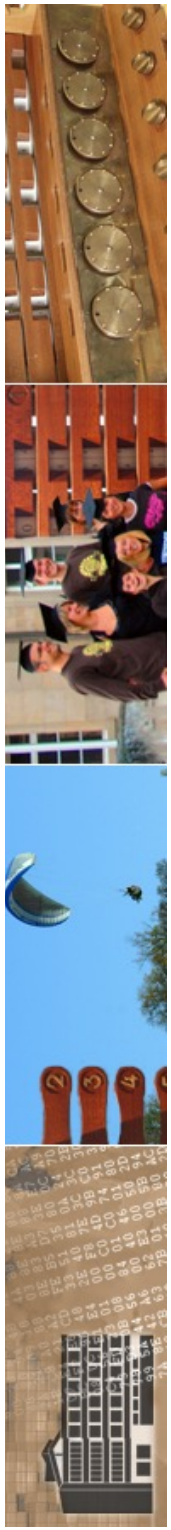

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MATHEMATISCH-
NATURWISSENSCHAFTLICHE FAKULTÄT
FACHBEREICH INFORMATIK
INFORMATIONSDIENSTE

Grundlagen der Web-Entwicklung

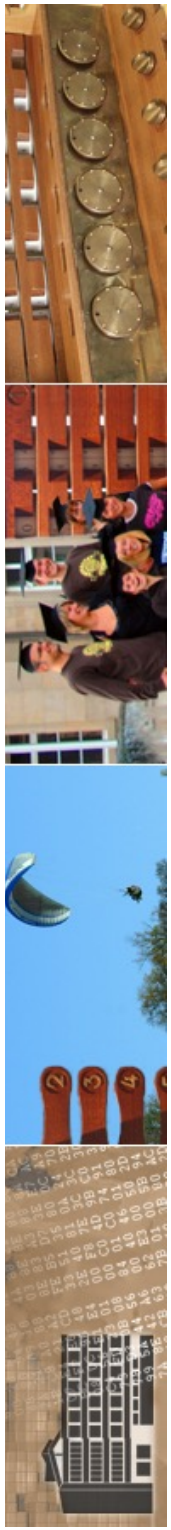
INF3172

Web-Services und Frontend-Frameworks

Thomas Walter

29.01.2026

Version 1.0



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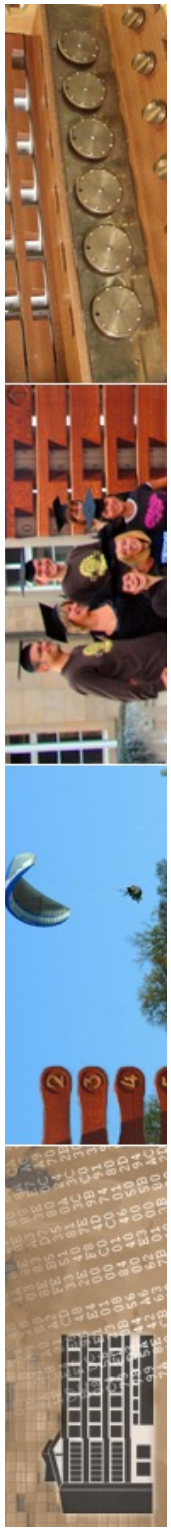
Klausur

- unsere Klausur findet statt:

  Freitag, 06.02.2026, 12h – 14h, N10

- Nachklausur 27.03.2026, 12h - 14h, F119



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wir suchen: HiWis

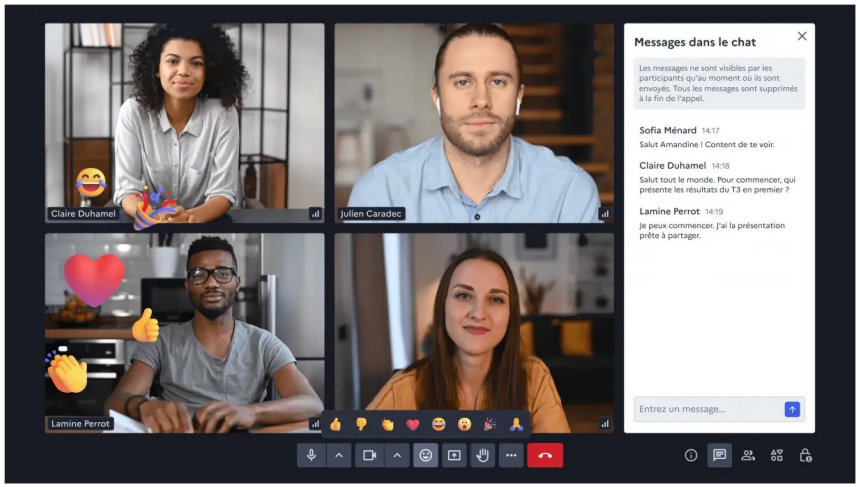
- am ZDV sind häufig HiWi-Stellen zu besetzen
- aktuell suchen wir ab SoSe 2026:

  HiWis für die Genius-Bar
  - ein sehr spannender, abwechslungsreicher und lehrreicher (!) Job
  - bei Interesse Mail mit dem Subject HiWi an thomas.walter@uni-tuebingen.de

Frankreich sagt Microsoft Teams und Zoom den Kampf an

Mit Visio führt Frankreich seine Open-Source-Videokonferenzen für Behörden ein. Bis 2027 sollen 200.000 Beamte unabhängig von US-Anbietern arbeiten können.

268



(Bild: DINUM)

27.01.2026, 10:50 Uhr **Lesezeit: 3 Min.** | **iX Magazin**

Von Moritz Förster

Frankreich weitet seine souveräne Videokonferenzsoftware Visio auf alle staatlichen Dienste aus. Bis 2027 sollen rund 200.000 Beamte auf die Plattform umsteigen. Visio wird von der Direction Interministérielle du Numérique (DINUM) entwickelt und soll die Abhängigkeit von außereuropäischen Anbietern wie Microsoft Teams, Zoom, Google Meet, Webex und GoTo Meeting beenden.

Tschüss Big Tech: Acht sichere E-Mail-Alternativen aus Europa im Vergleich

Gmail, iCloud, Outlook – die größten E-Mail-Anbieter sitzen in den USA. Mit diesen europäischen Alternativen erklären Sie Ihre digitale Unabhängigkeit.

Artikel verschenken

199

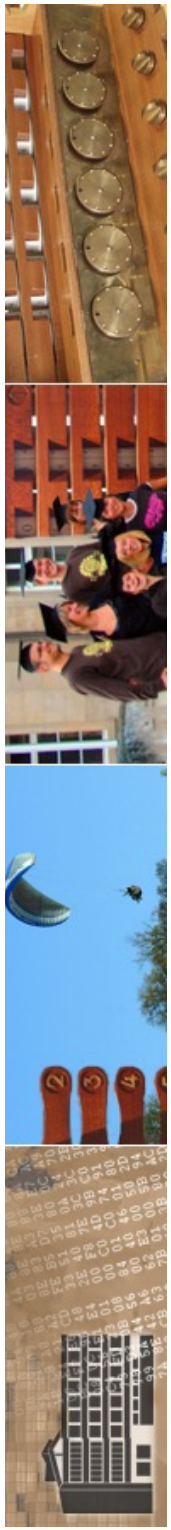
(Bild: KI / heise online)

23.01.2026, 16:08 Uhr **Lesezeit: 25 Min.** | **heise+ exklusiv**

Von Daniel Ziegener

INHALTSVERZEICHNIS

Kaum jemand beschäftigt sich gerne mit seinem Mail-Postfach: Hunderte ungelesene Nachrichten, Werbung, Spam und Newsletter frustrieren einen schnell. Trotzdem geht es nicht ohne, für fast jede Online-Anmeldung ist eine E-Mail-Adresse Pflicht. Vom zurückgesetzten Passwort über die Terminbestätigung beim Arzt bis zur digitalen Brieffreundschaft sammeln sich über die Jahre Berge an persönlichen Daten an. Sollten diese wirklich auf dem Server eines US-Konzerns liegen?



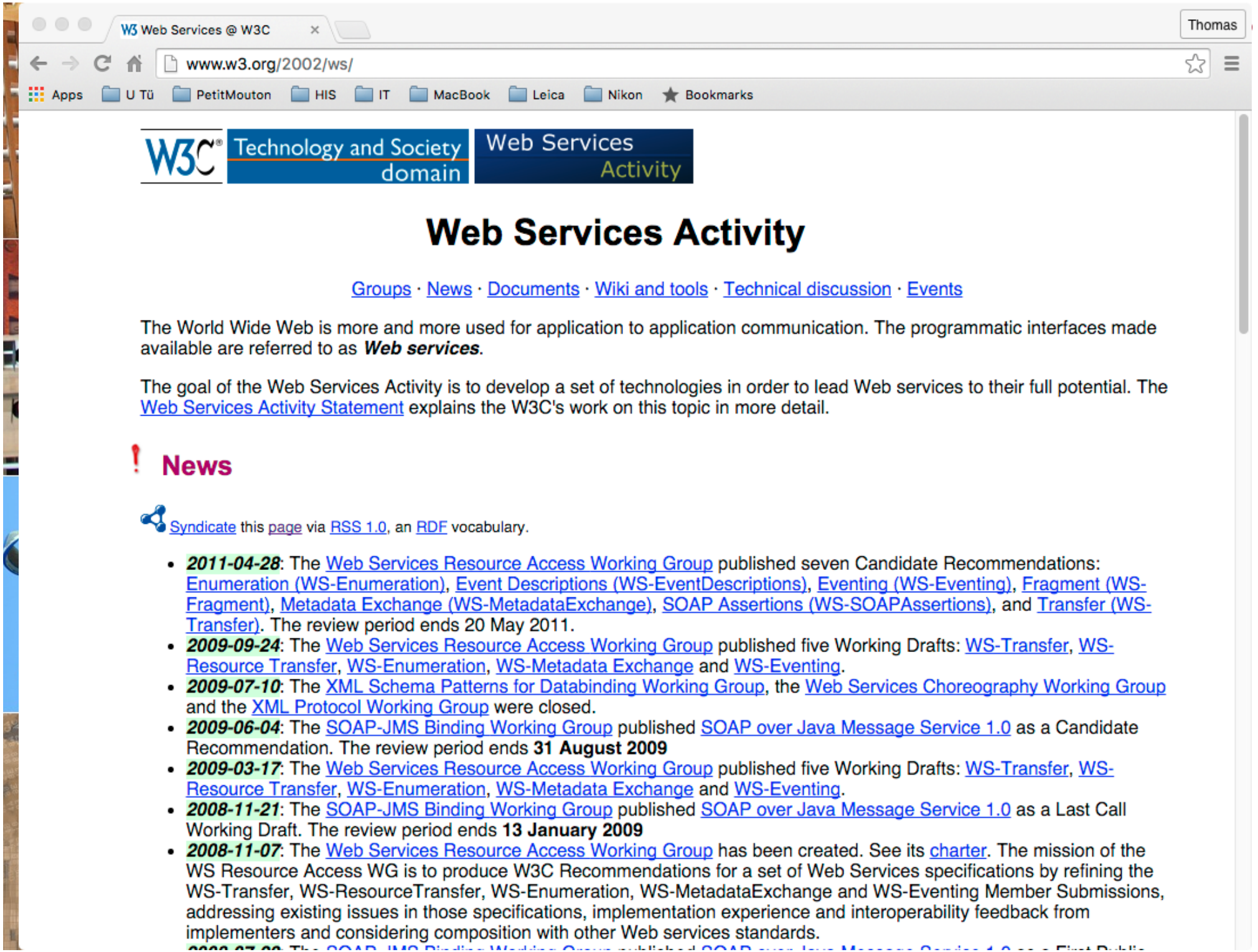
Webservice

- weitere grundlegende Architektur im Web:

  Webservice (Web-Dienst)

- Zusammenarbeit verschiedener Anwendungsprogramme auf unterschiedlichen Plattformen

- primäre Quelle: http://www.w3.org/2002/ws/



W3C Technology and Society domain | Web Services Activity

Web Services Activity

Groups · News · Documents · Wiki and tools · Technical discussion · Events

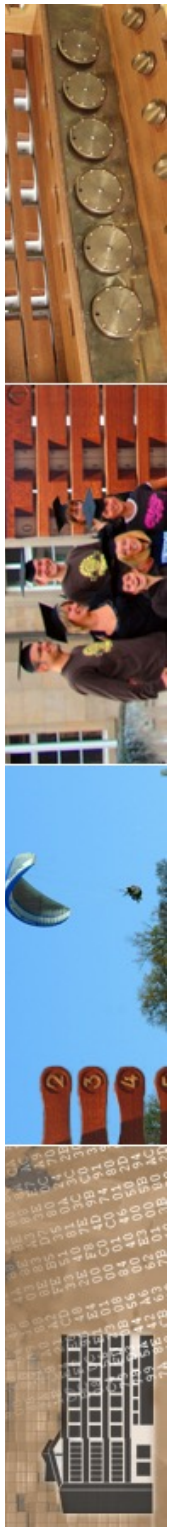
The World Wide Web is more and more used for application to application communication. The programmatic interfaces made available are referred to as ***Web services***.

The goal of the Web Services Activity is to develop a set of technologies in order to lead Web services to their full potential. The Web Services Activity Statement explains the W3C's work on this topic in more detail.

News

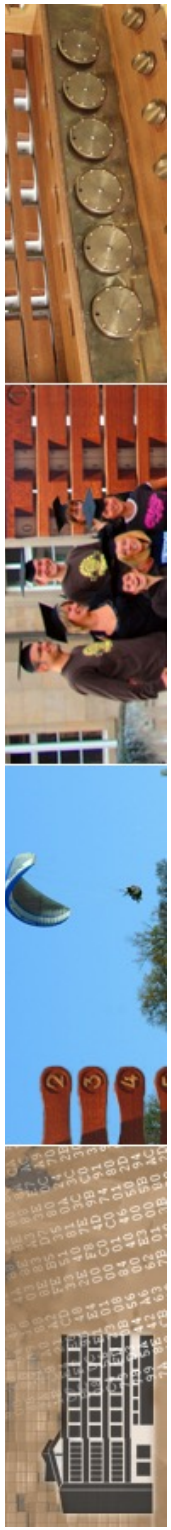
Syndicate this page via RSS 1.0, an RDF vocabulary.

- ***2011-04-28***: The Web Services Resource Access Working Group published seven Candidate Recommendations: Enumeration (WS-Enumeration), Event Descriptions (WS-EventDescriptions), Eventing (WS-Eventing), Fragment (WS-Fragment), Metadata Exchange (WS-MetadataExchange), SOAP Assertions (WS-SOAPAssertions), and Transfer (WS-Transfer). The review period ends 20 May 2011.
- ***2009-09-24***: The Web Services Resource Access Working Group published five Working Drafts: WS-Transfer, WS-Resource Transfer, WS-Enumeration, WS-Metadata Exchange and WS-Eventing.
- ***2009-07-10***: The XML Schema Patterns for Databinding Working Group, the Web Services Choreography Working Group and the XML Protocol Working Group were closed.
- ***2009-06-04***: The SOAP-JMS Binding Working Group published SOAP over Java Message Service 1.0 as a Candidate Recommendation. The review period ends **31 August 2009**
- ***2009-03-17***: The Web Services Resource Access Working Group published five Working Drafts: WS-Transfer, WS-Resource Transfer, WS-Enumeration, WS-Metadata Exchange and WS-Eventing.
- ***2008-11-21***: The SOAP-JMS Binding Working Group published SOAP over Java Message Service 1.0 as a Last Call Working Draft. The review period ends **13 January 2009**
- ***2008-11-07***: The Web Services Resource Access Working Group has been created. See its charter. The mission of the WS Resource Access WG is to produce W3C Recommendations for a set of Web Services specifications by refining the WS-Transfer, WS-ResourceTransfer, WS-Enumeration, WS-MetadataExchange and WS-Eventing Member Submissions, addressing existing issues in those specifications, implementation experience and interoperability feedback from implementers and considering composition with other Web services standards.



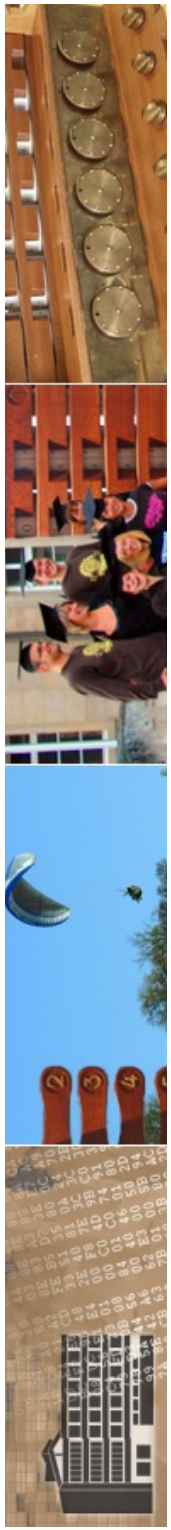
Idee

- Austausch von Daten und Funktionalität mit Web-Übertragungsmechanismen zwischen automatisierten Kommunikationspartnern
  - **Maschine-Maschine-Kommunikation** (Unterschied zum klassischen Web)
- Web-Services sind für die **maschinelle Nutzung**, sie bieten **keine** Benutzerschnittstellen



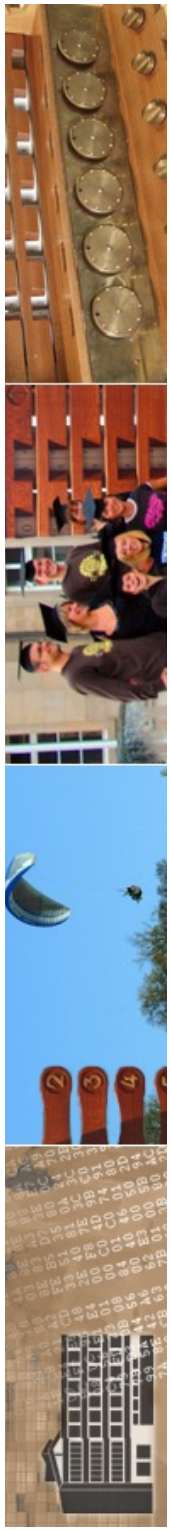
Definitionsversuch

- ein Webservice ist ein Service, der von anderen Softwaresystemen über ein Netzwerk und möglicherweise auch dem Internet über SOAP aufrufbar ist.
  - die Schnittstelle eines Webservice wird mittels **WSDL** (Web Services Description Language) beschrieben.



Basics

- Adressierung über
  Uniform Resource Identifier (URI)
- Schnittstellen XML
- Internet-Protokolle



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Beispiele

- Google:
  Einbinden der Google-Suche in eigene Seite
- Amazon: Webservice Shop-Suche und Partner-Programm
  - Beispiele für einseitige Kommunikation
  - kann auch bidirektional sein


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Google Benutzerdefinier
A A A
Uni A-Z
Anmelden
STUDIENINTERESSIERTE | STUDIERENDE | BESCHÄFTIGTE | ALUMNI | PRESSE
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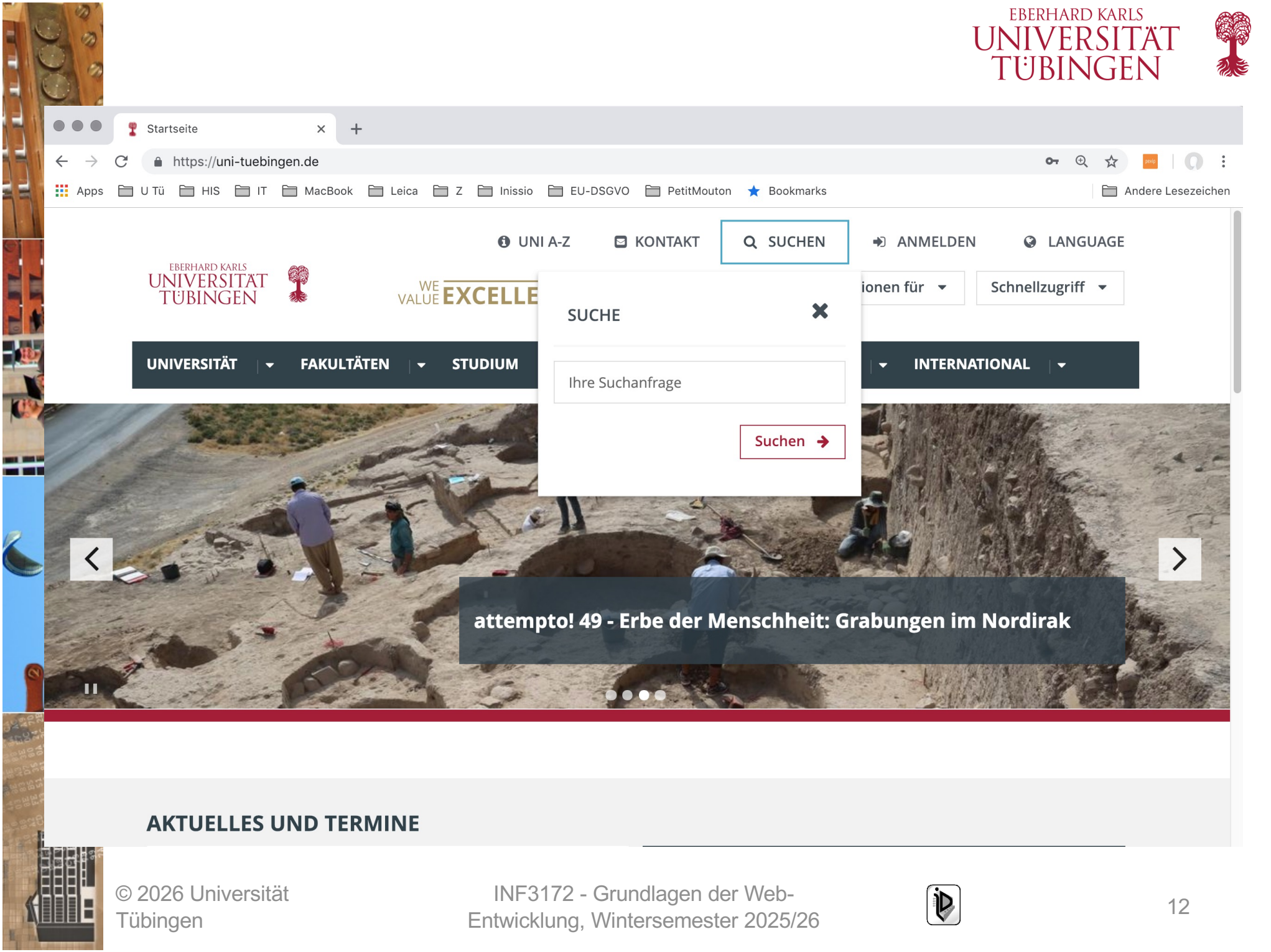
AKTUELLES
STUDIUM
FORSCHUNG
FAKULTÄTEN
EINRICHTUNGEN
INTERNATIONAL
SERVICE
Adventskalender der Universität Tübingen
Aktuelle Veranstaltungen an der Universität Tübingen
Personensuche (EPV)
Pressemitteilungen
05.01.2012
Stärkung der Schulpsychologie in Baden-Württemberg: Start des Kompetenzzentrums an der Universität Tübingen
Enge Zusammenarbeit zwischen dem Land Baden-Württemberg und der Universität Tübingen
[mehr]
02.01.2012
Ausstellung „Weltmaschine“ an der Universität Tübingen
Am gigantischen Teilchenbeschleuniger des CERN sollen die Geheimnisse der Entstehung des Universums aufgeklärt werden


Startseite
https://uni-tuebingen.de
Apps
U Tü
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IT
MacBook
Leica
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Inissio
EU-DSGVO
PetitMouton
Bookmarks
Andere Lesezeichen
UNI A-Z
KONTAKT
SUCHEN
ANMELDEN
LANGUAGE
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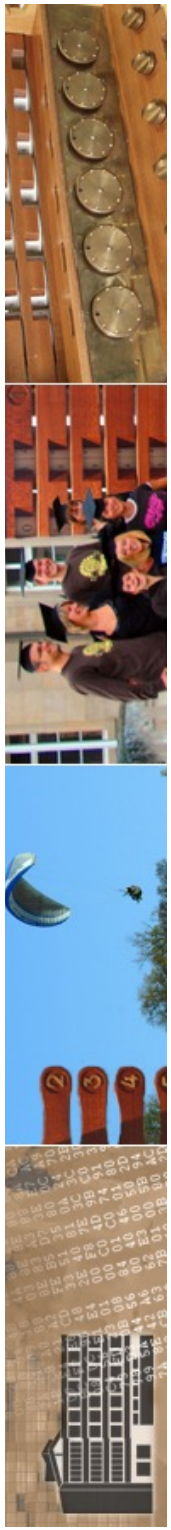
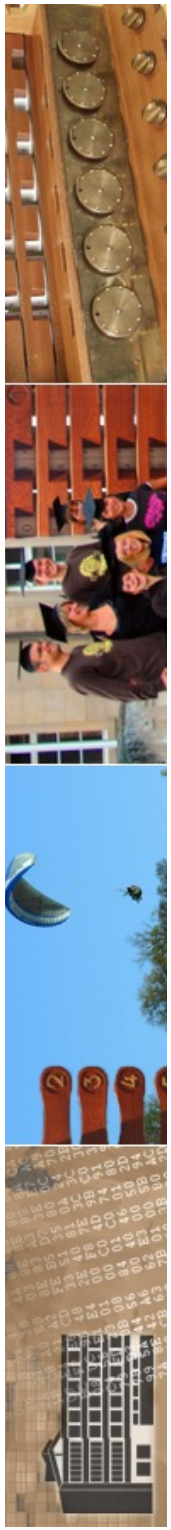
WE VALUE EXCELLE
ionen für
Schnellzugriff
SUCHE
Ihre Suchanfrage
Suchen
UNIVERSITÄT
FAKULTÄTEN
STUDIUM
INTERNATIONAL
attempto! 49 - Erbe der Menschheit: Grabungen im Nordirak
AKTUELLES UND TERMINE



Architektur

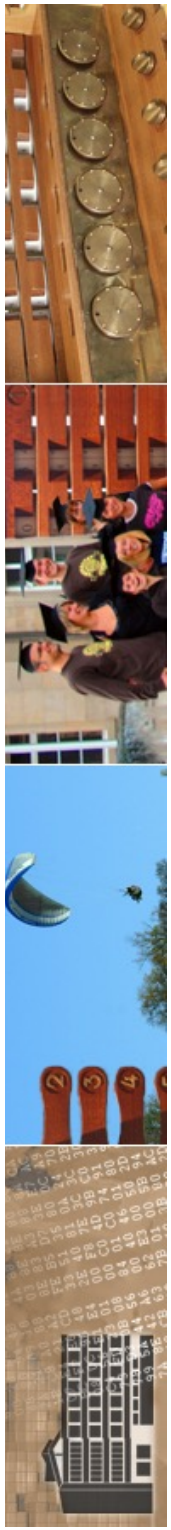
- Client-Programm sendet Anfrage an Web-Service
  - Internet-Protokolle
- Web-Service verarbeitet Anfrage und sendet Antwort
- XML

- Bestandteile:
  - Konsument
  - Anbieter
  - Verzeichnis: Veröffentlichung der Beschreibung des Dienstes durch den Anbieter

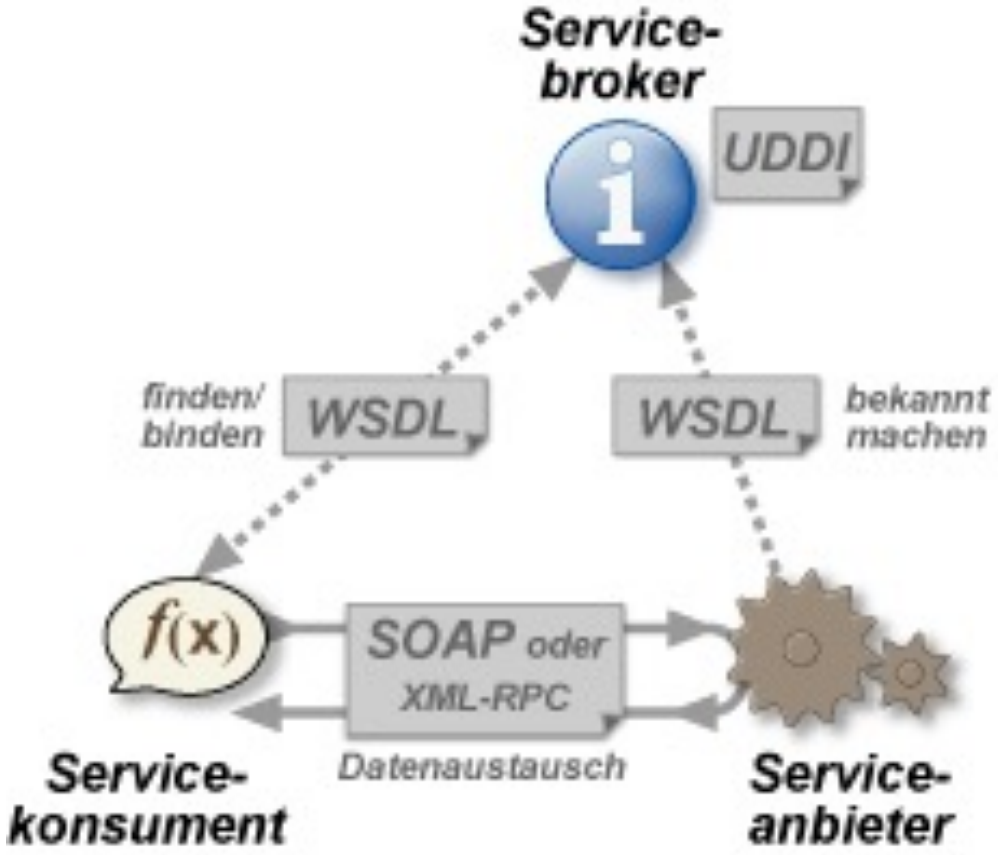


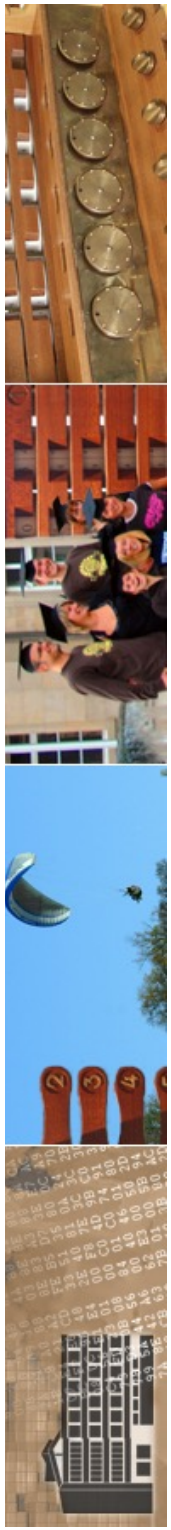
zugrundeliegende Standards

- **SOAP** oder **XML-RPC**: Kommunikation
- **WSDL** (Web Services Description Language): Sprache zur Beschreibung der unterstützten Methoden und ihrer Parameter
- **UDDI** (Universal Description, Discovery and Integration): Verzeichnisdienst zum Registrieren von Web-Services



Prinzip


Service-broker
UDDI
finden/ binden
WSDL
WSDL
bekannt machen
f(x)
SOAP oder XML-RPC
Datenaustausch
Service-konsument
Service-anbieter



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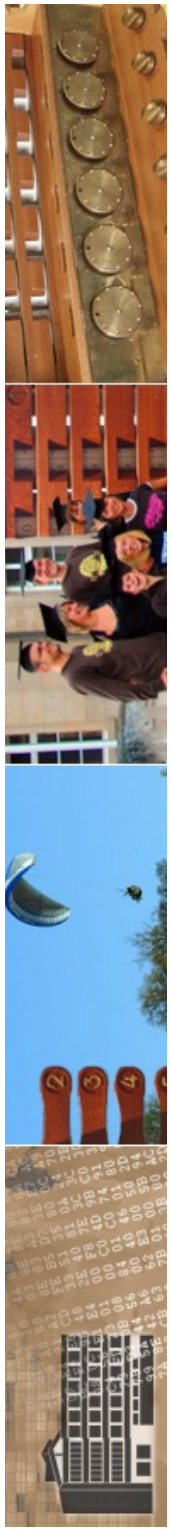
Prinzip der Webservices

- Service-Anbieter stellt Service zur Verfügung
- Service-Verzeichnis zum Publizieren des Service
- Service-Konsument sucht und findet Service in Service-Verzeichnis
- Service-Konsument fragt über URL Service nach
- weitere Kommunikation auf Basis von HTTP-Requests in XML



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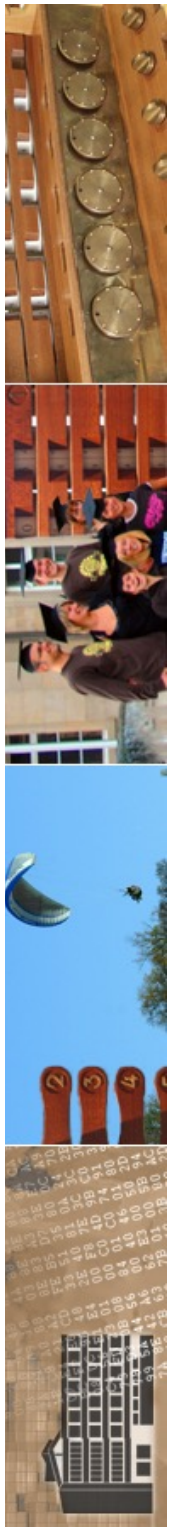
Bewertung

Vorteile

- offene Standards, keine Lizenzkosten
- verschiedene Protokolle wie HTTP, Java-RMI, CORBA, …
- offene und flexible Architektur
- einfacher Einstieg

Nachteile

- Sicherheit
- Performance
- einzelne Techniken sind komplex



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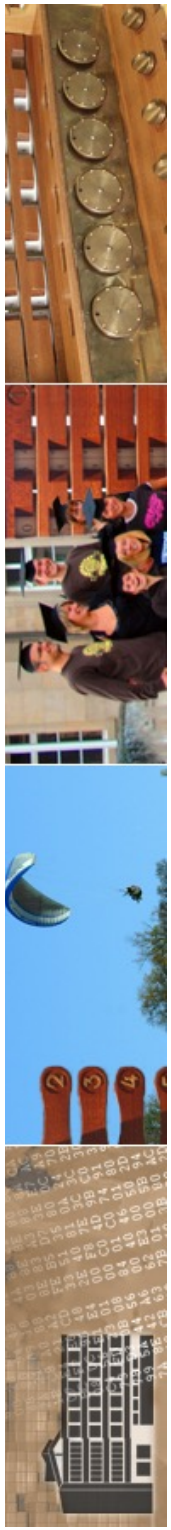
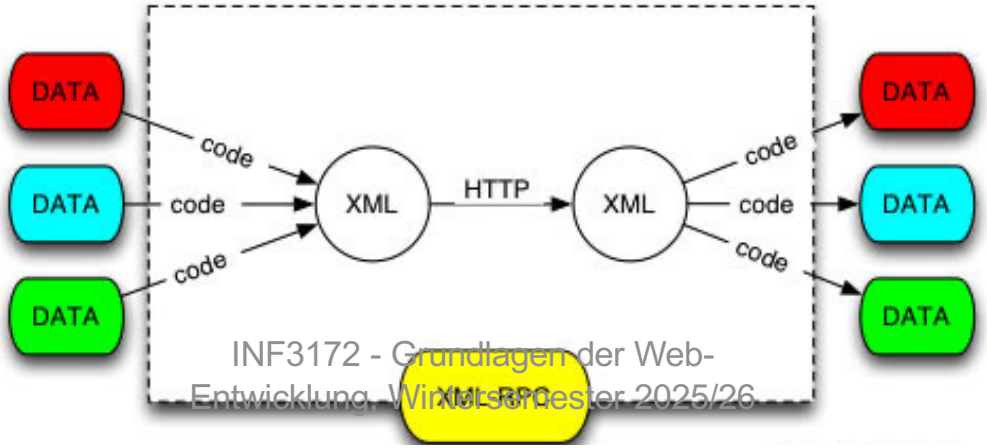
Kernbegriff: SOA

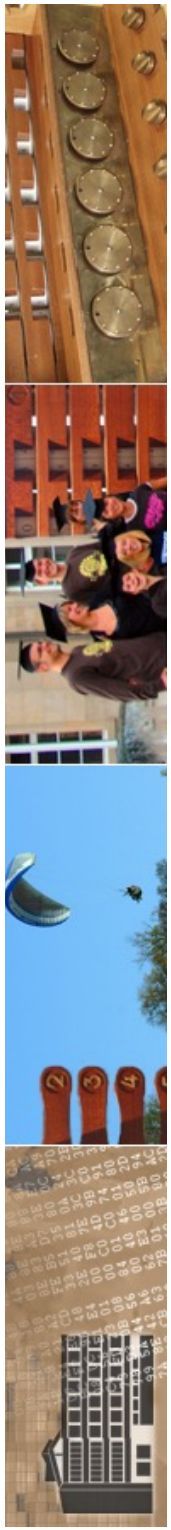
- SOA: service-oriented architecture
  - Idee 1999 von HP (e-Speak-Plattform)



Übertragung I

- XML-RPC
  - siehe http://www.xmlrpc.com
  - u.a. Implementierung in PHP
  - Prinzip:
    - HTTP-POST-Request
    - Request enthält Methodenaufruf und übergibt optionale Parameter
    - Antwort in einen der acht xml-rpc-Typen in XML-Struktur





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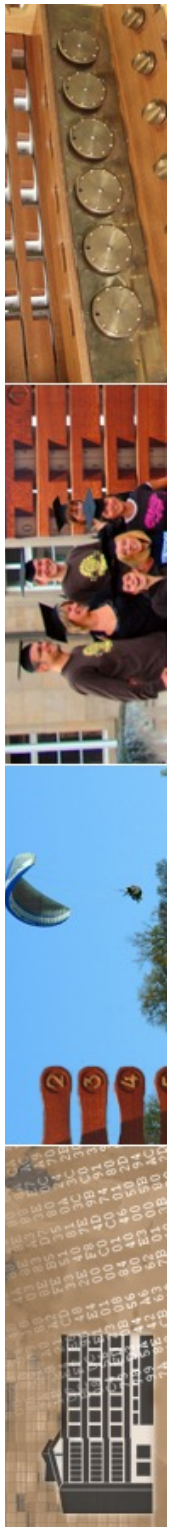
Request und Response

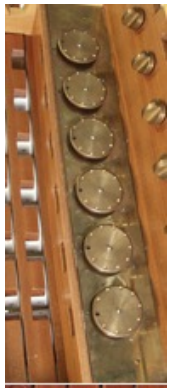
-
```
<?xml version="1.0" ?>
<methodCall>
  <methodName>
     Berechnung
   </methodName>
   <params>
      <param>
         <value>
            <string>
               Tuebingen
            </string>
          </value>
       </param>
     </params>
</methodCall>
```

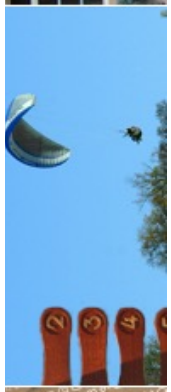
-
```
<?xml version="1.0" ?>
<methodResponse>
   <params>
      <param>
         <value>
            <string>
               Reutlingen
            </string>
          </value>
       </param>
     </params>
</methodResponse>
```



Datentypen von XML-RPC

- XML-RPC bietet acht Datentypen
  - Integer (32 bit)
  - Double (64 bit)
  - String
  - Boolean
  - dateTime
  - Base64
  - Array
  - Struktur






XML-RPC.Com

Simple cross-platform distributed computing, based on the standards of the Internet.

Spec

Mail List

Directory

C/C++

RSS

OPML

XML

Dave

Home

"Does distributed computing have to be any harder than this? I don't think so." -- Byte.

What is XML-RPC?

It's a spec and a set of implementations that allow software running on disparate operating systems, running in different environments to make procedure calls over the Internet.

It's remote procedure calling using HTTP as the transport and XML as the encoding. XML-RPC is designed to be as simple as possible, while allowing complex data structures to be transmitted, processed and returned.

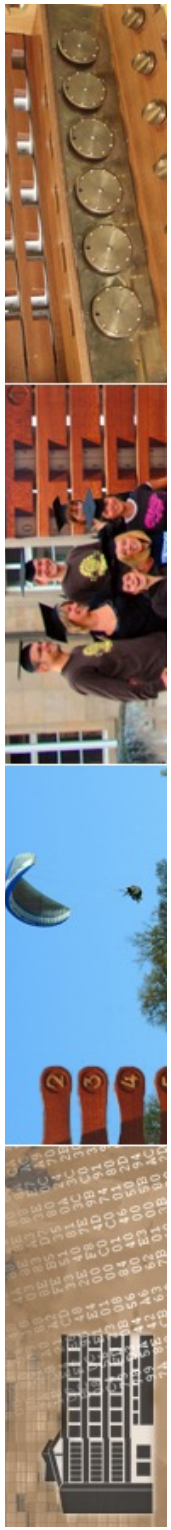
The XML-RPC community

The implementations page lists the accomplishments of the community, a set of compatible XML-RPC implementations that span all operating systems, programming languages, dynamic and static environments, open source and commercial, for Perl, Python, Java, Frontier, C/C++, Lisp, PHP, Microsoft .NET, Rebol, Real Basic, Tcl, Delphi, WebObjects and Zope, and more are coming all the time.

The services page lists the next-level-up, public applications, or "web services" that are accessible through XML-RPC.

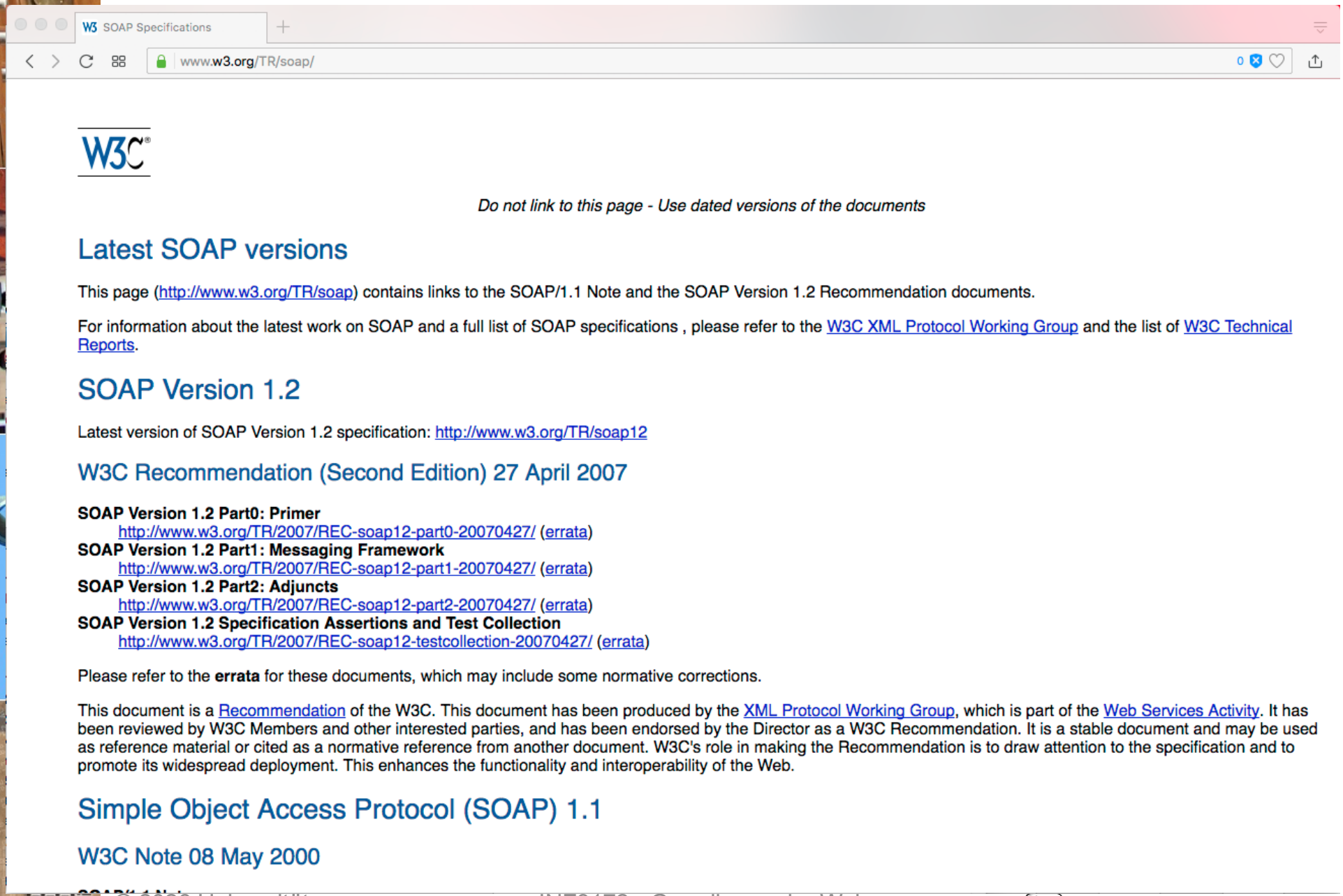
The communities page tries to organize all the activity around XML-RPC on mail lists, websites and search engines.

Finally, the tutorials/press page points to articles written about XML-RPC.



Übertragung II

- SOAP: Simple Object Access Protocol
  - …ist weder simple noch dient es dem Objektzugriff
  - Akronym wird nicht mehr verwendet
  - siehe http://www.w3c.org/TR/SOAP
  - flexibler als XML-RPC
    - auch asynchrone Kommunikation
    - Peer-to-Peer-Kommunikation
    - nicht nur Request-Response, sondern auch Nachrichtenversand



Do not link to this page - Use dated versions of the documents

Latest SOAP versions

This page (http://www.w3.org/TR/soap) contains links to the SOAP/1.1 Note and the SOAP Version 1.2 Recommendation documents.

For information about the latest work on SOAP and a full list of SOAP specifications , please refer to the W3C XML Protocol Working Group and the list of W3C Technical Reports.

SOAP Version 1.2

Latest version of SOAP Version 1.2 specification: http://www.w3.org/TR/soap12

W3C Recommendation (Second Edition) 27 April 2007

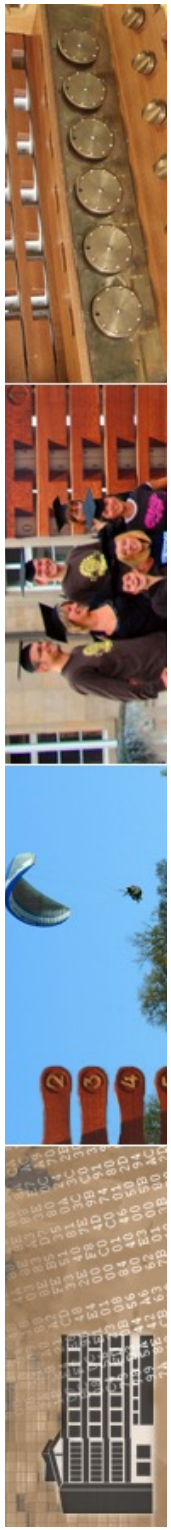
SOAP Version 1.2 Part0: Primer
http://www.w3.org/TR/2007/REC-soap12-part0-20070427/ (errata)
SOAP Version 1.2 Part1: Messaging Framework
http://www.w3.org/TR/2007/REC-soap12-part1-20070427/ (errata)
SOAP Version 1.2 Part2: Adjuncts
http://www.w3.org/TR/2007/REC-soap12-part2-20070427/ (errata)
SOAP Version 1.2 Specification Assertions and Test Collection
http://www.w3.org/TR/2007/REC-soap12-testcollection-20070427/ (errata)

Please refer to the **errata** for these documents, which may include some normative corrections.

This document is a Recommendation of the W3C. This document has been produced by the XML Protocol Working Group, which is part of the Web Services Activity. It has been reviewed by W3C Members and other interested parties, and has been endorsed by the Director as a W3C Recommendation. It is a stable document and may be used as reference material or cited as a normative reference from another document. W3C's role in making the Recommendation is to draw attention to the specification and to promote its widespread deployment. This enhances the functionality and interoperability of the Web.

Simple Object Access Protocol (SOAP) 1.1

W3C Note 08 May 2000



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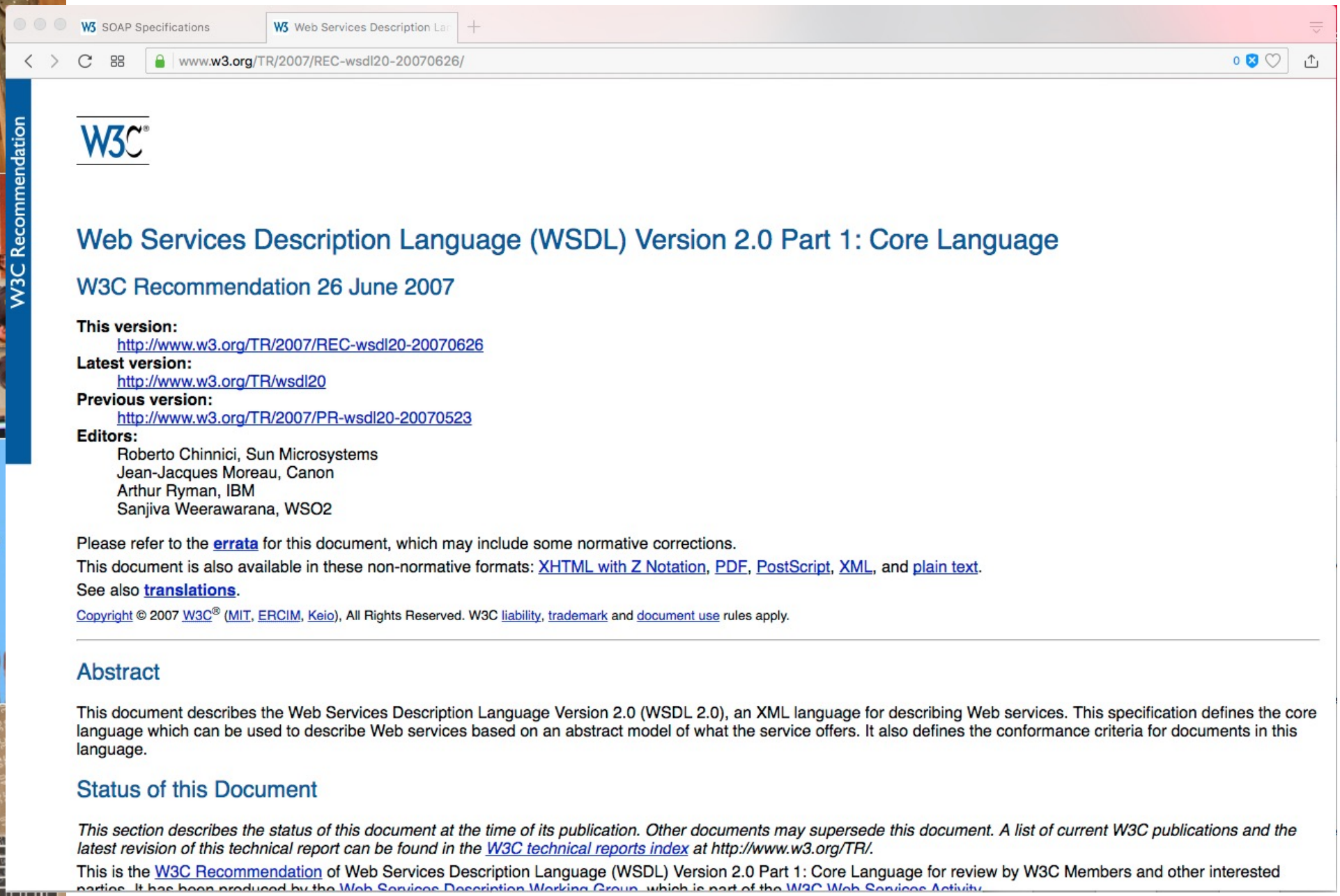
Beschreibung von Webservices

- Webservices werden mit **WSDL** beschrieben:
  Web Services Description Language
  - Bestandteile des Webservices
  - welche Daten werden ausgetauscht
  - wie ist der Webservice aufgebaut
  - siehe http://www.w3.org/TR/wsdl
- Beschreibung ist nicht zwingend notwendig



SOAP Specifications | Web Services Description Lar

www.w3.org/TR/2007/REC-wsdl20-20070626/

W3C Recommendation

Web Services Description Language (WSDL) Version 2.0 Part 1: Core Language

W3C Recommendation 26 June 2007

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http://www.w3.org/TR/2007/REC-wsdl20-20070626
Latest version:
http://www.w3.org/TR/wsdl20
Previous version:
http://www.w3.org/TR/2007/PR-wsdl20-20070523
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Please refer to the **errata** for this document, which may include some normative corrections.
This document is also available in these non-normative formats: XHTML with Z Notation, PDF, PostScript, XML, and plain text.
See also **translations**.

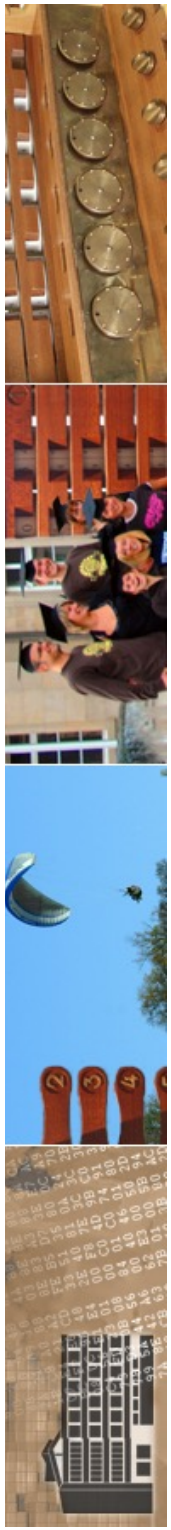
Abstract

This document describes the Web Services Description Language Version 2.0 (WSDL 2.0), an XML language for describing Web services. This specification defines the core language which can be used to describe Web services based on an abstract model of what the service offers. It also defines the conformance criteria for documents in this language.

Status of this Document

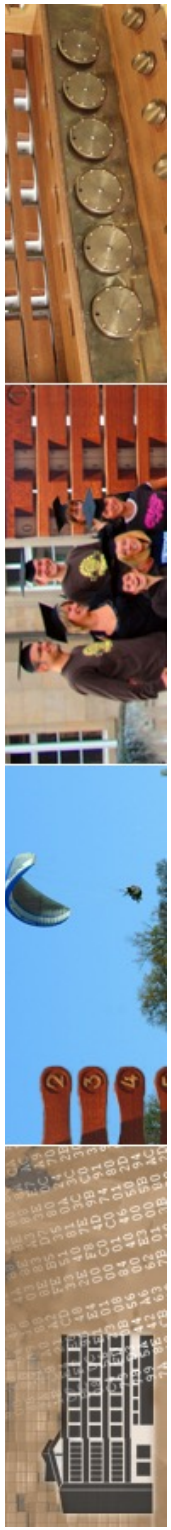
This section describes the status of this document at the time of its publication. Other documents may supersede this document. A list of current W3C publications and the latest revision of this technical report can be found in the W3C technical reports index at http://www.w3.org/TR/.

This is the W3C Recommendation of Web Services Description Language (WSDL) Version 2.0 Part 1: Core Language for review by W3C Members and other interested parties. It has been produced by the Web Services Description Working Group, which is part of the W3C Web Services Activity.

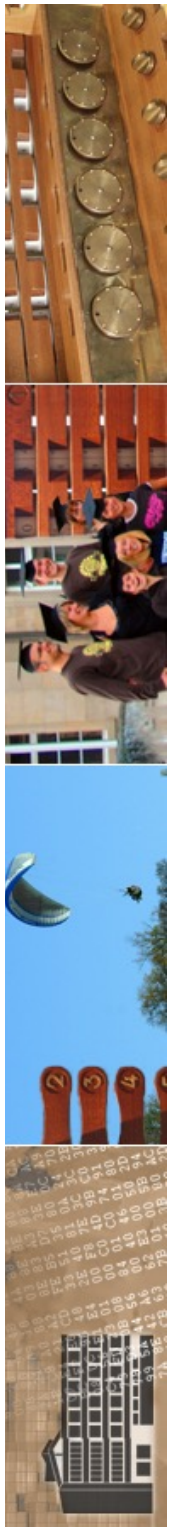


Konzept

- WSDL-Beschreibung: XML-Dokument, das den Dienst korrekt beschreibt
  - Struktur: Elemente
    - **`definitions`** : Name des Services, …
    - **`types`** : Datentyp-Definitionen
    - **`message`** : Informationen über Daten in einer Nachricht
    - **`portType`** : Methoden
    - **`binding`** : Protokoll der Methoden
    - **`service`** : Endpunkte des Dienstes (URI)



```xml
<?xml version="1.0" ?>
<definitions name="WeatherReport"
targetNamespace="http://www.example.org/weather.wsdl"
   xmlns:tns="http://www.example.org/weather.wsdl"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
   xmlns="http://schemas.xmlsoap.org/wsdl/">
<types>
  <schema xmlns="http://www.w3.org/2001/XMLSchema"
    targetNamespace="http://www.example.org/xsd">
  </schema>
  </types>
   <message name="getWeatherRequest">
     <part name="forCountryCode" type="string" />
     <part name="fromDate" type="date" />
     <part name="toDate" type="date" />
   </message>
   <message name="getWeatherResponse">
     <part name="forCountryCode" type="string" />
     <part name="fromDate" type="date" />
     <part name="toDate" type="date" />
   </message>
   <portType name="PortForGetWeather">
     <operation name="getWeather">
       <input message="tns:getWeatherRequest"/>
       <output message="tns:getWeatherResponse"/>
     </operation>
   </portType>
   <binding name="getWeatherSOAPBinding"
      type="tns:PortForGetWeather">
     <soap:binding style="document"
      transport="http://schemas.xmlsoap.org/soap/http" />
     <operation name="getWeather">
     <soap:operation
      soapAction="http://www.example.org/soap/Weather"/>
     <input>
       <soap:body use="literal"/>
     </input>
     <output>
       <soap:body use="literal"/>
     </output>
     </operation>
   </binding>
   <service name="Weather Report">
     <port name="PortForGetWeather"
      binding="tns:getWeatherSOAPBinding">
       <soap:address
        location="http://www.example.org/Weather"/>
     </port>
  </service>
</definitions>
```



Verzeichnisdienste

- Auffinden von Webservices
- **UDDI: Universal Description, Discovery and Integration** of Web Services
  - Standard für diesen Zweck
  - aktuell Version 3.0.2
- Anbieter publiziert Webservice im Verzeichnis
- Konsument findet Webservice im Verzeichnis

OASIS

UDDI Spec TC

UDDI Version 3.0.2

UDDI Spec Technical Committee Draft, Dated 20041019

Document identifier:
uddi_v3

Current version:
http://uddi.org/pubs/uddi-v3.0.2-20041019.htm

Latest version:
http://uddi.org/pubs/uddi_v3.htm

Previous version:
http://uddi.org/pubs/uddi-v3.0.1-20031014.htm

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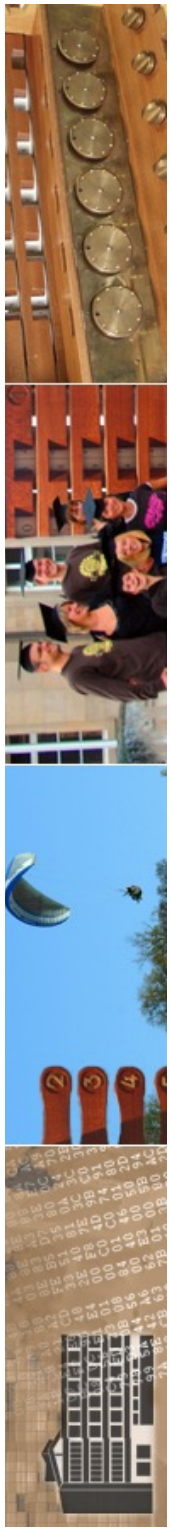
Abstract:
The UDDI Version 3.0.2 Specification describes the Web services, data structures and behaviors of all instances of a UDDI registry.

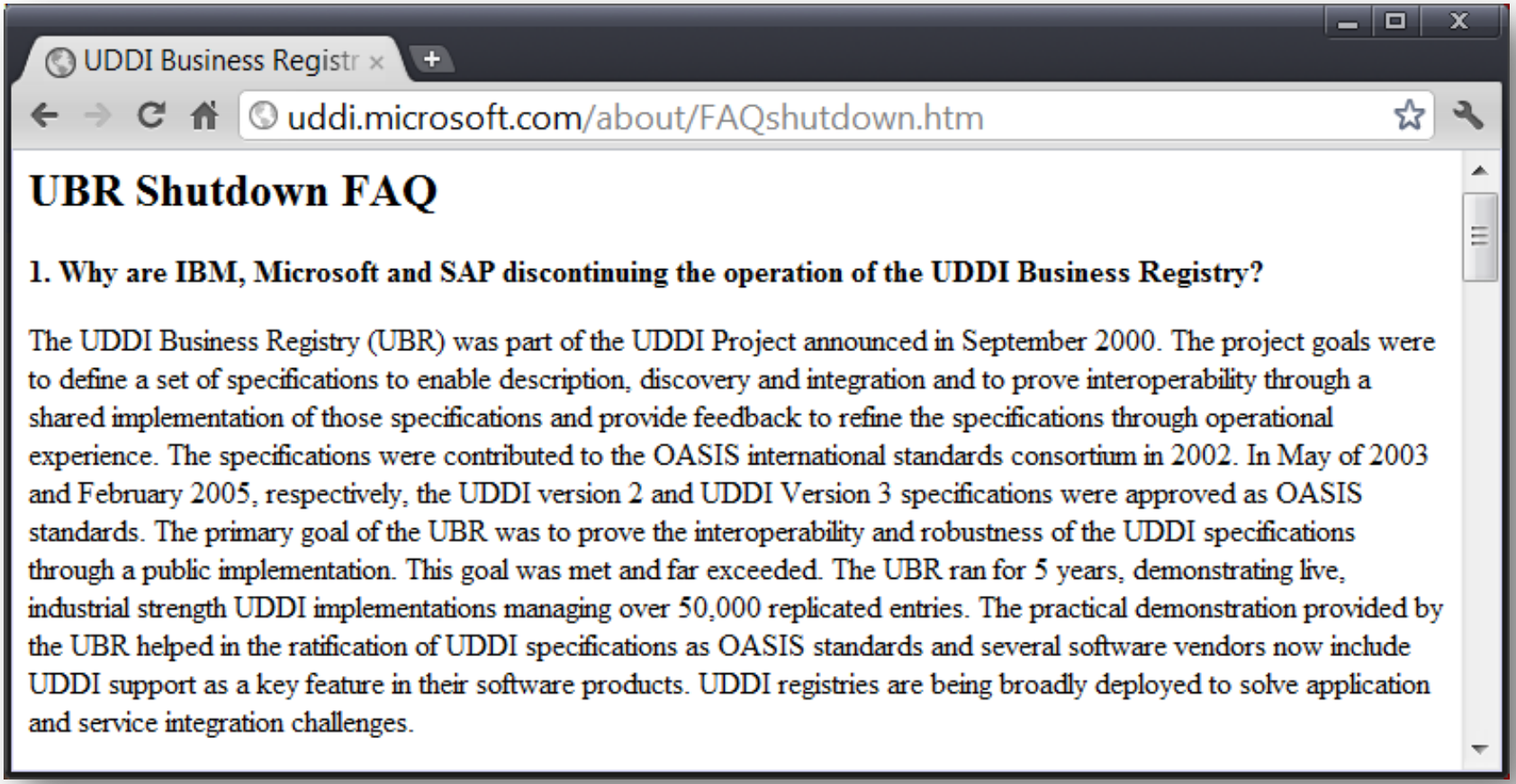
Status:
This specification has attained the status of Committee Draft. This document is updated periodically on no particular schedule.

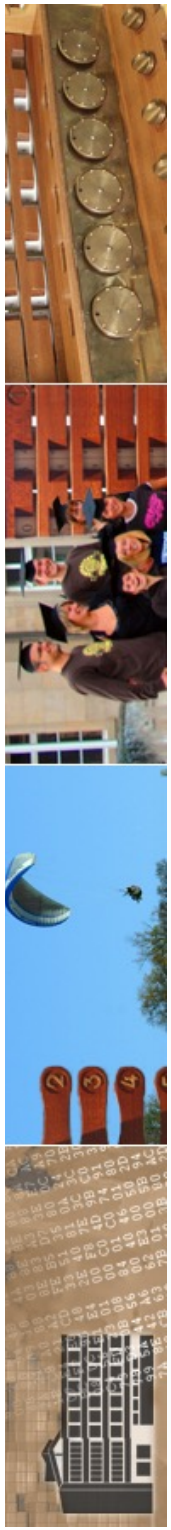
Committee members should send comments on this Committee Specification to the uddi-spec@lists.oasis-open.org list. Others should subscribe to and send comments to the uddi-spec-comment@lists.oasis-open.org list. To subscribe, send an email message to uddi-spec-comment-request@lists.oasis-open.org with the word "subscribe" as the body of the message.

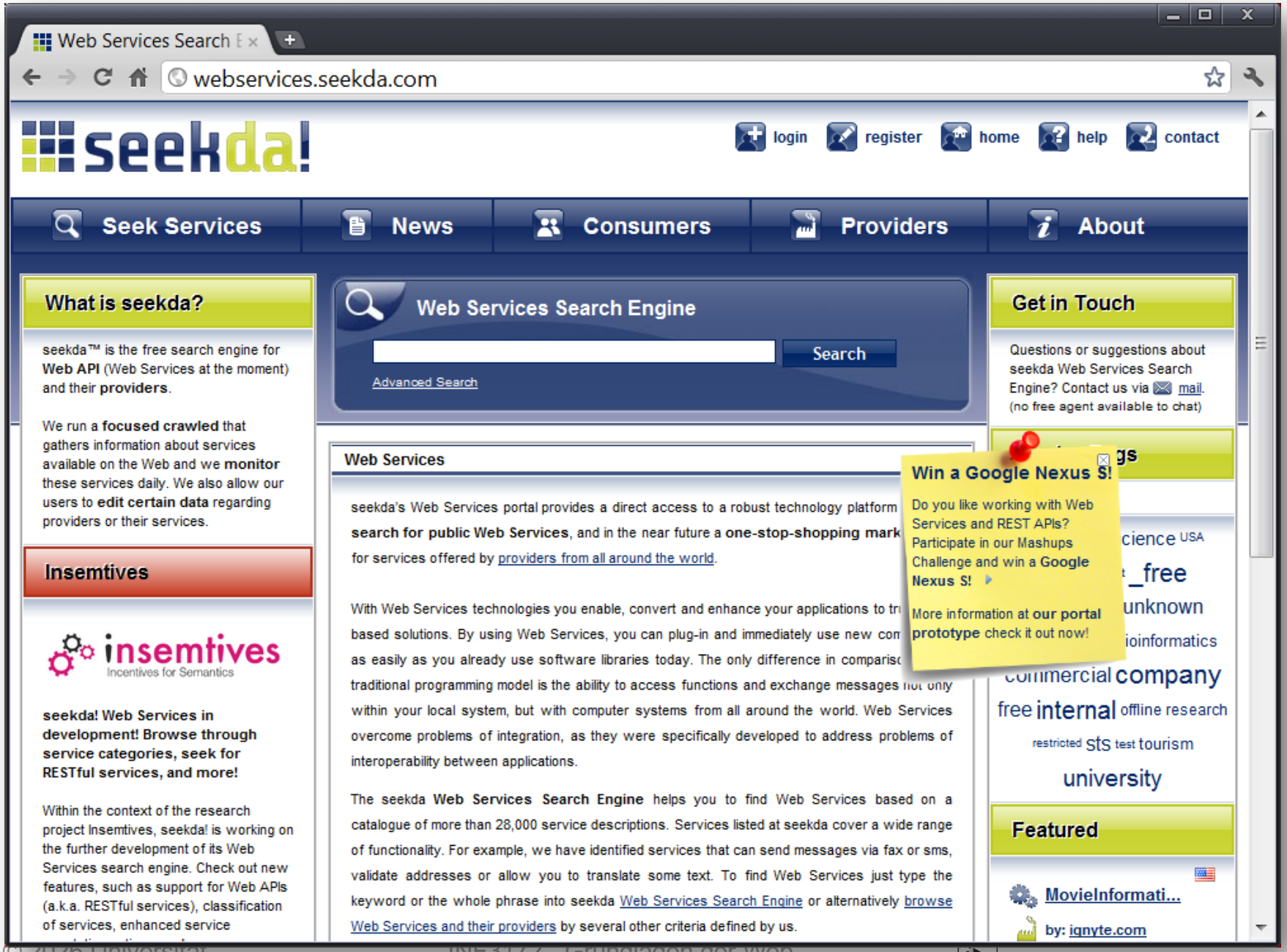


UDDI Shutdown

- Unterstützung von UDDI geht zurück






Web Services Search E
webservices.seekda.com
seekda!
login
register
home
help
contact
Seek Services
News
Consumers
Providers
About
What is seekda?
seekda™ is the free search engine for Web API (Web Services at the moment) and their providers.
We run a focused crawled that gathers information about services available on the Web and we monitor these services daily. We also allow our users to edit certain data regarding providers or their services.
Insemtives
insemtives
Incentives for Semantics
seekda! Web Services in development! Browse through service categories, seek for RESTful services, and more!
Within the context of the research project Insemtives, seekda! is working on the further development of its Web Services search engine. Check out new features, such as support for Web APIs (a.k.a. RESTful services), classification of services, enhanced service
Web Services Search Engine
Search
Advanced Search
Web Services
seekda's Web Services portal provides a direct access to a robust technology platform
search for public Web Services, and in the near future a one-stop-shopping mark
for services offered by providers from all around the world.
With Web Services technologies you enable, convert and enhance your applications to tr
based solutions. By using Web Services, you can plug-in and immediately use new com
as easily as you already use software libraries today. The only difference in comparis
traditional programming model is the ability to access functions and exchange messages not only
within your local system, but with computer systems from all around the world. Web Services
overcome problems of integration, as they were specifically developed to address problems of
interoperability between applications.
The seekda Web Services Search Engine helps you to find Web Services based on a catalogue of more than 28,000 service descriptions. Services listed at seekda cover a wide range of functionality. For example, we have identified services that can send messages via fax or sms, validate addresses or allow you to translate some text. To find Web Services just type the keyword or the whole phrase into seekda Web Services Search Engine or alternatively browse Web Services and their providers by several other criteria defined by us.
Win a Google Nexus S!
Do you like working with Web Services and REST APIs? Participate in our Mashups Challenge and win a Google Nexus S!
More information at our portal prototype check it out now!
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Questions or suggestions about seekda Web Services Search Engine? Contact us via mail. (no free agent available to chat)
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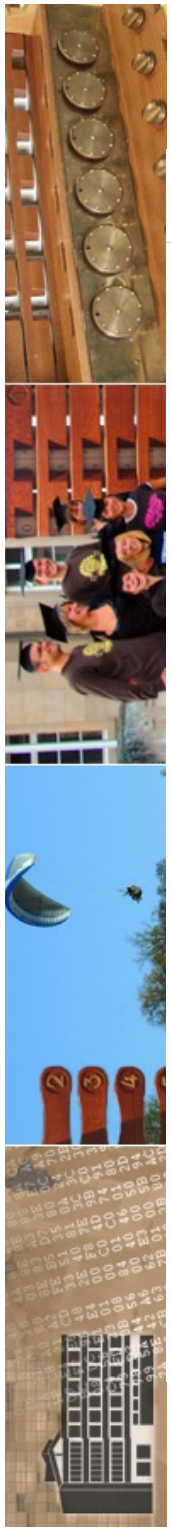


https://db.cs.washington.edu/projects/woogle.html

Apps | U Tü | HIS | IT | MacBook | Leica | Z | Inissio | EU-DSGVO | PetitMouton | Bookmarks | Andere Lesezeichen

Web Service Search

A web service is a network accessible interface to application functionality, built using standard Internet technologies. The features that web services are published through UDDI registration nodes; that web services have standard description documents, WSDL documents; and that each web service is made up of particular operations, and each operation has particular input and output parameters, distinguish web service search from other web contents search. Therefore, instead of crawling the web for web services, we obtain web services from UDDI registration nodes, and focus on (1) extracting the semantic meaning of web services based on WSDL descriptions; (2) performing composition of web services to form a web service repository; and (3) presenting the users a search interface that exposes the semantic relationship of web services to the largest extend.

Project Members

- Alon Halevy
- Luna Dong
- Jayant Madhavan
- Jun Zhang
- Ema Nemes
- Dinh Lam

Related Projects

Woogle -- Web Service Search Engine

Features in v1.0 (2003/10):

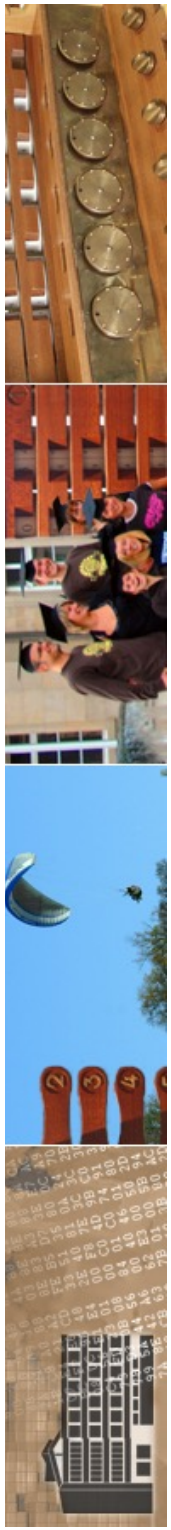
- Web service category browse
- Keyword search
- Input/output parameter search
- Web service on-site try
- Web service status report (whether the web service is down or malfunctioned)

Features in v2.0 (2004/3):

- Similarity search for web services. Given a web-service operation, return
  - operations with similar functionalities
  - operations with similar inputs/outputs
  - operations that compose

Features in v3.0 (2004/6):

- Template search: Search web-service operations by specifying the input, output, and functionality description.
- Composition search: Search compositions of operations that fulfill the user's requirement.
- Composition similarity search: Given a web-service operation, return compositions of operations with similar functionality.



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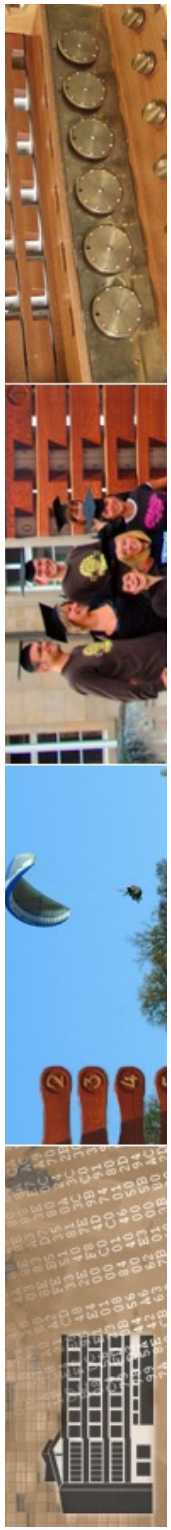
Webservice und Sicherheit

- Webservices gelten als *besonders kritisch in Hinsicht auf die Sicherheit*
  - Angreifer von außen hat viele Angriffspunkte
  - Teillösungen
    - SSL
    - IPsec und VPN
    - Firewalls



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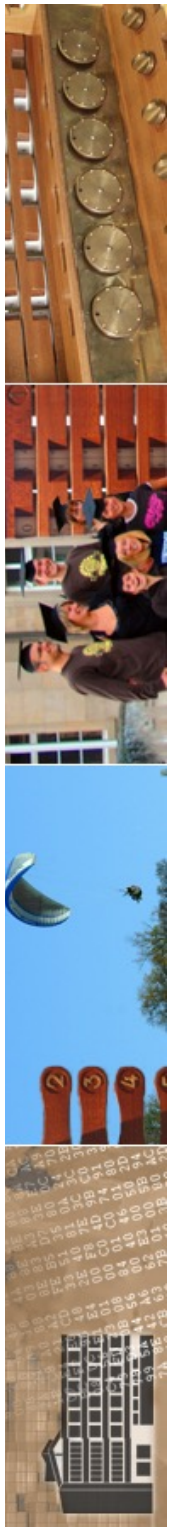
Standards für Sicherheit

- XML-Signature: digitale Signatur in XML
- XML-Encryption: Verschlüsselung von Daten
- XKMS: XML Key Management Specification
- SAML: Secure Assertion Markup Language
- WS-Security



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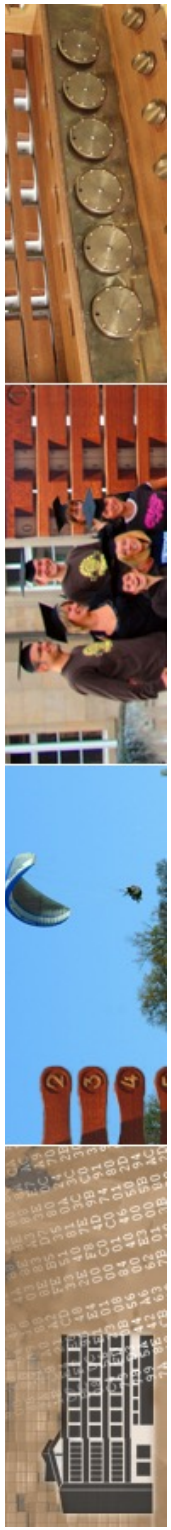
MATHEMATISCH-
NATURWISSENSCHAFTLICHE FAKULTÄT
FACHBEREICH INFORMATIK
INFORMATIONSDIENSTE

Frameworks für den Client
Angula



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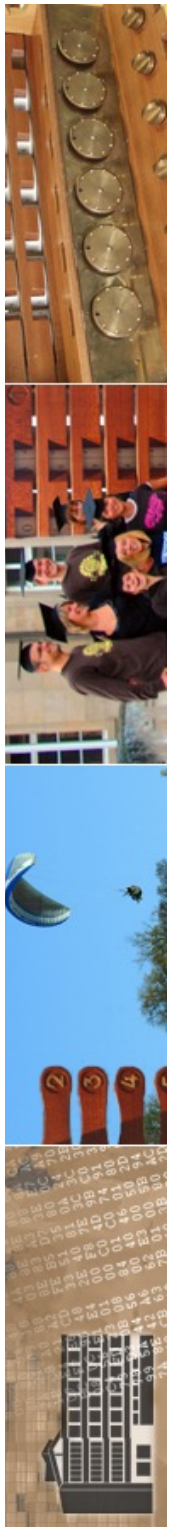
frontend-Frameworks

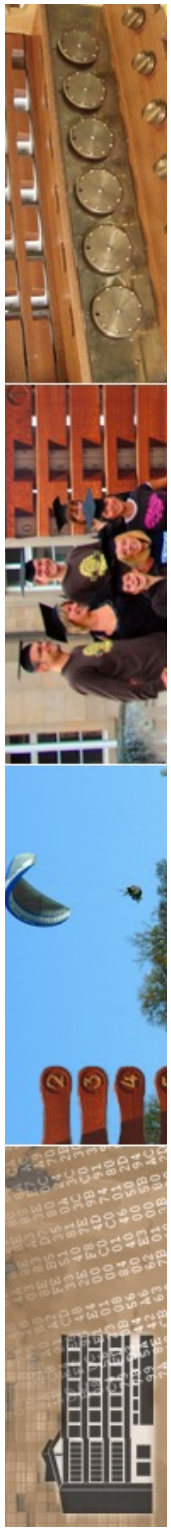
- bisher: Backend-Frameworks
  - Generierung der View
  - Controller
  - Model
- Jetzt: Frameworks auf Client-Seite

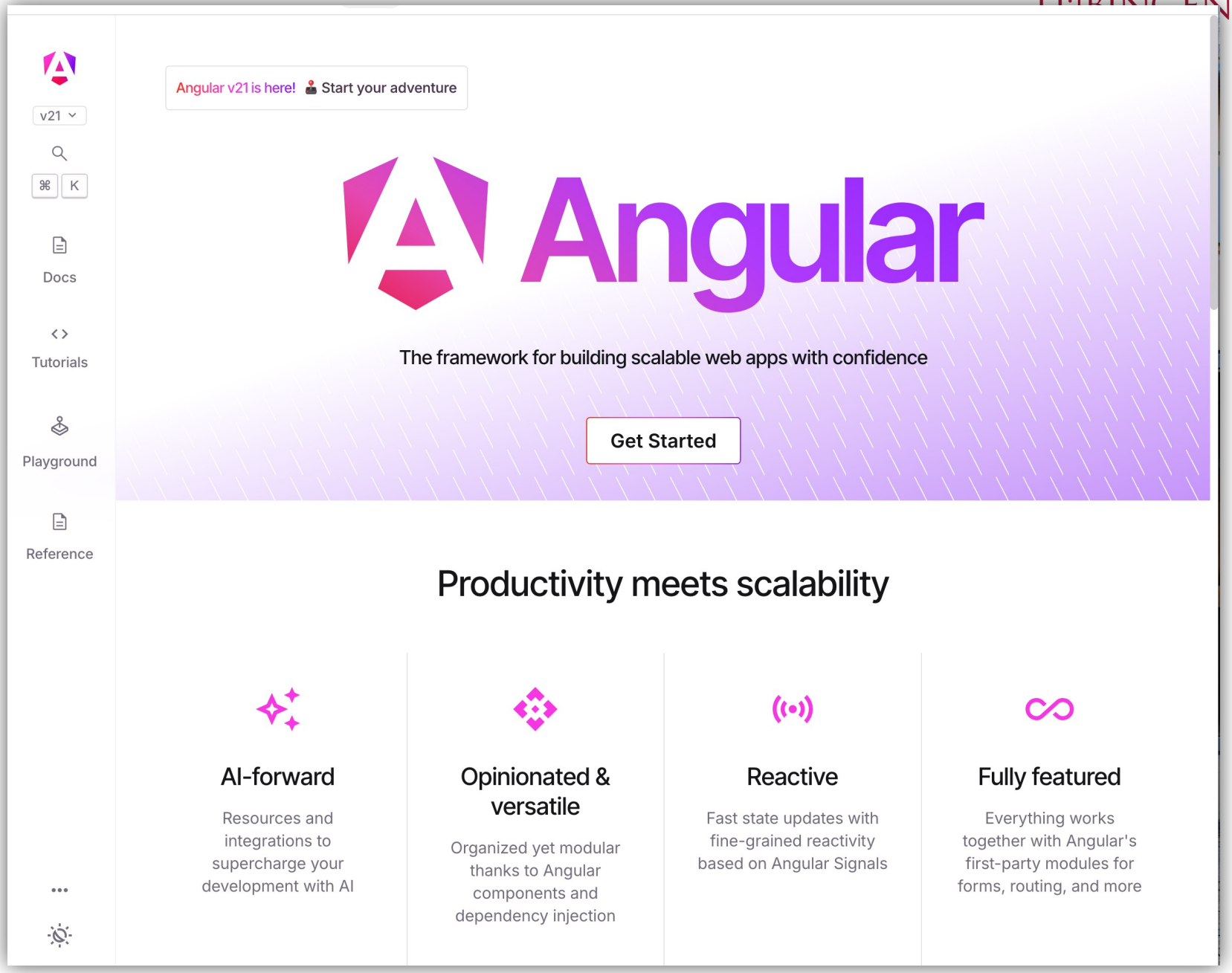
Front-End-Webapplikationsframework



Angular

- zentrales Beispiel: **Angular**
  - früher AngularJS (Angular 1)
  - 2014: Angular2
  - ...
  - 2025: Angular Version 20
  - Open Source (MIT Lizenz)
  - Hauptunterstützer: Google




v21
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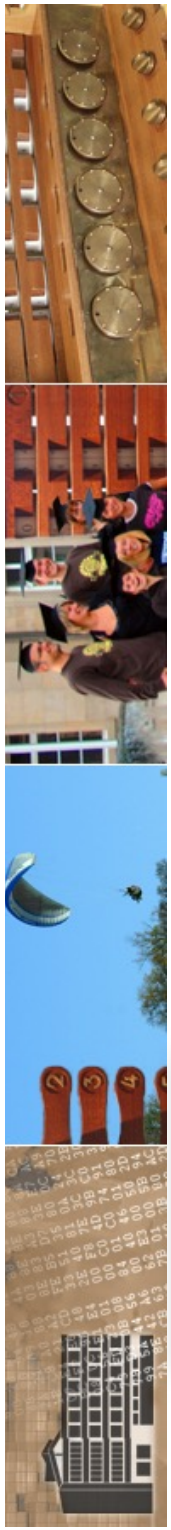
Docs
Tutorials
Playground
Reference
Angular v21 is here! Start your adventure
Angular
The framework for building scalable web apps with confidence
Get Started
Productivity meets scalability
AI-forward
Resources and integrations to supercharge your development with AI
Opinionated & versatile
Organized yet modular thanks to Angular components and dependency injection
Reactive
Fast state updates with fine-grained reactivity based on Angular Signals
Fully featured
Everything works together with Angular's first-party modules for forms, routing, and more



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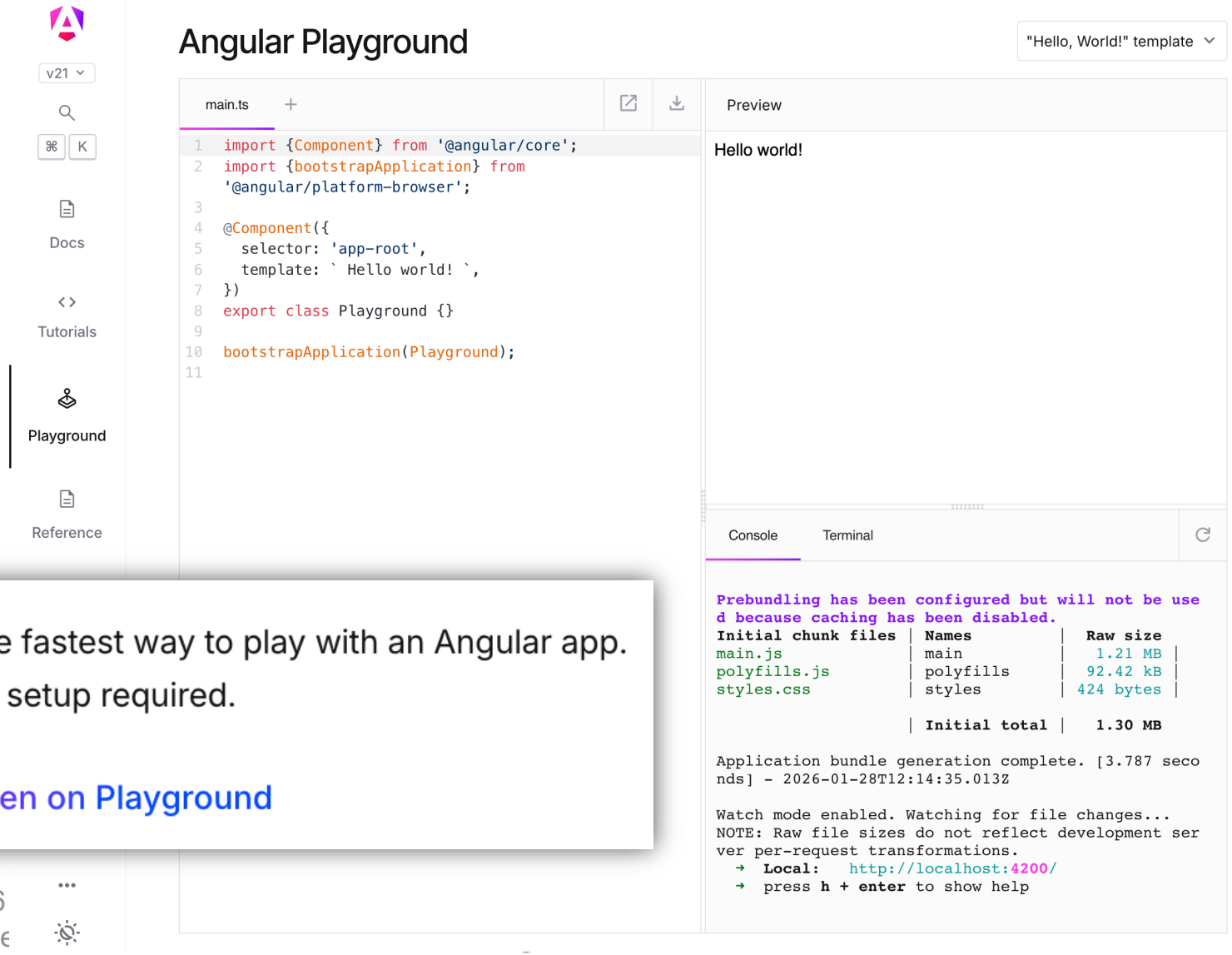
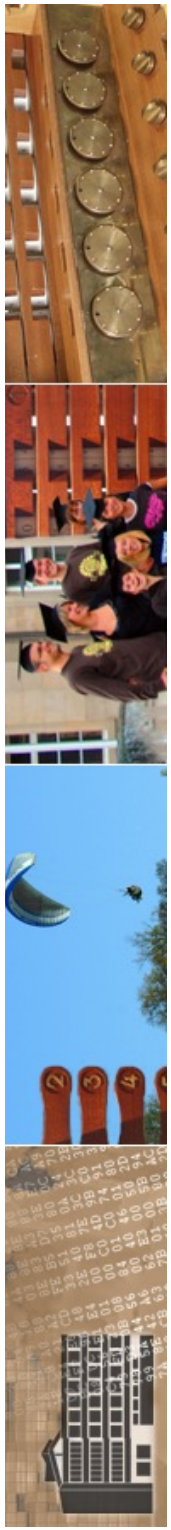
Installation



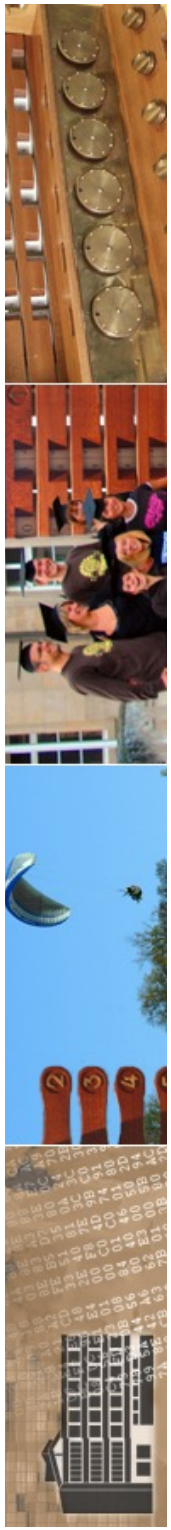


verwendete Sprache

- Angular wird im Browser (Vorsicht Kompatibilität!) ausgeführt:

  benötigt EcmaScript-Konforme Sprache

  - JavaScript
  - **TypeScript**
    - statische Typisierung



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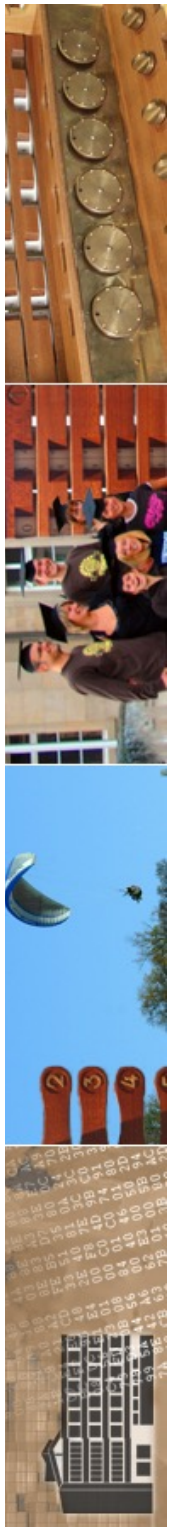
Angular - Besonderheiten

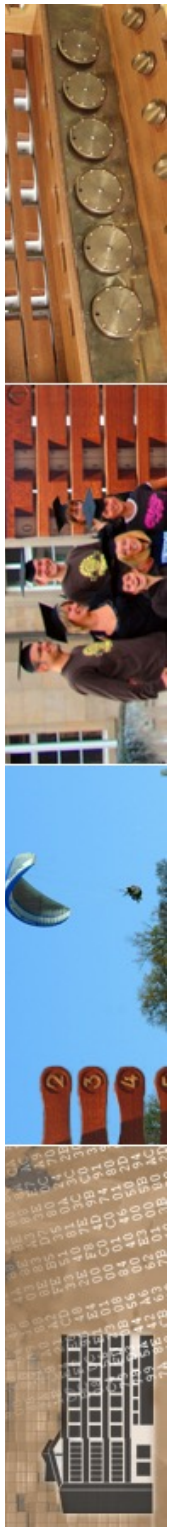
- komponentanbasierte und modulare Architektur
- umfassendes Framework
- große Community, Weiterentwicklung
- im Business-Umfeld optimal
- gute IDE Integration

- auch **Progressive Web-APPs** (WPA) mit Angular



Alternativen zu Angular

- weitere Frontend-Frameworks
  - **React**
  - Vue
  - Next.js
  - SolidJS



…und nun…

- kennen wir das Prinzip von Webservices als weiteres Architekturbeispiel im Internet und Angular für die Frontend-Entwicklung