Koordinatentransformation als Web Service

Standardkonforme Implementierung mit deegree

Oliver Heimann

Vodafone D2 GmbH, Abt. TNS(G)

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Web Coordinate Transformation Service (WCTS)

deegree based implementation using standards

Oliver Heimann

Vodafone D2 GmbH, Dept. TNS(G)

deegree day 2008, June 17th

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Agenda

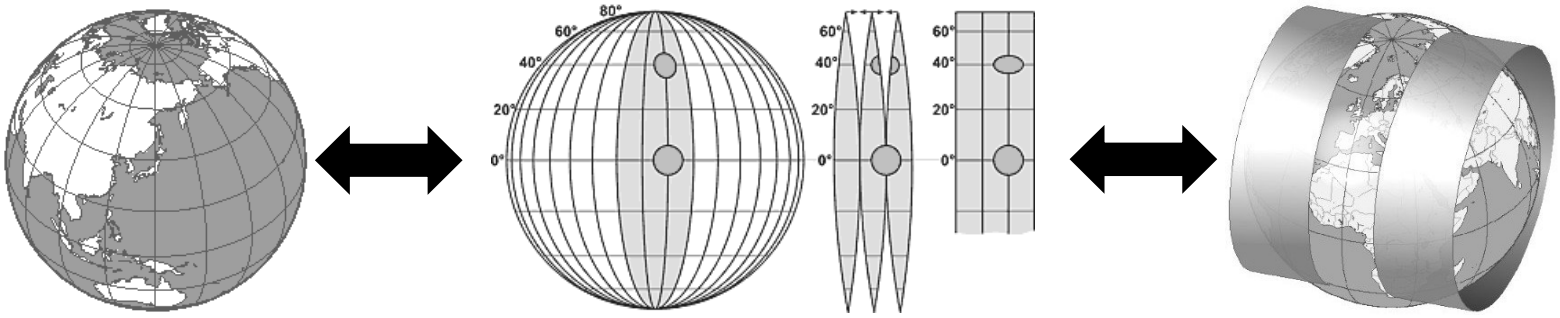
- Introduction
- Status quo
- Why a web service and why deegree?
- Considered standards
- The user application "Kotrans"
- The web services
- Live demonstration
- Outlook
- Discussion

Coordinate transformation

„A coordinate transformation is a conversion from one system to another, to describe the same space."

- **Federal Office for Cartography and Geodesy (BKG*)**: „Transformation and Conversion:
  The change of coordinate from one Coordinate Reference System to another is a so called coordinate operation. There exist two kinds of operations - coordinate transformation and coordinate conversion."
- **„Transformation**: The change of coordinates from one CRS to another CRS based on **different datum** is only possible via a coordinate transformation."
- **„Conversion:** The change from one Coordinate System to another based on the **same datum** is possible via a coordinate conversion."
- In this presentation the terms „transformation" and „conversion" are used as synonyms to simplify matters
- *) Reference: http://crs.bkg.bund.de/crs-eu/

Coordinate transformation



Map on the sphere

geographic coordinates

X:6,741130 Y:51,242998

Map on the plane

projected coordinates

Gauß-Krüger

X:3342344,28 Y:5681103,42

Map on the plane

projected ccordinates

UTM

X:342334,13 Y:5679271,96

Status quo

- The network planing department uses (since 1992) at least four different coordinate systems:

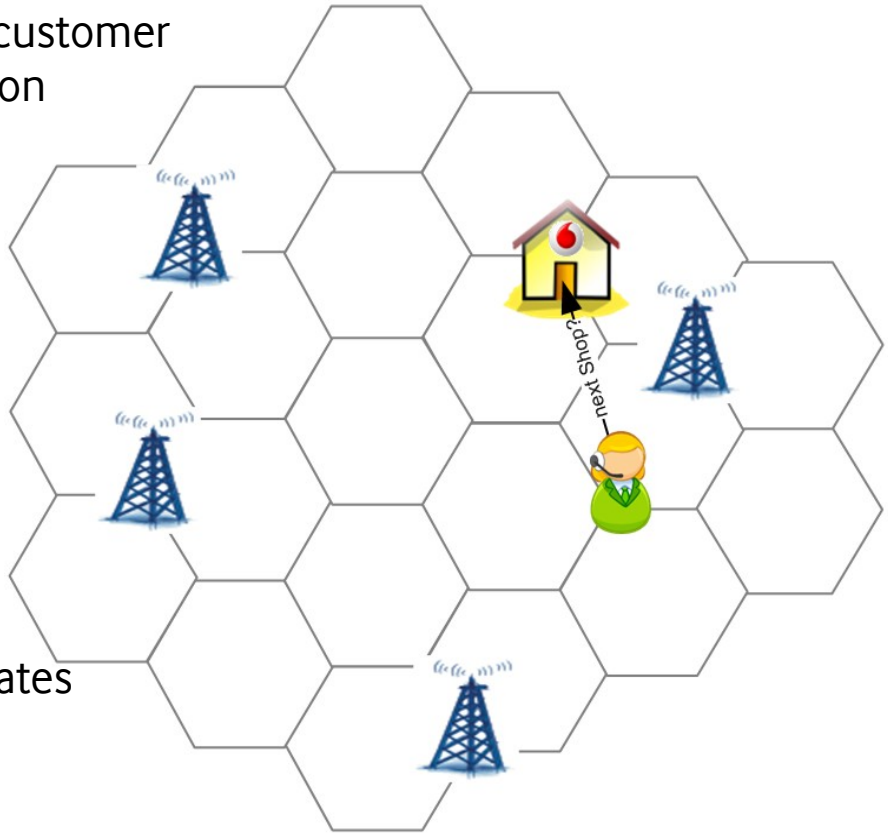
1.	geographische Koordinaten	(Ellipsoid: Bessel,	Datum: DHDN)
2.	geographische Koordinaten	(Ellipsoid: WGS84,	Datum: WGS84)
3.	Gauß-Krüger Koordinaten	(Ellipsoid: Bessel,	Datum: DHDN)
4.	Gauß-Krüger Koordinaten	(Ellipsoid: Krassowski,	Datum: Pulkowo)
5.	*Arcor: UTM, Zone 32N*	*(Ellipsoid: GRS80,*	*Datum: ETRS89)*

- Examples: Position of antennas, position of sites (equipment), point-to-point radio systems, ...
- All these coordinates are stored in relational database management systems (most commonly used: Sybase database servers)
- Nearly 90% of all coordinates at Vodafone D2 are stored (in 21 systems) **outside a GIS and/or outside a spatially enabled database!**
- Beyond the network planing department, coordinates are used in many other applications and domains (business support systems, operating support systems, ...)

Status quo

- Example for coordinates used outside network support systems: Shop finder

- 1. costumer calls the hotline (a computer) and want's to know the next Vodafone Shop to his current position
- 2. hotline asks for a permission to localise the customer
- 3. location server determines customers position
- 4. an application computes the „nearest" (linear distance) Vodafone Shop



-  EPSG:4326

-  EPSG:31467 (geocoded addresses)

- for caculating a distance, both pairs of coordinates have to be in the same coordinate system

Status quo: coordinate transformation at Vodafone D2

- C-library designed in the early days of Mannesmann Mobilfunk (antecessor of Vodafone D2)
- Implementing a private geodetic datum „Potsdam IST (Information Systems Technique)“ --> in 1992 the datum definition by BKG was a „*state secret*“
- C-library is used by >20 different systems
- 2005: embedding of PROJ.4 in Vodafone C-library (using BKG 1995 parameters)
- Disadvantages:
  - C-library, no thread safeness
  - Hard coded parametrisation of coordinate systems in library (in case of a change of parameters, you have to change the source code, to recompile the library and to integrate the new one in over 20 applications)
  - Nobody knows which application uses the library with which parametrisation
  - 1995 parameters, but 2001 ones are up to date!
  - Usability of C-library in Java environments is very poor (JNI wrapper for PROJ.4, but no native Java implementation)
  - Missing web service interface

Why a web service and why deegree?

- To overcome the obstacles of the C-library
  - Adjustable coordinate definitions
  - Adjustable coordinate conversions/transformations
  - No hard coding --> changes only on one (!) centralised server
  - Java not C
- „To participate in the SOA hype“
  - Provide web service interfaces for Vodafone D2 SDI
  - Provide web service interfaces for Non-SDI's (90%)
  - Simplify programming (WSDL)
- 3 reasons for deegree & lat/lon
  - Markus Müller (married Markus Lupp) is coauthor of the OGC specification (he should know how it works)
  - lat/lon head quarter is in Bonn (Germany)
  - deegree is (one of) the most complete and active implementation(s) of OGC standards

1. Open Geospatial Consortium Inc.

Date: 2007-10-08

Reference number of this document: OGC 07-055r1

Version: 0.4.0

Category: OpenGIS® Discussion Paper

3. Editors: Arliss Whiteside, Markus Müller, Stephane Fellah, Frank Warmerdam

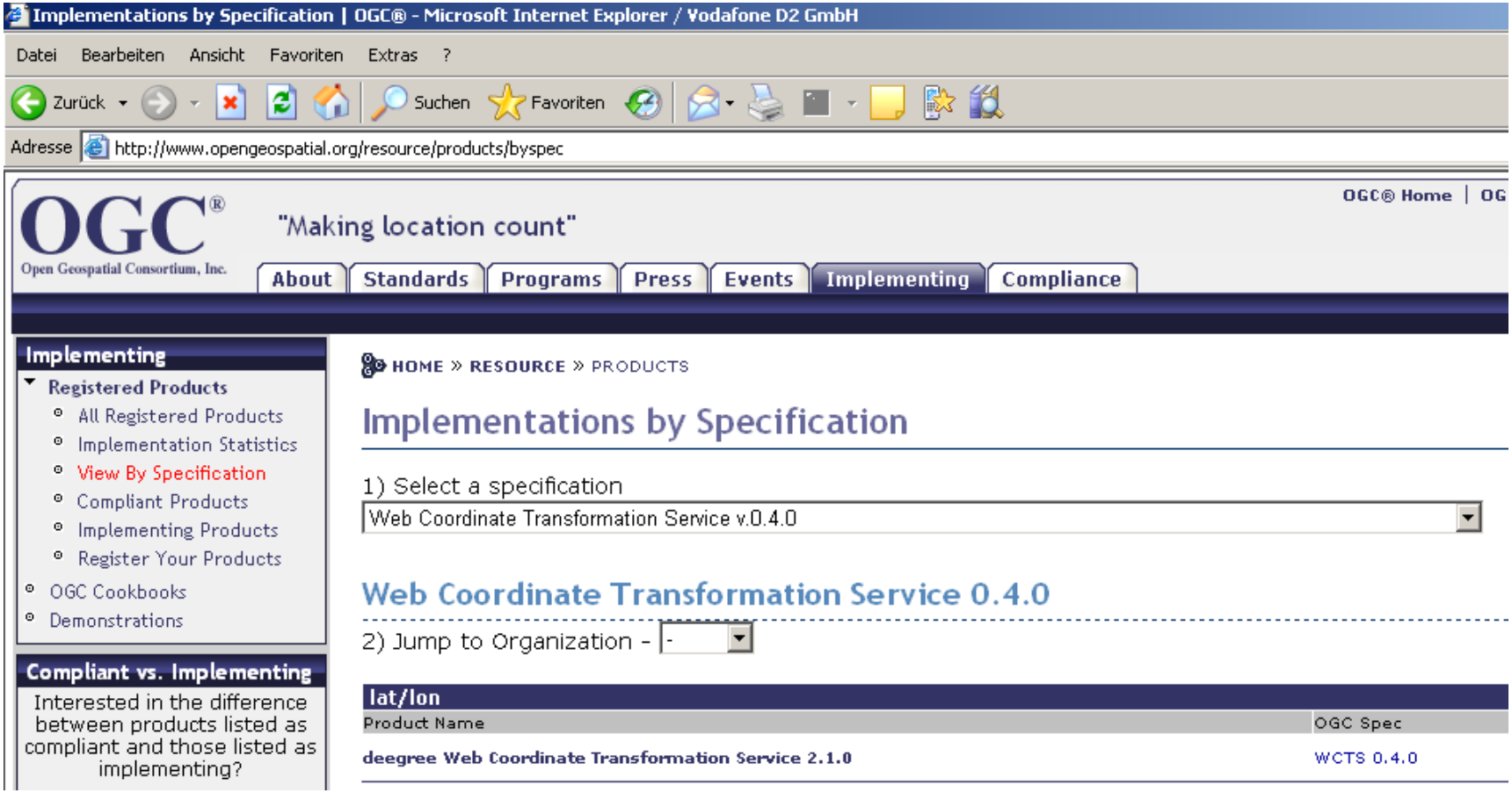
2. **Web Coordinate Transformation Service (WCTS) Interface Engineering Report**

Considered standards

- **Standards**
  - **Open Geospatial Consortium, Inc.(OGC):**
    Web Coordinate Transformation Service (WCTS) draft Implementation Specification
    Web Coordinate Transformation Service (WCTS) Interface Engineering Report
  - **European Petroleum Survey Group (EPSG) :**
    EPSG Geodetic Parameter Dataset
  - **Federal Office for Cartography and Geodesy (BKG):**
    Transformation parameters (already included in EPSG)
  - **Web Services Interoperability Organization (WS-I):**
    Basic Profile 1.1 Profile for SOAP and WSDL
    incl. Testing Tools (for sopaUI, Eclipse, ...)
  - **Vodafone D2 internal standards:**
    Software releases (Tomcat 5.5.x, Java 1.5, ...)
    Logfile guidelines for monitoring purposes

D2-WCTS / Kotrans

- "Standards"

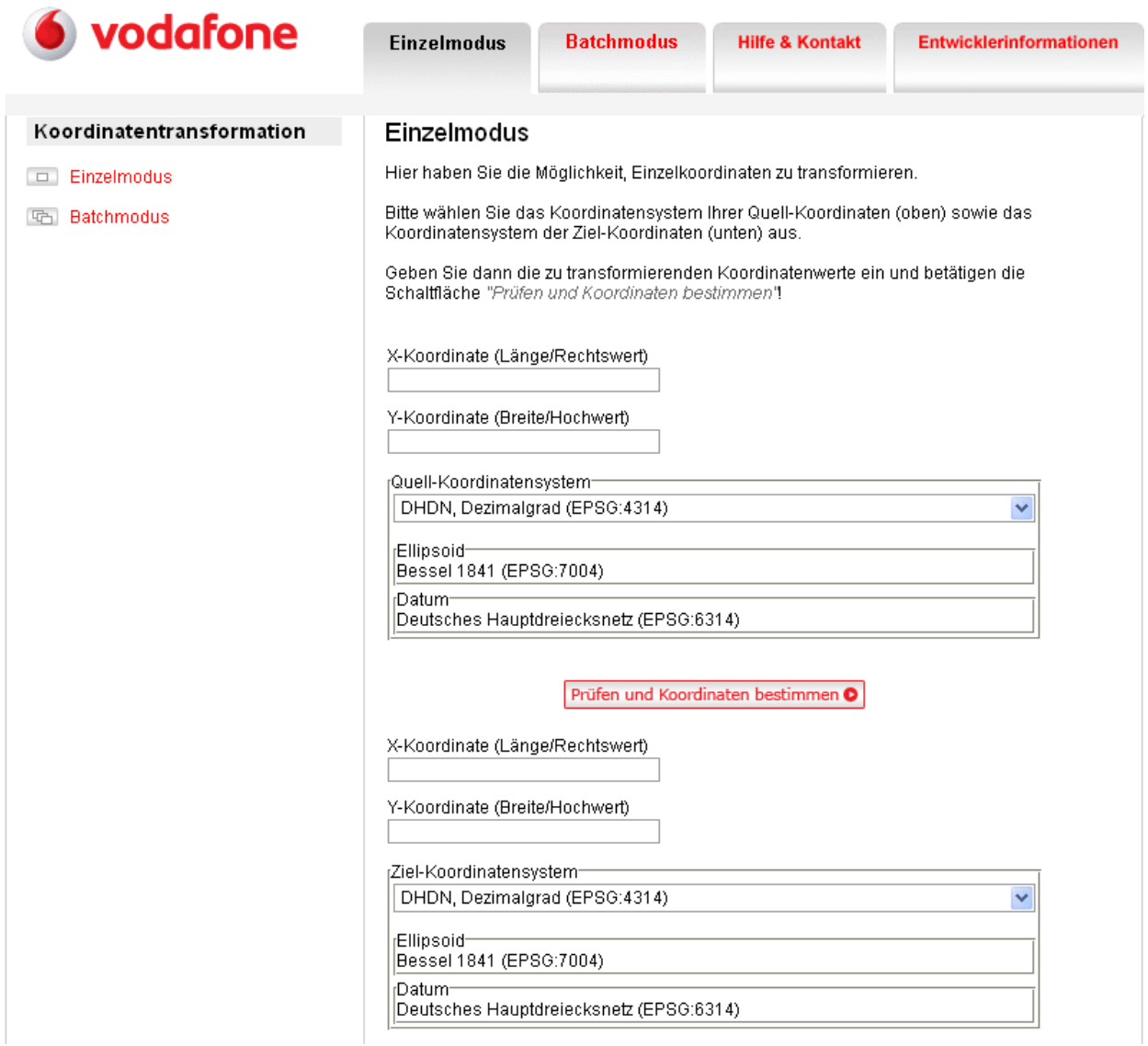


D2-WCTS / Kotrans

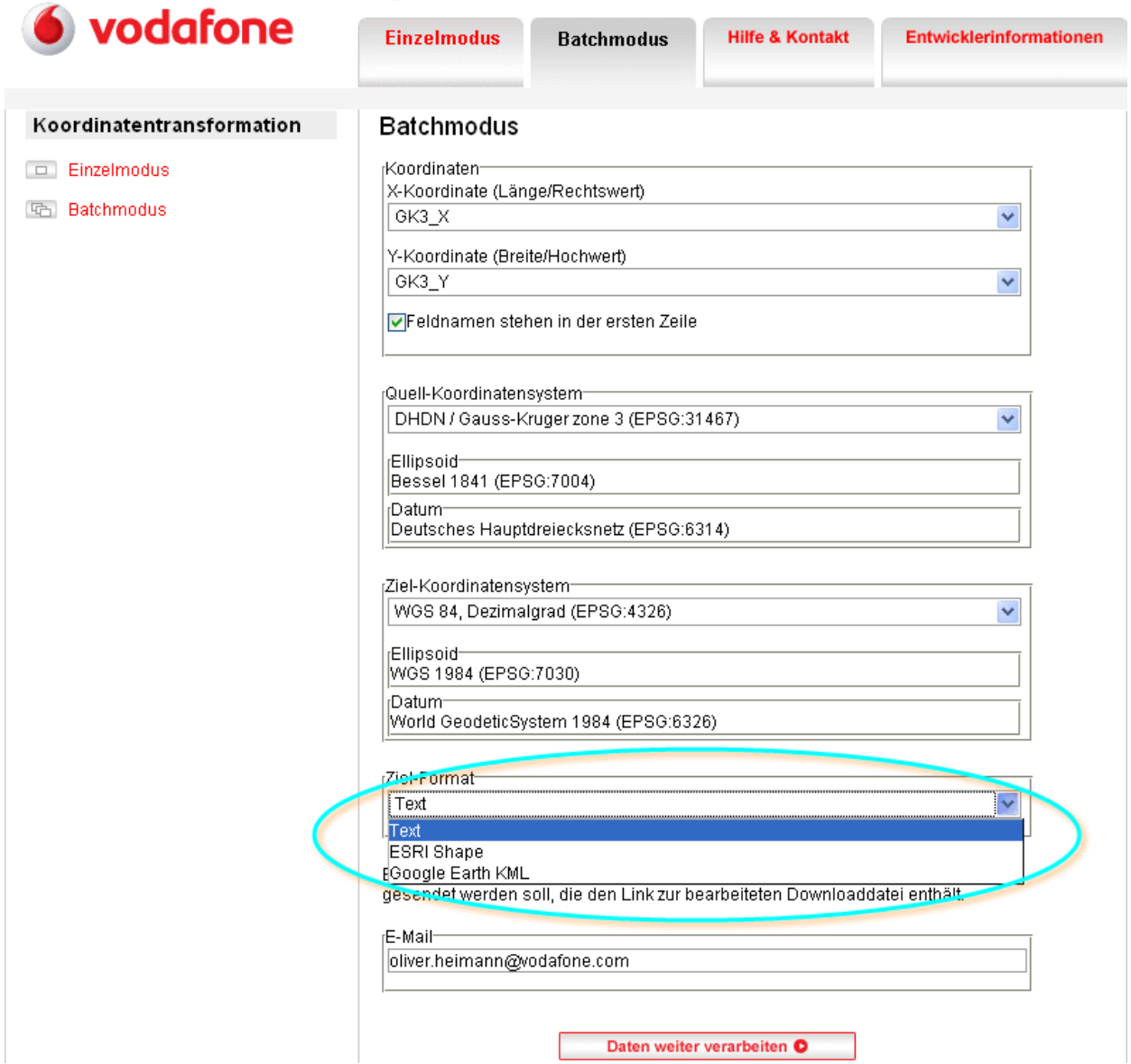
- http://localhost:8080/kotrans
- **D2-WCTS**: the web services (1. OGC, 2. SOAP)
- **Kotrans**: the user application (GUI)
- Both, D2-WCTS and Kotrans are using the same code
- but they are deployed as separate web applications (Tomcat *.wars) for performance reasons (batch)

- **Live demo**

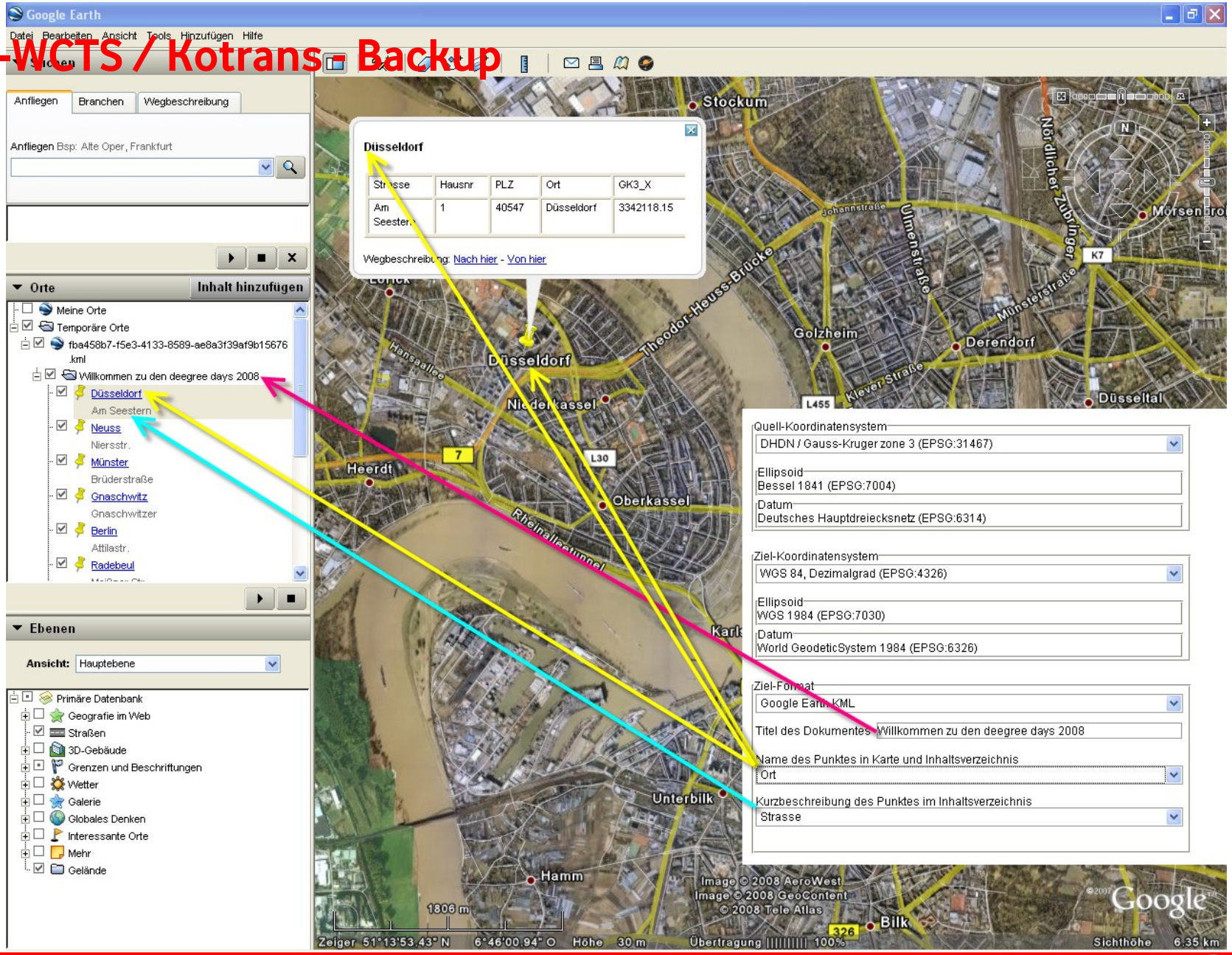
D2-WCTS / Kotrans - Backup



D2-WCTS / Kotrans - Backup



D2-WCTS / Kotrans Backup



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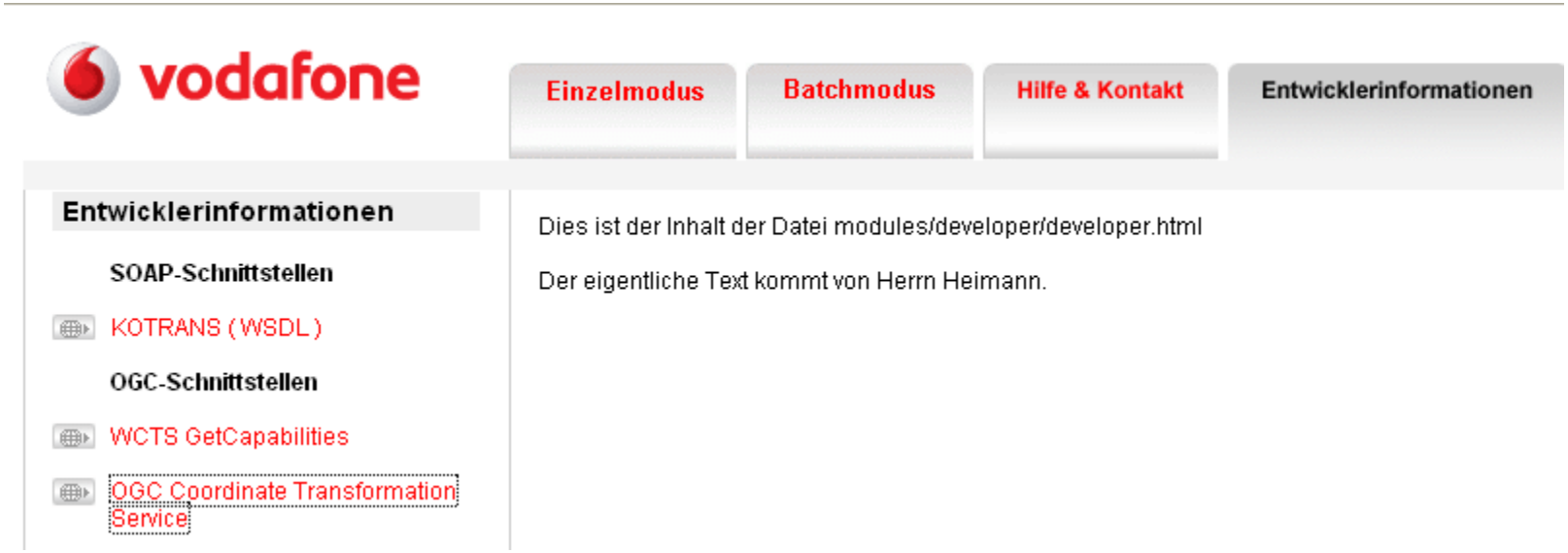
D2-WCTS / Kotrans - Backup



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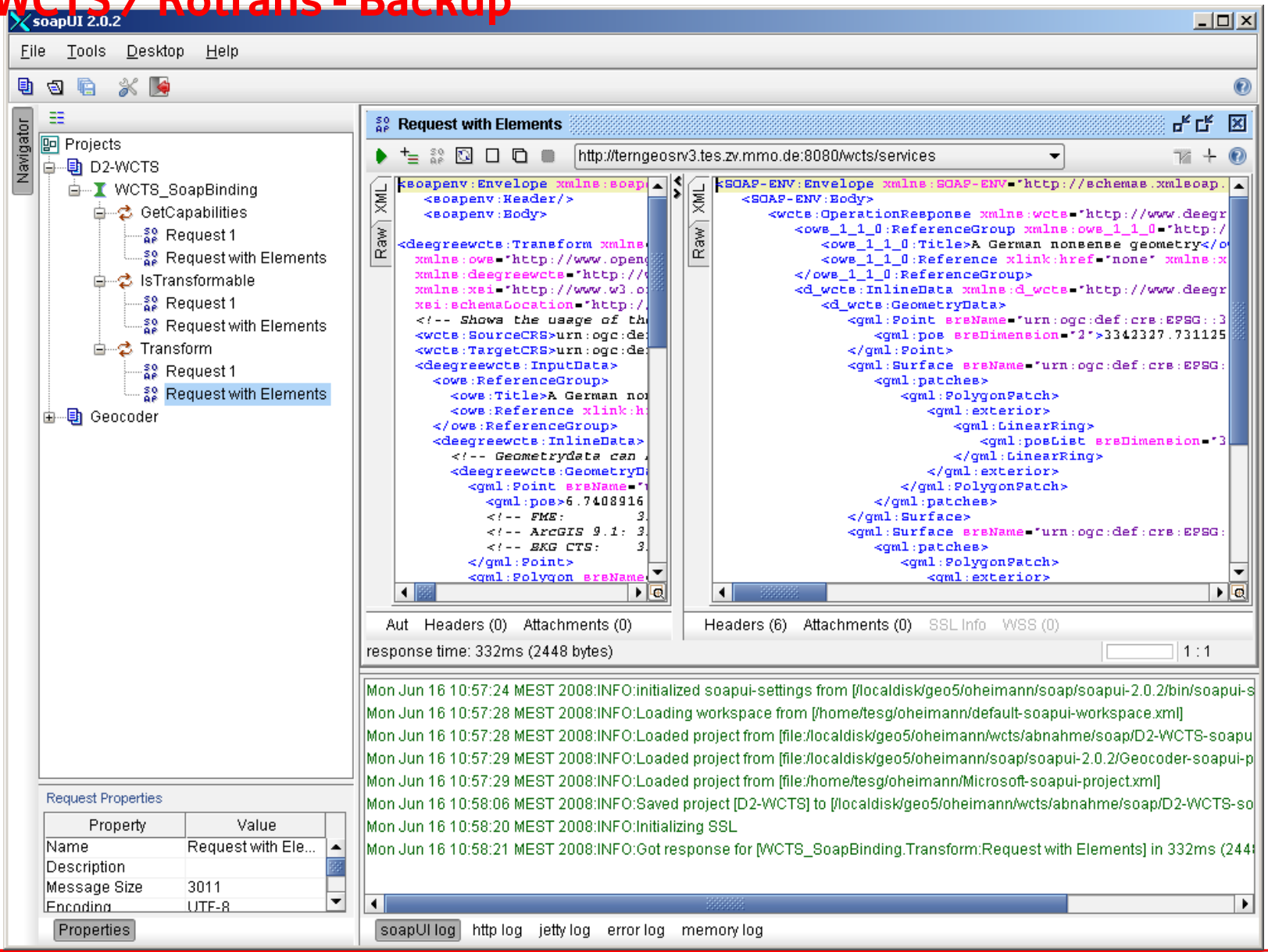

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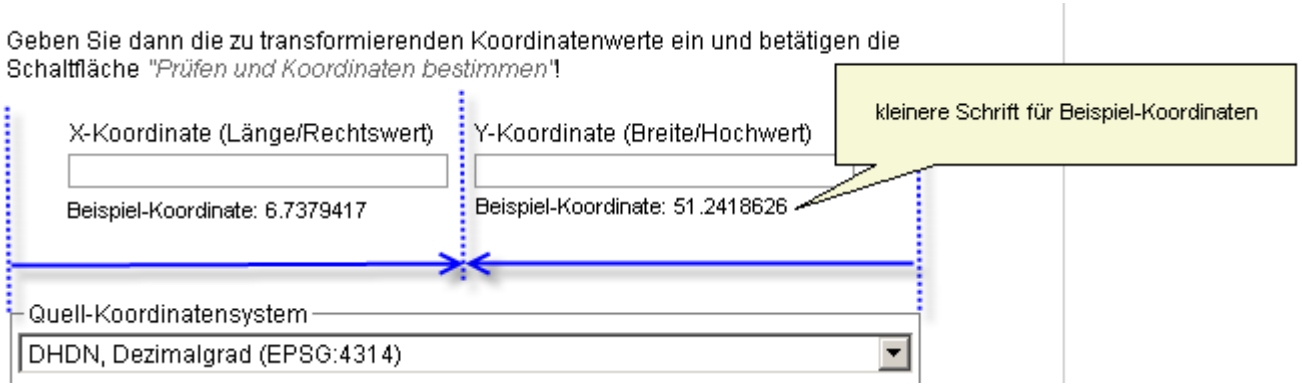
Outlook

- **Version 2.0**
  - Additional coordinate systems (EPSG:3068, EPSG:2397-2399, ...)
  - Additional In-/Output formats for batch processing (Tab-text, MS Excel using Apache POI HSSF)
  - Some GUI optimisations (Ajax Tooltips, ...)
  - Preparations to support different transformations (now: only Helmert, 7 params)

    now: *<wcts:Transformation>urn:ogc:def:coordinateOperation:EPSG::WWWW</wcts:Transformation>*
    soon: *<wcts:Transformation>urn:ogc:def:coordinateOperation:EPSG::1777</wcts:Transformation>*



GUI optimisations: sample coordinates

- **For the future**
  - Transformation: DE_DHDN (BeTA, 2007) to ETRS89 (EPSG:15948) using jGridShift

Discussion

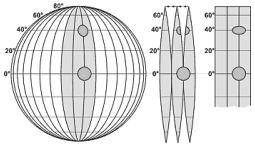
- Your questions and remarks!?

Contact

- Oliver Heimann
- Vodafone D2 GmbH
  Dept. TNS(G)
  Am Seestern 5
  40547 Düsseldorf
- Oliver.Heimann@vodafone.com

- Dr. Christian Kiehle
  lat/lon GmbH
- Kiehle@lat-lon.de

Picture references

-  http://www.aquarius.geomar.de/omc/images/ortho_proj.gif
-  http://www.kowoma.de/gps/geo/mercatorkonstruktion.gif
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