Tvorba webových stránek

Úvod a technologie WWW

FIT

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Osnova

1. **10.2.** Internet a služba WWW
2. **17.2.** Úvod do HTML
3. **24.2.** Úvod do kaskádových stylů (CSS)
4. **3.3.** Kaskádové styly – základní mechanismy
5. **10.3.** Kaskádové styly – rozmísťování prvků
6. **17.3.** Praktické použití, layouty
7. **24.3.** Půlsemestrální test
8. **31.3.** Pokročilé vlastnosti HTML 5, XHTML
9. **7.4.** Responsivní design
10. **14.4.** Rozšiřující technologie, CSS frameworky
11. **21.4.** JavaScript a jQuery
12. **18.4.** Informační architektura, použitelnost, přístupnost
13. **5.5.** Zápočtový test

Cvičení

- Praktické vyzkoušení webových technologií
  - Celkem 6 týdnů
- Dva samostatné projekty

1. Základní prezentace v HTML + CSS
2. Pokročilá prezentace s využitím HTML5, CSS3 a jQuery

- Hodnocení
  - Cvičení – **10 bodů**
  - Projekty – **20 + 30 bodů**
  - Testy (v rámci přednášek) – **20 + 20 bodů**

Plán cvičení

Cvičení v týdnu od

1. **16.2.** DNS, HTTP
2. **23.2.** Základy HTML
3. **2.3.** Základní styl pomocí CSS
4. **9.3.** Rozložení stránky pomocí CSS
5. **20.4.** CSS3
6. **27.4.** JavaScript & JQuery

(**Pozor:** Páteční cvičení v dubnu budou o týden dříve, viz IS VUT)

Osoby a obsazení

- Přednášky
  - Radek Burget, burgetr@fit.vut.cz https://www.fit.vut.cz/person/burgetr/
  - Jiří Hynek, hynek@vut.cz https://www.fit.vut.cz/person/hynek/
- Cvičení
  - viz Moodle

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

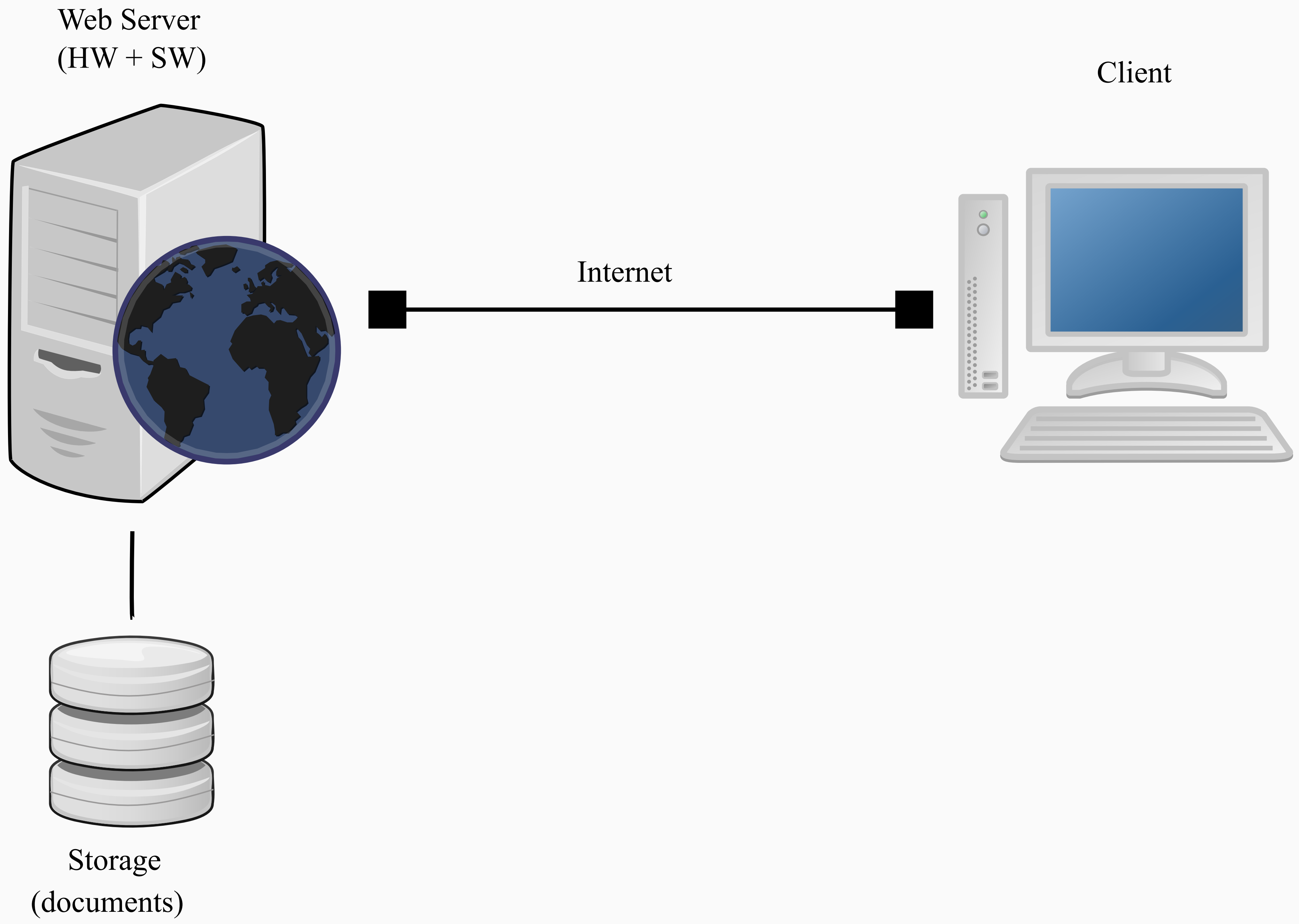
WWW

- 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

```
http://www.fit.vutbr.cz/units/UIFS/index.php
-----
Schema
       ---------------
           Hostname
                        -----------------------------------------
                                          Document path
       --------------------------------------------------------------
                                  HTTP address
```

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

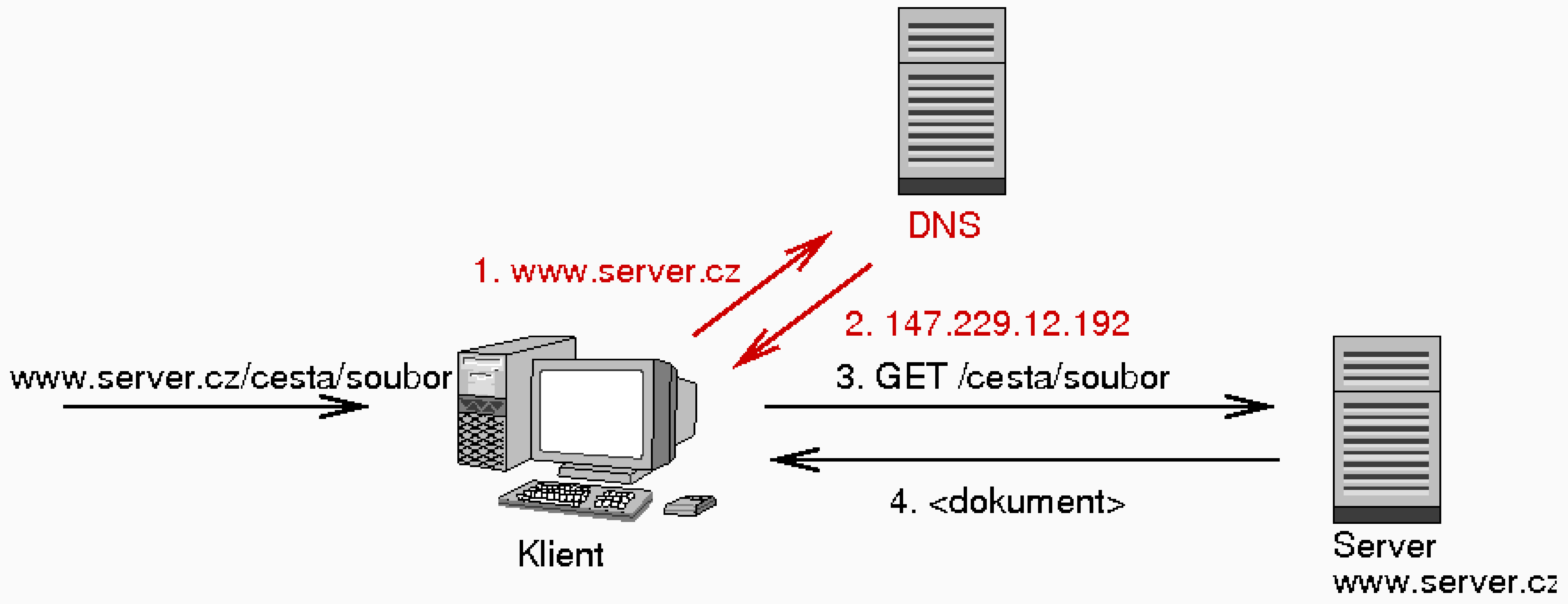
The way of the document transfer is defined in many layers:

- 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 efficient (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!