# Follow your wastewater using the open source Graph Tracing Engine

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GEOSPARC

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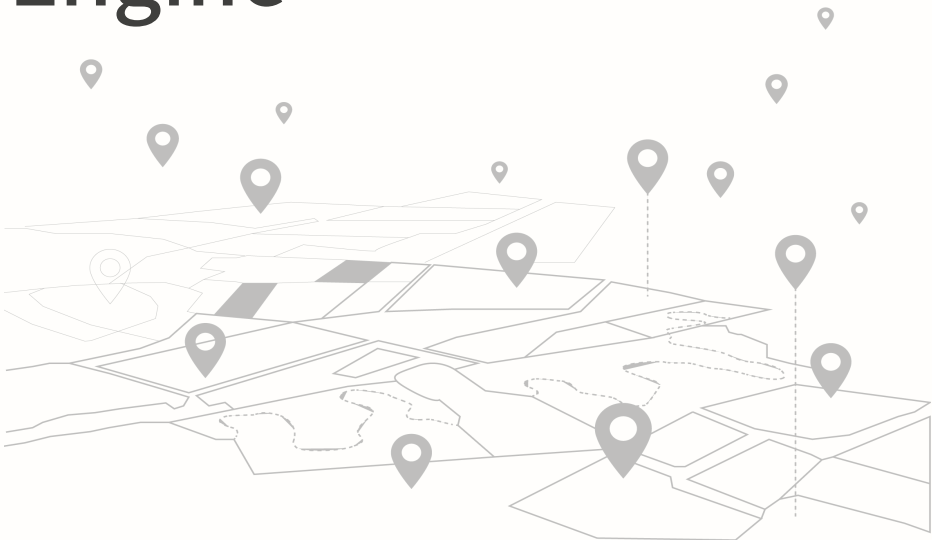

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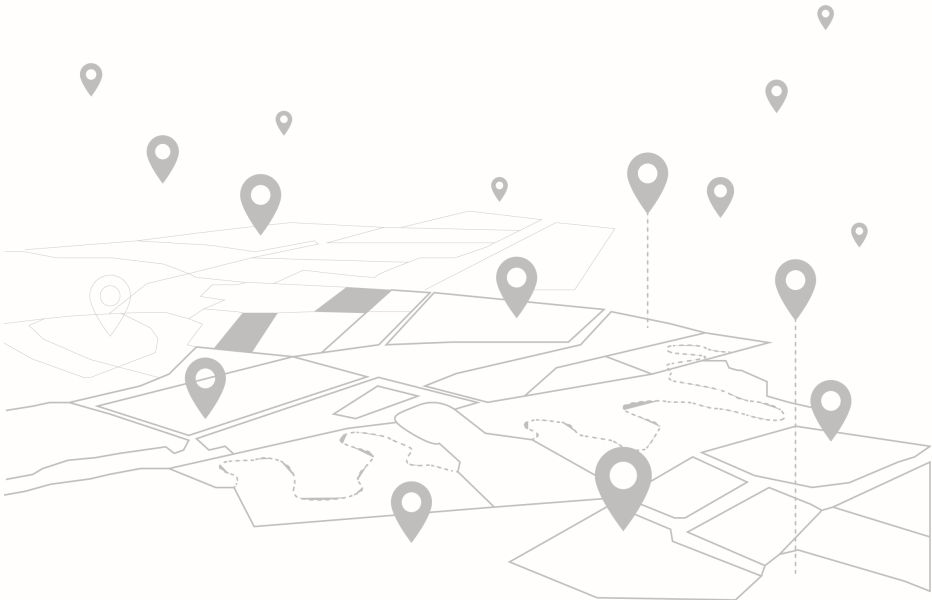

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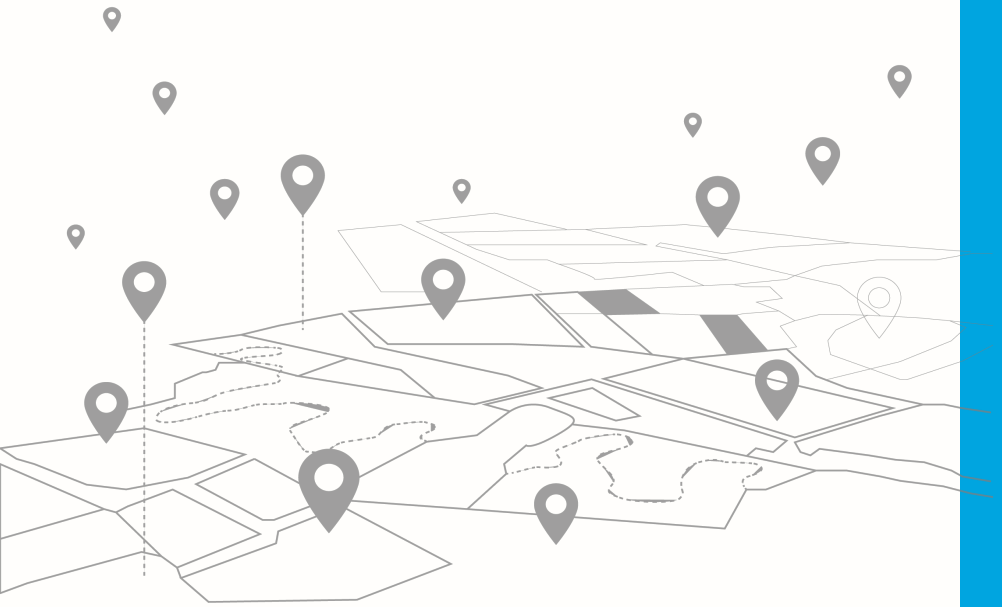

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# Geosparc


WE IMPROVE THE LIVES OF CITIZENS WITH WELL THOUGHT-OUT, GEOLOCATION BASED SOLUTIONS BASED ON OPEN SOFTWARE AND OPEN DATA.
That's our mission. Discover Our Solutions

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# Professional Team

## Executive office

Kris De Pril
CEO
20y experience in software business

### Customer Relations
**Jeroen Saegeman**

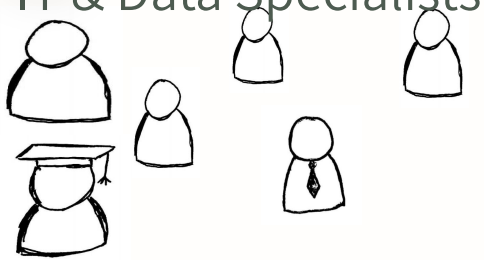
### Service Delivery
**Berdien De Roo**

### Product Development
**Peter De Mangelaere**

### Support
**Pepijn Viaene**

## GIS Experts

## IT & Data Specialists



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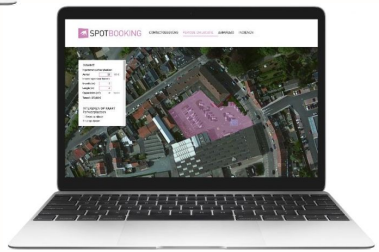
# Main Solutions

## PARKTRACK

Smart insights in your parking policy

## SPOTBOOKING

The smart way to manage and reserve the use of public domain

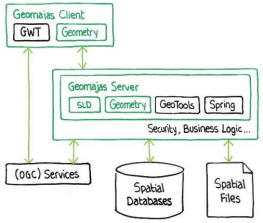


## ISSUEDOC

The quickest way to effectively manage enforcement.


## GEOMAJAS

Open source software framework for custom-made web-based geo applications

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MILIEUMAATSCHAPPIJ

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North-West Europe
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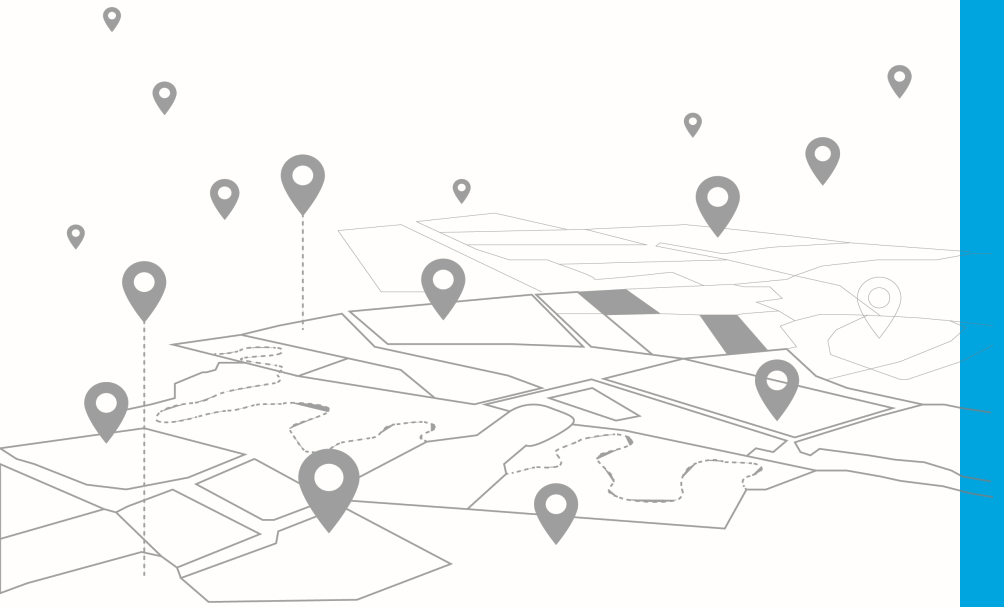
European Regional Development Fund

EUROPEAN UNION



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# Waste water tracing algorithm

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# Trace what?

**Downstream**

- Extinguishing water flow-off
- Invasive plant species
- Simulation, future planning
- …

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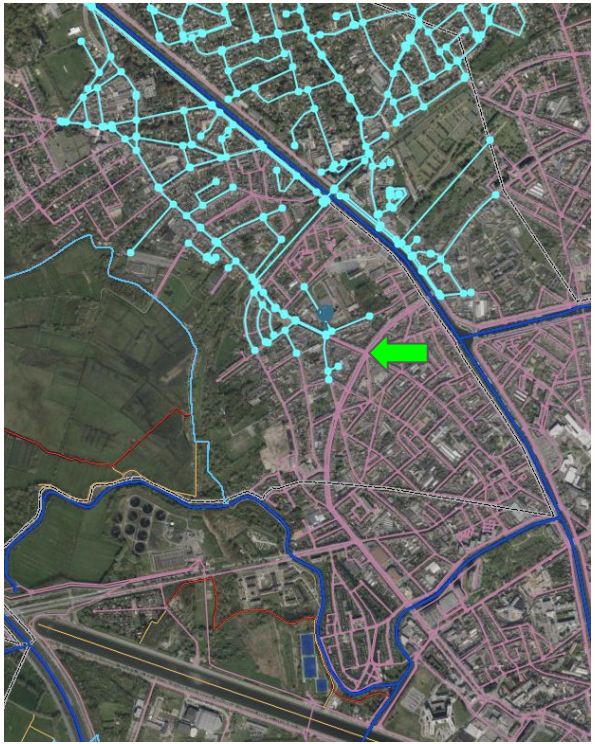
# Trace what?

**Upstream**

- Trace source of contamination
- Calculate waste load
- Simulation, future planning
- …



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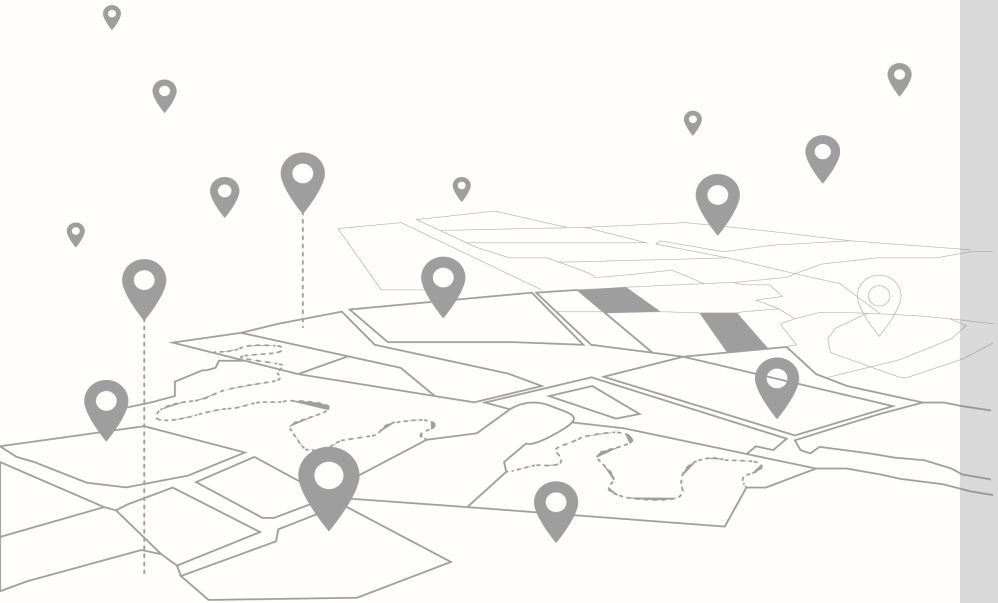

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# Waste water tracing algorithm

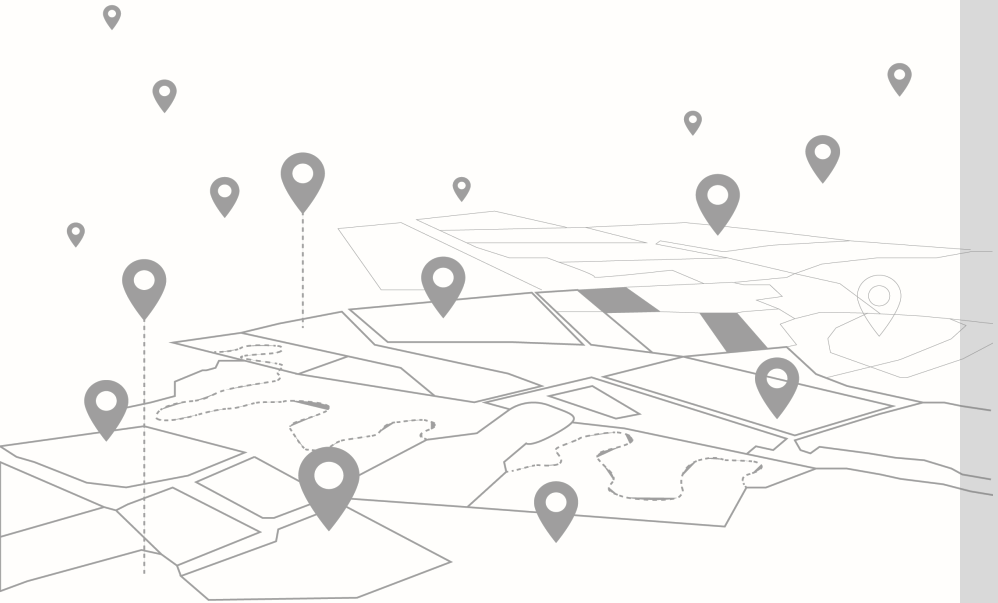
## Objective

## Pains

Poor performance
Limited flexibility in data
No insight in risk areas
Only available in sewer inventory application
Tracing limited to single network

## Main objective

Improve and extend VMM's tracing algorithm for sewers and surface water by creating an open, re-usable application that allows fast tracing and risk analysis over different interconnecting data sources.



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# Waste water tracing algorithm

**Performance**

Data flexibility

Risk analysis

Re-usability

Multiple networks

# Performance

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**Performance issues**

- Long response times, over 10 seconds
- Limited & incomplete results
- Web browser freeze
- → Frustrated users

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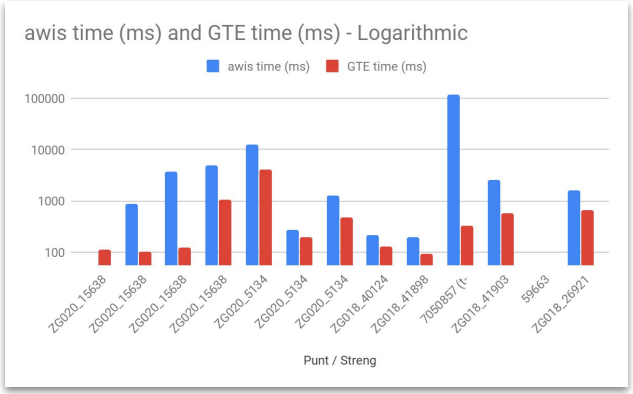
# Performance

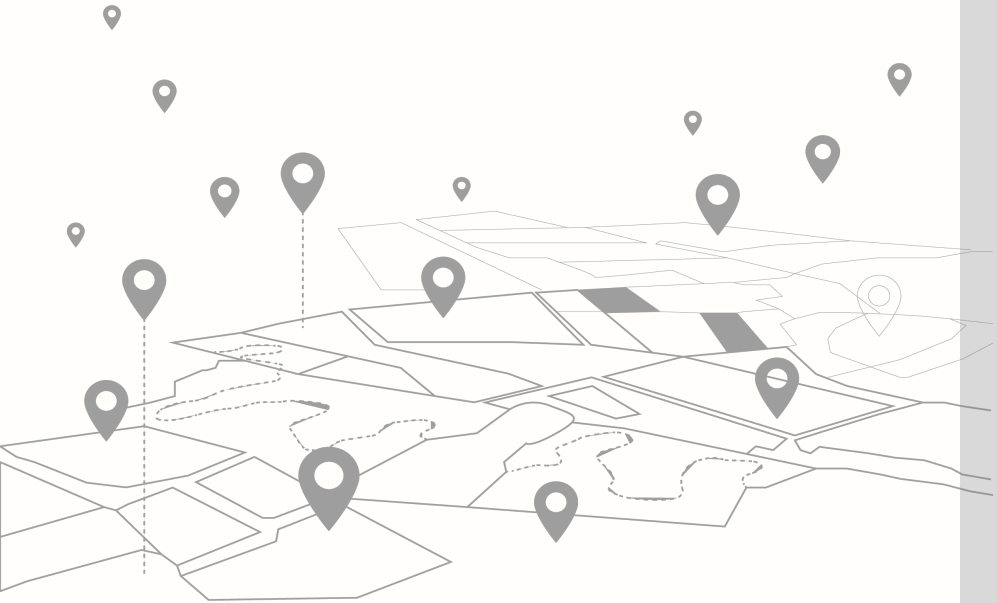
## New Tracing Core

- Store network in memory (= faster)
- Use existing graph library JGraphT
- Implement efficiënt tracing algorithm
- Limit and preprocess data sent to browser

## Improvements

- Up to 10 times faster
- Better browser response times
- Bigger trace results possible





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# Waste water tracing algorithm

Performance

**Data flexibility**

Risk analysis

Re-usability

Multiple networks

# Data flexibility

**Limited flexibility in source data**

- Tracing algorithm hard-coded against existing dataset
- Very database oriented
- High (development) cost to update data model
- Difficult to add new datasets

# Data flexibility

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### Graph preprocessor

- Configuration mechanism for data sources
- Uses geotools software library (compatible with multiple data sources)
- Configure different types of networks (i.e. Geographical, Logical, …)

### Improvements

- Configuration by non-developer
- Easy to add new datasets from various sources
- No longer limited to specific data structure


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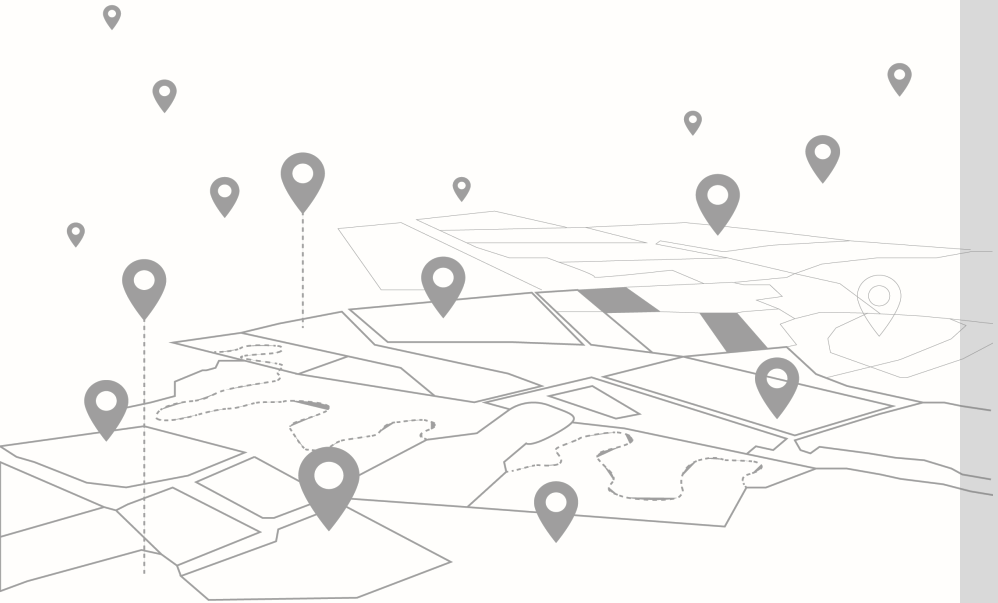
# Data flexibility

Successful proof-of-concept with Delfland water authority data



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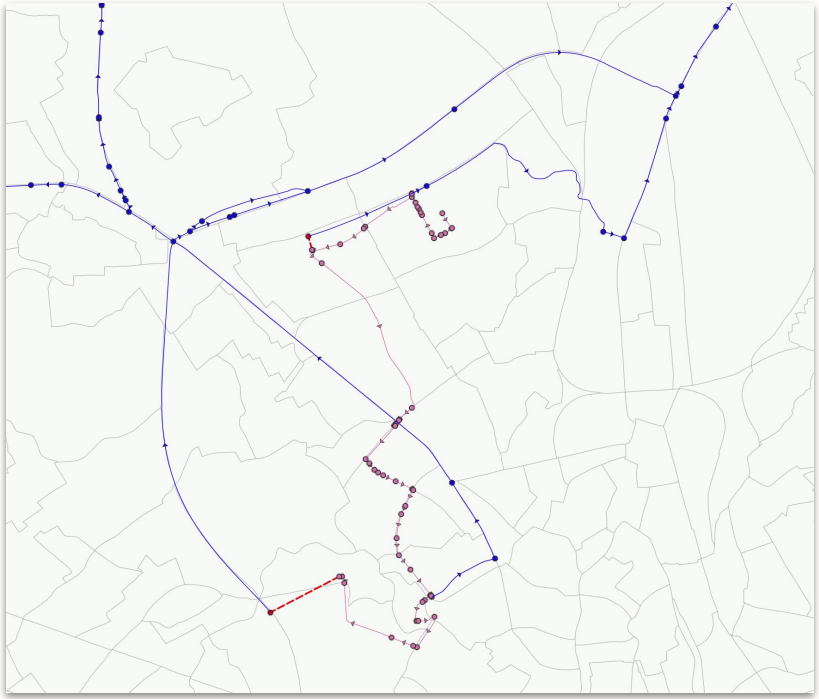
# Waste water tracing algorithm

Performance
Data flexibility
**Risk analysis**
Re-usability
Multiple networks

# Risk areas

**Risk analysis feature**

- No easy way to calculate which areas a tracing passes



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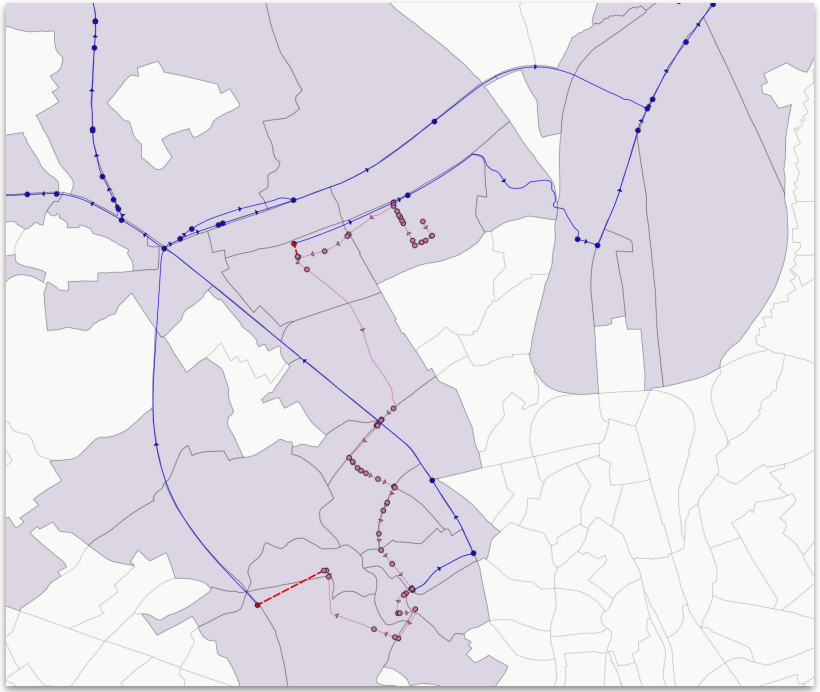
# Risk areas

**Result**

- Configuration mechanism for areas of interest
- Returns all areas where trace passes
- Not limited to areas, can be lines or points



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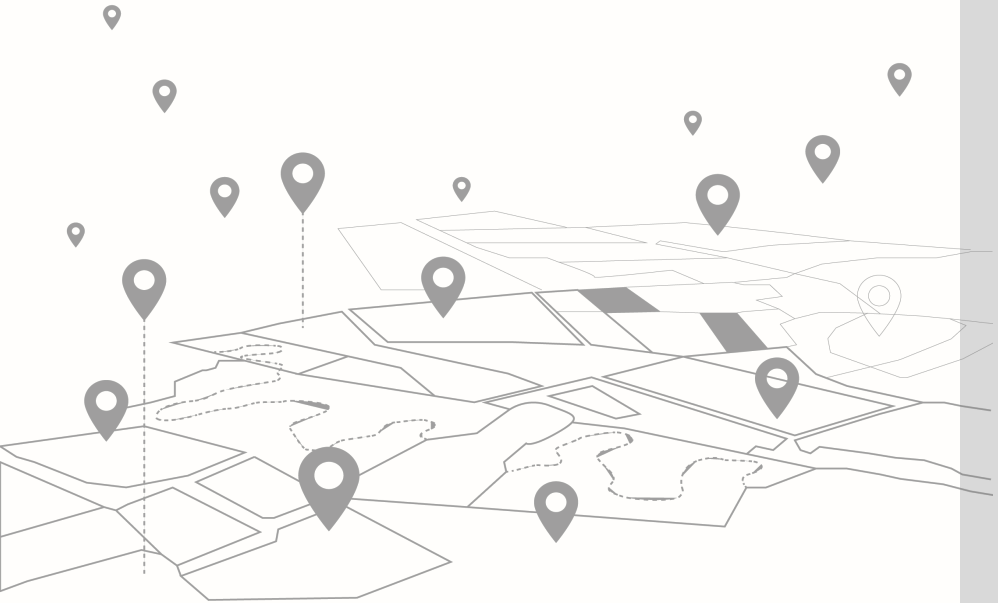

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# Waste water tracing algorithm

Performance
Data flexibility
Risk analysis
**Re-usability**
Multiple networks

# Reuse

**Reusability**

- Tracing is only available in sewer inventory application
- Other services cannot access tracing
- Difficult to expose tracing to outside world

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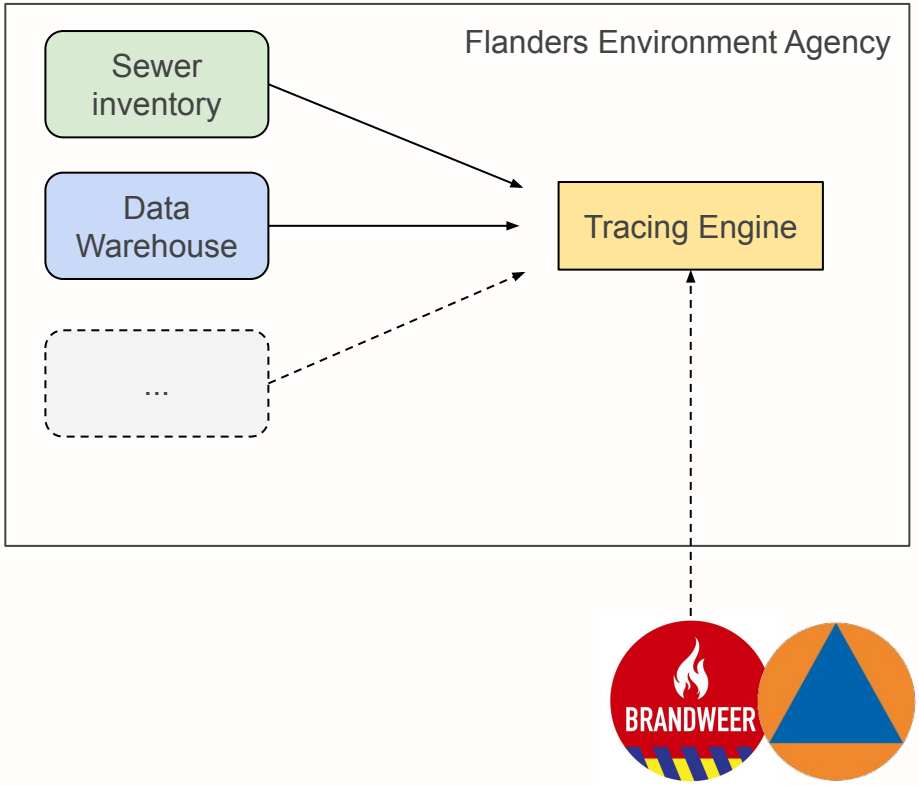
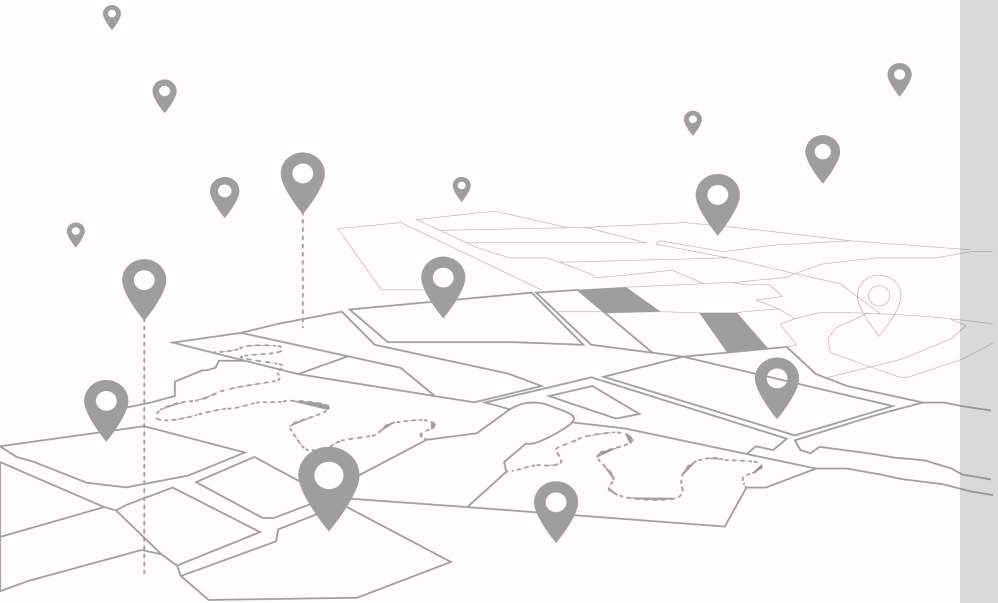
# Reuse

**Tracing Engine as (micro)service**

- The tracing engine is a stand-alone application
- Accessible by other applications via REST api
- Not limited to inside organisation





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# Waste water tracing algorithm

Performance
Data flexibility
Risk analysis
Re-usability
**Multiple networks**

# Multiple networks

**No interconnections**

- The sewer inventory application tracing does not support tracing between different networks (waterways, sewer system)
- Does not support transnational tracings

# Multiple networks

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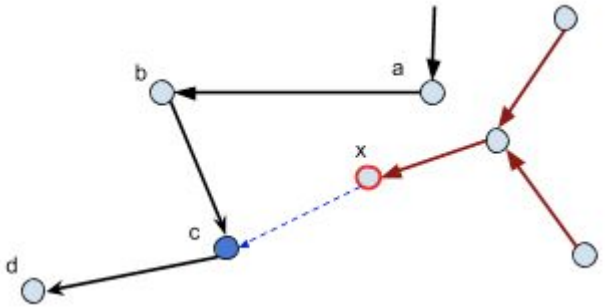
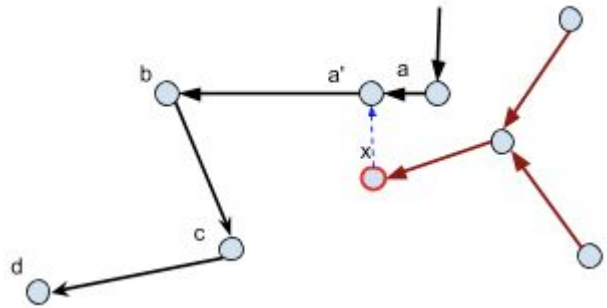
**Configurable interconnections**

- Support for different network interconnections
  - Logical
  - Geographical
  - Projected
- User can combine data sources for tracing
- Cross-border tracing possible

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## Results

Improved performance
Easily configurable data sources
Insight in risk areas
Available for the whole organisation (and possibly outside)
Interconnection between multiple networks

## Main objective

Improve and extend VMM's tracing algorithm for sewers and surface water by creating an open, re-usable application that allows fast tracing and risk analysis over different interconnecting data sources.

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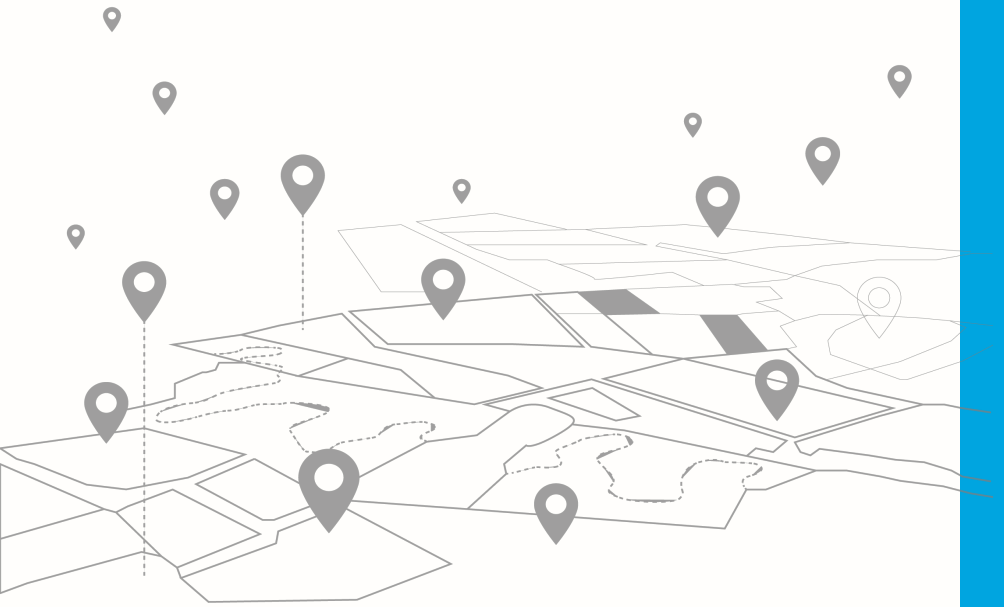

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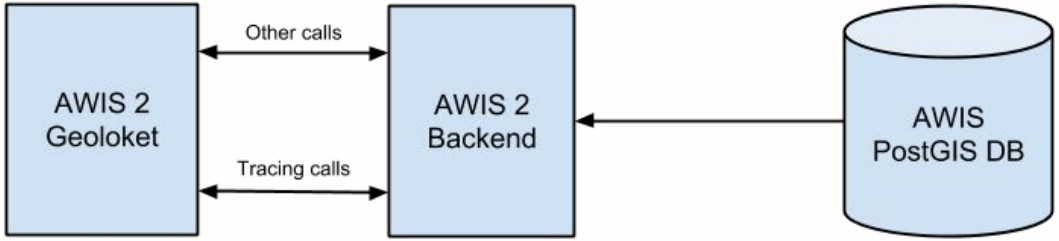
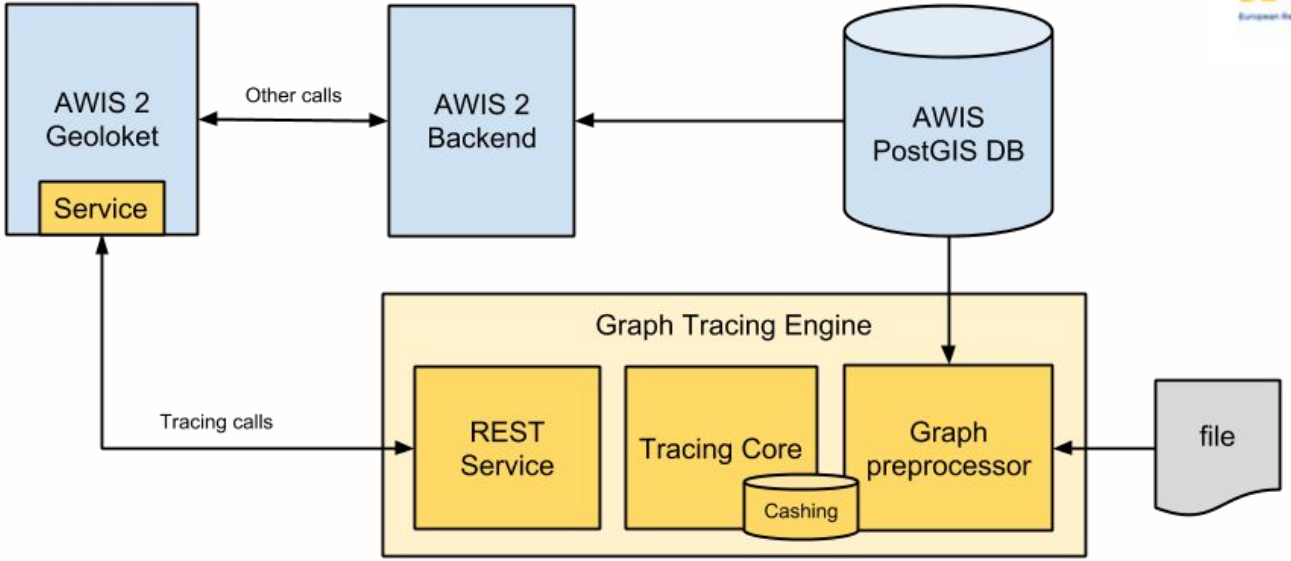
# Under the hood

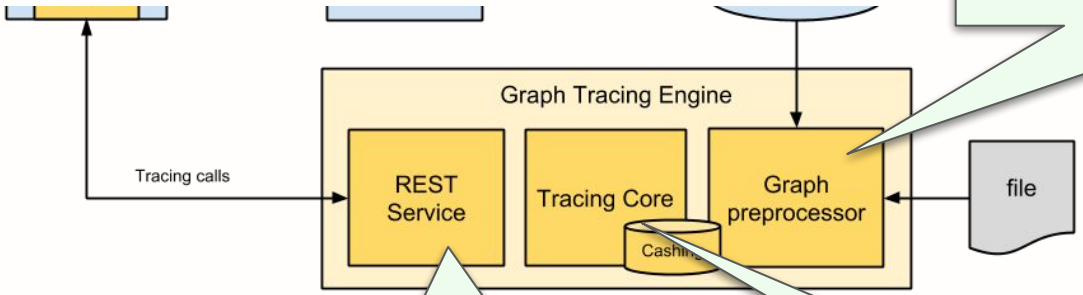
# Architecture as-is



# Architecture to-be



# Graph Tracing Engine

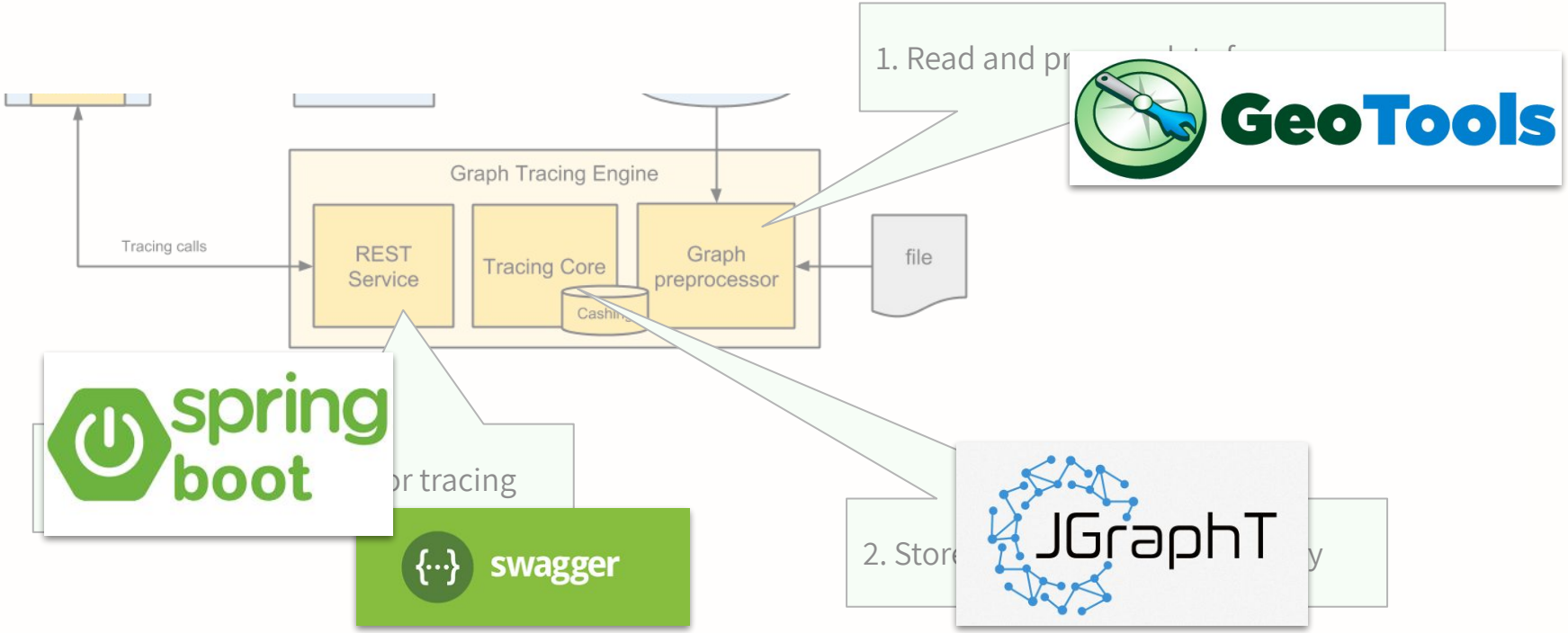


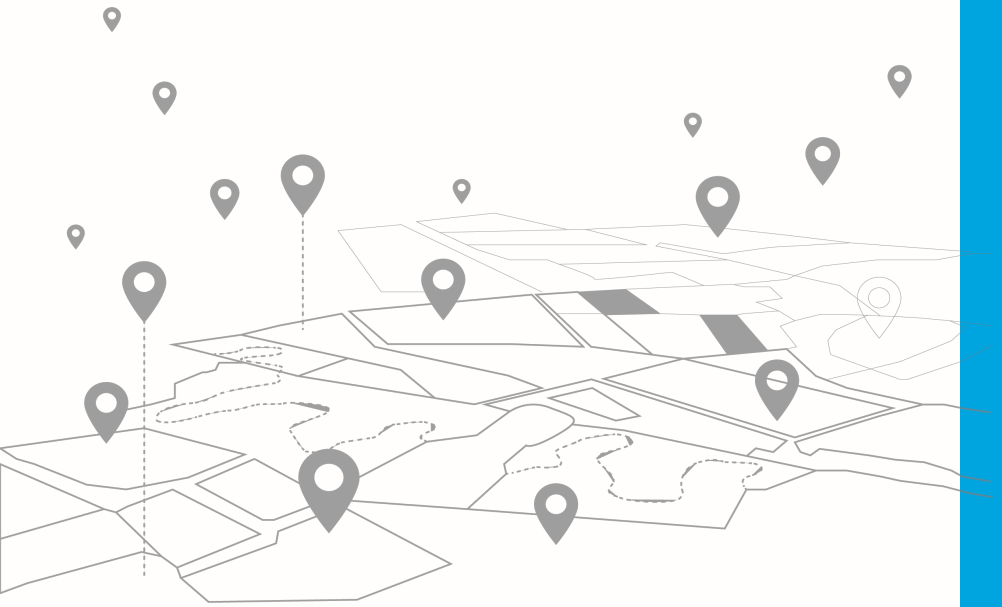

1. Read and process data from sources

3. Publish REST service for tracing

2. Store data as Graph in memory

# Libraries


1. Read and pr
GeoTools
Graph Tracing Engine
Tracing calls
REST Service
Tracing Core
Graph preprocessor
file
spring boot
r tracing
swagger
2. Stor
JGraphT



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# Future

# Business opportunities study

**Report delivered :**

- USPs
- Technology choice
- Open source license options
- Immediate and potential future (by extending) use cases/applications
- Business opportunities

**Other applications:**

- Database Subsoil Flanders: Sediment tracing
- Think outside of the box

# Open Source

*"It takes a village to raise a child"*

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# Open Source

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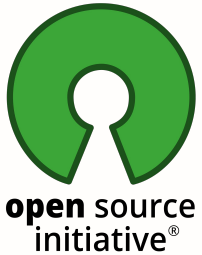
## Advantages

- Lower total cost of ownership
- Value for the society

## Challenges

- Ownership
- User base - Community

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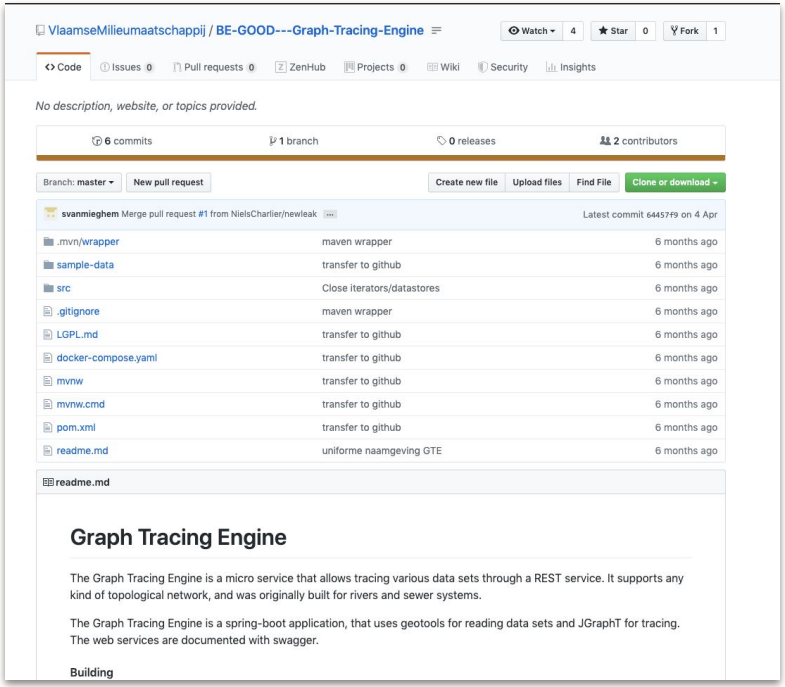
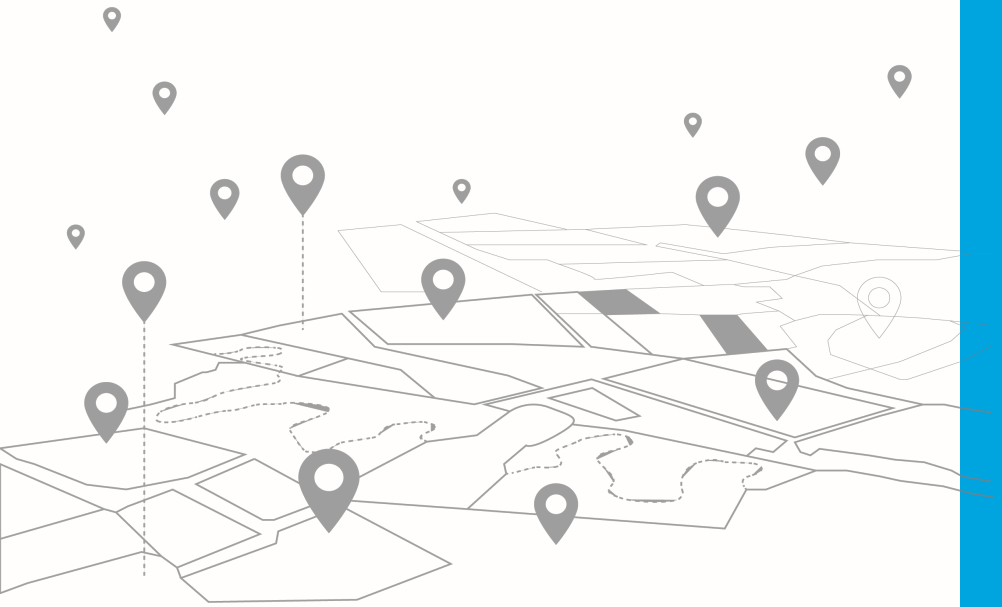
# Getting started

- Visit the github page

https://github.com/VlaamseMilieumaatschappij/BE-GOOD---Graph-Tracing-Engine





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## Questions?

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