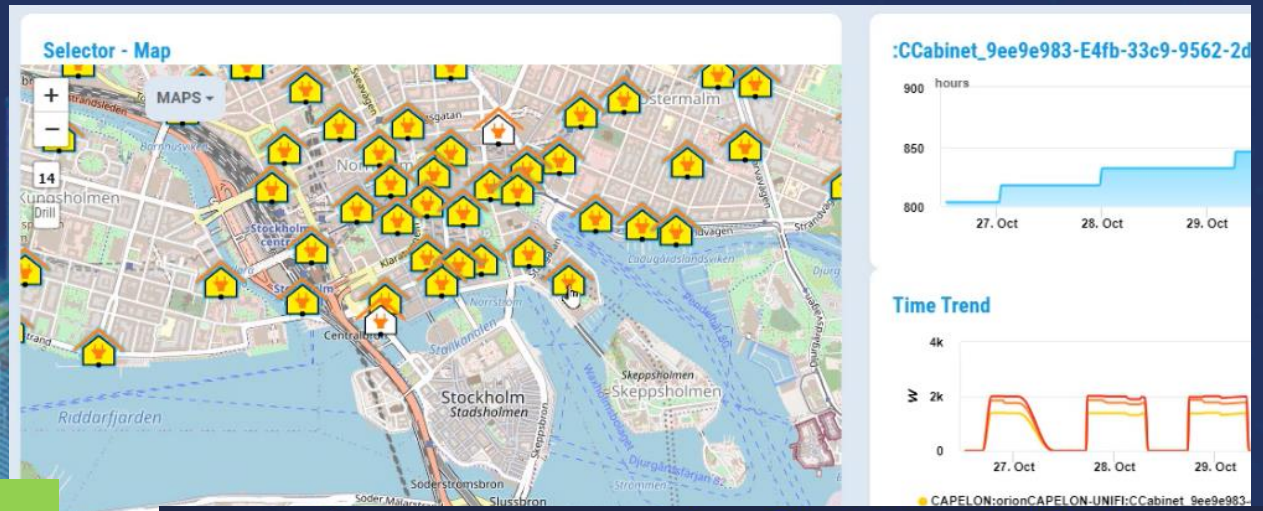
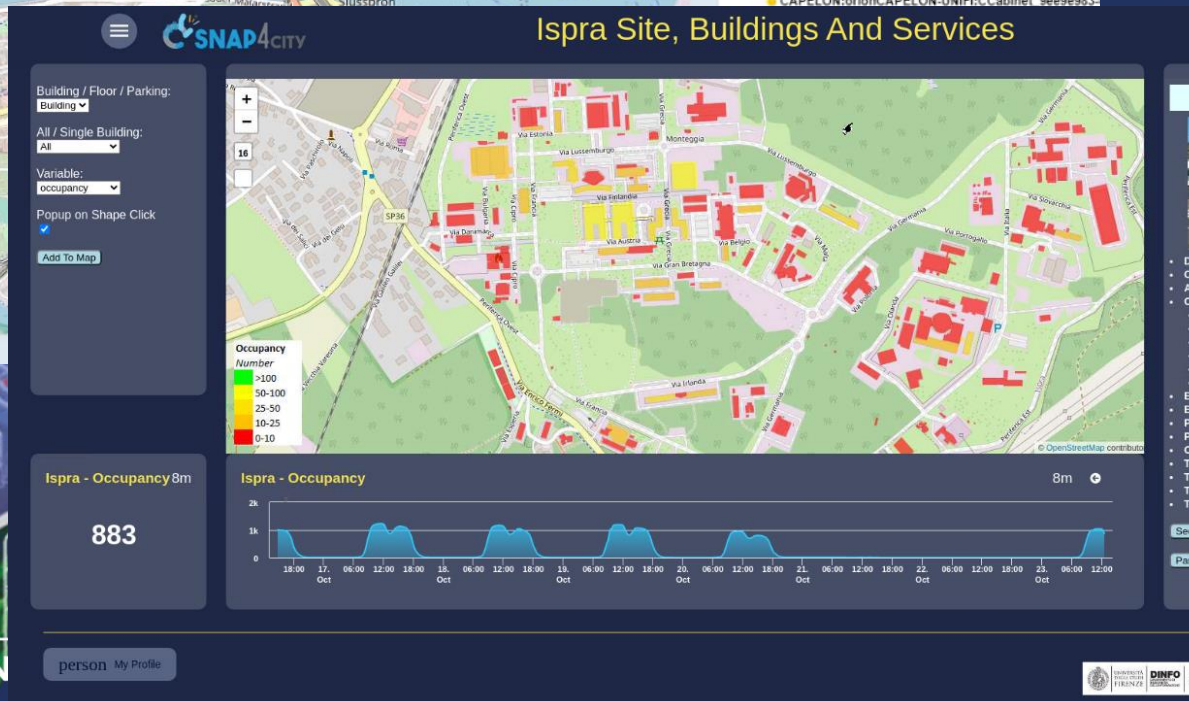
SNAP4CITY

www.snap4city.org
www.snap4solutions.org



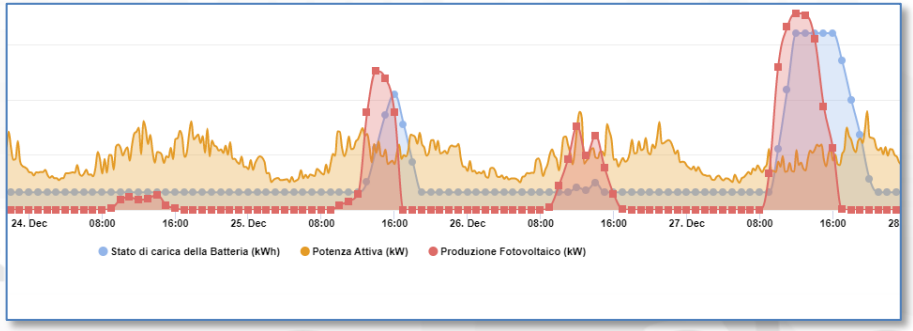
Smart Energy and Smart Buildings Operation and Plan Digital Twin



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

City Energy and Buildings

- **Goals:**
  - Energy consumption reduction, increment of efficiency,
  - Areas and building sustainability
  - Improve accessibility to services, security and safety
- **Energy Monitoring:** Building, floors, rooms, recharging poles, cabinets, Community of Energy, Data centers, Energy for Hot / cold, air condition, energy vs temperature and usage, etc.
- **Energy Management:** Predictions, early warning, identification of critical conditions
- **Smart Light Management**: LED/mixt, cabinets, lights vs traffic, lights vs safety, energy saving, luminaries profiling, group management.
- **Smart Building Management:** consumption, number of people, etc.
  - Communities of Energy, Photovoltaic plants, sustainability
  - What-if analysis, optimisation tools
- **KPI: Energy consumption, efficiency, pros/cons**
  - Light profiling and adaptation
  - Autoclave industrial plants simulation, Photovoltaic plant simulation
  - consumption / usage, energy vs temperature
- **Mobile App:** monitoring, info-recharge, eSharing, booking, ..
- **Participatory**: problem reporting, ticketing, etc.
- **Integration of any kind**



Smart Energy

FROM CITY DASHBOARD TO APPLICATIONS

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	

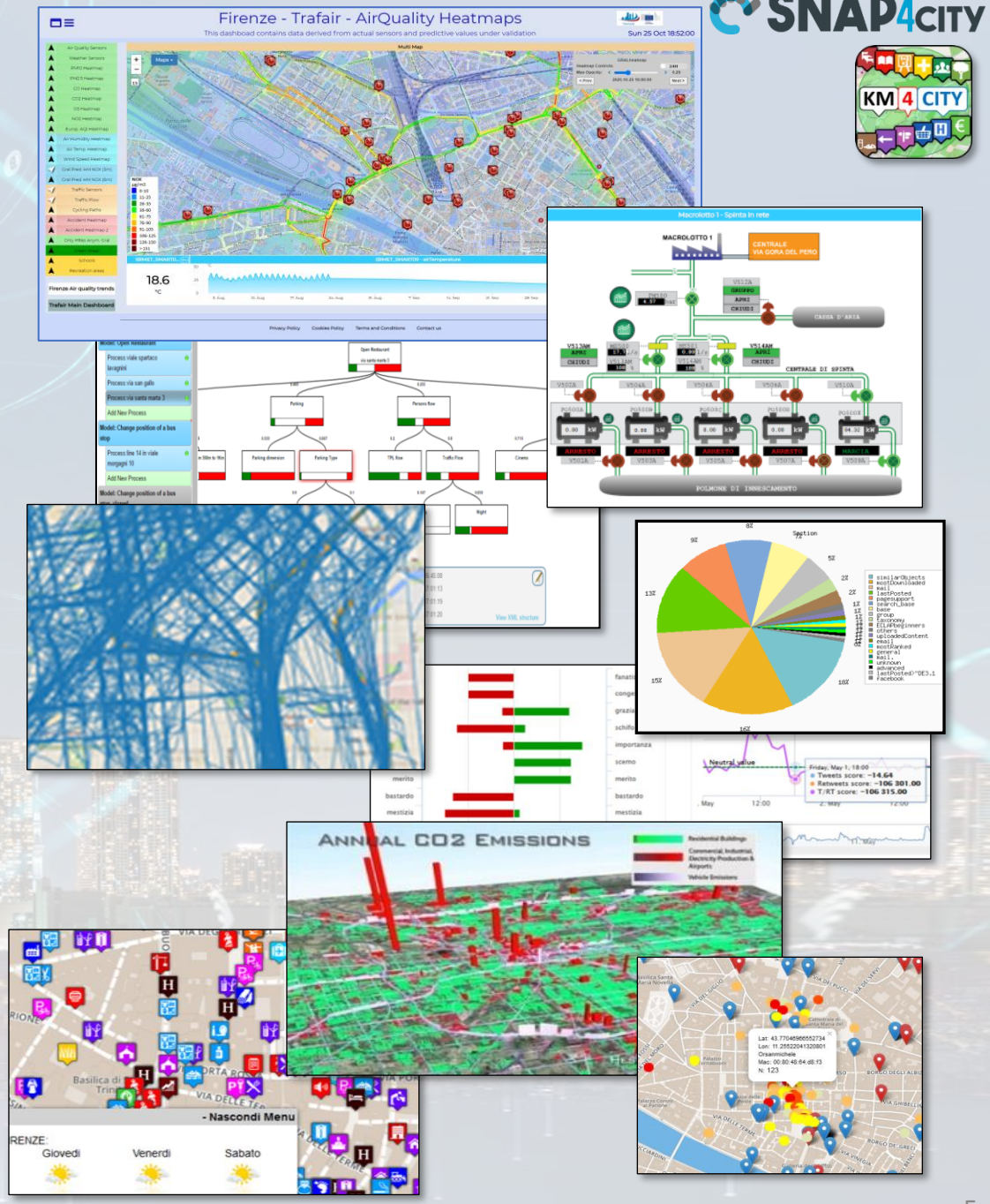
- **United Nations Sustainable Development Goals, SDGs** (for which cities can do more to achieve some of the 17 SDGs, https://sdgs.un.org/goals);
- **15 minutes cities** (where primary services must be accessible within 15 minutes on foot);
- **objectives of the European Commission** in terms of pollutant 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**
- **SUMP/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

Data Driven Decision Support

- Decision Support system
- Assessment / Strategies
- Data Rendering,
  - visual analytics, business intel..
- Data Analytics, ML, AI
- Data aggregation, Storage, indexing
- Data Ingestion



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

SNAP4CITY | KM4CITY

www.snap4city.org

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100% OPEN SOURCE

Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

JS Foundation

E015 digital ecosystem

NVIDIA

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

SNAPADVISOR

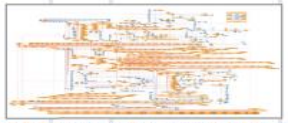
BUSINESS INTELLIGENCE - SIMULATIONS - VISUAL ANALYTICS - SYNOPTICS - GRAPHICAL WIDGETS - ANALYTICS

DASHBOARDS, WIDGETS
TEMPLATES

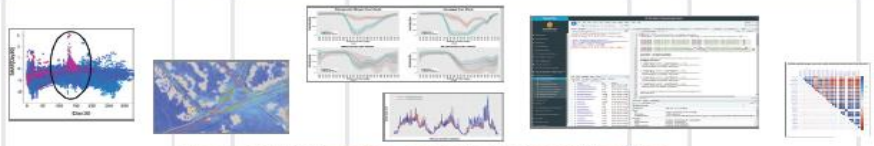
PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG
15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...

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

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



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



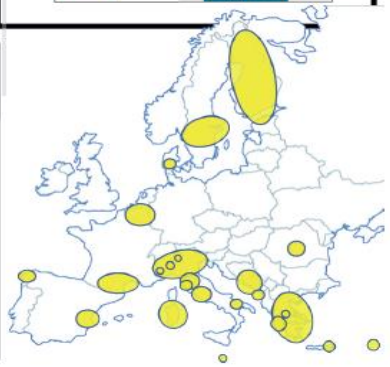
BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI
OPERATIVE RESEARCH, STATISTICS

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

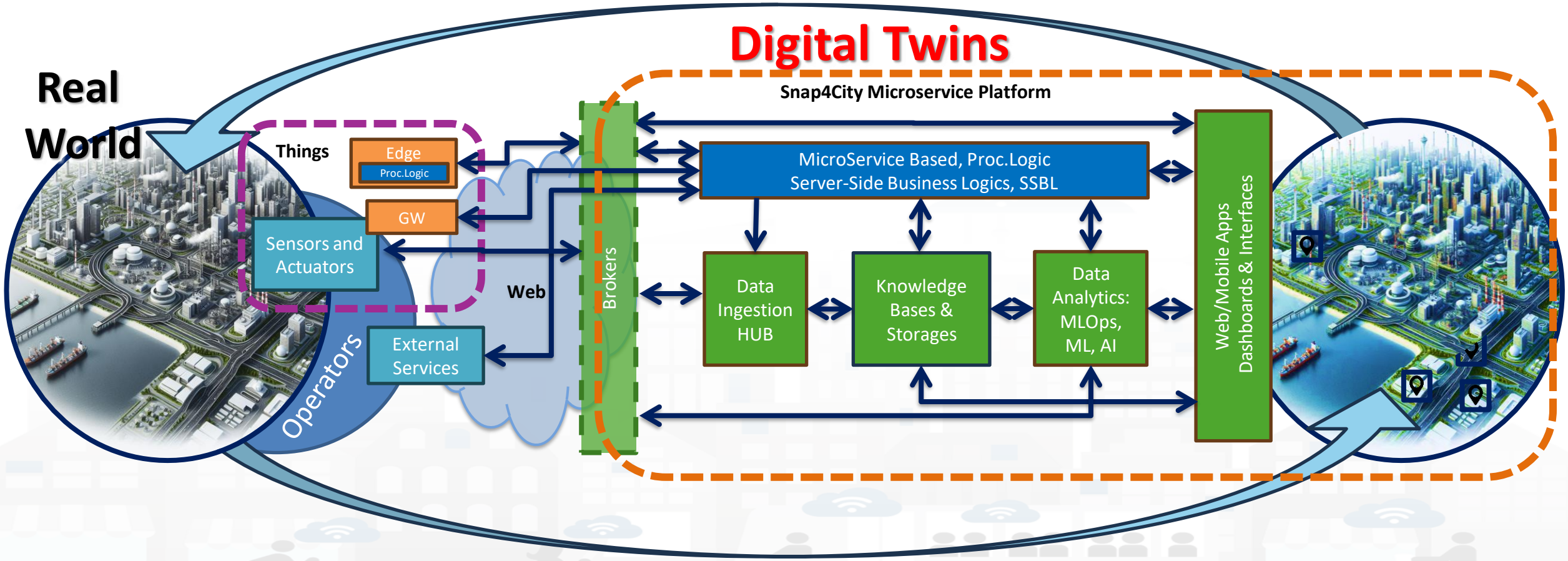
FULL INTEROPERABILITY, ANY: DATA, BROKERS, NETWORKS AND VERTICALS

NATIVE AND EXTERNAL APPLICATIONS

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



Digital Twin Development Platform



Standards and Interoperability

Compliant with:

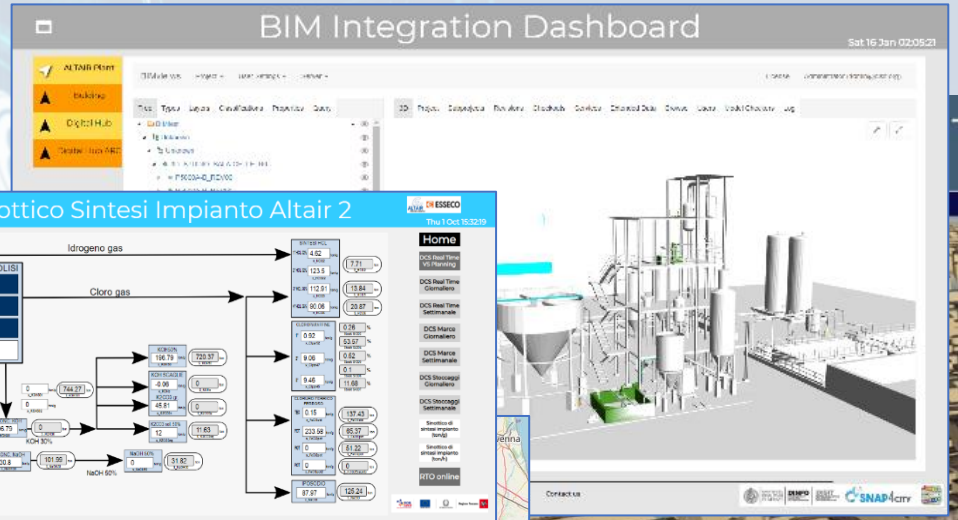
- **IoT:** NGSI V2/LD, LoRa, LoRaWan, MQTT, AMQP, COAP, OneM2M, TheThingsNetwork, SigFOX, Libelium, IBIMET/IBE, Enocean, Zigbee, DALI, ISEMC, Alexa, Sonoff, HUE Philips, Tplink, BACnet, TALQ, Protocol Buffer, KNX, OBD2, Proximus, ..
- **IoT model:** FIWARE Smart Data Model, Snap4City IoT Device Models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

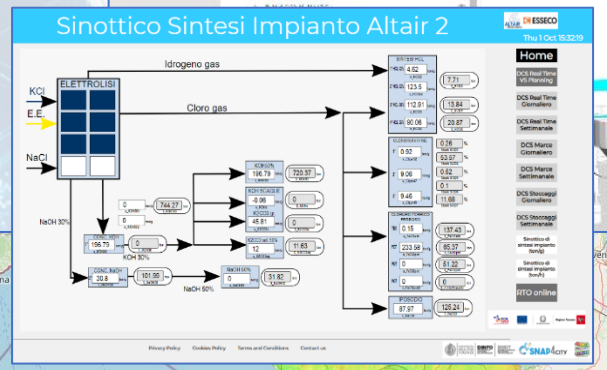
https://www.snap4city.org/65

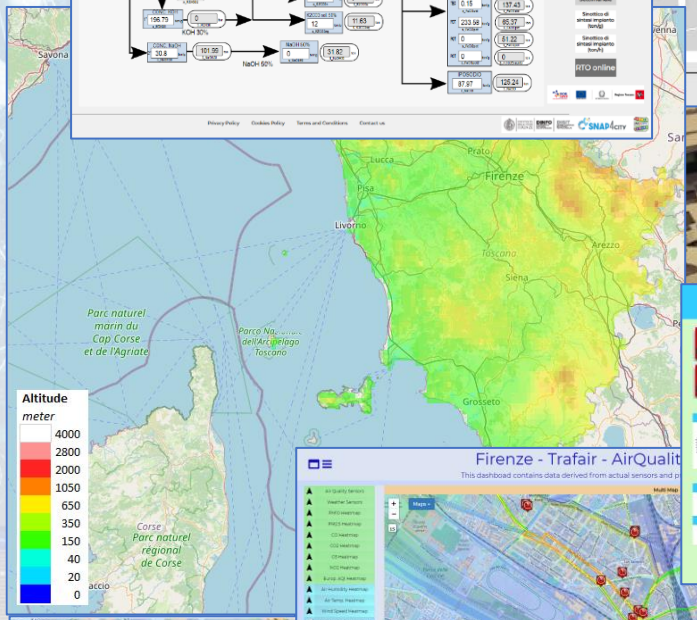
High Level Types

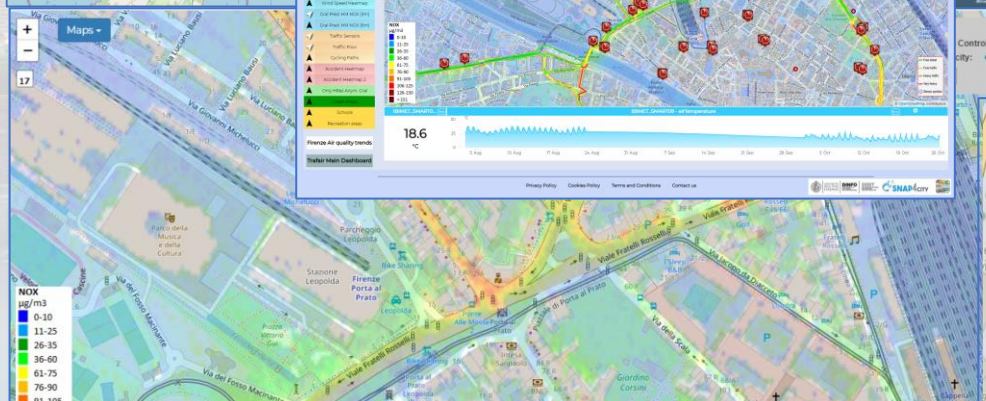
Snap4City (C), October 2025

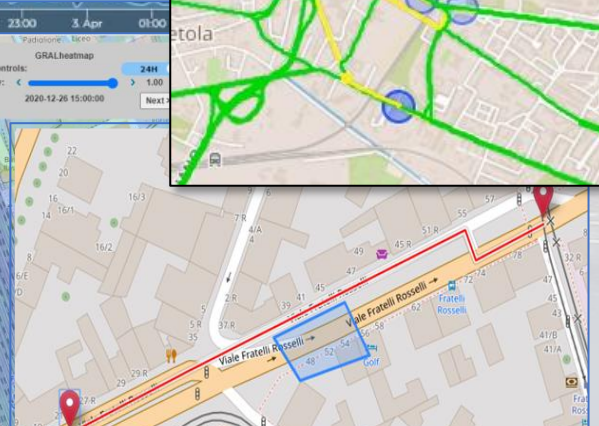
- POI, IOT Devices, shapes,..
  - FIWARE Smart Data Models,
  - IoT Device Models
- GIS, maps, orthomaps, WFS/WMS, GeoTiff, calibrated heatmaps, ..
- Satellite data, any kind..
- traffic flow, typical trends, ..
- Vector fields + heatmaps, ..
- trajectories, events, workflow, ..
- 3D Models, BIM, Digital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



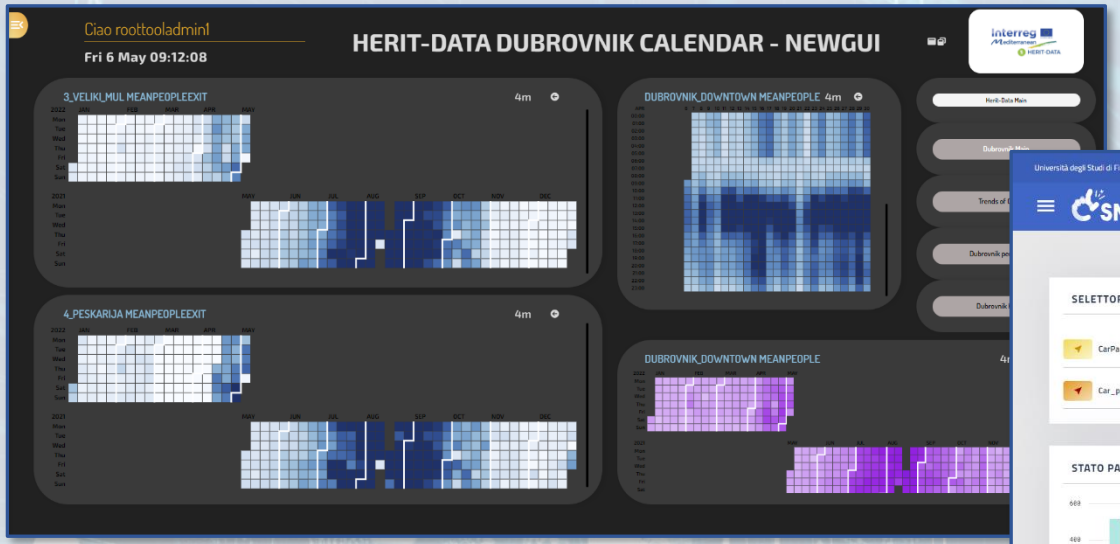


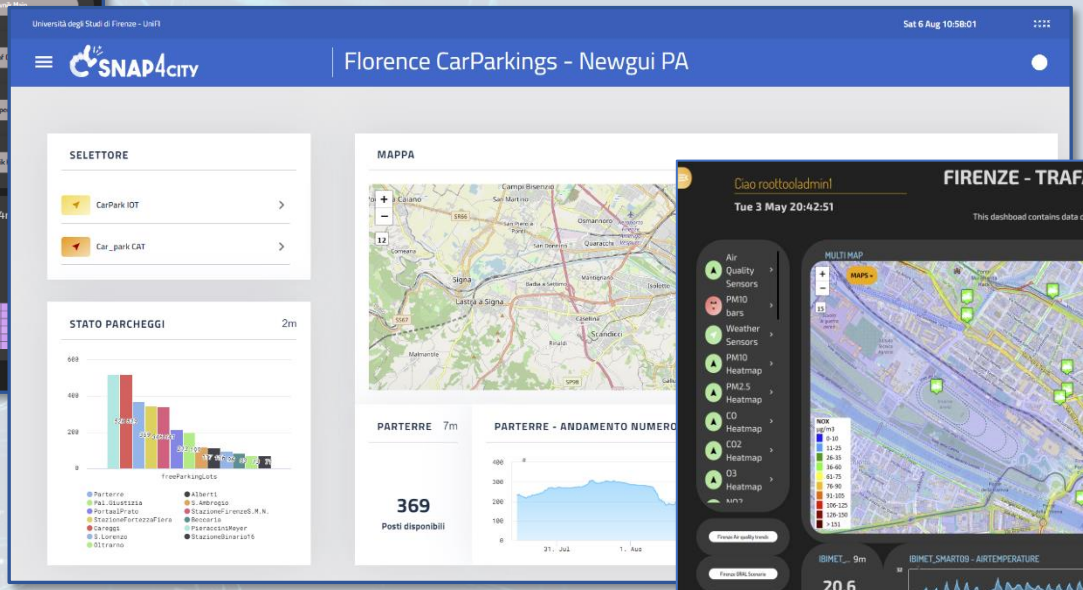


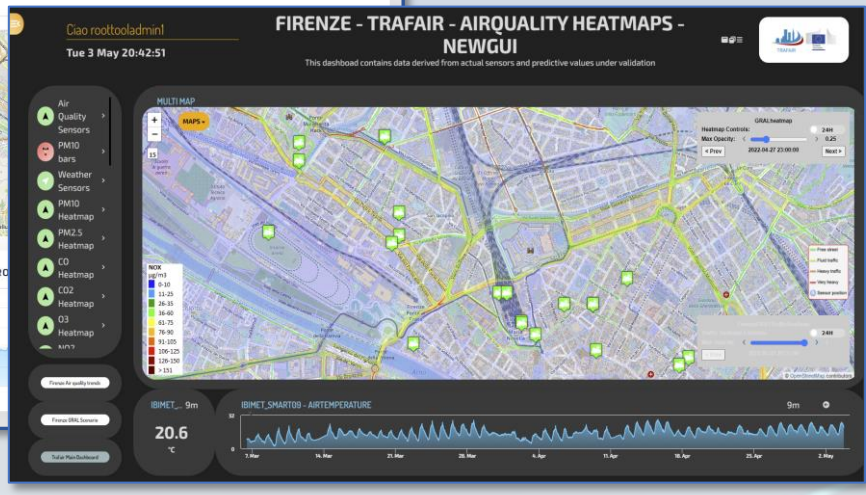


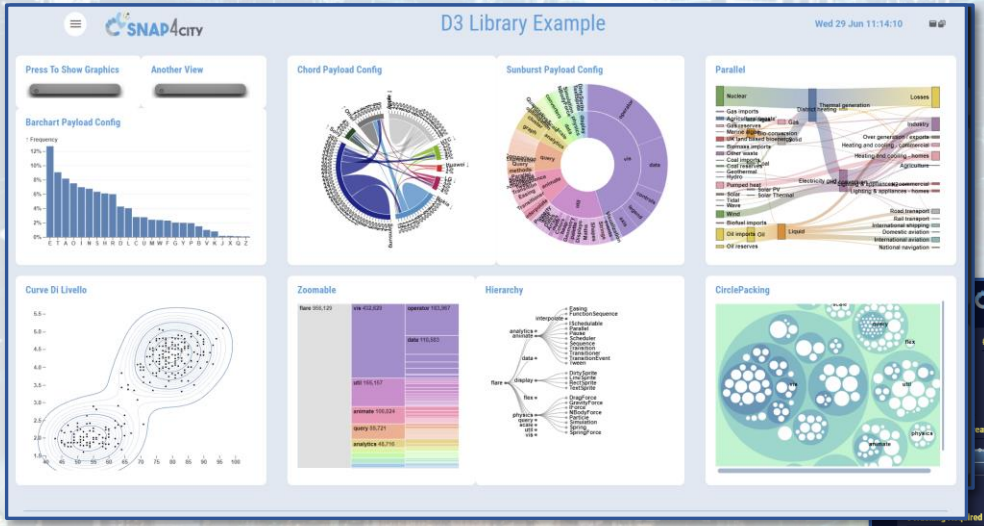


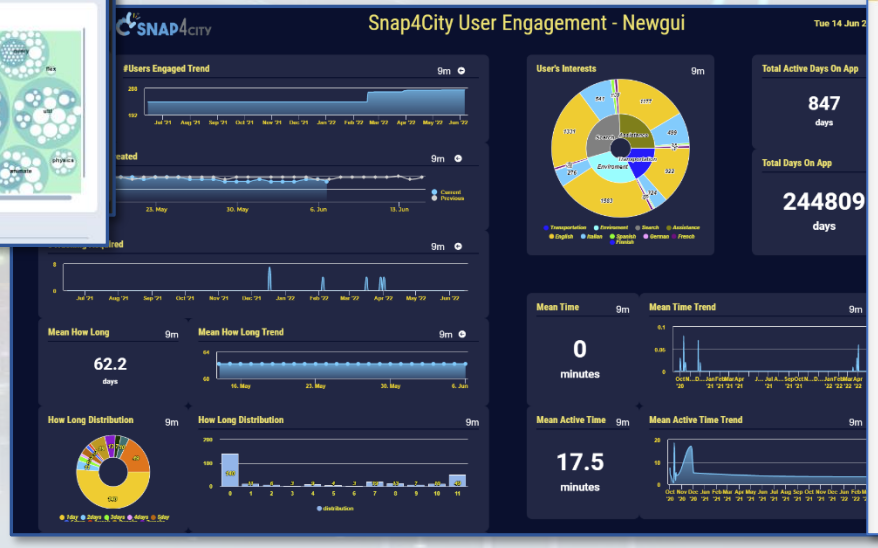
Different Themes

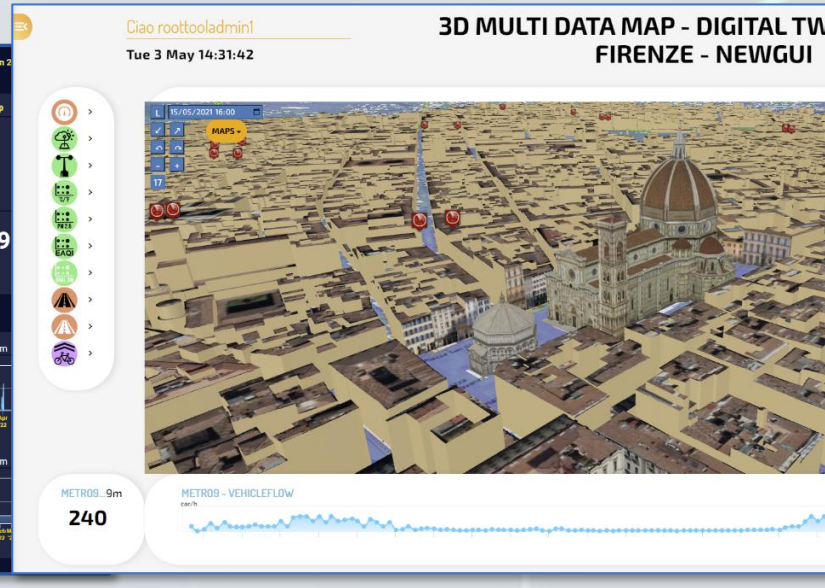








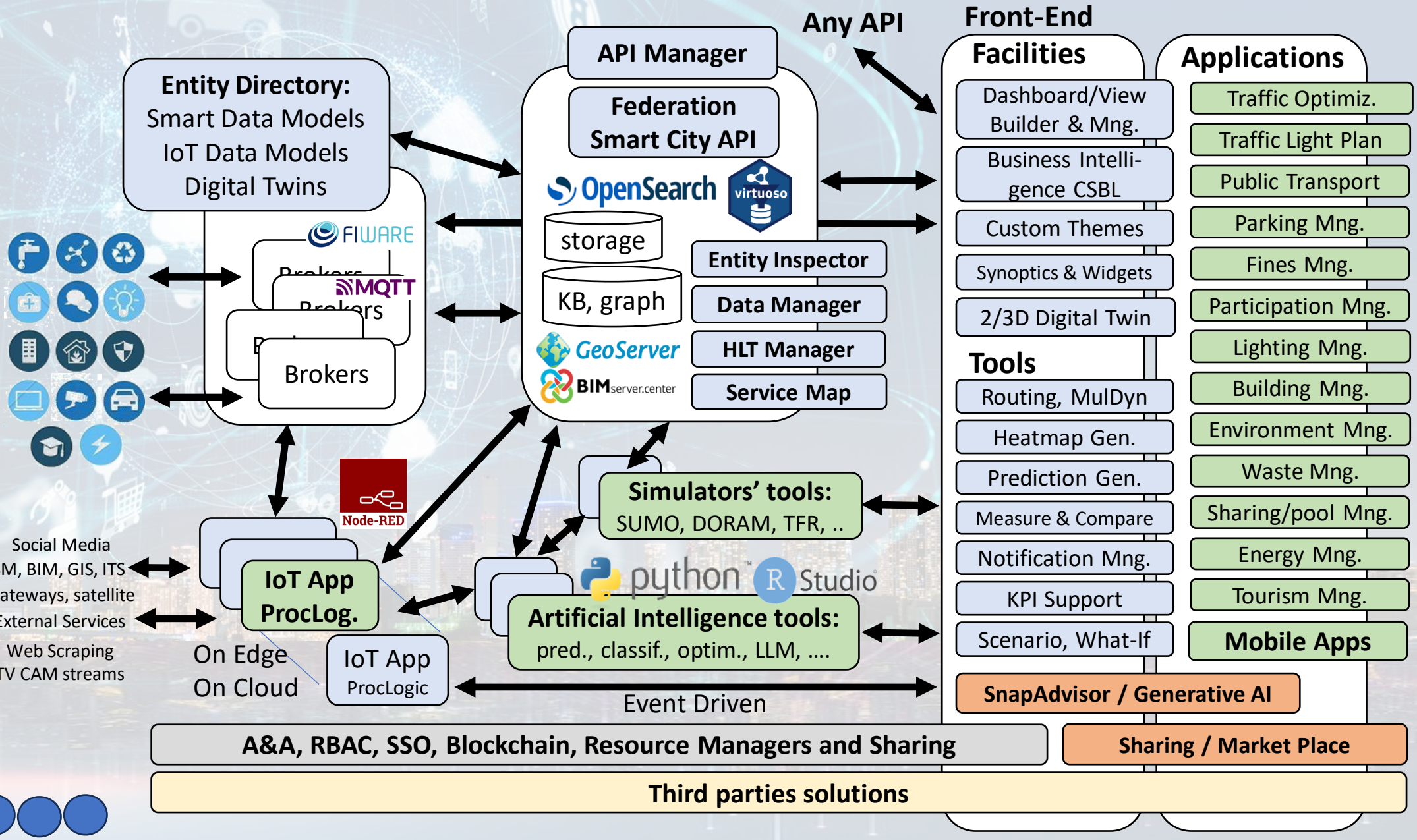




New styles/themes can be developed by specializing a few files from open source

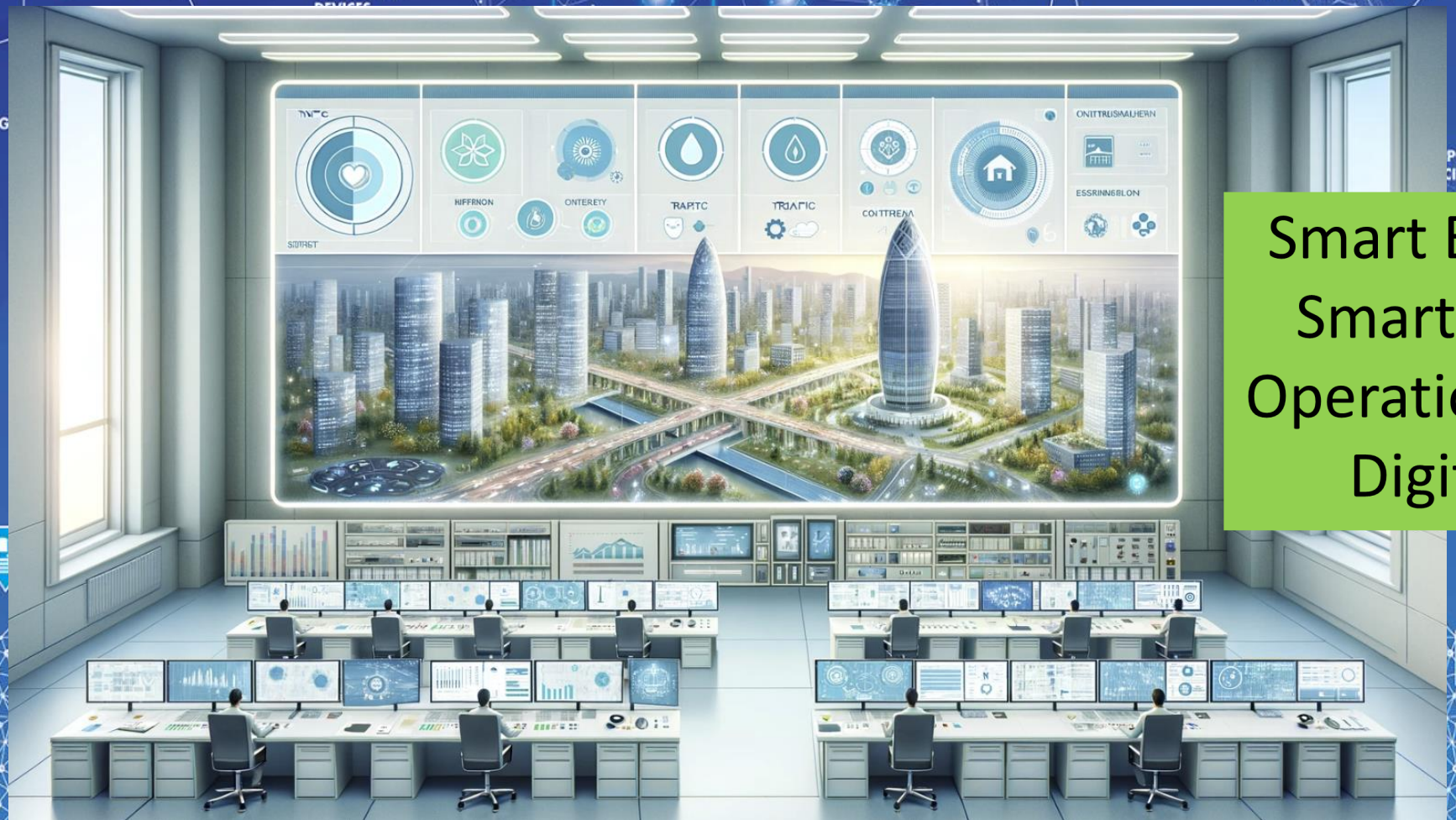
https://www.snap4city.org/793

Technical Architecture



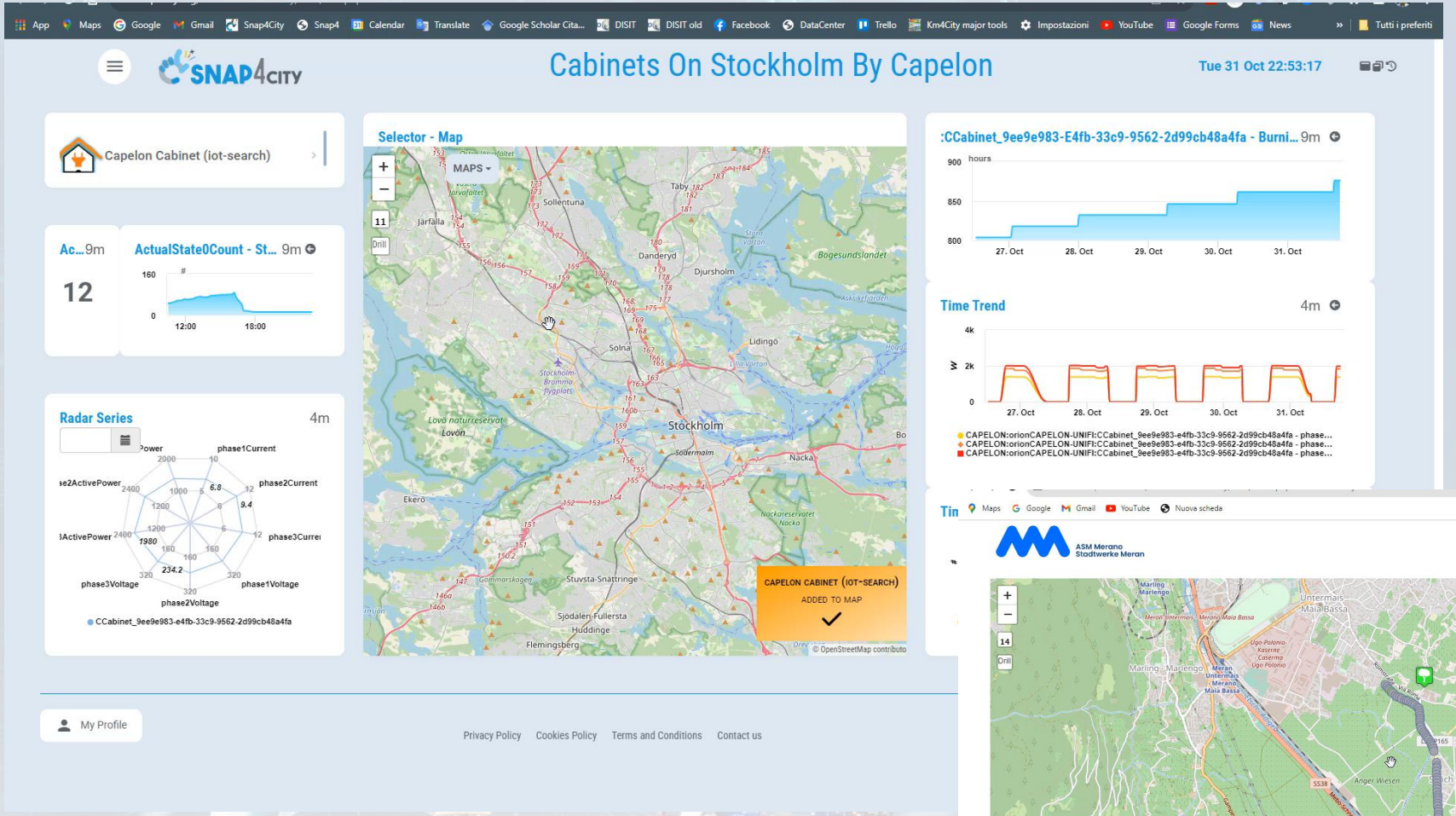
TOP

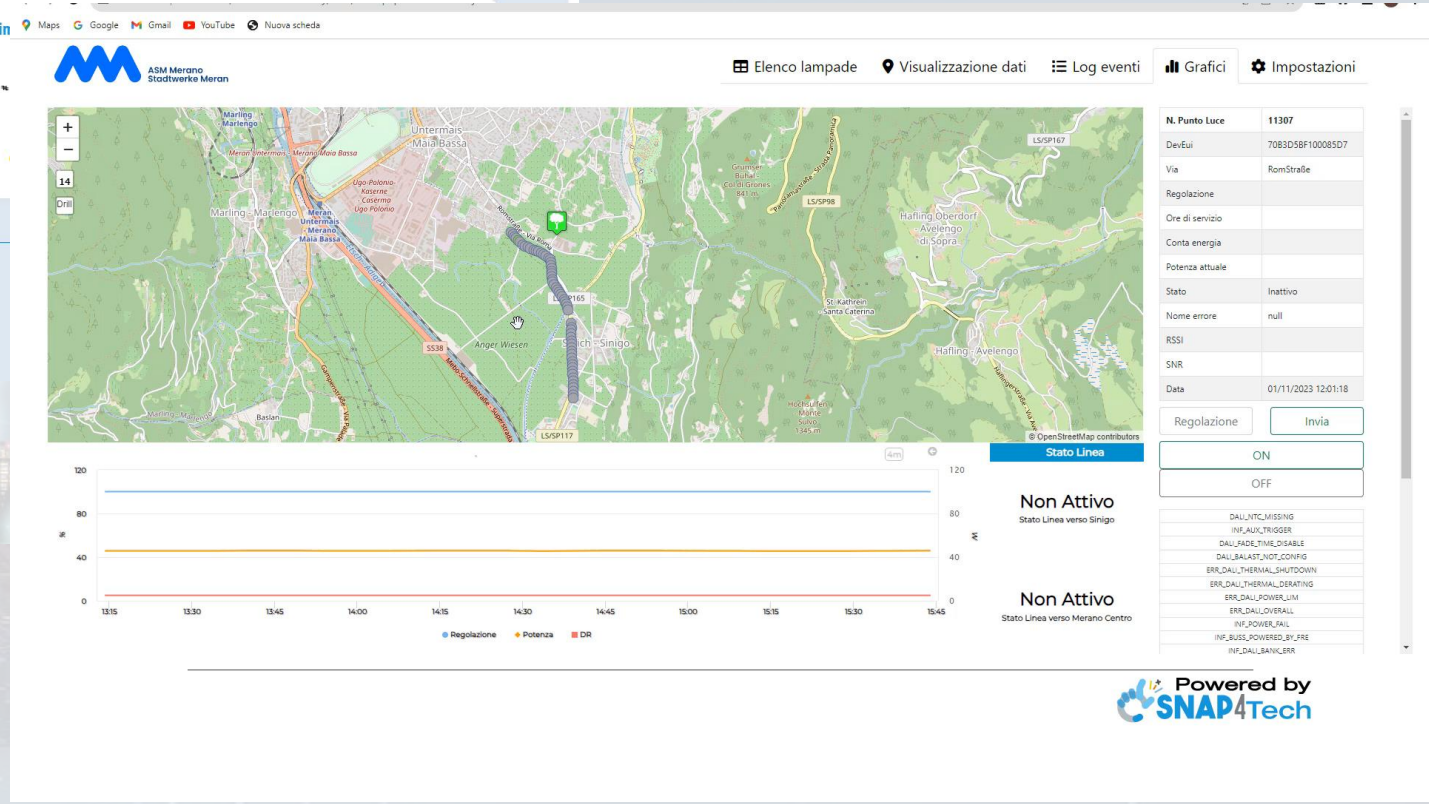
Monitoring and control



Smart Energy and Smart Buildings Operation and Plan Digital Twin

100% OPEN SOURCE





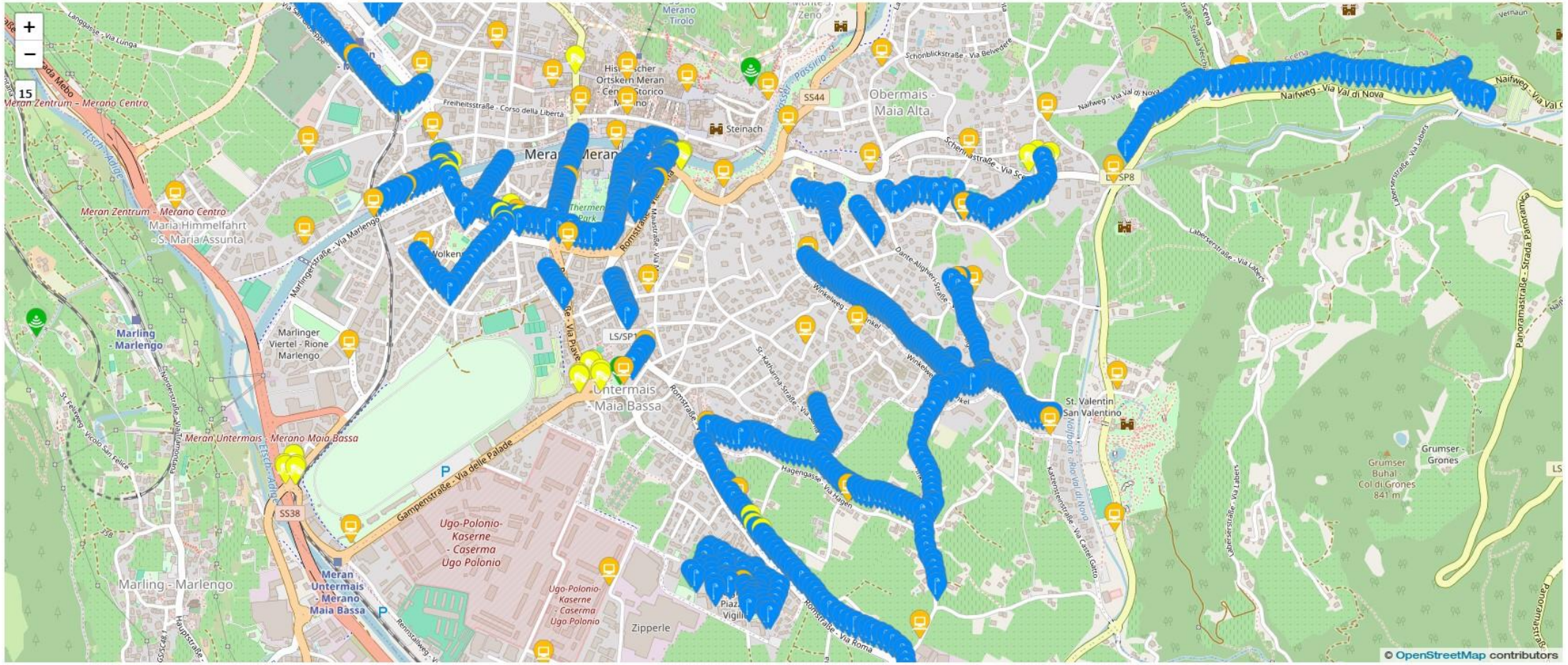
Smart Light Management

Smart Light in Merano

ASM Merano Stadtwerke Meran

Merano - tutti i servizi

Wed 13 Dec 15:34:57



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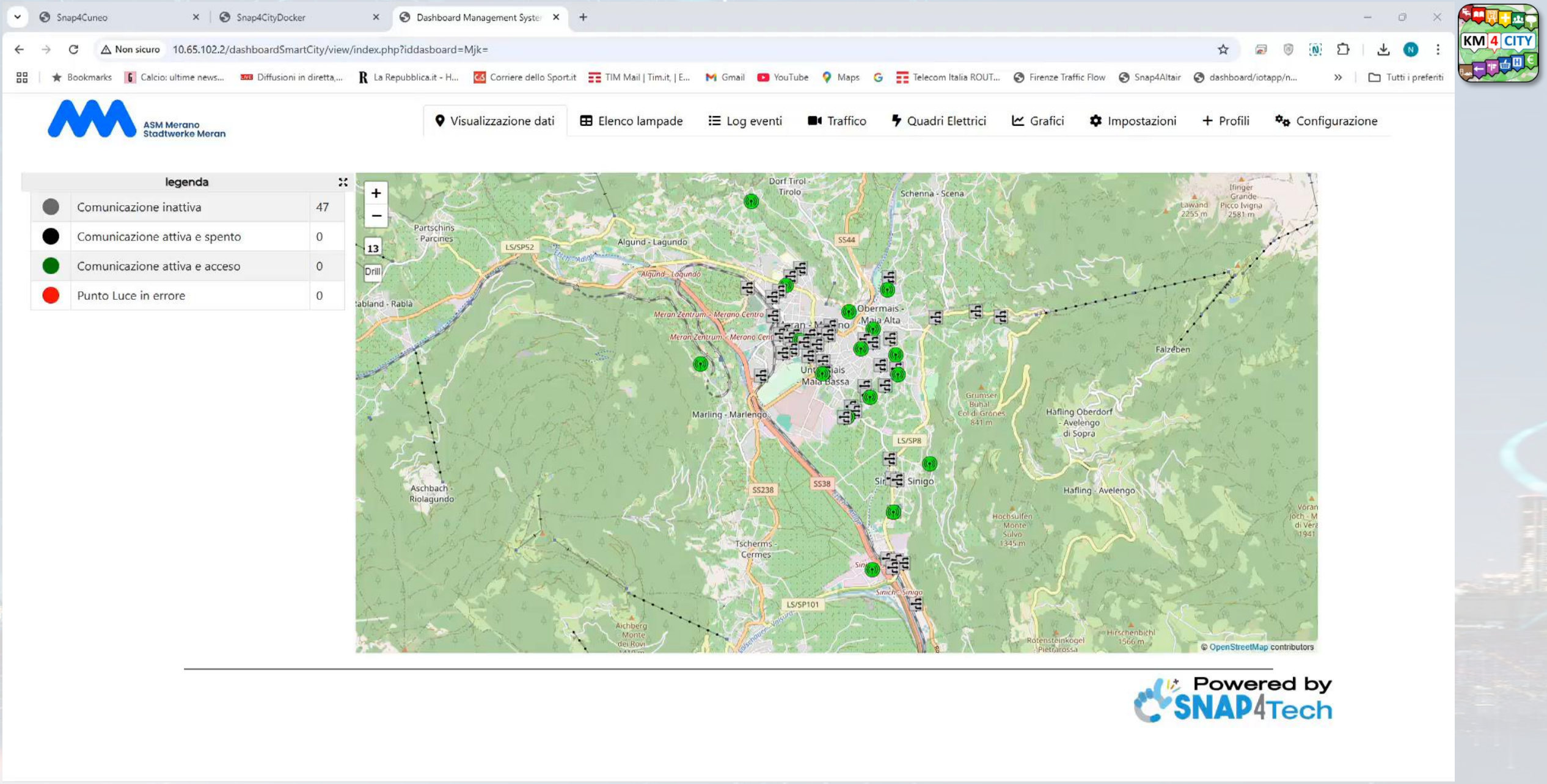
Snap4Cuneo
Snap4CityDocker
Dashboard Management Syste
Non sicuro
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ASM Merano
Stadtwerke Meran
Visualizzazione dati
Elenco lampade
Log eventi
Traffico
Quadri Elettrici
Grafici
Impostazioni
Profili
Configurazione
legenda
Comunicazione inattiva 47
Comunicazione attiva e spento 0
Comunicazione attiva e acceso 0
Punto Luce in errore 0
Dorf Tirol - Tirolo
Schenna - Scena
Partschins - Parcines
Algund - Lagundo
Obermais - Maia Alta
Falzeben
Marling - Marlengo
Hafling Oberdorf - Avelengo di Sopra
Hafling - Avelengo
Aschbach - Riolagundo
Tscherms - Cermes
Sinigo
LS/SP52
SS44
LS/SP8
SS238
SS38
LS/SP101
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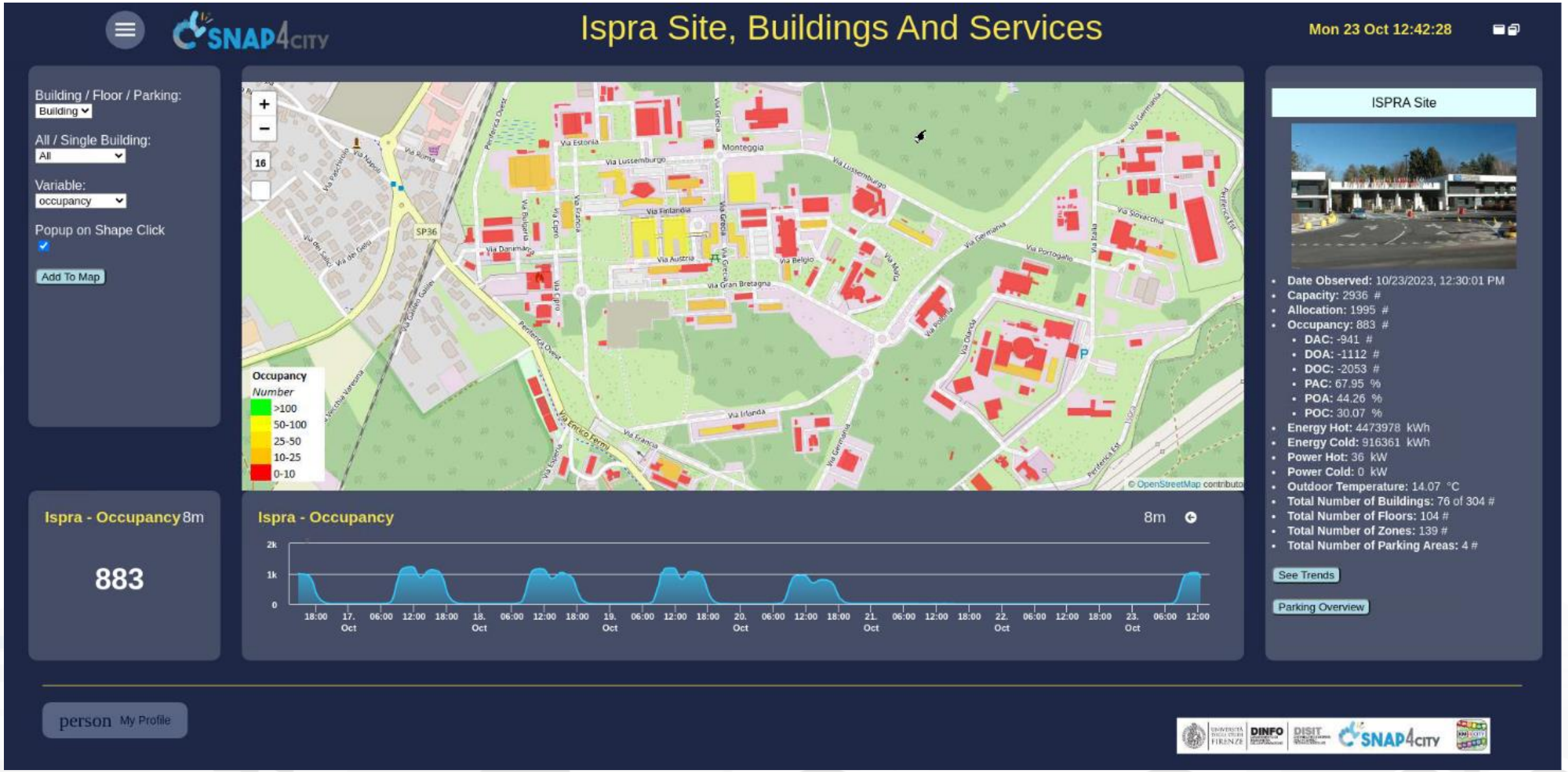
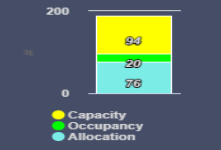

SNAP4CITY
Ispra Site, Buildings And Services
Mon 23 Oct 12:42:28
Building / Floor / Parking:
Building
All / Single Building:
All
Variable:
occupancy
Popup on Shape Click
Add To Map
Occupancy
Number
>100
50-100
25-50
10-25
0-10
© OpenStreetMap contributo
ISPRA Site
Date Observed: 10/23/2023, 12:30:01 PM
Capacity: 2936 #
Allocation: 1995 #
Occupancy: 883 #
DAC: -941 #
DOA: -1112 #
DOC: -2053 #
PAC: 67.95 %
POA: 44.26 %
POC: 30.07 %
Energy Hot: 4473978 kWh
Energy Cold: 916361 kWh
Power Hot: 36 kW
Power Cold: 0 kW
Outdoor Temperature: 14.07 °C
Total Number of Buildings: 76 of 304 #
Total Number of Floors: 104 #
Total Number of Zones: 139 #
Total Number of Parking Areas: 4 #
See Trends
Parking Overview
Ispra - Occupancy 8m
883
Ispra - Occupancy
8m
2k
1k
0
18:00 17. Oct 06:00 12:00 18:00 18. Oct 06:00 12:00 18:00 19. Oct 06:00 12:00 18:00 20. Oct 06:00 12:00 18:00 21. Oct 06:00 12:00 18:00 22. Oct 06:00 12:00 18:00 23. Oct 06:00 12:00
person My Profile

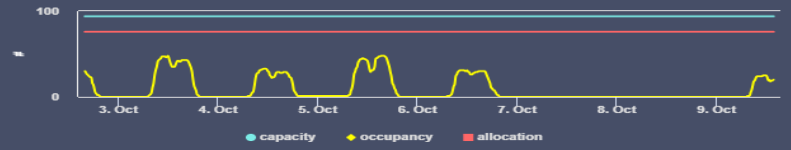
Building 27B Trends

Mon 9 Oct 13:47:14

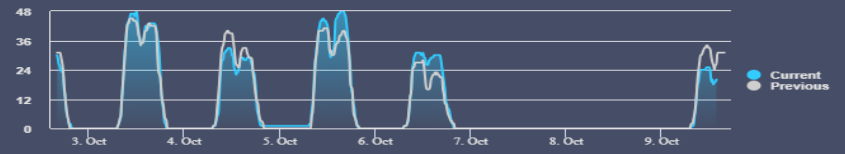
Actual 4m



Capacity - Allocation - Occupancy 4m



Occupancy Weekly Time Trend Compare 9m



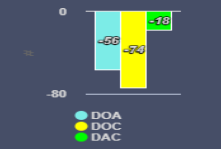
Office Mq 9m

803.9 m2

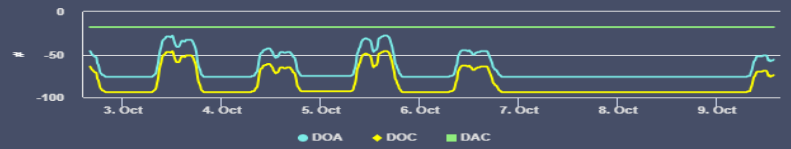
Temp. 9m

20.6 °C

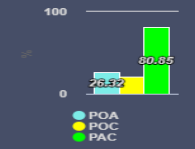
Difference 4m



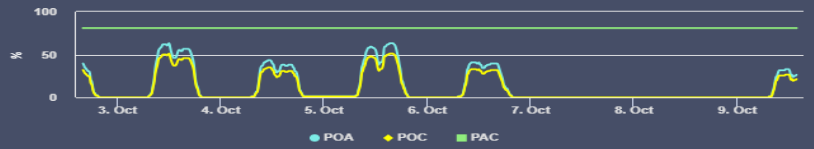
DOA - DOC - DAC 4m



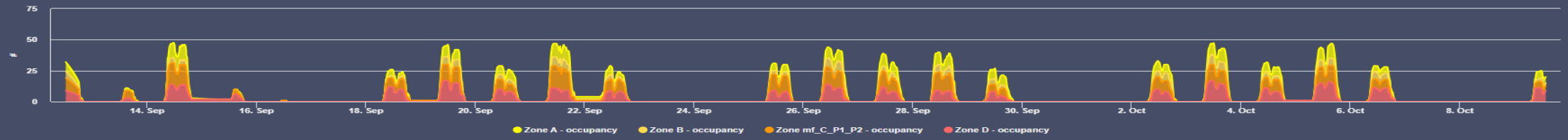
Percentage 4m



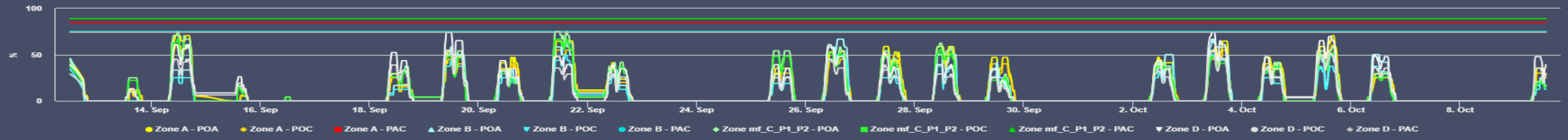
POA - POC - PAC 4m



Occupancy Per Zones - Monthly Time Trend Comparison Stacked 4m



Percentage Per Zones - Monthly Time Trend Comparison 4m



Heat Power 9m

0 kW

Heat Energy 9m

1931279 kWh

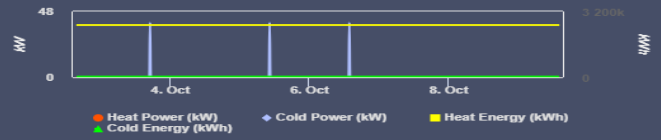
Cold Power 9m

0 kW

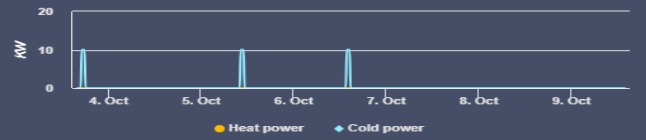
Cold Energy 9m

888311 kWh

Energy Trends 4m



Average Hourly Power 4m



En./Mq 9m

0 kWh

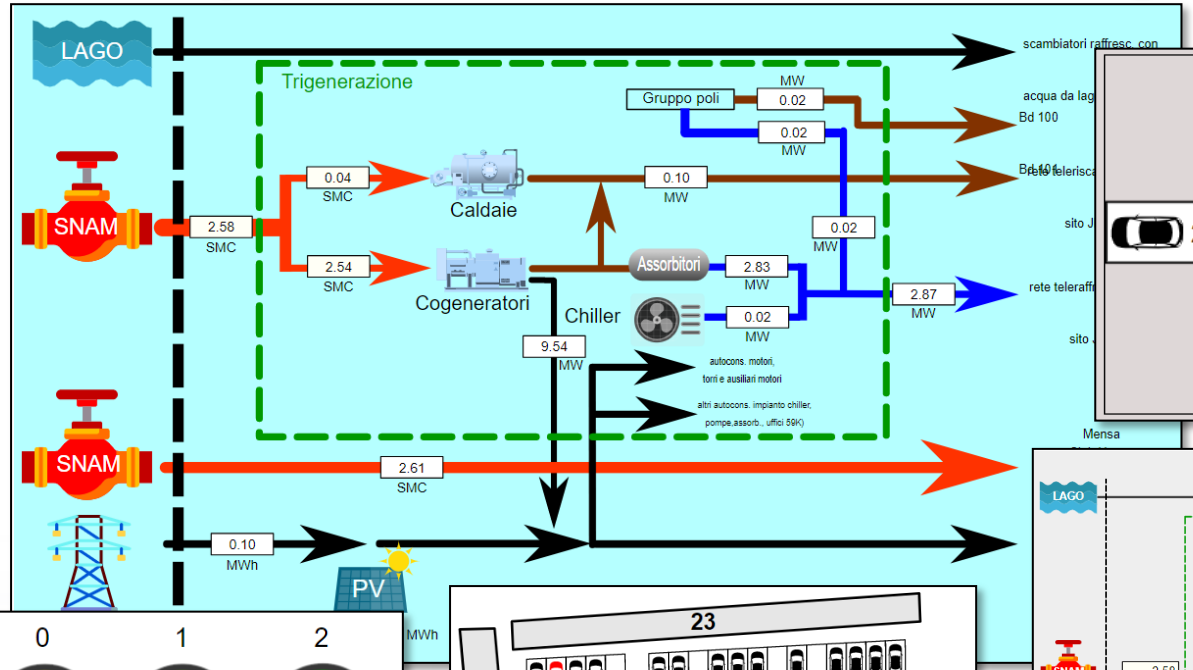
En./Pax 9m

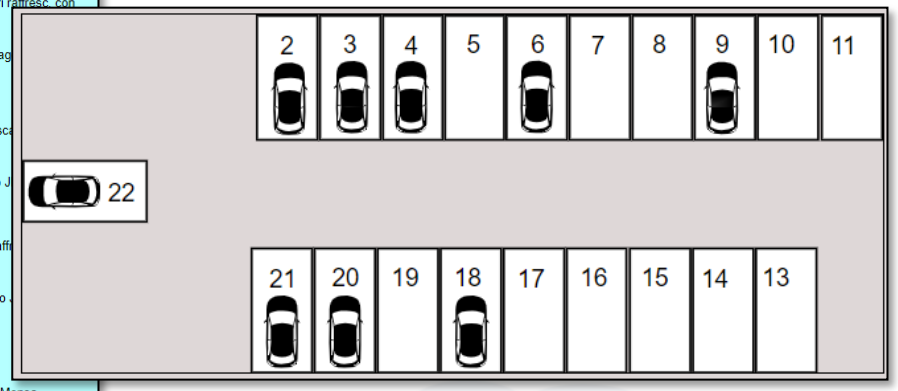
0 kWh

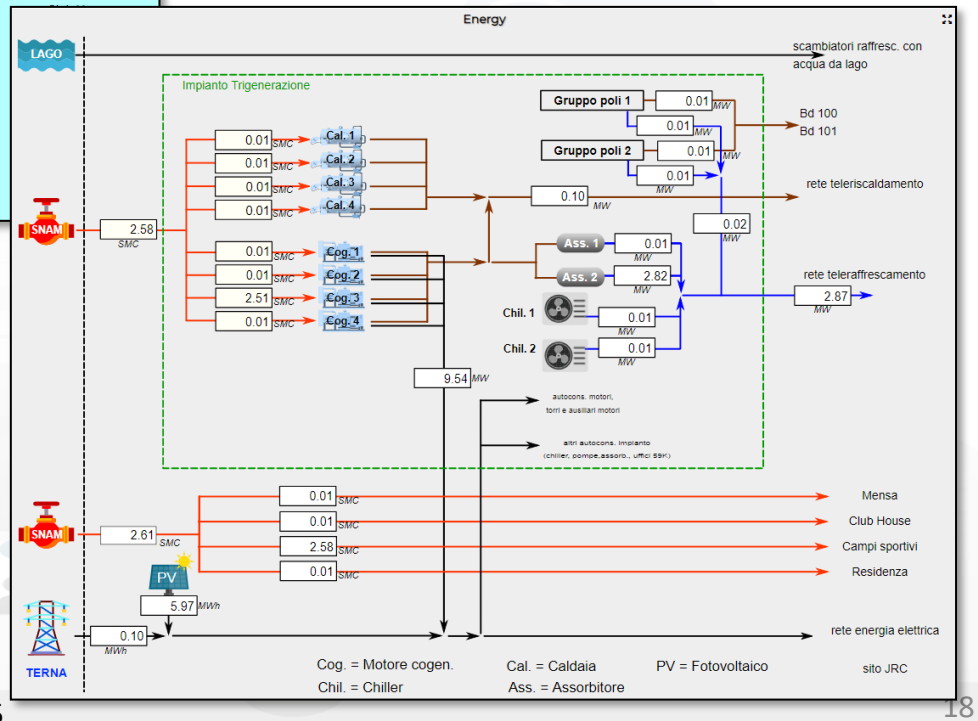
person My Profile

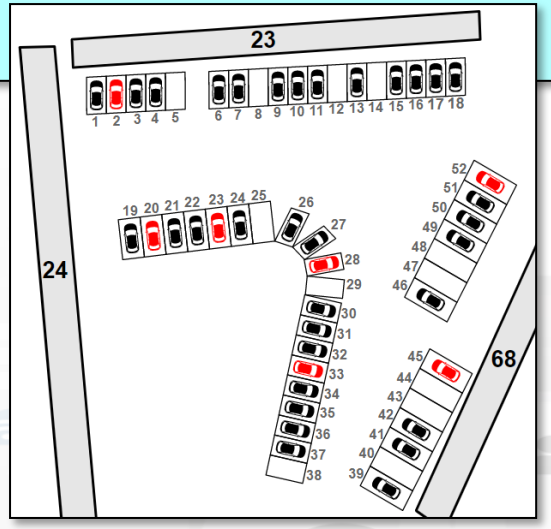
Special Custom Widgets

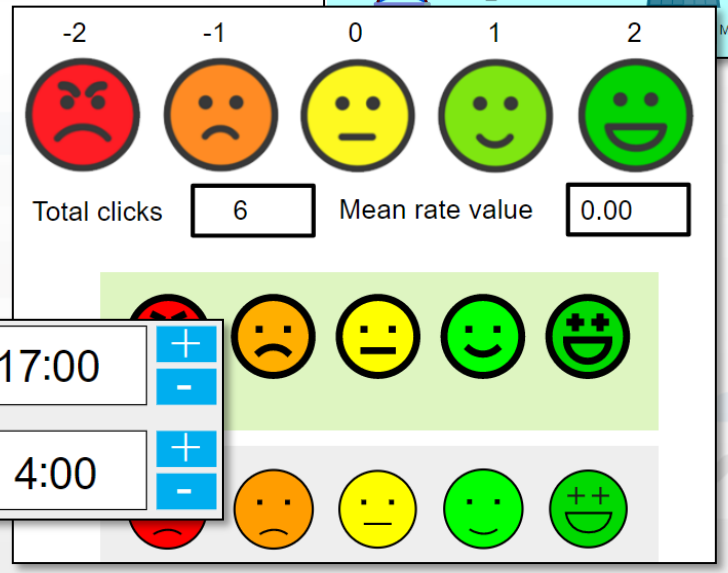
- Smart parking
- Smart Energy
- Smart Light
- Smart ….
- Energy View
- Custom Controls



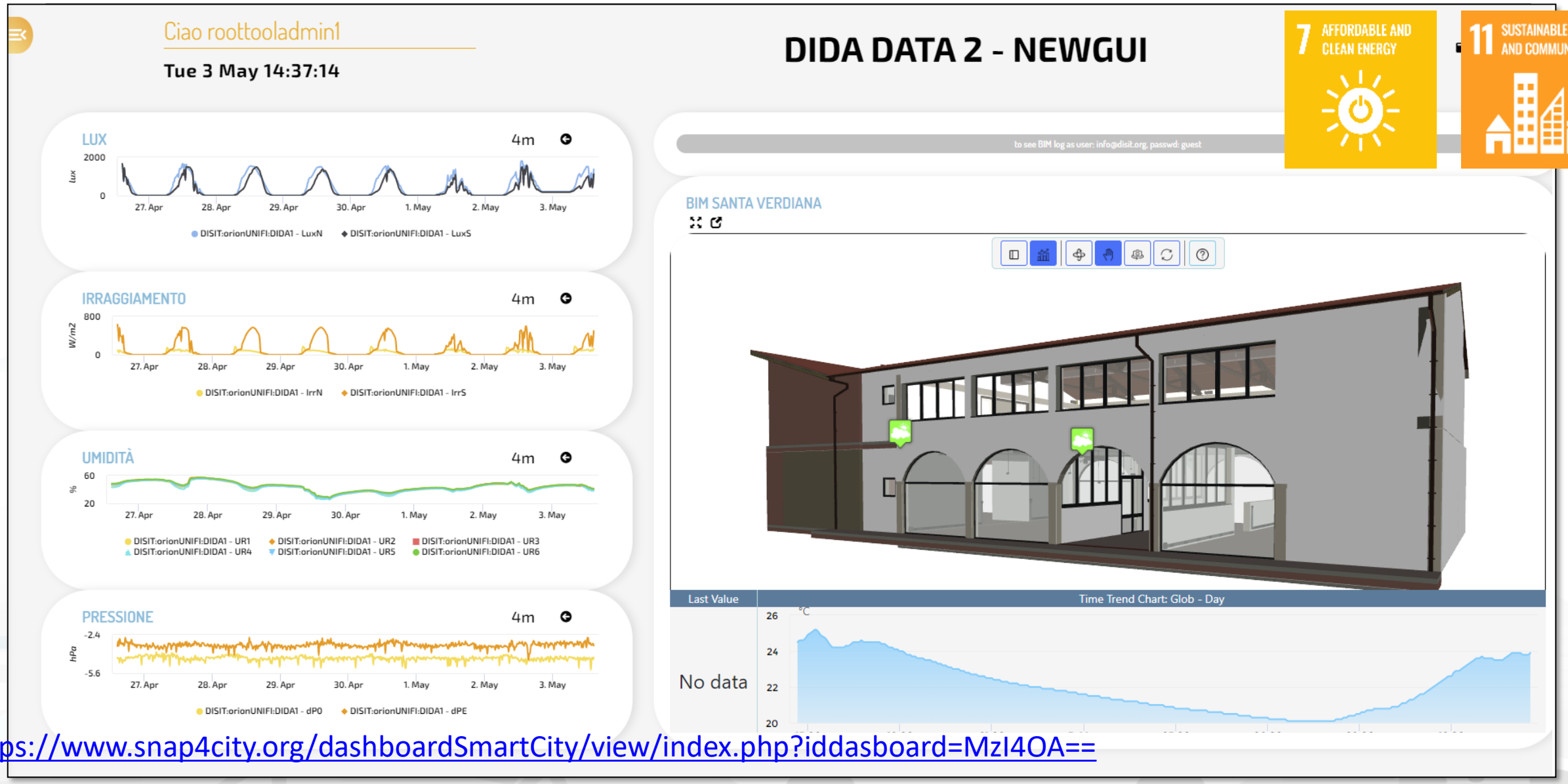








Smart Building



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzI4OA==

TOP

Decision Support Tactic and Strategic Plans What-if Analysis

Smart Energy and Smart Buildings Operation and Plan Digital Twin

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

Available AI Solutions on Snap4City

https://www.snap4city.org/997

More than 80 Available Solutions & 300 AI applic.

- **Mobility and Transport**
- **Environment, Weather, Waste, Water**
- **City Users Behaviour and Social analysis**
- **Energy and Control**
- **Tourism and People**
- **Security and Safety**
- **High Level Decision Support Solutions**
  - **Asset management**
  - **Resilience and Risks Analysis**
- **Low level Techniques**

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

https://www.snap4city.org/download/video/course/p4/

City

Monitoring

KPI

Digital Twin
Models &
Data

Predictions,
Anomaly Detection,
Analysis, Assessment
Warning

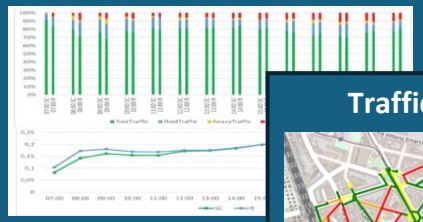
Decision
Support System

Scenarious

Simulations,
TFR, Crossroad,
Public Transport,
Routing, ..

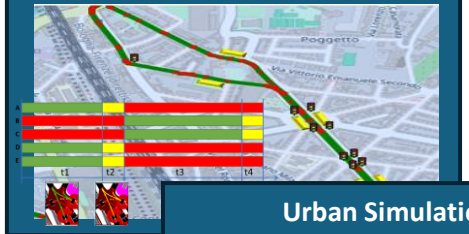
What-If Analysis,
Optimization

KPI, Predictions, ...



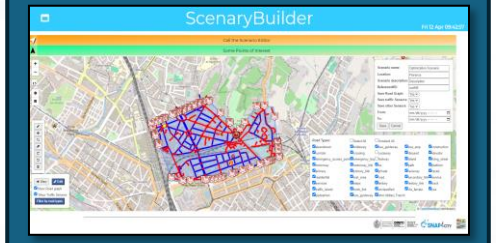
Traffic Reconstruction

Traffic Light Plan optimization

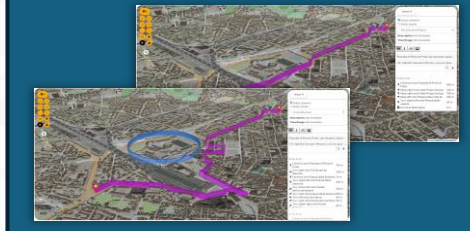


Urban Simulation

Scenario Editor



Routing / Dynamic Routing



Traffic Infrastructure optimization

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

TOP

Data Analytic Energy consumption monitoring and planning

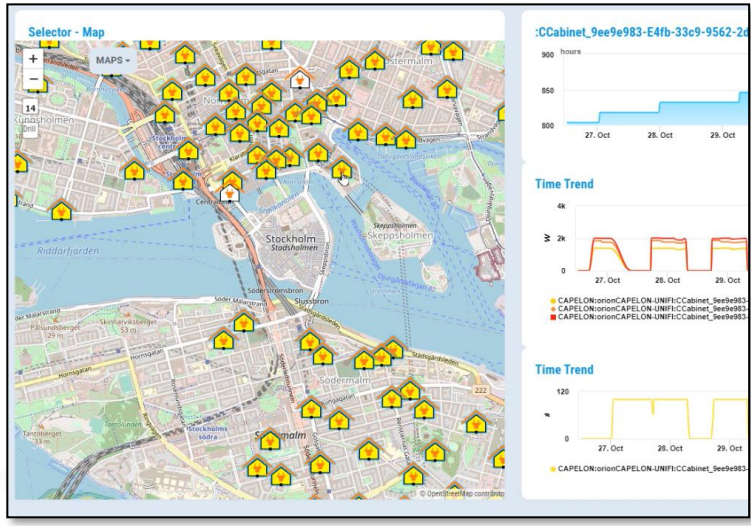
Smart Energy and Smart Buildings Operation and Plan Digital Twin

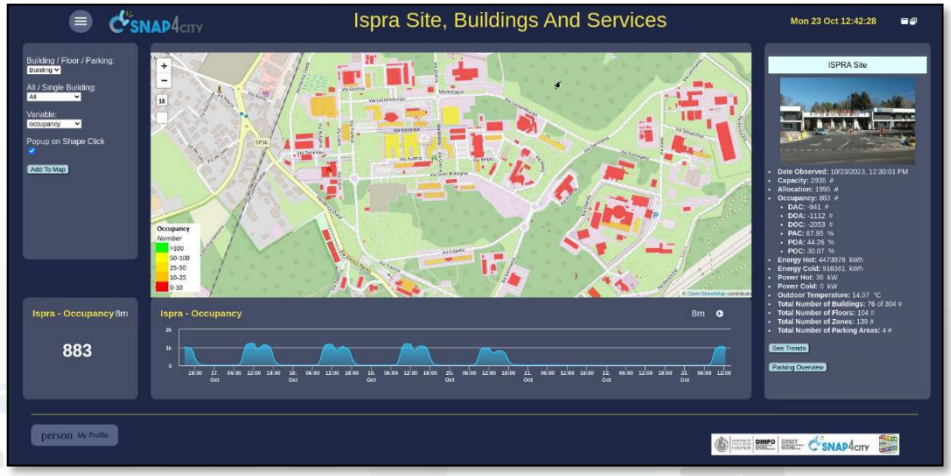
100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

Energy Domain (2024/8)

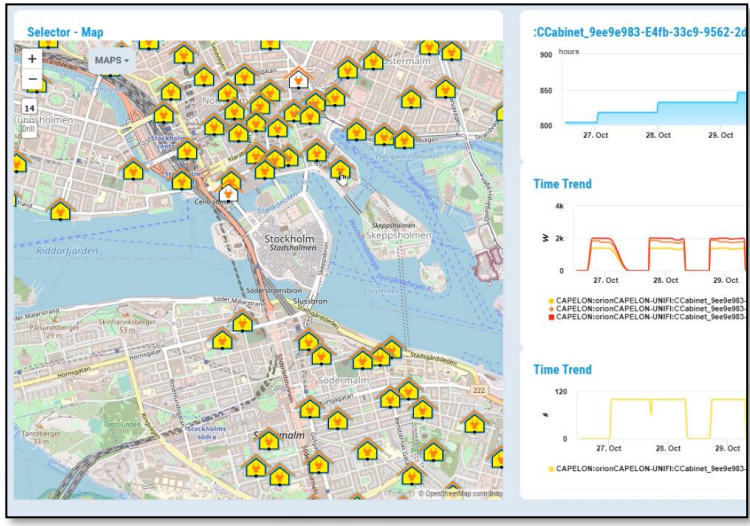
- Goals:
  - Energy consumption reduction, increment of efficiency, sustainability
  - accessibility to services
- Solutions for Operation (monitoring, managing, mobile apps, digital signages, control rooms)
  - Monitoring energy consumption (heating, cooling, prod.,..), conditions, charging stations, etc.
  - Managing Smart Light for city: dimering, programming, traffic control, controllers, legacy, etc.
  - Early detection/warning, alarm, of critical conditions
  - Managing smart services: cabinets, lockers, etc.
  - Production of suggestions, nudging
  - Global and local 3D/2D representations of area and buildings
  - Managing Communities of Energy, certification via Blockchain
  - Computing predictions of any kind
- Solutions for Planning (optimization and what-if analysis)
  - Reduction of energy costs, via optimization
  - Identification of roofs with better orientation
  - Optimization of battery storage size for PV plants
  - Community of Energy planning and viability
- Algorithms and computational solutions, see next slide





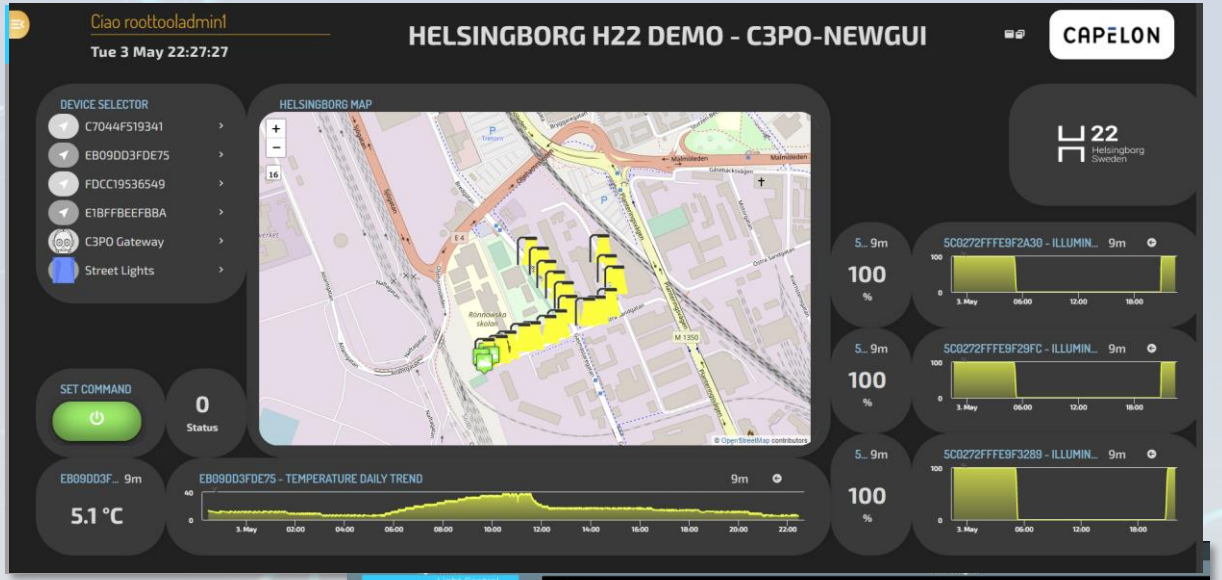
Tools: Energy Domain (2024/8)

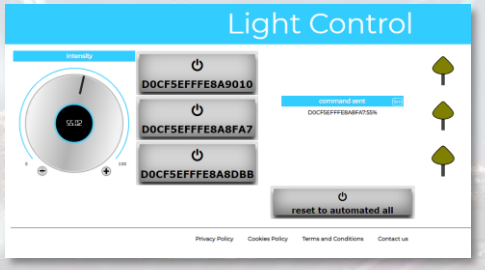
- **Monitoring Energy Consumption in single building, area and per zone**
- **Smart Light management**, unicast and multi cast management, smart light controlled by **traffic flow data**
- Monitoring Energy provisioning on **recharging station**
- **Matching Energy consumption with respect to the actual usage**
- **Computing Roof orientation for Photovoltaic installations**
- **Optimisation of Photovoltaicc installations** to identify the best parameters of size and storage
- Collecting and managing **Communities of Energy**
- Computing **KPI**
- Etc.

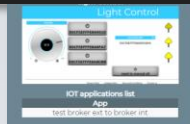


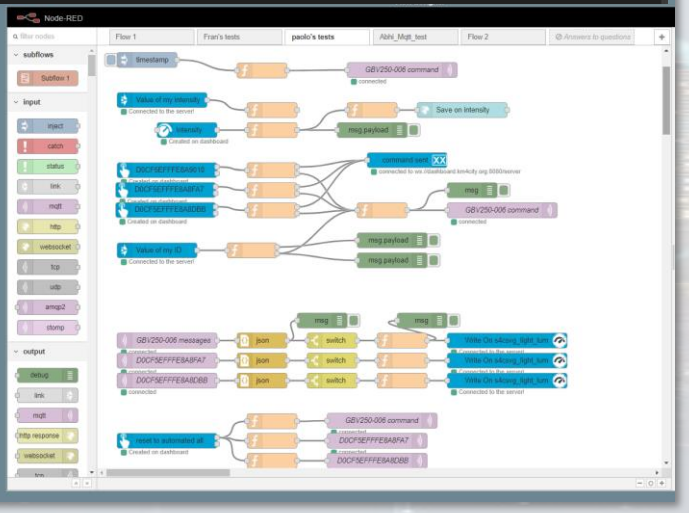
Smart Light Control of CAPELON *reference*

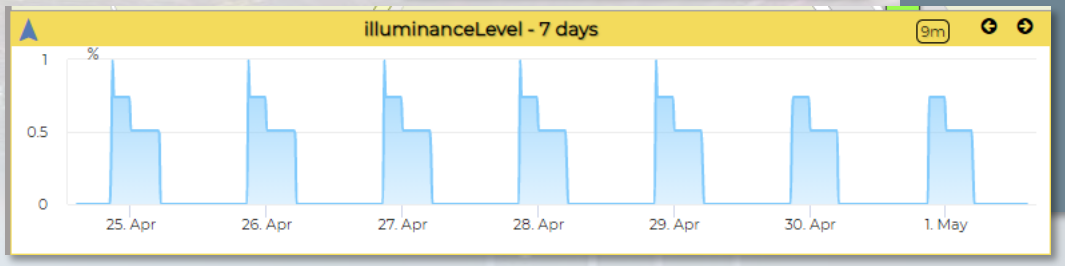
- **Energy Domain**
  - Smart Light, MQTT, ….
  - IoT Orion Broker FIWARE
- **Dashboards**
  - Map coverage on Sweden
  - Monitoring and real time control
  - Energy control, analytics
  - Direct control
- **Historical and Real Time data**
- **Services Exploited on:**
  - Multiple Levels, API
  - Dashboards
- **Since 2020**



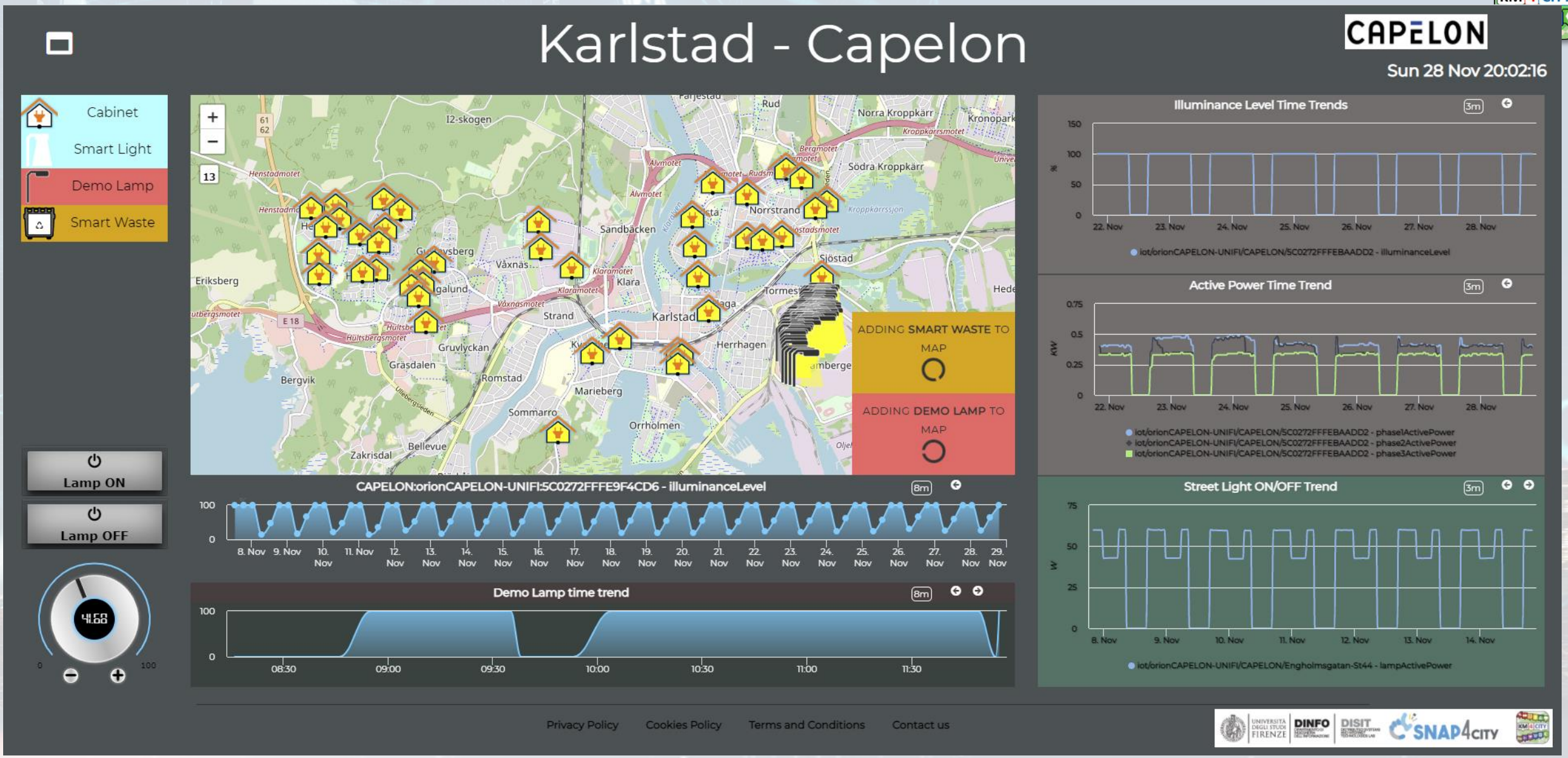








Karlstad Street Lights



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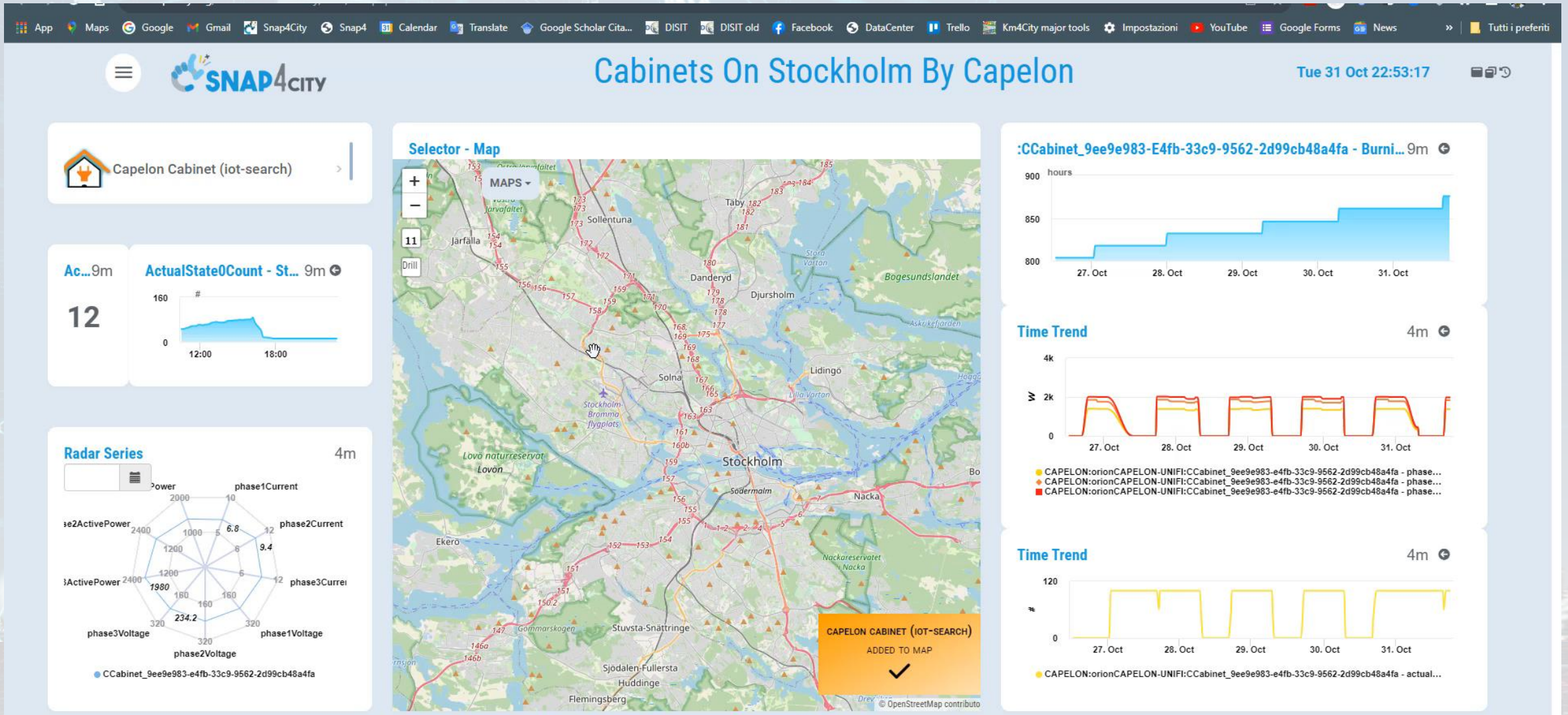
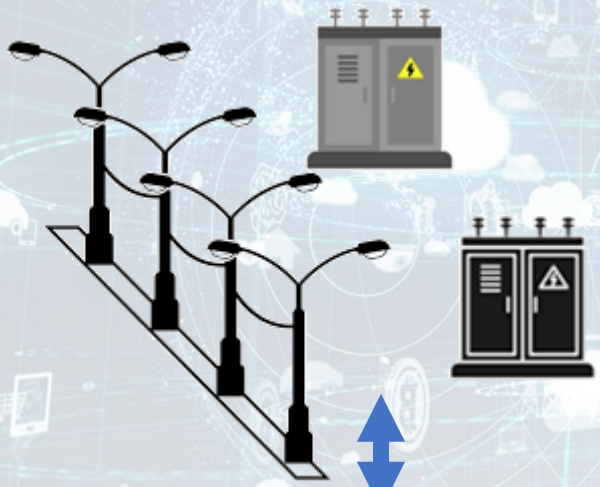
Cabinets' Monitoring in Stockholm



Snap4Light Conceptual Architecture



GW API

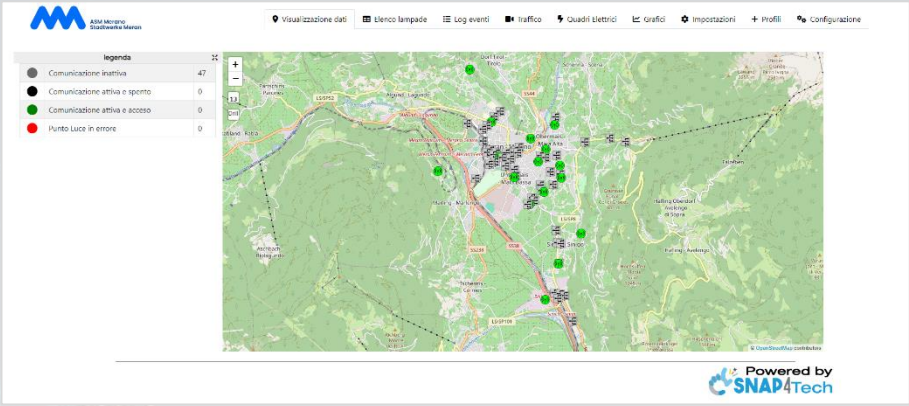
GW API

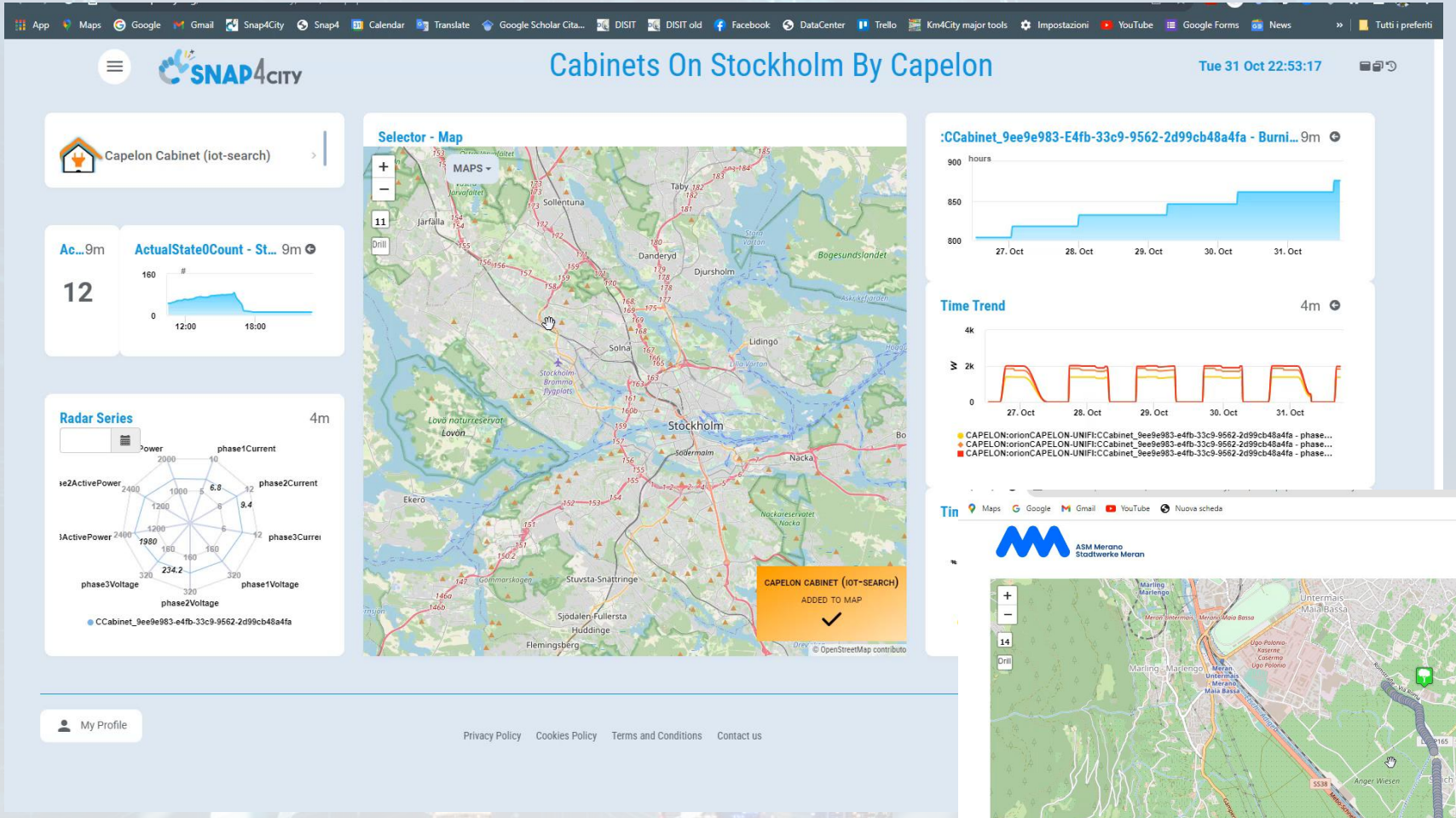
GW API

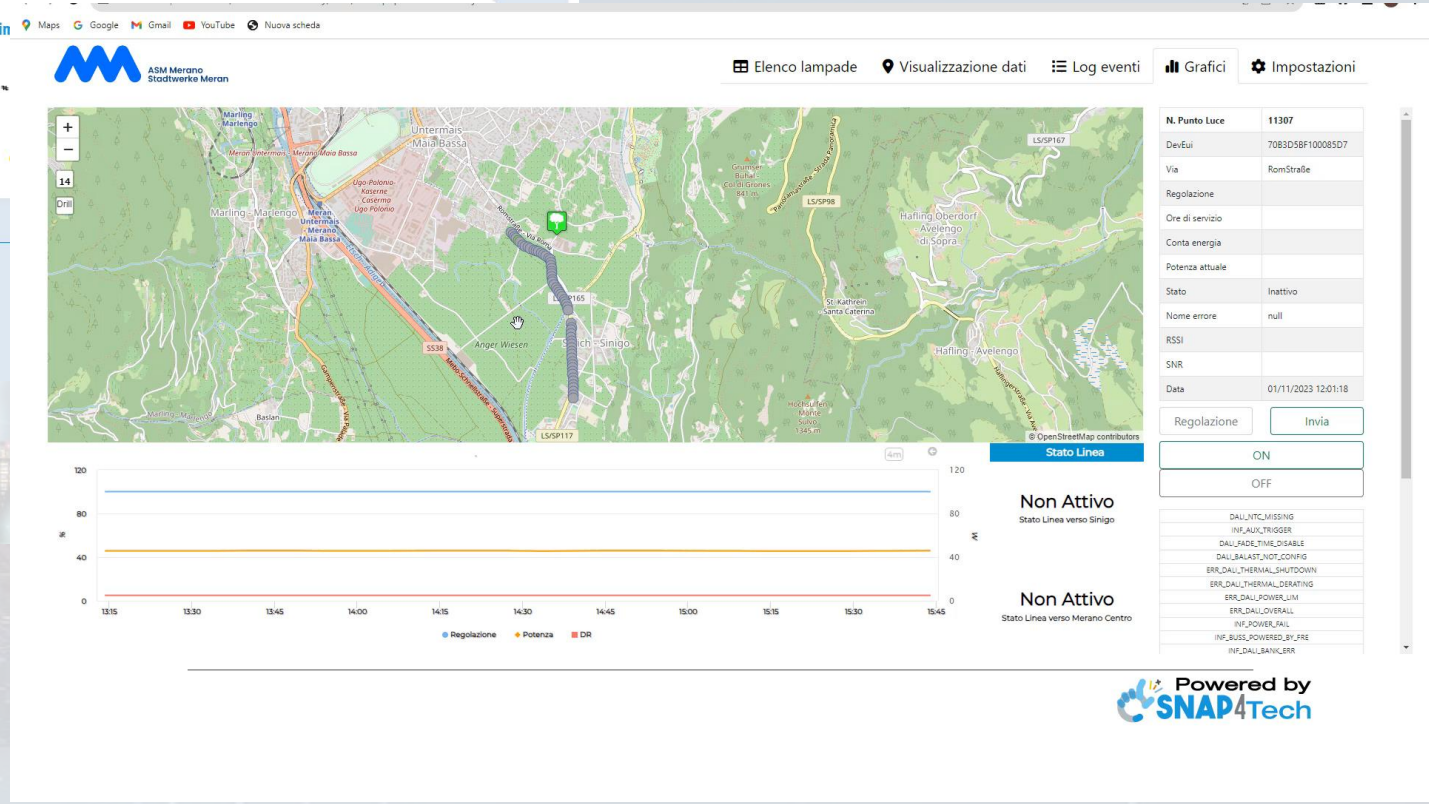
Snap4City Platform

- Area & Slot Loading
- Area/Slots Monit.
- KPI Estimation
- Lum. profiling
- Control Gateways
- Traffic Based Light
- Alarms Mng
- Groups Mng
- KPI Mng
- .....

City Operator

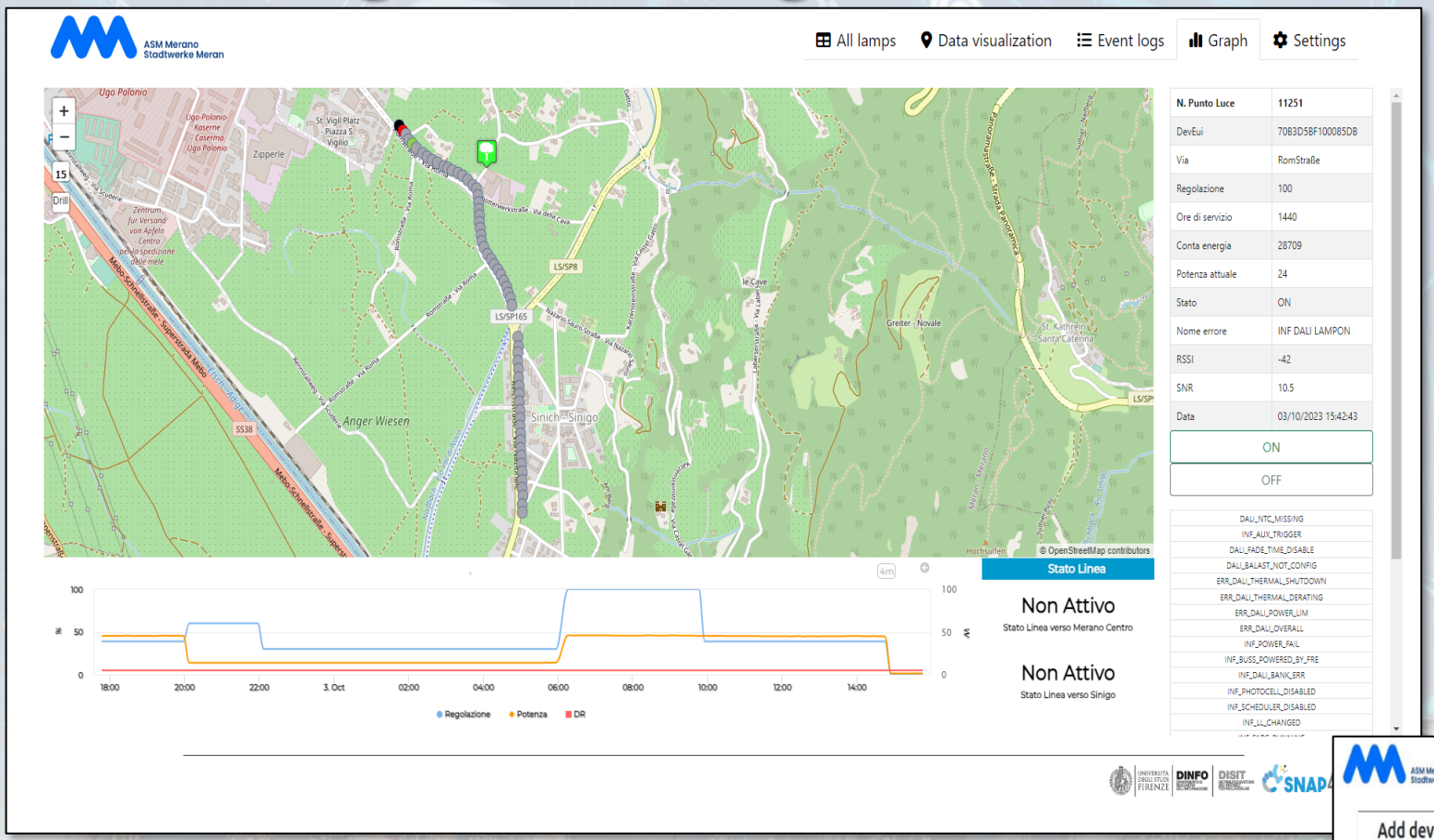




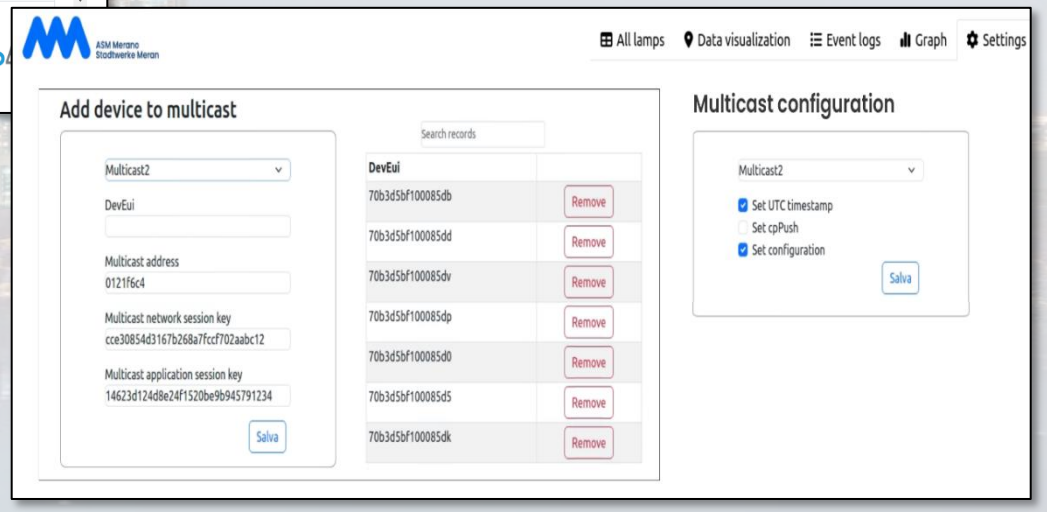


Smart Light Management

Smart Light Management in Merano, Italy



- Managing DALI 2 devices FlashNet via LoraWan
- programming SmartLight via UniCast and MultiCast
- Controlling devices
- Automation of Smart Luminaries on the basis of Traffic Flow
- Usage of Chirpstack as net server



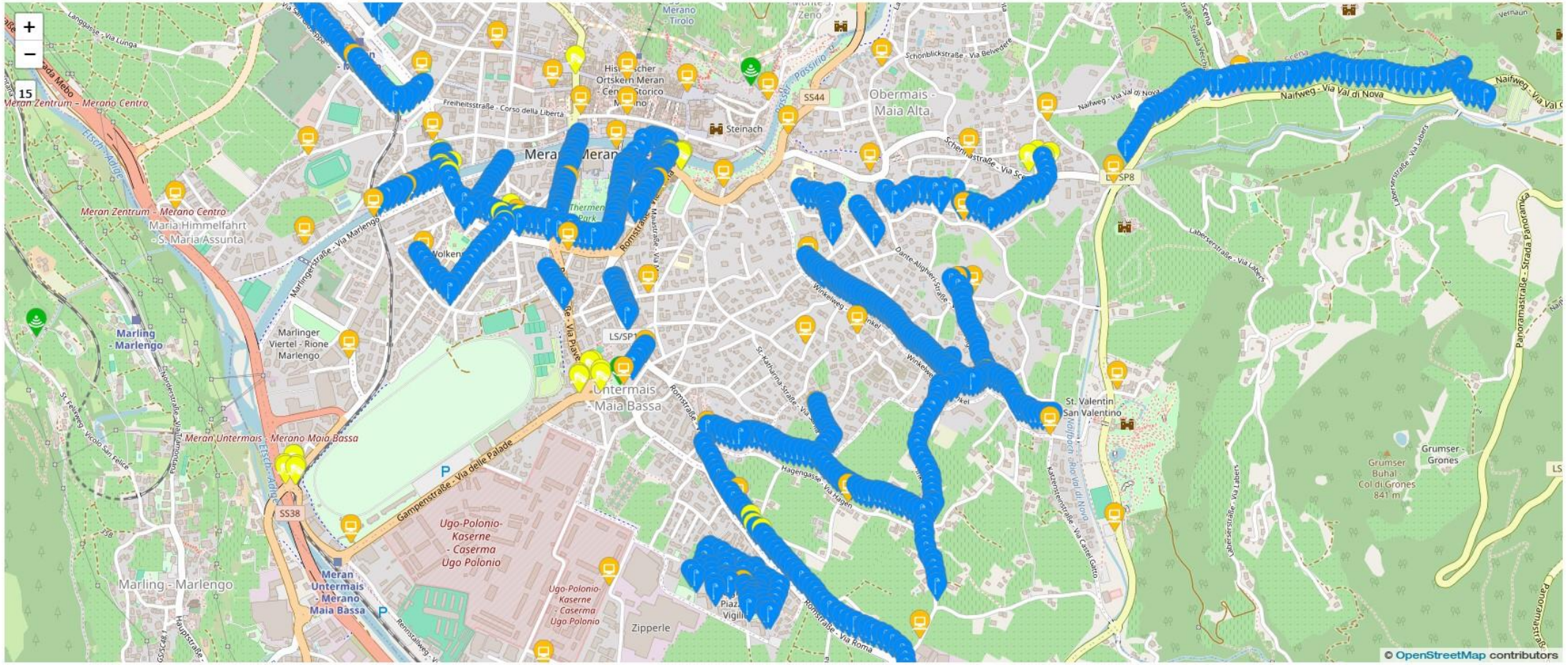
https://www.snap4city.org/968

Smart Light in Merano

ASM Merano Stadtwerke Meran

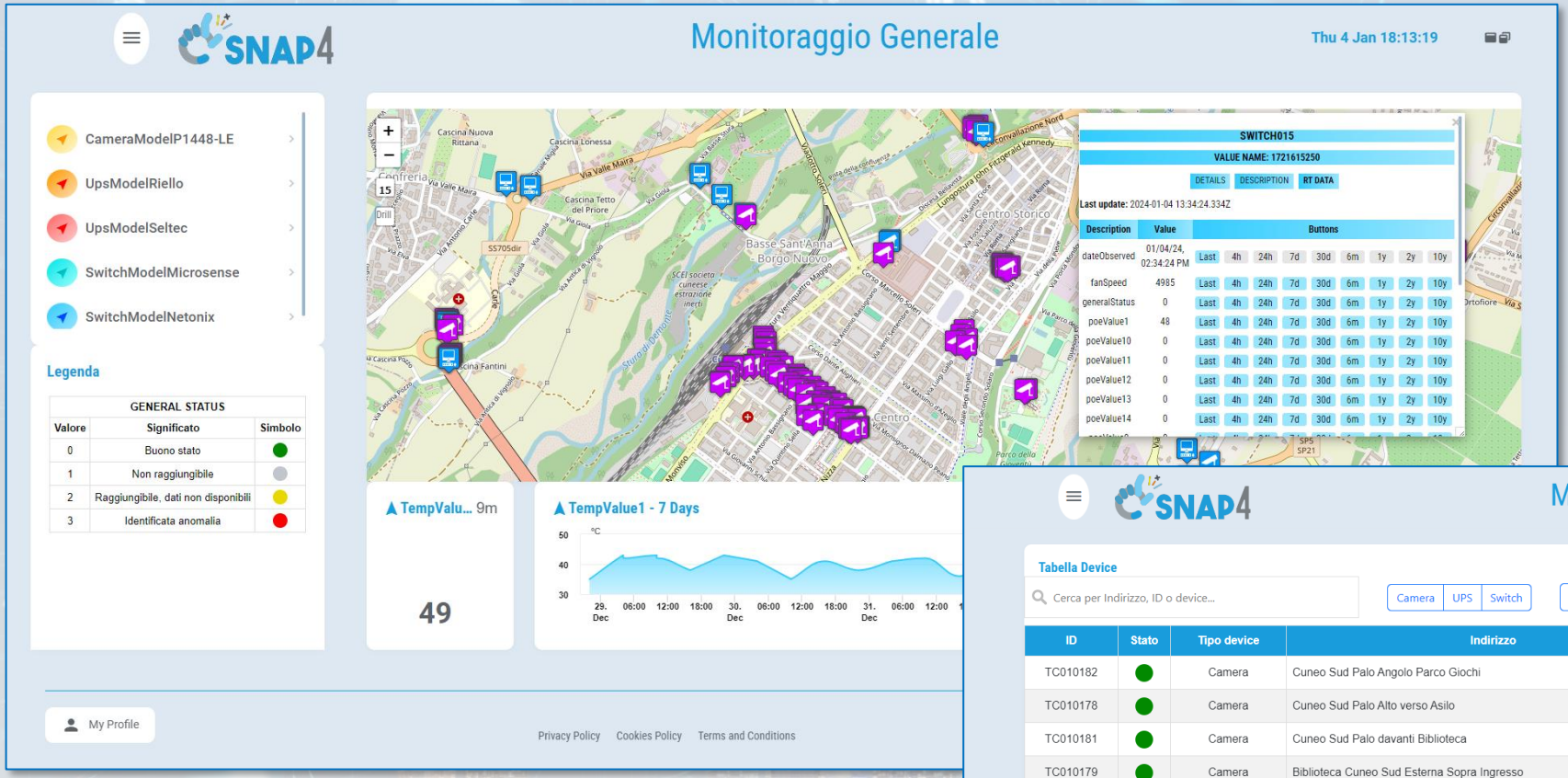
Merano - tutti i servizi

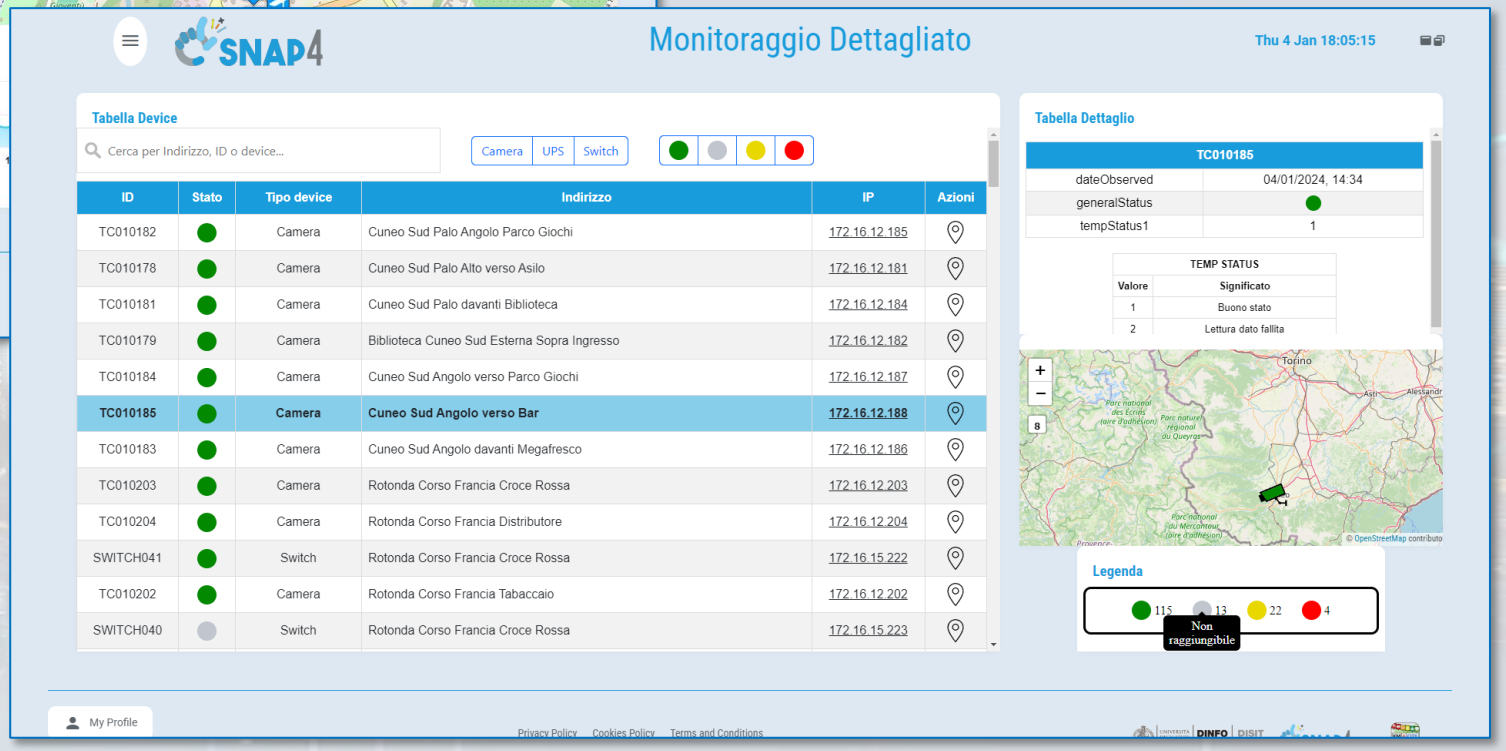
Wed 13 Dec 15:34:57



Powered by SNAP4Tech

Cuneo Assets' Monitoring, Safety

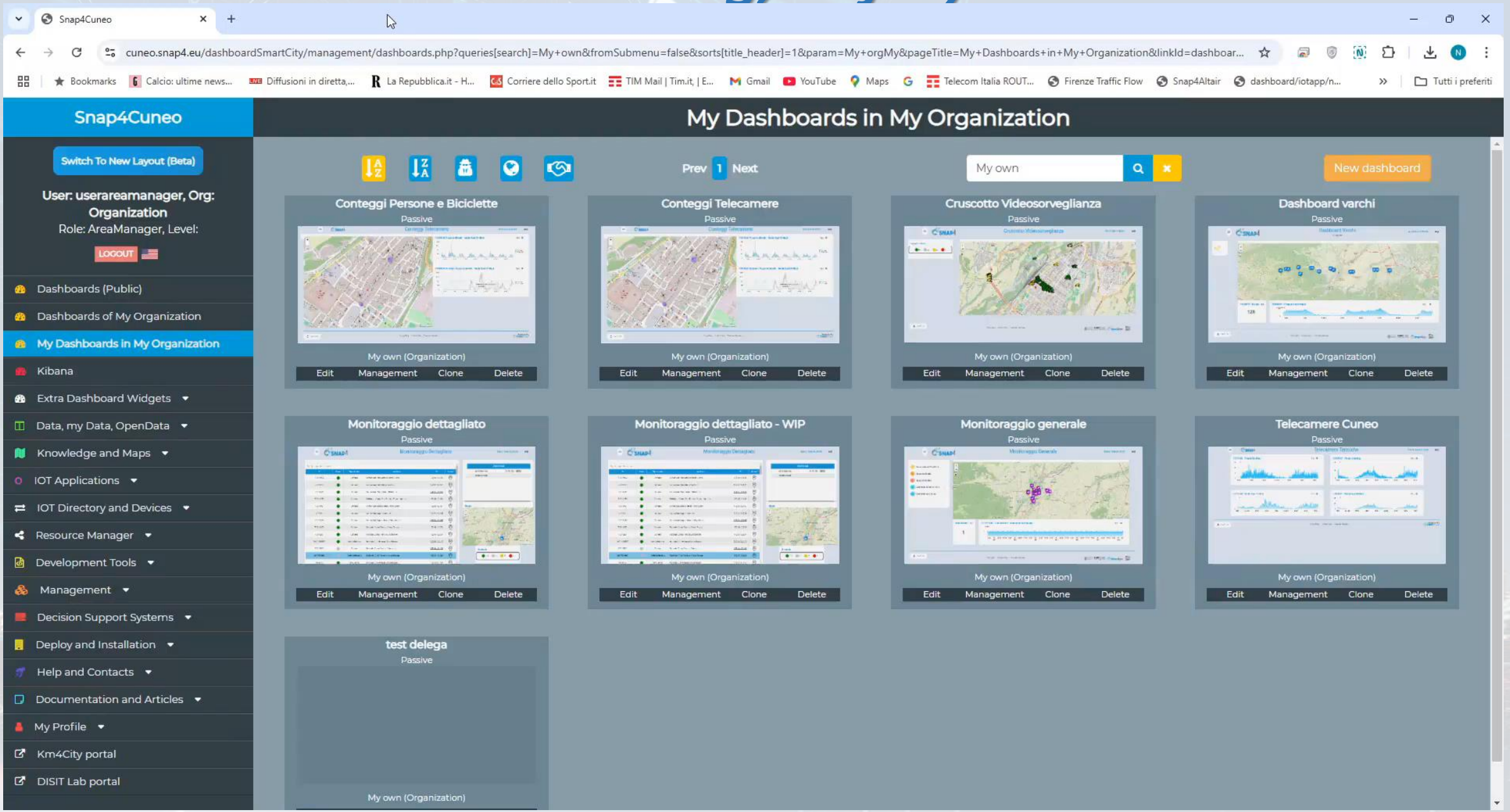




- More than 400 devices

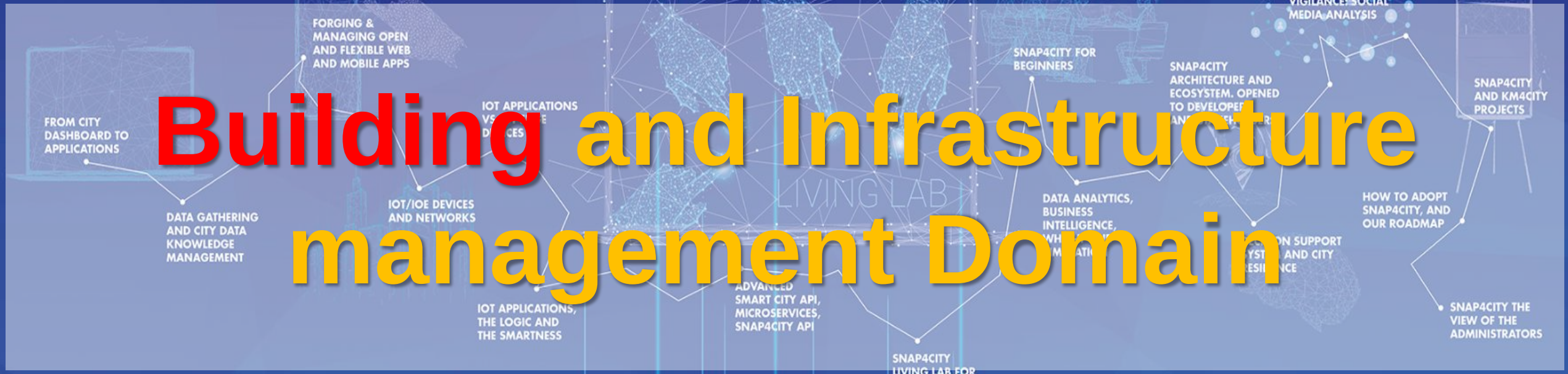
- TV Cams: color, Thermal
- Traffic Gates
- Switches
- UPS

Cuneo Assets' Monitoring, Safety



TOP

Building and Infrastructure management Domain



https://www.snap4city.org/970

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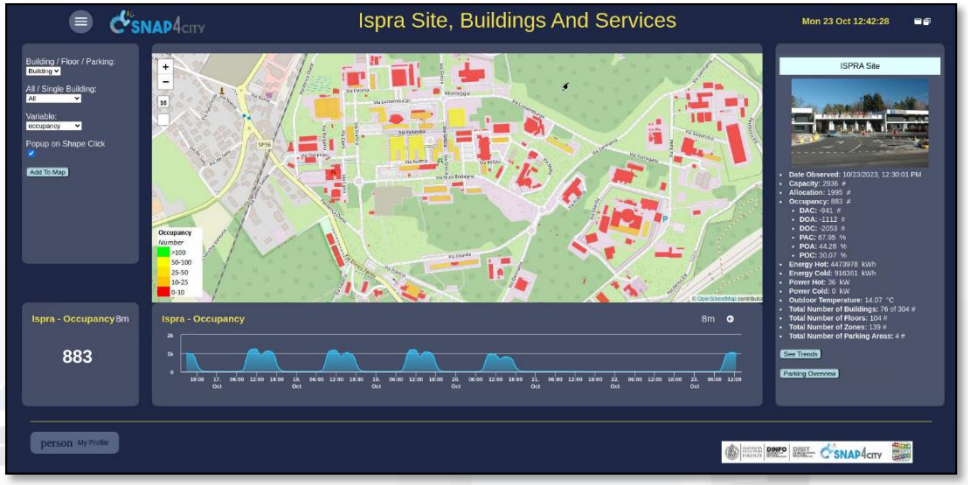
SNAP4 Appliances and Dockers **Installations**

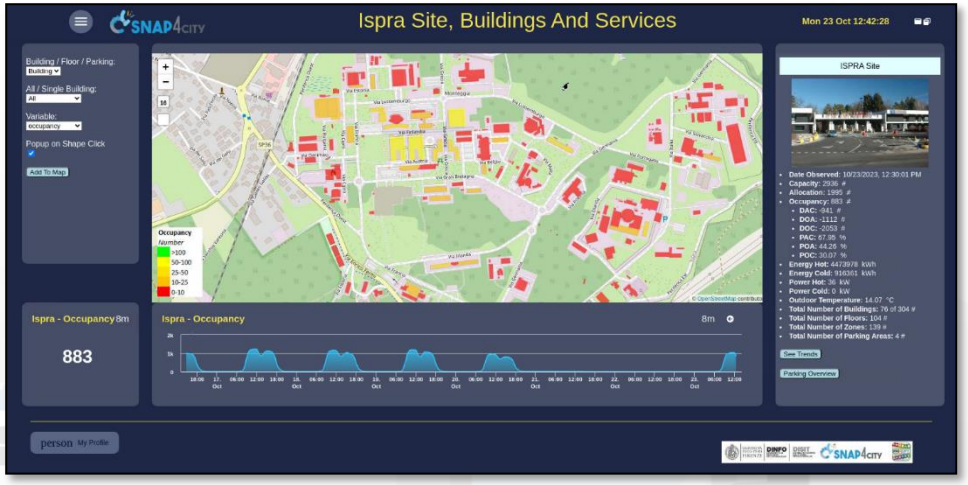
Snap4Building Domain (2024/8)

- Goals:
  - increase efficiency, cost reduction, sustainability
  - Accessibility to services, Security/Safety
- Solutions for Operation (monitoring, managing, mobile apps, digital signages, control rooms)
  - Monitoring: usage, energy, environmental conditions, people flows, services, etc.
  - Early detection/warning, alarm, of critical conditions, notifications, decision support
  - Production of suggestions/prescriptions, nudging
  - Managing smart services: cabinets, dispenser, lockers, etc.
  - Global and local 3D/2D representations of area and buildings
  - Integration with Video Management Systems
  - Computing predictions of any kind
- Solutions for Planning (optimization and what-if analysis)
  - Reduction of energy costs via optimization
- Algorithms and computational solutions, see next slide

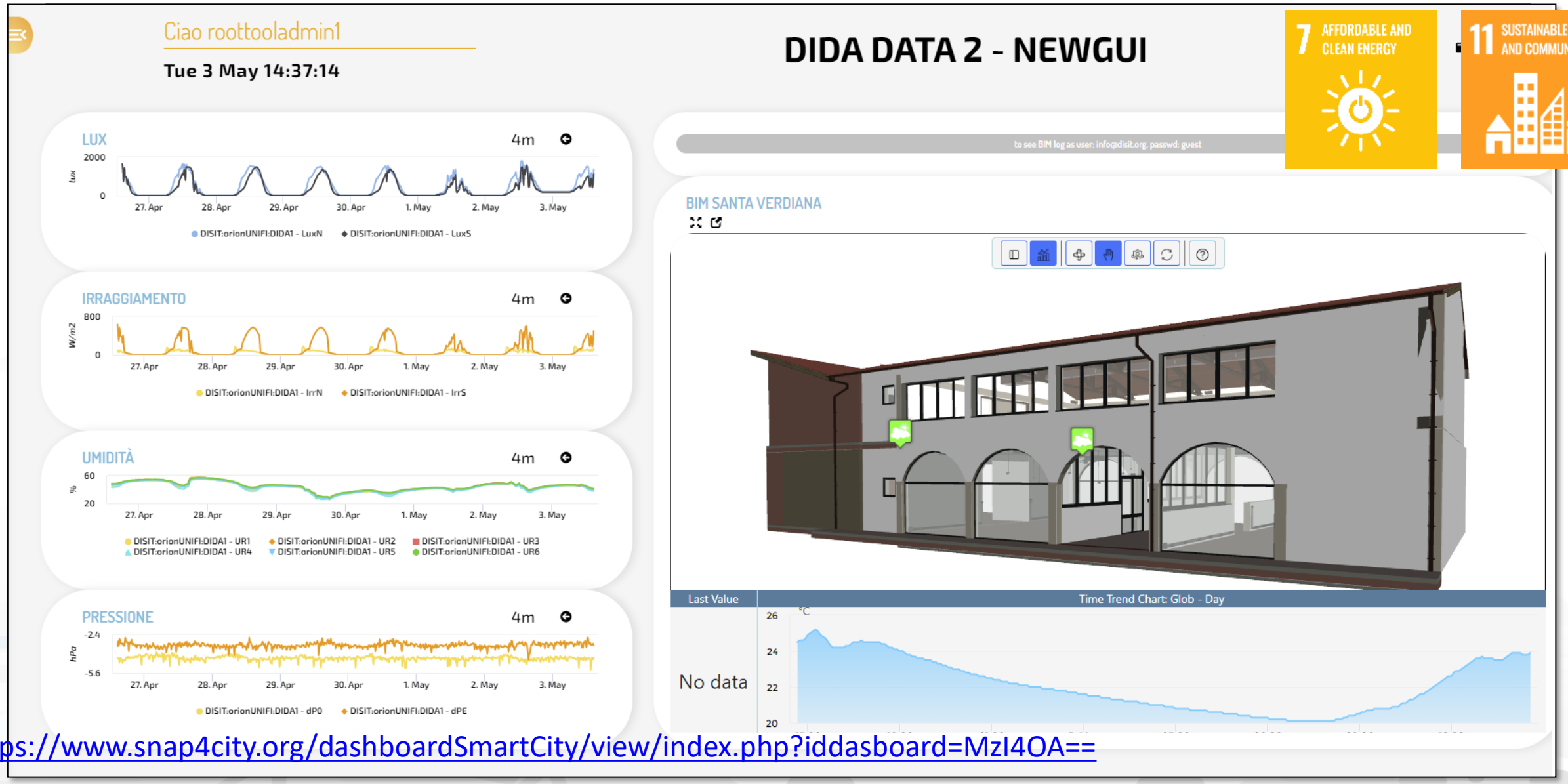


Smart Buildings, Snap4Building (2024/8)

- **Digital Twin for monitor, control and manage distributed infrastructures**
  - 2D/3D representations of the whole set of buildings, BIM modeling
  - Entities (building, floors, rooms, parking, charging stations, gates, etc.) with their shapes and descriptors, and data monitoring the allocation to office, meeting, cafeteria, storage, stairs, elevator, etc.
- **Monitoring and computing KPIs on real time for**
  - **energy** consumed or produced (hot/cold), **parking, logistic, presences, cleaning, air quality, departments, subareas, maintenance, etc.**
  - **allocation/designation**, dispositions, heating, cooling, temperature, equipment, etc.
  - **grouped in Zones**



Smart Building



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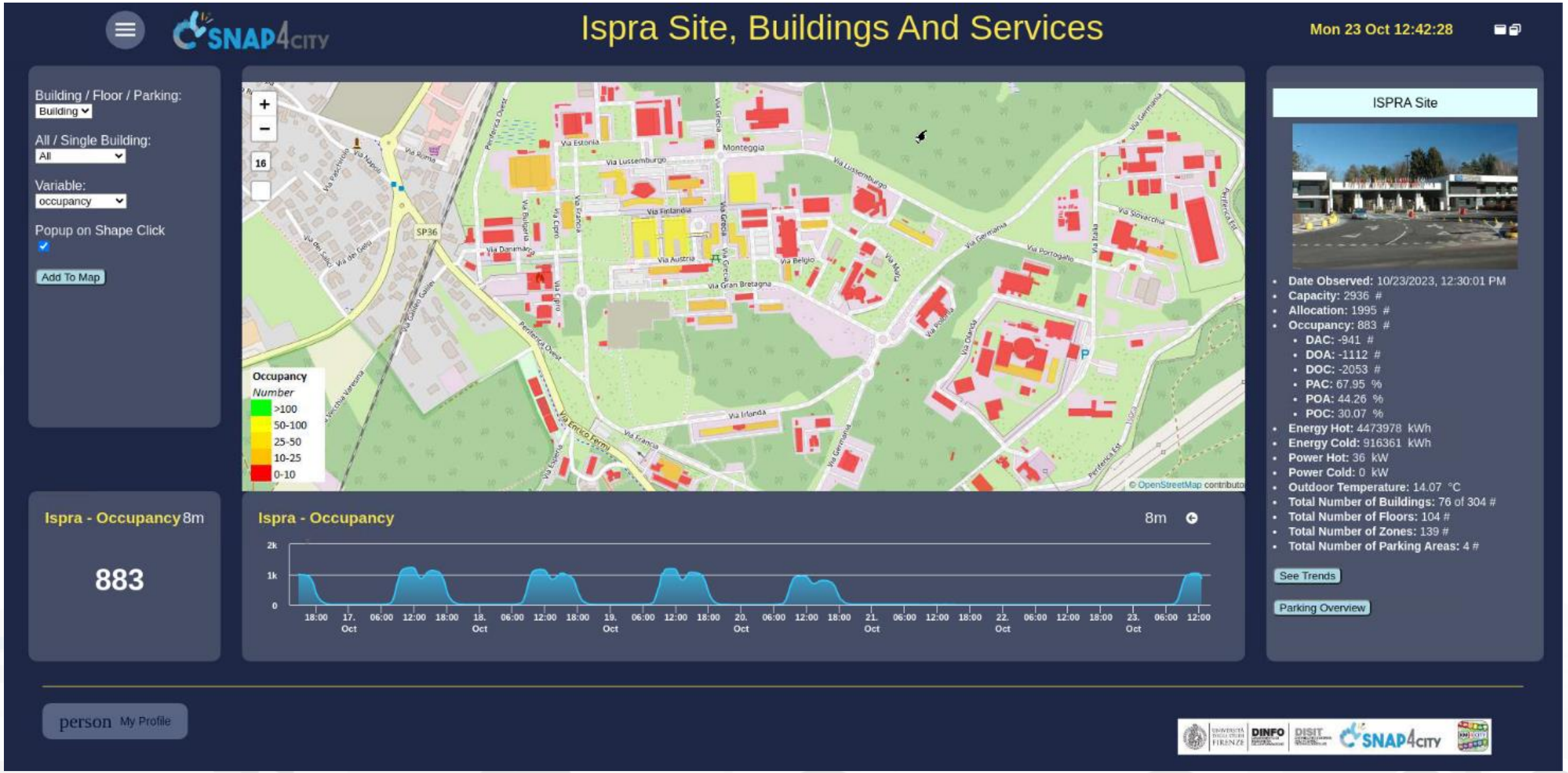
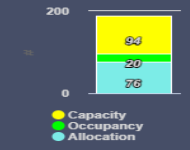

Ispra Site, Buildings And Services
Mon 23 Oct 12:42:28
Building / Floor / Parking:
Building
All / Single Building:
All
Variable:
occupancy
Popup on Shape Click
Add To Map
Occupancy
Number
>100
50-100
25-50
10-25
0-10
ISPRA Site
Date Observed: 10/23/2023, 12:30:01 PM
Capacity: 2936 #
Allocation: 1995 #
Occupancy: 883 #
DAC: -941 #
DOA: -1112 #
DOC: -2053 #
PAC: 67.95 %
POA: 44.26 %
POC: 30.07 %
Energy Hot: 4473978 kWh
Energy Cold: 916361 kWh
Power Hot: 36 kW
Power Cold: 0 kW
Outdoor Temperature: 14.07 °C
Total Number of Buildings: 76 of 304 #
Total Number of Floors: 104 #
Total Number of Zones: 139 #
Total Number of Parking Areas: 4 #
See Trends
Parking Overview
Ispra - Occupancy 8m
883
Ispra - Occupancy
8m
person My Profile

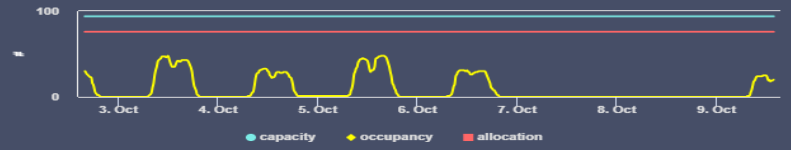
Building 27B Trends

Mon 9 Oct 13:47:14

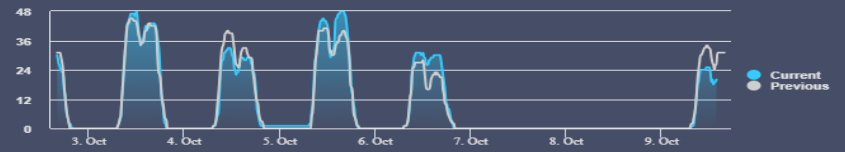
Actual 4m



Capacity - Allocation - Occupancy 4m



Occupancy Weekly Time Trend Compare 9m



Office Mq 9m

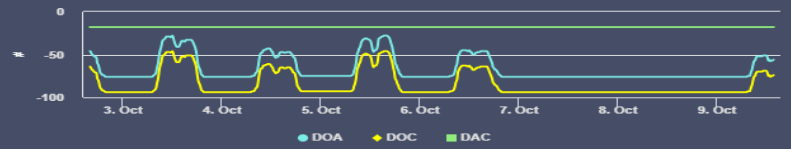
803.9 m2

Temp. 9m

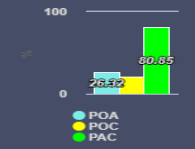
20.6 °C

Difference 4m

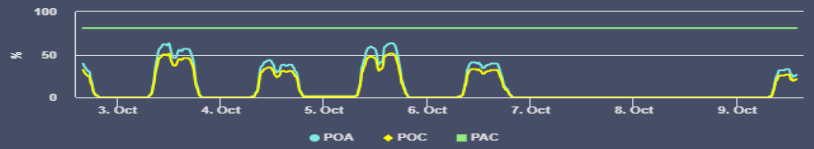
DOA - DOC - DAC 4m



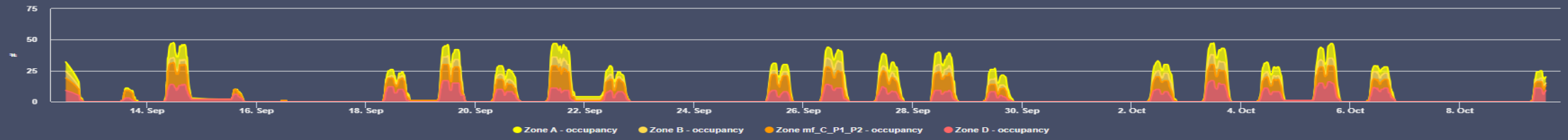
Percentage 4m



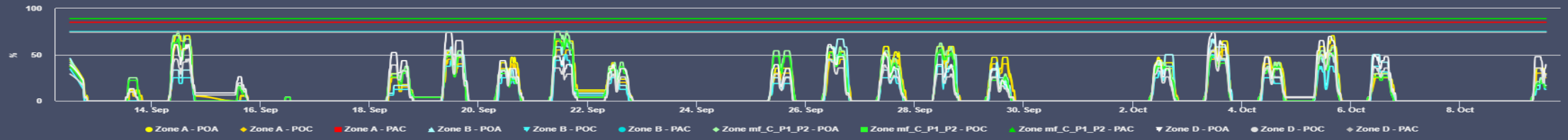
POA - POC - PAC 4m



Occupancy Per Zones - Monthly Time Trend Comparison Stacked 4m



Percentage Per Zones - Monthly Time Trend Comparison 4m



Heat Power 9m

0 kW

Heat Energy 9m

1931279 kWh

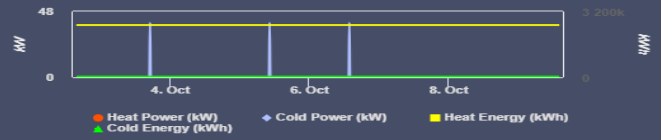
Cold Power 9m

0 kW

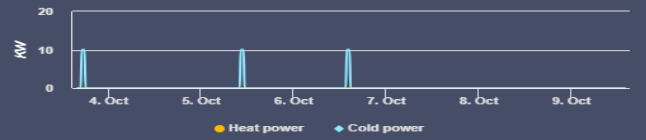
Cold Energy 9m

888311 kWh

Energy Trends 4m



Average Hourly Power 4m



En./Mq 9m

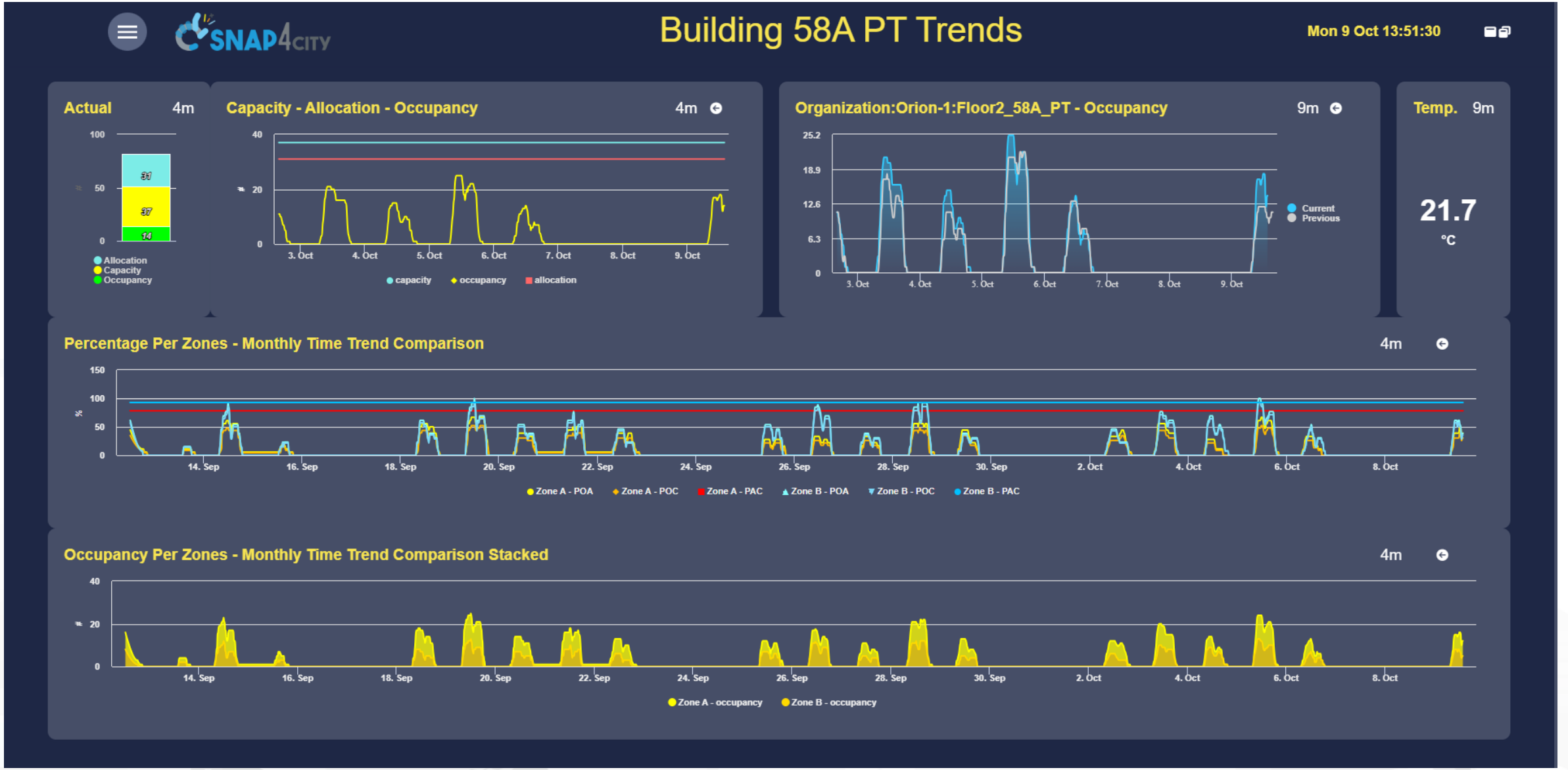
0 kWh

En./Pax 9m

0 kWh

person My Profile

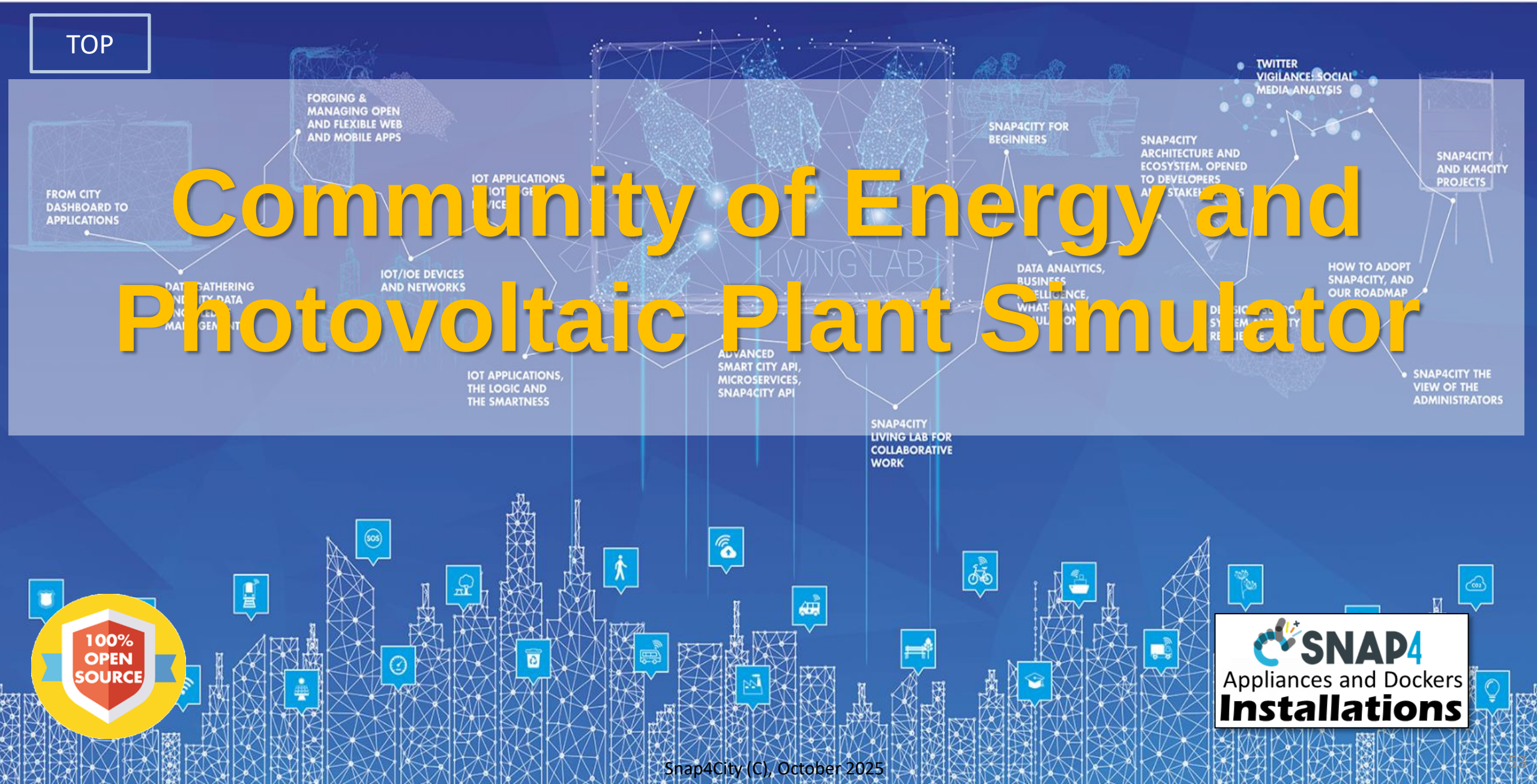
Floor Details


Building 58A PT Trends
Mon 9 Oct 13:51:30
Actual 4m
Allocation
Capacity
Occupancy
Capacity - Allocation - Occupancy 4m
capacity
occupancy
allocation
Organization:Orion-1:Floor2_58A_PT - Occupancy 9m
Current
Previous
Temp. 9m
21.7
°C
Percentage Per Zones - Monthly Time Trend Comparison 4m
Zone A - POA
Zone A - POC
Zone A - PAC
Zone B - POA
Zone B - POC
Zone B - PAC
Occupancy Per Zones - Monthly Time Trend Comparison Stacked 4m
Zone A - occupancy
Zone B - occupancy

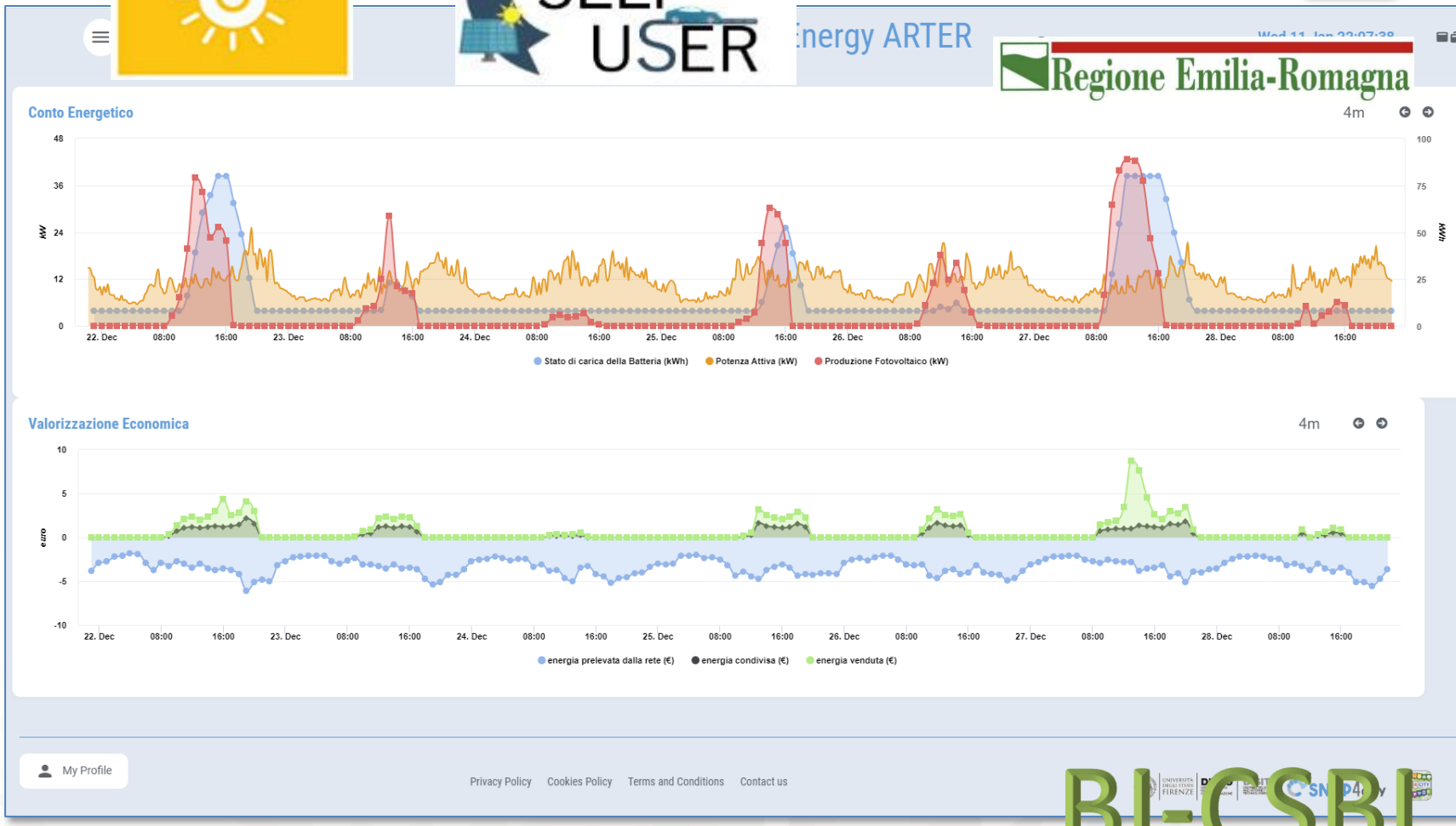
Smart Building

TOP

Community of Energy and Photovoltaic Plant Simulator



- **Field-tested energy community: the self-consumer condominium**
- The Self User project creates in the pilot condominium, through the collection and analysis of data, a model for calculating and enhancing the impact of an energy community on a community of people, with a view to actions to combat energy poverty



https://www.selfuser.it

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

SNAP4CITY KM4CITY

SNAP4CITY

SELF USER

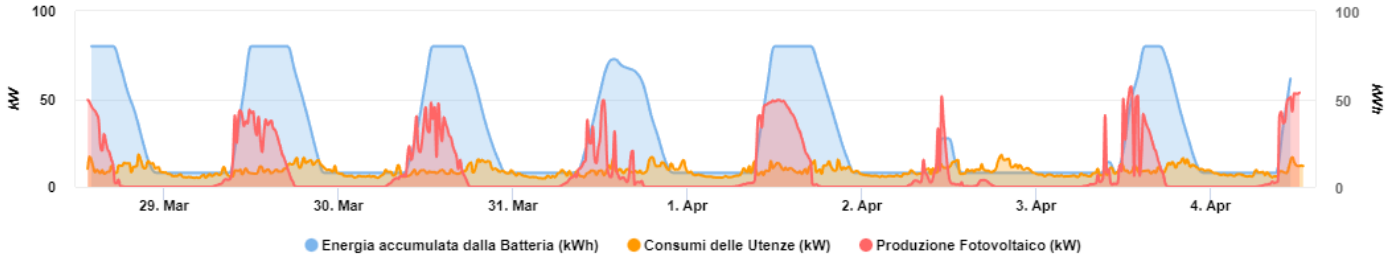
Monitoraggio in tempo reale della comunità energetica condominiale

Tue 4 Apr 13:20:04

SELF USER

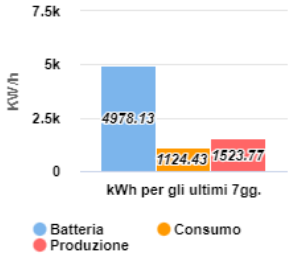
Conto Energetico

4m



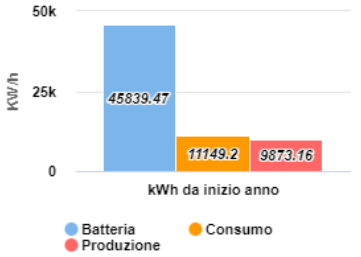
KWh Ultimi 7 Gg.

4m



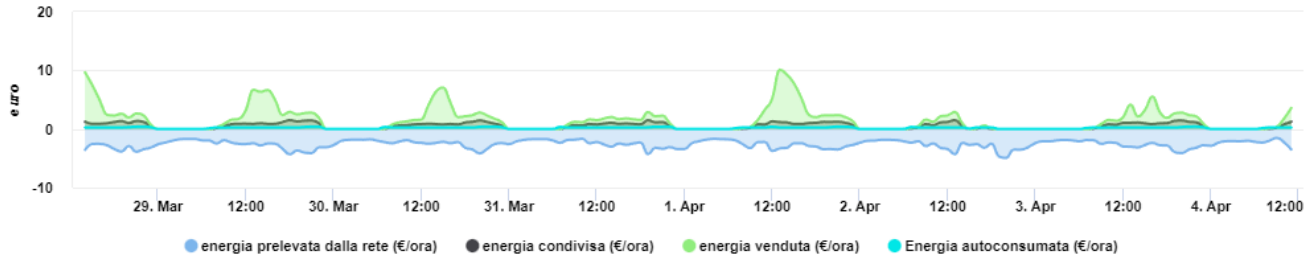
KWh Da Inizio Anno

4m



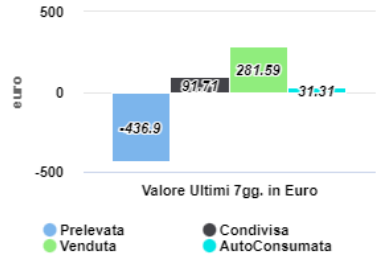
Valorizzazione Economica

4m



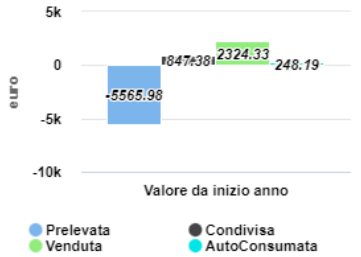
Valore Ultimi 7gg.

4m



Valore Da Inizio Anno

4m



Regione Emilia-Romagna · ART-ER · ACER · Alma Mater Studiorum Università di Bologna · ENEA · enel x

7 AFFORDABLE AND CLEAN ENERGY

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

Ciao roottooladmin1

Sat 11 Nov 17:26:28

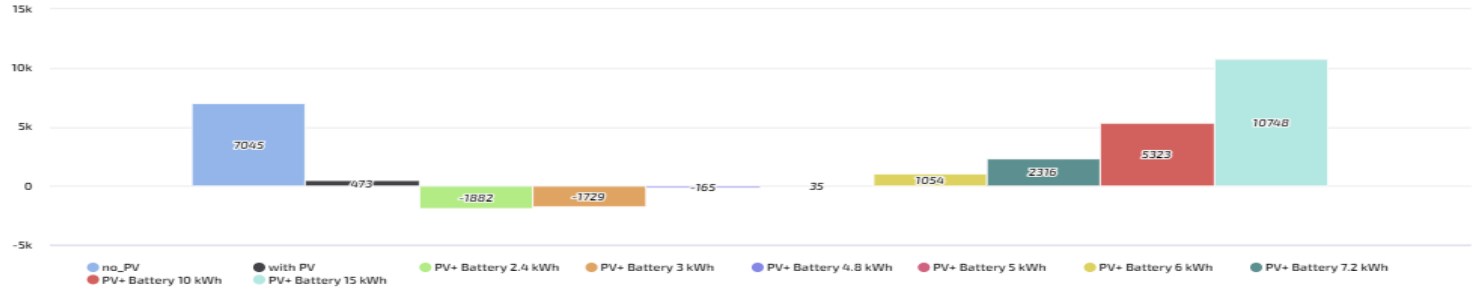
ONLINE PHOTOVOLTAIC SYSTEM SIMULATOR

User Manual

Italian Version

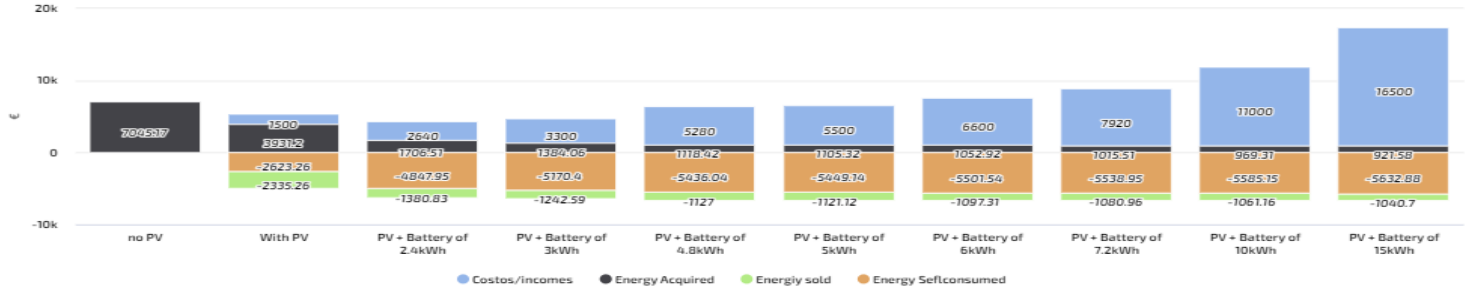
TOTAL COSTS OVER THE INVESTMENT YEARS

599m



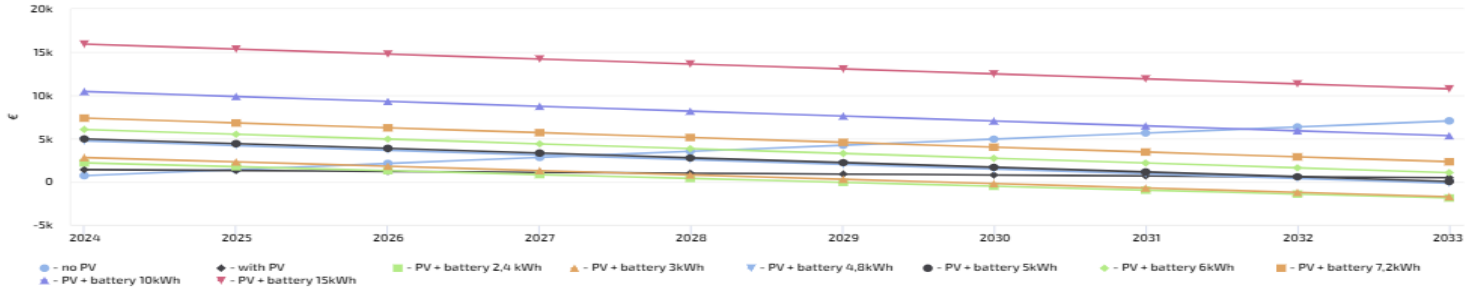
TOTAL COSTS OVER YEARS DECOMPOSED IN COSTS AND INCOMES

599m



BREAK EVEN TREND FOR THE DIFFERENT KIND OF PLANTS

599m



PARAMETERS OF YOUR PV PLANT

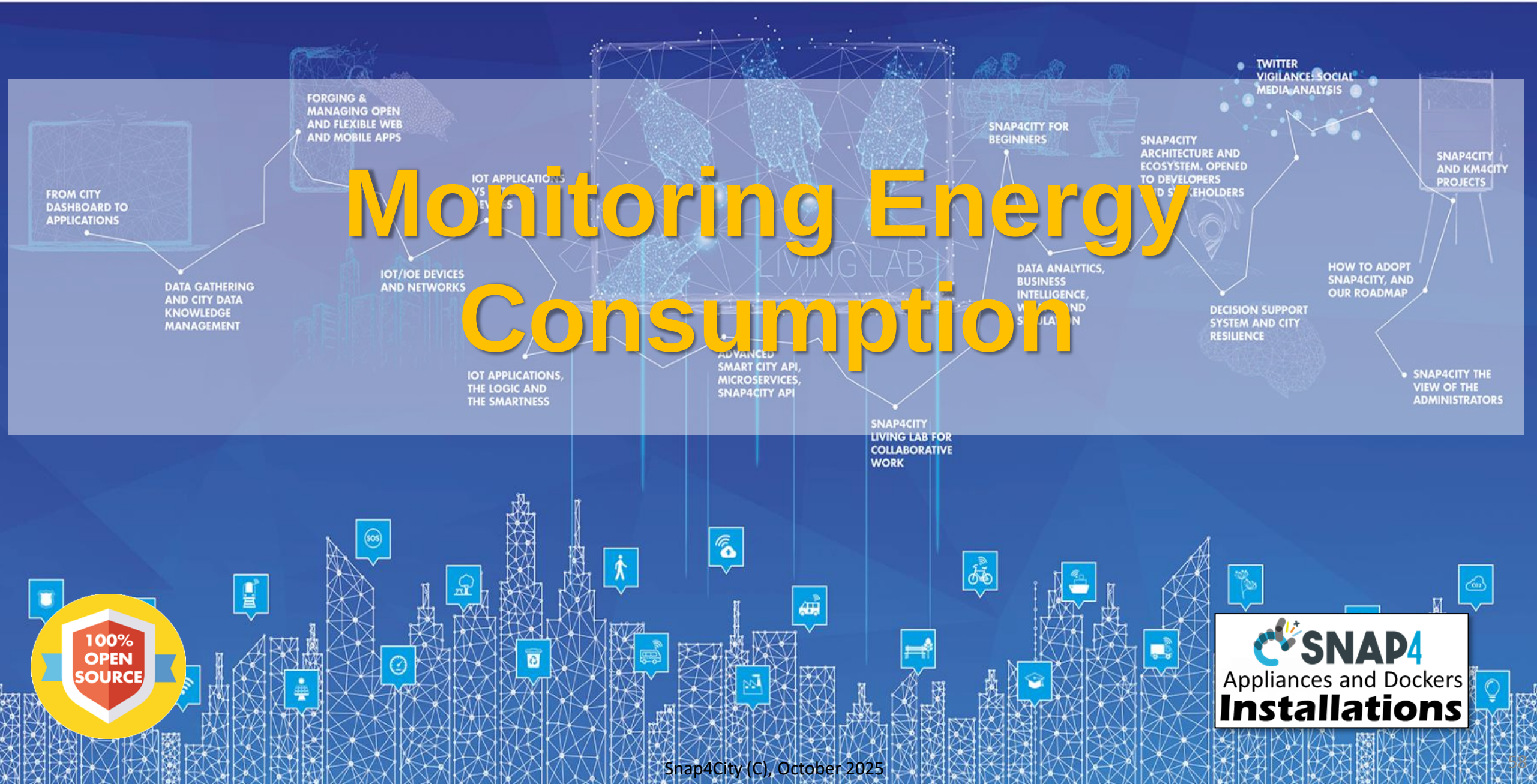
We suggest you PV plus battery of 2.4 kWh

Annual Consumption	2000 kWh
Price of energy sold (€/kWh)	0,15
Price of Energy Acquired (€/kWh)	0,35
Years of Investiment	10
Months for typical trends	Gennaio

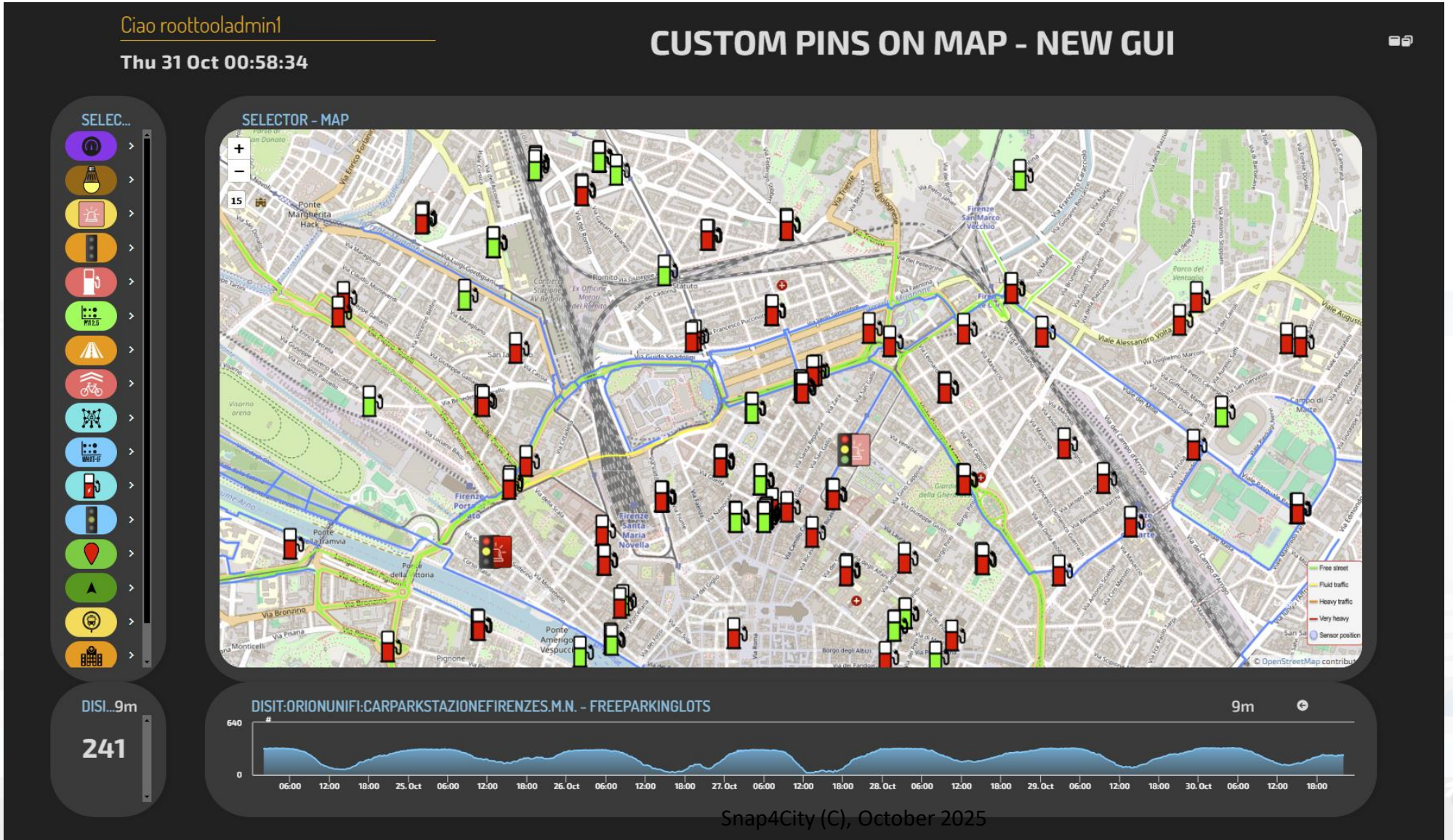
Compute

7 AFFORDABLE AND CLEAN ENERGY

Monitoring Energy Consumption



Monitoring recharing station and assets



Energy monitoring and business intelligence

Green and Data Driven District

Aggregated KPI | JuicePark | SmartPole | CityAnalytics

Energy produced to date		CityAnalytics insight		Videoanalysis – KPI to date	
JuicePark	0 kWh	Average daily people	9845.3	People counted	0
SmartPole	27.341 kWh	Average Milan resident over tourist ratio	1.57	Vehicle counted	520
				People aggregation	0
WiFi sessions daily peak		**SOS events to date**		**Vehicle charging sessions to date**	
Max connected devices	0	SmartPole requests	0	EV car	0
		JuicePark requests	0		
		AED requests	0		

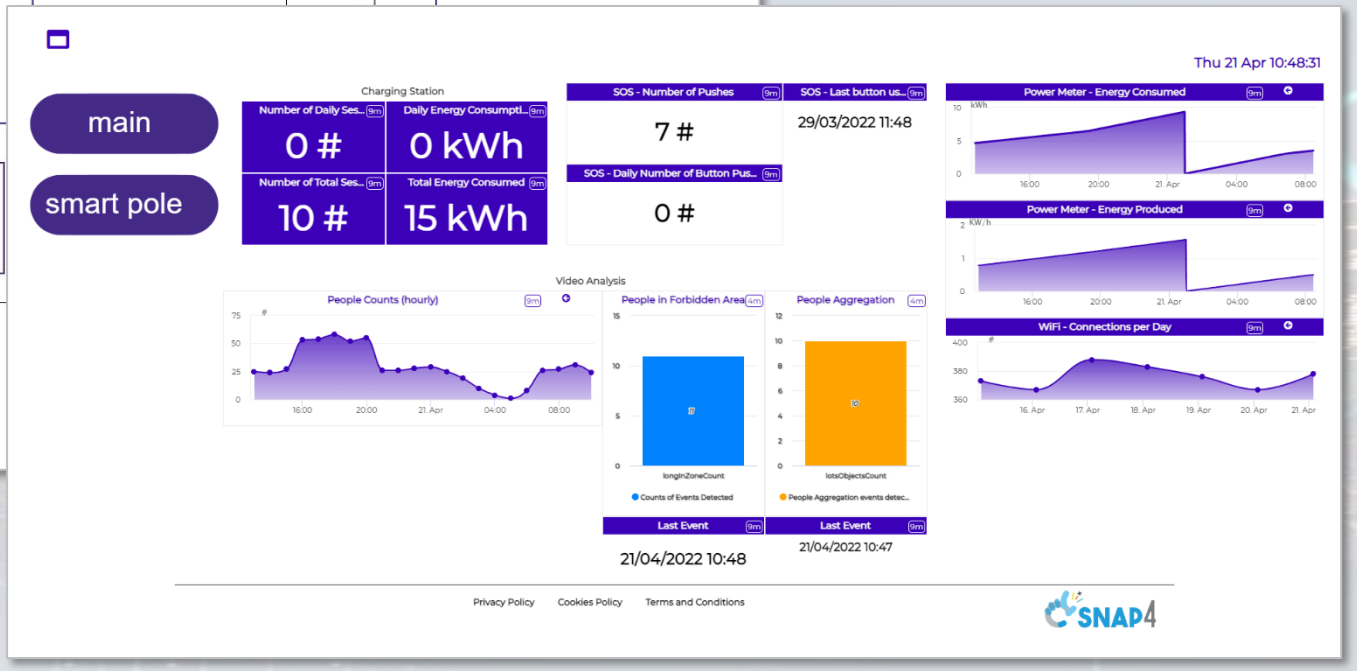
Juice Park Detailed KPIs

Smart Pole Detailed KPIs

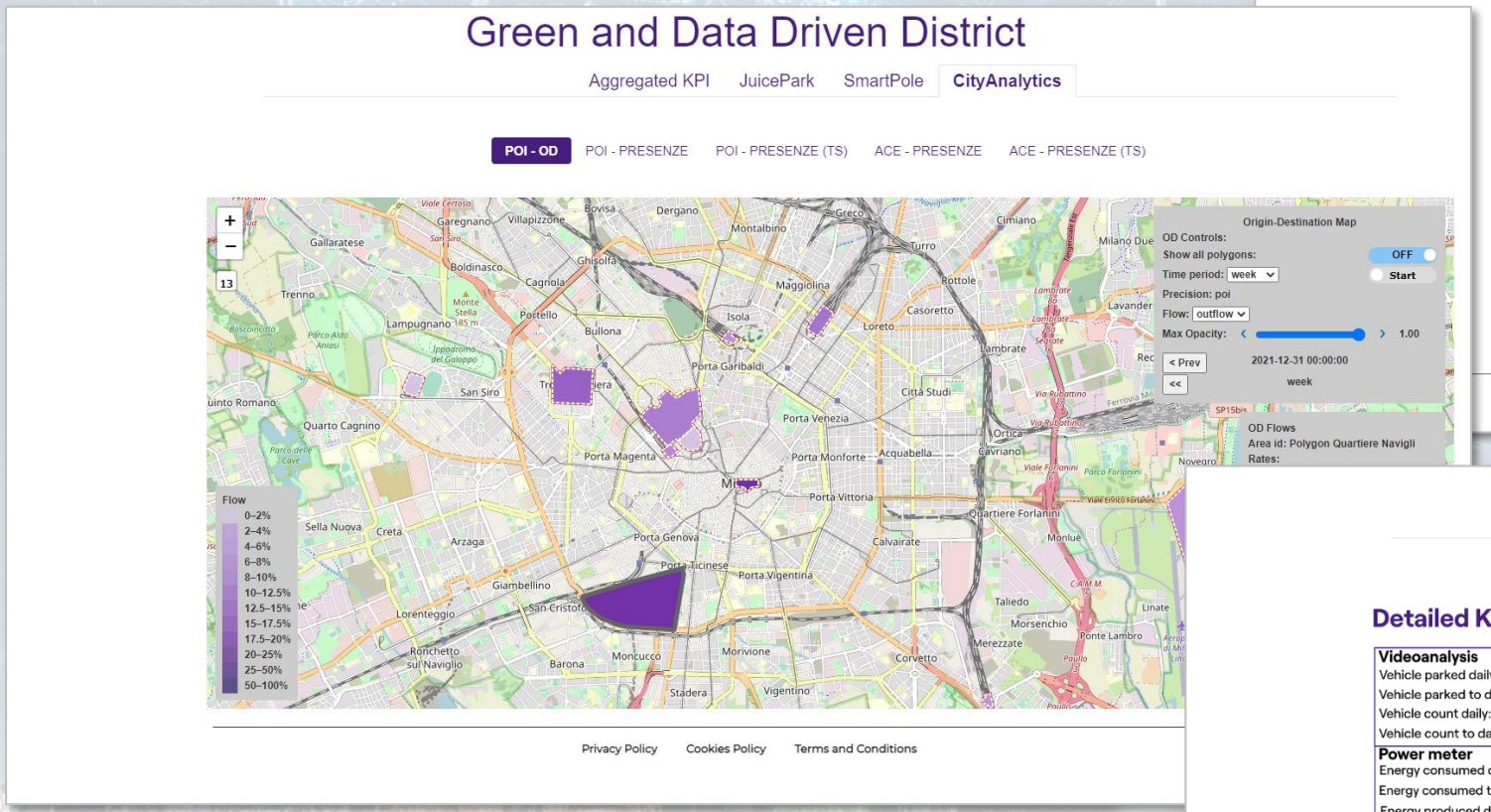
Privacy Policy Cookies Policy Terms and Conditions

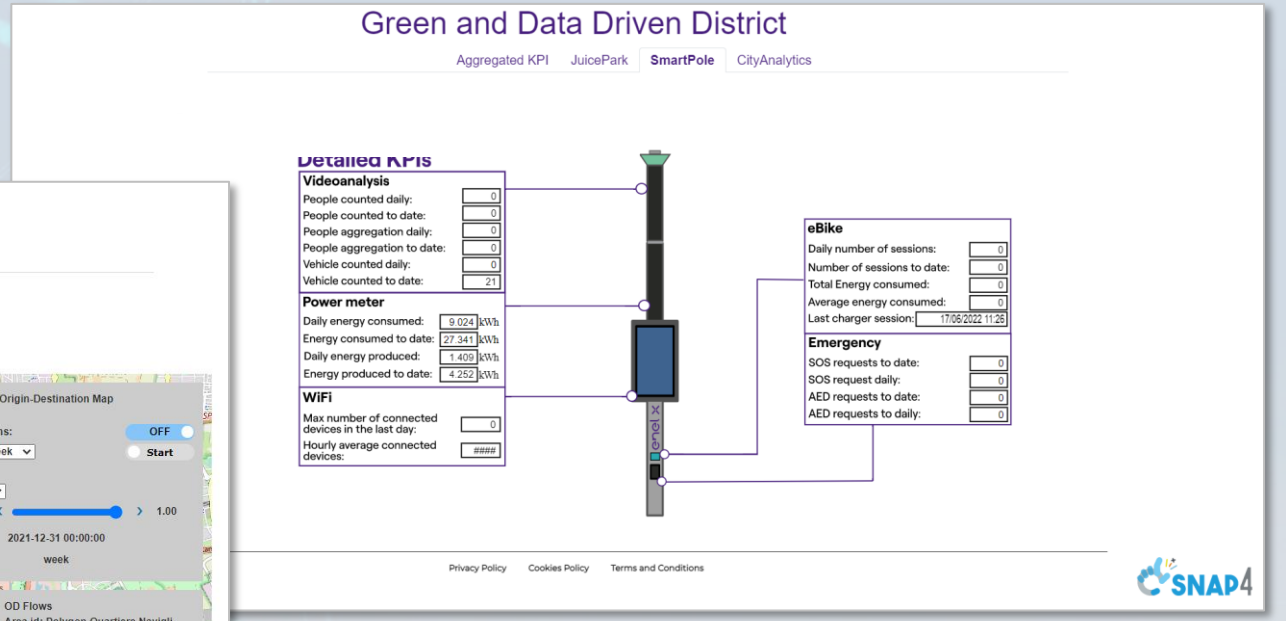
7 AFFORDABLE AND CLEAN ENERGY

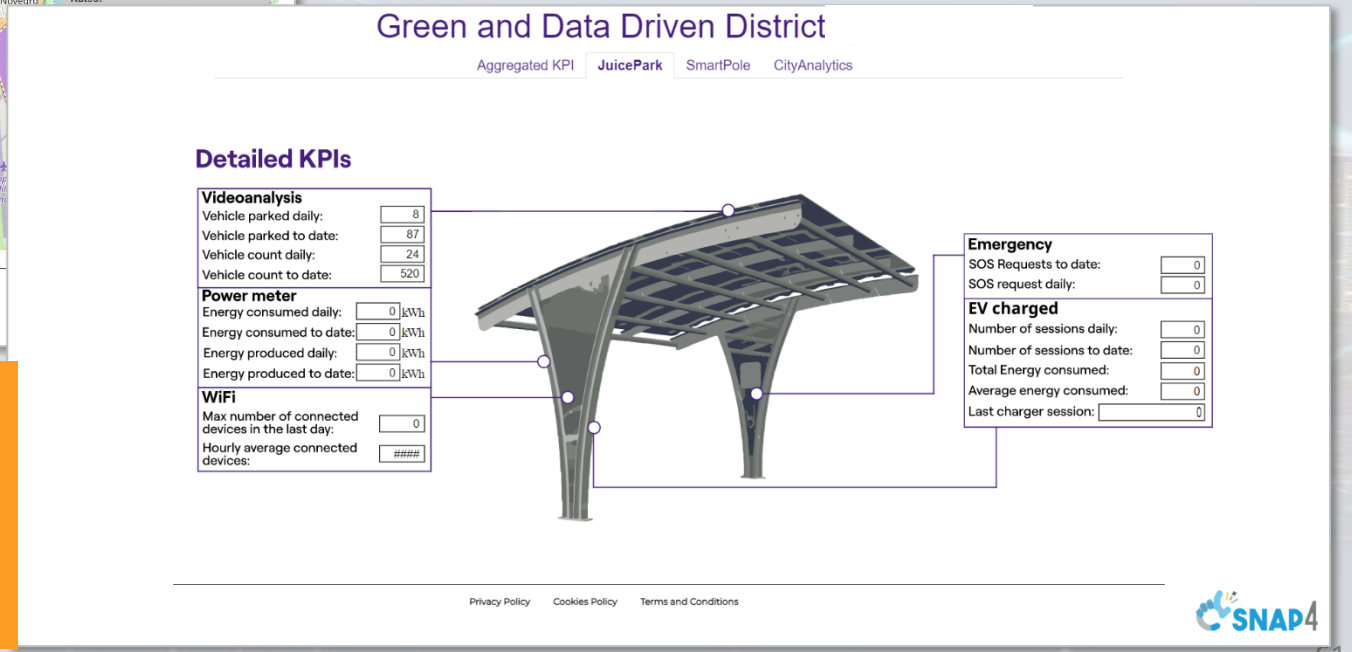
11 SUSTAINABLE CITIES AND COMMUNITIES



Energy monitoring and business intelligence



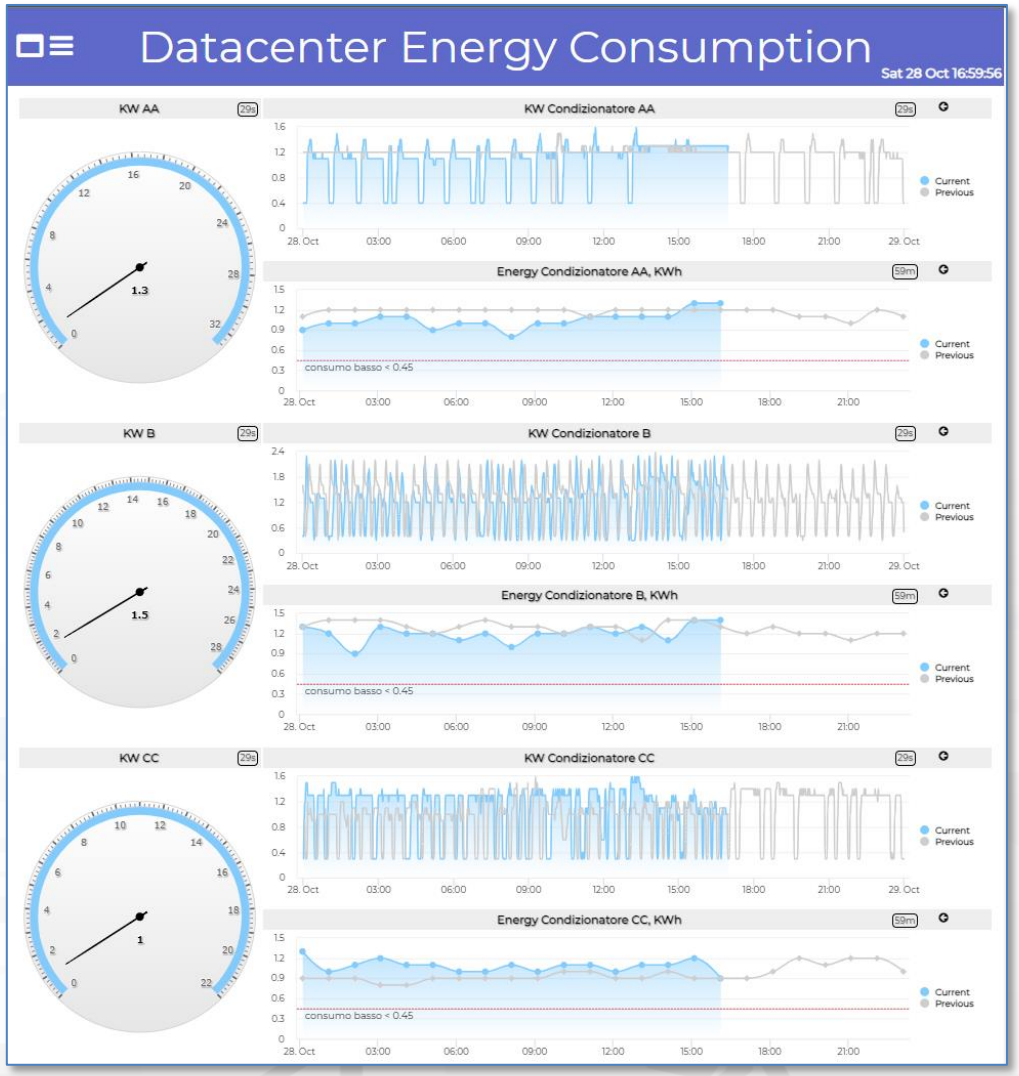


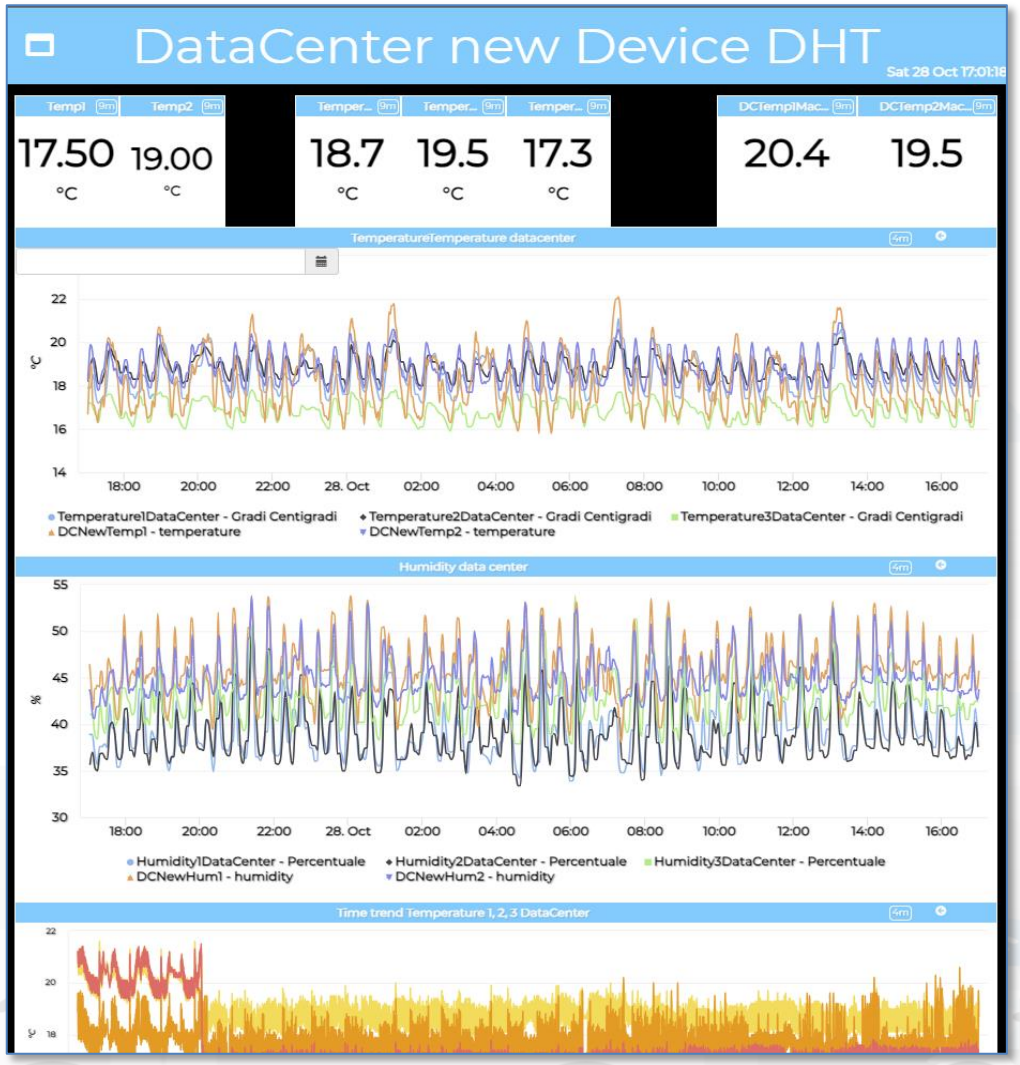


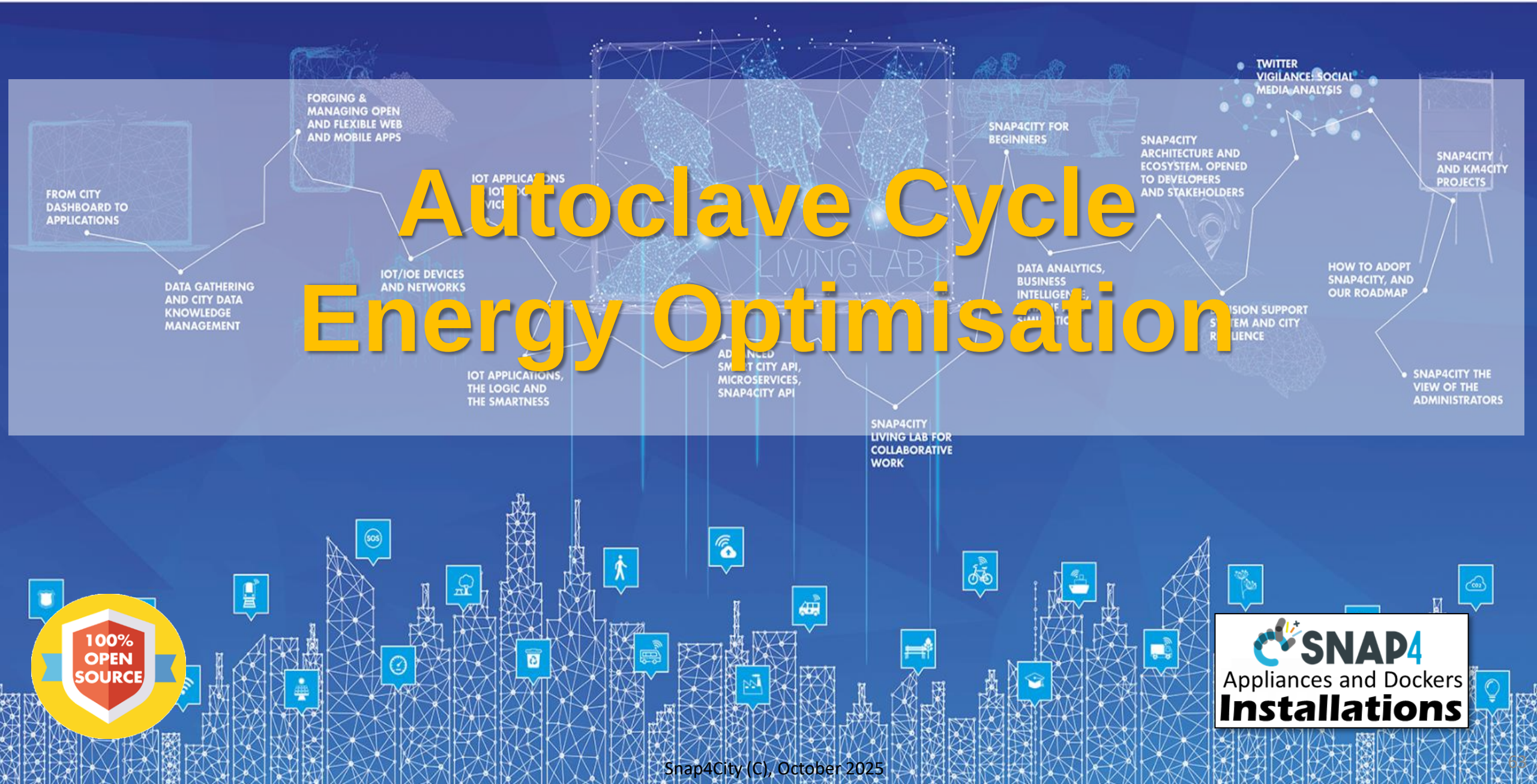
7 AFFORDABLE AND CLEAN ENERGY

11 SUSTAINABLE CITIES AND COMMUNITIES

Data Center monitoring







Autoclave Cycle Energy Optimisation

Sinottico Impianto

Sinottico Impianto Presse - Autoclave

italmatic

Mon 4 Oct 15:34:59

Stato Presse

OFF 1	OFF 2	OFF 3	OFF 4	OFF 5	ON 6
OFF 7	OFF 8	OFF 9	OFF 10	ON 11	OFF 12
OFF 13	ON 14	OFF 15	OFF 16	OFF 17	OFF 18
OFF 19	OFF 20	OFF 21	OFF 22	OFF 23	

Select Pressa

PRESSA 6

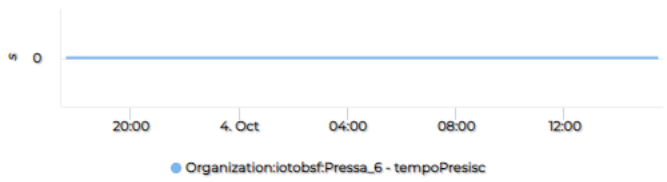
Press to update the list

Status

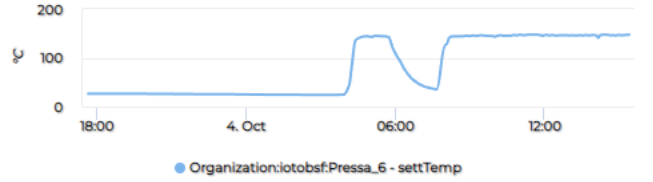
NO STATUS

Tempo Vulcanizzione Pressa

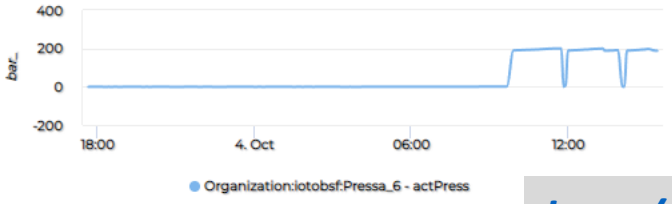
Tempo Preriscaldo Pressa



Temperatura Settore Pressa

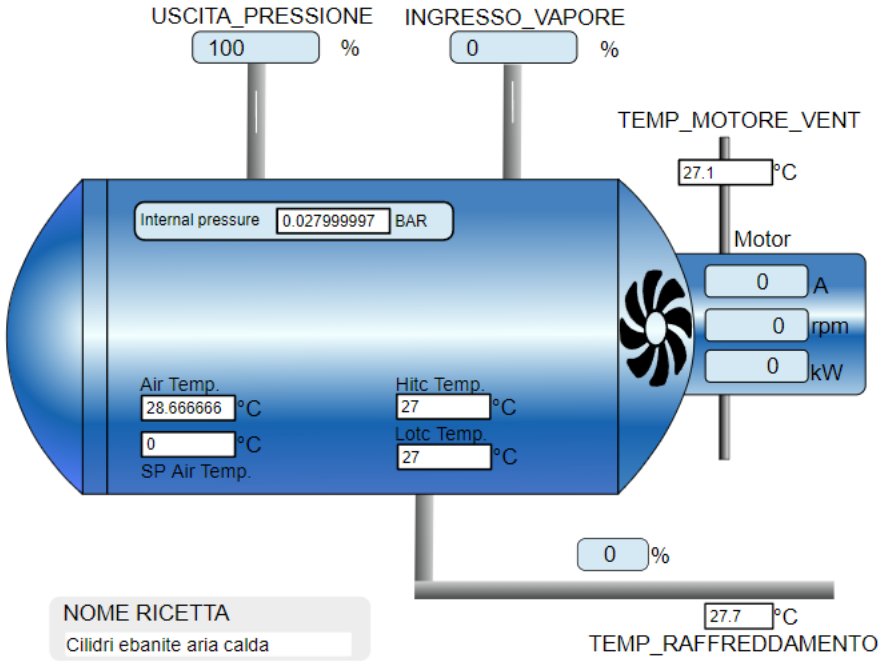


Pressione Pressa



Temperatura Piani Pressa

Stato autoclave



NOME RICETTA
Cilidri ebanite aria calda

Main Dashbaord
Autoclave db - Weekly
Autoclave KPI - Weekly
Impianto Presse - Weekly
OpcUaValues - Weekly
OpcUaValues ...rison

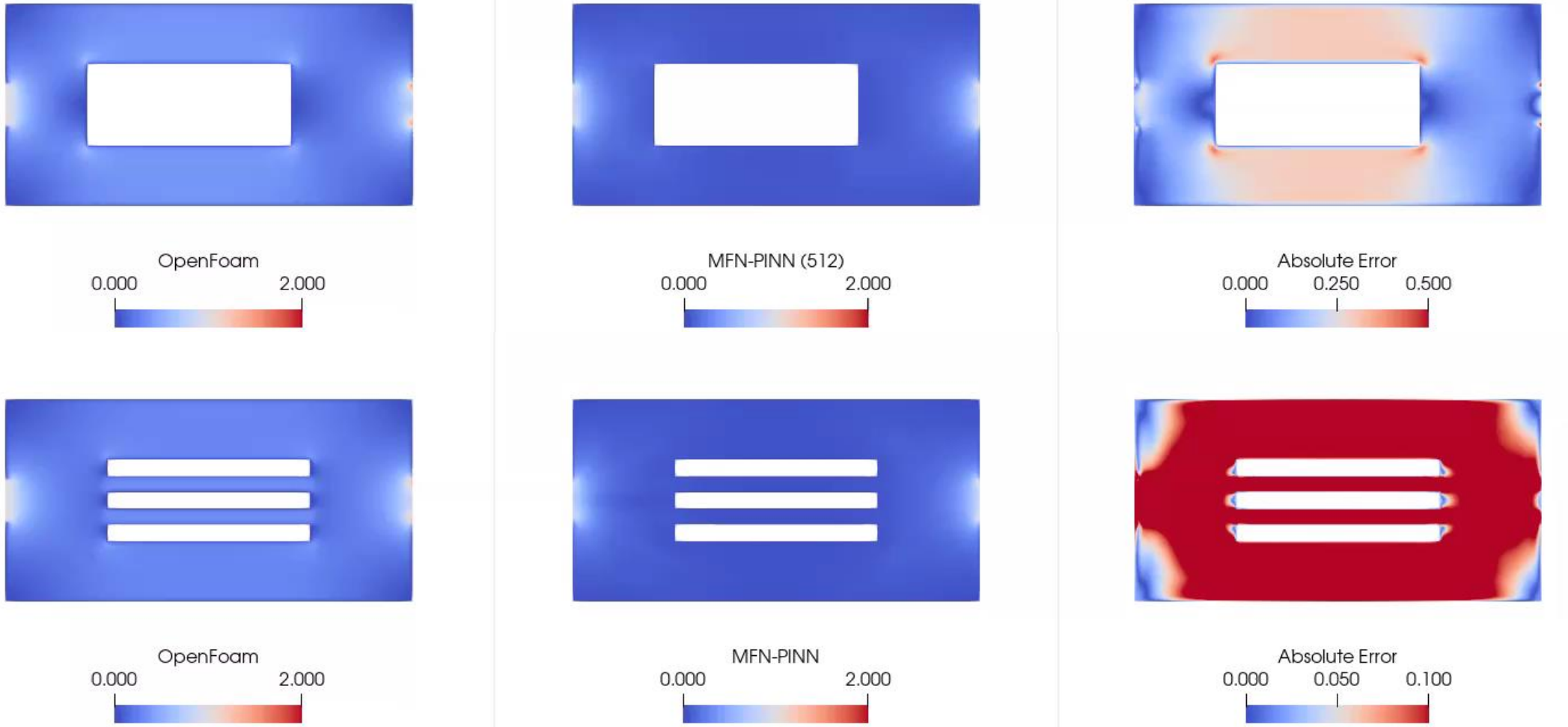
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

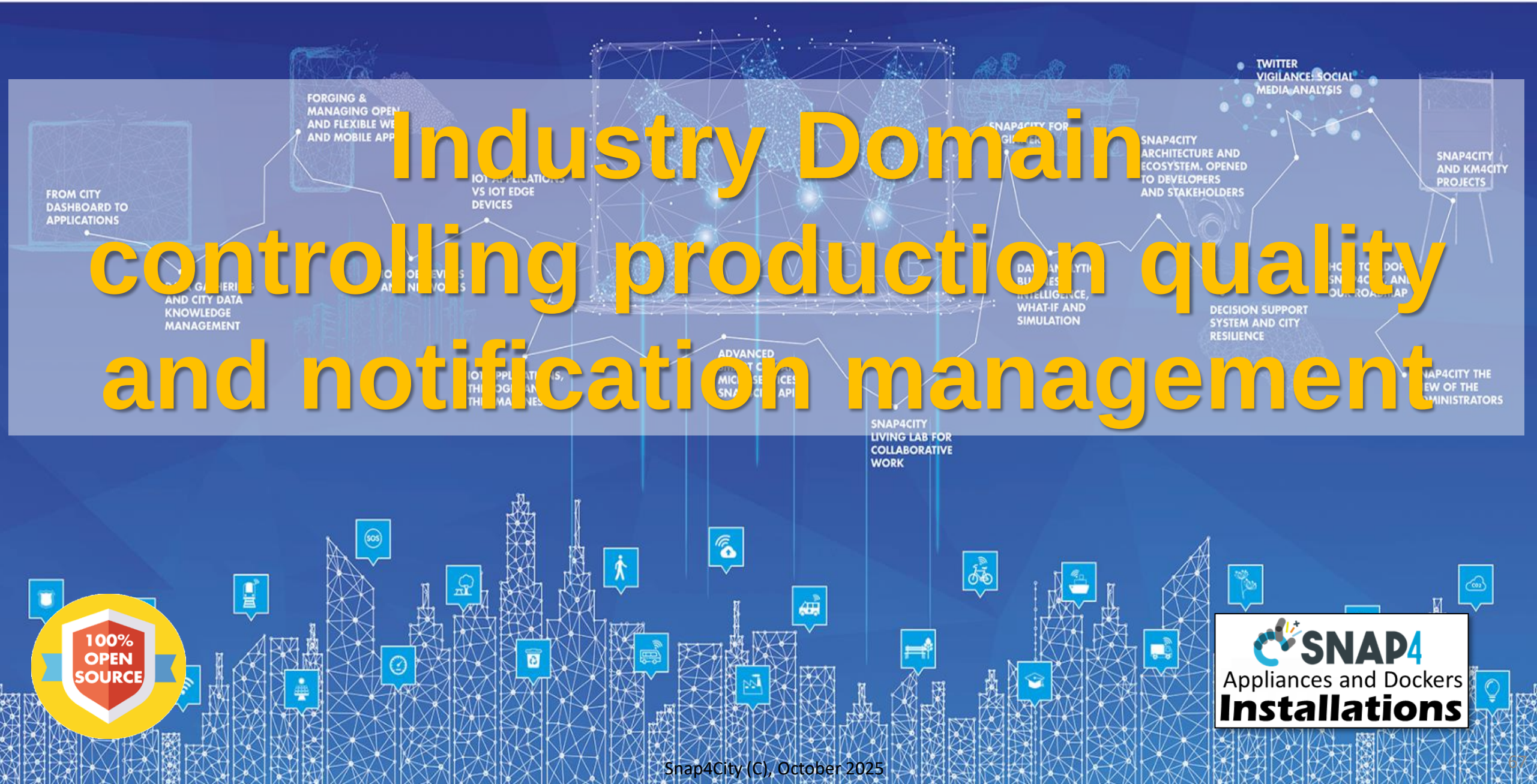
http://dashboard/dashboardSmartCity/view/index.php?iddasboard=MTk=

PINN: Physically Informed Neural Neworks Models

- **Solving Navier-Stokes PDE** (partial differential equations) equation, **via PINN** approach
  - Reduction of computing costs for simulating load effect into the autoclaves curing process
  - Validation wrt Open Foam
  - Precision on steady and transitory cases
  - Definition of Transfer Learning techniques
- Videos on https://www.snap4city.org/1010

Comparison of PINN vs OpenFoam and error





Industry Domain controlling production quality and notification management

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

EN.TE.R.PR.I.S.E.

(**EN**hanced **TE**chnological **R**&D of new **PR**oducts and Processes for **I**nnovation, **S**mart factory and green **E**conomy)

ALTAIR CHIMICA

Administrative Data from AS400

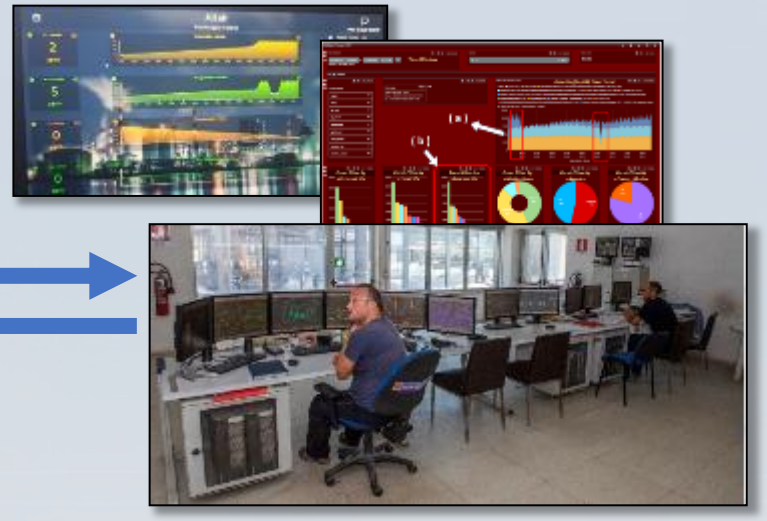
Real Time Data, Historical, Events from DCS

OPC UA

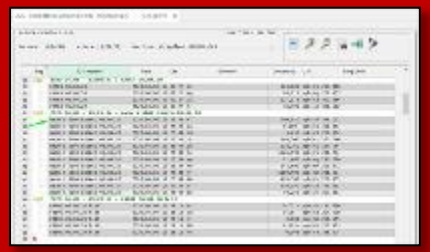
Unique National Energy Costs (PUN)

Big Data Analytics Artificial Intelligence Engine

SNAP4INDUSTRY

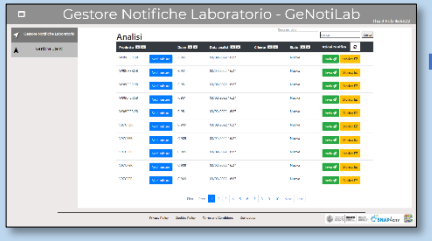


Analytical Data from the product quality Lab (LIMS/SAM)



SNAP4

GeNotiLab



POR CreO FESR 2014-2020 REGIONE TOSCANA FONDO EUROPEO DI SVILUPPO REGIONALE

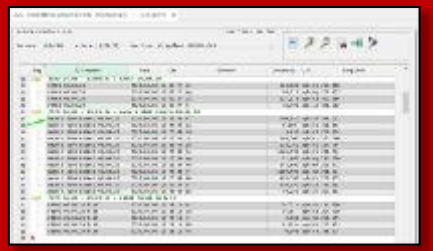
UNIONE EUROPEA

REPUBBLICA ITALIANA

Regione Toscana

GeNotiLab Architecture for ALTAIR

Analytical Data from the product quality Lab(LIMS/SAM)



AS400

IOT App

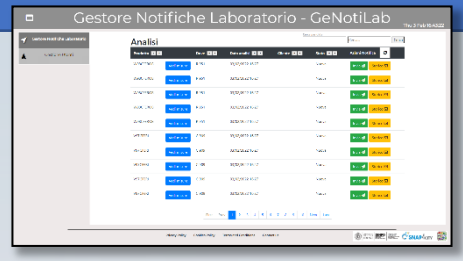
Users

Analysis

Notifications

IOT App Analytics

Dashboards

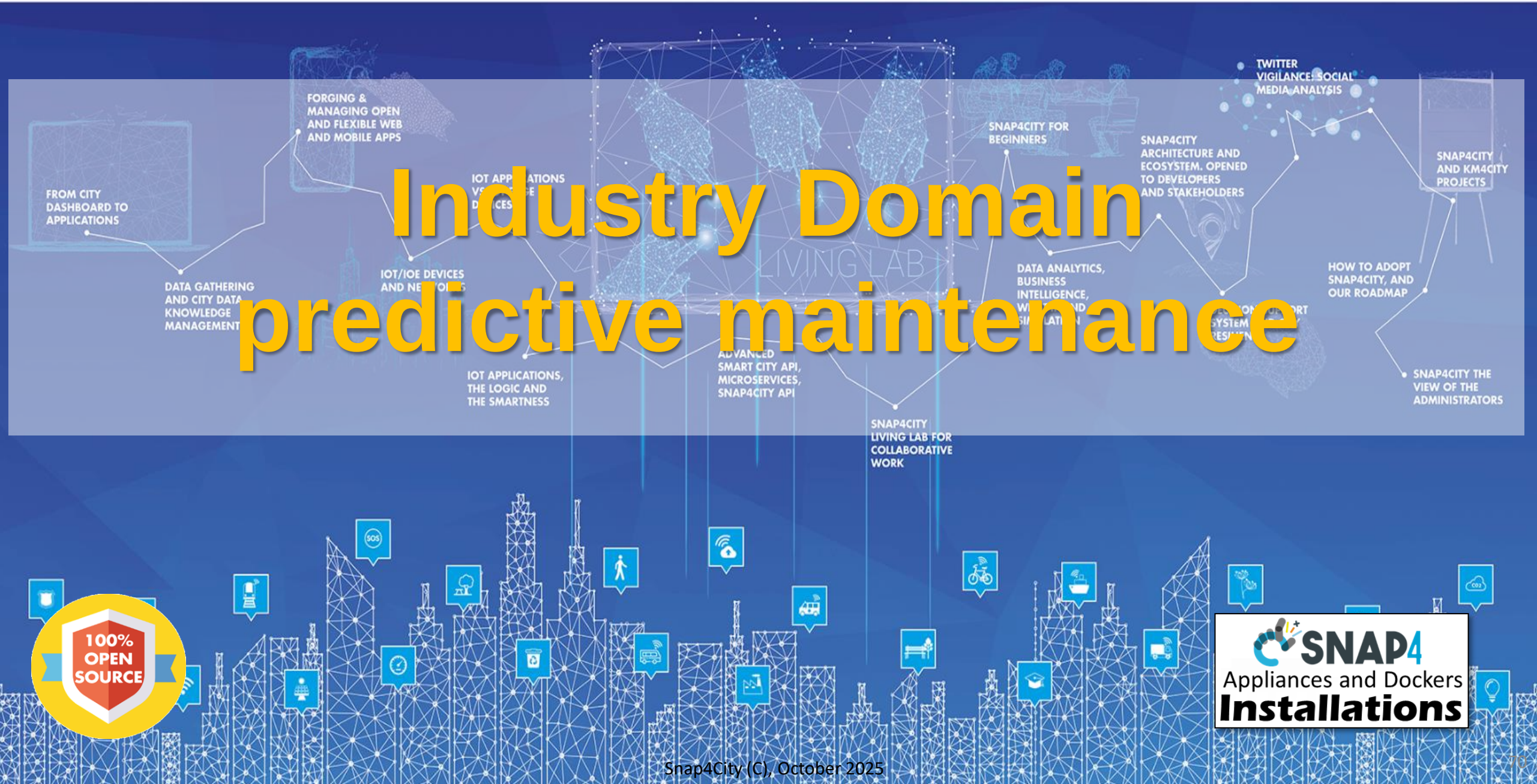


IOT App Management

Tools:
-- List of Chemical Analyses
-- List of Notifications
-- Define notifications
-- Program, send notifications
-- see notification status

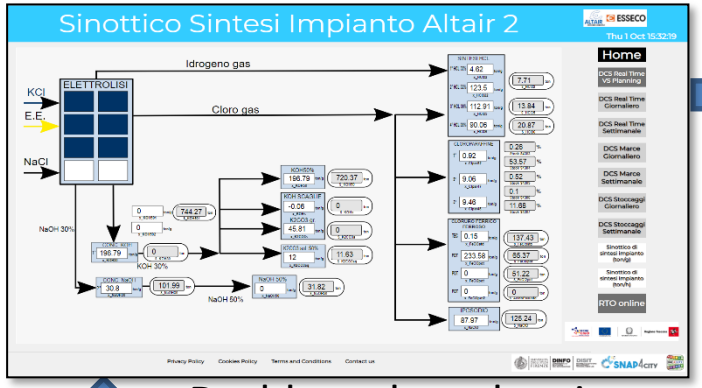
IOT App Vs Telegram

Telegram Bot

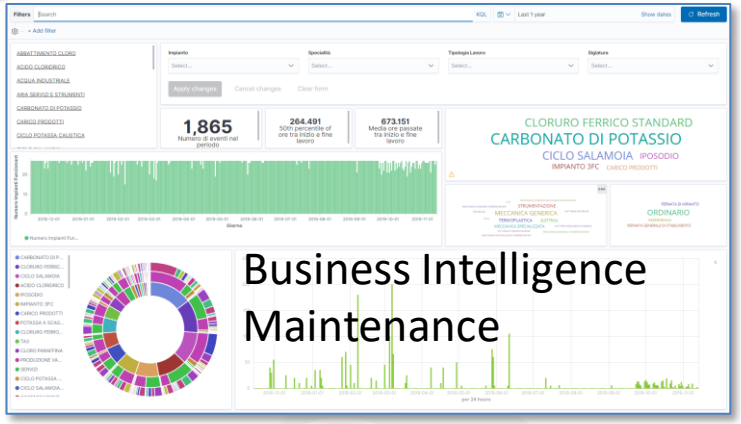


Industry Domain predictive maintenance

Workflow for Ticket management



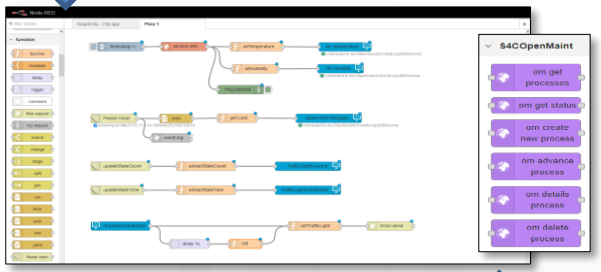
Consumptions/productions

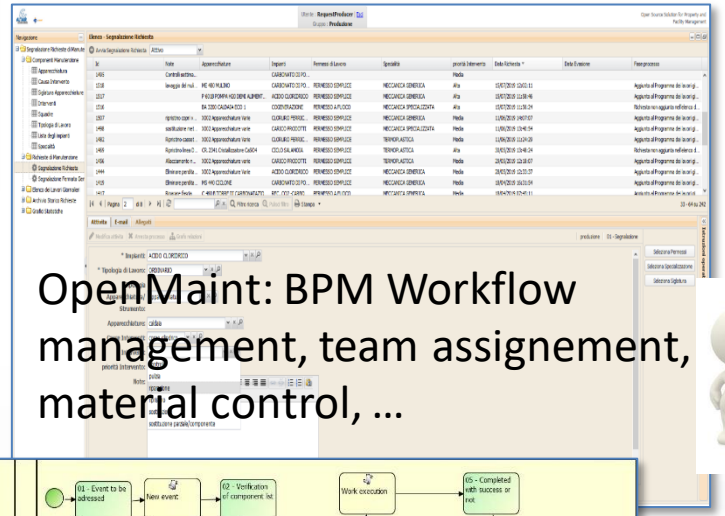


Events/actions

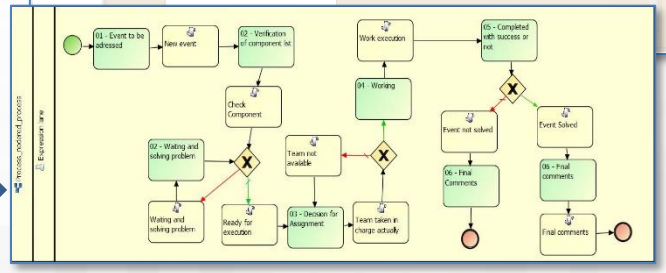
Business Intelligence
Maintenance

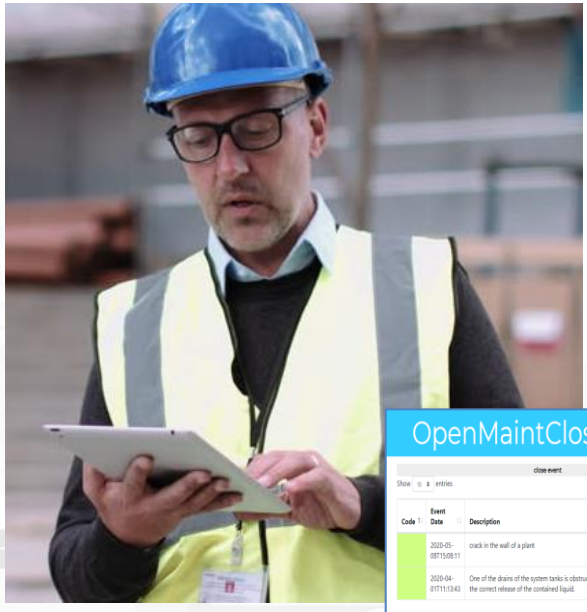
Dashboards and actions





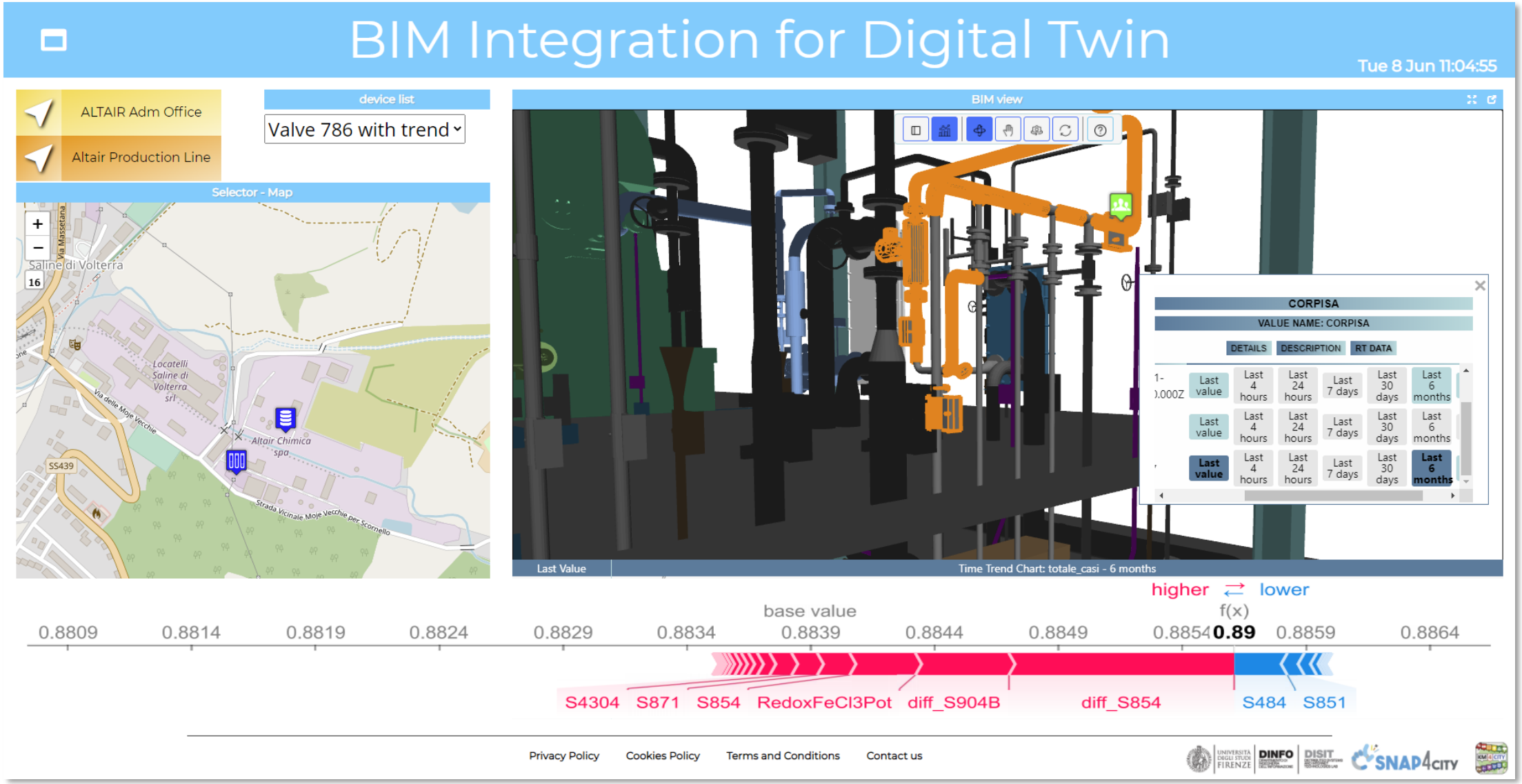
OpenMaint: BPM Workflow management, team assignement, material control, …



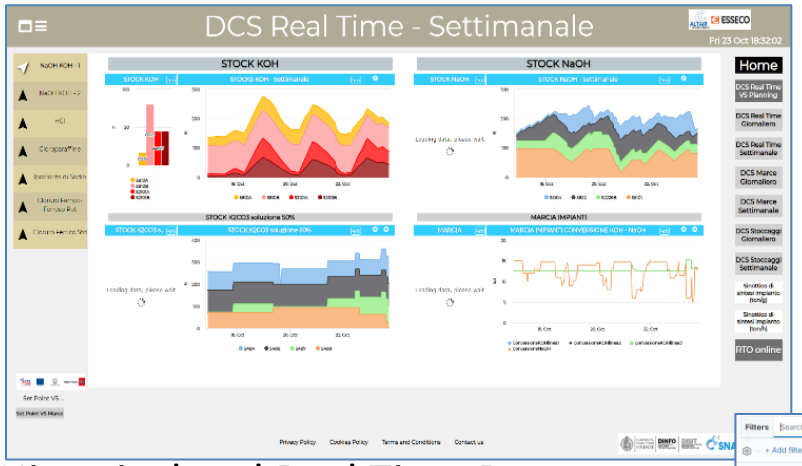


IOT App, Data event firing, event detection and firing Critical event management

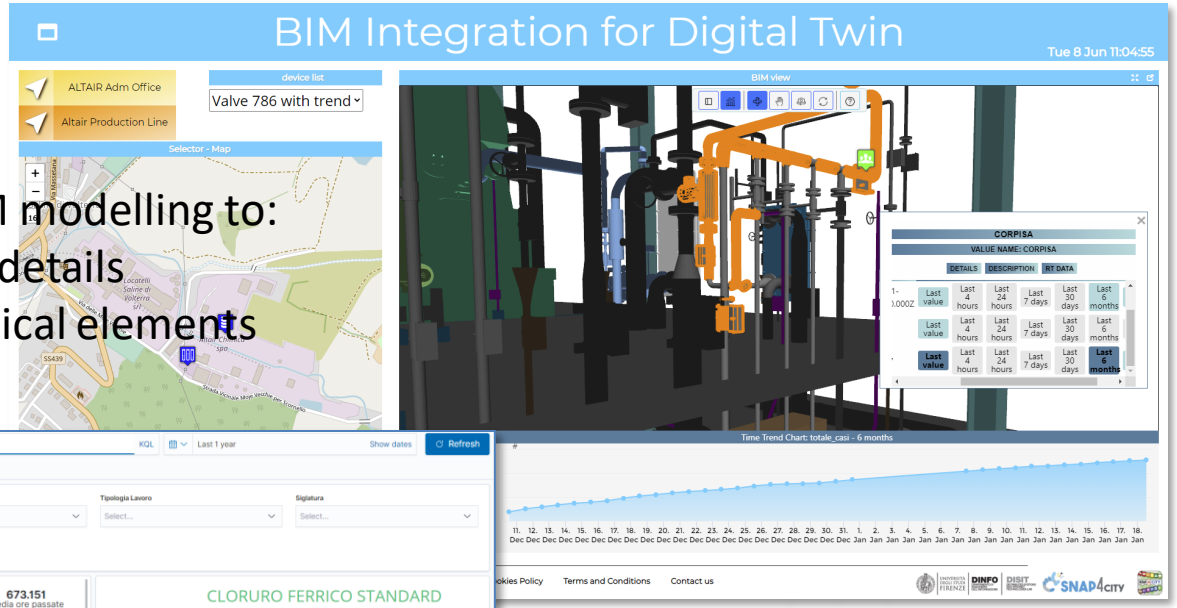
Digital Twin Local, 3D vs Real Time Data



Closing the loop

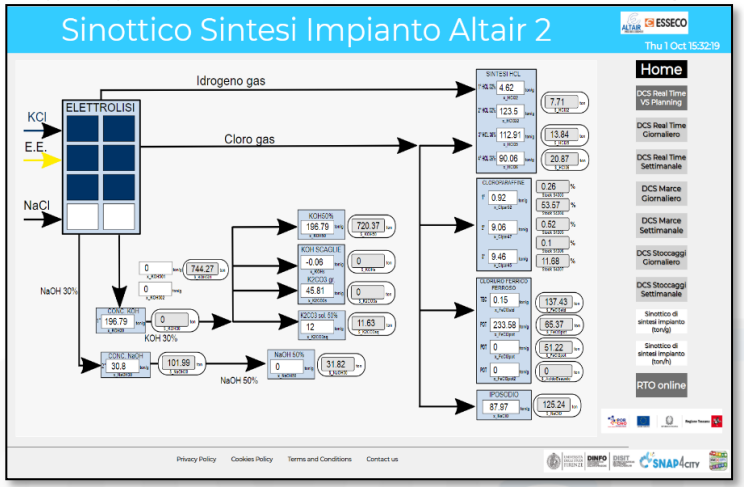


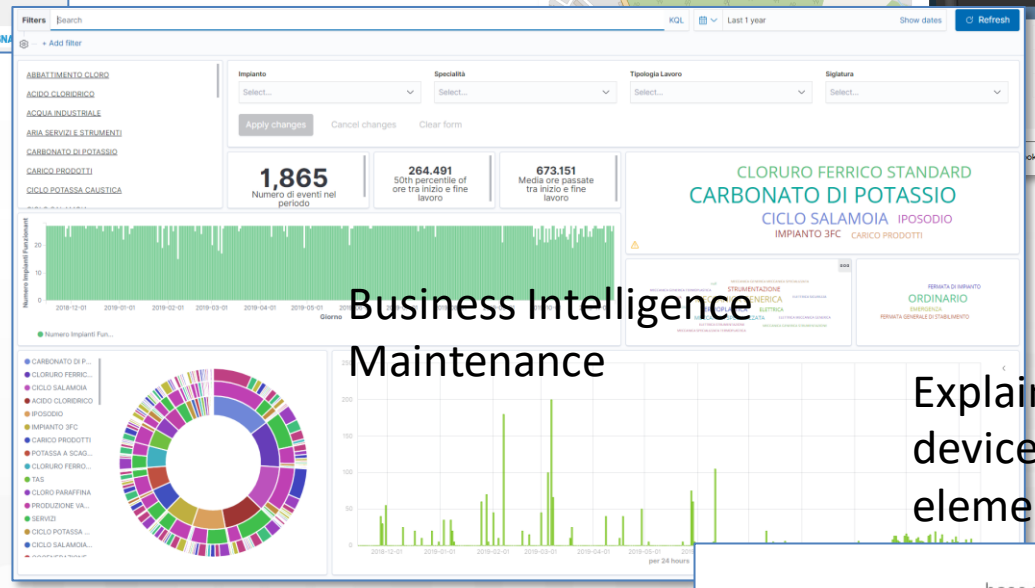
Historical and Real Time Data



Map and 3D BIM modelling to:
-- represent the details
-- associate physical elements with data

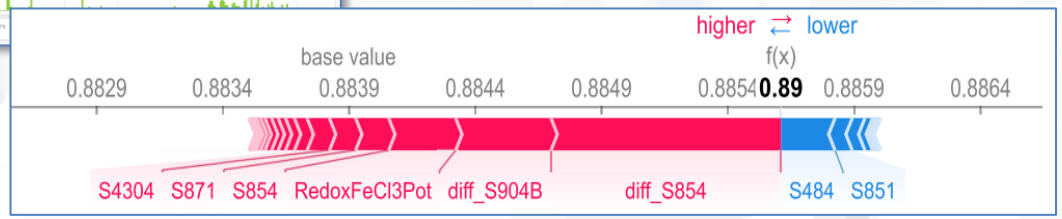
Synoptics for real time monitoring





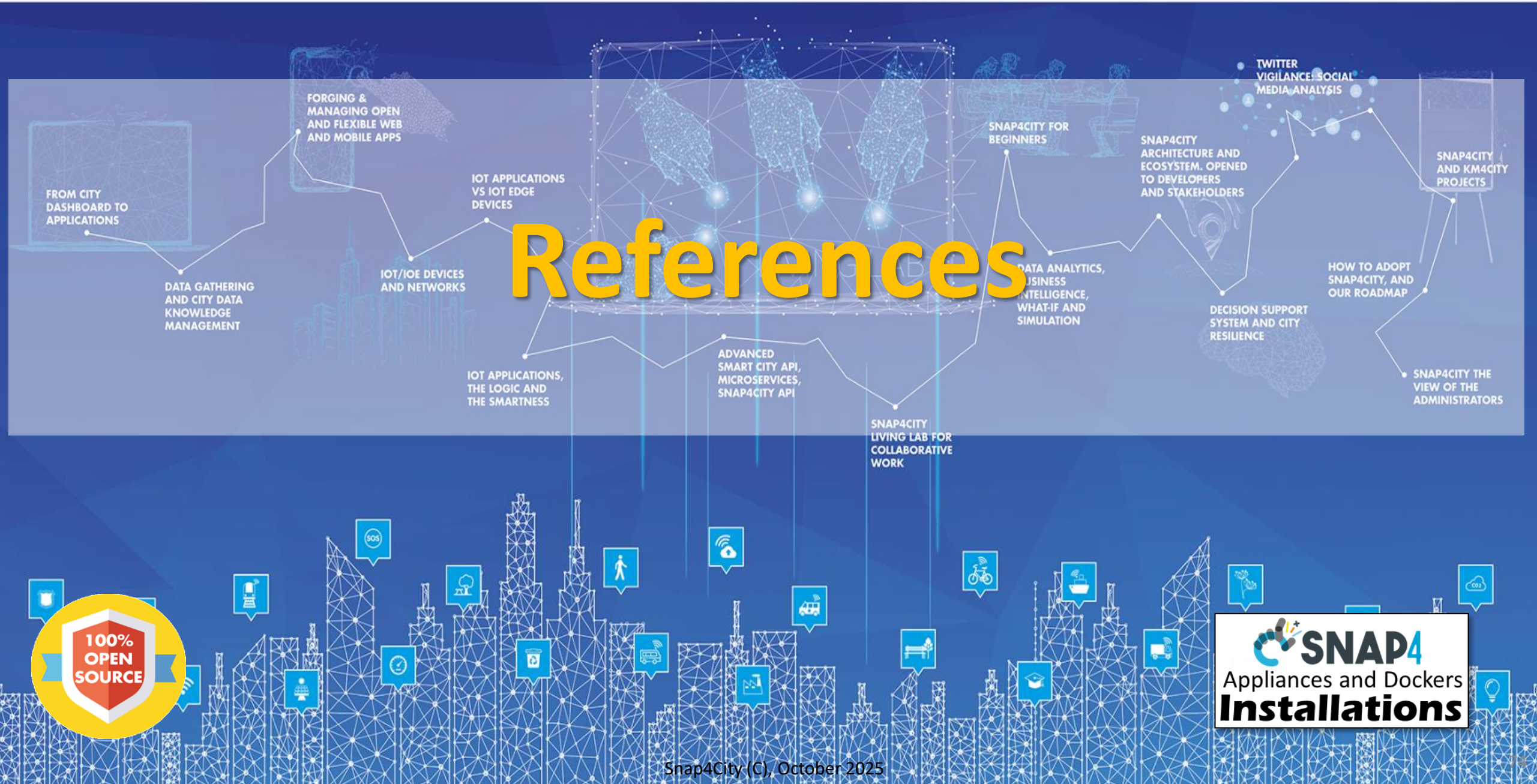
Business Intelligence Maintenance

Explainable AI to map critical values of devices and detection to physical elements in the plant



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzA1NA==

References


FROM CITY DASHBOARD TO APPLICATIONS
DATA GATHERING AND CITY DATA KNOWLEDGE MANAGEMENT
FORGING & MANAGING OPEN AND FLEXIBLE WEB AND MOBILE APPS
IOT/IOE DEVICES AND NETWORKS
IOT APPLICATIONS VS IOT EDGE DEVICES
IOT APPLICATIONS, THE LOGIC AND THE SMARTNESS
ADVANCED SMART CITY API, MICROSERVICES, SNAP4CITY API
SNAP4CITY LIVING LAB FOR COLLABORATIVE WORK
SNAP4CITY FOR BEGINNERS
DATA ANALYTICS, BUSINESS INTELLIGENCE, WHAT-IF AND SIMULATION
SNAP4CITY ARCHITECTURE AND ECOSYSTEM. OPENED TO DEVELOPERS AND STAKEHOLDERS
DECISION SUPPORT SYSTEM AND CITY RESILIENCE
TWITTER VIGILANCE: SOCIAL MEDIA ANALYSIS
HOW TO ADOPT SNAP4CITY, AND OUR ROADMAP
SNAP4CITY AND KM4CITY PROJECTS
SNAP4CITY THE VIEW OF THE ADMINISTRATORS
100% OPEN SOURCE
SNAP4
Appliances and Dockers
Installations

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

DISIT lab roadmap vs model and tools' usage

2013
Km4City Ontology 1.1

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

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

- Twitter Vigilance
- Social Media Analytics, Sentiment Analysis

Km4City 1.4

2015
Km4City 1.5

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

ckan, resolute

H2020 (2015-18)

2016
(2016-21) H2020 REPLICATE

Km4City 1.6.4

- Smart Energy
- Sustainable Mobility
- Control Room
- Dashboard

Km4City 1.6.2

Sii-Mobility (2016-21) MIUR

SII-MOBILITY SCN

- Infomobility
- Mobile App
- Routing
- Multimodality

FIWARE

Km4City 1.5

2017
Sii-Mobility

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

E0I5 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

- 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)

2018
- Mobility Demand / Offer Analytics and Strategy

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 (NaOH, POR CreO, Regione Toscana)

- Industry 4.0

bee smart city

- Smart Lonato

Reverberi Enetec Gruppo MPES

SODA

Winner of Select4Cities PCP

SELECT for Cities — 1° place award to UNIVERSITY OF FLORENCE - DEPARTMENT OF INFORMATION ENGINEERING — SNAP4CITY

SNAP4CITY KM4CITY

SNAP4CITY roadmap

2020

- Smart Tourism
- 6 Pilots
- Data Analytics
- Extended platform

- Smart Mobility
- PISA, PUMS
- Living lab

Km4City 1.6.7

smartGARDAlake

Smart Ambulance (2021-22)

Enterprise (2021-22) Industry 4.0

Sii-Mobility Contract

JRC Contract

2021

PC4City (2020-21) Monitoring Terrain

Winner of Open Data Challenge of

- Smart Light
- Sweden

Almafluida Industry 4.0 (2021-22)

AMPERE (2021-22) Industry 4.0

SYN-RG-AI SmartCity

GRUPPO PRETTO Industry 4.0

uni.systems SmartCity, 2021-23

AXIS collab SmartCity

2022

Asymmetrica Smart City, 2022-23

JRC Contract, 2022-23

Italferr, Smart City

2023

ART-ER Contract, 2022-23

Filippi 2022-2023

enel x Contract, 15min

IMPETUS Security and Risk

Smartea

CN MOST, 2022-26

EI THE, 2022-26

G. Agile, 2021-23

TUSCANY EDIH 2023-26 Finanziato dall'Unione europea NextGenerationEU

Merano, smart light

OceanRace, Genova, AWS

Cuneo, smart city

2024

Km4City 1.6.8

TOURISMO

Interreg Euro-MED Co-funded by the European Union

ELLIE IA 2025-2027

UrbanDT4TF

JRC Contract, 2024-25

CAI4DSA

FAIR Future Artificial Intelligence Research

OPTIFaaS

SASUAM

Rhodes, smart city

eShare UNIFI TUSS

AMMIRARE

Interreg MARITTIMO-IT FR-MARITIME

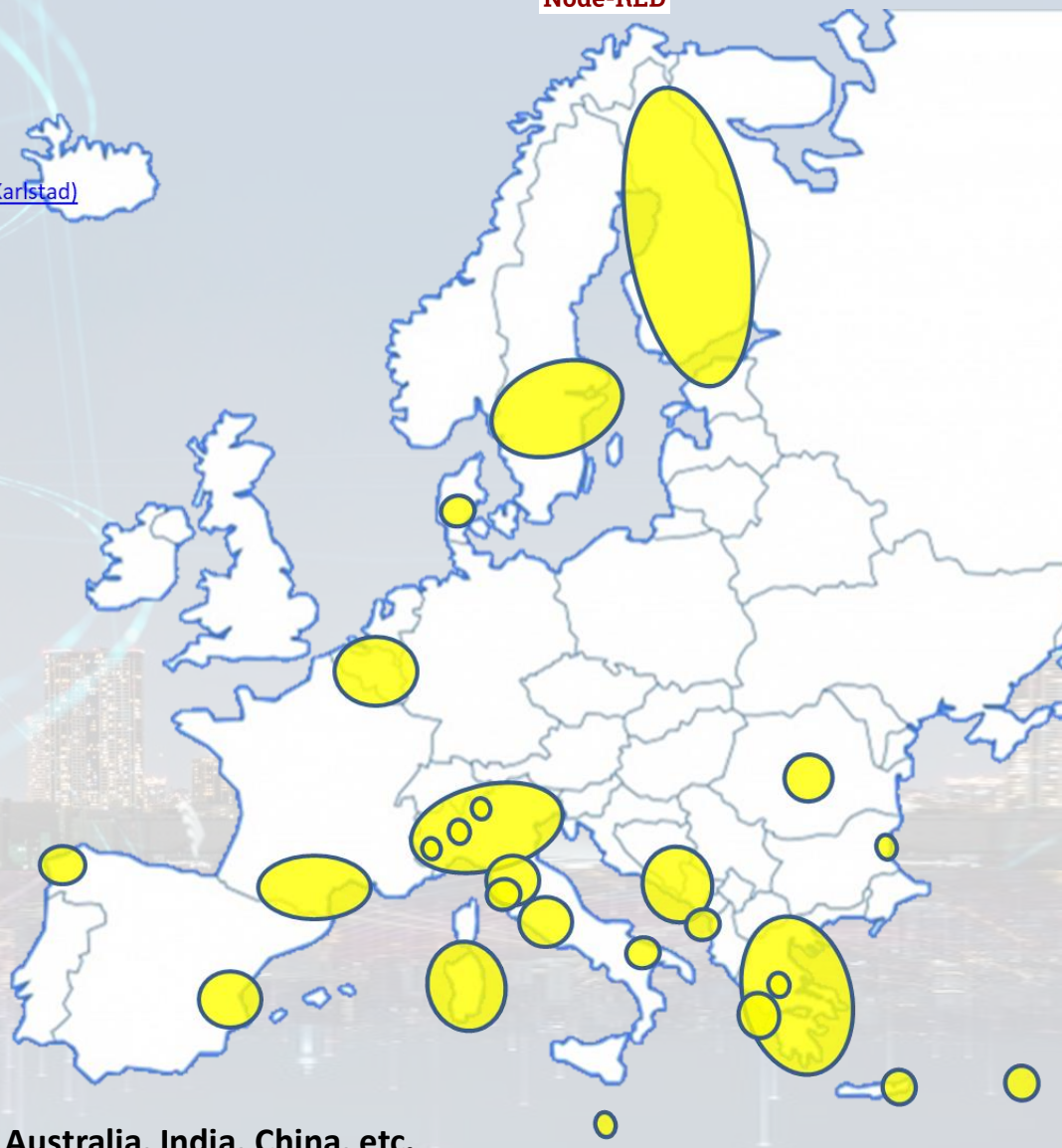
https://www.Snap4City.org

- Update: 29-10-2024

- 12 running installations in Europe
  - Snap4.city.org, Greece, Merano, Cuneo, ..
  - Toscana, Pisa, Sweden, ISPRA, Snap4.eu,
  - Altair, Italmatic, Romania, Rhodes, ….
- 16 projects, 12 pilots on 10 Countries
  - >40 cities/area
- **Widest MULTI-tenant deploy has**
  - 24 Organizations / tenant
  - > 8850 users on
  - > 1800 Dashboards
  - > 17 mobile Apps
  - **> 2.2 Million of structured data per day**
  - > 580 IoT Applications/node-RED
  - > 750 web pages with training
  - > 75 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.**

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KM4CITY

CITY

INDUSTRY

ARTIFICIAL INTELLIGENCE

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Rodhes
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Santa María la Real fundación
Fundación Valenciaport
READ S.A. Development Agency of South Aegean Region
Varna Economic Development Agency
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E015 digital ecosystem

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Università degli Studi di Firenze - School of Engineering

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