



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



SNAP4CITY



Powered by

Managing Data Models in Broker-Based Internet/Web of Things Architectures

<https://www.Snap4City.org>

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<https://www.Km4City.org>

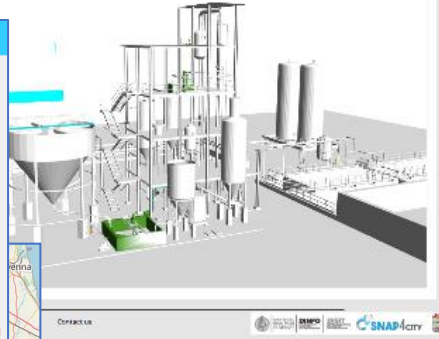
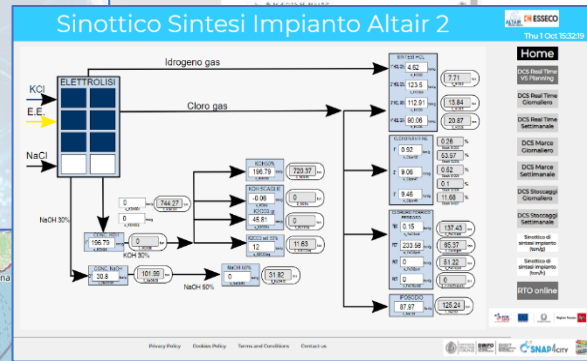
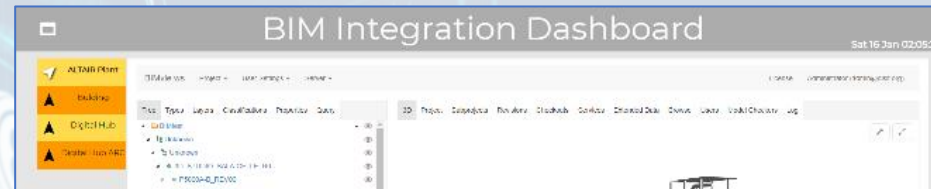
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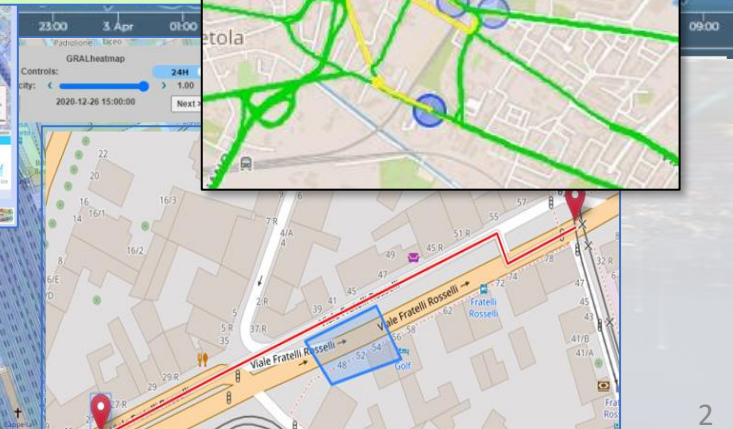
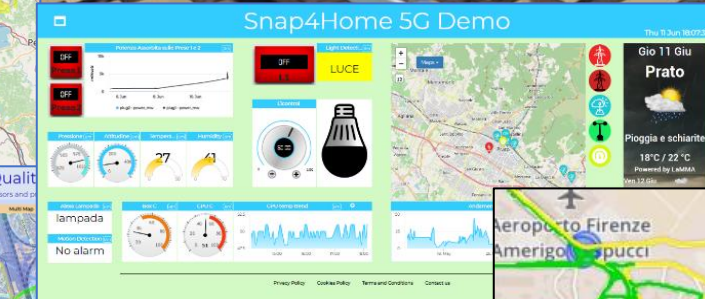
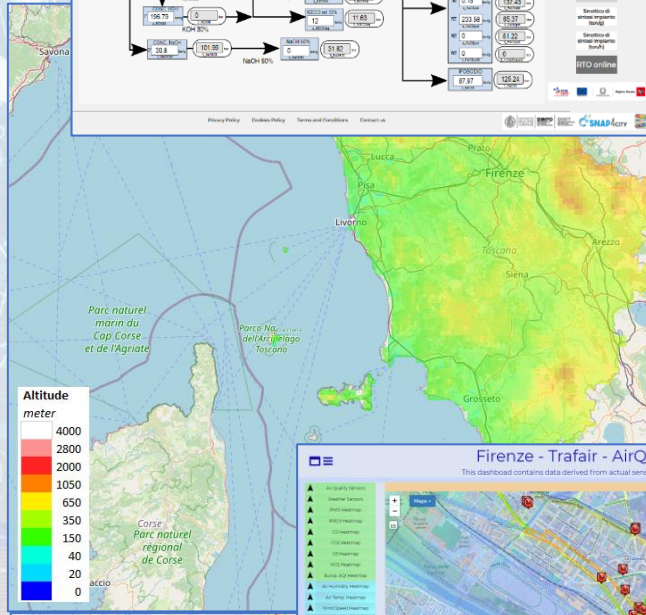
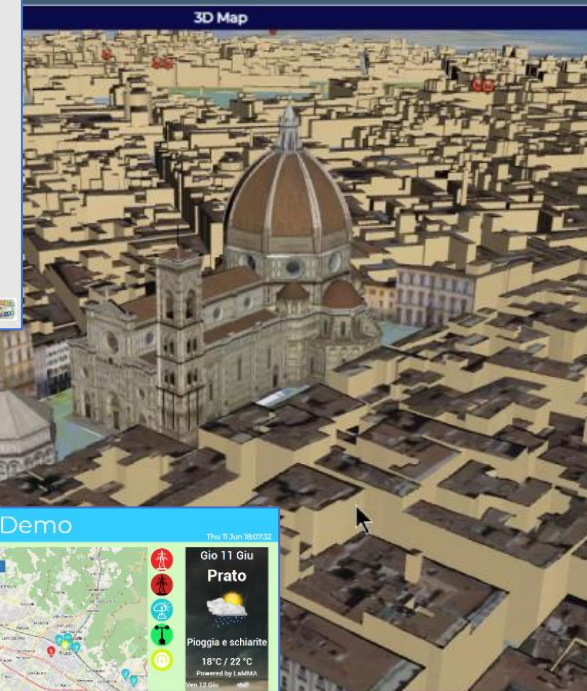
High Level Types

Snap4City (C), June 2023

- POI, IOT Devices, shapes, ...
 - FIWARE Smart Data Models,
 - IoT Device Models
- GIS, maps, orthomaps, WFS/WMS, GeoTiff, calibrated heatmaps, ...
- Satellite data, ...
- traffic flow, typical trends, ...
- trajectories, events, Workflow, ...
- 3D Models, BIM, Digital Twins, ...
- OD Matrices of several kinds, ...
- Dynamic icons/pins, ...
- Synoptics, animations, ...
- KPI, personal KPI, ...
- social media data, TV Stream, ...
- routing, multimodal, constraints, ...
- decision scenarios,
- etc.



SNAP4CITY
- Digital Twin Global - Fire
demonstrator



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- **For PUBLIC:**
 - IOT Devices, Sensors,
 - Sensor mobile,
 - Actuators,
 - Virtual Sensors,
 - POI, etc.
- See as
 - ServiceURI

Snap4City
User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7
[LOGOUT]

My Snap4City.org
Dashboards
My Dashboards in All Org.
Dashboards of My Organization
My Dashboards in My Organization
Extra Dashboard Widgets
Notificator
Data, my Data, OpenData
Knowledge and Maps
Service Map (Toscana)
Service Map 3D (Firenze)
Helsinki Service Map
Antwerp Service Map
Garda Lake Service Map
Cagliari Service Map
Lonato Del Garda Service Map
Valencia Service Map
Pont Du Gard Service Map
Dubrovnik Service Map
WestGreece Service Map
Mostar-Bosnia Service Map
Svealand Service Map
Roma Service Map
Pisa Service Map
Creating WKT
Service Map 3D (Antwerp)
Service Map 3D (Helsinki)
Producing POI triples for KB
Load WKT on ServiceMap (Helsinki)
Load WKT on ServiceMap (Toscana)
Load WKT on ServiceMap (Antwerp)

ServiceMap (Toscana)

Public transport | Municipalities | Text Search | Address Search | Events

Select an agency:
- Select an Agency -
Select a line:
- Select a Line -
Select a route:
- Select a Route -
Select a bus stop:
- Select a Stop -

Position of selected Buses

Actual Selection
Service: IBIMET Air Quality Sensor - BORGO SAN LORENZO

IBIMET Air Quality Sensor - BORGO SAN LORENZO

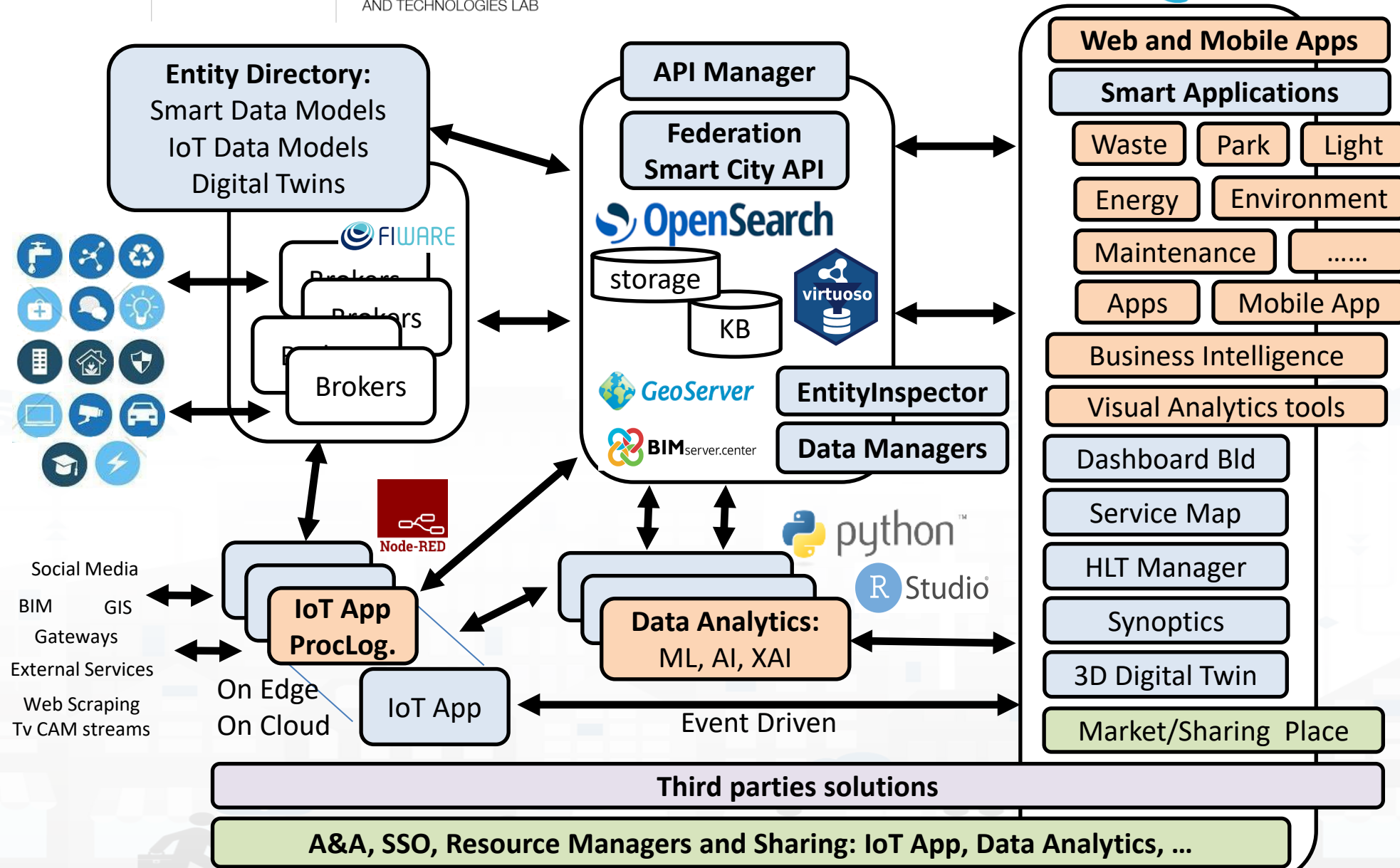
Serviceuri: http://www.disit.org/km4city/resource/IBIMET_SMART01
Name: IBIMET_SMART01
Nature: Environment
Subnature: Air_quality_monitoring_station
Address: BORGO SAN LORENZO
City: FIRENZE

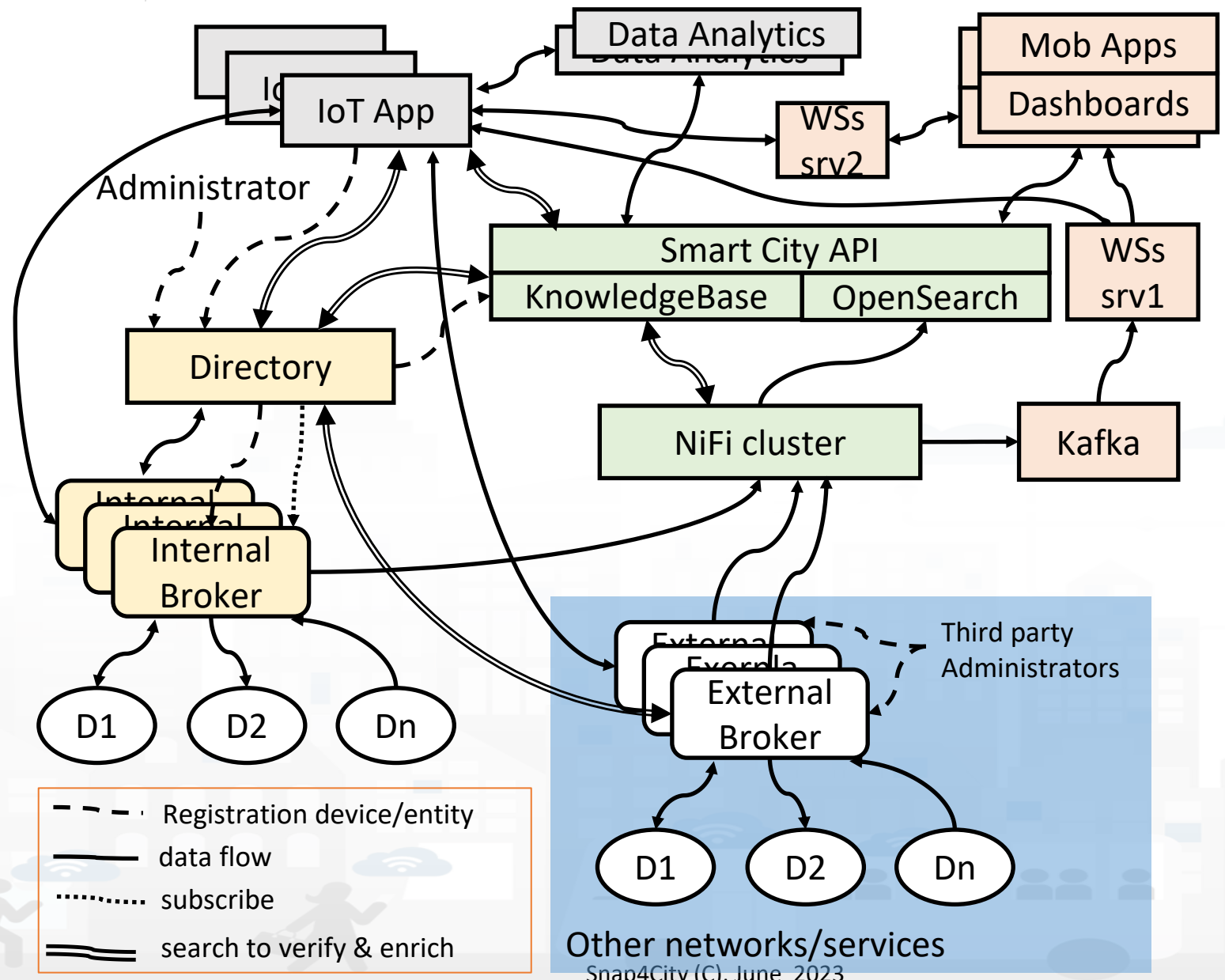
Property/Value Type	Value
PM10	2.4131048386898826
PM2_5	19.236197270630925
CO	0.22832953110492907
CO2	391.00
NO	
NO2	25.268744995957327
O3	128.39966613043157
airTemperature	18.60
airHumidity	73.60

Latest Update: 2020-10-26T17:46:50+02:00

ServiceURI: http://www.disit.org/km4city/resource/IBIMET_SMART01

Tech Arch





Requirements

- 1. Manage different kinds of Brokers, Devices and Edge Devices**
- 2. Connect External and Internal Brokers**
- 3. Register, manage and use messages conformant to any Data Model with any data type**
- 4. Verify if Data Messages are correct with respect to the defined data model.**
- 5. Semantic Interoperability**
- 6. Support automatic cloud deployment of Internal Brokers**
- 7. Register External Brokers**
- 8. Discover Devices on Brokers**
- 9. Semantic identification and match**
- 10. Easy management to list and test Brokers, and Devices**
- 11. Manage Device Model and Device Data Type ownership and access grants**

Req.	Snap4 City	Azure IoT	Aws IOT	IBM Watson	Mind sphere
R1	Y	N	(y)	(y)	(y)
R2	Y	N	(y)	N	(y)
R3	Y	N	N	(y)	N
R4	Y	Y	Y	Y	Y
R5	Y	Y	Y	Y	N
R6	Y	N	(y)	N	(y)
R7	Y	N	N	N	N
R8	Y	Y	(y)	N	N
R9	Y	N	N	N	N
R10	Y	(y)	(y)	(y)	(y)
R11	Y	(y)	Y	Y	Y

Conclusions

- (i) Internal and External brokers,
- (ii) automated registration of devices/entities managed into External Brokers' single- or multi-tenant services,
- (iii) automated registration by harvesting and reasoning of data models/entities compliant with standard models such as FIWARE SDM, and any custom Data Model in Snap4City IoT Device Model providing a formal semantic definition of device attributes,
- (iv) fast data ingestion for ingesting / migrating historical data from legacy platforms and services to a new established uplevel platform,
- (v) sustained data usage from query demand and for data driven show changes in real time.