Visualisation Node-RED de données sémantiques du bâtiment

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Plan

- Le projet CoSWoT
- Architecture CoSWoT
- Modélisation des données
- API backend
- Node-RED
- Conclusion

Constrained Semantic Web of Things

Applications intelligentes et décentralisées sur des objets contraints utilisant les technologies du Web sémantique pour les bâtiments connectés et l'agriculture.

ANR-19-CE23-0012
Février 2020 - Juillet 2024
Budget: 1.05M€
306 personne / mois
https://coswot.gitlab.io/

Lyon **Saint-Étienne** **Clermont-Ferrand** **Paris**

Objectifs de CoSWoT

CoSWoT une plate-forme pour applications WoT distribuées capable :

(1) d'utiliser des **modèles de connaissances** en graphes pour spécifier déclarativement

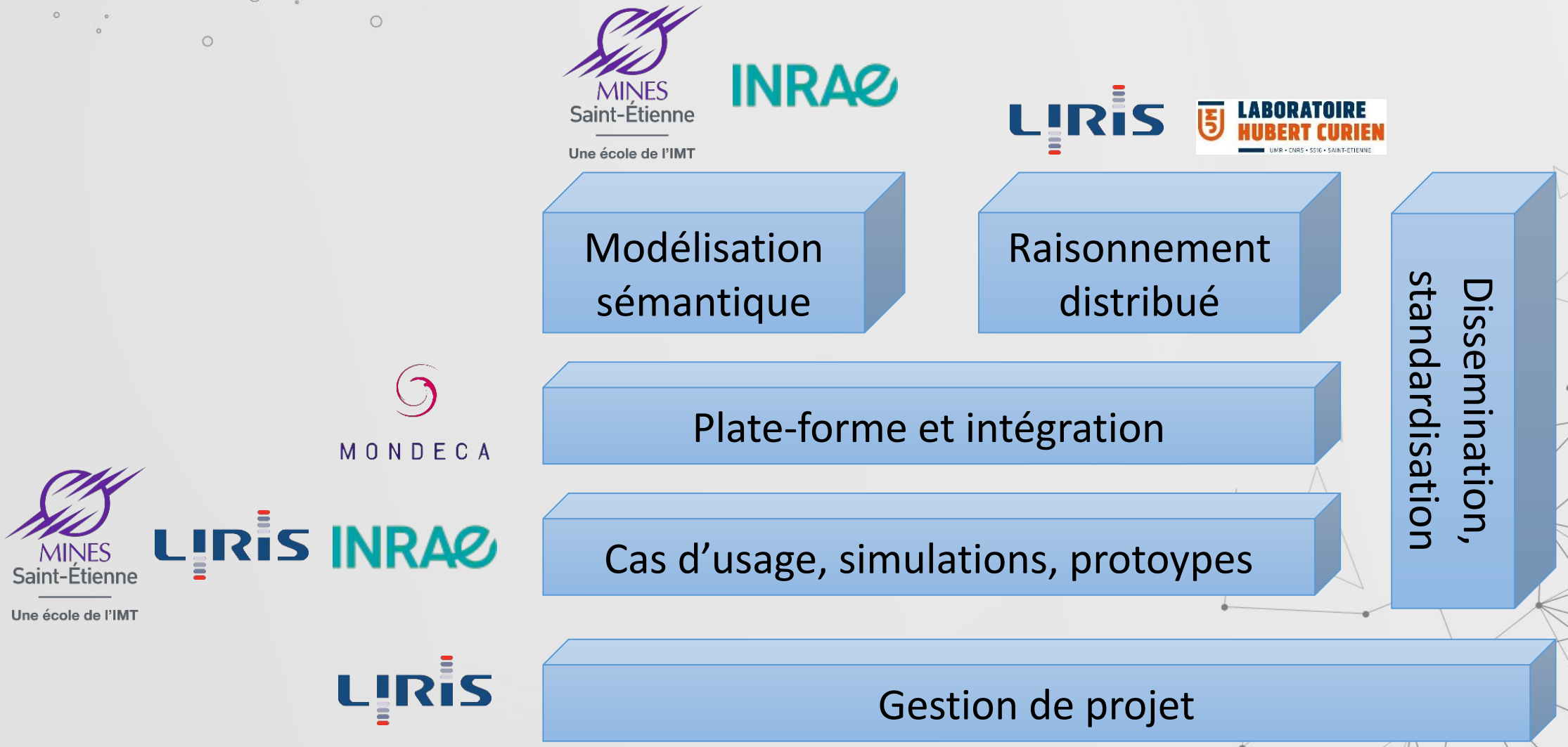
- la sémantique des messages échangés entre noeuds réseau
- la connaissance du domaine d'une application WoT

(2) de répartir des tâches de **raisonnement** entre des noeuds hétérogènes, dont des noeuds **contraints** en bout de réseau, en prenant en compte

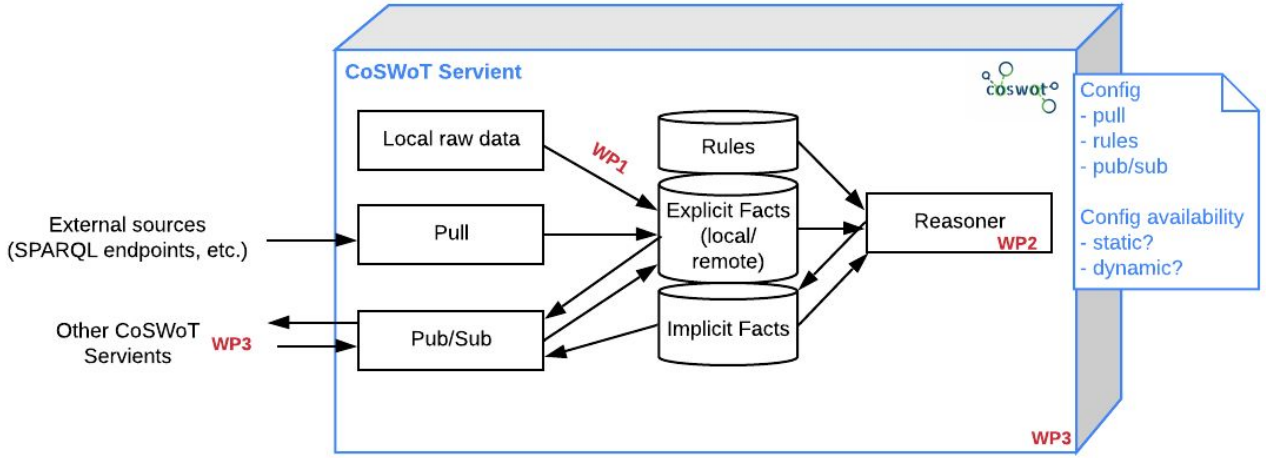
- l'infrastructure réseau
- les caractéristiques matérielles du noeud

Notre plate-forme permettra de développer des applications WoT décentralisées et traçables sur un réseau hétérogène.

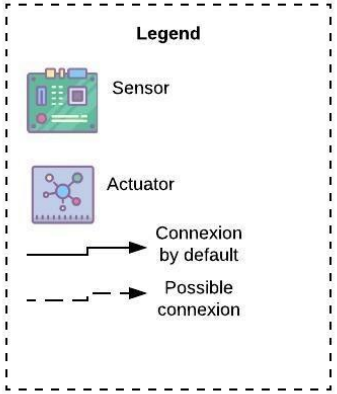
CoSWoT work packages

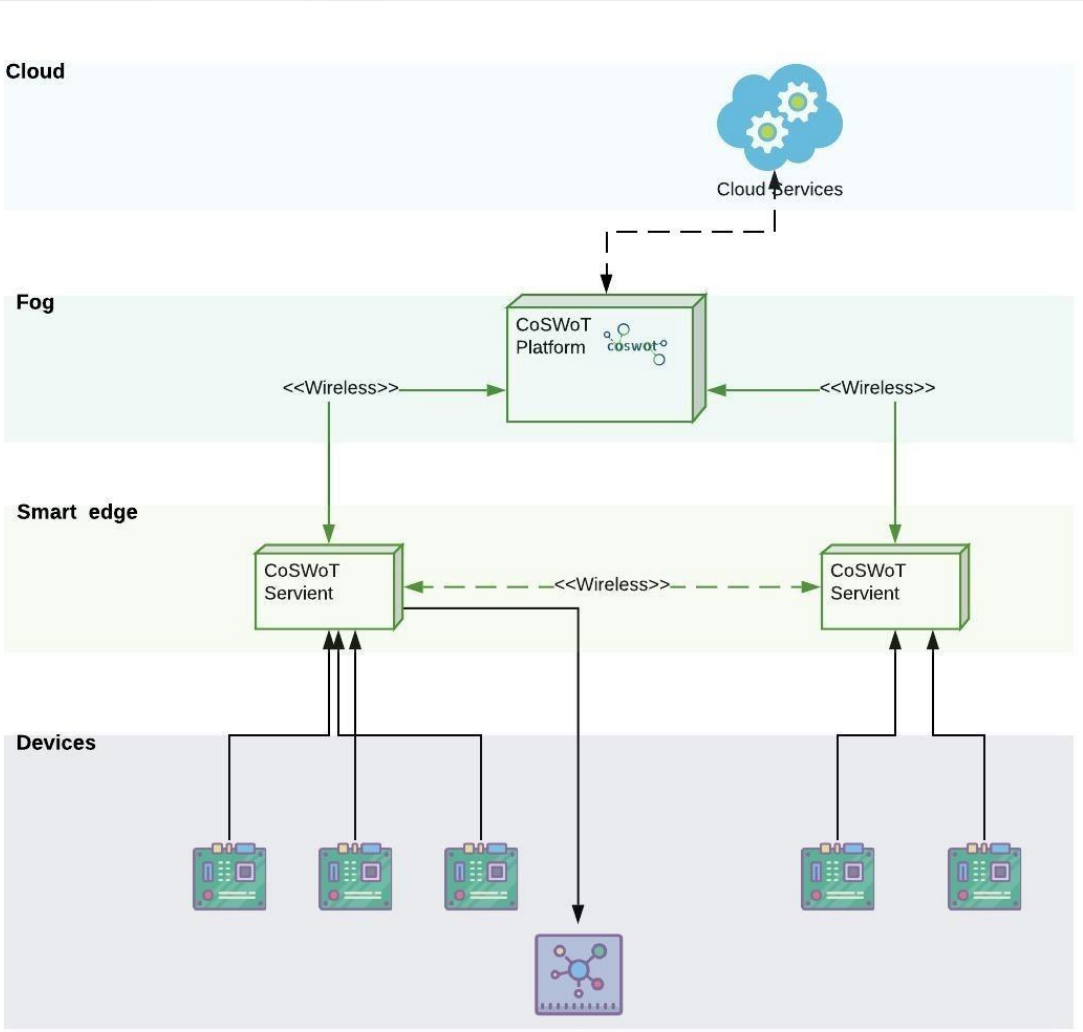


Architecture - Vue globale



- Raisonnement incrémental
- Traitement en continu
- Architecture fog/edge

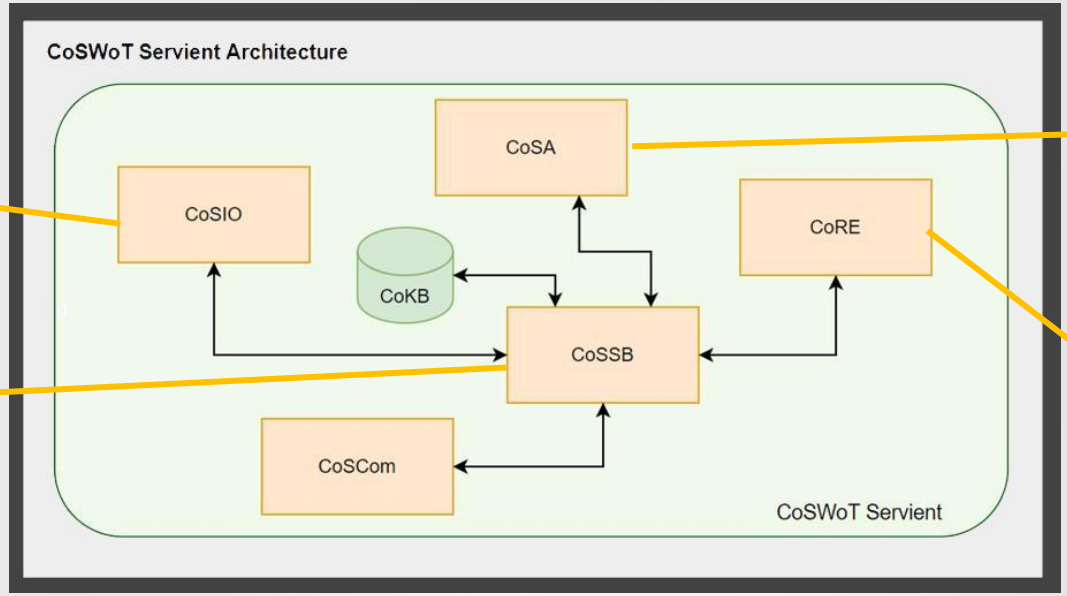




CoSWoT Servient & Use case

Semantic Input Output:
Transforms data into RDF

Semantic Service Bus :
acts as a broker to the modules (pub/sub)



Semantic Aggregator:
Aggregates data (minimum, maximum, average)

Semantic Reasoner:
Runs a rules engine to create new data from the input stream

Smart Building INSA Lyon
Hundred of EnOcean sensors deployed in the buildings

Temperature

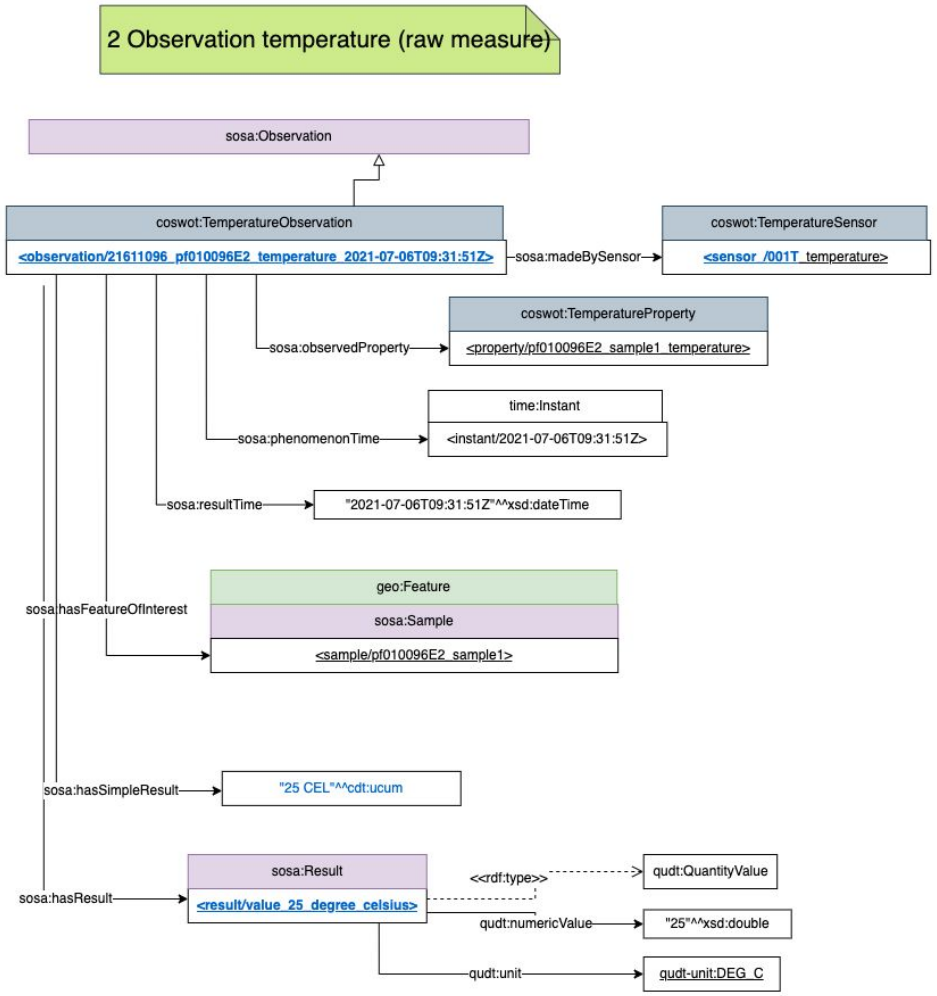
Humidity

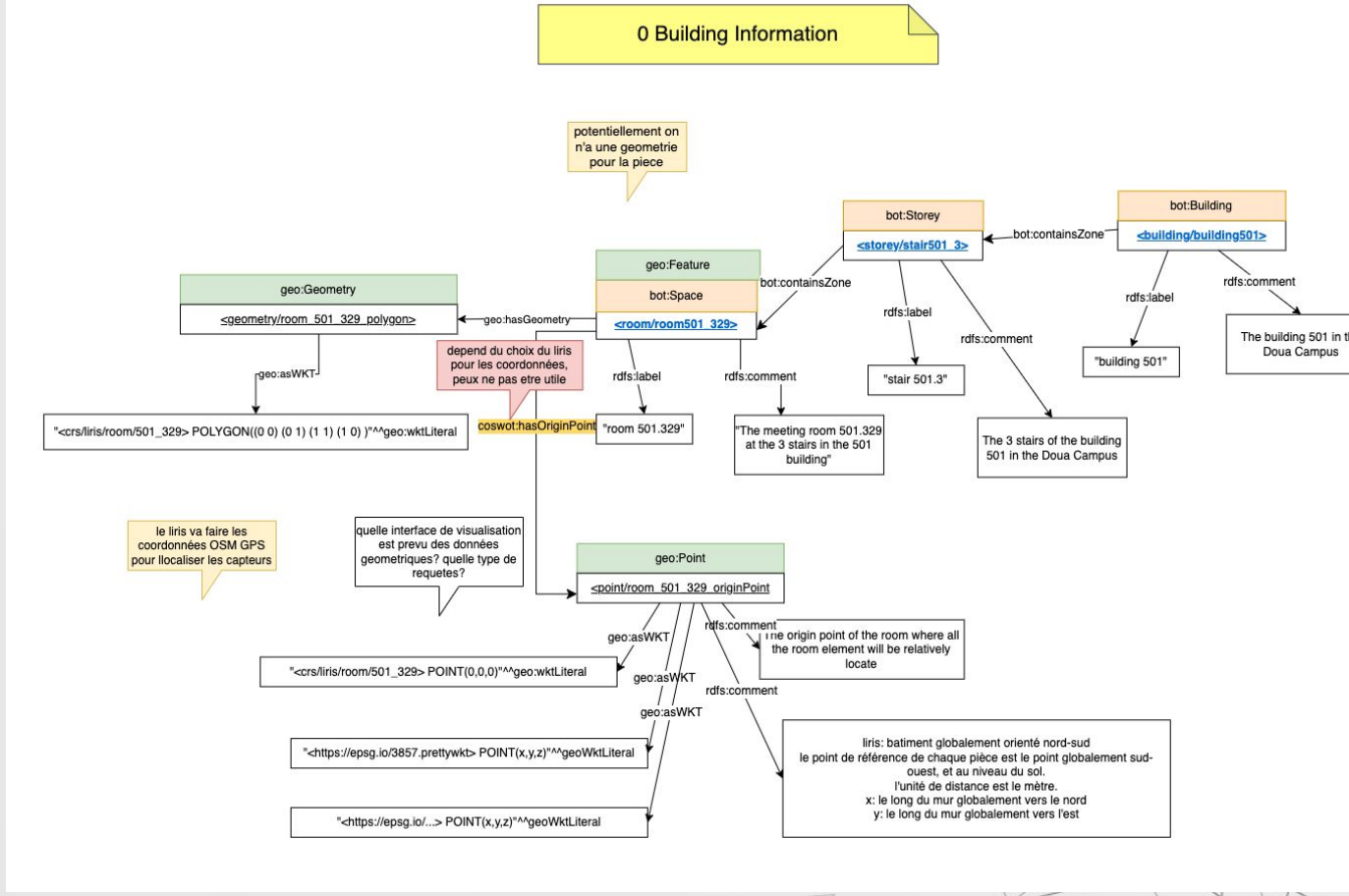
Co2 Concentration

Build a personalized dashboard

- Flexible thresholds
- Different scale of time and space
- View aggregated facts at different scale and time

Modélisation des données brutes des capteurs





Building a KG from sensors data

```
## Observation for Humidity sensor
# URI - {MeasureID}_{DeviceID}_{ProbeRole}_{ResultTime}
#####################################

ob:21611094_010096E2_Humidity_2021-07-06T09:31:51Z a sosa:Observation ;
          sosa:madeBySensor sen:010096E2_Humidity ;
          sosa:observedProperty prop:010096E2_sample1_relativeHumidity ;
          sosa:resultTime "2021-07-06T09:31:51Z"^^xsd:dateTime ;
          sosa:phenomenonTime inst:2021-07-06T09:31:51Z ;
          sosa:hasFeatureOfInterest spl:010096E2_sample1 ;
          sosa:hasSimpleResult "52 %"^^cdt:ucum;
          sosa:hasResult rt:value_52_Percent ;
          .

# Result value of the humidity in percentage
#############################################################
rt:value_52_Percent a sosa:Result, qudt:QuantityValue ;
          qudt:unit unit:PERCENT ;
          qudt:numericValue "52"^^xsd:double;
          sosa:isResultOf ob:21611094_010096E2_Humidity_2021-07-06T09:31:51Z ;
          .

## time instant with the time and class associated
inst:2021-07-06T09:31:51Z a time:Instant ;
    time:inXSDDateTimeStamp "2021-07-06T09:31:51Z"^^xsd:dateTime.

## sample links to properties via ssn:hasProperty
spl:010096E2_sample1 a sosa:Sample ;
    ssn:hasProperty prop:010096E2_sample1_CO2Concentration ;
    ssn:hasProperty prop:010096E2_sample1_relativeHumidity ;
    ssn:hasProperty prop:010096E2_sample1_Temperature ;
    .
```

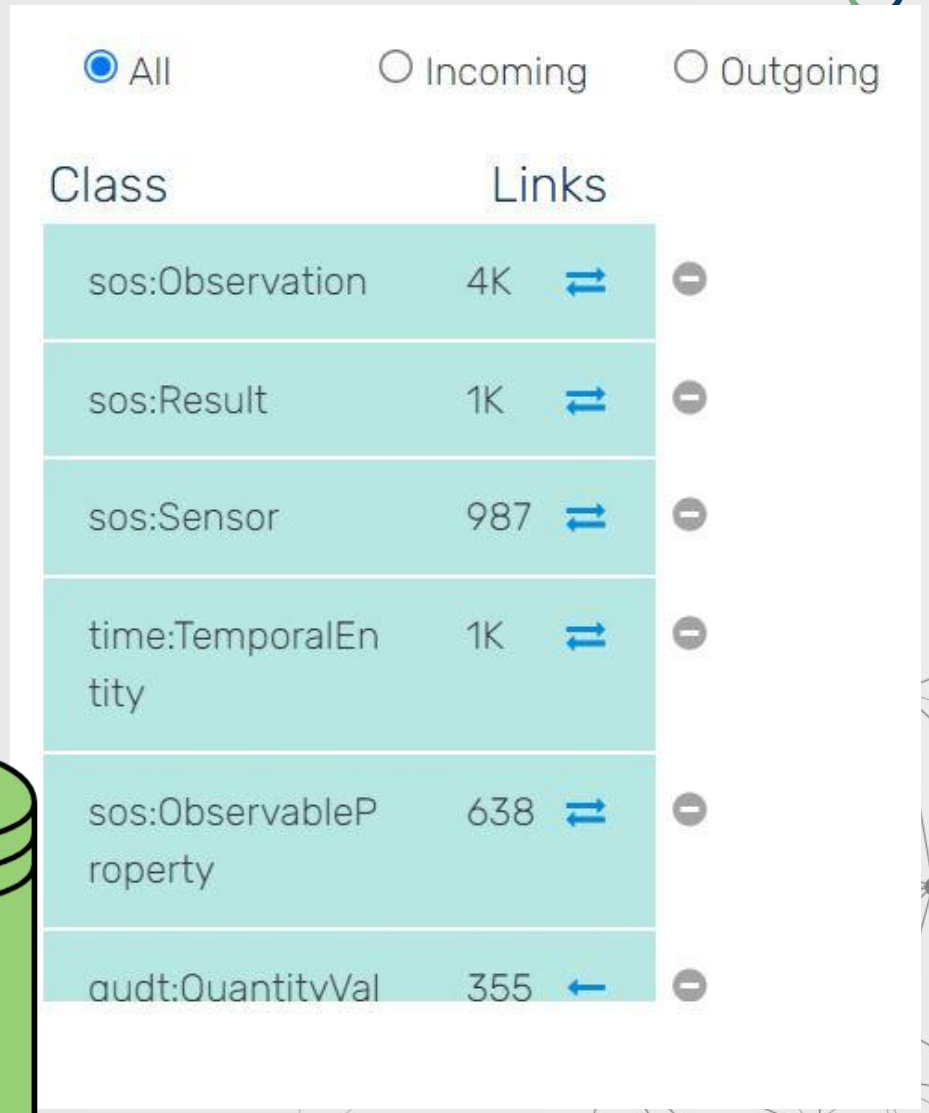
```
@prefix sosa: <http://www.w3.org/ns/sosa/>.
@prefix liris: <http://data.coswot.fr/smartbuilding/liris/id/>.
@prefix pf: <http://data.coswot.fr/smartbuilding/liris/id/platform/>.
@prefix sen: <http://data.coswot.fr/smartbuilding/liris/id/sensor/>.
@prefix sys: <http://data.coswot.fr/smartbuilding/liris/id/system/>.
@prefix sp: <http://data.coswot.fr/smartbuilding/liris/id/space/>.
@prefix bd: <http://data.coswot.fr/smartbuilding/liris/id/building/>.
@prefix st: <http://data.coswot.fr/smartbuilding/liris/id/storey/>.
@prefix inst: <http://data.coswot.fr/smartbuilding/liris/id/instant/>.
@prefix rt: <http://data.coswot.fr/smartbuilding/liris/id/result/>.
@prefix ob: <http://data.coswot.fr/smartbuilding/liris/id/observation/>.
@prefix si: <http://data.coswot.fr/smartbuilding/liris/id/site/>.
@prefix coswot: <http://data.coswot.fr/smartbuilding/def/coswot#>.
@prefix bot: <ttps://w3id.org/bot#>.
@prefix spl: <http://data.coswot.fr/smartbuilding/fayol/id/sample/>.
@prefix seas: <https://w3id.org/seas/>.
@prefix pro: <http://data.coswot.fr/smartbuilding/fayol/id/property/>.
@prefix unit: <http://qudt.org/vocab/unit/>.
@prefix quantitykind: <http://qudt.org/vocab/quantitykind/>.
@prefix qudt: <http://qudt.org/schema/qudt/>.
@prefix qtype: <http://qudt.org/vocab/type/>.
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>.
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>.
@prefix xsd: <http://www.w3.org/2001/XMLSchema#>.
@prefix sent: <http://data.coswot.fr/smartbuilding/liris/id/sensorType/>.
@prefix cdt: <https://w3id.org/cdt/>.
@prefix saref: <https://saref.etsi.org/core/>.
@prefix time: <http://www.w3.org/2006/time#>.
@prefix ssn: <http://www.w3.org/ns/ssn/>.
@prefix prop: <http://data.coswot.fr/smartbuilding/fayol/id/property/>.
```

Triple store SBLirisRL (2021-02-10 to 2021-12-21)

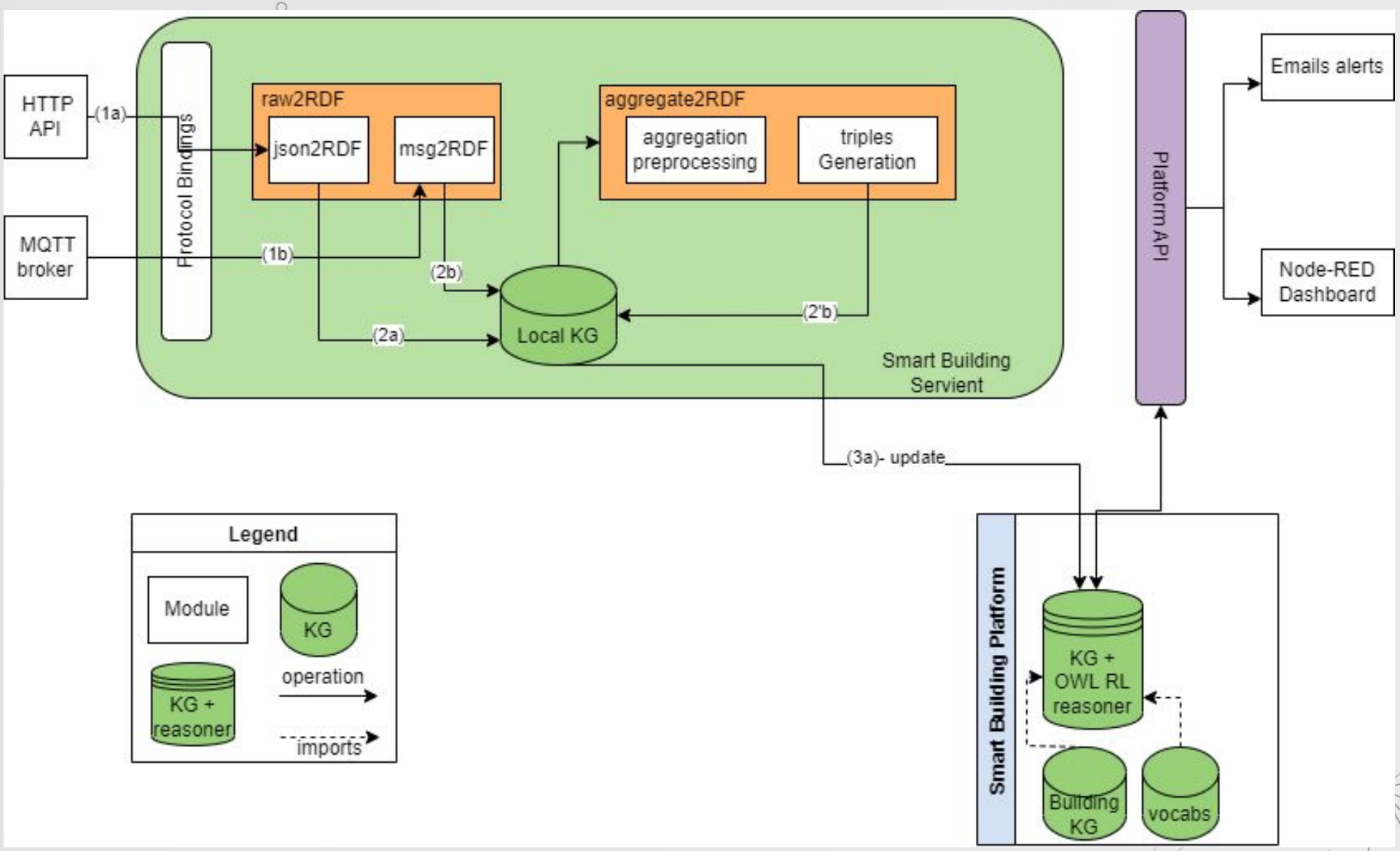
1- GraphDB triple store + OWL RL activated

2- Explicit triples: 17, 259 triples
Inferred triples: 104,288 triples
Total triples: **121, 547 triples**
Expansion factor: 7.0

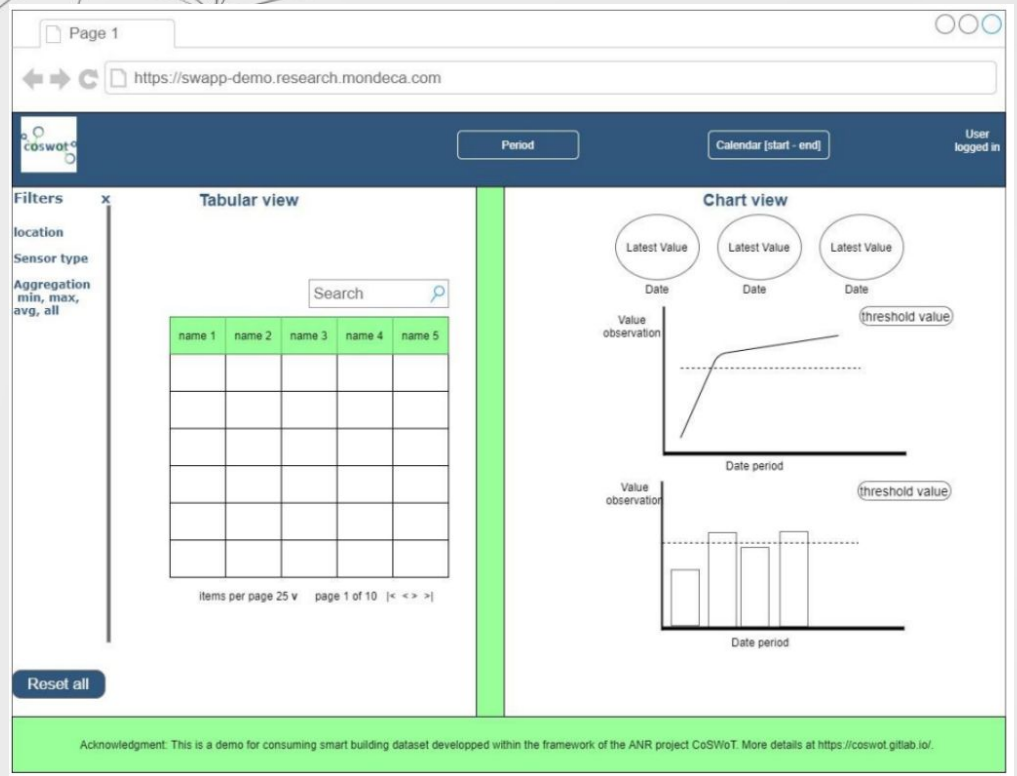
3- Two named graphs
http://data.coswot.fr/onto
http://data.coswot.fr/sensors



API sur données sémantiques



From raw data to Dashboard



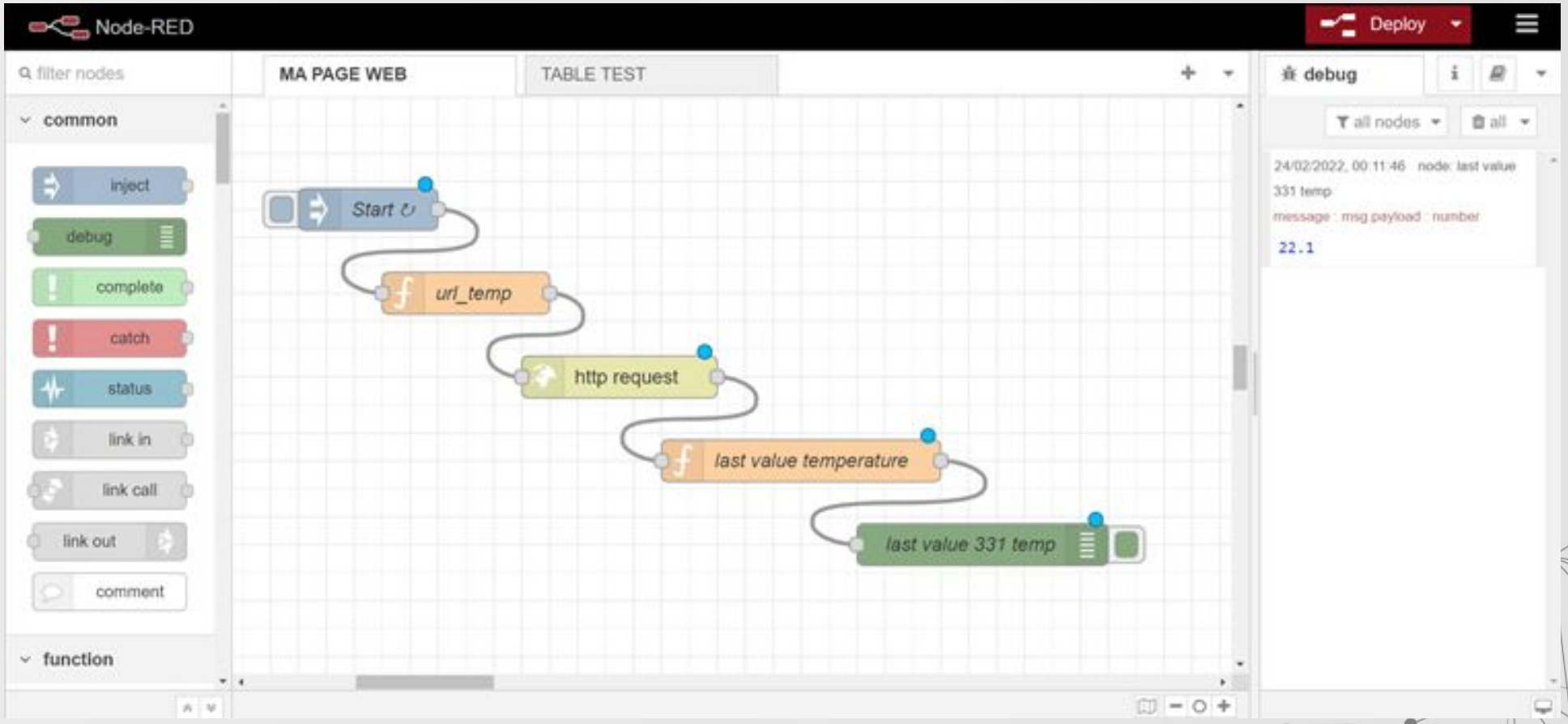
- Server manages the sensors
- http request to get the data

https://research.mondeca.com/coswot/smartbuilding/server/actions/query?sensorLocation&startDate&endDate&functionOnData&sensorType&minValue&maxValue

- SensorLocation
- startDate & endDate
- functionOnData
- sensorType
- minValue
- maxValue

Node-RED

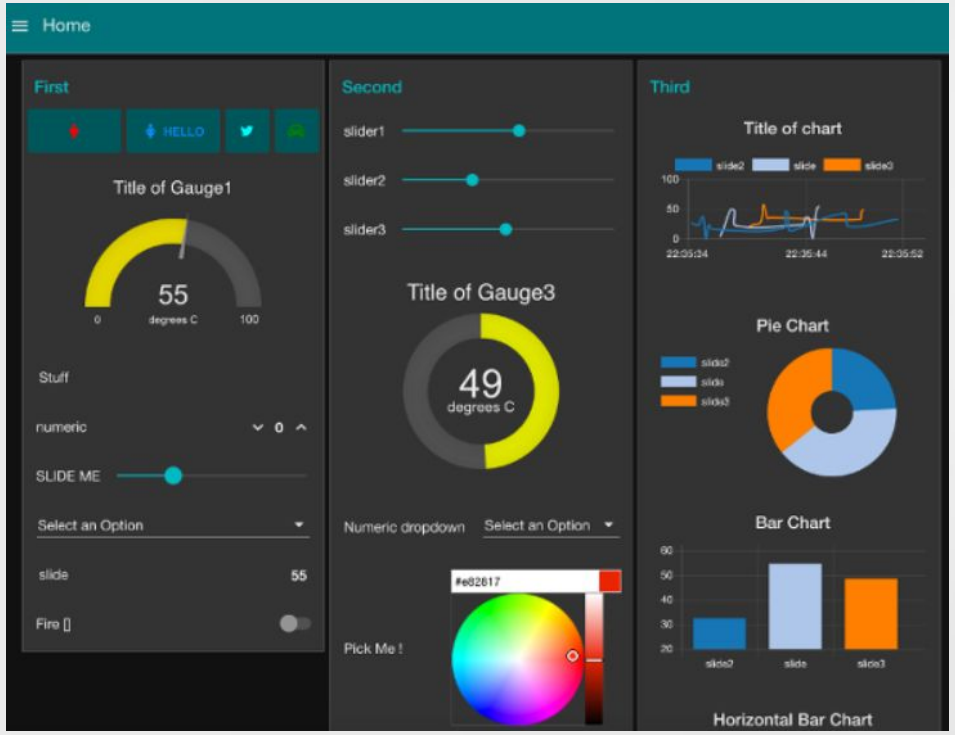
- Node-RED is a flow-based development tool for connecting hardware devices, APIs and online services together for the Internet of Things
- Node-RED provides a browser-based flow editor, which can be used to create JavaScript functions



Node-RED add-on modules

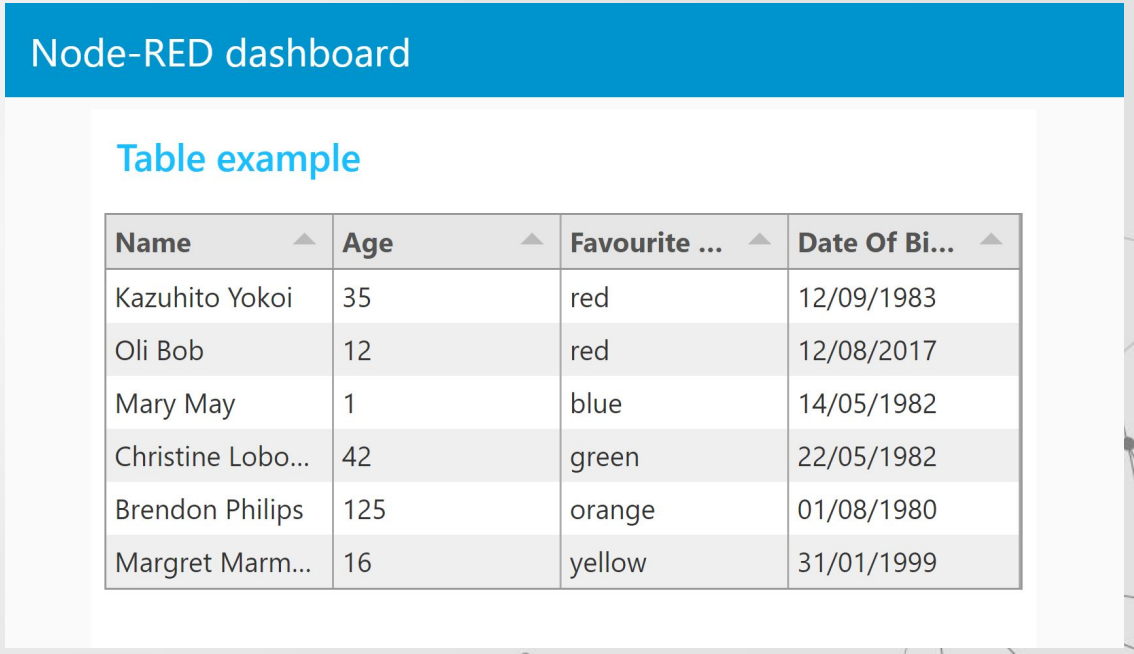
- Node-RED Dashboard

This module provides a set of nodes in Node-RED to quickly create a live data dashboard



- Node-RED-ui-table

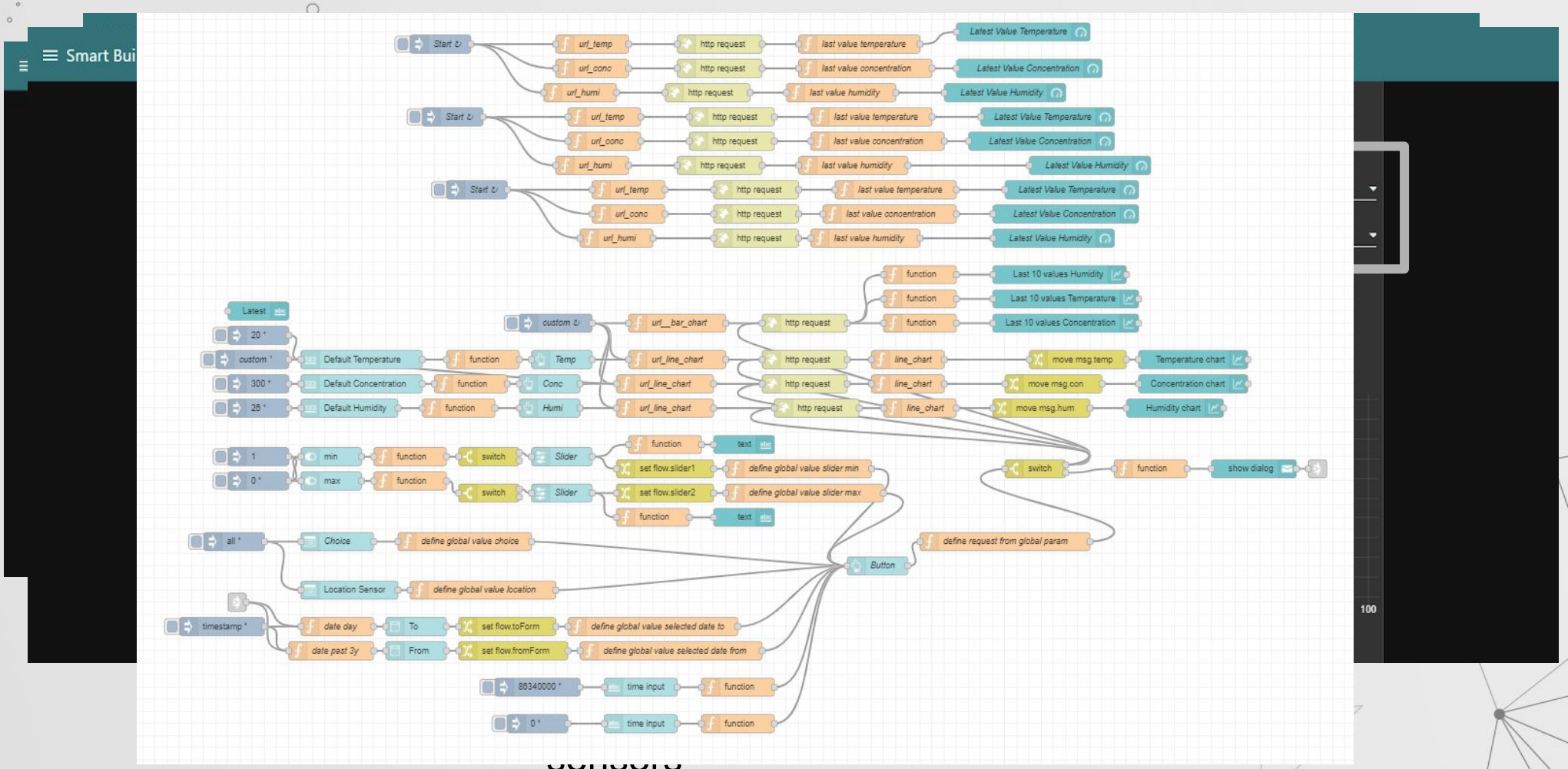
Node to displays data as table



Name	Age	Favourite ...	Date Of Bi...
Kazuhito Yokoi	35	red	12/09/1983
Oli Bob	12	red	12/08/2017
Mary May	1	blue	14/05/1982
Christine Lobo...	42	green	22/05/1982
Brendon Philips	125	orange	01/08/1980
Margret Marm...	16	yellow	31/01/1999

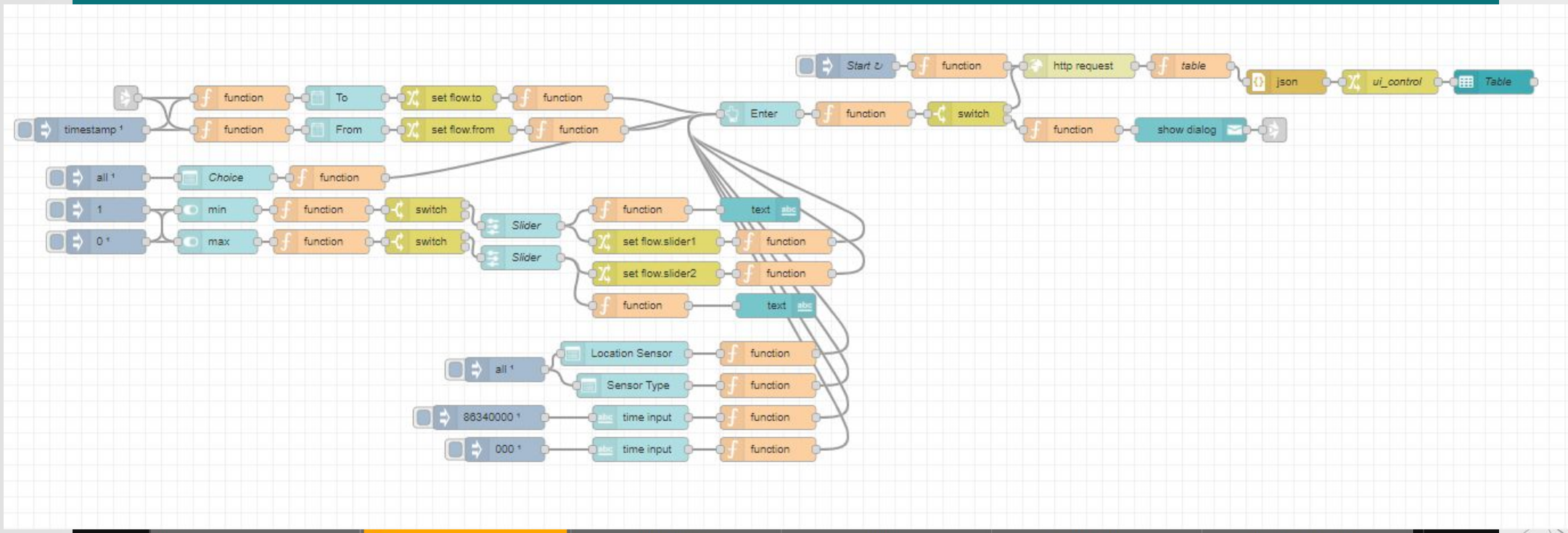
Dashboard Results

First page : **Smart Building Visualisation**



Dashboard Results

Second page : **Table Visualization**



501.309	22	Temperature	DEG_C	01008130_Temperature	2022-02-01T09:28:42Z
501.309	22	Humidity	PERCENT	01008130_Humidity	2022-02-01T09:28:42Z
501.309	650	Concentration	PPM	01008130_CO2	2022-02-01T09:28:42Z

Conclusion

- Implémentation d’un tableau de bord personnalisé avec des données sémantiques.
- Node-RED présente une approche de prototypage rapide et facile à déployer
- La solution est disponible en ligne
  https://smartbuilding-dasboard-liris.research.mondeca.com/
- Faire une version distribuée avec raisonneur intégré pour étudier les collaborations inter-servients

Thanks!

Merci pour votre attention.

https://coswot.gitlab.io/

contact-coswot@liris.cnrs.fr