

# TOURISMO

TOURism Innovative and Sustainable Management  
of flows

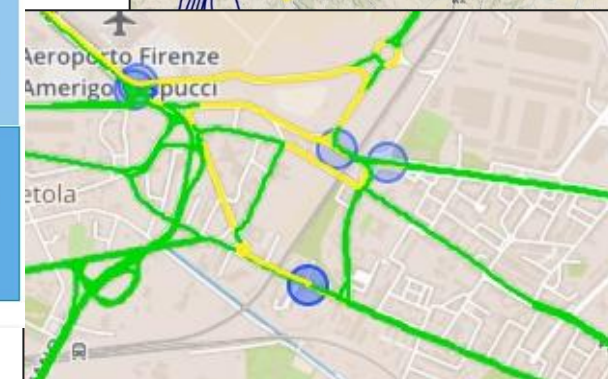
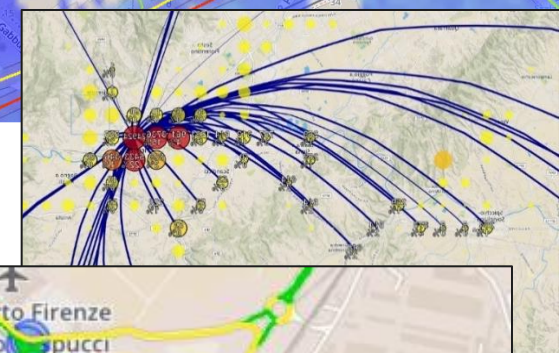
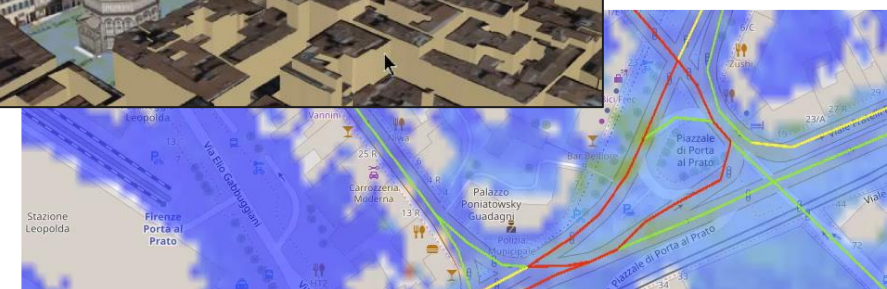
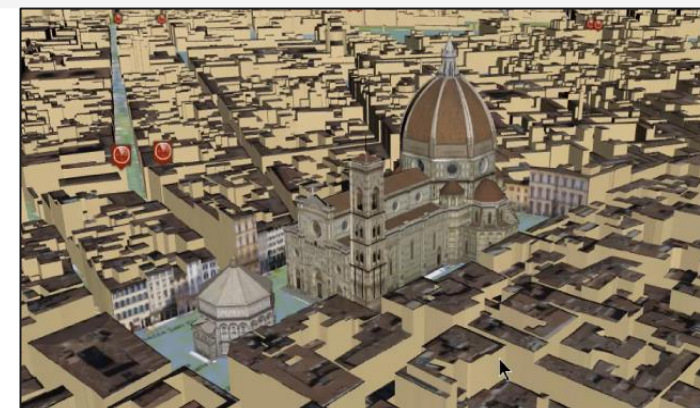
## Open Day on Valencia Pilot

Paolo Nesi, DISIT Lab/Snap4City  
*Università degli Studi di Firenze*  
[info@snap4city.org](mailto:info@snap4city.org)



# Main Tasks di un sistema cittadino

- **Controlling Status:** management, and operational
  - Monitoring via KPI
  - Computing predictions data from the field and KPI
  - Anomaly detection
  - Early warning on critical conditions
- **Making plan: tactic and strategic,** medium and long range
  - Optimisation: Prescriptions, suggestions
  - Risk assessment
  - What-if analysis on scenarios
    - Simulation and predictions
  - Resilience
- **Be ready for Unexpected Unknowns**





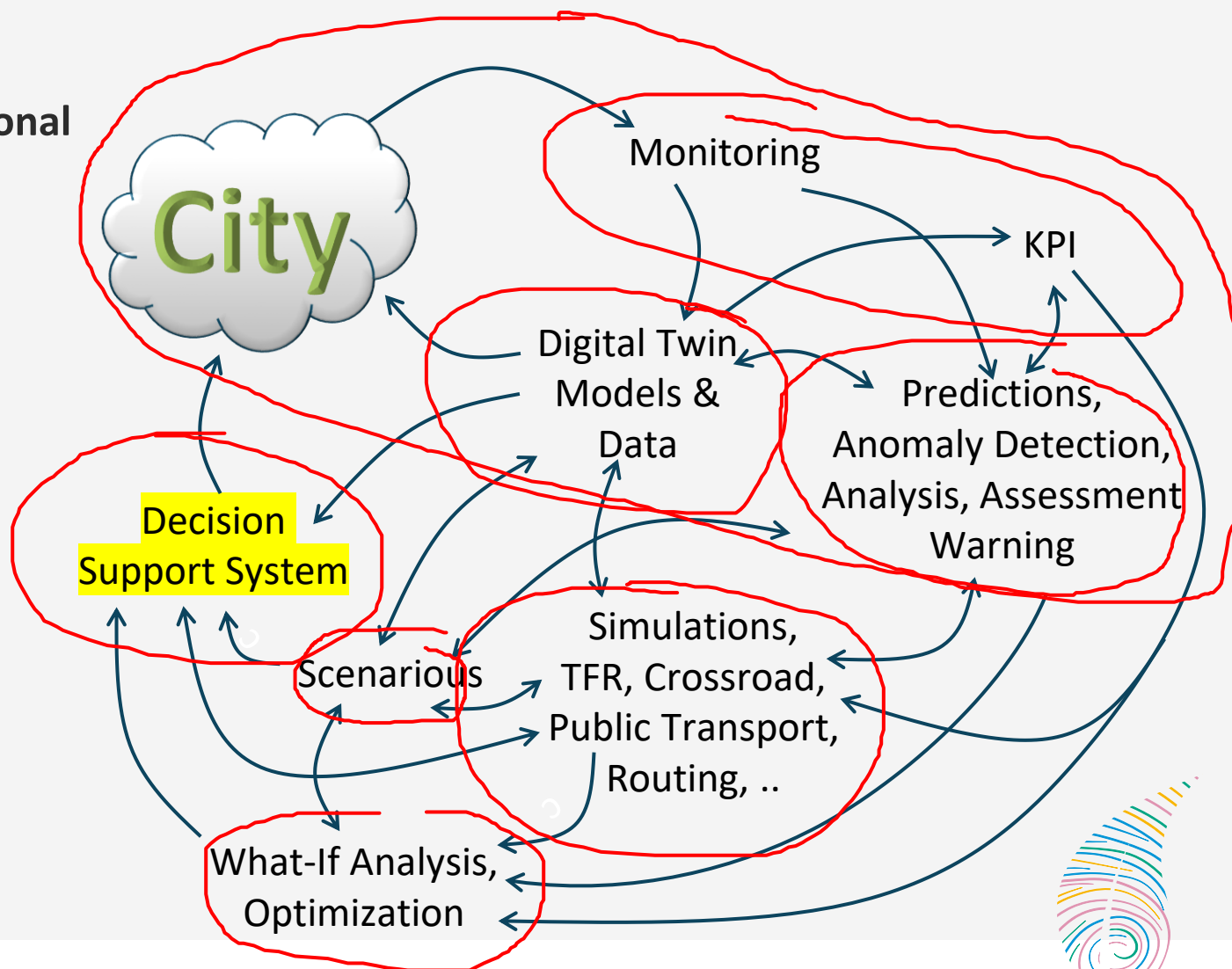
# Main tasks di un sistema cittadino

- **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







# Digital Twin

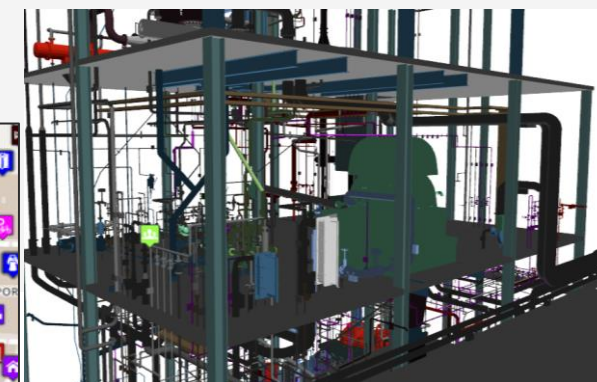
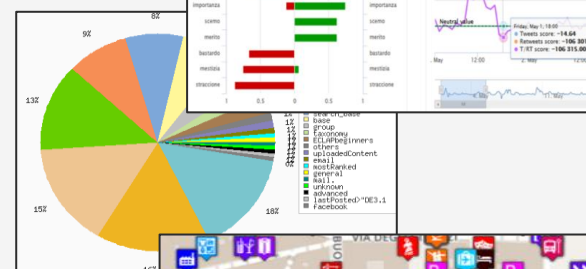
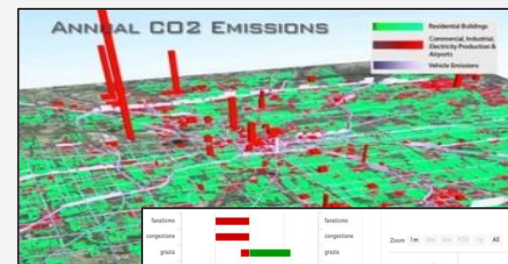
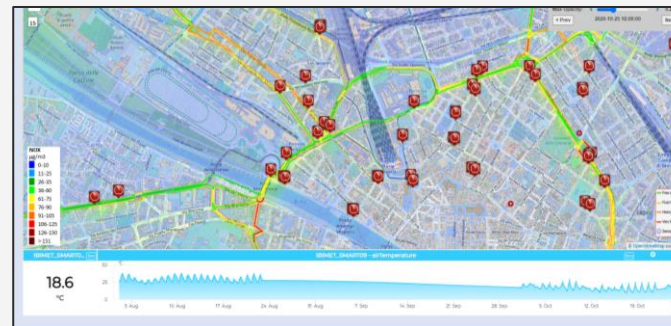
## • Digital Twin

- **Connected** with real systems
- **Modelling** aspects: structural, visual, informative, real time data sensors (context), POI, functional, resources, etc.
- **Analytics:** AI/XAI techniques, simulations, users' needs, etc.

## • Easier to understand the context, review from multiple points of view

## • Useful to perform

- Discussion with city users
- Support decision makers
- By Case Experiments for analysing
  - New solutions, impact of disaster (natural and provoked)
  - Reduction of costs in the analysis, in reduction of mistakes







# Digital Twin Solutions for Sustainability

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

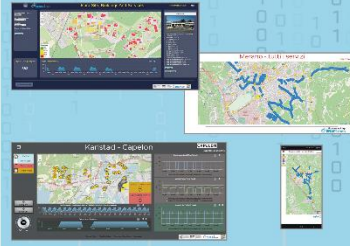
## HORIZONTAL AI PLATFORM



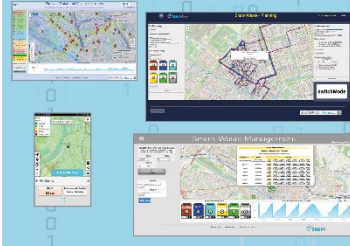
## MOBILITY AND TRANSPORT



## SMART ENERGY AND SMART BUILDING



## ENVIRONMENT AND WASTE MANAGEMENT



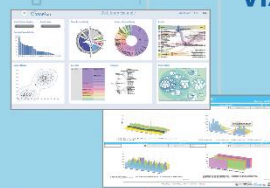
## CITY USER'S SERVICES AND TOURISM MANAGEMENT



- DEVELOPMENT ENVIRONMENT AND METHODOLOGY
- VISUAL PROGRAMMING, ML, AI, HPC
- TRAINING COURSES
- LIVING LABS
- GUI CUSTOM STYLES
- FULL APPLICATIONS, DASHBOARDS AND VIEWS
- MOBILE APPS



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



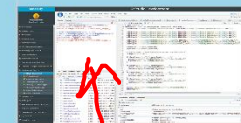
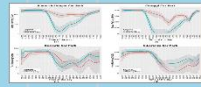
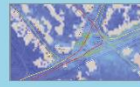
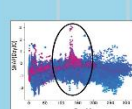
DASHBOARDS, WIDGETS  
TEMPLATES

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

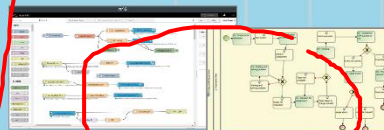
API - MICROSERVICES - GIS - BPM  
VIDEO - REPORTS - MAPS - 3D ...



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

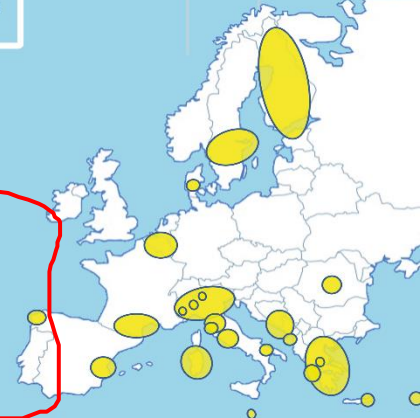


BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE  
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI  
OPERATIVE RESEARCH, STATISTICS



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

FULL INTEROPERABILITY, ANY: DATA, BROKERS, NET WORKS AND VERTICALS



Powered by  
FIWARE

FREE  
TRIAL

PEN Test  
Passed

EU GDPR  
COMPLIANT

SNAP4  
Appliances and Dockers  
Installations

EUROPEAN OPEN  
SCIENCE CLOUD

Node-RED

JS Foundation

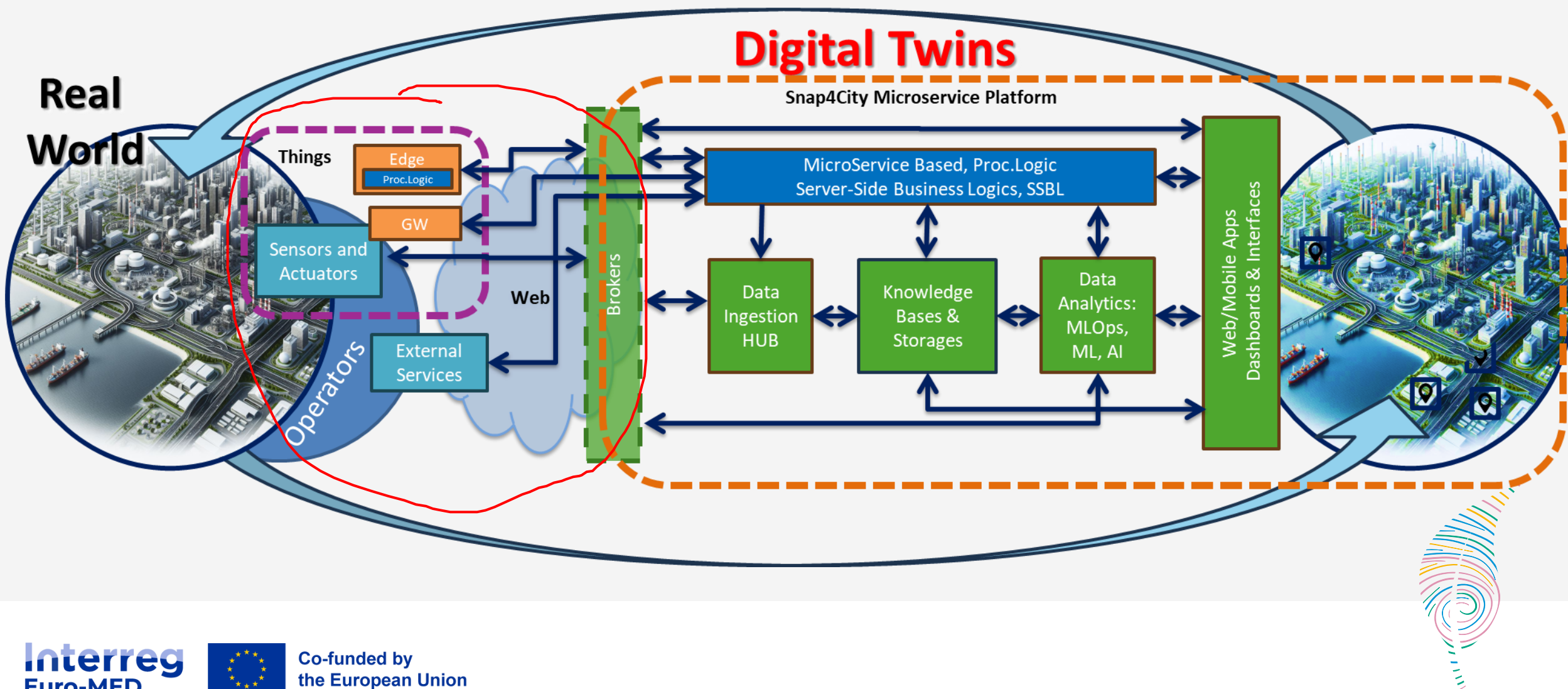
E015  
digital ecosystem

NVIDIA





# Digital Twin Development Platform

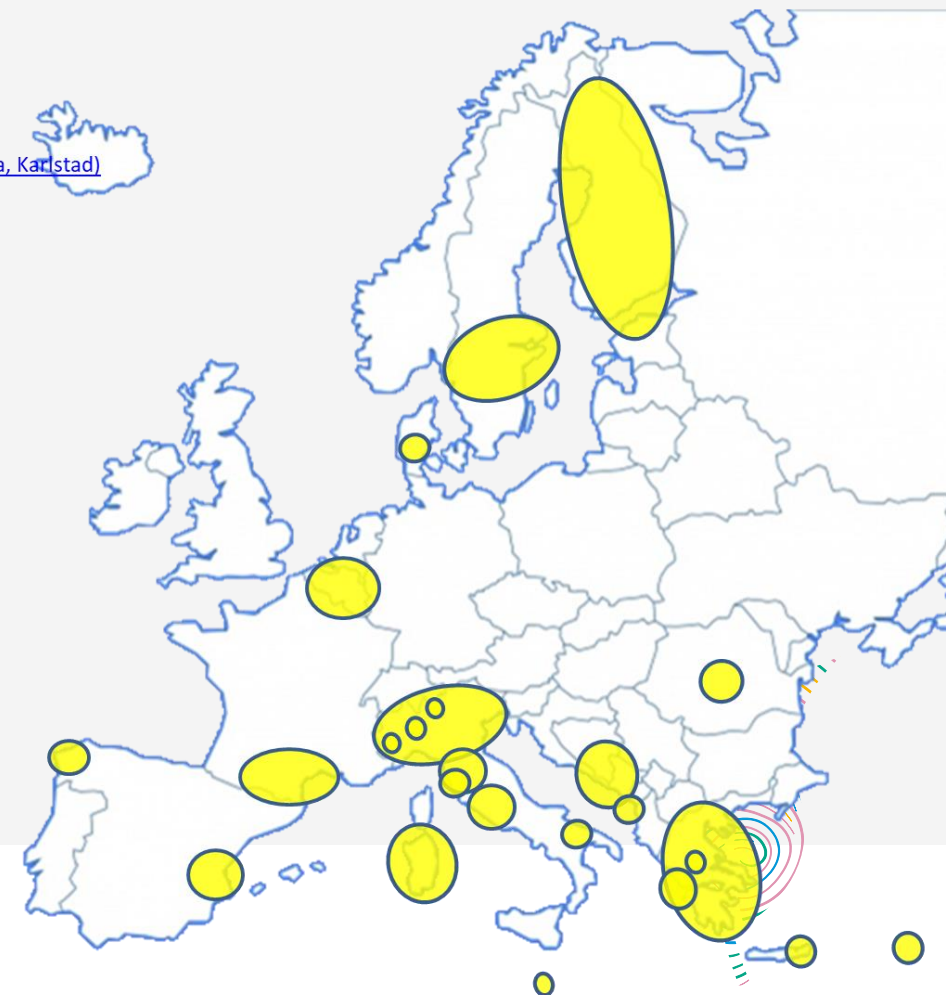




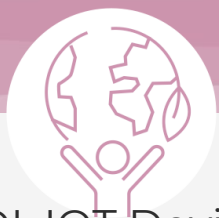
- 11 running installations in Europe
  - Snap4.city.org, Greece, Merano, Cuneo, ...
  - Toscana, Pisa, Sweden, ISPRA, Snap4.eu,
  - Altair, Italmatic, Romania, ....
- 18 projects, 12 pilots on 10 Countries
  - >40 cities/area
- **Widest MULTI-tenant deploy has**
  - 26 Organizations / tenant
  - > 9200 users
  - > 1800 Dashboards and applications
  - > 17 mobile Apps
  - **> 2.4 Million of structured data per day**
  - > 600 IoT Applications/node-RED
  - > 750 web pages with training
  - > 75 videos, training videos

#### Main Organizations/areas

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

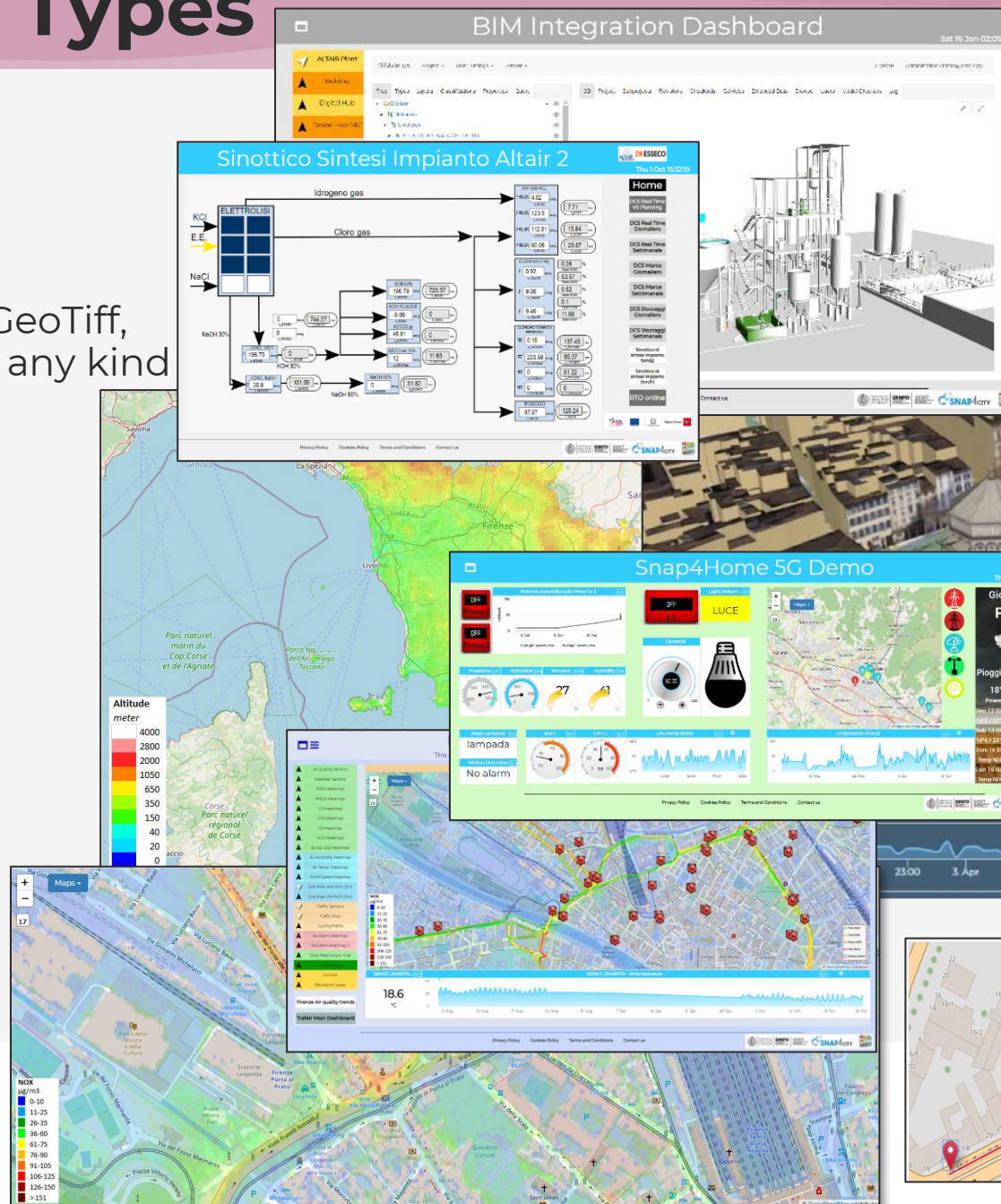






# High Level Types

- 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, ..
- trajectories, events, Workflow, ..
- 3D Models, BIM, Digital Twins, ..
- OD Matrices of several kinds, ..
- Dynamic icons/pins, ..
- Synoptics, animations, ..
- KPI, personal KPI,..
- social media data, TV Stream,
- routing, multimodal, constraints, ..
- decision scenarios, ....
- etc.





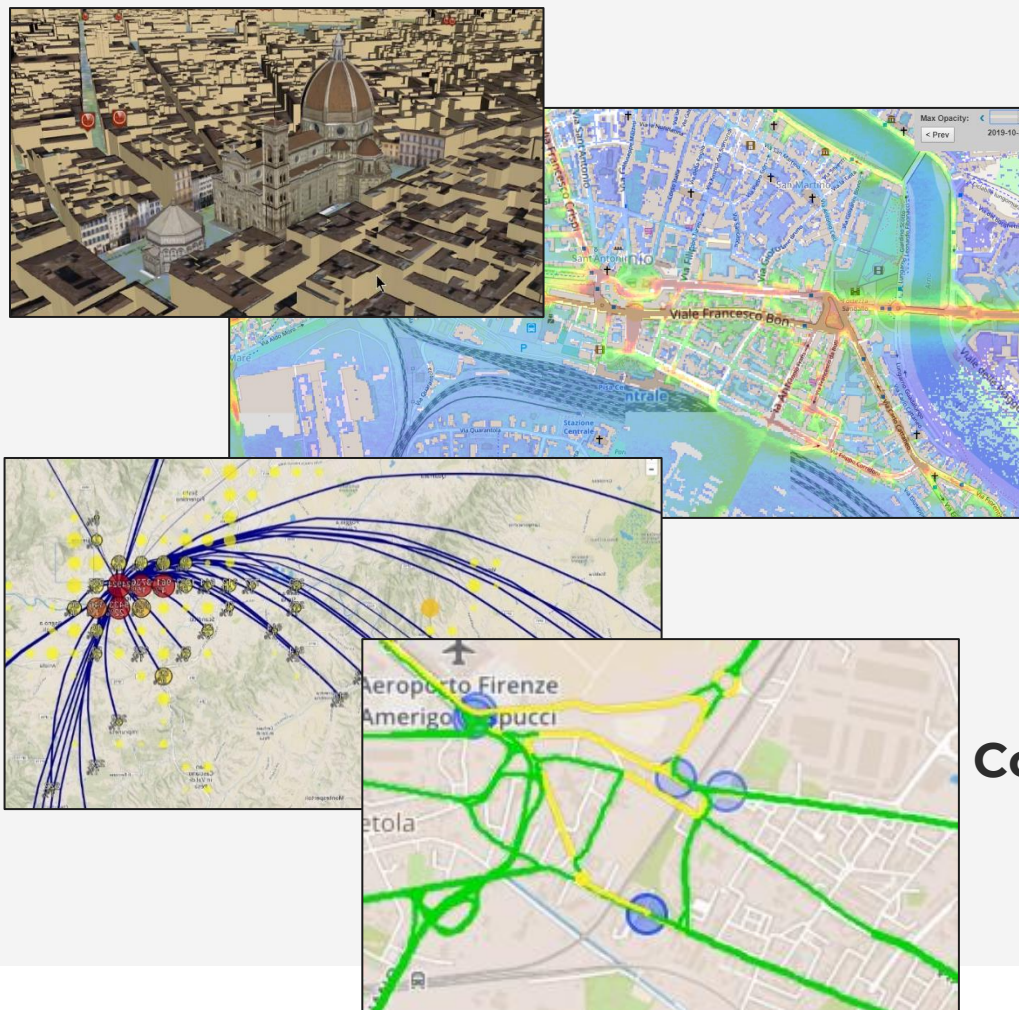


## City Digital Model with...

- 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

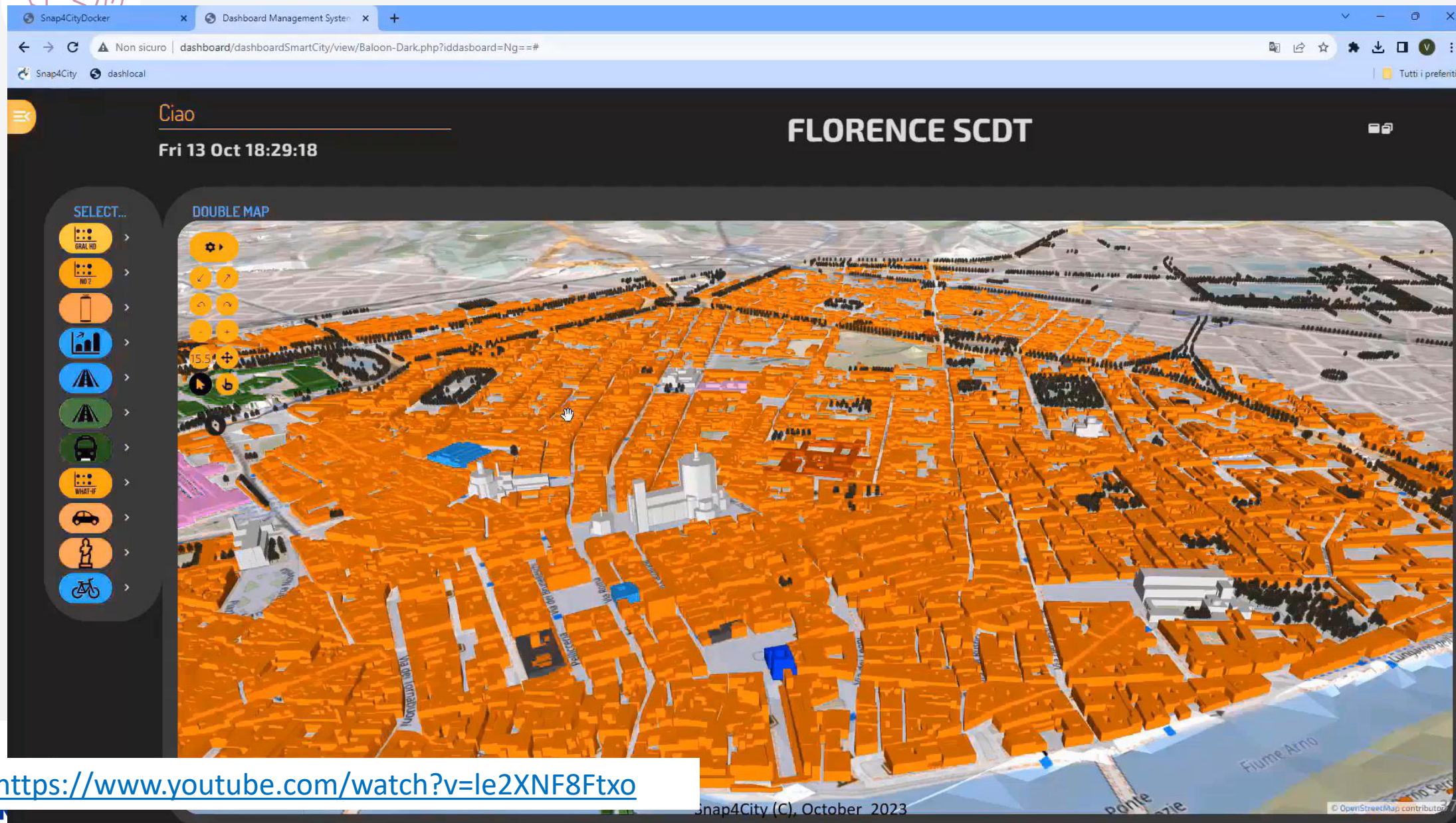
- GIS, ITS, AVM, IoT, BIM, CKAN, etc.
- Satellite services
- MaaS, last-mile delivery HUBs
- etc.







# 3D Digital Twin





# 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)

# 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, simulations, what-if, optimization; Deep Learning, ML, BERT, LLM, XAI (Shap/Lime),
  - **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
- **Mobile App:** modular applications, operators' modules, multiple cities, etc.
- **Participatory:** problem reporting, ticketing, etc.
- **Integration of any kind**



# Mobility and Transport

# Goals



Decongestion



Safety



Accessibility



Cost Reduction

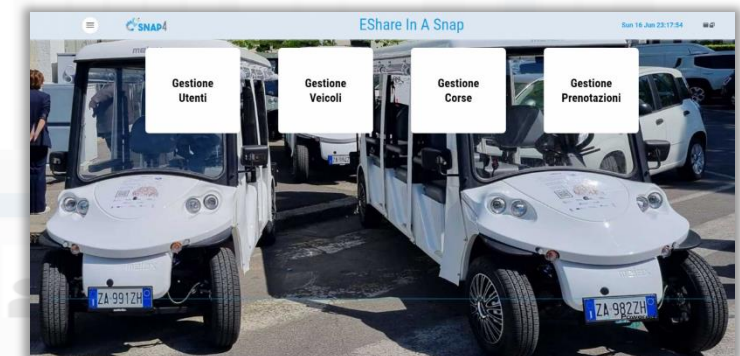
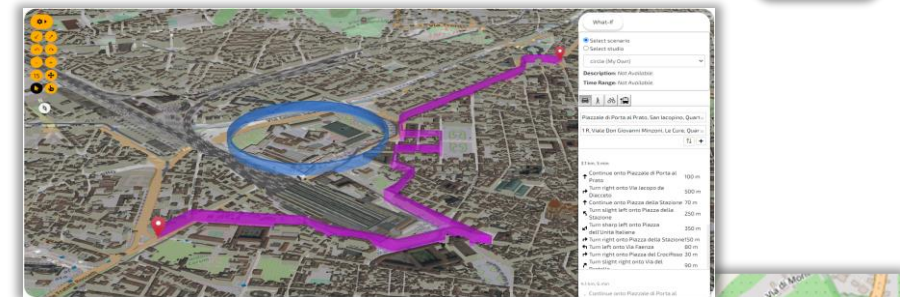


Decarbonization



# 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, infrastructure**
  - **Reduction:** travel time, waiting time, stops, CO2 emissions, consume fuel, travel time for tramways
- **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.

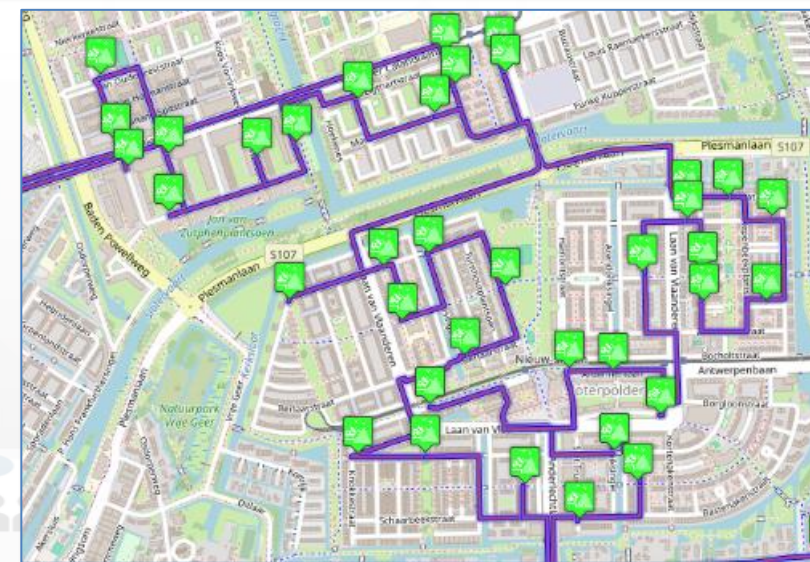
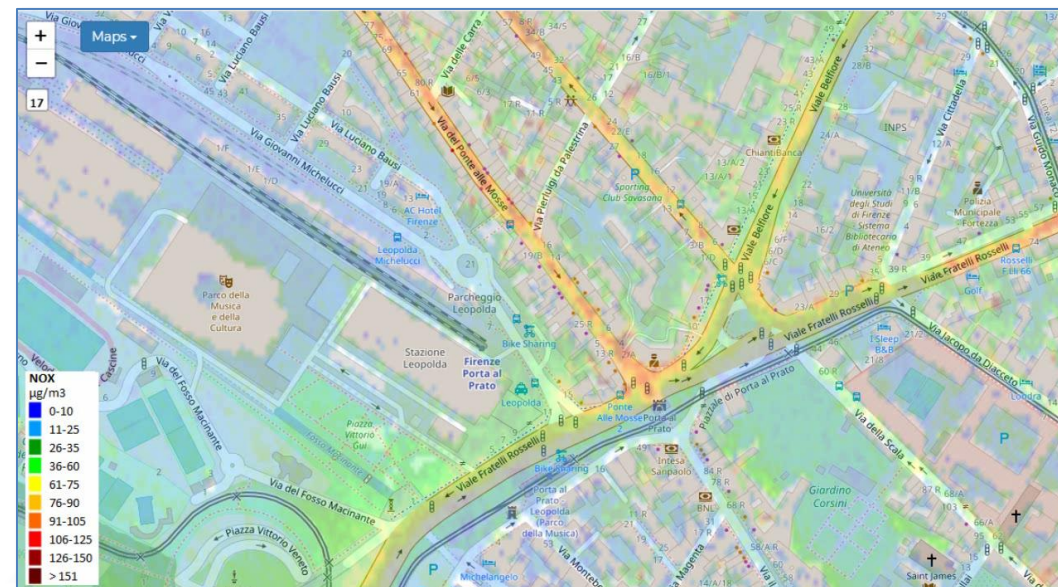






# Environment and Waste

- **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 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

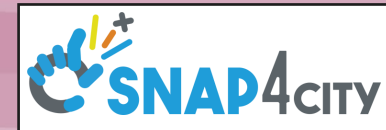
# Goals

## *Actions:*

- *TOURISMO Interreg*
- Herit-Data Interreg
- *SADI-MIAC, regional on retail*
- Feedback, regional on retail



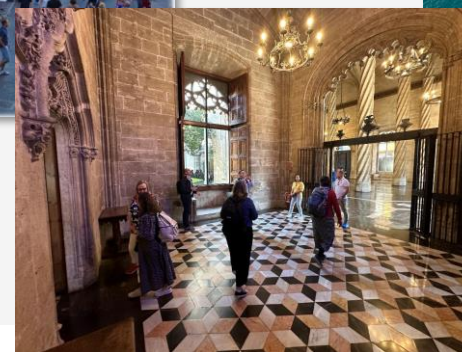
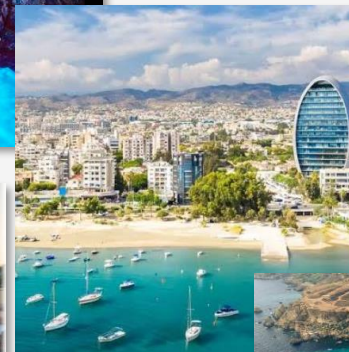
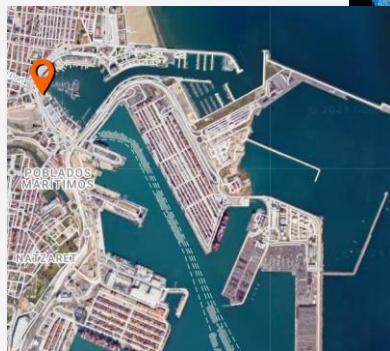
# TOURISMO data integration into Snap4City



## Snap4City is the reference platform for TOURISMO

Integration of different technologies and data source  
from 8 pilots:

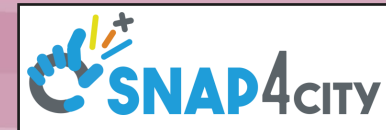
- Bisevo, Croatia
  - Florence, Italy
  - Limassol, Cyprus
  - Golden Bay, Malta
  - Rhodes, Greece
  - Valencia La Lonja and City Museum, Spain
  - Port of Valencia, SpainVarna, Bulgaria
- Greater differentiation in pilot sites compared to Herit-Data
  - The spectrum of technologies implemented has increased







# TOURISMO data integration into Snap4City



- Decision support applications
- AI solutions for predictions, causality, suggestions and recommendations
- Data acquisition and aggregation from different sources, in Digital Twin:
  - Context and evaluations
    - Road graph, networks, POI, Points of interest
    - Sentiment analysis from questionnaires and other services
    - Historical data of different types
  - Counting and flows,
    - people and vehicles
    - Pax counter/Wi-Fi Sniffer, radar
    - Data from thermal cameras
    - CCTV for counting people and vehicles
    - Data from drones with high-resolution thermal cameras
    - Parking
  - Environment
    - Open weather, Open pollution, Tides
    - Data from indoor and outdoor environmental sensors
    - Context data: OpenWeather, Open Pollution, Tides.....





# Expected results for TOURISMO

The tested solutions and the use of AI in the various pilots will be able to produce a valid and transferable method in other contexts. Including in the best practice:

- Comparison between types of sensors
- Efficiency and effectiveness of the various solutions
- Acquisition models and processes
- Predictive, causal, and management models
- Correlations and causes for reputation and evaluations, of services and structures
- Applications and dashboards







# On Line Training Material (free of charge)

















































Course: <https://www.snap4city.org/944> (ENG)

Introductionary course to Snap4City technology

In Italiano: <https://www.snap4city.org/1068>



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
							
							





2020



Contract



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



- Smart Mobility
- PISA, PUMS
- Living lab



Km4City 1.6.7

Smart Ambulance (2021-22)



enel x Contract



Contract

2021

PC4City (2020-21) Monitoring Terrain

Winner of Open Data Challenge of enel x

CAPELON

- Smart Light
- Sweden

Enterprise (2021-22) Industry 4.0

Almafluida Industry 4.0 (2021-22)

AMPERE (2021-22) Industry 4.0

SYN-RG-AI SmartCity



Industry 4.0

uni.systems

SmartCity, 2021-23



AXIS collab SmartCity

2022



Asymmetrica Smart City, 2022-23

Contract, 2022-23



2023



Contract, 2022-23



2022-2023

enel x Contract, 15min



Security and Risk



Italferr, Smart City



CN MOST, 2022-26



EI THE, 2022-26

G. Agile, 2021-23



2023-26



Merano, smart light

OceanRace, Genova, AWS

Cuneo, smart city

2024

Km4City 1.6.8

TOURISMO



UrbanDT4TF

ELLIE IA 2025-2027

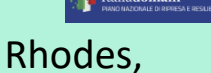


Contract, 2024-25

CAI4DSA



OPTIFaaS



Rhodes, smart city

eShare

UNIFI TUSS



AMMIRARE





**++2024/25**

- **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>
  - **PRIN UNICagliari**, **SMART3R**: mobility, DSS, <https://www.snap4city.org/drupal/node/1087>
  - **Tuscany X.0**, **EDIH**, TestBeforeInvest, Training on AI, Big Data, Security, HPC: <https://www.tuscanyx.eu/>
  - **The IE**, PNRR: AI, NLP, Legal Aspects
  - **Energia**, RT, conv: AI, PINN, DSS
  - **RFI contract**: mobility, AI, DSS
  - **Salerno Port**: for container ID recognition
  - **Talent Hub**, ECRF, conv: NLP, match demand vs offer
- + currently: Merano, Salerno, Cuneo, Rhodes, Reverberi, Florence, IDTS, ALTAIR, etc.





















































































































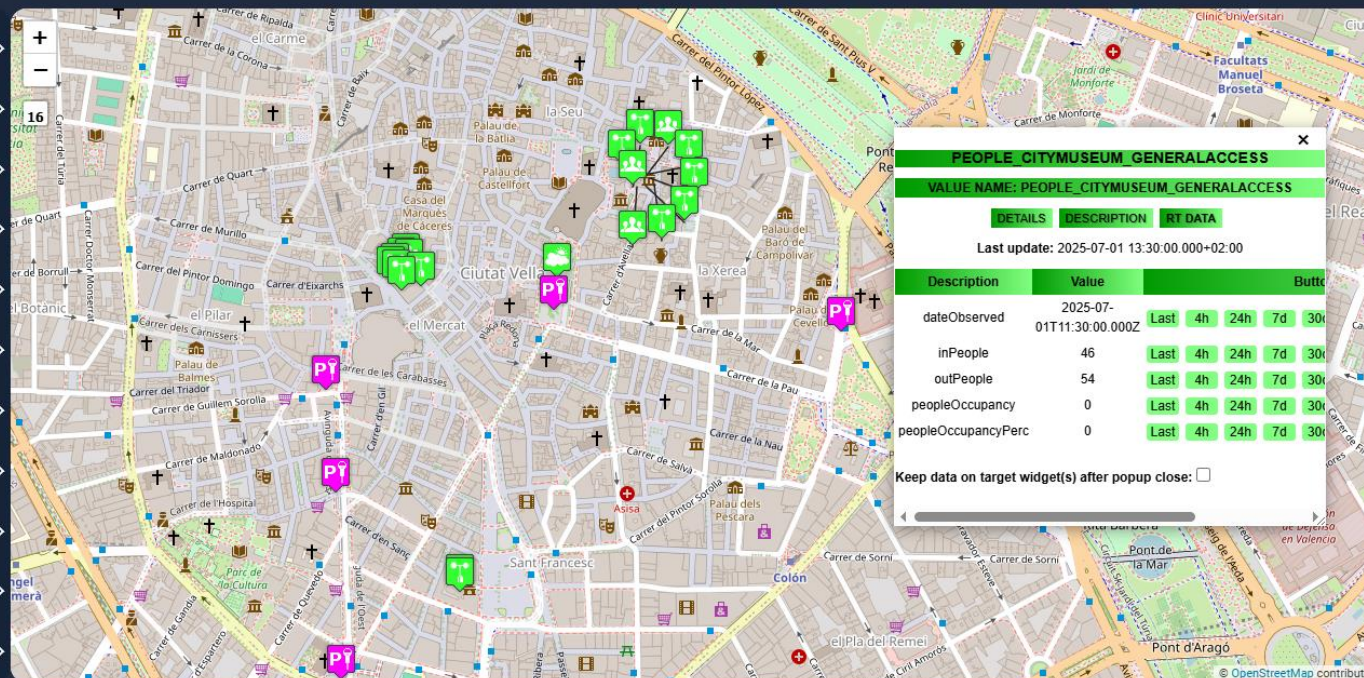




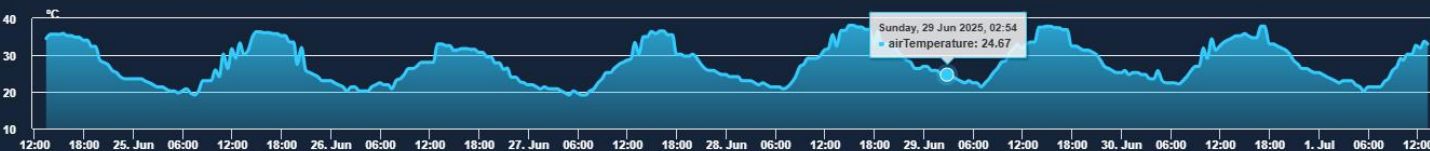




-  parkingValencia
-  Open Weather
-  Sea Conditions
-  Air Pollution
-  UV Index Forecast
-  Indoor People Counting
-  Indoor Env. CO2 Noise
-  Indoor Env.
-  Indoor CO2
-  Indoor Noise
-  Outdoor People Counting

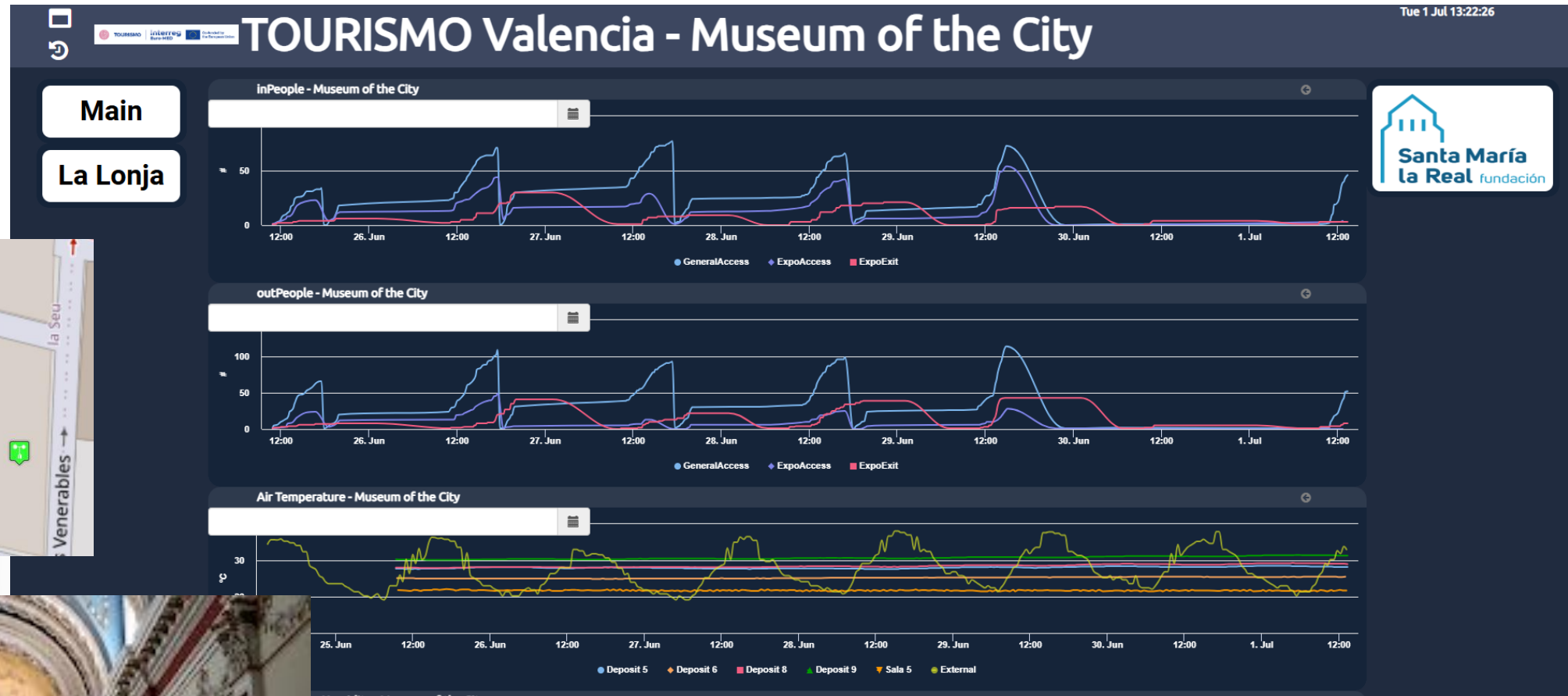


## La Lonja

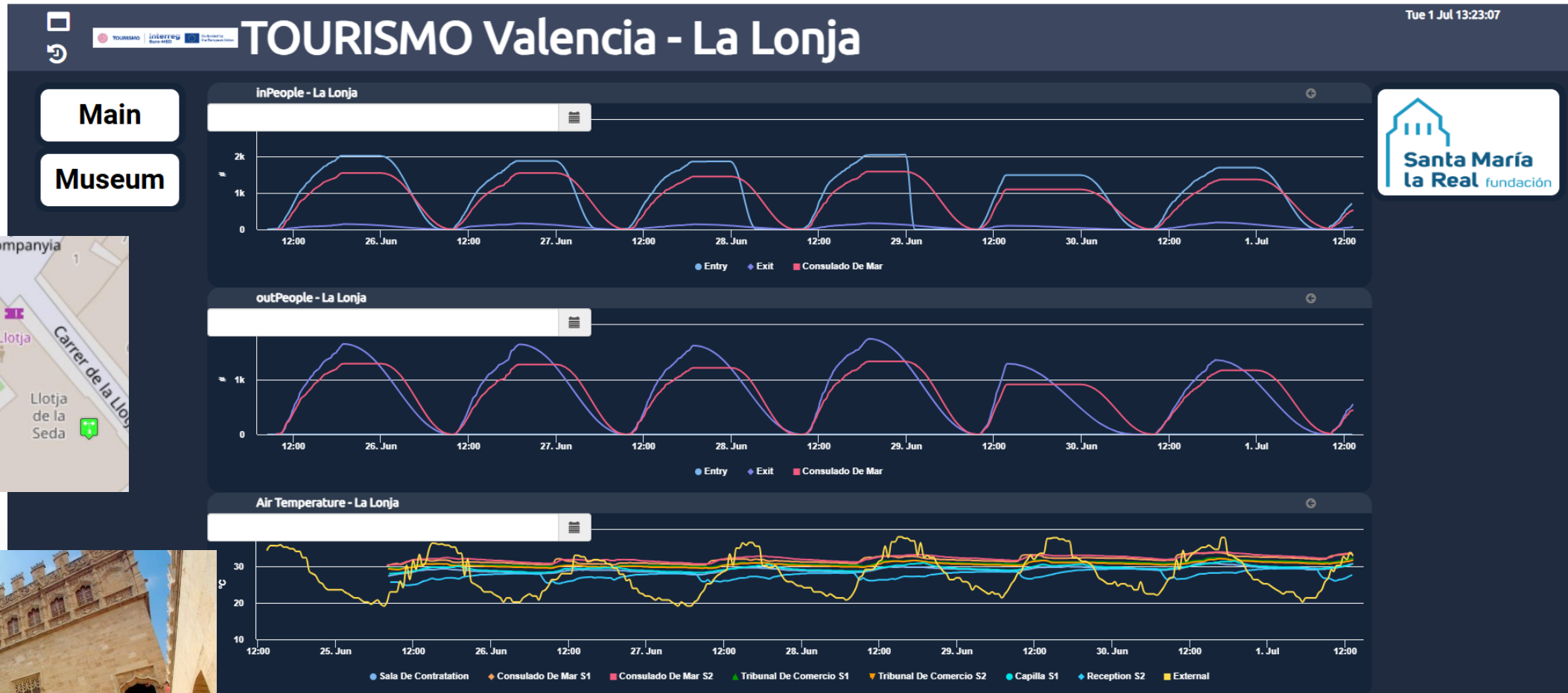




<https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddashboard=NDYyMQ==>



<https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddashboard=NDYxOQ==>





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# Making the **Mediterranean** **Green Transition** happen

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