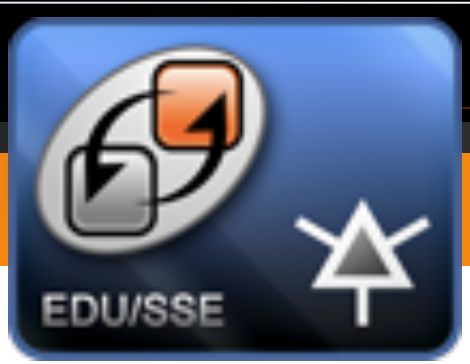

Software Service Engineering

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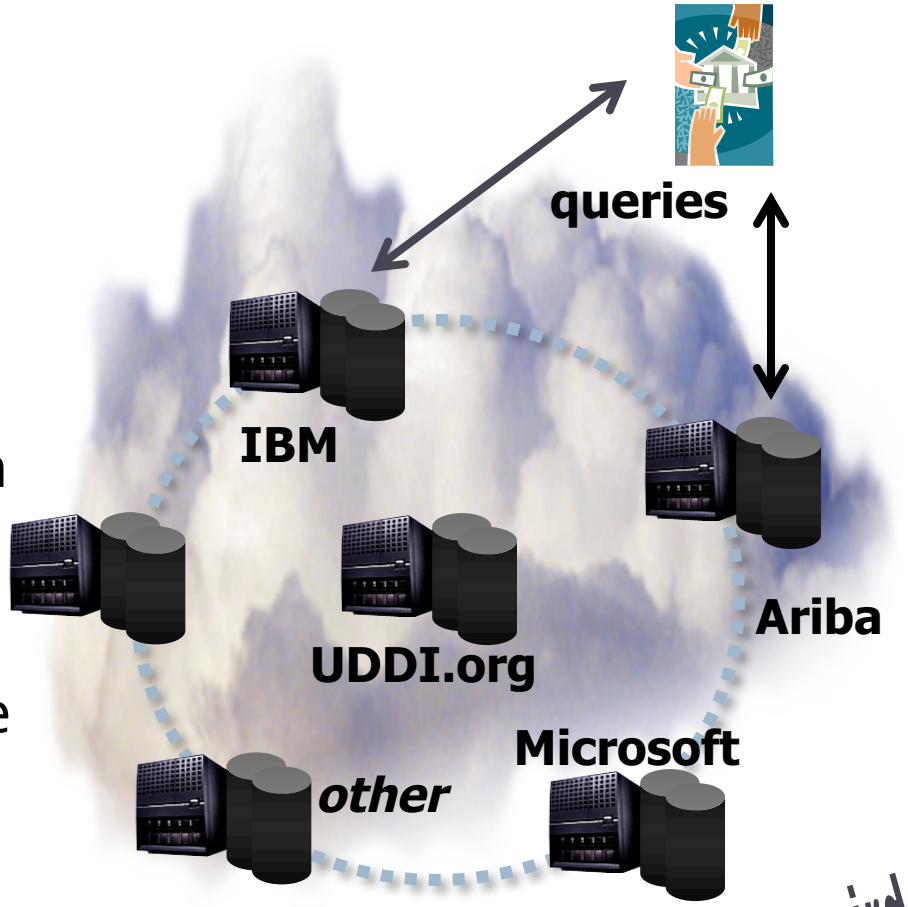
Chapter 4
UDDI

Einführung

- **Universal Description, Discovery, and Integration (UDDI)** – UDDI beschreibt Ansätze um eine interoperable Plattform zu etablieren, die es Firmen und Applikationen ermöglicht, schnell, einfach und dynamisch Web-basierte Dienste zu finden und über das Internet zu benutzen
  - OASIS-Standard, UDDI Version 3, Februar 2005
  - UDDI spezifiziert das API für Web-basierte Registries
  - API fokussiert Veröffentlichen und Auffinden von Diensten im Web (d.h. nicht nur Web Services)
  - Ursprünglich auch Beschreibung wie UDDI Business Registry betrieben wird (Geschäftsmodell, Bezahlung etc.)
  - Weitere Informationen unter http://uddi.org
- **UDDI Registry** – vereint drei Kategorien
  - **White Pages**: Namensregister, Kontakt zum Anbieter, Klassifikation (z.B. Bank,Großhandel, Ländercodes etc.) – vgl. Telefonbuch
  - **Yellow Pages**: Entspricht der Idee des Branchenbuchs, d.h. Einordnung von Diensten in Geschäftskategorien
  - **Green Pages**: Technisches Informationsmodell (tModel)

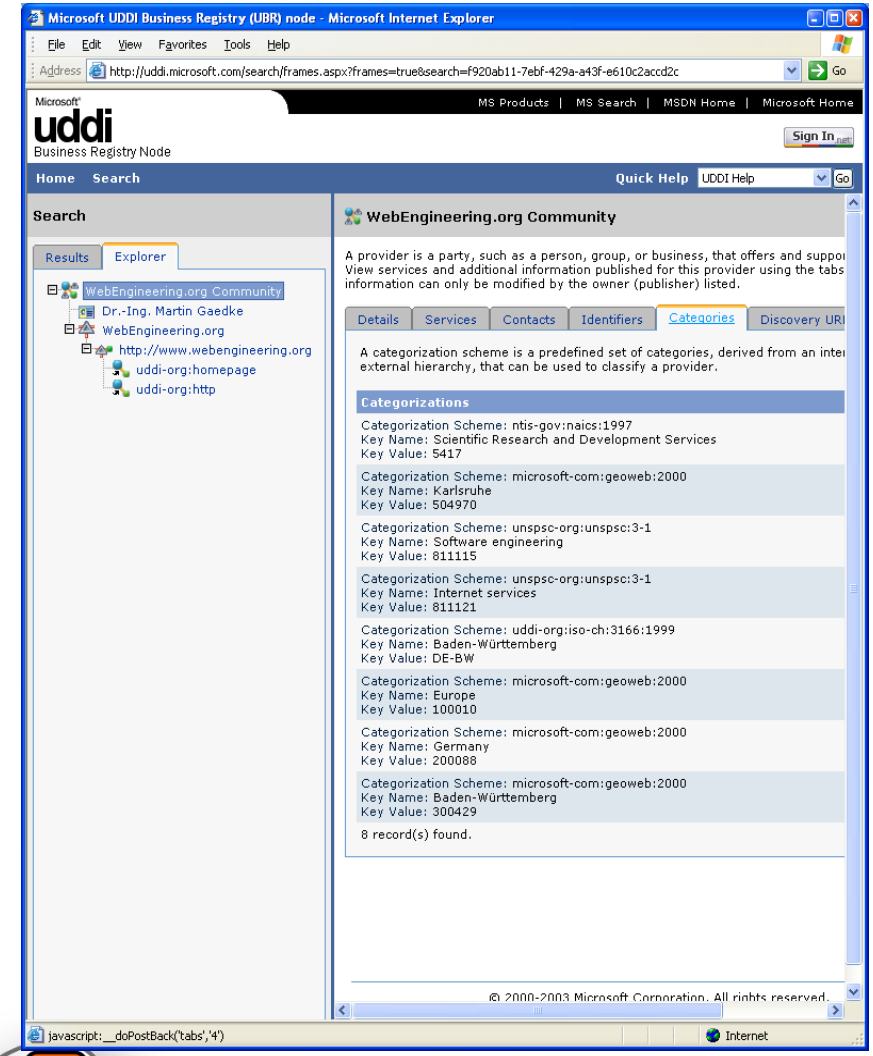
UDDI Business Registry (UBR) - Idee

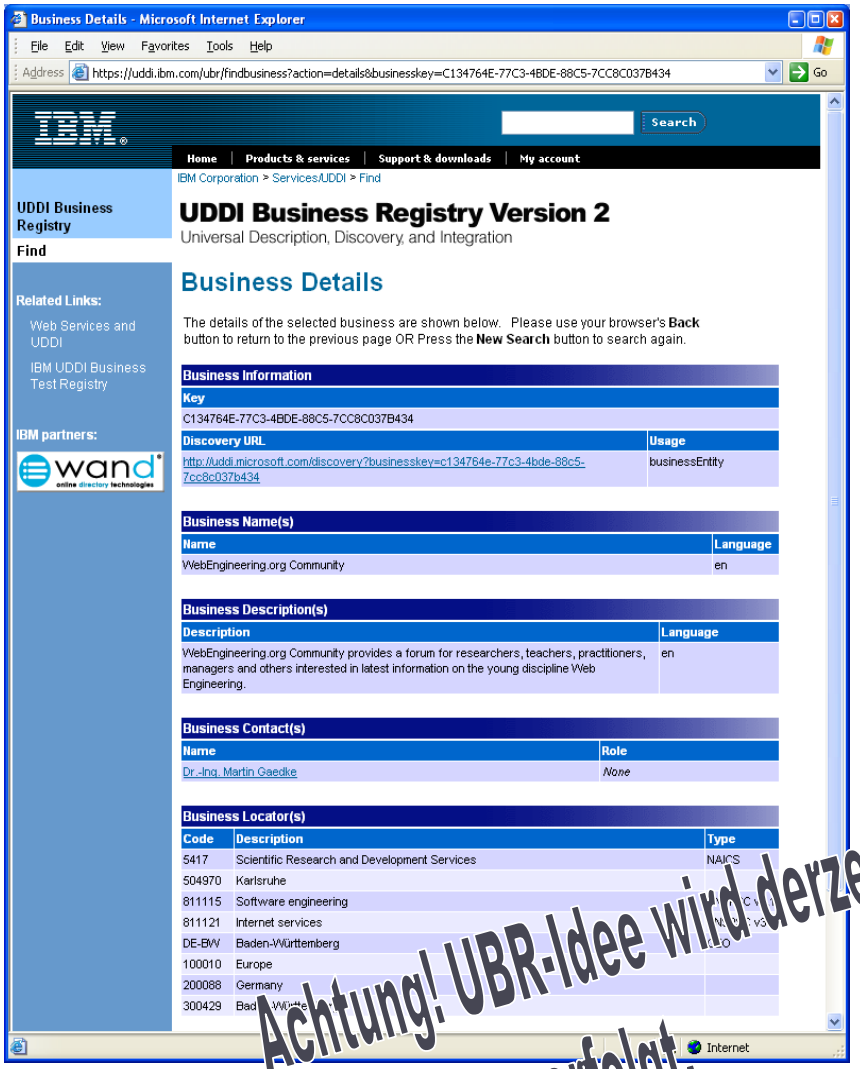
- UBR agieren als Peer Nodes (Websites)
- Firmen (Kunden) können bei irgendeiner Firma bzw. Deren UBR ihre Daten registrieren
- Registrierungen werden mit den anderen UBRs repliziert (Registrierungen sind daher jederzeit über alle UBRs verfügbar)
- Standard SOAP API muss von allen UBRs unterstützt werden
- Vertragliche Regelung



Achtung! UBR-Idee wird derzeit nicht mehr verfolgt.

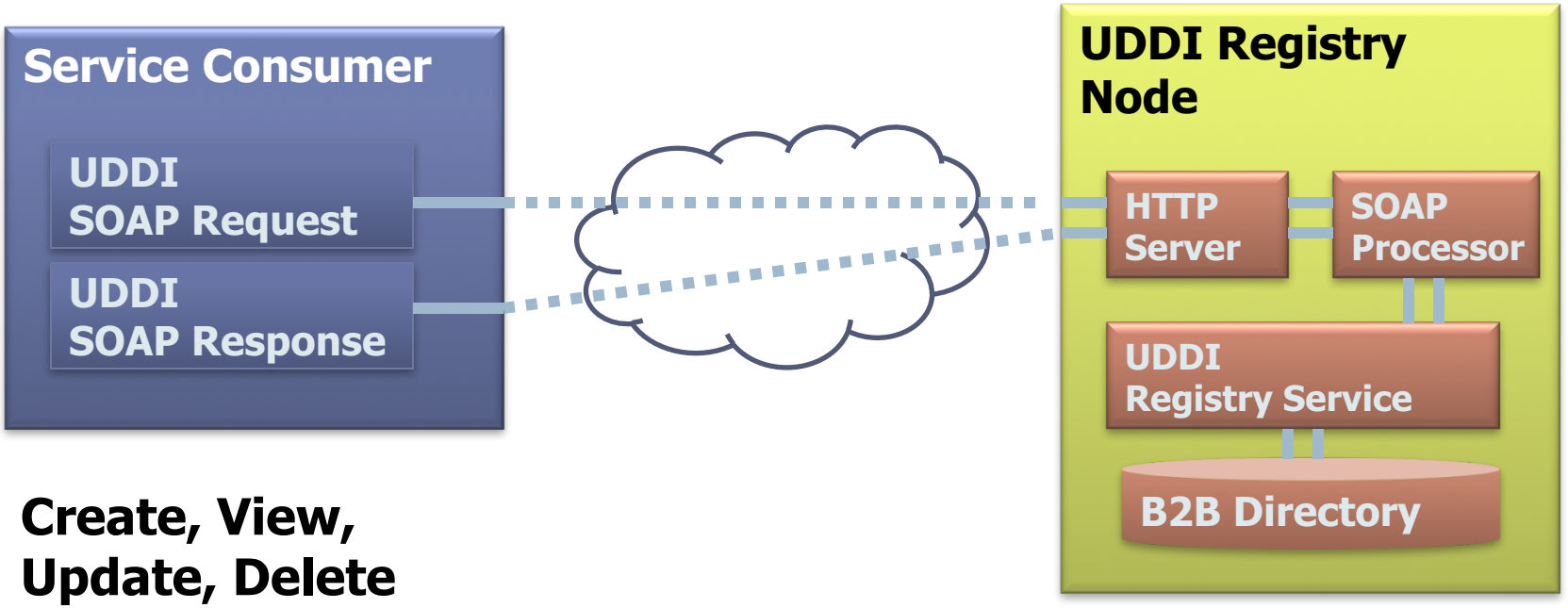
UBR Beispiel





Achtung! UBR-Idee wird derzeit nicht mehr verfolgt.

UDDI im Einsatz (1) - Szenario



Create, View, Update, Delete Registrierungen

Black-Box-Prinzip (Implementierungs-Unabhängig)

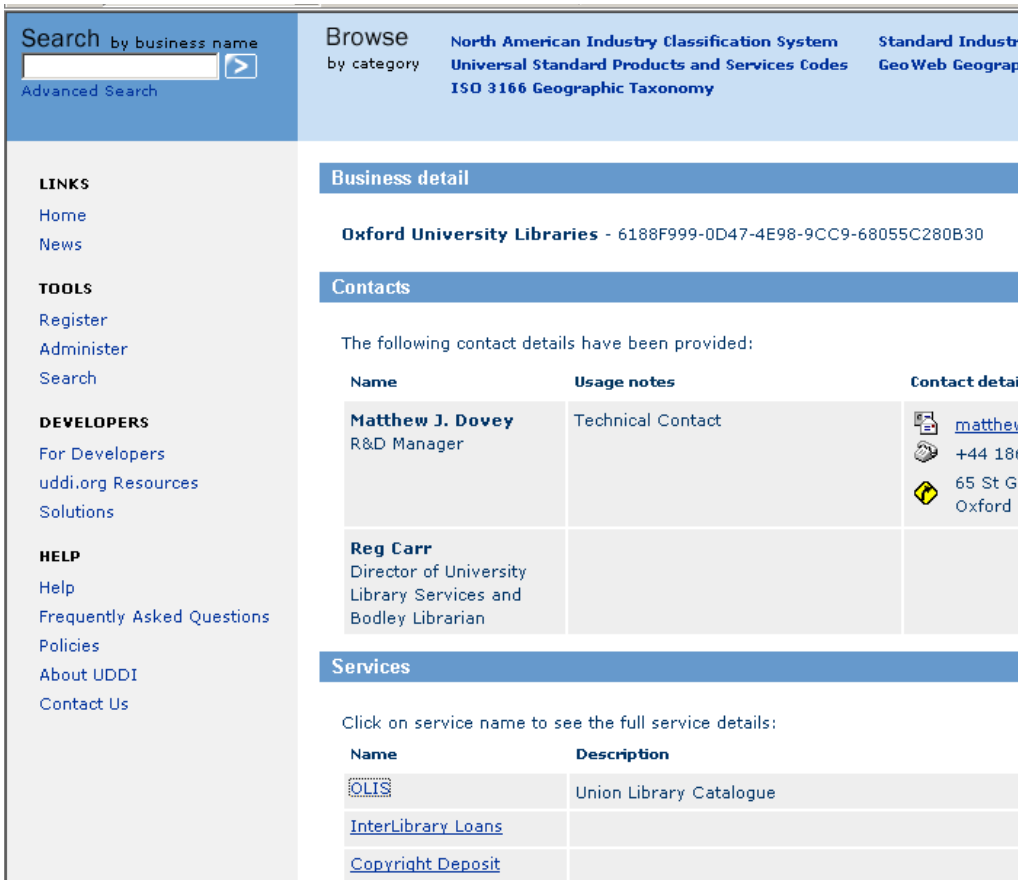
UDDI im Einsatz (2) - Ablauf

UDDI im Einsatz (3) - APIs

- **APIs in Verbindung mit SOAP**
  - Inquiry API für Finden von Diensten
  - Publisher API für die Verwaltung von Dienst-Informationen des Anbieters (Service Providers)
- **Inquiry API**
  - Find things
    - find_business
    - find_service
    - find_binding
    - find_tModel
  - Get Details about things
    - get_businessDetail
    - get_serviceDetail
    - get_bindingDetail
    - get_tModelDetail
- **Publishers API**
  - Save things
    - save_business
    - save_service
    - save_binding
    - save_tModel
  - Delete things
    - delete_business
    - delete_service
    - delete_binding
    - delete_tModel
  - security…
    - get_authToken
    - discard_authToken

UDDI Registry (1) – Wer/Was/Wo/Wie

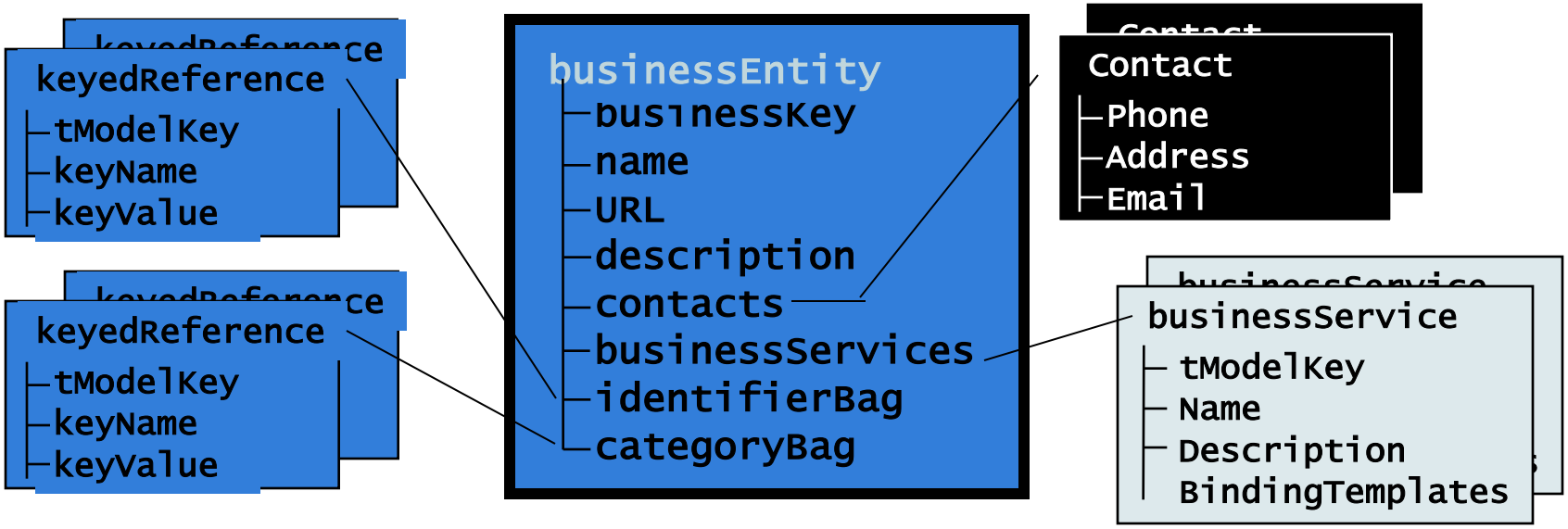
- **Wer** – Information über Anbieter des Web-basierten Dienst
- **Was** – Typ im Sinne Geschäftskategorie
- **Wo** – Wo kann der Dienst abgerufen werden
- **Wie** – Beschreibung der Dienstschnitt-stelle



UDDI Registry (2) - Anbietersicht

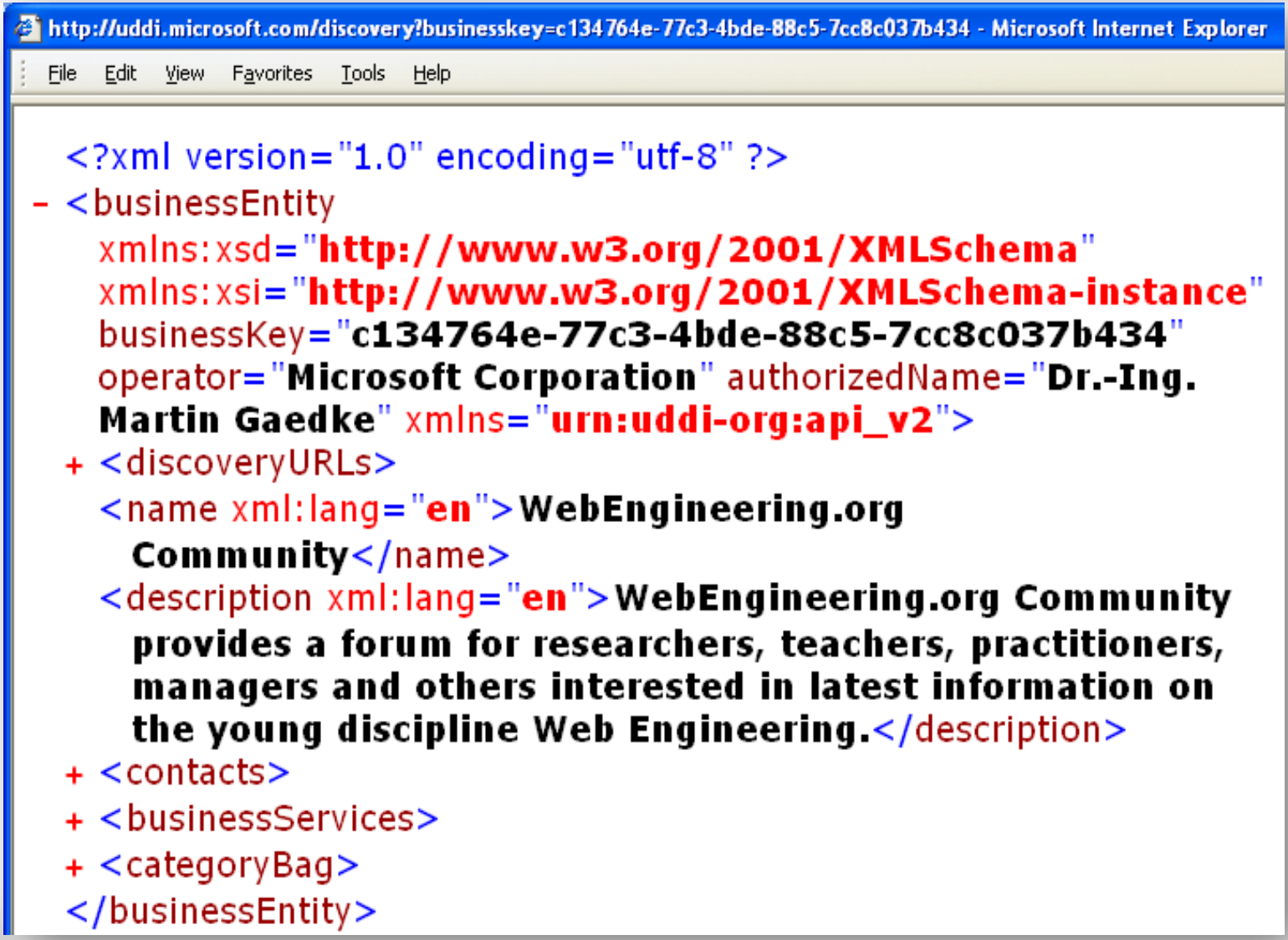
UDDI Registry (3) - Datenmodell

- **businessEntity** – Ist der zentrale Datentyp, der alle Informationen zu einer Organisation oder Geschäftseinheit in UDDI registriert
  - Dient als "master container" für alle Beziehungen
  - Kann keine organisatorischen Hierarchien abbilden (in V1)
  - Nutzt **tModel** Konzept

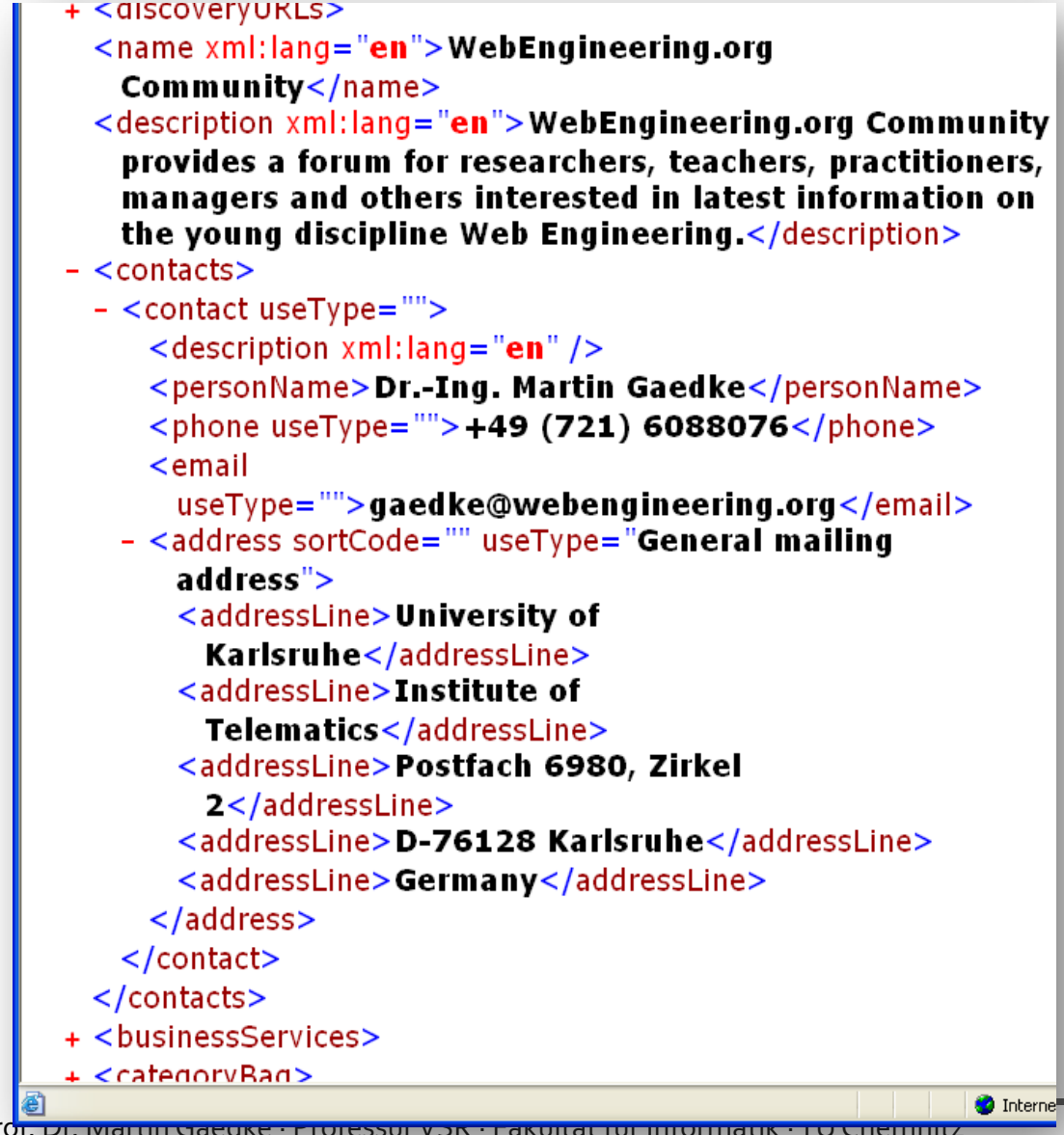


- ***tModel*** – (UUID, Name, Beschreibung)

UDDI Registry (4) – Bsp-Business (1)



UDDI Registry (4) – Bsp-Business (2)



UDDI Registry (4) – Bsp-Business (3)

```
us">WebEngineering.org</name>
- <bindingTemplates>
  - <bindingTemplate bindingKey="5cec6be9-0fb9-
      45bb-b186-ec172fb1e2f6"
      serviceKey="536d76f6-47a3-4faa-baa6-
      7b3464bfc253">
      <description xml:lang="en">The
        WebEngineering.org Site assists you in
        endeavouring, teaching, or applying the
        Web Engineering discipline by providing a
        constantly updated suite of system
        software, development tools, software
        architectures, process models, research
        approaches, liter</description>
      <accessPoint
        URLType="http">http://www.webengineering.org<
    - <tModelInstanceDetails>
        <tModelInstanceInfo
          tModelKey="uuid:4cec1cef-1f68-4b23-
          8cb7-8baa763aeb89" />
        <tModelInstanceInfo
          tModelKey="uuid:a9618442-aec4-4b0d-
          9715-826b733e25da" />
      </tModelInstanceDetails>
    </bindingTemplate>
  </bindingTemplates>
</businessService>
```

UDDI Registry (4) – Bsp-Business (4)

```
+ <businessServices>
- <categoryBag>
    <keyedReference tModelKey="uuid:c0b9fe13-179f-413d-
      8a5b-5004db8e5bb2" keyName="Scientific Research
      and Development Services" keyValue="5417" />
    <keyedReference tModelKey="uuid:297aaa47-2de3-4454-
      a04a-cf38e889d0c4" keyName="Karlsruhe"
      keyValue="504970" />
    <keyedReference tModelKey="uuid:db77450d-9fa8-45d4-
      a7bc-04411d14e384" keyName="Software engineering"
      keyValue="811115" />
    <keyedReference tModelKey="uuid:db77450d-9fa8-45d4-
      a7bc-04411d14e384" keyName="Internet services"
      keyValue="811121" />
    <keyedReference tModelKey="uuid:4e49a8d6-d5a2-4fc2-
      93a0-0411d8d19e88" keyName="Baden-Württemberg"
      keyValue="DE-BW" />
    <keyedReference tModelKey="uuid:297aaa47-2de3-4454-
      a04a-cf38e889d0c4" keyName="Europe"
      keyValue="100010" />
    <keyedReference tModelKey="uuid:297aaa47-2de3-4454-
      a04a-cf38e889d0c4" keyName="Germany"
      keyValue="200088" />
    <keyedReference tModelKey="uuid:297aaa47-2de3-4454-
      a04a-cf38e889d0c4" keyName="Baden-Württemberg"
      keyValue="300429" />
  </categoryBag>
</businessEntity>
```

Chapter 5
THE CLIENT

Clients in SOA

- Important properties:
  - Cooperation
  - Negotiation
  - Autonomy
  - Optimisation
  - Adapted to the presence and availability of many different services over the internet

Client vs. Service

- **Service** is about modeling actions and interactions.
- **Client** is to use those actions to achieve the users goals.

- **Service** provides the tools (i.e. functionality)
- **Client** decides what to do and how to do it (i.e. which service will be called for executing the functionality needed)

Requirements

- **Service-based**: The basic means of interaction between entities residing on the platform will be the concept of service. This means that each action has to be annotated with a service description and needs to be executable via a service-protocol.
- **Distributed**: In order to make full use of the advantages of service-based communication, the entities need to be spreaded in a system over different physical locations.
- **Knowledge-based**: To make Agents be able to make intelligent decisions, they need a powerful representation for knowledge within them which allows the evaluation of a situation and reasoning about it. Furthermore the service descriptions need to contain enough useful information for the agents to deliberate about them.

Chapter 6

UNIFORM ADDRESSING

Addressing Resources

- As with DNS and IP-Addresses…
- Goals:
  - It must be possible to identify resources
    - By Name
    - By Address resp. Location
  - Any resource in the Internet should be identified
    - Web pages, FTP-Resources, Mailboxes, Directories, interactive services
- Requirements: Identification mechanism should be
  - Extensible
  - Complete
  - Printable (to be represented as string of 7-bit characters)

Uniform Resource Identifier

- Uniform Resource Identifier (**URI**)
  - Generic term for all textual names/addresses
  - URI is URL or URN or URC
- Uniform Resource Locator (**URL**)
  - The set of URI schemes that have explicit instructions on how to access the resource over the Internet
- Uniform Resource Name (**URN**)
  - A URI that has an institutional commitment to availability, etc.
  - A particular scheme intended to identify resources
- Uniform Resource Characteristic (**URC**)
  - A URC provides Meta Information

Uniform Resource Identifier

- URI – Syntax for identifiers [RFC3986] **<URI> ::= <scheme>":"<scheme-specific-part>**

- **<scheme>**
  name of the scheme
- **<scheme-specific-part>**
  identifier in a format that is according to the scheme

Reserved Characters

- For all types of URIs the following Rules apply:
- The percent sign ("%", ASCII 25 hex)
  - Escape character
- Hierarchical forms ("/", ASCII 2F hex)
  - Delimiting of substrings whose relationship is hierarchical
- Hash - fragment delimiter ("#", ASCII 23 hex)
  - Identifies a fragment in a resource
- Query Delimiter ("?", ASCII 3F hex)
  - To delimit the boundary between the URI of a query able object

Uniform Resource Locator

- URL – Scheme definition [RFC1738,3986]
  - explicit instructions on how to access …
  - <scheme> ::= "http" | "https" | "ftp" | "news" | "mailto" | "nntp" …
- Specific Part defined in a general format
  - <scheme-specific-part> ::= ["//"] [user [":"password] "@"] host [":"port] ["/"url-path]
- Definitions are maintained by the Internet Assigned Numbers Authority (IANA)
- URLs can also be relative [RFC 1808,3986]

Example – HTTP URL

- HTTP URL
- <scheme> ::= "http"
- <scheme-specific-part> ::= "//"<host>[":"<port>][<abs_path>]
- <host> = "[" (IPv6address | IPvFuture) "]" | <IPv4address> | <reg-name>
- <port> = *DIGIT
- <abs_path> = "/"[<path>][";"<params>]["?"<query>]["#"<fragment>]
- <path> = <fsegment> *("/")
- Example
  - http://vsr.informatik.tu-chemnitz.de:8080/a/b?x=1#2345
  - http://www.secret.xyz/account/euro?add=100#FragId

Uniform Resource Name

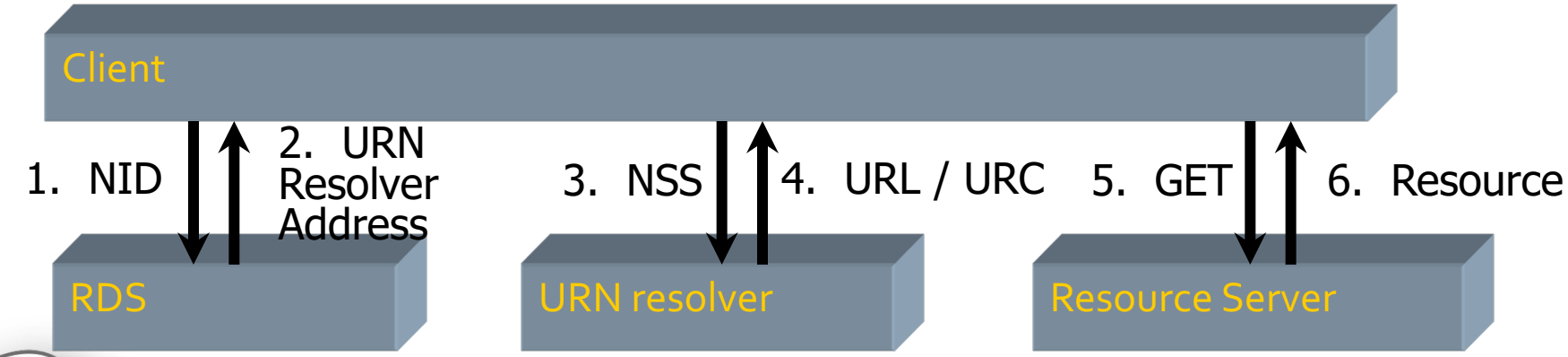
- URN – Scheme definition [RFC 1737, RFC 2141]
  - URNs serve as persistent, location-independent, resource identifiers
- <scheme> ::= "urn"
- <scheme-specific-part> ::= <nid> ":" <nss>
  - nid = Namespace Identifier
  - nss = Namespace Specific String
- E.g. urn:schemas:httpmail:subject

URN Properties

- Global scope and uniqueness
- Persistence
- Scalable
- Legacy support
- Extensible
- Independent
- Resolvable

URN - Resolution

- Infrastructure for URNs is still experimental
  - Resolver Discovery Service (RDS)
  - Name service, name resolution (URN resolver)
  - Result of the resolution is a URL or a URC
  - Cf. RFC 1737, 2276
  - <urn> ::= "urn:" <nid> ":" <nss>



Comparison URN vs. URL

	URN	URL
Scope	Global	Global (abs. URL) Local (rel. URL)
Globally Unique	Yes	Yes (abs. URL) No (rel. URL)
Persistent	Yes	No
Scalable	Yes	Yes
Legacy Support	Yes	Limited
Resolution	Not yet determined	Partly using DNS

The core of all ***bindings*** in the web

Chapter 7

HYPERTEXT TRANSFER PROTOCOL (HTTP)

Section 1

THE BASICS

Hypertext Transfer Protocol

- **Hypertext Transfer Protocol (HTTP)** is used to exchange resources (such as websites, pictures, JavaScript, other MIME-types resources) between a user agent and a server following the Request/Response model.
  - Basic web resource transfer mechanism
  - IETF-Standard: RFC 2616 - Hypertext Transfer Protocol -- HTTP/1.1
  - Development: World Wide Web Consortium (W3C)
  - Is a transfer protocol, not a transport one
- Protocol properties
  - Exchange of Request/Response data based on TCP/IP
  - Stateless communication between user agent and server
  - Two message types: Request and Response
  - Messages are ASCII-encoded
  - Messages are used to realize methods: GET, POST, HEAD, etc.

HTTP Versions

- Early onset - Version 0.9
  - Only one command is supported: "GET" (no other approaches, like, for example, attributes)
  - Is not extensible, no versioning support
- Ideas of versioning and robustness of the Web
  - Use of version numbers for HTTP (RFC 2145, May 1997)
  - Robustness principle (backward compatibility support)
- May 1996 - Version HTTP/1.0 (RFC 1945)
  - Introduction of version numbers
  - Stateless protocol (TCP-Slow-Start problematics)
  - Support for extensions
  - HTTP/1.0 is still widespread
- June 1999 Version HTTP/1.1 (RFC 2616), supplemented by TLS (RFC 2817)
  - Enables persistent connections and proxy use
  - Many improvements in terms of performance, i.e. Request Pipelining or Multihomed Server
  - Addition of a secure connection possibility by means of Transport Layer Security (TLS)

Generic Approach

- Generic message structure enables extensions
- Important: The concept is used in all protocols that build upon HTTP

Generic-Message = **Start-Line**
***Header**
CRLF
[Message-Body]

Start-Line ::= Request-Line | Response-Line

Header ::= field-name ":" [field-value] CRLF
field-name = token
field-value = *(field-content | LWS)
LWS = Linear White Space

Message-Body
If exists MUST be encoded
Presence signaled by header field Content-Length or Transfer-Encoding

HTTP-Request Message

- Message structure
  <Method>" "<URI>" "<Protocol>
  <Headers>
  CRLF
  [<Data>]

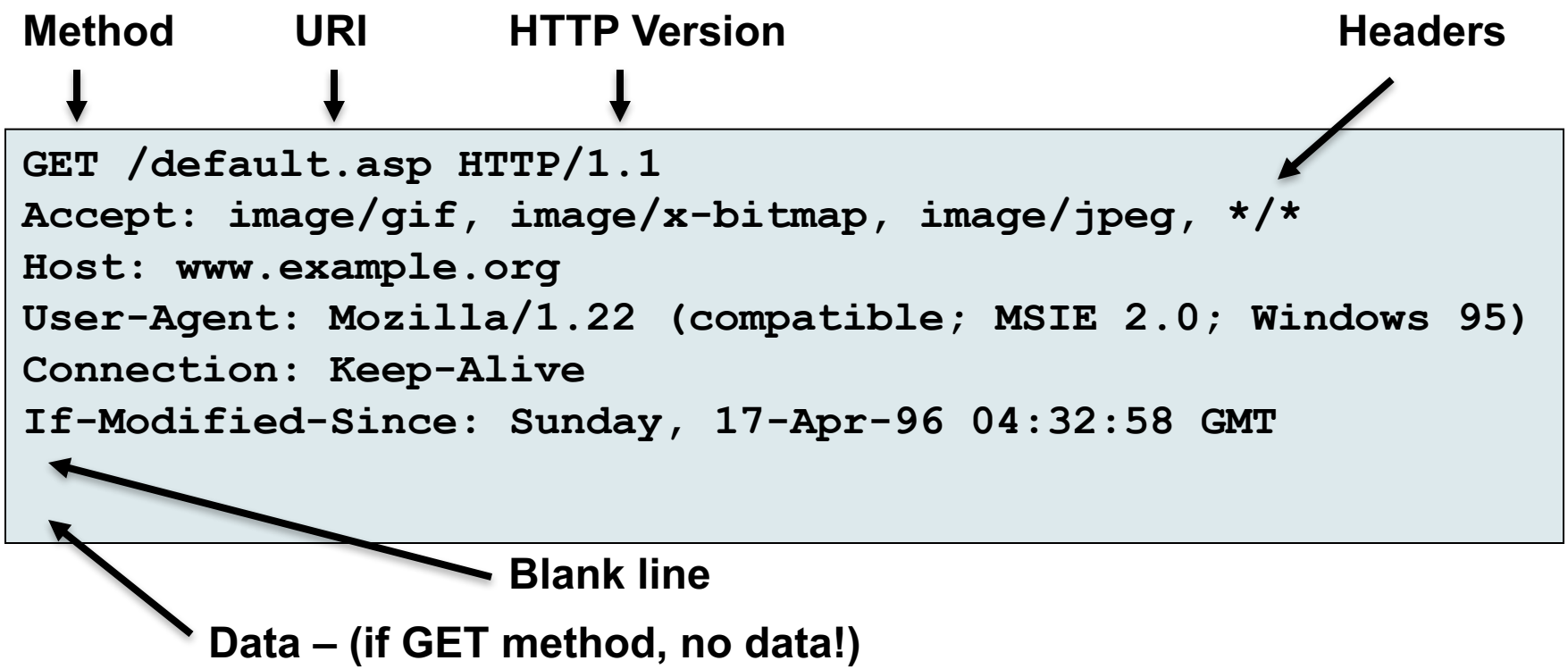
- *Method* ::= "GET" | "POST" | "HEAD" | …
- *Protocol* ::= "HTTP/1.0" | "HTTP/1.1" | …
- *Headers* ::= <hName>":"<hValue>
  hName – header name h (Attribut-Name)
  hValue – Value of the value space of header h (Attribut-Wert)
- *Data* ::= <TEXT>

HTTP-Response Message

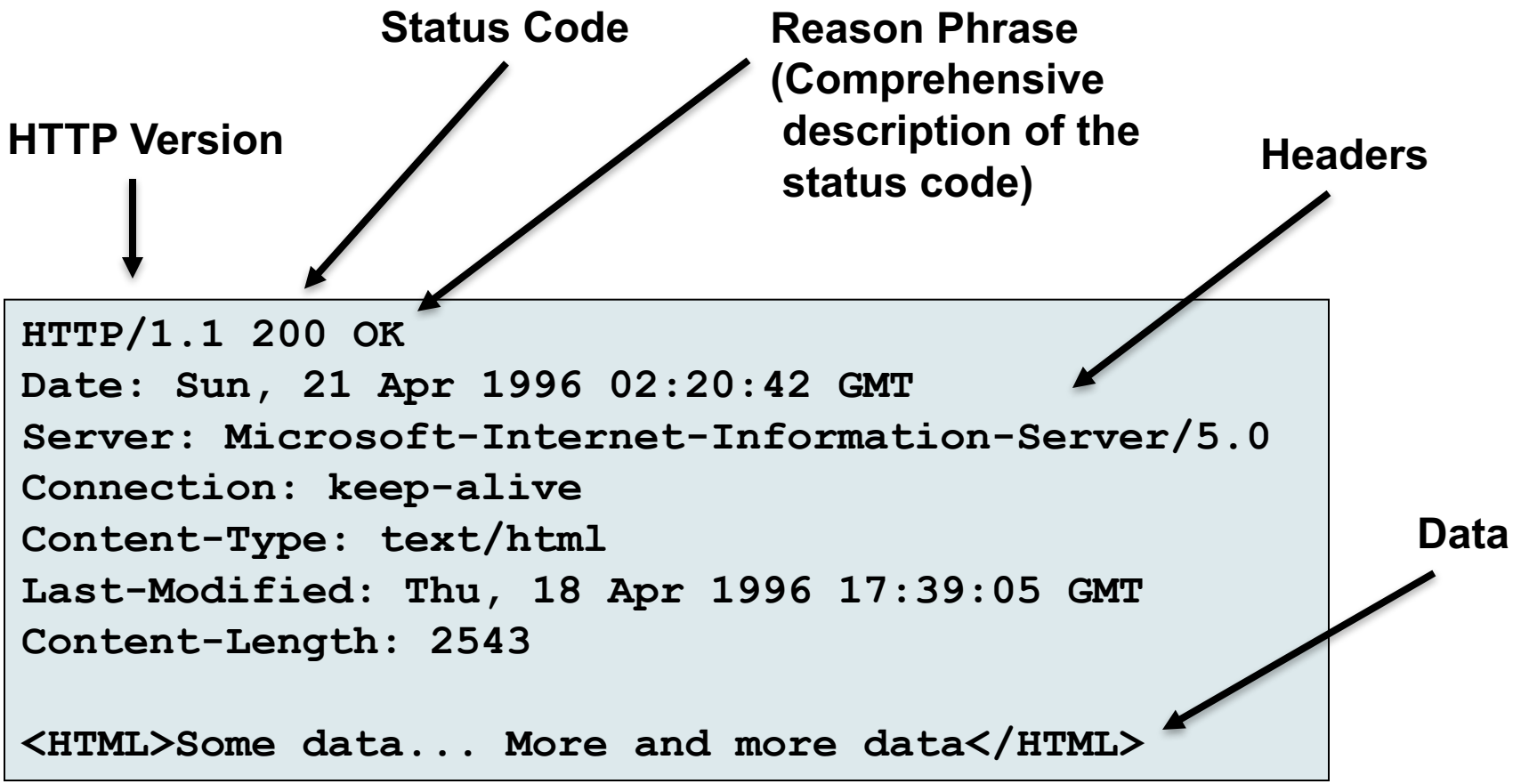
- Message structure
  <Protocol>" "<Status-Code>" "<Reason-Phrase>
  <Headers>
  CRLF
  [<Data>]

- *Protocol* ::= "HTTP/1.0" | "HTTP/1.1"
- *Status-Code* ::= DIGIT+ ; for use by automata
- *Reason-Phrase* ::= <TEXT> ; for use by human user
- *Headers* ::= <hName>":"<hValue>
  hName – Specific Header Name h (Attribut-Name)
  hValue – Value of the value space of header h (Attribut-Wert)
- *Data* ::= <TEXT>

HTTP Request



HTTP Response



Typical HTTP Methods (1)

- Methods are applied in the context of HTTP Requests
  - For further detail on methods see RFC 2616
- **GET**
  - Deliver the resource addressed by the URI
- **POST**
  - Request to the server with respect to processing of encoded message body data (processing wrt. the URI provided in POST)
  - Enables among others:
    - Annotation of existing resources
    - Send (POST) data blocks to an application, like comment, user ID, pictures
    - Available (send data via messages) from a form
- **HEAD**
  - Like GET but without the Response Body
- **OPTIONS**
  - Request on information submission on communication options

Typical HTTP Methods (2)

- **PUT**
  - Resources encoded in the Body should be saved at the Request URI
- **DELETE**
  - Server should remove the resources connected to the Request URI
- **TRACE**
  - Methods for development support of the so-called application layer request loop-back
  - All requests of user agents that the server gets should return to the user agent

Typical HTTP Headers (1)

- Repetition: Header entry (name-value pair) *hName:hValue*
  - The following examples are often used hNames
- **Content-Type**
  - Media type used
- **Expires**
  - Date/time from which the response is considered invalid
  - Important for caching!
- **Host**
  - Specifies Internet host and port number of the requested resource
  - Required for "multi-homed server" (HTTP/1.1)!
- **Last-Modified**
  - Date and time when the "variant" (object referenced by the Request-URI) was last modified
  - Important for caching!

Typical HTTP Headers (2)

- **Location**
  - Is set in the HTTP Response to notify the user agent of the new location of the requested Request-URI
  - Very important concept in different protocols which build up on HTTP, for example, in the security area
  - Is used for implementation of the so-called "Redirects"
- **Referrer**
  - Reference to the URI from which the user agent has posted the current Request URI
  - Useful for maintenance/service tasks
    - Where do the users come from?
    - Logging, optimization, caching, user types
  - Not used as a security mechanism
- **User-Agent**
  - Information about the user agent
  - Important for personalization and internationalization
- Numerous further attributes exist for use for different tasks

Typical HTTP Headers (3)

Code	Description
1xx	**Information as intermediate response**
2xx	**Successful operations**
200	OK
201	Created
3xx	**Redirects**
301	Moved Permanently
302	Moved Temporarily
4xx	**Client Error**
400	Bad Request – not understood
401	Unauthorized
403	Forbidden – not authorized
404	Not Found
5xx	**Server Error**