WWW Document Technologies

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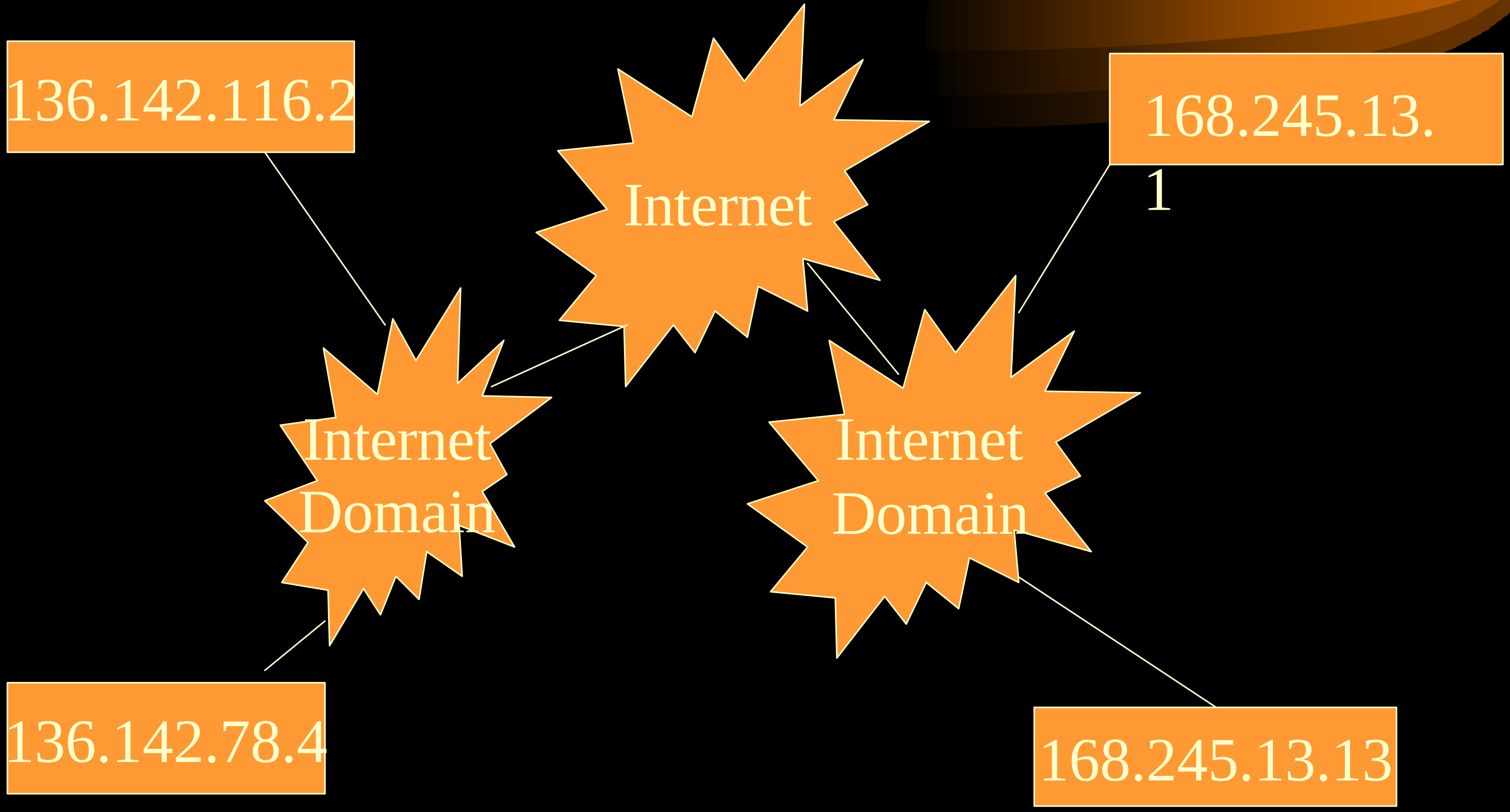
Overview

- The Internet and the World Wide Web
- HTML, SGML, and XML
- The Protocol
  - Requests and Responses
  - CGI
  - Javascript

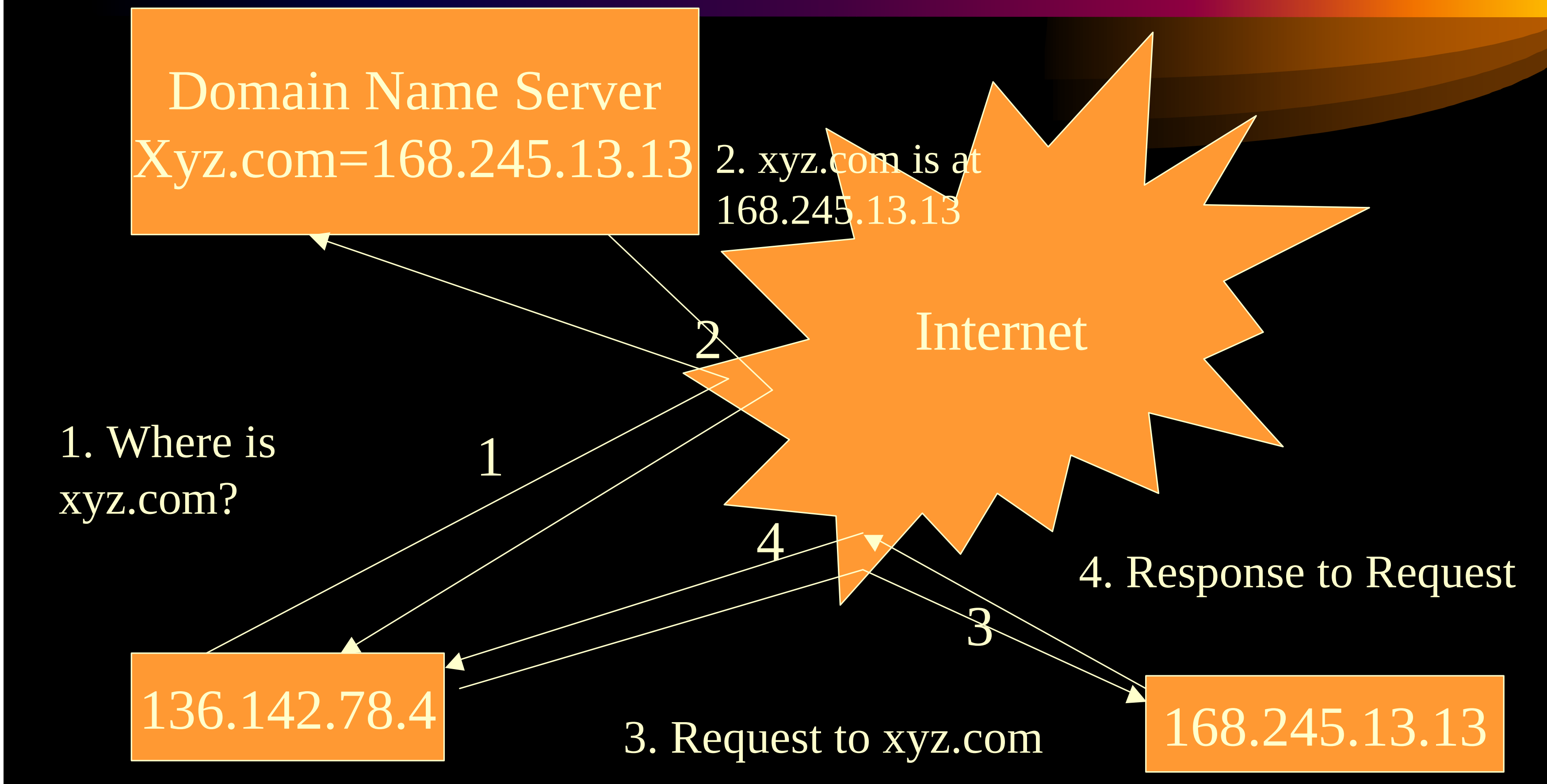
The Internet

- The internet is a set of communicating machines
- The basis for communications is:
  - a shared machine address space (IP)
  - A name lookup mechanism -- Domain Name Space (DNS)
  - A protocol for integral messaging (TCP)
  - A protocol for doing business (http)
  - Software to interpret the messages exchanged

The Internet Generically



An Internet Transaction



Domain Name Server
Xyz.com=168.245.13.13

2. xyz.com is at
168.245.13.13

Internet

1. Where is
xyz.com?

4. Response to Request

136.142.78.4

3. Request to xyz.com

168.245.13.13

The World Wide Web (History)

- 1989, March Tim Berners-Lee(TBL), working at the Swiss Institute for Particle Physics (CERN) wrote "Information Management: A Proposal"
- 1990, Oct. TBL starts work on a hypertext GUI browser+editor using a Next Machine TBL coins the term WWW
- 1990, Dec the system is demonstrated
- 1992, Jan. Line mode browser available by FTP.
- 1993, Jan. X and Mac browsers released. 50 known servers.
- 1993, February NCSA release Andreessen's "Mosaic for X"
- 1993, October Over 200 known HTTP servers.
- 1994, March Marc Andreessen and colleagues leave NCSA to form "Mosaic Communications Corp" (now Netscape).

The World Wide Web (Parts)

- Built on top of the Internet
- A simple protocol
  - GET, POST
  - PUT, HEAD, OPTIONS, TRACE, DELETE
- A simple message
  - Here is some data
  - Here is a “document”
- An increasingly complex server (state, authentication, encryption, application serving)
- An increasing complex client (parse a variety of documents, trace links, spawn applications)

The http protocol

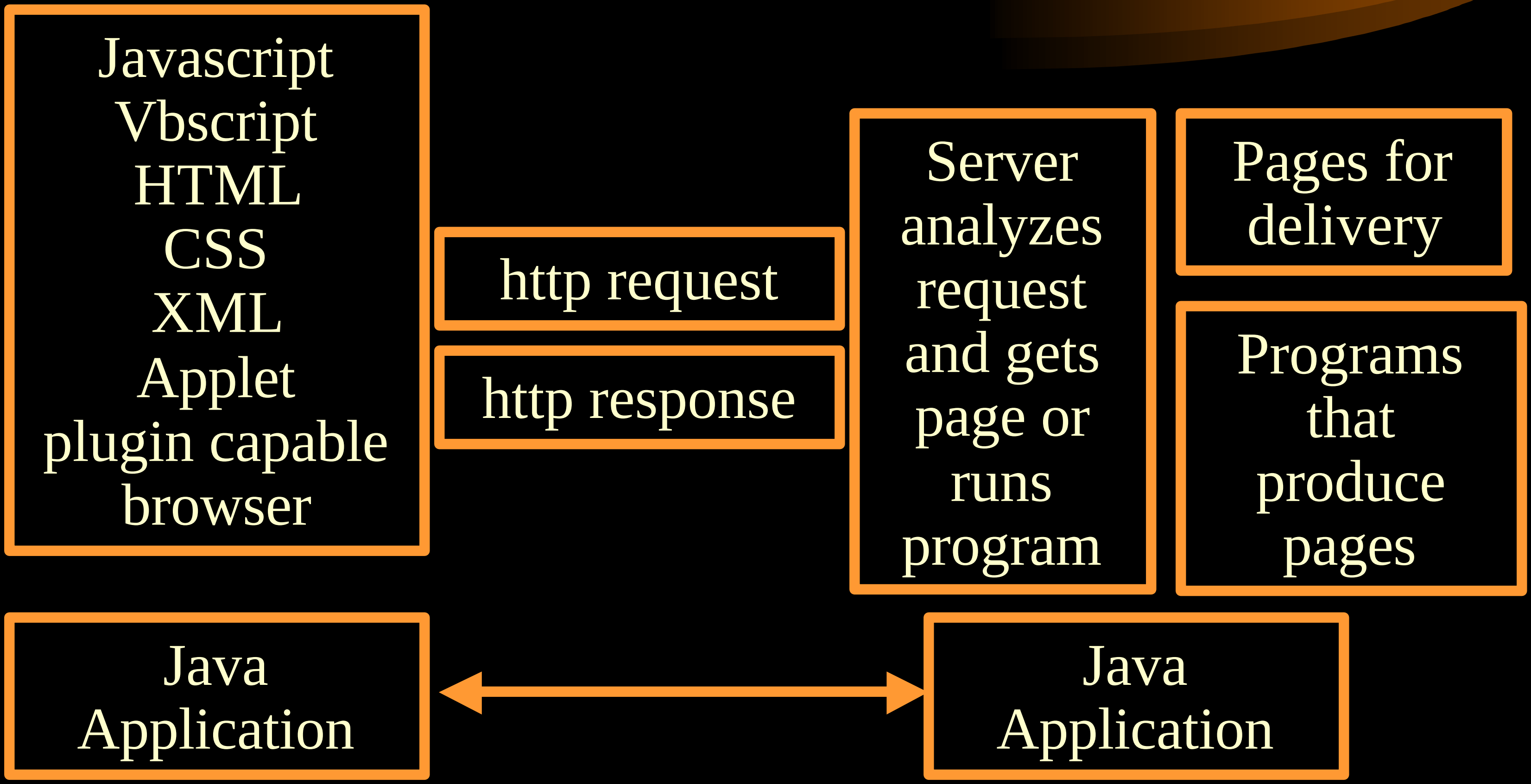
- The web protocol is very robust and very simple
- For each request, the client:
  - Does a DNS lookup if needed
  - Opens a connection to the server
  - Sends a request for a resource
- The server
  - Checks the availability of the resource
  - Returns the resource or an error message
  - Closes the connection

The structure of requests and responses

- Requests have a header and a body
- The header has many lines but:
  - Begins with one of seven standard types
- The body is null for five of the request types and contains data for the POST and PUT types

- Responses have a header and a body
- The header has many lines but:
  - Begins with a status
  - Ends with a content type
- The body contains either the resource or an explanatory message

Web Technology



Javascript
Vbscript
HTML
CSS
XML
Applet
plugin capable browser

http request

http response

Server analyzes request and gets page or runs program

Pages for delivery

Programs that produce pages

Java Application

Java Application

HTML and SGML

- The body of an http message may be anything, but frequently it is a document encoded using a markup language known as HTML
- HTML is in reality simply an SGML “Document Type Definition” (DTD)
- SGML is the “Standard Generalized Markup Language”
  - SGML (ISO 8879) is a standard for document interchange
  - SGML divorces structure and appearance
  - SGML defines the rules for defining documents

SGML Structured Documents

- SGML is important in that it defines the rules for constructing structured documents
- Under SGML a document is defined as a diredcted acyclic graphs -- i.e. tree consisting of a series of nested elements
- Elements consist of start and stop tags with the associated content
  - <name> is a start tag for element name
  - </name> is an end tag for element name
- Elements, through their tags, may have associated attribute sets.
  - <name attributename = stringvalue> associates stringvalue with attribute attributename for tis particular instance of element name

HTML and XML

- HTML is a technically weak DTD
  - It defines a very weak structure (e.g. H3 anywhere)
  - Some tags (e.g. bold) are too procedural
  - HTML 1.1 is better than 1.0
- XML is gaining momentum as a replacement
  - XML is a language, like SGML but simpler for defining DTDs
  - XML companion standards are appearing very rapidly

XML

- XML, or eXtended Markup Language was developed to replace HTML on the Web
- It is a “simplified” version of SGML
- It is extended in that it offers more capability than HTML.
- XML more complex document forms
- XML is also being used to “wrap” records.
  - XML datatypes and schema allows XML to wrap DBMS records and EDI transaction data

An Structure of an HTML Doc

- An HTML document has a <head> and a <body>
  - Don’t confuse with protocol the header and body
- The <head> of an html document contains control information (meta tags, title, keywords, scripts, etc.)
- The <body> of an html document contains all of the elements that will normally appear in the browser window

HTML Elements

- HTML elements fall into ten categories
  - Overall document structure -- head and body
  - Text level formatting – bold, italic
  - Block level -- quote
  - List tags
  - Hyperlink tags
  - Image related tags
  - Table Tags
  - Form Tags
  - Frame Tags
  - Executable Content tags

Anchors and Hyperlinks

- HTML defines an element known as an Anchor
  - <A>This is an anchor</A>
- A property or attribute of an anchor is its HREF – Hypertext Reference
  - Web HREF values are Universal Resource Locator
- <A href = http://www.sis.pitt.edu:80/~spring/index.html> Home page Michael B. Spring</A>
- A URL is made up four parts
  - A service identifier – e.g. http://
  - An Internet Address – e.g. www.sis.pitt.edu
  - A port overriding the default service specification – e.g. 8080
  - A absolute path ~spring/index.html

A Sample Request

- The user types the following in their client:

  http://www.sis.pitt.edu/~cascade/index.html

- The client sends only a header:

```
GET /~cascade/index.html HTTP/1.0
If-Modified-Since: Fri, 10 Oct 1997 17:35:54 GMT;
User-Agent: Mozilla/4.7 [en] (X11; I; SunOS 5.6 sun4u)
Pragma: no-cache
Host: www.sis.pitt.edu
Accept: image/gif, image/jpeg, image/pjpeg, image/png, */*
Accept-Encoding: gzip
Accept-Language: en-US, en
Accept-Charset: iso-8859-1,*,utf-8
```

Request/Response Headers

Authorization: encoding, name and password

Content-Encoding: how the body is encoded

Content-Length: length of the body

Content-Type: type(mime) of the body

Date: the date and time the request was generated

From: email address of the requestor

Last-Modified: date/time of last modification

Pragma: directives to the client – e.g. no-cache

Server/User Agent: server/browser type

Referer: the address of the resource of the link

A Sample Response

```
HTTP/1.1 200 OK
Date: Wed, 01 Dec 1999 16:11:19 GMT
Server: Apache/1.3.1 (Unix)
Last-Modified: Wed, 12 May 1999 20:31:56 GMT
ETag: "7a108-16c2-3739e53c"
Content-Length: 5826
Connection: close
Content-Type: text/html

<HTML>
<HEAD>
<TITLE> CASCADE </TITLE> </HEAD>…
<BODY>…
```

Status Codes

- Five categories of status code
  - 1xx: informational – used for development
  - 2xx: Successful response
  - 3xx: Redirection
  - 4xx: Client Error
  - 5xx: Server Error

- Frequently used codes:
  - 200 -- success
  - 301 and 302 – moved permanently or temporarily
  - 400 – bad request
  - 401 – unauthorized
  - 403 – forbidden
  - 404 – not found

Development of web capability

- With time, it became clear that web was too static
- The Common Gateway Interface (CGI)
  - CGI created a capability to develop dynamic pages based on server program execution. Perl became the language of choice.
- Scripting Languages
  - As the CGI load on networks and servers grew, scripting languages were developed to offload some of the demand to the client
  - Full client side applications – applets emerged as well
  - Stylesheets were also added for clients
- Active Server Pages (ASP)
  - ASPs are pages that call functions that yield specific pieces of text.
  - These provided an alternative to CGI -- programs that wrote pages.
  - Java Server Pages (JSP) parallel Microsoft’s ASP

HTML Forms and CGI

- To make pages more dynamic, the Common Gateway Interface (CGI) was defined
- CGI defines the rules for passing data to and running and application of the server
- “Forms” are to pass data to a CGI program
- The server, takes the data and gives it to the program which it runs.
- The program processes the data and returns the results to the – most commonly an HTML doc

Forms Construction

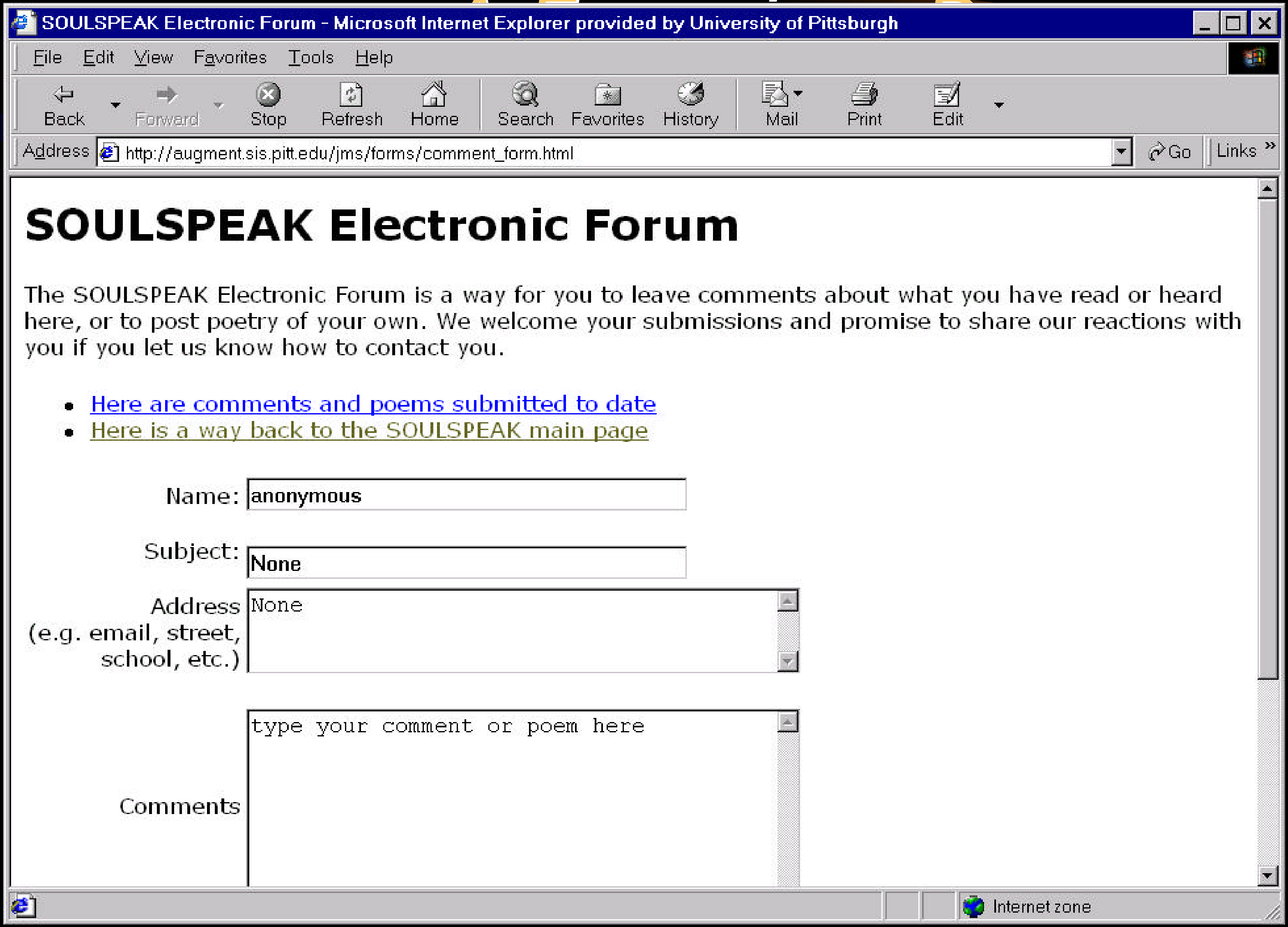
- A form is an element in the body of an HTML document.
- A form element has two attributes – method and action
  - The method specifies which http protocol will be used
  - The action specifies the program that will process the data
- A form will have one or more inputs elements

A Sample Form

```
<form
METHOD = "POST"
ACTION = "http://augment.sis.pitt.edu/cgi-bin/form.cgi">

<P>Name: <input TYPE="text"
   SIZE = "40"  MAXLENGTH ="80"
   NAME ="name" VALUE     = "anonymous">
<P>Subject: <input TYPE="text"
   SIZE = "40" MAXLENGTH ="80"
   NAME ="subject" VALUE = "None">
<input TYPE = "submit" NAME = "ssc" VALUE = "Send
   Comment">
<input TYPE = "reset"  NAME = "clr" VALUE = "Clear
   Comment">

</form>
```


SOULSPEAK Electronic Forum - Microsoft Internet Explorer provided by University of Pittsburgh
File Edit View Favorites Tools Help
Back Forward Stop Refresh Home Search Favorites History Mail Print Edit
Address http://augment.sis.pitt.edu/jms/forms/comment_form.html
Go Links
Internet zone

SOULSPEAK Electronic Forum

The SOULSPEAK Electronic Forum is a way for you to leave comments about what you have read or heard here, or to post poetry of your own. We welcome your submissions and promise to share our reactions with you if you let us know how to contact you.

- Here are comments and poems submitted to date
- Here is a way back to the SOULSPEAK main page

Name: anonymous

Subject: None

Address (e.g. email, street, school, etc.) None

Comments type your comment or poem here

Scripts

- The use of CGI for data validation, given the overhead of the transactions proved costly.
- To reduce the time and cost of simple processing, client side scripting was introduced
  - Javascript is one of the many scripting languages
  - Javascript is a java-like language that combines HTML objects and java-like syntax

A Sample Javascript

```
<HTML><HEAD><TITLE>Javascript Validation</TITLE>
<SCRIPT language="JavaScript">
<!-- begin script hide
function checknum(Obj,min,max)
{val = Obj.value
if ((val<=min)||(val>max))
      { window.alert("Value in "+Obj.name+": "+Obj.value+
        “, is out od bounds, it must be between "+
         min+" and "+max);
      Obj.value="";
      Obj.focus(); }
}
// end script -->
</SCRIPT></HEAD>
```

A Sample Javascript *(cont.)*

```
<BODY><FORM name = myform method = post action ="">
<P>Field1:<INPUT TYPE=TEXT NAME=Field1 VALUE=0
   onchange="checknum(this,0,100)">
<P>Field2:<INPUT TYPE=TEXT NAME=Field2 VALUE=0
   onchange="checknum(this,1000,2000)">
<P>Field3:<INPUT TYPE=TEXT NAME=Feild3 VALUE=0
   onchange="checknum(this,-200,100)">
<P><input type = submit name=submit>
</FORM></BODY></HTML>
```