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Project acronym: ATHENA				
Work Package WP4				
Deliverable	D4.6 Material from 3 <sup>rd</sup> workshop			



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Author(s):	Diofantos G. Hadjimitsis, Andreas Christofe, Athos Agapiou, Vasiliki Lysandrou		
Contributor(s):	Verena Jaspersen, Gunter Scl	nreier	
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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 3 <sup>rd</sup> workshop							
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#### 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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#### 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).

D4.6- Material from 3<sup>rd</sup> Workshop

## 2. Agenda of the workshop

(			Sixth Inter	national Conferer	ice on Remote Sen: Confer	sing and Geoinfori ence Program	nation of Environ	ment - RSCy2018			
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Day Time		Monday 26/3/2018			Tuesday 27/3/2017			Nednesday 28/3/2017		Thursday	29/3/2017
8:00 - 17:00		Registration ARION BAR Right Si	ą	RION	egistration BAR Right Side		RION	egistration BAR Right Side		Registratio ARION BAR Righ	n t Side
		Opening Ceremony			Parallel Sessions			Parallel Sessions		Parallel	Sessions
00-11-00-6		9:15 - 10:30 Aphrodite Hall					Enrart	Ţ	GIS Applications		
		Keynote Speakers GEO - Barbara Ryar ESA - Rosemarie Leor		Coper	vicus Infosession phrodite Hall	Remote Sensing Adonis Room	Aphrodite Hall	Coastal Adonis Room	on Marine Spatial Planning (in Greek) Zeus Room	Natural Hazards Aphrodite Hall	uavs Adonis Room
11:00 - 11:30		Aphrodite Hall		Coffee	Break - Poster present	ations	Coffee I	Break - Poster presen	tations	Coffee Break - Po	oster presentations
	Coffe	e Break - 11:50 - 12:20 A	ARION BAR		Parallel Sessions			Parallel Sessions		Parallel	Sessions
11:30 - 13:00	<u>S</u> D	Keynote Speakers: PERNICUS - Stefano La T NASA - Vincent Ambro: (CELSIOR - Diofantos Hat Aphrodite Hall	erra Bella sia djimitsis	Coper	nicus Infosession phrodite Hall	Remote Sensing Adonis Room	Forest Aphrodite Hall	Coastal Adonis Room	Cultural Heritage Workshop Zeus Room	Geology Aphrodite Hall	Agriculture Adonis Room
13:00 - 14:30		Lunch Pantheon Restau	urant	2	nch Pantheon Restaura	ut	č	anized Trin with Lun	-	Closing	Ceremony
					Parallel Sessions		Archaeological F	ark and Agios Neoph	ytos Monastery	Dest paper, u Aphro	est poster award dite Hall
14:30 - 16:00	Resea Op Intera	rch, Educational and Ent portunities in Earth Obse ctive Networking and Co EXCELSIOR Worksho Aphrodite Hall	repreneurial ervation: Illaboration op	Copernicus Infosession Aphrodite Hall	<b>GIS</b> Zeus Room	Remote Sensing Adonis Room		A A		Sponsors:	DEC
16:00 - 16:30	Col	ffee Break - Poster prese	ntations	Coffee	Break - Poster present:	ations				Sunnortare.	
		Parallel Sessions			Parallel Sessions				on the second		-
16:30 - 19:00	SEO-DWARF WORKSHOP Aphrodite Hall	Atmospheric Adonis Room	Information Extraction from Laser Scanning Data Workshop Zeus Room	Copernicus Infosession Aphrodite Hall	ATHENA GIS Workshop Fundamentals of GIS - QGIS Zeus Room	Land Cover & Urban Areas Adonis Room	E				RECURS OPERACIONA RECIFIECO
19:00 - 20:00		Free			Free			Free			E DETAL SMALL
20:00					Social Dinner						

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		Tuesday 27 March, 2018	8
08:0	0-17:00	REGISTRATI	ON
27/3 95	00-11:00 ID	COPERNICUS INFOSESSION THE	Boose: Askendita Hall
		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 case 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
	0	Title	Authors
	477	Remote Sensing Data Fusion to Detect Illicit Crops and Unauthorized Ainstrips	J. A. Pena, T. Yumin & J. A. Garcia
	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	G. Anis
		Ecosystems at Wide Scales	A Receive advantage & Allahood T Perlanda & Taken M Makeur & Anaphol B
	DK.D	Unveiling Cyprus wetlands: A Combination of Kemote Sensing and Held Validation Techniques	A. Papatheodolidu, K. Michael, I. Limittade, S. 20104, M. Victora, K. Anastasi e. 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
11:0	0-11:30	COFFEE BREAK - POSTER I	RESENTATIONS
	10	Title	Authors
		Overview of Copernicus Services	
		Copernicus Land Monitoring Service (CLMS)	CLMS (GAF, DC Contractor)
		Copernicus Marine Environment Monitoring Service (CMEMS)	CMEMS (Noveltis, EC Contractor)
		Monitoring Natura 2000	GAF, DC Contractor
		Coastal Marine pollution	Planetek Hellas, EC Contractor
27/3 11	1:30 - 13:00	REMOTE SENSING	Chair: C. Rogass Room: Adonis Room
	0	Title	Authors
		manual maging spectroscopy in the cash avery as not not decision reppindents	La regent y r. Roeneng, L. Hiteley, A. Renau, H. Daerigs ing it b. Hober
	635	Uthological and Lineament Mapping Using Landsat 8 OU and ASTER Multispectral Data in Imini-sunlia District South High Atlas of Marrakech	Z. Ourhalf, A. Algouti & A. Algouti
	561	Revisiting the Validity of Brask's Equation on Altitudinal Temperature Lapse Rate Using Thermal-Infrared Bands of Landast B	D. Suyamto, L.D. Prasetyo & Y. Setiawan
	583	Rapeseed Crops Flowering Duration Estimation by RGB images Acquired With Consumer Drone: A Tool for Ground-Truthing	D. Ganeva
566		Remote Sensing Measurements in Creating Thematic Spectral Library	D. Borisova, D. Petkov, R. Nedkov, H. Nikolov, V. Dimitrov, M. Metodieva & D. Avetinan
13:0	0-54:30	LUNOI	
27/3 14:00-16:00		COPERNICUS INFOSESSION	Room: Aphrodite Hall
	D	TIBO	Authors
		Local Use Cases (section in Greek) - 2 or 3 presentations	
		Local Use Cases (session in Greek) - 2 or 3 presentations Examples of Land-related Applications	
		Local Use Cases (usuion in Greek) - 3 or 3 presentations Examples of Land-related Applications Elimate Change and the Agricultural Sector	Telespatio Vega, DC Contractor
		Local Use Cases (section in Greek) - 2 or 3 presentations Examples of Land-related Applications Elimate Change and the Agricultural Sector Assessment of Solar Resources for Screening Potential Stess Lond Crear Monitories Reads on Section 2 data	Telespario Vega, DC Contractor Finalis Meteorological Institute, DC Contractor PDDI FILIODE Contractor
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27/3 14	:30-16:00	Local Use Cases (used on In Greek) - 2 or 3 persentations Camples of Land-related Applications Climate Change and the Agricultural Sector Assessment of Solar Jessarces of the Servening Peterstial Stee And Gaver Monitoring Based on Section-2 data Copernicus Early Warning Service: Forecasting Fires Incodes Services	Telespario Vega, DC Contractor Renish Meteorological Institute, DC Contractor DDGB, DURNGB, DC Contractor e-46DS, EC Contractor e-46DS, EC Contractor Chair; F. Remontino Room: Adonts Room
27/3 14	:30-16:00 ID	Local Use Cases (section in Greek) -2 or 3 persentations Camples of Land-related Applications Climate Change and the Agricultural Sector Assessment of Solar Resources for Screening Potential Sites Land Cover Monitoring Based on Section-2 data Copernicus Early Warning Service: Forecasting Fires Services Sections Tele Commission of Different Datasets for the Back Manches of Natural Usersols	Telespario Wags, EC Contractor Pinelah Meta-onological Institute, EC Contractor EGGI, EURORA, EC Contractor 4-6055, EC Contractor Chair, E, Bemondhoo Authors J Tanchi M, Allonca, E, Bernandho J Kalisaharan E, B. Statilain
27/3 34	-36-16:00 ID 565 598	Local Use Cases (section in Greek) -2 or 3 presentations Examples of Land-related Applications Elimate Change and the Agricultural Sector Assessment of Solar Resources for Screening Potential Sites Land Cover Monitoring Eased on Section-12 data Copernicus Early Warning Services Forecasting Fires BERNING Screening A Comparison of Different Datasets for the Rapid Mapping of Natural Hazards Assessment of Termetrial OI Sell Dynamics, Using an Integrated Approach of Field Eased,	Telespasio Vega, EC Contractor Telespasio Vega, EC Contractor DEOG, UBIOG, EC Contractor DEOG, UBIOG, EC Contractor Caling F, Bencondino Authors L. Toschi, M. Allocca, F, Remondino, T. Kellenberger & A. Stellein M. Obgio, J. Kasuk, C. Ianvis B. A. Ogschukwa
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27/3 16:30 - 19:00	ATHENIA GES Workshop Fundamentals of GES -QGES	Chair: Verena Jasperson	Room: Zeus Room



#### **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.



#### List of participants

A/A	NAME	INSTITUTION	CONTACT DETAILS	SIGNATURE
1	Skevi Perdikou	Geofen Ltd	skevi.perdikou@ geofem.com	Q.
2	ATHAWASIOS NTANTOS	DATIONAL GUARD	dmx_tgty@ uptonet.you	He
3	Christodoulou Andrew.	cyprist Noitrand Guard.	dmx_tyty@ytanet.gov.	Mult
4	Aspara Creorgiades	Department of Antiquities	aspasia georgiades	84
5	Andreas Christofe	CUT	Andreas, Christofe@	Am

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9	Uichalakis Christoforov	CUT	m. christofora Q cct. al. cy	the
10	Athina Silvestrou	Cyprus University of Technology	a thena.s; luestice @ gmoil.com	Adestra
11	Michaella KonazZia	OF TECHNOLOGY	mg. Kanatzia@edu. cut.ac.cy	AD
12	Andreas Avraam	Gyprus university of Technology	ang.avraam@edu.cut.c	u.cy atac
13	SOINOS AILGOBEROD	CYPHUS UNIVERSILY of Technology	Souros aristodenos @Lutroil.com	2-0-
14	Angelos Kakouris	>>	angelos- Kakounis @hotmail.com	4
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17	MILTO MILTIADOU	CUT	miltomiltiadou partas
18	KYRIAKI FOTIOU	CUT	kyriacia totiou@gnail.com
19	Hapiva Tekpin	CUT	worinapetrin Domail.cay
20	CHEN WANG	JHI	chen warg@ Hutton, a. UK 3/80
21	Alexey Noskov	Heidelberg University	aph-hov.com An
22	DIULANTUS HORIMITUS	CUT	a hudgimioup
23	Christiana Papoutse	an	autaciay Xianon
24	Marios Tzouvaria	C07	Cutaria MElle
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### 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













### ANNEX

PRESENTATIONS OF THE WORKSHOP



## **Geo Information Systems (GIS)**

## Fundamentals, Usage, Standards and Examples

Verena Jaspersen





## **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



# 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=4Yg61PzlSQCTViw simGQrRk4y4QdwPlN57fquJjk

## **Thinking about Space**

### Absolute space



https://onmaps.de/files/onmaps/news/TK25/tk25\_20000.png

## Topological space

## Cognitive space



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



http://www.beruehrungspunkte.de/wpcontent/uploads/2011/05/Bildschirmfoto-2015-02-24-um-14.15.12.png



## **Thinking about Location**

### absolute location



nominal location

9/11

https://thumbs-prod.si-

cdn.com/0rQSHAWkucV1O0dmyJVN8Ml0sS4=/800x600/filters:no\_upscal e()/https://public-media.smithsonianmag.com/filer/5c/ea/5cea567c-050b-432a-834f-fc94dcb1b49e/coordinates.jpg

### relative location

South of Turkey



North of Egypt

### cognitive location



http://mediacdn.sueddeutsche.de/image/sz.1.1108264/920x 613?cropRatios=0:0-BiGawww&cropRatios=3:2&cropRatios=2:3&method= resize&v=1355628030 http://www.eisbachwelle.de/wpcontent/uploads/2012/04/Flosslaende-Munchen-Surfen-2012.jpg



## **Thinking about Distance**





## **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**

Attributes of Recent Earthquakes									
Object ID	Earthquake Date	Depth	Earthquake ID	Latitude	Longitude	Magnitude	I		
52263583	12/15/2011	9.4	60291161	19.3043	-155.2217	2.8	¢		
52263587	12/15/2011	2.9	60291156	19.3808	-155.282	2.5	£		
52263599	12/15/2011	60.9	c0007727	13.0353	-88.6686	4.9	i.		
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http://doc.arcgis.com/de/maps-for-sharepoint/arcgis-map-web-part/GUID-AF491B84-B33B-4CFD-8929-88D4E53D2F45-web.png

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Cities Continent World							
OBJECTID	POP_RANK 🔺	CITY_NAME	POP				
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451	1	Bogota	7102602				
1104	1	Cairo	7734614				
85	1	Lima	7737002				

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



## **Storing descriptive Information**





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)



Line features



# **Raster Data**

## **Formats**

- Geo TIFF
- IMG (Erdas Imagine
- **JPEG2000** ۲
- netCDF-CF



Polygon features



Raster polygon features



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

# **Application of GIS**






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**



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



# **Open Geospatial Consortium**



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





https://image.slidesharecdn.com/percivallogcandispl s-140515081119-phpapp02/95/ogc-standardsrelevant-to-isprs-5-638.jpg?cb=1400141755

#### OGC User Community





### **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



https://www.spar3d.com/wpcontent/uploads/2014/12/OGC\_LOGO\_real.jpg





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

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

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

. . .

Formats

# **OGC Web Services: Communication Pattern**



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### **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/



#### Latest News and Announcement



#### **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





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 ( <i>place</i> ).			
keywords	Remote sensing, Land Cover Classification ( <i>discipline</i> ).			
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/



#### About the WISDOM SYSTEM

The WISDOM Information System is the central access point for all data generated by the WISDOM project's partners. It is a web-based Geographic Information System that follows widely agreed international standards. Everyone is welcome to register as a new user (see the login box) for the WISDOM System and browse through the data and information products already gathered. Log in and access the functions of our WISDOM System via the internet by using your favorite browser, such as Internet Explorer, Firefox, or Google Chrome. Or go to the Website of the WISDOM Project to read more about the project.

#### Data in the WISDOM SYSTEM

The WISDOM System holds a large amount of data. Geo database consists of administrative boundaries, river and transportation networks, and many others. Time series data derived from satellite imagery show inundated areas, water quality, and soil moisture. Other remote sensing products are land cover and land use classifications or sealed surfaces. Hydrological and hydraulic modeling results depict flood patterns in different scenarios. In-situ sensor measurements show parameters such as water level and discharge, temperature, pesticide concentrations and others. Statistical data cover topics like aquaculture and agriculture, health, or economic development. An organization database not only shows players in the water sector but also legal documents issued in recent years. Start exploring now!



# **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





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

# Understanding Coordinate Systems and Map Projections

### <u>Datum</u>

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!1s0x14de1767ca494d 55:0x324c3c807fc4146e!2sZypern!3b1!8m2!3d35.126413!4d33.429859!3m5!1s0x0:0x0!7e 2!8m2!3d34.9360437!4d32.8634251?dcr=0





#### 2-D Coordinate system/ Cartesian Coordinate System



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**



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



#### Conformal map projection Mercator projection



https://upload.wikimedia.org/wikipedia/commons/thum b/f/f4/Mercator\_projection\_SW.jpg/350px-Mercator\_projection\_SW.jpg



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

# 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



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/Understandin

 $g\_Coordinate\_Systems\_and\_Map\_Projections\%20 output/story\_html5.html$ 






CRS information coordinate reference system:



GIS Hands on . Pahpos March 2018 . Verena Jaspersen

 WGS 84 / UTM zone 36N (EPSG:32636)

 2.
 Add WMS Layer from <a href="https://geoservice.dlr.de">https://geoservice.dlr.de</a>:

 Layer > Add Layer > Add WMS/WMTS Layer





3.	Create a new WMS connection         Connection details         Name       geoservice.dir.de/eoc/basemap/wms         URL       https://geoservice.dir.de/eoc/basemap/wms         Authentication       Configurations         If the service requires basic authentication, enter a user name and optional password       User name         Password       Image: Connection details         Referer       PDI-Mode       all         Urrsion       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection details       Image: Connection details         Image: Connection details       Image: Connection detai	Give a name URL: https://geoservice.dl r.de/eoc/basemap/w ms click OK
4.	Add Layer(s) from a WM(1)'s Server         Layer Order         geosenvice.dir.de Basemap         Connect       New         Edit       Delete         Layer Conder       Server Search         D       Name         D       Basemap         Layer Conde basemap       Lawer Conde basemap         D       Basemap         Layer Conde basemap       Lawer Conde basemap         2       basemap         1       basemap         2       basemap	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 b	ands in one	Raster > Miscellanous > Build Virtual Raster
🕺 Build	/irtual Raster (Catalog)		8 23
(* Use	visible raster layers for input		
Toput f	es		Select
Output	file D:/01. Projects/Athena/truecolor.vrt		Select
Re	olution Average		,
Sou	rce No Data 0		
Tar	pet SRS		Select
Sep Allo	arate w projection difference		
× Load	into canvas when finished		
gdalbui S2/S2A S2/S2A S2/S2A S2/S2A	<pre>wrt -separate D:/01_Projects/Athena/truecolor.wrt D:/01_Projects/Athena/truecolor.wrt D:/soft/Tr MSIL1C_20180129T083211_N0206_R021_T365VD_20180129T122059.SAFE/GRANULE/L1C_T365 MSIL1C_20180129T083211_N0206_R021_T365VD_20180129T122059.SAFE/GRANULE/L1C_T365 MSIL1C_20180129T083211_N0206_R021_T365VD_20180129T122059.SAFE/GRANULE/L1C_T365</pre>	est- VD_A013603_20180129T083908/IMG_DATA/T365VD_20180129 VD_A013603_20180129T083908/IMG_DATA/T365VD_20180129 VD_A013603_20180129T083908/IMG_DATA/T365VD_20180129	T083211/B04.p2 D:/soft/Test- T083211/B03.p2 D:/soft/Test- T083211_B02/p2
			OK Close Help
Chec	k separate"		
Chec	the correct order of bands		
Chee			
9.	Do the same for two Sentinel 2 Datasets. If off the layers you already created and the	Between the steps, switch bands you don't use.	
10.	Merge the two raster datasets (if you do it take a lot of time)	for all 5 datasets, it will	Raster > Miscellaneous > Merge





🔮 Merge 🔹 🔹 🗶	
Merge          Choose input directory instead of files         Input files       sr\truecolor_sxe.vrt         Output file       Sentinel_merge.tif         Select       Output file         No data value       Image: Select         No data value       Image: Select         Place each input file into a separate band       Image: Select         Use intersected extent       Image: Select         Creation Options       Image: Select         Vada into canvas when finished       Image: Select         gdal_merge.bat-pct-of GTiff -o D:/Nina/test-s2/Arbeitsordner/truecolor_sve.vrt D:       Image: Select         Vina (test-s2/Arbeitsordner/truecolor_sve.vrt D:       Image: Select         Vina (test-s2/Arbeitsordner/truecolor_swe.vrt D:       Image: Select	
OK Close Help	

## 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.	Vew Shapefile Layer     Type     Point     Line   Polygon     File encoding   System     Selected CRS (EPSG:4326, WGS 84)     Name   Type   Uength   10   Precision   Icagth   Fields list     Name   Type   Length   10   Precision   id   Integer   10   name   String   50     OK     Cancel     Help	> 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.	QGIS 2.18.4 - Zypern_Sentinel2         Project       Edit       View       Layer       Settings       Plugins       Vector       Raster       Database       Web         Image: Settings       Image: S	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





	use Version 2.18.15 (bug in version 2.18.14)	> Merge Vector Layers
20.		
21.	Merge vector løjert       Bun as batish processo         Herge vector løjert       Bigorden scolender after stor ette ander after atter bester atter atte	Browse layers to merge, save file
22.	update existing attributes or add new ones	Open attribute table, open field
	calculate the area with the field calculator	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





General	Categorized							•
Style	Column 123	id					- 3	
c Lahels	Symbol				Change			
	Color ramp	[sou	urce]			,	- Edit	📃 🔲 Invert
Fields	Symbol	Value	Legend					
Rendering		1	forest					
Display		2 3	agriculture water body					
Actions	Classify	f) =	Delete all					Advanced 🔻
Diagrams	Layer render Layer transparency	ring						0
Metadata Variables	Layer blending mod Feature blending m	le ode	Normal Normal	<ul> <li>▼</li> </ul>				
Legend	Draw effects     Control feature	rendering	order					in All

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: <i>select/ move item</i> or <i>move item content;</i>	
29.	<b>Legend</b> : in the legend items you can choose the items for your legend with + or -; you can change the <b>font</b> size of each group in the legend; <b>spacing:</b> change the space between the item groups	Layout > Add Legend
30.	<b>Scale bar</b> : make sure that the scale bar starts at 0, you can add a background color (white)	ltem properties, segments, left 0
31.	Insert a <b>grid</b> (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 <b>image</b> ; choose one of the existing images (arrow) or add a new one by searching directorie	Layout > Add image





33.	<b>Overview</b> : 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: ⇒ <u>http://www.qgistutorials.com/en/docs/making_a_map.html</u> ⇒ <u>https://docs.qgis.org/2.18/en/docs/training_manual/map_composer/map_composer.html</u>	