SNAP4CITY

www.snap4city.org
www.snap4solutions.org

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

KM4CITY

www.km4city.org

Overview
Short November 2025

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

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#km4city
#disitlab
@snap4city

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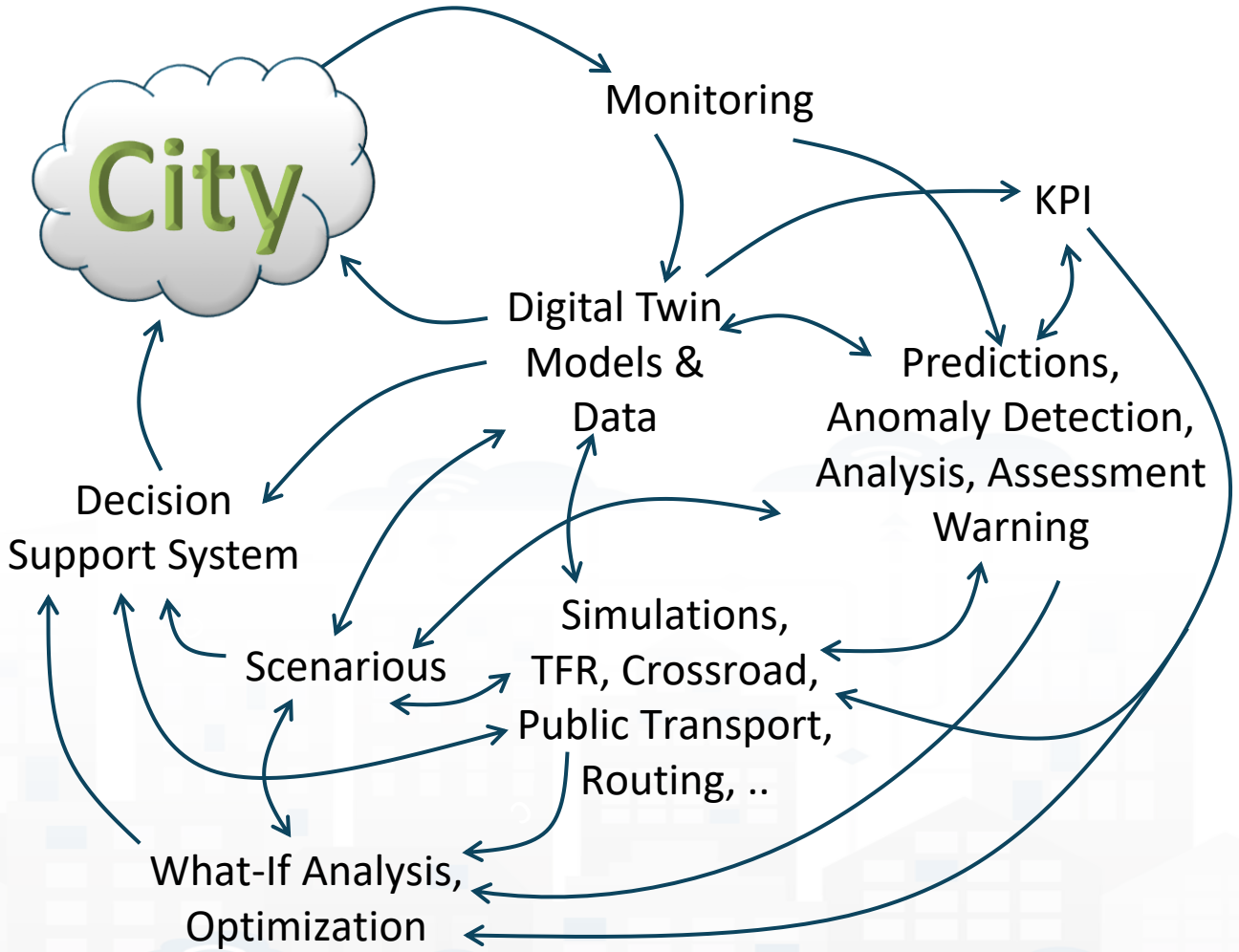
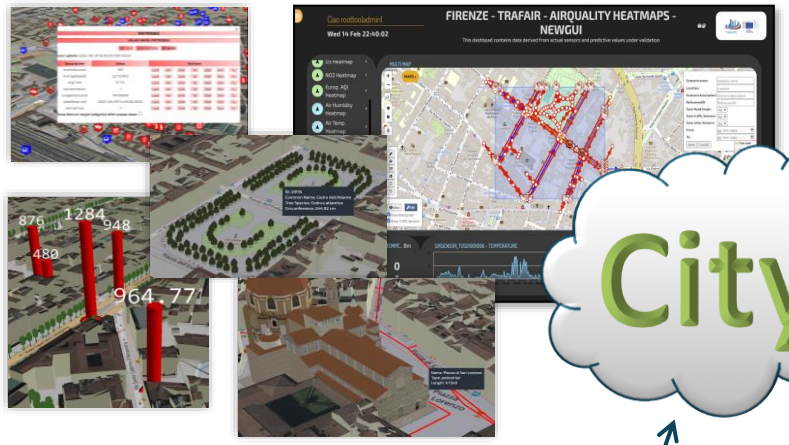
Main tasks

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





City

Monitoring

KPI

Digital Twin Models & Data

Predictions, Anomaly Detection, Analysis, Assessment Warning

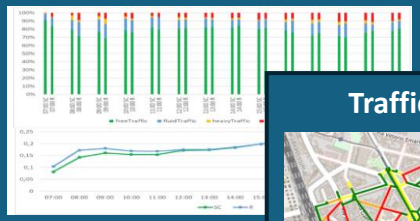
Decision Support System

Scenarious

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

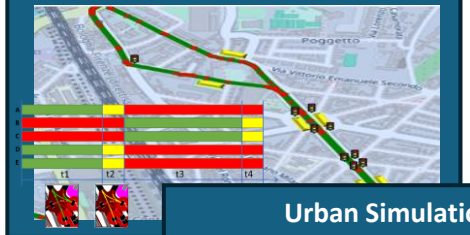
What-If Analysis, Optimization

KPI, Predictions, ...



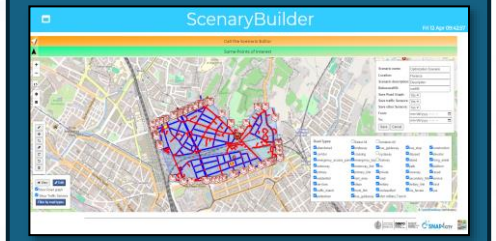
Traffic Reconstruction

Traffic Light Plan optimization

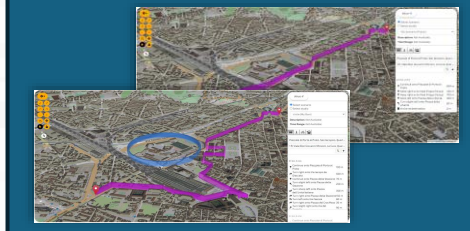


Urban Simulation

Scenario Editor



Routing / Dynamic Routing



Traffic Infrastructure optimization

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

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100% OPEN SOURCE

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Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

JS Foundation

EØ15 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

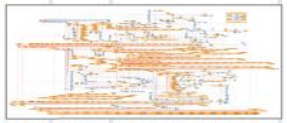
BUSINESS INTELLIGENCE - SIMULATIONS - VISUAL ANALYTICS - SYNOPTICS - GRAPHICAL WIDGETS - ANALYTICS

DASHBOARDS, WIDGETS
TEMPLATES

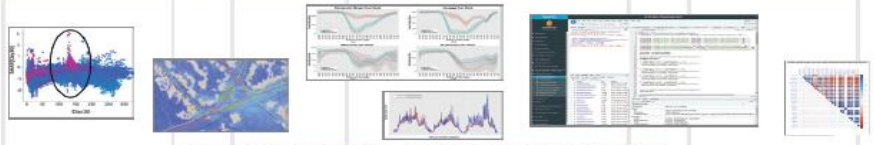
PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG
15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...

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



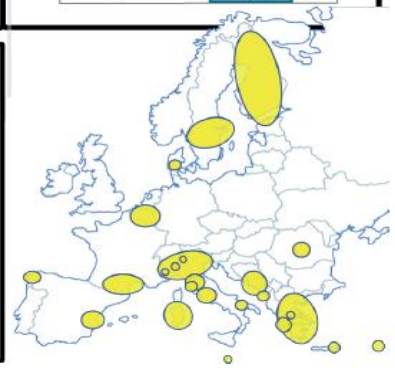
BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI
OPERATIVE RESEARCH, STATISTICS

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

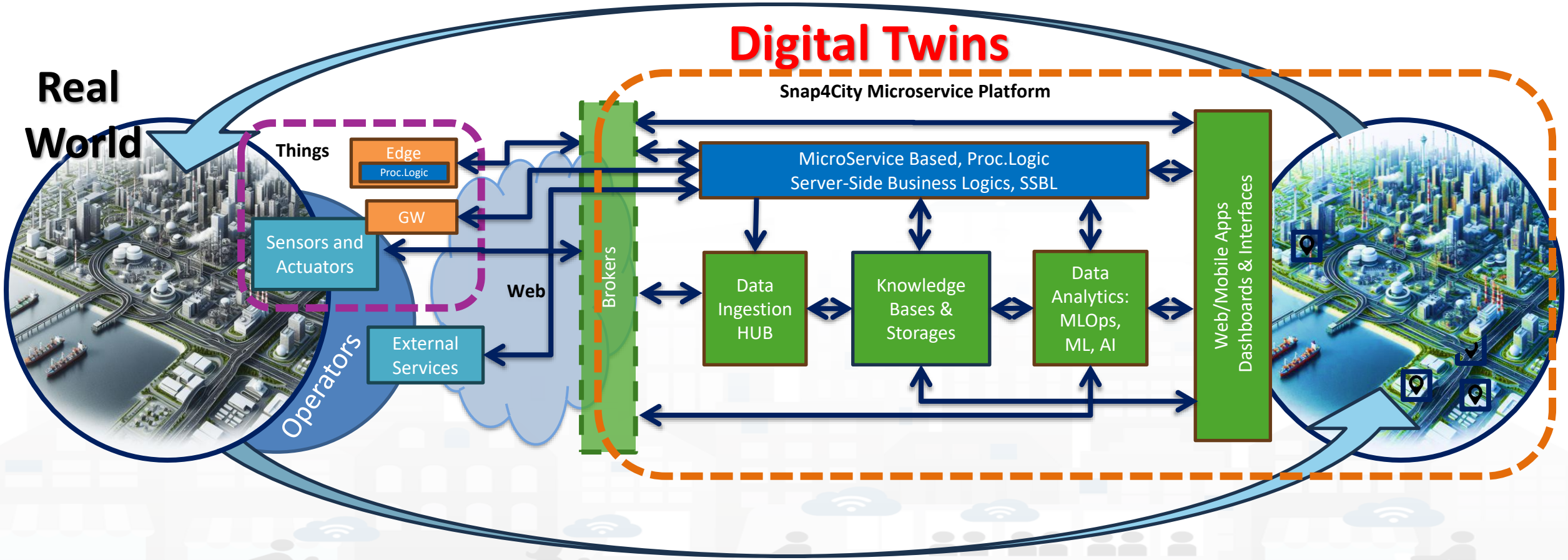
FULL INTEROPERABILITY, ANY: DATA, BROKERS, NETWORKS AND VERTICALS

NATIVE AND EXTERNAL APPLICATIONS

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

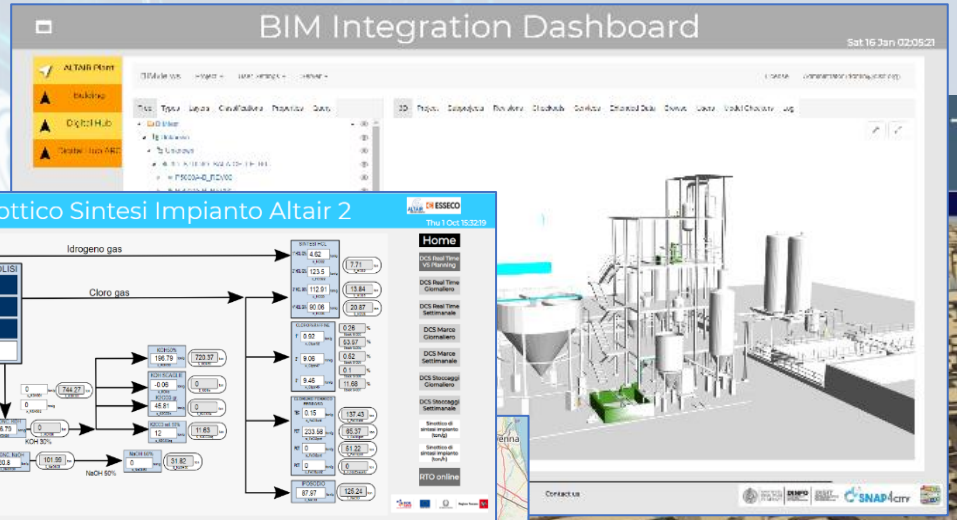


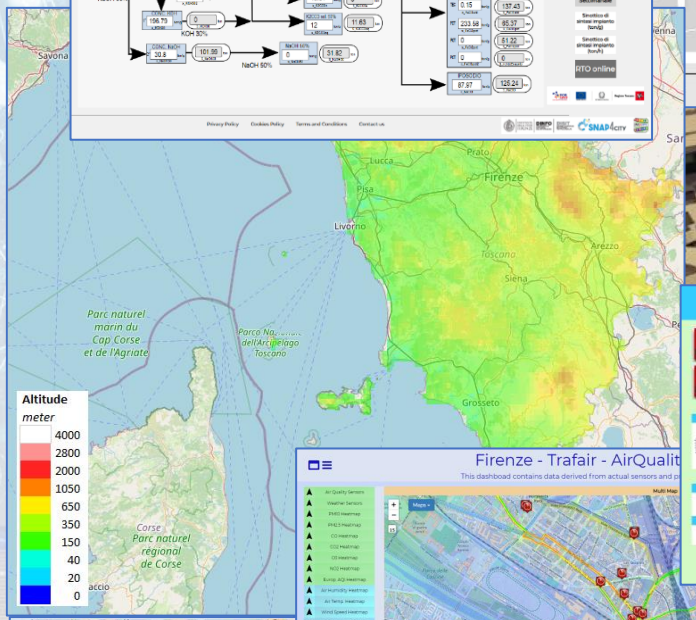
Digital Twin Development Platform



High Level Types

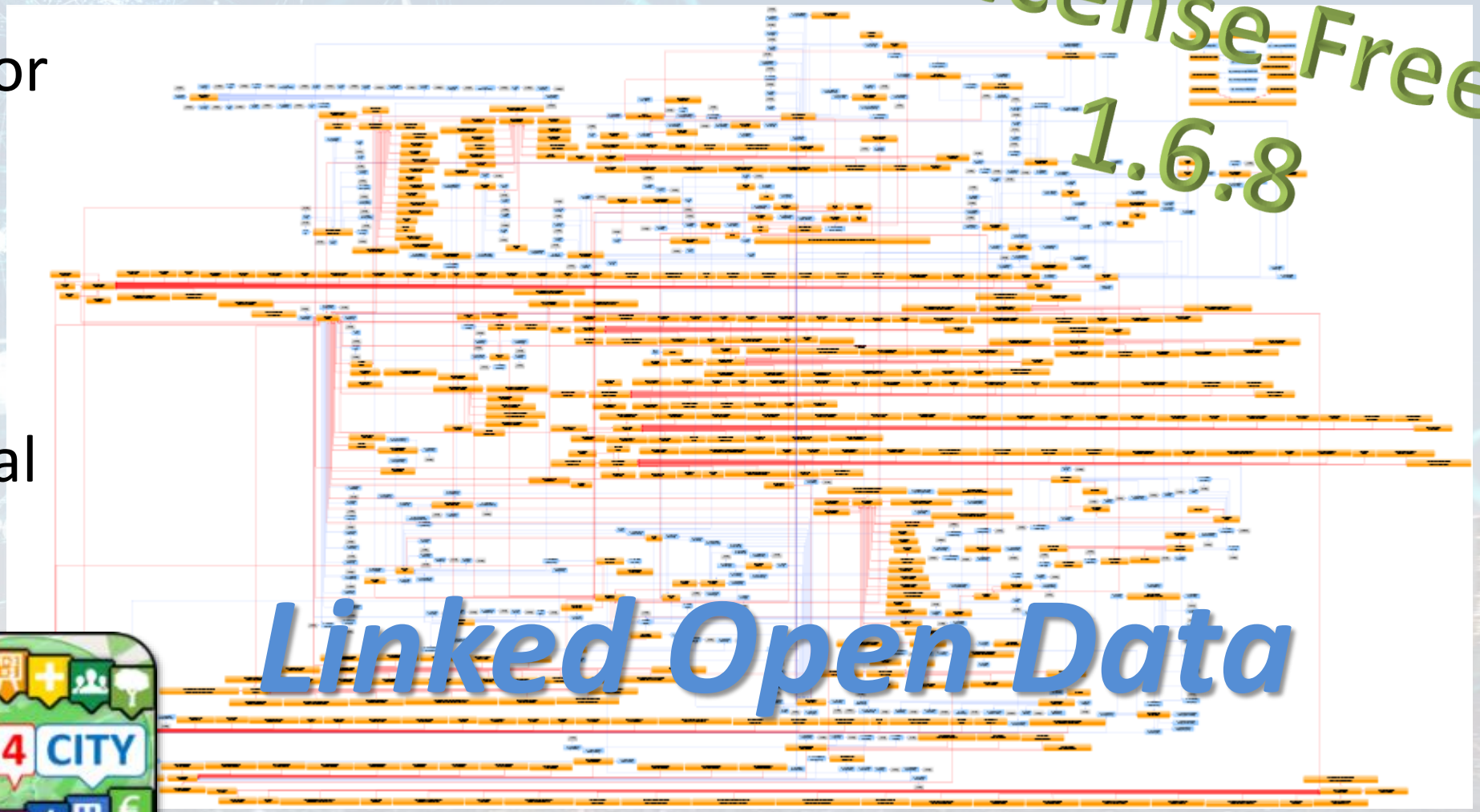
- POI, IOT Devices, shapes,..
  - FIWARE Smart Data Models,
  - IoT Device Models
- GIS, maps, orthomaps, WFS/WMS, GeoTiff, calibrated heatmaps, ..
- Satellite data, any kind..
- traffic flow, typical trends, ..
- Vector fields + heatmaps, ..
- trajectories, events, workflow, ..
- 3D Models, BIM, Digital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





Expert System semantic queries

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



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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.

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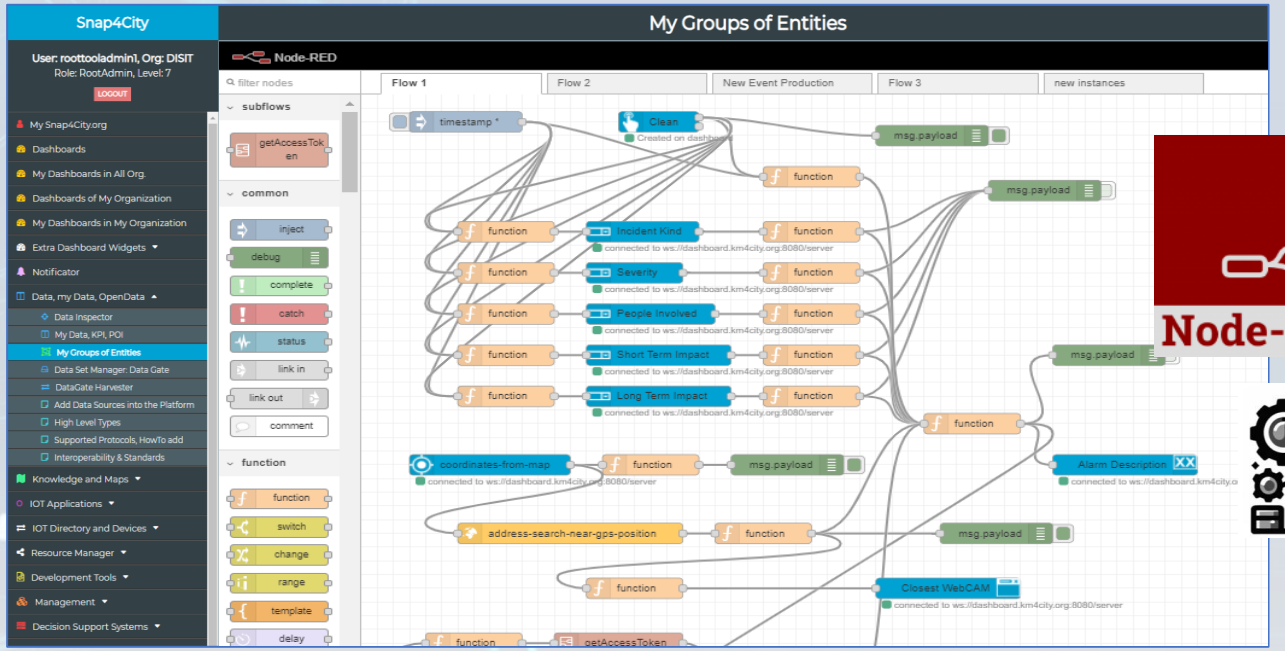
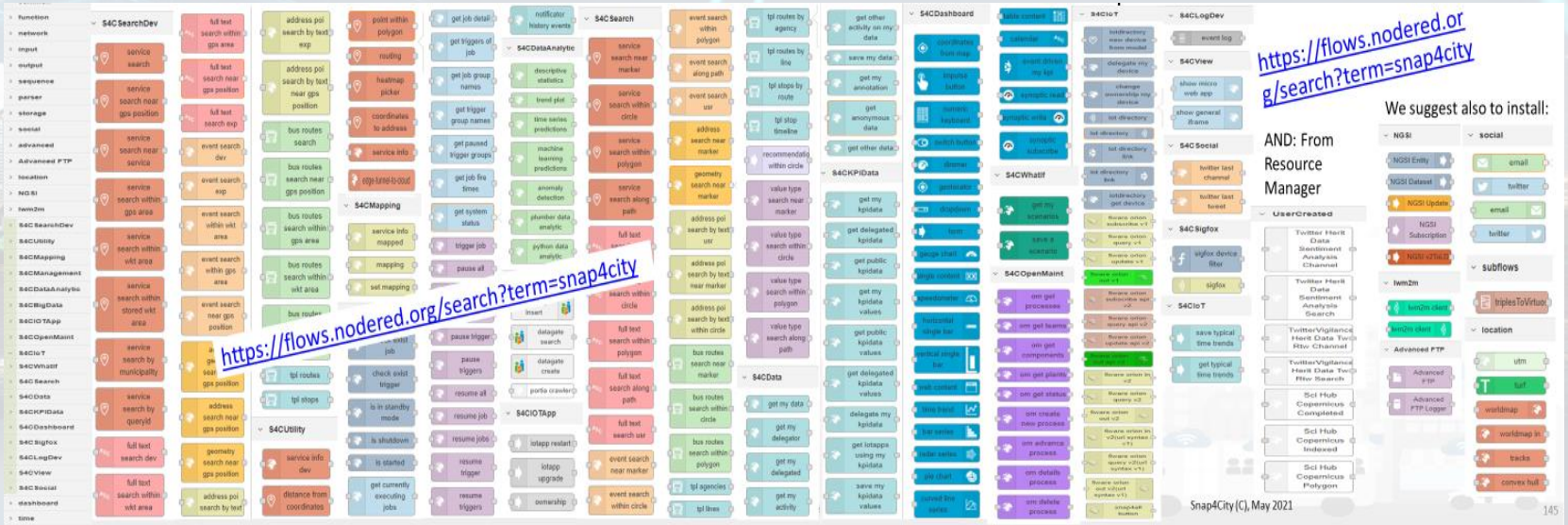
Ingestion, aggreg. → exploitation

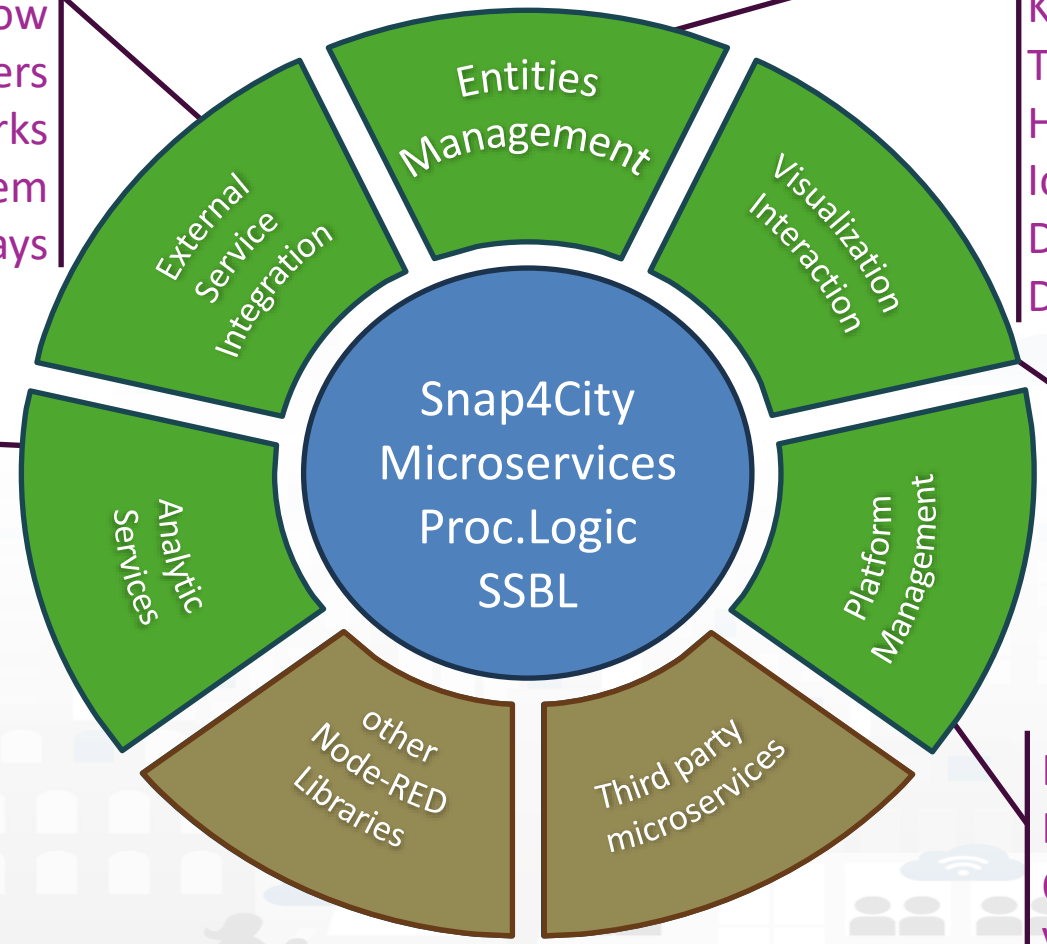
- **IoT App Visual Programming, no coding**
  - **Data transformation**
  - **Integration, Interoperab.**
  - **Scripting Data Analytics**
  - **Data ingestion**
  - **Business logic Server Side**
- **Edge and Cloud**
- **MicroServices** data event driven develop via visual language Node-RED





MicroServices Areas

> 60.000 downloads (up to 2024)



Open Data CKAN
Ticket Management, workflow
BIM Servers
Social Networks
Video Management system
Gateways

Data Load / Search / Retrieval
KPI, POI, GIS Data, Scenarios
Time Series, Public transport
High Level Types: heatmaps, ODM,…
IoT / Entity Discovery
Delegation Management
Data Mapping

Data Analytics
Statistic, Optimization
Simulation
Artificial Intelligence
What-if Analysis Support
Geo Utilities Support
Routing & Traffic Flow
MLOps support
Python support
R Studio Support

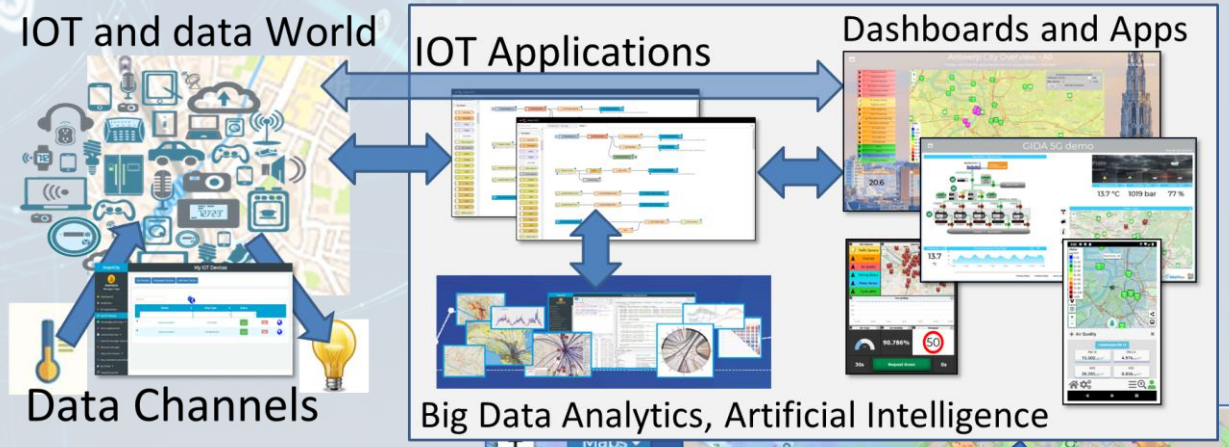
Dashboards
Widgets: Graphic Libraries
Interactive Widgets
Maps, 3D representations
Synoptics, External Content
Micro Web App

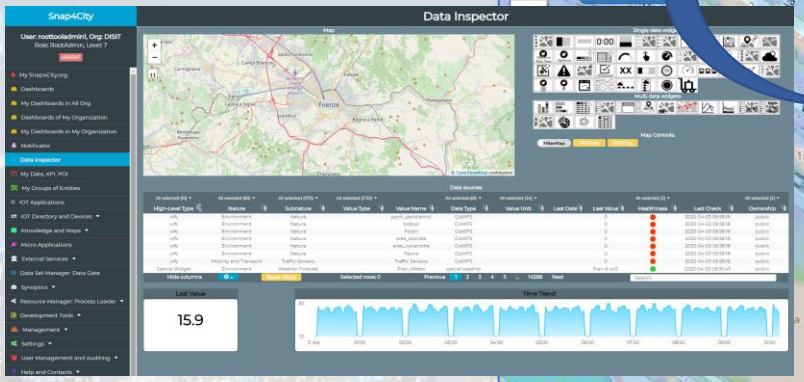
IoTApp Management
Data Logs, A&A, Security
Ownership Management
VPN remote access

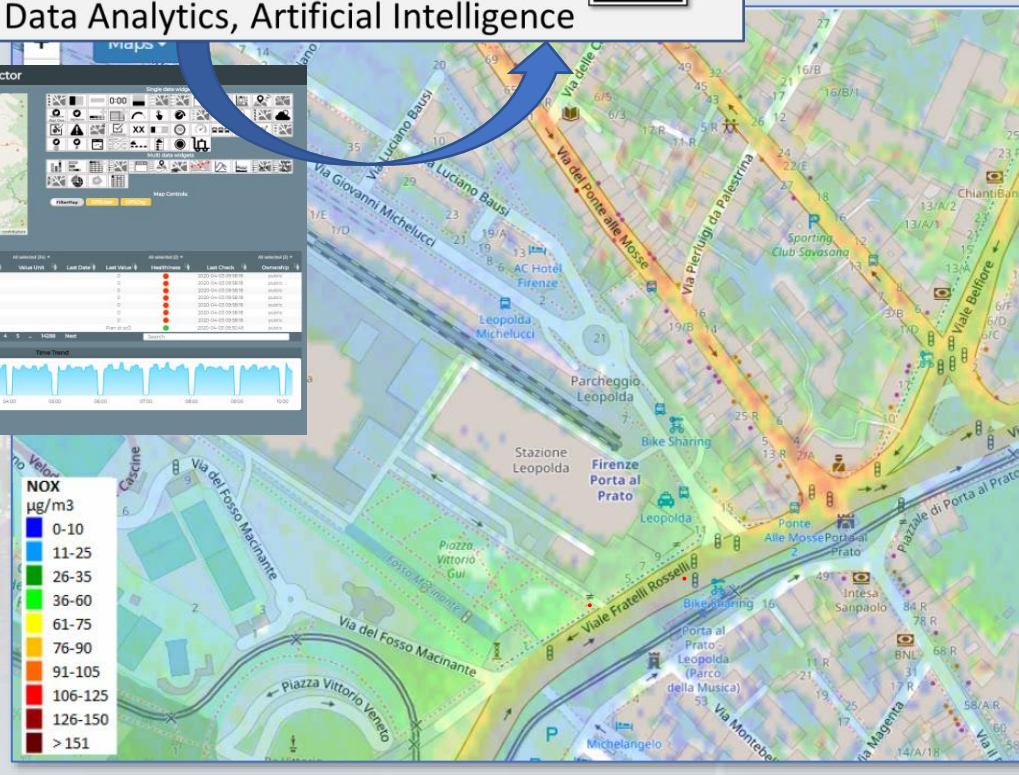
Solutions: reliable, secure and fast to realize

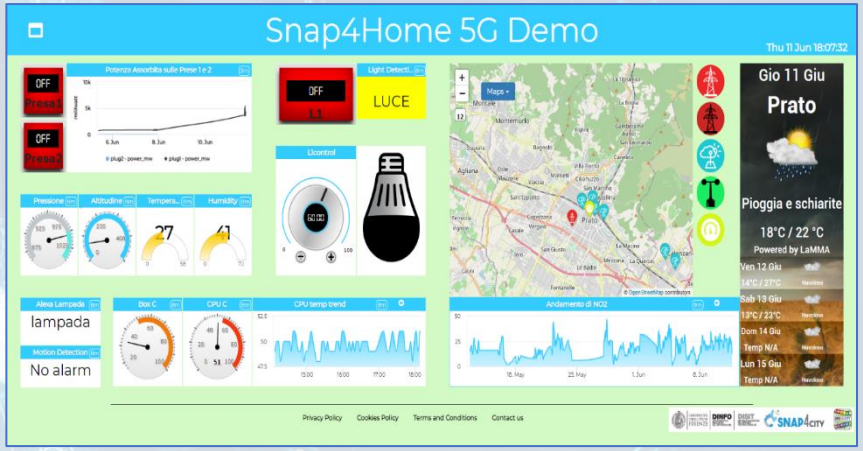
- **Via Snap4City tools**
  - **Dashboard Wizard**
  - **Dashboard Builder**
  - **Data/Visual Analytic**

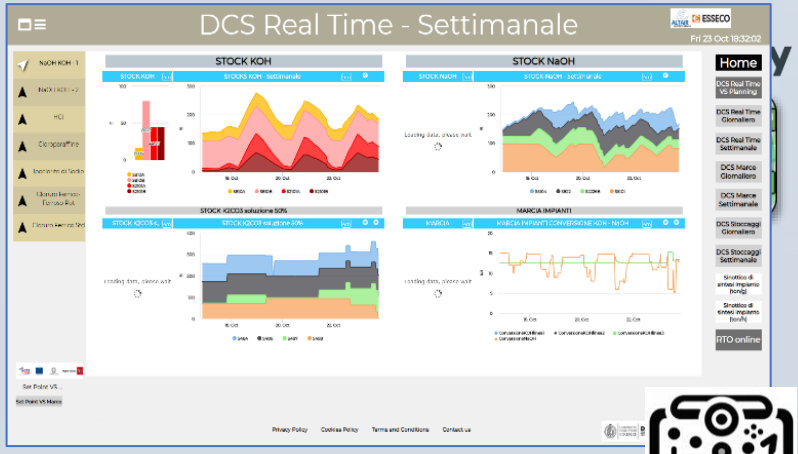
- **Smart Solutions results to be**
  - **Real time data drive**
  - **Secure end-to-end**
  - **GDPR compliant**
  - **Reliable, interoperable**
  - **Auditable, marketable**

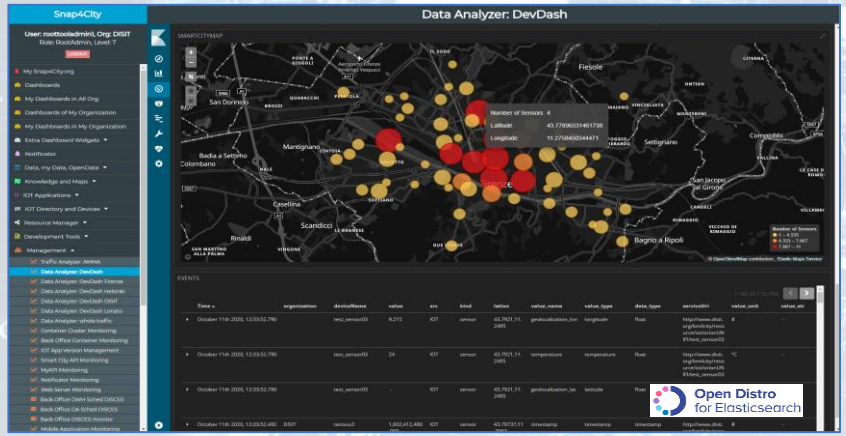


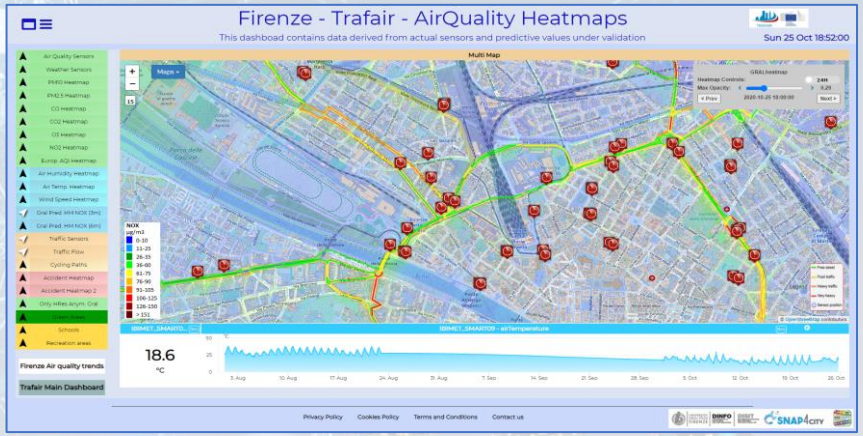


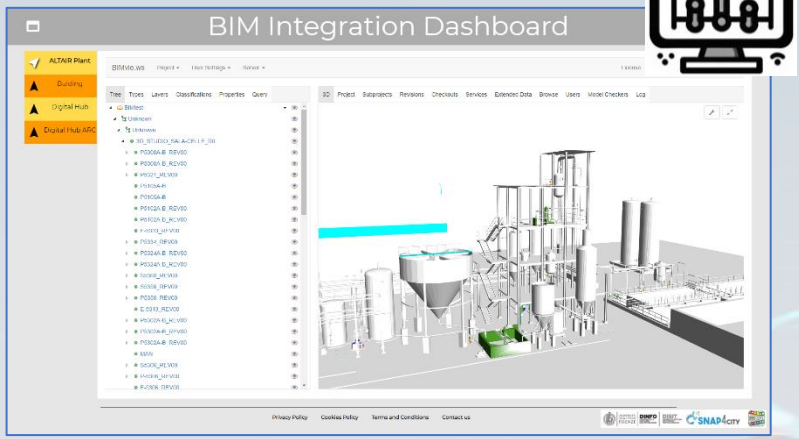


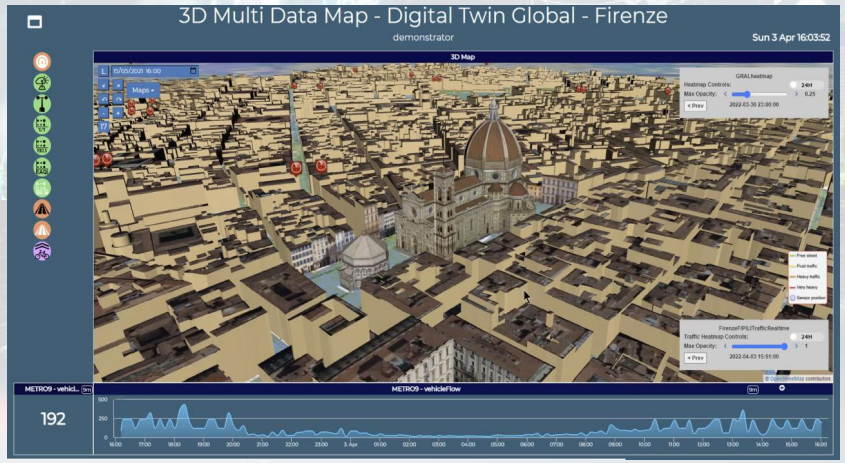


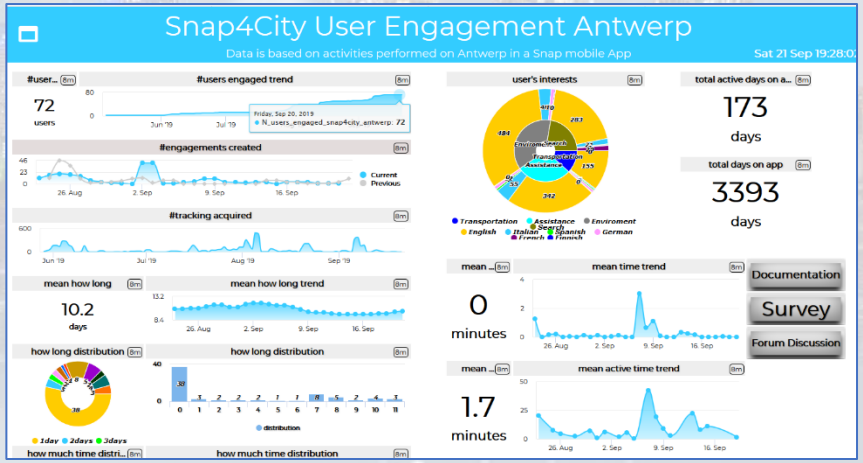


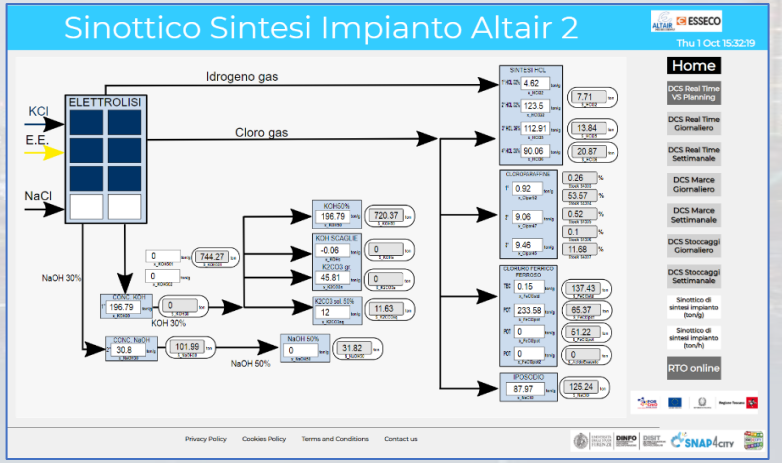




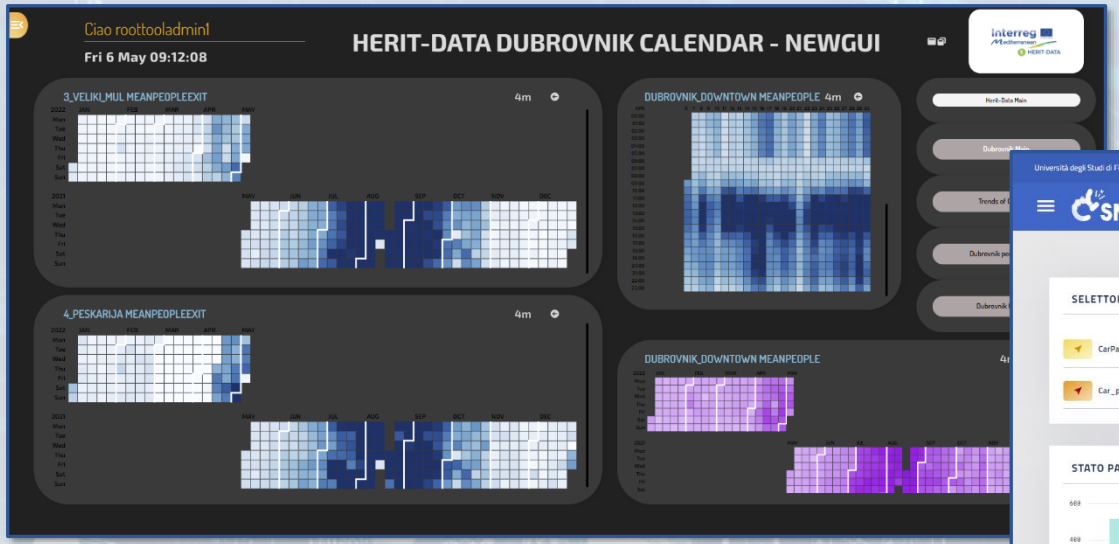


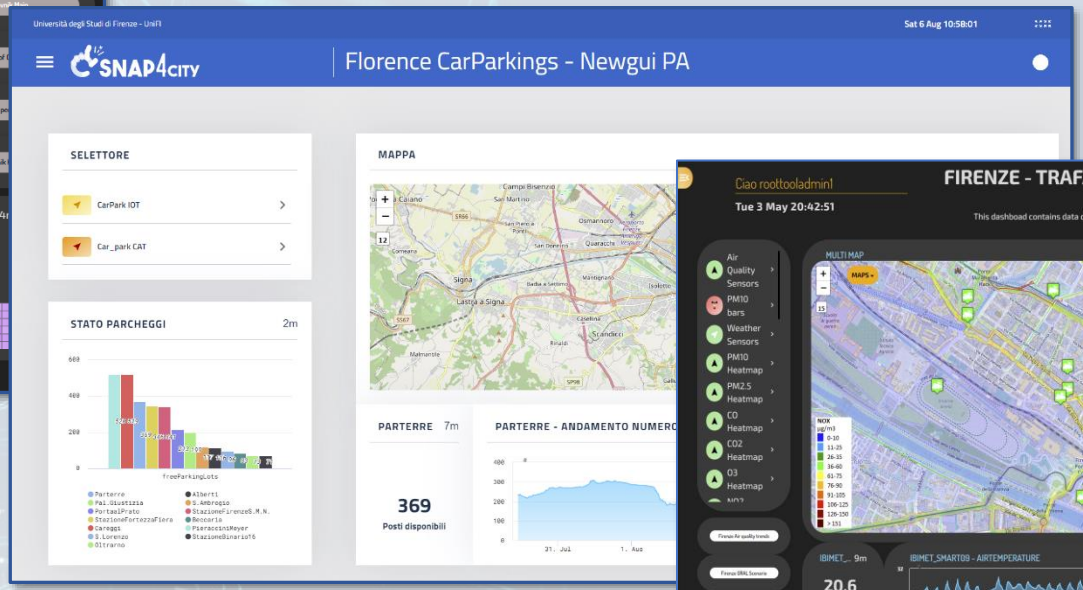


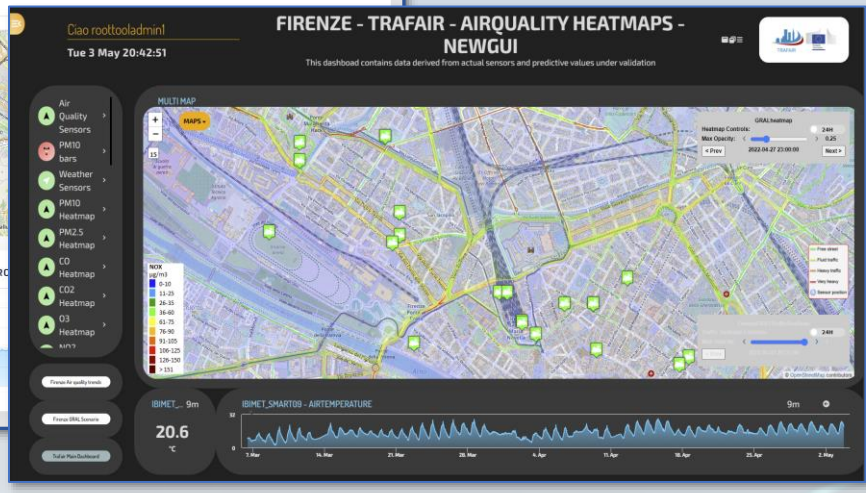


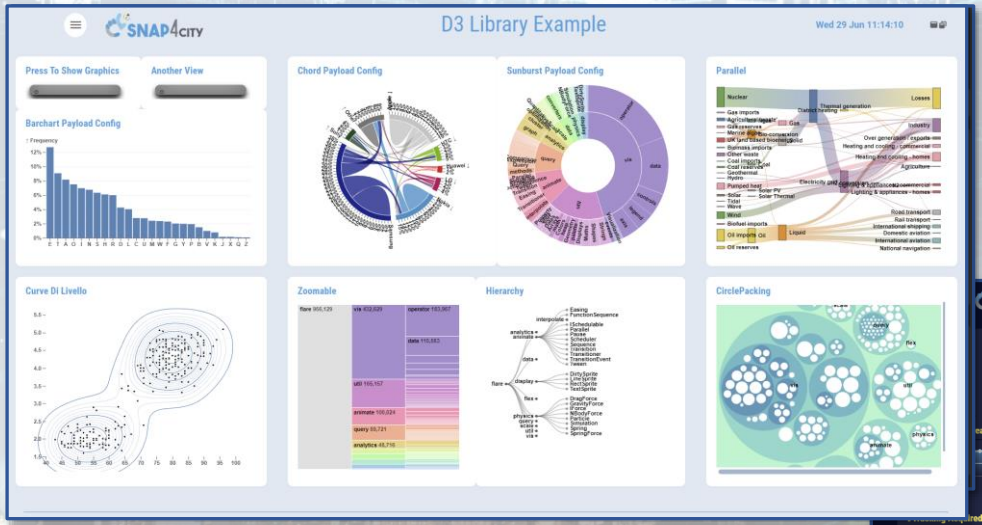


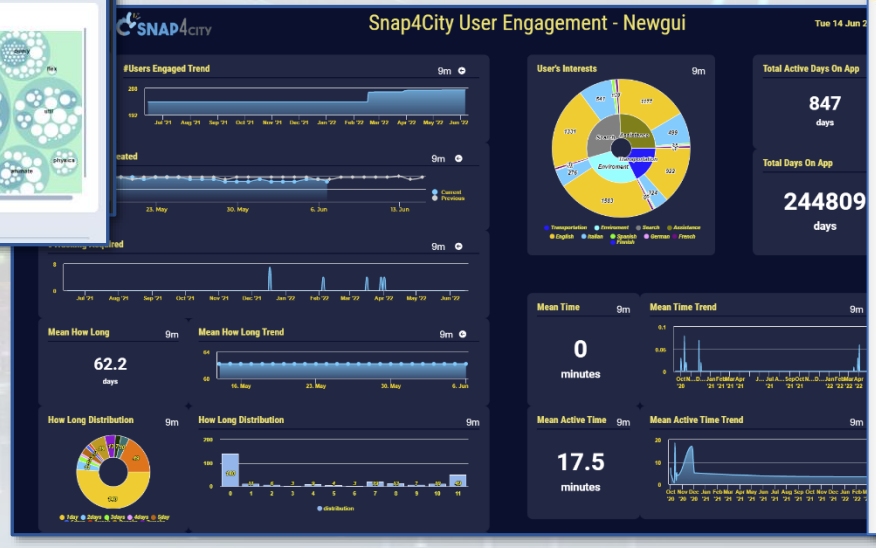
Different Themes

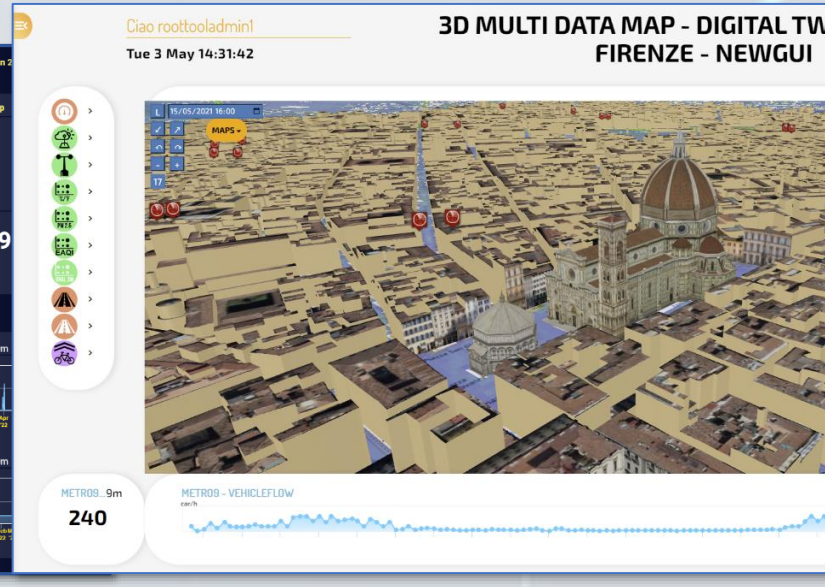












New styles/themes can be developed by specializing a few files from open source

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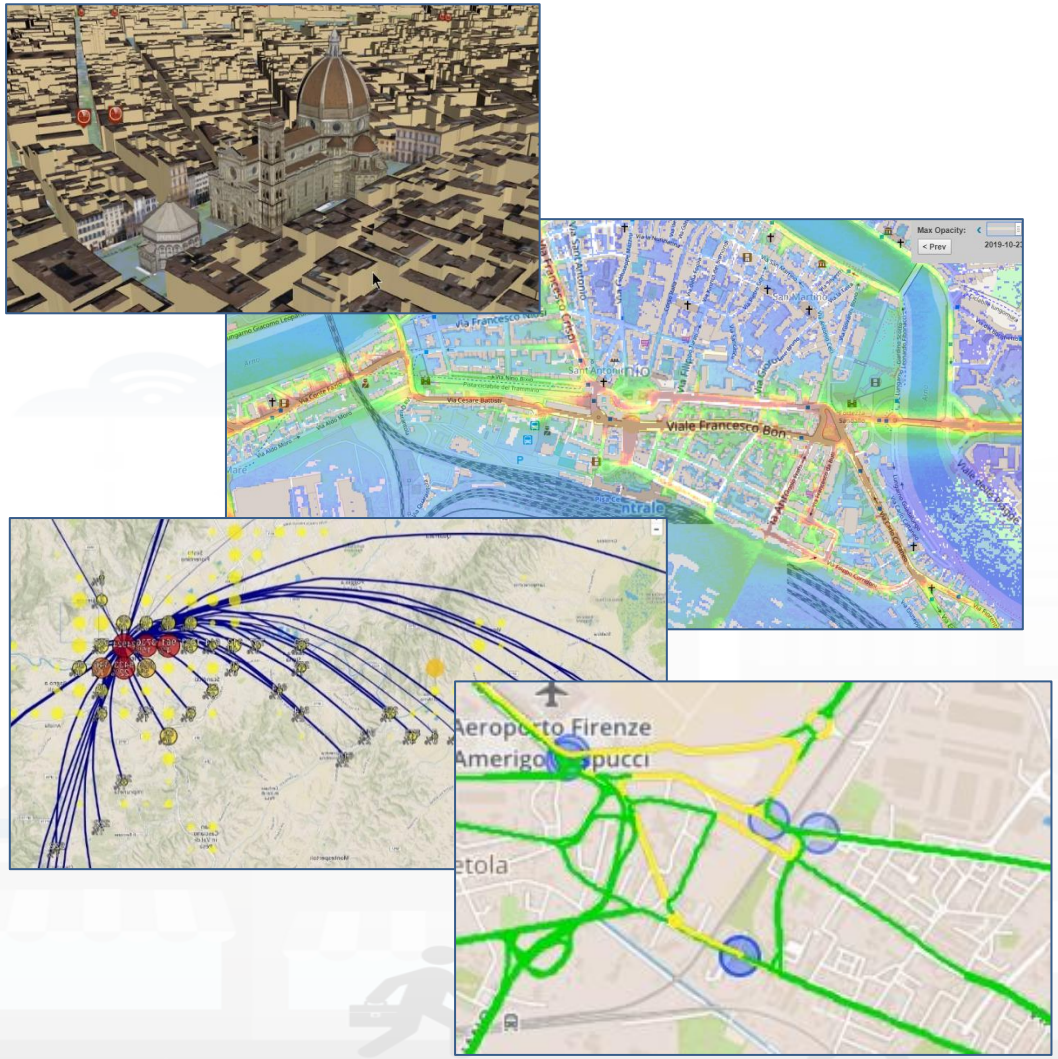
Smart City Digital Twin



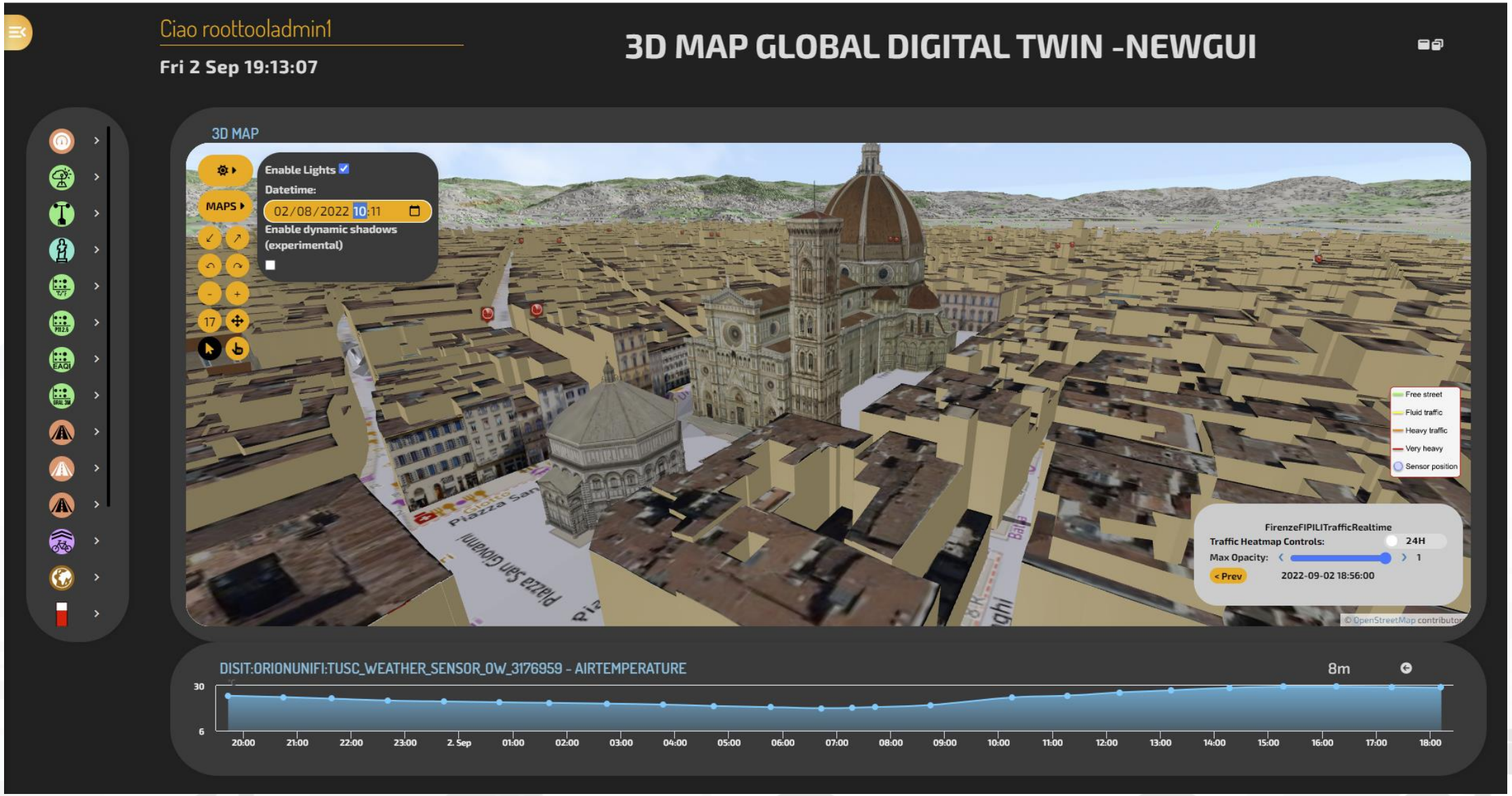
City Digital Model with…

- 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.

3D Digital Twin



Snap4CityDocker | Dashboard Management Syster

Non sicuro | dashboard/dashboardSmartCity/view/Baloon-Dark.php?iddasboard=Ng==#

Snap4City | dashlocal

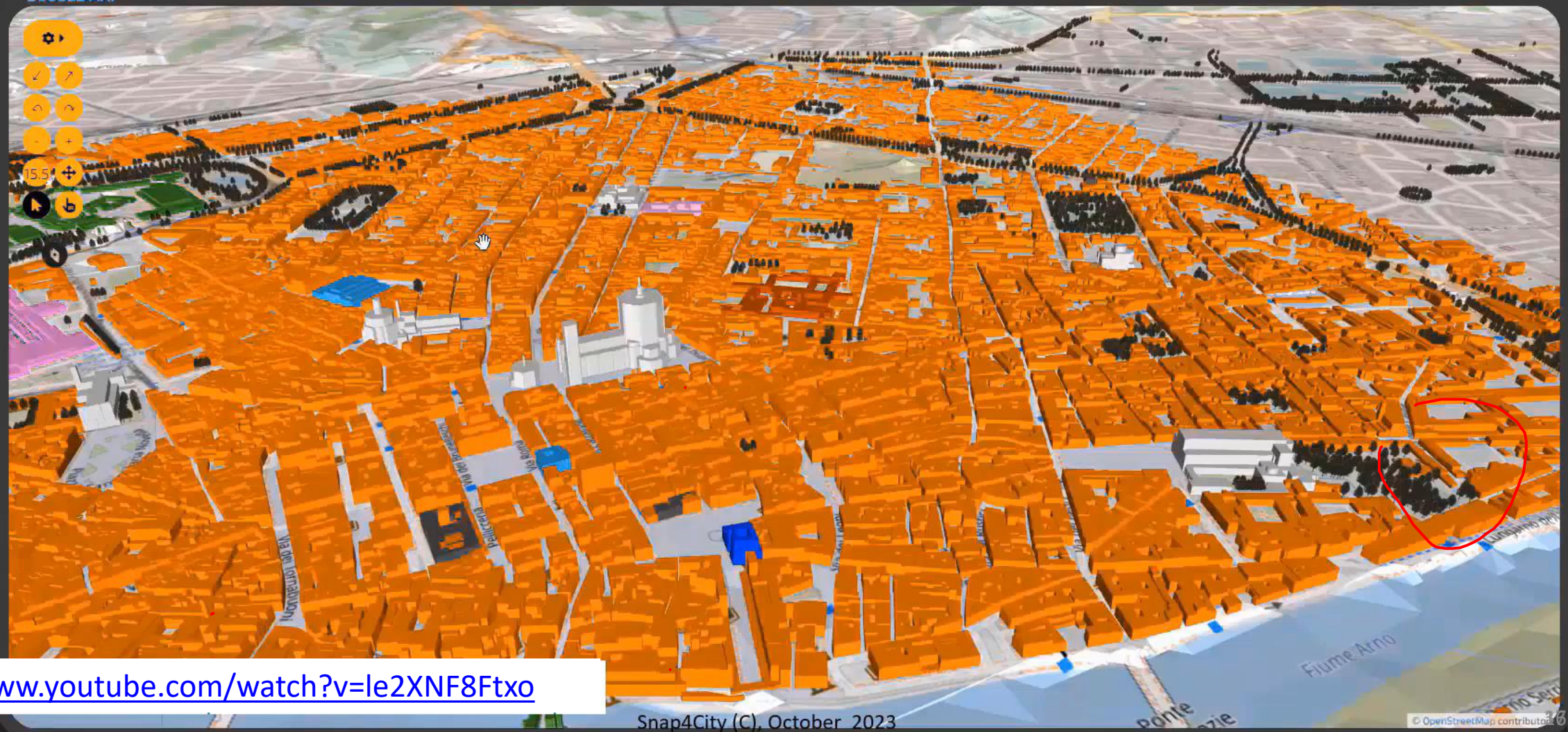
Ciao

Fri 13 Oct 18:29:18

FLORENCE SCDT

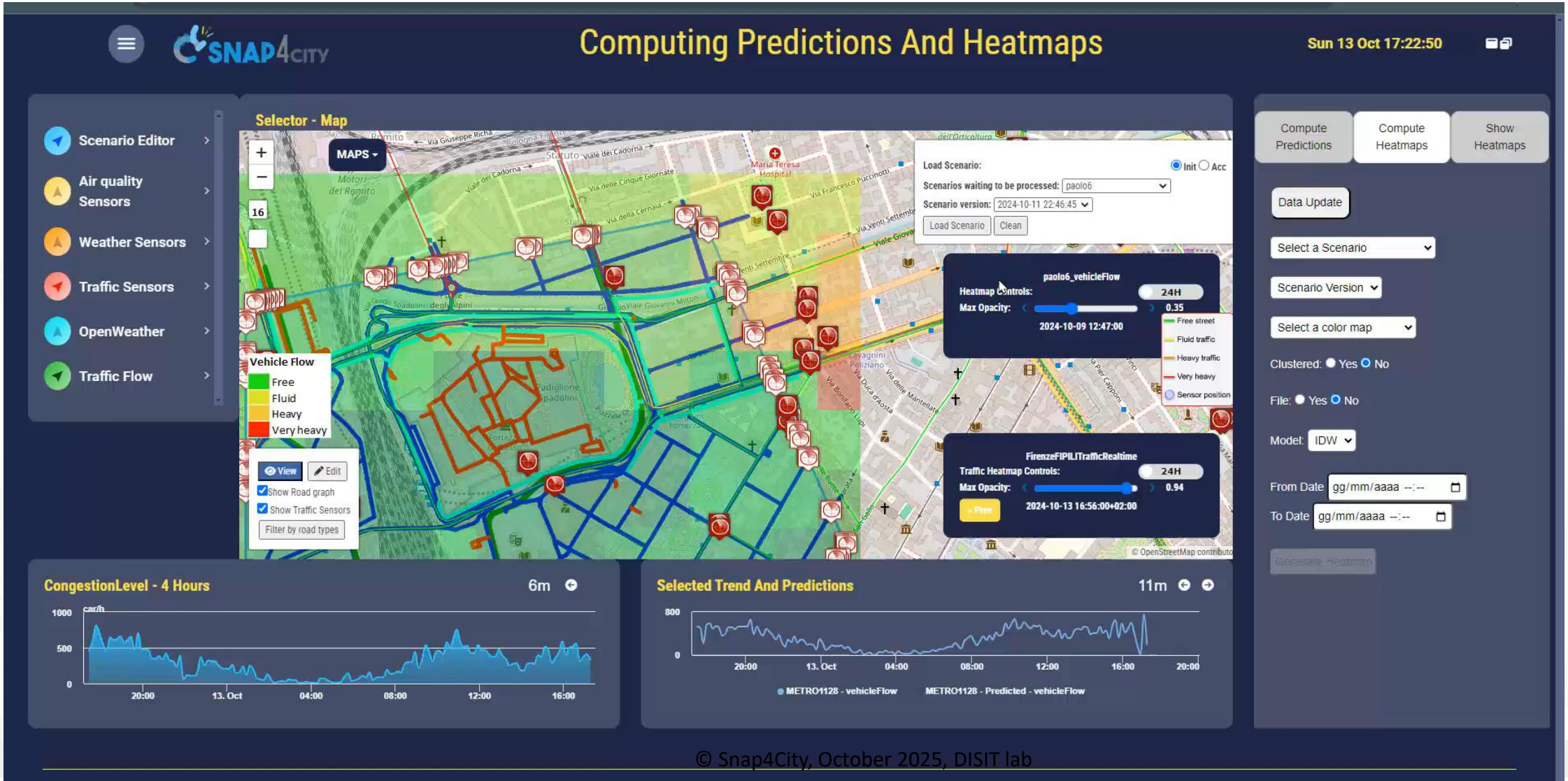
SELECT...

DOUBLE MAP



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

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/

Scenarious

Scenarious

- 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 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
- [illegible] Digital Twin (ITA)
- [illegible] for Traffic Density (the actual case of Merano) PDF
- [illegible] mobilità e trasporti, MaaS, parcheggi, inquinamento (ITA)
- Snap4City integration with Milestone X Protect, VMS, Video Management System PDF
- SCENARIO: Smart Light Control, 2023, CAPELON, PDF
- Florence HeritData FactSheet: https://www.snap4city.org/drupal/sites/default/files/files/FACTSHEET%20FLORENCE.pdf
- SCENARIO: Smart City Living Lab in Romania, PDF
- Snap4PVenergy: 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)

https://www.snap4city.org/4

SNAP4CITY roadmap

Smart Ambulance (2021-22)

Enterprise (2021-22) Industry 4.0

Almafluida Industry 4.0 (2021-22)

Contract, 2022-23

CN MOST, 2022-26

ELLIE IA 2025-2027

UrbanDT4TF

2020

Sii-Mobility

JRC EUROPEAN COMMISSION Contract

Interreg Mediterranean HERIT-DATA

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

Interreg MARITTIMO-IT FR-MARITIME MOBI MART

- Smart Mobility Mobility
- PISA, PUMS Living lab

smartGARDAlake

Km4City 1.6.7

Sii-Mobility

enel x Contract

JRC EUROPEAN COMMISSION Contract

2021

PC4City (2020-21) Monitoring Terrain

Winner of Open Data Challenge of enel x

CAPELON

- Smart Light
- Sweden

AMPERE (2021-22) Industry 4.0

SYN-RG-AI SmartCity

GRUPPO PRETTO Industry 4.0

uni.systems SmartCity, 2021-23

AXIS COMMUNICATIONS AXIS collab SmartCity

2022

ASYMMETRICA URBAN TECHNOLOGY Asymmetrica Smart City, 2022-23

ITALFERR GRUPPO FERROVIE DELLO STATO ITALIANE Italferr, Smart City

2023

ART-ER ATTRATTIVITÀ RICERCA TERRITORIO Contract, 2022-23

Filippi 2022-2023

enel x Contract, 15min

IMPETUS Security and Risk

Smartea

Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

ICSC Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing

Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

EI THE, 2022-26

G. Agile, 2021-23

TUSCANY XD 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

ICSC Centro Nazionale di Ricerca in HPC, Big Data and Quantum Computing

JRC EUROPEAN COMMISSION Contract, 2024-25

CAI4DSA

FAIR Future Artificial Intelligence Research

Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

OPTIFaaS

MOST CENTRO NAZIONALE PER LA MOBILITÀ SOSTENIBILE

Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

SASUAM

MOST CENTRO NAZIONALE PER LA MOBILITÀ SOSTENIBILE

Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

Rhodes, smart city

eShare UNIFI TUSS

MOST CENTRO NAZIONALE PER LA MOBILITÀ SOSTENIBILE

AMMIRARE

Interreg MARITTIMO-IT FR-MARITIME

Currently 2025

- **UrbanDT4TF**, CN HPC: Digital Twin mobility, https://www.snap4city.org/drupal/node/1057
- **DI-DTPlatform**, CN HPC: Digital Twin, mobility, environment, https://www.snap4city.org/drupal/node/1097
- **Sasuam**, CN MOST, PNRR: AI, mobility, https://www.snap4city.org/drupal/node/999
- **OPTIFaaS**, CN MOST, PNRR: AI, mobility, DSS, https://www.snap4city.org/drupal/node/1008
- **LeverageOPTIFaaS**, CN MOST: PNRR, mobility, https://www.snap4city.org/drupal/node/1064
- **TOURISMO**, Interreg, EC: Tourism, NLP, DSS, https://www.snap4city.org/drupal/node/1001
- **ELLIE**, Horizon Europe, EC: AI, VR, https://www.snap4city.org/drupal/node/1056
- **CN MOST**, PNRR: sustainable mobility, platform, https://www.snap4city.org/drupal/node/1050
- **ISPRA JRC contract**, EC: DSS, SOC, control room, energy, https://www.snap4city.org/drupal/node/970
- **AMMIRARE**, Interreg, EC: AI, environment, Big Data, https://www.snap4city.org/drupal/node/1002
- **CAI4DSA**, FAIR PE1, PNRR: AI, Neuro-Symbolic, PINN, NG-DSS, https://www.snap4city.org/drupal/node/1016
- **SADI-MIAC**, RT, partner: AI, Tourism, Retail, Computer Vision, https://www.snap4city.org/drupal/node/1055
- **SMART3R,** PRIN UNICagliari: mobility, DSS, https://www.snap4city.org/drupal/node/1087
- **Tuscany X.0, EDIH,** TestBeforeInvest, Training on AI, Big Data, Security, HPC: https://www.tuscanyx.eu/
- **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

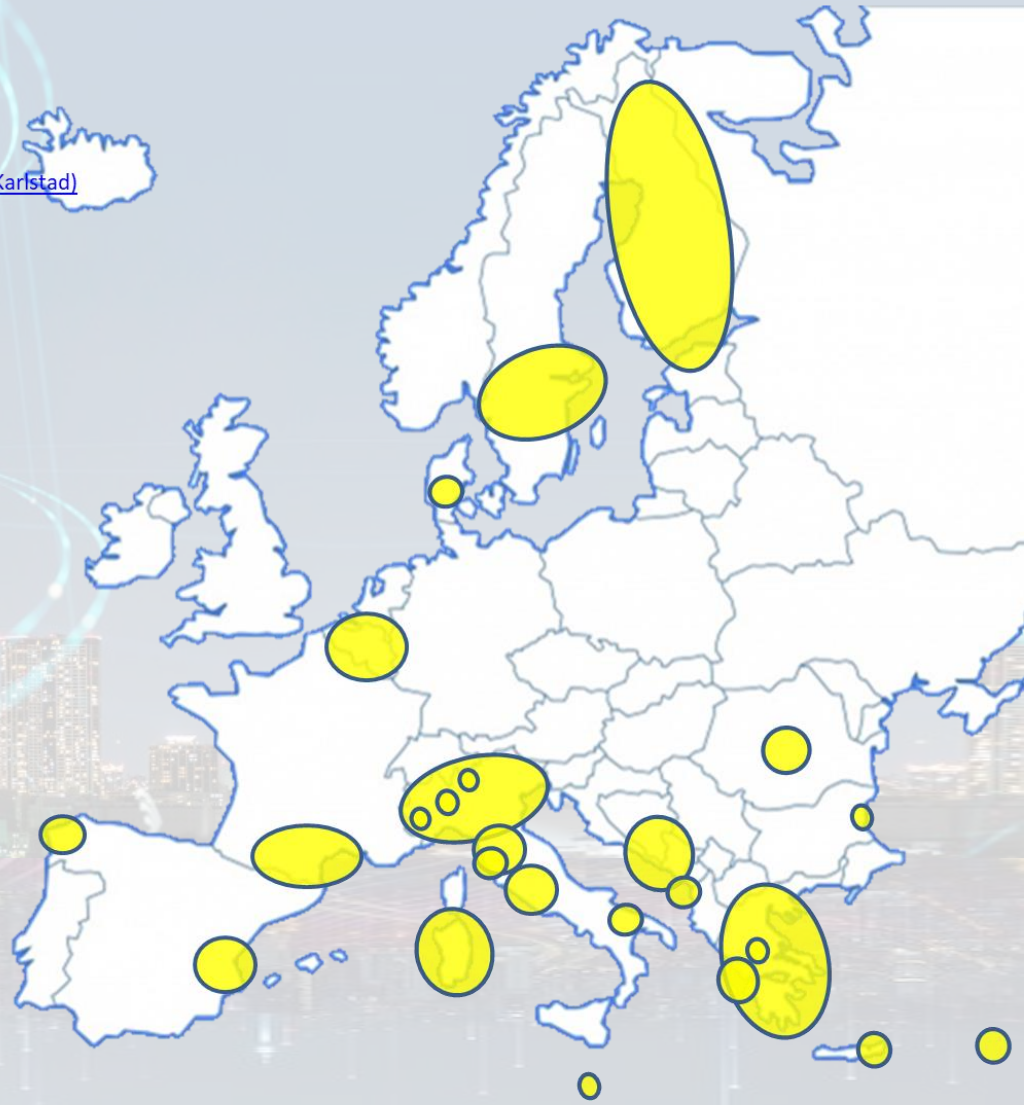
+ currently: Merano, Salerno, Cuneo, Rhodes, Reverberi, Florence, IDTS, ALTAIR, etc.

https://www.Snap4City.org

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

Main Organizations/areas

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



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

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)

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

EØ15 digital ecosystem

NVIDIA

SNAP4CITY KM4CITY

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

www.snap4city.org

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

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

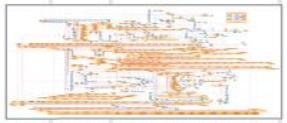
BUSINESS INTELLIGENCE - SIMULATIONS - VISUAL ANALYTICS - SYNOPTICS - GRAPHICAL WIDGETS - ANALYTICS

DASHBOARDS, WIDGETS
TEMPLATES

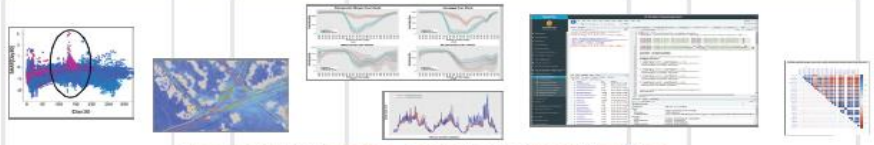
PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG
15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...

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



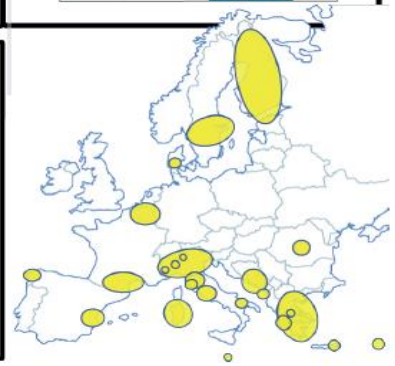
BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI
OPERATIVE RESEARCH, STATISTICS

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
- ...



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/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

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

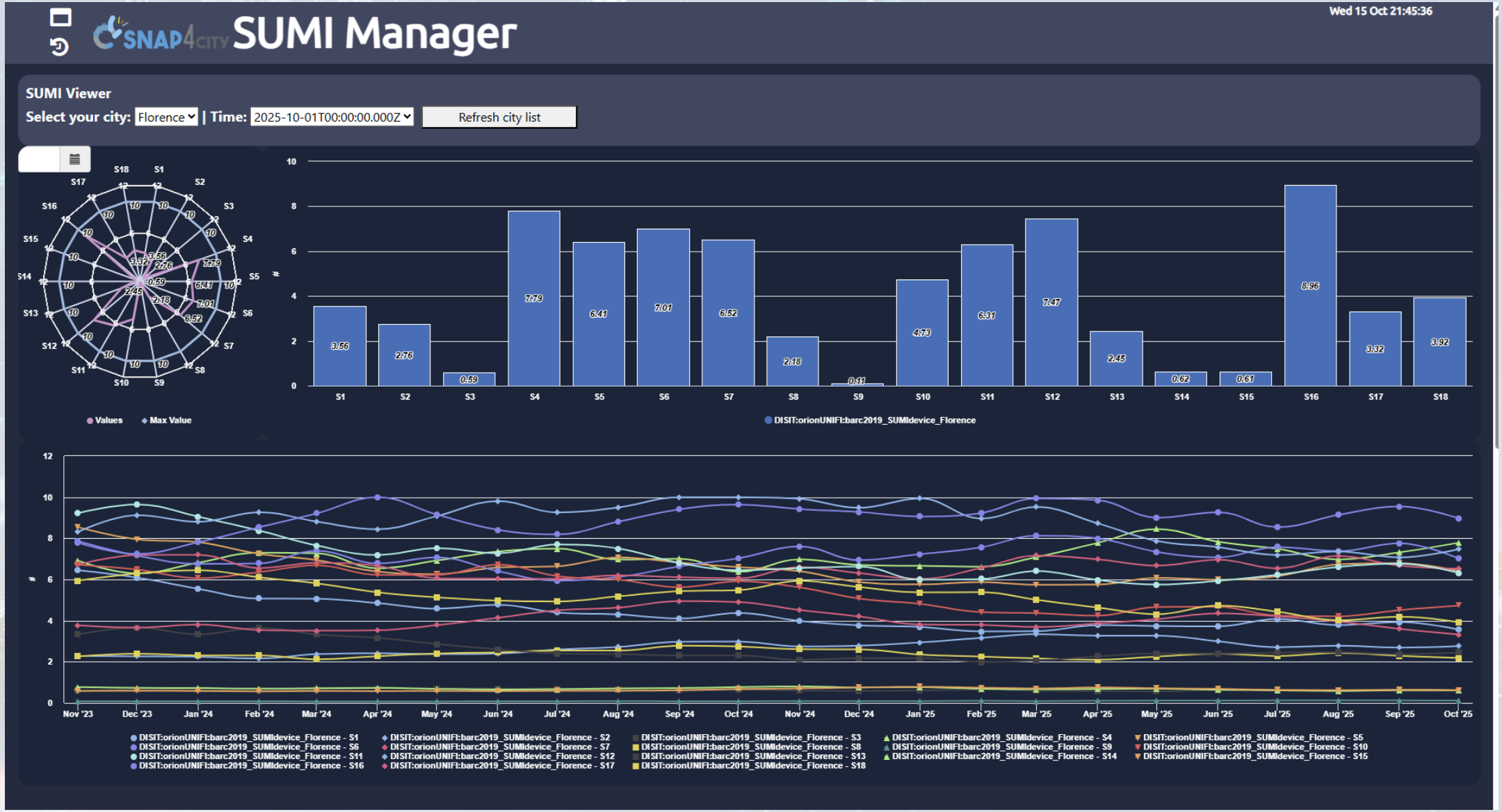
- Predictive maintenance
- Decisions Support Systems
- Process optimization, control
- Industry 4.0 integrated solutions
- AI assistant for commercial activities

- 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

(9/2025)

SUMI: Sustainable Urban Mobility Indicators



Control Room

Smart City Control Room
Florence Metropolitan City

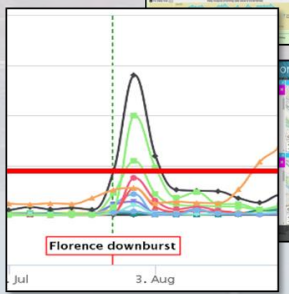
COMUNE DI FIRENZE

reference

SNAP4CITY

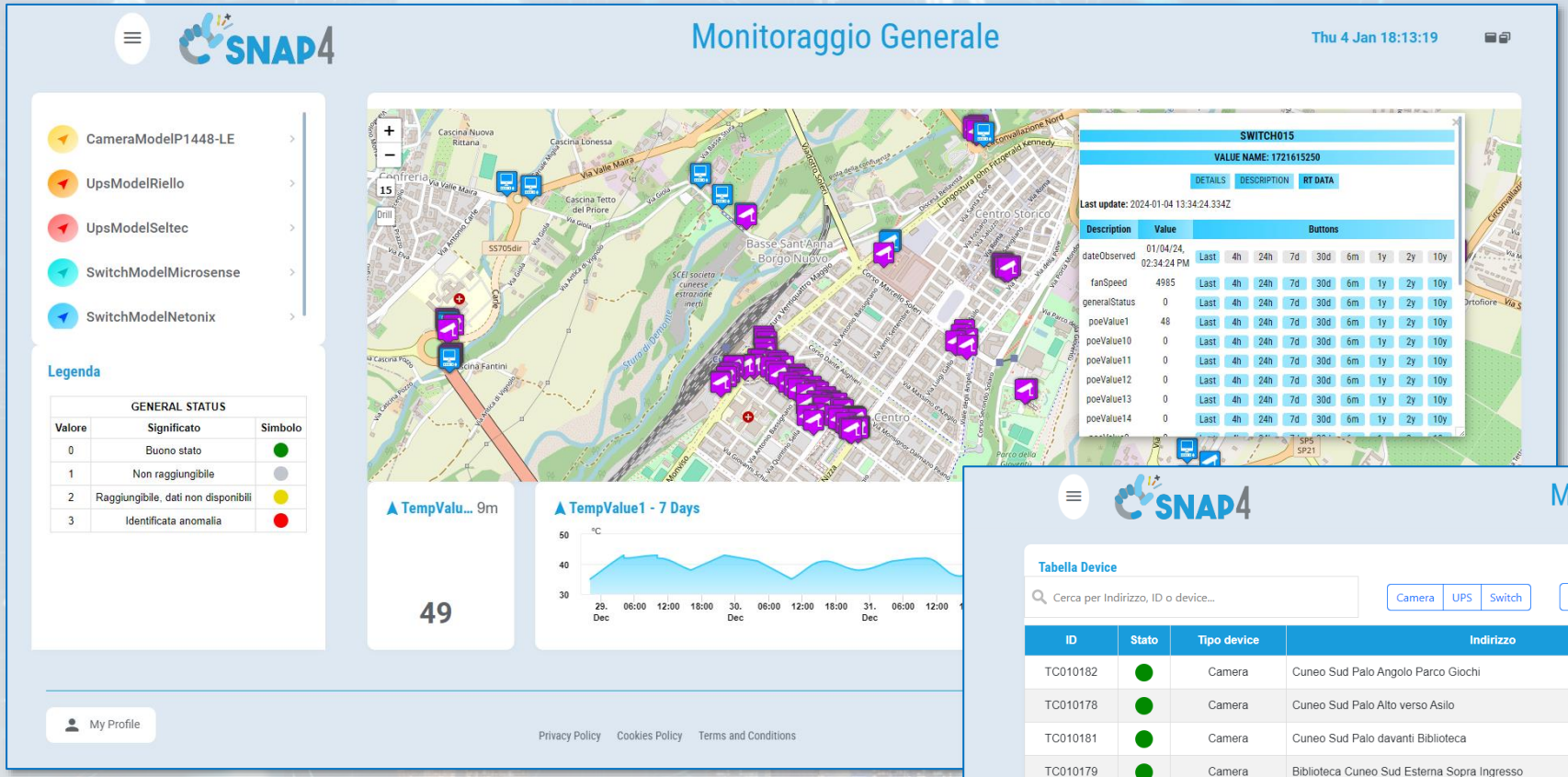
KM 4 CITY

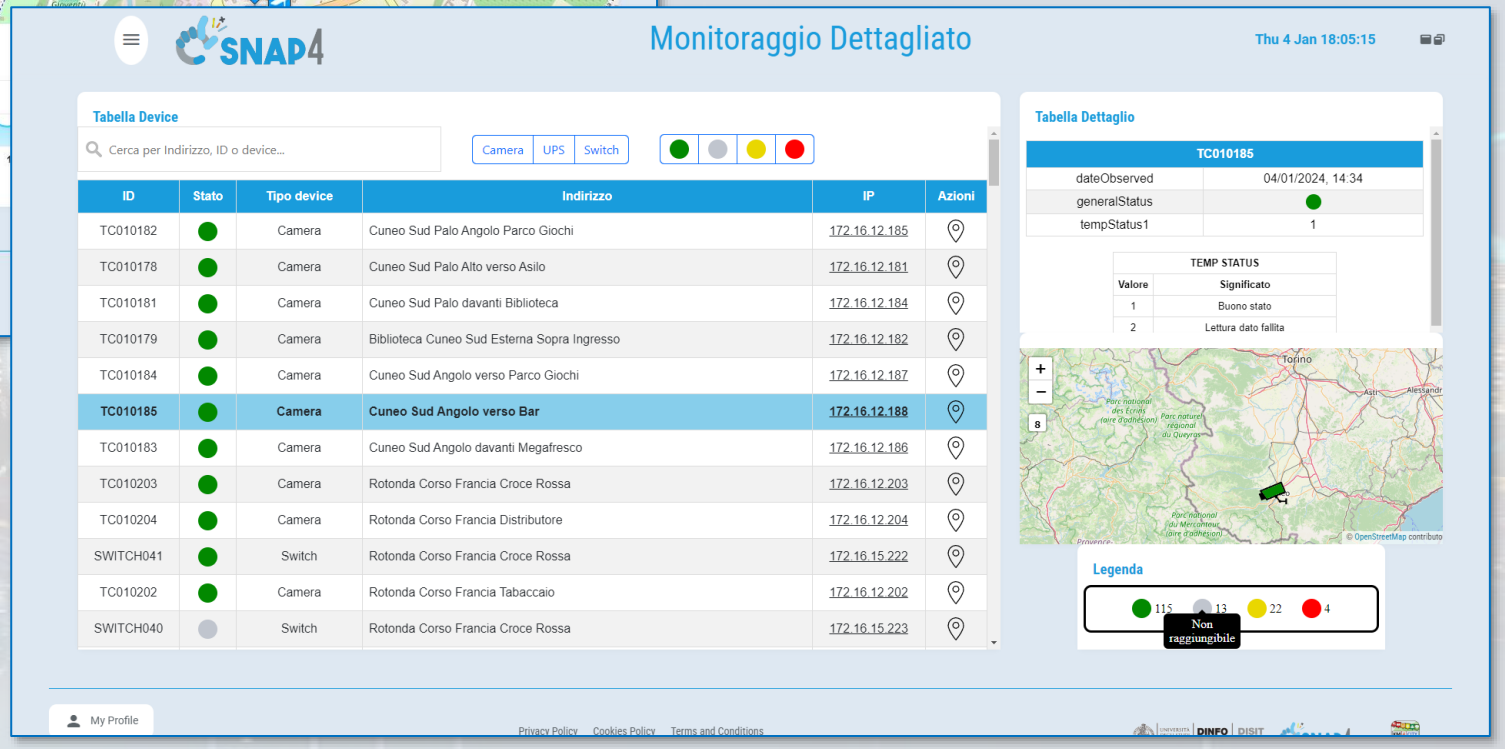
- **Multiple Domain Data**
  - Thousands of Open/Private data, POI, IOT, etc.
  - ***mobility and transport***: accidents, public transport, parking, traffic flow, Traffic Reconstruction, KPI, …
  - ***AND***: environment, civil protection, gov KPI, covid-19, social & social media, people flow, tourism,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



https://www.snap4city.org/747

Cuneo Assets' Monitoring, Safety



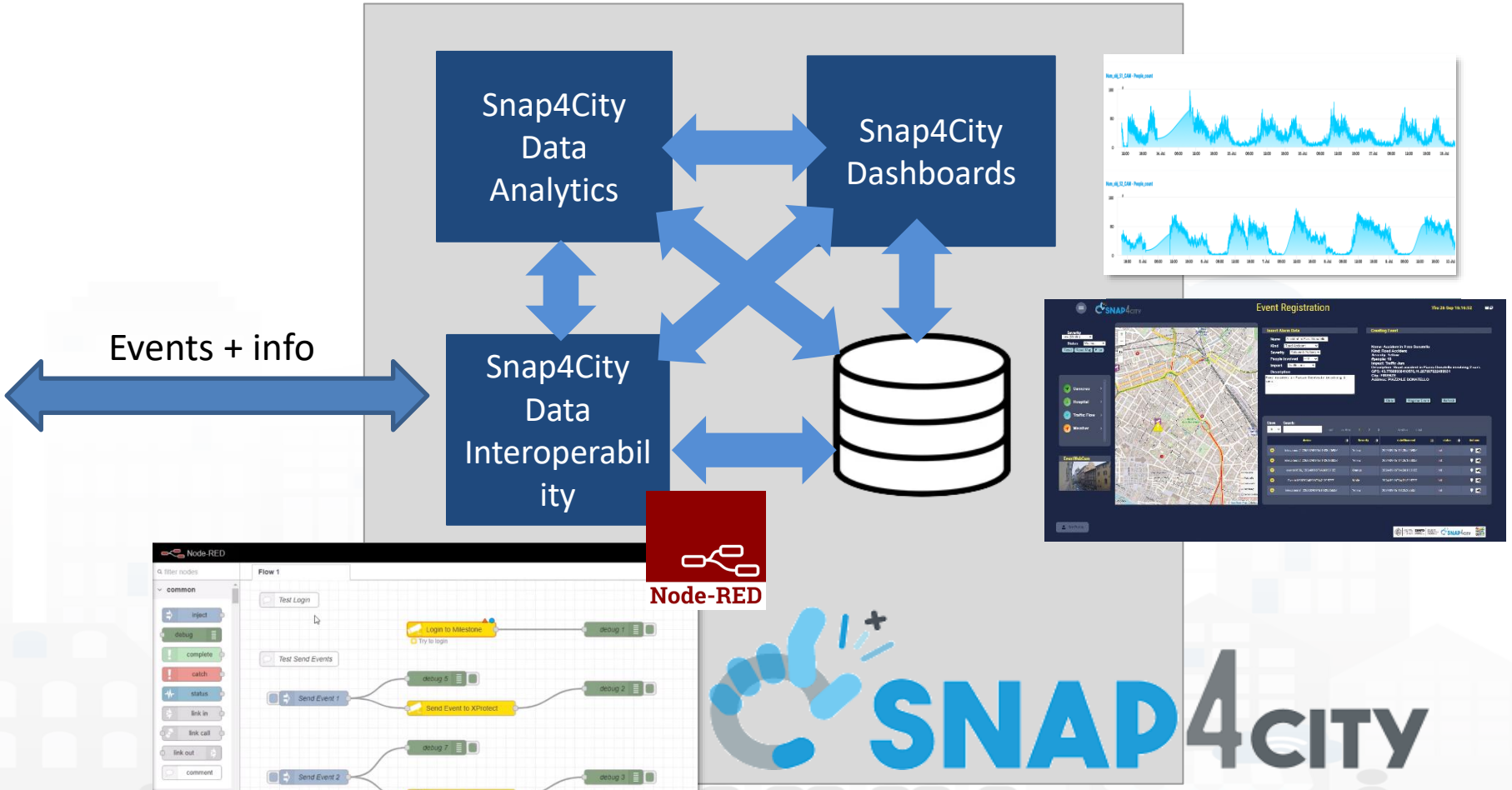


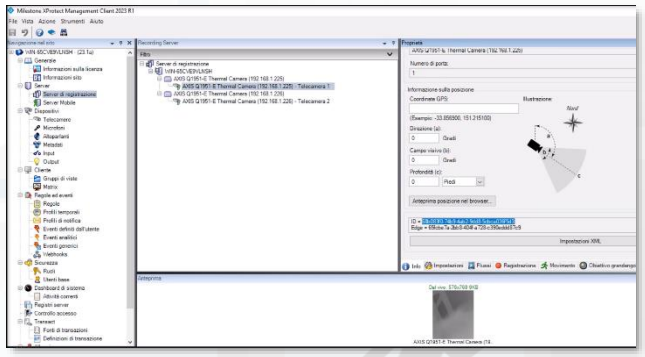
- More than 400 devices

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

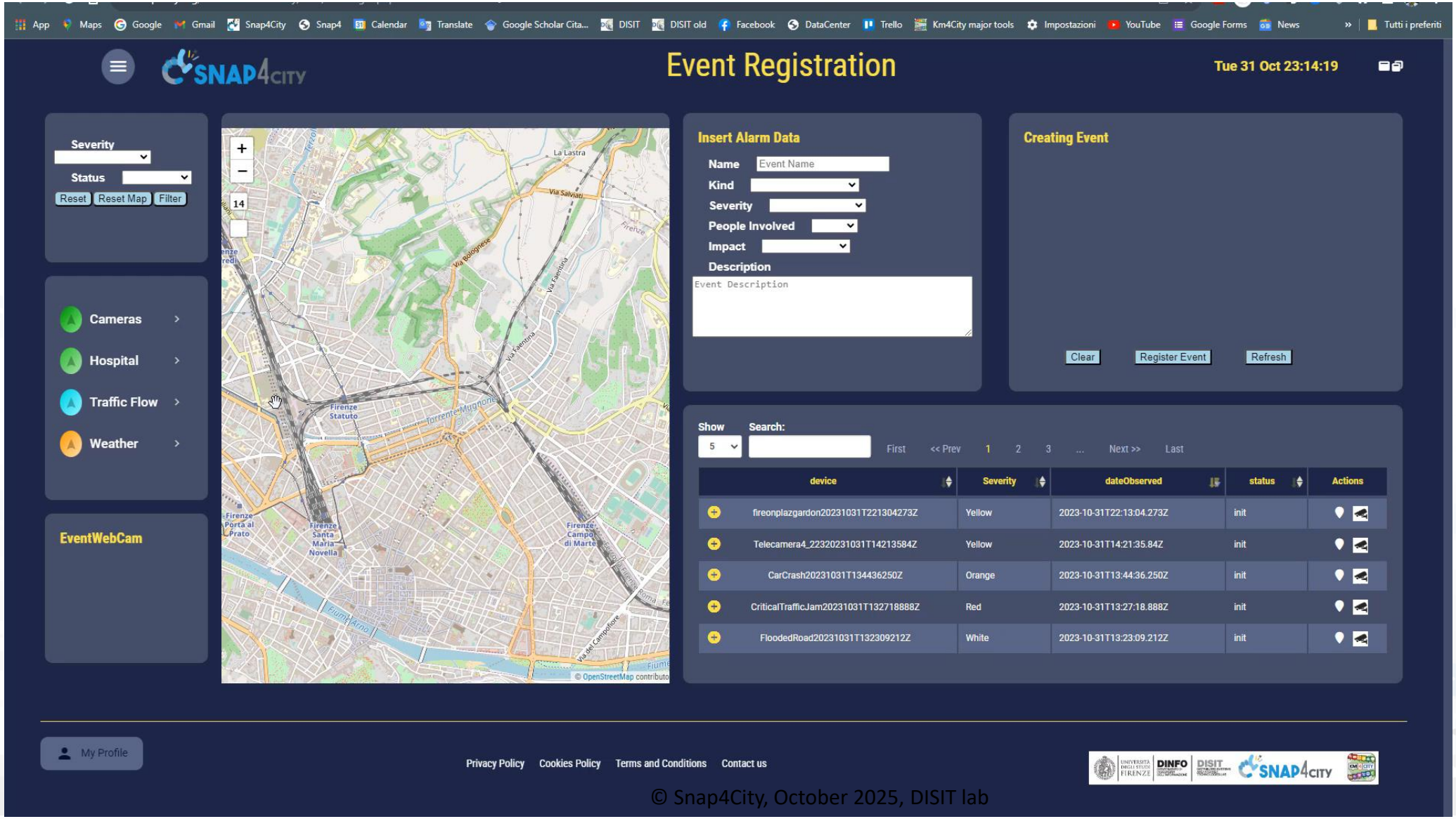
VMS vs Snap4City: sending and getting events, AI solutions

Events + info





Video Event Management



Mobility and Transport Goals

Decongestion

Safety

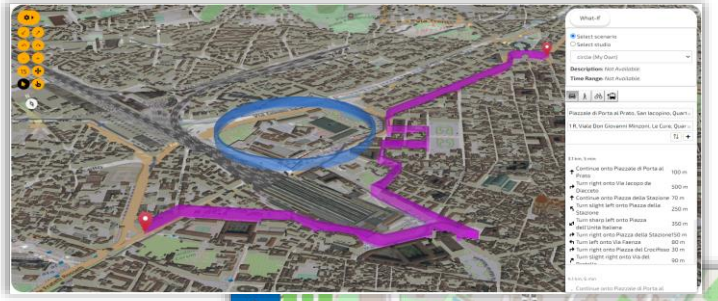
Accessibility

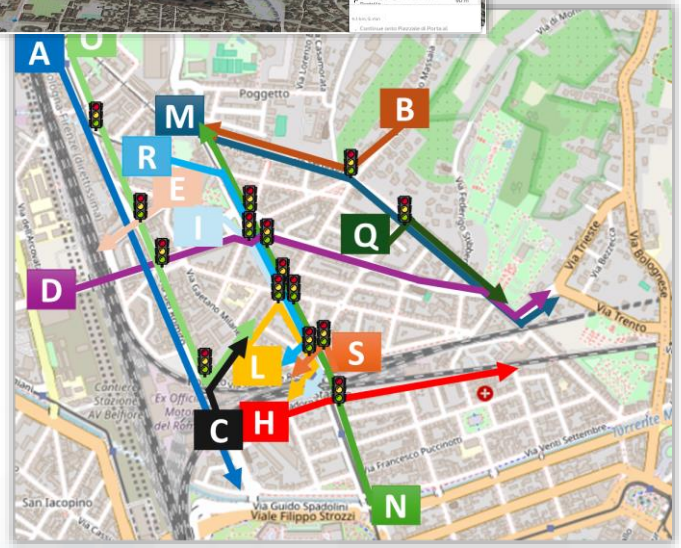
Cost Reduction

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

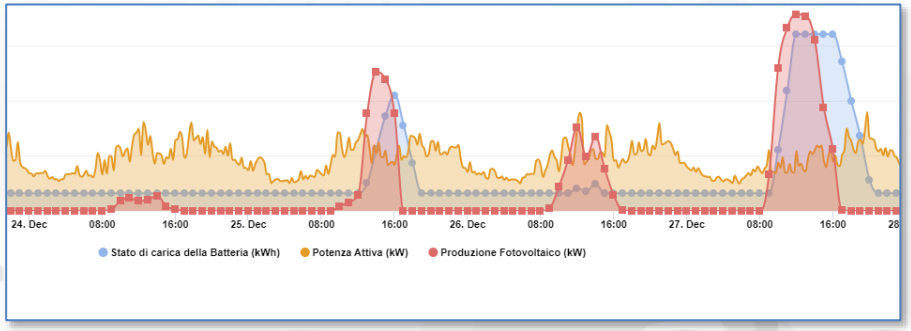
Goals

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

Goals

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, colleting 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, ..**

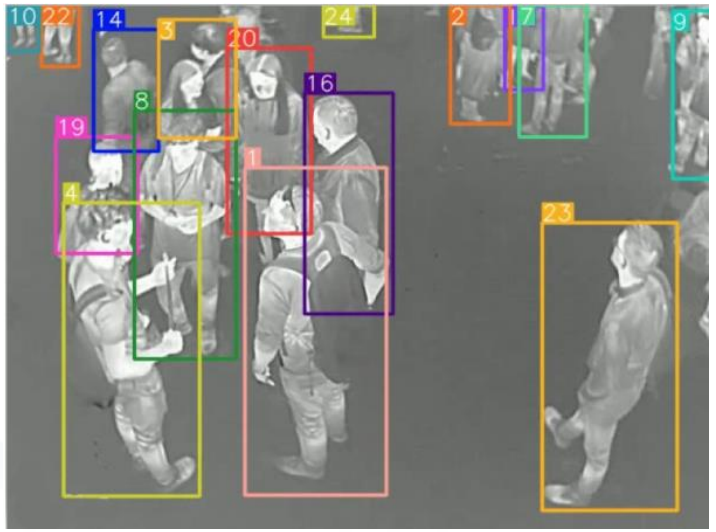
City Users' Services and Tourism Management

Goals

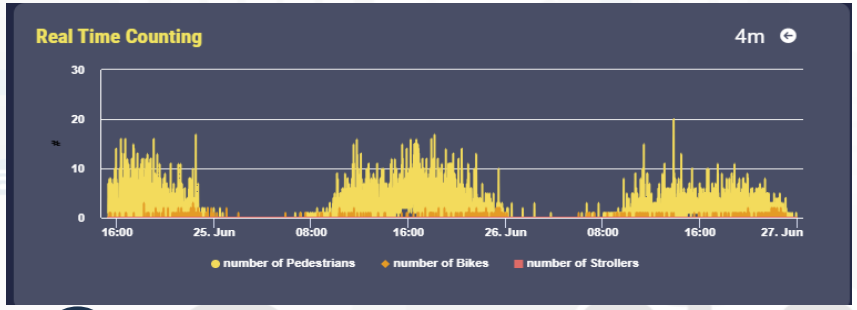
- Improve Quality of Life and quality of services,
- Over tourism mitigation, sustainability
- Costs reduction of services
- Improve accessibility to services: citizens, Tourists, commuters, etc.
- Improve Security/Safety of city users

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

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

www.snap4city.org

100% OPEN SOURCE

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KM4CITY

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Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

JS Foundation

EØ15 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

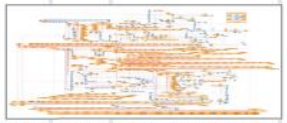
- DEVELOMENT ENVIRONMENT AND METHODOLOGY
- VISUAL PROGRAMMING, ML, AI, HPC
- TRAINING COURSES

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

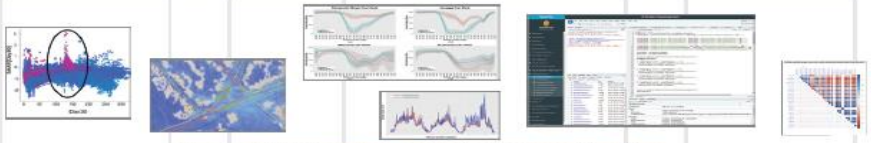
DASHBOARDS, WIDGETS
TEMPLATES

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



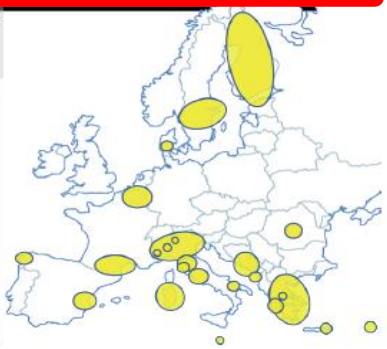
BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI
OPERATIVE RESEARCH, STATISTICS

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
- ...



SNAP4CITY

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

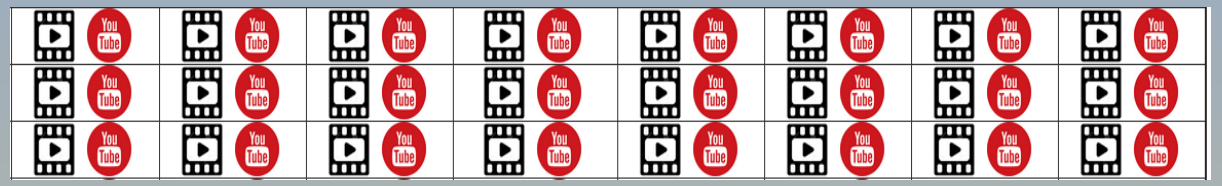
Come creo una dashboard?

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.

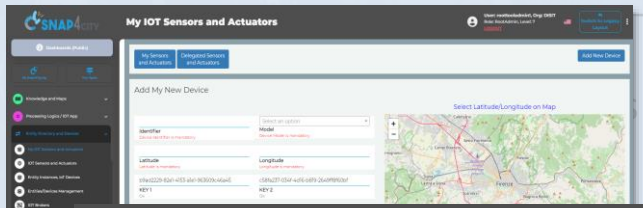
Write a message...

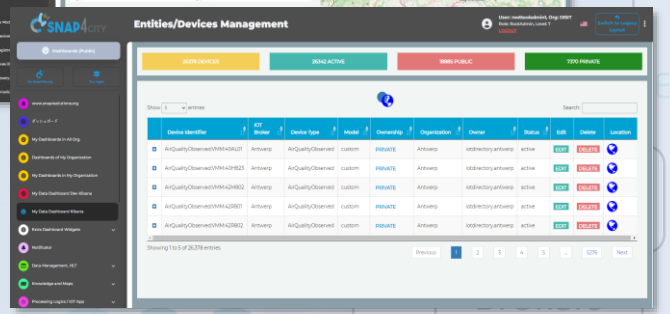
Developing on Snap4City

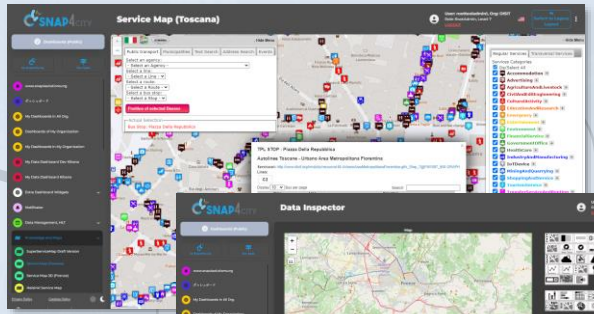
1st part	2nd part	3rd part	4th part	5th part	6th part	7th part	8th
Overview	Dashboards	IOT App, IOT Network	Data Analytics	Data Ingestion processes	System and Deploy Install	Smart City API: Web & Mob. App	Design and Develop Smart Solutions

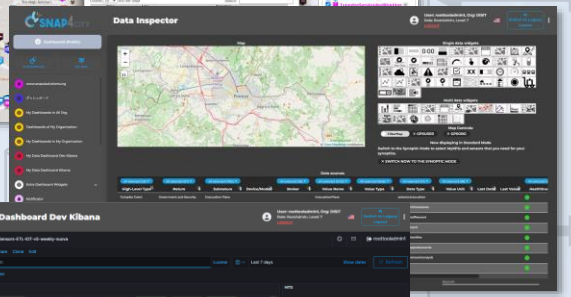


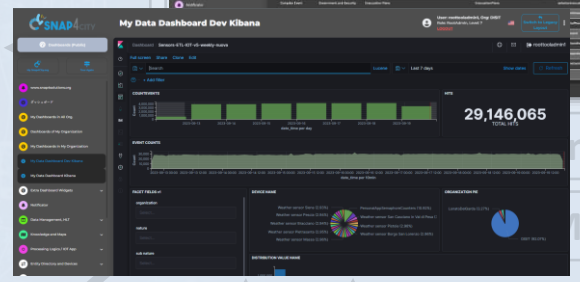
Visual Development Tools

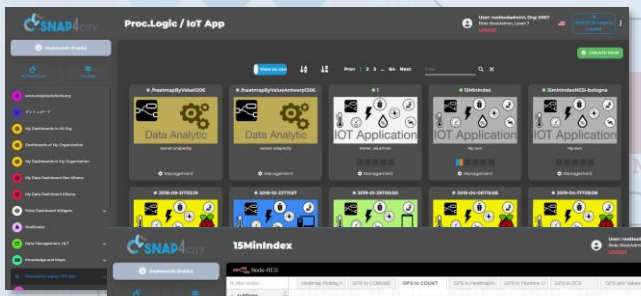


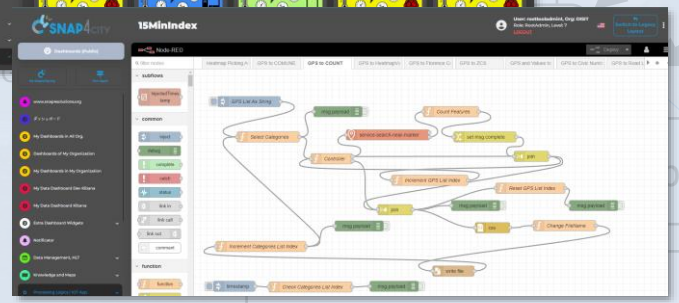


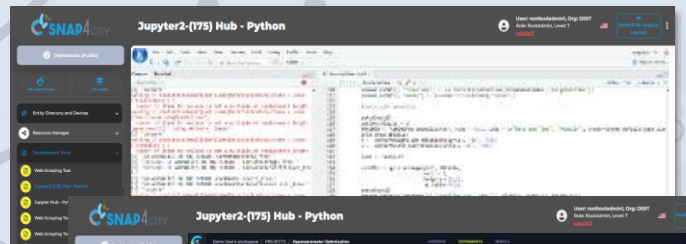


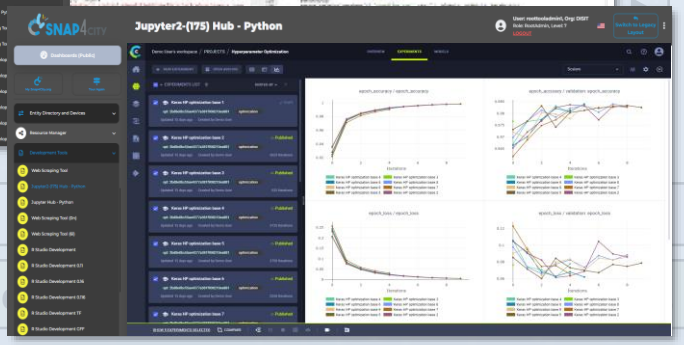


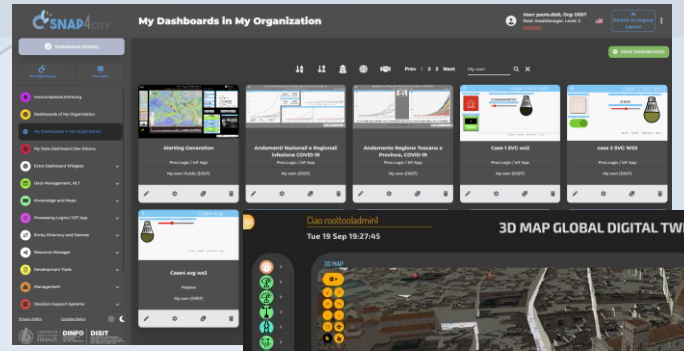


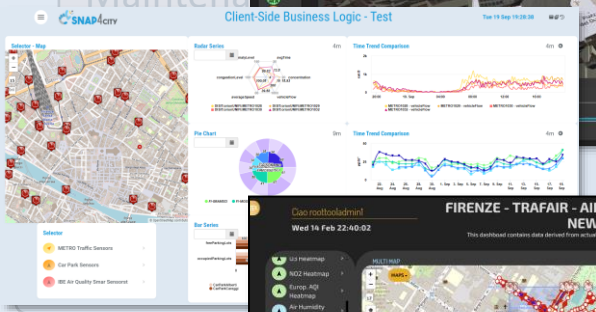


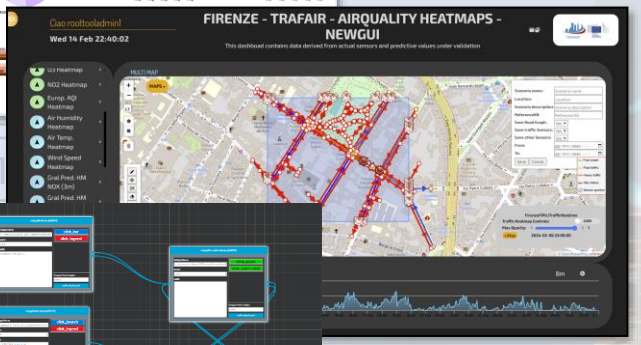


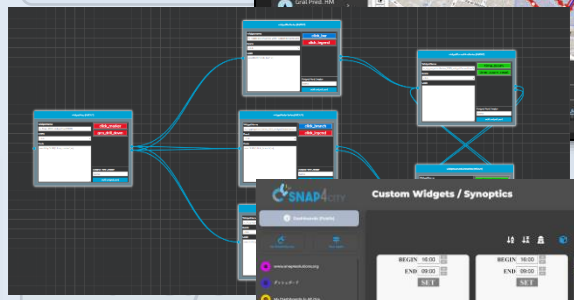




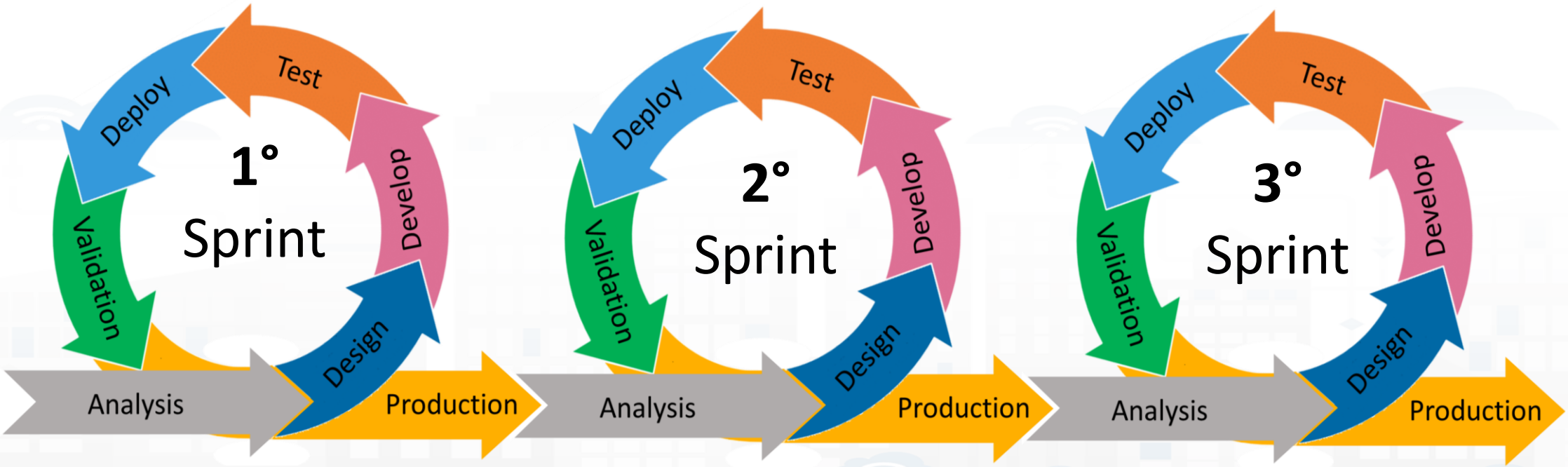




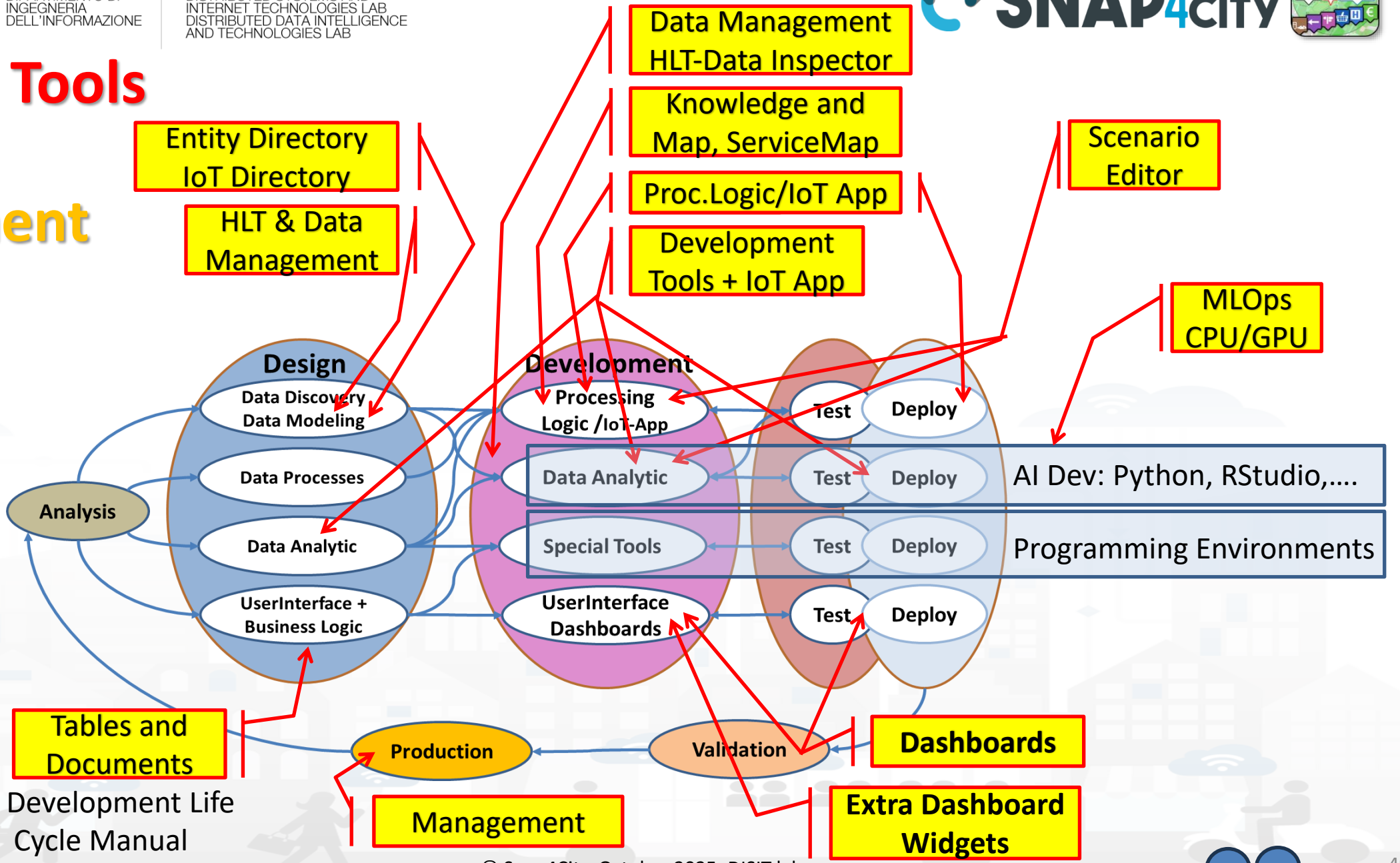




Agile Development Life Cycle by sprint Smart Solutions



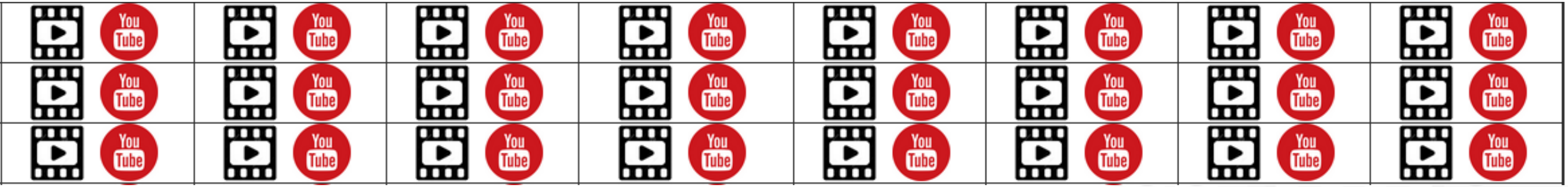
Snap4City Tools vs Development Life Cycle



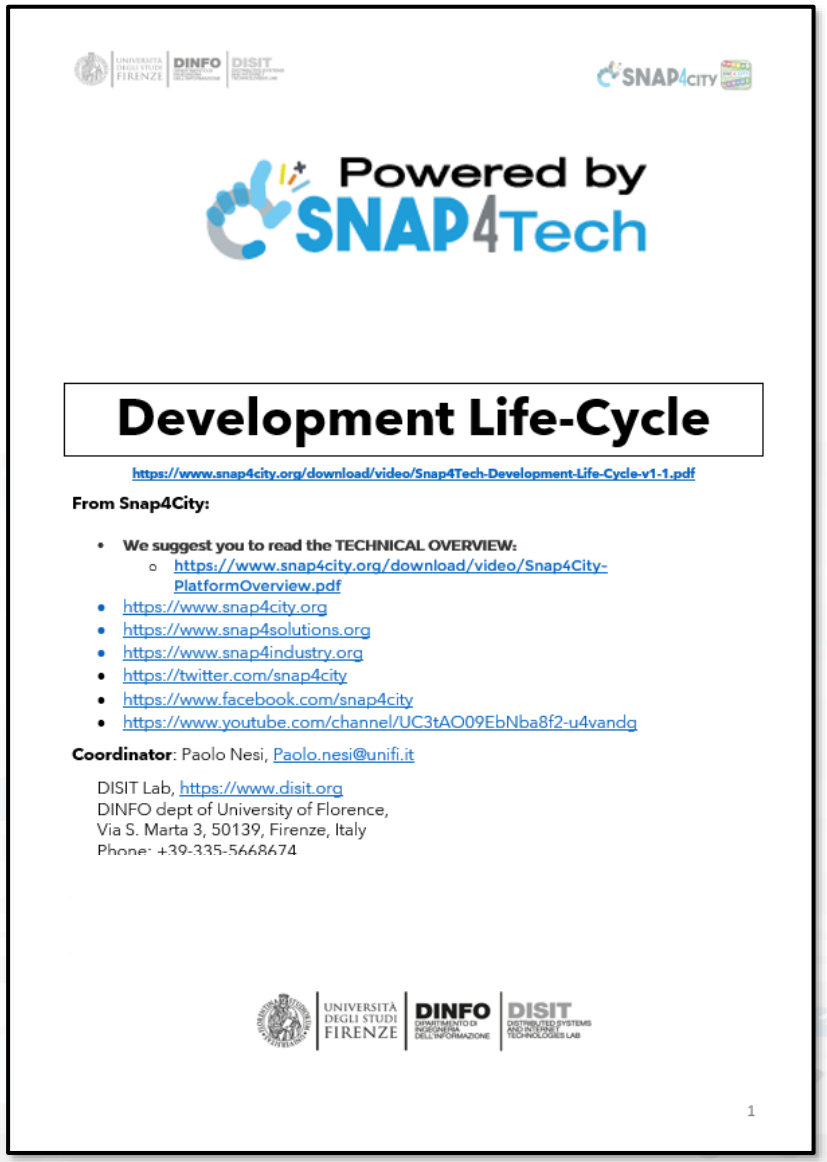
https://www.snap4city.org/944

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



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Development Life-Cycle

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

From Snap4City:

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

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

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

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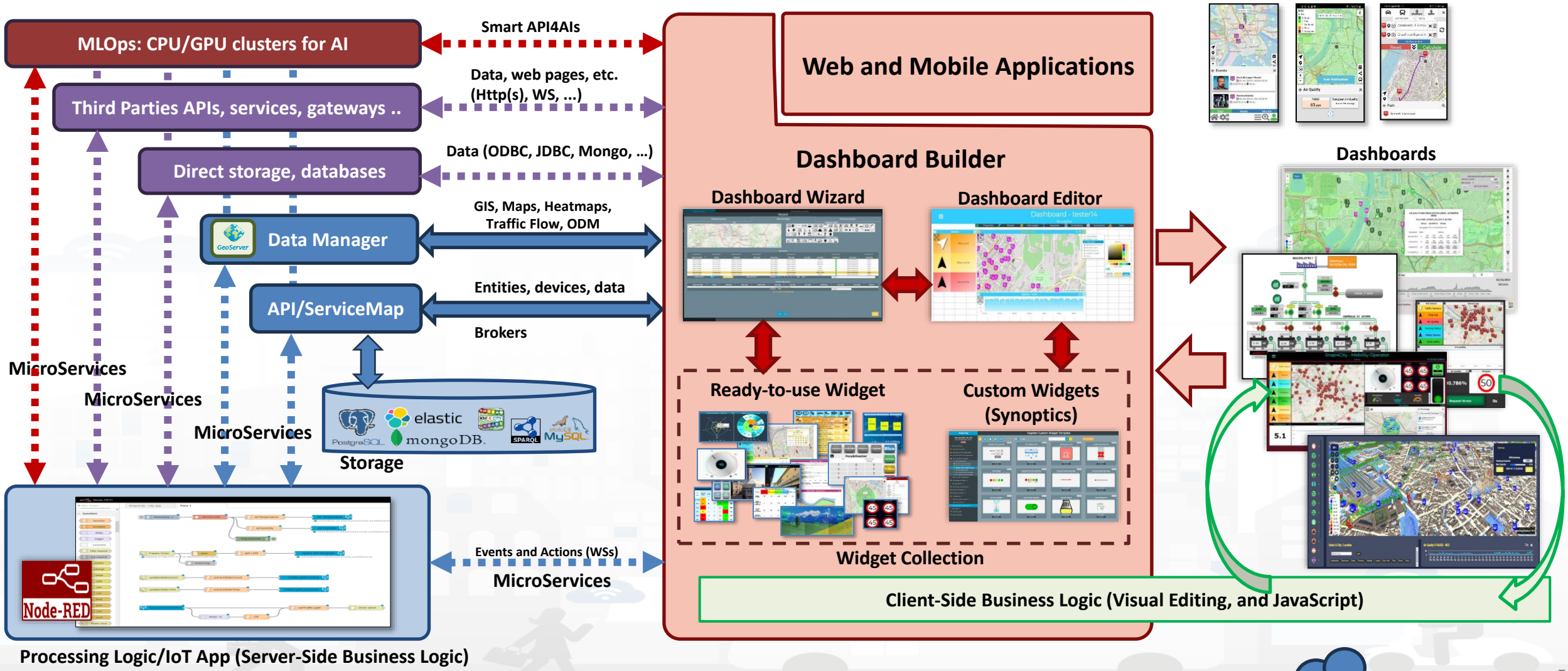
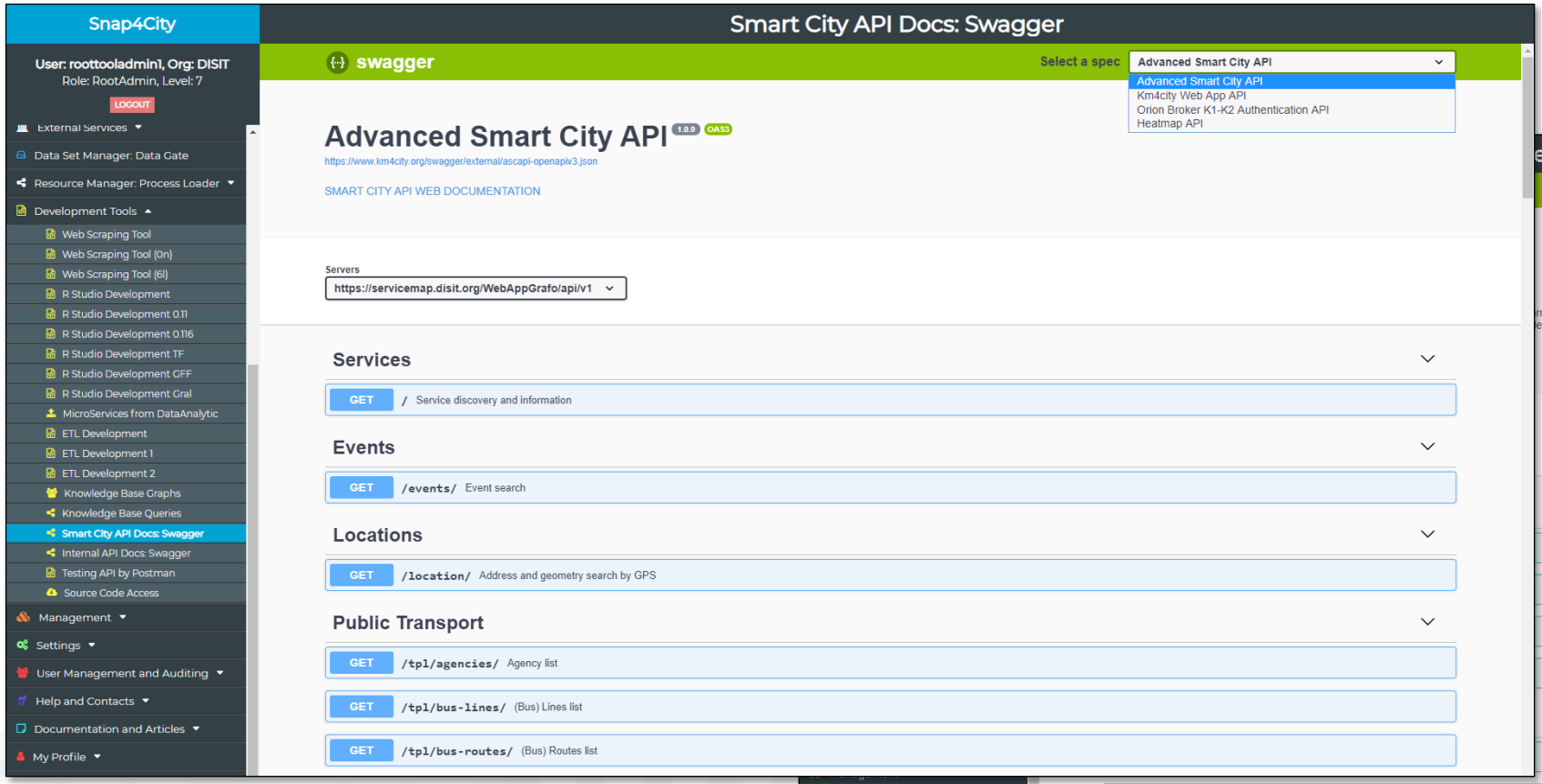
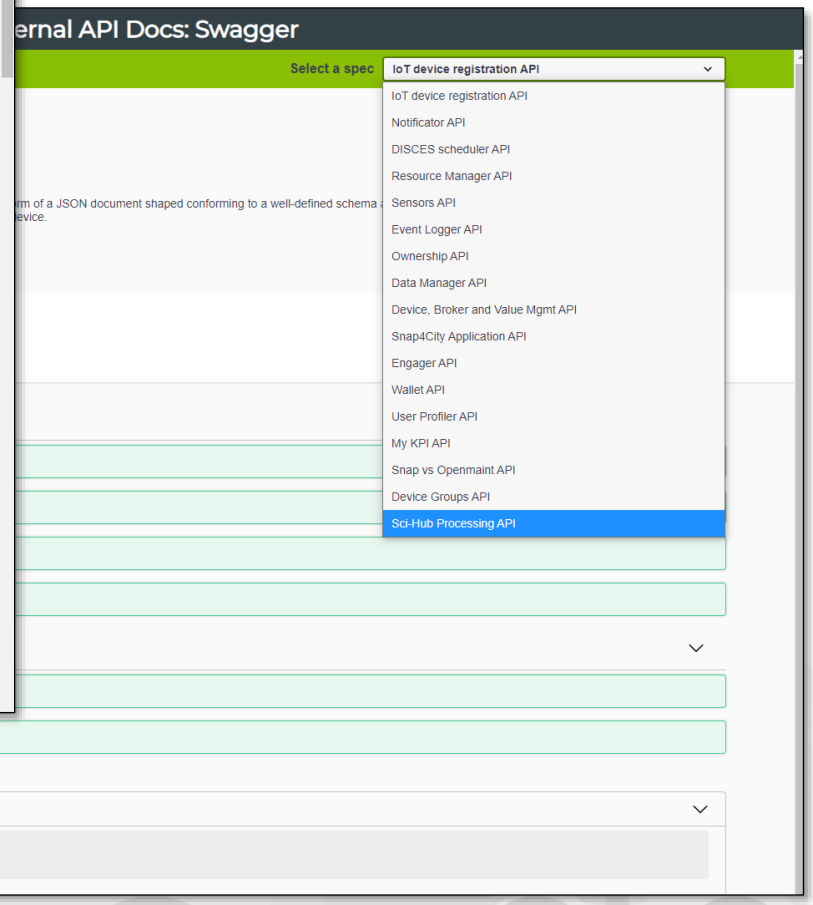
https://www.snap4city.org/download/video/Snap4Tech-Development-Life-Cycle.pdf

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



Internal and External Smart City API





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

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

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CONTACT

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

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

www.snap4city.org

Email: snap4city@disit.org

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

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