



Bundeswehr Geospatial Data Infrastructure: Concept and Realisation

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Motivation and Challenge



MAW TAURUS (© WTD 61)

Modern C4I, mission planning and weapon systems require high precision 3D geospatial intelligence information worldwide available

... another challenge

Cooperation between organisations



E-Government

Risk Management

Research

Defense & interior security

Land cover information

Sustainable development

Mobile Enterprise

Web Mapping

Location-Based Services

Sensor Webs

Standardised Web Services (ISO/OGC)

Modeling & Simulation

Multi-Source Operations

Portal Services

Decision Support



Organisations are confronted with the challenge to *share data, information, and knowledge* with other national and/or international organisations!



1. Bundeswehr Geoinformation Service
2. Bundeswehr Geospatial Data Infrastructure
 - Concept
 - System architecture
 - Realisation status
3. Experiences from CWID 2006-2008
4. Conclusions





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- ▶ In accordance with the situation,
the Bundeswehr
Geoinformation Service



is to incorporate the impact of relevant
geospatial and environmental factors on
the planning and conduct of operations
into the decision-making process and to
guarantee the supply of the German
Armed Forces with Geoinformation



Mission BGIS





GeoInfo Bases / Models

Set-up / Maintenance GeoInfo Database

Data / Map / Chart Production

Online Supply

Reproduction of GeoInfo Data / Materials

Indirect

GeoInfo Support



Direct GeoInfo-Support

Meteorological Data Collection

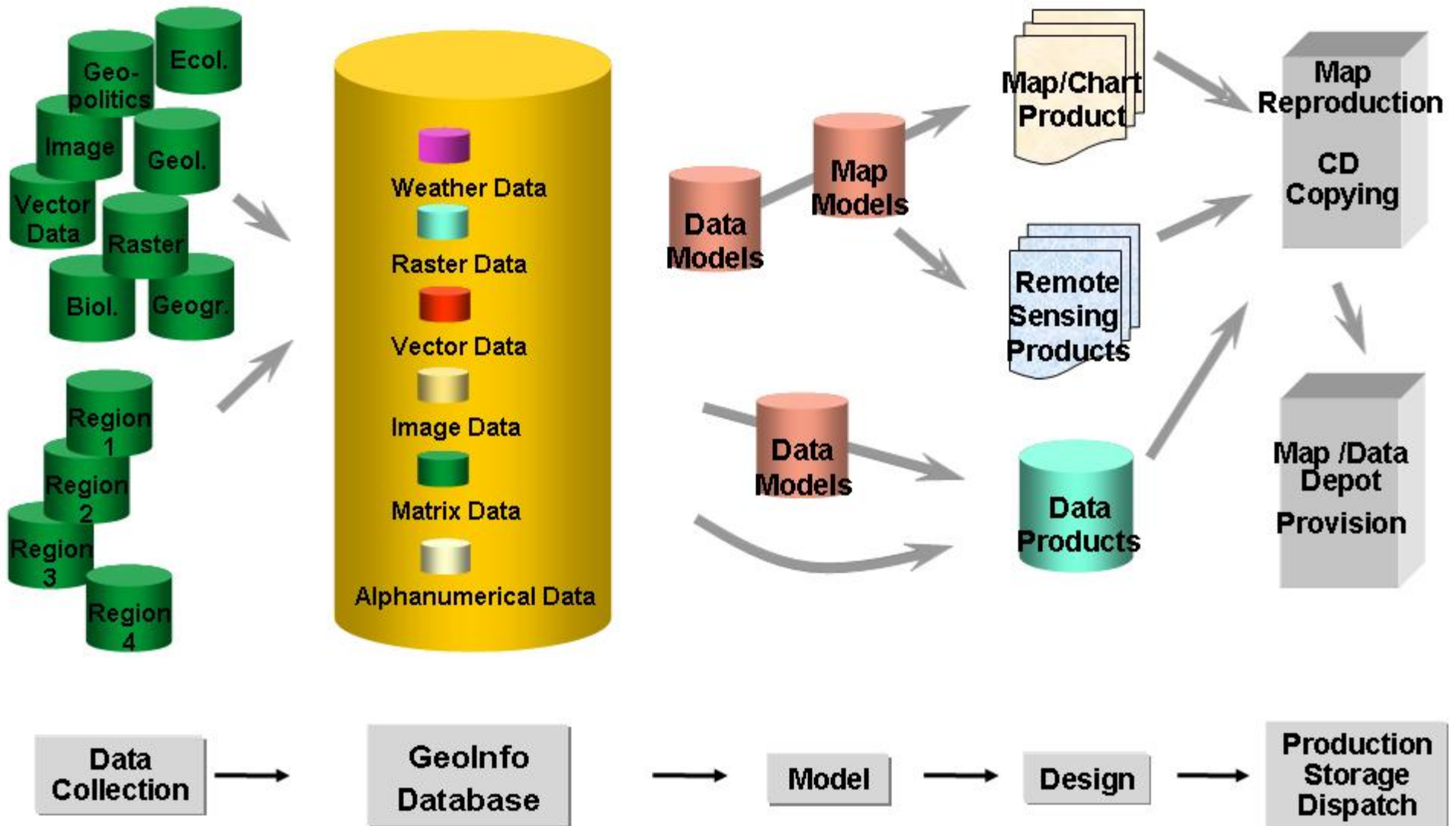
GeoInfo Advisory / Support Services

Surveying

Geospatial Reconnaissance

Map / Data Supply

Indirect GeoInfo Support



Direct GeoInfo Support



GeoInfo Advisory / Support Services

Meteorological Data Collection

Surveying

Geospatial Reconnaissance

Map / Data Supply

Video and CCD cameras
GPS antennas
Laser scanner
Digital barometer

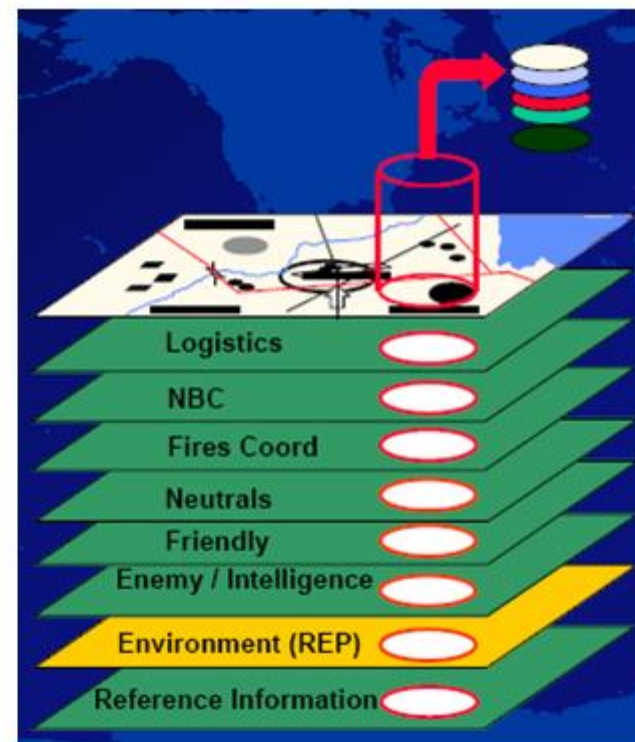


Common Operational Picture

Definition



- ▶ A **Common Operational Picture (COP)** is a single identical display of relevant operational information (e.g. position of own troops and enemy troops, position and status of important infrastructure such as bridges, roads, etc.) shared by more than one command. A COP facilitates collaborative planning and assists all echelons to achieve situational awareness (*source: US Joint Forces Command Glossary*).
- ▶ Geospatial information is included in the environmental layer



Recognised Environmental Picture



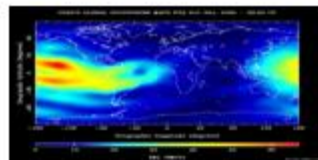
Environment (REP) 

Recognised Environmental Picture (REP)

Support Provided by
GeoInfo Information Systems
upon Request

Direct Use by the User

GeoInfo Products



GeoInfo Applications



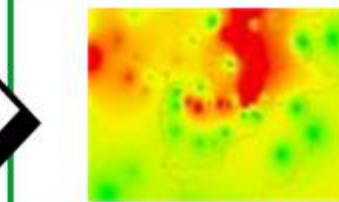
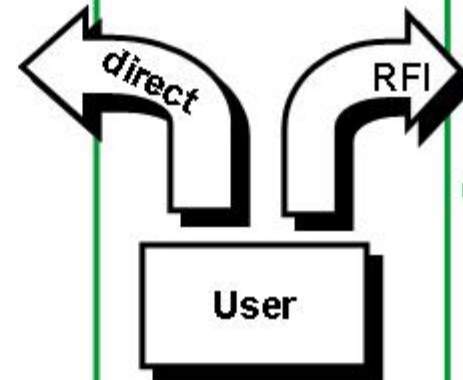
(e.g. Visibility Analysis)



(e.g. Path Profile)



(e.g. Fly-through)



(e.g. Cross-country Movement)



(e.g. Propagation Models)



(e.g. Infrared Ranges)



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- **Concept**
- **System architecture**
- **Realisation status**

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Requirements:

„A reasonable utilisation of geodata requires that data, information and services are

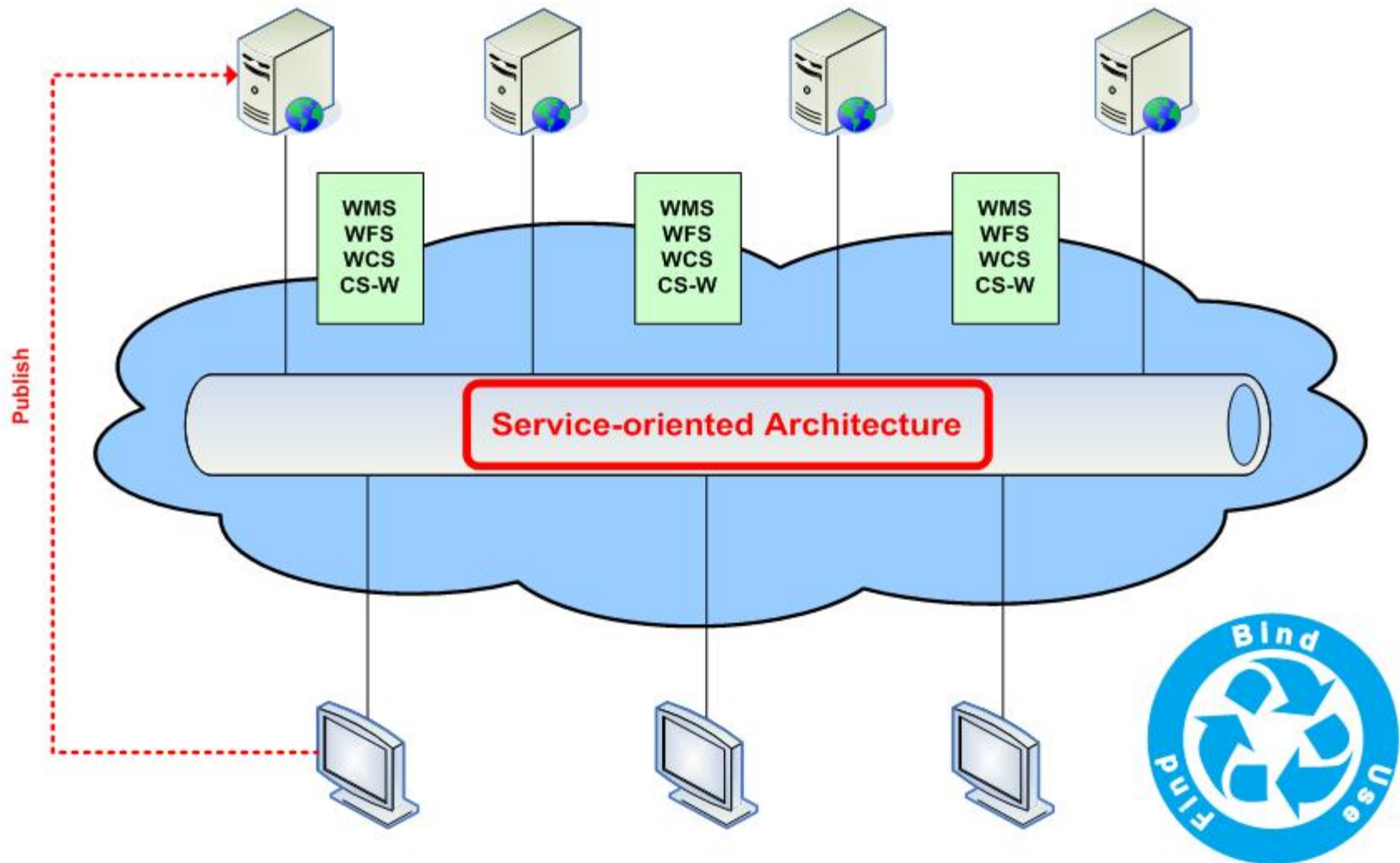
- ▶ accessible anytime,
- ▶ processed appropriately,
- ▶ unique w.r.t. to their contents, and
- ▶ no incompatibilities exist w.r.t. different IT systems and standards.“

(from: „gis-report-news“, 11.10.05, published by Bernhard Harzer)

Definition (Geo-)Spatial Data Infrastructure (SDI/GDI):

Complex network for the exchange of geodata, where geodata producers, service providers and users are connected to each other via a physical data network (Internet, Intranet, Extranet). The software architecture is based on a SOA concept.

GDI and SOA



GDI Bw Concept



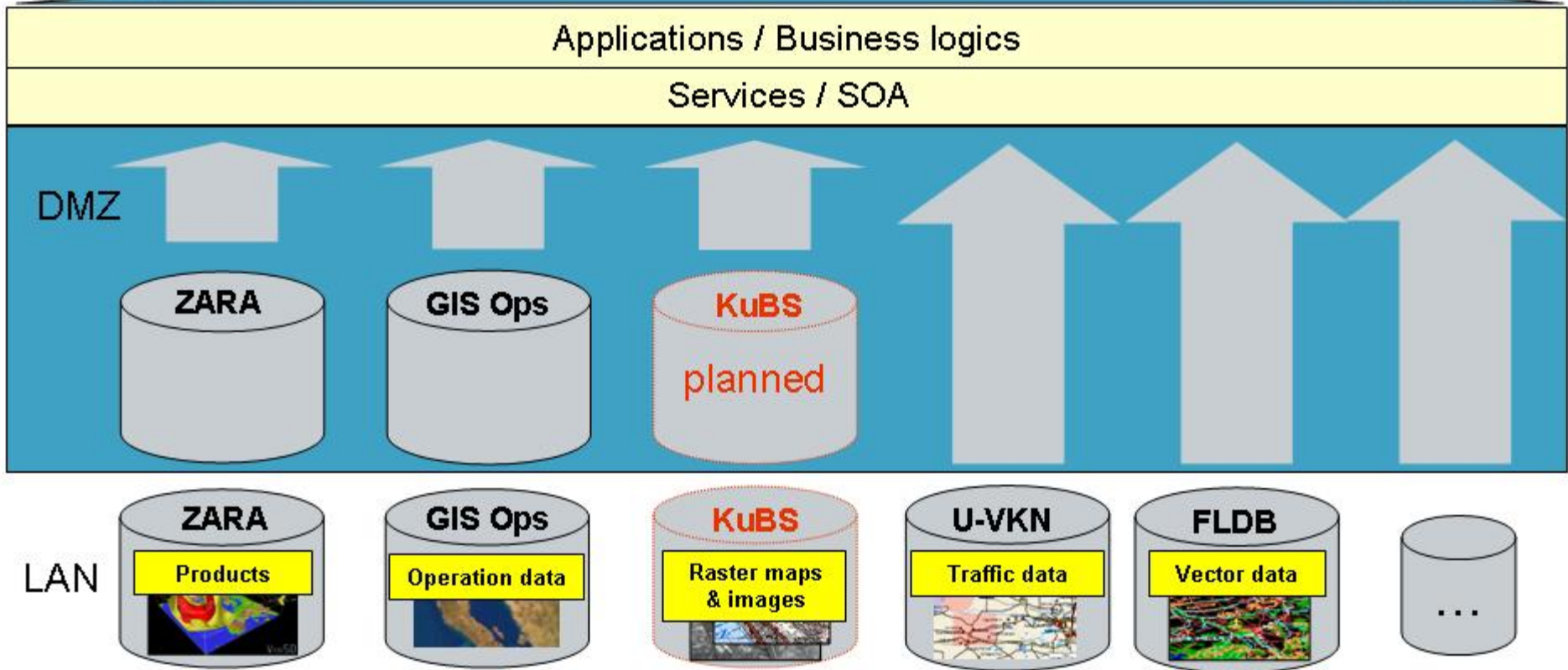
Optimisation of data
and services for provision



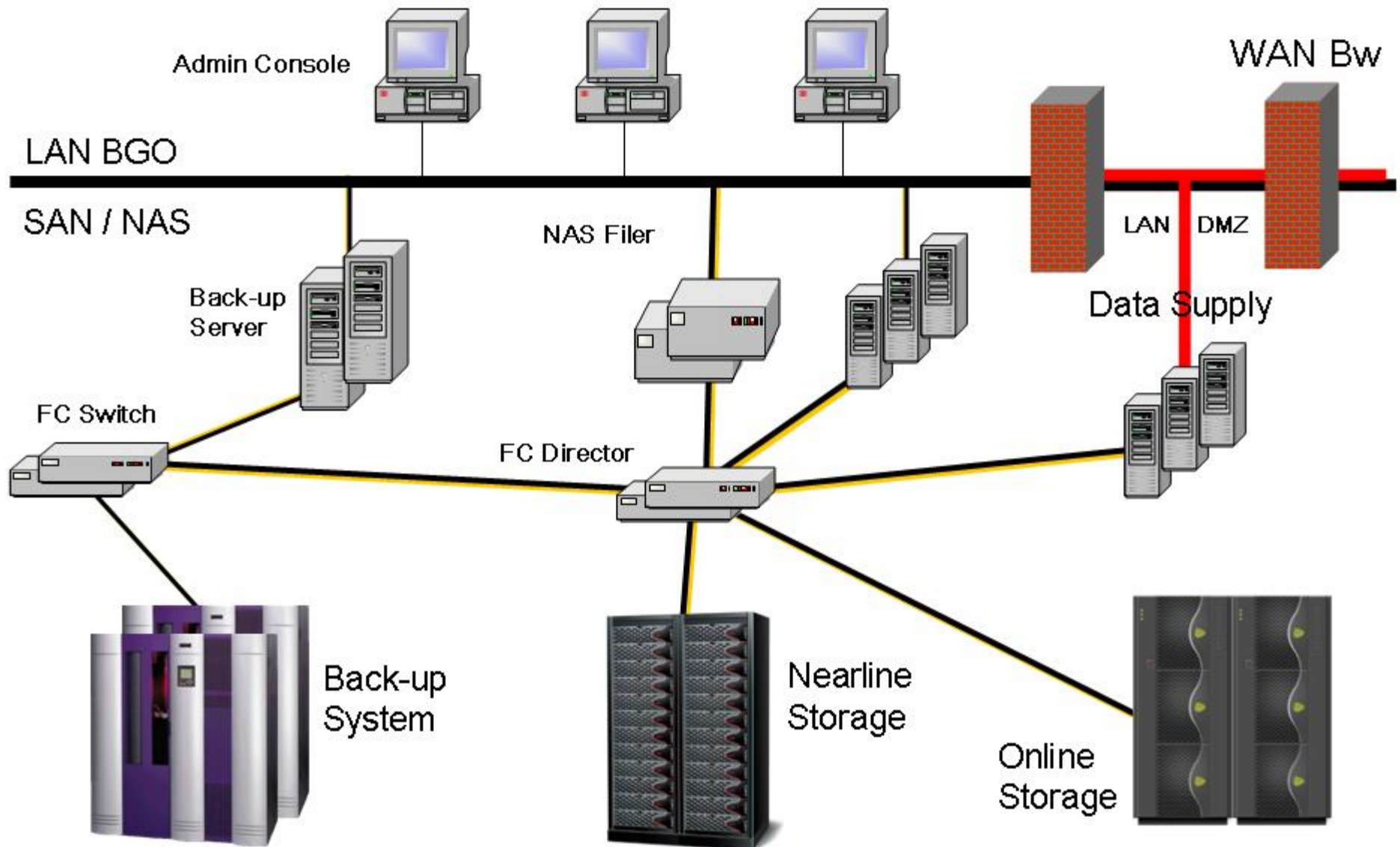
NUTZER



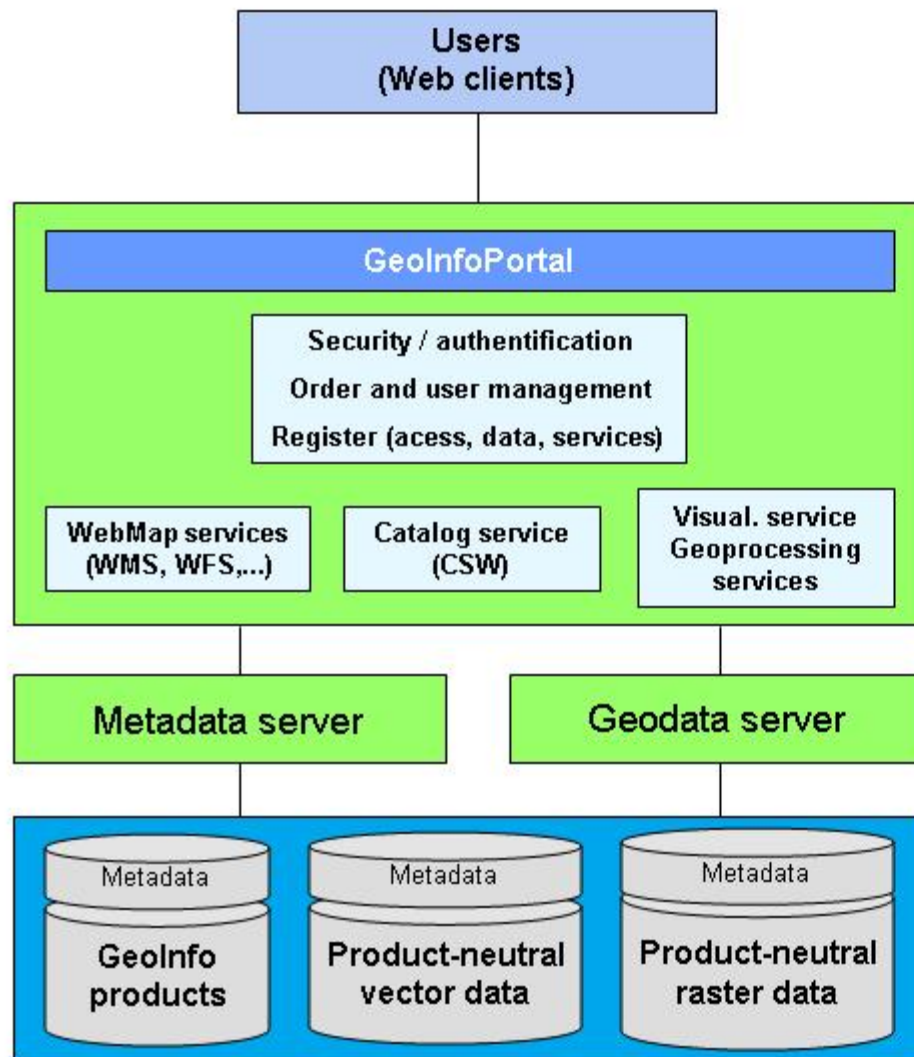
Systems,
Business logics



Hardware Architecture



Software Architecture



Search & navigation
 Overview map
 Visualisation
 Download

Frontend

Portal toolkit

Web portal

Web-Mapping
 WEB-ZARA
 ArcIMS

Application framework

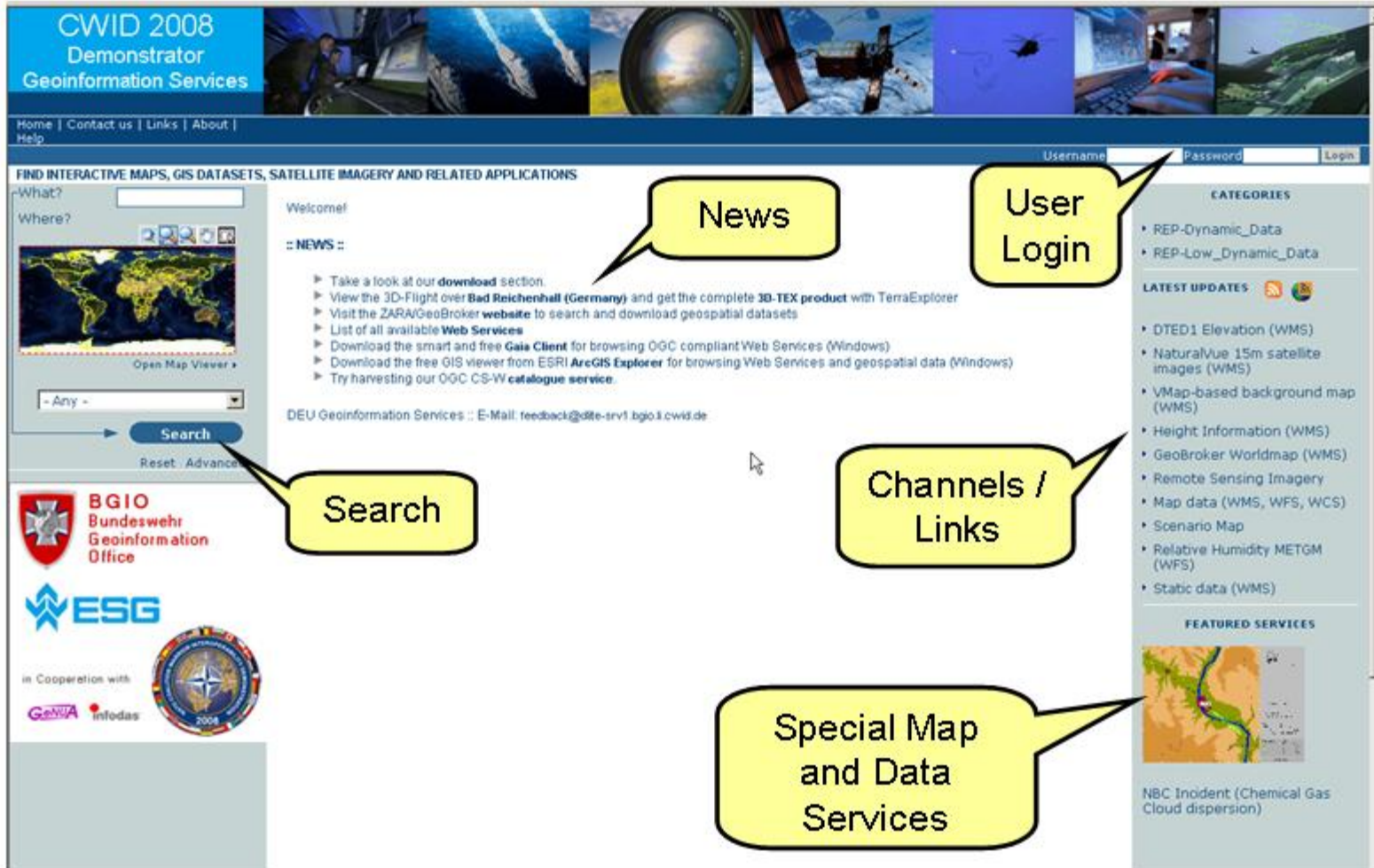
ZARA server
 ArcGIS server

Core software

Statical & dynamical geodata
 Oracle DB
 ZARA archive

GeoInfo data

GeoInfoPortal (CWID 2008)




CWID 2008 Demonstrator Geoinformation Services

Home | Contact us | Links | About | Help

Username Password Login

FIND INTERACTIVE MAPS, GIS DATASETS, SATELLITE IMAGERY AND RELATED APPLICATIONS

-What?
Where?


Open Map Viewer

- Any -

Search
Reset Advanced

Welcome!

:: NEWS ::

- ▶ Take a look at our **download** section.
- ▶ View the 3D-Flight over **Bad Reichenhall (Germany)** and get the complete **3D-TEX product** with TerraExplorer
- ▶ Visit the **ZARA/GeoBroker website** to search and download geospatial datasets
- ▶ List of all available **Web Services**
- ▶ Download the smart and free **Gaia Client** for browsing OGC compliant Web Services (Windows)
- ▶ Download the free GIS viewer from ESRI **ArcGIS Explorer** for browsing Web Services and geospatial data (Windows)
- ▶ Try harvesting our OGC **CS-W catalogue service**.

DEU Geoinformation Services :: E-Mail: feedback@dte-srv1.bgio.i.cwid.de


CATEGORIES

- REP-Dynamic_Data
- REP-Low_Dynamic_Data

LATEST UPDATES

- DTED1 Elevation (WMS)
- NaturaVue 15m satellite images (WMS)
- VMap-based background map (WMS)
- Height Information (WMS)
- GeoBroker Worldmap (WMS)
- Remote Sensing Imagery
- Map data (WMS, WFS, WCS)
- Scenario Map
- Relative Humidity METGM (WFS)
- Static data (WMS)

FEATURED SERVICES


NBC Incident (Chemical Gas Cloud dispersion)

Search

News

User Login

Channels / Links

Special Map and Data Services

BGIO Bundeswehr Geoinformation Office

ESG

in Cooperation with **GeoWA infodas**

Provision of GeoInfo Products

WEB-ZARA – Data request



WEB-ZARA - Management system for geospatial information

Home
Login
Apply an account
Technical demands
Help
GeoBroker Map (SVG)
Visitors on this website

WEB-ZARA - Management system for geospatial information

Retrieval of geospatial information.
Display of request hits in terms of lists and footprints in a map.
Quicklooks of geospatial information.
Download of geospatial information.
Ordering of geospatial information.

Guest-account: User name = gast, Password = WEB-ZARA

WEB-ZARA - Microsoft Internet Explorer

Map Window Contact Modify password Help Close

Geoinformationsdienst der Bundeswehr

Area of Interest

Latitude North: +32° 48'
Longitude West: -117° 18'
Longitude East: -116° 57'
Latitude South: +32° 38'

Source date from: 1 1 1900
until: 20 5 2006
Confidential level: Unclassified
Archive status: online

Region cross national: America, North
State: United States, The, western Hemisph
Region intrastate: California
City: SAN DIEGO (CALIFORNIA)

Elevation data
 DHM
 DOM
 DTED
 GTopo
 SRTM X-Band

Maps MIIGeo-PCMAP Remote sensing Raster data Vector data Elevation data Points Others Weather

Start request Reset settings

Select all datatypes
Reset all datatypes

Lokales Intranet

Provision of GeoInfo Products

WEB-ZARA – Data retrieval



WEB-ZARA Map | List of request hits | Request window | Info | Close window

Map display: DTED with ID 604193
 Lon: -124.68550 * Lat: 40.23906 *

Options:

- Show Legend
- Lodge Relief
- Grid
- Footprints visible
- Height data - S
- Aerial view - CI
- Flight map - TF
- Flight map - OF

Status: Ready

Legende:

- Hauptstadt
- Fluss
- - - Staatsgrenze
- Küstenlinie
- See

Download mass data of request hit - Microsoft Internet Explorer

Data type:	DTED
ID:	604193
Name of ZIP-file:	DTED_00093921_Data.zip
Size of ZIP-file (in bytes):	496395 Bytes
Size of ZIP-file (in mb):	0,47 MB
Transmission time:	
Modem (56 KB@sec):	1 Min. 9 Sek.
ISDN (64 KB@sec):	1 Min. 1 Sek.
T-DSL (768 KB@sec):	5,049 Sek.
T-DSL (6 MB@sec):	0,631 Sek.
Intranet (12 MB@sec):	0,316 Sek.

Quicklook of request hit - Microsoft Internet Explorer

with Id 604188, Data type = DTED

4,679,726 m (am Äquator) | 2,339,863 m

Info: Basemap of scalegroup 2 is loaded from server! | Projection: Plate carree with globe radius 6,378,127 m

Data type	Series	Edßion	Horiz. datum	Vert. datum	Source date	Archive format	Archive status	Id
DTED	DTED1	99	World Geodetic System 1984	EG96	01.02.2000	DTED1	online	604188

ArcIMS Web Services (Examples)



Feyzabad ArcGIS Server Application



Image City Map - LEBANON



Disaster Alarm Plan



Satellite Image Service (SIS)
Feyzabad



GIS Operation



Regional Military
Geographic Material
To Specific Regions



Flight Feyzabad to Bay Malasi

ArcIMS Web Service „GIS Operations“



GIS-Einsatz - Microsoft Internet Explorer

Adresse http://meersburg/Website/GIS_Einsatz/viewer.htm

Zoom In

Layers

Visible Active

- CONTINENTAL MAP
- populated_place
- capital
- more than 5,000,000
- 1,000,000 to 4,999,999
- 500,000 to 999,999
- 250,000 to 499,999
- 100,000 to 249,999

Zoom to Scale 1: 5808185

Go

DMS:
E 34° 47' 59.99" N 31° 07' 47.99"

MGRS:
36R XV 71618 45403

UTM:
X: 671618.59 Y: 3445403.3 Zone: 36 N

AGeoBw Euskirchen, Dez. Datenmodelle, App. 5824 16. März 2006

0 283 Kilometers

Map Coordinates (Geographisch, WGS84): 34.8 , 31.13 -- Scale1:5808185

Lokales Intranet



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CWID Keyfacts



▶ NATO CWID – Coalition Warrior Interoperability Demonstration



2006



2007



2008



3 years successful cooperation

▶ International joint and combined interoperability exercise

- 4 weeks Lillehammer (Norway) including VIP days
- Additional national trial sites
- AGeoBw participates as geoinformation provider supported by ESG
- Operation of a demonstrator in a classified NATO network (CTF-NRF)
- Ca. 20 participating nations, partners for the execution of test cases
- Recent technology trends from geoinformatics, IT security and Web 2.0 will be tested

CWID Geoinformation Service

GDI Bw in a nutshell



Objectives and Partners

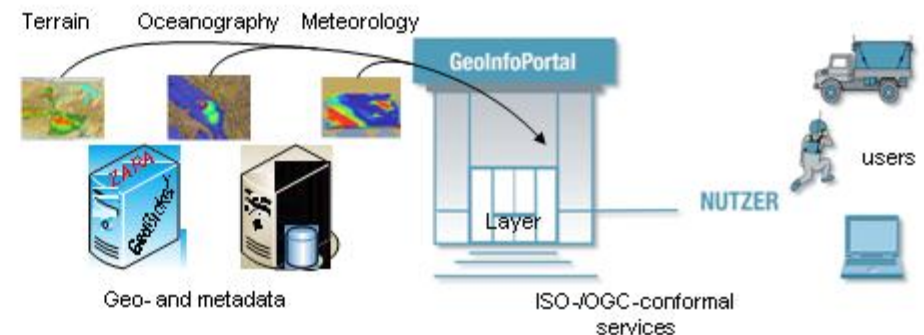
Demonstrator Geoinformation Service

- ▶ Online provision of geospatial and METOC data
- ▶ REP generation and visualisation
- ▶ Interoperable interfaces to C4I systems using standardised geo web services (WMS, WFS, CS-W, WCS according to ISO/OGC)
- ▶ Service oriented architecture (SOA), Enterprise Service Bus (ESB)
- ▶ Red-black data transfer (RSGate)
- ▶ Performance analyses
- ▶ Open source technologies

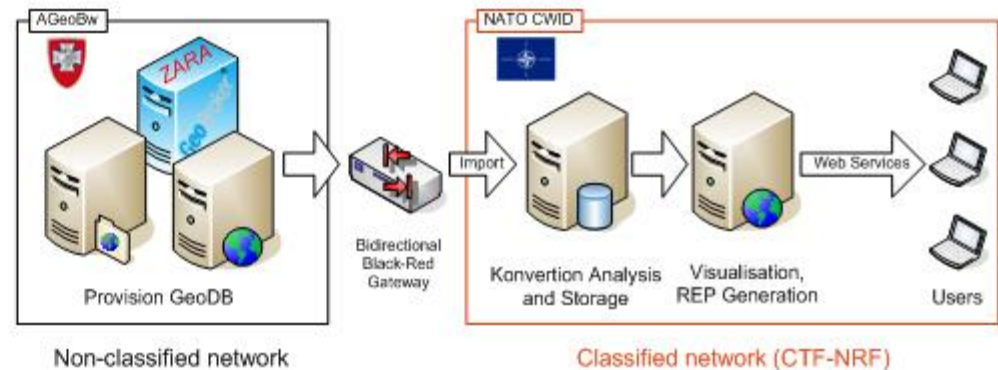
Trial partners CWID 2006, 2007 und 2008:

- ▶ 1. GE/NL Korps, NC3A, NGA, FülInfoSysSK, Airforce, Navy
- ▶ EADS, SBS, FSC, GeNUA/Infodas, Carmenta
- ▶ ...

Example: REP and GeoInfoPortal



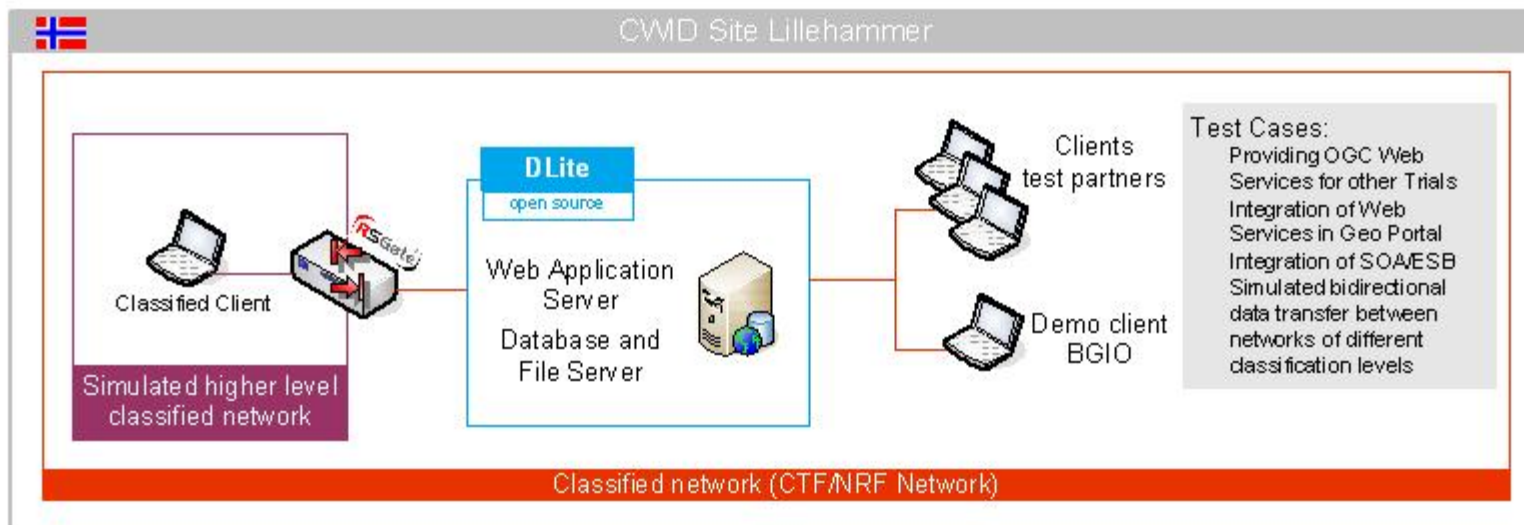
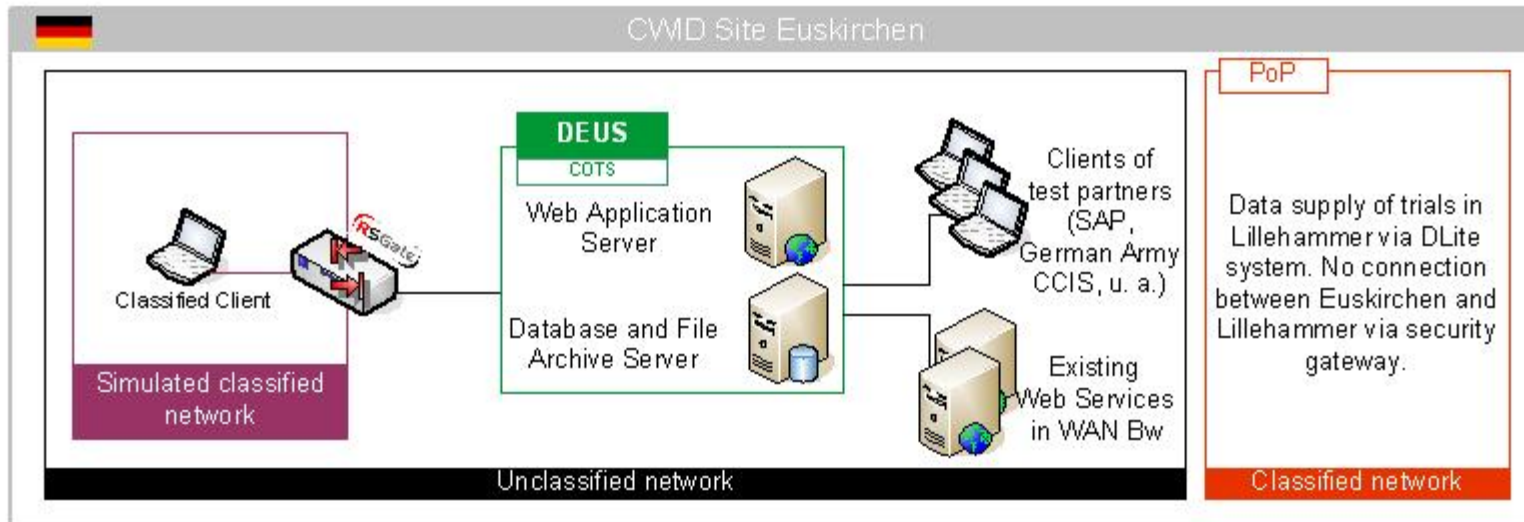
Example: Red-black data transfer



Testbed for a future online provision of Geoinfo data using a web portal

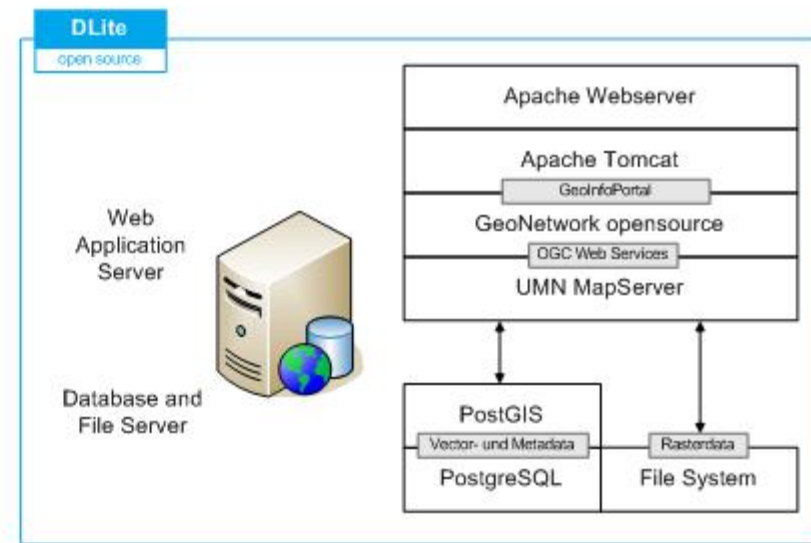
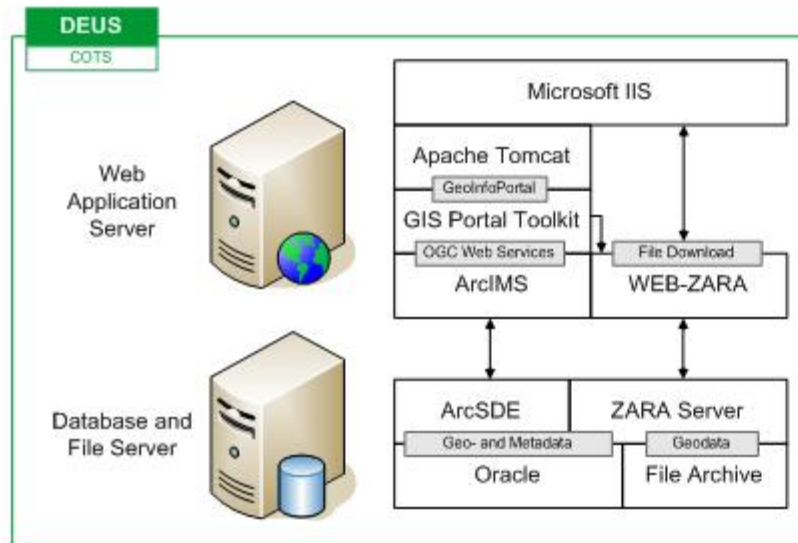
CWID 2008

Network configuration in Euskirchen and Lillehammer



CWID 2008

Two Demonstrators Geoinformation Services



Comparison of performance between commercial and open source software

DEUS (COTS)

- Hardware: HP Proliant DL 380 G4, HP Proliant DL 380 G5
- Commercial software: Windows Server 2003, ArcIMS 9.2, ArcSDE 9.2, GIS Portal Toolkit 3.1, Oracle 10.2.0.3g, GeoBroker, IIS 6
- Open source software: Apache Tomcat 6.0.14
- Available services: Geo Portal, CS-W, WMS, WFS, WEB-ZARA

DLite (open source)

- Hardware: HP Proliant DL 380 G5
- Open source software: Ubuntu Linux 7.10, PostgreSQL 8.2.6, PostGIS 1.2.1-2, UMN MapServer 4.10.3-1, Apache Webserver 2.2.4, Apache Tomcat 5.5.25, GeoNetwork opensource 2.3
- Available services: Geo Portal, CS-W, WMS, WFS, WCS

Impressions from CWID 2008



CWID Lessons Learned



- ▶ CWID is an important international testbed and shows the latest developments in C4I systems
- ▶ Geoinformation Service was highly accepted by the CWID community, more than 80 web site visitors during 3 weeks
- ▶ Data transfer from „red“ to „black“ network ran stable
- ▶ Full interoperability was proven in several test cases based on OGC's WMS/WFS/CS-W/WCS
- ▶ REP concept was verified, where the REP provides geospatial basis information for the COP
- ▶ Both commercial and open source systems were adequate and powerful



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Conclusions – 1



IT systems & Users



Offline provision



Intranet

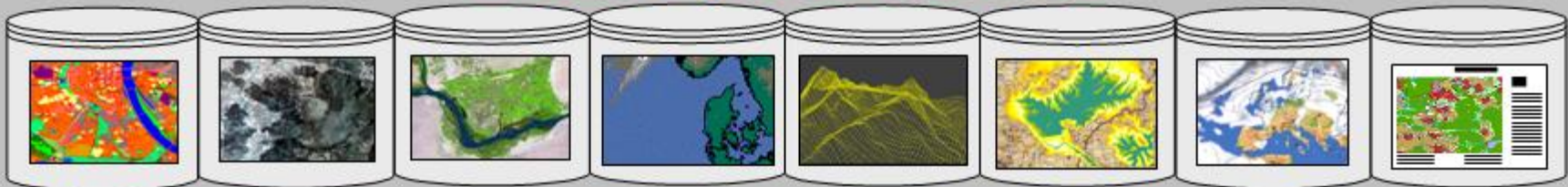


Internet



Classified IT systems

GeoInfo portal solution



Conclusions – 2



- ▶ Uniform access to available, quality-assured GeoInfo data and products (Web portal)
- ▶ Fast and economic user supply
- ▶ Task-oriented services (applications, systems, business logics)
- ▶ Integration and combination of geospatial data from different databases (REP concept)
- ▶ Vendor-independent interoperability



Contact



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