H2020-TWINN-2015. Grant Agreement no 691936	
Project full title:	Remote Sensing Science Center for Cultural Heritage
Project acronym:	ATHENA
Work Package	WP4
Deliverable	D4.6 Material from 3rd workshop

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Call:	Work programme **H2020** under **"Spreading Excellence and Widening Participation", call: H2020-TWINN-2015: Twinning** (Coordination and Support Action).
Project full title:	**Remote Sensing Science Center for Cultural Heritage**
Project acronym:	**ATHENA**
Work Package (WP):	**WP4**
Deliverable (D):	**D4.6 (Material from 3rd workshop)**
Due date of deliverable:	**April 2018 (Month 29 of the project)** / **Version: 1**
Author(s):	**Diofantos G. Hadjimitsis, Andreas Christofe, Athos Agapiou, Vasiliki Lysandrou**
Contributor(s):	**Verena Jaspersen, Gunter Schreier**
Start date of project:	**1/12/2015** / Duration: **36 months**

Dissemination Level		
PU	Public	√
CO	Confidential, only for members of the consortium (including the Agency Services)	□

Document Sign-off				
Nature	**Name**	**Role**	**Partner**	**Date**
DRAFT	Diofantos G. Hadjimitsis Athos Agapiou Vasiliki Lysandrou Andreas Christofe	Project Leader	CUT	27/03/2018
REVIEWED	Gunter Schreier Verena Jaspersen	Partner 2 (WP Leader)	DLR	19/04/2018
APPROVED	Diofantos G. Hadjimitsis Athos Agapiou Vasiliki Lysandrou Andreas Christofe Gunter Schreier Verena Jaspersen	WP Leader / Partner 2	CUT, DLR	19/04/2018

Work Package: 4 – Training and knowledge transfer Deliverable: D4.5 – Material from 3rd workshop				
Sections to be protected	**Description**	**Owner**	**Access Rights**	
			Period	**Type***
none				

Summary

The present deliverable summarizes the outcomes of the third ATHENA workshop and provides all related material, both prior its accomplishment (e.g. agenda) and material such as presentations and list of participants.

The third workshop was entitled: “Geo information systems (GIS)” and was organised by Verena Jaspersen from the DLR at the RSCy 2018 in Cyprus. The workshop was split into two parts. In the first part, Verena Jaspersen covered the fundamentals of GIS in form of a presentation. What is GIS? What is it used for? What are the main parts of a GIS? Which software can be used to set up a GIS? Furthermore, the participants got an insight into examples of web-based GIS that show-case how GIS can be used to disseminate data and information to a wide user group. The participants also learnt about Open Geospatial Consortium and their standards such as Web Mapping Service (WMS) and Catalogue Service for the Web (CSW) to make GIS work in a distributed world.

The second part was a real Hands-On Workshop on working with. In this hands-on workshop the participants started to work with QGIS (https://www.qgis.org). After a general introduction to QGis and its plugin mechanism, we practically worked with what was covered during the presentation.

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ANNEX 21

1. Introduction

The 3nd Workshop of ATHENA has been succesfully accomplished in line to the timeline of the project. The Workshop was leaded by the DLR consortium member and hosted by CUT (Project coordinator) during the 'Sixth International Conference on Remote Sensing and Geoinformation of Environment' - RSCy2018 held on the 27 March 2018 in Paphos (Cyprus).
The topics of the conference and workshop are correlated, thus the partners of ATHENA project decided to combine the two events, in order to attract more scientists interested in the subject. The workshop was free and open. This was an added value for the workshop, as well as for dissemination of the ATHENA project to the internaitonal scientific community and to local stakeholders. This was agreed by all ATHENA consortium members, after the last year's succesfull second annual meeting at CUT.
The workshop entitled “Geo information systems (GIS)”, was a 2 hours and 30 minutes (refer to the agenda below - section 2 of the present document) that ended with Hands-On Workshop on working with GIS (refer to minutes of the workshop below - section 5 of the present document).

2. Agenda of the workshop

Tuesday 27 March, 2018			
08:00-17:00	REGISTRATION		
27/3 9:00 - 11:00	COPERNICUS INFOSESSION		Room: Aphrodite Hall
ID	Title		
	Registration and Welcome Coffee		
	Welcome and Introduction		
	Welcome Speech	Kyriacos Themistocleous (Cyprus Remote Sensing Society), George Komodromos	
	General Introduction to Copernicus	European Commission	
	Overview of the access to Copernicus data	Noveltis, EC Contractor	
	Overview of the Copernicus Data and Information Access Services (DIAS)	DIAS (European Commission)	
27/3 9:00 - 11:00	REMOTE SENSING	Chair: K. Tansey	Room: Adonis Room
ID	Title	Authors	
477	Remote Sensing Data Fusion to Detect Illicit Crops and Unauthorised Airstrips	J. A. Pena, T. Yumin & **J. A. Garcia**	
490	Web-Based Geospatial Visualization of CPM Data with CesiumJS	**M. Lammers**	
493	Land Surface Satellite Remote Sensing Gap Analysis	**P. Jurado** & A. Regan	
602	Development of a New EO-based Tool for the Location and the Delineation of Wetland Ecosystems at Wide Scales	**G. Anis**	
605	Unveiling Cyprus Wetlands: A Combination of Remote Sensing and Field Validation Techniques	A. Papatheodoulou, K. Michael, T. Eminzade, **S. Zotos**, M. Victora, A. Anastasi & L. Sergides	
504	Prospecting for Micro Hydropower Sites on African Rivers Using Satellite Data	**K. Tansey**, J. Lee & M. Cowsill	
498	Detecting Underground Structures in Cyprus Using Field Spectroscopy	G. Meillos, **K. Themistocleous**, A. Agapiou, S. Michaelides & D.G. Hadjimitsis	
11:00-11:30	COFFEE BREAK - POSTER PRESENTATIONS		
27/3 11:30 - 13:00	COPERNICUS INFOSESSION		Room: Aphrodite Hall
ID	Title	Authors	
	Overview of Copernicus Services		
	Copernicus Land Monitoring Service (CLMS)	CLMS (GAF, EC Contractor)	
	Copernicus Marine Environment Monitoring Service (CMEMS)	CMEMS (Noveltis, EC Contractor)	
	Examples of Copernicus Service Applications		
	Monitoring Natura 2000	GAF, EC Contractor	
	Coastal Marine pollution	Planetek Hellas, EC Contractor	
27/3 11:30 - 13:00	REMOTE SENSING	Chair: C. Rogass	Room: Adonis Room
ID	Title	Authors	
579	Translational Imaging Spectroscopy in the Laboratory as Tool for Geoscientific Applications	**C. Rogass**, **F. Koerting**, C. Mielke, **A. Kuras**, H. Daempfling & B. Huber	
635	Lithological and Lineament Mapping Using Landsat 8 OLI and ASTER Multispectral Data in Imini-ouanilla District South High Atlas of Marrakech	**Z. Durhalf**, A. Algouti & A. Algouti	
561	Revisiting the Validity of Brask's Equation on Altitudinal Temperature Lapse Rate Using Thermal-Infrared Bands of Landsat 8	**D. Suyanto, L.B. Prasetyo & Y. Setiawan**	
583	Rapeseed Crops Flowering Duration Estimation by RGB Images Acquired With Consumer Drone: A Tool for Ground-Truthing	**D. Ganeva**	
588	Remote Sensing Measurements in Creating Thematic Spectral Library	**D. Borisova**, D. Petkov, R. Nedkov, H. Nikolov, V. Dimitrov, M. Metodieva & D. Avetisyan	
13:00-14:30	LUNCH		
27/3 14:00-16:00	COPERNICUS INFOSESSION		Room: Aphrodite Hall
ID	Title	Authors	
	Local Use Cases (session in Greek) - 2 or 3 presentations		
	Examples of Land-related Applications		
	Climate Change and the Agricultural Sector	Telespazio Vega, EC Contractor	
	Assessment of Solar Resources for Screening Potential Sites	Finnish Meteorological Institute, EC Contractor	
	Land Cover Monitoring Based on Sentinel-2 data	DIGI, EUROGI, EC Contractor	
	Copernicus Early Warning Service: Forecasting Fires	e-GEOS, EC Contractor	
27/3 14:30-16:00	REMOTE SENSING	Chair: F. Remondino	Room: Adonis Room
ID	Title	Authors	
565	A Comparison of Different Datasets for the Rapid Mapping of Natural Hazards	I. Toschi, M. Allocca, **F. Remondino**, T. Kellenberger & A. Streilein	
598	Assessment of Terrestrial Oil Spill Dynamics, Using an Integrated Approach of Field Based, Optical and Radar Remote Sensing	**M. Onijir**, J. Kaduk, C. Jarvis & A. Ogochukwu	
651	SEN4RUS, Sentinels Copernicus Sentinels for Urban Planning in Russia: Sentinel 1, 2 & 3 Use and Processes Understanding	C. Kontopoulos, **E. Maltezos, V. Charisampopoulou**, N. Chrysoulakis, Z. Mitraka, M. Marconcini, T. Esch, A. Sazonova, A. Tald, S. Dusgun, C. Felgenwinter, E. Parlow & M. Cavur	
526	Assessing the Discrepancy in Open-Source Atmospheric Correction of Sentinel-2 Acquisitions for a Tropical Mining Area in New Caledonia	**E. Ibrahim**, G. Buydens, T. Debouny, R. Deprez & E. Pirard	
625	From a Change Detection Image to an Operational Alert System With Sentinel-1 Time Series	**B. Navaro** & N. Saporiti	
27/3 14:30-16:00	GIS	Chair: D. Demetriou	Room: Zeus Room
ID	Title	Authors	
492	Precipitation Accumulation that is Nearly Global and Near-realtime: A GIS Data Product Based on IMERG	D. A. Kelley & **E. F. Stocker**	
512	A Review Of Spatial Expert Systems: Do They Still Have a Role to Play?	**D. Demetriou**	
516	Backend and Frontend Strategies for Deployment of Web GIS Services	**A. Noskov** & A. Zlot	
606	A Citizen Science Approach to Assess the Impact of Roads on Reptile Mortality in Cyprus	**S. Zotos**, F. Baier, M. Zomeni, D.J. Sparrow & I.N. Vogiatzakis	
612	Energy Poverty in Cyprus and the use of Geographic Information Systems	**I. Kyprianou** & D. K. Serghides	
16:00-16:30	COFFEE BREAK - POSTER PRESENTATIONS		
27/3 16:30 - 19:00	COPERNICUS INFOSESSION		Room: Aphrodite Hall
ID	Title	Authors	
	Examples of Marine and Coastal-related Applications		
	Ship Detection With Sentinel-1	SpaceTec Partners, EC Contractor	
	Anthropogenic Pressure on Coastal Zones	Planetek Hellas, EC Contractor	
	High Resolution Mapping of Water Quality	DIGI, EUROGI, EC Contractor	
	Questions and Answers		
	Conclusion		
27/3 16:30 - 19:00	LAND COVER/URBAN AREAS	Chair: V. Ambrosia	Room: Adonis Room
Time	Title	Authors	
614	Urban Energy Balance From Space: Final Results From Urbanfluxes	N. Chrysoulakis, S. Grimmond, C. Felgenwinter, F. Lindberg, J.-P. Gastellu-Etchegorry, M. Marconcini, F. Del Frate, J. Klostermann, Z. Mitraka, **S. Stagakis**, F. Olofson, L. Landier, B. Crawford, T. Esch & E. Parlow	
615	Monitoring CO2 Emissions Of An Urban Area Using Eddy Covariance And Earth Observation	**S. Stagakis**, N. Chrysoulakis, N. Spyridakis, C. Felgenwinter & R. Vogt	
476	Supervised and Unsupervised Classification for Obtaining Land Use/Cover Classes From Hyperspectral and Multi-Spectral Imagery	**M. Boori**, R. Paringer, K. Choudhary & A. Kupriyanov	
489	Integration of Digital Surface Models in Land Cover Classification Using Multi-Temporal Rapideye Images in Germany	**S. Seissiger**, S. Arnold & M. Hovenbitzer	
620	Innovation in Arabic cartography for the National State of Qatar	N. Bearman & **C. Robinson**	

27/3 16:30 - 19:00	ATHENA GIS Workshop Fundamentals of GIS -QGIS	Chair: Verena Jasperson	Room: Zeus Room

Cultural Heritage Workshop

This workshop will feature the results of current cultural heritage projects, including PROTHEGO, CLIMA, ATHENA, EXCELSIOR and the UNESCO Chair in Digital Cultural Heritage – MNEMOSYNE.

Information Extraction from Laser Scanning Data Workshop

organized with the ISPRS WG III/5

The aim of this session is to present research carried out using Laser scanning data at different scales for either terrestrial or aerial applications. The contributions may consider the use of Laser Scanning data in integration with other geo-spatial information or optical imagery. The application domains could be (but not limited to) surveying, monitoring and mapping at a territorial and/or urban scale.

The event is open and free to all registered participants.

Earth Observation for the Coastal and Marine Environment

The workshop will focus on the SEO-DWARF project, whose main objective is to realize the content-based search of earth observation (EO) images on an application specific basis. Queries such as "Calculate the rate of increasing chlorophyll in the baltic sea" will be answered by the SEO-DWARS, helping users to retrieve the appropriate EO images for their specific needs or alert them when a specific phenomenon occurs.. The main research and innovation of the proposed project is the bridging of the gap between the raw information that remote sensing images provide and the knowledge gained from the marine application domain to retrieve relevant to the semantic query data.

The event is open and free to all registered participants.

ATHENA Workshop on Geo information systems (GIS) - [open for public]

In this workshop, we will cover the fundamentals of GIS. What is GIS? What is it used for? What are the main parts of a GIS? Which software can be used to set up a GIS? Furthermore, you will get an insight into examples of web-based GIS that show-case how GIS can be used to disseminate data and information to a wide user group. Here, you will also learn about Open Geospatial Consortium and their standards such as Web Mapping Service (WMS) and Catalogue Service for the Web (CSW) to make GIS work in a distributed world.

Hands-On Workshop on working with GIS [closed for 15 – 20 people]

In this hands-on workshop you will directly start to work with QGIS (https://www.qgis.org). After a general introduction to QGis and its plugin mechanism, we will practically work with what we have learned in the workshop on GIS.

Requirements

QGIS 2.18 (Las Palmas) (LTR) https://www.qgis.org/en/site/forusers/download.html

Institute

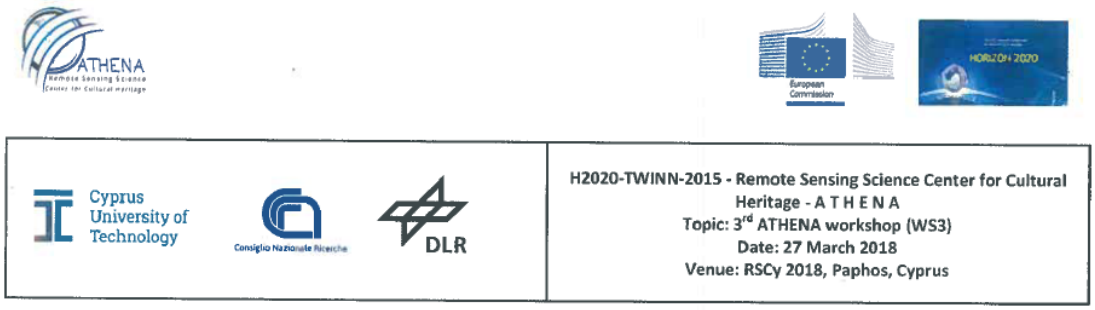
Neapolis University Pafos

Find us on Facebook

Hosted by OpenSolutions

3. List of Participants

Twenty-Four participants attended the Workshop coming from various European and international institutions, representing both the academia, industry and research centers. The majority of the participants were from the Cyprus University of Tecchnology.Supporters of the project such as the Department of Antiquties of Cyprus have also the opportunity to follow the specific workshop.



H2020-TWINN-2015 - Remote Sensing Science Center for Cultural Heritage - A T H E N A
Topic: 3rd ATHENA workshop (WS3)
Date: 27 March 2018
Venue: RSCy 2018, Paphos, Cyprus

List of participants

A/A	NAME	INSTITUTION	CONTACT DETAILS	SIGNATURE
1	Skevi Perdikou	Geofem Ltd	skevi.perdikou@geofem.com	
2	ATHANASIOS IOANNOS	NATIONAL GUARD	dmx_tgty@cytanet.gov.cy	
3	Christodoulou Andreas	Cyprus National Guard	dmx_tgty@cytanet.gov.cy	
4	Aspasia Georgiades	Department of Antiquities	aspasiageorgiades@gmail.com	
5	Andreas Christofe	CUT	andreas.christofe@cut.ac.cy	

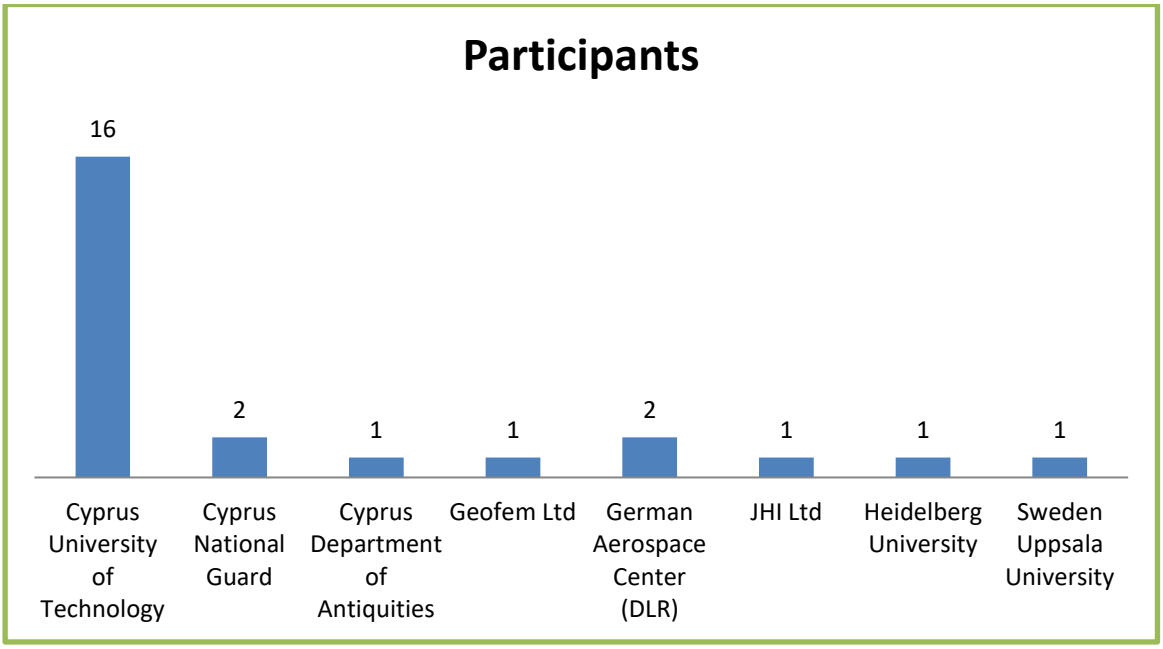
1

6	Athos Agapiou	Cyprus University of Tecnology	athos.agapiou@cut.ac.cy	
7	Evagoras Evagorou	Cyprus University of Technology	evagoras.evagorou@cut.ac.cy	
8	P-O Hardeu	Sweden (Uppsala)	hardeudaka@comhem.se	
9	Michalakis Christoforou	CUT	m.christoforou@cut.ac.cy	
10	Athina Silvestrou	Cyprus University of Technology	athena.silvestrou@gmail.com	
11	Michaella Konatzia	CYPRUS UNIVERSITY OF TECHNOLOGY	mg.konatzia@edu.cut.ac.cy	
12	Andreas Avraam	Cyprus university of Technology	ang.avraam@edu.cut.ac.cy	
13	Sovvas Aristodemou	Cyprus University of Technology	sovvas_aristodemou@hotmail.com	
14	Angelos Kakouris	>>	angelos_kakouris@hotmail.com	
15	Argyro Visaltzi	Cyprus University of Technology	argyro.visaltzi@cut.ac.cy	

2

16	DANIELE CERRA	DLR	DANIELE.CERRA@DLR.DE	
17	MILTO MILTIADOU	CUT	milto.miltiadou@cut.ac.cy	
18	KYRIAKI FOTIOU	CUT	kyriakifotiou@gmail.com	
19	Μαρίνα Πετρή	CUT	marinapetri@gmail.com	
20	CHEN WANG	JHI	chen.wang@hutton.ac.uk	
21	Alexey Noskov	Heidelberg University	a@n-kov.com	
22	ΔΙΟΦΑΝΤΟΣ ΧΑΤΖΗΜΙΤΣΗΣ	CUT	d.hadjimitsis@cut.ac.cy	
23	Christiana Papoutsa	CUT	christiana.papoutsa@cut.ac.cy	
24	Marios Tzouvaras	CUT	marios.tzouvaras@cut.ac.cy	
25				

3


Participants
16
2
1
1
2
1
1
1
Cyprus University of Technology
Cyprus National Guard
Cyprus Department of Antiquities
Geofem Ltd
German Aerospace Center (DLR)
JHI Ltd
Heidelberg University
Sweden Uppsala University

4. Minutes of the workshop

" ATHENA Workshop on Geo information systems (GIS) ", Paphos, Cyprus, March 27th 2018

First part: Presentation on the fundamentals, usages, software and standards iof GIS

Verena Jaspersen (DLR) presented some fundamental concepts geographic information systems. GIS can be thought of as an umbrella under which we find hardware, software, methods, data, network and people. So GIS is not just software, or just data.

We saw what space, distance and location can mean in a GIS. Furthermore, the difference between spatial data and attribute data was highlighted by some examples. Different ways of representing spatial phenomena were shown, and how they can be then assembled in GIS layers.

GIS is applied in many different disciplines to solve many different problems. There are many free and open source, but also commercial GIS Desktop applications available to work with, but also a bunch of software to bring GIS to the world wide web. A common GIS web infrastructure was shown, and the problem described how to share spatial data within such a spatial data infrastructure. The need for standards was discussed. Here, the open geospatial consortium (OGC) plays a crucial role, so the consortium was introduced to the audience. The audience learned which standards are propagated by OGC and how the communication pattern roughly worked in OGC Web Services. The difference between ISO and OGC was shown as well. The WMS Standard was demonstrated in a live demo. Verena Jaspersen showed the underlying communication between a web site and a WMS Service to demonstrate the former described communication pattern.

The Infrastructure for Spatial Information in the European Community (INSPIRE) plays a crucial role in the data exchange efforts within all EU countries, therefore the presentation also covered the main goals of this initiative. There is also an implementation of INSPIRE existing for cyprus.

Last but not least, the topic of metadata was addressed in the presentation, why metadata about data is needed, and how this data can be encoded in XML in a standardized way. Verena Jaspersen demonstrated the use of metadata in the already finished project WISDOM (http://wisdom.eoc.dlr.de, on this project page you also find a link to the developed information system) and also showed the basic communication pattern between the client (the browser) and the OGC Catalogue service for the web.

Second part: Hands-on session

In this hands-on session the participants learned how to work with QGIS. We used the version QGIS 2.18. The sessions was structured as follows:

1. download sentinel 2 scenes from sci hub
2. load different layers to QGIS
3. create new vector layers by digitizing
4. merge and style vector layers
5. use composer to desgin a map for printing

1.) As sentinel imagery is free and with a quite good resolution, the participants were introduced to the Sentinel Science Hub (https://scihub.copernicus.eu). The participants could search data by applying different filters. Verena Jaspersen provided already downloaded sentinel 2 images and distributed them among the participants as the download would have taken too long during the session.

2.) In QGIS there are different ways to load data to the During the session, we have seen how to add a WMS Layer from a WMS Service (namely https://geoservice.dlr.de). Furthermore, the participants were introduced to the plugin management and should install the Open Layers Plugin. This plugin allows to use services such as bing, google maps and OSM. Then, the we loaded the sentinel 2 scenes (bands 4,3,2) to QGIS and built virtual layers so that the three bands can be visualized as one optical image. The different sentinel 2 scenes needed to be merged and the color tables harmonized so that the scenes looked similar.

3.) With the sentinel 2 images as a background, we started to create new vector layers by digitizing objects. The main idea was to create a land cover classification, so objects of interest were water bodies, agricultural fields, forests, etc. The participants learned how to use the digitizing tool set to create vector layers for each class with respect to the correct coordinate system.

4.) The created vector layers of step 3. were then merged into one layer. We also used the QGIS styling capabilities to color the different classes in a nice and intuitive way.

5.) In this part of the session, the participants should use the QGIS composer to create a nice looking, printable map, that provides information on the created land cover classification.

A title, abstract, legend information, north arrow, credit etc. should be placed on the map so that users of the map are well informed about the information they see.

Step 5 could not be demonstrated anymore, as we ran out of time. But on the hand-out for this hands on session, detailed description is given, so that the participants can try to solve that later on.

5. Photos from the Workshop


RSCy2018


RSCy2018
COPERNICUS
Training and
Information Session
27 March 2018
Paphos, Cyprus
Copernicus
RSCy2018
Sixth International
Conference on
Remote Sensing
and Geo-information
of Environment
ATHENA


EXCELSIOR
ERATOSTHENES:
Excellence Research Centre
for Earth Surveillance & Space-Based
Monitoring of the Environment


SCy2018
Sixth International
Conference on
Remote Sensing
and Geo-information
of Environment
Geo Information Systems (GIS)
Fundamentals, Usage, Standards and Examples
Verena Jaspersen
ATHENA

ANNEX

PRESENTATIONS OF THE WORKSHOP

Geo Information Systems (GIS)

Fundamentals, Usage, Standards and Examples

Verena Jaspersen

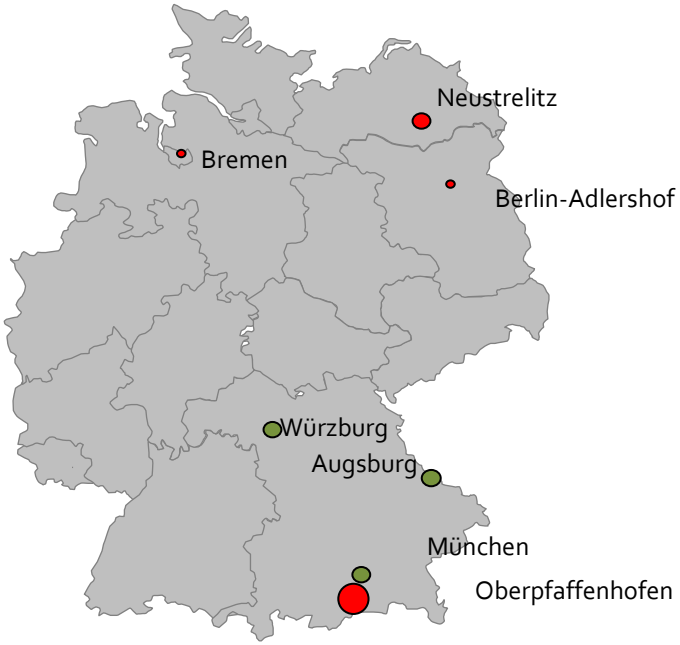
ATHENA
Remote Sensing Science
Center for Cultural Heritage

DLR

Earth Observation Center (EOC)

German Remote Sensing Data Center (DFD)
Director: Stefan Dech

Remote Sensing Technology Institute (IMF)
Director: Richard Bamler



~ 350 staff at EOC

~40 staff at Universities
(TU München, Univ. Würzburg, Augsburg)

~ 250 scientists

– ca. 53 % third party funding

System approach at EOC

Sensor Technologies
Method Development
Basic Processing

IMF

Thematic Products
Geo-Research
Geo-Information Systems

DFD

Atmosphere
Land Surface
Geo Risks/ Security
Water and Cryosphere
Transportation / Energy

Payload Data Ground Segment
IT- Development, Engineering, Operations

DFD

Earth Observation Missions

TerraSAR-X, TanDEM-X, Sentinel-1, Sentinel-3, Sentinel 5P, NOAA, Terra/Aqua, Landsat, FireBIRD, TanDEM-L, Enmap etc.

User Services

World Data Center (WDC)
Emergency Mapping (ZKI)
Airborne Optical Remote Sensing (OPAIRS)
German Satellite Data Archive (D-SDA)
Maritime Safety and Security Lab

DLR

Agenda

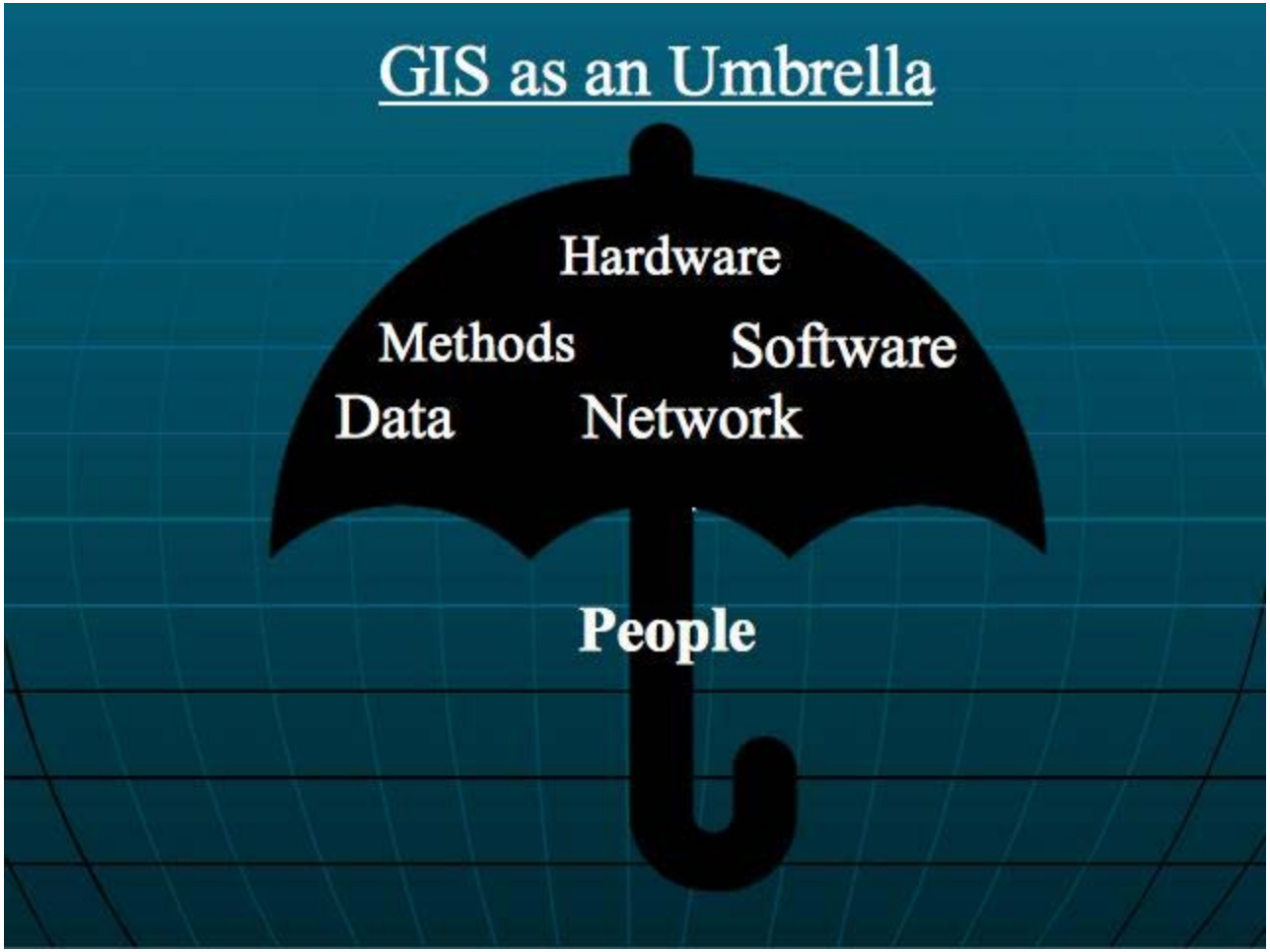
- Introduction to GIS
  - What is GIS
  - Thinking about Space, Location, Distance
  - Understanding Geospatial Data Models
- GIS Applications and GIS Software
- GIS and the Need for Standards
- Open Geospatial Consortium and OGC Standards
- INSPIRE: the European Initiative
- Metadata: Data about Data

What is GIS

GIS is a computer based system to aid in the

- Collection
- Maintenance
- Storage
- Analysis
- Output
- Distribution

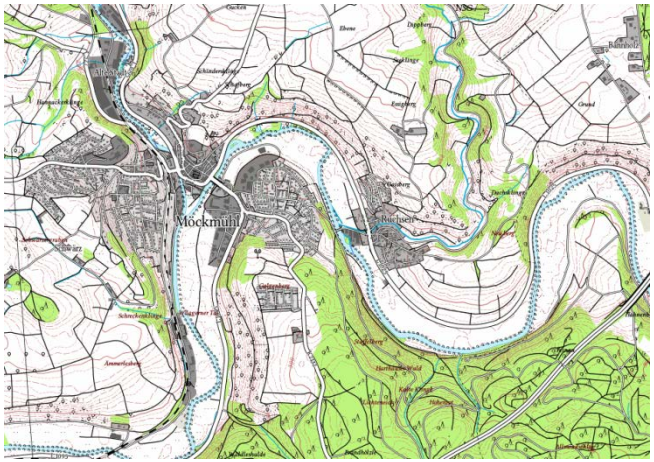
of spatial and non spatial data



https://learn.canvas.net/courses/464/files/238860/preview?verifier=4Yg61PzlSQCTViwsimGQrRk4y4QdwPlN57fquJjk

Thinking about Space

Absolute space

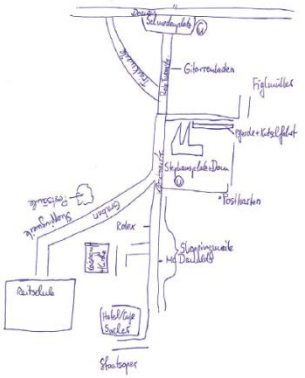


https://onmaps.de/files/onmaps/news/TK25/tk25_20000.png

Topological space

https://www.u-bahn-muenchen.de/bild/sehrgross/schnellbahn1972februar.jpg

Cognitive space



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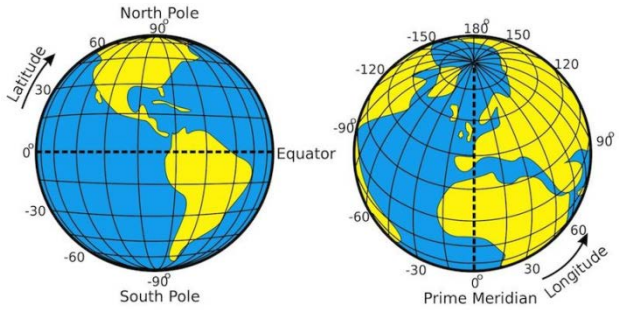
Thinking about Location

absolute location



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nominal location

9/11

relative location

South of Turkey

North of Egypt

cognitive location

http://media-cdn.sueddeutsche.de/image/sz.1.1108264/920x613?cropRatios=0:0-BiGa-www&cropRatios=3:2&cropRatios=2:3&method=resize&v=1355628030

http://www.eisbachwelle.de/wp-content/uploads/2012/04/Flosslaende-Munchen-Surfen-2012.jpg

Thinking about Distance

https://upload.wikimedia.org/wikipedia/commons/thumb/7/78/Eiffel_Tower_from_north_Avenue_de_New_York%2C_Aug_2010.jpg/220px-Eiffel_Tower_from_north_Avenue_de_New_York%2C_Aug_2010.jpg

absolute distance

~460 km

relative distance

~6 h

cognitive distance

Personal feeling

http://travel.home.sndimg.com/content/dam/images/travel/fullset/2015/05/28/big-ben-london-england.jpg.rend.hgtvcom.1280.960.suffix/1491582155388.jpeg

Understanding Geospatial Data Models

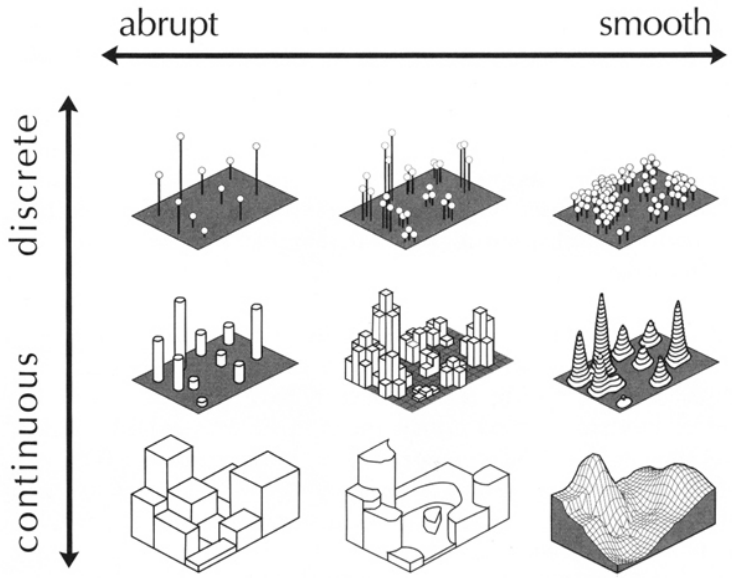
- spatial data (where):

  specific location

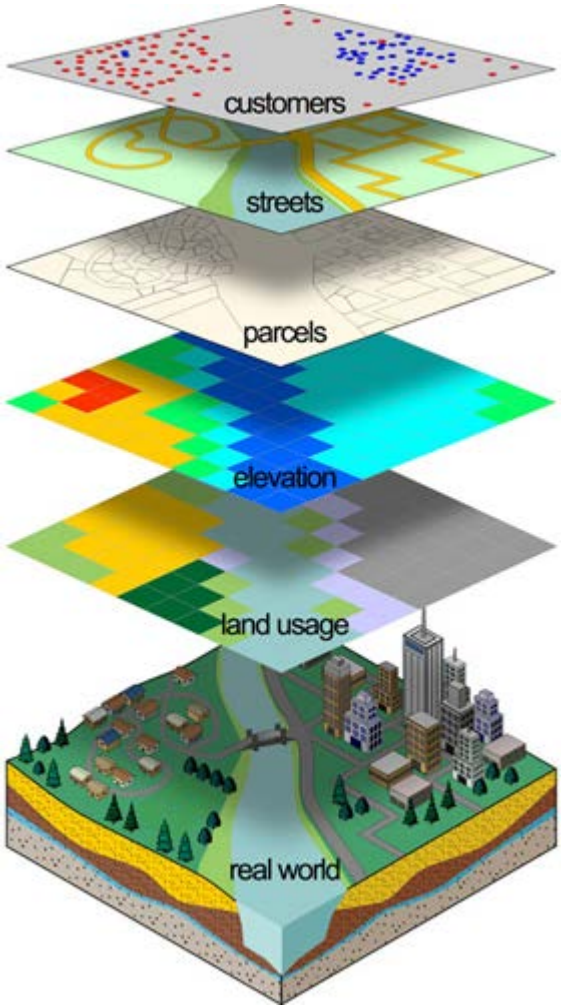
- attribute data (what):

  specifies what is at that location
  stored in a database table

Types of spatial phenomenon

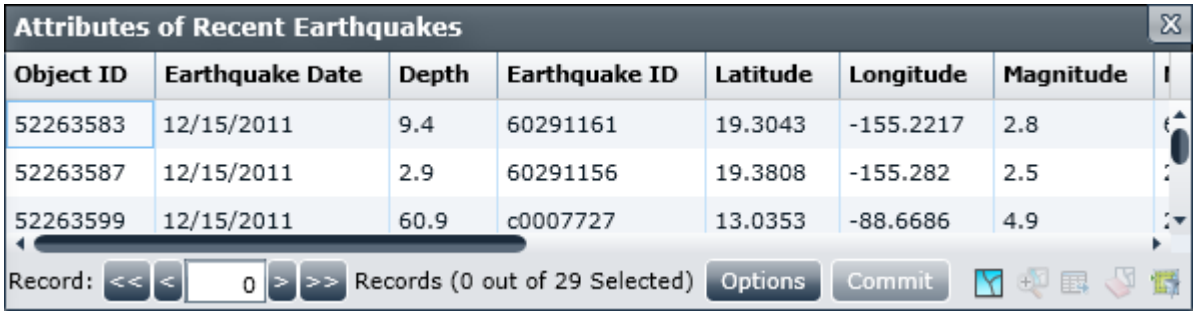


https://www.e-education.psu.edu/geog486/sites/www.e-education.psu.edu.geog486/files/image/L05_fig01.jpg



http://www.williamsnd.com/usrfiles/dept/136/img/gis_layers.png

Attributes



http://doc.arcgis.com/de/maps-for-sharepoint/arcgis-map-web-part/GUID-AF491B84-B33B-4CFD-8929-88D4E53D2F45-web.png

https://doc.arcgis.com/de/web-appbuilder/create-apps/GUID-62B44A73-C4E0-41F7-9C03-A65B7BCD4667-web.png

Storing descriptive Information

	POINT	LINE	AREA
NOMINAL	Town Mine Church BM Bench Mark	River Road Graticule Boundary	Swamp Desert Forest Census Regions
ORDINAL	Large Medium Small	(Roads) Interstate U.S. numbered State County	Major industrial region Minor industrial region
INTERVAL - RATIO	REPETITION Each dot represents 75 persons GRADUATED One-dimensional Bars Two-dimensional Circles,squares, triangles, etc.	REPETITION 60 40 20 Isarithms GRADUATED Hachures Flowlines 1500 1000 500 0	Density 40 30 20 10 0 Elevation 5000 2000 0

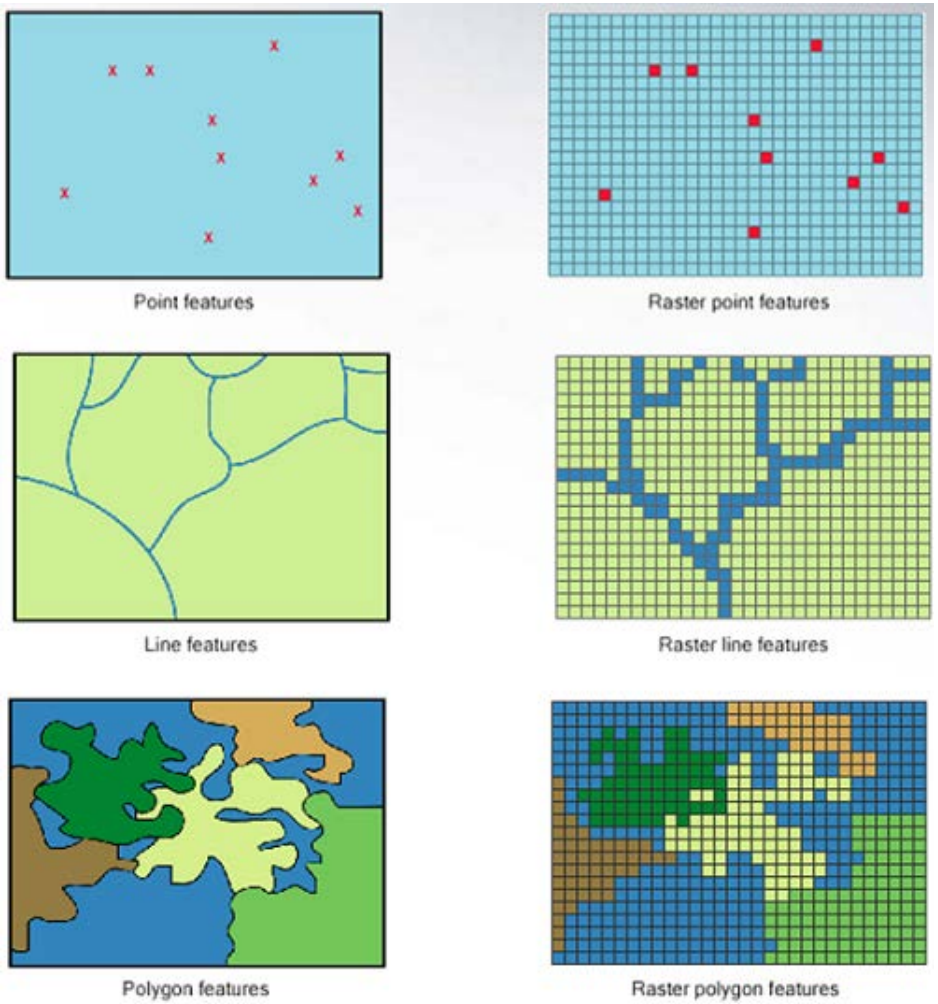
http://www.geog.ucsb.edu/~kclarke/G176B/robinson.jpg

Types of Spatial Data Models

Vector Data

Formats

- Digital Line Graphs (USGS)
- GML
- GeoJSON
- Shapefile (Esri)
- …



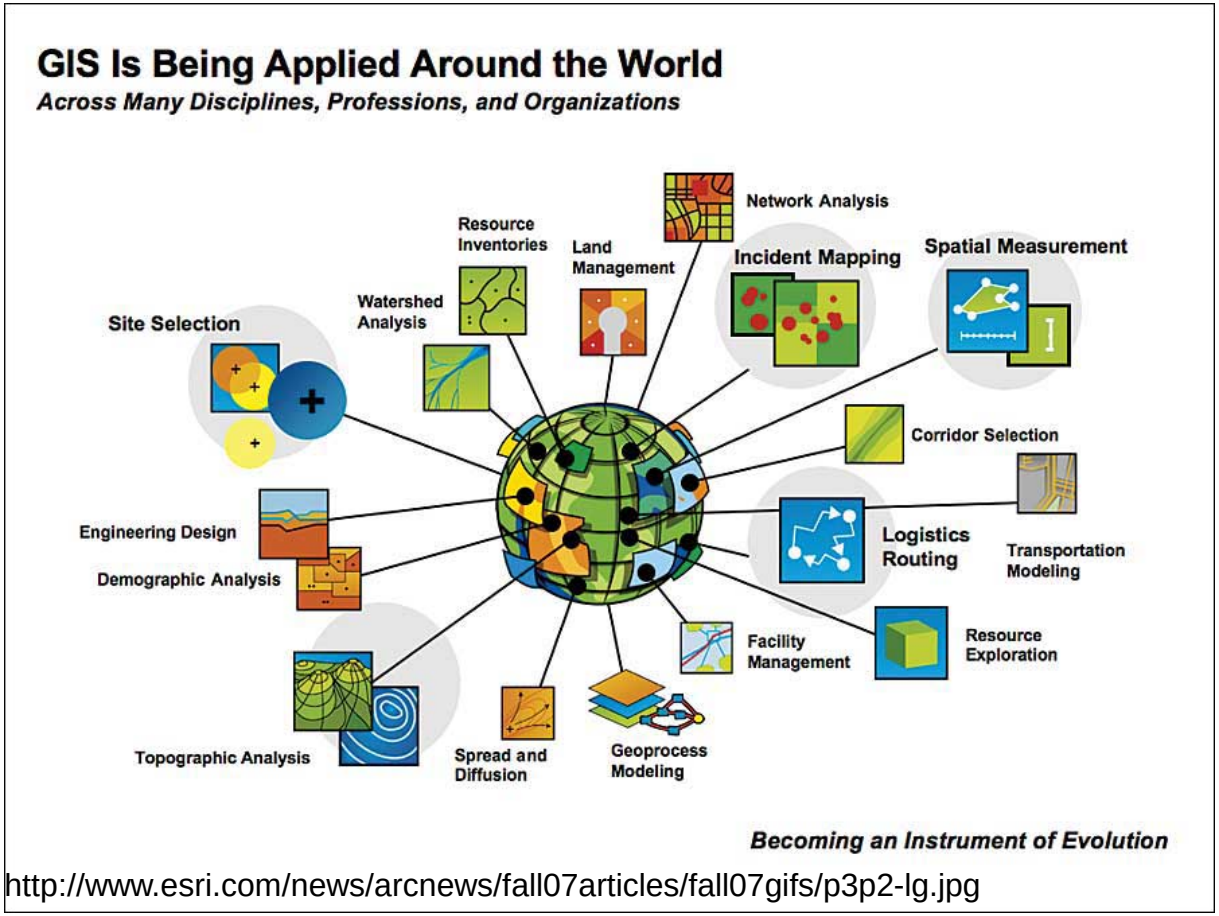
http://gsp.humboldt.edu/olm/Lessons/GIS/08%20Rasters/Images/convertingdatamodels2.png

Raster Data

Formats

- Geo TIFF
- IMG (Erdas Imagine
- JPEG2000
- netCDF-CF
- …

Application of GIS



http://www.esri.com/news/arcnews/fall07articles/fall07gifs/p3p2-lg.jpg

GIS Desktop Software

ArcGIS

QGIS

Geomedia

SAGA GIS

MapInfo Professional

gvSIG

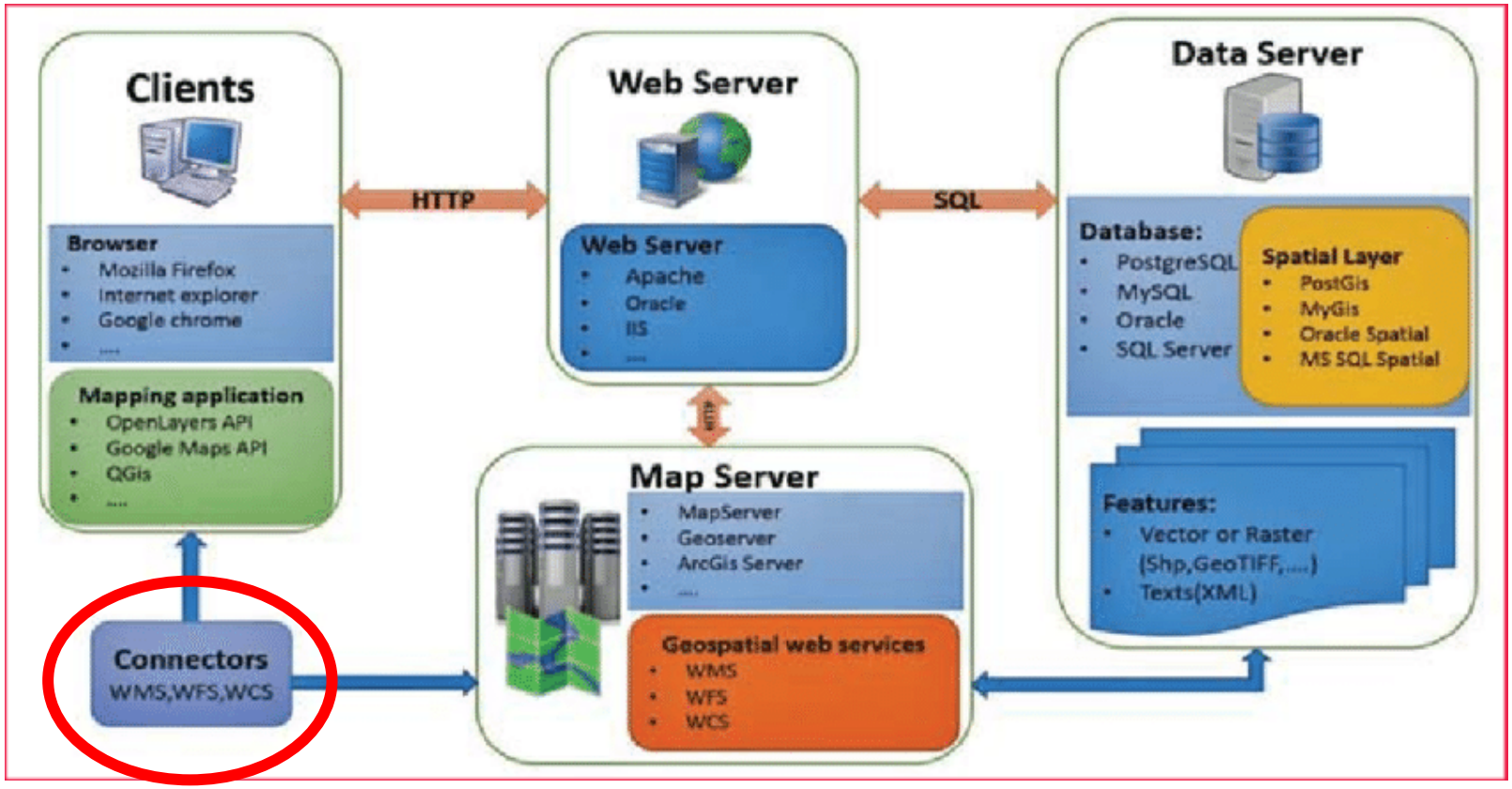
GRASS GIS

AutoCAD

https://gisgeography.com/free-gis-software/

https://gisgeography.com/commercial-gis-software/

GIS Software for the Web



INFRASTRUCTURE DESIGN FOR MAKING YOUR OWN WEB-GIS APPLICATION WITH OPEN SOURCE GEOINFORMATION TECHNOLOGY – Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/Structure-of-Web-Mapping-Web-GIS_fig1_316788084 [accessed 23 Mar, 2018]

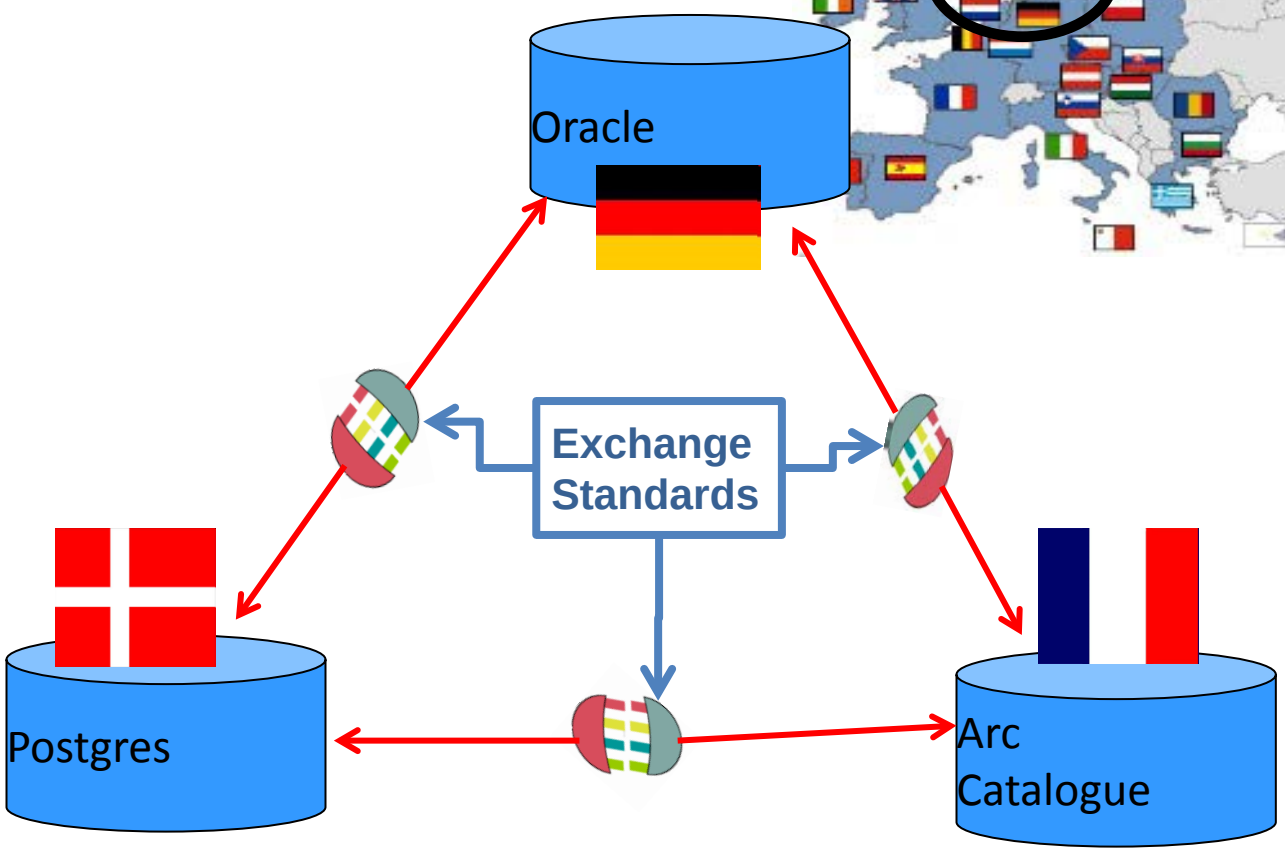
GIS: Need for Standards

Oracle

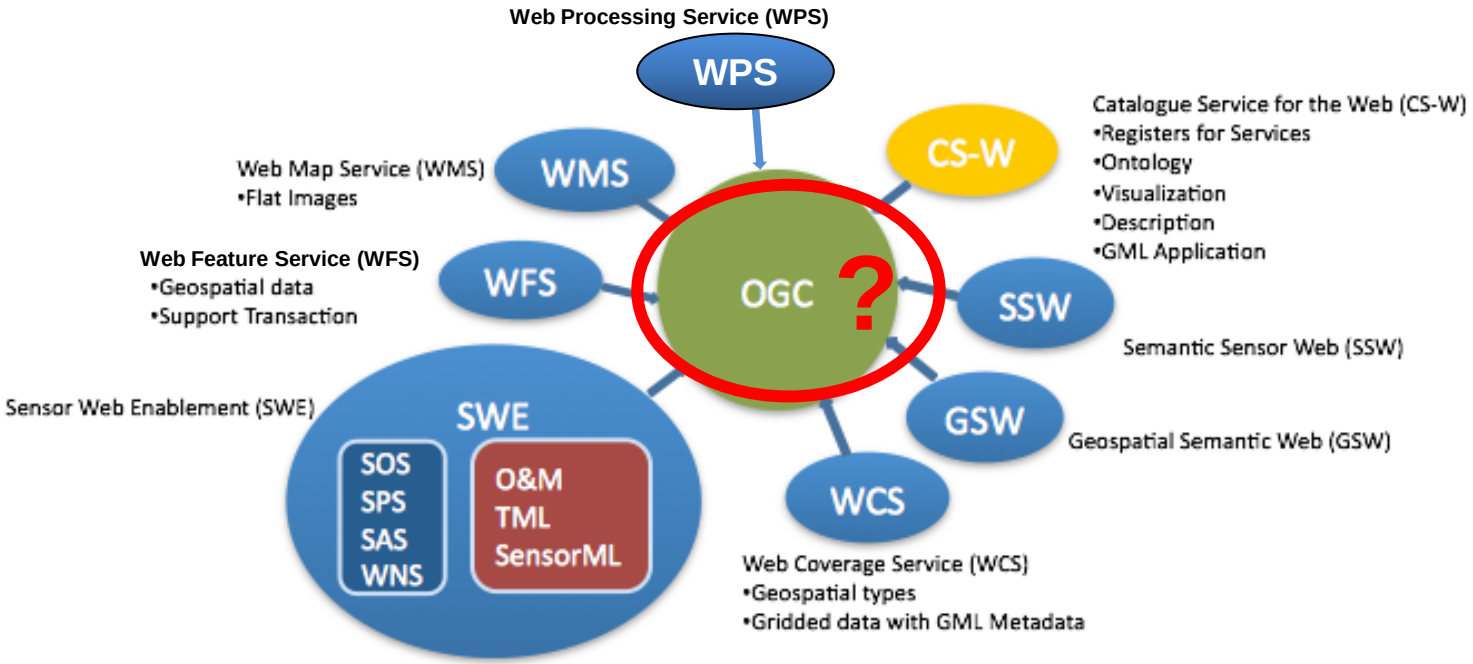
Postgres

Arc Catalogue

GIS: Need for Standards



GIS: Need for Standards



http://commons.esipfed.org/sites/default/files/skitched-20120424-161559.png

Open Geospatial Consortium

OGC®
Making location count.

http://www.opengeospatial.org/

- OGC is an international standardization organization
- Definition of standards for geospatial content and services,

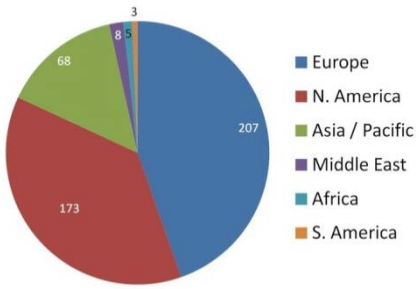
  GIS data processing and data sharing
- Using a standard like OGC, the interfaces are compatible

Open Geospatial Consortium

Standards Development is not easy!

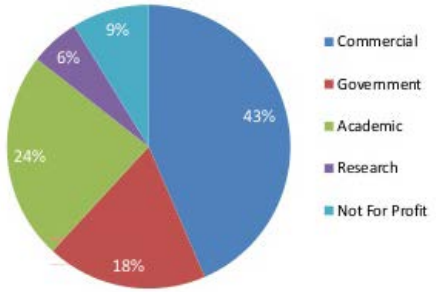
- Requires collaboration on a global basis
- Requires consensus by many organizations
- Requires give and take
- Requires repeatable processes

OGC Membership Distribution



http://slideplayer.com/12364829/73/images/11/OGC%3A+Membership+Distribution.jpg

OGC User Community



https://image.slidesharecdn.com/percivallogcandisprs-140515081119-phpapp02/95/ogc-standards-relevant-to-isprs-5-638.jpg?cb=1400141755

Differences between ISO and OGC

- The OGC Standard development process is transparent and consensus oriented
- Workflows are defined
- Standards are freely available – ISO Standards need to be payed for
- Agreements with ISO are arranged if possible and necessary to avoid conflicts
- ISO Standards are more like laws

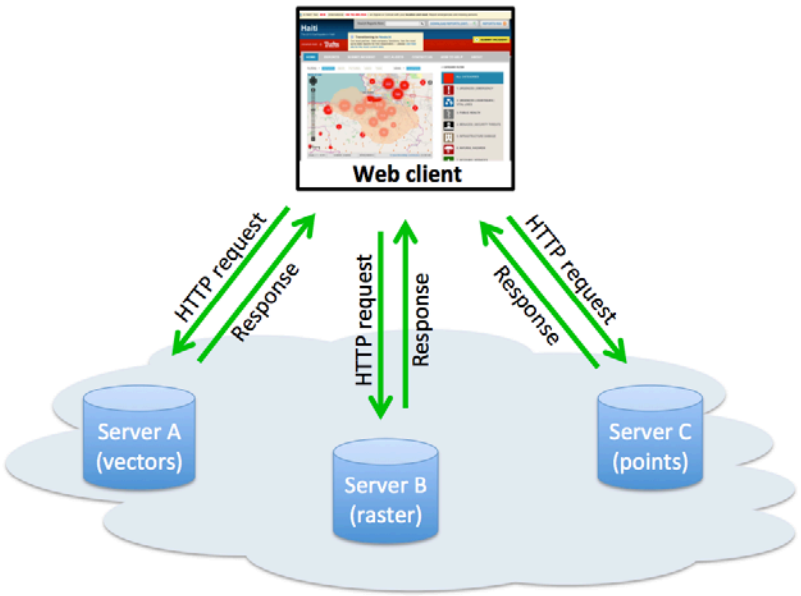
OGC®
Making location count.

https://www.spar3d.com/wp-content/uploads/2014/12/OGC_LOGO_real.jpg

ISO International Organization for Standardization

http://tqtconsultant.com/wp-content/uploads/2016/08/ABOUT-ISO.jpg

OGC Web Services (OWS)



http://www.eclipse.org/community/eclipse_newsletter/2014/march/images/article1.1.png

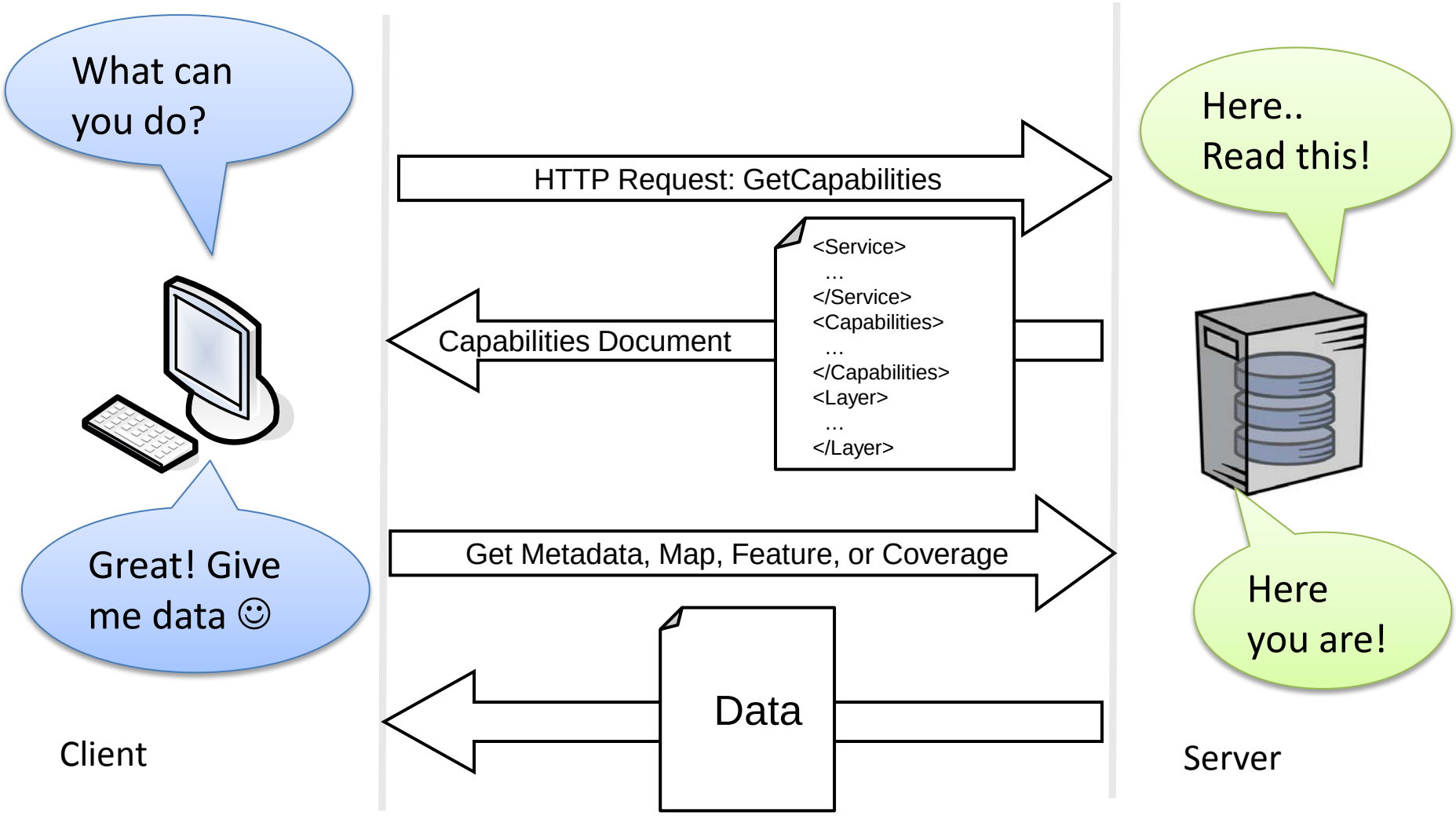
Services

CSW – Catalogue Service for the Web
WMS – Web Map Service
WFS – Web Feature Service
WCS – Web Coverage Service
WPS – Web Processing Service

Formats

SLD – Styled Layer Descriptor
GML – Geographic Markup Language
Simple Features for SQL
…

OGC Web Services: Communication Pattern



DLR

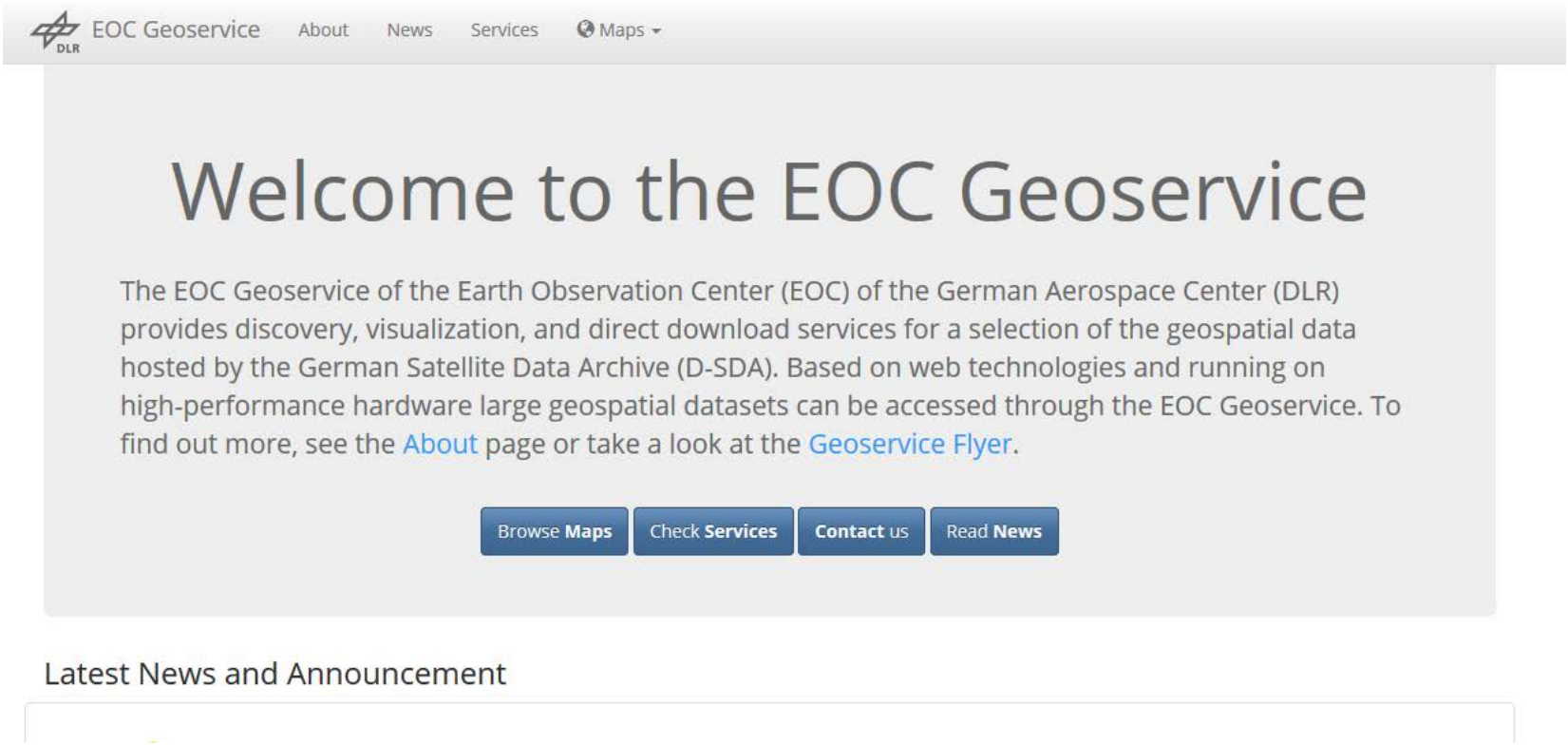
Advantages of Using OGC Standards

- You can exchange data easily, as you provide interoperable services
- You avoid redundant data management: this saves a lot of money!
- You can easily access up to date datasets
- You are independent from software vendors

⟶ All are speaking a “common language”

OGC Services: Demo WMS

- https://geoservice.dlr.de/



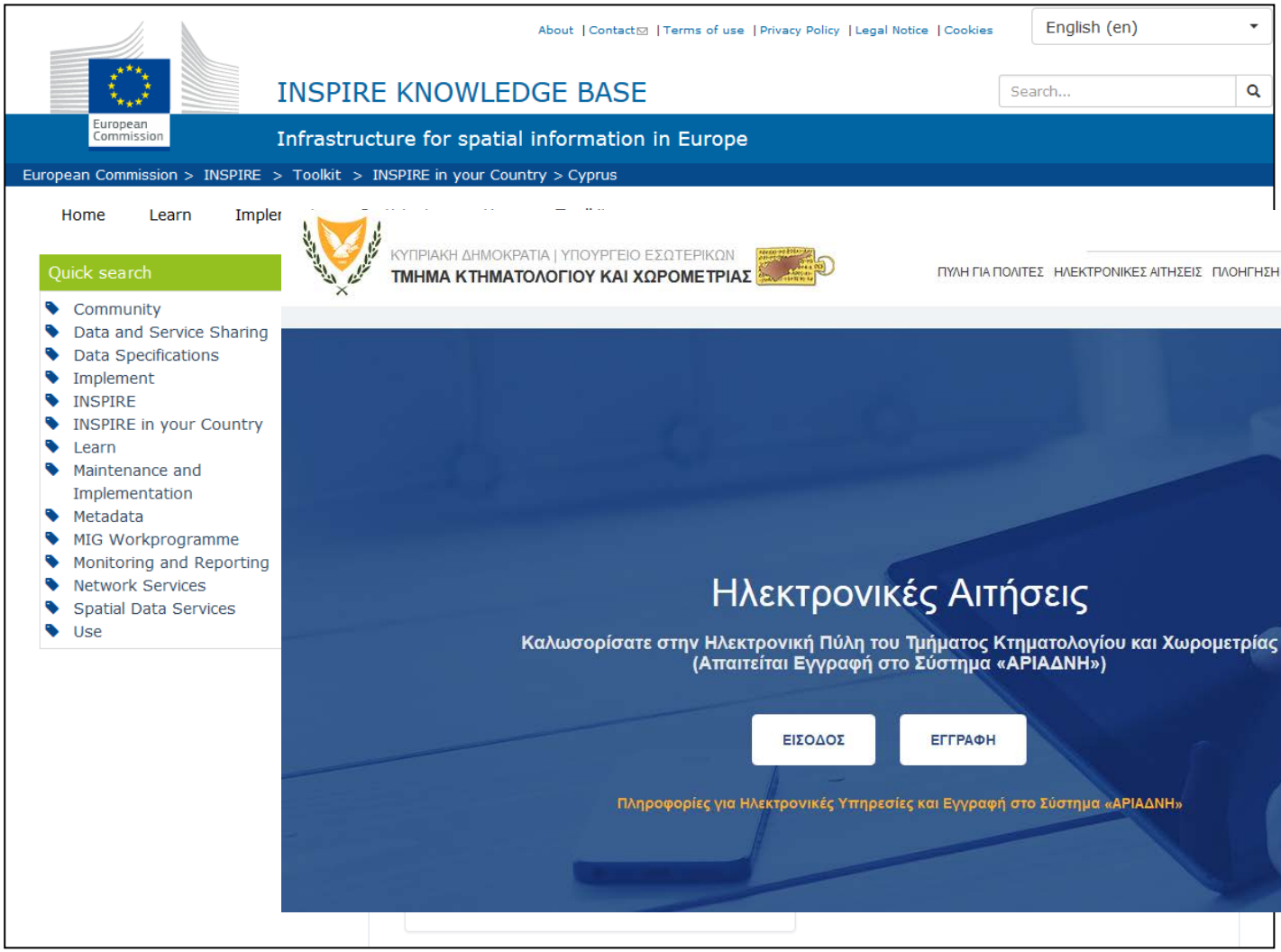
INSPIRE

Infrastructure for Spatial Information in the European community

- aims to create a **European Union spatial data infrastructure** for the purposes of EU environmental policies and policies or activities which may have an impact on the environment.
- Focused on sharing of environmental spatial information among public sector organisations ➔ semantic interoperable services
- Based on the infrastructures established and operated by the Member States of the European Union
- The Directive came into force on 15 May 2007 and will be implemented in various stages, with full implementation required by 2021.

https://inspire.ec.europa.eu/

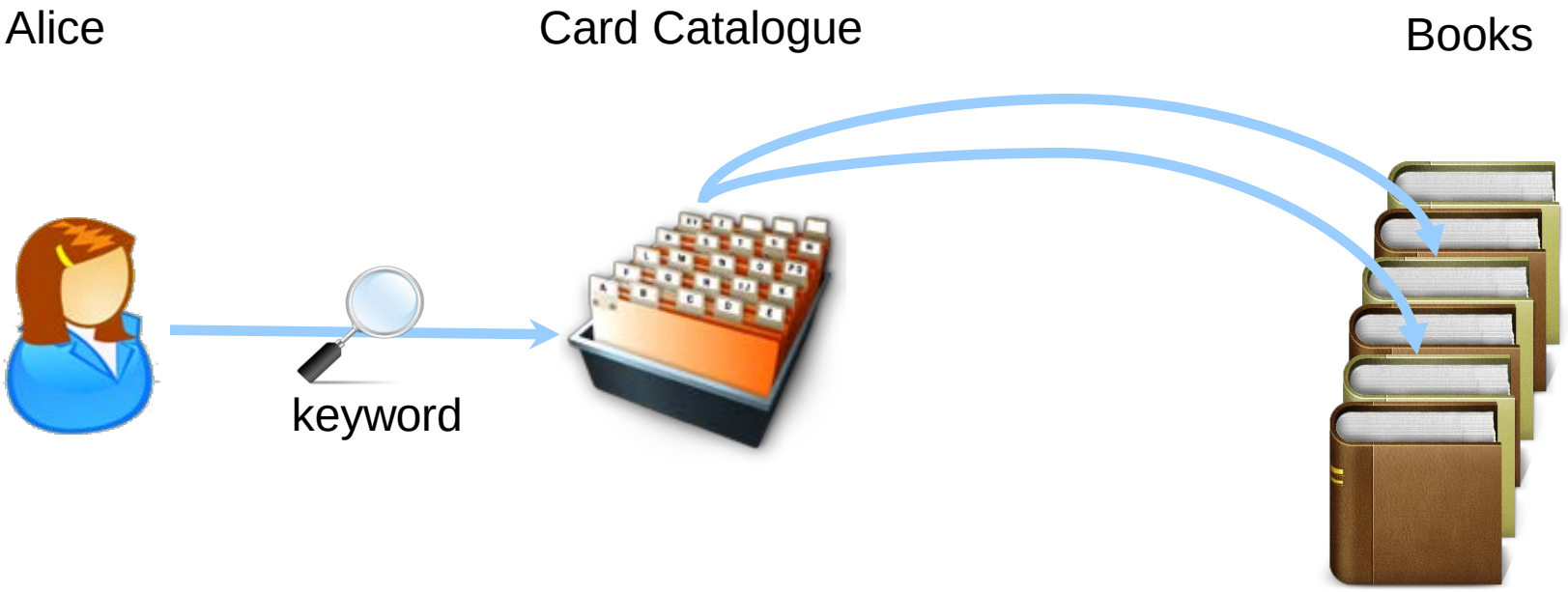
INSPIRE in your Country https://inspire.ec.europa.eu/INSPIRE-in-your-Country



Need for Metadata: Data on Data

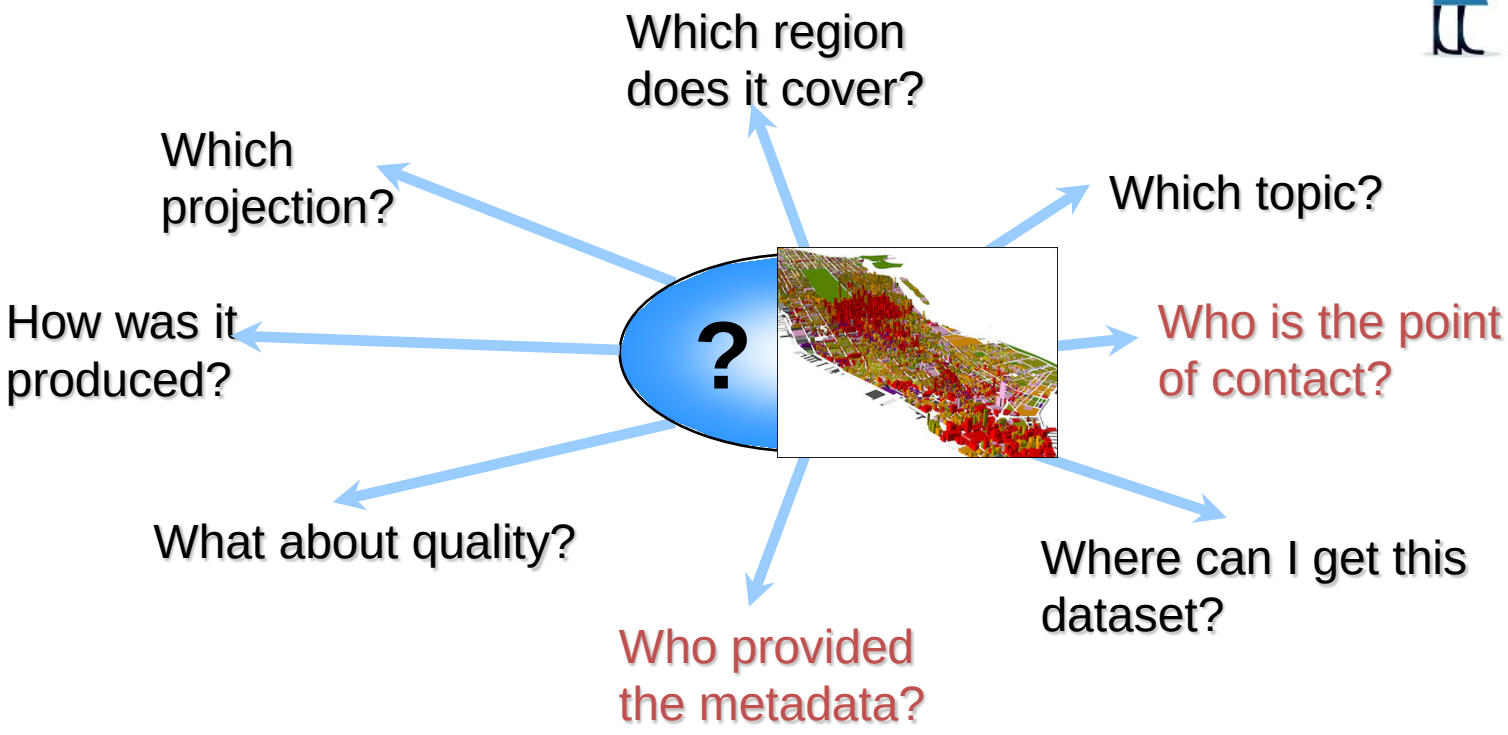
Catalogue and structure data for better searching

➔ Users can **asses the suitability** of a dataset for a particular application



Need for Metadata: Data on Data

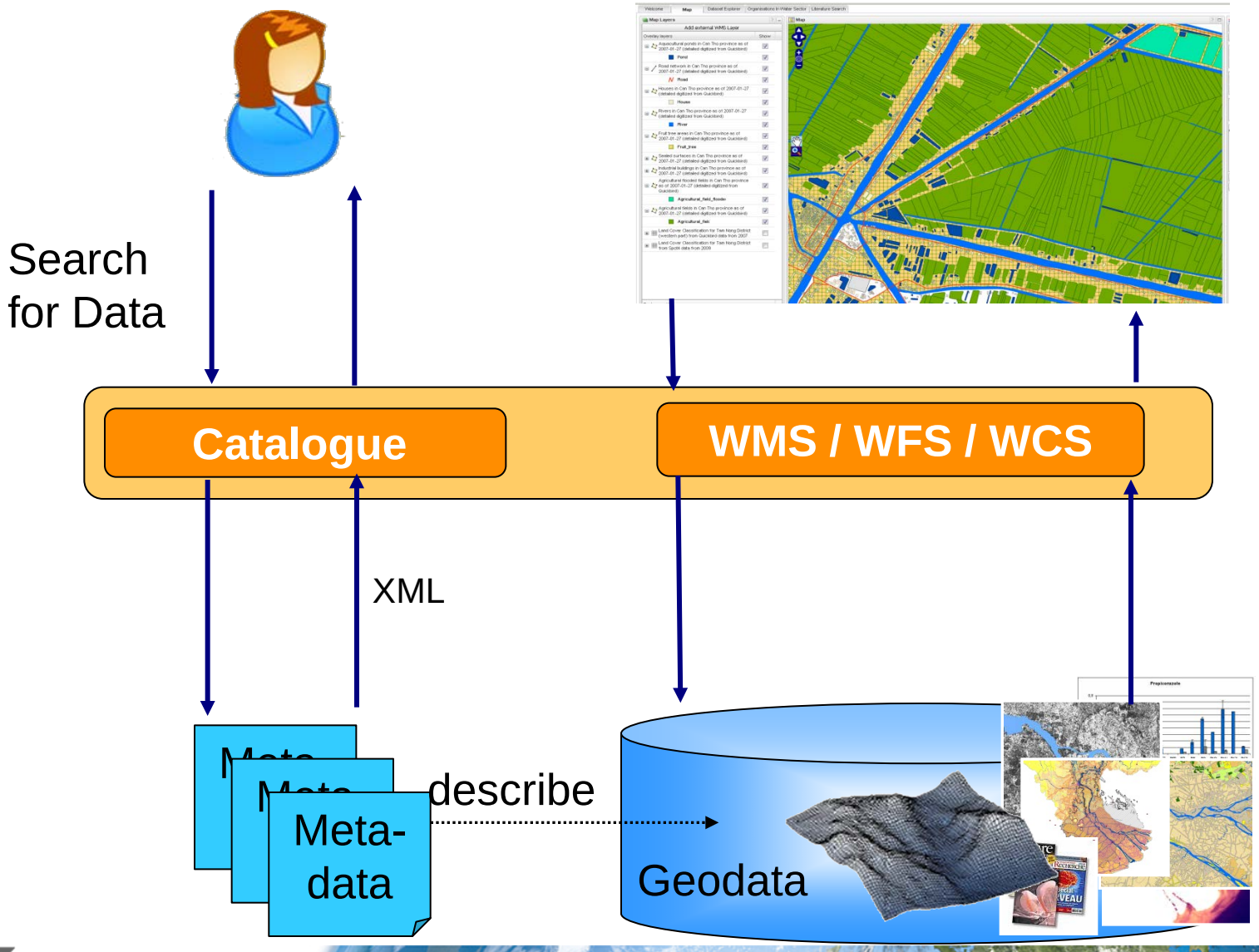
https://www.dpconline.org/images/metadata.png



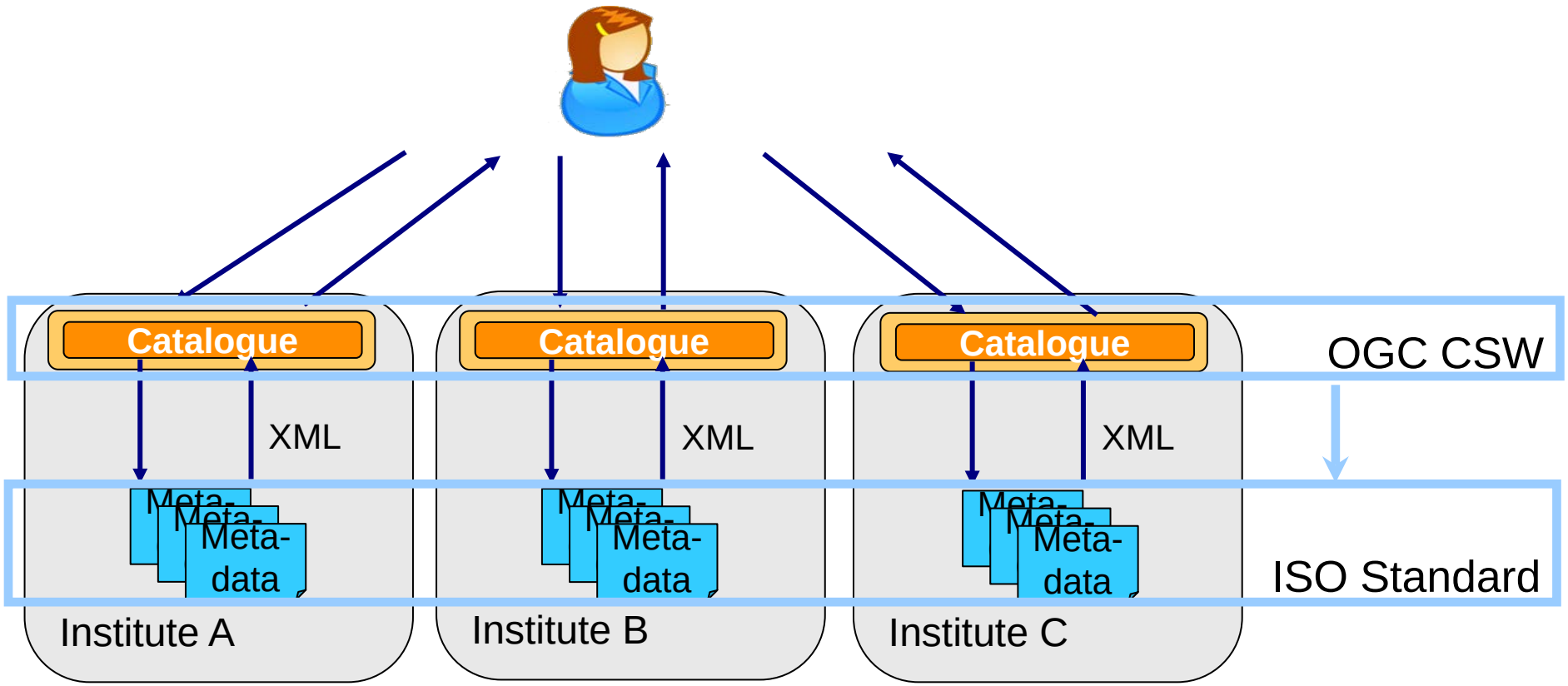
https://ocw.mit.edu/resources/res-str-001-geographic-information-system-gis-tutorial-january-iap-2016/res-str-001iap16.jpg

Metadata provide answers to these questions!

Metadata & OGC Catalogue Service for the Web (CSW)



Metadata & Catalogue Service for the Web (CSW)



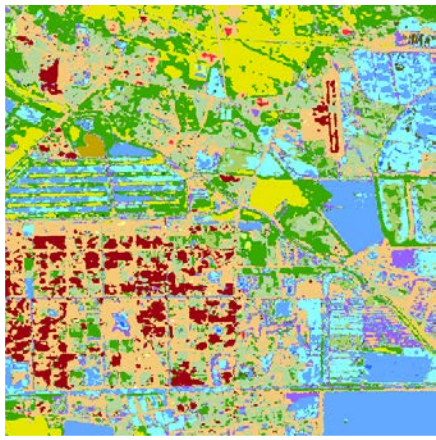
Metadata: Important ISO Standards

- ISO 19115, 19119 defines what information has to be given
  - Based on Content Standard for Digital Metadata of Federal Geografic Data Committee (FGDC), USA
  - Mandatory elements (they MUST be given)
  - Optional elements (they CAN be given)

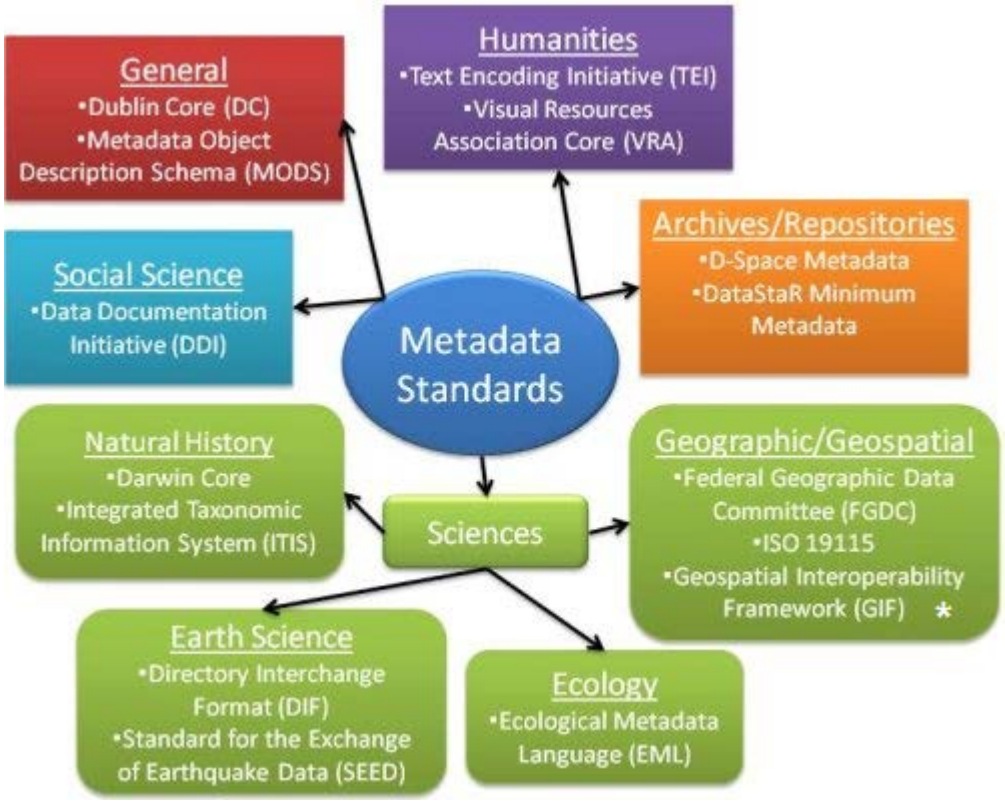
  →Definition of domain specific Profiles possible
- ISO 19139 defines how the information can be encoded in XML

Metadata: ISO Standard by Example

Title	Land Cover Classification 2010
Alternate title	Land Cover Classification for Dongying Municipality 2010
Date	2013-08-22T16:33:47 (creation)
Language	En
Abstract	
Supplemental Information	Description of Attributes 3: clouds; 1124: shrubs; 2121: bare soil; 2122: tidal flat; 2211: aquaculture; 2212: water reservoir; 2213: brine ponds; 2221:clear water;2222:sediment-rich water;2223:polluted water;11111:dry crops;11112:irrigated crops;11211:broadleaved trees;11231:saline meadow;21111:sparse built-up area;21112:dense built-up area;
Credit	German Remote Sensing Data Center (DFD) German Aerospace Center (DLR)
keywords	Land Cover, Land Cover and Landuser
keywords	China, Shandong (*place*).
keywords	Remote sensing, Land Cover Classification (*discipline*).
keywords	Remote sensing product, Landsat5 (*sensor*).



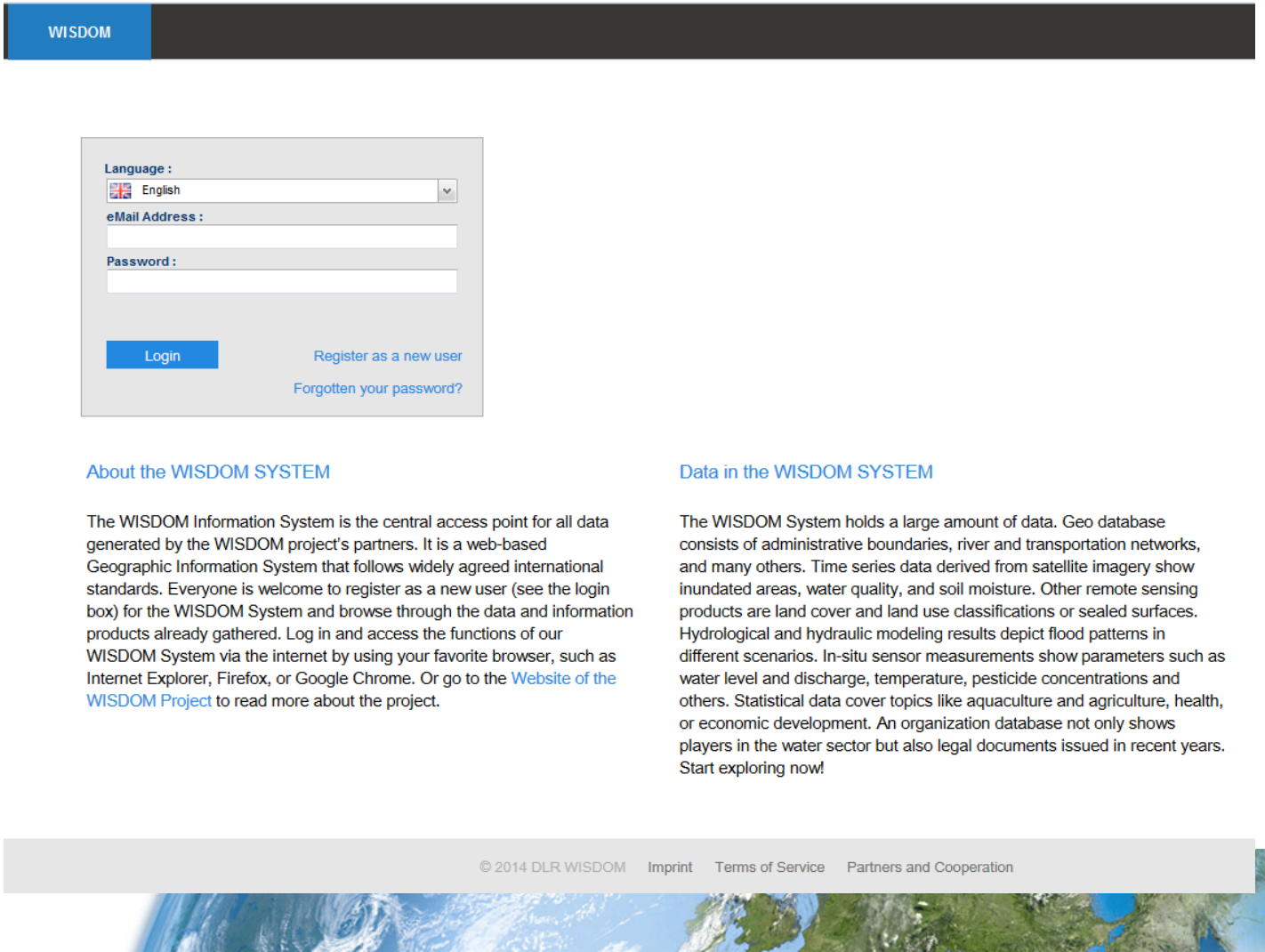
Metadata: Profiles for Different Disciplines



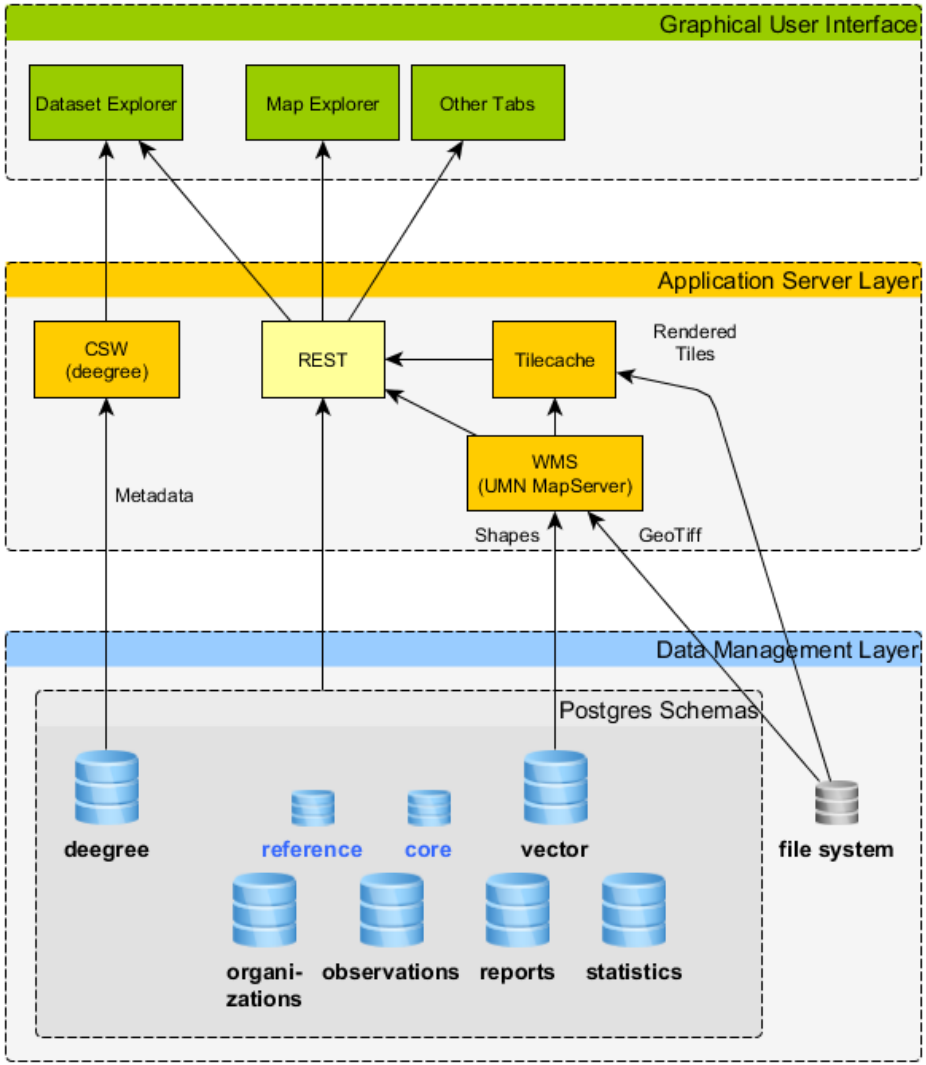
https://s3.amazonaws.com/libapps/accounts/3908/images/metadatastandards.png

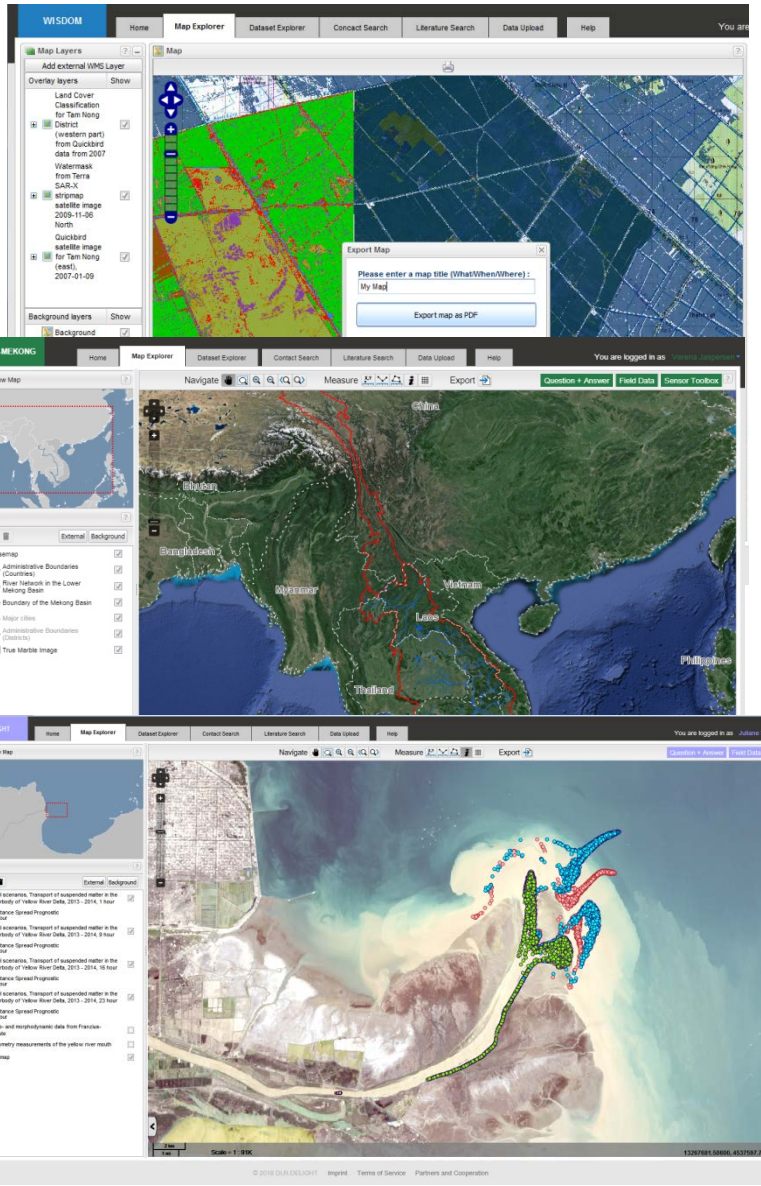
Metadata: Demo CSW

- http://wisdom.eoc.dlr.de/

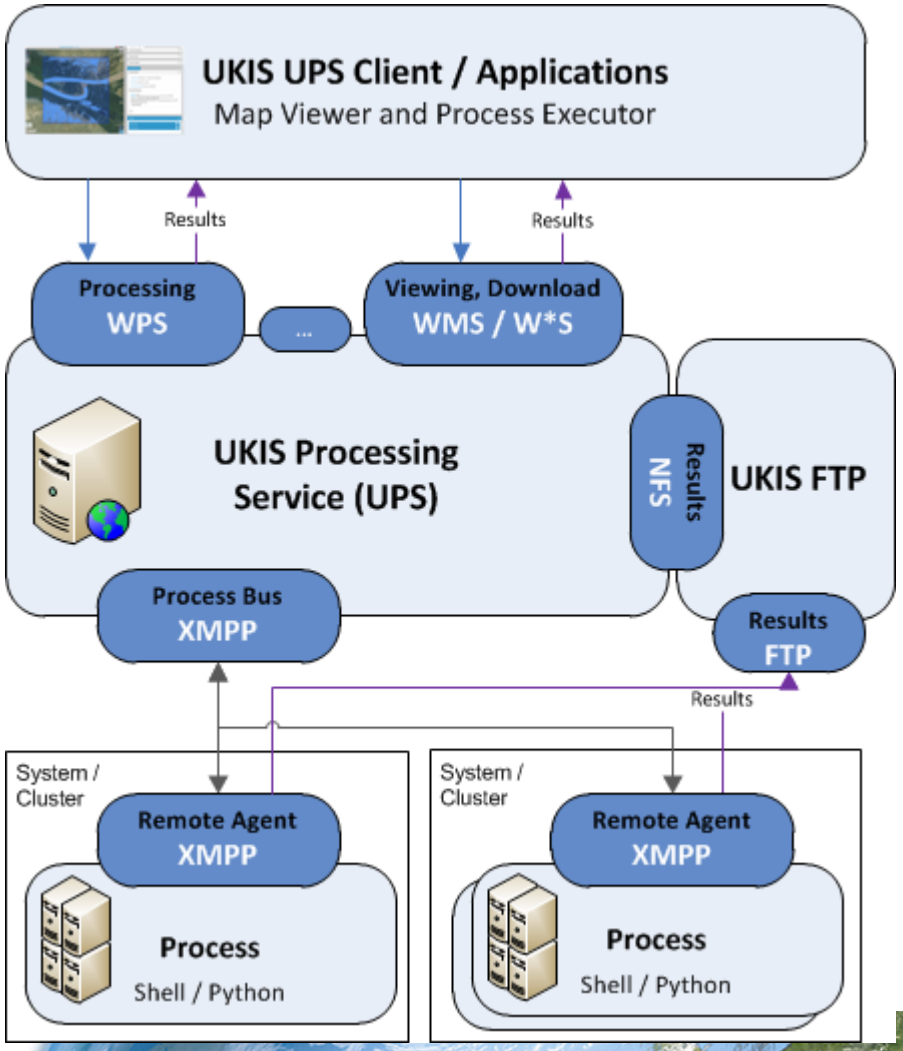


GIS Architecture: Example





GIS Architecture: Distributed Processing with WPS



Wrap Up

- What is GIS?
- GIS Software
- Standards to bring GIS towards a Geospatial Data Infrastructure (GDI)
    - OGC OWS
    - ISO and Metadata
- GIS Architecture Examples

Thanks for your attention!
Any questions?

https://i2.wp.com/www.northrivergeographic.com/wp-content/uploads/2012/07/wordle.png?ssl=1

Understanding Coordinate Systems and Map Projections

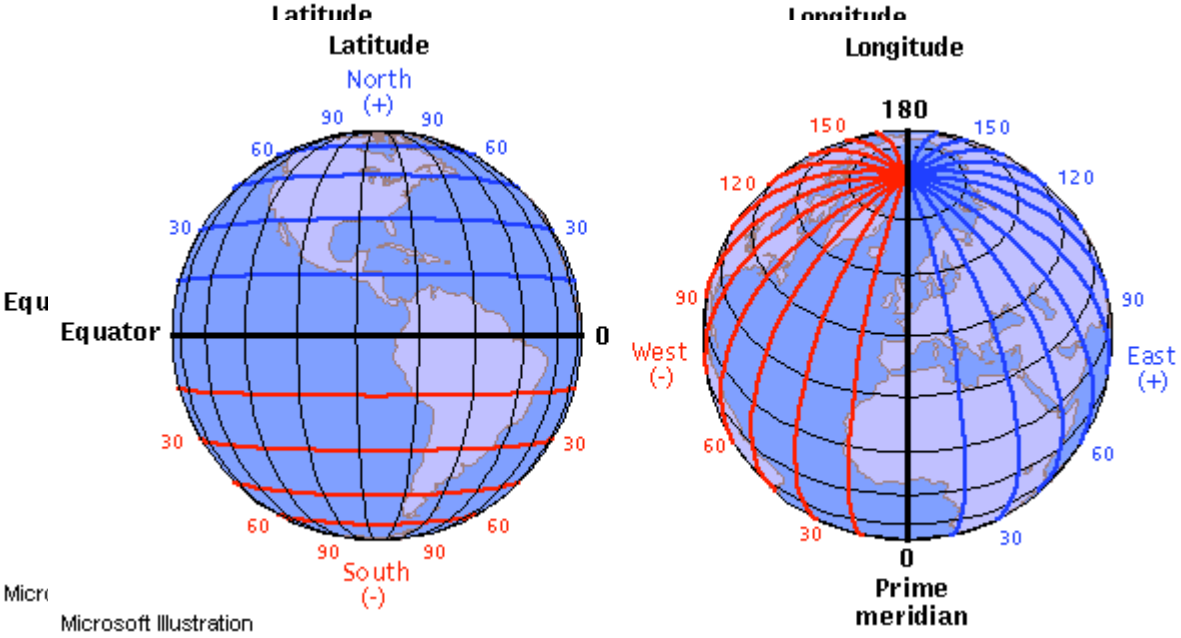
Datum

North American Datum of 1927
(NAD 27)

World Geodetic System 1984
(WGS 84)

North American Datum of 1983
(NAD 83)

3-D Coordinate Systems

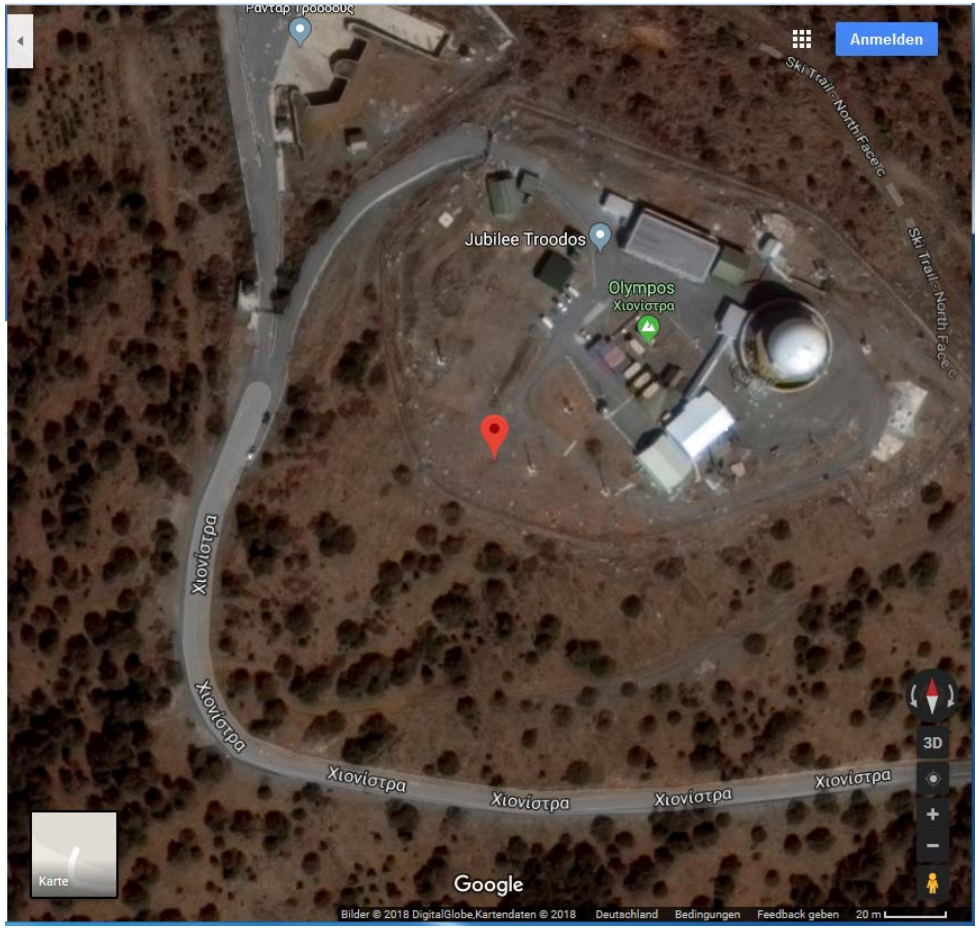


http://www.learner.org/jnorth/images/graphics/mclass/Lat_Long.gif

coordinates

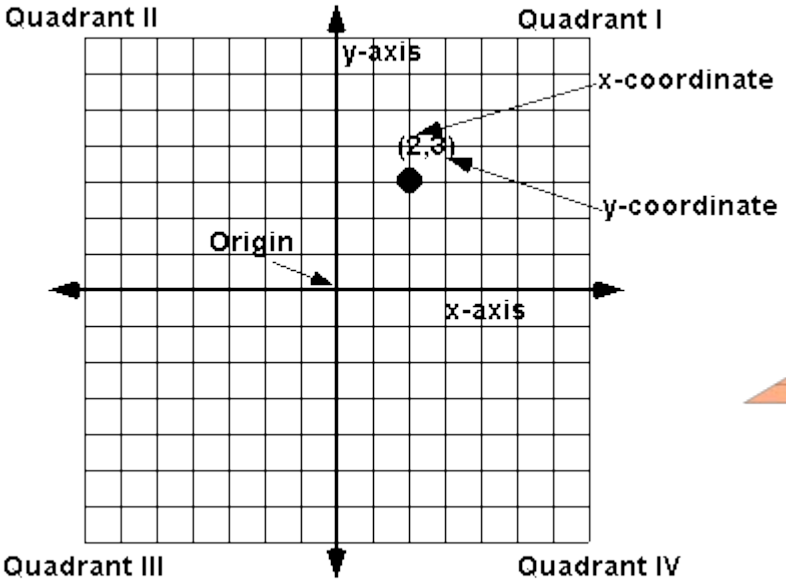
Degrees minutes secodns:
34°56‘09.8“N 32°51‘48.3“E

Decimal Degrees:
34.936044, 32.863425

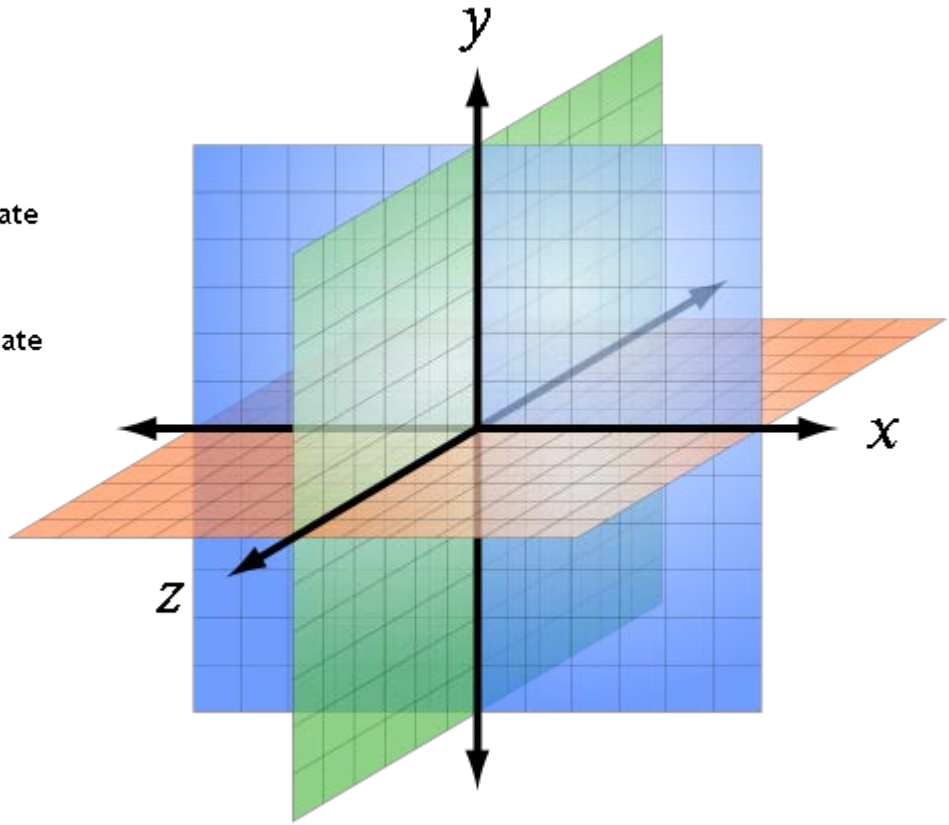


https://www.google.de/maps/place/34%C2%B056'09.8%22N+32%C2%B051'48.3%22E/@34.9360457,32.8625934,303m/data=!3m2!1e3!4b1!4m14!1m7!3m6!1s0x14de1767ca494d55:0x324c3c807fc4146e!2sZypern!3b1!8m2!3d35.126413!4d33.429859!3m5!1s0x0:0x0!7e2!8m2!3d34.9360437!4d32.8634251?dcr=0

2-D Coordinate system/ Cartesian Coordinate System



http://faculty.wlc.edu/buelow/PRC/grid2.gif

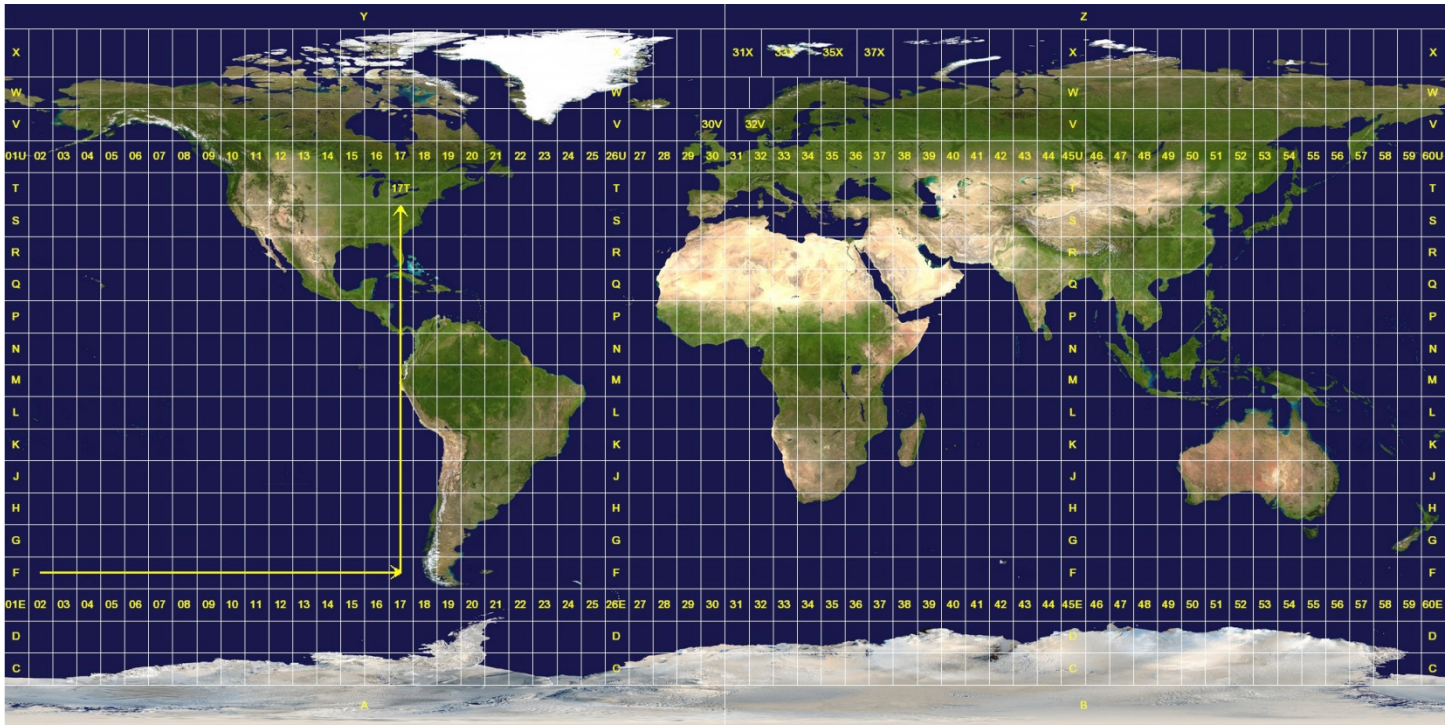


https://upload.wikimedia.org/wikipedia/commons/thumb/2/2c/3D_coordinate_system.svg/487px-3D_coordinate_system.svg.png

2-D Coordinate system/ Cartesian Coordinate System

- Universal Transverse Mercator Coordinate System (UTM)

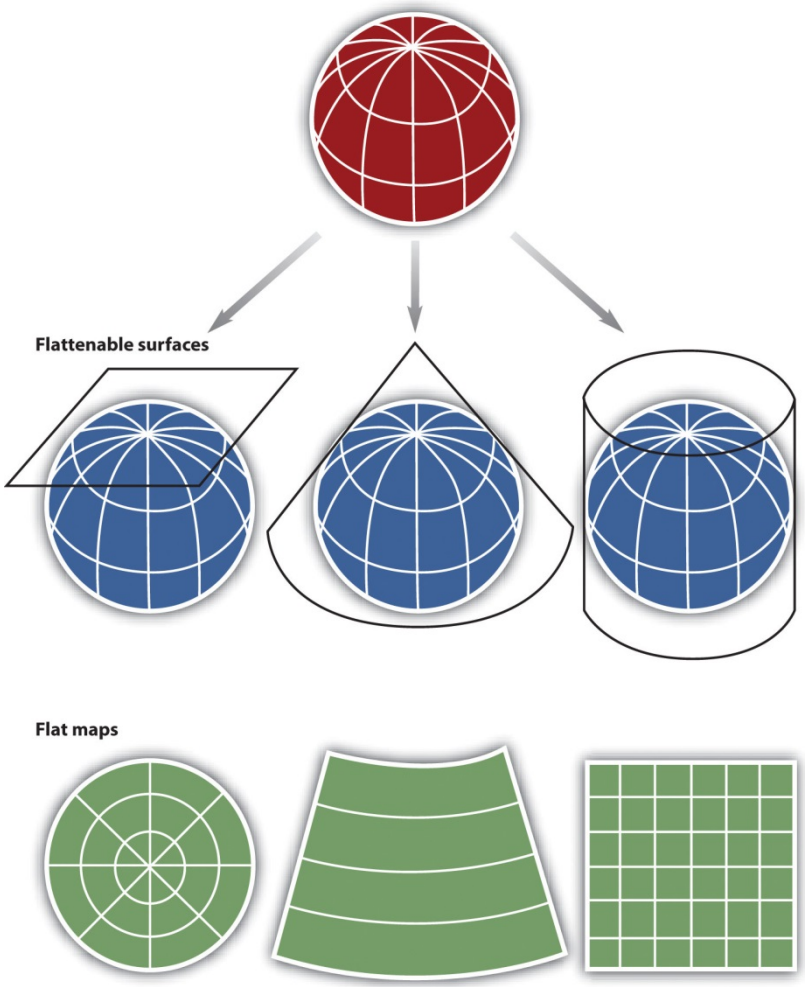
1-60 zones



https://upload.wikimedia.org/wikipedia/commons/e/ed/Utm-zones.jpg

Map projections

Concept of map projection



https://2012books.lardbucket.org/books/geographic-information-system-basics/section_06/8c5c63aacfa3743ed4962745a77d782c.jpg

Projection Properties

Major properties

area and shape

Minor properties

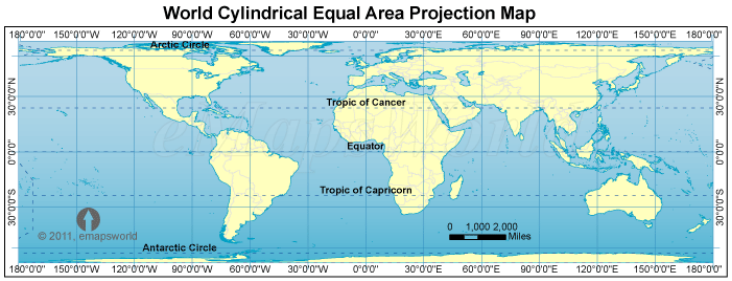
distance and direction

map distortion

True directions
True distances
True areas
True shapes

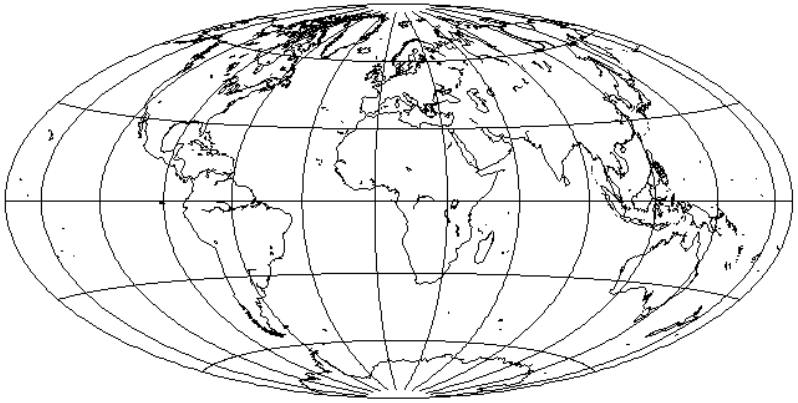
Map Projections

Equal area projections



http://www.emapsworld.com/images/world-cylindrical-equal-area-projection-map.gif

Hammer-Aitoff projection



http://www.quadibloc.com/maps/images/hammer.gif

Conformal map projection

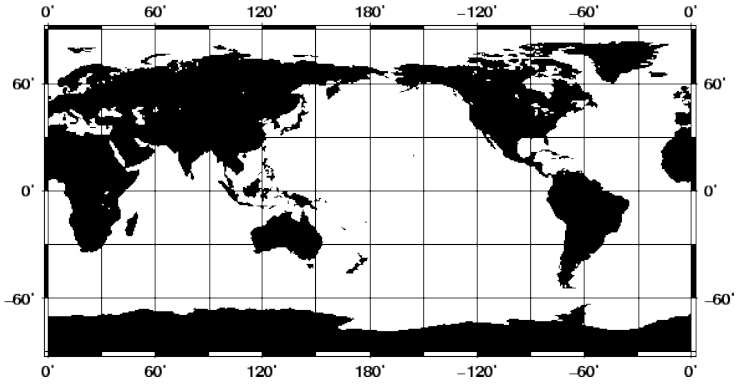
Mercator projection

https://upload.wikimedia.org/wikipedia/commons/thumb/f/f4/Mercator_projection_SW.jpg/350px-Mercator_projection_SW.jpg

Map projections

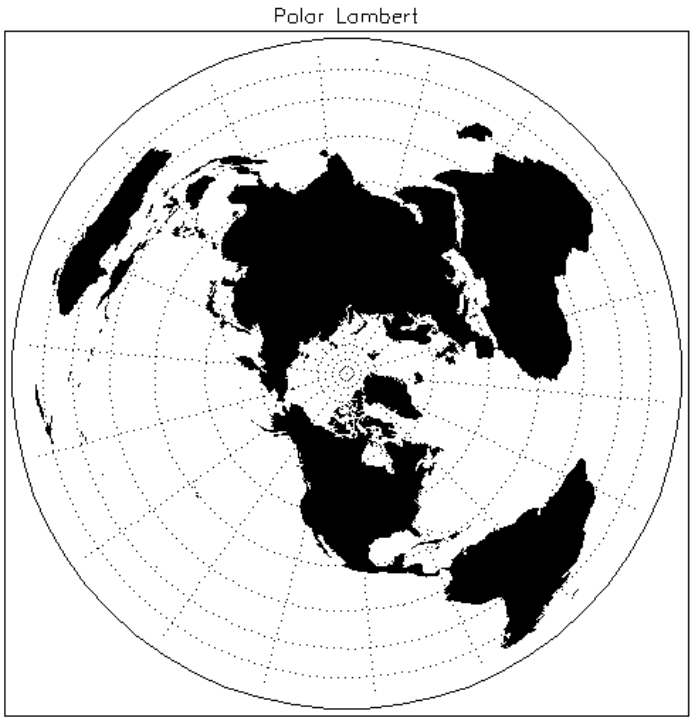
Equidistant map projections

Equidistant cylindrical map projection



http://geophysics.eas.gatech.edu/classes/Intro_GMT/gmt_www/gmt/doc/html/GMT_Docs/img147.png

Azimuthal map projection



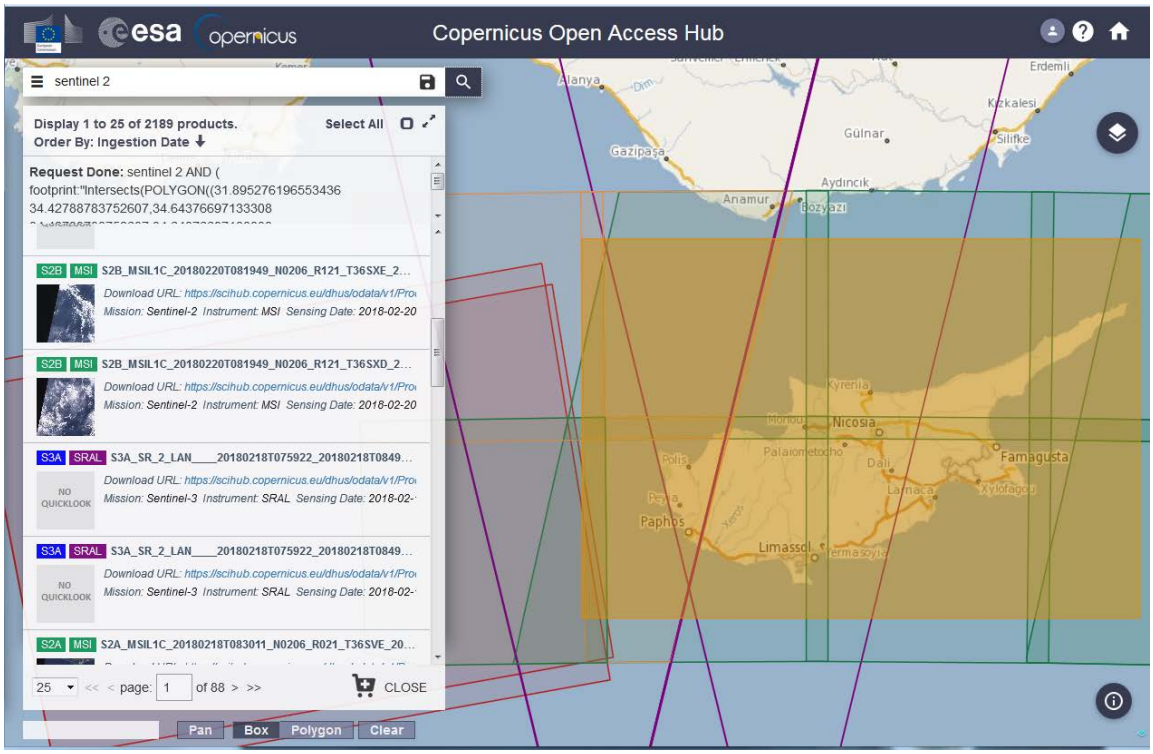
http://northstar-www.dartmouth.edu/doc/idl/html_6.2/images/maps06.gif

Combining Map projections

	Equal Area	Conformal	Equidistant	Azimuthal
Equal Area	--	No	No	Yes
Conformal	No	--	No	Yes
Equidistant	No	No	--	Yes
Azimuthal	Yes	Yes	Yes	--

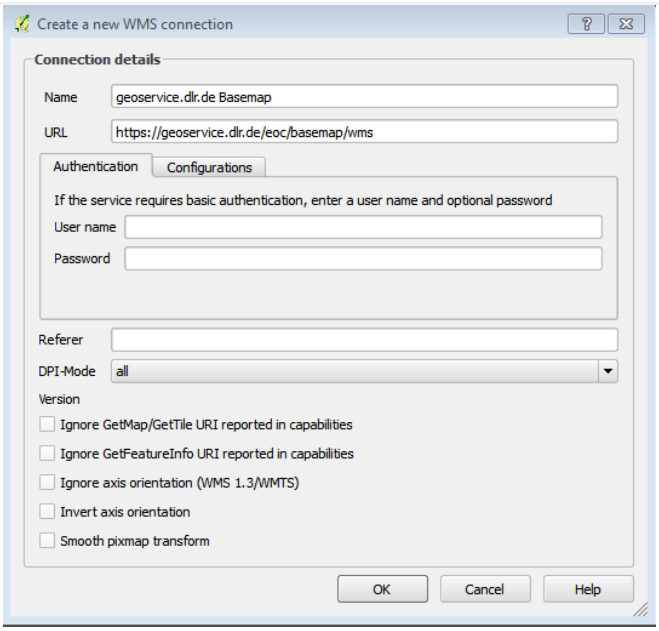
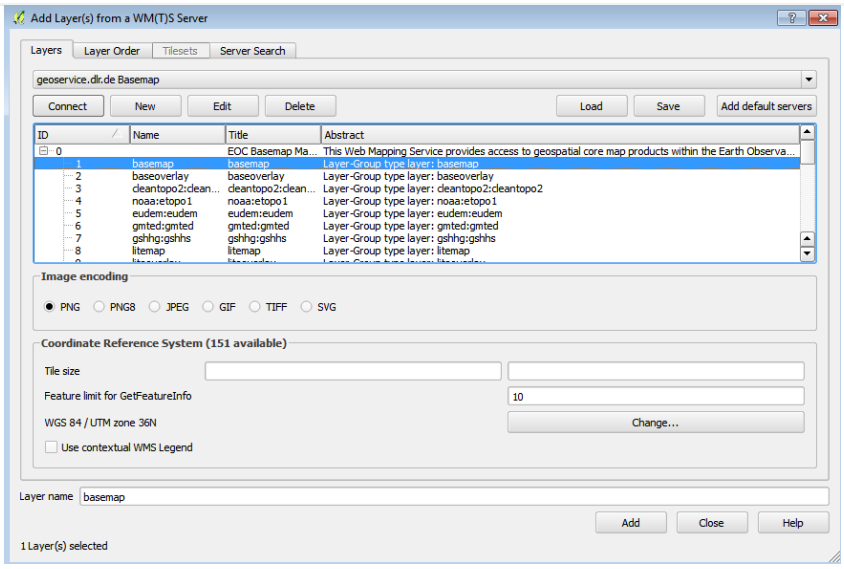
http://www.spatialquerylab.com/FOSS4GAcademy/Lectures/GST101/L3/Understanding_Coordinate_Systems_and_Map_Projections%20output/story_html5.html

	Basic Usage of QGIS	Command, software
1.	**Get Data: https://scihub.copernicus.eu**	Open hub, sign up/login,
2.	Search for data for Cyprus and download if needed (Data is rather big, so download takes some time	

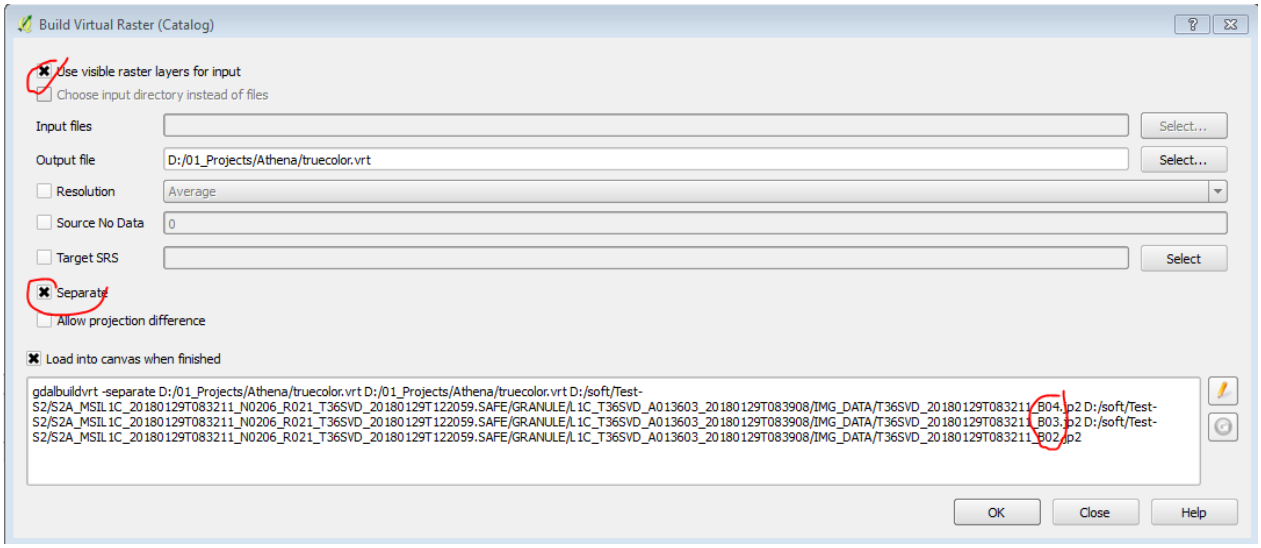


Working With QGIS: Load Different Data To Map

1.	**Open QGIS 2.18.15 and start a new Project**	Project > Project Properties > check enable '*on the fly*' CRS information coordinate reference system: WGS 84 / UTM zone 36N (EPSG:32636)
2.	Add **WMS Layer** from https://geoservice.dlr.de:	Layer > Add Layer > Add WMS/WMTS Layer

3.		Give a name URL: https://geoservice.dlr.de/eoc/basemap/wms click OK
4.		choose 1 basemap and click Add
5.	Plugins allow you to extend the functionality QGIS offers: Use Well Known Services for your Map	Plugins > Manage and Install Plugins > Open Layers Plugin, install plugin
6.	Use Services such as Bing, Google, OSM	Web > Open layers plugin: e.g. Google Maps
	Load Sentinel Data into QGIS (layer panel)	
7.	Sentinel 2 Data comes in different bands. Visual bands are 4 (red), 3 (green), 2 (blue)	Browser panel > browse the files,GRANULE, IMG_DATA,drag and drop of band 2,3,4

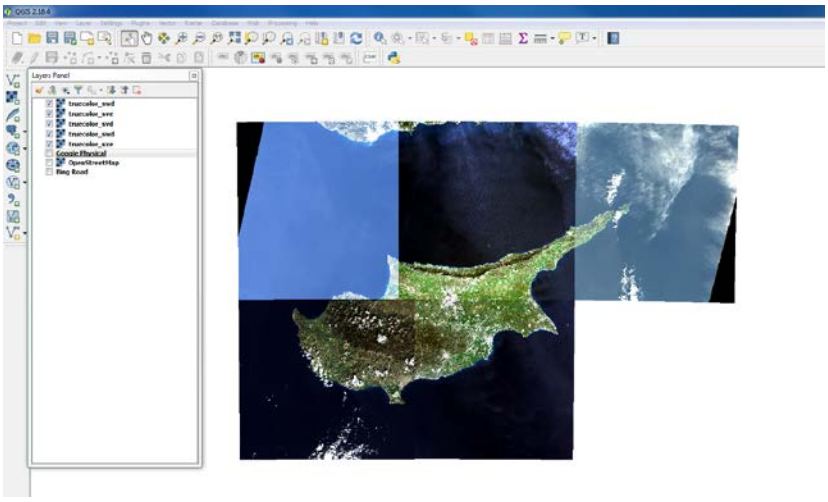
8.	Build virtual layer in QGIS to display all 3 bands in one	Raster > Miscellanous > Build Virtual Raster



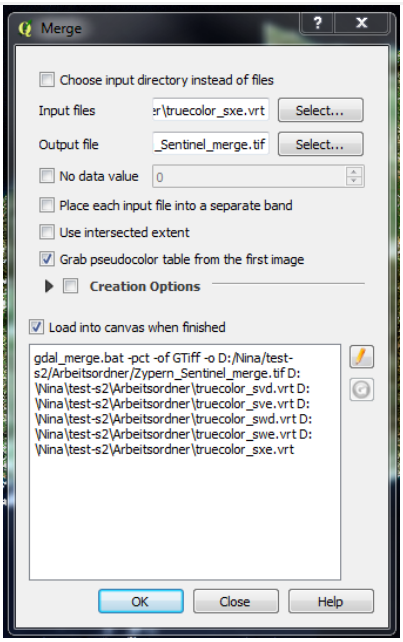
Check „separate“

Check the correct order of bands!

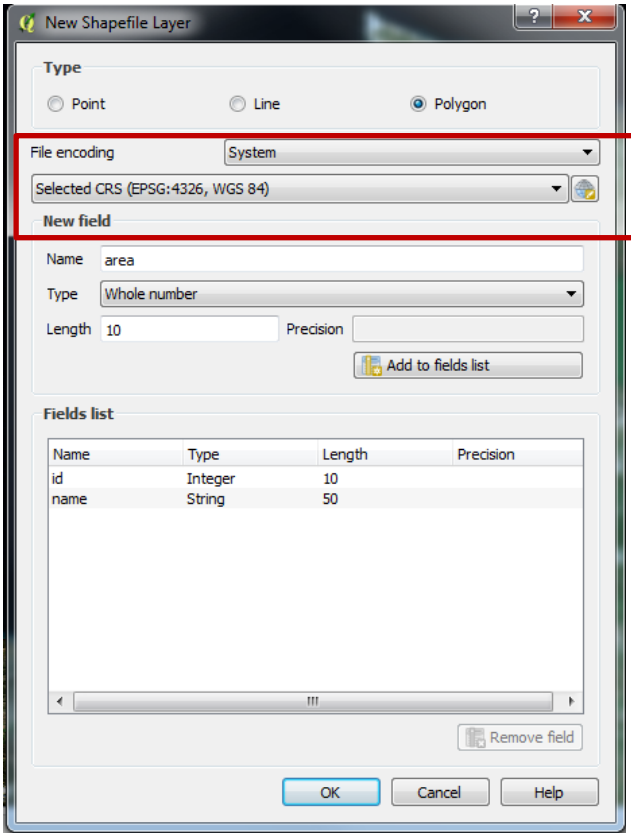
9.	Do the same for two Sentinel 2 Datasets. Between the steps, switch off the layers you already created and the bands you don't use.	

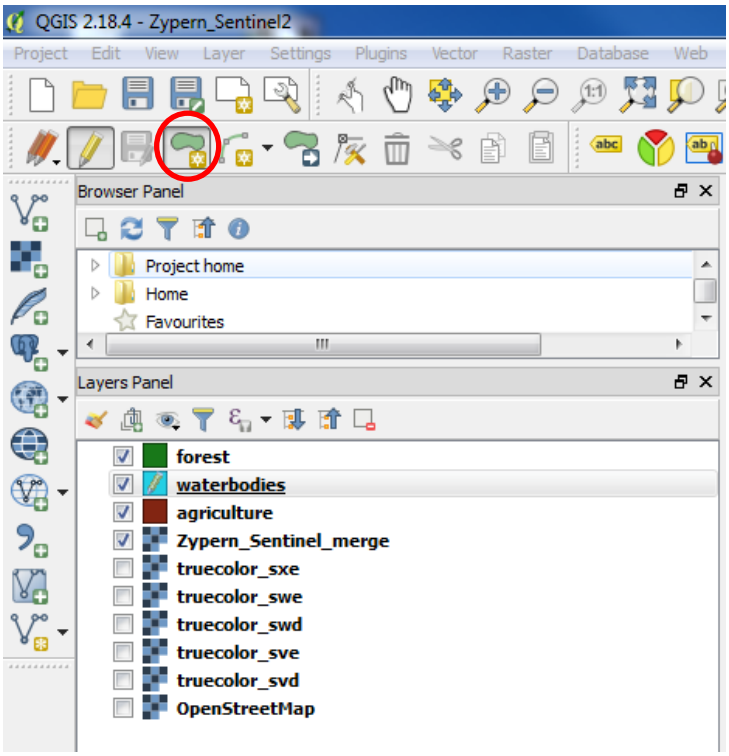


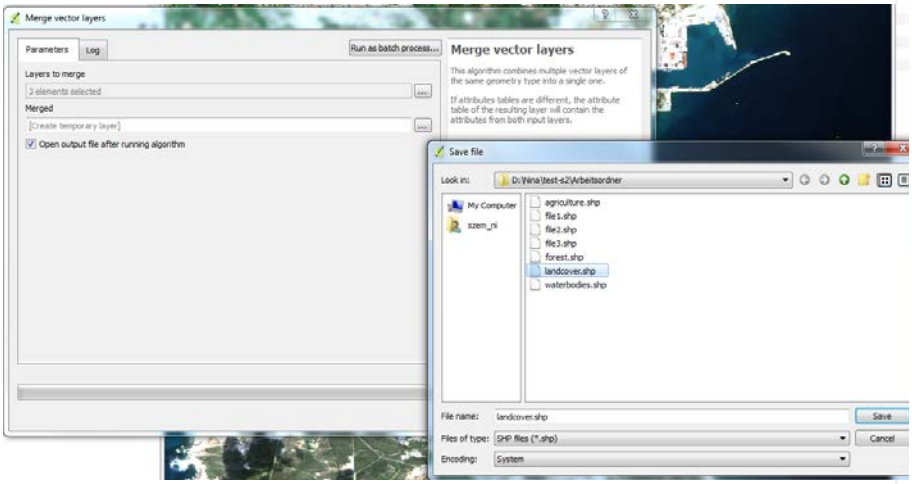
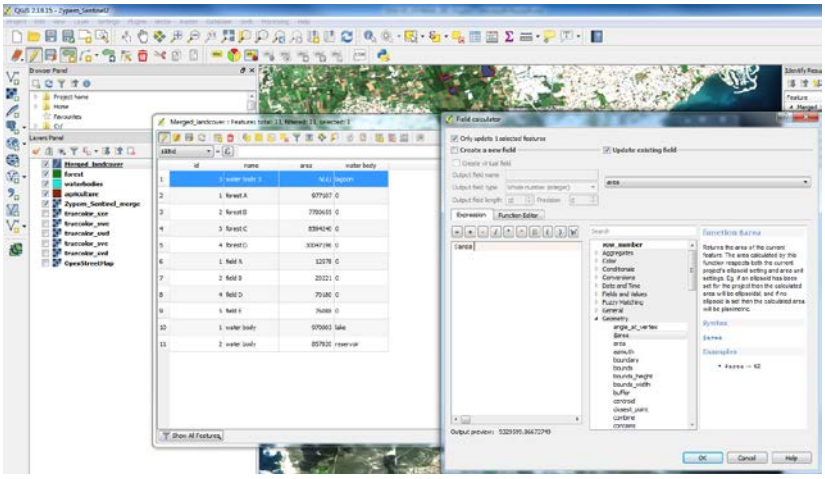
10.	Merge the two raster datasets (if you do it for all 5 datasets, it will take a lot of time)	Raster > Miscellaneous > Merge

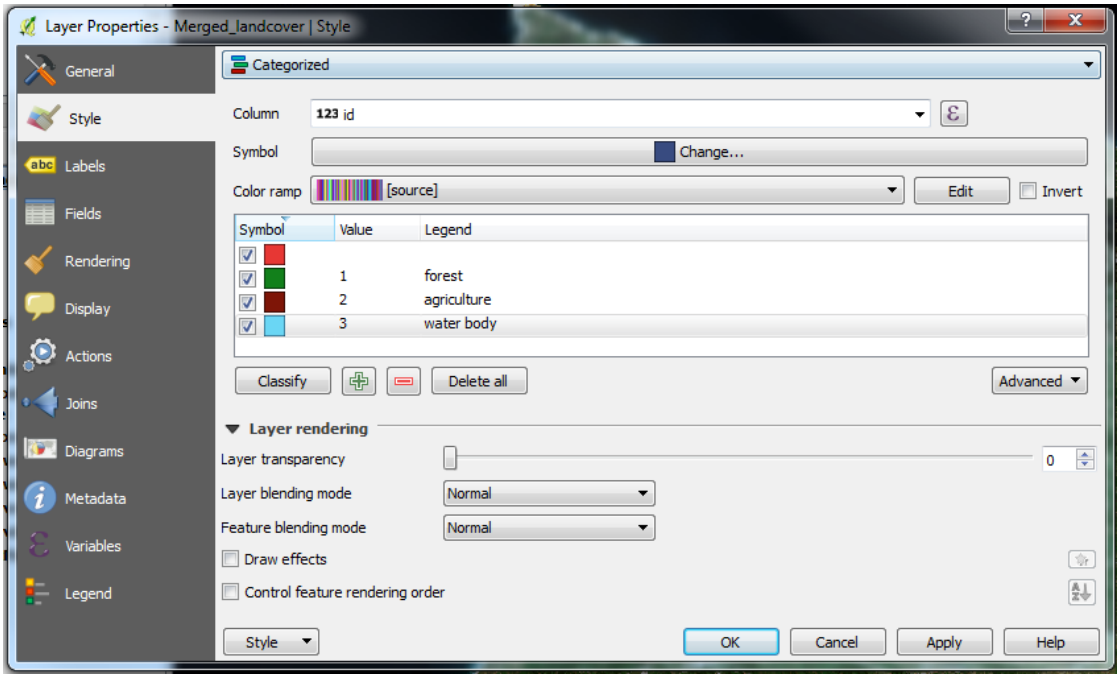


Working With QGIS: Create New Layers by Digitizing

	Create a layer with two or three different land cover or land use categories	
11.	First: Create new shapefiles (for each category one)	Layer > Create Layer > New Shapefile Layer
12.		> Polygon > WGS 84 / UTM zone 36N (EPSG:32636)

13.	**New field:** you can add many different attributes (name, area…)	
14.	Start editing the polygons	Right click at the shp., toggle editing,
15.		Add feature
16.		Clip the polygon
17.	When you finished the polygon: right click, the attributes appear (make sure that the id of each polygon of the same land cover/ land use category is the same)	insert attributes
18.	Stop editing	Right click at the layer > save layer edits. current edits, cancel for selected layer(s)
19.	**Merge shapefiles**	Vector > Data Management Tools

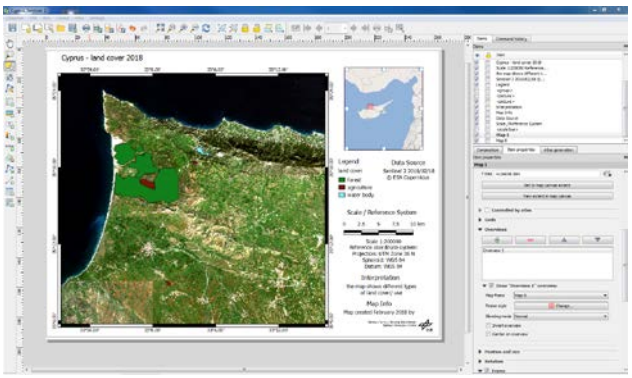
	use Version 2.18.15 (bug in version 2.18.14)	> Merge Vector Layers
20.		
21.		Browse layers to merge, save file
22.	**update existing attributes or add new ones** calculate the area with the field calculator 	Open attribute table, open field calculator
23.	Field calculator	Uncheck only update 1 selected feature, Check update existing field, row number (geometry), $area
24.		
25.	Make sure that each category gets a different color	Properties, style, categorized, column: id, classify



You can change each color/legend (double click)

Working With QGIS: Design Your Own Map

26.	**Use Composer to design your own map**	Project > new print composer
27.	composer for mapdesign; Your map from qgis desktop will be shown in the map frame; check the scale in the main properties in the item properties; you can add a second map frame which displays something different or an overview map (check the map in QGIS desktop)	Layout > Add map
28.	On the left side or layout: many different tools, e.g. scale bar, north arrow, legend, you can move your map or the map content: *select/ move item* or *move item content;*	
29.	**Legend**: in the legend items you can choose the items for your legend with + or -; you can change the **font** size of each group in the legend; **spacing:** change the space between the item groups	Layout > Add Legend
30.	**Scale bar**: make sure that the scale bar starts at 0, you can add a background color (white)	Item properties, segments, left 0
31.	Insert a **grid** (first you have to check the frame button; make sure CRS is the right one) Choose a grid type, the intervall, frame style, Draw cordinates, chosse format	Grids +,
32.	Insert an **image**; choose one of the existing images (arrow) or add a new one by searching directorie	Layout > Add image

33.	**Overview**: Besides the main map, add a smaller Map that will be configured to be the overview map.	Add Map > Overview +, choose the main Map (map 0) as map frame
		
34.	Export	Composer > Export as
35.	More Information found here: ⇨ http://www.qgistutorials.com/en/docs/making_a_map.html ⇨ https://docs.qgis.org/2.18/en/docs/training_manual/map_composer/map_composer.html	