SensorSDI op PDOK

met het Smart Emission Data Platform

Just van den Broecke
Just Objects B.V.

Geo Gebruikersfestival 2018 en SDI.Next
Amersfoort 31 oktober, 2018

Met dank aan

Context

Historie

- **2014/2015 - SOSPilot - Geonovum en RIVM**
  RIVM LML Data via OGC Sensor Observation Service (SOS)
  http://sensors.geonovum.nl

- **2015-2017 - Smart Emission Nijmegen - Consortium**
  Burgers meten zelf luchtkwaliteit en geluid
  http://smartemission.ruhosting.nl

- **2017-2018 - Consolidatie en Opschaling**
  Smart City Living Lab (meerdere steden),
  Green Challenge Nijmegen, AirSensEUR (EU JRC)
  SE Platform Migratie naar PDOK - Kadaster
  https://data.smartemission.nl

Smart Emission Nijmegen

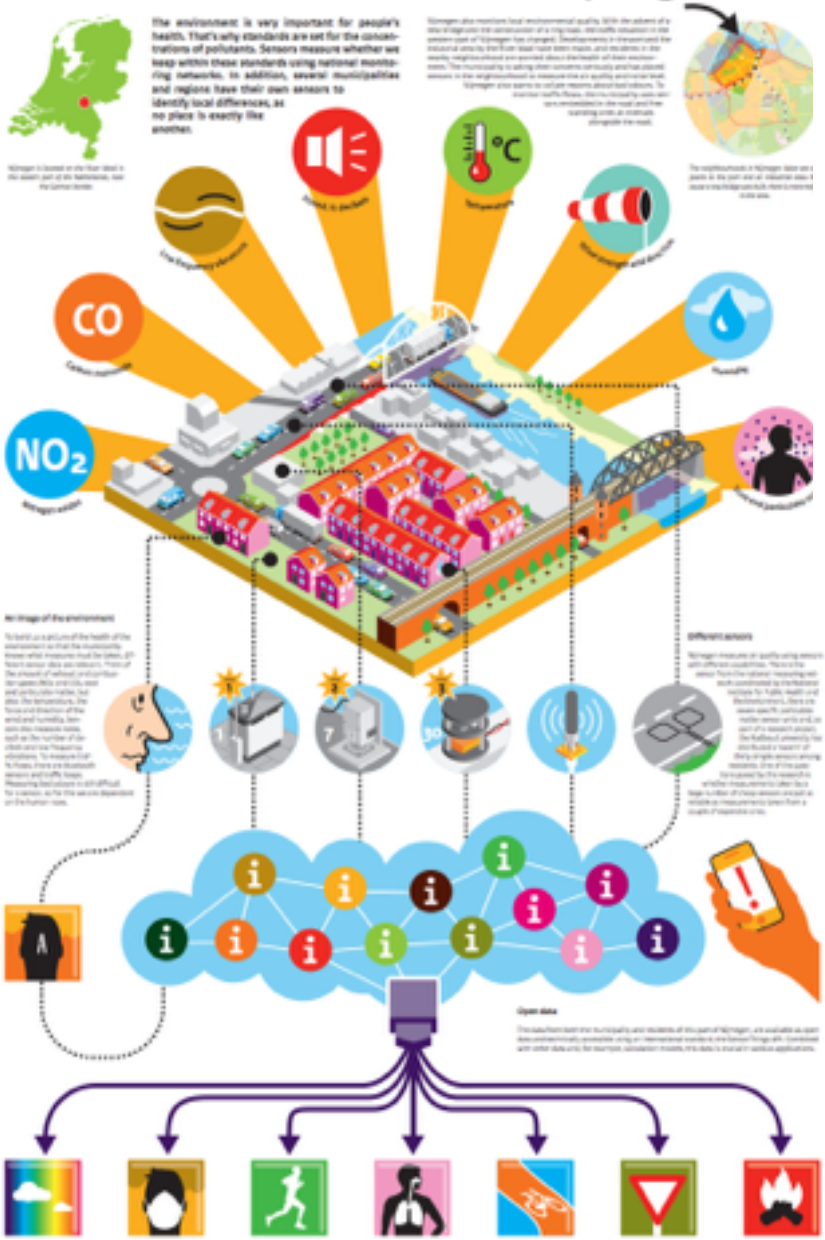
Inclusive Citizen Sensing

- Citizen-sensor-networks for fine-grained measurements, with ***new low-cost sensing devices***
- ***Transparency*** and democracy of pollution monitoring, 'making the externalities (e.g. noise, air pollution) visible'
- Cost-effective environmental monitoring with ***Open Source, Open Data, Open Standards (APIs)***

Ministerie van Infrastructuur en Milieu

The smart city knows *what's* happening and *where*

Case: Environmental health in Nijmegen



The smart city

from environmental monitoring to a dynamic management of the environment

The smart residents

well-informed residents create solutions themselves

Radboud Universiteit Nijmegen

Nijmegen

GEONOVUM

Issues and questions

1. **Deployment of a local air quality network using low-cost sensors**

   - What is the quality of low-cost sensors in general?
   - Which type of low cost sensors to deploy?
   - ***How to calibrate the low-cost sensors?***
   - How many and at what locations (spatial pattern) to deploy the sensors?
   - ***What data platform for data collection and distribution?***
   - ***Which standards for data acquisition and distribution?***
   - ***Which (interpolation) models for further processing air quality data?***
   - ***How to visualize the results?***

2. **Involvement of citizens in the deployment and maintenance of the sensor network**

   - Which method to use for citizen engagement?
   - Do we need to train citizens to deploy and maintain the sensor?

3. **Involvement of citizens in the analysis of the results of local air quality monitoring**

   - How to engage citizens?
   - How to preprocess and visualize the data for citizens?
   - How to interact with citizens?
   - How and when to meetup with citizens?
   - What applications will the citizens need?

Smart Emission Nijmegen

Which type of low cost sensors to deploy?

Quality and price

National Air Quality stations

Aireas "Airbox"

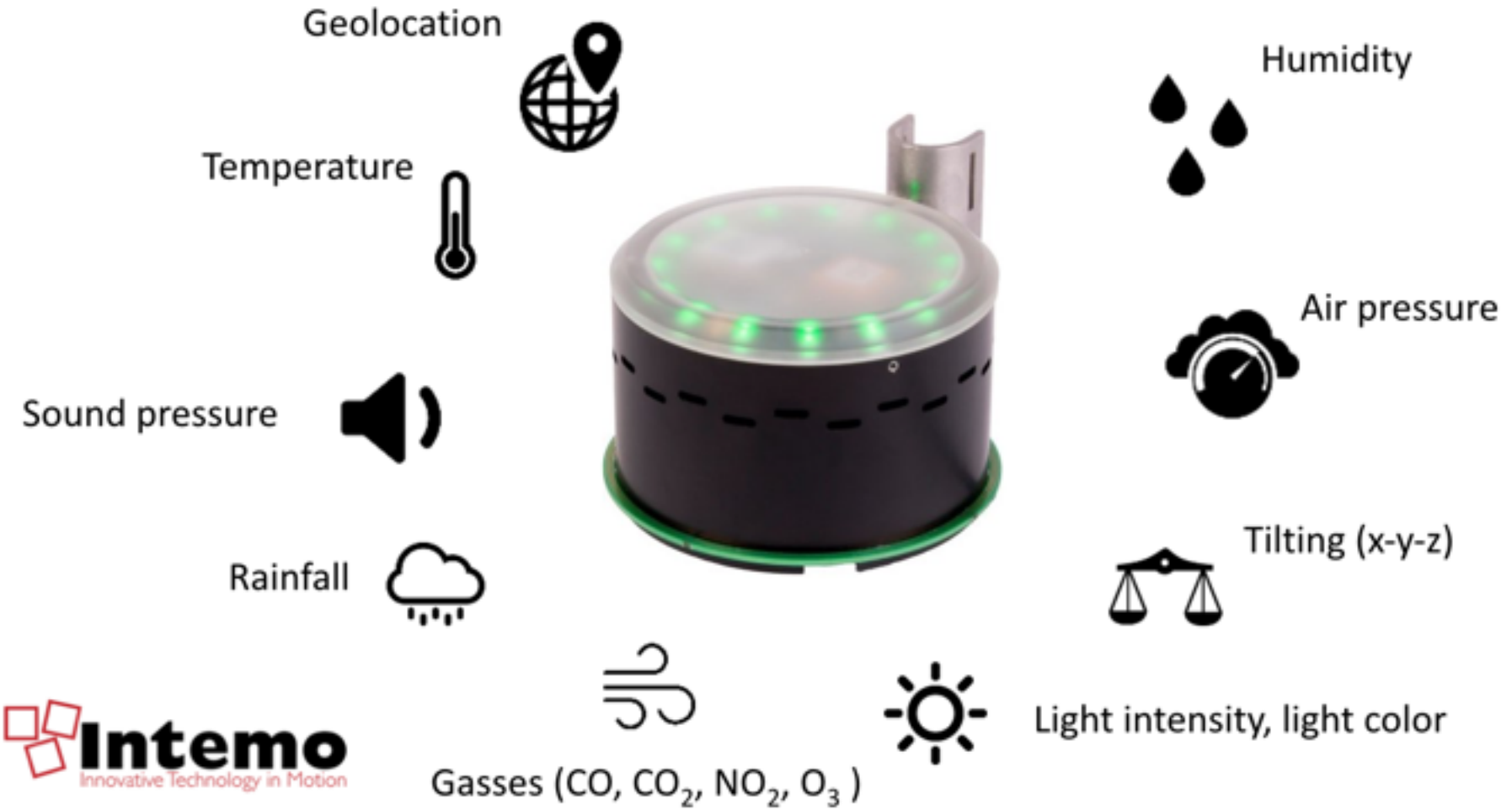
Smart Emission "Jose"

"Smart Citizen Kit"

Number of sensors applied in a city

Smart Emission Nijmegen

Jose Multi-Purpose Sensor Station - Intemo



Intemo
Innovative Technology in Motion

Smart Emission Nijmegen

Interactive process with citizens and experts
during the pilot project 2016 – 2017, photos













Smart Emission Platform

SE Platform
The Big Picture

sensors

Client Apps/Viewers

luchtradar

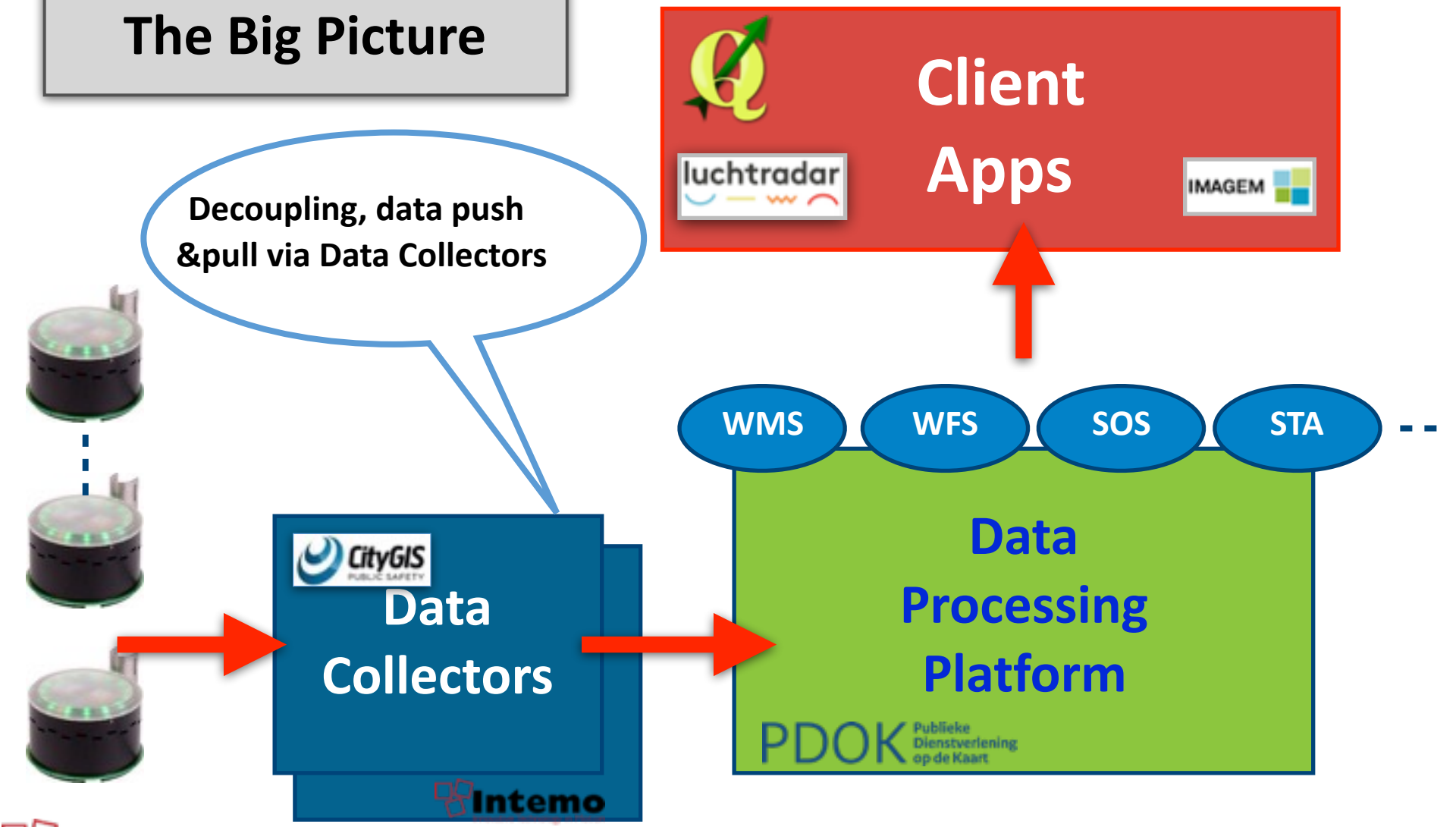
web-APIs

WMS WFS SOS STA - -

Data Management

Collector APIs

SE Platform
The Big Picture



Smart Emission Platform Dataflow and APIs

GEONOVUM

pdok

OGC

(Current Values)

Dataflow

Outbound

API

Inbound

API

WMS

WFS

SOS

STA

SOSEmu

Smart Emission Platform

ETL

Harvesters

PDOK Publieke Dienstverlening op de Kaart

GEONOVUM

Whale API

CityGIS Data Collector

Whale API

Intemo Data Collector

Influx HTTP

InfluxDB Data Collector

PDOK Publieke Dienstverlening op de Kaart

SOS

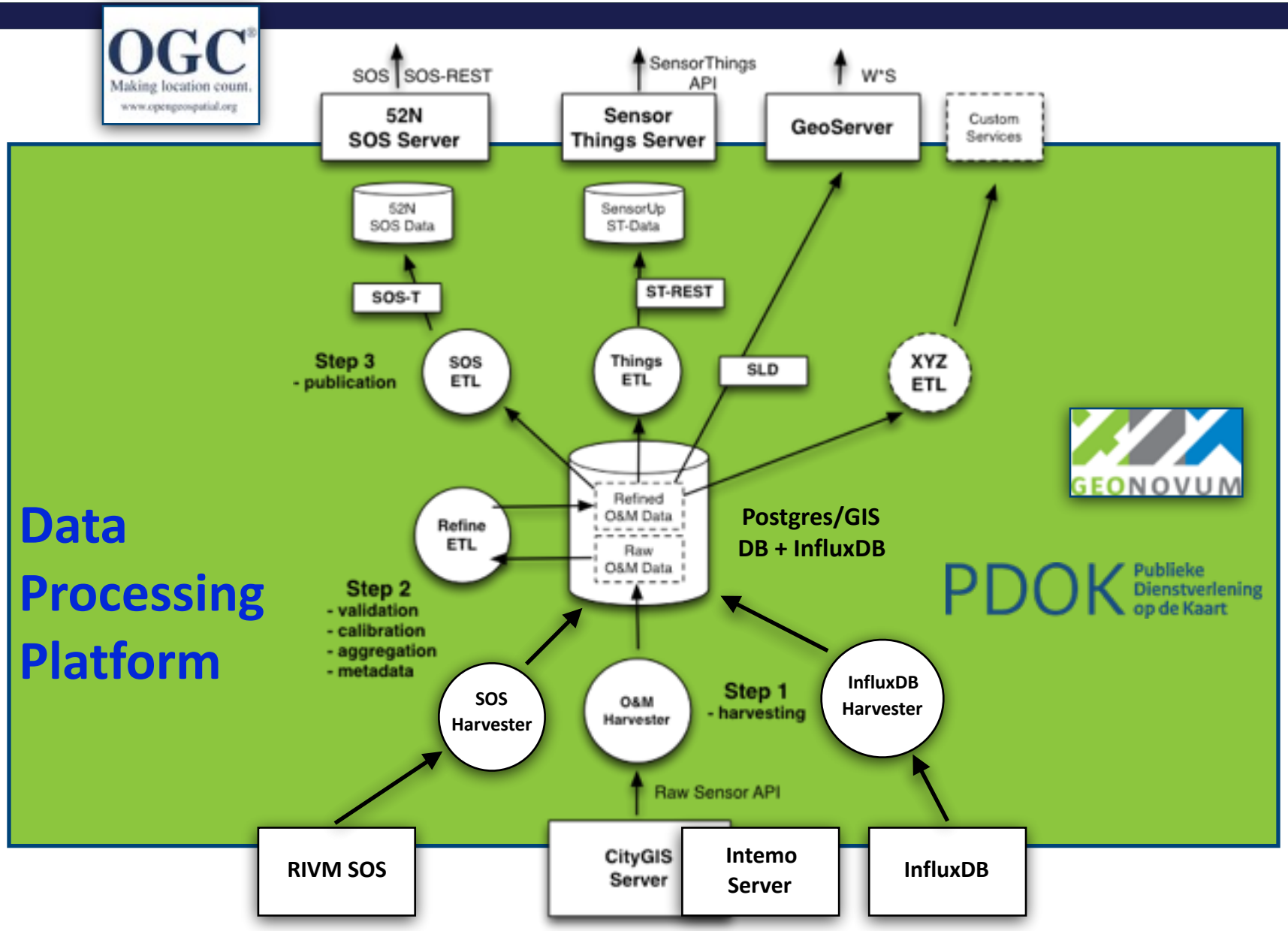
RIVM LML SOS

Influx HTTP

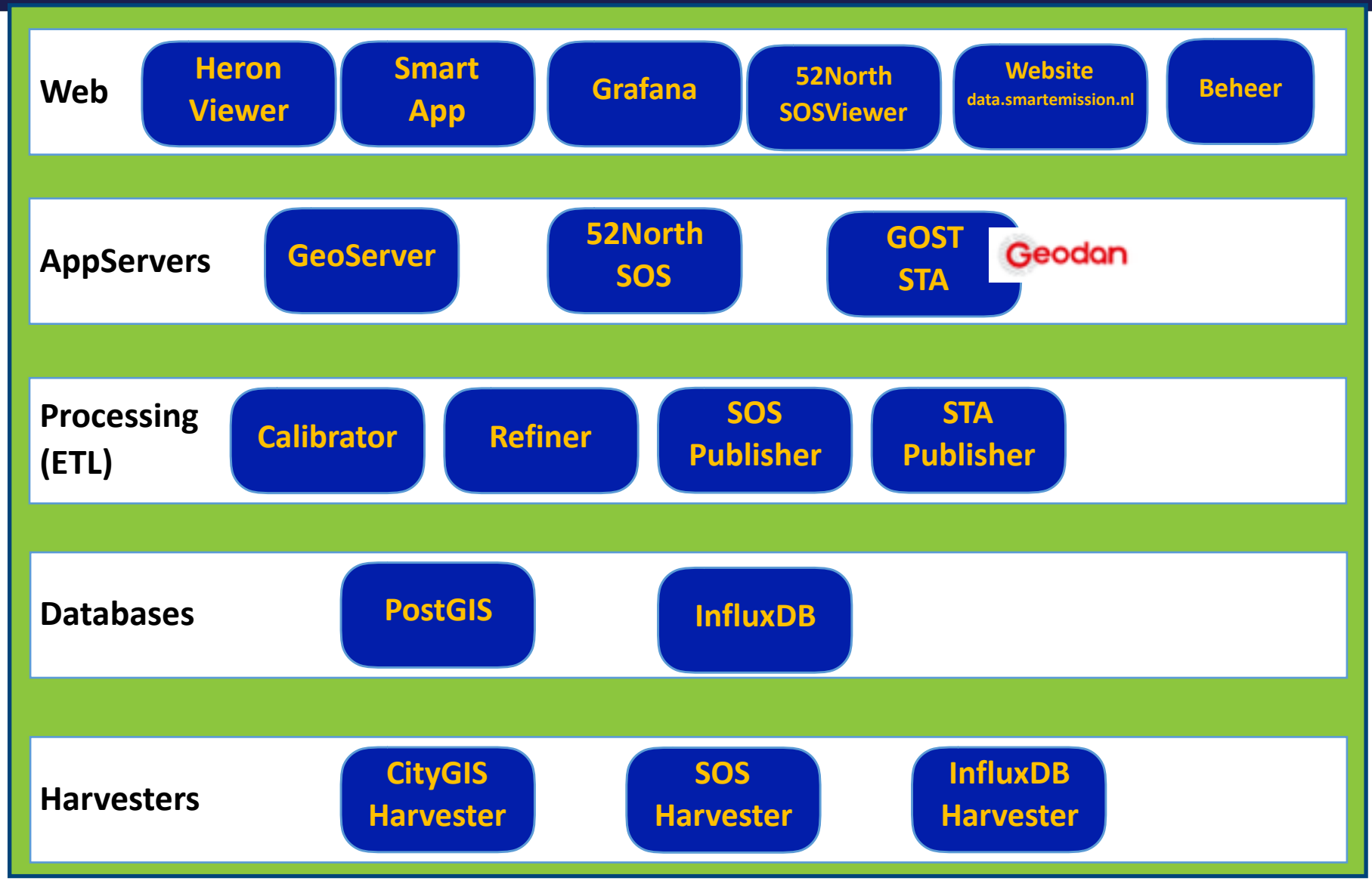
LML

Sensors

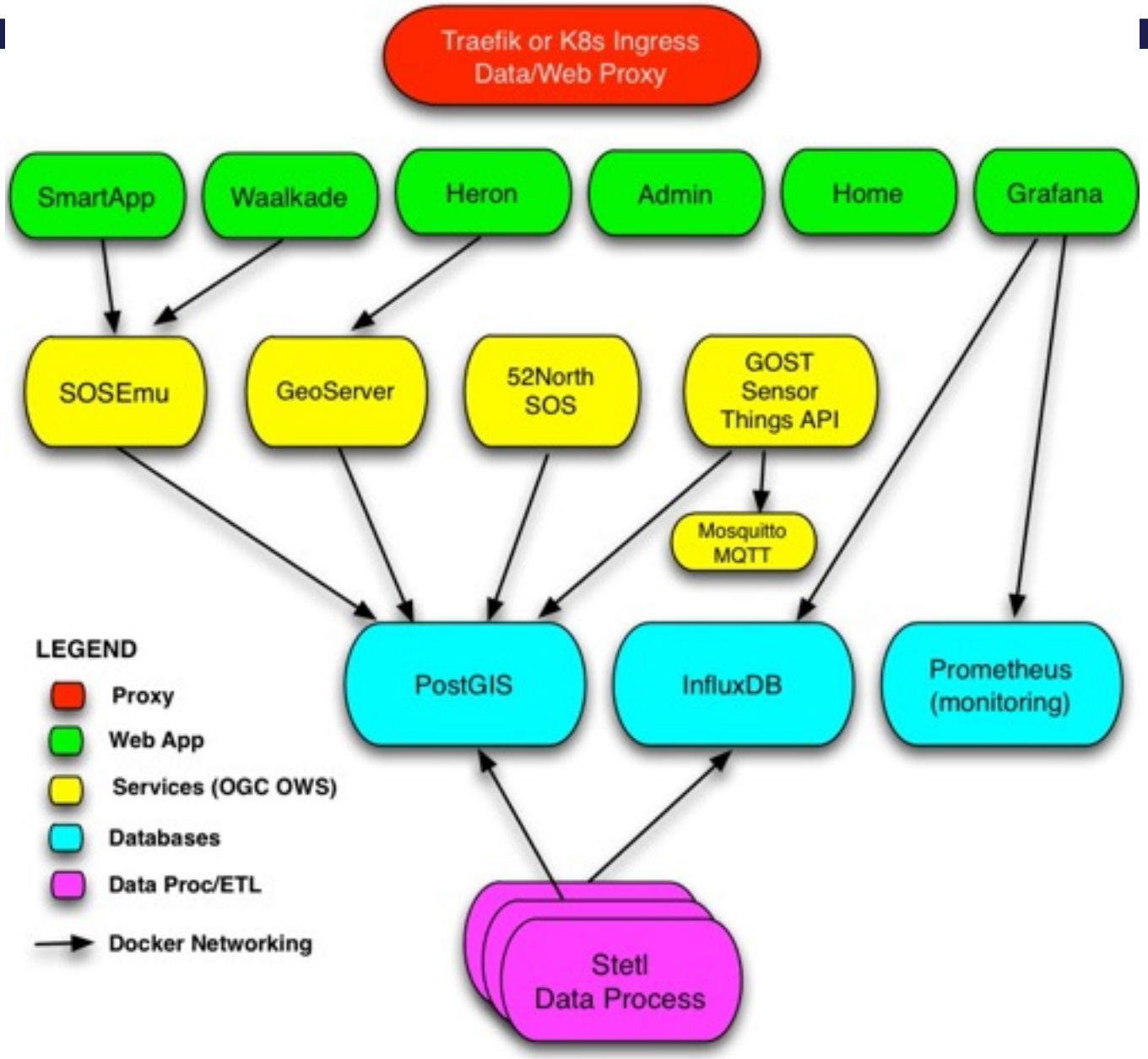
Data Architecture with 3-Step ETL



Smart Emission Platform
Componenten in Functionele Lagen

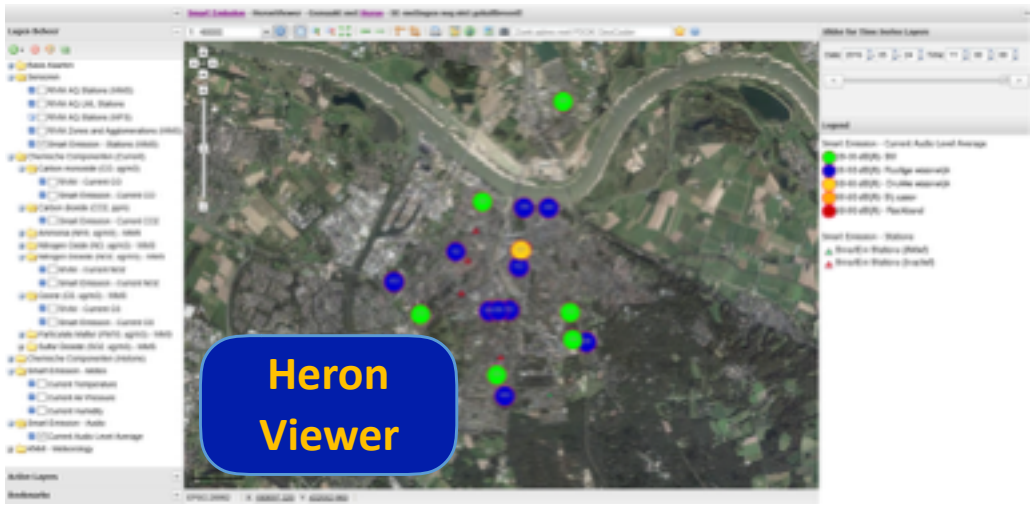


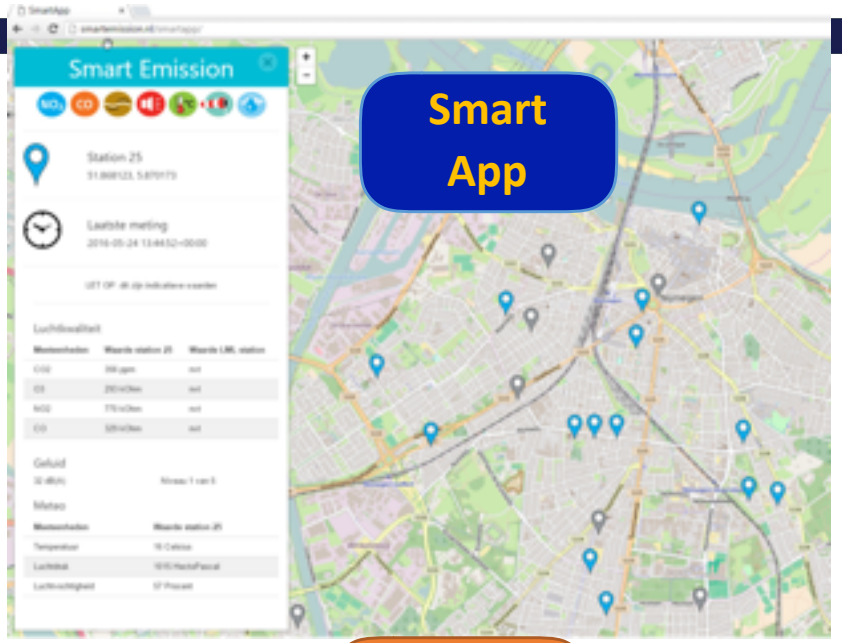
Smart Emission Docker Deployment

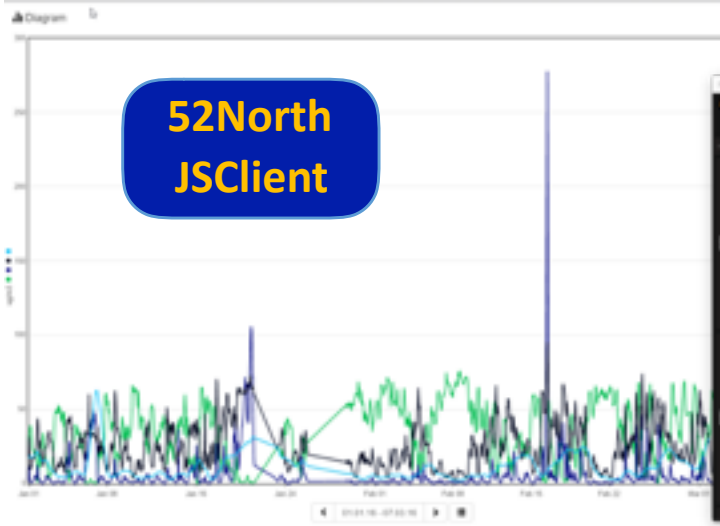


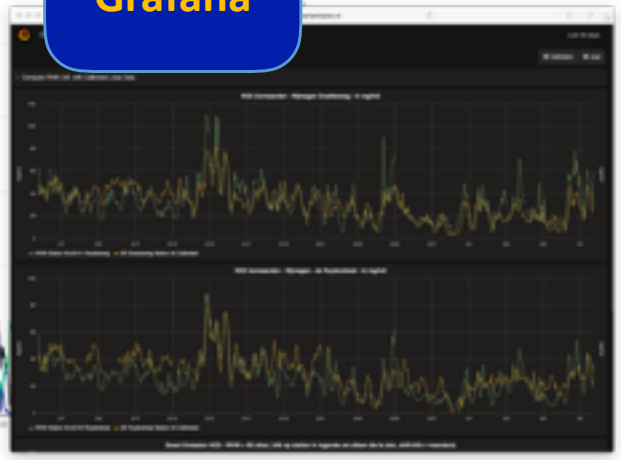
Viewers

In SE Platform









Extern

ArcGIS ESRI

https://data.smartemission.nl (data platform)

National Sensor SDI Thoughts

National SensorSDI Functional Blocks

Dataflow

APIs

API

Apps

API

Data Services

API

Data Processing

API

Data Collection

API

Metadata/ Registry
- users
- sensors
- apps
- services
- …

API

Sensors

National SensorSDI Principles

Distributed (Federated)

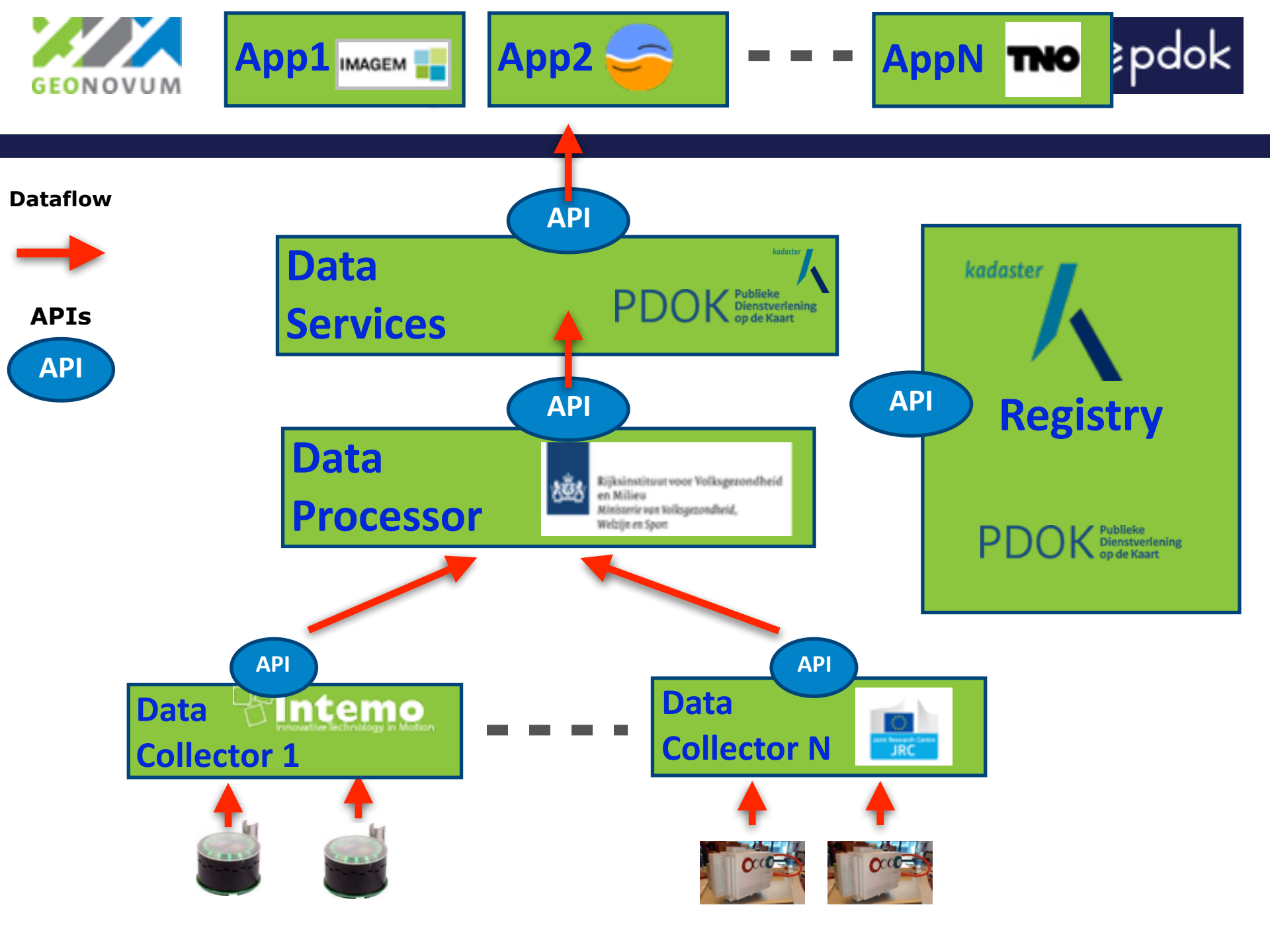
Architecture follows Organization (and v.v.)

Organizational Specialisms

Common Standards & APIs

Common Open Source

Cloud-Based (e.g. Kubernetes)


GEONOVUM
App1
IMAGEM
App2
AppN
TNO
pdok
Dataflow
APIs
API
API
Data Services
PDOK Publieke Dienstverlening op de Kaart
kadaster
API
Data Processor
Rijksinstituut voor Volksgezondheid en Milieu
Ministerie van Volksgezondheid, Welzijn en Sport
API
kadaster
Registry
PDOK Publieke Dienstverlening op de Kaart
API
Data Collector 1
Intemo
Innovative technology in Motion
API
Data Collector N
JRC

OGC SensorThings API

OGC SensorThings API Showcase Modern Standard

(REST) API-based: HTTP Verbs

SOS-Killer?

Pub/Sub via MQTT

Data Model is First Class Citizen

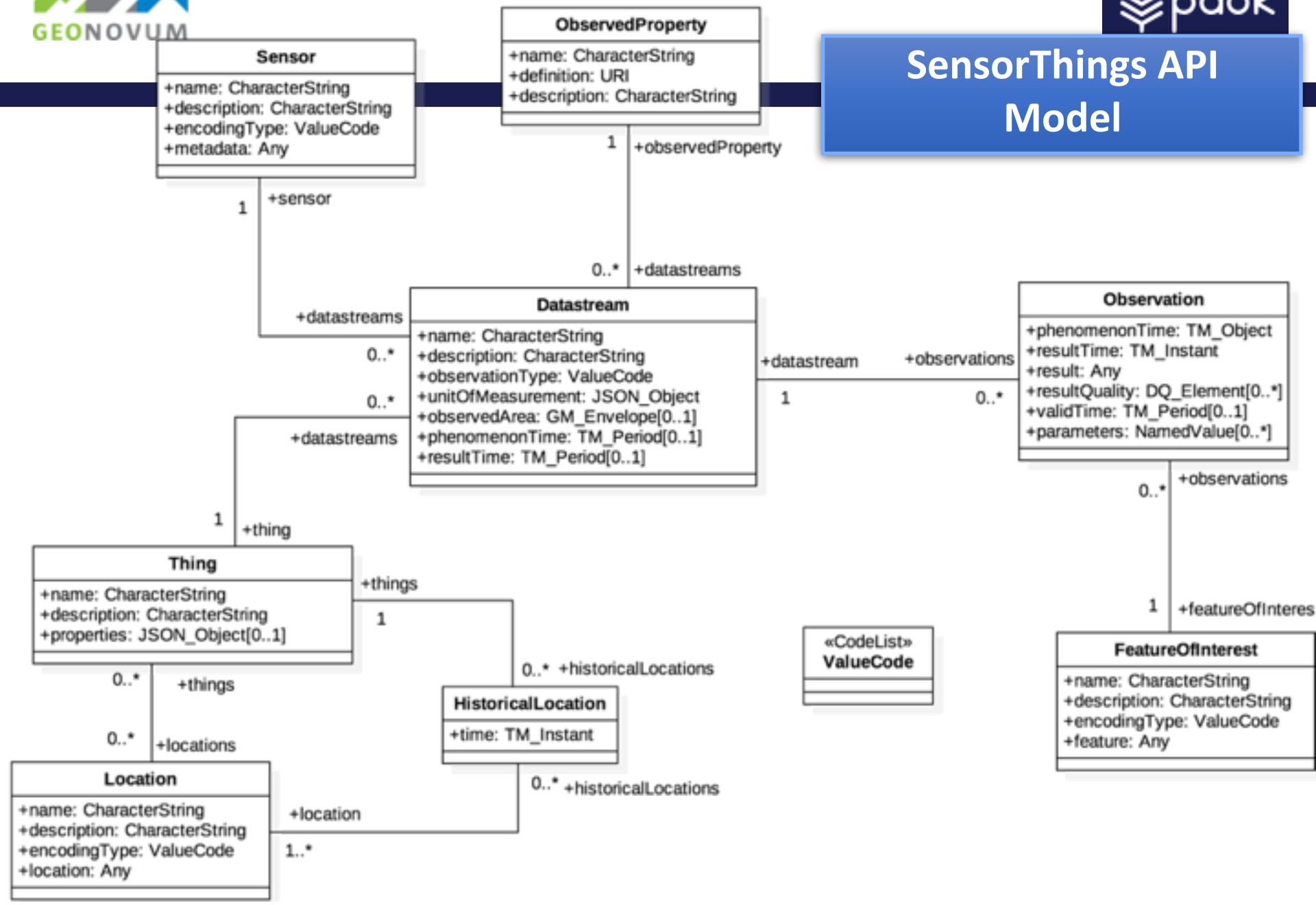
(Geo)JSON Encoding

Multiple Implementations

GOST

Geodan

SensorThings API Model



https://www.gostserver.xyz

GOST

HOME BLOG TUTORIALS API DOCS CHANGELOG CONTACT

GOST

IoT Platform

OGC SensorThings API certified software

GOST is alpha software and is not (yet) considered appropriate for customer use. Feel free to help development :-)

OPEN SOURCE

GOST is open-source software, the source code can be found on GitHub

View on GitHub

MIT LICENSE

GOST is licensed under MIT which puts only very limited restriction on reuse

View License

GO

GOST is written in Go which is open-source and fast to learn, compile, deploy and run. G
platform support

More Info

OGC SensorThings API

An Open Geospatial Consortium (OGC) standard providing an open and unified framework to interconnect IoT sensing devices, data, and applications over the Web. It is an open standard addressing the syn
interoperability and semantic interoperability of the Internet of Things. GOST is an OGC certified implementation on all levels. See OGC GOST Product details

REDUCE HARDWARE COSTS

REDUCE LICENSE COSTS

SIMPLIFY

SensorThings API Entity Mapping

Data records produced by the *Refiner* are mapped to STA Entities by the *STA Publisher*.

SE Artefact	STA Entity	Example
Station	*Thing*	Intemo station AirSensEUR Box
Station point location	*Location*	AirSensEUR Box location at 4.982, 52.358 lon/lat
Sensor Type/Metadata	*Sensor*	AlphaSense NO2B43F
Type and unit (uom)	*ObservedProperty*	NO2 in ug/m3
Value and time	*Observation*	42 ug/m3 on 1 aug 2018 13:42:45
Combination of above	*Datastream*	Combines T, S, OP and O
Station time+location	*HistoricalLocation*	AirSensEUR Box at lat/lon 52.35,4.92 on on 1 aug 2018 13:43:26
Station Area	*FeatureOfInterest*	Location of Station 11820004

Dank U!

Links

https://data.smartemission.nl (data platform)

https://github.com/smartemission (source code)

https://smartplatform.readthedocs.io (documentation)

https://smartplatform.readthedocs.io/en/latest/evolution.html (SensorSDI)

https://geoforum.nl/c/datasets/sensordata (support and comms)

https://en.wikipedia.org/wiki/SensorThings_API (SensorThings API, STA)

https://www.gostserver.xyz/ (Geodan STA Open Source Implementation)

We would like to acknowledge for their valuable input:

All partners of the Smart Emission Consortium