

# Using IoT standards for push-based communication of hydrological data

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(Wupperverband)



# Water Ressource Management



 catchment area >800 km<sup>2</sup>

 14 reservoirs

 11 sewage plants

precipitation: < 1400 mm/anno

inhabitants: ca. 900,000

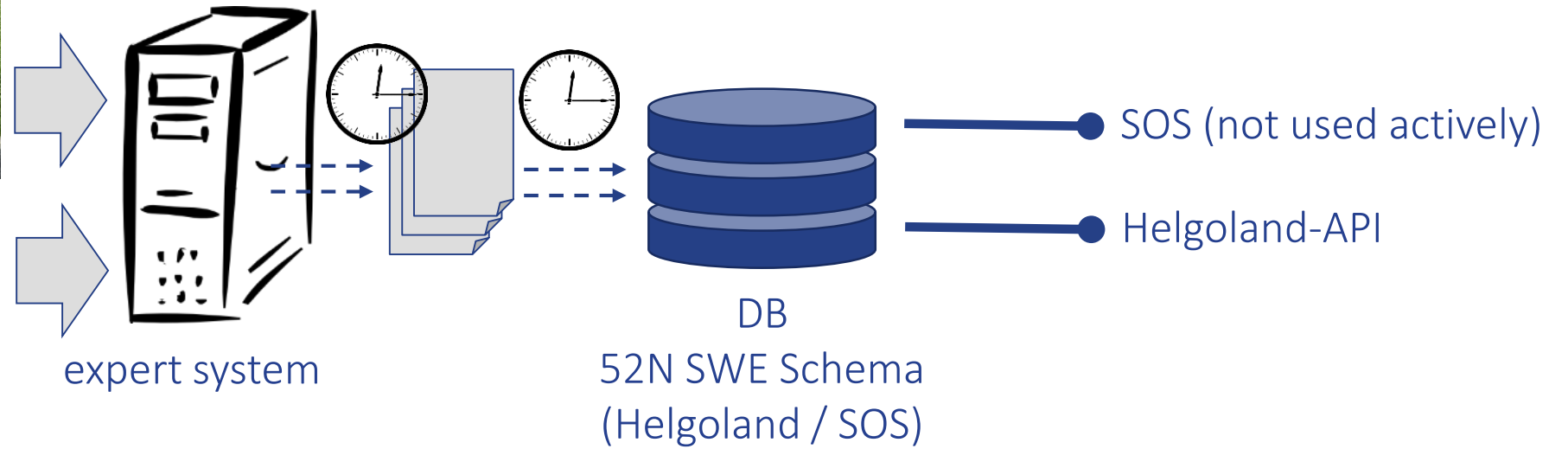


# Current Data flow: batch processing

manual



auto

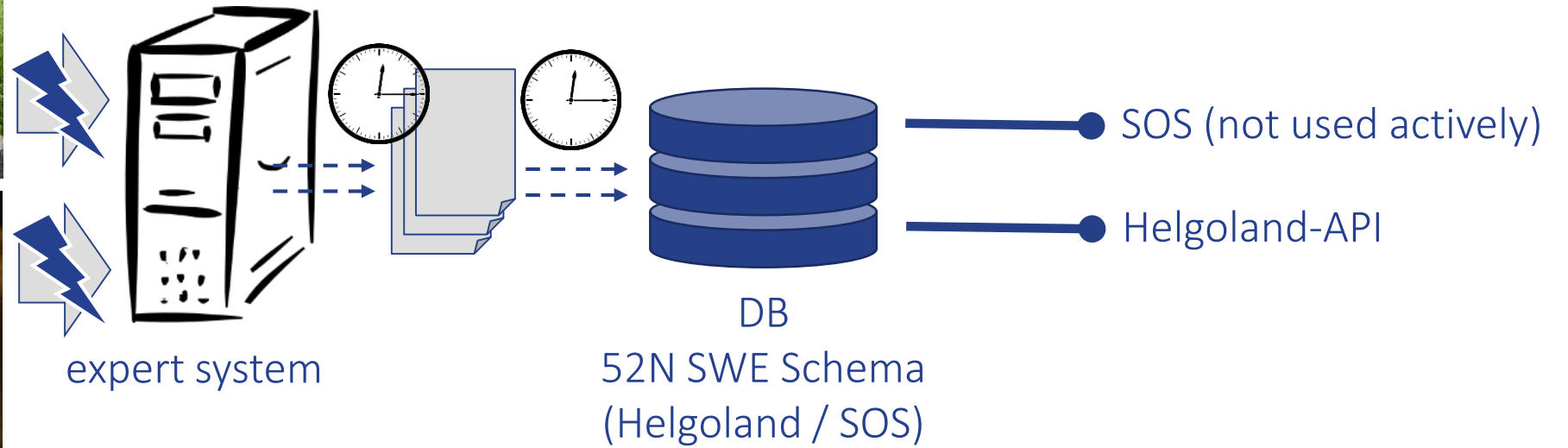


# Current Data flow: batch processing

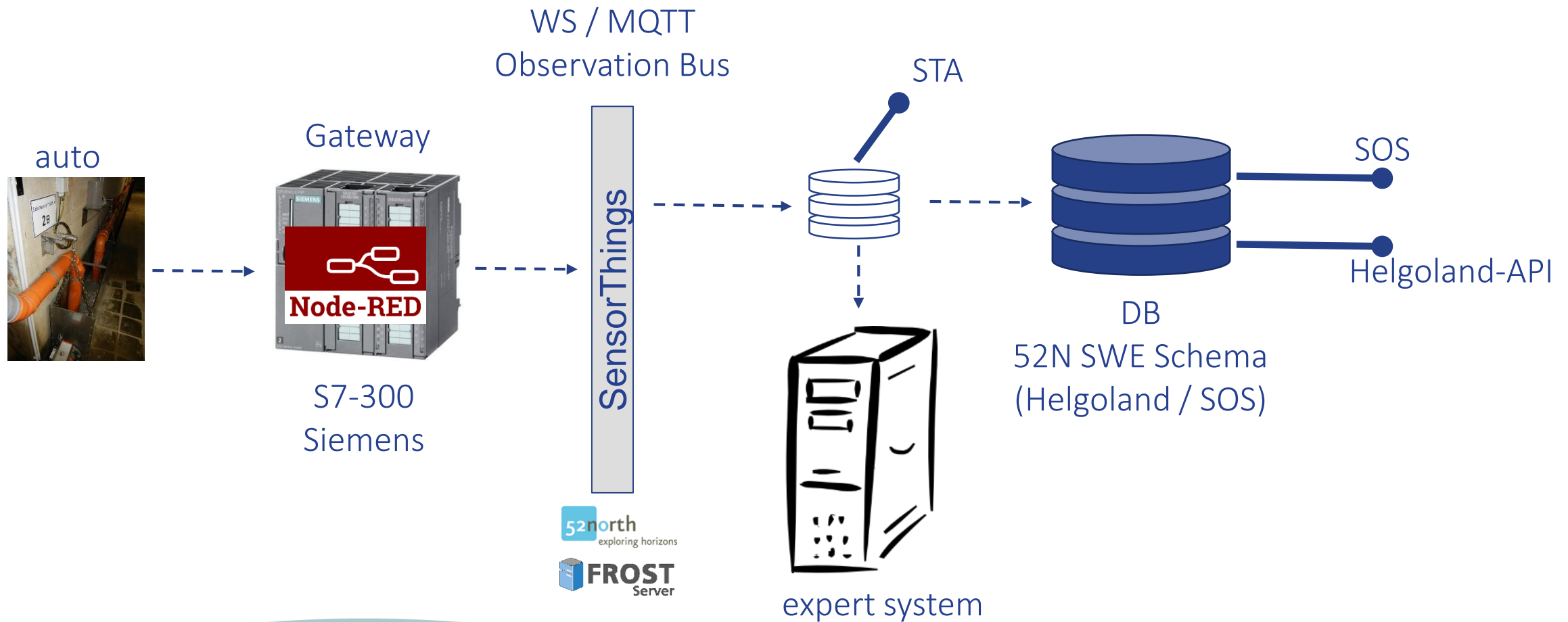
manual



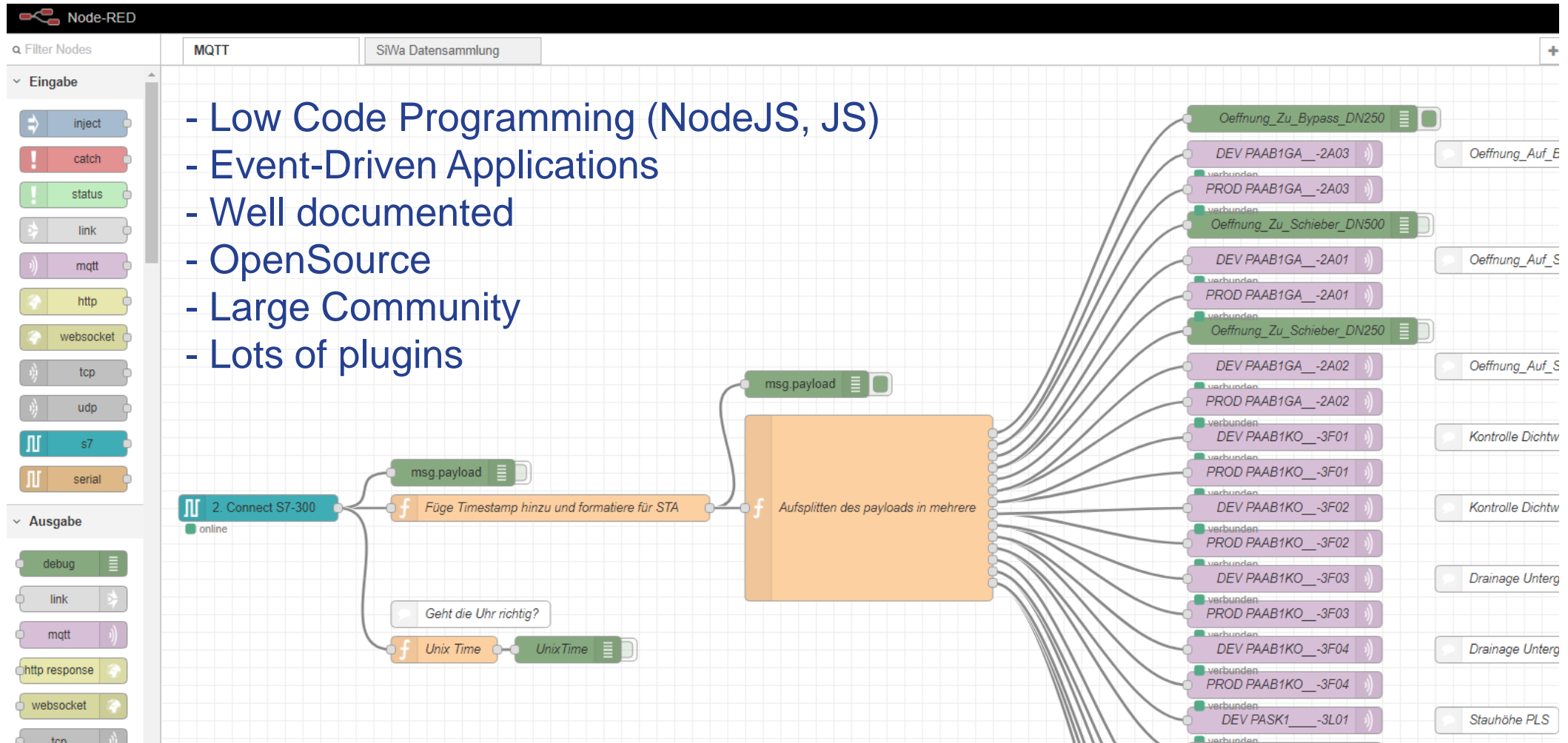
auto



# SensorThings API



# NodeRED (nodered.org)



- Low Code Programming (NodeJS, JS)
- Event-Driven Applications
- Well documented
- OpenSource
- Large Community
- Lots of plugins



# Visualisation (TaMiS)

Panzer-Talsperre
Dashboard
Berichte
EZG Übersicht

angemeldet als **Christian Malewski**  
Abmelden

Alle Sichten

- Dashboard
- Kontrollmessungen
- Kontrollmesskalender
- Berichte
- EZG Übersicht
- Talsperren-Auswahl

Anstehende Kontrollmessungen

- heute Wasser- und Lufttemperatur, Stauhoehe
- heute ABGABE
- bis in 4T SBK
- bis in 4T Kontr. D, Drainage U
- bis in 4T Grundwasserpegel
- bis in 4T Kronen- und Fussbohrung

DWD Unwetterwarnungen

0 Meldungen vor 1sek

Speicherinhalt

110469 m<sup>3</sup> vor 6min

Speicherfüllstand

289.5 mNHN vor 6min

Niederschlag

mm heute

Prognose

mm morgen

Schüttmenge KD links

0.054 l/s vor 6min

Schüttmenge KD rechts

0 l/s vor 6min

Interne Meldungen

-- Meldungen vor 5sek

Durchfluss DN 250

8.03 l/s vor 6min

Öffnungsgrad DN 250

11 vor 6min

Öffnungsgrad DN 500

1 vor 6min

DU links

0.001 l/s vor 6min

DU rechts

0.004 l/s vor 6min

Stauziele

293.95 mNHN.ZK

291.97 mNHN.ZH2

291.97 mNHN.ZH1

291.37 mNHN.ZV

291.25 mNHN.ZS

289.506 mNHN

282.13 mNHN.ZA

282.13 mNHN.ZT

Zeile Erläuterungen

Stauinhalt

\* ↓ 1M 3M 12M

— Inhalt

Schnellzugriff

Kontrollmessungen

HOCHWASSER PORTAL

Sensor Web

www.WUPPERVERBAND.de

# SensorThings

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Documentation: [developers.sensorup.com](http://developers.sensorup.com)

Query Options: expand, select, orderby, count, ...

Datastreams with some metadata  $\approx$  [helgoland-api/timeseries](http://helgoland-api/timeseries):

```
<root-url>/sensorthings/Datastreams?
```

```
$expand= ObservedProperty ($select=description,name,id) ,  
        Thing ($select=description,name) ,  
        Sensor ($select=description,name) ,  
        Observations (  
            $top=1 ;  
            $orderby=phenomenonTime%20desc ;  
            $expand=FeatureOfInterest ;  
            $select=result,phenomenonTime,FeatureOfInterest)
```





# SensorThings (Sensing Profile)

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- Provides two fit-for-purpose APIs
  - One for push-based access
  - One for pull-based access
- Easy to adopt and lightweight
  - Based on standards (MQTT)
  - Dataset/Datastream metadata managed in database
- Allows for service based data processing in the sensor web (Apache Kafka)
- Allows for service based Data Science (Apache Spark, Jupyter Notebook)

**An OGC standard as practical as the WMS for the Sensor Web at last!**



# Next Steps

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- Evaluation of submission of manual measures
- Evaluation of scalability on our IT-infrastructure
- Evaluation of performance in our IT-infrastructure
- Evaluation of integration with OPC-UA
- Role out to all WV-facilities

## Feature Requests

- Integration with current SOS-DB-Schema so that STA and Helgoland-API can be served from same DB-Schema (harmonisation of primary keys)
- Better JavaScript support, current support of helgoland toolbox is rudimentary and does handle datastreams as second class citizens
- Datastream / Dataset Metadata Editor (No SensorML!!!)
- Role based editing of Datastreams clusters

