

How digging into the earth for the fibre roll-out took GRASS to the cloud

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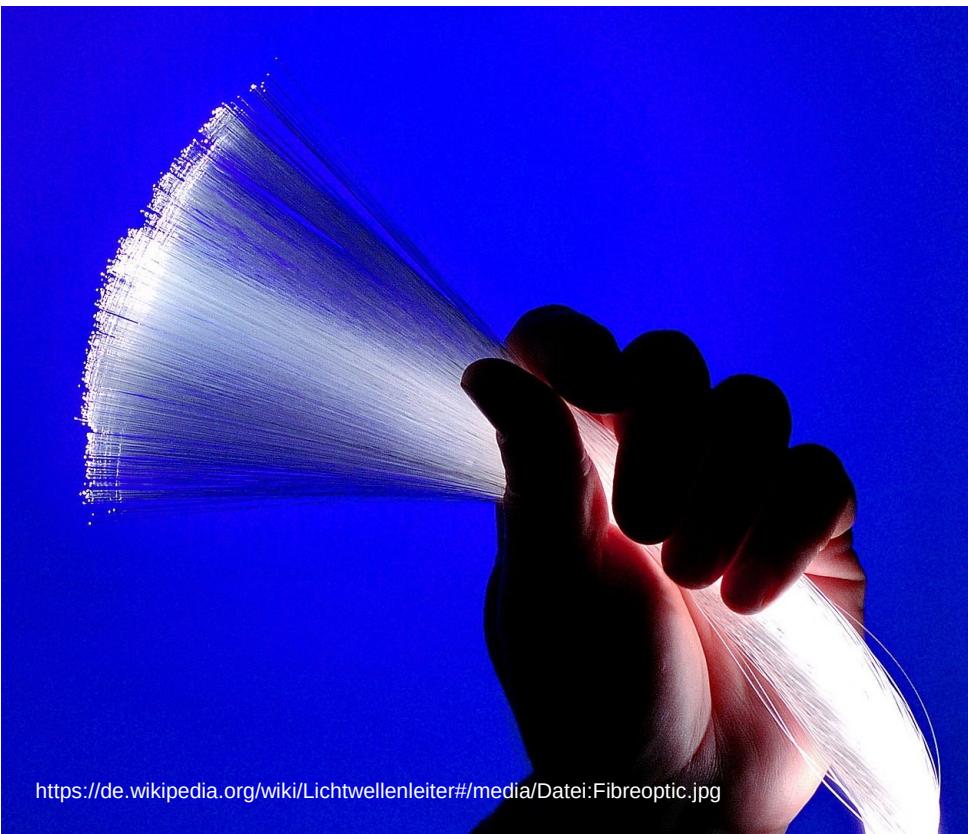
FOSS4G 2019 – Bucharest, Romania



FTTH? What's that?

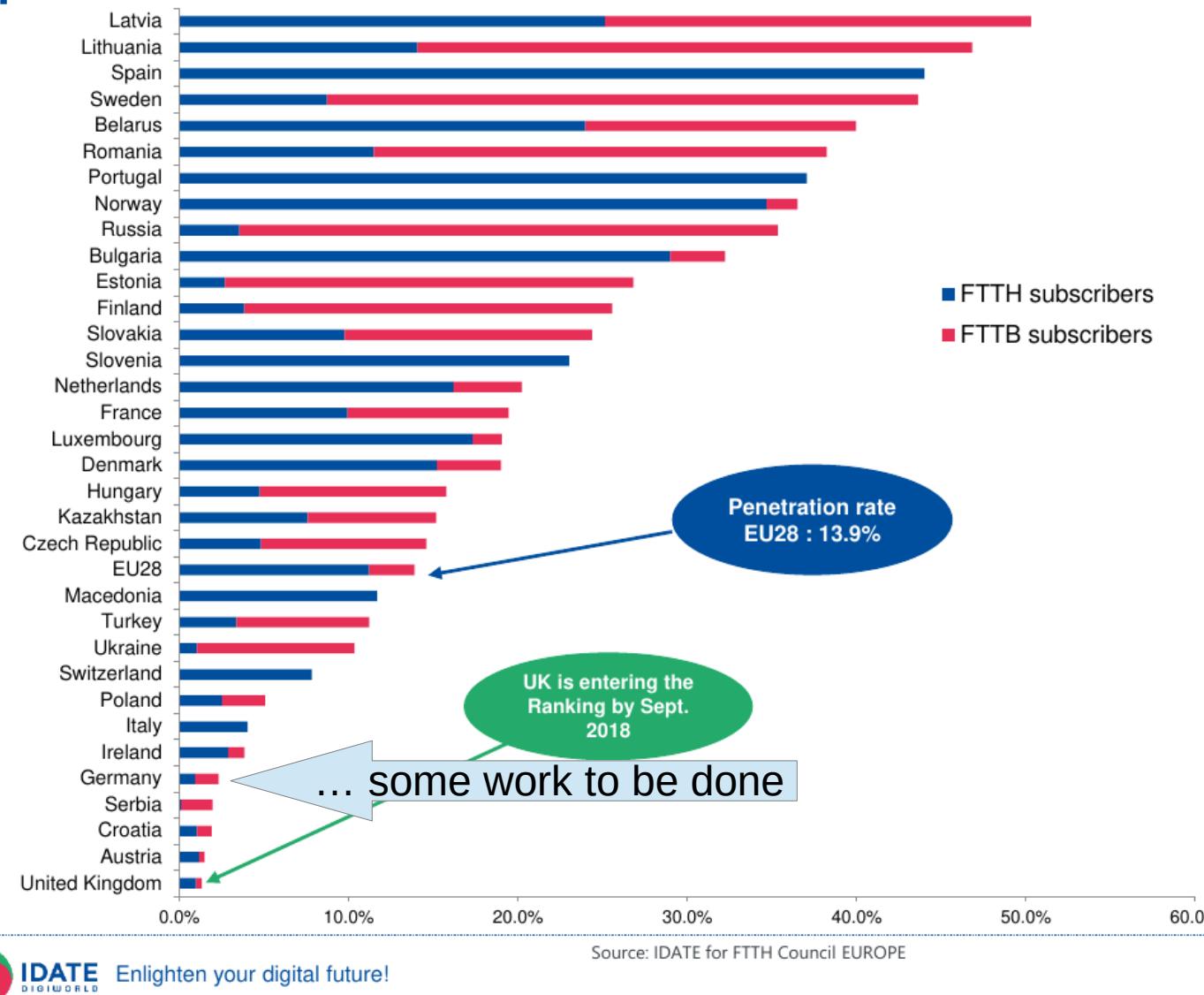


FTTH = Fibre to the Home | Fibre optics
Broadband of $\geq 1\text{Gb/s}$ – fast Internet access



<https://de.wikipedia.org/wiki/Lichtwellenleiter#/media/Datei:Fibreoptic.jpg>

European Ranking as at September 2018



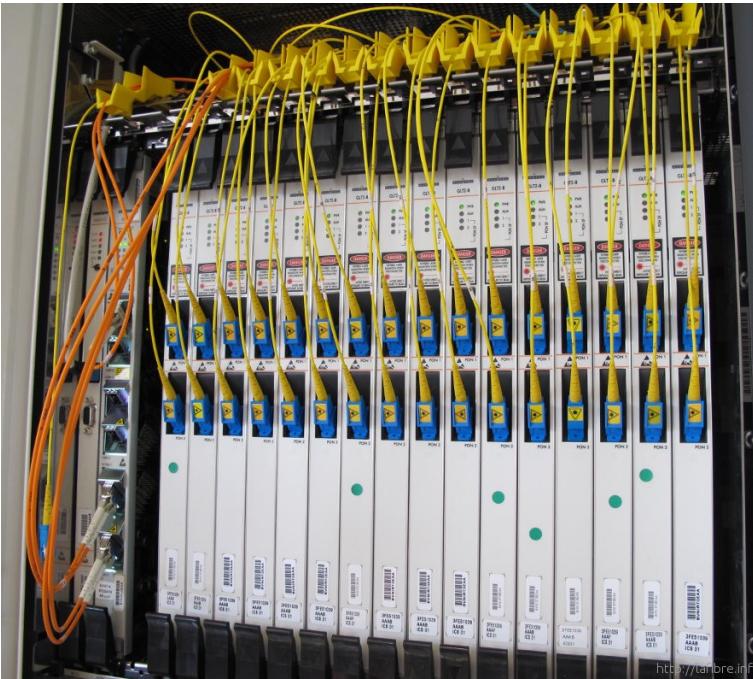
FTTH: Cloud & SDI @ FOSS4G 2019



More talks!!

- Carmen Tawalika & MN: "**GRASS GIS in the cloud: actinia geoprocessing**"
28 Aug 2019, 11:30–11:50, Hora Room,
<https://talks.2019.foss4g.org/bucharest/talk/GCNPMC/>
- Emmanuel Belo et al.: "**When building, maintaining & continuously improving a SDI isn't enough: DevOps processes to the rescue**"
28 Aug 2019, 17:30–17:50, Rapsodia Ballroom,
<https://talks.2019.foss4g.org/bucharest/talk/DVLP9R/>
- Torsten Drey et al.: "**From paper to pods: Revolutionised fibre planning process at Deutsche Telekom AG with FOSS4G components**"
29 Aug 2019, 16:00–16:20, Ronda Ballroom,
<https://talks.2019.foss4g.org/bucharest/talk/UBXJR3/>

Main FTTH question: where to put the cable



Author: [Vivien Guéant](#)

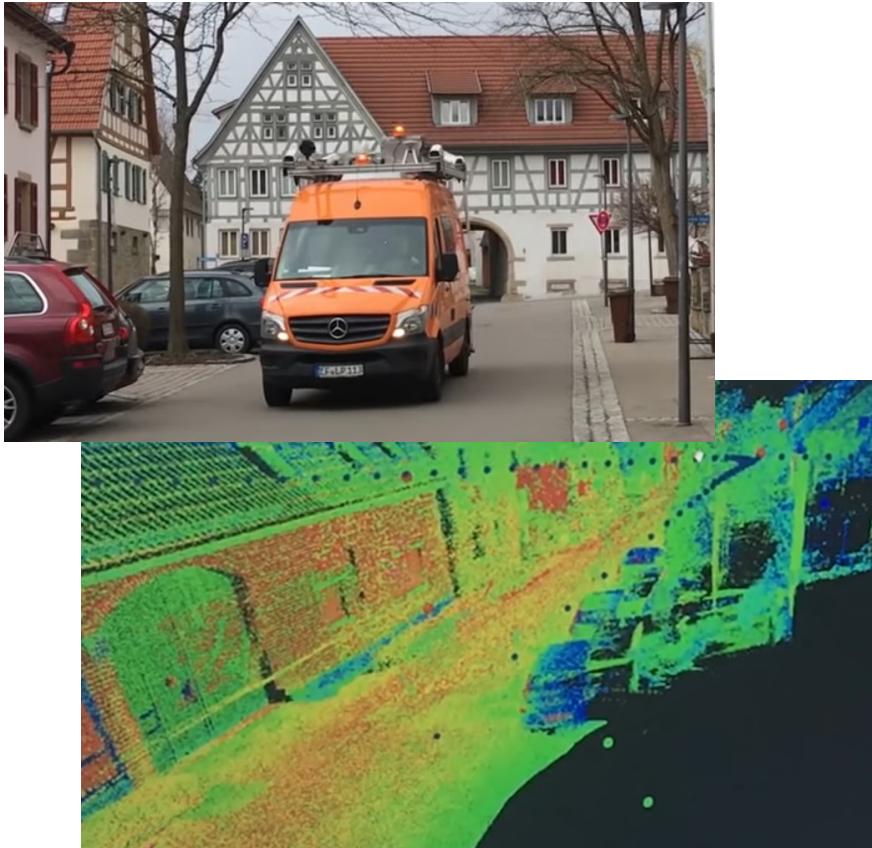


Photo: dpa, Guido Kirchner via [heise.de](#)

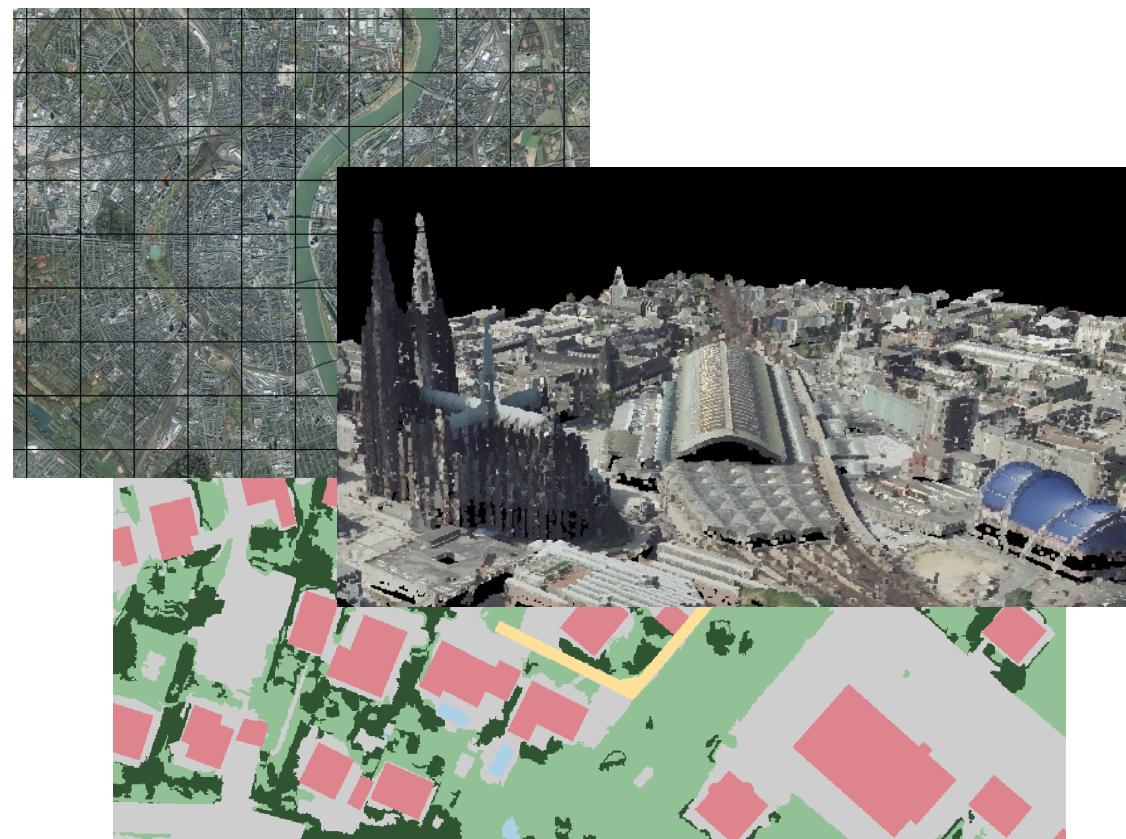
FTTH in DTAG: data sources



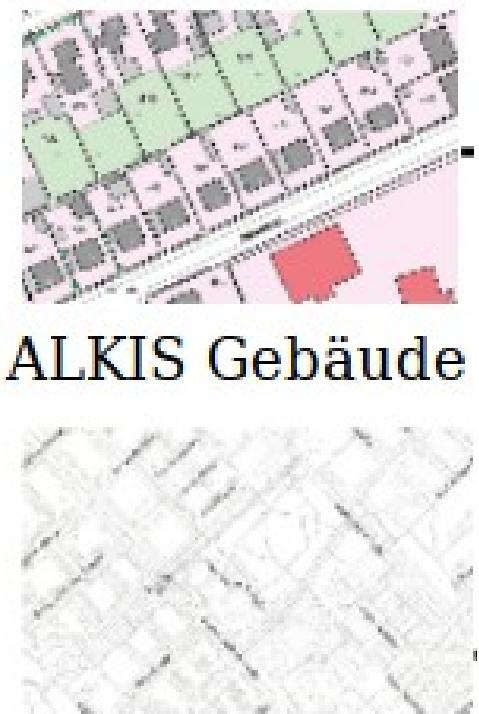
Terrestrial street scanning



Aerial photography and laser scanning



Official data

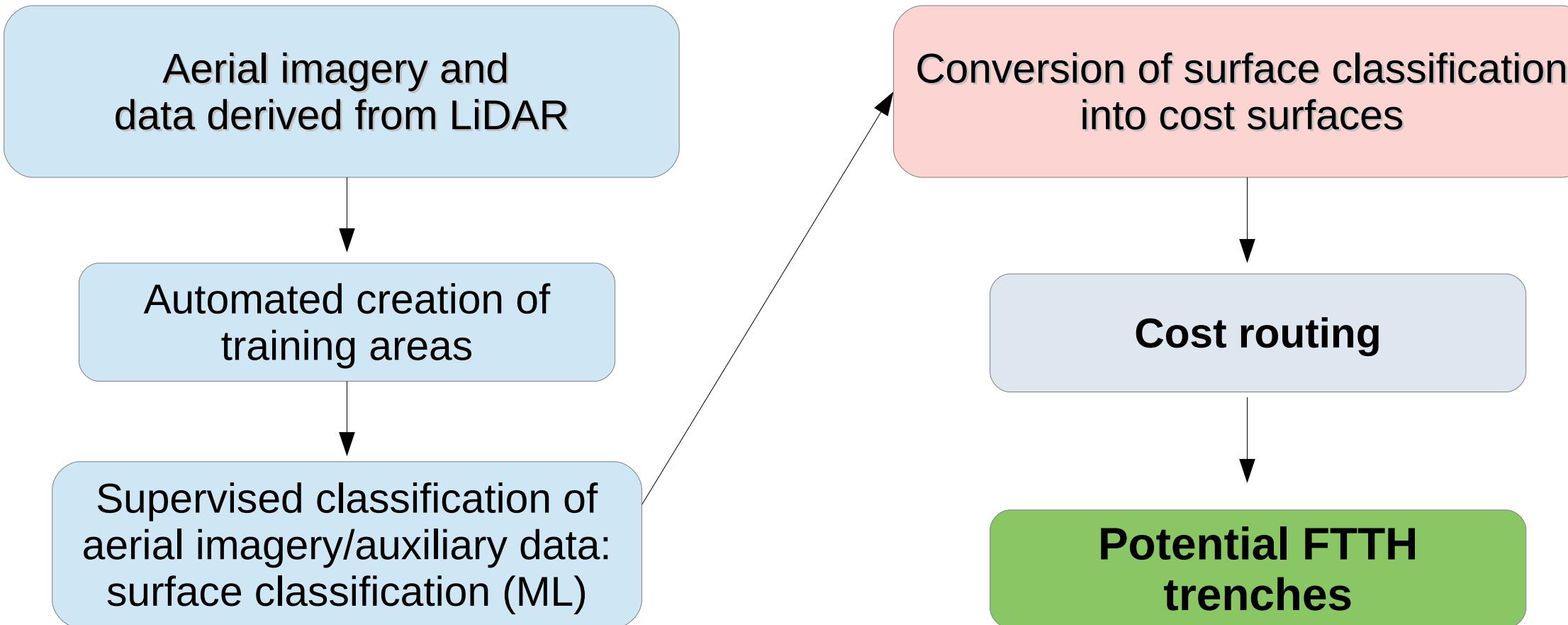


ALKIS Gebäude



Strassenetz

From input data to potential FTTH trenches



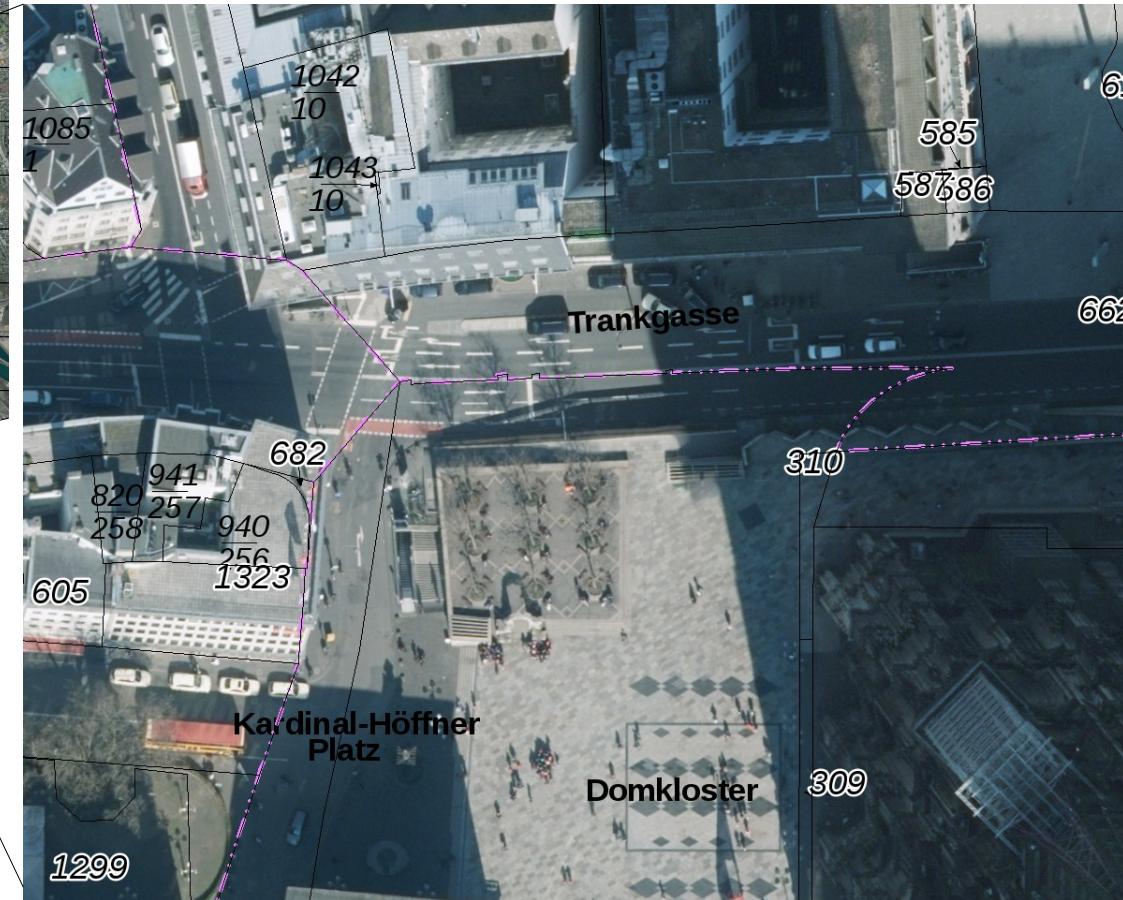
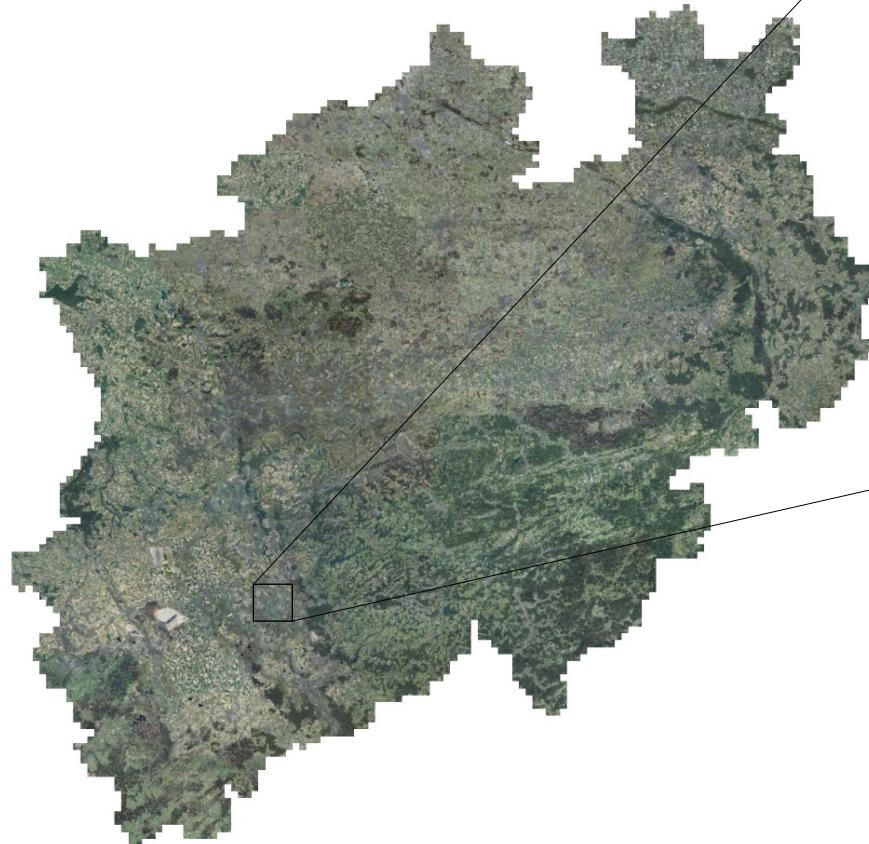


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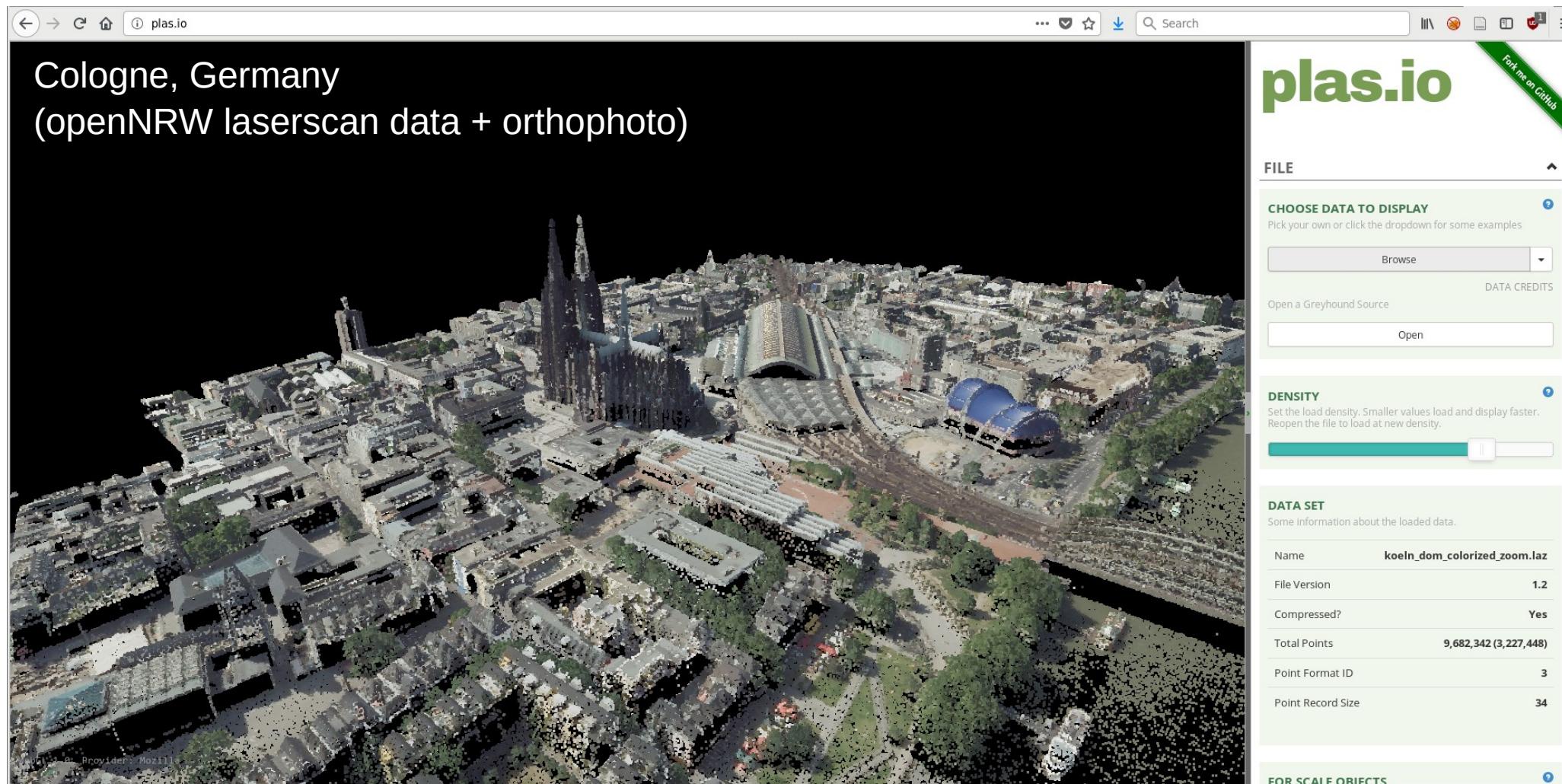
Data sources: 10 cm orthophotos (DOP)



- OpenNRW data



Data sources: LiDAR point clouds



Tools:



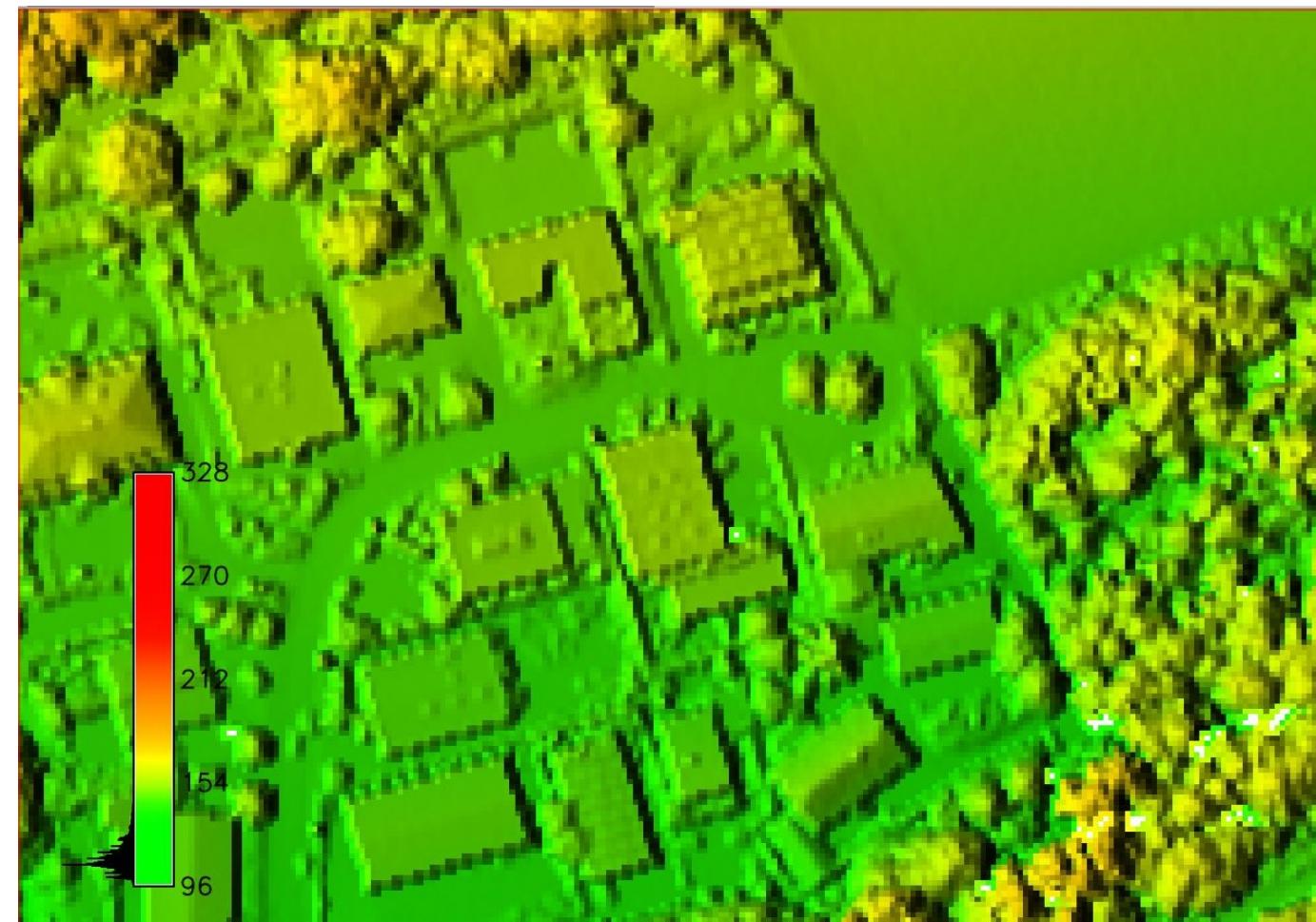
DSM 1m derived from LiDAR point cloud



Input: LiDAR point cloud

Gridded to 1m by
95% percentile

(to reduce outliers like
bird, etc.)



Example:
Herdecke, NRW

DSM derived from
LiDAR point cloud
(values a.s.l.)

Later converted to
"normalized DSM":

$$n\text{DSM} = \text{DSM} - \text{DTM}$$

Tree detection: simple threshold (nDSM, NDVI)



Filter:

nDOM > 2 m
NDVI > 0.2

Future: develop classification

Example:

Herdecke, NRW

Building detection: detected trees + nDSM



Masked out trees using the tree map (see before)

nDSM thresholding:

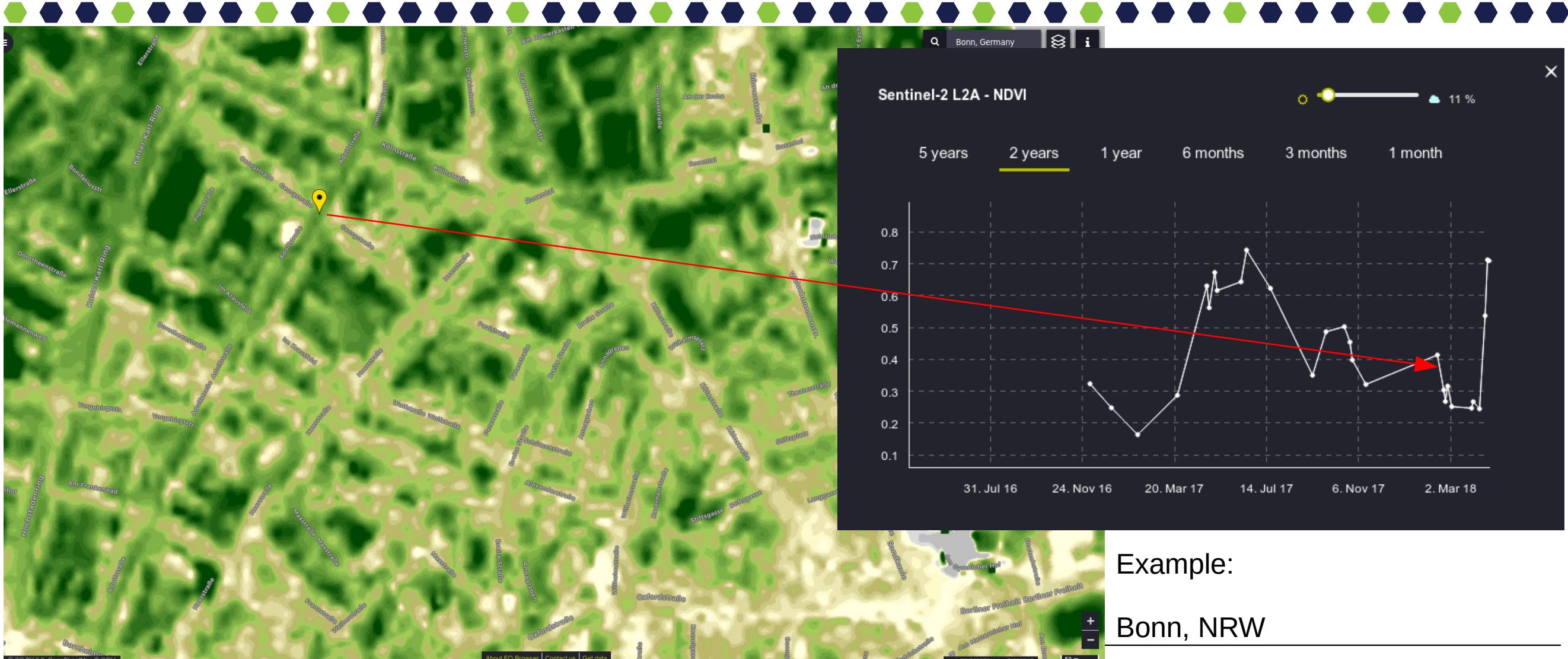
- `building_height_thresh_min=2.5 m`
- `building_height_thresh_max=15 m (5 floors)`
- `building_area_thresh_sqm=20 m2`

(... to be further improved)

Example:

Herdecke, NRW

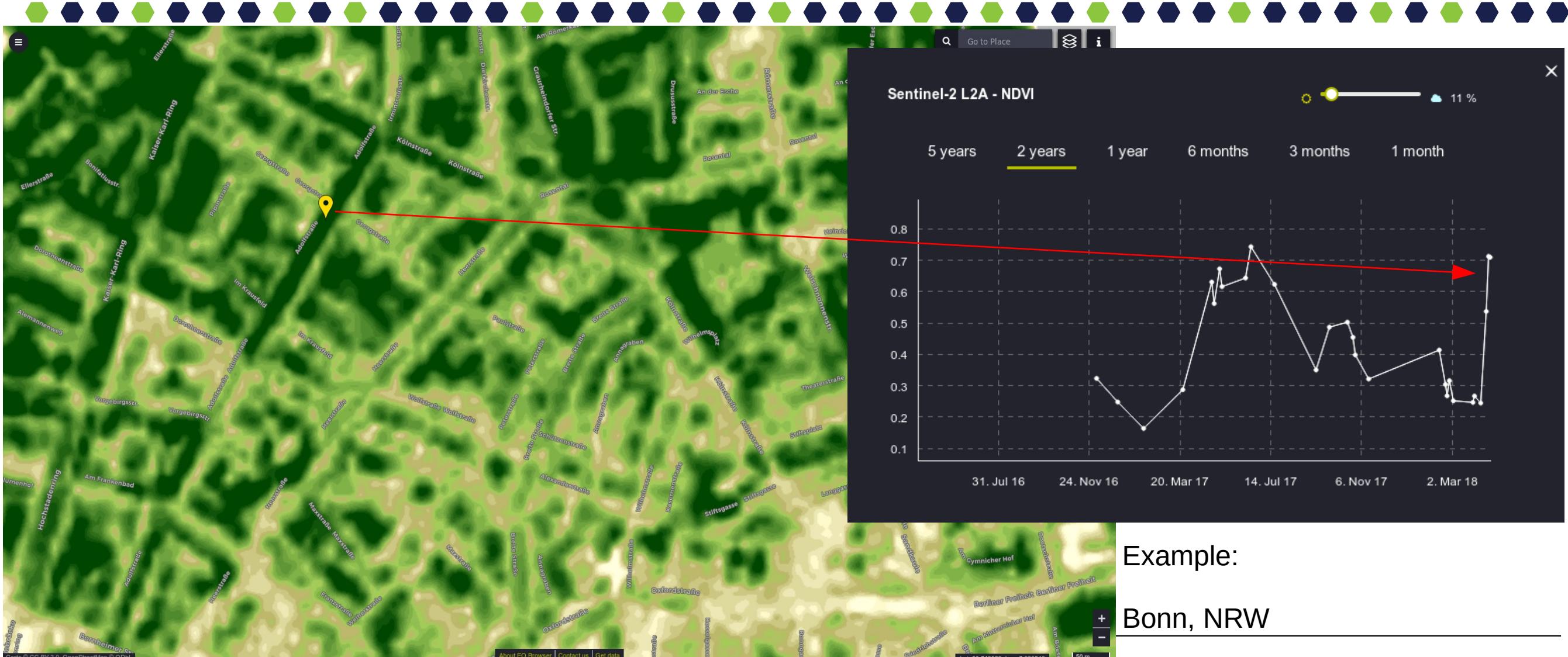
Data sources: Sentinel-2 time series for better support of vegetation detection



Example:

Bonn, NRW

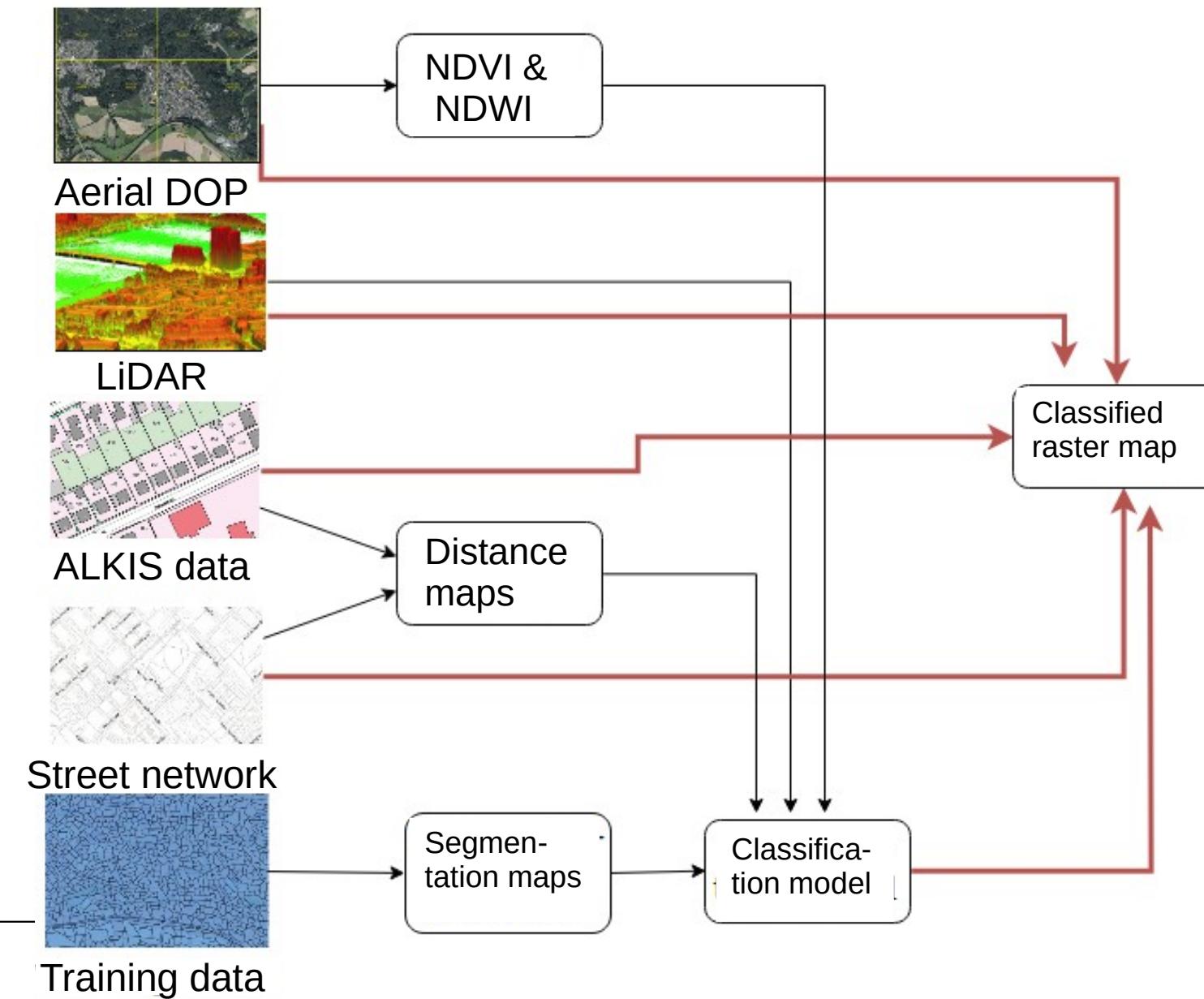
Data sources: Sentinel-2 time series for better support of vegetation detection





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FTTH: DOP image classification, simplified



Object based supervised classification using machine learning (ML)



Using GRASS GIS addon **r.learn.ml**
(GH code)

Method: DecisionTreeClassifier

- **unsealed**
- **trees**
- **sealed**
- **buildings**
- **paths/gravel**
- **water**

DOP resolution: 10cm



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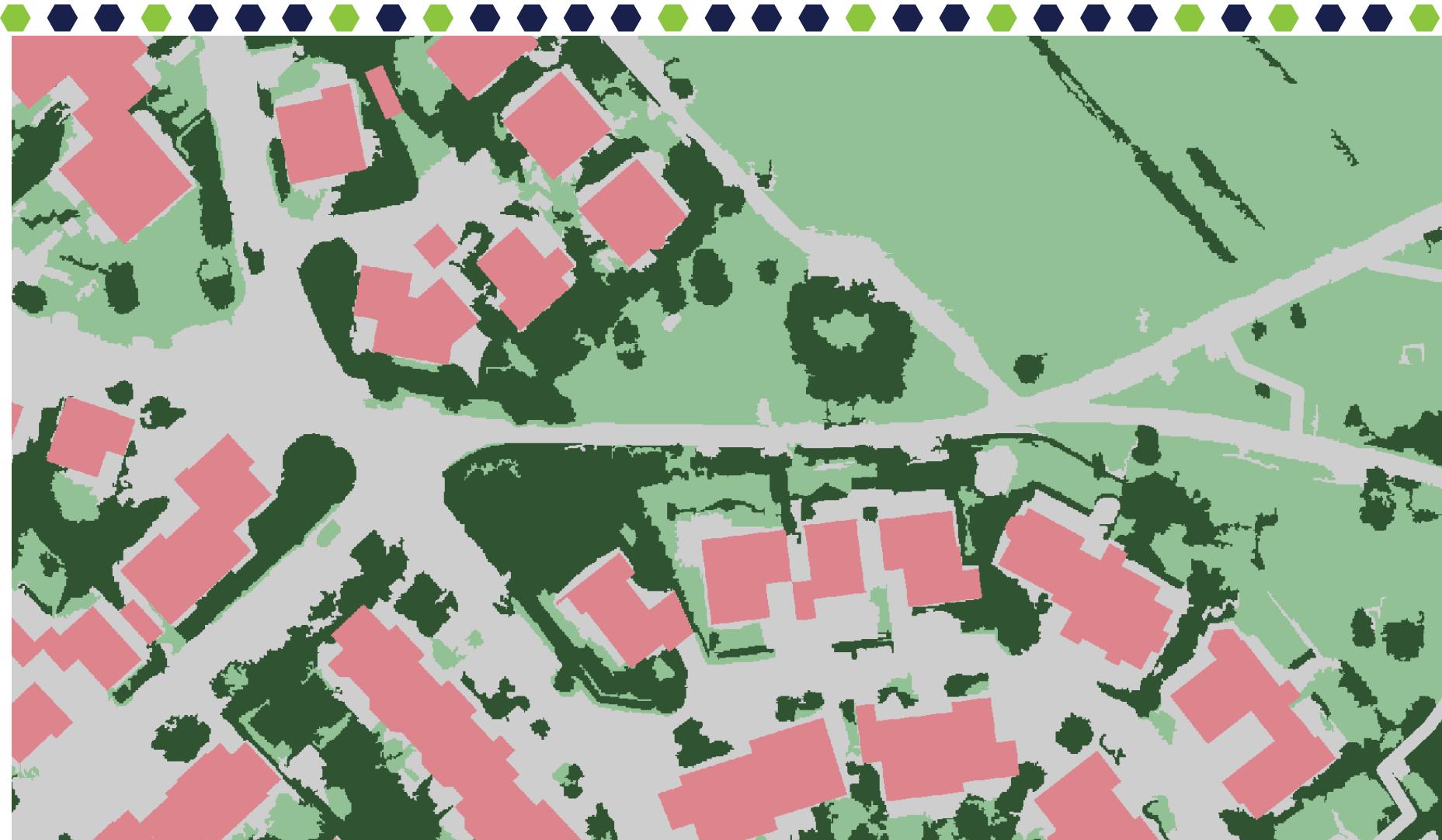
Automated classification: input data



DOP, 10cm res.

Hersel:
Rheindorfer Straße/Donaustraße

Automated classification: output



Fully automated
classification incl.
automatically selected
training data

Hersel:
Rheindorfer Straße/Donaustraße

Computing of potential trenches, cost optimized



80.2	78.7	78.7	77.4	200.0	200.0	200.0	104.6	102.5	100.5	98.4	96.4	94.3	92.3	90.2	Null	Null
81.6	80.2	80.2	78.7	77.4	200.0	200.0	200.0	104.6	102.5	100.5	98.4	96.4	94.3	92.1	89.8	Null
83.0	81.6	81.6	80.2	78.7	77.4	200.0	200.0	106.6	104.6	102.5	100.5	98.4	96.2	93.9	91.6	89.2
84.4	83.0	83.0	81.6	80.2	78.7	77.4	200.0	200.0	200.0	104.6	102.5	100.3	98.0	95.7	93.3	90.8
85.9	84.4	84.4	83.0	81.6	80.2	78.7	77.4	200.0	200.0	200.0	104.4	102.1	99.8	97.3	94.9	92.3
87.2	85.9	85.9	84.4	83.0	81.6	80.2	78.7	200.0	200.0	200.0	106.2	103.8	101.4	98.8	96.4	94.3
88.7	87.2	87.2	85.9	84.4	83.0	81.6	80.2	78.7	200.0	200.0	200.0	105.4	102.8	100.5	98.4	96.4
90.0	88.7	88.7	87.2	85.9	84.4	83.0	81.6	80.0	78.4	76.7	200.0	200.0	104.6	102.5	100.5	98.4
91.5	90.0	90.0	88.7	87.2	85.9	84.4	83.0	81.6	80.2	79.4	200.0	200.0	200.0	104.6	102.5	100.5
92.8	91.5	91.5	90.0	88.7	87.2	85.6	83.9	82.1	80.3	78.7	77.4	Null	Null	200.0	104.6	102.5
94.3	92.8	92.8	91.5	90.0	88.3	86.6	84.8	83.0	81.6	80.2	78.7	77.4	Null	200.0	200.0	104.6
95.5	94.3	94.3	92.8	91.1	89.2	87.4	85.9	84.4	83.0	81.6	80.2	78.7	77.4	200.0	200.0	200.0
97.2	95.5	95.5	93.7	91.8	90.0	88.7	87.2	85.9	84.4	83.0	81.6	80.2	78.7	77.4	200.0	200.0

Cost for digging trenches
depend on surface type!

→ Surface data is converted
into cost surfaces

→ Routing on cost surfaces to
find potential FTTH trenches





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Computing of potential trenches, cost optimized



Extraction of largest connected network

(cost for digging trenches depend on surface type!)

- asphalt
- green areas
- paths/gravel
- trees
- buildings
- surface water

- Trench in asphalt
- Trench in tree
- Trench in green area
- Trench in gravel





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FTTH: computing the potential trenches



- Trench in asphalt
- Trench in tree
- Trench in green area
- Trench in gravel



Source: [Heise](#)





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Big Data in Geoinformatics & Earth Observation

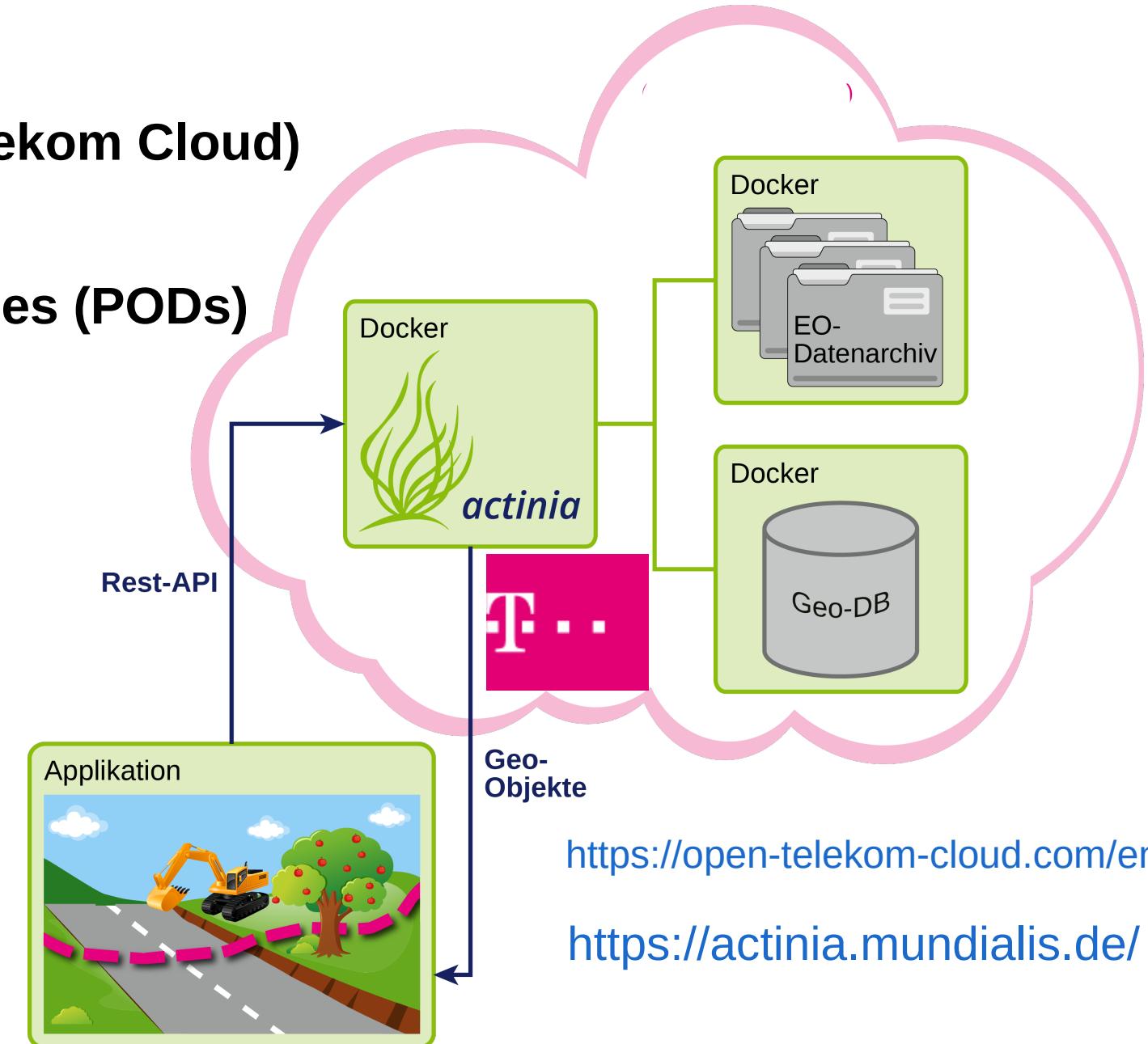


- Cloud based geoprocessing (Open Telekom Cloud)
 - All GDI components in OpenShift
 - Service deployment via docker images (PODs)
 - Infrastructure as Code



Microservices

mundialis @ FOSS4G 2019



actinia: cloud based geoprocessing engine



GRASS GIS and actinia:

actinia REST service: (<https://actinia.mundialis.de/>):

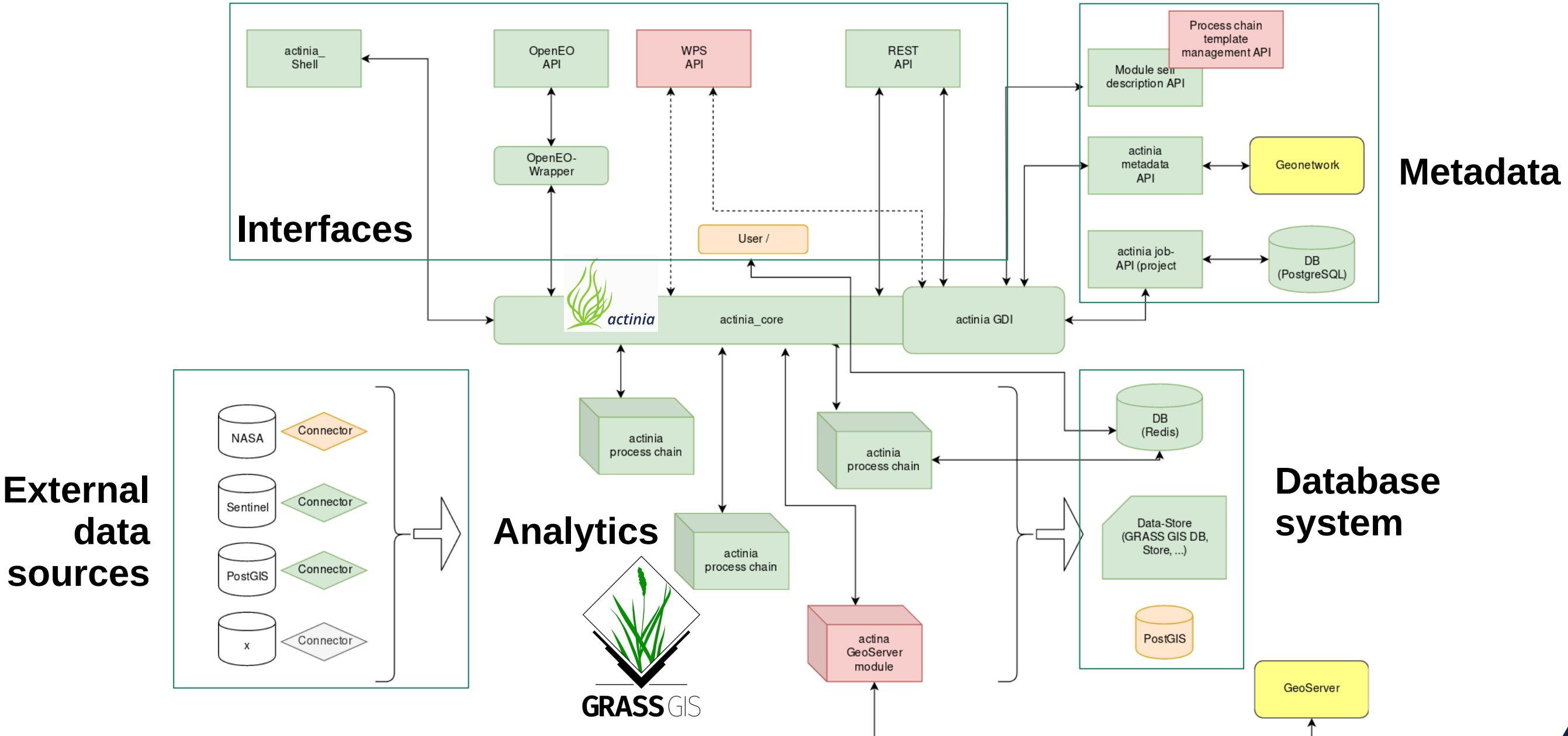
- geoprocessing commands are sent to an actinia node,
 - commands are executed in the cloud
 - results stored in the cloud, can be downloaded if needed for inspection
 - data are left in the cloud for further processing
 - GRASS GIS is the underlying geoprocessing engine
- ... the integrated job management distributes requests to multiple servers ("compute nodes")





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actinia: cloud based geoprocessing engine



actinia – FOSS!



- actinia is Open Source: https://github.com/mundialis/actinia_core
- since March 2019 actinia is recognized as an OSGeo Community Project!

actinia.mundialis.de latest

Actinia in action

Actinia API documentation

Actinia tutorial

Latest API documentation

Try it out

1. Sentinel-2 NDVI
2. Land Surface Temperature

NDVI of Sentinel-2

Let's calculate the NDVI for a Sentinel-2 Scene.

<https://actinia.mundialis.de/>



actinia

https://github.com/mundialis/actinia_core/

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Code Issues Pull requests Projects Wiki Security Insights

Actinia Core is an open source REST API for scalable, distributed, high performance processing of geographical data that uses mainly GRASS GIS for computational tasks. <https://actinia.mundialis.de/>

rest-api opensource grass-gis geospatial-analysis earth-observation

228 commits 2 branches 14 releases 6 contributors GPL-3.0

Branch: master New pull request Find File Clone or download

File	Description	Time Ago
neteler	Process chains updated to current syntax	2 days ago
docker	added testing and swarm deployment	21 days ago
docs	Apply suggestions from code review	10 days ago
scripts	Process chains updated to current syntax	2 days ago
src/actinia_core	all Sentinel-2 (A, B) are supported	6 days ago
tests	enable actinia to connect to a password protected redis db	5 months ago
.coveragerc	Initial commit	2 years ago
.gitignore	add production docker config and remove GISBASE (fixed in GRASS)	4 months ago
AUTHORS.rst	Add missing authors	10 months ago
CHANGELOG.rst	Initial commit	2 years ago
CONTRIBUTING.md	clarified to whom to address copyright header issues	8 months ago
LICENSE.txt	Initial commit	2 years ago
Makefile	Python 2 to Python 3 conversion (work in progress)	2 years ago
README.md	docker build batch added	3 months ago
requirements.txt	Working versions of google-cloud-bigquery and google-cloud-storage de...	18 days ago

Conclusions



- Open access data policy enable us to deliver better products
- Deutsche Telekom (DTAG) as a supporter of FOSS development
- mundialis contributes to core OSGeo project GRASS GIS:
 - r.buildvrt (new)
 - v.overlay (massive speed improvement)
 - r.in.wms (improvements)
 - g.search.modules (addon support)
 - r.cost/r.walk (multiple path directions)
- support of some **actinia** development (actinia-GDI and more)



To know more ...



...talk to us here at the conference!

Carmen Tawalika – Till Adams – Markus Neteler

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