Vorlesung
Advanced Topics in HCI
(Mensch-Maschine-Interaktion 2)

Ludwig-Maximilians-Universität München

LFE Medieninformatik

Albrecht Schmidt & Andreas Butz

SS2006

http://www.medien.ifi.lmu.de/

Advanced Topics in HCI
Vorlesung Mensch-Maschine-Interaktion 2

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- Vorlesung: Donnerstag, 12-14 Uhr, Theresienstraße, Raum 112
- Übungen: Mittwoch, 12.00 bis 14.00 oder Donnerstag, 14.00 bis 16.00, Amalienstraße 17, Raum 105/107 oder Computerraum EG
  Übungsleitung: Richard Atterer, Paul Holleis, Heiko Drewes
- Informationen zur Vorlesung und Übung:
  http://www.medien.ifi.lmu.de/lehre/ss2006/mmi2/

Inhalt

- Die Vorlesung „Advanced Topics in HCI“ (Mensch-Maschine-Interaktion 2) behandelt weitergehende Aspekte der Interaktion zwischen Mensch und Computer. Prinzipien und Konzepte der Mensch-Maschine-Interaktion werden in konkreten Anwendungsbereichen behandelt.

- Themen
  - Hypertext, Web Design, Web Usability, Accessability
  - Visualisierung von Information
  - UIs für mobile Geräte
  - Benutzerschnittstellen für Spiele
  - Weitere Themen:
    - User Interface Softwareentwicklung
    - Adaptive Benutzerschnittstellen und Intelligente UIs
    - Multimodale Benutzerschnittstellen
    - Tangible User Interfaces
    - Groupware, CSCW, CSCL

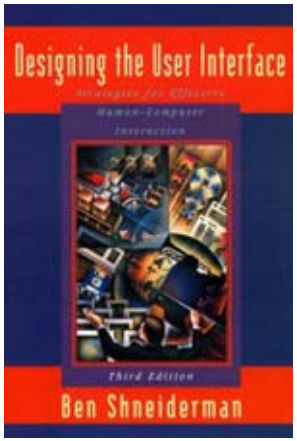
Ablauf und Anforderungen

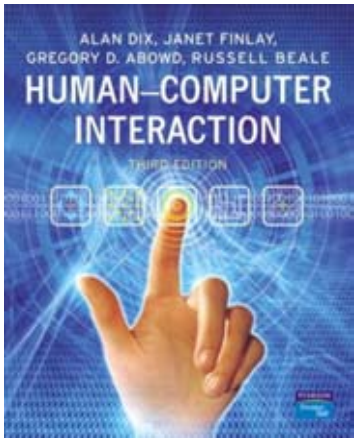
- Vorlesung mit Übung, 2h+2h
- Lesematerial (ca. ein Artikel pro Woche)
- Übungsaufgaben

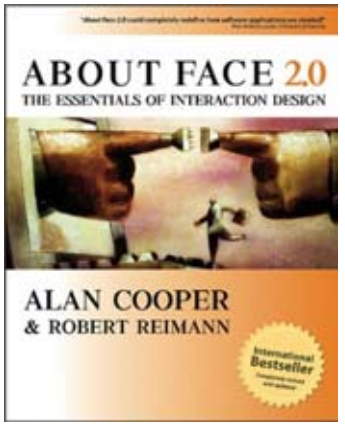
- Scheinkriterien
  - Erfolgreiche, termingerechte Abgabe aller Übungsaufgaben (oder aller bis auf eine)
  - Die abgegebenen Lösungen müssen von ausreichender Qualität sein.
  - Zusammenfassung der Pflichtlektüre (ca. 100 Worte pro Artikel)
  - Analyse von verschiedenen Web Anwendungen

- Vorkenntnisse
  - Grundstudium Medieninformatik oder Informatik
  - Grundkenntnisse im Bereich Mensch-Maschine-Interaktion
  - Grundkenntnisse in der Programmierung von graphischen Benutzerschnittstellen
  - Englische Sprachkenntnisse

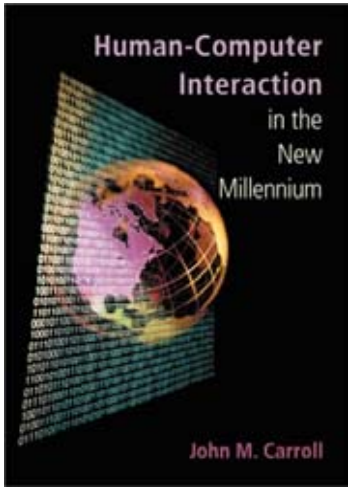
Books

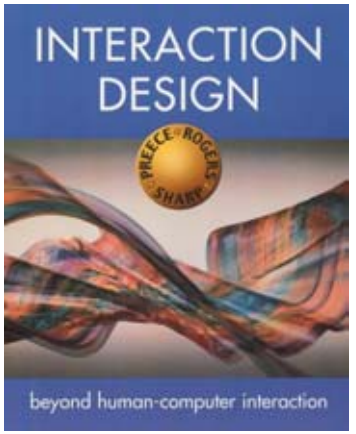






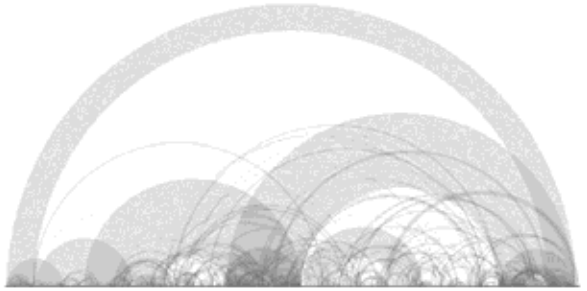
- Alan Dix, Janet Finlay, Gregory Abowd and Russell Beale. (2003) Human Computer, Interaction (third edition), Prentice Hall, ISBN 0130461091
- Ben Shneiderman. (1998) Designing the User Interface, 3rd Ed., Addison Wesley; ISBN: 0201694972
- Alan Cooper, Robert M. Reimann. (2003) About Face 2.0: The Essentials of Interaction Design; ISBN: 0764526413.
- John M. Carroll. Human-Computer Interaction in the New Millennium. Addison-Wesley Professional (2001), ISBN: 0201704471
- Jennifer Preece, Yvonne Rogers, Helen Sharp. Interaction Design. John Wiley and Sons Ltd (2002). ISBN: 0471492787





Structure

- Chapter 1:
  HCI and the WWW



- Chapter 2:
  Information Visualization

- Chapter 3:
  Mobile and Ubiquitous User Interfaces

Chapter 1: HCI and the WWW

Table of Content

1.1 Human Computer Interaction (HCI)
- a quick reminder

1.2 Web Usability
Web Technology
Web Design
Management of Web projects
Usability evaluation of Web sites and applications

1.3 Web Accessibility, Universal Access to Information

1.4 Usability Report

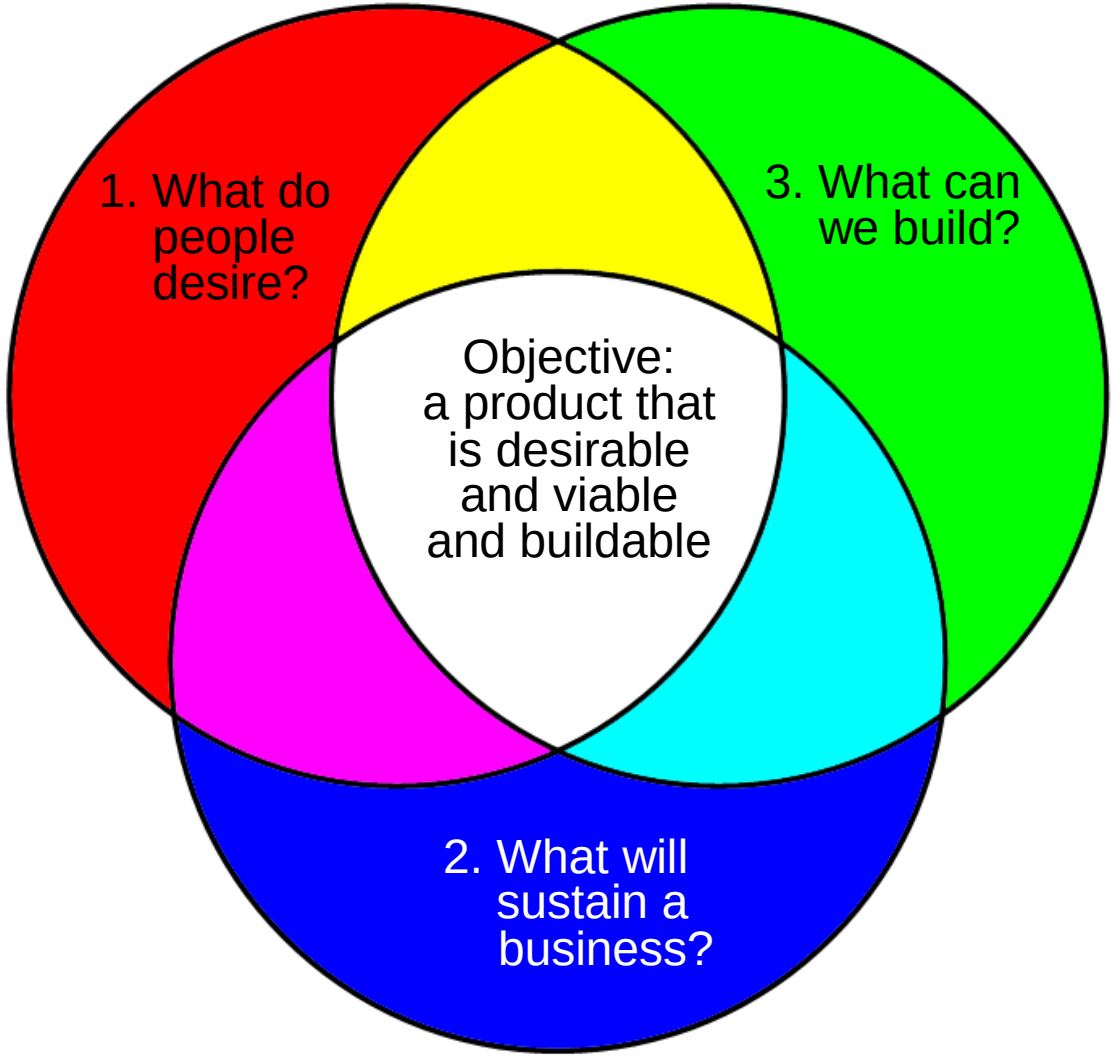
Human Computer Interaction (HCI)

- *"Human-computer interaction is a discipline concerned with the **design**, **evaluation** and **implementation** of interactive computing systems for human use and with the study of major phenomena surrounding them"*
  (working definition in the ACM SIGCHI Curricula for HCI)

- Computer science view point:
  "Interaction between one or more **humans** and one or more **computational machines**"

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 Nielson)

- “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, see Interview Maryam Mohit

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!

Excurse: Web Technology

- Web technology basics
- Heterogeneous distributed systems
- Hypertext and Hypermedia
- Media, Media Types, MIME
- Caching

What do we need for a distributed system to share documents

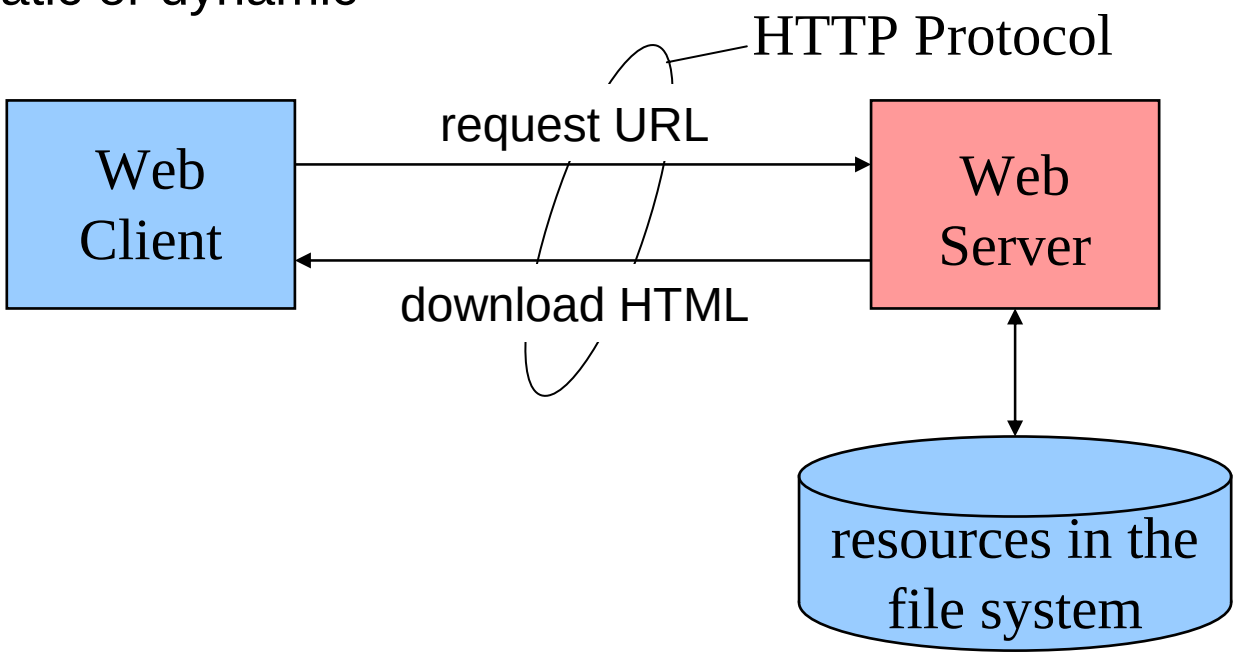
- How are documents encoded?
  - content
  - semantics
  - presentation
- How documents are identified?
  - Where is data held?
  - How can data be accessed?
- How are the documents transmitted/transported to the user?

The WWW Approach

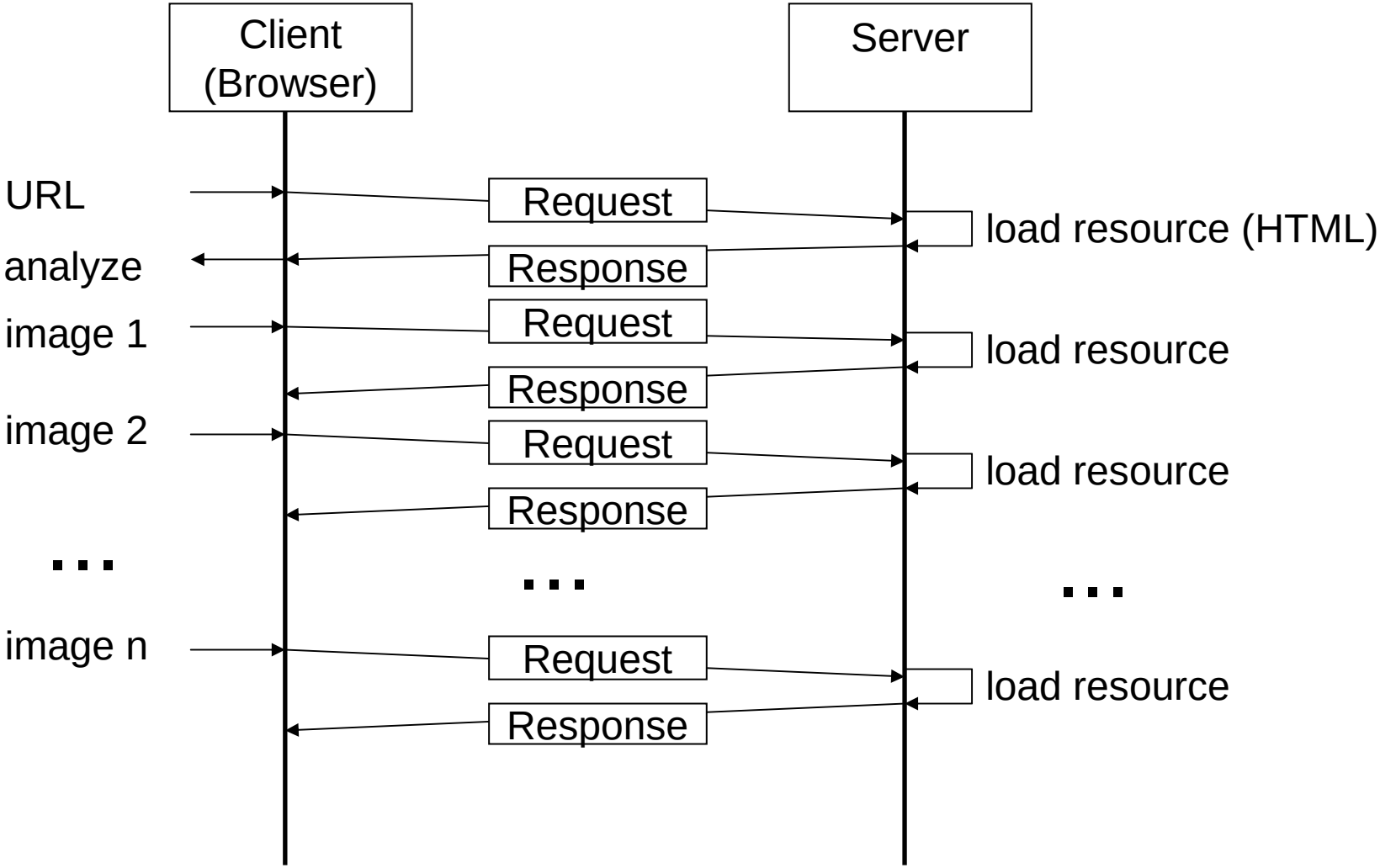
- Document format
  - Hypertext Markup Language, HTML
    - Document Type Definition (DTD)
      Standardized General Markup Language (SGML)
- Mechanism for identification
  - Uniform Resource Identifier, URI
    - use as Uniform Resource Locator, URL
- Transfer protocol
  - Hypertext Transfer Protocol, HTTP
    - ASCII-coded Request-Reply protocol using TCP/IP

Architecture and Protocol (simplified)

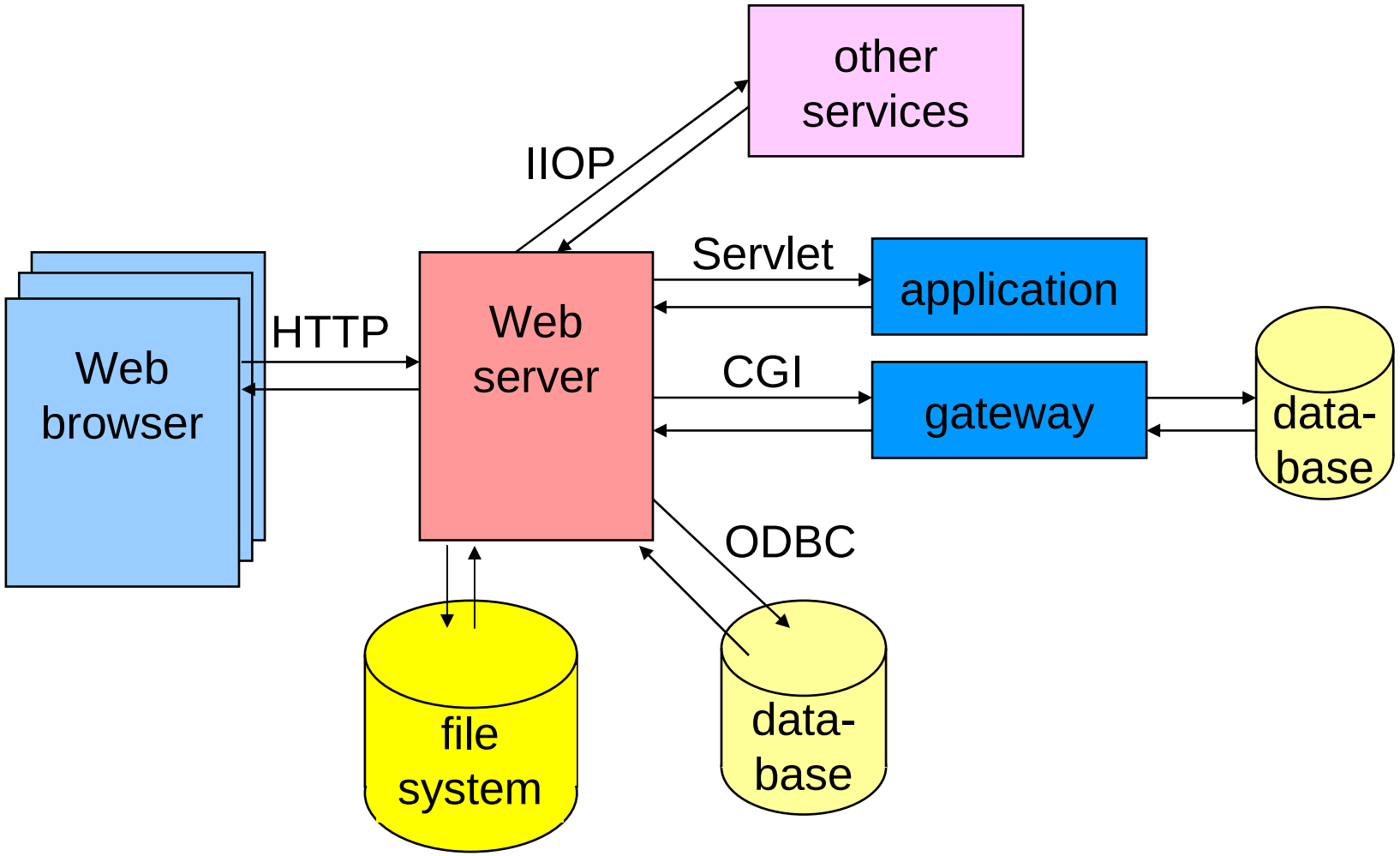
- client-server architecture
- synchronous communication model (request/response)
- resources
  - Unit that is communicated between Client and Server
  - static or dynamic



Documents contain Resources IV



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.“

  - Lamport (?)
    a distributed system is a system that you can not use at a certain moment because a machine is crashed which you even do not know that this exists.

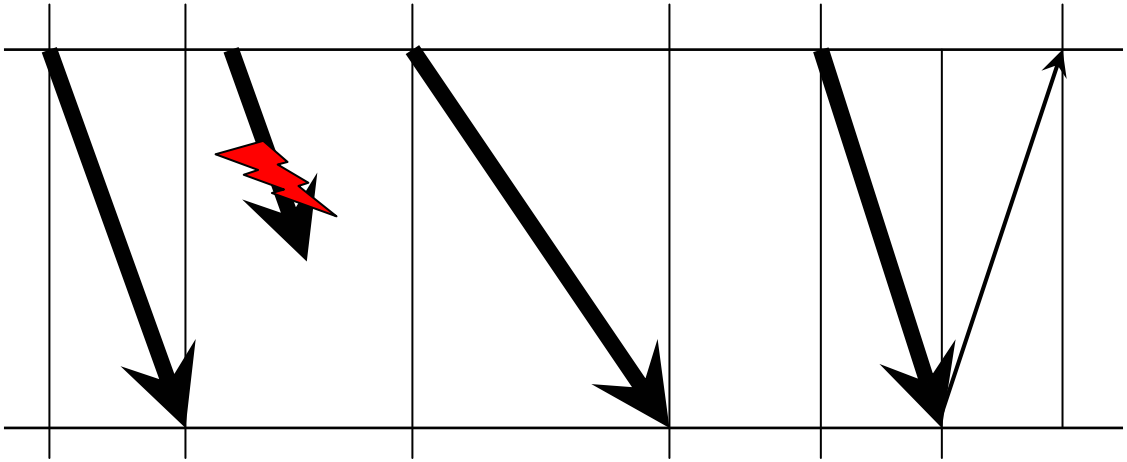
Information Exchange Between Browser and Server

- 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

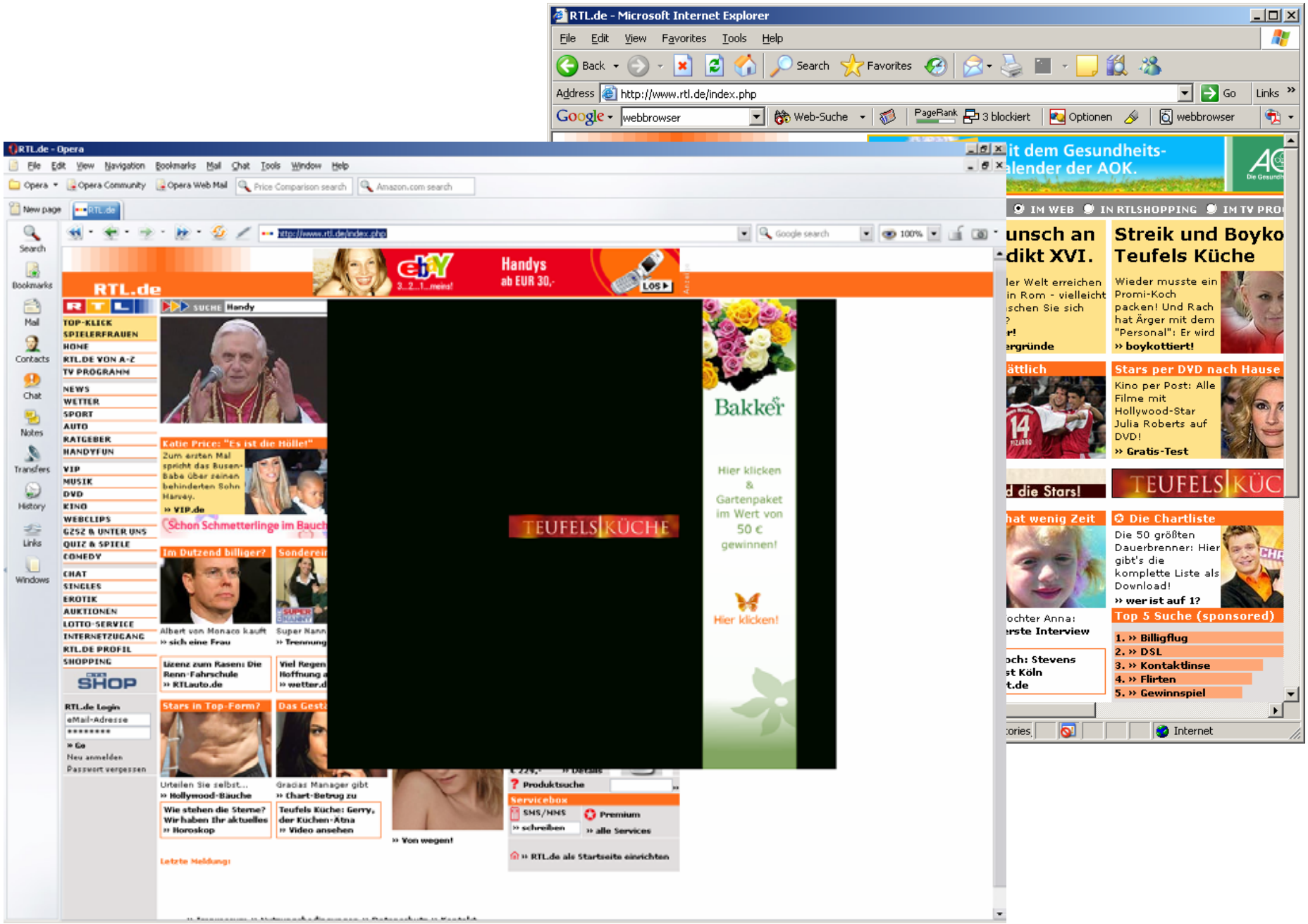
- Basics
  - applications consist of several parts (e.g. different processes)
  - in general these parts are executed on different machines
  - these parts of the application are executed concurrently or one after another
  - there is communication between these parts

- Software/Application Design Aspects
  - data
    - analyzing data transfer (optimize for minimum)
    - investigate how caching can be supported
    - keep data save (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)

Systems are Heterogeneous

Platform may vary to a great extent – it still should be usable

- Processing power
  - processor, co-processors, cache
  - RAM
- I/O-performance
  - hard drive speed
  - network
- Input and Output
  - displays
  - keyboard layout
- Additional Hardware and Periphery
  - video and audio (in/out)
  - card reader, printer, scanner
- Software,
  - Browser
  - Operating System


RTL.de - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.rtl.de/index.php
Go Links
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Web-Suche PageRank 3 blockiert Optionen webbrowser
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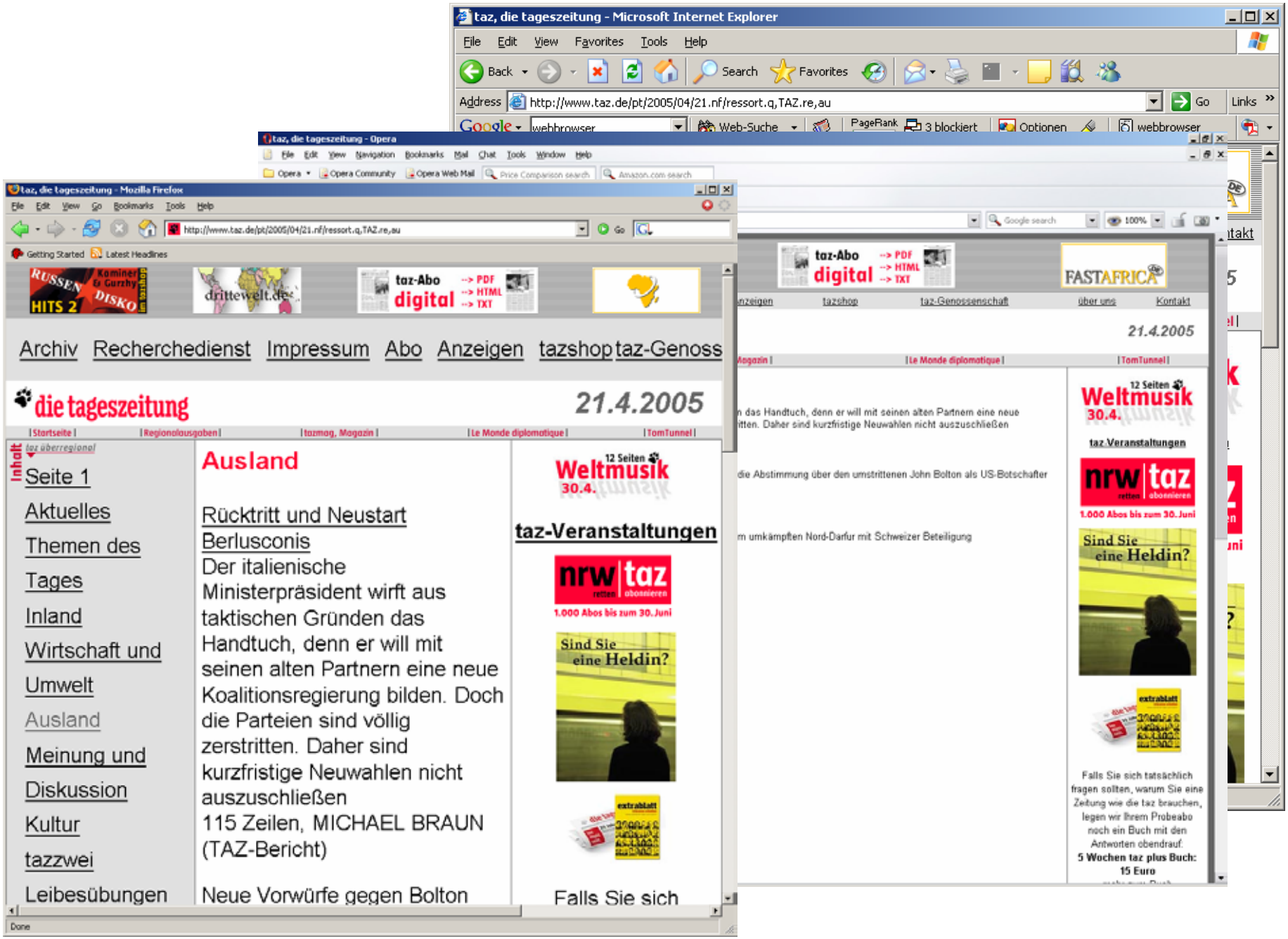
Stars per DVD nach Hause
Kino per Post: Alle Filme mit Hollywood-Star Julia Roberts auf DVD!
» Gratis-Test
Die Chartliste
Die 50 größten Dauerbrenner: Hier gibt's die komplette Liste als Download!
Top 5 Suche (sponsored)
1. » Billigflug
2. » DSL
3. » Kontaktlinse
4. » Flirten
5. » Gewinnspiel
Internet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taz, die tageszeitung - Mozilla Firefox
Archiv Recherchedienst Impressum Abo Anzeigen tazshop taz-Genoss
die tageszeitung
21.4.2005
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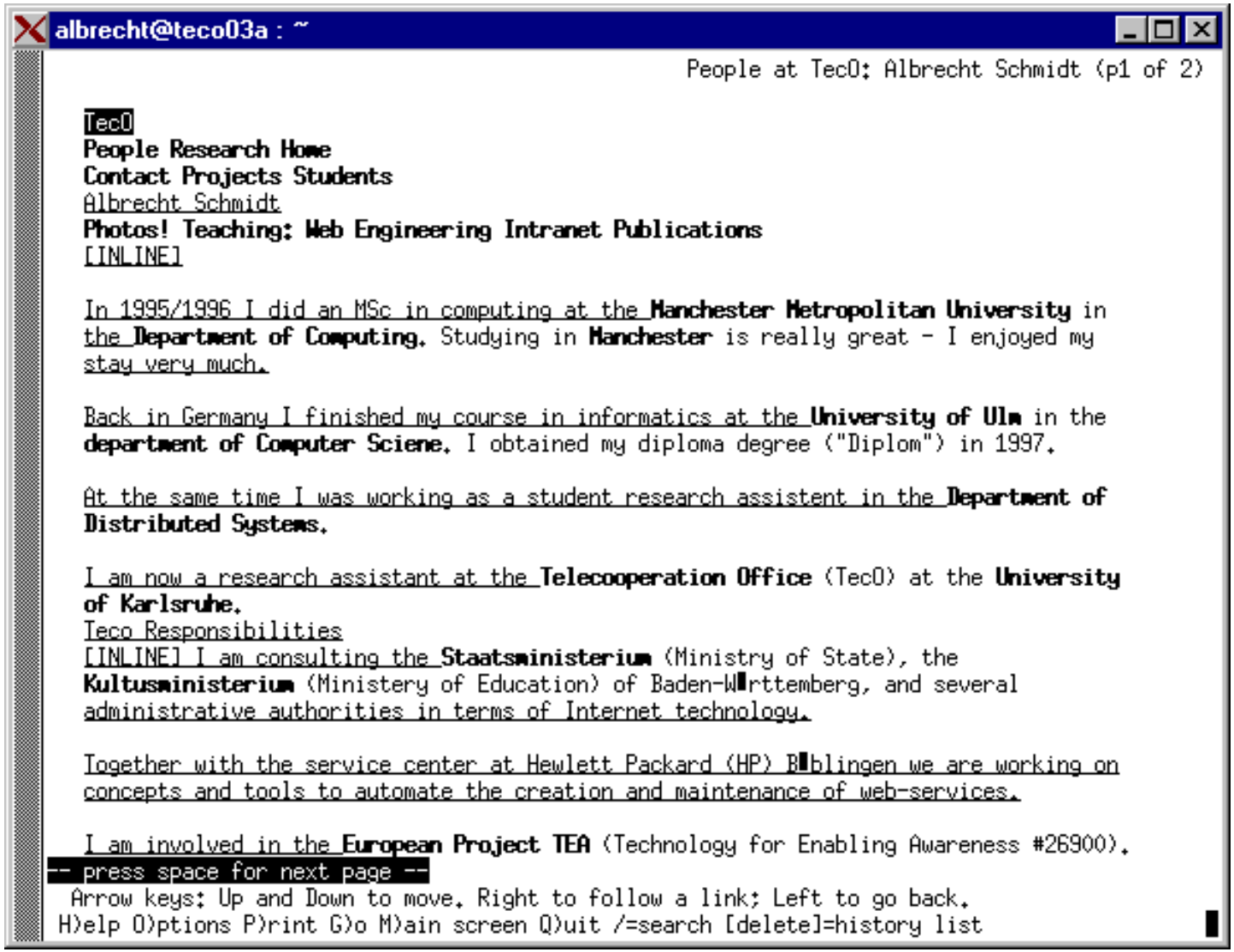
Aktuelles
Themen des Tages
Inland
Wirtschaft und Umwelt
Ausland
Meinung und Diskussion
Kultur
tazzwei
Leibesübungen
Ausland
Rücktritt und Neustart Berlusconis
Der italienische Ministerpräsident wirft aus taktischen Gründen das Handtuch, denn er will mit seinen alten Partnern eine neue Koalitionsregierung bilden. Doch die Parteien sind völlig zerstritten. Daher sind kurzfristige Neuwahlen nicht auszuschließen
115 Zeilen, MICHAEL BRAUN (TAZ-Bericht)
Neue Vorwürfe gegen Bolton
taz-Veranstaltungen
Weltmusik 30.4.
nrw taz
1.000 Abos bis zum 30. Juni
Sind Sie eine Heldin?
Falls Sie sich tatsächlich fragen sollten, warum Sie eine Zeitung wie die taz brauchen, legen wir Ihrem Probeabo noch ein Buch mit den Antworten obendrauf.
5 Wochen taz plus Buch: 15 Euro

Other Graphical Browser

Text or Audio Browser, e.g. Lynx



Compatibility

- To ensure usability define systems and environments that are supported (e.g. functional specification)
  - hardware
  - operating system(s)
  - Browser(s)
  - network (bandwidth, latency)

- the logfiles of an existing website for this user group can be used to calculate the percentage of compatibility

- Trade-off compatibility vs. cost

- Try to optimize the design for the “main” visitors and make sure it is still usable for the others.

MSIE 6.0	46%
MSIE 5.0	3%
Firefox 1.5	20%
Firefox 1.0	7%
Bots	15%
Safari	2%
Others	7%

Example figures from last week at hcilab.org

Compatibility

Visitors at hcilab.org

Browser of Visitors at hcilab.org (March 2006)	
MSIE	53%
Mozilla/Firefox	29%
Netscape	5%
msnbot	4%
Opera	3%
Safari	2%
googlebot	1%
other	3%

OS of Visitors at hcilab.org (March 2006)	
WinXP	65%
Win2000	12%
OS unknown	7%
Robots	5%
Linux	4%
Win98	3%
Mac	2%
Misc	2%

Hypertext

- concept to organize information

One problem…

People structure their knowledge differently.

- motivation
  - “knowledge” is not linear, it is associative
  - authoring a document =
    making knowledge linear
  - reading a document =
    reproduce the non-linear structure of the knowledge ➔ navigation

➔ hypertext-documents:

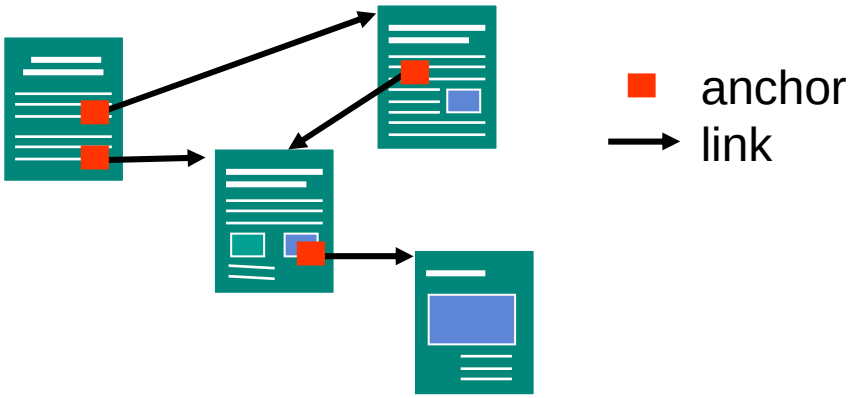
- keep the inherent association of information in a document

Roots of Hypertext

- “Memex”
  - Vannevar Bush: “As we may think”, 1945
  - “Memory Expander”-Machine
  - associative storage/access
  - personal annotation linked to documents
- Xanadu
  - Ted Nelson, 1965/1981
  - term Hypertext
  - Docuverse: global hypertext system, Pay per View
- Augment/NLS (oNLine System)
  - Douglas Englebart, 1968
  - Shared Hypertext Document Spaces

Hypertext Components

- structure
  - hypertext document: directed graph
- components
  - node: information unit
  - anchor: Information chunk within a node, target for a link
  - link: connections between nodes

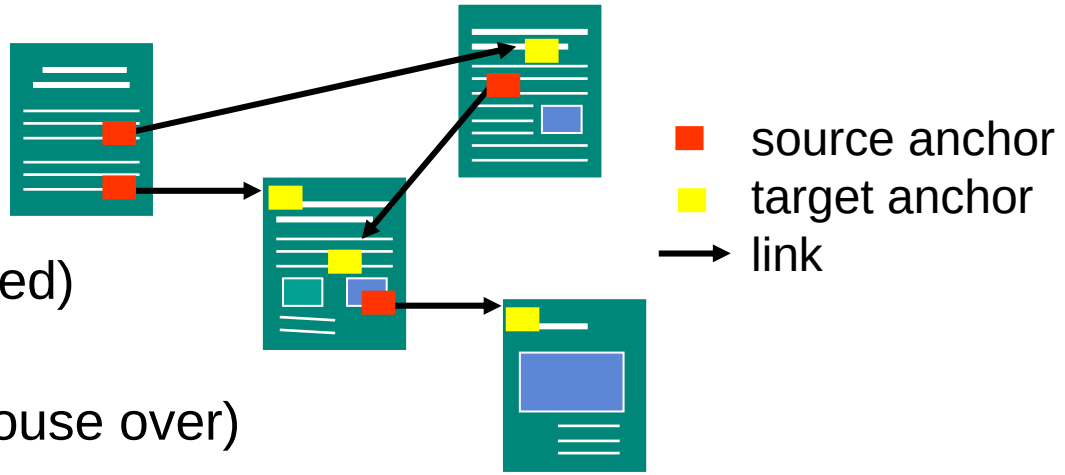


Node

- single media nodes
  - only one media type per node
- mixed media nodes
  - different media types possible per node
  - alternatives, combination
- systems with limited content size
  - no internal navigation
  - e.g. HyperCard
- systems with unlimited content size
  - internal navigation necessary
  - e.g. Scrolling

Anchor

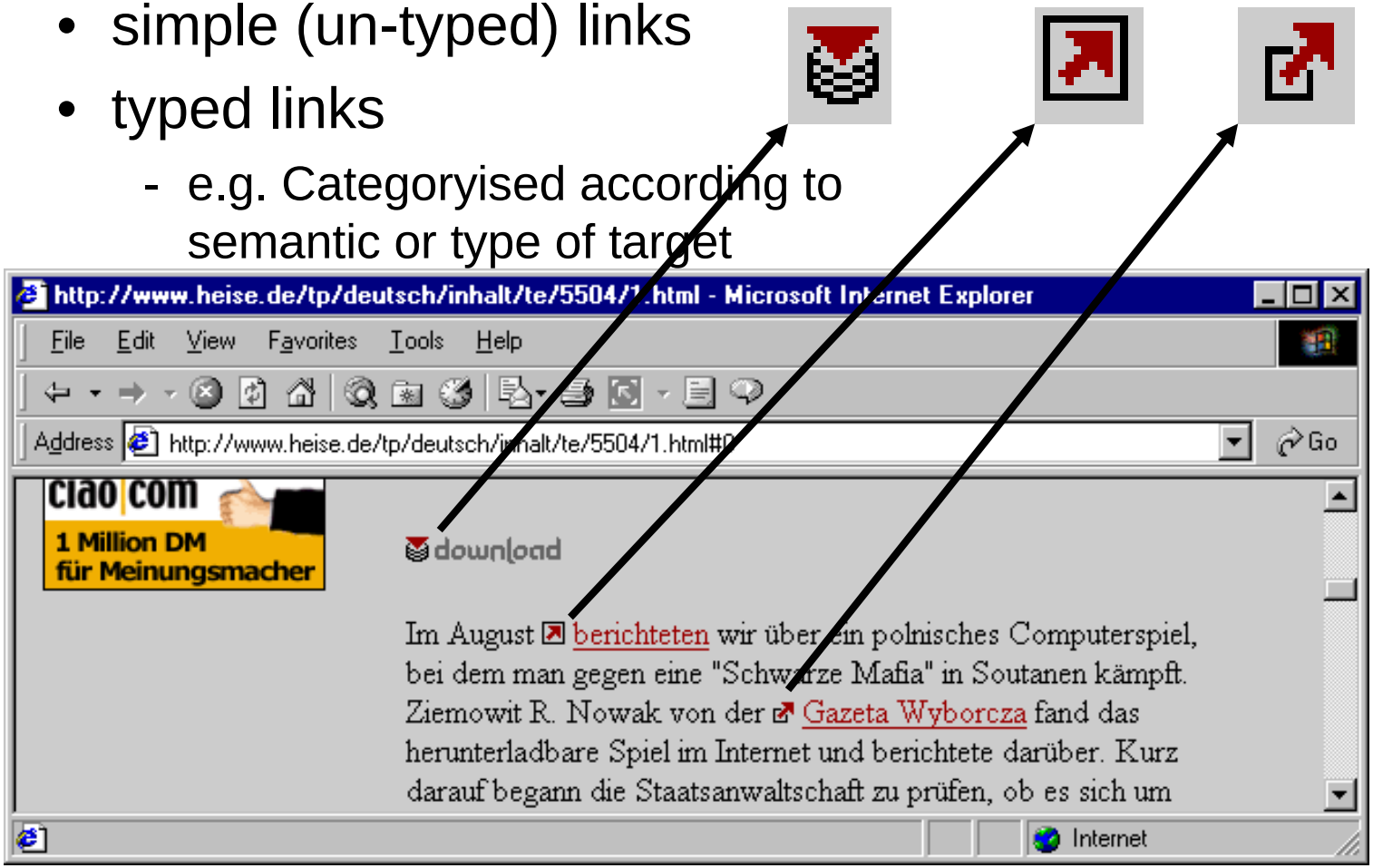
- types of anchors
  - source anchor
  - target anchor
- represented as
  - button
  - icon
  - text (e.g. Underlined)
  - hidden
  - animation (e.g. mouse over)
  - ...



- representation of source anchors as link
- representation of target anchors is often hidden

Links

- information content of a link
  - simple (un-typed) links
  - typed links
    - e.g. Categoryised according to semantic or type of target

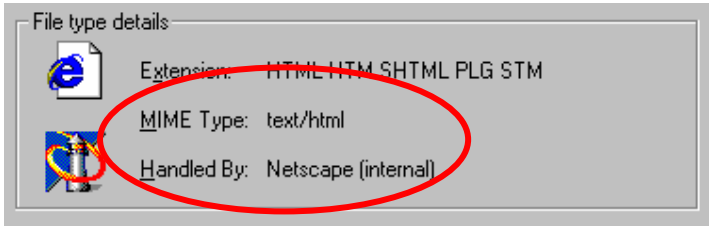


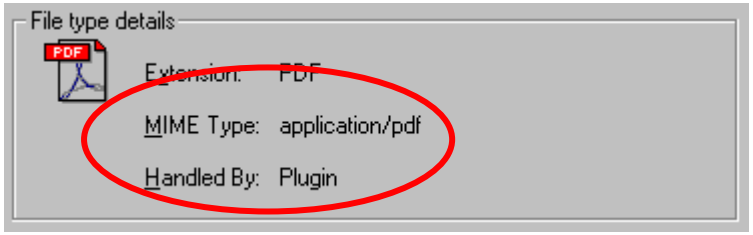
Media Types in the Web

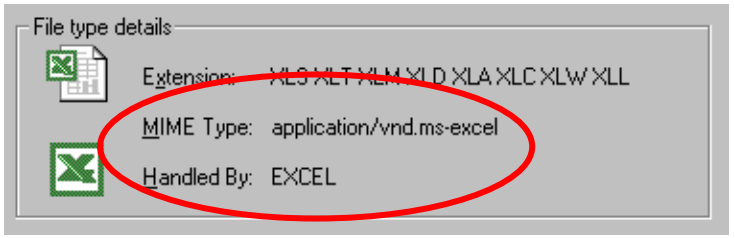
- text / hypertext
- Inline graphics in Hypertext
- icons / graphics (bitmap, vector) / drawings / photos
- interactive graphics: active maps
- animations
- programs (e.g. JavaScript)
- audio clips / video clips (e.g. MP3, MPG)
- audio / video streams
- 3D-scenes (e.g. VRML)
- objects, like Applets, 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 build-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

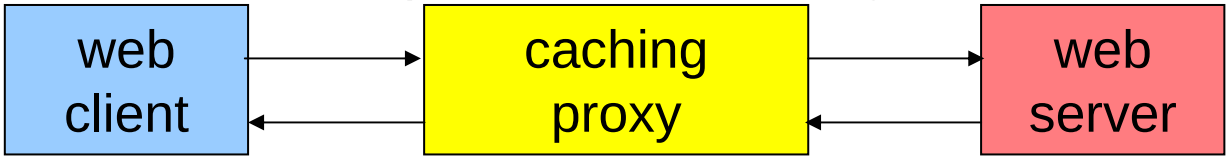
- content that can be displayed/provided
  - text, HTML, images, videos, audio, ...
- content and programs that can be interpret by the browser
  - HTML
  - browser script: JavaScript, VBScript, SMIL, MathML, ...
- programs that are executed in the context of the browser
  - Java Applets (Byte Code, Virtual Machine)
  - Flash
  - ActiveX (Native Code, executed directly by the operating system)
- programs that are pluged 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

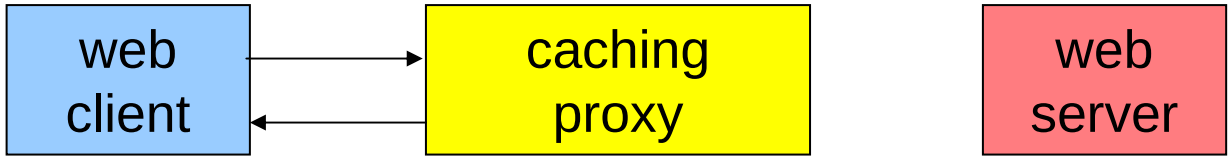
- content (e.g. HTML-pages) that contains statements that can be replaced or executed:
  - SSI, XSSI
  - server side scripting (ASP, PHP, JSP, ...)
- programs that create content
  - additional process: CGI
  - In the context of the servers:Servlets, ...
- extensions of web servers
  - NSAPI, IISAPI, 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



Web Error Messages I

- categories of errors (see HTTP)
  - most often : 404 (file not found)
  - 4xx – error on client side
  - 5xx – error on server side
- errors should be intercepted
  - define useful reaction
  - make specific pages for errors
  - e.g. 404 – file not found
    - possible reasons: file does not exist (anymore), typos, ...
    - some possible solutions
      a) show an error page – tell the user that the page is not available :-(
      b) show the main page of the server
      c) show a search page on the server, tell the user to search
      d) try to find with the filename and the path the page or a related page in the internal search engine and show this page :-)

Web Error Messages II

- errors should be intercepted!
  - e.g. 500 – server error
    - possible reasons: CGI-program crashed, hard drive full, database down, permission changes, gateway not available, ...
    - some possible solutions
      a) show CGI/Server error messages :-(

      b) give the user an alternative: e.g.
      „Sorry our WWW online ordering system is currently not available. Please print out your order an send us a fax (0815/007007) or order by email (orders@shop.com). The system will be online in a minute. Sorry for any inconvenience.“

```
SoftArtisans.SAFile.1 error '80020009'
Error occurred when moving cached file to final destination. Please
check the NTFS permissions for the directory "C:\WINNT\" and the
directory containing the file "D:\CMTLibrary\SIGCHIShort\523_admin.pdf".
These directories require Read, Write and Delete permissions by the
anonymous user ( NT account: IUSR_computername ) as well as for your
authenticated users.
/sigchishort/PaperEditProcess.asp, line 107
```

Excurse: Web Technology Essentials

- Be aware that
  - That the web is heterogeneous distributed systems
  - Hypertext and Hypermedia allows complex information architecture
  - That any media type can be used, however there is little control how they are handled at the client
  - There is a mixture of code and content

- Try to minimize technical complexity
- Specify technical requirements
  - Minimal setup
  - Anticipated setup
  - Test under these conditions

References

- ACM SIGCHI Curricula for Human-Computer Interaction
  http://www.acm.org/sigchi/cdg/
- Blockvorlesung "Web-Technologien"
  http://www.medien.ifi.lmu.de/lehre/ws0506/pwt.html
  (login and password on request)