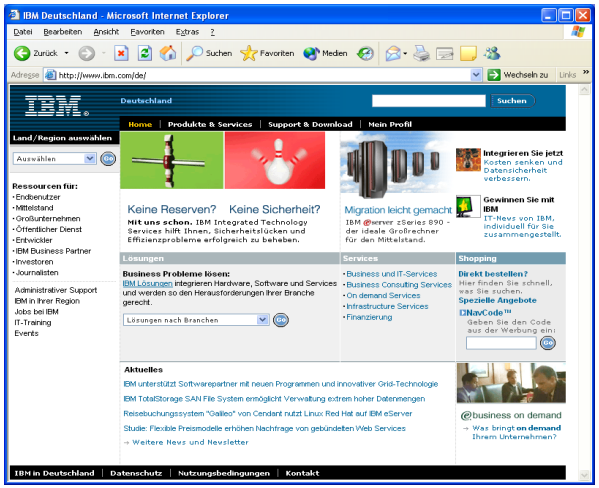
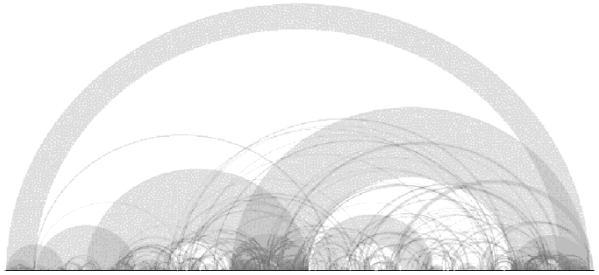
Mensch-Maschine-Interaktion II
Human-Machine Interaction II

Prof. Andreas Butz / Dr. Paul Holleis
Ludwig-Maximilians-Universität München
Wintersemester 2009/10

Structure



- Chapter 1:
  HCI and the WWW
- Chapter 2:
  Mobile and Ubiquitous User Interfaces
- Chapter 3:
  Information Visualization



Vorbemerkung: Deutsch und Englisch

- Viele Materialien sind nur in englischer Sprache verfügbar
  - ...oder in besserer Qualität / Aktualität

- Wissenschaftliches Arbeiten ist international
  - Die Wissenschaftssprache ist englisch
  - Austausch von Materialien zwischen Lehre und Forschung in deutscher Sprache ist schwierig
  - Viele Begriffe sind in englischer Sprache geprägt und schwer zu übersetzen

- Konsequenz:
  - Lehrmaterialien in englischer Sprache!
  - Unterricht in deutscher Sprache.

Organisatorisches

- Geeignet für Diplomstudenten (nicht anrechenbar für Bachelor)
- Die Lehrveranstaltung (2V+2Ü) besteht aus:
  - Vorlesung (vsl. 12 Doppelstunden, davon 2-3 mit externen Referenten)
    - » A. Butz & P. Holleis nach Themenblöcken
  - Übungen: Fabian Hennecke
    - » in 3-Personen-Arbeitsgruppen
    - » sowohl Einzel- als auch Gruppenaufgaben

- Für Leistungsnachweis (siehe auch nächste Folie):
  - Erfolgreiche Bearbeitung von allen Einzel- und Gruppenaufgaben
  - Teilnahme an einer zusätzlichen Nutzerstudie (verschiedene Angebote)
    - » aus Projekt-, Diplom- und Forschungsarbeiten
- Einbringung in mündliche Prüfung
  - Fachgebiet MM für Medieninformatik-Studierende
  - Fachgebiet A für Informatik-Studierende

Übungen (Pflichtveranstaltung!)

- Wöchentliche Aufgaben
  - Gruppenweise zu bearbeiten, insgesamt 55 Punkte erreichbar
  - Bei anspruchsvollen / aufwändigen Aufgaben 2 Wochen Bearbeitungszeit
  - Pro Aufgabe max. 5 Punkte erreichbar (10 bei 2 Wochen Bearbeitungszeit)
- Einzeln zu bearbeitende Aufgaben
  - Zusammenfassung der Pflichtlektüre, bis zu 35 Punkte erreichbar
    - Vsl. 4 Artikel, Zusammenfassung ca. 100 Worte pro Artikel
- Teilnahme an einer Nutzerstudie
- Anmeldung über UniWorx (siehe Webseite zur Vorlesung)
- Schein bei mindestens 60 von 90 erreichbaren Punkten
- Termine (Beginn: Freitag 23.10.2009 bzw. Montag 26.10.2009)
  - Montags, 12-14 Uhr, Hauptgebäude D Z007
  - Freitags, 12-14 Uhr, Hauptgebäude D Z007
- Bei “Wiederverwerten” von Lösungen, Kopieren der Pflichtlektüren-Zusammenfassung u.Ä. kein Schein!

Website

- http://www.medien.informatik.uni-muenchen.de/mmi2

- Content
  - General Information / news
  - Lecture Slides
  - Exercises
  - Literature
  - Links

1 HCI and the Web

Main Literature:

- Jakob Nielsen: Designing Web Usability, New Riders 2000
- Steve Krug: Don't Make Me Think, New Riders 2006 (2nd ed.)
- Shneiderman, Plaisant: Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition)

Building Successful Digital Products

- Tension
  - different objectives
  - different design goals
- Step by step 1-2-3
- Solution
  - Products in the overlapping space

From A. Cooper, About Face 2.0

What is Usability?

- “Usability is a quality attribute that assesses how easy user interfaces are to use. The word ‘usability’ also refers to methods for improving ease-of-use during the design process.” (Jakob Nielsen)

- “Scientific discipline using observation, measurement and design principles to enhance a site visitor’s ability to perform specific tasks” (Kathy Gill)

- “… the **effectiveness**, **efficiency** and **satisfaction** with which a specified set of users can achieve a specified set of tasks …” (ISO)

Why is Usability Important?

- Improving usability can
  - Increase productivity of users
  - Reduce costs (support, efficiency)
  - Increase sales/revenue (web-shop)
  - Enhance customer loyalty
  - Win new customers

- Several case studies that show the benefit of usability

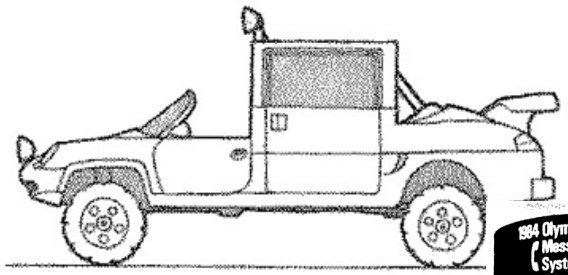
- Usability is often considered as sign of quality

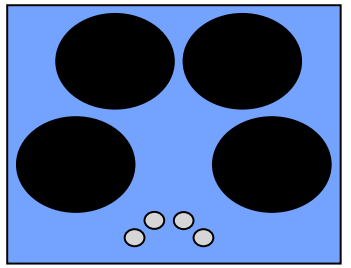
- Working with users can create ideas for new products, e.g. "similarities" feature (*people who bought this also bought that*) at amazon.com (Source: Interview Maryam Mohit)

Human-Computer Interaction Basics (1): Views and Models

- Facade & machinery and their integration
  - What the user sees and what happens in the background
  - What humans ***can perceive***
    - » Physiological and psychological limitations
  - What users ***want***
    - » Requirements analysis, studies
  - What humans ***make of*** what they see
    - » Mental models

- Create adequate conceptual models
  - Make the application domain visible/tangible
  - “Know Thy User”
  - Map internal functions to externally visible affordances
  - Create an experience





Human-Computer Interaction Basics (2): Process

- Investigate requirements seriously
  - Observations, studies, focus groups
- Usability is a central element of all development activities
  - Part of quality assurance
- Iterative development
  - Early prototypes: Paper prototypes, mock-ups
  - High-fidelity prototypes & user studies
- Guidelines and principles
  - E.g. learnability, efficiency, memorability, errors, satisfaction (Nielsen)
- Evaluation
  - Usability engineering as an empirical discipline

Web Usability

- Usability of Web sites and applications delivered over the WWW
- Dependent on several issues related to
  - Web technology
  - Web design
  - Project Management
  - Usability evaluation
- Web usability is **not** about “adding some fancy graphics, color, and cool styles at the end of the project”
- Web usability can be measured!

What are potential problems? (1)

- From http://www.siteusability.com/mistakes.html (now offline)

- **Downright errors:**
  - Broken links or missing images.
  - Firewall errors, server cannot be contacted, directory browsing not allowed (or allowed?).
  - Scripting errors that pop up an error message, make the page unusable, or write strings of gibberish amongst the text.
  - HTML coding errors that mean the page doesn't display properly, or at all.

What are potential problems? (2)

- **Annoying or inaccessible page design:**
  - An "entrance tunnel" or splash screen - lots of flashy imagery but no real content that requires a click to get to the real home page.
  - Pages with such poor contrast between background and text they are hard to read.
  - Text in tiny or illegible fonts.
  - Pages that take minutes to download (even worse if when they have finished, you weren't interested in the content anyway).
  - Content that requires a specialized plug-in to read it.
  - Pages that require a specific browser to display nicely.
  - Links that lead to "under construction" pages.
  - Link color schemes where you can't tell which ones you have already visited.
  - Links with badly-chosen targets that display numerous hidden windows on the desktop, break the Back button, or display pages without the necessary menus to use them properly.
  - Forms where you don't know what the site owners want to do with the information you are asked to supply.
  - Forms that don't explain properly what you need to enter, or don't let you go back and amend any errors.
  - Pages with typographical or grammatical errors, confusing and poorly-written text, or inconsistent terminology.

What are potential problems? (3)

- **Search engine problems:**
  - Pages with no links to other pages in the site.
  - Pages called "No title", "Untitled", "Insert document title here", and/or with a meaningless abstract, so the user has no idea if the link is relevant or not.
  - Pages that no longer exist on your site because you moved or renamed them.
  - Pages so poorly designed they will never even appear in a search engine listing.

What are potential problems? (4)

- **Information architecture problems:**
  - Pages with different layouts and appearance for the same kind of information.
  - Very long pages with no quick way to skip about them.
  - Forms that don't work in a comprehensible way, and shopping cart systems that confuse in their complexity.
  - Links that lead to mystery destinations (e.g. "click here"), or to other sites without warning.
  - Overwhelming numbers of links on the home (or other) page.
  - Menu options or navigation bar icons that mean little to the average visitor.
  - No consistent way to move around the site on every page.
  - No clear distinction between different kinds of information.
  - Confusing site structure so the visitor cannot guess where to go for information.

What are potential problems? (5)

- **E-commerce problems:**
  - Potential buyers can't find the product they want because they don't understand the categories you have chosen.
  - Visitors leave without purchasing because they don't want to register.
  - Visitors can't find your returns policy or how their privacy is protected if they buy from you.
  - Buyers have to work out the shipping and handling charges for themselves when viewing an item in your online catalogue.
  - Visitors from overseas don't understand the measurement system you use for sizes or weights.
  - ... the list of potential problems is endless - this just skims the surface for sites selling to the consumer.

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What do we need for a distributed system to share documents?

- How are documents encoded?
  - Content
  - Semantics
  - Presentation
- How are documents identified?
  - Where is data held?
  - How can data be accessed?
- How are documents transmitted/transported to the user?
  - Which protocol(s)?
  - Whole or in chunks?

Distributed File Servers

- Document format
  - Any document
- Mechanism for identification
  - File name (Alias for server name and path)
- Transfer protocol
  - E.g. SMB/CIFS, NFS, AFP

The WWW Approach

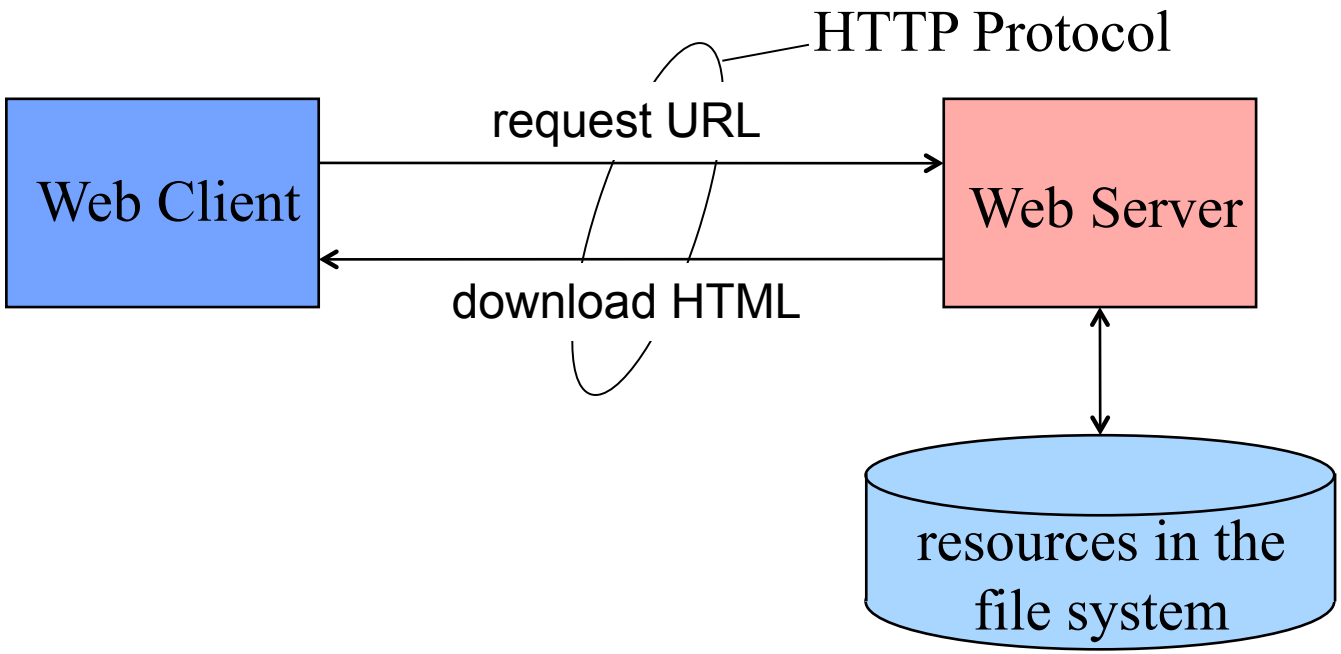
- Document format
  - Hypertext Markup Language, HTML
    - » Document Type of Standardized General Markup Language (SGML)
  - Alternative (simpler): XHTML, based on XML
- Mechanism for identification
  - Uniform Resource Identifier, URI
    - » used as Uniform Resource Locator, URL
- Transfer protocol
  - Hypertext Transfer Protocol, HTTP
    - » ASCII-coded Request-Reply protocol using TCP/IP

Mixture of Content, Semantics, Presentation

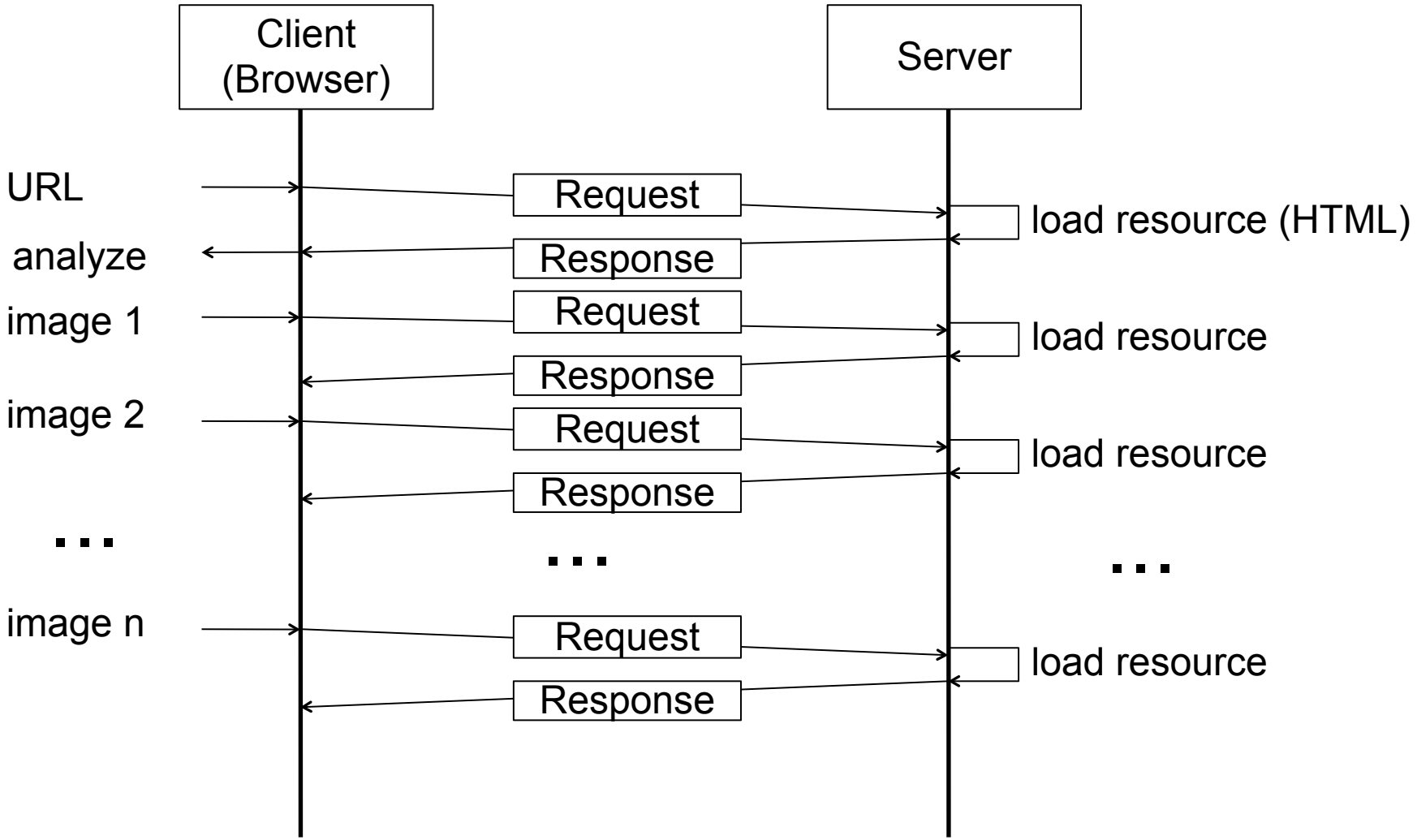
```
<!DOCTYPE HTML PUBLIC "-/W3C//DTD HTML 4.01 Transitional//EN"
  "http://www.w3.org/TR/REC-html41/loose.dtd">

<HTML>
  <HEAD>
    <TITLE>Simple Example Document in HTML</TITLE>
    <META name="author" content=„A. Uthor">
    <META name="description" content="Just for demo">
  </HEAD>

  <BODY>
    A simple text. <BR>
    <FONT FACE="Helvetica">Font Helvetica</FONT> <BR>
    <FONT FACE="Times">Font Times</FONT> <BR>
    <B>Bold</B> <I>Italic</I>
  </BODY>
</HTML>
```

Architecture and Protocol (simplified)

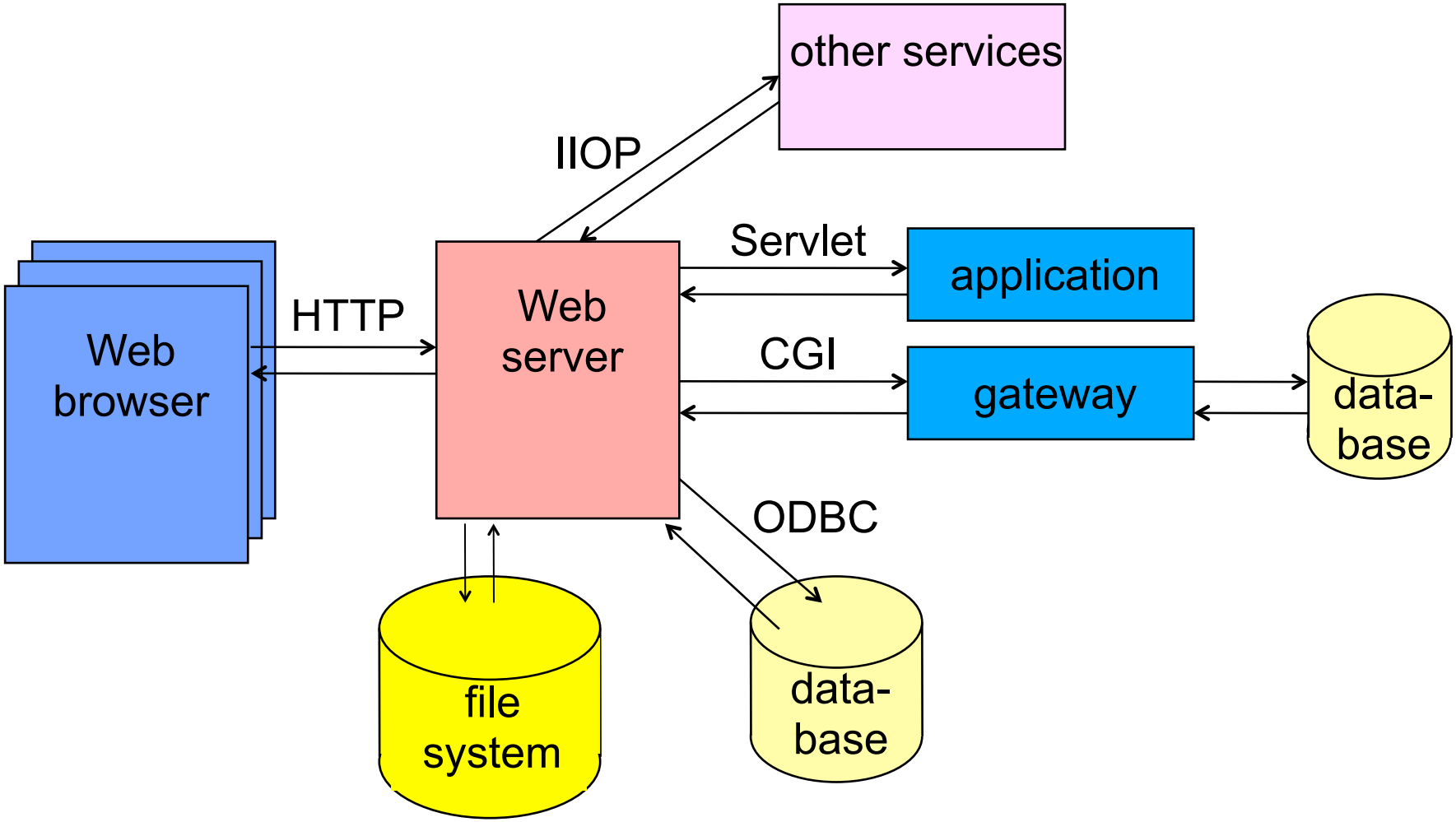
- Client-server architecture
- Synchronous communication model (request/response)
- Resources
  - Unit that is communicated between Client and Server
  - Static or dynamic



Documents and Resources



Example Architecture



The WWW is a Distributed System

- What is a distributed System?
  - Tanenbaum, A.,S. (from Computer Networks)
    "... in a distributed system, the existence of multiple autonomous computers is transparent (i.e., not visible) to the user."
  - Leslie Lamport:

```
Received: by jumbo.dec.com (5.54.3/4.7.34)
         id AA09105; Thu, 28 May 87 12:23:29 PDT
Date: Thu, 28 May 87 12:23:29 PDT
From: lamport (Leslie Lamport)
Message-Id: <8705281923.AA09105@jumbo.dec.com>
To: src-t
Subject: distribution



There has been considerable debate over the years about what
constitutes a distributed system.  It would appear that the following
definition has been adopted at SRC:

  A distributed system is one in which the failure of a computer
  you didn't even know existed can render your own computer
  unusable.
```

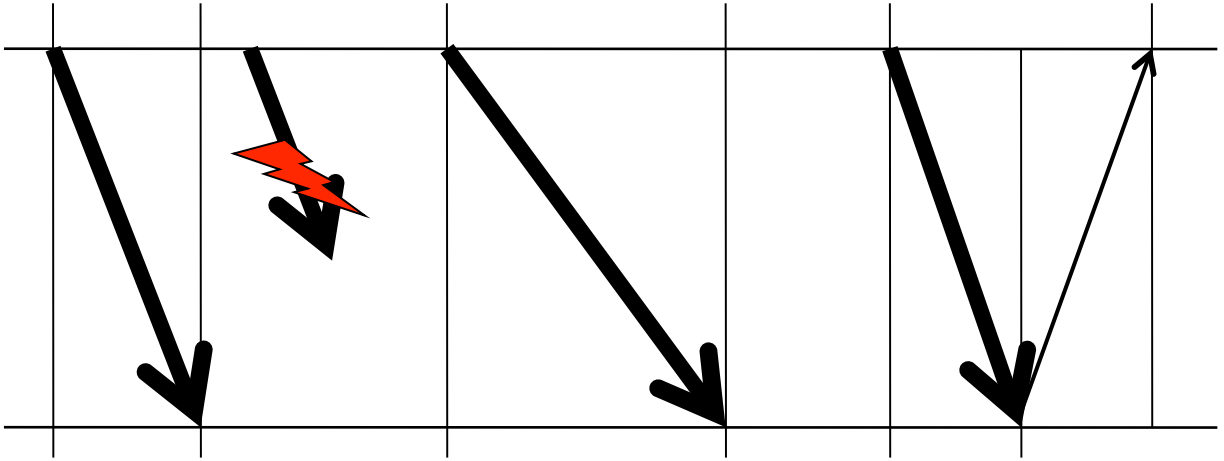
Information Exchange Between Browser and Server

- Obviously the document
- Further information available (e.g. header fields)
  - Browser type and version
  - Operating system (version)
  - Referer
  - Cookies
  - Screen size, window size
  - If Java/JavaScript/VBScript are enabled
  - List of plug-ins installed
  - Network parameter and route
  - …
- Rich source of information
  - Can make applications more usable
  - Information may not be complete or may be wrong

Try it out at:
http://network-tools.com/analyze/

The WWW is a Distributed System
Usability Issues

- Network
  - Delay
  - Failure
  - Jitter
  - Latency
  - Bandwidth



- Multi-user System
  - Work load, system performance
  - Concurrency problems

Designing Distributed Applications

- Basics
  - Applications consist of several parts (e.g. different processes)
  - In general these parts are executed on different machines
  - These parts of the application are executed concurrently or one after another
  - There is communication between these parts

- Software/Application Design Aspects
  - Data
    - » analyzing data transfer (optimize for minimum)
    - » investigate how caching can be supported
    - » keep data safe (minimize data that is given away)
  - Functional
    - » execute functions where it is most reasonable
    - » regard the infrastructure on that the applications will be executed
  - Response time (optimize for minimum)

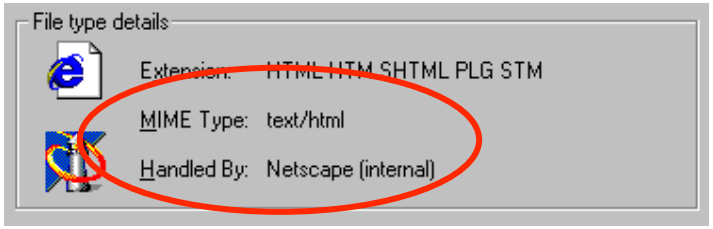
Media Types in the Web

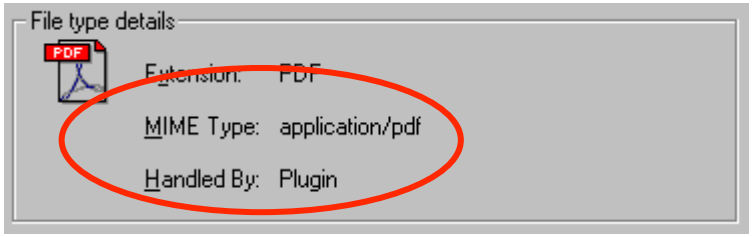
- Text / hypertext
- Inline graphics in Hypertext
- Icons / graphics (bitmap, vector) / drawings / photos
- Interactive graphics: active maps
- Animations
- Programs (e.g. JavaScript)
- Audio clips / video clips (e.g. MP3, MPG)
- Audio / video streams
- 3D-scenes (e.g. VRML)
- Objects, like Applets, Flash, …
- Any type of media ...

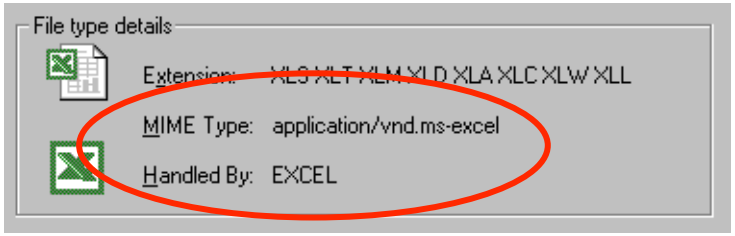
Media Types in the Web - Concept

- Open concept to integrate arbitrary media
  - transmitted in the MIME format

- Interpretation of different Media types in the WWW
  - Browser built-in for most basic types
    - » text, HTML hypertext, GIF and JPEG images
  - Using browser plug-Ins
    - » e.g. for Acrobat PDF,Real-Audio, RealVideo, Shockwave, Flash
  - Using external applications (helper applications)
    - » e.g. ghostscript for PostScript, other proprietary formats/applications
  - Save files
    - » download of arbitrary formats







MIME Extension

- Mapping of file types (e.g. extensions in the file system, UNIX) onto MIME types (on the server)

- Mapping of MIME types to applications (in the browser)

- … it is open – but this may be a serious usability problem
  - Do the users have the right connection?
  - Does the external program / plug-in work?

Technology Overview Client

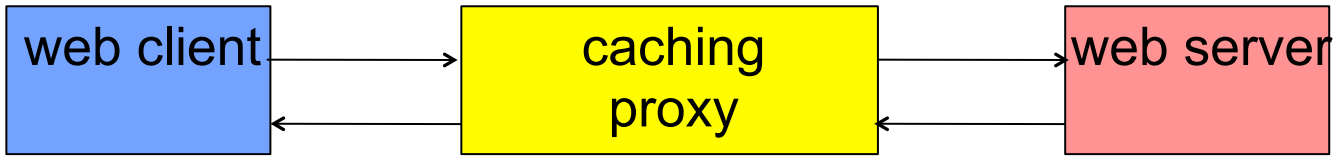
- Content that can be displayed/provided
  - Text, HTML, images, videos, audio, ...
- Content and programs that can be interpret by the browser
  - HTML
  - Browser script: JavaScript, VBScript, SMIL, MathML, ...
- Programs that are executed in the context of the browser
  - Java Applets (Byte Code, Virtual Machine)
  - Flash
  - ActiveX (Native Code, executed directly by the operating system)
- Programs that are plugged into the browser and executed in the context of the browser for specific data types
  - Plug-Ins
- External programs that are started by the browser to handle data that can not be handled by the browser
  - Helper applications

Technology Overview Server

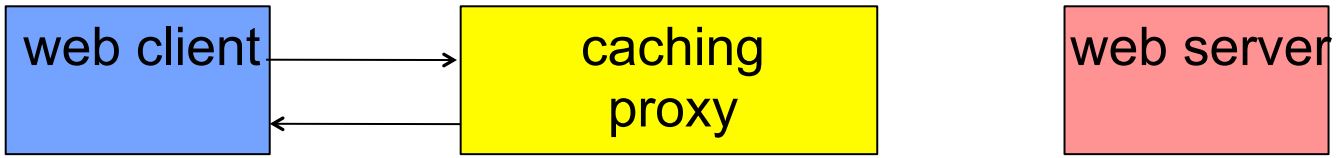
- Content (e.g. HTML-pages) that contains statements that can be replaced or executed:
  - SSI, XSSI
  - Server side scripting (ASP, PHP, JSP, ...)
- Programs that create content
  - Additional process: CGI
  - In the context of the servers: Servlets, ...
- Extensions of web servers
  - NSAPI, IISAPI, Apache-Modules, ...
- Gateways and front-ends for databases
- Application server
- Dedicated / specific server

Caching-Proxy - Example

- Cache - MISS
  - The requested resource is not stored in the cache
  - The resource is requested from the original server



- Cache - HIT
  - The requested resource is stored in the cache of the proxy and is still valid
  - The resource sent back directly from the caching proxy, it is not requested from the original host



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