



www.snap4city.org
www.snap4solutions.org



www.km4city.org

Data Ingestion and Interoperability

Nov. 2023, Course, Part 5

<https://www.snap4city.org/944>

<https://www.snap4city.org/577>

DIGITAL TWIN SOLUTIONS TO SETUP SUSTAINABLE DECISION SUPPORT SYSTEMS AND BUSINESS INTELLIGENCE



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB

Paolo Nesi, paolo.nesi@unifi.it
<https://www.Km4City.org>
<https://www.disit.org>



Be smart in a SNAP!



7-9 November 2023, Barcelona, Spain

SMARTCITY
EXPO WORLD CONGRESS

Visit Snap4City in Hall 1

Data Ingestion and Interoperability



Nov. 2023, Course, Part 5

<https://www.snap4city.org/944>

<https://www.snap4city.org/577>

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES



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AND INFRASTRUCTURE
TECHNOLOGIES LAB





UNIVERSITÀ DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DELL'INFORMAZIONE

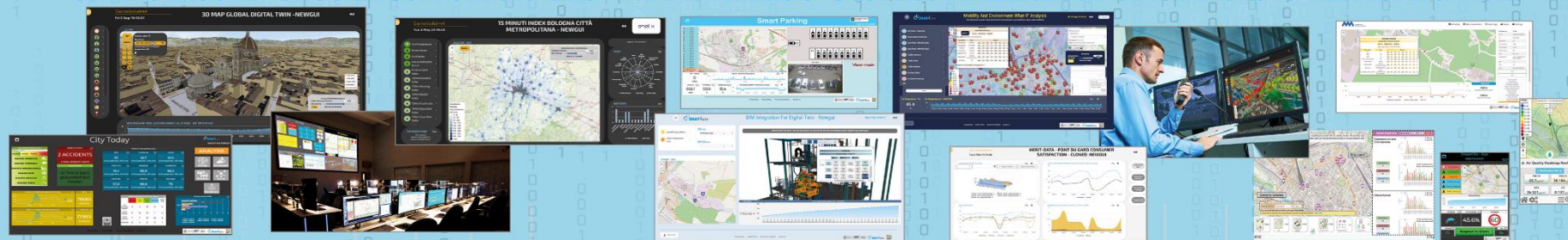
DISIT
DIPARTIMENTO SISTEMI
TECNOLOGICI

SNAP4CITY

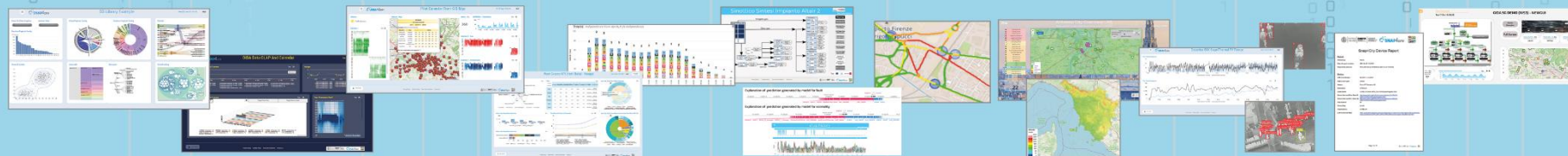


Smart Solutions and Decision Support Systems

CONTROL ROOMS - DECISION SUPPORT SYSTEMS - WHAT-IF ANALYSIS - BUSINESS INTELLIGENCE - SIMULATIONS - SMART APPLICATIONS



DASHBOARDS - VISUAL ANALYTICS - SYNOPTICS - DIGITAL TWIN - GRAPHICAL WIDGETS - ANALYTICS - GUI CUSTOM STYLES - VISUAL PROGRAMMING



DASHBOARDS, WIDGETS
TEMPLATES

PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW
PEOPLE FLOWS - SDG - 15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - ETC...

API - MICROSERVICES - GIS - BPM
VIDEO - REPORTS - MAPS - 3D ...

ANY: DATA, BROKER, NETWORK AND VERTICAL

EXPERT SYSTEM, KNOWLEDGE BASE
SEMANTIC REASONING
SMART DATA MODEL
IOT DEVICE MODELS, STORAGE

BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING
OPERATIVE RESEARCH, STATISTICS

VISUAL PROGRAMMING, ADAPTERS
DATA FLOWS, WORKFLOWS
PARALLEL DISTRIBUTED PROCESSING
EVENT DRIVEN

Native and External
Smart Applications

Mobility & Transport

Light & Energy

Waste

Environment

Building

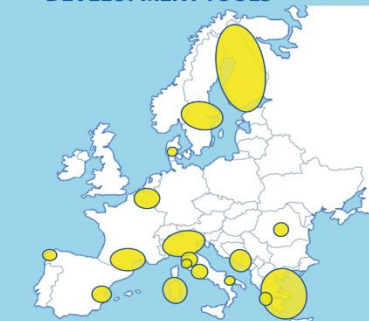
Tourism

Asset Management

Security and Safety

Social Media

METHODOLOGIES
LIVING LABS
COURSES AND COMMUNITY
DEVELOPMENT TOOLS



Powered by
FIWARE

FREE
TRIAL

PEN Test
Passed

EU GDPR
COMPLIANT

SNAP4
Appliances and Dockers
Installations

EUROPEAN OPEN
SCIENCE CLOUD

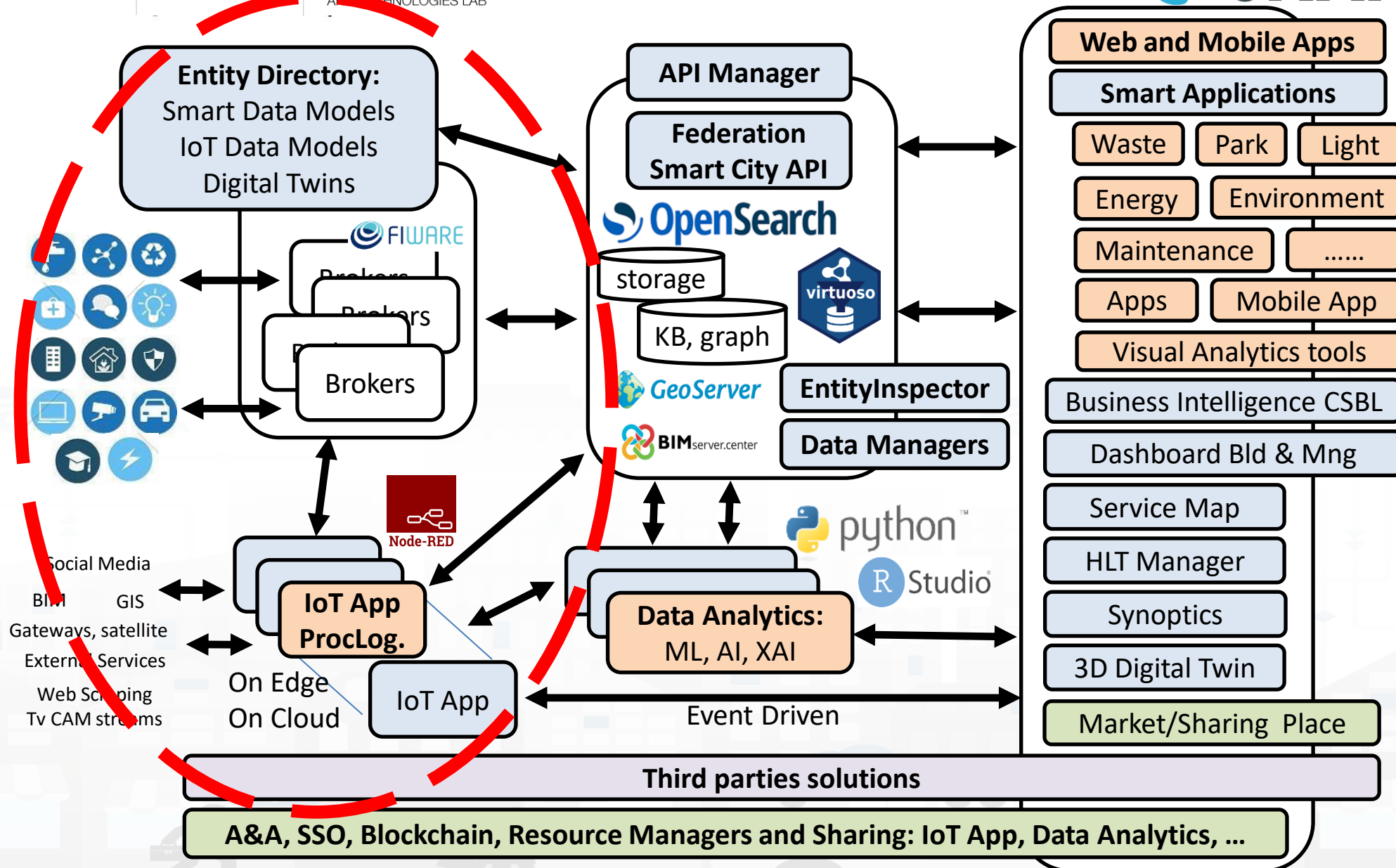
Node-RED

JS Foundation

E015
digital ecosystem

NVIDIA

Tech Arch



















































<https://www.snap4city.org/944>

On Line Training Material (free of charge)



1st part	2nd part	3rd part	4th part	5th part	6th part	7th part	8th
Overview	Dashboards	IOT App, IOT Network	Data Analytics	Data Ingestion processes	System and Deploy Install	Smart City API: Web & Mob. App	Design and Develop Smart Solutions
							
							





Note on Training Material





- **Course 2023:** <https://www.snap4city.org/944>
 - Introductionary course to Snap4City technology
- **Course** <https://www.snap4city.org/577>
 - Full training course with much more details on mechanisms and a wider set of cases/solutions of the Snap4City Technology
- **Documentation** includes a deeper round of details
 - Snap4City Platform Overview:
 - <https://www.snap4city.org/drupal/sites/default/files/files/Snap4City-PlatformOverview.pdf>
 - Development Life Cycle:
 - <https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf>
 - Client Side Business Logic:
 - <https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual.pdf>
- **On line cases and documentation:**
 - <https://www.snap4city.org/108>
 - <https://www.snap4city.org/78>
 - <https://www.snap4city.org/426>



Tech Overview

- <https://www.snap4city.org/drupal/sites/default/files/files/Snap4City-PlatformOverview.pdf>









Snap4City Platform

Technical Overview

From: DINFO dept of University of Florence, with its
DISIT Lab, <https://www.disit.org> with its Snap4City solution

Snap4City:

- Web page: <https://www.snap4city.org>
- <https://twitter.com/snap4city>
- <https://www.facebook.com/snap4city>

Contact Person: Paolo Nesi, Paolo.nesi@unifi.it

- o Phone: +39-335-5668674
- o LinkedIn: <https://www.linkedin.com/in/paolo-nesi-849ba51/>
- o Twitter: <https://twitter.com/paolonesi>
- o FaceBook: <https://www.facebook.com/paolo.nesi2>

1

Development

<https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf>



Development Life-Cycle

<https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle-v1-1.pdf>

From Snap4City:

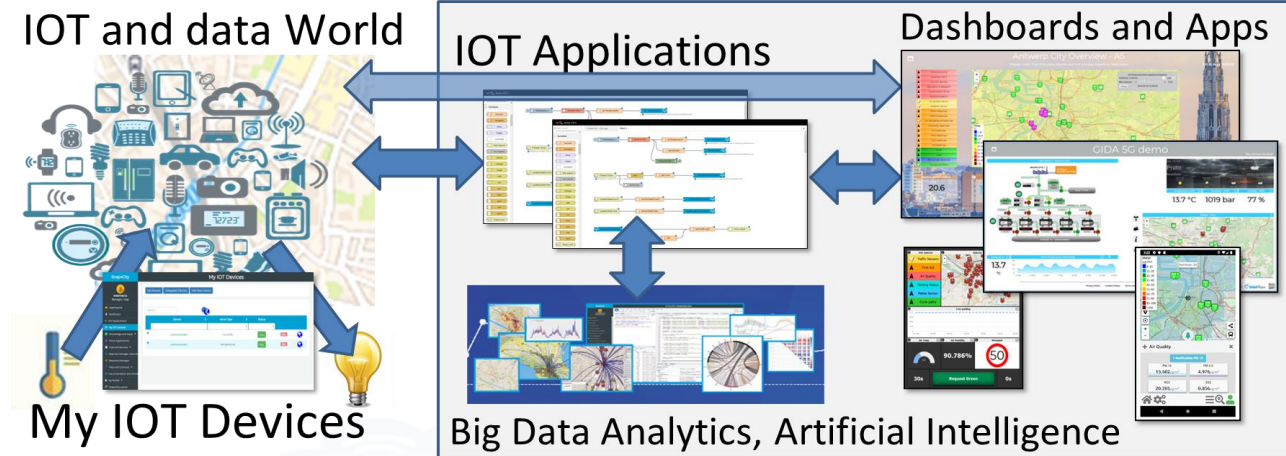
- We suggest you to read the **TECHNICAL OVERVIEW**:
 - <https://www.snap4city.org/download/video/Snap4City-PlatformOverview.pdf>
- <https://www.snap4city.org>
- <https://www.snap4solutions.org>
- <https://www.snap4industry.org>
- <https://twitter.com/snap4city>
- <https://www.facebook.com/snap4city>
- <https://www.youtube.com/channel/UC3tAO09EbNba8f2-u4vandg>

Coordinator: Paolo Nesi, Paolo.nesi@unifi.it

DISIT Lab, <https://www.disit.org>
DINFO dept of University of Florence,
Via S. Marta 3, 50139, Firenze, Italy
Phone: +39-335-5668674

Free Trial

- Register on WWW.snap4city.org
 - Subscribe on **DISIT Organization**
- **You can:**
 - Access on basic Tools
 - Access to a large volume of Data
 - Create Dashboards
 - Create IOT Applications
 - Connect your IOT Devices
 - Exploit Tutorials and Demonstrations



IF you need to go more in deep you can ask us to pass at the next Role becoming full AreaManager with full rights of development, also for Data Analytics, machine learning, etc.

Agenda of Part 5

- When Solutions and tools for Data Ingestion and Interoperability are needed
- Overview of Snap4City Data Storage and Stack
- Knowledge Base: Modelling and Setting Up
- High Level Types vs Ingestion Process
- Data Ingestion Strategy and Orientation
- Ingestion of Points of Interest with POI Loader
- Models vs Devices/Entities and Registration
- Verification of Data Ingestion
 - Digital Twin Data Inspector vs Data Processes Details
 - My Data Dashboard Dev to assess data on Open Search Storage
- An Integrated Example for Time Series
- Entities Ingestion with Data Table Loader
- High Performance Ingestion via Python
- FIWARE Smart Data Models on Snap4City
- Ingestion of MyKPI with Proc.Logic / IoT App
- Training Material

TOP

When Solutions and tools for Data Ingestion and Interoperability are needed

FROM CITY DASHBOARD TO APPLICATIONS

FORGING & MANAGING OPEN AND FLEXIBLE WEB AND MOBILE APPS

DATA GATHERING AND CITY DATA MANAGED MANAGEMENT

IOT/IOE DEVICES AND NETWORKS

IOT APPLICATIONS AND IOT EDGE DEVICES

IOT APPLICATIONS, THE LOGIC AND THE SMARTNESS

ADVANCED SMART CITY API, MICROSERVICES, SNAP4CITY API

SNAP4CITY LIVING LAB FOR COLLABORATIVE WORK

SNAP4CITY FOR BEGINNERS

SNAP4CITY ARCHITECTURE AND ECOSYSTEM. OPENED TO DEVELOPERS AND STAKEHOLDERS

DATA ANALYTICS, BUSINESS INTELLIGENCE, VISUAL ANALYTICS, SIMULATION

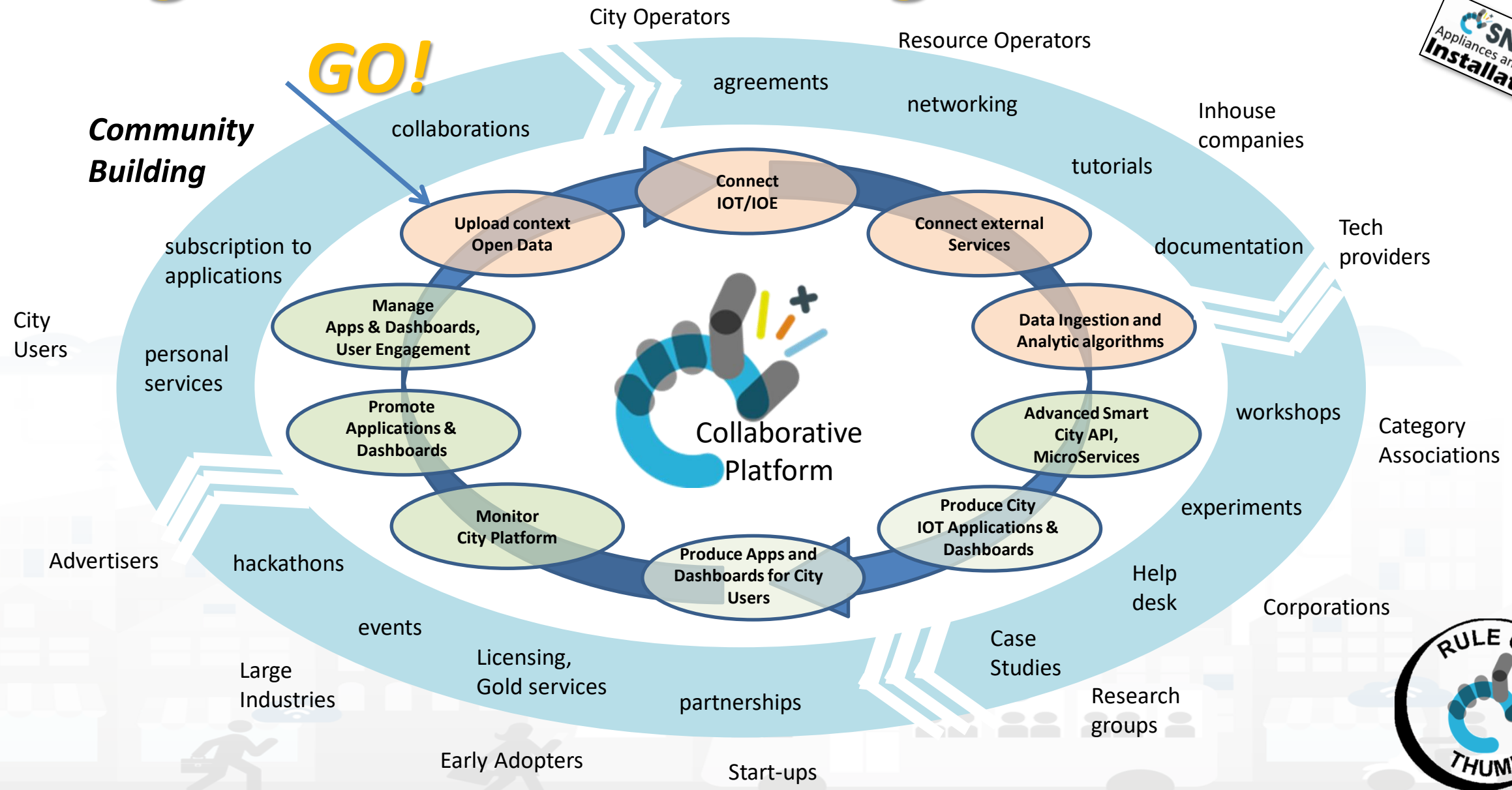
TWITTER VIGILANCE, SOCIAL MEDIA ANALYSIS

HOW TO ADOPT SNAP4CITY, AND OUR ROADMAP

SNAP4CITY AND KM4CITY PROJECTS

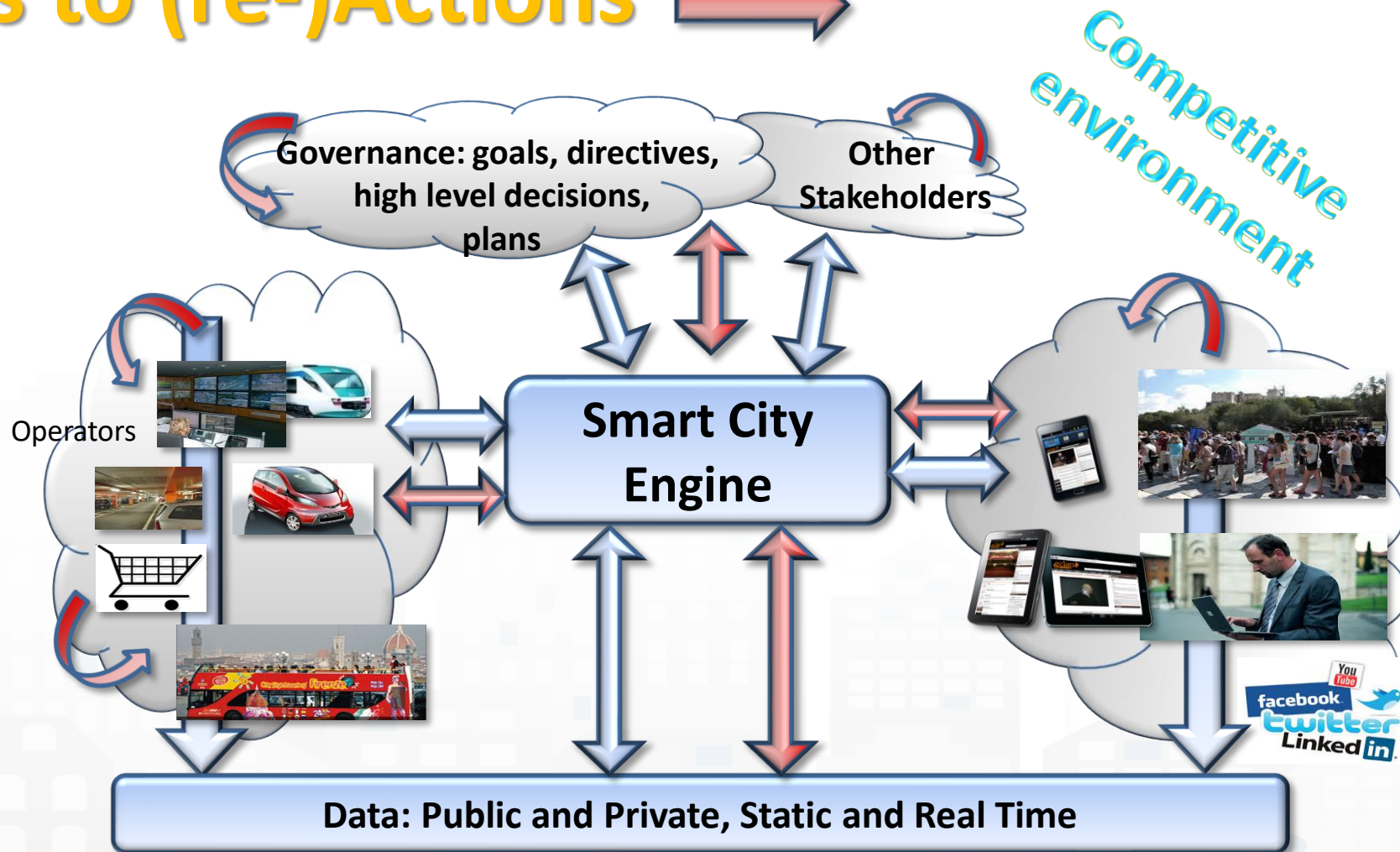
SNAP4CITY THE VIEW OF THE ADMINISTRATORS

Living Lab Accelerating



From Strategies to (re-)Actions

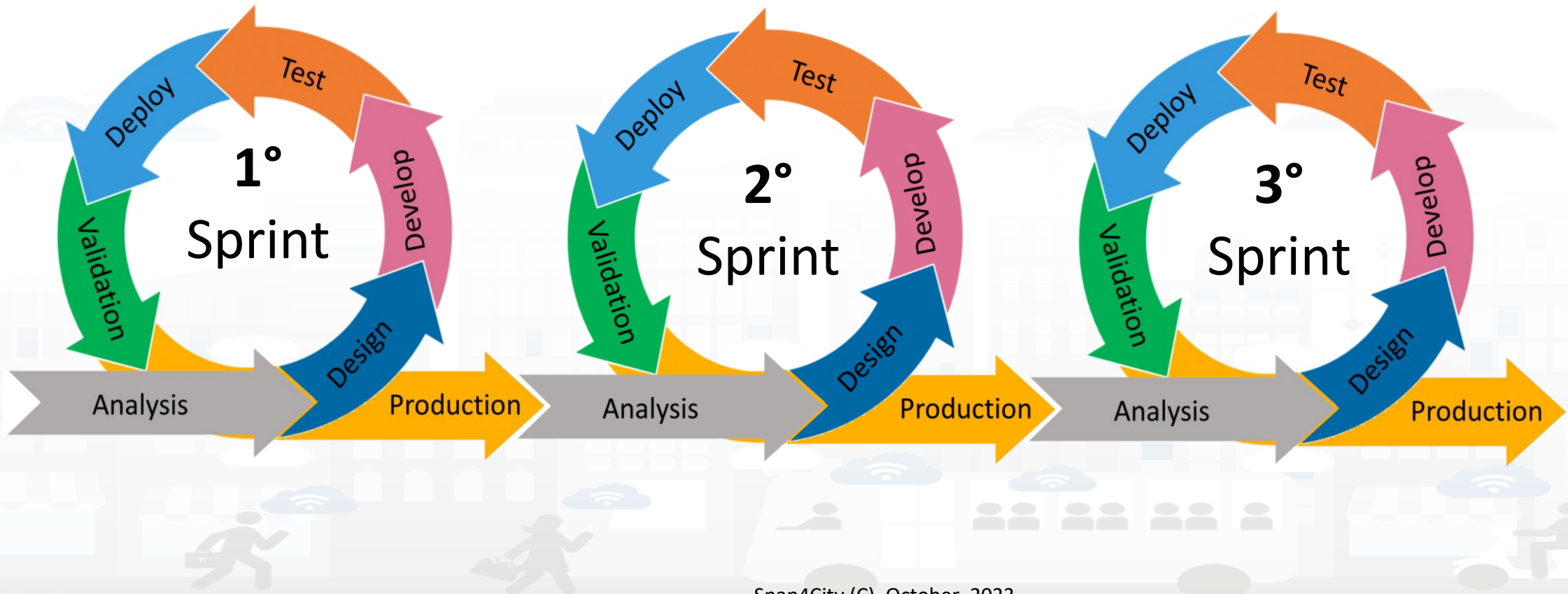
- Analyze
- Alerting, Early Warning
- Support Decision makers
- Plans
- Prescriptions
- Inform
- Suggest
- Engage
- Research



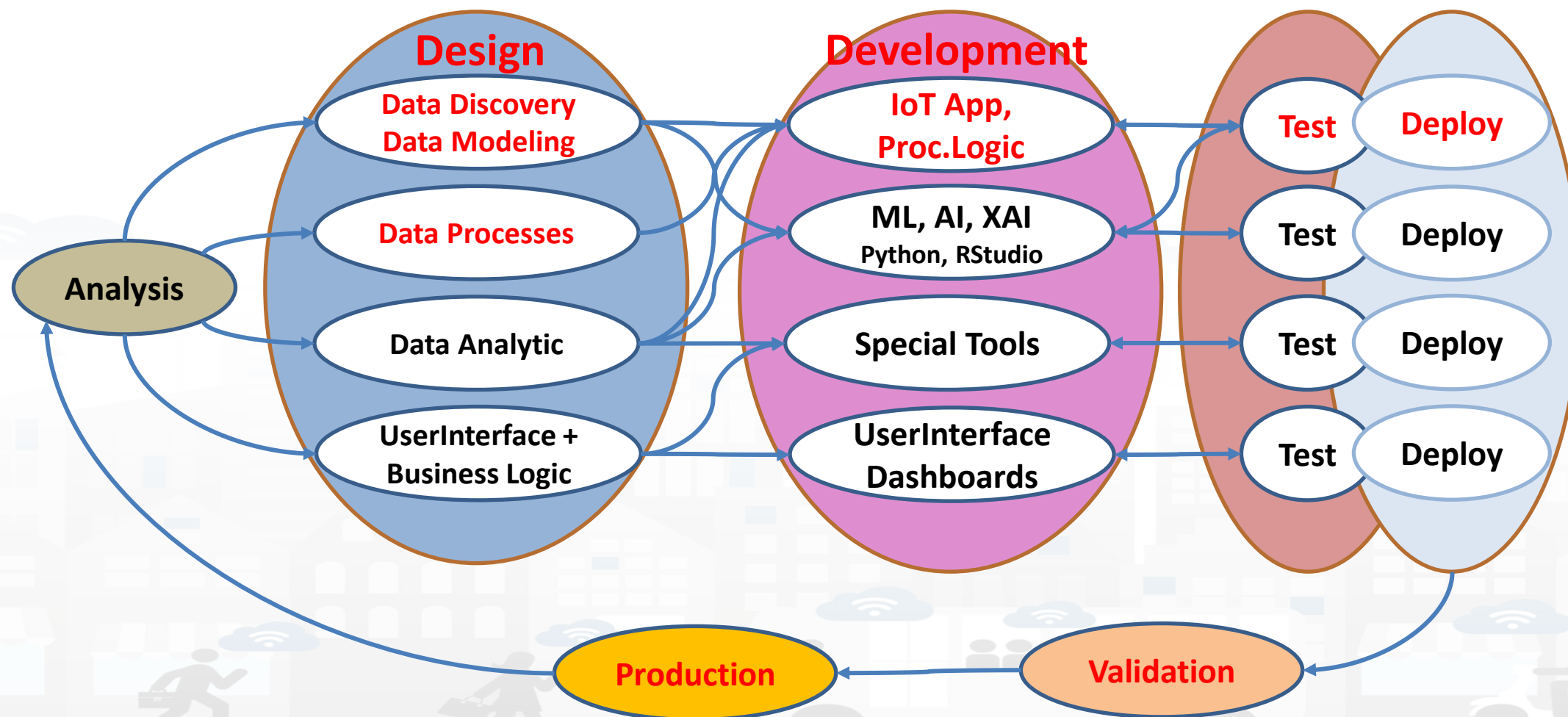


Agile Development Life Cycle by sprint

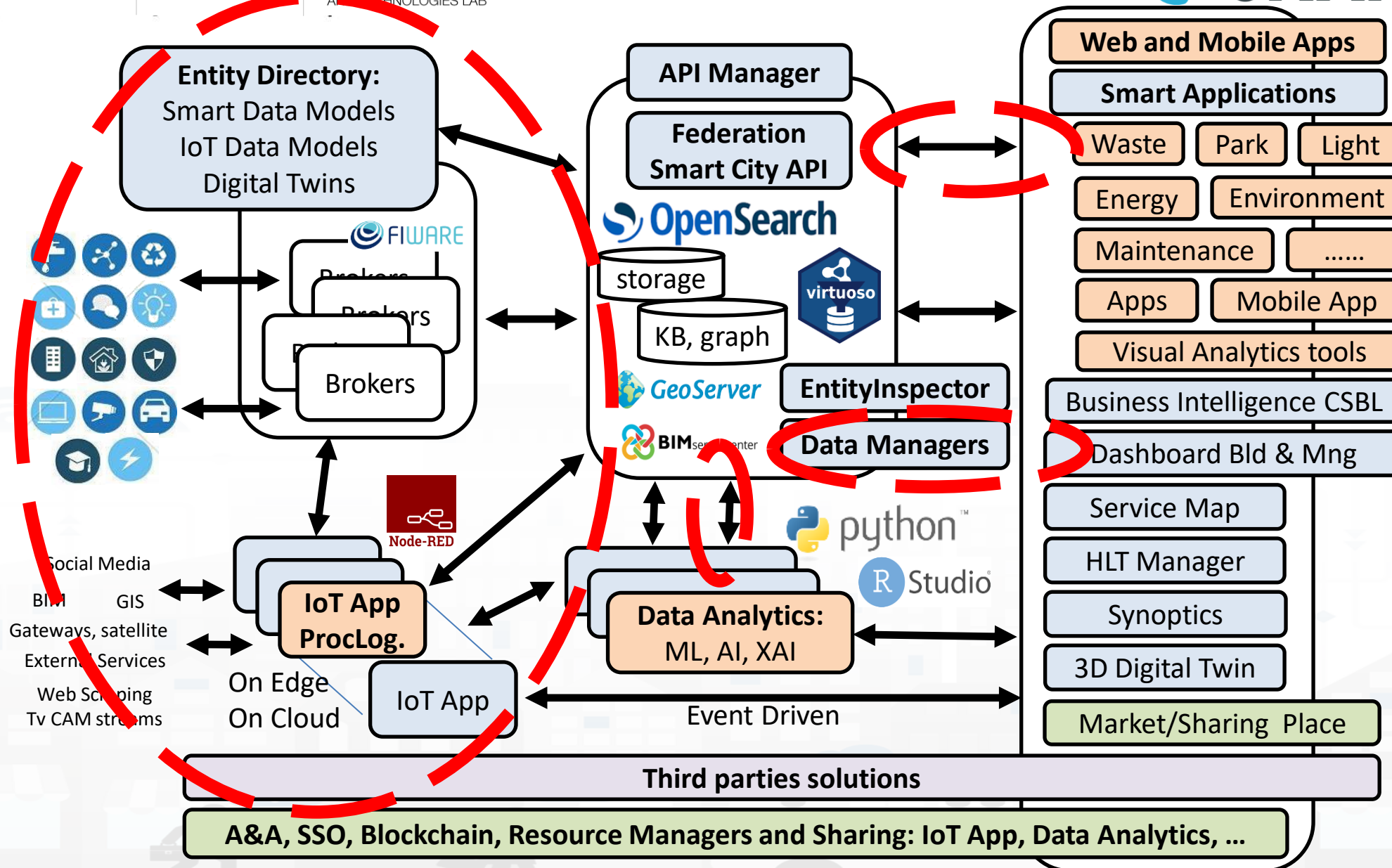
Smart Solutions



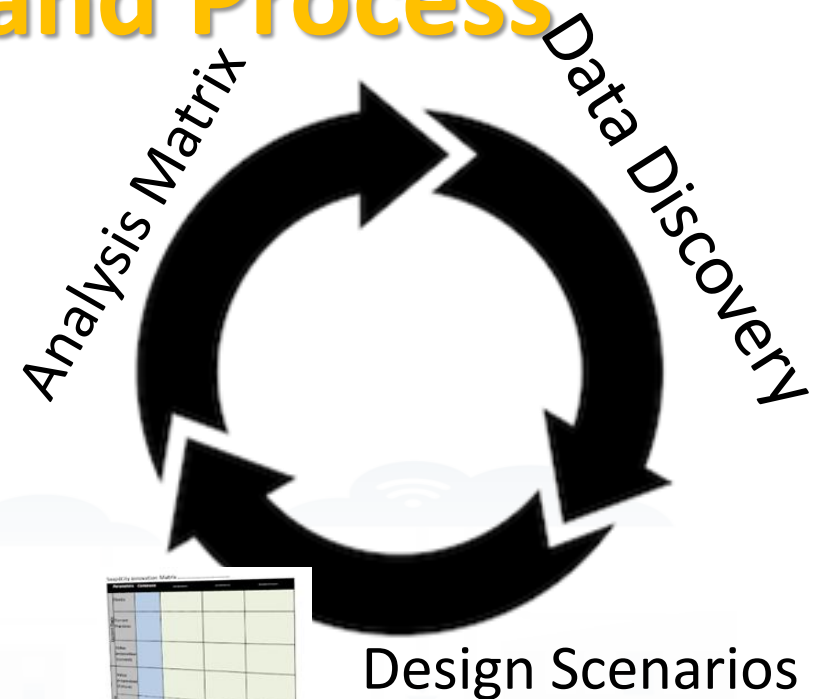
Development Life Cycle Smart Solutions



Tech Arch



Snap4City Innovation Matrix and Process



Snap4City Innovation Matrix

	Parameters	Commons	Operators	360°	Visitors
Current State	Needs				
	Current Practices				
	Value proposition (Current)				
Future State	Value proposition (Future)				
	Solution				
	Value Capture				
	Key Partners				
	Barriers				

Snap4City Innovation Matrix

	Parameters	Commons
Current State		
Future State		



see Course Part 6

Data vs Smart Services enabling on Snap4City

- **Public Transportation and mobility activated services in some where with Snap4City**
 - **Smart parking** (parking locations, real time parking data, traffic, meteo) → predictions
 - **Smart Fuel pricing** (fuel station locations and real time prices)
 - **Routing** (detailed GIS information, text indexing of streets, POI, etc.)
 - Quite routing, perfect shopping, etc. etc. (more data in needed....)
 - **multimodal routing** (detailed GIS information, Public transport time schedule)
 - **Info traffic** (traffic flow sensors, real time Traffic events, their localization, etc.)
 - **Dense info traffic** (traffic flow sensors and traffic flow reconstruction algorithm)
 - **Car/Bike/Scooter Sharing** (position and availability of Cars/Bikes, Scooters) ... predictions
 - **Smart Biking** (cycling paths, environmental data) → predictions
 - **E-vehicles** (position, status of recharging stations,. ...) ... predictions vs booking
 - **Smart river crossing** (position and status of Underpass, Ferry) ... prediction
 - **Quality of Public Transport** (actual time of arrival at the bus stops, wrt planned time schedule)
 - **Early Warning vs Resilience** (combination of several data including mobility, events, Social to perform early warning...)

Data vs Smart Services enabling on Snap4City

- **Social and Users Behaviour**

- **Smart First Aid**
- **search for POI and public transport services**
- **Social Media Monitoring and acting**
- **Information to Tourists**
- **Early Warning, prediction of audience**
- **Improvement of services for Tourists**

(Location of First AID, real time status of triage)

(POI geolocalized, spatial queries, along paths)

(Identification of dysfunction, quality of service perceived)

(Entertainment Events)

(Twitter data, social media)

(people flow, usage of services)

(Origin Destination Matrices, trajectories, heatmaps)

(People Monitoring, via App, Wifi, PAX Counter)

(Twitter Data, social mea,...)

- **Weather and environment, quality of life**

- **Weather forecast/condition**
- **Air quality Pollution**
- **Pollination**
- **Alerting on Air quality for multiple parameters**
- **Information Heatmaps for weather and air quality**
- **Air quality indexes, and forecast**

(Weather forecast)

(pollution sensors, PM10, PM2.5, NOX, etc.)

(Pollination sensors)

(Prediction of parameters time slots, notification)

(air quality sensors, heatmaps, prediction)

(.....)

Kind of Data Sources/channels

- **IoT Networks and/or devices** which
 - provide data in PUSH: Brokers, devices, etc.
 - receive data in PUSH to act on devices, via brokers, gateways, etc.
- **Gateways and Services** which provide data access from some API or other protocols in PULL
 - GIS, governmental servers, legacy servers, admin servers, ...
 - Satellite, open data CKAN networks, ...
 - third party services: Here, Vodafone, ...
 - some devices may be ready to provide data in PULL
- **Mobile Apps** which
 - get data in PULL from the smart city servers and
 - provide data in PUSH to the smart city servers
- **ETC.....**

TOP

Overview of Snap4City

Data Storage and Stack

FROM CITY
DASHBOARD TO
APPLICATIONS

DATA GATHERING
AND CITY DATA
KNOWLEDGE
MANAGEMENT

FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT/IOE DEVICES
AND NETWORKS

IOT APPLICATIONS
VS. IOT DEVICES

IOT APPLICATIONS,
THE LOGIC AND
THE SMARTNESS

SNAP4CITY API,
MICROSERVICES,
SNAP4CITY API

SNAP4CITY
LIVING LAB FOR
COLLABORATIVE
WORK

SNAP4CITY FOR
BEGINNERS

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
WHAT-IF AND
SIMULATION

SNAP4CITY
ARCHITECTURE AND
ECOSYSTEM, OPENED
TO DEVELOPERS
AND TAILORERS

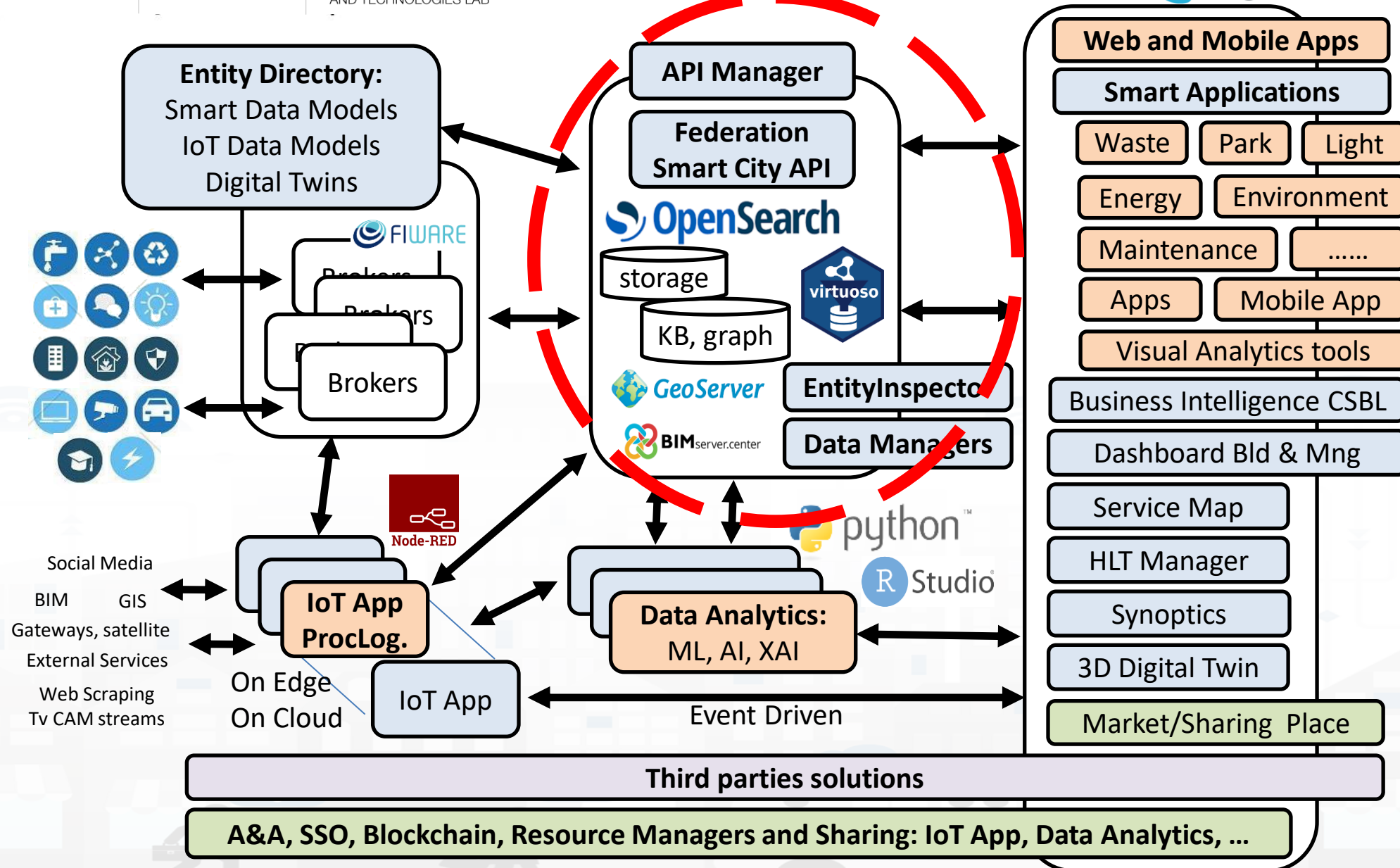
TWITTER
VIGILANCE: SOCIAL
MEDIA ANALYSIS

HOW TO ADOPT
SNAP4CITY, AND
OUR ROADMAP

SNAP4CITY
AND KM4CITY
PROJECTS

SNAP4CITY THE
VIEW OF THE
ADMINISTRATORS

Tech Arch



Snap4city Data Ingestion Diagram

storage

Manual or automated
Registration
of Entities/Devices

**Entity/IoT
Directory**

registration
triples

NGSI



Orion Broker

subscription note
NGSI
Real Time

IoT Orion Broker

IoT Orion Broker

IoT Orion Broker

Brokers

Knowledge Base

Semantic Reasoners

Semantic Reasoners

Semantic Reasoners

SURI Link

Indexing and Aggregating
NIFI, OpenSearch

Data Managers

Data Managers

Entity Inspector



A number of KB
federated



Federation
Smart City API, ASCAPI

API Manager

Cluster of **OpenSearch**
for storage with in
front a cluster of
NIFI

Platform Automation:
IoT Apps, Proc.Logics,
Python, ...



Data Analytics: ML, AI, XAI **python**

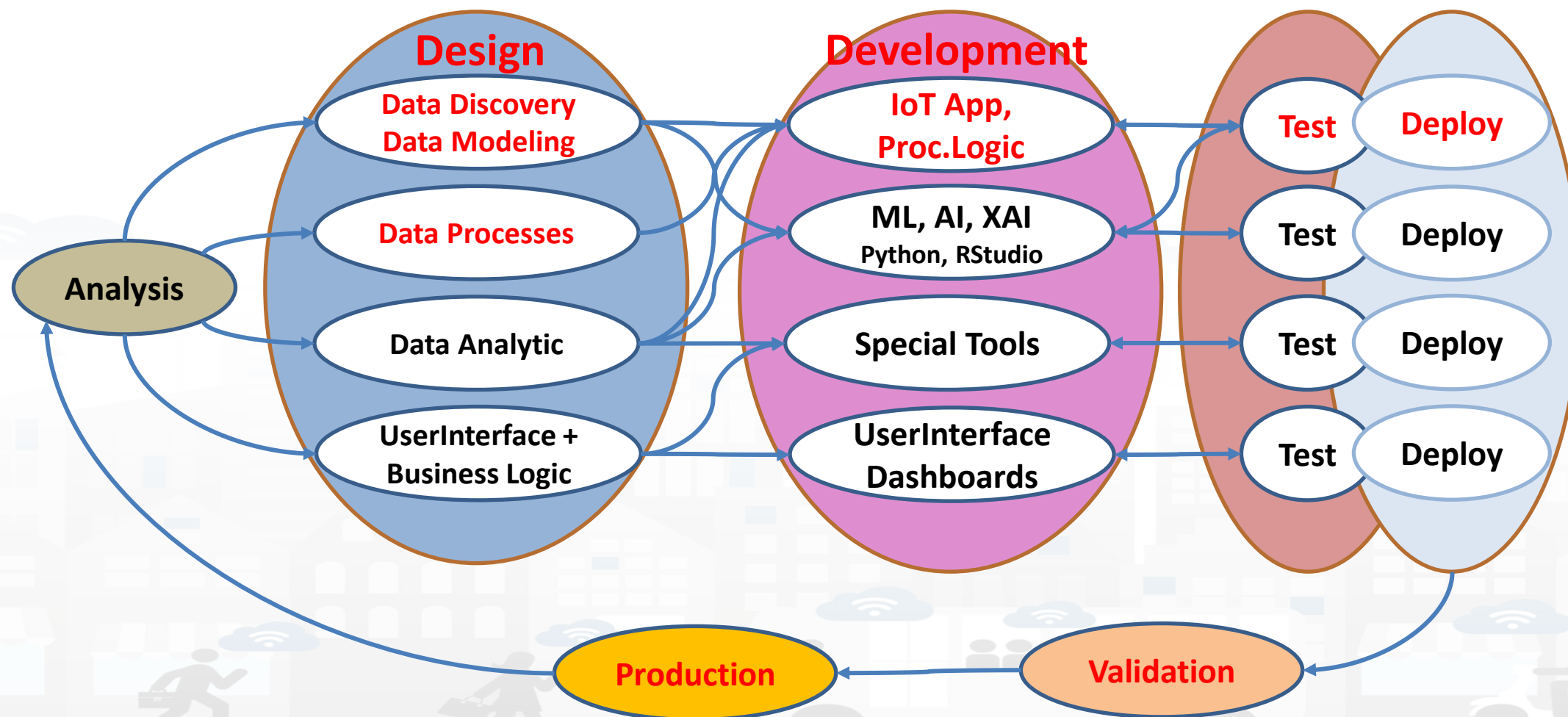


Platform Control and Management

Massive data flow
entering

Massive data flow
exiting

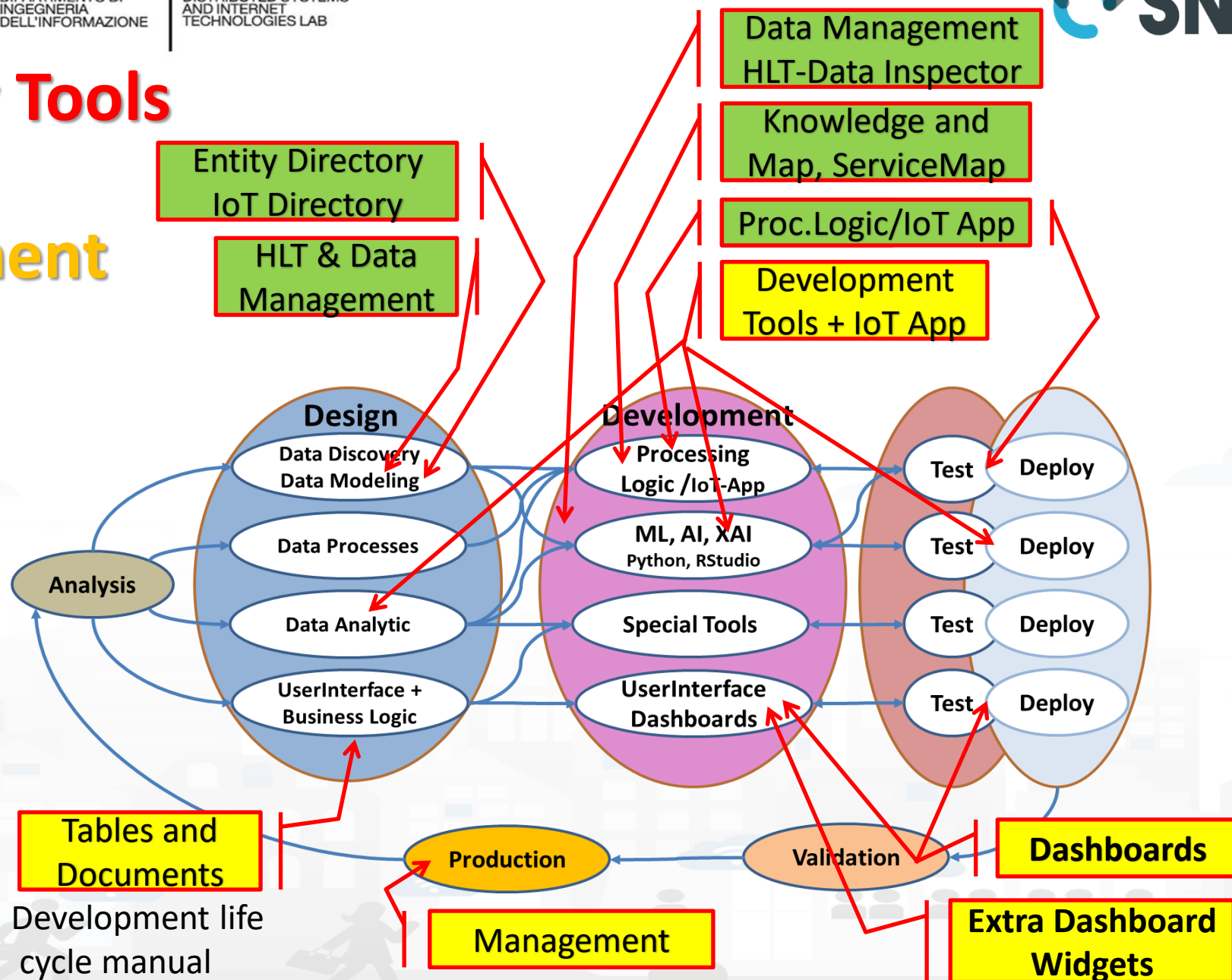
Development Life Cycle Smart Solutions



Snap4City Tools

vs

Development Life Cycle



TOP

Knowledge Base: Modelling and Setting Up

FROM CITY
DASHBOARD TO
APPLICATIONS

DATA GATHERING
AND CITY
KNOWLEDGE
MANAGEMENT

FORGING &
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AND STAKEHOLDERS

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
STATISTICS AND
MULTI-ANALYTICS

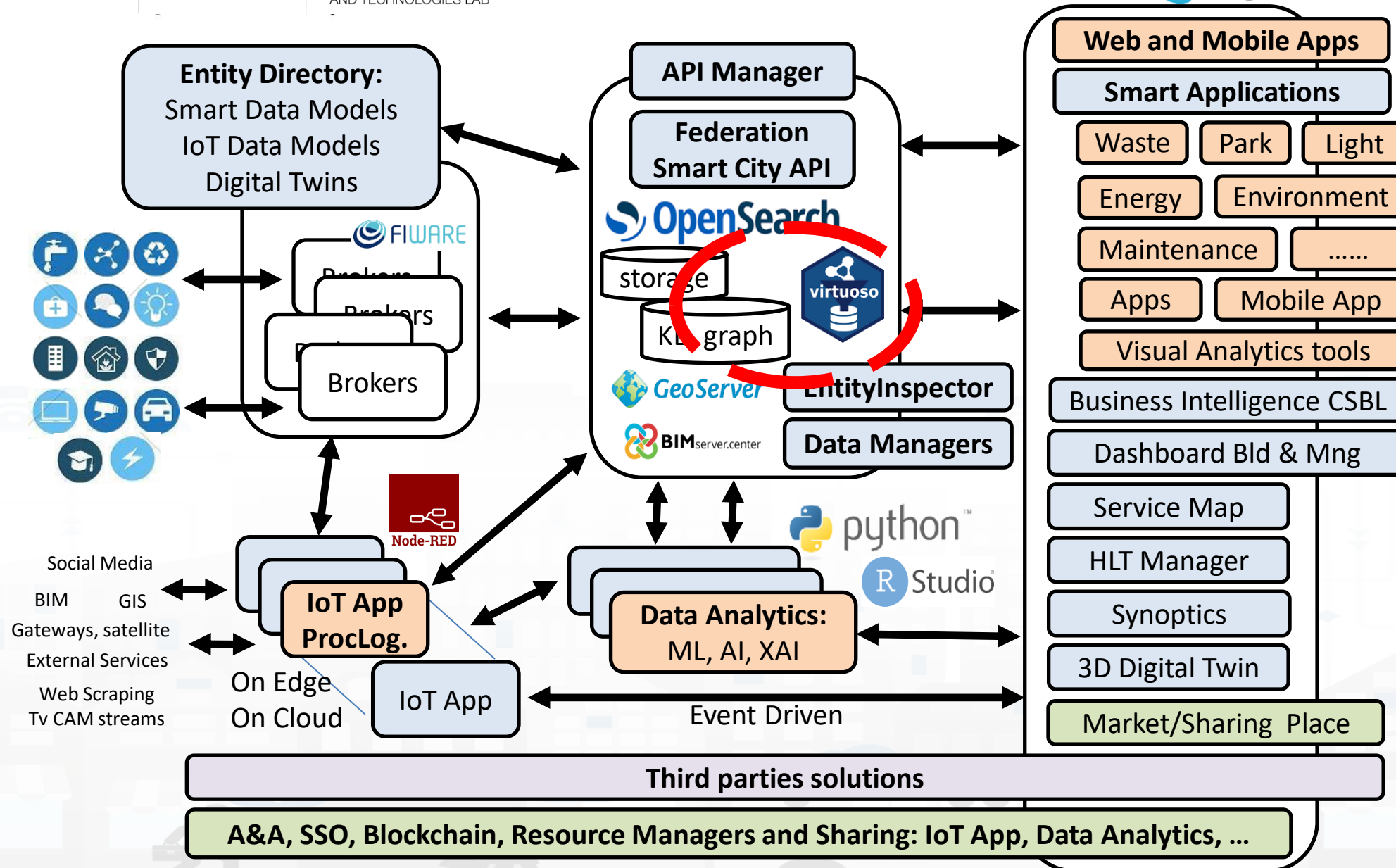
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Tech Arch



Knowledge Base city structure

- Needs of the KB city Structure:
 - For many trivial applications of Smart City the KB does not need to be initialized with some road graph, for example taken from OSM
 - For example, if you need only to position devices on map to some GPS coordinates you do not need to set up the KB
- The KB Set up is needed only when is needed to have:
 - Geoserver functionality
 - Routing based on KB
 - Some spatial reasoning queries
 - Etc.

TOP

Usage of the ServiceMap and Knowledge Base Browsing

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
- Greece Service Map
- Valencia Service Map
- Pont Du Gard Service Map
- Dubrovnik Service Map
- WestGreece Service Map
- Mostar-Bosnia Service Map
- Svealand Service Map
- Bologna Service Map
- Roma Service Map
- Pisa Service Map



Snap4city Data Ingestion Diagram

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Manual or automated
Registration
of Entities/Devices

**Entity/IoT
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Orion Broker

subscription note
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Cluster of **OpenSearch**
for storage with in
front a cluster of
NIFI

Platform Automation:
IoT Apps, Proc.Logics,
Python, ...



Data Analytics: ML, AI, XAI **python**

Platform Control and Management

Snap4City

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

LOGOUT

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)

My Annotation on Services/Data

Mapping Services Data

ArcGIS DISIT Service

Static GTFS Manager

IOT Applications

IOT Directory and Devices

Service Map (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 Busses

Actual Selection

Bus Stop: Salvemini

TPS STOP : Salvemini

ATAF&LINEA

Serviceuri: http://www.disit.org/km4city/resource/Bus_ataflinea_Stop_FM0612_500 GRAPH

Lines:

14 23 C1 C2

Display 10 Bus per page Search:

Time	Line	Direction
09:31:00 2020-10-07	C1	Parterre
09:33:00 2020-10-07	23	T2 Guidoni
09:36:00 2020-10-07	14	Santa Maria Maggiore
09:38:00 2020-10-07	C2	Leopolda T1 Porta Al Prato
09:39:00 2020-10-07	23	T2 Guidoni
09:40:00 2020-10-07	C1	Parterre

Showing page 1 of 45

1 2 3 4 5 ... 45

Real-time data currently not available

Regular Services

Transversal Services

Services Categories

De/Select All

Accommodation

Advertising

AgricultureAndLivestock

CivilAndEdilEngineering

CulturalActivity

EducationAndResearch

Emergency

Entertainment

Environment

FinancialService

GovernmentOffice

HealthCare

IndustryAndManufacturing

IoTDevice

MiningAndQuarrying

ShoppingAndService

TourismService

TransferServiceAndRenting

UtilitiesAndSupply

Wholesale

WineAndFood

Filter:

search text into service

Service providing value type:

select value type

N. results: 100

Search Range visible area

Search Area select...

Search Results

Services 100 of 60336 available

Knowledge Base

Semantic Reasoners

KM4CITY



- **KB is based on the Km4City ontology**, It allows to:
 - keep connected city entities each other:
 - Semantic Index, reticular
 - Perform spatial, geo graphic, and temporal reasoning
 - Discover city entities and their relationships via Proc.Logic / IoT App and Smart City API:
 - Entities / devices, sensors, city elements, roads, services, Brokers, etc. etc.
 - Provide access via Advanced Smart City API
 - Federate other Smart Cities / Knowledge Bases, the approach allows to scale geographically and create redundancies, improving performances

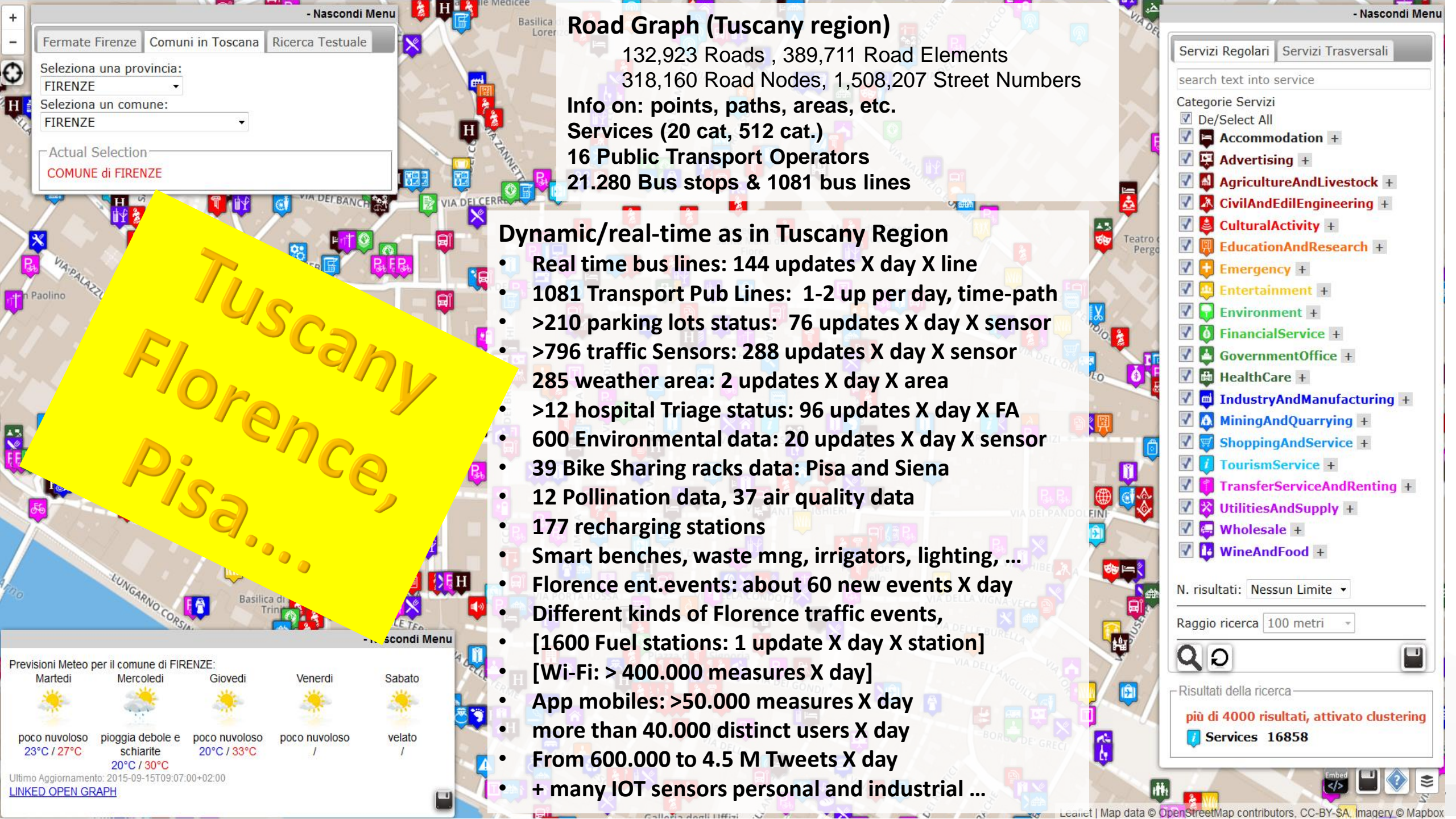
Views of the Knowledge Base

Knowledge Base
Semantic Reasoners



- How pass from ServiceMap to Linked Open Graph, Linked Data view tool

The screenshot displays the Snap4City interface. On the left, a sidebar lists various maps and services. The main area shows a map of Helsinki with a red arrow pointing from a specific location to a 'Linked Open Graph' view. This view includes a 'Linked Open Graph' section with a search bar and a 'Your data' section with a search bar. Below these, there is a 'Type of relations' section with checkboxes for different relationship types. The bottom part of the screenshot shows a detailed graph visualization with nodes and edges, representing the semantic data associated with the selected location.





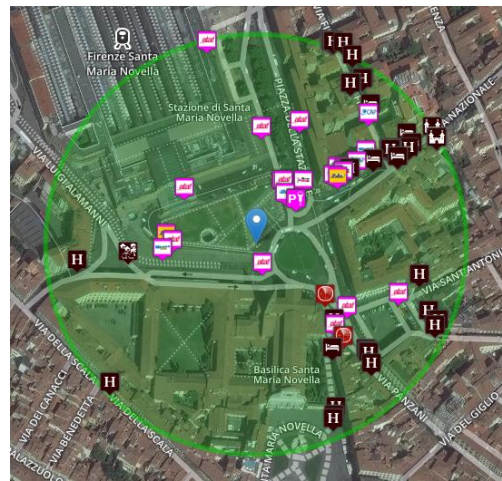
Around a point or POI

Search by Shape and Distance

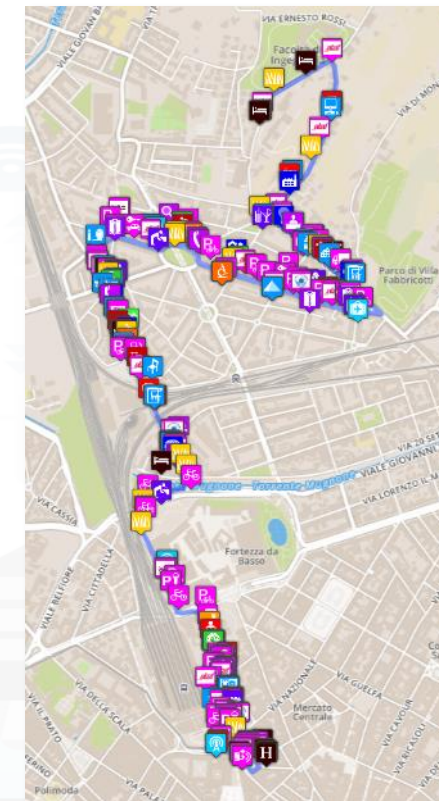
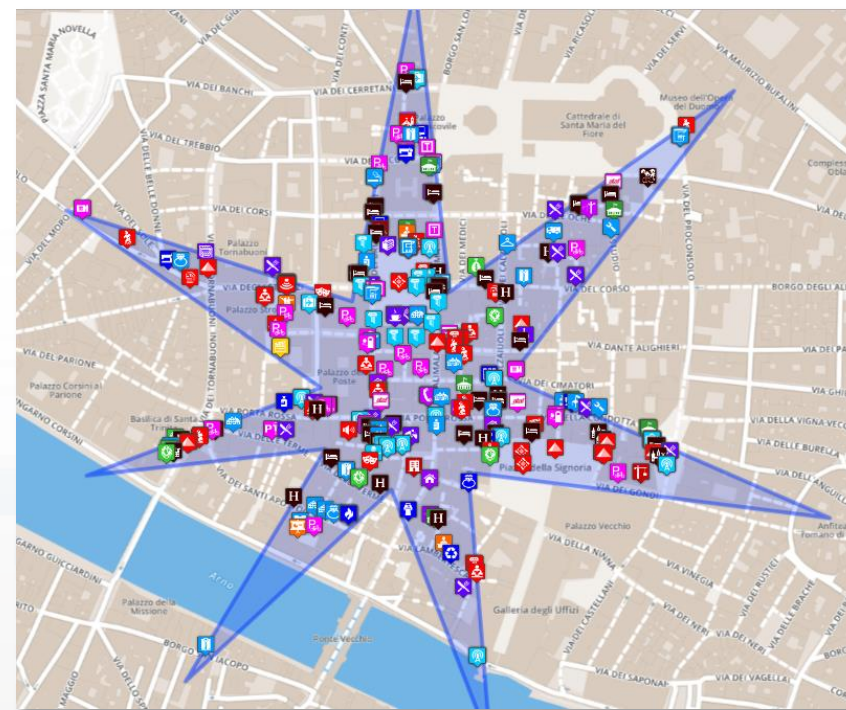
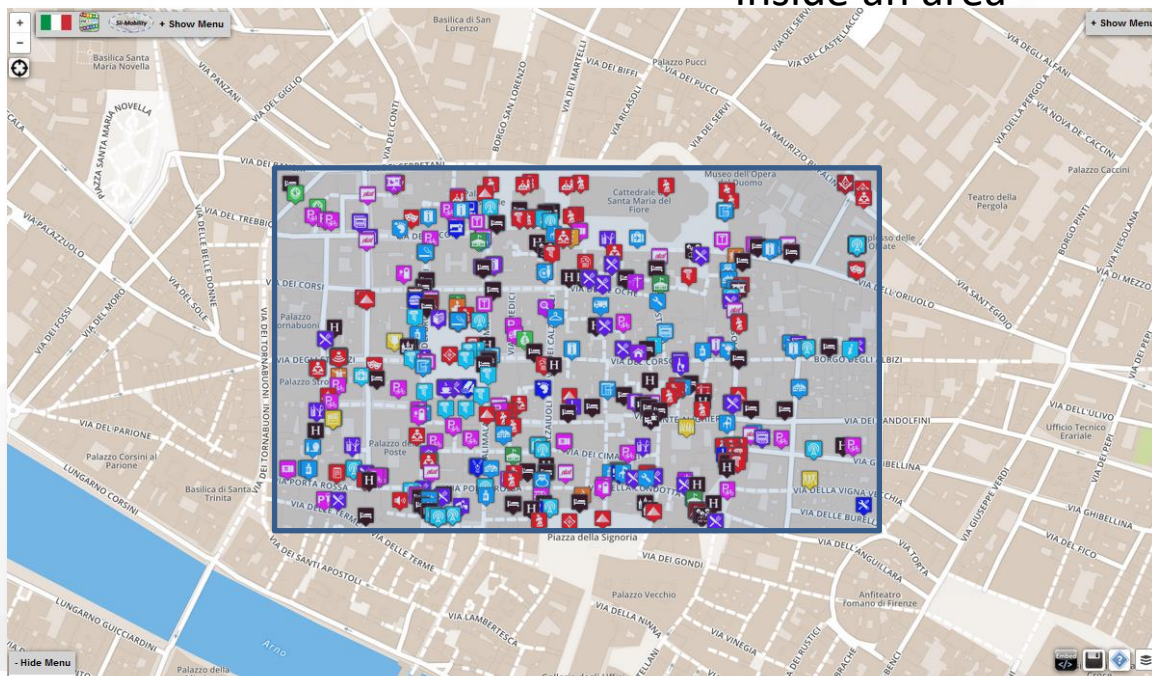
Each request or search in the Km4City model can be referred to a point and a ray, to an area, to a polyline

Inside a closed polyline

Along a polyline



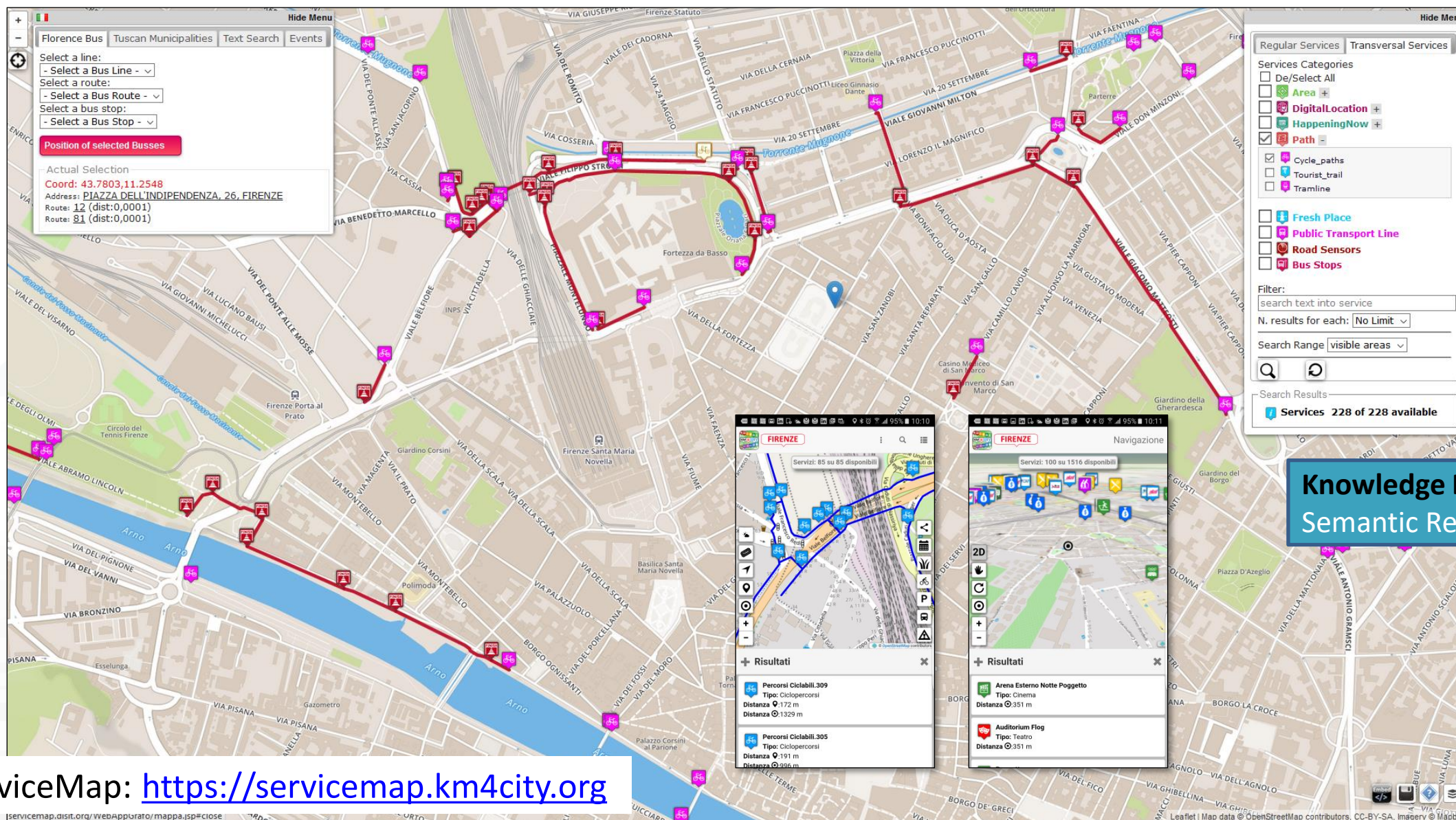
Inside an area



Knowledge Base
Semantic Reasoners



Cycling Paths

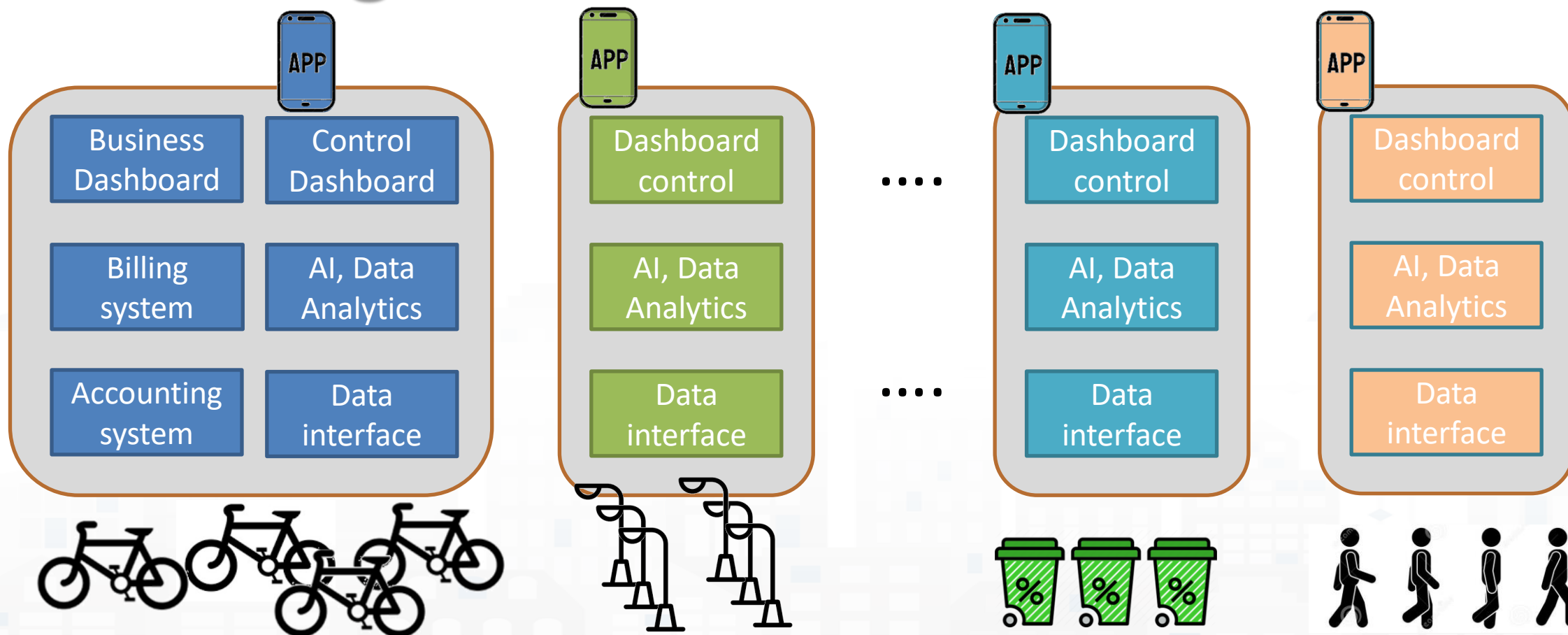


ServiceMap: <https://servicemap.km4city.org>

*Set up of the **Knowledge Base** performed with an open source tool*



Avoiding to have a collection of verticals



Simplifying the development and integration of verticals

Km4City: Knowledge Base



- Multiple DOMAINS
- Geospatial reasoning
- Temporal reasoning
- Metadata
- Statistics
- Risk and Resilience
- Licensing
- Open and Private Data
- Static and Real time
- IOT/IOE

- Street-Guide
- Mobility and transport
- Points of interest
- Sensors, IOT, ...
- Energy
- Administration
- Citations from strings
- ..

Big Data Tools



LOD and reasoners



Schema: <http://www.disit.org/km4city/schema>

RDF version: <http://www.disit.org/km4city.rdf>



OPEN DATA



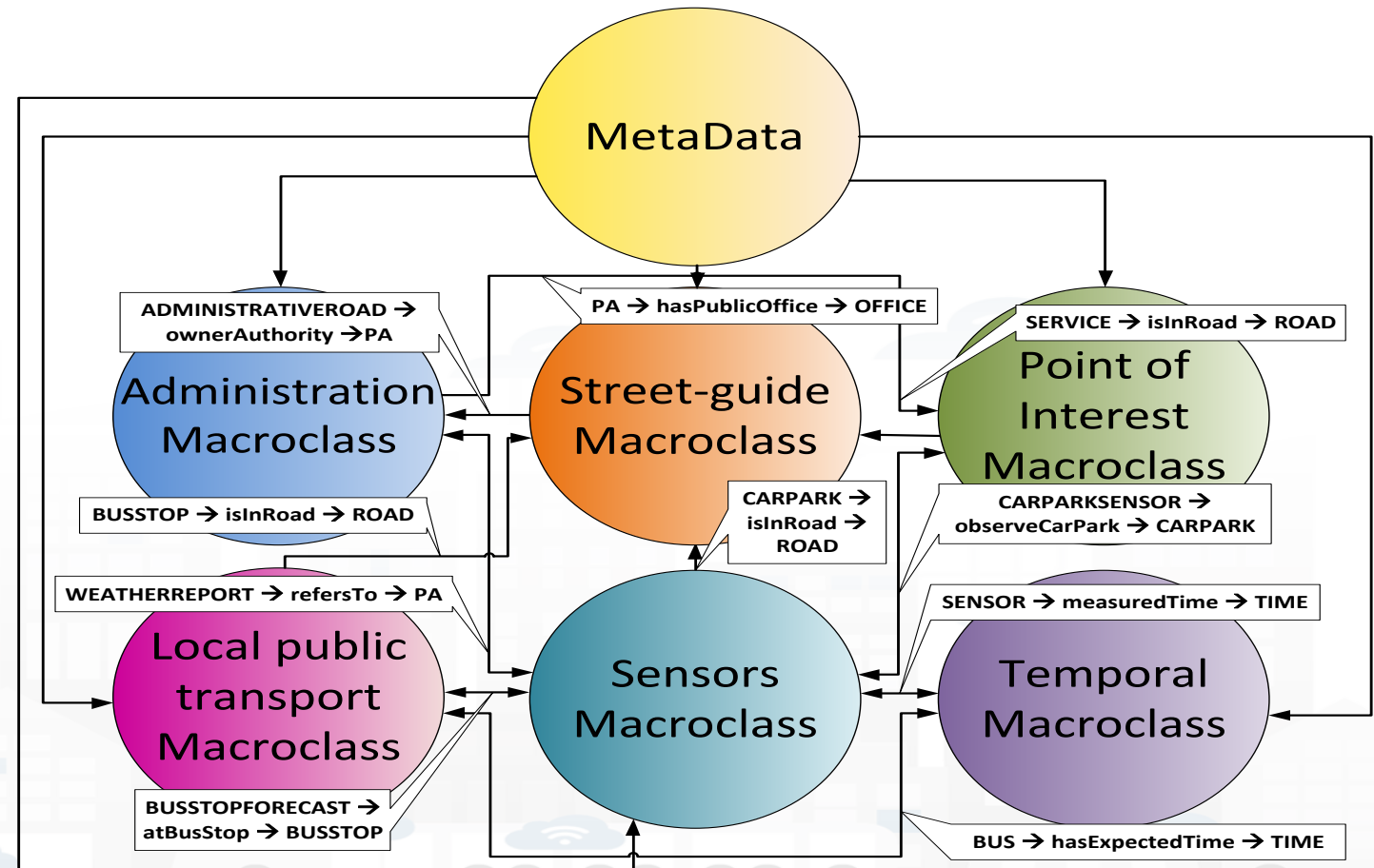


- **Km4City is the reference ontology for Snap4City**, It allows to:
 - keep connected city entities each other:
 - Semantic Index, reticular
 - Perform spatial, geo graphic, and temporal reasoning
 - Provide access via Advanced Smart City API
 - Discover city entities and their relationships via Proc.Logic / IoT App and Smart City API:
 - Entities / devices, sensors, city elements, roads, services, Brokers, etc. etc.
 - Federate other Km4City Knowledge Bases, the approach allows to scale geographically and create redundancies, improving performances
- **Documentation**
 - [TC5.15 - Snap4City Smart City API Collection and overview, real time](#)
 - [ServiceMap and ServiceMap3D, Knowledge Model, Km4City Ontology](#)
 - [Knowledge Base Graphs and Queries: browsing and queries into the KB](#)

Smart-city Ontology: 1.6

- covers different aspects:

- Administration
- Street-guide
- Points of interest
- Local public transport
- Sensors
- Temporal aspects
- Metadata on the data
- Industry 4.0 structures



Km4City Ontology elements 1.6.7

- **Km4C:** Km4City 1.6.7
- Using
 - **DCTERMS:** for metadata Dublin Core Metadata Initiative
 - **FOAF:** friends of a friends
 - **Good Relation:** entities relationships
 - **iot-lite:** IOT Vocabulary
 - **OTN:** Ontology of Transportation Networks
 - **OWL-Time:** time reasoning
 - **SAREF** Smart Appliances REference extension for building devices available at <https://saref.etsi.org/saref4bldg/>
 - **Schema.org** for people and organizations
 - **SSN:** Semantic Sensor Network Ontology (see <https://www.w3.org/TR/vocab-ssn/>)
 - **WGS84** Datum of Geo-Objects
 - **GTFS**, General Transit Feed Specification, and **Transmodel**, for public transport infrastructures: lines/rides time schedules, real-time records, paths, etc.;



Smart-city Ontology km4city

License Free
1.6.7



Also covers Industry 4.0 structures

<https://www.snap4city.org/19>

Set up of the Knowledge Base, KB

- The **KB starts with the ontology and empty in terms of instances**, it should to be **initialized** with the Road Graph(s) of interest, but may be not needed in some cases.
- **Road Graphs** can be obtained from:
 - GIS of the municipalities, regional govern, etc.
 - Open Street Map, OSM
 - Etc.
- See this note on KM vs OSM: <https://www.snap4city.org/397>
- Snap4City provides a tool for **feeding the KB with OSM**
 - [TC5.10- Open Street Map ingestion process](#)
 - [From the Open Street Map to the Km4City street graph](#)
 - <https://www.snap4city.org/download/video/From%20the%20Open%20Street%20Map%20to%20the%20Km4City%20street%20graph.pdf>
 - **OSM2KM4C** tool is included into KBSM, VM and Docker <https://www.snap4city.org/471>
 - Tool: <https://github.com/disit/osm2km4c>
- The load of a city of 1 Million of inhabitants can be done in few hours.

Knowledge Base
Semantic Reasoners



Which are the mechanisms to send data into the Knowledge Base?

The KB is feed with new concepts and entities, and they are produced by the solution and feed into the KB:

- (i) automatically by the Entity/Device Directory about all the new registered Entities / Devices which are registered on some IoT broker which have been already registered on Directory
- (ii) automatically from an Proc.Logic / IoT App it is possible to generate triples in somehow and poste them in N3 formats into the specific KB you targeted, according to the ORG you have
- (iii) automatically from POI Loader tool that takes Excel file in input and generate triples for a specific your organization
- (iii) manually producing triples and send them to RootAdming for feeding KB, or using an IOT App for feeding KB
- (iv) converting OSM in triples about road graph details by using a tool called
 - From the Open Street Map to the Km4City street graph, OSM2SM, OSMOSIS
 - <https://www.snap4city.org/download/video/From%20the%20Open%20Street%20Map%20to%20the%20Km4City%20street%20graph.pdf>

Linked Open Graph

LOG: <https://log.disit.org>

Linked Open Graph

SiiMobility (by DISIT)

Examples:

- [VIA GIACOMO MATTEOTTI](#)
- [Bagno a ripoli](#)
- [Florence](#)

Choose a class:

Search for keyword

keyword:

uri: Request

Your data

sparql endpoint: (optional)

uri: Request

Status

Requests:

<http://www.disit.dinfo.unifi.it/SiiMobility/MUSE>

Remove Clear

Type of relations

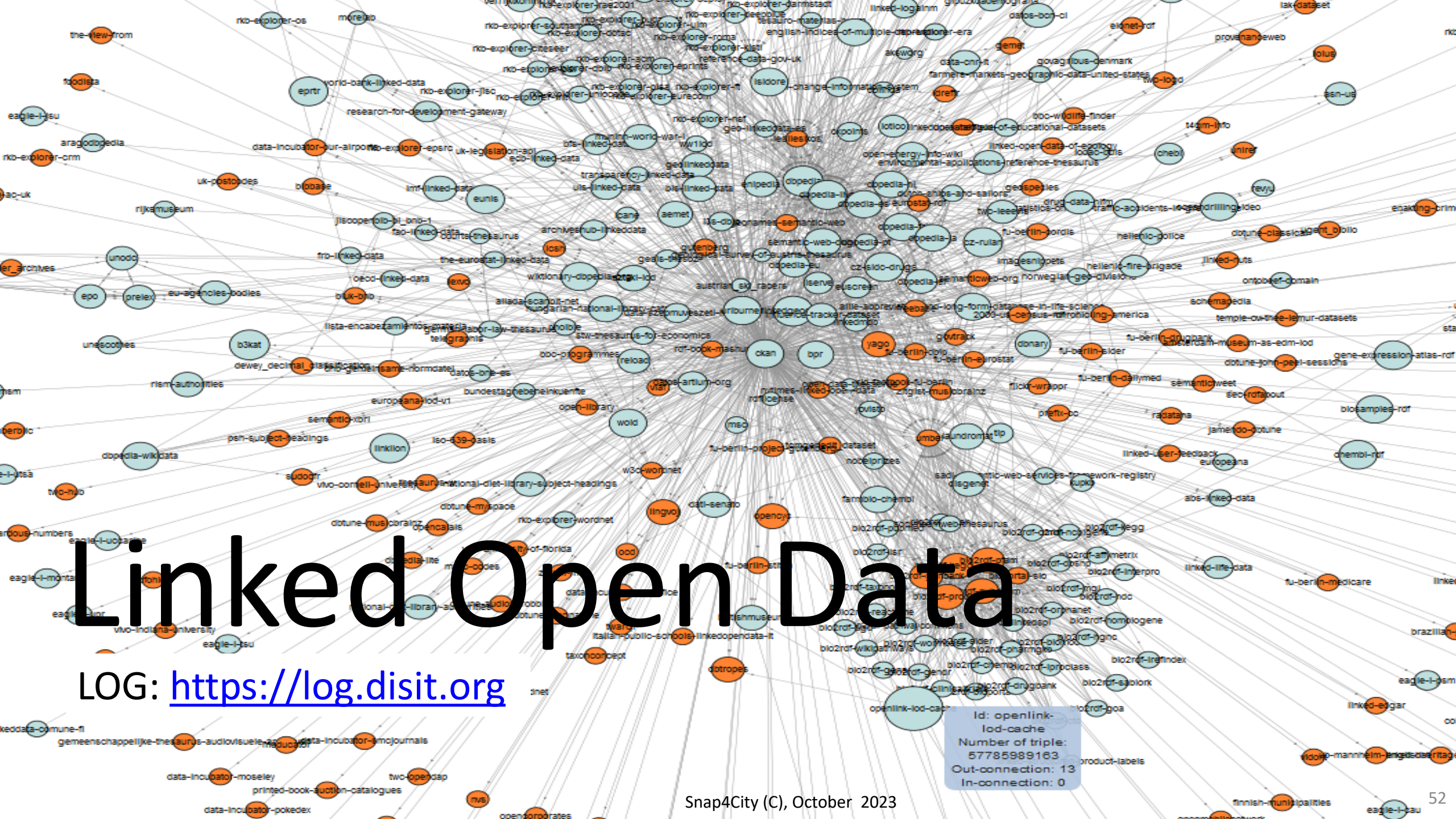
Select all Deselect all Invert Hide all inverse

<input checked="" type="checkbox"/> belongTo	<input checked="" type="checkbox"/> coincideWith
<input checked="" type="checkbox"/> contains	<input checked="" type="checkbox"/> depiction
<input type="checkbox"/> ends	<input checked="" type="checkbox"/> forming
<input type="checkbox"/> has	<input checked="" type="checkbox"/> hasAccess
<input checked="" type="checkbox"/> hasExternalAccess	<input checked="" type="checkbox"/> hasMunicipality
<input checked="" type="checkbox"/> hasProvince	<input checked="" type="checkbox"/> hasRule
<input checked="" type="checkbox"/> hasStreetNumber	<input checked="" type="checkbox"/> inMunicipalityOf
<input checked="" type="checkbox"/> isIn	<input checked="" type="checkbox"/> isPartOf
<input checked="" type="checkbox"/> isPartOfProvince	<input checked="" type="checkbox"/> isPartOfRegion
<input checked="" type="checkbox"/> managingAuthority	<input checked="" type="checkbox"/> ownerAuthority
<input checked="" type="checkbox"/> placedIn	<input type="checkbox"/> sameAs
<input checked="" type="checkbox"/> seeAlso	<input type="checkbox"/> starts

Linked Open Graph

Schema: <http://www.disit.org/km4city/schema>

RDF version: <http://www.disit.org/km4city.rdf>



Linked Open Data

LOG: <https://log.disit.org>

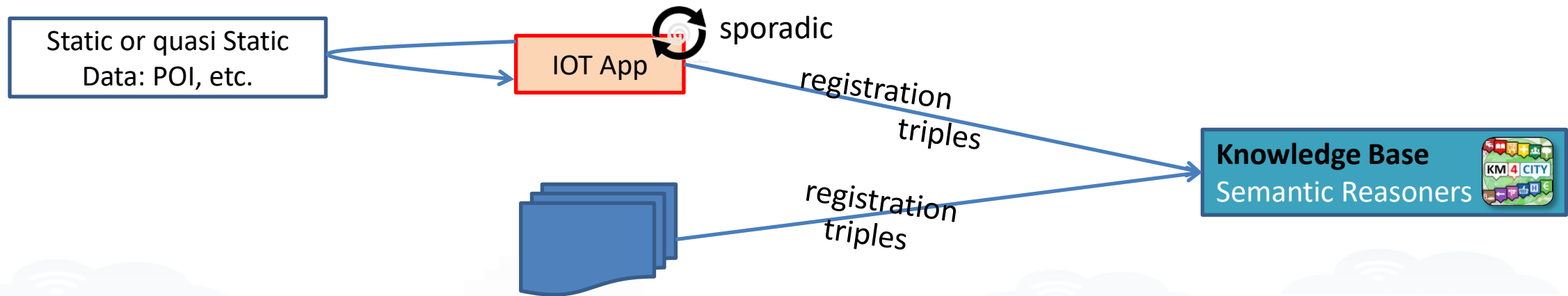
TOP

How to load triples into the KB

(Admin and on-premise)



Loading Static Data into KB



- The loading is performed via
 - Proc.Logic / IoT App, with a specific flow exploiting a **MicroService/API of ServiceMap**, KB
 - **files of triples** on a shared folder of the ServiceMap, KB, for massing loading of Triples. For batch loading of triples

Load Triples in KB

Pre-requirements:

- Available only for your Proc.Logic / App on premise and for administrators

Load Static Data on Snap4City KB:

- Register Static Data on Snap4City KB (point 1 and 2 on the right)
- Connect the additional blocks present in the IOT App and save ('Deploy' button)
- Upload your csv

Register Static Data on Snap4City KB:

1. 'Regularize' your data (csv)
2. Create your IoTApp
3. Upload your csv

The screenshot displays the Snap4City Node-RED interface. On the left, a sidebar shows the user 'paolucci' from 'DISIT' with a 'Logout' button. Below this is a menu with categories like 'My Snap4City.org', 'Dashboards', 'IOT Applications', and 'Knowledge and Maps'. The main workspace shows a flow named 'Flow 2' with the following nodes: a 'CSV' input node, a 'produce triples' function node, an 'Email adapting' function node, a 'send email from xxxxxxxx' node (marked 'send failed'), an 'html' node, an 'http' node, a 'prepare DELETE graph' function node, a 'triplesToVirtuoso (3)' node, a 'prepare POST' function node, and another 'triplesToVirtuoso (3)' node. A 'Deploy' button is visible in the top right corner. On the right side, a panel shows flow information: Name 'Flow 2', ID 'e6ec9194.8ffc7', and Status 'Enabled'.

<https://www.snap4city.org/596>

Load Triples in KB

- Additional Option Only for ONPREMISE Snap4City versions and for administrators
- In case you need to upload ONLY on the Knowledge Base a set of data containing static data and dynamic data all together:
 - Example: Cultural Events or weather predictions
- Use a predefined IoT App available here <https://www.snap4city.org/594> (with the copy and past method, you can create your Mobile App)
- Add:
 - Inject block
 - Function block
 - Debug block
- The function block must contain ...
- Now you can see the triples to be updated in the Knowledge Base in the Debug Tab

The screenshot shows the Snap4City Node-RED interface. On the left, the user is logged in as 'paolucci' from the 'DISIT' organization. The main workspace shows a flow with the following blocks: 'inject' (under the 'input' category), 'timestamp', 'function', 'triplesToVirtuoso', and 'msg.payload'. The 'triplesToVirtuoso' block is highlighted. On the right, the 'info' tab is open, showing details for the 'triplesToVirtuoso' node, including its name, type, and ID.

The input message to be provided to *triplesToVirtuoso* has to have the following properties:

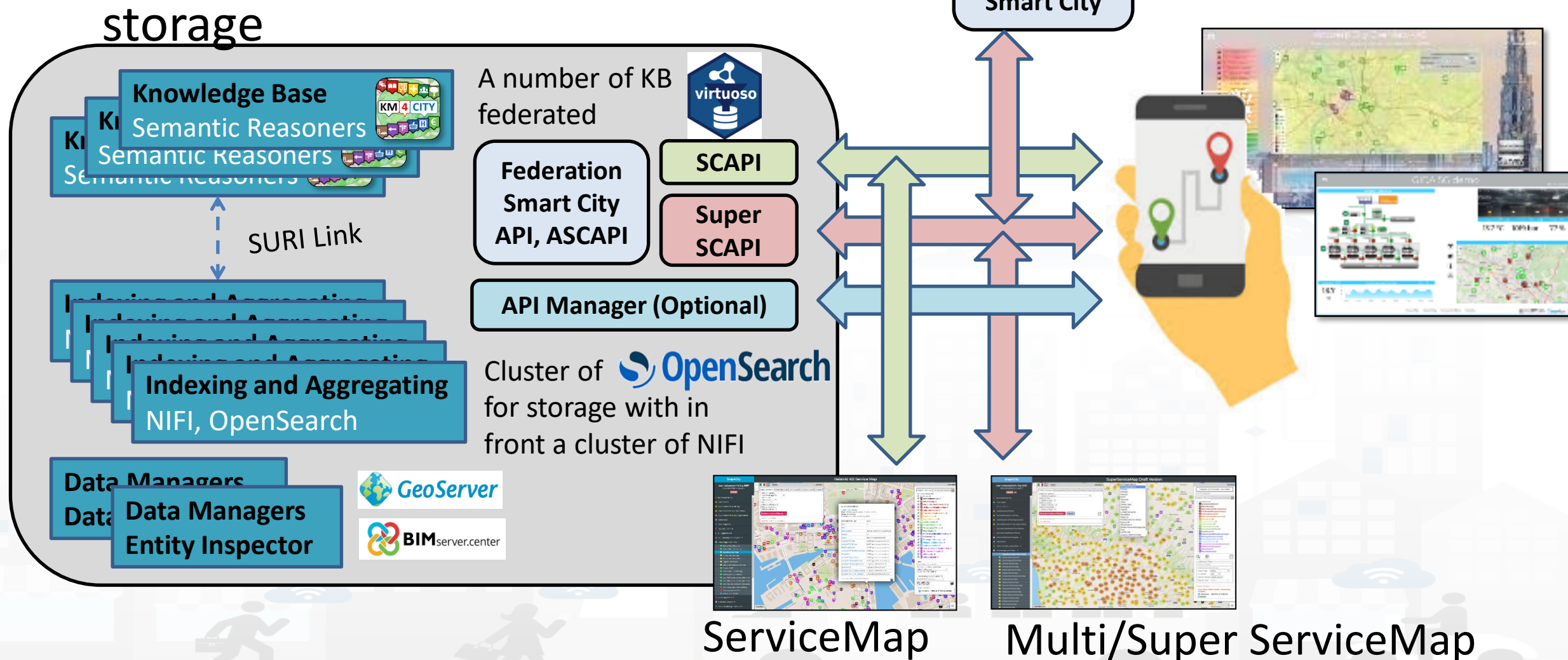
```
msg.user="dba" // the user of virtuoso to be used to access to virtuoso
msg.passw="dba" //the password
msg.method="POST" //the http method: GET, POST, DELETE, PUT
msg.url="http://virtuoso-kb:8890/sparql-graph-crud-auth?graph-uri=urn:graph:POIs"
msg.triples= "..."
```


TOP

The role of Knowledge base and ServiceMaps



Accessing to Snap4City Services



- ServiceMap is the **main Tool** to:
 - monitor the status of the Knowledge Base
 - test queries and produce query and SmartCity API testing calls for developers
 - Any kind of search (semantic, full text, etc.), routing,
 - Access at the specific Graph Data base via LOG.disit.org
- **ServiceMap is showing:**
 - only **public data**. Private data are not shown via ServiceMap but can be accessed via DataInspector
 - data regarding a **single Knowledge Base** of the federated network of KBs. Each KB may contain multiple Organizations.
 - technical views for developers
- **Super ServiceMap** shows to you your private data and data which have been delegated in Access to you.
- In most cases we refer as ServiceMap to intend both Super and basic
- In the installations on Cloud, the Super is the Default used by Dashboards, on premise the basic ASCAPI are the default

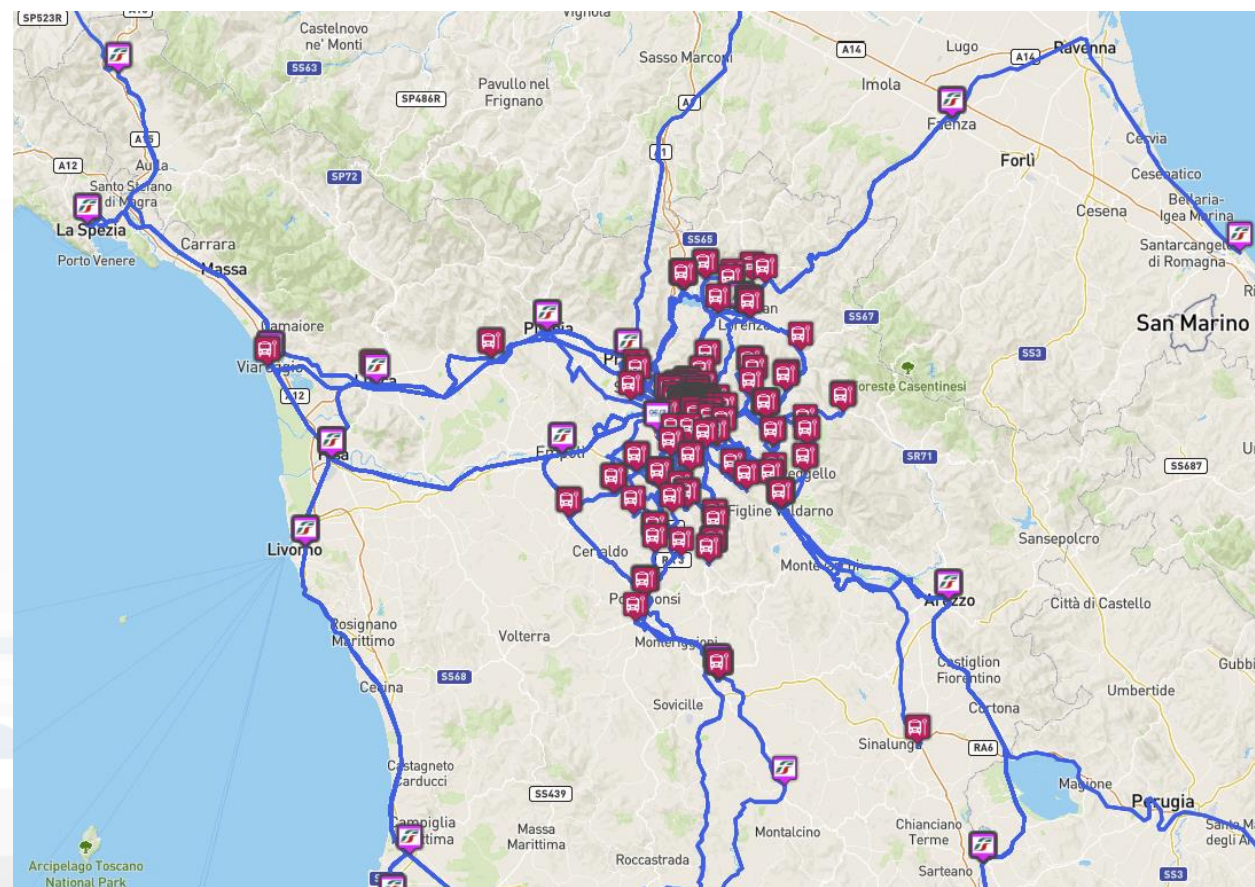
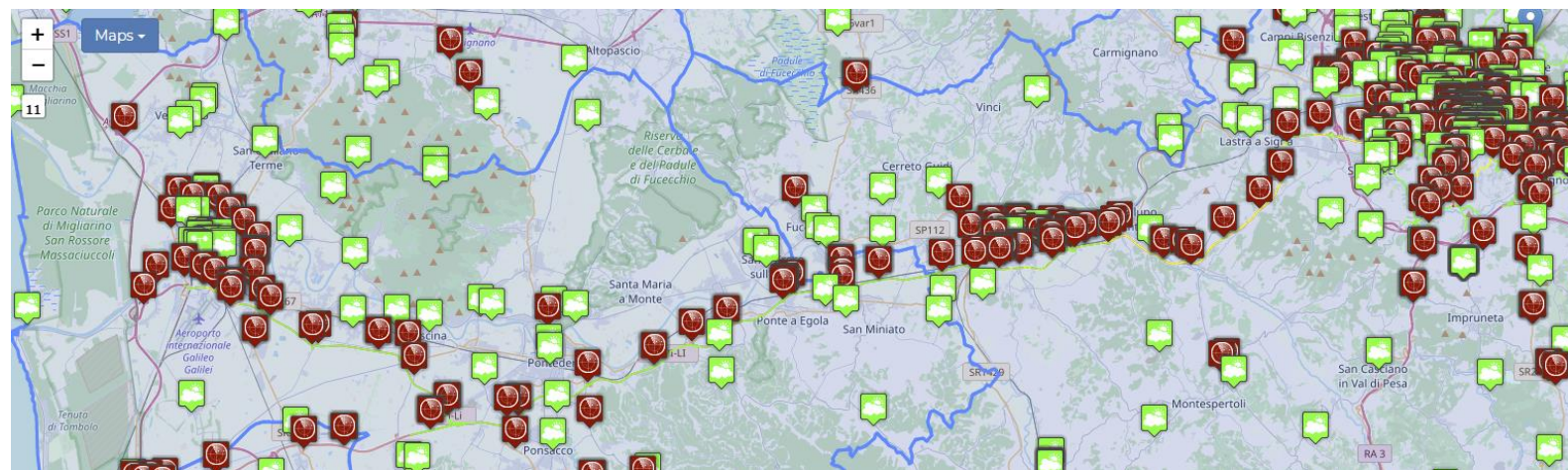
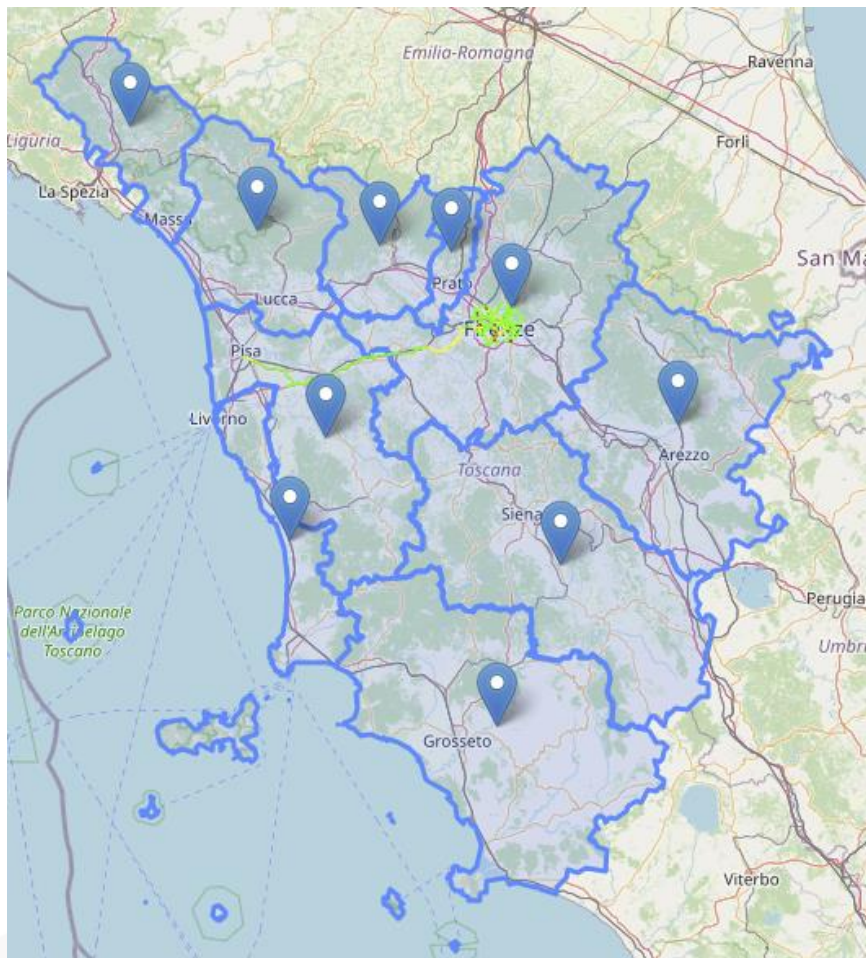
TOP

Federation of: Service Maps, Knowledge Bases, Smart City APIs

Knowledge and Maps ▲

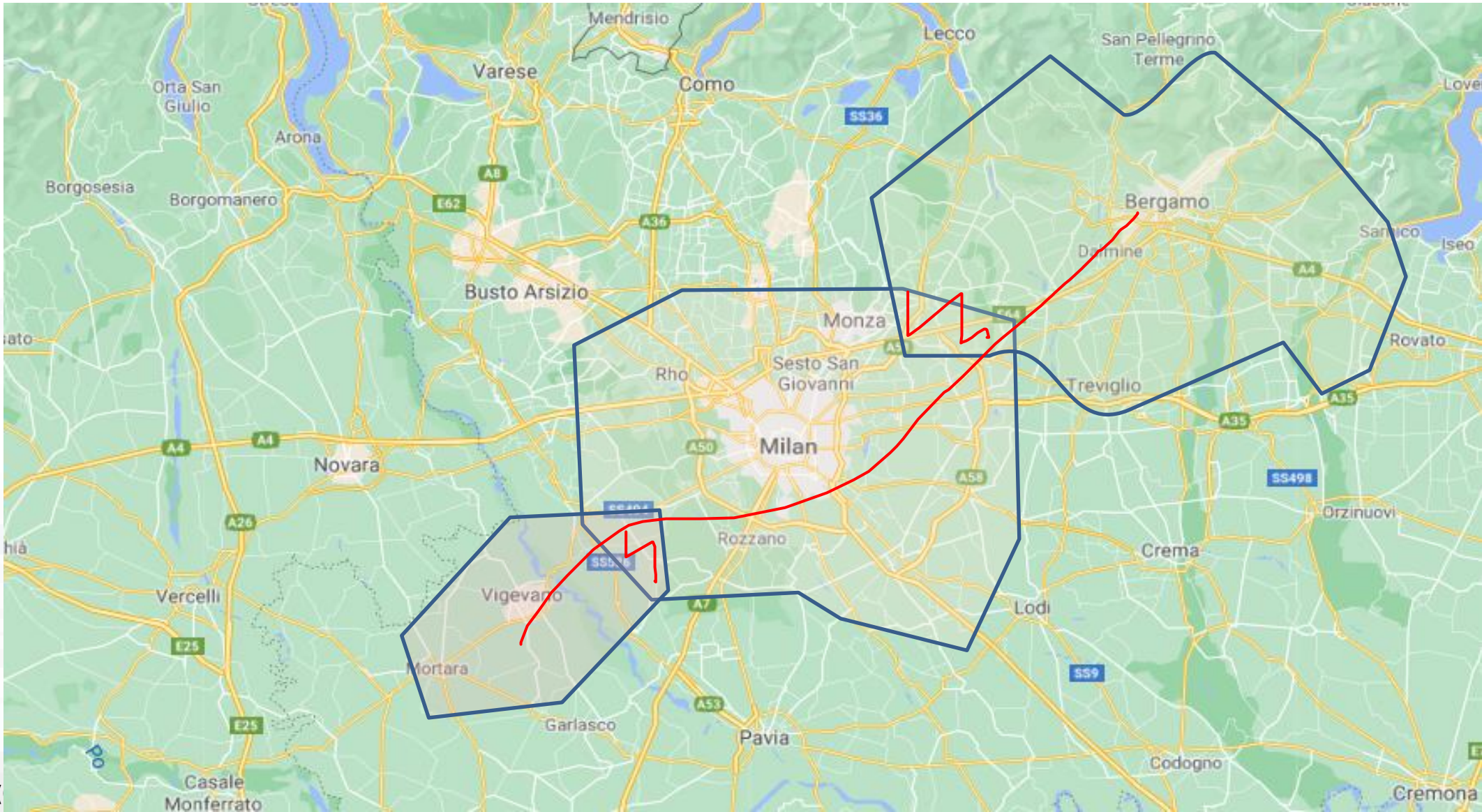
- Service Map (Toscana)
- Service Map 3D (Firenze)
- Helsinki Service Map
- Antwerp Service Map
- Garda Lake Service Map
- Cagliari Service Map
- Lonato Del Garda Service Map
- Greece Service Map
- Valencia Service Map
- Pont Du Gard Service Map
- Dubrovnik Service Map
- WestGreece Service Map
- Mostar-Bosnia Service Map
- Svealand Service Map
- Bologna Service Map
- Roma Service Map
- Pisa Service Map





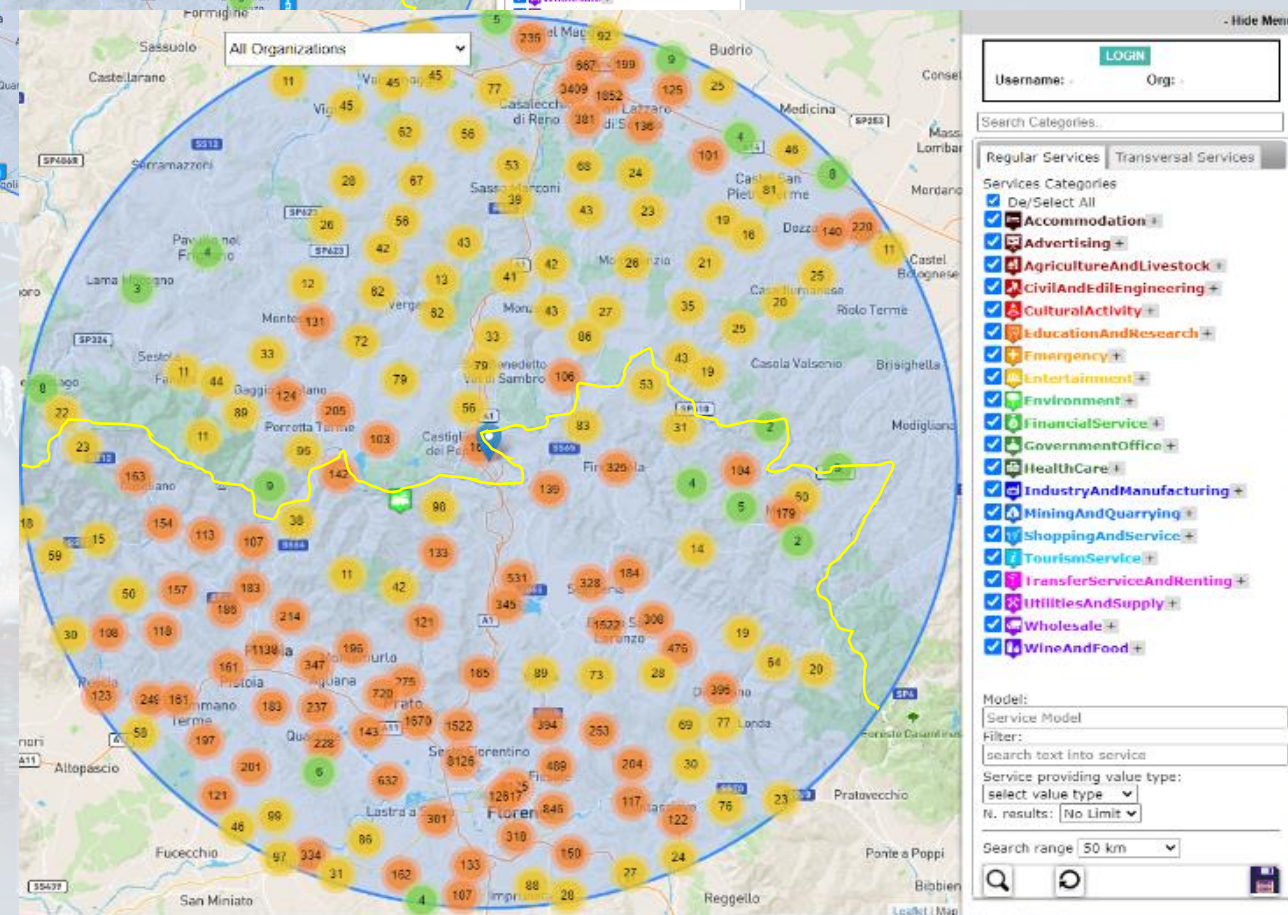
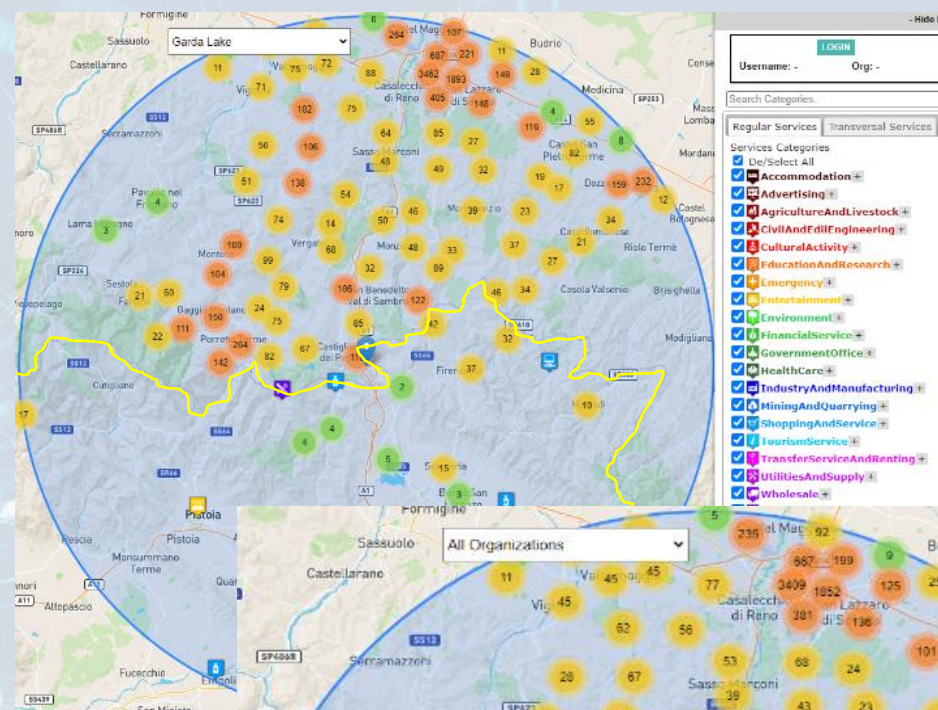
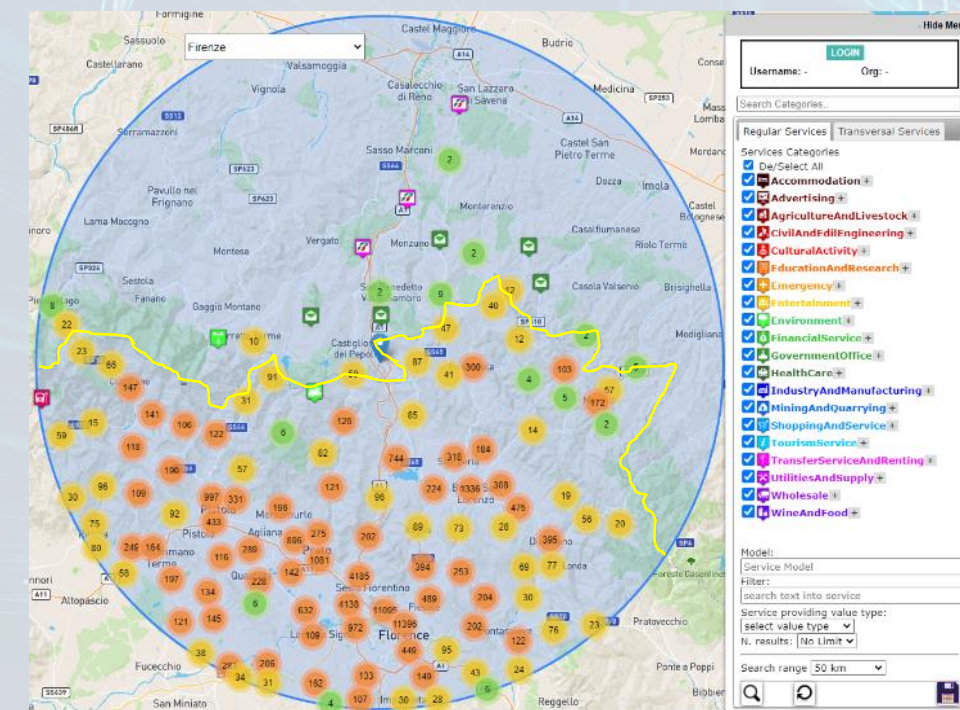
Admin Models & limitations

One Snap4City Platform may serve Multiple Cities

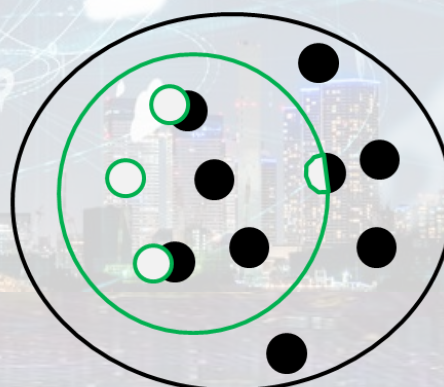




Knowledge Base Semantic Reasoners



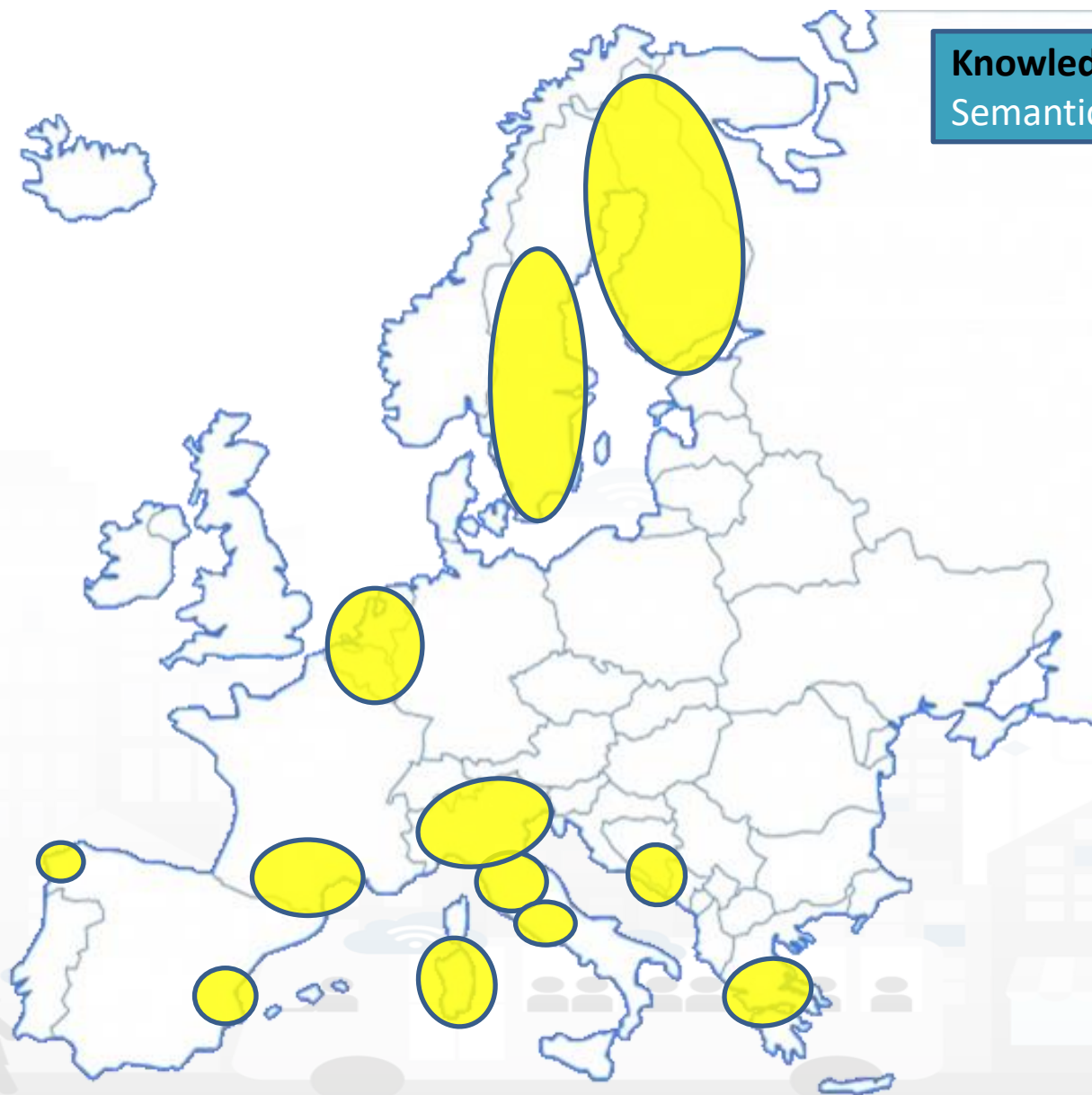
a) Overlap



b) Inclusion

Main Organizations/areas

- [Antwerp area \(Be\)](#)
- Capelon (Sweden)
- [DISIT demo \(multiple\)](#)
- [Dubrovnik, Croatia](#)
- [Firenze area \(I\)](#)
- [Garda Lake area \(I\)](#)
- [Helsinki area \(Fin\)](#)
- [Livorno area \(I\)](#)
- [Lonato del Garda \(I\)](#)
- [Modena \(I\)](#)
- [Mostar, Bosnia-Herzegovina](#)
- [Pisa area \(I\)](#)
- [Pont du Gard, Occitanie \(Fr\)](#)
- [Roma \(I\)](#)
- [Santiago de Compostela \(S\)](#)
- [Sardegna Region \(I\)](#)
- SmartBed (multiple)
- [Toscana Region \(I\)](#), [SM](#)
- [Valencia \(S\)](#)
- [Venezia area \(I\)](#)
- [WestGreece area \(Gr\)](#)



Knowledge Base
Semantic Reasoners



Federated ServiceMap and Smart City API

To improve scalability, fault tolerance and federation among cities:

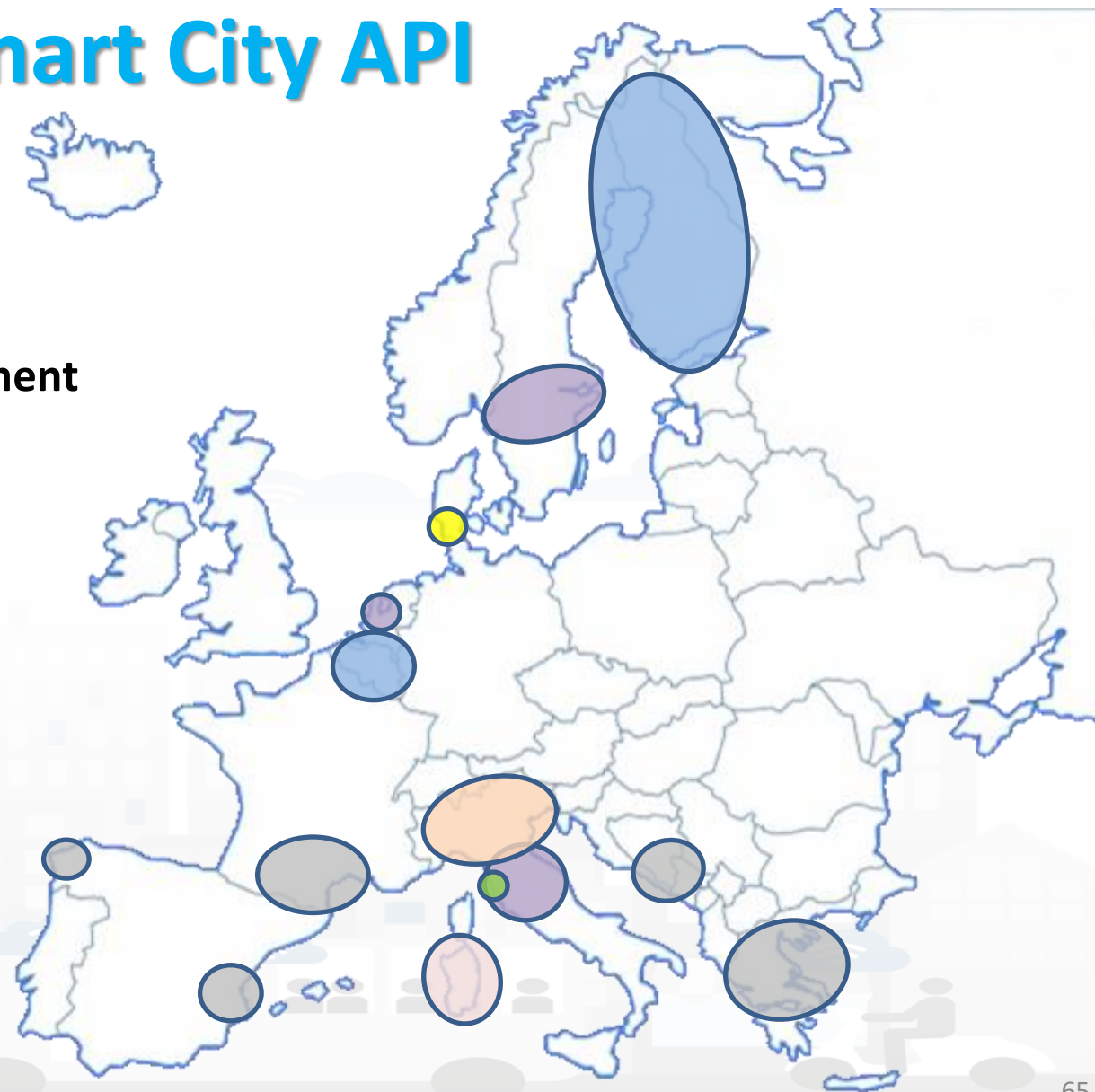
- One entry point Smart City API for all zones
- Multiple Knowledge base See performance assessment

At different levels:

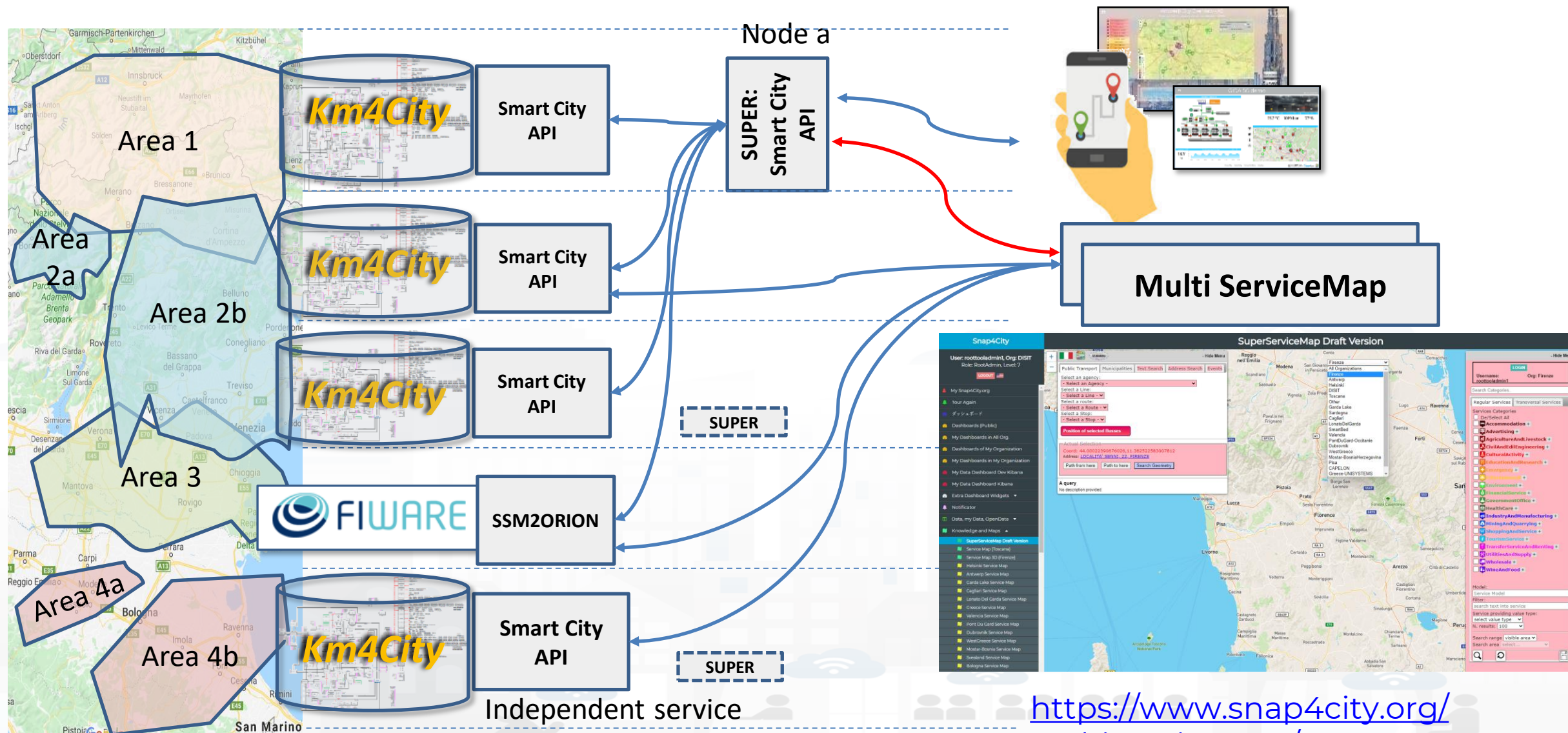
- Among cities/regions
- Among data providers, Operators

By Means of:

- Smart City API → Apps
- Smart City Ontology
- Dashboards/data analytics
- Organization independent



MultiServiceMap



<https://www.snap4city.org/MultiServiceMap/>

Snap4City

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

LOGOUT

- My Snap4City.org
- Tour Again
- ダッシュボード
- Dashboards (Public)
- My Dashboards in All Org.
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
- My Data Dashboard Kibana
- Extra Dashboard Widgets
- Notificator
- Data, my Data, OpenData
- Knowledge and Maps
- SuperServiceMap Draft Version**
- 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
- Greece Service Map
- Valencia Service Map
- Pont Du Gard Service Map
- Dubrovnik Service Map
- WestGreece Service Map
- Mostar-Bosnia Service Map
- Svealand Service Map
- Bologna Service Map
- Roma Service Map
- Pisa Service Map

SuperServiceMap Draft Version

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 -

Show the Position of Vehicles Cancel

Actual Selection
No selection

All Organizations
All Organizations
Firenze
Antwerp
Helsinki
DISIT
Toscana
Other
Garda Lake
Sardegna
Cagliari
LonatoDelGarda
SmartBed
Valencia
PontDuGard-Occitanie
Dubrovnik
WestGreece
Mostar-BosniaHerzegovina
Pisa
CAPELON
Greece-UNISYSTEMS

USERNAME: ROOTTOOLADMIN1, ORG: FIRENZE

Search Categories...

Regular Services Transversal Services

De/Select All

Accommodation +

Advertising +

AgricultureAndLivestock +

CivilAndEdilEngineering +

CulturalActivity +

EducationAndResearch +

Emergency +

Entertainment +

Environment +

FinancialService +

GovernmentOffice +

HealthCare +

IndustryAndManufacturing +

MiningAndQuarrying +

ShoppingAndService +

TourismService +

TransferServiceAndRenting +

UtilitiesAndSupply +

Wholesale +

WineAndFood +

Additional Filters

Service Model

search text into service

Value Type select

N. results 100

Search Range visible area

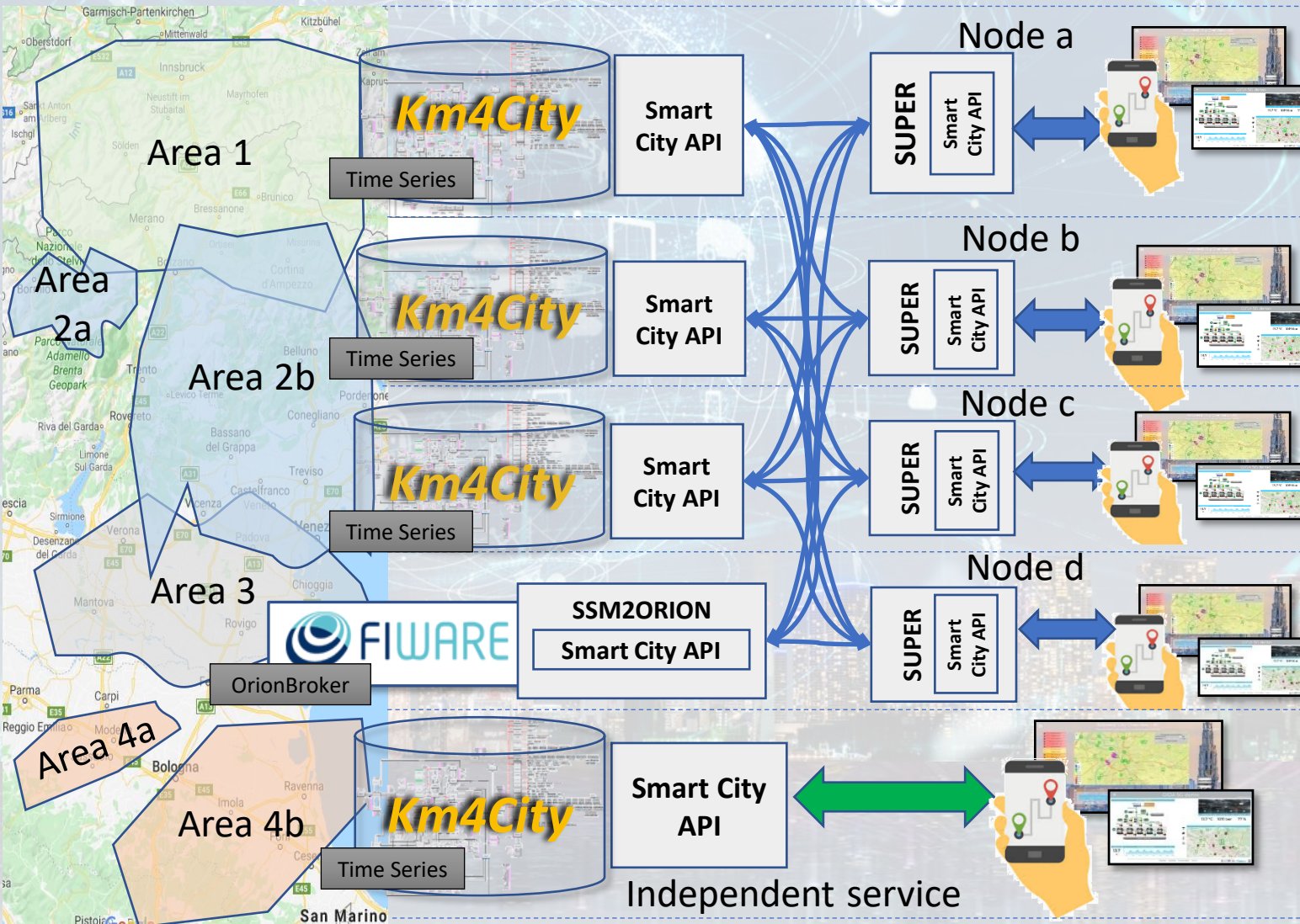
Search Area select...

Search Results

more than 4000 results, clustering enabled

Services 108102 of 108310 available

Federation of Smart City Services



- Km4City Semantic Reasoner
- ServiceMap interoperability
- Seamless for multiple Mobile Apps
- Smart City API
- Super:
 - distributed access and sharing services
 - Each city control its own data
 - Final user can pass from one city / area to another in seamless manner: without changing the mobile Apps

- Super, Nodes and SSM2ORION presents the same Smart City APIs.
- The **network of Super** can be reconfigured dynamically
 - Multiple networks of Super can be realized as well
 - Distributed Searches via the Federation of Super are performed with $o(1)$ complexity
 - Results from an API rest calls are provided in real time also when the size of the network is large
 - Dashboard widgets and Mobile Apps are enabled to use the Super
 - Clients can pass from one Super to another transparently: moving devices
- Nodes
 - do not need to permanently share data
 - data can be of any size, the data shared is typically public since users of different KB are different and not refer to the same LDAP/KeyCloak authentication/authorization service.
 - may have different number of services
 - Services can be based on KB as well as on Brokers
 - Services managed as HLT of: Sensors, Sensor-Actuators, POI.
 - Data of other HLTs are managed independently from the other SmartCity API such as: MyKPI, External Services, WFS GIS, Heatmaps, special tools, etc. etc.
- The solution support disjointed nodes, federation and independent services

TOP

High Level Types vs Ingestion Process

FROM CITY
DASHBOARD TO
APPLICATIONS

DATA GATHERING
AND CITY DATA
KNOWLEDGE
MANAGEMENT

FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT/IOE DEVICES
AND NETWORKS

NOT PERFORMING
THROUGHOUT
THE SMARTNESS

ADVANCED
MANAGEMENT
MICROSERVICES,
SNAP4CITY API

SNAP4CITY
LIVING LAB FOR
COLLABORATIVE
WORK

SNAP4CITY FOR
BEGINNERS

SNAP4CITY
ARCHITECTURE AND
ECOSYSTEM OPENED
TO DEVELOPERS
AND STAKEHOLDERS

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
WHAT-IF AND
SIMULATION

DECISION SUPPORT
FROM A CITY
RESILIENT

HOW TO ADOPT
SNAP4CITY, AND
OUR ROADMAP

SNAP4CITY
AND KM4CITY
PROJECTS

SNAP4CITY THE
VIEW OF THE
ADMINISTRATORS

TWITTER
VIGILANCE: SOCIAL
MEDIA ANALYSIS

High Level Types

- 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.

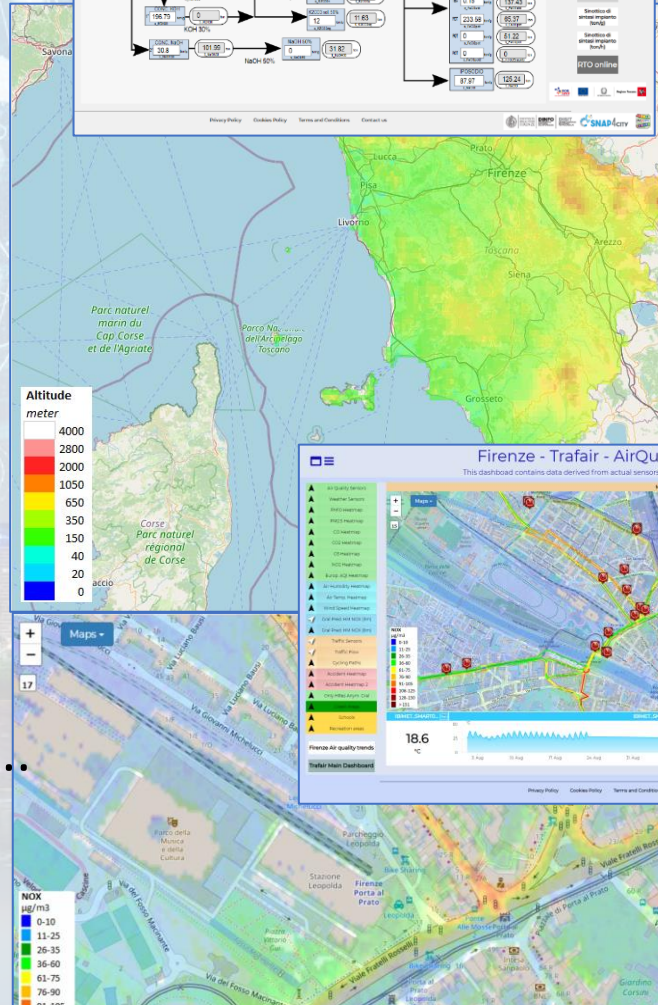
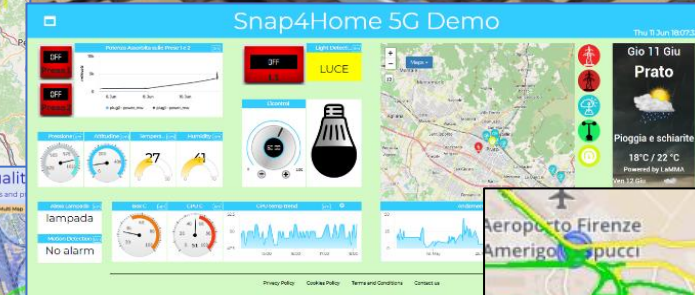
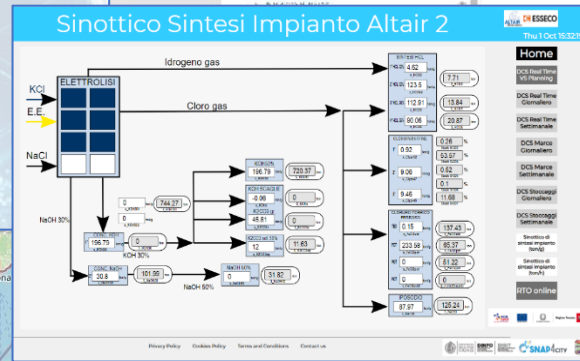


UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB

Snap4City (C), October 2023



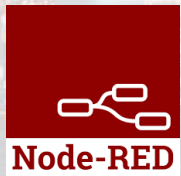
Standards and Interoperability (6/2023)



Compliant with:

- **IoT:** NGSI V2/LD, LoRa, LoRaWan, MQTT, AMQP, COAP, OneM2M, TheThingsNetwork, SigFOX, Libelium, IBIMET/IBE, EnOcean, Zigbee, DALI, ISEMC, Alexa, Sonoff, HUE Philips, Tplink, BACnet, TALQ, Protocol Buffer, KNX, OBD2, Proximus, ..
- **IoT model:** FIWARE Smart Data Model, Snap4City IoT Device Models
- **General:** HTTP, HTTPS, TLS, Rest Call, SNMP, TCP, UDP, SOAP, WSDL, FTP, FTPS, WebSocket, WebSocket Secure, GML, WFS, WMS, RTSP, ONVIF, AXIS TVCam, CISCO Meraki, OSM, Copernicus, The Weather Channel, Open Weather, OLAP, VMS Milestone,
- **Formats:** JSON, GeoJSON, XML, CSV, GeoTIFF, OWL, WKT, KML, SHP, db, XLS, XLSX, TXT, HTML, CSS, SVG, IFC, XPD, OSM, Enfuser FMI, Lidar, glTF, GLB, DTM, GDAL, Satellite, D3 JSON, ...
- **Database:** Open Search, MySQL, Mongo, HBASE, SOLR, SPARQL, ODBC, JDBC, Elastic Search, Phoenix, PostGres, MS Azure, ..
- **Industry:** OPC/OPC-UA, OLAP, ModBUS, RS485, RS232, ..
- **Mobility:** DATEX, GTFS, Transmodel, ETSI, NeTEx, ..
- **Social:** Twitter, FaceBook, Telegram, ..
- **Events:** SMS, EMAIL, CAP, RSS Feed, ..
- **OS:** Linux, Windows, Android, Raspberry Pi, Local File System, AXIS, ESP32, etc.

<https://www.snap4city.org/65>



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
- My Data Dashboard Dev Kibana
- My Data Dashboard Kibana
- 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
- Svalbard 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)

Service Map (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 Bus Stop -

Position of selected Busses

Actual Selection
Service: METRO758

Serviceuri: <http://www.disit.org/km4city/resource/METRO758>

Name: METRO758
Nature: TransferServiceAndRenting
Subnature: SensorSite
Address: Lavagnini dir. Viale Strozzi (38)
DBpedia: "Spartaco_Lavagnini"

Property/Value Type	Value
avgDistance	Not Available
avgTime	14.291604
occupancy	Not Available
concentration	8.25
vehicleFlow	1344.0
averageSpeed	29.613344
thresholdPerc	Not Available
speedPercentile	Not Available
congestionLevel	119.0967
anomalyLevel	101.56058

Latest Update: 2021-01-16T13:00:00

Regular Services | Transversal Services

De/Select All

- ☒ Accommodation +
- ☒ Advertising +
- ☒ AgricultureAndLivestock +
- ☒ CivilAndEdilEngineering +
- ☒ CulturalActivity +
- ☒ EducationAndResearch +
- ☒ Emergency -
- ☒ Carabinieri
- ☒ Civil_protection
- ☒ Coast_guard
- ☒ Corps_of_forest_rangers
- ☒ Emergency_medical_care
- ☒ Emergency_services
- ☒ Fire_brigade
- ☒ First_aid
- ☒ Italian_finance_police
- ☒ Entertainment +
- ☒ Environment +
- ☒ Fire_service +
- ☒ GovernmentOffice +
- ☒ HealthCare +
- ☒ IndustryAndManufacturing +
- ☒ IoTDevice +
- ☒ MiningAndQuarrying +
- ☒ ShoppingAndService +
- ☒ TourismService +
- ☒ TransferServiceAndRenting +
- ☒ UtilitiesAndSupply +
- ☒ Wholesale +
- ☒ WineAndFood +

Filter:
search text into service

Select value type
N. results: 500

Search Range: 2 km
Search Area: select...

Weather Forecast for Municipality of: FIRENZE

Saturday	Sunday	Monday	Tuesday	Wednesday
bit cloudy -2°C / 7°C	overcast -2°C / 6°C	cloudless -3°C / 7°C	cloudy -3°C / 6°C	overcast 5°C / 10°C

Latest Update: 2021-01-16T07:57:00+01:00
<http://www.disit.org/km4city/resource/Firenze1610780220000>

Dev, Entity

Geometry of
a POI or Dev

POI

Dev, Entity

Map: Struct.
Information

Snap4City vs Formats

- *Snap4City is capable to ingest* and work with *any format*:
 - Data **exchange**: JSON, GeoJSON, XML, HTML, HTML5, DATEX, GTFS, binary, etc.
 - **GIS formats**: WMF, WFS, heatmaps,
 - **Table**: CSV, XLSX, XLS, database, ...
 - **Road graphs**: OSM, triples, geoJSON, etc.
 - **graphics**: IFC, Shape, WKT, SVG, ...
 - **archive** file formats: zip, rar, 7z, tgz, pdf, ...
 - **image** formats: png, gif, tiff, geoTiff, ico, jpg, ...
 - **ODM**: JSON and other formats
 - **Traffic Flow**: JSON and other formats
 - **Heatmaps**: GeoTIFF, JSON, etc.
 - **video** formats: mp4, avi, mov, RTSP, ...
 - **3D elements**: GLB, DWG, IFC, etc.
- Search the format you need to cope on the search box of Snap4City portal!: [Snap4City Supported Protocols, adding new protocols](#)

Data Management, HLT
Data Inspector
MyKPI, MyData, MyPOI
My Groups of Entities
View/Set MyPOI on Tuscany
Data Table Loader (Excel)
POI Loader (Excel)
Harvest Satellite Copernicus Dat...
File Manager
HeatMap Manager
BIM Server old
BIM Server New
BIM Srv New: Add
BIM Srv new: View
OpenData Manager: Data Gate
OpenData Manager: Data Gate
Add Data Sources into the Platfo...
Doc: Data Table Loader
Doc: POI Loader
Doc: BIM, Digital Twin Local
High Level Types
Supported Protocols, HowTo add...
Interoperability & Standards
Copernicus Satellite Data

How to ingest with most relevant HLT

main High Level Types	1st option	2nd option
POI, Point of Interest	IOT App/Proc.Logic or POI Loader (from EXCEL files)	Create an Entity Model, Entity Registration , ingest via IoT App
IoT Devices, KPI multivariable, WoT, Entities Instances	Create an Entity Model, Entity Registration , ingest via broker (e.g., Time Series) or IoT App/proc.Logic	Data Table Loader (from EXCEL files)
GIS data	Use GIS API from IoT App/Proc.Logic, Create an Entity Model, Entity Registration , ingest via IoT App/Proc.Logic	Load them on GeoServer
Satellite Data	Use Snap4City tool to download satellite data and push them into the Heatmap Manager/GeoServer , via API	<i>(seen in Course Part 3)</i>
Traffic Flow	Compute the traffic flow and/or load them into the TrafficFlow Manager , via API	<i>(seen in Course Part 3)</i>
Heatmaps	Compute them and/or push them into the Heatmap Manager/GeoServer , via API	<i>(seen in Course Part 3)</i>
OD Matrices	Compute the ODM and/or push them into the OD Manager , via API	<i>(seen in Course Part 3)</i>
BIM Models	Produce them on some BIM editor, convert into IFC and load them on BIM Manager and server	<i>(seen in Course Part 3)</i>
MyKPI (single var)	Create them on MyKPI Manager , save/load by using IoT App / Proc.Logic and/or API	<i>(seen in Course Part 2)</i>

Data Inspector

Snap4City

Switch To New Layout (Beta)

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3

LOGOUT

- My Snap4City.org
- Tour Again
- www.snap4solutions.org
- Dashboards (Public)
- Dashboards of My Organization
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- My Data Dashboard Dev Kibana
- Extra Dashboard Widgets
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- File Manager
- HeatMap Manager
- BIM Server old
- BIM Server New
- BIM Srv New: Add
- BIM Srv new: View
- OpenData Manager: Data Gate
- OpenData Manager: Data Gate

Data Inspector

Map

METRO729

VALUE NAME: METRO729

DESCRIPTION	DESCRIPTION	RT DATA
congestionLevel	109.37501	Last value, Last 4 hours, Last 24 hours, Last 7 days
dateObserved	2023-07-08T17:15:00.000Z	Last value, Last 4 hours, Last 24 hours, Last 7 days
vehicleFlow	1138.9792	Last value, Last 4 hours, Last 24 hours, Last 7 days

Keep data on target widget(s) after popup close: ☐

Single data widgets
Multi data widgets

Map Controls:

FilterMap GPSUser GPSOrg

Now displaying in Standard Mode

Switch to the Synoptic Mode to select MyKPIs and sensors that you need for your synoptics.

Switch now to the Synoptic Mode

Data sources

High-Level Type	Nature	Subnature	Device/Model	Broker	Value Name	Value Type	Data Type	Value Unit	Last Date	Last Value	Healthiness	Last
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO792	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO791	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO793	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO713	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO729	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO7	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO760	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO799	orionUNIFI			sensor_map		2023-07-08 13:55:00			2023-07-08

Hide column Reset filters Selected rows: 1 Previous 1 2 3 4 5 ... 262 Next

metro7

vehicleFlow

1139

vehicleFlow - Day

HLT wrt to Time Series, GPS and Geometry

High Level Types	Evolution over time ?	May have GPS/Geom
POI, Point of Interest	Sporadically, for versioning	Yes/Yes
IoT Devices, KPI multivariable, WoT Entities	A set of values for each time instant of observation (dateObserved)	Yes/Yes
GIS data	Sporadically, for versioning	Yes/Yes
Satellite Data	An image for each time instant of observation (dateObserved)	Yes/Yes
Traffic Flow	A Traffic Flow network for each time instant of observation (dateObserved)	Yes/Yes
Heatmaps	An Heatmap for each time instant of observation (dateObserved)	Yes/Yes
OD Matrices	An ODM for each time instant of observation (dateObserved)	Yes/Yes
BIM Models	Sporadically, for versioning	Yes/Yes
MyKPI (single variable)	A value for each time instant of observation (dateObserved)	Yes/no
3D model data	Sporadically, for versioning or for model kind for example	Yes/Yes
<i>Messages exchanged with Dashboards</i>	<i>A set of values for each time instant of observation (dateObserved)</i>	No/No
<i>Messages exchanged with Synoptics</i>	<i>A set of values for each time instant of observation (dateObserved)</i>	No/No

Substantially

- **Entities** are used to model Digital Twins and thus:
 - POI, MyPOI, KPI, MyKPI, IoT Devices, etc.
 - **including: metadata info, time series, GPS position, geometries, hyper Links, and Actions which are links to tools/functions/processes to Act on them**
- **Complex Data** such as used to model spec. aspects as Traffic Flow, Heatmaps, ODM, BIM, TV cameras, 3D elements, .. :
 - Are placed on map as an Entity plus **additional information** into a dedicated <data> Manager
 - **Entity includes: metadata info, time series, GPS posizione, geometries, iper Links, and Actions which are links to tools/functions/processes to Act on them**

TOP

Classification by Nature/SubNature

Semantic Classification



Data Inspector

Snap4City

Switch To New Layout (Beta)

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3

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IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO7	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08 14:05:00
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO760	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08 14:05:00
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO799	orionUNIFI			sensor_map		2023-07-08 13:55:00			2023-07-08 13:55:00

Hide columns Reset filters Selected rows: 1 Previous 1 2 3 4 5 ... 262 Next metro7

vehicleFlow

1139

vehicleFlow - Day

Any Entity has a Semantic Classification

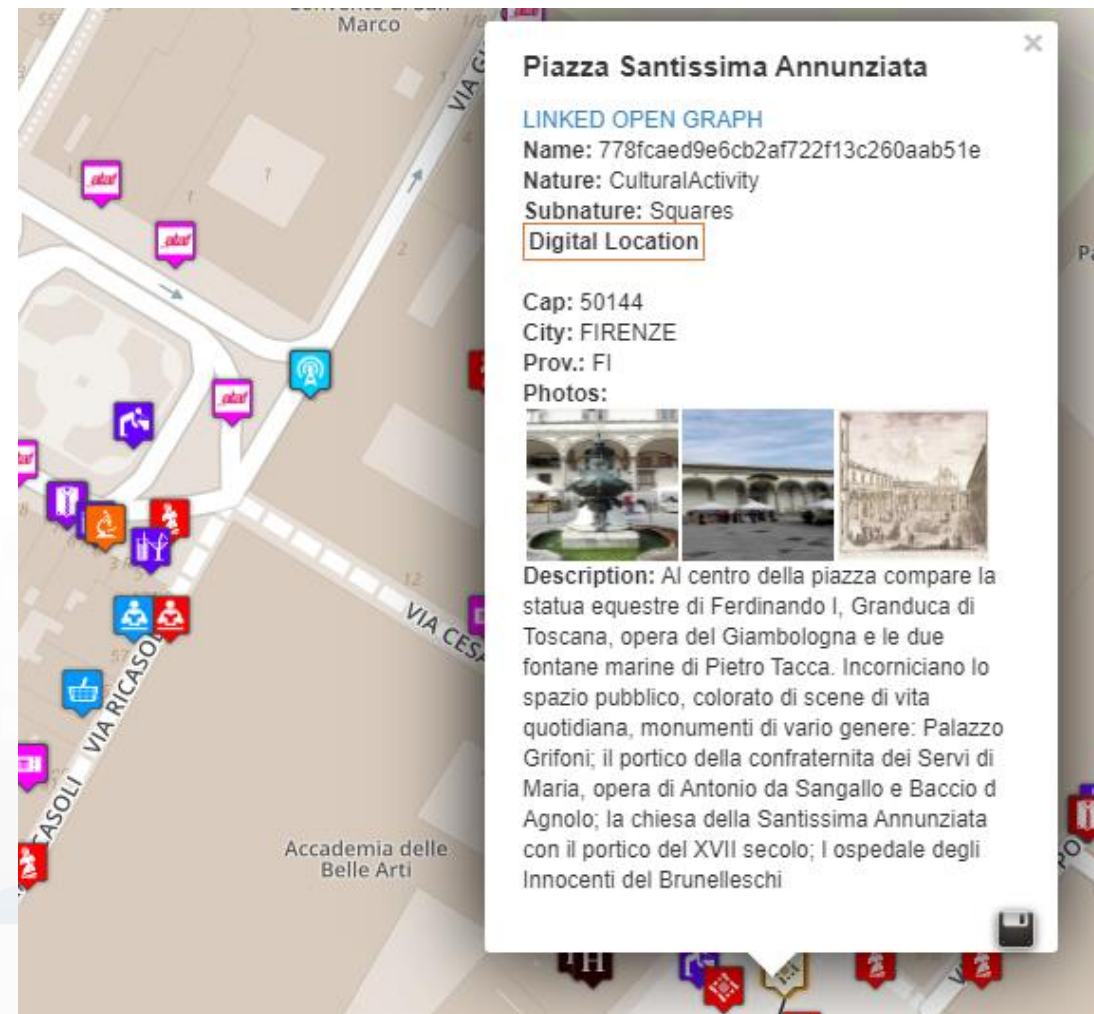
Nature

- Accommodation +
- Advertising +
- AgricultureAndLivestock +
- CivilAndEdilEngineering +
- CulturalActivity +
- EducationAndResearch +
- Emergency +
- Entertainment +
- Environment +
- FinancialService +
- GovernmentOffice +
- HealthCare +
- IndustryAndManufacturing +
- IoTDevice +
- MiningAndQuarrying +
- ShoppingAndService +
- TourismService +
- TransferServiceAndRenting +
- UtilitiesAndSupply +
- Wholesale +
- WineAndFood +

SubNature

- ☒ EducationAndResearch -
 - ☐ Educational_support_activities
 - ☐ Higher_education
 - ☐ Language_courses
 - ☐ Performing_arts_schools
 - ☐ Post_secondary_education
 - ☐ Pre_primary_education
 - ☐ Primary_education
 - ☐ Private_high_school
 - ☐ Private_infant_school
 - ☐ Private_junior_high_school

SKOS



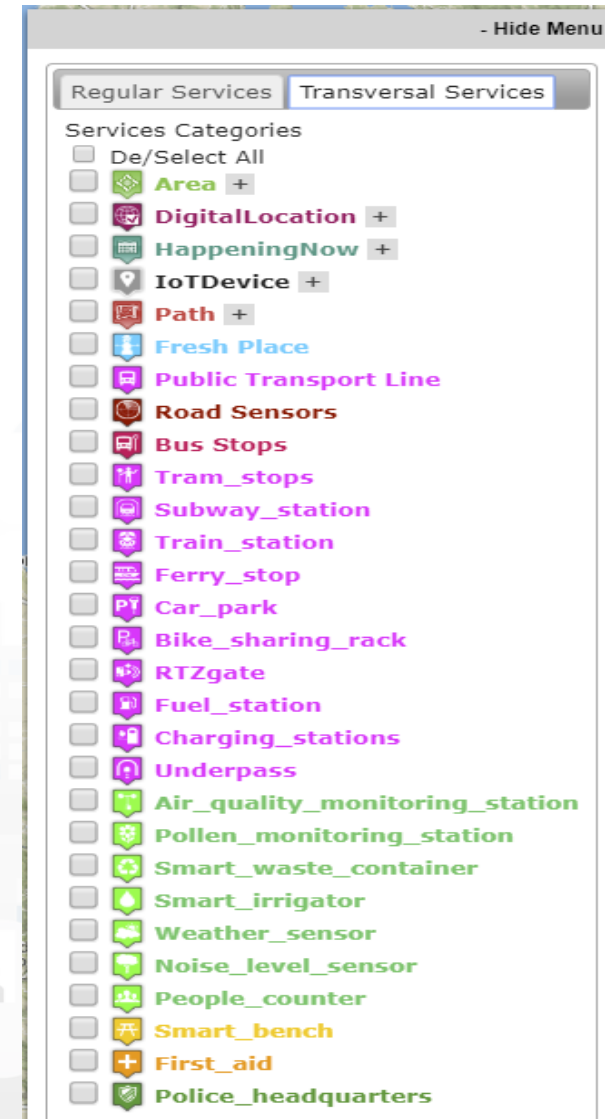
TOP

Point of Interests, POI *mainly static data*



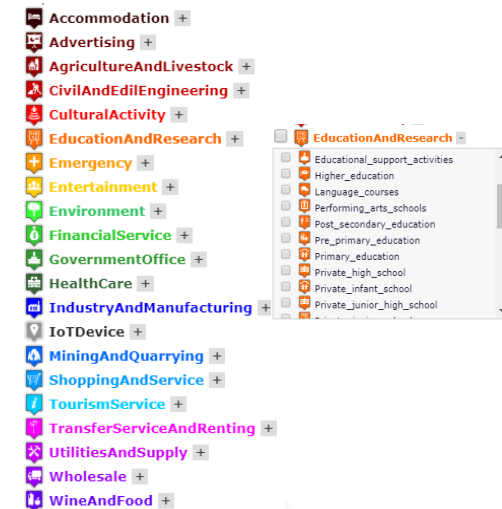
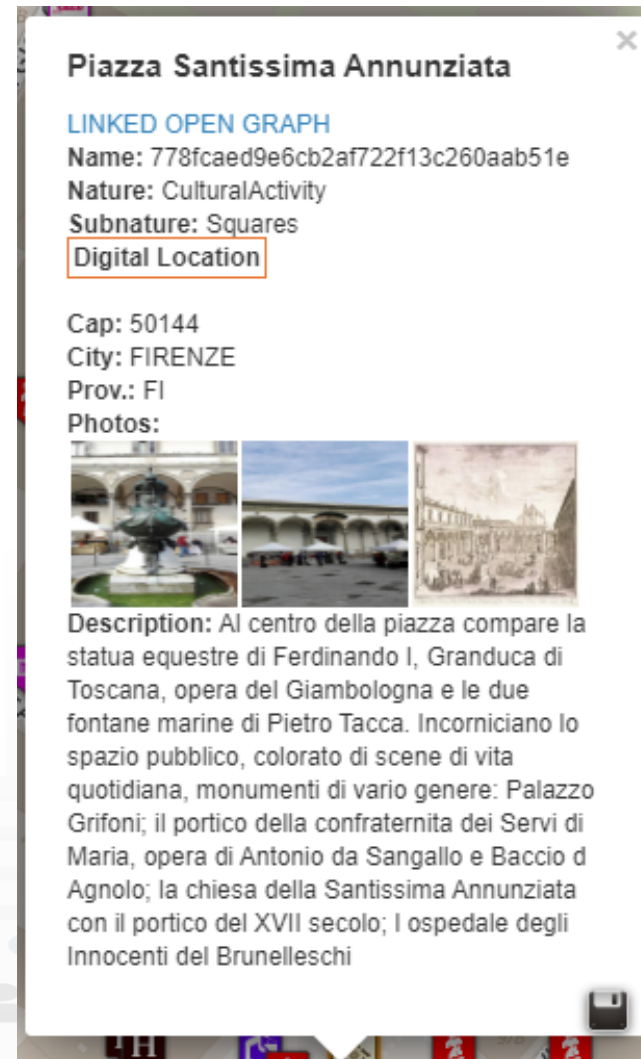
Access to Point of Interest information, POI

- **POI:** point of interest
- **type:** macro (nature) and subcategories (subnature)
- **Position:** GPS, address, telephone, fax, email, URL, ...
- **Description:** textual, multilingual, with images, ...
- **Link to dbPedia, Linked Open Data**
- **Links to other services**
 - **Not Real time data if any, please use Entities / devices connected:** sensors data, timeline, events, prices, opening time, rules of access, status of services, status of queue, etc..
- *See transversal services on ServiceMap*
 - *Regular and in test platform*



POI, Point of Interest

- They are
 - classified in terms of nature/subnature
 - relevant services with codified **metadata** to simplify the massive management of huge amount of POIs
 - mapped on Knowledge Base on **specific GPS location**
 - Do not move over time
 - represented as PIN
- **Do not have Time Series** for variable over time
- May sporadically change over time



Time Series can be: IoT Devices, MyKPI, Entities, etc.



IOT Device



Entity: IOT
Device

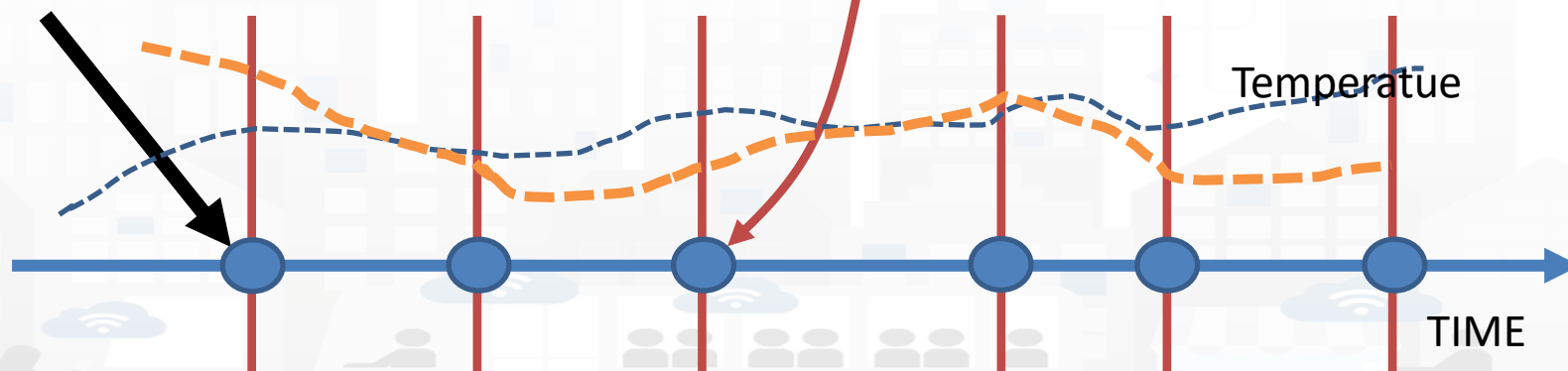
Sends a
message

Message (
timestamp: 02-04-2020 at 10:30,
Temperature: 29.34,
Humidity: 35
)

dateObserved	Temp	Humidity
02-04-2020 10:30	34.5	23
02-04-2020 10:40	36.5	24
02-04-2020 10:50	36.0	22.5

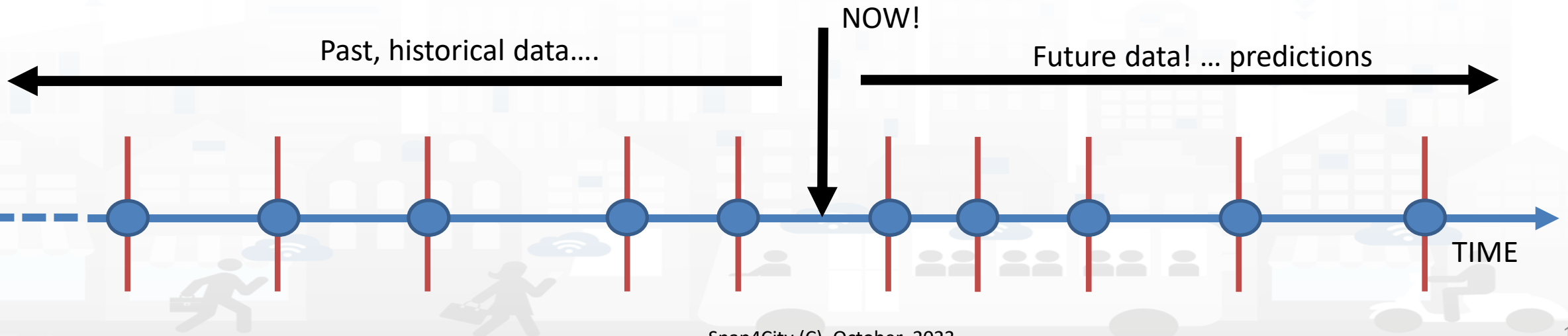
What About a Time Series

- A set of data coming from an IoT Device with multiple sensor become a time series of values for devices.
 - For example: taking a new measure every 10 minutes (**Red Lines**)
 - Non regular rates can be valid data as well.
- Each new measure in Snap4City is conventionally time located in «**dateObserved**», which has to be **Unique**.
 - **Only one message per dateObserved is allowed**



Time Series: they are data streams

- As soon as you have a variable changing over time → time series
 - You are ready to get Future data, may be arriving in PUSH
 - Recall and store historical data as well, but they have to be
 - recalled in PULL with some IoT App/Proc.Logic
 - Loaded in PULL with some File or Data Table Loader



A time series

The messages posted on Entity Instances / IoT Devices can produce different effects on time series.

Omitting the message would allow the broker to reuse the last data to fill it, as for V5, which appear

- valid in all messages on graphs
- With holes in tables

Putting null values (as in V3) would produce a missing data and thus would lead to create:

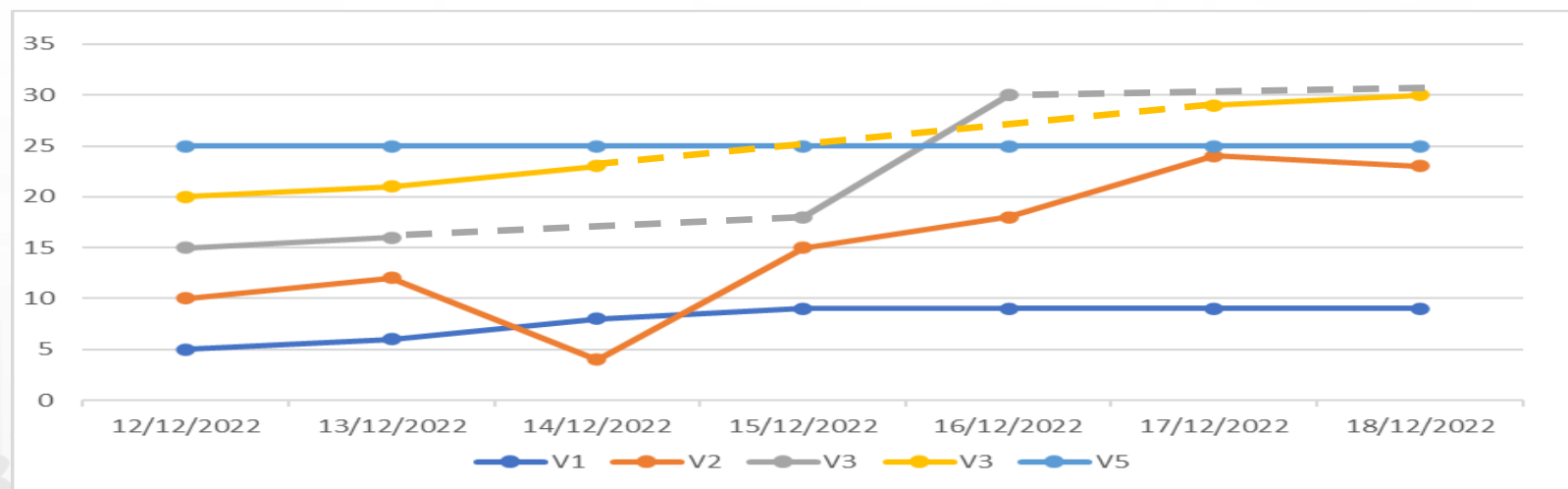
- interpolate line on graphs: dashed are actually continuous lines in Dashboards
- Empty values in the tables

device42

Entity Messages over time

12-12-2022	13-12-22	14-12-22	15-12-22	16-12-22	17-12-22	18-12-22
V1: 5	5	6	8	9	9	9
V2: 10	10	12	4	15	18	24
V3: 16	15	16	null	18	30	null
V4: 20	20	21	23	null	null	29
V5: 25	25	25	25	25	25	25

Color for missed



IoT Devices, Entities Instances, WoT



IoT Device Models



IoT Device

- Name: CM23
- Model: Lavazza
- Position:

IoT Device Variables

- **dateObserved:**
- ID: CM23
- Status: ready
- Temperature: 70°
- WaterLevel: 35%
- UsedCapsBox: 30%
- Power: OK
-

- Conceptually are Devices with sensors/actuators, IN/IN-OUT
- They are classified in terms of nature/subnature
- For Searching and showing on maps and dashboards
HLT of Devices/Entities can be:

- **(IoT Device) Entity Models**, for example: «personal coffee machine»
- **Entity** name, for example: «mycoffemachine1», «CM23»
- **Entity Variable**, for example: «Temperature»



Mobile Devices/Entities



Mobile Device Models



Mobile Device

- Name: BMWJD7356HD
- Model: BMW 318
- Spec:...

Mobile Entity/device Variables

- ID: BMWJD7356HD
- **dateObserved:**
- Status: ready
- Temperature: 70%
- Gasoline: 35%
- Velocity: 231,3 Km/h
- **Position: 44.3223, 11.3432**
-

- They are a special case of devices/entities
 - they are managed as Devices/Entities in the system
 - They are classified in terms of nature/subnature
 - For Searching and showing on maps and dashboards, they are different
- HLT of Mobile Devices/entities** can be:
- **Mobile Entity Model**, for example: «sedan»
 - **Mobile Entity Instance** name, for example: «BMW JD7356HD», «Ford KO786KK»
 - **Mobile Entity Variable**, for example: «velocity»



Sensor/Sensor-Actuator



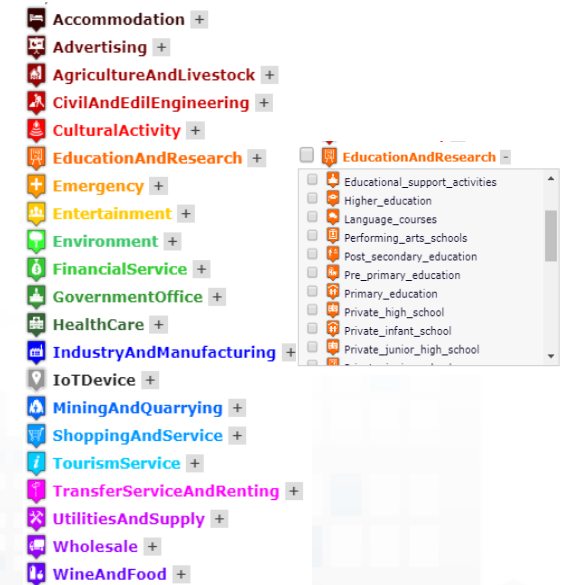
IoT Device

- Name: CM23
- Model: Lavazza
- Position:

Sensors

- **dateObserved:**
- ID: CM23
- Status: ready
- Temperature: 60°
- WaterLevel: 35%
- UsedCapsBox: 30%
- Power: OK
-

- They are classified in terms of nature/subnature
 - For Searching and showing on maps and dashboards
- HLT of Sensors/Sensor-Actuator** can be:
- **Sensor Device** name, for example: «mycoffemachine1», «CM23»
 - **Sensor/sensor-actuator** is a variable of a Sensor Device, for example: «Temperature»
- They do not have a model, while, in KB, have a reference process from which their real time data are collected from the field, from gateways, etc..



KPIs, Key Performance Indicators



- They are classified in terms of nature/subnature
- Typically associated with
 - City or infrastructure, so that the GPS can be city center
 - Some date: 2019, march 2019, etc.
- For example:
 - Number of Arrivals from France in March 2019
 - Average price for **** hotels in 2019, downtown
 - Net income of the region
 - CO2 saved in the April 2020
 - Total number of vehicles sold in 2020
 - Stock option value of Airport
- Note that in most cases:
 - They are time series, change over time, by year
 - they can be managed as *Virtual IoT Devices*

Data from INSETE

Basic Sizes of Incoming Tourism

Basic Sizes of Incoming Tourism of the Region of Western Greece 2019							
Regions	Countries Origin	Visits (in thousands)	Receipts (in € million)	Nights (in thousands)	Expenditure / Visit (in €)	Cost / Night (in €)	Average Length of Stay
West Hellas	Albania	132.9	26.5	225.8	199.7	117.5	1.7
	United Kingdom	47.7	17.9	345.8	375.2	51.8	7.2
	Germany	70.3	36.4	672.4	517.9	54.1	9.6
	France	55.4	16.5	321.6	298.1	51.4	5.8
	Other	510.7	160.0	2,964.9	313.3	54.0	5.8
	Total	817.0	257.4	4,530.4	315.0	56.8	5.5
	% of the total	2.2%	1.5%	1.9%			

Source: BoG Border Research, INSETE Intelligence Editing

Basic Sizes of Incoming Tourism of the Region of Western Greece 2018							
Regions	Countries of Origin	Visits (in thousands)	Receipts (in € million)	Nights (in thousands)	Expenditure / Visit (in €)	Cost / Night (in €)	Average Length of Stay
West Greece	Albania	138.7	29.0	222.9	209.2	130.1	1.6
	United Kingdom	42.6	13.5	180.6	317.6	74.9	4.2
	Germany	71.3	26.0	466.5	365.1	55.8	6.5
	France	44.2	13.5	262.9	304.7	51.2	6.0
	Other	402.5	129.8	2,050.7	322.4	63.3	5.1
	Total	699.2	211.8	3,183.5	302.9	66.5	4.6
	% of the total	2.0%	1.4%	1.4%			

TOP

Classification of Variables of Devices, Entities, Sensors, etc. Data Dictionary



Data Inspector

Snap4City

Switch To New Layout (Beta)

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3

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IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO7	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08 14:05:00
IoT Device	TransferServiceAndRenting	Traffic_sensor	METRO760	orionUNIFI			sensor_map		2023-07-08 14:05:00			2023-07-08 14:05:00
Device	TransferServiceAndRenting	Traffic_sensor	METRO799	orionUNIFI			sensor_map		2023-07-08 13:55:00			2023-07-08 13:55:00

Hide columns | Reset filters | Selected rows: 1 | Previous | 1 | 2 | 3 | 4 | 5 | ... | 262 | Next

vehicleFlow

1139

vehicleFlow - Day

HLT: Unified Classification for Data and Services

IoT Device Variable, Sensor Device	All selected (15)	All selected (48)	All selected (27)		All selected (1499)	All selected (159)	All selected (15)	All selected (63)			All selected (2)	All selected (2)	
High-Level Type	Nature	Subnature	Device/Model	Broker	Value Name	Value Type	Data Type	Value Unit	Last Date	Last Value	Healthiness	Last Check	Ownership
IoT Device Variable	IoTDevice	IoTSensor	devicetest1	orionUNIFI	temperature	temperature	float	°C	2018-05-31 19:16:05		●	2021-10-15 10:01:02	private (My Own)
IoT Device Variable	IoTDevice	IoTSensor	devicetest1	orionUNIFI	humidity	humidity	float	#			●	2021-10-15 10:01:02	private (My Own)
IoT Device Variable	IoTDevice	IoTSensor	MyThermometer_001	orionUNIFI	temperature	temperature	float	°C			●	2021-10-15 10:01:01	private
IoT Device Variable	IoTDevice	IoTSensor	MyThermometer_001	orionUNIFI	humidity	humidity	float	#			●	2021-10-15 10:01:01	private
IoT Device Variable	IoTDevice	IoTSensor	adminTest1	orionUNIFI	temperature	temperature	string	°C			●	2021-10-15 10:01:00	private (My Own)
IoT Device Variable	IoTDevice	IoTSensor	adminTest1	orionUNIFI	humidity	humidity	string	%			●	2021-10-15 10:01:00	private (My Own)
IoT Device Variable	IoTDevice	IoTSensor	newmarcodev1	orionUNIFI	temperature	temperature	float	°C			●	2021-10-15 10:00:59	private
IoT Device Variable	IoTDevice	IoTSensor	newmarcodev1	orionUNIFI	humidity	humidity	float	%			●	2021-10-15 10:00:59	private
Hide columns		Reset filters	Selected rows: 1		Previous 1 2 3 4 5 ... 2466 Next				Search				

High Level Types

Nature

SubNature

**Semantic
Classific.**

Dev/Model name

Broker name

**Technical
Source**

Value Name

Value Type

Data Type

Value Unit

Variables, names

Last Date/Time

Last Value

**Real
Time**

Healthiness


Last Check

Status

Ownership
Organization


**For
Admin**

• HLT: MyKPI

- **Nature:** Industry and manufacturing
- **Subnature:** Chemical
- **Value Name:** CloroParaffine
- **Value Type:** Density percentage
- **Value Unit:** %
- **Data Type:** float mykpi
- **Last Date:** 2019-02-25 «*DateTime*»
- **Last Value:** 87.0
- **Healthiness:** 
- **Last Check:** 2020-04-03 10:28:12
- **Ownership:** private for xyz...
- **Organization:** Firenze

Single Variable for MyKPI

• HLT: IoT Device, Sensor Device, Data Tab Device

- **Nature:** Industry and manufacturing
- **Subnature:** Chemical
- **Value Name:** Irrigator fioriera Gag
- **Value Type:** Battery Level
- **Value Unit:** V
- **Data Type:** float
- **Last Date:** 2020-04-01 12:59:00 «*dateObserved*»
- **Last Value:** 5.18
- **Healthiness:** 
- **Last Check:** 2020-04-03 03:28:12
- **Ownership:** public/private
- **Organization:** Firenze

This Section
is repeated
for each
variable

an IoT Device may have multiple Sensors/variables

Unified Data and Services Model/Classification

Semantic
Nature

SubNature

SubNature

Technical meaning

Value Type

Value Unit

Value Unit

- Exists a Dictionary for the 4 categories
- They are related each other and not all values are possible
- **Right setting** leads to right rendering on graphs / dash
- **automated** combinations and processing
- The Dictionary is used by many tools

Technical meaning

^{Power}
Value Type

Value Unit

mW

Value Unit

KW

Data Type

Integer

Data Type

Float

Link to Friend Sensor as ServiceURI: Value Type

Value Unit

URL

Value Unit

KW

Data Type

String, URL

Data Type

Float

Example of Energy and its Value Units

Snap4City

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7
[LOGOUT](#)

My Snap4City.org
Tour Again
ダッシュボード
Dashboards (Public)
My Dashboards in All Org.
Dashboards of My Organization
My Dashboards in My Organization
My Data Dashboard Dev Kibana
My Data Dashboard Kibana
Extra Dashboard Widgets
Notificator
Data, my Data, OpenData
Knowledge and Maps
IOT Applications
IOT Directory and Devices
Resource Manager
View Resources
Managing Resources
Process Models
Processes in Execution
Process execution Archive
Dictionary Editor for Data Fields
Doc: Resource Manager

+ Insert new Dictionary element
Filter by Dictionary type

Show 10
Search:

Value Name	Dictionary Type	Description	Data Types	Parent Value Name	Child Value Name	Controls
Boats_and_shi...	subnature	Boats And Ships Rental		TransferServiceAndRenti...		EDIT DELETE
Bollard	subnature	Bollard		TransferServiceAndRenti...		EDIT DELETE
Bookshop	subnature	Bookshop		ShoppingAndService		EDIT DELETE
bool	value unit	boolean		dali_com_error, dali_dim...		EDIT DELETE
Botanical_and...	subnature	Botanical & Zoolog. Gardens		CulturalActivity		EDIT DELETE
Boxoffice	subnature	Boxoffice		Entertainment		EDIT DELETE
bpm	value unit	Beat per minute		average_heart_rate, avera...		EDIT DELETE
brightness_flag	value type	Brightness Flag	string		#	EDIT DELETE
broken_bikes	value type	Broken Bikes	integer		#	EDIT DELETE
Building_and_...	subnature	Build. & Indust. Clean. Activ.		Environment		EDIT DELETE

First << Prev 1...9 10 11...89 Next >> Last

Value Type: Energy

Value Units:

- Watt per hour
- KiloWatt per hour
- MegaWatt per hour

Please note on: Data Type

- Value Types have only a few number of **Data Types** because they represent how the data area treated into the system
- Therefore: main Data Types are:
 - **Float**: numbers with decimals large as you like, etc.
 - **Integer**: numbers, booleans (0/1), etc.
 - **String**: url, links, names, id, descriptions, status code, etc.
 - **Json**: structured data, vector, matrices, etc.
 -

IoT Device Model and Devices Data

Dictionary: updated at 11/2022

<https://www.snap4city.org/818>

IoT Device Model and Devices Data Dictionary: updated at 11/2022

View Edit Track Access control Convert

Any update and addition to the dictionary of snap4city.org has to be requested to snap4city@disit.org

if you have your own instance of the platform you can define your own dictionary and request a copy of the snap4city.org dictionary

The dictionary is used into the IoT Device Model definition, in mapping smart data models, and in creating full custom devices.

https://www.snap4city.org/drupal/sites/default/files/image_from_word/fil...

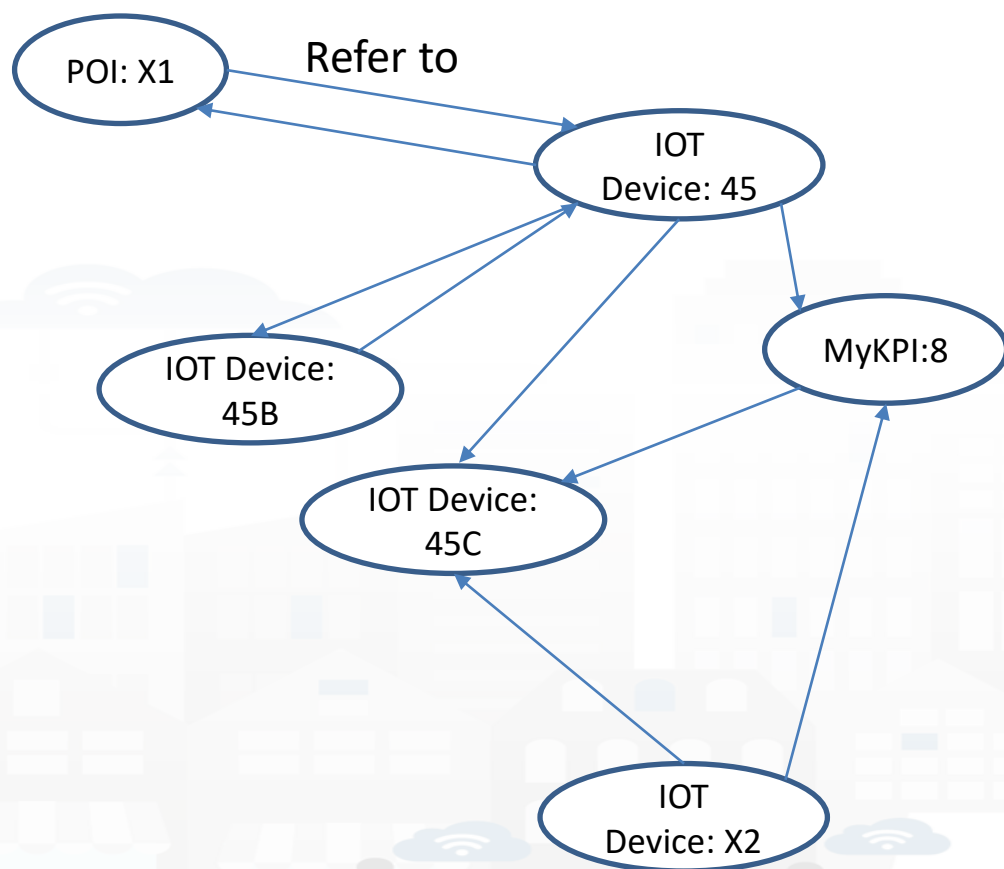
value type	Description	possible value Units	Possible Data Types
actuator_canceller	Actuator Canceller		string
actuator_deleted	Actuator Deleted		integer
actuator_deletion_date	Actuator Deletion Date	timestamp	string
air_quality_index	Air quality index		float
altitude	Altitude	m	float, integer
angle	angle	deg	float
annual_C6H6_average	annual_C6H6_average	ppm, mg/m ³ , µg/m ³	float
annual_C6H6_exceedance_count	annual_C6H6_exceedance_count	#	integer, float
annual_CO_average	annual_CO_average	ppm, mg/m ³ , µg/m ³	float
annual_CO_exceedance_count	annual_CO_exceedance_count	#	integer, float
annual_NO2_average	annual_NO2_average	ppm, mg/m ³ , µg/m ³	float
annual_NO2_exceedance_count	annual_NO2_exceedance_count	#	integer, float
annual_O3_average	annual_O3_average	ppm, mg/m ³ , µg/m ³	float

TOP

References/Links to Entities Instances / IoT Devices



Relationships among Devices/Entities, POI and MyKPI



- **Devices and POI** may refer to:
 - IoT Devices/Entities, POI, MyKPI, Heatmaps, etc.
 - The Links may change over time
- **MultiDataMap** can be used for navigation:
 - Among: IoT Devices, POI, MyKPI
 - Automated focus
 - Accessing Time Trends

IoT device with References to other and MyKPI

```
{  
  "id": "ThermalBOX1",  
  "type": "thermalbox",  
  "dateObserved": {"type": "string", "value": "2022-02-24T17:15:34.609Z"},  
  "latitude": {"type": "float", "value": "43.76965"},  
  "longitude": {"type": "float", "value": "11.25570"},  
  "SHTdevice": {"type": "string",  
    "value": "http://www.disit.org/km4city/resource/Viot/Vorion/Firenze2/Firenze/SHT20lab_new"},  
  "cam51count": {"type": "string", "value": "datamanager/Vapi/Vv1/Vpoidata/V17058000"},  
  "cam52count": {"type": "string", "value": "datamanager/Vapi/Vv1/Vpoidata/V17058001"},  
  ...  
}
```

Value Type: Identifier

Value Unit: ServiceURI

Data Type: String

//any query: such as those of the Selector

TOP

Data Ingestion Strategy and Orientation

FROM CITY
DASHBOARD TO
APPLICATIONS

DATA GATHERING
AND CITY DATA
KNOWLEDGE
MANAGEMENT

FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT/IOE DEVICES
AND NETWORKS

IoT APPLICATIONS,
THE LOGIC AND
THE SMARTNESS

ADVANCED
ANALYTICS,
MICROSERVICES,
SNAP4CITY API

SNAP4CITY
LIVING LAB FOR
COLLABORATIVE
WORK

SNAP4CITY FOR
BEGINNERS

SNAP4CITY
ARCHITECTURE AND
SCENARIO OF
DEVELOPMENT AND
DEVELOPER

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
WHAT-IF AND
SIMULATION

TWITTER
VIGILANCE: SOCIAL
MEDIA ANALYSIS

DECISION SUPPORT
SYSTEM AND CITY
RESILIENCE

HOW TO ADOPT
SNAP4CITY, AND
OUR ROADMAP

SNAP4CITY
AND KM4CITY
PROJECTS

SNAP4CITY THE
VIEW OF THE
ADMINISTRATORS

The main High Level Types

- **POI**: codified metadata, static GPS, + info, no time series
- **Entity Instance / IoT Device**: static GPS, Info, variable data, Time Series
 - Sensors and actuators
 - **Entity Mobile / IoT Device Mobile**: if dynamic GPS
- **MyKPI**: dynamic GPS, - info, single variable, Time Series
- *Heatmaps: matrices on some area, Time Series*
- *Traffic Flow: road segments with flow density, Time Series*
- *OD matrix: different parameters, Time Series*
- ...

Part 4

How to ingest with most relevant HLT

main High Level Types	1st option	2nd option
POI, Point of Interest	IOT App/Proc.Logic or POI Loader (from EXCEL files)	Create an Entity Model, Entity Registration , ingest via IoT App
IoT Devices, KPI multivariable, WoT, Entities Instances	Create an Entity Model, Entity Registration , ingest via broker (e.g., Time Series) or IoT App/proc.Logic	Data Table Loader (from EXCEL files)
GIS data	Use GIS API from IoT App/Proc.Logic, Create an Entity Model, Entity Registration , ingest via IoT App/Proc.Logic	Load them on GeoServer
Satellite Data	Use Snap4City tool to download satellite data and push them into the Heatmap Manager/GeoServer , via API	<i>(seen in Course Part 3)</i>
Traffic Flow	Compute the traffic flow and/or load them into the TrafficFlow Manager , via API	<i>(seen in Course Part 3)</i>
Heatmaps	Compute them and/or push them into the Heatmap Manager/GeoServer , via API	<i>(seen in Course Part 3)</i>
OD Matrices	Compute the ODM and/or push them into the OD Manager , via API	<i>(seen in Course Part 3)</i>
BIM Models	Produce them on some BIM editor, convert into IFC and load them on BIM Manager and server	<i>(seen in Course Part 3)</i>
MyKPI (single var)	Create them on MyKPI Manager , save/load by using IoT App / Proc.Logic and/or API	<i>(seen in Course Part 2)</i>

TOP

Ingestion of Points of Interest with POI Loader

FROM CITY DASHBOARD TO APPLICATIONS

DATA GATHERING AND CITY DATA KNOWLEDGE MANAGEMENT

FORGING & MANAGING OPEN AND FLEXIBLE WEB AND MOBILE APPS

IOT/IOE DEVICES AND NETWORKS

SMART APPLICATIONS, THE LOGIC AND THE SMARTNESS

ADVANCED SNAP4CITY, MICROSERVICES, SNAP4CITY API

SNAP4CITY LIVING LAB FOR COLLABORATIVE WORK

SNAP4CITY FOR BEGINNERS

SNAP4CITY ARCHITECTURE AND ECOSYSTEM. OPENED TO DEVELOPERS AND STAKEHOLDERS

DATA ANALYTICS, BUSINESS INTELLIGENCE, WHAT-IF AND SIMULATION

DECISION SUPPORT SYSTEM

HOW TO ADOPT SNAP4CITY, AND OUR ROADMAP

TWITTER VIGILANCE: SOCIAL MEDIA ANALYSIS

SNAP4CITY AND KM4CITY PROJECTS

SNAP4CITY THE VIEW OF THE ADMINISTRATORS

How to ingest POI

main	High Level Types	1st option	2nd option
	POI, Point of Interest	IoT App or POI Loader (from EXCEL files)	Create an Entity Model, Entity Registration , ingest via IoT App
	IoT Devices, KPI multivariable, WoT, Entities Instances	Create an Entity Model, Entity Registration , ingest via broker (e.g., Time Series) or IoT App	Data Table Loader
	GIS data	Pose query from IoT App, Create an Entity Model, Entity Registration , ingest via IoT App	Load them on GeoServer

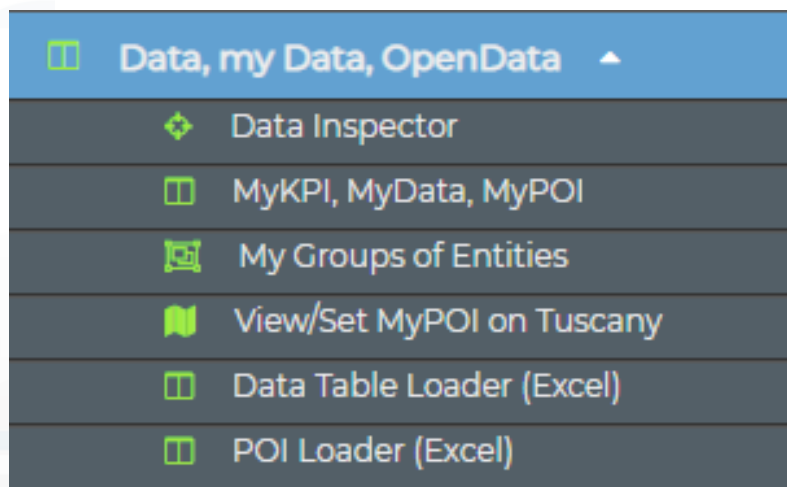
Ingestion of POI

- Their structure has been described previously
 - They do not change over time → they do not have dateObserved
- **Open Data** referring to services on the territory can be regarded as POI
- **POI Loader** to perform the automated loading of new POI
- There is also a **MicroApplication** which allows to load MyPOI one by one, and a procedure to pass from MyPOI to POI can be activated by the RootAdmin
- **POI may be modelled as Entity Instances / IoT Devices**

TOP

POI Loader, from Excel Files

(for authorized AreaManagers)



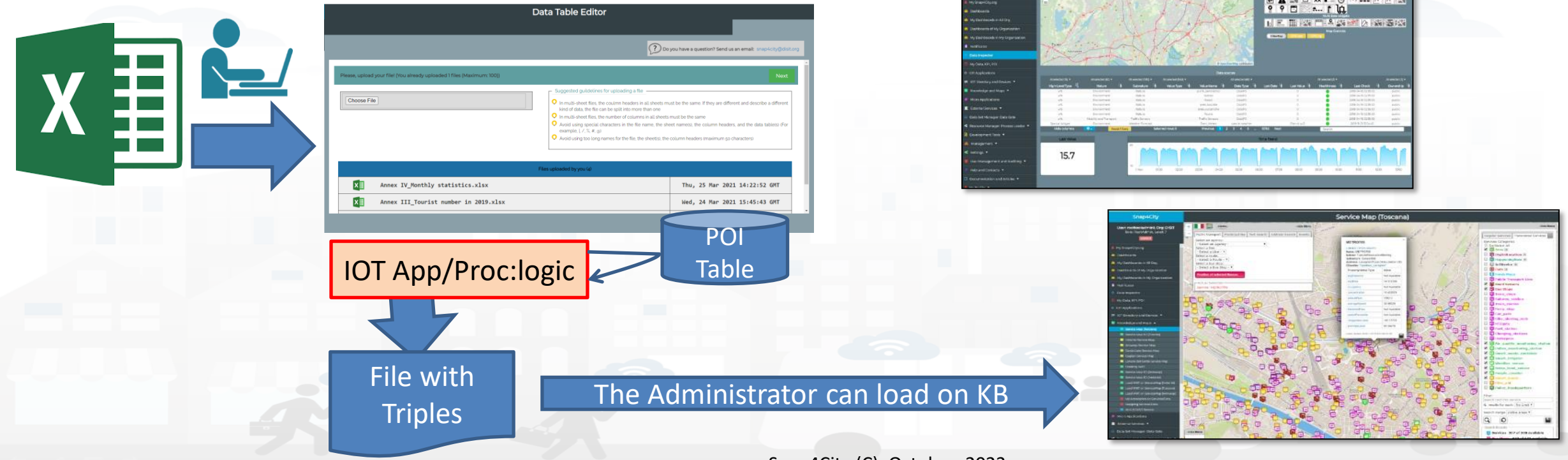
<https://www.snap4city.org/731>

POI, Point of Interest

- They are
 - classified in terms of nature/subnature
 - relevant services with codified **metadata** to simplify the massive management of huge amount of POIs
 - mapped on Knowledge Base on **specific GPS location**
 - Do not move over time
 - represented as PIN
- **Do not have Time Series** for variable over time
- May sporadically change over time



- To help you to **upload POI data in short/zero time** <https://www.snap4city.org/731>
 - **Start from Excel Files, they should be formatted some how or well formatted according to our guidelines (model provided)**
 - https://www.snap4city.org/drupal/system/files/private/POI_loader_template.zip
 - Custom upload for each Organization is possible on the provided IOT App/Proc.Logic
- To **enable you to**
 - create dashboards from them according to different views and nature



Snap4City

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

LOGOUT

- My Snap4City.org
- Tour Again
- ダッシュボード
- Dashboards (Public)
- My Dashboards in All Org.
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
- My Data Dashboard Kibana
- Extra Dashboard Widgets ▾
- Notificator
- Data, my Data, OpenData ▴
 - Data Inspector
 - MyKPI, MyData, MyPOI
 - My Groups of Entities
 - View/Set MyPOI on Tuscany
 - Data Table Loader (Excel)
 - POI Loader (Excel)**
 - Harvest Satellite Copernicus Data
 - HeatMap Manager
 - ColorMap Manager
 - TrafficFlow Manager
 - BIM Server old

POI Loader (Excel)

? Do you have a question? Send us an email: snap4city@disit.org

Please, upload your file, following the [Reference Template!](#) (You have uploaded 0 files (Maximum: 100))

Next

Scegli file

General Guidelines

- Use "Previous" and "Next/Save" (not browser navigation) buttons to move to previous and next pages
- Avoid using special characters in cells (For example,|,?)
- Avoid using special characters in file name (For example,|,/,#,@,%,"',';','\')
- Avoid using special characters in sheet name(s) and column headers (For example, blank space,|,/,#,@,%,"',';','\')
- Avoid using too long names for file name, sheet name(s), and column headers (maximum 50 characters)
- Avoid using line breaks in column headers

Uploaded Files (9)								
	Organization	File Name	Triple Status	RDF File	Upload Date & Time			
	Greece-UNISYSTEMS	ergaPOI2.xlsx	Created	ergaPOI2.n3	Tue, 29 Jun 2021 13:28:24 GMT	VIEW DETAILS	CHANGE STATUS	DELETE
	DISIT	Fresh_places.xlsx	Not Created	-	Fri, 11 Jun 2021 14:28:40 GMT	VIEW DETAILS	CHANGE STATUS	DELETE
	Greece-UNISYSTEMS	POI_citycare.xlsx	Created	POI_citycare.n3	Fri, 11 Jun 2021 12:28:48 GMT	VIEW DETAILS	CHANGE STATUS	DELETE

POI Structure, EXCEL

- nameENG, abbreviationENG, descriptionShortENG, descriptionLongENG
- Phone, Fax,
- url (web page), email
- refPerson
- secondPhone, secondFax, secondEmail, secondCivicNumber, secondStreetAddress
- notes
- timetable
- photo
- Other1, other2, other3
- Postalcode, Province, city
- streetAddress, civicNumber
- Latitude, longitude

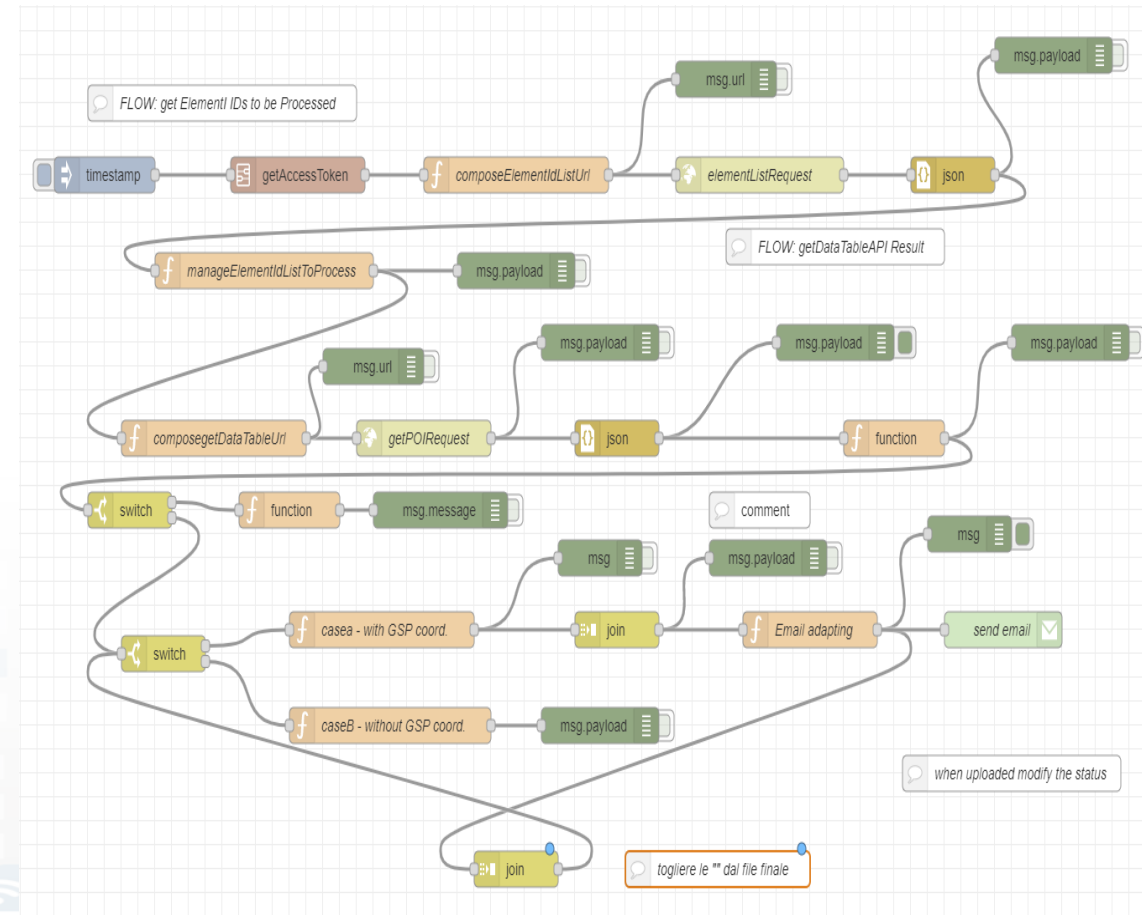
<https://www.snap4city.org/731> Manual

[illegible]

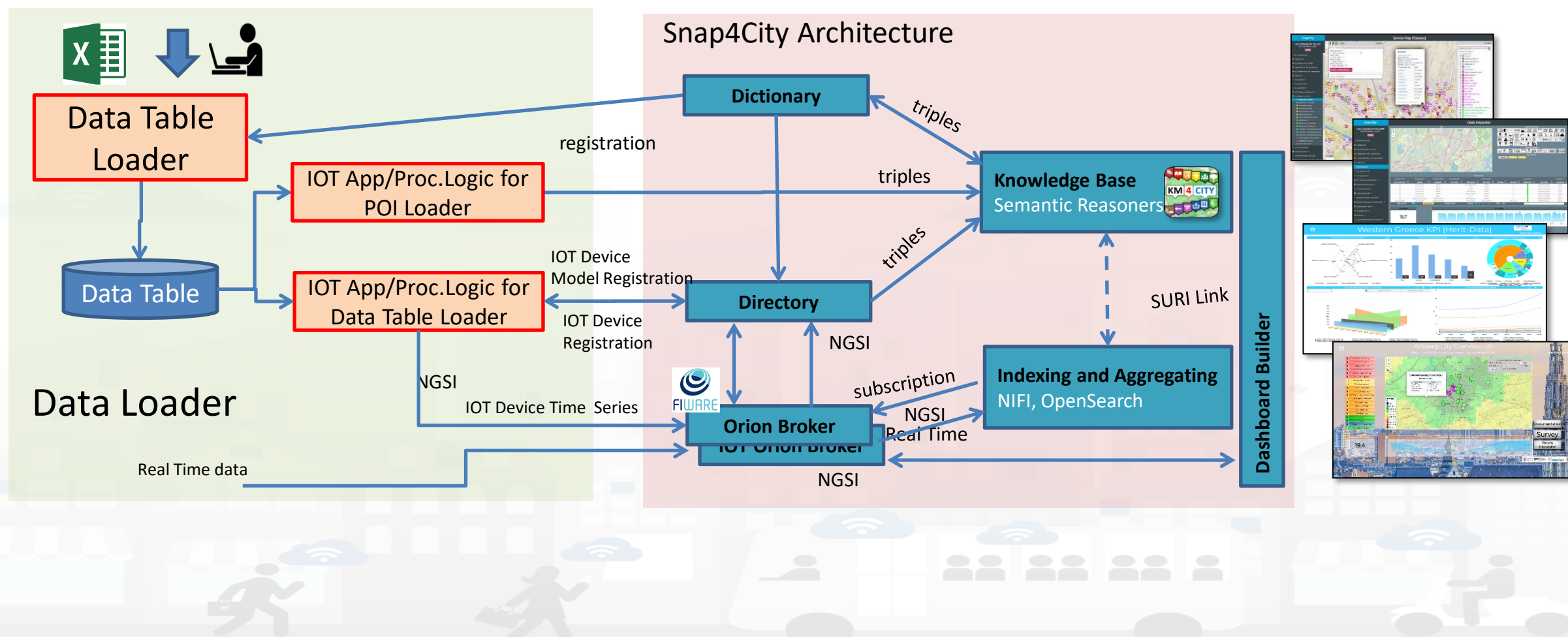
https://www.snap4city.org/drupal/system/files/private/POI_loader_template.zip

Note on POI Loader

- The structure of Excel File is fixed
- UTF8 characters can be used into the values and not in the device name neither on field names
- Follow the guidelines in the first page and the instruction during the upload
- POI Loading is performed via an IoT App which produces triples
 - They are verified and loaded by some administrator
- Any AreaManager can upload POI data sets but only specific dedicated responsible for data upload can actually load being owners and responsible of the IOT App process, which can be customized also.



Short cut Data Ingestion from Excel file



TOP

Models vs Devices/Entities and Registration

DATA GATHERING
AND CITY DATA
KNOWLEDGE
MANAGEMENT

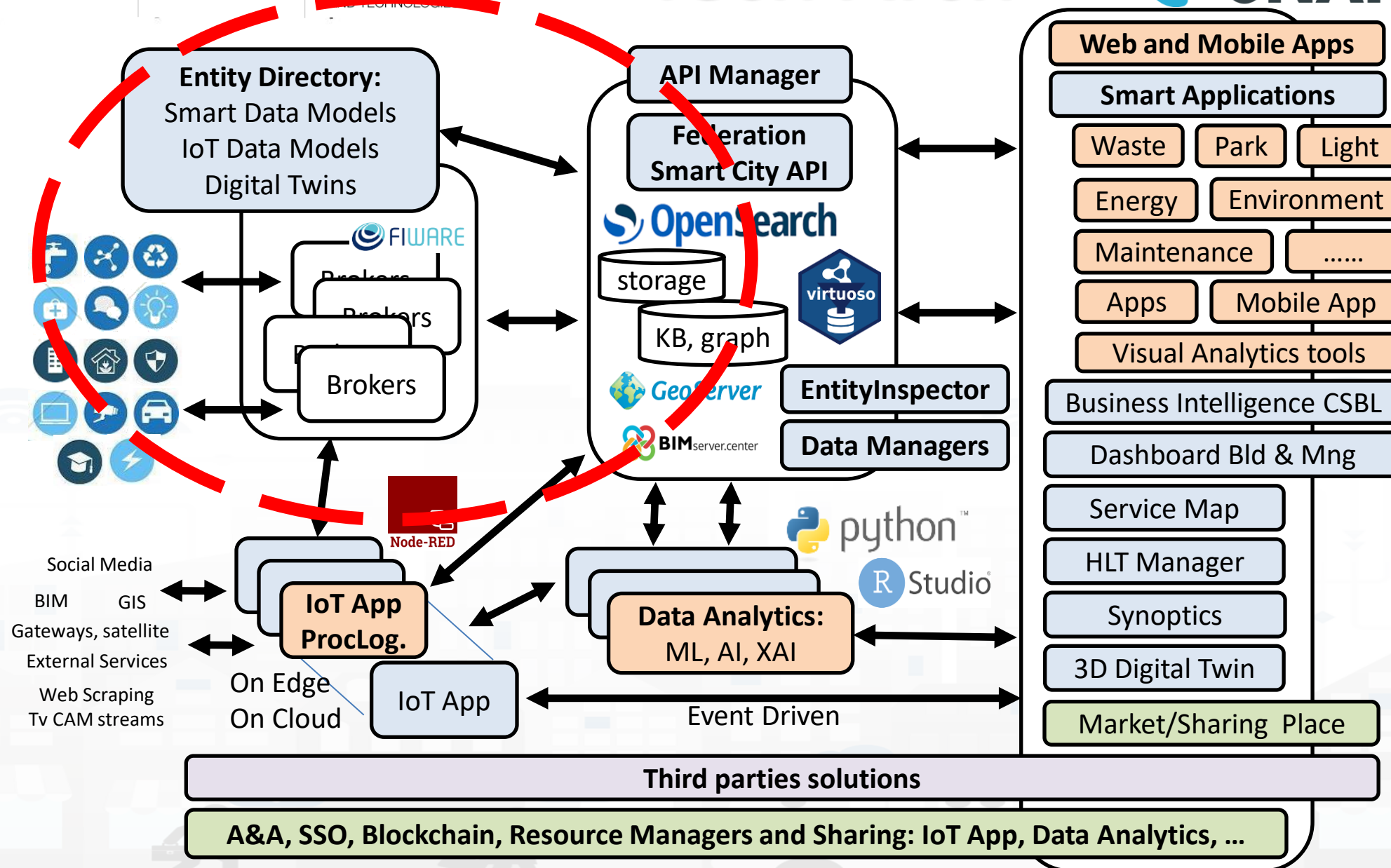
FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT/IOE DEVICES
AND NETWORKS

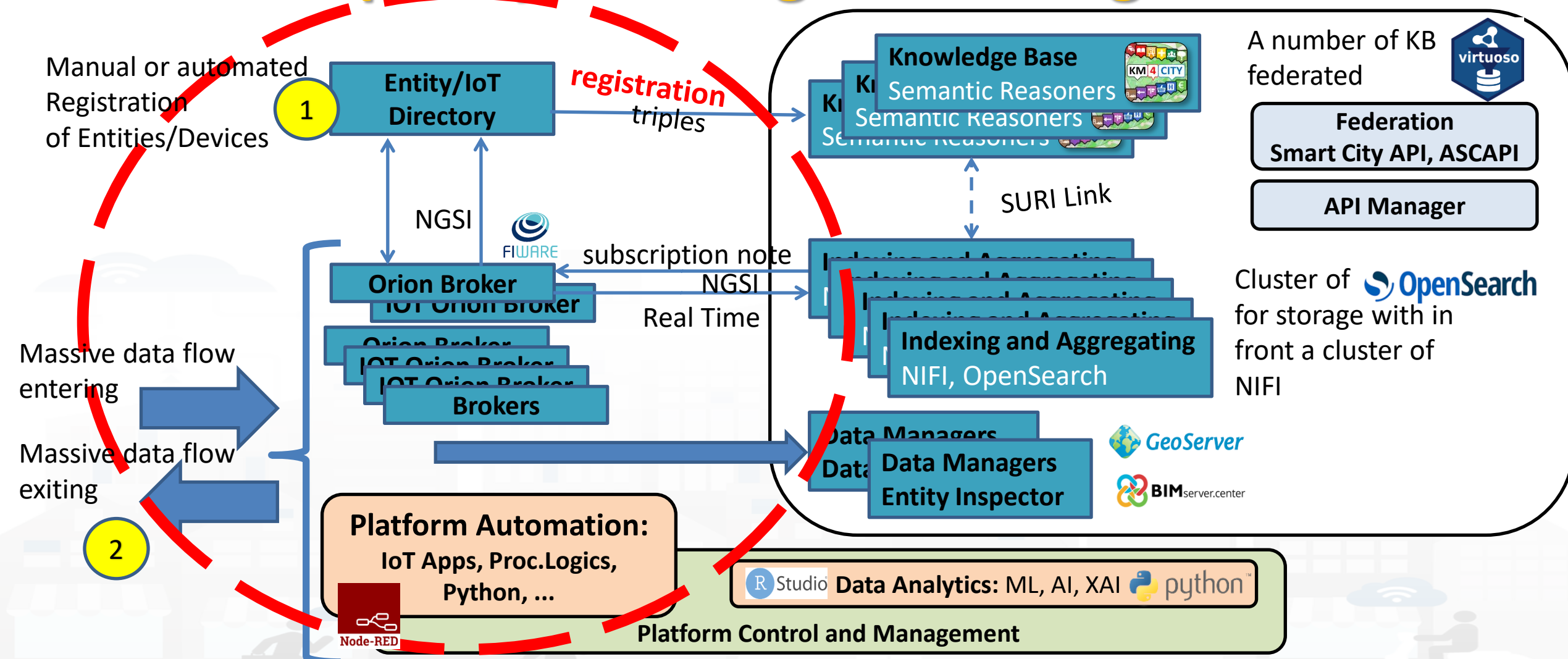
IOT APPLICATIONS,
THE LOGIC AND
THE SMARTNESS



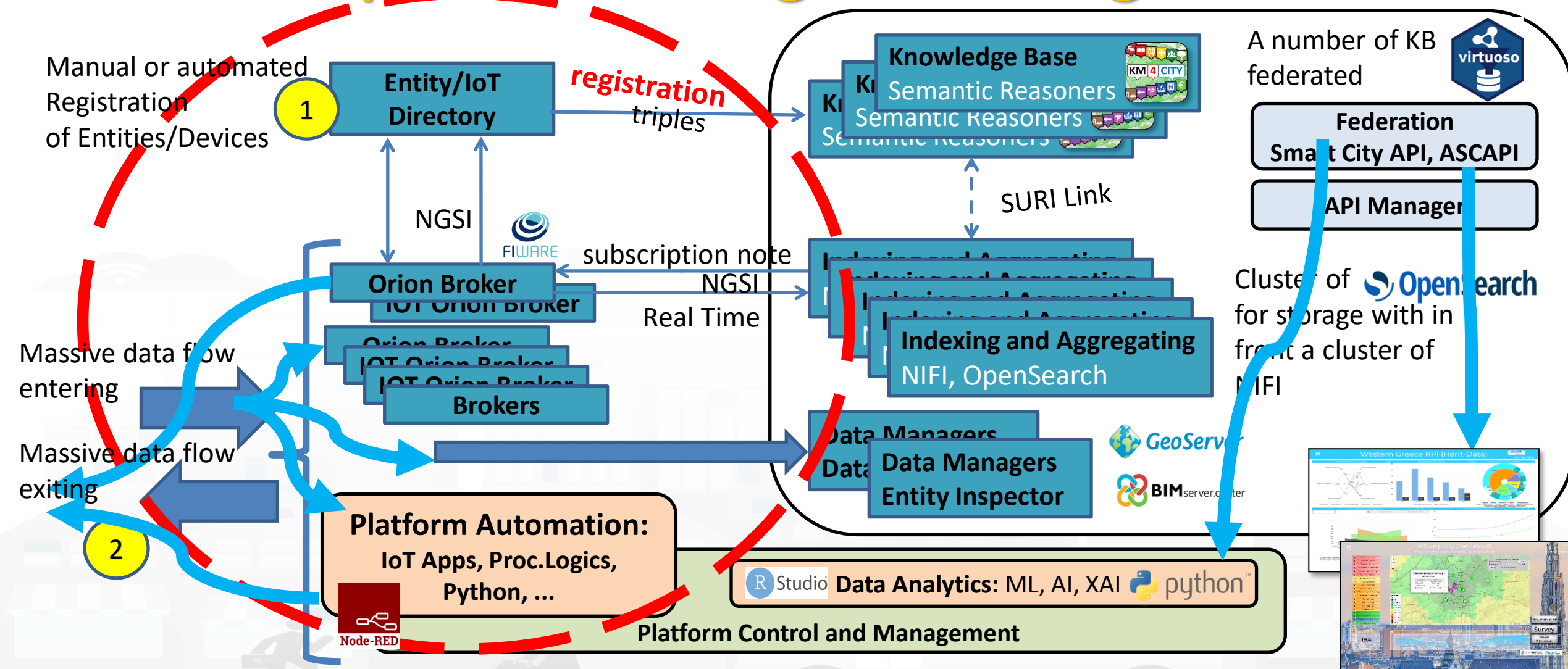
Tech Arch

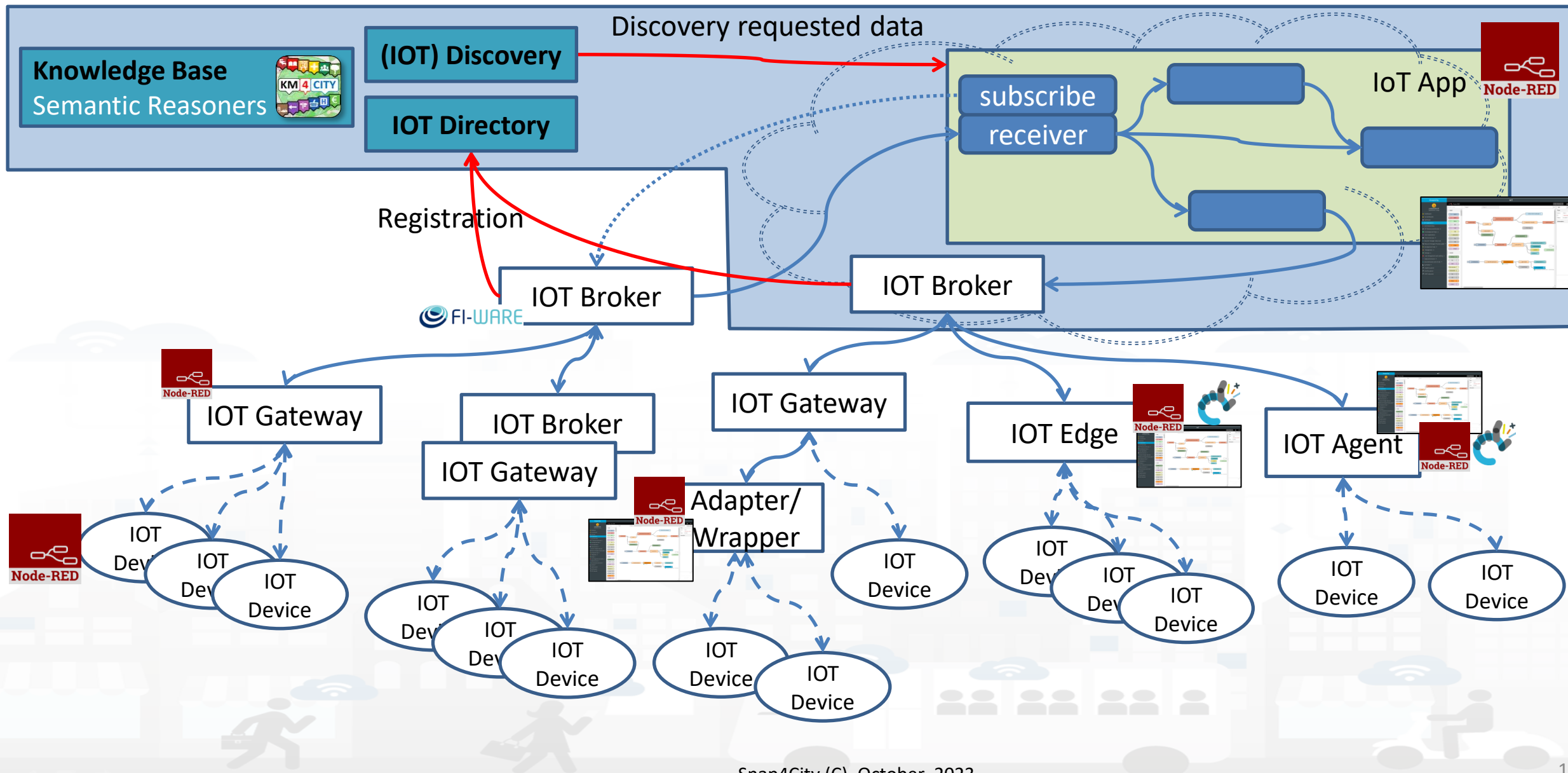


Snap4city Data Ingestion Diagram



Snap4city Data Ingestion Diagram

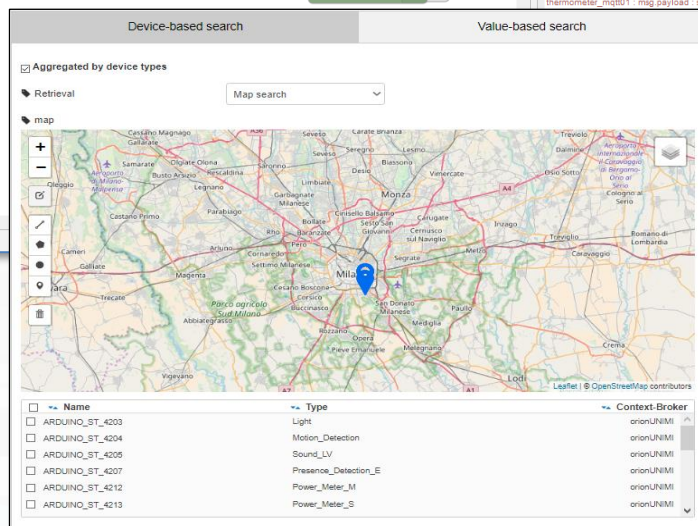
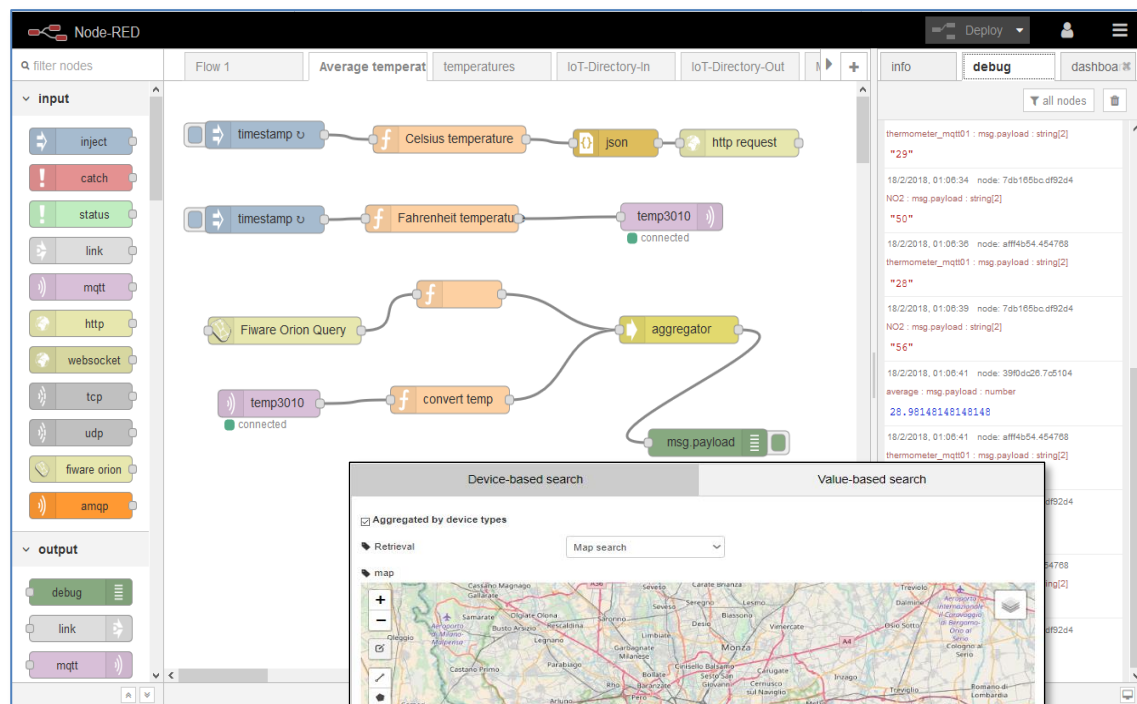




Directory Features vs Users Roles (07/23)

Entities	what	By using IOT Directory and:	Manager	AreaManager	ToolAdmin/ RootAdmin	Proc.Logic/IOT App microservices
Sensor/Actuator	Browse, use	Several Tools	X	X	X	Yes
	Delegate	API, ..	X	X	X	
	Discovery	KB, API, ..	X	X	X	Yes
Devices/Entities	Browse, use	Several Tools	X	X	X	Yes (use)
	Create, change, delete	API, ..	X	X	X	Yes
	Register in Bulk	API, ..		X	X	Yes
	Delegate, Change Owner	API, ..	X	X	X	Yes
	Discovery	KB, API, ..	X	X	X	Yes
Models (S4C, Fiware)	Browse, Use		X	X	X	(Yes)
	Create, change, delete		X	X	X	(Yes)
	delegate, change ownership		X	X	X	
Brokers	Browse, use		use	Browse, use	X	Yes (use)
	Register/change/Delete				X	
	Deploy Orion Broker				ToolAdmin	
	Delegate				X	
	Periodic Update				X	

Discovery on Proc.Logic/IoT App Node-RED



Node-RED interface showing a flow for device registration. The flow starts with a 'feedparser' node, followed by an 'exec' node, then an 'event log' node, and finally a 'device-registration' node. The 'device-registration' node is connected to a 'dashboa' panel. The interface also shows a 'debug' console with logs and a 'dashboa' panel.

Device Name:

Model:

Key 1 *

Key 2 *

These keys have been generated automatically for your device. Keep track of them. Details on [info](#)

TOP

Entity/Device Registration

many possibilities

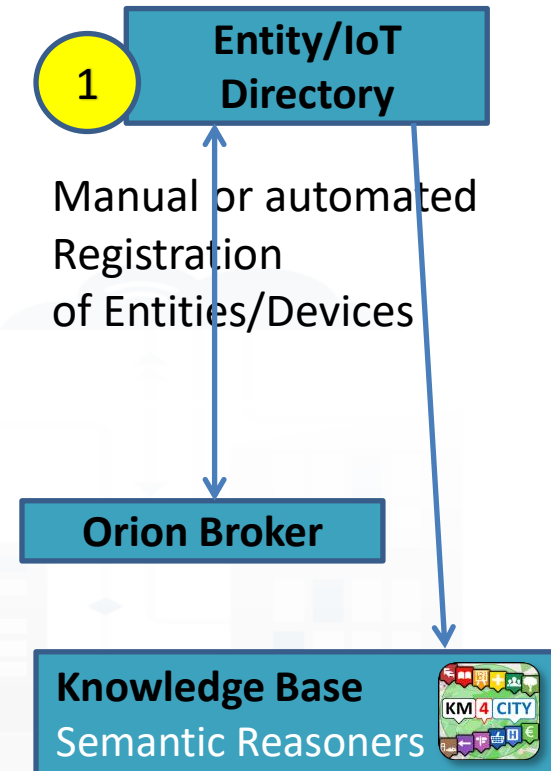
IOT Directory and Devices

- My IOT Sensors and Actuators
- IOT Sensors and Actuators
- IOT Devices
- IOT Devices Management
- IOT Device Discovery
- IOT Brokers
- IOT Device Models
- IOT Devices Bulk Registration
- IOT Broker Periodic Update setti...
- IOT Orion Broker Mapping Rules...
- ☒ Doc: IOT Directory and Devices
- ☒ Create an IOT Device Instance
- ☒ Create an IOT Device Model
- ☒ Add an IOT Device into Snap4Cit...



Benefits of Registration on Directory

- The registration implies the automated production of the Digital Twin Device into the Knowledge Base
 - Registration of the Entity on Brokers and KB
 - Activation of the Storage “DataShadow” for historical data access
 - Activation of all the relationships
 - Activation of Discovery mechanisms via Entity Directory, KB and SCAP, etc.
 - Activation of Dashboard Wizard (after a few minutes), and Data Inspector



Activities for Registration on Directory

- **Manual Registration**

- From scratch Single Device / Entity Registration
→ **Entity Directory / IoT Directory**
- From a template (the templates are called Models)

- **Automated Registration for bulk/massive registration: N Entities / Devices**

- From IoT App/Proc.Logic on the basis of some **Models** from IoT App
- From IoT App/Proc.Logic **loading a CSV** (with or without a reference IoT/Entity Model)
- Programming from scratch or from a **Model**
- On the basis of some EXCEL file with data by using the **Data Table Loader, which create model, devices and data**
- Etc.

1

Entity/IoT
Directory

Manual or automated
Registration
of Entities/Devices

[Switch To New Layout \(Beta\)](#)

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3

LOGOUT

- My Snap4City.org
- Tour Again
- www.snap4solutions.org
- Dashboards (Public)
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
- Extra Dashboard Widgets ▾
- Data Management, HLT ▾
- Knowledge and Maps ▾
- Processing Logics / IOT App ▾
- Entity Directory and Devices ▴
 - My IOT Sensors and Actuators
 - IOT Sensors and Actuators
 - Entity Instances, IoT Devices**
 - IOT Brokers
 - FIWARE Smart Data Models
 - Entity Models/IoT Devices
 - IOT Devices Bulk Registration**
 - Doc: IOT Directory and Devices
 - Create an IOT Device Instance
 - Create an IOT Device Model

Entity Instances, IoT Devices

Show delegated dev.

[Show public dev.](#)

Show my dev.

[Show all dev](#)

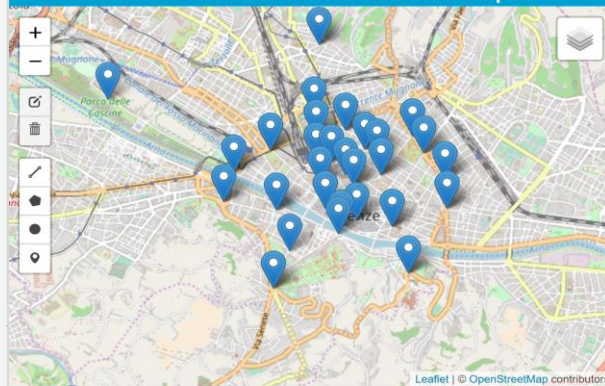
Show entries

Search:

	Device Identifier	IOT Broker	Device Type	Model	Ownership	Status	Edit	Delete	Location	View
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	orionUNIFI	File	fileModel	MYOWNPUBLIC	active	EDIT	DELETE		VIEW
+	alert_1610543238306	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610548534047	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610613189703	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610629197473	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	161063054074300	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	161063054074300	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	161063054074300	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	161063054074300	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	161063054074300	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW

Search Device Location on Map

Search Device Location on Map



Cancel

[Previous](#)

1

2

3

Next

What you can do ?

- List and browse your devices and those received in delegation
- Change ownership, control the delegation
- Edit, Change, delete all parameters
- View on map and view all data
- See details

Entity/IoT
Directory

	alert_1610548534047	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
Broker URI: https://broker1.snap4city.org				Broker Port: 8080						
Kind: sensor				Visibility: MyOwnPrivate						
Device Type: event				Format: json						
Protocol: ngsi				MAC:						
Model: AlertGeneric				Producer: disit						
Longitude: 11.241117				Latitude: 43.776703						
Device Uri: http://www.disit.org/km4city/resource/iot/orionUNIFI/DISIT/alert_1610548534047				VIEW IN SERVICE MAP						
Organization: DISIT				NEW DATA IN alert_1610548534047						
Owner: undefined										
PAYLOAD NGSI v1				PAYLOAD NGSI v2						
K1: 44eca781-af56-490f-a6c6-36d88b1bcd9c				K2: 6a620551-e4e5-4c0d-8777-d0721175cfb0						
Created on: 2021-01-13 15:35:41										

Add New Device

Add a new device

Info
IOT Broker
Position
Static Attributes
Values

Device Identifier
Device Identifier is mandatory

Device Type
Ok

Edge-Gateway Type

Producer

Private

Ownership

KEY1

Custom

Model
Ok

Mac Address

Edge-Gateway URI

600
sec

Frequency
Ok

Generate Keys

KEY2

Cancel Confirm

Add a new device

Info
IOT Broker
Position
Static Attributes
Values

Latitude
Latitude is mandatory

Longitude
Longitude is mandatory

Add a new device

Info
IOT Broker
Position
Static Attributes
Values

Value Name
Value name is mandatory

Value Type
Value type is mandatory

Value Unit
Ok

Data Type
Ok

Refresh rate

Healthiness Criteria

300
Ok

Remove Value

Value Name
Value name is mandatory

Value Type
Value type is mandatory

Value Unit
Ok

Data Type
Ok

Refresh rate

Healthiness Criteria

300
Ok

Remove Value

Value Name
Value name is mandatory

Value Type
Value type is mandatory

Value Unit
Ok

Data Type
Ok

Refresh rate

Healthiness Criteria

300
Ok

Remove Value

Add Value

Cancel Confirm

Add a new device

Info
IOT Broker
Position
Static Attributes
Values

ContextBroker
Context broker is mandatory

Protocol
Device protocol is mandatory

Service/Tenant
only ngsi w/MultiService supports Service/Tenant selection

sensor
Kind
Ok

Format
Device format is mandatory

ServicePath
only ngsi w/MultiService supports ServicePath


Cancel Confirm

Entity / Device: Attributes

Where	IOT Device	AT 23-12-2019T20:13:12...	AT 23-12-2019T22:13:12...
IOT Broker	Broker: OrionUNIFI	--	
IOT Broker	Protocol: NGSI	--	
Info	ID: "park45"	park45	park45
Position	GSP Position: 43.12, 11.34	GSP Position: 44.12, 11.12	GSP Position: 44.14, 11.13
Static attribute	Description: "parking massaia"	--	
Static attribute	Location: "Via Massaia"	--	
Static attribute	Civic Number: 3	--	
Static attribute	MaxCapacity: 456	--	
Values	dateObserved: Timestamp	23-12-2019T20:13:12...	23-12-2019T22:13:12...
Values	FreeSlots: Integer, #	345	356
Values	Humidity: float, %	25,5	25,5
Values	Temperature: float, celsius	34	

IoT Device Management for All, Developers

Snap4City

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3
[LOGOUT](#) 

My Snap4City.org

Tour Again

Dashboards (Public)

Dashboards of My Organization

My Dashboards in My Organization

My Data Dashboard Dev Kibana

Extra Dashboard Widgets ▾

Data, my Data, OpenData ▾

Knowledge and Maps ▾

IOT Applications ▾

IOT Directory and Devices ▴

My IOT Sensors and Actuators

IOT Sensors and Actuators

IOT Devices

IOT Brokers

IOT Device Models

IOT Devices Bulk Registration

Doc: IOT Directory and Devices

Create an IOT Device Instance

Create an IOT Device Model

Add an IOT Device into Snap4City

Resource Manager ▾

Development Tools ▾











IOT Devices

Show delegated dev. Show public dev. Show my dev. Show all dev.

Add new device

Show entries

Search:

	Device Identifier	IOT Broker	Device Type	Model	Ownership	Status	Edit	Delete	Location	View
+	alert_1610543238306	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610548534047	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610613189703	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610629197473	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610714974380	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610715864347	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610715997465	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610717002089	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610717247691	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610717428876	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW

Showing 1 to 10 of 108 entries

Previous

1

2

3

4

5

...

11

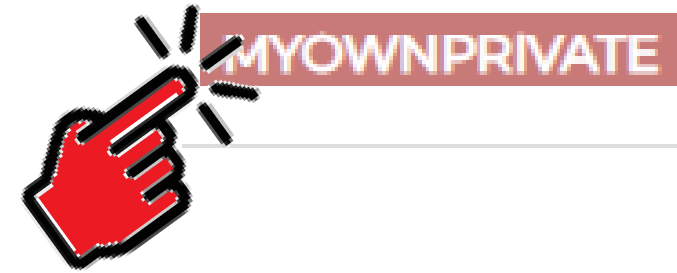
Next

Snap4City (C), October 2023

170

Developers can

- Manage their own Devices
 - Edit/Modify, Delete, view, send messages, etc.
 - Pass the ownership of a Device to another user
 - Delegate in
 - READ_ACCESS the IoT Device to other users
 - READ_WRITE the IoT Device to other users
 - MODIFY the IoT Device to other users
 - See and change the Delegations
- See Delegated IoT Devices, ...
- See Public IoT Devices, ...



Device - alert_1610543238306
Ownership
Visibility
Delegations
Group Delegations

Add new delegation

READ_ACCESS
READ_ACCESS
READ_WRITE
MODIFY

Confirm

Delegated username can't be empty

Current delegations

Delegated user	Kind	Remove

Close

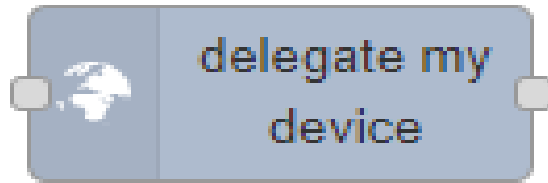
What they mean ?

Supposing that User User45 has the Device D34 !

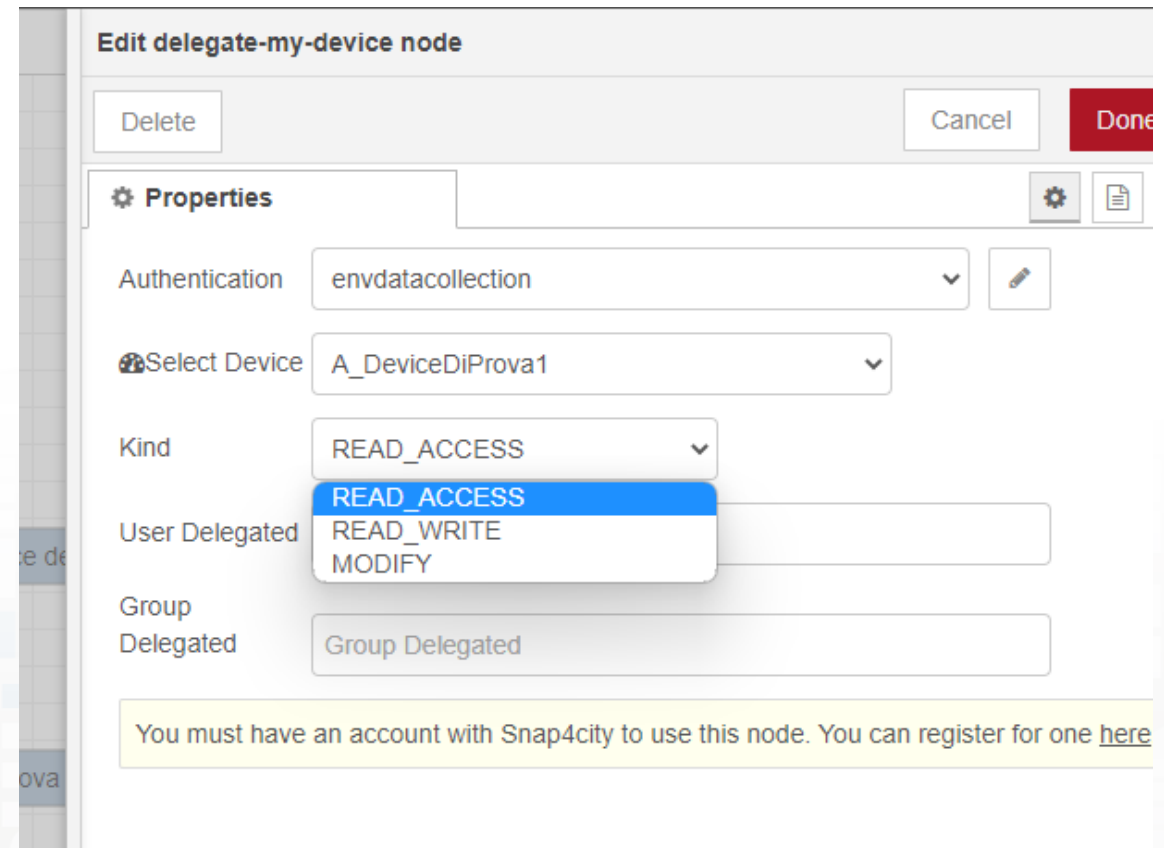
THUS: User45 can delegate Device D34 at User DD12 for

- **READ_ACCESS.** This means that User DD12 can read the values/data of Device D34, real time and historical
- **READ_WRITE.** This means that User DD12 can
 - read the values/data of Device D34, real time and historical
 - Send messages to the broker to add them for device DD12
- **MODIFY.** This means that User DD12 can Modify structure of Device D34, for example: changing the name of variables, etc.

Delegate Management from IoT App



To delegate a certain
device to some other
user



The screenshot shows a web interface for editing a node named 'delegate-my-device'. At the top, there are 'Delete', 'Cancel', and 'Done' buttons. Below is a 'Properties' section with several fields: 'Authentication' set to 'envdatacollection', 'Select Device' set to 'A_DeviceDiProva1', 'Kind' set to 'READ_ACCESS' (with a dropdown menu open showing 'READ_ACCESS', 'READ_WRITE', and 'MODIFY'), 'User Delegated' (empty), and 'Group Delegated' (empty). A yellow warning box at the bottom states: 'You must have an account with Snap4city to use this node. You can register for one [here](#)'.

Simplified Device Management

Snap4City

Switch To New Layout (Beta)

User: **paolo.disit**, Org: **DISIT**
Role: AreaManager, Level: 3

LOGOUT

- My Snap4City.org
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- www.snap4solutions.org
- Dashboards (Public)
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- Entity Directory and Devices
 - My IOT Sensors and Actuators**
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 - Create an IOT Device Model
 - Add an IOT Device into Snap4City
- Resource Manager

My IOT Sensors and Actuators

My Sensors and Actuators Delegated Sensors and Actuators

Add New Device

Show 10 entries

Search:

	Device Identifier	Value Type	Device Type	Ownership	Status	Location
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	timestamp	File	MYOWNPUBLIC	active	
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	entity_desc	File	MYOWNPUBLIC	active	
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	entity_desc	File	MYOWNPUBLIC	active	
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	entity_desc	File	MYOWNPUBLIC	active	
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	description	File	MYOWNPUBLIC	active	
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	description	File	MYOWNPUBLIC	active	
+	1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	description	File	MYOWNPUBLIC	active	
+	alert_1610543238306	status	event	MYOWNPRIVATE	active	
+	alert_1610543238306	timestamp	event	MYOWNPRIVATE	active	
+	alert_1610543238306	timestamp	event	MYOWNPRIVATE	active	

Showing 1 to 10 of 1,045 entries

Previous 1 2 3 4 5 ... 105 Next



Simplified Add Device: only from Model

Snap4City

Switch To New Layout (Beta)

User: **paolo.disit**, Org: **DISIT**
Role: AreaManager, Level: 3

LOGOUT

- My Snap4City.org
- Tour Again
- www.snap4solutions.org
- Dashboards (Public)
- Dashboards of My Organization
- My Dashboards in My Organization
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- Extra Dashboard Widgets
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- Processing Logics / IOT App
- Entity Directory and Devices
- My IOT Sensors and Actuators**
- IOT Sensors and Actuators
- Entity Instances, IoT Devices
- IOT Brokers
- FIWARE Smart Data Models
- Entity Models/IoT Devices
- IOT Devices Bulk Registration
- Doc: IOT Directory and Devices

My IOT Sensors and Actuators

My Sensors and Actuators | Delegated Sensors and Actuators

Add New Device

Identifier Device Identifier is mandatory

Model Device Model is mandatory

Latitude Latitude is mandatory

Longitude Longitude is mandatory

3c4bab66-c273-4599-a1ed-1db1a35d15fe KEY 1

1743d0d5-01d6-42a4-a443-1c09c3834ae7 KEY 2

ContextBroker

Protocol

Format

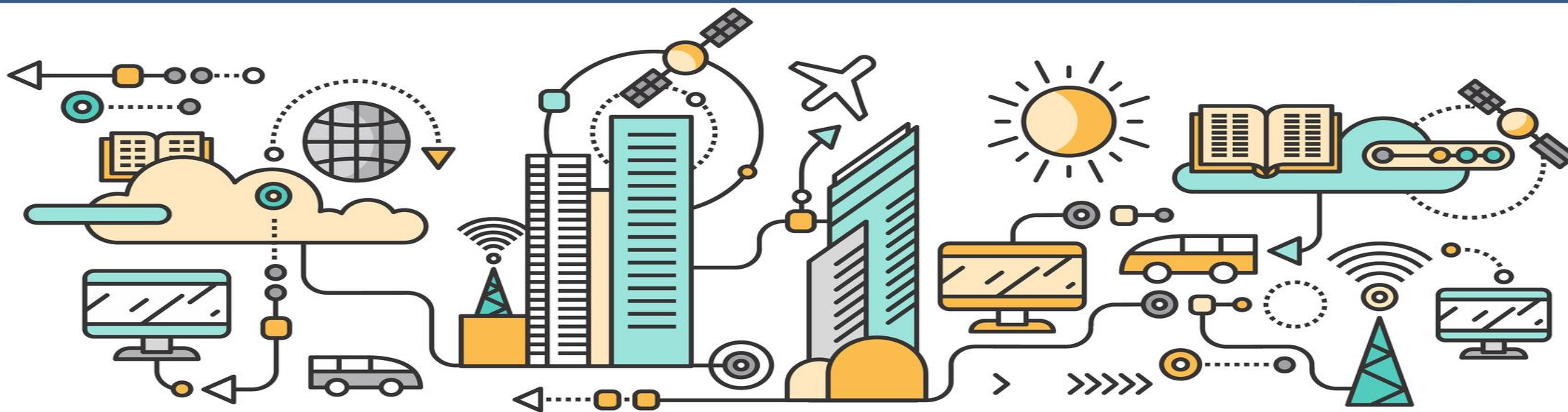
Submit Device

Select Latitude/Longitude on Map

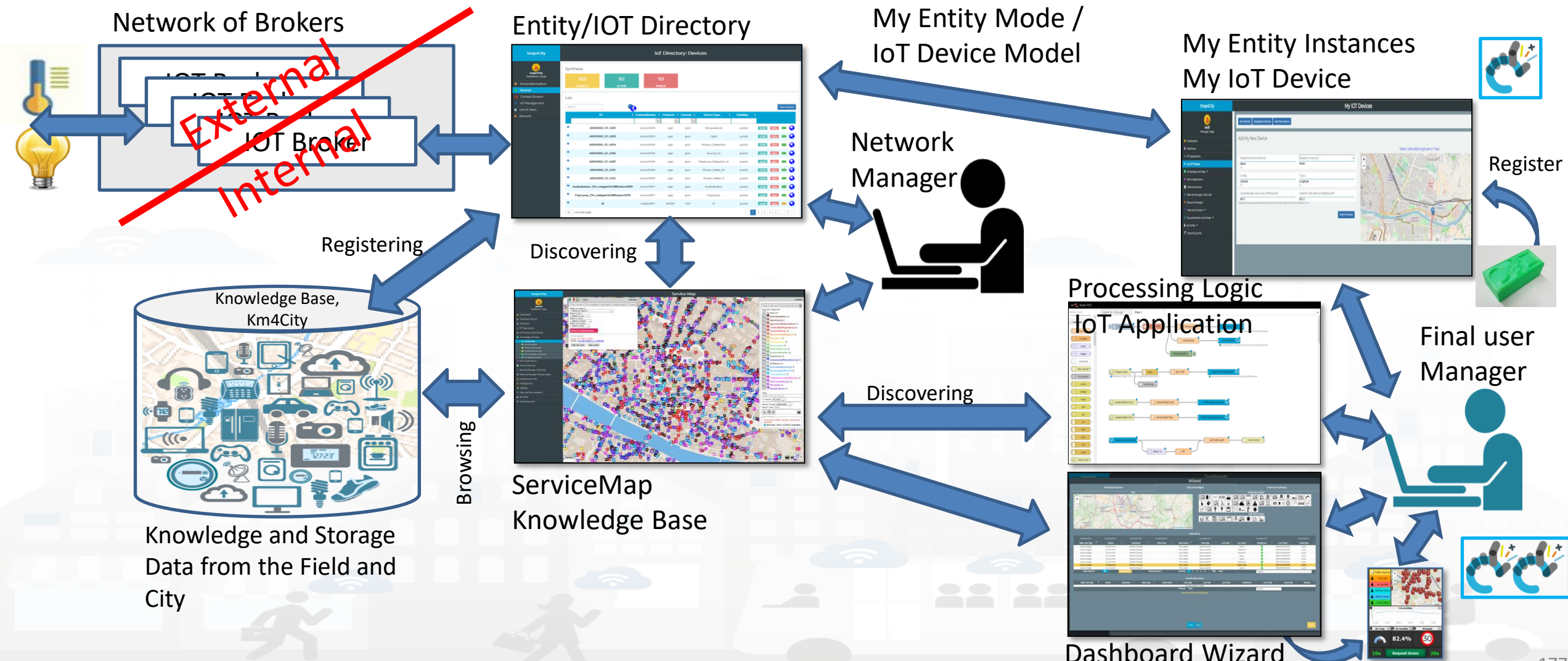
Leaflet | © OpenStreetMap contributors

TOP

*Design: from **Data Modelling** to Data Ingestion*



IoT/Entity Network Manager vs Final User



Using the Entity/Device Model notes!!!

- Once performed the Entity/Device Model, a number of Entities/Devices can be produce **using the model as a Template**
 - **NOTE:** the produced Entities/Devices are not going to change if the Entity/Device Model is modified.
 - *Your biscuit is not changing if the template is modified after the printout*



The Data Models can be simply instantiated from

- a) **FIWARE Smart Data Models**, versioning, and harvesting the standard repository
- b) **Entity Model / IoT Device Model** which are accessible into the Snap4City environment
- c) **Excel files by using Data Table tool**, which extracts the model from the excel table and automatically creates **Entity Model / IoT Device Model**, Entity Instances / IoT Devices and data attached to them
- d) Creating a **custom Entity Model / IoT Device Model** in standard Snap4City format via **Entity Directory / IoT Directory**

FIWARE Smart Data Models -- Library

Snap4City

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

LOGOUT

Knowledge and Maps

IOT Applications

IOT Directory and Devices

- My IOT Sensors and Actuators
- IOT Sensors and Actuators
- IOT Devices
- IOT Devices Management
- IOT Brokers
- FIWARE Smart Data Models**
- IOT Device Models
- IOT Devices Bulk Registration
- Ext. MS Broker Devices Discovery
- Ext. MS Broker Discovery
- Ext. Broker Devs Periodic Update
- Rules for Discovery
- OLD IOT Orion Broker Mapping Rule
- Doc: IOT Directory and Devices
- Create an IOT Device Instance
- Create an IOT Device Model
- Add an IOT Device into Snap4City

Resource Manager

Development Tools

FIWIRE Smart Data Models Library

Show 10 entries

Search:

Name	Subdomain	Domain	Version	Edit
Alert	Alert	CrossSector	0.0.2	EDIT
Anomaly	Alert	CrossSector	0.0.2	EDIT
Battery	Battery	CrossSector	0.0.2	EDIT
BatteryStatus	Battery	CrossSector	0.0.2	EDIT
StorageBatteryDevice	Battery	CrossSector	0.0.2	EDIT
StorageBatteryMeasurement	Battery	CrossSector	0.0.2	EDIT
CallUser	CallComplaints	CrossSector	0.0.1	EDIT
Complaint	CallComplaints	CrossSector	0.0.1	EDIT
ComplaintsCollection	CallComplaints	CrossSector	0.0.2	EDIT
ComplaintsOrganization	CallComplaints	CrossSector	0.0.2	EDIT

Showing 1 to 10 of 441 entries

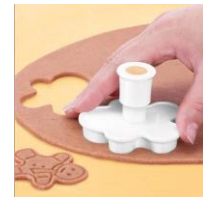
Previous12345...45Next

Connections among Entities

Where	Entity Model (IOT Device Model)	Entity Instance (IOT Device)	Entity Message at 23-12-2019T20:15:00	Entity Message at 23-12-2019T20:30:12
Broker	Broker: OrionUNIFI			
Broker	Protocol: NGSI			
Info	ID: string	ID: " park45 "	park45	park45
Position	GPS: lat, long	GSP: 43.12, 11.34	GSP: 44.1256, 11.1234	GSP: 44.1259, 11.1233
Static attribute	Description: string	Description: " parking massaia "		
Static attribute	MyAddInfoSURI: string	MyAddInfoSURI: " http://...../InfoPersonal "		
Values	dateObserved: Timestamp		23-12-2019T20:15:00	23-12-2019T20:30:12
Values	FreeSlots: Integer, #		FreeSlots: 345	FreeSlots: 234
Values	TodayCarSURI: string		TodayCarSURI: " http://...../CarNF126GD "	TodayCarSURI: " http://...../CarGF789KK "
Values	Temperature: float, celsius		34	34

Model meaning

- **ID:** is the unique identifier for reconnecting Temporal Instances with registered Entity / Devices
- **Static Attributes:**
 - Are typically associated with instances of the IOT Device.
E.g.:, You have a set of parking areas, each of them is located in a specific street, and has its one name, etc.
 - Different kinds of attributes can be set for each SubNature. Their definition has to be prepared into the Knowledge Base 😊 for automated indexing.
- **Values:** they are time varying variables (temporal values/instances)
 - They change over time, the timestamp of the time series is conventionally «dateObserved» in Snap4City
 - In new *SensorMobile* HLT, also GPS can be changing over time as in the MyKPI
- **NOTE for:**
 - **names/IDs:** Spaces or strange characters are not allowed in the. Please use simple alphanumeric strings, it is a limitation of many solutions including Orion Broker and increase interoperability of your data.
 - **Values of attributes and variables:** can be UTF8, but similarly, they do not accept: () <> “ ‘ ; = into values
 - https://fiware-orion.readthedocs.io/en/master/user/forbidden_characters/index.html



Entity / Device Model (1)



- IOT Broker
 - Name of the Brokers: among those registered
 - Protocol: NGSI, AMQP, MQTT, etc..
 - Format: CSV, JSON, XML.
 - Service/Tenant:.....
 - ServicePath:.....

- Info
 - Name (Identifier)
 - Model: Custom or Model ID
 - DeviceType: ..a string..
 - MAC address: ...optional...
 - Edge-GW: Raspberry, Android, ...
 - Edge-GW: URI
 - Producer
 - Owner
 - Freq: Sec
 - Keys: K1, K2

Add new device

IOT Broker	Info	Position	Static Attributes	Values
ContextBroker <small>Context broker is mandatory</small>		sensor	Kind Ok	
Protocol <small>Device protocol is mandatory</small>			Format <small>Device format is mandatory</small>	
Service/Tenant <small>only ngsi w/MultiService supports Service/Tenant selection</small>			ServicePath <small>only ngsi w/MultiService supports ServicePath</small>	

Cancel Confirm

Add new device

IOT Broker	Info	Position	Static Attributes	Values
Name <small>Device name is mandatory</small>		custom	Model Ok	
Device Type <small>Device Type is mandatory</small>			Mac Address	
Edge-Gateway Type			Edge-Gateway URI	
Producer			600 Frequency Ok	sec
Private Ownership			Generate Keys	
KEY1			KEY 2	

Cancel Confirm

Entity / Device Data Model (2)

Add new device

IOT Broker
Info
Position
Static Attributes
Values

Latitude
Latitude is mandatory
Longitude
Longitude is mandatory

Cancel
Confirm

Edit Model - ChargingStationModel

General Info
IoT Broker
Static Attributes
Values

chargingStateValue Value Name Ok	charging_state (Chargin Value Type Ok	some coded status (sta Value Unit Ok	string Data Type
Refresh rate Healthiness Criteria	900 Healthiness Value	Remove Value	
stationStateValue Value Name Ok	charging_station_state Value Type Ok	some coded status (sta Value Unit Ok	string Data Type
Refresh rate Healthiness Criteria	900 Healthiness Value	Remove Value	
dateObserved Value Name Ok	timestamp (Timestamp Value Type Ok	timestamp in millisecond Value Unit Ok	string Data Type
Refresh rate Healthiness Criteria	900 Healthiness Value	Remove Value	
chargingState Value Name Ok	charging_state (Chargin Value Type Ok	some coded status (sta Value Unit Ok	string Data Type
Refresh rate Healthiness Criteria	900 Healthiness Value	Remove Value	
stationState Value Name Ok	charging_station_state Value Type Ok	some coded status (sta Value Unit Ok	string Data Type
Refresh rate Healthiness Criteria	900 Healthiness Value	Remove Value	

Add Value
Cancel
Confirm

SURI Connections

From a

- *Static* Attribute of an Entity Instance to another Entity Instance, as highlighted in green in previous table.
- *Dynamic* Value/Variable of an Entity Message of an Entity Instance to another Entity Instance, as highlighted in green in previous table.
- *the example reports a*
 - *static connection and*
 - *dynamic connection to change the car at a given timestamp, note also change of position and other parameters, if needed*

www.disit.org/km4city/resource/iot/traffic [ma#organization](#)

TOP

Entity / Device Registration from Model

IOT Directory and Devices

- My IOT Sensors and Actuators
- IOT Sensors and Actuators
- IOT Devices
- IOT Devices Management
- IOT Device Discovery
- IOT Brokers
- IOT Device Models
- IOT Devices Bulk Registration
- IOT Broker Periodic Update setti...
- IOT Orion Broker Mapping Rules...
- ☒ Doc: IOT Directory and Devices
- ☒ Create an IOT Device Instance
- ☒ Create an IOT Device Model
- ☒ Add an IOT Device into Snap4Cit...



Many IoT Devices?

IOT Device Model!!!

Example: ChargingStationModel

- **Prerequisites:** only for AreaManager users
- If you have a set of sensors with the same features,
 - you can create a model and then a set of instances (IoT Devices) in compliance with the model (not time consuming and avoiding errors)
- IoT Directory and Devices > IoT Device Models > 'New Model' button

Edit Model - ChargingStationModel

General Info | IoT Broker | Values

ChargingStationModel

Name
Ok

Modello per stazioni di ricarica elettrica

Description
Ok

ChargingStation

Device Type
Ok

Sensor

Kind

Comune di Firenze

Producer
Ok

600

Frequency

Healthiness Criteria

Healthiness Value

Automatically generated

Key Generation

Edge-Gateway Type

Edit Model - ChargingStationModel

General Info | IoT Broker | Values

orionFirenze-UNIFI

ContextBroker

ngsi

Protocol

json

Format

Cancel Confirm

Edit Model - ChargingStationModel

General Info | IoT Broker | Static Attributes | Values

Value Name	Value Type	Value Unit	Data Type
chargingStateValue	charging_state (Chargii	some coded status (sta	string
Refresh rate	900	Remove Value	
Healthiness Criteria	Healthiness Value		
stationStateValue	charging_station_state	some coded status (sta	string
Refresh rate	900	Remove Value	
Healthiness Criteria	Healthiness Value		
dateObserved	timestamp (Timestamp	timestamp in millisecon	string
Refresh rate	900	Remove Value	
Healthiness Criteria	Healthiness Value		
chargingState	charging_state (Chargii	some coded status (sta	string
Refresh rate	900	Remove Value	
Healthiness Criteria	Healthiness Value		
stationState	charging_station_state	some coded status (sta	string
Refresh rate	900	Remove Value	
Healthiness Criteria	Healthiness Value		

Add Value

Cancel Confirm

Add Entity / Devices, exploiting a Model

Snap4City

Switch To New Layout (Beta)

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3

Logout

- My Snap4City.org
- Tour Again
- www.snap4solutions.org
- Dashboards (Public)
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- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
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- Resource Manager

My IOT Sensors and Actuators

My Sensors and Actuators | Delegated Sensors and Actuators

Add New Device

Show 10 entries

Device Identifier	Value Type	Device Type	Ownership	Status	Location
1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	timestamp	File	MYOWNPUBLIC	active	
1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	entity_desc	File	MYOWNPUBLIC	active	
1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	entity_desc	File	MYOWNPUBLIC	active	
1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	entity_desc	File	MYOWNPUBLIC	active	
1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	description	File	MYOWNPUBLIC	active	
1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	description	File	MYOWNPUBLIC	active	
1dd79caa95f6771afad4fd38e699c8542022-12-05T18:54:13.000Z	description	File	MYOWNPUBLIC	active	
alert_1610543238306	status	event	MYOWNPRIVATE		
alert_1610543238306	timestamp	event	MYOWNPRIVATE		
alert_1610543238306	timestamp	event	MYOWNPRIVATE		

Showing 1 to 10 of 1,045 entries

Previous 1 2 3 4

Snap4City

User: rootooladmin1, 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
- Notifier
- Data, my Data, OpenData
- Knowledge and Maps
- IOT Applications
- IOT Directory and Devices
 - My IOT Sensors and Actuators
 - IOT Sensors and Actuators
 - IOT Devices
 - IOT Devices Management
 - IOT Brokers
 - IOT Device Models
 - IOT Devices Bulk Registration
 - IOT Broker Periodic Update setting
 - IOT Orion Broker Mapping Rules

My IOT Sensors and Actuators

My Devices | Delegated Devices | Add New Device

Add My New Device

Select Latitude/Longitude on Map

Identifier: Dubrovnik Total Average Person
Model: OK

Latitude: 16d71349-2eb6-454e-84f1-ae54fd3617ce
Longitude: 4e7dbd20-77ea-4412-8aed-8e352d055093

KEY1: These keys have been generated automatically for your device. Keep track of them. Details on info

KEY2:

Monitoring Camera (TransferServiceAndRem)

Subnature: Locality Dubrovnik Value Remove

Add Attribute

Submit Device

Add Entity / Devices, exploiting a Model

Just Buy an IOT Device and register: SigFOX, MQTT, NGSi (FiWare), ...

- Attach them by
 - Models
- A range of protocols, formats, approaches

Create your own devices:

- Arduino,
- Raspberry,
- Android,
- LoraWAN + Arduino,
- etc.

**Secure Communication: HTTPS,
TLS (K1, K2), Certificates**

Add Entity / Devices, exploiting a Model

Addition of Static
Attributes of the
Entity Instance /
IoT Device

Only if you
enabled from
model

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
- Notifier
- Data, my Data, OpenData
- Knowledge and Maps
- IoT Applications
- IOT Directory and Devices
 - My IOT Sensors and Actuators**
 - IOT Sensors and Actuators
 - IOT Devices
 - IOT Devices Management
 - IOT Brokers
 - IOT Device Models
 - IOT Devices Bulk Registration
 - IOT Broker Periodic Update setting
 - IOT Orion Broker Mapping Rules

My IOT Sensors and Actuators

[My Devices](#) [Delegated Devices](#) [Add New Device](#)

Add My New Device

Identifier Dubrovnik Total Average Person Model Dubrovnik Total Average Person

Latitude 16d71349-2eb6-454e-84f1-ae54fd3617ce Longitude 4e7dbd20-77ea-4412-8aed-8e352d055093

KEY1 KEY2

These keys have been generated automatically for your device. Keep track of them. Details on [info](#)

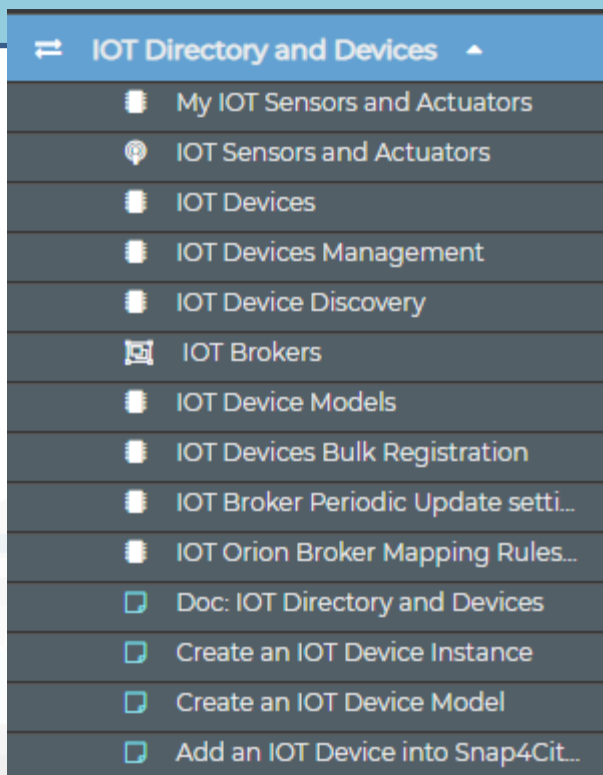
Monitoring Camera (TransferServiceAndRen) Subnature

Locality	Value	Remove
Dubrovnik		

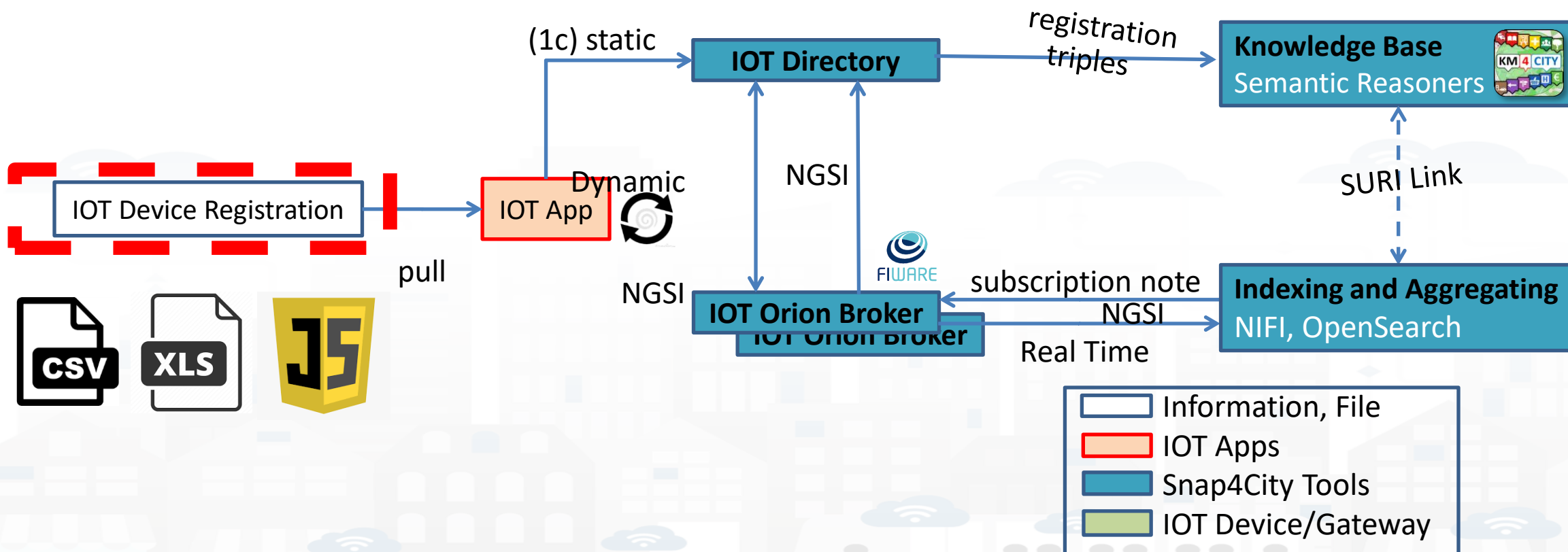
[Add Attribute](#) [Submit Device](#)

TOP

Entity / Device Registration from IOT App/Proc.Logic (automation)



Snap4city Data Ingestion Flow Diagram



1) Model creation

IOT Device Models

Edit Model - Florence wifi average person

General Info | IoT Broker | Static Attributes | Values

Florence wifi average person

Name
Ok

wifiSensor

Device Type
Ok

Comune Di Firenze

Producer
Ok

Healthiness Criteria

Automatically generated
Key Generation

Average Number of person for each wifi point in Florence

Description
Ok

Sensor

Kind

900

Frequency

Healthiness Value

Edge-Gateway Type

Cancel Confirm

Model name: Florence wifi average person

Edit Model - Florence wifi average person

General Info | IoT Broker | Static Attributes | Values

orionToscana-UNIFI

ContextBroker

ngsi

Protocol

json

Format

Service/Tenant
only ngsi v2/MultiService supports

ServicePath

Edit Model - Florence wifi average person

General Info | IoT Broker | Static Attributes | Values

Wifi (TourismService)

Subnature

Locality

FIRENZE

Value

Remove

Region

FI

Value

Remove

Add Attribute

Edit Model - Florence wifi average person

General Info | IoT Broker | Static Attributes | Values

meanPeople

people_count (People C)

Mean number of people

integer

Value Name

Value Type

Value Unit

Data Type

Refresh rate

900

Remove Value

Healthiness Criteria

Healthiness Value

dateObserved

timestamp (Timestamp)

timestamp in millisecond

string

Value Name

Value Type

Value Unit

Data Type

Refresh rate

900

Remove Value

Healthiness Criteria

Healthiness Value

Add Value

Cancel Confirm

Snap4City

User: michela_toscana, Org: Toscana
Role: ToolAdmin, Level: 3
[Logout](#)

My Snap4City.org

- Dashboards (Public)
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- IOT Applications
 - MicroServices for IOT Applications
 - MicroServices from DataAnalytic
 - IOT MicroServices for Final Users
 - IOT MicroServices for Developers
 - Doc: IOT Applications
 - How to Develop IOT Applications
 - Create A MicroService from RestCall

Florence_wifi

Node-RED

Dynamic Flow | Static flow | Flow 1

input

- inject
- catch
- status
- link
- mqtt
- http
- websocket
- top
- udp
- amqp
- amqp2
- stomp

output

provider

timestamp

wifi_location_temp

All_devices_cleaned

delay 5s

/data/firenze_wifi

json

split

every device

iotdirectory-new-device-from-model

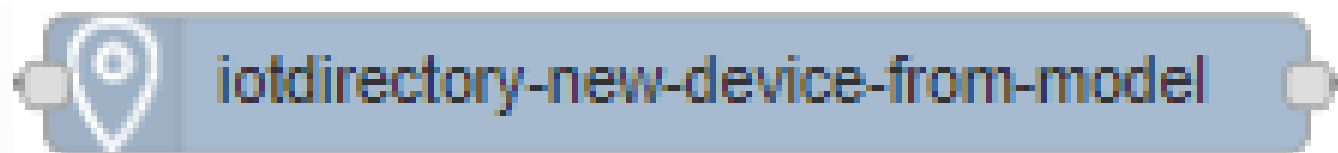
msg

debug console:

```

13/7/2020, 15:55:15 node: c597e7d.dd94
msg: Object
  object:
    topic: ""
    payload: null
    _msgid: "800b6958.c0fc68"
  wifi: array[231]
  statusCode: 201
  headers: object
    responseUrl: "https://wifi-aaa.comune.fi.it/resolute/dettaglio_stato_rete/"
  parts: object
    id_number: "186"
    id_name: "ParcoMusica"
  id: array[309]
    last_date: "2020-07-13T13:46:00.000Z"
    send_averages: false
    date_avg: 0
    passo: 0
    avg: "non la calcolo ancora"
    minuti_last: 46
    minuti_now: 55
13/7/2020, 15:55:15 node: c597e7d.dd94
msg: Object
  { topic: "", payload: null, _msgid: "800b6958.c0fc68", wifi: array[231], statusCode: 201 ... }
13/7/2020, 15:55:15 node: c597e7d.dd94
    
```

2) IoT Devices Creation from IOT APP



BLOCK: 'IoTDirectory-new-device-from-model'
Model name: Florence wifi average person

Snap4City

User: michela_toscana, Org: Toscana
Role: ToolAdmin, Level: 3

[Logout](#)

- My Snap4City.org
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 - Doc: IOT Applications
 - How to Develop IOT Applications
 - Create A MicroService from RestCall

Florence_wifi

Node-RED

Dynamic Flow Static flow Flow 1

filter nodes

input

- inject
- catch
- status
- link
- mqtt
- http
- websocket
- tcp
- udp
- amqp
- amqp2
- stomp

output

timestamp

provider

wifi_location_temp

All_devices_cleaned

delay 5s

/data/firenze_wifi

split

every device

msg

info

debug

dashboard

13/7/2020, 15:55:15 node: c59f7e7d4dd94

msg: Object

object

Florence_wifi

Node-RED

Dynamic Flow Static flow

filter nodes

input

- inject
- catch
- status
- link
- mqtt
- http
- websocket
- tcp
- udp
- amqp
- amqp2
- stomp

output

timestamp

provider

wifi_location_temp

All_devices_cleaned

split

every device

msg

info

debug

dashboard

13/7/2020, 15:55:15 node: c59f7e7d4dd94

msg: Object

object

Edit iotdirectory-new-device-from-model node

Delete

Cancel Done

node properties

devicename

latitude

longitude

Map

k1

k2

Model

Florence wifi average person

Info

debug

dashboard

Node

Type

iotdirectory-new-device-from-model

ID

a378a999-8c274

Information

It allows to create a device from model

Inputs

A JSON with these parameters:

devicename

The name of the device you want to create

latitude

latitude of a GPS position

longitude

longitude of a GPS position

k1

K1 and K2 are the keys necessary to read and write access to the device. They must be different from each other.

k2

K1 and K2 are the keys necessary to read and write access to the device. They must be different from each other.

model

The name of the model

Outputs

Returns the k1 and k2 of device created

Details

The node can receive a JSON with the parameters described in the Inputs section and with them generate the output JSON. If the values are not present in the input JSON, these are read by those in the

Snap4City

User: michela_toscana, Org: Toscana
Role: ToolAdmin, Level: 3

[Logout](#)

- My Snap4City.org
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- Notifier
- Data, my Data, OpenData
 - Data Inspector
 - My Data, KPI, DOI
 - My Groups of Entities
 - Data Set Manager: Data Gate
 - Add Data Sources into the Platform
 - High Level Types
 - Supported Protocols, HowTo add
 - Interoperability & Standards

My Groups of Entities

Return to My Device Groups List

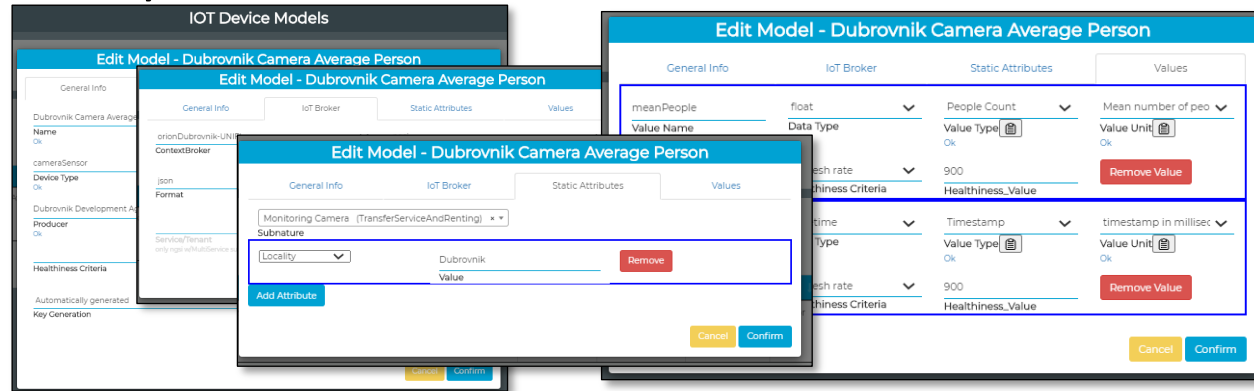
Device Group ID 20 Name Florence_Wifi Description Wifi averages

10 Filter Table Search

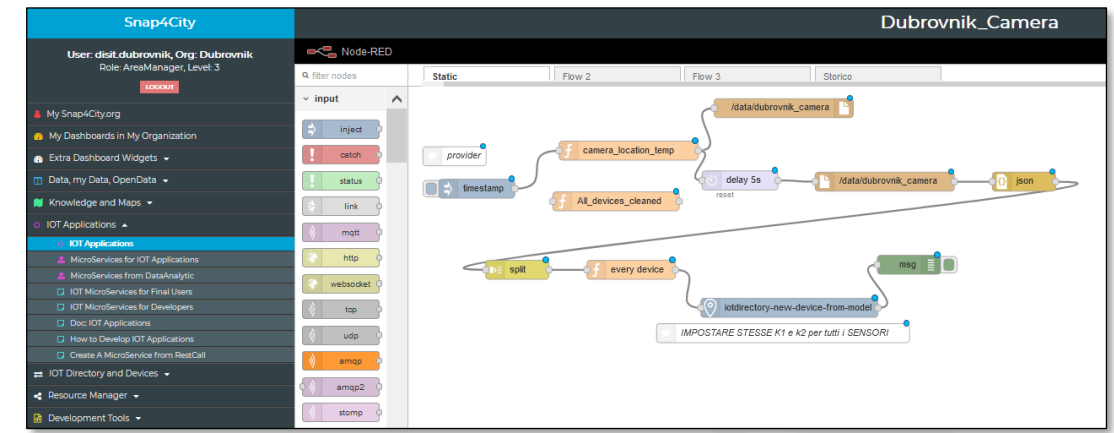
No.	Username	Element ID	Element Type	Element Name	Added
104	michela_toscana	Toscana.orionToscana-UNIFI-wifi_2_Parcheggio_Porta_alPrato_Leopolda	IOT Device	wifi_2_Parcheggio_Porta_alPrato_Leopolda	6/7/2020, 18:36:77
105	michela_toscana	Toscana.orionToscana-UNIFI-wifi_6_Parcheggio_Santa_Maria_Novella	IOT Device	wifi_6_Parcheggio_Santa_Maria_Novella	6/7/2020, 18:36:77
106	michela_toscana	Toscana.orionToscana-UNIFI-wifi_5_Parcheggio_Beccaria	IOT Device	wifi_5_Parcheggio_Beccaria	6/7/2020, 18:36:77
107	michela_toscana	Toscana.orionToscana-UNIFI-wifi_9_Ospedale_Pediatrico_Meyer	IOT Device	wifi_9_Ospedale_Pediatrico_Meyer	6/7/2020, 18:36:77
108	michela_toscana	Toscana.orionToscana-UNIFI-wifi_0_Parcheggio_Europa	IOT Device	wifi_0_Parcheggio_Europa	6/7/2020, 18:36:77
109	michela_toscana	Toscana.orionToscana-UNIFI-wifi_4_Parcheggio_San_Lorenzo_Mercato_Centrale	IOT Device	wifi_4_Parcheggio_San_Lorenzo_Mercato_Centrale	6/7/2020, 18:36:77
110	michela_toscana	Toscana.orionToscana-UNIFI-wifi_7_Parcheggio_5_Ambrogio	IOT Device	wifi_7_Parcheggio_5_Ambrogio	6/7/2020, 18:36:77

3) Group Creation (more than 200 devices) -> put all the devices in the group and put them as 'public' (or they remain private)

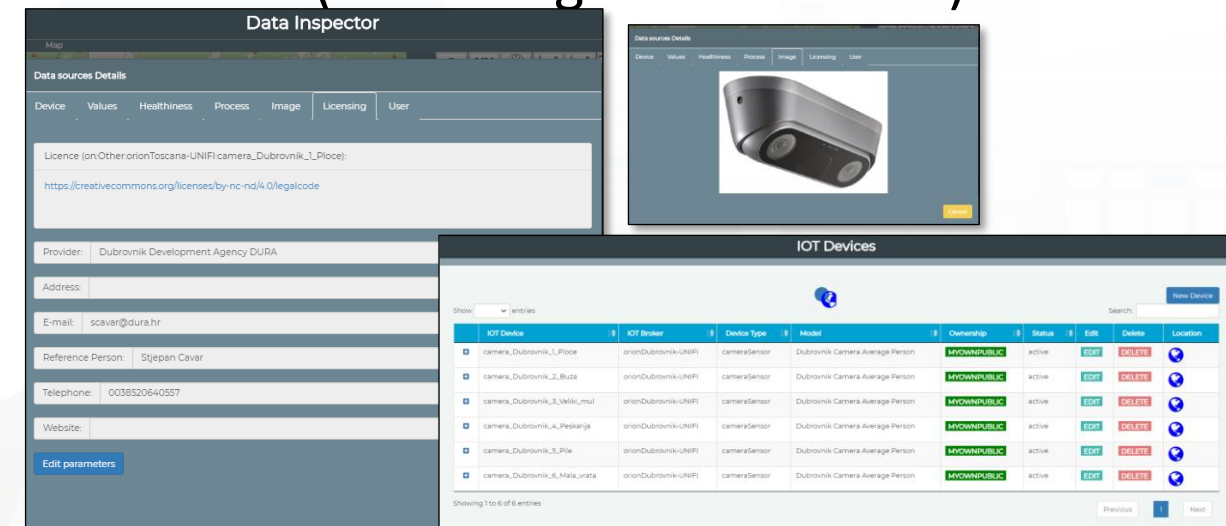
1) IoTModel



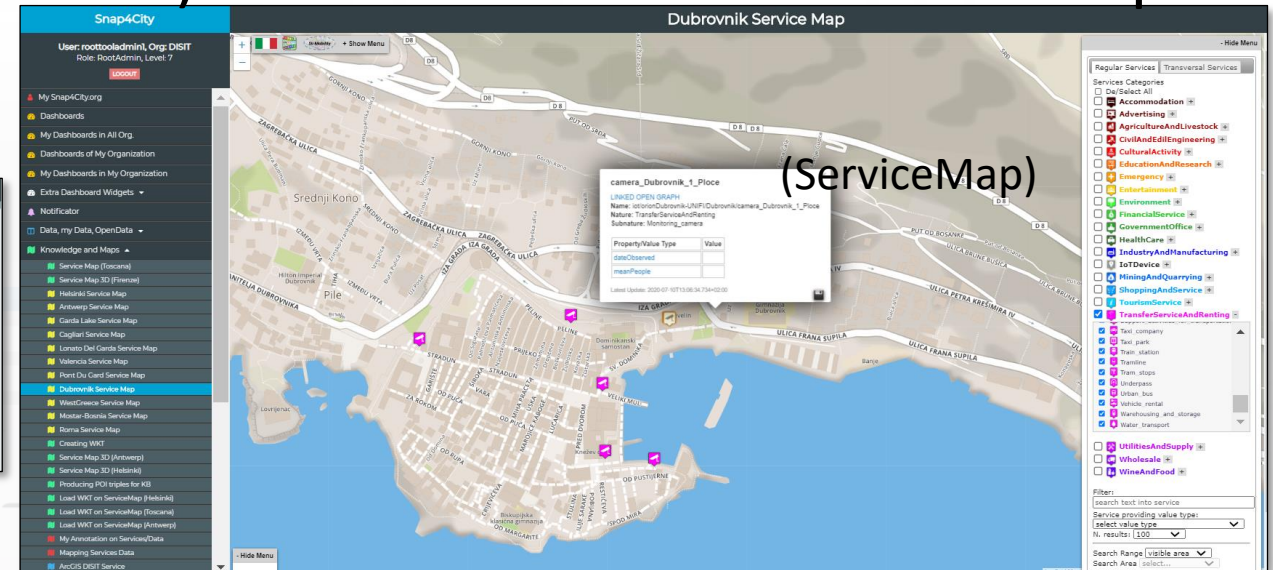
2) Static Flow to create IoTDevices



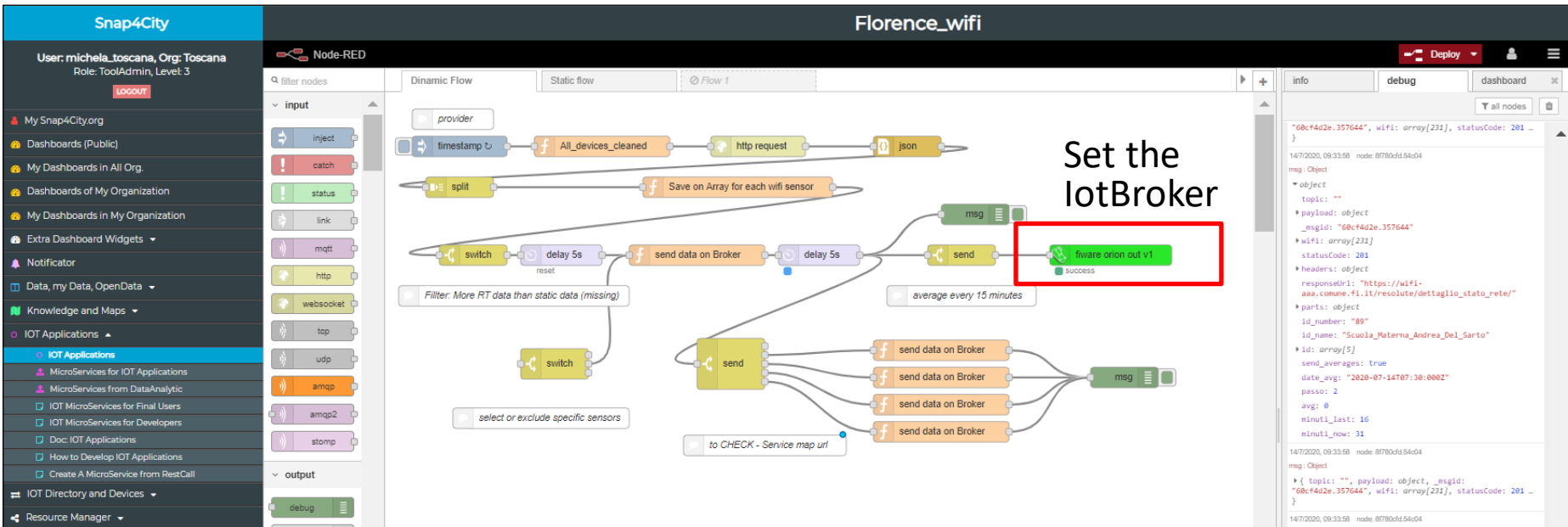
3) Add the license and Make Public the IoTDevices (according to the license)



4) Search for the Cameras on Map



5) Working on Dynamic Flow to save Average #people every 15 minutes for each IoTDevice

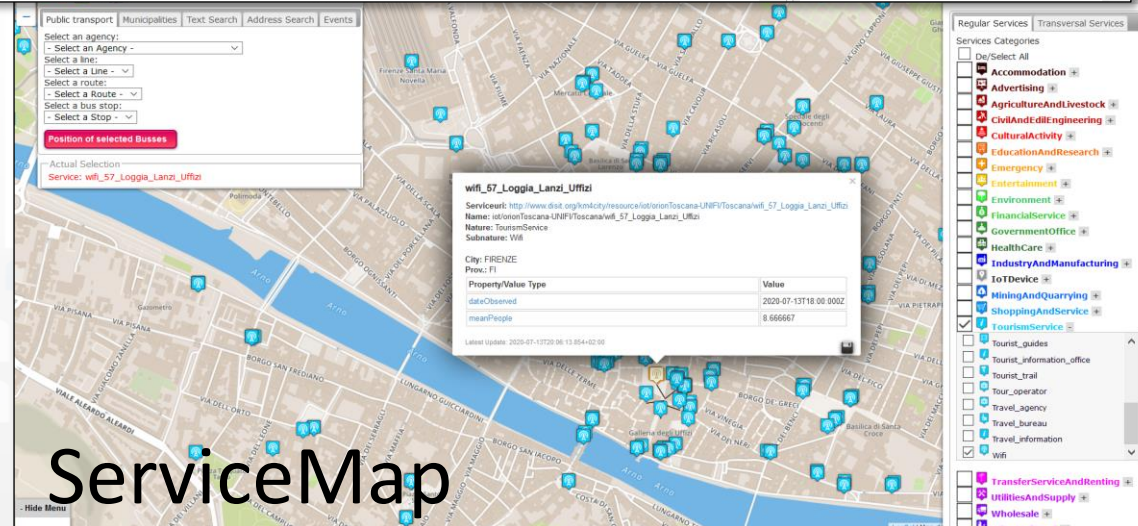


Snap4City API

JSON	Dati non elaborati	Header
Salva	Copia	Comprimi tutto
Espandi tutto		
Filtro JSON		
Service: type: "FeatureCollection" features: [...]		
realtime: head: vars: 0: "measuredTime" 1: "dateObserved" 2: "meanPeople" results: bindings: 0: measuredTime: value: "2020-07-13T19:49:26.780+02:00" dateObserved: value: "2020-07-13T17:45:00Z" meanPeople: value: "0" 1: measuredTime: value: "2020-07-13T19:40:43.168+02:00" dateObserved: value: "2020-07-13T17:30:00Z" meanPeople: value: "0" 2: measuredTime: value: "2020-07-13T19:20:31.181+02:00" dateObserved: value: "2020-07-13T17:15:00Z" meanPeople: value: "0" 3: measuredTime: value: "2020-07-13T19:01:21.564+02:00" dateObserved: value: "2020-07-13T17:00:00Z" meanPeople: value: "0" 4: measuredTime: value: "2020-07-13T19:01:21.564+02:00" dateObserved: value: "2020-07-13T17:00:00Z" meanPeople: value: "0"		

5) Send RT data to the IoTDevices

6) Verify RT Data via Snap4City API or via ServiceMap



TOP

Verification of Data Ingestion

FROM CITY
DASHBOARD TO
APPLICATIONS

DATA GATHERING
AND CITY DATA
KNOWLEDGE
MANAGEMENT

FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT/IOE DEVICES
AND NETWORKS

ICP APPLICATIONS
THE LOGIC AND
THE SMARTNESS

ADVANCED
SMART CITY
MICROSERVICES
SNAP4CITY

SNAP4CITY
LIVING LAB FOR
COLLABORATIVE
WORK

SNAP4CITY FOR
BEGINNERS

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
WHAT-IF AND
SIMULATION

SNAP4CITY
ARCHITECTURE AND
ECOSYSTEM. OPENED
TO DEVELOPERS AND
STAKEHOLDERS

TWITTER
VIGILANCE: SOCIAL
MEDIA ANALYSIS

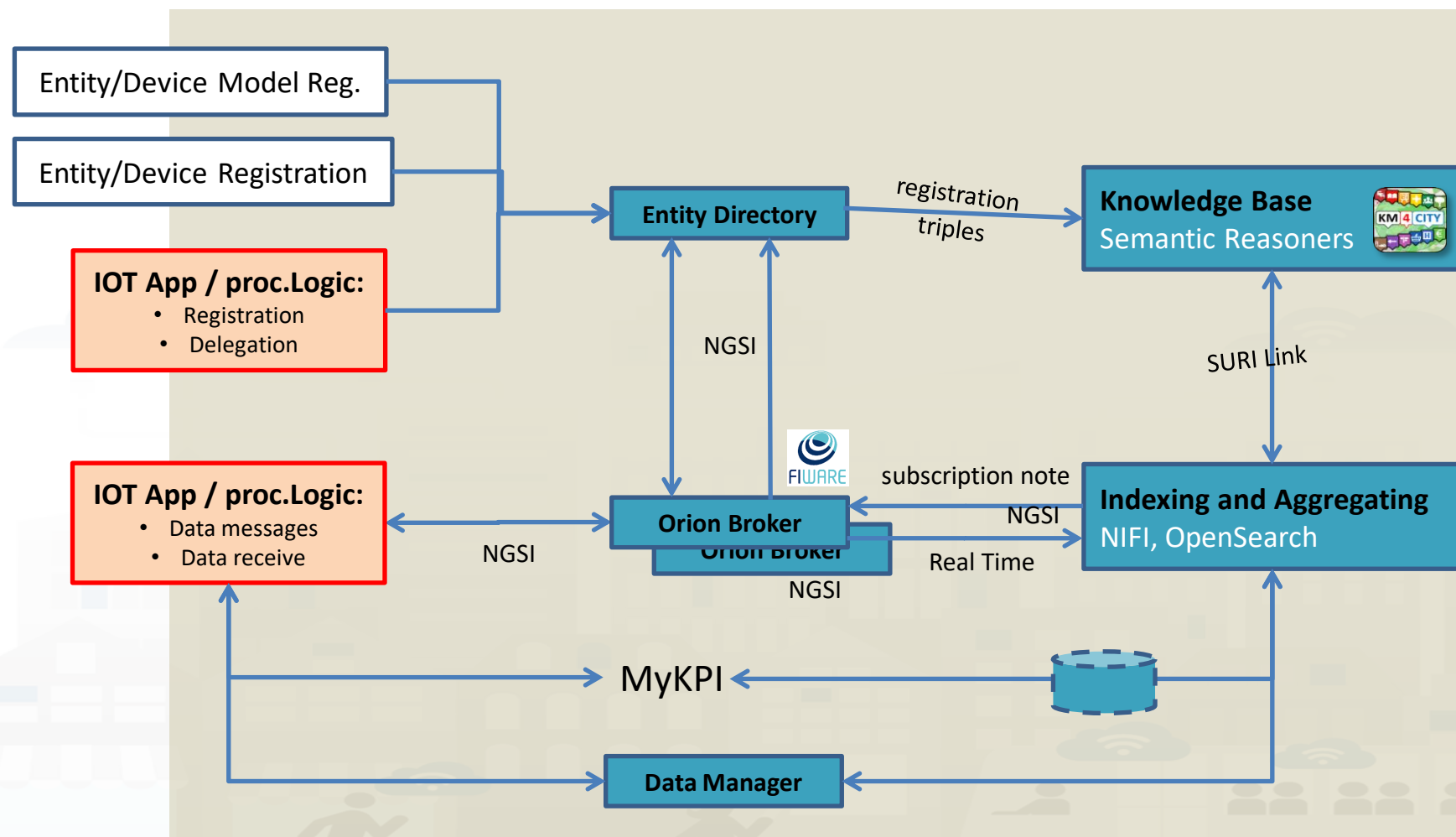
DECISION SUPPORT
SYSTEM AND CITY
RESILIENCE

HOW TO ADOPT
SNAP4CITY, AND
OUR ROADMAP

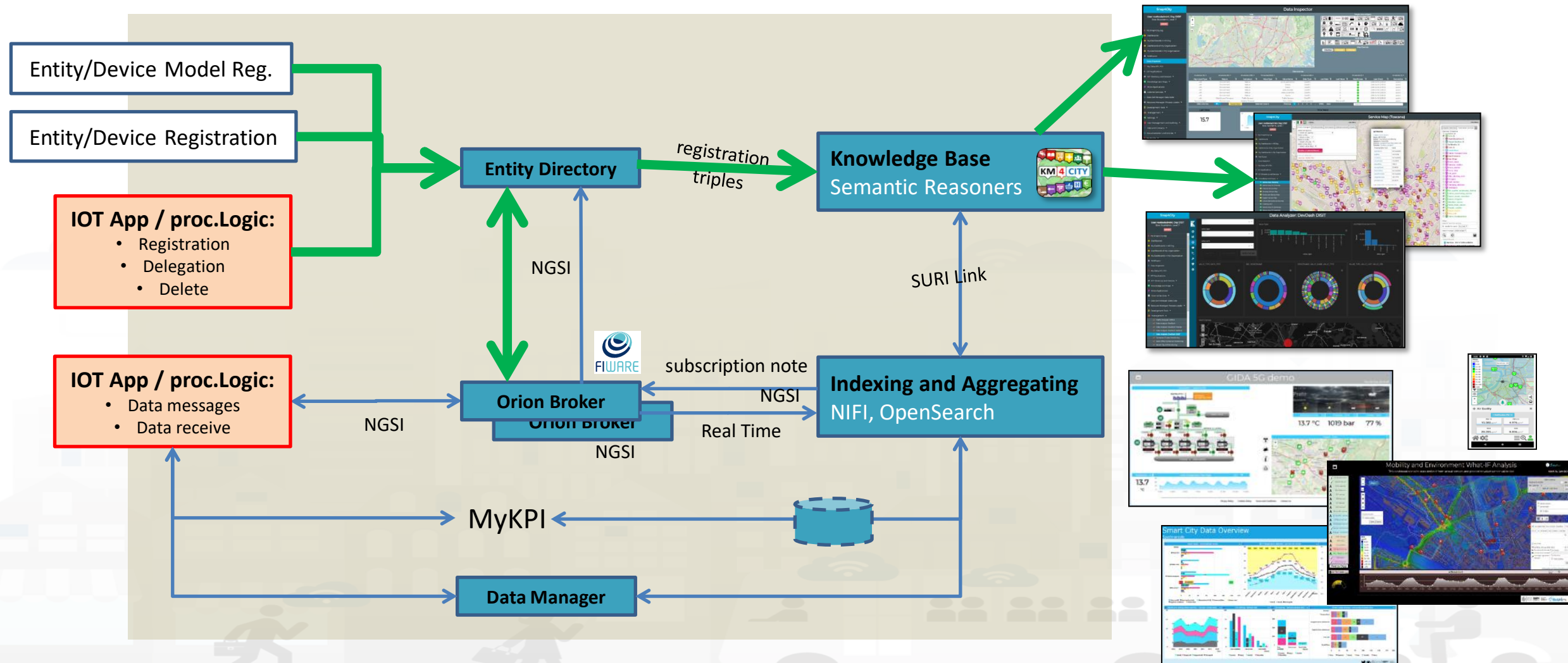
SNAP4CITY
AND KM4CITY
PROJECTS

SNAP4CITY THE
VIEW OF THE
ADMINISTRATORS

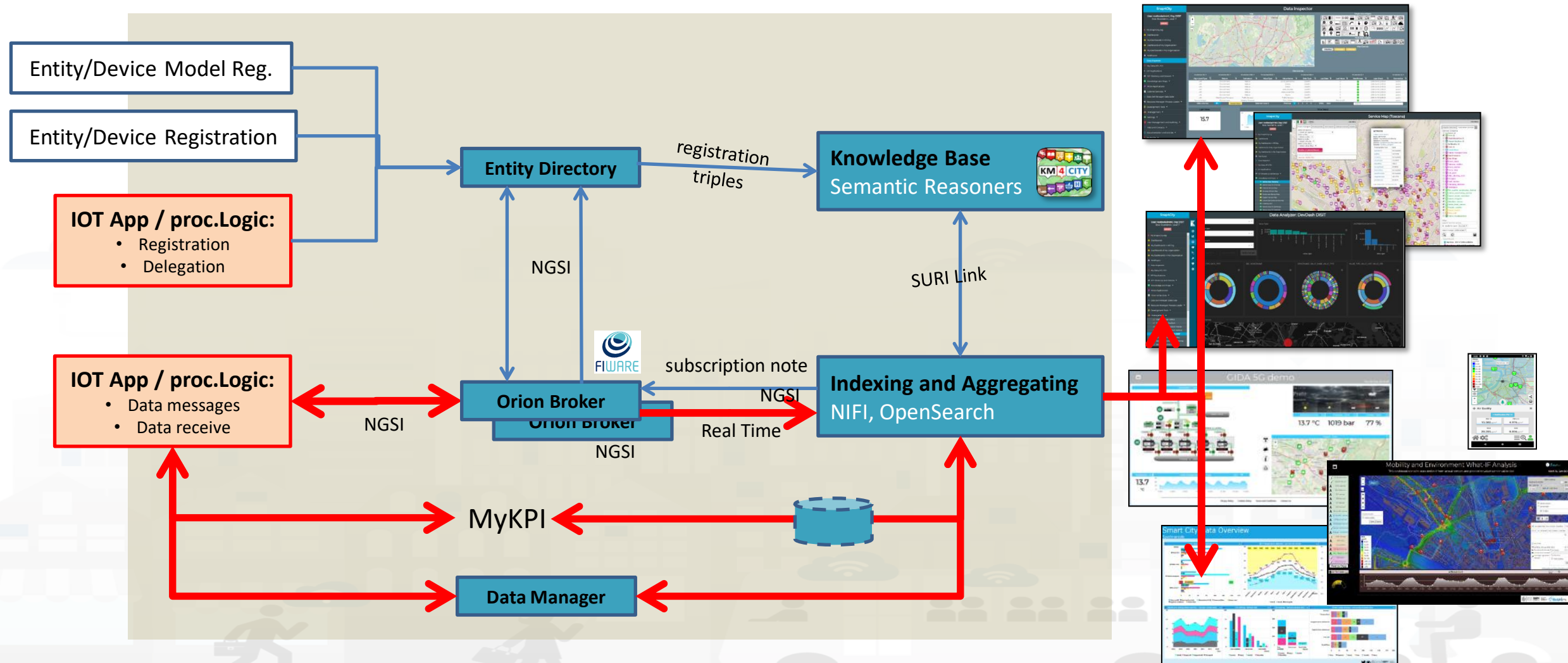
Main Data In/Out flows



Main Data In/Out flows



Main Data In/Out flows



Checking data/Entity ingestion results

Knowledge base Semantic reasoners



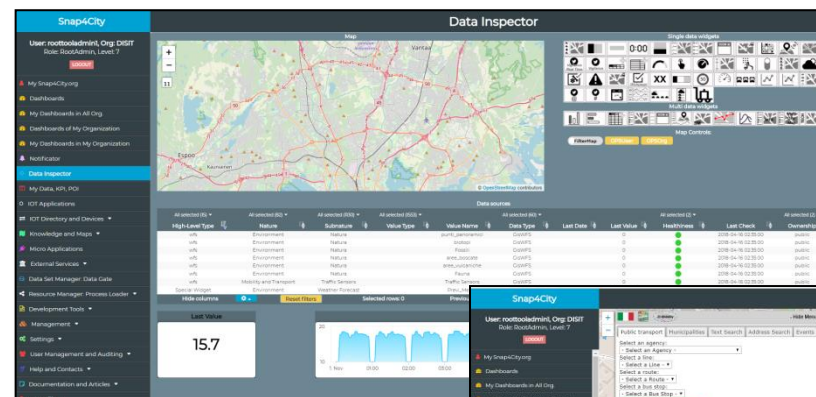
- All searches
- Metata
- Structure
- Last values of IoT Dev
- GTFS
- Only public IoT Dev

Indexing and aggregating NIFI, OpenSearch

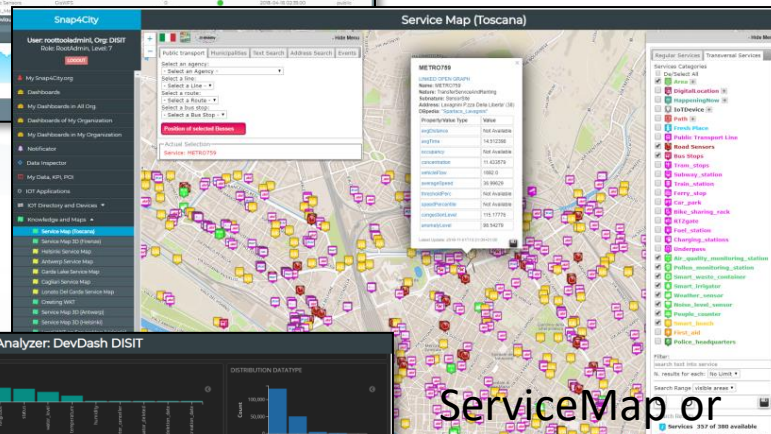
- Faceted search
- Geo search
- Time Series
- Private and Public

- **Data Inspector**
- **ServiceMap, SCAPI**
 - LOG / LOD viewer
 - Super Service Map
- **IoT/Entity Directory**
- **SCAPI: Swagger**
- **IoT Brokers**

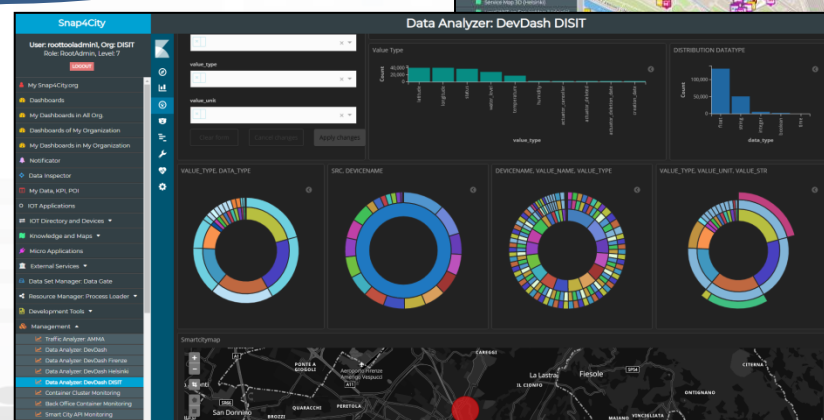
- **Data Inspector**
- **ServiceMap, SCAPI**
- **My Data Dashboard, OpenSearchDash**
- **OpenSearch**



Data Inspector
Digital Twin view



ServiceMap or
Super ServiceMap



My Data Dashboard
DevDash

Verification of Data Ingestion Process

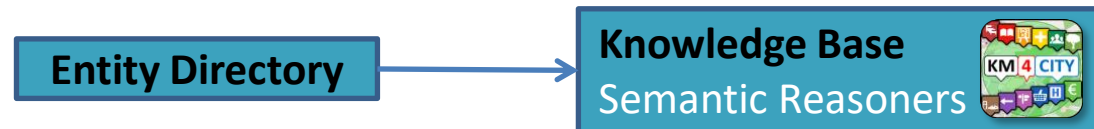
- **Verify that**

- **Entity/Device Creation** see it on

- Entity/IoT Directory, Entities/Devices list
 - Service Map if the device is Public
 - Data Inspector if the device is public and/or private
 - You can see the trend to see the time series and last value from the pin on map of the Data Inspector
 - Dashboards..... you can create a specific one using the Dashboard Wizard

- **Entities/Device Data (time series)** see them on

- Broker, via A dedicated services is coming....
 - Service Map if the device is Public
 - Data Inspector, this means that the data are on Storage
 - You can see the trend to see the time series and last value from the pin on map of the Data Inspector
 - Dashboards..... you can create a specific one using the Dashboard Wizard



Verify on IoT Directory

1. Verify the presence of the IoT Device you created
2. Verify the structure of the device by edit tool
3. See the **NGSI V2 JSON** format to be used on sending data msgs
4. Call the IoT Broker to see the last data on it (some user name and Pwd can be needed)
 - Get the Broker Name from the device profile
5. See next slide

Broker service URL such as

- <https://www.snap4city.org/brokrname/v2/entities>
- <http://brokrname.snap4city.org/v2/entities/>

Verify on Knowledge Base

5. Click on ServiceURI (device URI) to Open in a new TAB the data sent on the KB

6. If your device is Public and you have sent data → the list of the last data from OpenSearch querying from KB will appear as:

The screenshot shows the Snap4City IOT Devices Management interface. The top bar indicates 1970 DEVICES, 1959 ACTIVE, 540 PUBLIC, and 1395 PRIVATE. A table lists devices with columns: Device Identifier, IOT Broker, Device Type, Model, Ownership, Organization, Owner, Status, Edit, Delete, and Location. A device named 'basilicaDesamparados_new2' is highlighted. A green arrow points to its ServiceURI, which is then shown in a separate window. The ServiceURI window displays a list of data points (p) and their corresponding OpenSearch queries (o).

p	o
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/ns/sosa:Sensor
http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.disit.org/km4city/schema#Historical_buildings
http://www.w3.org/ns/sn:implements	http://www.disit.org/km4city/resource/iot/building
http://www.disit.org/km4city/schema#hasAttribute	http://www.disit.org/km4city/resource/iot/orionValencia-UNIFI/Valencia/basilicaDesamparados_new2/conservationStatus
http://www.disit.org/km4city/schema#hasAttribute	http://www.disit.org/km4city/resource/iot/orionValencia-UNIFI/Valencia/basilicaDesamparados_new2/dateObserved
http://www.w3.org/ns/sosa:observes	http://www.disit.org/km4city/resource/value_type/status
http://www.w3.org/ns/sosa:observes	http://www.disit.org/km4city/resource/value_type/timestamp
http://www.w3.org/ns/sn:hasSystemCapability	http://www.disit.org/km4city/resource/iot/orionValencia-UNIFI/Valencia/basilicaDesamparados_new2/systemCapability
http://purl.oclc.org/NET/UNITS-fiware/iot-lite#exposedBy	http://www.disit.org/km4city/resource/iot/orionValencia-UNIFI
http://www.disit.org/km4city/schema#protocol	"ngsi"
http://www.disit.org/km4city/schema#format	"json"
http://www.w3.org/2003.01/geo/wgs84_pos#long	-0.374804
http://schema.org/name	"basilicaDesamparados_new2"
http://www.w3.org/2003.01/geo/wgs84_pos#lat	39.47627
http://www.w3.org/2003.01/geo/wgs84_pos#geometry	"POINT(-0.374804 39.47627)"^^<http://www.openlinksw.com/schemas/virttrd#Geometry>
http://www.disit.org/km4city/schema#model	"buildingval"
http://www.disit.org/km4city/schema#organization	"Valencia"

Service
URI
LOD

Verify data ingestion on KB via ServiceMap

- 7) Verify on ServiceMa by Search on data location or by text name of the device
- 8) click on ServiceURI to jump on 9 LOG.DISIT.ORG to see semantic structure in terms of Linked Open Data, LOD

The screenshot displays the Snap4City interface. On the left, a sidebar shows the user's role as 'rootAdmin' and a list of service maps, with 'Valencia Service Map' selected. The main area shows a map of Valencia with a search bar containing 'basilicaDesamparados'. A search result for 'basilicaDesamparados_new2' is highlighted. A pop-up window shows the service details, including the ServiceURI: http://www.disit.org/km4city/resource/ot/orionValencia-UNIFI/Valencia/basilicaDesamparados_new2. A green arrow points from this URI to a 'Linked Open Graph' window at the bottom, which shows a network of semantic relationships between various entities like 'building', 'sensor', and 'systemCapability'.

Service
URI
LOD

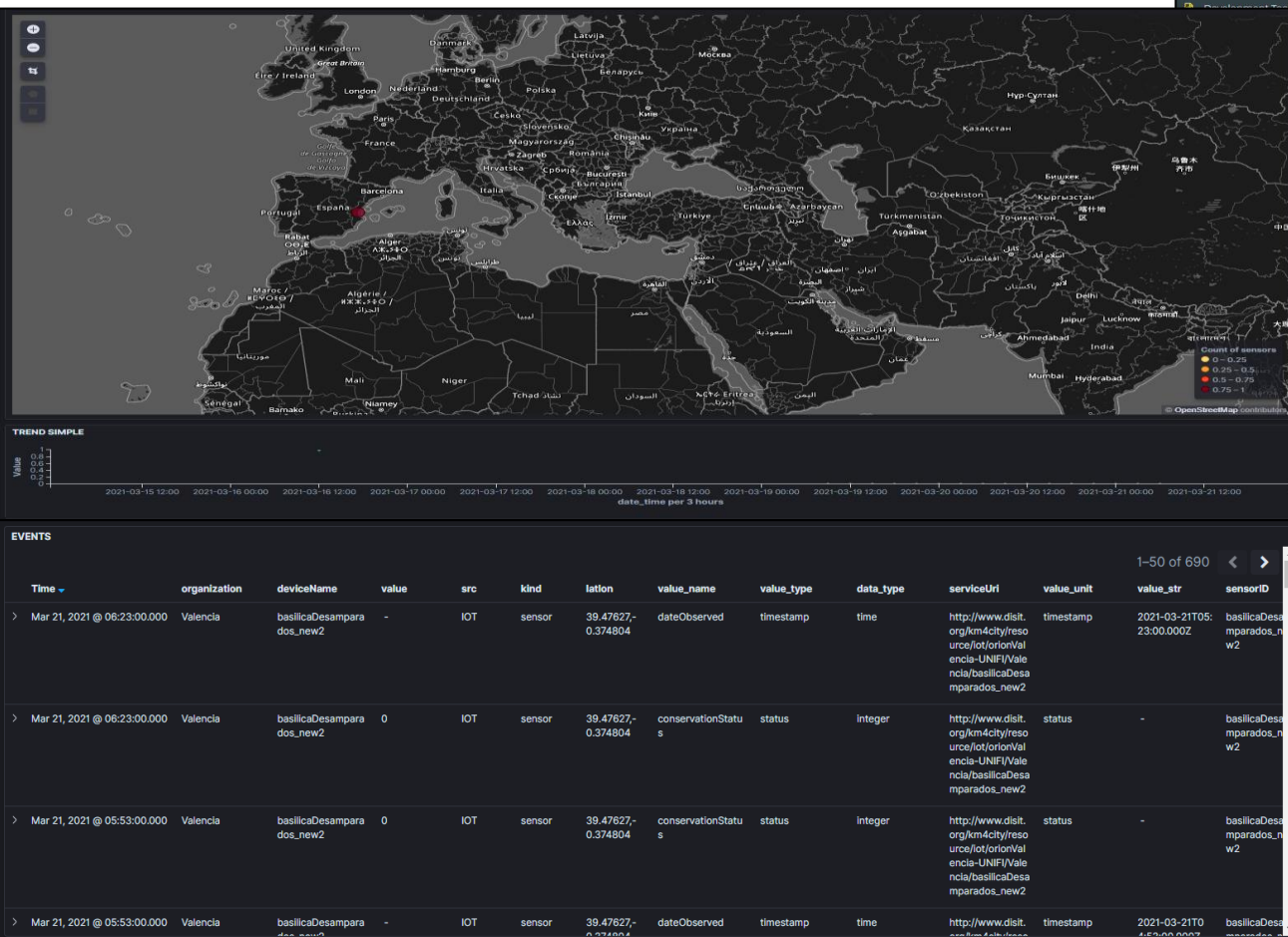
Every data on OpenSearch

- Verify on OpenSearch Dash which monitor Open Search: My data Dash

Snap4City

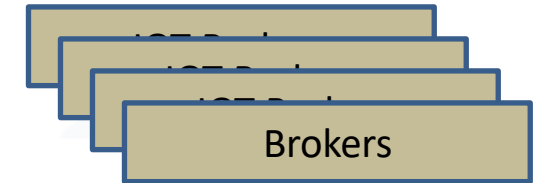
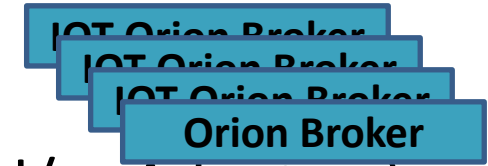
User: root@localhost Org: DISIT
Role: RootAdmin, Level: 7
[Logout](#)

- My Snap4City.org
- Tour Again
- ダッシュボード
- Dashboards
- My Dashboards in All Org
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
- Extra Dashboard Widgets
- Notifier
- Data, my Data, OpenData
- Knowledge and Maps
- IOT Applications
- IOT Directory and Devices
- Resource Manager
- Dashboard Tools



Additional Notes

- The **Orion Brokers** can be feed by means of
 - **IoT App/Proc.Logic** of Snap4City (to implement Agents and/or Adapters)
 - **IoT Agents** and/or **NGSI Adapters** by FiWare for different protocols
 - **Brokers** of any kind, different protocols and producers, also as Gateways, and they can be located on premise and/or on any cloud

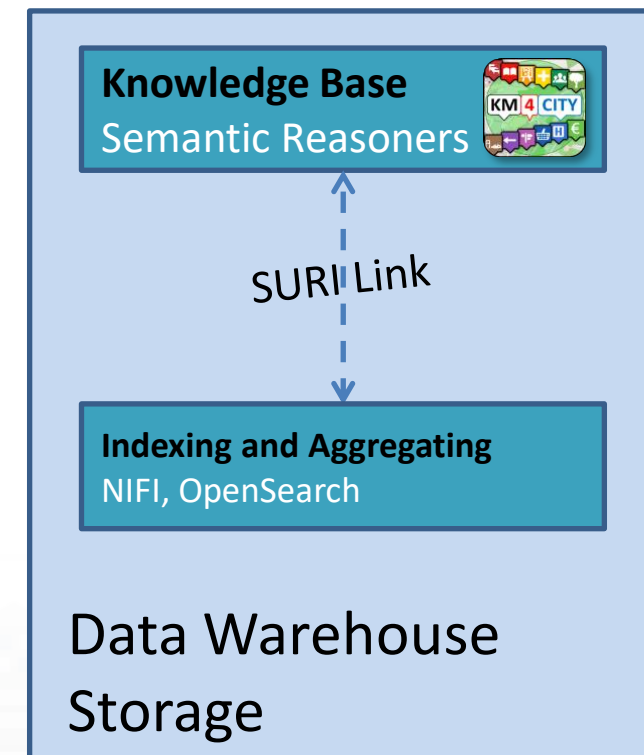


- **Proc.Logic/IoT App, IoT Agents, Adapters** can
 - be on IoT Edge
 - be implemented as IoT App/Proc.Logic of Snap4City
 - be on other clouds and services
 - work on a large range of different protocols and kinds
 - have or not Snap4City libraries installed



- The **Internal Orion Brokers** at Snap4City **Orion Broker** are used as a gate for data ingestion and actuations. Since they are
 - connected with the Directory and discovery of the Knowledge Base to make easy the production of Dashboards by wizard, Data Inspector;
 - Synchronized automatically with NIFI/OpenSearch for the Automated Data Shadow and Indexing
 - Ready to be used by Proc.Logic/IoT App to subscribe for creating even driven Proc.Logic/IoT Apps, on Edge and Cloud, etc...
 - Compatible and harmonized with FiWare networks

- **Direct Data Ingestion is also possible:**
 - From data sources to Data Warehouse Storage of Snap4City, Snap4Industry
- **Data Warehouse Storage includes:** KB, and I&A, reported on right side can be acted via API REST Call
 - for direct feeding data into store and retrieval,
 - which can be exploited by:
 - IOT App/Proc.Logic
 - applications in Python, R Studio, Java



Notation Terminology

WHERE	Are synonymous at level of service which can be IoT device or entity with data and references to	Are synonymous at level of the single attribute of the entity , device, service, etc.
IoT Directory, Entity Directory	IoT Device, Entity Instance, Device URI	Sensor, Actuator, Attributes, Values (value name)
Knowledge Base, ServiceMap, SmartCity API, ASCAPI	Service, ServiceURI, SURI	Attribute, Metric, SURI with metric
DataInspector, Wizard, Dashboard	Value Name (Model name, Category)	Sensor, Sensor Actuator, ValueType
IoT App., Proc.Logic, Node-RED	ServiceURI, SURI	SURI and its real time results of the objects into the data structure

ServiceURI, SURI of a sensor device:

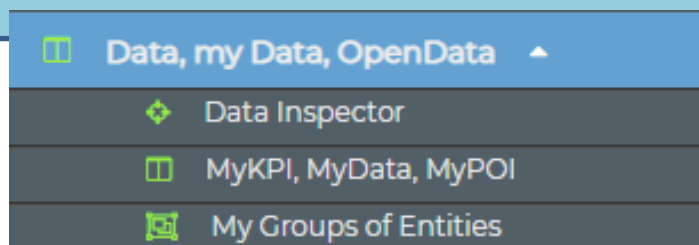
- <http://www.disit.org/km4city/resource/METRO759>
- <http://www.disit.org/km4city/resource/iot/orionCAPELON-UNIFI/CAPELON/Streetlight%3A90FD9FFFFEBD5A7F>

ServiceURI, SURI extended with attribute/variable/value:

- <http://www.disit.org/km4city/resource/METRO759&metric=vehicleFlow>
- <http%3A%2F%2Fwww.disit.org%2Fkm4city%2Fresource%2FMETRO759&metric=vehicleFlow>
- In some cases
 - <http://www.disit.org/km4city/resource/METRO759/vehicleFlow>

TOP

Digital Twin Data Inspector vs Data Processes Details



*Some functionalities are
limited to certain roles*

- It is showing data:
 - Listed by High Level Types, and classified as in the **Dashboard WIZARD: see Tutorial Part 2 for details.**
 - of your Organization only, that are public of the organization, your private or those that have been delegated to you some how.

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
- Notificator
- Data Inspector**
- My Data, KPI, POI
- My Groups of Entities
- IOT Applications
- IOT Directory and Devices
- Knowledge and Maps
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Synoptics
- Resource Manager: Process Loader
- Development Tools
- Management
- Settings
- User Management and Auditing
- Help and Contacts

Data Inspector

Single data widgets

Multi data widgets

Map Controls: [FilterMap](#) [GPSUser](#) [GPSOrg](#)

High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Value Unit	Last Date	Last Value	Healthiness	Last Check	Ownership
wfs	Environment	Natura		punti_panoramici	GisWFS			0		2020-04-03 09:58:18	public
wfs	Environment	Natura		biotopi	GisWFS			0		2020-04-03 09:58:18	public
wfs	Environment	Natura		Fossili	GisWFS			0		2020-04-03 09:58:18	public
wfs	Environment	Natura		aree_boscate	GisWFS			0		2020-04-03 09:58:18	public
wfs	Environment	Natura		aree_vulcaniche	GisWFS			0		2020-04-03 09:58:18	public
wfs	Environment	Natura		Fauna	GisWFS			0		2020-04-03 09:58:18	public
wfs	Mobility and Transport	Traffic Sensors		Traffic Sensors	GisWFS			0		2020-04-03 09:58:18	public
Special Widget	Environment	Weather Forecast		PrevL_Meteo	special weather					2020-04-03 09:30:45	public

Hide columns [Reset filters](#) Selected rows: 0 Previous 1 2 3 4 5 ... 14288 Next

Last Value

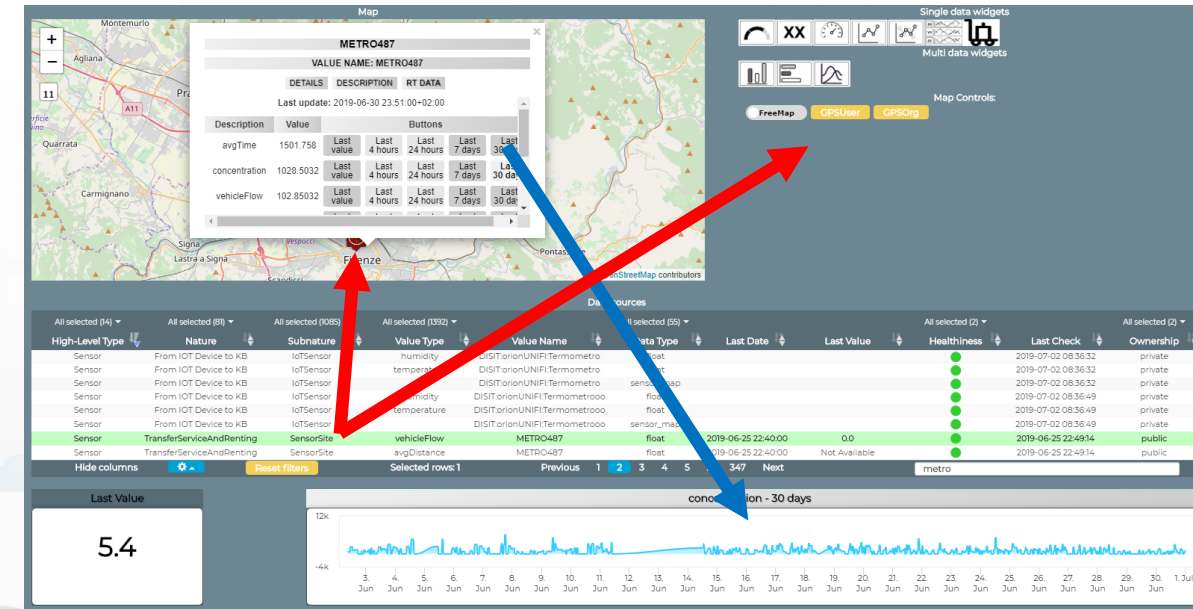
15.9

Time Trend

Data Inspector (open on your left side menu)

- **Cross Filtering on the basis of:**
 - **MAP:** pan and zoom → lock , center on GPS coordinates of the user
 - **Data Source Classification:**
 - faceted filtering
 - full text search
 - **Click on data source** to see it on map, and see the graphics representation, just to learn how widgeting it.
 - **Full Text Search** if you remember some desc...

- **Selecting a Data Source on Map:**
on its Pin you can see:
 - Real time data
 - Time trend: 4 hours, 12 hours, 1 day, 1 week, 30 days.
 - Full status and description (only for Administrators)





Snap4City

User: roottooladmin, Org: DISIT
Role: RootAdmin, Level: 7

[Logout](#)

- My Snap4City.org
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- My Dashboards in All Org.
- Dashboards of My Organization
- My Dashboards in My Organization
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- Help and Contacts
- Documentation and Articles

Data Inspector

Map

Single data widgets

Multi data widgets

Map Controls:

[FilterMap](#) [GPSUser](#) [GPSOrg](#)

Data sources

Selected (2)

Healthiness	Check	Ownership
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public
●	2019-08-13 07:18:30	public

Data sources Details

Device	Values	Healthiness	Process	Image	Licensing	User
GPS Coordinates:	42.642033, 18.1122					
High-Level Type:	Sensor					
Nature:	From IOT Device to KB					
Subnature:	IoT Sensor					
Value Name:	Dubrovnik:orionDubrovnik-UNIFI:camera_Dubrovnik_1_Place					
Device ServiceURI or Data ID:	http://www.disit.org/km4city/resource/iot/orionDubrovnik-UNIFI/Dubrovnik/camera_Du					
Sensor ServiceURI or Data ID:	http://www.disit.org/km4city/resource/iot/orionDubrovnik-UNIFI/Dubrovnik/camera_Du					
Datasource:	IoT					
Ownership:	private					
Organizations:	Dubrovnik					

[Link to Service Map](#) [Link to IoT Device](#)

Sensor

All selected (7)

High-Level Type	Nature
Sensor	Environment
Sensor	Environment
Sensor	Environment
Sensor	Environment
Sensor	Environment
Sensor	Environment
Sensor	Environment

Hide columns

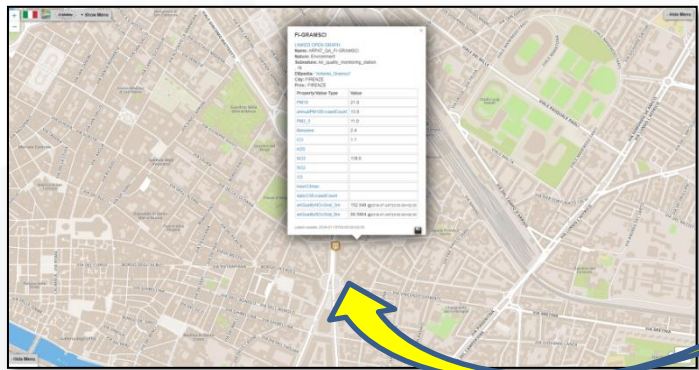
Last Value

14.9

- Click with the mouse on it

HLT: Sensor

Knowledge Base view



Some functionalities are limited to certain roles

Snap4City

User: roottooladmin, 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
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- Resource Manager: Process Loader
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- Settings
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- Help and Contacts
- Documentation and Articles

IOT Devices

Show: 10 entries

IOT Device	IOT Broker	Device Type	Model	Ownership	Status	Edit	Delete	Location
AccessPoint1_FamiasSuperstore	orionLoratoDeCarda-UNIFI	AccessPointSensor	AccessPointLorato	DELEGATED	active	EDIT	DELETE	
AccessPoint2_TT65	orionLoratoDeCarda-UNIFI	AccessPointSensor	AccessPointLorato	DELEGATED	active	EDIT	DELETE	
AccessPoint3_Paleopart	orionLoratoDeCarda-UNIFI	AccessPointSensor	AccessPointLorato	DELEGATED	active	EDIT	DELETE	
AdminDev1	orionUNIFI	Ambiental		MYOWNPRIVATE	active	EDIT	DELETE	
AdminDevice001	orionUNIFI	Ambiental		MYOWNPRIVATE	active	EDIT	DELETE	
AdminDevice002	orionUNIFI	Ambiental		MYOWNPRIVATE	active	EDIT	DELETE	
AdminDevice004	orionUNIFI	Ambiental		MYOWNPRIVATE	active	EDIT	DELETE	
AdminDevice009	orionUNIFI	Ambiental		MYOWNPRIVATE	active	EDIT	DELETE	
AdminDevice010	orionUNIFI	Ambiental		MYOWNPRIVATE	active	EDIT	DELETE	
AdminTest005	orionUNIFI	Ambiental		MYOWNPRIVATE	active	EDIT	DELETE	

Showing 10 of 370 entries

Details regarding the IOT Ingestion process

Data sources Details

Device	Values	Healthiness	Process	Image	Licensing	User
Knowledge Base IP:	192.168.0.206					
IoT Broker:	orionFinland					
IoT Device:	373773207E330105					
Device Set name:						

[Link to Knowledge Base](#)
[Link to IoT Broker](#)

Cancel

- For IOT Device data
- IOT Broker details

```
{
  "service": {
    "type": "FeatureCollection",
    "features": [
      {
        "type": "Point",
        "coordinates": [ 24.822805, 40.215797 ]
      }
    ]
  },
  "properties": {
    "name": "Air Quality Monitoring Station",
    "type": "Air Quality Monitoring Station",
    "format": "json",
    "producer": "nelli",
    "address": "Via Po 150 05140",
    "brokerName": "orionFinland",
    "brokerAddress": "192.168.1.1",
    "ownership": "public",
    "organization": "MediCity",
    "realtimeAttributes": {
      "address": {
        "data_type": "json", "value_type": "latitude_longitude", "attr_type": "DeviceAttribute", "value_unit": "m", "value_refresh_rate": "300",
        "value_bounds": "unspecified", "different_values": "0", "dateObserved": "2019-03-13 14:57:17",
        "data_type": "datetime", "value_type": "location_data", "attr_type": "DeviceAttribute", "value_unit": "m", "value_refresh_rate": "300",
        "value_bounds": "unspecified", "different_values": "0", "location": {
          "data_type": "json", "value_type": "latitude_longitude", "attr_type": "DeviceAttribute", "value_unit": "m", "value_refresh_rate": "300",
          "value_bounds": "unspecified", "different_values": "0", "realtime": {
            "data_type": "json", "value_type": "PM2.5_concentration", "attr_type": "DeviceAttribute", "value_unit": "µg/m³", "value_refresh_rate": "300",
            "value_bounds": "unspecified", "different_values": "0", "PM2.5": {
              "data_type": "float", "value_type": "PM2.5_concentration", "attr_type": "DeviceAttribute", "value_unit": "µg/m³", "value_refresh_rate": "300",
              "value_bounds": "unspecified", "different_values": "0", "reliability": {
                "data_type": "float", "value_type": "reliability", "attr_type": "DeviceAttribute", "value_unit": "m", "value_refresh_rate": "300", "value_bounds":
                "unspecified", "different_values": "0", "source": {
                  "data_type": "string", "value_type": "status", "attr_type": "DeviceAttribute", "value_unit": "m", "value_refresh_rate": "300", "value_bounds":
                  "unspecified", "different_values": "0"
                }
              }
            }
          }
        }
      }
    }
  },
  "realtime": {
    "head": {
      "name": "MeasuredTime", "PM2.5", "dateObserved", "reliability", "source"
    },
    "result": {
      "timestamp": {
        "value": "2019-03-13T14:57:17.000000000", "PM2.5": {
          "value": "1.47", "PM2.5": {
            "value": "1.29", "dateObserved":
            "2019-03-13T14:57:17.000000000", "reliability": {
              "value": "0.87", "source":
              "https://www.who.int/news-room/fact-sheets/diseases/diabetes"
            }
          }
        }
      }
    }
  }
}
```

Snap4City

User: root@snap4city.org, Org: DISIT, Role: RootAdmin, Level: 7

IOT Brokers

IOT Broker	Access Link	Access Port	Protocol	Ownership	Organization	Owner	Created	Edit	Delete
Antwerp	https://antwerp.belgisipolis/ovvma/1/entities		ngsi	DELEGATED	Antwerp	iotdirectory.antwerp	2019-03-13 14:57:17	EDIT	DELETE
Antwerp2	https://antwerp-belgisipolis.belmecc/smartzone/v1		ngsi	DELEGATED	Antwerp	iotdirectory.antwerp	2019-01-01 00:00:00	EDIT	DELETE
CB-test-multi	192.168.1.47	8444	ngsi	DELEGATED	DISIT	angelodifino	2020-05-20 15:42:39	EDIT	DELETE
iotobf-smartbed	192.168.1.47	8443	ngsi	DELEGATED	SmartBed	angelodifino	2019-11-29 15:31:51	EDIT	DELETE
mqttUNIFI	192.168.1.10	1883	mqtt	DELEGATED	DISIT	iotdirectory.dist	2018-02-07 15:14:39	EDIT	DELETE
mqttUNIMI	159.149.129.184	1884	mqtt	DELEGATED	DISIT	iotdirectory.dist	2018-04-30 16:49:05	EDIT	DELETE
orionAntwerp-UNIFI	broker3.snap4city.org	8080	ngsi	PUBLIC	Antwerp	iotdirectory.antwerp	2019-06-03 14:25:16	EDIT	DELETE
orionDubrovnik-UNIFI	192.168.1.47	8446	ngsi	DELEGATED	Dubrovnik	iotdirectory.dubrovnik	2020-07-09 11:06:49	EDIT	DELETE
orionFinland	https://hgsi.fh.fi		ngsi	PUBLIC	Helsinki	iotdirectory.helsinki	2018-11-21 16:05:24	EDIT	DELETE
orionFirenze-UNIFI	192.168.1.17	8443	ngsi	PRIVATE	Firenze	iotdirectory.firenze	2019-10-28 10:01:53	EDIT	DELETE

Showing 1 to 10 of 20 entries

Previous 1 2 Next

Some functionalities are limited to certain roles

HLT: Sensor

- Specific values of selected
- Information of the values of the other sensors on the same device
- View Trends, marking problems, healthiness by point according to a Fuzzy model
- Marking problems for future machine learning processes (separate tool)

Data sources Details

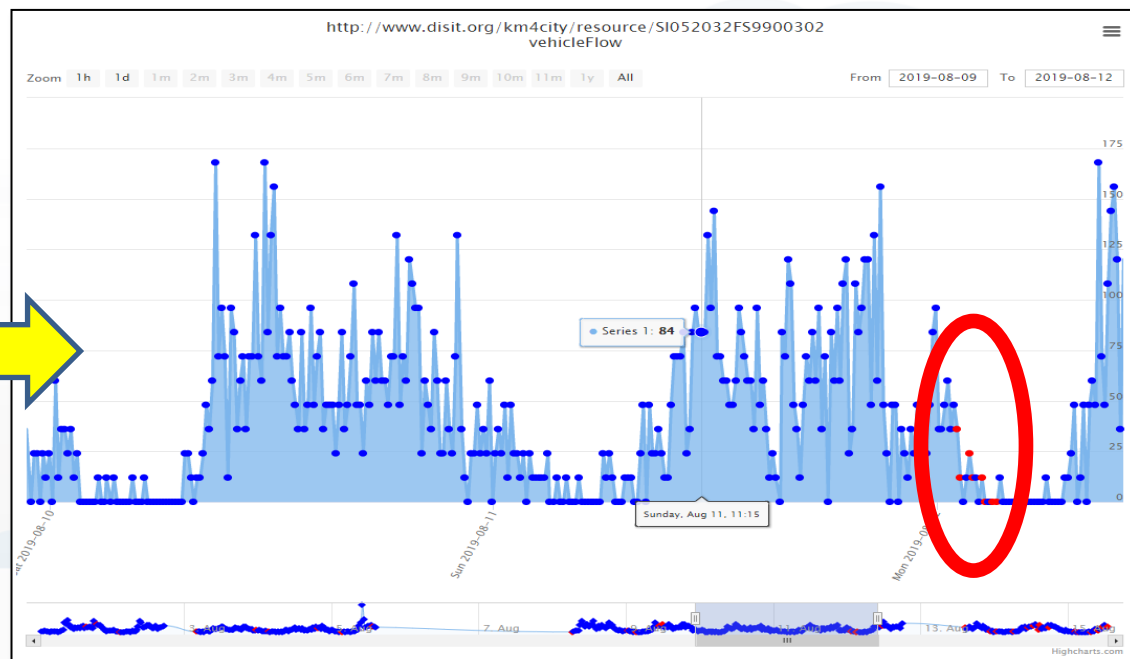
Device Values Healthiness Process Image Licensing User

Last Date: 2020-07-21 19:00:00

Last Value:

Value Type	Healthy	Delay (s)	Reason	Healthiness Criteria	Refresh Rate (s)	Data type	Unit	Value	Time Trend
dateObserved	●	61890	undefined	undefined	300	time	timestamp	2020-07-21T17:00:00.000Z	VIEW
deceduti	●	61890	undefined	undefined	300	integer	#	16797	VIEW
dimessi_guariti	●	61890	undefined	undefined	300	integer	#	71775	VIEW
isolamento_domiciliare	●	61890	undefined	undefined	300	integer	#	6838	VIEW
nuovi_attualmente_positivi	●	61890	undefined	undefined	300	integer	#	-131	VIEW
ricoverati_con_sintomi	●	61890	undefined	undefined	300	integer	#	151	VIEW
stato	●	61890	undefined	undefined	300	string	#	ITA	VIEW
tamponi	●	61890	undefined	undefined	300	integer	#	1212468	VIEW
terapia_intensiva	●	61890	undefined	undefined	300	integer	#	21	VIEW
totale_attualmente_positivi	●	61890	undefined	undefined	300	integer	#	7010	VIEW
totale_casi	●	61890	undefined	undefined	300	integer	#	95582	VIEW
totale_ospedalizzati	●	61890	undefined	undefined	300	integer	#	172	VIEW
codice_regione	●	61890	missing value	undefined	300	integer	status		VIEW
denominazione_regione	●	61890	missing value	undefined	300	string	status		VIEW

Cancel




Some functionalities are limited to certain roles

Image of the Devices and Licensing

Data sources Details

Device Values Healthiness Process Image Licensing User




Upload

Nessun file selezionato

Data sources Details

Device Values Healthiness Process Image Licensing User

Licence (on:Dubrovnik:orionDubrovnik-UNIFI:camera_Dubrovnik_1_Ploce):



<https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>

Provider: Dubrovnik Development Agency DURA

Address:

E-mail: scavar@dura.hr

Reference Person: Stjepan Cavar

Telephone: 00385 20640557

Website:

Some functionalities are limited to certain roles

HLT: From Dashboard to IOT APP

- Click with the mouse on it

Data Inspector

Data sources Details

Device	Values	Healthiness	Image	Licensing	User
GPS Coordinates:					
High-Level Type:	Dashboard-IOT App				
Nature:	From Dashboard to IOT App				
Subnature:	Mobile PAXCounter 01 in Antwerp				
Value Name:	nr8a0bv				
Device ServiceURI or Data ID:					
Sensor ServiceURI or Data ID:					
Datasource:	From Dashboard to IOT App				
Ownership:	private (My Own)				
Organizations:	Other				

Link to lot App
List of Dashboard

Link to dashboard "Mobile PAXCounter 01 in Antwerp"
Link to dashboard "PaxMobAnt05"
Link to dashboard "Mobile PAXCounter 03 in Antwerp"

Mobile PAXCounter 01 in Antwerp

Begin: 19:00
Finish: 19:00
Activate

CUMULATIVE MODE: OFF
Device in Cumulative Mode: OFF

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
- Data Inspector**
 - My Data, KPI, POI
 - My Groups of Entities
 - Data Set Manager: Data Gate
 - DataGate Harvester
 - Add Data Sources into the Platform
 - High Level Types
 - Supported Protocols, HowTo add
 - Interoperability & Standards
- Knowledge and Maps
- IOT Applications
- IOT Directory and Devices
- Resource Manager
- Development Tools
- Management
- Decision Support Systems

Data Inspector

Data sources Details

Device	Values	Healthiness	Image	Licensing	User
GPS Coordinates:	60.215797, 24.812305				
High-Level Type:	MyKPI				
Nature:	UtilitiesAndSupply				
Subnature:	Agents				
Value Name:	S4CAntwerpAppUsage				
Device ServiceURI or Data ID:	17056644				
Sensor ServiceURI or Data ID:	17056644/App Usage Information Saved From The App				
Datasource:					
Ownership:	private				
Organizations:	Antwerp				

Single data widgets

data widgets

Controls:

Optic Mode

and sensors that you need for your synoptics.

- Click with the mouse on it

ID	Value	Latitude	Longitude	Data Time	Insert Time	Controls
142797	api	52.2844	4.427791	20/09/2019 19:03:24	20/09/2019 19:04:28	edit delete
142798	api	52.2838	4.427754	20/09/2019 19:03:27	20/09/2019 19:04:28	edit delete

List of lotApp

Link to lotApp nrqolob

HLT: External Service

Data sources Details

Device	Values	Image	Ownership
GPS Coordinates:	51.222744, 4.405380		
High-Level Type:	External Service		
Nature:	Environment		
Subnature:	Antwerpen (park Spoor Noord) Air Pollution		
Value Name:	ExternalContent		
Datasource:	Special Process		
Ownership:	public		
Organizations:	['DISIT', 'Antwerp', 'Other']		

[Link to External Service](#)

Data sources Details

Device	Values	Image	Ownership
Value Type:			
Data Type:	webpage		
Last Date:			
Last Value:	Antwerp		

Value Type	Healthy	Delay (s)	Reason	Health

Data sources Details

Device	Values	Image	Ownership

Data sources Details

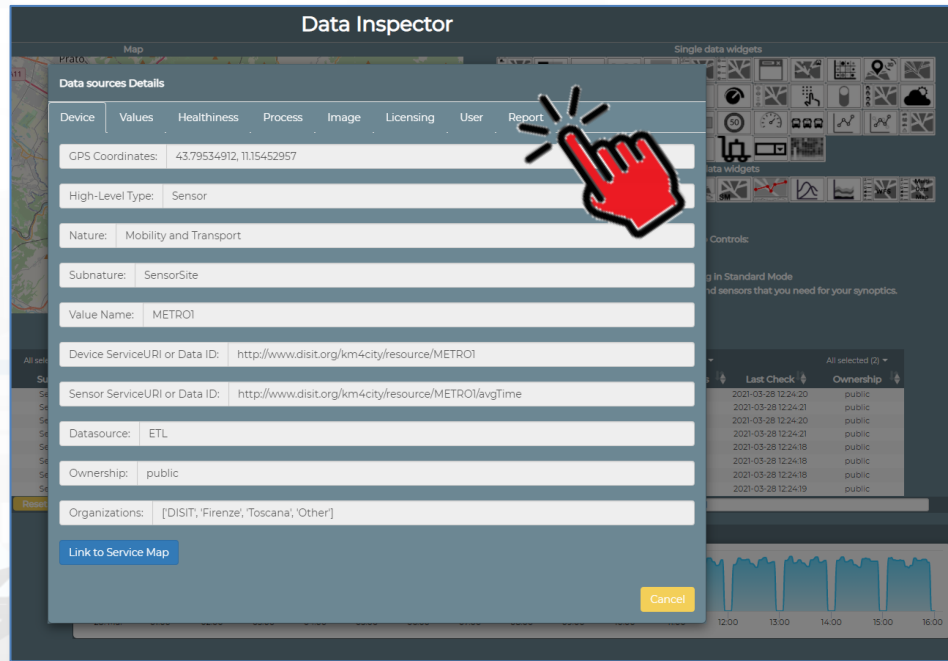
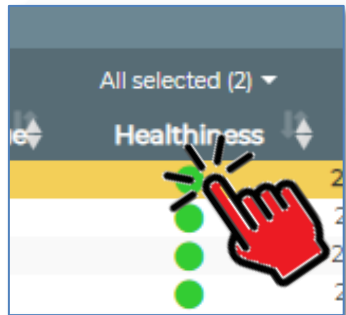
Device	Values	Healthiness	Process	Image	Licensing	User
User Creator:	angelo.difino.dubrovnik					
Status:						
E-mail creator:						

[Cancel](#)

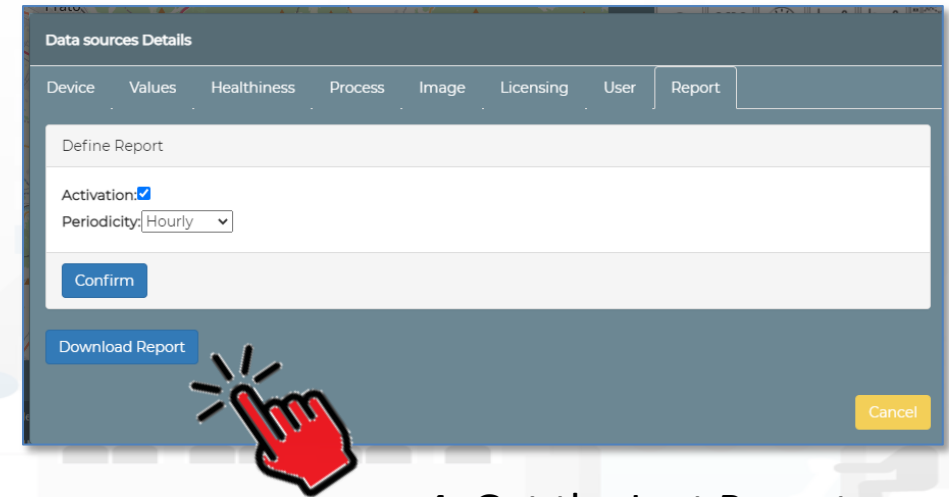
The fields shown may be present or not depending on the HLT and on the information received

Report Generation and Access

- **Device/data** owner may have their reports: **monthly** or **3-monthly**
 - Ready to use reports are available for:
 - Single Device: ETL and IOT
 - Ask to your RootAdmin to activate the production of reports (and also **hourly** report **for testing only**).



3. Click on report



4. Get the Last Report

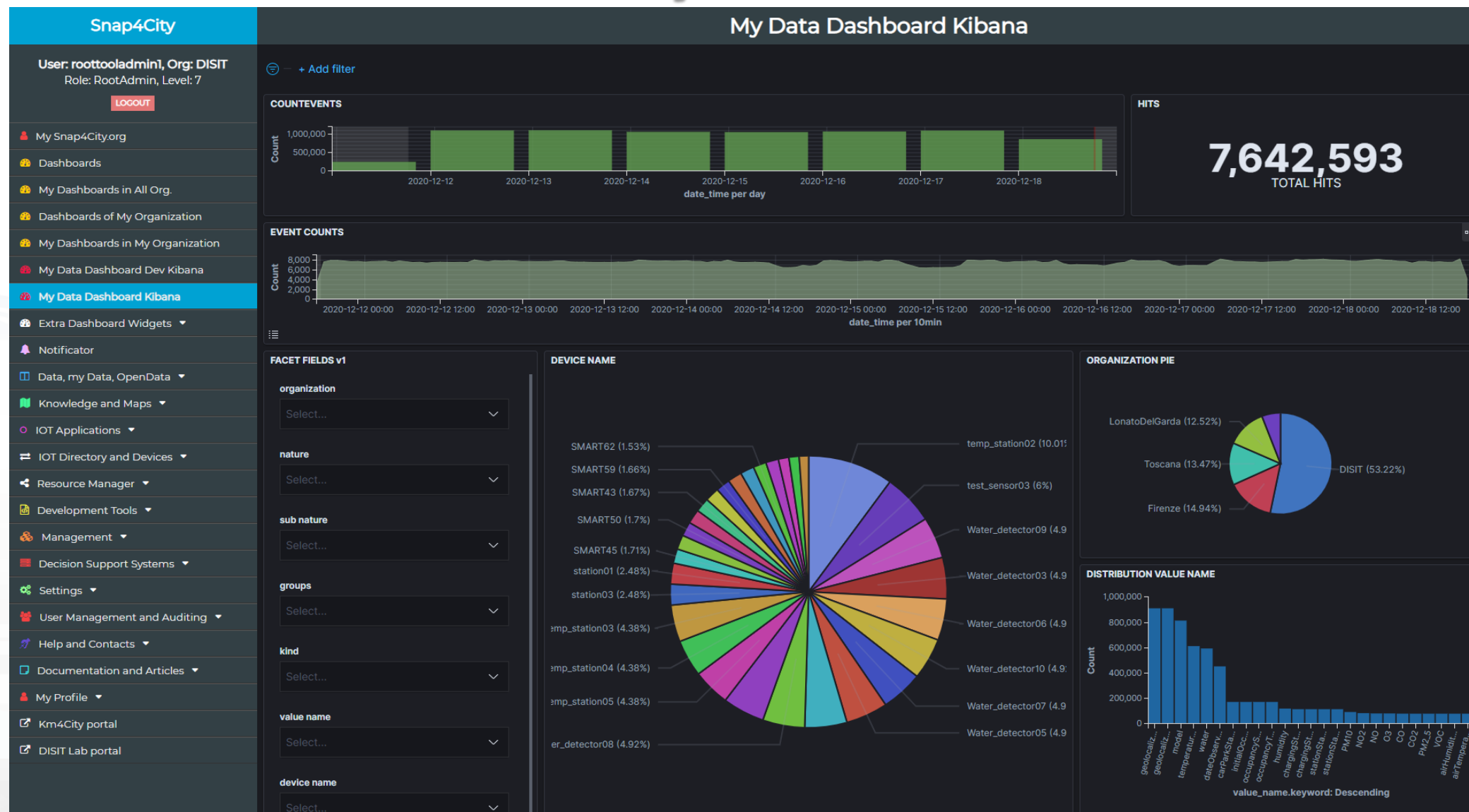
TOP

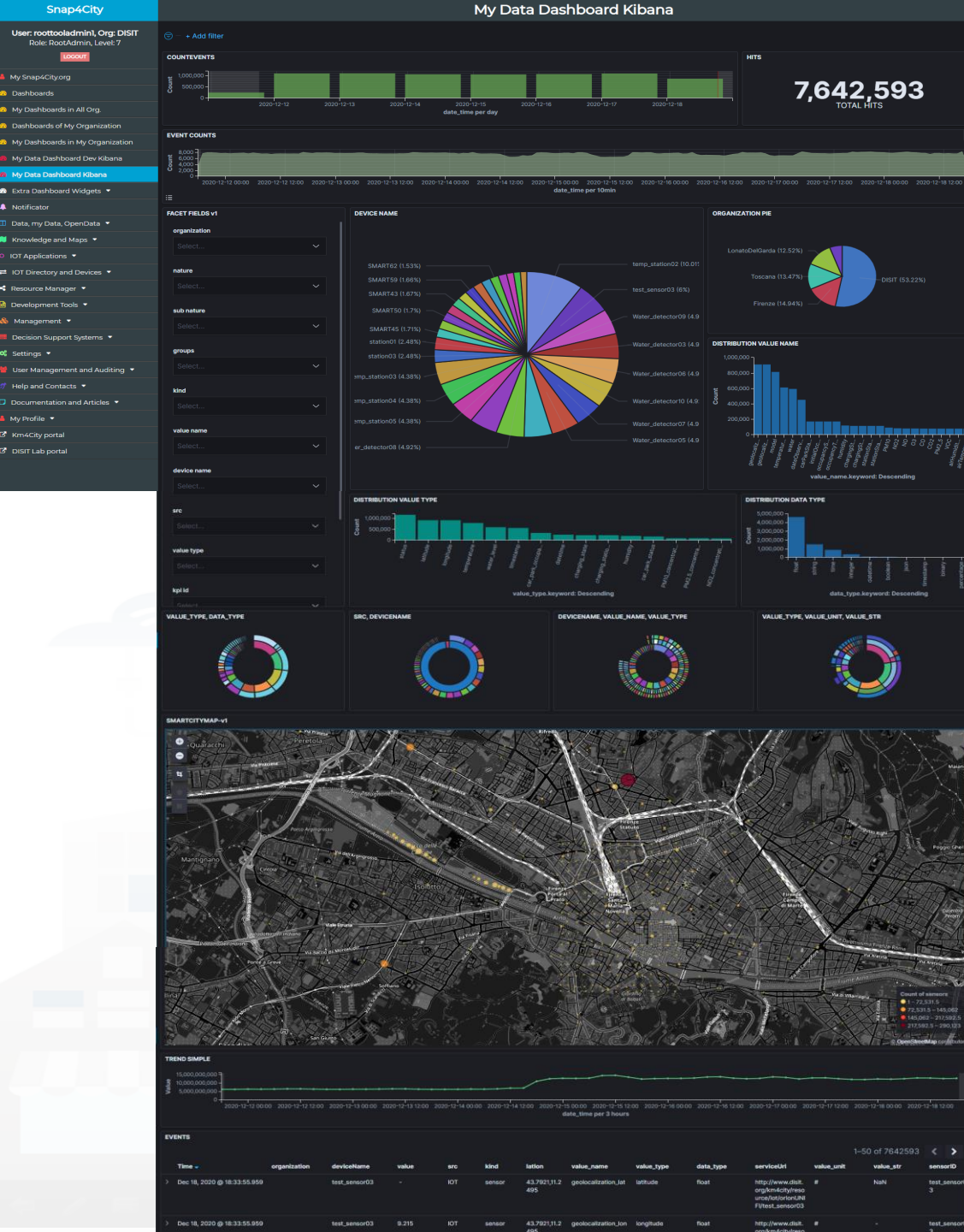
My Data Dashboard Dev to assess data on Open Search Storage



Some functionalities are limited to certain roles

DevDash: My Data Dashboard





Business Analysis Dashboards For all kind of users: DevDash

- Dynamic Filtering, Adaptable, ...
- Full data details, drill down,...
- Synergic with **Data Inspector** which addresses data relationships, processing and information
- **Only Your Data for**
 - Manager and Area Managers
- **All Accessible Data for**
 - ToolAdmin and RootAdmin



- Multi faceted Search by
 - Devices
 - Organization
 - Drill on Time
 - Drill on Map
 - Value Types
 - Data Type
 - Value name
 - Data table
 - Etc.



- Respect Privacy and GDPR



VALUE_TYPE, DATA_TYPE

SRC, DEVICENAME

DEVICENAME, VALUE_NAME, VALUE_TYPE

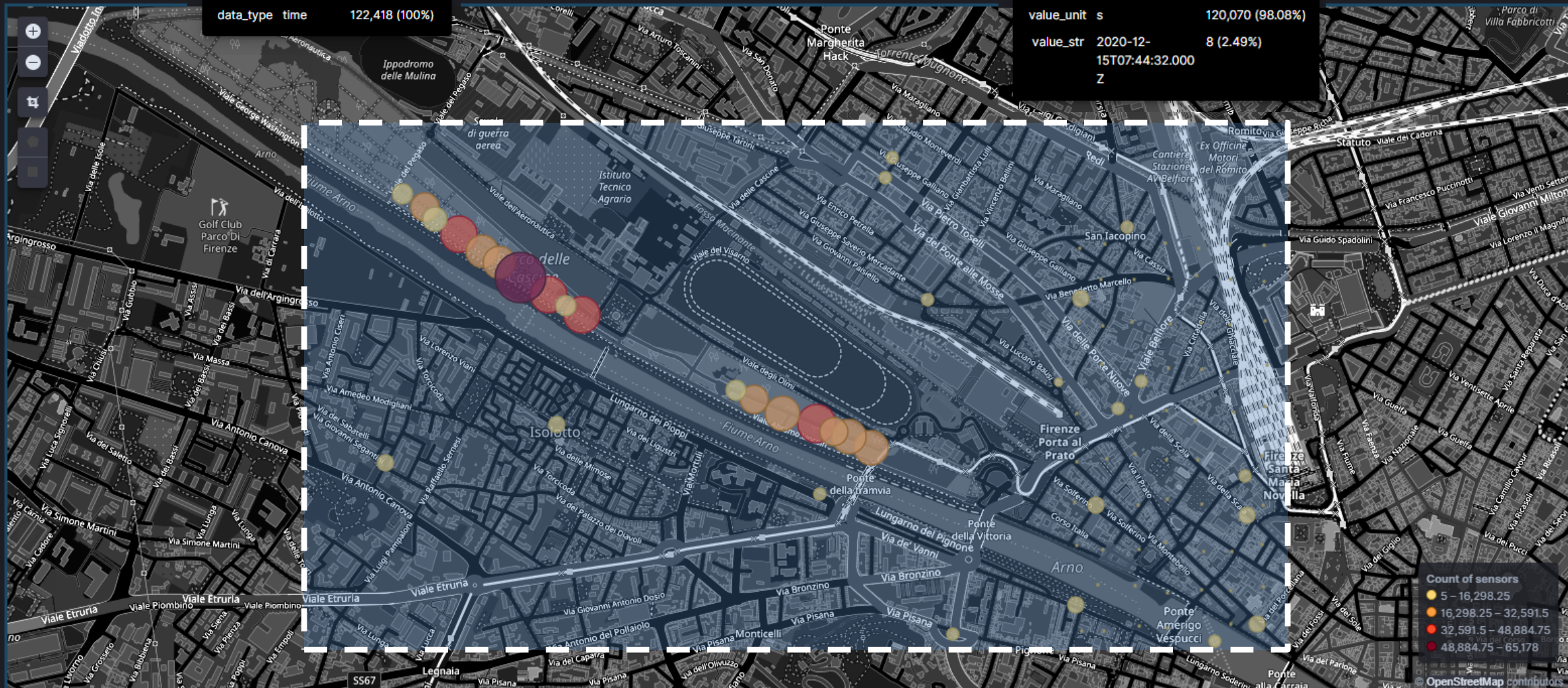
VALUE_TYPE, VALUE_UNIT, VALUE_STR



SMARTCITYMAP-v1

field	value
value_type	timestamp 122,418 (22.9%)
data_type	time 122,418 (100%)

field	value
value_type	timestamp 122,418 (33.17%)
value_unit	s 120,070 (98.08%)
value_str	2020-12-15T07:44:32.000Z 8 (2.49%)



Count of sensors

- 5 - 16,298.25
- 16,298.25 - 32,591.5
- 32,591.5 - 48,884.75
- 48,884.75 - 65,178

OpenStreetMap contributors

TOP

An Integrated Example for Time Series

FROM CITY
DASHBOARD TO
APPLICATIONS

DATA GATHERING
AND CITY DATA
KNOWLEDGE
MANAGEMENT

FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT/IOE DEVICES
AND NETWORKS

IOT APPLICATIONS,
THE LOGIC AND
THE SMARTNESS

IOT APPLICATIONS
AND THE
DEVELOPMENT

ADVANCED
SMART CITY API,
MICROSERVICES,
SNAP4CITY API

SNAP4CITY
LIVING LAB FOR
COLLABORATIVE
WORK

SNAP4CITY FOR
BEGINNERS

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
WHAT-IF AND
SIMULATION

SNAP4CITY
ARCHITECTURE AND
ECOSYSTEM OPENED
TO DEVELOPERS
AND STARTUPS

TWITTER
VIGILANCE: SOCIAL
MEDIA ANALYSIS

DECISION SUPPORT
SYSTEM AND CITY
RESILIENCE

HOW TO ADOPT
SNAP4CITY, AND
OUR ROADMAP

SNAP4CITY
AND KM4CITY
PROJECTS

SNAP4CITY THE
VIEW OF THE
ADMINISTRATORS

Activities for Registration on Directory

- **Manual Registration**

- From scratch Single Device / Entity Registration
→ **Entity Directory / IoT Directory**
- From a template (the templates are called Models)

- **Automated Registration for bulk/massive registration: N Entities / Devices**

- From IoT App on the basis of some **Models** from IoT App
- From IoT App **loading a CSV** (with or without a reference IOT Model)
- Programming from scratch or from a **Model**
- On the basis of some EXCEL file with data by using the **Data Table Loader, which create model, devices and data**
- Etc.

1

**Entity/IoT
Directory**

Manual or automated
Registration
of Entities/Devices

created a Model as:

Edit Model - statuscorregione

General Info

IoT Broker

Static Attributes

Values

statuscorregione

Name

Ok

misura

Device Type

Ok

protezione civile

Producer

Ok

Healthiness Criteria

Automatically generated

Key Generation

statuscorregione

Description

Ok

Sensor

Kind

600

Frequency

Healthiness Value

Edge-Gateway Type

Cancel

Confirm

Edit Model - statuscorregione

General Info

IoT Broker

Static Attributes

Values

orionUNIFI

ContextBroker

json

Format

Service/Tenant

only ngsi w/MultiService supports Service/Tenant selection

ngsi

Protocol

ServicePath

only ngsi w/MultiService supports ServicePath

Cancel

Confirm

Edit Model - statuscorregione

General Info

IoT Broker

Static Attributes

Values

Select an option

Subnature

Add Attribute

Cancel

Confirm

Edit Model - statuscorregione

General Info	IoT Broker	Static Attributes	Values
dateObserved	timestamp (Timestamp)	timestamp in millisecond	string
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
deceduti	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
dimessi_guariti	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
isolamento_domiciliare	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
nuovi_attualmente_positiv	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		

For Time Series



- **ValueName:**
dateObserved
- **ValueType:**
timestamp
- **ValueUnit:**
timestamp in millisecond
- **DataType:**
string
- **E.g.: ISO string of the date-time**

terapia_intensiva	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
totale_attualmente_positiv	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
totale_casi	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
totale_ospedalizzati	people_count (People C)	number (#)	integer
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
codice_regione	status (Status)	some coded status (str)	string
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		
denominazione_regione	status (Status)	some coded status (str)	string
Value Name Ok	Value Type Ok	Value Unit Ok	Data Type
Refresh rate ▼	300	Remove Value	
Healthiness Criteria	Healthiness Value		

Add Value Cancel Confirm

Please note for Time Series of IoT Devices

- Snap4City engine recognizes as time basis for the TimeSerie only 1 Variable with
 - ValueType as TimeStamp (in milliseconds)
- **If you need more than one timestamp** in milliseconds use:
 - ValueType as ***DateTime*** (in milliseconds)

Startingtime	datetime (Datetime) ▼	timestamp in millisecond ▼	string ▼
Value Name	Value Type 	Value Unit 	Data Type
Ok	Ok	Ok	
Refresh rate ▼	300	<div>Remove Value</div>	
Healthiness Criteria	Healthiness Value		

From Model, you can create instances of Entities / Devices

Snap4City

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3

LOGOUT

- My Snap4City.org
- Tour Again
- Dashboards (Public)
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
- Extra Dashboard Widgets
- Data, my Data, OpenData
- Knowledge and Maps
- IOT Applications
- IOT Directory and Devices
 - My IOT Sensors and Actuators
 - IOT Sensors and Actuators
 - IOT Devices**
 - IOT Brokers
 - IOT Device Models
 - IOT Devices Bulk Registration
 - Doc: IOT Directory and Devices
 - Create an IOT Device Instance
 - Create an IOT Device Model
 - Add an IOT Device into Snap4City
- Resource Manager
- Development Tools
- Management
- Decision Support Systems

IOT Devices

Show entries

Search:

[Add new device](#)

	Device Identifier	IOT Broker	Device Type	Model	Ownership	Status	Edit	Delete	Location	View
+	adminDev1	orionUNIFI	Ambiental		PUBLIC	active				VIEW
+	alert_1610543238306	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610548534047	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610613189703	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610629197473	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610714974380	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610715864347	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610715997465	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610717002089	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610717247691	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW

Showing 1 to 10 of 217 entries

Previous 1 2 3 4 5 ... 22 Next

They have been created by «Add new Device»

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 ▾
- IOT Applications ▾
- IOT Directory and Devices ▴
- My IOT Sensors and Actuators**
- IOT Sensors and Actuators
- IOT Devices
- IOT Devices Management
- IOT Brokers
- IOT Device Models
- IOT Devices Bulk Registration
- IOT Broker Periodic Update setting
- IOT Orion Broker Mapping Rules

My IOT Sensors and Actuators

[My Devices](#)
[Delegated Devices](#)
[Add New Device](#)

Add My New Device

Dubrovnik Total Average Person ▾

Model
Ok

Latitude
Latitude is mandatory

Longitude
Longitude is mandatory

16d71349-2eb6-454e-84f1-ae54fd3617ce
KEY 1

4e7dbd20-77ea-4412-8aed-8e352d055093
KEY 2

These keys have been generated automatically for your device. Keep track of them. Details on [info](#)

Monitoring Camera (TransferServiceAndRen▾

Subnature

Locality ▾
Dubrovnik
Value

[Remove](#)

[Add Attribute](#)

[Submit Device](#)

Select Latitude/Longitude on Map

Device from Model by Providing:

- **NAME** (it has to be unique)
- Select the IoT/Entity Model: «**statuscorregione**»
 - Thus the K1, K2 appears since the model is associated to an Orion Broker that needs to have them, the tool generate them for you but you can impose if you like
 - See in previous slide the ID name of the IOT Broker used
- **Lat** and **Lon**, GPS coordinates you can:
 - pick on the map
 - Write the coordinates manually and see the pin on map

Once Created, I may send a new data to it

Snap4City

User: paolo.disit, Org: DISIT
Role: AreaManager, Level: 3

LOGOUT

- My Snap4City.org
- Tour Again
- Dashboards (Public)
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
- Extra Dashboard Widgets
- Data, my Data, OpenData
- Knowledge and Maps
- IOT Applications
- IOT Directory and Devices
 - My IOT Sensors and Actuators
 - IOT Sensors and Actuators
 - IOT Devices**
 - IOT Brokers
 - IOT Device Models
 - IOT Devices Bulk Registration
 - Doc: IOT Directory and Devices

IOT Devices

Show entries

Search:

Add new device

	Device Identifier	IOT Broker	Device Type	Model	Ownership	Status	Edit	Delete	Location	View
+	adminDev1	orionUNIFI	Ambiental		PUBLIC	active				VIEW
-	alert_1610543238306	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
<div> <p>Broker URI: https://broker1.snap4city.org</p> <p>Kind: sensor</p> <p>Device Type: event</p> <p>Protocol: ngsi</p> <p>Model: AlertGeneric</p> <p>Longitude: 11.215839</p> <p>Device Uri: http://www.disit.org/km4city/resource/iot/orionUNIFI/DISIT/alert_1610543238306</p> <p>Organization: DISIT</p> <p>PAYLOAD NGSI v1</p> <p>K1: 44eca781-af56-490f-a6c6-36d88b1bcd9c</p> <p>Created on: 2021-01-13 14:07:21</p> </div> <div> <p>Broker Port: 8080</p> <p>Visibility: MyOwnPrivate</p> <p>Format: json</p> <p>MAC:</p> <p>Producer: disit</p> <p>Latitude: 43.766755</p> <p>PAYLOAD NGSI v2</p> <p>K2: 6a620551-e4e5-4c0d-8777-d0721175cfb0</p> </div>										
+	alert_1610548534047	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610613189703	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW
+	alert_1610629197473	orionUNIFI	event	AlertGeneric	MYOWNPRIVATE	active	EDIT	DELETE		VIEW

VIEW IN SERVICE MAP

NEW DATA IN alert_1610543238306

Get/See last message
from Broker

Generate a New Message
towards the Device, Storage

View IoT Device on
map and its last value

Edit Message

Impose current
date time on
dateObserved

Send the
Message
to the
Device,
Storage

Snap4City

User: roottooladmin, Org: DISIT
Role: RootAdmin, Level: 7
Logout

My Snap4City.org
Tour Again
ダッシュボード
Dashboards (Public)
My Dashboards in All Org.
Dashboards of My Organization
My Dashboards in My Organization
My Data Dashboard Dev Kibana
My Data Dashboard Kibana
Extra Dashboard Widgets
Notifier
Data, my Data, OpenData
Knowledge and Maps
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My IOT Sensors and Actuators
IOT Sensors and Actuators
IOT Devices
IOT Devices Management
IOT Brokers
IOT Device Models
IOT Devices Bulk Registration
Ext. MS Broker Devices Discovery
Ext. Broker Devs Periodic Update
IOT Orion Broker Mapping Rules
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Resource Manager
Development Tools
Management
Decision Support Systems
Deploy and Installation

2457 DEVICES

Show 5 entries

Device Identifier	IOT Broker
alert_1610543238306	orionUNIFI
alert_1610548534047	orionUNIFI

Broker URI: https://broker1.snap4city.org
Kind: sensor
Device Type: event
Protocol: ngsi
Model: AlertGeneric
Longitude: 11.241117
Device Uri: http://www.disit.org/km4city/resource
Organization: DISIT
Payload NGSI v2
Created on: 2021-01-13 15:35:41

Device Identifier	IOT Broker
alert_1610613189703	orionUNIFI
alert_1610629197473	orionUNIFI
alert_1610714974380	orionUNIFI

Showing 1 to 5 of 39 entries

1513 PRIVATE

Search: alert_

Status	Edit	Delete	Location
active	EDIT	DELETE	
active	EDIT	DELETE	
active	EDIT	DELETE	

VIEW IN SERVICE MAP
NEW DATA IN alert_1610548534047

peopleinvolved

Value Name

people_count (People i

Value Type

number (#)

Value Unit

integer

Data Type

☒ Send value

responsible

Value Name

Identifier (Identifier)

Value Type

symbolic identifier (ID)

Value Unit

string

Data Type

☒ Send value

severity

Value Name

status (Status)

Value Type

some coded status (sta

Value Unit

string

Data Type

☒ Send value

shorttermimpact

Value Name

status (Status)

Value Type

some coded status (sta

Value Unit

string

Data Type

☒ Send value

ticketID

Value Name

Identifier (Identifier)

Value Type

symbolic identifier (ID)

Value Unit

string

Data Type

☒ Send value

Get Time stamp

Close

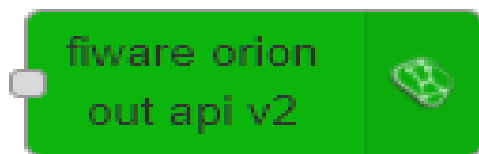
Confirm

Once created the Device you may send data on it



- You may create a Proc.Logic / IOT App, where:
 - Function: is preparing the JSON package
 - Block «FIWARE Orion OUT V2» is sending the data to the Orion Broker. Namely: «OrionUNIFI»
 - Please note that several version of ORION Brokers and protocols exists:
 - So that you have to know which protocols you need to use for your broker

Settings ?



- Certificates are automatically loaded at the first authentication
- Done!!

Edit fiware orion out v1 node

Delete Cancel Done

Properties

Service Orion Service

Certificates Add new tls-config...

Device Type

Device Identifier

key 1

key 2

Service/Tenant

Service Path

apikey

auth

Name node-red-contrib-snap4city-user/fiware-orion:com1

fiware orion out v1 > Edit orion-service node

Delete Cancel Update

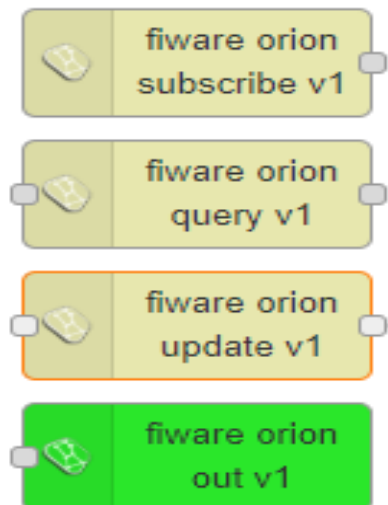
Broker URL 192.168.1.9

port 8443

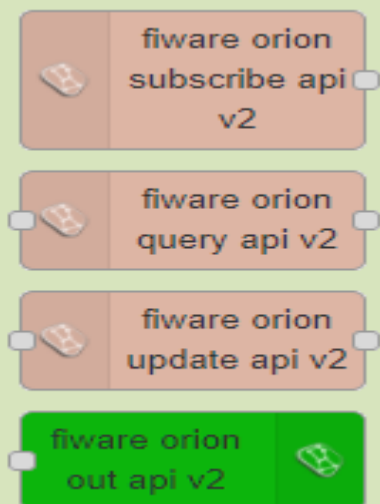
Name Name

- IP if the Broker is in cloud (internal)
 - List of brokers is automatically provides
 - The K1, K2 is automatically provided if you are authenticated
- Symbolic address of Broker can be taken from Directory

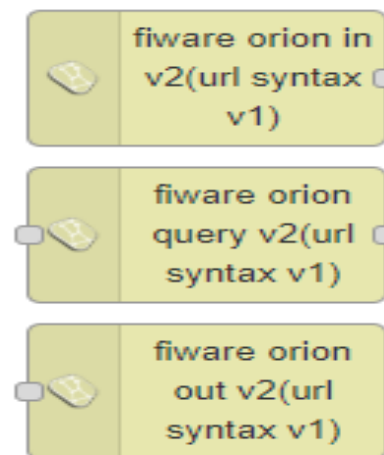
NGSI versions



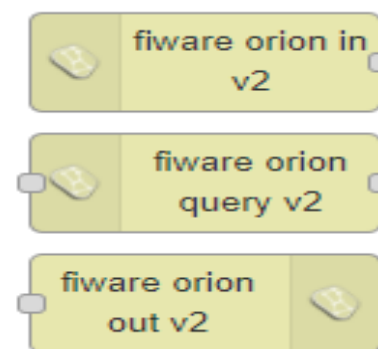
- Orion Broker of V1 with **NGSI syntax of V1** + Secure Filter of Snap4city (deprecated)



- Orion Broker of V2 with **NGSI syntax of V2** + Secure Filter of Snap4city

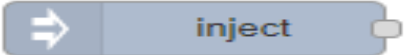
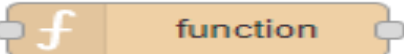

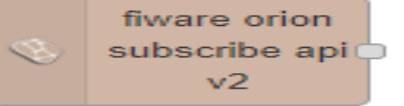

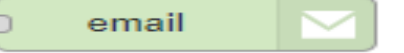
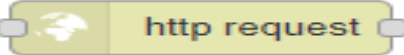
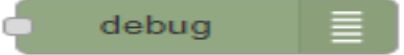
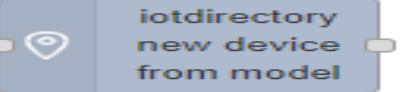
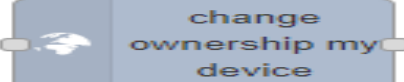
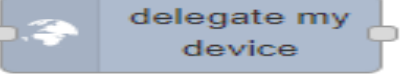
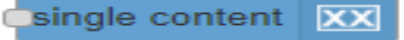


- Orion Broker of V2 with NGSI syntax of V1 (deprecated)



- Orion Broker of V2 with NGSI syntax of V2 (deprecated)

examples

	To generate injection messages into a flow, scheduled or on demand by click
	A java script function, from a JSON input to one or more JSON outputs
	To send a message of and Entity Instance into the storage. The Device has to be registered and you have to be the owner or to be delegated in READ-WRITE to send messages to it.
	To subscribe an IoT App to receive event-driven notification about messages and changes on specific devices. You can subscribe to many and then to get all of them from it.
	Query call to Smart City API to get any information about a SURI, ServiceURI. There are many other Nodes which can be used to pose Smart City API queries in very simple manner
	Send email, you can even send Telegram, SMS, etc.
	To send a REST CALL (get, post, etc.). Please USE THIS ONLY for the external API not for the Snap4City API for which a lot of MicroService accessible as NODEs/Blocks in the IoT App are simpler and ready to use.
	A block which is printing on debug view the data JSON passed in input.
	To create a device instance from a model prepared on IoT Directory
	To change the ownership of a device.
	To delegate a certain device to some other user
	To show something on Snap4City dashboard with a simple widget.

- A Json from the IOT App
 - **NGSI V1**
- **ID:** The Name of the IOT Device: «corveneto»
- **Type** as that define in the IOT Device when you created
- **The Time stamp:** “dateObserved” to have a time series data
 - “str” is a string with the date and time in standard ISO, such as ,
 - “2020-08-04T04:00:00+02:00”,
 - “2020-08-03T00:00:00.000Z”
- And the **vector** of “attributes”

```
msg = { payload : {
```

```
  "id": "corveneto",
```

```
  "type": "misura",
```

```
  "attributes":[
```

```
    { "name": "dateObserved", "value": str, "type": "timestamp" },
```

```
    { "name": "stato", "value": "active", "type": "string" },
```

```
    { "name": "ricoverati_con_sintomi", "value": 12, "type": "integer" },
```

```
    { "name": "terapia_intensiva", "value": 34, "type": "integer" },
```

```
    { "name": "totale_ospedalizzati", "value": 34, "type": "integer" },
```

```
    { "name": "isolamento_domiciliare", "value": 334, "type": "integer" },
```

```
    { "name": "totale_attualmente_positivi", "value": 12, "type": "integer" },
```

```
    { "name": "nuovi_attualmente_positivi", "value": 33, "type": "integer" },
```

```
    { "name": "dimessi_guariti", "value": 22222, "type": "integer" },
```

```
    { "name": "deceduti", "value": 2, "type": "integer" },
```

```
    { "name": "totale_casi", "value": 2222, "type": "integer" },
```

```
    { "name": "tamponi", "value": 222222344, "type": "integer" } ]
```

```
  }
```

```
}
```

```
return msg;
```


NGSI V2

```
{
  "id": "corveneto",
  "type": "misura",
  "codice_regione": { "type": "integer", "value": "" },
  "dateObserved": { "type": "time", "value": "2021-01-18T17:00:00.000Z" },
  "deceduti": { "type": "integer", "value": "8025" },
  "denominazione_regione": { "type": "string", "value": "" },
  "dimessi_guariti": { "type": "integer", "value": "222062" },
  "isolamento_domiciliare": { "type": "integer", "value": "66514" },
  "latitude": { "type": "float", "value": "45.43490" },
  "longitude": { "type": "float", "value": "12.33845" },
  "nuovi_attualmente_positivi": { "type": "integer", "value": "-1557" },
  "ricoverati_con_sintomi": { "type": "integer", "value": "2233" },
  "stato": { "type": "string", "value": "ITA" },
  "tamponi": { "type": "integer", "value": "3663538" },
  "terapia_intensiva": { "type": "integer", "value": "336" },
  "totale_attualmente_positivi": { "type": "integer", "value": "69083" },
  "totale_casi": { "type": "integer", "value": "299170" },
  "totale_ospedalizzati": { "type": "integer", "value": "2569" }
}
```


The differences are mainly on how the variable are provided:

```
{  
  "id": "MyMobileDeviceTest",  
  "type": "misura",  
  "dateObserved": {"type": "timestamp", "value": "2021-06-11T16:17:23.425Z"},  
  "status": {"type": "float", "value": 25}  
  "mydescription": {"type": "string", "value": "see below the note for the forbidden  
characters"}  
}
```

- **NOTE for:**

- **names/IDs:** Spaces or strange characters are not allowed in the. Please use simple alphanumeric strings, it is a limitation of many solutions including Orion Broker and increase interoperability of your data.
- **Values of attributes and variables:** can be UTF8, but similarly, they do not accept: () < > “ ‘ ; = into values
- https://fiware-orion.readthedocs.io/en/master/user/forbidden_characters/index.html

DateObserved

- The **Timestamp**: “dateObserved” to have a time series data
 - “str” is a string with the date and time in standard ISO, such as ,
 - “2020-08-04T04:00:00+02:00”,
 - “2020-08-03T00:00:00.000Z”
- In JavaScript you can obtain by using:
 - Var str = new Date().toISOString();
 - **Str** has to be the ISO date string of today-now (at the current time).

From date to ISOString with fuse aligned time

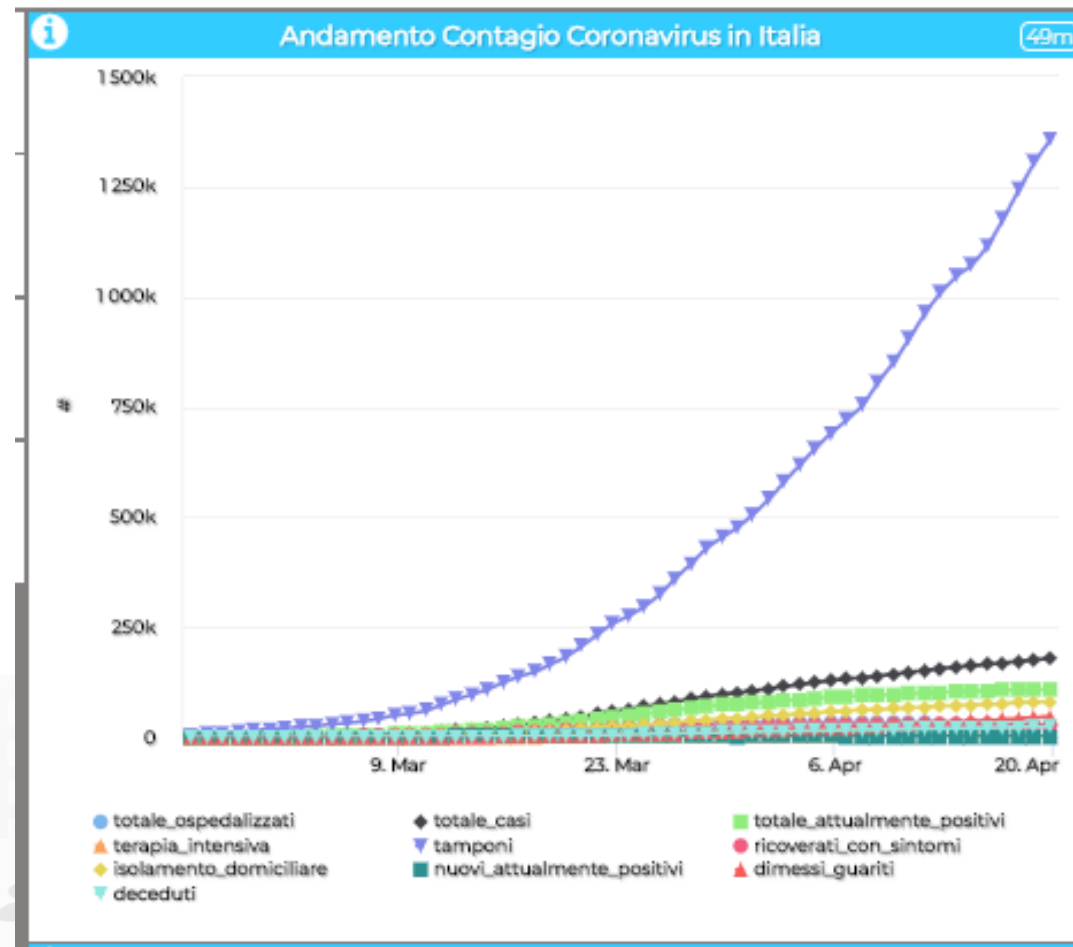
```
var todaynow = new Date();  
dateCET2Z(todaynow).toISOString();
```

```
function dateCET2Z(date) {  
    d = new Date(date).toLocaleString('nl-BE', {timeZone: 'Europe/Brussels'});  
    offset = new Date(d).getTime() - new Date(date).getTime();  
    return new Date(new Date(date).getTime() - offset);  
}
```


Multi Series Widget coming from the same IOT Device

- Over on the serie label to highlight
- Click on the serie label to on/ok
- Over on the graph to see the values

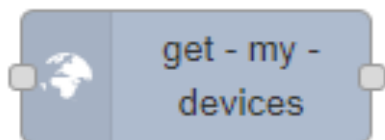
[https://www.snap4city.org/dashboardSmartCity/vi
ew/index.php?iddasboard=MjU2OQ==](https://www.snap4city.org/dashboardSmartCity/vi
ew/index.php?iddasboard=MjU2OQ==)



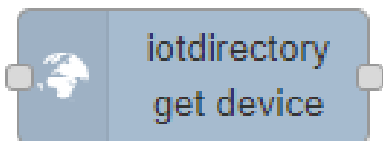
JSON for Authentication as well

```
msg.auth= {  
  "k1": "1ef0e5e8-yyyy-xxxx-9462-0aa4cfcf5e19",  
  "k2": "b2b34425-yyyy-xxxx-818d-2d6cac2314a6",  
  "apikey": "apikey",  
  "basicAuth": "basicAuthKey"  
};
```

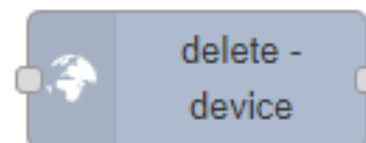

You may use other functions from Directory



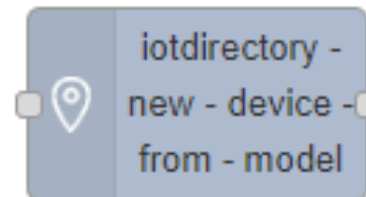
- Discovery in an area
- Query on Directory



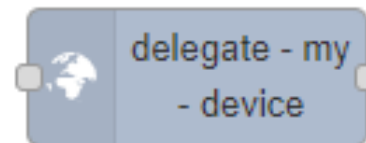
- Get Device Info



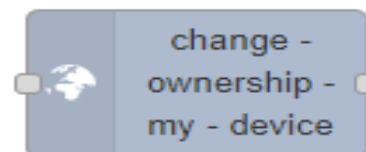
- Delete a Device
(max rate 1 per minute)



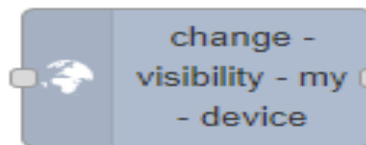
- Registering an Device from model



- Delegate an Device

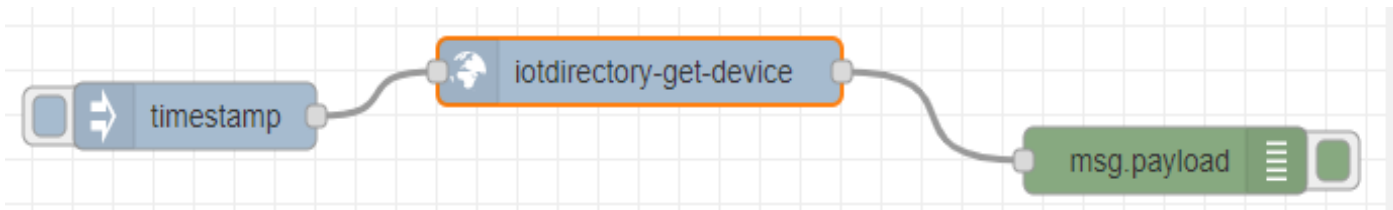


- Change Ownerhip of an Device



- Change Visibili, Publish

Get IOT Device Info



- You can create smart Proc.Logic / IoT App that on the basis of the list of Devices would request all what you need to load data into **YOUR OWN** Devices including:
 - Service URI
 - K1, K2
 - Authentication

msg.payload : Object

▼ object

status: "ok"

▼ content: object

uri:

"http://www.disit.org/km4city/resource/iot/orionUNIFI/DISIT/corarezzo"

devicetype: "misura"

kind: "sensor"

status1: "active"

macaddress: ""

model: "statuscorregione"

producer: "protezione civile"

longitude: "11.88228"

latitude: "43.46642"

protocol: "ngsi"

format: "json"

visibility: "public"

frequency: "600"

created: "2020-03-21 18:34:32"

privatekey: ""

certificate: ""

organization: "DISIT"

accesslink: "https://broker1.snap4city.org"

accessport: "8080"

sha: "C61E32DBFAE7F14C0810177F2D2300843C41C550"

subnature: null

static_attributes: null

k1: "bf739214-f6b4-45fe-85f7-97cd09fe8e57"


k2: "c19e0b6f-8f98-4130-b135-e7a1dfae9273"


error_msg: ""


TOP


Entities Ingestion with Data Table Loader *(for Authorized AreaManagers)*


 Data, my Data, OpenData ▲

 Data Inspector

 MyKPI, MyData, MyPOI

 My Groups of Entities

 View/Set MyPOI on Tuscany

 Data Table Loader (Excel)

<https://www.snap4city.org/729>

How to ingest Devices/Entities in automatic

main	High Level Types	1st option	2nd option
	POI, Point of Interest	IoT App or POI Loader (from EXCEL files)	Create an Entity Model, Entity Registration , ingest via IoT App
	IoT Devices, KPI multivariable, WoT, Entities Instances	Create an Entity Model, Entity Registration , ingest via broker (e.g., Time Series) or IoT App	Data Table Loader
	GIS data	Pose query from IoT App, Create an Entity Model, Entity Registration , ingest via IoT App	Load them on GeoServer

Ingestion of Entities

-

Snap4City

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7
LOGOUT

My Snap4City.org
Tour Again
ダッシュボード
Dashboards (Public)
My Dashboards in All Org.
Dashboards of My Organization
My Dashboards in My Organization
My Data Dashboard Dev Kibana
My Data Dashboard Kibana
Extra Dashboard Widgets
Notificator
Data, my Data, OpenData
Data Inspector
MyKPI, MyData, MyPOI
My Groups of Entities
View/Set MyPOI on Tuscany
Data Table Loader (Excel)
POI Loader (Excel)
Harvest Satellite Copernicus Data
HeatMap Manager
ColorMap Manager
TrafficFlow Manager
BIM Server old
BIM Server New

Data Table Loader (Excel)

Do you have a question? Send us an email: snap4city@disit.org

Please, upload your file! (You have uploaded 0 files (Maximum: 100))
Next

Scegli file

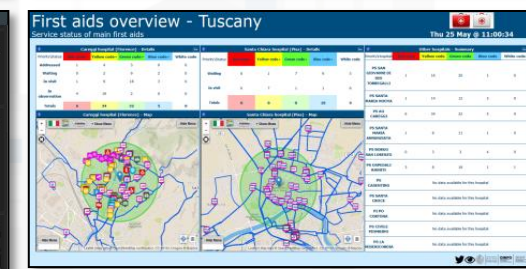
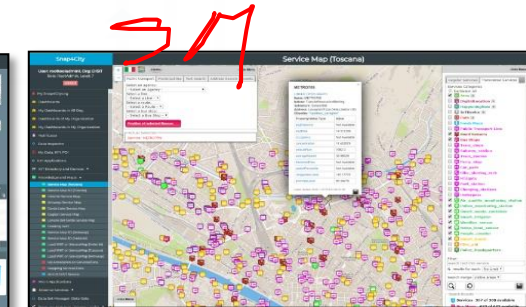
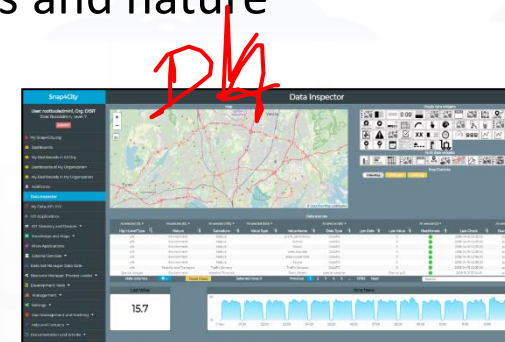
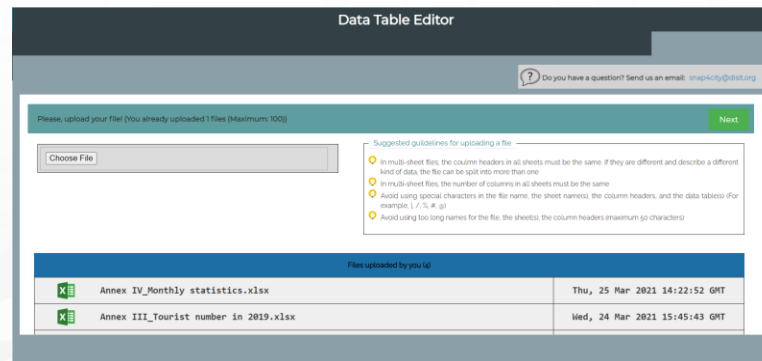
General guidelines

- Use "Previous" and "Next/Save" (not browser navigation) buttons to move to previous and next pages
- In multi-sheet files, coulumn headers in all sheets must be the same. If they are different and describe a different kind of data, the file can be split into more than one
- In multi-sheet files, the number of columns in all sheets must be the same
- Avoid using special characters in file name (For example,|,/,#,@,%,[,])
- Avoid using non-UTF-8 (e.g., non-English) letters in the file name and column headers (For example,II,Ž,ć)

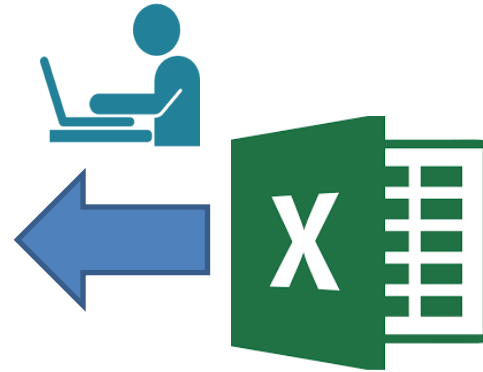
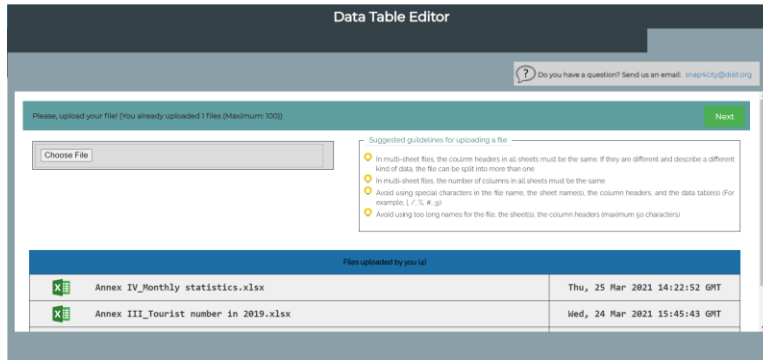
Uploaded Files (18)					
	Organization	File Name	Status	Upload Date & Time	
	Greece-UNISYSTEMS	KOK2021_877019342_SAMPLE_demo.xlsx	Model: Created Device(s): Created Instance(s): Not Created	Tue, 08 Jun 2021 08:41:41 GMT	VIEW DETAILS DELETE
	WestGreece	Rooms for rent 2017-2019.xlsx	Model: Created Device(s): Created Instance(s): Created	Tue, 11 May 2021 08:56:05 GMT	VIEW DETAILS DELETE
	WestGreece	Arrivals_Departures of Air Transport_Montly_2010-2019.xlsx	Model: Created Device(s): Created Instance(s): Created	Mon, 10 May 2021 15:04:21 GMT	VIEW DETAILS DELETE

Data Table Loader

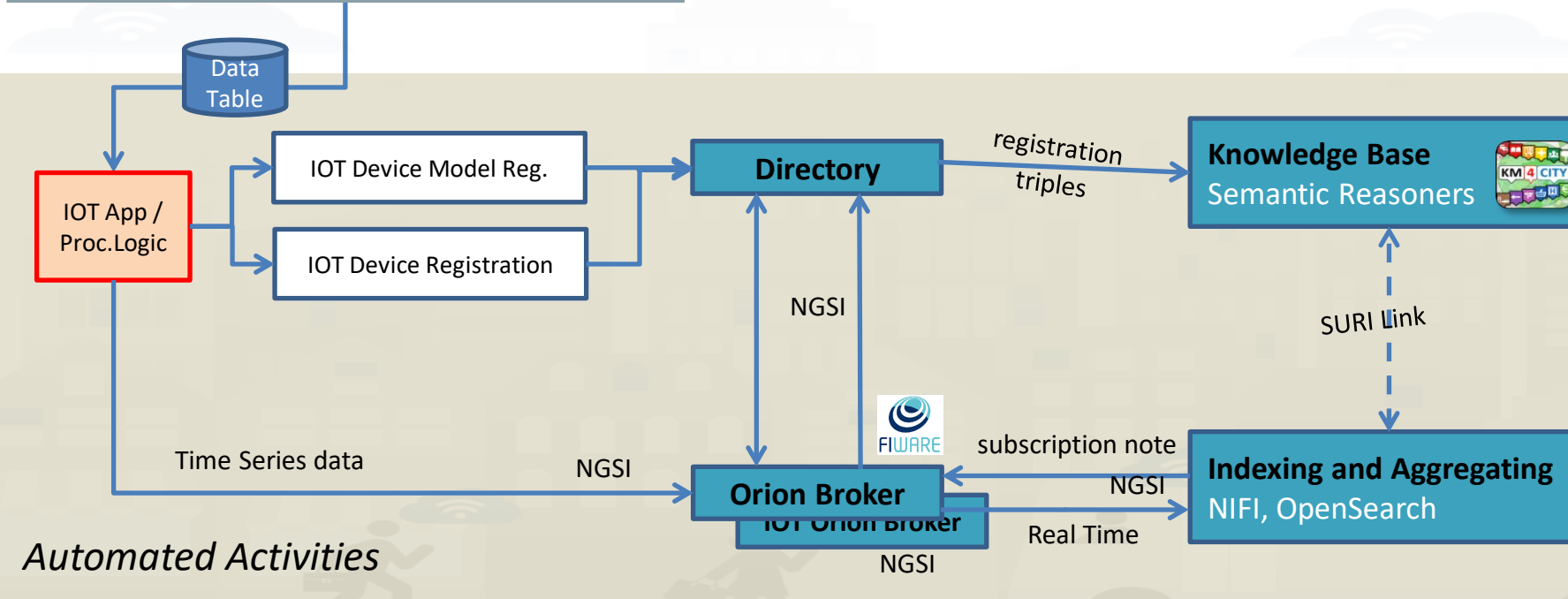
- For: IoT Devices, KPI as devices, OD as devices, time Series ...
- To help you to **upload data in short/zero time**
 - **Start from Excel Files, they should be formatted some how or well formatted according to our guidelines (models are provided)**
 - Custom upload for each Organization is possible
- To **enable you** to
 - create dashboards from them according to different views and nature



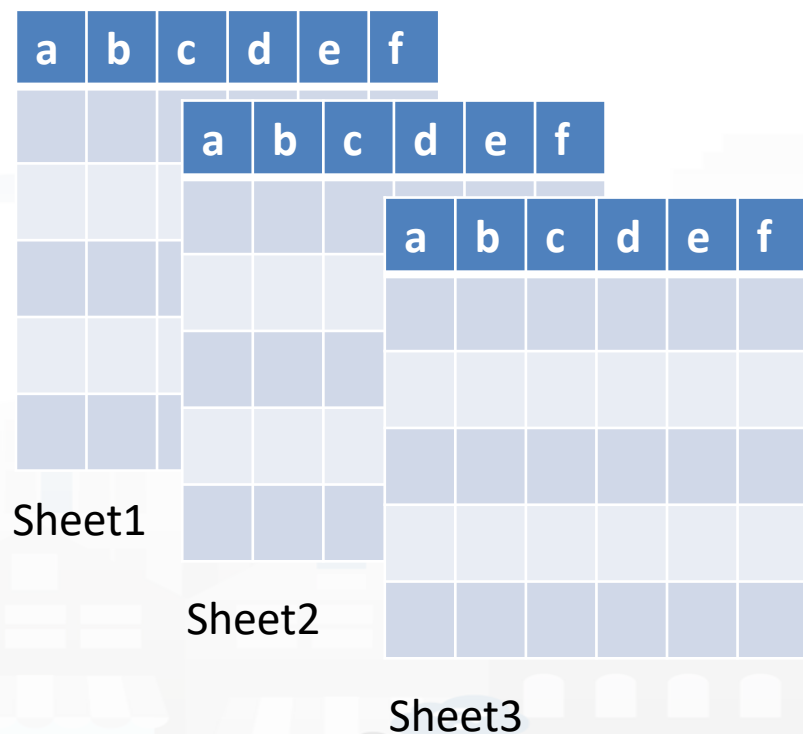
Short cut Data Ingestion from Excel file



- 1) Upload the file on **Data Table Loader**
- 2) Follows the instructions and guidelines
-- the dirty work will be done in a Snap
-- wait! –
- 3) See data on your Data Inspector ☺
- 4) Use Data Into Dashboards ☺



Assuming an Excel file with 1 or more Sheets all of them with the same structure



If this is not the case!

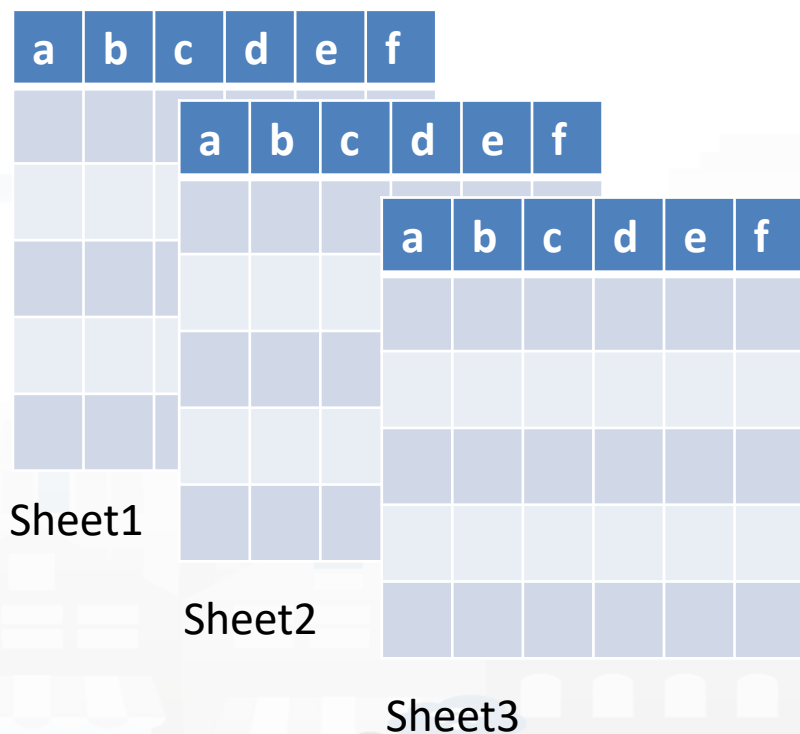
- Columns in the sheets are different AND it is not possible to regularize them (by editing: adding empty columns, change names, etc.)

→ split the excel file in multiple files

Assuming an Excel file with 1 or more Sheets all of them with the same structure

If this is the case!

- 1) The Schema of the sheets is becoming an IoT Device Model
- 2) Each single Sheet is becoming a single IoT Device
- 3) The row in the single Sheet are becoming instances of the corresponding IoT Device



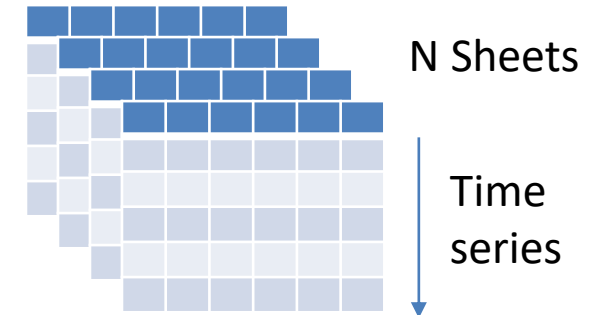
Row Case

- One **dateObserved for each Row of each Sheet**, multiple sheets with the same structure
 - An **IoT Device/Entity Model** is created for the structure of the sheet
 - a number of **variables are produced**
 - Including dateObserved variable which is a column
 - For each Sheet an **IoT Device/Entity** is produced from the model
 - The device name is the combination: sheet+..... as defined by the user
 - Sheet name is part of the IOT Device Name and may also become a variable
 - Sheets may have a different number of rows
 - For each Row of each Sheet an **IoT Device/entity Time Instance** is created
 - Each row has a specific dateObserved
 - Each row has ... other attributes as well

1 model

iotdirectory-new-device-from-model

fiware orion out api v2



1 model

A Device for each sheet

N devices

A Time Series for each Device/sheet

Example

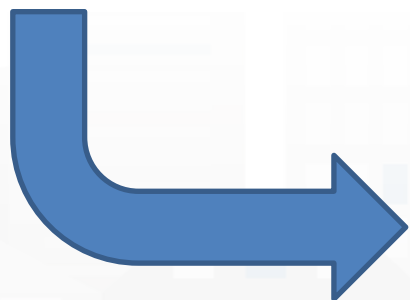
Data from INSETE
Basic Sizes of Incoming Tourism

Basic Sizes of Incoming Tourism of the Region of Western Greece 2019							
Regions	Countries Origin	Visits (in thousands)	Receipts (in € million)	Nights (in thousands)	Expenditure / Visit (in €)	Cost / Night (in €)	Average Length of Stay
West Hellas	Albania	132.9	26.5	225.8	199.7	117.5	1.7
	United Kingdom	47.7	17.9	345.8	375.2	51.8	7.2
	Germany	70.3	36.4	672.4	517.9	54.1	9.6
	France	55.4	16.5	321.6	298.1	51.4	5.8
	Other	510.7	160.0	2,964.9	313.3	54.0	5.8
	Total	817.0	257.4	4,530.4	315.0	56.8	5.5
	% of the total	2.2%	1.5%	1.9%			

Source: BoG Border Research, INSETE Intelligence Editing

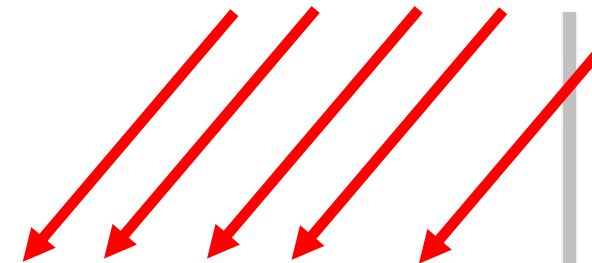
Basic Sizes of Incoming Tourism of the Region of Western Greece 2018							
Regions	Countries of Origin	Visits (in thousands)	Receipts (in € million)	Nights (in thousands)	Expenditure / Visit (in €)	Cost / Night (in €)	Average Length of Stay
West Greece	Albania	138.7	29.0	222.9	209.2	130.1	1.6
	United Kingdom	42.6	13.5	180.6	317.6	74.9	4.2
	Germany	71.3	26.0	466.5	365.1	55.8	6.5
	France	44.2	13.5	262.9	304.7	51.2	6.0
	Other	402.5	129.8	2,050.7	322.4	63.3	5.1
	Total	699.2	211.8	3,183.5	302.9	66.5	4.6
	% of the total	2.0%	1.4%	1.4%			

Region	Visits_in_Thousands	receipts_in_Millions_Euro	Nights_in_Thousands	Expenditure_per_Visit_Euro	Cost_per_Night_Euro	Average_Length_of_Stay	dateObserved
West Greece	77,5	12,8	165,6	165,3	77,4	2,1	2016-12-31T23:00:00+0000
West Greece	131,3	18,8	183,3	142,9	102,3	1,4	2017-12-31T23:00:00+0000
West Greece	138,7	29	222,9	209,2	130,1	1,6	2018-12-31T23:00:00+0000
West Greece	132,9	26,5	225,8	199,7	117,5	1,7	2019-12-31T23:00:00+0000



Resulted Data Table Loaded by Row Model

Value Type							
geolocation	Count	price	Count	price	price	duration	timestamp
Value Unit							
text	K#	Meuro	K#	euro	euro	day	timestamp
Data Type							
string	float	float	float	float	float	float	time



Device Name	Sheet Name	Region	Visits_in_Thousands	receipts_in_Millions_Euro	Nights_in_Thousands	Expenditure_per_Visit_Euro	Cost_per_Night_Euro	Average_Length_of_Stay	dateObserved	Latitude	Longitude	Nature	Sub-Nature	Context Broker
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Albania	Albania	West Greece	77.5	12.8	165.6	165.3	77.4	2.1	2016-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Albania	Albania	West Greece	131.3	18.8	183.3	142.9	102.3	1.4	2017-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Albania	Albania	West Greece	138.7	29	222.9	209.2	130.1	1.6	2018-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Albania	Albania	West Greece	132.9	26.5	225.8	199.7	117.5	1.7	2019-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__UnitedKingdom	United Kingdom	West Greece	48.1	17.4	373.1	362.6	46.8	7.8	2016-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__UnitedKingdom	United Kingdom	West Greece	49.7	20	290.5	402.5	68.8	5.8	2017-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__UnitedKingdom	United Kingdom	West Greece	42.6	13.5	180.6	317.6	74.9	4.2	2018-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__UnitedKingdom	United Kingdom	West Greece	47.7	17.9	345.8	375.2	51.8	7.2	2019-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Germany	Germany	West Greece	42.5	13.6	237.9	319.2	57	5.6	2016-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Germany	Germany	West Greece	46.5	15	320.3	323.6	47	6.9	2017-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Germany	Germany	West Greece	71.3	26	466.5	365.1	55.8	6.5	2018-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Germany	Germany	West Greece	70.3	36.4	672.4	517.9	54.1	9.6	2019-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__France	France	West Greece	36.3	12.1	173.3	334.7	70.1	4.8	2016-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__France	France	West Greece	34.7	14.7	213.7	424.8	69	6.2	2017-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__France	France	West Greece	44.2	13.5	262.9	304.7	51.2	6	2018-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__France	France	West Greece	55.4	16.5	321.6	298.1	51.4	5.8	2019-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Other	Other	West Greece	308.9	89.5	1791.9	289.8	50	5.8	2016-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Other	Other	West Greece	301.3	90.3	1810.8	299.7	49.9	6	2017-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI
BasicSizeofIncomingTourismoftheRegionofWesternGreece.xlsx__Other	Other	West Greece	402.5	129.8	2050.7	322.4	63.3	5.1	2018-12-31T12:00:00.000+02:00	38.2384	21.7385	TourismService	TravelInformation	orionWestGreece-UNIFI

Requested information if not provided

GeoLocation to assign at the city or area

- Latitude
- Longitude

Classification to simplify the search

- Nature
- Subnature

Broker is assigned automatically on the basis of Organization / tenant

Latitude	Longitude	Nature	Sub-Nature	Context Broker
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI
38.2384	21.7385	TourismService	Travel_information	orionWestGreece-UNIFI

Variables of the Device

- dateObserved for Time Series, UNIQUE!
- Variables have to be assigned to:
 - Value Type, Value Unit, Data Type
- For example for Device

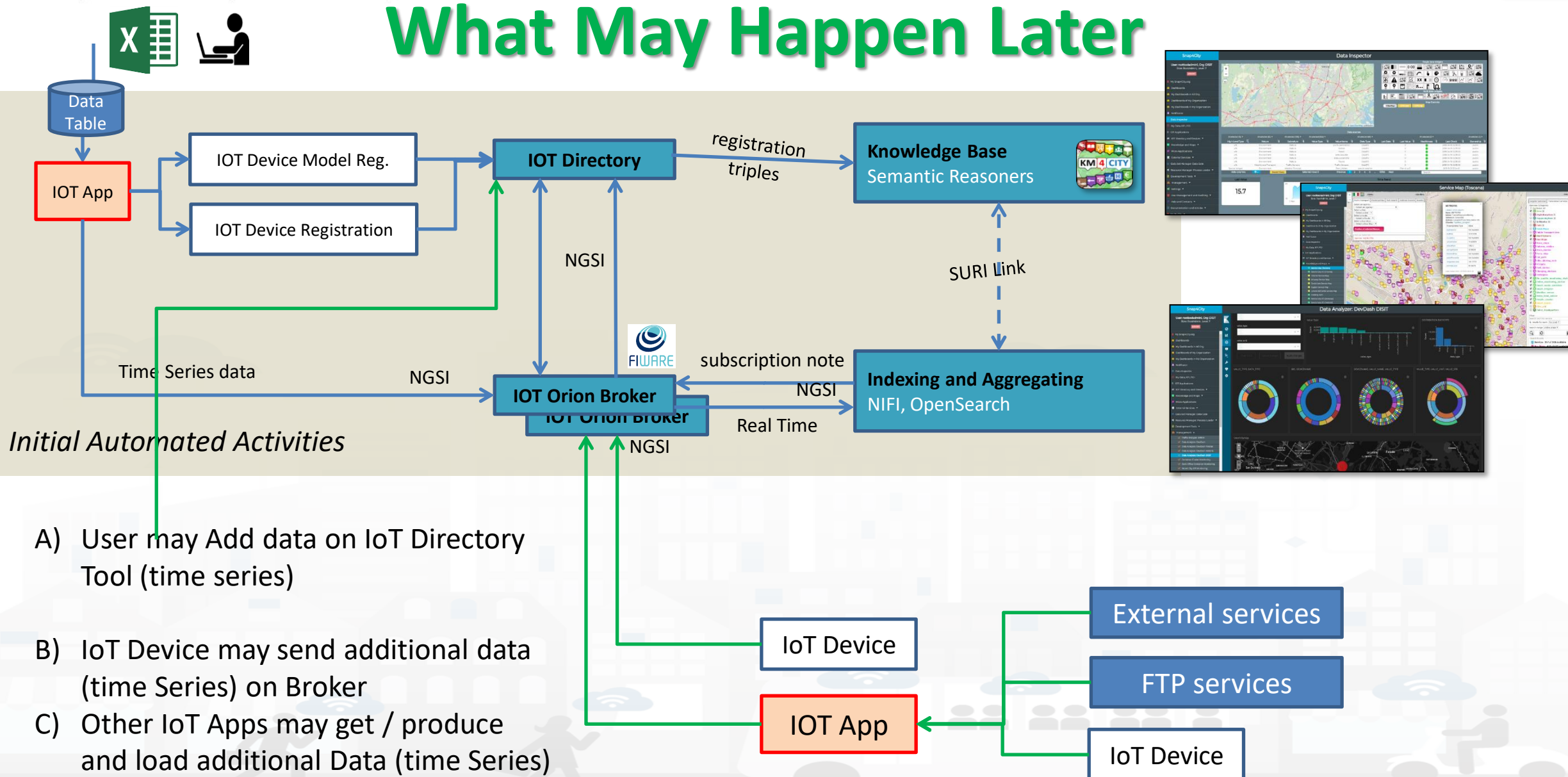
BasicSizesofIncomingTourismoftheRegionofWesternGreece.xlsx__UnitedKingdomb

IoT Broker	Info	Position	Static Attributes	Values	Status
<div> <div>Average_Length_of_Stay</div> <div>float</div> <div>Duration</div> <div>duration in days (day)</div> </div>					
<div> <div>Value Name</div> <div>Data Type</div> <div>Value Type</div> <div>Value Unit</div> </div>					
<div> <div>Ok</div> <div>false</div> <div>Refresh rate</div> <div>100</div> </div>					
<div> <div>Editable</div> <div>Healthiness Criteria</div> <div>Healthiness_Value</div> </div>					
<div>Remove Value</div>					
<div> <div>Cost_per_Night_Euro</div> <div>float</div> <div>price</div> <div>Euro (euro)</div> </div>					
<div> <div>Value Name</div> <div>Data Type</div> <div>Value Type</div> <div>Value Unit</div> </div>					
<div> <div>Ok</div> <div>false</div> <div>Refresh rate</div> <div>100</div> </div>					
<div> <div>Editable</div> <div>Healthiness Criteria</div> <div>Healthiness_Value</div> </div>					
<div>Remove Value</div>					
<div> <div>dateObserved</div> <div>time</div> <div>Timestamp</div> <div>timestamp in milliseco</div> </div>					

Value Type							
geolocation	Count	price	Count	price	price	duration	timestamp
Value Unit							
text	K#	Meuro	K#	euro	euro	day	timestamp
Data Type							
string	float	float	float	float	float	float	time
Region	Visits_in_Thousands	receipts_in_Millions_Euro	Nights_in_Thousands	Expenditure_per_Visit_Euro	Cost_per_Night_Euro	Average_Length_of_Stay	dateObserved
West Greece	77.5	12.8	165.6	165.3	77.4	21	2016-12-31T12:00:00.000+02:00
	131.3	18.8	183.3	142.9	102.3	1.4	2017-12-31T12:00:00.000+02:00
	138.7	29	222.9	209.2	130.1	1.6	2018-12-31T12:00:00.000+02:00
	132.9	26.5	225.8	199.7	117.5	1.7	2019-12-31T12:00:00.000+02:00
	48.1	17.4	373.1	362.6	46.8	7.8	2016-12-31T12:00:00.000+02:00
	49.7	20	290.5	402.5	68.8	5.8	2017-12-31T12:00:00.000+02:00
	42.6	13.5	180.6	317.6	74.9	4.2	2018-12-31T12:00:00.000+02:00
	47.7	17.9	345.8	375.2	51.8	7.2	2019-12-31T12:00:00.000+02:00
	42.5	13.6	237.9	319.2	57	5.6	2016-12-31T12:00:00.000+02:00

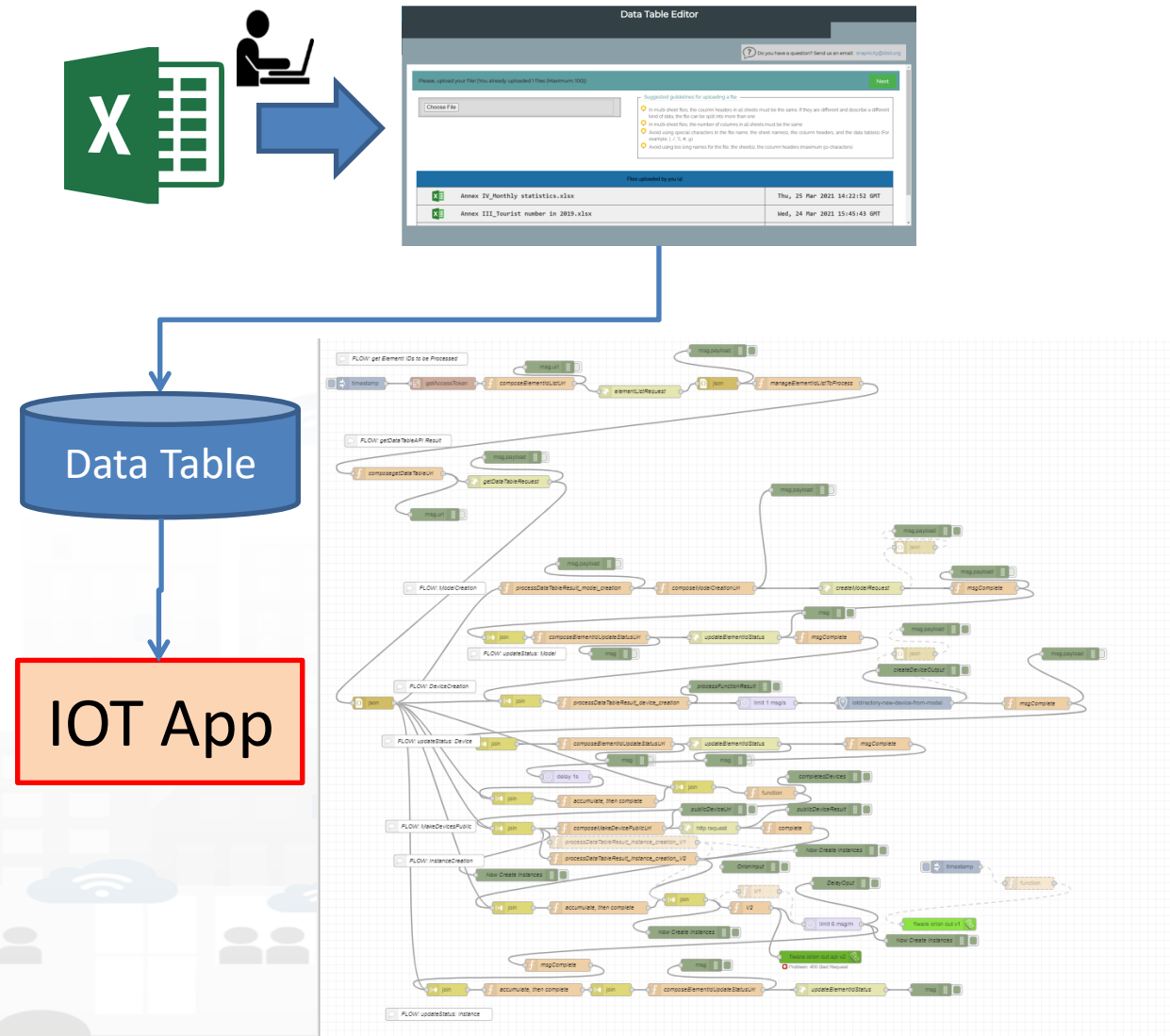


What May Happen Later



Notes on the implementation

- The Data Table Loader has been developed in PHP to interact with the user to regularize data in ingestion, request missing information, etc., and finally to save this information on a **DataTable** in MySQL
 - A Status for data ingestion is defined, managed, evolved
- **The IoT App** gets the data and when possible and needed: creates the IoT Device Modes, IoT Devices, and IoT Device Instances (time series)
- Any AreaManager can upload DataTable sets but only specific dedicated responsible users for data upload can actually load. We suggest one.
 - Each of them is becoming the owner and responsible of the IOT App process, which can be customized also, and of the IoT Device Model, IoT Device.



TOP

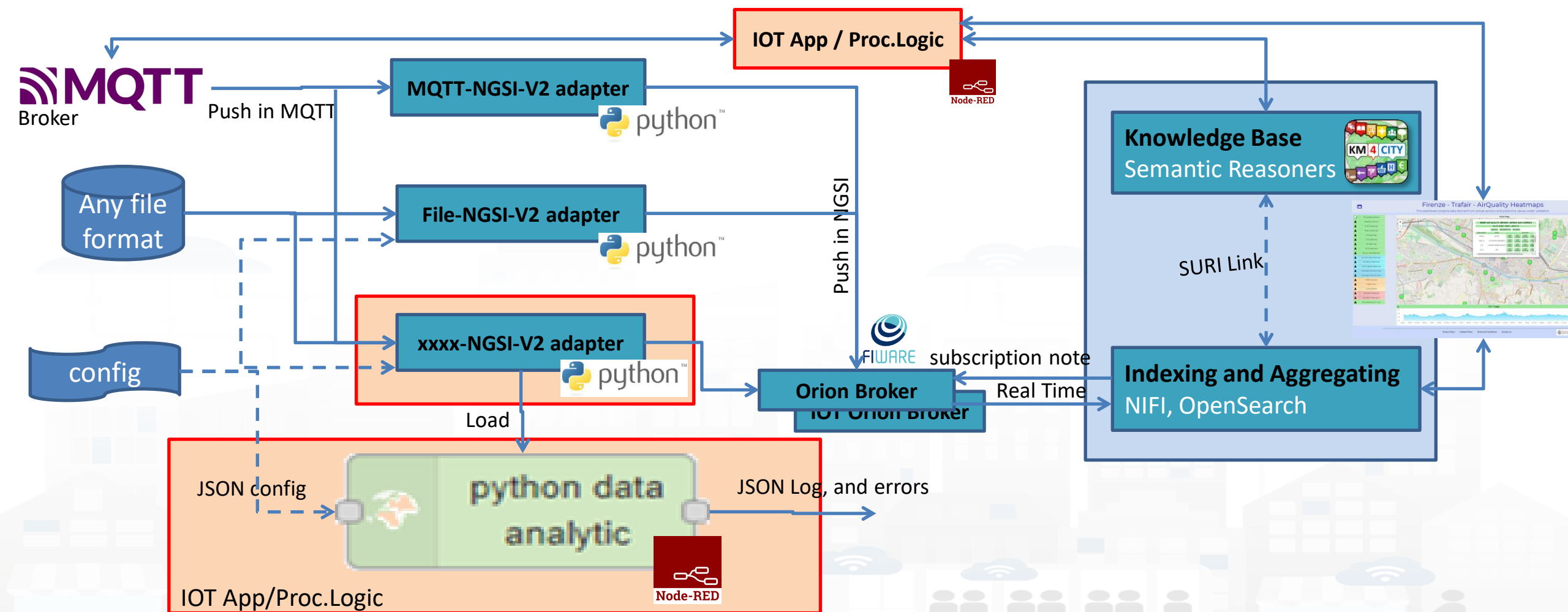
High Performance Ingestion via Python (FastDataLoader)

<https://www.snap4city.org/831>

Fast and Massive Data Ingestion

- The ingestion processes passes data to some Orion Broker when the device is registered on Directory.
 - The ingestion in this case consists in posting each single message on the broker and the broker posts them on NIFI which performs regularization exploiting KB and passes them on Open Search
 - The process can be performed by IoT App, thus in Node-RED with high flexibility (95% of cases is ok) but with some limitation on throughput
- **Faster approaches** can be to **write a Python process** to get data and:
 - **Case A)** post each single message on one of the Orion Brokers
 - Case B) post each single message directly on Ni-Fi cluster (not suggested but viable)
 - For Both: *you have to register the IoT devices/Entities on Directory*

High Performance Solutions on Snap4City Framework



TOP



Smart Data Models on Snap4City

- IOT Directory and Devices
 - My IOT Sensors and Actuators
 - IOT Sensors and Actuators
 - IOT Devices
 - IOT Devices Management
 - IOT Brokers
 - FIWARE Smart Data Models**
 - IOT Device Models
 - IOT Devices Bulk Registration
 - Ext. MS Broker Devices Discovery
 - Ext. MS Broker Discovery
 - Ext. Broker Devs Periodic Update
 - Rules for Discovery
 - OLD IOT Orion Broker Mapping Rule
 - Doc: IOT Directory and Devices
 - Create an IOT Device Instance
 - Create an IOT Device Model
 - Add an IOT Device into Snap4City

<https://www.snap4city.org/800>

FIWARE Smart Data Model



- Include
 - JSON Schema (for verification and validation) and Specs
 - Examples in: NGSI V2, NGSI LD
- Domains



<https://www.fiware.org/smart-data-models/>

FIWARE Smart Data Models -- Library

Snap4City

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

[LOGOUT](#)

- Knowledge and Maps
- IOT Applications
- IOT Directory and Devices
 - My IOT Sensors and Actuators
 - IOT Sensors and Actuators
 - IOT Devices
 - IOT Devices Management
 - IOT Brokers
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 - IOT Device Models
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 - Rules for Discovery
 - OLD IOT Orion Broker Mapping Rule
 - Doc: IOT Directory and Devices
 - Create an IOT Device Instance
 - Create an IOT Device Model
 - Add an IOT Device into Snap4City
- Resource Manager
- Development Tools

FIWARE Smart Data Models Library

Show 10 entries Search:

Name	Subdomain	Domain	Version	Edit
Alert	Alert	CrossSector	0.0.2	EDIT
Anomaly	Alert	CrossSector	0.0.2	EDIT
Battery	Battery	CrossSector	0.0.2	EDIT
BatteryStatus	Battery	CrossSector	0.0.2	EDIT
StorageBatteryDevice	Battery	CrossSector	0.0.2	EDIT
StorageBatteryMeasurement	Battery	CrossSector	0.0.2	EDIT
CallUser	CallComplaints	CrossSector	0.0.1	EDIT
Complaint	CallComplaints	CrossSector	0.0.1	EDIT
ComplaintsCollection	CallComplaints	CrossSector	0.0.2	EDIT
ComplaintsOrganization	CallComplaints	CrossSector	0.0.2	EDIT

Showing 1 to 10 of 441 entries

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[5](#)
[...](#)
[45](#)
[Next](#)



Exploiting FIWARE Smart Data Models

- **Smart Data Models** can be used into Snap4City:
 - as initial IoT Data Model without precise Variable Definitions
 - Attach automated rules to each specific Smart Data Model of a Broker for directly registration and management of IoT Device Messages
- **Exploitation** to simplify IoT Device Registration from Orion Brokers, for
 - **External Brokers**: automating Device Registration while Device Discovery
 - **Internal Brokers**: exploiting the Smart Data Model as a Template for Device Registration

TOP

Get a New Orion Broker

automated deploy of Orion Brokers

IOT Directory and Devices

- My IOT Sensors and Actuators
- IOT Sensors and Actuators
- IOT Devices
- IOT Devices Management
- IOT Device Discovery
- IOT Brokers
- IOT Device Models
- IOT Devices Bulk Registration
- IOT Broker Periodic Update setti...
- IOT Orion Broker Mapping Rules...
- ☒ Doc: IOT Directory and Devices
- ☒ Create an IOT Device Instance
- ☒ Create an IOT Device Model
- ☒ Add an IOT Device into Snap4Cit...



Automated Deploy of Orion Brokers

ToolAdmin user access to the button for the automated Deploy of Orion Brokers.

This feature can be provided to large Organizations and on demand to medium and small



Snap4City

User: iotdirectory.disit, Org: DISIT
Role: ToolAdmin, Level: 6

LOGOUT

- My Snap4City.org
- Tour Again
- Dashboards (Public)
- My Dashboards in All Org.
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dashboard Dev Kibana
- Extra Dashboard Widgets
- Notificator
- Data, my Data, OpenData
- Knowledge and Maps
- IOT Applications
- IOT Directory and Devices
 - My IOT Sensors and Actuators
 - IOT Sensors and Actuators
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 - IOT Device Models
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 - Ext. MS Broker Devices Discovery
 - Ext. Broker Devs Periodic Update
 - IOT Orion Broker Mapping Rules
 - Doc: IOT Directory and Devices
 - Create an IOT Device Instance
 - Create an IOT Device Model
 - Add an IOT Device into Snap4City
- Resource Manager
- Development Tools
- Management

IOT Brokers

30 TOTAL

Show 10 entries

Register new IOT Broker Deploy new orion broker

Search:

	IOT Broker	Access Link	Access Port	Kind	Protocol	Ownership	Organization	Created	Edit	Delete	Go to	Util
+	Antwerp	https://ext-api-gw-p.antwerpen.be/digipolis/aovmma/v1/entities		external	ngsi	PRIVATE	Antwerp	2019-03-13 14:57:17			Go	TEST VIEW
+	Antwerp2	https://ext-api-gw-p.antwerpen.be/imec/smartzone/v1		external	ngsi	PRIVATE	Antwerp	2019-01-01 00:00:00			Go	TEST VIEW
+	CB-test-multi	192.168.1.47	8444	internal	ngsi w/MultiService		DISIT	2020-05-20 15:42:39			Go	TEST VIEW
+	iotobsf-smartbed	192.168.1.47	8443	internal	ngsi	PRIVATE	SmartBed	2019-11-29 15:31:51			Go	TEST VIEW
+	mqttUNIFI	192.168.1.10	1883		mqtt	MYOWNPRIVATE	DISIT	2018-02-07 15:14:39	EDIT	DELETE		VIEW
+	mqttUNIMI	159.149.129.184	1884		mqtt	MYOWNPRIVATE	DISIT	2018-04-30 16:49:05	EDIT	DELETE		VIEW
+	orion-DISIT-external	192.168.1.47	1034	external	ngsi w/MultiService	PRIVATE	Firenze	2021-04-20 10:03:34			Go	TEST VIEW
+	orion-test1	https://iot-app.snap4city.org/orionfilter/orion-test1	443	internal	ngsi	MYOWNPRIVATE	DISIT	2021-10-01 17:11:49	EDIT	DELETE	GoDyn	TEST VIEW
+	orionAntwerp-UNIFI	broker3.snap4city.org	8080	internal	ngsi	PUBLIC	Antwerp	2019-06-03 14:25:16			Go	TEST VIEW
+	orionCAPELON-Tampere	https://context.tampere.fiware.cityvision.cloud		external	ngsi w/MultiService		CAPELON	2021-05-17 18:29:27			Go	TEST VIEW

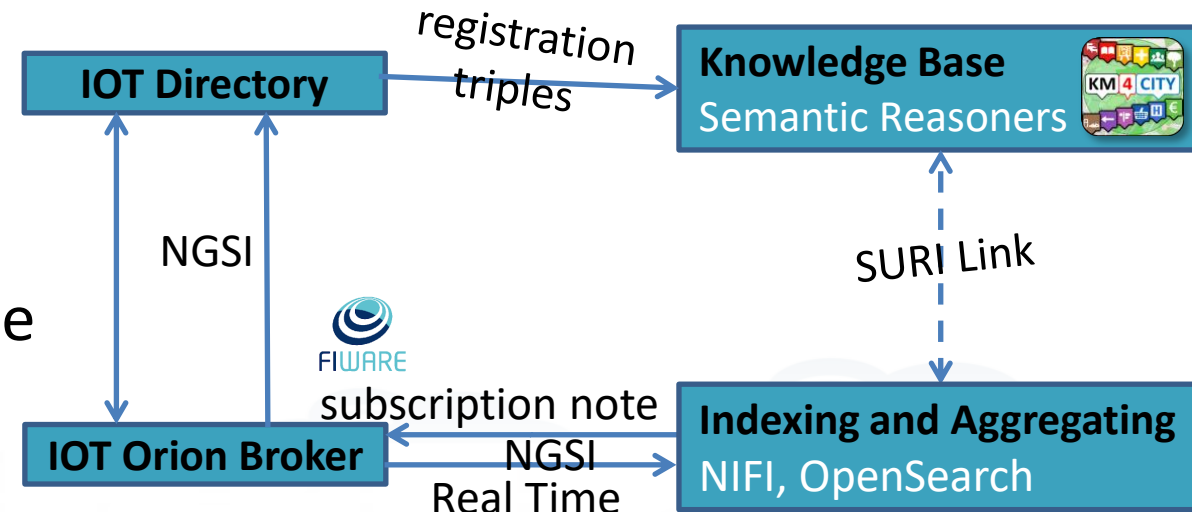
Showing 1 to 10 of 30 entries

Previous 1 2 3 Next



Automated Deploy of Orion Brokers

- **You can define**
 - Name/nickname
 - GPS position
 - Accessible from inside and/or outside
- **→ Automatically....**
 - an Orion Broker is deployed in
 - Container for your organization
 - Proxy are set up
 - Registration on data shadow is established (OpenDistro ES)
 - New IoT Device Model and IoT Devices can be registered, etc. (NIFI)



Deployed Orion Brokers

orion-test1	https://iot-app.snap4city.org/orionfilter/orion-test1	ngsi	MYOWNPRIVATE	DISIT	2021-10-01 17:11:49	EDIT	DELETE	GoDyn	TEST	VIEW
Broker URI: https://iot-app.snap4city.org/orionfilter/orion-test1			Broker Port: 443							
Latitude: 43.80381			Longitude: 11.20262							
Login:			Password:							
SHA:			Version: v2							
Orion version: 3.1.0-next			Orion status: upgraded 2021-10-04 15:10:01							

- You can:

- Delete: undeploy the broker from the cloud
- Change ownership, delegate access
- See/View/Edit of config parameters
- Access: public / private
- External access test
- Test on internal registration
- Update to upgrade the Broker at the last Docker version from FIWARE

The broker answers at the link:
<http://192.168.1.47:2032/v2/entities>

TOP

IOT Broker Registration

*(for External/Internal Orion Brokers
or other Brokers)*

IOT Directory and Devices
My IOT Sensors and Actuators
IOT Sensors and Actuators
IOT Devices
IOT Devices Management
IOT Device Discovery
IOT Brokers
IOT Device Models
IOT Devices Bulk Registration
IOT Broker Periodic Update setti...
IOT Orion Broker Mapping Rules...
<input checked="" type="checkbox"/> Doc: IOT Directory and Devices
<input checked="" type="checkbox"/> Create an IOT Device Instance
<input checked="" type="checkbox"/> Create an IOT Device Model
<input checked="" type="checkbox"/> Add an IOT Device into Snap4Cit...



Snap4City

User: iotdirectory.disit, Org: DISIT
Role: ToolAdmin, Level: 6

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 - IOT Orion Broker Mapping Rules
 - Doc: IOT Directory and Devices
 - Create an IOT Device Instance
 - Create an IOT Device Model
 - Add an IOT Device into Snap4City
 - Resource Manager
 - Development Tools
 - Management
 - Decision Support Systems
 - Deploy and Installation

IOT Brokers

30

Register new IOT Broker

Deploy new orion broker

Show 10 entries

Search:

	IOT Broker	Access Link	Access Port	Kind	Protocol	Ownership	Organization	Created	Edit	Delete	Go to	Utility
+	orionPisa-UNIFI	192.168.1.47	8447	internal	ngsi	PRIVATE	Pisa	2020-08-03 12:55:52			Go	TEST VIEW
-	orionPontDuGard-UNIFI	192.168.1.47	8454	internal	ngsi	PRIVATE	PontDuGard-Occitanie	2021-06-15 11:00:54			Go	TEST VIEW
Broker URI: 192.168.1.47						Broker Port: 8454						
Latitude: 43.96910						Longitude: 4.52808						
Login:						Password:						
SHA:						Version: v2						
+	orionToscana-UNIFI	192.168.1.47	8445	internal	ngsi	PRIVATE	Toscana	2020-05-19 10:00:30			Go	TEST VIEW
+	orionUNIFI	https://broker1.snap4city.org	8080	internal	ngsi	MYOWNPRIVATE	DISIT	2018-02-07 15:14:39	EDIT	DELETE	Go	TEST VIEW
+	orionUNIFIProxyHelsinki	https://www.snap4city.org/iot_ingestion/		internal	ngsi	PRIVATE	Helsinki	2019-04-05 14:31:21			Go	TEST VIEW
+	orionUNIMI	159.149.129.184	1026		ngsi	MYOWNPRIVATE	DISIT	2018-03-12 15:17:11	EDIT	DELETE	Go	TEST VIEW
+	orionValencia-UNIFI	valencia-broker.snap4city.org	443	internal	ngsi	PRIVATE	Valencia	2020-08-10 10:16:50			Go	TEST VIEW
+	orionWestGreece-UNIFI	192.168.1.47	8451	internal	ngsi	PRIVATE	WestGreece	2021-03-23 16:41:55			Go	TEST VIEW
+	rabbitUNIMI	159.149.129.184	5672		amqp	MYOWNPRIVATE	DISIT	2018-02-07 15:14:39	EDIT	DELETE		VIEW
+	sigfox	213.186.33.69	0		sigfox	MYOWNPRIVATE	DISIT	2018-05-28 00:31:53	EDIT	DELETE		VIEW

Showing 21 to 30 of 30 entries

Previous

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Next

Register a New IOT Broker



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
Notificator
Data Inspector
My Data, KPI, POI
IOT Applications
IOT Directory and Devices

- My IOT Devices
- IOT Sensors and Actuators
- IOT Devices
- IOT Devices Management
- IOT Brokers**
- IOT Device Models
- IOT Devices Bulk Registration
- IOT Broker Periodic Update setting
- IOT Orion Broker Mapping Rules

Knowledge and Maps

- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager: Process Loader
- Development Tools

IOT Brokers

Show 10 entries

	IOT Broker	Access Link					
+	Antwerp	https://ext-api-gw-p.antwerpen.be/digipolis/aov					
+	Antwerp2	https://ext-api-gw-p.antwerpen.be/imec/smartz					
+	mqttUNIFI	192.168.1.10					
+	mqttUNIMI	159.149.129.184					
+	orionAntwerp-UNIFI	broker3.snap4city.org					
+	orionFinland	https://ngsi.fvh.fi					
+	orionHelsinki-UNIFI	broker2.snap4city.org					
+	orionUNIFI	https://broker1.snap4city.org					
+	orionUNIFIProxyHelsinki	https://www.snap4city.org/iot_ingestion/		ngsi	PRIVATE	Helsinki	
+	orionUNIMI	159.149.129.184		1026	ngsi	DELEGATED	DISIT

Showing 1 to 10 of 12 entries

Add new context broker

Info

Geo-Position

Security

Kind

Name

Context Broker name is mandatory

IP

IP is mandatory

Port

Port is mandatory

amqp

Protocol

Version

Access Link

Access Port

Private

Ownership

Cancel

Confirm

Add new context broker

Info

Geo-Position

Security

Latitude

Latitude is mandatory

Longitude

Longitude is mandatory

Cancel

Confirm

Snap4city Data Ingestion Diagram

storage

Manual or automated
Registration
of Entities/Devices

**Entity/IoT
Directory**

registration
triples

NGSI



Orion Broker

subscription note
NGSI
Real Time

IoT Orion Broker

Orion Broker

IoT Orion Broker

IoT Orion Broker

Brokers

Knowledge Base

Semantic Reasoners

Semantic Reasoners

Semantic Reasoners

SURI Link

Indexing and Aggregating
NIFI, OpenSearch

Data Managers

Data Managers

Entity Inspector



A number of KB
federated



Federation
Smart City API, ASCAPI

API Manager

Cluster of **OpenSearch**
for storage with in
front a cluster of
NIFI

Platform Automation:
IoT Apps, Proc.Logics,
Python, ...



Data Analytics: ML, AI, XAI **python**



Platform Control and Management

Snap4 technology is broker Agnostic. Most of the features are only accessible for FIWARE Orion Brokers

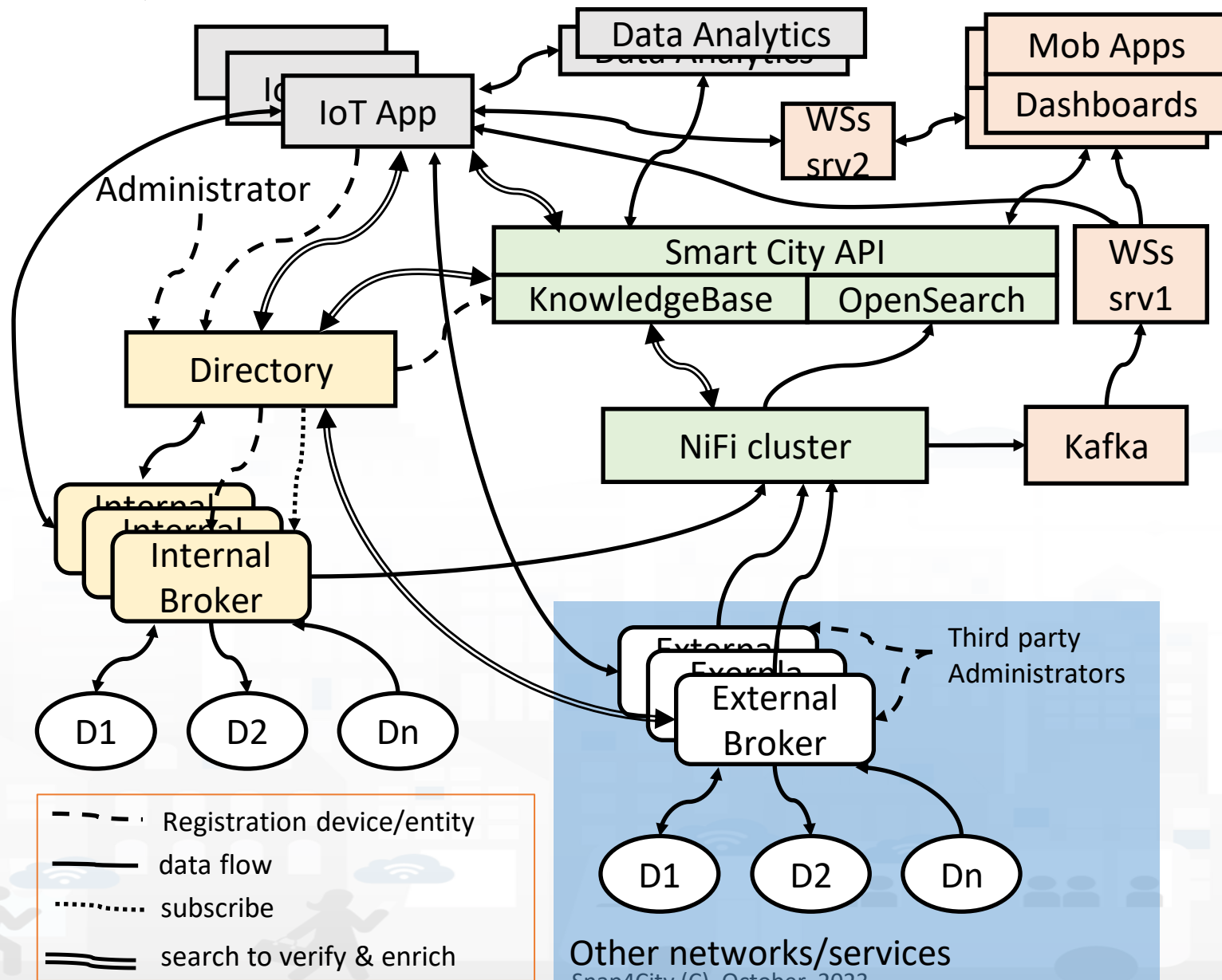
- **IOT Brokers**

- You can test, view, and register, and also automatically deploy Orion Brokers
- are associated with an Organization
 - Each **Organization** has a **Knowledge Base** of reference (KB, ServiceMap)
 - Each **KB** may host multiple **Organizations** and addresses multiple **Geographic areas**
- can be compliant with
 - **NGSI version**: V1, V2-1, V2, etc...
 - with Snap4City Security or regular NGSI FiWare
 - other protocols as well such as: MQTT, COAP, AMQP, etc.
- can
 - expose different **authentication methods**: K1/K2, Certificate, etc.
 - be accessible from IOT Devices and IOT App **in Cloud only**
 - be accessible **from Internet to post data from outside, etc.**

IOT Orion Broker Network: NGSI V1 and V2

- **IOT Broker can be Internal (on Snap4City Cloud)**
 - Registration of IOT Devices can be performed by the IOT Directory
 - Authentication is automatic, K1 and K2 are not needed since the security is performed via Access Token, M2M secure communication, on the basis of IOT App ownership
 - The **NIFI Cluster** automatically subscribes to all the entities on the Broker, to post data into the Data Shadow enriched with data of the KB
- **IOT Broker can be External (managed by third party)**
 - Registration of IOT Devices is managed by third parties
 - The registered IOT Devices can be collected and queried from the IOT Directory as well
 - The NIFI Cluster **may** automatically subscribes to all the entities on the Broker, to post data into the Data Shadow enriched with data of the KB
- **IOT Brokers can be networked**
 - Services, Service paths: for managing the IOT Broker network
 - Multi-tenant: more than one user/org on the same IOT Broker

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.

TOP

Ingestion of MyKPI with Proc.Logic / IoT App

Data, my Data, OpenData

Data Inspector

MyKPI, MyData, MyPOI

IOT Applications

IOT Applications

MicroServices for IOT Applicatio...

MicroServices from DataAnalyti...

IOT MicroServices for Final Users...

IOT MicroServices for Developers...

Doc: IOT Applications

How to Develop IOT Application...

Create A MicroService from Rest...

- be time series + metadata
- be POI with full metadata decryption, MyPOI
- be passed in ownership to other users,
- be delegated in access to other users
- model daily trajectories from: Mobile Phone Apps, CANBUS data and GPS location from mobiles, PAX Counter Mobile, mobile IOT Devices, etc.
- be saved and retrieved from IOT Apps
- create events at their changes towards IOT Apps
- be saved into: MySQL and/or OpenSearch (default saving modality can be different for solutions on cloud and on premise)
 - The access from smart city API is in any way transparent, while only when they are saved into the OpenSearch they are accessible from the so called
 - “My Data Dashboard”

My Data, KPI, POI

10 ☐ My ☐ Public in Org. ☐ Delegated ☐ Public Add My KPI Add My POI Add My Data

No. +	High Level Type	Nature	Sub Nature	Value Name	Value Type	Value Unit	DB of Values	Data Type	Last Date	Last Value	Ownership	Username	Organization
17057849	MyKPI	Emergency	Emergency_services	WebServers	status	status	ElasticSearch	string	19/2/2021, 07:11:24	ServiceMap:2021-02-19T06:11:24.721Z;code:ESOCKETTIMEDOUT;From:undefined;https://servicemap.snap4city.org/VM206	private	roottooladmin1	Firenze

Create your MyKPIs

- My Data, KPI, POI > 'Add My KPI' button
- Verify the KPI existence in My Data, KPI, POI
- Create your IoT App/Proc.Logic sending data to your KPIs
- Example: Lonato Car Park:
 - NumFreeSlots
 - MaxDuration
 - MaxDurationSlotId

My KPI Details

Nature * Transfer Service And Renting

Subnature * Car Park

Value Name * NumFreeSlots

Value Type * Slots

Value Unit *

Data Type * integer

Description

Info

Latitude 45.461596

Longitude 10.484975

Map view showing location near Lonato del Garda.

Close SAVE

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
- Notifier
- Data Inspector
- My Data, KPI, POI

My Data, KPI, POI

10

My Public in Org. Delegated Public

Add My KPI Add My POI Add My Data

NumFreeSlo Search

No. +	High Level Type	Nature	Sub Nature	Value Name	Value Type	Value Unit	Data Type	Last Date	Last Value	Ownership	Username	Controls	Data	Visibility
17057184	MyKPI	TransferServiceAndRenting	Car_park	NumFreeSlots	Slots	#	integer	8/4/2020, 19:37:14	7	private	disit_lonatodelgarda	VIEW EDIT DELETE	VALUES METADATA	DELEGATE USERS CHANGE OWNERSHIP

Showing 1 to 1 of 1 My KPI Data

First < - 1 - > Last

Page Number

IoT App sending data to your KPIs

- Create your IoT App (ex: 'SmartParking LonatoDelGarda')
 1. Use an **inject** block to choose the frequency of update
 2. Use **http** block to download data (e.g.)
 3. Use a **function** of blocks to convert data in a specific json sending data to each KPI
 4. Use a **save-my-kpdata-values** block

The screenshot displays the Snap4City IoT App interface. On the left, a sidebar shows the user 'rootooladmin1, Org: DISIT' and a list of applications, with 'IOT Applications' selected. The main area shows a Node-RED flow titled 'Flow 1' for 'SmartParking LonatoDelGarda'. The flow includes an 'inject' block, a 'timestamp' block, an 'http request' block (highlighted with a red box), a 'split' block, a 'Parcheggi' function block, and a 'fiware orion out v1' block. Below the 'http request' block, there is an 'estimations' function block (highlighted with a green box) and a 'save-my-kpdata-values' block (highlighted with a blue box). The 'estimations' block is connected to the 'http request' block and the 'save-my-kpdata-values' block. The 'save-my-kpdata-values' block is connected to the 'estimations' block and has a dropdown menu for 'Select KPI' with a list of KPIs: 17057184-NumFreeSlots, 17057183-NumBusySlots, 17057185-MaxDuration, 17057186-MaxDurationSlotID, 17057257-AccessPoint3_Palasport, 17057258-AccessPoint2_ITIS, and 17057259-AccessPoint1_FamilaSuperstore. Below the flow, there are two panels: 'Edit function node' for the 'estimations' block and 'Edit save-my-kpdata-values node' for the 'save-my-kpdata-values' block. The 'Edit function node' panel shows the function code for the 'estimations' block, which is a JavaScript function that processes the data from the 'http request' block and sends it to the 'save-my-kpdata-values' block. The 'Edit save-my-kpdata-values node' panel shows the configuration for the 'save-my-kpdata-values' block, including the 'Select KPI' dropdown and the 'Save on NumFreeSlots', 'Save on MaxDuration', and 'Save on MaxDurationSlotID' options.

What is missing here and you can get from former course

DATA GATHERING
AND CITY DATA
KNOWLEDGE
MANAGEMENT

FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT APPLICATIONS
VS. IOT DEVICES

IOT/IOE DEVICES
AND NETWORKS

IOT APPLICATIONS,
THE LOGIC AND
THE SMARTNESS

ADVANCED
SMART CITY API,
MICROSERVICES,
SNAP4CITY API

SNAP4CITY
LIVING LAB FOR
COLLABORATIVE
WORK

SNAP4CITY FOR
BEGINNERS

SNAP4CITY
ARCHITECTURE AND
ECOSYSTEM. OPENED
TO DEVELOPERS
AND MAKERS

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
WHAT IS AND
SIMULATIONS

TWITTER
VIGILANCE: SOCIAL
MEDIA ANALYSIS

HOW TO ADOPT
SNAP4CITY, AND
OUR ROADMAP

SNAP4CITY
AND KM4CITY
PROJECTS

SNAP4CITY THE
VIEW OF THE
ADMINISTRATORS

What is missing here and you can find in the former course or other parts of this

- GIS Interoperability
- Ingestion of Public Transportation data:
 - GTFS, Transmodel, GTFS RT, NeTEx, etc.
- CKAN interoperability
- Satellite data Ingestion
- IOT Devices integration
 - AIRQINO, Libelium, SIGFOX,
 - LORA, MQTT, OBD2, AXIS Cameras

Part 6

- Snap4City vs FIWARE
- Data Streams from participatory, Mobile App
- Data streams from Mobile vehicles and smart phones Devices
- Data Ingestion via Web Scraping
- Data stream from TV Cameras, TV Cam Manager

















































- Social Media interoperability
- Open Maintenance Ticketing Interoperability
- Telegram Interoperability
- Another Complete Example
- Blockchain models and devices in Snap4City (new feature)
- Orion Broker:
 - Services/SrvPath and Multitenant
- External and Internal Brokers,
 - External Broker harvesting
- Managing Node-RED on edge from cloud
- More on Security of Snap4City Stack from device to dashboards
- <https://www.snap4city.org/577>

<https://www.snap4city.org/944>

On Line Training Material (free of charge)



1st part	2nd part	3rd part	4th part	5th part	6th part	7th part	8th
Overview	Dashboards	IOT App, IOT Network	Data Analytics	Data Ingestion processes	System and Deploy Install	Smart City API: Web & Mob. App	Design and Develop Smart Solutions
							
							

Training Material


	1st part	2nd part	3rd part	4th part	5th part	6th part	7th part	8th
what	Overview	Dashboards	IOT App, IOT Network	Data Analytics	Data Ingestion processes	System and Deploy Install	Smart City API: Web & Mob. App	Design and Develop Smart Solutions
PDF 2022								
Interactive (2022) with video and animations								

Note on Training Material

- **Course 2023:** <https://www.snap4city.org/944>
 - Introductionary course to Snap4City technology
- **Course** <https://www.snap4city.org/577>
 - Full training course with much more details on mechanisms and a wider set of cases/solutions of the Snap4City Technology
- **Documentation** includes a deeper round of details
 - Snap4City Platform Overview:
 - <https://www.snap4city.org/drupal/sites/default/files/files/Snap4City-PlatformOverview.pdf>
 - Development Life Cycle:
 - <https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf>
 - Client Side Business Logic:
 - <https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual.pdf>
- **On line cases and documentation:**
 - <https://www.snap4city.org/108>
 - <https://www.snap4city.org/78>
 - <https://www.snap4city.org/426>

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Home / Tutorials and Videos / Welcome: how to start using Snap4City for beginners

Welcome: how to start using Snap4City for beginners



We suggest you:

Congratulations! You have really contributed to Snap4City and successfully passed all first levels!

You have reached a level in which you can contribute with competence to the city improvement and smartness. We hope you interested in helping other users in conquering higher levels on the city smartness ranking, and provising of smart services to all city users!

So that we could be interested in engaging and elevating your role in the Snap4City community as coordinator of thematic groups, for example on **Mobile APP development**, **Dashboard on Mobility**, **IOT Application Development**, etc., according to your preferences.

Please contact paonesi@gmail.com !



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- TECHNICAL OVERVIEW: <https://www.snap4city.org/download/video/Snap4City-PlatformOverview.pdf>
- Development Life Cycle: <https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf>
- Client-Side Business Logic Widget Manual: <https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual.pdf>
- Booklet Data Analytics, Snap4Solutions: https://www.snap4city.org/download/video/DPL_SNAP4SOLU.pdf

Please start a fully guided training cases:

- [HOW TO: create a Dashboard in Snap4City](#)
- [HOW TO: add a device to the Snap4City Platform](#)
- [HOW TO: add data sources to the Snap4City Platform](#)
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Training on Tools
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Updates on Tools

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drupaladmin

Snap4City Newsletter of April
2023 [new](#)
roottooladmin1

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- Booklet Data Analytics, Snap4Solutions: https://www.snap4city.org/download/video/DBL_SNAP4SOLUTION.pdf

2023 booklets



- Smart City



https://www.snap4city.org/download/video/DPL_SNAP4CITY.pdf

- Industry



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- Artificial Intelligence

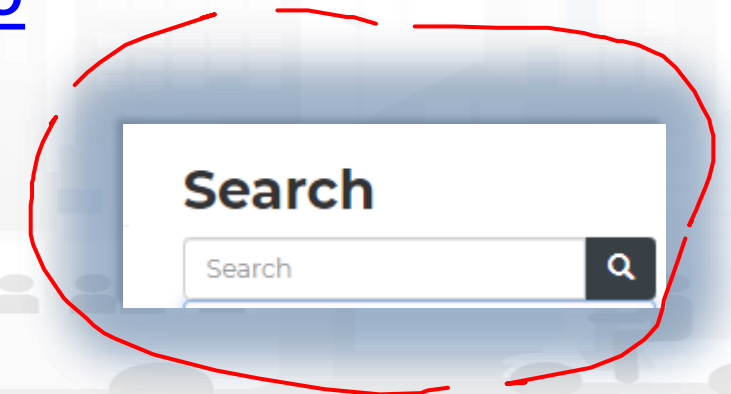


https://www.snap4city.org/download/video/DPL_SNAP4SOLU.pdf

The Platform



- **Free Registration on Snap4City.org**
 - Please select DISIT ORG to be sure to access at the examples
 - Most of the cities / tenant are private and they do not left much visible
- **What you get** is probably the 10% of what is on the platform 😊
- **Training:** <https://www.snap4city.org/577>
- **Scenarious:** <https://www.snap4city.org/4>
- **Publications:** <https://www.snap4city.org/426>
- **WEB pages:** <https://www.snap4city.org/78>
- ***SEARCH on the right side***



Technical Overview

From: DINFO dept of University of Florence, with its
DISIT Lab, <https://www.disit.org> with its Snap4City solution

Snap4City:

- Web page: <https://www.snap4city.org>
- <https://twitter.com/snap4city>
- <https://www.facebook.com/snap4city>

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- o Twitter: <https://twitter.com/paolonesi>
- o FaceBook: <https://www.facebook.com/paolo.nesi2>

- <https://www.snap4city.org/drupal/sites/default/files/files/Snap4City-PlatformOverview.pdf>



Development

<https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf>







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Development Life-Cycle

<https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle-v1-1.pdf>

From Snap4City:

- We suggest you to read the **TECHNICAL OVERVIEW**:
 - <https://www.snap4city.org/download/video/Snap4City-PlatformOverview.pdf>
- <https://www.snap4city.org>
- <https://www.snap4solutions.org>
- <https://www.snap4industry.org>
- <https://twitter.com/snap4city>
- <https://www.facebook.com/snap4city>
- <https://www.youtube.com/channel/UC3tAO09EbNba8f2-u4vandg>

Coordinator: Paolo Nesi, Paolo.nesi@unifi.it

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Via S. Marta 3, 50139, Firenze, Italy
Phone: +39-335-5668674



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Client Side Business Logic

<https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual>



Client-Side Business Logic Widget Manual

From Snap4City:

- We suggest you read <https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf>
- We suggest you read the TECHNICAL OVERVIEW:
 - <https://www.snap4city.org/download/video/Snap4City-PlatformOverview.pdf>
- slides go to <https://www.snap4city.org/577>
- <https://www.snap4city.org>
- <https://www.snap4solutions.org>
- <https://www.snap4industry.org>
- <https://twitter.com/snap4city>
- <https://www.facebook.com/snap4city>
- <https://www.youtube.com/channel/UC3IAQ09EbNba8f2-u4vanda>

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Phone: +39-335-5668674

Commercial Overview



- <https://fiware-foundation.medium.com/snap4-city-fiware-powered-smart-app-builder-for-sentient-cities-acfe24df49d5>
- https://www.snap4city.org/drupal/sites/default/files/files/FF_ImpactStories_Snap4City.pdf



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Acknowledgements

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DASHBOARD TO
APPLICATIONS

DATA GATHERING
AND CITY DATA
KNOWLEDGE
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FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT APPLICATIONS
VS IOT EDGE
DEVICES

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THE LOGIC AND
THE SMARTNESS

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MICROSERVICES,
SNAP4CITY API

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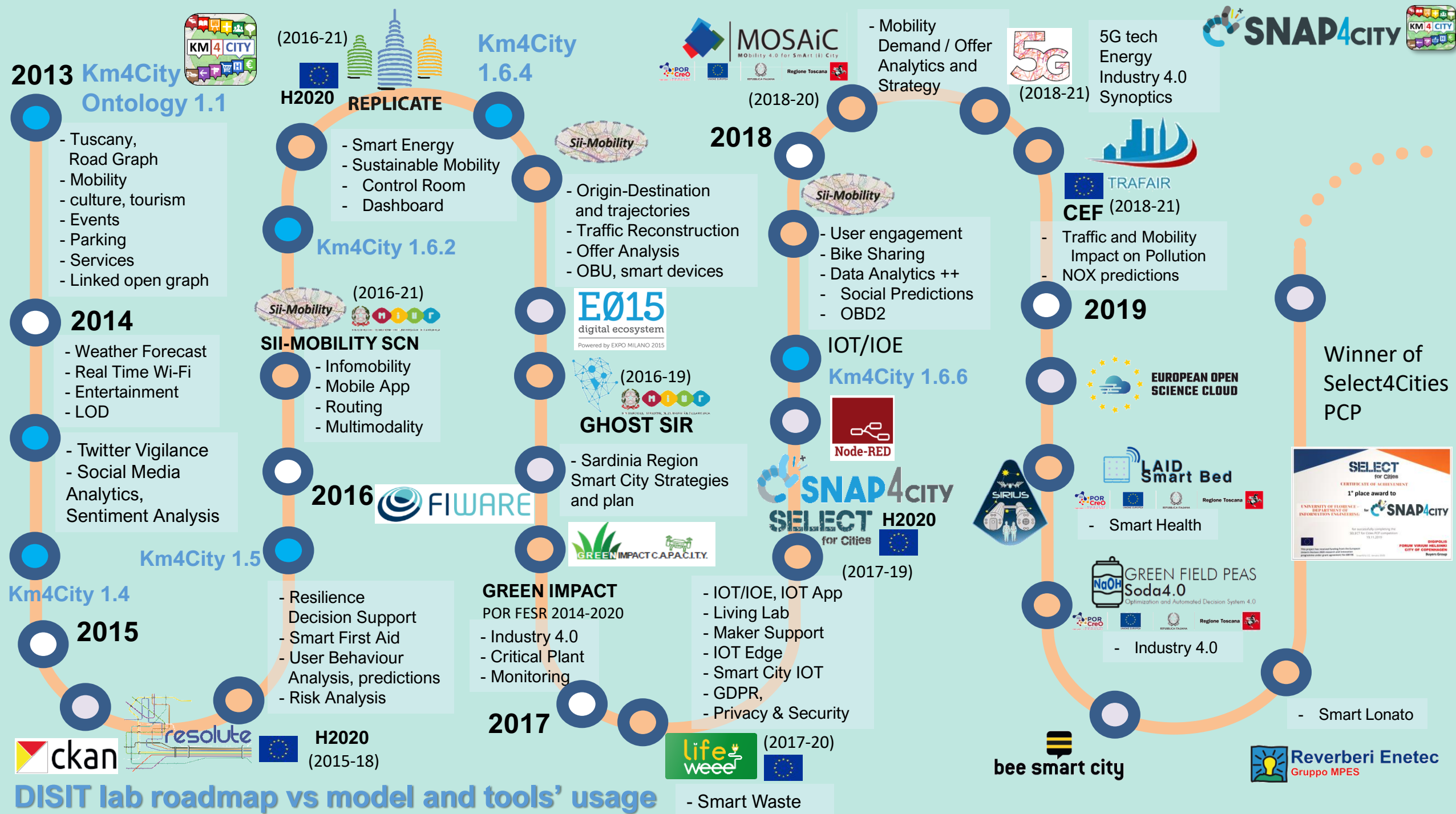
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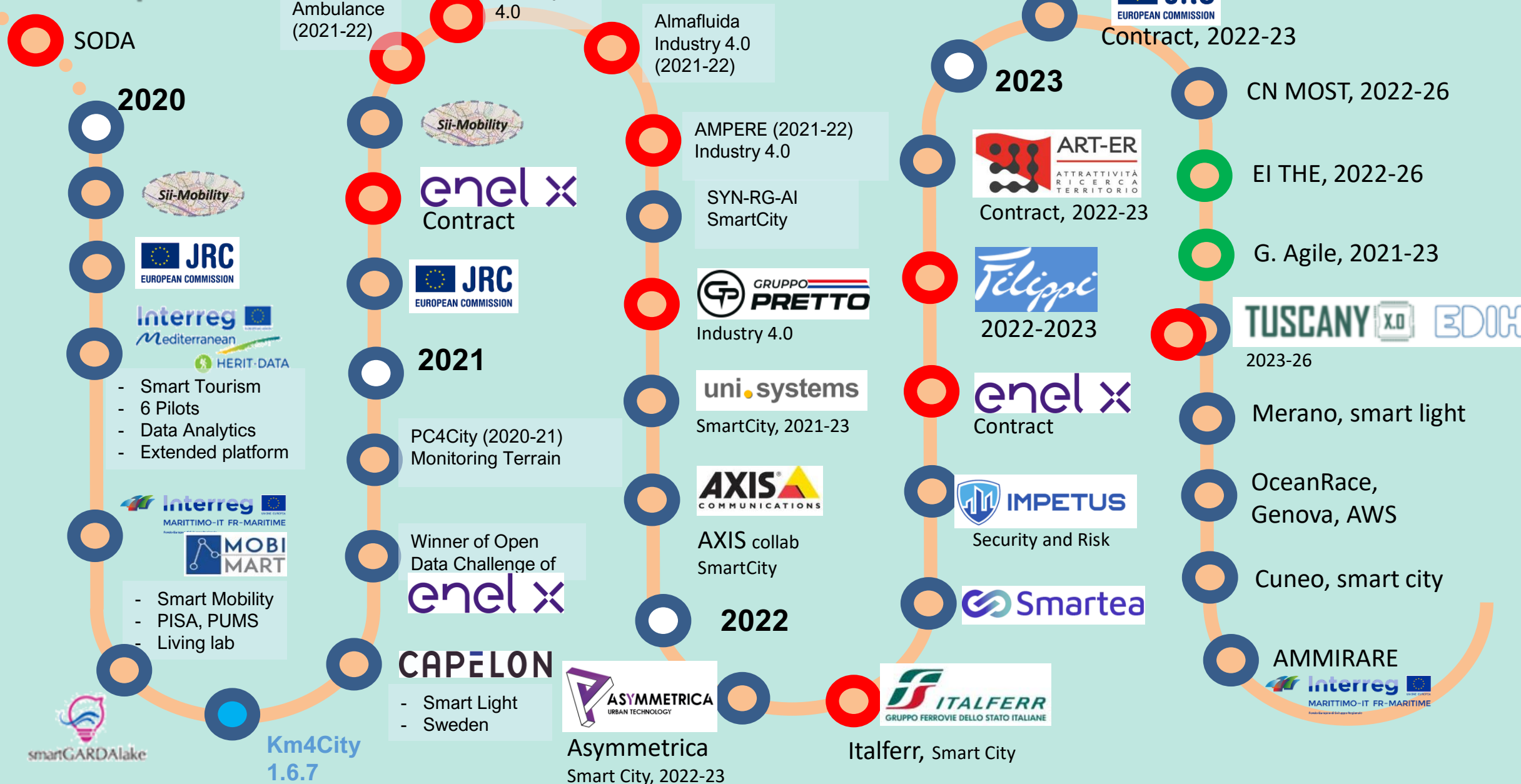
DECISION SUPPORT
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