52north
exploring horizons

Integration of Sensor Web Components into the GeoNode Ecosystem

GeoNode Summit | Virtual 2020

Martin Pontius, **Matthes Rieke**

52°North GmbH
Münster, Germany

Overview

1. 52°North
2. Idea and Concept
   a. Research Data Infrastructure requires management of measurements, time series
   b. SOS, STA good candidates
   c. STA in particular web-friendly
3. OGC and Sensor Web
   a. SOS
   b. STA
   c. Helgoland
4. Way Forward - GeoNode and Sensor Data
   a. Component Integration, Challenges

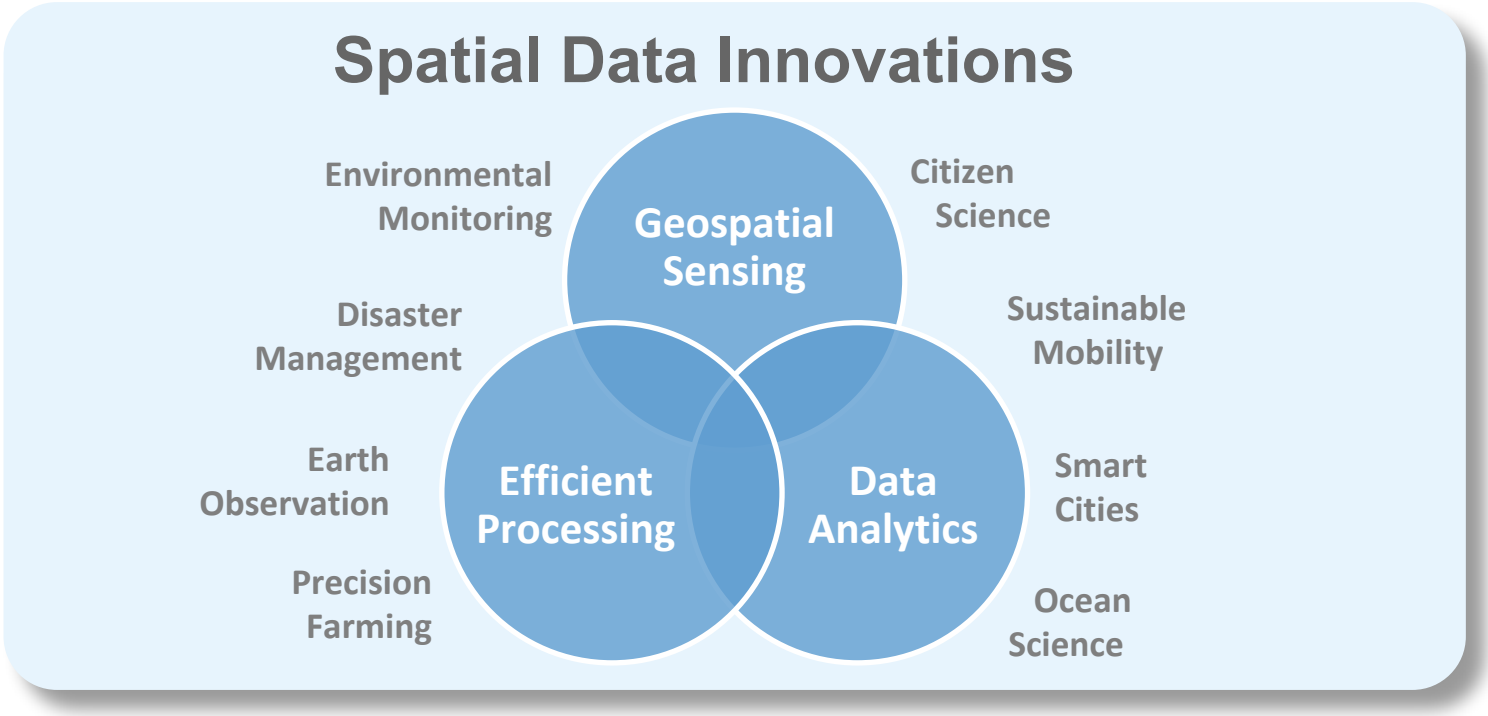
52°North

Innovation in Geospatial Technologies

52°North – Initiative for Geospatial Open Source Software GmbH

- Open Research and Innovation Network in the field of Geoinformatics
- 52°North GmbH (non-profit) is the legal body and service centre of this network
  - Staff: ca. 20
  - Founded as a company in 2006
- Main activities are applied research and knowledge transfer
- All results of joint R&D Innovation activities are published as Open Source Software
- 52°North has revenues from Partnership-Fees, European and national R&D Budgets, consultancy services

52°North's R&D Focus is on..



52°North and OGC

- Long-term involvement in OGC standardization programs and interoperability experiments
  - Sensor Web
  - Web Processing
- Currently active in **OGC API - Processes SWG** → chaired by Benjamin Proß (52N)

- Work in the Sensor Web domain beyond OGC as well → web applications, REST APIs, security (auth/auth) concepts

52°North and OSGeo

Contribution to OSGeo Live since 4.0 release

- Several 52°North Open Source components:
  - 52N WPS (Web Processing framework)
  - 52N SOS (Sensor Web Server)
  - 52N Helgoland (Sensor data and time series browser app)
  - prior: Web Security Service (WSS)

Idea and Concept

GeoNode + Sensor Web = X?

Motivation

Current Trend: Research Data Infrastructures (RDI)

- Amount of (geo) data for research increases steadily
- New concepts are demanded to support the research work as well as the publication of scientific results

*"The aim of the national research data infrastructure (NFDI) is to **systematically manage** scientific and research data, provide long-term data storage, backup and accessibility, and **network the data** both nationally and internationally. The NFDI will bring multiple stakeholders together in a coordinated network of consortia tasked with providing **science-driven data services** to research communities."*

DFG, German Research Foundation

Motivation

Landscape in Germany (excerpt):

- NFDI4Agri (agriculture), NFDI4Earth (earth and environmental sciences), NFDIxCS (computer science), NFDI4DS (AI, data science), ...

Source: DFG, German Research Foundation

An RDI

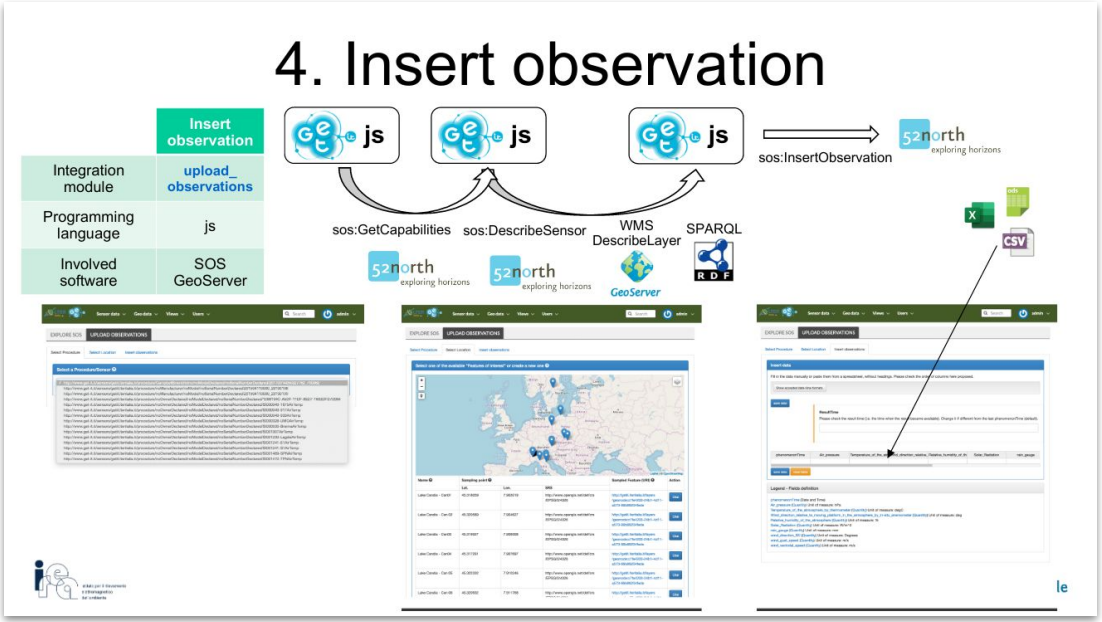
- requires management of multitude of data types and formats

  → GeoNode is a very good starting point for geo-related RDIs

- measurements, time series → 52°North components provide solutions

GeoNode and Sensor Data

- Cristiano Fugazza presented GET-IT and its Sensor Data approach → very interesting work



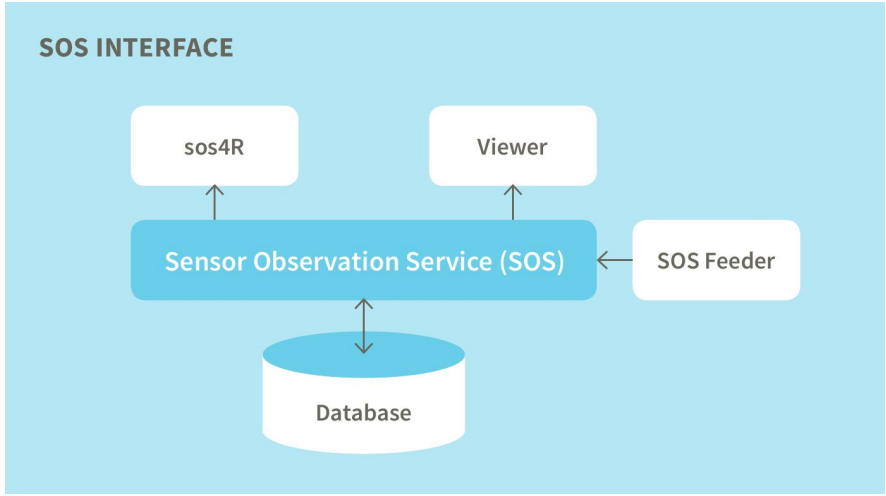
Source: irea/ CNR

OGC and Sensor Web

52°North Software Suite

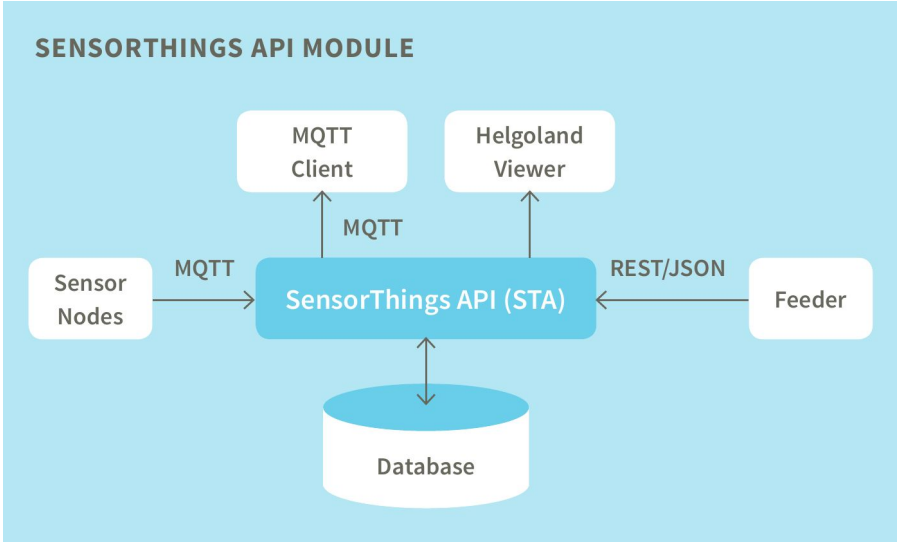
SOS (Sensor Observation Service)

- OGC specification (version 2.0)
- Access to sensor data
- Consistent interface and data format for all kinds of sensors
- Pull-based access to observations
- Hides the heterogeneous structure of proprietary sensor data formats and protocols



STA (Sensor Things Api)

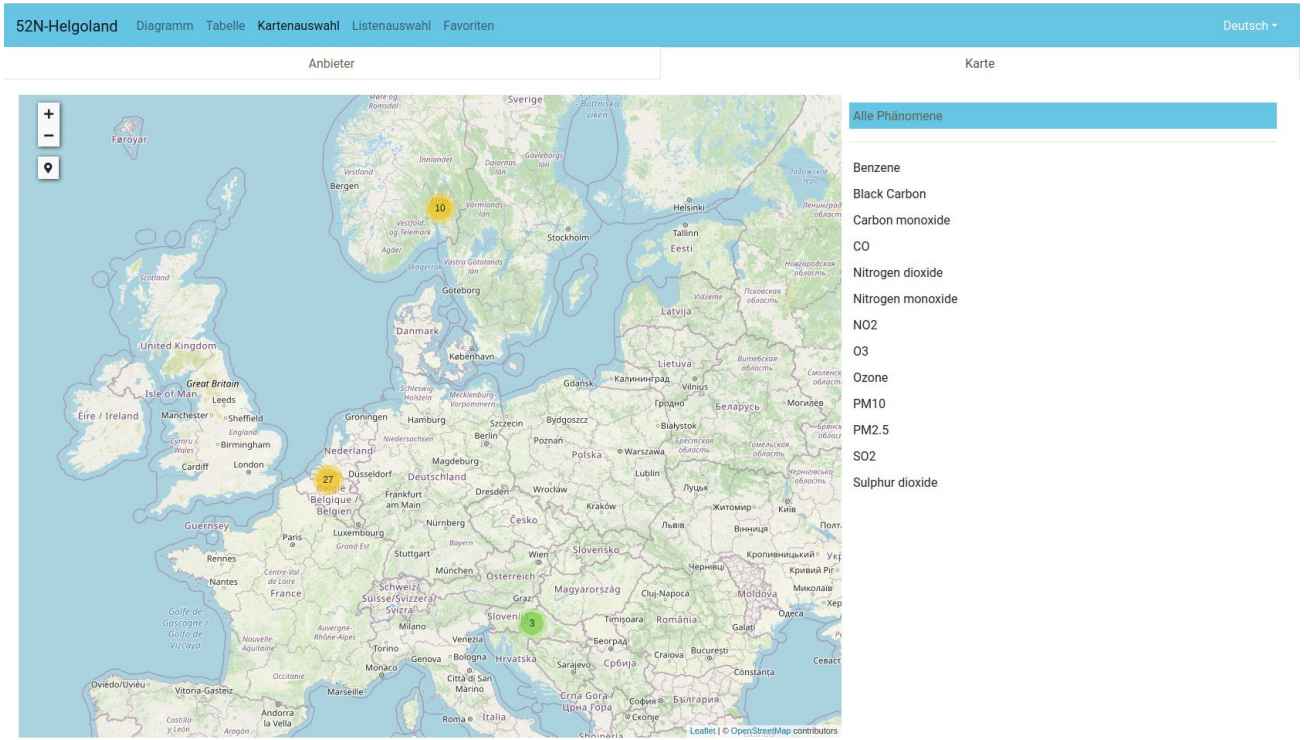
- Complementary OGC specification for **Internet of Things** applications
- Simplified approach based on REST and JSON
  - REST binding for SOS functionalities
  - JSON binding for the O&M model
- MQTT: Publish-Subscribe
- CRUD



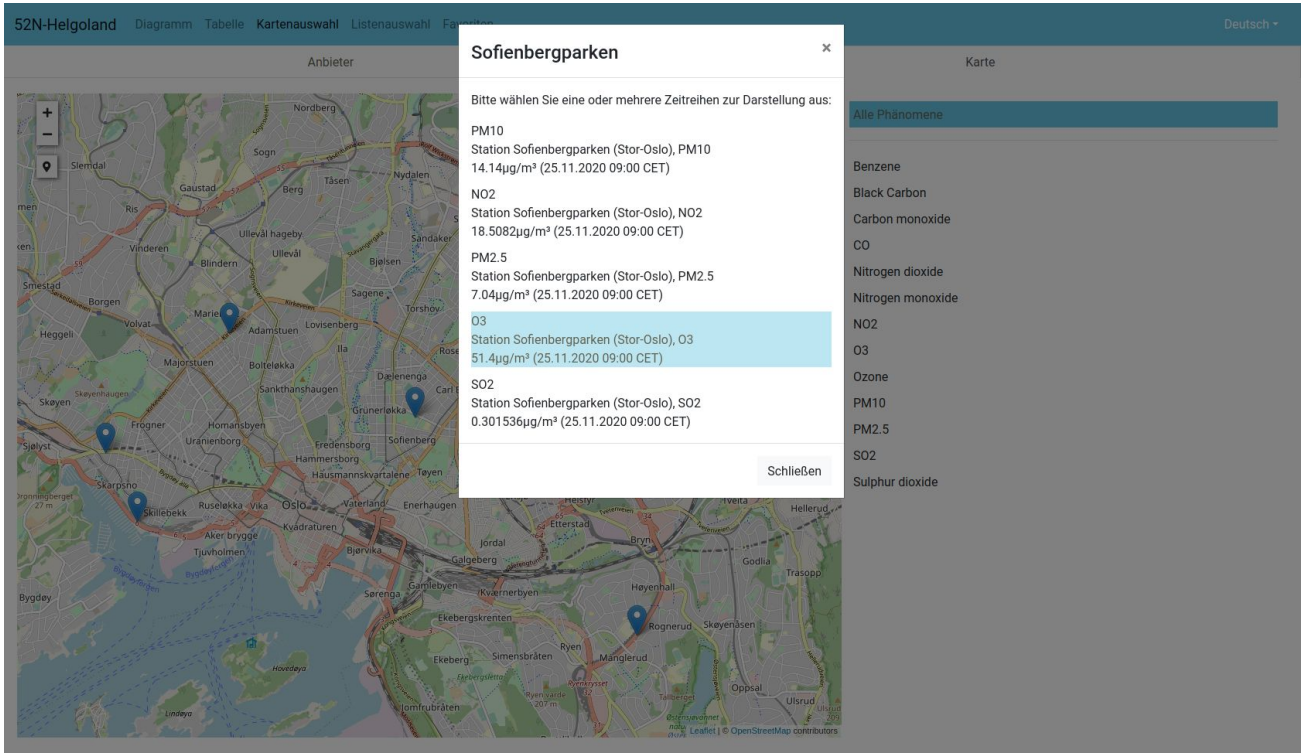
Helgoland - Demo

- https://aqsens.52north.org/helgoland/

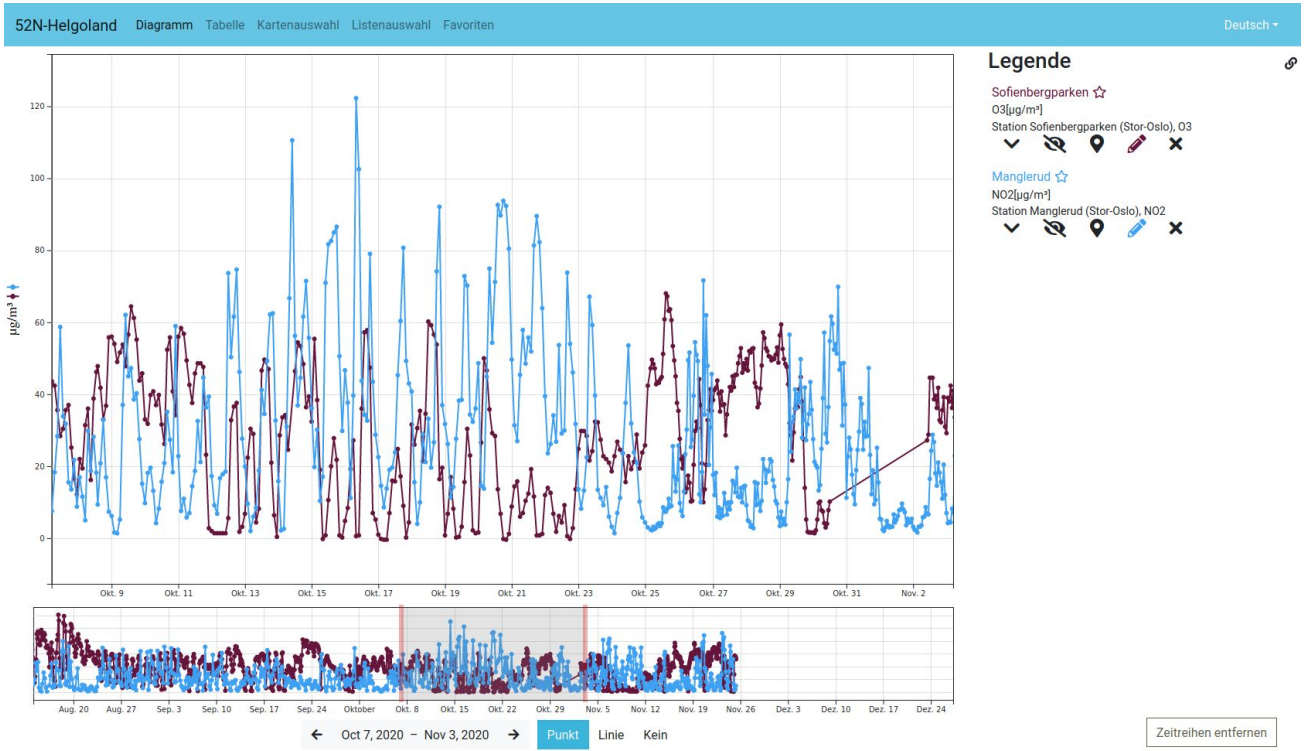
Helgoland


52N-Helgoland
Diagramm
Tabelle
Kartenauswahl
Listenauswahl
Favoriten
Deutsch
Anbieter
Karte
Alle Phänomene
Benzene
Black Carbon
Carbon monoxide
CO
Nitrogen dioxide
Nitrogen monoxide
NO2
O3
Ozone
PM10
PM2.5
SO2
Sulphur dioxide
10
27
3
Leaflet | © OpenStreetMap contributors

Helgoland


52N-Helgoland
Diagramm
Tabelle
Kartenauswahl
Listenauswahl
Deutsch
Anbieter
Karte
Alle Phänomene
Benzene
Black Carbon
Carbon monoxide
CO
Nitrogen dioxide
Nitrogen monoxide
NO2
O3
Ozone
PM10
PM2.5
SO2
Sulphur dioxide
Sofienbergparken
Bitte wählen Sie eine oder mehrere Zeitreihen zur Darstellung aus:
PM10
Station Sofienbergparken (Stor-Oslo), PM10
14.14µg/m³ (25.11.2020 09:00 CET)
NO2
Station Sofienbergparken (Stor-Oslo), NO2
18.5082µg/m³ (25.11.2020 09:00 CET)
PM2.5
Station Sofienbergparken (Stor-Oslo), PM2.5
7.04µg/m³ (25.11.2020 09:00 CET)
O3
Station Sofienbergparken (Stor-Oslo), O3
51.4µg/m³ (25.11.2020 09:00 CET)
SO2
Station Sofienbergparken (Stor-Oslo), SO2
0.301536µg/m³ (25.11.2020 09:00 CET)
Schließen
Leaflet | © OpenStreetMap contributors

Helgoland


52N-Helgoland
Diagramm
Tabelle
Kartenauswahl
Listenauswahl
Favoriten
Deutsch
µg/m³
120
100
80
60
40
20
0
Okt. 9
Okt. 11
Okt. 13
Okt. 15
Okt. 17
Okt. 19
Okt. 21
Okt. 23
Okt. 25
Okt. 27
Okt. 29
Okt. 31
Nov. 2
Aug. 20
Aug. 27
Sep. 3
Sep. 10
Sep. 17
Sep. 24
Oktober
Okt. 8
Okt. 15
Okt. 22
Okt. 29
Nov. 5
Nov. 12
Nov. 19
Nov. 26
Dez. 3
Dez. 10
Dez. 17
Dez. 24
Oct 7, 2020 – Nov 3, 2020
Punkt
Linie
Kein
Legende
Sofienbergparken
O3[µg/m³]
Station Sofienbergparken (Stor-Oslo), O3
Manglerud
NO2[µg/m³]
Station Manglerud (Stor-Oslo), NO2
Zeitreihen entfernen

Way Forward

Contribution to the GeoNode Community

TECHNICAL INTEGRATION

Re-usage of existing software components

- 52°North Sensor Web Server
- Sensor Observation Service
- SensorThings API → built-in CRUD support

Evaluation how existing JavaScript components can be integrated

- Helgoland → SPA based on Angular 8+
- Helgoland Toolbox → modularized components that drive Helgoland (also Angular based)
- assess options
  - e.g. standalone app as part of GeoNode, launched for specific layer types
  - integrate with existing MapStore client

Challenges

Metadata Management

- How to describe metadata for sensors / timeseries in a GeoNode friendly way?

Data Publication

- Data publication of sensor data should not be a manual process

Integration / Deployment

- Docker-first concept favored
  - 52N Sensor Web Server production ready with Docker

Related Concepts

Integration of 52°North javaPS into GeoNode

- **Web Processing Service 2.0** and **OGC API Processes** interface
- many supported processing backends:
  - R
  - Python
  - GeoTools (basic geo processes)
  - generic Docker (e.g. via OGC ADES - Application Deployment and Execution Service)
- Browser App (SPA based on Angular) available

Thanks for the Attention!

Questions?

Martin Pontius (m.pontius@52north.org)
Matthes Rieke (m.rieke@52north.org)

52north
exploring horizons

https://52north.org