Internet Programming CSC2233

Lecture 1:
Introduction to Internet Programming

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Course Structure

- Lectures   : 30 hours

- Practical   : 45 hours

- 3 credits

- Prerequisites : CSC113 α (Internet Services and Web Development)

- **Evaluation**   : Written exam

                                     : Practical exam

- Update information on LMS

Learning Outcomes

- After a Successful completion of this lecture series student will be able to,
  - Defines/explains basic concepts about internet programming.
  - Select and apply markup languages for processing, identifying, and presenting of information in web pages.
  - Demonstrate an understanding of how server-side scripts can be implemented in the context of the World Wide Web
  - Use scripting languages and web services to transfer data and add interactive components to web pages.
  - Implement web applications using suitable programming language(s), and database systems
  - Make use of industry standard components and frameworks in the design and implementation of server-side programs.

Learning Outcomes of the lesson

- Student will be able to
  - Understand the need of server side scripting
  - Illustrate the Server side scripting process
  - Define basic syntax of a PHP script
  - Define valid PHP variables and identify data type

Internet

- Worldwide collection of networks that connects millions of computers.
- Medium for communication and interaction.
- Mixes computing and communication technologies.
- Makes information constantly and instantly available to anyone with a connection.

What is Web?

- The **Web (World Wide Web)** consists of information organized into Web pages containing text and graphic images.

- It contains hypertext links, or highlighted keywords and images that lead to related information.

- A collection of linked Web pages that has a common theme or focus is called a **Web site**.

- The main page that all of the pages on a particular Web site are organized around and link back to is called the site's **home page**.

TCP/IP Protocol

- Set of rules and standards that the network-nodes must use in order to communicate with each other.

- TCP/IP (Transmission Control Protocol/ Internet Protocol)
  - Set of communication protocols used to connect hosts on the Internet

HTTP Protocol

- Hyper Text Transfer protocol
- Hyper Text is structured text that uses logical links (hyperlinks) between nodes containing text.
- HTTP protocol provides the access to the web pages.
- This protocol exchanges or transfers hypertext

Web browsers

Software that allows users to locate, retrieve and display content on the World Wide Web, including Web pages, images, videos and other files.

1. Microsoft Internet Explorer

2. Firefox
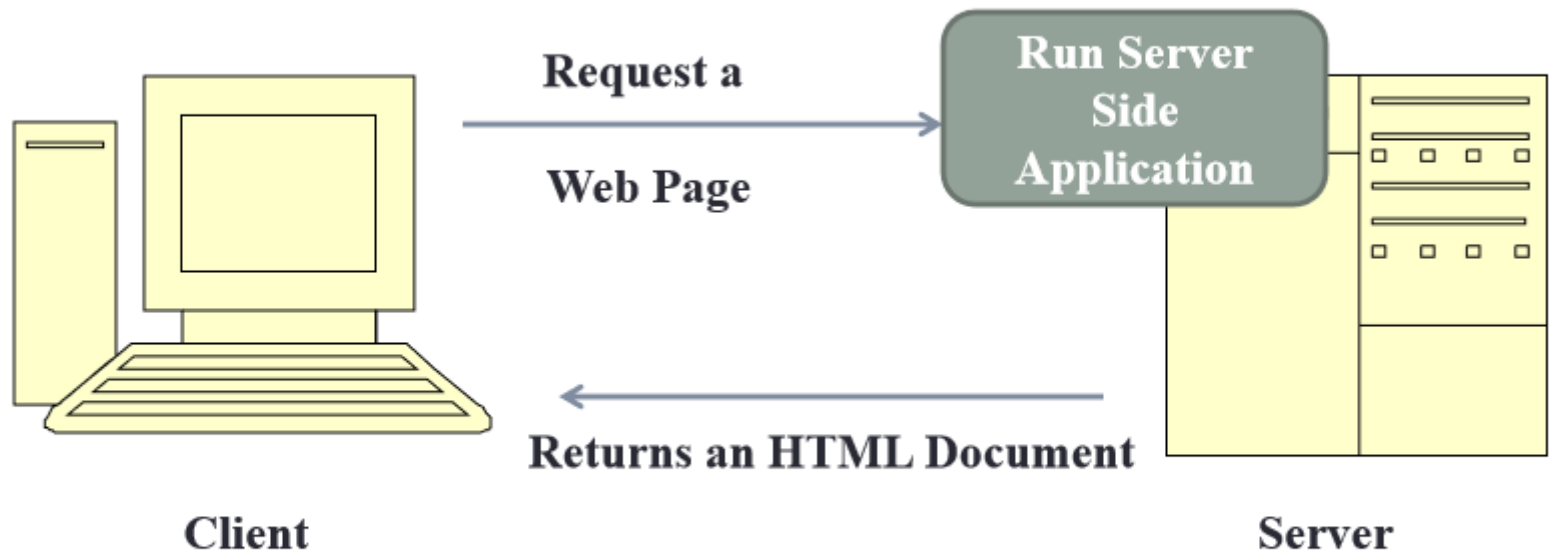
3. Safari

4. Netscape Navigator

What is a Web Application ?

- A computer program that allows website visitors to submit and retrieve data to / from a database over the Internet using their preferred web browser.

Client Server Architecture

Request a

Web Page

Run Server
Side
Application

Returns an HTML Document

Client

Server

WWW

- **Web Client** :Browser that makes requests to a remote server.
- **Web Server :** Responds to the client requests by providing resources
- How does WWW works
  - Web server and client communicate with platform independent Hypertext Transfer Protocol (HTTP)

What is a script

- A script can adapt the content based on input from the user or other variables
- Scripting is code used to automate processes that would otherwise need to be executed step-by-step by a web developer.

Web Server

- Piece of software runs on web server machine

- Responds to client requests by providing resources

- Executes server side scripts (PHP, JSP, ASP etc.) that provide functions such as database accessing

Internet Programming?

- Scripting
  - Access and modify properties and attributes in a web page
  - A script can adapt the content based on input from the user or other variables

Client Side Scripting

- Client is the system in which the web browser exists.
- Client side scripts are interpreted by the browser.
- Client-scripting is used to change the Web pages after they arrive at the browser.
- It makes web pages more dynamic and interactive.
- The performance of Client – Side scripts relies on the user's computer.
- E.g. JavaScript

JavaScript : Object – Based Scripting

- JavaScript
  - Object-based language
  - Powerful scripting language
    - Portable
    - Program executes interpretively on client machine

Server Side Scripting

- Server Side Scripts are executed on a server to generate results which are sent to the user/client.

- User/Client cannot see the Server Side scripts.

E.g. PHP , ASP, JSP

Server side programming

- Short history
  - CGI – separate programs launched by web server
    - They produce an HTML document as output
    - They receive arguments as input
    - Strong isolation, bad performance
  - Programs embedded inside web page (php, ASP, JSP)
    - Program executed inside web server process
  - Separate "code-behind" file for the code (ASP.NET)
- What are dynamic pages used for?
  - Personalizing based on user identity
  - Interacting with databases (e.g. on-line banking)
  - Web applications (e.g. web based email)
- Separate database keeps persistent data

Common Gateway Interface (CGI)

- In the early days of web development CGI was one of the few ways to provide interactivity in a web application.

- It was most common on Apache, but ports were made to run CGI on IIS as well.

- The most common usage of CGI is using scripting languages, and so it's common to refer to this as running a CGI script. CGI programs and scripts are usually collected in a folder named /cgi-bin/.

Client Side Scripting vs Server Side Scripts

- Client Side Scripts
  - Downloaded, Interpreted and executed by the browser.
  - Enhance Web pages with allowing access to functions of the web browser of the user's computer.
  - Validate user inputs.
  - Reduce requests needed to be passed to server.
- Server Side Scripts
  - Executed on Server.
  - Generate custom responses for clients.
  - Wide range of programming capabilities
  - Access to server-side software that extends server functionality

Web Servers

- Piece of software that runs on a server machine.
- Execute Server-Side Scripts which provides functions such as database accessing.

    E.g. IIS , Apache

Web server refers to server software, or hardware dedicated to running said software, that can serve contents to the World Wide Web. A web server processes incoming network requests over the HTTP protocol. Wikipedia

Apache HTTP Server

- Apache is available for a range of operating systems, including Unix, Linux, Novell Netware, Windows, Mac OS X, Solaris, and FreeBSD.

- free and open source

- Developed and maintained by Apache Software Foundation

Microsoft Internet Information Services (IIS)

- The second most popular web server on the web.

- IIS comes as an optional component of most Windows operating systems.

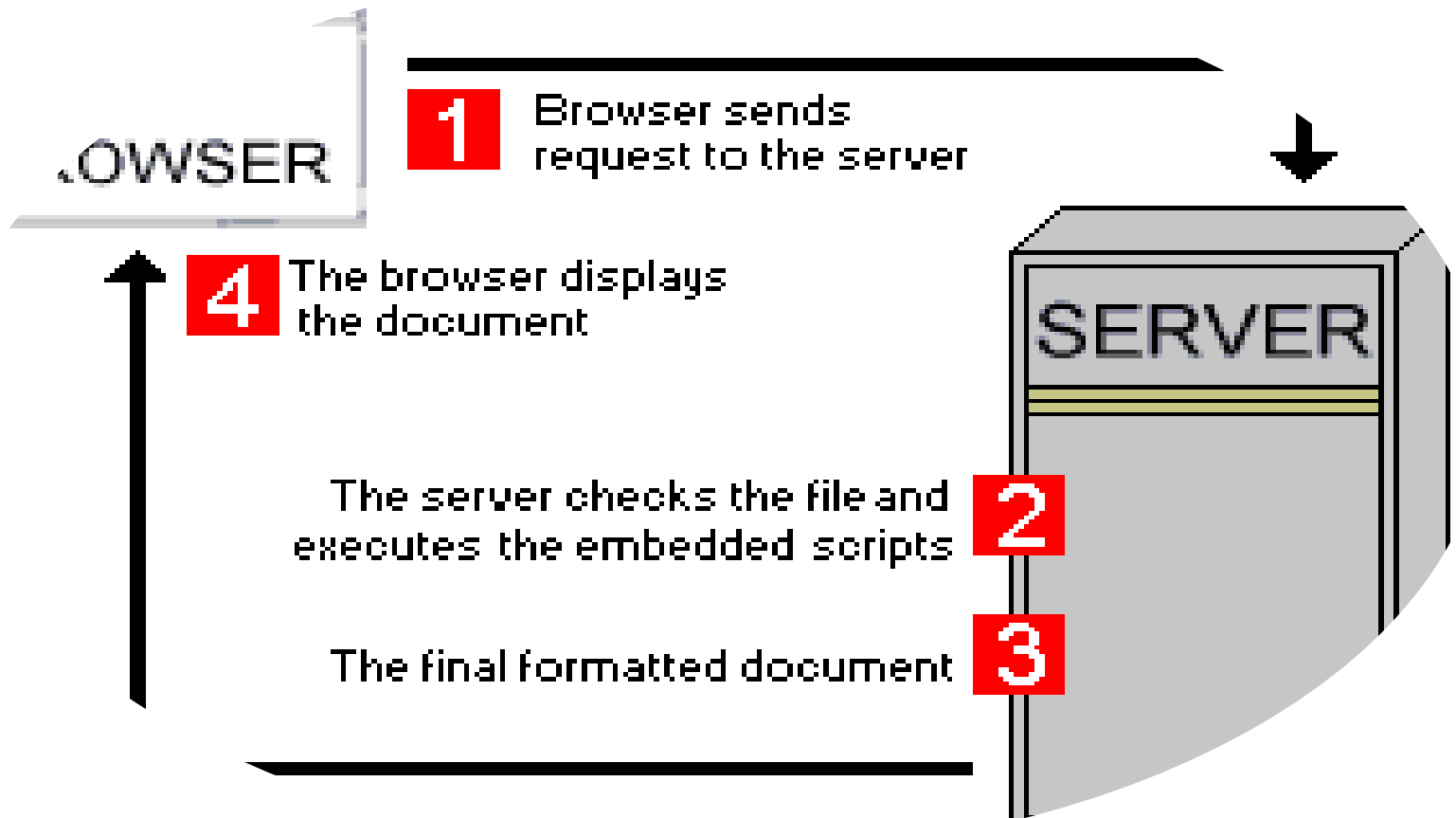- You can configure IIS via the GUI and via configuration files.

Server side Scripting Options

- JavaServerPages (JSP) by Sun Microsystems

- Hypertext Preprocessor (PHP) [open-source]

- Active Server Pages (ASP and ASP.NET) by Microsoft

Client-side scripting

- Client-side scripting
  - Validates user input
  - Accesses the browser
  - Enhances Web pages with ActiveX® controls, applets, etc.
  - Manipulates browser documents
- Client-side validation
  - Reduces number of requests that need to be passed to server
- Client-side scripting limitations
  - Browser dependency
  - Viewable to users through **View Source** command
- JavaScript most popular client-side script

What is server-side scripting?

ROWSER

1 Browser sends request to the server

4 The browser displays the document

SERVER

The server checks the file and executes the embedded scripts **2**
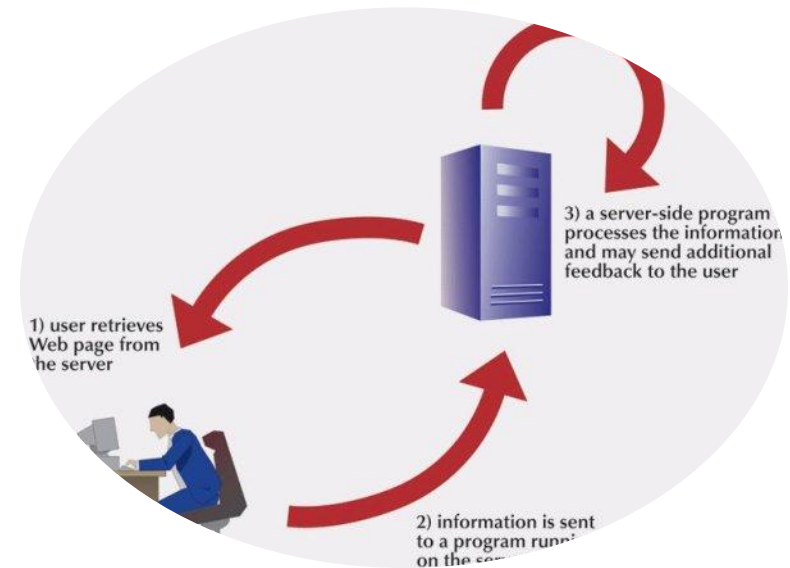
The final formatted document **3**

What can server scripts do?

- Customize a web page and dynamically change its contents
- Respond to queries from users or from HTML forms
- Access database and send the information back to the browser

Advantages of server-side scripting

- User does not need to download plugins like Java or Flash

- User can create one template for the entire website

- The site can use a content management system which makes editing simpler.

- Generally quicker to load than client-side scripting

- User is able to include external files to save coding

- Scripts are hidden from view so it's more secure. Users only see the HTML output.

1) user retrieves Web page from the server

2) information is sent to a program running on the server

3) a server-side program processes the information and may send additional feedback to the user

Disadvantages of server-side scripting

- The scripts can be used by attackers to access the server. They do this by changing the URL to something that takes advantage of a hole in security. System administrators must keep all server-side scripting updated and use an application firewall to prevent this.

- Scripting software must be installed on the content management system tools in order to store the dynamic data.
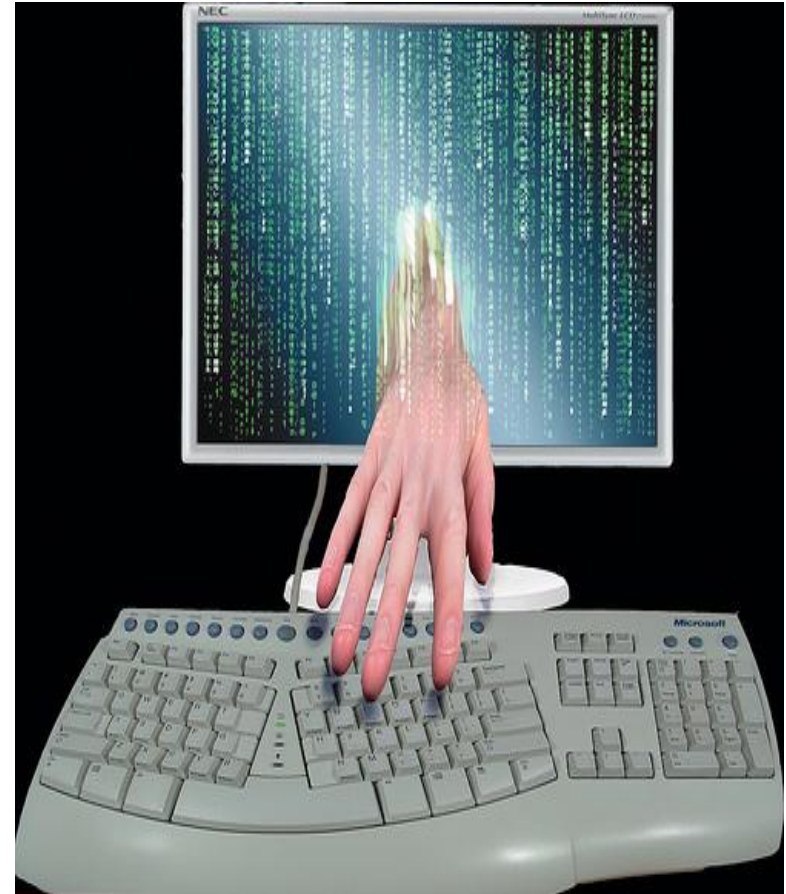
Common server-side scripting languages

- ASP/ASP.net –Active Server Pages developed by Microsoft to make advanced web pages.
- JSP/Servlets – Java Server Pages which include JSP tags mixed in with html. Most popular language for higher level applications.
- ColdFusion – Runs on top of a JSP/servlet engine. Can cost $1,299 a server. Users can download a free "developer" edition but that is limited to one IP address.

More server-side scripting languages

- **Perl – Practical Extraction and Reporting Language**,. Available for free from various scripting directories. Supported by operating systems UNIX, MAC OS 7-9 and

- **PHP or PHP Hypertext Preprocessor** is an open source language. Considered by "standard' choice for server side scripting in Unix/Linux platforms.

- **Python-** Created in 1989, it is not supported by most web hosting companies. Although easy to learn, there is no standard web application framework for it.

What is client-side scripting language?

- **Client-side scripts** are placed within an HTML document in the user's web browser rather than the web server to allow greater interactivity in a document. *For example – client-side scripting could check the user's form for errors before submitting it*

- Enables web pages to change content according to user input and other variables, including the time of day. Can also be stored in a separate file that is referenced to the documents that use it.