WWW Document Technologies

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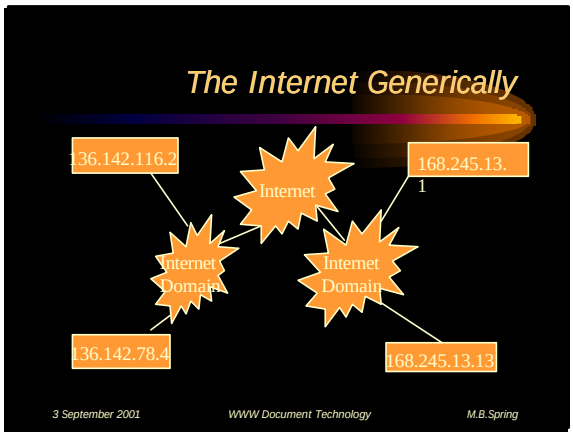
Overview

- 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



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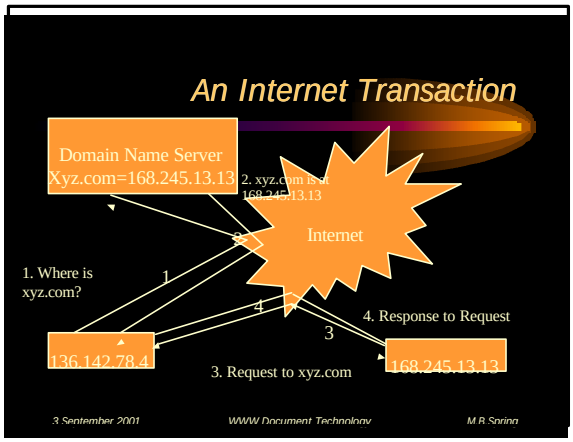
An Internet Transaction



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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).

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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

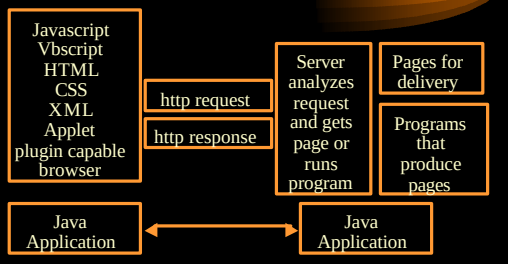
- The web protocol is very robust and very simple
- For each request, the client:
  - Does a DNS lookup if needed
  - Opens a connection to the server
  - Sends a request for a resource
- The server
  - Checks the availability of the resource
  - Returns the resource or an error message
  - Closes the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



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

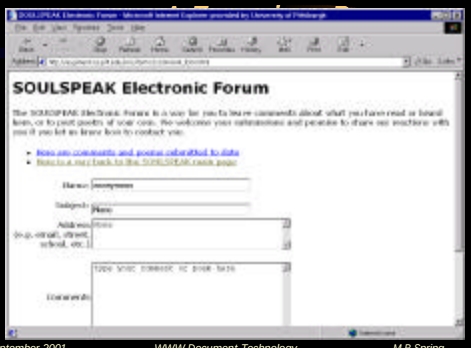
- A form is an element in the body of an HTML document.
- A form element has two attributes – method and action
  - The method specifies which http protocol will be used
  - The action specifies the program that will process the data
- A form will have one or more inputs elements

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>
```

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>
```