Web Servers

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It’s not a bug!

The terms Web and Internet are proper nouns and thus are capitalized!

Introduction

- The Internet is growing
- Not for information gain only
- Services for business, communication, entertainment
- Key to the success of the Internet

$\Longrightarrow$ Made possible by Web servers

Introduction

As Web servers play an important role

1. How to support development of Web sites towards more attractive and modern Web sites?
2. How to assure high performance in the Web?

Definitions - Web server

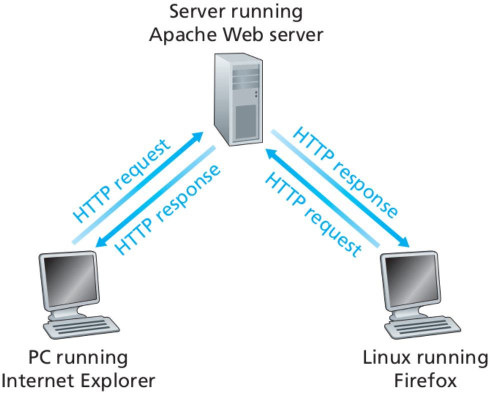


Figure 1 : Client Server Architecture. Taken from [Kurose and Ross, 2012]

Definitions - HTTP

- HyperText Transfer Protocol
- Application-layer protocol
- Server Client Architecture
- Communication by using HTTP messages

Concept

- Mainly based on HTTP
- Communication by using HTTP messages
- Static behaviour

Files addressed by URL:

- HTML files
- jpg, png, pdf etc.
- . . .

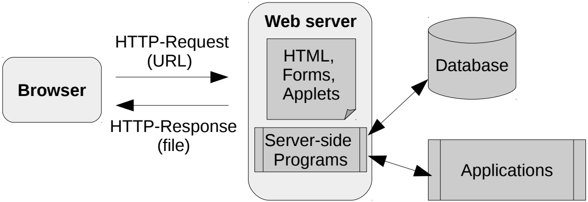


Figure 2 : Concept of an HTTP Web server

Example HTTP - Request

Example

```
GET /somedir/page.html HTTP/1.1
Host: www.someschool.edu
Connection: close
User-agent: Mozilla/5.0
Accept-language: fr
```

Listing 1 : Simple HTTP request message. Taken from [Kurose and Ross, 2012]

Example HTTP - Response

Example

```
HTTP/1.1 200 OK
Connection: close
Date: Tue, 09 Aug 2011 15:44:04 GMT
Server: Apache/2.2.3 (CentOS)
Last-Modified: Tue, 09 Aug 2011 15:11:03 GMT
Content-Length: 6821
Content-Type: text/html

 (data data data data data ...)
```

Listing 2 : Simple HTTP response message. Taken from [Kurose and Ross, 2012]

History

- Closely tied to the history of the Internet
- Web servers still rely on HTTP and HTML

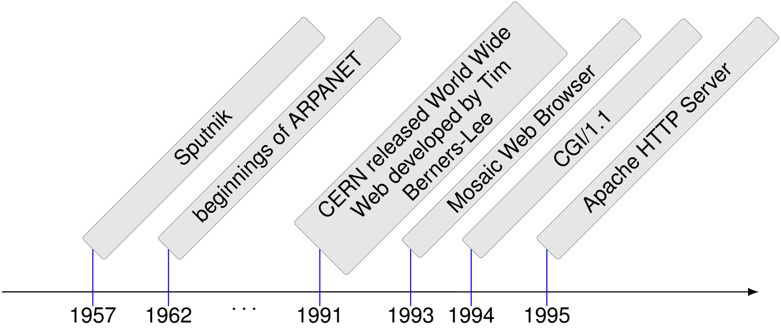
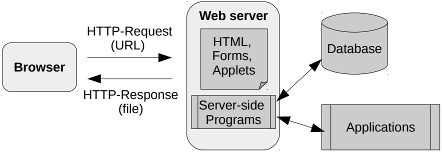


Figure 3 : Chronology of the Web

Server-side Technologies

- Need for interactivity grew
- Number of competing technologies evolved
- Used as external programs or modules
- Examples: CGI, ASP.NET, PHP, JSP



CGI - Common Gateway Interface

As defined in [Coar, 1998]:

Definition

A simple interface for running external programs, software or gateways under an information server in a platform-independent manner

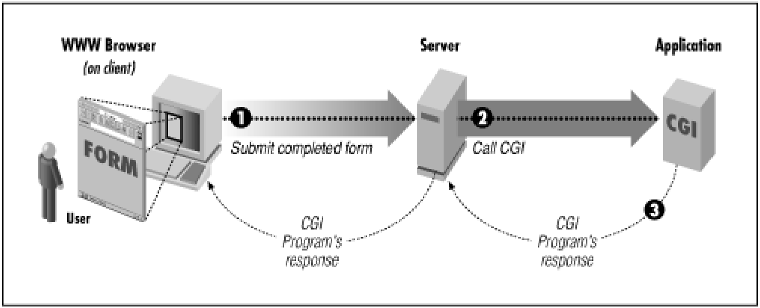


Figure 4 : How CGI works. Taken from [Gundavaram, 1996]

CGI - Common Gateway Interface

Example

```
GET /cgi-bin/welcome.pl HTTP/1.0
Accept: www/source
Accept: text/html
Accept: image/gif
User-Agent: Lynx/2.4 libwww/2.14
From: shishir@bu.edu
```

Listing 3 : Client request for CGI program. Taken from [Gundavaram, 1996]

CGI - Common Gateway Interface

Result of execution can be

- a new document
- an URL to an existing one

Advantages:

- CGI is platform-independent

Significant drawbacks:

- Low scalability
- Bad performance

$\Longrightarrow$ Most modern Web servers provide their own solutions for popular technologies, e.g. *mod_php*, *mod_perl* for Apache.

PHP:Hypertext Preprocessor

As defined in [PHP.net, 2013]:

Definition

A widely-used Open Source general-purpose scripting language that is especially suited for Web development and can be embedded into HTML. Its syntax draws upon C, Java, and Perl, and is easy to learn.

- According to [W3Techs, 2013] by far the most popular used technology in Web development
- Needs to be interpreted
- Interpreter can be a module or a CGI binary
- Embedded inside HTML and executed every time the HTML file is accessed
- Usually used together with Linux, Apache Web server, MySQL (LAMP architecture)

PHP:Hypertext Preprocessor

Example

```
<?php
echo "<p>Order processed at ";
echo date(’H:i, jS F Y’);
echo "</p>";
?>
```

Listing 4 : PHP embedded in HTML. Taken from [Welling and Thomson, 2008]

PHP:Hypertext Preprocessor

Advantages of PHP:

- High performance
- High scalability
- Object oriented support
- Database integration
- Low costs

Disadvantages:

- Code maintenance
- Not fully object oriented
- Problems with stability and interdependencies

JSP - JavaServer Pages

- Similar to PHP, but easier to achieve more structure
- Uses Java
- Meant to be used in a MVC design fashion
- All components are wrapped inside a container
- Container manages communication between JSP technology and Web server
- A popular container today is e. g. Tomcat

JSP - JavaServer Pages

- JavaBeans encapsulates the data and methods to work on it
- Servlet gets the requests and sends back responses to the Web server
- JSPs are responsible for the view

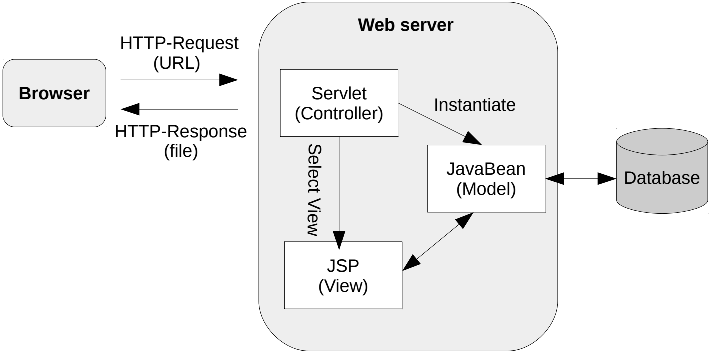


Figure 5 : Model of JSP

JSP - JavaServer Pages

Similarly to PHP, JSPs are HTML files with embedded Java code

But

Usually the code is meant as directives to display data. It should not contain logic.

JSP - JavaServer Pages

Example

```
Hobby:
<input type="text" name="hobby"
value="${refData.hobby}">
<br>
Aversion:
<input type="text" name="aversion"
value="${refData.aversion}">
```

Listing 5 : Java embedded in HTML. Taken from [Downey, 2008]

Advantages of JSP:

- Encourages more structure
- Supports Java Code

Disadvantages:

- Difficult to trace errors
- Not as good performance as PHP initially: JSPs need to be compiled

Increasing Performance

- Number of Web users grows rapidly
- Expanding Web infrastructure is expensive
- Today's Web servers generally use fair scheduling

$\Longrightarrow$ Possible solution: Size-based scheduling [Harchol-Balter et al., 2003] and [Biersack et al., 2007]

Increasing Performance

Definition

Dies ist eine Definition!

Beispiel

Dies ist ein Beispiel!

Warnung

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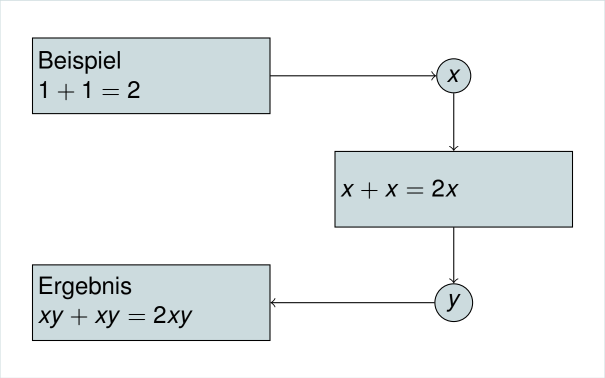
TikZ



Beispiel
$1 + 1 = 2$

x

$x + x = 2x$

y

Ergebnis
$xy + xy = 2xy$

Ende

Ich hoffe, diese Vorlage gefällt Ihnen!

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