



Internet of Water

Flanders

Aan de slag met live data over waterkwaliteit

Workshop Internet of Water IoT-platform

8 december 2022
Mechelen



Met steun van



Uitgevoerd door





Agenda

1. Intro

- Wie is wie
- Historiek en traject

2. Interactie - workshop

- Initiële opzet en huidige architectuur (30 min)
- **Interactiemoment 1 (20 min)**
- Vervolg/next steps (10 min)
- **Interactiemoment 2 (20 min)**



Moderatoren

VLAAMSE
MILIEUMAATSCHAPPIJ



De Watergroep
WATER. VANDAAG EN MORGEN.

VLAAMSE
MILIEUMAATSCHAPPIJ

VLAAMSE
MILIEUMAATSCHAPPIJ

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Imec platform
operationeel op VMM Infra

Q1 '22

Q2 '22

Q3 '22

Jan

Feb

Mar

Apr

May

Jun

Jul

Aug

Sep

Kennisoverdracht

Migratietraject infrastructuur

Datamigratie

GoLive VMM

Hypercare

Analysis new architecture

setup NGSI LD

Q4 '23

Q1 '23

Q2 '23

Oct

Nov

Dec

Jan

Feb

Maa

Apr

May

Jun

Infrastructure as Code

UAT - PROD setup

Switch new platform

New Management Application/GUI

Proof Of Concept Dataspace DWG

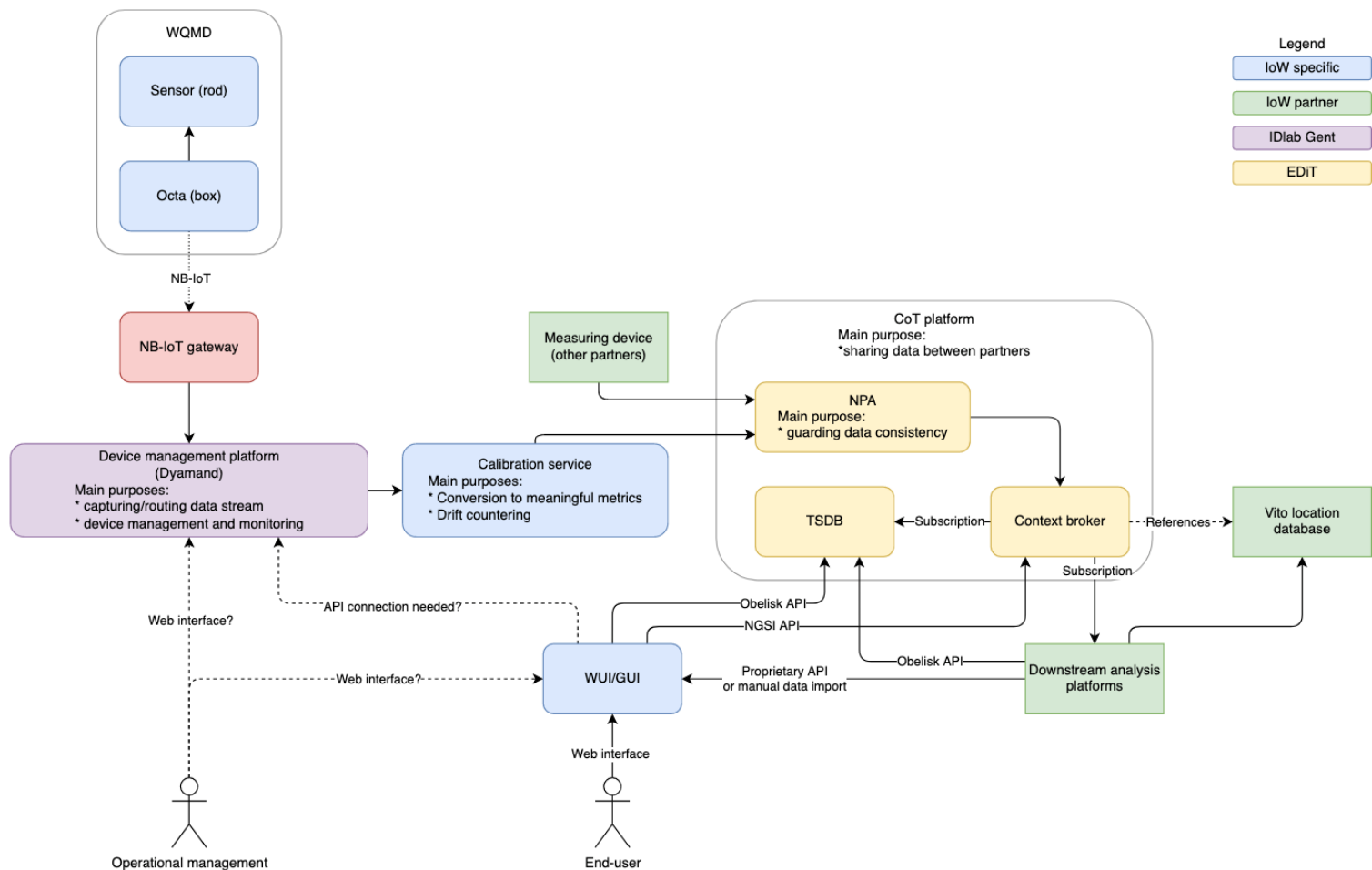
Failsafe mechanisms

Implementation LDES connector

Data retention



Initiële opzet





Smart Data Modellen

- Uitwisseling van data tussen partners via "**Smart Data Modellen**"
- **Interoperabiliteit** bevorderen tussen partners
- Gebaseerd op bestaande, algemeen gebruikte **modellen/entiteiten**
- NGSI-v2 (JSON); NGSI-LD, DTDL, OSLO (JSON LD)



Smart Data Modellen

[←](#) [→](#) [↺](#) [https://smartdatamodels.org](#) [☆](#) [🔍](#) [☰](#)

Get live support by booking a 30 min slot [here](#)

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- Community ▾
- New data model request ▾

Domains

Smart Cities	Smart Agrifood	Smart Water	Smart Energy	Smart Logistics
Smart Robotics	Smart Sensoring	Cross sector	Smart Health	Smart Destination
Smart Environment	Smart Aeronautics	Smart Manufacturing	Smart Incubated	Smart Harmonization

New database of data models' versions

28/11/2022

Cross Sector, Smart Cities domain, Smart Energy domain, Smart Environment domain, Smart Manufacturing domain, Smart Robotics domain, Smart Water Domain, Smart-Sensing domain, SmartAeronautics, SmartAgrifood domain, SmartDestinations, SmartHealth, SmartLogistics

In the main menu, it has been extended the submenu of list data models with a complete database of all versions of the data models. It includes not only the data model, subject, and version but also the data directly linked to the raw version of the data model. You...

[More...](#)

New data model Medication at subject HL7 (Health)

24/11/2022 SmartHealth

Subscribe

Email Address *

Subscribe!

Start data model/s

Data Models in progress

Go to a data model

Type part of the name and it will be filtered

dataModel:

dataModel

Show 10 entries

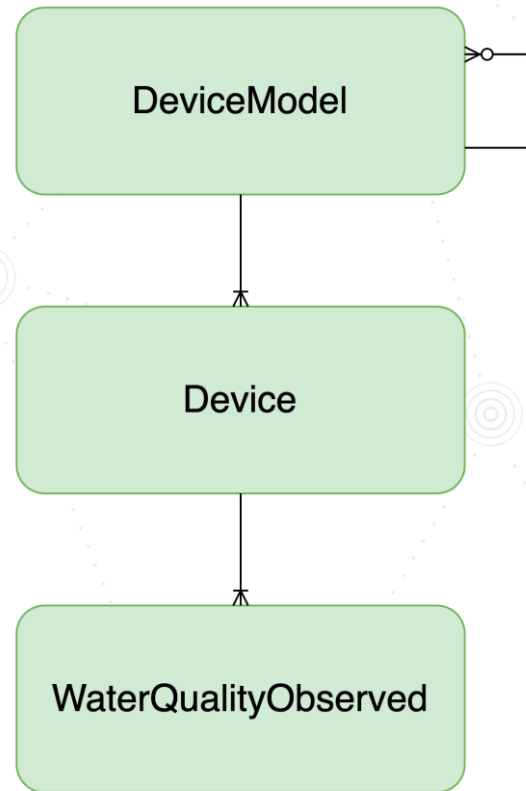
dataModel



22/03/2022



Smart Data Models





Smart Data Models – Voorbeeld: "DeviceModel"

```
[
  {
    "id": "urn:ngsi-v2:cot-imec-be:devicemodel:eijkelpkamp-ctd-diver",
    "type": "DeviceModel",
    "brandName": "Eijkelpkamp",
    "category": [
      "sensor"
    ],
    "controlledProperty": [
      "temperature",
      "conductivity",
      "depth"
    ],
    "function": [
      "sensing"
    ],
    "iow_tags": [
      "external"
    ],
    "manufacturerName": "Eijkelpkamp",
    "modelName": "CTD-Diver",
    "name": "CTD-Diver",
    "supportedUnits": [
      "CEL",
      "G42",
      "MMT"
    ]
  }
]
```



Smart Data Models – Voorbeeld: "Device"

```
[
  {
    "id": "urn:ngsi-v2:cot-imec-be:Device:dwg-iow-ToXPUMdijnBmPNHB3RPh4C",
    "type": "Device",
    "adminState": "up",
    "alternativeIds": [
      "urn:ngsi-v2:cot-imec-be:WaterQualityObserved:dwg-iow-B6g7vGeuSFtwTx8Si4dfwt",
      "dwg-box-40772927"
    ],
    "dateLastValueReported": "2022-11-28T14:10:00.000Z",
    "extraMeasurementAttributes": {
      "location": true,
      "samplingPoint": true,
      "locationName": true
    },
    "healthState": "up",
    "location": {
      "type": "Point",
      "coordinates": [
        2.852631333,
        51.0842249
      ]
    },
    "locationName": "loc-00017-39",
    "maxTimeBetweenObservations": 1500,
    "name": "dwg-box-40772927",
    "owner": [
      "dwg"
    ],
    "refDeviceModel": "urn:ngsi-v2:cot-imec-be:devicemodel:eijkelpkamp-ctd-diver",
    "samplingPoint": "spt-00031-91",
    "source": "cot.iow.observed"
  }
]
```



Smart Data Models Voorbeeld: "WaterQualityObserved"

```
{
  "id": "urn:ngsi-v2:cot-imec-be:WaterQualityObserved:dwg-iow-B6g7vGeuSFtwTx8Si4dfwt",
  "type": "WaterQualityObserved",
  "conductivity": {
    "type": "Number",
    "value": 740,
    "metadata": {
      "unitCode": {
        "type": "text",
        "value": "G42"
      }
    }
  },
  "dateObserved": {
    "type": "DateTime",
    "value": "2022-11-28T14:10:00.000Z",
    "metadata": {}
  },
  "...",
  "refDevice": {
    "type": "Relationship",
    "value": "urn:ngsi-v2:cot-imec-be:Device:dwg-iow-ToXPUMdijnBmPNHB3RPh4C",
    "metadata": {}
  },
  "...",
  "temperature": {
    "type": "Number",
    "value": 9.17,
    "metadata": {
      "unitCode": {
        "type": "text",
        "value": "CEL"
      }
    }
  }
}
```



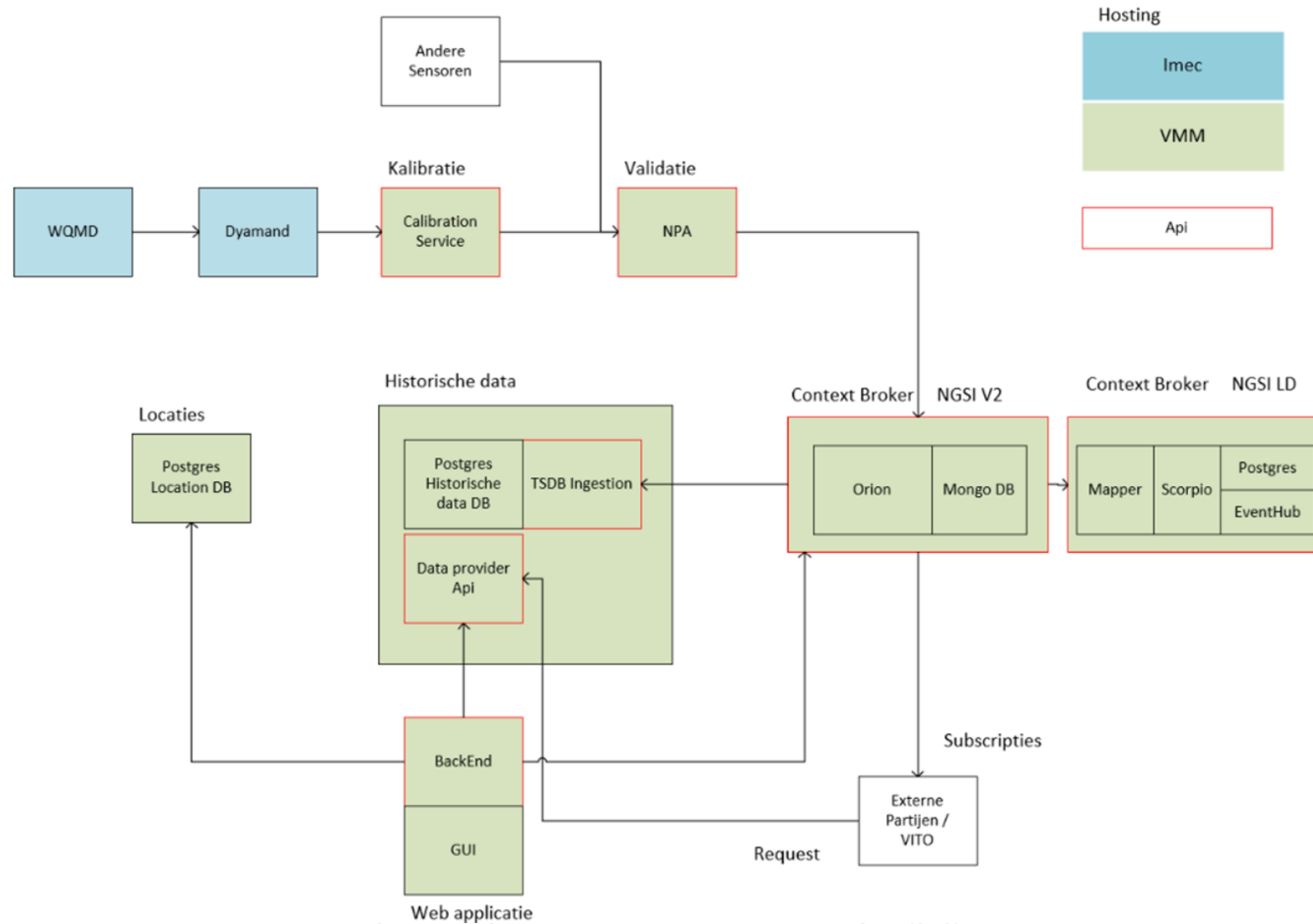
Overdracht dataplatform

■ **Imec** > VLAAMSE
MILIEUMAATSCHAPPIJ

- Alle componenten naar **Azure Paas services**
- Oplossing **ontbrekende componenten**
 - Imec Obelisk => Orion, Mongo en Historische database
- Inbouwen uitgebreide platform **monitoring**
- Integratie **NGSI LD** voor **Vlaamse Smart Data Space** (p.o.c. **LDES**)
 - Generische mapping NGSI V2 -> NGSI LD
 - Integratie Scorpio Context Broker



Huidige architectuur





User interface

IoW

Boxes	Sensors	External sensors	Locations	Device models	Provision device
Box	Last updated	Connected sensor	Model	Location	
 box-00013-57	28/11/2022, 14:46:08	sen-00104-23	v0003	loc-00009-63	
 box-00014-54	28/11/2022, 14:45:17	sen-00168-25	v0003	loc-00016-42	
 box-00015-51	28/11/2022, 14:44:49	sen-00061-55	v0003	loc-00021-27	
 box-00017-45	28/11/2022, 14:48:52	sen-00171-16	v0003	loc-00054-25	
 box-00020-36	28/11/2022, 14:44:55	sen-00063-49	v0003	loc-00020-30	
 box-00022-30	28/11/2022, 14:45:56	sen-00062-52	v0003	loc-00022-24	
 box-00027-15	28/11/2022, 14:48:30	sen-00167-28	v0003	loc-00015-45	
 box-00030-06	28/11/2022, 14:48:25	sen-00069-31	v0003	loc-00012-54	
 box-00031-03	28/11/2022, 14:48:34	sen-00066-40	v0003	loc-00023-21	
 box-00121-24	28/11/2022, 14:25:40	sen-00146-91	v0003	loc-00041-64	
 box-00129-97	28/11/2022, 14:26:29	sen-00157-58	v0003	loc-00069-77	

IoW

BoxesSensorsExternal sensorsLocationsDevice modelsProvision device



LocationTownAsset name

☐ loc-00000-90EindhovenImec-NL

☐ loc-00001-87HouthulstMartjesvaart

☐ loc-00002-84Lo-ReningeKanaal Ieper-Uzer

☐ loc-00003-81DiksmuideUzer

☐ loc-00004-78Lo-ReningeUzer

☐ loc-00005-75PoperingeUzer

☐ loc-00006-72AntwerpenRWZI Aartselaar

☐ loc-00007-69CSO Randweg Boezinge

☐ loc-00008-66DiksmuideGrondwaterput 3-0080-f2

IoW

BoxesSensorsExternal sensorsLocationsDevice modelsProvision device

Provision device

Device type: Non-WQMD (reference) sensor

Internal ID/name:

Owner: Aquafin

Device model: CTD-10

Location: loc-00000-90

Sampling point: spt-00000-87

Maximum minutes between observations:

Save



Huidige architectuur - Azure

Home > Resource groups >

Resource groups

VMM (vmmbe.onmicrosoft.com)

+ Create ⚙️ Manage view ▾ ...

Filter for any field...

Name ↑↓

- cloud-shell-storage-westeurope ...
- DefaultResourceGroup-WEU ...
- NetworkWatcherRG ...
- rg-apimanagement-sbx-iow-001 ...
- rg-calibration-sbx-iow-001 ...**
- rg-contextbroker-sbx-iow-001 ...
- rg-dataproviderapi-sbx-iow-001 ...
- rg-defender-sbx-internetofwater ...
- rg-keyvault-sbx-iow-001 ...
- rg-ldes-sbx-iow-001 ...
- rg-mongodb-sbx-iow-001 ...
- rg-npa-sbx-iow-001 ...
- rg-ops-sbx-iow-001 ...
- rg-postgres-sbx-iow-001 ...
- rg-scorpiocontextbroker-sbx-iow-001 ...
- rg-scorpiocontextbrokersupport-sbx-iow-001 ...
- rg-supporting-services-sbx-iow-001 ...
- rg-temporaltesting ...
- rg-terraform-sbx-iow-001 ...
- rg-tsdbingestion-sbx-iow-001 ...

rg-calibration-sbx-iow-001

Resource group

Search

+ Create ⚙️ Manage view ▾ 🗑️ Delete resource group 🔄 Refresh ⬇️ Export to CSV 🔗 Open query | 🏷️ Assign tags → Move ▾ 🗑️ Delete ⬇️ Export template

Overview

Activity log

Access control (IAM)

Tags

Resource visualizer

Events

Settings

Deployments

Security

Policies

Properties

Locks

Cost Management

Cost analysis

Cost alerts (preview)

Budgets

Advisor recommendations

Monitoring

Insights (preview)

Alerts

Metrics

Diagnostic settings

Essentials

Subscription (move) : [sub-weu-sbx-internetofwater](#) Deployments : [1 Succeeded](#)

Subscription ID : 338257ec-eb5a-496a-9001-12d310db1701 Location : West Europe

Tags (edit) : [Click here to add tags](#)

Resources

Recommendations

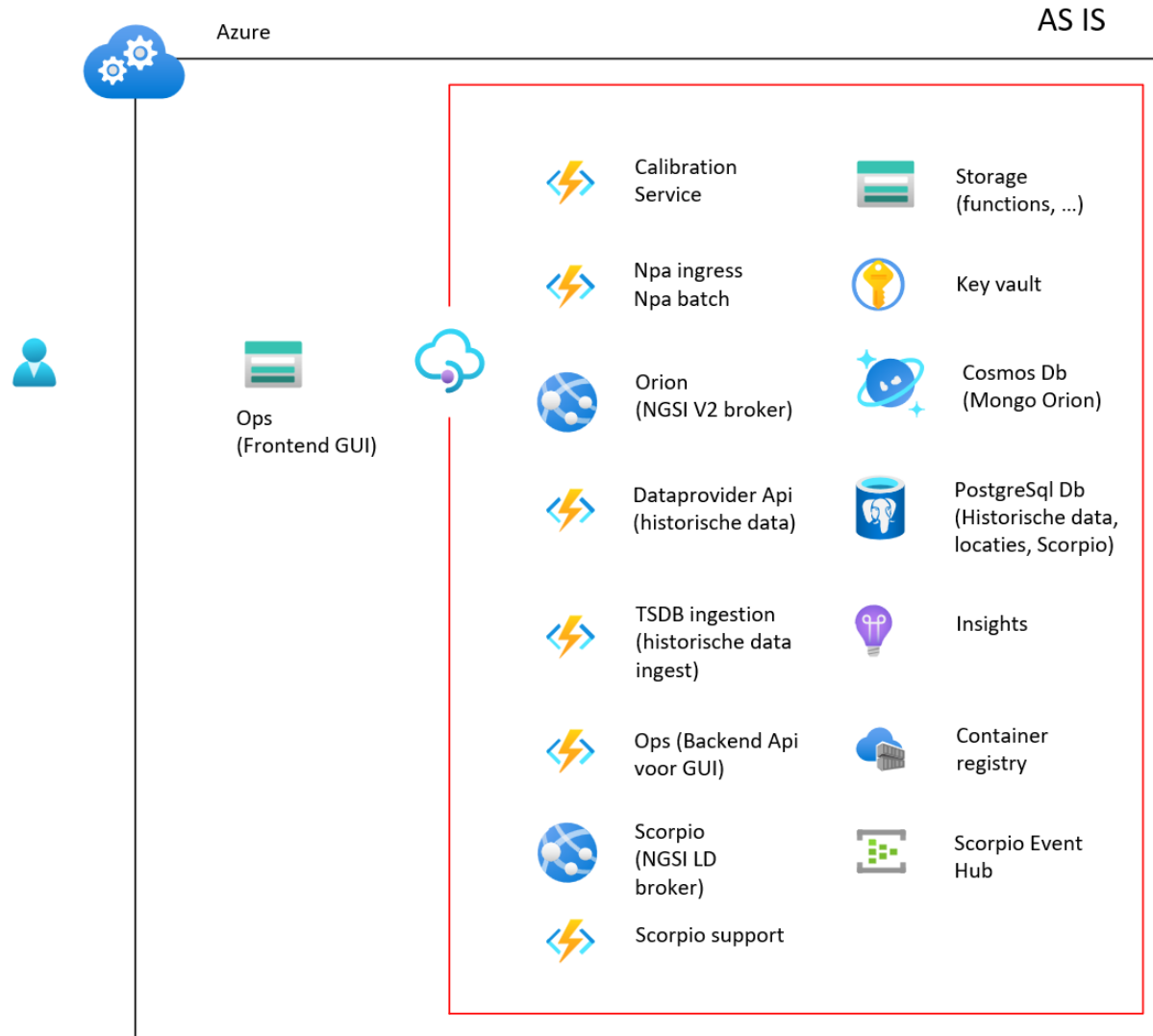
Filter for any field... Type equals all × Location equals all × + Add filter

Showing 1 to 3 of 3 records. ☐ Show hidden types ⓘ

☐ Name ↑↓	Type ↑↓
☐ ASP-rgcalibrationsbx-iow001-9e8f	App Service plan
☐ fa-iow-calibration	Function App
☐ rgcalibrationsbx-iow8c9c	Storage account

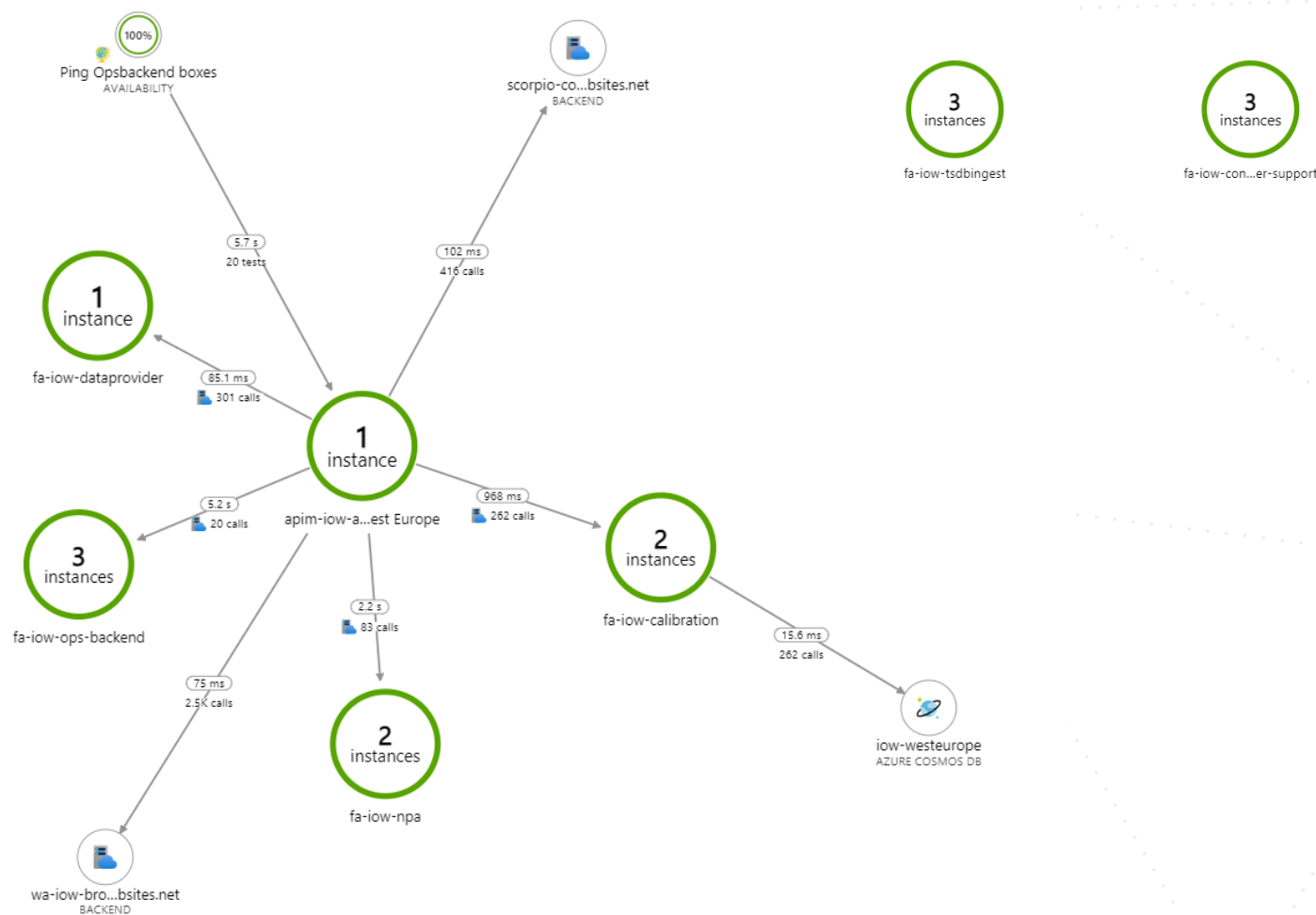


Huidige architectuur – Azure services





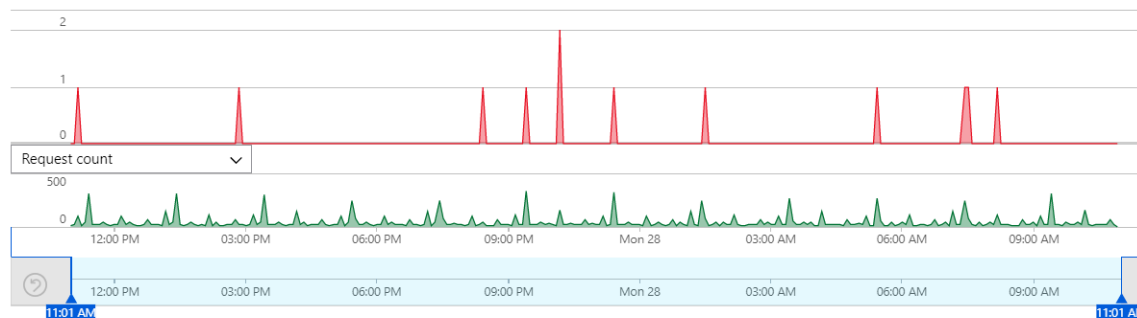
Monitoring – Application insights





Monitoring – Application insights

Failed request count

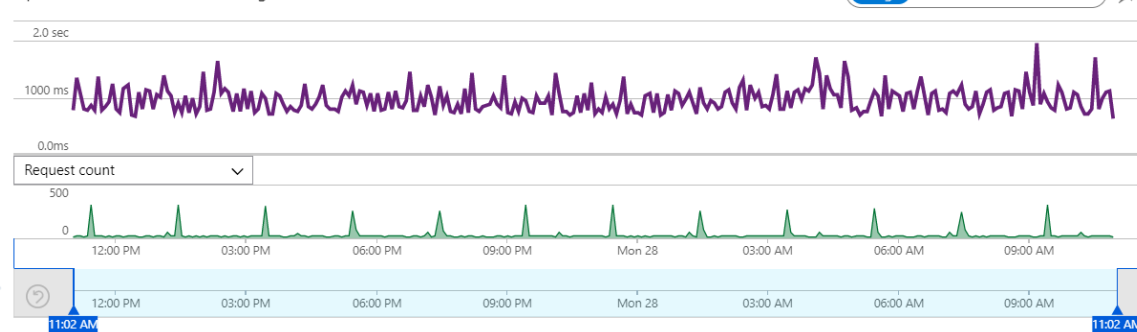


Select operation

OPERATION NAME	COUNT (FAILED)	COUNT	PIN
Overall	14	146.02k	
scorpio-contextbroker-appservice;rev=1 - 62a9f787bc945363957a5c14	12	12.35k	

Operations Dependencies Roles

Operation times: zoom into a range



Overall

Top 3 response codes	COUNT	FILTERING
400	12	
0	2	

Top 3 exception types	COUNT	FILTERING
FunctionTimeoutEx...	4	

Suggested

11/28/2022, 1:35:27 AM
POST /iow-scorpio/ngsi-ld/v1/entityOperations/upsert
Duration: 112.1 ms Response code: 400

All

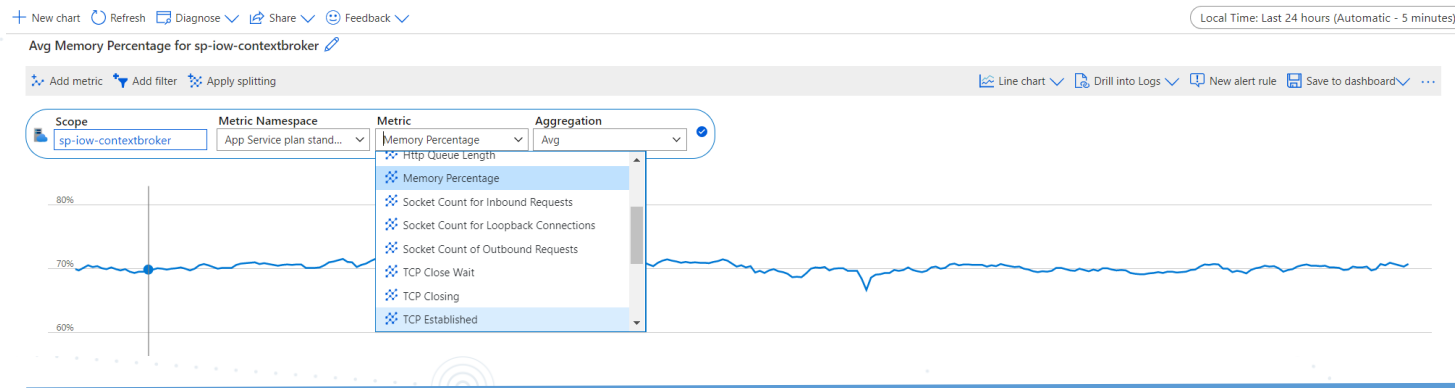
Sort by
Relevance

11/28/2022, 1:35:27 AM
POST /iow-scorpio/ngsi-ld/v1/entityOperations/upsert
Duration: 112.1 ms Response code: 400

11/28/2022, 7:35:48 AM
POST /iow-scorpio/ngsi-ld/v1/entityOperations/upsert
Duration: 124.1 ms Response code: 400



Monitoring – Log analytics





Security

- Microsoft Defender for Cloud / Azure advisor
 - Policies (VMM / Microsoft)
 - Cost, Security, Reliability, Performance, ...
- API management
 - Policies, gateway, identity
- Network restrictions
- Virtual network
- Private endpoint
- Key Vault
- Managed identities



Evolutie sinds het initiële systeem

- **Multi-tier** omgeving (LandingZones)
- **Infrastructure as Code**: volledige platform
- **CI CD** pipelines
- **Failsafe**
 - Messaging, retry, DLQ en pub/sub tussen componenten
- **Performantie** historische tabel
- **Gaps** filler
- **VSDS LDES** op IoW

=> IOW 1.0

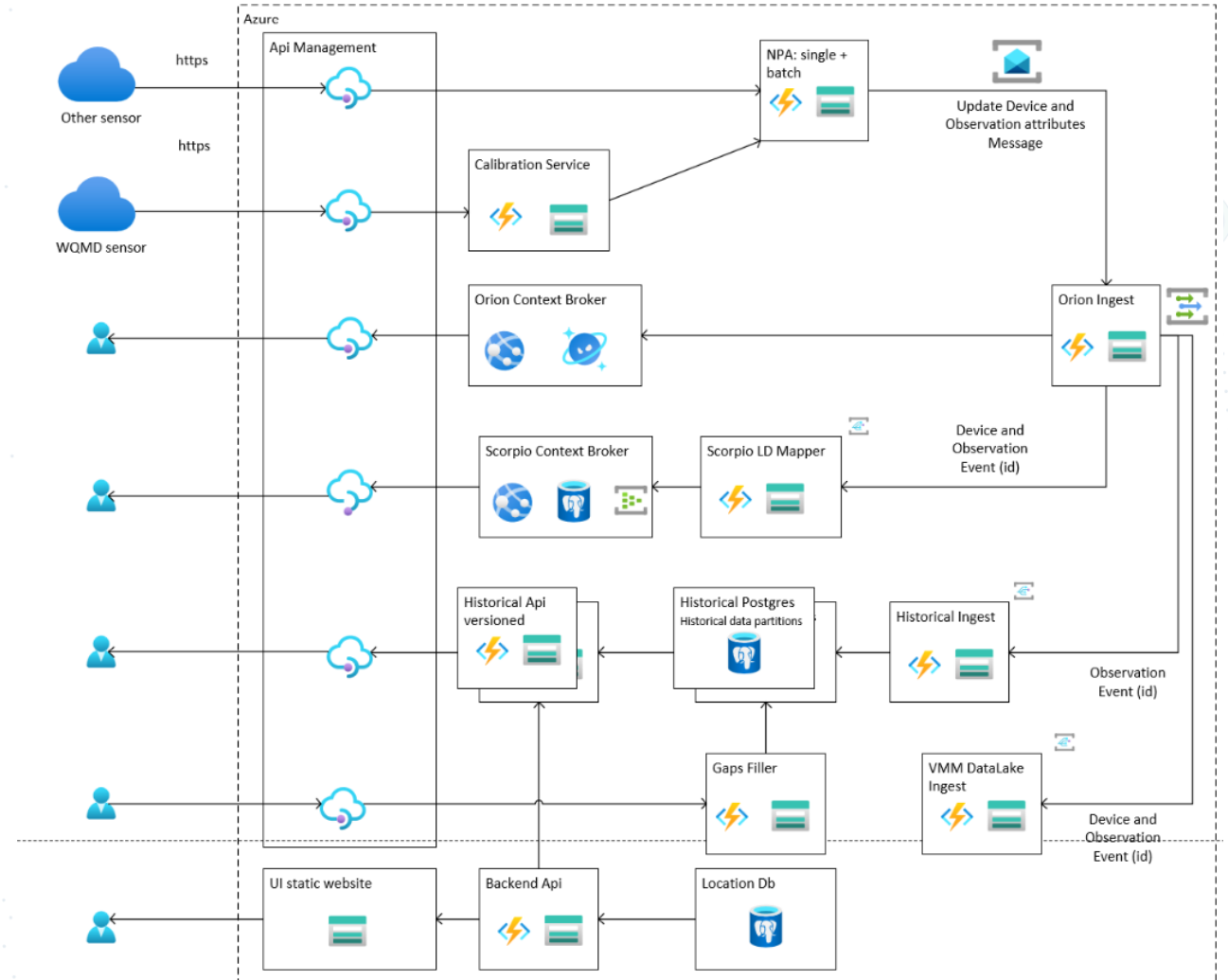


IoW 1.0 - IaC

```
module npaModule 'modules/function.bicep' := {  
  scope: rgNpa  
  name: '${npa}Deploy'  
  params: {  
    functionName: funNpa  
    servicePlanName: planNpa  
    storageAccountName: storNpa  
    location: location  
  }  
  dependsOn: [  
    supportingServicesModule  
  ]  
}  
  
module calibrationModule 'modules/function.bicep' := {  
  scope: rgCalibration  
  name: '${calibration}Deploy'  
  params: {  
    functionName: funCalibration  
    servicePlanName: planCalibration  
    storageAccountName: storCalibration  
    location: location  
  }  
  dependsOn: [  
    supportingServicesModule  
  ]  
}  
  
module orionSupportModule 'modules/function.bicep' := {  
  scope: rgOrionSupport  
  name: '${orion}SupportDeploy'  
  params: {  
    functionName: funOrionSupport  
    servicePlanName: planOrionSupport  
    storageAccountName: storOrionSupport  
    location: location  
  }  
}
```

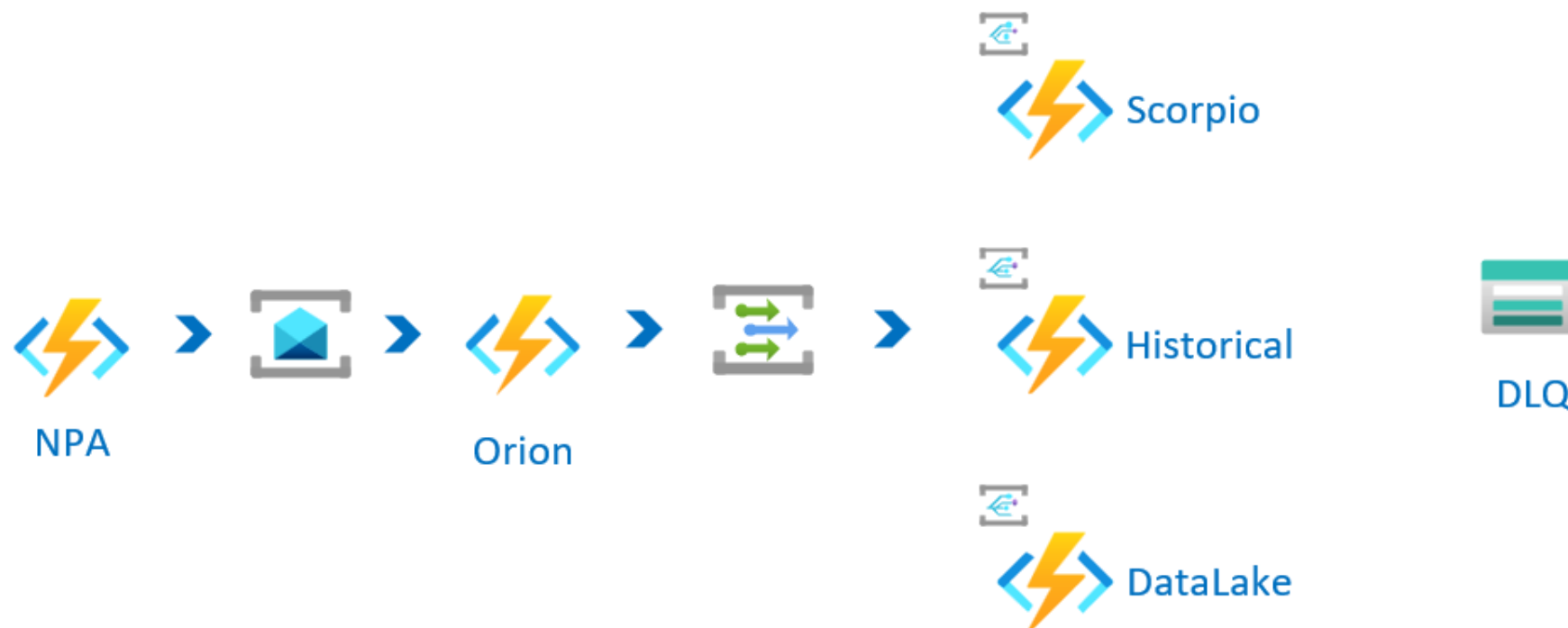



IoW 1.0 - Architectuur



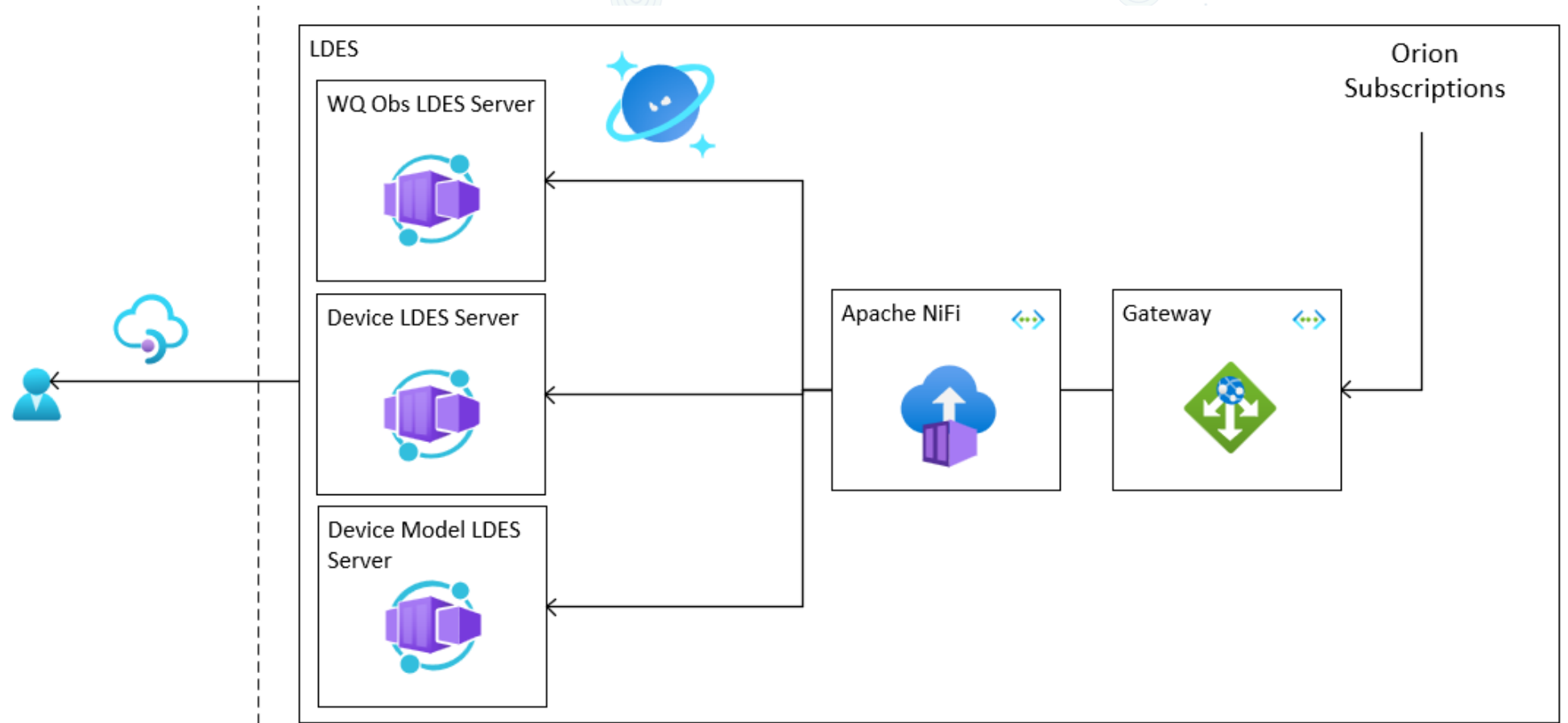


IoW 1.0 - Failsafe





LDES implementatie





Q&A deel 1

- Vragen
- Opmerkingen
- Delen van ervaringen
- Bedenkingen



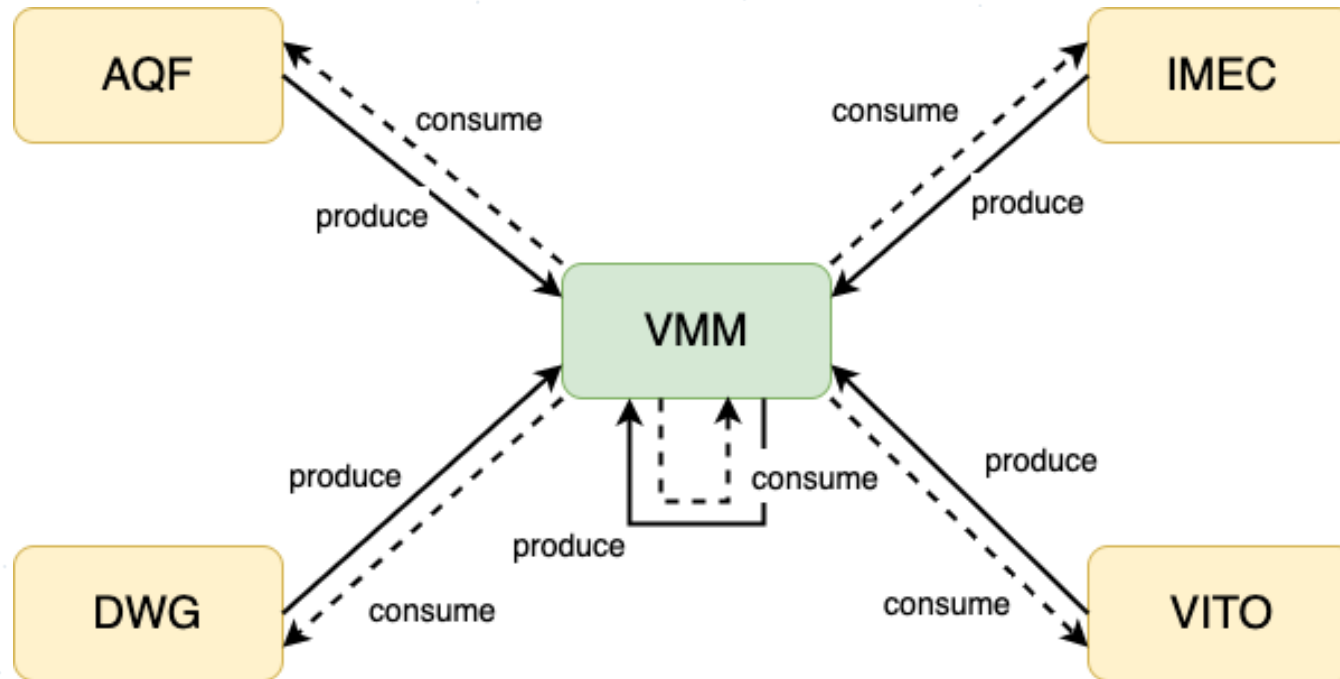
Vervolg: Van "Push" naar "Pull"

- Waarom?
 - Data ownership
 - Data owners/producers kunnen ook data ter beschikking stellen los van IoW
 - Geen single-point-of failure
 - ...



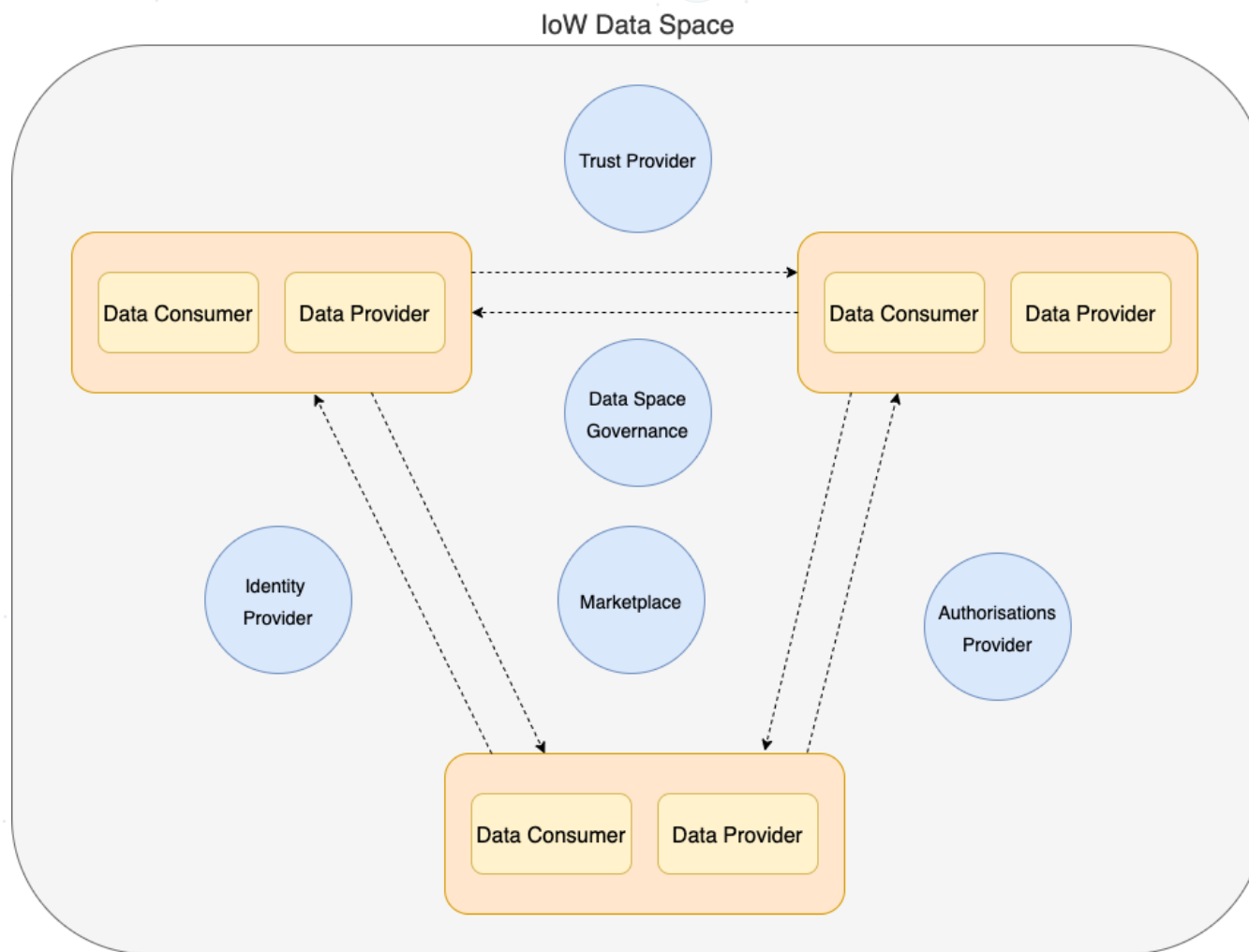
Vervolg: Van "Push" naar "Pull"

"Push" / Centraal systeem





"Pull" / Gedecentraliseerd systeem: Data Sharing





Van "Push" naar "Pull": Data Sharing

Data sharing rollen

- **Data consumer:** A party or person who consumes data provided by the data provider. The data consumer has to agree to use the data as defined by the data license under which it received the authorization to access that data.
- **Data provider:** An organization that hosts a service to provide data on behalf of data owners. Data provider has the responsibility to verify who the data consumers are and provide only data that they are authorized to have access to.
- **Data owner:** A party or person who owns the data in the context of the process at a given time. Do note that a data owner does not necessarily have to be a data creator, it could be an application that generates data as a result of some processing.

Andere rollen

- **Trust Authority Provider**
- **Service Provider rollen:**
 - **Identity Provider, Authorisation Registry Provider, Marketplace Provider**



Vervolg: van "Push" naar "Pull": Data Sharing

Randvoorwaarden:

- Bereidwilligheid van de partners om in een data spaces/data sharing verhaal te stappen
- Nodige infrastructuur voorzien door de partners
- Gestandaardiseerd formaat gebruiken (smart data models, NGSI-LD, OSLO, ...) door de partners

Opmerking:

"Backwards compatibility": VMM blijft ook de "push" mogelijkheid aanbieden!



Q&A deel 2

- Vragen
- Opmerkingen
- Delen van ervaringen
- Bedenkingen



Links naar meer informatie

<https://smartdatamodels.org/>

<https://www.fiware.org/>

<https://www.vlaanderen.be/digitaal-vlaanderen/onze-oplossingen/oslo>

<https://www.vlaanderen.be/digitaal-vlaanderen/onze-oplossingen/vlaamse-smart-data-space>

<https://fiware-orion.readthedocs.io>

<https://scorpio.readthedocs.io>

<https://azure.microsoft.com>