Web Design

Introduction and the WWW Technology

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Outline

1. Internet and the WWW service
2. Introduction to HTML
3. Advanced features of HTML, XHTML
4. Introduction to Cascading Style Sheets (CSS)
5. CSS – cascade, inheritance, normal flow
6. CSS – box model, positioning
7. Midterm test
8. Media, practical use of CSS
9. Responsive design
10. CSS3, CSS frameworks
11. JavaScript and jQuery
12. Final test

Practical Part

- Practical examples during the lectures
  - Feel free to follow me!
- Labs
  - Individual work, tasks prepared in advance
- Project

  1. Creating a presentation using HTML5, CSS3 and jQuery (optional)
  2. Project presentation
- Evaluation
  - Project – **50 points + 10 for presentation**
  - Tests – **20 + 20 points**

Contact

- Lecturers
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- Course web pages
  - https://www.fit.vut.cz/study/course/ITWe/

Web Design

Web Design

- Web presentation A showcase of a company (organization, product, …)
- Web Design Design and implementation of a web presentation
- Includes many tasks:
  - Initial analysis
  - Information architecture design
  - Graphical design
  - Content preparation
  - Implementation (coding)
  - Testing
  - Publishing on the Web
  - Monitoring, link building, …
- Usually performed by a team of experts

Web Design Professions

- Consultant
  - What does the client want and need?
- Copywriter
  - How to write the text in order to sell?
- UX (user-experience) designer
  - How will the user find the relevant information?
- Graphic designer
  - How to present the contents in a visual way?
- Coder
  - How to get all this into the user's browser?
- SEO consultant, link builder
  - How to get visitors?
- Marketing consultant
  - How to earn money on this?

Principles of the World Wide Web

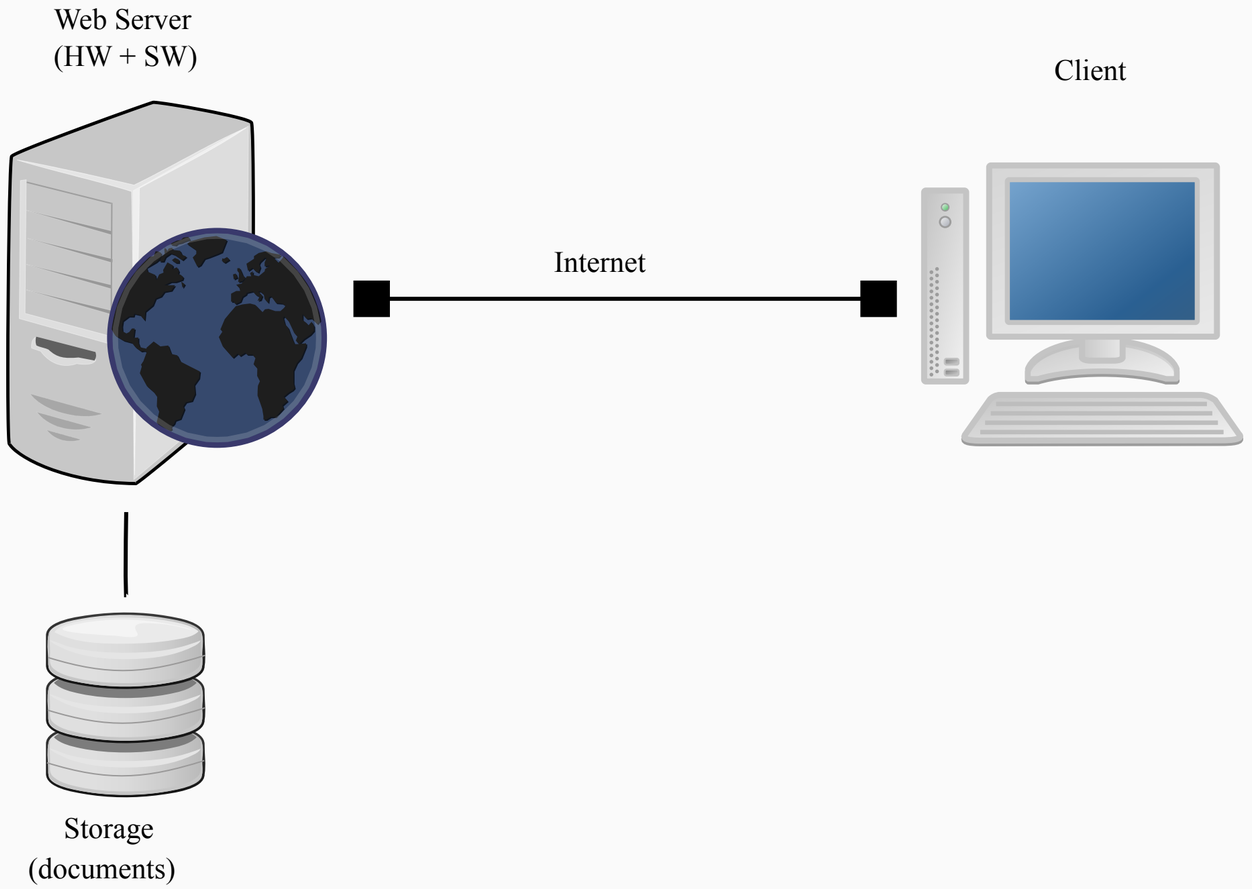
WWW

- WWW = World Wide Web
- Main features of the web
  - **Distributed**
    - Great number of independent units
  - **Heterogenous**
    - Different platforms
  - **Dynamic**
    - Still changing
  - **Document – oriented**
    - **Document** is the basic information unit

History

- **1989** – Tim Berners-Lee (CERN) publishes a paper „Information Management: A Proposal” – a proposal of the architecture and use of hypertext
- **1990** – Start of the „World Wide Web” project, first web browser, first web page
- **1992** – 26 more or less reliable servers
- **1993** – Over 200 servers (mainly academic), first aplha version of the Mosaic browser
- **1994** – The WWW Consortium (W3C) has been founded. The load of the first server `info.cern.ch` is 1000x gerater than in the beginning.
- **1996** – official HTML 3.2 specification (frames, scripts, external objects)
- **2000** – first XHTML 1.0 specification (XML-based HTML clone)
- **2004** – foundation of WHATWG – The Web Hypertext Application Technology Working Group
- **2007** – W3C and WHATWG joined to HTML WG, start of the HTML5 effort
- **2014** – HTML 5 specification finished
- … and further continuous development

WWW Architecture



WWW Server

- Document storage
  - Hierarchically organized documents in folders
  - E.g. `/products/phones/sony.html`
- Software running on the physical server
  - Sends an arbitrary document on request
  - E.g. Apache, Microsoft IIS (Internet Information Services) server, …

Other Services on Servers

- A single physical server may provide multiple services
- The service is identified by its number (port) and a name
- Examples:

Port	Name	Protocol
21	ftp	FTP
22	ssh	SSH
23	telnet	-
25	smtp	SMTP
80	**www**	**HTTP**
443	**https**	**HTTPS**

WWW Client – a Browser

- Sends a request to a server and displays the obtained document.
- Rendering (layout) engines:
  - Gecko (Mozilla Foundation)
    - Firefox
  - WebKit (Open source, KHTML + Apple)
    - Safari, formerly Chrome
  - Blink (Google)
    - Chromium (Chrome), Opera, New Edge
- Discontinued
  - Trident (Microsoft)
    - Internet Explorer
  - Edge HTML (MSHTML)
    - Old Edge browsers

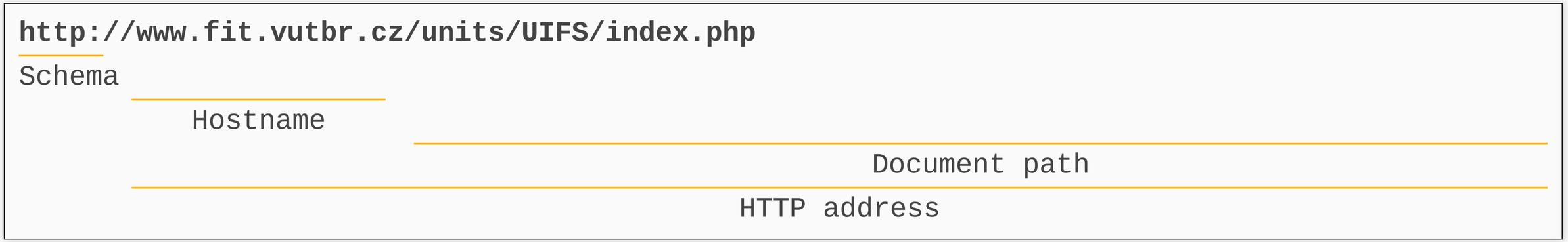
Detailed overview (@Wikipedia)

Documents on the WWW

- Document = a single file stored on the server
- Different types of documents
  - Plain text documents
  - **Hypertext documents**
  - Images
  - Multimedia data (sound, music, movies, …)
  - Programs
  - …
- Document type is distinguished using the MIME standard:
  - A specification of the form **class/type**
  - E.g. `text/plain`, `text/html`, `image/jpeg`, `video/mpeg`, …

Document Identification – URI

- URI = Unified Resource Identifier
- Uniquely identifies a single document on the Web
- Typical format



Document Identification – URI

- A port may be specified after the server name

```
http://www.fit.vutbr.cz:8080/document.html
```

- The file name need not be specified

```
http://www.fit.vutbr.cz/
http://www.fit.vutbr.cz/study/
```

- URL = Unified Resource Locator – unofficial but frequently used.
- URI is used in technical specifications.

Client-Server Communication

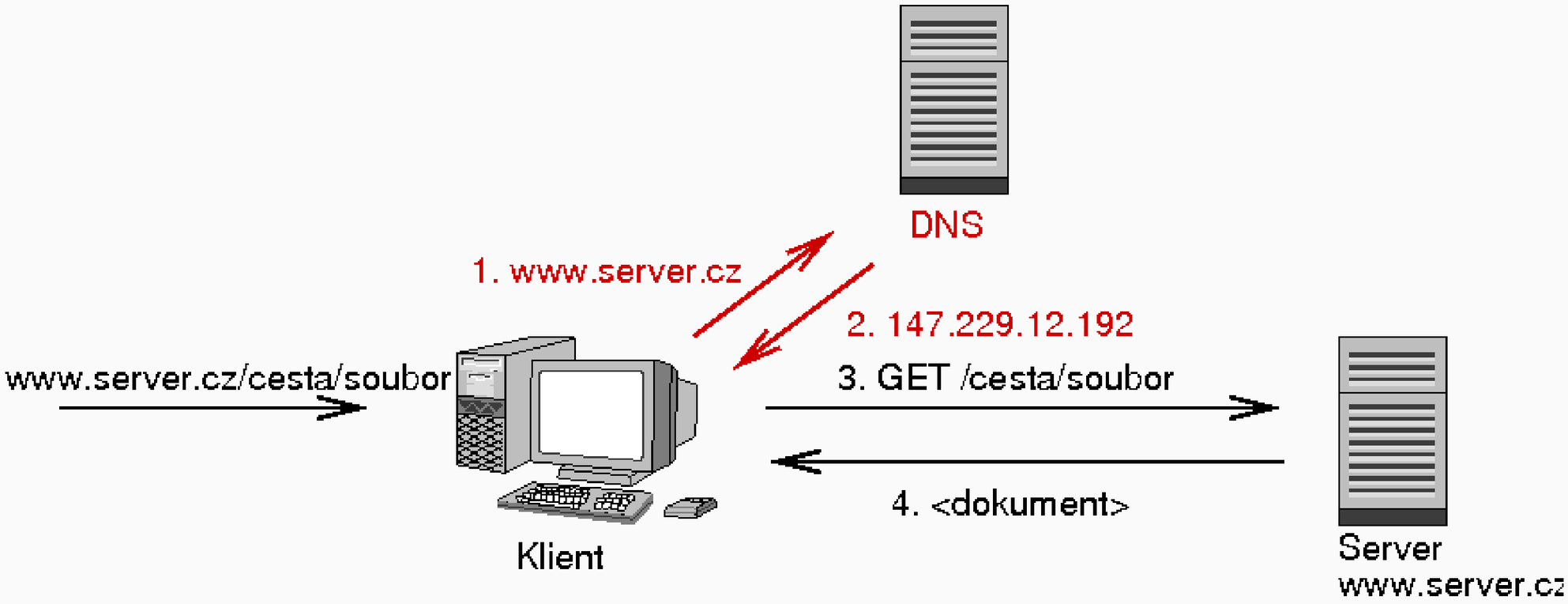
The way of the document transfer is defined in many layers:

- Physical + link - any
  - ethernet, ATM, wifi, …
- Network + transport - **TCP/IP**
  - Guarantees reliable data transport between two points
  - Defines the form of unique computer address (IP address)
- Application - mostly **HTTP**
  - HyperText Transfer Protocol
  - Defines the form of requests
  - The form of answer (required document or error)
  - Error codes

HTTP protocol

- Based on the request - response model
- No state information is stored
  - => a **stateless** protocol
- History
  - **HTTP 0.9** – just the document transport (obsolete)
  - **HTTP 1.0** – MIME types incorporated (obsolete)
  - **HTTP 1.1** – Permanent connections, content negotiation, more extensions (standard)
  - **HTTP 2** – Transfer efficiency improvements (upcoming standard)
  - **HTTP 3** – Use QUIC (UDP) instead of TCP for efficienct (upcoming standard)

HTTP Request



HTTP methods

- A „command” sent to the server
- Defines the requested action
- Server doesn't have to support all methods

Method	Description
GET	Request for document (URL)
HEAD	As GET, only the response header
POST	Additional data in the request
PUT	Document upload

HTTP request

- A request line
- Header
- An empty line
- (Request body)

```
GET /index.html HTTP/1.0
Accept: text/html
Accept: image/gif
User-Agent: Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.1)
```

Responses

- Different responses have a code number and a name
- **1xx** – information (not used yet)
- **2xx** – success
  - **200** OK
  - …
- **3xx** – another action required (redirect)
  - **301** Moved permanently
  - **302** Moved temporarily
  - …

Responses

- **4xx** - bad request
  - **400** Bad request (server doesn't understand)
  - **401** Unauthorized (user is not authorized)
  - **403** Forbidden (server is not authorized)
  - **404** Not found
  - **406** Not acceptable (requested variant is not available)
  - …
- **5xx** - server-side error
  - **500** Internal server error
  - **503** Service unavailable (overload, …)
  - **505** HTTP version not supported
  - …

Response

- Status line
- Header
- Response body (separated by a blank line)

```
HTTP/1.1 200 OK
Date: Wed, 08 Sep 2004 13:19:30 GMT
Server: Apache/1.3.31 Ben-SSL/1.55 (Unix)
Pragma: no-cache
Connection: close
Content-Type: text/html; charset=iso-8859-2
Content-Language: cs

<html>
….
```

Document Processing on the Client

- The client accepts the document and displays it
- **HTML and XML documents**
  - Interpret and display (rendering)
- **Plain text file**
  - Displayed directly
- **Bitmap images (JPG, PNG, GIF)**
  - Displayed directly
- **Others**
  - An external program is called
  - Can have a form of a plugin

MIME type

- The type of the transferred document
  - Specification in the form **class/type**
  - E.g. `text/plain`, `text/html`, `image/jpeg`, `video/mpeg`, ...
- The type information is usually sent by the server during the HTTP transfer
  - The `Content-Type:` header
  - Depends on the server settings
  - Important for processing the document by the client

More Addressing Schemes

- **http:** – use the HTTP protocol (www service)
  `http://www.fit.vutbr.cz/news`
- **https:** – secured HTTP
- **mailto:** – e-mail address
  `mailto:burgetr@fit.vutbr.cz`
- **file:** – local filesystem
  `file:///home/burgetr/text.html`
  `file://C:\My Documents\text.html`

Cache

- Integrated in the browser
- The documents (hypertext, images, …) are stored once retrieved
- In case of the new request, we check if the document has been modified on the server
  - HEAD request
  - The expiration date is checked
- Only expired or changed documents are transfered again
- The cache behavior and expiration can be configured in each document

Cache control

- Some document don't change often - they can be stored in cache
  - Manuals, images, icons, …
- Some are always changing
  - Newspaper webs, …
- For each document, we can define
  - An expiration time (till which date it can be stored in cache)
  - Whether to allow / disallow caching
- This can be set by
  - HTTP server configuration
  - In some document directly in their contents

Dynamic pages

- Static pages
  - The content is prepared and stored on the server
  - They are just transferred to the client and displated
- Dynamic pages
  - A part of the document is a product of some program code
  - The code is stored on the server and it's executed
    - On the server when the request is received
    - On the client (in the browser) when a document containing code is received
  - Some input parametres can be processed
- Web apllication
  - Functionally interconected set of dynamic pages

Documents generated on the server

- Based on some input parametres (HTTP method POST)
- Advantages
  - No support in client needed
  - All the technology on the server side (databases, …)
- Disadvantages
  - Greater server load
  - When something changes, the whole page must be transfered again
- Known technologies
  - CGI, PHP, ASP(.NET), JSP, …

Client generated pages

- The documents contain code in some language (JavaScript)
- When displaying the page, the browser executed the code
- It may react on user activity (mouse, keyboard, …)
- Advantages
  - Speed - the page can be modified without transferring data
  - Interactive work
- Disadvantages
  - The client has to interpret the code
  - Compatibility problems
  - Security problems

Content Management Systems (CMS)

- Dynamically generate web pages based on a specification
  - Document contents
  - Page templates
  - Links among pages (menu, text links)
- CMS allows a third person to maintain the web
- Higher requirements on implementation and maintenance
- E.g. WordPress

That's all for today!