Hackathon

6500 Euro di Premi

IEEE ITSS – Italian Chapter
&
DISIT LAB of Università di Firenze

present

IEEE Intelligent Transportation Systems Snap4City Hackathon

https://www.snap4city.org/757

IEEE Intelligent Transportation Systems Snap4City Hackathon

Quando si svolge

Evento di lancio
11 Ottobre 2021
ore 09:30 - 13:00

Apertura ufficiale
Venerdì 15 ottobre 2021

Scadenza sottomissione soluzioni
13 Dicembre 2021

Come partecipare

- Registrandosi alla piattaforma Snap4City come «DISIT organization»
- Compilando il form di registrazione
- Seguendo le istruzioni per la sottomissione finale delle soluzioni alla pagina ufficiale dell'Hackathon
- Gli eventi si svolgeranno online

Chi può partecipare

- Individualmente
- Gruppi composti da massimo 5 persone

Aperto a studenti o privati residenti in Italia e/o soggetti appartenenti ad istituzioni/amministrazioni pubbliche

Open PreHackathon Training and QnA: 11 Ottobre 2021 at 09:30
If interested send an email to Nicola.Mitolo@unifi.it

Challenge A

Richiede l'utilizzo della tecnologia Snap4City per lo sviluppo di soluzioni di mobilità urbana ITS. I partecipanti potranno utilizzare:

- una IOT App con più flussi/processi;
- uno o più dashboard;
- al massimo un processo di analisi dei dati in Python o Rstudio, da eseguire in automatico da IoT App, ma più funzioni, e.g.: training off line, ed execution on line…

Challenge B

Sviluppo di un'idea progettuale senza implementare effettivamente la soluzione o fornire un mock-up, utilizzando gli strumenti e i dati della piattaforma Snap4City.
Sarà sufficiente la presentazione di una dashboard Demo.

La sfida offre piena libertà per creare soluzioni innovative per migliorare il futuro della mobilità e dei sistemi di trasporto nelle città in cui viviamo.

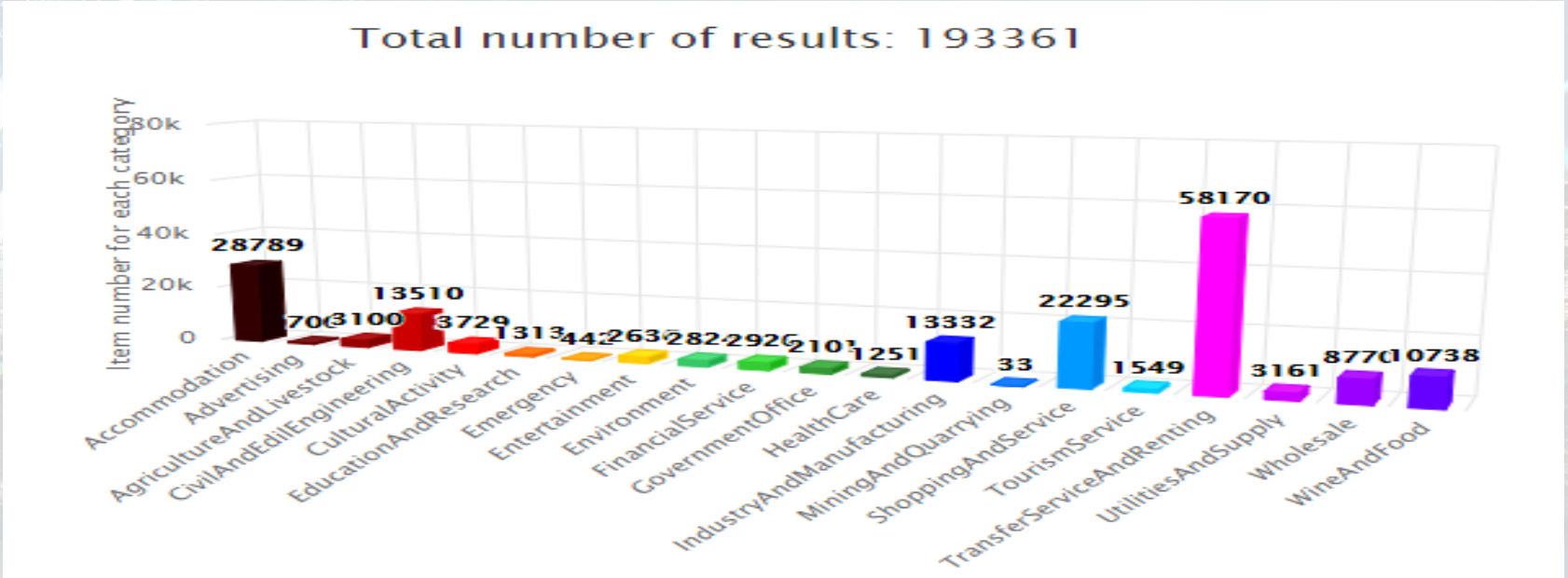
Hackathon Data Focus

https://www.snap4city.org/755

Tuscany region which is a region with more than 3.5 M of inhabitants.
MicroService, API and services for routing and multimodal routing in Tuscany, etc.
regarding:

- **Road model for the whole Tuscany, plus routing**
- **car parking status,**
- **public transport operators,**
- **bike sharing,**
- **Pollutant sensors,**
- **traffic flow sensors,**
- **Weather sensors,**
- **points of interests,**
- **Pollination sensor,**
- **Heatmaps of several kind**
- **picking from heatmaps,**

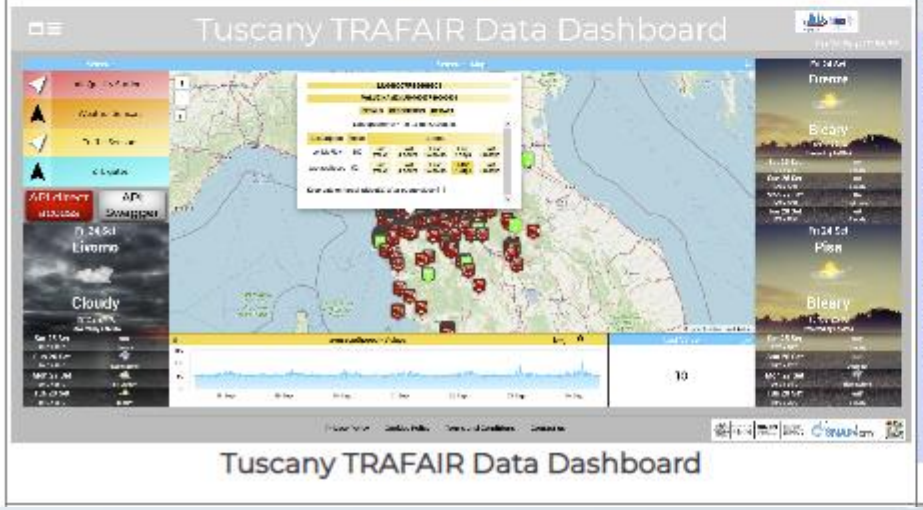
- Tuscany: https://www.snap4city.org/760
- Florence: https://www.snap4city.org/747
- Pisa: https://www.snap4city.org/746
- Livorno: https://www.snap4city.org/751
- Siena: https://www.snap4city.org/759
- Prato: https://www.snap4city.org/758
- Pistoia: https://www.snap4city.org/761



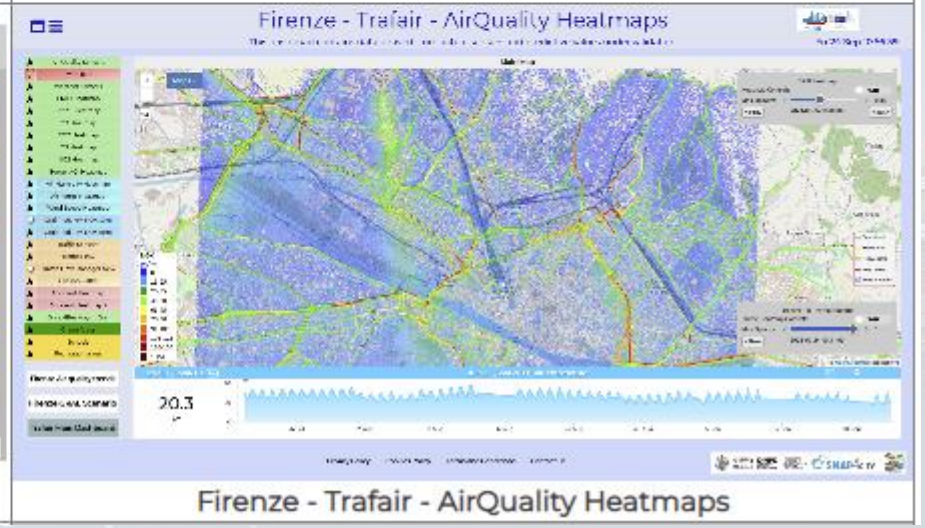
Toscana region: https://www.snap4city.org/760

Toscana Traffico

Trafair Main Dashboard



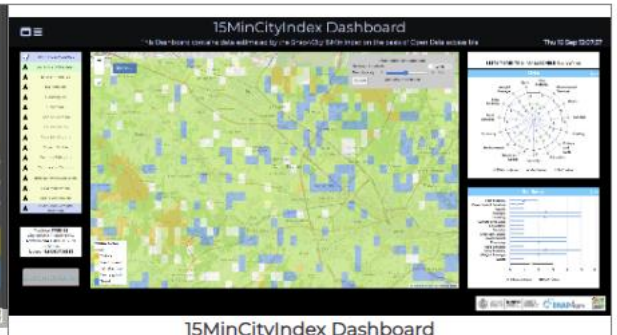
Tuscany TRAFAIR Data Dashboard



Firenze - Trafair - AirQuality Heatmaps

Florence/Firenze: https://www.snap4city.org/747

Firenze Oggi New (private)

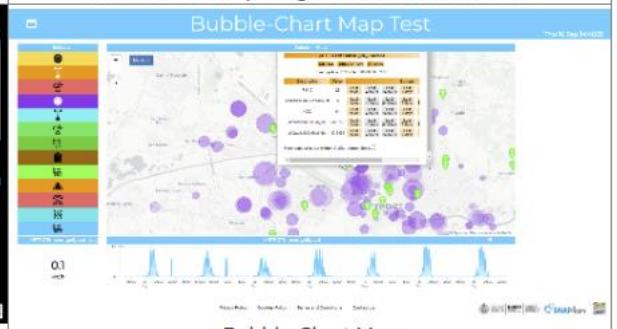


15MinCityIndex Dashboard

Energy - with custom pins

3D Multi Data Map - Digital Twin Global - Firenze

Alerting Generation



Bubble-Chart Map

Premi

Challenge A

1° classificato 3000 euro

2° classificato 2000 euro

Challenge B

1° classificato 1000 euro

2° classificato 500 euro

Promozione delle soluzioni più meritevoli attraverso Snap4City.org e IEEE ITSS – Italian Chapter

Criteri di valutazione

La soluzione sarà valutata da una giuria sulla base dei seguenti criteri:

- **Utilità e Valore** della soluzione nel contesto ITS
- **Pertinenza** agli obiettivi proposti;
- **Progettazione**/Esperienza Utente;
- **Creatività e Innovazione** della soluzione;
- **Chiarezza e Completezza** della presentazione;

Challenges

- **full freedom** for creating new and innovative solutions
  - to improve the future of mobility and transportation systems in the cities in which we live.
- **For example:**
  - sustainable mobility and transport
  - services for ITS
  - addition of devices and data and t heir usage
  - interesting data analytics on accessible data
  - predictive models and solutions
  - services for the final users in city or rural areas
  - event driven solution and early warning
  - anomaly detections of critical conditions.
  - etc.

How to proceed

- **Registration on Snap4City Portal**
  - One or more people
  - On DISIT Organization if not interested to access specifically on other areas and data
- **Register the team** with the google form from the Hackathon page:
  - Only one official Team user can be officially registered:
    - This use will be leveraged to AreaManager by Snap4City admin
    - Team may have more AreaManagers, but only one official
    - The Official team account is going to have access to DataAnalytics: Rstudio or Python, please ask!
- **See details for the submission process**

What we do for you!

- **Each Team is going to have** a set of persons for assistance
  - a Skype continuous live chat for 24/7 connection with Snap4City team and hackathon organizers
  - OUR experts for you are:
    - Snap4city experts, FIWARE Experts,
    - Business Experts,
    - Experts in the context of mobility and transport of IEEE and many research centers in Italy!!
- **Help Desk:**
  - See on the menu of the left for the documentation, FAQ, etc.
  - USE THE Search on the right side and Google it works, we have more than 400 pages, more than 150 video, etc. etc.

Links - IEEE Intelligent Transportation Systems Snap4City Hackathon

- Official page of Hackathon

  https://www.snap4city.org/757

- data:

  https://www.snap4city.org/755

- Registration form

  https://docs.google.com/forms/d/e/1FAIpQLSeEhs2atacvQRAvBRMOYdSYlL7DB260WICDxKv29GR5aLlIOg/viewform?vc=0&c=0&w=1&flr=0

- Rules for the final submission

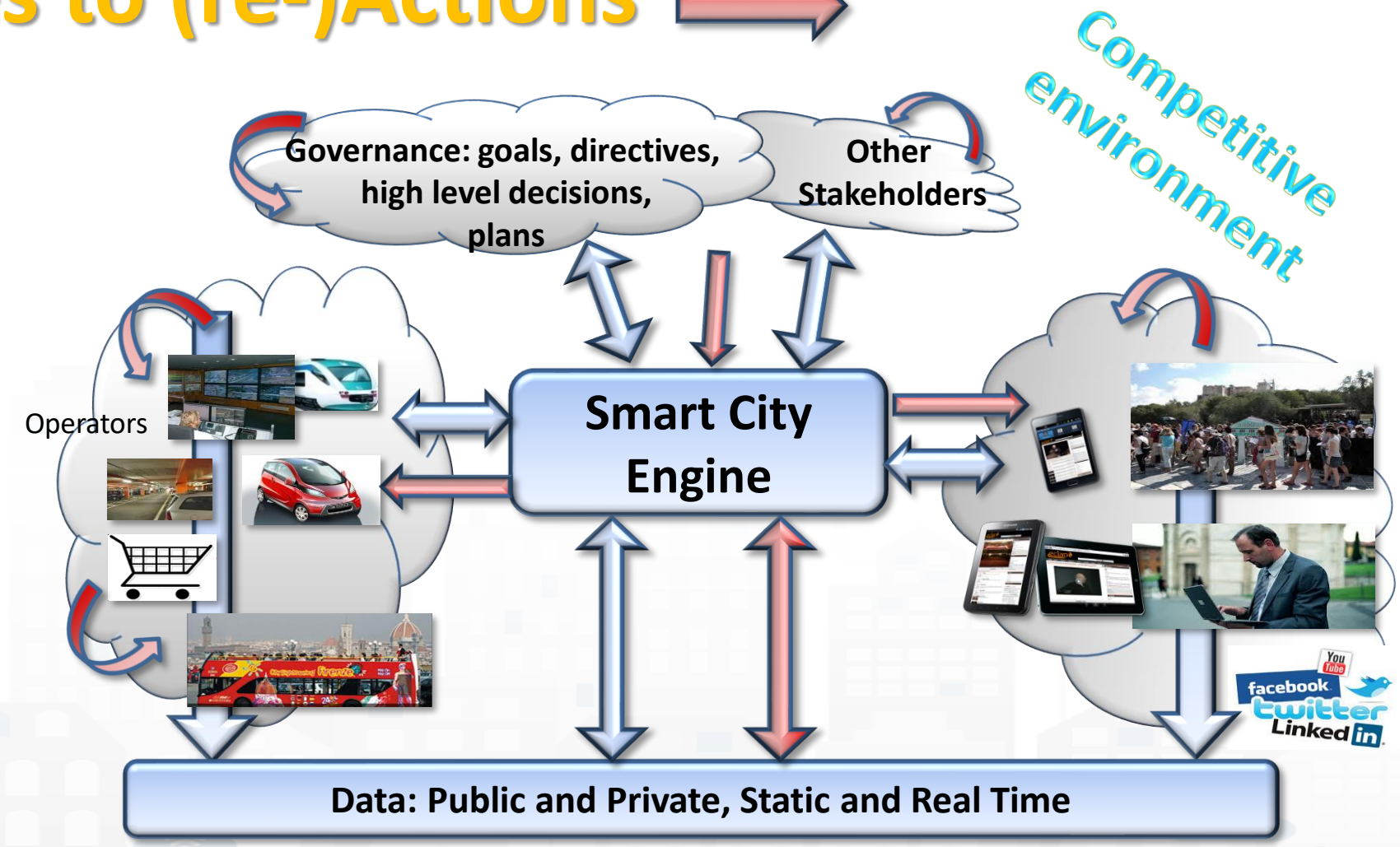
  https://www.snap4city.org/756

Snap4City *Tools for rapid implementation of - Sustainable Smart Solutions - Decision Support Systems as a no-coding, low-coding*

snap4city@disit.org
https://www.Snap4city.org

From Strategies to (re-)Actions

- Analyzing
- Alerting, Early Warning
- Making Decision active
- Prescripting
- New Plan
- Informing
- Suggesting
- Engaging



Data Driven Decision Support

- Decision Support system
- Assessment / Strategies
- Data Rendering, visual analytics
- Data Processing
- Data aggregation, Storage, indexing
- Data Ingestion

Tools for rapid implementation of sustainable Smart Solutions and Decision Support Systems

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTELLIGENT TECHNOLOGIES LAB | SNAP4CITY | KM4CITY

www.snap4city.org

100% OPEN SOURCE

Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

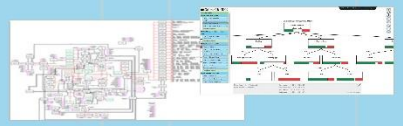
JS Foundation

E015 digital ecosystem

NVIDIA

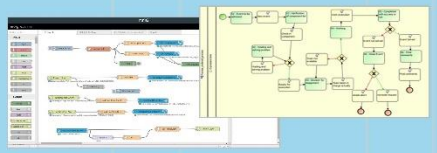
DASHBOARDS AND APPS - CONTROL ROOMS - DECISION SUPPORT SYSTEMS - WHAT-IF ANALYSIS - VISUAL ANALYTICS

PREDICTION - ANOMALY DETECTION - ENVIRONMENTAL MODEL - 3D MODEL
KPI - SIMULATION - EARLY WARNING - SYNOPTIC - DIGITAL TWIN - VIRTUAL REALITY



EXPERT SYSTEM
KNOWLEDGE BASE
STORAGE

BIG DATA ANALYTICS
EXPLAINABLE ARTIFICIAL INTELLIGENCE
BUSINESS INTELLIGENCE
MACHINE LEARNING



DATA FLOWS, DATA DRIVEN
WORKFLOWS, MICROSERVICES
PARALLEL DISTRIBUTED PROCESSING

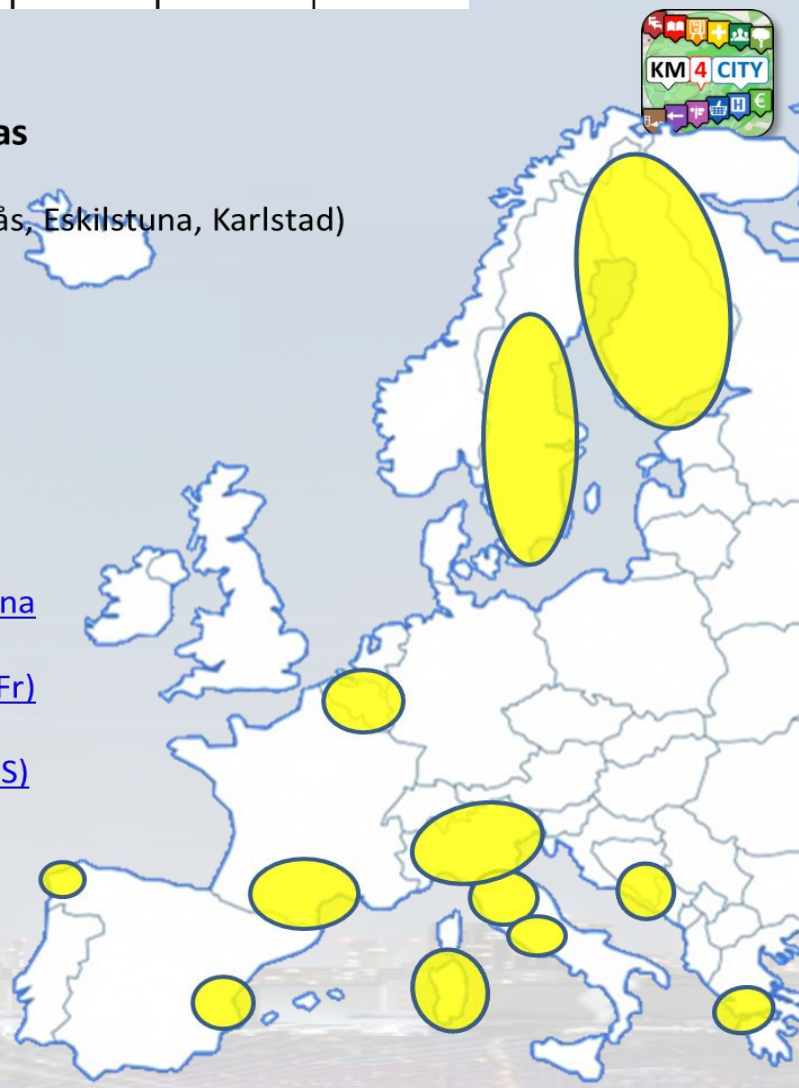
METHODOLOGIES
COURSES AND COMMUNITY
LIVING LABS
DEVELOPMENT TOOLS

2021/10: Snap4City Numbers

- > 120 Protocols
- *Mobility, energy, people flow, environment, Industry 4.0, tracking, smartbed, smart ambulance, Tourism, smart light, culture, etc…*
  - 6 running installations
  - 13 projects, 12 pilots on 9 Countries
- **On the largest deploy**
  - 17 Organizations / tenant
  - > 4800 users on https://www.Snap4City.org
  - > 1300 Dashboards
  - > 15 mobile Apps
  - > 2 Million of structured data per day
  - > 550 IoT Applications/node-RED /Docker
  - > 680 web pages with training
  - > 140 videos, training videos

Main Organizations/areas

- Antwerp area (Be)
- Capelon (Sweden: Västerås, Eskilstuna, Karlstad)
- 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)

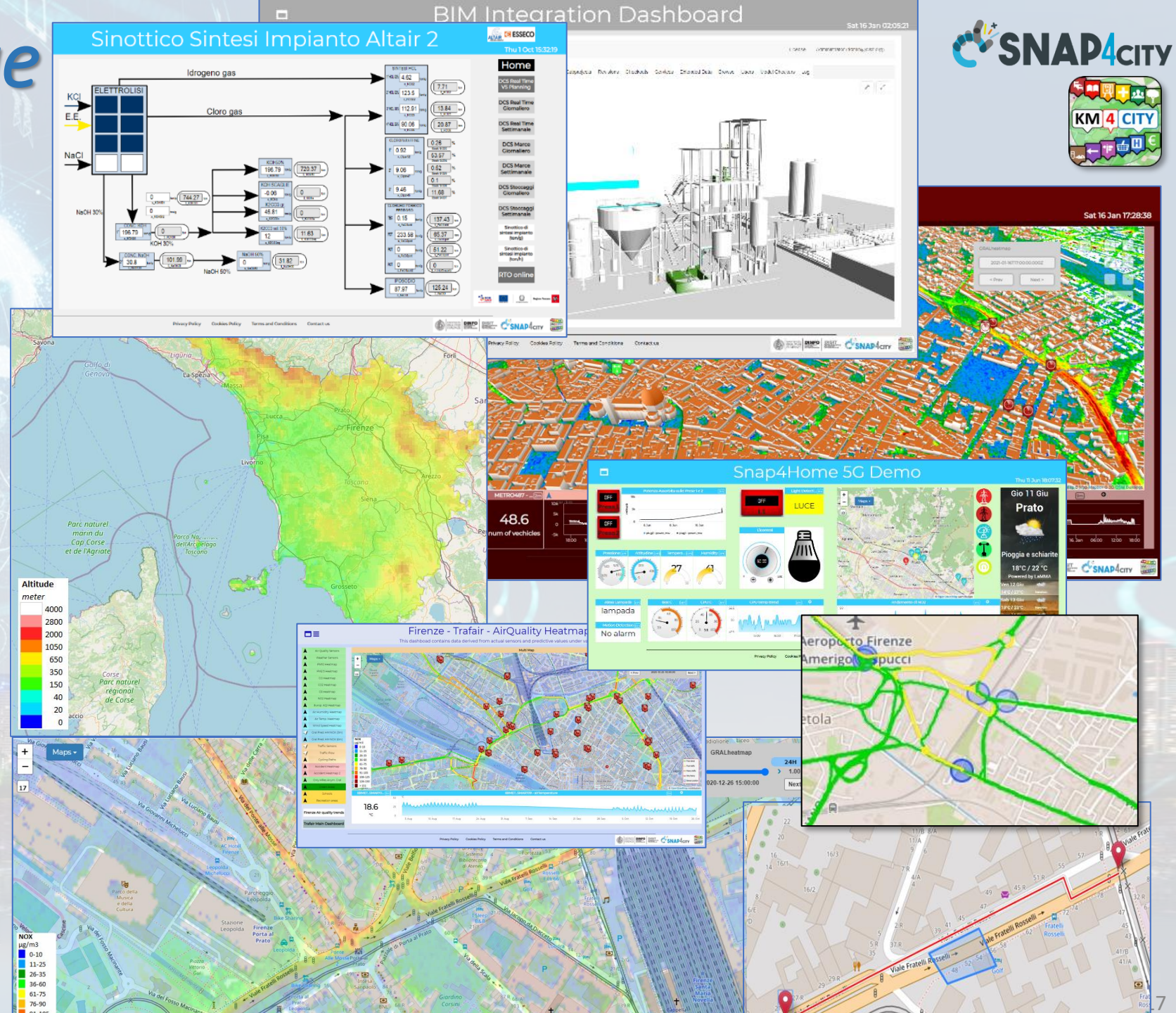


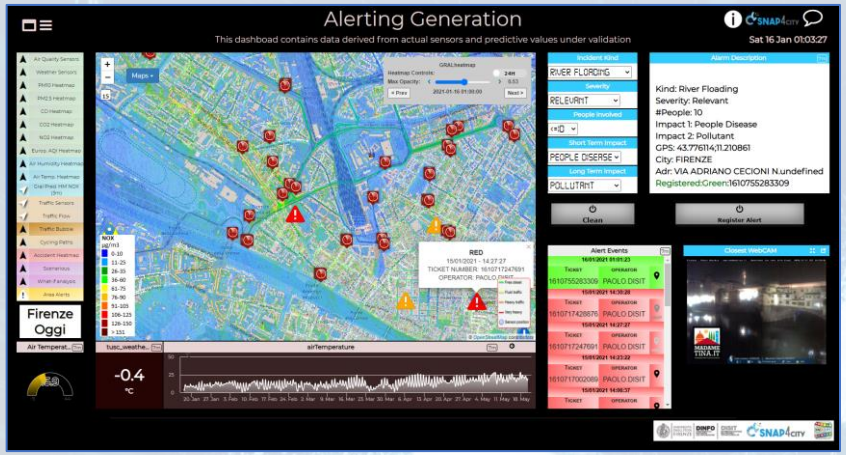
Last minute:

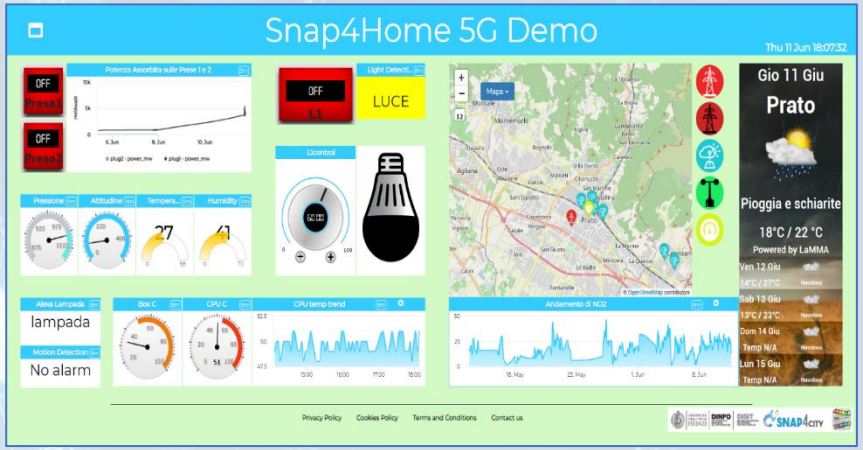
- Installation in Israel
- Coverage of all Greece is coming

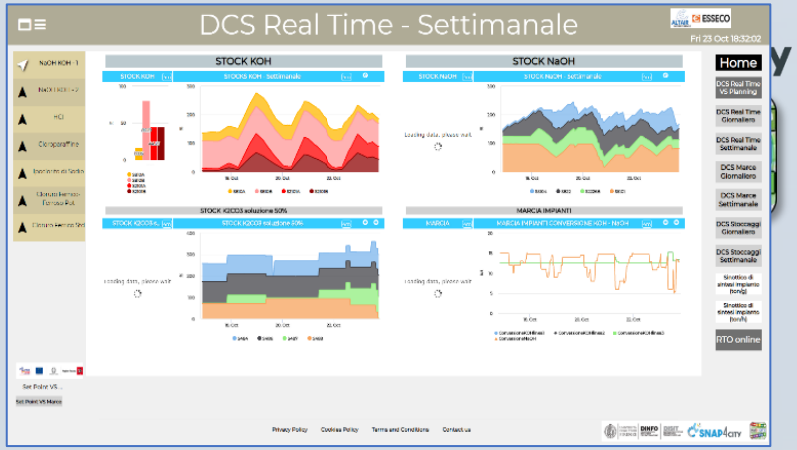
Data Type Coverage

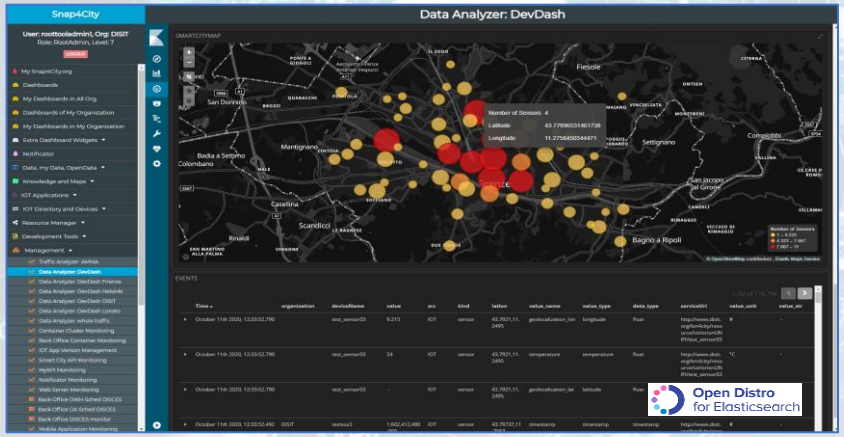
- POI, IOT, shapes,..
- maps, orthomaps, GTFS, GIS WFS/WMS, GeoTiff, ..
- calibrated heatmaps, ..
- traffic flow, typical trends, ..
- trajectories, events, ..
- 3D, BIM, Workflow, ..
- Dynamic icons/pins, ..
- OD Matrices, scenarios, ..
- prediction models, ...
- decision support, ...
- Synoptics, animations, ..
- social media, Routing, ..
- Satellite data, ..
- KPI, personal KPI,..
- etc.

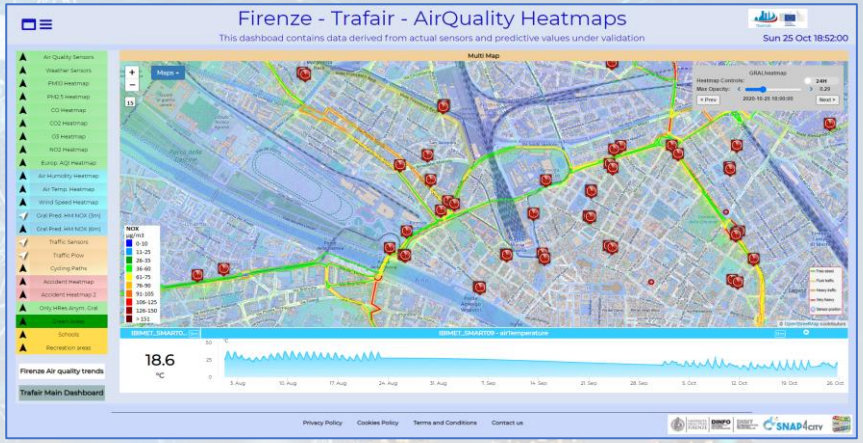


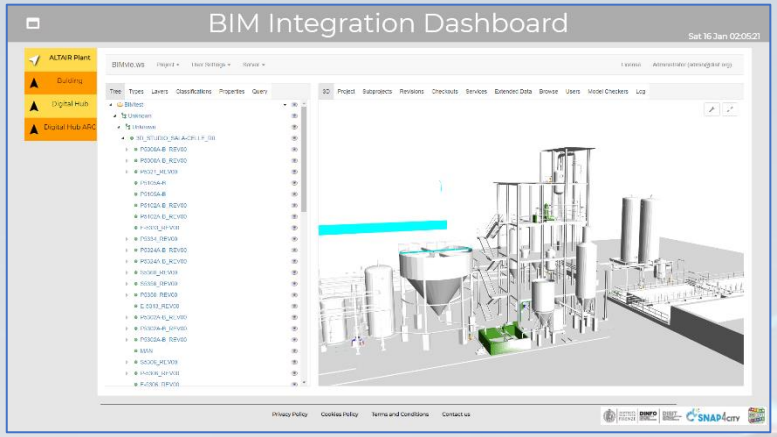

Alerting Generation
This dashboad contains data derived from actual sensors and predictive values under validation
Sat 16 Jan 01:03:27
Firenze Oggi
-0.4

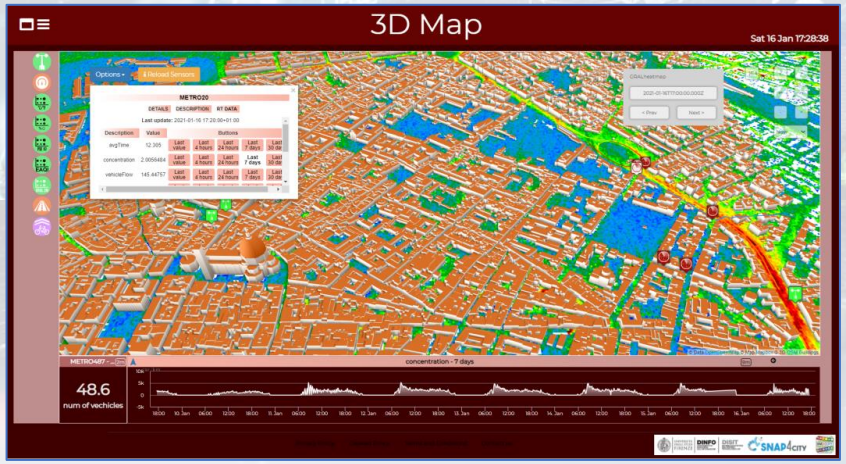

Snap4Home 5G Demo
Thu 11 Jun 18:07:32
LUCE
lampada
No alarm
Gio 11 Giu
Prato
Pioggia e schiarite
18°C / 22 °C
Powered by LaMMA

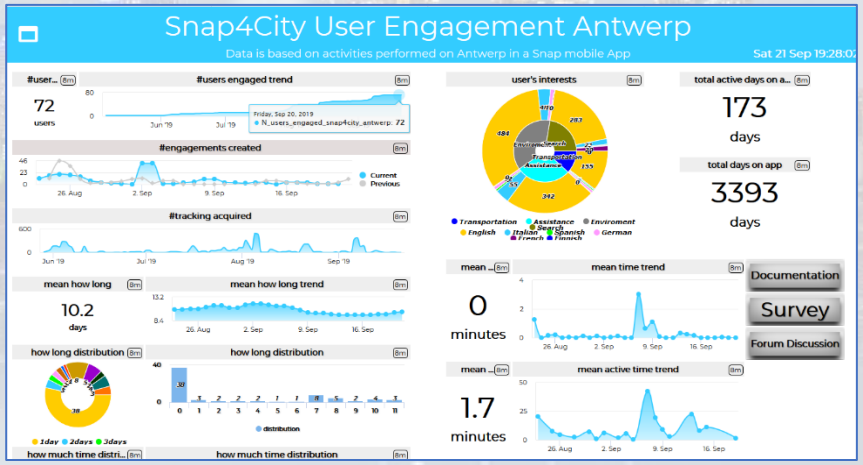

DCS Real Time - Settimanale
Fri 23 Oct 18:32:02
STOCK KOH
STOCK NaOH
Home

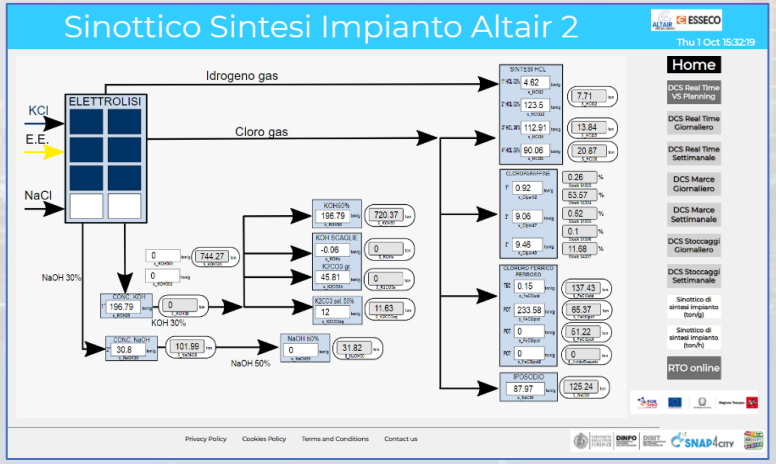

Snap4City
Data Analyzer: DevDash
Open Distro for Elasticsearch


Firenze - Trafair - AirQuality Heatmaps
This dashboad contains data derived from actual sensors and predictive values under validation
Sun 25 Oct 18:52:00
18.6


BIM Integration Dashboard
Sat 16 Jan 02:05:21


3D Map
Sat 16 Jan 17:28:38
48.6
num of vechicles


Snap4City User Engagement Antwerp
Data is based on activities performed on Antwerp in a Snap mobile App
72
users
10.2
days
0
minutes
173
days
3393
days
1.7
minutes
Documentation
Survey
Forum Discussion


Sinottico Sintesi Impianto Altair 2
Thu 1 Oct 15:32:19
Home
Idrogeno gas
Cloro gas
ELETTROLISI
KCl
E.E.
NaCl
NaOH 30%
KOH 30%
NaOH 50%

TOP

Some Use Cases

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

Smart City Control Room
Florence Metropolitan City

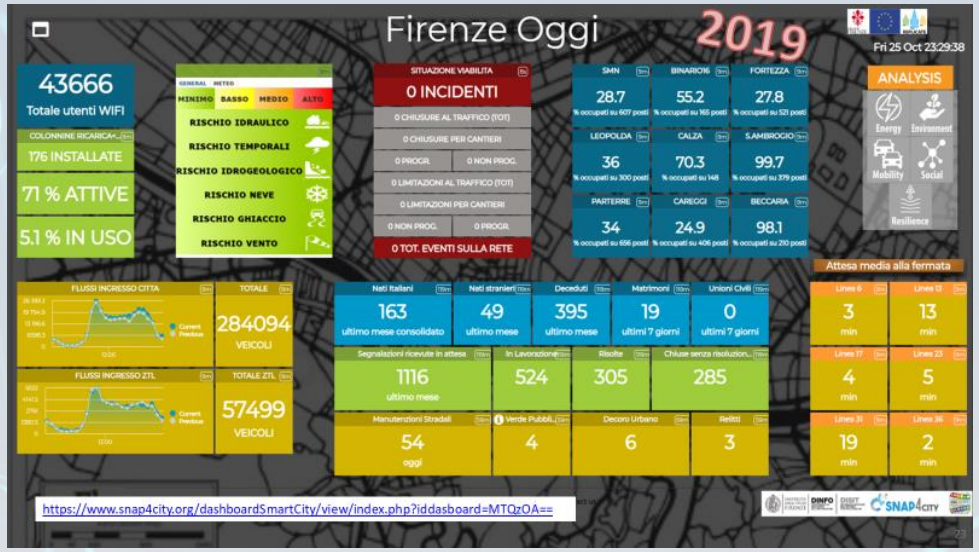
COMUNE DI FIRENZE

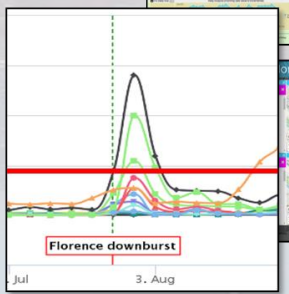
reference

SNAP4CITY

KM 4 CITY

- **Multiple Domain Data**
  - Thousands of Open/Private data, POI, IOT, etc.
  - ***mobility and transport***: accidents, public transport, parking, traffic flow, Traffic Reconstruction, KPI, …
  - ***AND***: environment, civil protection, gov KPI, covid-19, social & social media, people flow, tourism, energy, culture, …
- **Multiple dash/tool Levels & Decision Makers**
  - Real Time monitoring, Alerting, quality assess.
  - Predictions, KPI, DSS, what-if analysis
- **Historical and Real Time data**
  - Billions of Data
- **Services Exploited on:**
  - Multiple Levels, Mobile Apps, API
- **Since 2017**






60

Mobility and Transport Traffic Flow Analysis

Cities: Firenze, Pisa, Livorno, Modena, Santiago di Compostela

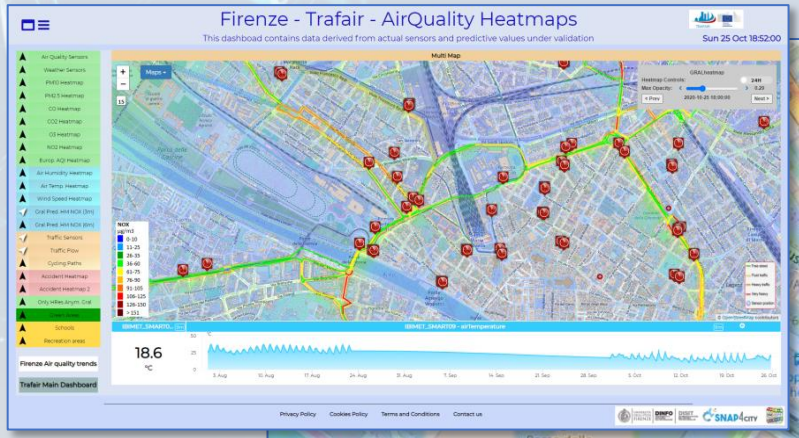
- **Multiple Domain Data**
  - Traffic Flow sensors, city structure, weather
- **Decision Makers Multiple Locations**
  - Real time Monitoring, predictions
  - Traffic Flow Predictions,
  - Traffic Reconstructions, routing
  - Dashboards, What-IF analysis
  - Mobile App, people flows
- **Historical and Real Time data**
- **Services Exploited on:**
  - Dashboards, Mobile App
- **Since 2017, 2019**

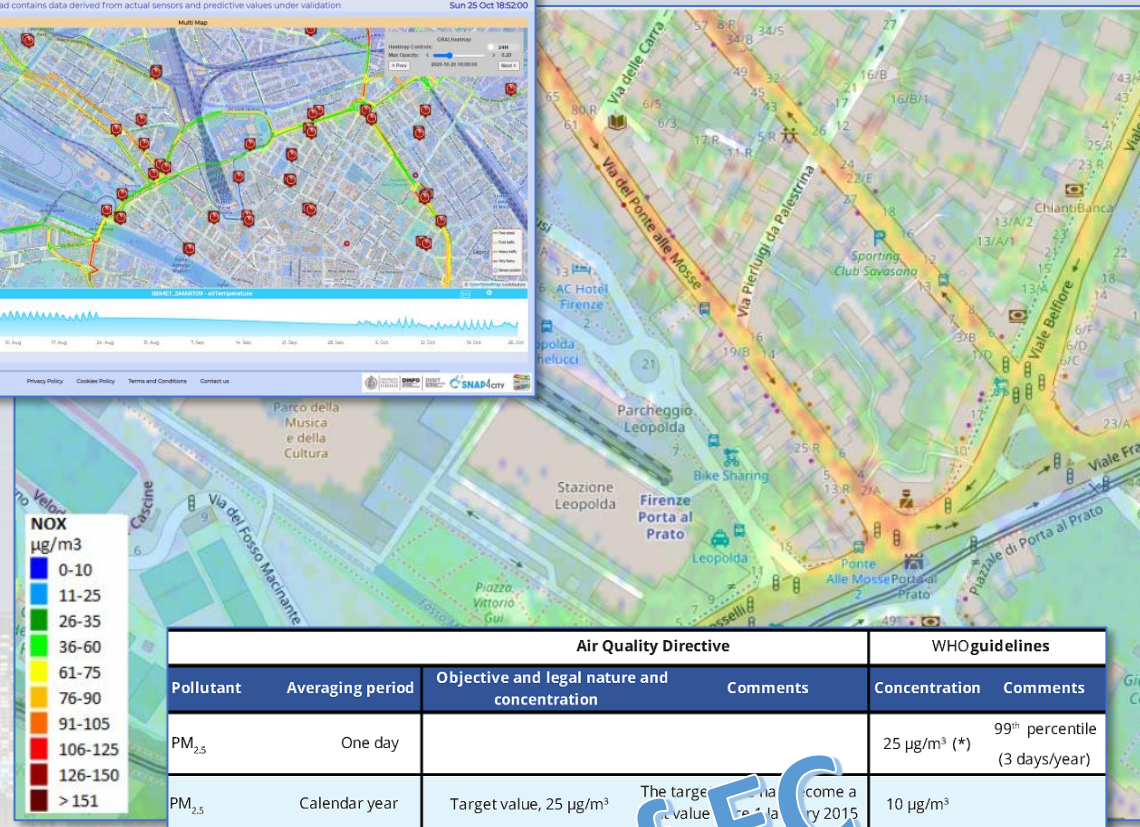
Environment and Quality of Life
Air Quality Predictions

Cities of: Firenze, Pisa, Livorno

reference

- **Multiple Domain Data**
  - Traffic Flow data, Pollutant: NOX, CO2, PM10, PM2.5, O3, ….
  - 3D City structure, weather, …
- **Multiple Decision Makers**
  - Pollutant Predictions: NOX, NO2, ..
  - City officers, energy industries
  - Dashboards, What-IF analysis
  - Traffic Flow Reconstruction
- **Historical and Real Time data**
  - Billions of Data
- **Services Exploited on:**
  - Dashboards, Mobile App
- **Since 2020**

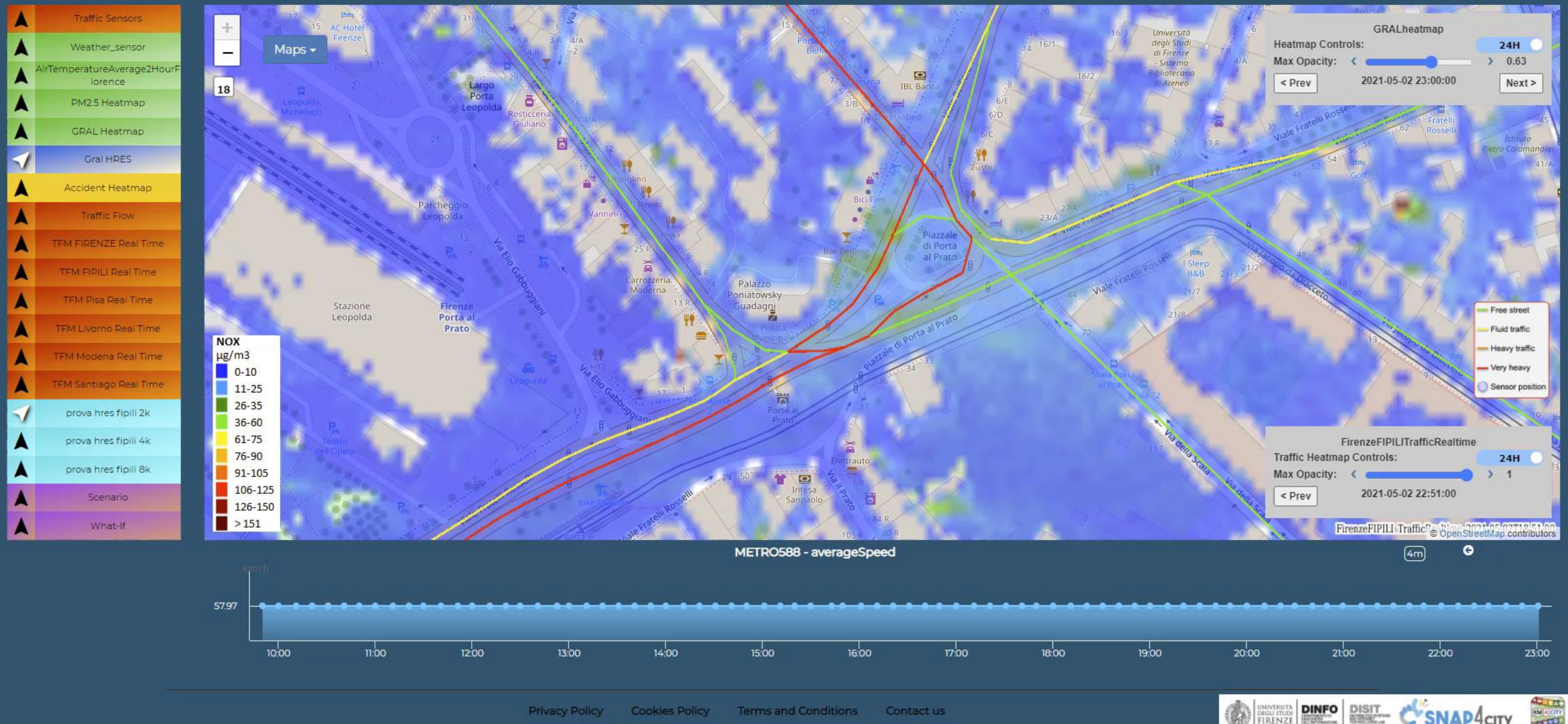




	Air Quality Directive			WHO guidelines	
Pollutant	Averaging period	Objective and legal nature and concentration	Comments	Concentration	Comments
$PM_{2.5}$	One day			25 µg/m³ (*)	99th percentile (3 days/year)
$PM_{2.5}$	Calendar year	Target value, 25 µg/m³	The targe… come a …value …ry 2015	10 µg/m³	
PM_{10}	One day	Limit …e, 50 µ…	…t to be e…ed on more …han 35 d…s per year.	50 µg/m³ (*)	99th percentile (3 days/year)
PM_{10}	Calend…	…va… 40 µg/m… (*)		20 µg/m³	
O_3	Maximum …ly 8-hour m…n	Target value, 120 µg/m³	Not to be exceeded on more than 25 days per year, averaged over three years	100 µg/m³	
NO_2	One hour	Limit value, 200 µg/m³ (*)	Not to be exceeded more than 18 times a calendar year	200 µg/m³ (*)	
NO_2	Calendar year	Limit value, 40 µg/m³		40 µg/m³	

KPI of EC

Traffic Flow Manager on multiple cities



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzEyNg==

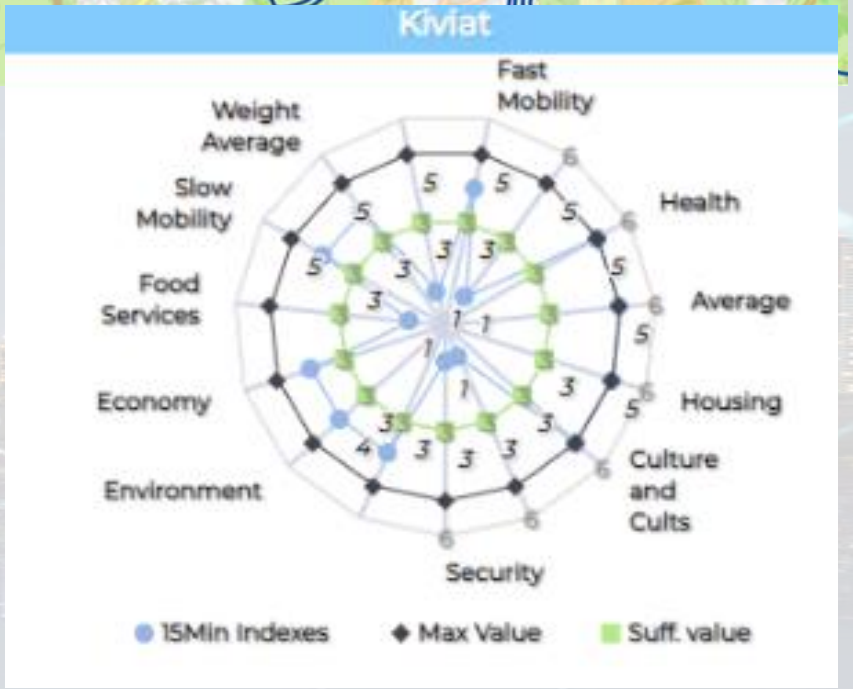
15MinCityIndex

What would support my neighborhood to become a 15-Minute City?

Using the Open Data:
We developed a data analytic tool based on municipal and national open data to assess services adequacy for people living in each 15 minutes areas of the city.

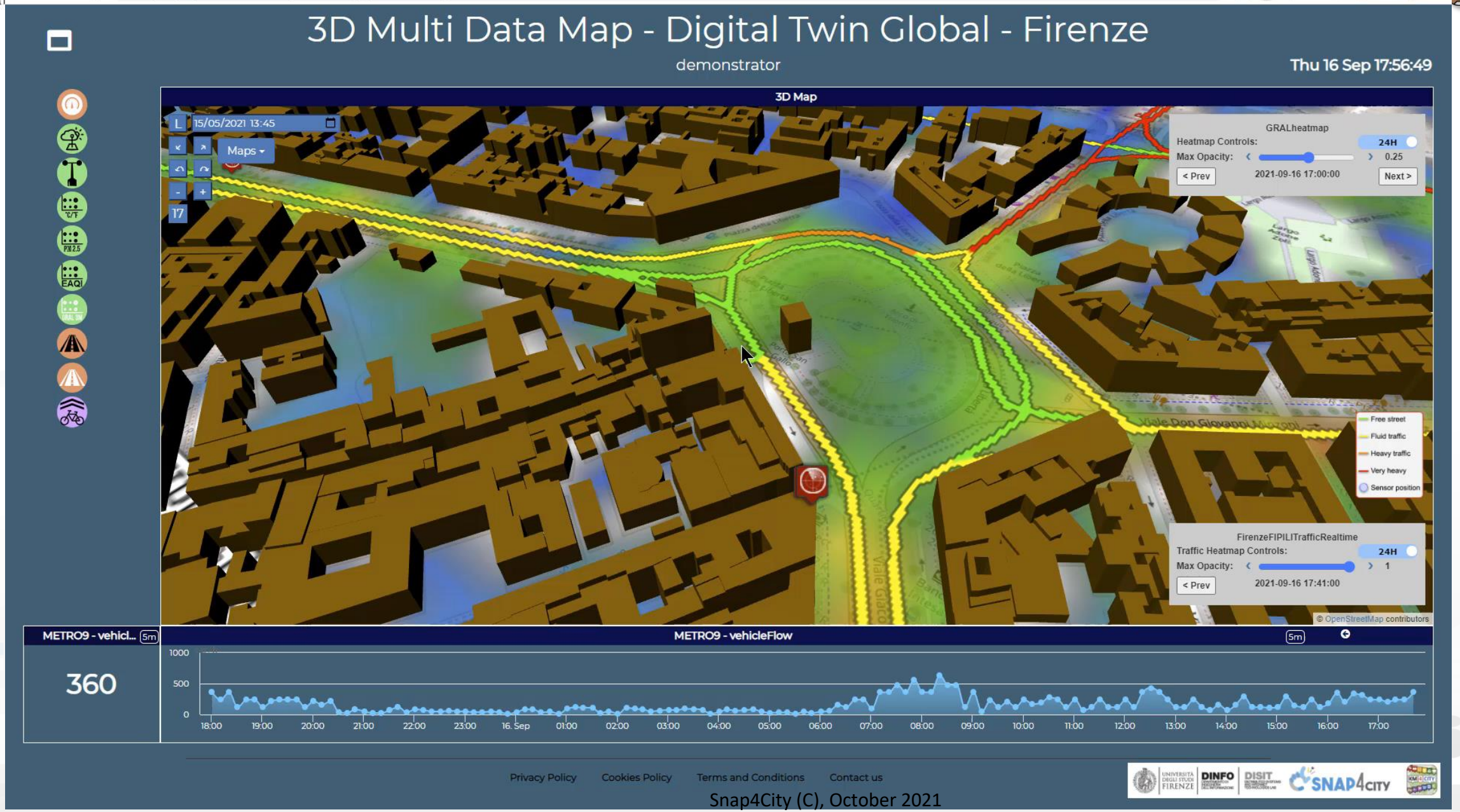
Good public transport services: bus, new tram line, train stations, cycle paths.

The tool supports the becoming of a 15-Minute city evaluating the service level in various domains.



Careggi/Rifredi is a relevant district in Florence because of hosting the main Florence/Tuscany hospitals Careggi and Meyer, but also university headquarters and many other workplaces.

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjkzOA==


3D Multi Data Map - Digital Twin Global - Firenze
demonstrator
Thu 16 Sep 17:56:49
3D Map
15/05/2021 13:45
Maps
GRALheatmap
Heatmap Controls:
24H
Max Opacity:
0.25
< Prev
2021-09-16 17:00:00
Next >
Free street
Fluid traffic
Heavy traffic
Very heavy
Sensor position
FirenzeFIPILITrafficRealtime
Traffic Heatmap Controls:
24H
Max Opacity:
1
< Prev
2021-09-16 17:41:00
© OpenStreetMap contributors
METRO9 - vehicl... 5m
360
METRO9 - vehicleFlow
5m
1000
500
0
18:00
19:00
20:00
21:00
22:00
23:00
16. Sep
01:00
02:00
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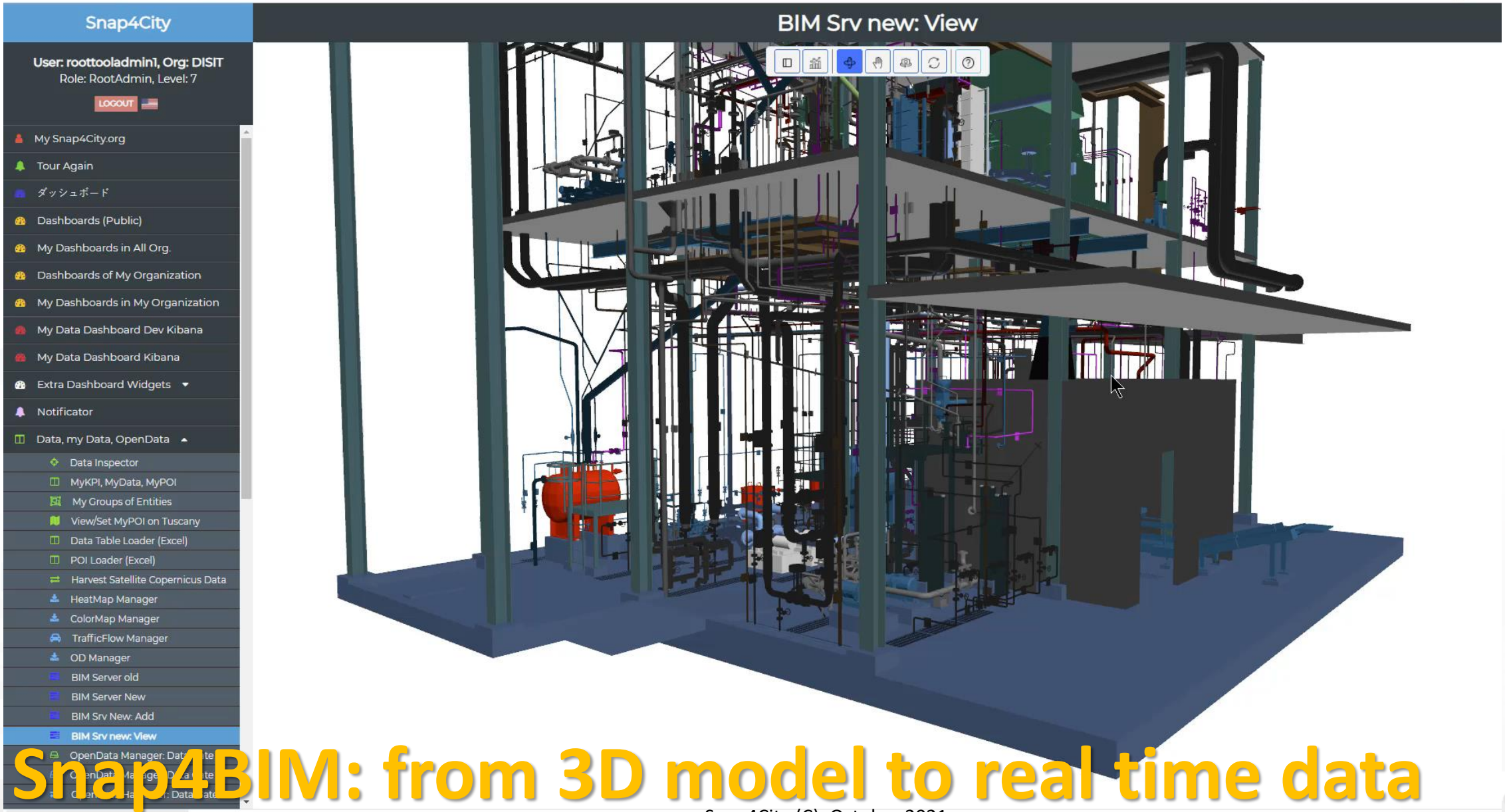
Privacy Policy
Cookies Policy
Terms and Conditions
Contact us



Snap4BIM: from 3D model to real time data

TOP

Development of Solutions

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
SNAP4CITY FOR BEGINNERS
DATA ANALYTICS, BUSINESS INTELLIGENCE, WHAT-IF AND
TWITTER VIGILANCE: SOCIAL MEDIA ANALYSIS
SNAP4CITY ARCHITECTURE
DECISION SUPPORT SYSTEM AND CITY RESILIENCE
HOW TO ADOPT SNAP4CITY, AND OUR ROADMAP
SNAP4CITY AND KM4CITY PROJECTS
SNAP4CITY THE VIEW OF THE ADMINISTRATORS

On Line Training Material (free of charge)

	1st part (*)	2nd part (*)	3rd part (*)	4th part (*)	5th part (*)	6th part (*)	7th part (*)
what	General	Dashboards	IOT App, IOT Network	Data Analytics	Data Ingestion processes	System and Deploy Install	Smart City API: Web & Mob. App
PDF							
Inter active							
Video1							
Video2							
Video3							
Video4				none		none	none
duration	2:55	3:16	3:41	2:00	2:48	2:35	1:47

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

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 s[illegible]. 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 commu[illegible] 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** !

Share Save ... Add to your favorites

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
- HOW TO: define privacy rules for personal data, produced by the end-users own device
- HOW TO: Develop Smart Applications, Snap4City development Life Cycle
- HOW TO: HLT vs Ingestion, and HLT vs Widgets
- HOW TO: Develop an IOT Application for Data Ingestion

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
Resource Manager
Development Tools
Management
Decision Support Systems
Deploy and Installation
Help and Contacts
Documentation and Articles
My Profile
Km4City portal
DISIT Lab portal

Username: paolo.disit

Search

Search

-Any-

Powered by www.km4city.org

FIWARE Node-RED

Organization Groups

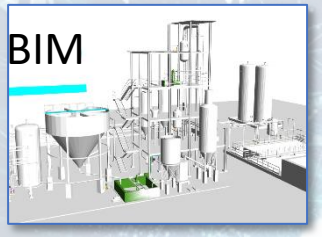
DISIT
- Developer
- Operativo

Updates on Tools

News from Snap4City & slides, Where to Meet Snap4City experts
updated
roottooladmin1

HOWTO: FIWARE Orion

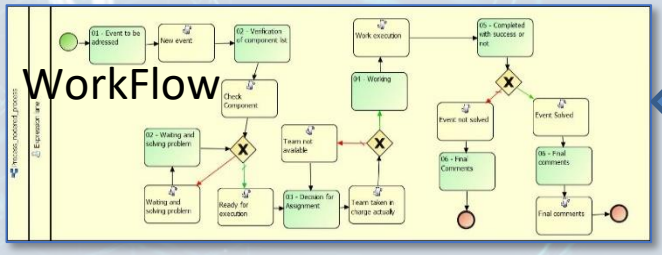
Snap4City: Architettura funzionale

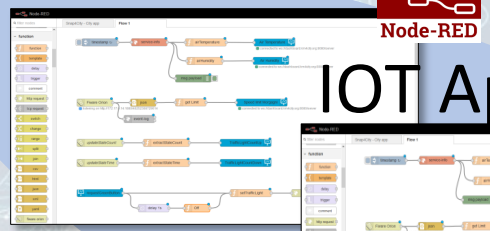


KPI, POI, MyKPI, …

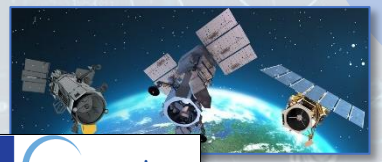
API, External Services

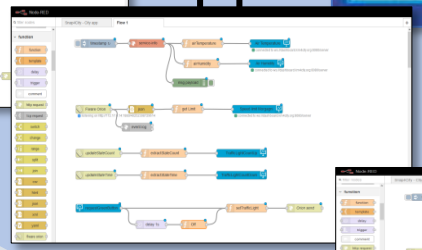
Web Scraping



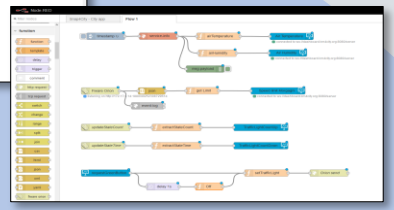


IOT Apps





Data Analytics,
Artificial Intelligence



IOT Brokers

IOT Broker

IOT Broker

FIWARE

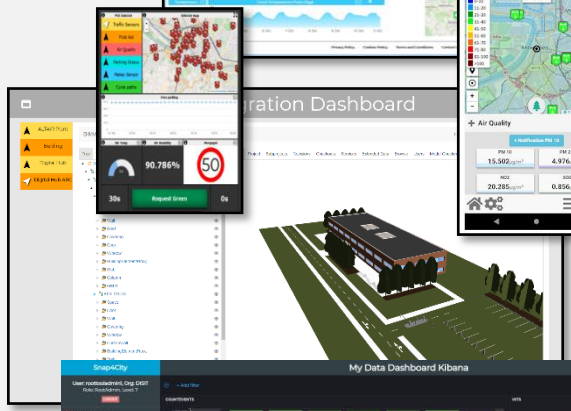
Big Data

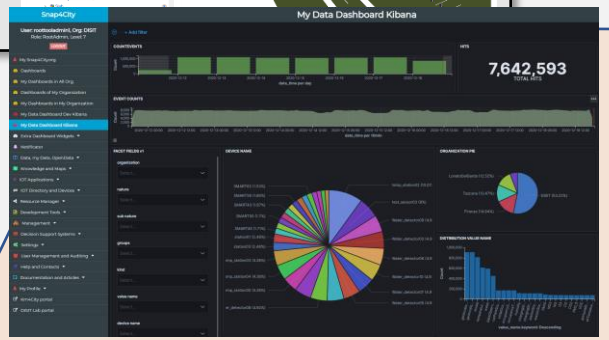
KB

LD, LOD

ckan

FI-WARE

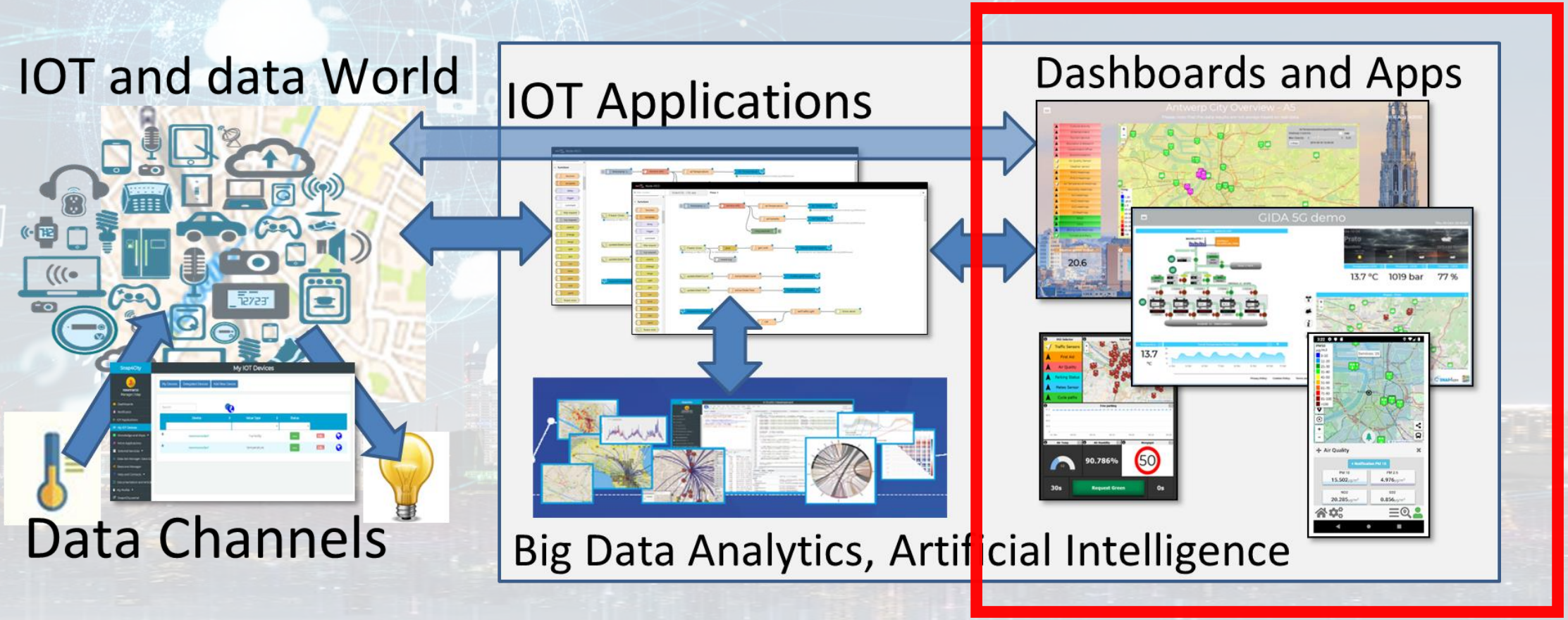




Dashboards and Apps

Challenge B

Sviluppo di un'idea progettuale senza implementare effettivamente la soluzione o fornire un mock-up, utilizzando gli strumenti e i dati della piattaforma Snap4City.
Sarà sufficiente la presentazione di una dashboard Demo.



Course 2021 https://www.snap4city.org/577

- ***1st part:*** *General Overview*
- ***2nd part:*** *Dashboards Creation and Management*
- ***3rd part:*** *IOT Applications development, IOT Devices, IOT Networks*
- ***4th part:*** *Data Analytics, in R Studio, in Python, how to Exploit and Manage Data Analytics in IOT Applications*
- ***5th part:*** *Data Ingestion, Data Warehouse, Data Gate, IOT Device Data ingestion, IOT App for Data Ingestion, Interoperability, etc.*
- ***6th part:*** *Snap4City Development, Extension, Administration, and Installation*
- ***7th part****: Smart city API (internal and external) Web and Mobile App development tool kit*

A number of the training sections include exercitations

Updated versions on: https://www.snap4city.org/577

See also courses in ITALIANO: https://www.snap4city.org/485

On Line Training Material (free of charge)

	1st part (*)	2nd part (*)	3rd part (*)	4th part (*)	5th part (*)	6th part (*)	7th part (*)
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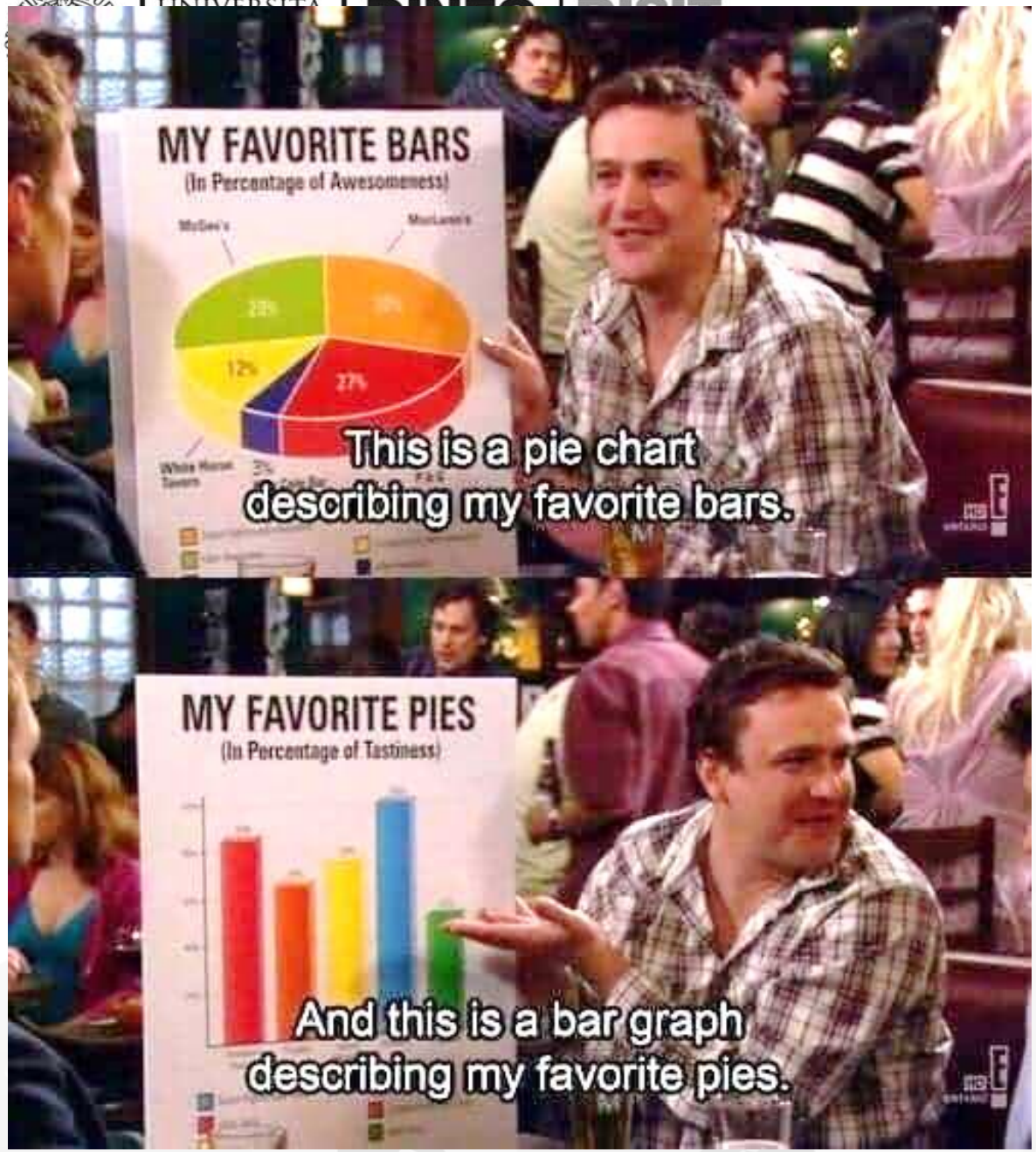
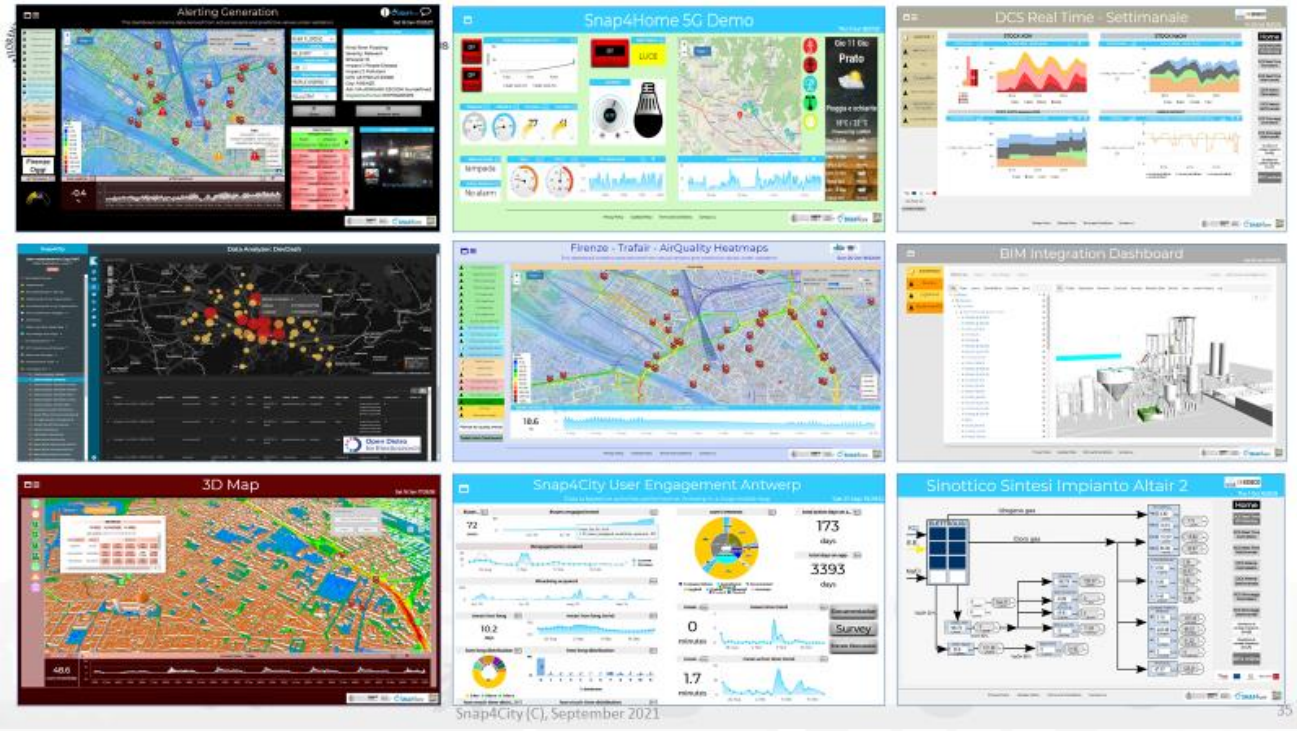
PDF							
Interactive							
Video1							
Video2							
Video3							
Video4				none		none	none
duration	2:55	3:16	3:41	2:00	2:48	2:35	1:47

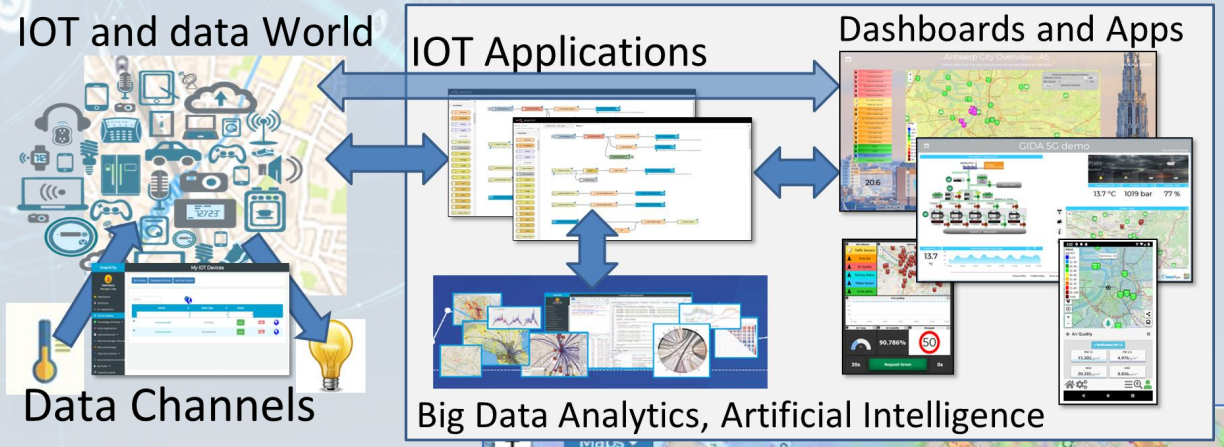

MY FAVORITE BARS
(In Percentage of Awesomeness)
This is a pie chart describing my favorite bars.
MY FAVORITE PIES
(In Percentage of Tastiness)
And this is a bar graph describing my favorite pies.

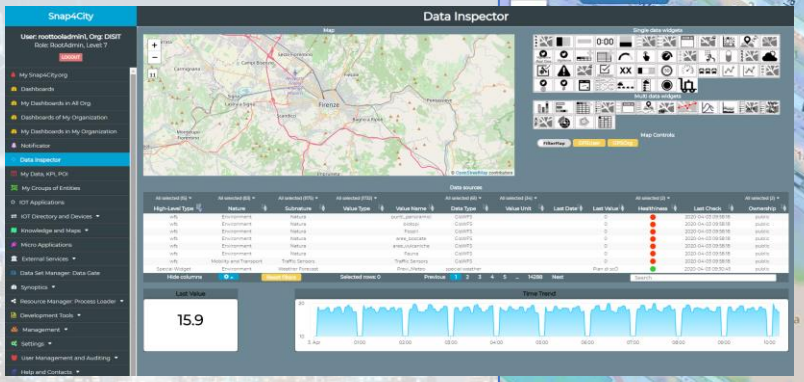

Alerting Generation
Snap4Home 5G Demo
DCS Real Time - Settimanale
Firenze - Trafair - AirQuality Heatmaps
BIM Integration Dashboard
3D Map
Snap4City User Engagement Antwerp
Sinottico Sintesi Impianto Altair 2
Snap4City (C), September 2021

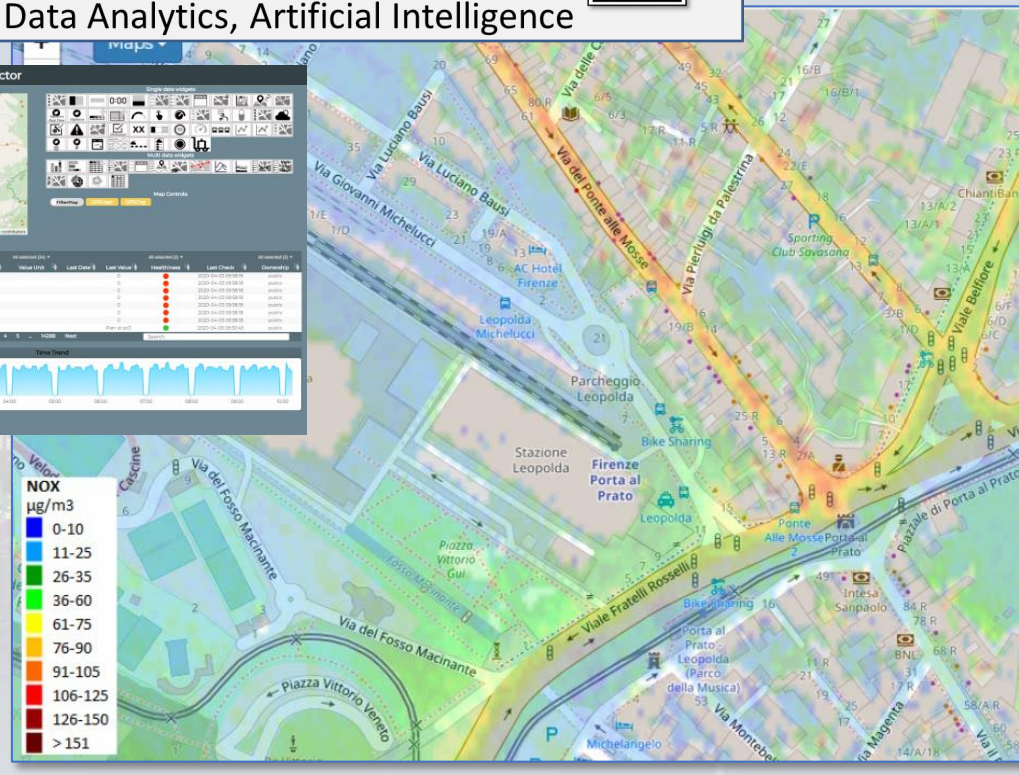
Fast to realize reliable & secure Solutions

- **Via Snap4City tools**
  - **Dashboard Wizard**
  - **Dashboard Builder**
  - **Data/Visual Analytic**

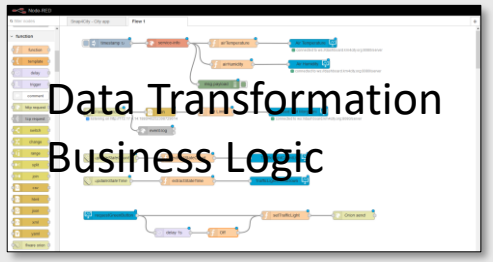
- **Smart Solutions results to be**
  - **Real time data drive**
  - **Secure end-to-end**
  - **GDPR compliant**
  - **Reliable, interoperable**
  - **Auditable, marketable**







Dashboard Builder: Development



Data Transformation
Business Logic

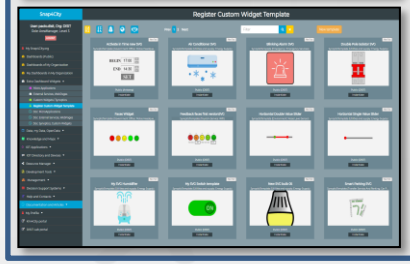
IOT Applications

Knowledge and Storage
Data from the Field and
City + MyKPI ++

Widget Collection

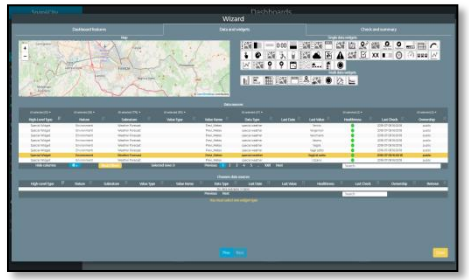
Micro
Applicat
ions

External
Services

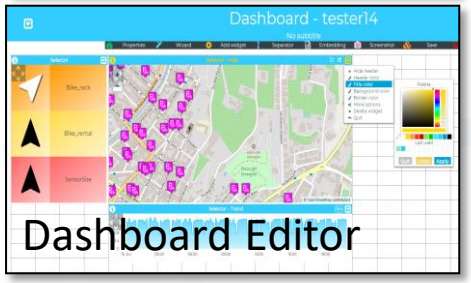


Custom
Widgets/
Synoptics

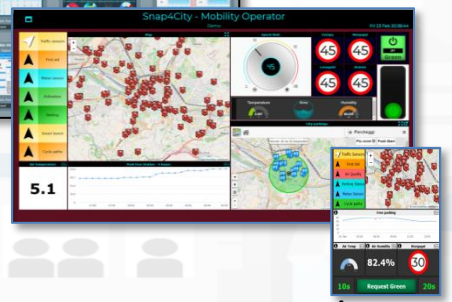
Dashboard Wizard



Create, save, load,
delegate, grant access,
change ownership



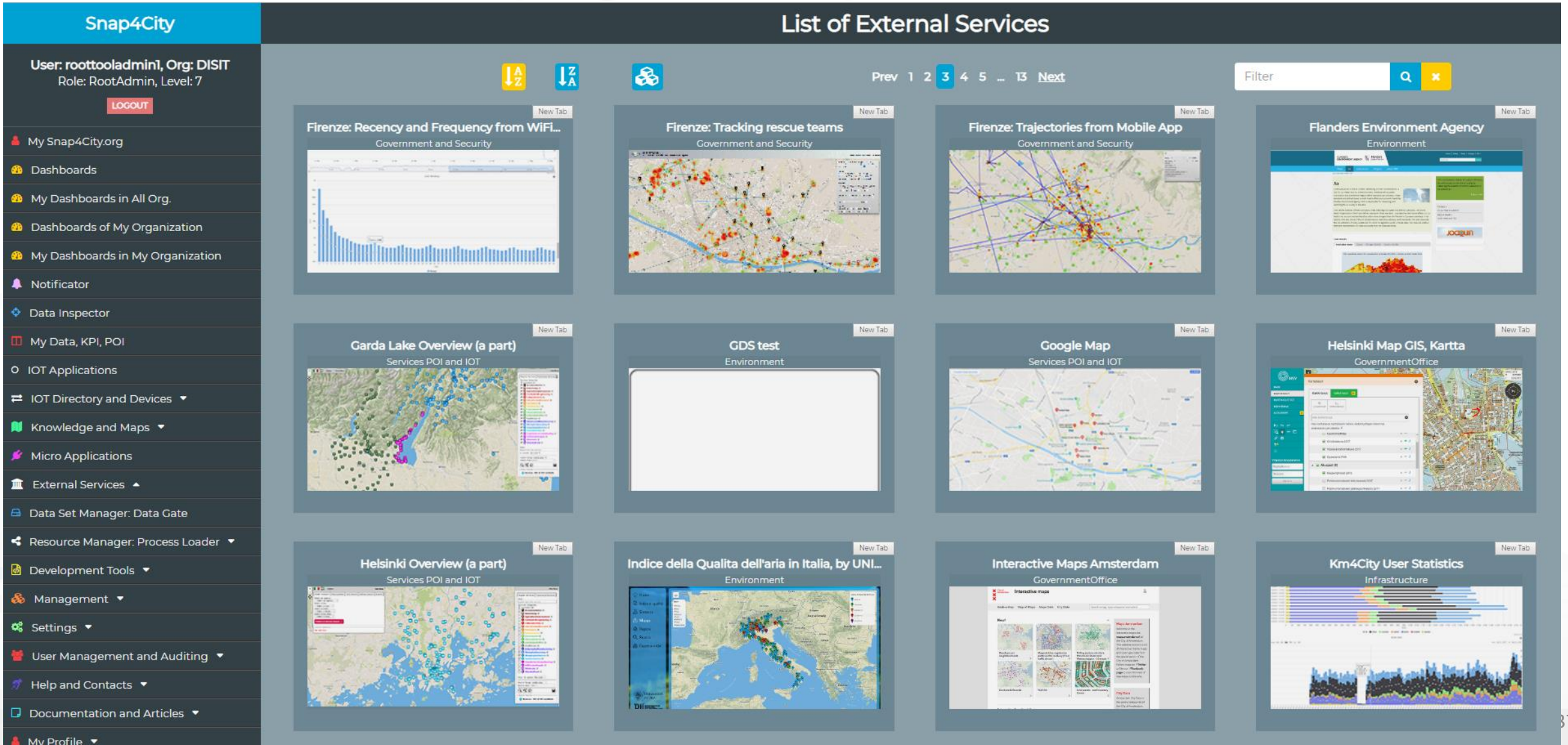
Dashboard Editor



Public
Dashboard
Collection

My Own Dash/App

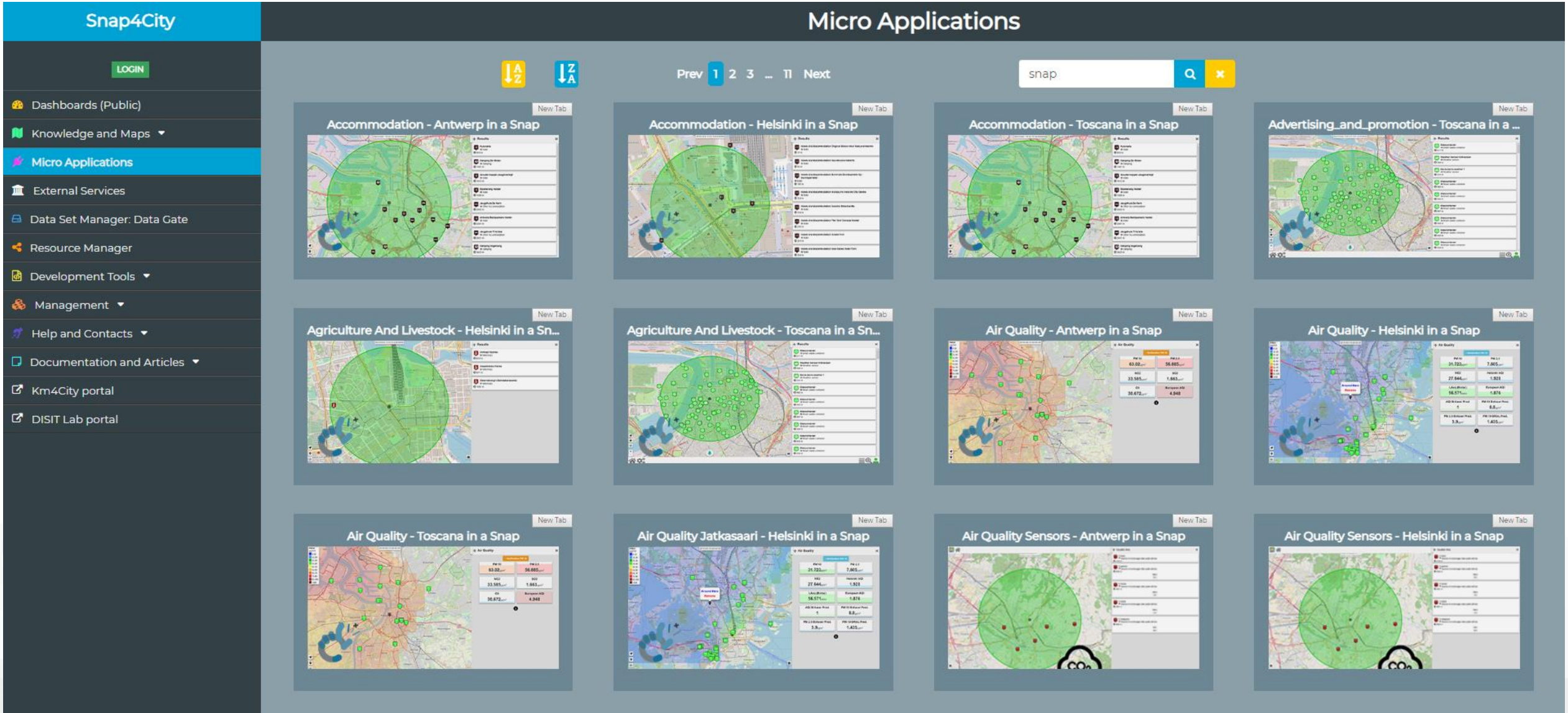
External Services (registered)



UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

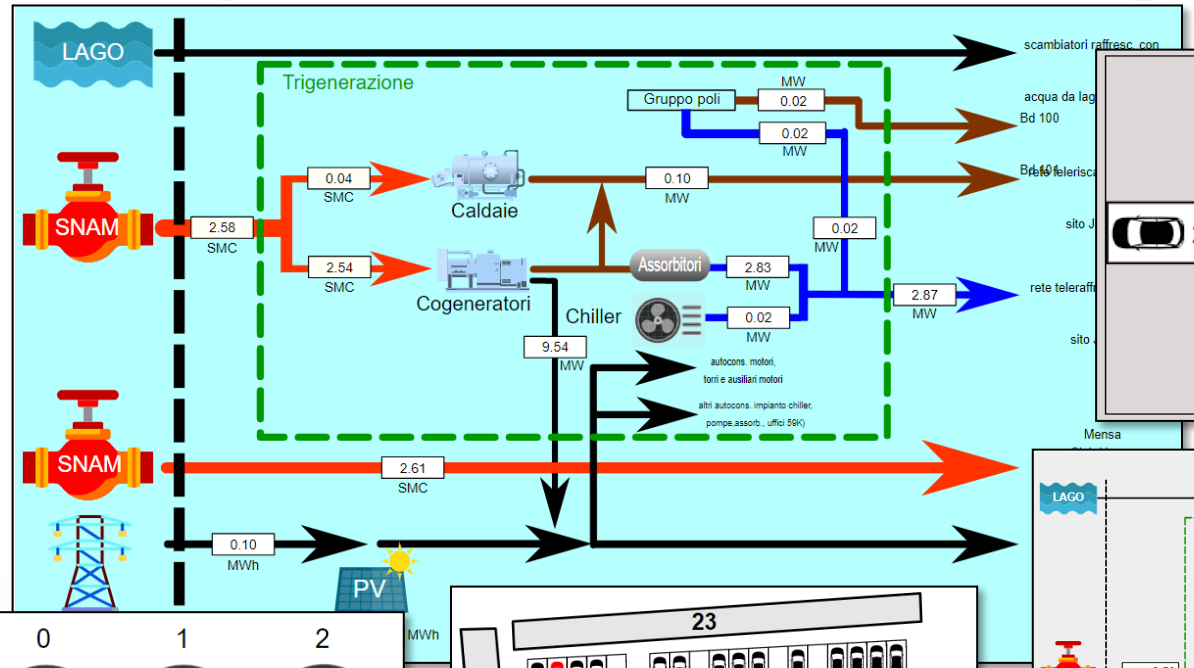
SNAP4CITY | KM4CITY

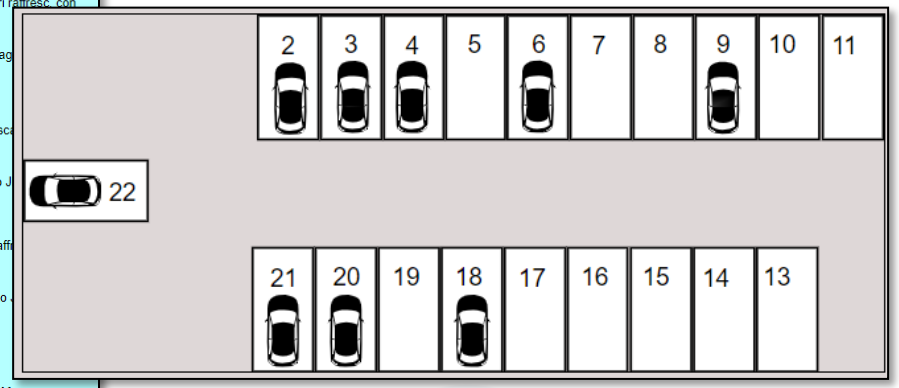
MicroApplications

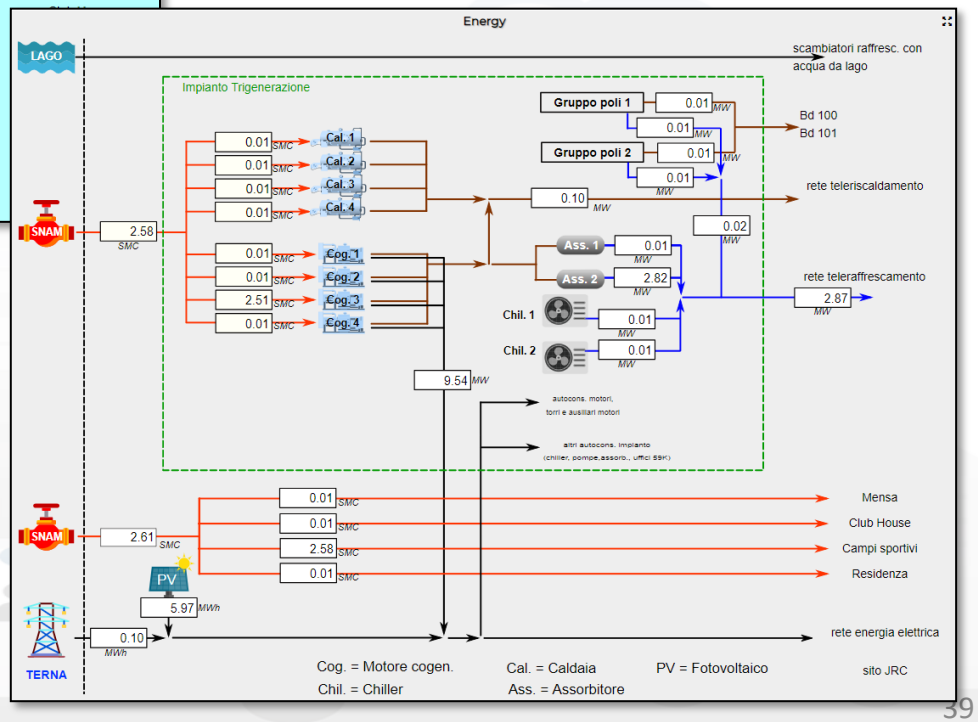


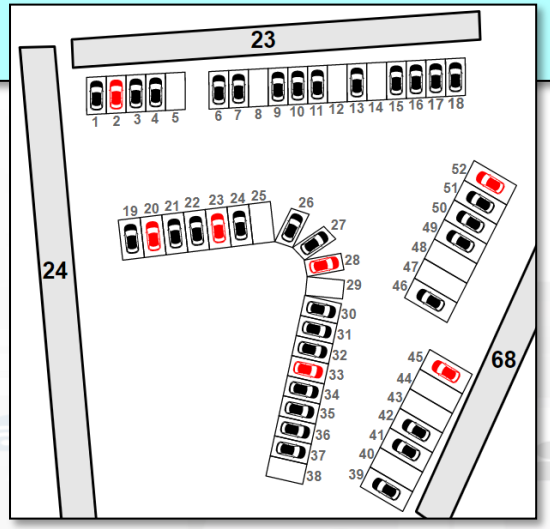
Special Custom Widgets

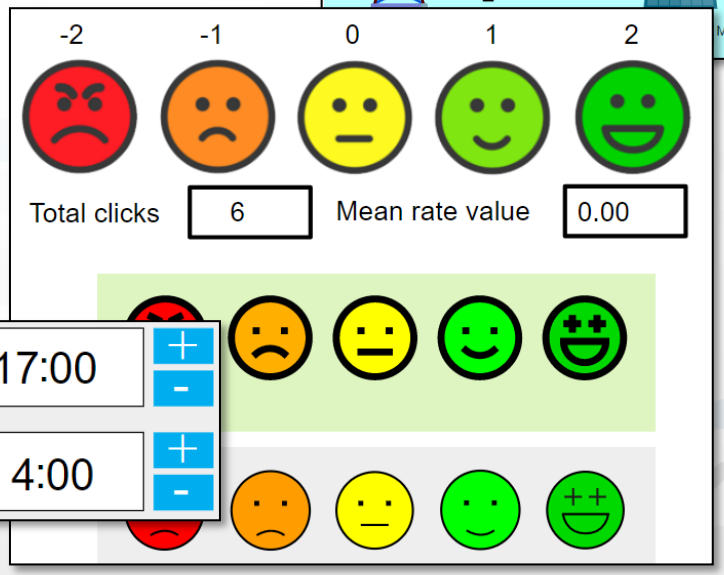
- Smart parking
- Smart Energy
- Smart Light
- Smart ….
- Energy View
- Custom Controls

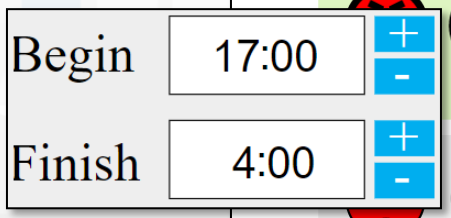




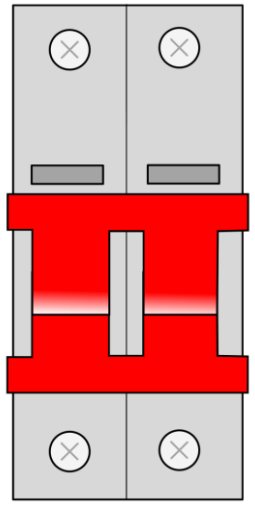




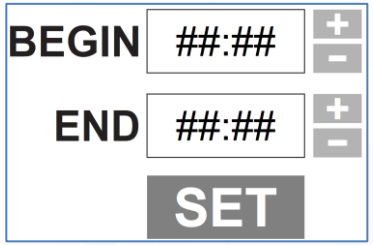


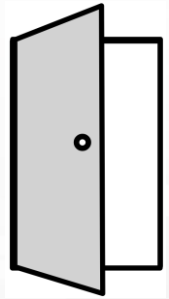


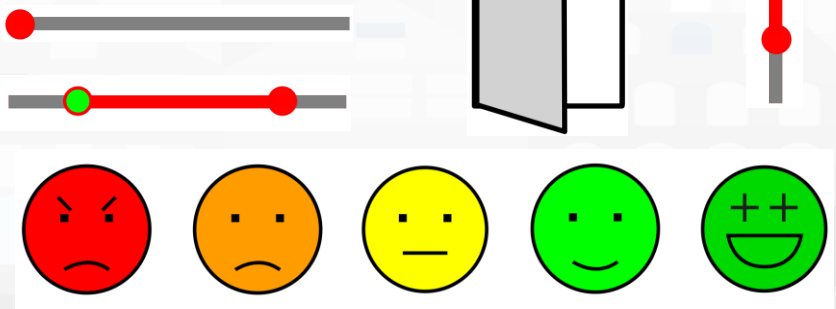
Other examples



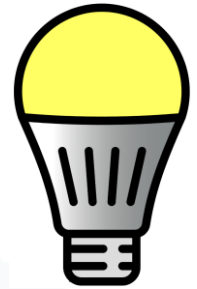
- **Virtual Actuators (sensor-actuator)**
  - From: Dashboard
  - To: IOT App, MyKPI, other Synoptics

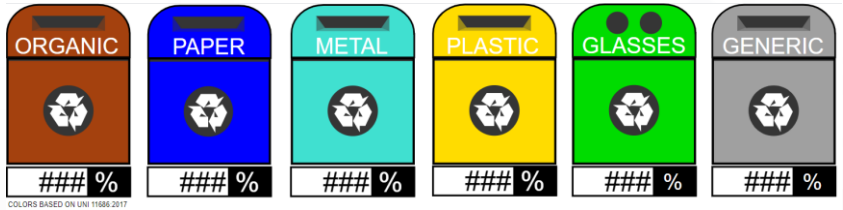


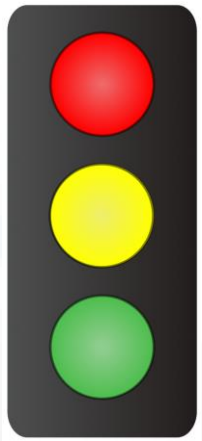


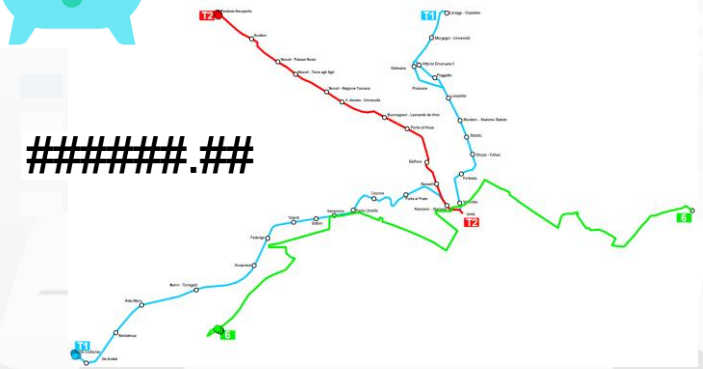


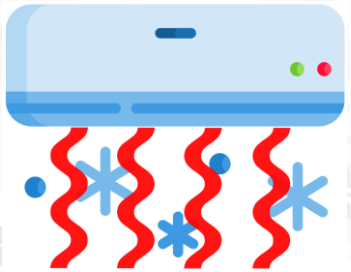
- **Virtual Sensors**
  - From: MyKPI, Sensors, IOT App, other Synoptics
  - To: Dashboards











How the Dashboards exchange data

Snap4City BigData Storage and KB

IOT Broker Orion Quantum Leap

ServiceMap Super ServiceMap

- Req. ServiceURI

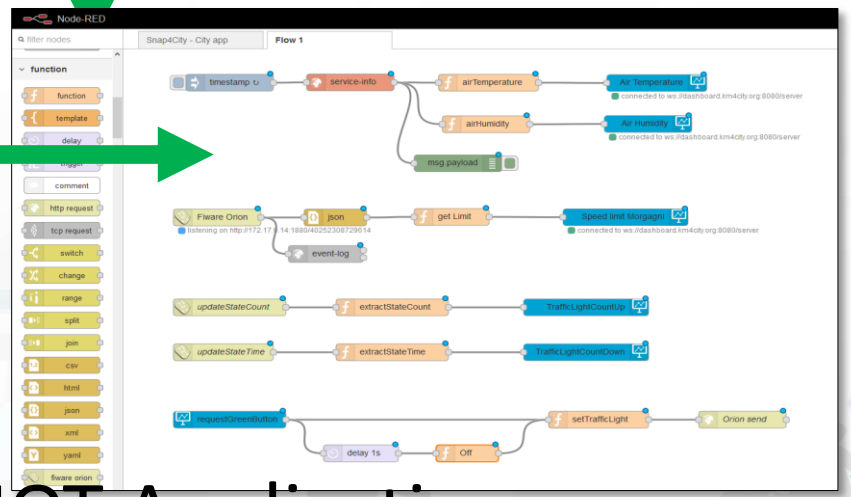
Metric, KPI

MyKPI, MyPOI, …

- Req. KPI, Metric ID
- Req. MyKPI ID

API, External Services, MicroApp

- Traffic Flow, MAPS, Heatmaps
- GIS, HTTPs URLs

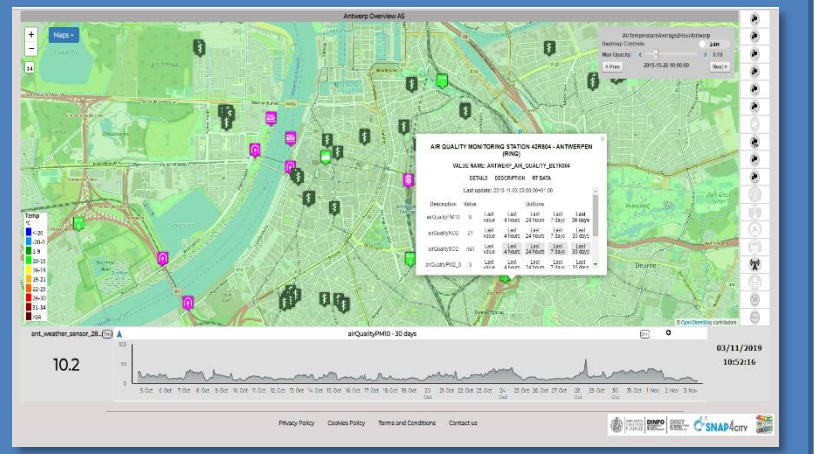


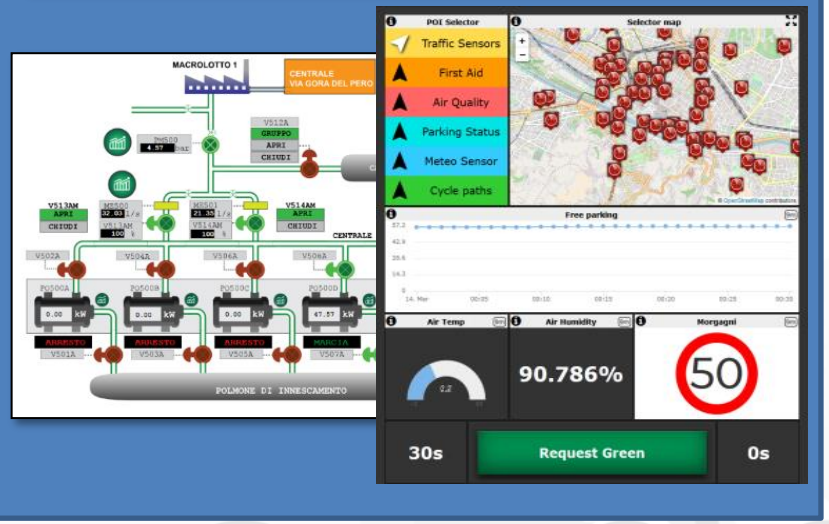
IOT Application

- ServiceURI (ID)
- MyKPI, Metric (ID)
- Dynamic Data, computed into IOT Application

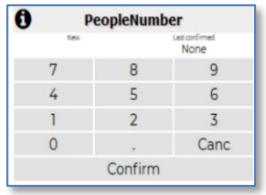
- Rx. Dynamic Data
- Event Driven Synoptics
- Actions, Show

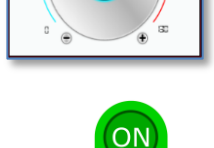
Dashboards

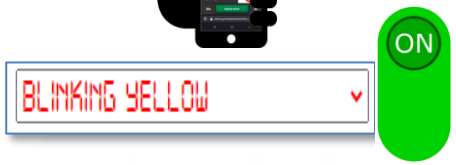


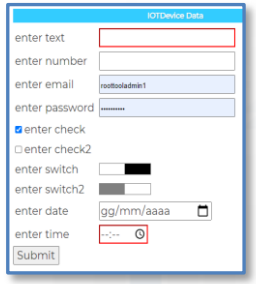


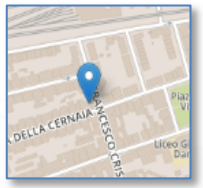
Business Logic on Dashboards

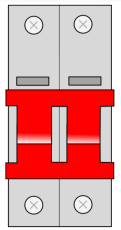


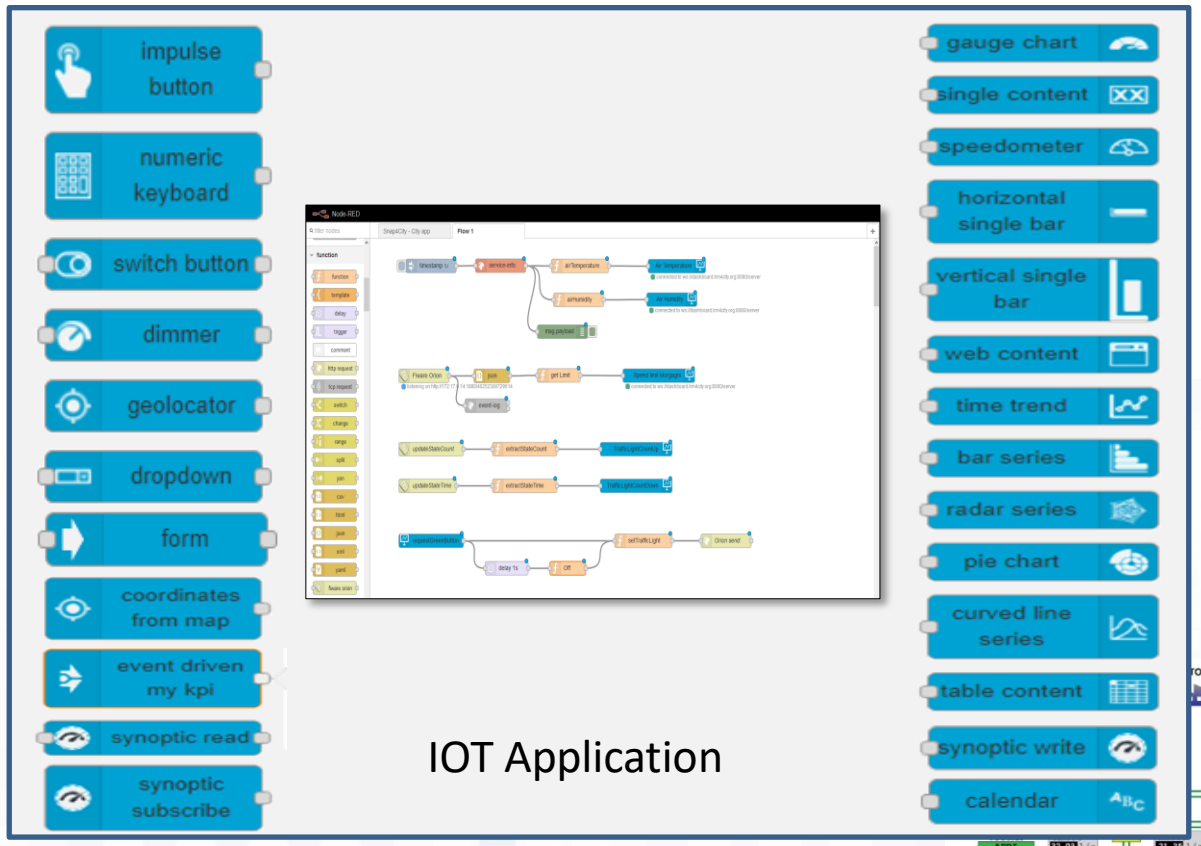










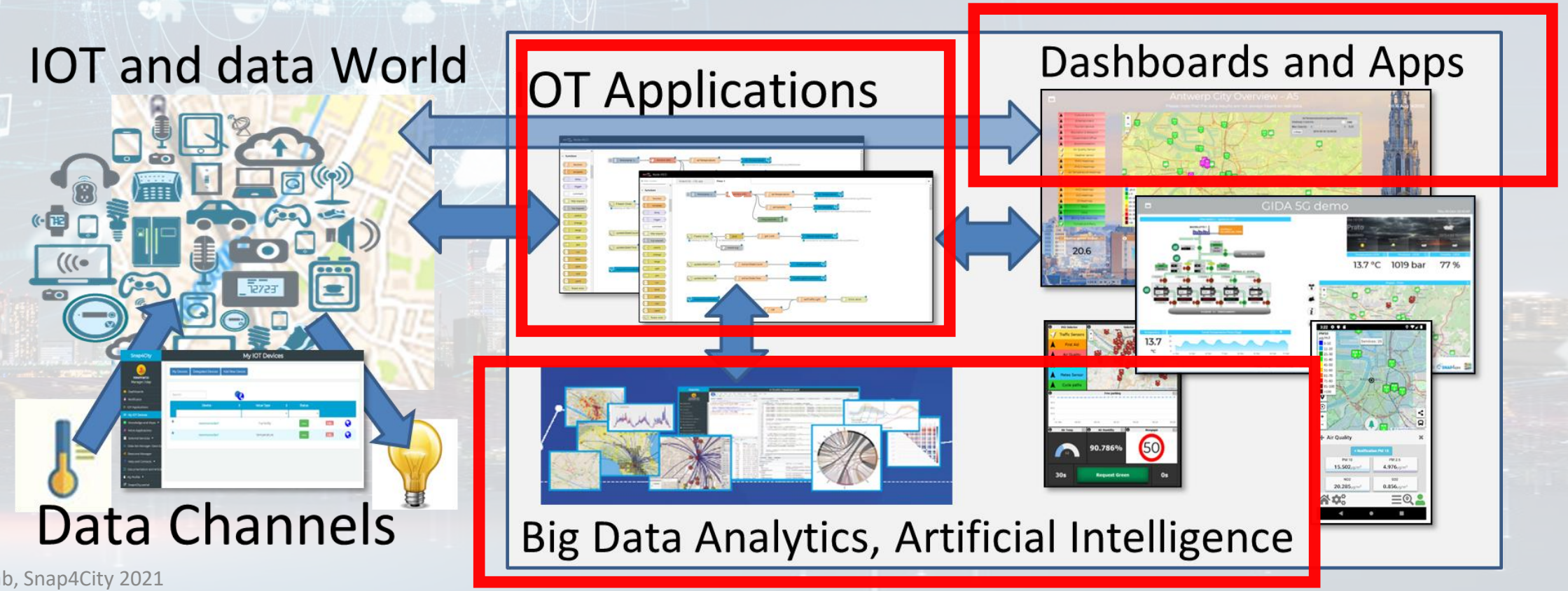


IOT Application

Challenge A

Richiede l'utilizzo della tecnologia Snap4City per lo sviluppo di soluzioni di mobilità urbana ITS. I partecipanti potranno utilizzare:

- una IOT App con più flussi/processi;
- uno o più dashboard;
- al massimo un processo di analisi dei dati in Python o Rstudio, da eseguire in automatico da IoT App, ma più funzioni, e.g.: training off line, ed execution on line…



Course 2021 https://www.snap4city.org/577

- ***1st part:*** *General Overview*
- ***2nd part:*** *Dashboards Creation and Management*
- ***3rd part:*** *IOT Applications development, IOT Devices, IOT Networks*
- ***4th part: Data Analytics****, in R Studio, in Python, how to Exploit and Manage Data Analytics in IOT Applications*
- ***5th part:*** *Data Ingestion, Data Warehouse, Data Gate, IOT Device Data ingestion, IOT App for Data Ingestion, Interoperability, etc.*
- ***6th part:*** *Snap4City Development, Extension, Administration, and Installation*
- ***7th part****: Smart city API (internal and external) Web and Mobile App development tool kit*

A number of the training sections include exercitations

Updated versions on: https://www.snap4city.org/577

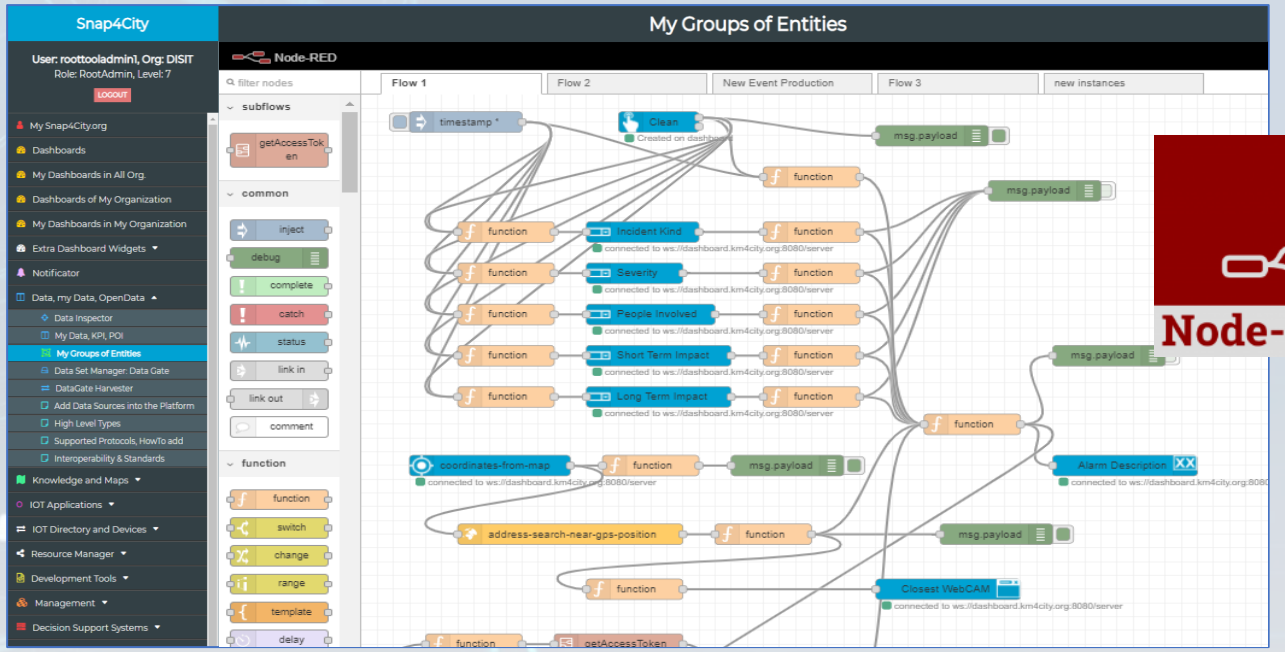
See also courses in ITALIANO: https://www.snap4city.org/485

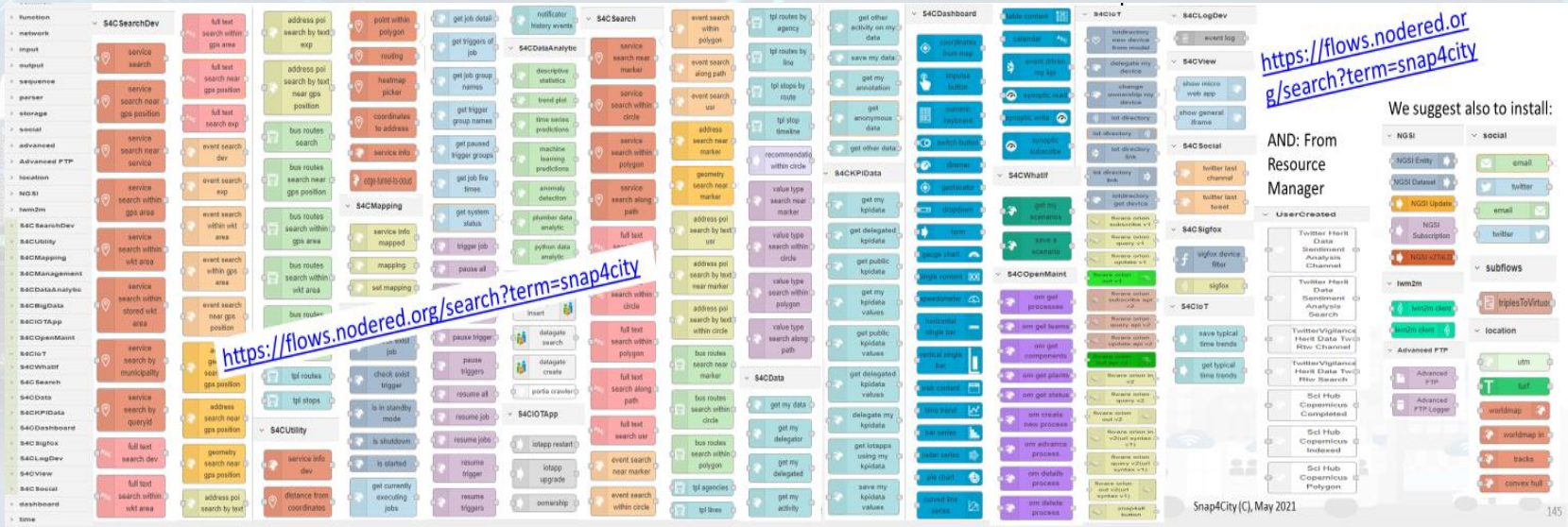
On Line Training Material (free of charge)

	1st part (*)	2nd part (*)	3rd part (*)	4th part (*)	5th part (*)	6th part (*)	7th part (*)
what	General	Dashboards	IOT App, IOT Network	Data Analytics	Data Ingestion processes	System and Deploy Install	Smart City API: Web & Mob. App
PDF							
Inter active							
Video1							
Video2							
Video3							
Video4				none		none	none
duration	2:55	3:16	3:41	2:00	2:48	2:35	1:47

Ingestion, aggreg. → exploitation

- **IoT App Visual Programming, no coding**
  - **Data transformation**
  - **Integration**
  - **Scripting Data Analytics**
  - **Data ingestion**
  - **Business logic**
- **MicroServices** data driven develop via visual language Node-RED





Standards and Interoperability (2021)

Compliant with: AMQP, COAP, MQTT, OneM2M, HTTP, HTTPS, TLS, Rest Call, SMTP, TCP, UDP, NGSI, LoRa, LoRaWan, TheThingsNetwork, SigFOX, DATEX II, SOAP, WSDL, Twitter, FaceBook, Telegram, SMS, OLAP, MySQL, Mongo, HBASE, SOLR, SPARQL, EMAIL, FTP, FTPS, WebSocket, WebSocket Secure, ModBUS, OPC/OPC-UA, GML, RS485, RS232, WFS, WMS, ODBC, JDBC, Elastic Search, Phoenix, XML, JSON, CSV, GeoTIFF, OWL, WKT, KML, SHP, db, GeoJSON, Enfuser FMI, Android, Raspberry Pi, Local File System, ESP32, Libelium, IBIMET/IBE, OBD2, SVG, XLS, XLSX, TXT, HTML, CSS, KNX, Enocean, Zigbee, DALI, ISEMC, Alexa, Sonoff, HUE Philips, Tplink, BACnet, TALQ, Copernicus, Protocol Buffer, IFC, XPDL, etc.

https://www.snap4city.org/65

https://www.snap4city.org/369

Measuring any kind of sensors values

Controlling Energy Power

Measuring
Energy Consumption

Any kind of notification channel

IOT Edge:
Node-RED
+
Snap4City

Local Control

SCADA

DCS

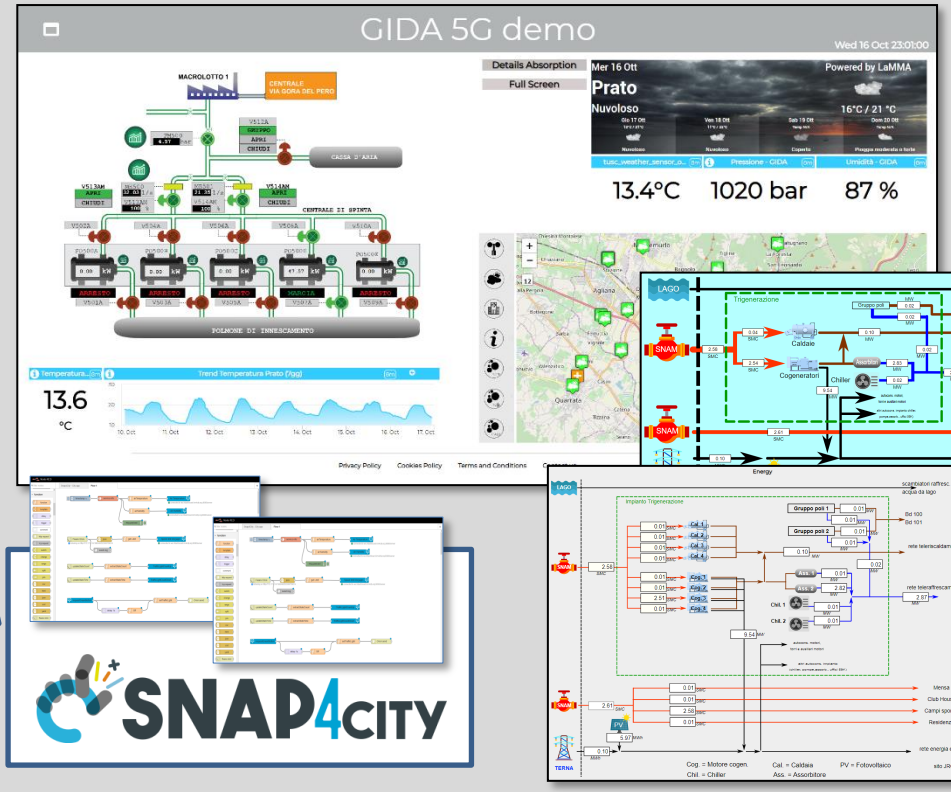
PLC

ODBC

Administrative Servers

Alexa: Voice Commands

Contextual (smart city/home) data, Data Analytics
Historical Data, Remote Control, Mobile App



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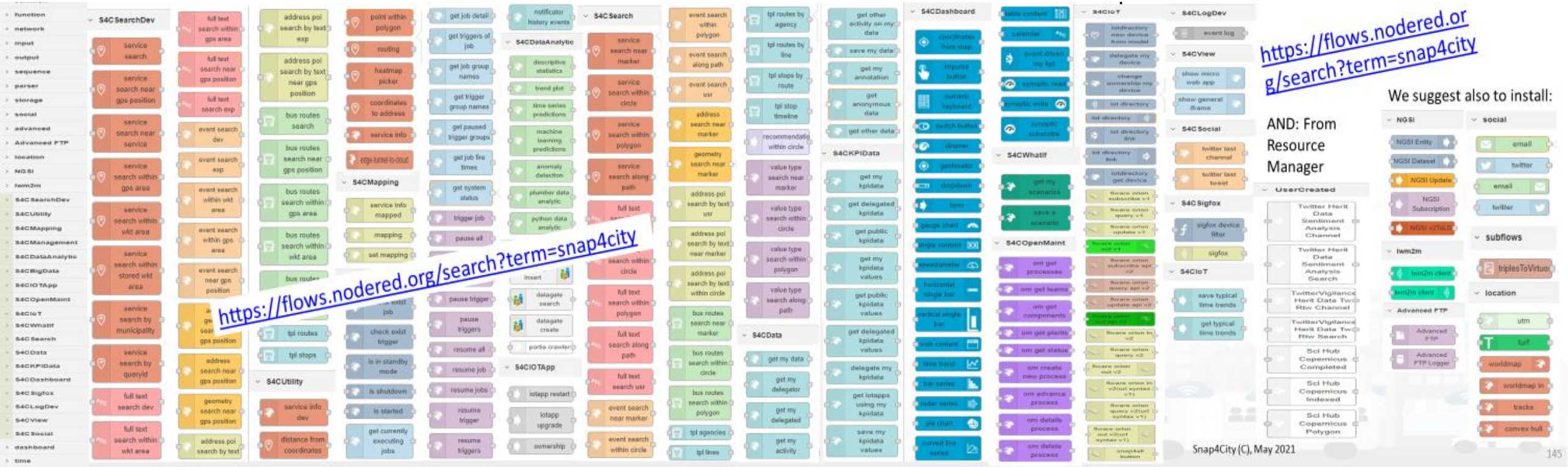
SNAP4CITY KM4CITY

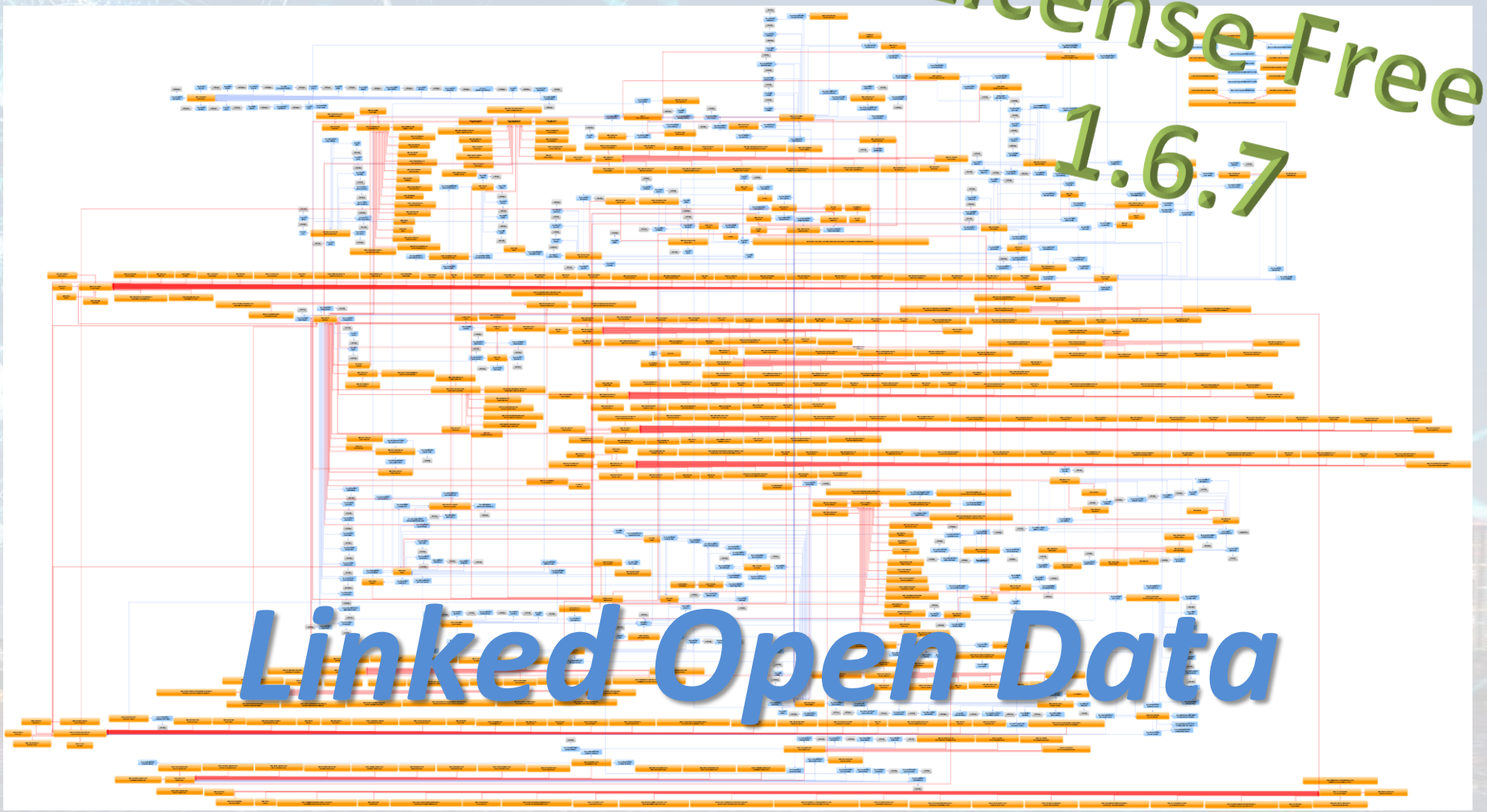
Snap4City Libraries of MicroServices on Node-RED

Node-RED



Expert System semantic queries

- **via**:
- **Smart City API** for Apps and third party
- **MicroServices** data driven develop via visual language Node-RED



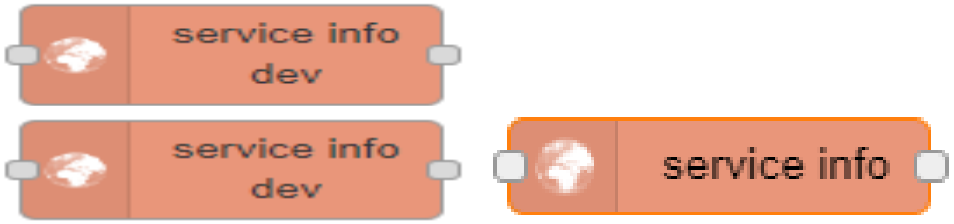
https://www.snap4city.org/19

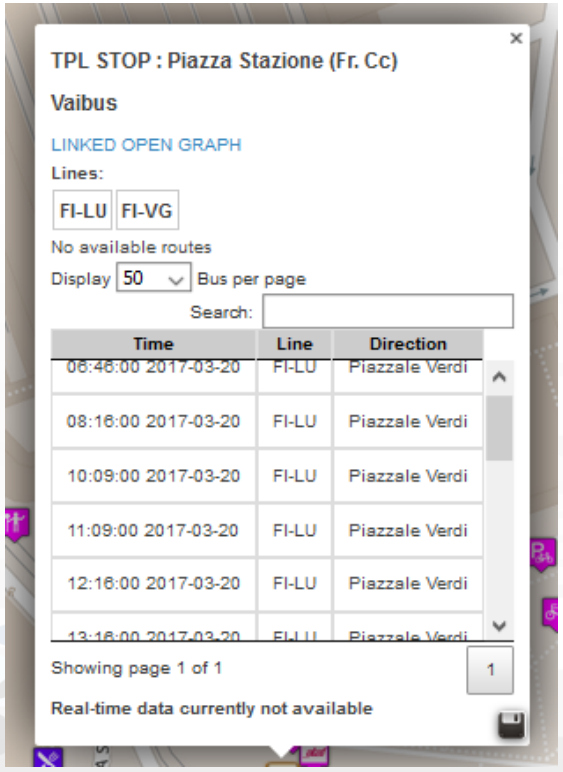
S4CSearch

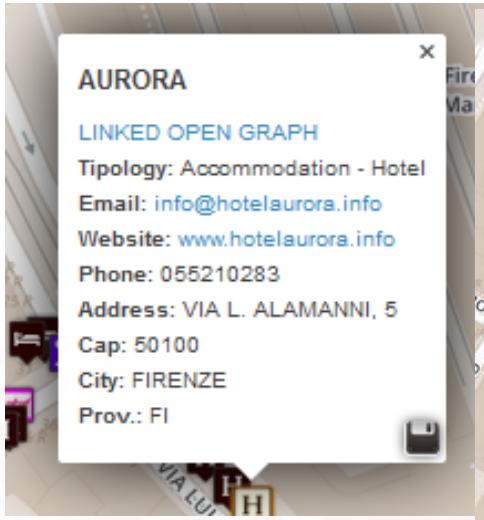
Node-RED

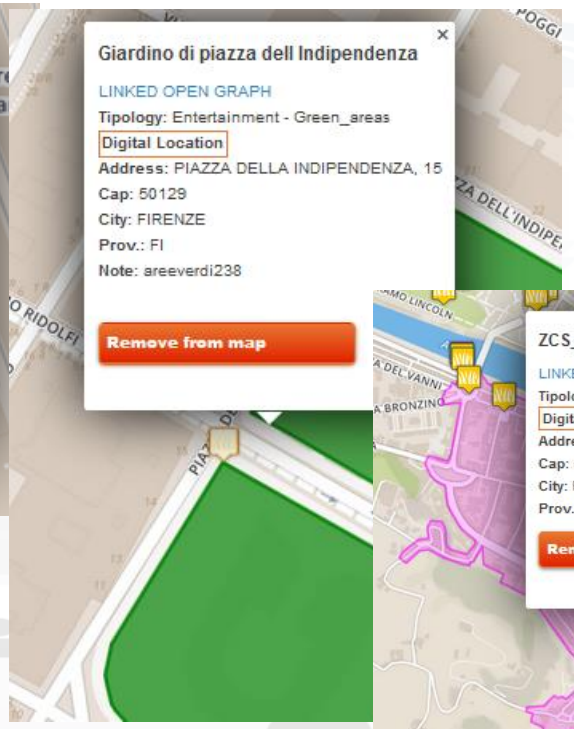
S4CUtility

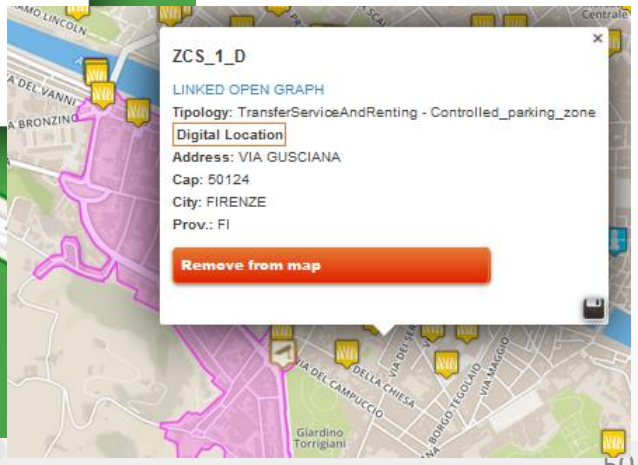
- ANY kind of sensors
- **To Get DATA of a Service / POI /sensor**
  - Historical and real time
  - Real Time



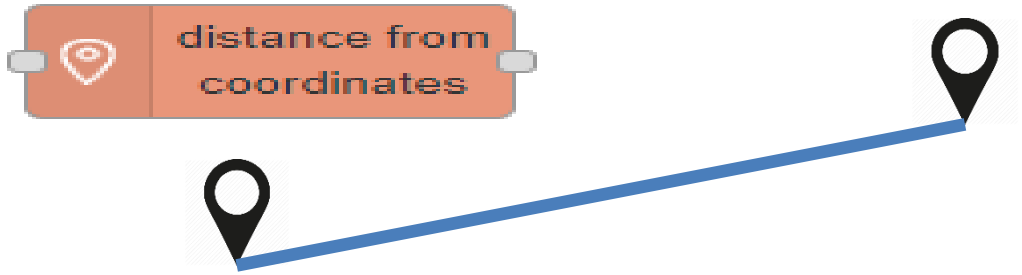




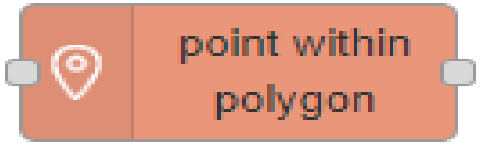




- **Distance from GPS point**



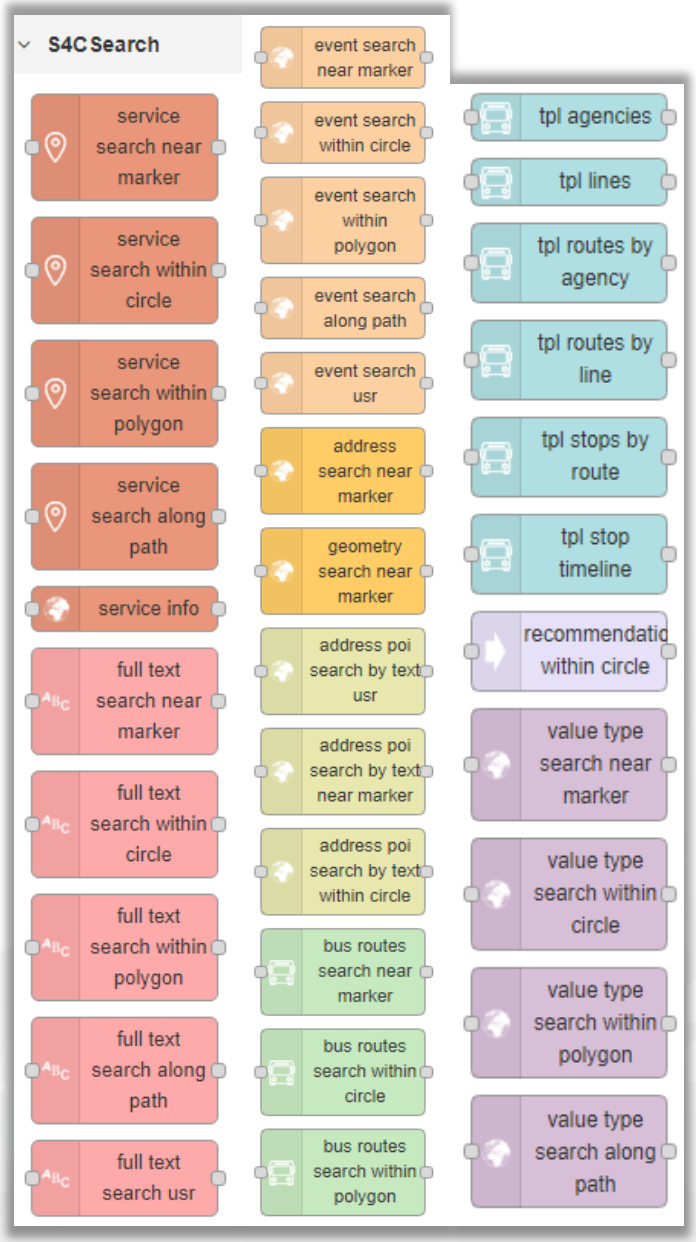
- **Point is in Polygon ?**
  - **Polyline as WKT**



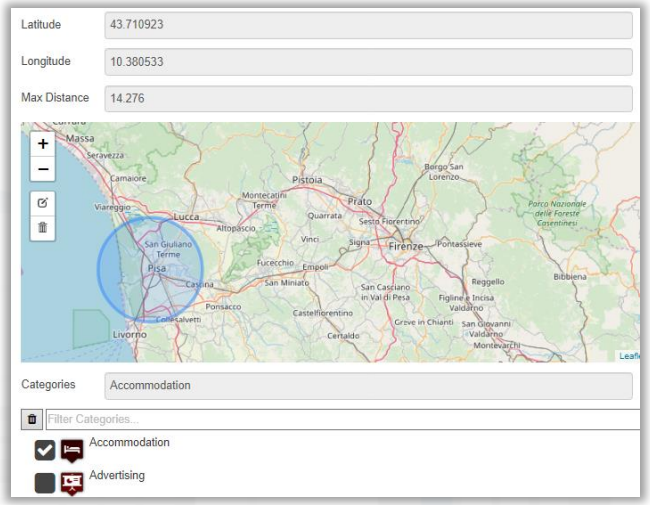
S4CSearch

Smart City Entities Search

Simple and Fast



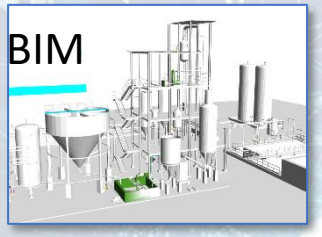
- **For example to search for:**
  - POIs:
    - near a GPS position, from text, along a path, in an area, etc..
  - Public Transport information / data
  - Suggestions
  - Public Transport Means Routes/Paths
  - Events in the area
  - Value Type (kind of data)
  - Etc.
- **To Get DATA of a Service / POI /sensor**
  - Real Time
  - ANY kind of senso



Which services ?

- **Mobility and transport:**
  - Data of: Parking, TPL, traffic, etc.
  - Services: routing, picking, geo reverse, etc..
  - Etc.
- **what**
  - **Search** entities with historical and real time data
  - **Transform** data into other data
  - **Save** data into temporary local data of process, IoT Devices, My KPI depending on their usage on front end.
  - **Connect** data to dashboard: event driven applications
  - **Communicate** with outside In/Out, receive / send, read / write

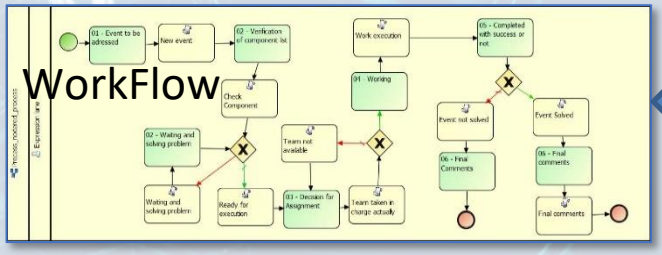
Snap4City: Architettura funzionale

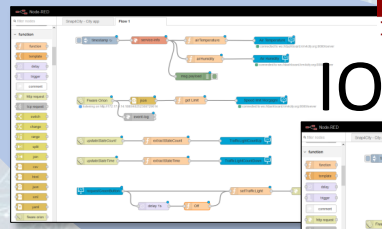


KPI, POI, MyKPI, …

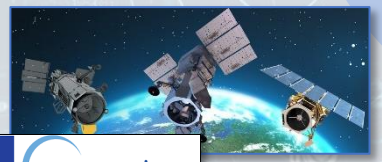
API, External Services

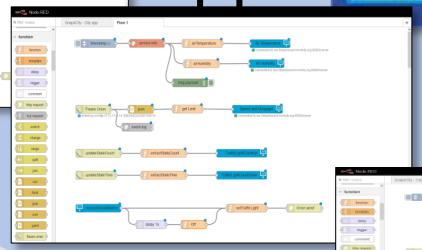
Web Scraping

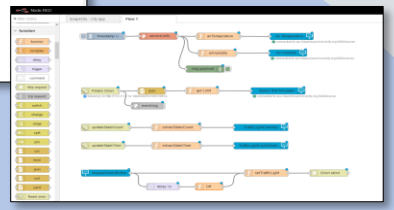




IOT Apps







Data Analytics,
Artificial Intelligence

IOT Brokers

IOT Broker

IOT Broker

FIWARE

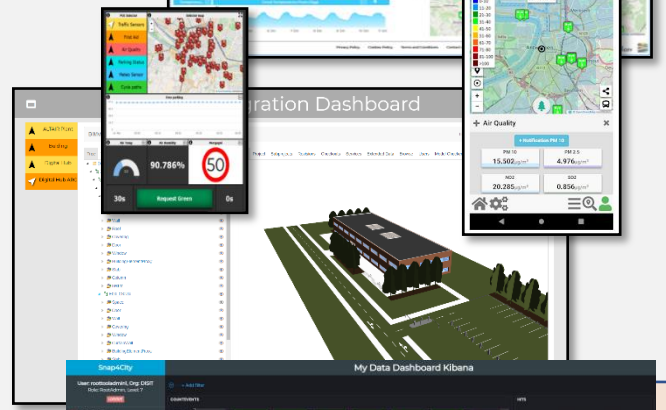
Big Data

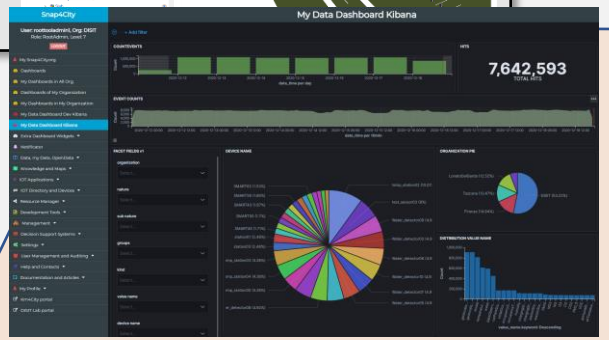
KB

LD, LOD

ckan

FI-WARE





Dashboards and Apps

Data Analytics on Snap4City platform

Swagger

Ontology Schema

LOG.disit.org

Knowledge Base, Km4City

Big Data Store Facility

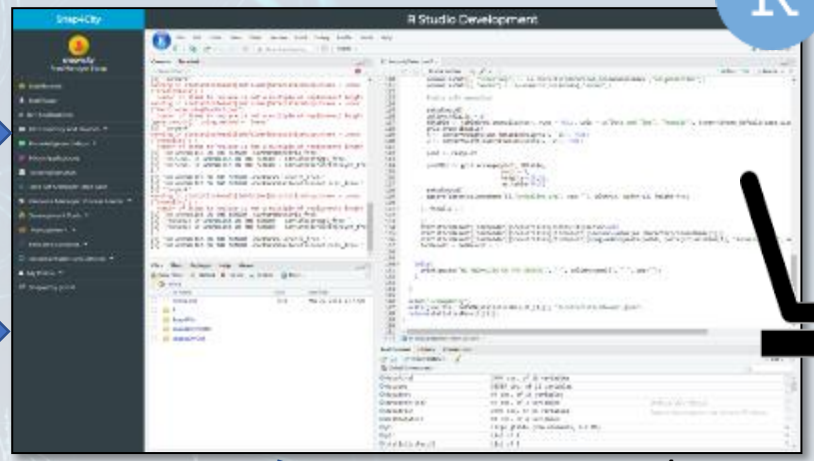
Smart City API from Knowledge Base and other tools

TensorFlow

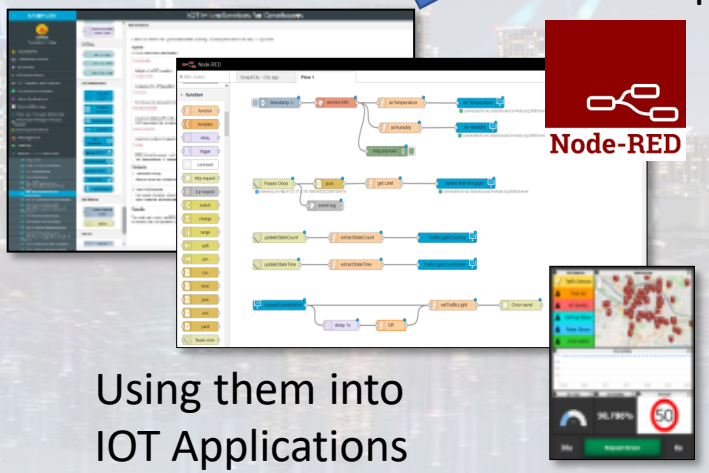
NVIDIA CUDA

python

R Studio



Creating MicroServices

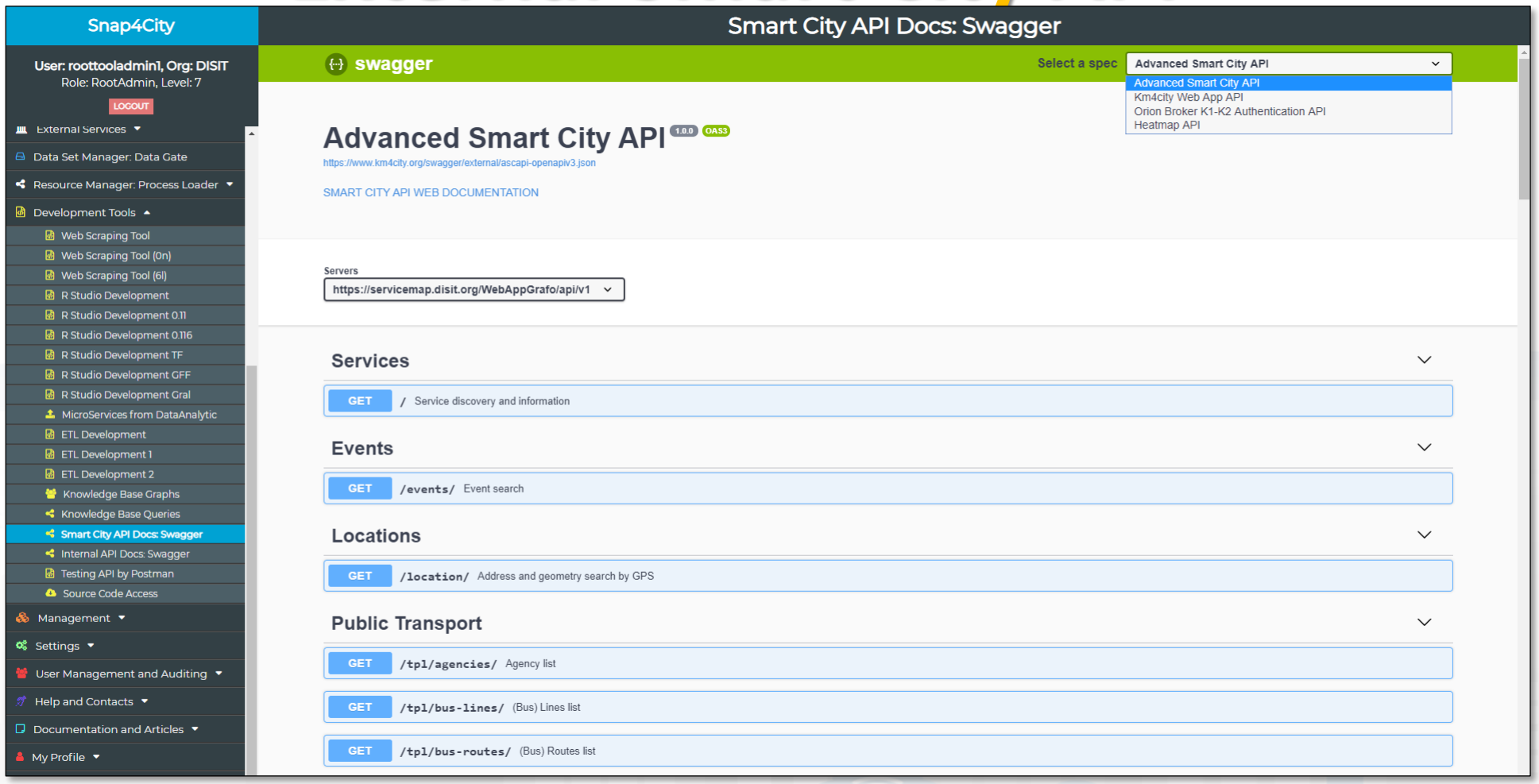


Using them into IOT Applications

Saving / Sharing reusing

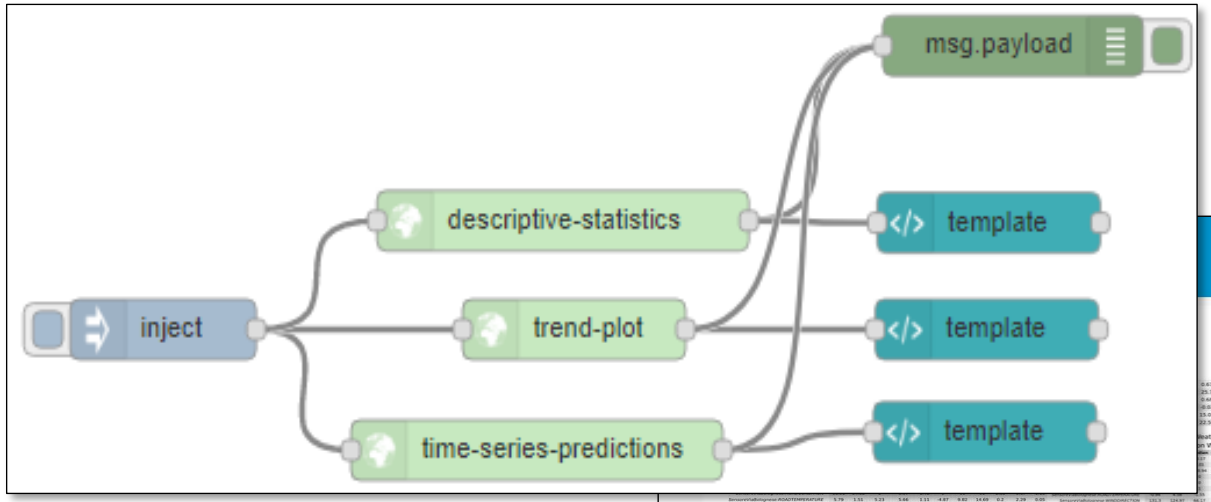
Resource Manager

External Smart City API

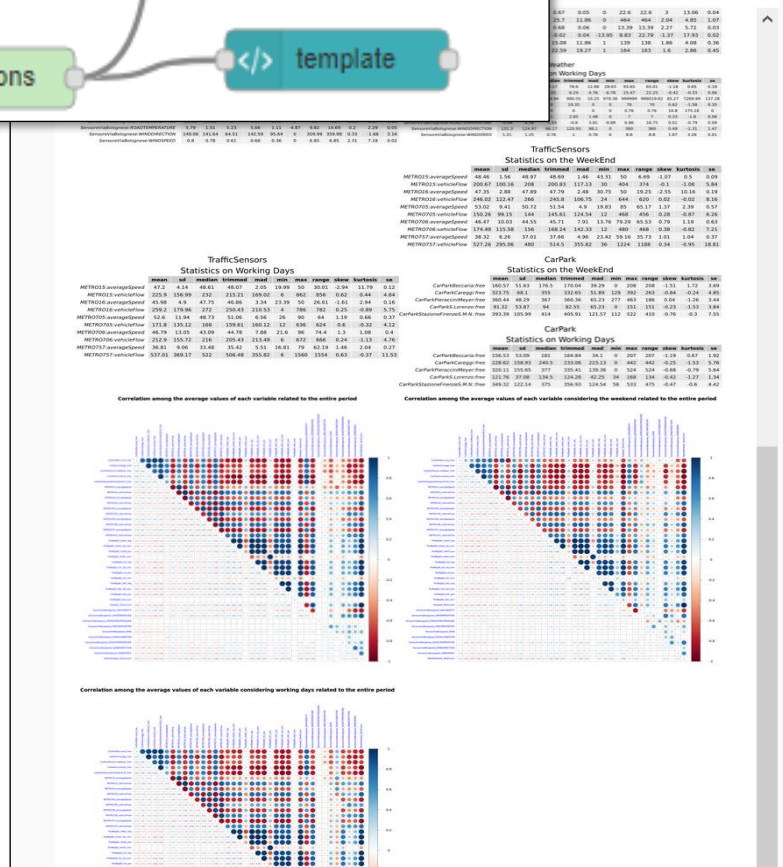


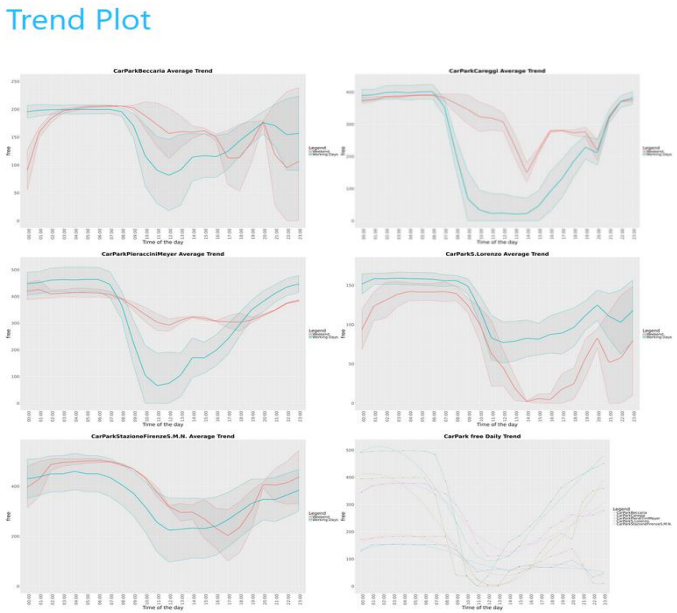
https://www.km4city.org/swagger/external/index.html

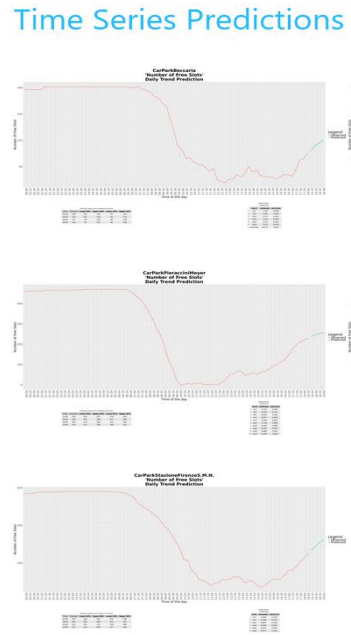
From R studio data analytics to MicroService



R Studio algorithms are automatically transformed into MicroServices for your IOT Applications



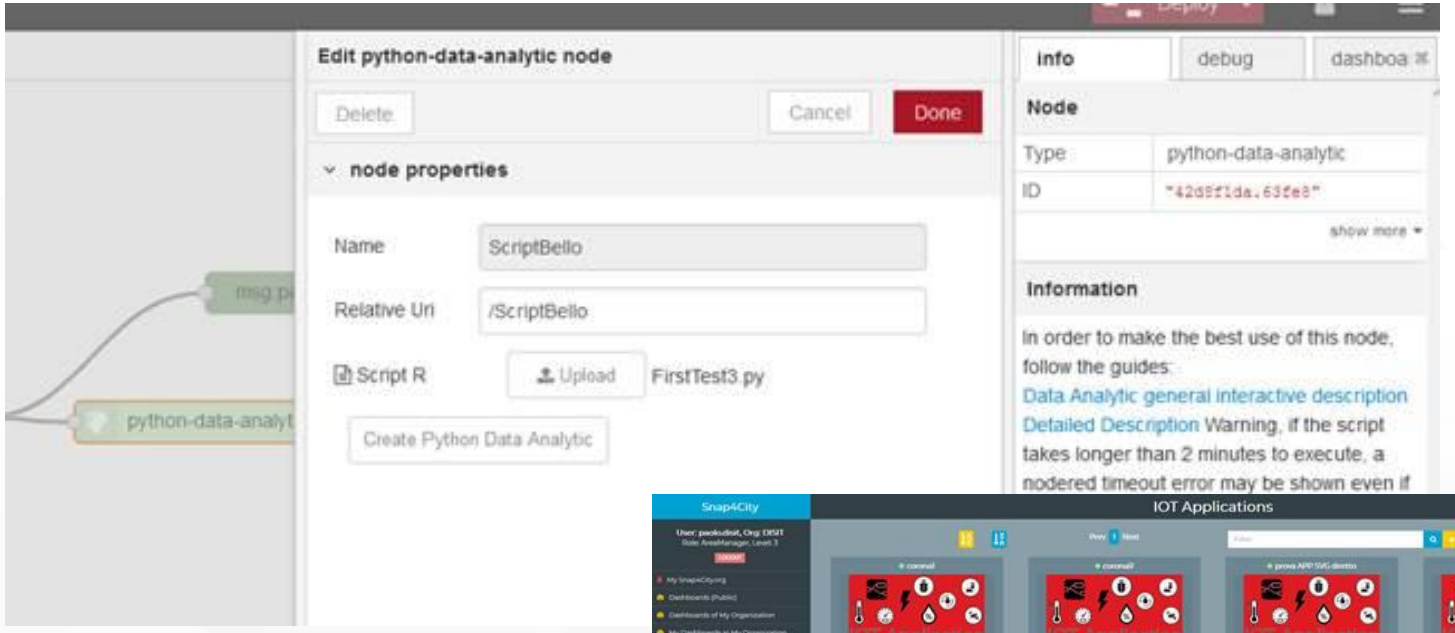




SNAP4CITY

Python process

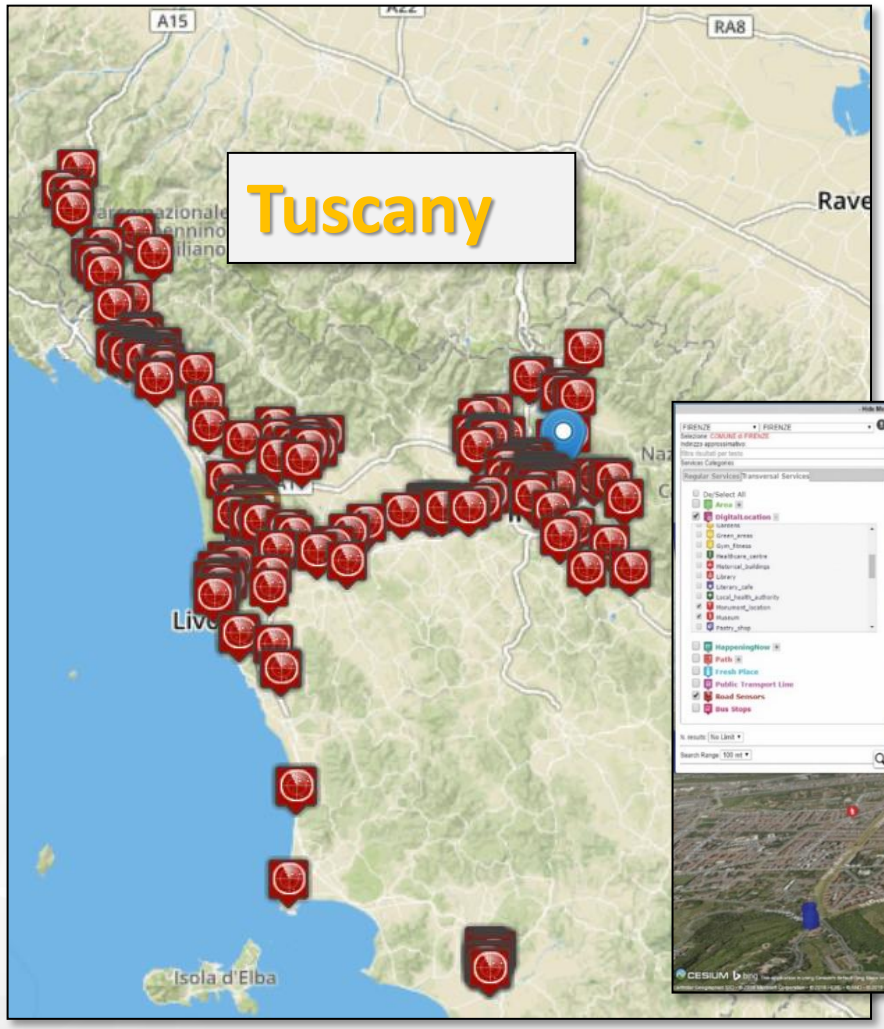
- Develop Python code exploiting Flask calls
- Test on local for the Call
- Test on Cloud for API
- Deploy via IOT App

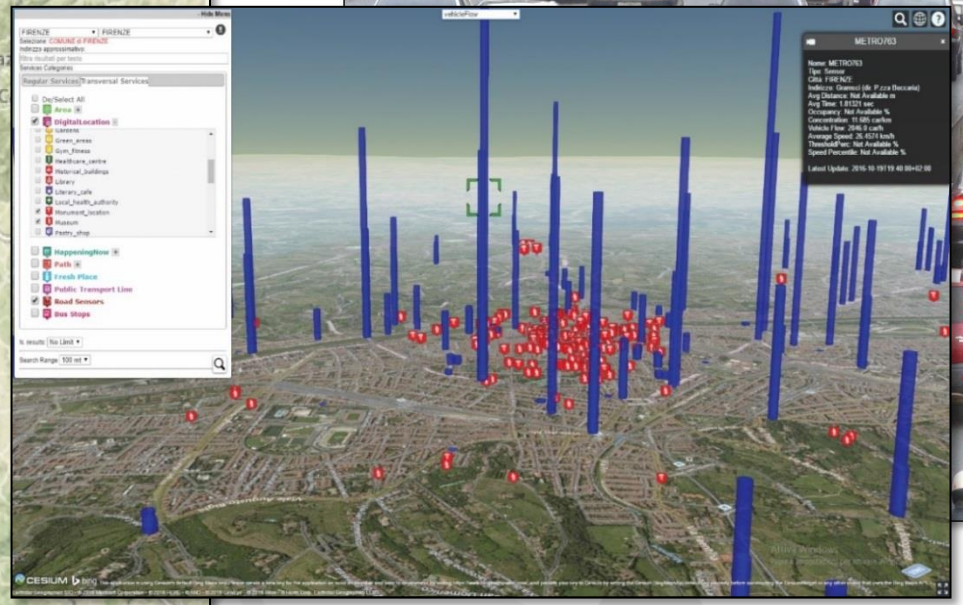


Traffic Flow Tools

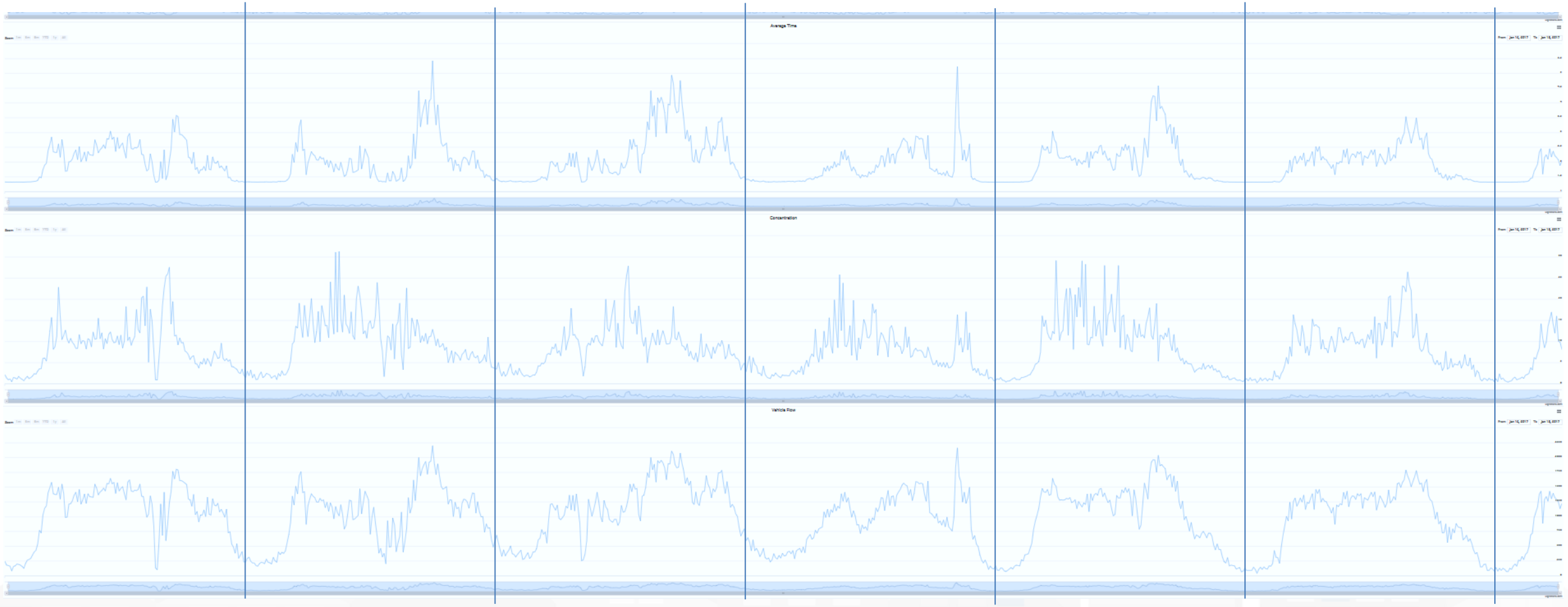
Spire and Virtual Spires (cameras), Bluetooth, ...

Specifically located: along, around, on gates, on x...



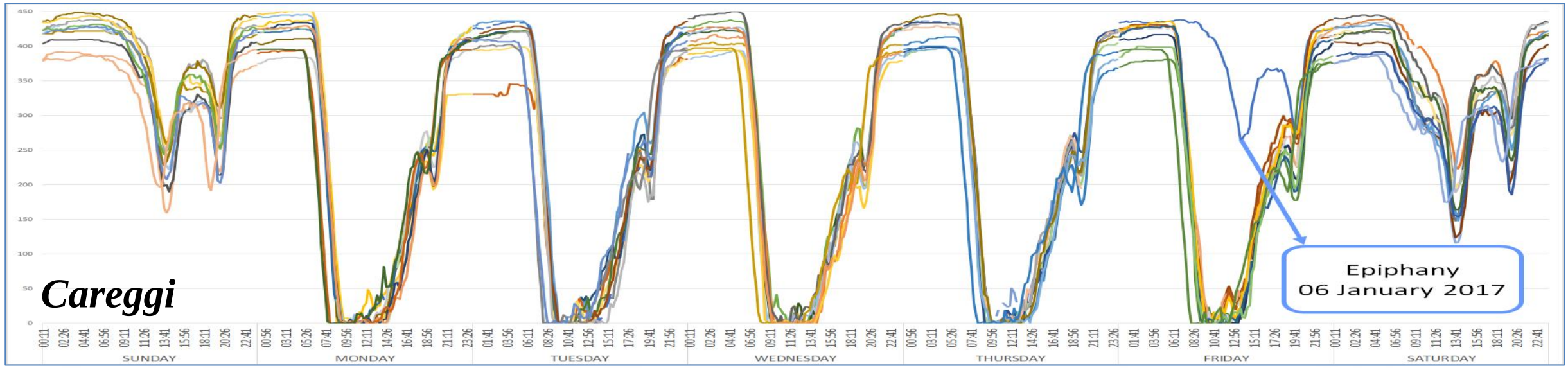


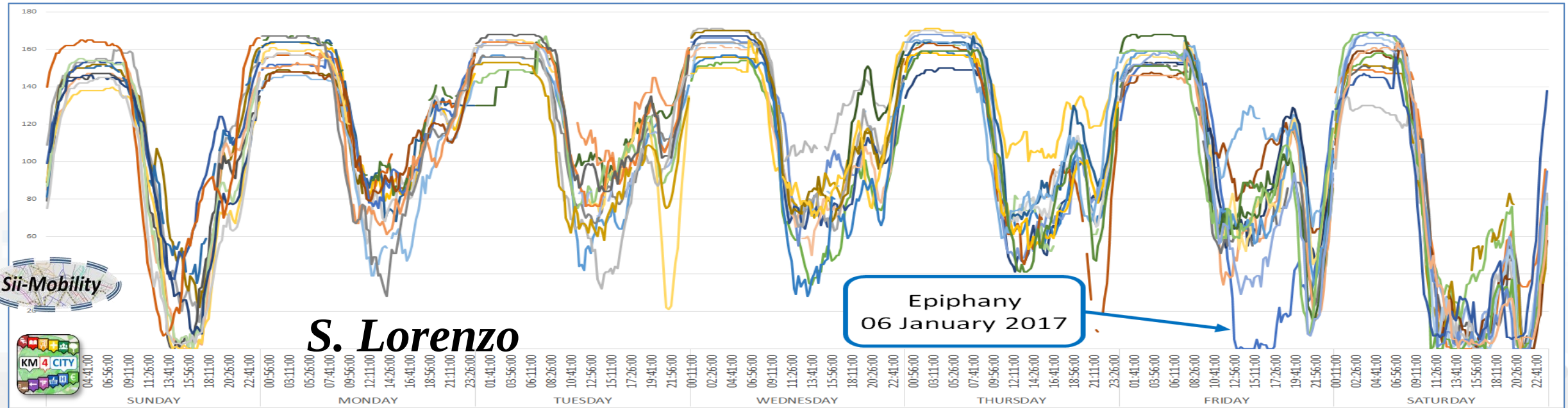
Traffic Flow data



- Day by day traffic flow data from 3 sensors

Free Parking space trends





Sii-Mobility

KM 4 CITY

Free Parking Predictions

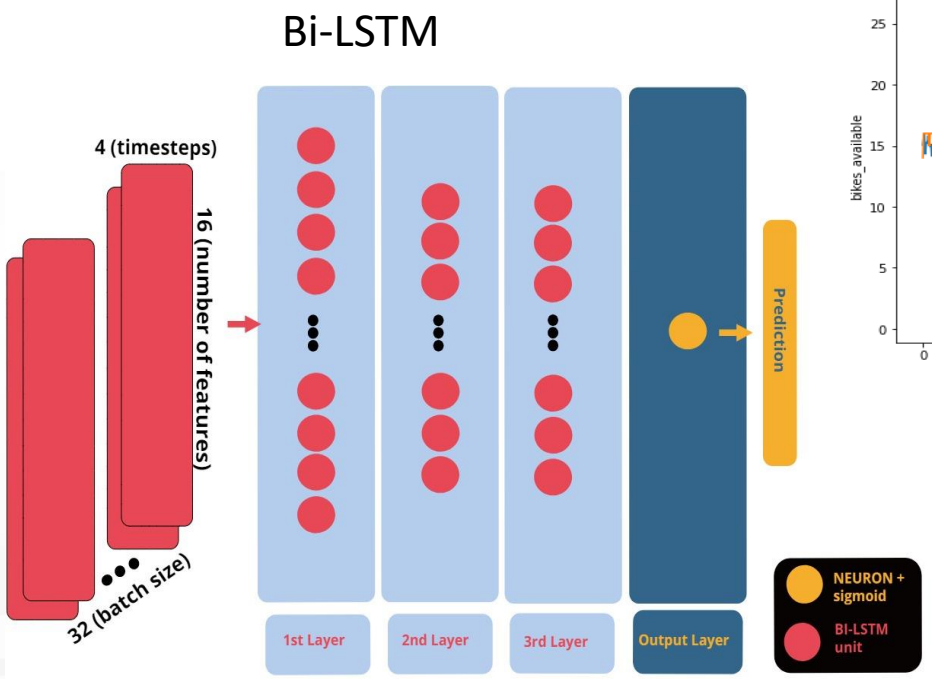
Careggi car park			
Model features	BRNN model results		
	R-squared	RMSE	MASE
Baseline	0.974	24	1.87
Baseline + Weather	0.975	24	1.75
Baseline + Traffic sensors	0.975	24	2.04
Baseline + Weather + Traffic sensors	0.975	24	1.87

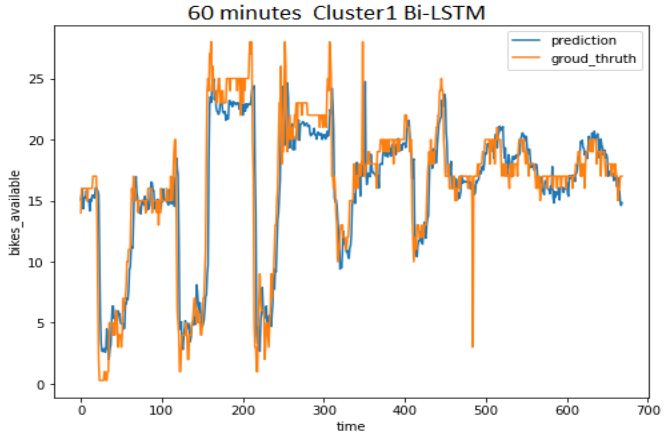
Active on Mobile Apps as:

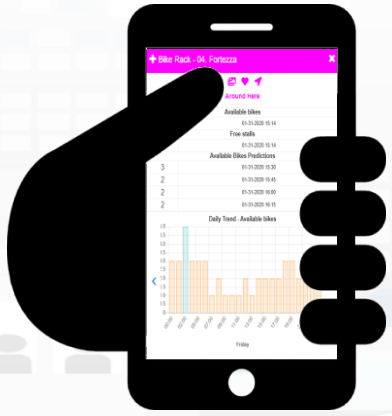
- «Firenze dove cosa»
- «Toscana dove cosa»

Precision: 97,5%

Deep Learning for Short-Term Prediction of Available Bikes on Bike-Sharing Stations







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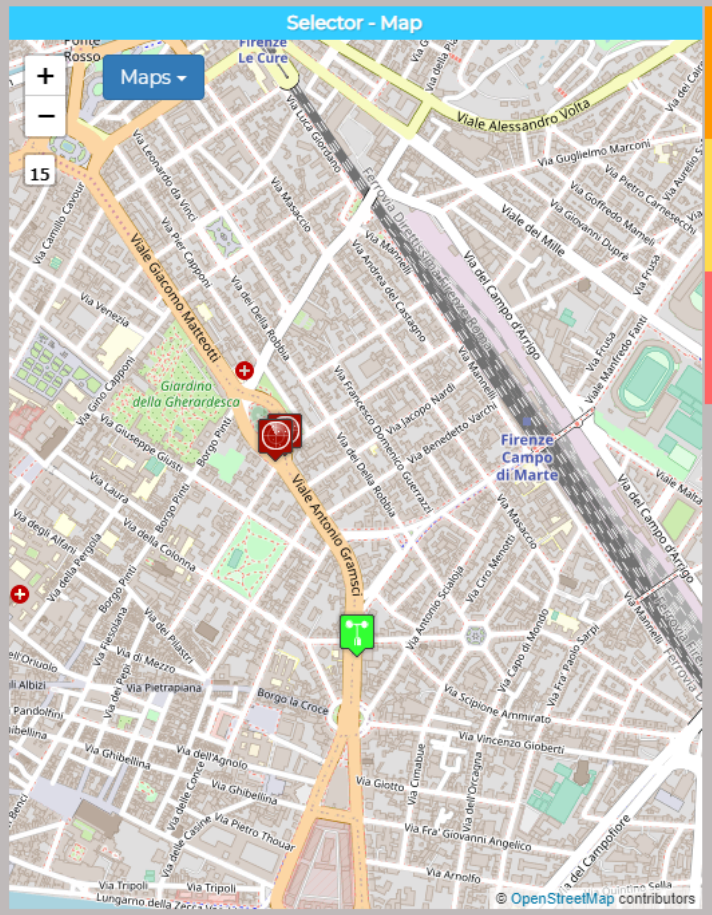
SNAP4CITY | KM4CITY

NOX reduction for COVID

Monitoraggio Area Gramsci: NO2 vs Traffico

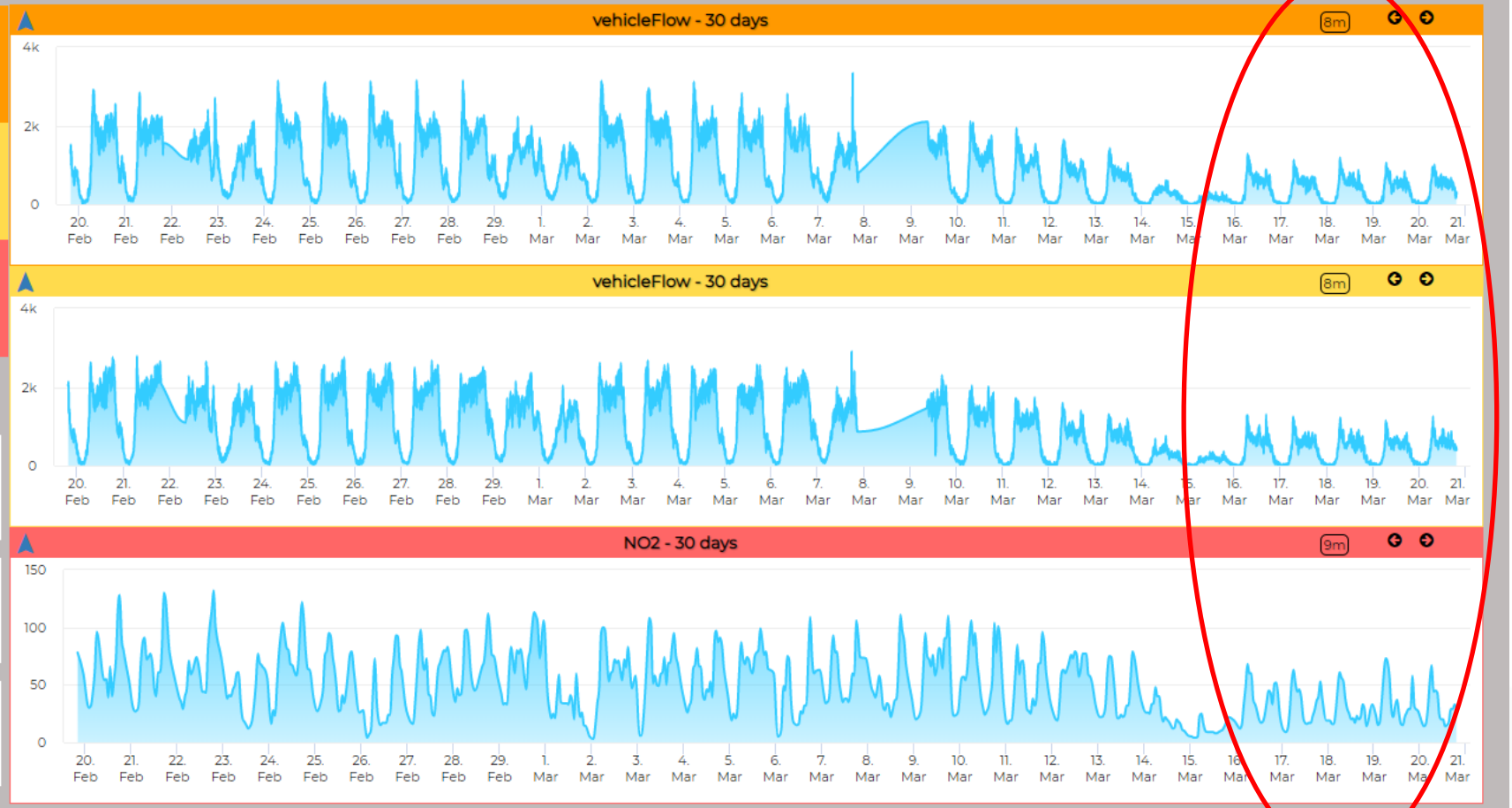
Sun 19 Apr 19:16:42



InOut traffic Firenze

NOX Predictions

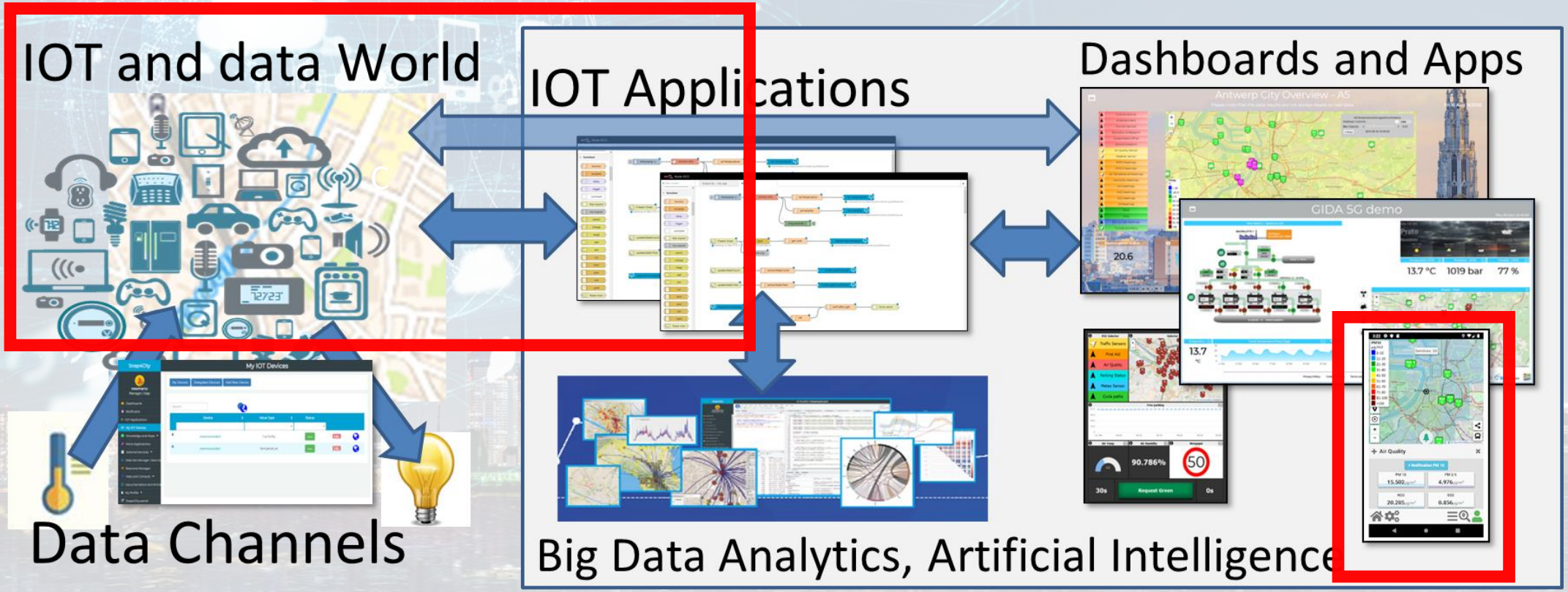
Real Time Traffic



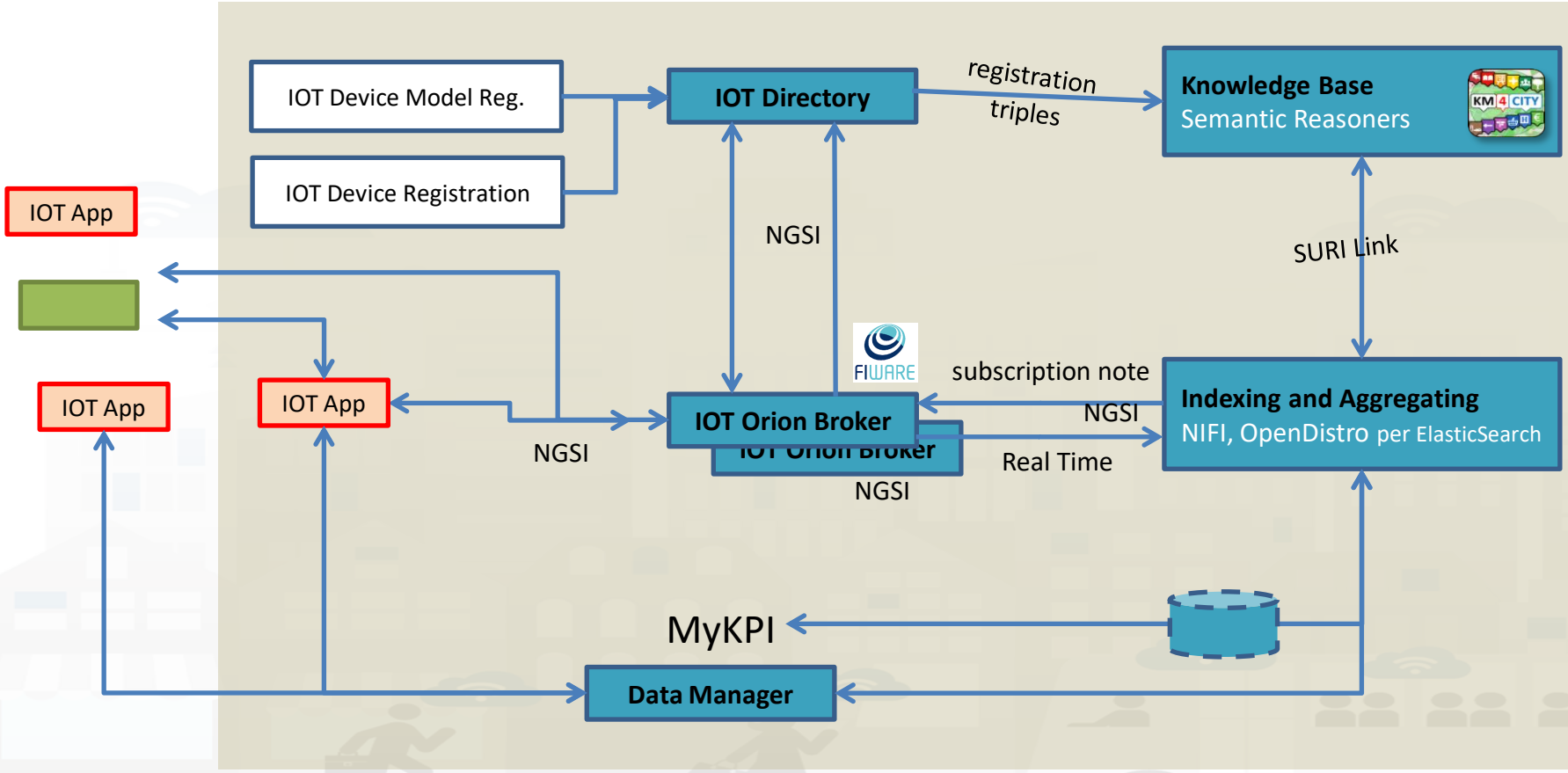
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjI4OQ==

eventually

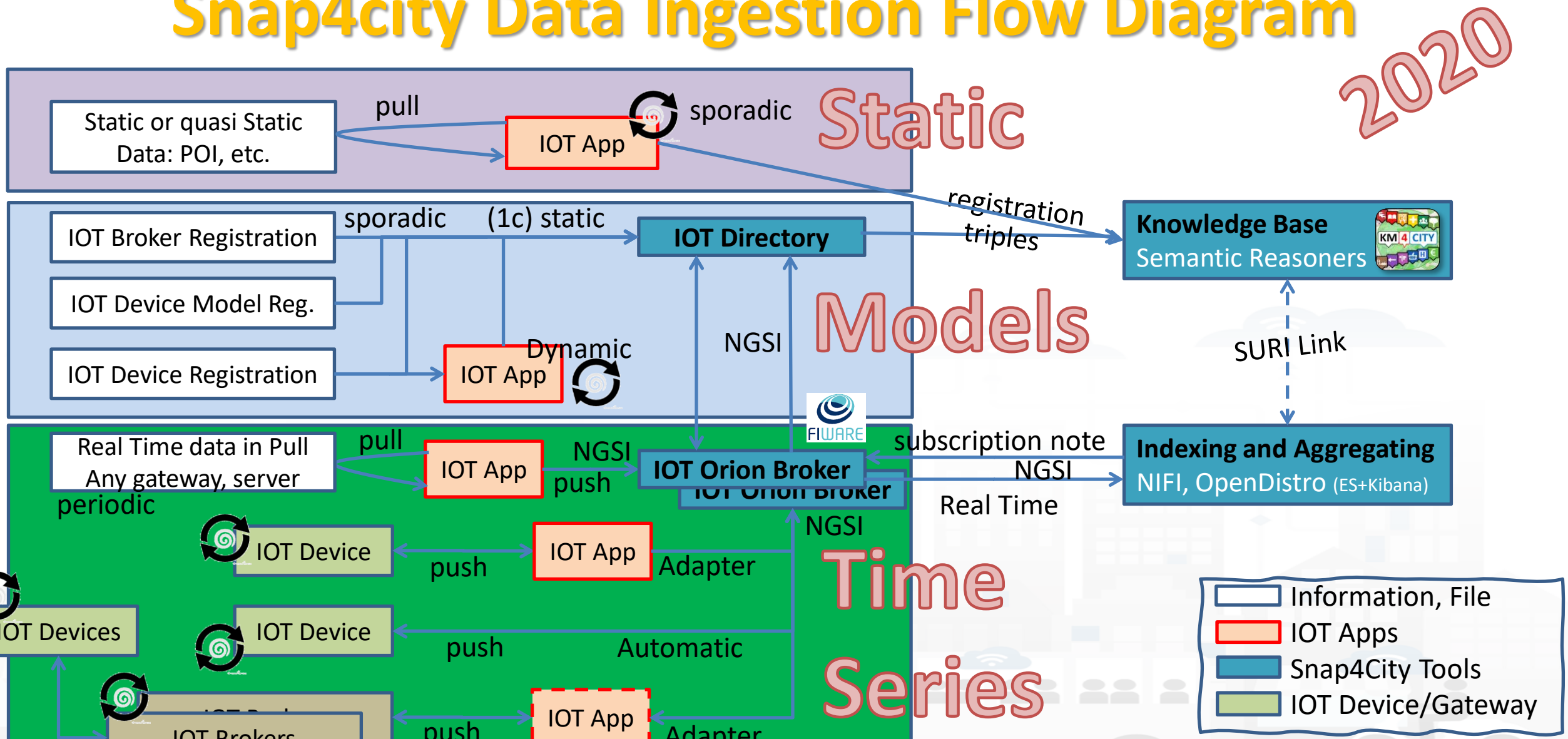
Develo: IoT App for data ingestion, and/or Mobile Applications



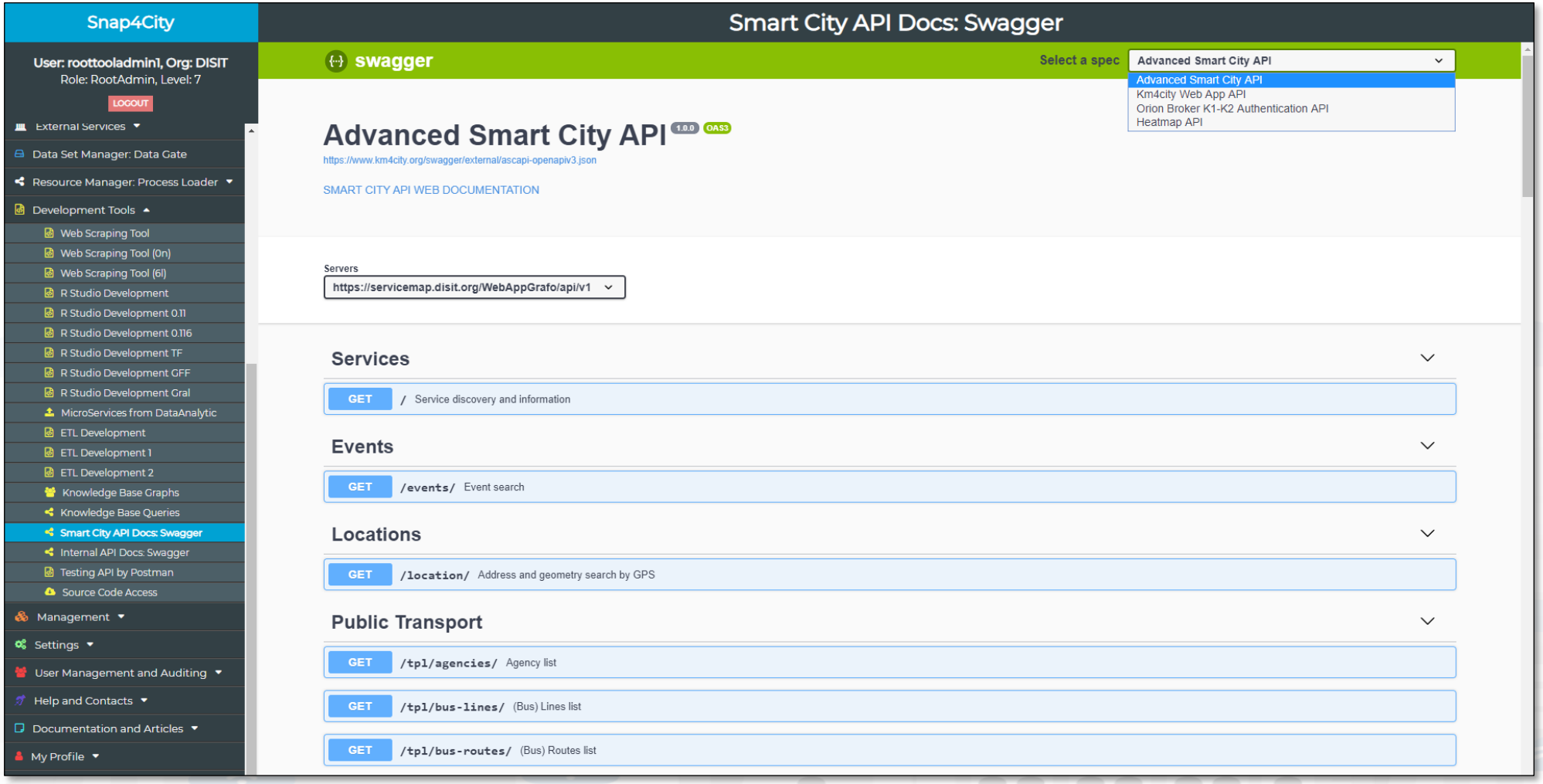
Main IoT Data In/Out flows



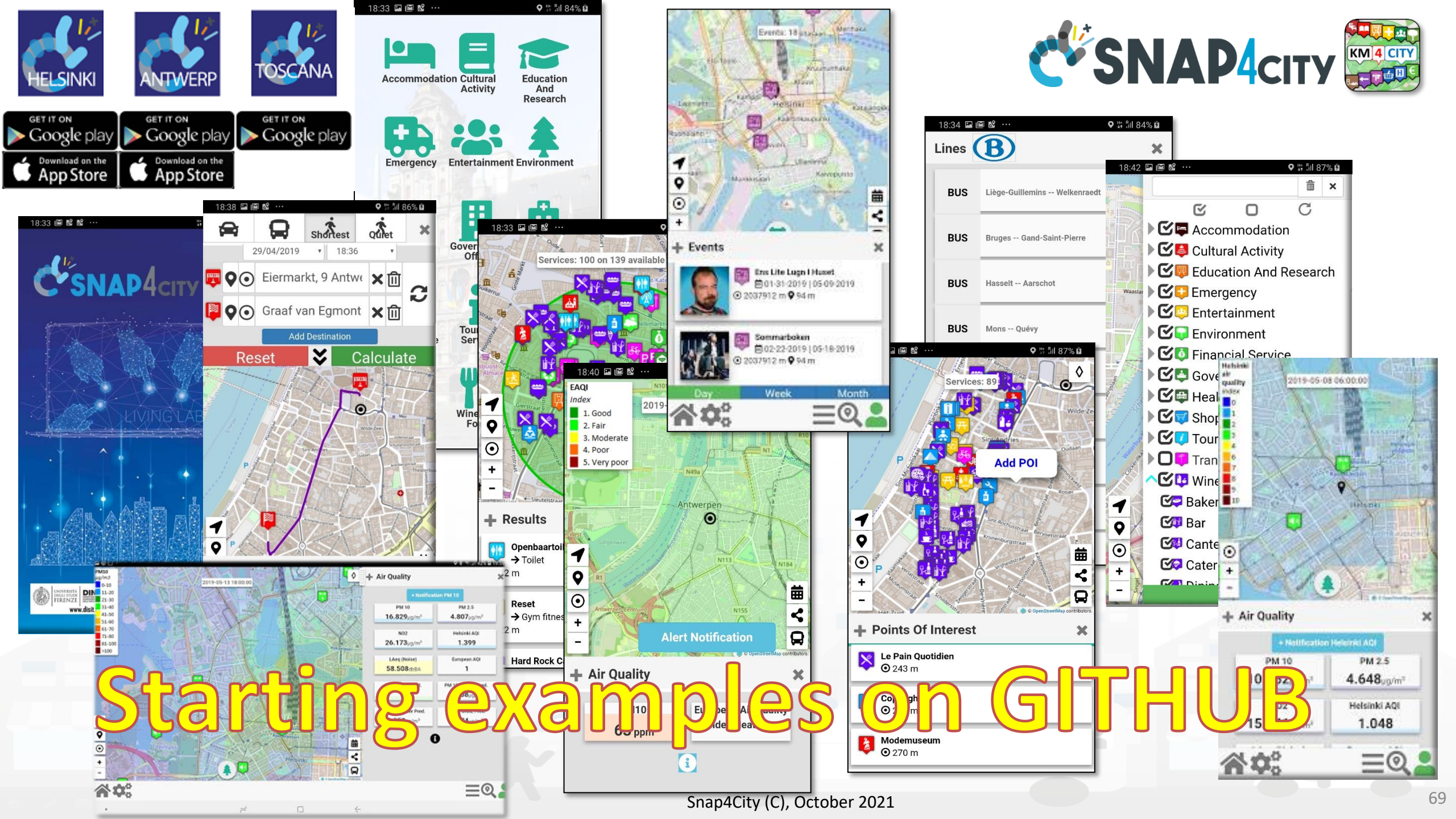
Snap4city Data Ingestion Flow Diagram



External Smart City API



https://www.km4city.org/swagger/external/index.html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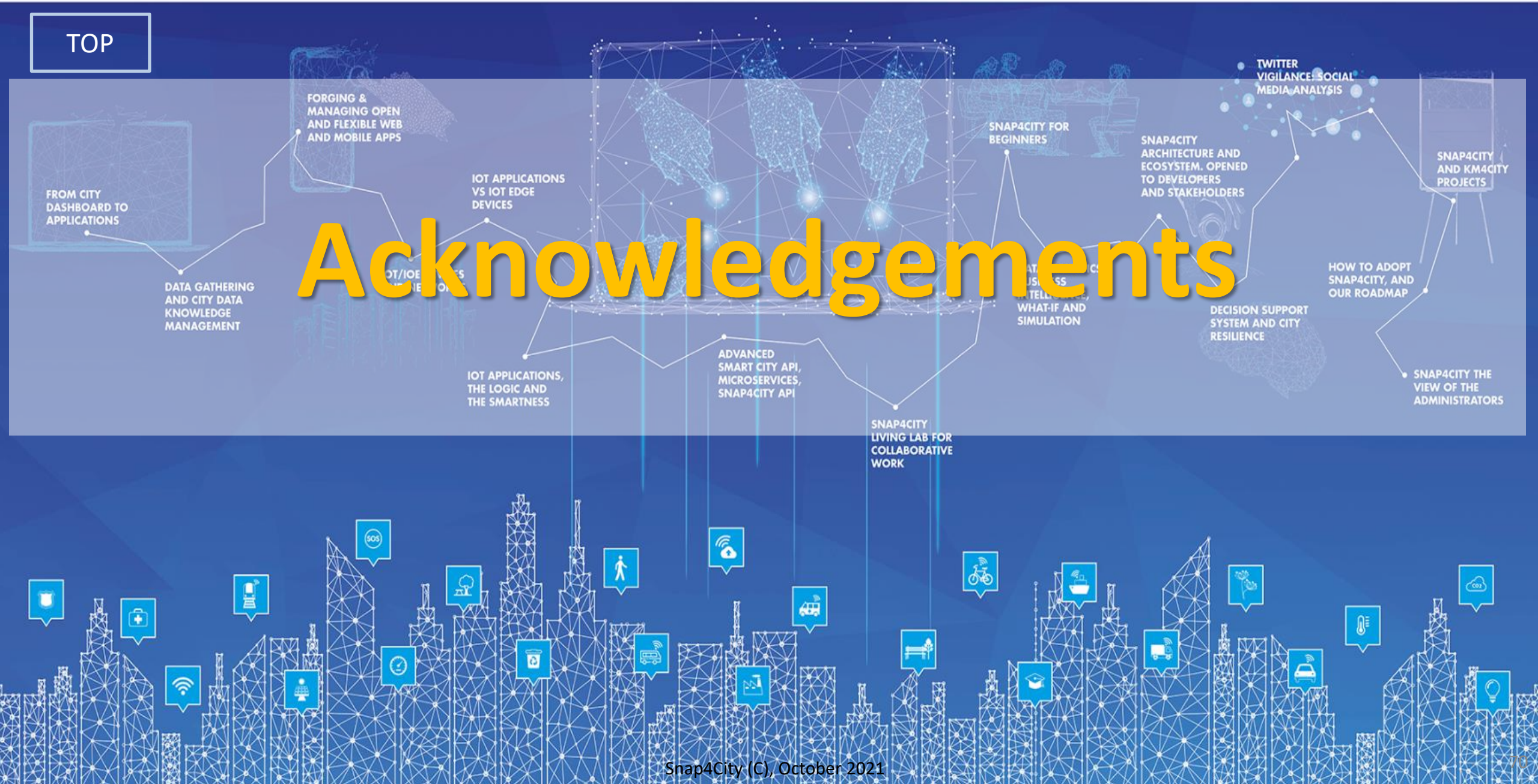
Education And Research
Emergency
Entertainment
Environment
Shortest
Quiet
Add Destination
Reset
Calculate
Events
Day
Week
Month
Services: 100 on 139 available
EAQI
Index
1. Good
2. Fair
3. Moderate
4. Poor
5. Very poor
Results
Antwerpen
Alert Notification
Air Quality
Lines
BUS
Liège-Guillemins -- Welkenraedt
Bruges -- Gand-Saint-Pierre
Hasselt -- Aarschot
Mons -- Quévy
Add POI
Points Of Interest
Le Pain Quotidien
243 m
Modemuseum
270 m
Financial Service
Bar
Helsinki AQI
1.048
Starting examples on GITHUB

TOP



Acknowledgements

DISIT lab roadmap vs model and tools' usage

2013
Km4City Ontology 1.1

- Tuscany, Road Graph
- Mobility
- culture, tourism
- Events
- Parking
- Services
- Linked open graph

2014
- Weather Forecast
- Real Time Wi-Fi
- Entertainment
- LOD

- Twitter Vigilance
- Social Media Analytics, Sentiment Analysis

Km4City 1.4

2015
Km4City 1.5

- Resilience Decision Support
- Smart First Aid
- User Behaviour Analysis, predictions
- Risk Analysis

ckan, resolute

H2020 (2015-18)

2016
(2016-21) H2020 REPLICATE

Km4City 1.6.4

- Smart Energy
- Sustainable Mobility
- Control Room
- Dashboard

Km4City 1.6.2

Sii-Mobility (2016-21) MIUR

SII-MOBILITY SCN

- Infomobility
- Mobile App
- Routing
- Multimodality

FIWARE

- Sardinia Region Smart City Strategies and plan

GREEN IMPACT C.A.P.A.C.I.T.Y.

GREEN IMPACT
POR FESR 2014-2020

- Industry 4.0
- Critical Plant
- Monitoring

2017
Sii-Mobility

- Origin-Destination and trajectories
- Traffic Reconstruction
- Offer Analysis
- OBU, smart devices

E Ø 15 digital ecosystem
Powered by EXPO MILANO 2015

(2016-19) MIUR
GHOST SIR

- IOT/IOE, IOT App
- Living Lab
- Maker Support
- IOT Edge
- Smart City IOT
- GDPR,
- Privacy & Security

life weee (2017-20)

- Smart Waste

MOSAiC Mobility 4.0 for SmArt (i) City
POR CreO, Regione Toscana

(2018-20)

- Mobility Demand / Offer Analytics and Strategy

2018
Sii-Mobility

- User engagement
- Bike Sharing
- Data Analytics ++
- Social Predictions
- OBD2

IOT/IOE

Km4City 1.6.6

Node-RED

SNAP4CITY
SELECT for Cities H2020
(2017-19)

SIRIUS

5G (2018-21)

- 5G tech
- Energy
- Industry 4.0
- Synoptics

TRAFAIR
CEF (2018-21)

- Traffic and Mobility Impact on Pollution
- NOX predictions

2019
EUROPEAN OPEN SCIENCE CLOUD

LAID Smart Bed
POR CreO, Regione Toscana

- Smart Health

GREEN FIELD PEAS
NaOH Soda4.0
Optimization and Automated Decision System 4.0
POR CreO, Regione Toscana

- Industry 4.0

bee smart city

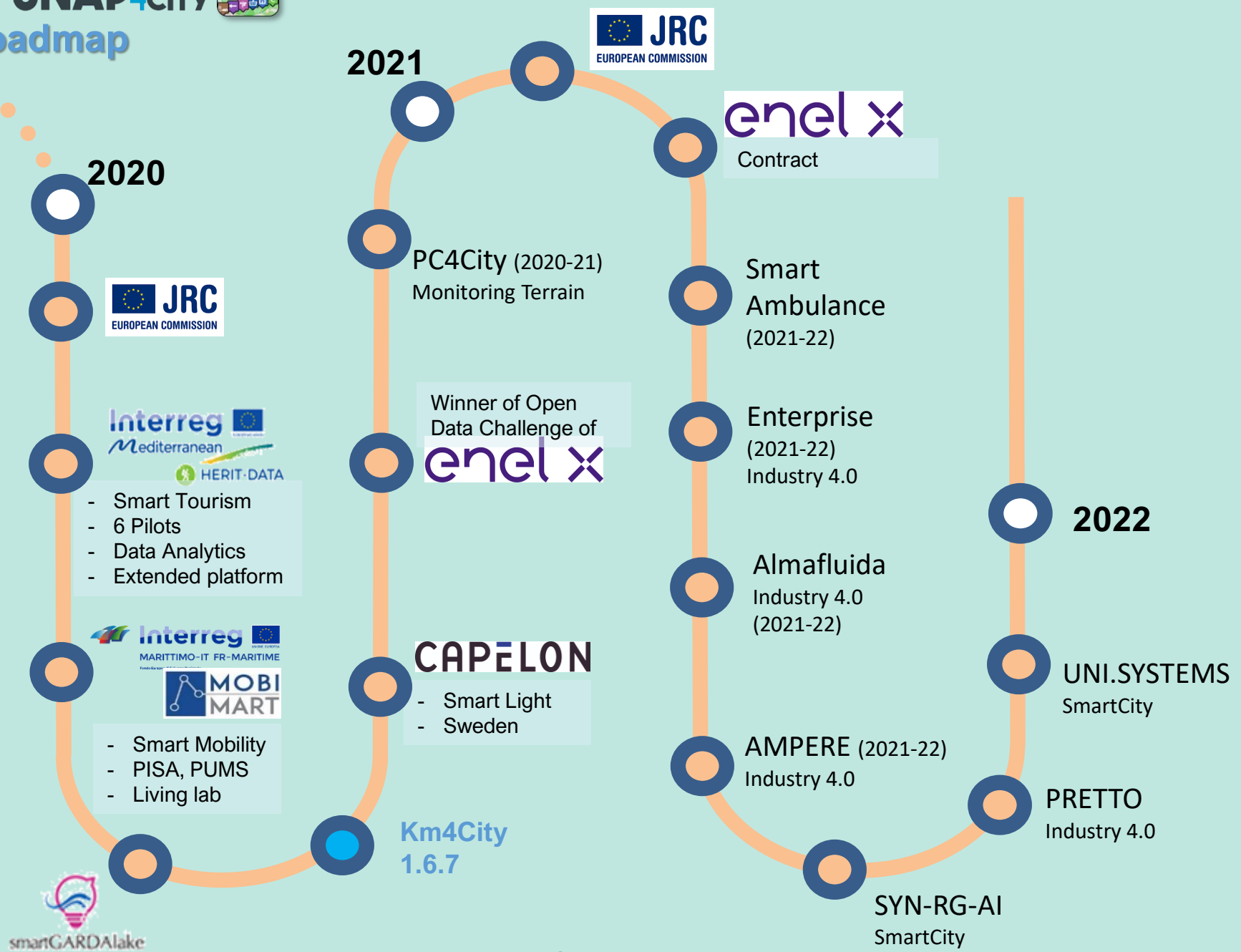
- Smart Lonato

Reverberi Enetec
Gruppo MPES

Winner of Select4Cities PCP

SNAP4CITY

roadmap


2020
JRC EUROPEAN COMMISSION
Interreg Mediterranean HERIT-DATA
- Smart Tourism
- 6 Pilots
- Data Analytics
- Extended platform
Interreg MARITTIMO-IT FR-MARITIME MOBI MART
- Smart Mobility
- PISA, PUMS
- Living lab
smartGARDAlake
Km4City 1.6.7
2021
JRC EUROPEAN COMMISSION
enel X
Contract
PC4City (2020-21)
Monitoring Terrain
Smart Ambulance (2021-22)
Winner of Open Data Challenge of enel X
Enterprise (2021-22) Industry 4.0
CAPELON
- Smart Light
- Sweden
Almafluida Industry 4.0 (2021-22)
AMPERE (2021-22) Industry 4.0
SYN-RG-AI SmartCity
2022
UNI.SYSTEMS SmartCity
PRETTO Industry 4.0

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SNAP4CITY

KM 4 CITY

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SNAP4
Appliances and Dockers
Installations

CONTACT

DISIT Lab, DINFO: Department of Information Engineering
Università degli Studi di Firenze - School of Engineering

Via S. Marta, 3 - 50139 Firenze, ITALY
https://www.disit.org

www.snap4city.org

Email: snap4city@disit.org

Office: +39-055-2758-515 / 517
Cell: +39-335-566-86-74
Fax.: +39-055-2758570

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