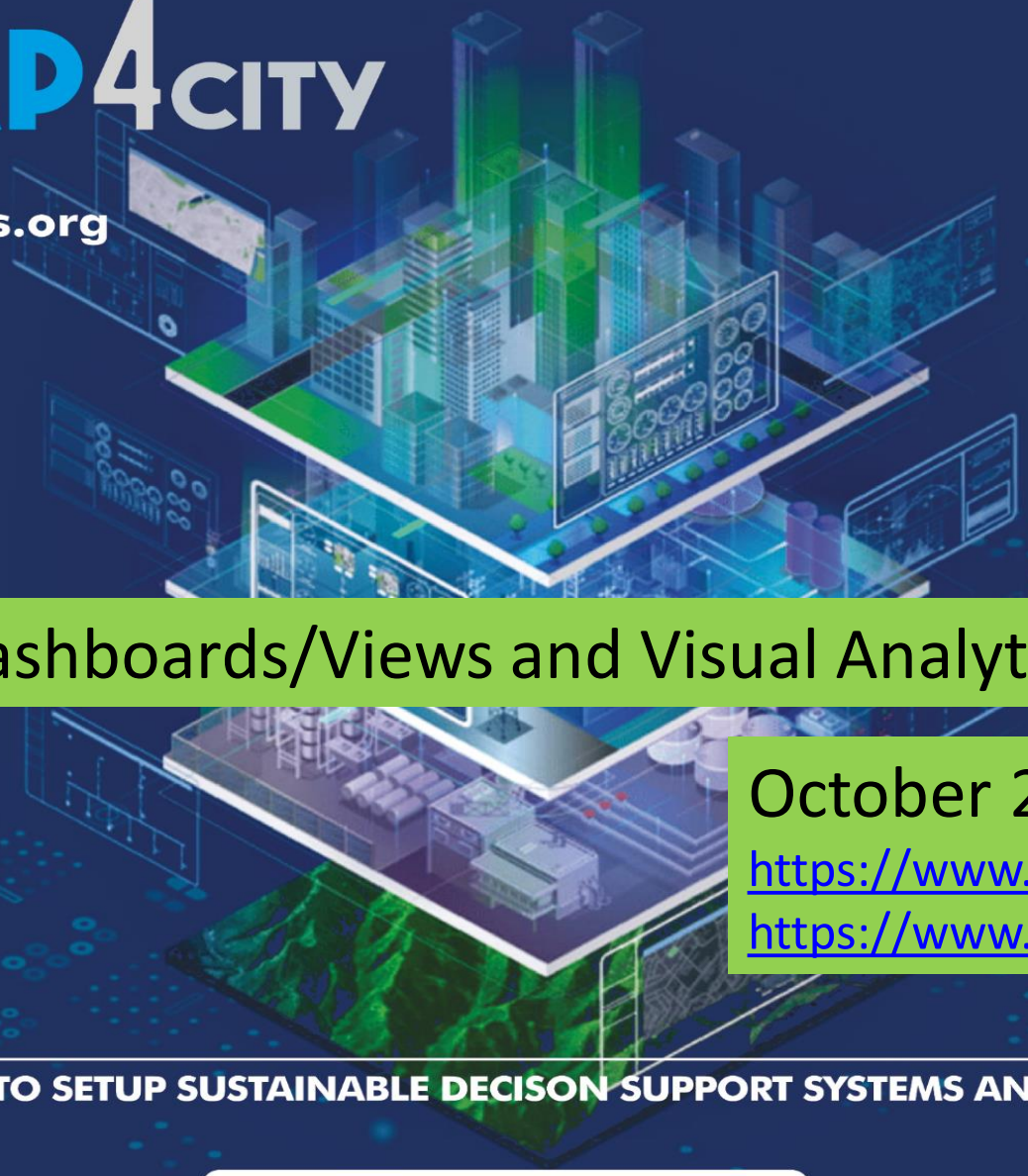
SNAP4CITY

www.snap4city.org
www.snap4solutions.org

www.km4city.org



Dashboards/Views and Visual Analytics

October 2025, Course, Part 2

https://www.snap4city.org/944
https://www.snap4city.org/577

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

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

SNAP4CITY

KM4CITY

SNAP4 Appliances and Dockers Installations

100% OPEN SOURCE

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Node-RED



Be smart in a SNAP!

SMARTCITY EXPO WORLD CONGRESS

Dashboards/Views and Visual Analytics



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LIVING LAB
SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES

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E015 digital ecosystem

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THE POWER OF ARTIFICIAL INTELLIGENCE AT THE SERVICE OF YOUR OPERATION AND PLAN

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OPERATION AND PLAN - CONTROL ROOMS - DECISION SUPPORT SYSTEMS - WHAT-IF ANALYSIS - OPTIMIZATION - APPLICATIONS

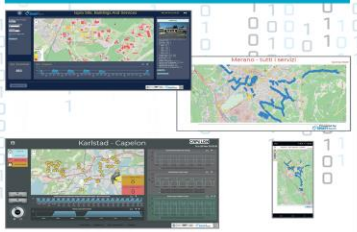
HORIZONTAL AI PLATFORM



MOBILITY AND TRANSPORT



SMART ENERGY AND SMART BUILDING



ENVIRONMENT AND WASTE MANAGEMENT



CITY USER'S SERVICES AND TOURISM MANAGEMENT



BUSINESS INTELLIGENCE - SIMULATIONS - VISUAL ANALYTICS - SYNOPTICS - GRAPHICAL WIDGETS - ANALYTICS



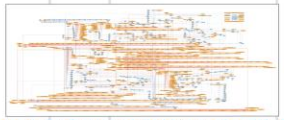
DASHBOARDS, WIDGETS TEMPLATES



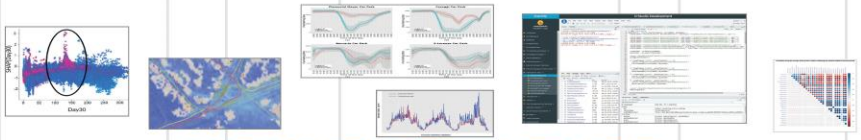
PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG
15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...



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



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



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



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

FULL INTEROPERABILITY, ANY: DATA, BROKERS, NETWORKS AND VERTICALS



NATIVE AND EXTERNAL APPLICATIONS

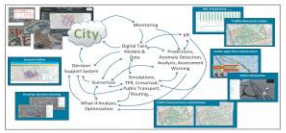
- Smart Parking
- Smart Light
- Smart Waste
- Smart Energy
- Smart Building
- Smart Tourism
- ...

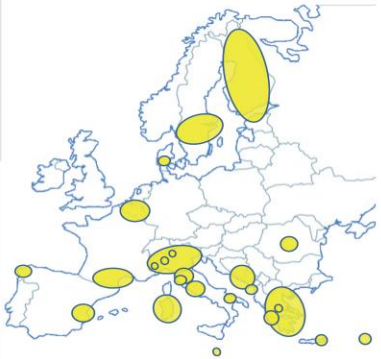
SnapAdvisor



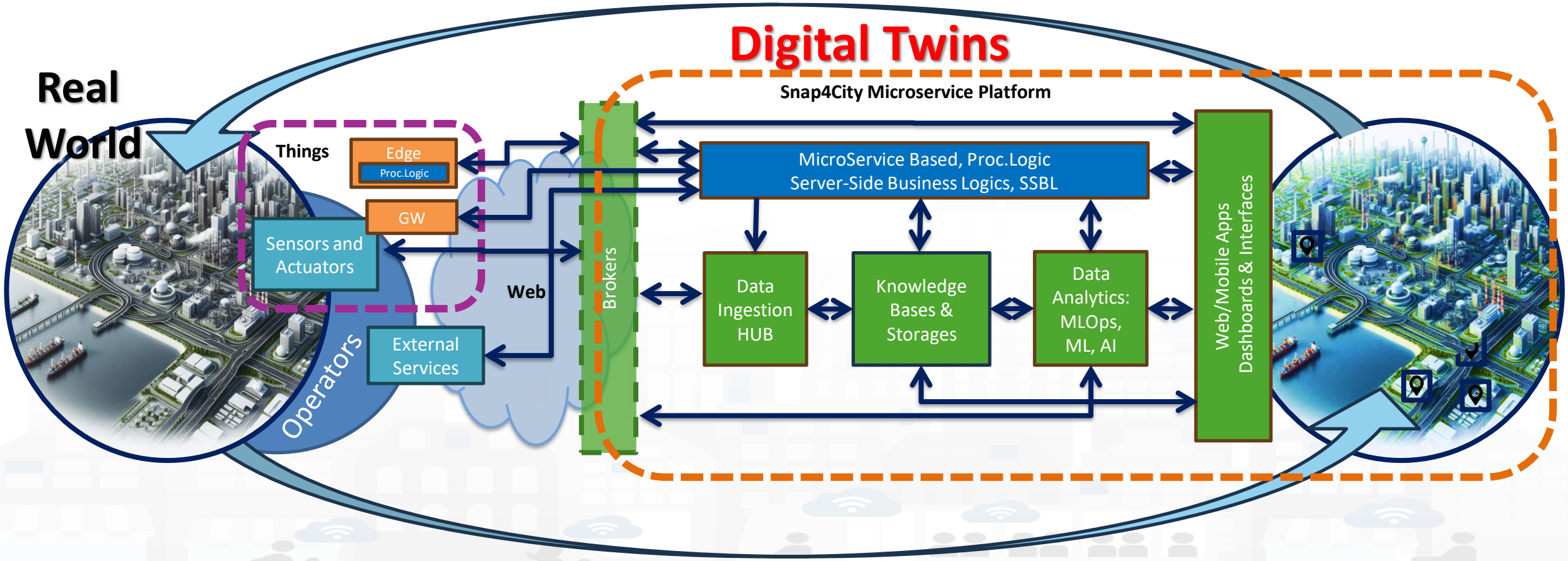
- DEVELOMENT ENVIRONMENT AND METHODOLOGY
- VISUAL PROGRAMMING, ML, AI, HPC
- TRAINING COURSES







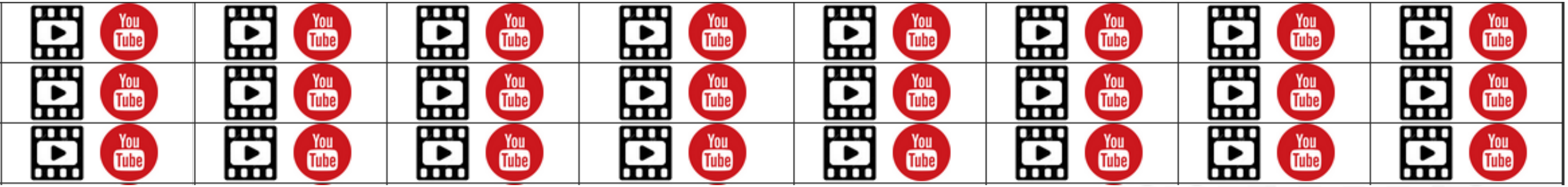
Digital Twin Development Platform



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
							
							

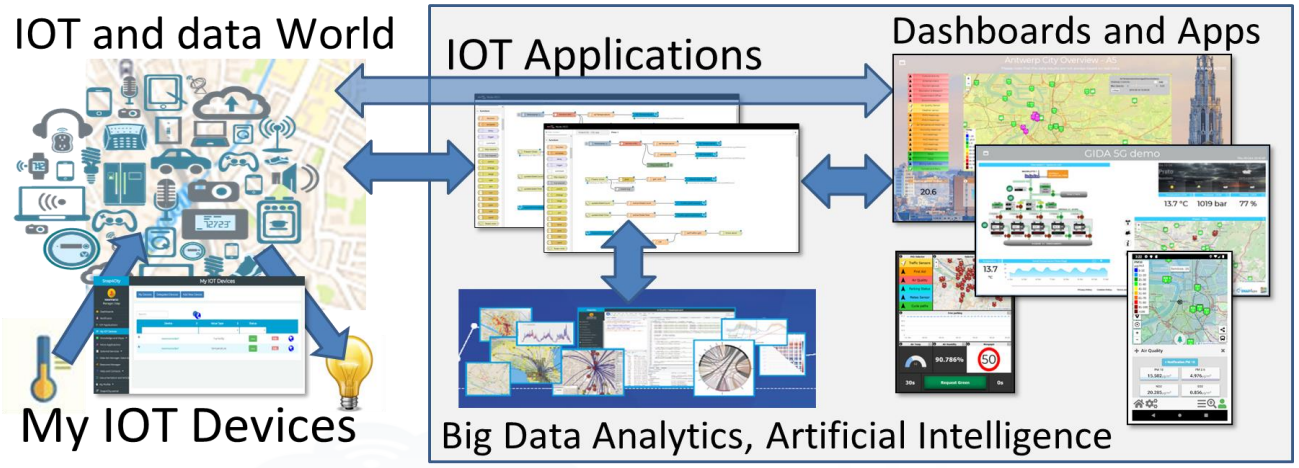


Note on Training Material

- **Course**: https://www.snap4city.org/944
  - Introductionary course to Snap4City technology
  - Italina version CN MOST: https://www.snap4city.org/1068
- **Older version 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

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



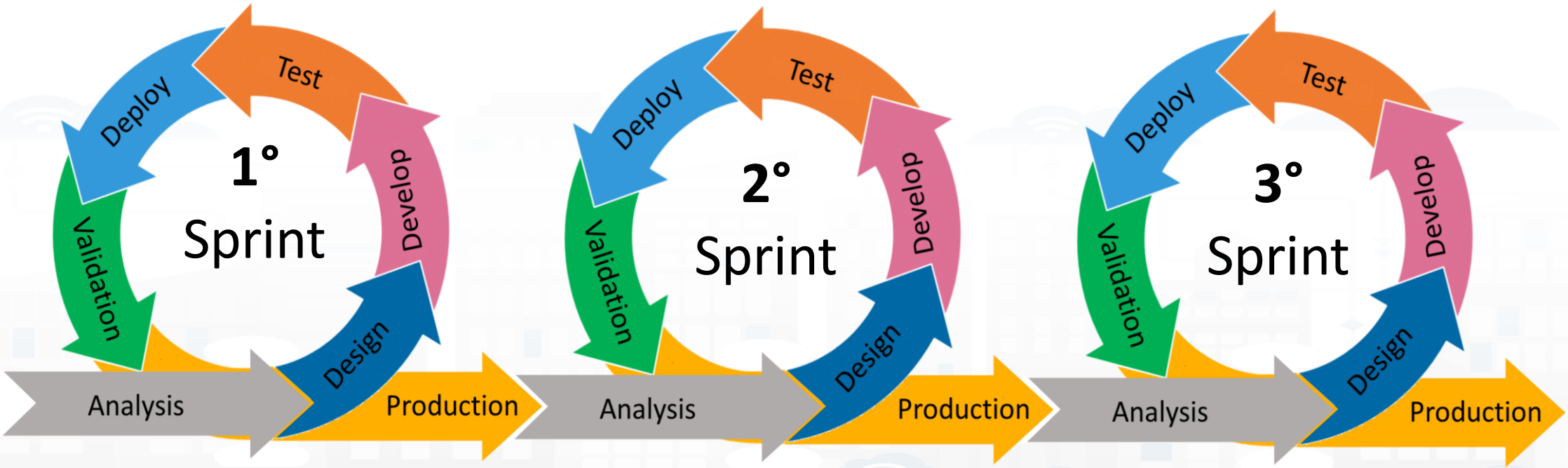
IF you need to go more in deep you can ask us to pass at the next Role becoming full AreaManager with full rights of development, also for Data Analytics, machine learning, etc.

Agenda of this second part

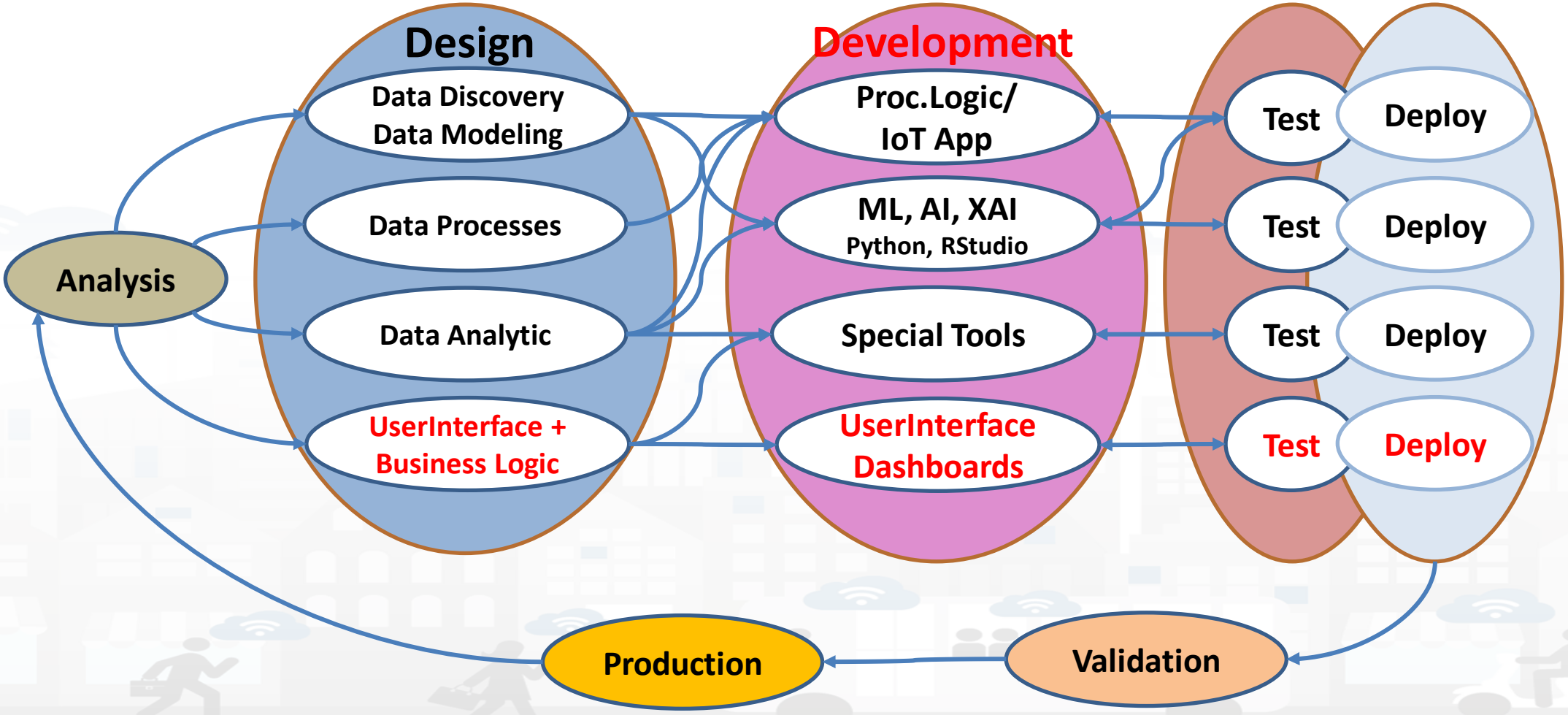
- Recall on Snap4City Architecture
- Snap4City Dashboards Purposes and Uses
  - Snap4City Dashboards vs Technical data monitoring dashboards
  - Snap4City Dashboards main concepts
- Main Data Kinds: data vs representations
- Snap4City DASHBOARDS: Main Concepts and simple Widgets
- Creating a Snap4City Dashboard
  - ***Coffe Break***
- Snap4City Multi Data Map Widget
- Snap4City High Level Types
  - Video Streams from TV Cameras
  - External Services (integration of) your or third party web pages
  - Synoptics, Custom Widgets as External Services
- Selector for the Multi Data Map Widget
- Data Inspector vs Data Processes Details
- Dashboard Management
- Training Material

https://www.snap4city.org/944

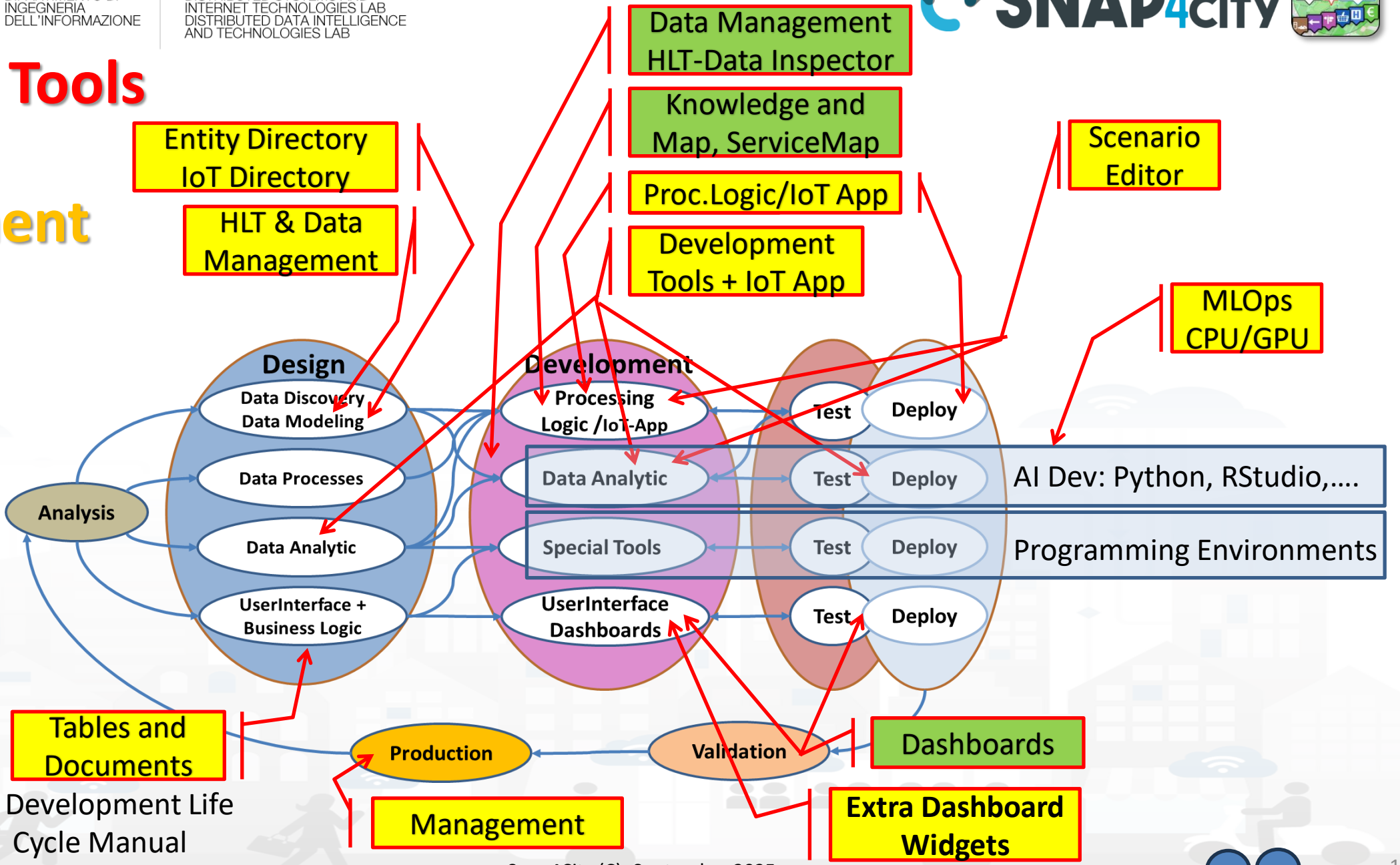
Agile Development Life Cycle by sprint Smart Solutions



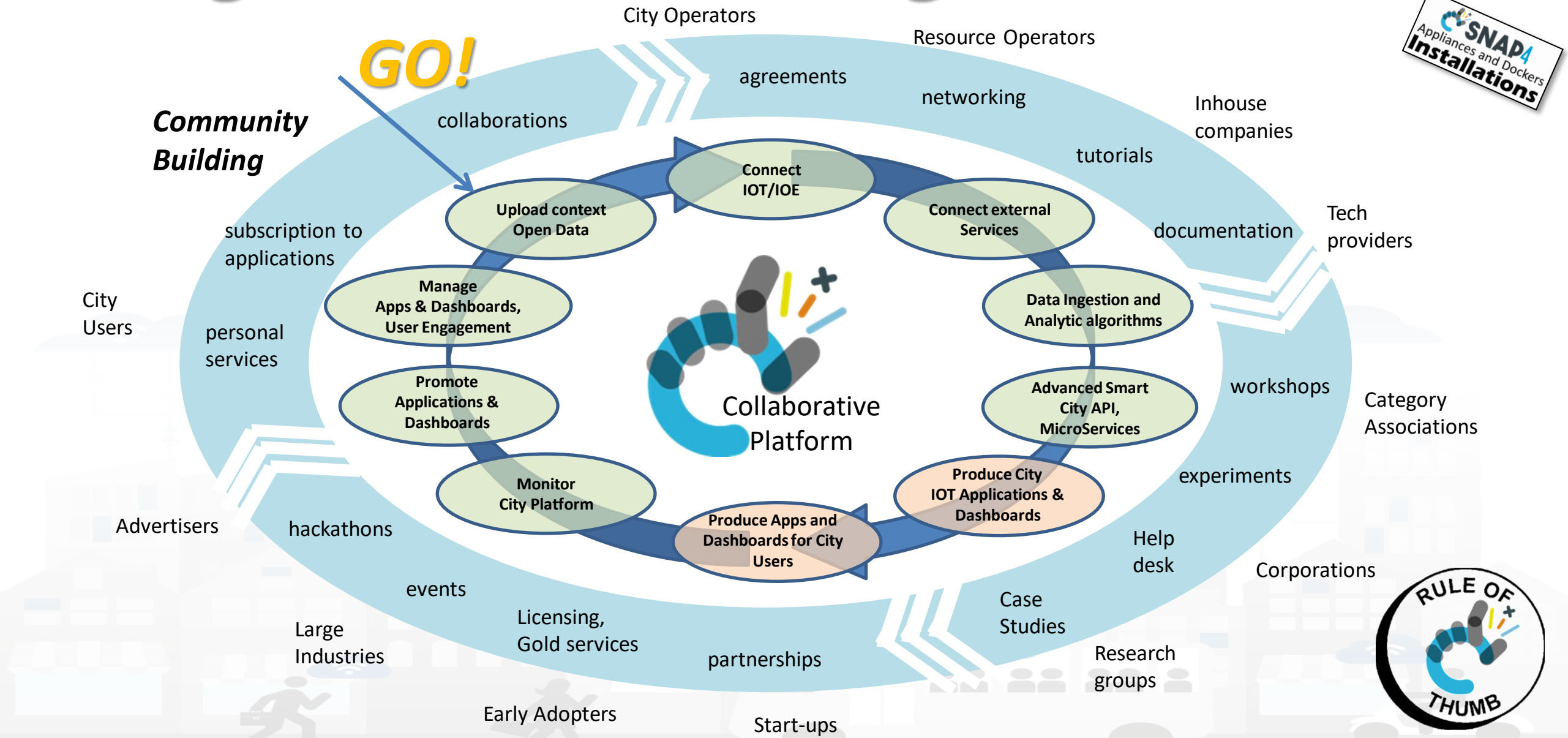
Development Life Cycle Smart Solutions



Snap4City Tools vs Development Life Cycle

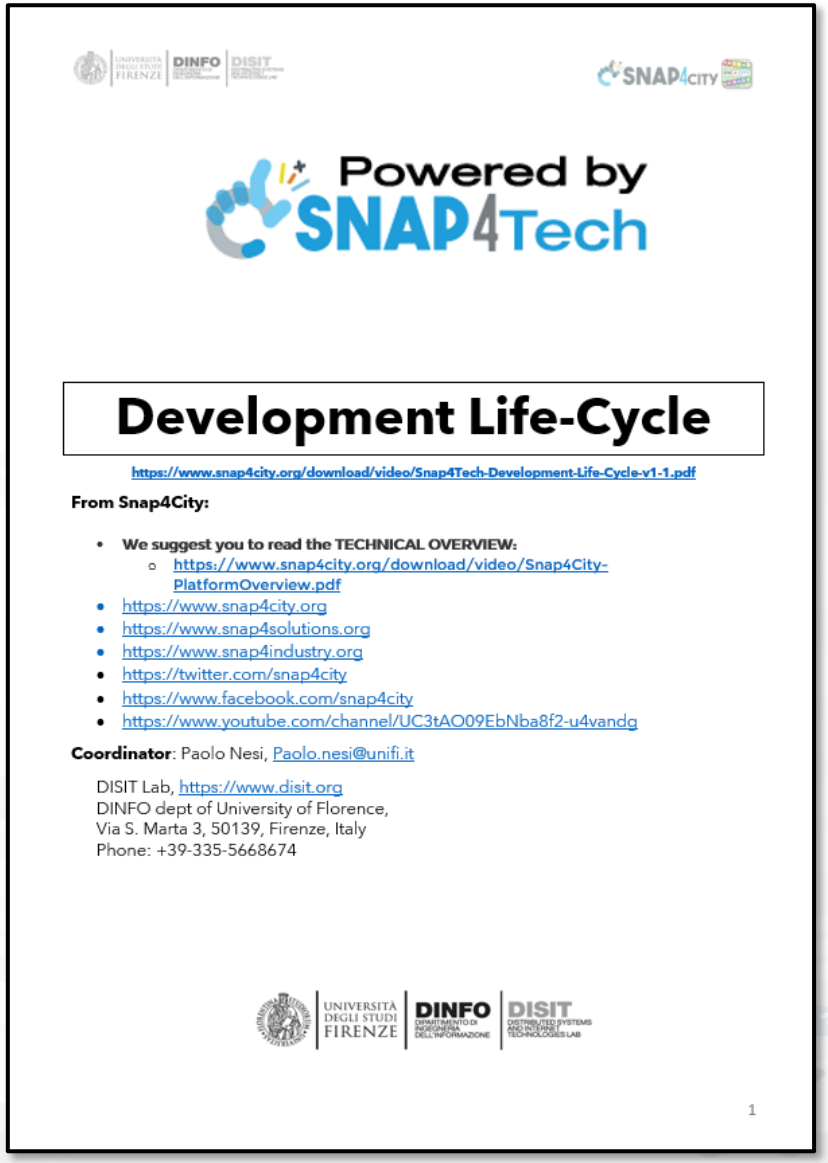


Living Lab Accelerating



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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DINFO dept of University of Florence,
Via S. Marta 3, 50139, Firenze, Italy
Phone: +39-335-5668674

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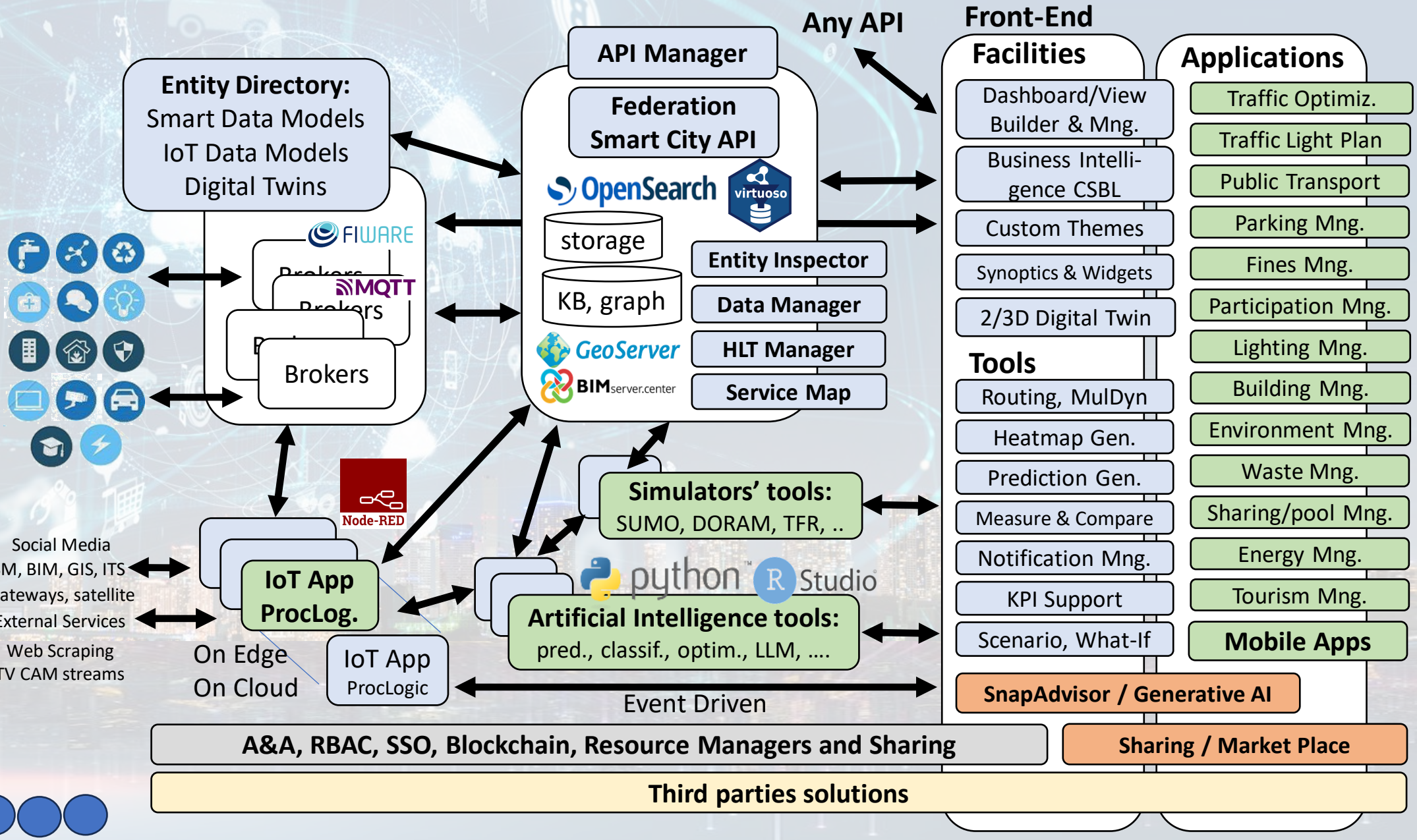
1

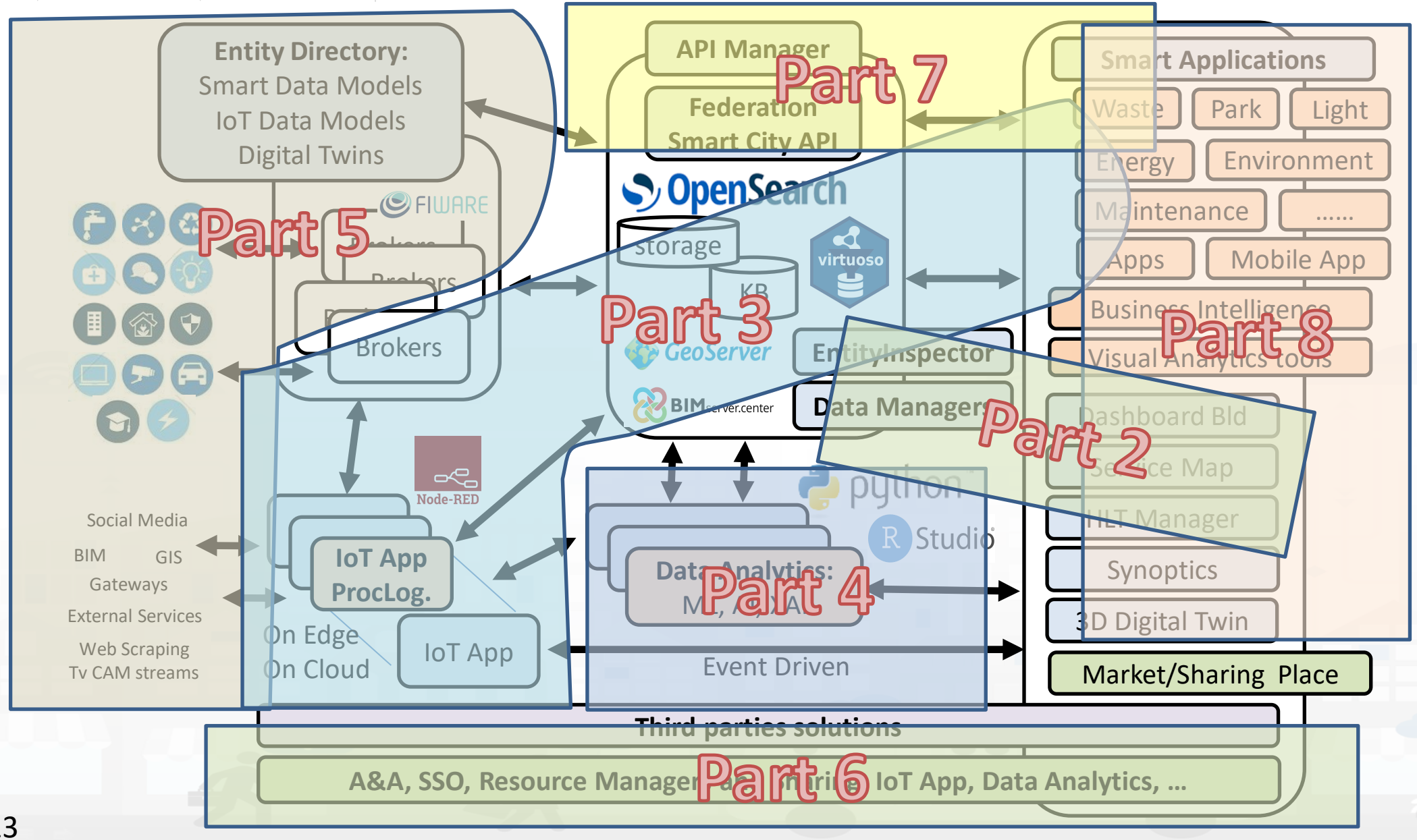
Recall on Snap4City Architecture



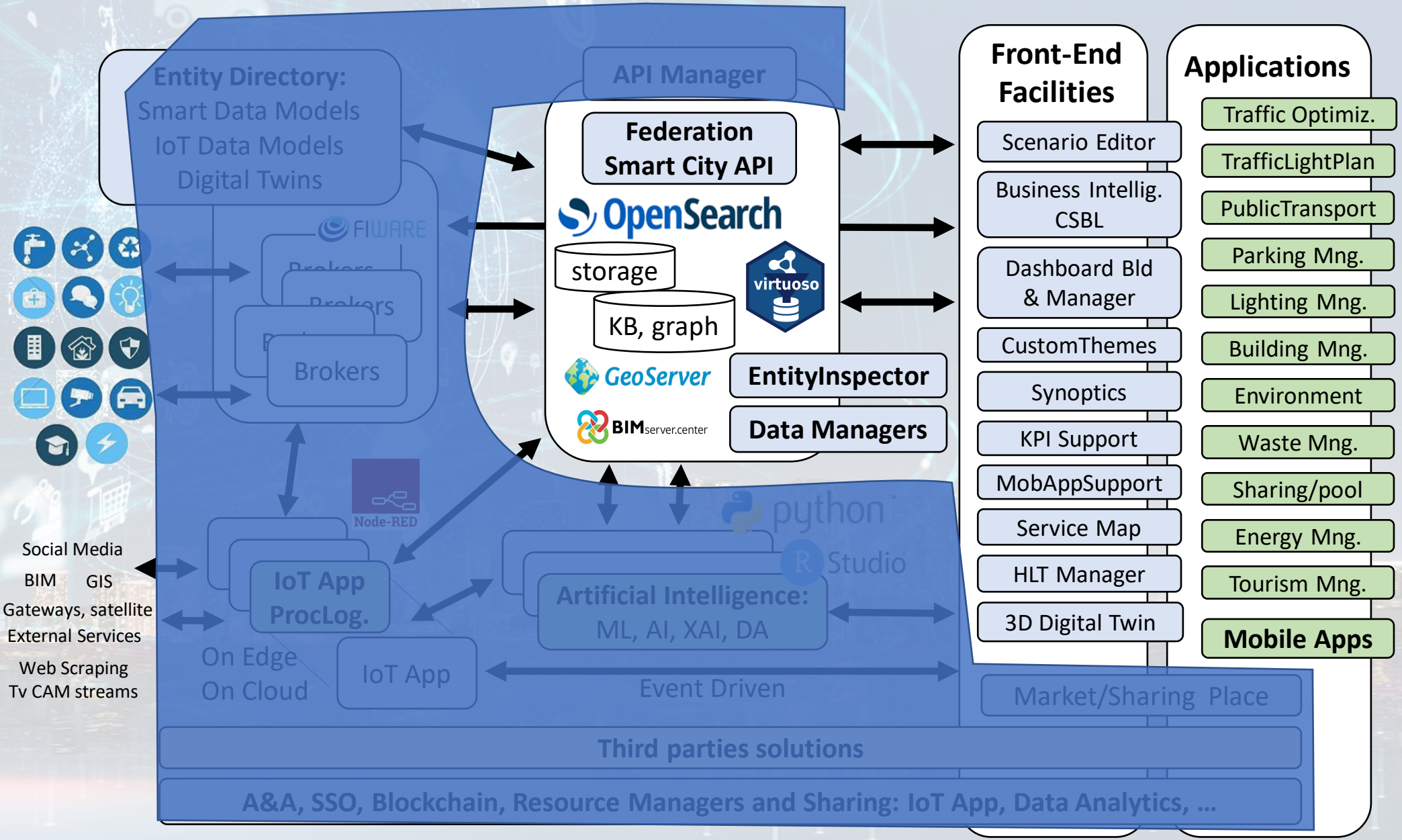
Technical Architecture



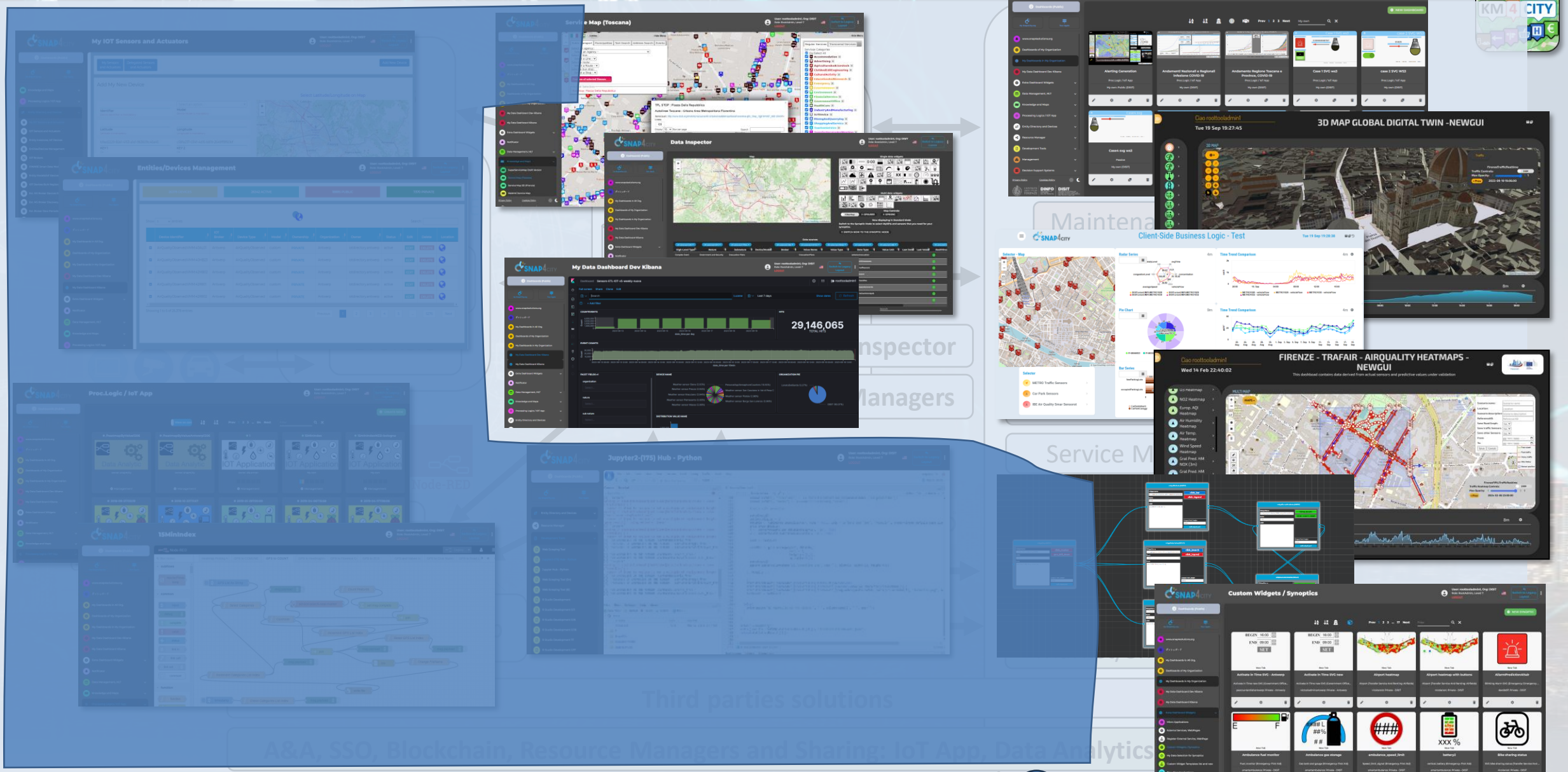
Tech Arch

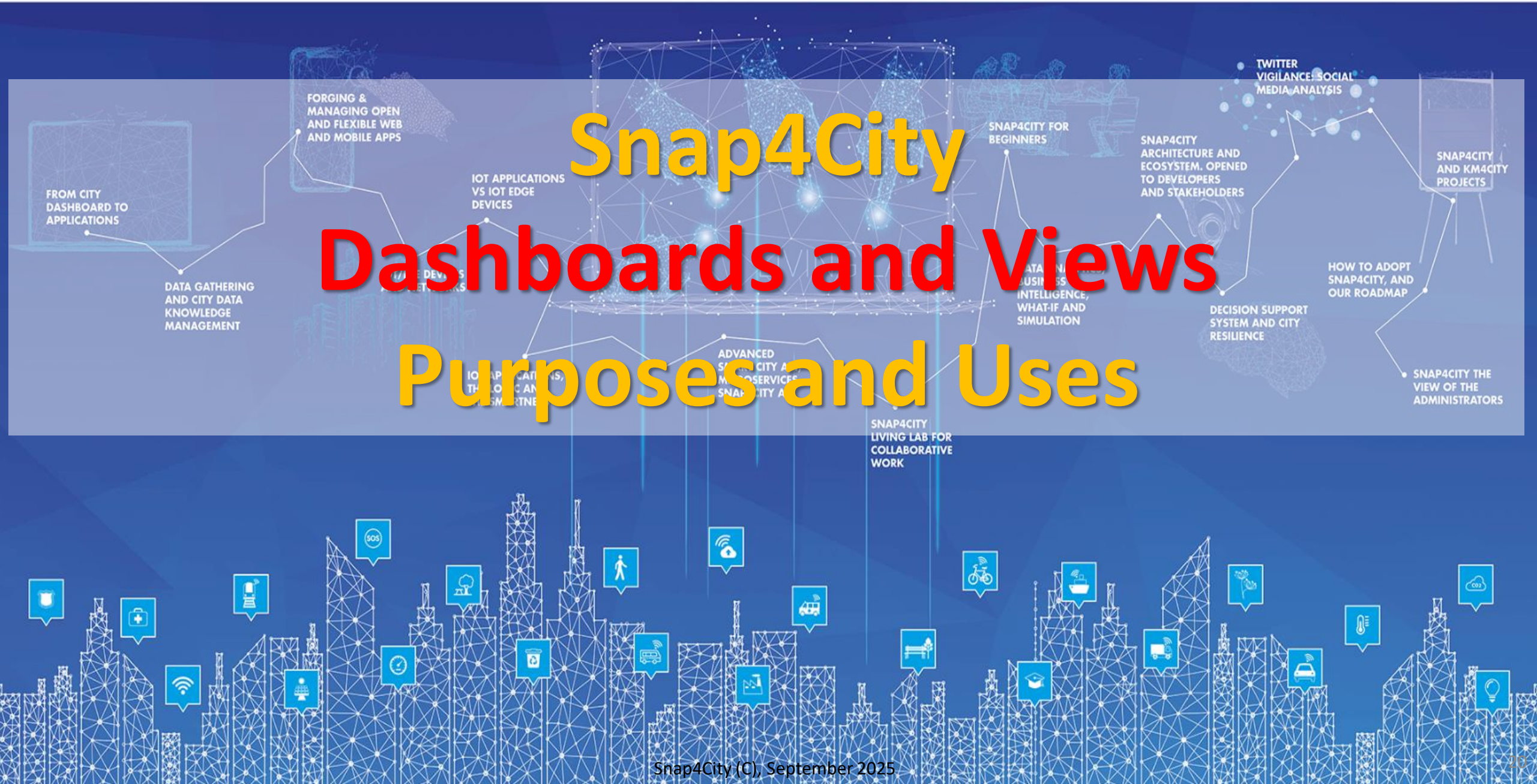

Entity Directory:
Smart Data Models
IoT Data Models
Digital Twins
Part 5
FIWARE
Brokers
Brokers
Brokers
Social Media
BIM
GIS
Gateways
External Services
Web Scraping
Tv CAM streams
Node-RED
IoT App
ProcLog.
On Edge
On Cloud
IoT App
API Manager
Part 7
Federation
Smart City API
OpenSearch
storage
KB
virtuoso
Part 3
GeoServer
BIM server.center
EntityInspector
Data Managers
python
R Studio
Data Analytics:
Event Driven
Smart Applications
Waste
Park
Light
Energy
Environment
Maintenance
.....
Apps
Mobile App
Business Intelligence
Visual Analytics tools
Part 8
Part 2
Dashboard Bld
Service Map
HLT Manager
Synoptics
3D Digital Twin
Market/Sharing Place
Third parties solutions
A&A, SSO, Resource Manager
IoT App, Data Analytics, ...
Part 4
Part 6

Technical Architecture



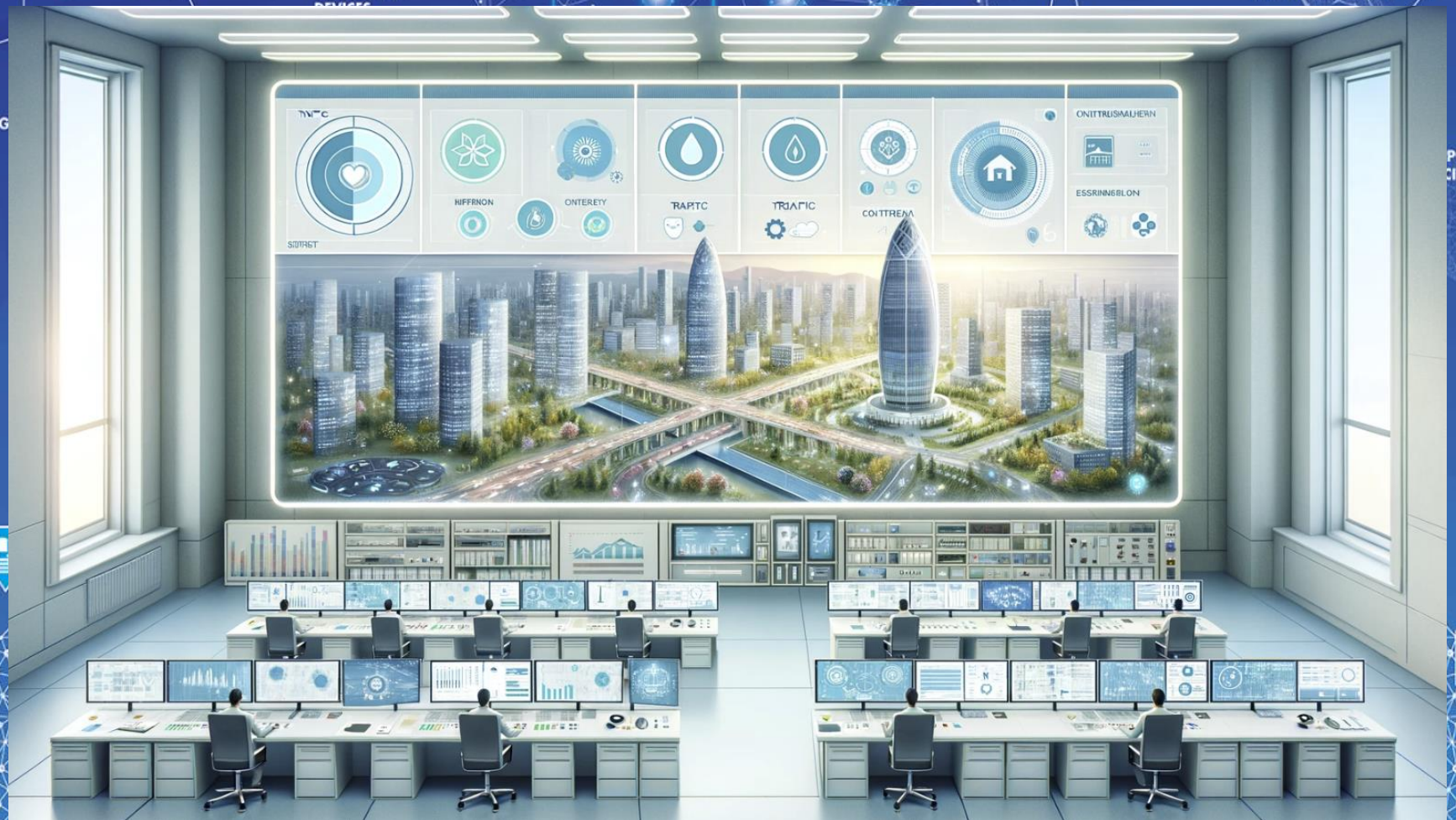
Visual Development Tools





Snap4City
Dashboards and Views
Purposes and Uses

Operation, Monitoring Control



FROM CITY DASHBOARD TO APPLICATIONS

DATA GATHERING AND CITY DATA KNOWLEDGE MANAGEMENT

FORGING & MANAGING OPEN

IOT APPLICATIONS VS IOT EDGE

TWITTER VIGILANCE: SOCIAL MEDIA ANALYSIS

TO DEVELOPERS AND STAKEHOLDERS

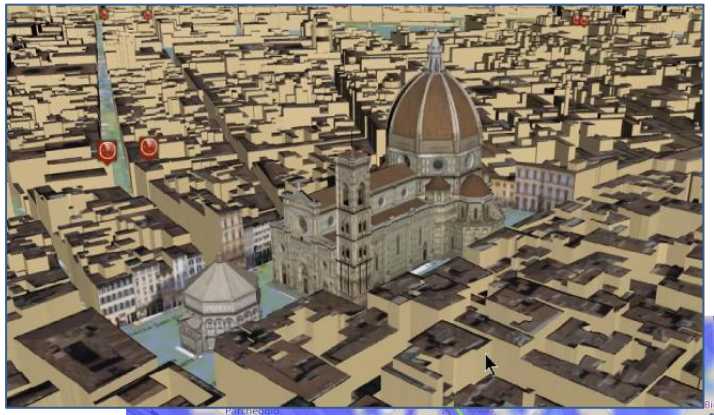
HOW TO ADOPT SNAP4CITY, AND OUR ROADMAP

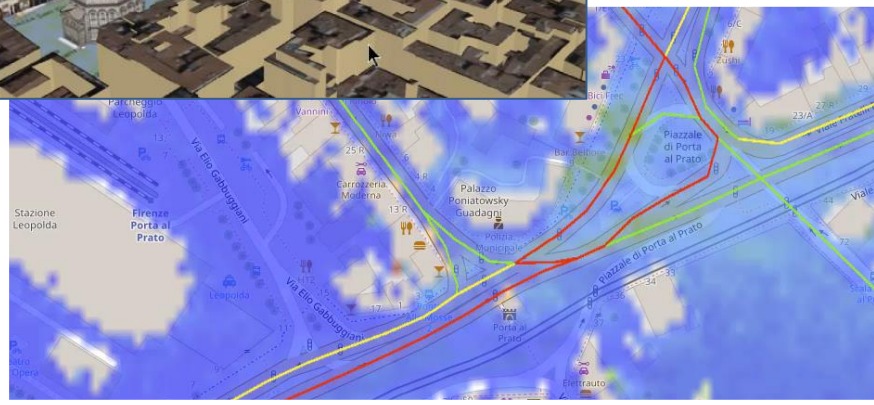
SNAP4CITY THE VIEW OF THE ADMINISTRATORS

100% OPEN SOURCE

Monitoring

- **Controlling Status: management, and operational**
  - Monitoring via KPI
  - Computing predictions and KPI
  - Anomaly detection, Early warning
  - Control Rooms, situation rooms
- **Reacting: Computing in real time**
  - Changing semaphore maps
  - Changing Dynamic signage
  - Real time Info Mobility
  - User engagement via Mobile Apps
  - What-if analysis, optimization
  - etc.,







Dashboards/views Purposes

- **Real Time: control room, monitoring, acting**
  - H24 Video Wall representation of the status:
- **Quasi Real Time, short term monitoring and management/acting**
  - Situation Rooms: interactive data representation with visual analytics and business intelligence, What-if analysis by scenario
  - Operational management, real time What-if analysis by scenario
- **Mid and Long term, for tactic and strategic planning/restructuring**
  - Visual Analytics and in deep Business Intelligence
  - Long term What-If analysis







Real Time: control room, monitoring

- **Video Wall:** physical and virtual:
  - control rooms OR distributed control rooms (web and mobile views)
- **Decision Makers** need to
  - **receiving in real time the same changes and events**
    - ***The business intelligence interactions performed by an operator shown to others***
  - rx **Early Warning**: receiving real time notifications in push, telegram, etc.
  - **share the same views** monitoring a specific situation
    - may be located in multiple places
    - may be connected by using multiple kind of devices
  - **chatting** privately on the same context, PushToTalk



Control Room



https://www.snap4city.org/621

Early Warning, Detection

Issue:

- Detection of critical condition
- Not easily detected with other means

Impact:

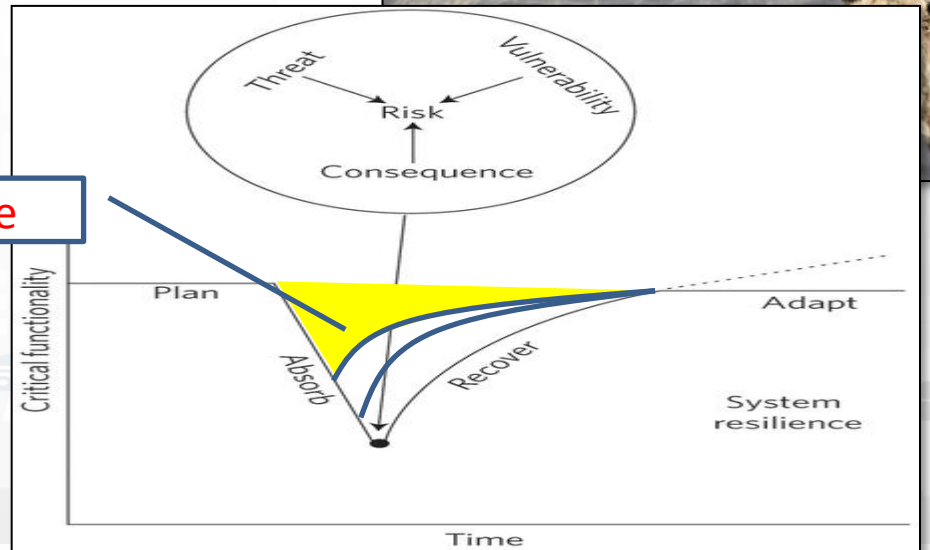
- Early warning, faster reaction
- Increased resilience

Several metrics related to:

- Volume of retweets
- Sentiment analysis

Prepare
Absorb
Recover
Adapt





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Video Wall

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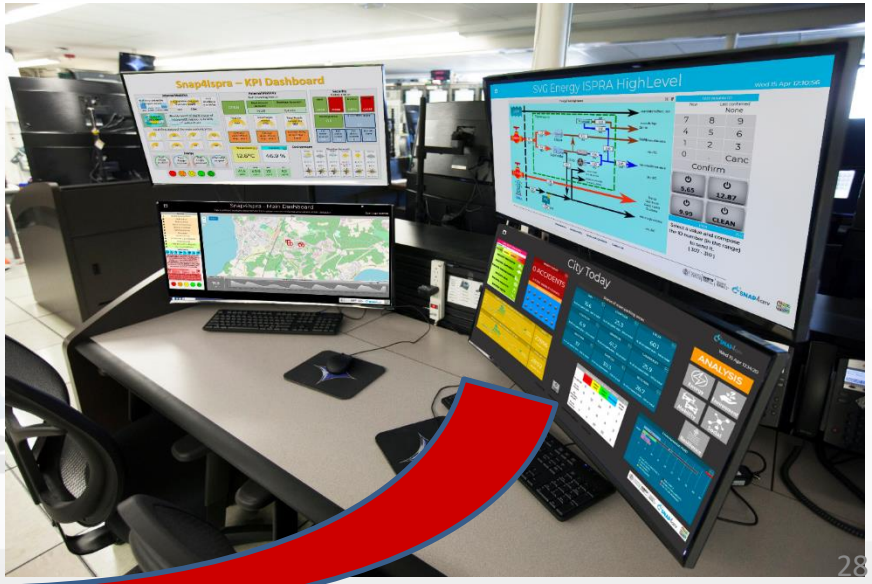


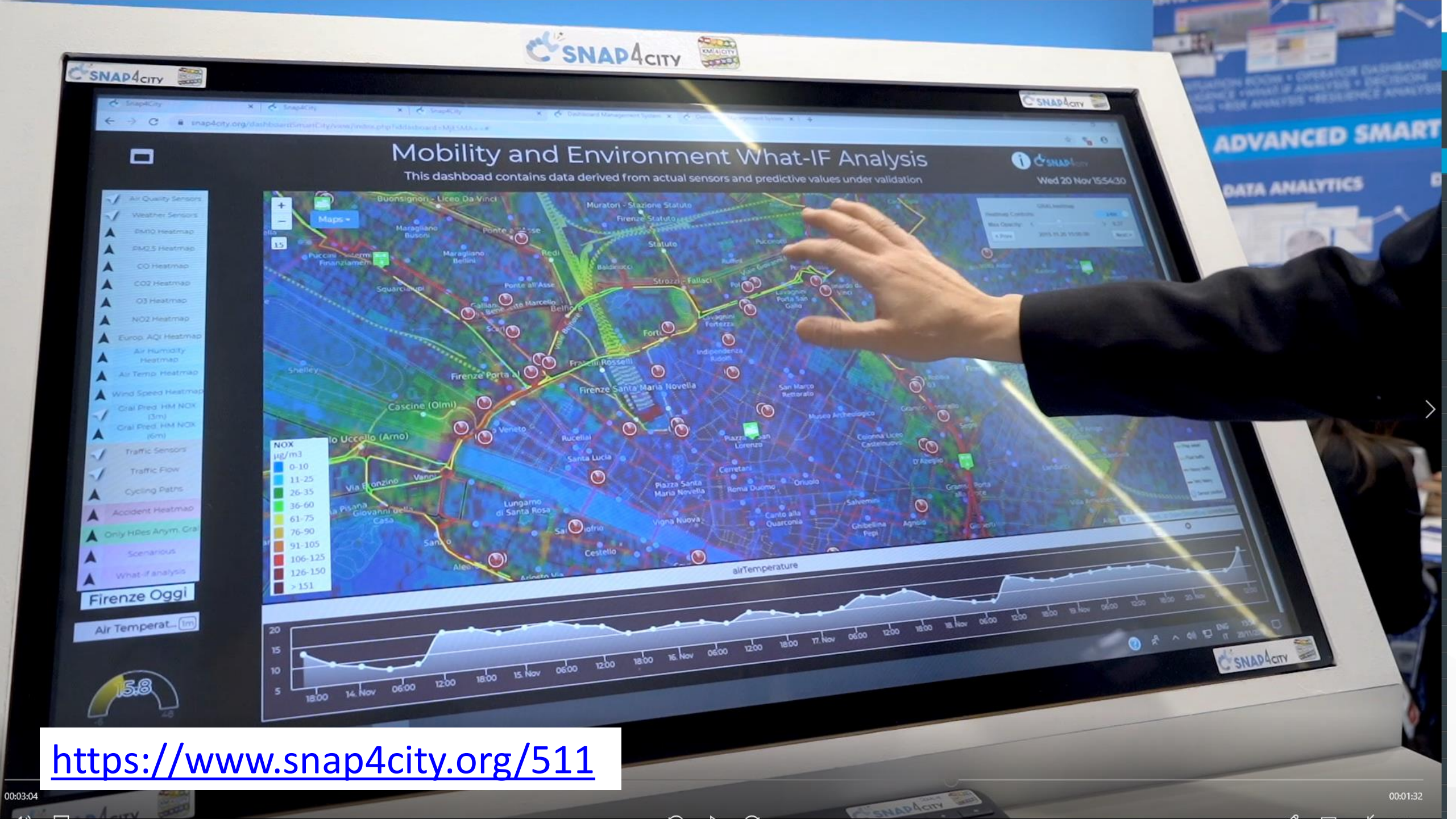
From Consolle Operator to the Video Wall


MAPPA FIRENZE
Fri 19 Oct 17:24:39
Colonnine Ricarica
Colonnine ricarica Fast
Pannelli a Messaggio Variabile
Parcheggi
Piste Ciclabili
Sensori del Traffico
Stazioni ambientali
Stazioni meteo
Traffico Real Time
Varchi ZTL
Wi-Fi
Eventi Traffico a Firenze
Concentration - 7 days
Main

Quasi Real Time, short term monitoring and management

- **Situation Rooms:** limited number of people in the same room on the same screen, on the ***business intelligence***
  - possibility of modifying the data in local simulations to better assess condition and validate proposed solving scenario
  - interactive and intelligent applications for
    - visual analytics and business intelligence,
    - What-if analysis by scenario
- **Operational management**,
  - real time What-if analysis by scenario





https://www.snap4city.org/511

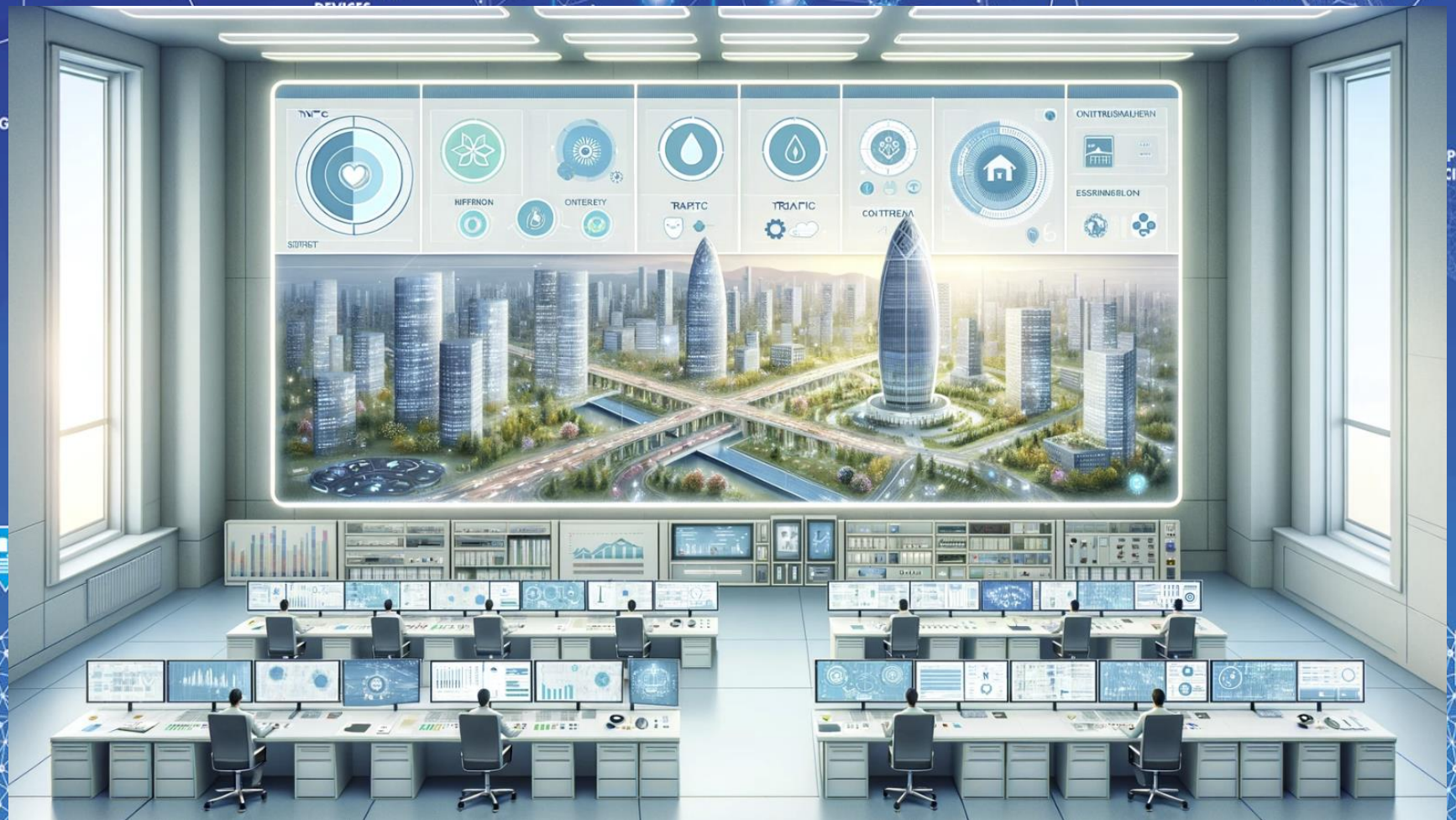
00:03:04

00:01:32



https://www.snap4city.org/511

Controlling via KPI, SDG, ...



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SNAP4CITY AND KM4CITY PROJECTS

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SNAP4CITY THE VIEW OF THE ADMINISTRATORS

100% OPEN SOURCE

Key Performance Indicators, KPI





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 target value has become a limit value since 1 January 2015	10 µg/m³	
PM_{10}	One day	Limit value, 50 µg/m³	Not to be exceeded on more than 35 days per year.	50 µg/m³ (*)	99th percentile (3 days/year)
PM_{10}	Calendar year	Limit value, 40 µg/m³ (*)		20 µg/m³	
O_3	Maximum daily 8-hour mean	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	

- **United Nations Sustainable Development Goals, SDGs** (for which cities can do more to achieve some of the 17 SDGs, https://sdgs.un.org/goals);
- **15 minutes cities** (where primary services must be accessible within 15 minutes on foot);
- **objectives of the European Commission** in terms of pollutant emissions for: NO2, PM10, PM2.5 (https://environment.ec.europa.eu/topics/air_en);
- **SUMI: mobility and transport vs env**
  - https://www.snap4city.org/951
- **PUMS: mobility and transport vs env**
- **ISO indicators:** city smartness, digitization, tech level.
- **Low Level/Real Time:** global traffic, quality of service, betweenness, centrality, queue, time to travel, etc.

Global & Local

Periodic & Realtime


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

SUSTAINABLE DEVELOPMENT GOALS

SNAP4CITY

KM 4 CITY









- ***15 Minute City Index:***
  - 13 subindexes: energy, slow mobility, fast mobility, housing, economy education, culture and cults, health, entertainment, gov, food, security…



- Optimization of car sharing/pooling
- Monitoring and Prediction of energy consumption
- Stimulating: Bike sharing, e-bikes, car charge, etc.
- Sizing energy plants, Community of energy



- Reduction of emissions, reduction of congestions
- Smart City infrastructure: monitoring and resilience, long terms predictions, optim. operation and plan
- Effective and Low cost smart solutions
- What-if analysis, Simulations, optimization
- Origin Destination matrices computation





- Reduction of emissions, reduction of congestions
- Monitoring and Predicting: NO2, NOX, CO2, Traffic flow, pollutant, landslide, waste, etc.
- Traffic flow reconstruction, optimisation
- Demand vs Offer of Mobility analysis



- Predictive maintenance
- Decisions Support Systems
- Process optimization, control
- Industry 4.0 integrated solutions
- AI assistant for commercial activities



- Optimization of Waste Collection
- business intelligence tools for decision makers
- Reduction production costs
- Monitoring resource consumption
- Advisor for documentation, generative AI

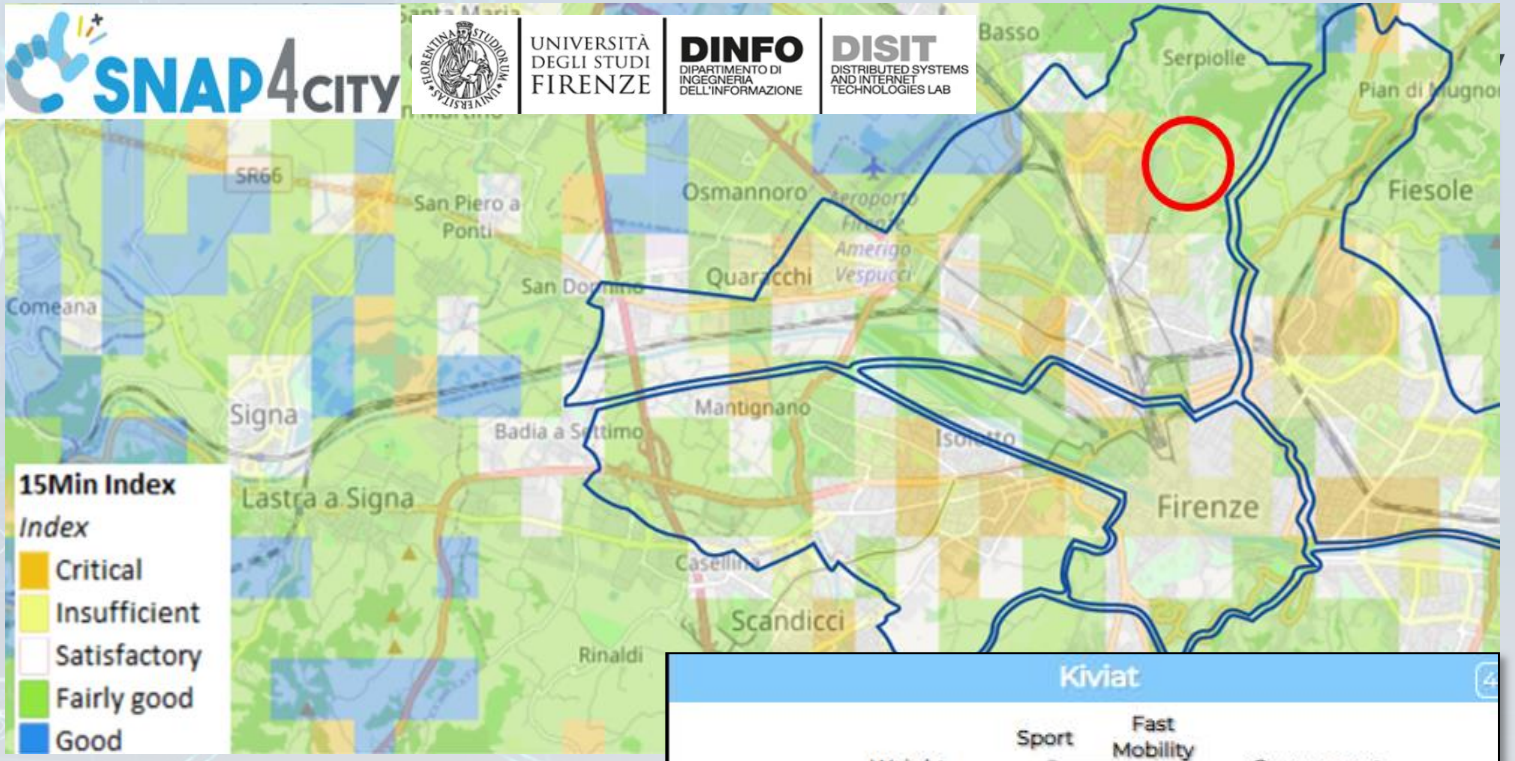


- Shortening justice time
- Prediction of mediation proneness
- Assisting institution is taking legal decisions
- Anonymization and indexing legal docs.
- Ethical Explainable Artificial Intelligence
- Advisor for legal documentation, generative AI

15MinCityIndex

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

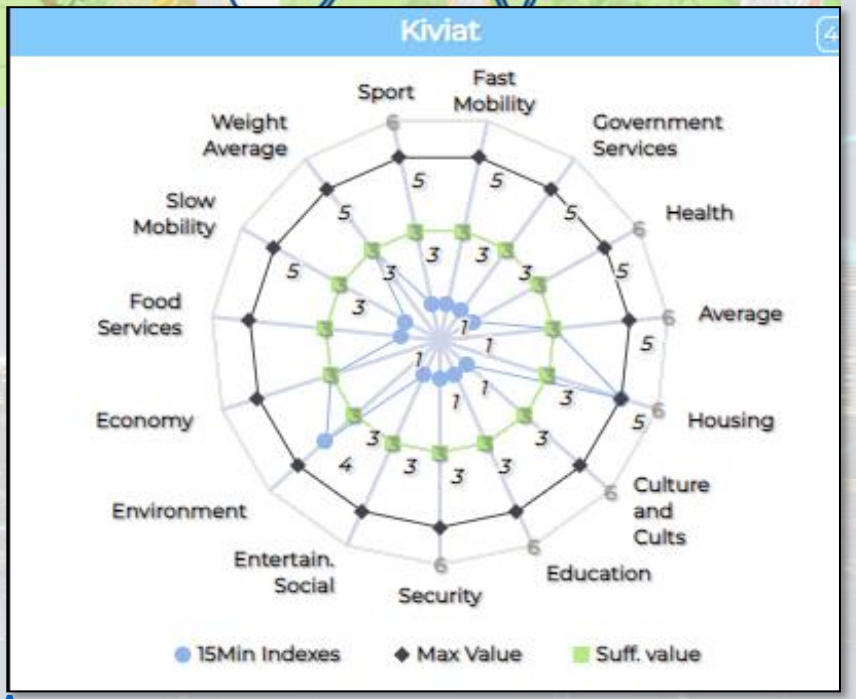
Using the Open Data:
We developed a data analytic tool based on municipal and national open data to assess services adequacy for people living in each 15 minutes areas of the city.



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.

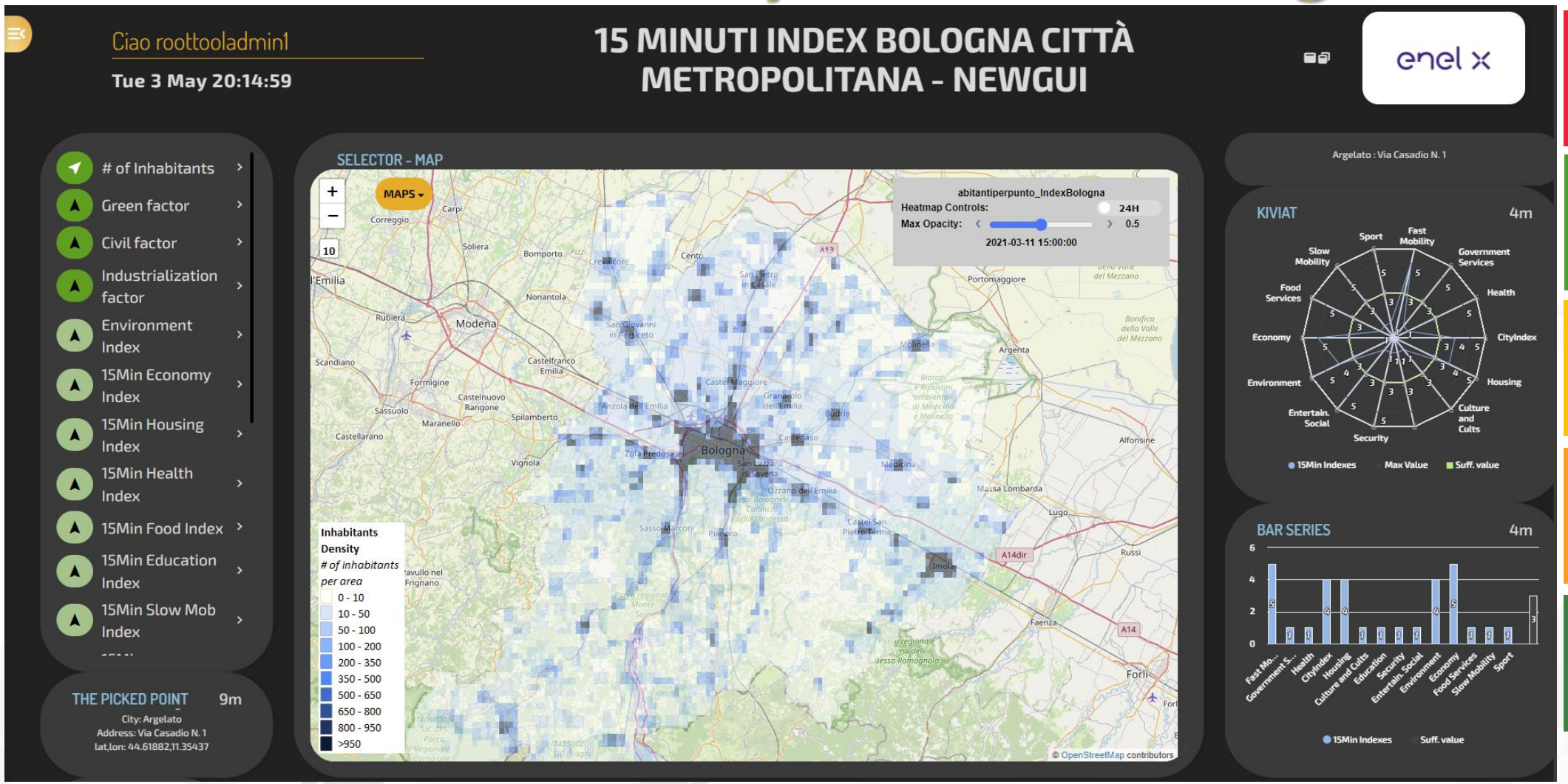


Careggi/Rifredi is a relevant district in Florence because of hosting the main Florence/Tuscany hospitals Careggi and Meyer, but also university headquarters and many other workplaces.



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

15MinCityIndex on Bologna





https://www.snap4city.org/dashboardSmartCity/view/Baloon-Dark.php?iddasboard=MzQxMg==

Decision Support System: Immediate response and Tactic and Strategic Plans, via What-if Analysis

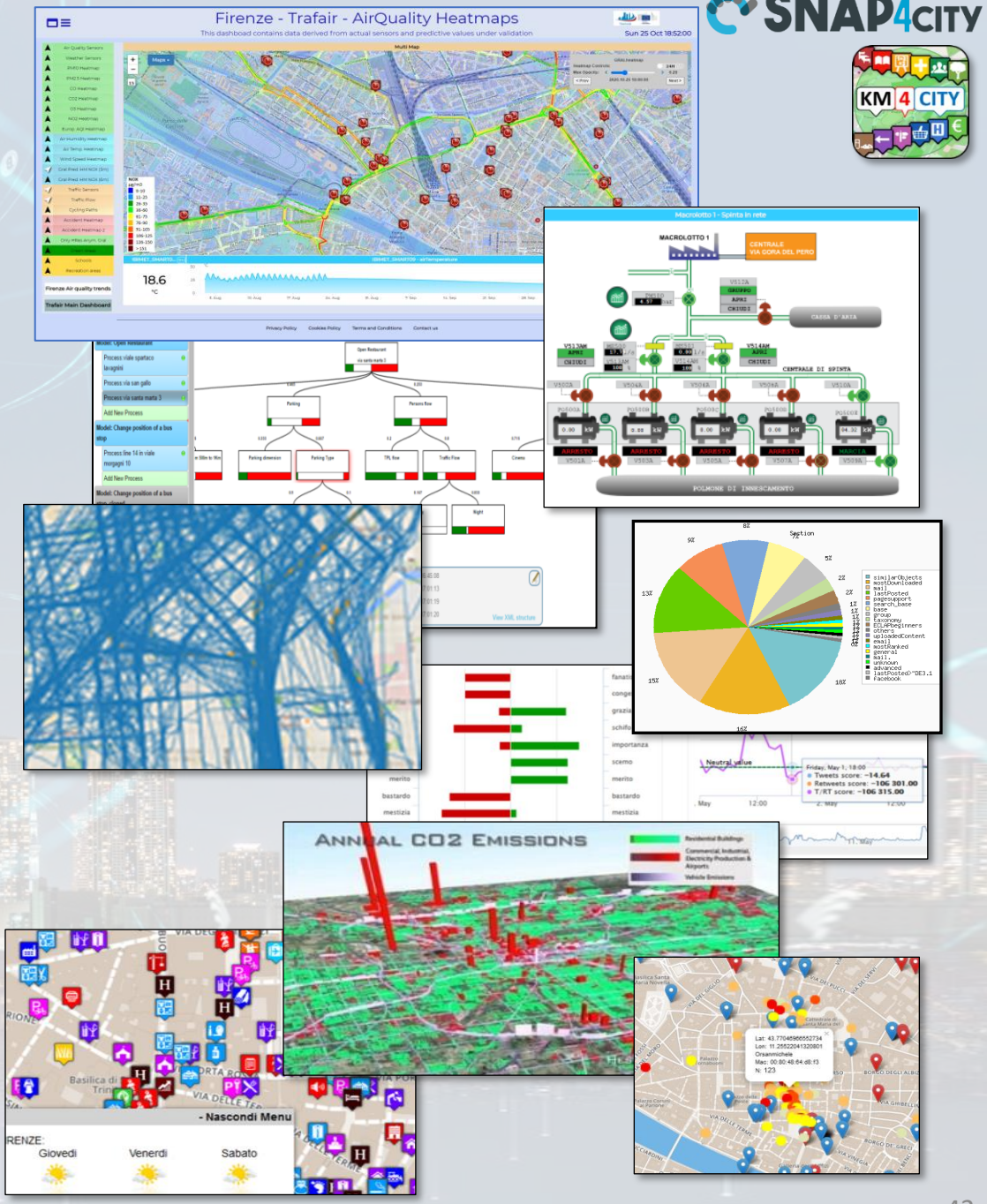


Mid and Long term, for tactic and strategic planning/restructuring

- **Defining Scenarios**: changes in the city, rules, structure, flows, roads, etc.
  - Targeting indicators, KPI, etc.
  - Simulating decisions: visual acting on defined/supposed changes
- **Visual Analytics** in deep Business Intelligence
  - Assessing results, drill down/up on space-time-relations to see the effects of the supposed decisions
- **Long term What-If analysis**
  - Computation of long terms predictions on never seen conditions
  - Simulations of the effects

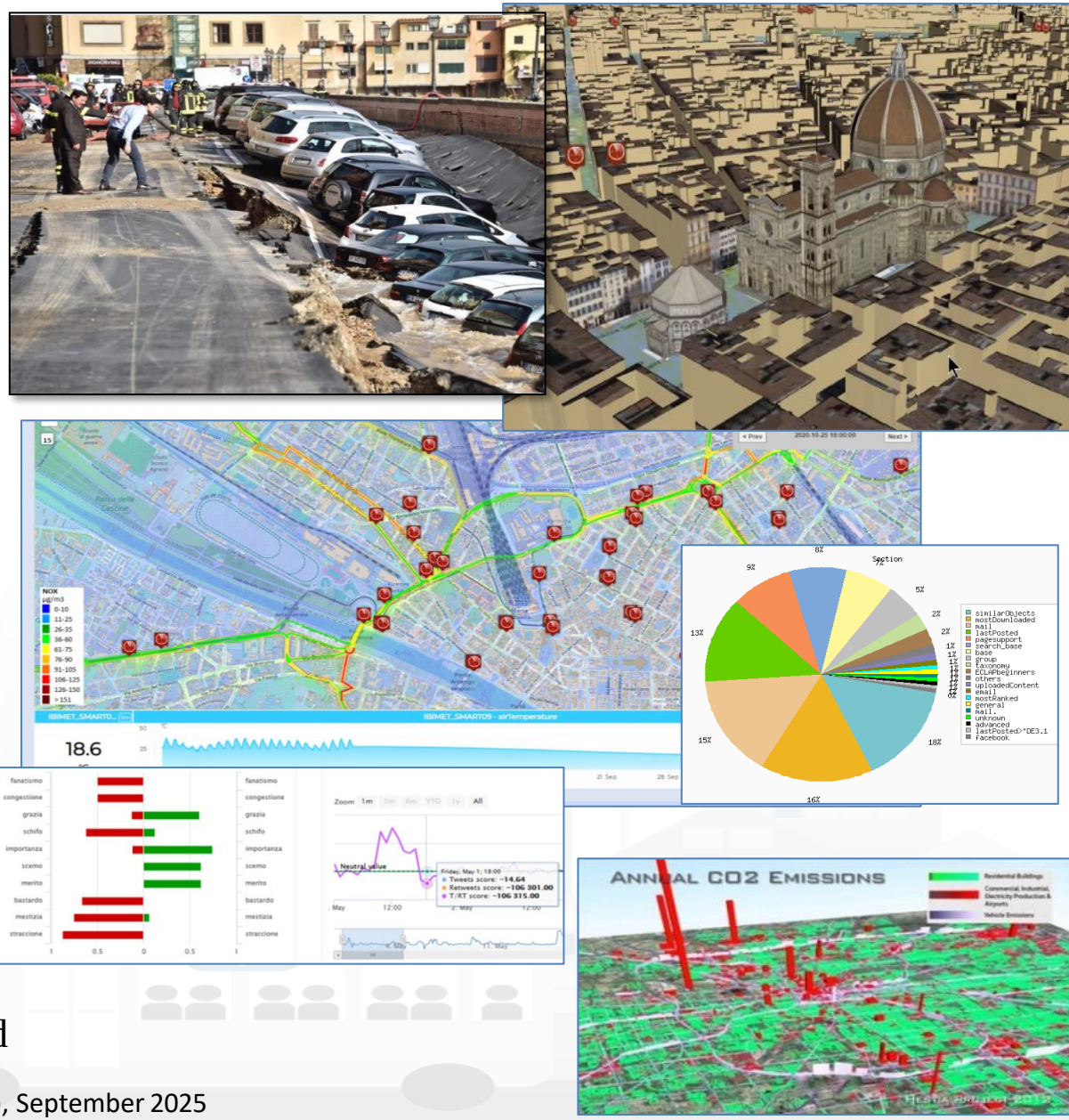
Data Driven Decision Support

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



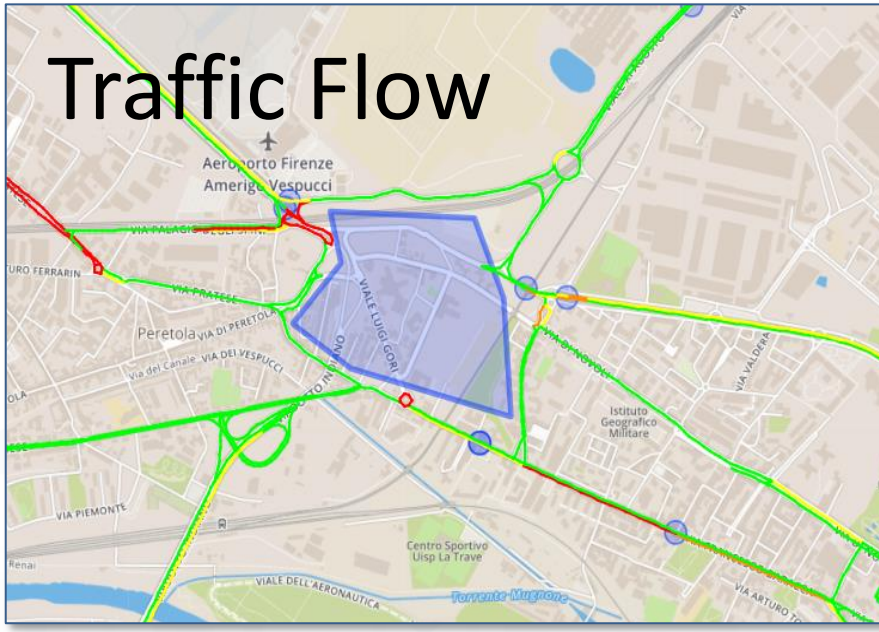
Challenges vs Technologies

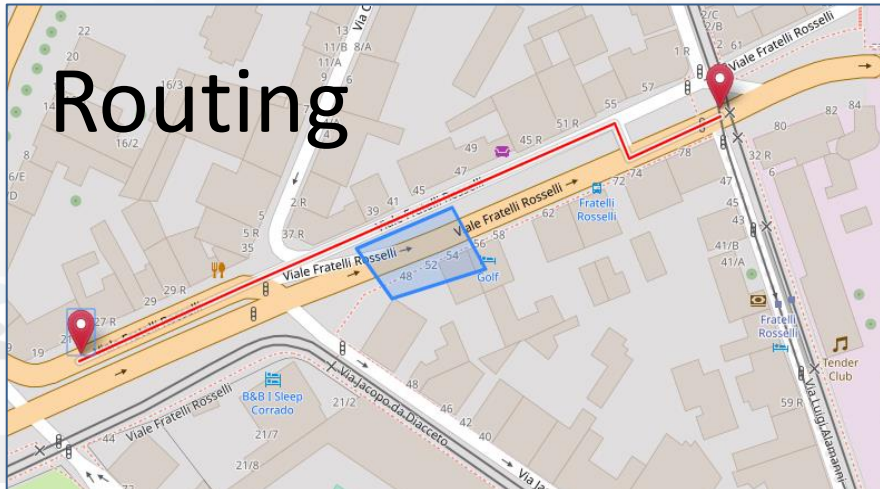
- **DSS, Decision Support Systems**, with multiple objectives:
  - **Quality of life** for citizens, improvements of services, cost reduction, innovation, attractiveness for tourists and/or industries and/or commercial activities, etc.
- **provide the decision-making process with simulation tools integrated with short-, long- and very long-term prediction algorithms**
  →*what-if analysis*
  - Analyse *incipient events* to cope with events;
  - Analyse future situations for structural planning: tactics/strategic.
- **Opportunities and needs**
  - **heterogeneous data (Big Data)**
  - **flexible, dynamic and interoperable models and analysis tools;**
  - **accessible for:**
    - Operators, decision-makers, stakeholders;
    - citizens: illustrating and discussing possible solutions and development plans with them: cowork



Decision Support Systems, What-if

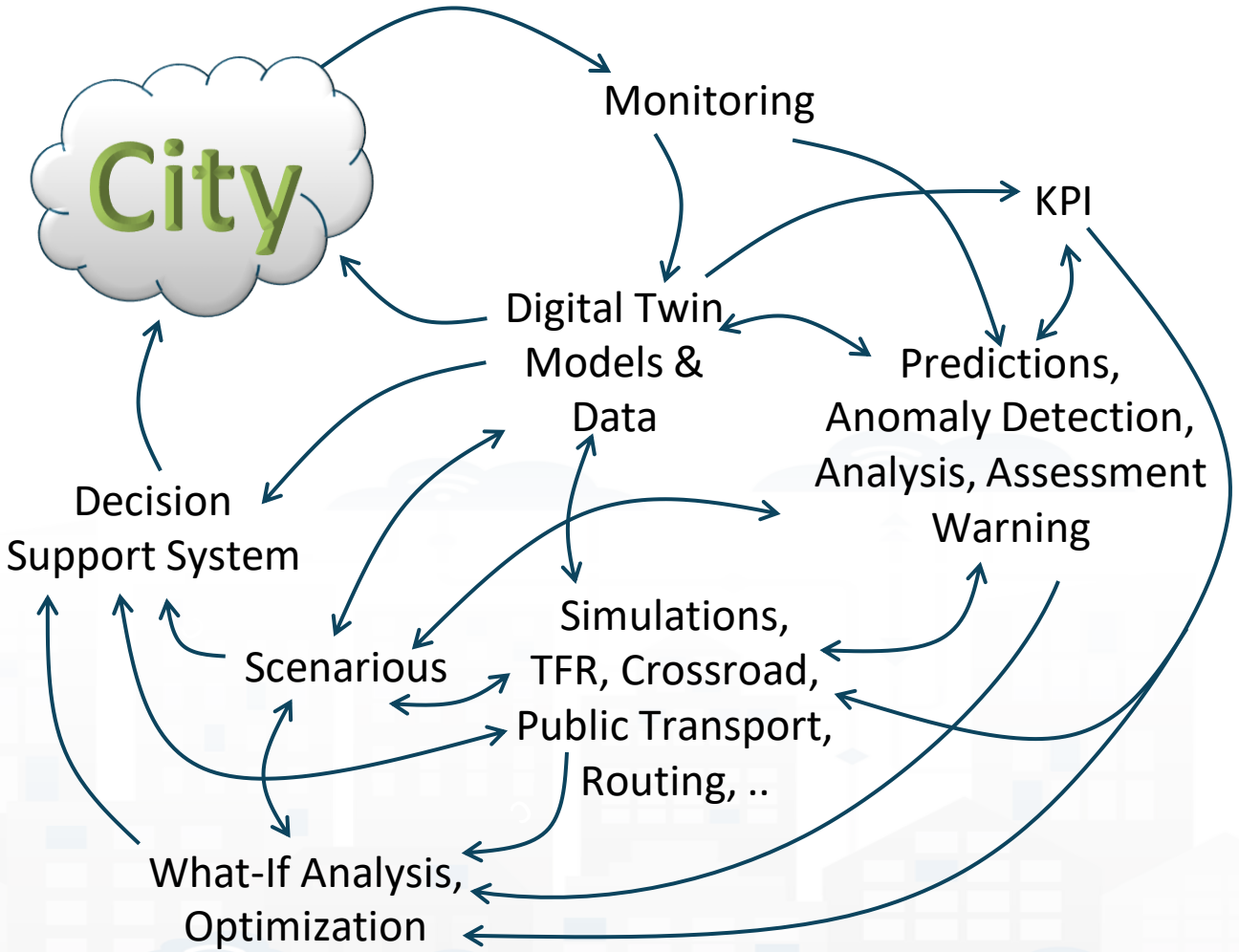
- **Event planning, via what-if analysis**
  - Change in the graph structure of the city
  - Impact on the flow of people and vehicles
  - Adaptation: public transport, traffic, pedestrian management, etc.
- **Immediate reaction to natural events or not**
  - Everything is ready and updated in real time
  - Each view is contextualized in terms of data: descriptive and prescriptive
- **Digital Twin**
  - More detail in the context integrated data
  - Greater realism in deductions and representations
  - Less fragmentation and non-uniformity in the views to support decisions





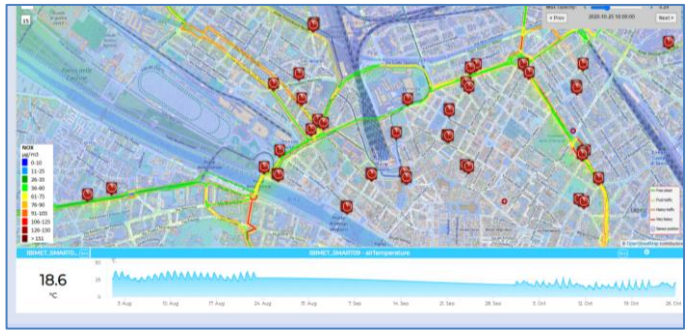
Main tasks

- **Controlling Status: management, and operational**
  - Monitoring via KPI
  - Predictions vs KPI
  - Anomaly detection
  - Neuro-Symbolic analysis
  - Risk assessment
  - Early warning on critical conditions
  - Fast What-if analysis
- **Making plan: tactic and strategic, medium and long range, micro/macro**
  - Simulation & optimization
  - Generative AI Prescriptions, scenarios
  - Resilience to Unexpected unknows
  - What-if analysis wrt scenarios
  - Collaboration with stakeholders

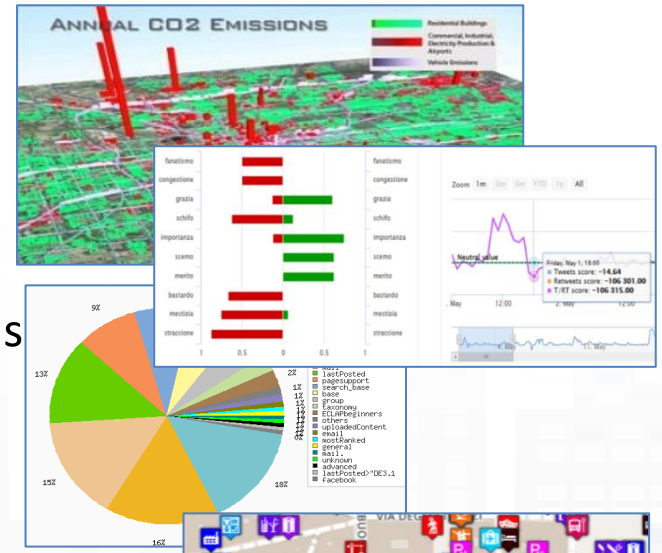


Digital Twin

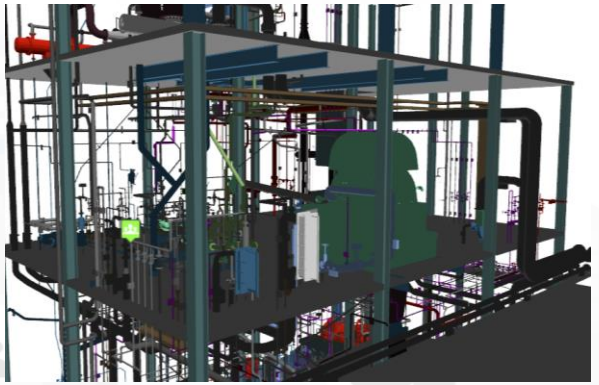
- **Digital Twin**
  - **Connected** with real systems
  - **Modelling** aspects: structural, visual, informative, real time data sensors (context), POI, functional, resources, etc.
  - **Integration:** AI/XAI techniques, simulations, users' needs, etc.
- **Utility to**
  - Experiment via simulations and analysis by case
    - Reduction of costs to experiments new solutions
    - Share the possibilities with city users
  - Virtual Representation
    - Easier to understand the context, review from multiple points of view
  - Who
    - Discussion with city users, decision makers
    - Support: decision makers, proposers of solutions

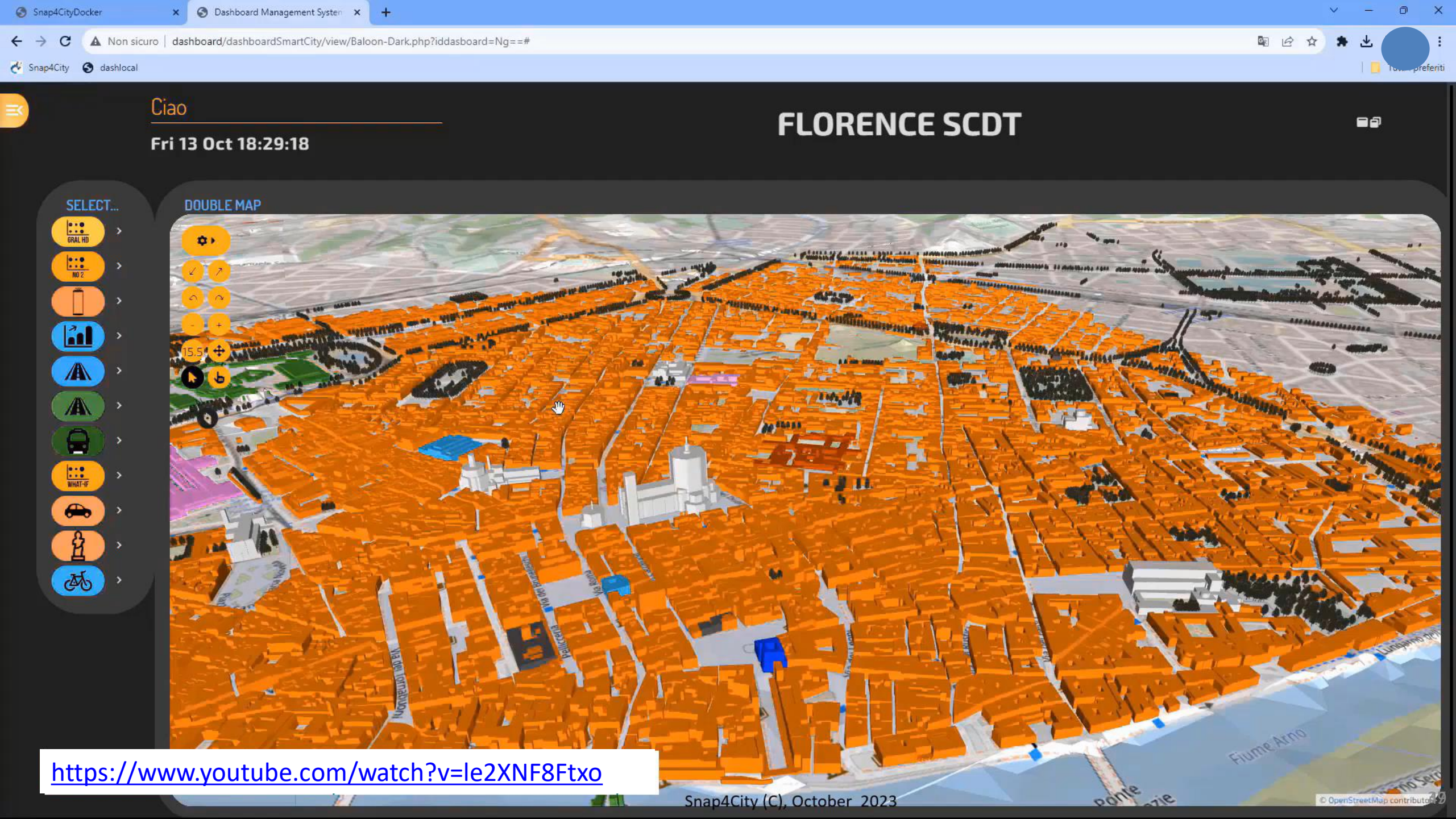






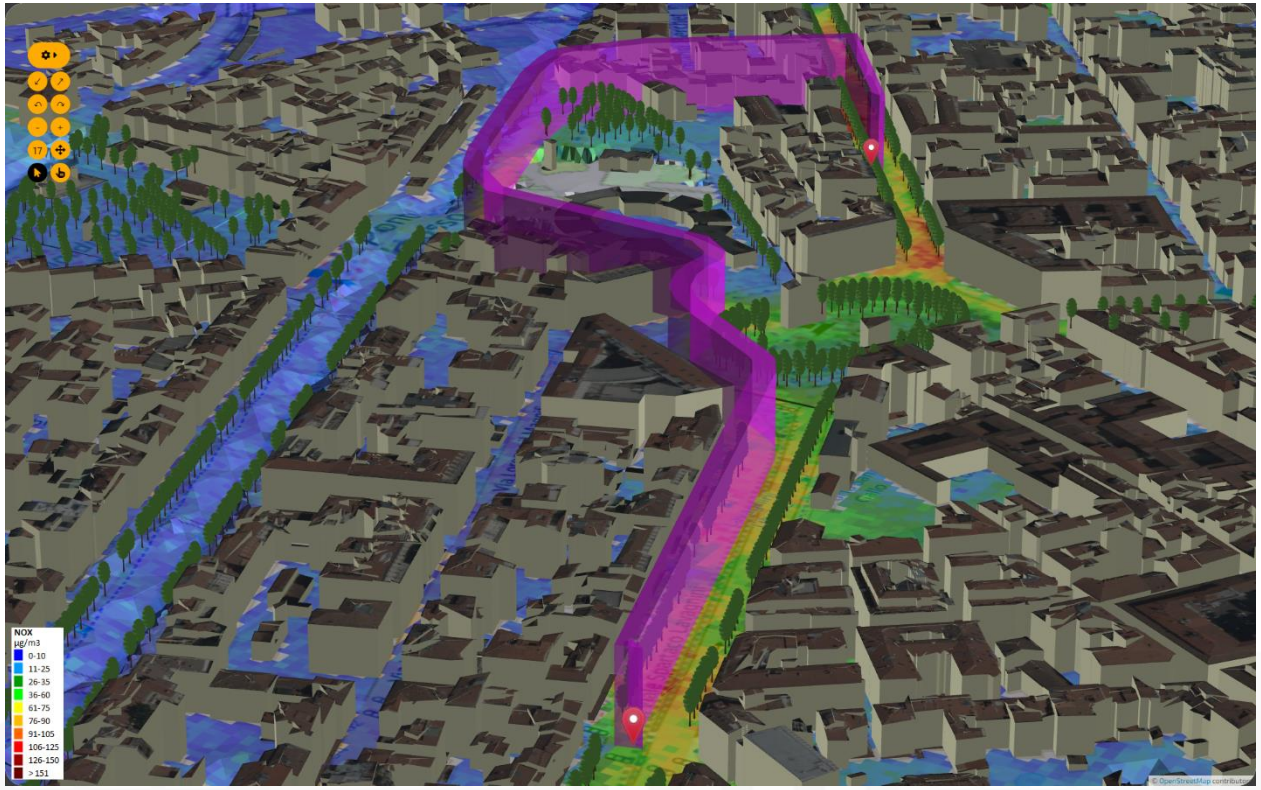


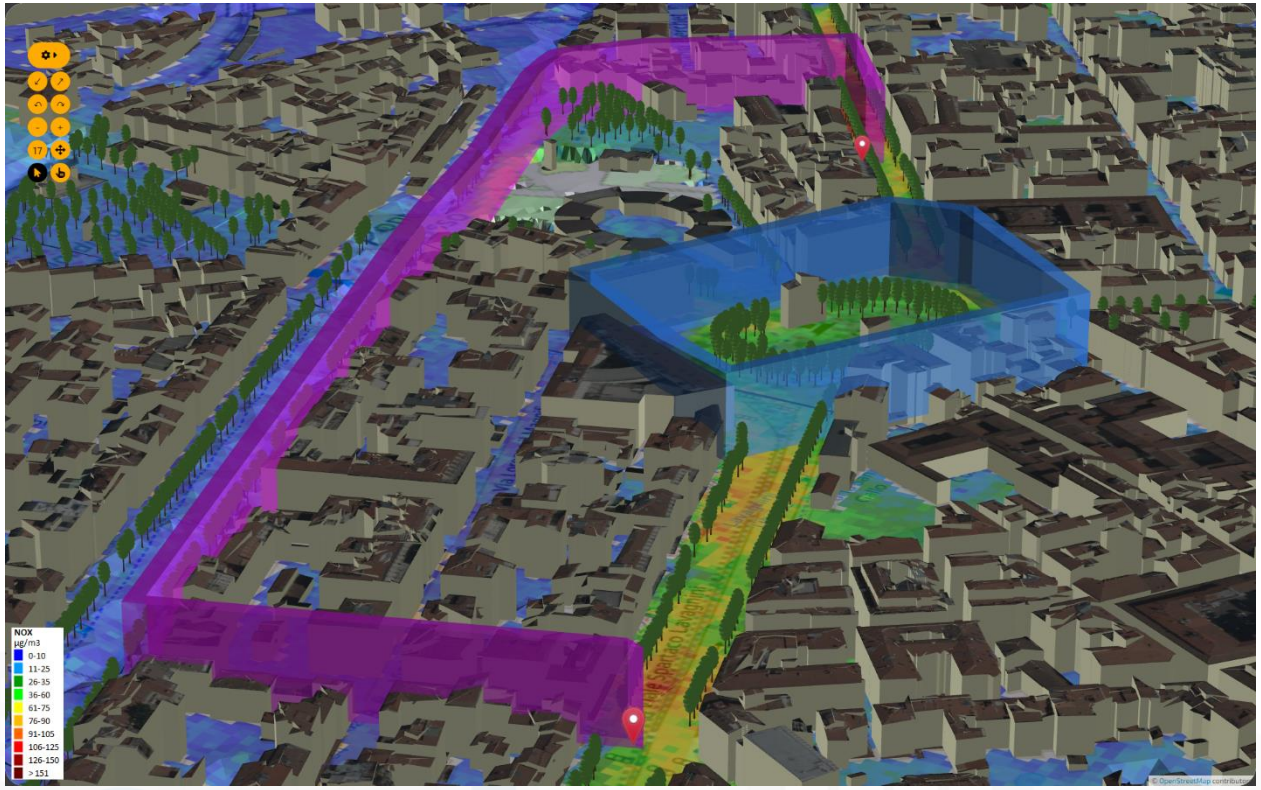




https://www.youtube.com/watch?v=le2XNF8Ftxo

Dyamic Routing in 3D space





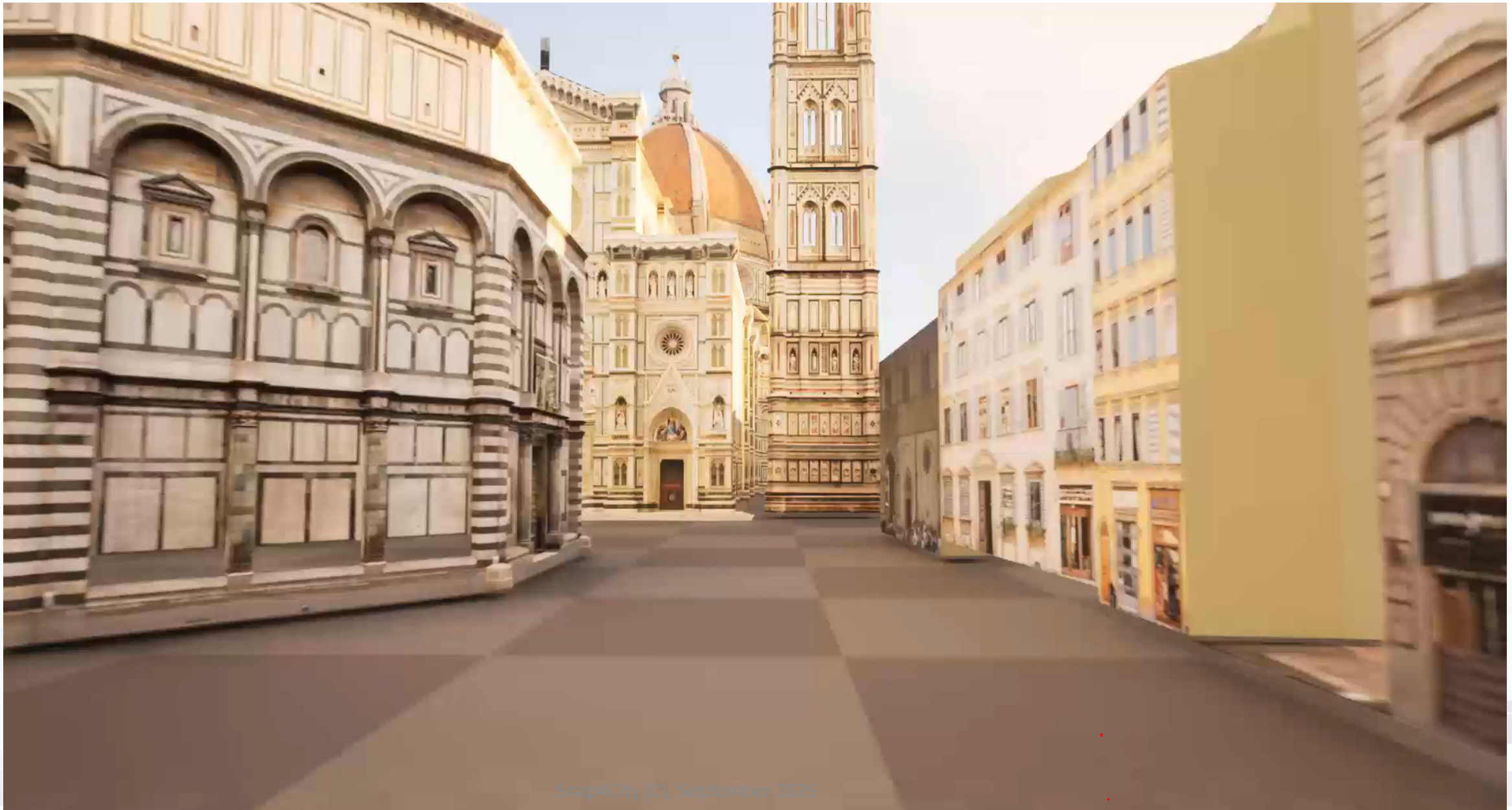
OCULUS



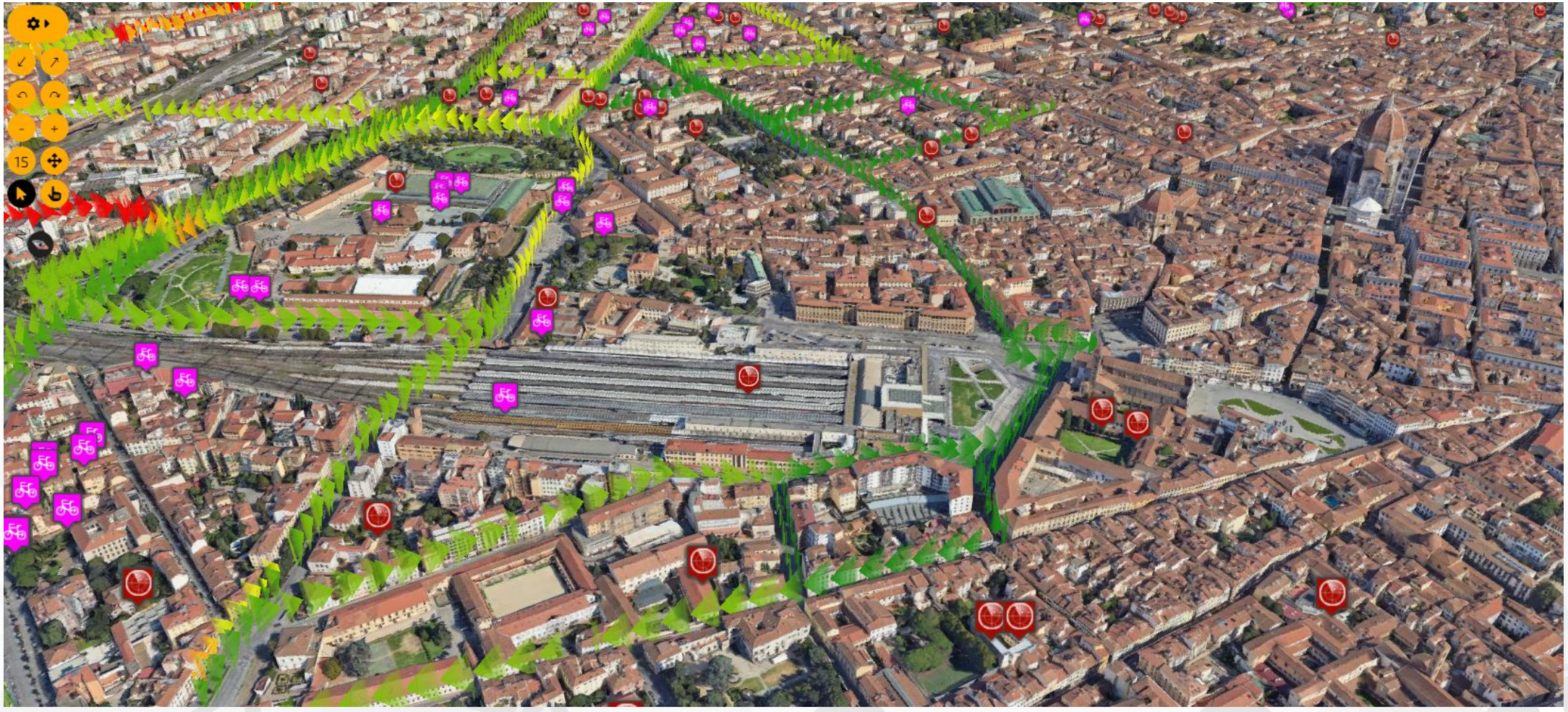

Perspective
Lit
Show
Scrivi qui per eseguire la ricerca
6°C
19:09
30/11/2022


Perspective
Lit
Show

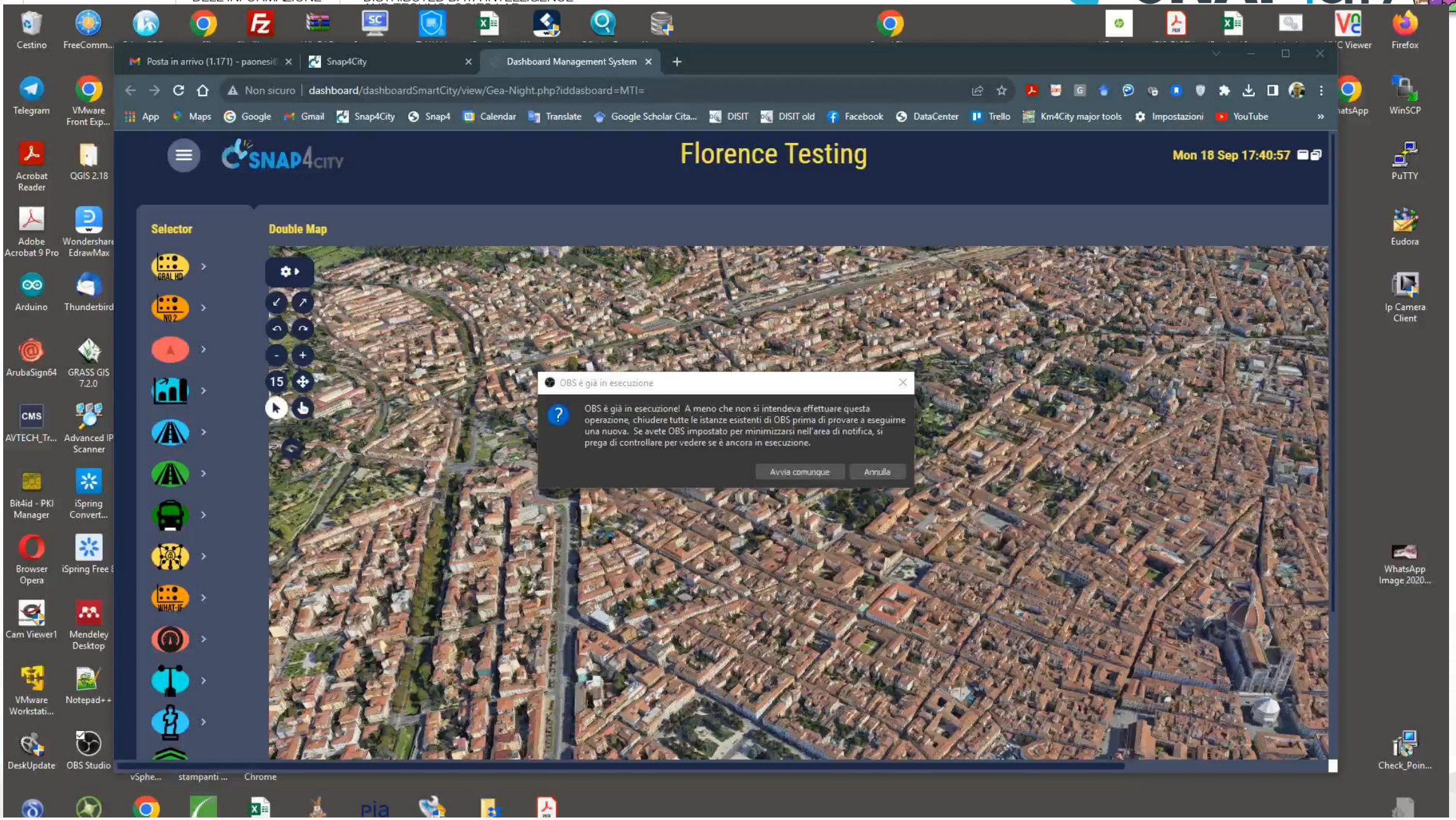
OCULUS



Snap4City Digital Twin Engine and data + 3D Google Data



Firenze


Florence Testing
Mon 18 Sep 17:40:57
Selector
Double Map
OBS è già in esecuzione
OBS è già in esecuzione! A meno che non si intendeva effettuare questa operazione, chiudere tutte le istanze esistenti di OBS prima di provare a eseguirne una nuova. Se avete OBS impostato per minimizzarsi nell'area di notifica, si prega di controllare per vedere se è ancora in esecuzione.
Avvia comunque
Annulla

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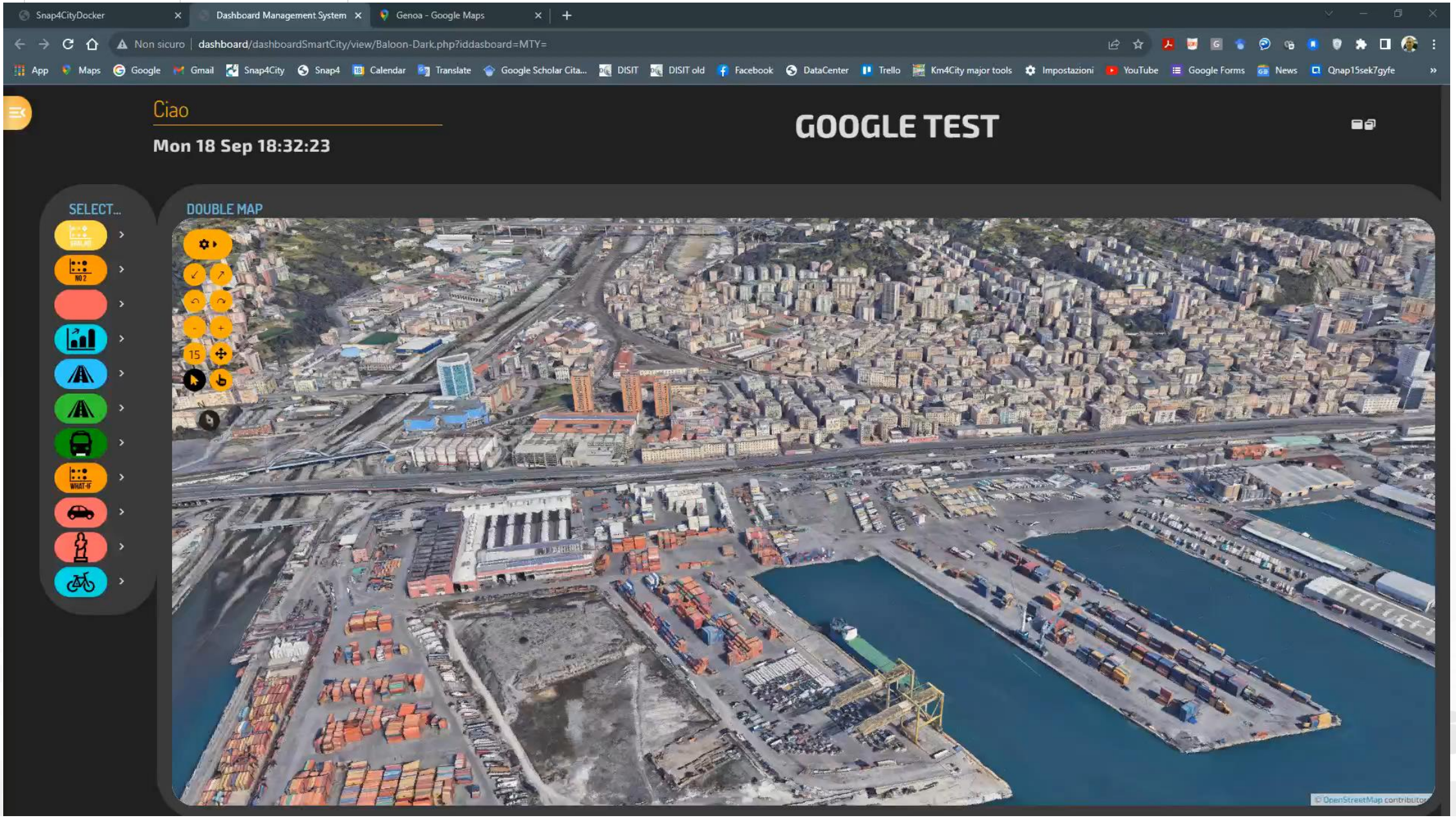
DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB
DISTRIBUTED DATA INTELLIGENCE AND TECHNOLOGIES LAB

Genova

SNAP4CITY

KM4CITY



Snap4City | Dashboard Management System | Nuova scheda

snap4city.org/dashboardSmartCity/view/index.php?iddasboard=Mzg0NA==

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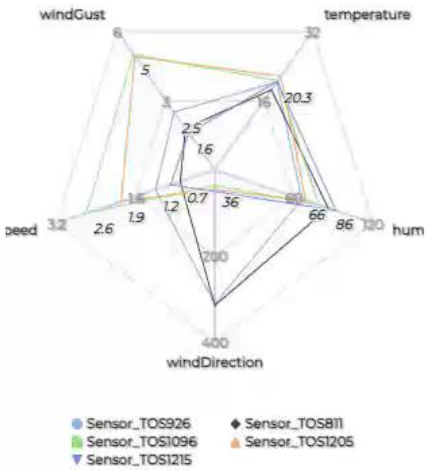
BIM Airport

Thu 25 May 18:16:22

Select the view of interest

- Airport Building 1
- Airport Heatmap dash
- Terminal Heatmap

Sensor Data 4m

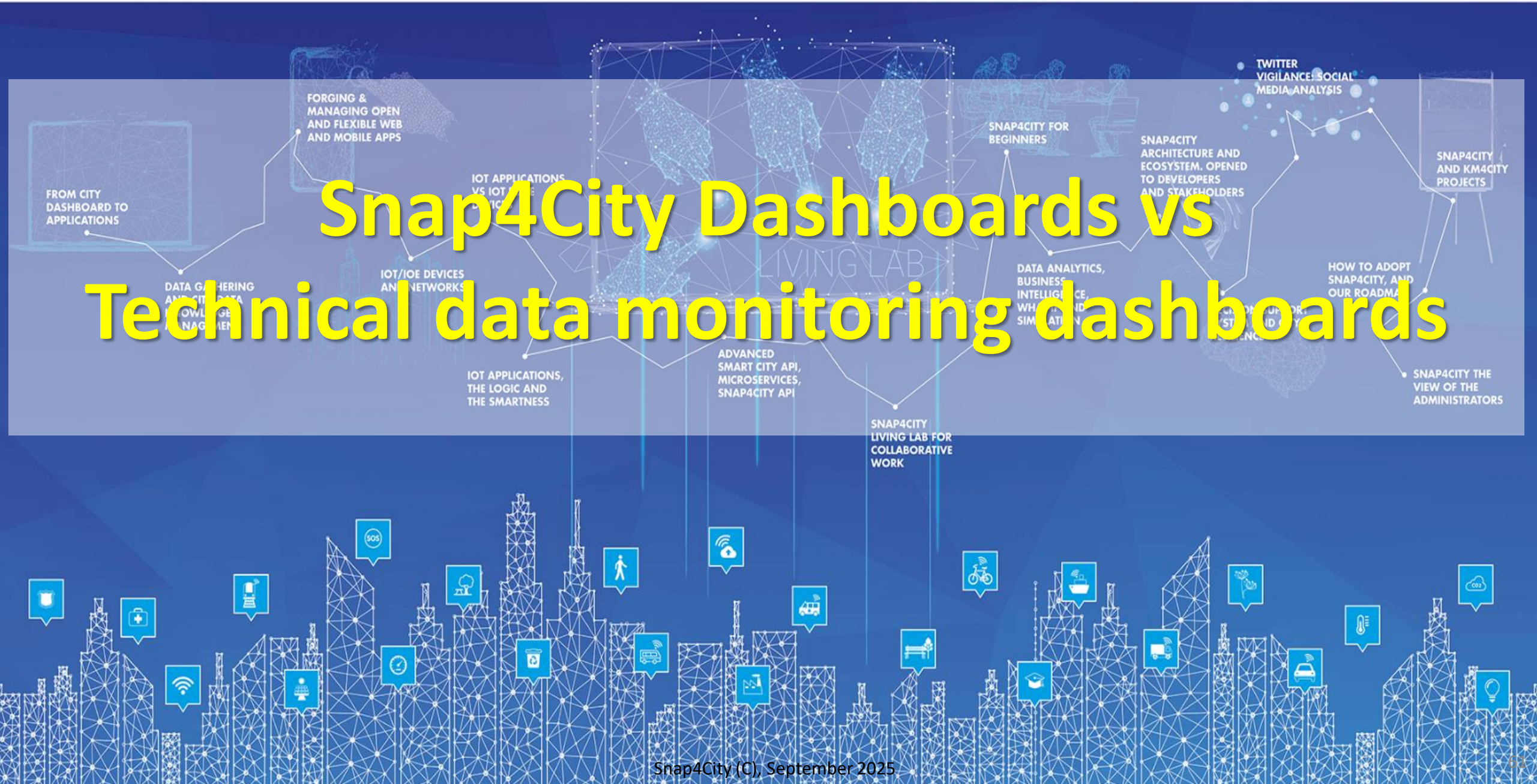




Last Value	Time Trend Chart
No data	

Local Digital Twin vs BIM





Snap4City Dashboards vs Technical data monitoring dashboards

Two Main Lines for Dashboarding

- **DevDash, My Dashboard (Dev) Kibana)**



Ready to use

You can customize

Limited details

- **Dashboard Builder of Snap4City**

You need to create / customize

Full Control

Professional details

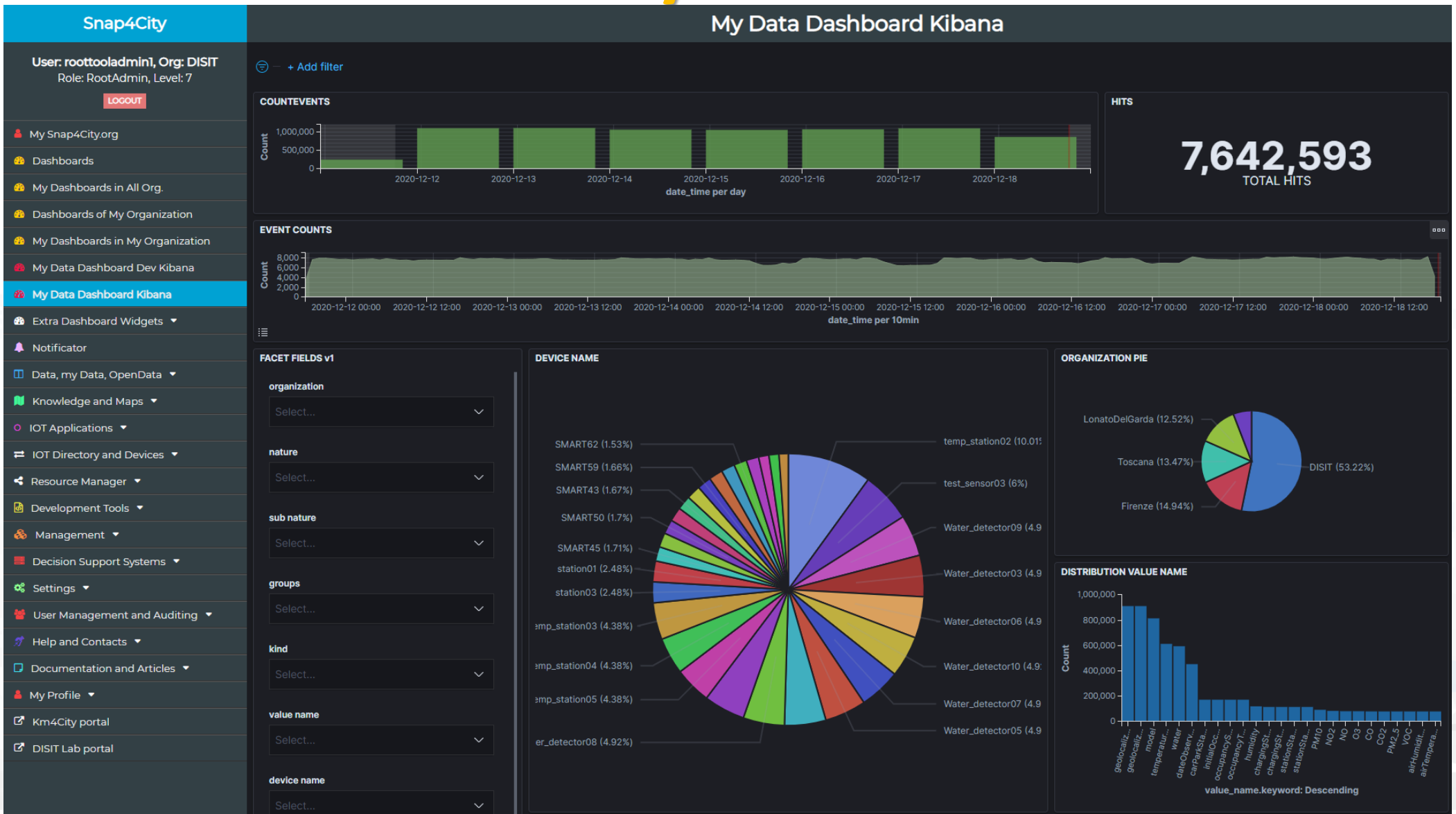


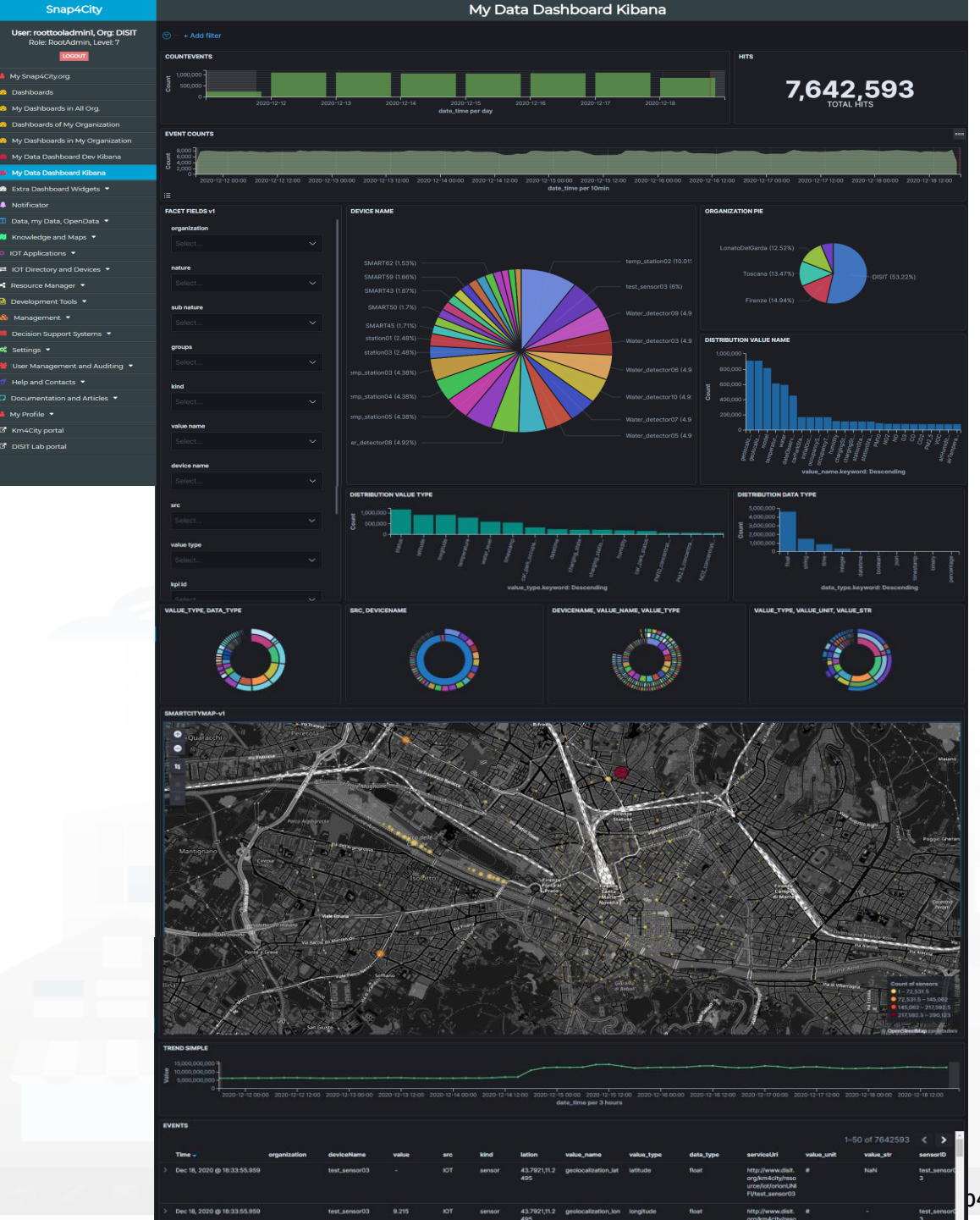
My Dev Dash (DevDash)

- For accessing and browsing data on Open Search (Elastic Search) storage and other sources supported
  - **Family of Grafana, Kibana, Banana**
- **No Support for real time event driven** widgets/panels, actuators and synoptics, no sophisticated maps, etc.
- **Not suitable for control room**, decision makers, etc.
- **Limited Business Intelligence,** Custom widgets, animation, external services.
- **Oriented to developers**, complex production of custom views, etc.
- **Partial support of GDPR** and deep control of access.
- Snap4City uses this technology only for monitoring data flow into the Storage with tools named: DevDash, or MyDevDash



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

Dashboard Builder of Snap4City

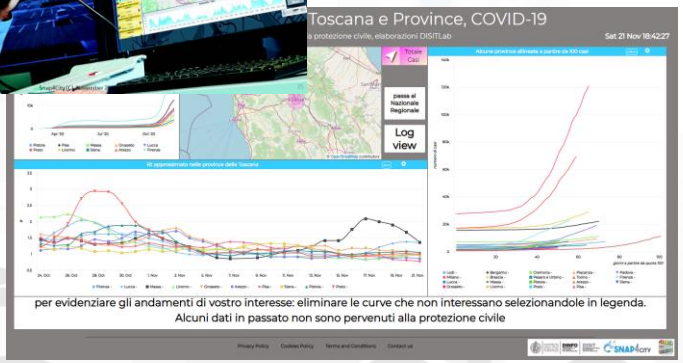
- For accessing and browsing data on: OpenSearch, Mongo, MySQL, Smart City API, Super and thus from federated Smart City API, etc.
- **Supports sensors/actuators**: data driven data, maps in extended manner, data driven widgets, large collection of widgets, direct IoT Connections, custom widgets, animated PIN on maps, a large set of panel/widgets, etc.
- **Very simple to be used for control room**, decision makers, situation rooms, operators, tactic, strategic, etc.
- **Very well integrated with c**ustom widgets, animation, external services.
- **Very simple to be customized** for non programmers since all the tools are visual. Including CSBL editor for Business Intelligence
- **Custom Business Intelligence**, Visual Analytics
- **Custom Widgets**
- **Support for GDPR** and deep control of access.
- Full Access to **Third Party API** via CSBL





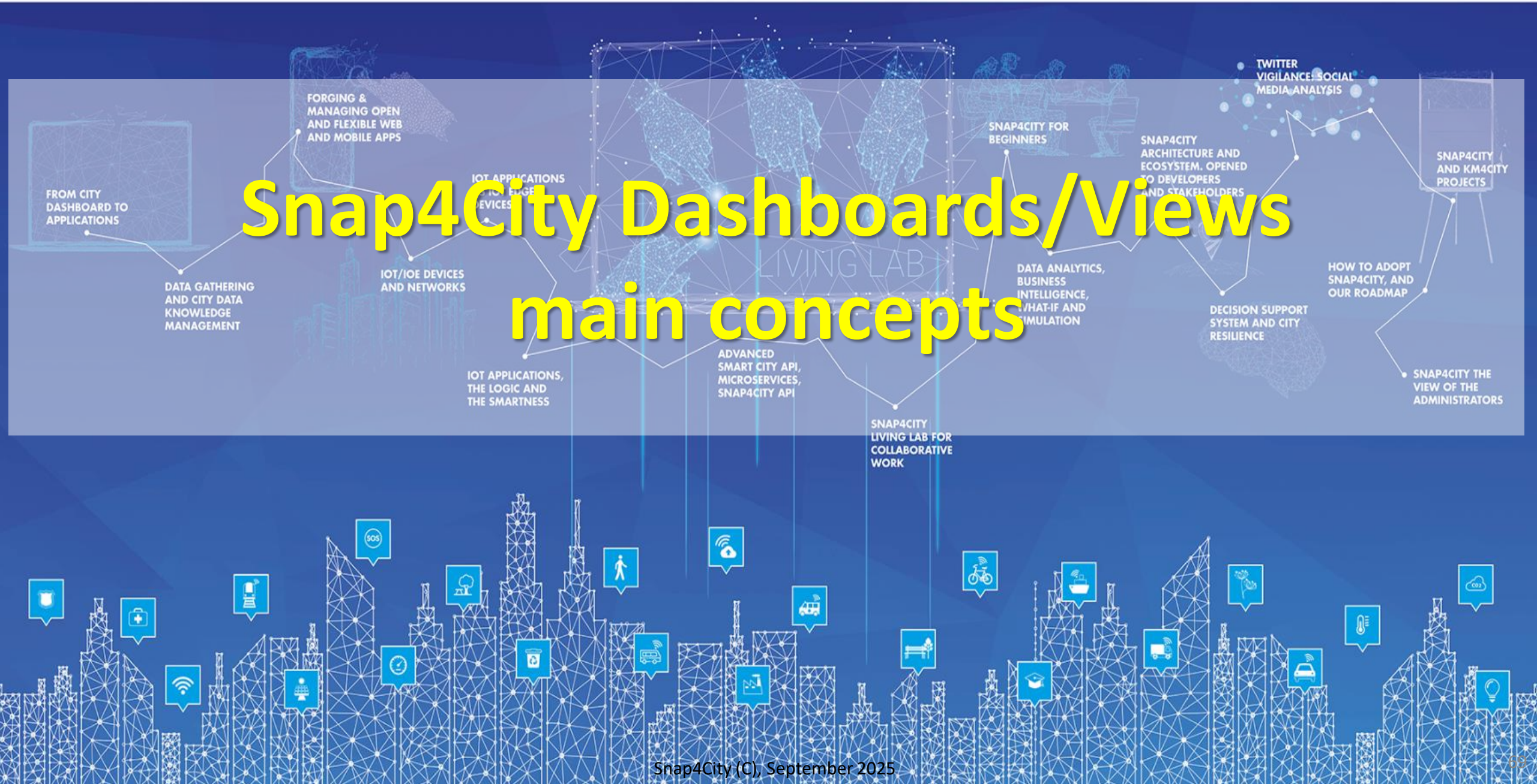






Snap4City Dashboard Builder (2025) vs Kibana/Grafana

Features	Snap4City Dashboard Builder	Kibana, Grafana
Large Collection of Widgets, also from D3 library	YES	Nothing
Custom Widgets SVG of any kind, full defined process for customization	YES	Nothing
Real time event driven widgets and data	YES	Nothing
Server/Client Side Business Logic for data transformation with visual programming: Node-RED	YES: visual/coding	coding
Maps with custom PIN, bubbles, animated and moving, etc.	YES	Nothing
Maps with paths, shapes, traffic flow, scenarios, routing, heatmaps, what-if, Origin Destination Matrix, …	YES	Nothing
Maps with Orthomaps from WFS, WMS, GIS connection, etc.	YES	Nothing
TV camera integration and selection	YES	Nothing
Widgets for business logic integration on real time: buttons, selector, switch, etc.	YES	Nothing
Kiviat, Spider net, Calendar (also any other D3 Widgets)	YES	Nothing
Typical Time Trends: day hours, month week, month days, …..	YES	Nothing
Time Trend Compare: day, week, month, year	YES	Nothing
Selectors/Menus: text, icons, etc., also in connection with IOT APP, Node-RED	YES	Nothing
Full control of graphic layout, font, colours, refresh per widget, etc.	YES	Nothing
Iframe integration of third-party widgets and web pages, nesting dashboards, embedding Kibana	YES	Nothing
Connection among multiple Dashboards and Widgets	YES	Nothing
Synchronization with Video Wall, and Operators Views	YES	Nothing
Multiseries, bar lines, charts, pie, donut, simple selectors, trends, etc., also from business logic	YES	Limited
Single content, string, html, any data, etc.	YES	Limited
Special widgets: Weather forecast, civil protection, road plates, Twitter, SVG, etc…	YES	Nothing
Digital Twin Local (BIM) and Global (3D city representation) with 3D traffic, Heatmaps, Devices, …	YES	Nothing
Faceted search	YES: selectors, forms, buttons	YES
Full custom access to third party APIs from CSBL	YES	Limited



Snap4City Dashboards/Views main concepts

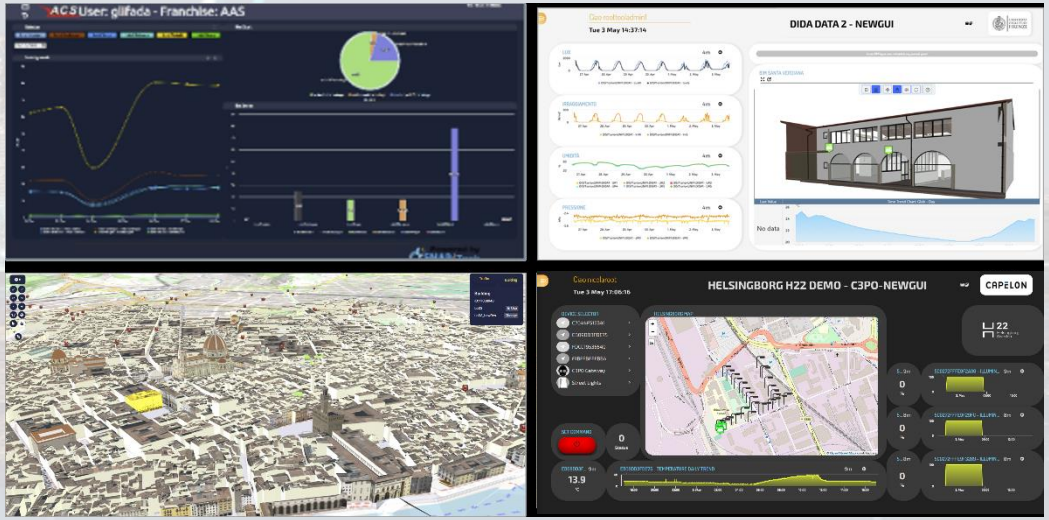
Flexible Graphic Modalities in Snap4City

Snap4City presents two main graphic modalities:

- **Development environment modality:**
  - getting information and presenting the menu on the left. It can be available in NEW and LEGACY Styles



- **Application Themes modality**.
  - Personalized Graphics Themes can be associated with each Dashboard/views, and is a modality typically provided for your final users (operators, consumers, city users)



Dashboards (Public by (ORG))

LOGIN

Switch to Legacy Layout

Dashboards (Public)

- www.snap4solutions.org
- Extra Dashboard Widgets
- Data Management, HLT
- Knowledge and Maps
- Processing Logics / IOT App
- Entity Director / [illegible] Devices
- Resource Manager
- Development Tools
- Management
- Decision Support Systems
- Deploy and Installation
- Help and Contacts
- Documentation and Articles
- Km4City portal

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Development environment modality

Prev 1 ... 34 35 36 37 38 Next

Filter by dashboarc



Traffic Flow Manager test

Passive

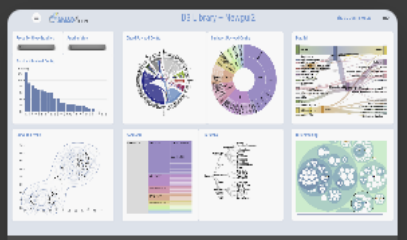
Public (DISIT)



Traffic Flow Monitoring - Firenze - Cloned2

Passive

Public (Firenze)



D3 library -- newgui2

Proc.Logic / IoT App

Public (DISIT)



Traffic Flow Reconstruction - Sii-Mobility

Passive

Public (Other)



Traffic Flow Reconstruction for the cities

Passive

Public (Other)



3D Map Global Digital Twin -newgui2

Passive

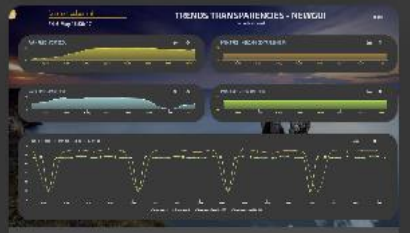
Public (DISIT)



3D Multi Data Map - Digital Twin Global - Firenze

Passive

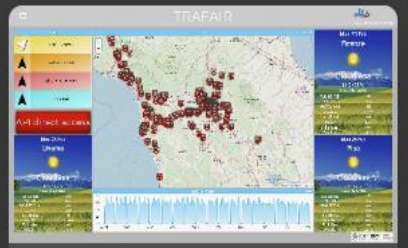
Public (DISIT)



Trends transparencies - newgui

Passive

Public (DISIT)



Tuscany TRAFAIR Data Dashboard

Passive

Public (DISIT)

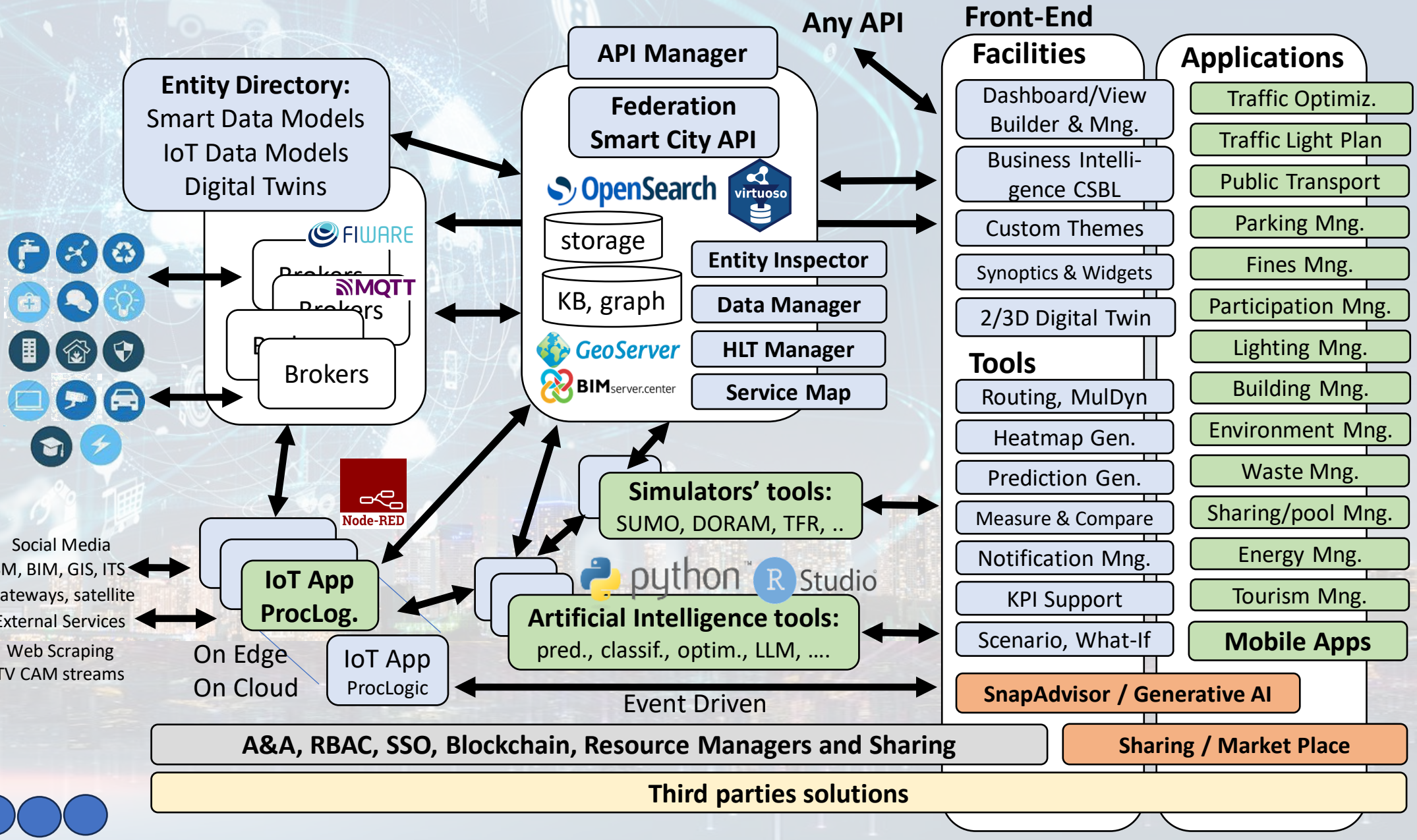


Tuscany weather dashboard 1

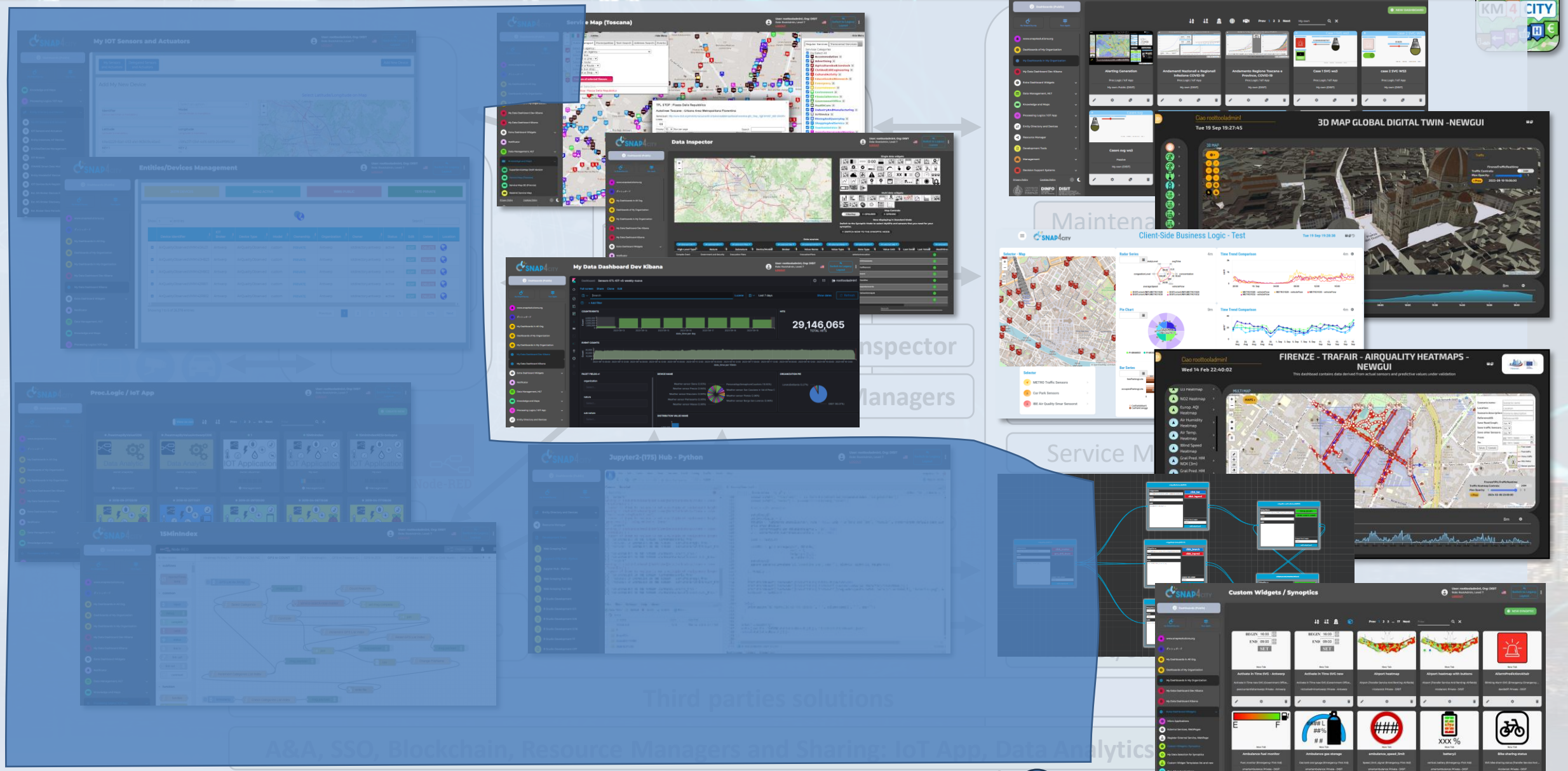
Passive

Public (DISIT)

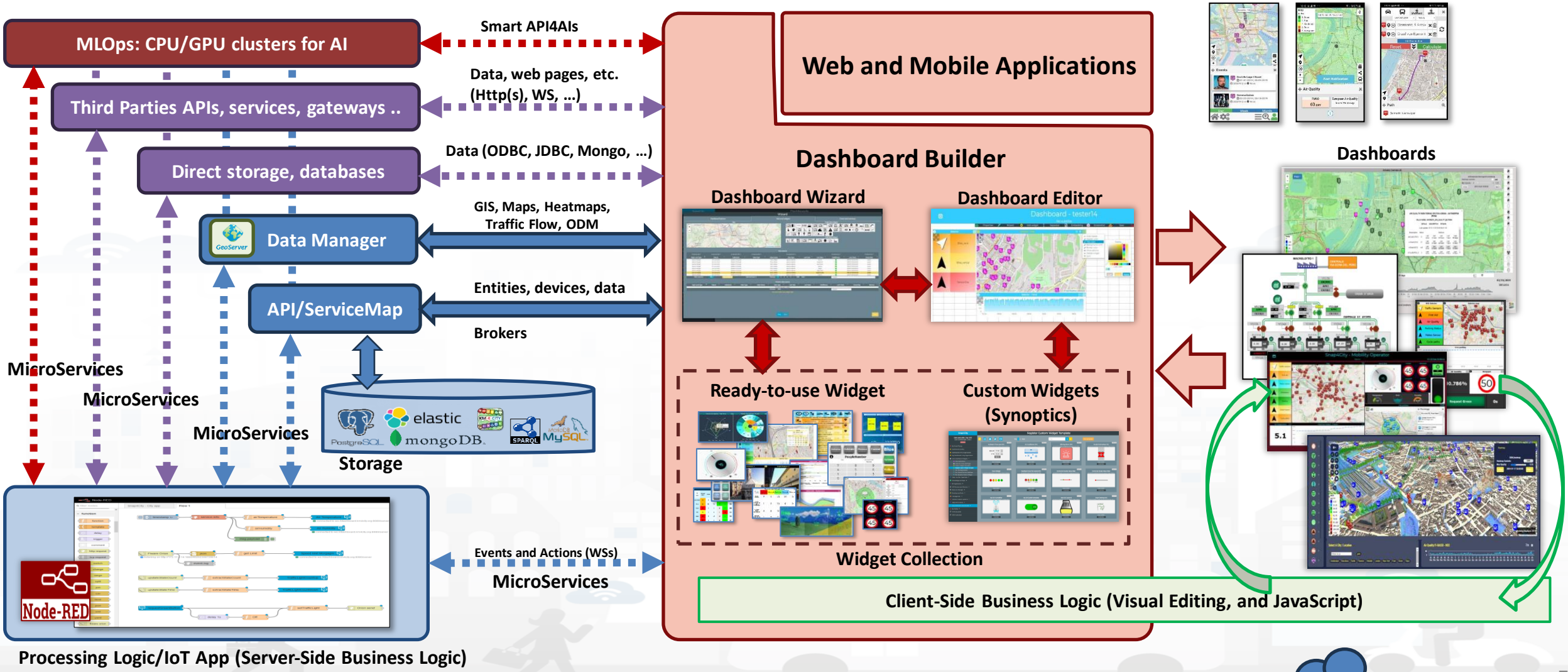
Technical Architecture



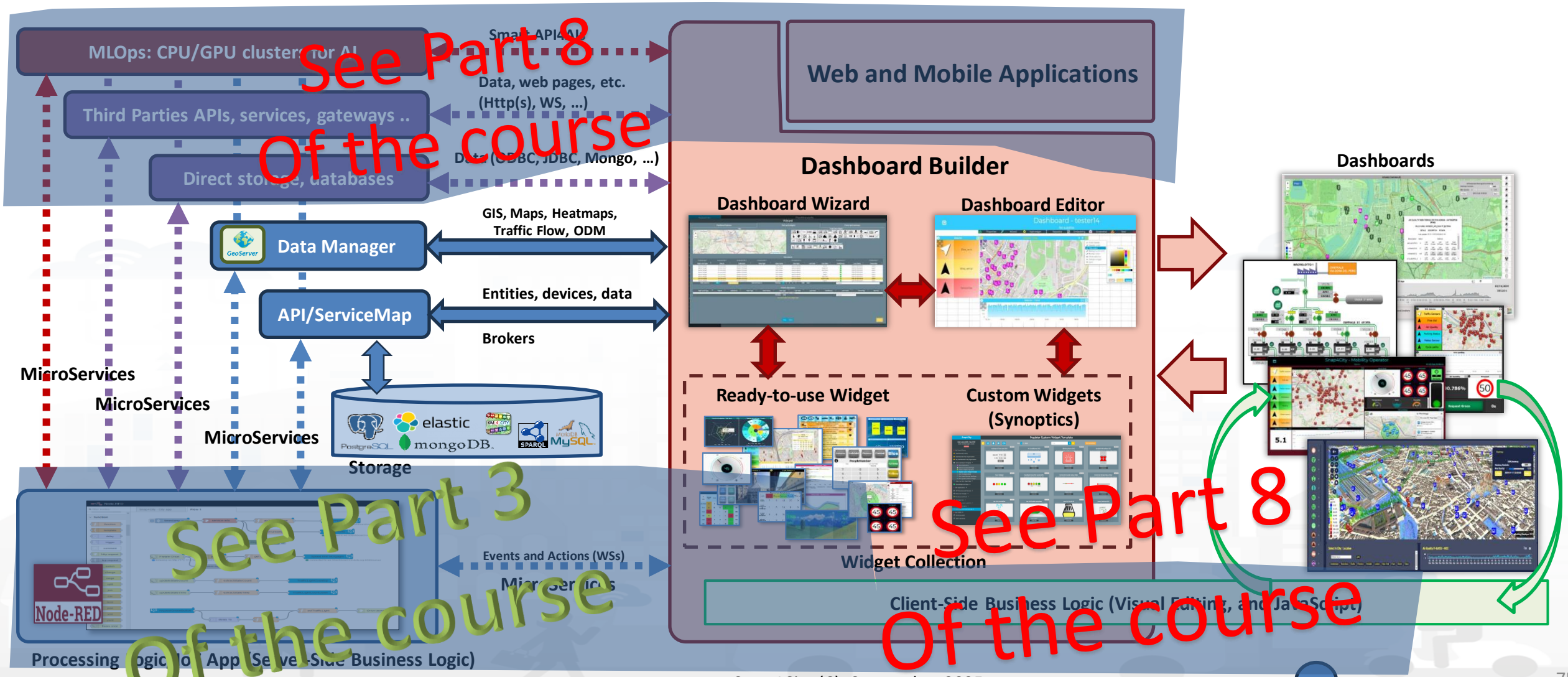
Visual Development Tools



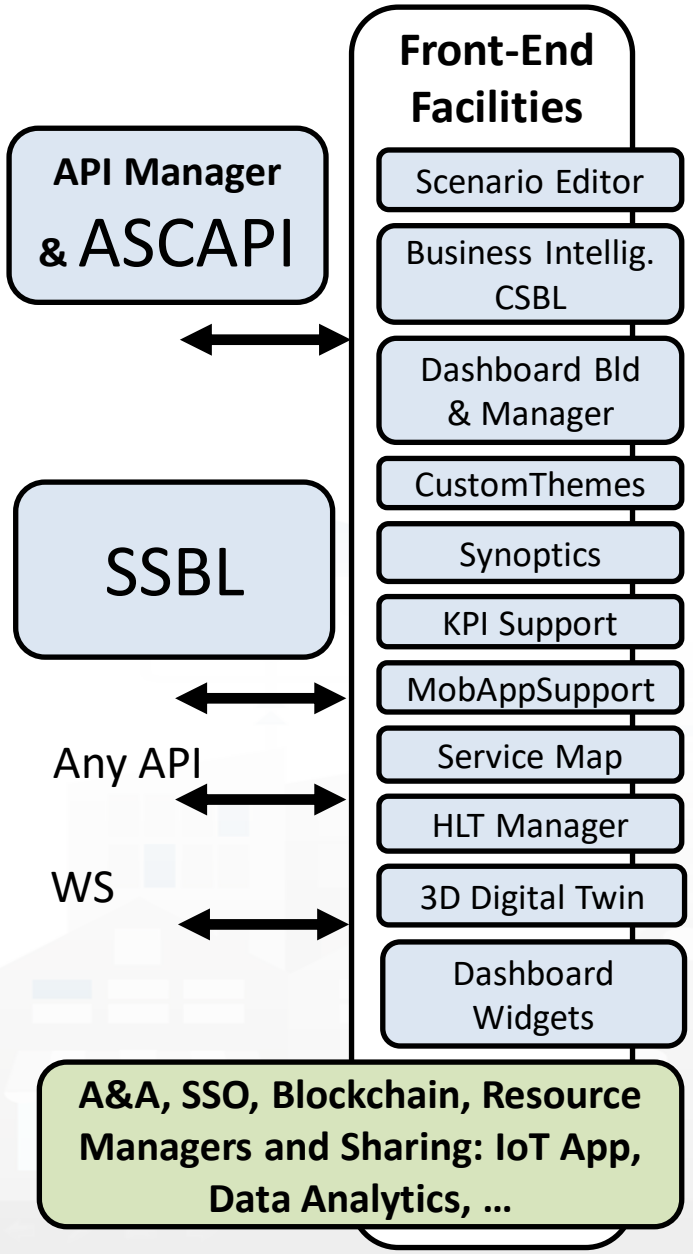
How the Dashboards / Apps Exchange data (2024/8)



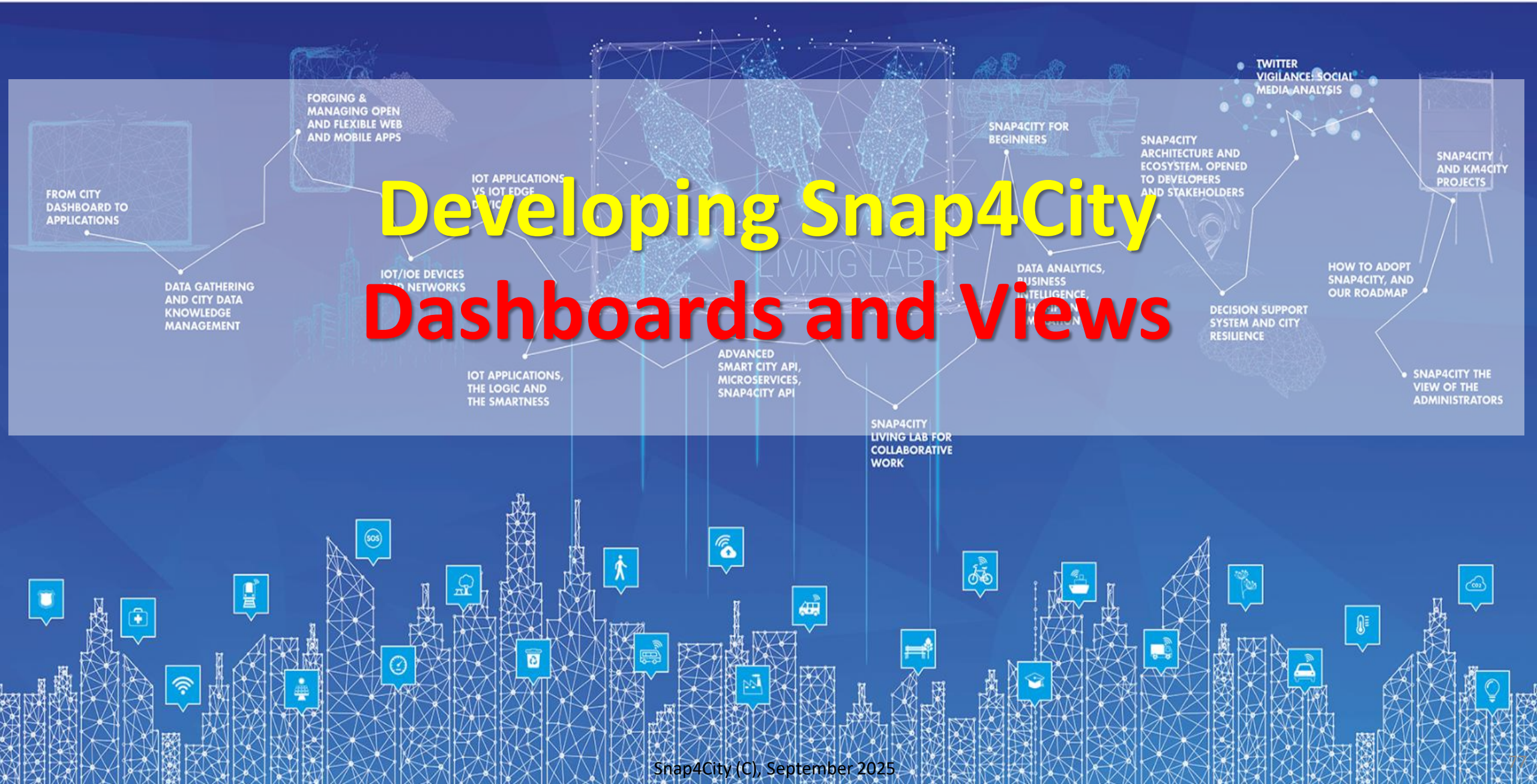
How the Dashboards / Apps Exchange data (2024/8)



Snap4City Applications

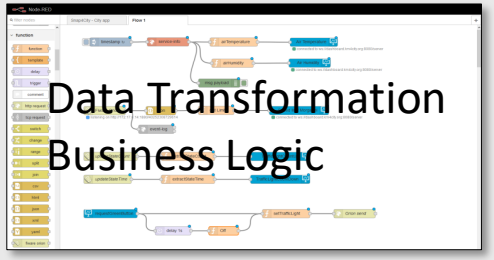


- The **Snap4City Applications** are those that use the SCAPI and/or Snap4City Front-End Facilities
- They can exploit the facilities at difference levels to create applications:
  - **Creating Dashboards** using proposed themes, adding CSBL, SSBL
  - Exploiting the **Dashboard theme**, as they are or customize them
  - Develop any Web and Mobile App using SCAPI and/or embedding/exploiting **Dashboard Widgets** per **HLT** and any data kind, icons, SVG, Synoptics, etc.
  - **Exploit services** for authentication and GDPR, SSO, OAuth, etc.
  - **Exploit SCAPI** for interoperability layer
  - **Exploit CSBL, SSBL**, etc.
  - Etc.
- **Snap4City Applications can be proprietary** of the developers and can be developed in any language with any library
  - The platform remains Affero GPL, Application remain **Powered by Snap4City**



Developing Snap4City Dashboards and Views

Dashboard Builder: Development



Data Transformation
Business Logic

IOT Applications

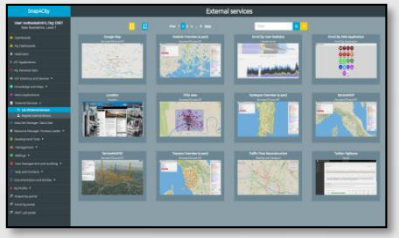


Knowledge and Storage
Data from the Field and
City + MyKPI ++

Widget Collection



Micro Applications

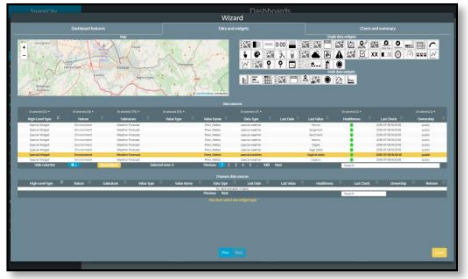


External Services



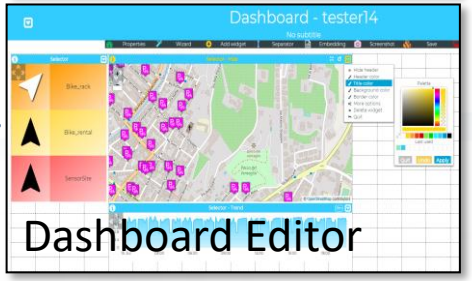
Custom Widgets/ Synoptics

Dashboard Wizard



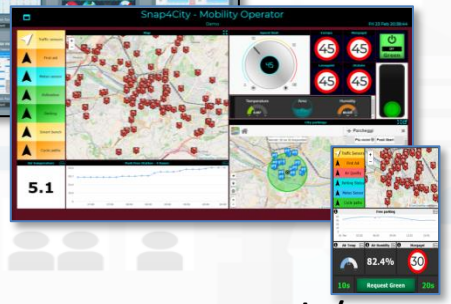
Create, save, load, delegate, grant access, change ownership





Dashboard Editor



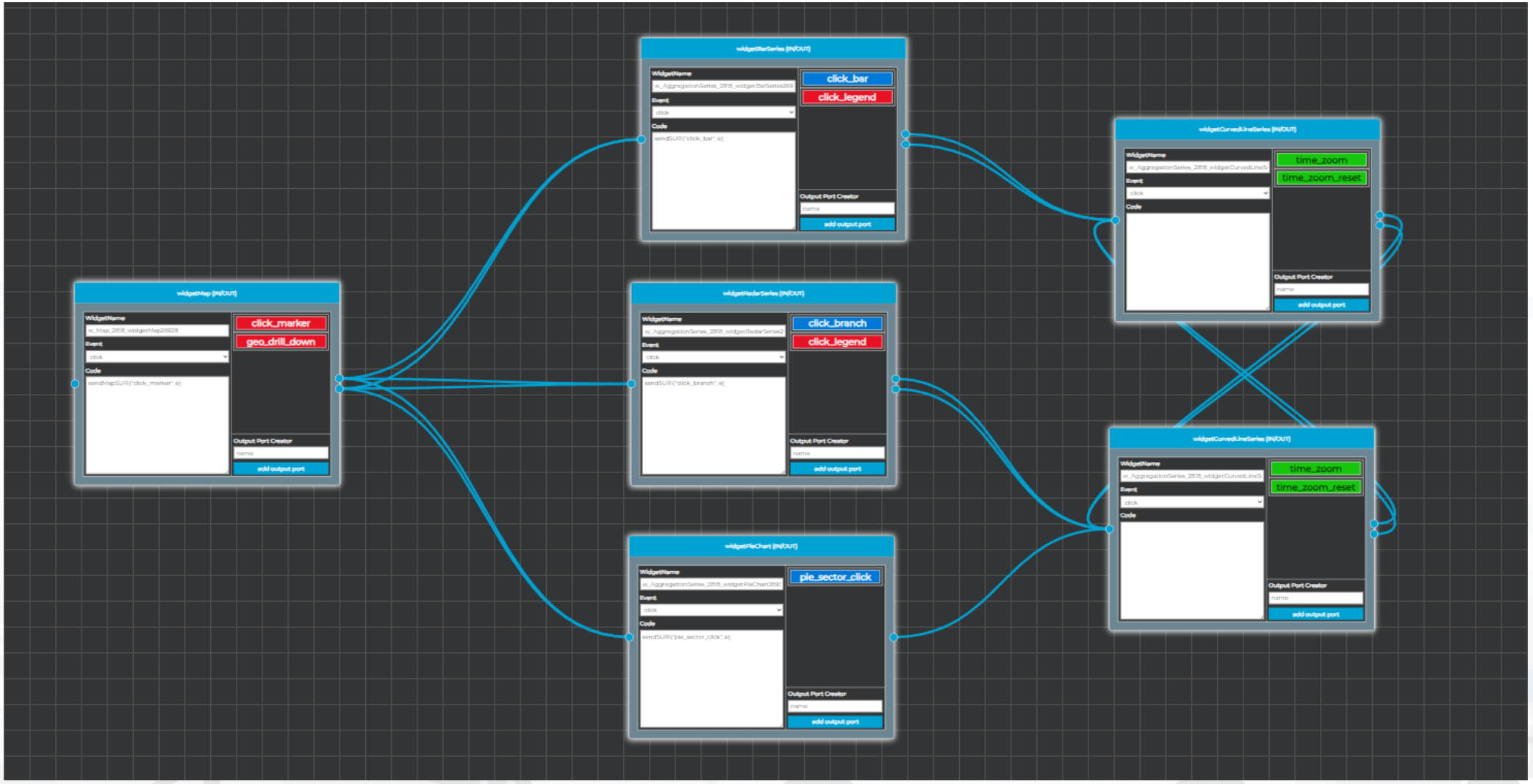


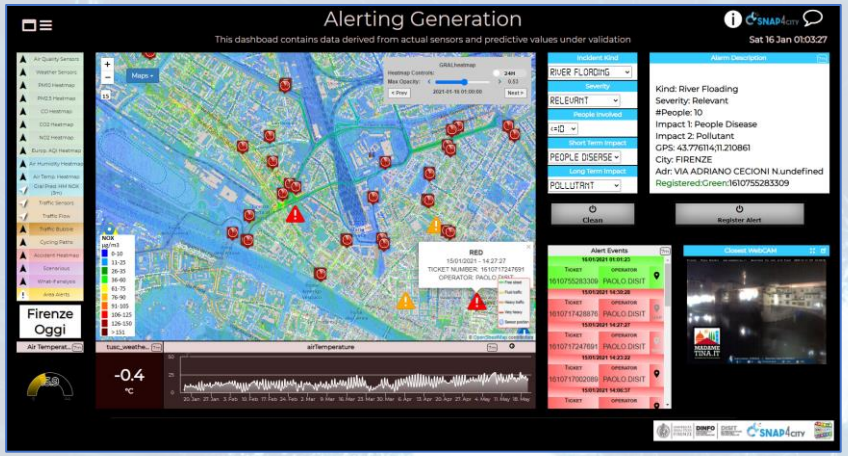
Public Dashboard Collection

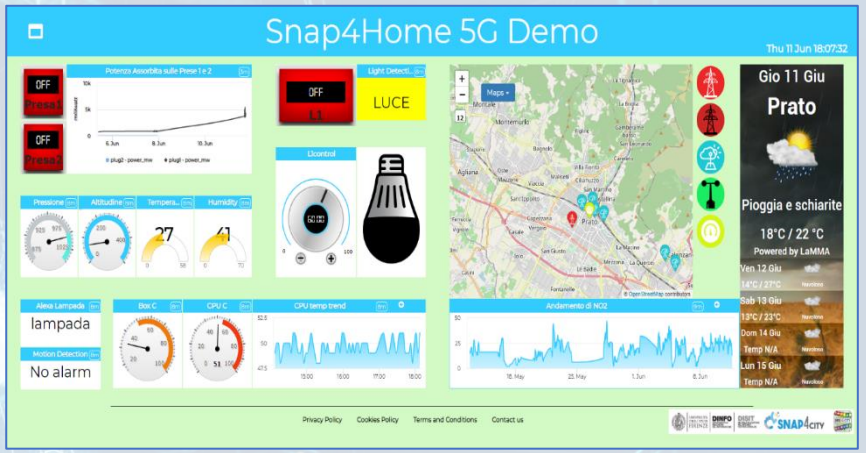
My Own Dash/App

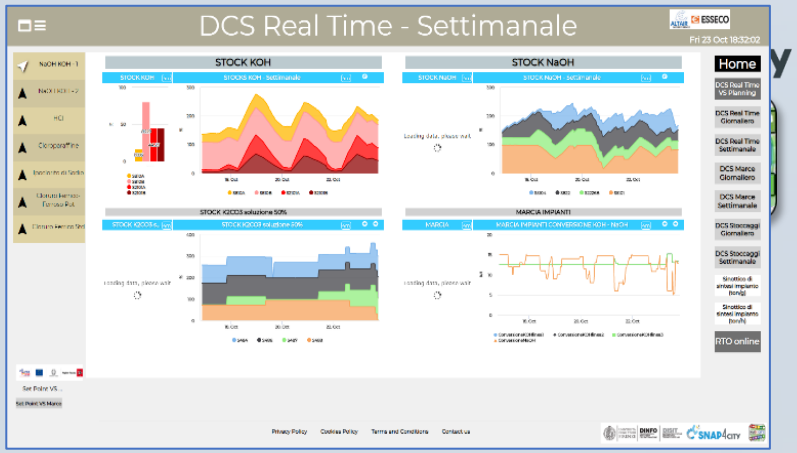


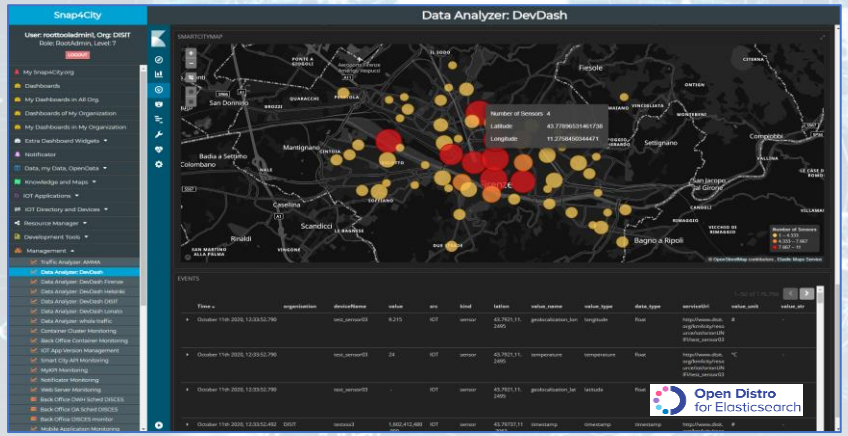
Visual programming for CSBL is coming soon

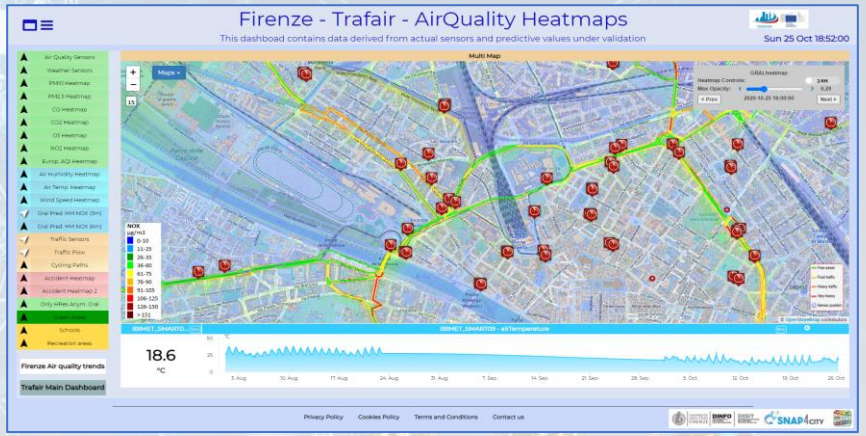


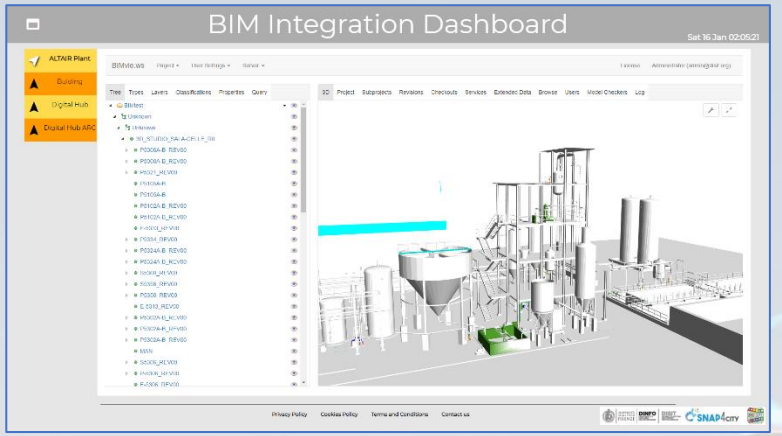

Alerting Generation
This dashboad contains data derived from actual sensors and predictive values under validation
Sat 16 Jan 01:03:27
Firenze Oggi
-0.4


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

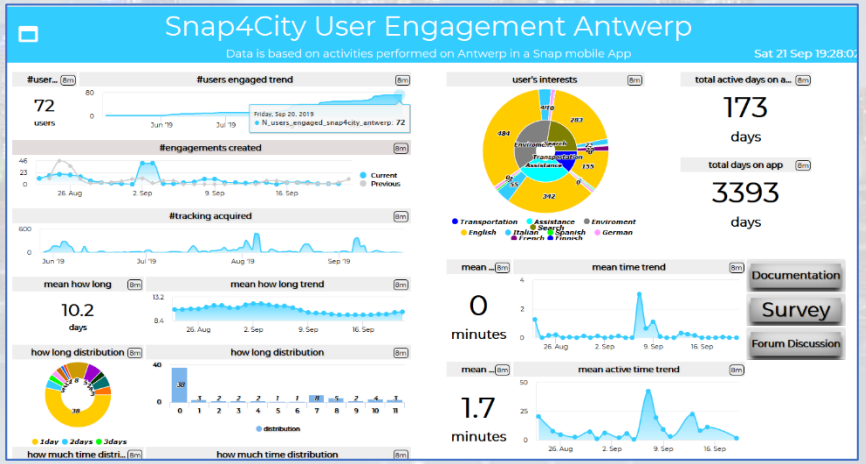

DCS Real Time - Settimanale
Fri 23 Oct 18:32:02
STOCK KOH
STOCK NaOH
Home

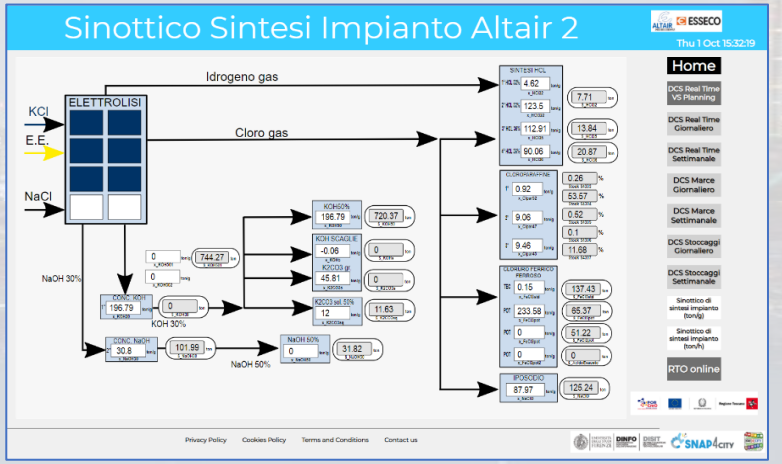

Data Analyzer: DevDash
Open Distro for Elasticsearch


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

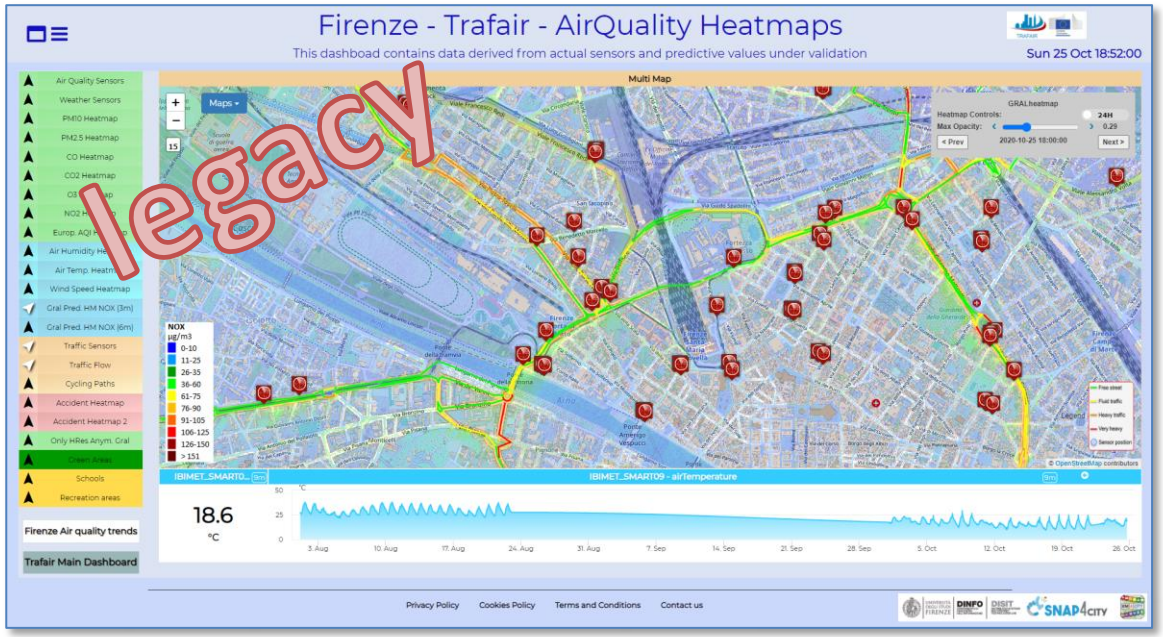

BIM Integration Dashboard
Sat 16 Jan 02:05:21

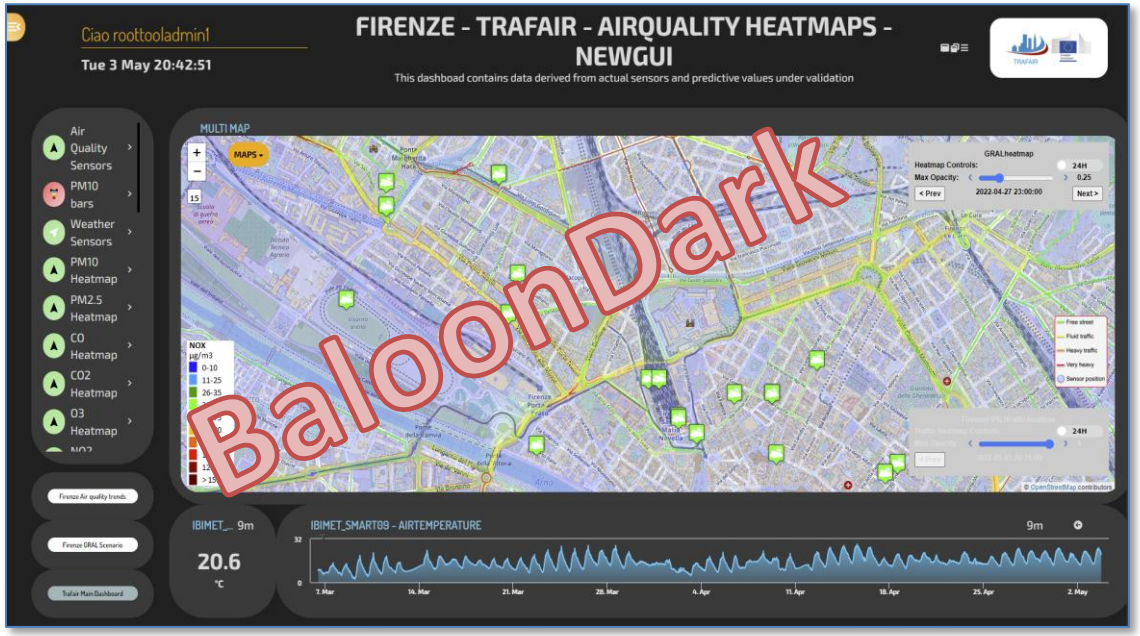

3D Multi Data Map - Digital Twin Global - Firenze
demonstrator
Sun 3 Apr 16:03:52
192

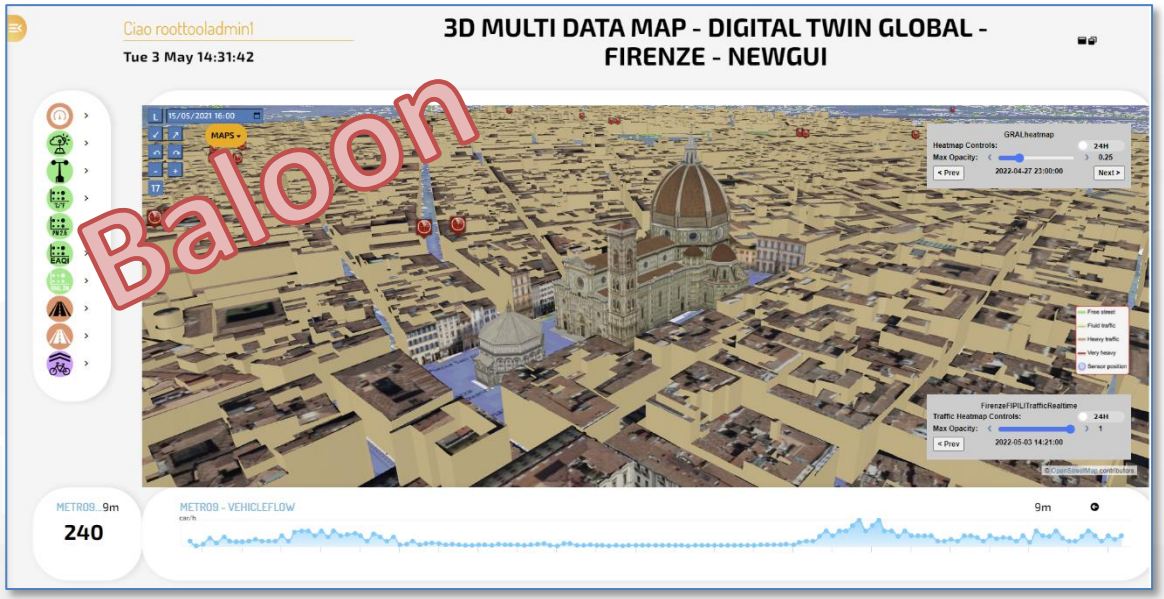

Snap4City User Engagement Antwerp
Data is based on activities performed on Antwerp in a Snap mobile App
Sat 21 Sep 19:28:0
72
users
173
days
3393
days
0
minutes
1.7
minutes
Documentation
Survey
Forum Discussion

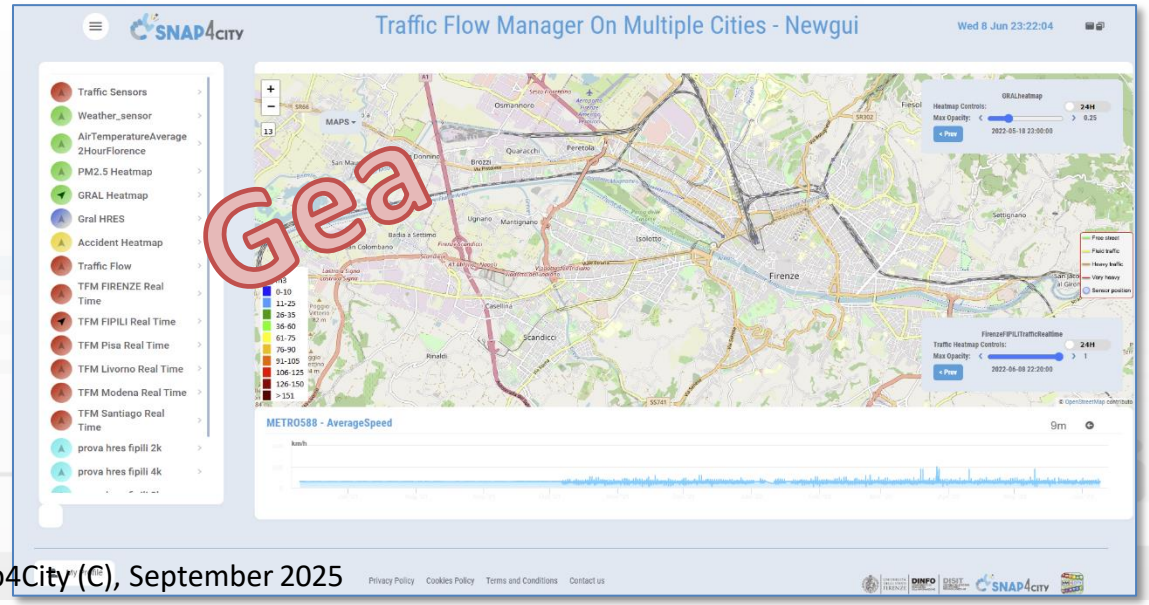

Sinottico Sintesi Impianto Altair 2
Thu 1 Oct 15:32:19
Home
Idrogeno gas
Cloro gas
ELETTROLISI
KCl
E.E.
NaCl
NaOH 30%
KOH 30%
NaOH 50%

Themes

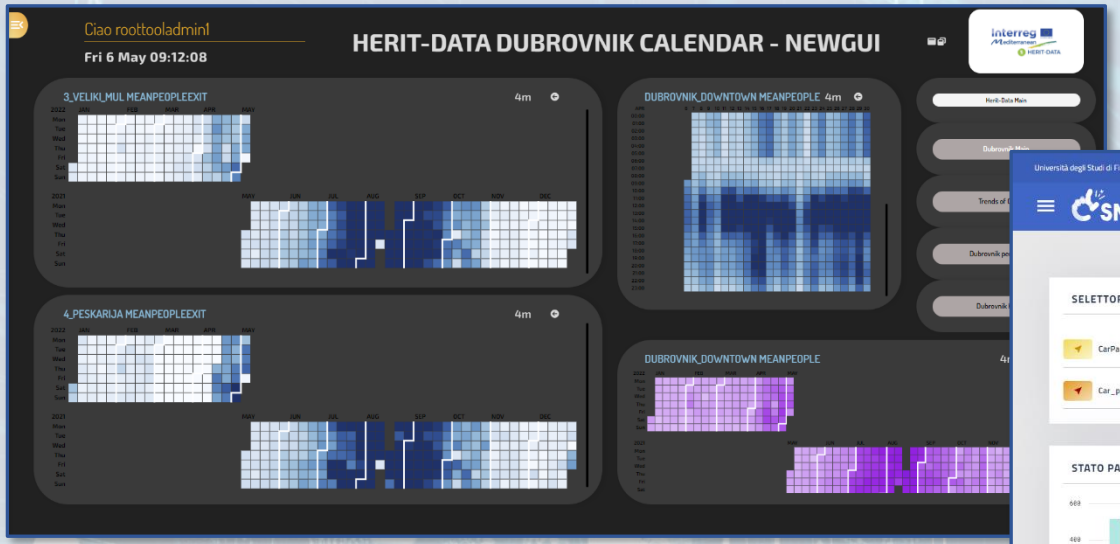

Firenze - Trafair - AirQuality Heatmaps
This dashboad contains data derived from actual sensors and predictive values under validation
Sun 25 Oct 18:52:00
Multi Map
Firenze Air quality trends
Trafair Main Dashboard
18.6
°C
IBIMET_SMART09 - airTemperature
Privacy Policy
Cookies Policy
Terms and Conditions
Contact us
legacy

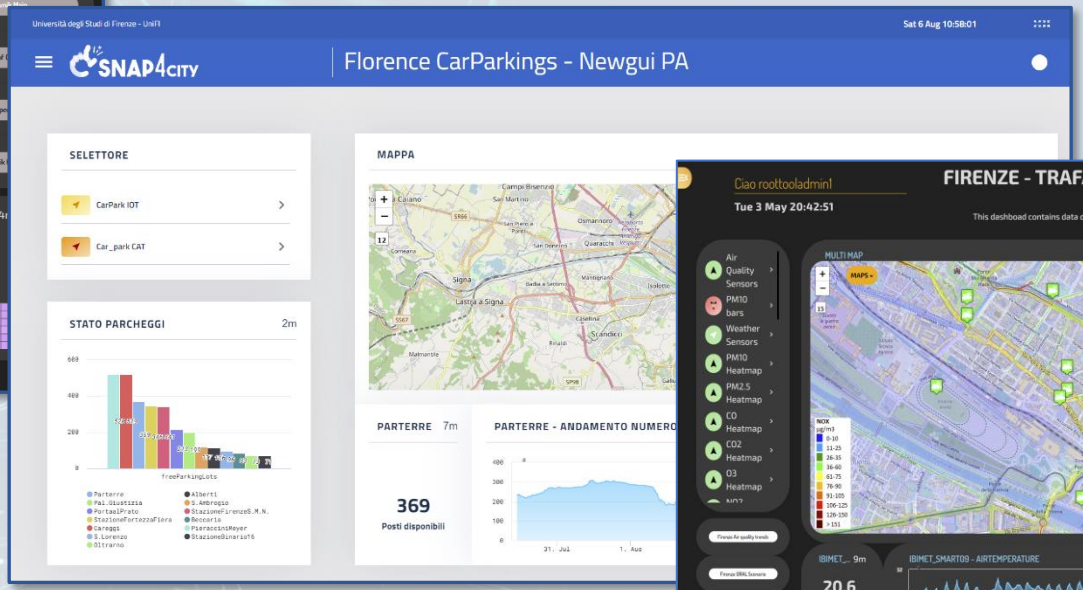

Ciao roottooladmin!
Tue 3 May 20:42:51
FIRENZE - TRAFAIR - AIRQUALITY HEATMAPS - NEWGUI
This dashboad contains data derived from actual sensors and predictive values under validation
Air Quality Sensors
PM10 bars
Weather Sensors
PM10 Heatmap
PM2.5 Heatmap
CO Heatmap
CO2 Heatmap
O3 Heatmap
MULTI MAP
20.6
°C
IBIMET_SMART09 - AIRTEMPERATURE
BaloonDark

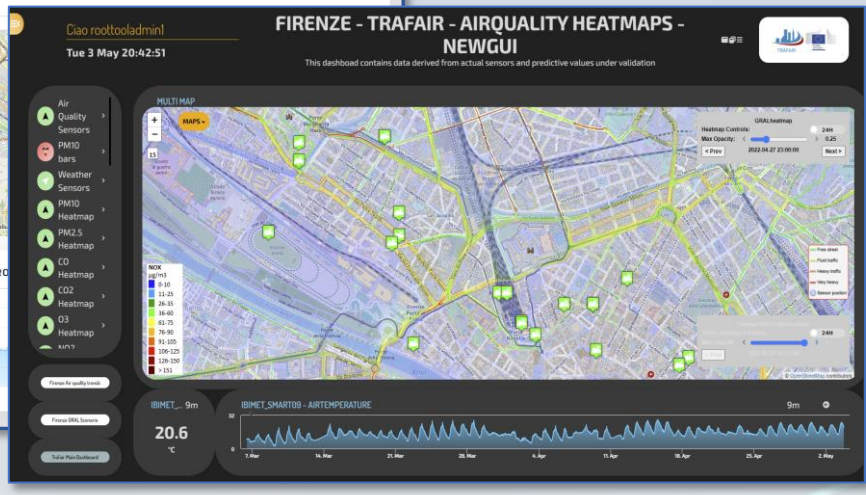

Ciao roottooladmin!
Tue 3 May 14:31:42
3D MULTI DATA MAP - DIGITAL TWIN GLOBAL - FIRENZE - NEWGUI
240
METRO9 - VEHICLEFLOW
Baloon

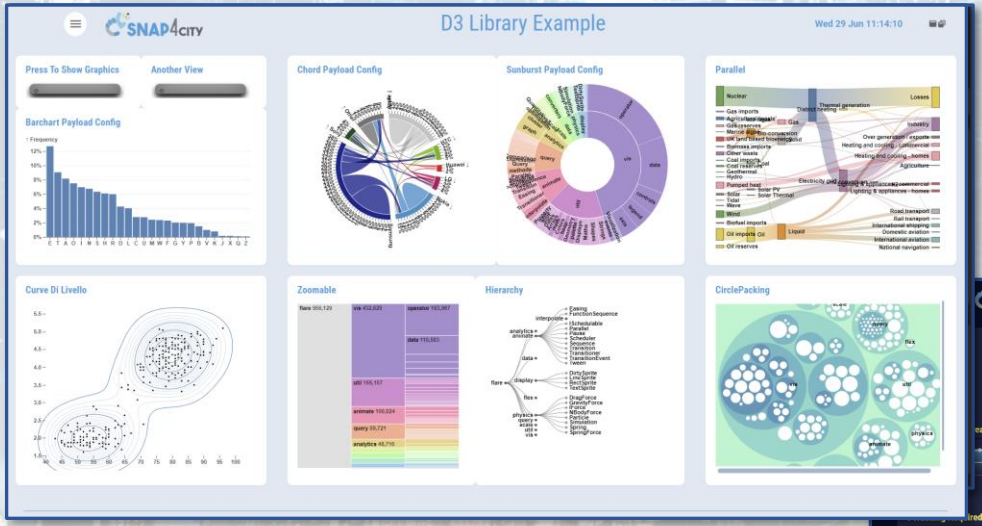

Traffic Flow Manager On Multiple Cities - Newgui
Wed 8 Jun 23:22:04
Traffic Sensors
Weather_sensor
AirTemperatureAverage 2HourFlorence
PM2.5 Heatmap
GRAL Heatmap
Gral HRES
Accident Heatmap
Traffic Flow
TFM FIRENZE Real Time
TFM FIPILI Real Time
TFM Pisa Real Time
TFM Livorno Real Time
TFM Modena Real Time
TFM Santiago Real Time
prova hres fipili 2k
prova hres fipili 4k
METRO588 - AverageSpeed
Gea

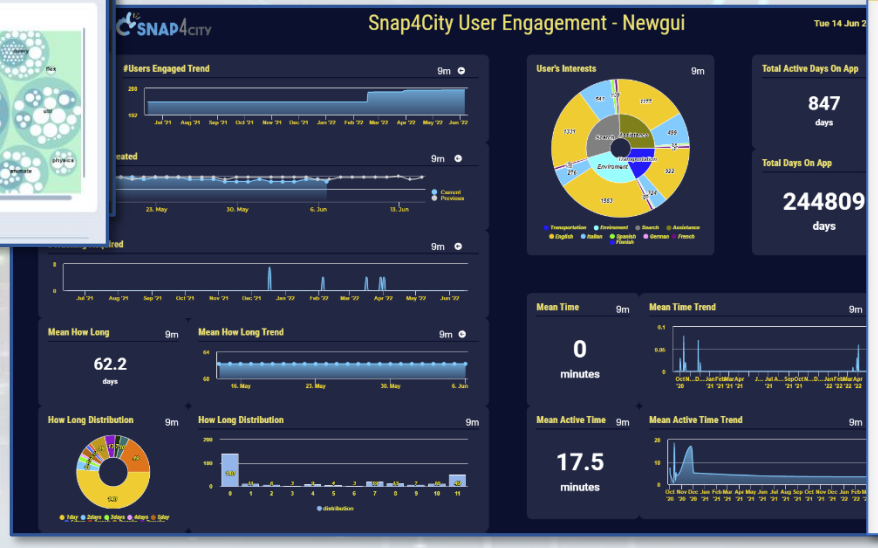
Different Themes

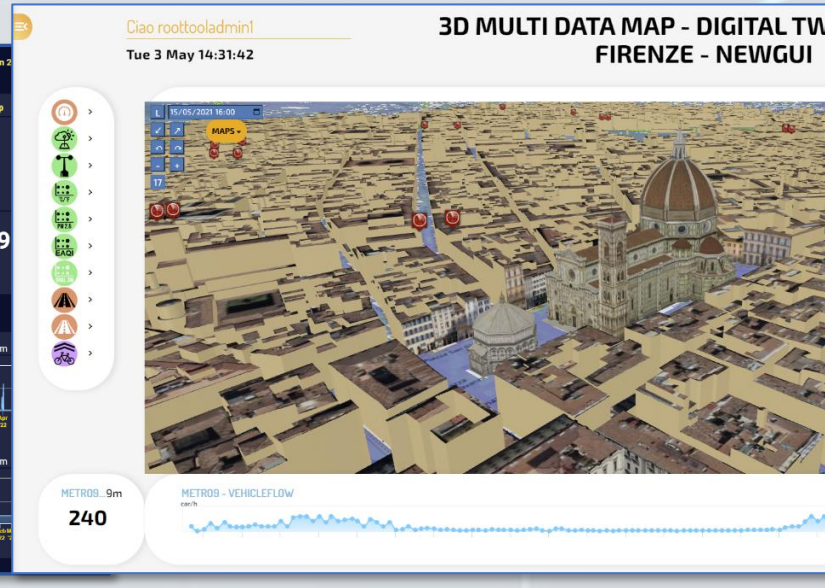








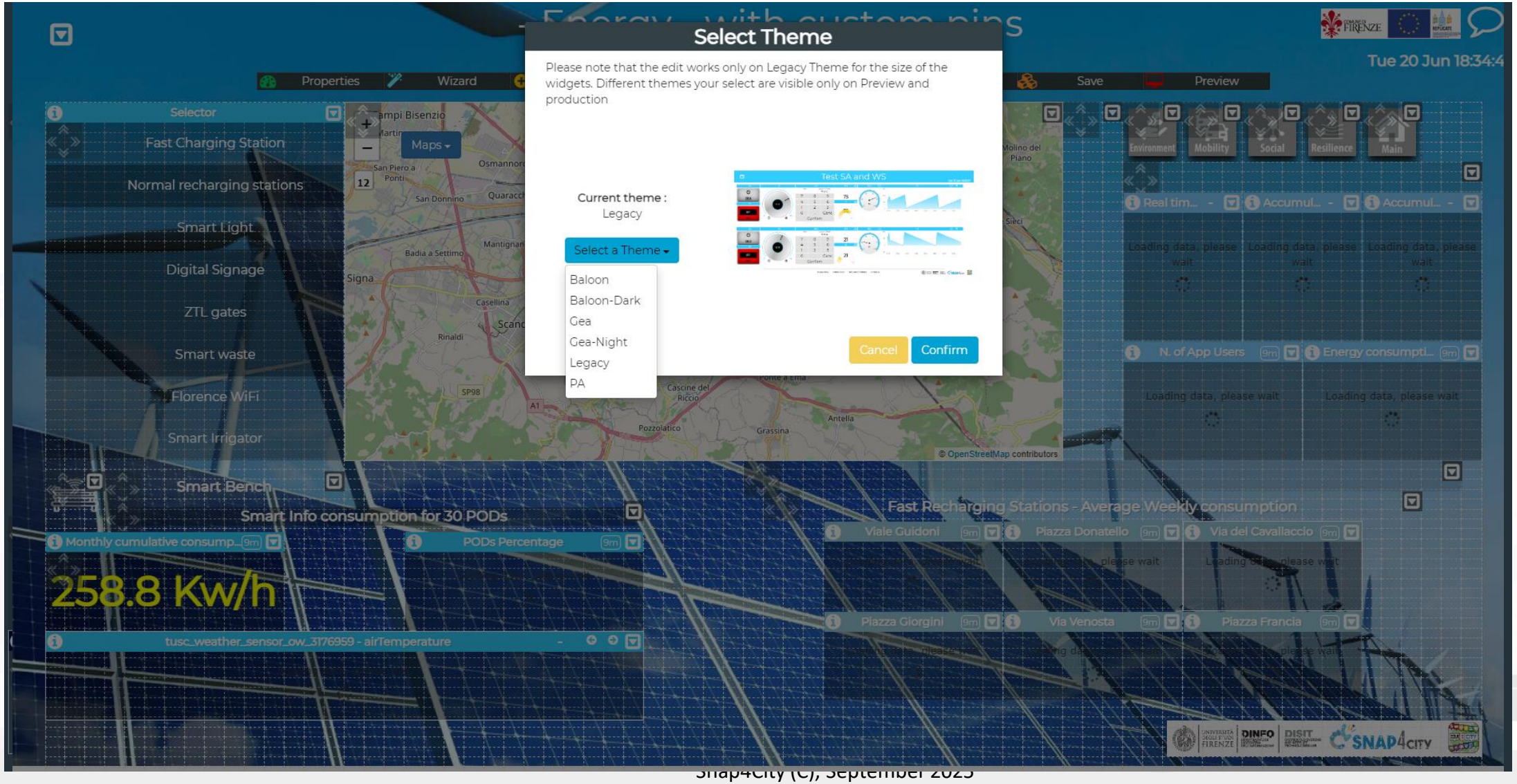


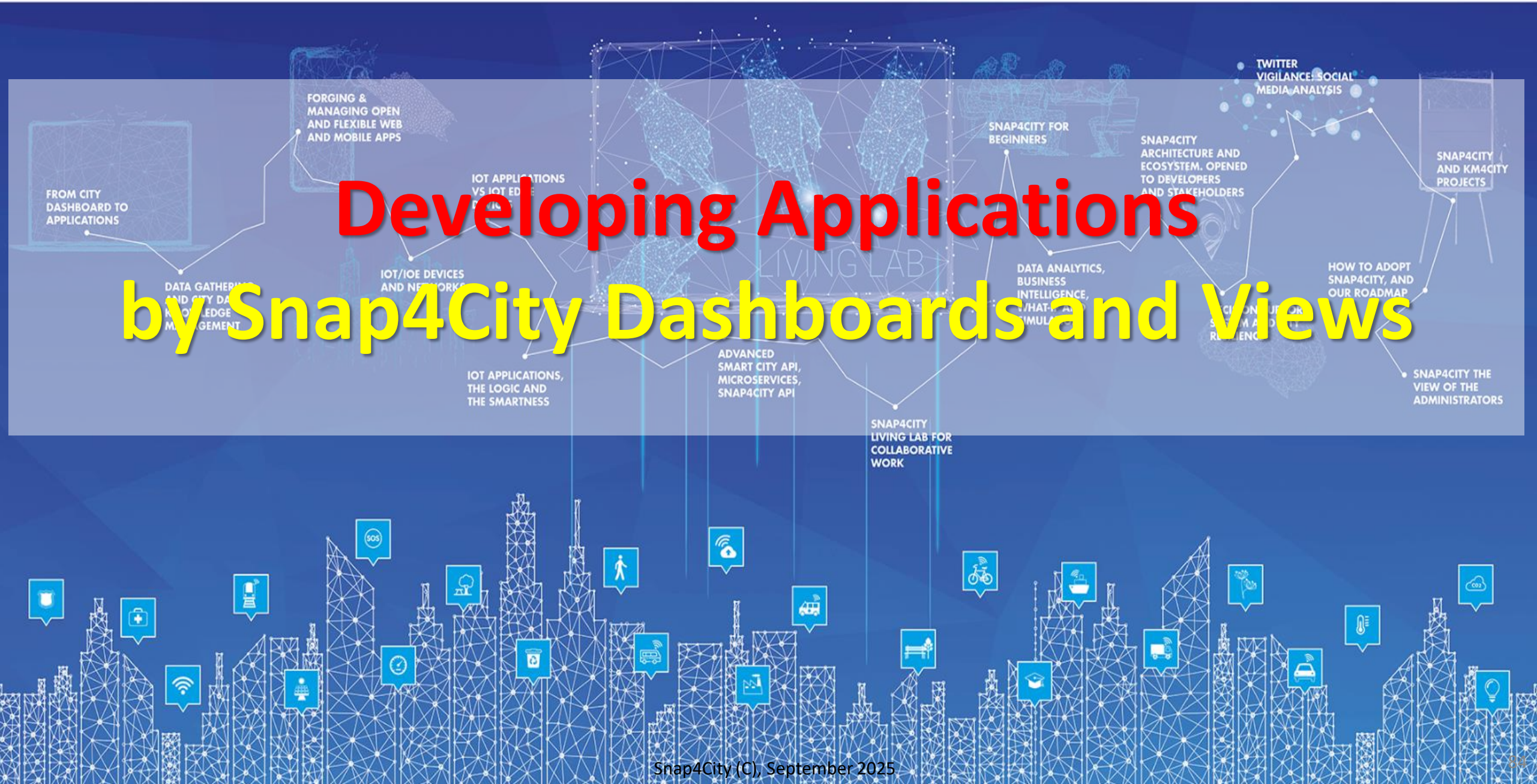


New styles/themes can be developed by specializing a few files from open source

https://www.snap4city.org/793

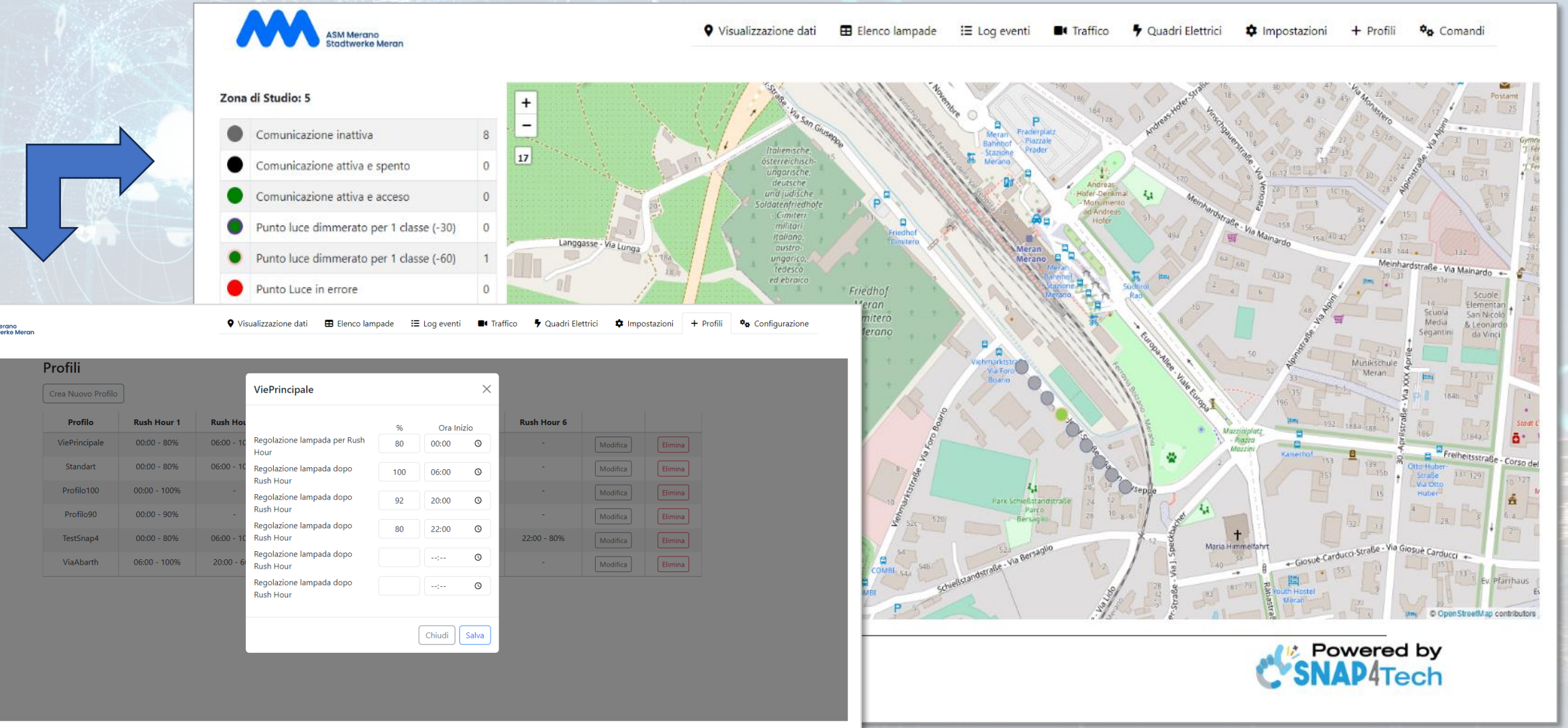
Changing Theme



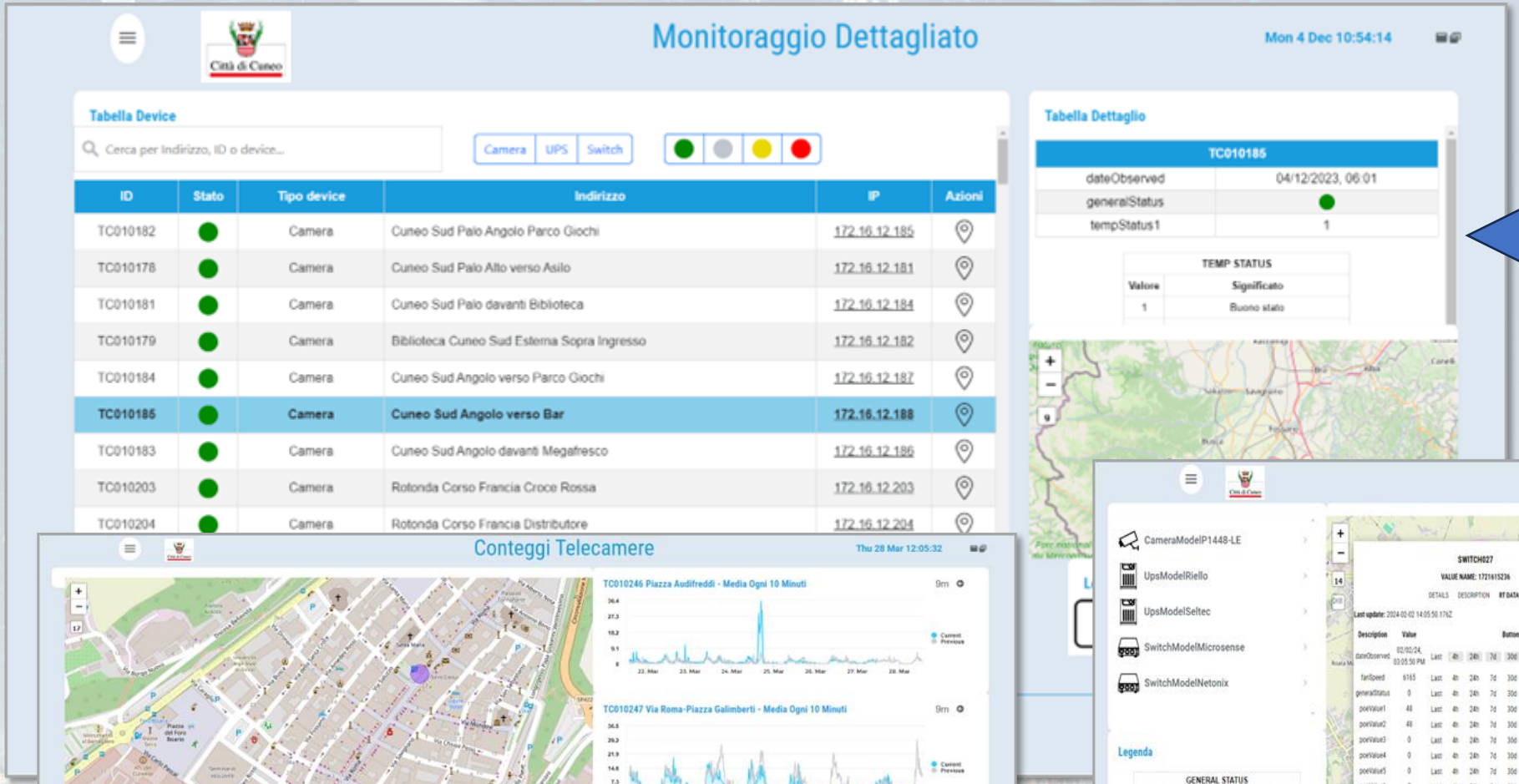


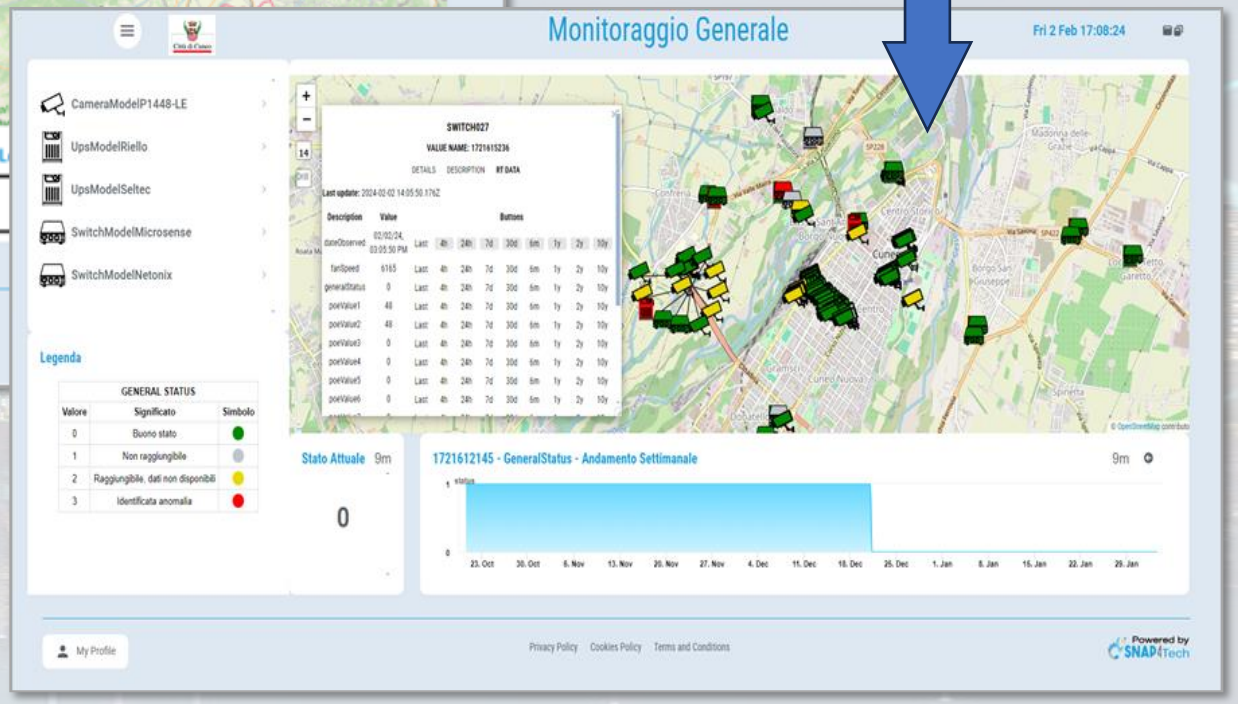
Developing Applications by Snap4City Dashboards and Views

Smart Light Operation and Plan: Merano Municipality



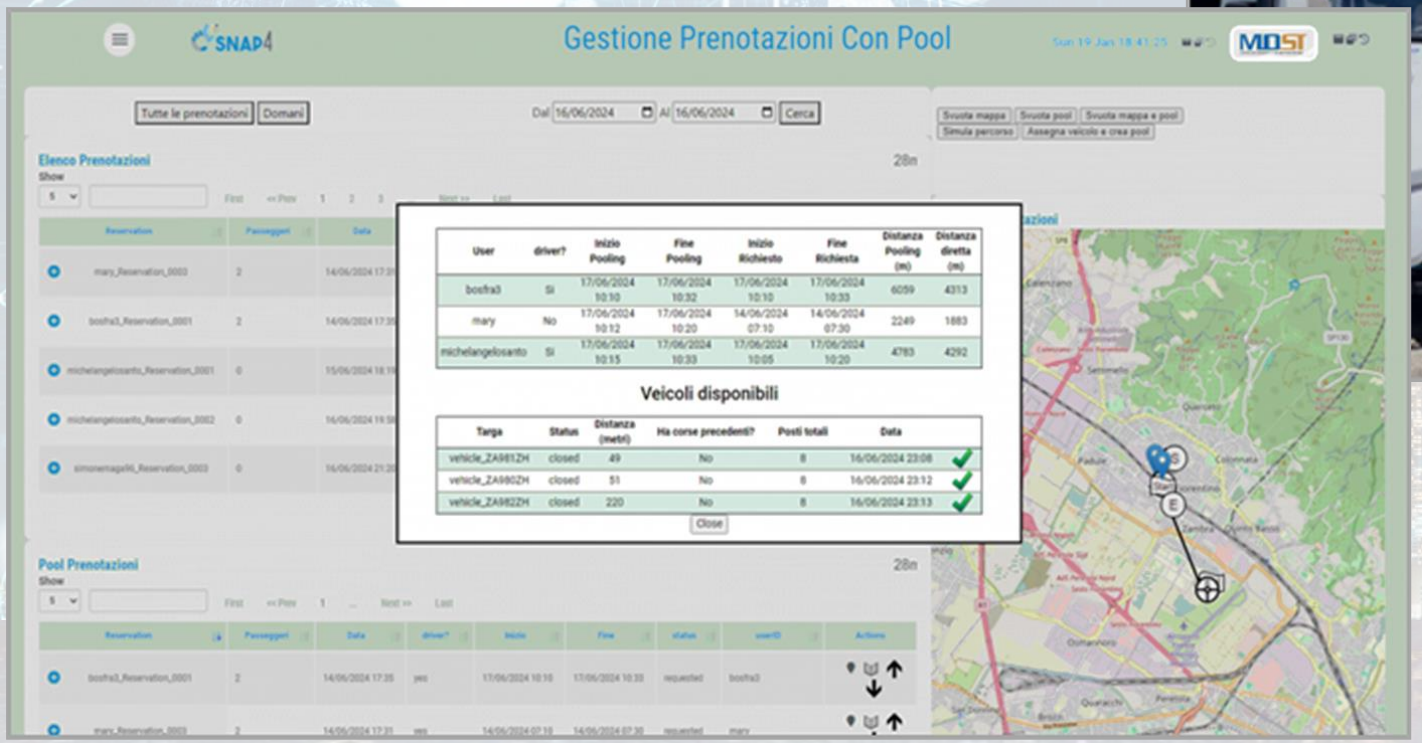
ICT Assets Control: CUNEO Municipality

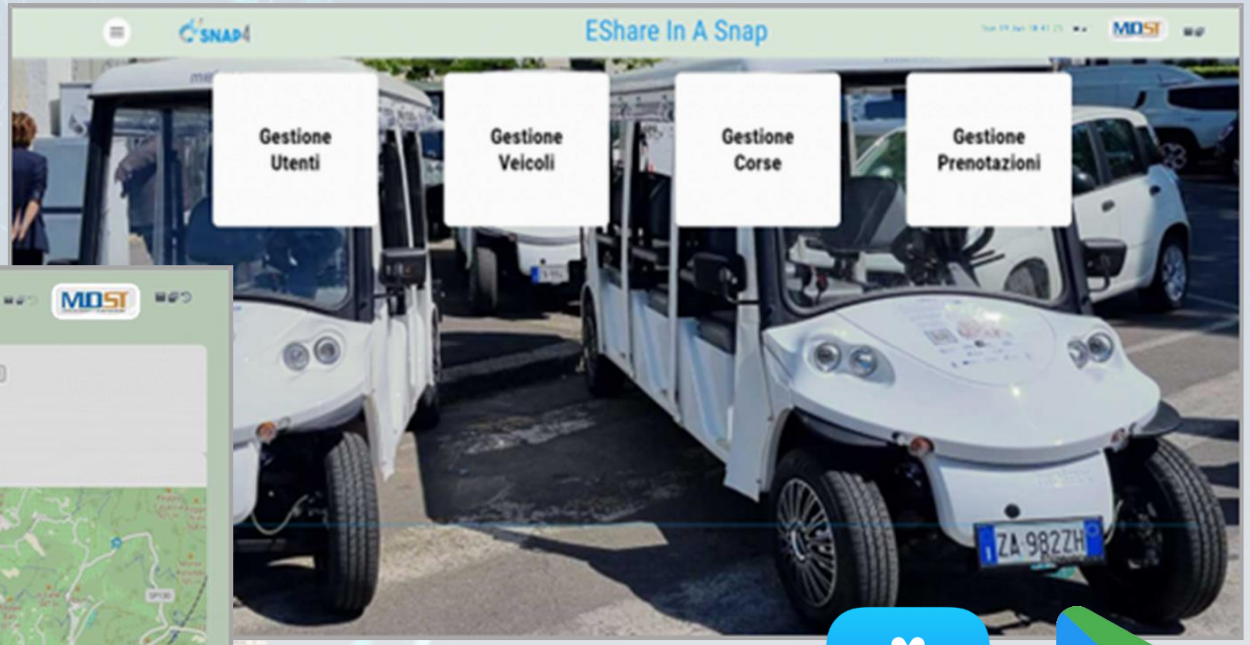


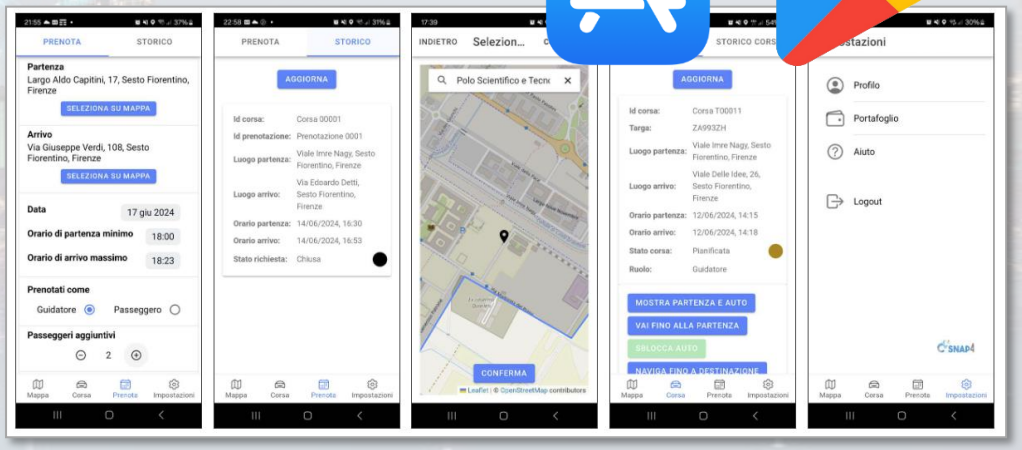


Car Sharing and Polling, Fleet Management

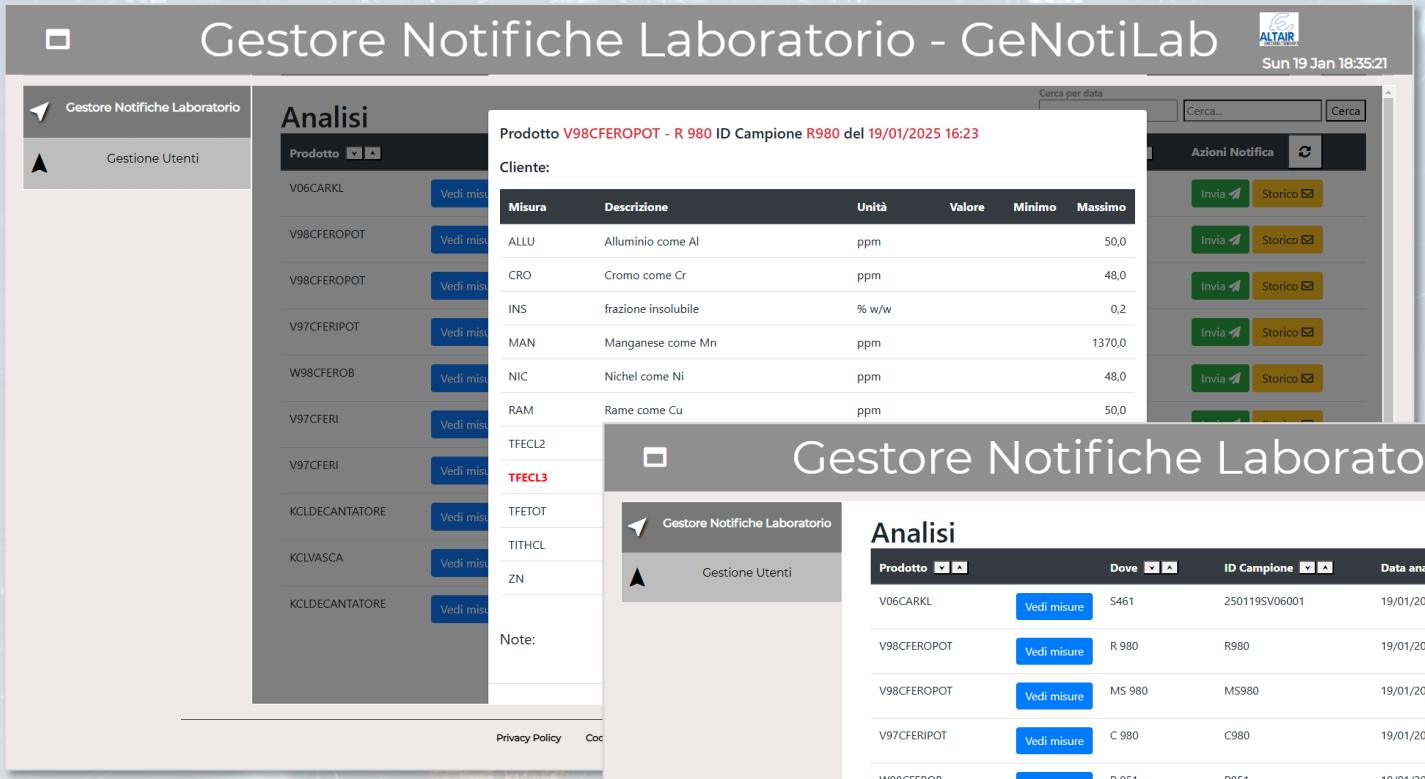
- **eShare in a Snap (TUSS)**

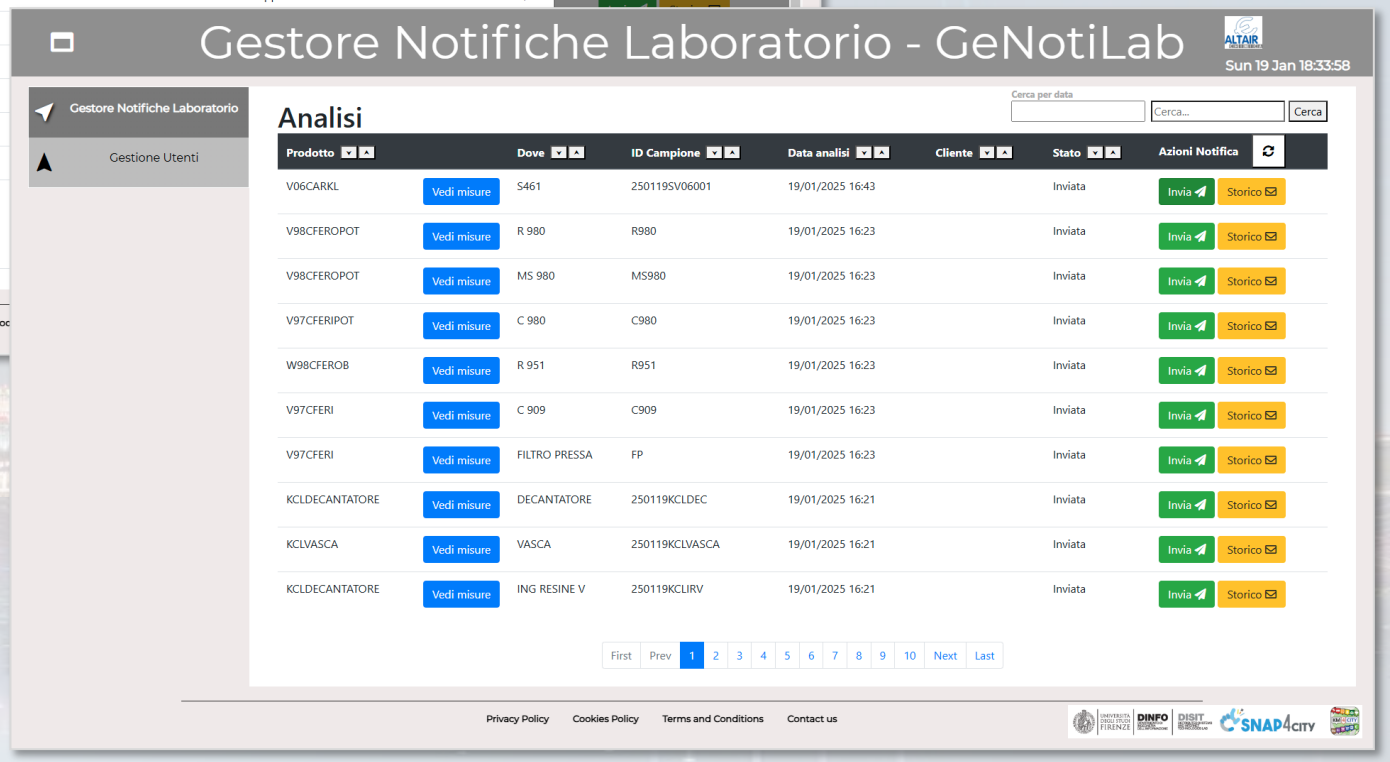


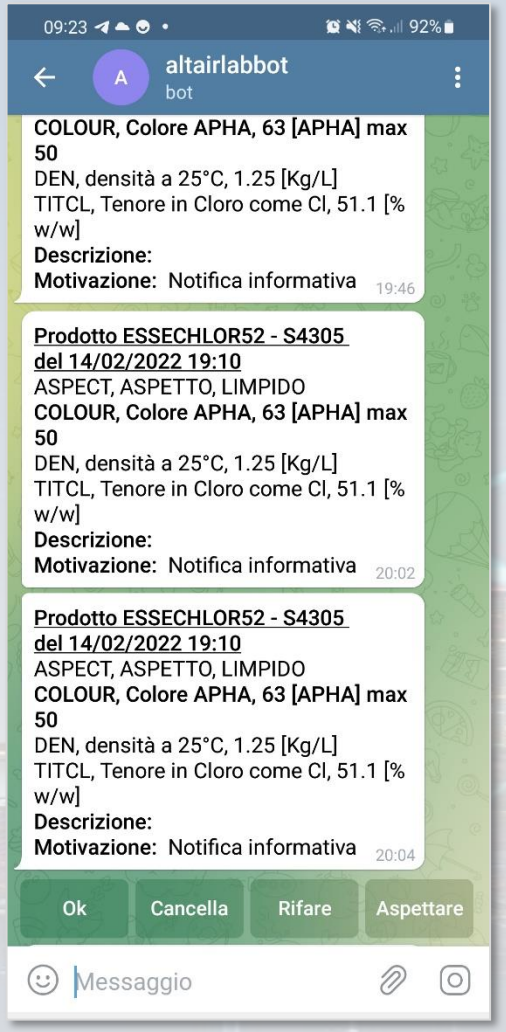




GENOTILAB: Smart production process control



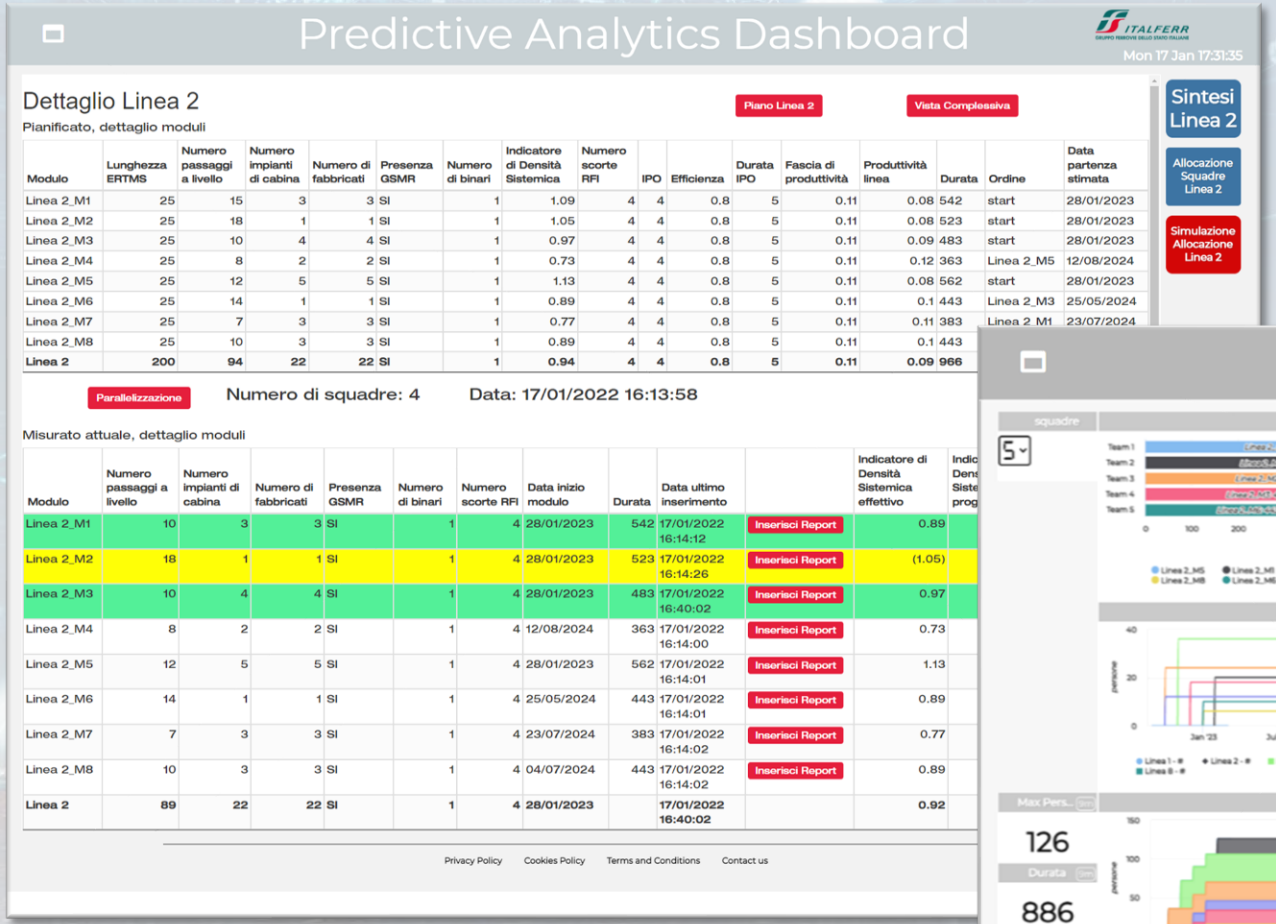




ITALFERR: Application to support decision-making processes to allocate human resources in the work plan

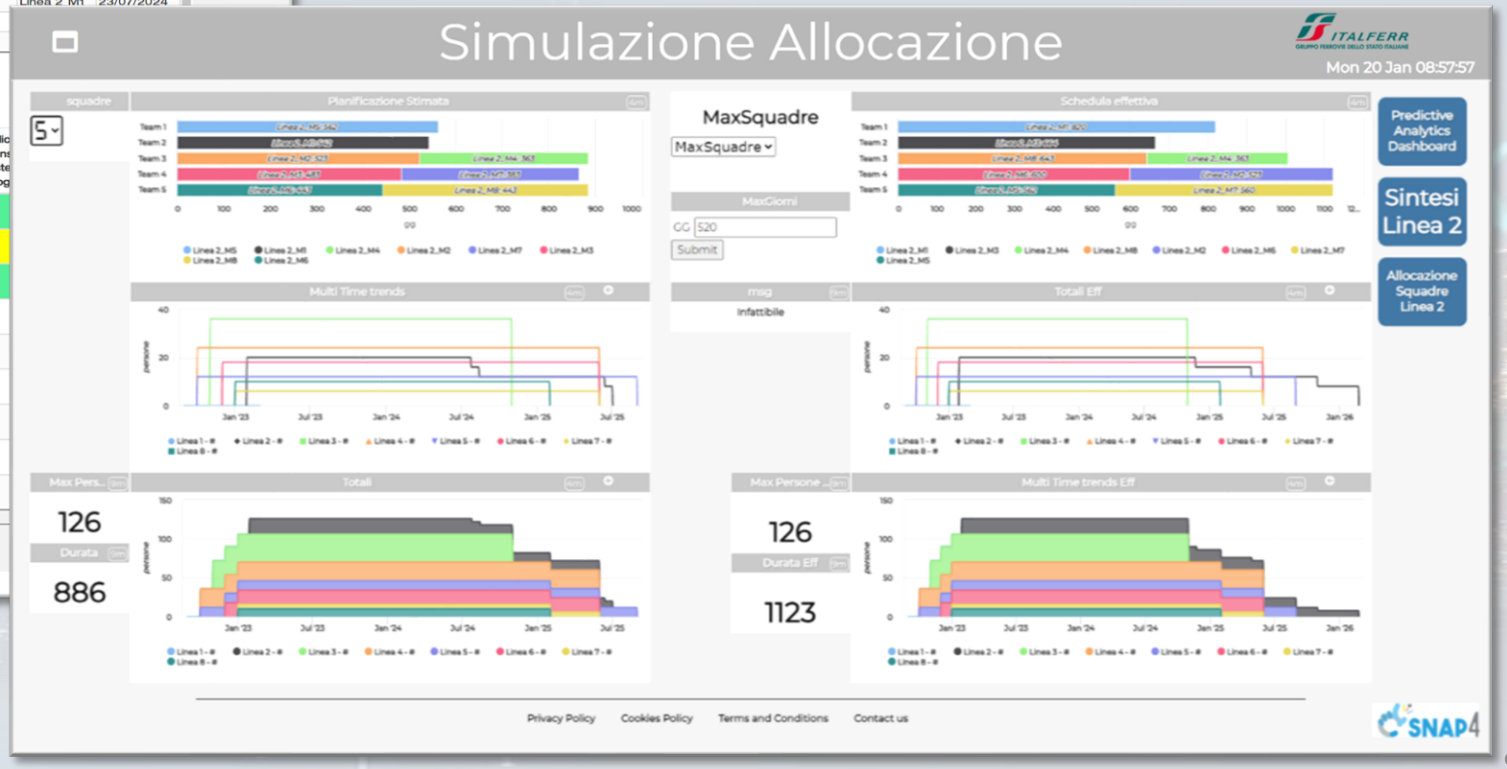
ITALFERR
GRUPPO FERROVIE DELLO STATO ITALIANE

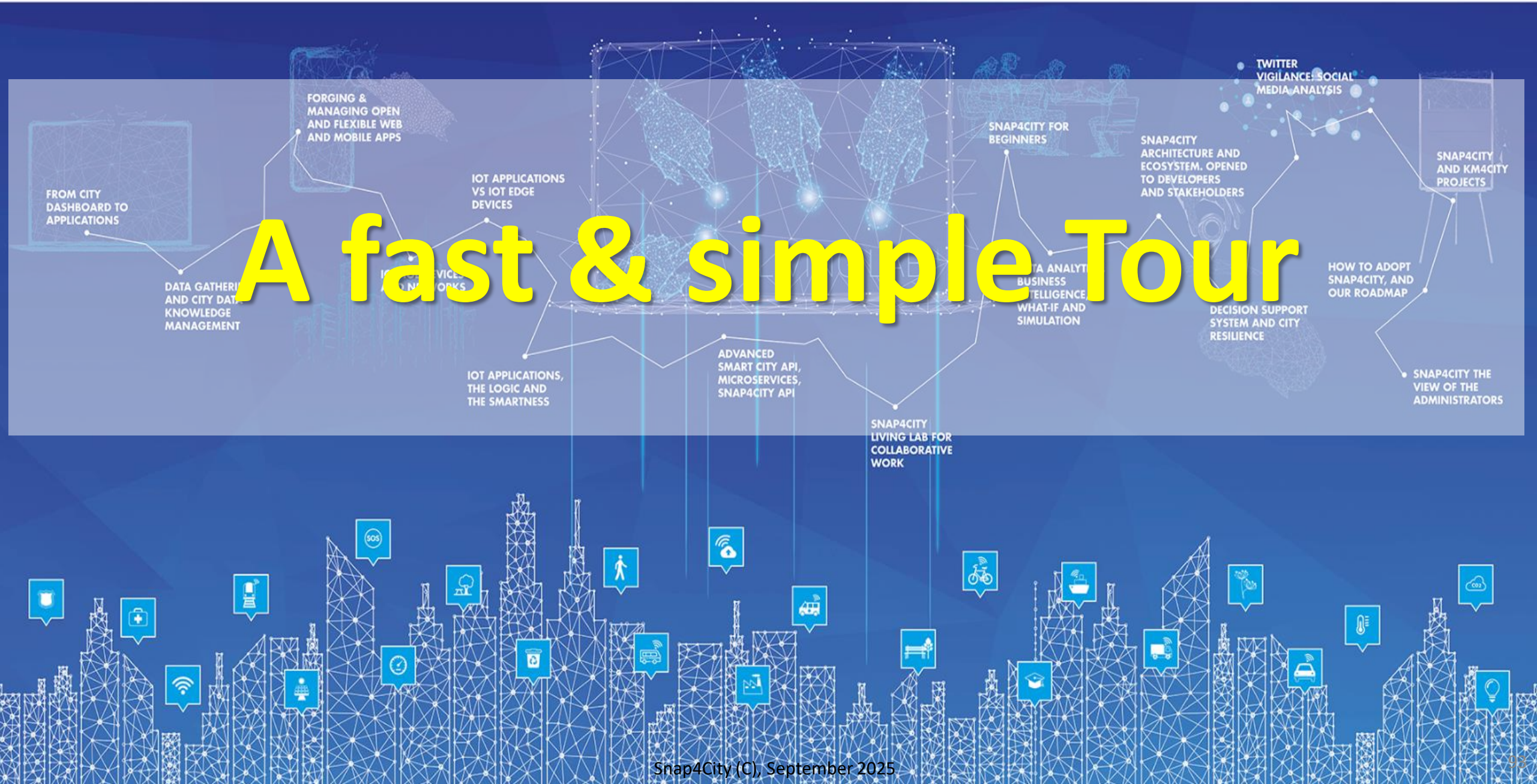
SNAP4



Modulo	Lunghezza ERTMS	Numero passaggi a livello	Numero impianti di cabina	Numero di fabbricati	Presenza GSMR	Numero di binari	Indicatore di Densità Sistemica	Numero scorte RFI	IPO	Efficienza	Durata IPO	Fascia di produttività	Produttività linea	Durata	Ordine	Data partenza stimata
Linea 2_M1	25	15	3	3	SI	1	1.09	4	4	0.8	5	0.11	0.08	542	start	28/01/2023
Linea 2_M2	25	18	1	1	SI	1	1.05	4	4	0.8	5	0.11	0.08	523	start	28/01/2023
Linea 2_M3	25	10	4	4	SI	1	0.97	4	4	0.8	5	0.11	0.09	483	start	28/01/2023
Linea 2_M4	25	8	2	2	SI	1	0.73	4	4	0.8	5	0.11	0.12	363	Linea 2_M5	12/08/2024
Linea 2_M5	25	12	5	5	SI	1	1.13	4	4	0.8	5	0.11	0.08	562	start	28/01/2023
Linea 2_M6	25	14	1	1	SI	1	0.89	4	4	0.8	5	0.11	0.1	443	Linea 2_M3	25/05/2024
Linea 2_M7	25	7	3	3	SI	1	0.77	4	4	0.8	5	0.11	0.11	383	Linea 2_M1	23/07/2024
Linea 2_M8	25	10	3	3	SI	1	0.89	4	4	0.8	5	0.11	0.1	443		
Linea 2	**200**	**94**	**22**	**22**	**SI**	**1**	**0.94**	**4**	**4**	**0.8**	**5**	**0.11**	**0.09**	**966**		

Modulo	Numero passaggi a livello	Numero impianti di cabina	Numero di fabbricati	Presenza GSMR	Numero di binari	Numero scorte RFI	Data inizio modulo	Durata	Data ultimo inserimento		Indicatore di Densità Sistemica effettivo
Linea 2_M1	10	3	3	SI	1	4	28/01/2023	542	17/01/2022 16:14:12	Inserisci Report	0.89
Linea 2_M2	18	1	1	SI	1	4	28/01/2023	523	17/01/2022 16:14:26	Inserisci Report	(1.05)
Linea 2_M3	10	4	4	SI	1	4	28/01/2023	483	17/01/2022 16:40:02	Inserisci Report	0.97
Linea 2_M4	8	2	2	SI	1	4	12/08/2024	363	17/01/2022 16:14:00	Inserisci Report	0.73
Linea 2_M5	12	5	5	SI	1	4	28/01/2023	562	17/01/2022 16:14:01	Inserisci Report	1.13
Linea 2_M6	14	1	1	SI	1	4	25/05/2024	443	17/01/2022 16:14:01	Inserisci Report	0.89
Linea 2_M7	7	3	3	SI	1	4	23/07/2024	383	17/01/2022 16:14:02	Inserisci Report	0.77
Linea 2_M8	10	3	3	SI	1	4	04/07/2024	443	17/01/2022 16:14:02	Inserisci Report	0.89
Linea 2	**89**	**22**	**22**	**SI**	**1**	**4**	**28/01/2023**		**17/01/2022 16:40:02**		**0.92**





A fast & simple Tour

https://www.youtube.com/watch?v=qS34LLdT9JM

Welcome on Snap4City

Snap4City is a full-featured platform to manage, aggregate, visualize and analyze big data, IoT. These operations can be customized to accomodate any business need

This short tour is going to show you the main features of the platform.

Leave the tour | Take the tour

Extra Dashboard Widgets
Data Management, HLT
Knowledge and Maps
Processing Logics / IOT App
Entity Directory and Devices
Resource Manager
Development Tools
Management
Decision Support Systems
Deploy and Installation
Help and Contacts
Documentation and Articles

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nap4city.org

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Home | How and Why To Use it | Tools | Tutorials and Videos

HOW ARE YOU GOING TO BUILD THE FUTURE?

Snap4City: a framework for rapid implementation of Decision Support Systems and Smart Applications.



Home > Snap4City: Smart aNalytic APp builder for sentient Cities and IOT

Snap4City: Smart aNalytic APp builder for sentient Cities and IOT










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Organizations









Innovations

Interoperability

Installations

What People say

Mobile Apps

IOT Devices

IOT Applications

Data Analytics

Dashboards


Living Lab


Smart City API



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Snap4Industry


Snap4Home

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Registration

- New Registration
- Request a new password
- Recover your registration

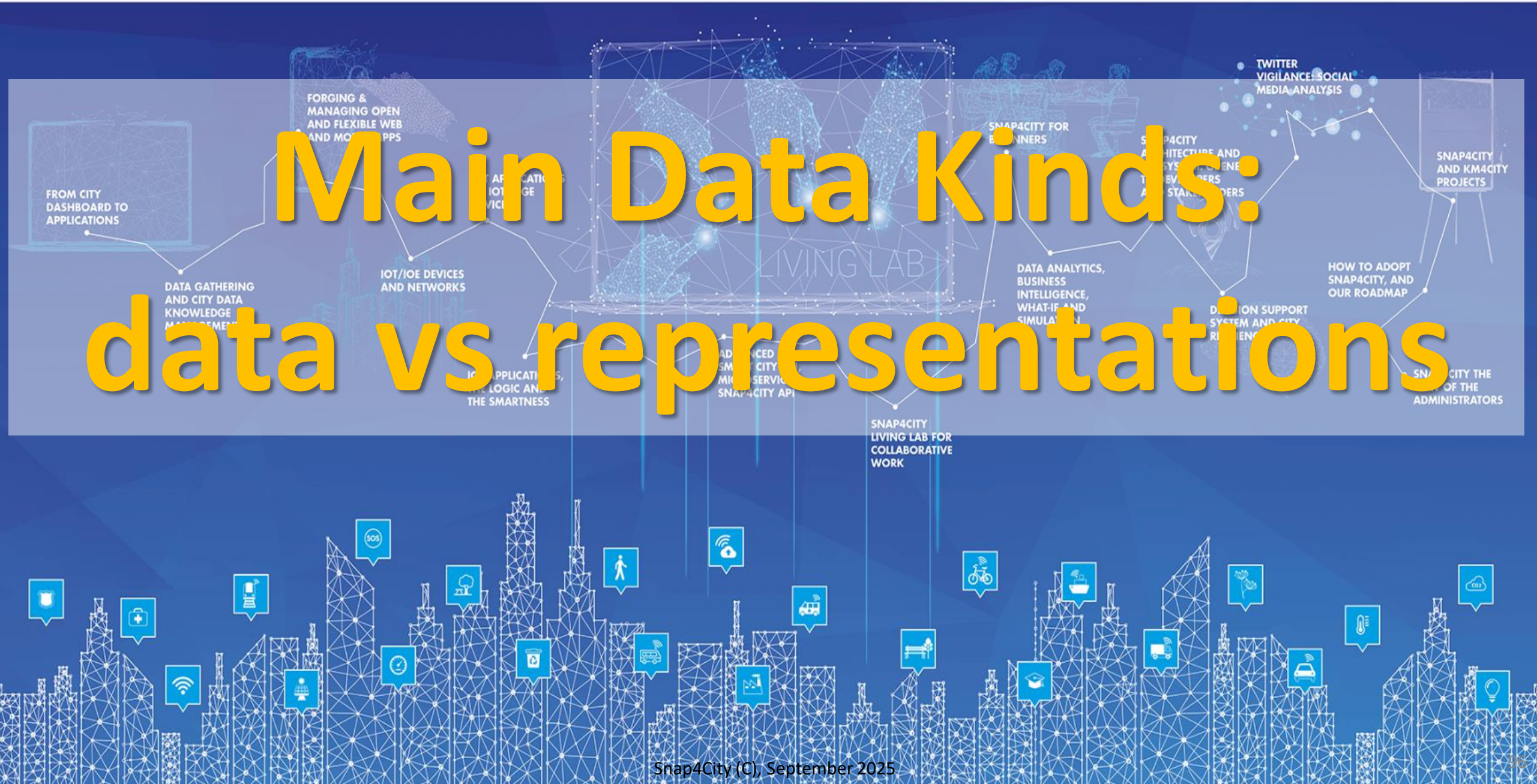
Search

Search

-Any-

Training on Tools and Platform

Powered by www.km4city.org



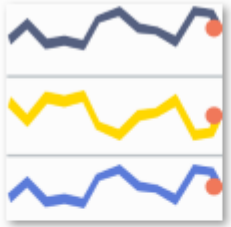
Main Data Kinds: data vs representations

From Data to Visualization



Visual Representations


Sliderwith-multiple-steps-for-KPI


sparklines



kpi


histogram


heatmap


flow-maps


geo-maps

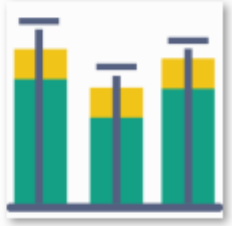

donut-chart

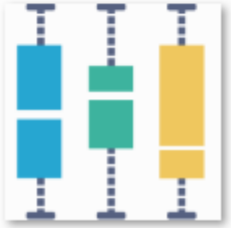

Data-grid


chord


Cone


Bubble-matrix-chart


Bullet


Box-plot


staked-area


Stacked-line-chart


Stacked-combinational-Chart


spider-maps


Sequence-Sunbur


Pivot


pie-chart-1


Pareto-chart


radar

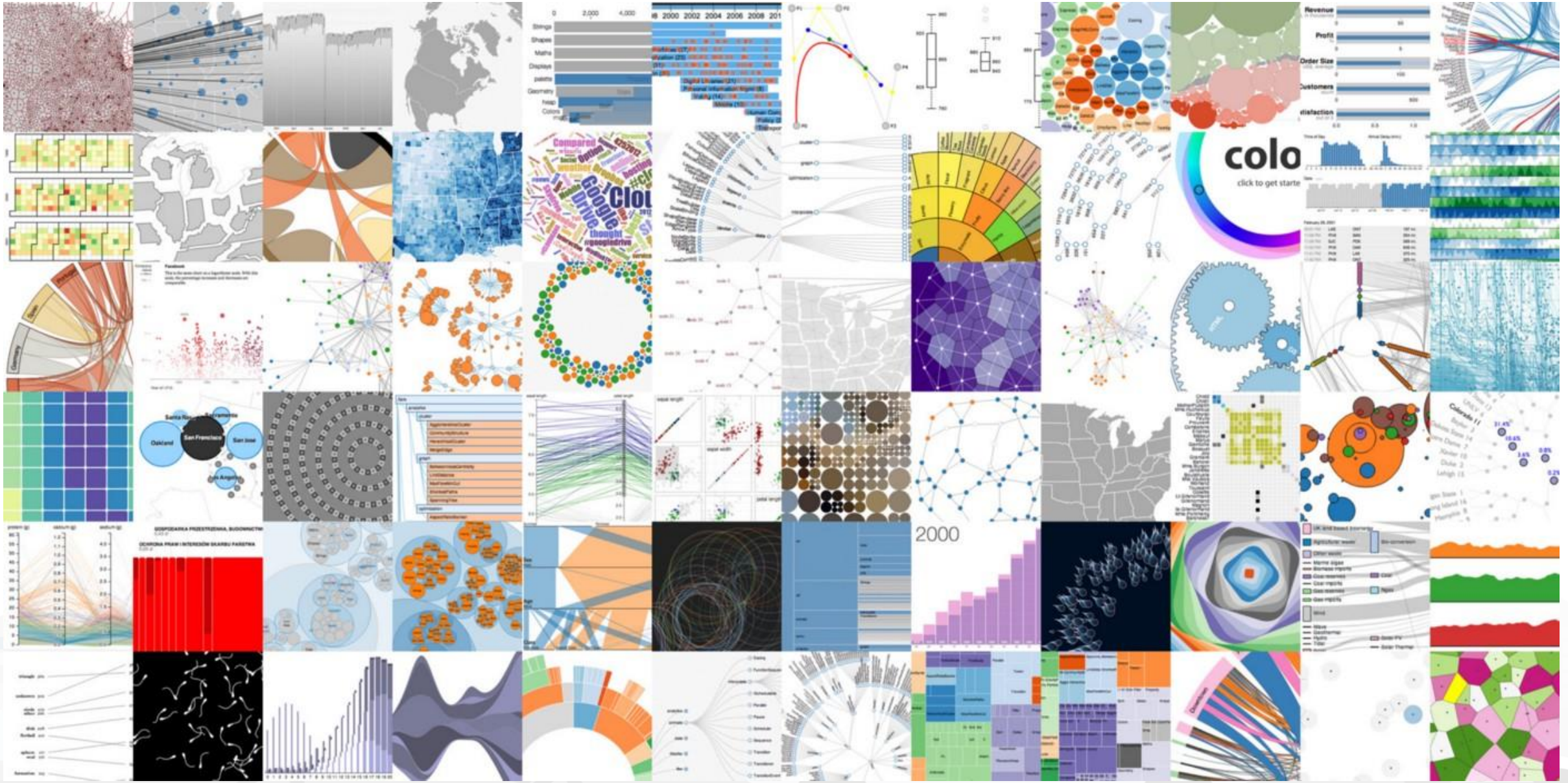

Bubble-maps


waterfall


Sunburst


Sankey

D3.js graphs


Revenue
Profit
Order Size
Customers
colo
click to get starte
2000

Main Concepts

- **Time Series**
  - Data sources (sensors / actuators) which provide changes of time. E.g., a sensor of some kind.
- **Geolocated Data on maps (PINs)** can be:
  - Structural info.: roads, building, etc.
  - Maps, orthomaps, Heatmaps (HM)
  - Elements and their positions as
    - Points of Interest
    - Shapes: garden, building, cycling paths, etc.
    - Entities/Devices as Time Series: which may move over time, e.g., tracking a Car
  - Origin Destination Maps, ODM
  - Trajectories, people and traffic flows, etc.
  - etc.
- **Static non GeoLocated Data**:
  - almost nothing since……

A single Data Kind may have multiple representations:

e.g.: the position of the car at 15:30, the trjaectory of yesterday, the ODM with set of travels performed in the last year, the most freq. Visited places as HM



Time Series, multi series

What About IoT Devices, Time Series

IOT Device



IOT Device

Sends a message

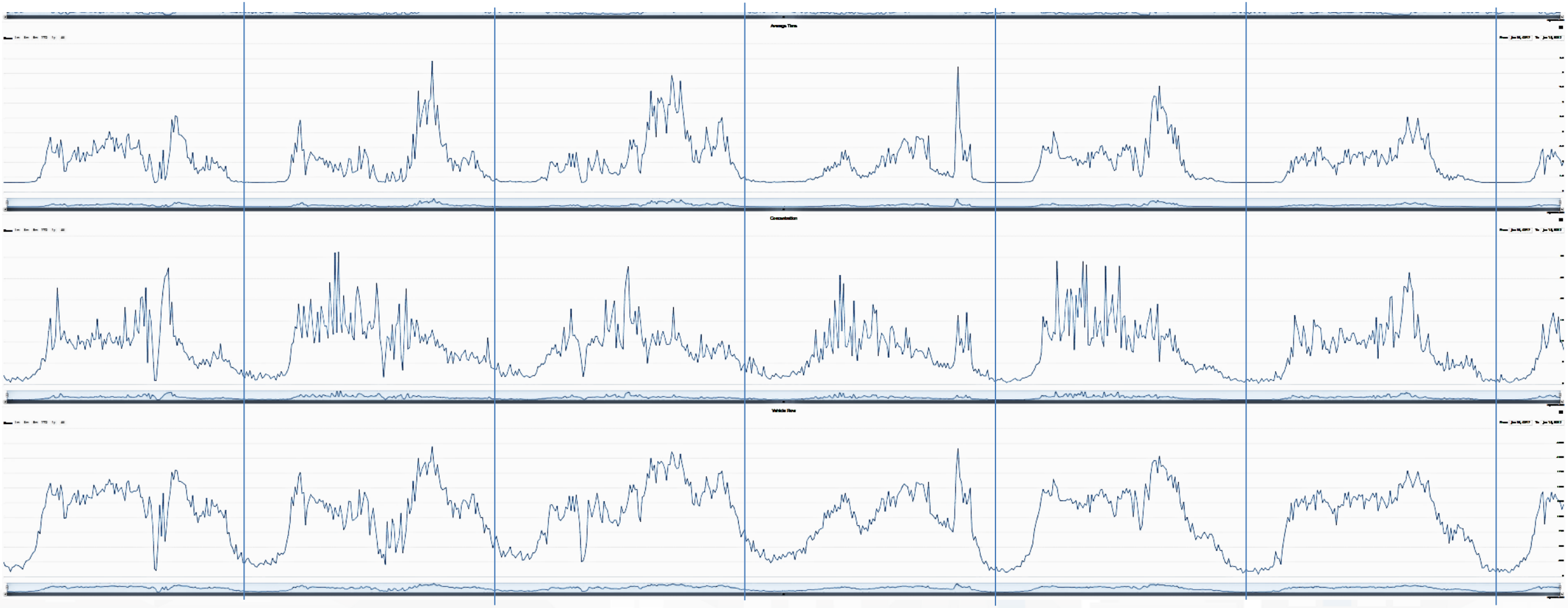
Message (
timestamp: 02-04-2020 at 10:30,
Temperature: 29.34,
Humidity: 35
)

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

- 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**

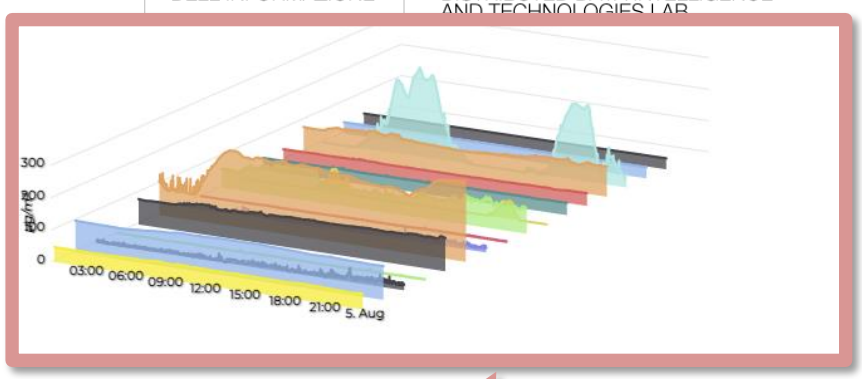


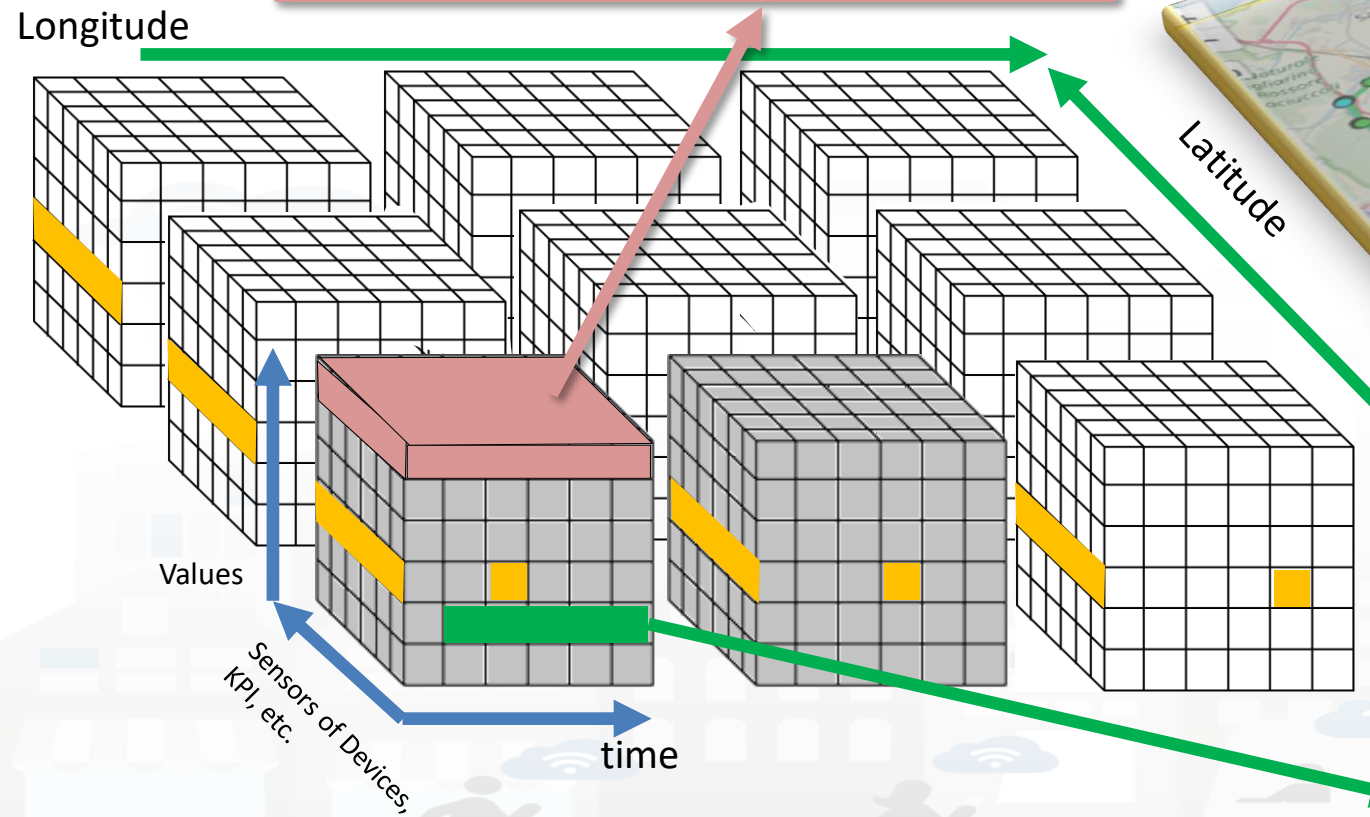
Traffic Flow data



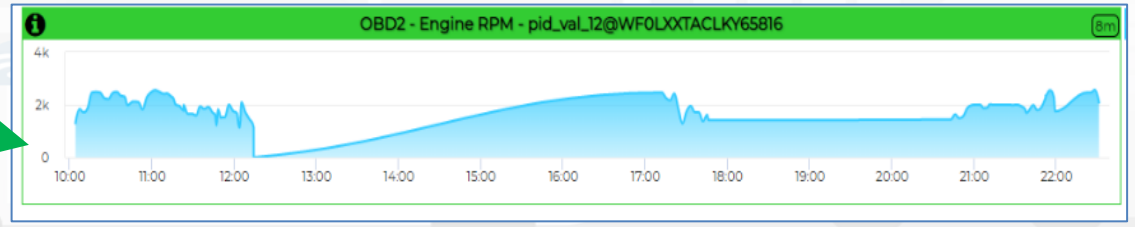
- Day by day traffic flow, on the week data from 3 sensors

Hypercube


300
200
100
0
03:00 06:00 09:00 12:00 15:00 18:00 21:00 5. Aug

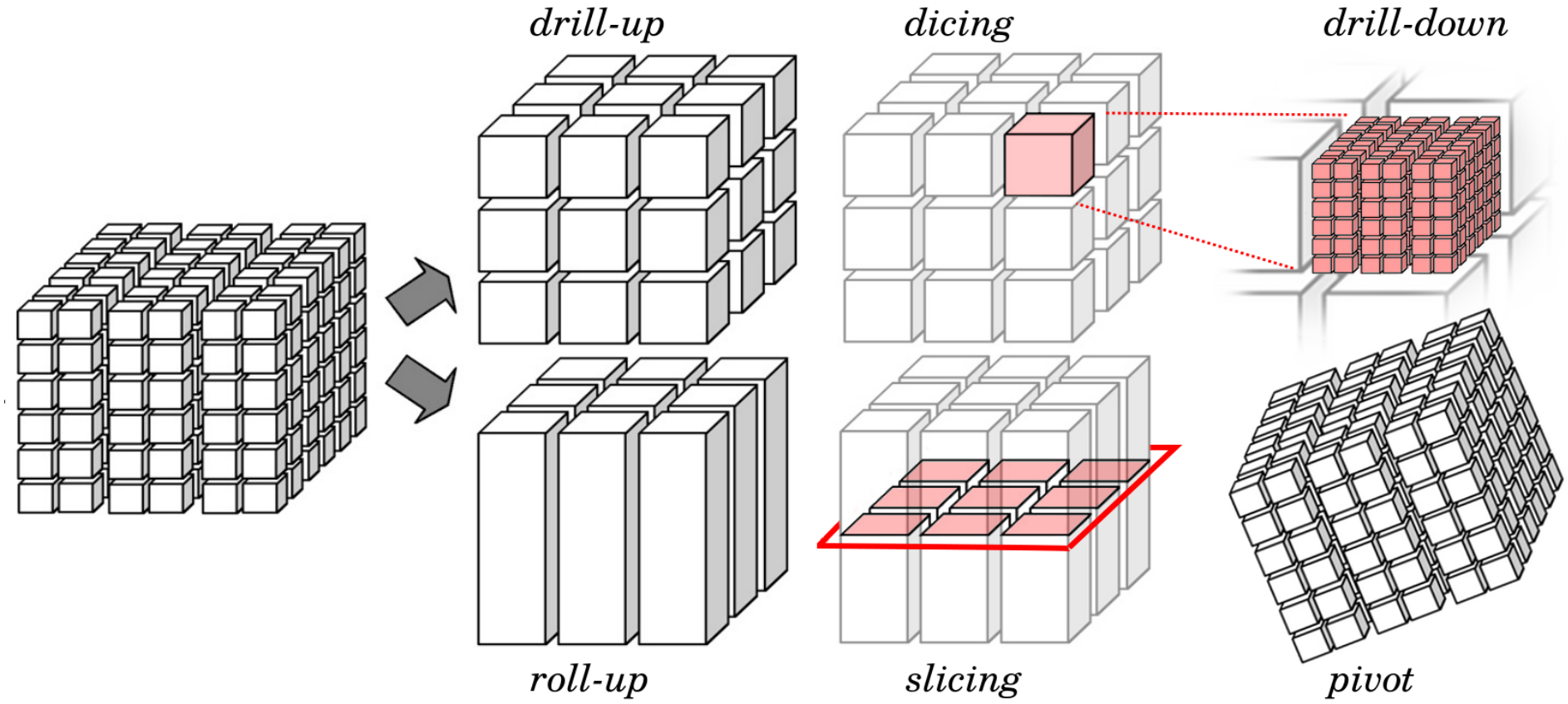

Longitude
Latitude
Values
Sensors of Devices, KPI, etc.
time



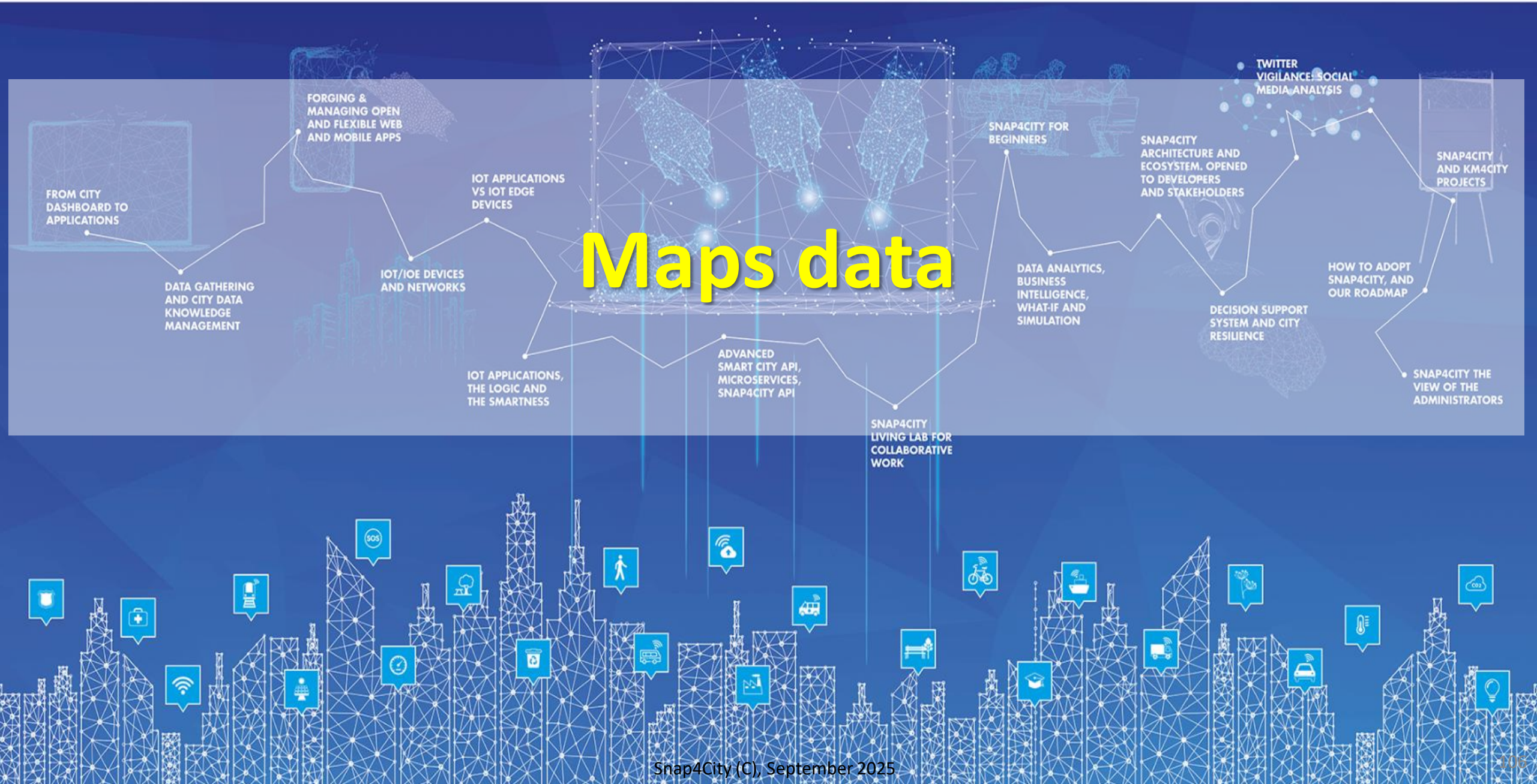

OBD2 - Engine RPM - pid_val_12@WF0LXXTACLKY65816
4k
2k
0
10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00

The data cubes

- Using Dashboard Wizard with Widgets all the different transformations may be possible with different representations.
- The IoT App allows to make them Dynamic

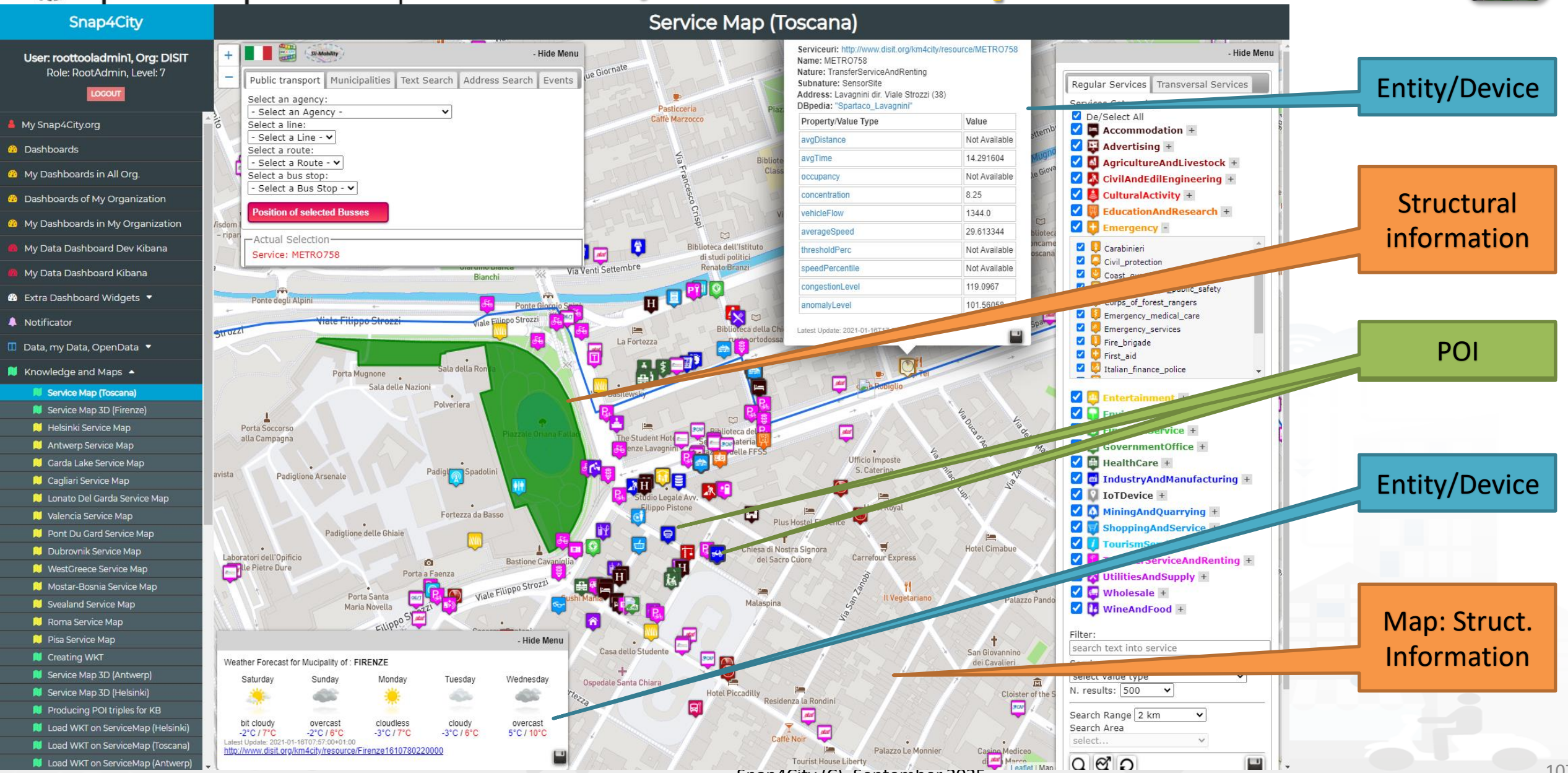


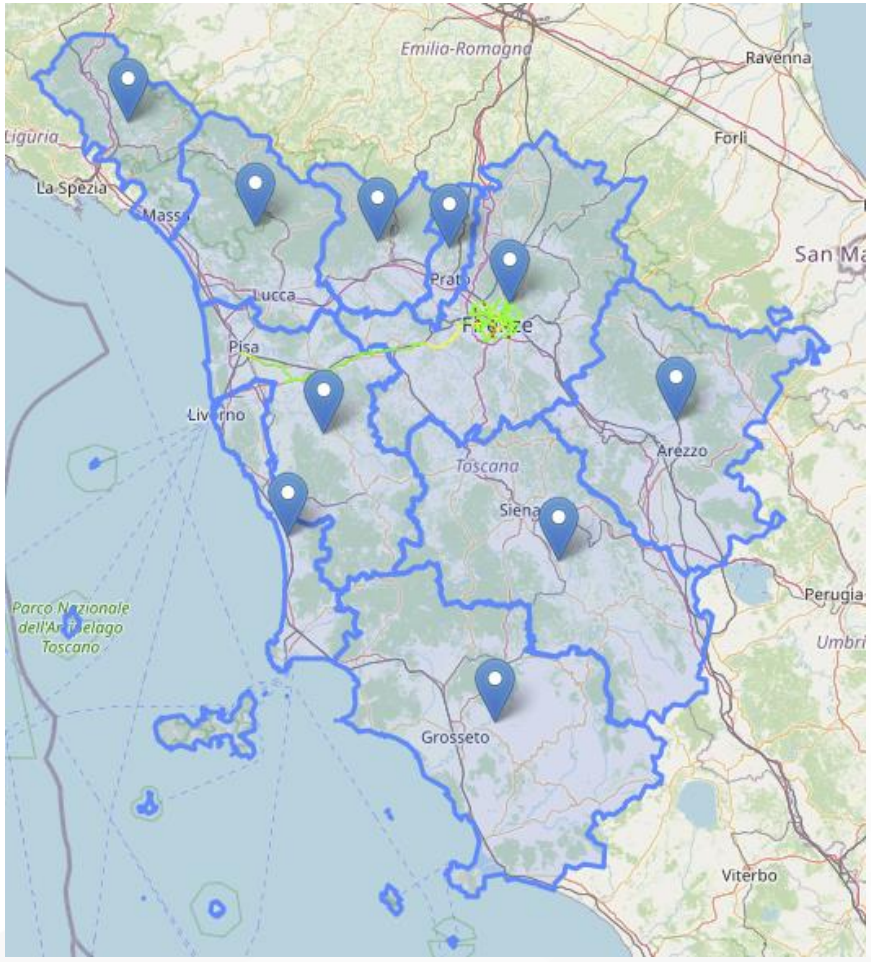
SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES

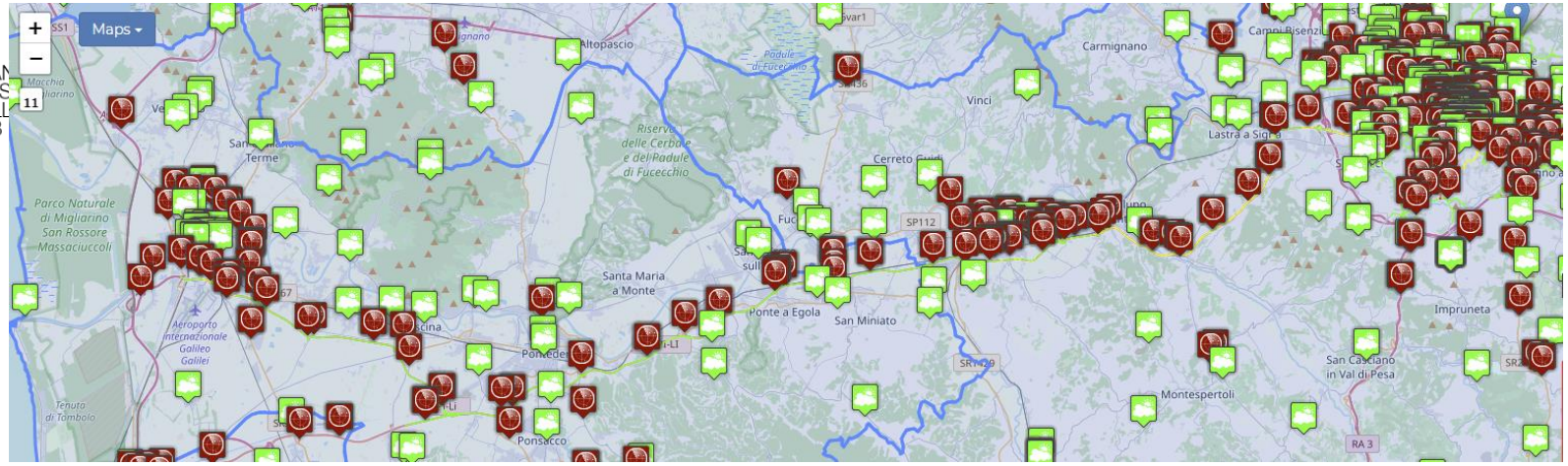


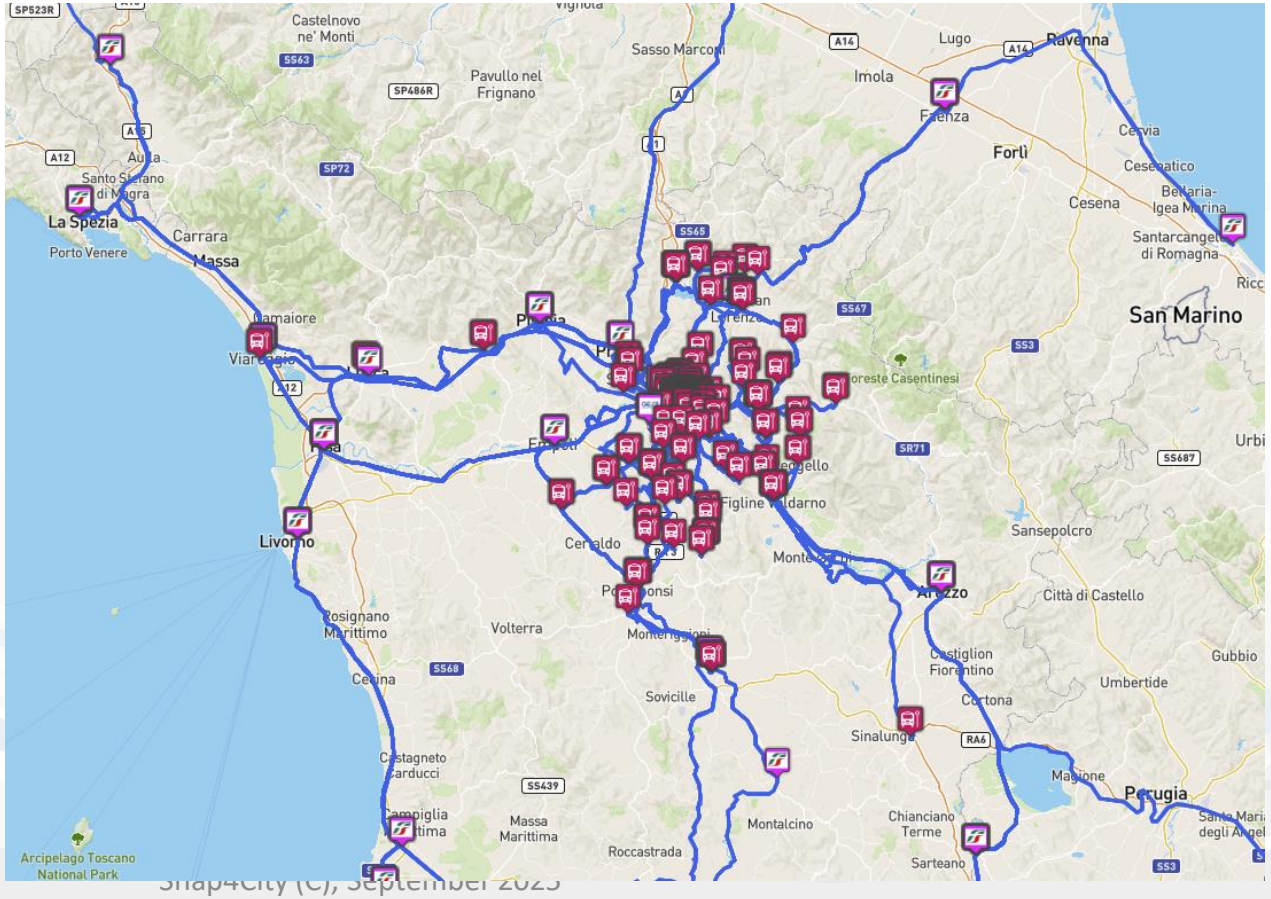
Maps data

KB, ServiceMap









Admin Models & limitations

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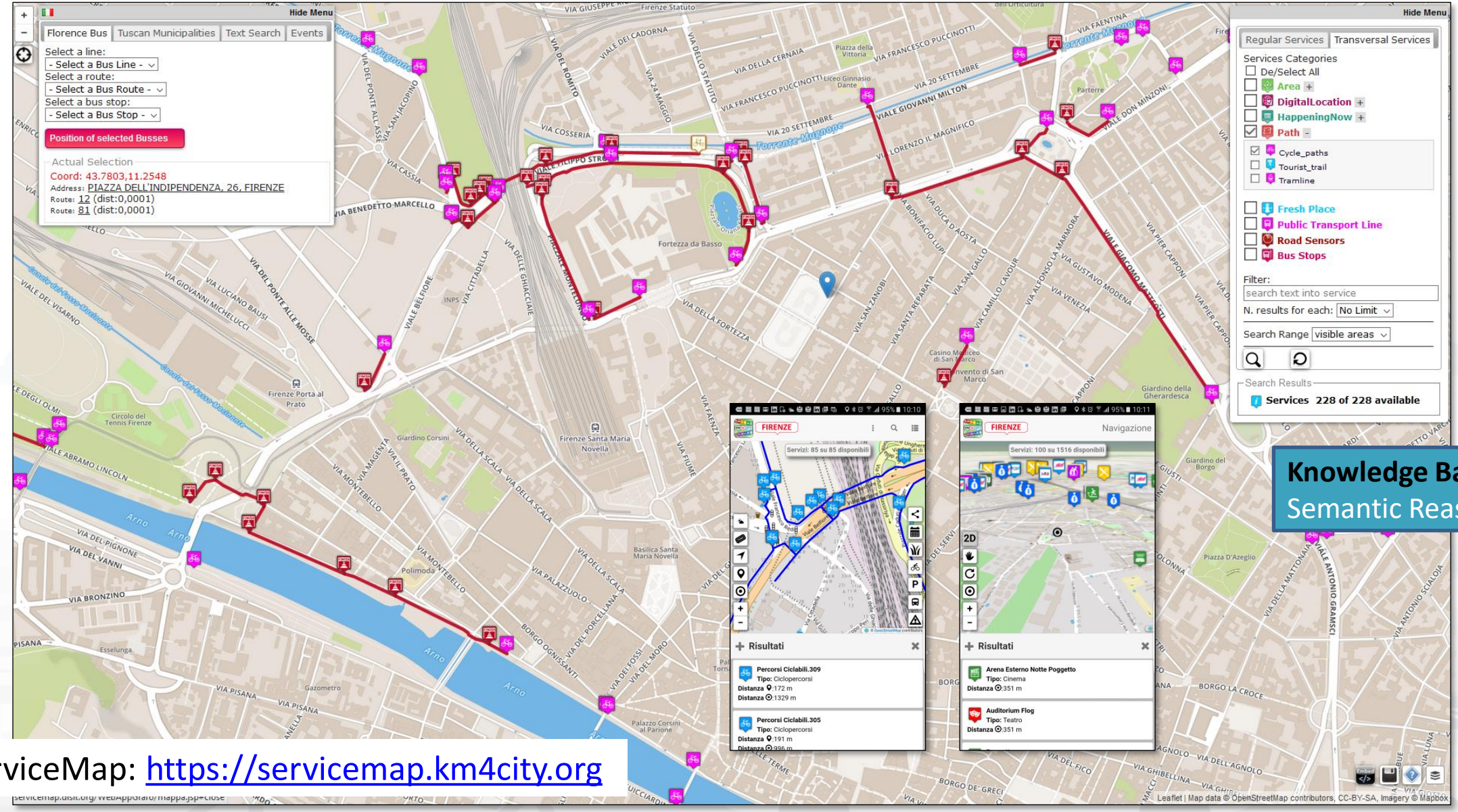
DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB
DISTRIBUTED DATA INTELLIGENCE AND TECHNOLOGIES LAB

Cycling Paths

SNAP4CITY KM4CITY

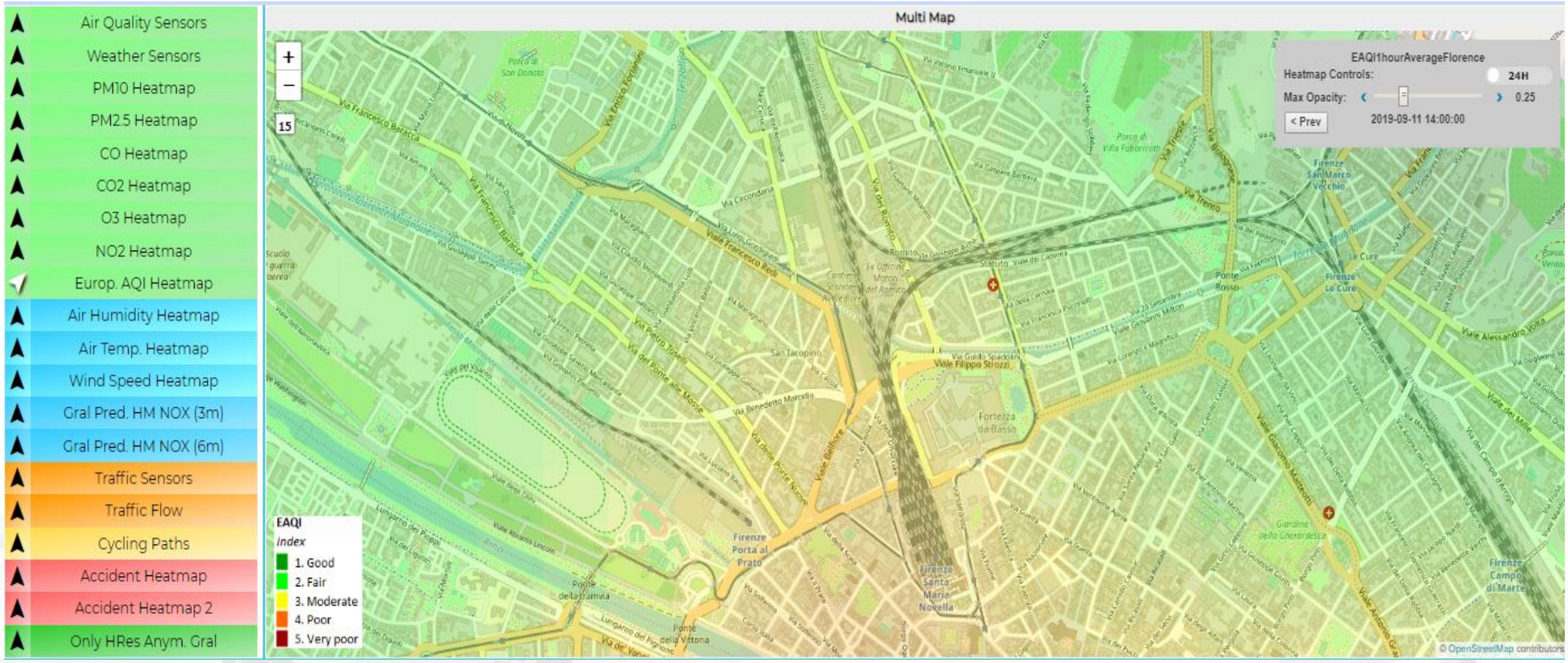


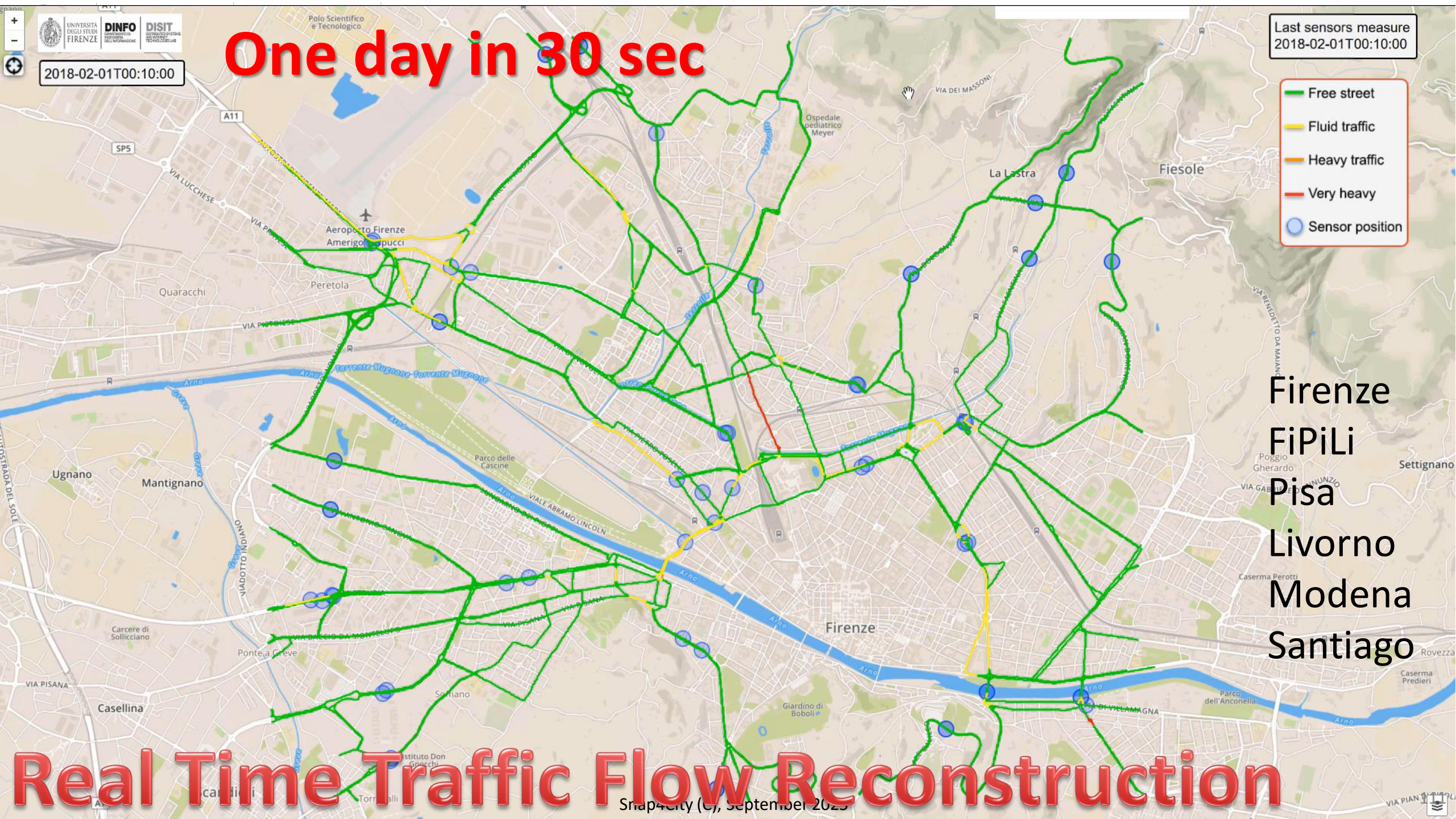
Sii-Mobility

Knowledge Base
Semantic Reasoners

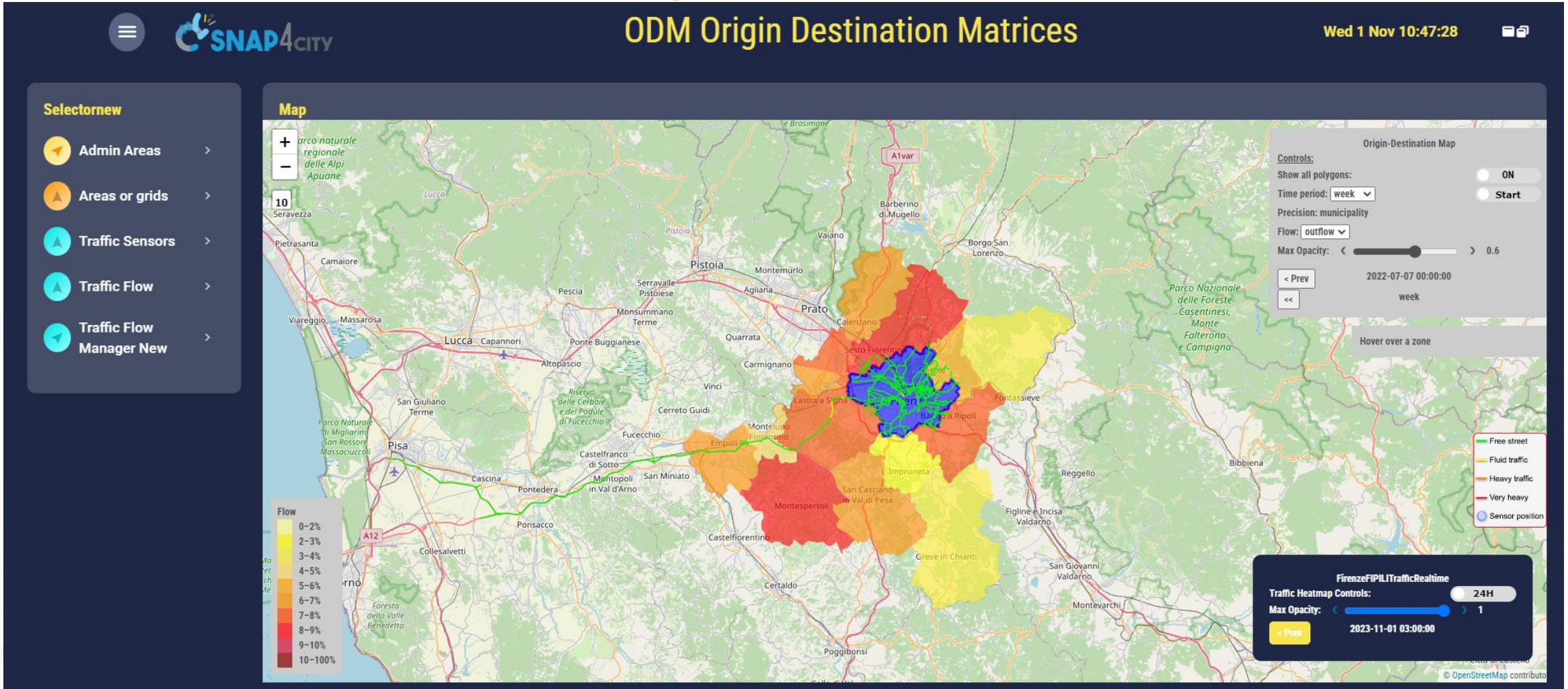
ServiceMap: https://servicemap.km4city.org

EAQI Heatmap and sequence

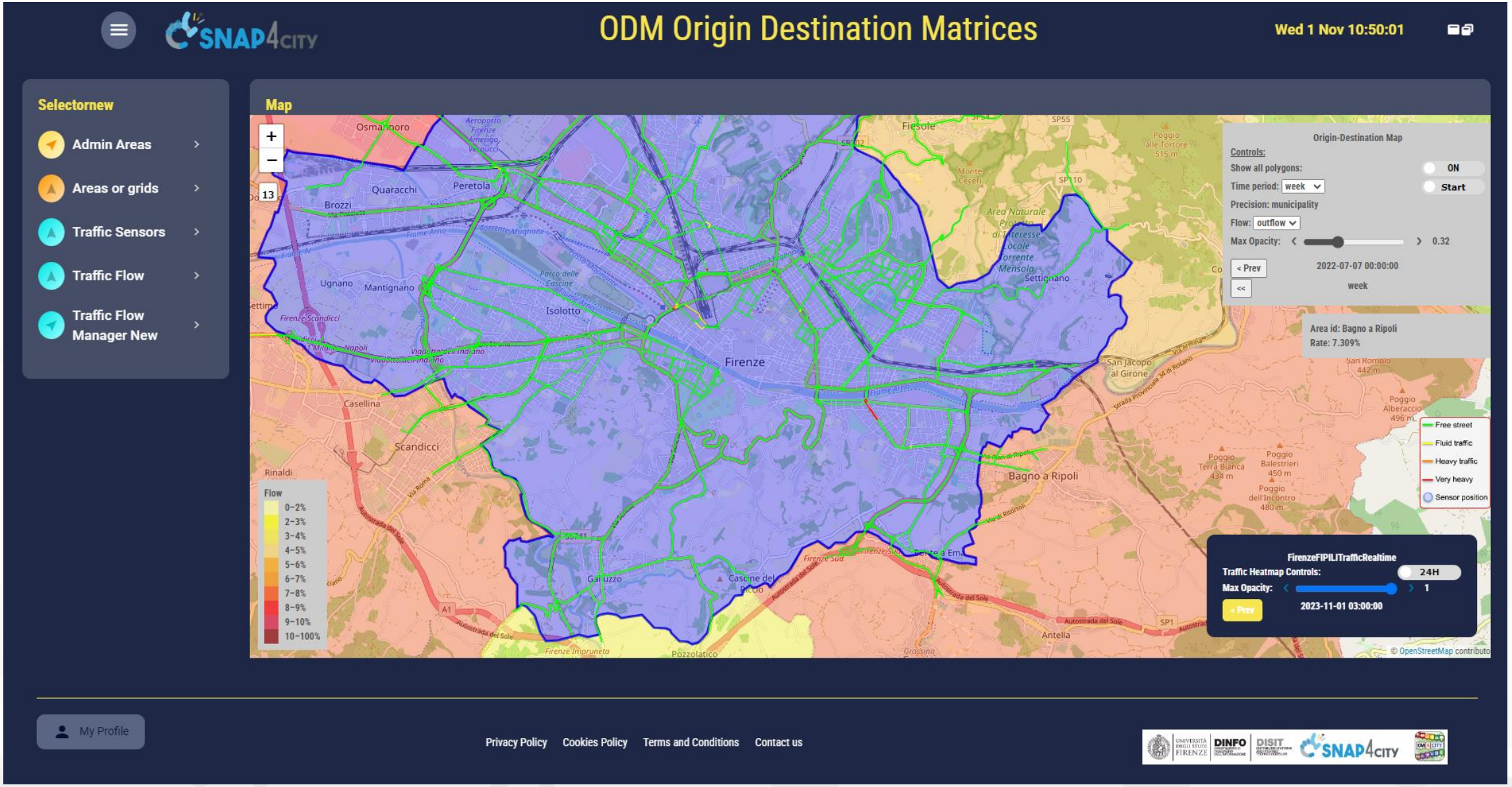



One day in 30 sec
2018-02-01T00:10:00
Last sensors measure
2018-02-01T00:10:00
Free street
Fluid traffic
Heavy traffic
Very heavy
Sensor position
Firenze
FiPiLi
Pisa
Livorno
Modena
Santiago
Real Time Traffic Flow Reconstruction
Snap4City (C), September 2023

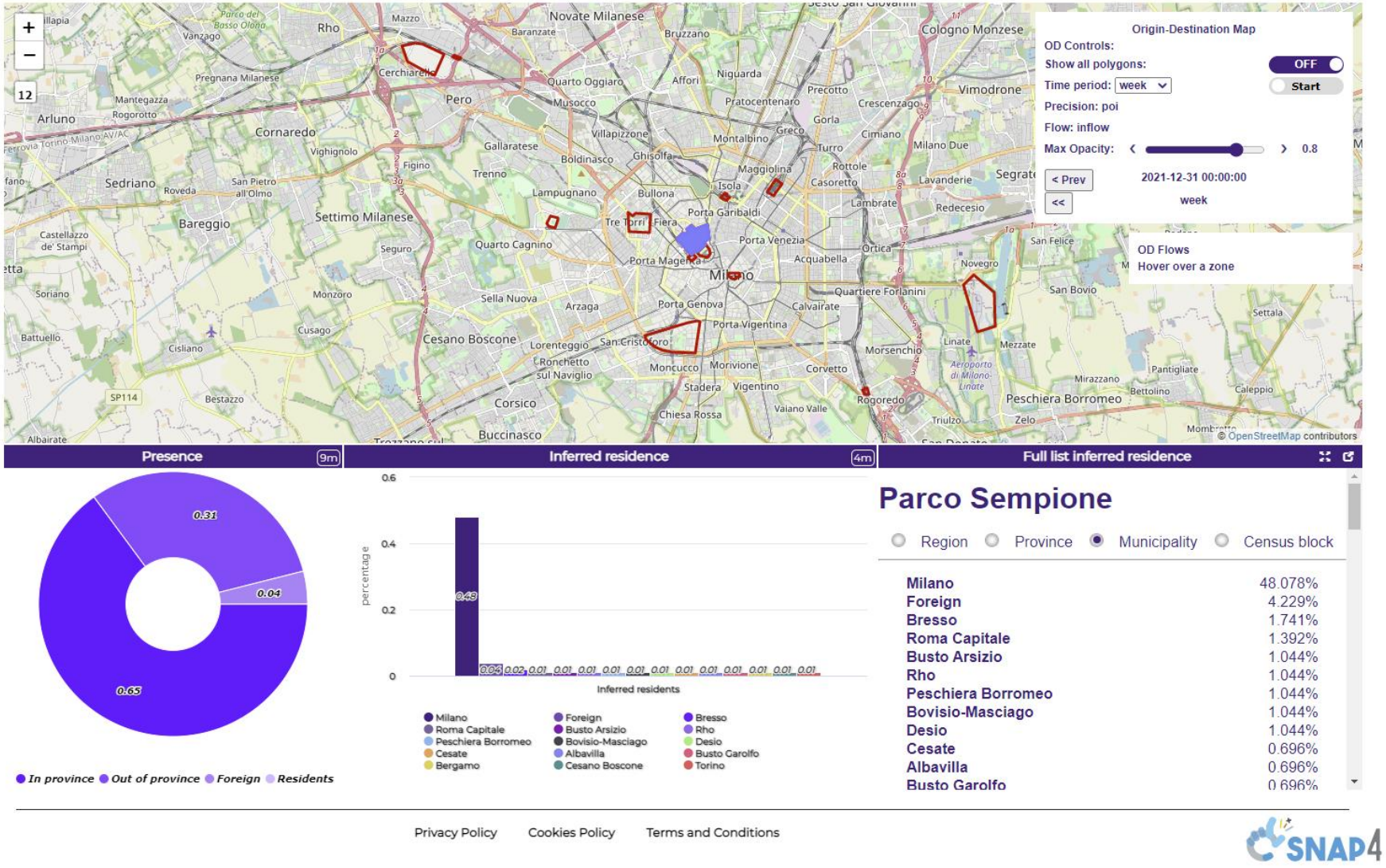
ODM, Traffic Flow

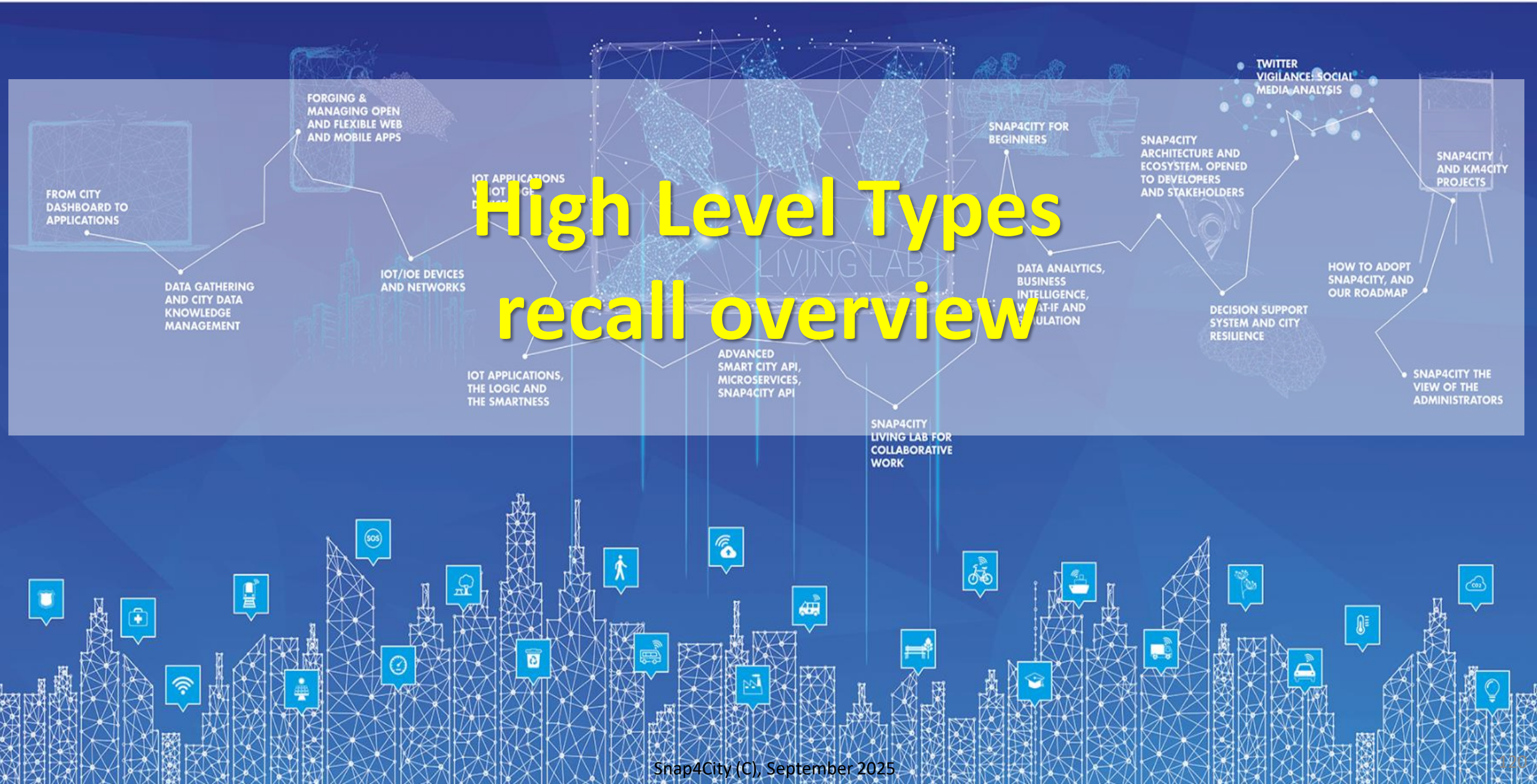


https://www.snap4city.org/dashboardSmartCity/view/Gea-Night.php?iddasboard=Mzk3Nw==


ODM Origin Destination Matrices
Wed 1 Nov 10:50:01
Selectornew
Admin Areas
Areas or grids
Traffic Sensors
Traffic Flow
Traffic Flow Manager New
Map
Origin-Destination Map
Controls:
Show all polygons:
ON
Time period: week
Start
Precision: municipality
Flow: outflow
Max Opacity:
0.32
< Prev
2022-07-07 00:00:00
week
Area id: Bagno a Ripoli
Rate: 7.309%
Free street
Fluid traffic
Heavy traffic
Very heavy
Sensor position
Flow
0-2%
2-3%
3-4%
4-5%
5-6%
6-7%
7-8%
8-9%
9-10%
10-100%
FirenzeFIPILITrafficRealtime
Traffic Heatmap Controls:
24H
Max Opacity:
1
< Prev
2023-11-01 03:00:00
© OpenStreetMap contributors
My Profile
Privacy Policy
Cookies Policy
Terms and Conditions
Contact us

ODM Visual Analytic on Milan Area





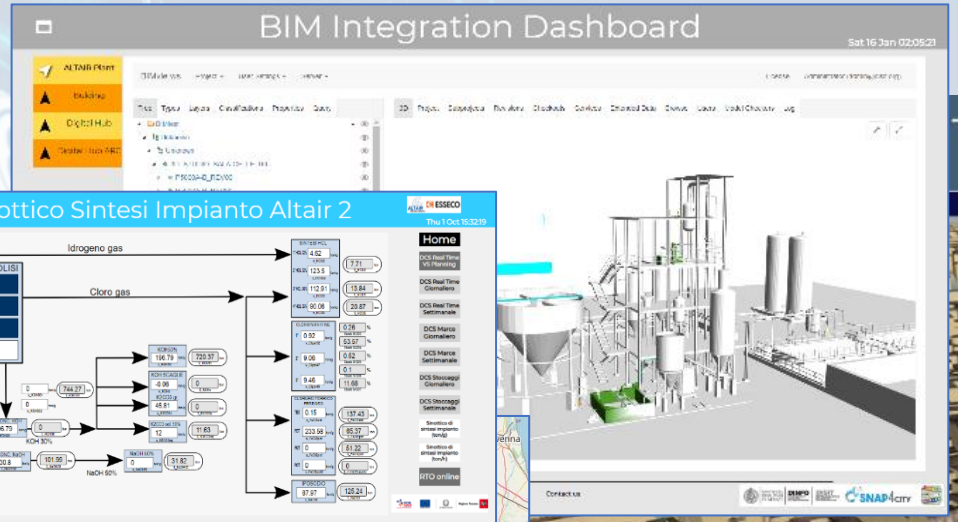
High Level Types recall overview

High Level Types

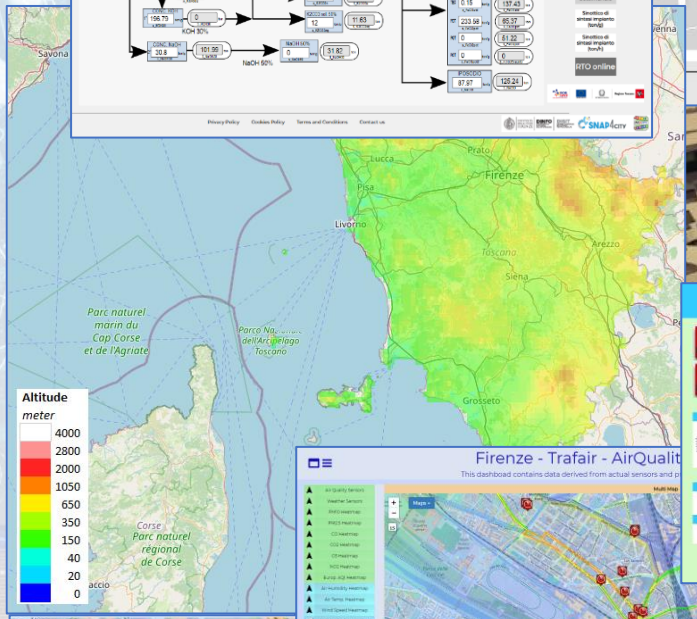
Snap4City (C), September 2025

- POI, IOT Devices, shapes,..
  - FIWARE Smart Data Models,
  - IoT Device Models
- GIS, maps, orthomaps, WFS/WMS, GeoTiff, calibrated heatmaps, ..
- Satellite data, any kind..
- 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.





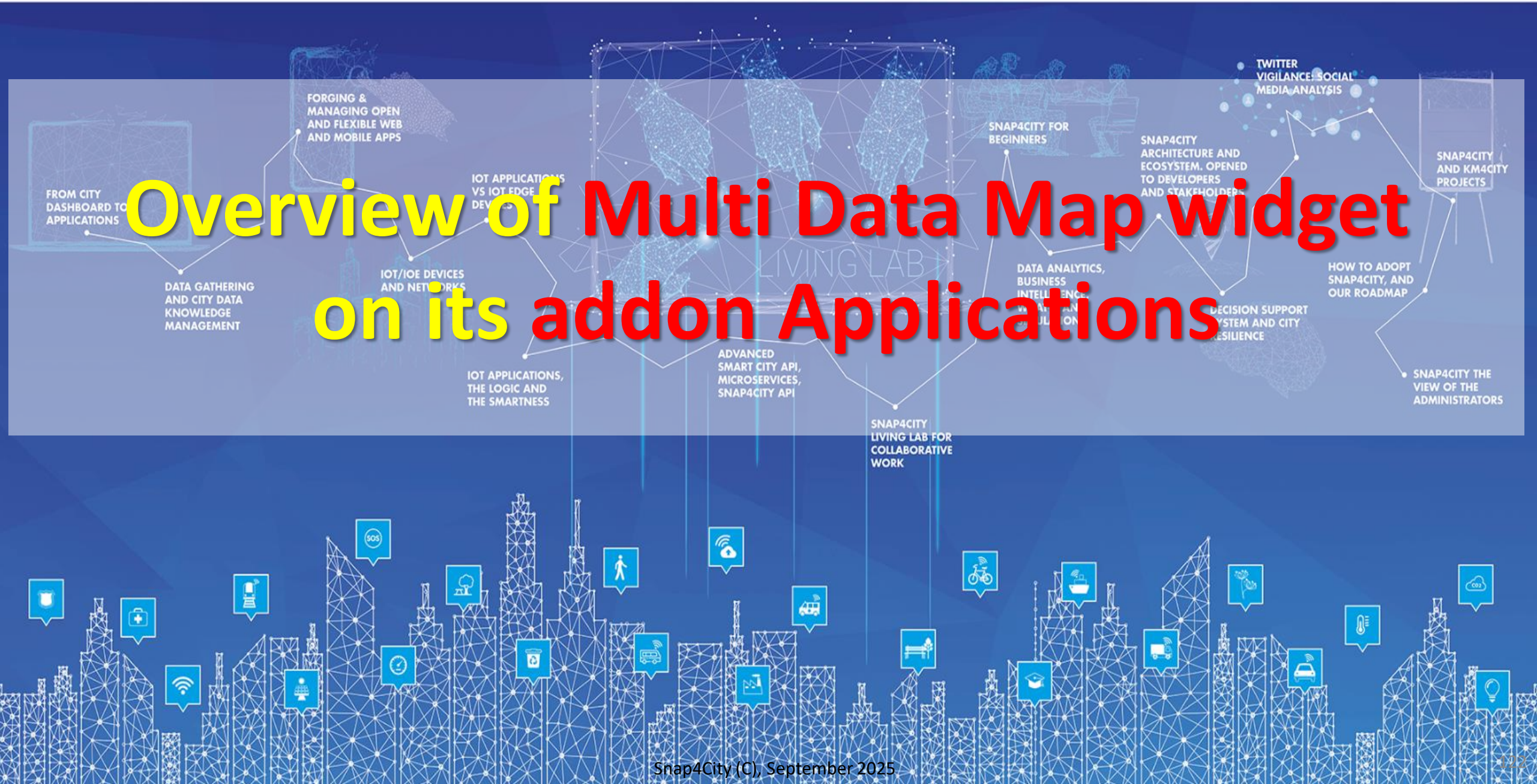










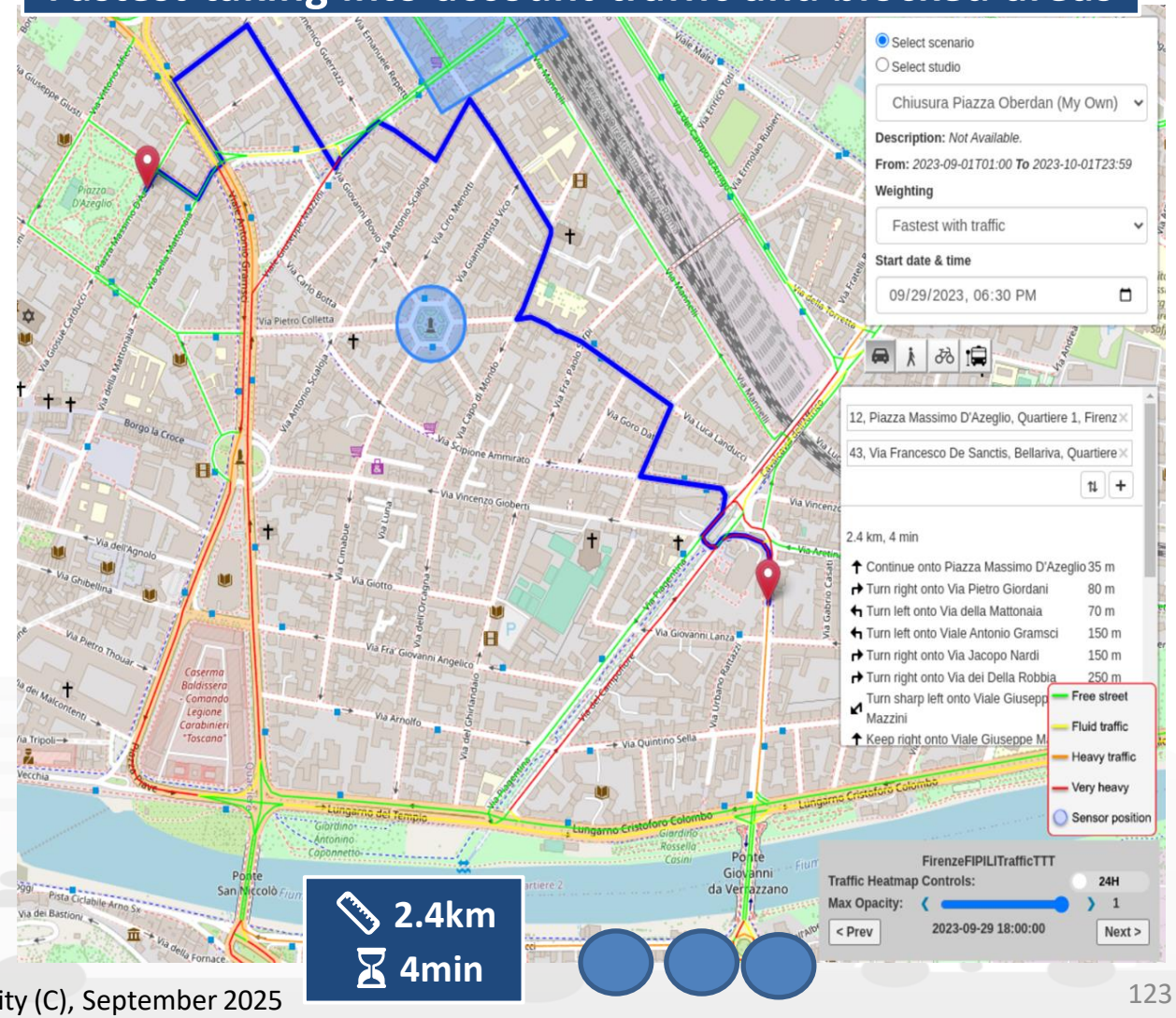


Overview of Multi Data Map widget on its addon Applications

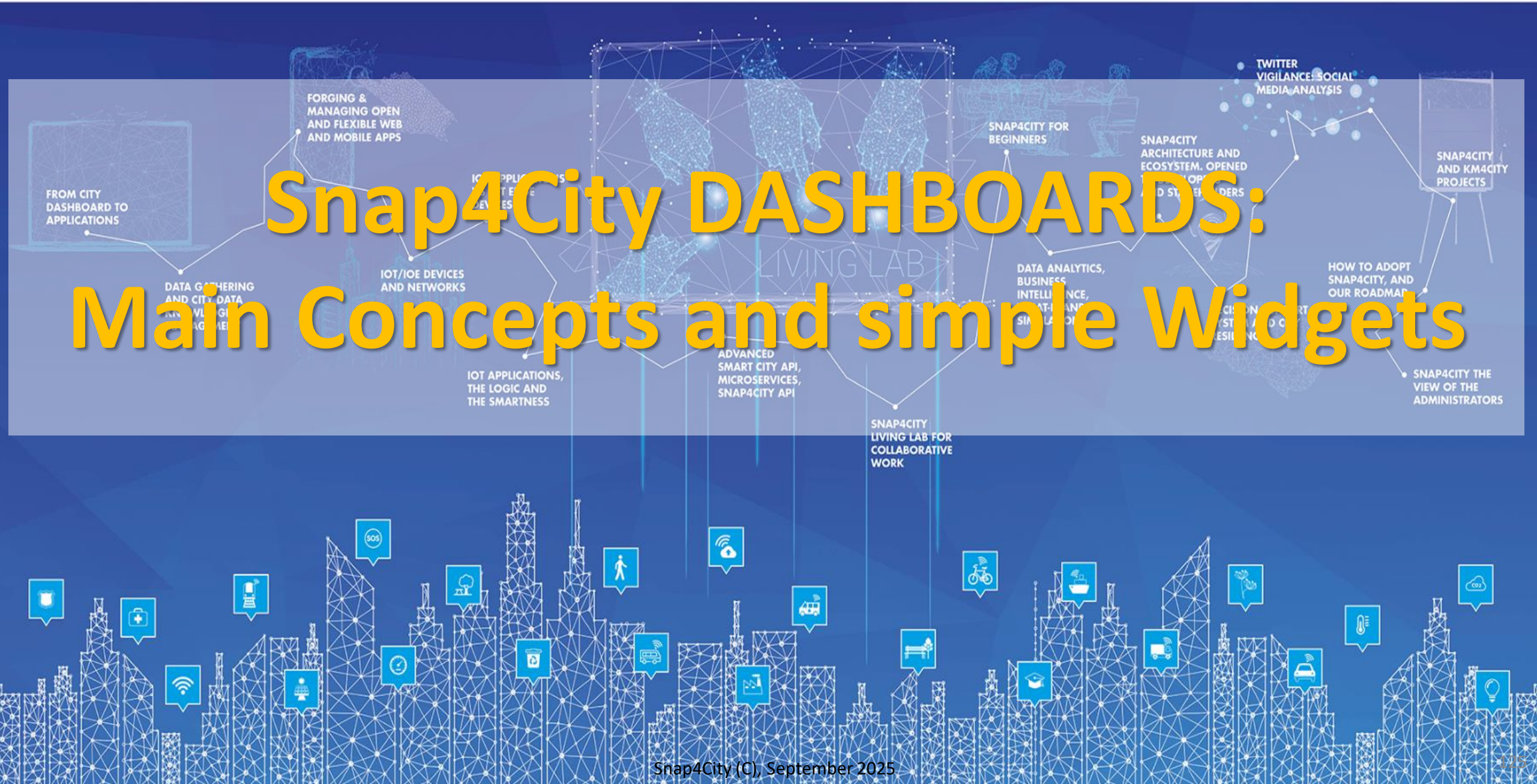
MultiDataMap Applications

- Scenario Editor
  - Simple: «/scenario/»
  - Advanced: «scenary»
- What-if with Routing
  - «/whatif/»
- Comparing Orthomaps
  - «/sideVision/»
- Heatmap Show
- Traffic Flow show
- ODM show
- Vector Fields
- Etc.
- CSBL: open the customization

Fastest taking into account traffic and blocked areas




Side Vision
Thu 3 Jul 17:54:34
Heatmap
Side Vision Mod
WFS
Scenari Editor
Pin
MAPS
Via Enrico Mayer
Scuola Primaria Guglielmo Marconi
Via Antonio Zobi
Via Francesco Bonaini
Via Angelo Maria Bandini
Via Gaetano Milanesi
Via Luigi Passerini
Via Egisto Fabbri
Via Giuseppe Richa
Bologna-Firenze (direttissima)
View
Edit
Show Road graph
Show Traffic Sensors
Draw sub-area
Filter by road types
Scenary
Load Scenario: Init Acc
Scenarios waiting to be processed: AirQuality
Load Scenari ean
sideVision.txt
30 m



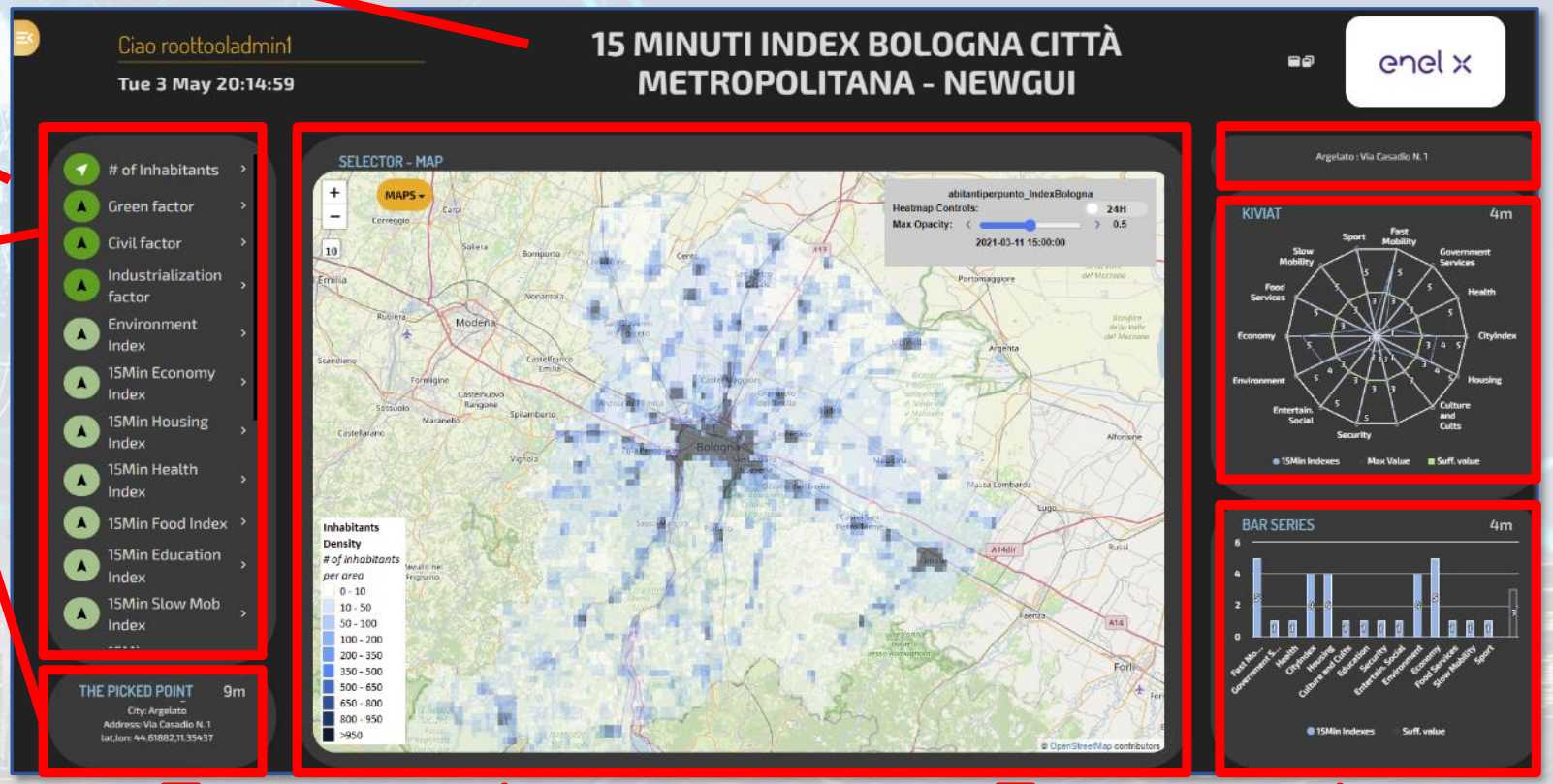
Snap4City DASHBOARDS: Main Concepts and simple Widgets

Snap4City Dashboards main concepts

Header

Dashboard

Interactive Widgets



Server Communication

- Real Time data requests/send
- Event Driven
- Server Side Business Logic
  - See Part 3 of the course

Inter Widget Communication:

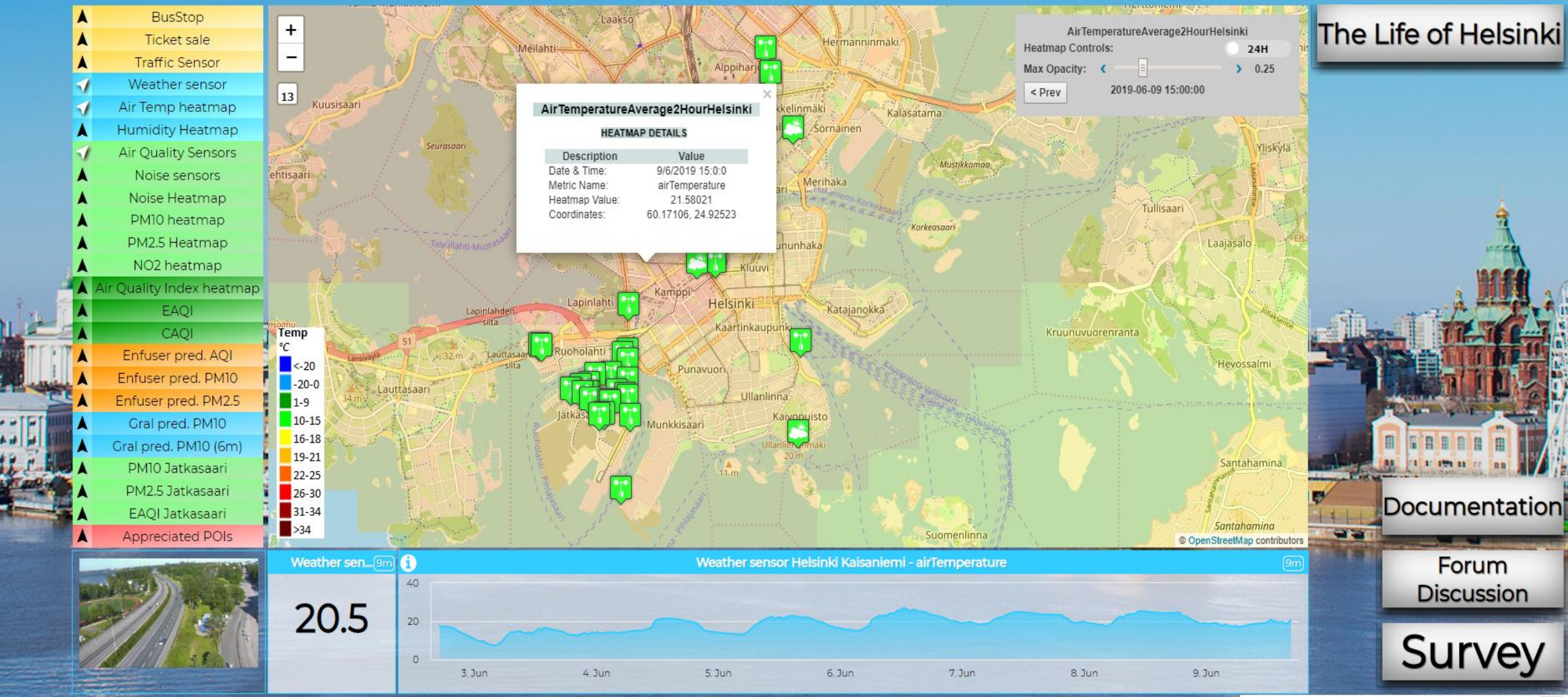
Client Side Business Logic

See part 8 of the Course

Helsinki City Overview (H5a)

Please note that the data results are not always based on real data.

Sun 9 Jun 17:07:25



The Life of Helsinki

Documentation

Forum Discussion

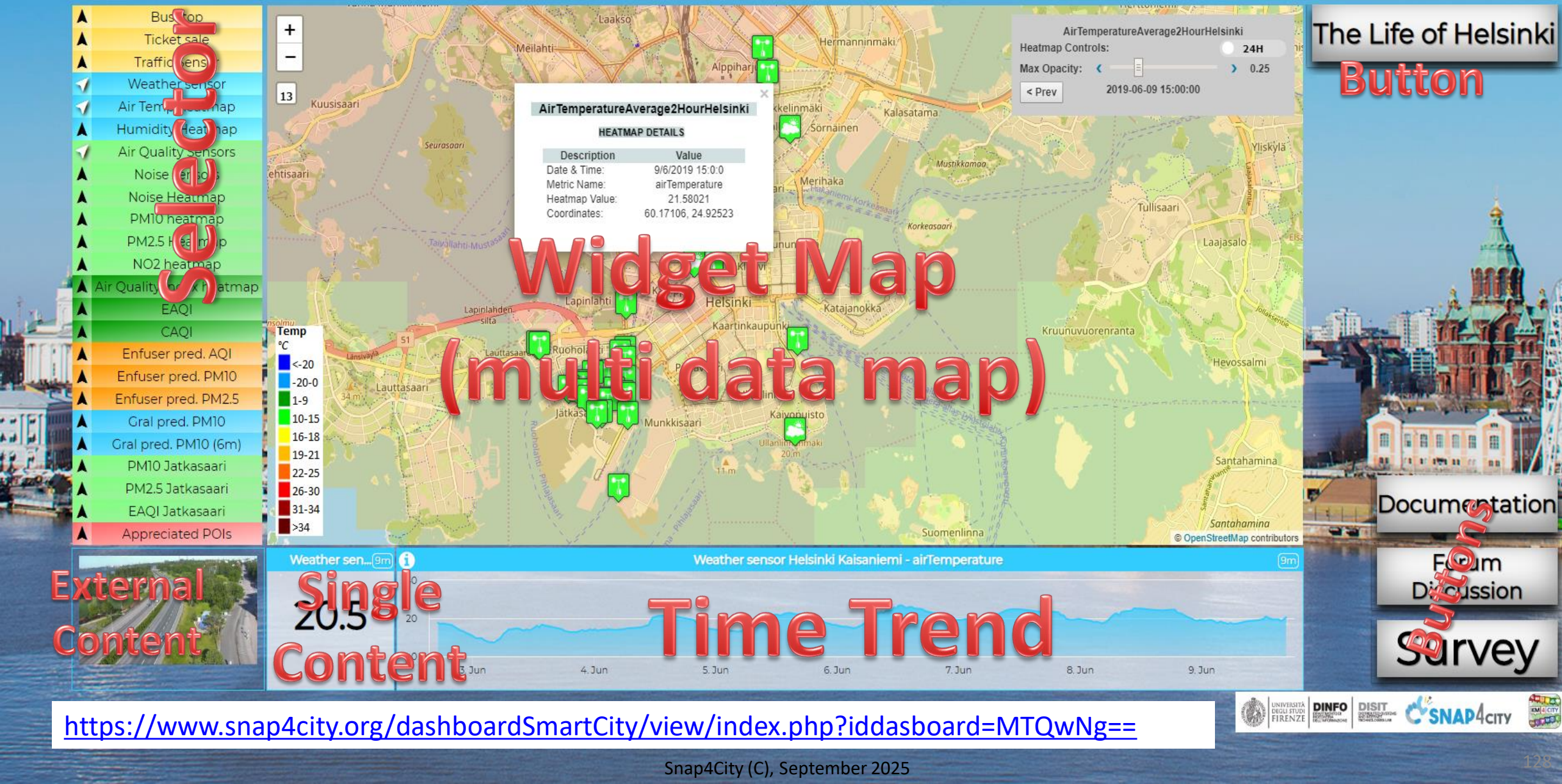
Survey

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

Helsinki City Overview (H5a)

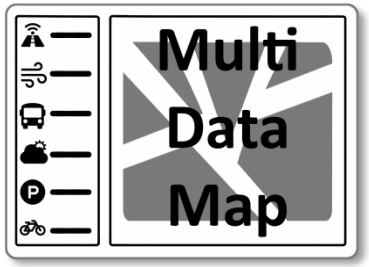
Please note that the data results are not always based on real data.

Sun 9 Jun 17:07:25

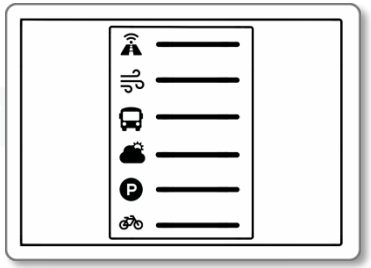


https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTQwNg==

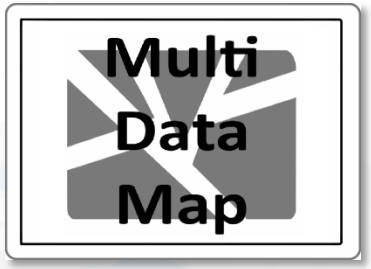
Dashboard Usage & Recipe



- https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTQwNg==
- **Selector Widget**: (of different kinds) present "Information", according to the HighLevelType (**HLT**), as overlapped layers on Target
  - **Additive**: PIN (POI, sensors, etc.), Cycling Paths, shapes, ...
  - **Mutual Exclusive by group**:
    - Heatmaps,
    - traffic,
    - Scenarios + what-if,
    - etc.

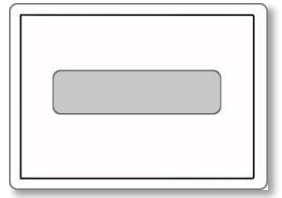


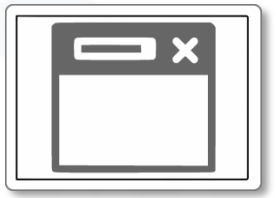
- **MultiDataMap Widget (Target**: (may be of different kind), this one may manage
  - Multiple representations on the same map
  - Each representation may provide specific interaction modalities and controls

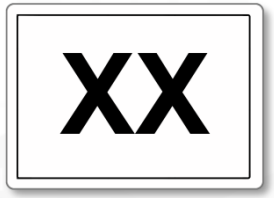


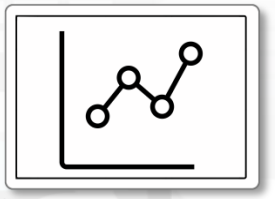
Other Widgets in the dashboard

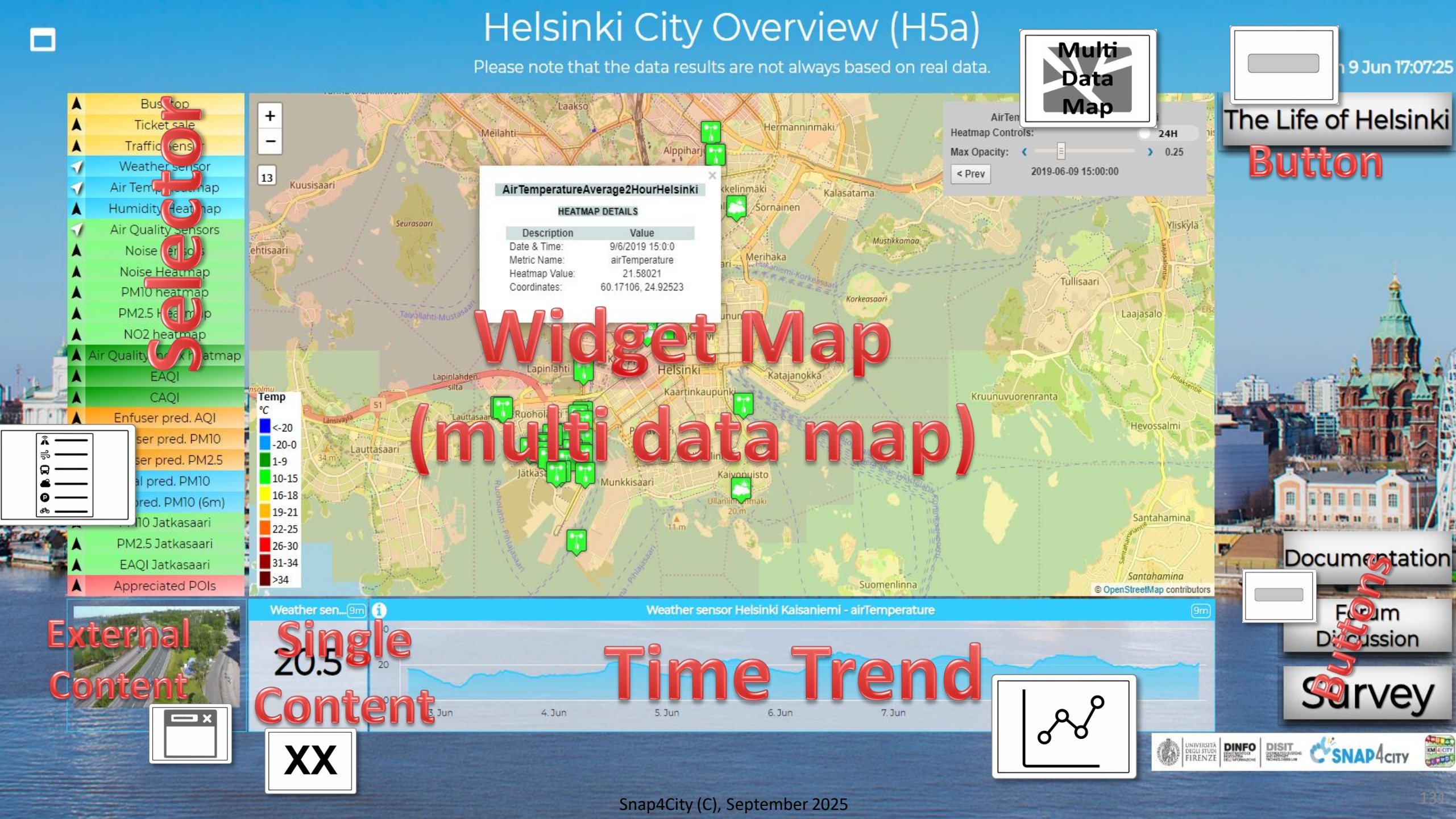
- **Button Widget** may be of different kind and may
  - Open external web pages, services, forum, surveys, etc.
  - Send messages on the field (IOT), etc.
- **External Content**:
  - Web pages (HTML + CSS + CSBL + etc..), Video Streams
  - Many many other tools see next exercise
- **Single Content**
  - Single value: numeric, string, HTML, etc.
- **Time Trend**
  - Time Series: numeric values over time



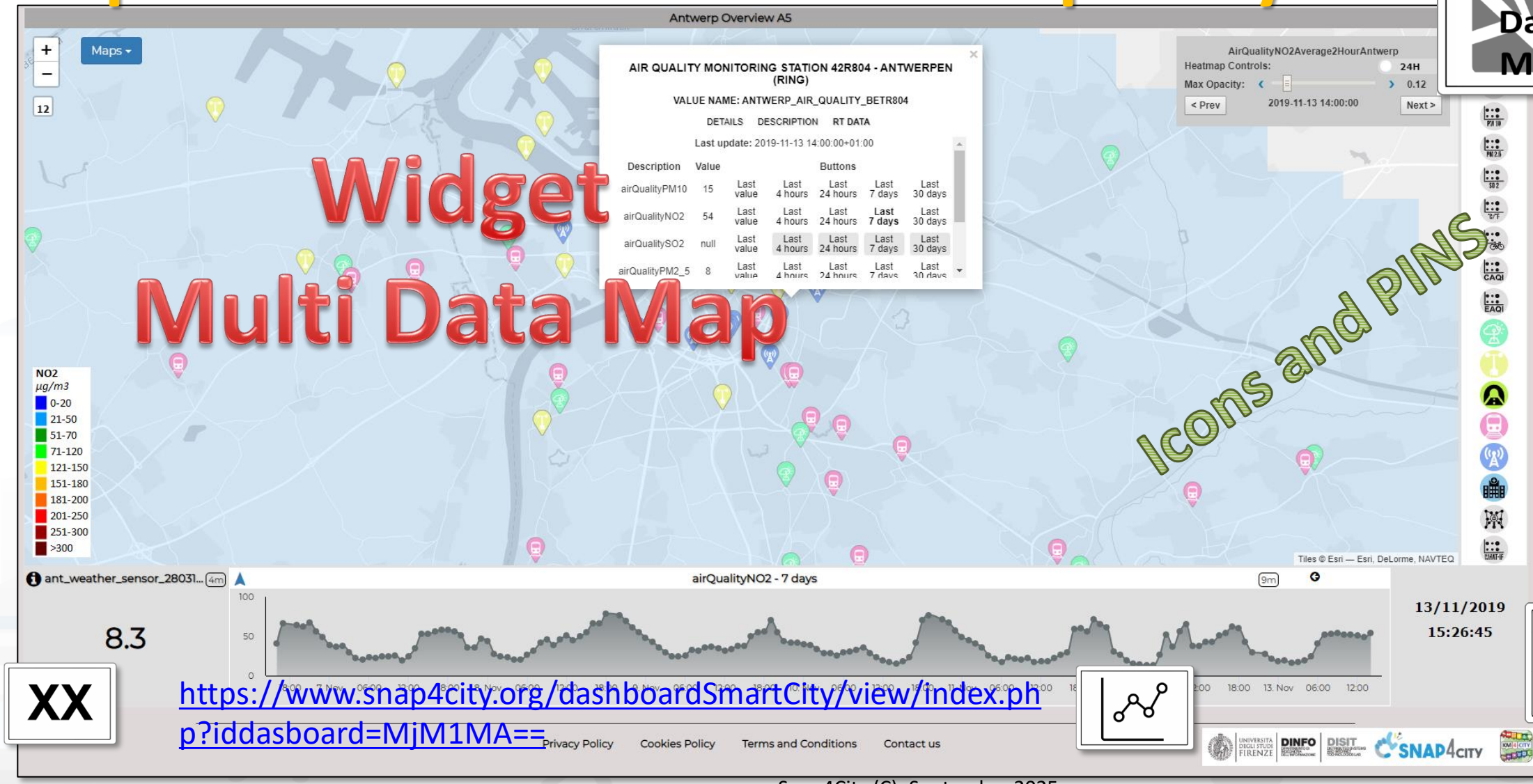







Helsinki City Overview (H5a)
Please note that the data results are not always based on real data.
Multi Data Map
The Life of Helsinki
Button
Selector
Bus stop
Ticket sale
Traffic sensor
Weather sensor
Air Temp heatmap
Humidity Heatmap
Air Quality Sensors
Noise sensors
Noise Heatmap
PM10 heatmap
PM2.5 Heatmap
NO2 heatmap
Air Quality Index heatmap
EAQI
CAQI
Enfuser pred. AQI
Enfuser pred. PM10
Enfuser pred. PM2.5
Final pred. PM10
Final pred. PM10 (6m)
PM10 Jatkasaari
PM2.5 Jatkasaari
EAQI Jatkasaari
Appreciated POIs
AirTemperatureAverage2HourHelsinki
HEATMAP DETAILS
Description Value
Date & Time: 9/6/2019 15:0:0
Metric Name: airTemperature
Heatmap Value: 21.58021
Coordinates: 60.17106, 24.92523
Heatmap Controls: 24H
Max Opacity: 0.25
< Prev
2019-06-09 15:00:00
Temp °C
<-20
-20-0
1-9
10-15
16-18
19-21
22-25
26-30
31-34
>34
Helsinki
Lapinlahti
Kaartinkaupunki
Katajanokka
Munkkisaari
Kaivopuisto
Lauttasaari
Kuusisaari
Meilahti
Laakso
Hermanninmäki
Alppiharju
Kalasatama
Sörnäinen
Merihaka
Tullisaari
Laajasalo
Kruunuvuorenranta
Hevossalmi
Santahamina
Suomenlinna
© OpenStreetMap contributors
Weather sensor Helsinki Kaisaniemi - airTemperature
20.5
3. Jun
4. Jun
5. Jun
6. Jun
7. Jun
Documentation
Forum Discussion
Survey
Buttons
External Content
Single Content
XX
Time Trend
Snap4City (C), September 2025
131

Unique Dashboard builder Multiple Styles



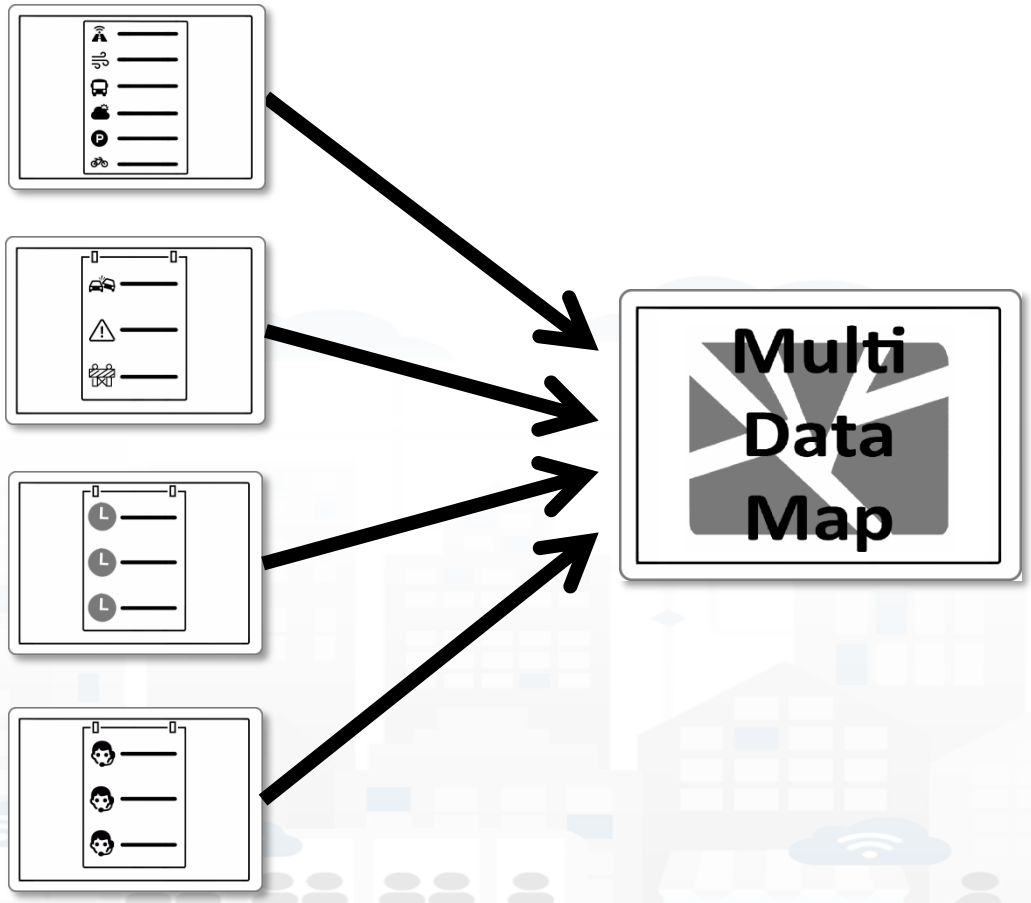
Multi Data Map

Multi Data Map

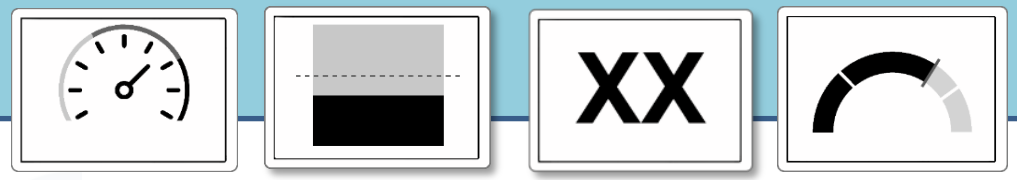
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjM1MA==

Dashboard Usage and recipe: Event map target

- Selector to Show on Map a
  - category of Map positioned elements
  - Single Entity
  - Heatmap among many
  - Traffic flow
  - Origin Destination Map
- Events which are also PIN on map



Main Single Values Widgets





Single Value Widgets

- Entity/device can be a Time Series
- They can be connected to some Entity/device to show the last value associated with the widget
- They can be controlled to show a specific value over time

Single values

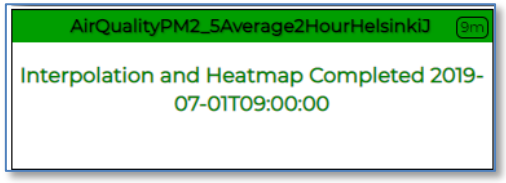
- **Single Content**
- **Speedometer**
- **Gauge**
- **Single Bar**



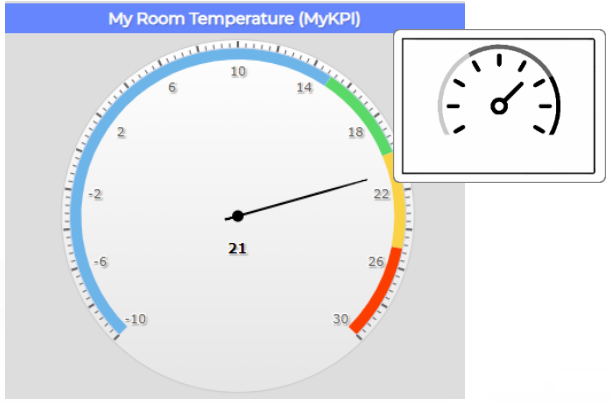


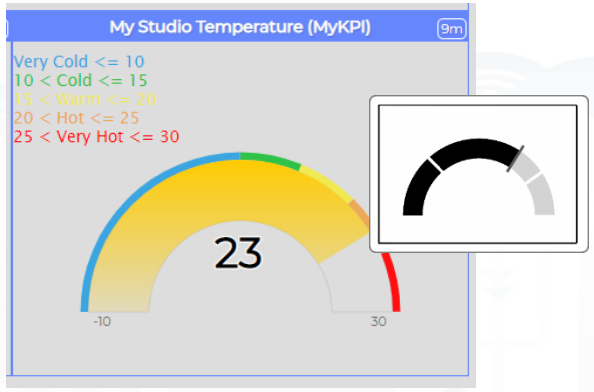


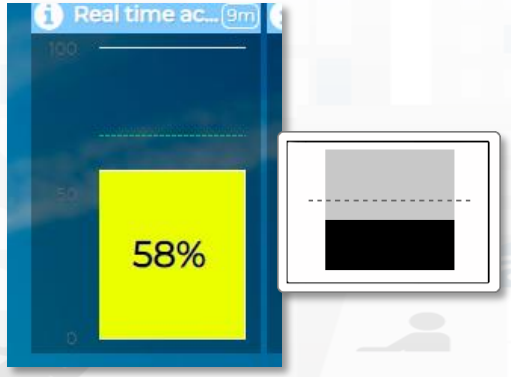












Most of the multi xxxx widgets can show also single values

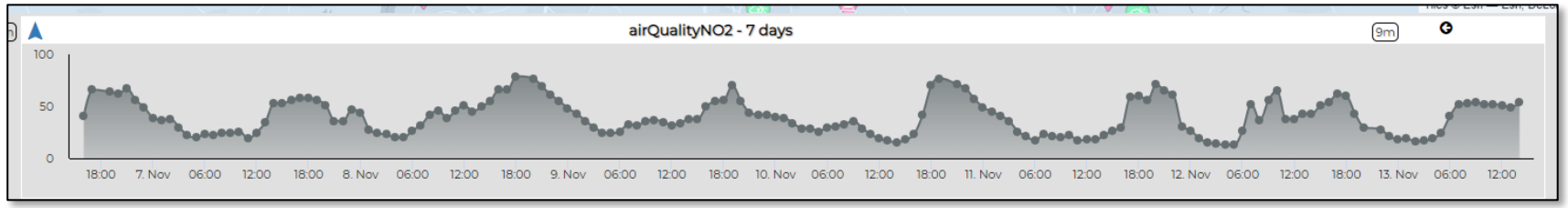
Time Series, Multi Series Widgets





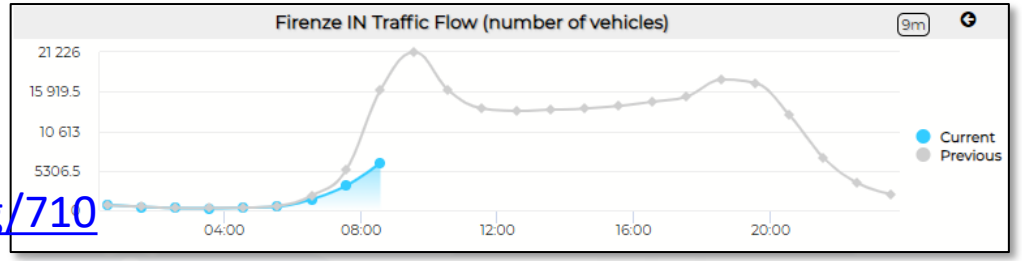
Time Series

- **Time Trend**

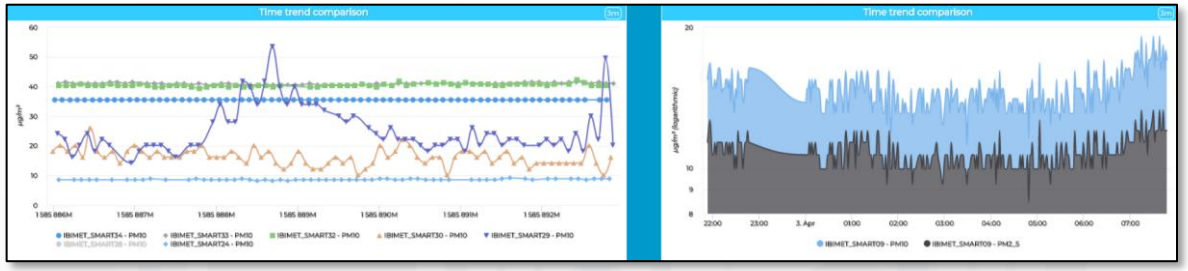


- **Time Trend Compare**
  - Comparing trends of the same time series

https://www.snap4city.org/710



- **Multi Series**
  - Showing multiple trends of multiple time series with same unit



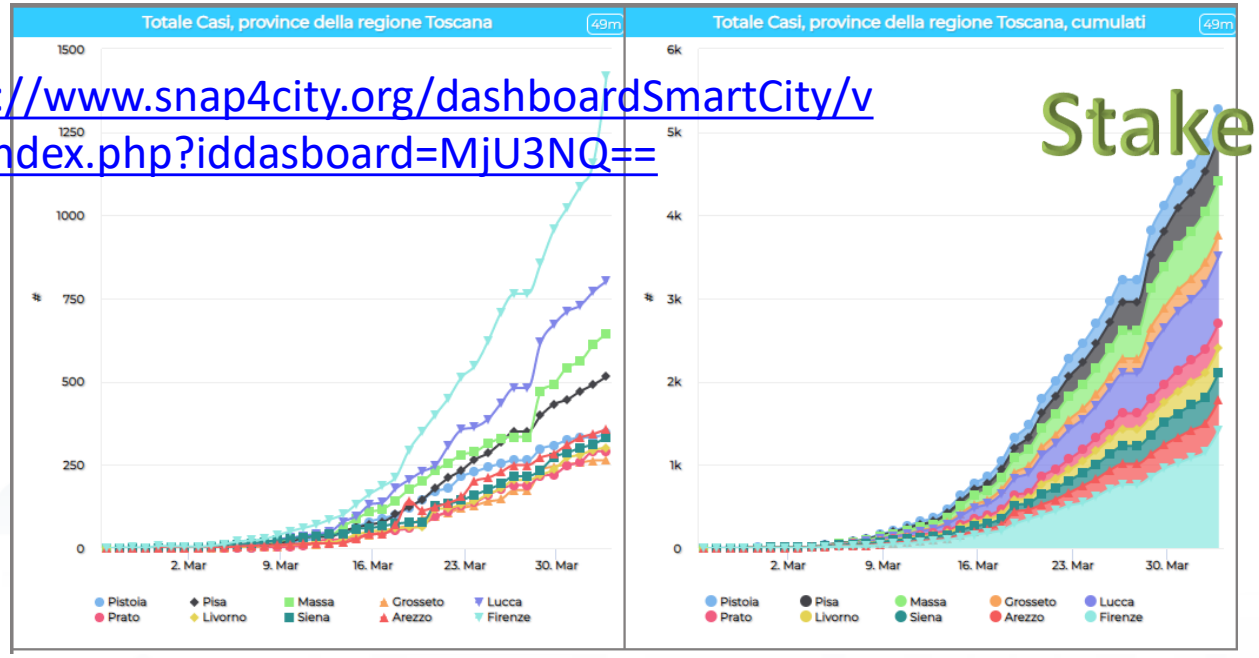
- **Typical Time Trend**
  - Showing the typical trend of a time serie: multiple modalities

https://www.snap4city.org/705

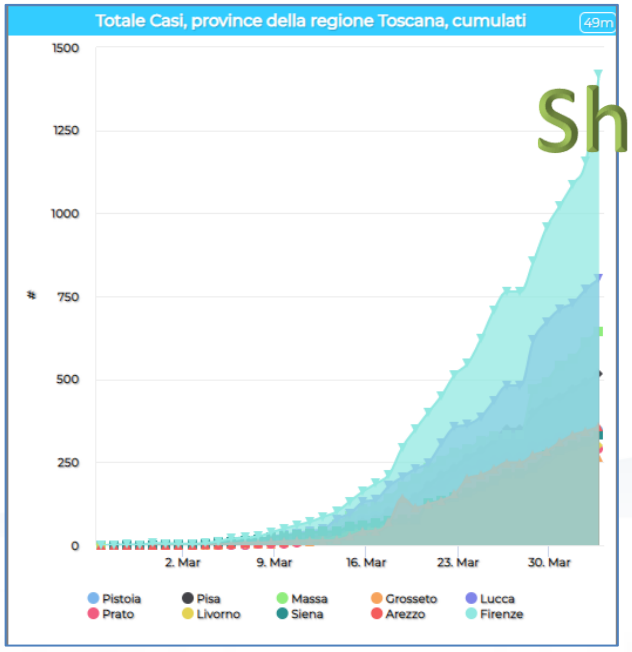


MultiSeries

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjU3NQ==

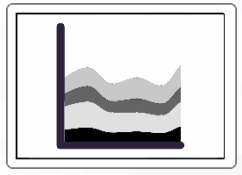


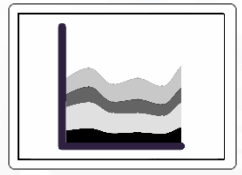
Staked



Shaded



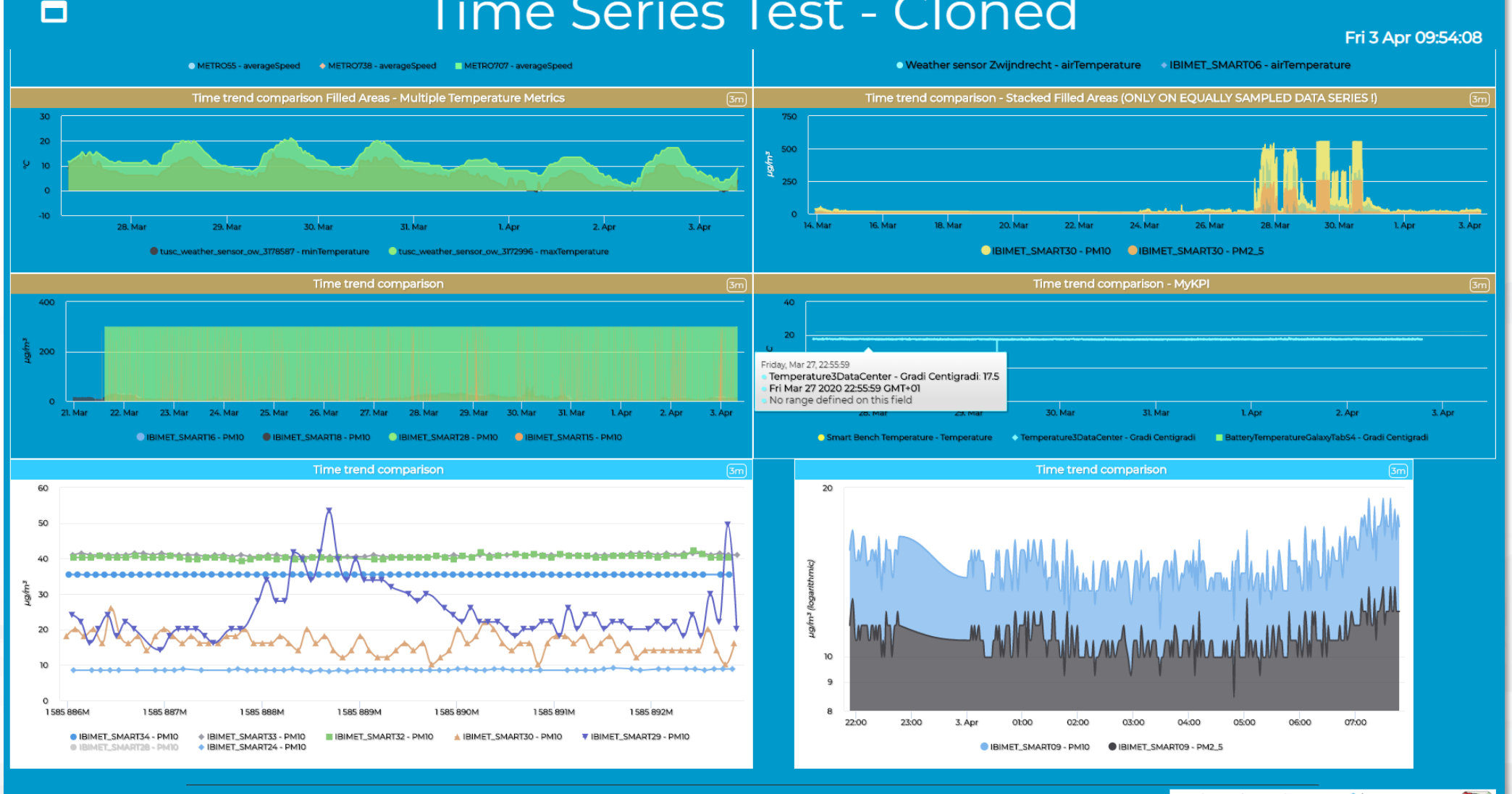




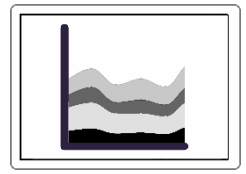
- **Stacked, shaded or regular**,
- Grouped by Value_unit, **linear** or **Logarithmic**
- From historical data and/or **dynamic** data from IOT Applications

Time Series Test - Cloned

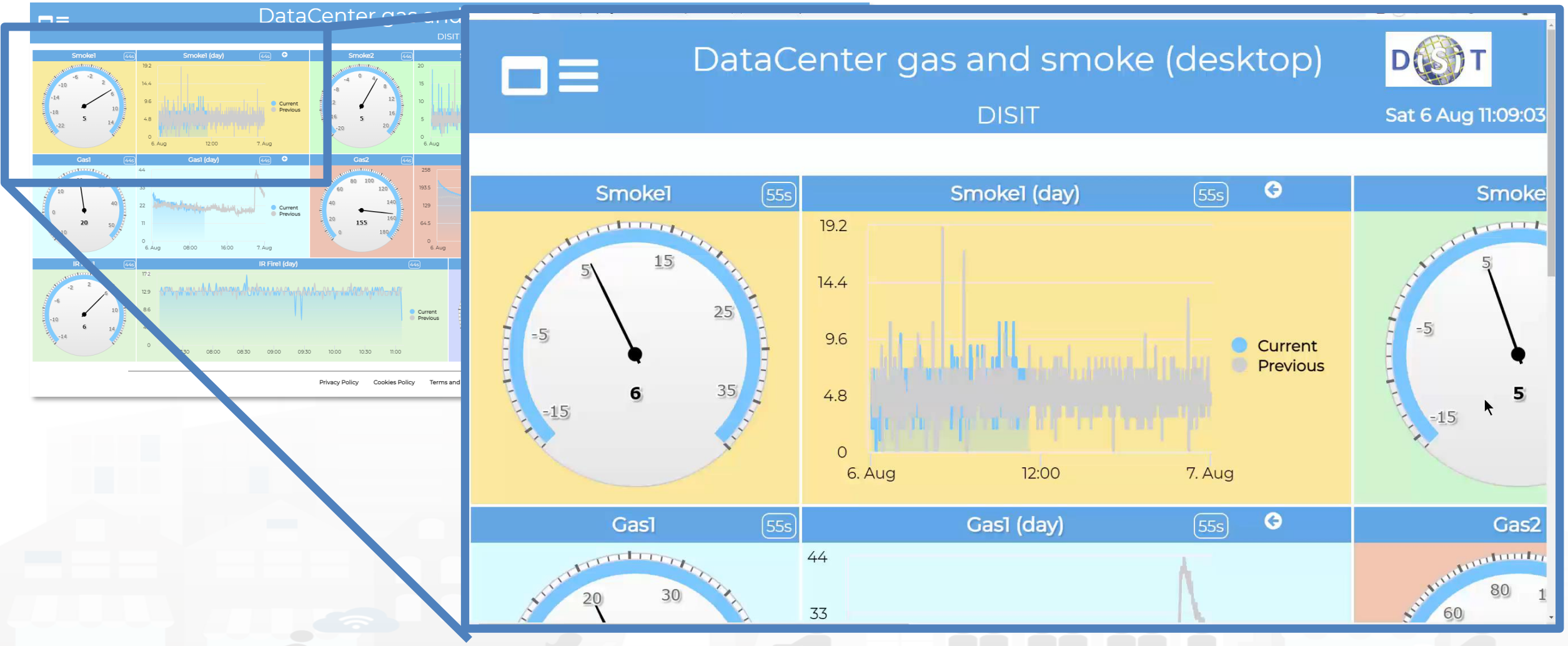
Fri 3 Apr 09:54:08





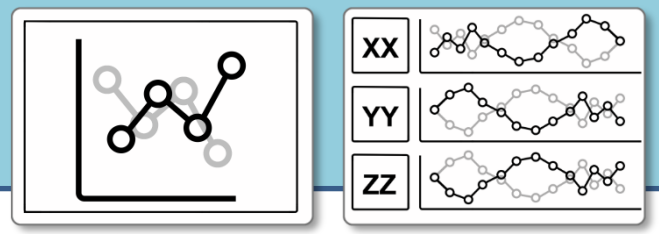


Drill Down over time



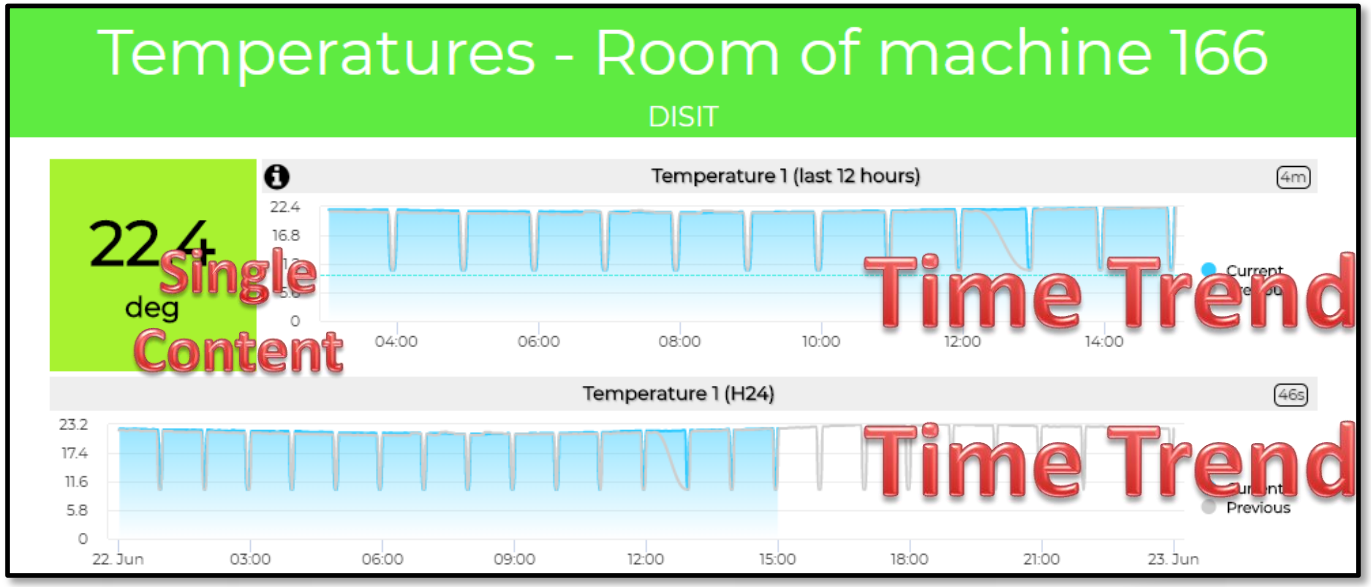
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjA1

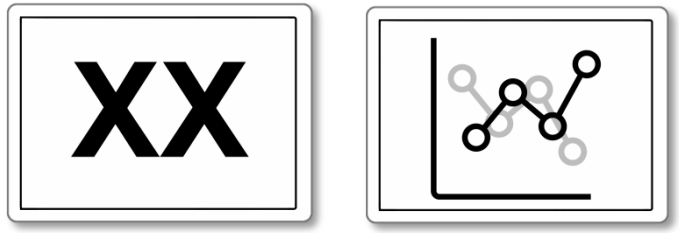
Time Trend Compare Widgets for Time Series

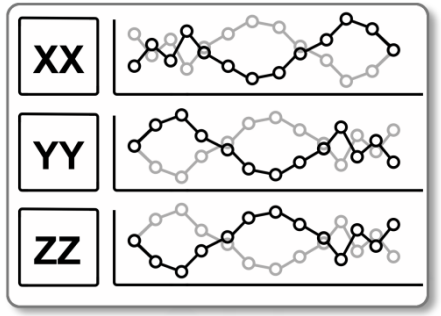


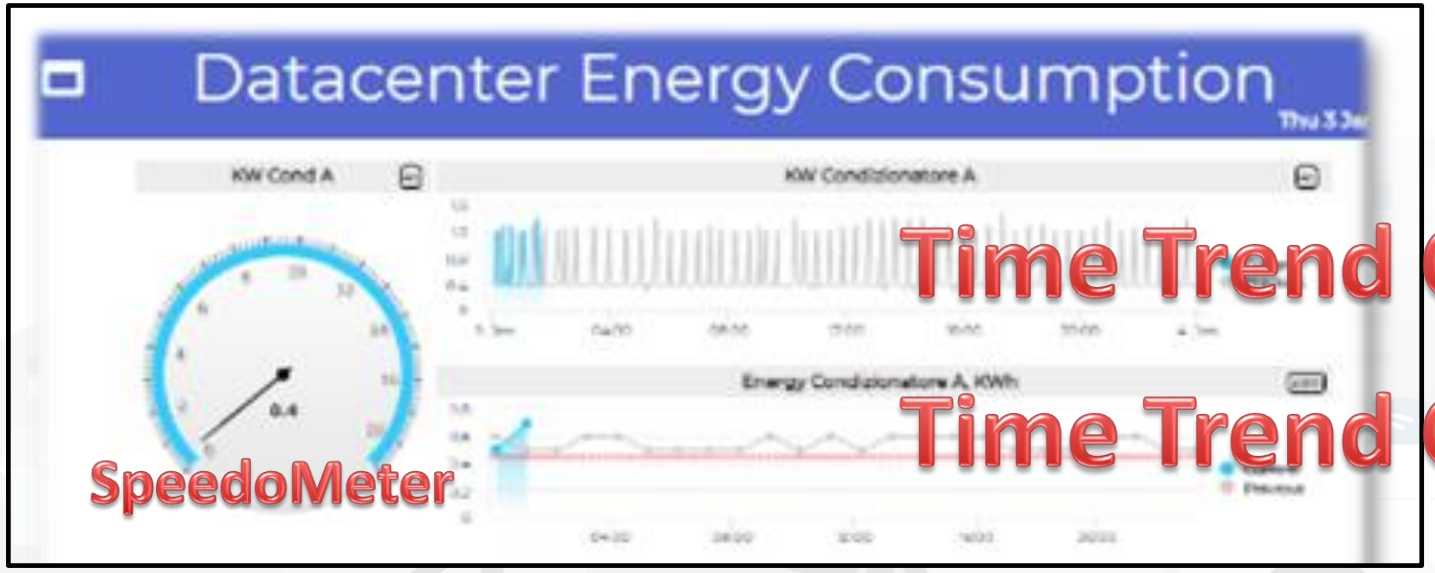


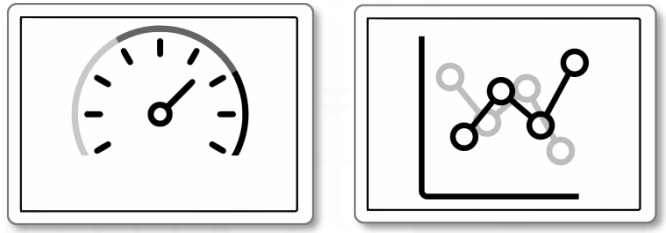
https://www.snap4city.org/710









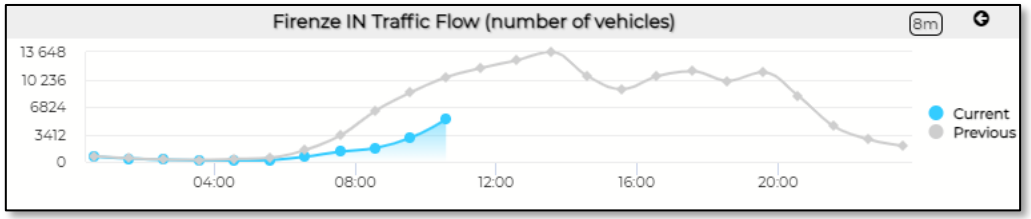


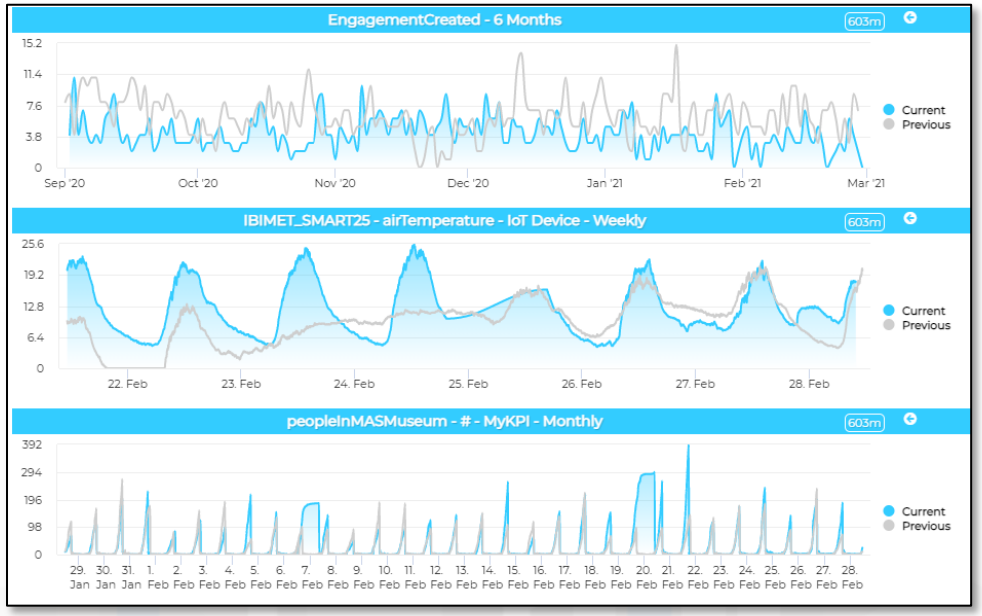
They manage
HLT: Sensor

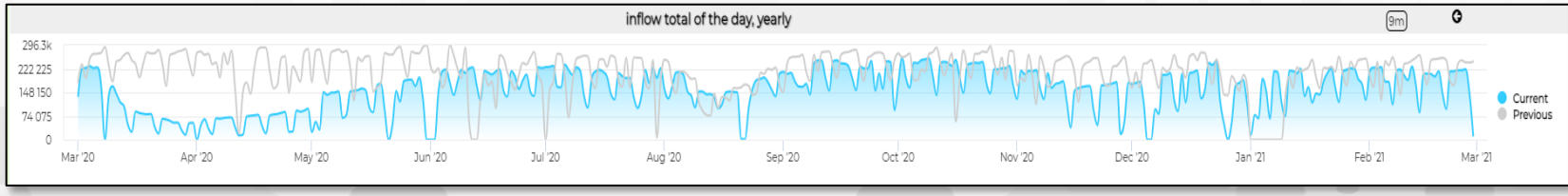
Time Trend Compare

A tool for visual Analytics, Comparing

- **4 hours** wrt those before, or same hours of previous day
- **12 hours** wrt those before, or same hours of previous day
- **Day** wrt day before, or same day of previous week or month
- **Week** wrt to previous week, or
  - week starting on Monday
- **Month** wrt to previous month, or
  - previous month starting 1st day, or
  - same month of the previous year
- **6 Months** wrt to previous 6 months, or
  - Aligned day 1 or same 6 months previous year day 1 or
  - 6 months previous year day 1 aligned 1st or 2nd semester
- **Year** wrt to previous year, or
  - previous year starting 1st day, or
  - previous year starting same month







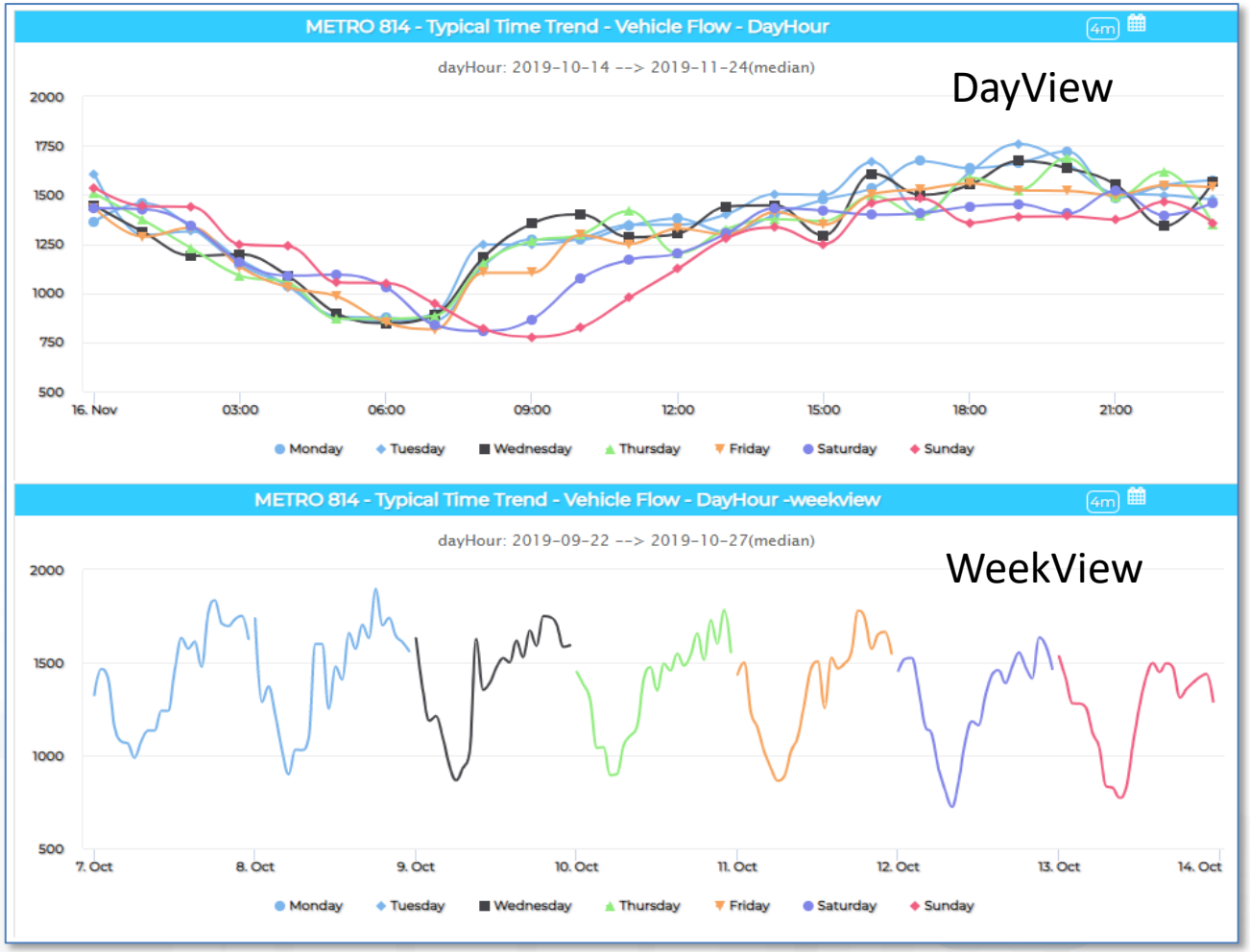
Typical Time Trend, Visual Analytic on Time Series



https://www.snap4city.org/705

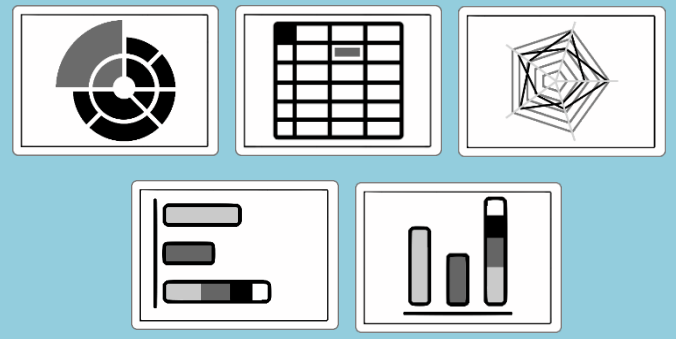
Typical Time Trend

- They:
  - **need to be computed in advance** on the basis of a Time Serie variable, and a reference period of computation.
  - **represent typical trends of: min, max, average, median**
  - You can change the data on view
- **Formats**:
  - **DayHour**: 7 time trends, one for each day of the week, each hour, 24 values.
    - As DayView or WeekView, start monday
  - **MonthDay**: a value per day, 30 values of the month.
  - **MonthWeek**: a value per day aligned to week days: 28 values, 4 weeks.
    - 1st Monday of the month
    - 3rd Friday, etc.

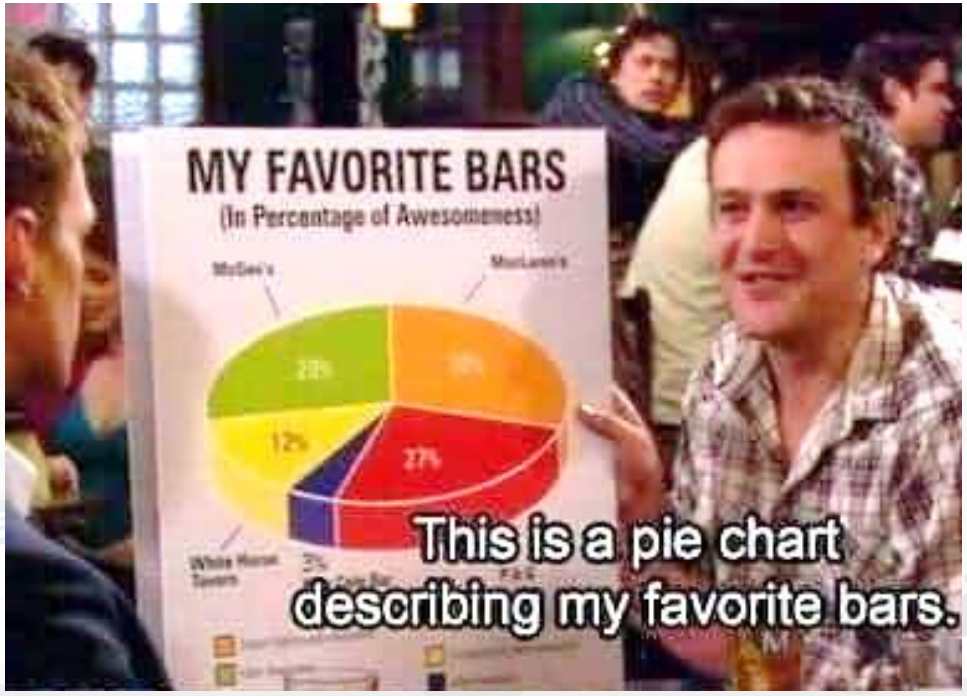


https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzA4NA==

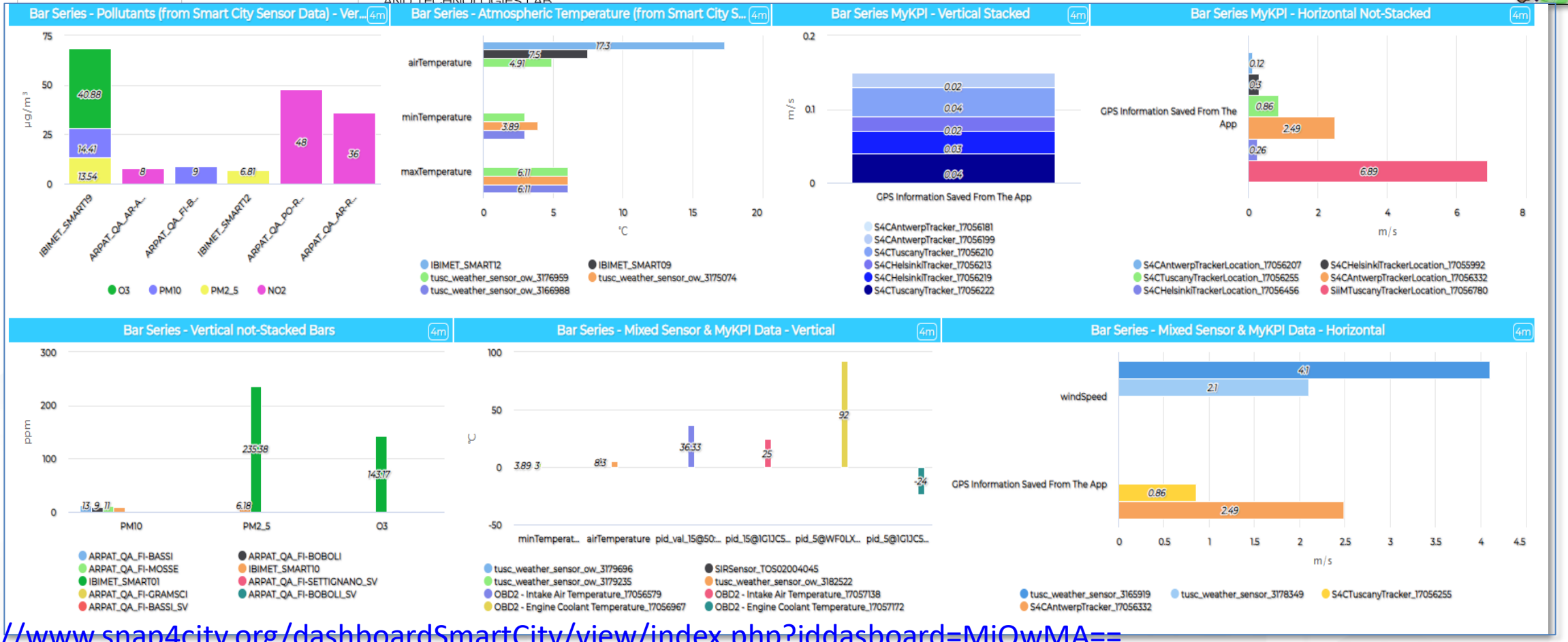
Bars, Pies, Donut, Spiders, Tables Widgets





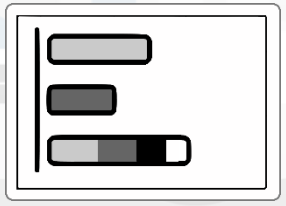


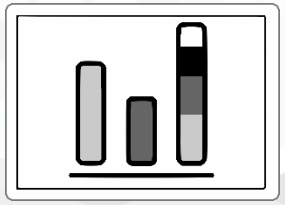
Barseries



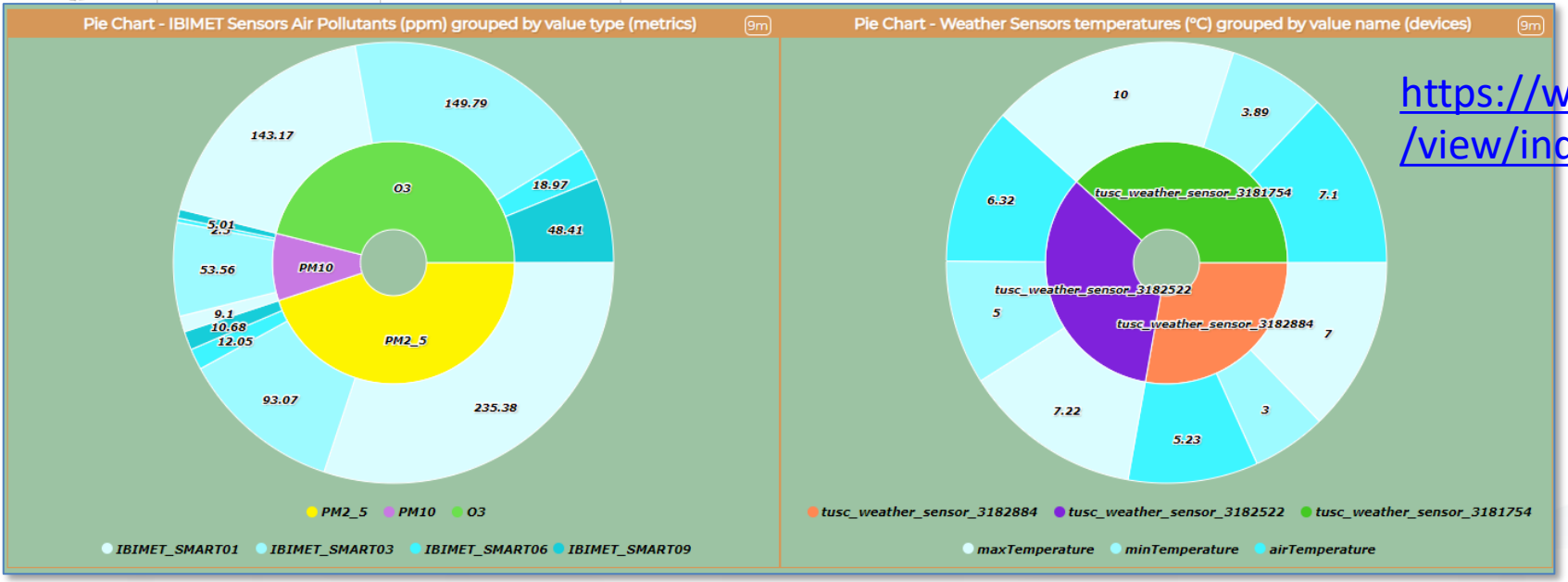
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjQwMA==

- **Staked and grouped** by Value_Name / Value_Type
- **Oriented**: Vertical and Orizontal
- **ordered** by value: crescent, descendent
- From historical data and/or dynamic data from IOT Applications





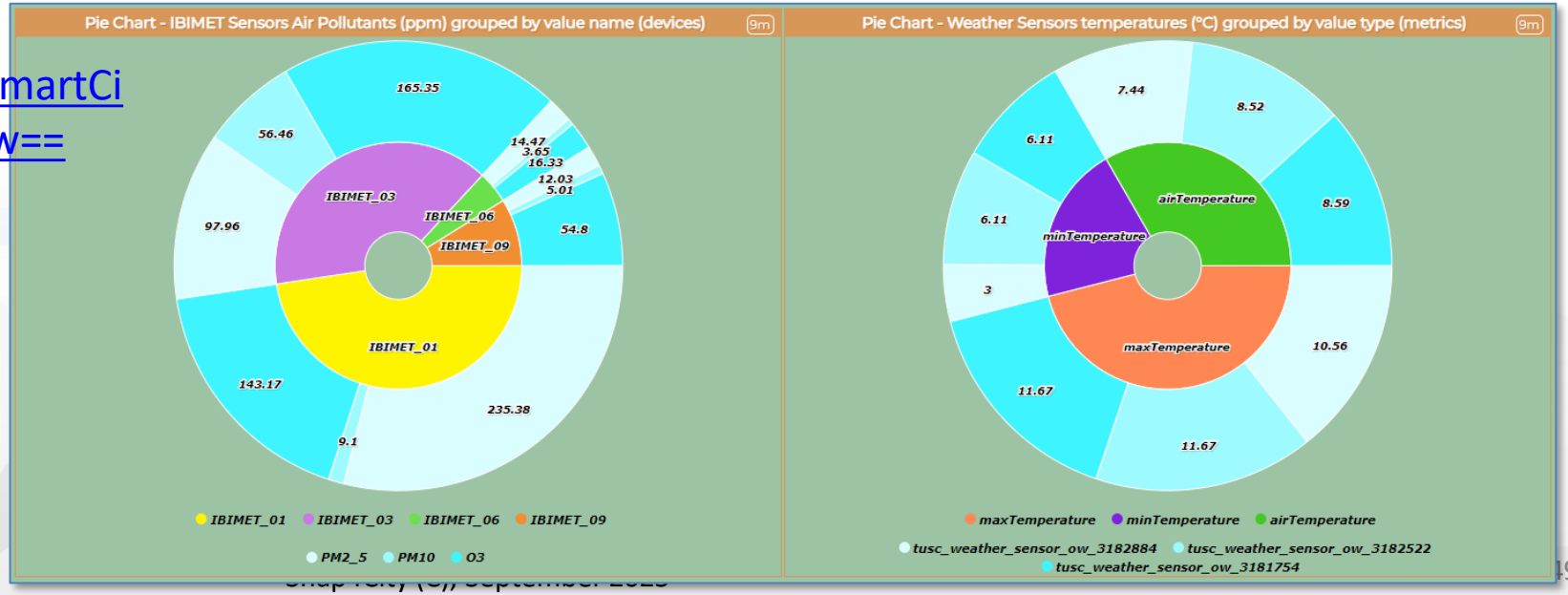
Pie & Donut



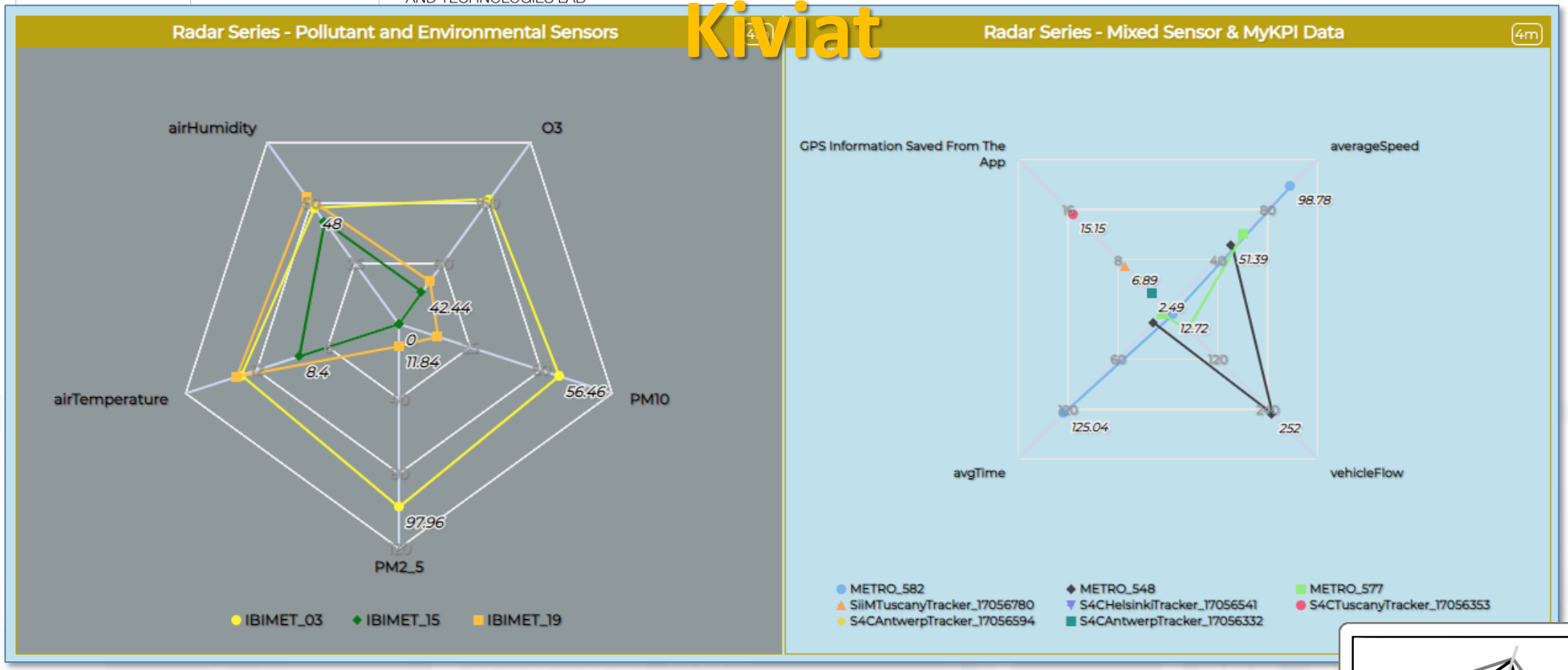
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjUxNw==

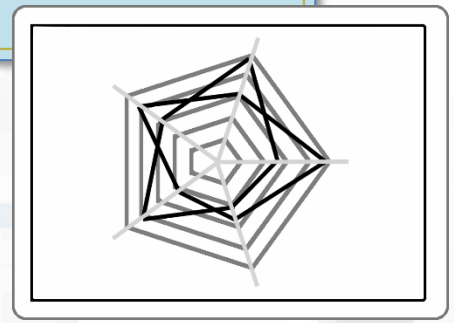
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjUyNw==

- Single level Pie and two levels as Donut
- Grouped ValueType, ValueUnit



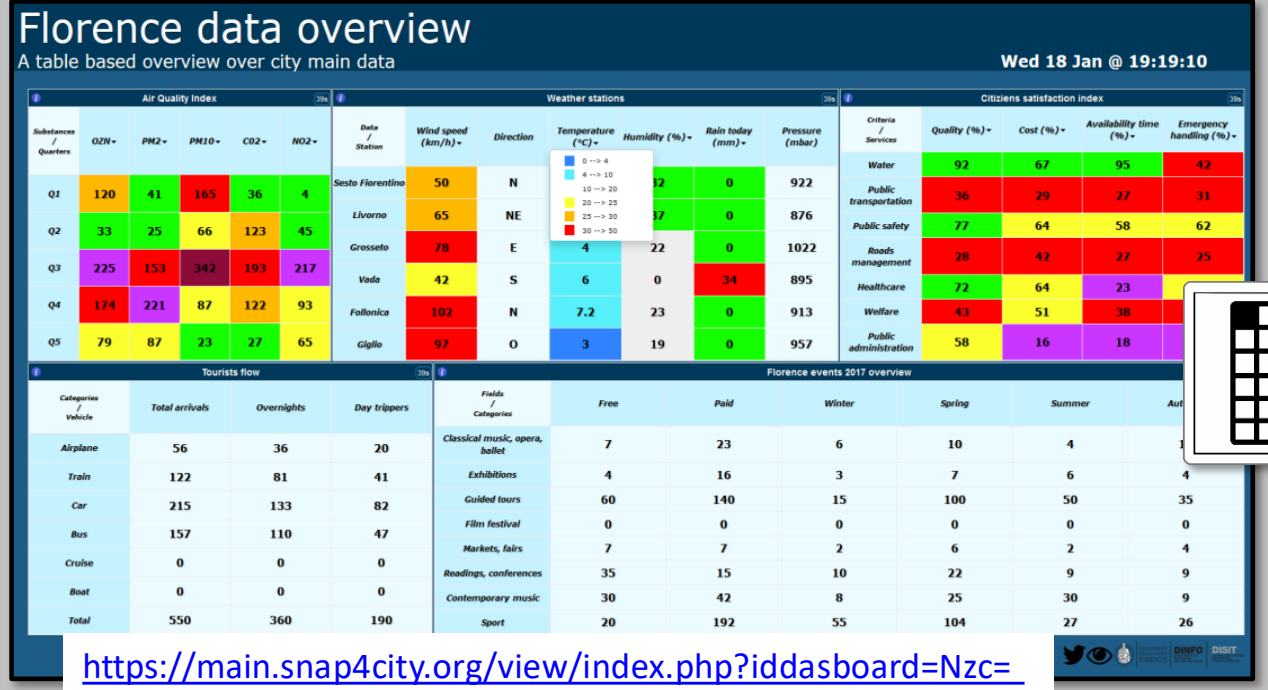
Radar, SpiderNet Kiviat





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

- Normalized, multiple value units
- Hystorical, KPI and Dynamic from IOT App

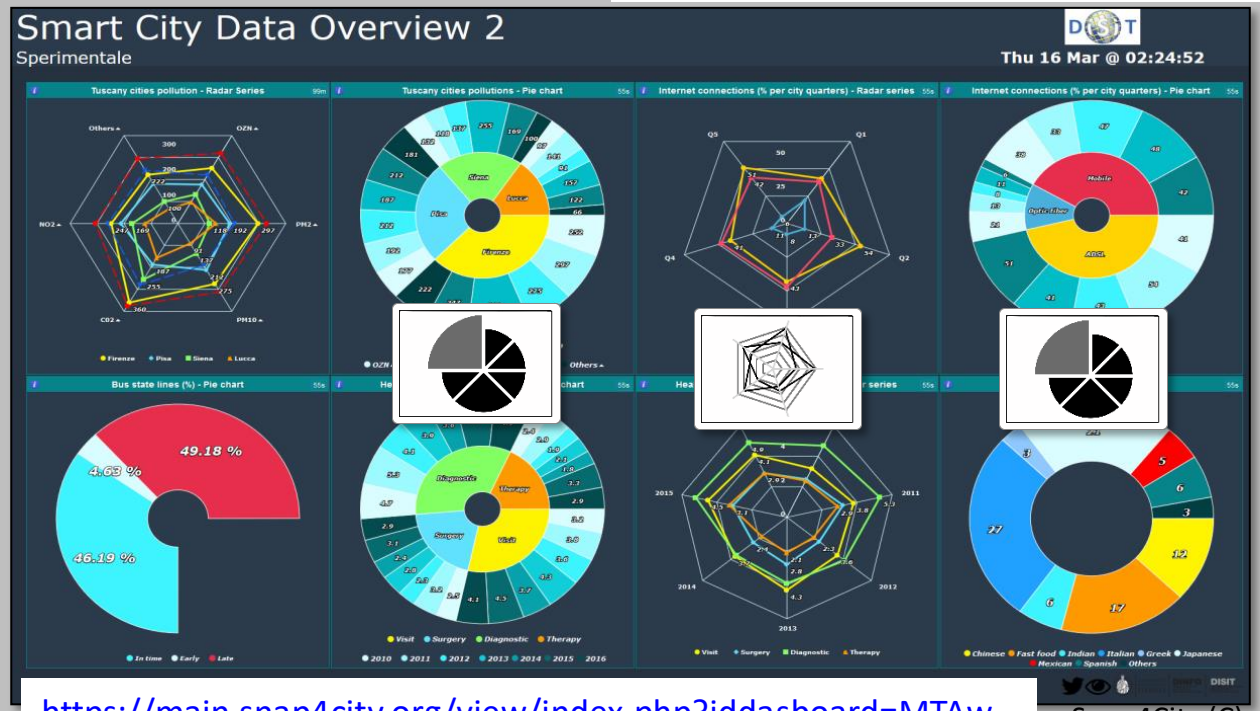


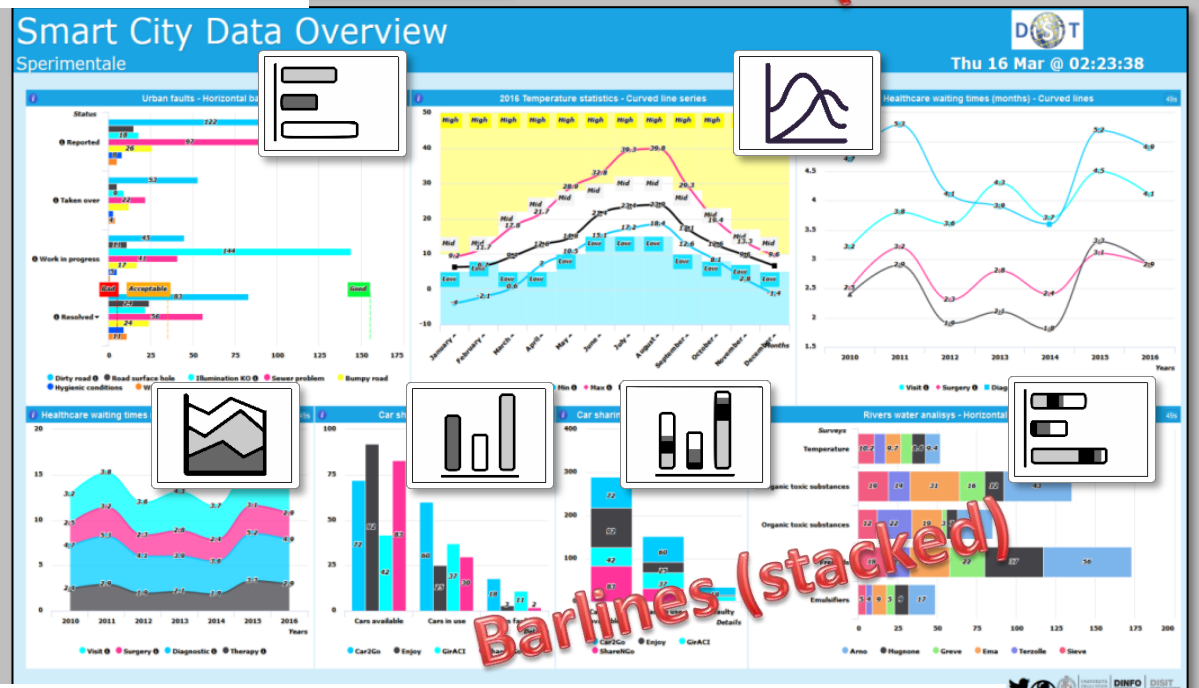
Table

Kiviat and Pies

Curved Lines (stacked)

https://main.snap4city.org/view/index.php?iddasboard=Nzc=





Barlines (stacked)

https://main.snap4city.org/view/index.php?iddasboard=MTAw

https://main.snap4city.org/view/index.php?iddasboard=ODM=

Calendar Widgets for Time Series

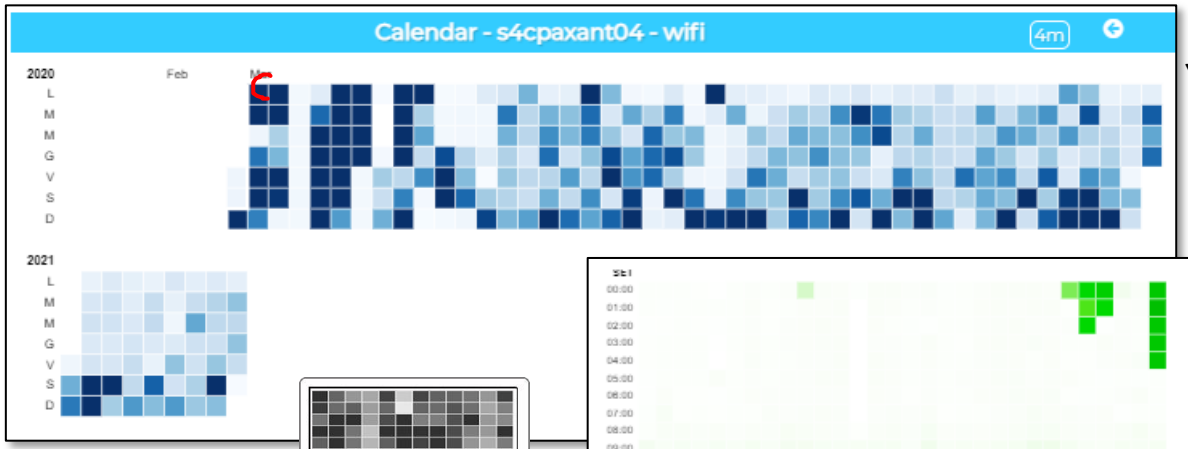


Calendar

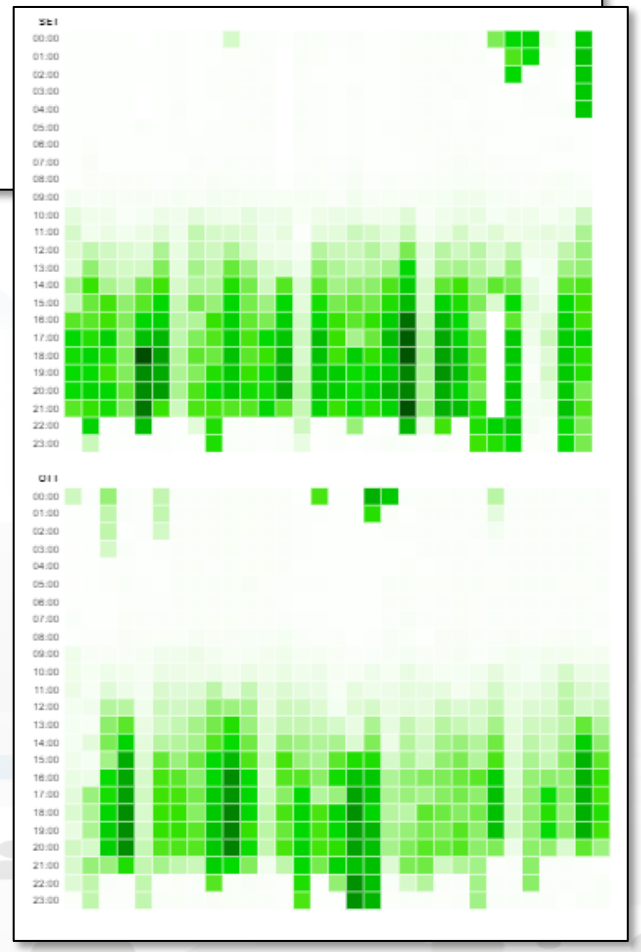
https://www.snap4city.org/706

Showing: **Sum, Average or Median** value of a variable as a colored calendar:

- **Year**
  - 1 Year, 12 months, by weeks, per days
  - Time Range: 1D, 7D, 1M, 6M, 1Y
- **Month**
  - 30 days, 24 hours
  - Time Range: 1D, 7D, 1M, 6M, 1Y
- **You can scroll in history**
- **They manage HLT: Sensor, MyKPI and work receiving Dynamic data from IOT App**



Year, 1Y



Month, 6M

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzA4MA==

Ciao roottooladmin1

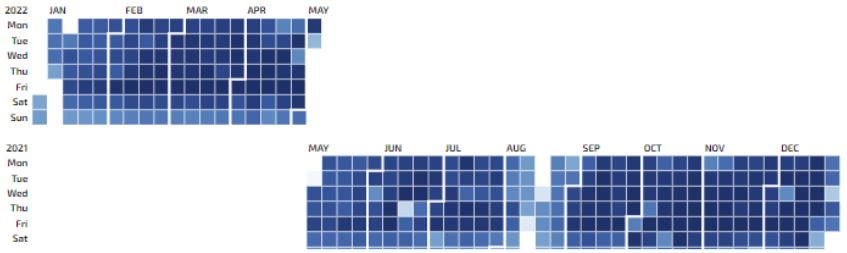
Tue 3 May 13:59:05

HERIT-DATA - ACTIVITIES CALENDAR - NEWGUI

Interreg Mediterranean HERIT-DATA

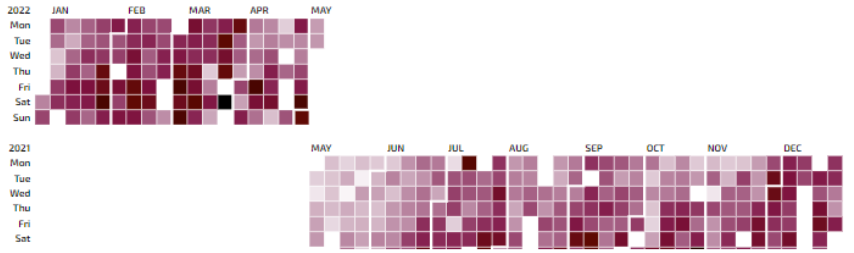
METRO763 VEHICLEFLOW VOLUME

4m



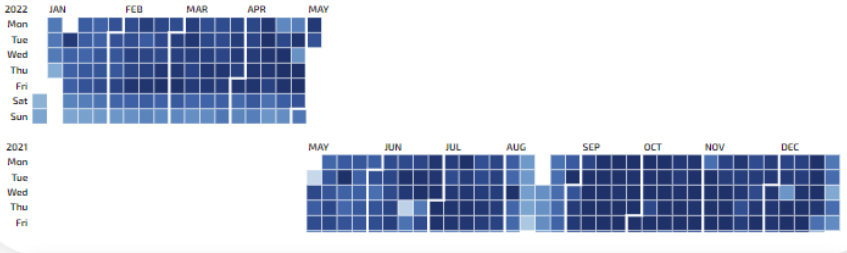
ARPAT_QA_FI-GRAMSCI_SV NO2 VOLUME

4m



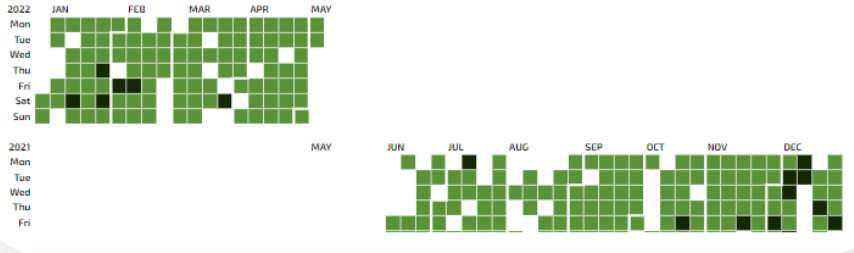
METRO762 VEHICLEFLOW (DAY MEAN)

4m



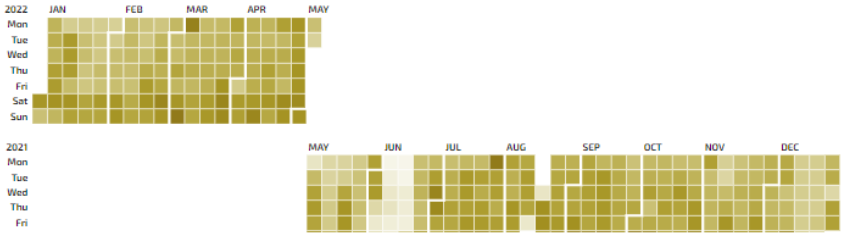
ARPAT_QA_FI-GRAMSCI_SV CO VOLUME

4m



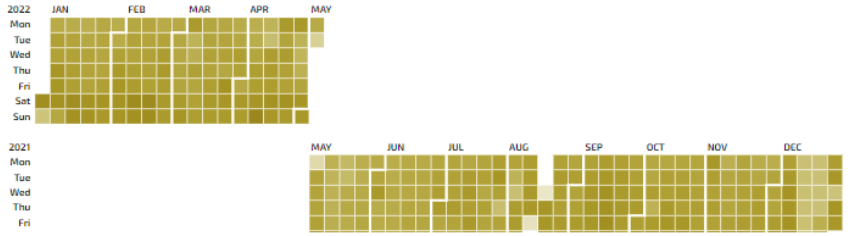
CARPARKSTAZIONEBINARIO16 BUSY SLOTS2 VOLUME

4m



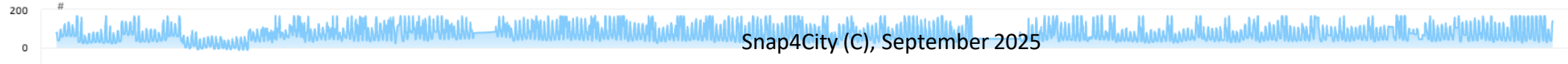
CARPARKSTAZIONEFIRENZES.M.N. BUSY SLOTS VOLUME

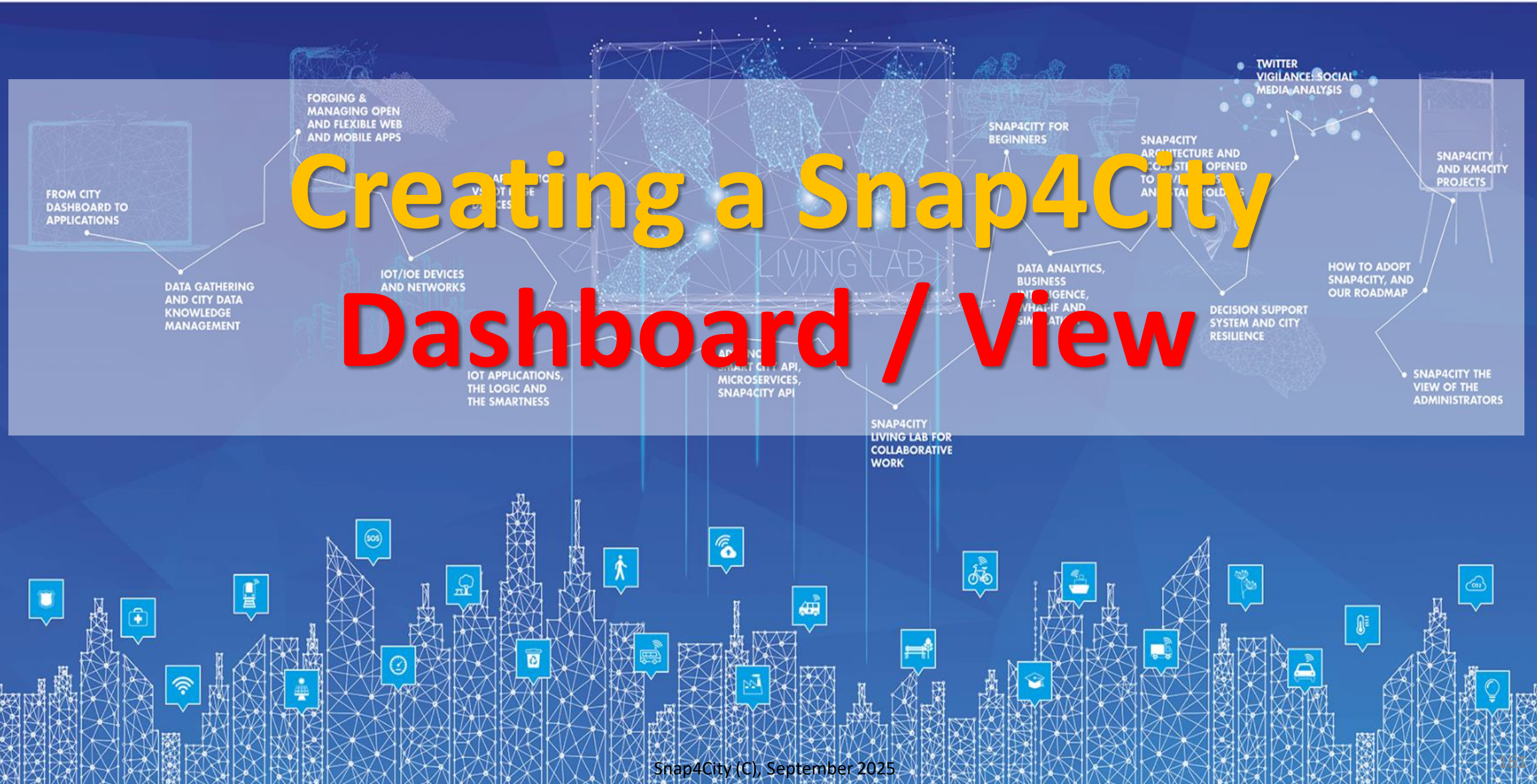
4m



CARPARKSTAZIONEBINARIO16 - OCCUPIEDPARKINGLOTS

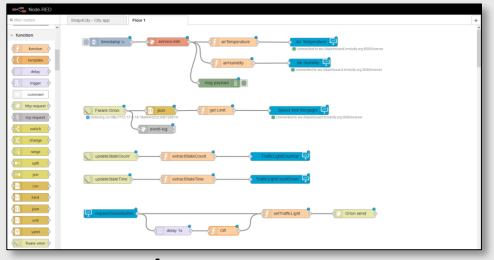
9m





Creating a Snap4City Dashboard / View

Dashboard Development



IOT Applications

Knowledge Base, Km4City



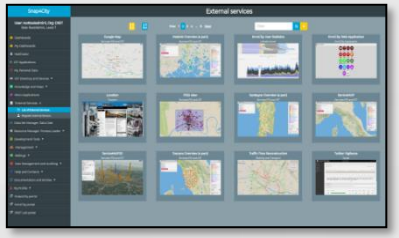
Knowledge and Storage Data from the Field and City + MyKPI ++

Widget Collection





Micro Applications

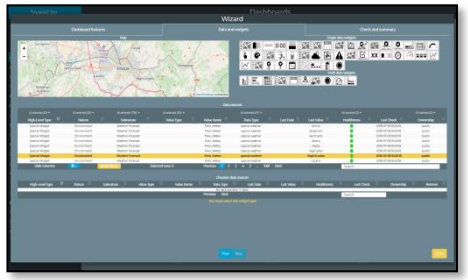


External Services



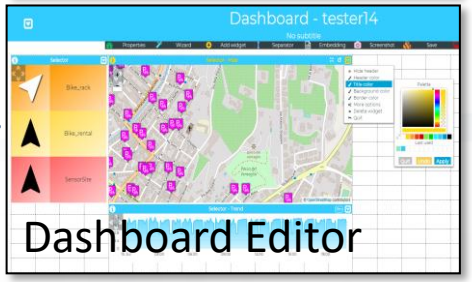
Custom Widgets/ Synoptics

Dashboard Wizard



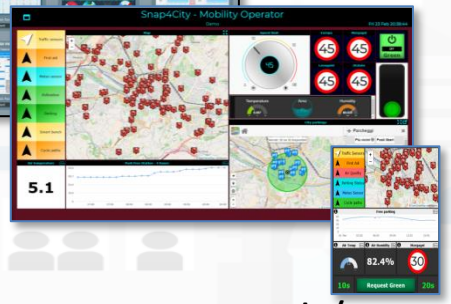
Create, save, load, delegate, grant access





Dashboard Editor





Public Dashboard Collection



My Own Dash/App

UNIVERSITÀ DEGLI STUDI FIRENZE

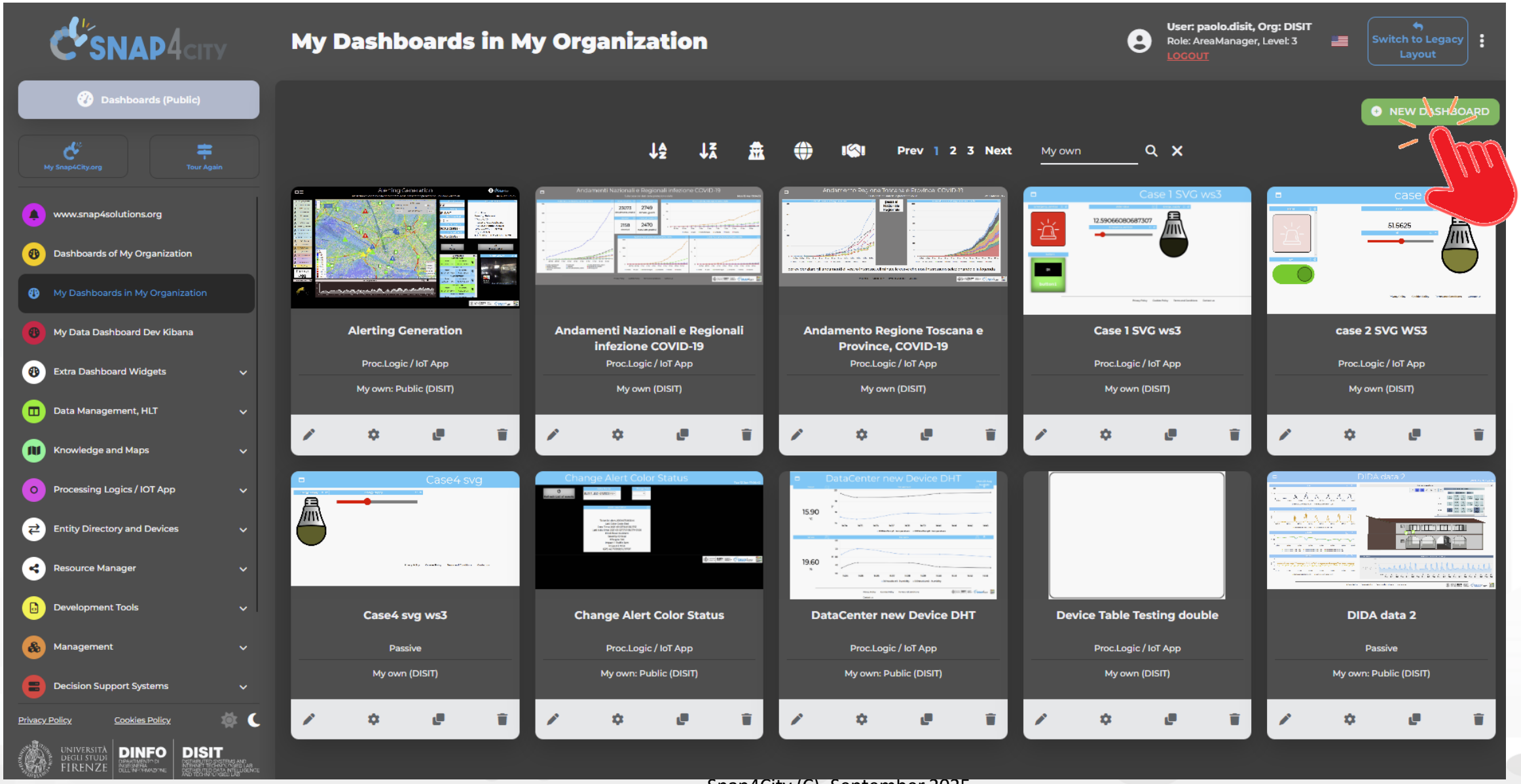
DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB DISTRIBUTED DATA INTELLIGENCE AND TECHNOLOGIES LAB

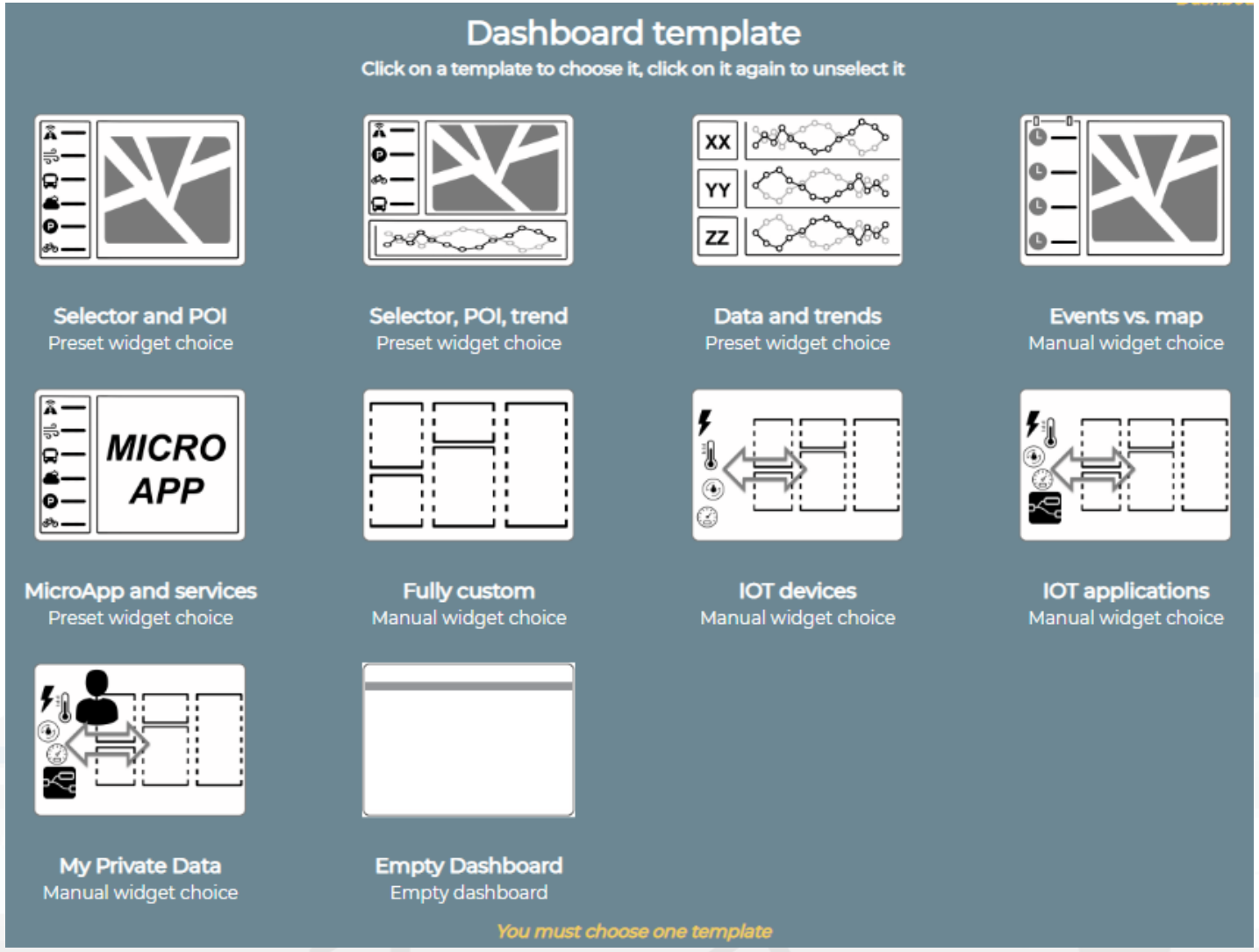
New Dash ?

SNAP4CITY

KM4CITY



From Templates to Wizard and Dashboards

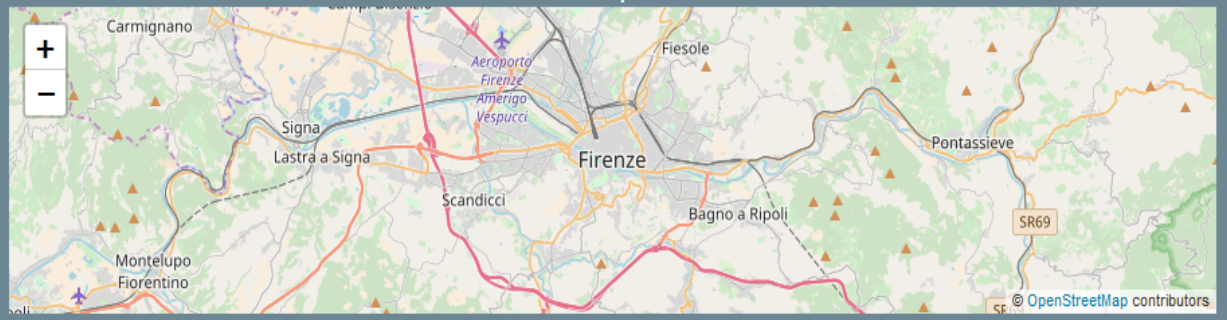


- to create a new Dashboard
- to add widgets and/or groups of them on any Dashboard

Wizard

Dashboard features | Data and widgets

Map



Single data widgets



Multi data widgets



Data sources

All selected (10)	All selected (55)	All selected (776)	All selected (315)		All selected (47)				All selected (2)
High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Last Date	Last Value	Healthiness	Last Check	Ownership
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Vaiano		2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Vaglia		2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Vagli sotto		2018-07-08 16:00:18	public
Special Widget	**Environment**	**Weather Forecast**		**Previ_Meteo**	**special weather**		**Vagli di sotto**		**2018-07-08 16:00:18**	**public**
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Uzzano		2018-07-08 16:00:18	public

Hide columns | Selected rows: 0 | Previous 1 2 3 4 5 … 1081 Next | Search

Choosen data sources

High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Last Date	Last Value	Healthiness	Last Check	Ownership	Remove

Previous Next | Search

Close

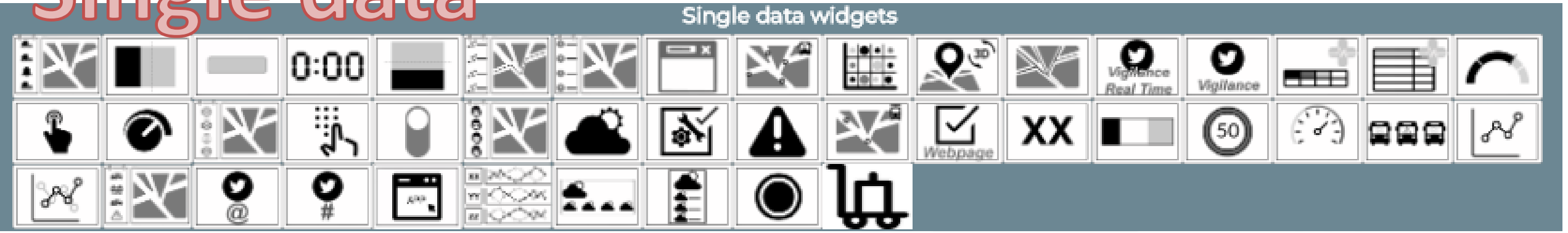
Wizard

- Select the area of your interest: panning and zooming
- Select the
  - graphic aspect of your interest, or
  - High Level Type of your interest, or
  - Make a search if you a have a precise idea or
  - Act on filters: nature, subnature, type, name, value, date, health, owner, …
  - Combine them as you like
- Select the lines of your interest
- Then click on Next and get the Dashboard by wizard

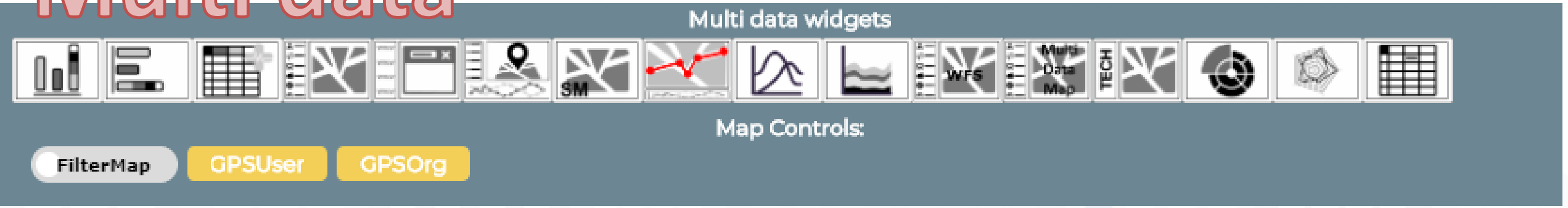
RULE OF THUMB

Widgets' Icons

Single data

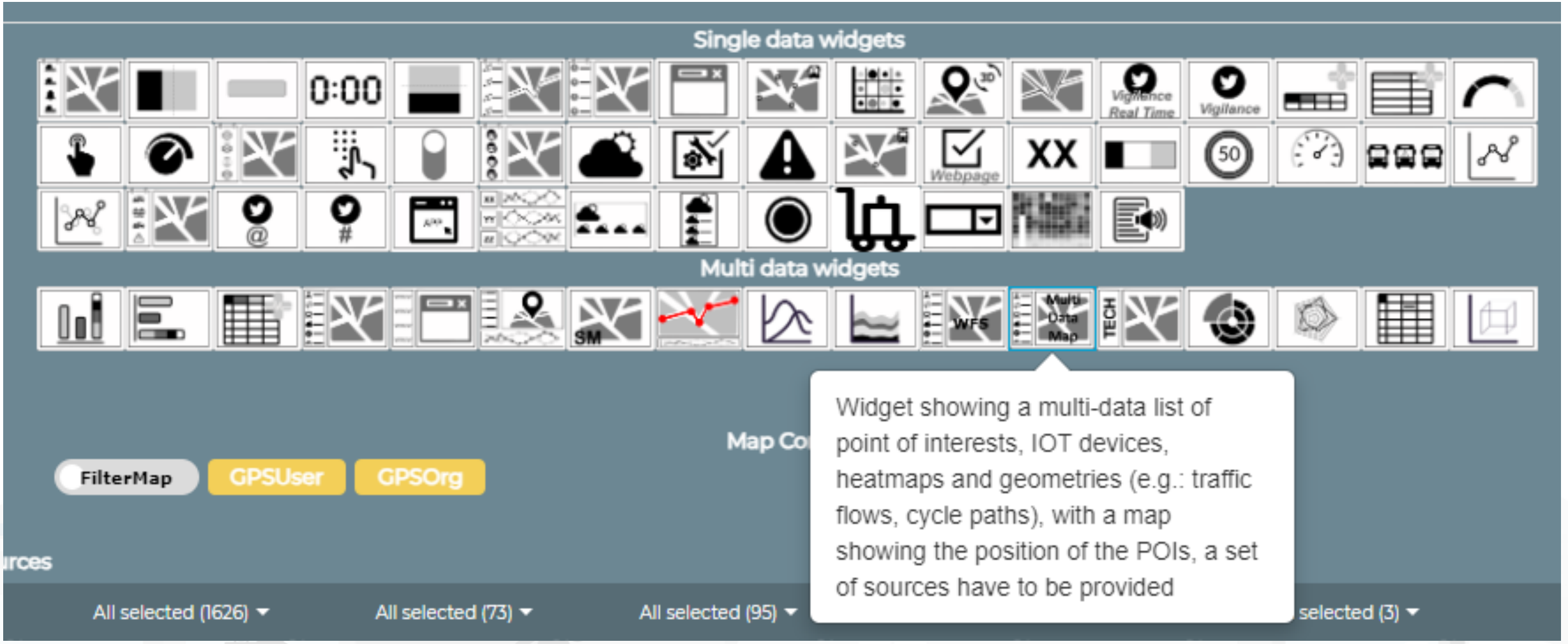


Multi data

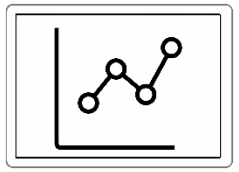


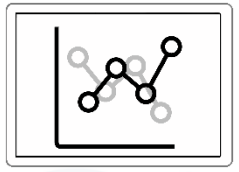
Map Controls

Widget selection

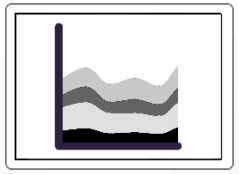


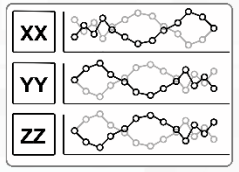
Selection of Main Widgets icons


Time Trend

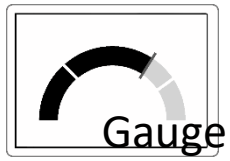

Time Trend Compare

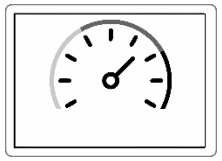

MultiSeries

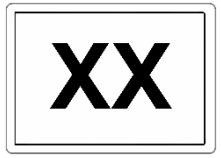

MultiSeries (stacked)



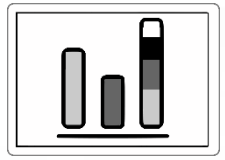
Multi TimeTrend

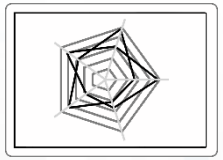

Gauge

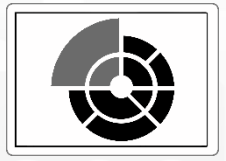

Speedometer

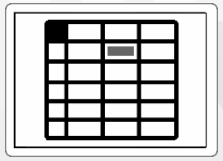


Single Content

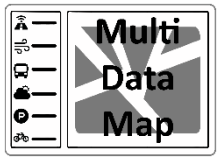

Barseries


Spider / Kiviat

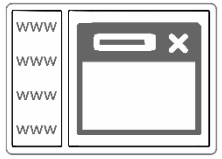

Pie / Donut

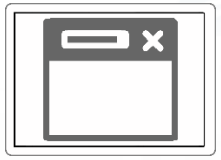


Table



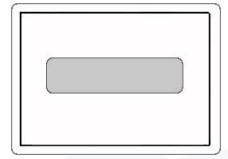
Selector + Multi Data Map


Selector + External Service


External Service

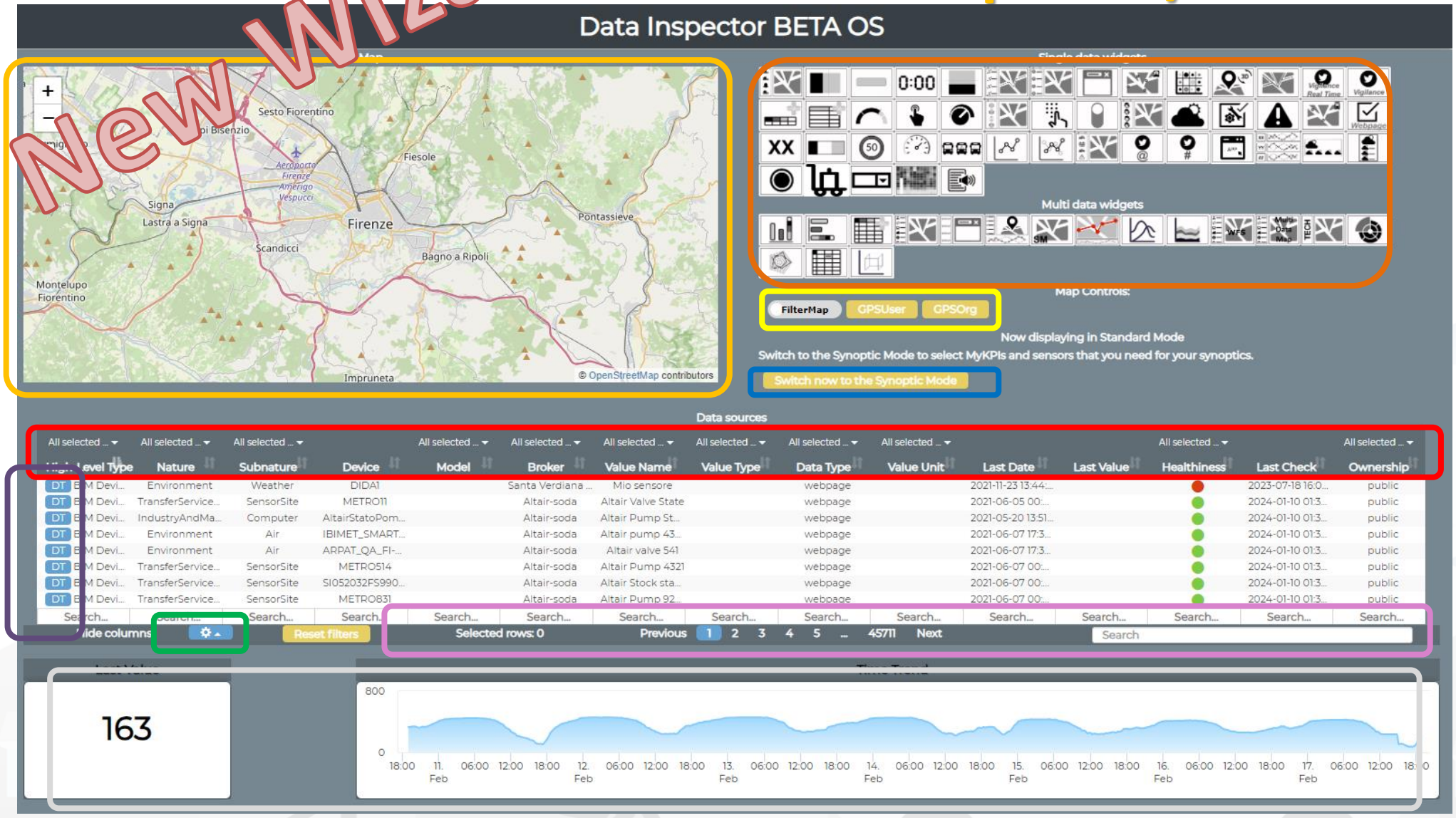


Clock


Button

New Data Inspector/Wizard

New Wizard



Filtering/Searching for individual fields (even for some fields not displayed as geographic coordinates)

Geographic Filtering

Text Search on all fields

Menu for choosing the fields to display in the table

View on Map(via PREVIEW)

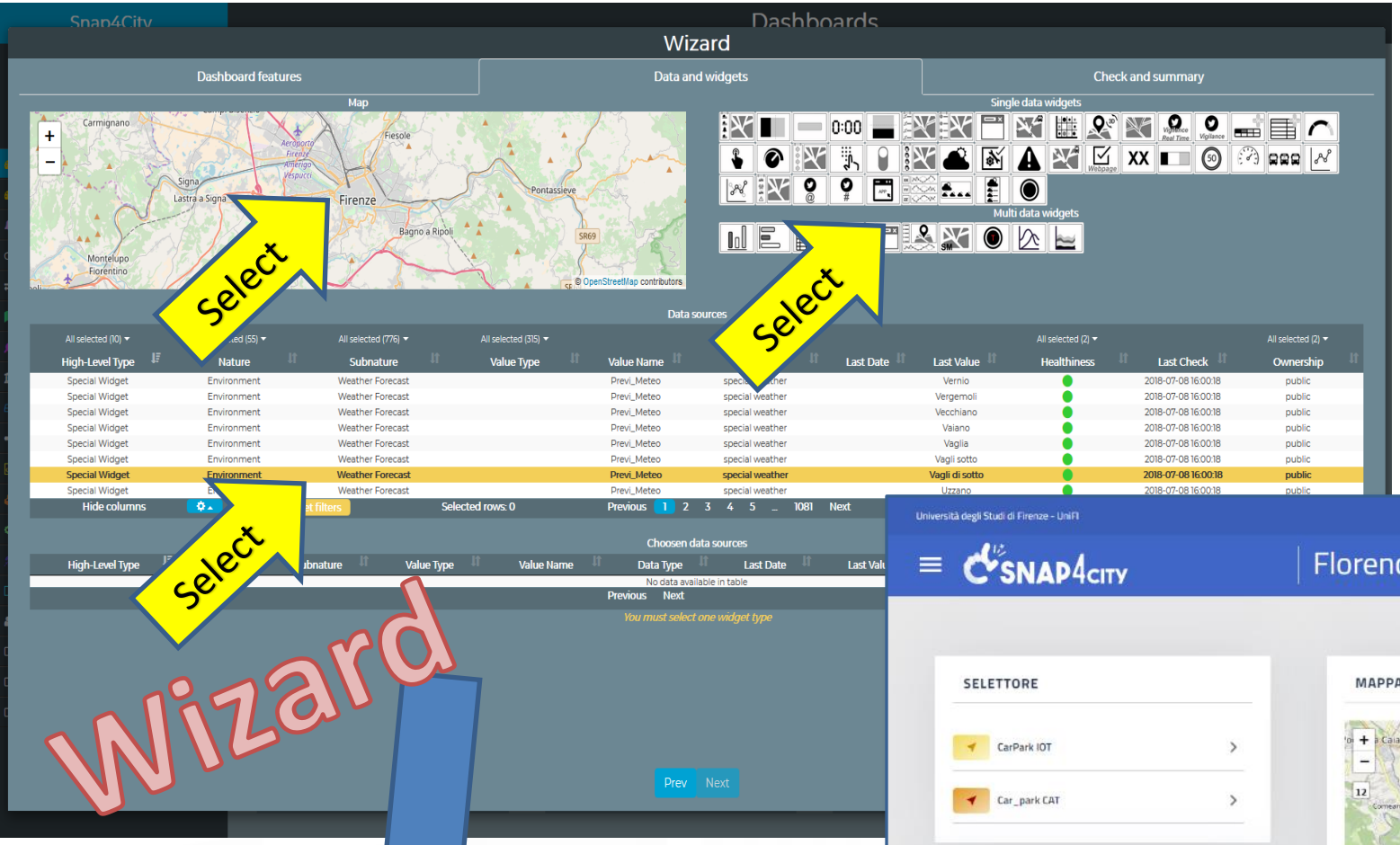
Data and Trend visualization

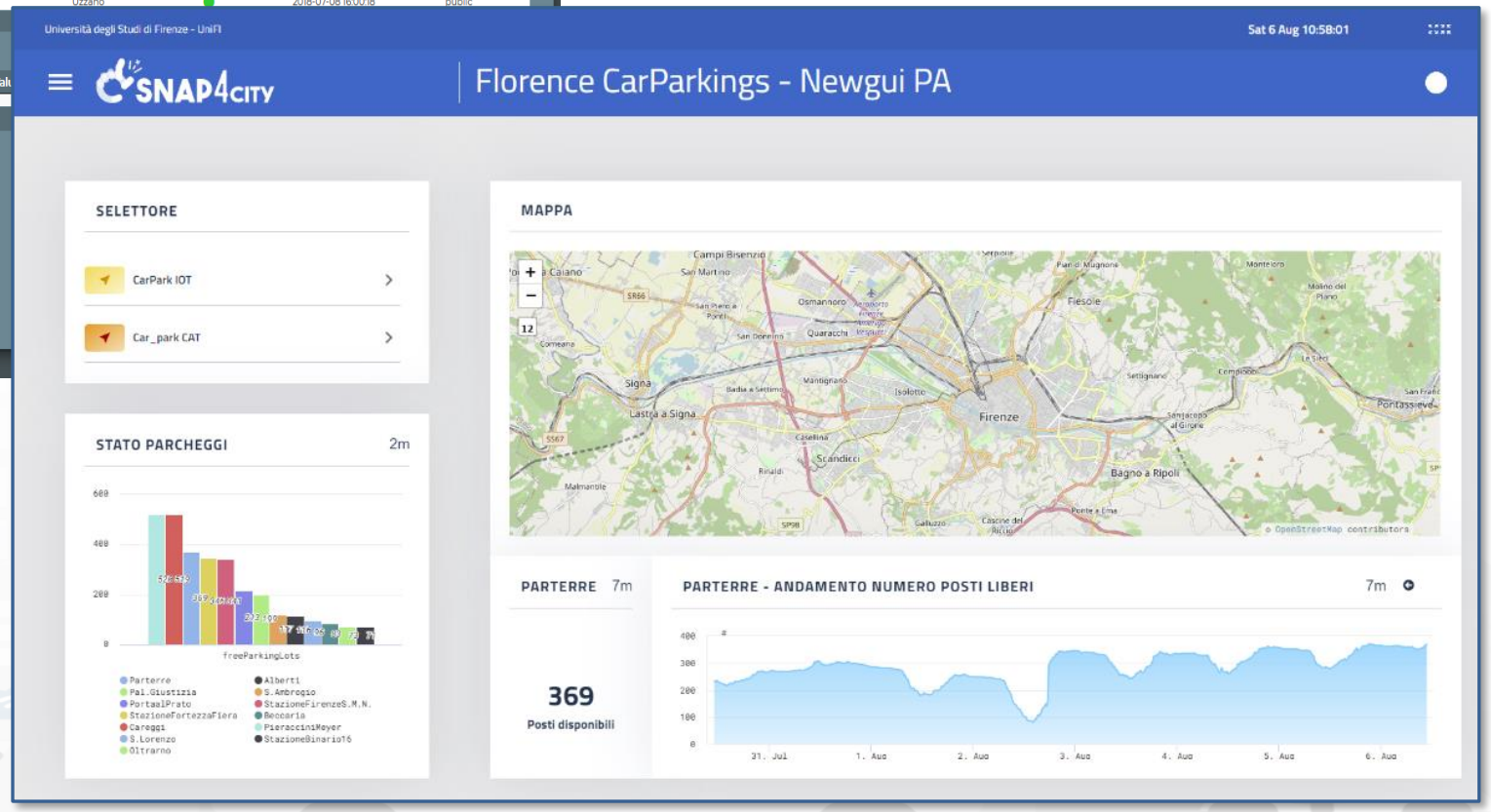
Opening Digital Twin

Pass to Synoptic mode

Select the graph representation

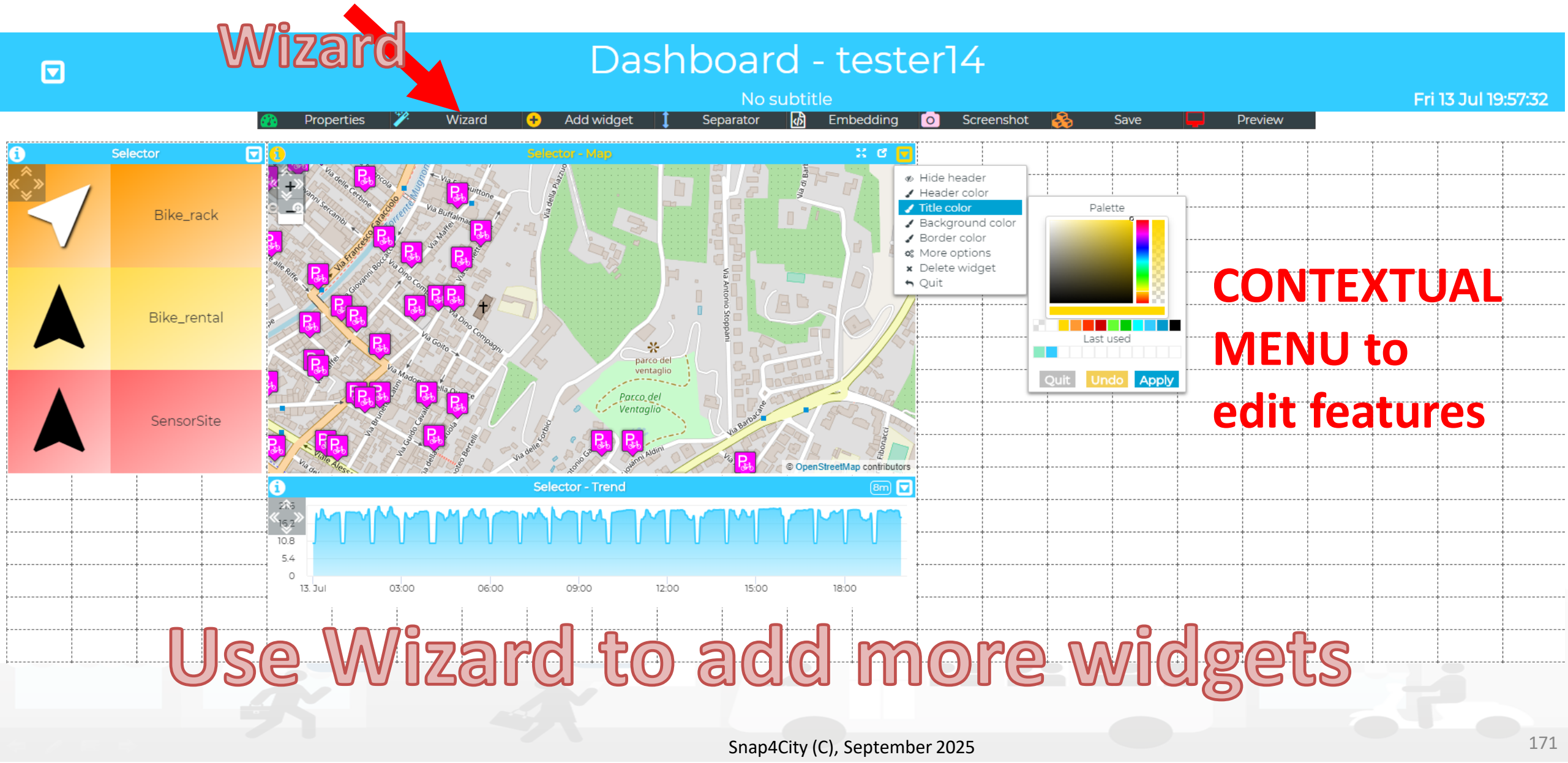
Dashboard Wizard





The Wizard help you in selecting only possible combination of data vs graphic representation

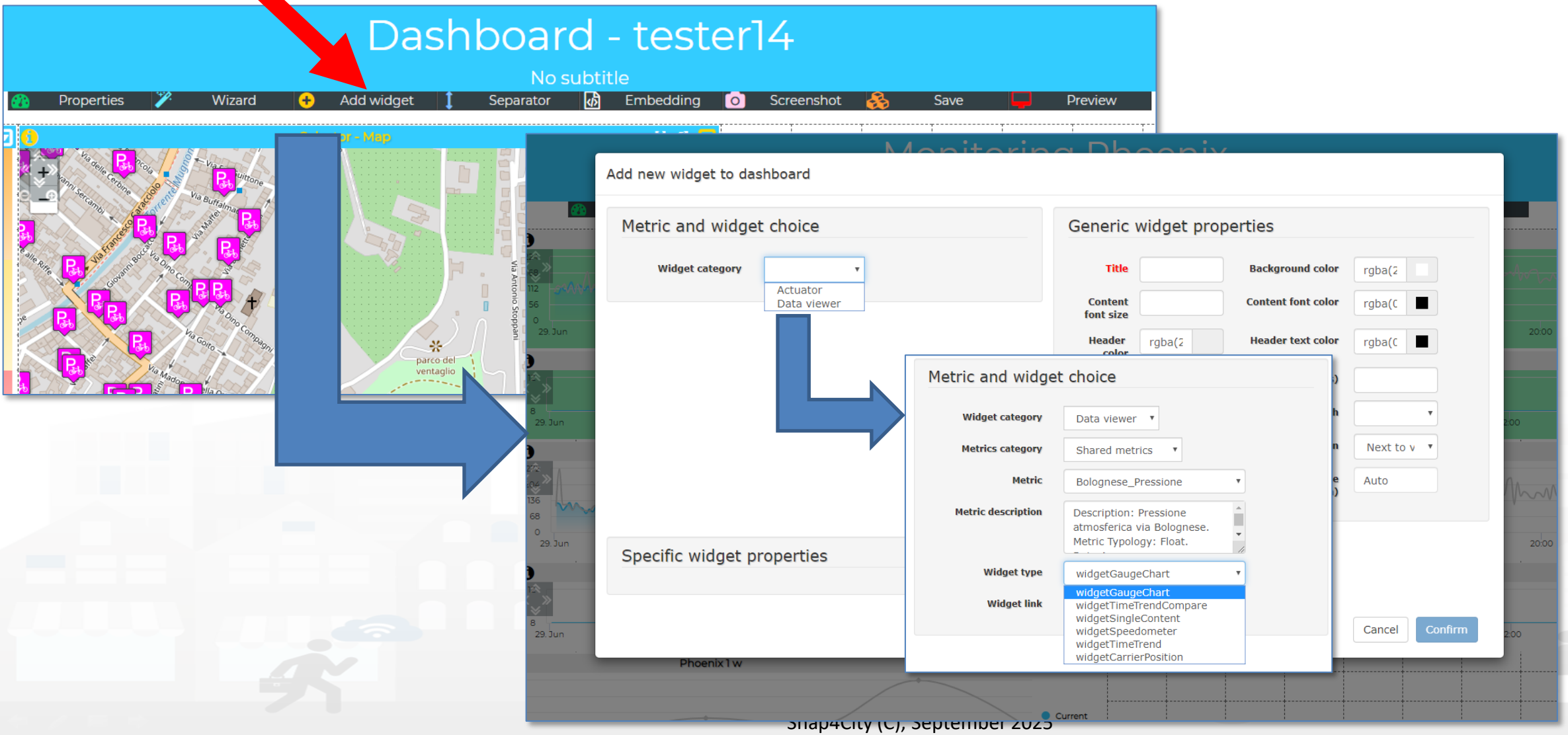
Wizard



CONTEXTUAL MENU to edit features

Use Wizard to add more widgets

Manual Addition of Widgets



Dashboards summary and further exercises

- **Suitable** as: City Dashboard, App interface, and Control Room Dashboards, Situation Room Dashboard, Operator Dashboard
- **Created** visually compounding graphic Widgets
  - Each widget can be set to have an autonomous update
  - Each metric/data-source may have associated with an alarm: blinking and sending events to people and machines in different manners
- **Can be**: public or private, private dash can be delegated or passed in ownership
- See https://main.snap4city.org/management/dashboards.php?linkId=dashboardsLink&fromSubmenu=false&sorts[title_header]=1
- See the following tutorials
  - **HOW TO: create a Dashboard in Snap4City**
  - **HOW TO: add data sources to the Snap4City Platform**
  - **US1. Using City Dashboards**
  - **US2. Using and Creating Snap4City Applications with Dashboards**
  - **US4. Creating City Dashboards and related Event Monitoring and Actions**

Snap4City

snap4city.org/dashboardSmartCity/management/iframeApp.php?linkUrl=https://www.snap4city.org/drupal&linkId=snap4cityPortalLink&pageTitle=www.snap4city.org&fromSubmenu=false

www.snap4city.org

ITA VERSION

User: nicola.areamanager, Org: DISIT
Role: AreaManager, Level: 3
LOGOUT

Switch to Legacy Layout

Dashboards (Public)

My Snap4City.org

Tour Again

- www.snap4solutions.org
- Dashboards of My Organization
- My Dashboards in My Organization
- My Data Dash Dev OpenSrcDash
- Extra Dashboard Widgets
- Data Management, HLT
- Knowledge and Maps
- Processing Logics / IOT App
- Entity Directory and Devices
- Resource Manager
- Development Tools
- Management

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Home How and Why To Use it Tools Tutorials and Videos

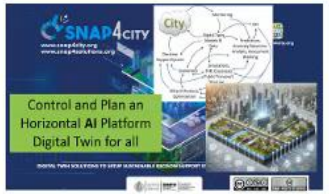


Home / Snap4City: Digital Twin Solutions to Setup Sustainable Decision Support Systems and Business Intelligence

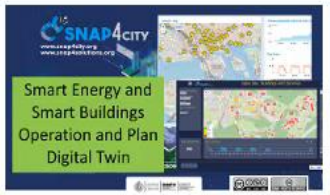
Username: nicola.areamanager

Snap4City: Digital Twin Solutions to Setup Sustainable Decision Support Systems and Business Intelligence

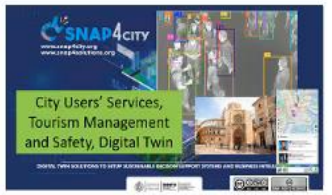
You can't delete this newsletter because it has not been sent to all its subscribers.











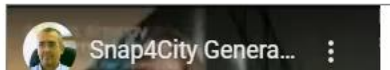
Please perform a free trial registration and select "DISIT" as organization, to use most of our tools on a large range of public data and dashboards.

Il prossimo corso Snap4City parte il 14 Gennaio 2025 ore 15:00 in Italiano, in relazione a CN MOST, accesso Libero

*28 January 2025: https://*meet.google.com/vmz-cucv-wsy

Il corso è in Italiano, per registrarsi inviate una email in Italiano a paolo.nesi@unifi.it con al vostra richiesta

la pagina del corso 2025 in Italiano è: https://www.snap4city.org/1068



Search

Search

-Any-

Training on Tools and Platform

Powered by www.km4city.org

Node-RED

MOST CENTRO NAZIONALE PER LA MOBILITÀ SOSTENIBILE

MQTT

FIWARE

https://www.youtube.com/watch?v=UChDNYboMvY

www.snap4city.org

HOW ARE YOU GOING TO BUILD THE FUTURE?

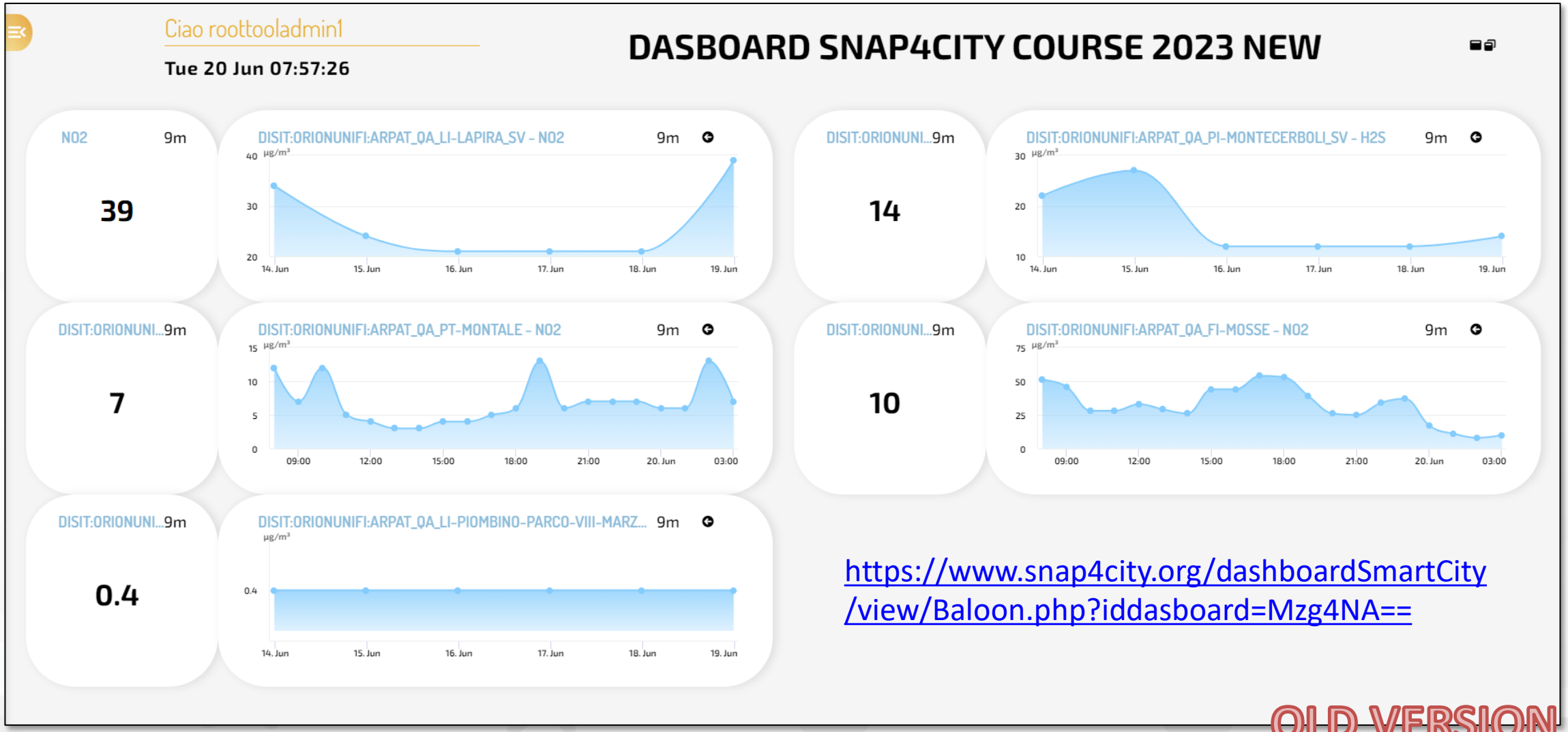
Snap4City: a framework for rapid implementation of Decision Support Systems and Smart Applications.

Snap4City: Smart aNalytic APp builder for sentient Cities and IOT

- 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/

OLD VERSION

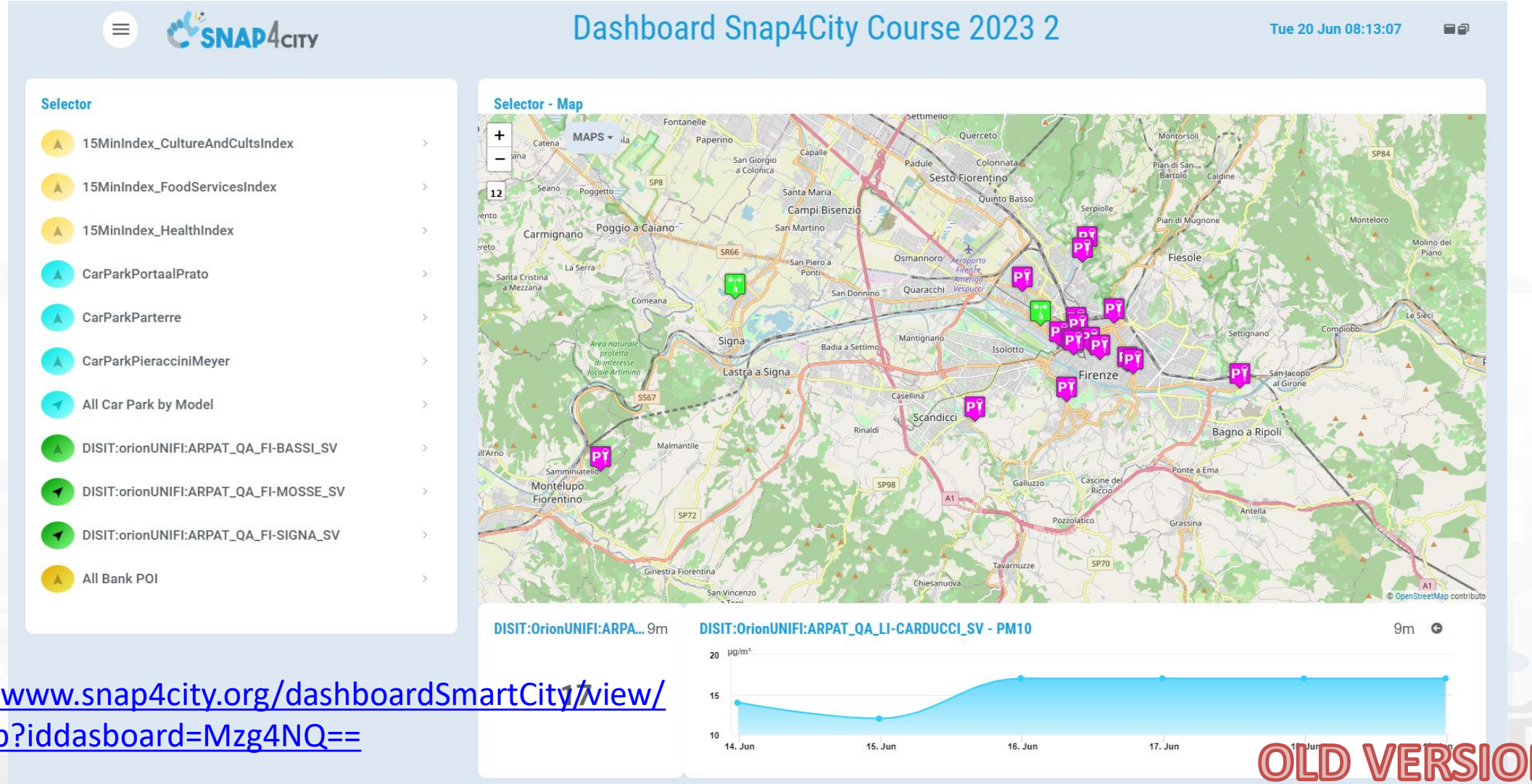
First Example



https://www.snap4city.org/dashboardSmartCity/view/Baloon.php?iddasboard=Mzg4NA==

OLD VERSION

Second Example with some improvement



https://www.snap4city.org/dashboardSmartCity/view/Gea.php?iddasboard=Mzg4NQ==

OLD VERSION

App Maps Google Gmail Snap4City Snap4 Calendar Translate Google Scholar Cita... DISIT DISIT old Facebook DataCenter Trello Km4City major tools Impostazioni YouTube Google Forms News Qnap15sek7gyfe

Snap4City

Dashboards (Public by (ORG))

Wizard

Dashboard features | Data and widgets | Check and summary

Dashboard title

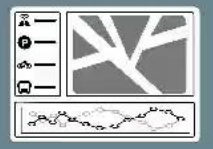
Dashboard title can't be empty

Dashboard template

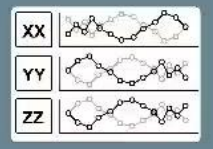
Click on a template to choose it, click on it again to unselect it



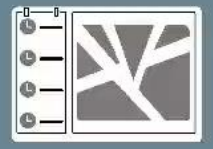
Selector and map
Preset widget choice



Selector, map, trend
Preset widget choice



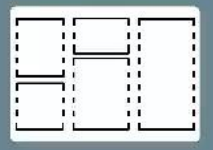
Data and trends
Preset widget choice



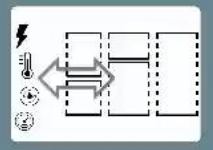
Events vs. map
Manual widget choice



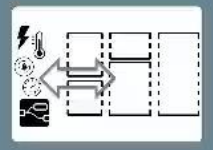
MicroApp and Services
Preset widget choice



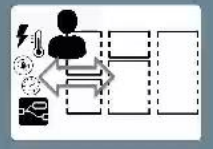
Fully custom
Manual widget choice



IOT devices
Manual widget choice



IOT applications
Manual widget choice



My Private Data
Manual widget choice



Empty Dashboard
Empty dashboard

You must choose one template

https://www.youtube.com/watch?v=UChDNYboMvY

Prev Next

Close

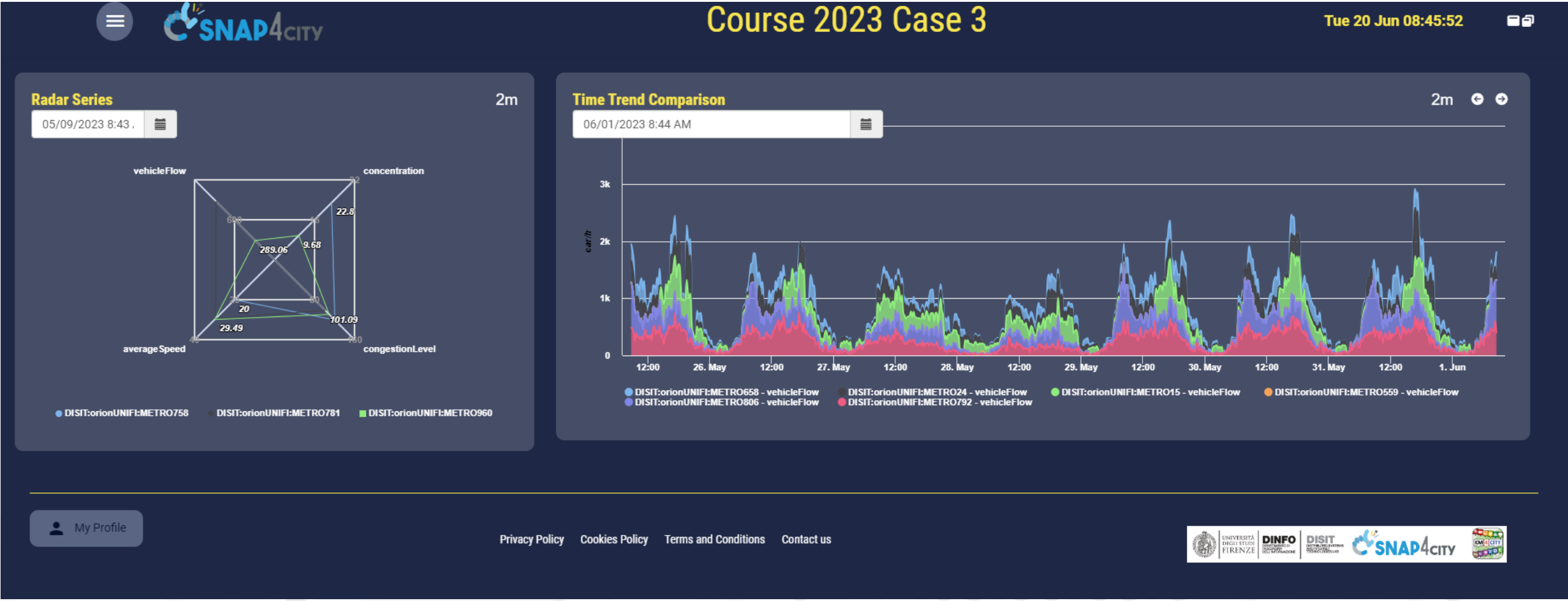
SuperSetting

User Management and Auditing

Help and Contacts

OLD VERSION

Example Case 3



https://www.snap4city.org/dashboardSmartCity/view/Gea-Night.php?iddasboard=Mzg4Ng==

OLD VERSION

Combining Widgets:
Nesting & Linking Dashboards



UNIVERSITÀ DEGLI STUDI FIRENZE

DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB DISTRIBUTED DATA INTELLIGENCE AND TECHNOLOGIES LAB

SNAP4CITY KM4CITY

Mixt per Roma

MENU

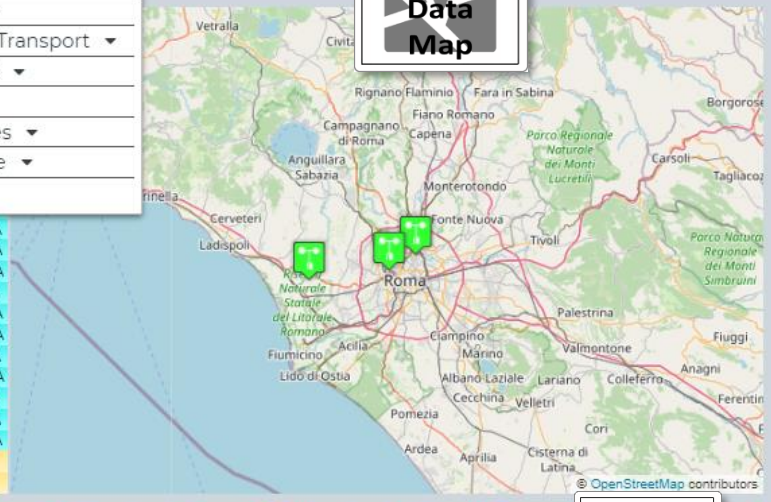
Roma Demo3 (Qualità dell'Aria)

Thu 23 Jul 13:35:09

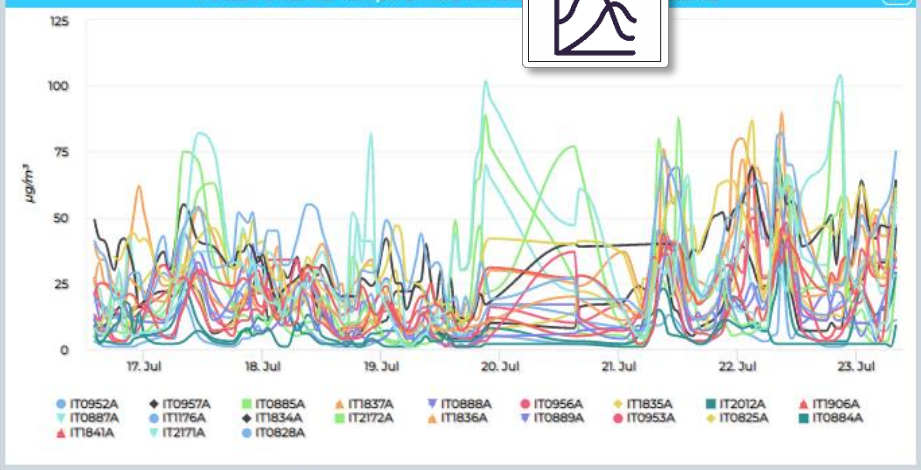
- Mobility and Transport
- Environment
- Social
- Some Services
- Infrastructure
- Quit

Multi Data Map

IT1836A IT0957A IT0828A IT2171A IT0952A IT0885A IT1837A IT0888A IT1176A IT1835A IT1834A 03 NO2



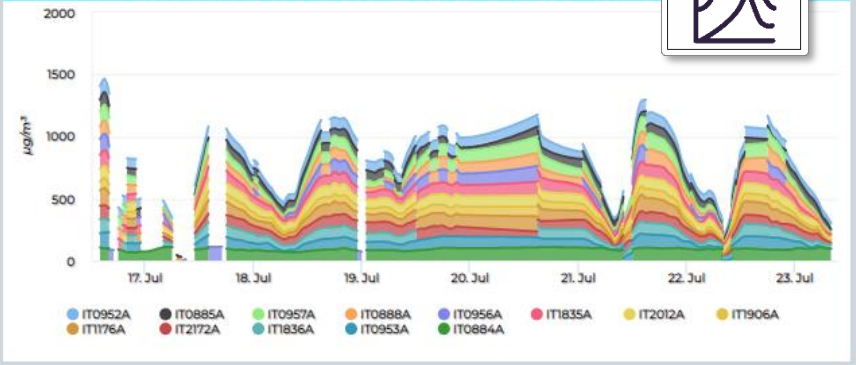
Andamento nel Tempo di NO2 rilevato ... Roma 2m



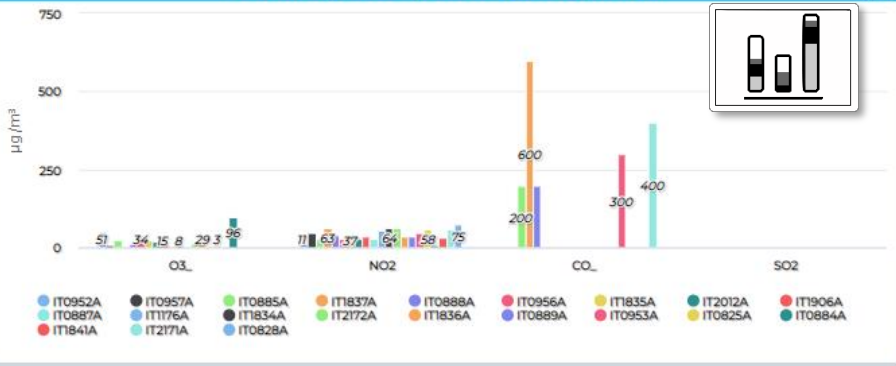
Valori Inquinanti in tempo reale, mappe 2m

value type / value name	O3_	NO2	CO_	SO2
IT0952A	51	11		
IT0957A	7	46		
IT0885A	25	29	200	
IT1837A		63	600	
IT0888A	11	37	200	
IT0956A	34	29		
IT1835A	24	37		
IT2012A	20	29		
IT1906A	15	34		
IT0887A		28		
IT1176A	8	54		
IT1834A		64		
IT2172A	15	61		
IT1836A	29	35		
IT0953A	3	47	300	1.3
IT0889A		34		
IT0825A		58		
IT0884A	96	9		
IT1841A		31		
IT2171A		57	400	
IT0828A		75		

Andamento nel Tempo di O3 rilevato nelle stazioni in Roma (st... 2m



Dati in Tempo reale inquinanti in Roma e provincia 2m



Home Trasporti

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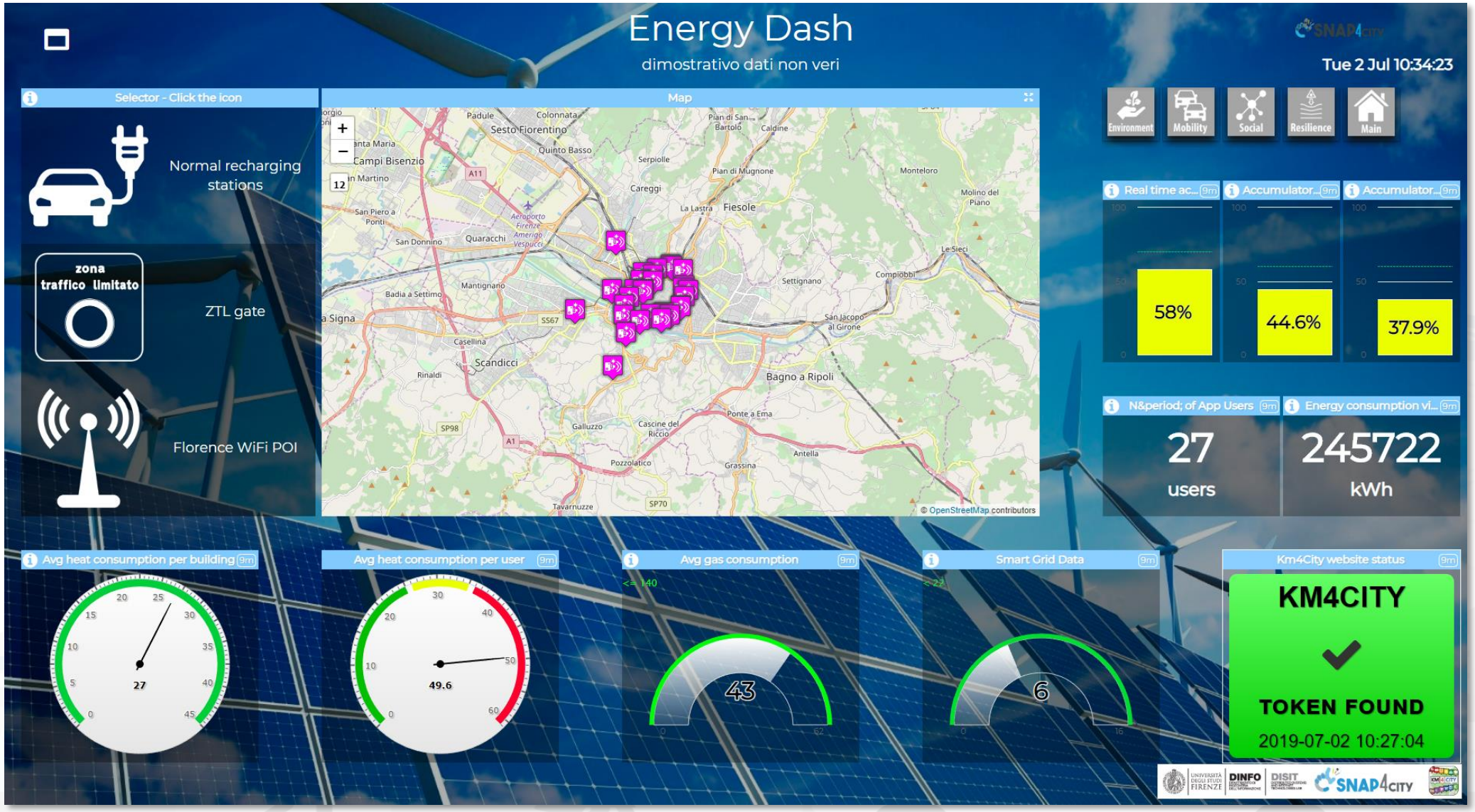
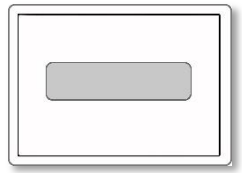
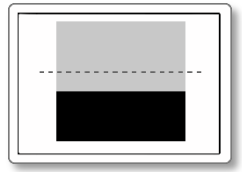
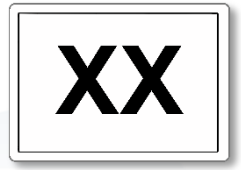
Match Widget vs Icon

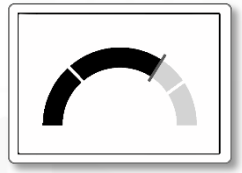


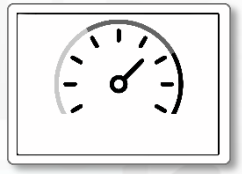












Monitoring My PAXCounter and Tracks (example)

Please note that the data results are not always based on real data.

Wed 3 Jul 09:18:07

Your PAX Counter

paxwifitest0... 8m

Single Content

paxwifitest001 - WIFI number 8m

Time Trend

paxwifitest001 - WIFI - Last Week 8m

Time Trend

paxwifitest001 - WIFI - Last Month 8m

Time Trend

Documentation

Button

Servizi: 27

Micro Application

S4cantwerpappusage

Your experiences on this App by day: you can access to you data from the portal and create additional services for you! See MyKPI on the portal

Rimuovi | Modifica | Delega

2019-07-01

Show 10 entries

Values	Data
bikeSharing	1/7 11:
transportMenu	1/7 11:
settings	1/7 11:
suggestionsNearYou	1/7 11:
settings	1/7 11:
suggestionsNearYou	1/7 11:

External Content

Selector Web

Origin Dest. Matrix

Typical Trajectories

My Track

Delegated Tracks

Multi Tracks

Twitter Vigilance

Twitter Vig. Real Time

Air Quality

Fourm Discussion

Survey

Button

FIRENZE

Tue 16 Oct 16:18:39

INDICI DI CRITICITA' DELLA QUALITA' DELL'ARIA (ICQA)	
2	inviata comunicazione alla cittadinanza

OZONO	
200 µ/m³	superata la soglia di informazione

39492 Utenti WiFi

STATI DI ALLERTA 9m

GENERAL | METEO

MINIMO | BASSO | MEDIO | ALTO

RISCHIO IDRAULICO

RISCHIO TEMPORALI

RISCHIO IDROGEOLOGICO

RISCHIO NEVE

RISCHIO GHIACCIO

Mar 16 Ott
Firenze

Nuvoloso
19°C / 24 °C
Powered by LaMMA

Mer 17 Ott 16°C / 24°C	Nuvoloso
Gio 18 Ott 15°C / 26°C	Nuvoloso
Ven 19 Ott Temp N/A	Sereno
Sab 20 Ott Temp N/A	Sereno

TPL

N	14	57	21
Attese	3'	8'	5'
Ritardo	2'	0'	2'

REPLICATE

DISIT

FLORENCE DASHBOARD

This dashboard is the main entry point to access dashbaords realised in the REPLICATE H2020 EC project.

REPLICATE has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 691735.

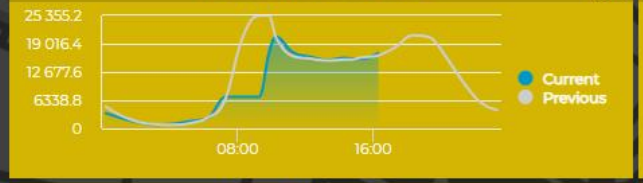
COLONNINE RICARICA 9m

180 INSTALLATE

81.1 % ATTIVE

8.9 % IN USO

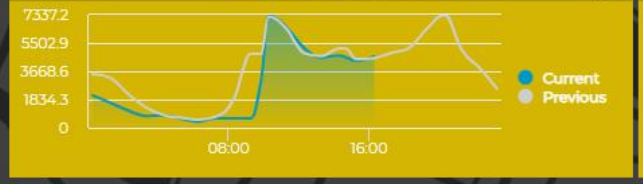
FLUSSI INGRESSO CITTA 9m



TOTALE 9m

141608
VEICOLI

FLUSSI INGRESSO ZTL 9m



TOTALE ZTL 9m

41146
VEICOLI

SITUAZIONE VIABILITA 54s

4 INCIDENTI

0 CHIUSURE AL TRAFFICO (TOT)

0 CHIUSURE PER CANTIERI

0 PROGR. | 0 NON PROG.

0 LIMITAZIONI AL TRAFFICO (TOT)

0 LIMITAZIONI PER CANTIERI

0 NON PROG. | 0 PROGR.

4 TOT. EVENTI SULLA RETE

SMN 9m	BINARIO16 9m	FORTEZZA 9m
63.4 % occupati su 901 posti	83 % occupati su 165 posti	17.9 % occupati su 521 posti
LEOPOLDA 9m	**CALZA 9m**	**S.AMBROGIO 9m**
36.3 % occupati su 300 posti	69.3 % occupati su 218	67 % occupati su 379 posti
PARTERRE 9m	**CAREGGI 9m**	**BECCARIA 9m**
64.9 % occupati su 106 posti	90.4 % occupati su 406 posti	78.6 % occupati su 210 posti

STATO TRIAGE CAREGGI 9m

Red code	Yellow code	Green code	Blue code	White code
3	12	83	37	9

MAPPA

Energy | Environment | Mobility | Social | Resilience

PM10	Riciclo rifiuto	Rifiuto per abitante	PIL residenti	Tasso di disoccupazione	Piste Ciclabili
26 superamenti/anno	56%	0,629 t/pers/anno	23.606 euro/pers	6,8%	19.7% km ciclabili/km totali

Most of the widgets are connected to an URL to jump to other views/dashboards

FIRENZE

Tue 16 Oct 16:18:39

Single Content

Single Content

Civil Protection

SOC

External Content

Meteo

Single Content

Single Content

Single Content

3 Single Content

External Content

Time Trend Compare

Single Content

10 Single Content

9 Single Content

Time Trend Compare

Single Content

6 Buttons

First AID

6 Buttons

Most of the widgets are connected to an URL to jump to other views/dashboards

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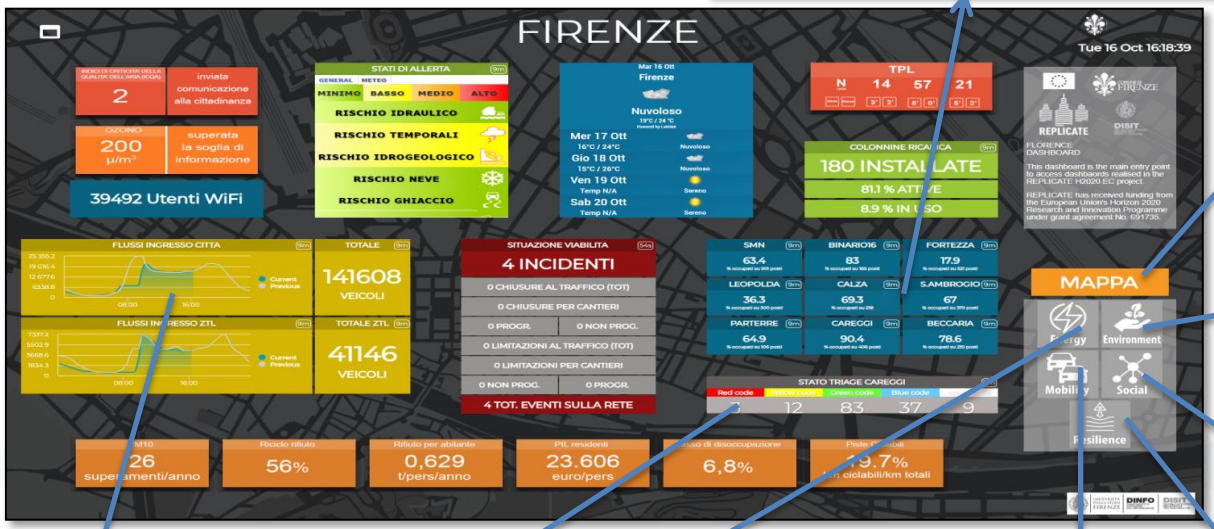
DISTRIBUTED DATA INTELLIGENCE AND TECHNOLOGIES LAB

REPLICATE

KM 4 CITY

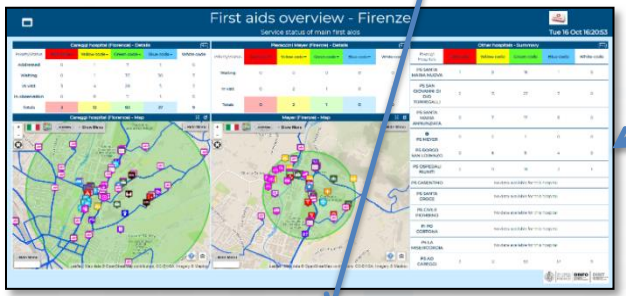


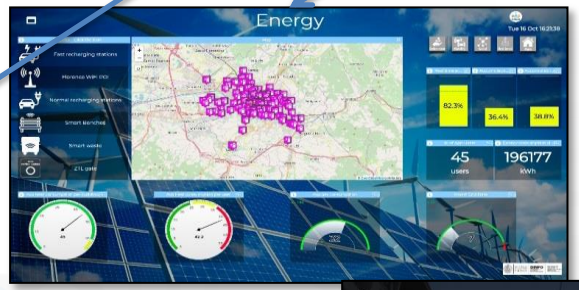


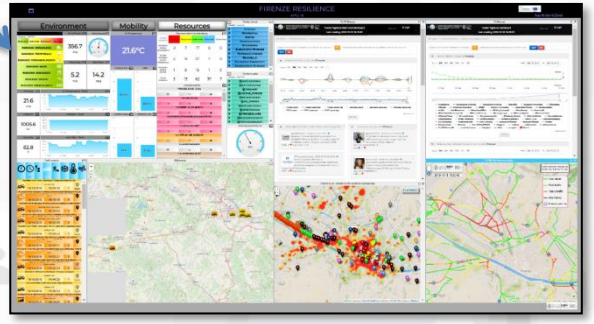


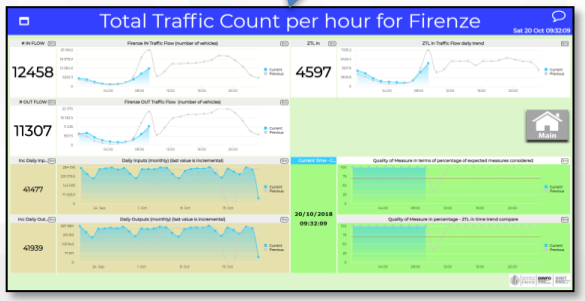




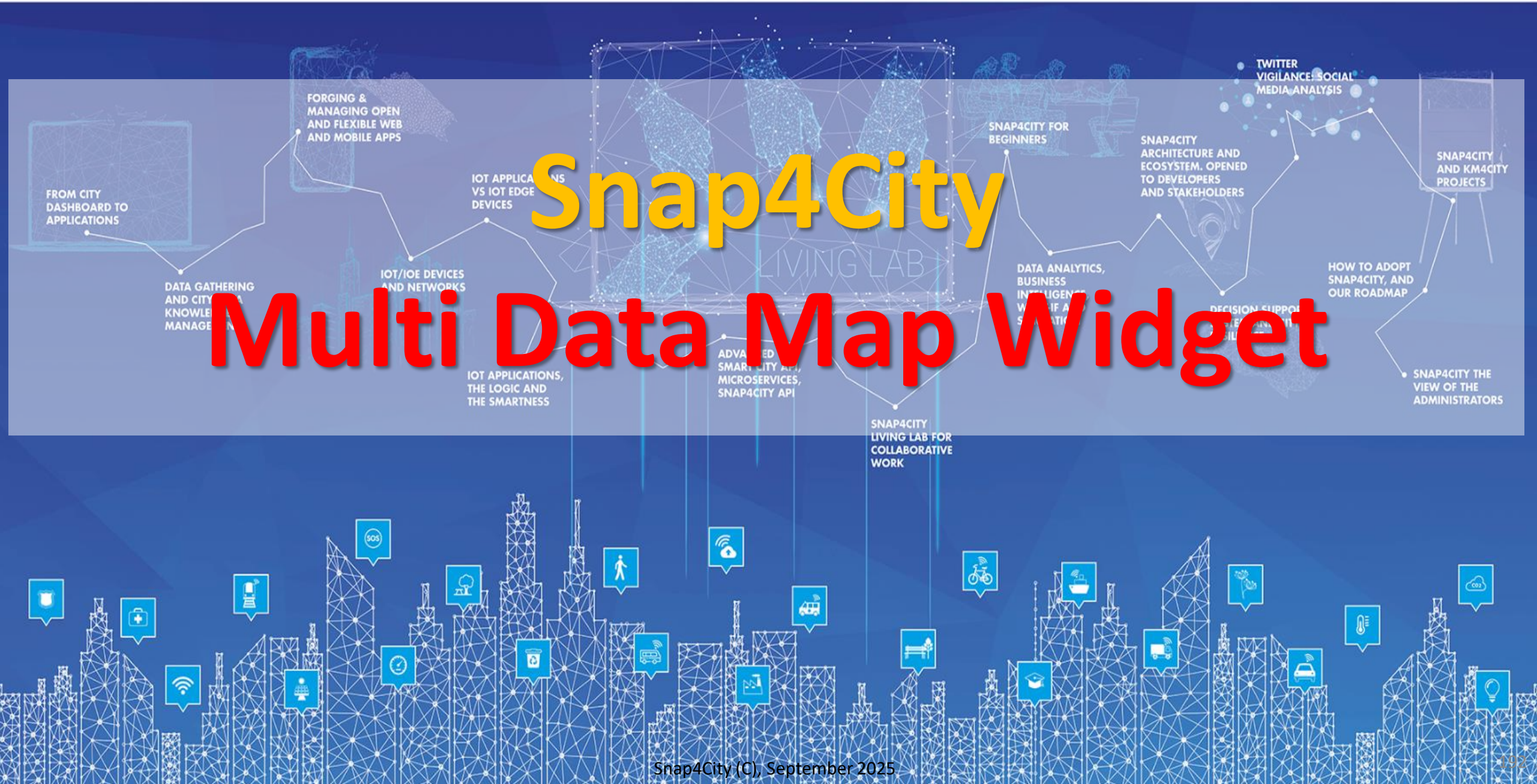






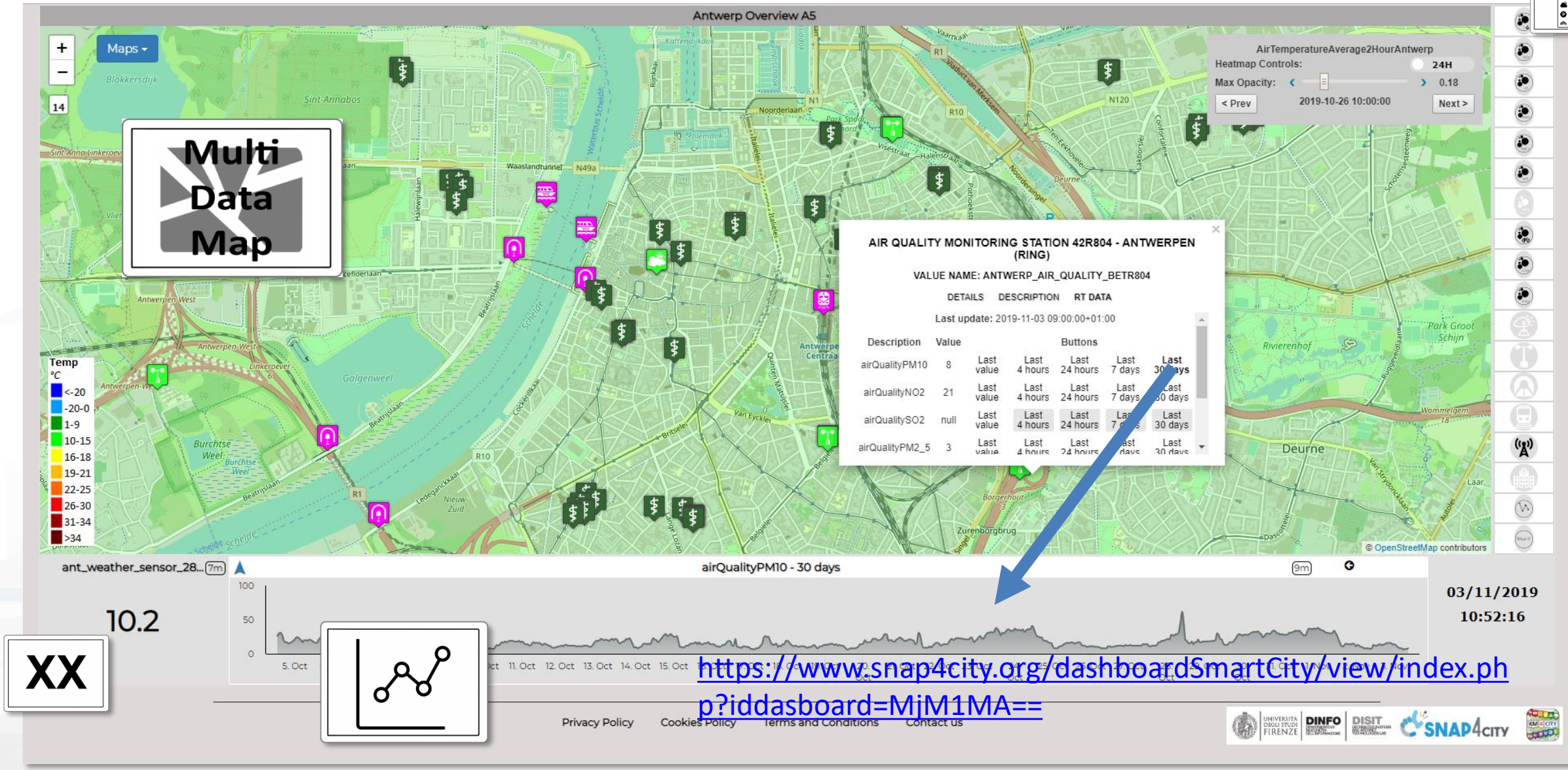






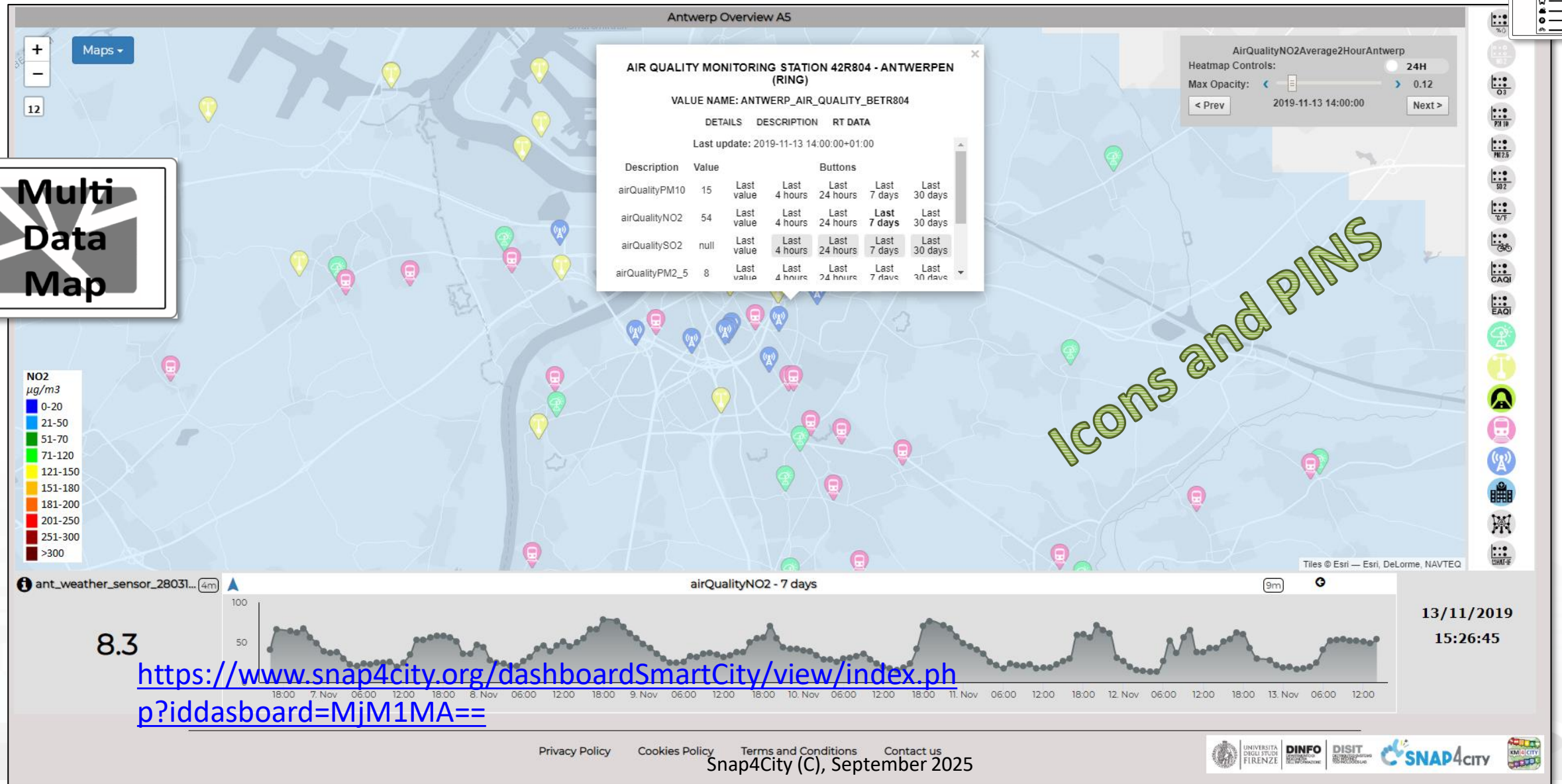
Snap4City
Multi Data Map Widget

Unique Dashboard builder Multiple Styles



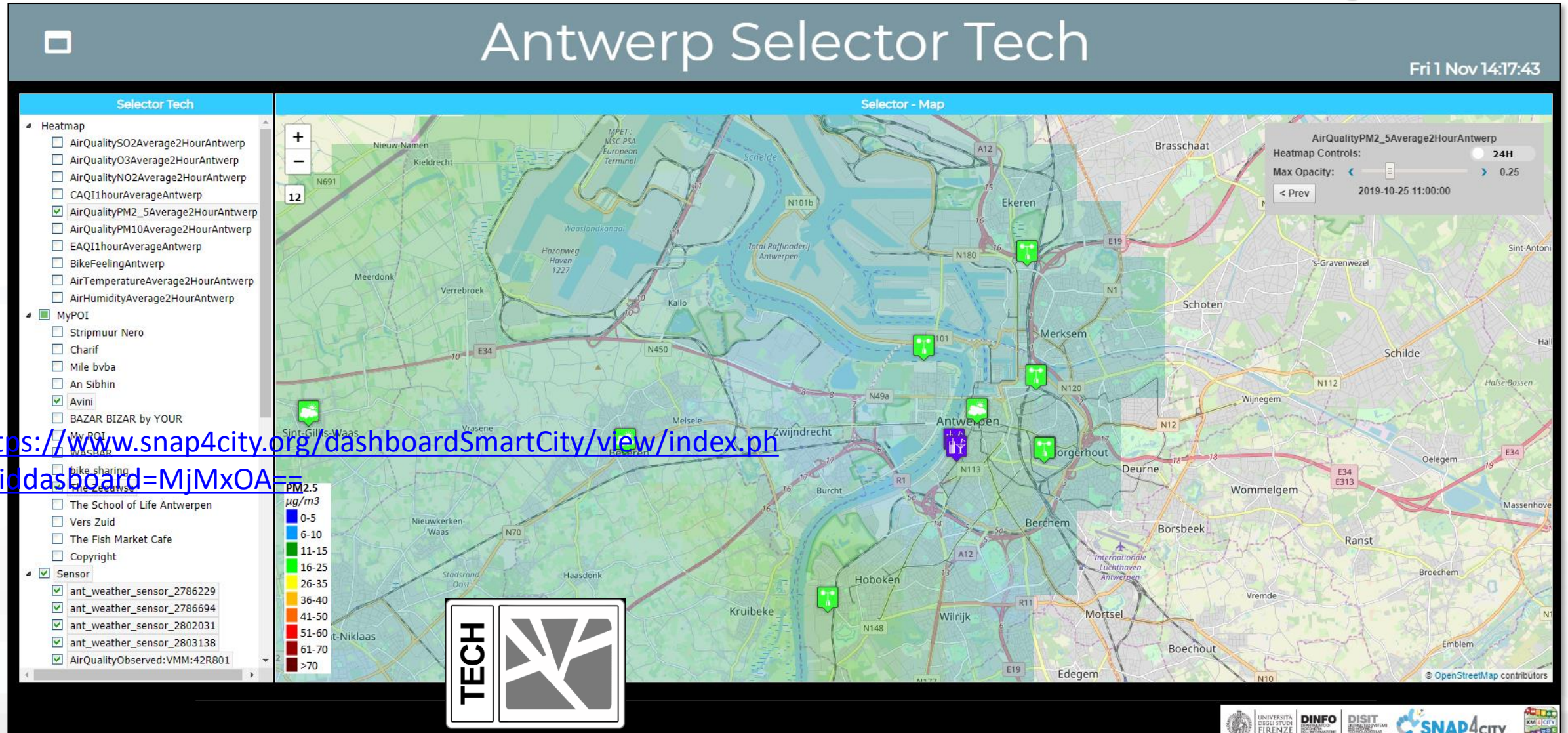
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjM1MA==

Menu Icon and PINs as Icons



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjM1MA==

Technical Selector: TECH MultiDataMap



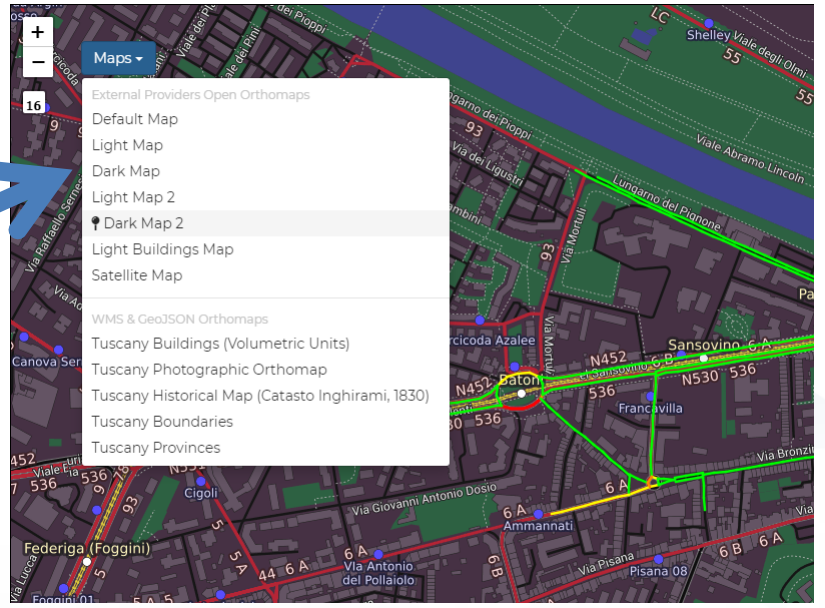
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjMxOA==

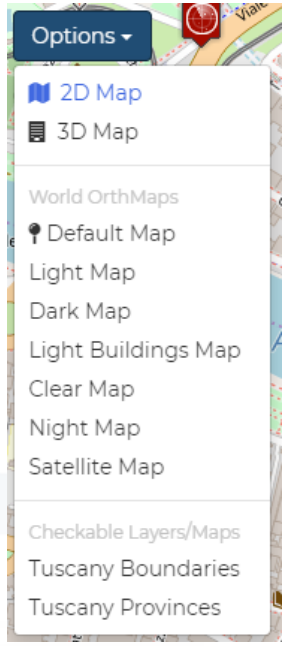
Multi Data Map: many kinds of data

- **Orthomaps**: plain maps and overlapped layers
- A range of **Pins Kinds** for marking Services, IOT Devices, etc.
- **Services**:
  - POI, MyPOI, IOT Devices, Sensors, Actuators, IOT Device Moving, etc.
  - Cycling paths
  - Areas shapes: gardens, etc…
  - GIS data: building shapes, floor shapes, etc.
  - Public Transport paths, routes, lines
- **Heatmaps**: different types, also animated, over time
- **Traffic Flows:** different kinds, also animated, over time
- **OD matrices:** spider, regular grid, administrative area, ACE, etc.
- **Vector Fields:** with and without heatmaps
- ***Add On Applications for Special data:***
  - ***What-If*** *analysis: routing, public routing, traffic flow*
  - ***Routing: private, public, pedestrian, public means***
  - ***Simple Scenarios*** *definition*
  - ***Advanced Scenario Editor***
  - ***Comparing Orthomaps: /sideVision/***
- **3D** buildings on the 3D version of MMD
- ….

Multi Data Map Widget

- The most powerful Data Map rendering tool, it supports:
  - **KB Sensor data**: POI, sensors, actuators, etc. (see in the following), moving devices
  - **WFS data** (see in the following)
  - **WMS background maps**
    - Ask to a **RootAdmin** for activating this feature on your MultiDataMap widgets once created the dashboard
    - Maps can come from GIS servers, and WMS
  - **WMS Heatmaps GeoTiFF**
  - **WMS Traffic Flow GeoTIFF**
  - **GTFS data from Public Transport**
  - **Special tools**
    - Scenario (see in the following)
    - What-IF (see in the following)





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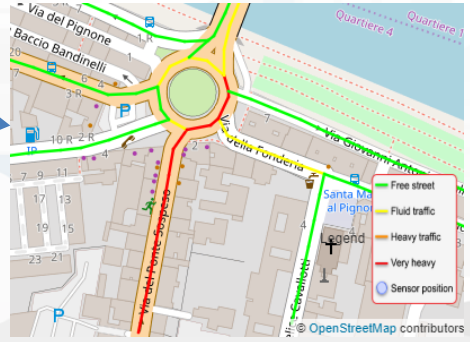
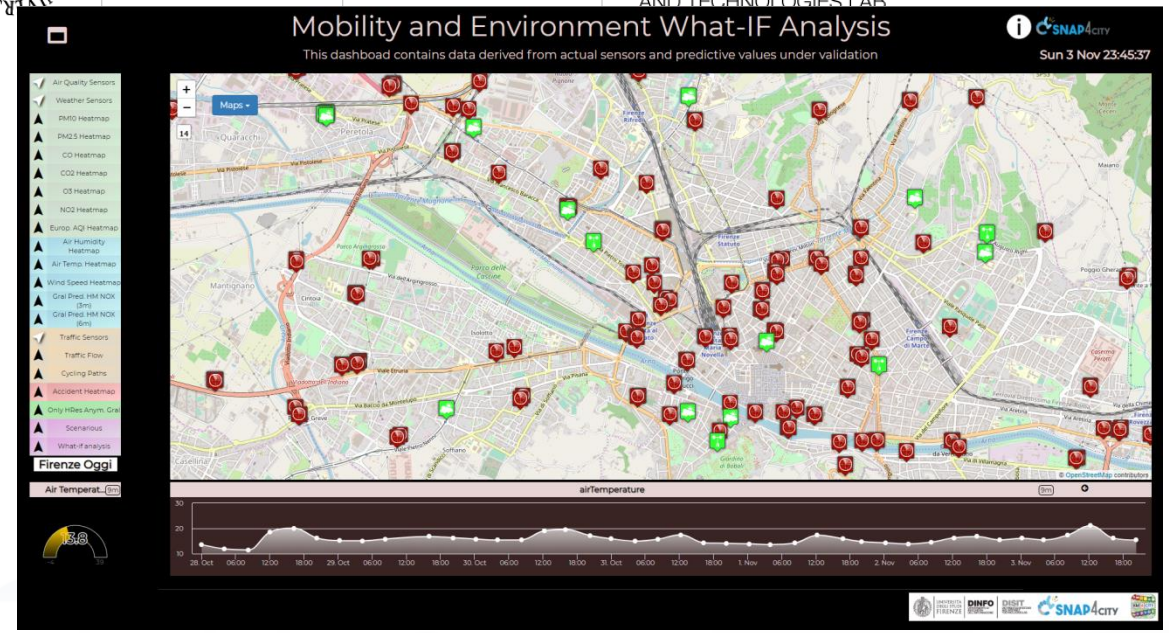
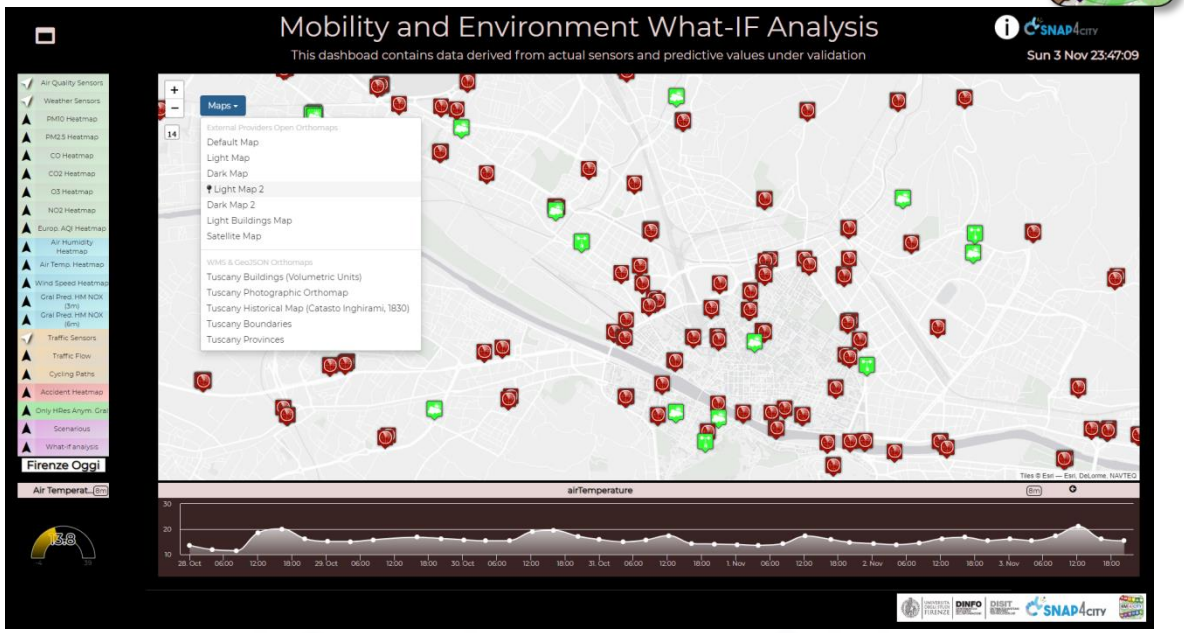


Orthomaps


Mobility and Environment What-IF Analysis
This dashboad contains data derived from actual sensors and predictive values under validation
Sun 3 Nov 23:45:37
Maps
Firenze Oggi
airTemperature


Mobility and Environment What-IF Analysis
This dashboad contains data derived from actual sensors and predictive values under validation
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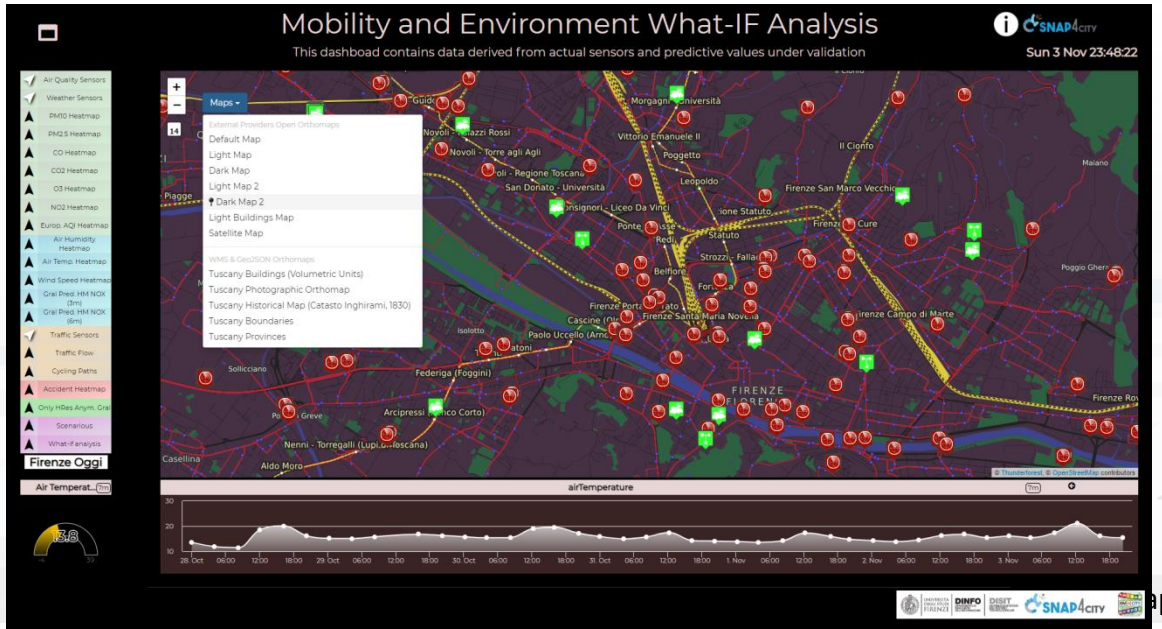
Maps
Default Map
Light Map
Dark Map
Light Map 2
Dark Map 2
Light Buildings Map
Satellite Map
Tuscany Buildings (Volumetric Units)
Tuscany Photographic Orthomap
Tuscany Historical Map (Catasto Inghirami, 1830)
Tuscany Boundaries
Tuscany Provinces
Firenze Oggi
airTemperature


Mobility and Environment What-IF Analysis
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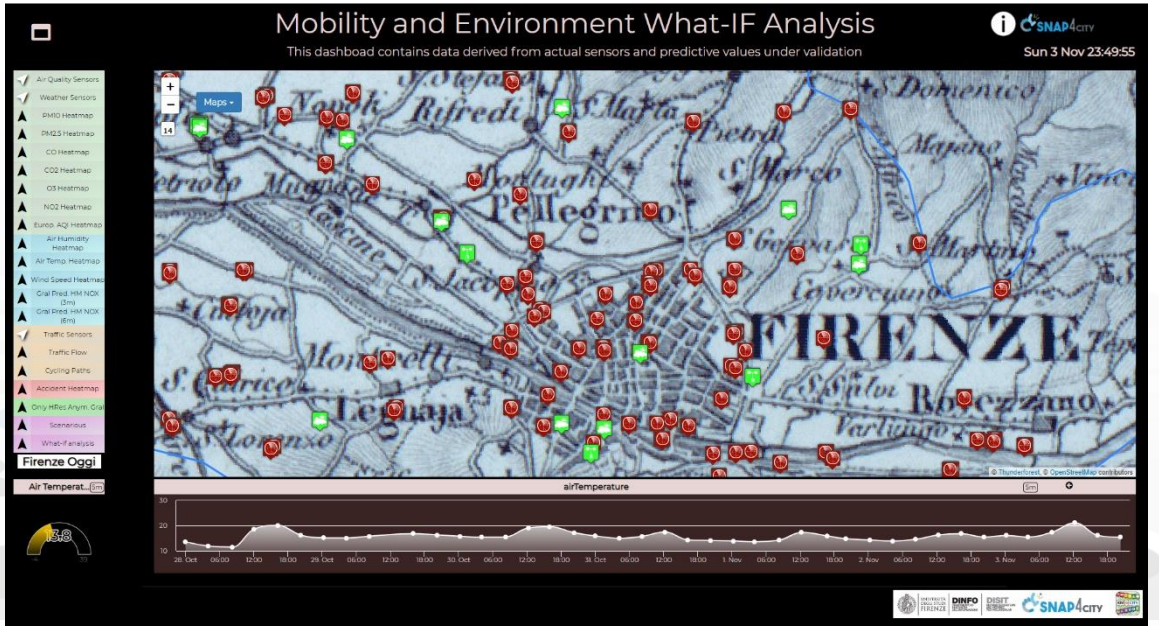
Maps
Default Map
Light Map
Dark Map
Light Map 2
Dark Map 2
Light Buildings Map
Satellite Map
Tuscany Buildings (Volumetric Units)
Tuscany Photographic Orthomap
Tuscany Historical Map (Catasto Inghirami, 1830)
Tuscany Boundaries
Tuscany Provinces
Firenze Oggi
airTemperature


Mobility and Environment What-IF Analysis
This dashboad contains data derived from actual sensors and predictive values under validation
Sun 3 Nov 23:49:55
Maps
FIRENZE
Firenze Oggi
airTemperature

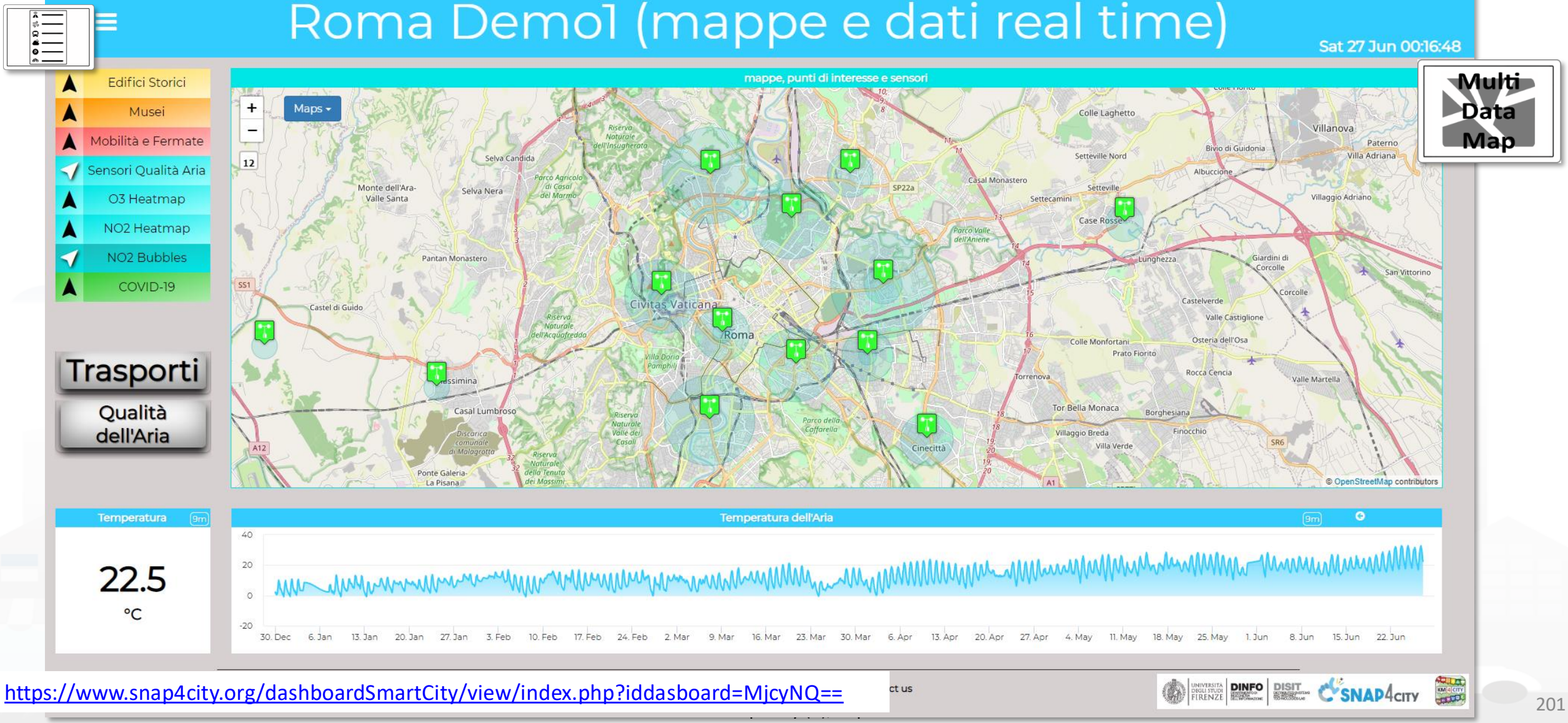
Orthomaps as graphic layers

- **Orthomaps can be**:
  - Directly exploited from public service via WMS protocol, from some GIS services as GeoServer
  - Loaded into the Snap4City GeoServer
  - Layered if they can be overlapped each other, such as map with gov border above.
- The Dashboard owner can
  - Select the Orthomaps to be used shown as default in the dashboard
- Each organization has its own set of Orthomaps

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjE5MA==

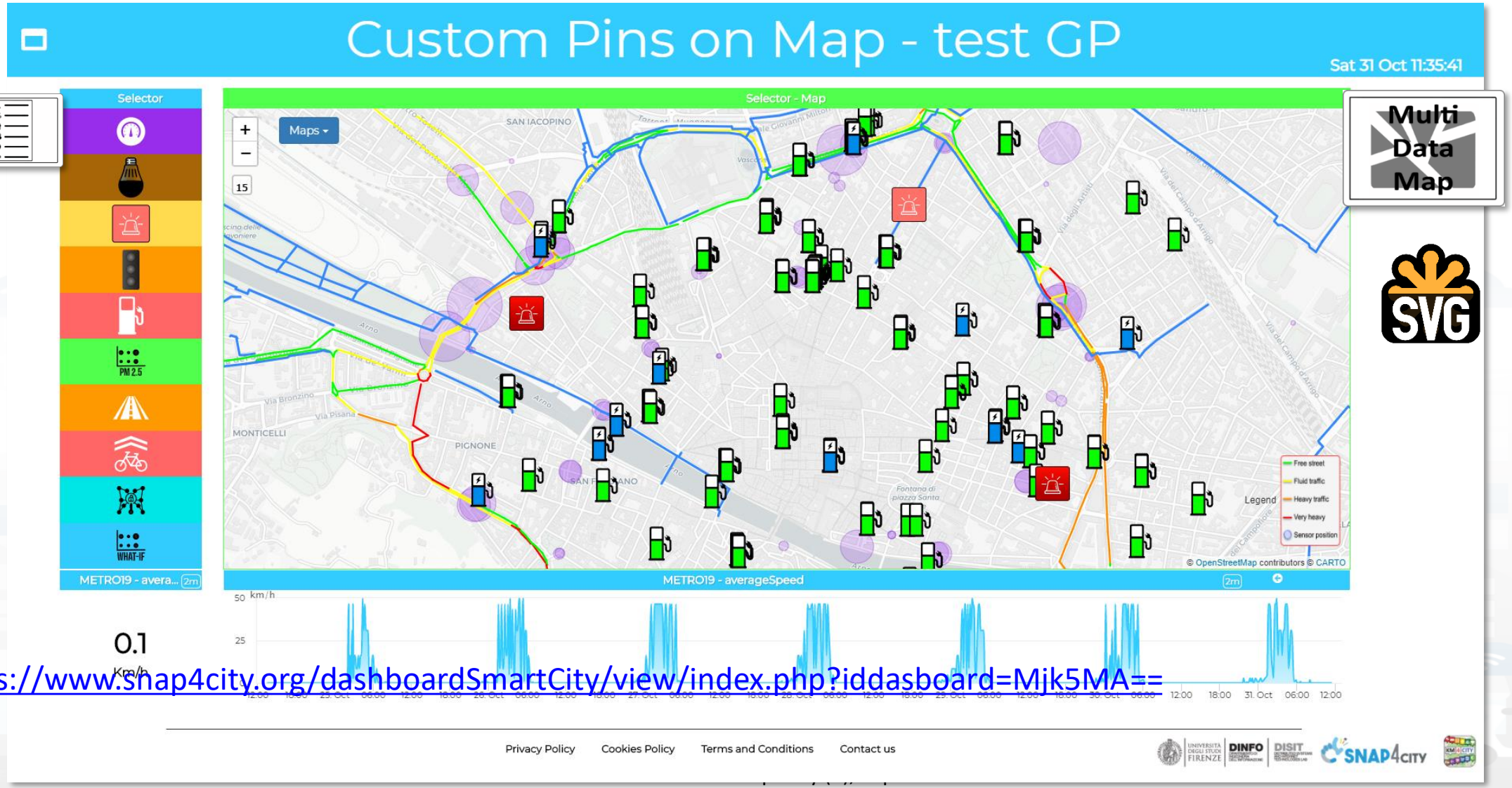

Side Vision
Thu 3 Jul 17:54:34
Heatmap
Side Vision Mod
WFS
Scenari Editor
Pin
MAPS
Scenary
Load Scenario: Init Acc
Scenarios waiting to be processed: AirQuality
Load Scenari ean
sideVision.txt
View
Edit
Show Road graph
Show Traffic Sensors
Draw sub-area
Filter by road types
Via Enrico Mayer
Via Antonio Zobi
Via Francesco Bonaini
Via Angelo Maria Bandini
Via Gaetano Milanesi
Via Luigi Passerini
Via Egisto Fabbri
Via Giuseppe Richa
Scuola Primaria Guglielmo Marconi
BlueMedical
Caffè Vieusseux
BoomBar

Weighted Bubbles



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

Custom Dynamic Pins



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=Mjk5MA==

Pins on Multi Data Maps (1)

Normal Over



- **Classic**: (default)
  - Text menu or Icon Menu
    - Custom color of the Menu only
  - Fixed on the basis of Nature and Subnature

Normal Over Icon Menu



- **Icon**: (accessible as **Icon Mode** of selector)
  - Also usable with **Text Mode** of the menu
  - Selectable from a large set
  - Coherent with Icon on Menu
  - Custom Color

Pins on Multi Data Maps (2)



Bubble Pins

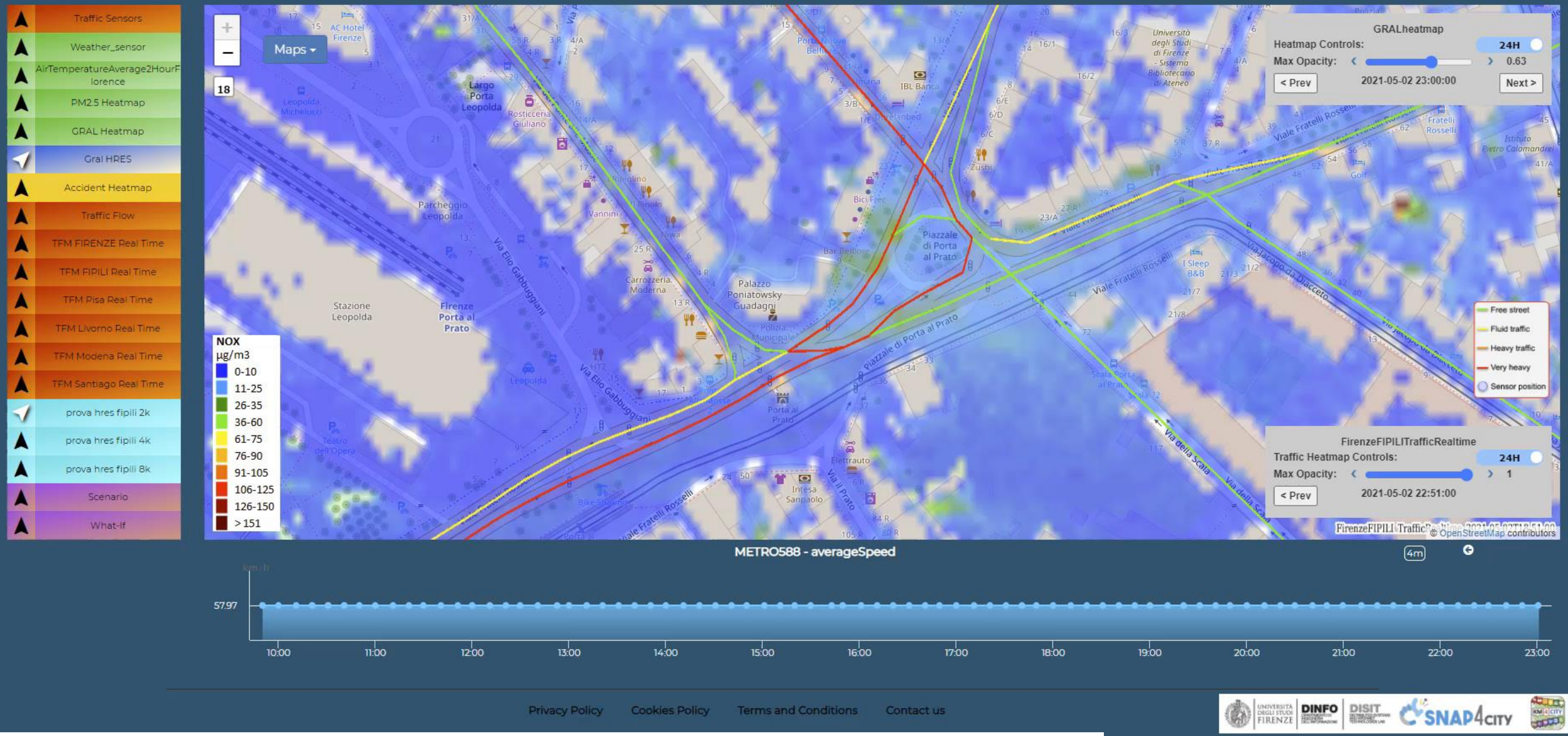
- **Bubble**:
  - Text Menu or Icon Menu
  - Custom Color
  - Size depending on ServiceURI Attribute, IOT Device ValueName
- **Custom**: (accessible from Alternate View Mode)
  - Can be created by AreaManagers as **Custom Widgets**
    https://www.snap4city.org/663
  - Selectable from a set
  - Coherent with Menu, also usable with text menu
  - Variable/Dynamic colors/animations associated with ServiceURI Attribute, IOT Dev ValueName



Pins and Menu icons

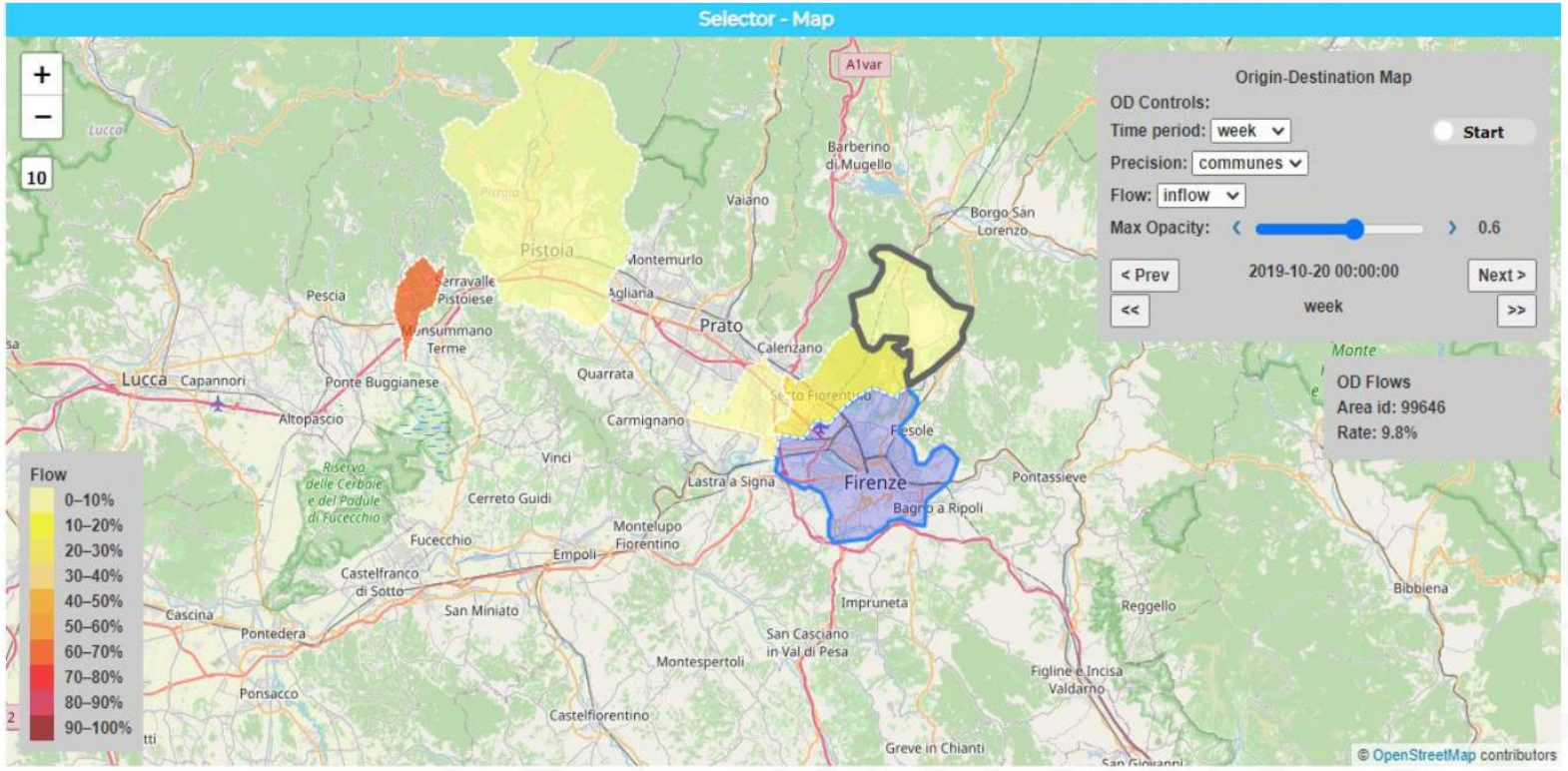
Traffic Flow Manager on multiple cities

Sun 2 May 23:16:31

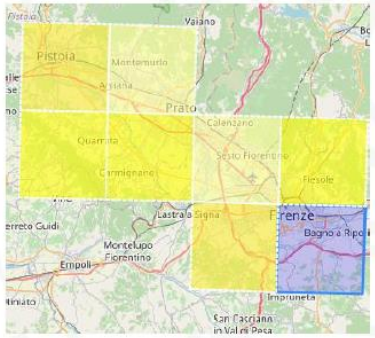


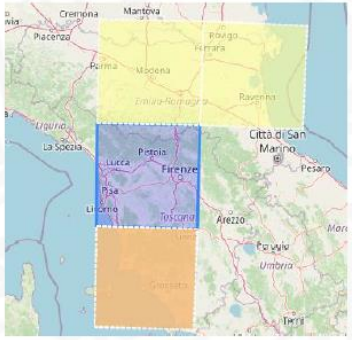
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzEyNg==

Different Origin Destination Matrices







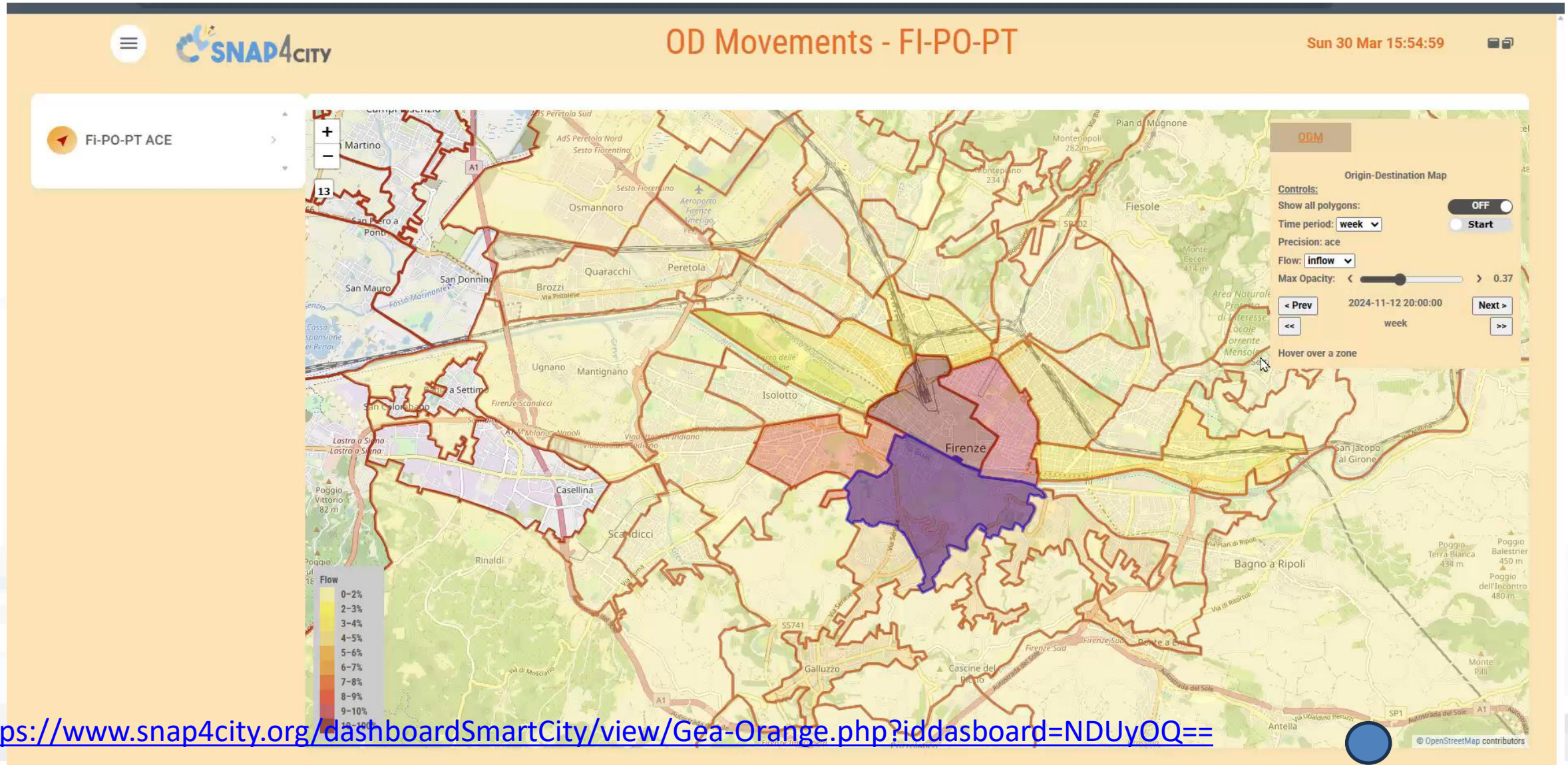


- **Get specific value**
- **Time window**
- **Opacity**
- **Animation**
- **Inflow/outflow**
- **Sequence of OD matrices: next/prev**

shapes

- **Shapes**: city, region, territories, etc.
  - GADM https://gadm.org/ , and ACE
- **Squared** MGRS:
  - 1m, 10m, 100m, **1Km, 10Km, 100Km**

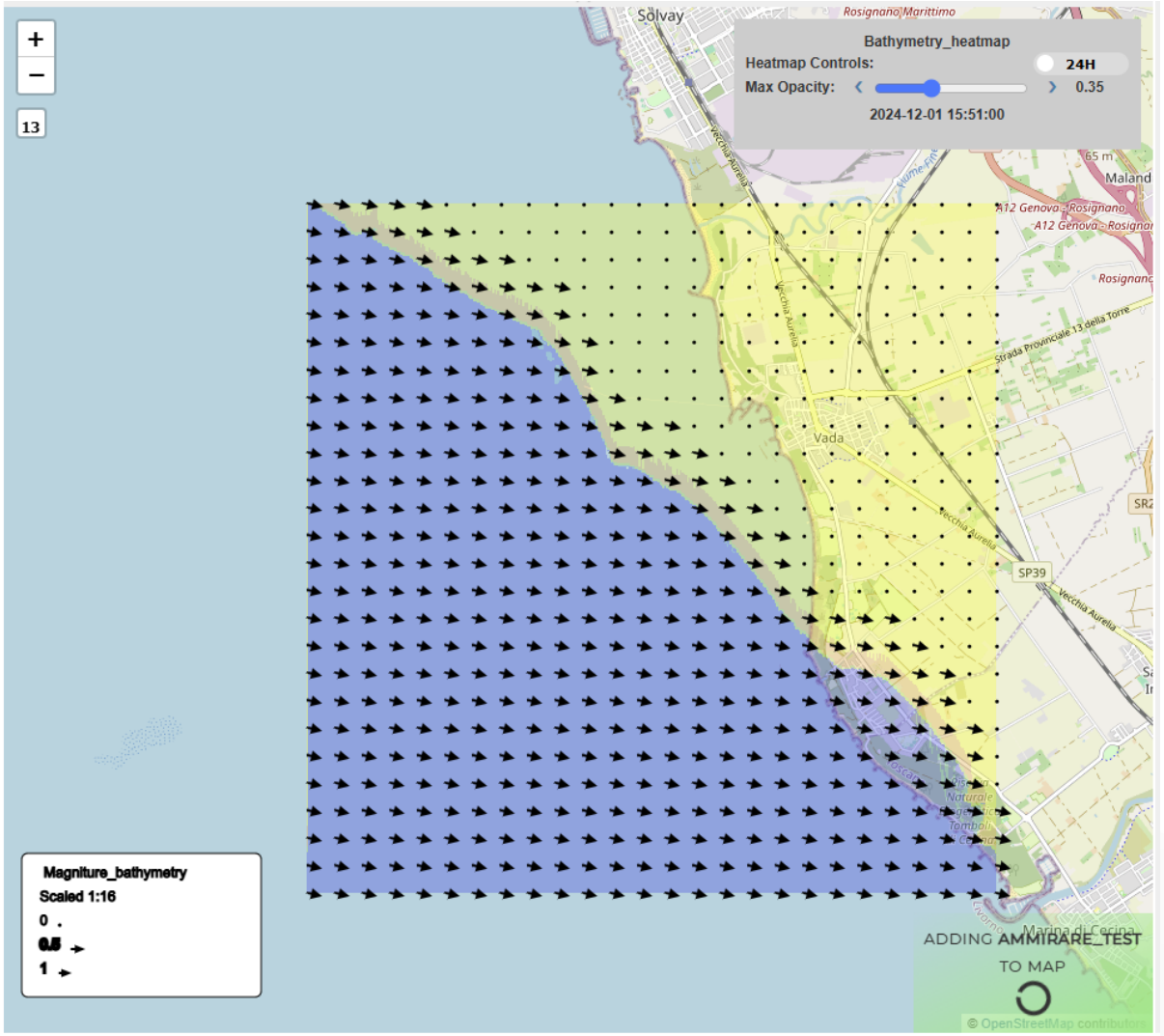
Origin Destination Matrices: Mobility Demand



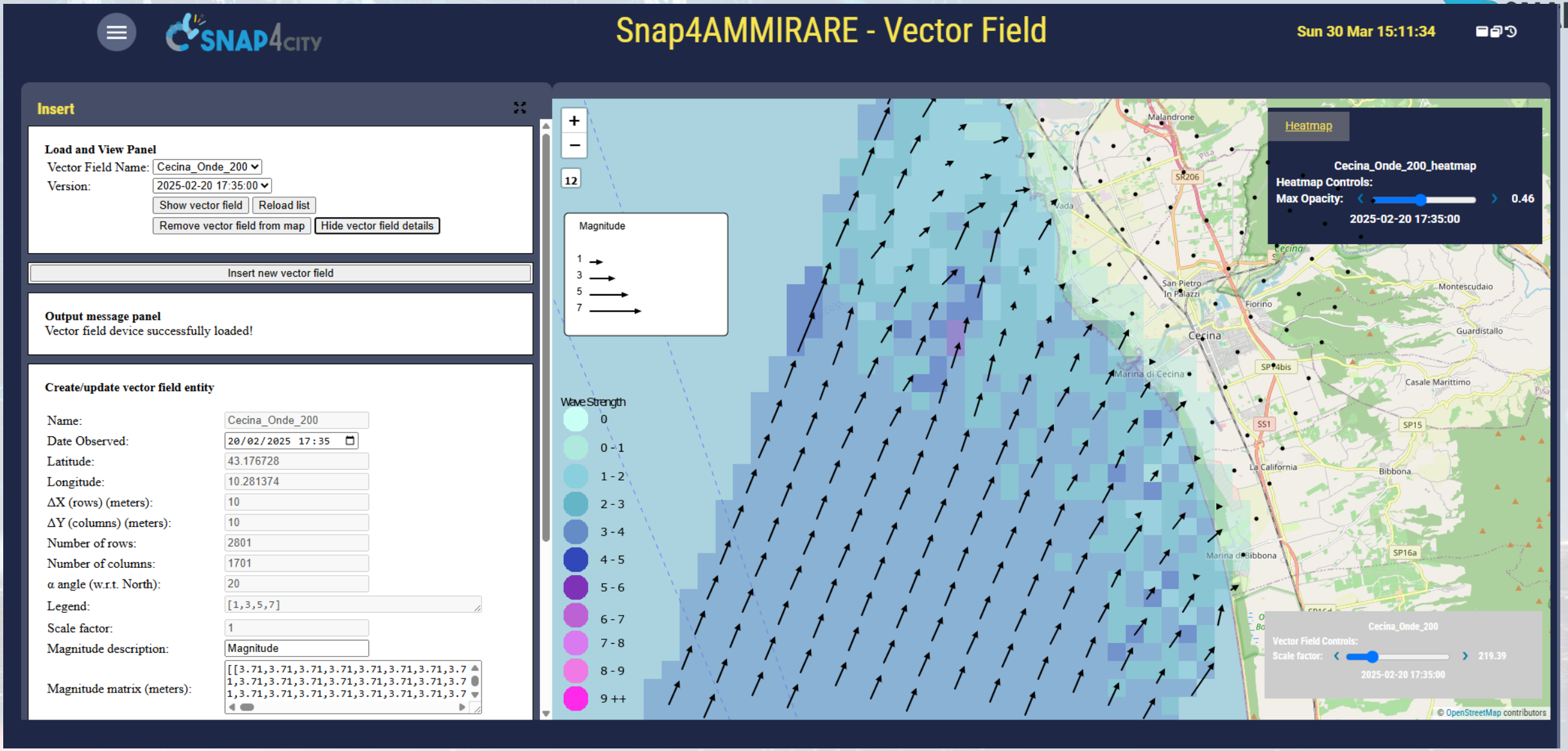
https://www.snap4city.org/dashboardSmartCity/view/Gea-Orange.php?iddasboard=NDUyOQ==

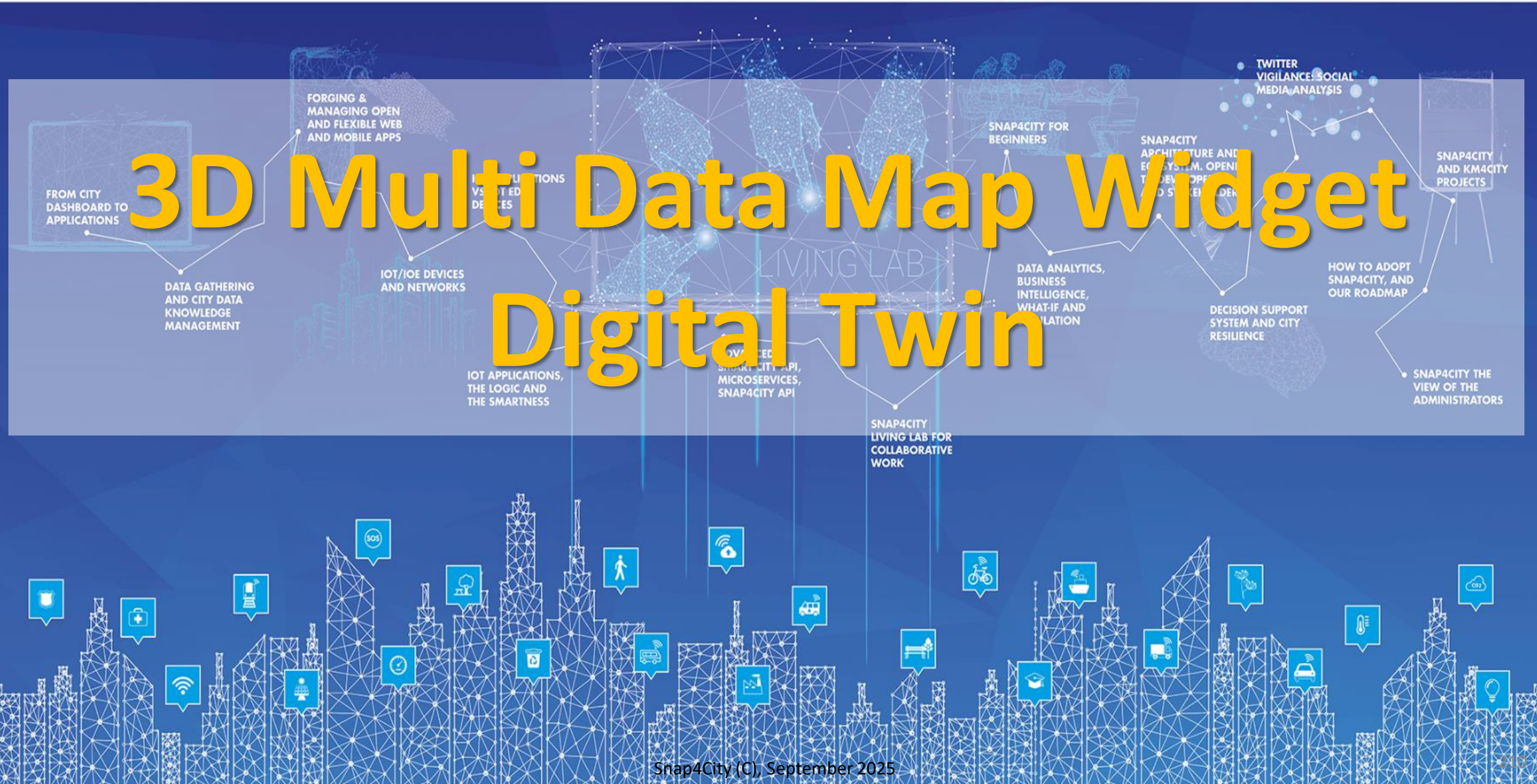
Vector Fields

- **As a Grid:** Magnitude and Angle
  - Scale
  - Rotated or not
  - With or without a Heatmap with its defined colormap
- **Representing**:
  - Sea waves, direction and size
  - Wind direction and intensity
  - Slope and direction, bathymetry
  - Etc.



Monitoring Costal Bathymetry and Waves

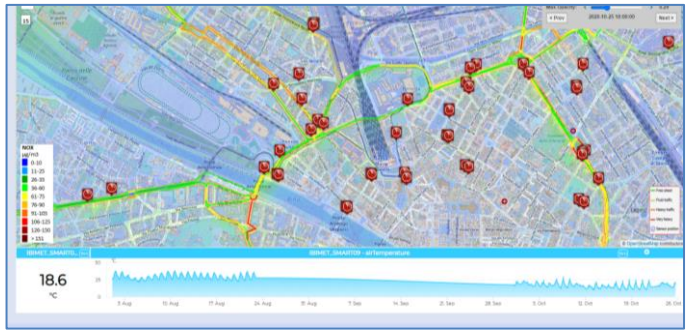




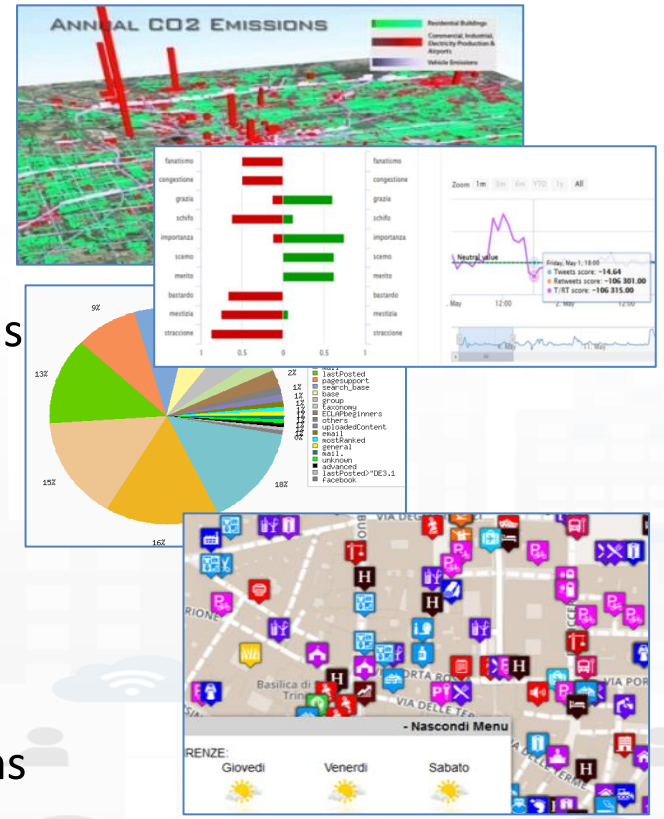
3D Multi Data Map Widget Digital Twin

Digital Twin

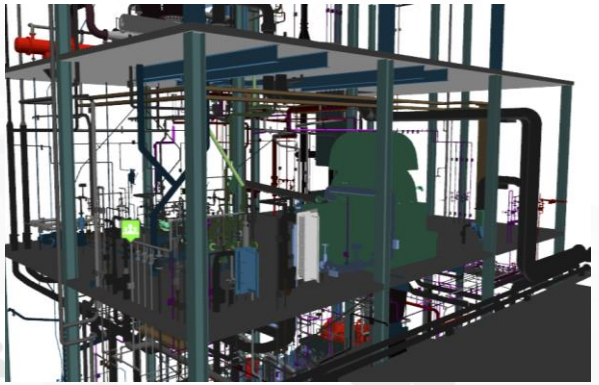
- **Digital Twin**
  - **Connected** with real systems
  - **Modelling** aspects: structural, visual, informative, real time data sensors (context), POI, functional, resources, etc.
  - **Integration:** AI/XAI techniques, simulations, users' needs, etc.
- **Utility to**
  - Experiment via simulations and analysis by case
    - Reduction of costs to experiments new solutions
    - Share the possibilities with city users
  - Virtual Representation
    - Easier to understand the context, review from multiple points of view
  - Who
    - Discussion with city users, decision makers
    - Support: decision makers, proposers of solutions







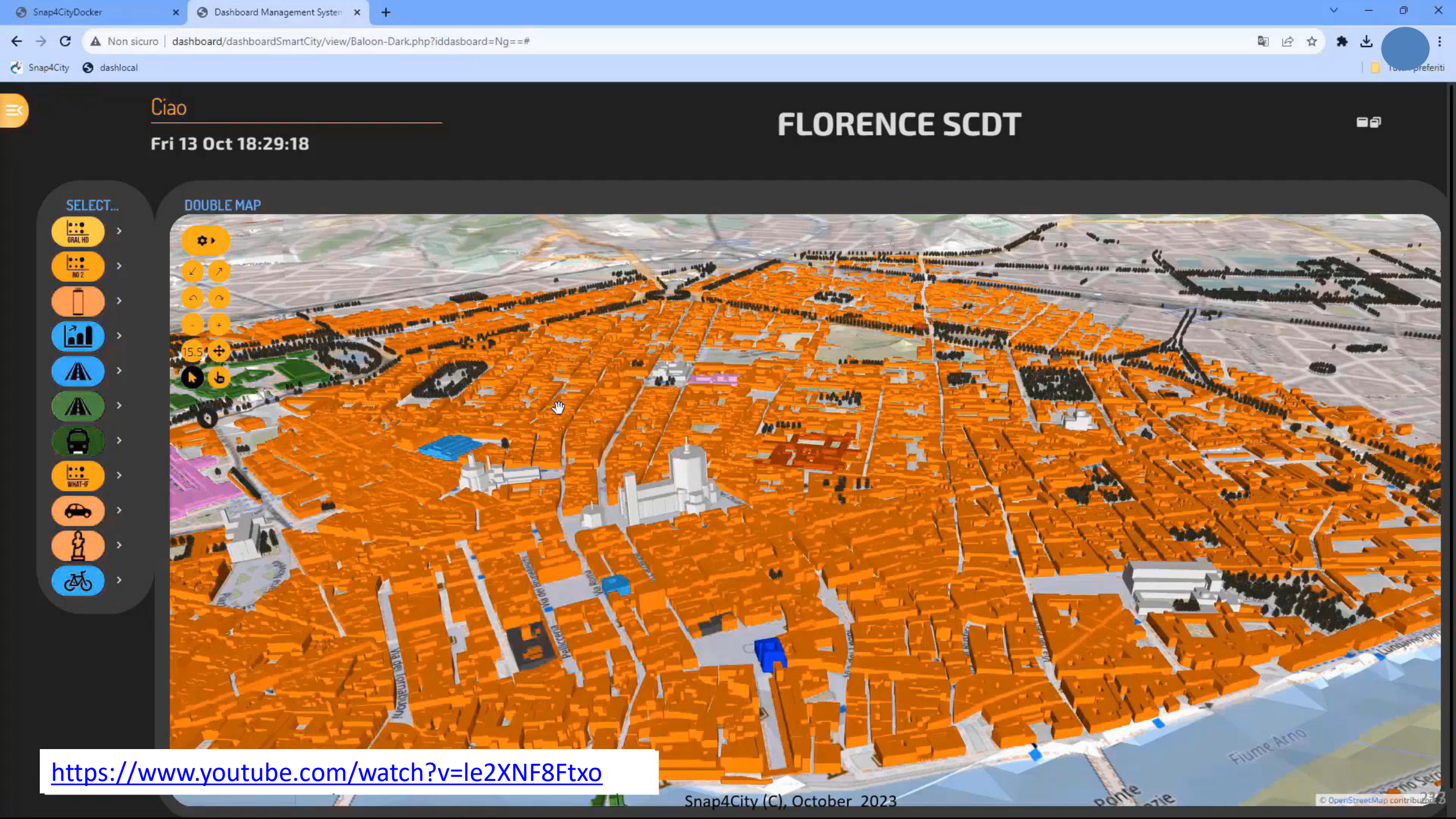




Interacting with 3D City Digital Twin

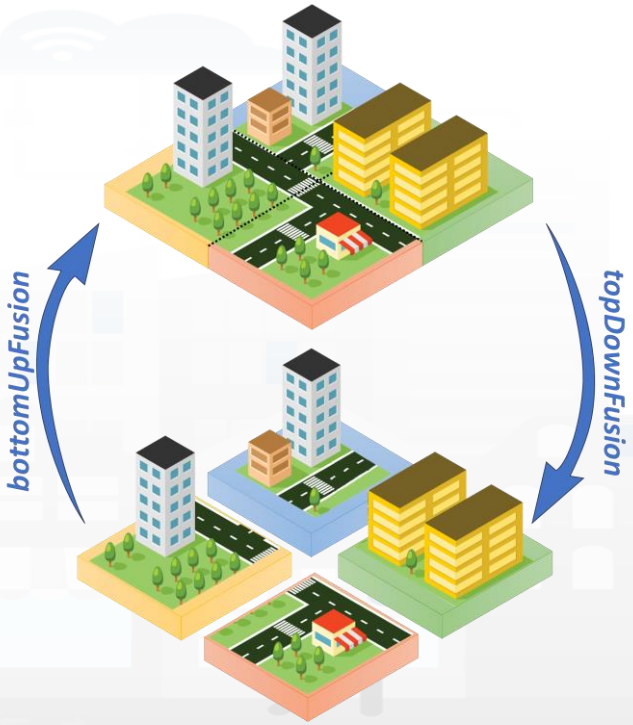
- You can see in the 3D model
  - Terrain model defining the level of the terrain and of the building
  - Generic Buildings, high value buildings, HVB (e.g., Dome, Palazzo Vecchio, etc.), facades, roofs, etc.
  - Sky pattern: sun, cloudy, etc.
  - Orthomaps below the buildings, by selection
  - Heatmaps, over orthomaps, and below buildings:
    - temperature, traffic, pollutant
  - Cycling paths and other shapes, polylines
  - Traffic Flows: as crests shaping the traffic flow density in high and color according to color map
  - POI, Sensors: PopUps to see real time data
  - Pillars reporting in 3D the values of specific sensors: temperature, traffic flow, people counting, pollutant, etc.
  - Blocked parts from the Scenarios
  - Routing, conditioned routing, dynamic routing

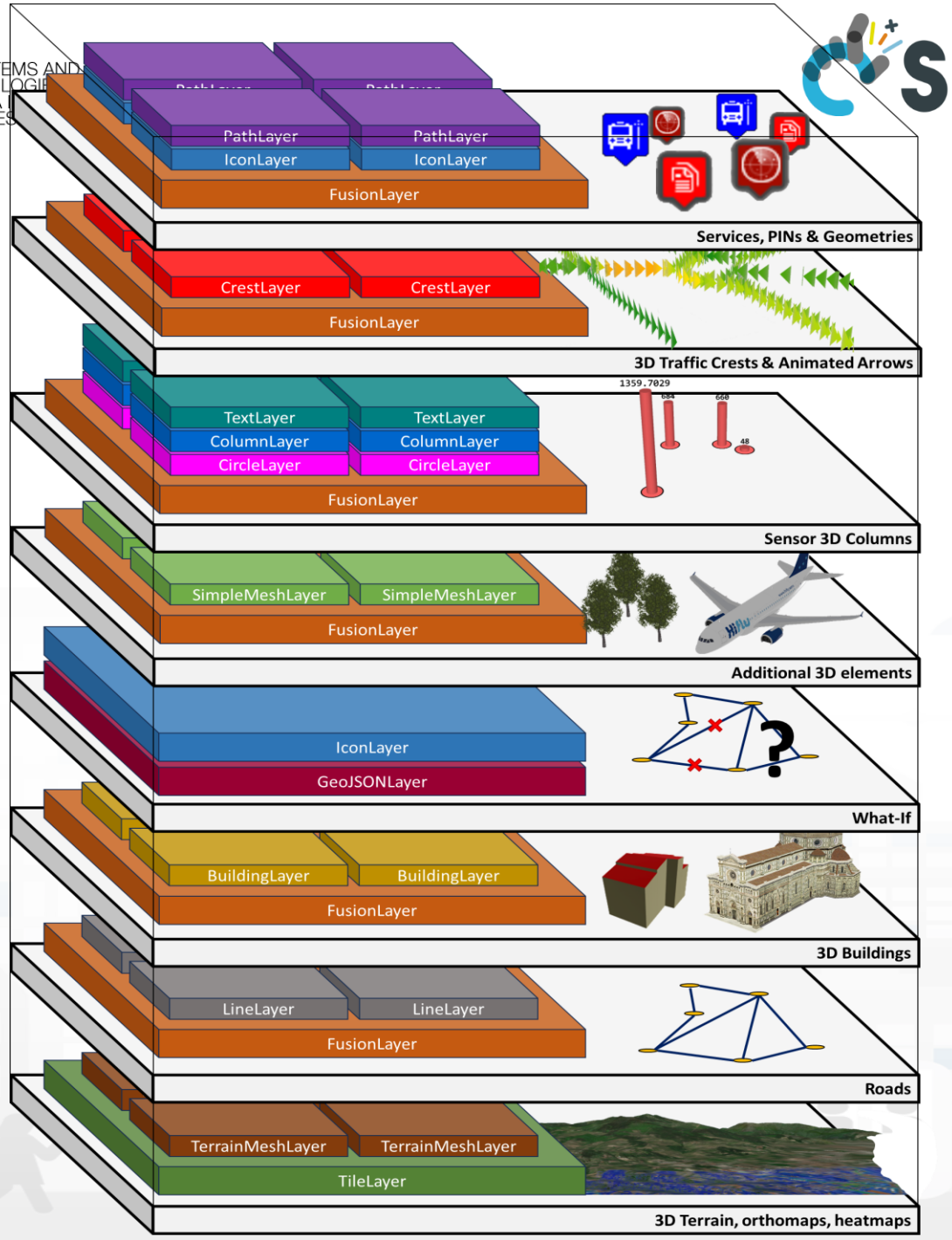




https://www.youtube.com/watch?v=le2XNF8Ftxo

Layers vs Fusion Layers



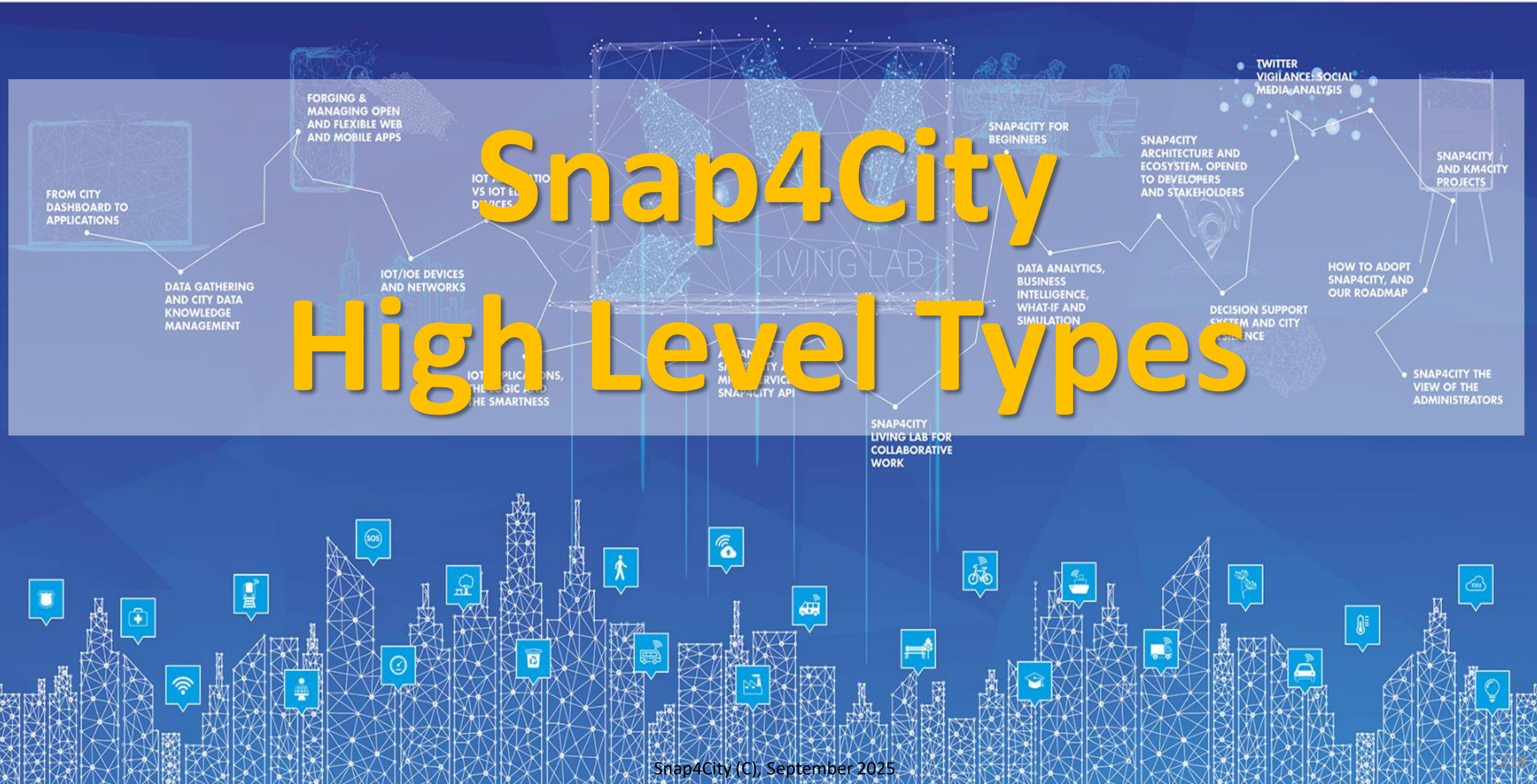


Snap4City Digital Twin Engine and data + 3D Google Data



Exploiting 3D Google API with Snap4City engine

- Select any city/locality and see if 3D Representation of your city is Available
- Snap4City redendering and distribution engine allows to
  - Optimize distribution of data
  - Integrate any kind of data on Digital Twin with 3D tiles of Google
    - PIN, IoT Data
    - Traffic Flows
    - Cycling paths
    - 3D shapes superimposed
    - Etc.



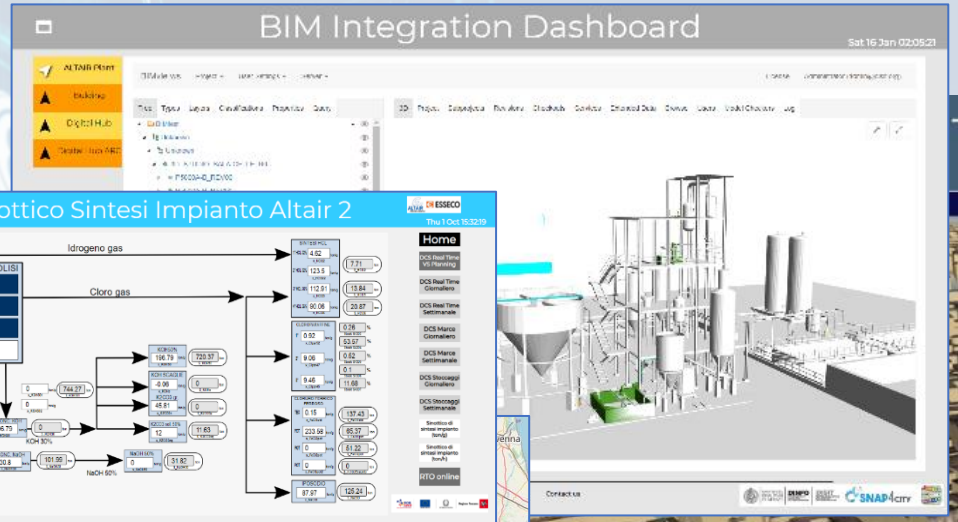
Snap4City High Level Types

High Level Types

Snap4City (C), September 2025

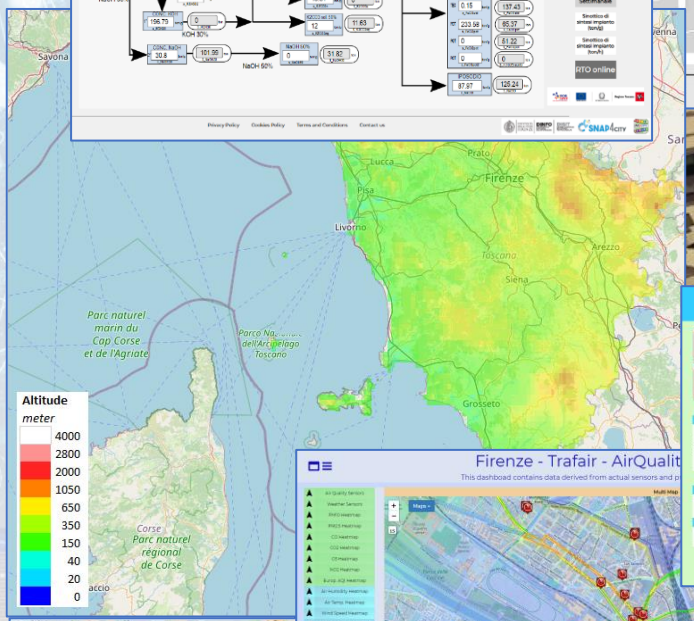
- POI, IOT Devices, shapes,..
  - FIWARE Smart Data Models,
  - IoT Device Models
- GIS, maps, orthomaps, WFS/WMS, GeoTiff, calibrated heatmaps, ..
- Satellite data, any kind..
- traffic flow, typical trends, ..
- trajectories, events, Workflow, ..
- 3D Models, BIM, Digital Twins, ..
- OD Matrices of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





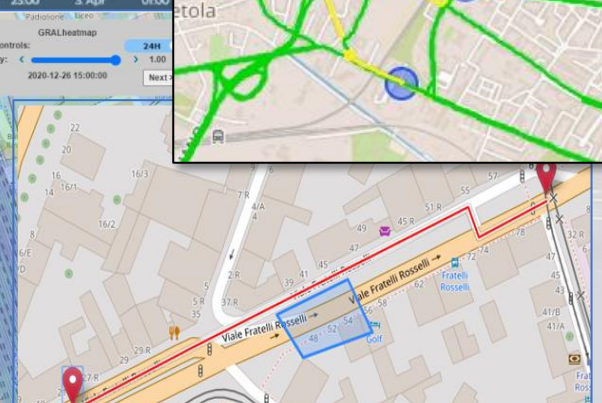






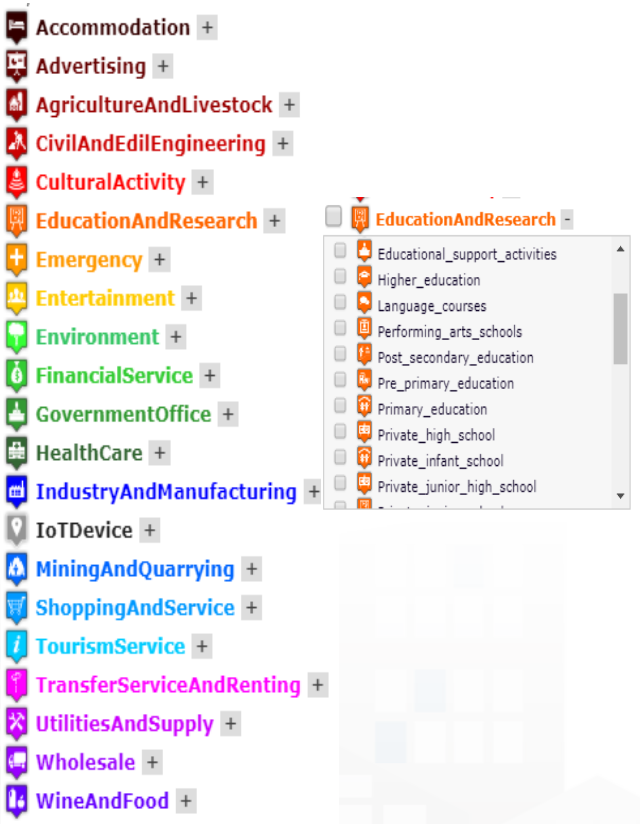






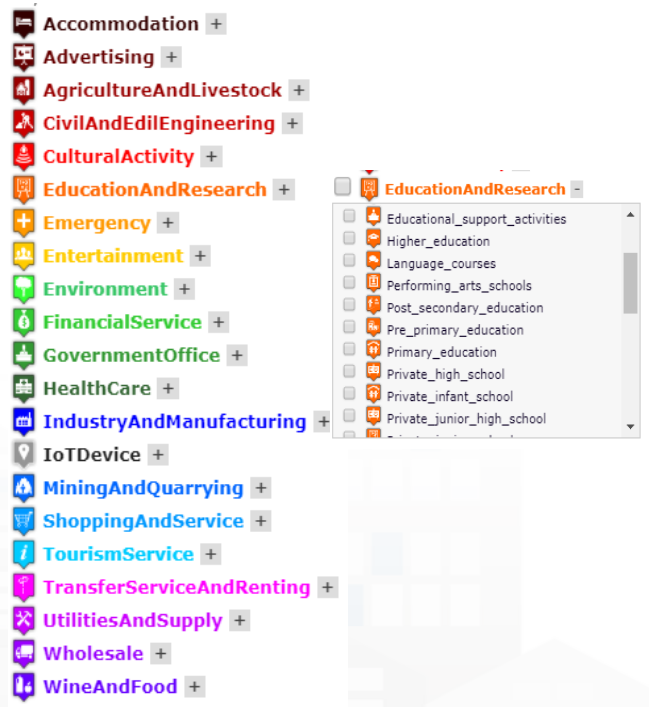
HLT: Unified Classification for Data and Services

- **Data Models**: all devices/entities sprunt from that model
  - Entity Model, IoT Device Model, Mobile Device Model, Data Table Model
- **Devices**: are instances of some model or sprunt from processes
  - Entity Device, IoT Device, Mobile Device, Data Table Device, Sensor Device
- **Variables**, Sensor/sensor-actuator, :
  - Entity Varible, IoT Device Variable, Mobile Device Variable, Data Table Variable, Sensor, Sensor-Actuator
  - **Dashboard-IOT App:** messages from GUI to Business Logic on IoT App
- **MyKPI**: dynamic GPS, info, single variable, Time Series, (Classification)
  - **KPI:** former KPI model
  - **MyPersonaData/MyData**: safes in which specific personal data are saved.
- **POI**: static GPS, info about a location, (Classification),
  - **MyPOI**: personal POI that can be leveraged to standard POI by administrator
- **Heatmaps**: matrices on some area, Time Series, (Classification)
- **Traffic Flow**: road segments with flow density, Time Series, (Classification)
- **OD Matrices**: origin destination matrices, Time Series, (Classification)
- **Complex events:** emergency, alarm, entertainment, CAP, … special widgets

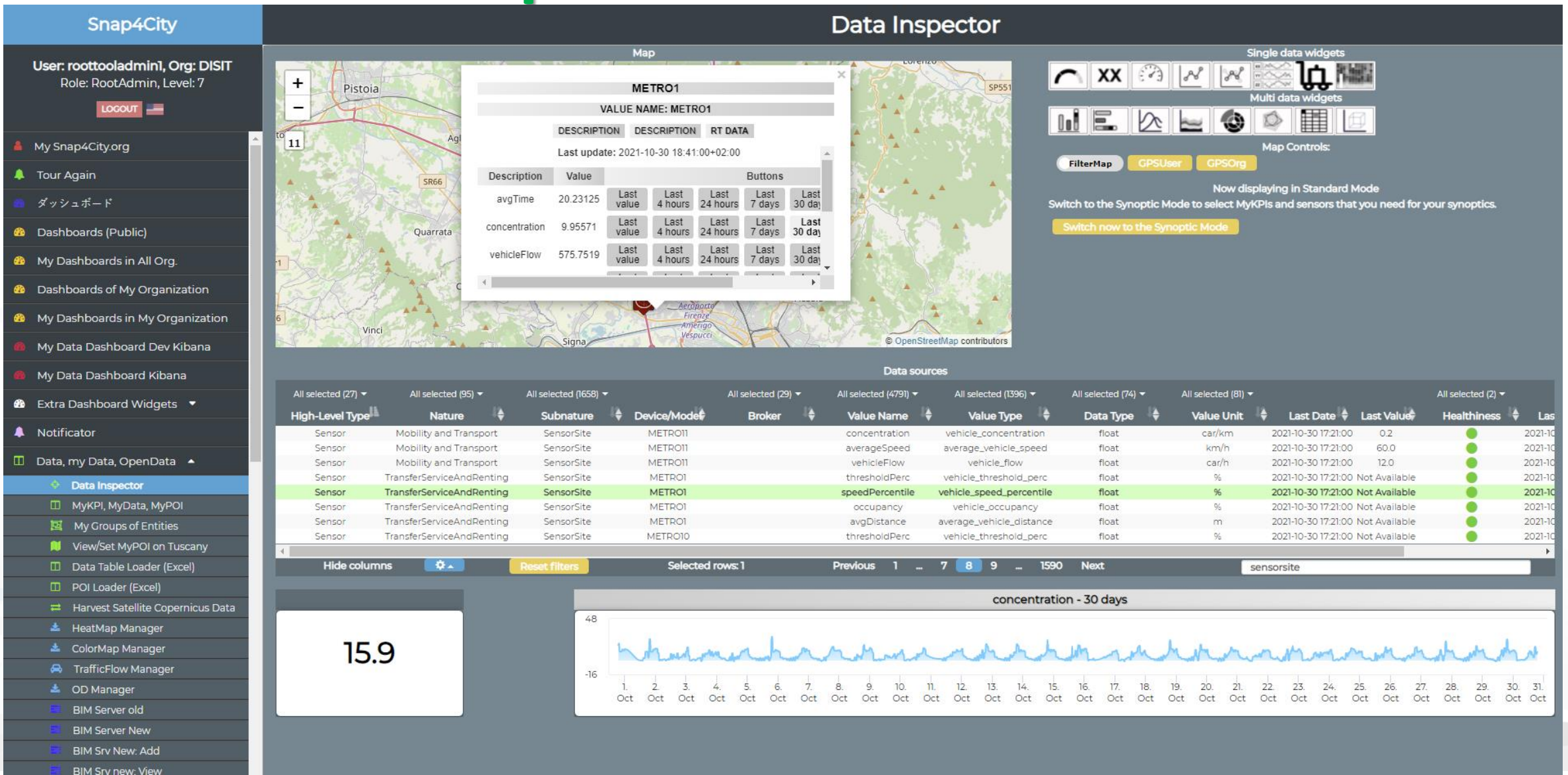


HLT: Unified Classification for Data and Services

- **External Service**: third party visualization tools, iFRAMED…
  - Also TV CAMs are rendered here, and substantially all the other Services
- **Synoptics**: graphic representations with animation connected to variables and/or MyKPI and/or IoTApp, etc.
- **BIM representations**: Digital Twin Local, …
- **Micro Applications**: Snap4City, Km4City micro applications, iFRAMED
- **Special Widget**: a set of special visualization tool with their dedicated data type
- **WFS**: a specific tool for WFS GIS rendering, please note almost the same kind of data type can be visualized as Data above described



Data Inspector: HLT classification



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			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	2018-05-31 19:16:05		2021-10-15 10:01:00	private (My Own)
IoT Device Variable	IoTDevice	IoTSensor	adminTest1	orionUNIFI	humidity	humidity	string	%	2018-05-31 19:16:05		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

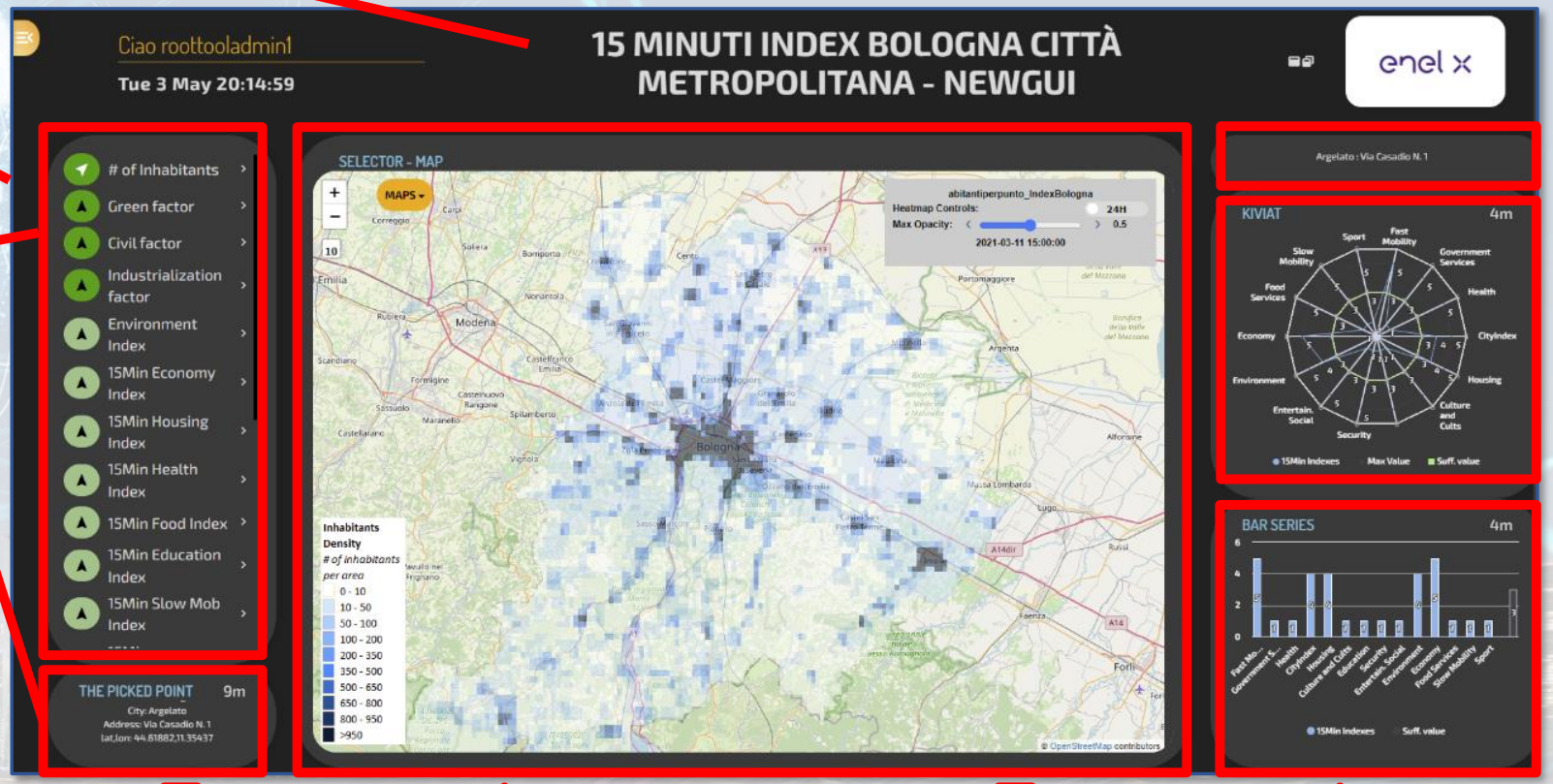
For Admin

Snap4City Dashboards main concepts

Header

Dashboard

Interactive Widgets



Server Communication

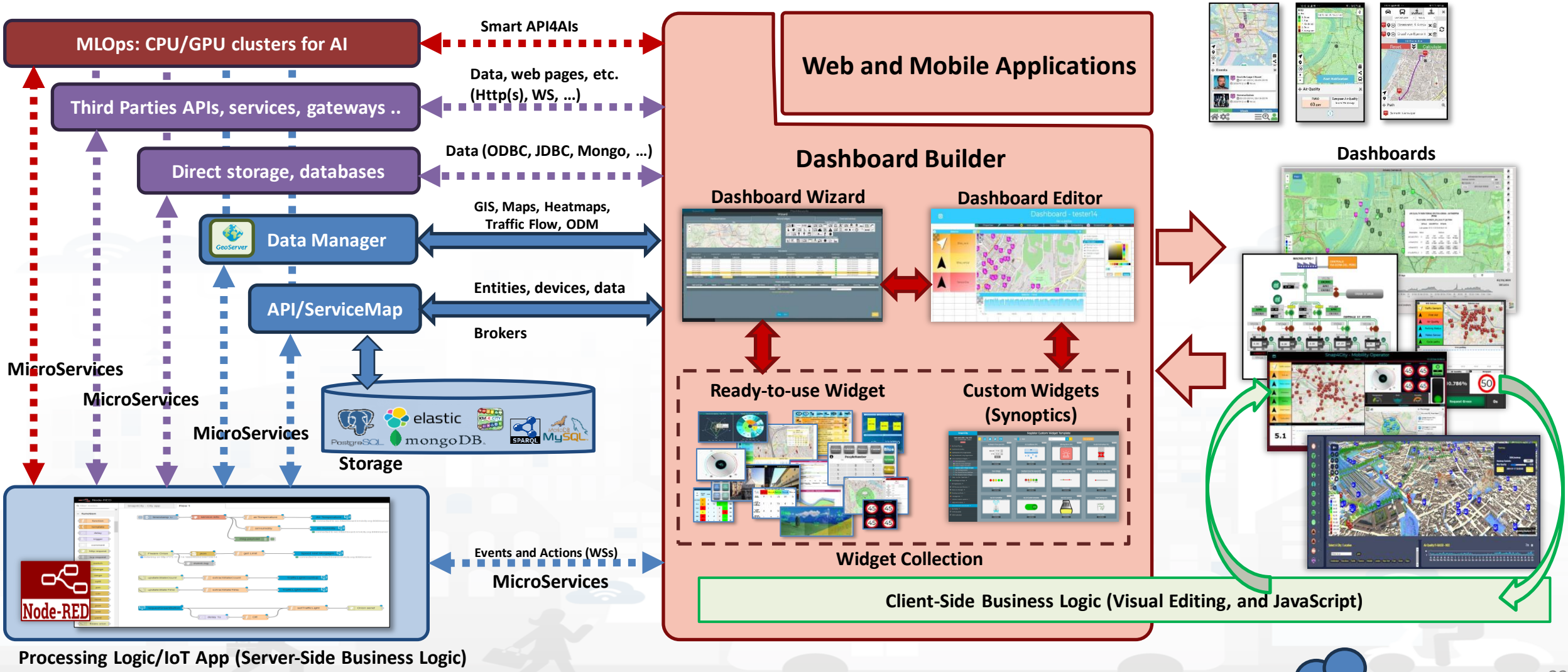
- Real Time data requests/send
- Event Driven
- Server Side Business Logic
  - See Part 3 of the course

Inter Widget Communication:

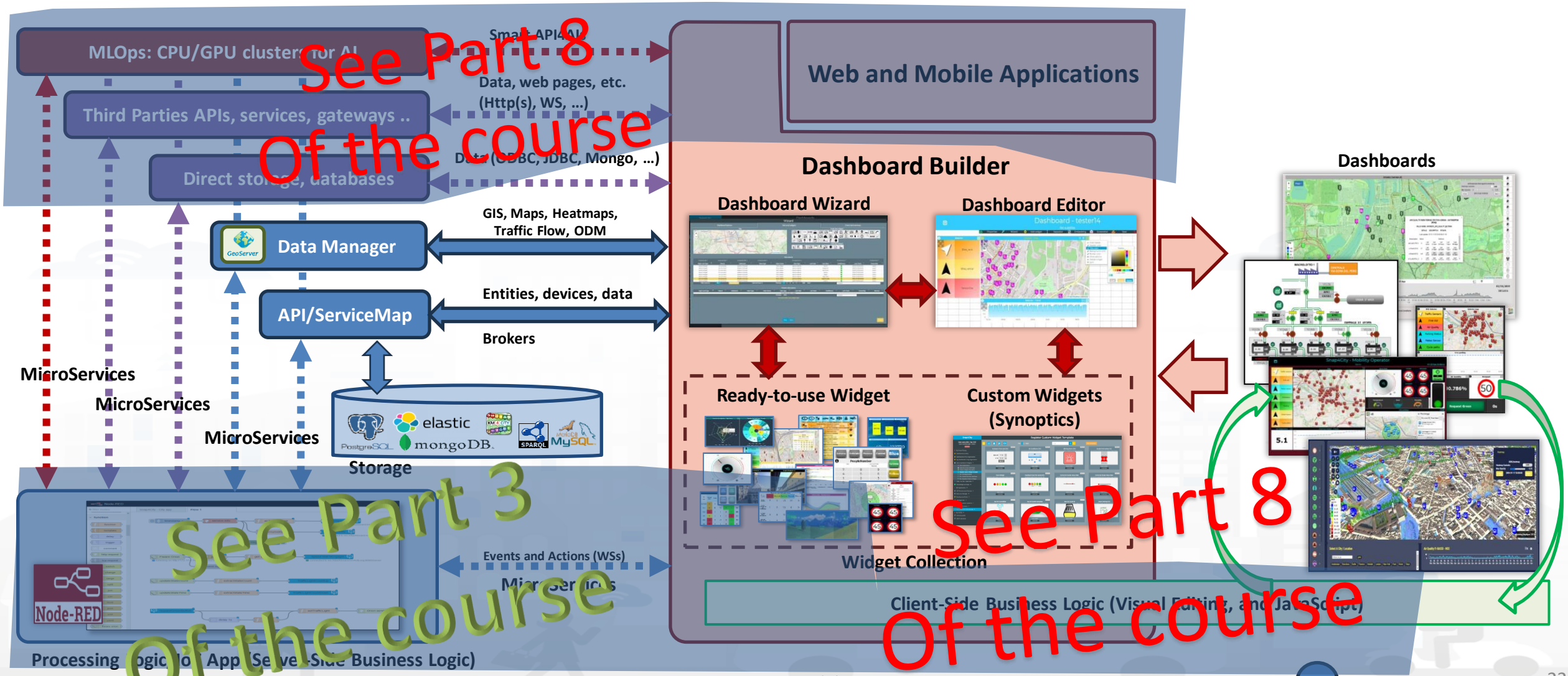
Client Side Business Logic

See part 8 of the Course

How the Dashboards / Apps Exchange data (2024/8)

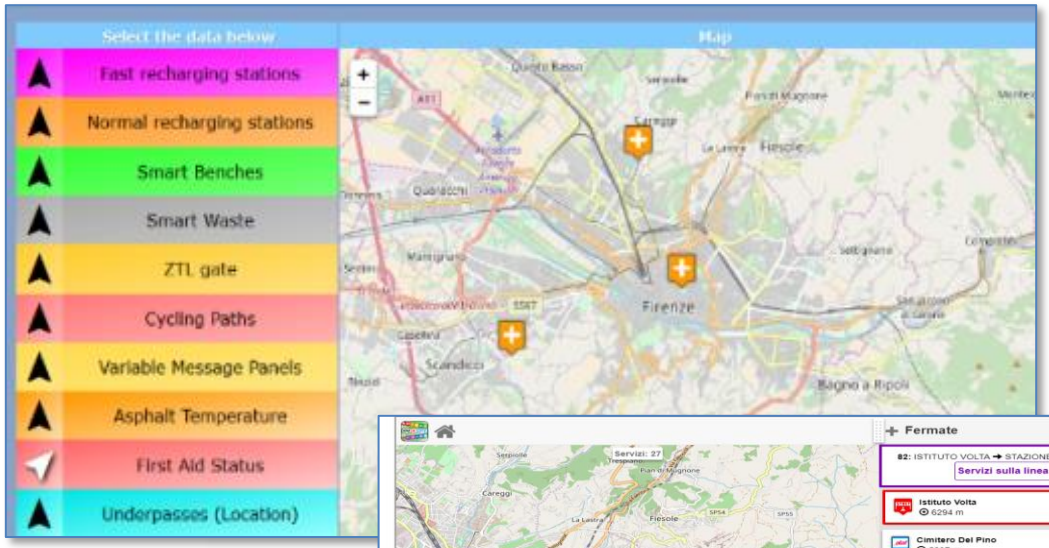


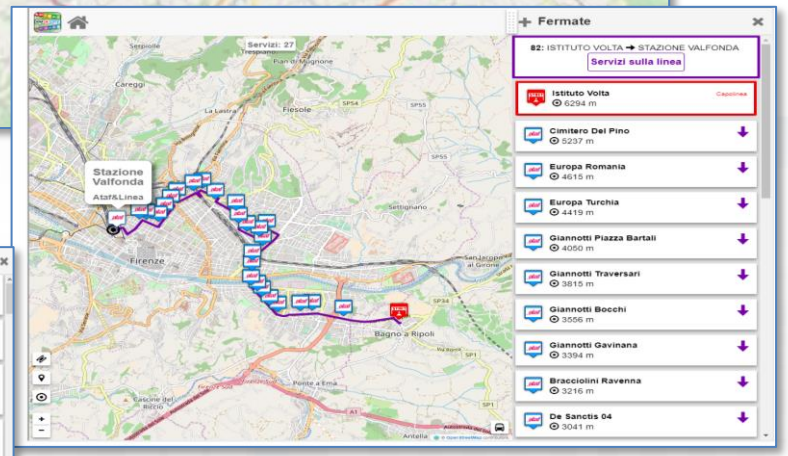
How the Dashboards / Apps Exchange data (2024/8)



HLT: POI

High Level Types





Single POI



Categories

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

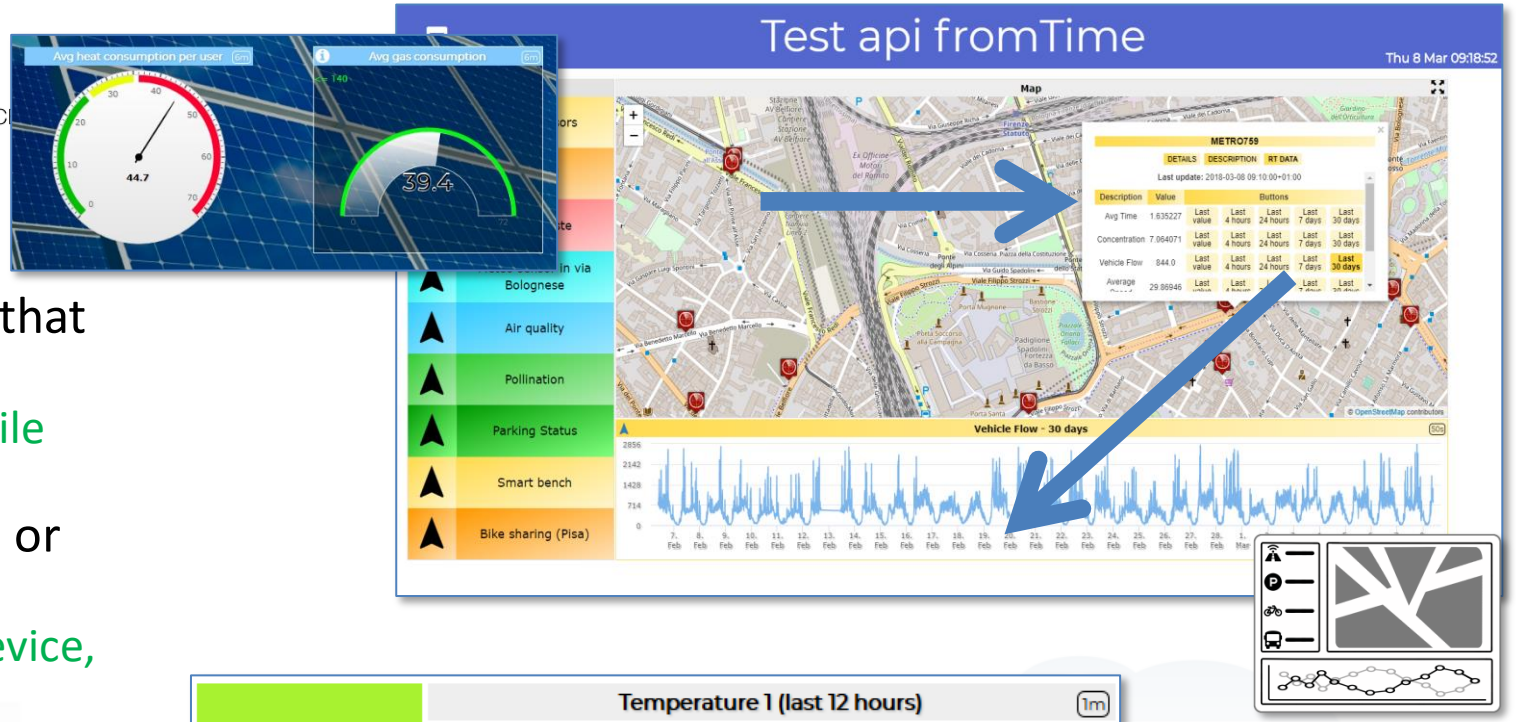
EducationAndResearch
- Educational_support_activities
- Higher_education
- Language_courses
- Performing_arts_schools
- Post_secondary_education
- Pre_primary_education
- Primary_education
- Private_high_school
- Private_infant_school
- Private_junior_high_school

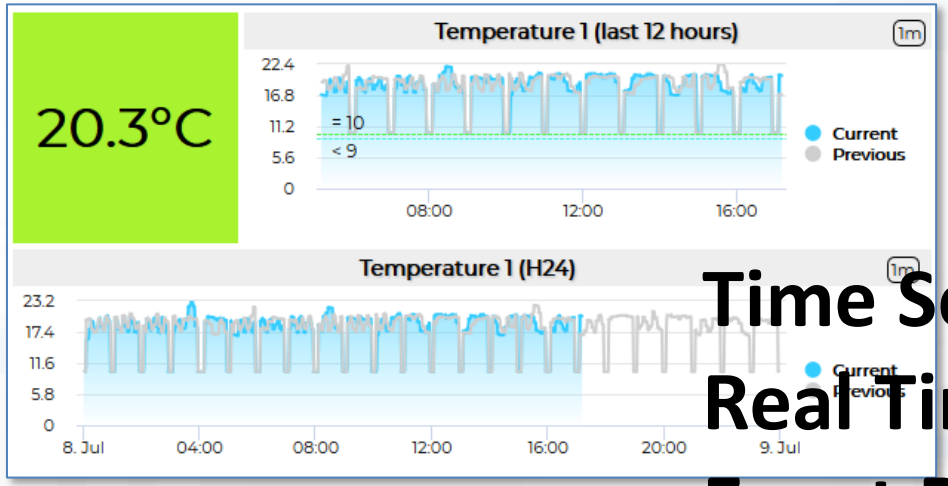
POI: static GPS, info about a location, (Classification),
MyPOI: personal POI that can be leveraged to standard POI by administrator

HLT: Entities

High Level Types

- **Data Models**: all devices sprunt from that model
  - Entity Model, IoT Device Model, Mobile Device Model, Data Table Model
- **Devices**: are instances of some model or sprunt from processes
  - Entity Instance, IoT Device, Mobile Device, Data Table Device, Sensor Device
- **Variables**, Sensor/sensor-actuator, :
  - Entity Variable, IoT Device Variable, Mobile Device Variable, Data Table Variable, Sensor, Sensor-Actuator
  - **Dashboard-IOT App:** messages from GUI to Business Logic on IoT App
- **MyKPI**: dynamic GPS, info, single variable, Time Series, (Classification)
  - **KPI:** former KPI model
  - **MyPersonaData/MyData**: safes in which specific personal data are saved.



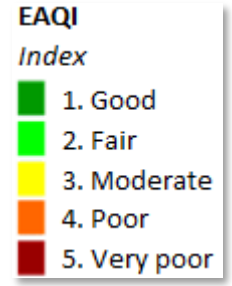


Time Series
Real Time
Event Driven
Historical Data

HLT: Heatmaps

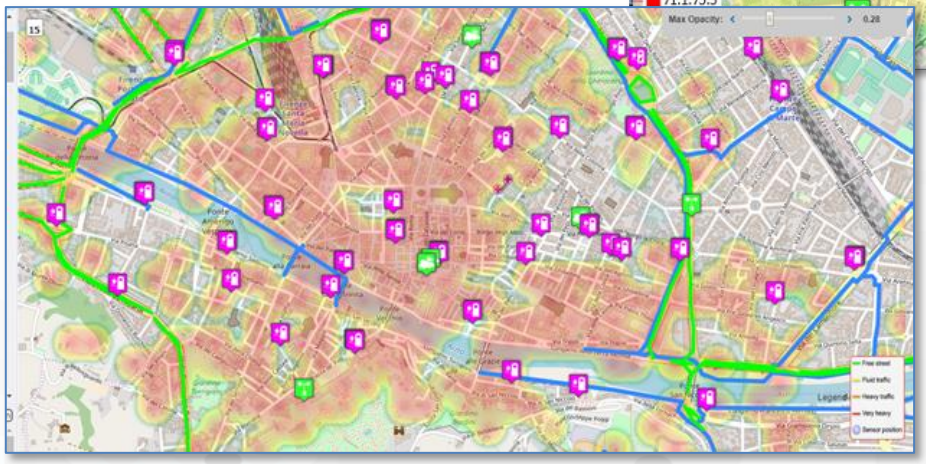
High Level Types

ColorMaps For Calibrated



Type: calibrated





Safety on bike density
Very bad
Bad
Not so good
Neutral
Good
Very good
Excellent

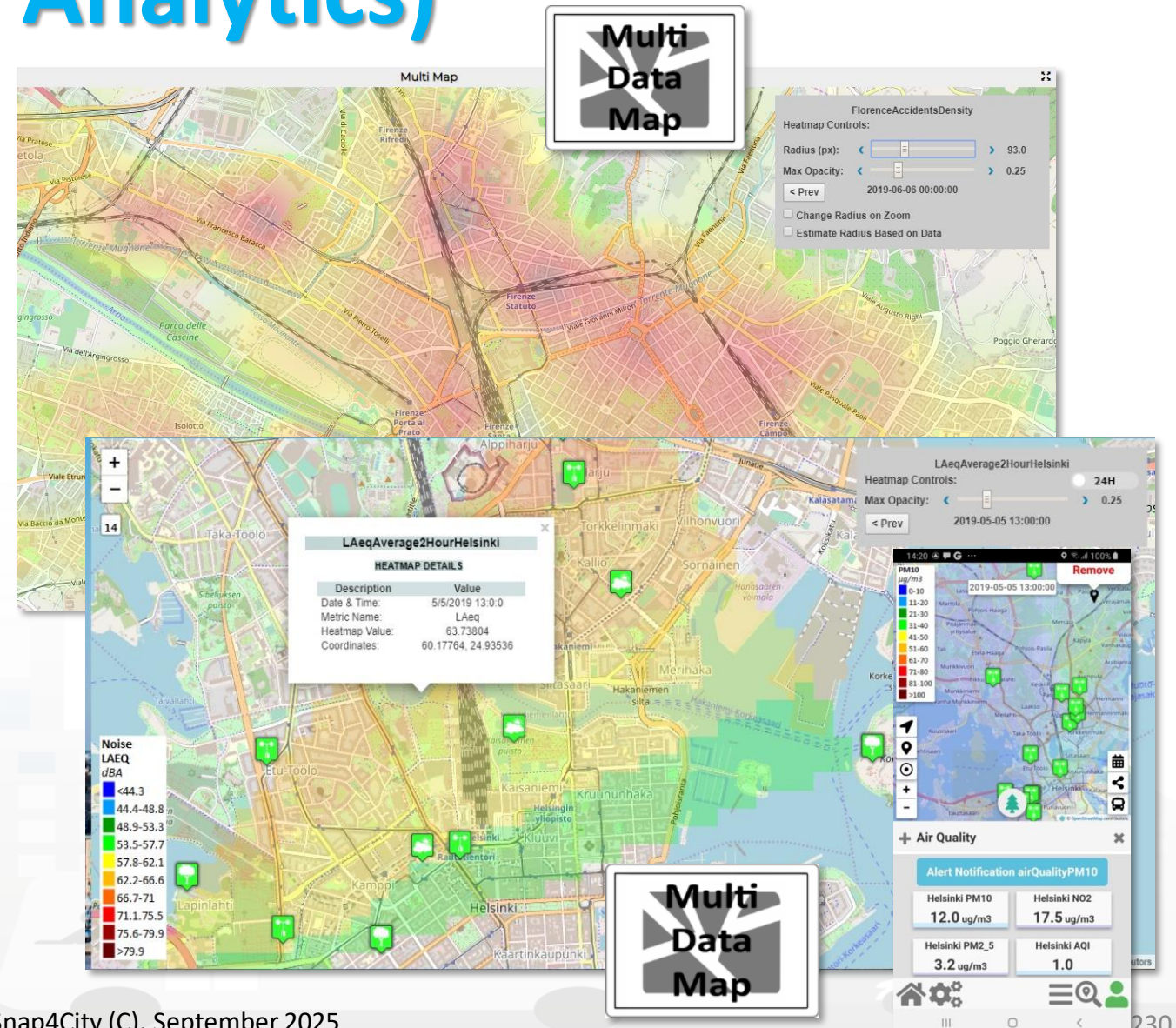
Multi Data Map

Noise
LAEQ
dBA
<44.3
44.4-48.8
48.9-53.3
53.5-57.7
57.8-62.1
62.2-66.6
66.7-71
71.1.75.5
75.6-79.9
>79.9

Type: Gaussian

Heatmaps (flexible Data Analytics)

- **Main:**
  - **Heatmaps are Time series**
- **A) Gaussian Heatmaps**
- **B) Calibrated heatmaps**
  - From KmxKm to 4x4 mt
  - PM10, PM2.5, SO2, NO2, Noise, NO, O3, Enfuser, **GRAL**,…. Copernicus
  - Any programmed ColorMap
  - Animations
  - Piking values in any place, values on their position.
  - On Web and Mobile App



HeatMap Manager: managing, colormaps

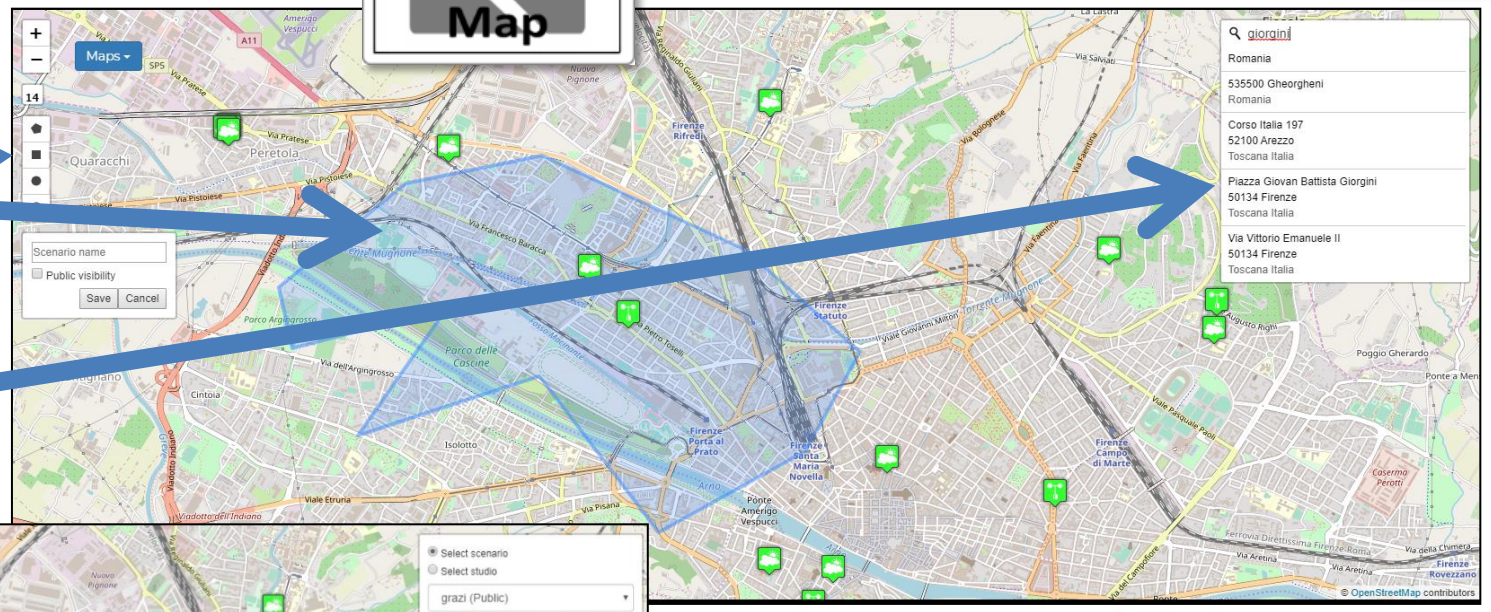
- Historical data, time series
- Huge amount of data and points per heatmap
- Data coming from: sensors, IOT App, Copernicus Satellite, …
- Multiple formats
- High speed computing
- WMS (GIS) compliant
- Animations
- Color maps: from few (5) to dense color scale (1000)
- Picking any place
- Smart City API to get them
- MicroServices for IOT Applications

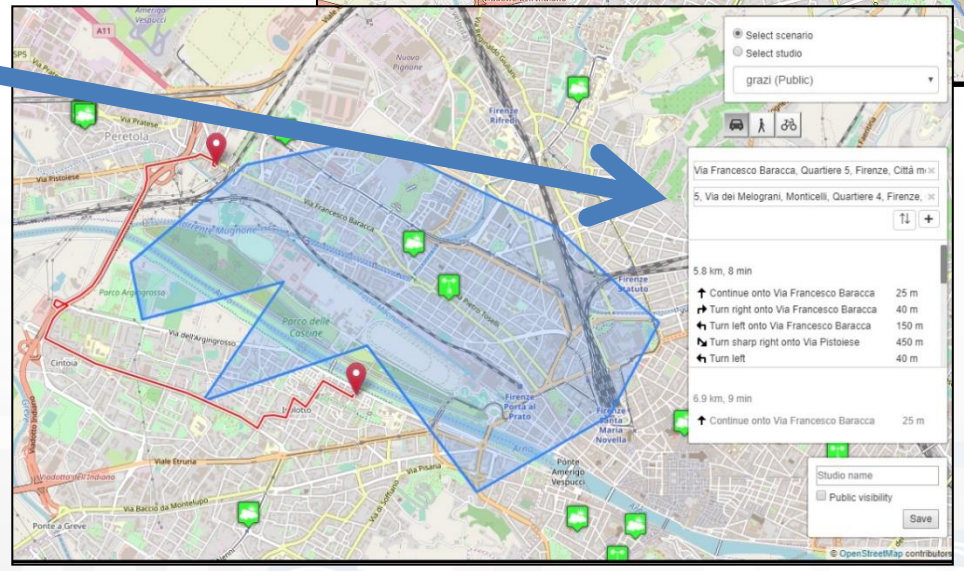


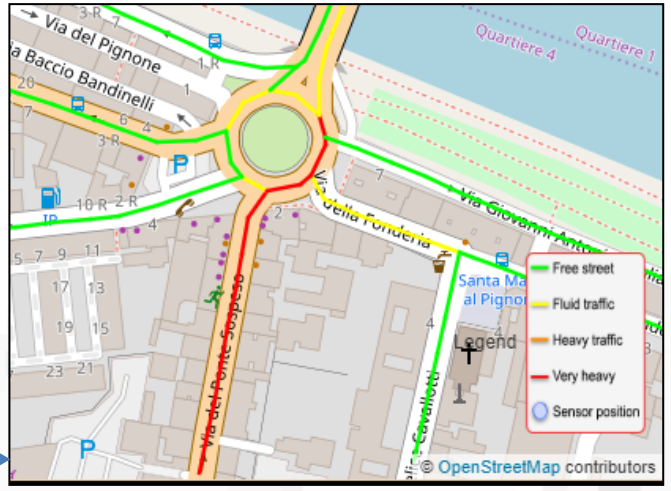
HLT: Special Tools

High Level Types

- **Scenarious**
  - Full text search of roads and geolocations.
  - Multiple areas, days
  - Global map of OSM
- **What-IF**
  - Conditional routing
  - Dynamic routing
  - Multiple paths
- **Traffic Flows**







https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjE5MA==

Video Streams from TV Cameras

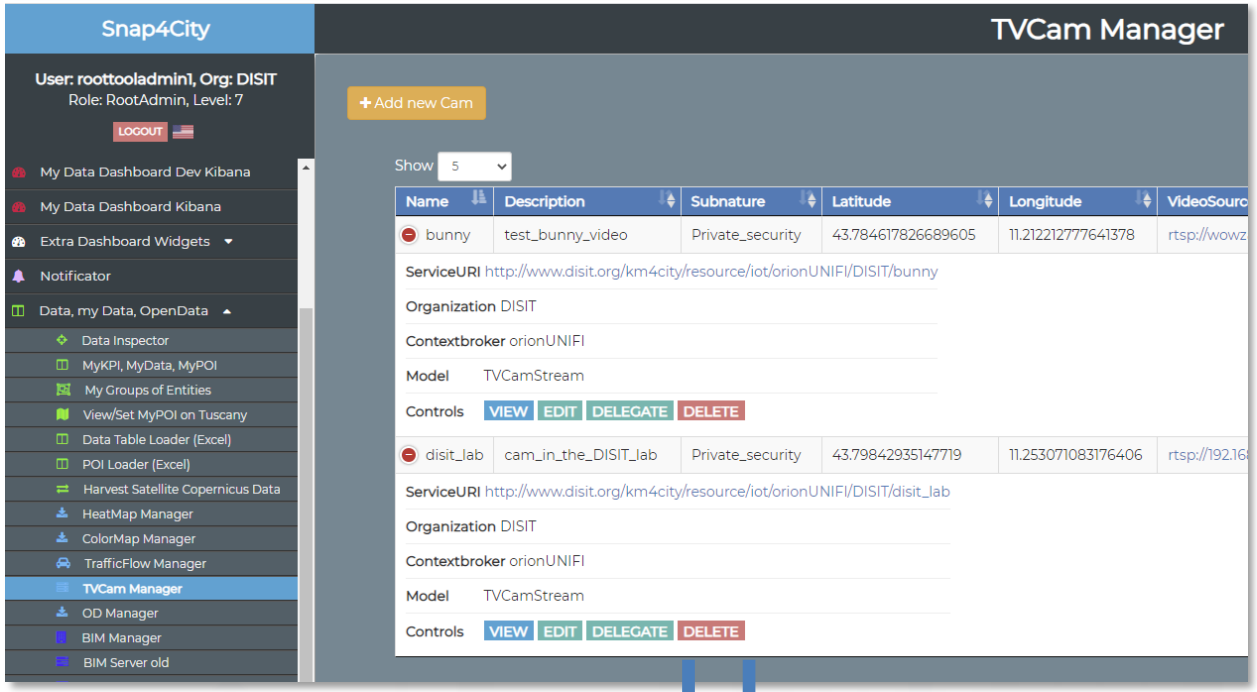
Settings for RootAdmin Only



TV Cameras

- **Two main modalities**
  - **Image frames**, periodically updated
    - Format: JPG
    - Protocols: http/https (with and without autentication)
    - Via **IPCAM Service**
  - **Video Stream**
    - Formats: MP4, H264,
    - Protocol: RTSP, ONVIF (with and without autentication)
    - Via **TVCam Manager**
      - ***based on Kurento, TURN, WebRTC***

TVCam Manager





RTSP
ONVIF

TVCam Streaming Servers

WebRTC





Video Device Model: TVCamStream

Variable		example
dateObserved	Timestamp	
name	ID camera	bunny
description	Text	test_bunny_video
videoSource	Call	rtsp://wowzaec2demo.streamlock.net/vod/mp4:BigBuckBunny_115k.mp4
…. custom		It is possible to create other models extending this kind of model

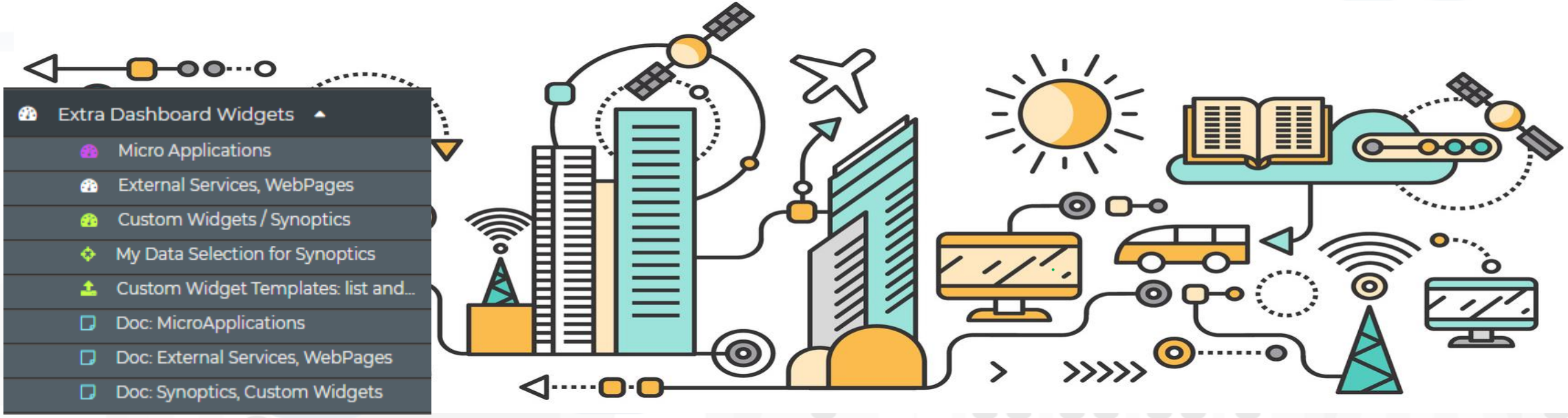
In addition you have:

- Model: TVCamStream
  - ContextBroker: selected in the model
- ServiceURI (automatically assigned)
- Nature and Subnature: ……..
- GPS Lat, Long: you can decide at the instance

Optional:

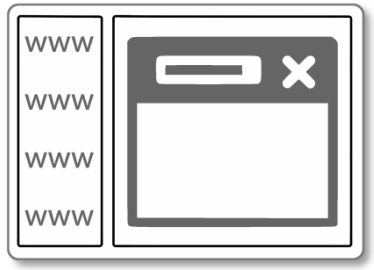
- Username: ……..
- Password: ……..

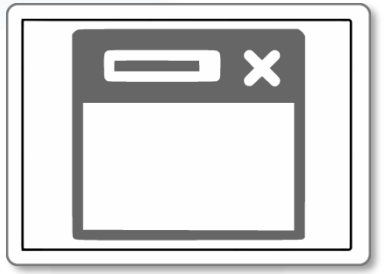
External Services (integration of) your or third-party web pages

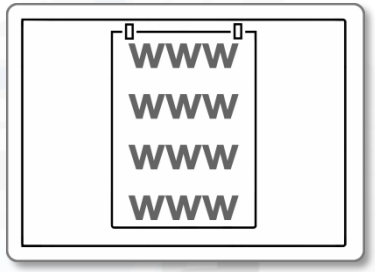


Dashboard Usage and Recipes

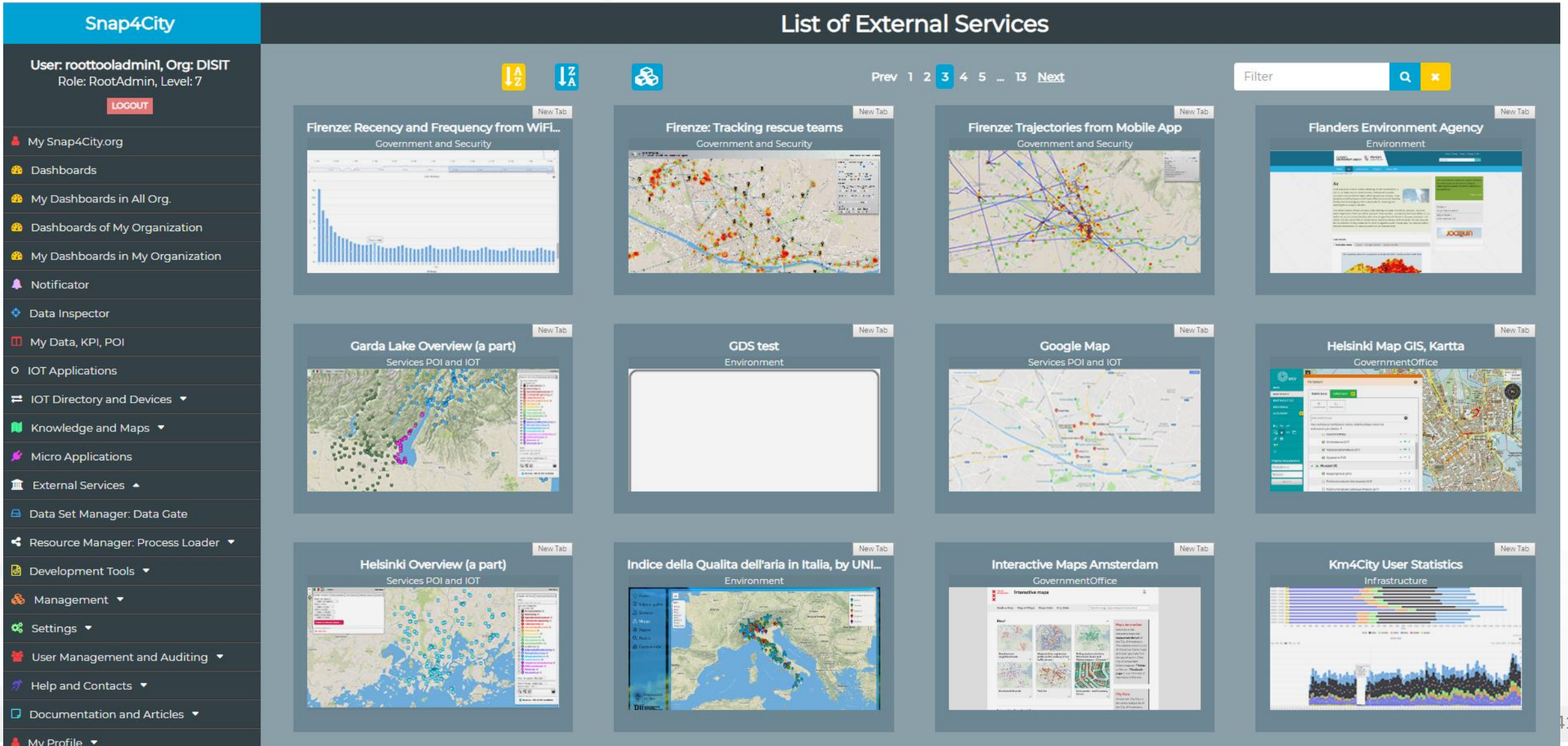
- https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTc3NA==
- **External Content Widget (optional zoom feature):**
  - **External Services**: Web Pages, web sites, web tools (registered or not)
    - **Tools**: Twitter Vigilance, Origin Destination Matrices, WiFi Tool, …
    - **GIS & MAPs**: ServiceMap, ArcGIS, ServiceMap3D, GoogleMap, etc. etc.
    - **TV CAM** Proxy adapted, VideoCam Streams, …
  - **MicroApplications**
    - More than 300 micro applications based on Snap4City and Km4City Tech.
  - **Synoptics and Custom widgets**
  - **Snap4City pages**: Form discussion, help desk, user manual, …
  - **Snap4City Dashboards** for nested views, MultiDashboards views
    - Ultra HD screens, UHD or even wider….
- **Selector WEB**
  - Anything that can be shown on External Content WG, one or more





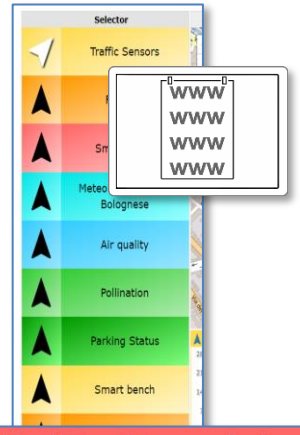


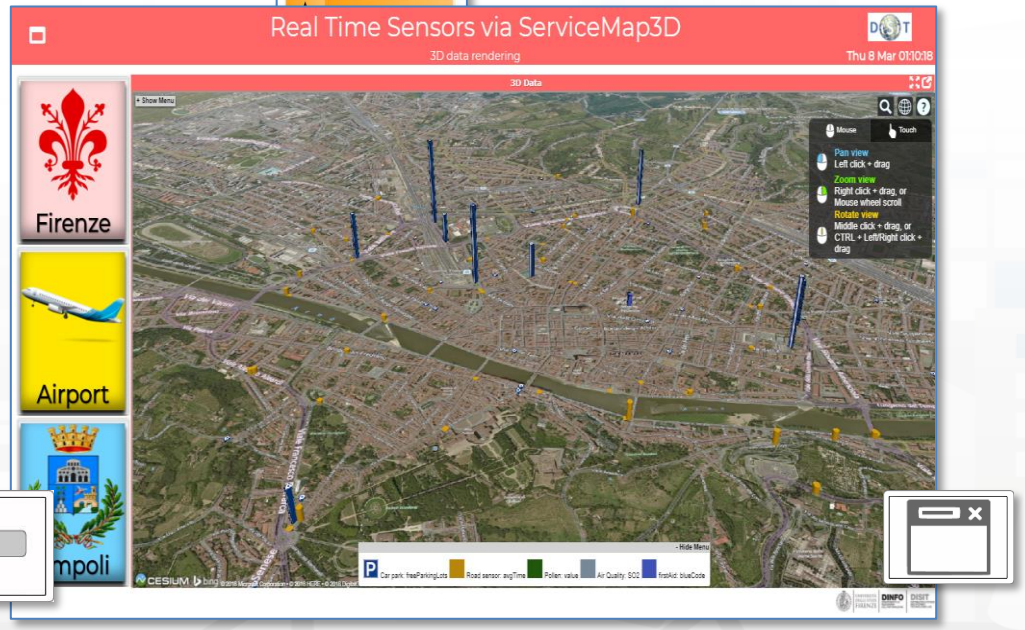
External Services (registered)

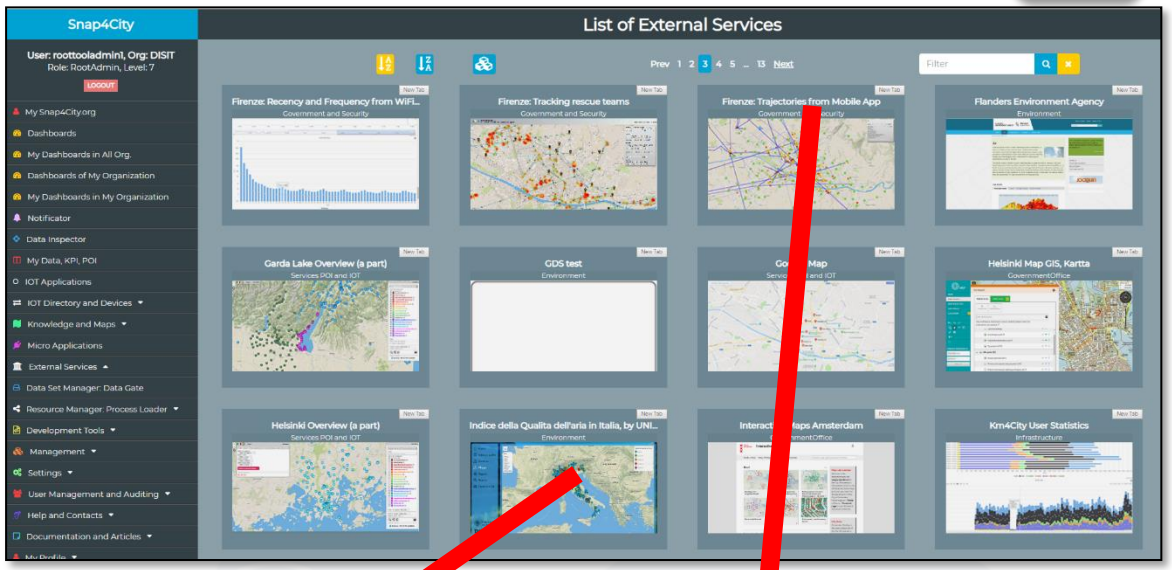


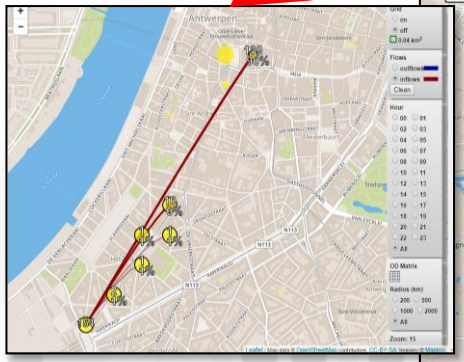
HLT: External Services

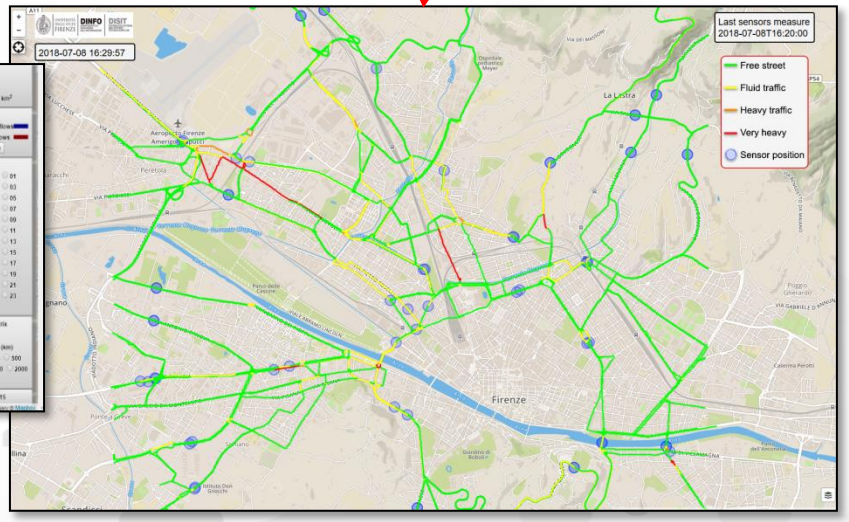
High Level Types







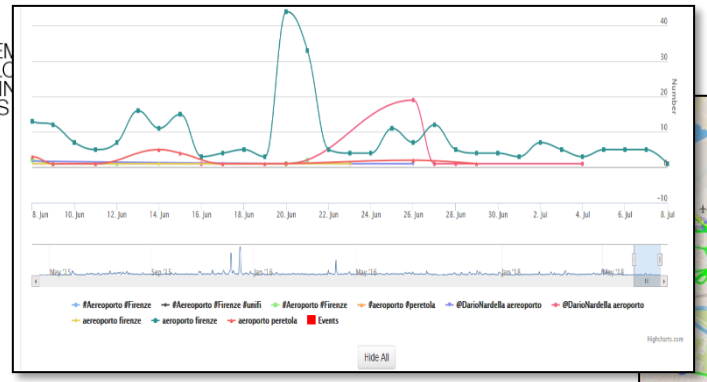


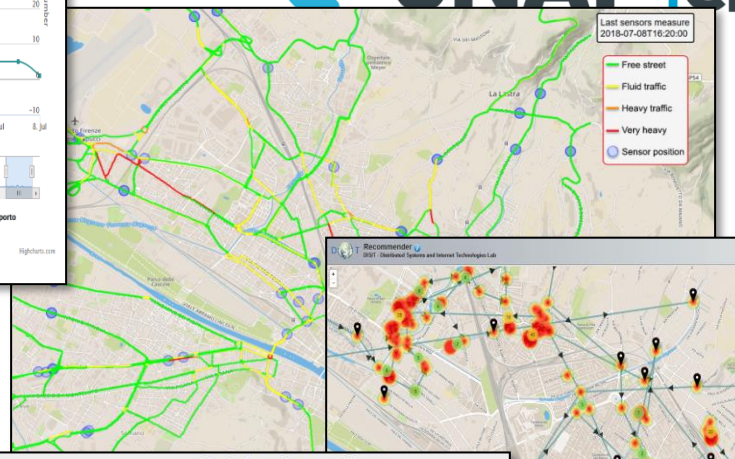


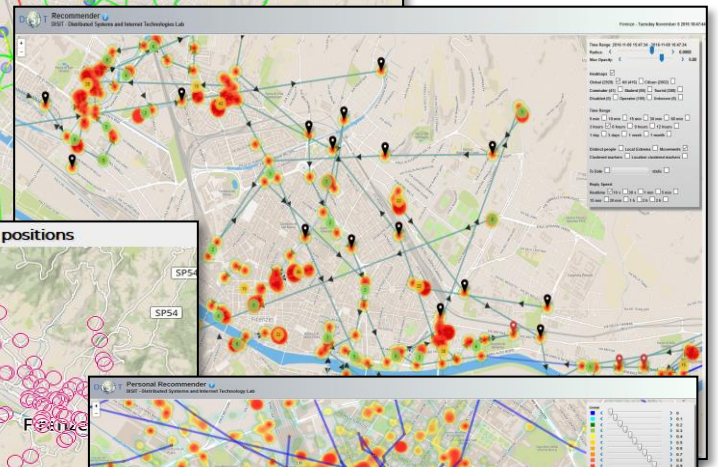
External Services

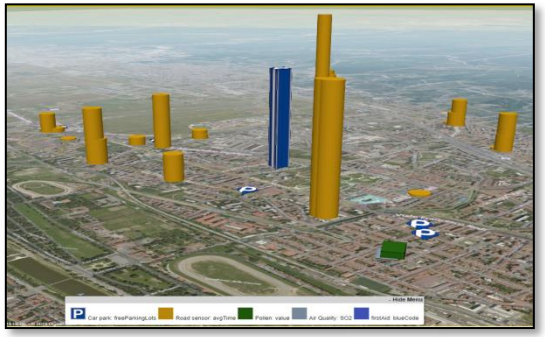
Nature

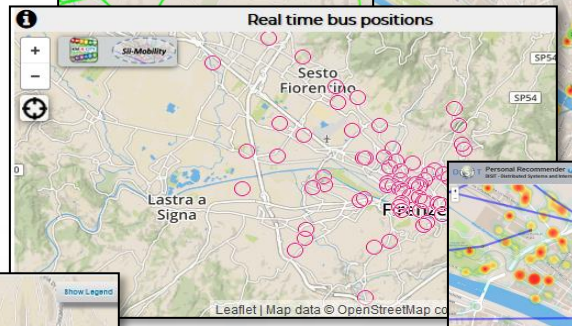
- **Twitter Vigilance:**
  - Daily and real time
  - Volume and sentiment analysis
- Services on Maps, GIS, ArcGIS
- Real time sensors on 3D
- Web HTML5 Applications
- Origin Destination Matrix
- Real Time fleets
- Routing, Multimodal tools
- **IPCAM** connector
- **Synoptics**
- **Third party tools!**
- **…..**
- **Other tools also internal**
  - Traffic Flow Reconstruction
  - User behaviour monitoring
  - Tracking tools
  - Heatmaps tools
  - Trajectories tools



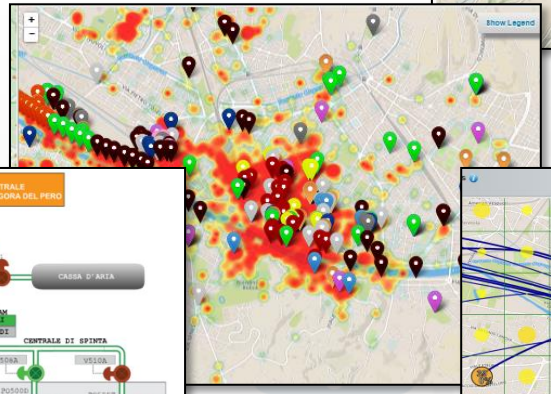


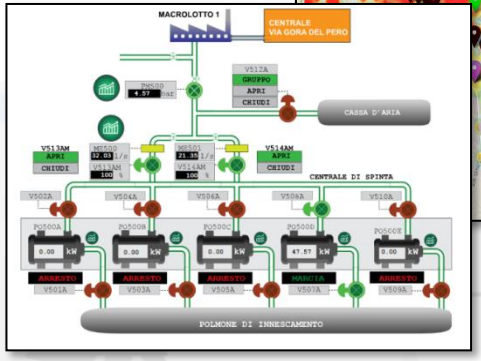


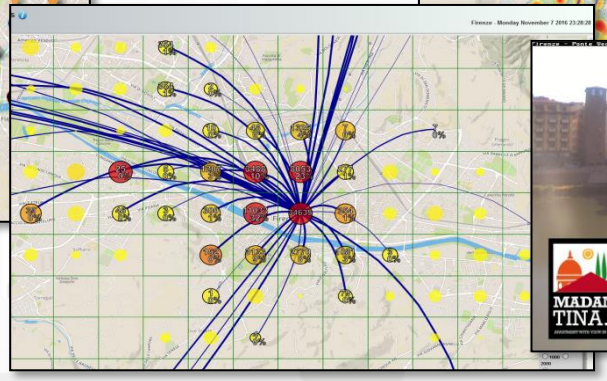






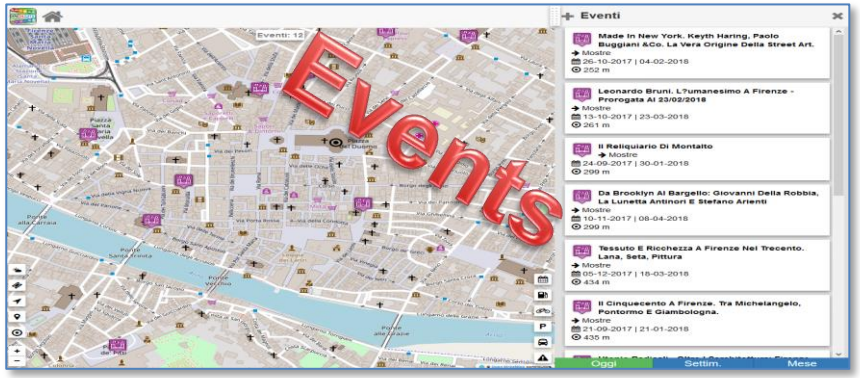


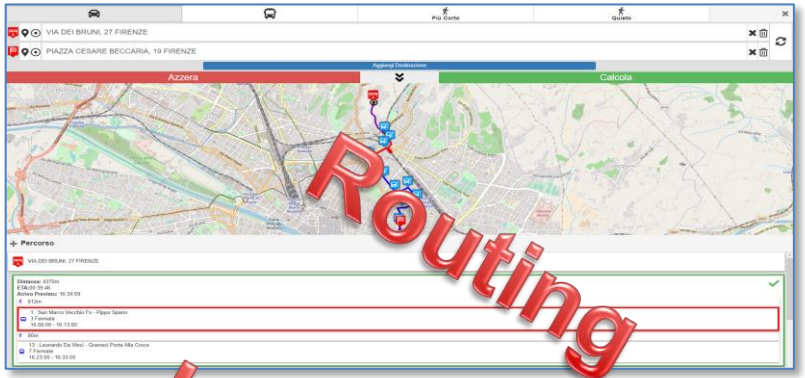


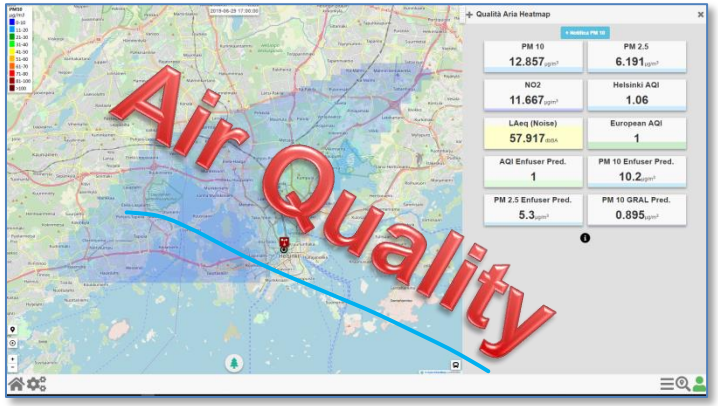


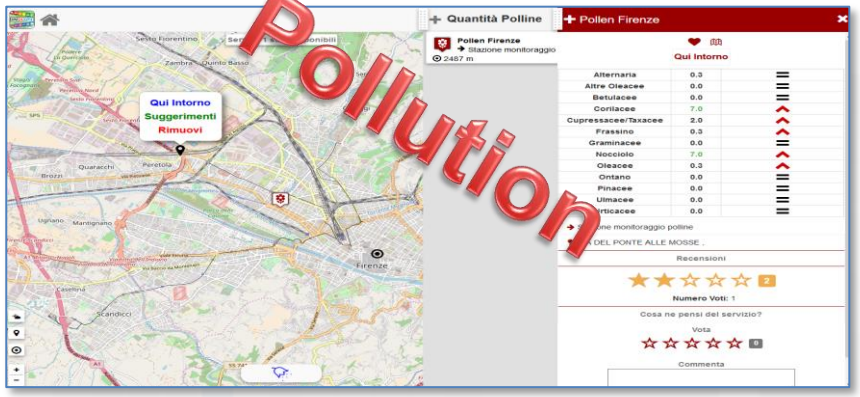


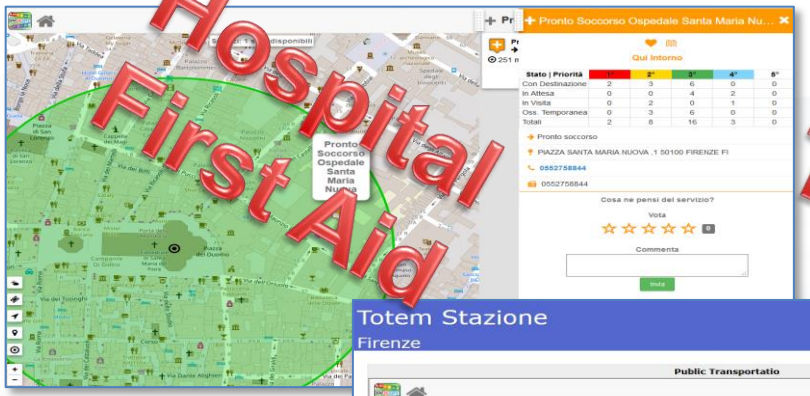
HTML5 MicroApplications

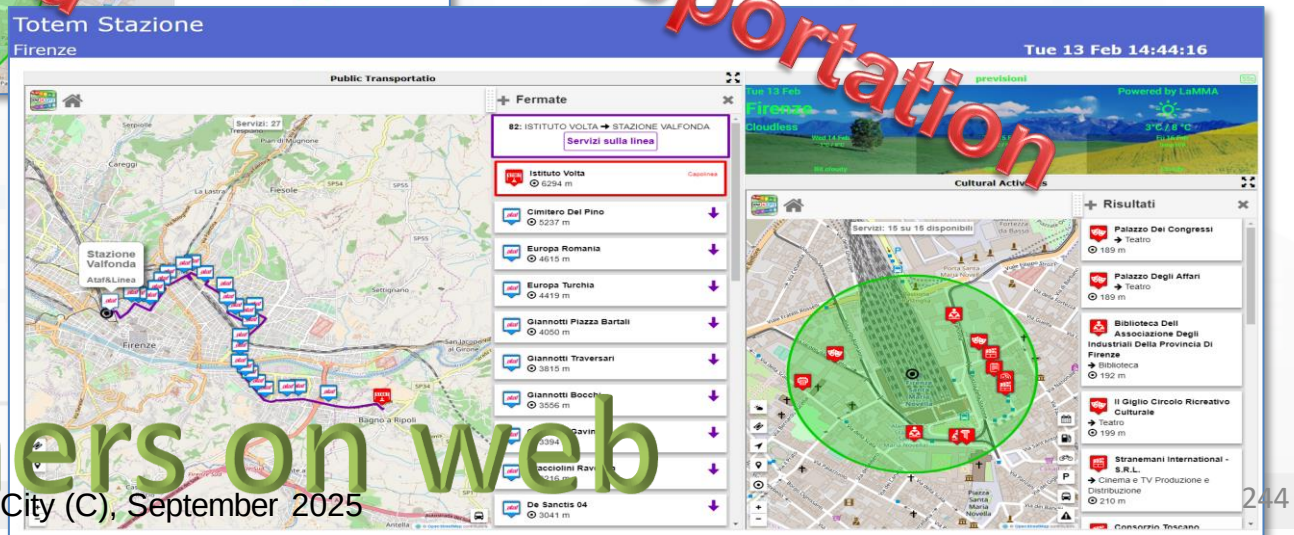


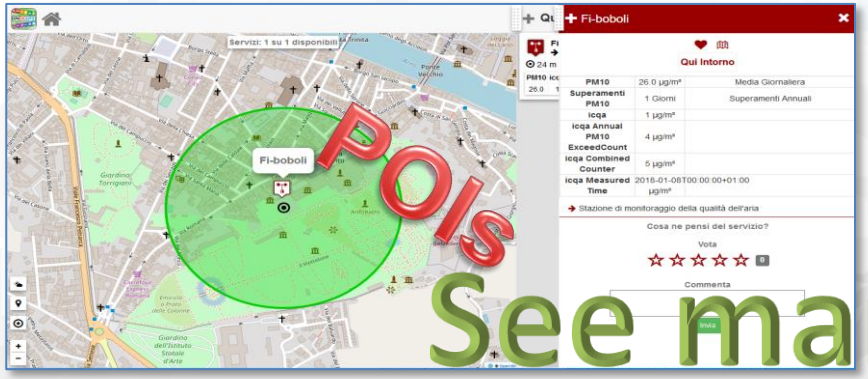






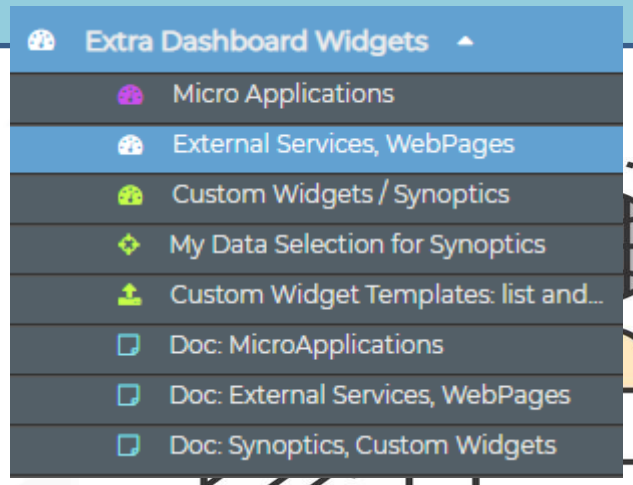






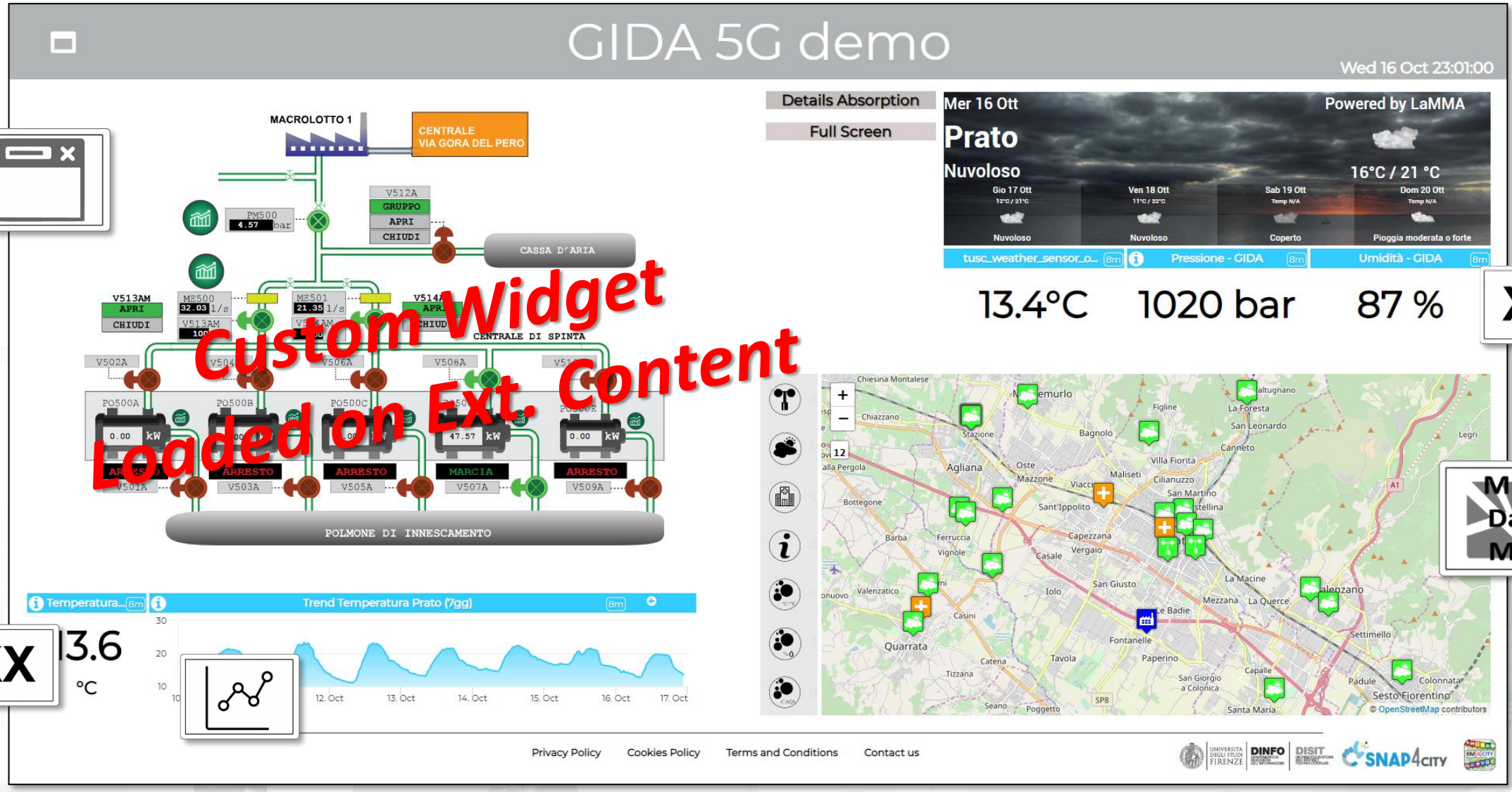
See many others on web

Synoptic, Custom Widgets and PINS Creation





Demo UC5 GIDA



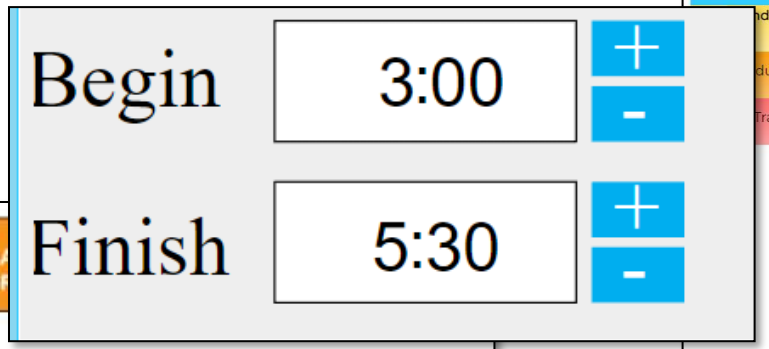
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjIyNg==

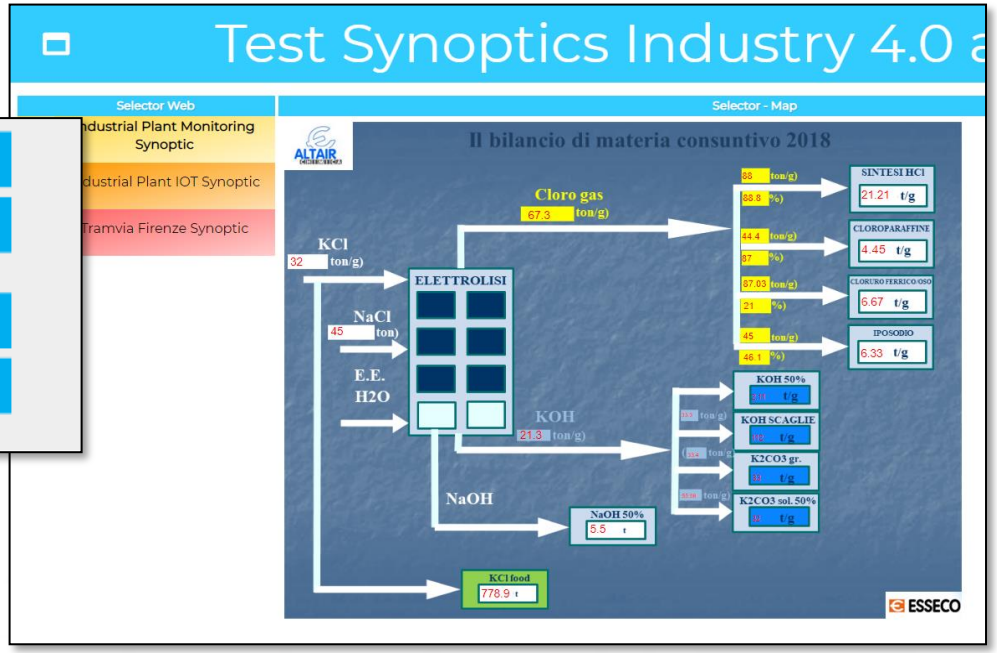
Custom Widgets

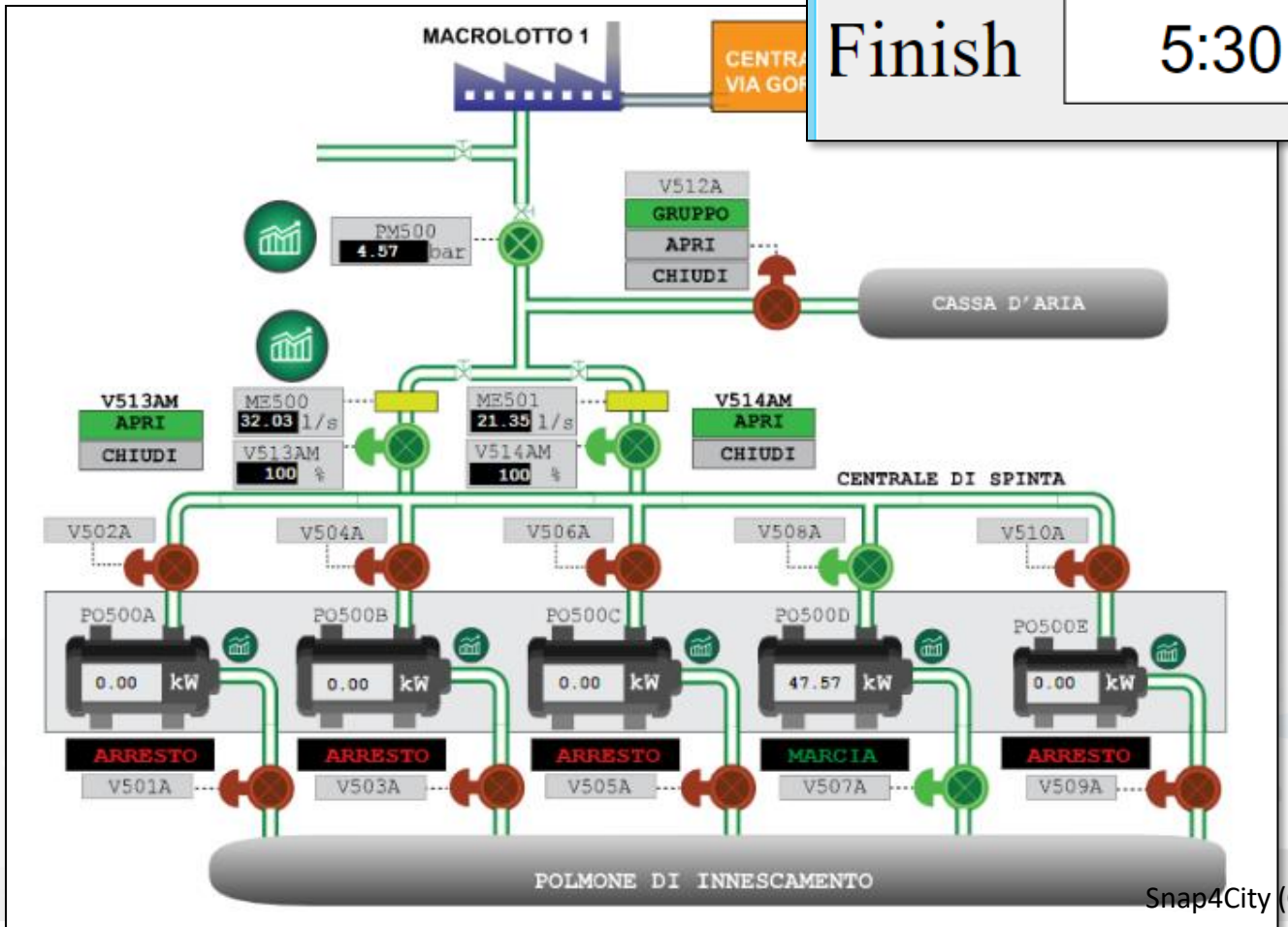
Custom Dashboards and Widgets (interactive, Animations, etc.)

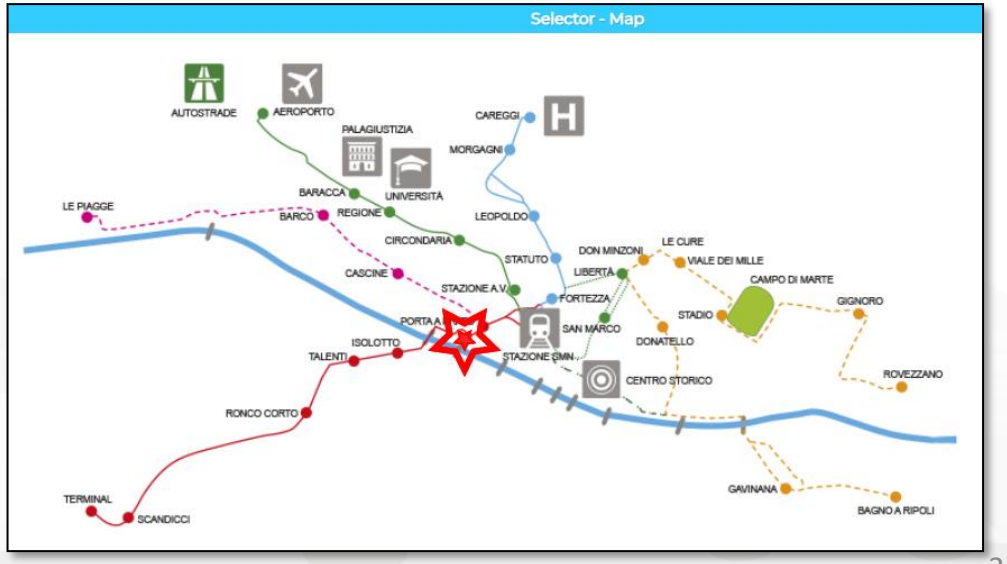
-- SVG for graphic design

-- MyKPI for collecting data



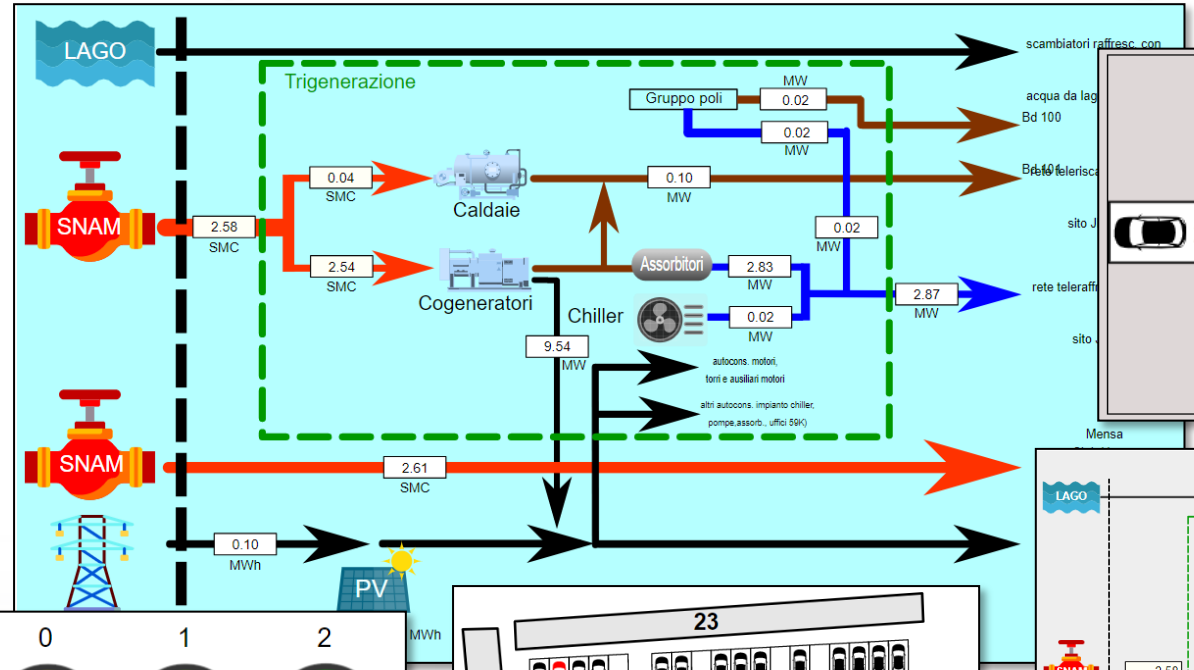


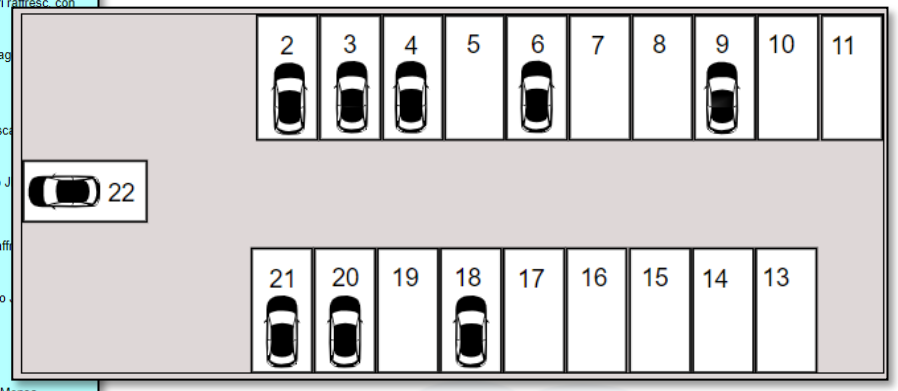


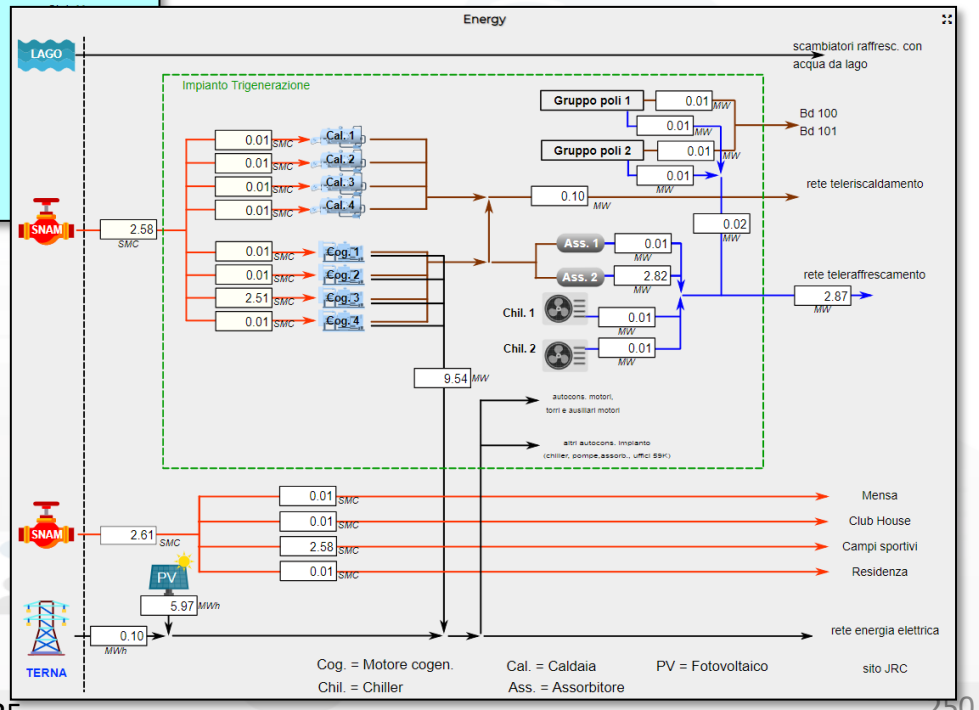


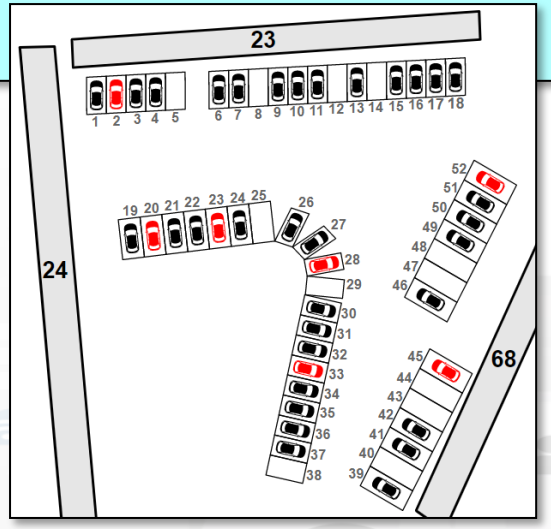
Special Custom Widgets

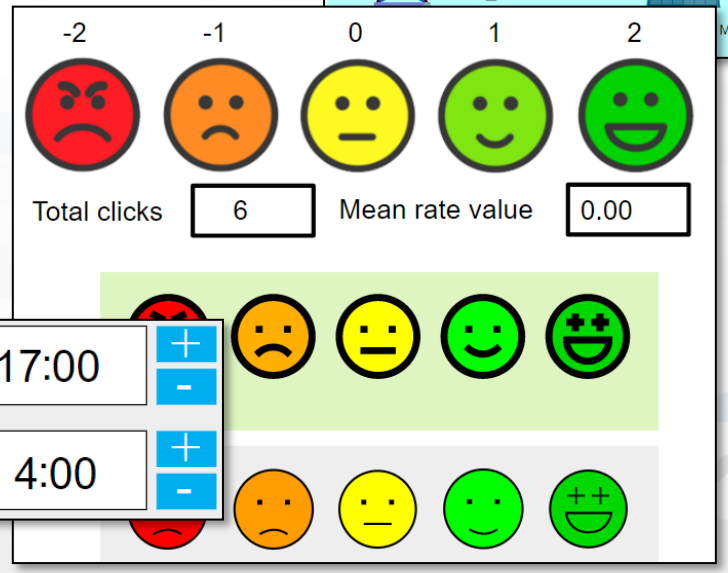
- Smart parking
- Smart Energy
- Smart Light
- Smart ….
- Energy View
- Custom Controls



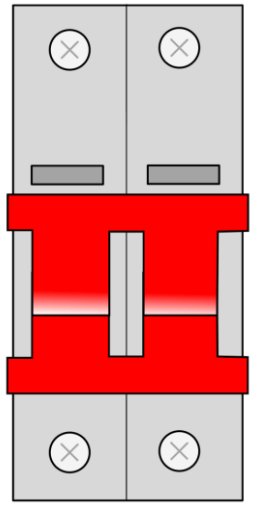






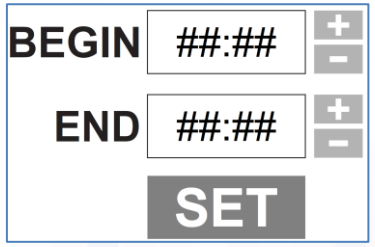


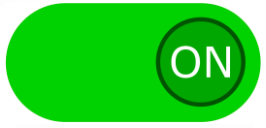
Other examples

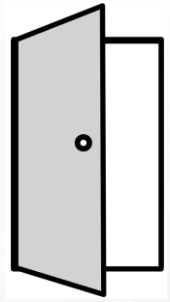


- **Virtual Actuators (sensor-actuator)**
  - From: Dashboard
  - To: IOT App, MyKPI, other Synoptics











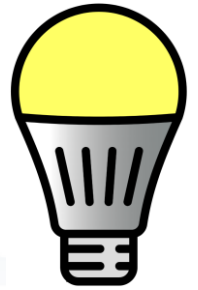




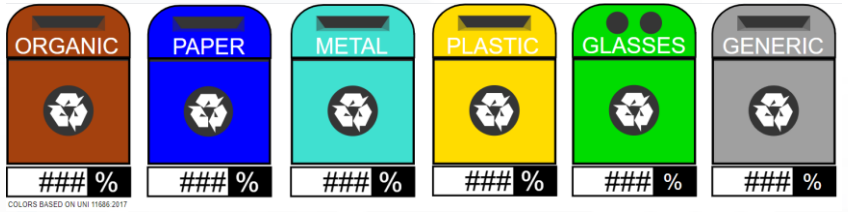
- **Virtual Sensors**
  - From: MyKPI, Sensors, IOT App, other Synoptics
  - To: Dashboards

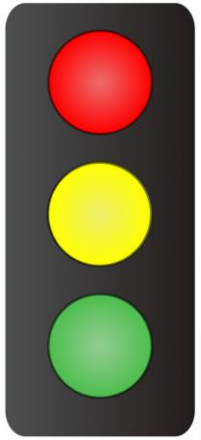


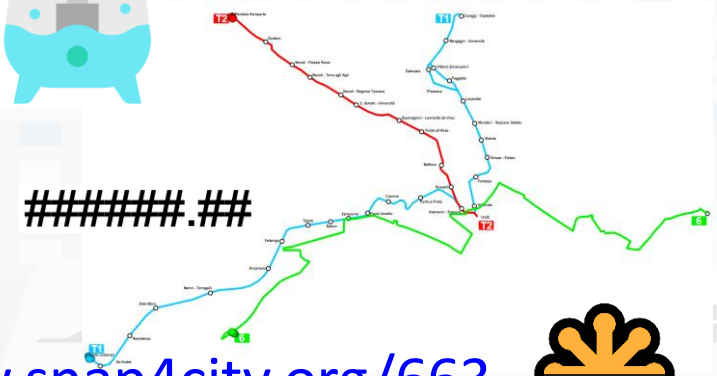


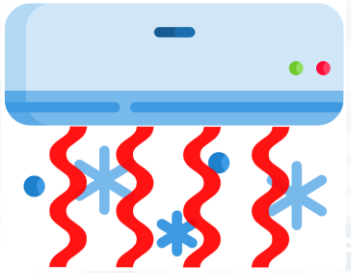












https://www.snap4city.org/663

Smart Lonato del Garda

Sat 9 Nov 17:20:59

Slot 1
Slot 2
Slot 3
Slot 4
Slot 5
Slot 6
Slot 7
Slot 8
Slot 9
Slot 10
Slot 11
Slot 12
Slot 13
Slot 14
Slot 15
Slot 16
Slot 17
Slot 18
Slot 19
Slot 20
Slot 21
Slot 22
Environment
other

Selector - Map

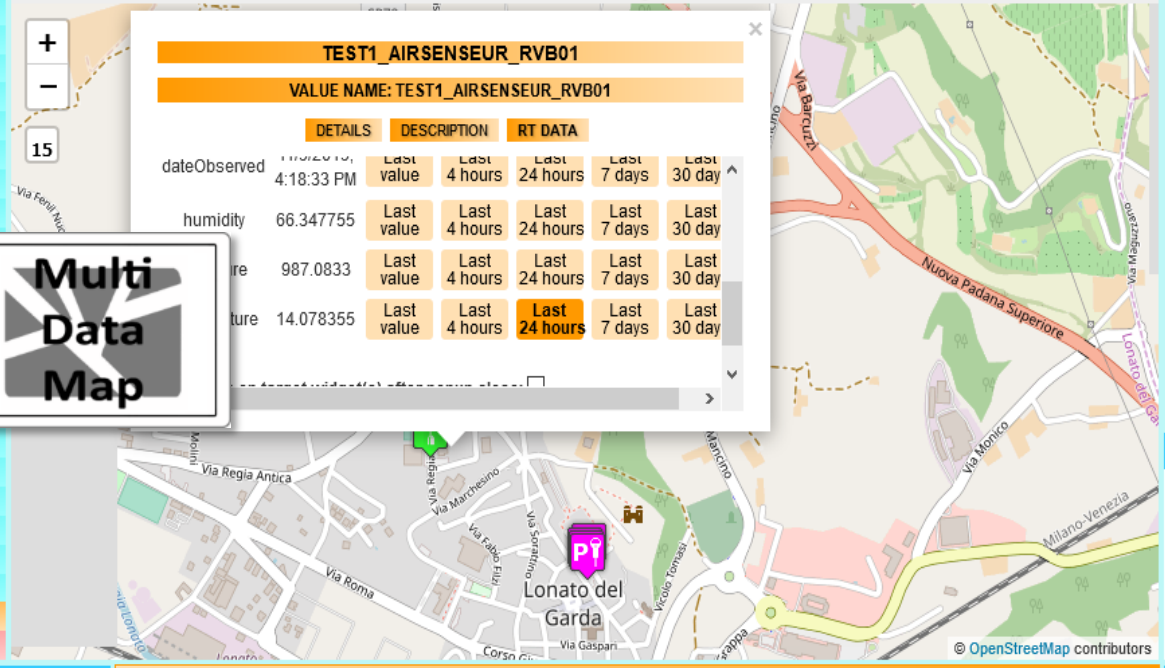
TEST1_AIRSENSEUR_RVB01

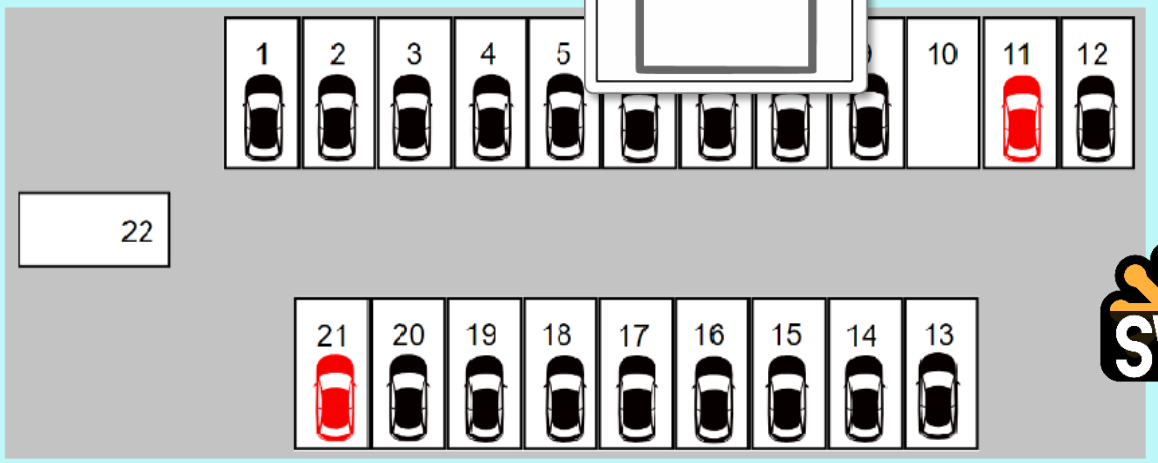
VALUE NAME: TEST1_AIRSENSEUR_RVB01

DETAILS | DESCRIPTION | RT DATA

dateObserved	4:18:33 PM	Last value	Last 4 hours	Last 24 hours	Last 7 days	Last 30 day
humidity	66.347755	Last value	Last 4 hours	Last 24 hours	Last 7 days	Last 30 day
re	987.0833	Last value	Last 4 hours	Last 24 hours	Last 7 days	Last 30 day
ture	14.078355	Last value	Last 4 hours	Last 24 hours	Last 7 days	Last 30 day

Multi Data Map

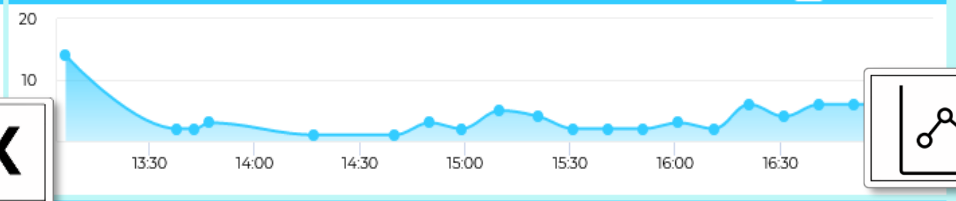




SVG

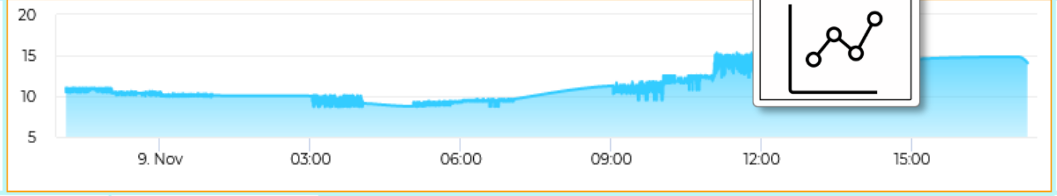
NumFreeSlo... 9m
2
free
XX

NumFreeSlots - Slots 9m

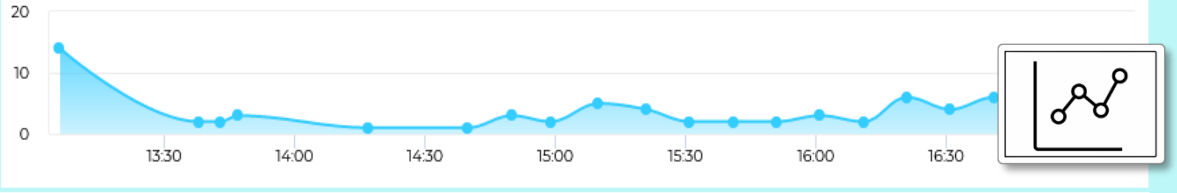


SmartParkingLonato_1 ... 9m
XX

temperature - Day 9m

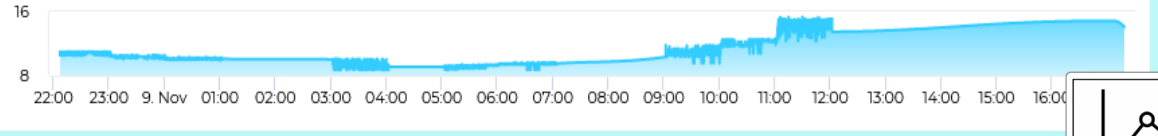


NumFreeSlots - Slots 9m



pressure 9m	humidity % 9m	temperature 9m	Slot ID 9m	Max Present Duration 9m
987.1	66.3	14.1	14	19 ore e 11 minuti
mm	%	C	slot ID	
	XX	XX		XX

TEST1_AirSensEUR_RVB01 - temperature 9m



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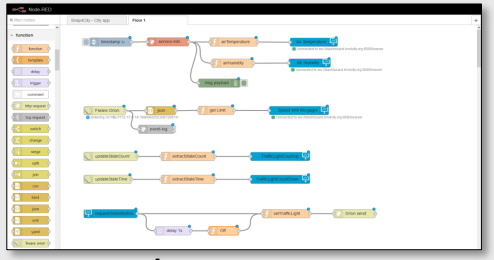
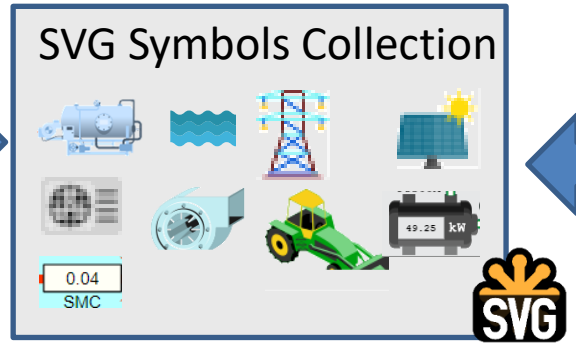
Custom Widget / Synoptic / PIN Development

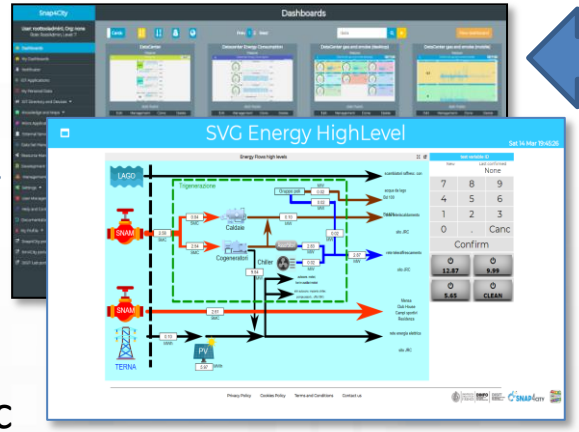


IOT Applications



Knowledge and Storage Data from the Field and City



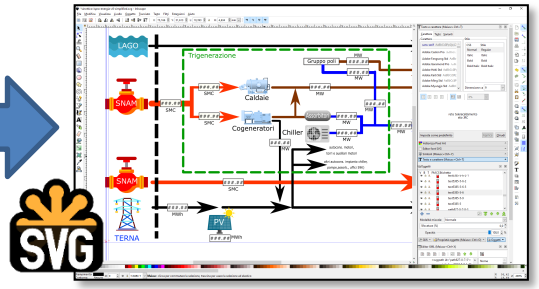


Public Dashboard Collection

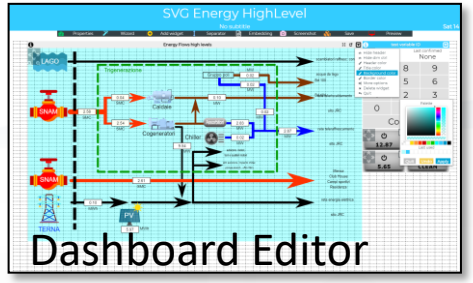
My Own Dash/App



Inkscape editor on your computer



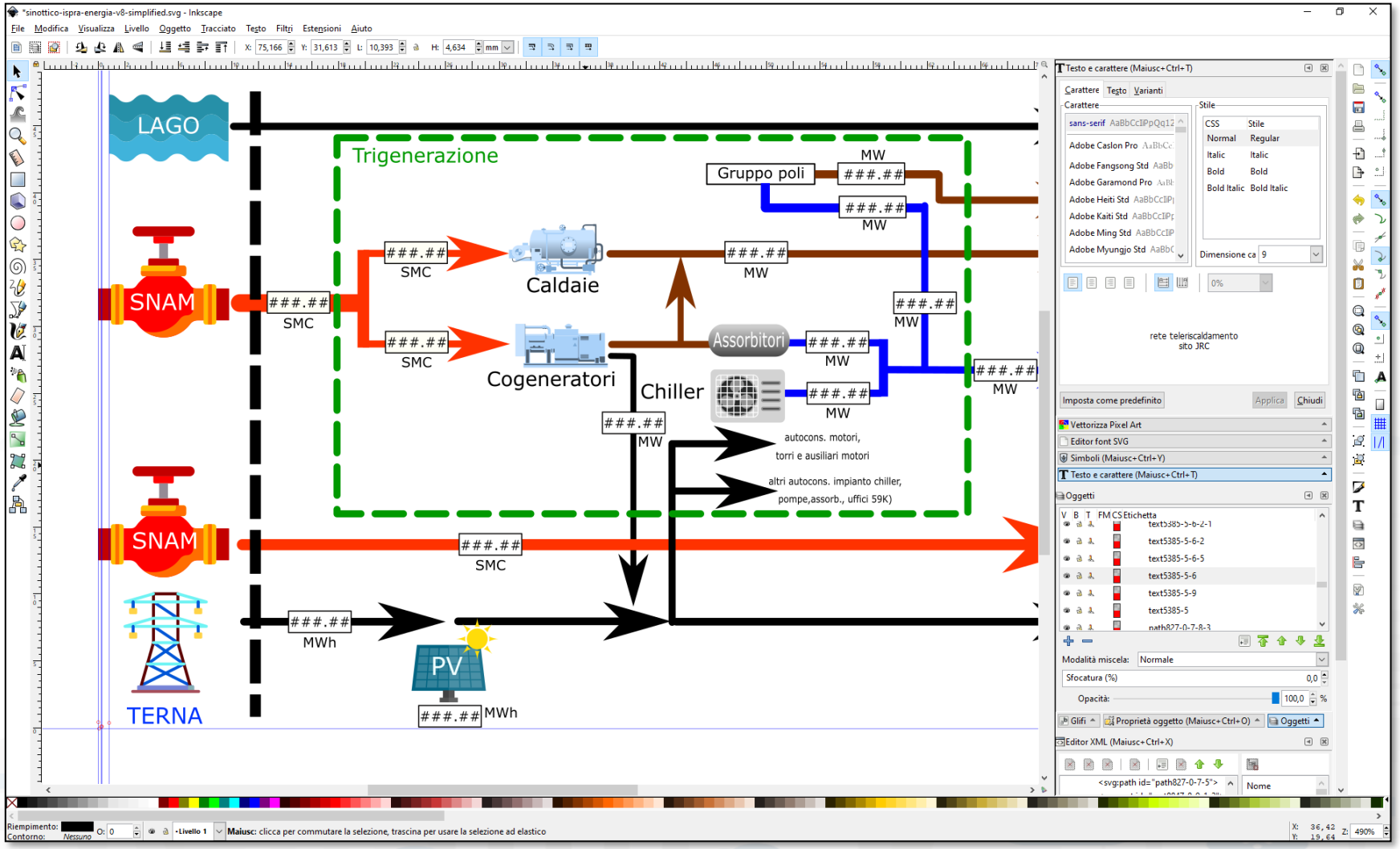
Create, save a Custom Widget in SVG





Create, save, load, delegate, grant access

1. Create and Load a Custom SVG
2. Select/Reuse an SVG
3. Make and Instance of Synoptic by Associate Variables with MyKPI
4. Create on Dashboard a Widget based on Synoptic HLT such as Ext. Srv.:
   - https://www.snap4city.org/synoptic/v2/synoptic.html?id=xxxx



How to create a custom Widget



- [User manual on: https://www.snap4city.org/595](https://www.snap4city.org/595)

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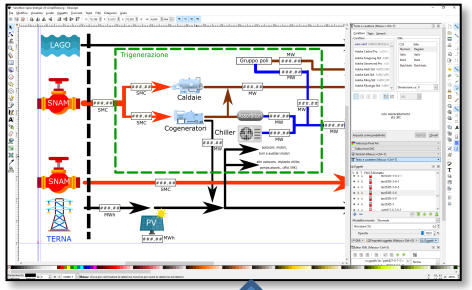
DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB
DISTRIBUTED DATA INTELLIGENCE AND TECHNOLOGIES LAB

CW with a single READ Variable are automatically usable as PINS

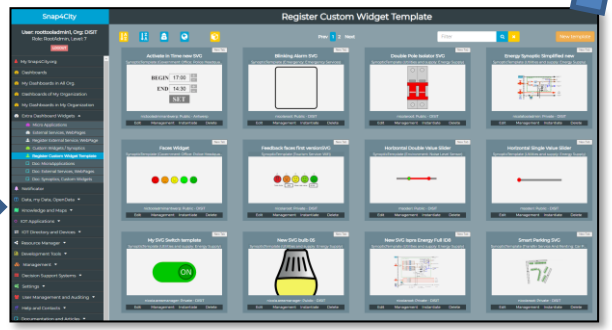
SNAP4CITY KM4CITY

Create, save a Custom Widget in SVG

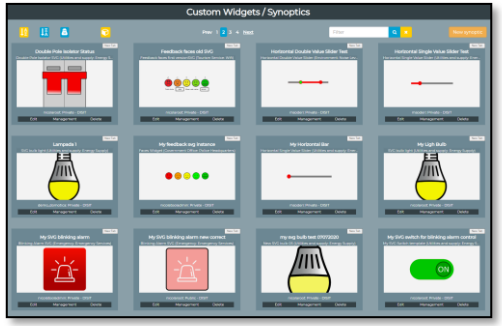


SVG

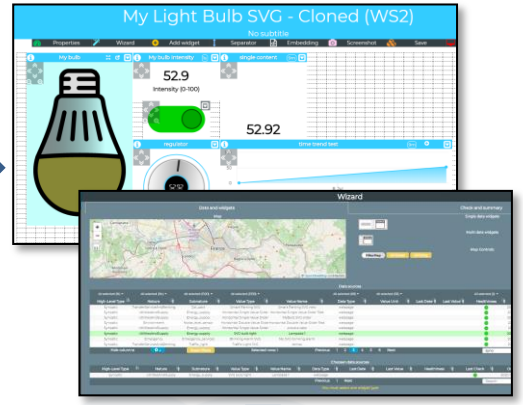
Upload as Custom Widget Template



List of Custom Widgets / Synoptics



Dashboard Editing/wizard



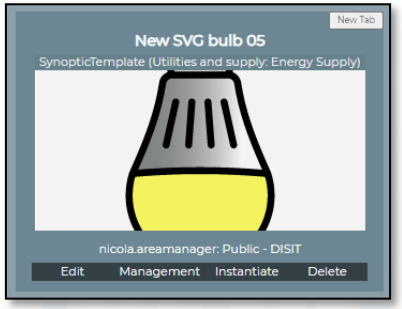
SVG Symbols Collection

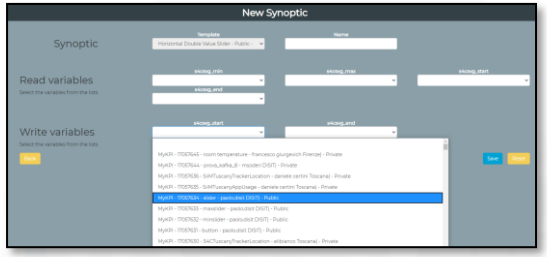


From any open library

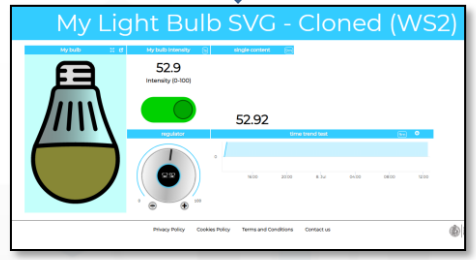
SVG

select

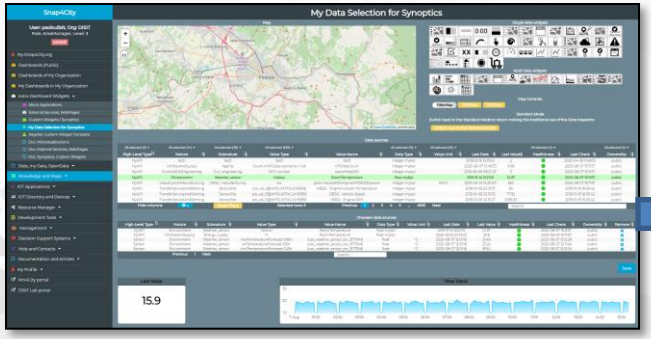




Instantiate as Custom Widgets / Synoptics Connect with WebSockets

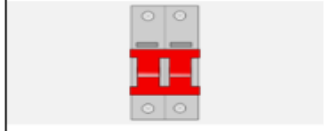


Final Dashboard

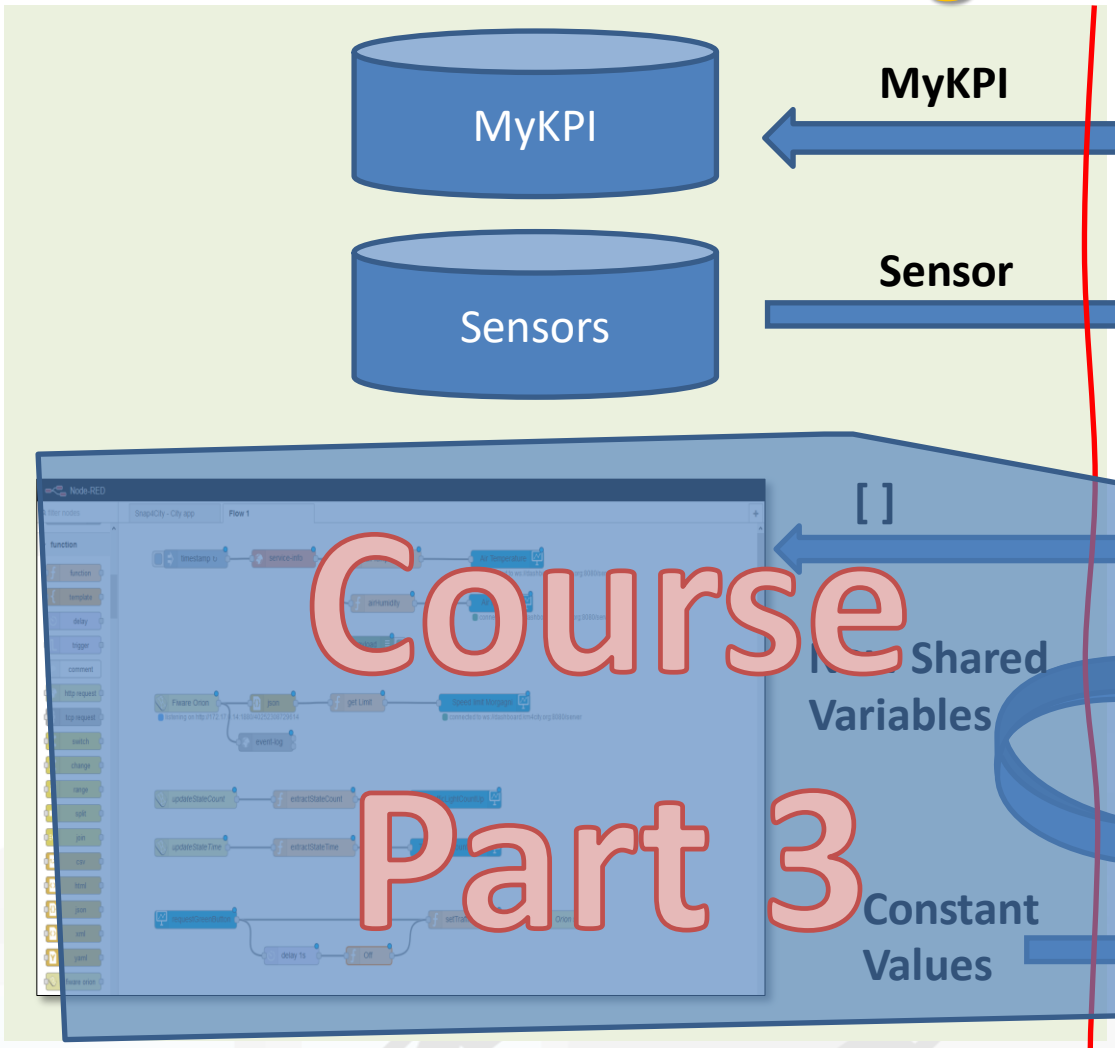


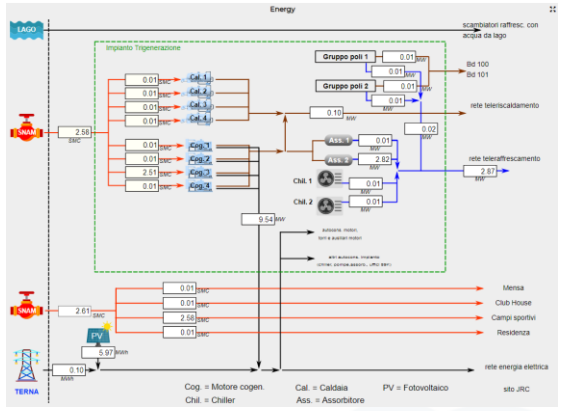
Select MyKPI and Sensor Data for Synoptics cases

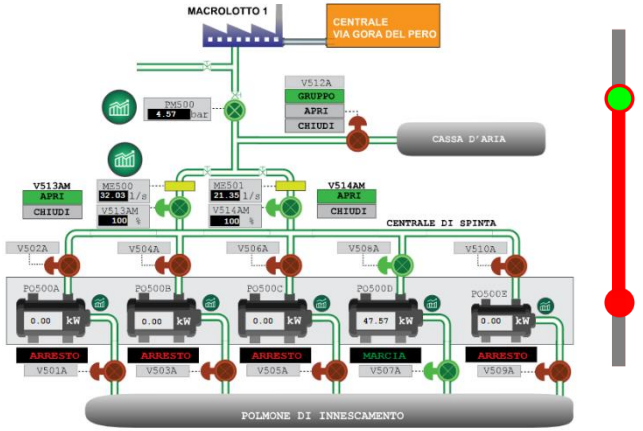
Help on Custom Widgets

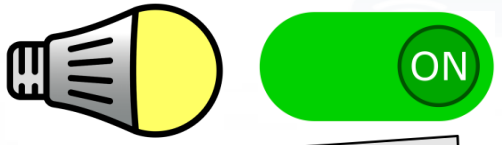
Custom Widget name and image	*Explanation*	*Variable(s)*	*Accepted values*
Activate in Time new SVG 	Set the begin and the end hours by using the small + and – buttons. Click SET to send the defined hours to the server.	s4csvg_begin (read and write variable) Default value: ##:##	starting hour in the form HH:mm to be set by clicking the + and – button
		s4csvg_finish (read and write variable) Default value: ##:##	ending hour in the form HH:mm to be set by clicking the + and – button
Air Conditioner SVG 	Change the image according to the value received.	s4csvg_airconditioner_status (read variable) Default value: undefined state, the SVG shows the overlapped cold and hot images.	0 = OFF, 1 = cold, 2 = hot
Blinking Alarm SVG 	The image blink or stop to blink according to the value received. Example: https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=Mjc4NQ==	s4csvg_blinking_alarm (read variable) Default value: 1, blinking	0 = OFF (fixed image), 1 = blinking
Double Pole Isolator SVG 	By clicking the SVG, the status of the switch changes accordingly and the corresponding value is sent to the server. Example: https://main.snap4city.org/view/index.php?iddasboard=Mjk4Ng==	s4csvg_isolator_onoff (read and write variable) Default value: undefined state, the SVG shows the overlapped position up and position down images.	0 = OFF (position down), 1 = ON (position up)
Faces Widget 	By clicking a coloured face the corresponding value is sent to the server. Examples: https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjU0NA==	s4csvg_userFeedback: value sent to the server by clicking the corresponding face (write variable). Default value: no value sent. The SVG shows the five	-2 = very bad, -1 = bad, 0 = so-and-so, 1 = quite-good, 2=good

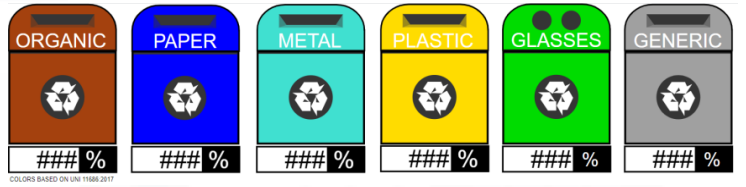
From-To Custom Widgets / Synoptics to Storage in WS

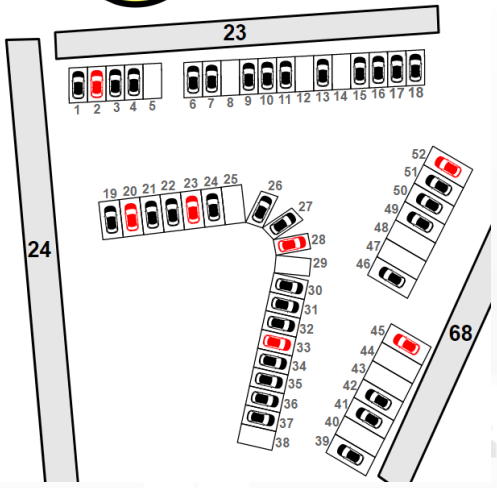






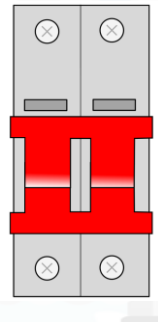


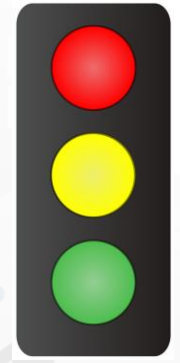




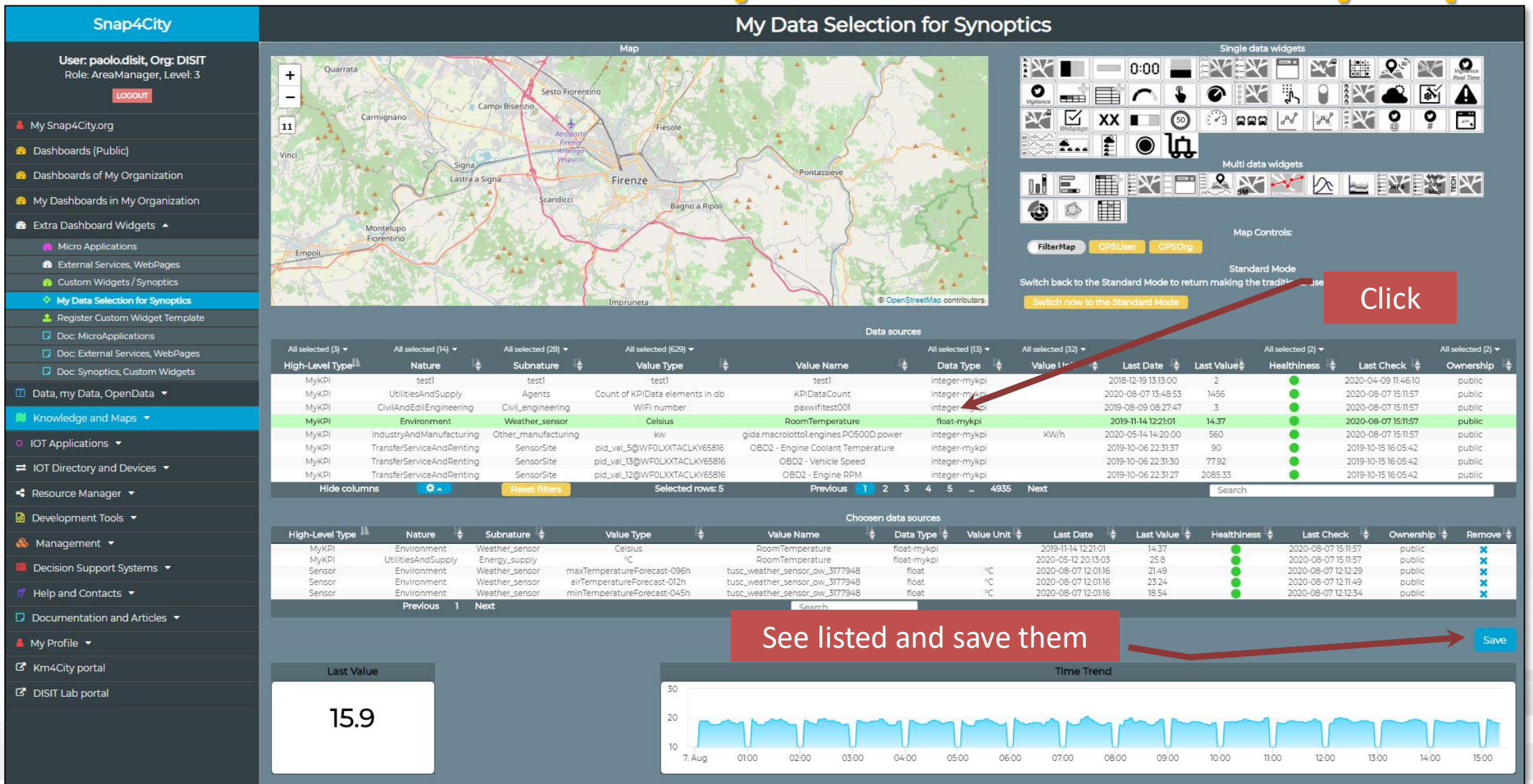




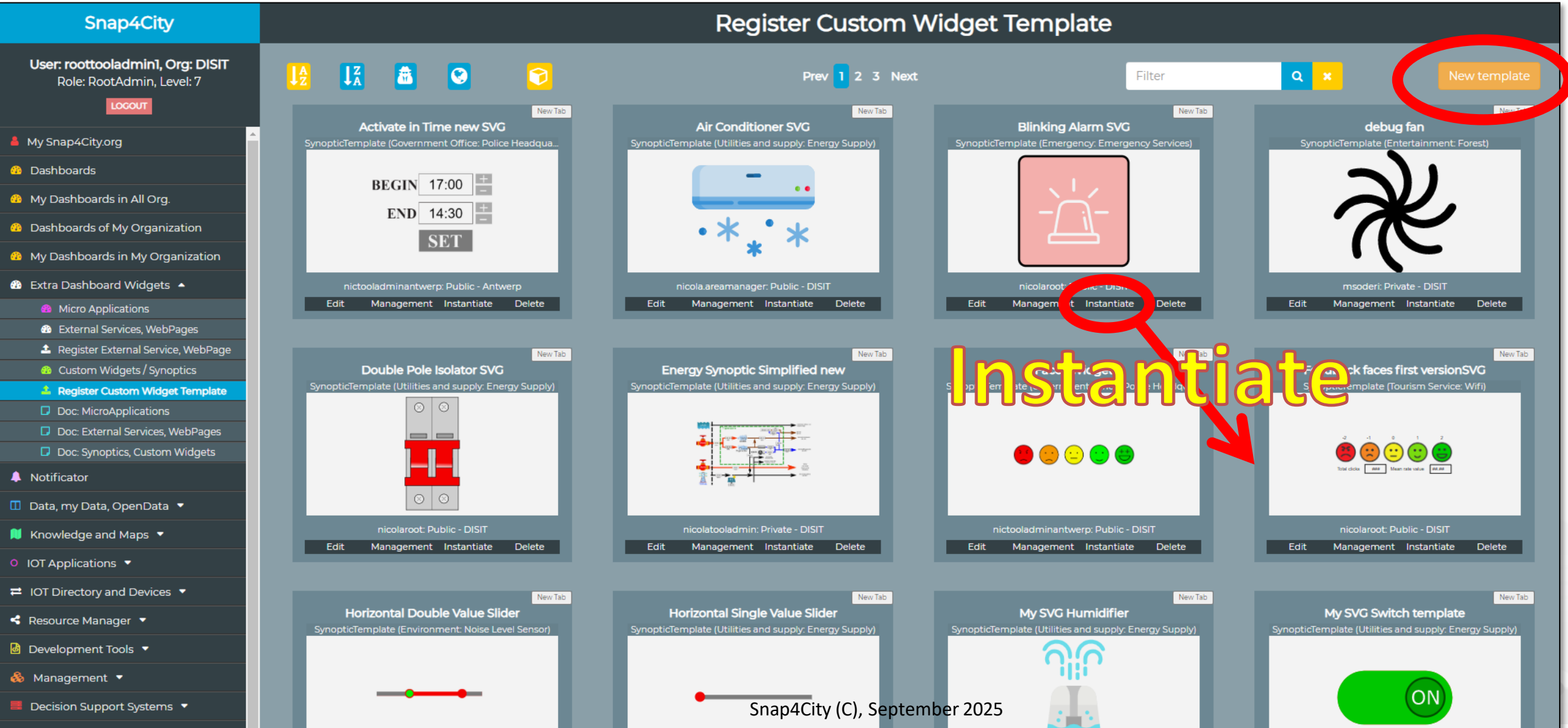




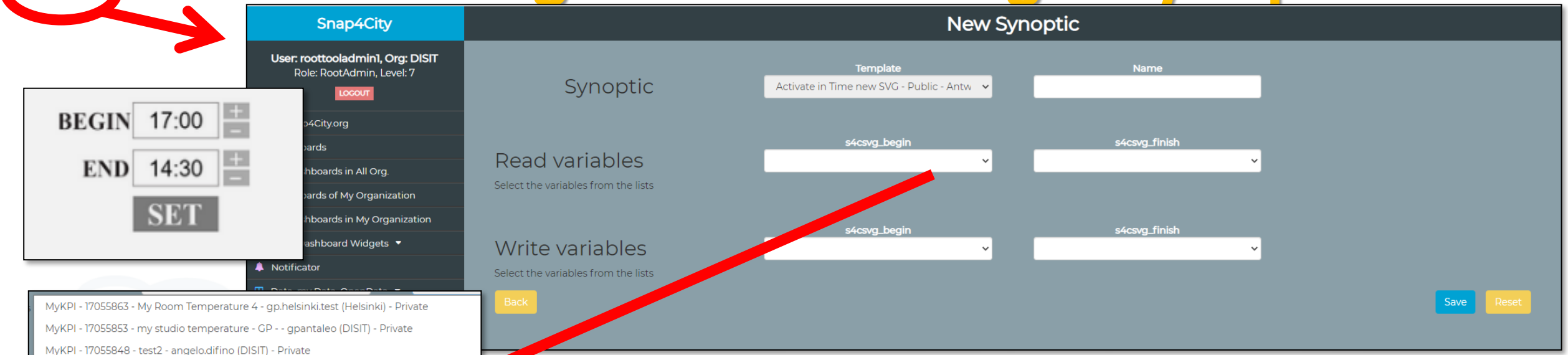
Select the Sensors and MyKPI to be used on Synoptics

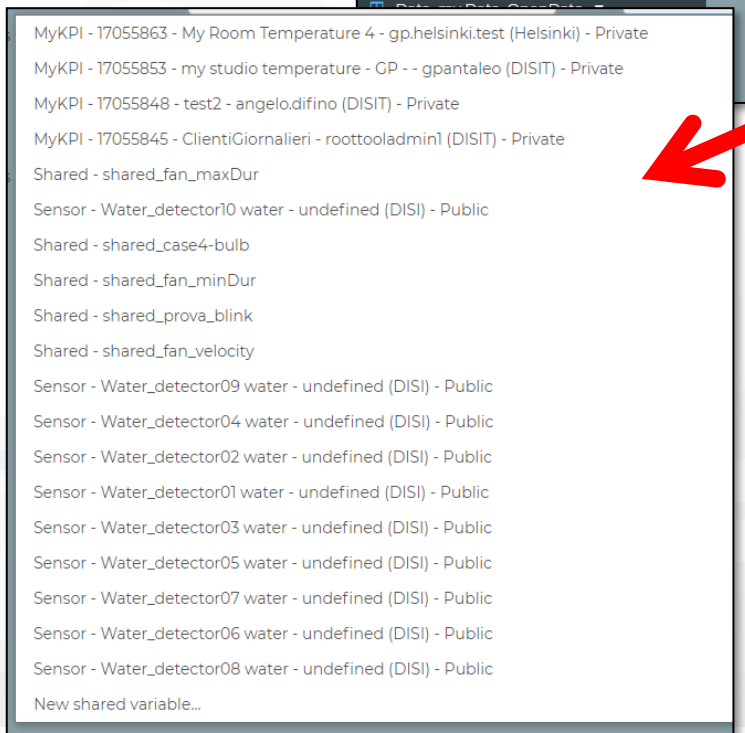


Custom Widgets Templates

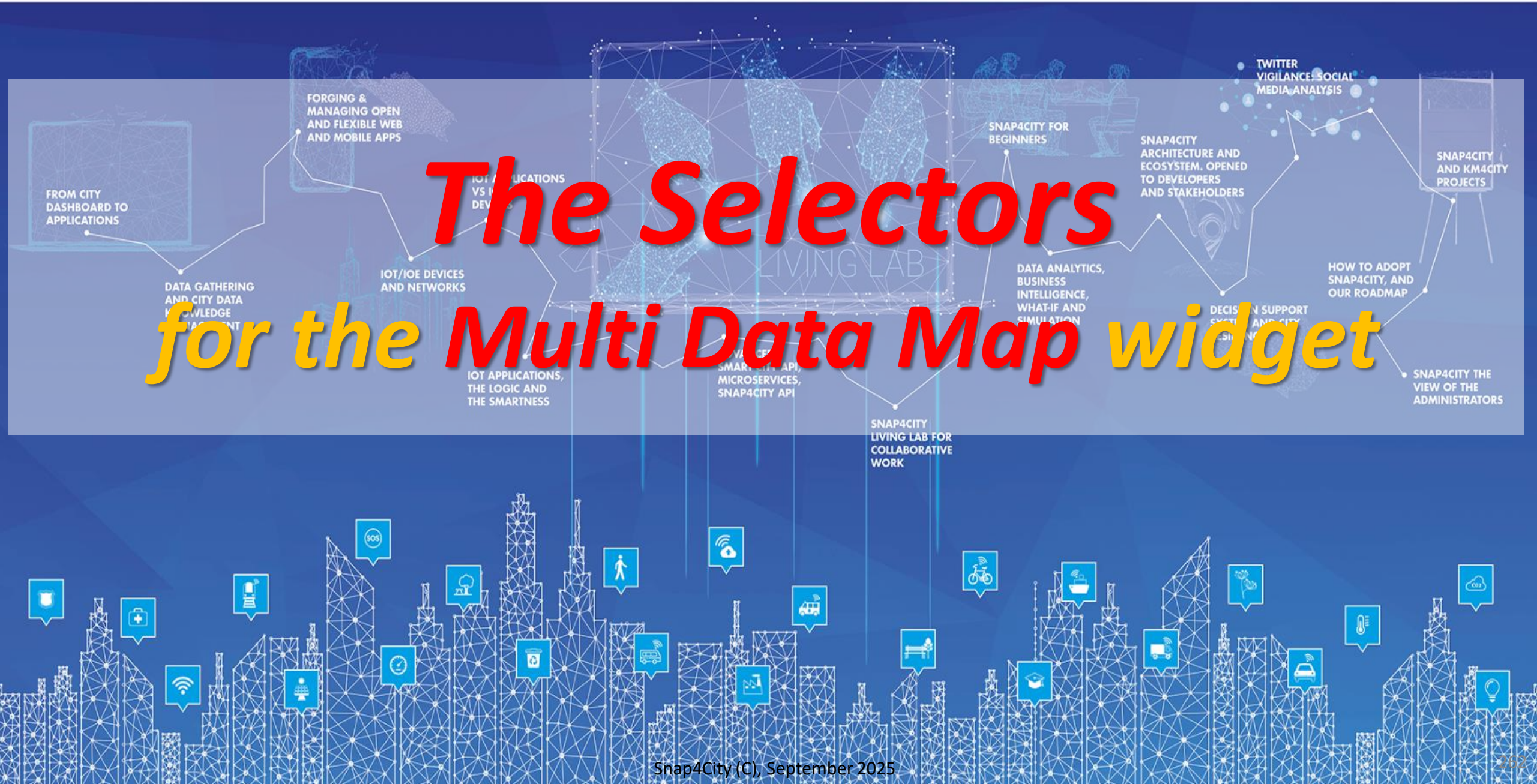


Instantiating a Custom Widget Synoptic





- **[ ]**
  - **leave it empty to connect later direcly from/to IOT APP**
- **MyKPI**
  - Read/write data, your KPI, and real time values
- **Sensors**
  - Your data collected as sensors only rendering data
- **New Shared Variables**
  - ….. Only for Case 3: Synoptic vs Synoptic Communications
  - No protection of data value

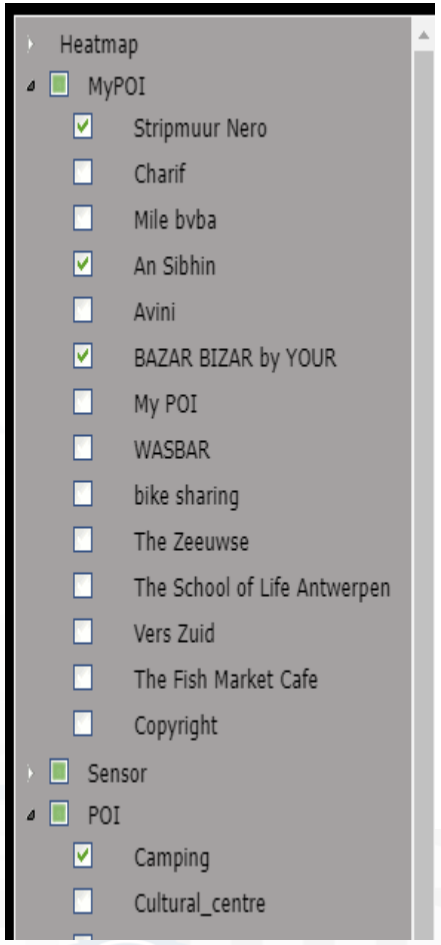


The Selectors
for the Multi Data Map widget

The Selectors for Multi Data Maps

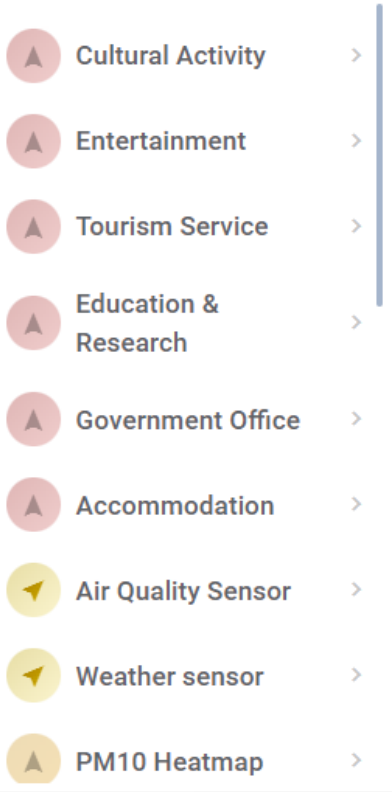








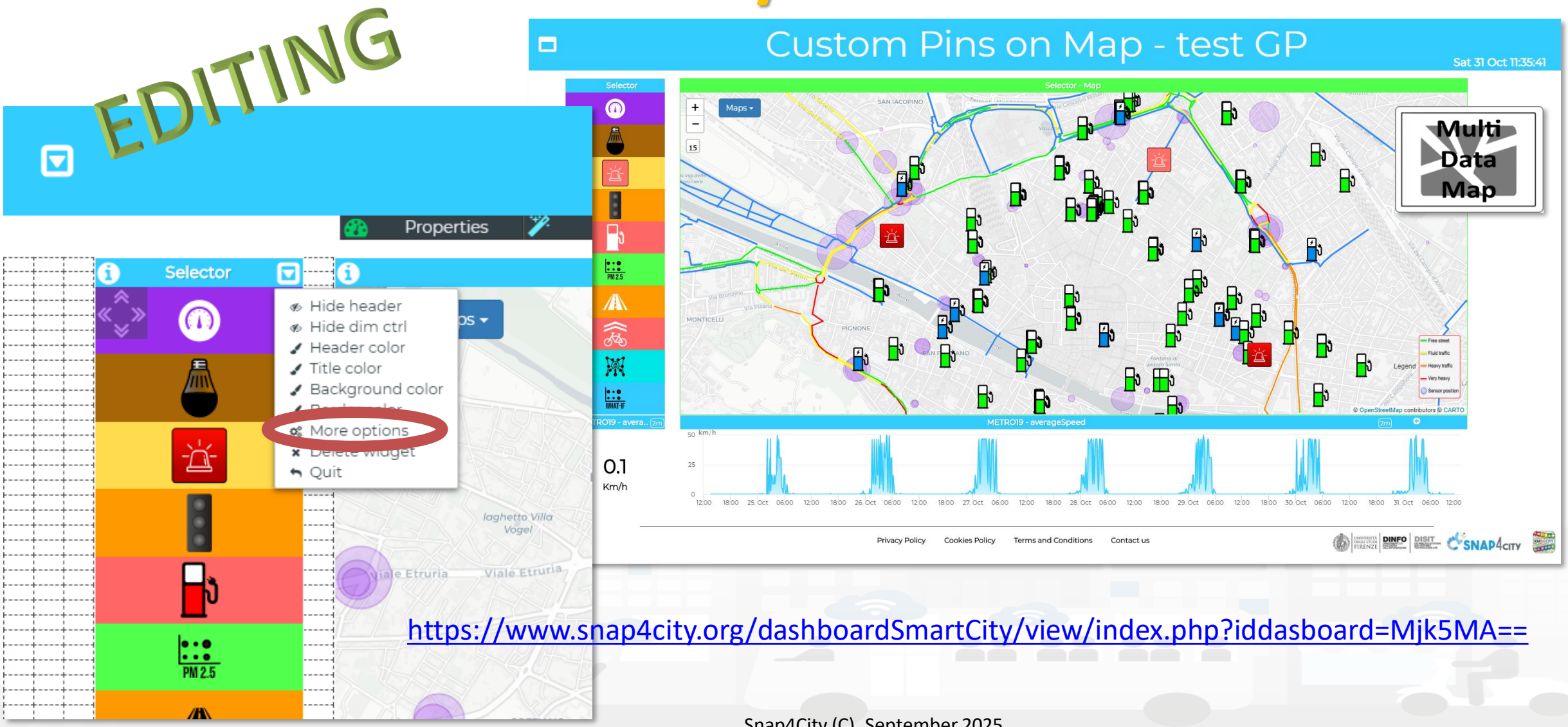




- **Different styles**
  - Icon and Text menu
  - Custom Menu Icon
  - Icon Menu buttons
  - Etc.
- **Features**
  - Removable header
  - Colours custom
  - Transparencies
  - Mixed modalities
- **Note:**
  - Manus can be realized also with a set of Buttons

A Selector is a Map Controller

Custom Dynamic Pins

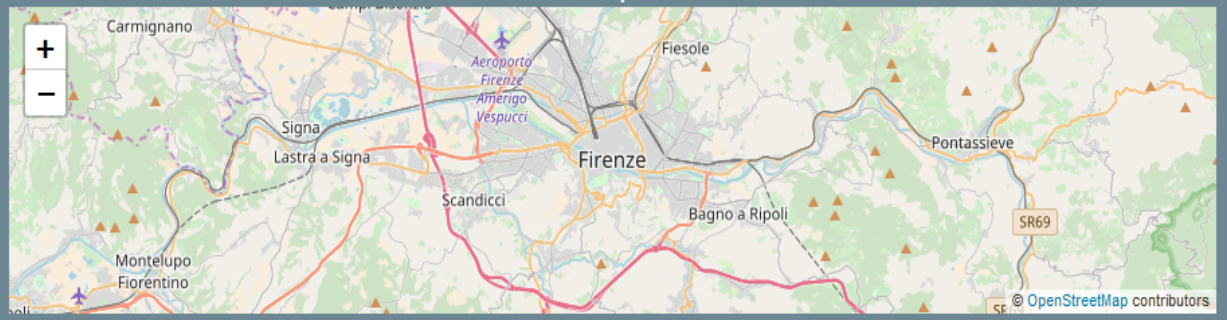


https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=Mjk5MA==

Wizard

Dashboard features | Data and widgets | [illegible]

Map



Single data widgets



Multi data widgets



Data sources

All selected (10)	All selected (55)	All selected (776)	All selected (315)		All selected (47)				All selected (2)
High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Last Dat	[illegible]	Last Check	Ownership
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Vecchio	2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Vergemoli	2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		[illegible]chiano	2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		[illegible]aiano	2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Vaglia	2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Vagli sotto	2018-07-08 16:00:18	public
Special Widget	**Environment**	**Weather Forecast**		**Previ_Meteo**	**special weather**		**Vagli di sotto**	**2018-07-08 16:00:18**	**public**
Special Widget	Environment	Weather Forecast		Previ_Meteo	special weather		Uzzano	2018-07-08 16:00:18	public

Hide columns | Res | Selected rows: 0 | Previous 1 2 3 4 5 ... 1081 Next | Search

Choosen data sources

High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Last Date	Last Value	Healthiness	Last [illegible]	Ownership	Remove

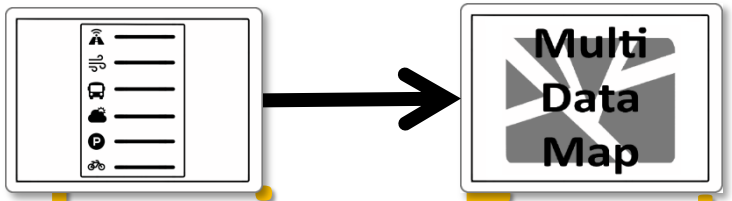
Previous Next | Search

Wizard

- Select the area of your interest: panning and zooming
- Select the
  - graphic aspect of your interest, or
  - High Level Type of your interest, or
  - Make a search if you a have a precise idea or
  - Act on filters: nature, subnature, type, name, value, date, health, owner, …
  - Combine them as you like
- Select the lines of your interest
- Then click on Next and get the Dashboard by wizard

RULE OF THUMB

Close



Dashboard Usage and recipe: Event map target

- **Selector to Show on Map a**
  - **category of Map positioned elements**
    - https://servicemap.disit.org/WebAppGrafo/api/v1/?selection=43.08694333811321;8.791809082031252;44.93758500391093;14.065246582031252&categories=Traffic_sensor&maxResults=0&maxDists=0.1&text=&model=&value_type=&format=json
    - https://servicemap.disit.org/WebAppGrafo/api/v1/?queryId=e5f39066cd68ffe259ed8877bcee222b&format=json
  - **Entity by Model**
    - https://www.disit.org/superservicemap/api/v1?selection=59.36535064975547;13.457822799682619;59.39031474260852;13.566999435424806&model=SmartLightCapelon&format=json
  - **Single Entity**
    - https://servicemap.disit.org/WebAppGrafo/api/v1/?serviceUri=http://www.disit.org/km4city/resource/iot/orionFirenze2/Firenze/SHT20lab_new&format=json&fromTime=3-day
  - **Heatmap among many**
    - https://wmsserver.snap4city.org/geoserver/Snap4City/wms?service=WMS&layers=Florence_PM10
  - **Traffic flow**
    - https://wmsserver.snap4city.org/geoserver/Snap4City/wms?service=WMS&layers=FirenzeFIPILITrafficRealtime&trafficflowmanager=true
    - https://firenzetraffic.km4city.org/trafficRTDetails/roads/read.php
  - **Origin Destination Map**
    - https://odmm.snap4city.org/api/get?precision=communes&from_date=&organization=Toscana&inflow=True&longitude=11.255751&latitude=43.769710&od_id=mobile_Toscana_1000&perc=True
- **Events which are also PIN on map**

- **Il Service URI as the unique identifier of the Entity**
  - **http://www.disit.org/km4city/resource/iot/orionUNIFI/DISIT/METRO632**

MoreOptions (below part)

Specific widget properties

Map widgets Selector Ma

Active rows font color rgba(0,0,0,1)

Icon/Text Mode Icon Only

Map Pin Icon Pin Icon

Default	Symbol mode	Symbol choice	Symbol preview	Symbol color	Description	Query	Color1	Color2	Data widgets	Default View Mode	Map Icon color	Alternate View Mode	Variable Name	Order	
Yes	Auto				Traffic Bubbl...	https://se...	rgba(1!	rgba(1!	Nothing se			Bub	vehicleFl	1	✖
No	Auto				Psvgb_X-val3	https://se...	rgba(1(	rgba(1(	METRO19	Pir		Cus	val3	2	✖
No	Auto				Psvgb_X-val1	https://se...	rgba(2!	rgba(2!	METRO19	Pir		Cus	val1	3	✖
No	Auto			rgba((	Psvgb_X-val4	https://se...	rgba(2!	rgba(2!	METRO19	Pir		Cus	val4	4	✖
No	Auto			rgba(!	recharging st...	https://se...	rgba(2!	rgba(2!	METRO19		Symbol (	Cus	stationSt	5	✖
No	Auto	PM 2.5	PM 2.5		PM2_5 Heatmap	https://wm...	rgba(8:	rgba(8:	Nothing se					Empty	✖
No	Auto				Traffic Flow	https://fi...	rgba(2!	rgba(2!	Nothing se					Empty	✖
No	Auto				Cycling Paths	https://se...	rgba(2!	rgba(2!	Nothing se					Empty	✖
No	Auto				Scenario	/scenario/	rgba(0,	rgba(1!	Nothing se					Empty	✖
No	Auto	WHAT-IF	WHAT-IF		What-IF	/whatif/	rgba(5:	rgba(	Nothing se					Empty	✖

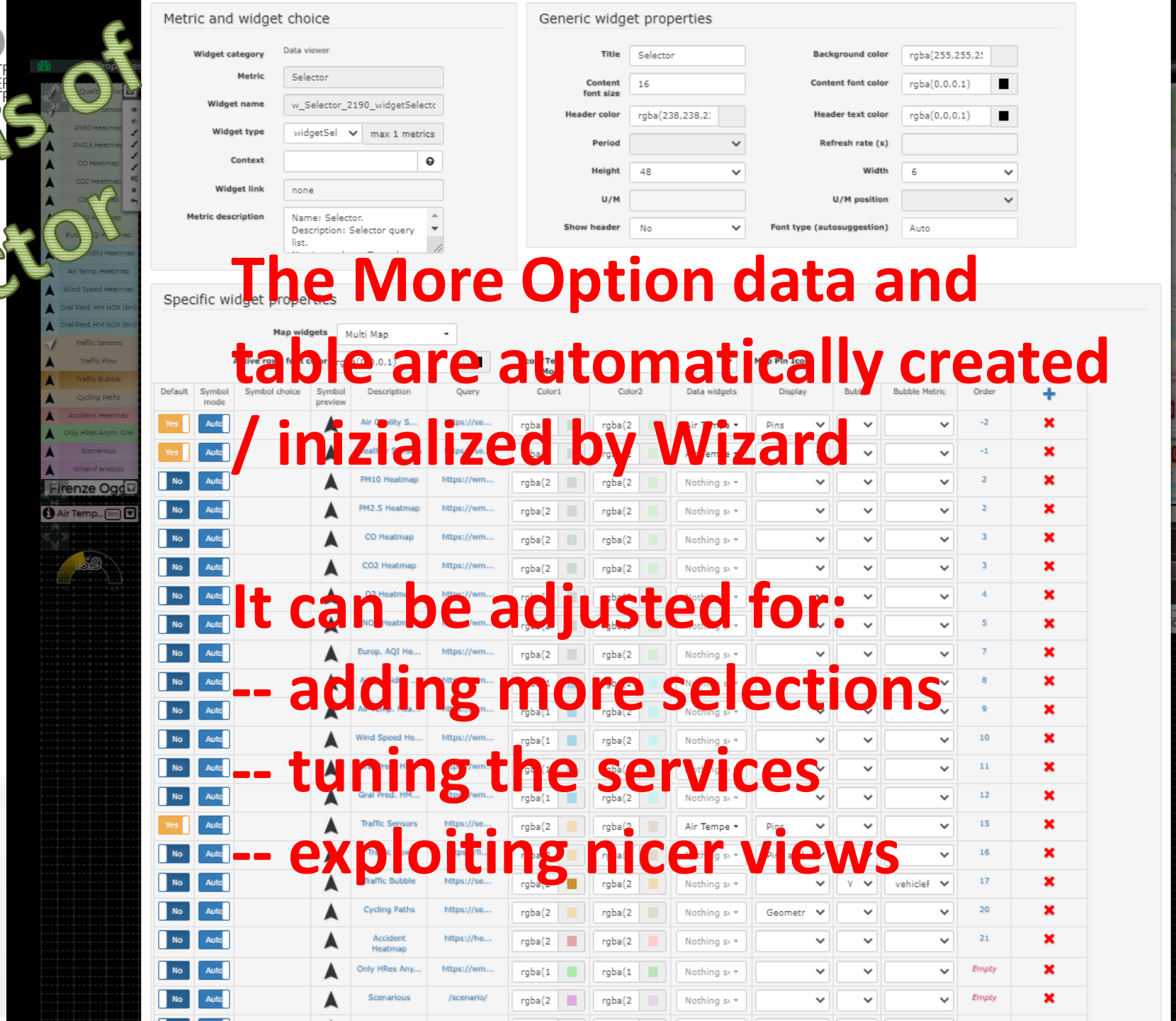
You may need to save and reopen the MoreOptions more than once to pass on different kinds of configurations

UNIVERSITÀ DEGLI STUDI FIRENZE

DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

More Options of the Selector

- Setting:
  - Heatmaps
  - Bubbles
  - Icons
  - Custom
  - Traffic flow
  - Cycling path
  - What-if
  - Etc. etc.



The Selector is the Map Controller

MoreOptions

Specific widget properties

Selector - Map

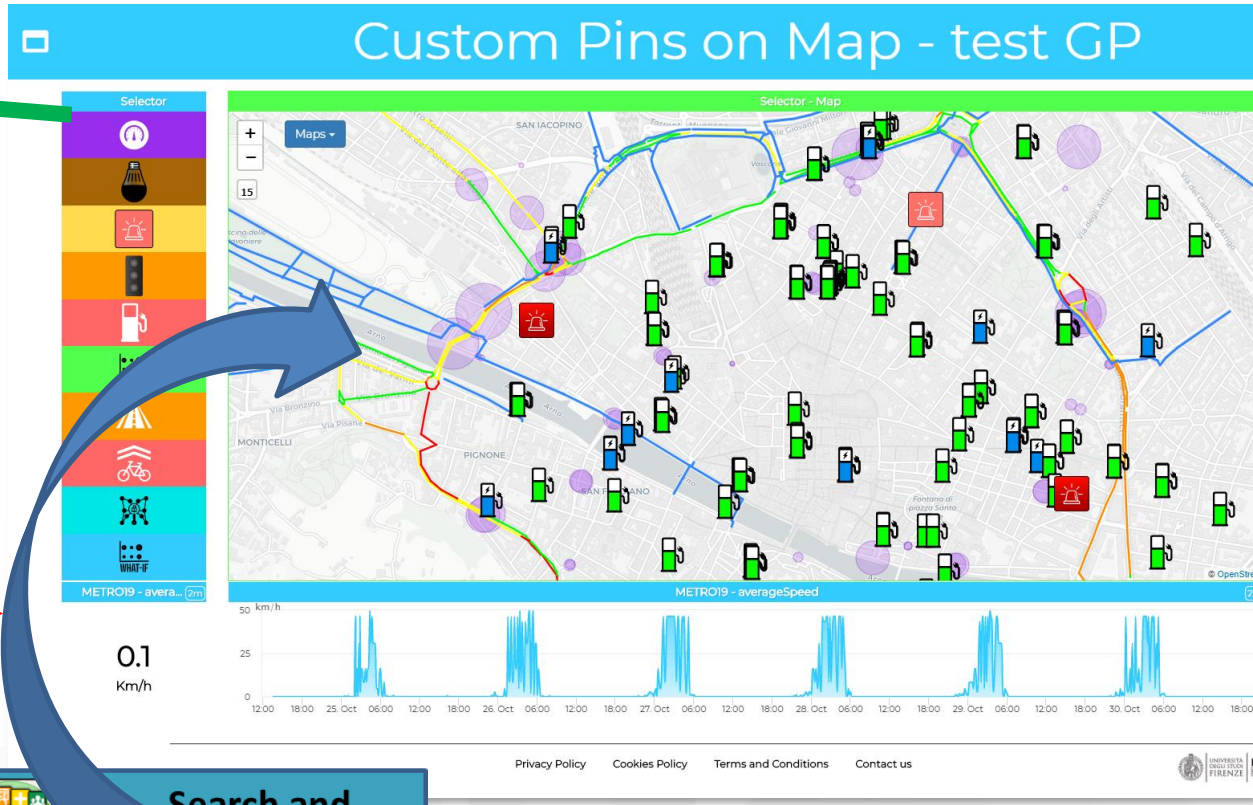
Active rows font color rgba(0,0,0,1)

Icon/Text Mode

Default	Symbol mode	Symbol choice	Symbol preview	Symbol color	Description	Query
Yes	Auto				Traffic Bubbl...	https://se...
No	Auto				Psvgb_X-val3	https://se...
No	Auto				Psvgb_X-val1	https://se...
No	Auto			rgba((	Psvgb_X-val4	https://se...
No	Auto			rgba((	recharging st...	https://se...
No	Auto				PM2_5 Heatmap	https://wm...
No	Auto				Traffic Flow	https://fi...
No	Auto				Cycling Paths	https://se...
No	Auto				Scenario	/scenario/
No	Auto				What-IF	/whatif/

More Options Edit

- Query ID
- REST CALL
- Command
- Heatmap



Knowledge base
Semantic reasoners

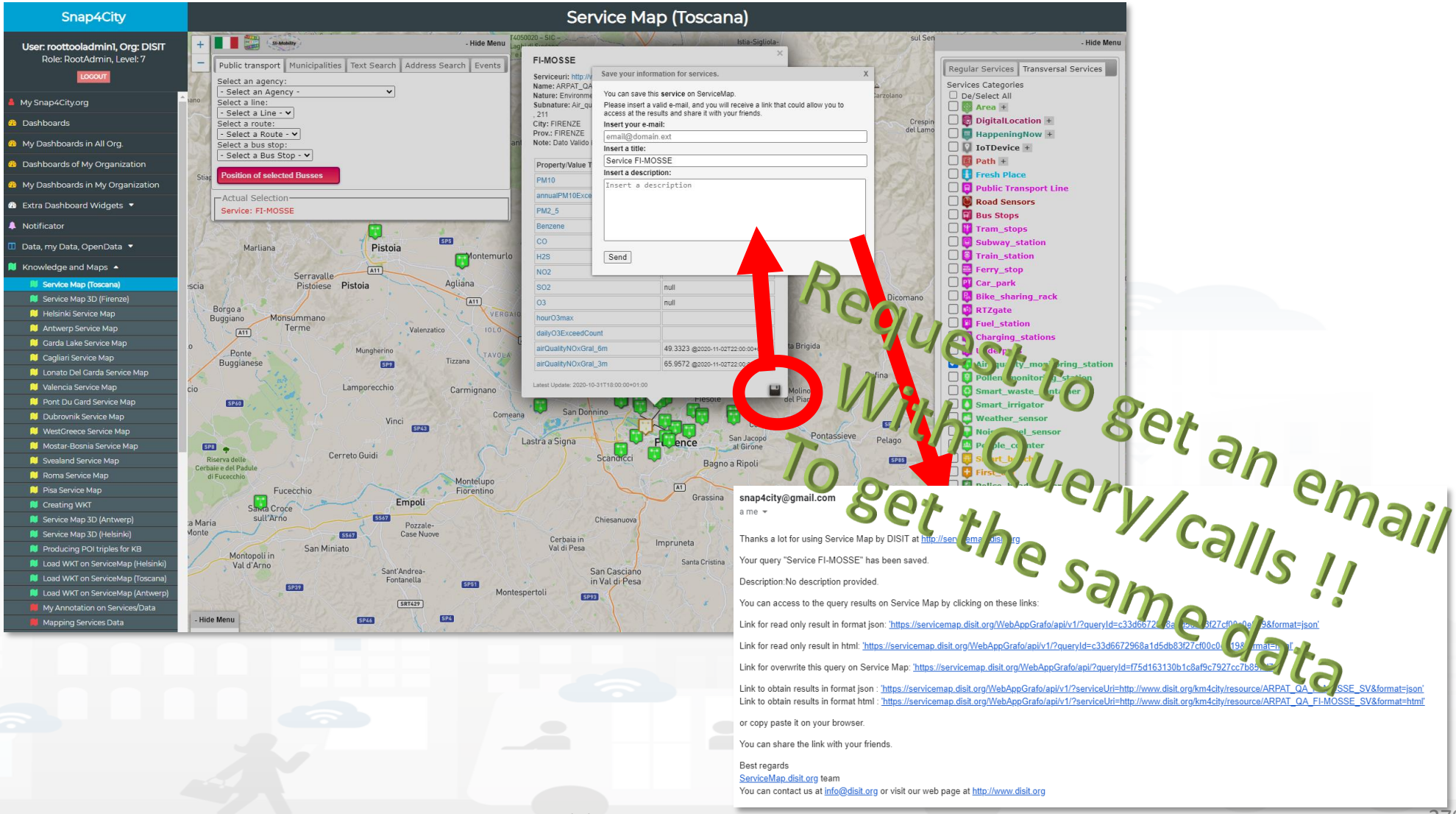
Indexing and aggregating
Elastic search

Search and Query, Smart City API
Facet, semantic search

- ***The Query is produced by Wizard but can be manually changed***

How to Get the «Query» used in More Options (1)

- **Query ID**
  - **only Read and Read/Write of the query**
- **REST CALL of the Smart City APIs**
  - **JSON**
  - **HTML (do not use into MoreOptions)**



The example of email from ServiceMap

snap4city@gmail.com

a me

Thanks a lot for using Service Map by DISIT at http://servicemap.disit.org

Your query "Service FI-MOSSE" has been saved.

Description:No description provided.

You can access to the query results on Service Map by clicking on these links:

Link for read only result in format json: 'https://servicemap.disit.org/WebAppGrafo/api/v1/?queryId=c33d6672968a1d5db83f27cf00c0e919&format=json'

Link for read only result in html: 'https://servicemap.disit.org/WebAppGrafo/api/v1/?queryId=c33d6672968a1d5db83f27cf00c0e919&format=html'

Link for overwrite this query on Service Map: 'https://servicemap.disit.org/WebAppGrafo/api/?queryId=f75d163130b1c8af9c7927cc7b857d70'

Link to obtain results in format json : 'https://servicemap.disit.org/WebAppGrafo/api/v1/?serviceUri=http://www.disit.org/km4city/resource/ARPAT_QA_FI-MOSSE_SV&format=json'
Link to obtain results in format html : 'https://servicemap.disit.org/WebAppGrafo/api/v1/?serviceUri=http://www.disit.org/km4city/resource/ARPAT_QA_FI-MOSSE_SV&format=html'

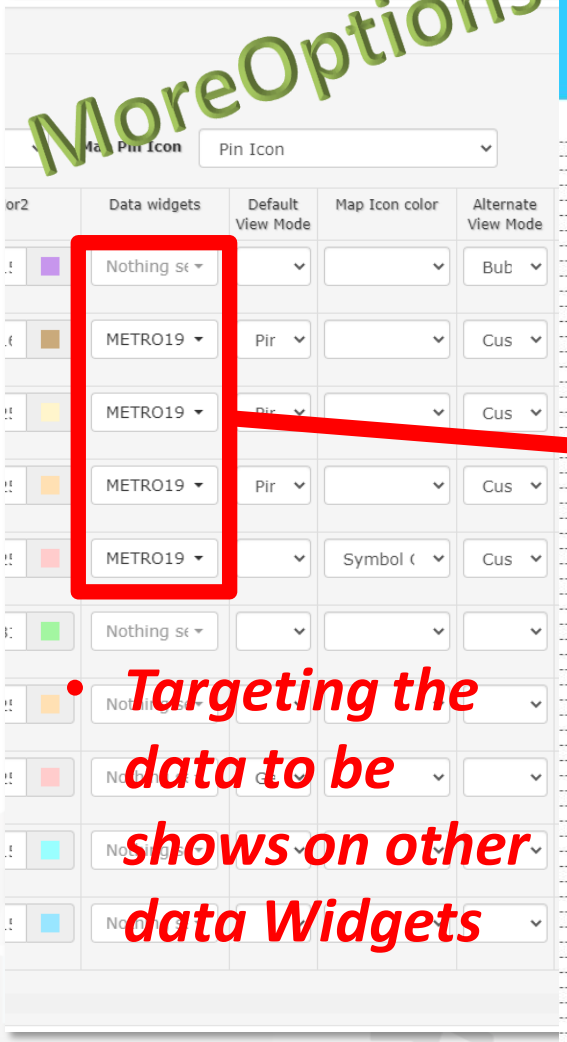
or copy paste it on your browser.

You can share the link with your friends.

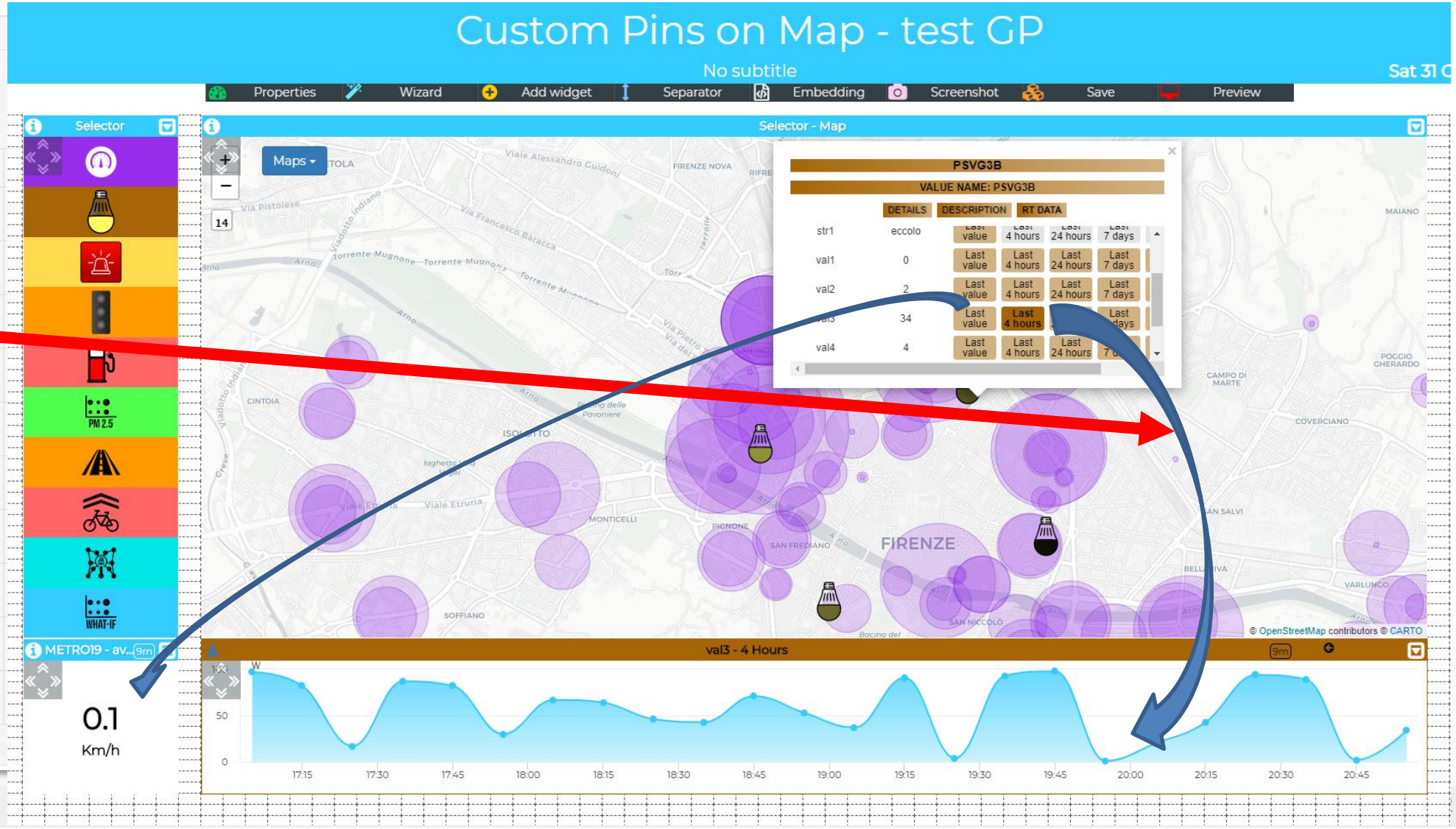
Best regards
ServiceMap.disit.org team
You can contact us at info@disit.org or visit our web page at http://www.disit.org

The Selector is the Map Controller

MoreOptions

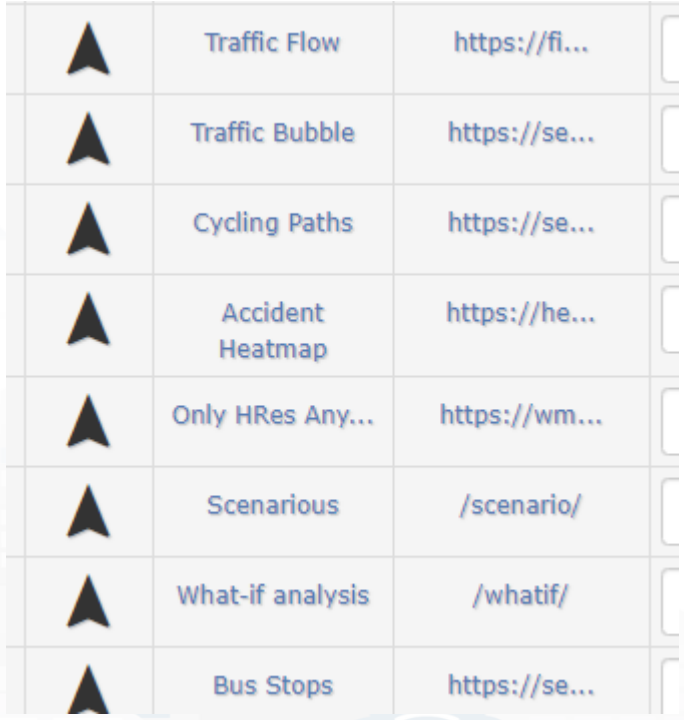


- *Targeting the data to be shows on other data Widgets*



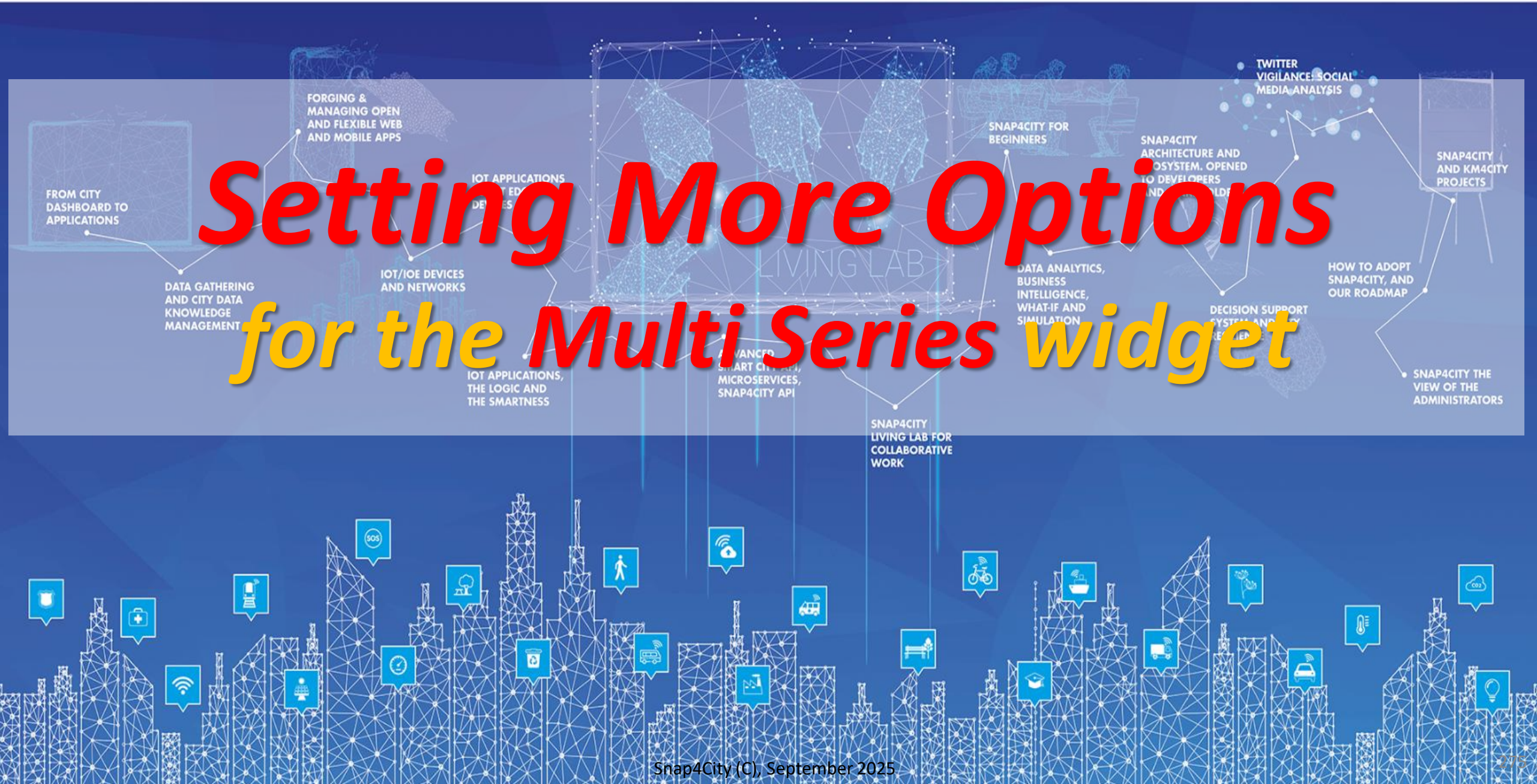
Activating Special Tools on Multi Data Map

- Special Data Rendering tools on multiDataMap can be activated from the Selector and/or from CSBL:
  - Requesting the visualization of HLT: traffic flow, heatmaps, VectorField, ODM, trajectories, etc.
- Special Tools can be activated from the Selector only as:
  - **/scenario/** → to active a simple blocking area for what-if analysis and routing
  - **/whatif/** → to activate the What-If analysis related to dynamic routing based on Graphhopper.
  - **scenary** → to activate the new Scenary Editor on road graph



What you can do with advanced tools

- Basic Scenario editor
  - Single and multiple blocked areas, which can be share among users
- What-if analysis tool
  - Ready to use tools for exploiting Basic Scenarios as blocked areas and simulating/computing in real time routing, in different traffic conditions
- Advanced Scenario Editor
  - Create complex and full detailed scenario, with road graph, sensors, of any kind, even new roads, restrictions, parameters, etc.
  - Exploit these scenarios to create
    - Simulation
    - Business intelligence tools and visual/business analytic tools also working in eal time
    - Traffic flow reconstruction
    - Traffic infrastructure optimisation
    - Traffic light plan optimization
    - Pedestrian analysis and simulation
    - Match demand vs Offer, simulation and analysis
    - Computation of SUMI, SUMP, 15 Min City Indexes, etc.
    - Heatmaps computation
    - Etc. etc.

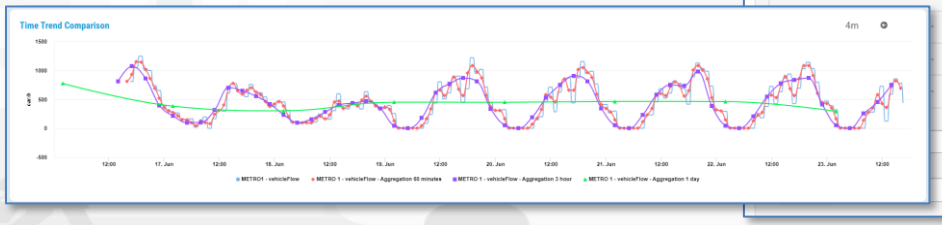


Setting More Options for the Multi Series widget

Setting Multiseries More Options

- Stacked/non stacked, shaded
- Linear / Log
- Typical time trend
- ServiceURI: http://www.disit.org/km4city/resource/iot/orionUNIFI/DISIT/METRO1
- Query: https://servicemap.disit.org/WebAppGrafo/api/v1/?serviceUri=http://www.disit.org/km4city/resource/iot/orionUNIFI/DISIT/METRO1&fromTime=7-day&valueName=vehicleFlow&aggregation=60-minute
- Query ID, MyKPI ID etc.



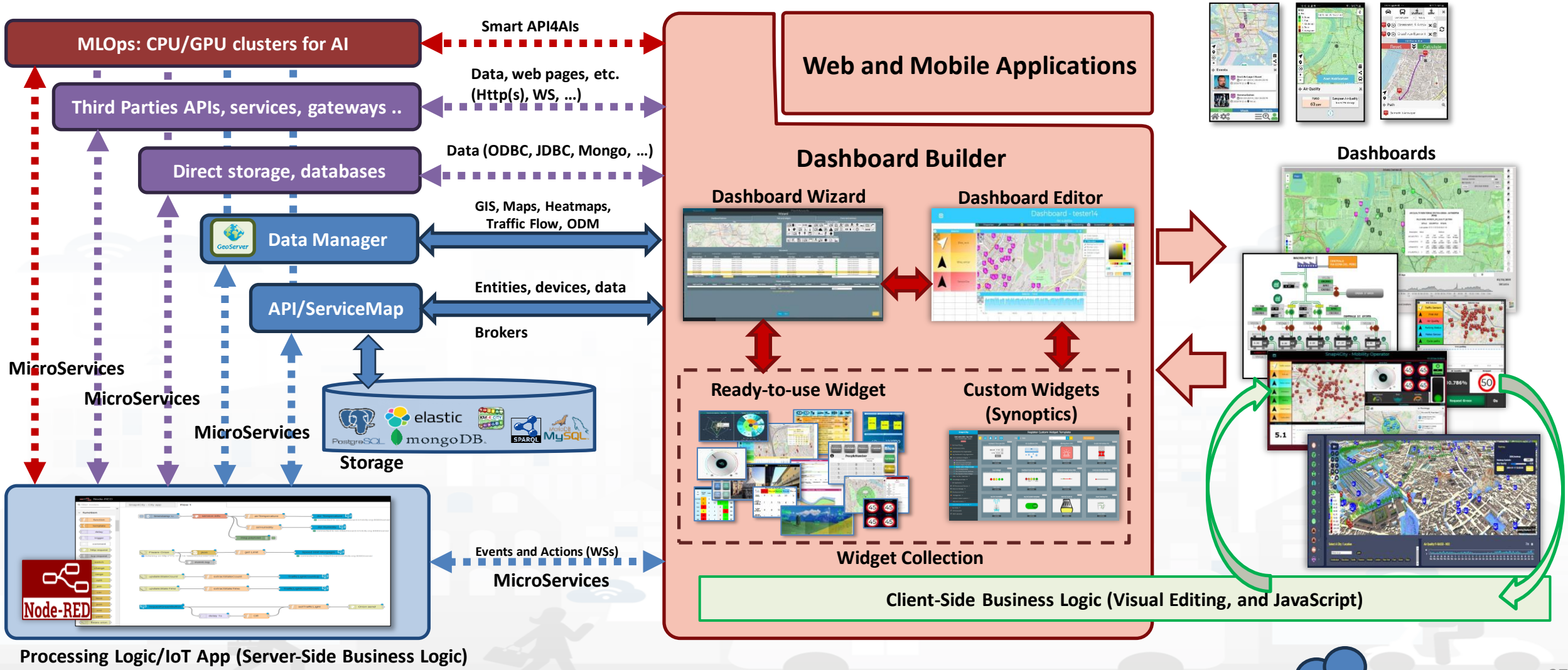




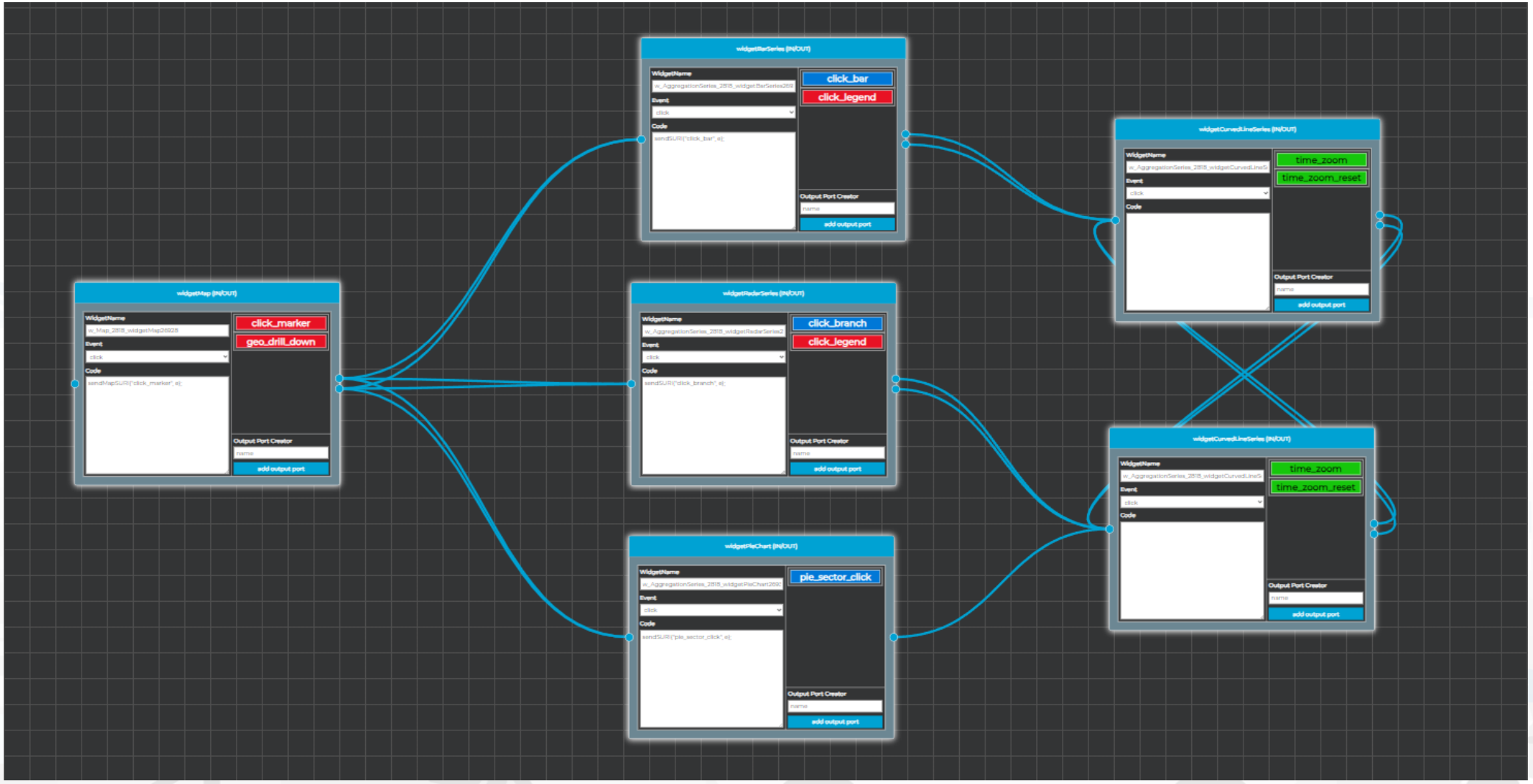
Dashboards/Views + CSBL Editor

Business Intelligence for beginners

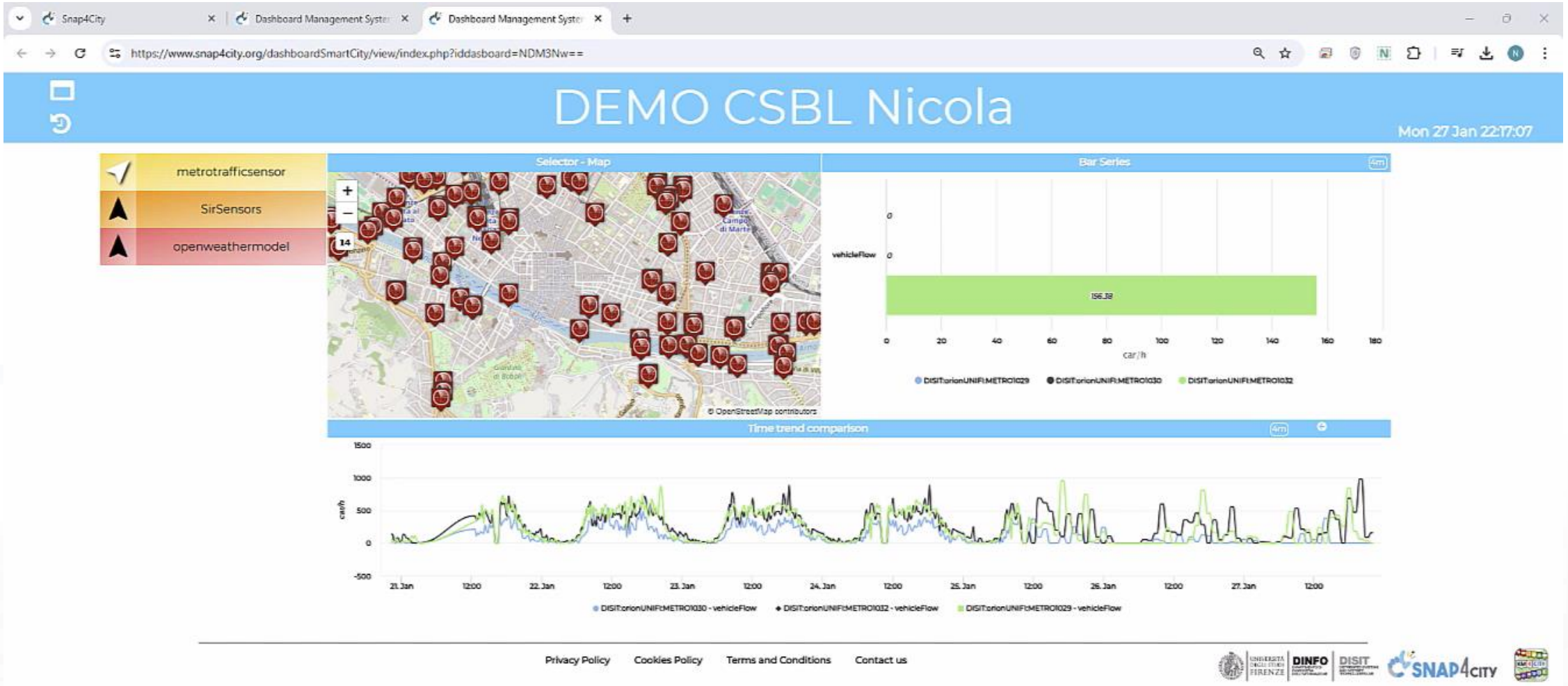
How the Dashboards / Apps Exchange data (2024/8)



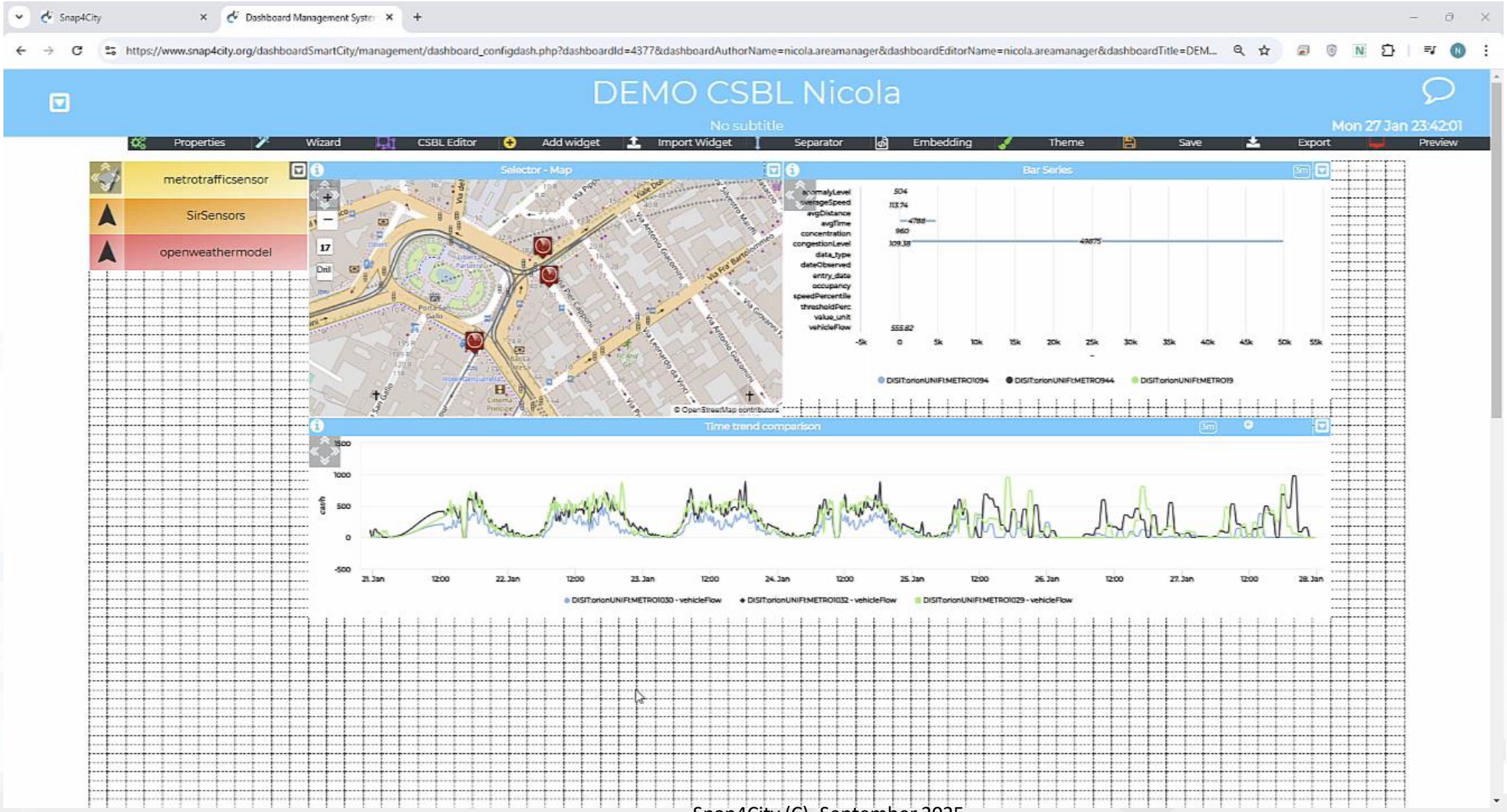
Visual programming for CSBL is coming soon



ITA VERSION


Snap4City
Dashboard Management Syste
Dashboard Management Syste
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=NDM3Nw==
DEMO CSBL Nicola
Mon 27 Jan 22:17:07
metrotrafficsensor
SirSensors
openweathermodel
Selector - Map
Bar Series
vehicleFlow
156.38
car/h
DISIT:orionUNIFI:METRO1029
DISIT:orionUNIFI:METRO1030
DISIT:orionUNIFI:METRO1032
© OpenStreetMap contributors
Time trend comparison
car/h
DISIT:orionUNIFI:METRO1030 - vehicleFlow
DISIT:orionUNIFI:METRO1032 - vehicleFlow
DISIT:orionUNIFI:METRO1029 - vehicleFlow
Privacy Policy
Cookies Policy
Terms and Conditions
Contact us

ITA VERSION

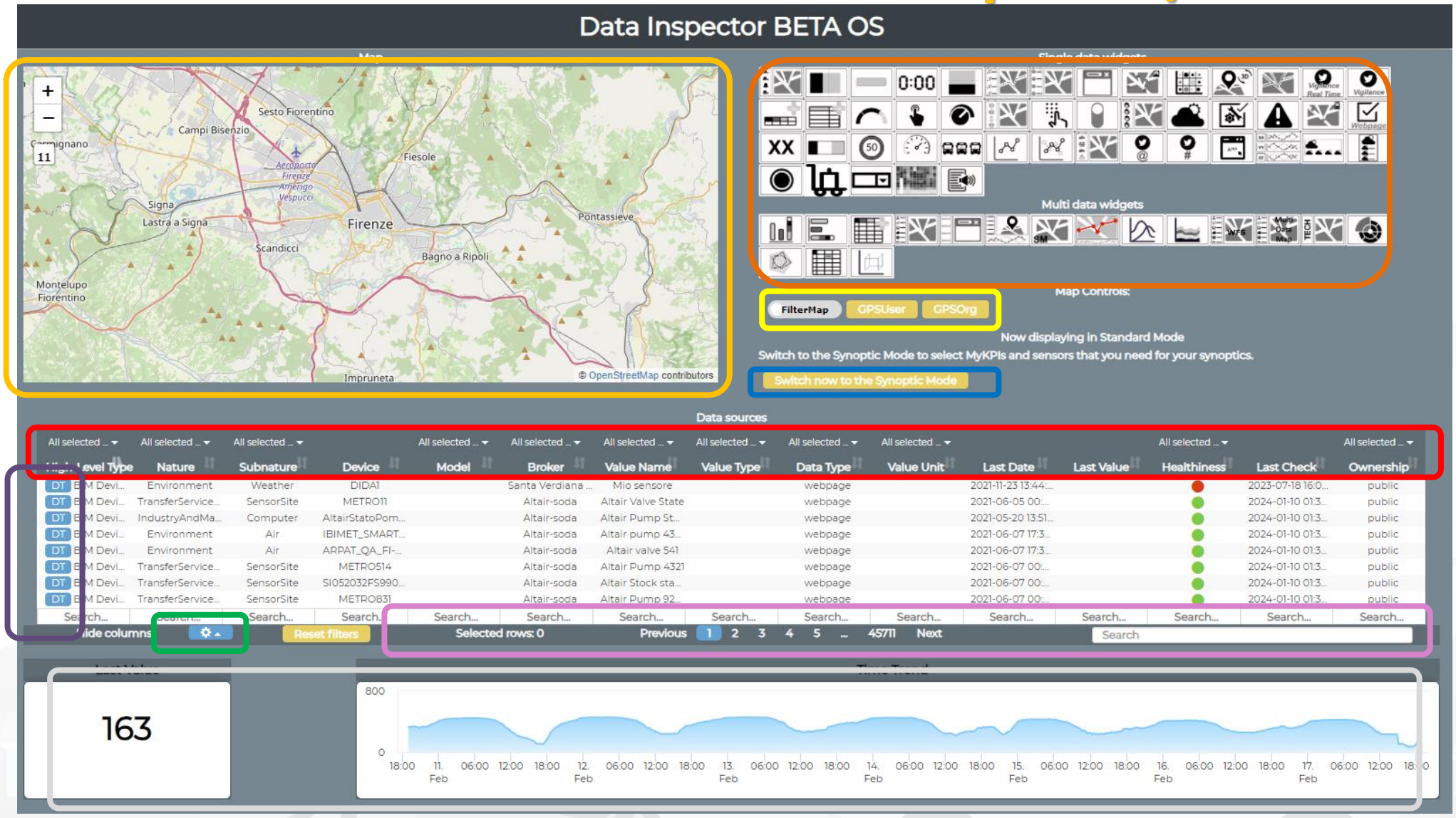

Snap4City
Dashboard Management Syste
https://www.snap4city.org/dashboardSmartCity/management/dashboard_configdash.php?dashboardId=4377&dashboardAuthorName=nicola.areamanager&dashboardEditorName=nicola.areamanager&dashboardTitle=DEM...
DEMO CSBL Nicola
No subtitle
Mon 27 Jan 23:42:01
Properties
Wizard
CSBL Editor
Add widget
Import Widget
Separator
Embedding
Theme
Save
Export
Preview
metrotrafficsensor
SirSensors
openweathermodel
Selector - Map
Bar Series
Time trend comparison
© OpenStreetMap contributors



Data Inspector/Wizard vs Data Processes Details

(some features are only accessible to *Admin roles)

New Data Inspector/Wizard



Filtering/Searching for individual fields (even for some fields not displayed as geographic coordinates)

Geographic Filtering

Text Search on all fields

Menu for choosing the fields to display in the table

View on Map(via PREVIEW)

Data and Trend visualization

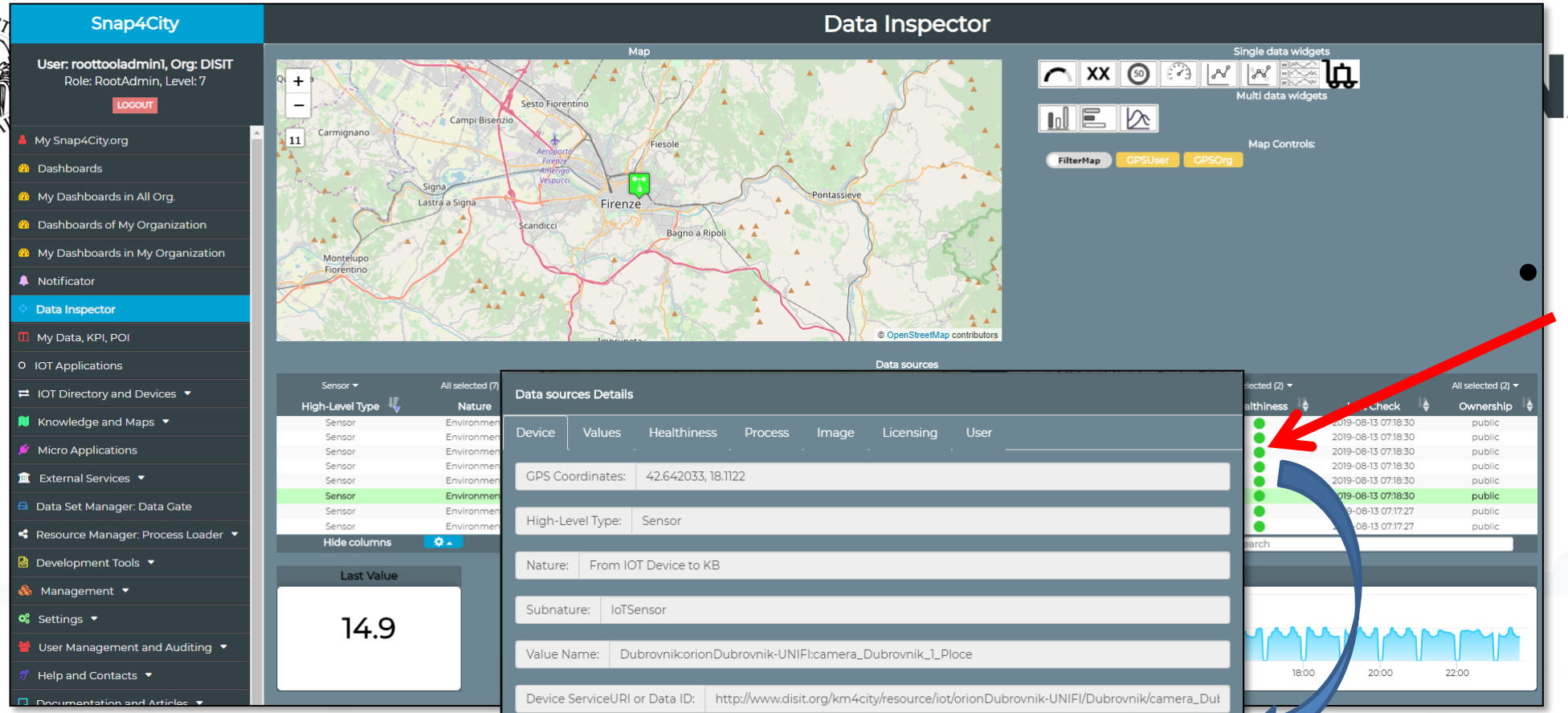
Opening Digital Twin

Pass to Synoptic mode

Select the graph representation

Advanced Features of the Data Inspector

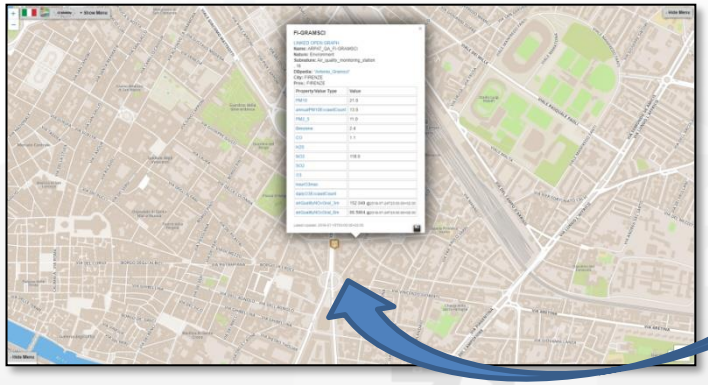
- Some features accessible only for the Owner and *Admin, such as:
  - Specific information on the basis of the High Level Type
  - Values connected to the data (structure of the single data)
  - Details regarding the ingestion process
  - Eventual image representing the City Entity, for example the sensor
  - Ownership (licensing) details regarding the data owner
- So that you can access on all of them in the Snap4City version if you install on premise.
- A part of these features can be activated for the Organization Managers, namely: «ToolAdmin» roles.

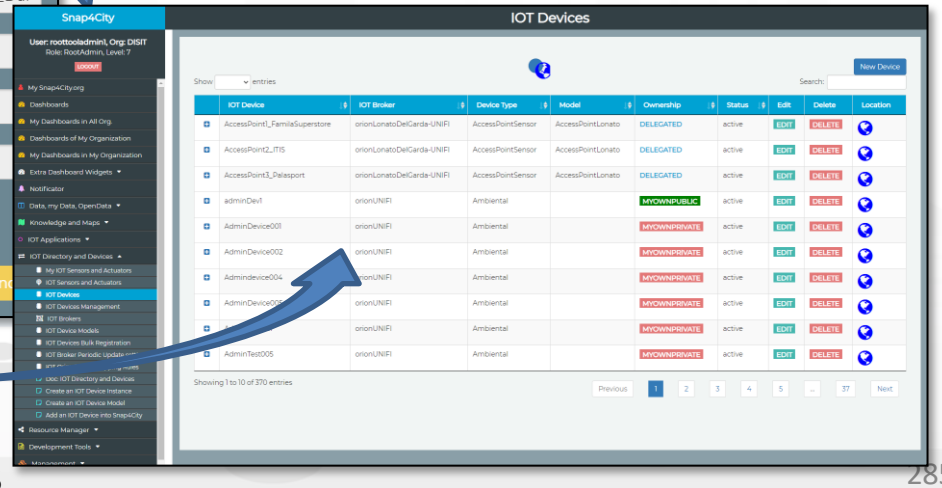


- Click with the mouse on it

HLT: Sensor

Knowledge Base view





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

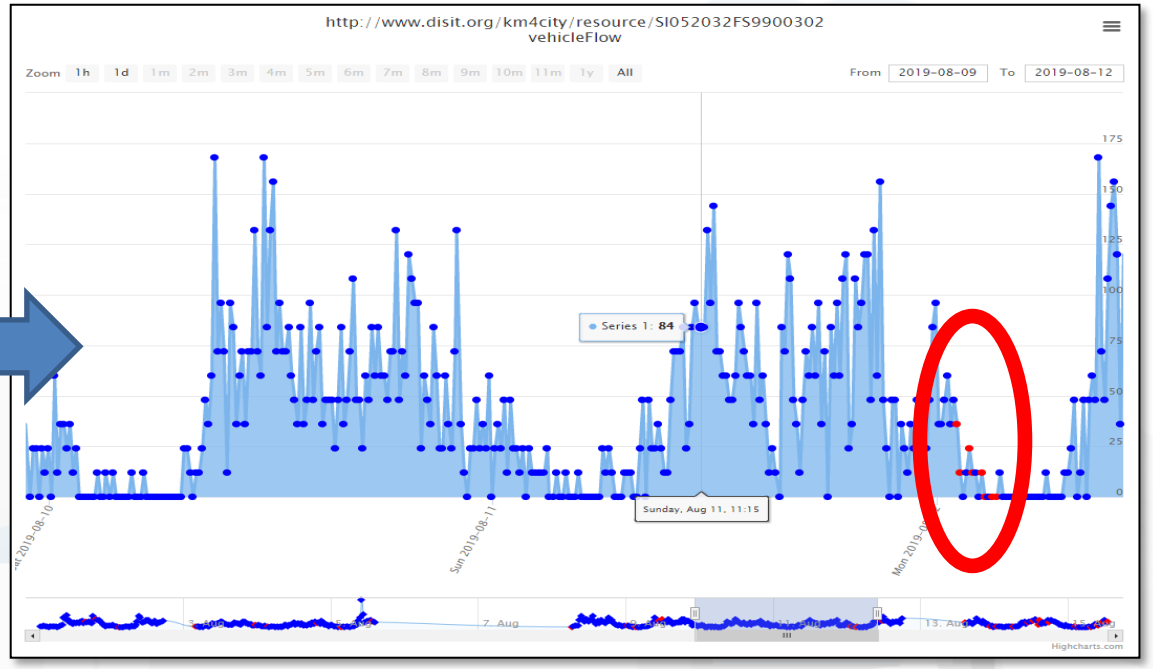
Device | Values | Healthiness | Process | Image | Licensing | User

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

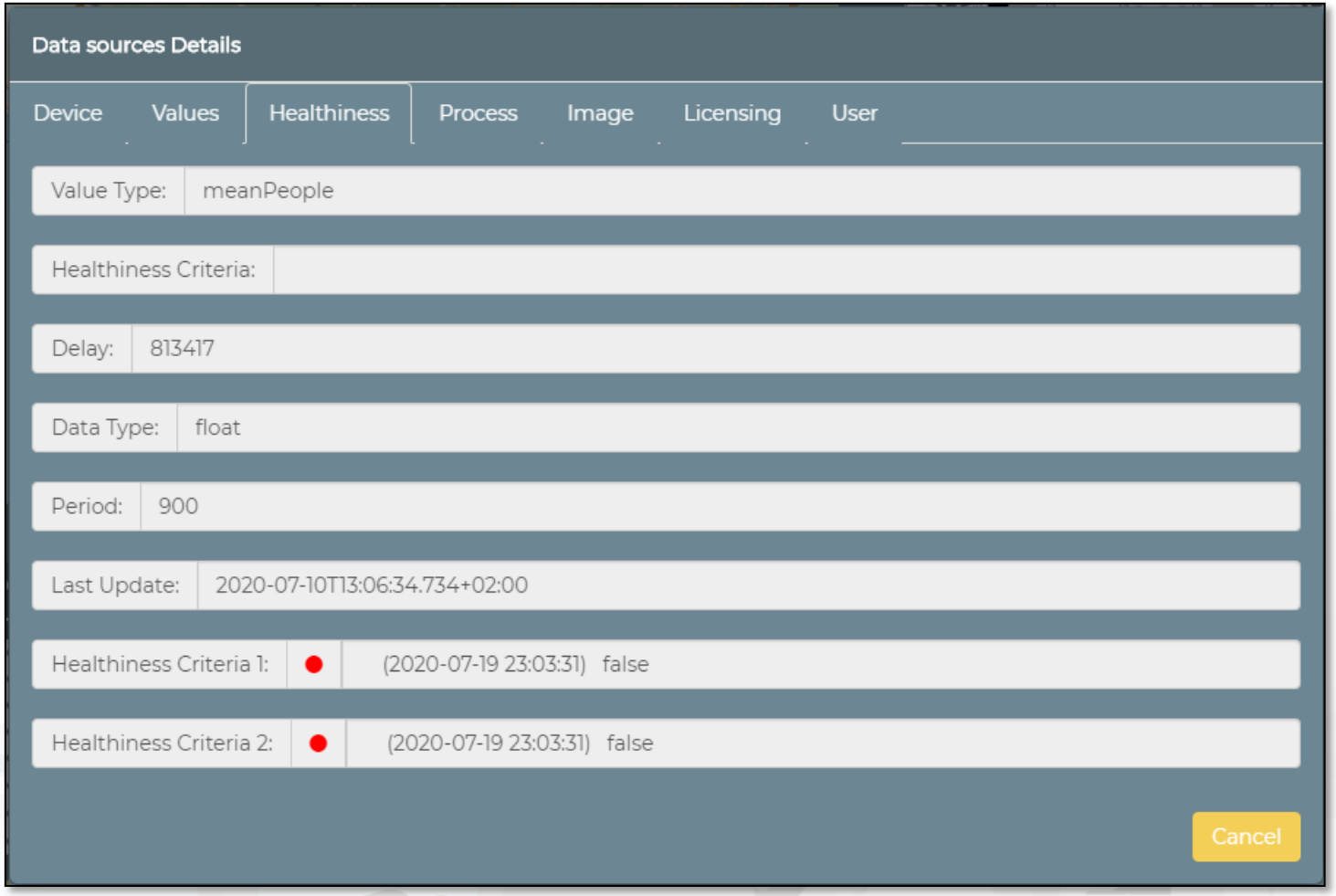
Last Value:

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



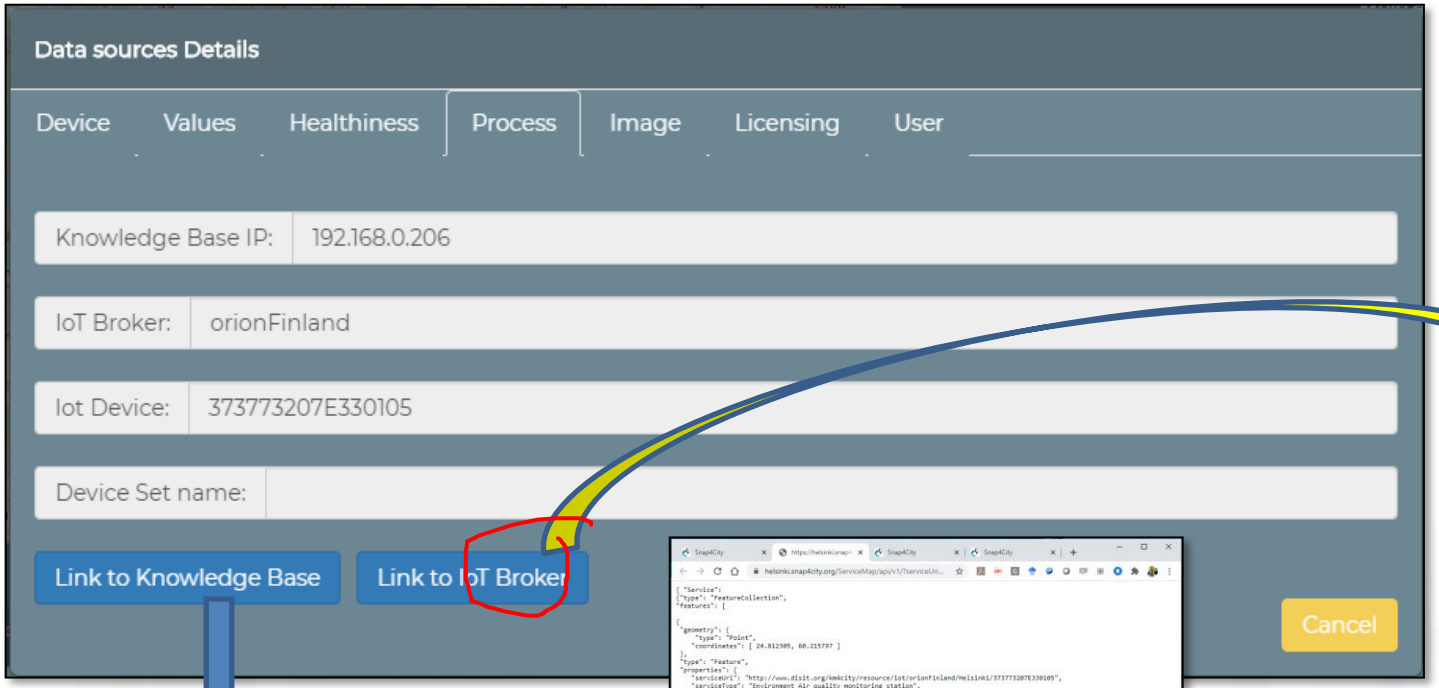
HLT: Sensor Healthiness

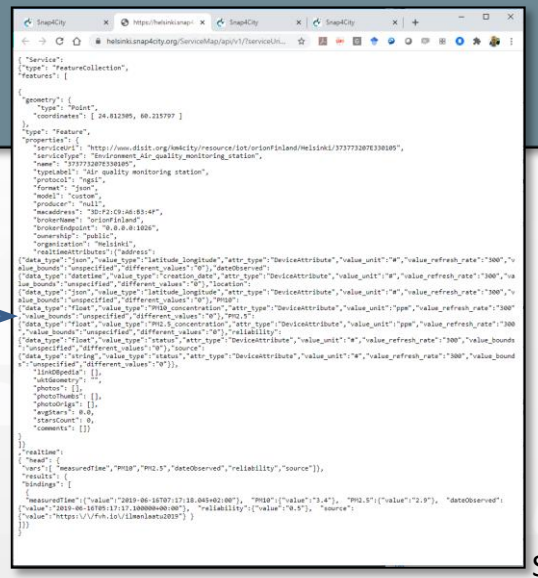


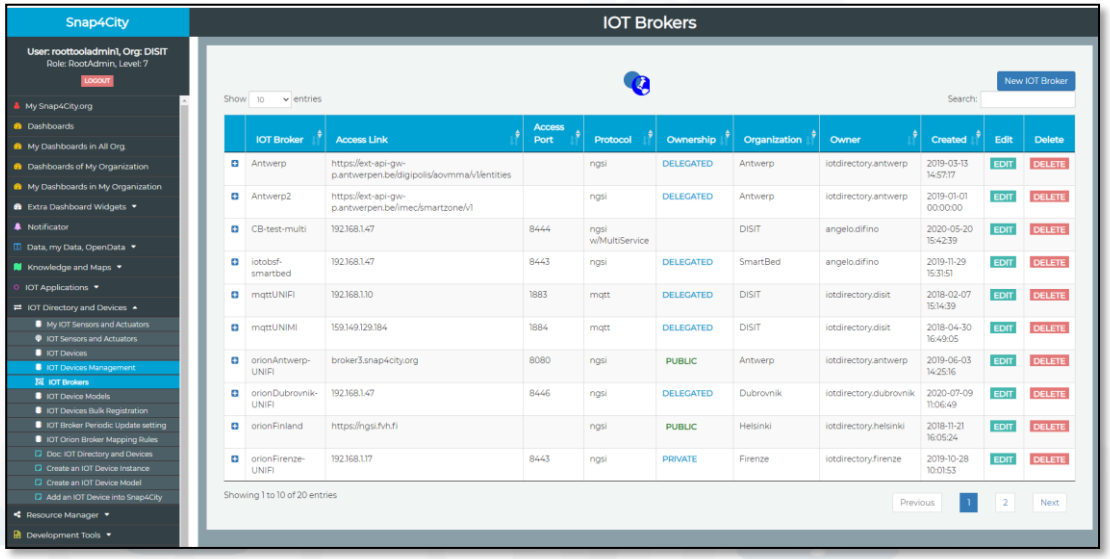
- Two different criteria
  - **H1**: at least an event i nthe last 24 hours
  - **H2**: machine learning for most of Sensors devices

Some functionalities are limited to certain roles

Details regarding the IOT Ingestion process



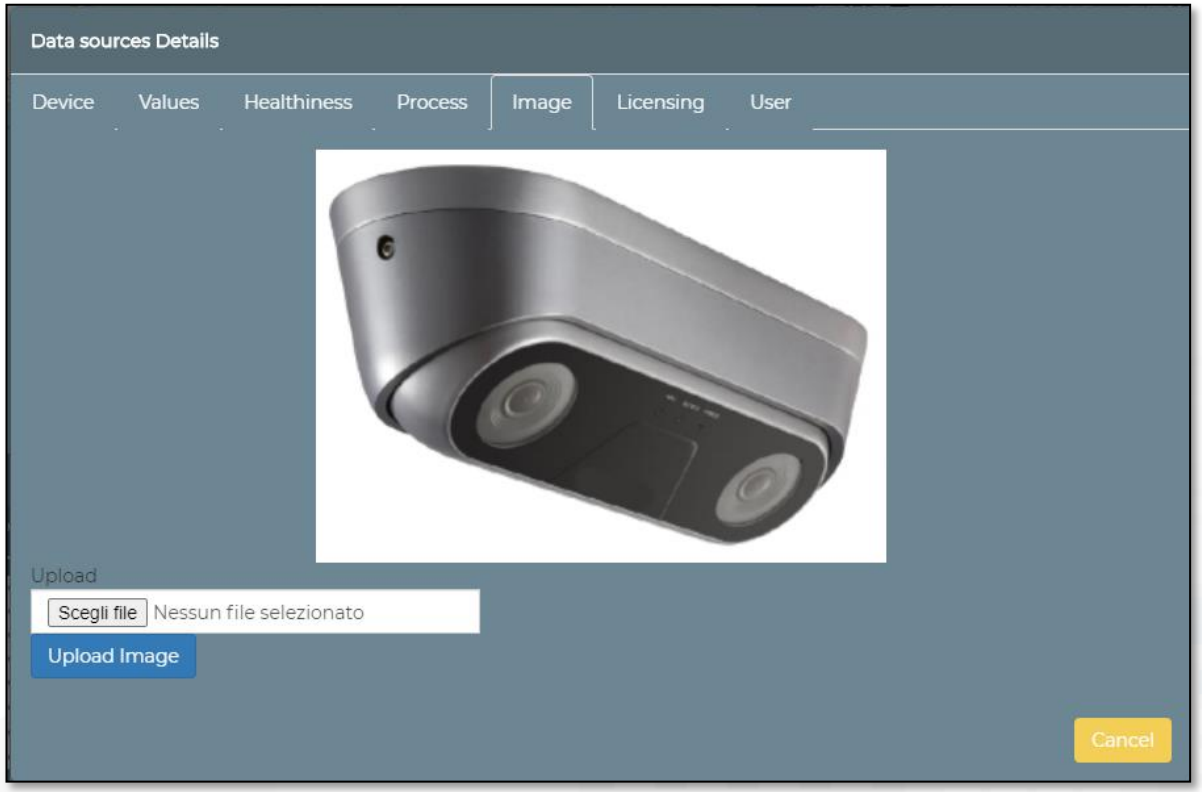


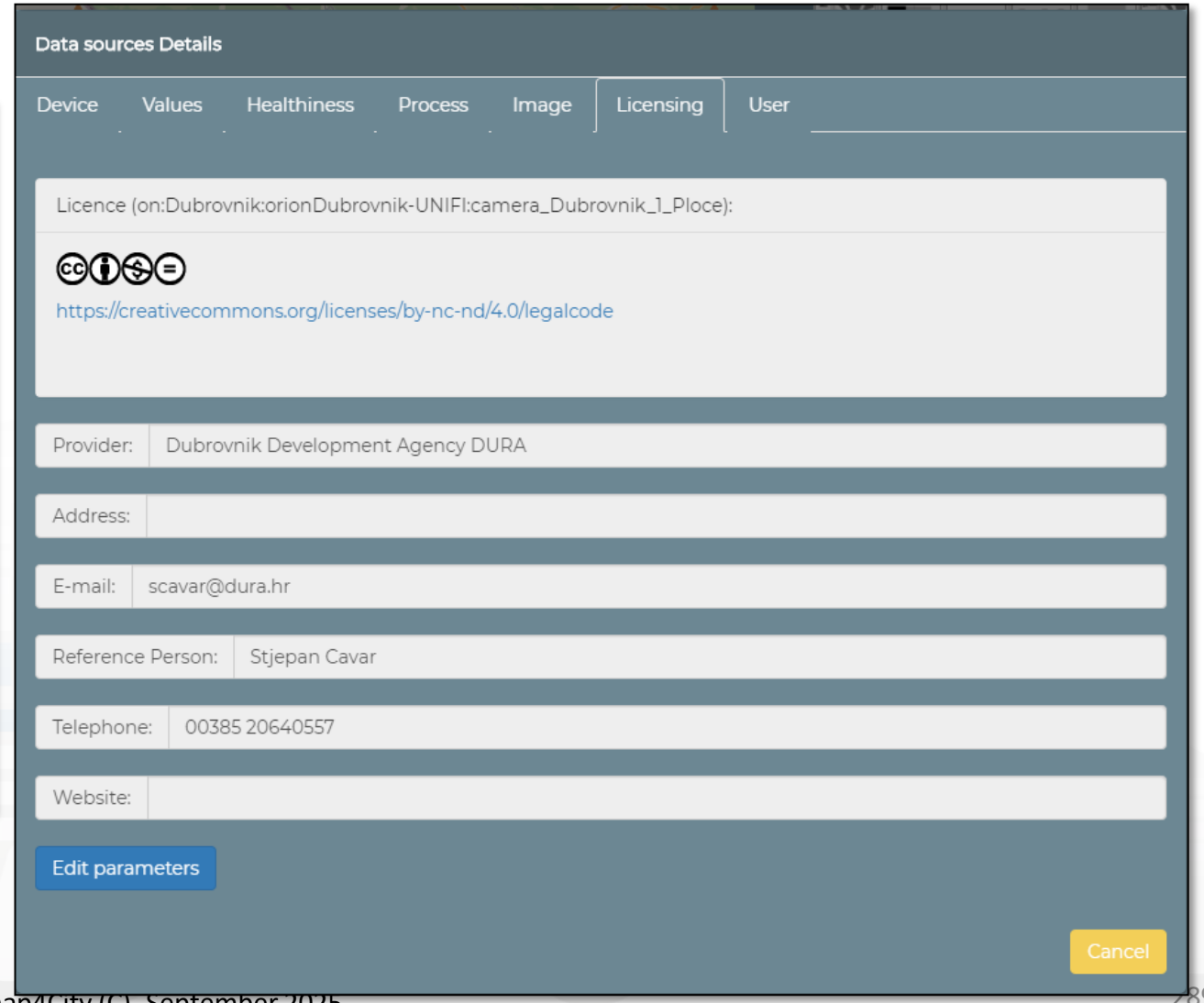


- For IOT Device data
- IOT Broker details

Some functionalities are limited to certain roles

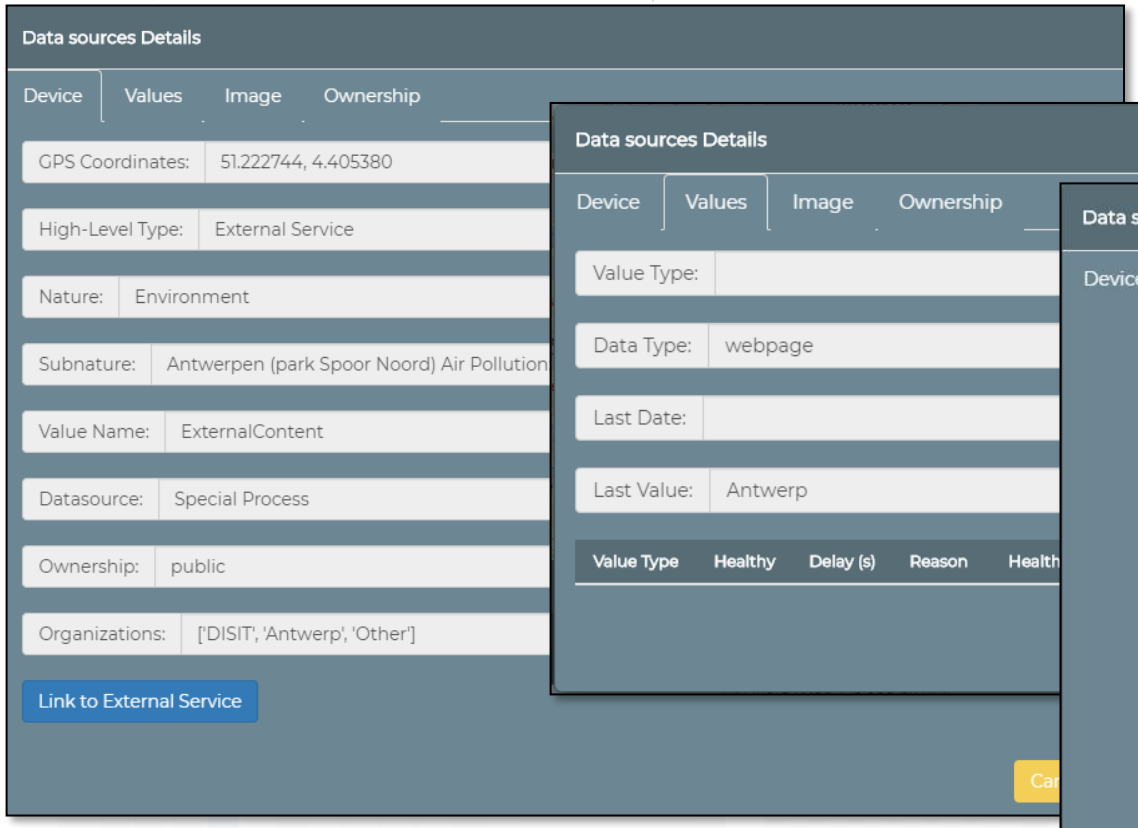
Image of the Devices and Licensing

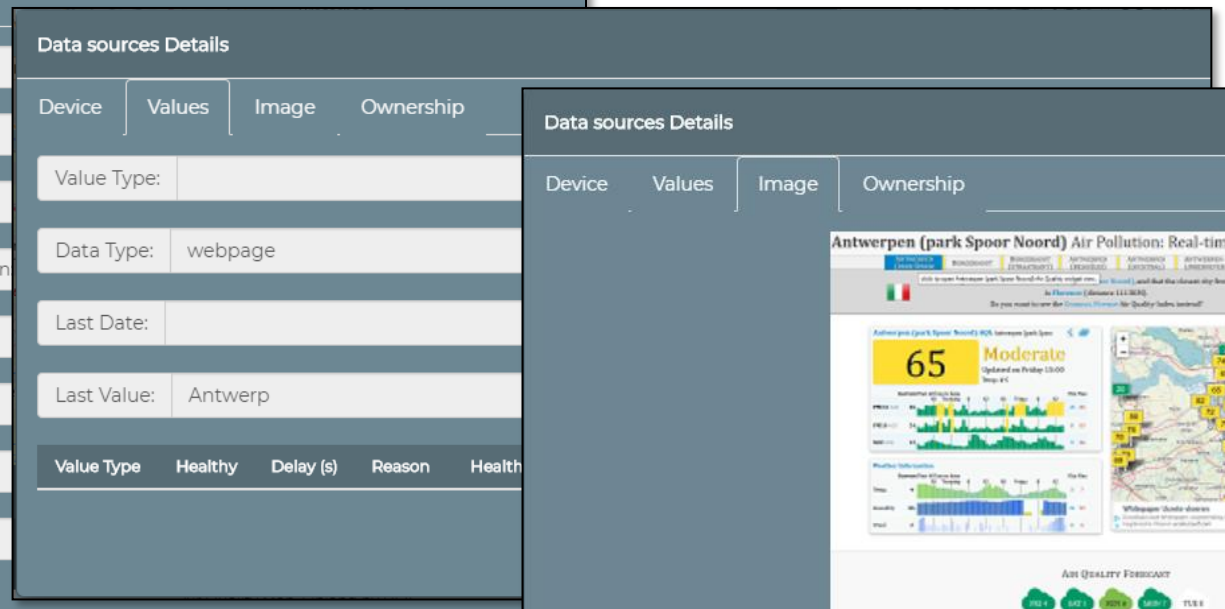


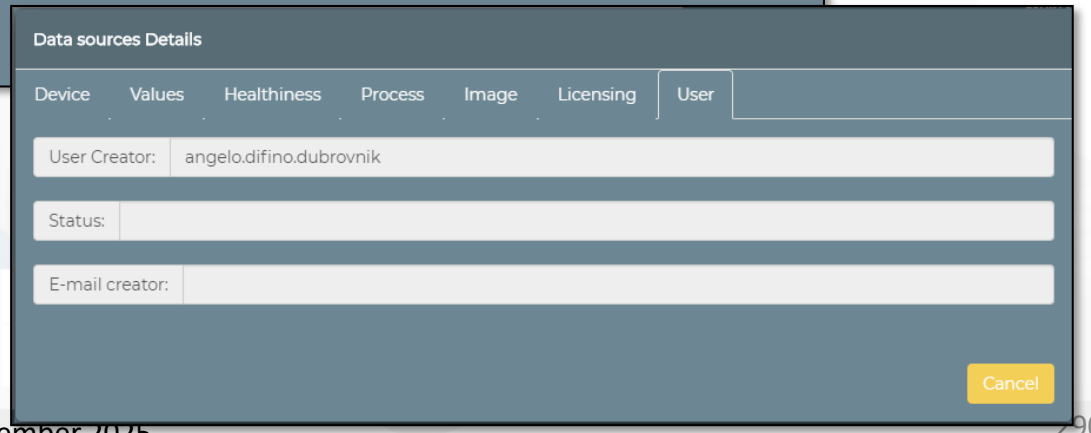


Some functionalities are limited to certain roles

HLT: External Service

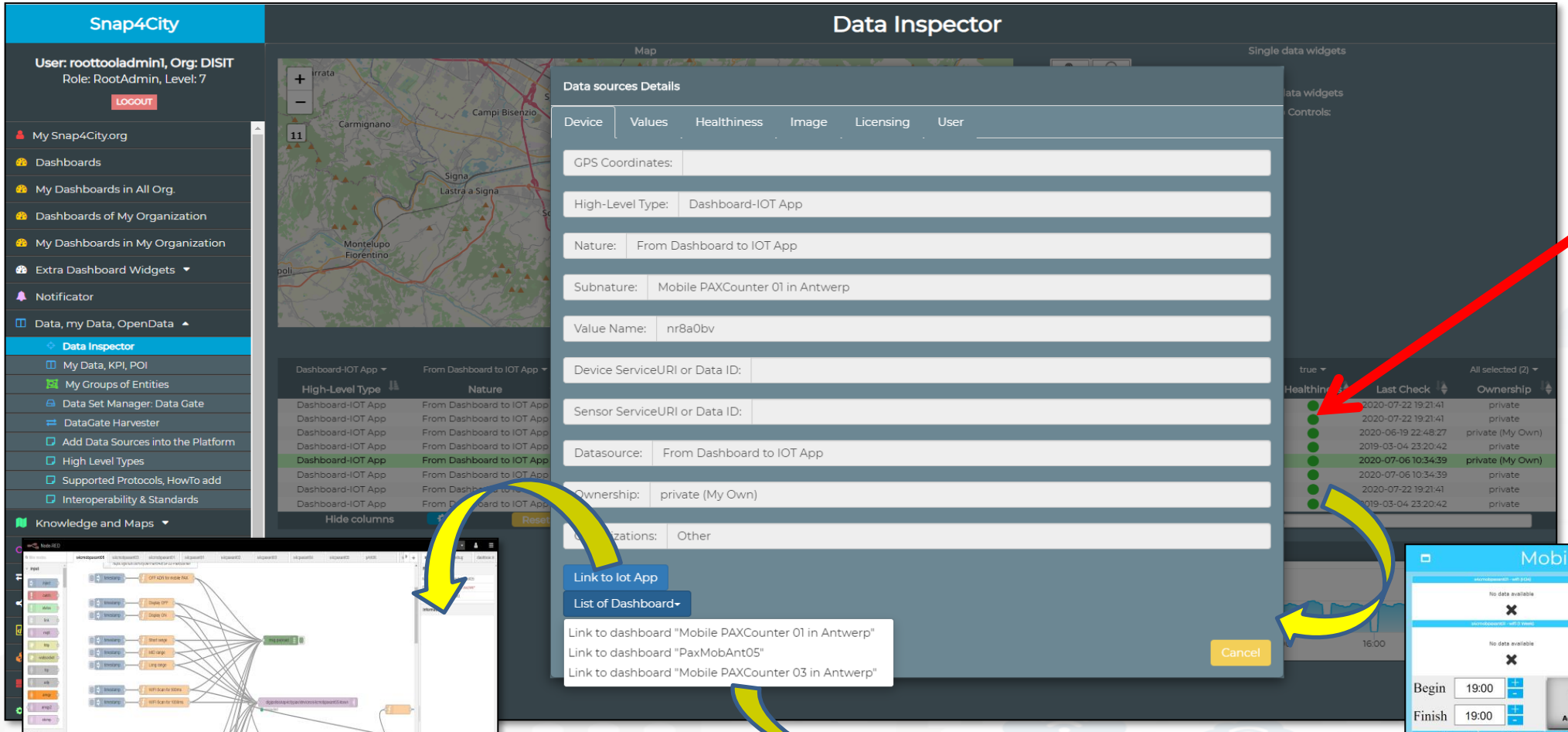






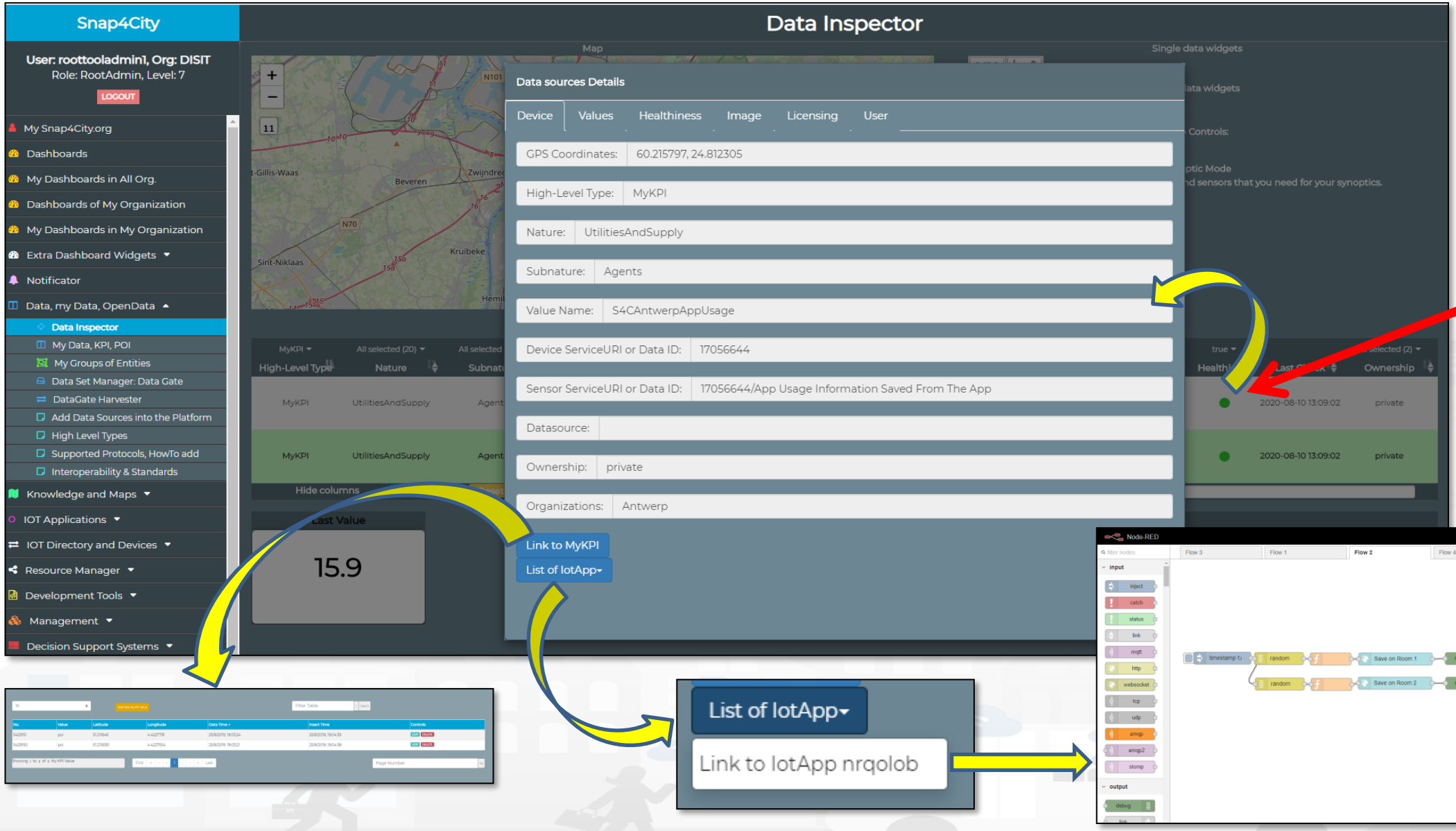
The fields shown may be present or not depending on the HLT and on the information received

HLT: From Dashboard to IOT APP



- Click with the mouse on it

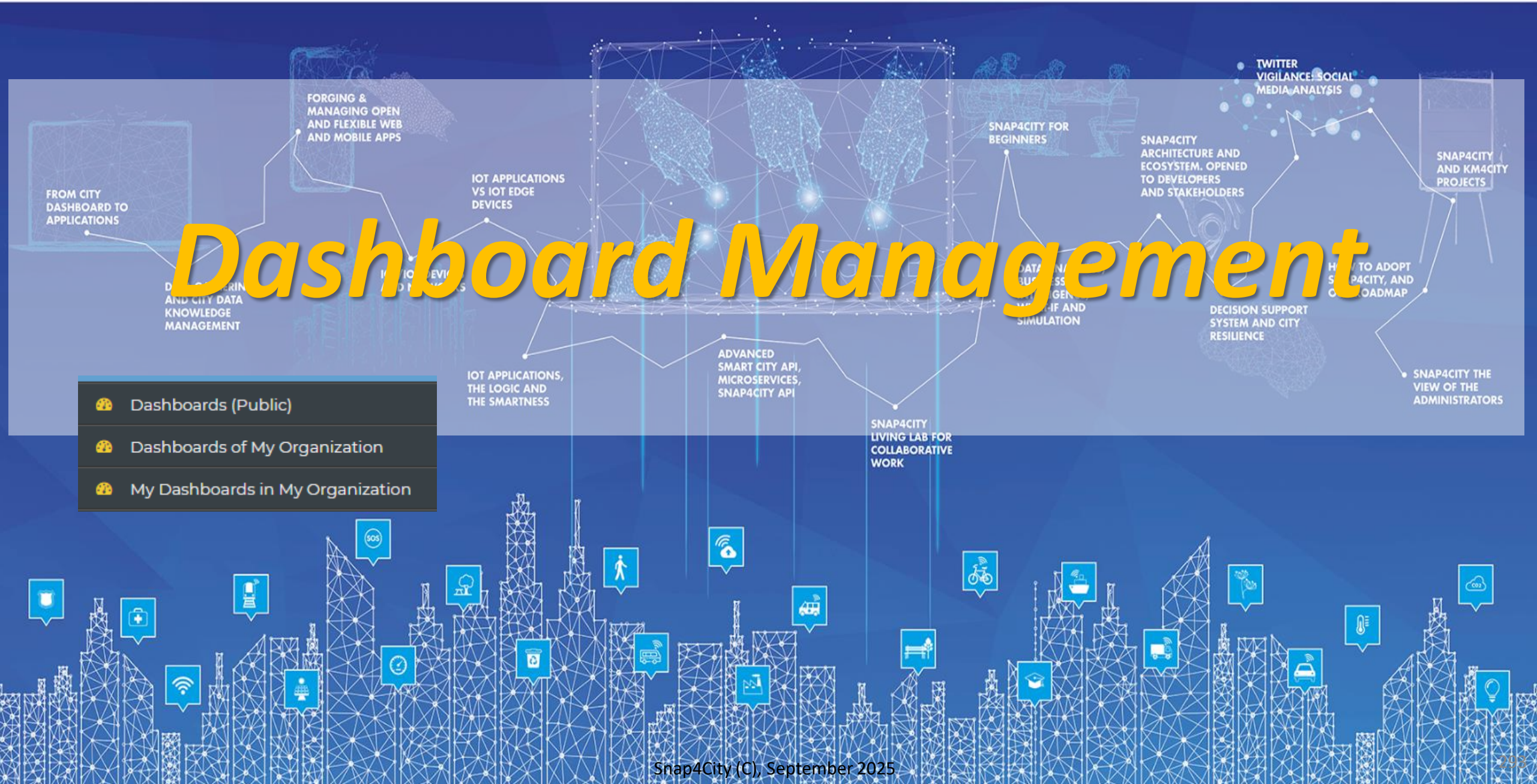
HLT: MyKPI



- Click with the mouse on it

Some functionalities are limited to certain roles

Dashboard Management



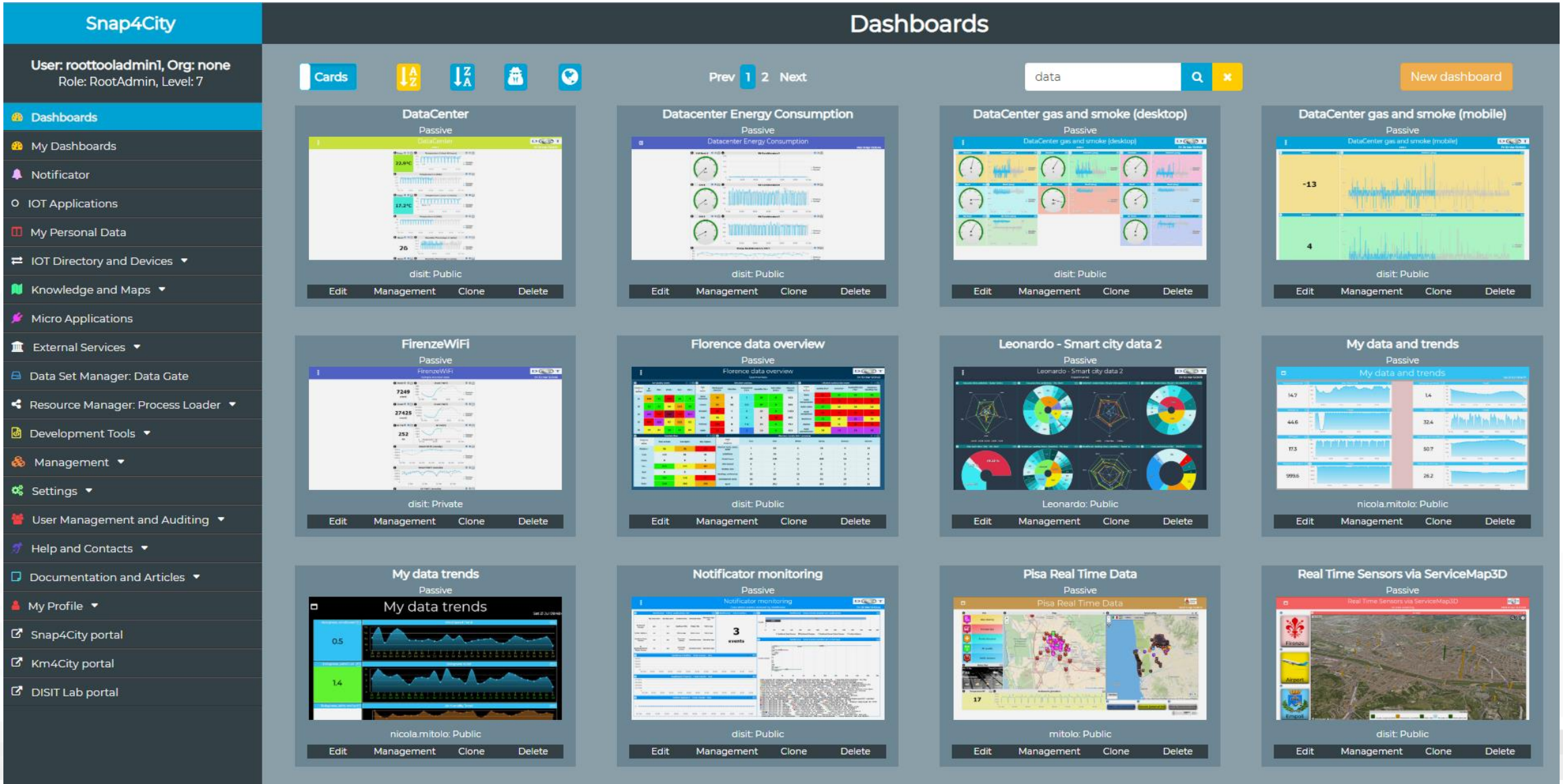
In addition

- Dashboards may:
  - have a grid with variable size
  - be resposible or not
  - provide transparent background
  - have a theme amog the coded one or full custom
  - adopt your custom theme
  - allow data export from specific widgets (admin feature)
  - Etc.

Dashboards List, Manage, Share, Delegate, Clone, …



Dashboard List and Editor

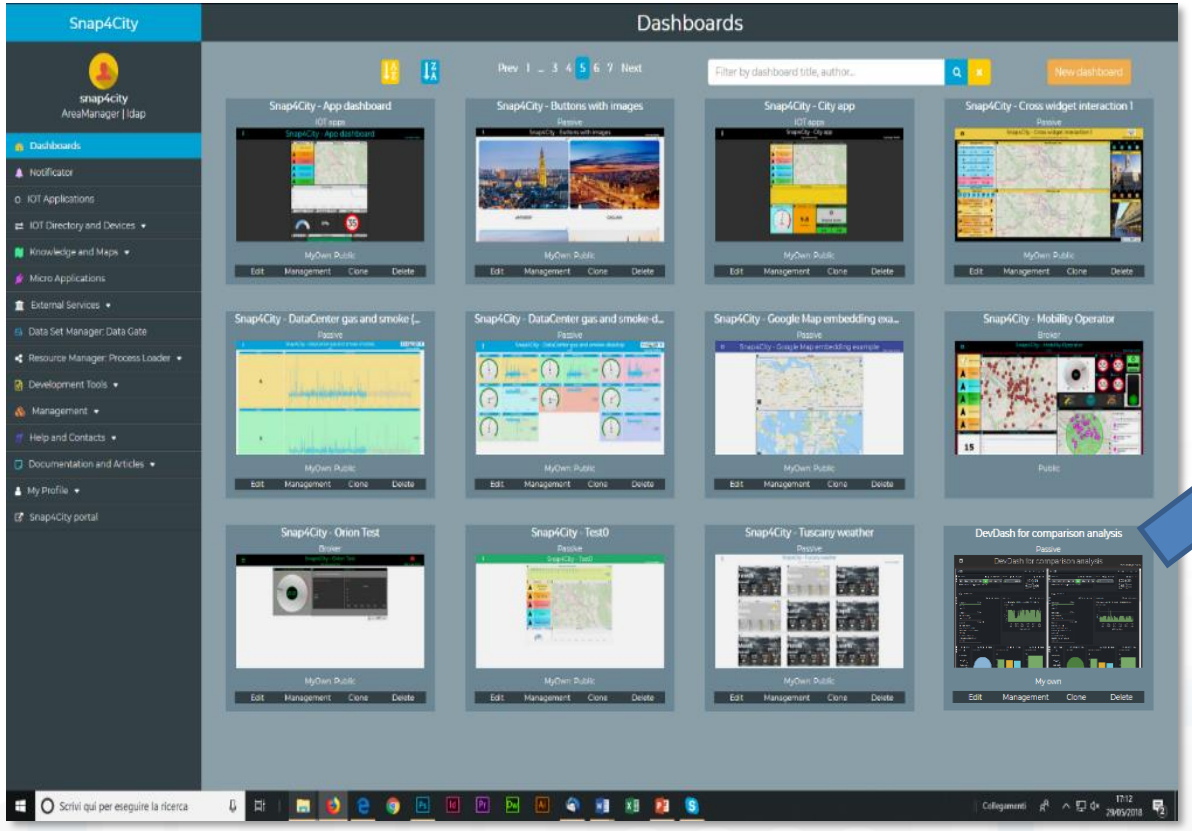


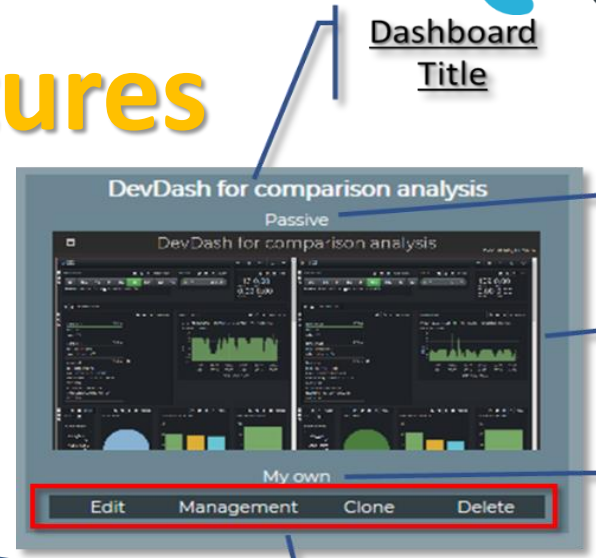
Clone Dashboard



- Cloned: Same dash with title having «- Cloned» at the end
  - You can: Clone, change name, pass to your colleague, edit, etc.
- Be carefull that exploited resources are not cloned

Dashboard Listing and Features





Dashboard Title

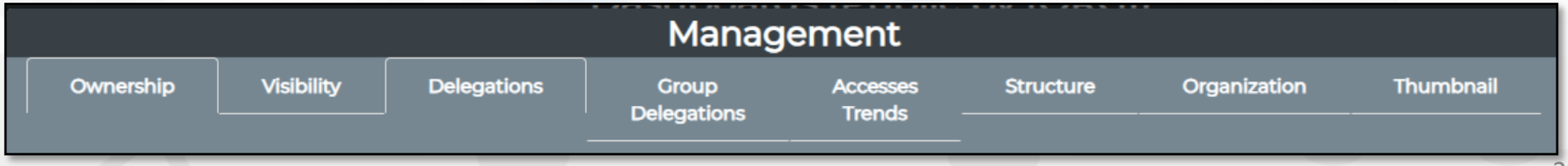
Dashboard Type

Dashboard Preview (click to open the dashboard in view)

Ownership

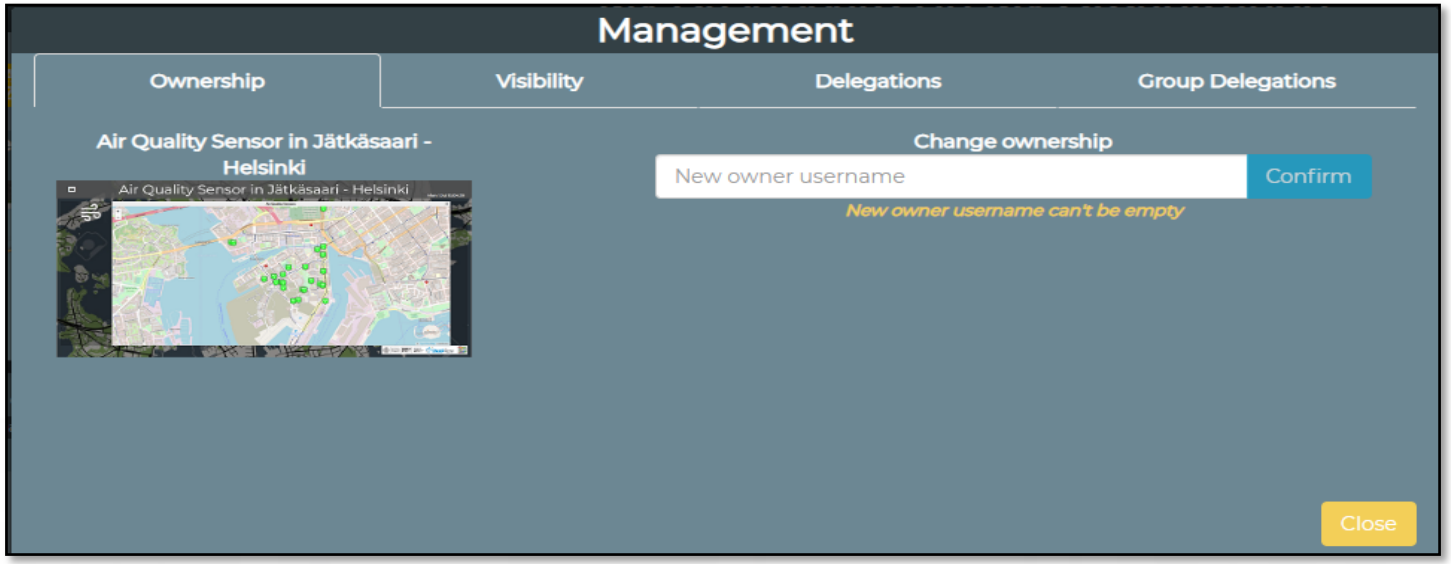
Additional actions (only for the dashboard owner)

- Edit (open Dashboard Builder)
- Management
- Clone (clone the Dashboard)
- Delete (delete the Dashboard)



Dashboard Management

- **Change Ownership**
  - Towards any user
  - Knowing the nickname

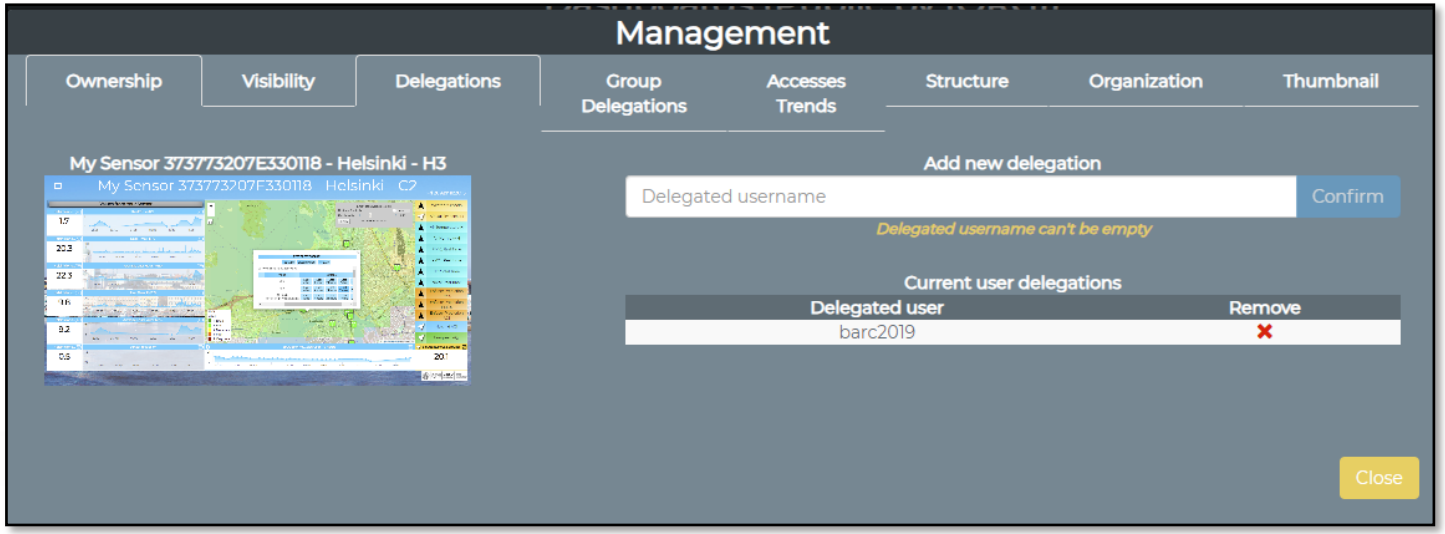


- Visibility
  - **Public or Private**
  - please note that data has to be published as well to make them accessible

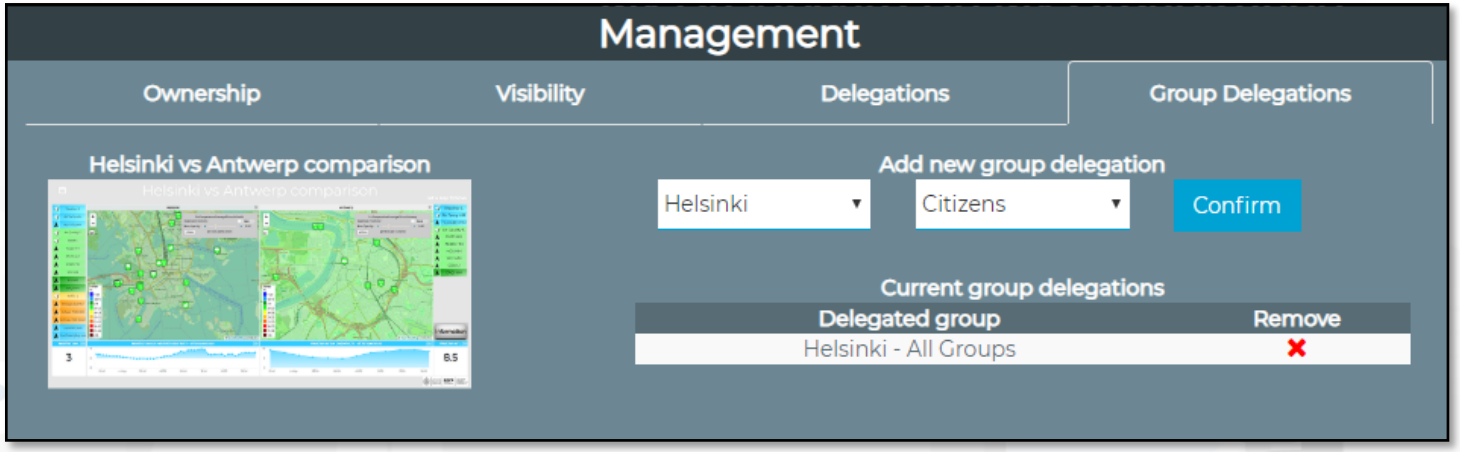


Dashboard Management

- **Delegation** access to other **users**
  - See next example

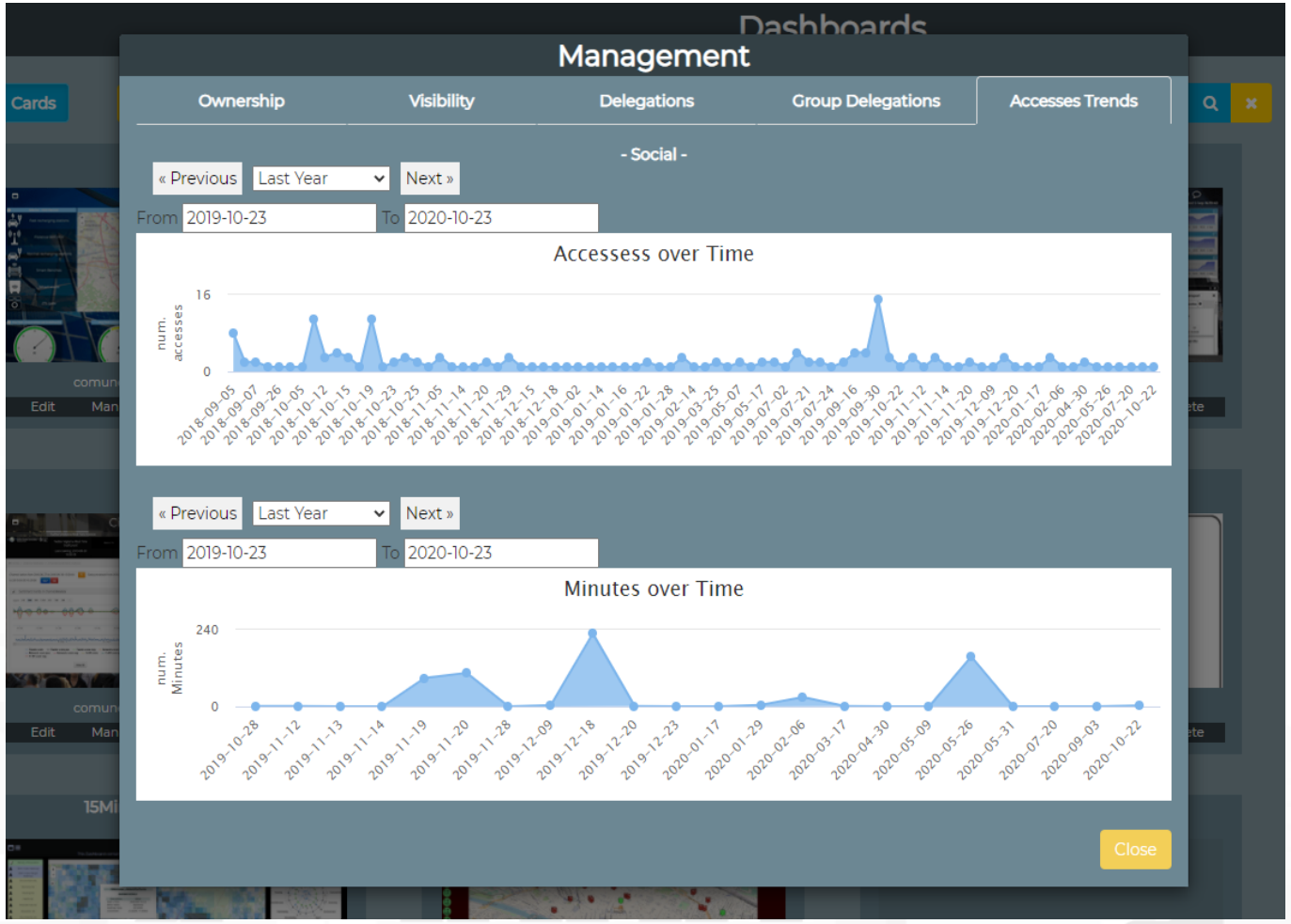


- **Delegation** Access to other **Groups** [Higher roles cross **Organization**]
  - See next example



Monitoring Dashboard Usage

- **Key Performance Indicators**
  - Number of Accesses
  - Minutes of exposition
- **Time Periods:**
  - Day by Day
  - Week by Week
  - Month by Month
  - 6 months by 6 months
  - Year by Year



Dashboards: Export/Import
Widgets: Export/Import



Sharing Features for Widgets

- Widgets can be Exported and Imported from the Dashboard editor.
  - The export creates a JSON on file, which can be used by the import to reload the widget on a dashboard in editing, in one or more.
  - Some of the Imported widgets may need to be edited to reestablish the links with other widget of the new landing dashboard. For example when you export/import:
    - IoTApp based widgets
    - Selectors which refer to the maps
    - Etc.

Sharing Features for Dashboards

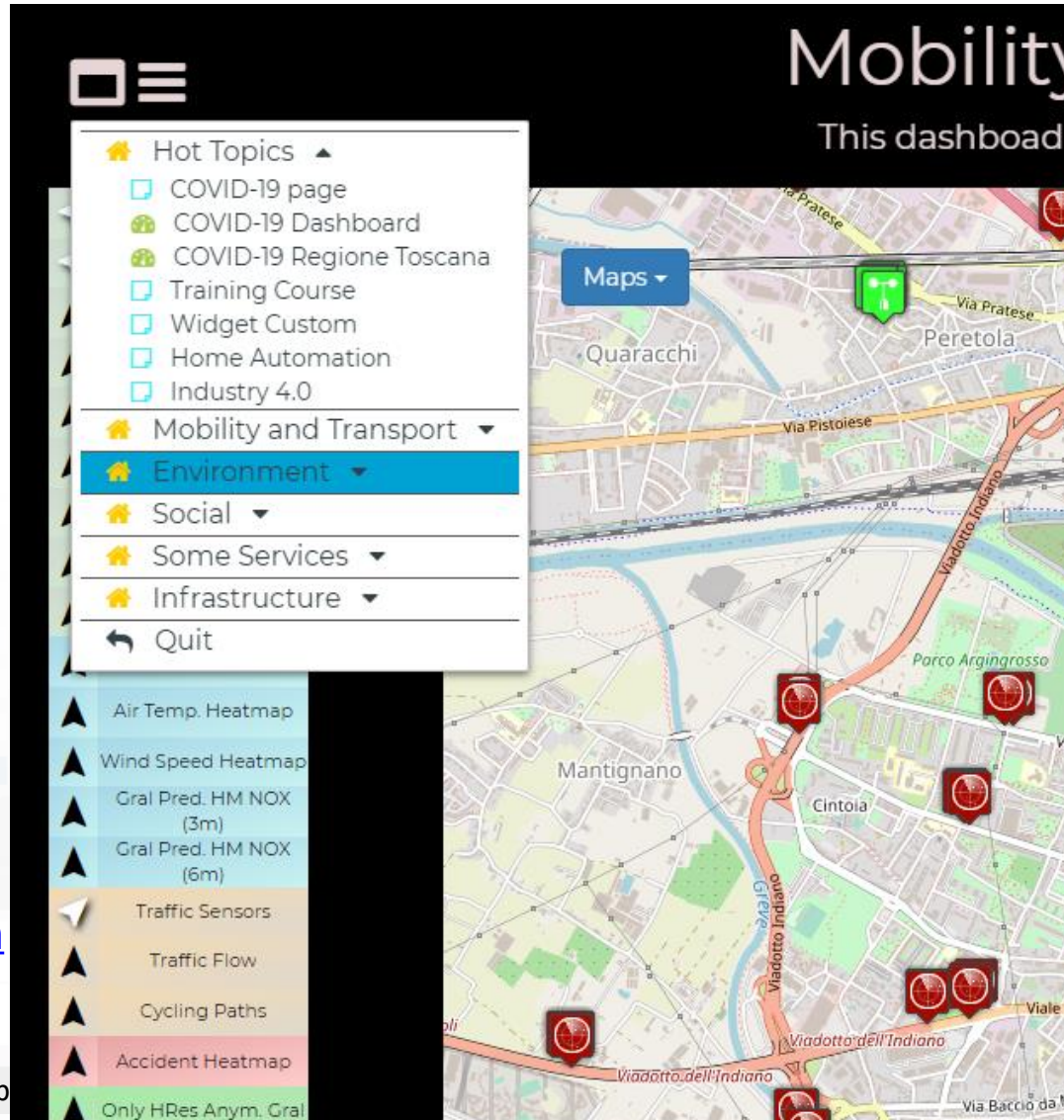
- Dashboards can be Exported and Imported from the Dashboard Manager:
  - This feature is only accessible for RootAdmin roles
  - The imported Dashboards may present some links to be reestablished if the dashboard presents:
    - references to IoT Apps
    - JavaScript code, for example CSBL code for business intelligence.

The Organization and its Dashboards/Views menu



Dashboard Menu a Short Cut for other…..

- **Each Organization** on Snap4City may define its own Menu on Dashboards
  - The Menu can be activated or not in each single Dashboard of the ORG
- **Definition includes a** list of Items and Subitems, each of which with
  - colors & icons
  - Links to web pages/dashboards to be activated and modality
  - User Roles at which it has to be proposed
  - Etc.



TC 1.23 – Dashboard Menu management per Organization

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjE5MA==

UNIVERSITÀ DEGLI STUDI FIRENZE

DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB DISTRIBUTED DATA INTELLIGENCE AND TECHNOLOGIES LAB

Mixt per Roma

SNAP4CITY KM4CITY

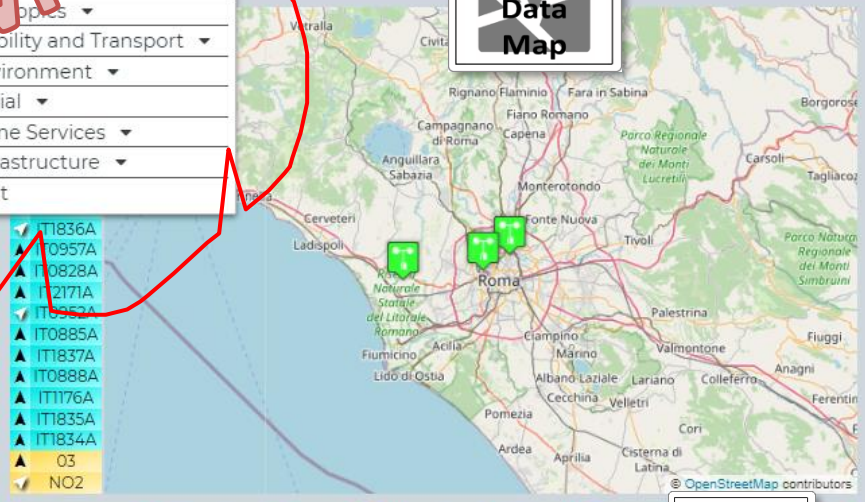
MENU

Roma Demo3 (Qualità dell'Aria)

Thu 23 Jul 13:35:09

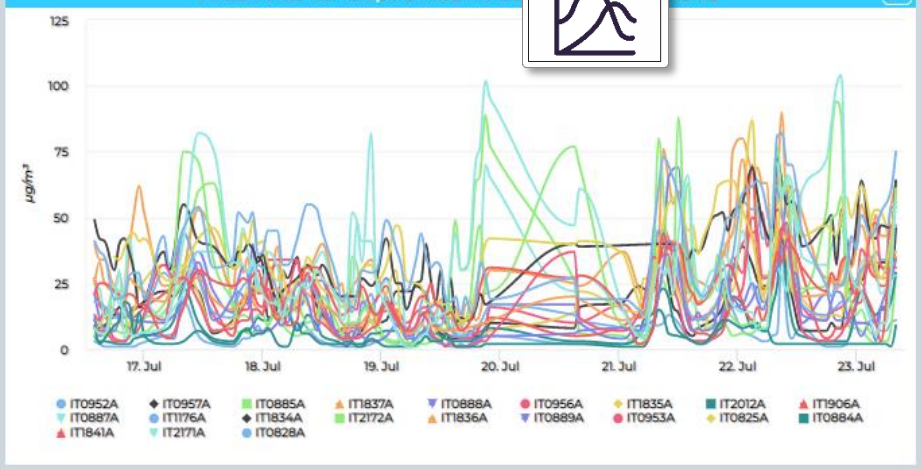
- Mobility and Transport
- Environment
- Social
- Some Services
- Infrastructure
- Quit

Multi Data Map



IT1836A
IT0957A
IT0828A
IT2171A
IT0952A
IT0885A
IT1837A
IT0888A
IT1176A
IT1835A
IT1834A
03
NO2

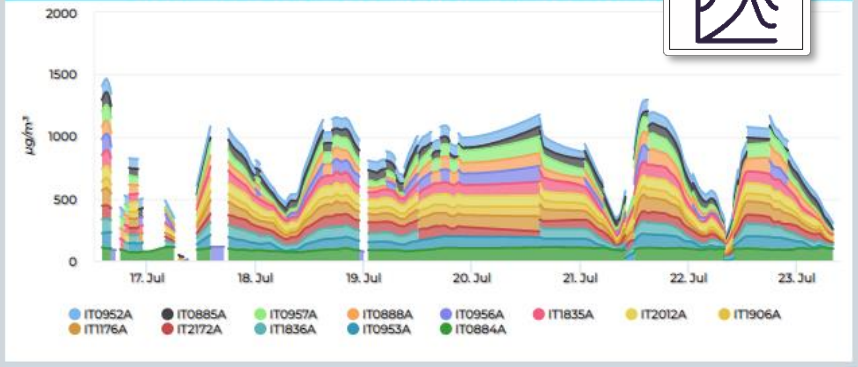
Andamento nel Tempo di NO2 rilevato ... Roma



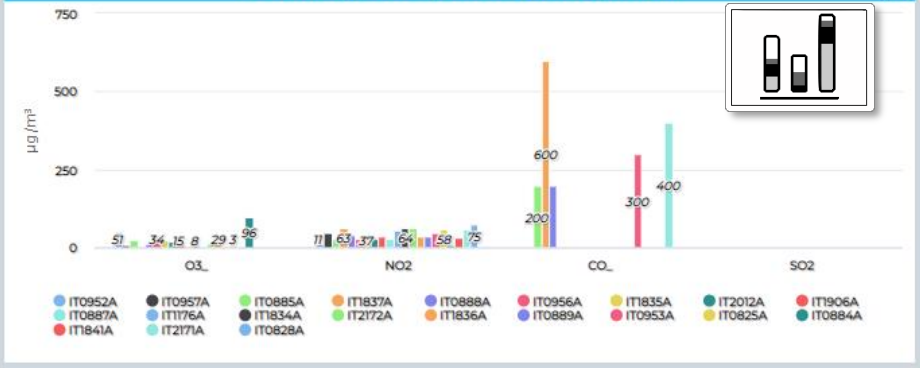
Valori Inquinanti in tempo reale, mappe

value type / value name	O3_	NO2	CO_	SO2
IT0952A	51	11		
IT0957A	7	46		
IT0885A	25	29	200	
IT1837A		63	600	
IT0888A	11	37	200	
IT0956A	34	29		
IT1835A	24	37		
IT2012A	20	29		
IT1906A	15	34		
IT0887A		28		
IT1176A	8	54		
IT1834A		64		
IT2172A	15	61		
IT1836A	29	35		
IT0953A	3	47	300	1.3
IT0889A		34		
IT0825A		58		
IT0884A	96	9		
IT1841A		31		
IT2171A		57	400	
IT0828A		75		

Andamento nel Tempo di O3 rilevato nelle stazioni in Roma (st...



Dati in Tempo reale inquinanti in Roma e provincia



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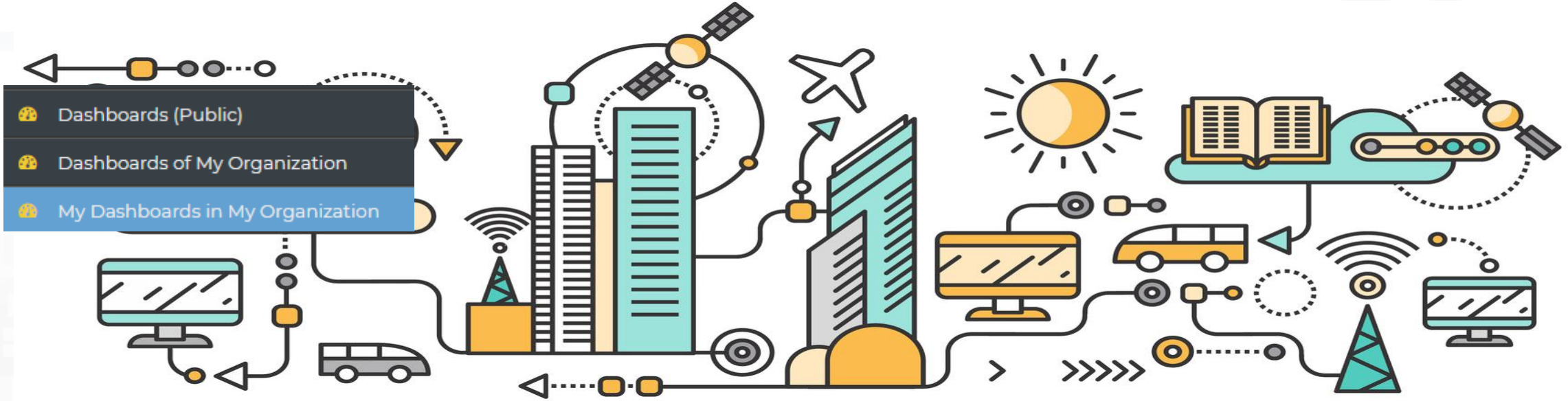
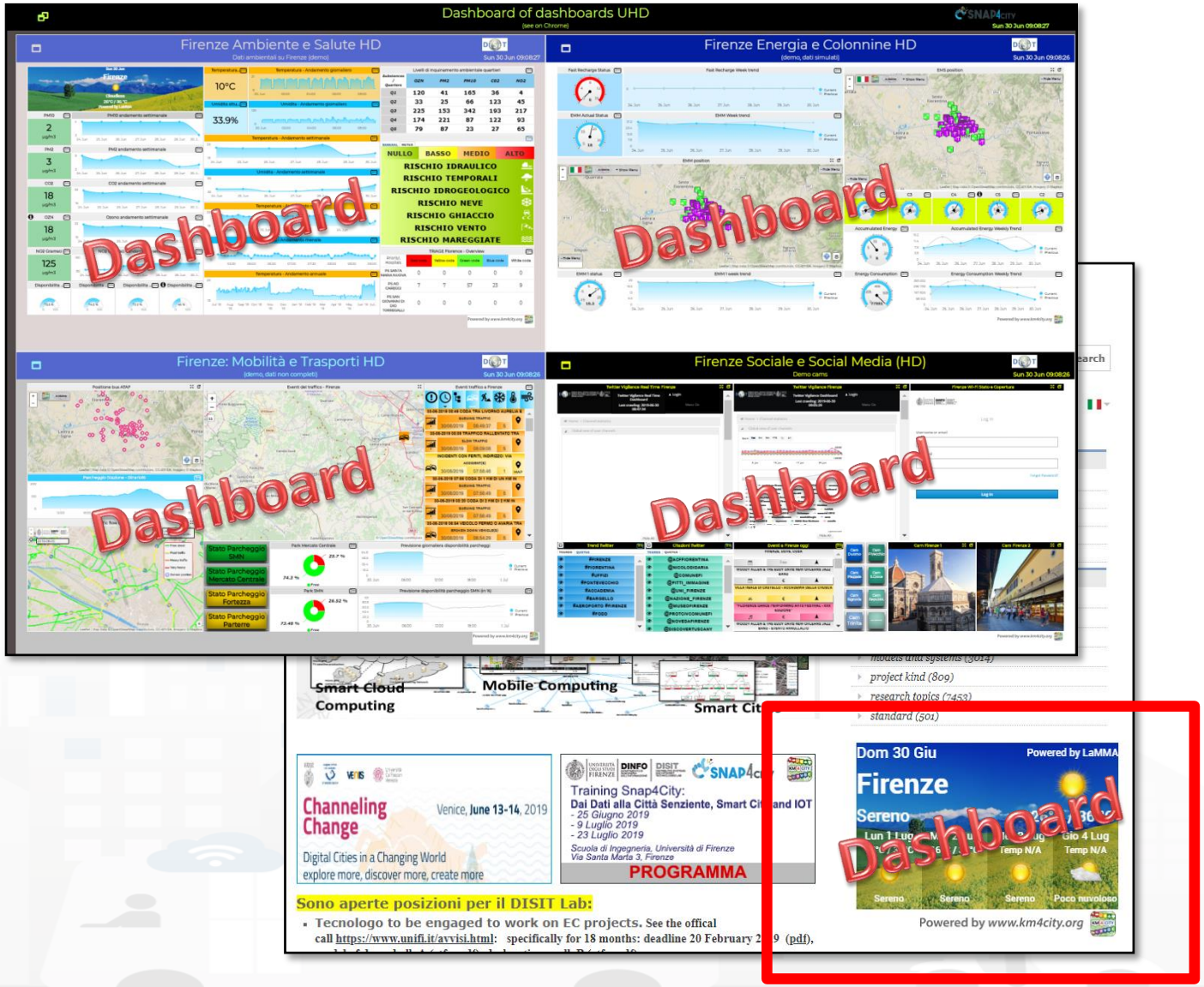
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjcyNg==

Dashboard Embedding into third party Web Sites/pages



Additional Properties from Edit Dashboard

- **Embedding Dashboards into**
  - a Dashboard
  - third Party Web Page
- **Header** or not
- **Footer** or not
- **Responsive** or not
- **Size**: any
- **Background** Image: any
- Add / change Screenshot (**Thumbnails**)
- **Menu** on left upper corner or not

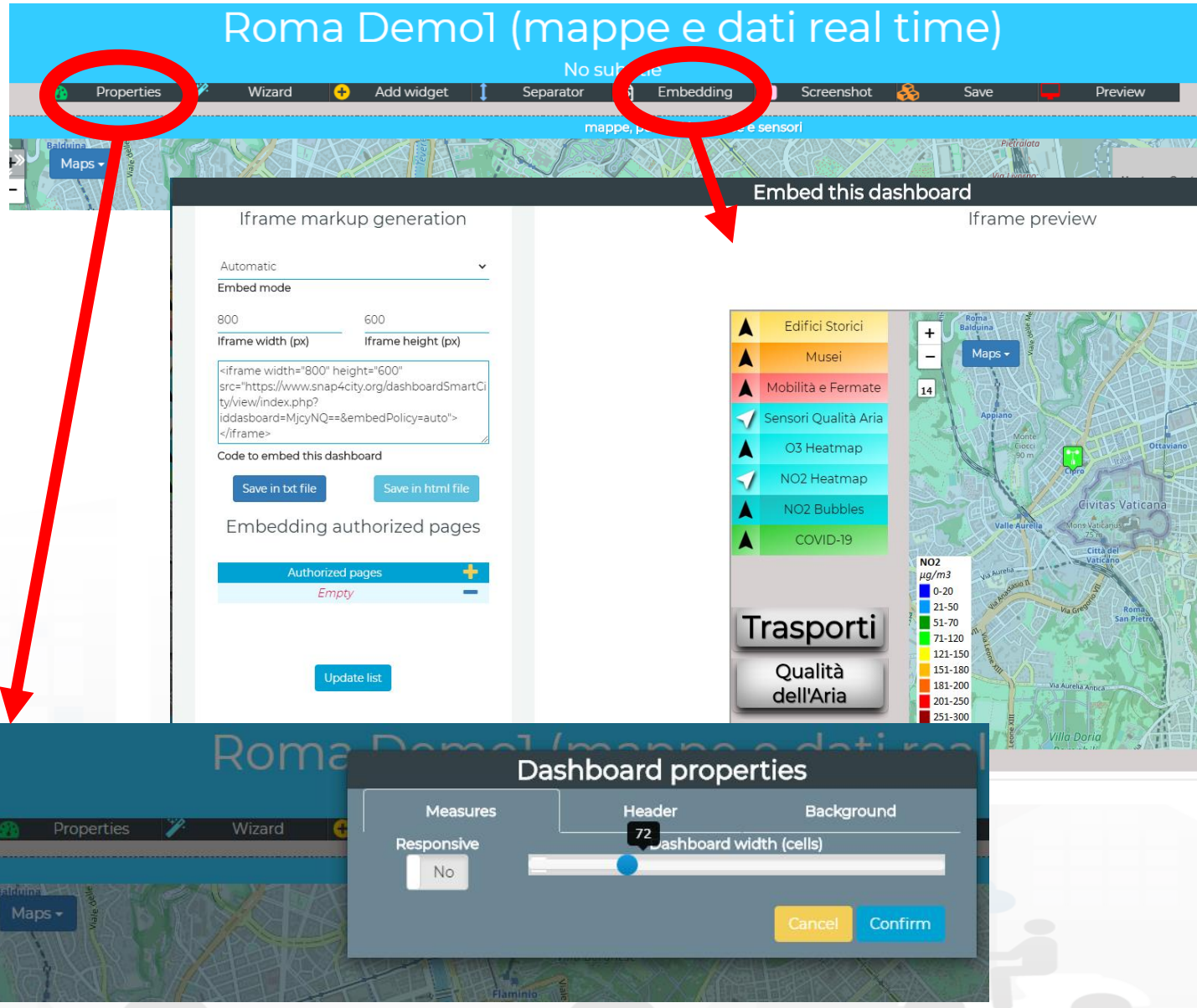


Exmaple of Dashboard without header

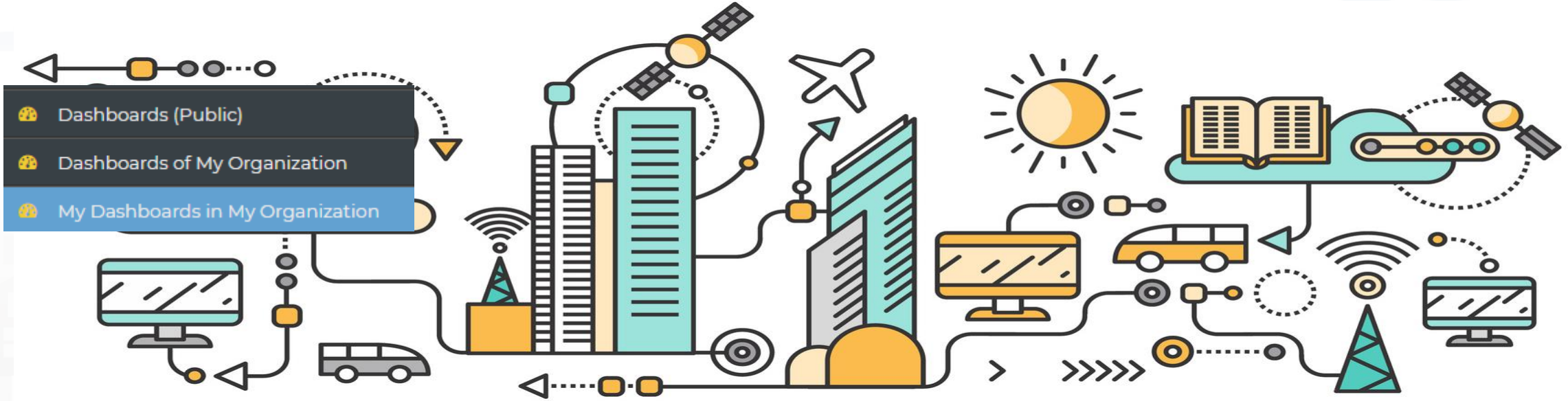
- To embed a dashboard without the header you can use the command
  - https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzMxNw==&embedPolicy=auto
  - embedPolicy can be: auto | manual
- Then:
  - header will be hiddend
  - footer will be reduced to the logo only, centered in the view

Dashboard Embedding

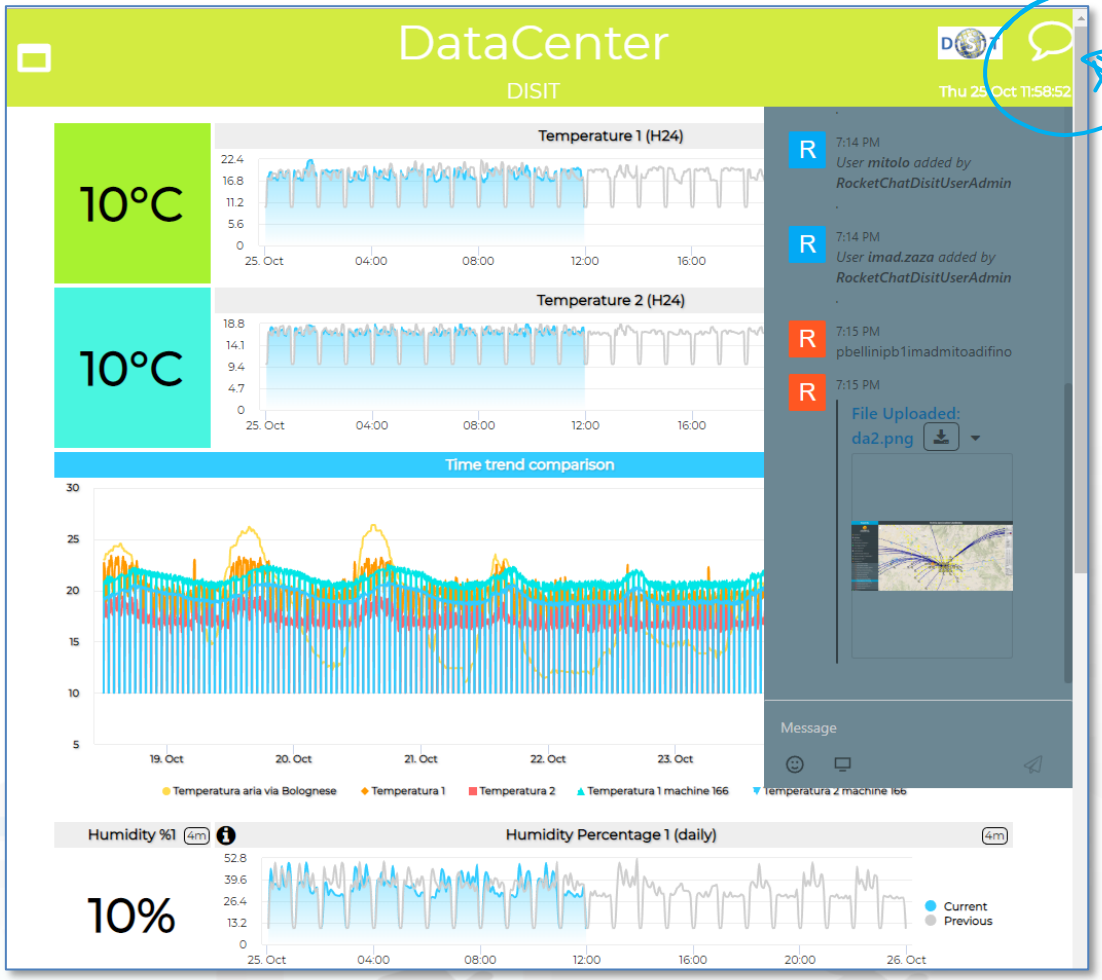
- go in Dashboard Edit
  - Get code for embedding
  - Providing domain on which you embed
  - See Iframe preview
- **Dashboard properties**
  - we suggest set Responsive
  - deciding on header On Off
  - Adjust size of Iframe and dashboard for tuning



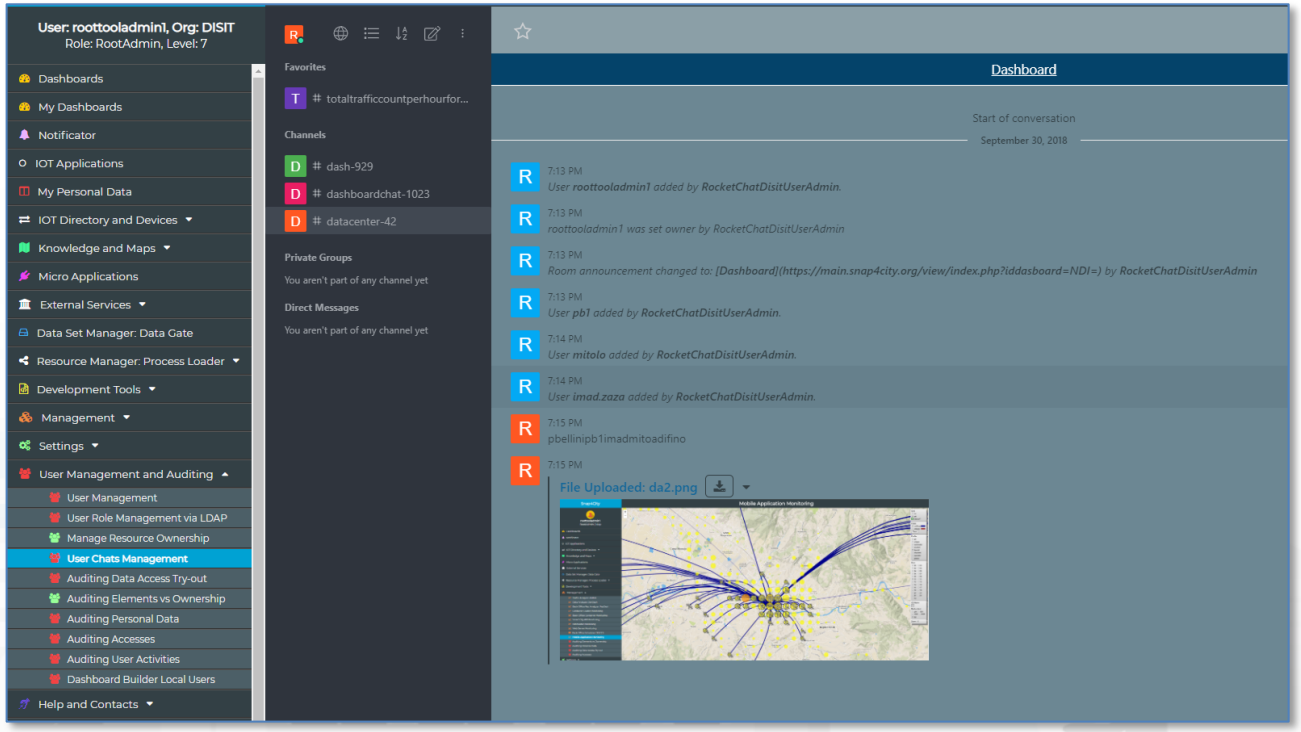
Private ChatRooms



Private ChatRoom per Dashboard



Chat Management



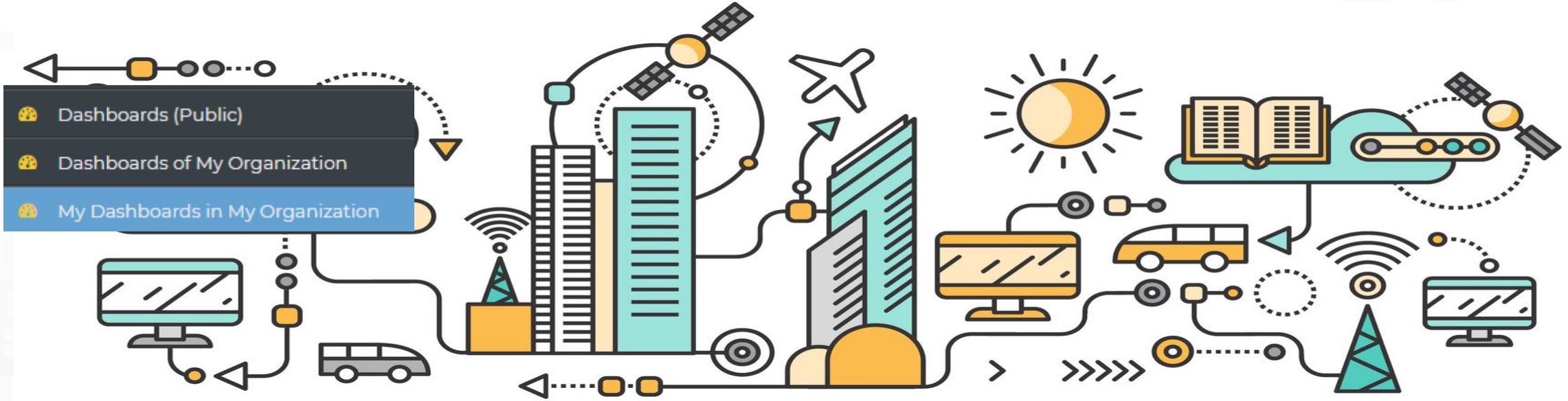
Chat Rooms

- **Activated** by the Dashboard creator which can invite a number of users of the platform to
  - Exchange Comments and Pictures
  - access on web and mobile
  - provoke notifications
- Accessible only under authentication
- The administrator can access to the log for review and log of the discussions.
- Chat Room capability is available as an additional appliance

Dashboard Chat Rooms

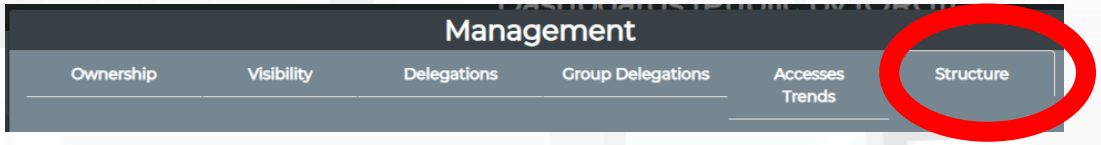
- Each Dashboard may have only **one separate ChatRoom**
- The Dashboard Owner can
  - Activate the Chat Room on Dashboard header in Edit
  - Add users of the platform to the chat room
- The **Chat** Room
  - Allows to Exchange Comments and Pictures
  - Can be Accessed on web and mobile
  - May Provoke notifications on the header of the Dashboard
  - Is accessible only under authentication
- The Administrators can access to the Log for review of the discussions

Dashboard/View Structure

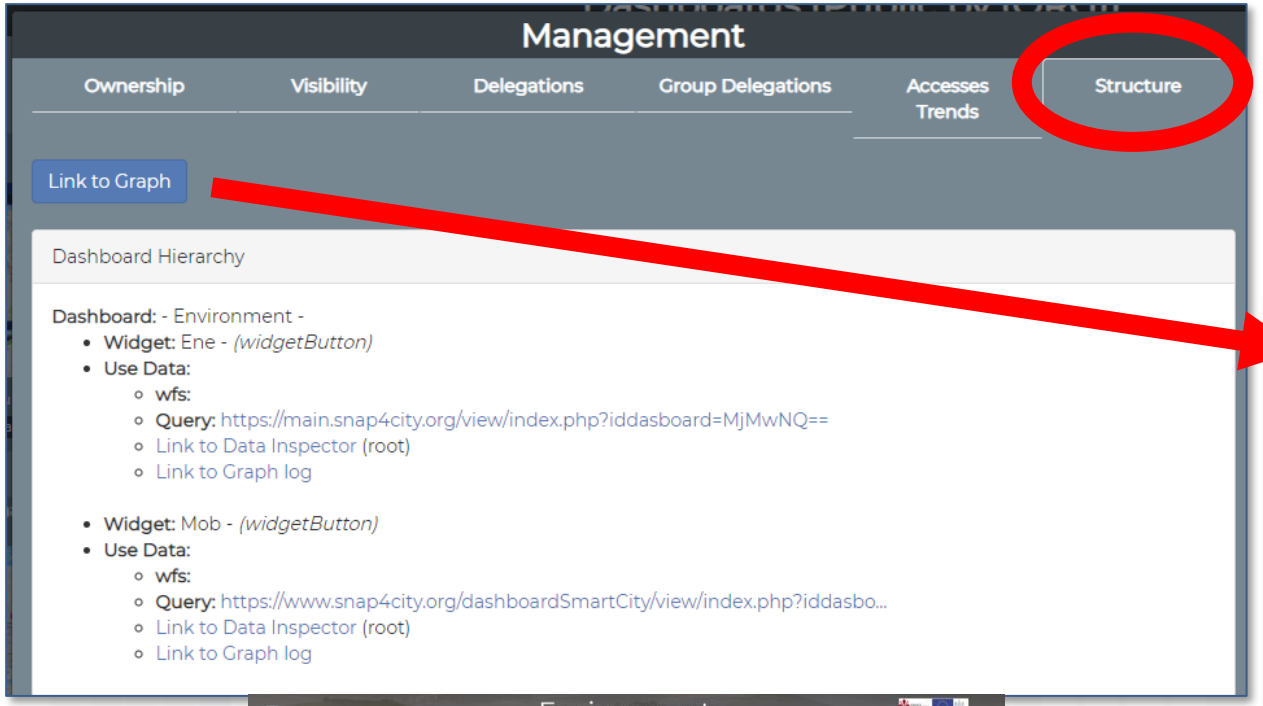


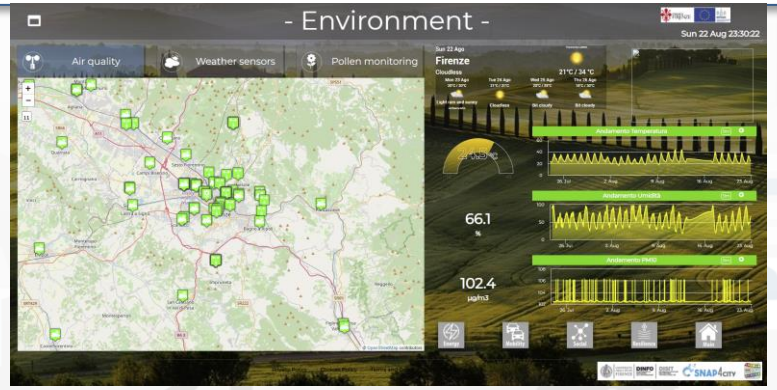
Dashboard Structure

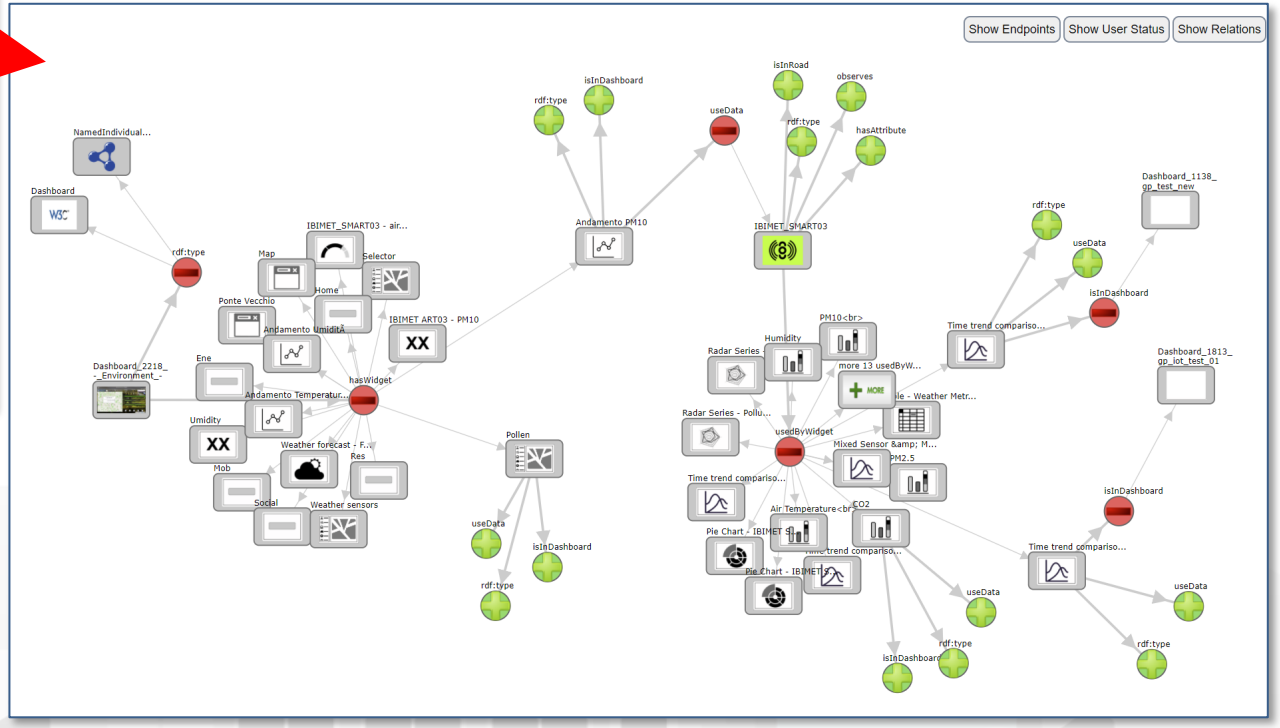
- **For each Dashboard** (Nane, ID, ORG, Users, etc..) you can have
  - W number of widgets
    - For each Widget
      - Name,
      - A data (1 …N)
  - I number of IoT Applications
    - ….
- **Thus:**
  - Different Dashboards may share the same data
  - Different Widgets in different Dashboards may share the same data…
  - Critical courses,….. More relevant data….
- **Access from Dashboard Management**



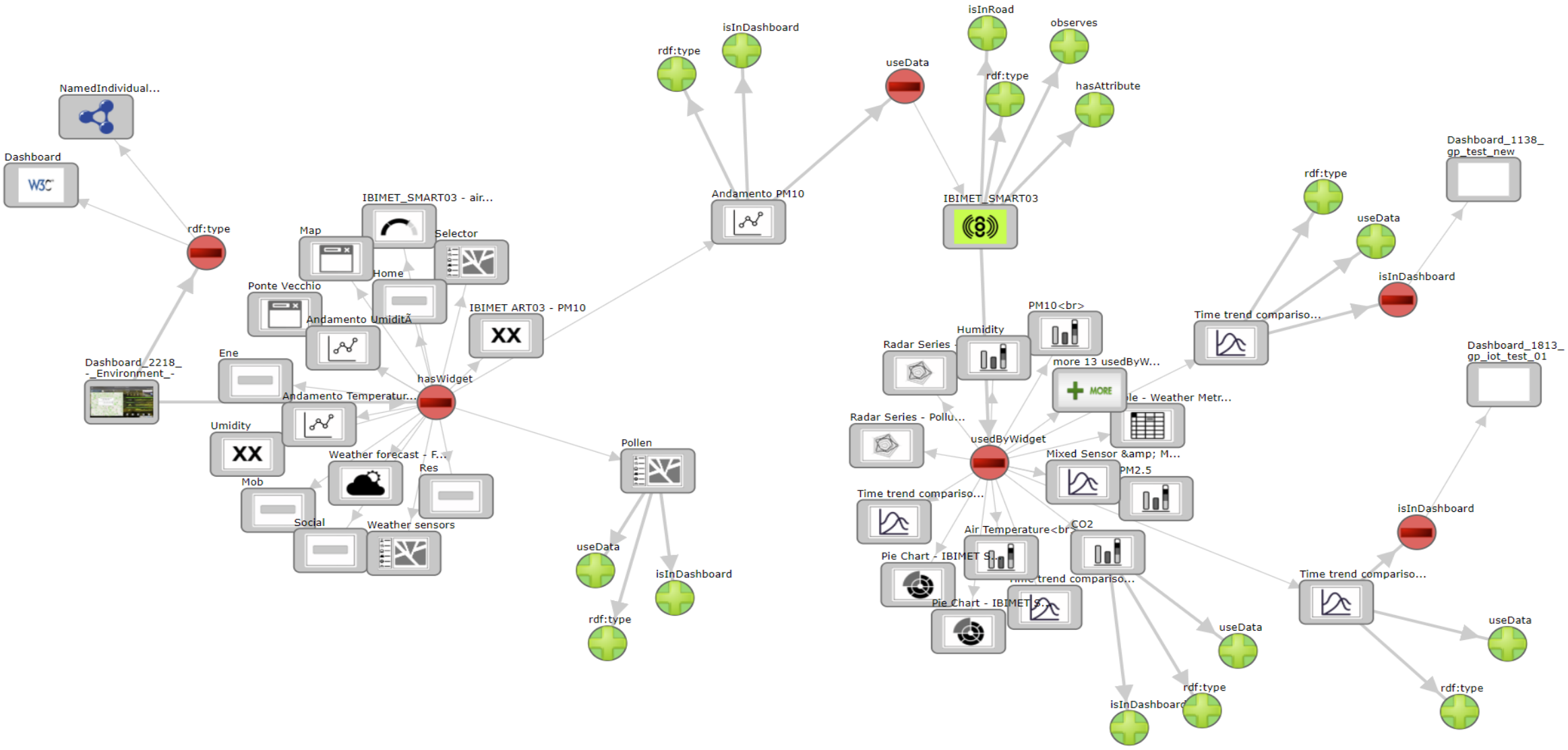
Dashboard Management: Graph of Smart Application







Show Endpoints | Show User Status | Show Relations



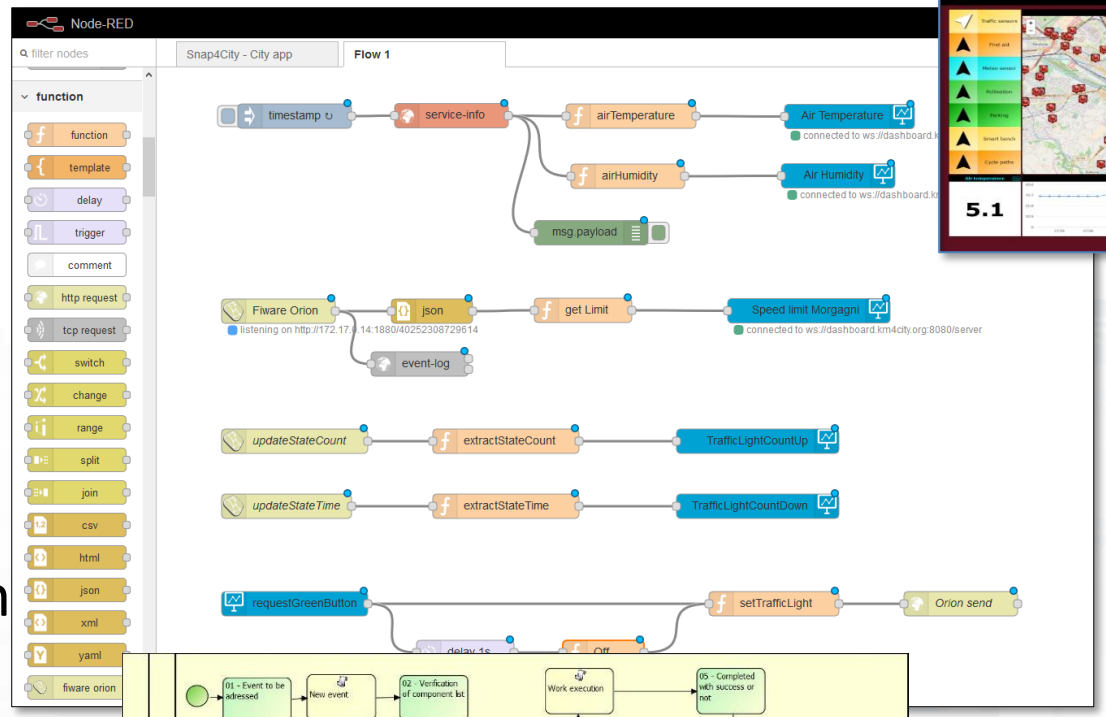
Notifications from Dashboard and from any Data Condition

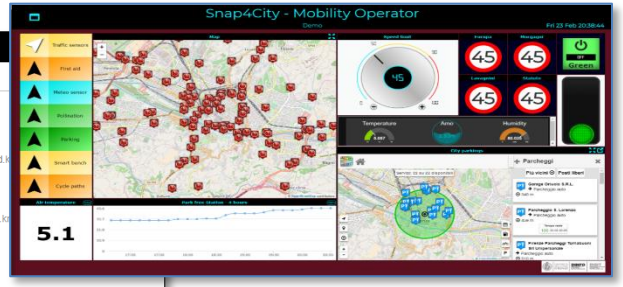


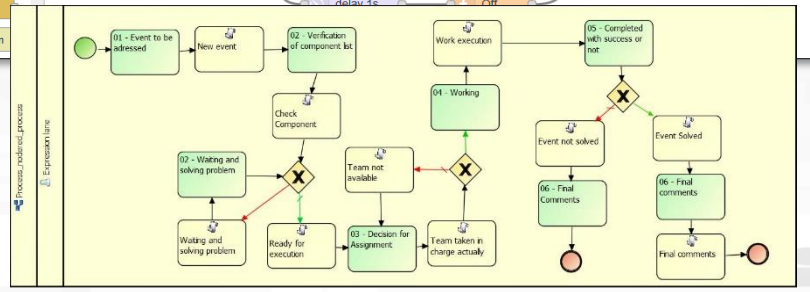
Smart City Monitoring: notifications, alerting

Notification with IOT App may

- Fire on any kind of condition exploiting on IOT App logic
- produce messages/events on
  - **Facebook, Telegram,**
  - **SMS, MMS, IOT Devices, ..**
  - **email, LOGS, FTP, ..**
  - **dashboards**, mobiles, …
  - **Workflow/incident** managem system for **ticketing**
  - **video wall** management,
  - **Video Management System** Milestone
  - etc. etc.











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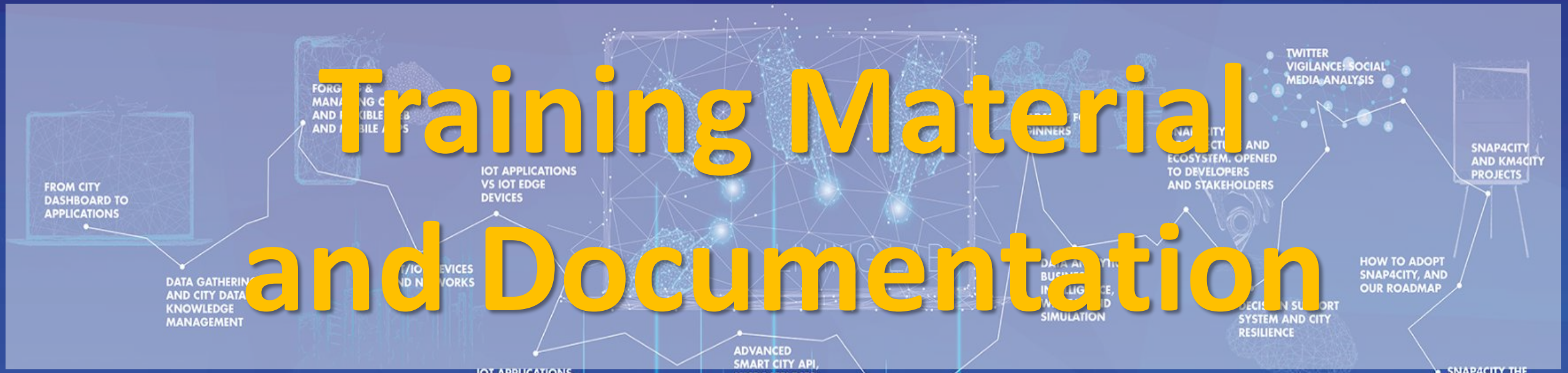
Training Material and Documentation



	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								

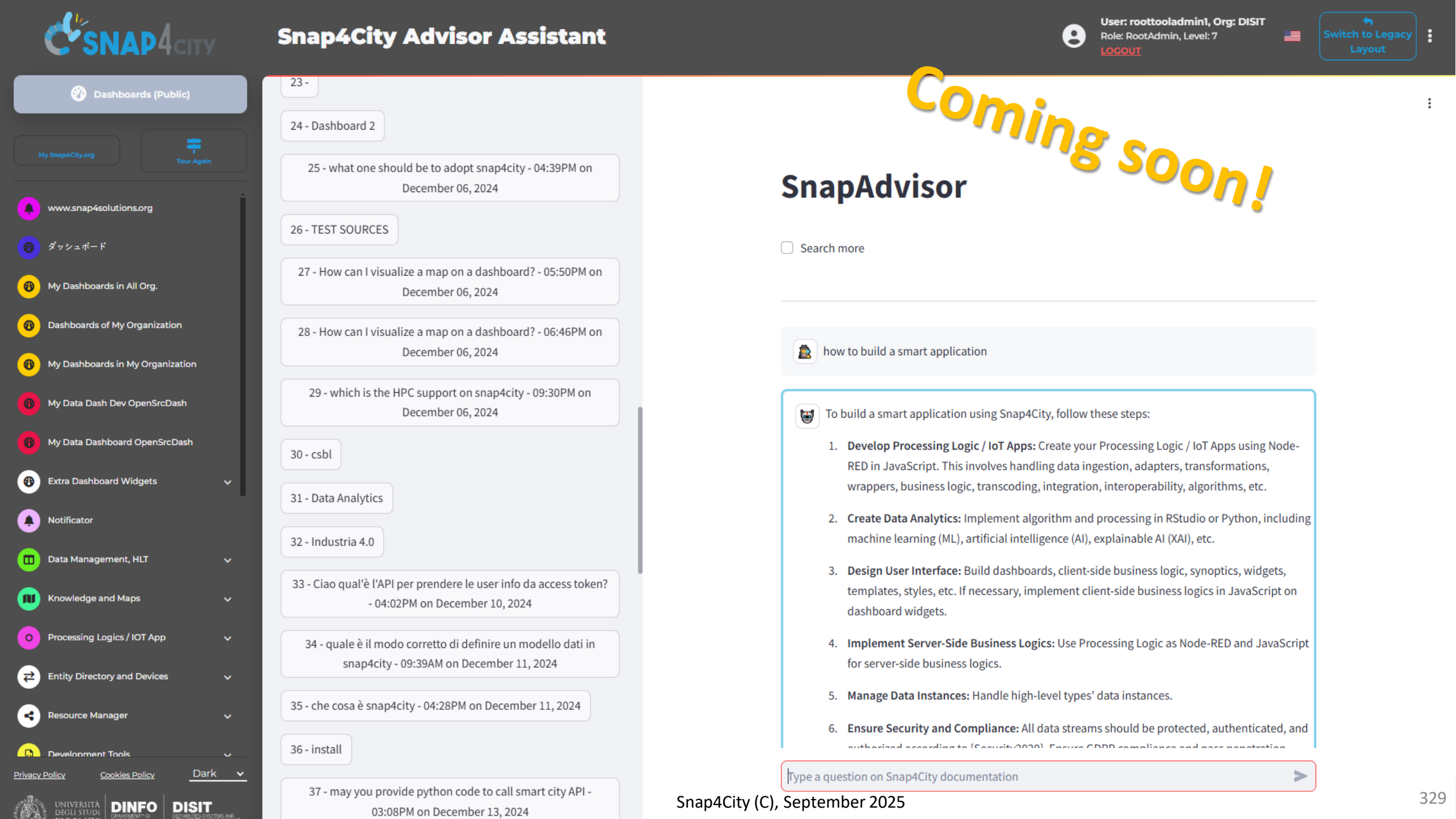
https://www.snap4city.org/944

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**: https://www.snap4city.org/944
  - Introduction course to Snap4City technology
  - Italian version CN MOST: https://www.snap4city.org/1068
- **Older version 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


Snap4City Advisor Assistant
User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7
LOGOUT
Switch to Legacy Layout
Dashboards (Public)
My Snap4City.org
Tour Again
www.snap4solutions.org
ダッシュボード
My Dashboards in All Org.
Dashboards of My Organization
My Dashboards in My Organization
My Data Dash Dev OpenSrcDash
My Data Dashboard OpenSrcDash
Extra Dashboard Widgets
Notificator
Data Management, HLT
Knowledge and Maps
Processing Logics / IOT App
Entity Directory and Devices
Resource Manager
Development Tools
Privacy Policy
Cookies Policy
Dark
UNIVERSITÀ DEGLI STUDI
DINFO
DISIT
23 -
24 - Dashboard 2
25 - what one should be to adopt snap4city - 04:39PM on December 06, 2024
26 - TEST SOURCES
27 - How can I visualize a map on a dashboard? - 05:50PM on December 06, 2024
28 - How can I visualize a map on a dashboard? - 06:46PM on December 06, 2024
29 - which is the HPC support on snap4city - 09:30PM on December 06, 2024
30 - csbl
31 - Data Analytics
32 - Industria 4.0
33 - Ciao qual'è l'API per prendere le user info da access token? - 04:02PM on December 10, 2024
34 - quale è il modo corretto di definire un modello dati in snap4city - 09:39AM on December 11, 2024
35 - che cosa è snap4city - 04:28PM on December 11, 2024
36 - install
37 - may you provide python code to call smart city API - 03:08PM on December 13, 2024
Coming soon!
SnapAdvisor
Search more
how to build a smart application
To build a smart application using Snap4City, follow these steps:
1. Develop Processing Logic / IoT Apps: Create your Processing Logic / IoT Apps using Node-RED in JavaScript. This involves handling data ingestion, adapters, transformations, wrappers, business logic, transcoding, integration, interoperability, algorithms, etc.
2. Create Data Analytics: Implement algorithm and processing in RStudio or Python, including machine learning (ML), artificial intelligence (AI), explainable AI (XAI), etc.
3. Design User Interface: Build dashboards, client-side business logic, synoptics, widgets, templates, styles, etc. If necessary, implement client-side business logics in JavaScript on dashboard widgets.
4. Implement Server-Side Business Logics: Use Processing Logic as Node-RED and JavaScript for server-side business logics.
5. Manage Data Instances: Handle high-level types' data instances.
6. Ensure Security and Compliance: All data streams should be protected, authenticated, and
Type a question on Snap4City documentation

Dashboards (Public)

My Snap4City.org | Tour Again

www.snap4solutions.org
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
Resource Manager
Development Tools
Management
Decision Support Systems
Deploy and Installation
Help and Contacts
Documentation and Articles

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Home / Snap4City: Smart aNalytic APp builder for sentient Cities and IOT

Snap4City: Smart aNalytic APp builder for sentient Cities and IOT

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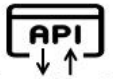
















- TECHNICAL OVERVIEW: https://www.snap4city.org/download/video/Snap4City-PlatformOverview.pdf
- Development Life Cycle: https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf
- Client-Side Business Logic Widget Manual: https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual.pdf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

Username: paolo.disit

Search

Search
-Any-

Training on Tools and Platform

Powered by www.km4city.org

FIWARE | Node-RED

Sii-Mobility

Organization Groups

DISIT
- Developer
- Operativo

Updates on

booklets

- Smart City



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

- Industry



https://www.snap4city.org/download/video/DPL_SNAP4INDUSTRY.pdf

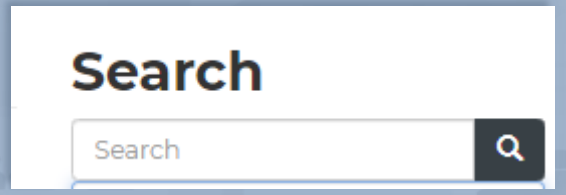
- Artificial Intelligence

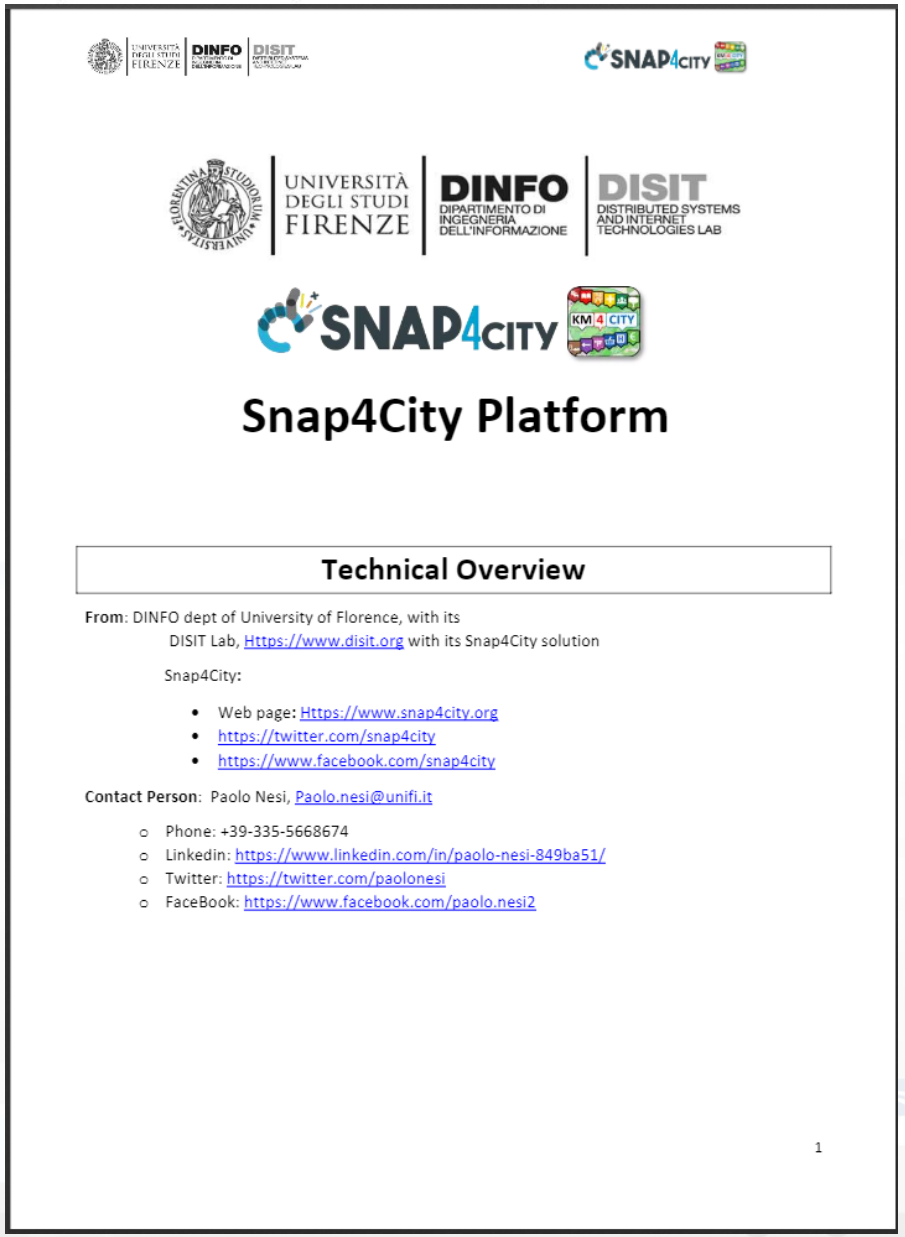


https://www.snap4city.org/download/video/DPL_SNAP4SOLU.pdf

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/944
- **Scenarious**: https://www.snap4city.org/4
- **Publications**: https://www.snap4city.org/426
- **WEB pages**: https://www.snap4city.org/78
- ***SEARCH on the right side***





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

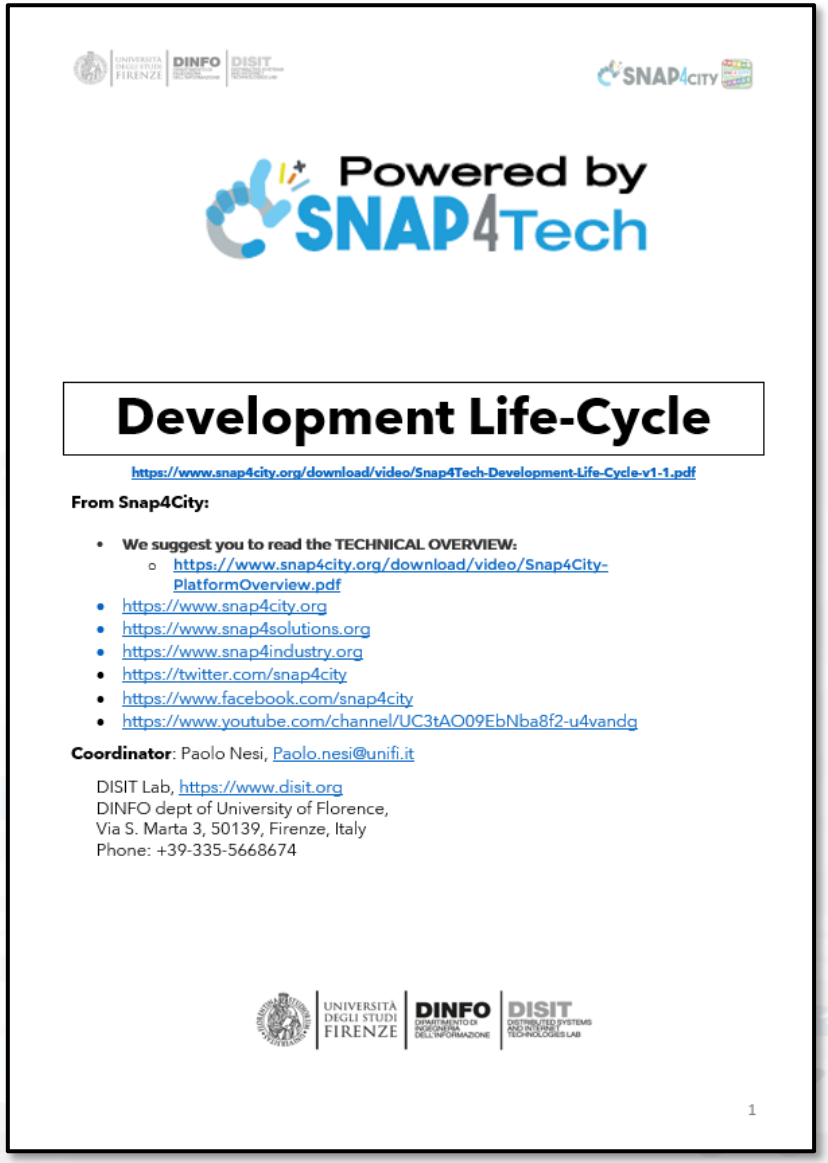
- Phone: +39-335-5668674
- Linkedin: https://www.linkedin.com/in/paolo-nesi-849ba51/
- Twitter: https://twitter.com/paolonesi
- FaceBook: https://www.facebook.com/paolo.nesi2

1

Tech Overview

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

Development



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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

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

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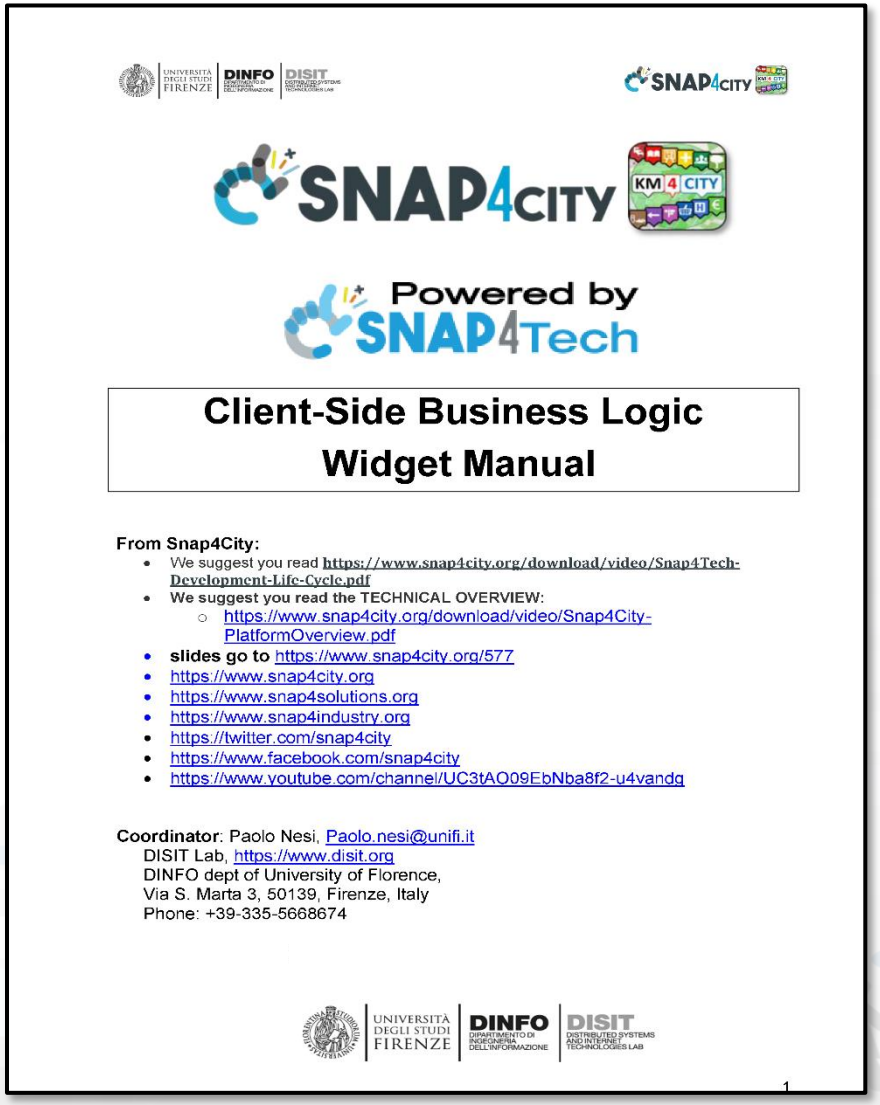
https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf

CSBL

Client Side Business Logic



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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/UC3tAO09EbNba8f2-u4vandg

Coordinator: Paolo Nesi, Paolo.nesi@unifi.it
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Phone: +39-335-5668674

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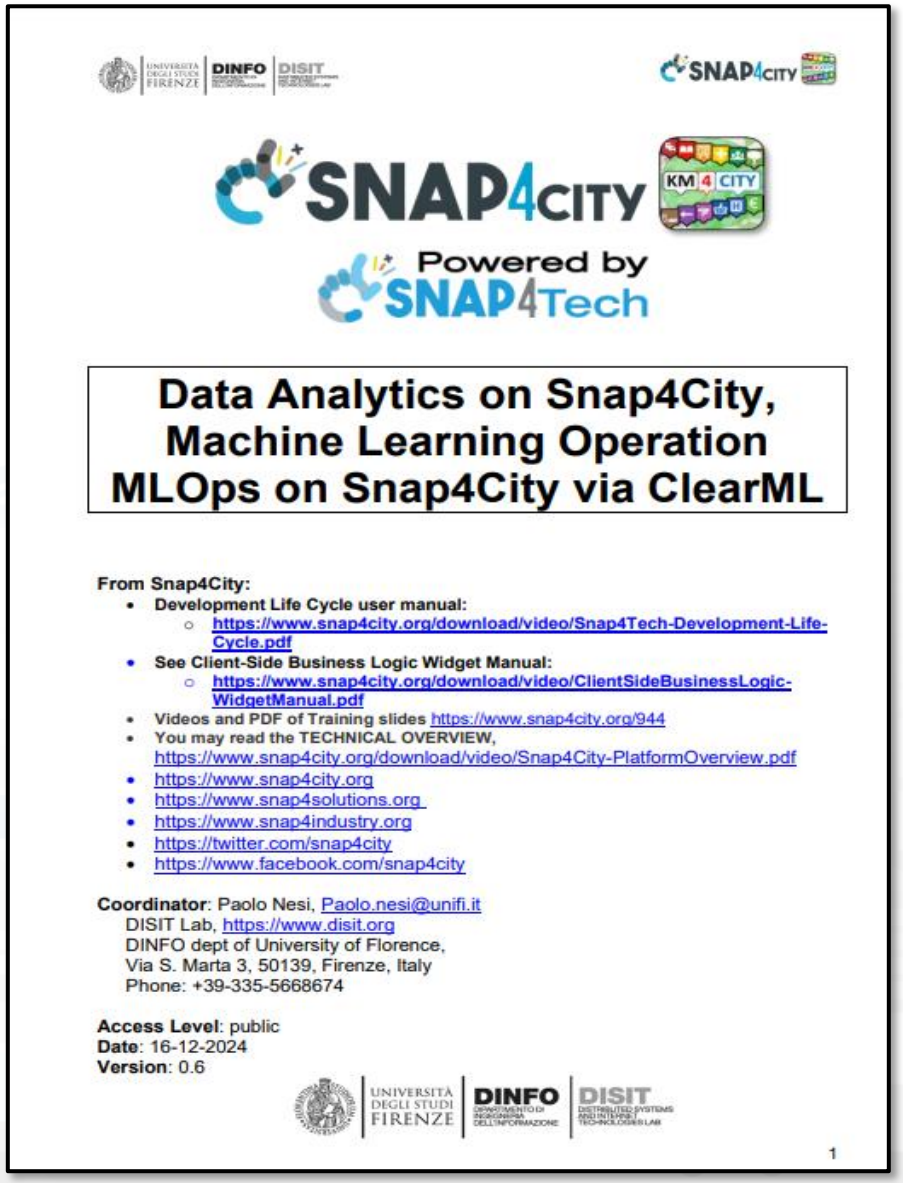
https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual.pdf



SNAP4CITY

Powered by SNAP4Tech

Data Analytics on Snap4City, Machine Learning Operation MLOps on Snap4City via ClearML

From Snap4City:

- **Development Life Cycle user manual:**
  - https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf
- **See Client-Side Business Logic Widget Manual:**
  - https://www.snap4city.org/download/video/ClientSideBusinessLogic-WidgetManual.pdf
- Videos and PDF of Training slides https://www.snap4city.org/944
- You may 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
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Phone: +39-335-5668674

Access Level: public
Date: 16-12-2024
Version: 0.6

1

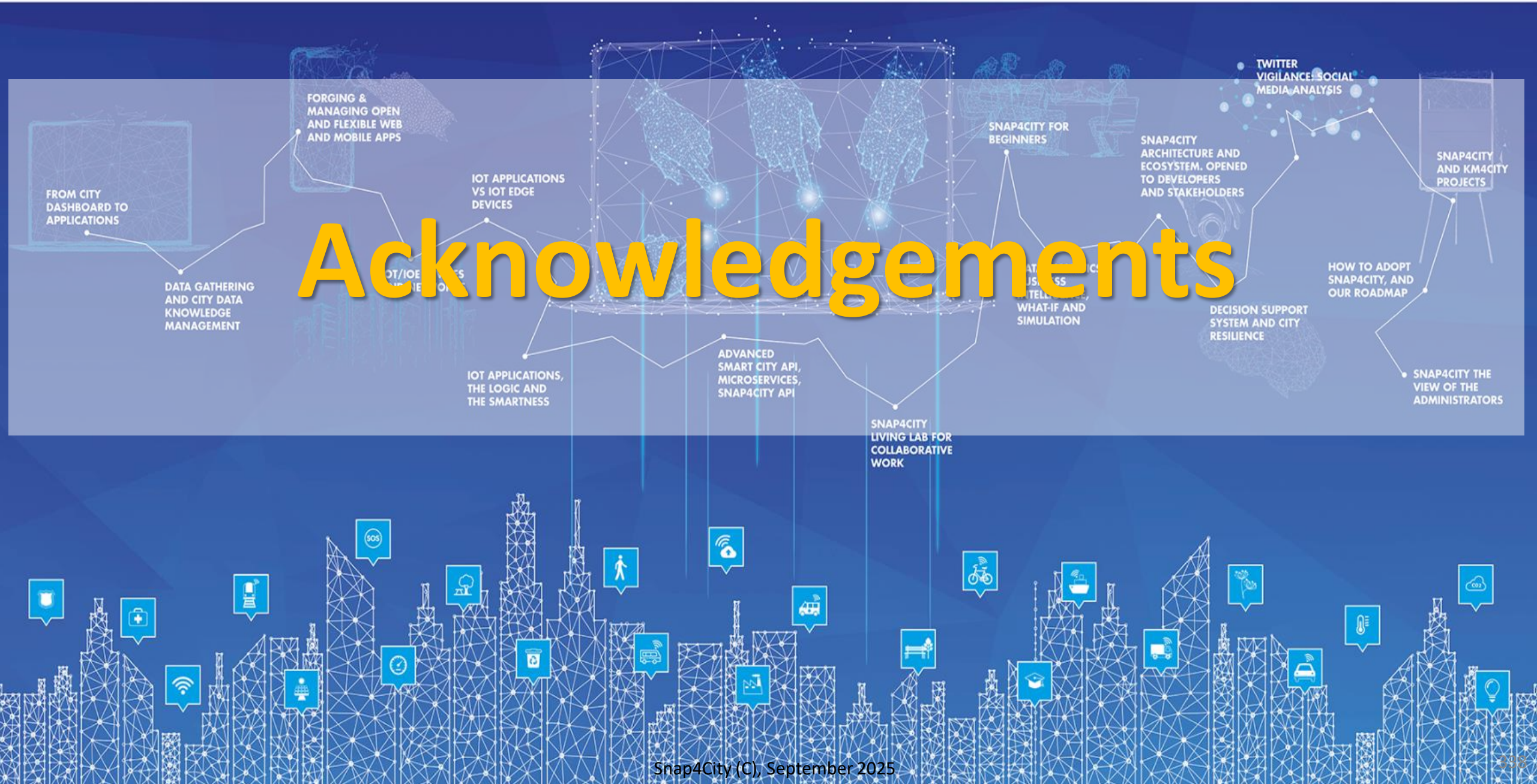
MLOperation

https://www.snap4city.org/download/video/Snap4City-MLOps-Manual.pdf

Overview



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



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)

(2016-21) H2020 REPLICATE

- Smart Energy
- Sustainable Mobility
- Control Room
- Dashboard

Km4City 1.6.2

Sii-Mobility (2016-21) MIUR

SII-MOBILITY SCN

- Infomobility
- Mobile App
- Routing
- Multimodality

2016
FIWARE

Km4City 1.6.4

Sii-Mobility

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

E015 digital ecosystem (Powered by EXPO MILANO 2015)

(2016-19) MIUR GHOST SIR

- 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
- 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)

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

SIRIUS

LAID Smart Bed (POR CreO, Regione Toscana)

- Smart Health

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

- Industry 4.0

bee smart city

- Smart Lonato

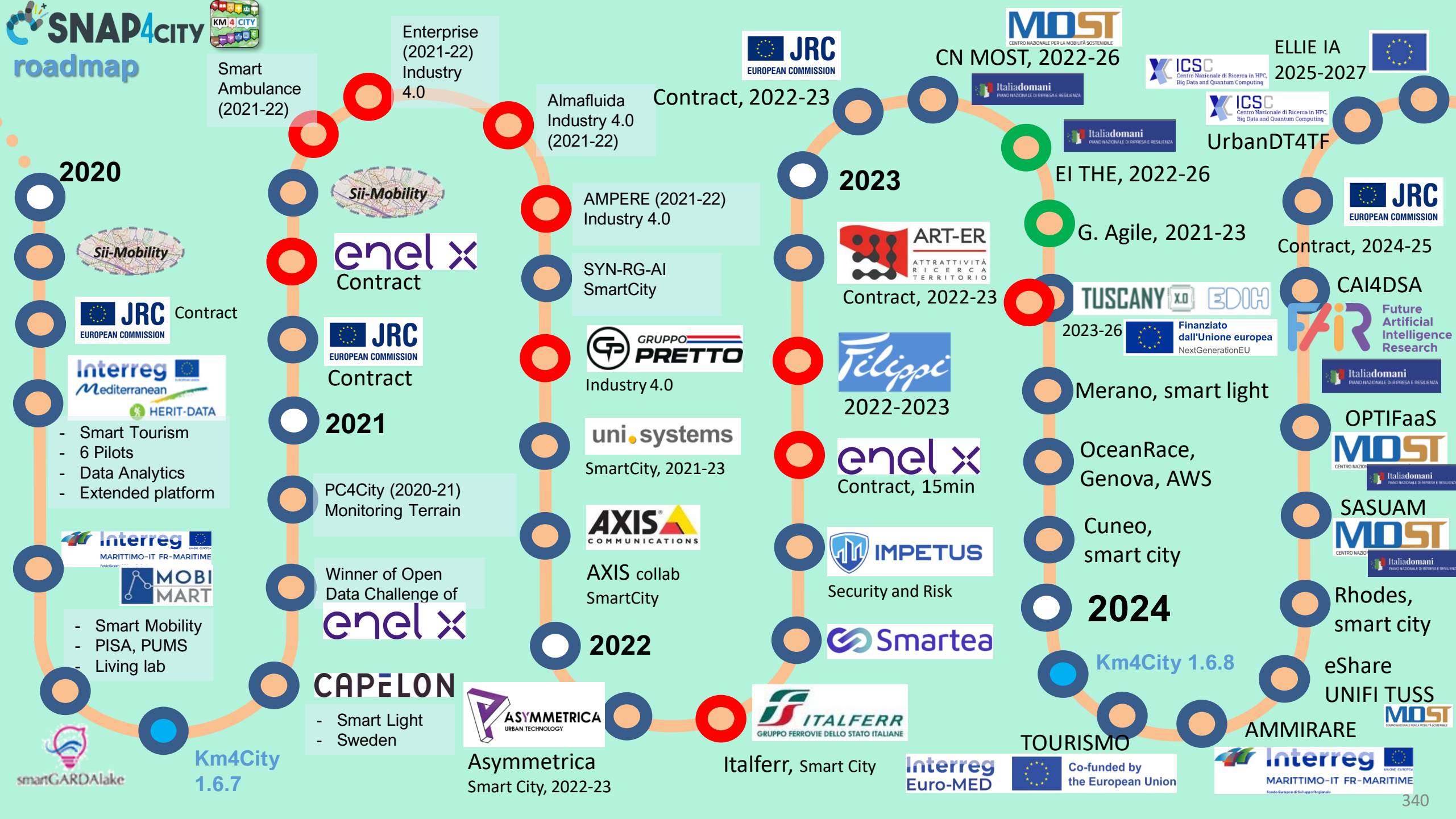
Reverberi Enetec Gruppo MPES

SODA

Winner of Select4Cities PCP

SELECT for Cities — CERTIFICATE OF ACHIEVEMENT — 1° place award to — UNIVERSITY OF FLORENCE - DEPARTMENT OF INFORMATION ENGINEERING — SNAP4CITY — DIGIPOLIS FORUM VIRIUM HELSINKI CITY OF COPENHAGEN Buyers Group

SNAP4CITY KM4CITY


SNAP4CITY
roadmap
KM4 CITY
Smart Ambulance (2021-22)
Enterprise (2021-22) Industry 4.0
Almafluida Industry 4.0 (2021-22)
JRC EUROPEAN COMMISSION
Contract, 2022-23
MOST
CENTRO NAZIONALE PER LA MOBILITÀ SOSTENIBILE
CN MOST, 2022-26
ICSC Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing
ELLIE IA 2025-2027
Italiadomani
PIANO NAZIONALE DI RIPRESA E RESILIENZA
UrbanDT4TF
EI THE, 2022-26
2020
Sii-Mobility
enel x
Contract
AMPERE (2021-22) Industry 4.0
SYN-RG-AI SmartCity
2023
ART-ER ATTRATTIVITÀ RICERCA TERRITORIO
Contract, 2022-23
G. Agile, 2021-23
JRC EUROPEAN COMMISSION
Contract, 2024-25
CAI4DSA
TUSCANY XD EDIH
2023-26
Finanziato dall'Unione europea NextGenerationEU
Future Artificial Intelligence Research
Contract
Interreg Mediterranean HERIT-DATA
- Smart Tourism
- 6 Pilots
- Data Analytics
- Extended platform
2021
GRUPPO PRETTO
Industry 4.0
Filippi
2022-2023
Merano, smart light
OPTIFaaS
uni.systems
SmartCity, 2021-23
PC4City (2020-21) Monitoring Terrain
AXIS COMMUNICATIONS
AXIS collab SmartCity
IMPETUS
Security and Risk
OceanRace, Genova, AWS
SASUAM
Cuneo, smart city
Interreg MARITTIMO-IT FR-MARITIME
MOBI MART
- Smart Mobility
- PISA, PUMS
- Living lab
Winner of Open Data Challenge of
enel x
Contract, 15min
Smartea
2022
2024
Rhodes, smart city
Km4City 1.6.8
eShare
UNIFI TUSS
CAPELON
- Smart Light
- Sweden
ASYMMETRICA URBAN TECHNOLOGY
ITALFERR GRUPPO FERROVIE DELLO STATO ITALIANE
AMMIRARE
TOURISMO
smartGARDAlake
Km4City 1.6.7
Asymmetrica
Smart City, 2022-23
Italferr, Smart City
Interreg Euro-MED
Co-funded by the European Union
Interreg MARITTIMO-IT FR-MARITIME

Currently 2025

- **UrbanDT4TF**, CN HPC: Digital Twin mobility, https://www.snap4city.org/drupal/node/1057
- **DI-DTPlatform**, CN HPC: Digital Twin, mobility, environment, https://www.snap4city.org/drupal/node/1097
- **Sasuam**, CN MOST, PNRR: AI, mobility, https://www.snap4city.org/drupal/node/999
- **OPTIFaaS**, CN MOST, PNRR: AI, mobility, DSS, https://www.snap4city.org/drupal/node/1008
- **LeverageOPTIFaaS**, CN MOST: PNRR, mobility, https://www.snap4city.org/drupal/node/1064
- **TOURISMO**, Interreg, EC: Tourism, NLP, DSS, https://www.snap4city.org/drupal/node/1001
- **ELLIE**, Horizon Europe, EC: AI, VR, https://www.snap4city.org/drupal/node/1056
- **CN MOST**, PNRR: sustainable mobility, platform, https://www.snap4city.org/drupal/node/1050
- **ISPRA JRC contract**, EC: DSS, SOC, control room, energy, https://www.snap4city.org/drupal/node/970
- **AMMIRARE**, Interreg, EC: AI, environment, Big Data, https://www.snap4city.org/drupal/node/1002
- **CAI4DSA**, FAIR PE1, PNRR: AI, Neuro-Symbolic, PINN, NG-DSS, https://www.snap4city.org/drupal/node/1016
- **SADI-MIAC**, RT, partner: AI, Tourism, Retail, Computer Vision, https://www.snap4city.org/drupal/node/1055
- **SMART3R,** PRIN UNICagliari: mobility, DSS, https://www.snap4city.org/drupal/node/1087
- **Tuscany X.0, EDIH,** TestBeforeInvest, Training on AI, Big Data, Security, HPC: https://www.tuscanyx.eu/
- **The IE**, PNRR: AI, NLP, LLM, Legal Aspects
- **BullVIT** , RT, conv**:** NLP, LLM
- **Energia**, RT, conv: AI, PINN, DSS
- **RFI contract**: mobility, AI, DSS
- **Salerno Port**: container ID recognition and tracking
- **Talent Hub**, ECRF, conv: NLP, match demand vs offer

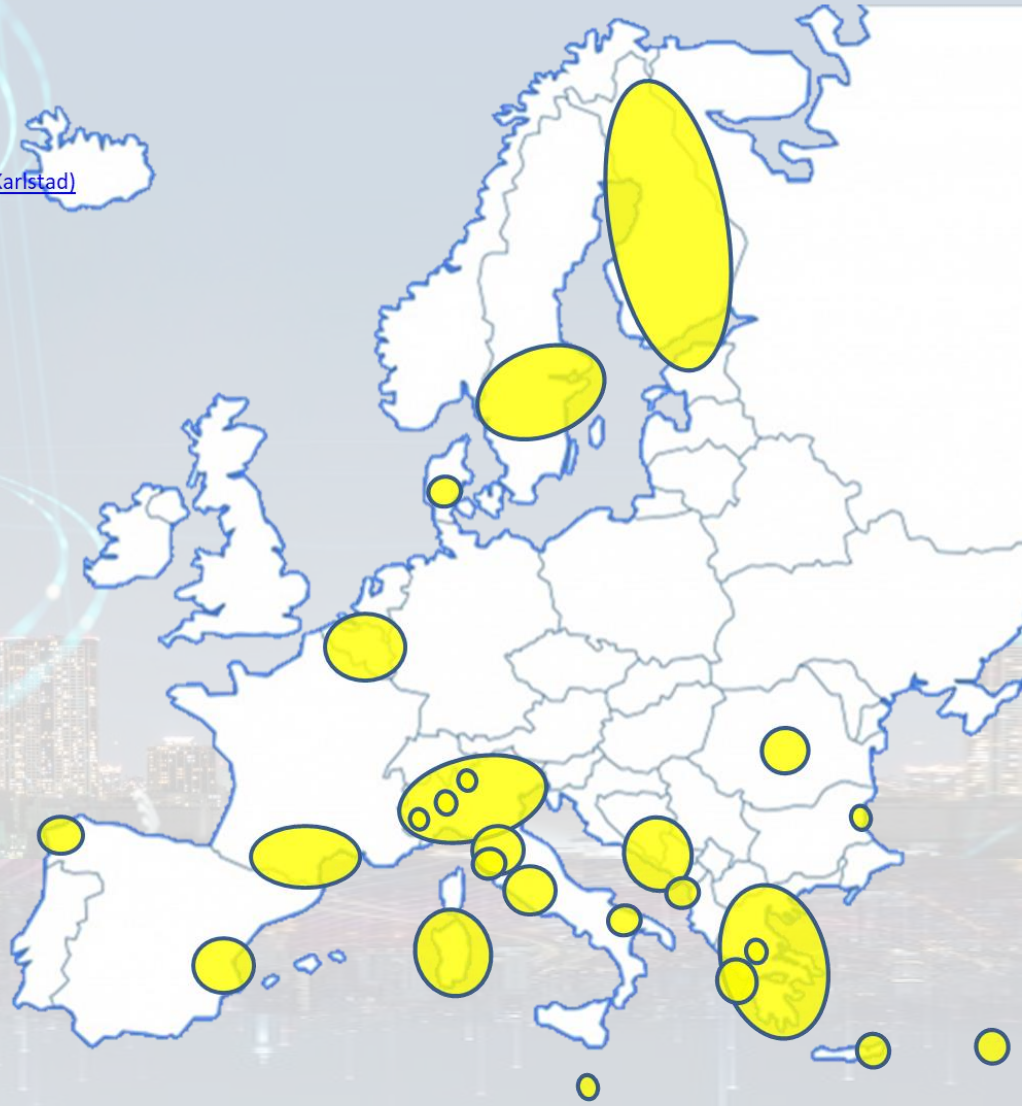
+ currently: Merano, Salerno, Cuneo, Rhodes, Reverberi, Florence, IDTS, ALTAIR, etc.

https://www.Snap4City.org

- 11 running installations in Europe
  - Snap4city.org, Greece, Merano, Cuneo, …
  - Toscana, Pisa, Sweden, ISPRA, Snap4.eu,
  - Altair, Italmatic, M4F, Romania, ….
- 20 projects, 12 pilots on 10 Countries
  - >40 cities/area
- **Widest MULTI-tenant deploy has**
  - 26 Organizations / tenant
  - > 8850 users on
  - > 1800 Dashboards
  - > 17 mobile Apps
  - **> 2.2 Million of structured data per day**
  - > 580 IoT Applications/node-RED
  - > 850 web pages with training
  - > 85 videos, training videos

Main Organizations/areas

- Antwerp area (Be)
- Bari (I)
- Bisevo, Croatia
- Bologna (I)
- Brasov (Ro), by ICEBERG
- Capelon (Sweden: Västerås, Eskilstuna, Karlstad)
- Cuneo (I)
- DISIT demo (multiple)
- Dubrovnik, Croatia
- Firenze area (I)
- Garda Lake area (I)
- Greece (Gr)
- Helsinki area (Fin)
- Limassol (Cy)
- Livorno area (I)
- Lonato del Garda (I)
- Malta (Malta)
- Merano (I)
- Modena (I)
- Mostar, Bosnia-Herzegovina
- Oslo & Padova (Impetus)
- Pisa area (I)
- Pistoia (I)
- Pont du Gard, Occitanie (Fr)
- Prato (I)
- Rhodes (Gr)
- Roma (I)
- Santiago de Compostela (S)
- Sardegna Region (I)
- Siena (I)
- SmartBed (multiple)
- Toscana Region (I), SM
- Valencia (S)
- Varna (Bulgaria)
- Venezia area (I)
- WestGreece area (Gr)



- **+ Israel, Colombia, Brasile, Australia, India, China, etc.**

SNAP4CITY

KM4CITY

CITY

INDUSTRY

ARTIFICIAL INTELLIGENCE

MOST Centro Nazionale per la Mobilità Sostenibile

SASUAM

LUTECH

Università degli Studi di Napoli Federico II

Funded by the European Union NextGenerationEU

PTIFaaS

Università degli Studi Firenze

DINFO Dipartimento di Ingegneria dell'Informazione

DISIT

Politecnico di Bari

FAIR Future Artificial Intelligence Research

MUR

CAI4DSA

UNIVERSITÀ DEGLI STUDI DI CAGLIARI

MUR

Interreg Maritime-IT FR-Maritime

AMMIRARE

TOURISMO

Interreg Euro-MED

Co-funded by the European Union

SADI-MIAC

Coesione Italia Toscana

Cofinanziato dall'Unione europea

Regione Toscana

ELLIE

Funded by the European Union

Comune di Firenze

ASM Meran Stadtwerke Meran

Città di Cuneo

Rodhes

Development Agency of Iemesos LTD

Santa María la Real fundación

Fundación Valenciaport

READ S.A. Development Agency of South Aegean Region

Varna Economic Development Agency

rerasd

MRDD Foundation

SNAP4 CAPELON

uni.systems

European Commission Joint Research Centre

italmatic Autoclaves Ovens & Rollers

cyta

100% Open Source

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

NVIDIA

Powered by FIWARE

FIWARE SERVICES Training & Coaching

FIWARE SERVICES Consultancy & Integration

gaia-x

JS Foundation

E015 digital ecosystem

SNAP4CITY

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