FAST Lab Speaker Series

Openness

and its importance for our global digital world

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April 13, 2021

Several of the resources used in this presentation can be found in:

- Article references at the end of these slides and the following:

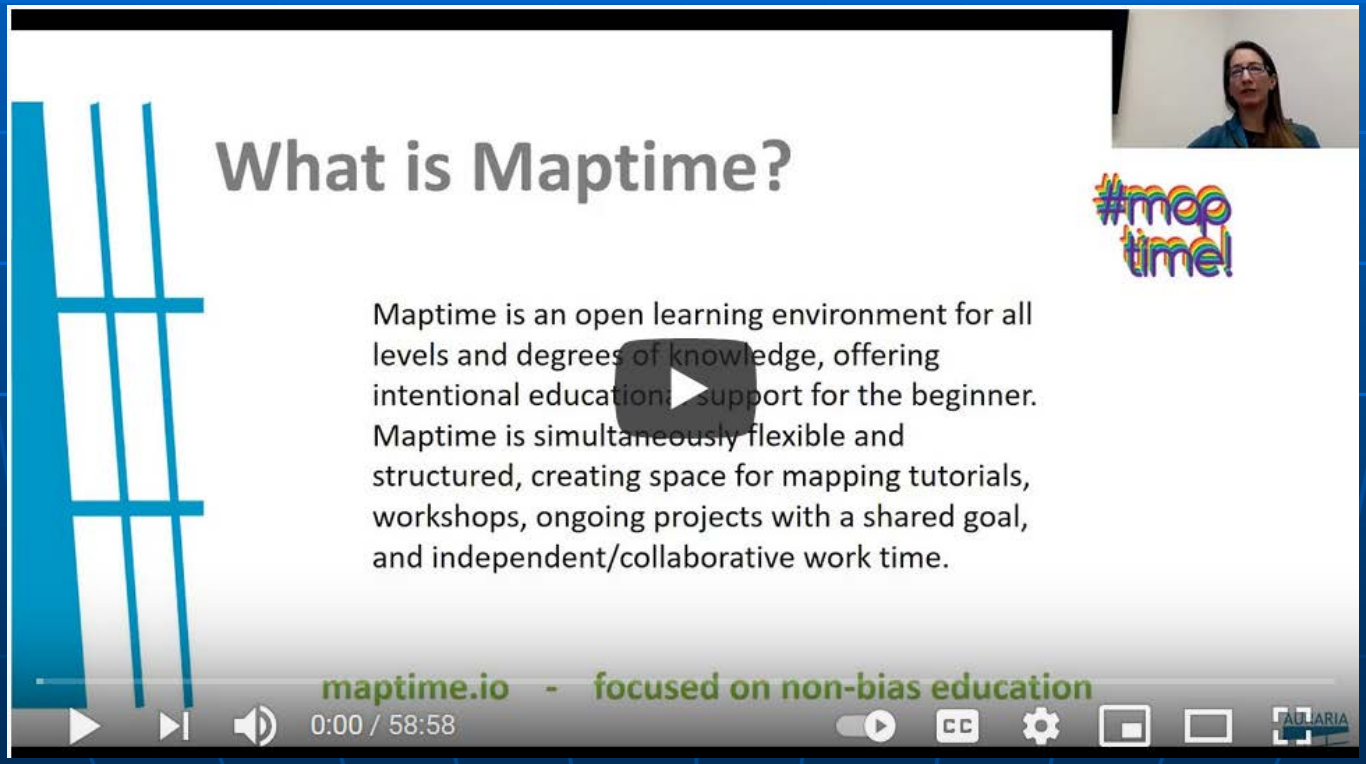
- **Moreno-Sanchez, R.** 2012. Free and Open Source Software for Geospatial applications (FOSS4G): A mature alternative in the geospatial technologies arena. *Transactions in GIS* 16(2): 81-88 http://geospatial.ucdenver.edu/foss4g/home-2

- Brovelli, M. A., Minghini, M., **Moreno-Sanchez, R**., & Oliveira, R. (2017). Free and open source software for geospatial applications (FOSS4G) to support Future Earth. *International journal of digital earth*, *10*(4), 386-404.
- (https://www.tandfonline.com/doi/pdf/10.1080/17538947.2016.1196505?needAccess=true)

- **Moreno-Sanchez, R.** and M. A. Brovelli (*In Press*). Free and Open Source software for geospatial applications (FOSS4G) and its relevance to today's challenges. *Routledge Handbook of Geospatial Technologies and Society.* Routledge.

- Dave Murray (2020). Guest presentation for the GeoForAll International Network of FOSS4G Labs: University level course opportunities and challenges. https://www.youtube.com/watch?v=d99W_9p-vL4

- Diane Fritz (2019). Guest presentation for the GeoForAll International Network of FOSS4G Labs: Using MapTime and Libraries to teach FOSS4G. https://www.youtube.com/watch?v=jHbEn66--Os



Outline

1. What is Openness? In which areas it is applied?
2. The need for Openness.
3. What is FOSS/FOSS4G? Why FOSS4G?
4. Several myths and misunderstandings about FOSS/FOSS4G are not true.
5. Sample of FOSS4G projects.
6. Our alumni leading the charge for change.

What is Openness?

Openness is a philosophy characterized by an emphasis on transparency and no-cost unrestricted access to data, information, knowledge, or technologies.

It also entails a commitment to sharing and to a collaborative or cooperative approach to development, management, and decision-making

(Peters & Britez, 2008)

University Consortium for GEOGRAPHIC INFORMATION SCIENCE
GIS&T Body of Knowledge

Topic Description

FC-35 - Openness

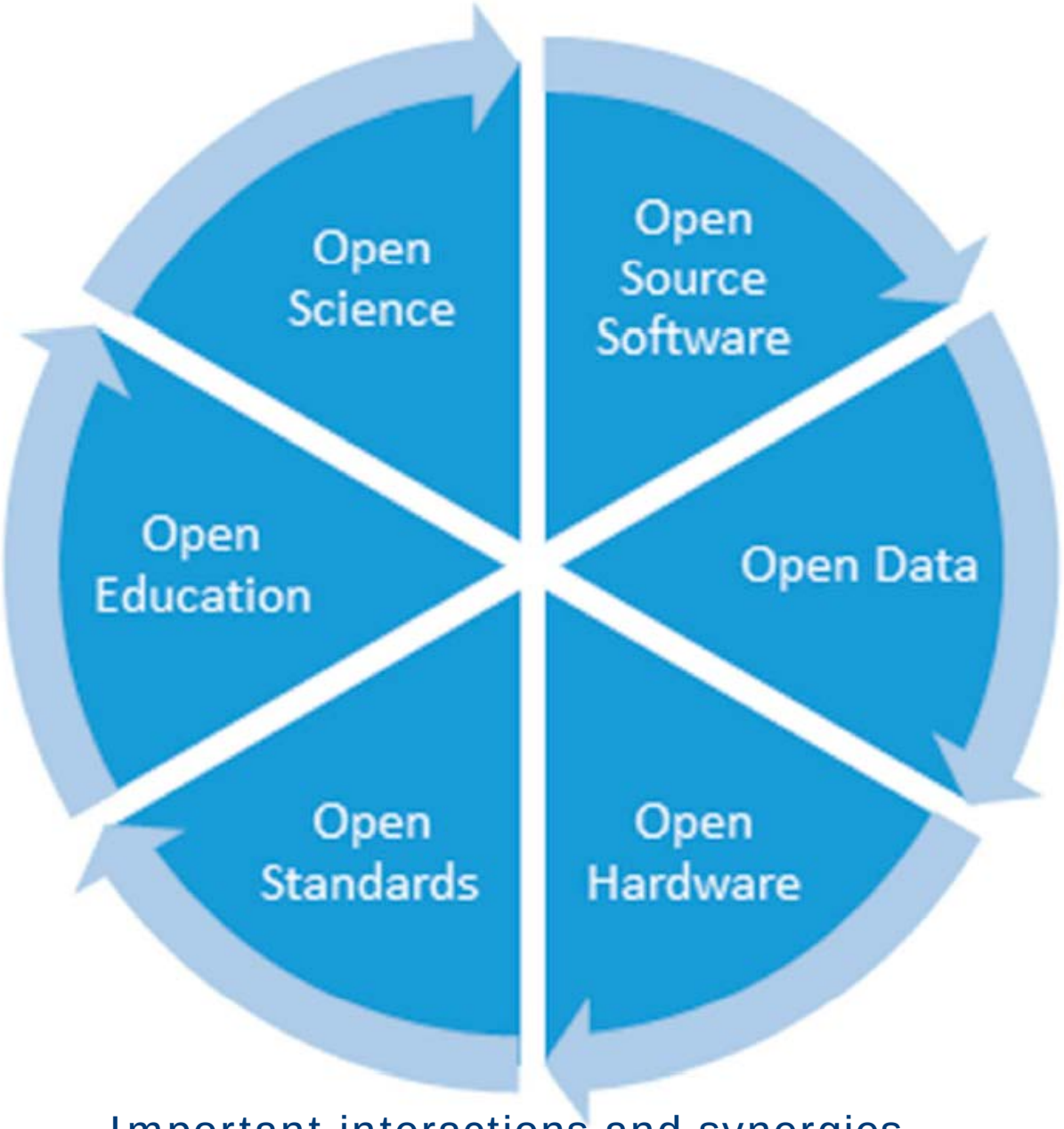
Author and Citation Info:

Moreno-Sanchez, R. (2018). Openness. *The Geographic Information Science & Technology Body of Knowledge* (4th Quarter 2017 Edition), John P. Wilson (ed.). DOI: 10.22224/gistbok/2018.1.5

https://gistbok.ucgis.org/bok-topics/openness

There are many applications of Openness

- Open source software.
- Open data.
- Open standards.
- Open government.
- Open innovation.
- Open publishing.
- Open education resources.



Important interactions and synergies

Figure 1. The many components of openness.

Coetzee, S., Ivánová, I., Mitasova, H., & Brovelli, M. A. (2020). Open geospatial software and data: A review of the current state and a perspective into the future. *ISPRS International Journal of Geo-Information*, *9*(2), 90.

https://www.mdpi.com/2220-9964/9/2/90

Why Openness?

As many reasons as areas of application of the philosophy

Open Data Handbook: Why Open Data?
http://opendatahandbook.org/guide/en/why-open-data/

Why FOSS?
http://www.dwheeler.com/oss_fs_why.html

Why open access?
http://www.righttoresearch.org/learn/whyOA/index.shtml

Why open education matters
https://www.opensocietyfoundations.org/voices/why-open-education-matters

Why open government matters
https://www.whitehouse.gov/blog/2009/12/09/why-open-government-matters

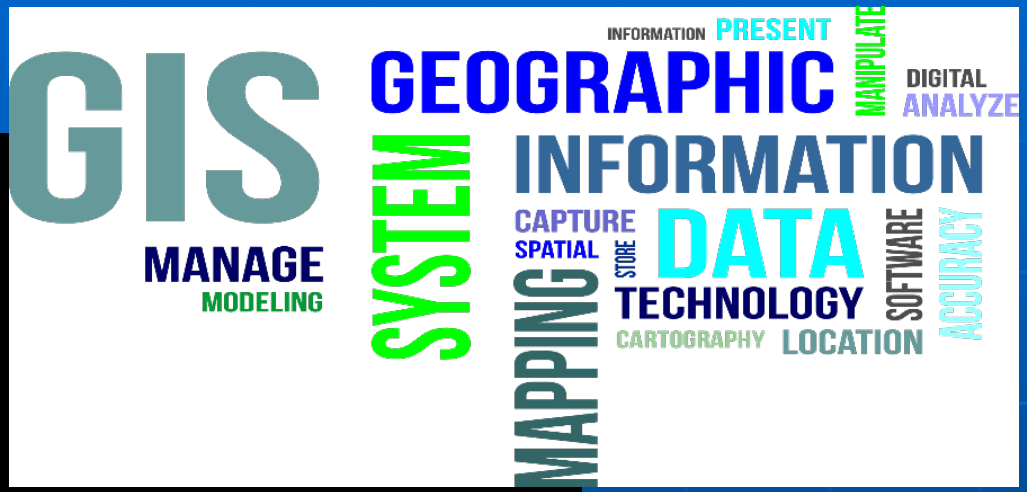
Overall, why are we in the business of education and GISc&T?

pur·pose

/'parpas/

Noun

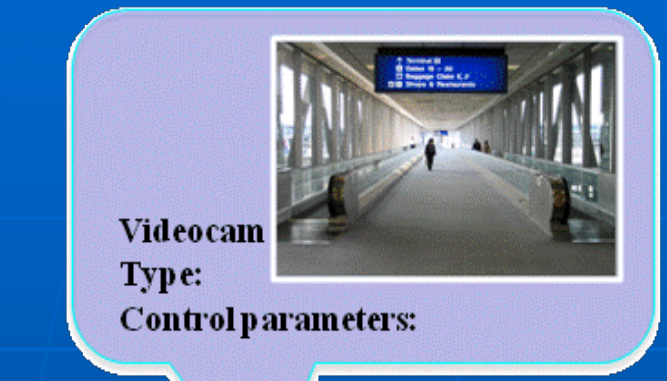
The reason for which something is done or created or for which something exists.

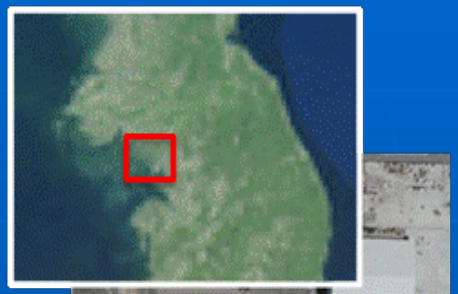


Contribute to move toward a Sustainable Development path

The need for Openness

The need





Sensors

Imagery

Features

DATA, INFORMATION, KNOWLEDGE

Integration

Fusion

Interoperability

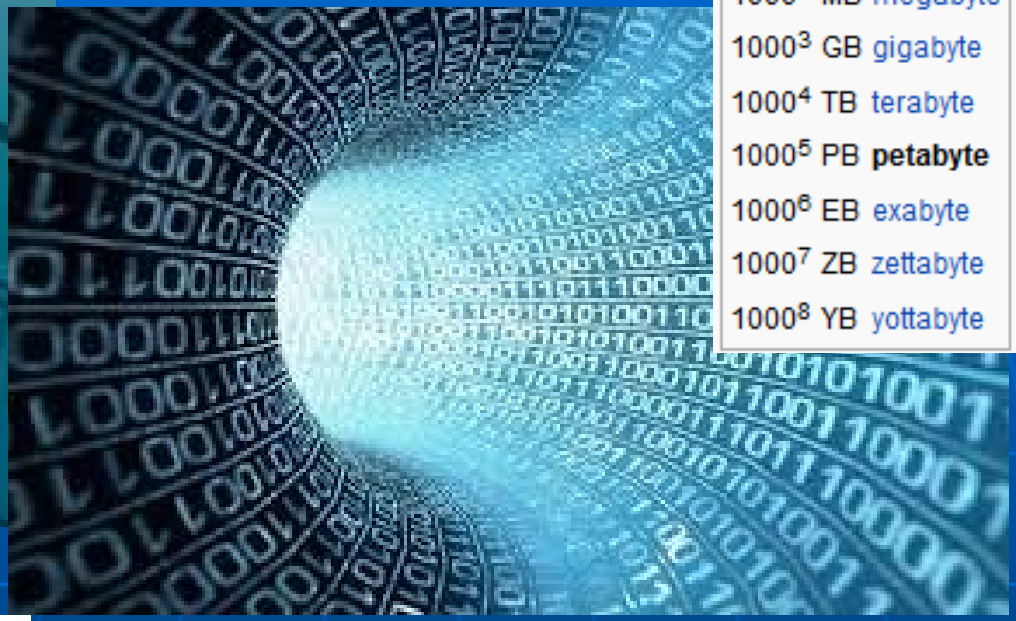
Collaboration

Transparency

A common picture

Local → Global

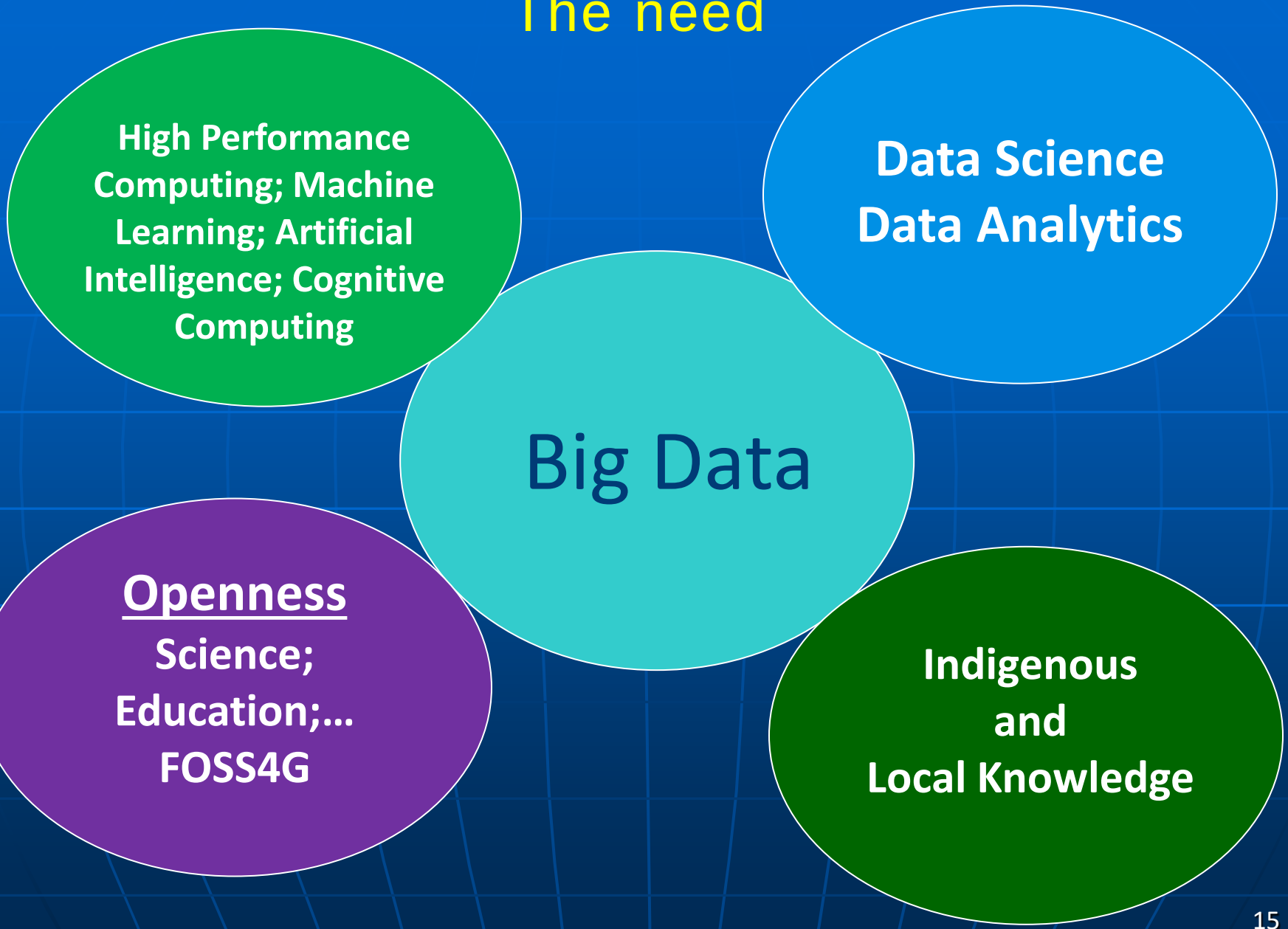
The need



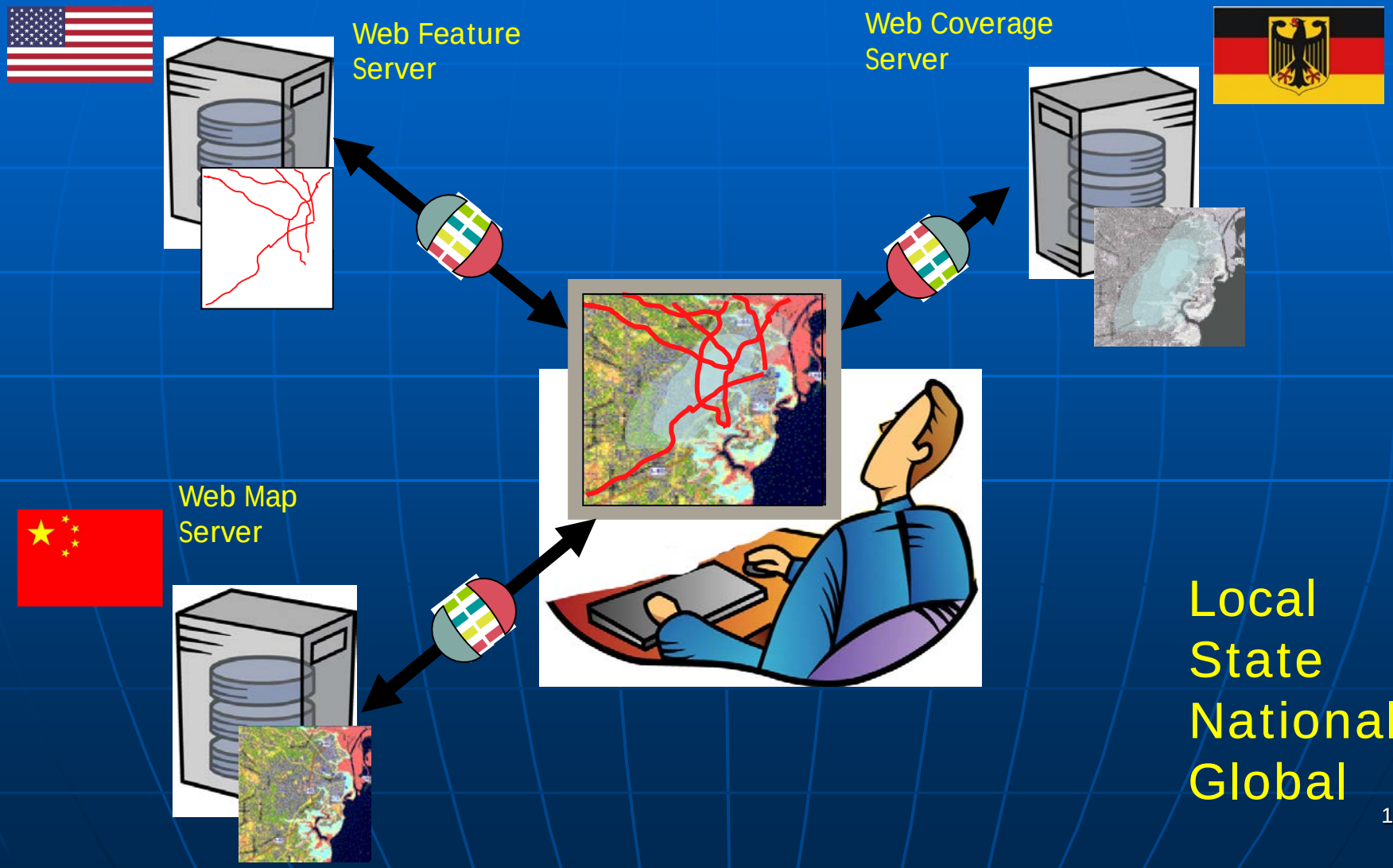
Decimal		
Value	Metric	
1000	kB	kilobyte
1000^2	MB	megabyte
1000^3	GB	gigabyte
1000^4	TB	terabyte
1000^5	PB	**petabyte**
1000^6	EB	exabyte
1000^7	ZB	zettabyte
1000^8	YB	yottabyte

In many areas the problem today is not lack of data, it is too much data that needs to be converted to useful actionable information, knowledge, and eventually wisdom.

The need


High Performance Computing; Machine Learning; Artificial Intelligence; Cognitive Computing
Data Science
Data Analytics
Big Data
Openness
Science; Education;… FOSS4G
Indigenous and Local Knowledge

The need: Interoperable Distributed (Web-Based) Information Systems



Local
State
National
Global

The need: The Digital Divide

https://www.apa.org/news/apa/2020/10/online-learning-mental-health

https://www.classvr.com/the-magic-of-using-augmented-reality-to-deliver-engaging-school-lessons/

The need: Tech giants are the new gatekeepers

https://www.axios.com/tech-giants-new-gatekeepers-1548976974-25f26494-a67c-4252-9c18-418588f8de06.html

The need: Why FOSS4G?

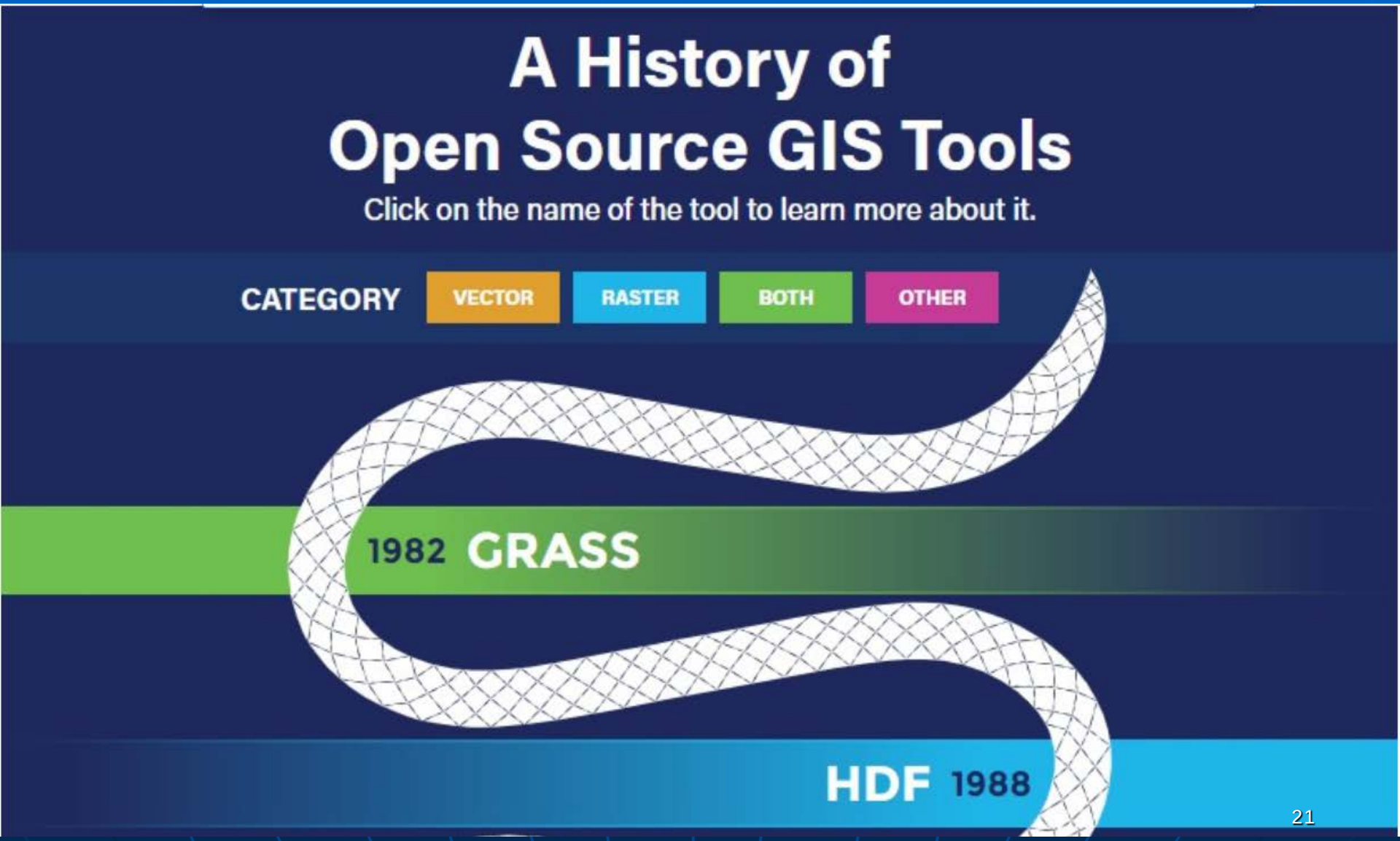
- FOSS4G is more appropriate for certain applications in certain technological, socio-cultural, economic and institutional contexts.
- Fosters innovation and collaboration (distributed development; compliance with Open Specs).
- Helps to develop a different way of learning, thinking, and solving IT and spatial problems. “The way of the hacker”.
- Sustainable Development tenets: “Develop local capacity”. “Self-reliance” “Resilience” “Reduction of risks” “Stability” “Democracy” “Equal access” “Strengthening of social networks” “Cooperation”

Free and Open Source Software
(FOSS)

- Free Software refers to freedom, not price.
- It means that the program's users have the freedom to run the program for any purpose, access the code to study how it works and change it, redistribute copies, and redistribute copies of modified versions of the software.
- Software must offer more than just access to the source code, it must comply with 10 criteria listed in the Open Source Initiative.

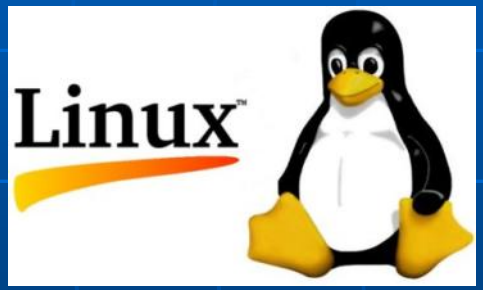
GNU Project (http://www.gnu.org/philosophy/free-sw.html)
Open Source Initiative
(http://www.opensource.org/docs/osd)

https://github.com/makepath/open-source-gis-infographic



FOSS and FOSS4G

- Are not new…
- Are not rare…
- Have a history of 20-40 years…



1991

1995

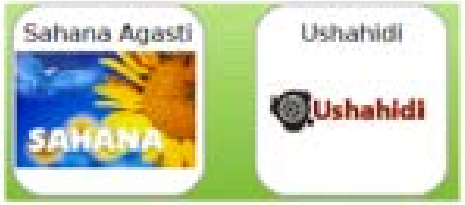
GRASS GIS

http://grass.osgeo.org/

Early 1980's

There is a mature FOSS4G project for every geospatial need and niche

https://www.giscorps.org/free-open-source-gis-software/



FOSS4G ECOSYSTEM

Interest in FOSS/FOSS4G is growing exponentially

- Increasing attention from end users, developers, businesses, governments, educators, students and researchers around the world.

- FOSS/FOSS4G has been declared as crucial for the developing world.
  (Naronha 2002 and 2003, Rajani 2003, Schenker 2003, Wambui 2004, Holmes et al. 2005, Camara and Fonseca 2007).

- Also, developed countries are increasing their use of FOSS/FOSS4G:
  France (Marson 2005, Kaneshige 2008)
  Germany (Gillespie 2000)
  England (Lettice 2004)
  Australia (Coonan 2004)
  Italy
  ...among others.

FOSS4G Resources and Education are growing rapidly

There is an increasing number of commercial support services, on-line tutorials, books, forums, user-group meetings and education resources to help FOSS/FOSS4G users to choose the right software and use it.

Self-contained package that allows you to try a wide variety of FOSS4G.

http://live.osgeo.org/es/index.html

OSGeo-ICA-ISPRS-International Labs Network

www.geoforall.org

http://wiki.osgeo.org/wiki/Edu_current_initiatives

OSGeo

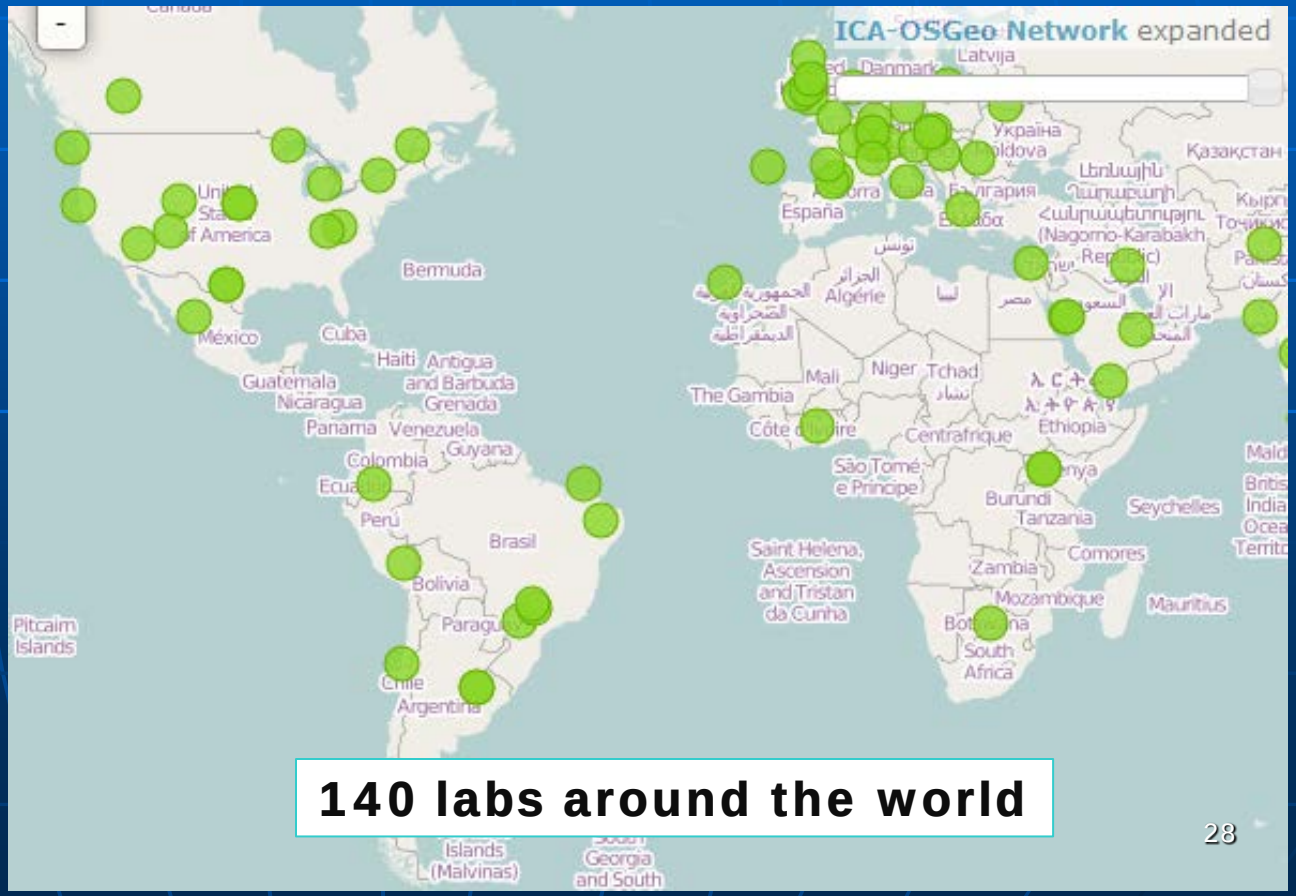
ICA

ACI

ICA-OSGeo MoU

isprs

Information from Imagery



140 labs around the world

Concerns and Myths about FOSS/FOSS4G

Wheatley (2004) provides examples that help dispel the following myths:
http://www.cio.com/article/2439780/open-source-tools/open-source--the-myths-of-open-source.html

- "The principal attraction is its no-cost"
- "The savings are not real"
- "There is no tech support"
- "It is not for mission-critical applications"
- "FOSS is not ready for the desktop"
- "It can't be that good if it is free"
- "It is difficult to learn"
- "It is only for programmer/developers"
- " There are no learning materials or books about them".

Why FOSS4G?

There are many reasons, among them:

- FOSS4G is more appropriate for certain applications in certain technological, socio-cultural, economic and institutional contexts.
- Fosters innovation and collaboration (distributed development; compliance with Open Specs).
- Helps to develop a different way of learning, thinking, and solving IT and spatial problems. “The way of the hacker”.
- Sustainable Development tenets: “Develop local capacity”. “Self-reliance” “Resilience” “Reduction of risks” “Stability” “Democracy” “Equal access” “Strengthening of social networks” “Cooperation”

There are many reasons …

- *Potential* cost reductions.
- Whole SDI can be built on FOSS/FOSS4G.
- Because of growth in interest and applications, GISc&T professionals are expected to at least be acquainted with FOSS4G.
- The future of GISc&T will be more diverse.

Sample of Mature FOSS4G

Holmes et al. 2005, Bruce 2007, Saenz-Salinas and Montesinos-Lajara 2009, Steininger and Bocher 2009, Garbin and Fisher 2010, Tsou and Smith 2011, Steinger and Hunter 2011, OSGeo-Live DVD http://live.osgeo.org/en/index.html

1.Desktop GIS:

- KOSMO (http://www.opengis.es/)
- gvSIG (http://www.gvsig.com)
- uDig (http://udig.refractions.net/)
- Quantum GIS (QGIS) (http://www.qgis.org/)
- GRASS (http://grass.osgeo.org/)

2. Remote Sensing:

- OSSIM (www.ossim.org)
- OpenEV (http://openev.sourceforge.net/)
- ILWIS Open (https://www.itc.nl/ilwis/)
- Opticks (https://www.osgeo.org/projects/opticks/)

3. Web GIS servers and clients:

SERVERS:

- MapServer (http://mapserver.org/)
- GeoServer (http://geoserver.org/)
- QGIS Server (https://docs.qgis.org/3.16/en/docs/server_manual/index.html)
- QGIS Cloud (https://qgiscloud.com/)
- MapGuide Open Source (http://mapguide.osgeo.org/)
- GeoNode (https://docs.geonode.org/en/master/about/)

CLIENTS:

- OpenLayers (http://openlayers.org/)
- Mapfish (http://mapfish.org/)
- Leaflet (https://leafletjs.com/)

4. Spatial extensions to Database Management Systems.

- PostGIS (http://postgis.refractions.net/) extension for PostgreSQL.
- MySQL Spatial Functions (https://dev.mysql.com/doc/refman/5.0/en/spatial-function-reference.html)

5. Code libraries and software frameworks

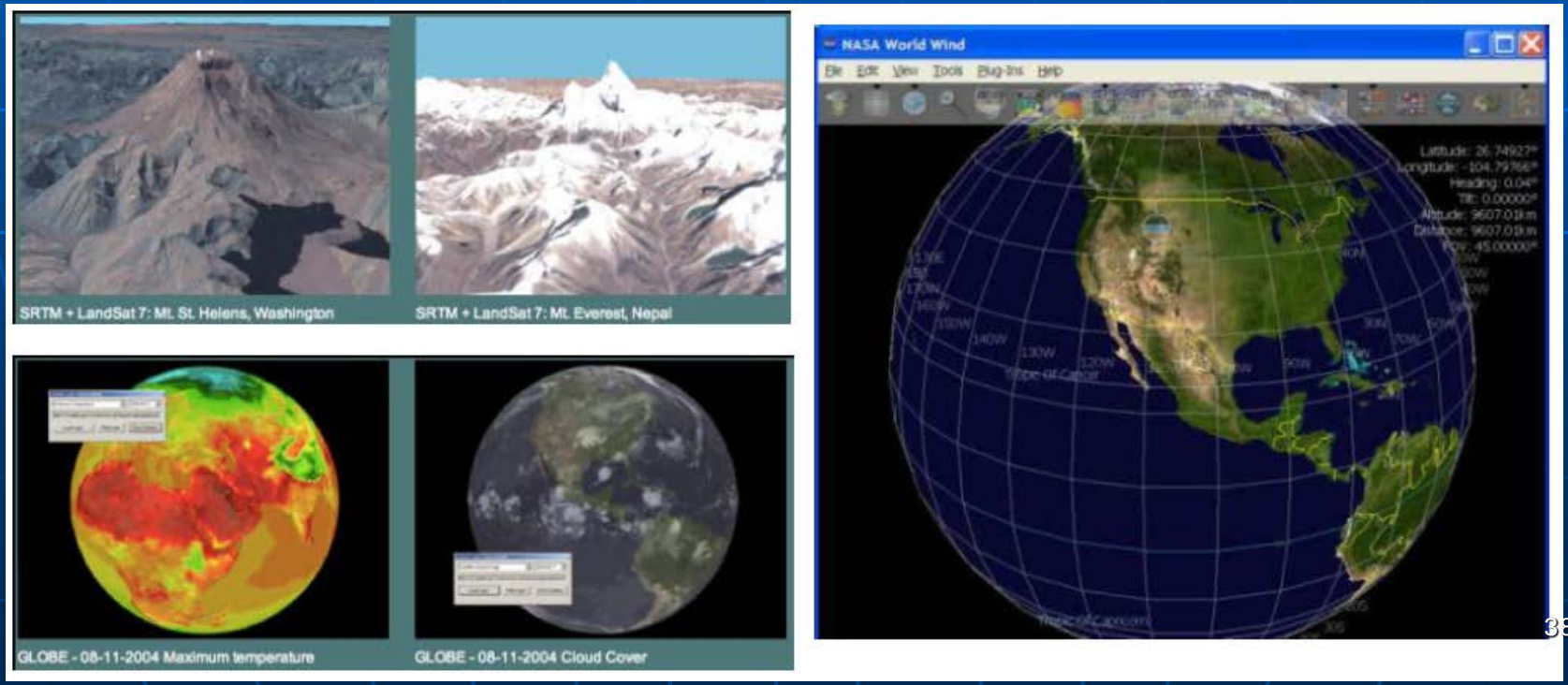
- GDAL/OGR (http://www.gdal.org/)
- PySAL (https://pysal.readthedocs.org/en/latest/)
- NASA CODE (http://ti.arc.nasa.gov/opensource/projects/code/)

6. Spatial analysis and statistics

R for spatial analysis (https://cengel.github.io/R-spatial/)

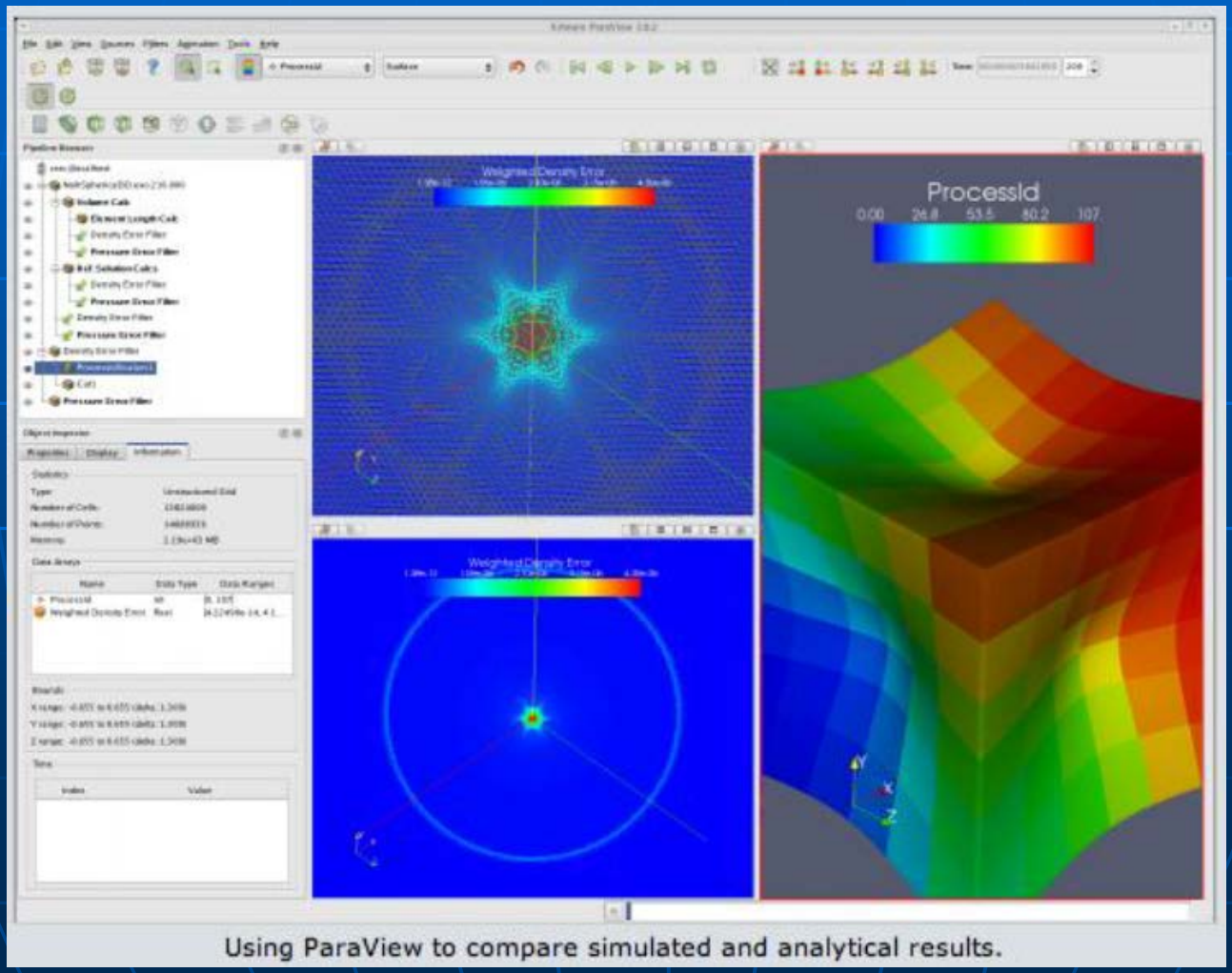
7. Virtual Globes

- NASA World Wind (https://worldwind.arc.nasa.gov/)
- ossimPlanet (http://trac.osgeo.org/ossim/wiki/OssimPlanet)



8. Tools for visualization and analysis.

- ParaView (http://www.paraview.org/)



Using ParaView to compare simulated and analytical results.

Close / private software and companies are interested in FOSS4G
Why?

ESRI and Open Source
http://www.esri.com/news/arcnews/spring11articles/open-source-technology-and-esri.html

Can Open Source save HP?
http://www.infoworld.com/article/2617869/open-source-software/can-open-source-save-hp-.html

GIS Industry Trends and Outlook 2012
http://www.gislounge.com/gis-industry-trends/ :

"Growth areas for the GIS Industry in 2012 are: Open source GIS will continue to grow and start to take its place among the commercial options as preferred desktop, mobile, and online mapping software"

ArcGIS Enterprise

Data Store is based on PostgreSQL

OpenStreetMap

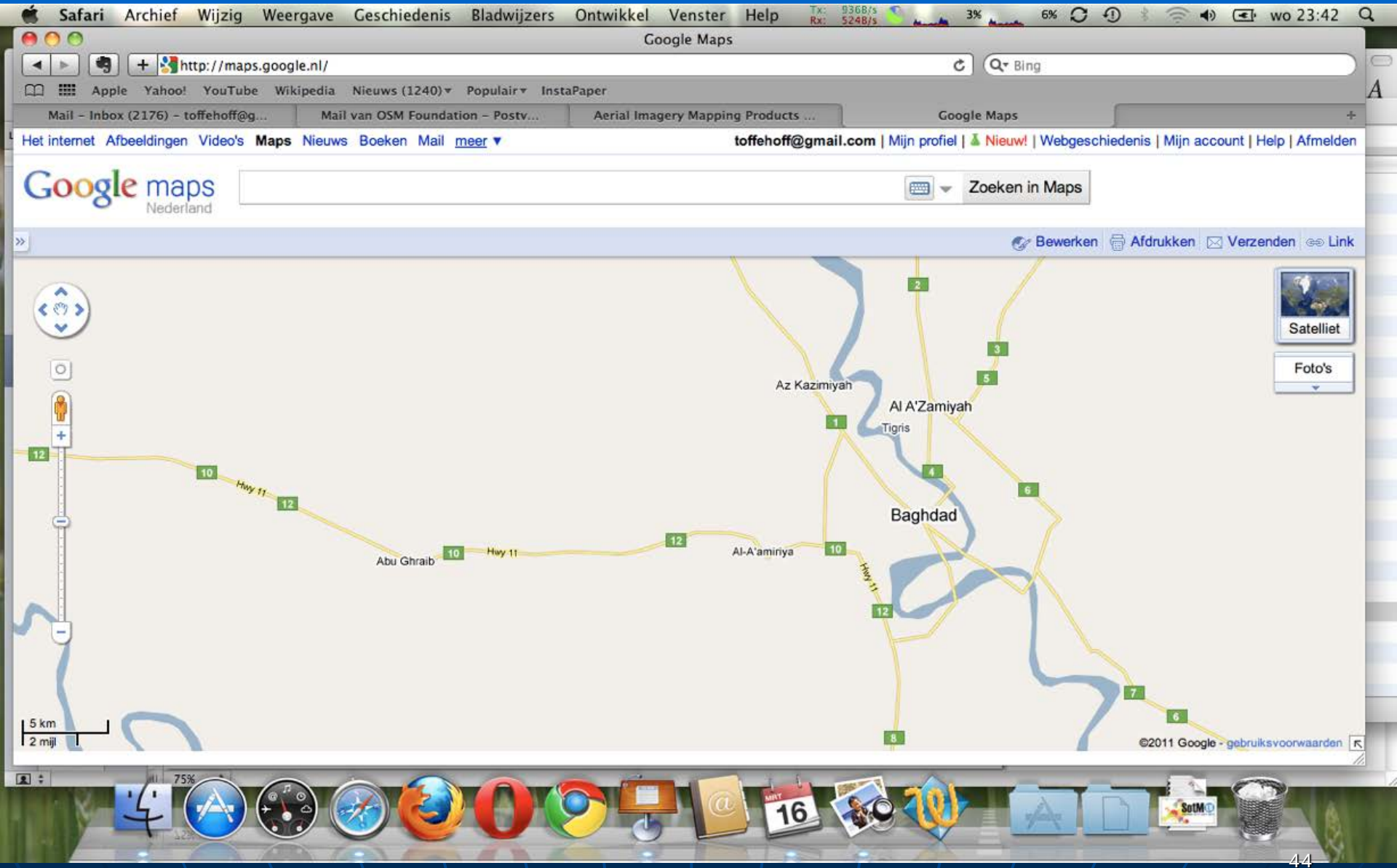
... the mappers map ...

Dr. Diane Fritz
Geospatial Scientist
Auraria Library

Why OpenStreetMap?

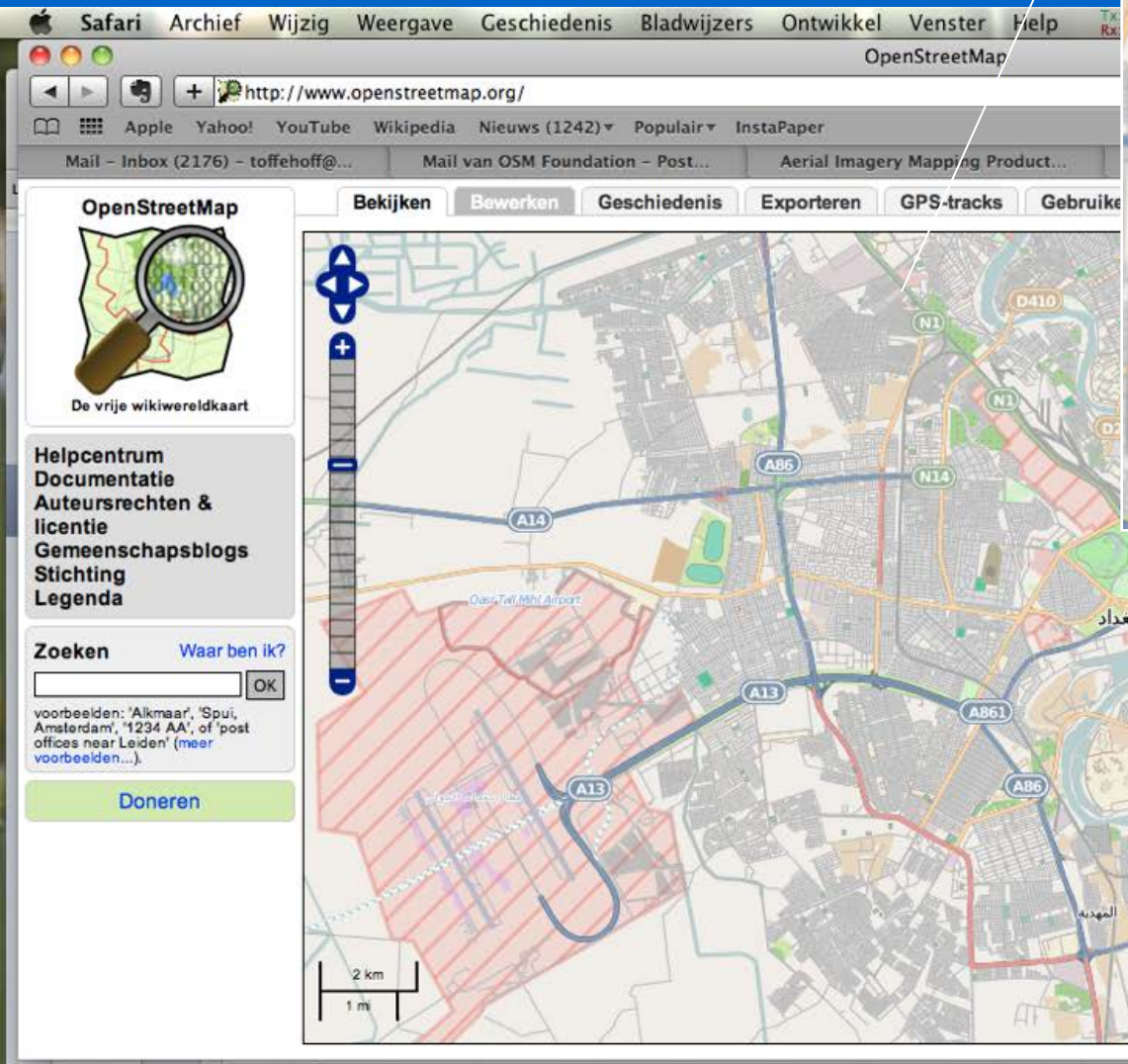
The project was started because most maps you think of as free actually have legal or technical restrictions on their use, holding back people from using them in creative, productive or unexpected ways.

Bagdad in Google Maps



(cortesia de Henk Hoff)

Bagdad in OpenStreetMap (OSM)



Our alumni are already leading the charge …

Erin Korris is the project lead for The National Map Corps

Erin Korris

Geographer

National Geospatial Technical Operations Center (NGTOC)

Email: ekorris@usgs.gov
Phone: 303-202-4503
https://orcid.org/0000-0002-1254-9696

Erin Korris is the project lead for The National Map Corps

Science and Products

Publications | News

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Year Published: 2015

Crowdsourcing The National Map

Using crowdsourcing techniques, the US Geological Survey's (USGS) Volunteered Geographic Information (VGI) project known as "The National Map Corps (TNMCorps)" encourages citizen scientists to collect and edit data about man-made structures in an effort to provide accurate and authoritative map data for the USGS National Geospatial Program's web-...

McCartney, Elizabeth; Craun, Kari J.; Korris, Erin M.; Brostuen, David A.; Moore, Laurence R.
Attribution: Core Science Systems, National Geospatial Program

https://www.usgs.gov/staff-profiles/erin-korris?qt-staff_profile_science_products=3#qt-staff_profile_science_products

NREL
Transforming ENERGY

FOSS4G
Big data
Parallel computing
Spatial DBMS extensions

They can do it.
You can do it.

Ricardo Oliveira

RESEARCHER II-GEOSPATIAL SCIENCE

Ricardo.Oliveira@nrel.gov | 303-275-3272

CU Denver
B.A. Geography 2016
MA Applied Geography and Geospatial Science 2018
Webinar
https://www.youtube.com/watch?v=ADPxO2q1k0k

Nicholas Grue

RESEARCHER III-GEOSPATIAL SCIENCE

Nick.Grue@nrel.gov | 303-384-7278

CU Denver
B.A. Geography 2011
Webinar
https://www.youtube.com/watch?v=sjIcb4BWso4

We have 3 other alumni and adding

OSM 10TH year anniversary animation

https://www.youtube.com/watch?v=7sC83j6vzjo

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