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

Markus Neteler, Torsten Drey, Carmen Tawalika, Markus Metz, Anika Bettge

mundialis GmbH & Co. KG
Bonn, Germany

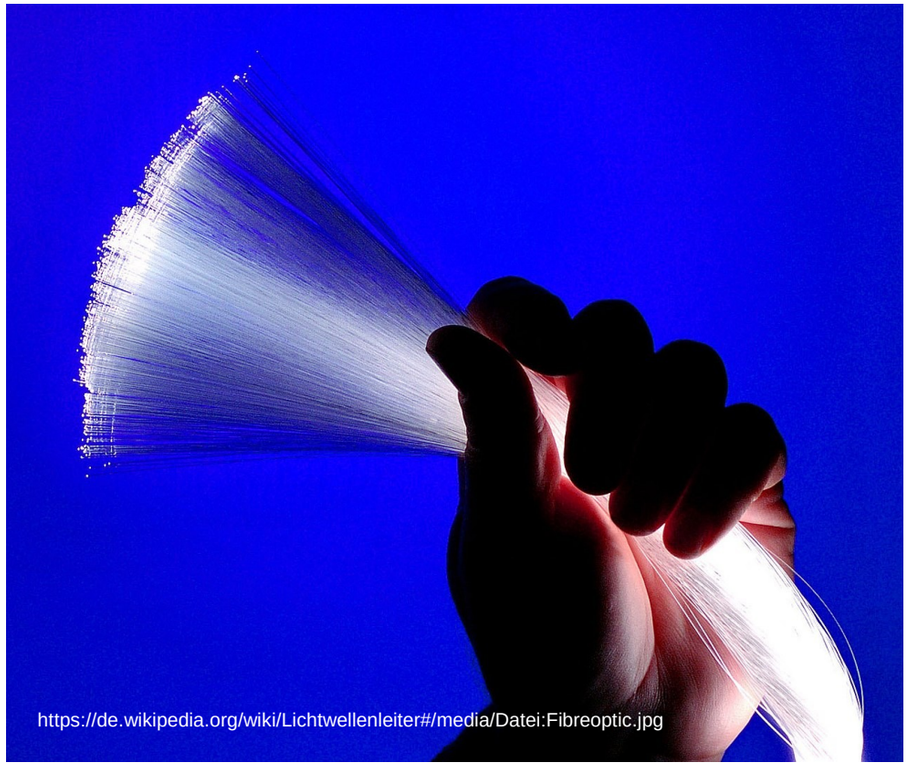
www.mundialis.de

mundialis

FTTH? What's that?

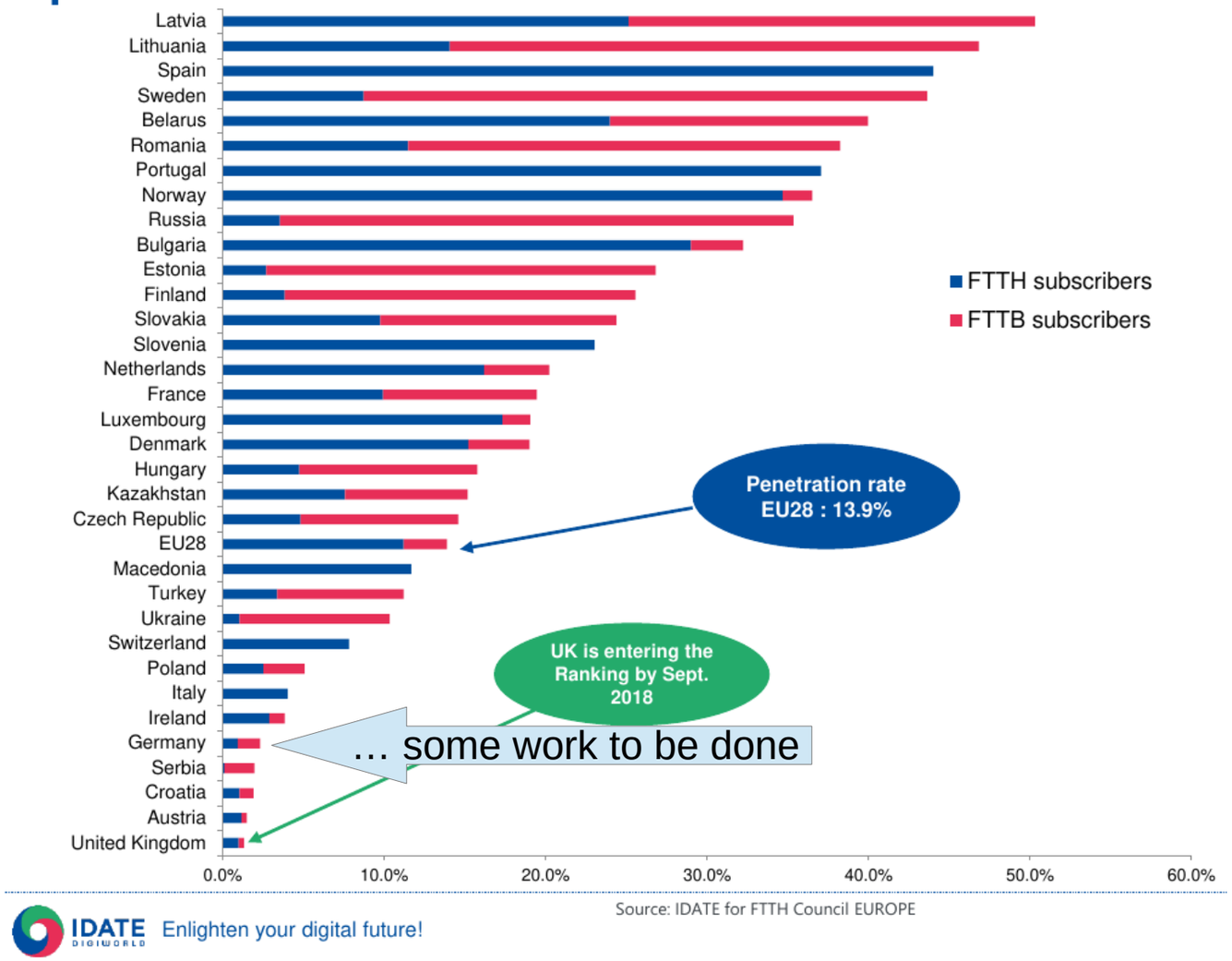
FTTH = Fibre to the Home | Fibre optics

Broadband of >= 1Gb/s – fast Internet access



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

European Ranking as at September 2018



Source: IDATE for FTTH Council EUROPE

IDATE DIGIWORLD Enlighten your digital future!

https://www.ftthcouncil.eu/documents/FTTH%20Council%20Europe%20-%20Panorama%20at%20September%202018.pdf

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

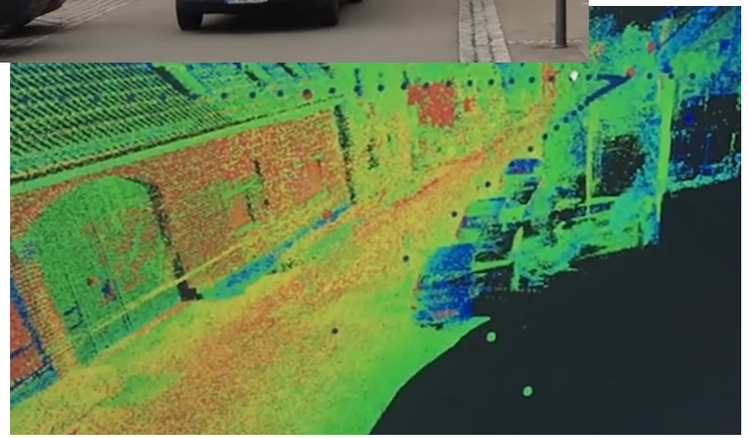
Author: Vivien Guéant

Photo: dpa, Guido Kirchner via heise.de

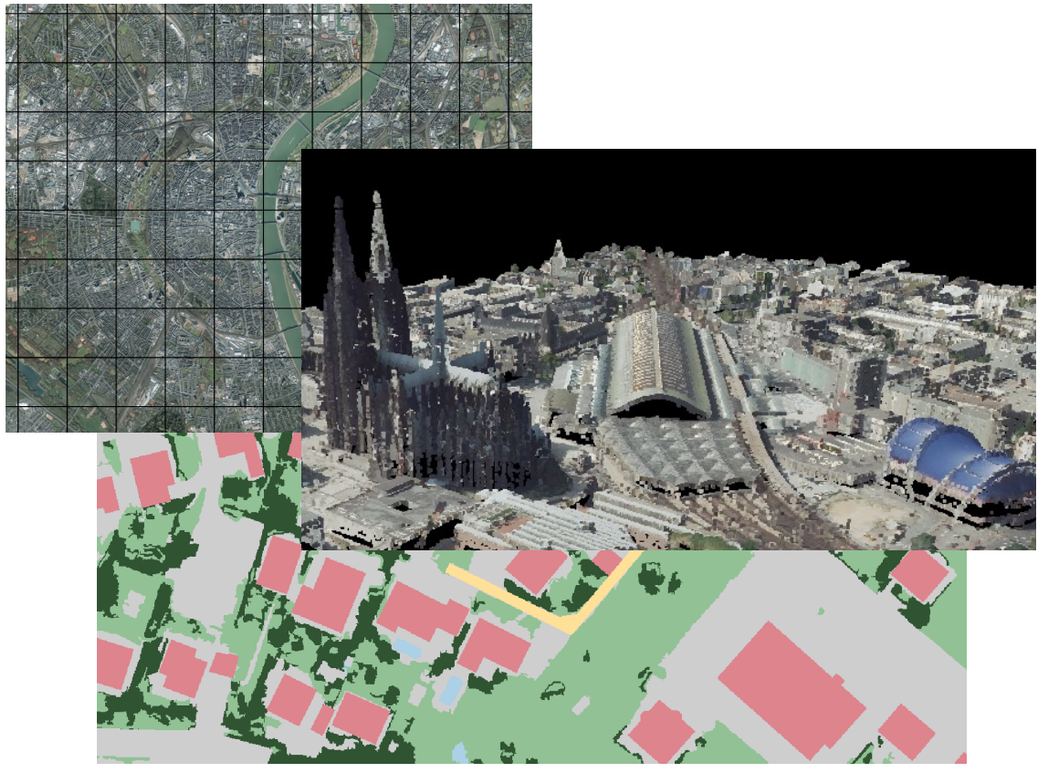
FTTH in DTAG: data sources

mundialis

Terrestrial street scanning

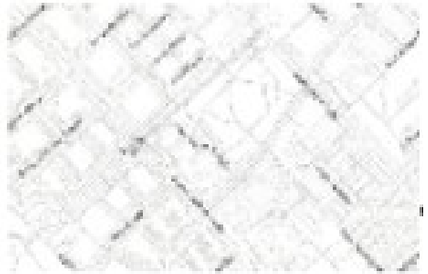


Aerial photography and laser scanning



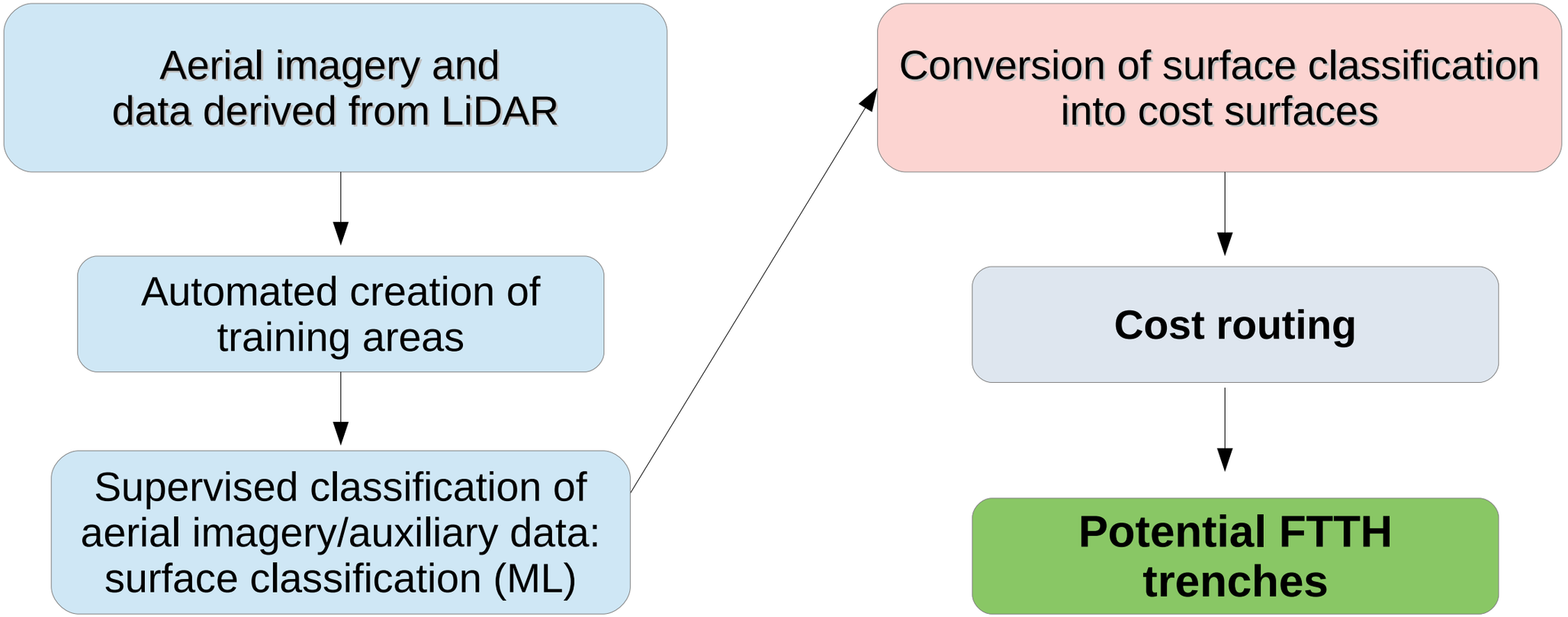
Official data

ALKIS Gebäude



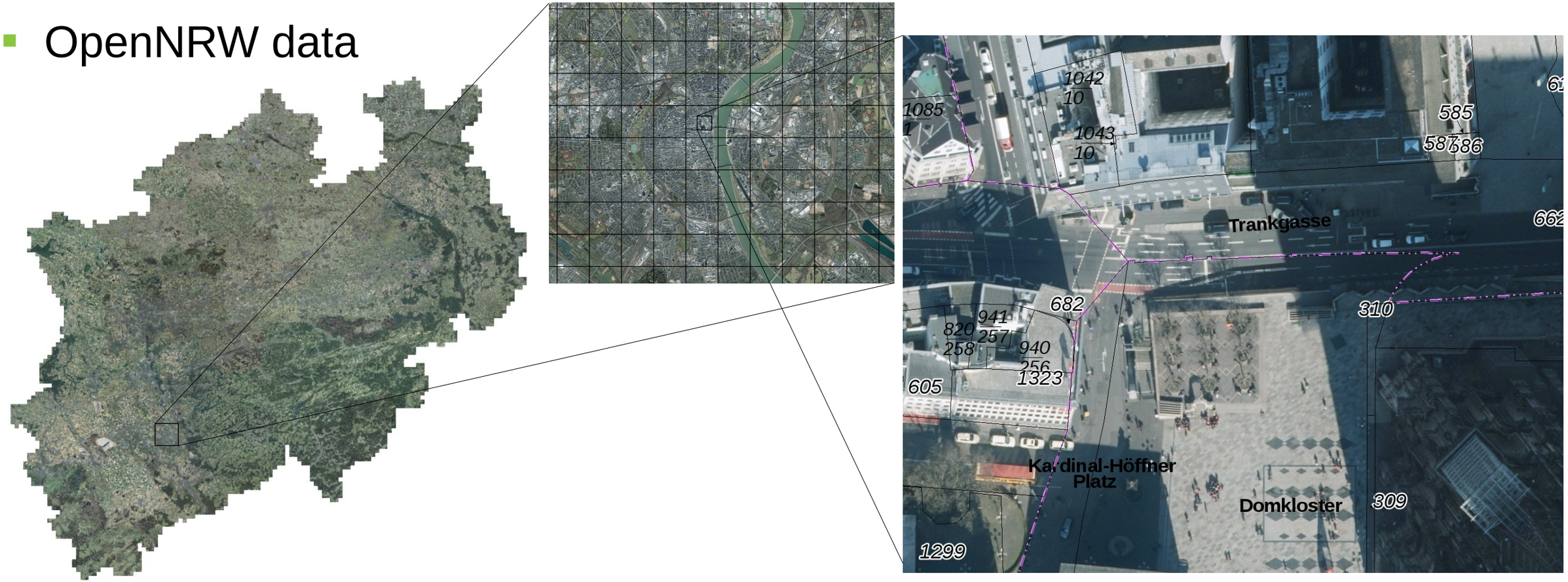
Strassennetz

From input data to potential FTTH trenches

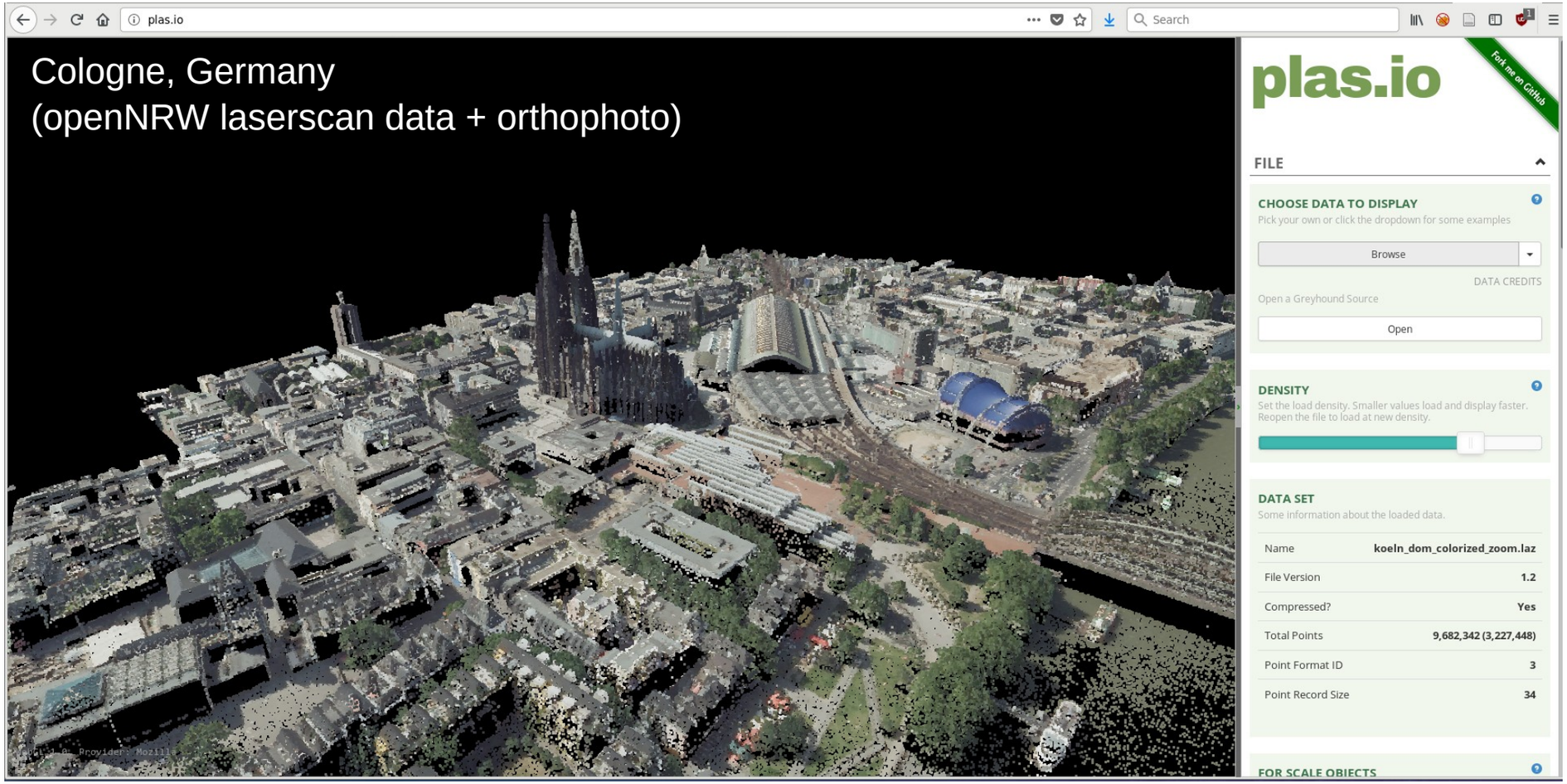


Data sources: 10 cm orthophotos (DOP)

- OpenNRW data



Data sources: LiDAR point clouds



Tools:

pdal

GRASS GIS

actinia

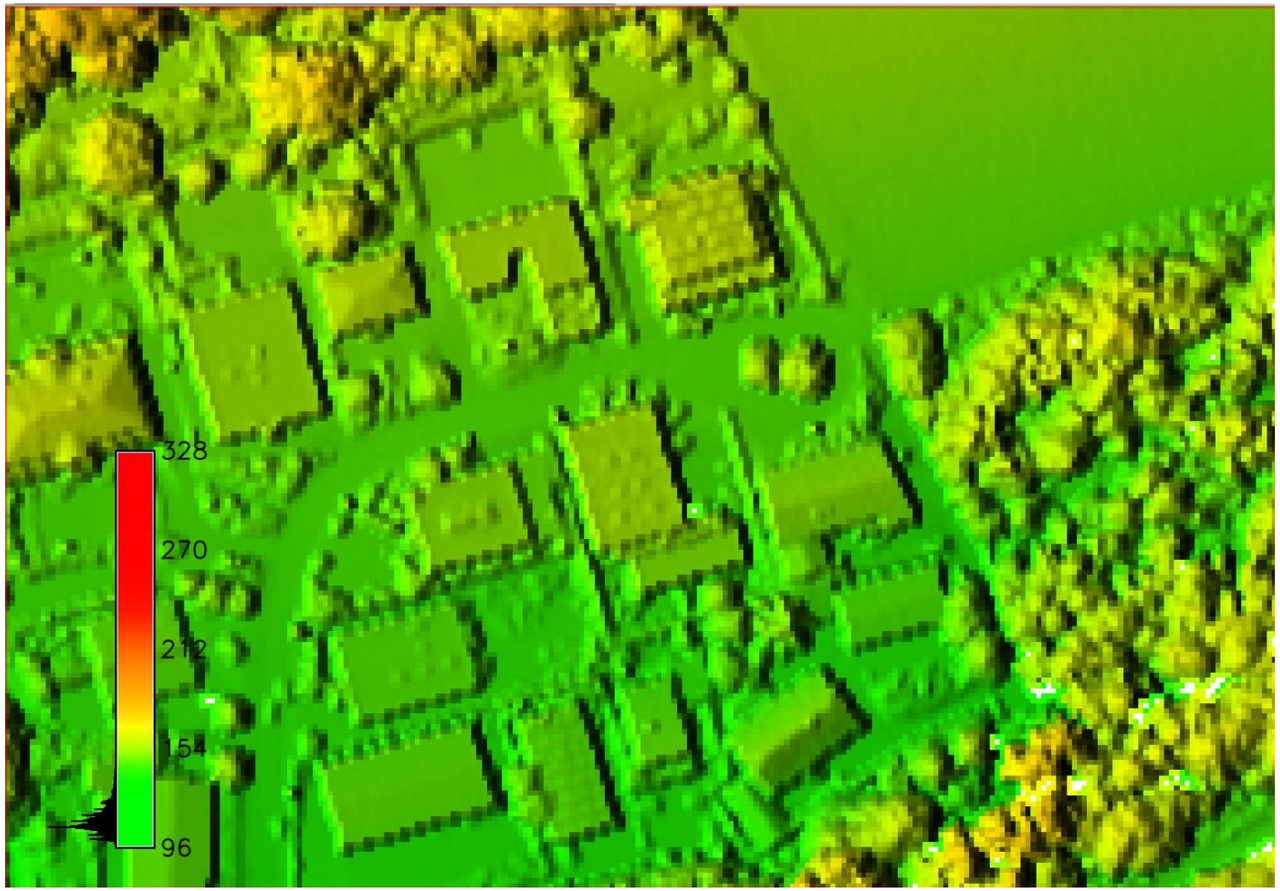
https://github.com/mundialis/openNRW

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”:

nDSM = DSM - 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:

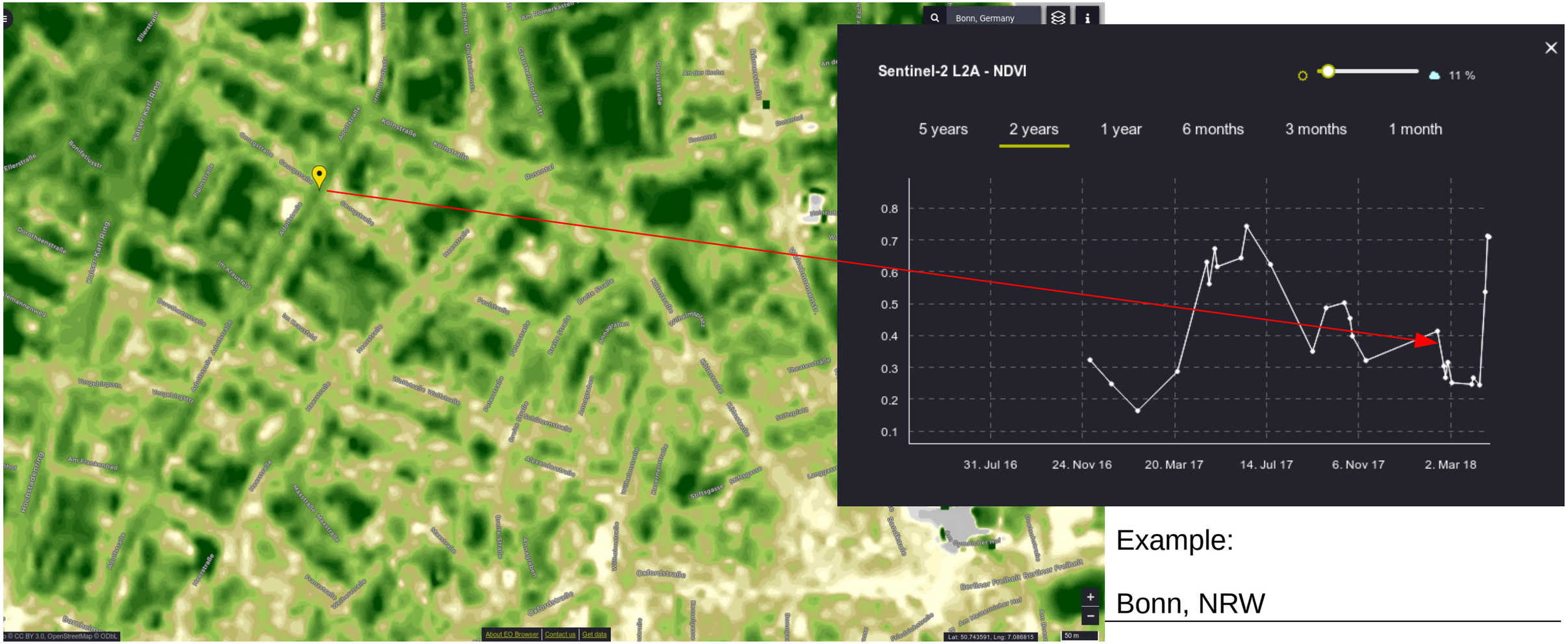
- building_height_thresh_min=2.5 m
- building_height_thresh_max=15 m (5 floors)
- building_area_thresh_sqm=20 m²

(… *to be further improved)*

Example:

Herdecke, NRW

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

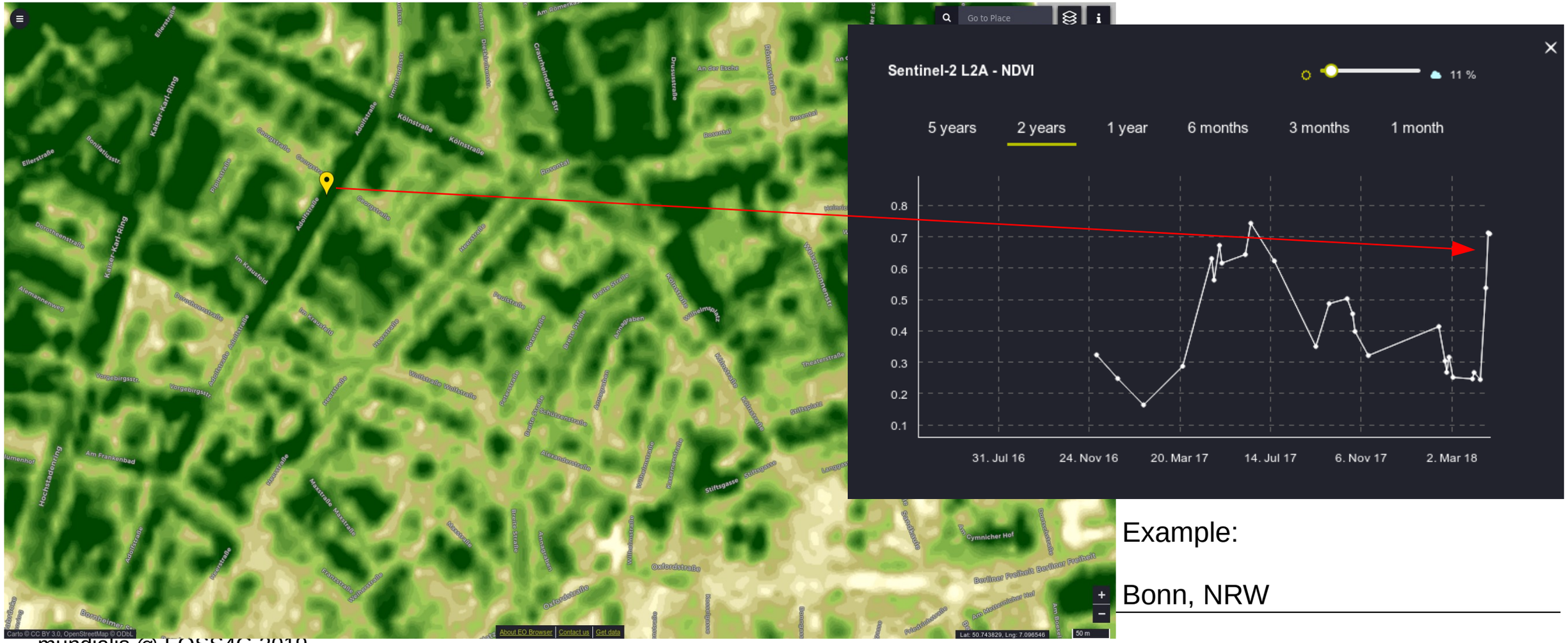


Example:

Bonn, NRW

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

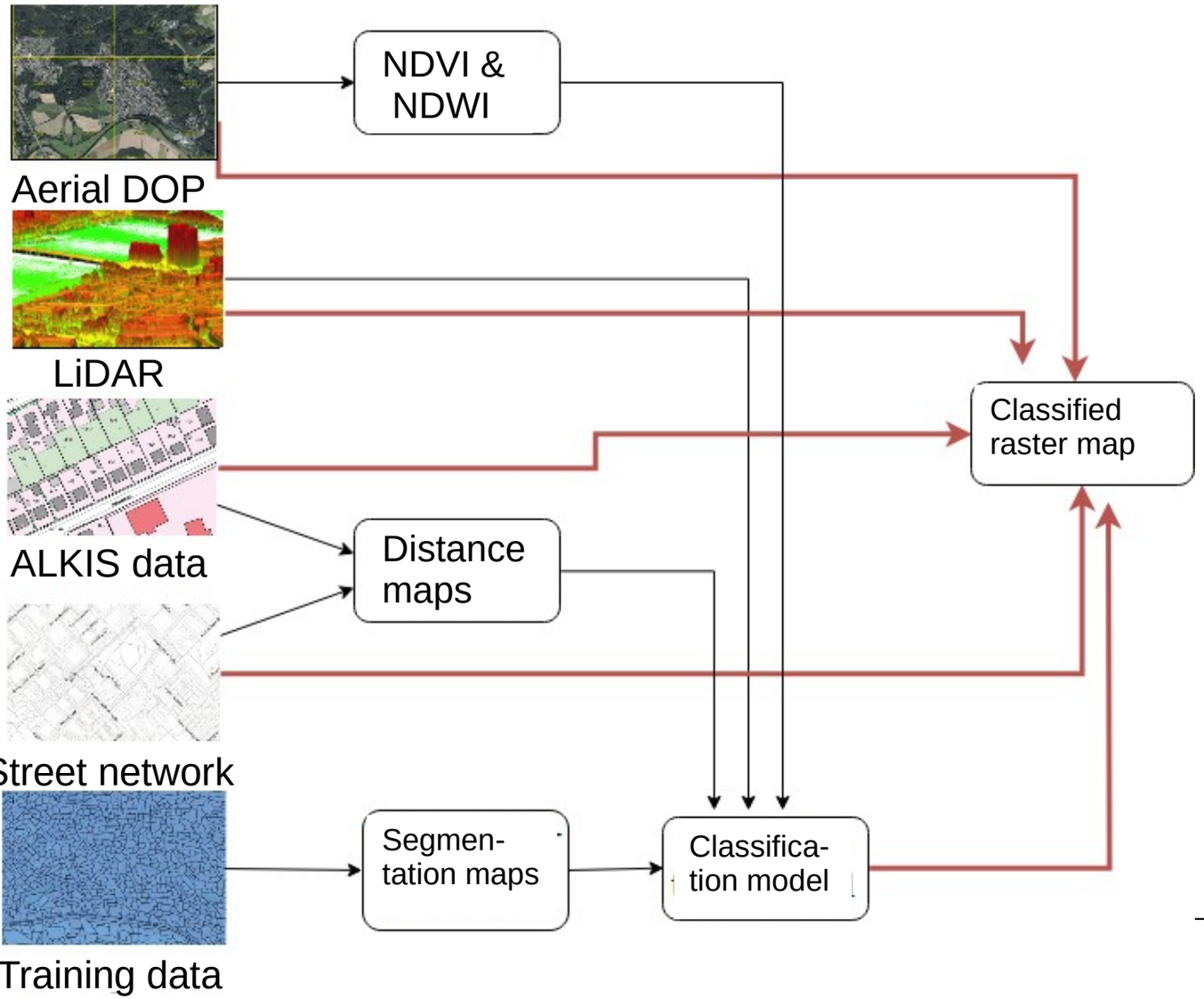
mundialis



Example:

Bonn, NRW

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**

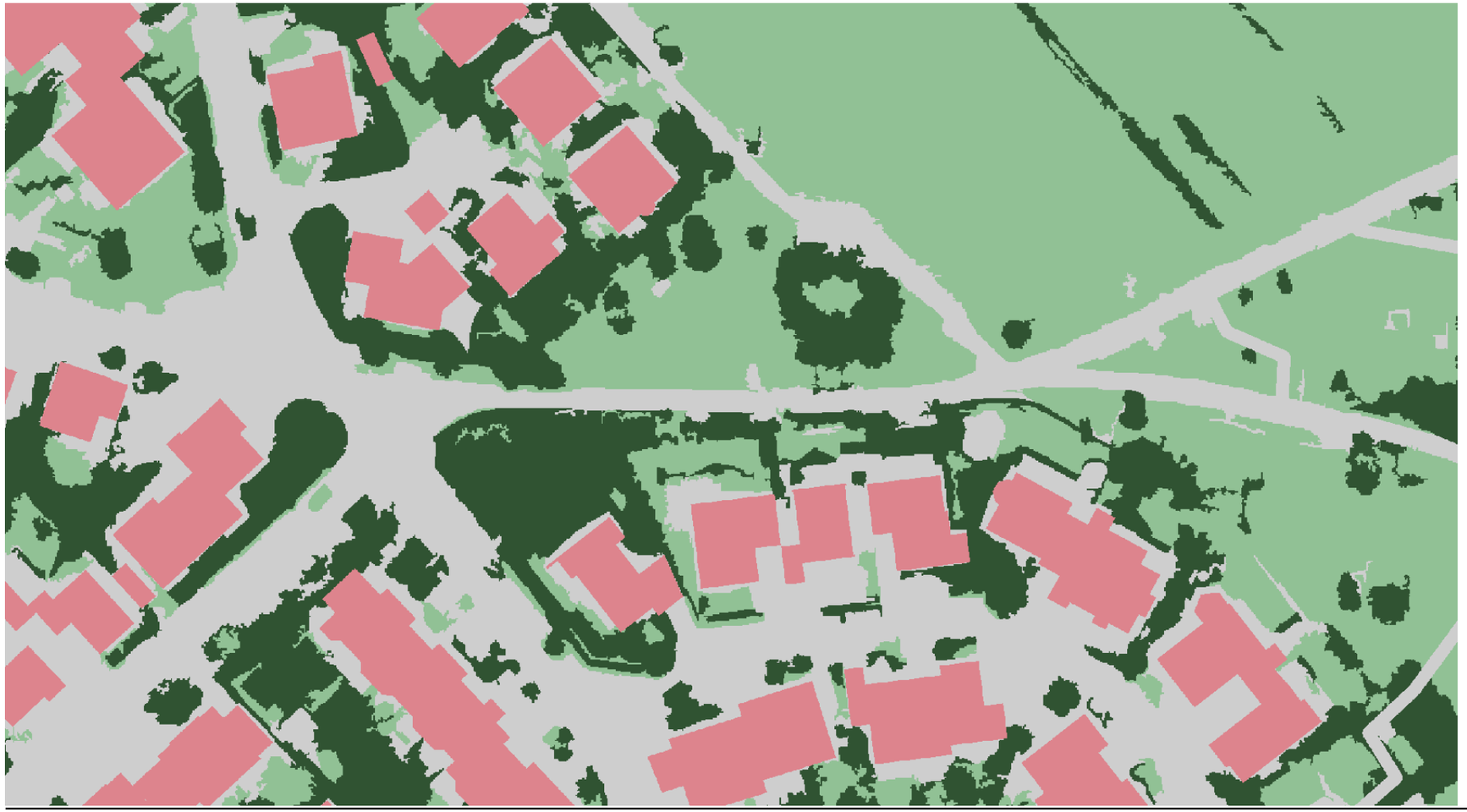
DOP resolution: 10cm

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	82.8	81.1	79.4	200.0	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

Computing of potential trenches, cost optimized

mundialis

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

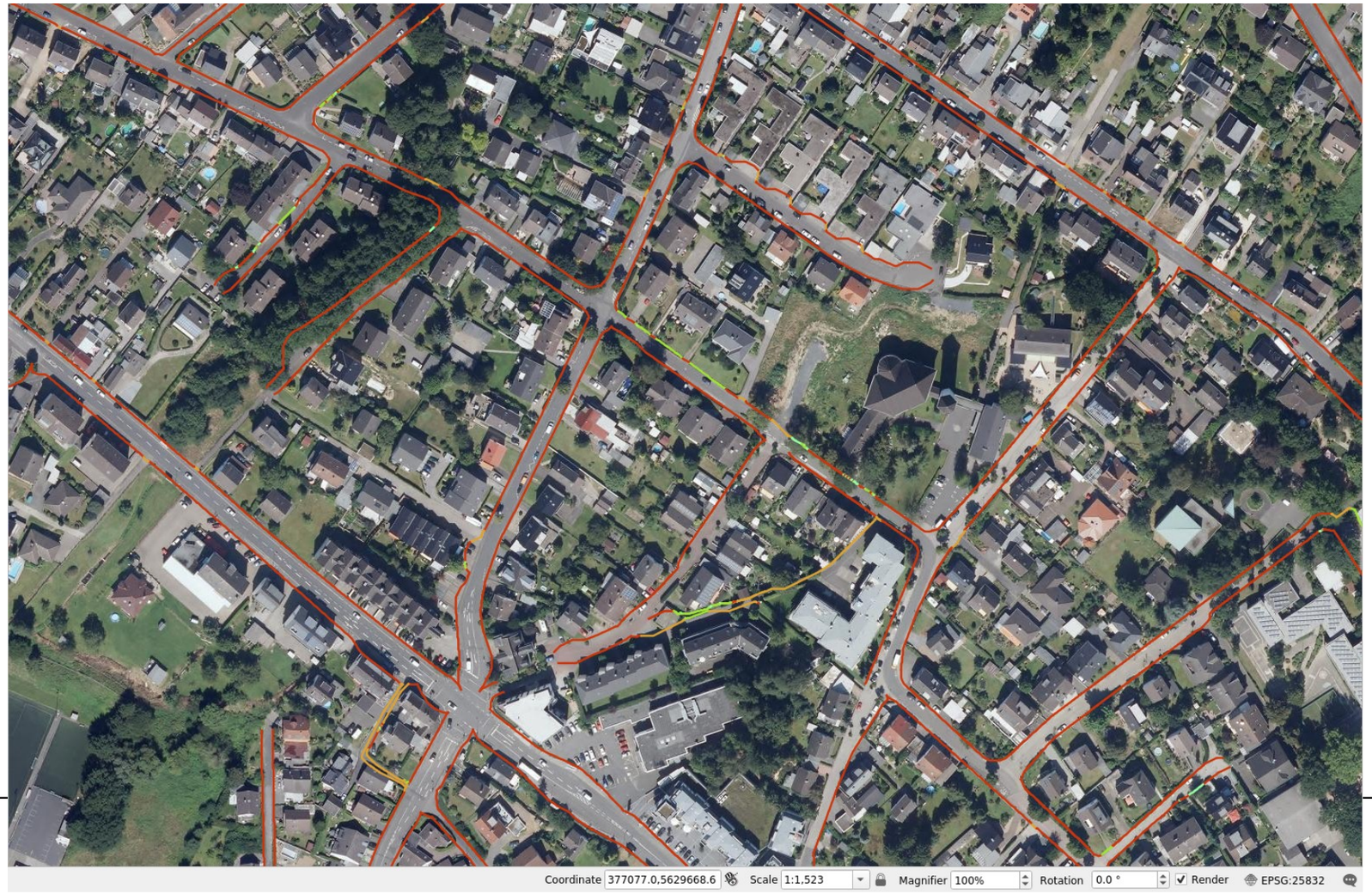
Source: Heise

FTTH: computing the potential trenches

mundialis

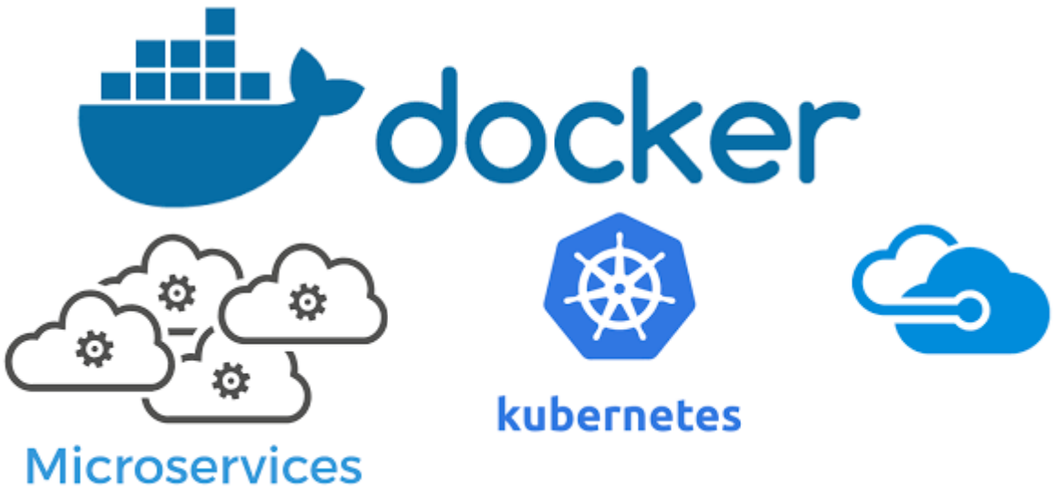
- [x] Trench in asphalt
- [x] Trench in tree
- [x] Trench in green area
- [x] Trench in gravel

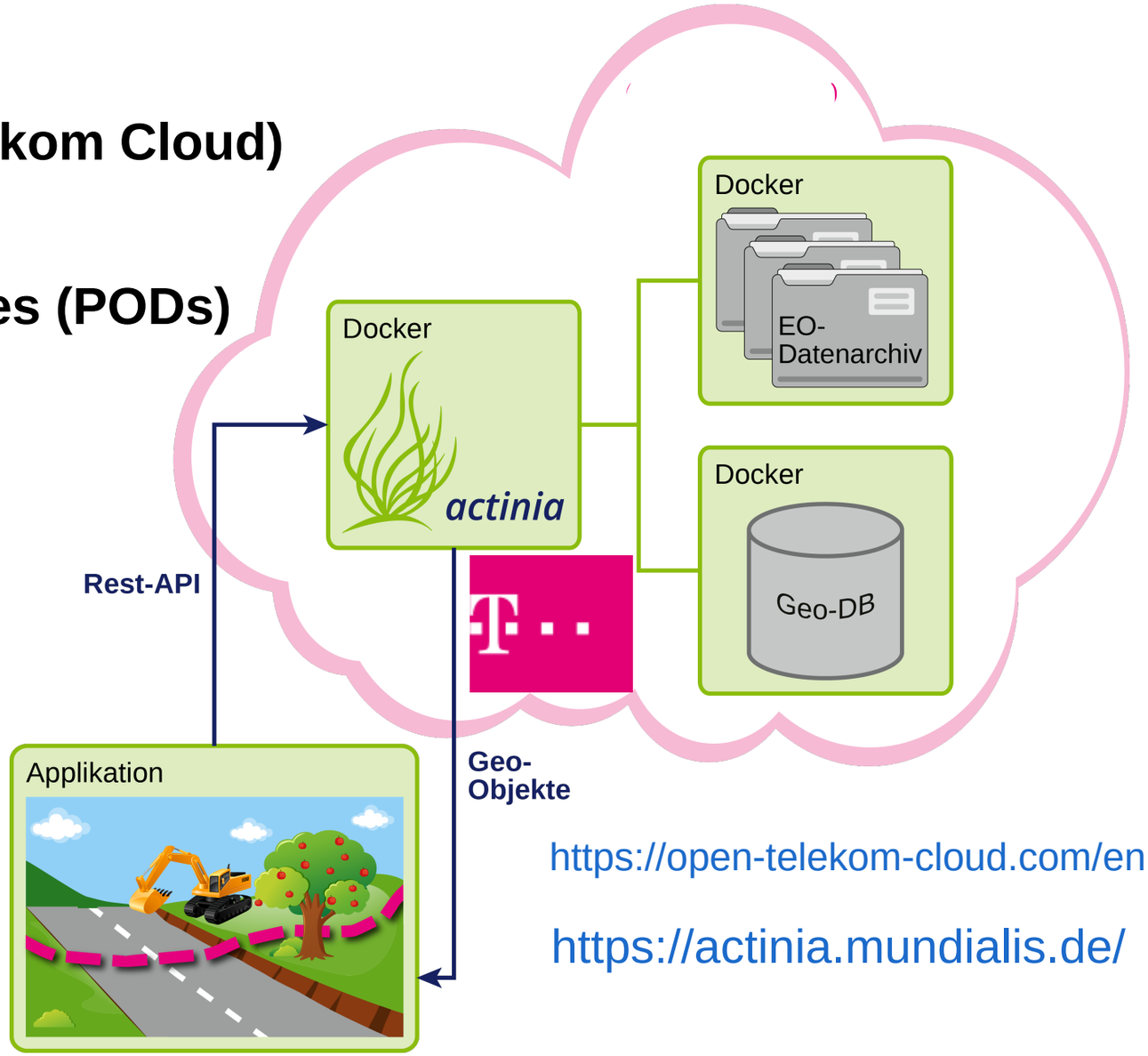
Source: Heise



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





https://open-telekom-cloud.com/en

https://actinia.mundialis.de/

actinia: cloud based geoprocessing engine

mundialis

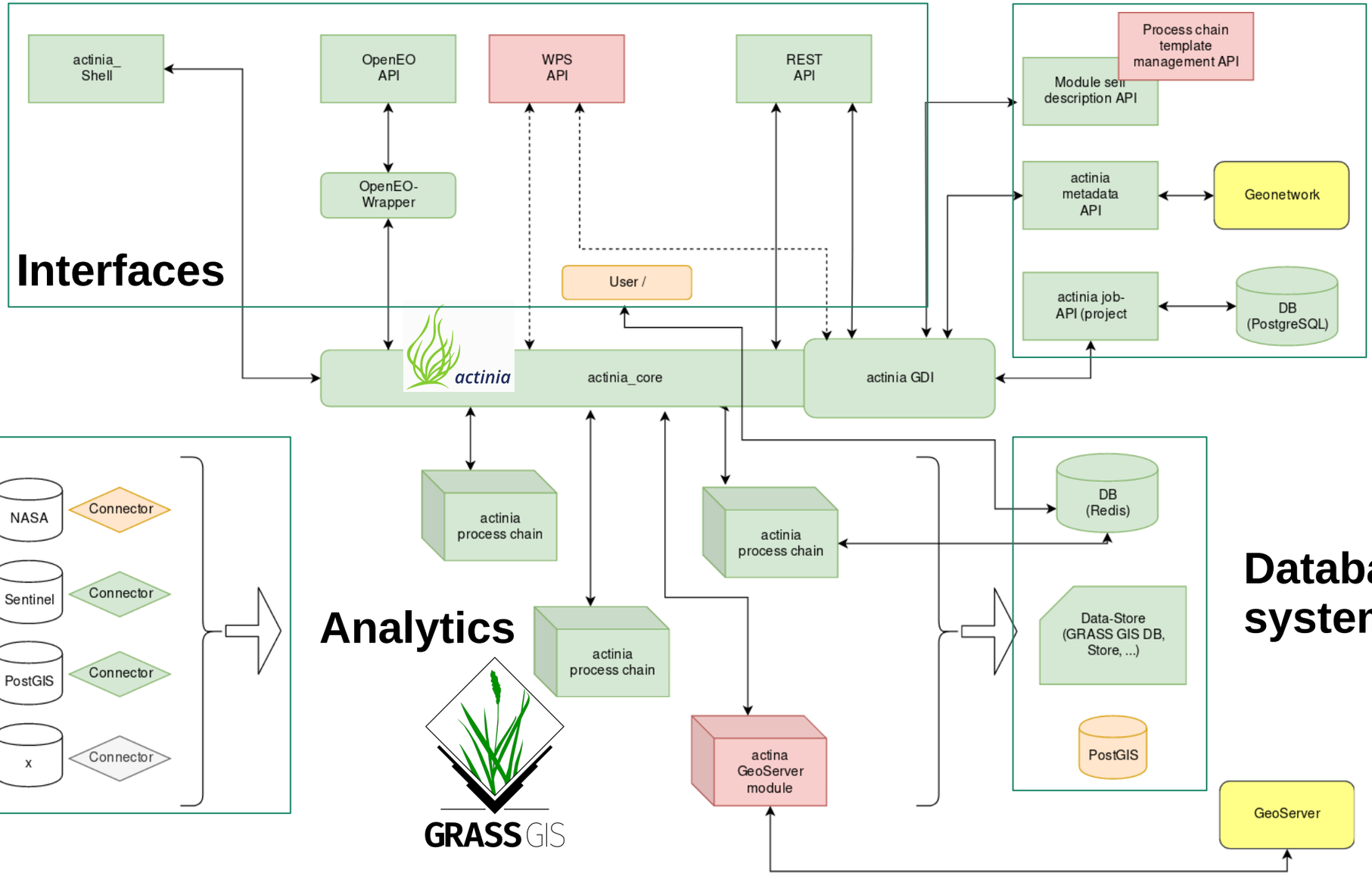
GRASS GIS and actinia:

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")

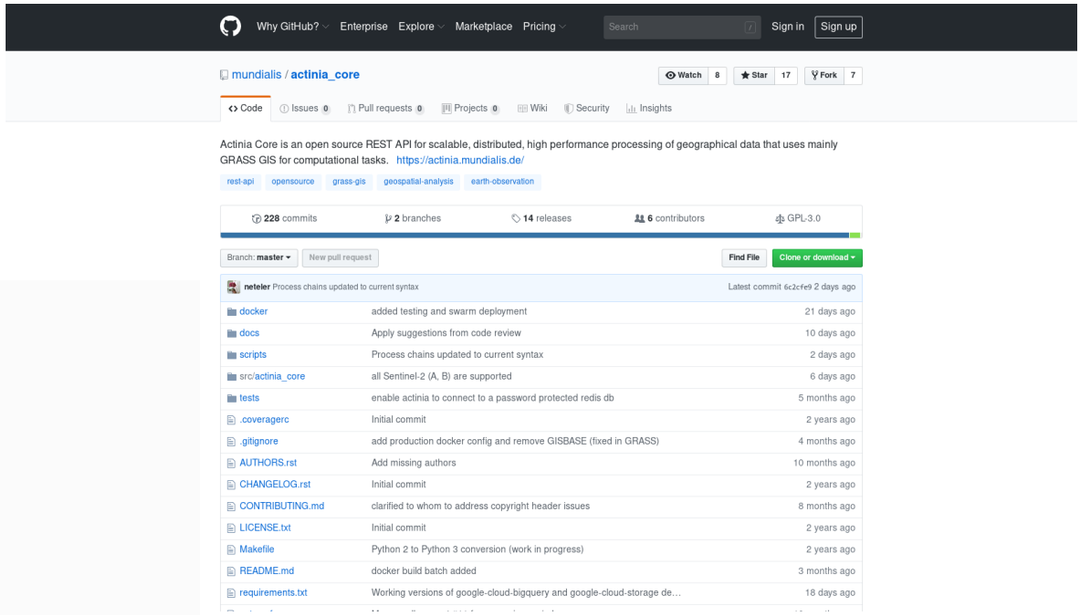
actinia: cloud based geoprocessing engine

mundialis



actinia – FOSS!

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



https://actinia.mundialis.de/

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

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

Contact

mundialis GmbH & Co. KG
Kölnstraße 99
53111 Bonn, Germany

Email: info@mundialis.de
Web: https://mundialis.de
Phone: +49 (0)228 / 387 580 80

mundialis