



www.snap4city.org

www.snap4solutions.org



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



www.km4city.org

Overview

Short November 2025

ANCI General Assembly 2025

*AI Digital Twin Platform
to set-up Sustainable
Decision Support Systems
& Business Intelligence*

#snap4city
#km4city
#disitlab
@snap4city



Funded by the
European Union
NextGenerationEU



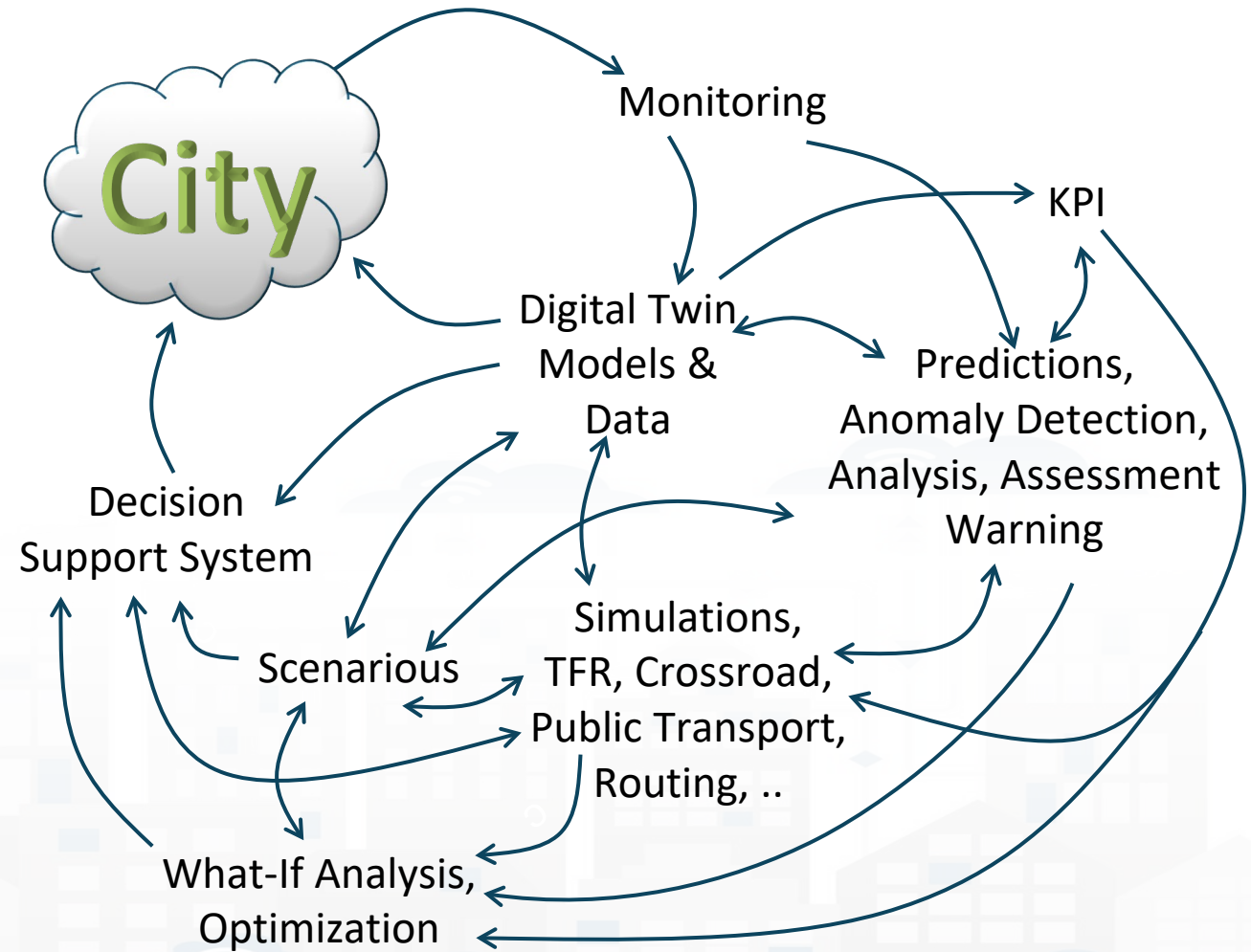
Ministero
dell'Università
e della Ricerca

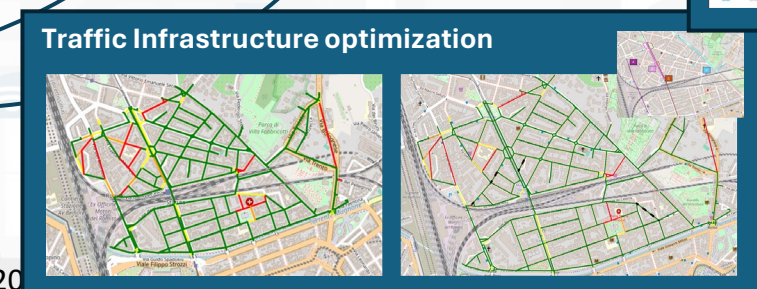
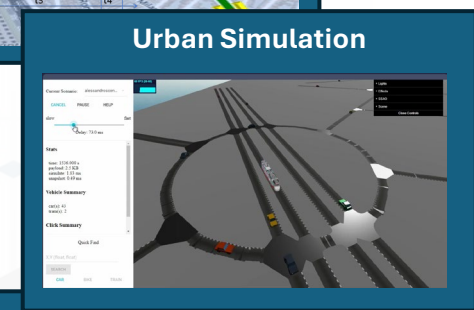
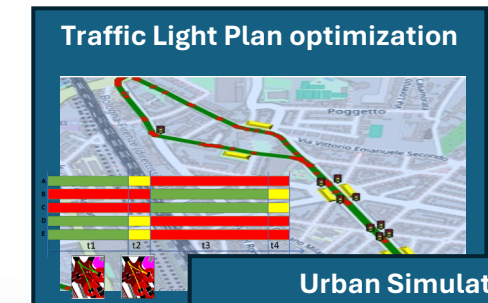
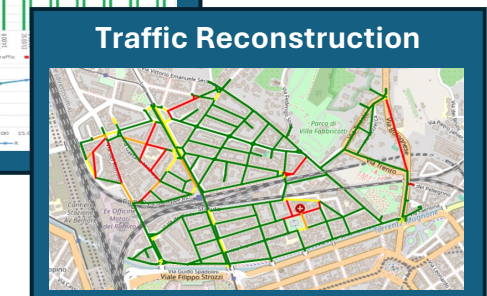
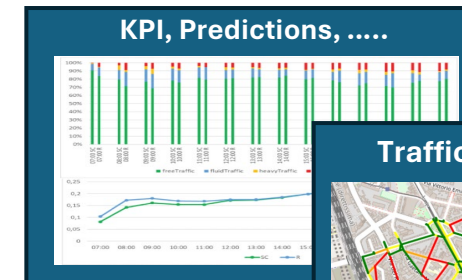
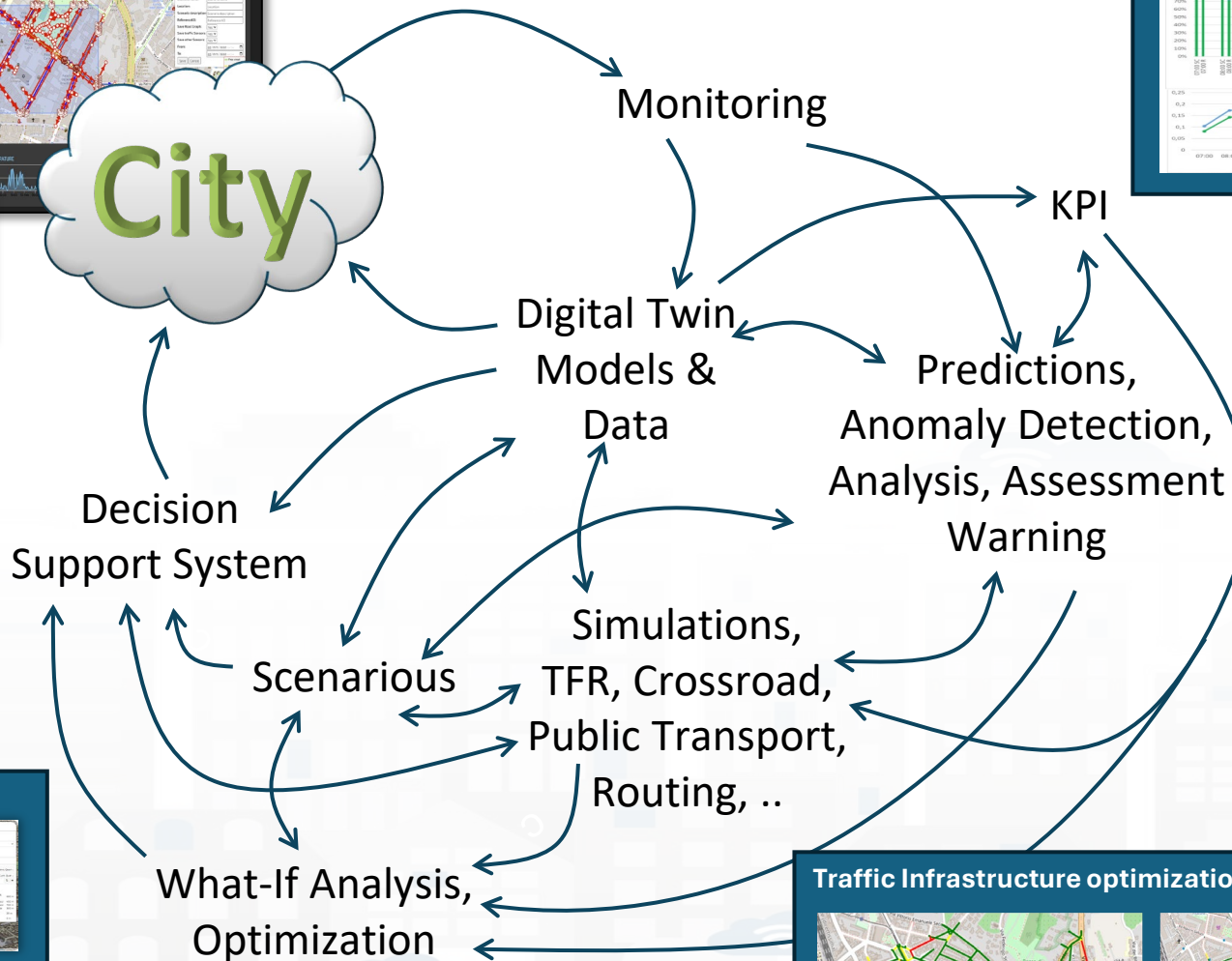
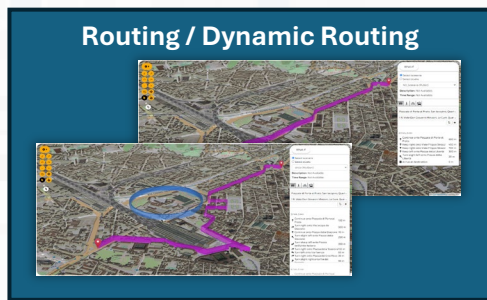
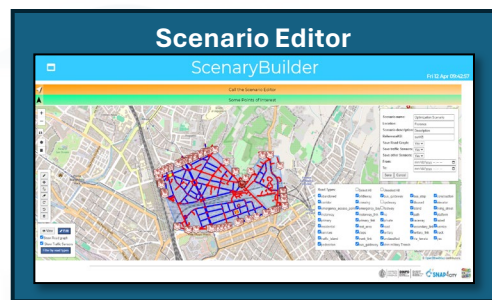


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



- **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 unknowns
 - What-if analysis wrt scenarios
 - Collaboration with stakeholders







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

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Powered by
FIWARE

**FREE
TRIAL**



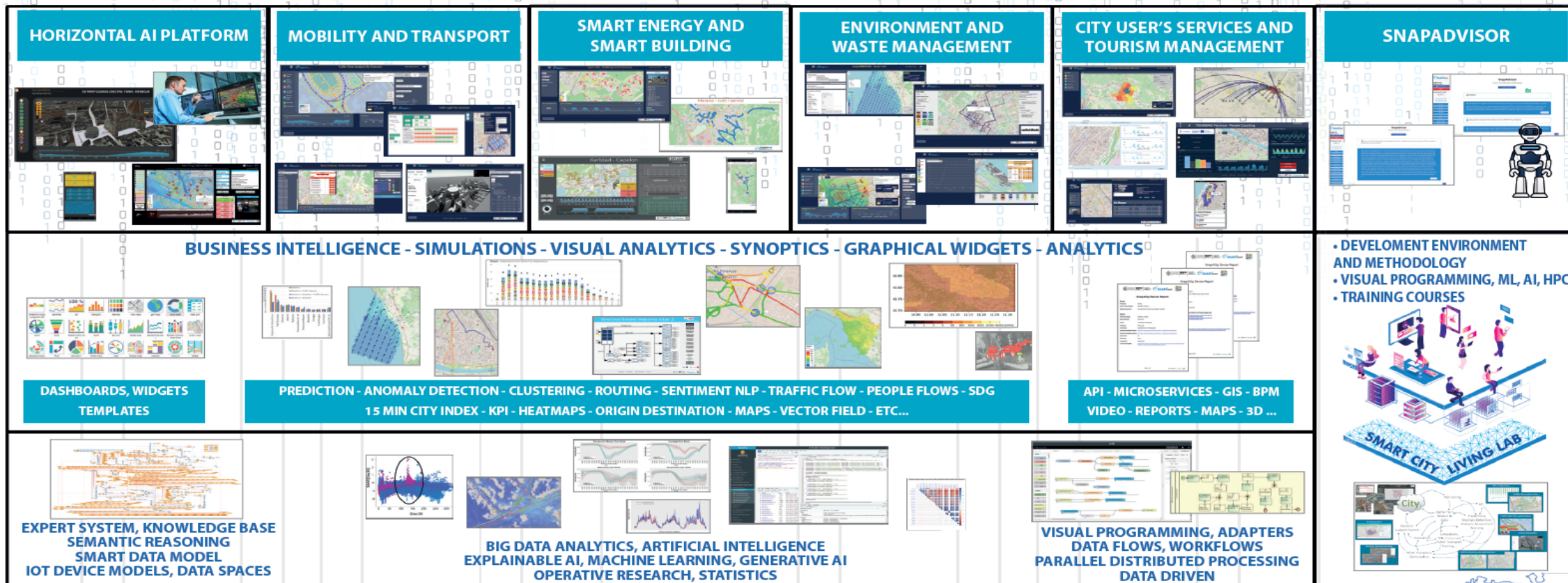
SNAP4
Appliances and Dockers
Installations



E015
digital ecosystem



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



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



NATIVE AND EXTERNAL APPLICATIONS

Smart Parking

Smart Light

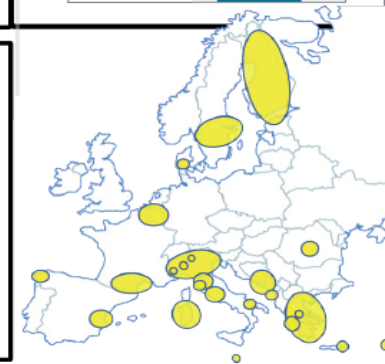
Smart Waste

Smart Energy

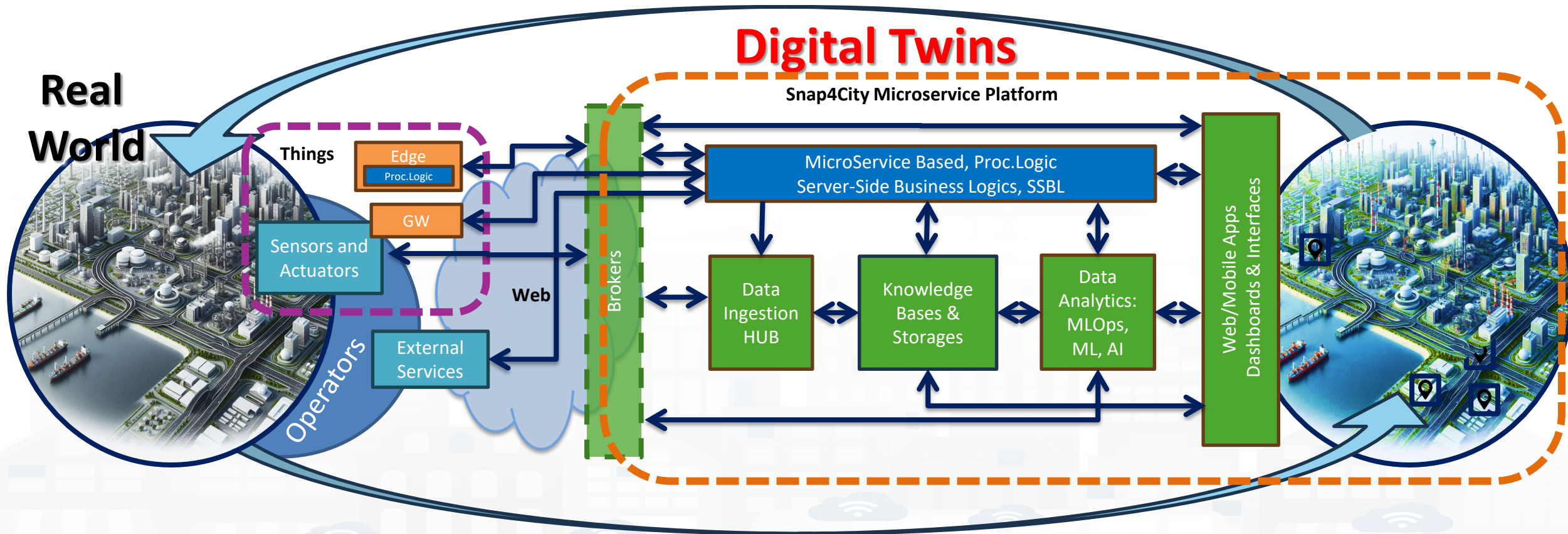
Smart Building

Smart Tourism

...



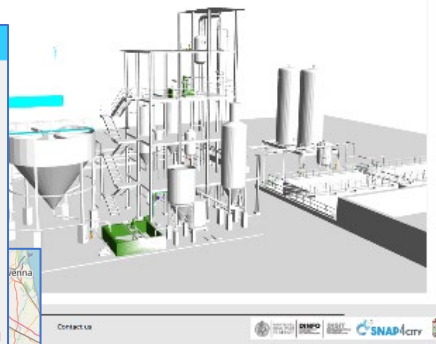
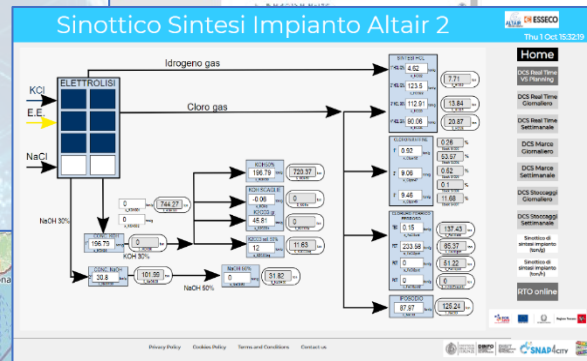
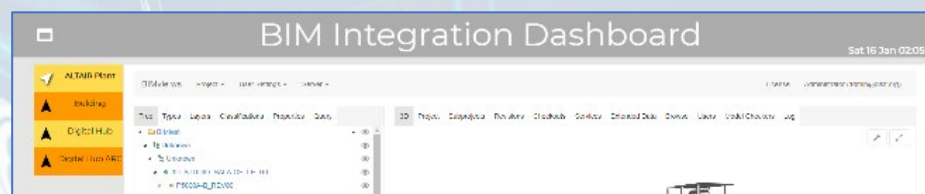
Digital Twin Development Platform



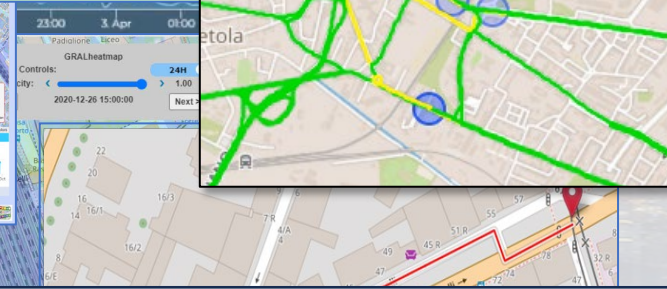
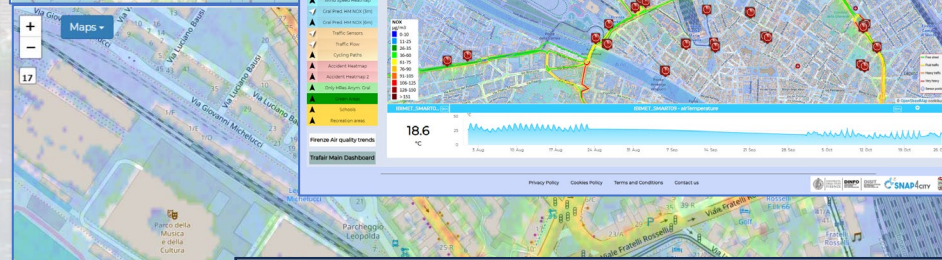
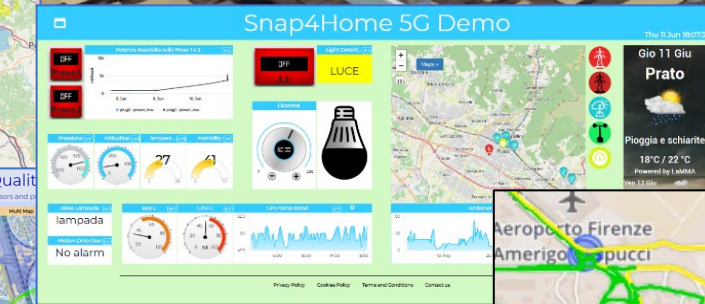
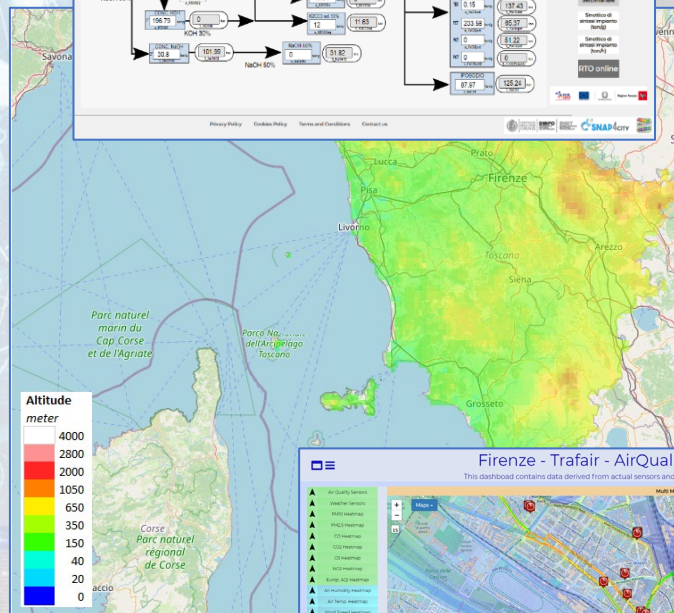
High Level Types

© Snap4City, October 2025, DISIT lab

- 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.

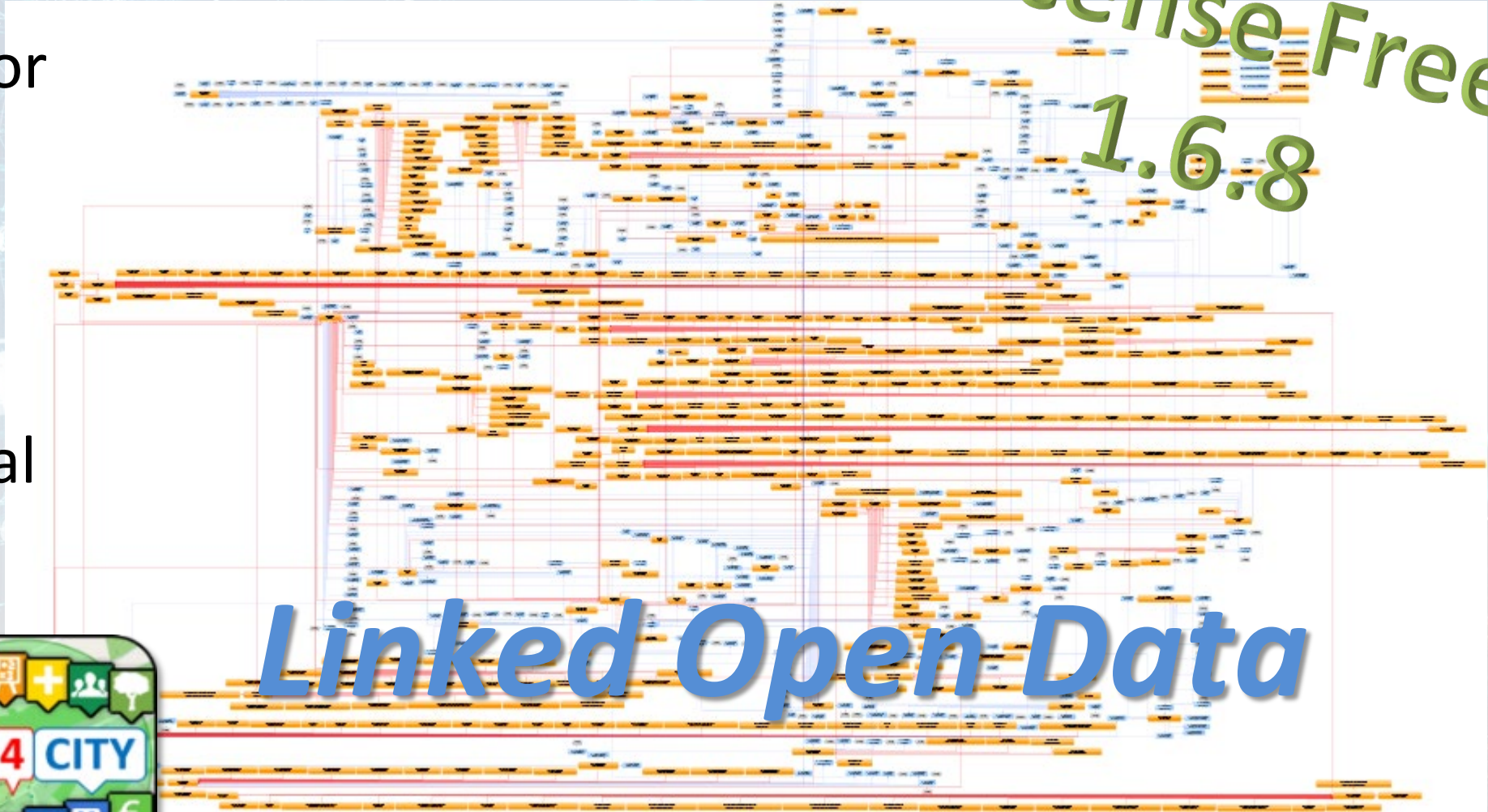


SNAP4CITY
- Digital Twin Global - Fire
demonstrator



Expert System *semantic queries*

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



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

Standards and Interoperability



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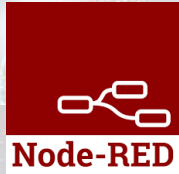
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Compliant with:

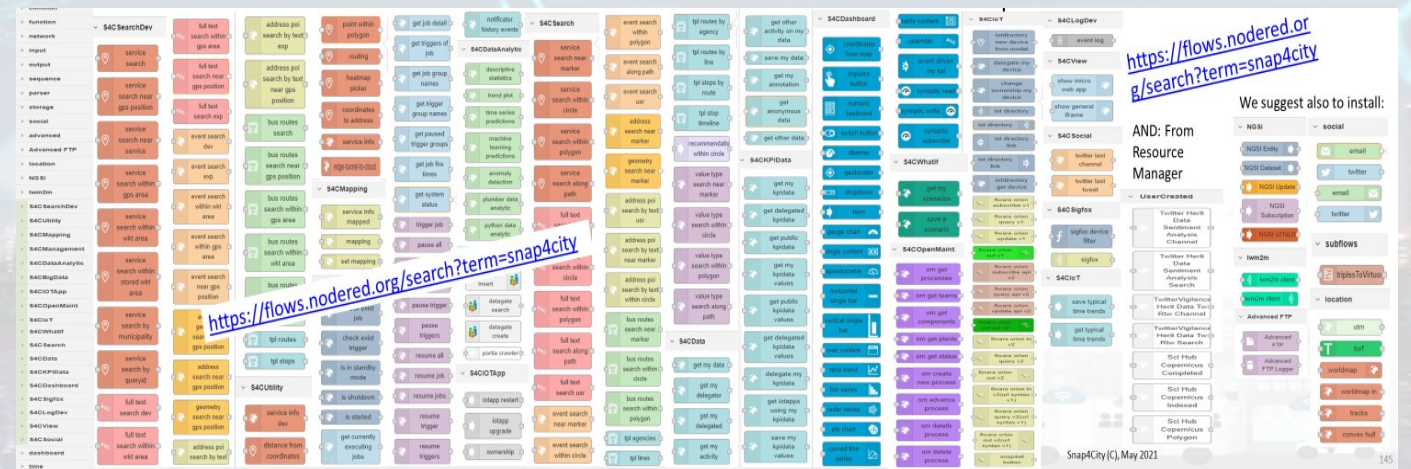
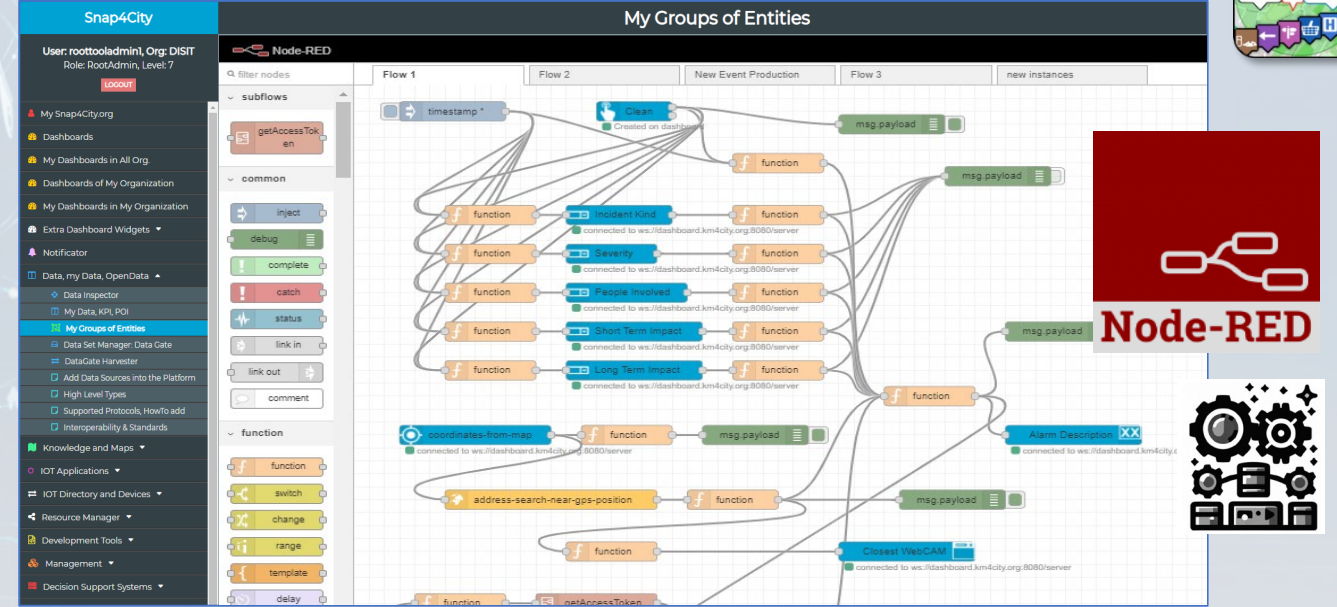
- **IoT:** NGSI V2/LD, LoRa, LoRaWan, MQTT, AMQP, COAP, OneM2M, TheThingsNetwork, SigFOX, Libelium, IBIMET/IBE, EnOcean, Zigbee, DALI, ISEMC, Alexa, Sonoff, HUE Philips, Tplink, BACnet, TALQ, Protocol Buffer, KNX, OBD2, Proximus, ..
- **IoT model:** FIWARE Smart Data Model, Snap4City IoT Device Models
- **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, XPD, OSM, Enfuser FMI, Lidar, glTF, GLB, DTM, GDAL, Satellite, D3 JSON, ...
- **Database:** Open Search, MySQL, Mongo, HBASE, SOLR, SPARQL, ODBC, JDBC, Elastic Search, Phoenix, PostGres, MS Azure, ..
- **Industry:** OPC/OPC-UA, OLAP, ModBUS, RS485, RS232,...
- **Mobility:** DATEX, GTFS, Transmodel, ETSI, NeTEx, ..
- **Social:** Twitter, FaceBook, Telegram, ..
- **Events:** SMS, EMAIL, CAP, RSS Feed, ..
- **OS:** Linux, Windows, Android, Raspberry Pi, Local File System, AXIS, ESP32, etc.

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



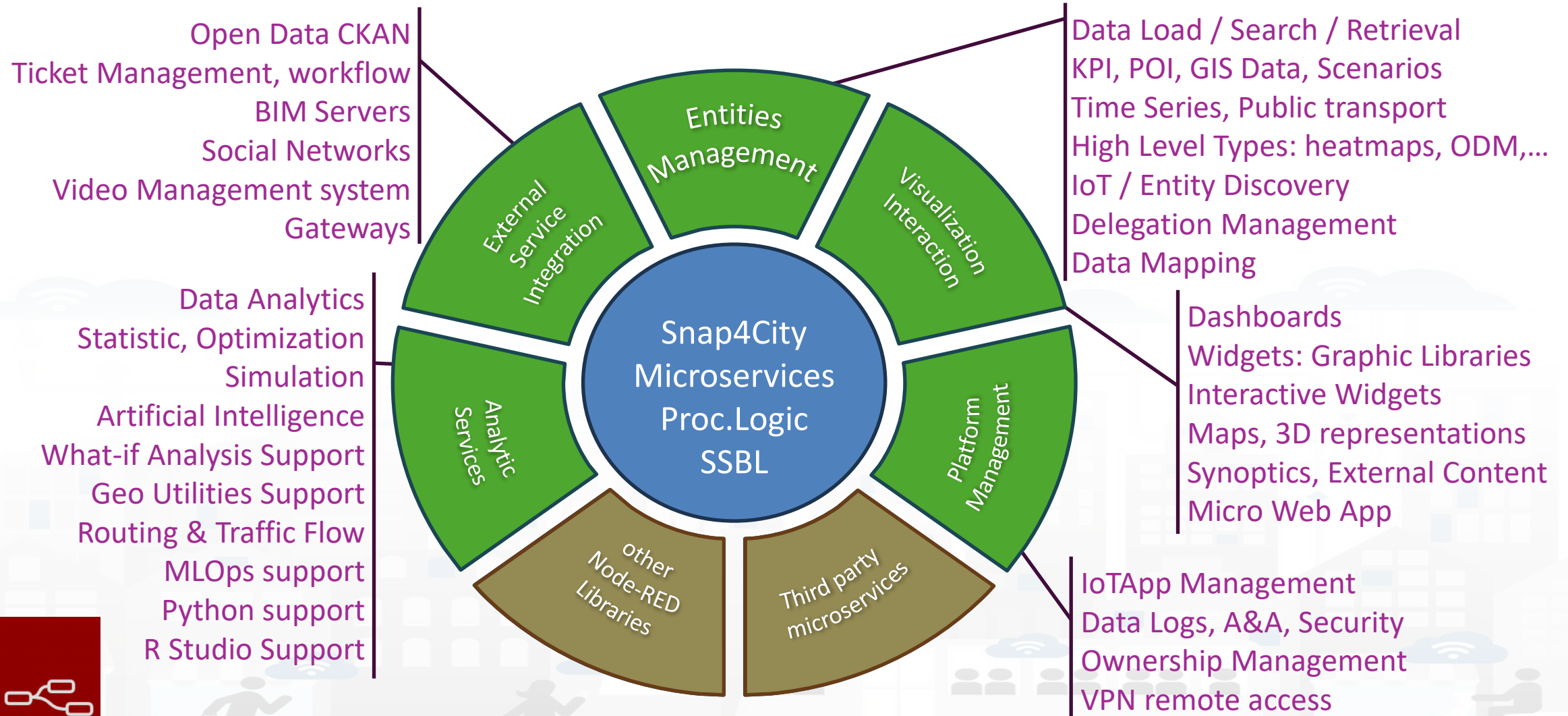
Ingestion, aggreg. → exploitation

- **IoT App Visual Programming, no coding**
- **Data transformation**
- **Integration, Interoperab.**
- **Scripting Data Analytics**
- **Data ingestion**
- **Business logic Server Side**
- **Edge and Cloud**
- **MicroServices** data event driven develop via visual language Node-RED



> 60.000 downloads (up to 2024)

Areas



Solutions: reliable, secure and fast to realize

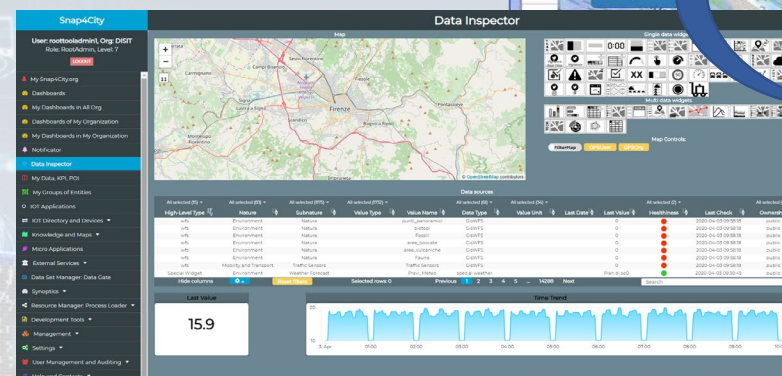
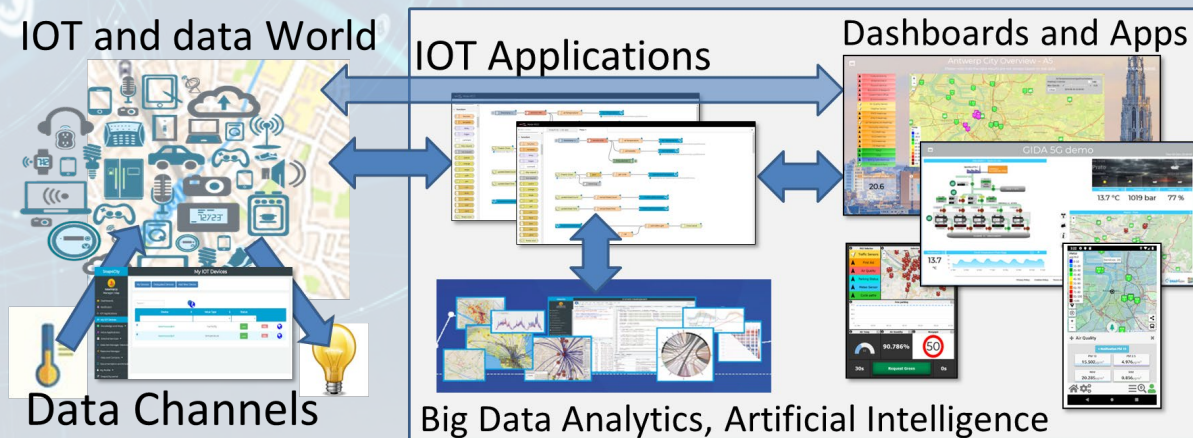


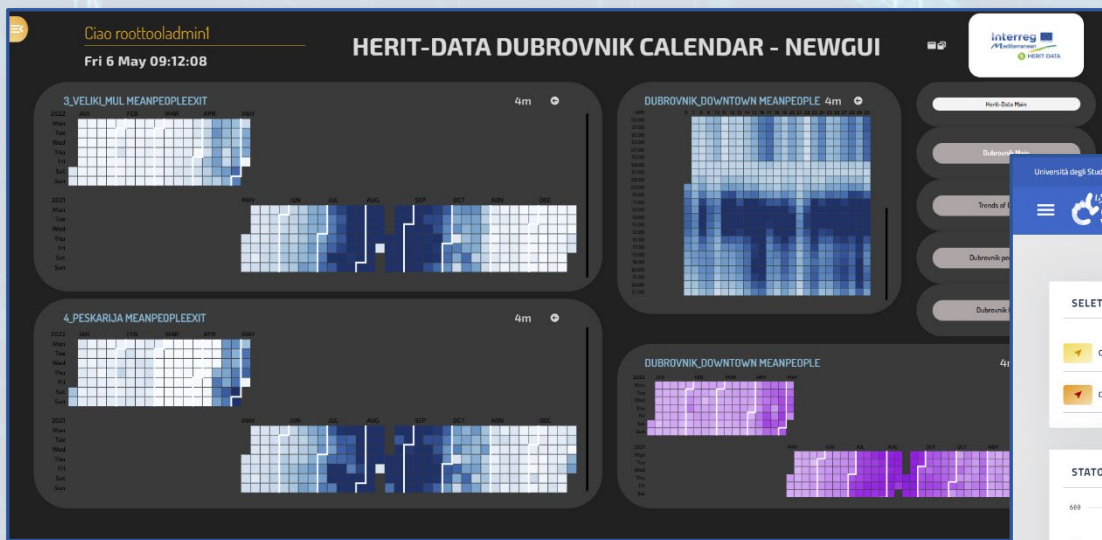
- Via Snap4City tools

- Dashboard Wizard
- Dashboard Builder
- Data/Visual Analytic

- Smart Solutions results to be

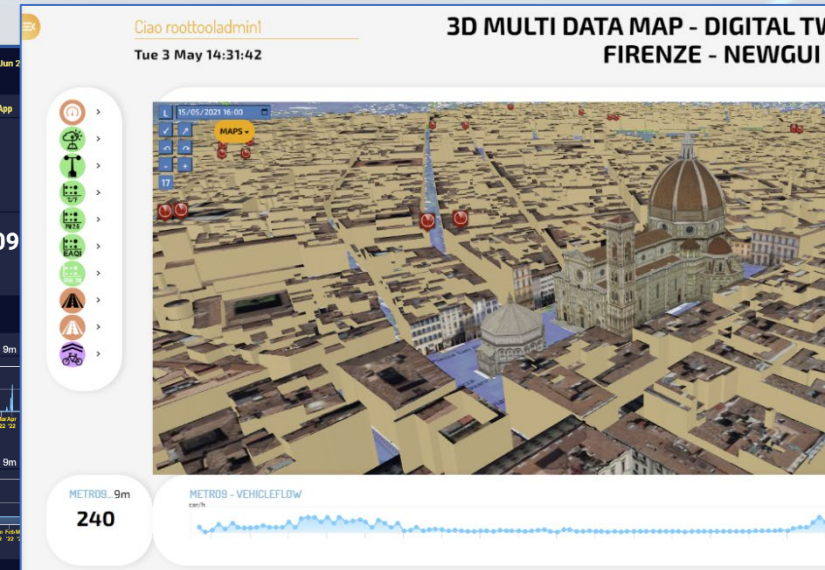
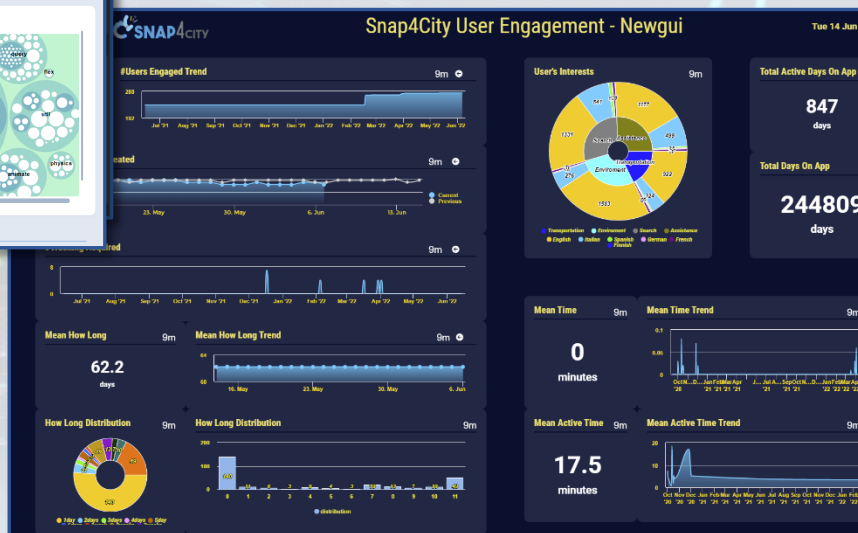
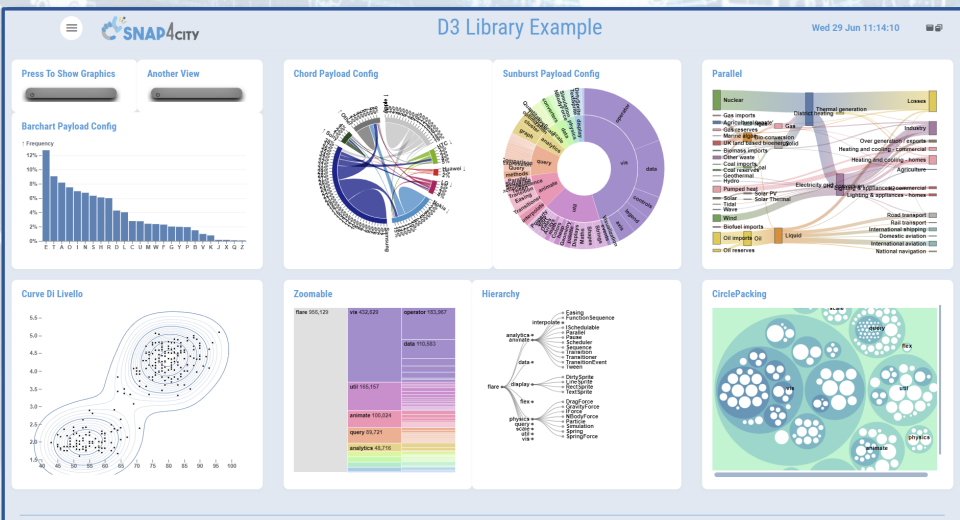
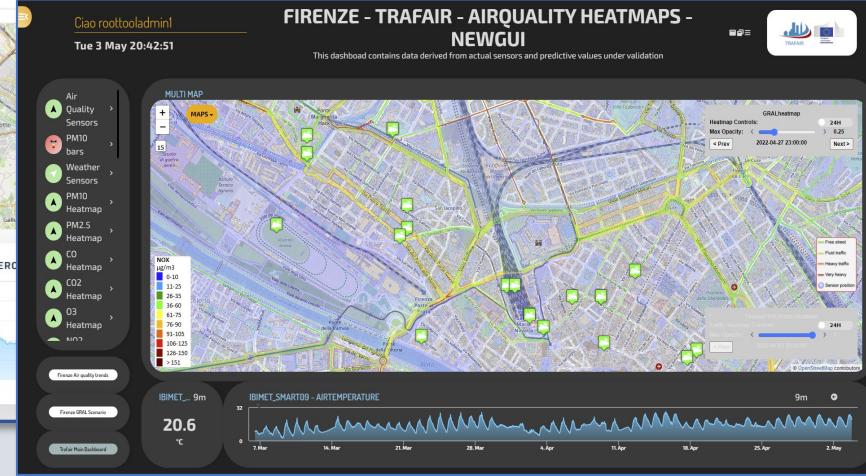
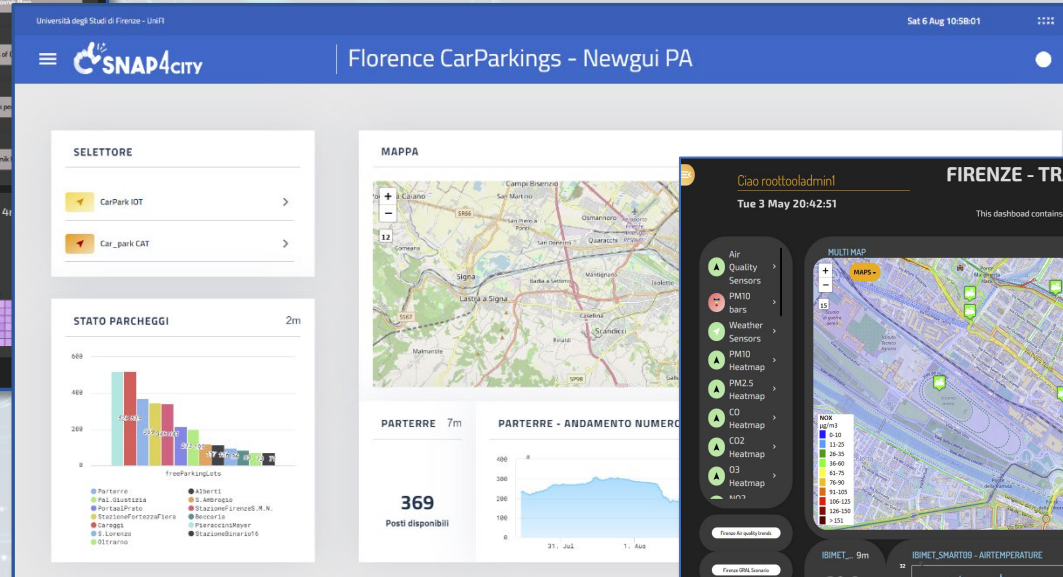
- Real time data drive
- Secure end-to-end
- GDPR compliant
- Reliable, interoperable
- Auditable, marketable





Different Themes

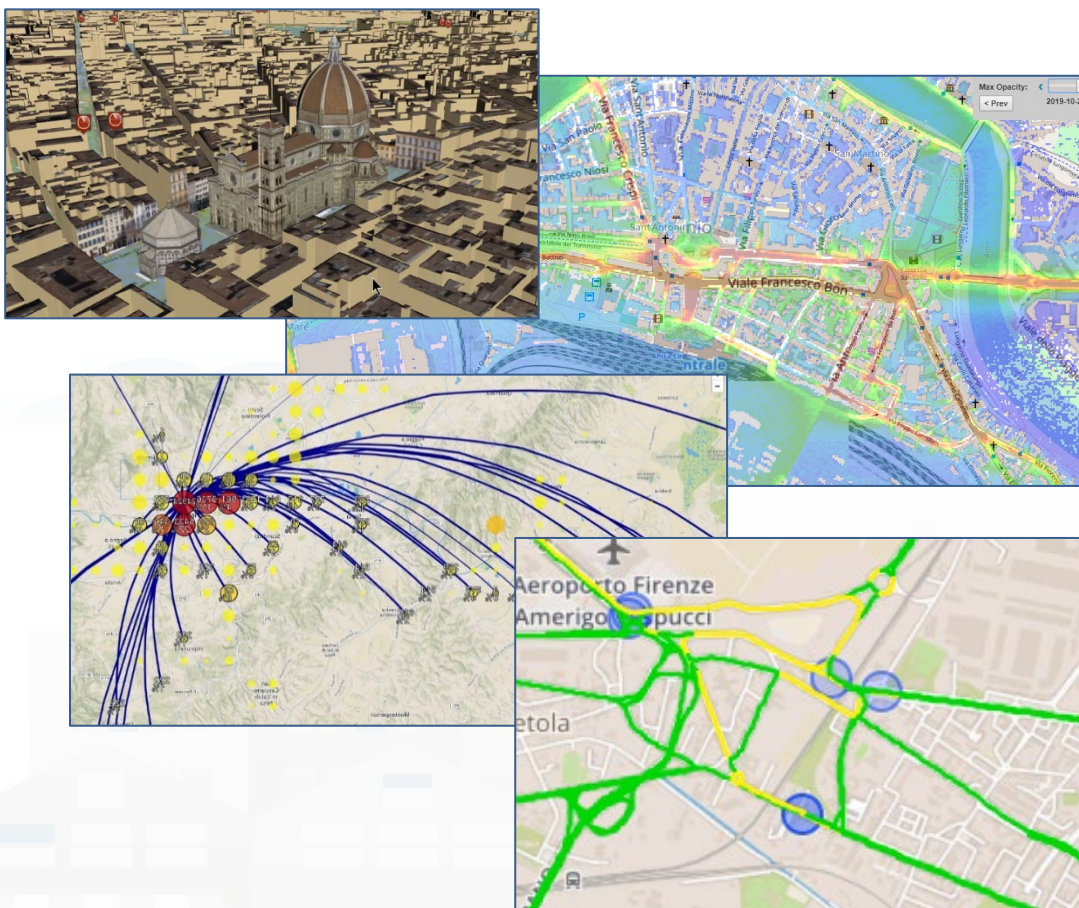
SNAP4CITY



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

<https://www.snap4city.org/793>

Smart City Digital Twin



City Digital Model with...

- Intuitive platform
- Any Data TYPE, any data source, any protocol
- Data storage seamless
- Data analytics → artificial intelligence, AI/XAI
- Data Ethics, AI Ethics, GDPR
- Interactive Data Representation, any kind
- Key Performance Indicators, any kind
- What-IF analysis – Simulation, prediction, 2D/3D
- Micro, Meso e macro scales
- Operation, planning tactic and strategic / optimization
- Collaborative and shared representation
- Sustainable, shared, open source 100%



Complex and heterogeneous information, interoperability

- GIS, ITS, AVM, IoT, BIM, CKAN, etc.
- Satellite services
- MaaS, last-mile delivery HUBs
- etc.



Ciao roottooladmin!

Fri 2 Sep 19:13:07

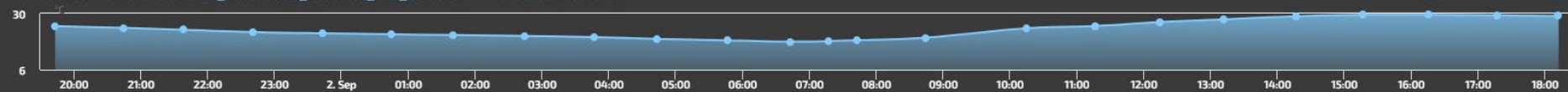
3D MAP GLOBAL DIGITAL TWIN - NEWGUI



3D MAP



DISIT:ORIONUNIFI:TUSC_WEATHER_SENSOR_OW_3176959 - AIRTEMPERATURE



Ciao

Fri 13 Oct 18:29:18

FLORENCE SCDT

SELECT...

DOUBLE MAP

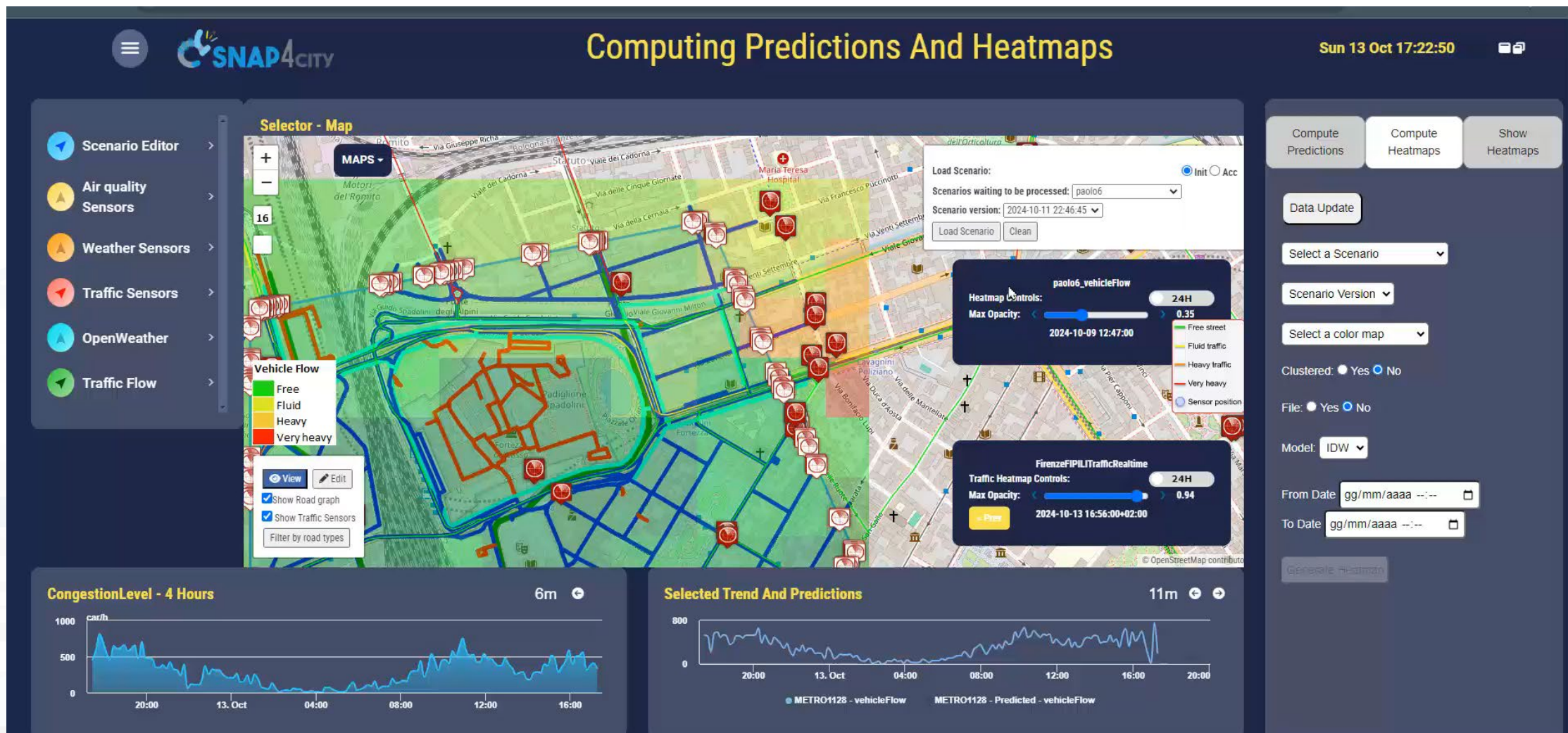


<https://www.youtube.com/watch?v=le2XNF8Ftxo>

Snap4City (C), October 2023

© OpenStreetMap contributors 16

Predictions and Heatmaps in Real Time



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/>



Scenariious

<https://www.snap4city.org/4>

- Snap4City at OSAKA with OPTIFaaS and CN MOST
- SMART3R-FLITS: SMART Transport for TRavellers and Freight Logistics Integration Towards Sustainability
- SOLUTION: Security, Smart City Asset Management for Cuneo, Italy [PDF](#)
- ENERGIA: R&S di autoclave a mandrini multipli nel curing di serbatoi in composito per storage di H2 mediante ottimizzazione energetica e machine learning.
- UrbanDT4TF: Urban Digital Twin for Traffic Flow
- ELLIE: On the Use of Internet of Senses for the Cultural Heritage
- Snap4Rhodes: The "Single Smart City & Cyber Security Monitoring Platform" for the Municipality of Rhodes
- SADI-MIAC: Integrated Decision Support System with Digital Twin Models and Artificial Intelligence for Business
- SADI-MIAC: Sistema di Assistenza alle Decisioni Integrato con Modelli Digital Twin e Intelligenza Artificiale per le attività commerciali
- SCENARIO: City Users' Participation and Engagement with Snap4City, [PDF](#)
- OPTIFaaS: Operation and Plan, Transport Infrastructure and Facilities Support as a Service
- SOLUTION: 15MinCityIndex: understanding city areas by means of 13 different aspects, [PDF](#)
- SOLUTION: Energy Management and Control, [PDF](#)
- SOLUTION: Environment Control, Predictions & Prescriptions, [PDF](#)
- SOLUTION: Smart Light Control and Light Adaptive with Traffic Density [PDF](#)
- SOLUTION: Smart Tourism Management with Snap4City [PDF](#)
- SOLUTION: Traffic Infrastructure Optimisation: reducing travel time and emissions [PDF](#)
- SOLUTION: Traffic Light Plan Optimisation: reducing travel time, number of stops for vehicles and tramway lines: [PDF](#)
- SOLUTION: Snap4Building: monitoring, managing, controlling infrastructures [PDF](#)
- SOLUTION: Snap4City integration with Milestone X Protect, VMS, Video Management System [PDF](#)
- SOLUTION: Snap4City Digital Twin, [PDF](#)
- SOLUTION: eShare in a Snap - The innovative car sharing and car pooling service, [PDF](#)
- SOLUTION: Snap4City Smart Parking Manager and mobile App supports [PDF](#)
- SOLUTION: Exploit Snap4City in different Smart Waste use cases, waste manager, [PDF](#)
- eShare in a Snap - The innovative car sharing and car pooling service
- Digital Twin Cityverse FAQ to Snap4City
- AMMIRARE: make the beach system more resilient to climate change risks through the implementation of natural based solutions
- TOURISMO: TOURism Innovative and Sustainable Management of fLOws
- CAI4DSA: Collaborative explainable neuro-symbolic AI for Decision Support Assistant
- SASUAM: Solutions for Safe, Sustainable and Accessible Urban Mobility
- SCENARIO: Exploit Snap4City in different Smart Waste use cases
- SCENARIO: Smart City Asset Management for Cuneo, Italy
- Digital Data analytical Data Models e Digital Twin (ITA)
- Smart City Living Lab in Romania, [PDF](#)
- Snap4PVerenergy: Online Photovoltaic System Simulator
- SCENARIO: Fashion Retail Recommendation System via Multiple Clustering Approach
- SCENARIO: Energy Community, CER, SELFUSER
- SCENARIO: Supporting Decision Makers in Real Time about Quality Lab Analyses on the production process, [PDF](#)
- Herit-Data and Snap4City: to better manage tourism flows, [PDF](#)
- Digital Twin Local and Global, [PDF](#)
- Social Media Analysis: Twitter Vigilance, [PDF](#)
- GDPR Compliant People Detection and Counting using Thermal Cameras, [PDF](#)
- Artificial Intelligence Predicts Landslides in Florence Area, [PDF](#)
- Available Parking Slots Prediction, [PDF](#)
- Available Bikes and Free Slots Prediction On Bike Sharing Stations, [PDF](#)
- Long Term Prediction of NO2 KPI of European Commission reference values, [PDF](#)
- Inventory of transferable digital applications and solutions for the tourism ecosystem
- Scenario: AMPERE Operator Manual
- Scenario: IMPETUS Intelligent Management of Processes, Ethics and Technology for Urban Safety (Oslo and Padova)



Smart Ambulance (2021-22)

Enterprise (2021-22)
Industry 4.0

Almafluida Industry 4.0 (2021-22)

Contract, 2022-23



MOST
CENTRO NAZIONALE PER LA MOBILITÀ SOSTENIBILE



ELLIE IA 2025-2027



UrbanDT4TF



Contract, 2024-25

CAI4DSA



OPTIFaaS



SASUAM



Rhodes, smart city

eShare

UNIFI TUSS



AMMIRARE



TOURISMO



Co-funded by the European Union



Security and Risk

enel x
Contract, 15min



2022-2023



Contract, 2022-23

2023



Italferr, Smart City



Asymmetrica Smart City, 2022-23

2022



AXIS collab SmartCity

uni.systems

SmartCity, 2021-23



Industry 4.0

SYN-RG-AI SmartCity

AMPERE (2021-22)
Industry 4.0



CAPELON

- Smart Light
- Sweden

Winner of Open Data Challenge of enel x

PC4City (2020-21)
Monitoring Terrain



Contract

enel x
Contract



Smart Ambulance (2021-22)

Km4City 1.6.7

CAPELON

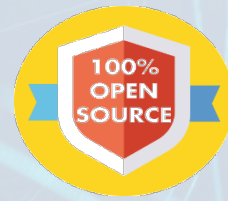
- Smart Mobility
- PISA, PUMS
- Living lab

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

Contract

2020

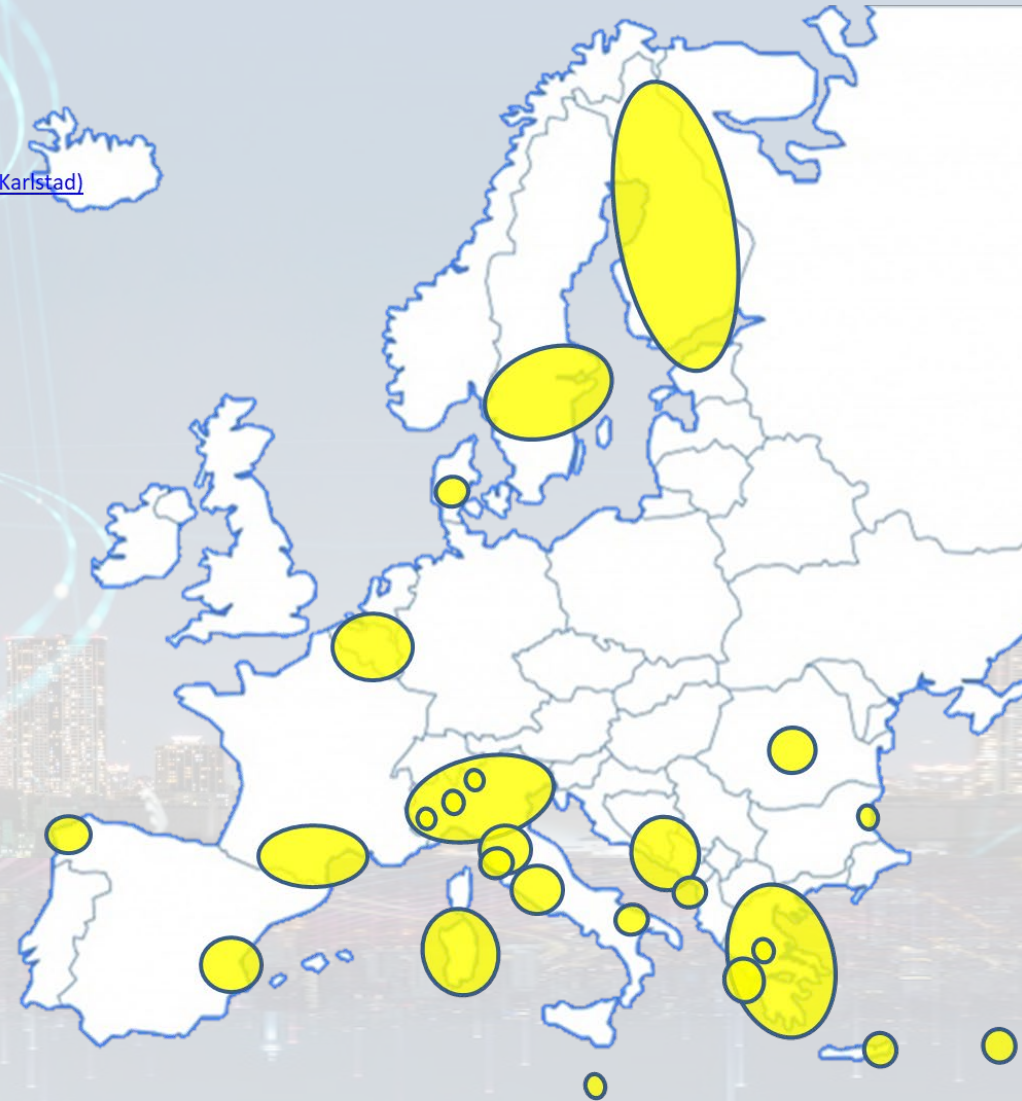
- **UrbanDT4TF**, CN HPC: Digital Twin mobility, <https://www.snap4city.org/drupal/node/1057>
 - **DI-DTPlatform**, CN HPC: Digital Twin, mobility, environment, <https://www.snap4city.org/drupal/node/1097>
 - **Sasuum**, CN MOST, PNRR: AI, mobility, <https://www.snap4city.org/drupal/node/999>
 - **OPTIFaaS**, 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/>
 - **Reg4IA**, AI for regional public administration, A project of presidency of national council
 - **SmartCyprus**, a project of Cyprus Ministry of Digital Innovation and Policy
 - **The IE**, PNRR: AI, NLP, LLM, Legal Aspects
 - **BullVIT**, RT, conv: AI, NLP, LLM on commercial phases
 - **Energia**, RT, conv: AI, PINN, DSS, on manufacturing
 - **RFI contract**: mobility, AI, DSS
 - **Salerno Port**: AI for container ID recognition and tracking
 - **Talent Hub**, ECRF, conv: NLP, match demand vs offer
- + currently: Merano, Salerno, Cuneo, Rhodes, Reverberi, Florence, IDTS, ALTAIR, etc.



- 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 \(Gr\)](#)



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

Control Planning

Goals

Control

Management and Operational
(monitoring, KPI, anomaly detection, early warning)

Planning

Tactic and strategic, medium and long range, micro/macro
(simulations and predictions, what-if analysis)



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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



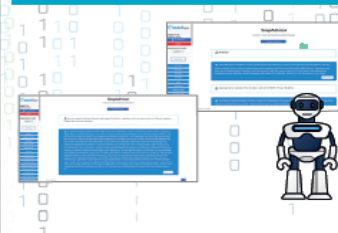
ENVIRONMENT AND WASTE MANAGEMENT



CITY USER'S SERVICES AND TOURISM MANAGEMENT



SNAPADVISOR



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



DASHBOARDS, WIDGETS
TEMPLATES

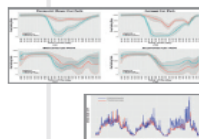
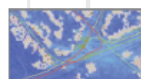
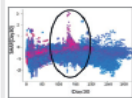


PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG
15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...



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

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



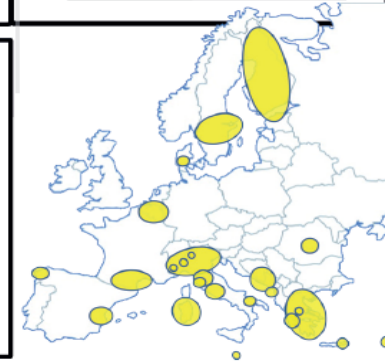
VISUAL PROGRAMMING, ADAPTERS
DATA FLOWS, WORKFLOWS
PARALLEL DISTRIBUTED PROCESSING
DATA DRIVEN

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



NATIVE AND EXTERNAL
APPLICATIONS

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



Control Horizontal Platform

- **Goals:**
 - Increasing quality of Life, quality of services,
 - Decongestion, Decarbonization, Sustainability
 - increase efficiency and production optimization
 - Improve accessibility to services: citizens, Tourists, commuters, etc.
 - Improve security/Safety of city users, risk reduction
 - Costs reduction of services, energy consumption reduction
 - Reduction of emissions and EC taxations
- **Horizontal homogeneous platform Uniform Technology for**
 - **Any Vertical operation/plan:** mobility, energy, environment, security, tourism, infrastructure and assets control, buildings, etc.
 - **AI Solutions: early warning, predictions, simulation, what-if, optimisation, MLOps;**
 - AI: Deep Learning, ML, BERT, LLM/RAG, XAI (Shap/Lime), etc.
 - Simulations: SUMO, DORAM, Routing, TFR, Flooding, people flow, etc.
 - **Development Environment for any vertical, Digital Twin:** City Global and Local, IoT, VR, Visual Programming, business intelligence, CSBL, SSBL, etc.
 - **Interoperability:** any format, any protocol, any video management system, any sensor, any device, etc.
- **KPI:** multidomain KPI, general management, early warning, early detection of critical conditions, 15 Min City Index, SDG, SUMI/SUMP
- **Mobile App:** modular applications, operators' modules, multiple cities, etc.
- **Participatory:** problem reporting, ticketing, etc.
- **Integration of any kind**



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/m ³ (*)	99 th percentile (3 days/year)
PM _{2.5}	Calendar year	Target value, 25 µg/m ³	The target value has become a limit value since 1 January 2015	10 µg/m ³	
PM ₁₀	One day	Limit value, 50 µg/m ³	Not to be exceeded on more than 35 days per year.	50 µg/m ³ (*)	99 th percentile (3 days/year)
PM ₁₀	Calendar year	Limit value, 40 µg/m ³ (*)		20 µg/m ³	
O ₃	Maximum daily 8-hour mean	Target value, 120 µg/m ³	Not to be exceeded on more than 25 days per year, averaged over three years	100 µg/m ³	
NO ₂	One hour	Limit value, 200 µg/m ³ (*)	Not to be exceeded more than 18 times a calendar year	200 µg/m ³ (*)	
NO ₂	Calendar year	Limit value, 40 µg/m ³		40 µg/m ³	

- **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, PM_{2.5} (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



• 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



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



- 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



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

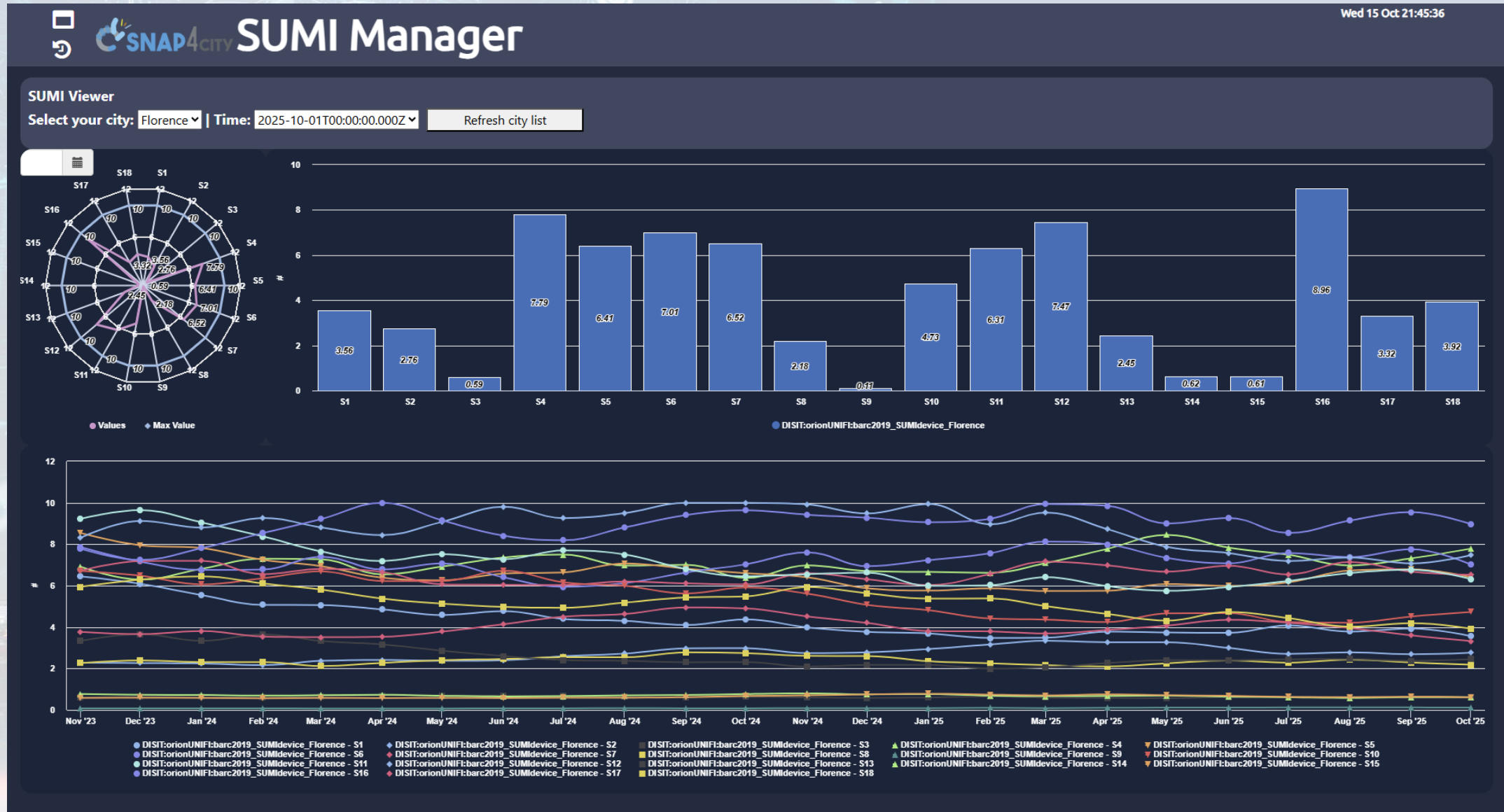


- Reduction of emissions, reduction of congestions
- Monitoring and Predicting: NO2, NOX, CO2, Traffic flow, pollutant, landslide, waste, etc.
- Traffic flow reconstruction, optimisation
- Demand vs Offer of Mobility analysis



- 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

SUMI: Sustainable Urban Mobility Indicators





Control Room



Smart City Control Room

Florence Metropolitan City



reference



- **Multiple Domain Data**

- Thousands of Open/Private data, POI, IOT, etc.
- **mobility and transport:** accidents, public transport, parking, traffic flow, Traffic Reconstruction, KPI, ...
- **AND:** environment, civil protection, gov KPI, covid-19, social & social media, people flow, tourism, energy, culture, ...

- **Multiple dash/tool Levels & Decision Makers**

- Real Time monitoring, Alerting, quality assess.
- Predictions, KPI, DSS, what-if analysis

- **Historical and Real Time data**

- Billions of Data

- **Services Exploited on:**

- Multiple Levels, Mobile Apps, API

- **Since 2017**



<https://www.snap4city.org/747>

© Snap4City, November 20



Cuneo Assets' Monitoring, Safety



CameraModelP1448-LE

UpsModelRiello

UpsModelSeltec

SwitchModelMicrosense

SwitchModelNetonix

GENERAL STATUS

Valore	Significato	Simbolo
0	Buono stato	●
1	Non raggiungibile	●
2	Raggiungibile, dati non disponibili	●
3	Identificata anomalia	●

Monitoraggio Generale

Thu 4 Jan 18:13:19

Map of Cuneo with device locations

SWITCH015

VALUE NAME: 1721615250

DETAILS DESCRIPTION RT DATA

Last update: 2024-01-04 13:34:24.334Z

Description	Value	Buttons
dateObserved	01/04/24, 02:34:24 PM	Last 4h 24h 7d 30d 6m 1y 2y 10y
fanSpeed	4985	Last 4h 24h 7d 30d 6m 1y 2y 10y
generalStatus	0	Last 4h 24h 7d 30d 6m 1y 2y 10y
poeValue1	48	Last 4h 24h 7d 30d 6m 1y 2y 10y
poeValue10	0	Last 4h 24h 7d 30d 6m 1y 2y 10y
poeValue11	0	Last 4h 24h 7d 30d 6m 1y 2y 10y
poeValue12	0	Last 4h 24h 7d 30d 6m 1y 2y 10y
poeValue13	0	Last 4h 24h 7d 30d 6m 1y 2y 10y
poeValue14	0	Last 4h 24h 7d 30d 6m 1y 2y 10y

TempValu... 9m

49

TempValue1 - 7 Days

Line graph showing temperature over 7 days

My Profile

Privacy Policy Cookies Policy Terms and Conditions

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

• More than 400 devices

Monitoraggio Dettagliato

Thu 4 Jan 18:05:15

Tabella Device

Cerca per Indirizzo, ID o device...

Camera UPS Switch

● ● ● ●

ID	Stato	Tipo device	Indirizzo	IP	Azioni
TC010182	●	Camera	Cuneo Sud Palo Angolo Parco Giochi	172.16.12.185	📍
TC010178	●	Camera	Cuneo Sud Palo Alto verso Asilo	172.16.12.181	📍
TC010181	●	Camera	Cuneo Sud Palo davanti Biblioteca	172.16.12.184	📍
TC010179	●	Camera	Biblioteca Cuneo Sud Esterna Sopra Ingresso	172.16.12.182	📍
TC010184	●	Camera	Cuneo Sud Angolo verso Parco Giochi	172.16.12.187	📍
TC010185	●	Camera	Cuneo Sud Angolo verso Bar	172.16.12.188	📍
TC010183	●	Camera	Cuneo Sud Angolo davanti Megafresco	172.16.12.186	📍
TC010203	●	Camera	Rotonda Corso Francia Croce Rossa	172.16.12.203	📍
TC010204	●	Camera	Rotonda Corso Francia Distributore	172.16.12.204	📍
SWITCH041	●	Switch	Rotonda Corso Francia Croce Rossa	172.16.15.222	📍
TC010202	●	Camera	Rotonda Corso Francia Tabaccaio	172.16.12.202	📍
SWITCH040	●	Switch	Rotonda Corso Francia Croce Rossa	172.16.15.223	📍

Tabella Dettaglio

TC010185

dateObserved 04/01/2024, 14:34

generalStatus ●

tempStatus1 1

TEMP STATUS

Valore	Significato
1	Buono stato
2	Lettura dato fallita

Map of Cuneo with device location

Legenda

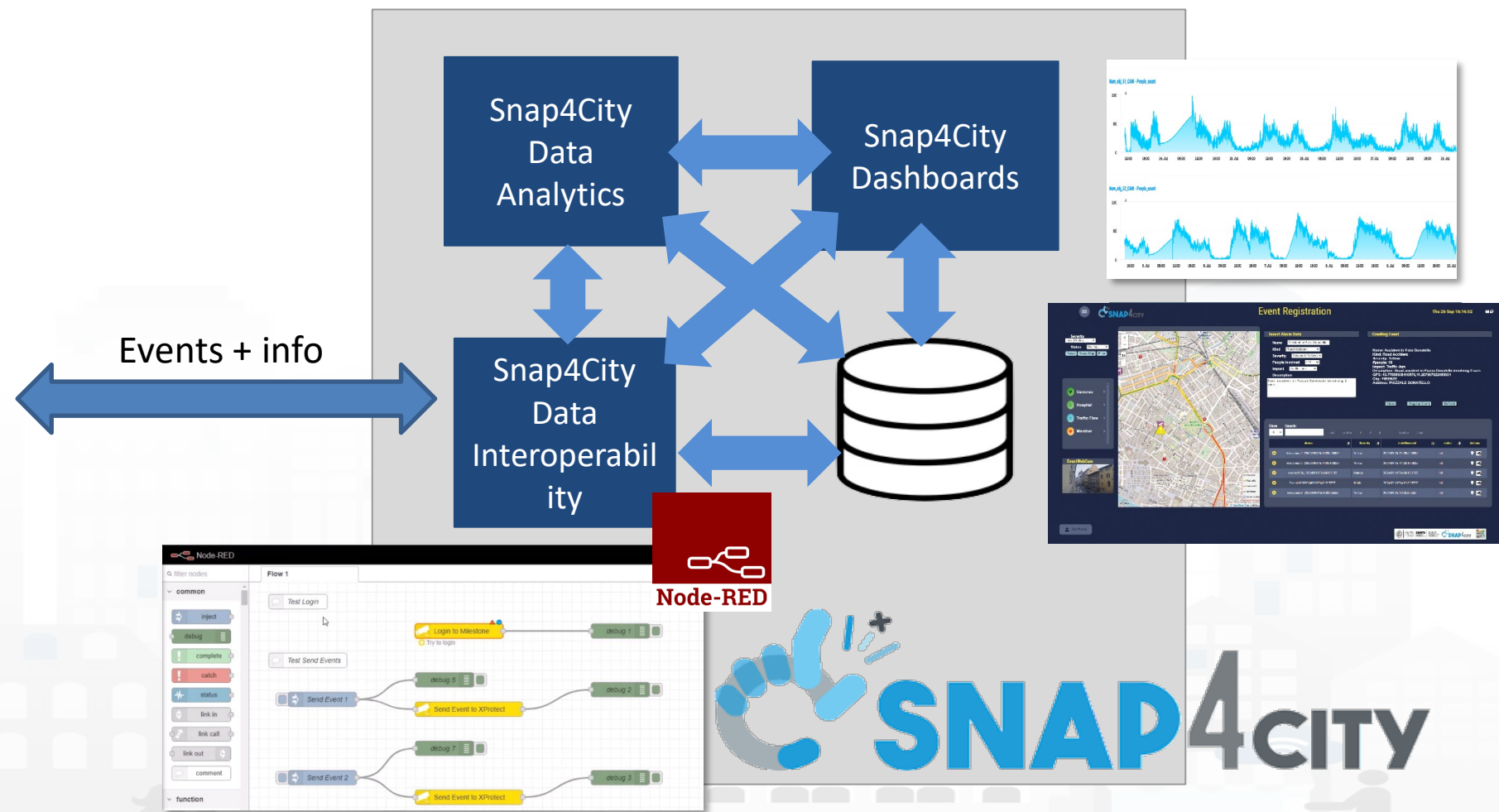
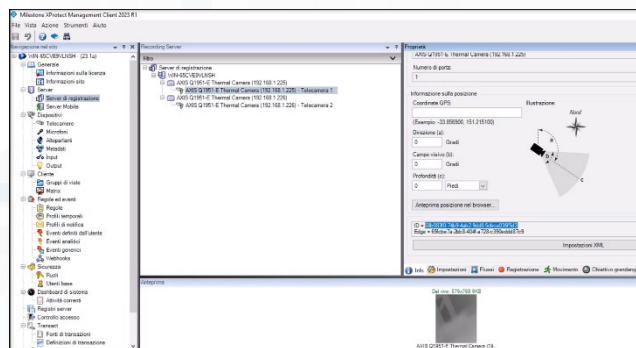
● 11 ● 13 ● 22 ● 4

Non raggiungibile

My Profile

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VMS vs Snap4City: sending and getting events, AI solutions





Mobility and Transport

Goals



Decongestion



Safety



Accessibility



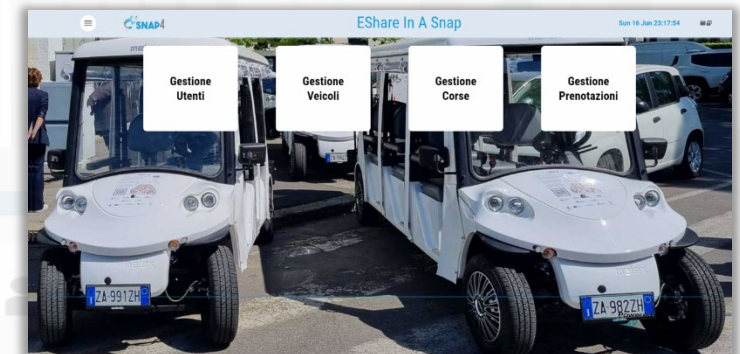
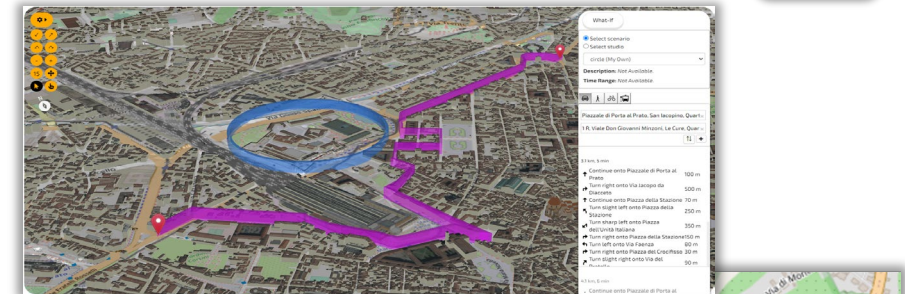
Cost Reduction



Decarbonization

Mobility & Transport

- **Goals:**
 - Decongestion, Decarbonization, costs reductions
 - Improve Accessibility to services
 - Improve Security/Safety of city users
- **Operation and Plan:**
 - Traffic monitoring, prediction, reconstruction, identification of critical conditions (early warning), fleet management, dynamic routing, multimodal routing, city user behaviour analysis
- **Optimization and what-if analysis traffic light plans, infrastructure**
 - **Reduction:** travel time, waiting time, # stops, CO2 emissions, consume fuel, travel time for tramways and busses
- **Public Transport:** analysis of Mobility Demand vs Offer of Transportation
- **Parking Management:** monitoring, prediction, any payments, on/off-road
- **Sharing / Pooling Management:** eShare and mobile app, bikesharing, smart bike, fleet management
- **KPI:** SUMI/SUMP, travel time, emissions, traffic status, accessibility, ..
- **Mobile App:** final users and operators
 - Info Mobility, traffic reconstruction, charging, participation,
 - Parking, payments, overparking, fine reporting, ..
- **Participatory:** problem reporting, ticketing, etc.
- **Data Integration of any kind: env, weather. Tickets, presences, POI, sat, etc.**



Smart Energy and Smart Building

Goals

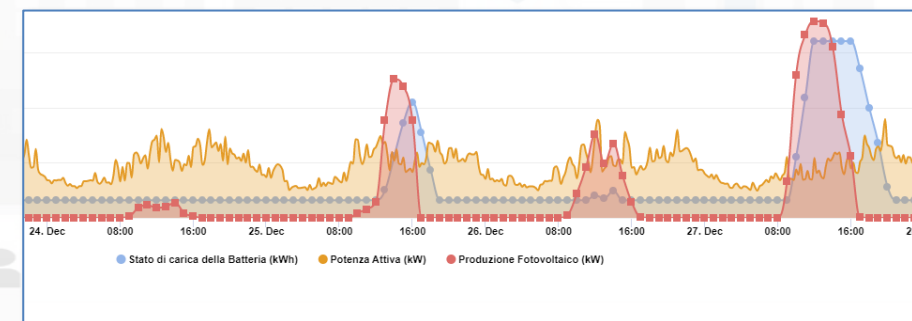
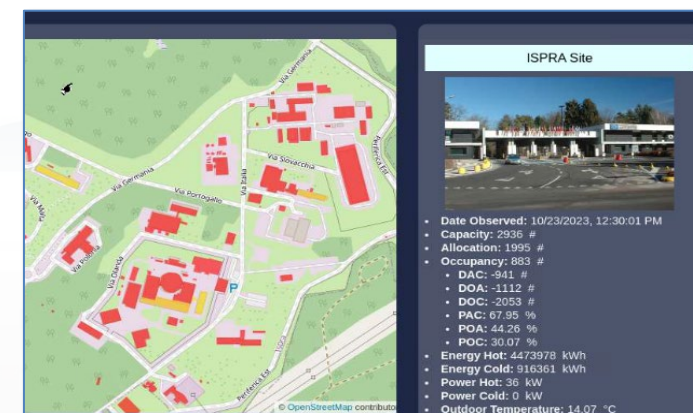
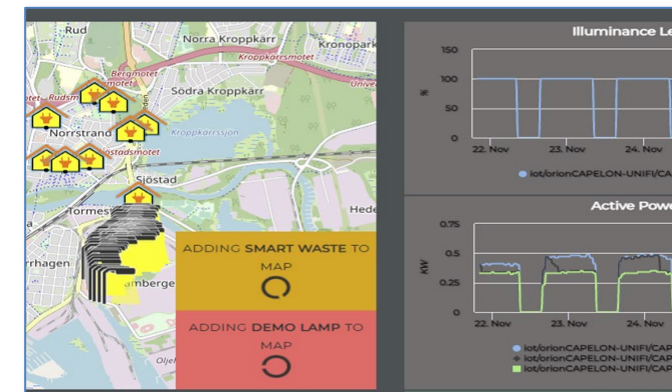


Cost Reduction

- Energy consumption reduction,
- increment of efficiency,
- Areas and building sustainability
- Improve accessibility to services,
- security and safety

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 security, 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**



Environment and Waste Management

Control of emissions

Reduction of emissions

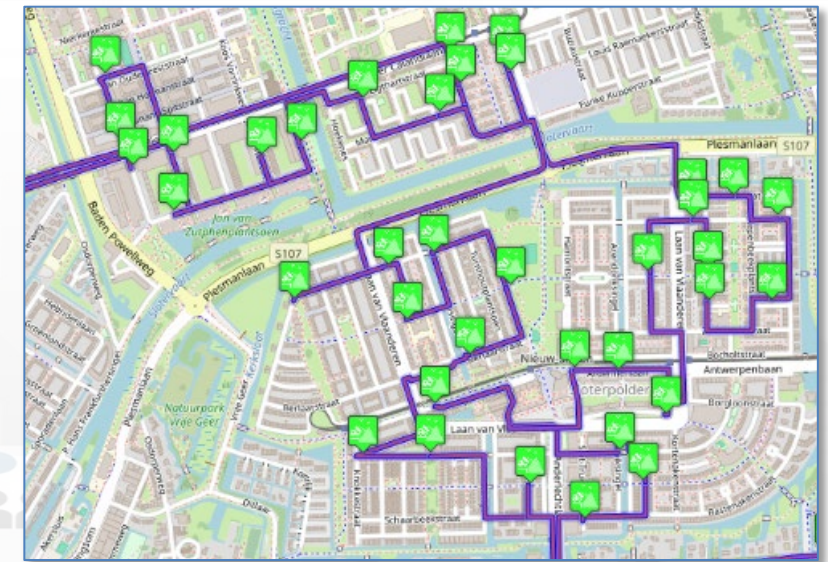
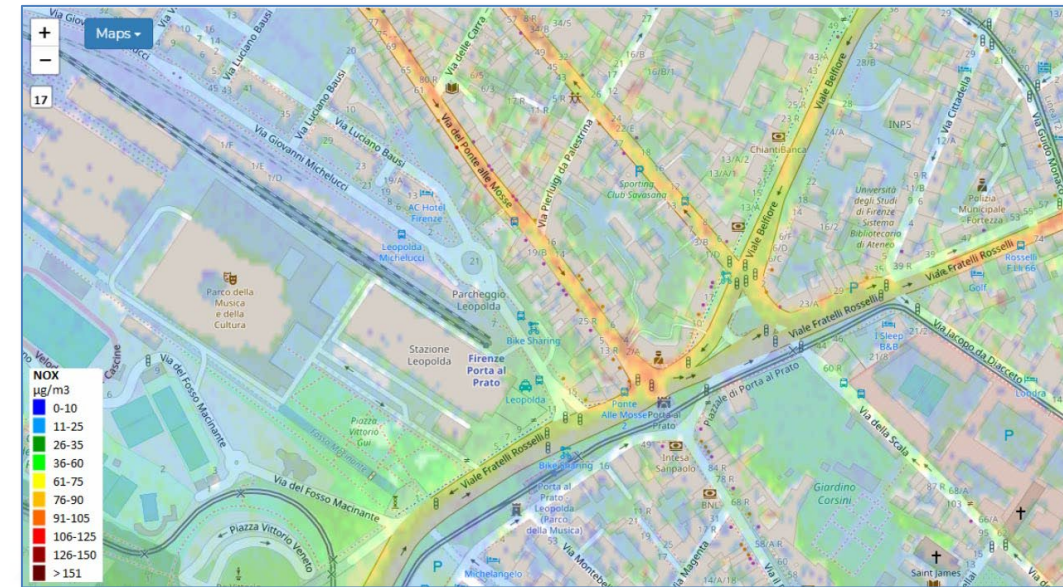
Early warning

Meet the EC targets

Reduction of EC taxation

Environment and Waste

- **Goals:**
 - Reduction of emissions and EC taxations
 - Cost reduction for waste collection,
 - reduction of waste collection impact on mobility
- **AIR quality (Indexes) monitoring and warning**
- **Environment Management & producing predictions/prescriptions:**
 - Monitoring, long and short-term predictions, warning for:
 - GHG, emissions, pollutants, aerosol, chemical plants analysis
 - Traffic Flow impact emissions, predictions
 - Sea conditions, UV conditions, etc.
- **Land slide prediction warning**
- **Coastal erosion monitoring and analysis**
- **Smart Waste Management and Optimisation:**
 - costs reduction, optimal routing production, pay as you throw,
 - avoiding out of bins, predictions of waste production on bins, alarms
- **KPI:** SDG, 15MinCityIndex, QOS, costs, Km, collecting time, EC KPI, emissions
- **Mobile App:** final users services/informing and operators
 - Info Waste for operators, participation, optimal routing, RAEE Collection, ..
- **Participatory:** problem reporting, ticketing, etc.
- **Integration of any kind: env/weather, mobility, ticketing, presences, POI, ..**



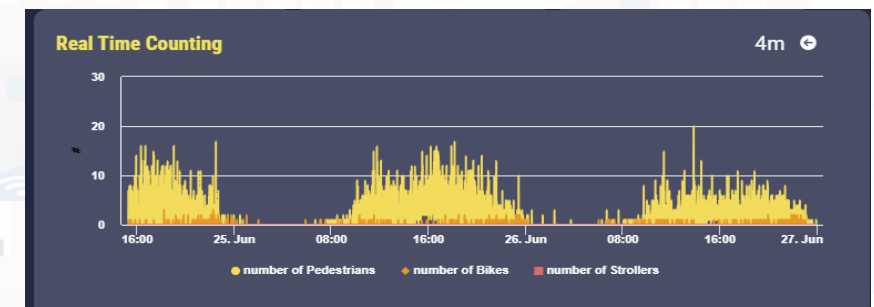
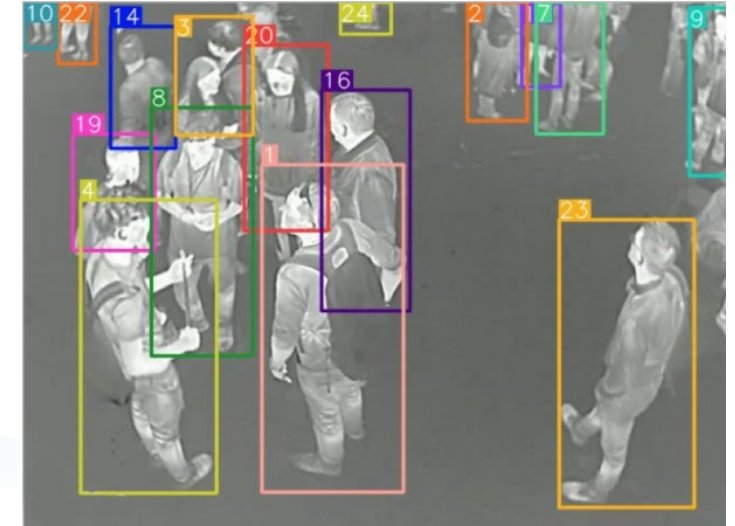
City Users' Services and Tourism Management

Goals

- Improve Quality of Life and quality of services,
- Over tourism mitigation, sustainability
- Costs reduction of services
- Improve accessibility to services: citizens, Tourists, commuters, etc.
- Improve Security/Safety of city users

City User Behaviour/services, Tourism and Safety

- **Goals:**
 - Improve Quality of Life and quality of services,
 - Over tourism mitigation, sustainability
 - Costs reduction of services
 - Improve accessibility to services: citizens, Tourists, commuters, etc.
 - Improve Security/Safety of city users
- **People Flow Analysis / Management:** in/out-door, retail, attractions
 - Counting, tracking, Flows, ODM, sentiment, recency/frequency, etc.,
 - multiple sources: thermal & TV cameras, radar sensors, PAX sniffers, mobile data, ...
 - Data and/or **OD matrices** from: Wi-Fi, traffic data, mobile phone data
 - **Suggestions:** info Tourism, digital signages, engagement, .., via email, mobile apps, etc.
- **Tourists Flows & Retail Management:** predictions of presences, services' reputations, suggestions on second offers, over-tourism, notifications, early warning,
- **KPI:** 15 MinCityIndex, energy vs people, over-tourism, accepted suggestions, precision
- **Mobile App:** final users services/informing and operators
 - Info Tourism, people flows, info mobility, sharing, ...
 - Participation, engagement, ..
- **Participatory:** problem reporting, ticketing, etc.
- **Integration of any kind:** env/weather, mobility, ticketing, presences, POI, ..



*Assistants on taking decision
and for development/training*

Goals

Details



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Passed**

**EU GDPR
COMPLIANT**

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Installations

**EUROPEAN OPEN
SCIENCE CLOUD**

Node-RED

JS Foundation

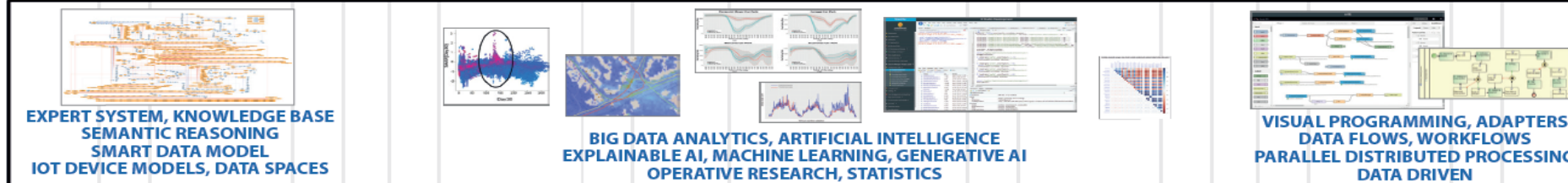
E015
digital ecosystem

NVIDIA

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



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

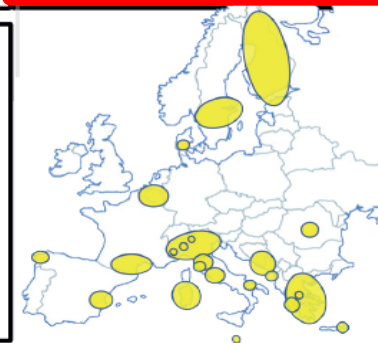


FULL INTEROPERABILITY, ANY: DATA, BROKERS, NETWORKS AND VERTICALS




NATIVE AND EXTERNAL
APPLICATIONS

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



Logged in as:
edoardo_tester

 Your Profile

Logout

SnapAssistant model:

Llama3.3 ▾

New Chat

EdoChat1

EdoChat2

EdoChat3

EdoChat4

prova

chatNuova

chatTest1LLAMA

chatTest2LLAMA

testGianniLLAMA

testTastoInvioPreChanges

ChatTestPostPSWINVIO

<https://www.snap4city.org/1116>

SnapAdvisor

Current chat: debug0

Visualize references

Personal
Advisor LLM



Come creo una dashboard?



Per creare una dashboard, puoi utilizzare la piattaforma Snap4City. La dashboard si compone di un insieme di widget grafici che possono essere impostati separatamente assegnando una serie di parametri, come origine dati, dimensioni, colori, forma, font, allarmi, relazioni con altri, ecc. (SOURCE: Snap4 City per la creazione di Smart City Control Room, SCCR). Inoltre, la piattaforma offre la possibilità di creare vere e proprie applicazioni interattive, multipagina/multidashboard, e non semplici storie monopagina da scrollare. Puoi anche condividere la dashboard con altri utenti anche fuori dalla Smart City Control Room tramite canali autenticati e protetti in HTTPS, in accordo al GDPR (SOURCE: Snap4 City per la creazione di Smart City Control Room, SCCR). Per vedere alcuni esempi di dashboard, puoi visitare il sito <https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MjU0Mg==> (SOURCE: Snap4 City 1st Overview v4 8 annot). Tuttavia, non ho trovato informazioni dettagliate sulla procedura di creazione di una dashboard. Se hai bisogno di ulteriore assistenza, ti consiglio di contattare direttamente il team di supporto di Snap4City. Non so dirti altro in merito.

Write a message...



Developing on Snap4City

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



Visual Development Tools



My IOT Sensors and Actuators

Add My New Device

Search Latitude/Longitude on Map

Entities/Devices Management

Entity Identifier	IoT Device	Device Type	Model	Category	Location	Status	Lat	Long	Entity	
IoTQualityObservedMMA4201	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4201
IoTQualityObservedMMA4202	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4202
IoTQualityObservedMMA4203	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4203
IoTQualityObservedMMA4204	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4204
IoTQualityObservedMMA4205	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4205
IoTQualityObservedMMA4206	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4206
IoTQualityObservedMMA4207	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4207
IoTQualityObservedMMA4208	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4208
IoTQualityObservedMMA4209	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4209
IoTQualityObservedMMA4210	Antwerp	IoTQualityObserved	custom	PM10s	Antwerp	IoTQualityObserved	active	50.85122	4.35122	IoTQualityObservedMMA4210

Service Map (Toscana)

Map showing various IoT sensors and actuators across the Toscana region.

Data Inspector

Map view showing data points and their locations.

My Data Dashboard Dev Kibana

Dashboard showing data trends and statistics.

My Dashboards in My Organization

Overview of various dashboards and widgets.

3D MAP GLOBAL DIGITAL TWIN - NEWGUI

3D visualization of a city model.

Client-Side Business Logic - Test

Map and charts showing business logic test results.

FIRENZE - TRAFFAIR - AIRQUALITY HEATMAPS - NEWGUI

Heatmaps showing traffic and air quality data in Florence.

Proc.Logic / IoT App

Visual programming interface for IoT applications.

Jupyter2-(75) Hub - Python

Jupyter notebook interface for Python development.

Jupyter2-(75) Hub - Python

Jupyter notebook interface showing data analysis results.

Custom Widgets / Synoptics

Grid of custom widgets and synoptics for data visualization.

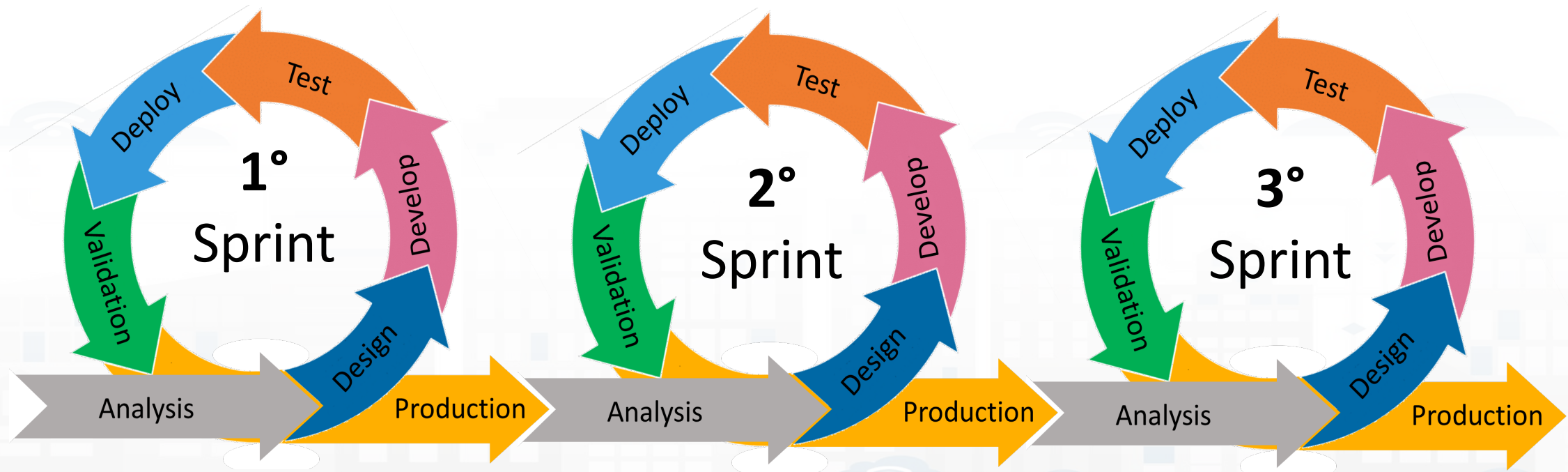
A&A, SSO, Blockchain, Res





Agile Development Life Cycle by sprint

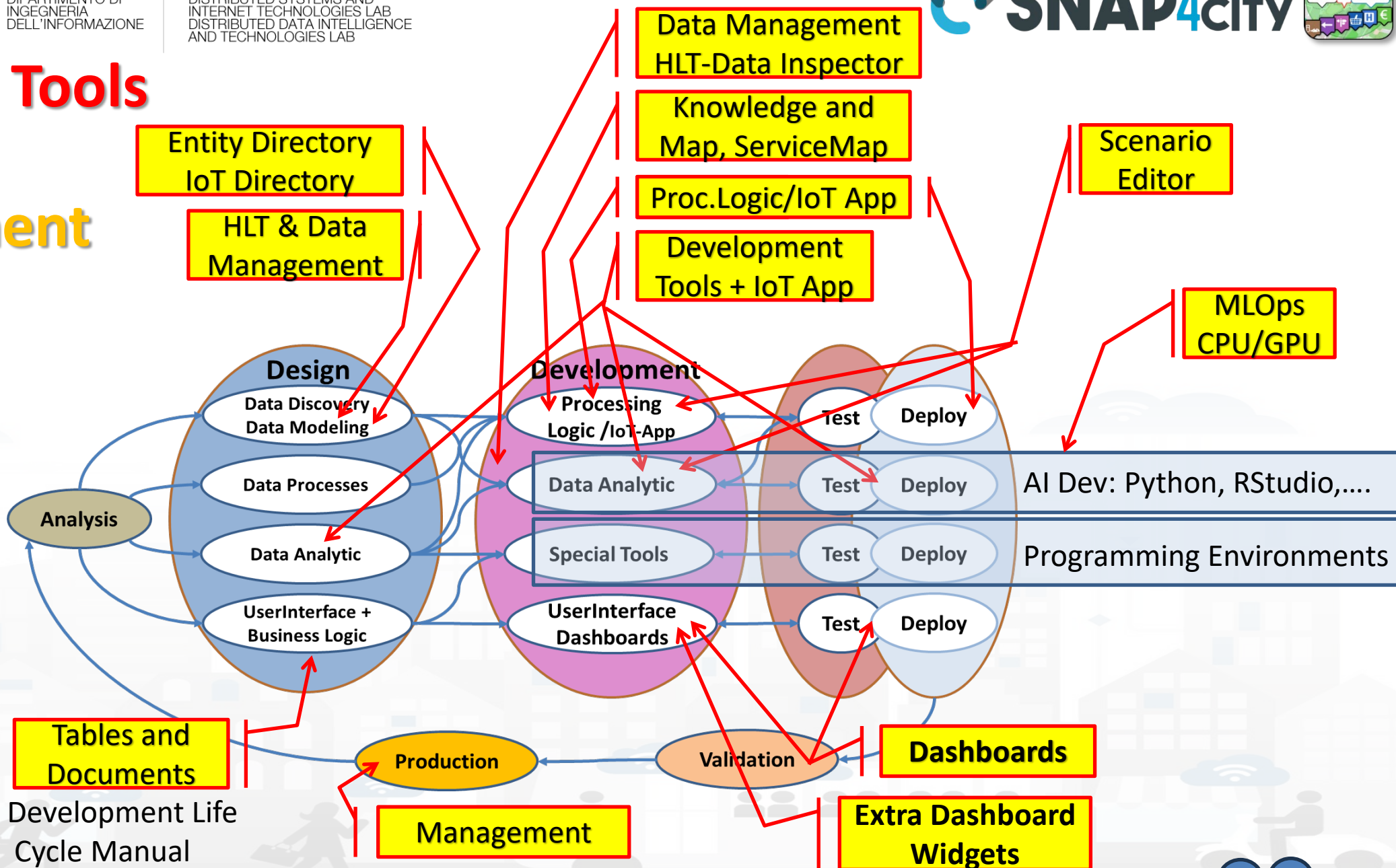
Smart Solutions



Snap4City Tools

vs

Development Life Cycle



<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

Development

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





Powered by

Development Life-Cycle




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

From Snap4City:

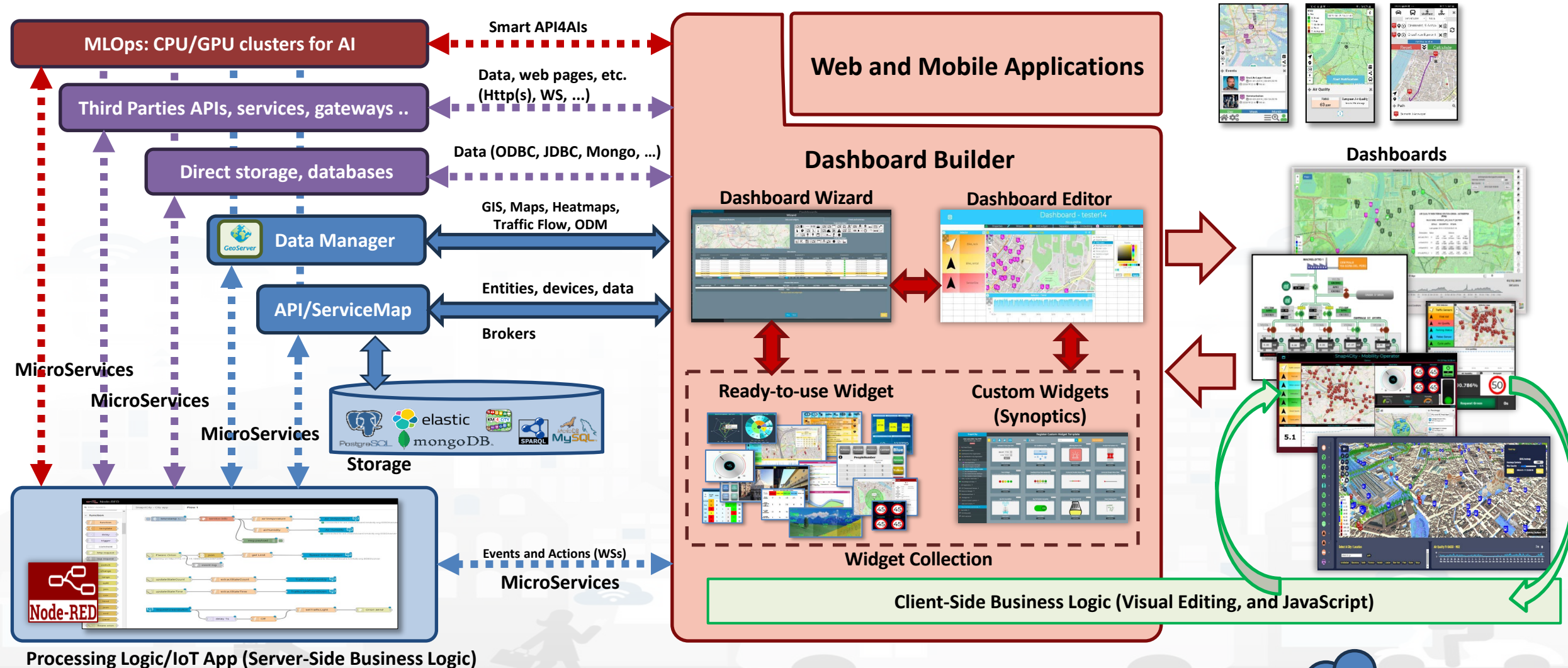
- We suggest you to read the **TECHNICAL OVERVIEW**:
 - <https://www.snap4city.org/download/video/Snap4City-PlatformOverview.pdf>
- <https://www.snap4city.org>
- <https://www.snap4solutions.org>
- <https://www.snap4industry.org>
- <https://twitter.com/snap4city>
- <https://www.facebook.com/snap4city>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

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

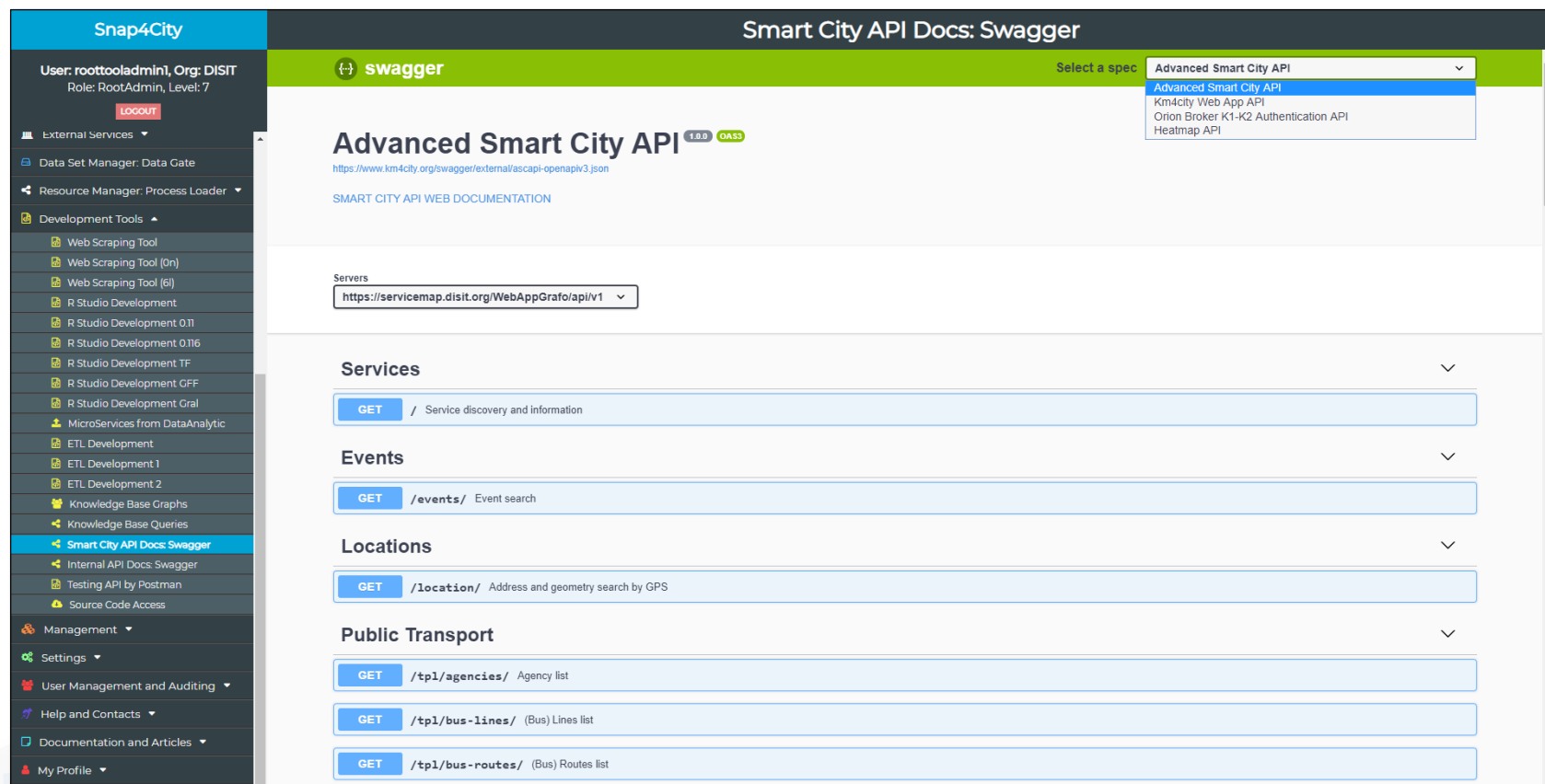
DISIT Lab, <https://www.disit.org>
DINFO dept of University of Florence,
Via S. Marta 3, 50139, Firenze, Italy
Phone: +39-335-5668674

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



Internal and External Smart City API



Snap4City

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

External Services

- Data Set Manager: Data Gate
- Resource Manager: Process Loader
- Development Tools
 - Web Scraping Tool
 - Web Scraping Tool (0n)
 - Web Scraping Tool (6i)
 - R Studio Development
 - R Studio Development 0.11
 - R Studio Development 0.116
 - R Studio Development TF
 - R Studio Development GFF
 - R Studio Development Gral
 - MicroServices from DataAnalytic
 - ETL Development
 - ETL Development 1
 - ETL Development 2
 - Knowledge Base Graphs
 - Knowledge Base Queries
 - Smart City API Docs: Swagger**
 - Internal API Docs: Swagger
 - Testing API by Postman
 - Source Code Access
- Management
 - Settings
 - User Management and Auditing
 - Help and Contacts
 - Documentation and Articles
 - My Profile

Smart City API Docs: Swagger

Select a spec: **Advanced Smart City API**

Advanced Smart City API 1.0.0 **GA53**
<https://www.km4city.org/swagger/external/ascapi-openapi3.json>
SMART CITY API WEB DOCUMENTATION

Servers

Services

- [GET /](#) Service discovery and information

Events

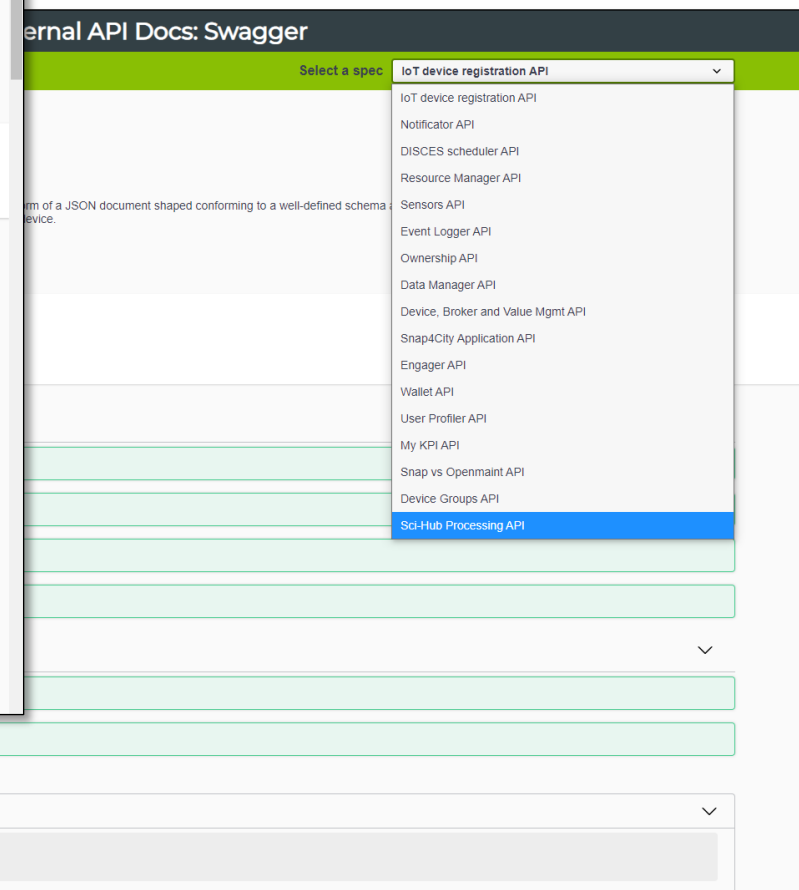
- [GET /events/](#) Event search

Locations

- [GET /location/](#) Address and geometry search by GPS

Public Transport

- [GET /tpl/agencies/](#) Agency list
- [GET /tpl/bus-lines/](#) (Bus) Lines list
- [GET /tpl/bus-routes/](#) (Bus) Routes list



Internal API Docs: Swagger

Select a spec: **IoT device registration API**

- IoT device registration API
- Notifier API
- DISCES scheduler API
- Resource Manager API
- Sensors API
- Event Logger API
- Ownership API
- Data Manager API
- Device, Broker and Value Mgmt API
- Snap4City Application API
- Engager API
- Wallet API
- User Profiler API
- My KPI API
- Snap vs Openmaint API
- Device Groups API
- Sd-Hub Processing API**

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

<https://www.km4city.org/swagger/internal/index.html>



Be smart in a SNAP!



CONTACT

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<https://www.disit.org>

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