

Web Engineering

WS 2022/23 KV: 351.036

Lecturer: Birgit Pröll

Lecture 1: Internet & Web

Web Application Characteristics

Contents of the Course

- Tiscover
 - Internet & World Wide Web
 - Introduction in WE & Characteristics of Web Applications

- WE Tasks and Phases

- Web Modelling

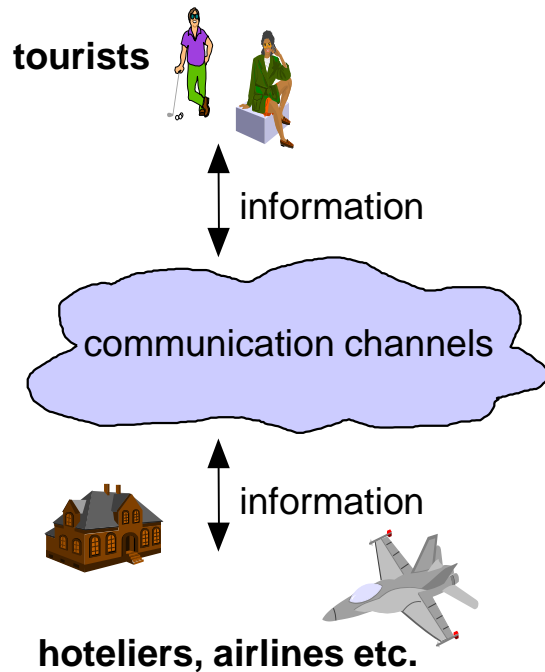
- Web Usability

- Web Performance/Caching
- Personalisation/Adaptation

- Web 2.0 & Web Science
- MockUp-Driven Web Applications

Example: Tourism Web Application

Tourism and the Web (1/2)

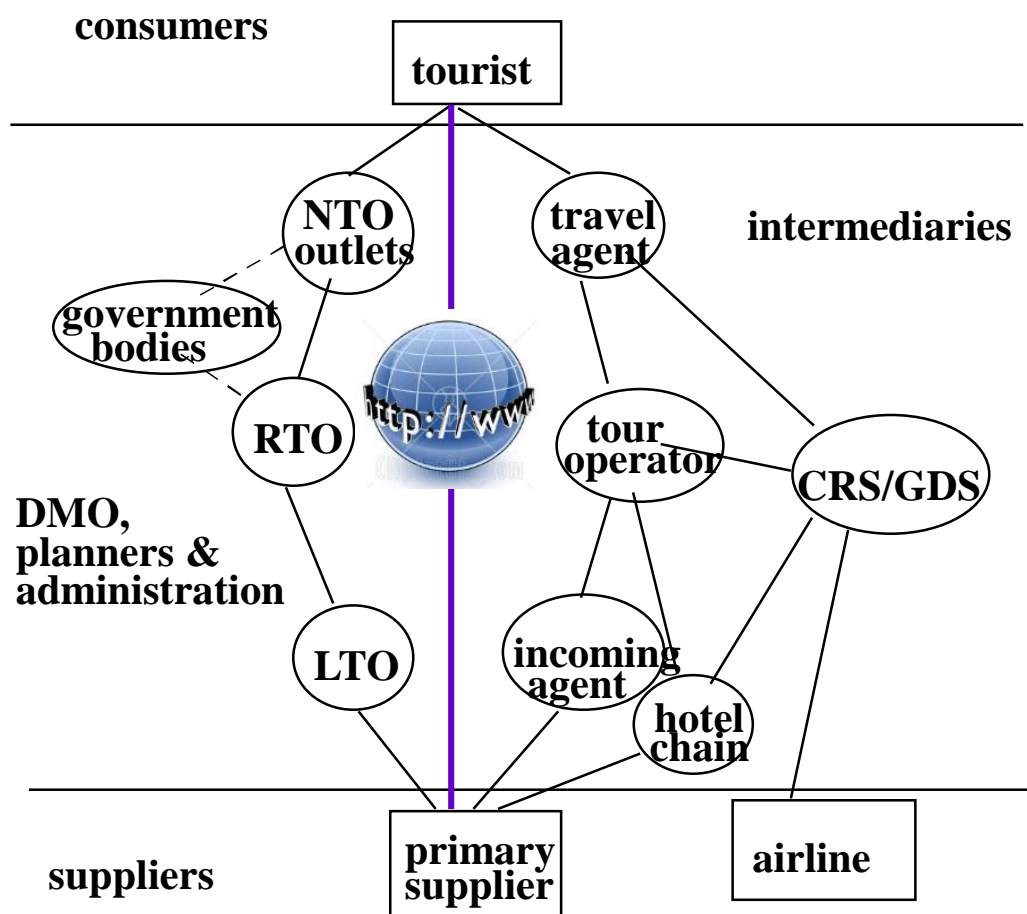


Tourism is an **information business**

- many people involved
- international
- variety of tourism (related) information and products
- tourism products are: **immaterial**, heterogeneous, complex
- various types of information: text, images, etc.
- various degree of change and precision: prices, snow level
- big business

Example: Tourism Web Application

Tourism and the Web (2/2)



[H. Werthner, S. Klein: IT & Tourism – A Challenging Relationship, 1999]
ENTER Conferences - eTourism Present and Future Services and Applications

Example: Tourism Web Application



History

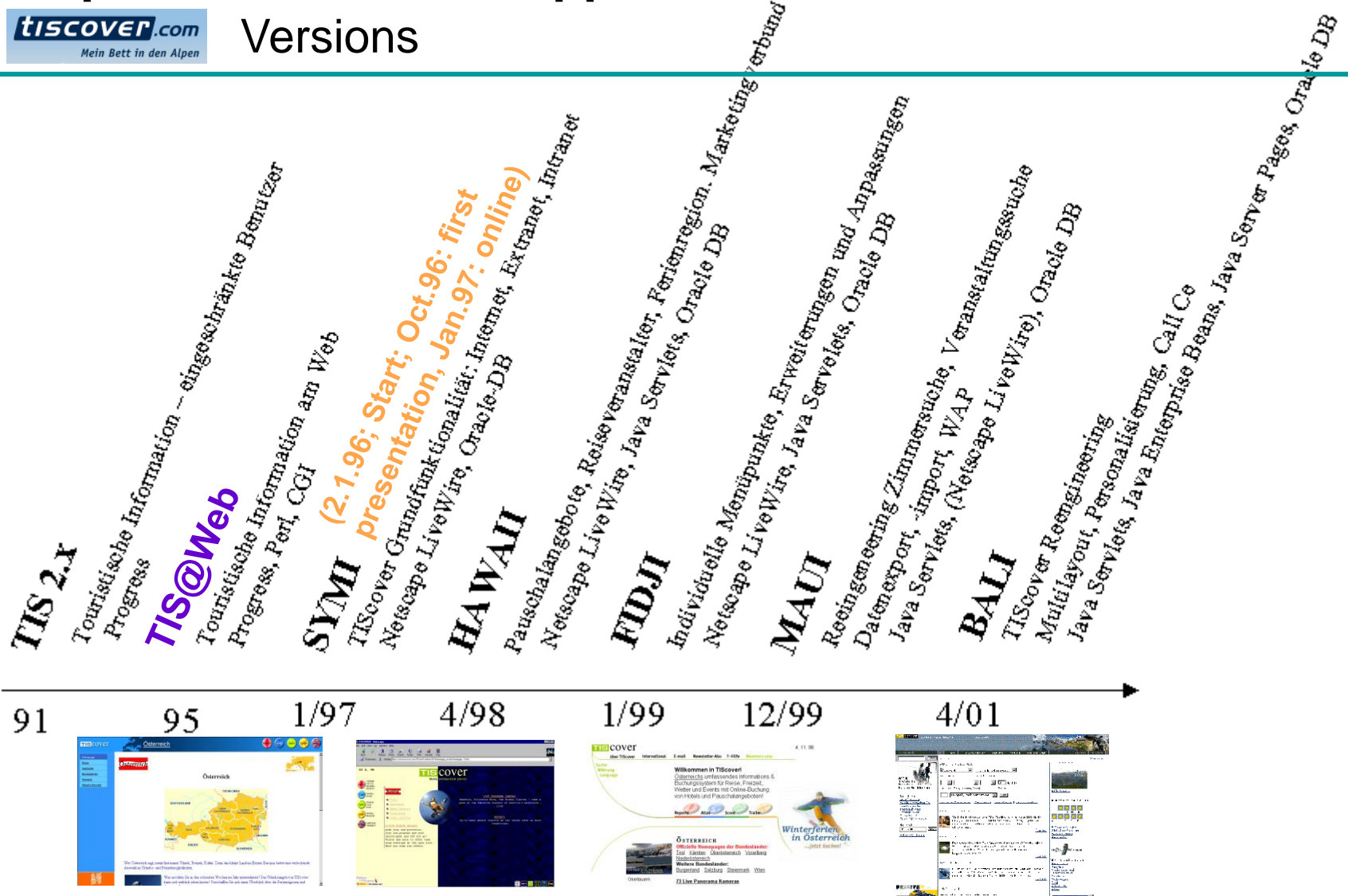
- Austrian destination and booking system
- Development in cooperation of **TIS AG** (Innsbruck) and **FAW**
- 1995: predecessor system **TIS@Web**
- 1996/97: development and launch of **TIScover**
- Employed in **7 countries**
- Content Tiscover Austria
 - 280.000 tourism objects comprising
 - 2.200 towns/villages,
 - 53.000 accomodations etc.
- Top 4 in access statistics of Austrian websites
 - [www.oewa.at, end of 90-ies]
- Sold to HRS.de (Hotel Reservation Systems, Köln)



Example: Tourism Web Application



Versions



Example: Tourism Web Application



Information Access Paradigms



Structured Search

Predefined Search Criteria

1. Suche 2. Ergebnisliste 3. Details 4. Buchen 5. Bestätigung

Erweiterte Suche einfache Suche

Sie können hier nach buchbaren Unterkünften suchen. Bitte füllen Sie alle Felder die mit einem * gekennzeichnet sind aus.

Ihr Urlaubsziel *

Entfernung vom

Zimmertyp & Belegung ☐ (Alle) ☐ für je * Erwachsene und Kinder im Alter von

Ausstattungs wünsche

<input type="checkbox"/> Sauna	<input type="checkbox"/> Solarium	<input type="checkbox"/> Restaurant
<input type="checkbox"/> Swimmingpool	<input type="checkbox"/> Tagungsräume	<input type="checkbox"/> Parkplätze
<input type="checkbox"/> Privatzimmer	<input type="checkbox"/> Hallenbad	<input type="checkbox"/> Haustiere erlaubt
<input type="checkbox"/> Am See	<input type="checkbox"/> Rollstuhlfahrer	

Erweiterte Auswahl... [Suchen](#)

Set of Results

1. Suche 2. Ergebnisliste 3. Details 4. Buchen 5. Bestätigung

Alle buchbaren Unterkünfte im Überblick

Sie suchen nach 1 Produkt für je 2 Erwachsene, 22.1.2007 - 29.1.2007

Neue Suche

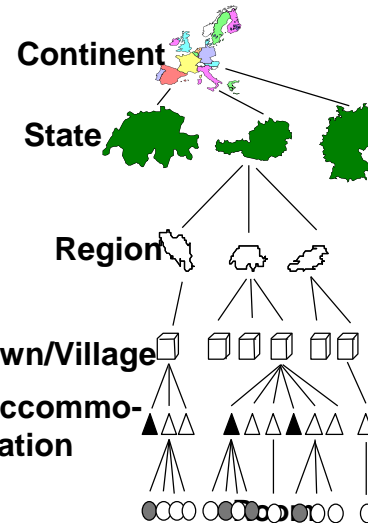
Eintrag 1-5 von 20

Sortieren | Bewertung absteigend | Gesamtpreis für 7 Nächte in EUR

	Feierwiesehaus Riedl Private Ferienwohnung/Haus OH Rauch am Adresssee, Adresssee > LAGERPLAN 50 km 3 Stunden 1. Bewertung	ab 329,00 weiter
	Feierwiesehaus Wälder Private Ferienwohnung/Haus OH Rauch am Adresssee, Adresssee 48 km 3 Stunden 3. Bewertung	ab 266,00 weiter



Navigation



Web Pages



Text Retrieval

Keywords

Search

Upper Aust

Set of Ranked Results

Fulltextsearch

Search Word

Results

Ergebnis

Ergebnisse 1 - 10 von 250

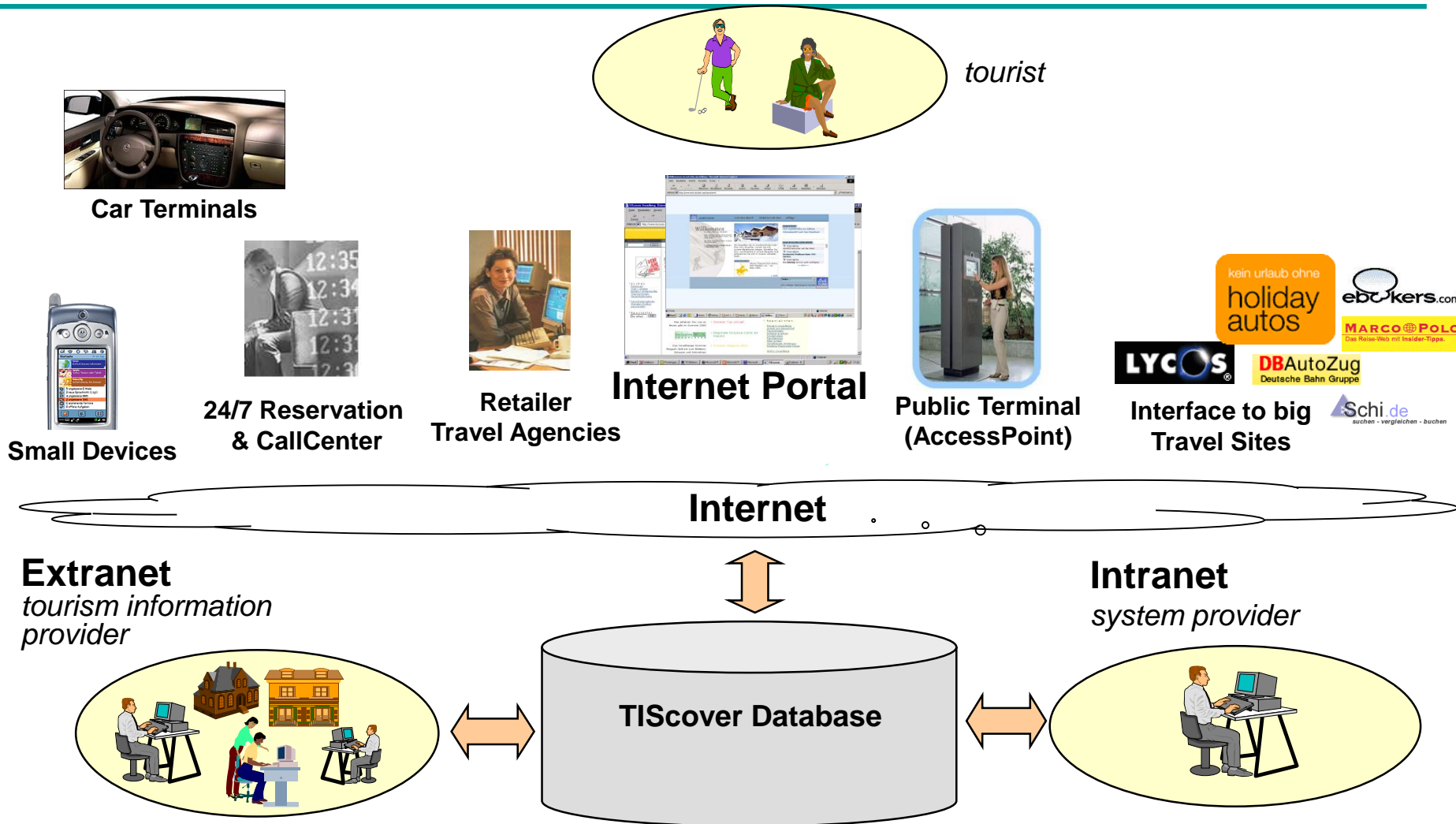
1. Andorf - Willkommen	Andorf, Upper Austria, Austria
2. Kirchham - Willkommen	Kirchham, Upper Austria, Austria
3. Klafter am Hochficht, der gemütliche Urlaubsort im Böhmerwald - Willkommen	Klafter am Hochficht, der gemütliche Urlaubsort im Böhmerwald, Böhmerwald, Muhlviertel, Upper Austria, Austria
4. Aurach am Hongar - Willkommen	Aurach am Hongar, Upper Austria, Austria
5. Pfarrkirchen bei Bad Hall - Willkommen	Pfarrkirchen bei Bad Hall, Bad Hall - Kremsmünster,



Example: Tourism Web Application



Architecture

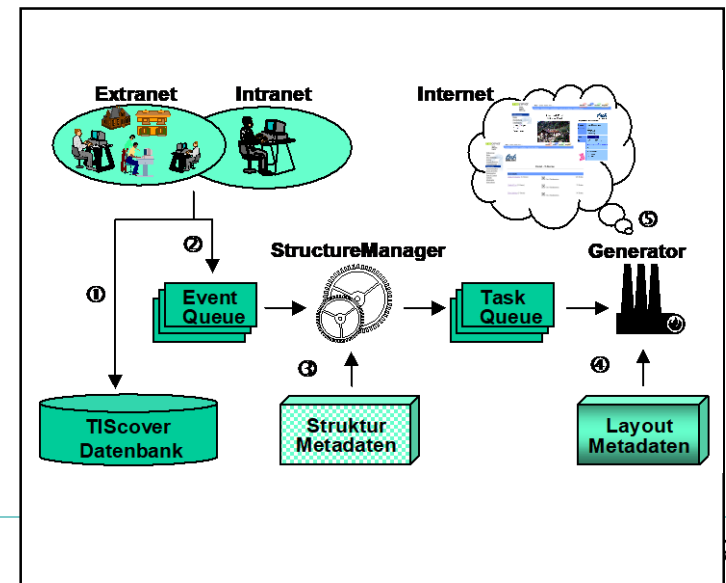
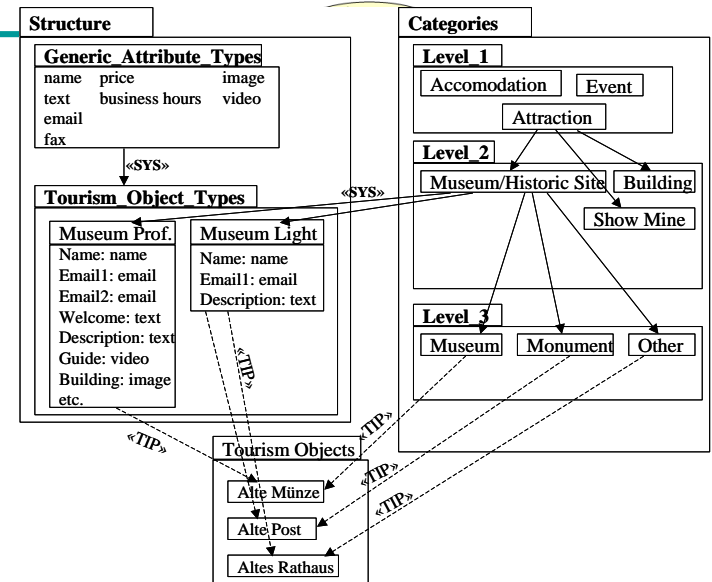


Example: Tourism Web Application



Concepts

- Decentralized maintenance
- Different information access paradigms
- Complex tourism data and price models
- Adaptability through meta-model
- Multilayout
- Performance concepts
- Cutting-edge technologies and features
- ...a number of related research projects
 - Recommendation system DIETORECS
 - Tourism ontology HARMONIZE
 - Natural search TISCOVER POWER SEARCH
 - Bid Agent: MyTravelDream



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- Web Performance/Caching
- Personalisation/Adaptation
- Web 2.0
- Web Science

Internet

Internet & World Wide Web

People commonly use the words "Internet" and "Web" interchangeably. This usage is technically incorrect.

[http://netforbeginners.about.com/od/internet101/f/the_difference_between_internet_and_web.htm]



Frequently asked questions (FAQ) to Tim Berners-Lee

Q: What is the difference between the Net and the Web?

...On the Net, you find computers -- on the Web, you find document, sounds, videos,... information....

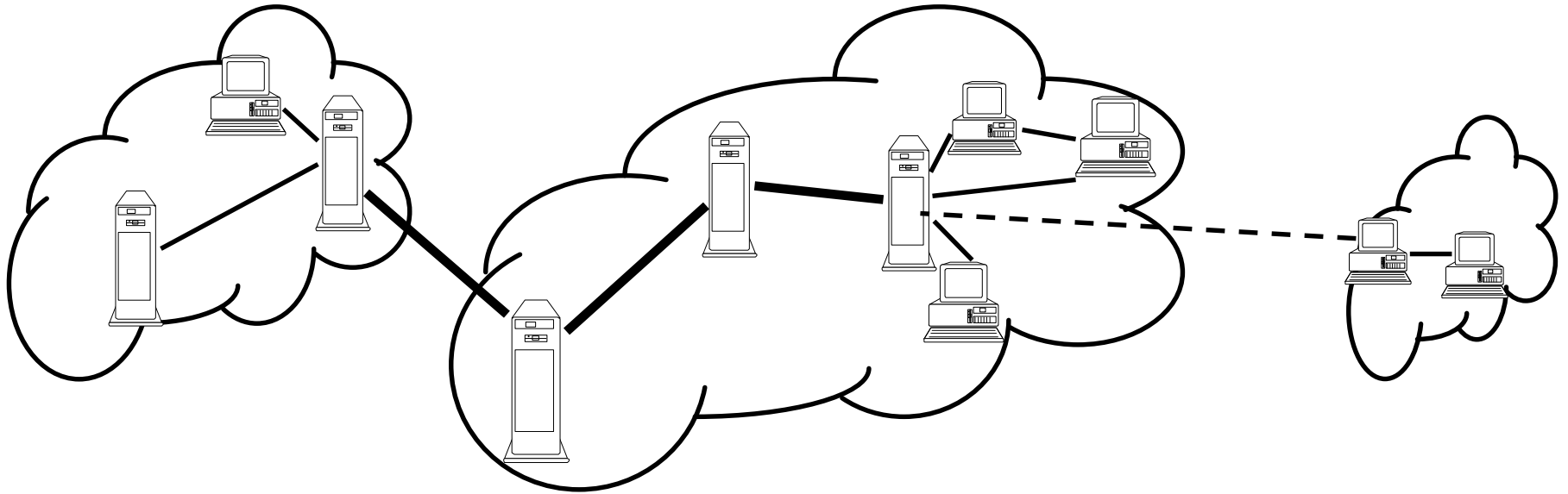
[<http://www.w3.org/People/Berners-Lee/FAQ.html#InternetWeb>]



...the Internet provides the basis for the World Wide Web....

Internet

What is...?



The Internet (short for “interconnected computer networks”)

- a number of **connected computers (hosts)**
- using the same **communication/identification protocol (TCP/IP)**
- offering or using defined **services**
- + number of further networks connected via Gateways

Internet History

US-ministry of defence

ARPANET

1969

TCP
E-Mail & „@“

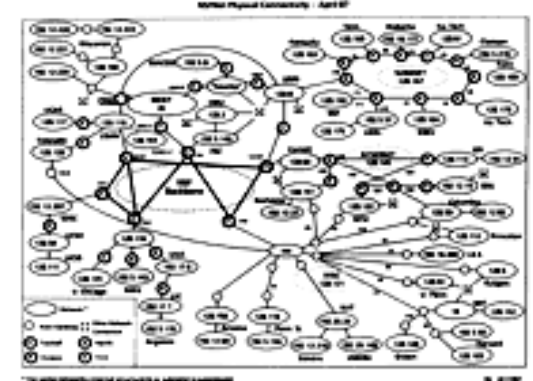
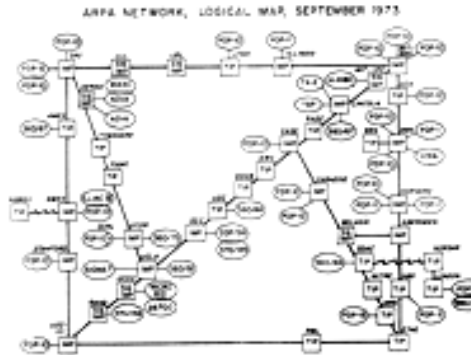
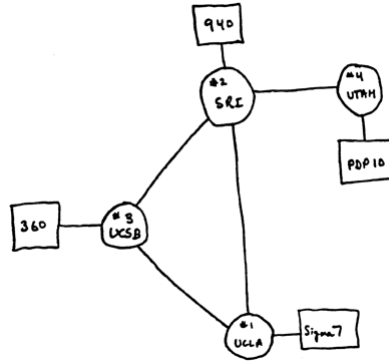
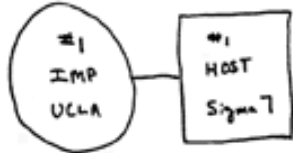
1972

IP

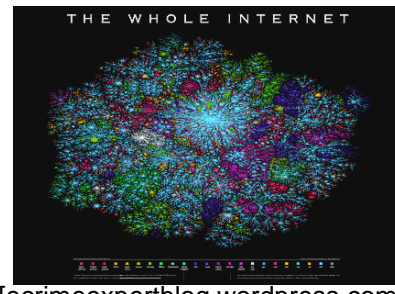
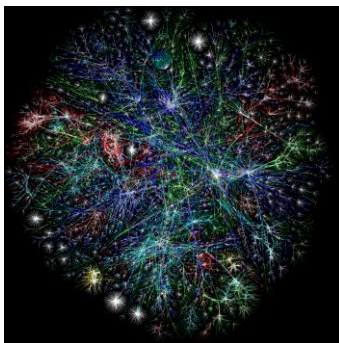
1978

DNS

1984



1990: In twenty years, 'the net' has grown from 4 to over 300,000 hosts



[<http://www.w3.org/2005/01/timelines/timeline-2500x998.png>]
[http://www.computerhistory.org/exhibits/internet_history/]

[<http://www.opte.org/maps/>]

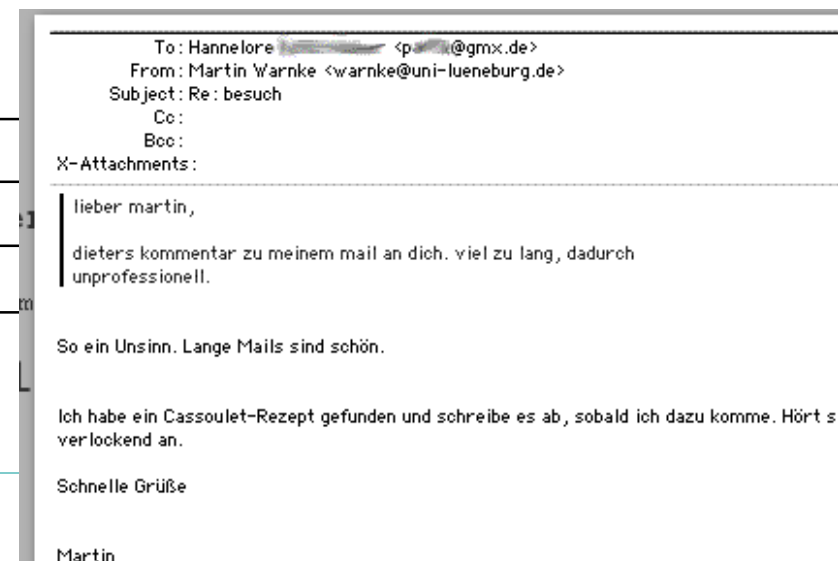
[crimeexpertblog.wordpress.com]

Internet

TCP/IP - Transmission Control Protocol / Internet Protocol (1/2)

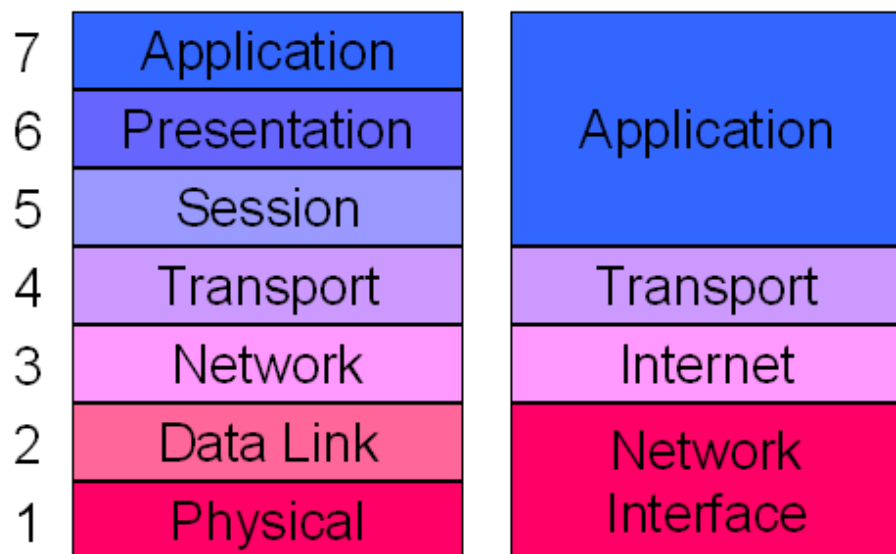
- Set of **protocols** (rules between computers on the Internet, specifying the structure of packets, semantics and ordering of data items)
- Allows **data exchange** between nodes in a network of **heterogeneous architectures** and **heterogeneous operation systems**
- Is responsible for **connection management** and **secured transport of data**
- Data streams are transferred as **packages** (header, body)
- Is characterized by **robustness** with respect to failures

Header			Body
Startadr.	Zieladr.	Typ	CONTENT



Internet

TCP/IP - Transmission Control Protocol / Internet Protocol (2/2)

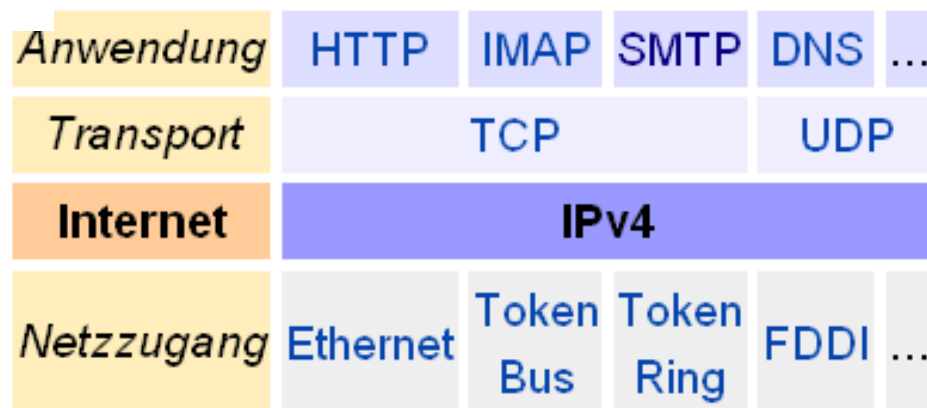


OSI Reference Model

TCP/IP

<http://www.hardwaresecrets.com/article/433>

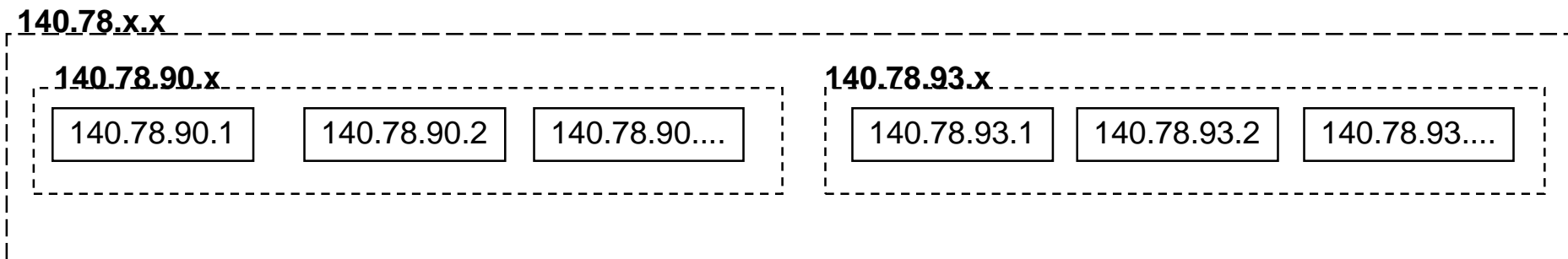
IPv4 im TCP/IP-Protokollstapel:



Internet

IP-Address

- Uniquely identifies hosts in the internet
 - Consists of number for network and number for host
 - **IPv4**: 32 bit - represented as 4 integers between 0 and 255 (2^8)
Example: 140.78.93.15
 - Addressable hosts: 2^{32} (~ 4 billion)
- A.x.x.x class A addresses
B1.B2.x.x class B addresses (1 add. identifies approx. 65.000 (2^{16}) nodes)
C1.C2.C3.x class C addresses



- **IPv6**: extension of addresses to 128 bit
- Example: fe80:z03:baff:fe24:585f
 - Addressable hosts: $2^{128} = 3,40282367 \cdot 10^{38} = 340\ 282\ 366\ 920\ 938\ 463\ 463\ 374\ 607\ 431\ 768\ 211\ 456$

Internet

Domain Name System (DNS) (1/2)

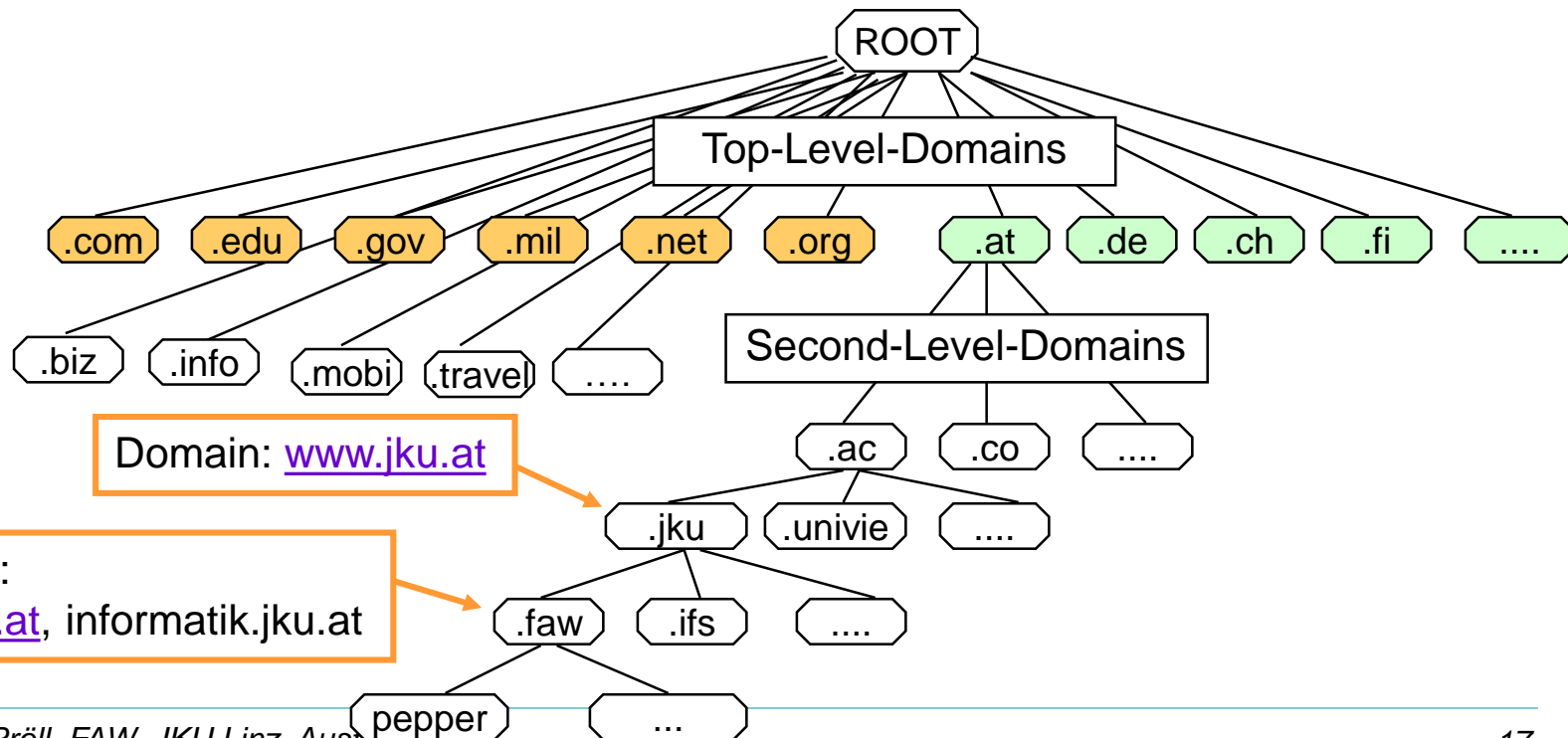


Jon Postel,
Internet Pioneer

"Father of the
DNS (Domain
Name System)"

(1943-1998)

- Domain name
 - hierarchically structured name
 - mnemonic pendant of the IP-address
 - Europe: server.department.institution.country (two.digits country code (ISO 3166))
 - US: server.department.institution.type.



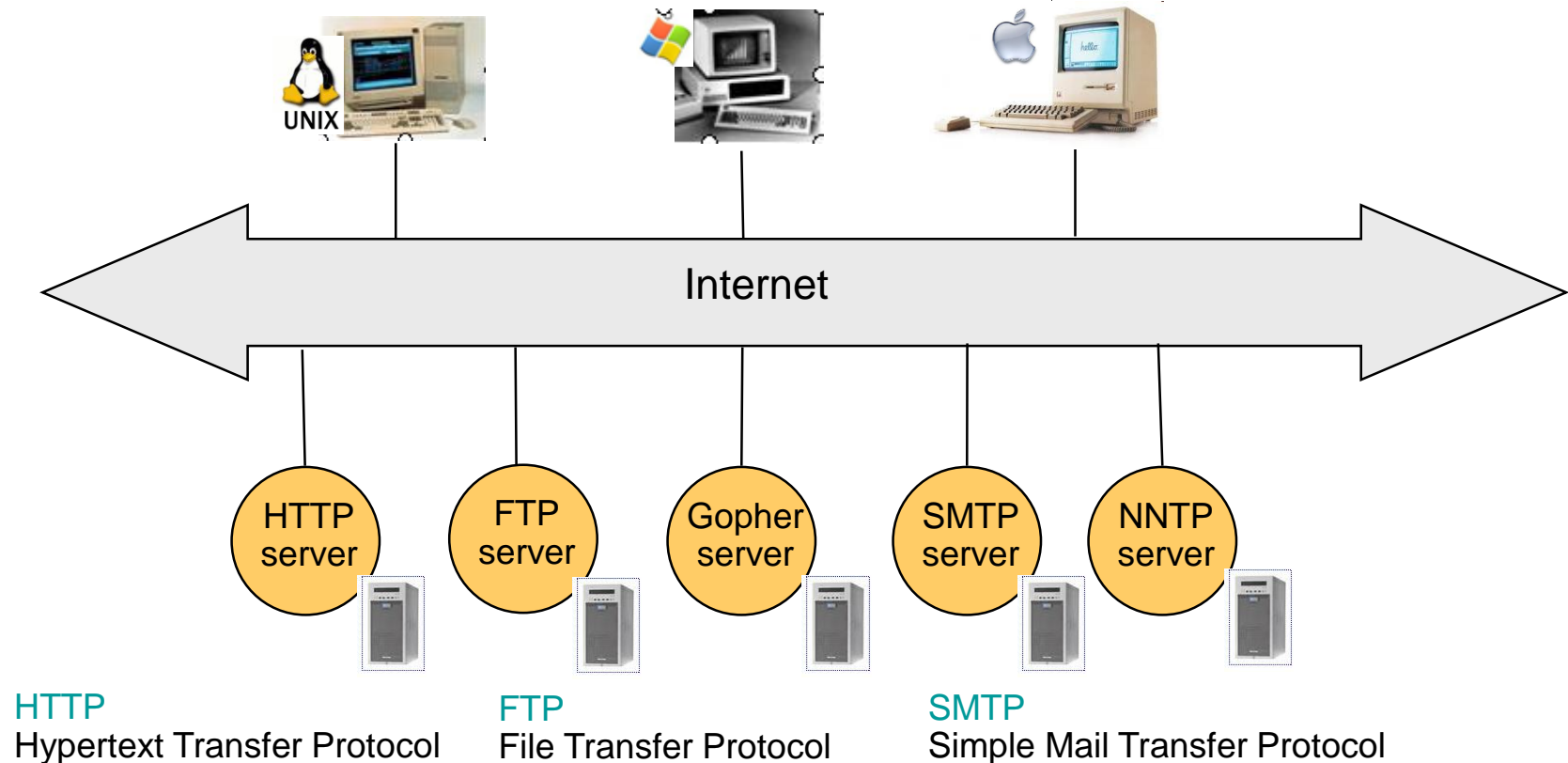
Internet

Domain Name System (DNS) (2/2)

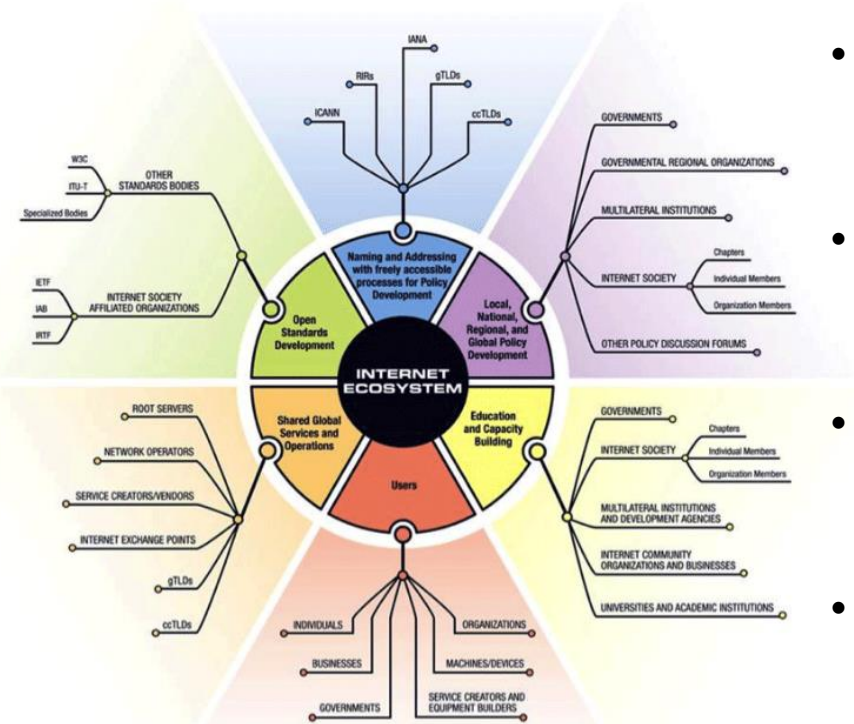
- Domain server
 - assignment IP address / domain name
- Domain reservieren
 - www.nic.at

Internet

Internet Services: FTP, SMTP, HTTP etc.



Internet Administration - Ecosystem



- **ISOC (Internet Society)**
 - Membership society: companies, individuals
 - Home for IETF and others
- **IETF (Internet Engineering Task Force)**
 - Evolution of the internet architecture
 - Standards
- **IRTF (Internet Research Task Force)**
 - Evolution of the future Internet
 - Standards
- **IANA (Internet Assig. Numbers Authority)**
 - ICAN
 - Naming and Addressing (IP-adr., DNS)
- **W3C**
 - Standards

- **Internet Standards**

- Are developed as RFC (Request for Comment); informational,..., draft standard, standard, history

Internet Challenges

- Security intrusion ➡ firewall
 eavesdropping ➡ encryption
- Net performance
- IP Addresses ➡ IPv6

World Wide Web

What is...?

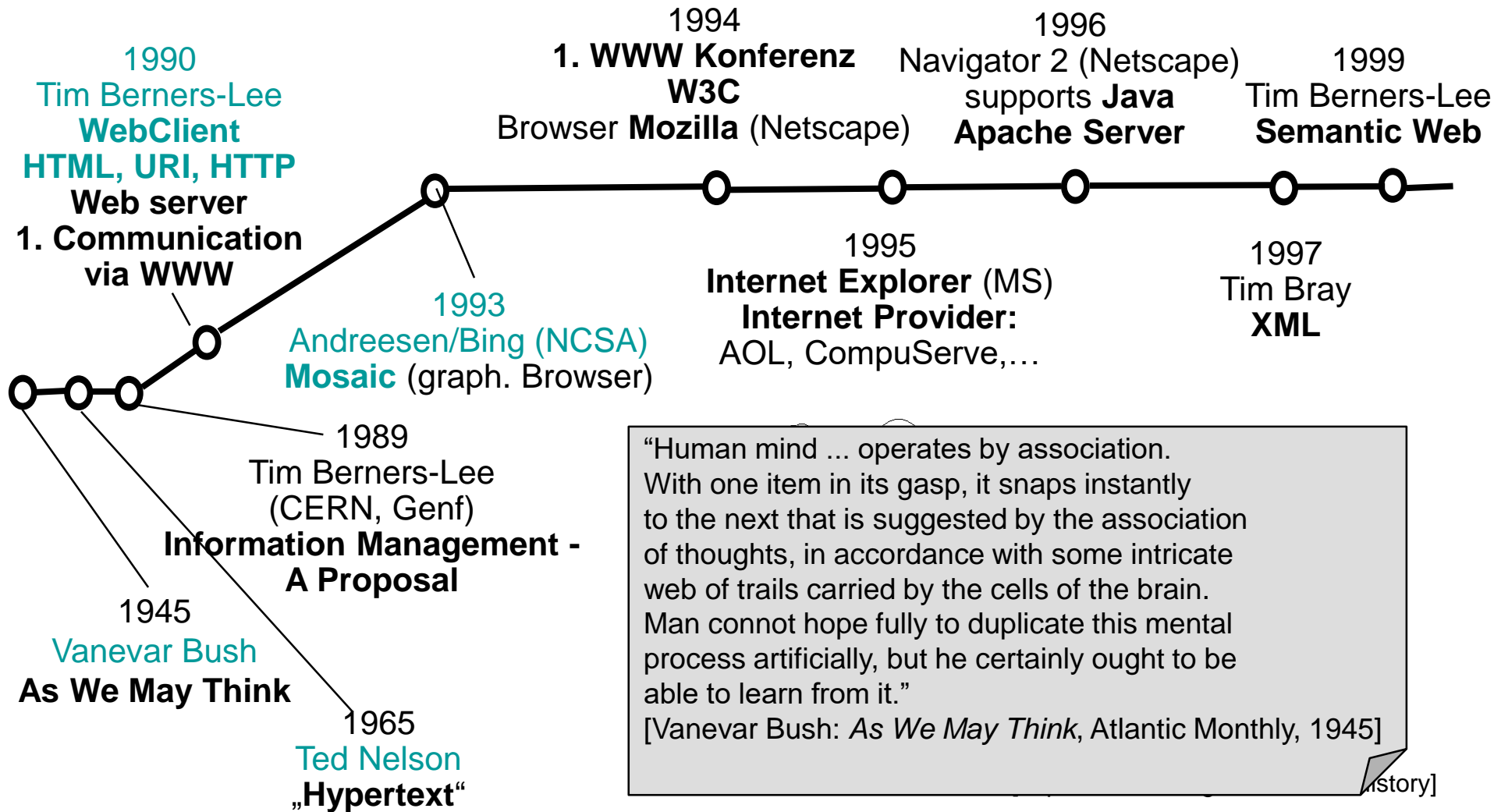
- Unifies the concepts
 - **Hypertext**
 - **Multimedia**
 - Distribution of **information** via the Internet
- Supports search paradigms
 - **hypertext links** (navigation)
 - **keyword search**
- Allows to incorporate other Internet services
 - FTP, SMTP, NNTP, etc.



Tim Berners-Lee
[www.w3.org/People/Berners-Lee/]

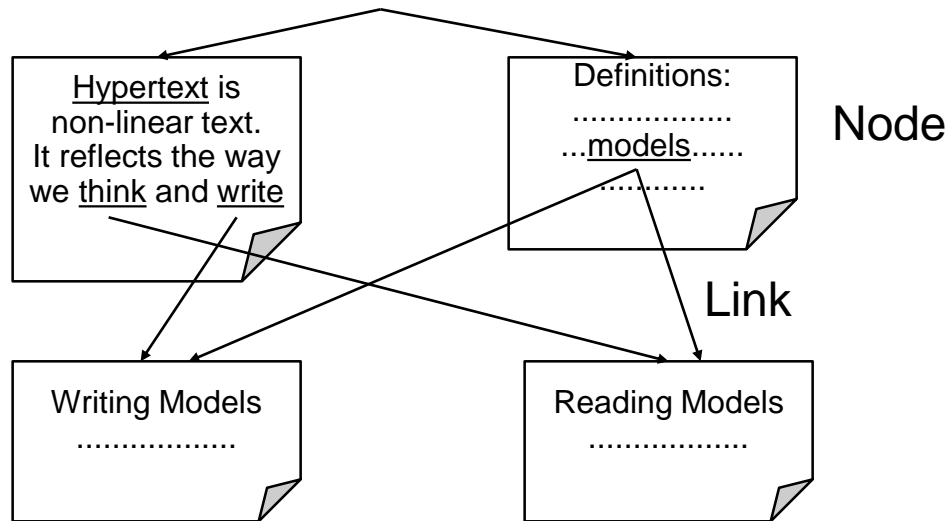
[T. Berners-Lee: The World Wide Web: Past, Present and Future, 1996;
<http://www.w3.org/People/Berners-Lee/1996/ppf.html>]

World Wide Web History



World Wide Web

Hypertext



„...**non-sequential** method of **accessing information** unlike traditional IS...”

- **Nodes:** Content (information, concept, idea)
- **Links:** Connect related nodes (referential, hierarchical links)
- **Navigation:** User must have the feeling of unrestricted movement in the information space (cp: lexica, enzyklopaedia)

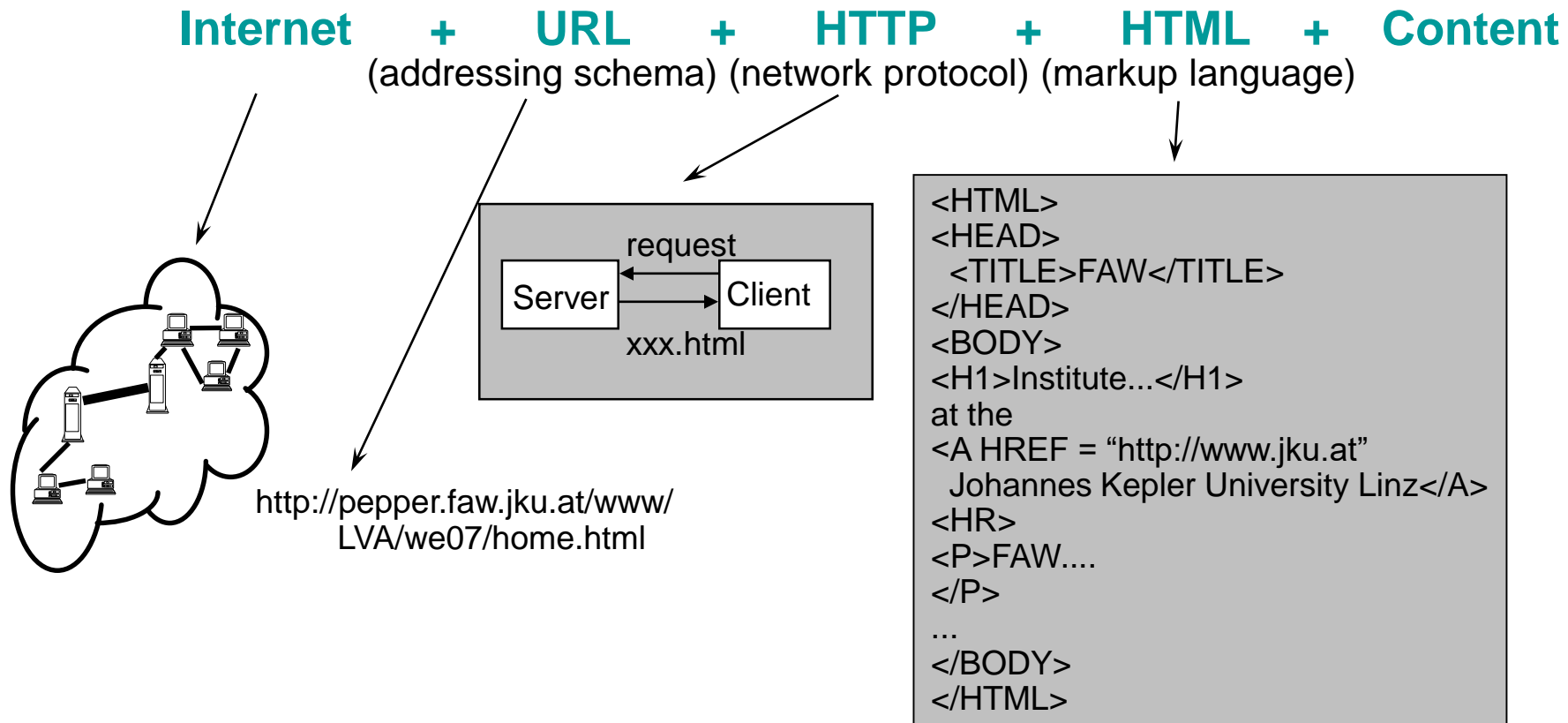
History

- 1965: **Ted Nelson** coined the term in 1965
- 1968: **Doug Engelbart** demonstriert Augment/NLS, inventer of the mouse
- 1989: **Bill Atkinson** (Apple): Hypercard
- 1989: first **Hypertext Conference**

World Wide Web

Definition of “World Wide Web” (“WWW”, “Web”)

- A global information system
- An interactive **hypertext** based on **Internet** technology

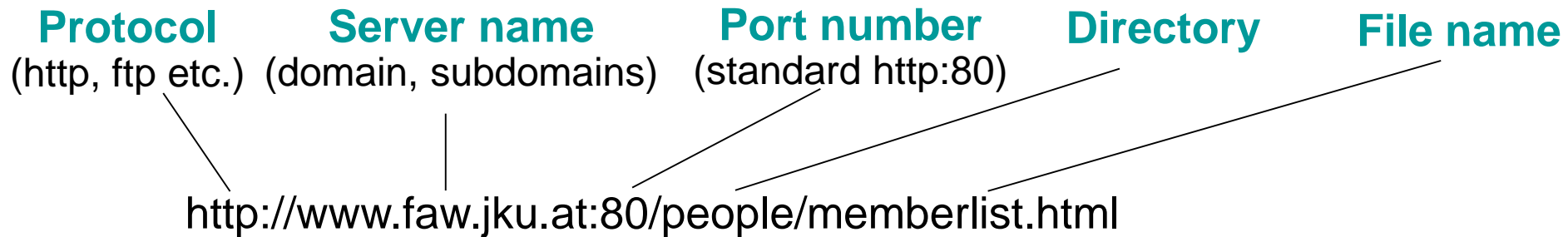


World Wide Web

Unified Resource Locator (**URL**)

URL + **HTTP** + **HTML**

- Allows **unique identification of documents worldwide**
- Not restricted to **WWW**, but also appropriate for **FTP**, **gopher**, etc.
- Provides the basis for a **hyperlink**

Protocol	Server name	Port number	Directory	File name
(http, ftp etc.)	(domain, subdomains)	(standard http:80)		
				

World Wide Web

Hypertext Transfer Protokoll (**HTTP**) ^{URL} + **HTTP** + **HTML**

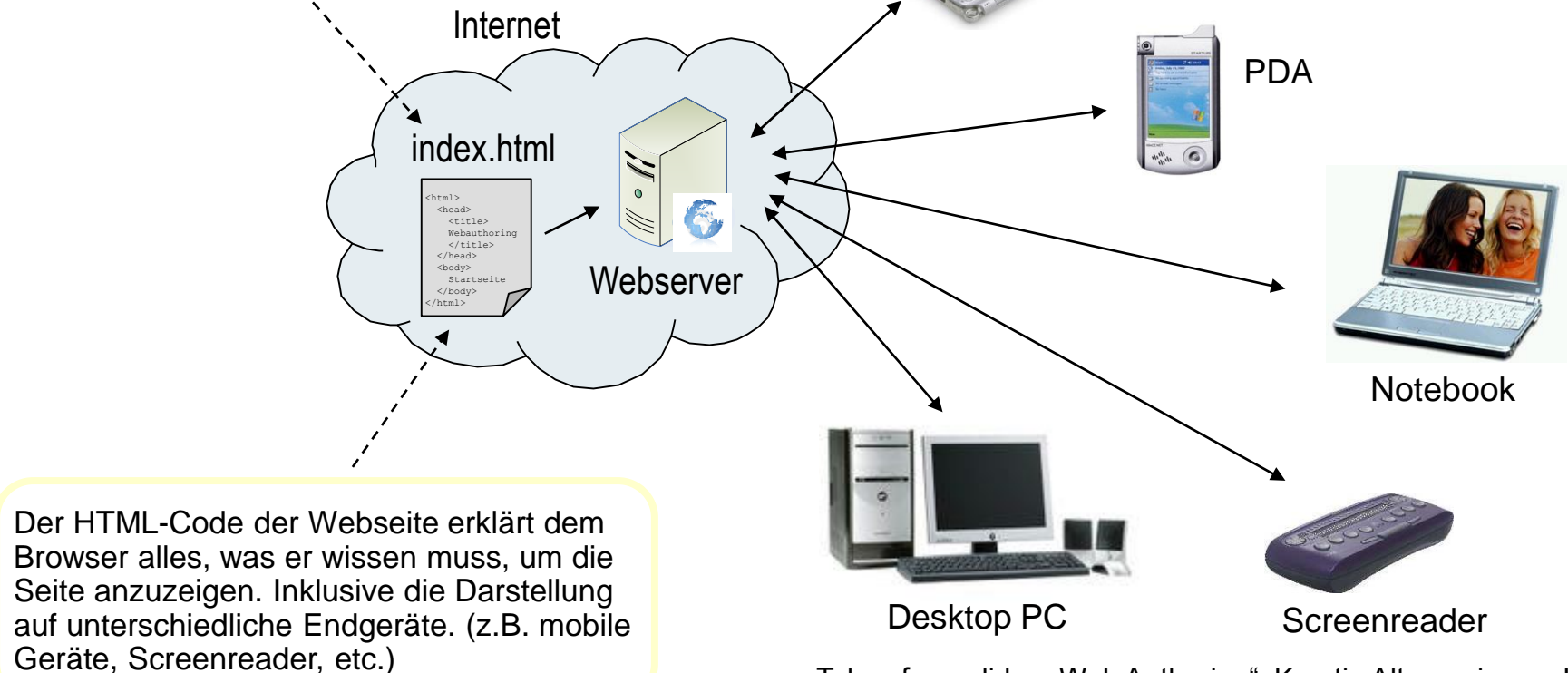
- An application-level protocol for distributed, collaborative, hypermedia information systems (generic, **stateless**, object-oriented)
- Allows the **transfer of information** (text, hypertext, pictures) and facilitates **hypertext jumps**
- **HTTP versions**
 - The first version of HTTP, referred to as **HTTP/0.9**, was a simple protocol for **raw data transfer** across the Internet
 - **HTTP/1.0**, as defined by RFC 1945, improved the protocol by allowing messages to be in the format of **MIME**-like messages
 - ongoing development, e.g. session management, security etc.
- Supports **client/server principle**

World Wide Web

Client/Server Principle (1/3)

Um eine Webseite zu erstellen, müssen die Dateien in der Hypertext Markup Language (HTML) geschrieben werden und auf einem Webserver abgelegt werden.

Sobald eine HTML-Datei auf dem Webserver abgelegt wurde, kann jeder **Browser** diese Seite über das Internet abrufen.



Taken from slides „Web Authoring“, Kerstin Altmanninger, JKU

World Wide Web

Client/Server Principle (1/3)

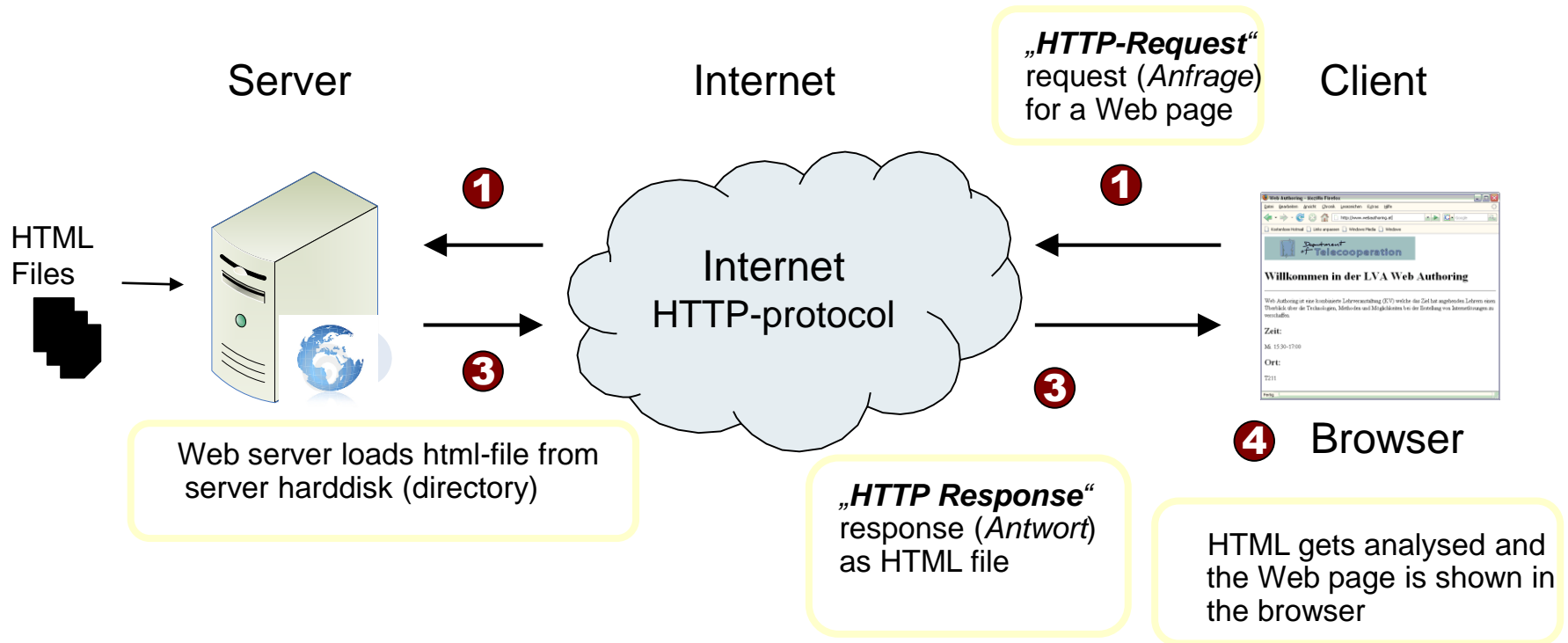
URL + HTTP + HTML

- **Client** (Web browser) sends a **request** to a server
 - software on the client side capable of communicating with a Web server
 - e.g.: Firefox (Mozilla, Netscape) Internet Explorer (MS), etc.
 - When the client sends a request, a process is started on the server which contacts one or more permanent running process(es)
- **Server** (Web server) answers with a **response**
 - software on the server side capable of communicating with a Web browser
 - e.g.: Apache Tomcat, Internet Information Server, etc.
- **Protocol** (a formal set of rules) must be followed in order to communicate
 - **Operation code**: method (GET, PUT, POST, etc.) + URL
 - **HTTP header** contains information on client (browser + version, etc.)
- **Statelessness of HTTP**
 - TCP/IP connection is established for only one request and closed afterwards

World Wide Web

Client/Server Principle (2/3)

URL + HTTP + HTML



Taken from slides „Web Authoring“, Kerstin Altmanninger, JKU


World Wide Web

MIME-Standard

- MIME-standard extends the transfer of raw data to multimedia data

Kategorie	Bezeichnung	Abkürzung	Datei
Text	Text	TXT	.txt
	LATEX	LATEX	.tex
Text + Bild	Postscript	PS	.ps
	Device Independent LATEX-Output	DVI	.dvi
	MS-Word		.doc
Bild	Graphic Interchange Format	GIF	.gif
	MS-Windows Bitmap	BMP	.bmp
	X11 Bitmap	XMP	
	Tag Image File Format	TIFF	.tif
	Joint Photographic Experts Group		
Bildfolge	Moving Picture Experts Group	MPEG	.mpg
Tonfolge	SUN Audio		.au
	MS-Windows Audio		.wav
Text + Bild + Bildfolge + Tonfolge	HyperText Markup Language	HTML	.html

Internet & World Wide Web Challenges

- **Challenges of Internet:** performance etc.
- **Large hypertext**
 - Information Overload
 - Disorientation
 - Cognitive overhead
-  Search and retrieval functionality, Information filtering, personalisation, hypertext patterns, etc.
- **Commerzialisisation**
 - The Web was meant as a service to exchange information between researchers
 - **The Web changed/changes**
 - Increasing system complexity: interaction, databases, transactions, etc.
 - Security, e-payment, access statistics, etc.
 - Evolution of new features, architectures, languages, businesses, etc.
 - W3C standards, „Netiquette“, Web & law

World Wide Web

Administration of the World Wide Web

- **W3C** (World Wide Web Consortium, www.w3c.org)
 - develops interoperable technologies (specifications, guidelines, software, and tools)
 - is a forum for information, commerce, communication, and collective understanding
- **RFCs** (Request for Comment)
 - specifications are documented as RFCs



[<http://www.w3.org/Consortium/history>]