Le soluzioni Intergraph per la Geospatial Intelligence e la Data Harmonisation nel contesto di standardizzazione dei flussi informativi delle SDI.

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Conferenza Tematica AMFM 2006

INTERGRAPH

Quello che sappiamo…

Infrastrutture di Dati Territoriali

- Insieme di policies, accordi istituzionali, tecnologie, dati e persone che rendano possibile la condivisione e l'uso efficiente dell'informazione geografica.

- Componenti essenziali:
  - Dati di riferimento univoci e condivisi
  - Metadati
  - Servizi di rete per visualizzazione, accesso, download
  - Standards e accordi di accesso e utilizzo
  - Struttura di coordinamento

- Numerose iniziative in Europa e altrove (http://www.gsdi.org/)

ies
Institute for
Environment and
Sustainability

Architettura di sistema SDI su 3 livelli

Server GIS - Web

Livello 1: condivisione dei dati geografici
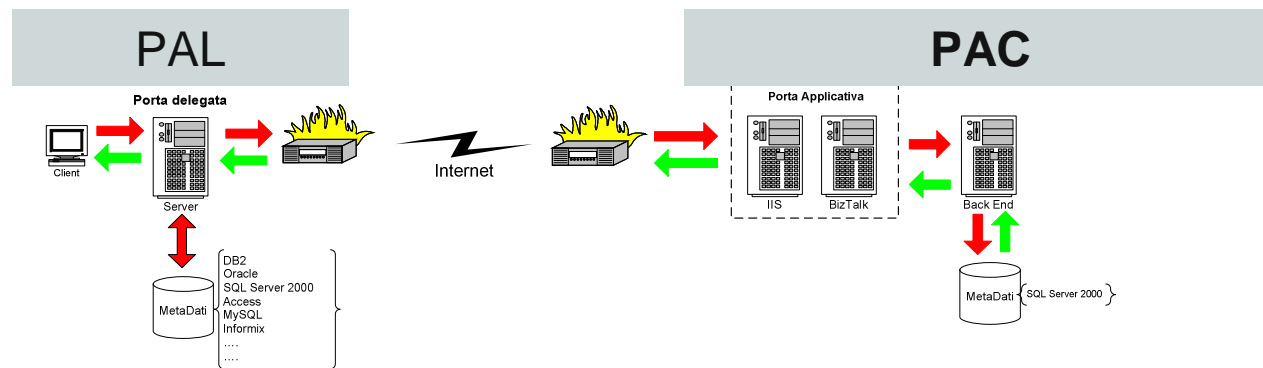
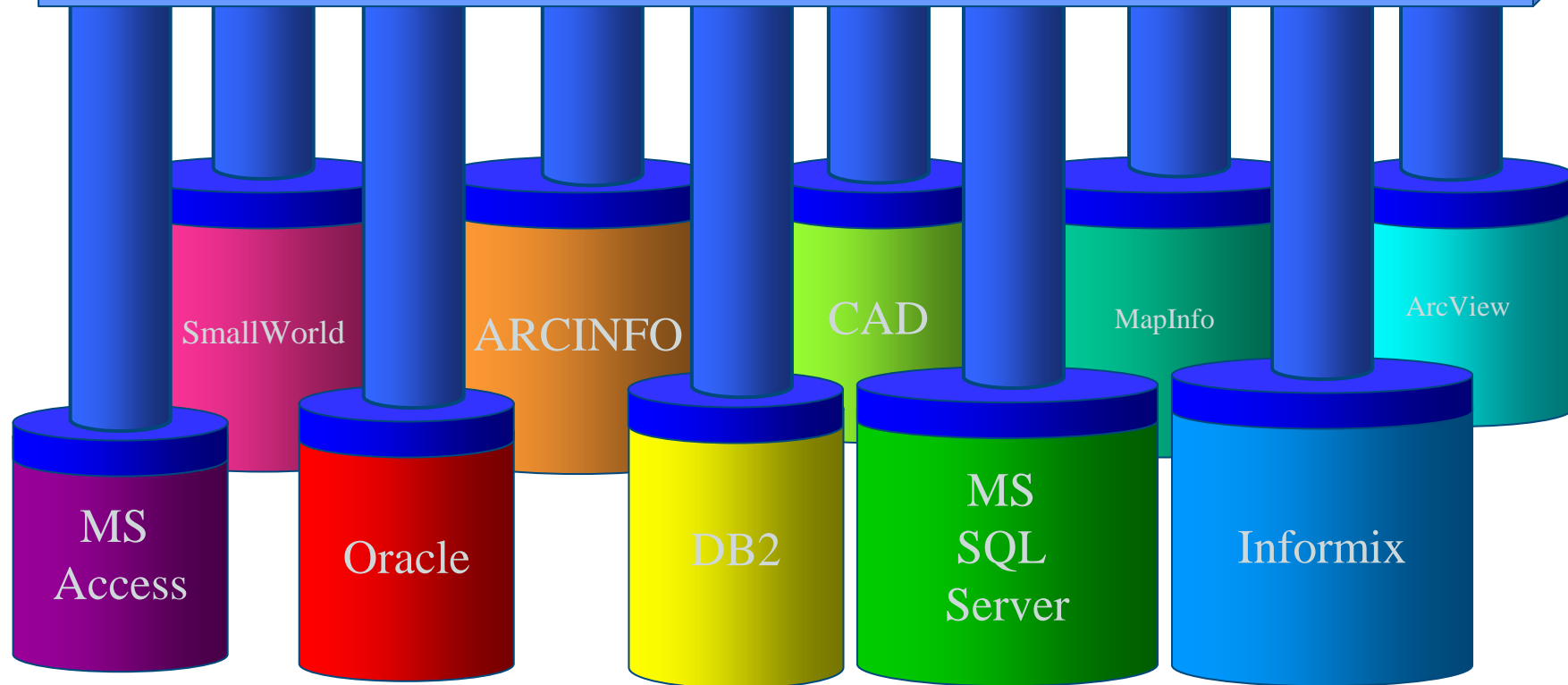## Livello 2: replicazione dei metadati (cooperazione applicativa)

Livello 3: sicurezza ed autenticazione

Servizi Web OpenGIS Consortium

SmallWorld · ARCINFO · CAD · MapInfo · ArcView

MS Access · Oracle · DB2 · MS SQL Server · Informix
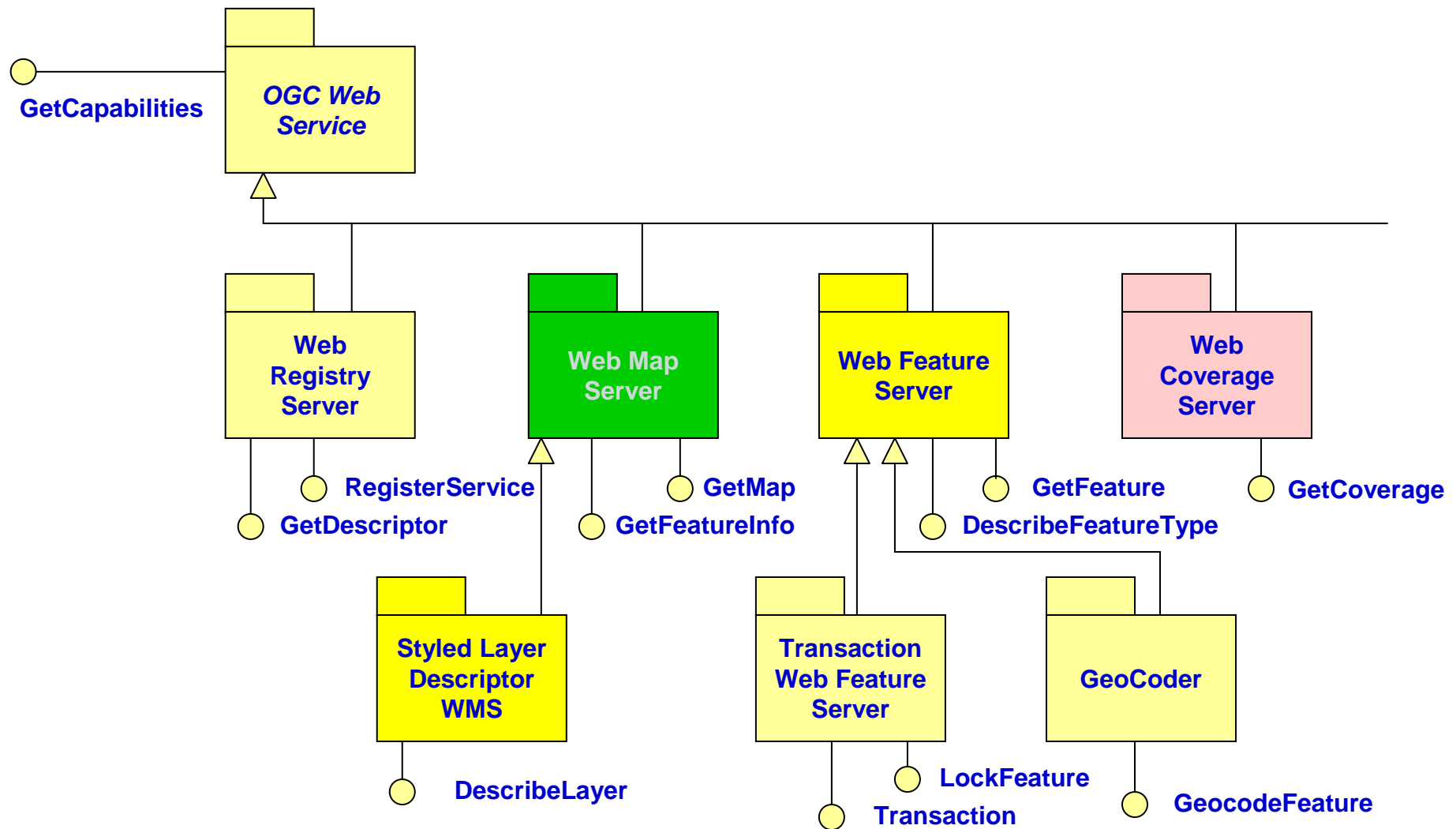
Integrazione di Dati Eterogenei

Il modello di riferimento proposto per l'interoperabilità dei dati geografici: i web services OGC

OGC Web Service

GetCapabilities

Web Registry Server

Web Map Server

Web Feature Server

Web Coverage Server

RegisterService

GetDescriptor

GetMap

GetFeatureInfo

GetFeature

DescribeFeatureType

GetCoverage

Styled Layer Descriptor WMS

Transaction Web Feature Server

GeoCoder

DescribeLayer

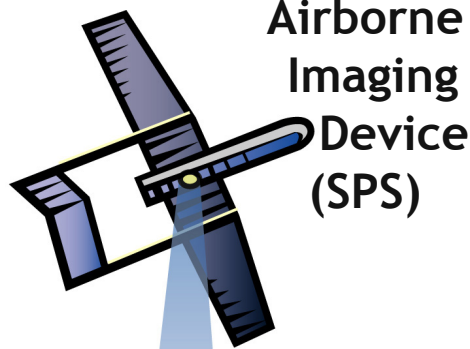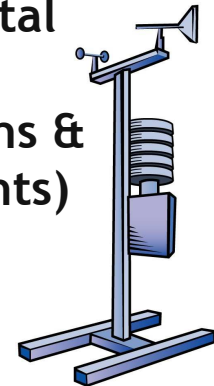LockFeature

Transaction

GeocodeFeature

OGC Sensor Web

- All connected to the web
- All sensors reporting position
- All sensors have defined observables
- All with metadata registered
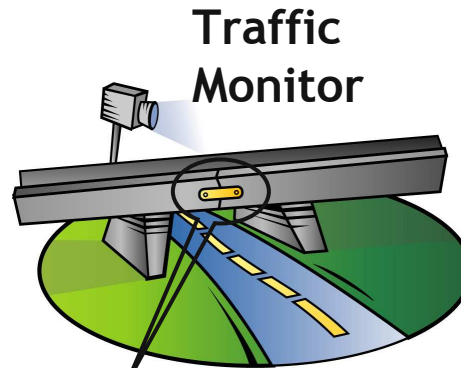
MUCH WORK ON SENSOR WEB IN OWS!
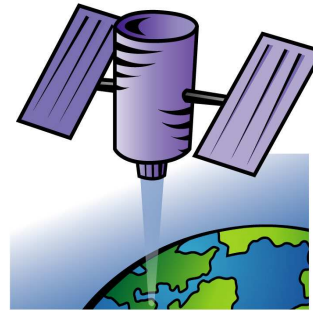
Satellite-borne Imaging Device (SensorML)

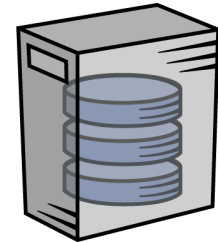Environmental Monitor (Observations & Measurements)

Airborne Imaging Device (SPS)

Traffic Monitor

Stored Sensor Data (SCS/IAS)

Strain Gauge (SCS)

Health Monitor

Industrial Process Monitor (SCS)

Webcam (SCS)

OGC
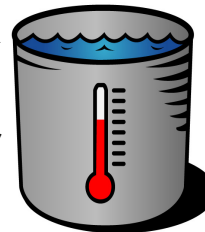
Iniziative di Standardizzazione in corso

Sistema di Riferimento Europeo

Vi sono differenze significative fra le altezze dei diversi paesi europei (in cm)
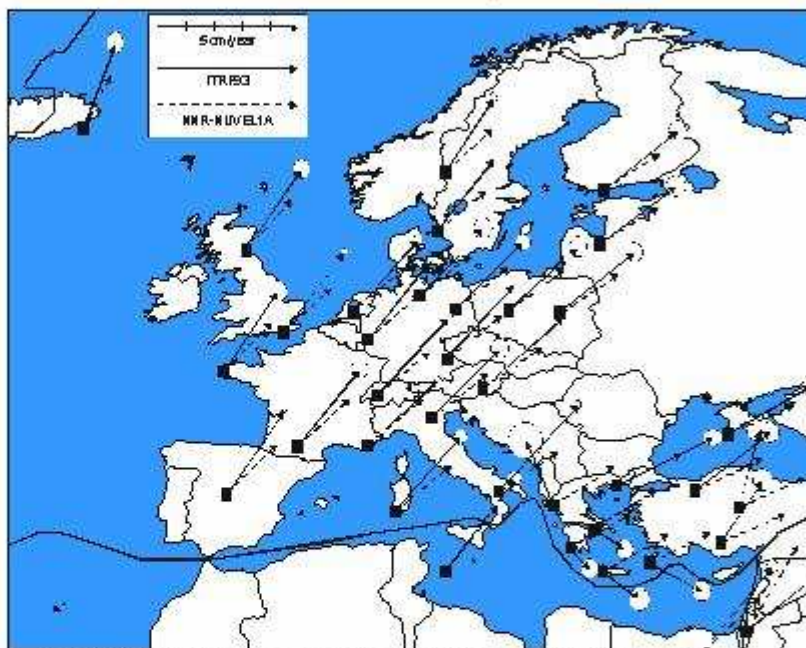
La piattaforma continentale Europea si muove uniformemente di ~3cm per anno
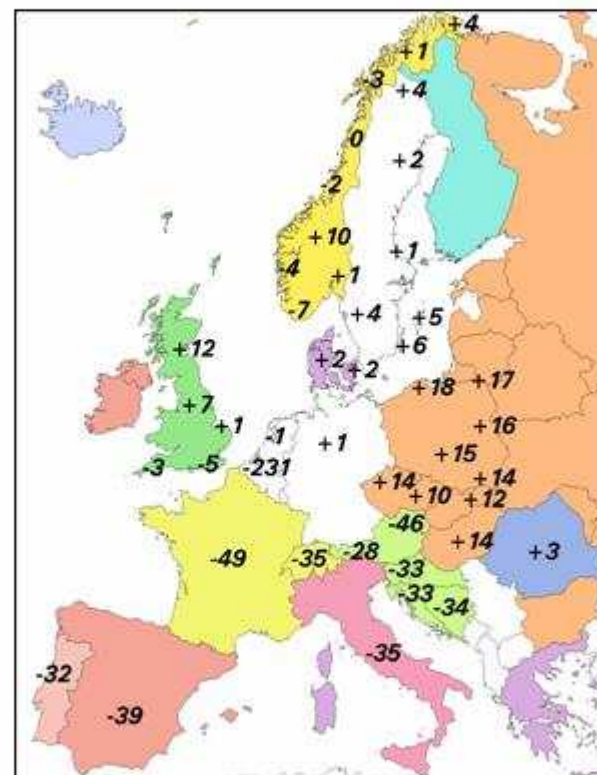
Joint Research Centre

ISO **cen** **Open GIS Consortium**
Spatial connectivity
for a changing world.

Standardizzazione
CEN/TC287, ISO/TC211, OGC

ies
Institute for
Environment and
Sustainability

Open Standards

- The **World Wide Web Consortium (*W3C*)** mission is to develop interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential.

- The **International Standards Organisation (ISO)** mission is to transform valued criteria such as quality, ecology, safety, economy, reliability, compatibility, interoperability, efficiency and effectiveness into real attributes of products and services that are manufactured, delivered, bought, used at work, at home, or at play.

- The **Open Geospatial Consortium (OGC)** mission is to create a world in which everyone benefits from geographic information and services made available across any network, application, or platform.

- The **Organization for the Advancement of Structured Information Standards (OASIS)** is a not-for-profit, global consortium that drives the development, convergence and adoption of e-business standards.

- W3C, ISO, OGC and OASIS standards have enabled a paradigm change for the provision and exploitation of data and services.

Accordo sul Sistema Cartografico di Riferimento

Intesa Stato-Regioni
(1996)

Accordo di Base
(1998)

Accordo integrativo tra Stato e Regioni

sul **Sistema Cartografico di Riferimento** (2000)

Il contesto europeo e nazionale

http://www.intesagis.it

http://www.padigitale.it

Costituisce il quadro giuridico di riferimento per la disponibilità, la gestione, l'accesso, la trasmissione, la conservazione e la fruibilità dell'informazione in modalità digitale.

Sistema Pubblico di Connettività (SPC) http://www.innovazione.gov.it

Costituisce il quadro tecnologico di riferimento per la cooperazione e lo scambio delle informazioni tra le diverse amministrazioni

I Documenti delle Specifiche

1n1007_1
Specifiche di Contenuto

1n1007_2
Documento d riferimento

1n1007_3
Codifica delle voci di legenda

- Documento di cui è disponibile già una bozza
- Documento per la cui produzione è già attivo un progetto
- Documento per il quale deve essere ancora approvato un progetto

1n1010_1
Il modello Concettuale GeoUML
Specifica formale

1n10010_2
Il modello Concettuale GeoUML
Inquadramento generale e introduzione all'uso

1n1010_3
Lo schema concettuale in GeoUML

1n1011_1
database topografico
alle scale 1:1000, 1:2000, 1:5.000 e 1:10.000
Prescrizioni Amministrative

1n1011_2
Database topografico alle scale 1:1.000 e 1:2.000
Specifiche tecniche

1n1011_3
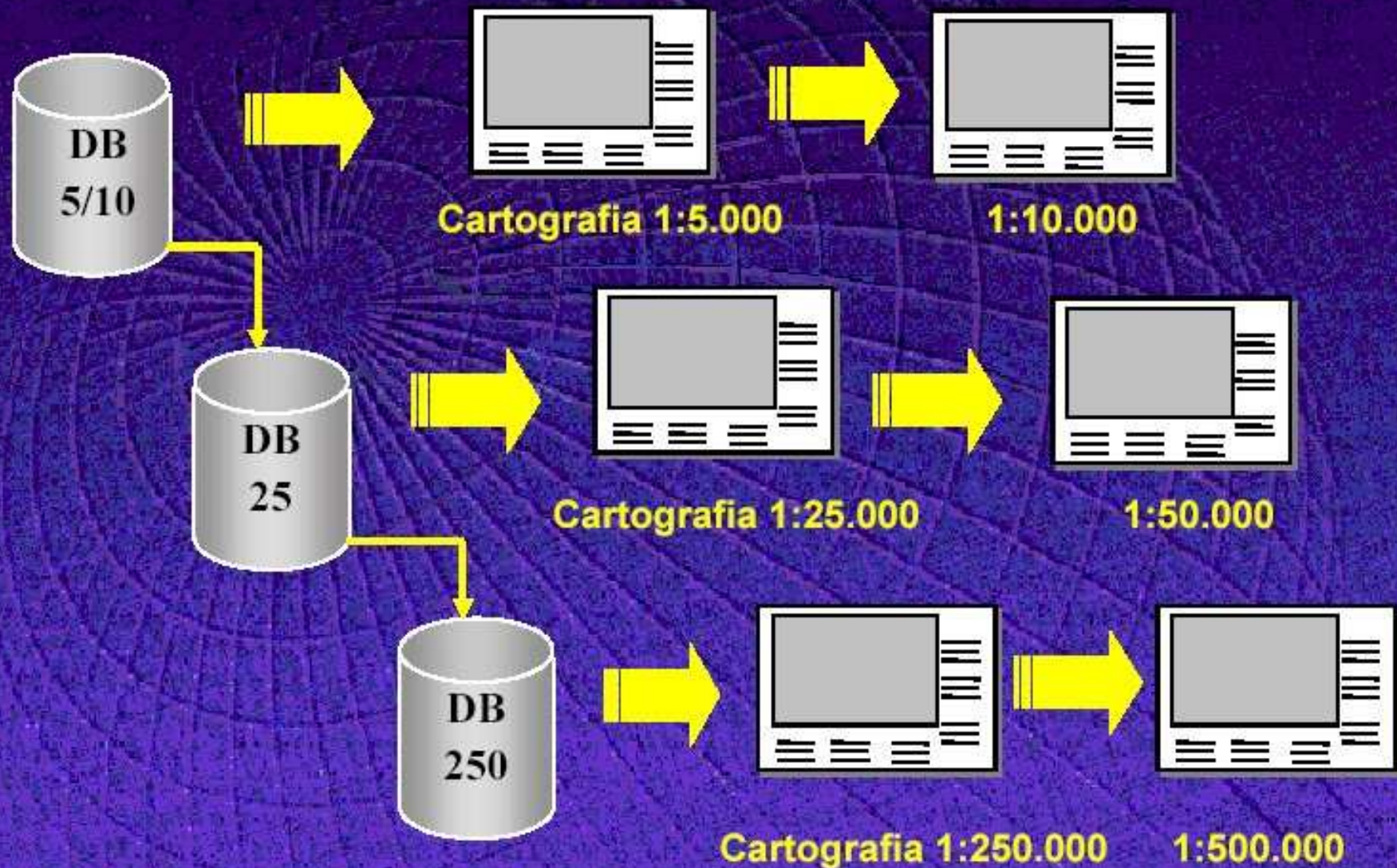Database topografico alle scale 1:5.000 e 1:10.000
Specifiche tecniche

1n1012_1
La specifica in GML3

Specifiche Tecniche per l'interoperabilità sintattica e semantica

Il "circolo virtuoso" dei dati geotopocartografici: l'aggiornamento "dalla base" della piramide informativa

Flusso dei dati
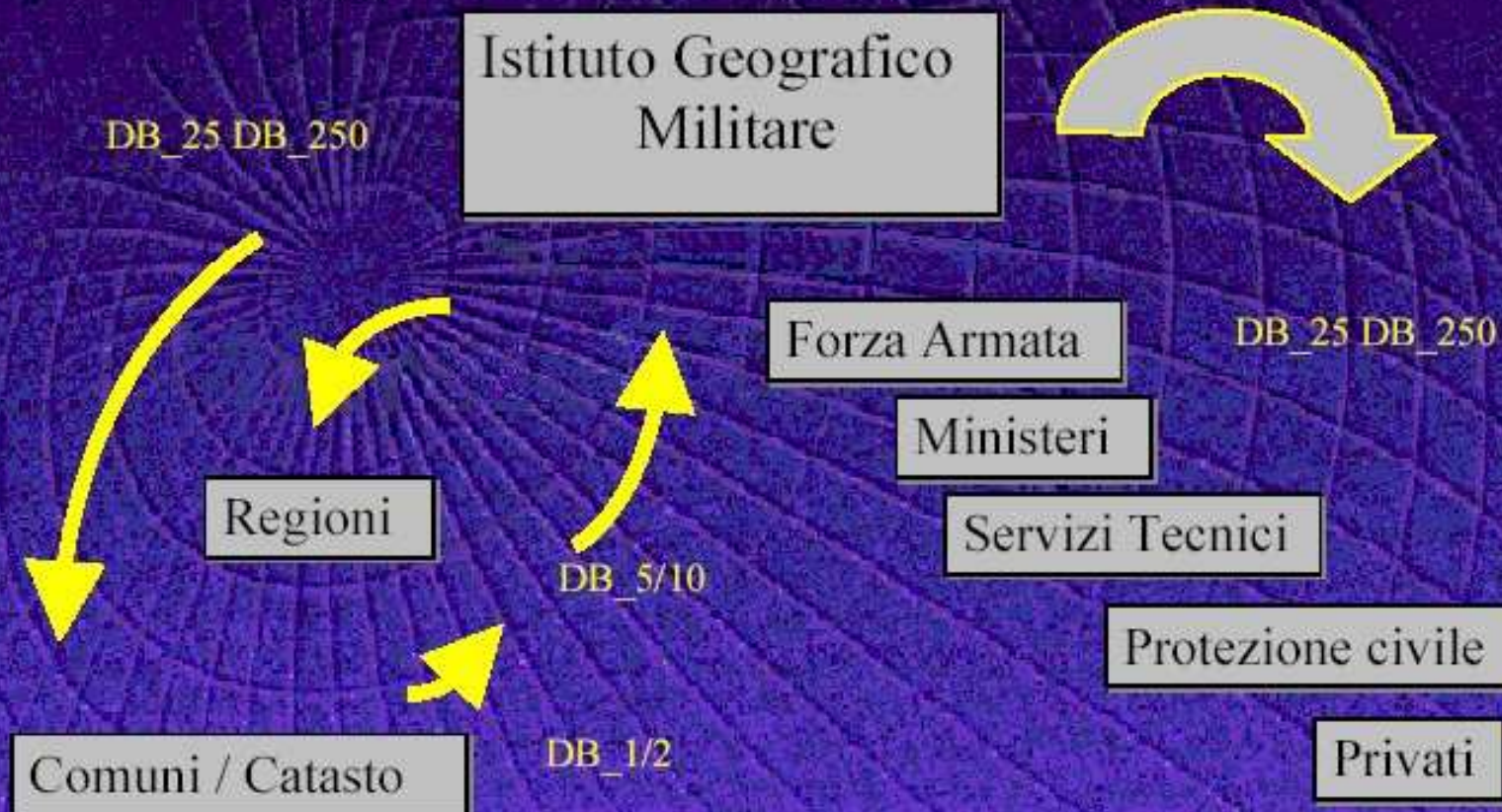
Il "circolo virtuoso" dei dati geotopocartografici:

l'aggiornamento "dalla base" della piramide informativa

La realizzazione della Spatial Data Infrastructure Europea

From discovery   →   to   **Full Interoperability**

Standardisation

- Metadata
- Discovery Service
- Data Policies
- Licensing Framework
- Coordinating structures
- ...

Harmonisation

- Geodetic Framework
- Seamless data
- Quality insurance
- Certification
- Data model
- ...

Integration

- Catalog Services
- View Service
- Query Service
- Object Access Service
- Generalisation Services
- Geo-Processing services
- ...

INSPIRE: architettura di sistema

INSPIRE: architettura di sistema

GIS applications

API

Geographic
Information Services

API

Service
access

API

Geographic
Information Services

API

Information Technology Services

HTI   ISI   CSI

NNI

CSI   ISI   HTI

NNI

Data sharing and
transfer based on
*common conceptual
models*

Legend

API - Aplication Programming Interface
HTI - Human Technology Interface
ISI - Information Services Interface
CSI - Communications Services Interface
NNI - Network to Network Interface

The Open Systems Environment (OSE) Reference Model worldview of geographic information services in distributed computing environments (from IS 19101; © 2002 ISO).

Si tratta di un processo Top-Down…

- Il processo che abbiamo descritto finora è un processo **"top-down", incrementale e fortemente asincrono** tra la componente strettamente informatica e quella relativa alla standardizzazione semantica e "di produzione" del dato. Una prima conseguenza sono delle vere e proprie acrobazie che vengono richieste alla componente tecnologica. Un esempio sono le tecnologie derivate dal paradigma del Semantic Web per affrontare e risolvere oggettive difficoltà di standardizzazione dei dati.

- Una seconda conseguenza può essere espressa, a nostro avviso, dal seguente interrogativo: **una *SDI top-down*, oltre ad essere costosa e difficile da realizzare, è utile?**

Geospatial Intelligence Exploitation: un approccio "bottom-up".

- La definizione di **Geospatial Intelligence Exploitation** è figlia della riorganizzazione dei servizi di sicurezza Nordamericani a seguito del *Intelligence Reform and Terrorism Prevenction Act* del 2004. Nell'ambito di tale reimpostazione funzionale ed organizzativa è stato istituito il *National System for Geospatial Intelligence* (NSG) cioè la "combinazione di tecnologie, politiche, capacità, dottrine, attività, personale, dati e comunicazioni necessarie per produrre geospatial intelligence in un ambiente integrato, multi-agenzia e multi-dominio" (NGA, 2006).

- Per "Geospatial Intelligence" si intende lo sfruttamento e l'analisi di immagini e informazioni territoriali per descrivere, valutare e rappresentare visivamente entità fisiche e attività localizzate geograficamente: si tratta, dunque, di una integrazione tra immagini, fotointerpretazione ed informazione geografica

Geospatial Intelligence Exploitation: un approccio "bottom-up".

- La "Geospatial Intelligence Exploitation" è una generalizzazione del concetto di monitoraggio che sfrutta tutte le potenzialità del patrimonio di informazione geografica "tradizionale" integrate dalle nuove sorgenti di dati delle sensoristiche di ogni tipo (militari e civili). Del resto, NSG non ha solo finalità di intelligence militare e di antiterrorismo, ma supporta anche le attività della Protezione Civile. Da un punto di vista tecnologico NSG è una federazione di sistemi informativi mirati a specifiche funzionalità che ha affrontato le necessità di interoperabilità delle informazioni geografiche in relazione a obiettivi cioè con un approccio "bottom-up".

Geospatial Intelligence

Geospatial Intelligence is defined as "the exploitation and analysis of imagery and geospatial information to describe, assess and visually depict physical features and geographically reference activities on the Earth."

Source: NIMA Capstone Concept, March/ April 2003
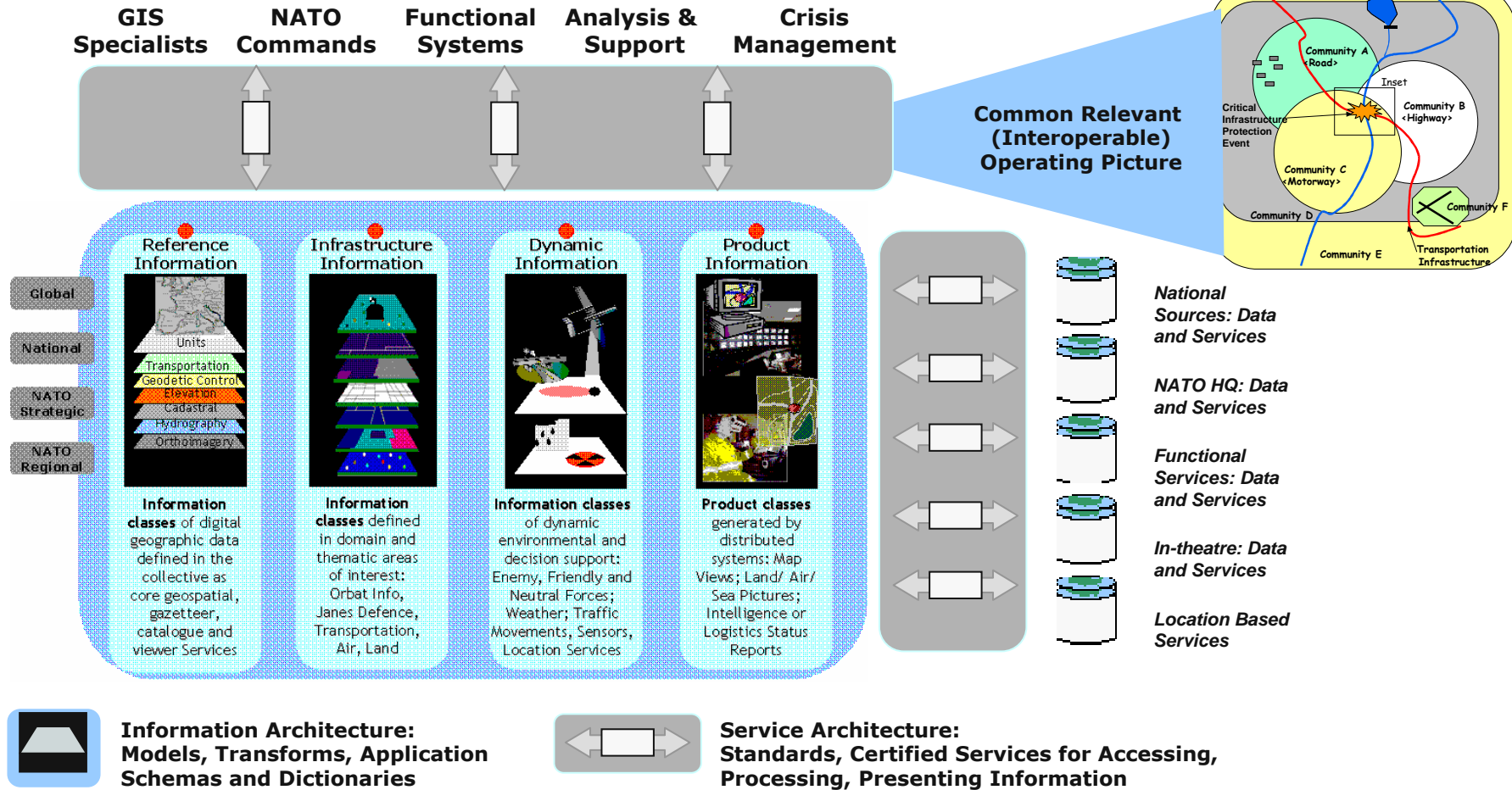
Geospatial Intelligence

Steps toward achievement of the Geospatial Intelligence vision:

- Full integration of the imagery analysis and geospatial process, products and tools
- Migration to an all digital, data-centric environment
- Reliance on web based, e-business strategies
- Use of ubiquitous knowledge maps as the interoperable foundation of the Common Relevant Operational Picture (CROP)

European Geospatial Intelligence Seminar, Bonn, Germany, 30th November 2004

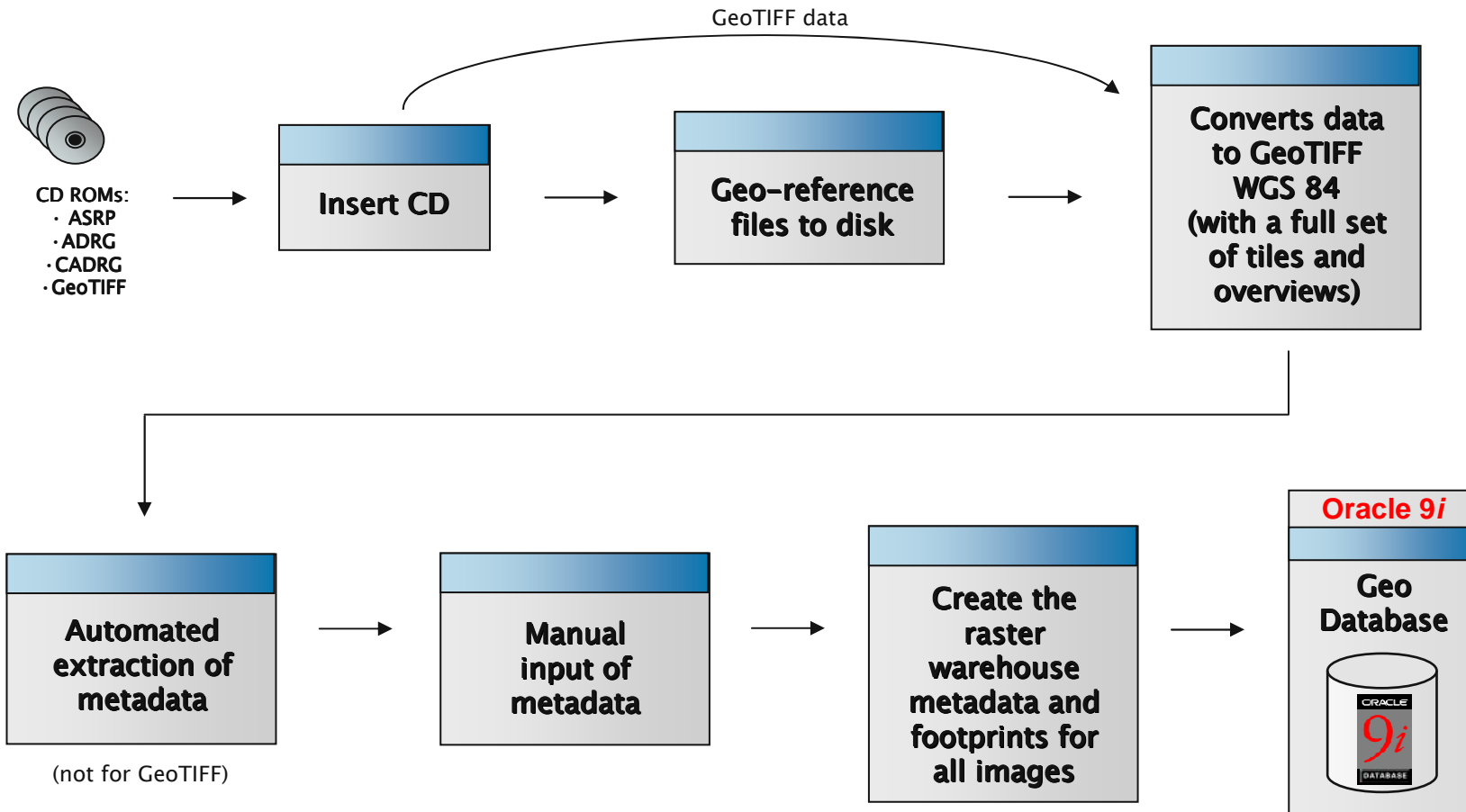# Geospatial Intelligence Exploitation: un approccio "bottom-up".

- L'approccio "bottom-up" alle SDI è caratterizzato, dunque, dal concentrare l'attenzione sulle finalità del sistema che nasce per rispondere a ben precisi requisiti e funzionalità (es. prevenzione del rischio idrogeologico, monitoraggio di aree critiche per problemi di homeland security, supporto tattico e strategico ad operazioni militari). Siffatti sistemi sono caratterizzati dalla necessità di integrare sorgenti di dati distribuite (con cicli autonomi di produzione e manutenzione) e, spesso, di effettuare, a partire da esse, delle elaborazioni in client pesanti.

Geospatial Interoperability Framework

GIS Specialists   **NATO Commands**   **Functional Systems**   **Analysis & Support**   **Crisis Management**

Common Relevant (Interoperable) Operating Picture

Community A <Road>
Inset
Critical Infrastructure Protection Event
Community B <Highway>
Community C <Motorway>
Community F
Community D
Community E
Transportation Infrastructure

Reference Information	Infrastructure Information	Dynamic Information	Product Information
Information classes of digital geographic data defined in the collective as core geospatial, gazetteer, catalogue and viewer Services	**Information classes** defined in domain and thematic areas of interest: Orbat Info, Janes Defence, Transportation, Air, Land	**Information classes** of dynamic environmental and decision support: Enemy, Friendly and Neutral Forces; Weather; Traffic Movements, Sensors, Location Services	**Product classes** generated by distributed systems: Map Views; Land/ Air/ Sea Pictures; Intelligence or Logistics Status Reports

Units
Transportation
Geodetic Control
Elevation
Cadastral
Hydrography
Orthoimagery

Global
National
NATO Strategic
NATO Regional

National Sources: Data and Services

NATO HQ: Data and Services

Functional Services: Data and Services

In-theatre: Data and Services

Location Based Services

Information Architecture: Models, Transforms, Application Schemas and Dictionaries

Service Architecture: Standards, Certified Services for Accessing, Processing, Presenting Information

Enabling a Geospatial Interoperability Framework

Un esempio di procedura di *data ingest*...

GeoTIFF data

CD ROMs:
· ASRP
· ADRG
· CADRG
· GeoTIFF

Insert CD

Geo–reference files to disk

Converts data to GeoTIFF WGS 84 (with a full set of tiles and overviews)

Automated extraction of metadata

(not for GeoTIFF)

Manual input of metadata

Create the raster warehouse metadata and footprints for all images

Oracle 9*i*

Geo Database

Geospatial Intelligence Exploitation: un approccio "bottom-up".

- Le SDI "bottom-up" sono, comunque, caratterizzate dalla **presenza degli elementi strutturali propri di una SDI (web services standard, geoportali)** che garantiscono interoperabilità, tuttavia ne viene sfruttato solo il sottoinsieme di interesse ai fini della realizzazione di un sistema informativo distribuito che, come già detto, deve realizzare delle ben specifiche funzionalità.

- Nell'approccio "bottom-up" alle SDI, infine, la problematica della data harmonisation viene affrontata essenzialmente con due strategie:

  - **specifiche di produzione rigorose e condivise** dei dati (in quanto spesso ci troviamo in un settore disciplinare ben individuato);

  - **procedure di *Data Ingest*** che normalizzano i dati, sia per gli aspetti sintattici che per quelli semantici, nei nodi di condivisione a monte dell'erogazione dei **web services**.

Open Interoperability Architectures for Defence

Geospatial Intelligence – A Critical Component of Defence

INTERGRAPH

What is IEC?

- IEC is the Integrated Exploitation Capability platform that the National Geospatial-Intelligence Agency uses for geospatial and imagery analysis.

- IEC provides COTS solutions for multiple disciplines of geospatial and imagery analysis.

  - Geospatial feature collection

  - Single image exploitation

  - Advanced image exploitation (multi-spectral, hyper-spectral, etc.)

  - Broad area search

- IEC is one component that provides the overall solution to the NGA enterprise.

How does IEC fit in the Enterprise?

- IEC manages the COTS products that are used to perform geospatial and imagery analysis.

- IEC provides and manages a local buffer (network storage) that stores imagery requested by analysts. This buffer provides high-bandwidth access to imagery.

- The National Exploitation System (NES) is the work management component of the NGA enterprise. The analyst uses NES to order and organize imagery and direct their analysis tasks.

- The Image Library is the source of imagery in the NGA enterprise. Images are transferred from the library to the IEC buffer by NES.

- When the necessary imagery is not present in the Image Library, the Requirements Management System (RMS) is tasked to acquire the needed images. RMS manages the tasking of available satellites.

NGA Enterprise Architecture
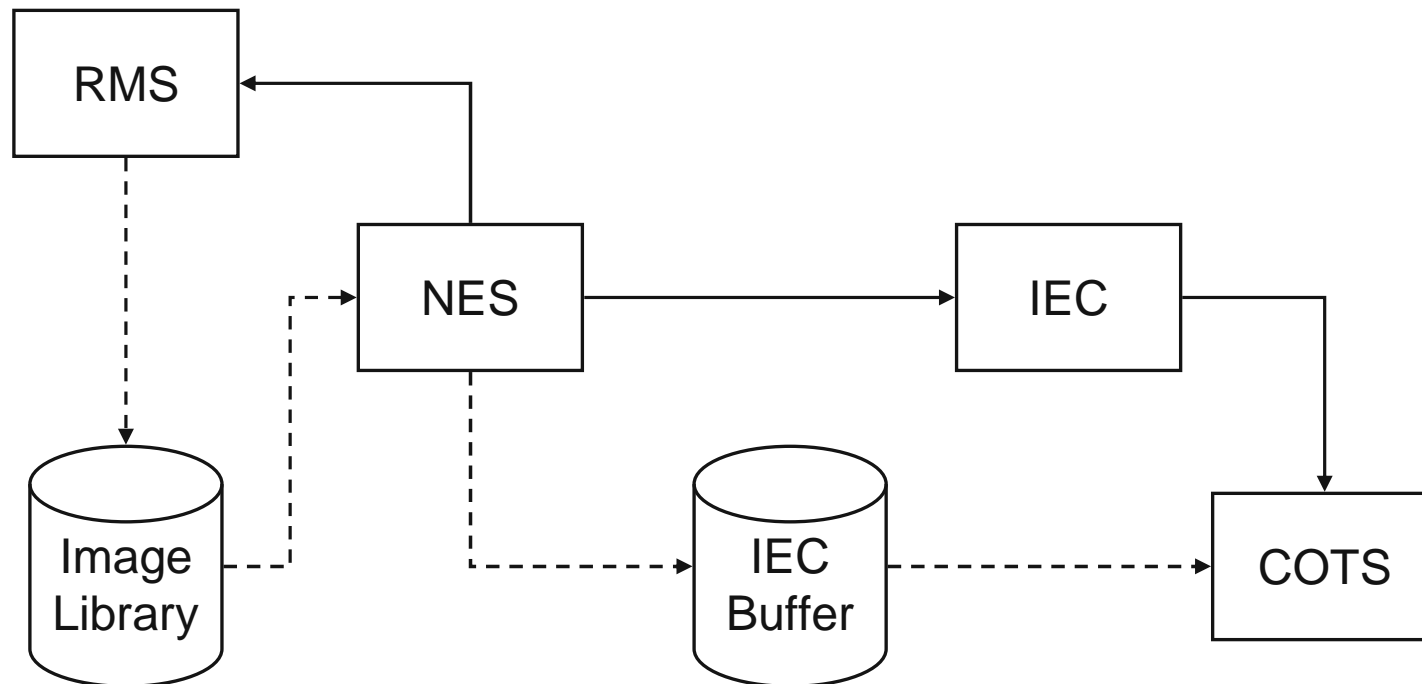
Softcopy Search BAA

- In 2000 the National Image and Mapping Agency issued a Broad Agency Announcement (BAA) seeking information regarding COTS products that could provide softcopy search capabilities.

- Around this same time Intergraph and Paragon Imaging entered into an agreement to integrate GeoMedia Professional and ELT/5500.

- Many companies provided proposals for the BAA and three teams were picked to participate in a demonstration and subsequent spiral evaluations.
  - Kodak, Intergraph, Paragon Imaging, Idelix, Hewlett-Packard
  - Boeing, Sensor Systems
  - Leica GeoSystems

- Based on requirements analysis and end-user evaluations Image Scout was chosen as the "preferred" solution for Softcopy Search on the IEC platform.

IEC in the Softcopy Search BAA

- During Spiral 3 of NGA's Softcopy Search Broad Agency Announcement Image Scout was directed to provide IEC with information regarding how the COTS product could be integrated into the IEC environment.

- Image Scout delivered a functional COM/OLE API for opening work packages and loading data from these work packages.

- Image Scout also delivered an API Test Driver that allowed IEC evaluators to exercise the delivered API.

- Discussion with IEC evaluators revealed that what was delivered was far beyond their expectations. IEC expected documents that described a potential API rather than a working prototype of the API.

- This functional API and associated test driver helped Image Scout earn high marks on the IEC integration portion of the Spiral 3 evaluation.

IEC 4.1 Integration

- Softcopy Search integration into the IEC 4.1 baseline is referred to as a "loose integration".

- IEC provides the ability to invoke the Image Scout product from the IEC applications lists.

- IEC provides a web service that allowed SCS applications to query the IEC buffer to find the desired imagery. Analysts still need to request their desired imagery using NES.

- Image Scout provides a command that allows the user to query the IEC buffer for imagery and loaded resulting images.

Query for Imagery Command

- The user specifies the metadata values that will be used to query the IEC buffer. These values are sent to the IEC web service using the HTTP protocol.

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- The results are returned in an XML file and are displayed on the Query Results tab of the command dialog. The footprints of the returned images are displayed as red polygons in the map window.

- The footprints of any images selected (checked) on the Query Results tab are highlighted in green.

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- The footprints of any images selected (checked) on the Query Results tab are highlighted in green.

- Thumbnails of the returned images may be reviewed by selecting the Thumbnails button. The footprint associated with highlighted thumbnails are displayed in blue in the map window.

- Images may be selected (checked) by double-clicking on the thumbnail.

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- Images may be selected (checked) by double-clicking on the thumbnail.

- Once images are selected, the images may be loaded into the map window and opened as a virtual mosaic or individual images in the image window.

Query for Imagery Command
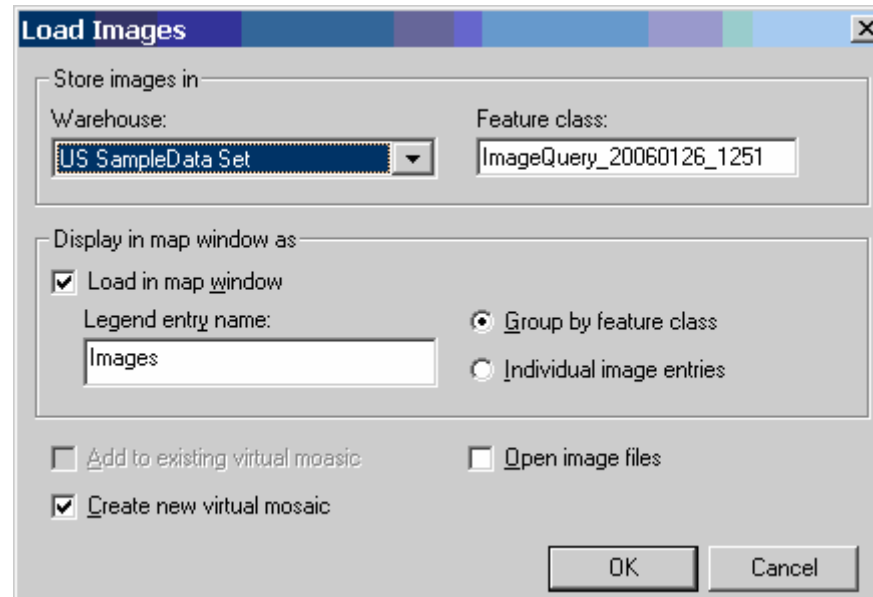
IEC 4.1 Integration Issues

- Initial XML Schema Definition (XSD) provided by IEC was not a complete definition. Intergraph personnel worked with IEC to provide a valid XSD file.

- Intergraph had no IEC web service available for testing. Image Scout developers created a pseudo-query capability that returned a valid XML file containing a static set of images.

- Following delivery of the Query for Imagery command to IEC, Image Scout developers were able to resolve missing functionality by working with the IEC developers.

IEC 5.0 Integration

- Softcopy Search integration into the IEC 5.0 baseline is a much tighter integration.

- NES provides Softcopy Search Work Set Management capabilities for the IEC 5.0 baseline.

- IEC invokes the Image Scout solution through a published API and directs Image Scout loading of data.

- Image Scout provides feedback to IEC regarding actions taken by the user during the exploitation session.

NES Work Sets

- NES introduces the Work Set construct on the IEC 5.0 baseline.

- Work Sets are geospatial data packages. These packages include imagery and associated support data.

- Support data exists in several different types.

  - Jump Points – a collection of known locations to be reviewed.

  - Search Notes – points, lines, and areas that allow the user to make notes about items found during the search process.

  - Overlays – Generic annotation features with no particular attribution.

- Work Set contents are updated based on modifications that are made during the exploitation session.

IEC 5.0 Architecture

RMS

NES

IEC

Image
Library

Images

Support
Files

WorkSet

IEC
Buffer

WorkPackage
API.exe
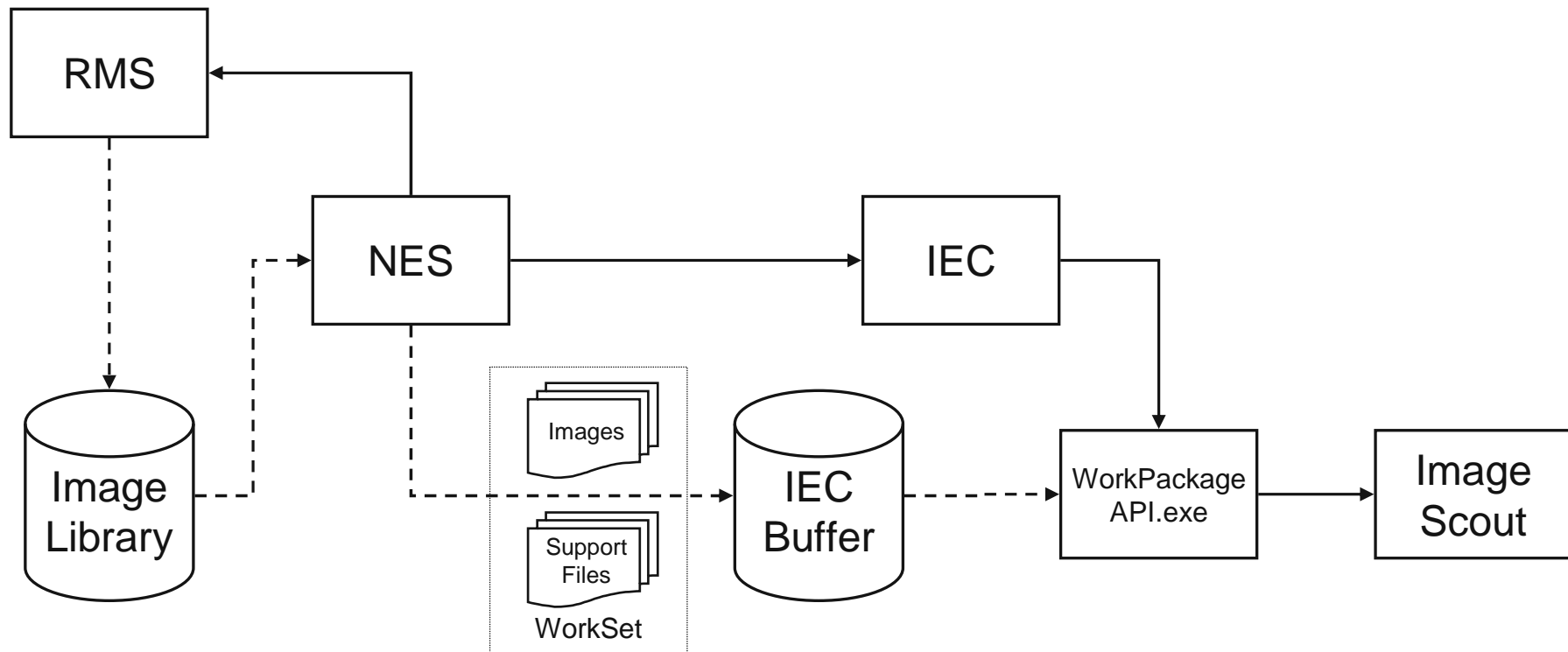
Image
Scout

WorkPackageAPI.exe

- Image Scout provides an ActiveX executable named WorkPackageAPI.exe.

- The WorkPackageAPI.exe contains an interface class named WorkSetManager.

- The WorkSetManager object provides interfaces to perform the following Softcopy Search actions:

  - Open a Work Set

  - Register Callback URLs

  - Create Virtual Mosaics

  - Add Images to Virtual Mosaics

  - Load Geospatial Data Support Files

  - Remove Geospatial Data Support Files

- The WorkSetManager object also provides interfaces to load individuals images into the image window and to load a pair of stereo images into the stereo viewer.

WorkSetManager Object

WorkSetManager
WorkSetDirectory
SessionFileDirectory
OverlayDirectory
PointsOfInterestDirectory
SearchNotesDirectory
SnailTrailDirectory
ImageDirectory
OpenWorkSet
RegisterCallbackURL
CreateVirtualMosaic
AddImagesToVirtualMosaic
RemoveImagesFromVirtualMosaic
LoadPointsOfInterest
LoadSnailTrail
LoadSearchNotes
LoadOverlay
RemovePointsOfInterest
RemoveSearchNotes
RemoveOverlay
OpenImageFiles
OpenStereoImagePair

IEC 5.0 Integration Issues

- Integration became a lengthy process because many expected behaviors were not provided as requirements. These expected behaviors had been implemented by other COTS products over the years and their existence was not noted as part of the initial requirements provided.

- The IEC architecture evolved from the UNIX environment. IEC development is done using Java, and IEC developers were not accustomed to integrating COM/OLE applications.

- Image Scout utilizes the COM/OLE messaging system to alert objects of events that have occurred during execution. Messages issued through the COM/OLE system must be handled by a "message pump". The absence of a message pump in the IEC Java code required Image Scout to rearchitect the WorkSetManager to exist in an ActiveX EXE rather than an ActiveX DLL.
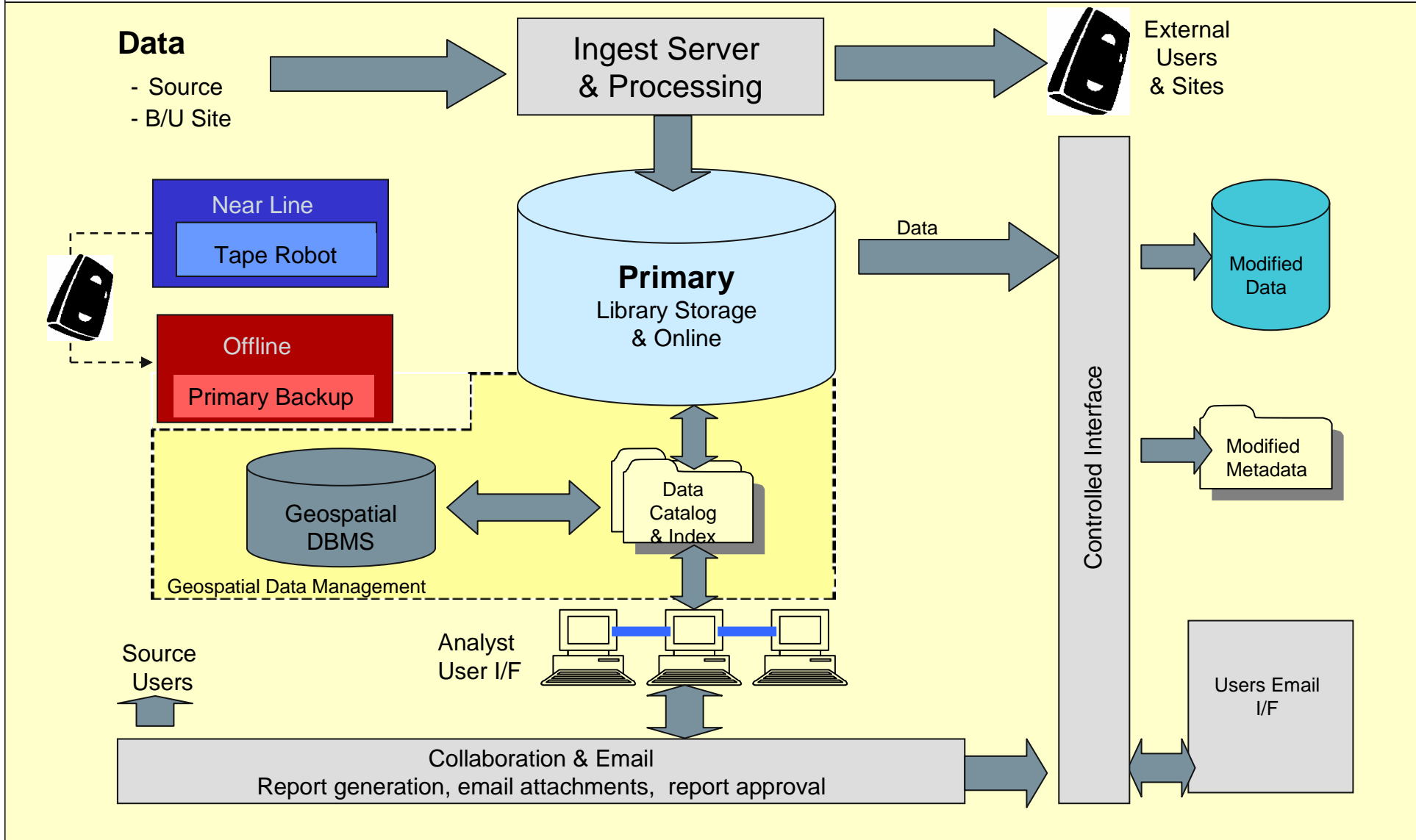
Integration Benefits

- Image Scout is now available to NGA users of IEC workstations. Availability started with the IEC 4.1 baseline.

- Image Scout's inclusion on the IEC baseline aided Intergraph in securing the recently signed NGA Enterprise Software Agreement (ESA).

- Many of the 115 Image Scout licenses available for the ESA in FY2006 have been issued to NGA users.
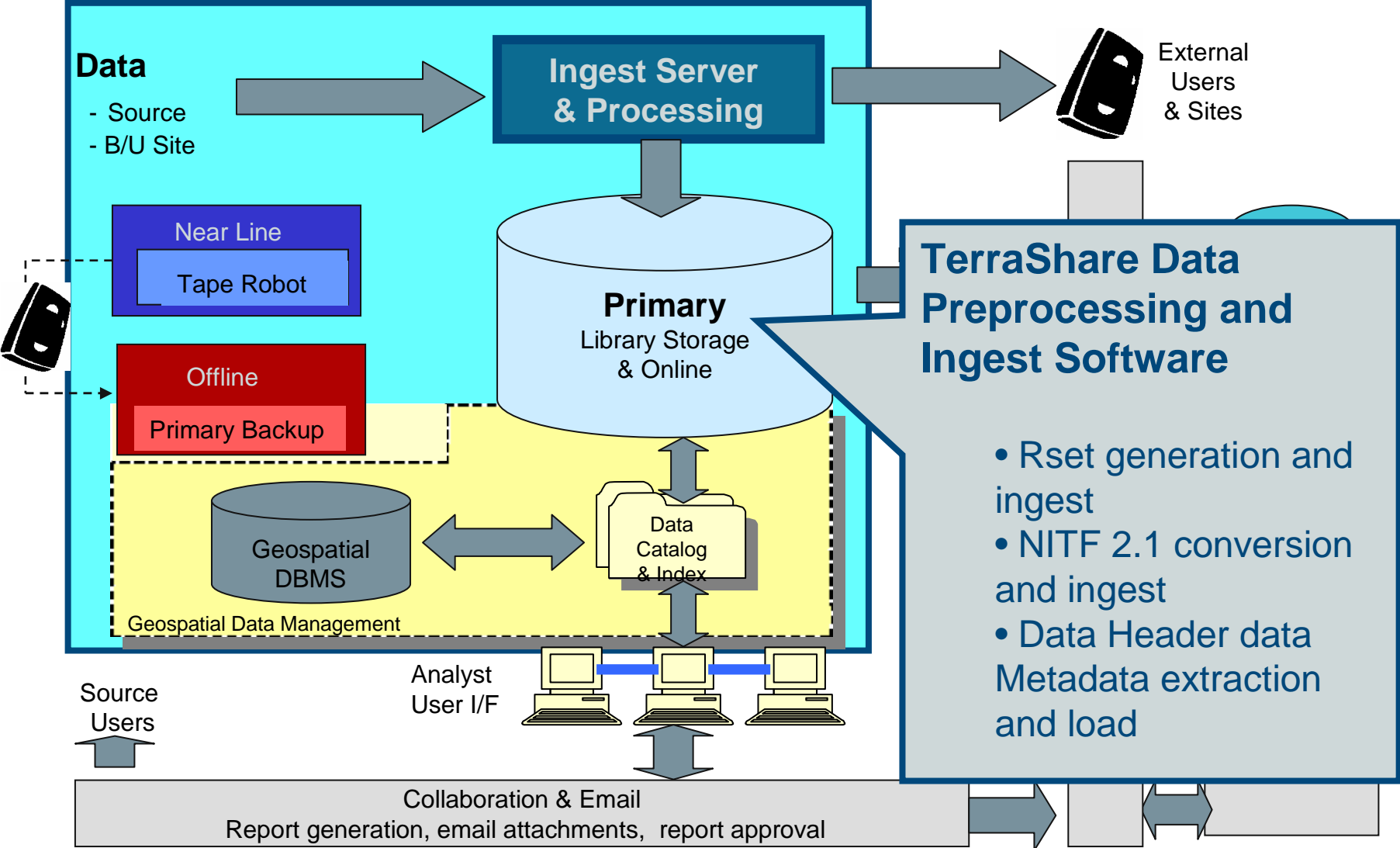
Future Integration

- Initial delivery of Image Scout to the IEC 6.0 baseline is scheduled for July 2006.

- Subsequent development will be performed to support 32-bit floating point elevation data and advanced geospatial products.

- Work Set Manager enhancements will improve the flexibility of user interaction with the Image Scout software.
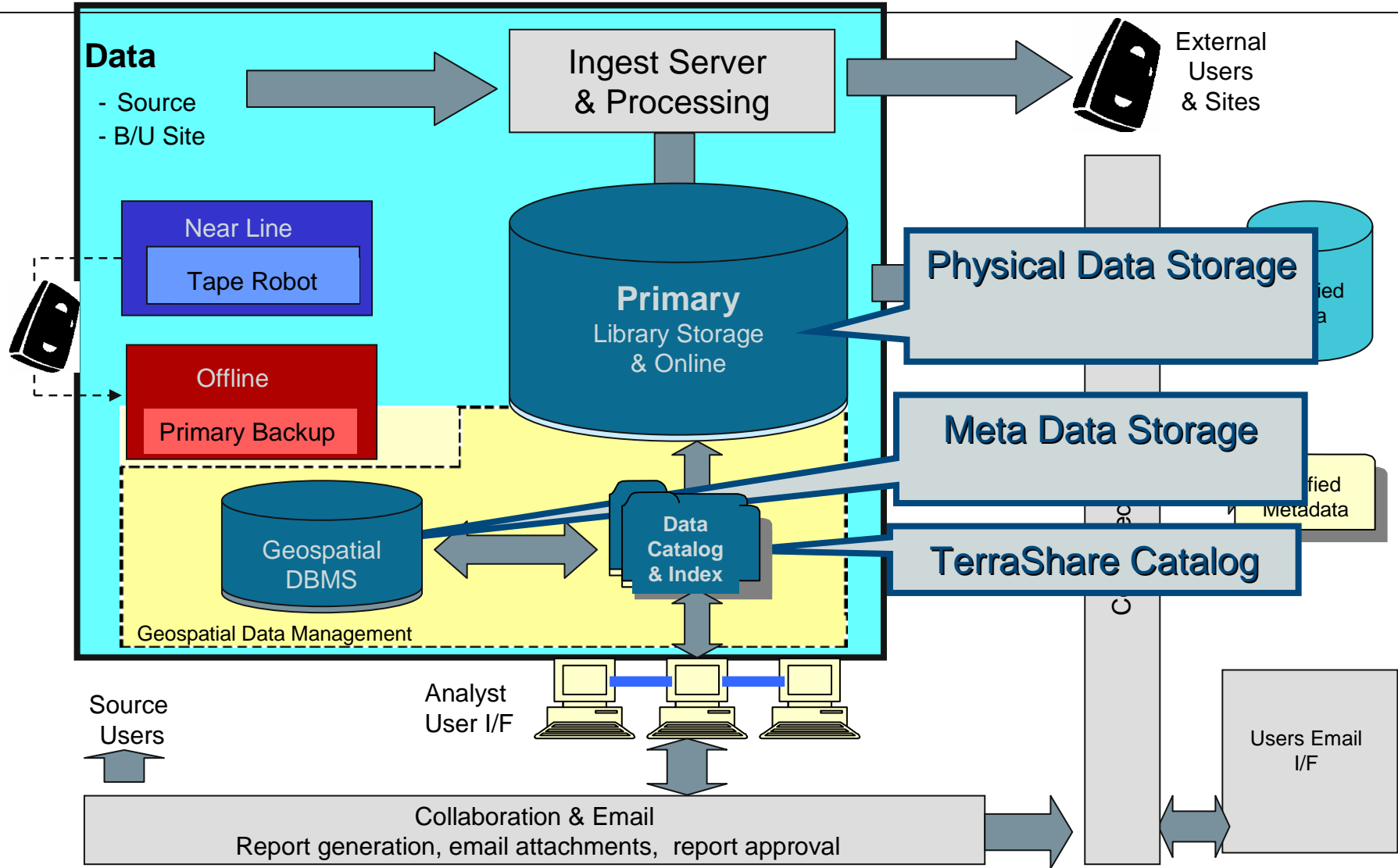
Functional Data Flow

Data
- Source
- B/U Site

Ingest Server & Processing

External Users & Sites

Near Line

Tape Robot

Offline

Primary Backup

Primary
Library Storage & Online

Data

Modified Data

Geospatial DBMS

Data Catalog & Index

Modified Metadata

Geospatial Data Management

Controlled Interface

Source Users

Analyst User I/F

Users Email I/F

Collaboration & Email
Report generation, email attachments, report approval

Data Ingest with Advanced TerraShare Server

Data
- Source
- B/U Site

Ingest Server & Processing

External Users & Sites

Near Line
Tape Robot

Offline
Primary Backup

Primary
Library Storage & Online

TerraShare Data Preprocessing and Ingest Software

- Rset generation and ingest
- NITF 2.1 conversion and ingest
- Data Header data Metadata extraction and load

Geospatial DBMS

Data Catalog & Index

Geospatial Data Management

Source Users

Analyst User I/F

Collaboration & Email
Report generation, email attachments, report approval

TerraShare Data Management System

Data
- Source
- B/U Site

Ingest Server & Processing

External Users & Sites

Near Line

Tape Robot

Offline

Primary Backup

Primary
Library Storage & Online

Physical Data Storage

Meta Data Storage

Geospatial DBMS

Data Catalog & Index

TerraShare Catalog

Geospatial Data Management

Analyst User I/F

Source Users

Collaboration & Email
Report generation, email attachments, report approval

Users Email I/F

TerraShare Back up Interface

Data
- Source
- B/U Site

Ingest Server & Processing

External Users & Sites

TerraShare catalog maintains location of physical file

I/F to Veritas Backup & Restore provides information on status of Data in archive and retrieves as appropriate

Near Line

Tape Robot

Pri...

...ary Storage & Online

Offline

Primary Backup

Geospatial DBMS

Data Catalog & Index

Geospatial Data Management

Analyst User I/F

Source Users

Users Email I/F

Collaboration & Email
Report generation, email attachments, report approval

Analyst Tool and Interface to TerraShare

Data
- Source
- B/U Site

Ingest Server & Processing

External Users & Sites

Near Line

Tape Robot

Primary
Library Storage & Online

GeoMedia TerraShare Data Server and TerraShare Client app

Offline

Primary Backup

Interface

Geospatial DBMS

Data Catalog & Index

Geospatial Data Management

Image Scout IA Tool

Overview (Toshiba)　Exploitation (IBM)

Source Users

Analyst User I/F

Collaboration & Email
Report generation, email attachments, report approval

Image Scout

- COTS software, PC standard hardware
- Z/I TerraShare imagery data management

Image Scout

- COTS software, PC standard hardware
- Z/I TerraShare imagery data management

- Data fusion using GeoMedia data server technology

Image Scout

- COTS software, PC standard hardware
- Z/I TerraShare imagery data management

- Data fusion using GeoMedia data server technology

- Fast, efficient workflows for Imagery Analysts

- Feature driven search tools

Image Scout

- COTS software, PC standard hardware
- Z/I TerraShare imagery data management
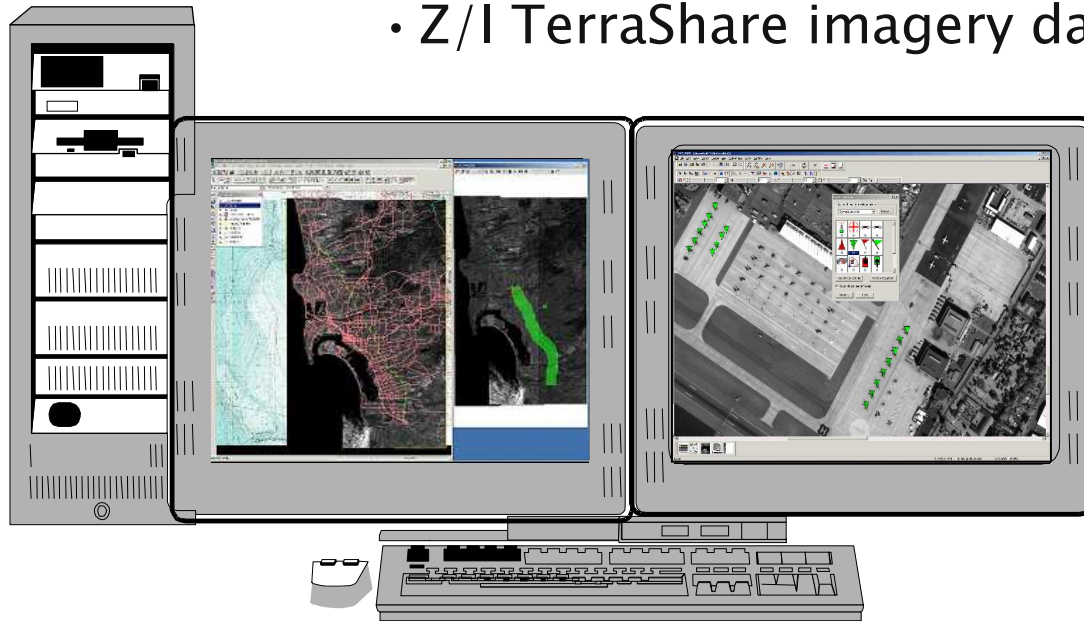
- Data fusion using GeoMedia data server technology

- Fast, efficient workflows for Imagery Analysts

- Feature driven search tools
- Full set of ELT tools
- Annotate and output to image chips, hardcopy or the web

OGC Web Services
in Flood Disaster Management

Location of Munich, Germany

Source: Google Earth

Location of Munich, Germany

Source: Google Earth

Location of Munich, Germany

Munich

Source: Google Earth

Technical University of Munich

Source: Google Earth

Agenda

- Introduction

- Climatic changes in the alpine area

- Impressions of flood events in prealpine area and consequences

- Usage of heterogeneous geodata

- Web based flood information system

- Summary

- Outlook

Climatic changes in the alpine area

Increasing temperatures throughout the year are predicted
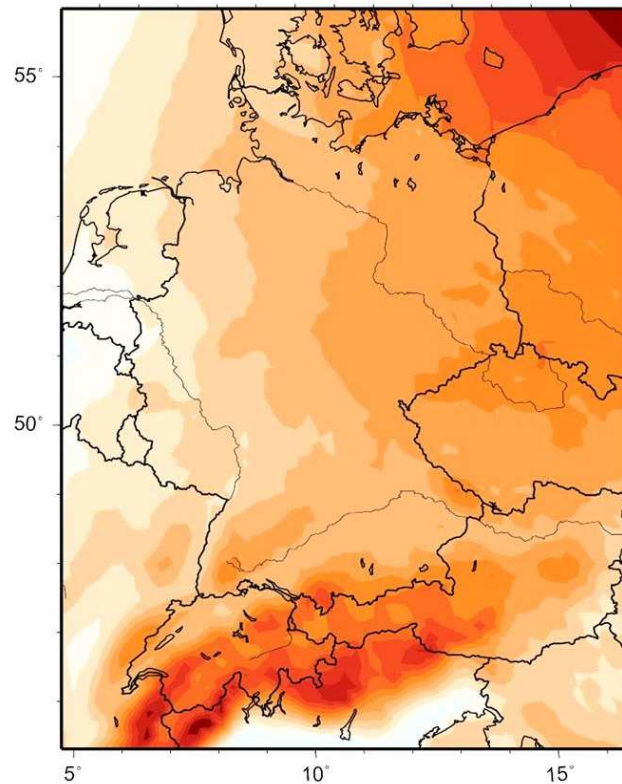
Temperature (°C) December to February
2070/99-1960/89
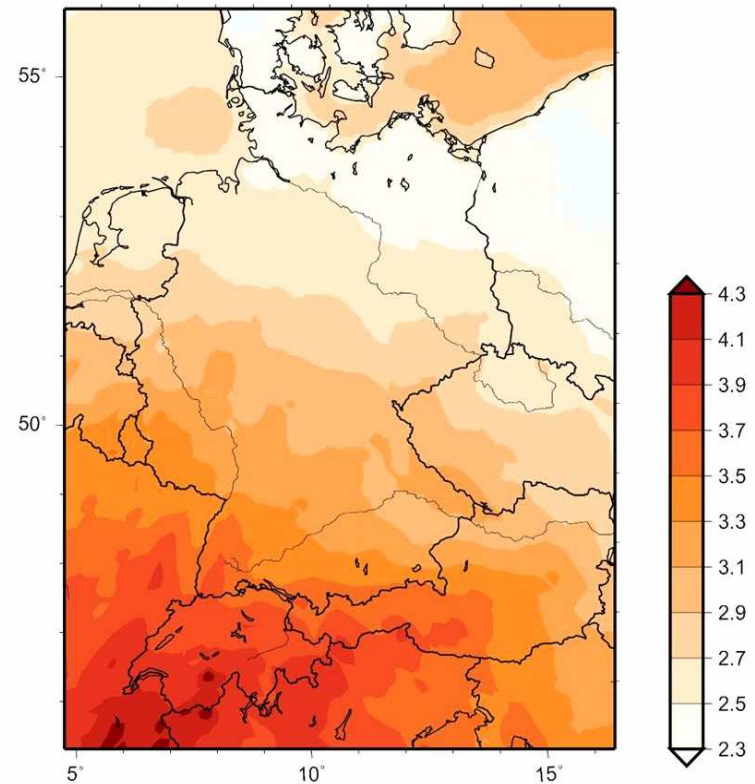
Temperature (°C) June - August
2070/99-1960/89

Climatic changes in the alpine area

Increasing precipitation in wintertime is predicted

- Espacially the concurrence of snow melt and precipitation in late wintertime or early spring in most cases lead to severe flood events

- The frozen and saturated soil prevents runoff from the infiltration into the ground and causes high amounts of surface runoff
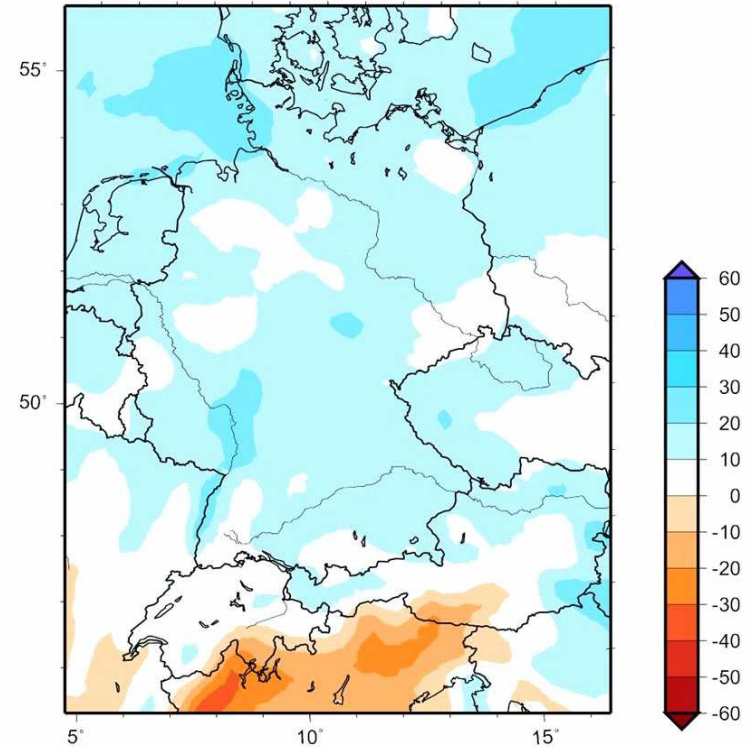
Percentage change of precipitation
December to February 2070/99-1960/89

Flooding of August 2005 in Bavaria
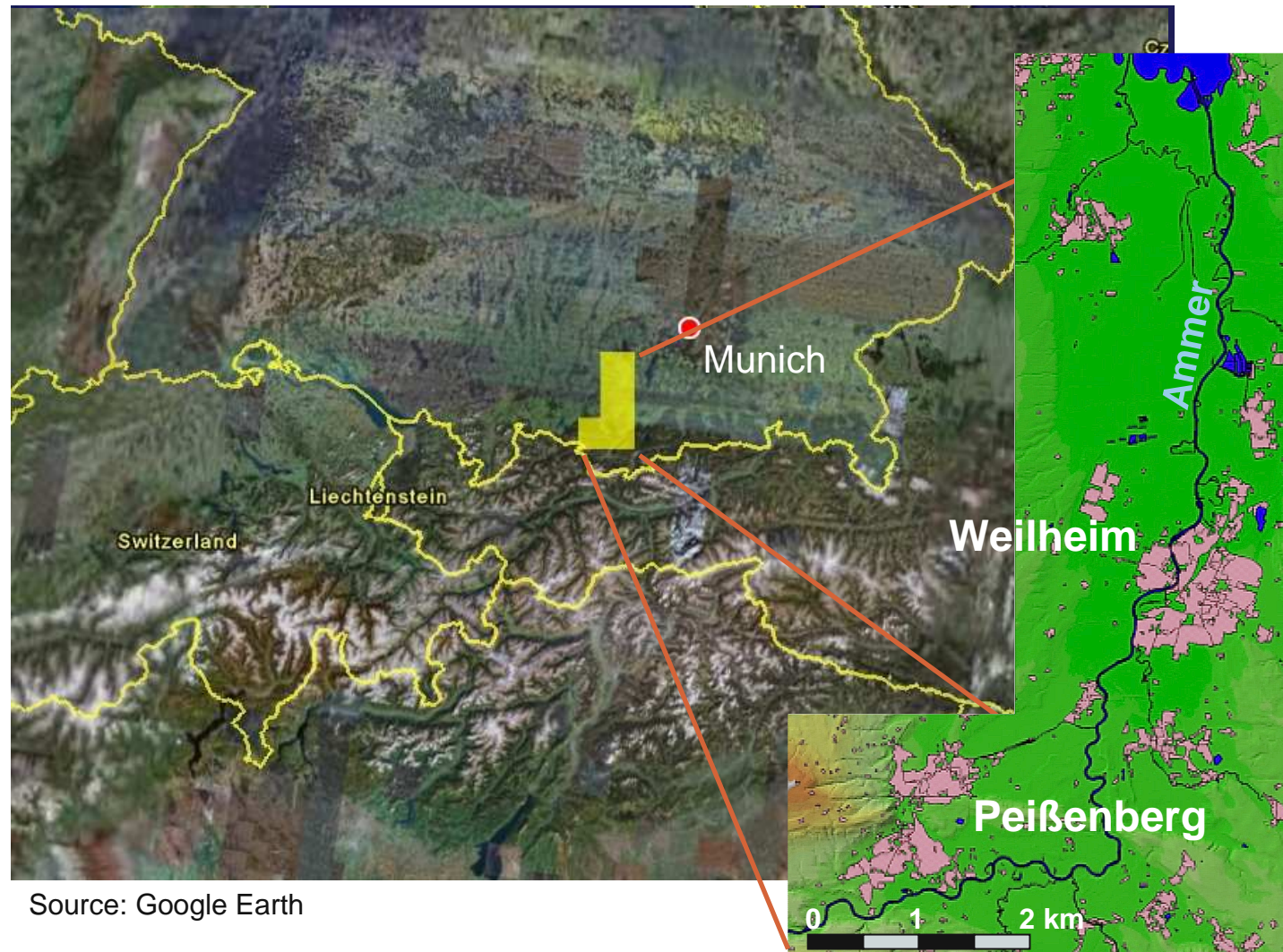
Source: Google Earth

August 23rd, 2005

Source: Dr. Franz Jakob, 2005

August 23rd, 2005

Source: Dr. Franz Jakob, 2005

August 23rd, 2005

Source: Dr. Franz Jakob, 2005

# August 23rd, 2005

Source: Dr. Franz Jakob, 2005

Implications of high waters

Considerable economic losses

- A lot of infrastructure is affected
- Spate August, 2005: Economic losses of 150 Mio. €

Source: Dr. Franz Jakob, 2005

Source: Dr. Franz Jakob, 2005

Current situation

- Insufficient information available:
  - Several Information Systems are available.
    But: Different authorities, different vendors, distributed
  - Systems were not combined to manage the disaster
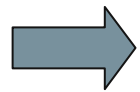
Demand for a system for the interoperable
useage of distributed geodata

Development of an application in coordination
with the local civil protection of Weilheim-
Schongau county and the fire brigade Peißenberg

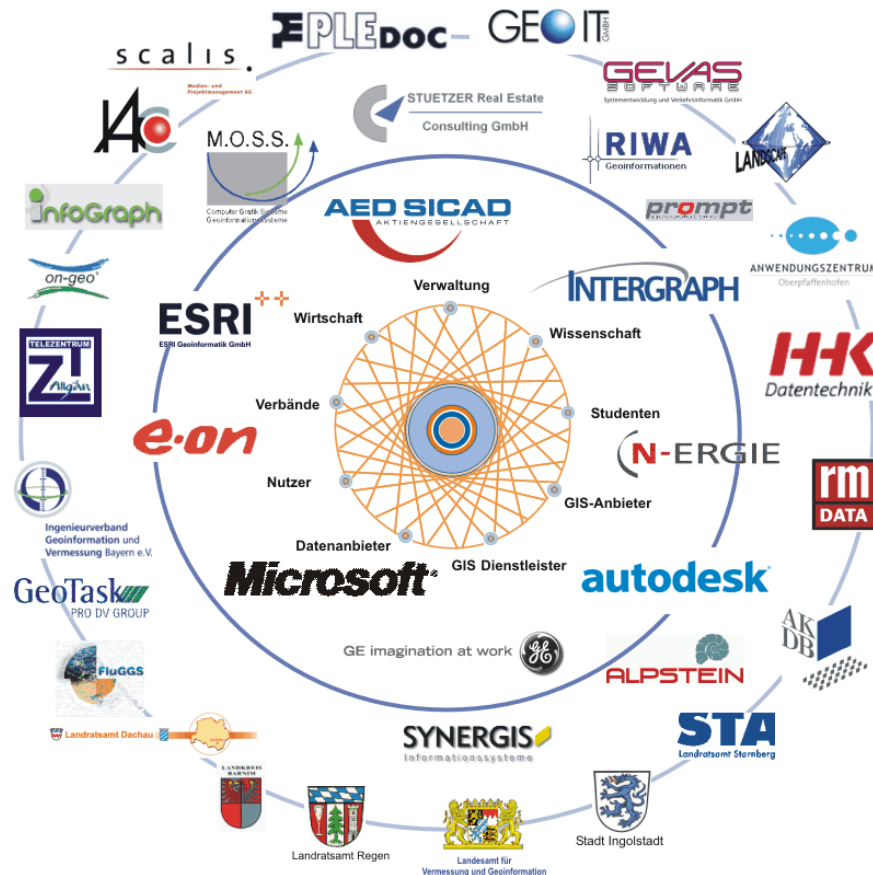# The Runder Tisch GIS Munich – relation to Intergraph

- The Runder Tisch GIS is a nonprofit organization

- Among others, one goal of the Runder Tisch GIS is to improve the standardized usage of geographic information – according to the visions of the OGC and ISO TC 211

- INTERGRAPH is a member of the Runder Tisch GIS and supports research projects by means of it's RRL Program and the Open Interoperability Grant Program

Intergraph
for Research and Education

INTERGRAPH

Registered Research Laboratory

- provides students, educators, and researchers with the leading-edge technology and development support needed for applied research activities

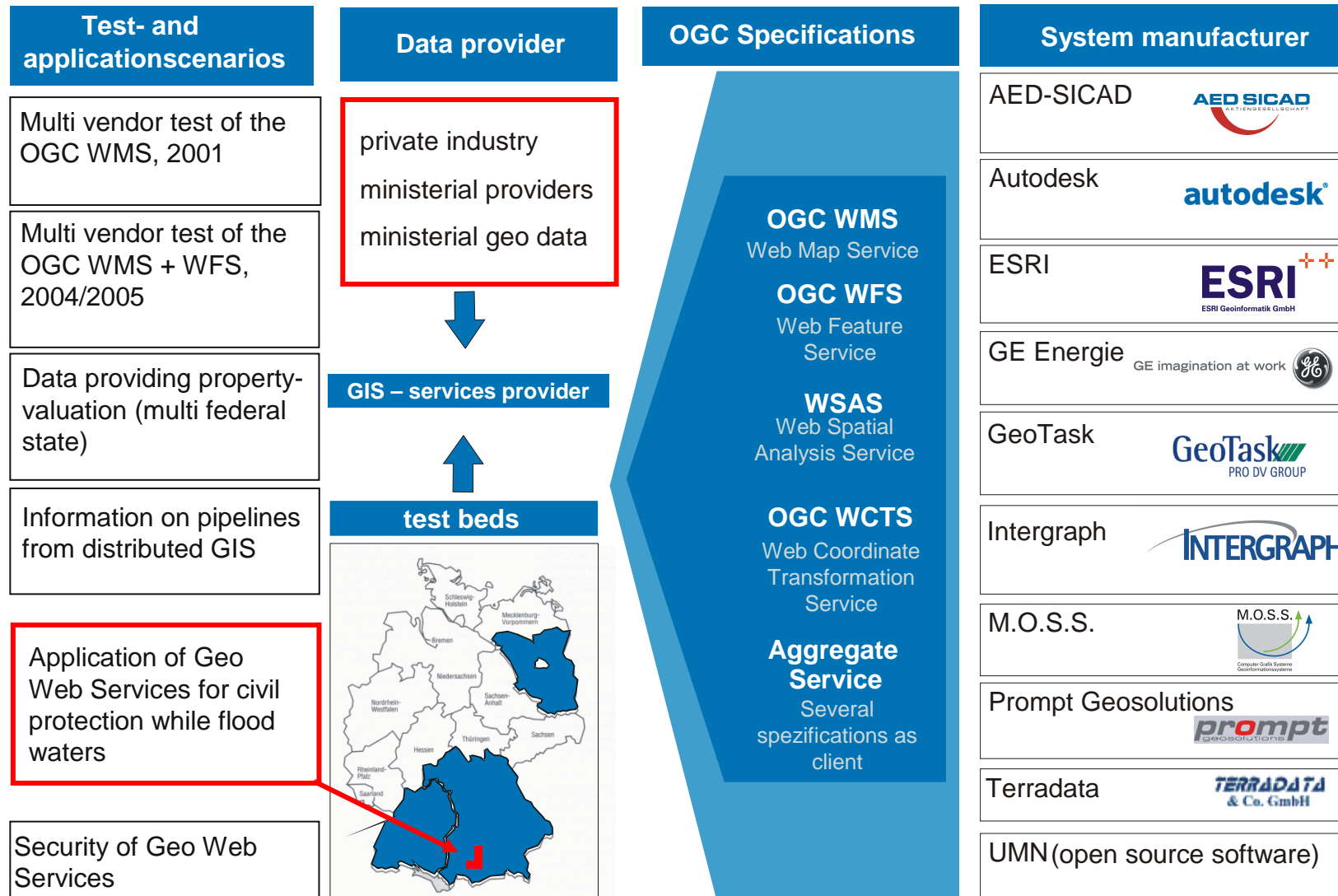- Includes software licenses, technical support, and many more

⇨ TUM

INTERGRAPH

Open Interoperability Grant

- stimulate the use of open interoperability standards

- support of organizations desiring to build OGC compliant Web services and / or to publish their data in XML/GML (file) format

- delivering GeoMedia Software including the OGC components (e.g. WMS & WFS Adapter Kit)
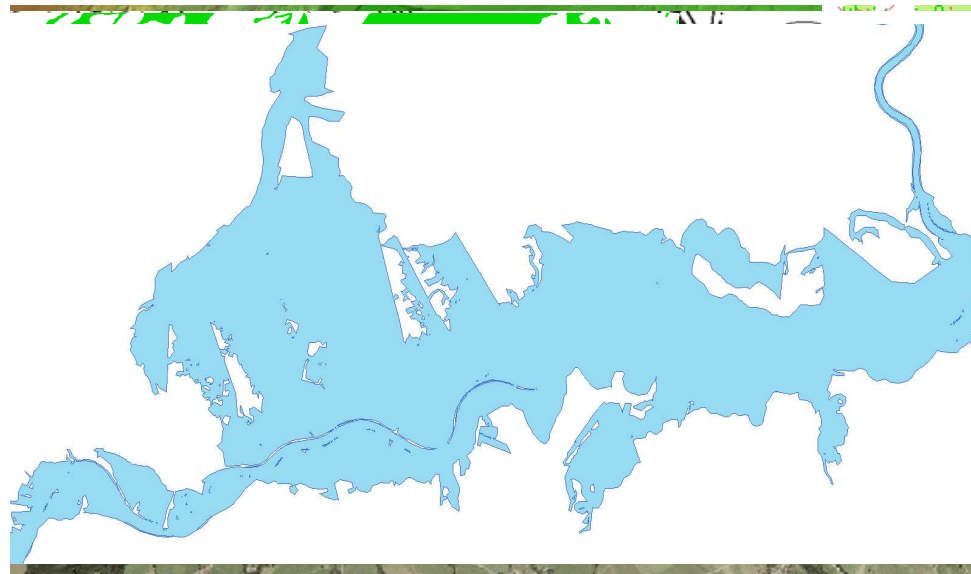
⇨ RTGIS

OGC test platform of Runder Tisch GIS e.V.

Test- and applicationscenarios	Data provider	OGC Specifications	System manufacturer

Test- and applicationscenarios

Multi vendor test of the OGC WMS, 2001

Multi vendor test of the OGC WMS + WFS, 2004/2005

Data providing property-valuation (multi federal state)

Information on pipelines from distributed GIS

Application of Geo Web Services for civil protection while flood waters

Security of Geo Web Services

Data provider

private industry

ministerial providers

ministerial geo data

GIS – services provider

test beds

OGC Specifications

OGC WMS
Web Map Service

OGC WFS
Web Feature Service

WSAS
Web Spatial Analysis Service

OGC WCTS
Web Coordinate Transformation Service

Aggregate Service
Several spezifications as client

System manufacturer

AED-SICAD

Autodesk

ESRI

GE Energie

GeoTask

Intergraph

M.O.S.S.

Prompt Geosolutions

Terradata

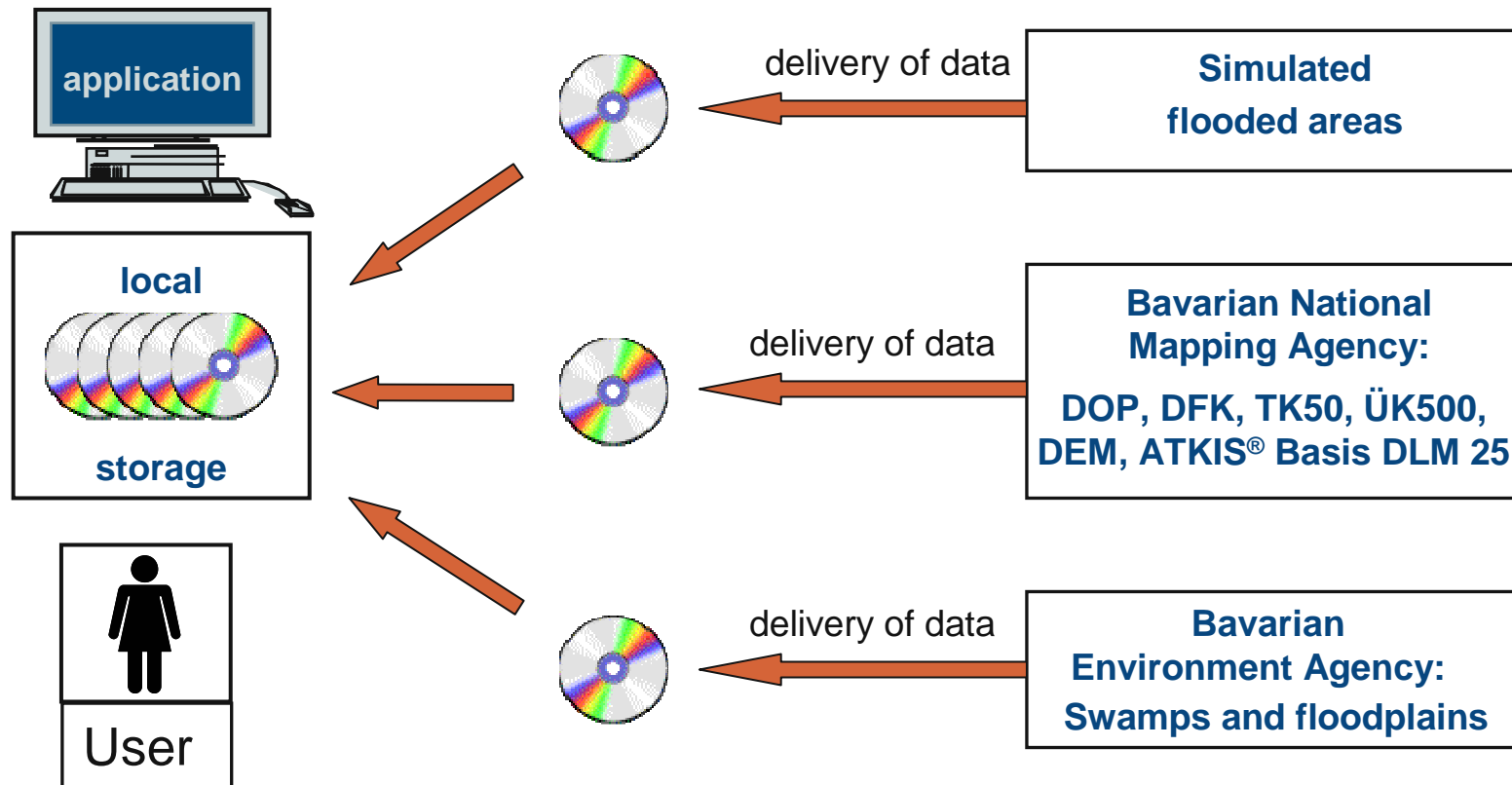UMN (open source software)

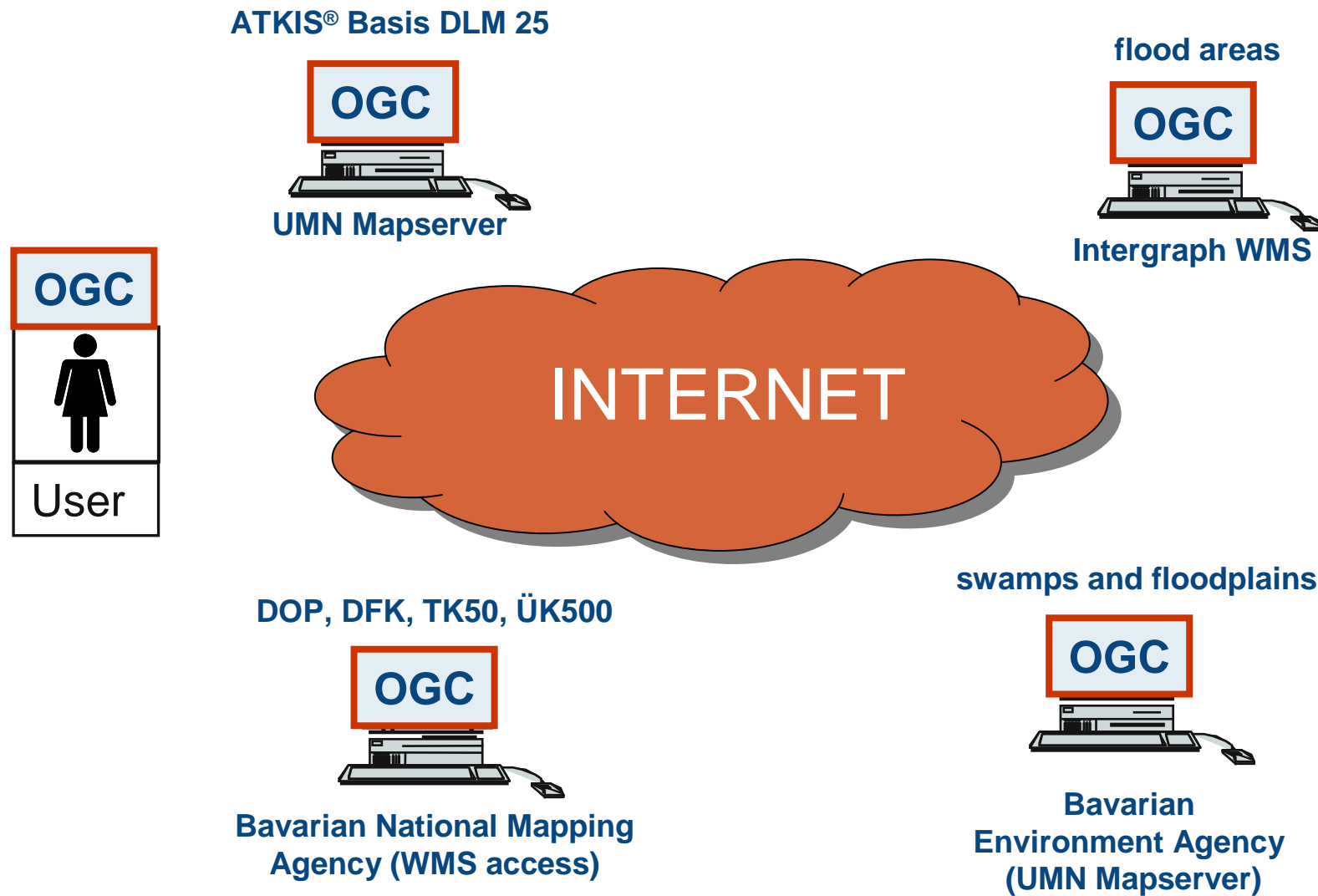# Included data

Heterogeneous Geodata

- Topographic maps (1:500000, 1:50000)
- ATKIS(R) Basis DLM 25
- Digital elevation model
- Orthophoto
- Digital land register map
- Floodplains, pit
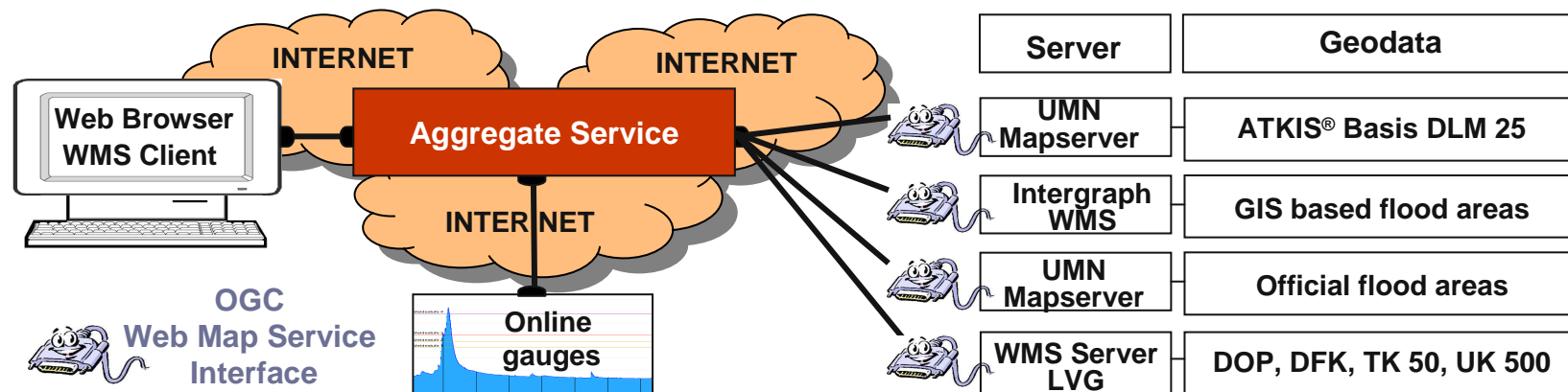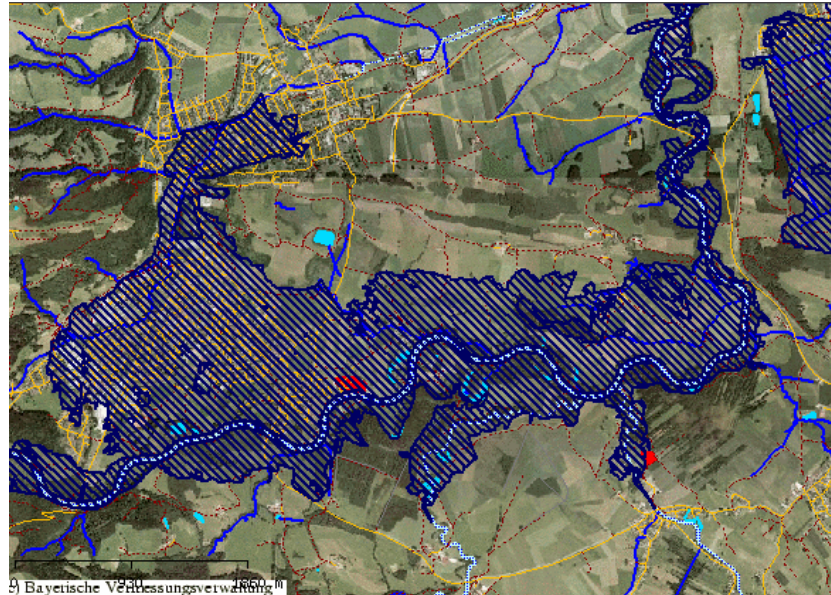- Potentially flooded area

conventional system architecture

application

local storage

User

delivery of data → **Simulated flooded areas**

delivery of data → **Bavarian National Mapping Agency:**

DOP, DFK, TK50, ÜK500, DEM, ATKIS® Basis DLM 25

delivery of data → **Bavarian Environment Agency: Swamps and floodplains**

Advanced system architecture:
OGC Web Services, distributed data sources

ATKIS® Basis DLM 25

OGC

UMN Mapserver

flood areas

OGC

Intergraph WMS

OGC

User

INTERNET

DOP, DFK, TK50, ÜK500

OGC

Bavarian National Mapping Agency (WMS access)

swamps and floodplains

OGC

Bavarian Environment Agency (UMN Mapserver)

Web based
flood information system

9) Bayerische Vermessungsverwaltung

Web Browser WMS Client	INTERNET / Aggregate Service / INTERNET / Online gauges	Server	Geodata
		UMN Mapserver	ATKIS® Basis DLM 25
OGC Web Map Service Interface		Intergraph WMS	GIS based flood areas
		UMN Mapserver	Official flood areas
		WMS Server LVG	DOP, DFK, TK 50, UK 500

Web based
flood information system

Launch application by a link to OGC-Testplattform at
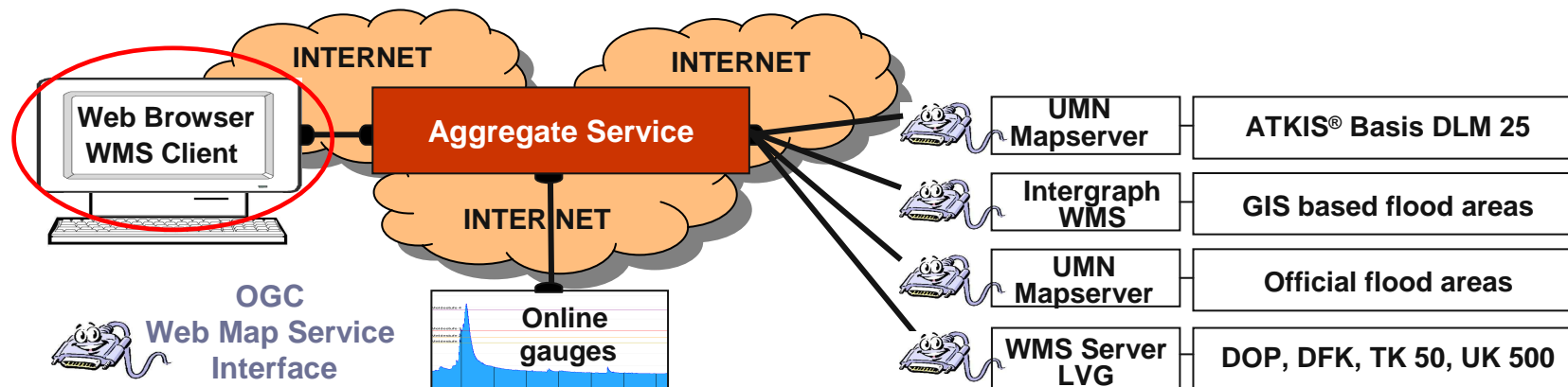www.rundertischgis.de

Web based
flood information system

Login

Einsatz von Geo Web Services für den Katastrophenschutz

Überflutung von Infrastruktureinrichtungen im Landkreis Weilheim-Schongau –

Einstieg zur Anwendung über Username und Passwort:

Username:	rtuser
Passwort:	****

Login   Löschen

INTERNET

INTERNET

INTERNET

Web Browser WMS Client

Aggregate Service

Online gauges

OGC
Web Map Service Interface

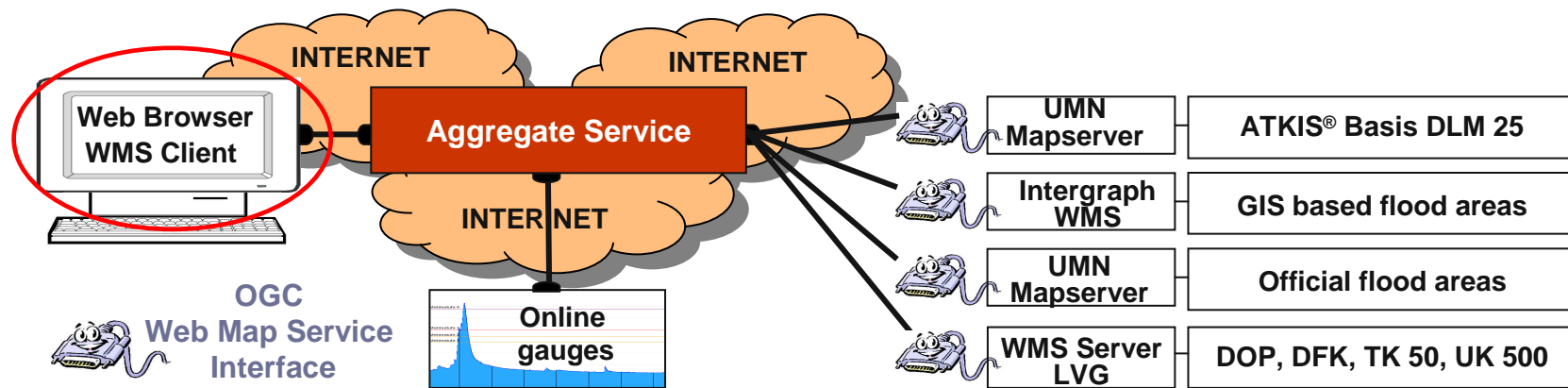| UMN Mapserver	**ATKIS® Basis DLM 25**
Intergraph WMS	**GIS based flood areas**
UMN Mapserver	**Official flood areas**
WMS Server LVG	**DOP, DFK, TK 50, UK 500**

Web based
flood information system

Login

2 ways of defining the water level

Einsatz von Geo Web Services für den Katastrophenschutz

Überflutung von Infrastruktureinrichtungen im Landkreis Weilheim-Schongau -

Online-Abfrage bzw. manuelle Eingabe des Wasserstandes durch "rtuser":

Aktueller Wasserstand der Ammer in Peissenberg:

Aktueller Wasserstand der Ammer in Weilheim:

Online-Abfrage

Manuelle Eingabe des Wasserstandes der Ammer [cm]:

Eingabe   Löschen

INTERNET   INTERNET

Web Browser
WMS Client

Aggregate Service

INTERNET

OGC
Web Map Service
Interface

Online
gauges

UMN Mapserver — ATKIS® Basis DLM 25

Intergraph WMS — GIS based flood areas

UMN Mapserver — Official flood areas

WMS Server LVG — DOP, DFK, TK 50, UK 500

Web based
flood information system

Login
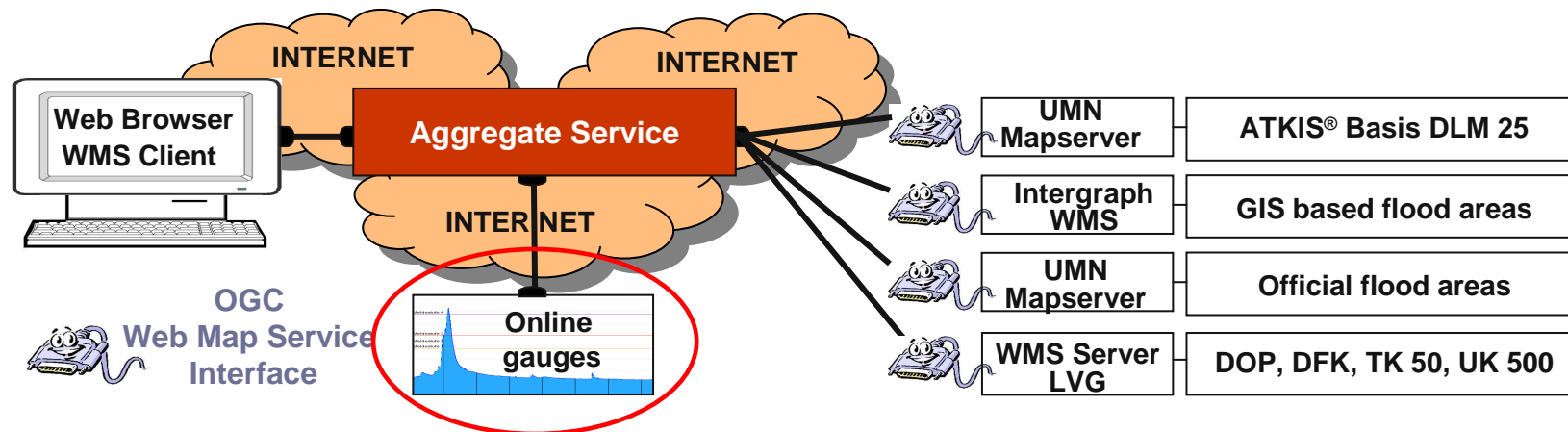2 ways of defining
the water level

1: Access to
online gauges

Einsatz von Geo Web Services für den Katastrophenschutz

Überflutung von Infrastruktureinrichtungen im Landkreis Weilheim-Schongau -

Online-Abfrage bzw. manuelle Eingabe des Wasserstandes durch "rtuser":

Aktueller Wasserstand der Ammer in Peissenberg:

Aktueller Wasserstand der Ammer in Weilheim:

Online-Abfrage

INTERNET   INTERNET

Web Browser
WMS Client

Aggregate Service

INTERNET

OGC
Web Map Service
Interface

Online
gauges

	UMN Mapserver	ATKIS® Basis DLM 25
	Intergraph WMS	GIS based flood areas
	UMN Mapserver	Official flood areas
	WMS Server LVG	DOP, DFK, TK 50, UK 500

Web based
flood information system

Position of online gauges within the test area

Online gauge Weilheim: 51cm

Online gauge Peißenberg: 68cm
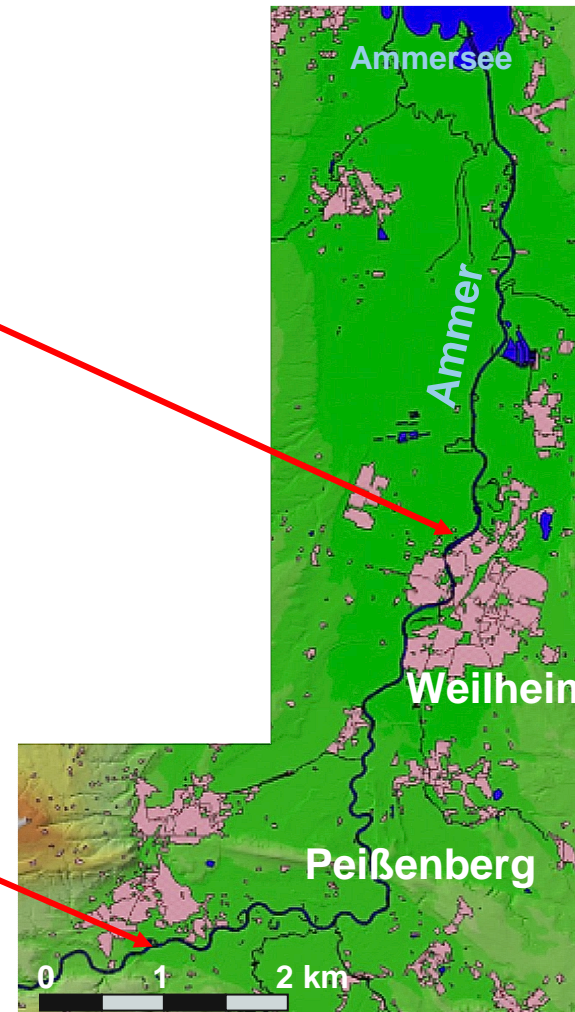
Web based
flood information system

Login

2 ways of defining
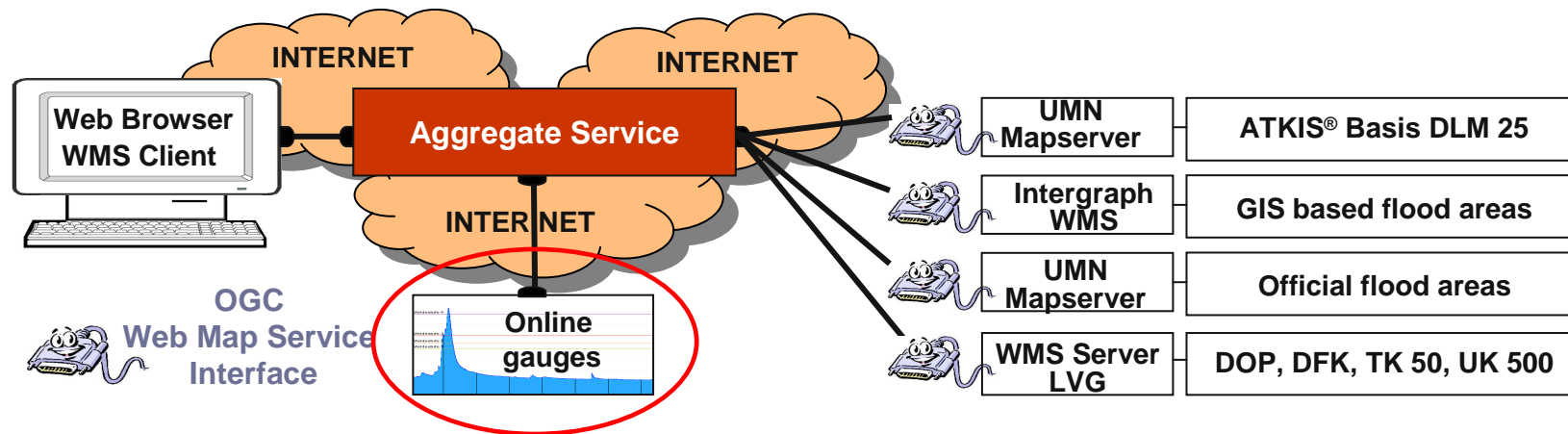the water level
1: Access to
online gauges

Result of the
online access

Einsatz von Geo Web Services für den Katastrophenschutz

- Überflutung von Infrastruktureinrichtungen im Landkreis Weilheim-Schongau -

Online-Abfrage beim Hochwassernachrichtendienst Bayern durch "rtuser":

Aktueller Wasserstand der Ammer in Peissenberg:	68	[cm]
Aktueller Wasserstand der Ammer in Weilheim:	51	[cm]
	Neue Eingabe	Start Kartendienst

INTERNET   INTERNET

Web Browser WMS Client

Aggregate Service

INTERNET

OGC
Web Map Service
Interface

Online gauges

UMN Mapserver	ATKIS® Basis DLM 25
Intergraph WMS	GIS based flood areas
UMN Mapserver	Official flood areas
WMS Server LVG	DOP, DFK, TK 50, UK 500

Web based
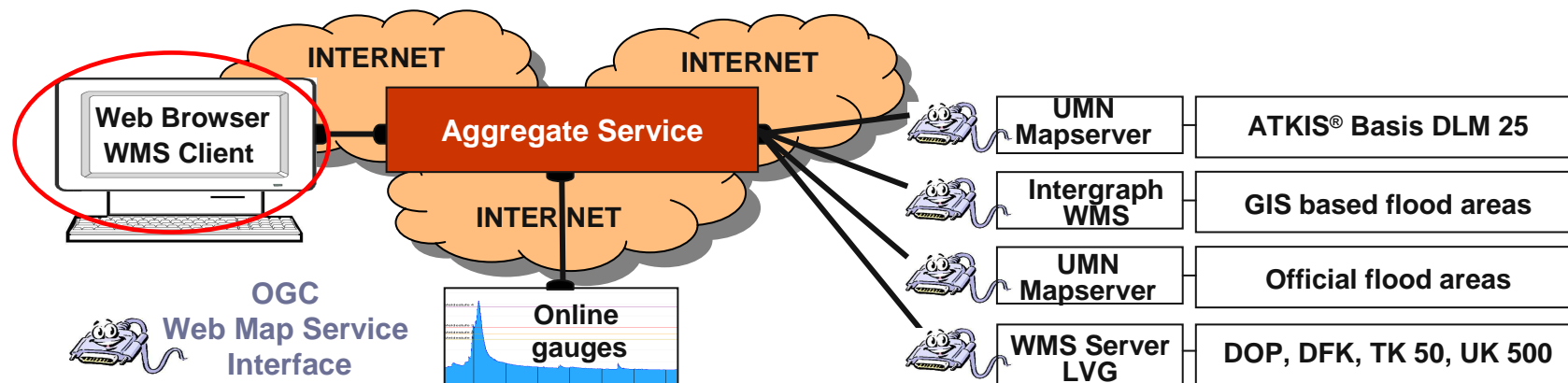# flood information system

Login

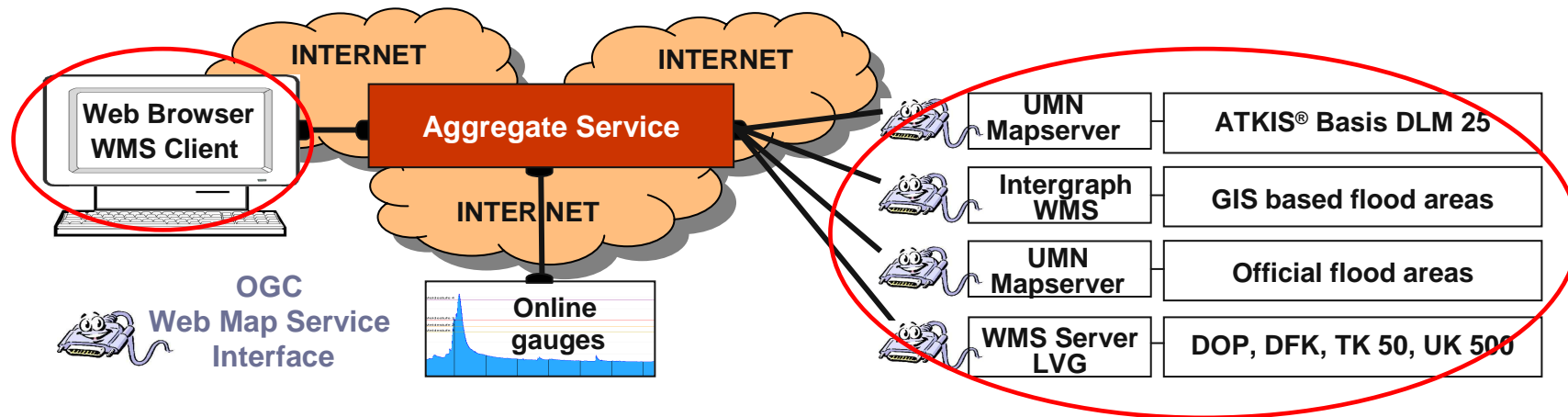2 ways of defining
the water level

2: Self defined
water levels

Einsatz von Geo Web Services für den Katastrophenschutz

- Überflutung von Infrastruktureinrichtungen im Landkreis Weilheim-Schongau -

Online-Abfrage bzw. manuelle Eingabe des Wasserstandes durch "rtuser":

Manuelle Eingabe des Wasserstandes der Ammer [cm]: | 750

Eingabe | Löschen

INTERNET

INTERNET

**Web Browser
WMS Client**

Aggregate Service

INTERNET

UMN Mapserver	ATKIS® Basis DLM 25
Intergraph WMS	GIS based flood areas
UMN Mapserver	Official flood areas
WMS Server LVG	DOP, DFK, TK 50, UK 500

**OGC
Web Map Service
Interface**

**Online
gauges**

Web based flood information system

Login

2 ways of defining the water level

2: Self defined water levels

Start Map Service

Einsatz von Geo Web Services für den Katastrophenschutz

- Überflutung von Infrastruktureinrichtungen im Landkreis Weilheim-Schongau –

Manuelle Eingabe des Waserstandes durch "rtuser":

Manuell eingegebener Wasserstand der Ammer: 750

○ WMS Client von **Intergraph**   ○ WMS Client von **Sicad**

| Neue Eingabe | Start Kartendienst |

INTERNET   INTERNET

Web Browser WMS Client

Aggregate Service

INTERNET

OGC Web Map Service Interface

Online gauges

UMN Mapserver	ATKIS® Basis DLM 25
Intergraph WMS	GIS based flood areas
UMN Mapserver	Official flood areas
WMS Server LVG	DOP, DFK, TK 50, UK 500

Web based
flood information system

Information system with potentially flooded areas corresponding
to the water level of 750 [cm]

Web based
flood information system

Extended view of the information system
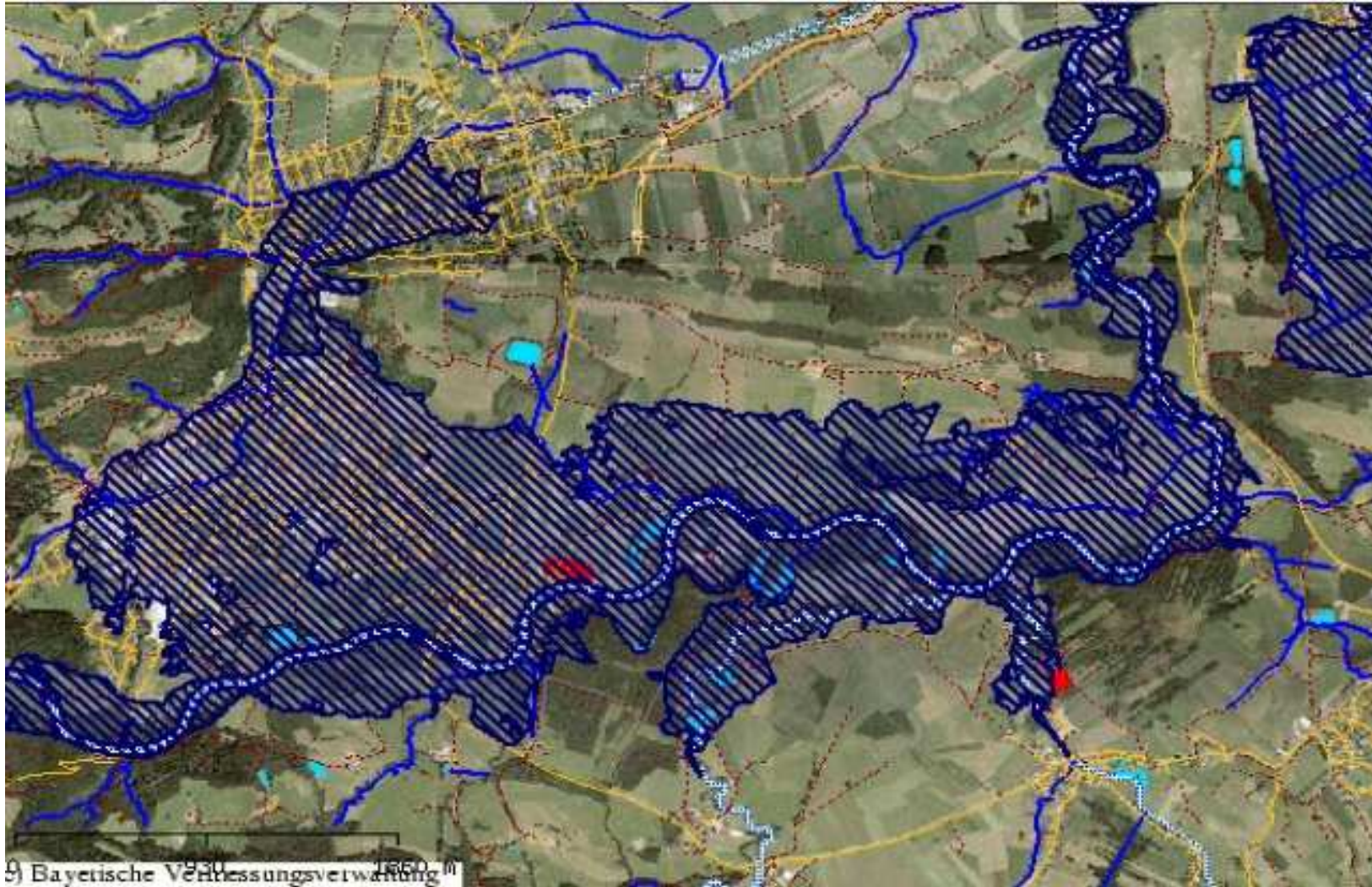
Web based
flood information system

Filter plant Weilheim within potentially flooded areas.
Implementation via Intergraph WMS interface, www.intergraph.de

The illustration of potentially flooded areas is based upon preliminary and uncorrected computations

Web based
flood information system

Filter plant Peißenberg:
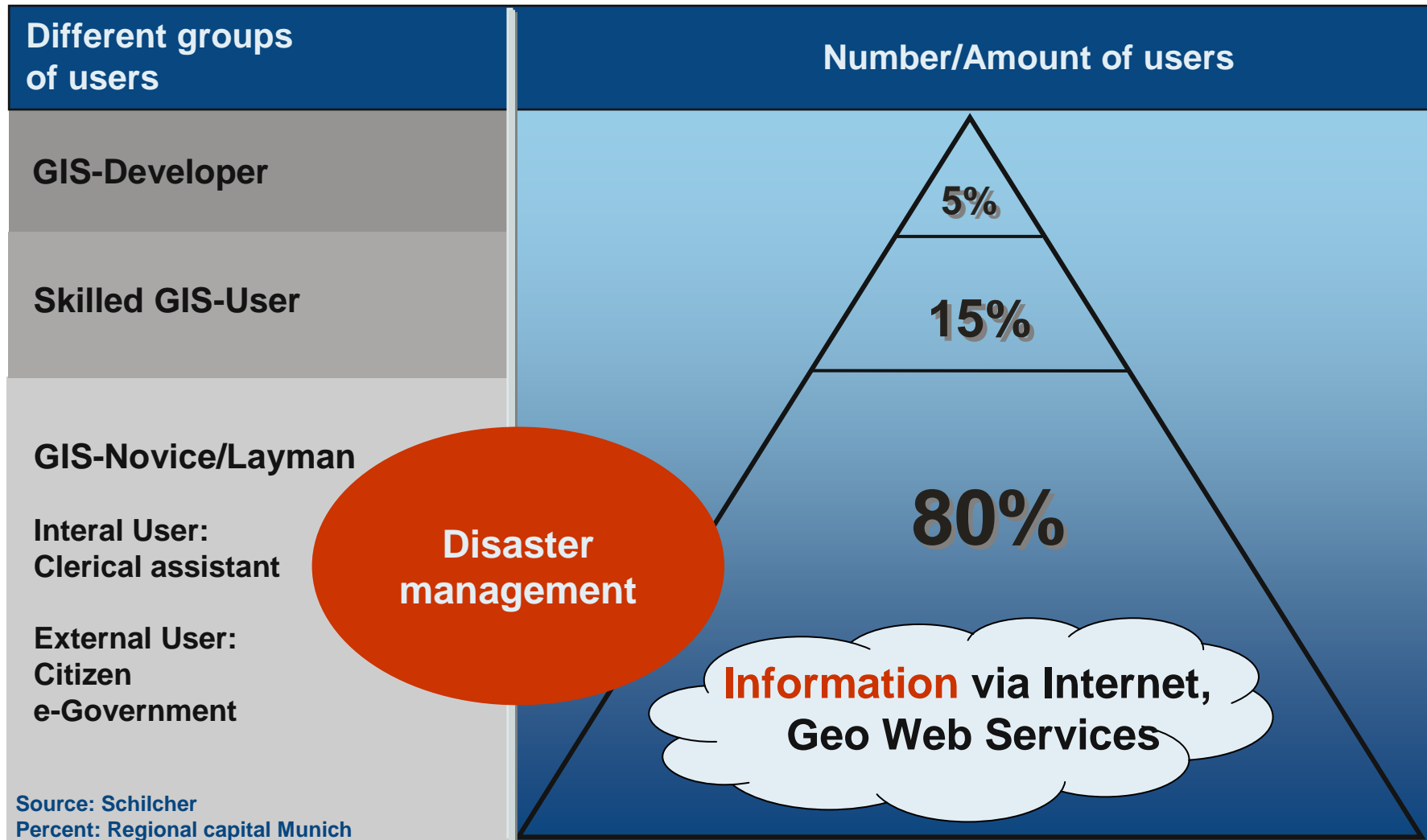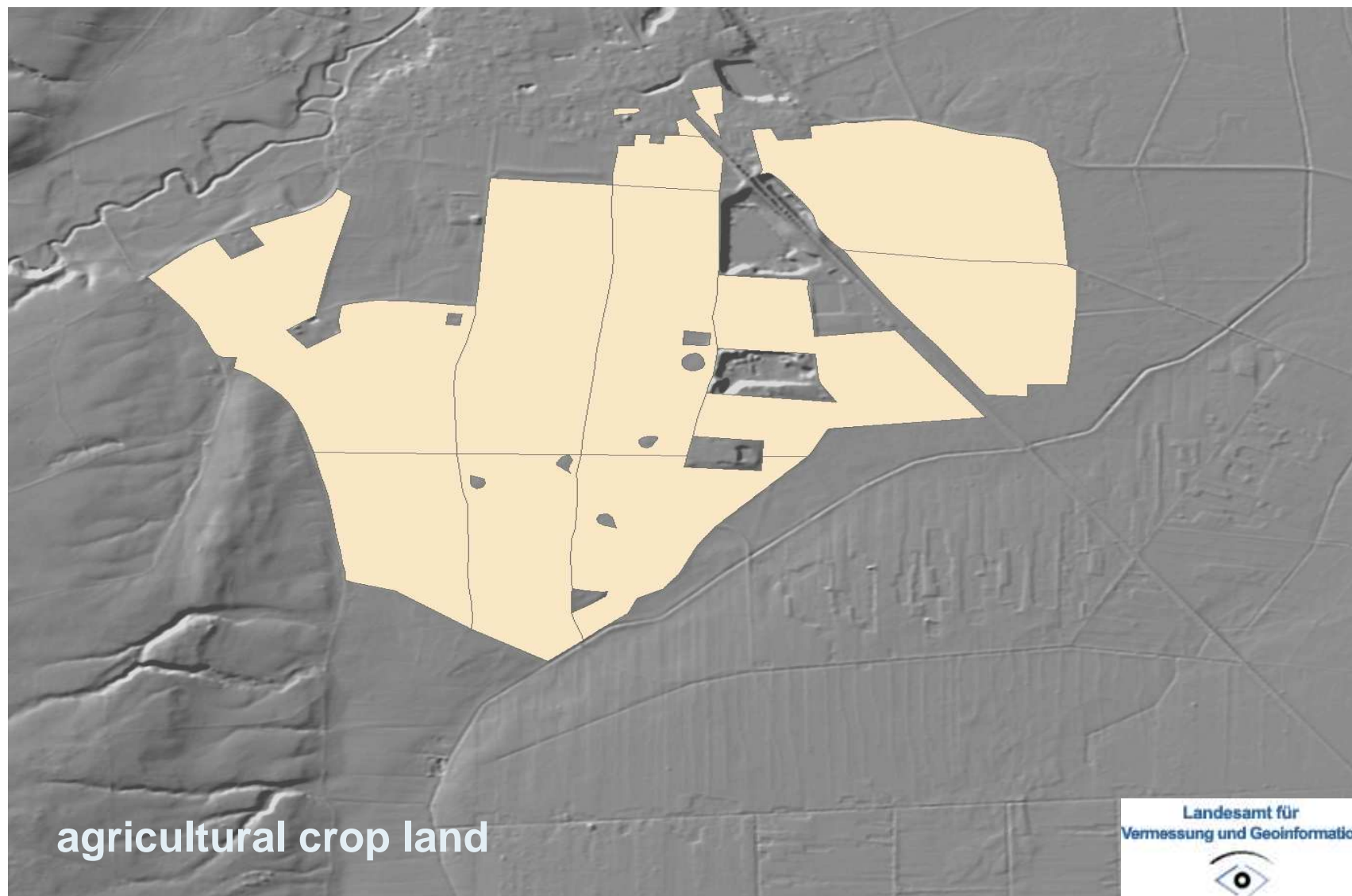Digital Orthophoto with land register map
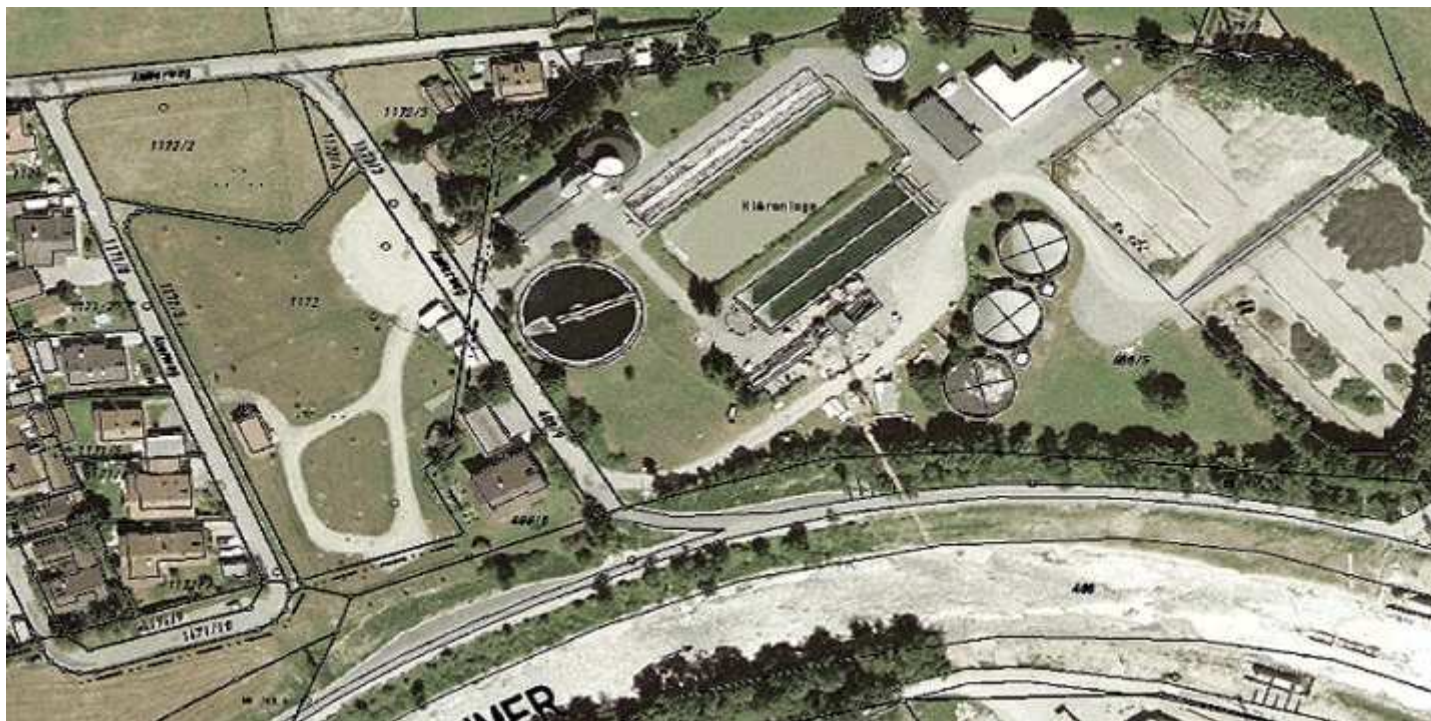
lessons learnt

- The requirements of the local civil protections on potentially flooded areas has been met

- Bottom-up approach and focussing on the idea of attendance turned out to be effective and purposeful

- Disaster management requires ad hoc access to existing information systems

- OGC Web Services allow the ad hoc combination of existing heterogenous multi-vendor GIS. This means a gain in information to the stored data.

- Disaster management benefits from existing SDI initiatives

- OGC Web Services for web publication of analysis results

- Information can be provided for many users

Groups of Users

Easy access to geodata means an increasing number of users

Different groups of users	Number/Amount of users
GIS-Developer	5%
Skilled GIS-User	15%
GIS-Novice/Layman **Interal User:** **Clerical assistant** **External User:** **Citizen** **e-Government**	**Disaster management** 80% **Information** via Internet, Geo Web Services

Source: Schilcher
Percent: Regional capital Munich

Outlook:
WSAS Web Spatial Analysis Service

agricultural crop land

Landesamt für
Vermessung und Geoinformation

Outlook:
WSAS Web Spatial Analysis Service

Flood area

agricultural crop land

Landesamt für
Vermessung und Geoinformation

Outlook:
WSAS Web Spatial Analysis Service

Area of flooded acres

flood area

agricultural crop land

Landesamt für Vermessung und Geoinformation