdFusion
 - Microsoft's Active Server Pages (ASP)
 - PHP
 - Java Server Pages (JSP)
- Scripted pages are generally easy to develop and deploy
- They mix logic with HTML, so can be difficult to read and maintain
- Not as effective for heavy-duty engineering

Summary Web Programming

- The major difference is deployment
 - Software is deployed across the Web using HTTP
 - Other deployment methods include bundling, shrink-wrapping, embedding, and contracting
- New software technologies
- New conceptual language constructs for programming
 - Integration
 - Data management
 - Control connections

These differences affects every aspect of
how to engineer high quality software

What We Will Study

We will learn about these concepts in the context of several technologies

- Ajax
- PHP
- Servlets
- JSPs