SNAP4CITY

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City Users' Services, Tourism Management and Safety, Digital Twin

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

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

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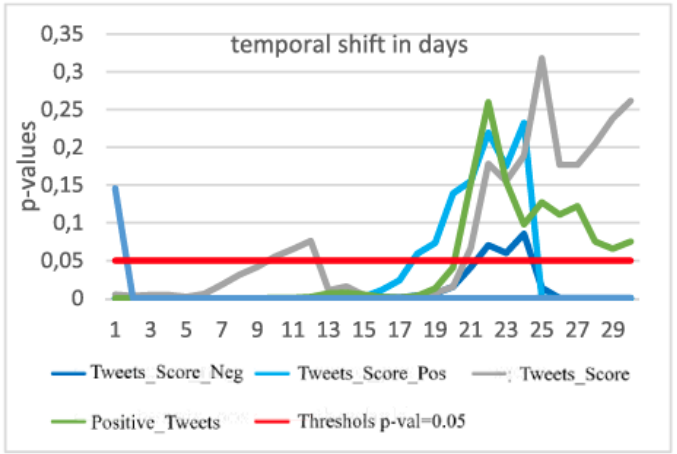
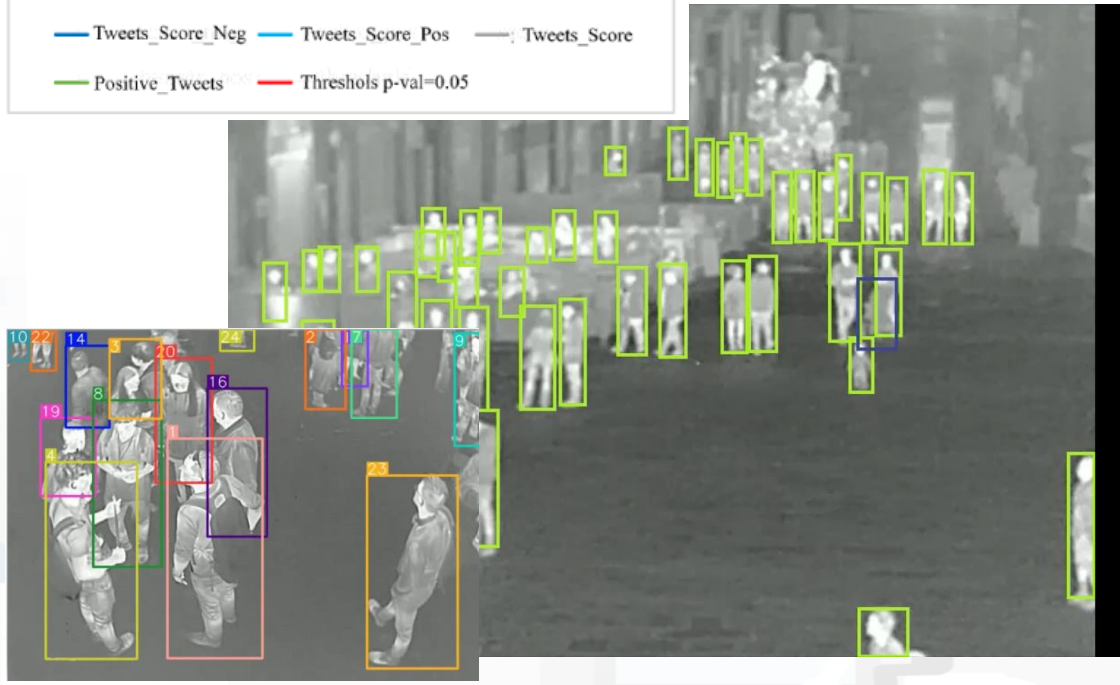
AI to Understand Users' Behavior, Tourism, DSS

- Service quality Assessment
- Engagement, … Suggestions
- Prediction of Offered Services Reputation
- Classification of Users' behaviour
- Counting and tracking user via thermal cameras
- Assessing the causality time of advertising
- From Wi-Fi/BT Sniffing to ODM





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Goals

Goals	How to	technicalities
Keep under control reputation	Measuring and predicting	Multichannel collections of appreciations, AI/LLM, sentiment analysis
Predicting number of presences in advances	Measuring and predicting	Counting, tracking and computing Orig. Dest. Matrices
Controlling the overtourism	Measuring, predicting, suggesting, producing tactics and strategies	Production of suggestions, serious games, engagements, ..
Stimulating actions, stimulating the second offer	Suggesting, engaging, producing tactics and strategies	Production of suggestions, and engagements
Identification of critical conditions	Short and long terms Measuring	In deep data analysis, AI for anomaly detections
Increasing resilience	Monitoring and early warning	Strategies, dynamic routing, real time information to city users

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Examples of Strategies

- Focus promotion, reduce price and increase the events in less relevant attractions
- Increase/decrease the time spendable at the attractions
- Promote guided tours with specific attractions and areas
- Prepare specific dynamic prices depending on time, season, day of the week, etc. → accept reservation to jump the queue.
- Usage of Digital Signages for reporting and suggesting:
  - PROS / CONS: Queues, time to reach it, people density, etc.
  - Alternatives, etc.
- Prepare the emergency plan, etc..

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City User behavior analysis multiple data sources

- **Main Data Sources on the market**
  - Mobile Cell data from telecom operators, macro areas
  - Mobile App data from their operators, micro areas
  - OBU from Insurance operators, only private vehicles
  - Social media: limited information and quality
  - Local Operators of: museum, ticket office, restaurants, etc.
  - Data integrators: a mixt of the above, not clear methods
- **Sensor Data**:
  - PAX Counters, Sniffer, Wi-Fi sniffers, Radar, laser, etc.
  - TV Camera color, Thermal Cameras, radar track
- ***Snap4City: integration and computing tools for deductions***

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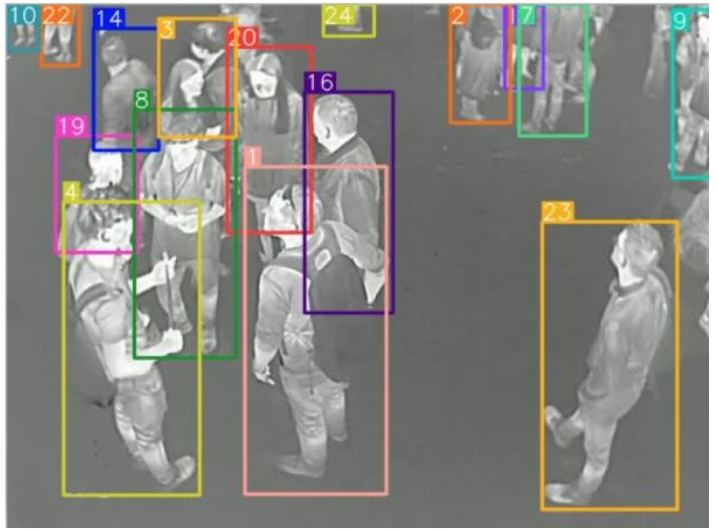
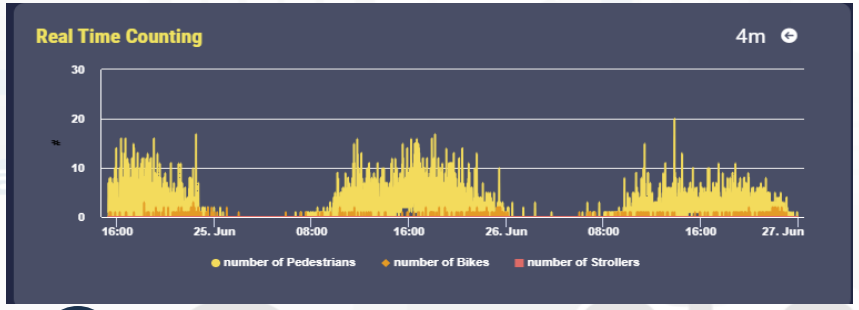
City User Behaviour/services, Tourism and Safety

- **Goals:**
  - Improve Quality of Life and quality of services for city users,
  - **Overtourism** 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, 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, ..**



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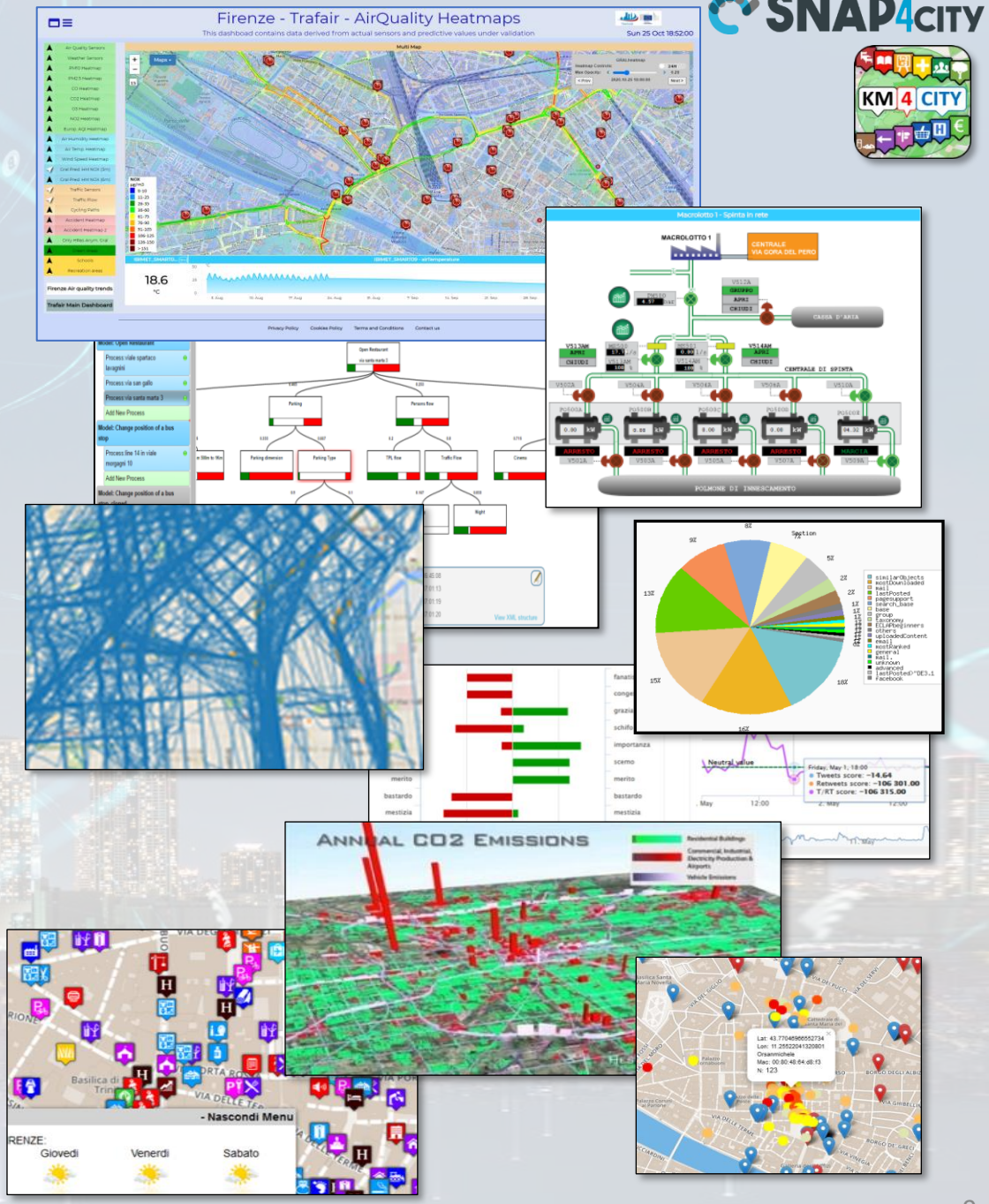
Data Driven Decision Support

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



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

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100% OPEN SOURCE

Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

JS Foundation

E015 digital ecosystem

NVIDIA

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

HORIZONTAL AI PLATFORM

MOBILITY AND TRANSPORT

SMART ENERGY AND SMART BUILDING

ENVIRONMENT AND WASTE MANAGEMENT

CITY USER'S SERVICES AND TOURISM MANAGEMENT

SNAPADVISOR

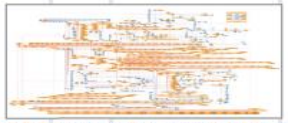
BUSINESS INTELLIGENCE - SIMULATIONS - VISUAL ANALYTICS - SYNOPTICS - GRAPHICAL WIDGETS - ANALYTICS

DASHBOARDS, WIDGETS
TEMPLATES

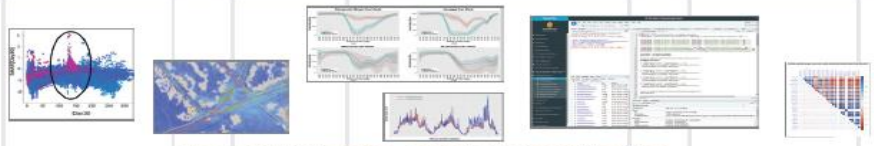
PREDICTION - ANOMALY DETECTION - CLUSTERING - ROUTING - SENTIMENT NLP - TRAFFIC FLOW - PEOPLE FLOWS - SDG
15 MIN CITY INDEX - KPI - HEATMAPS - ORIGIN DESTINATION - MAPS - VECTOR FIELD - ETC...

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

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



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



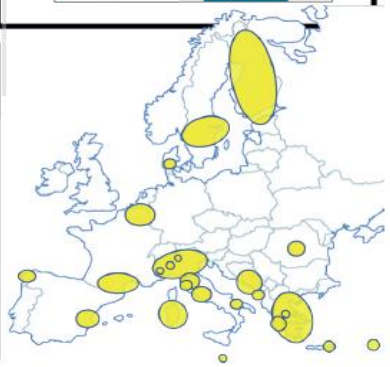
BIG DATA ANALYTICS, ARTIFICIAL INTELLIGENCE
EXPLAINABLE AI, MACHINE LEARNING, GENERATIVE AI
OPERATIVE RESEARCH, STATISTICS

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

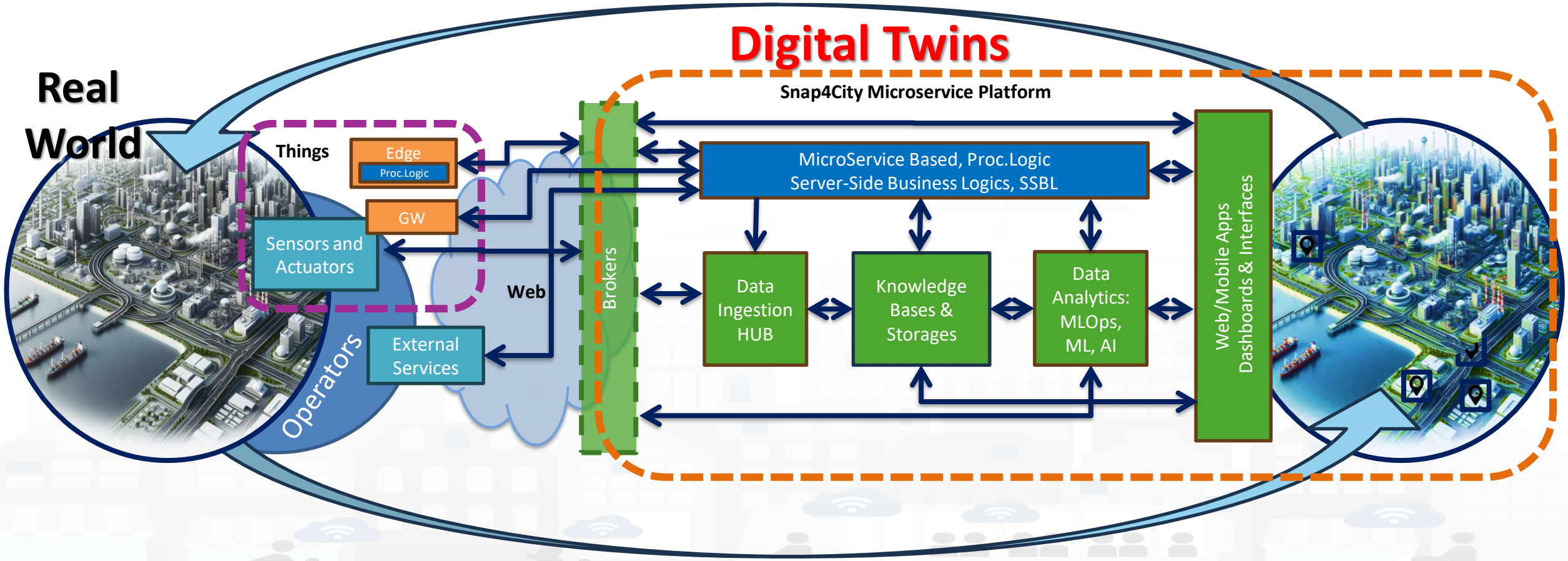
FULL INTEROPERABILITY, ANY: DATA, BROKERS, NETWORKS AND VERTICALS

NATIVE AND EXTERNAL APPLICATIONS

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



Digital Twin Development Platform



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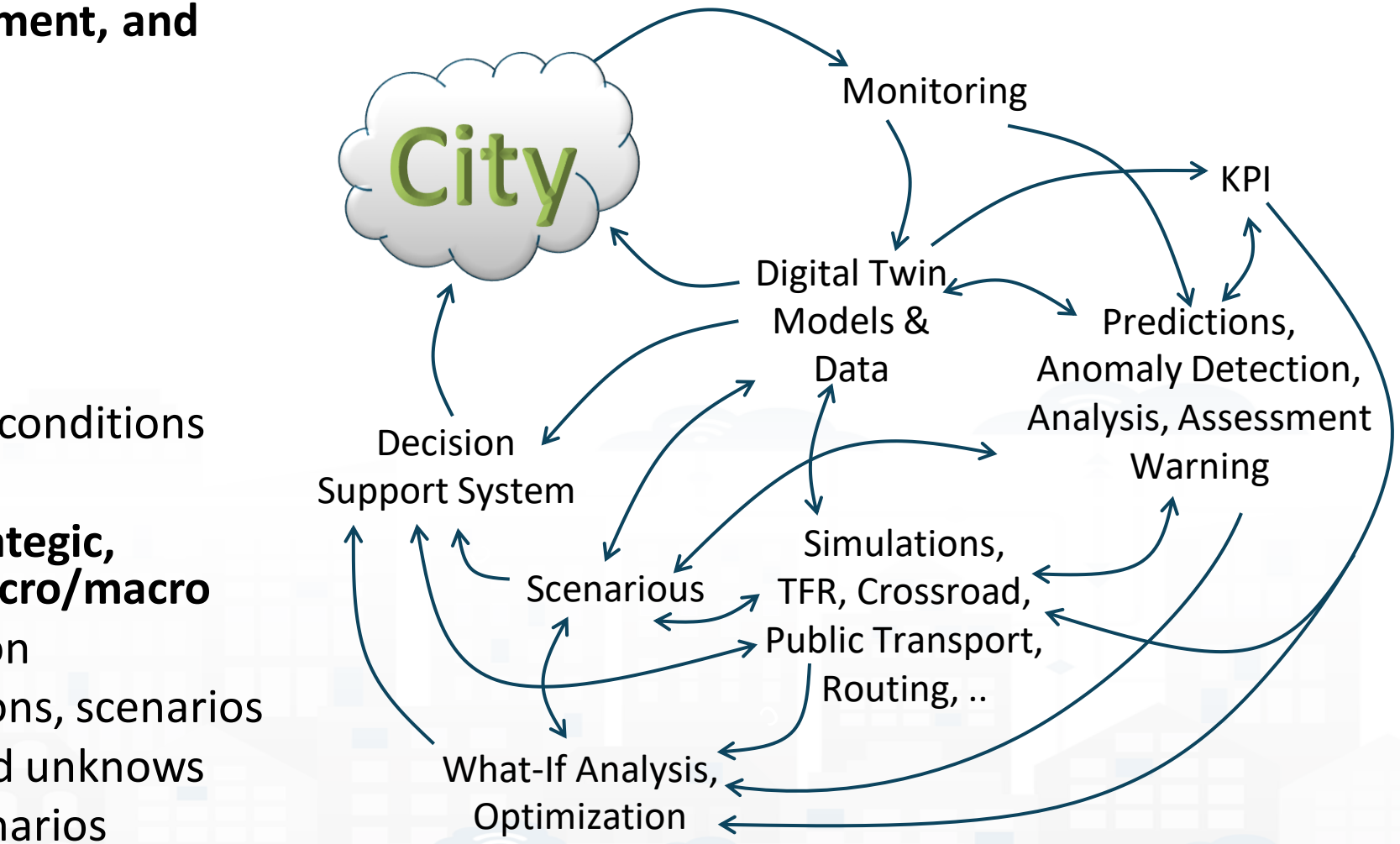
Main tasks

- **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



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Technical Architecture

Entity Directory:
Smart Data Models
IoT Data Models
Digital Twins

FIWARE Brokers
MQTT Brokers
Brokers

API Manager
Federation Smart City API
OpenSearch
virtuoso
storage
KB, graph
GeoServer
BIMserver.center
Entity Inspector
Data Manager
HLT Manager
Service Map

Any API

Front-End

Facilities
- Dashboard/View Builder & Mng.
- Business Intelligence CSBL
- Custom Themes
- Synoptics & Widgets
- 2/3D Digital Twin

Tools
- Routing, MulDyn
- Heatmap Gen.
- Prediction Gen.
- Measure & Compare
- Notification Mng.
- KPI Support
- Scenario, What-If

Applications
- Traffic Optimiz.
- Traffic Light Plan
- Public Transport
- Parking Mng.
- Fines Mng.
- Participation Mng.
- Lighting Mng.
- Building Mng.
- Environment Mng.
- Waste Mng.
- Sharing/pool Mng.
- Energy Mng.
- Tourism Mng.
- Mobile Apps

SnapAdvisor / Generative AI

Node-RED

Simulators' tools:
SUMO, DORAM, TFR, ..

python R Studio

Artificial Intelligence tools:
pred., classif., optim., LLM, ...

Social Media
OSM, BIM, GIS, ITS
Gateways, satellite
External Services
Web Scraping
TV CAM streams

IoT App ProcLog.

On Edge
On Cloud

IoT App
ProcLogic

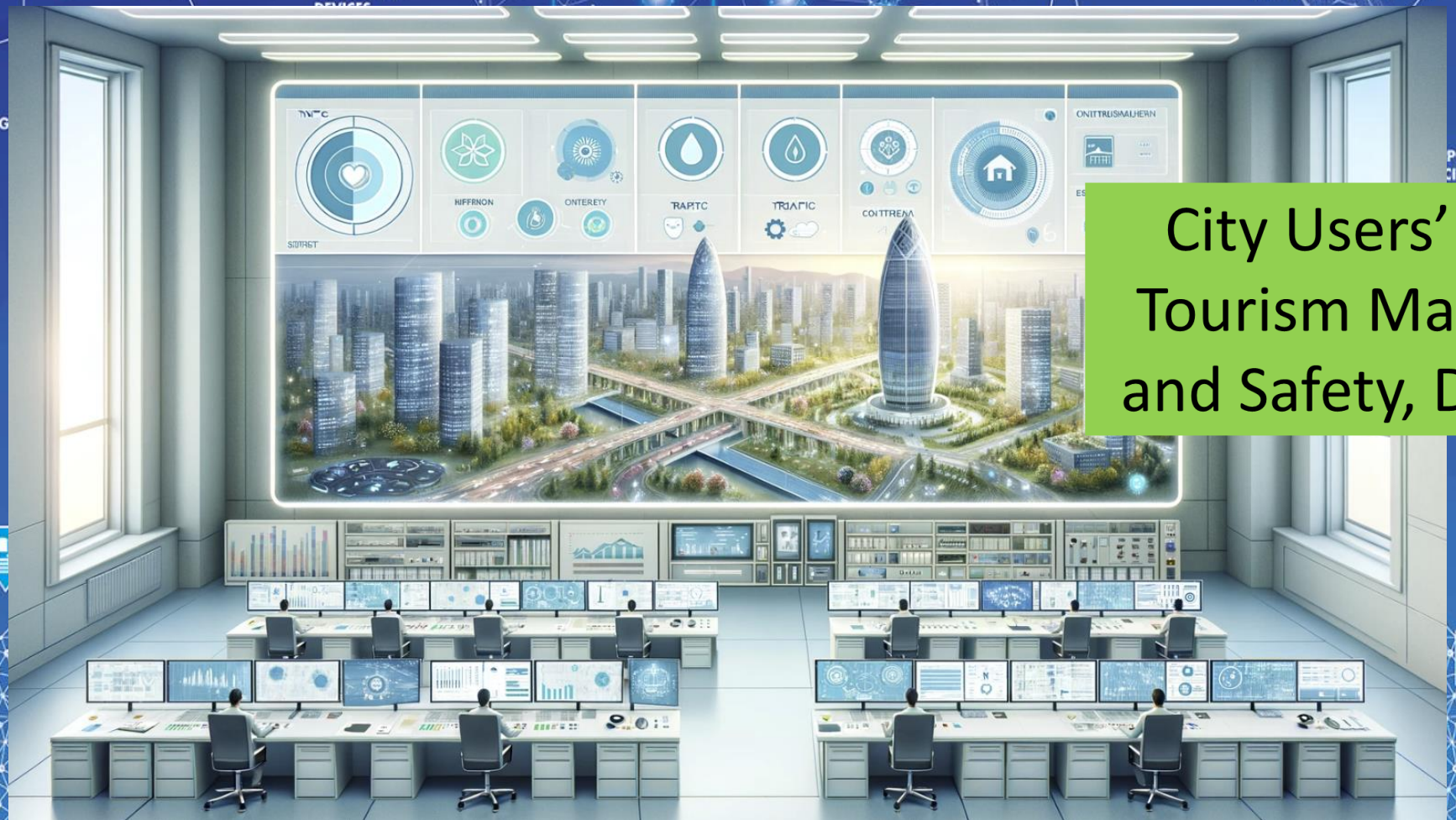
Event Driven

A&A, RBAC, SSO, Blockchain, Resource Managers and Sharing

Sharing / Market Place

Third parties solutions

Monitoring and control

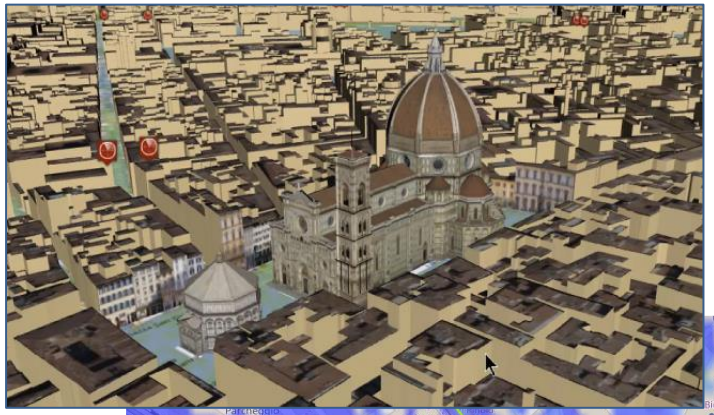


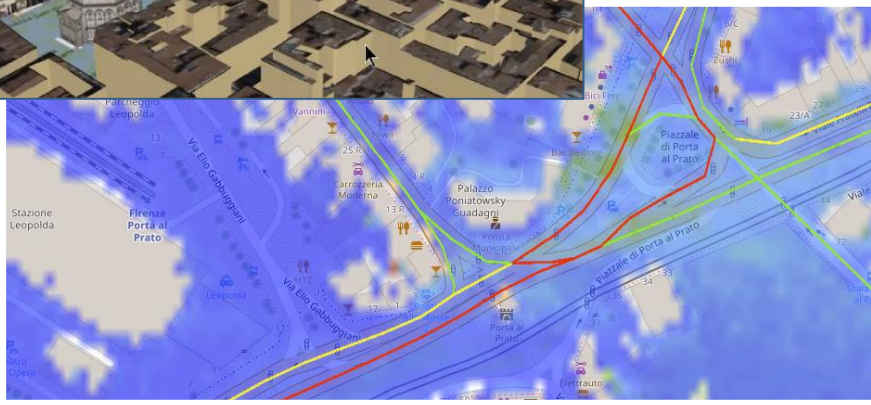
City Users' Services, Tourism Management and Safety, Digital Twin

100% OPEN SOURCE

Monitoring

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





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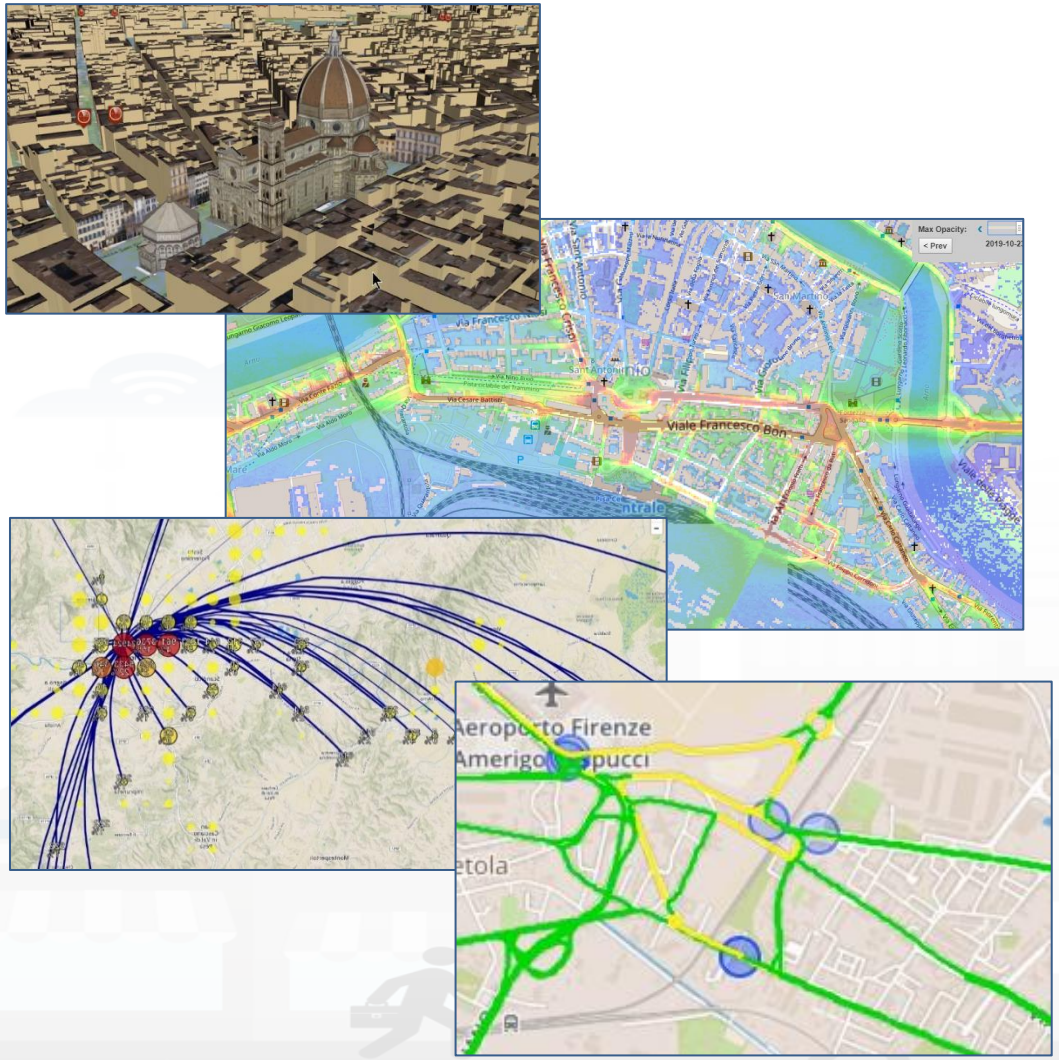
Smart City Digital Twin



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.

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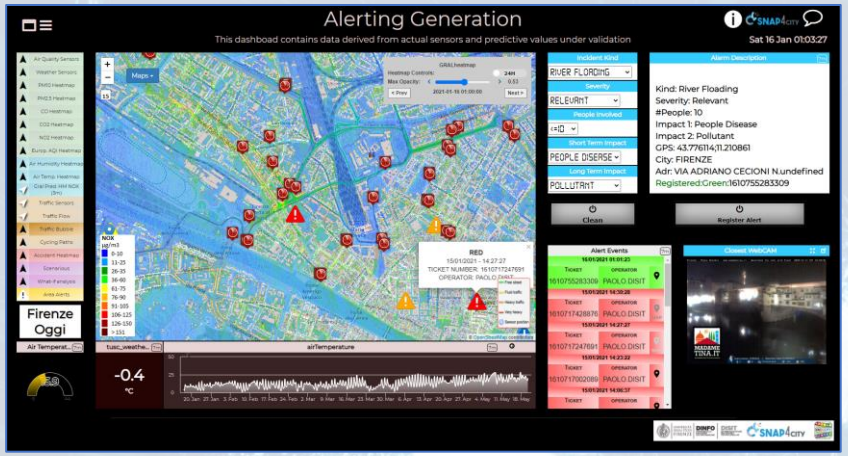

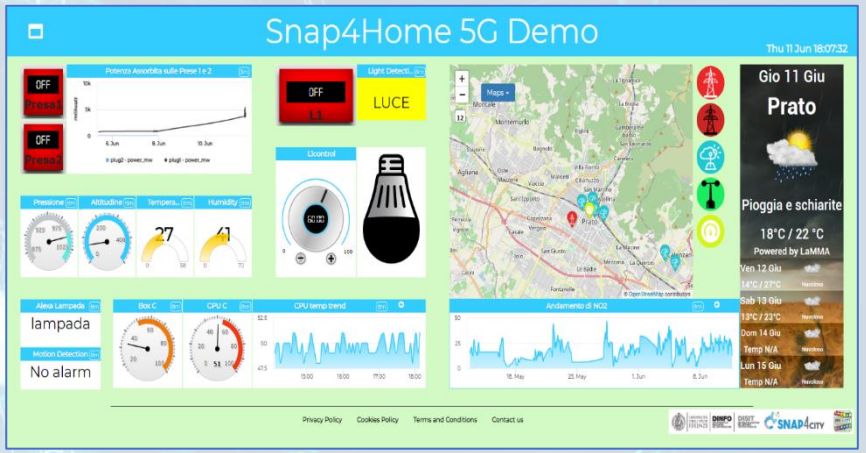

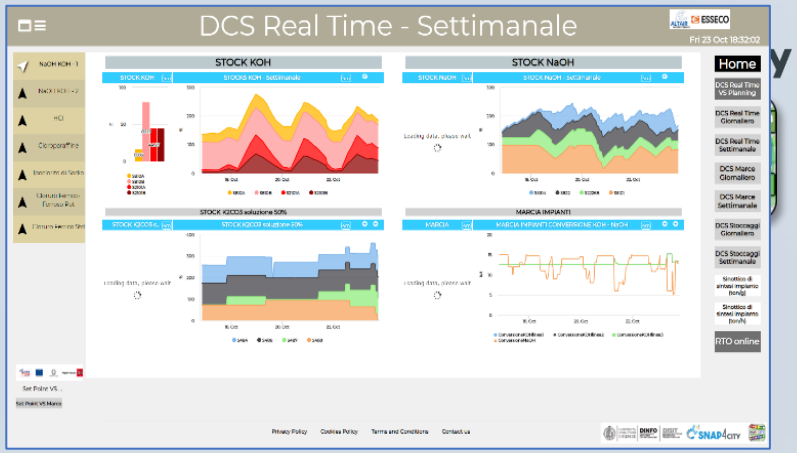

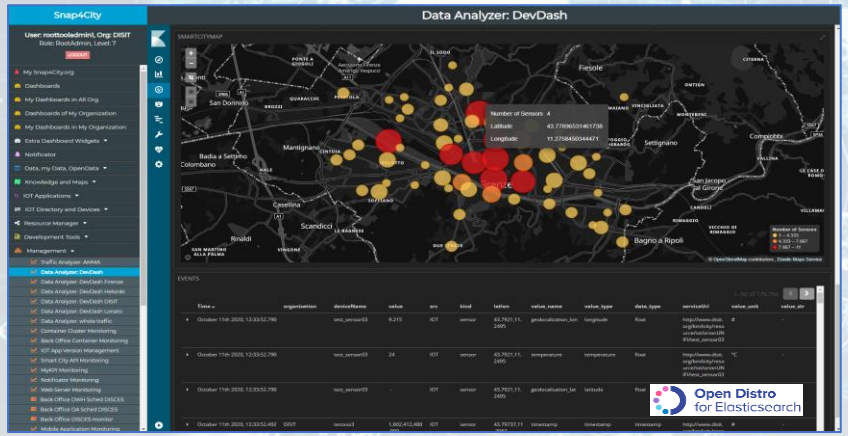

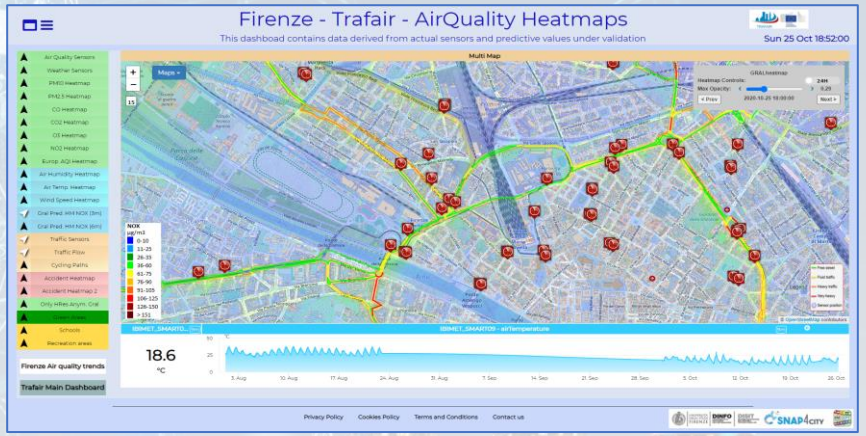

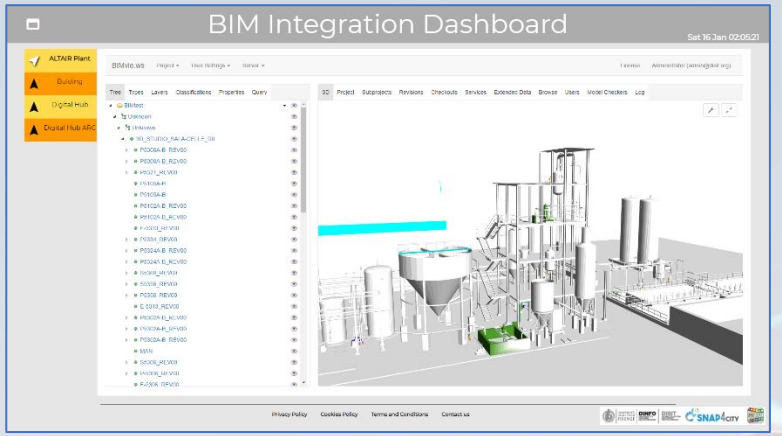

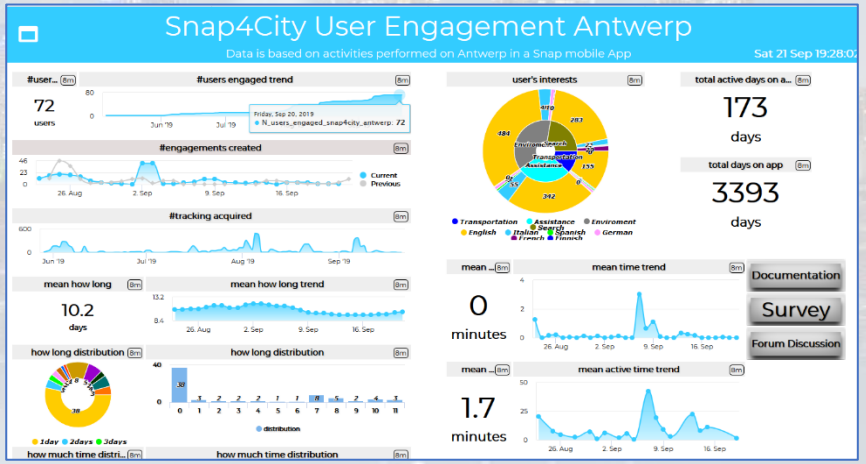

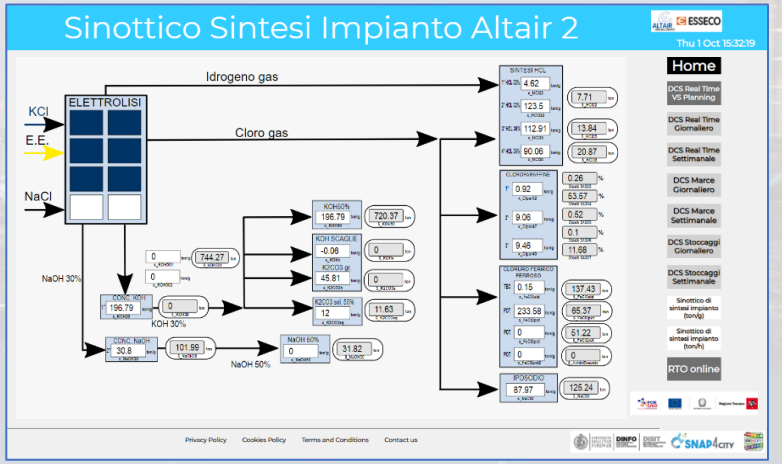

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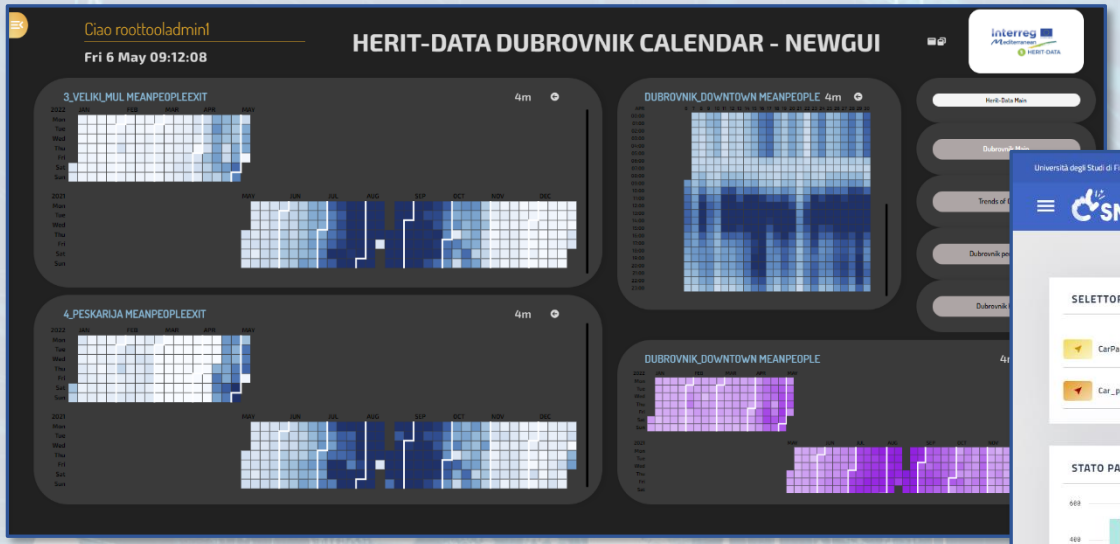
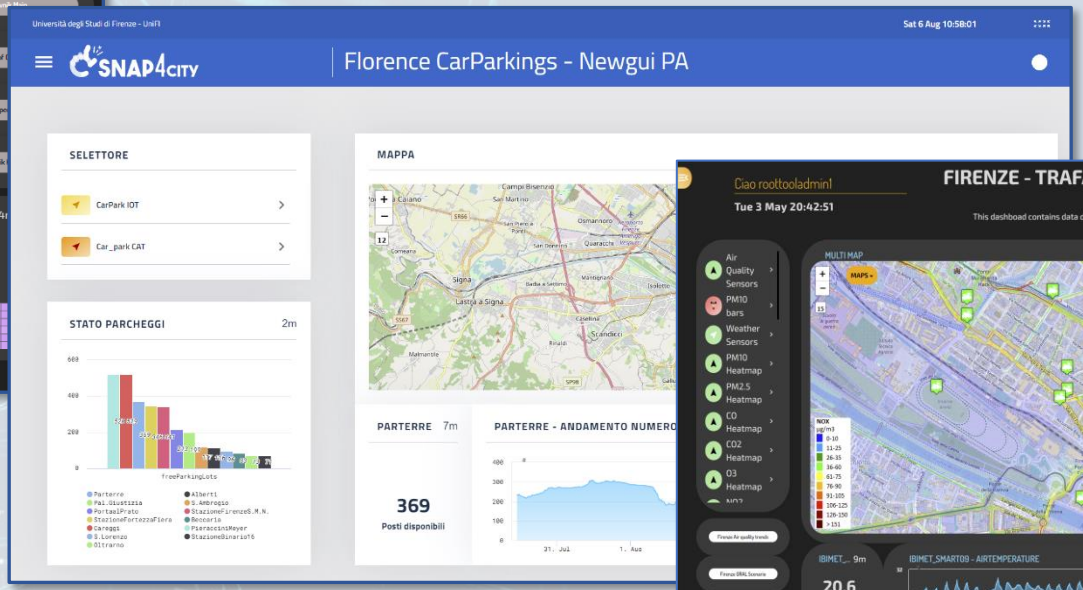
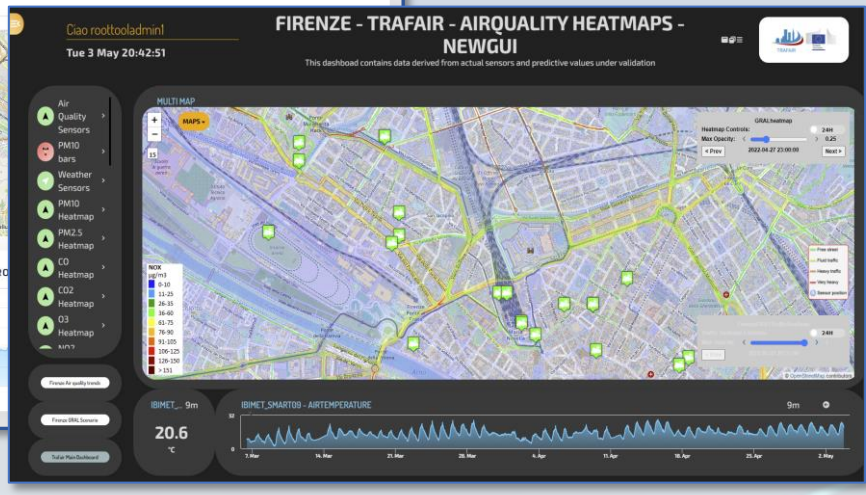
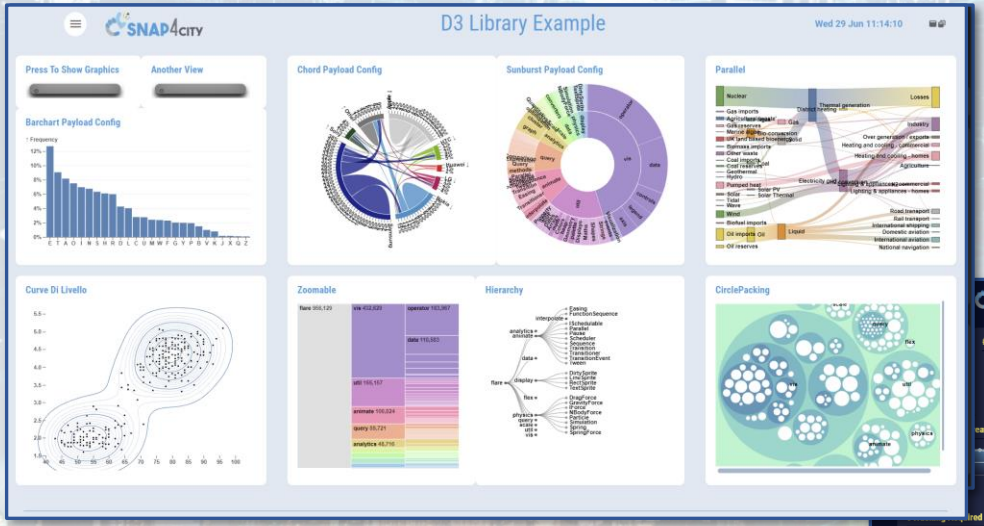
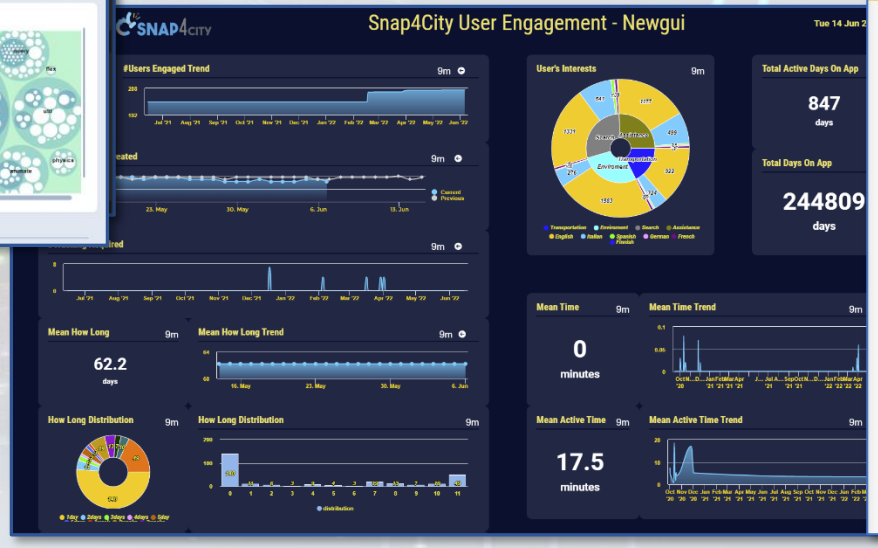
Different Themes

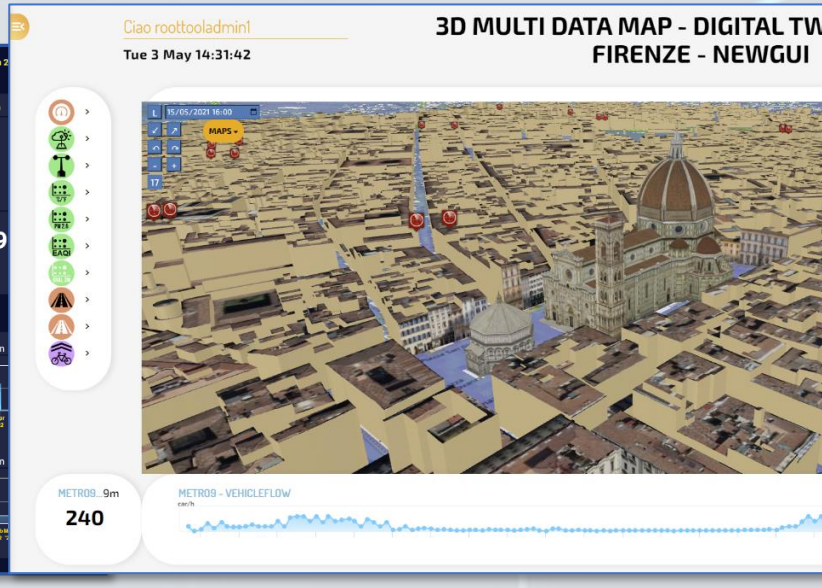












New styles/themes can be developed by specializing a few files from open source

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Control Room

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.

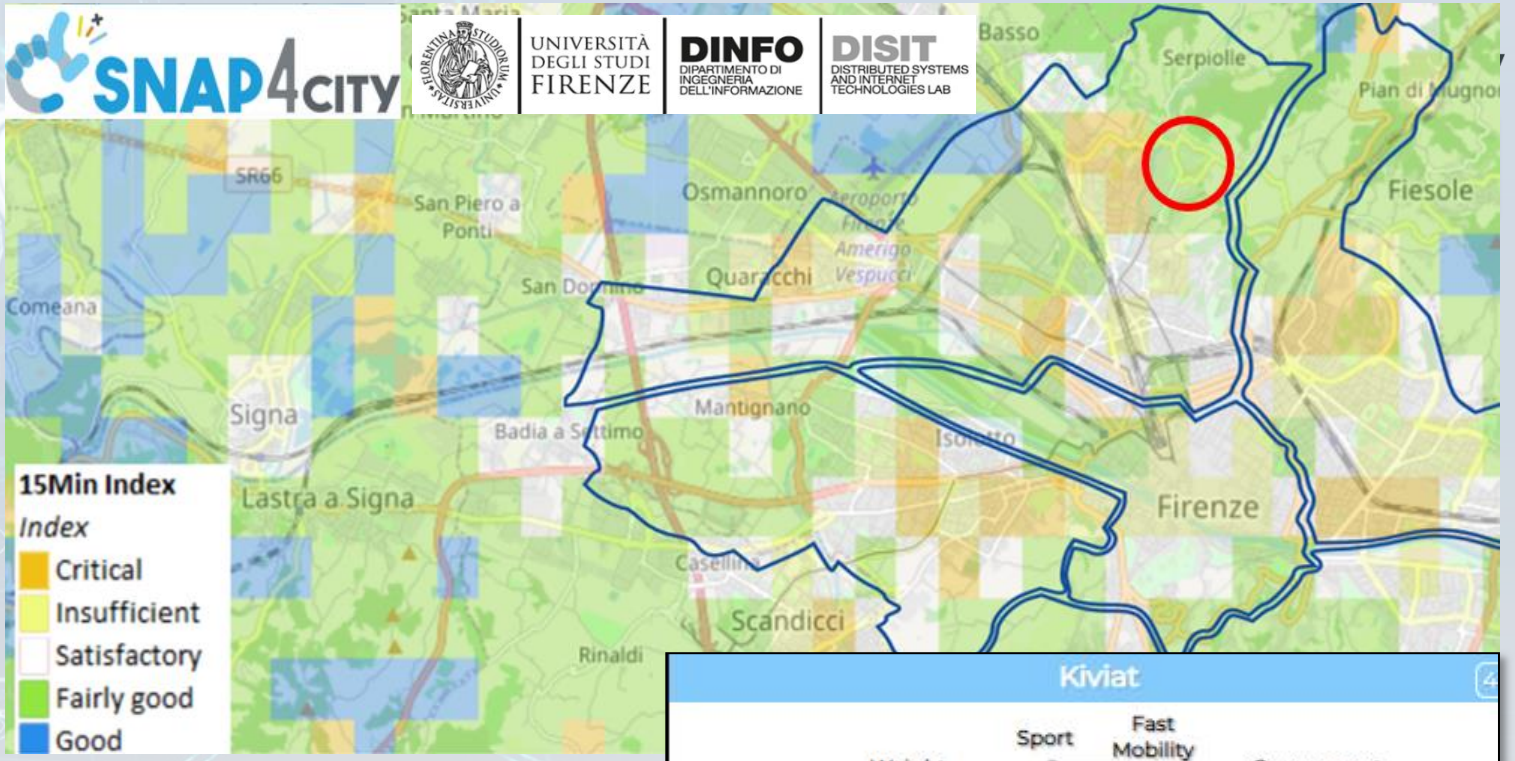
Global & Local

Periodic & Realtime

15MinCityIndex

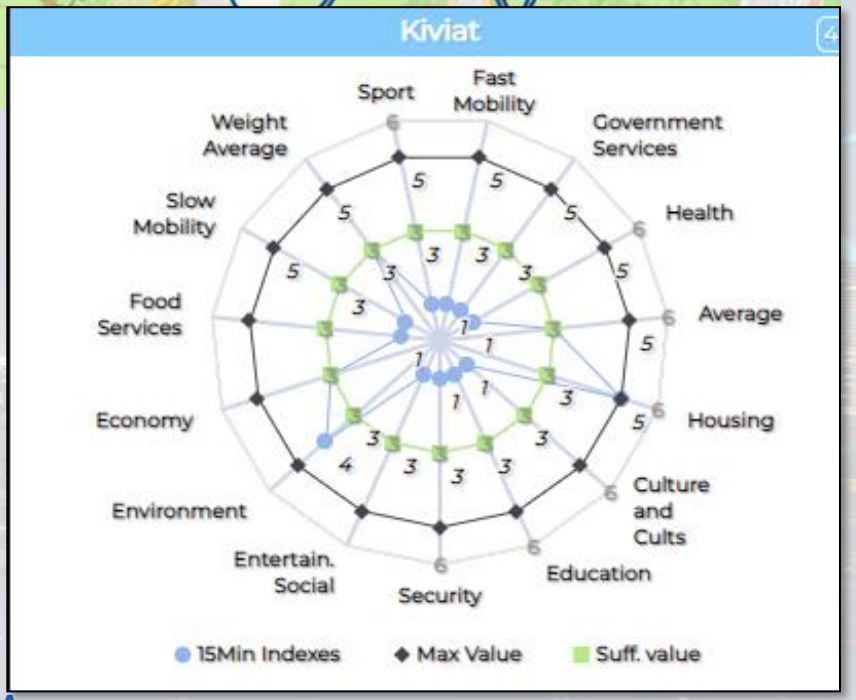
What would support my neighborhood to become a 15-Minute City?

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



Good public transport services: bus, new tram line, train stations, cycle paths.

The tool supports the becoming of a 15-Minute city evaluating the service level in various domains.



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

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

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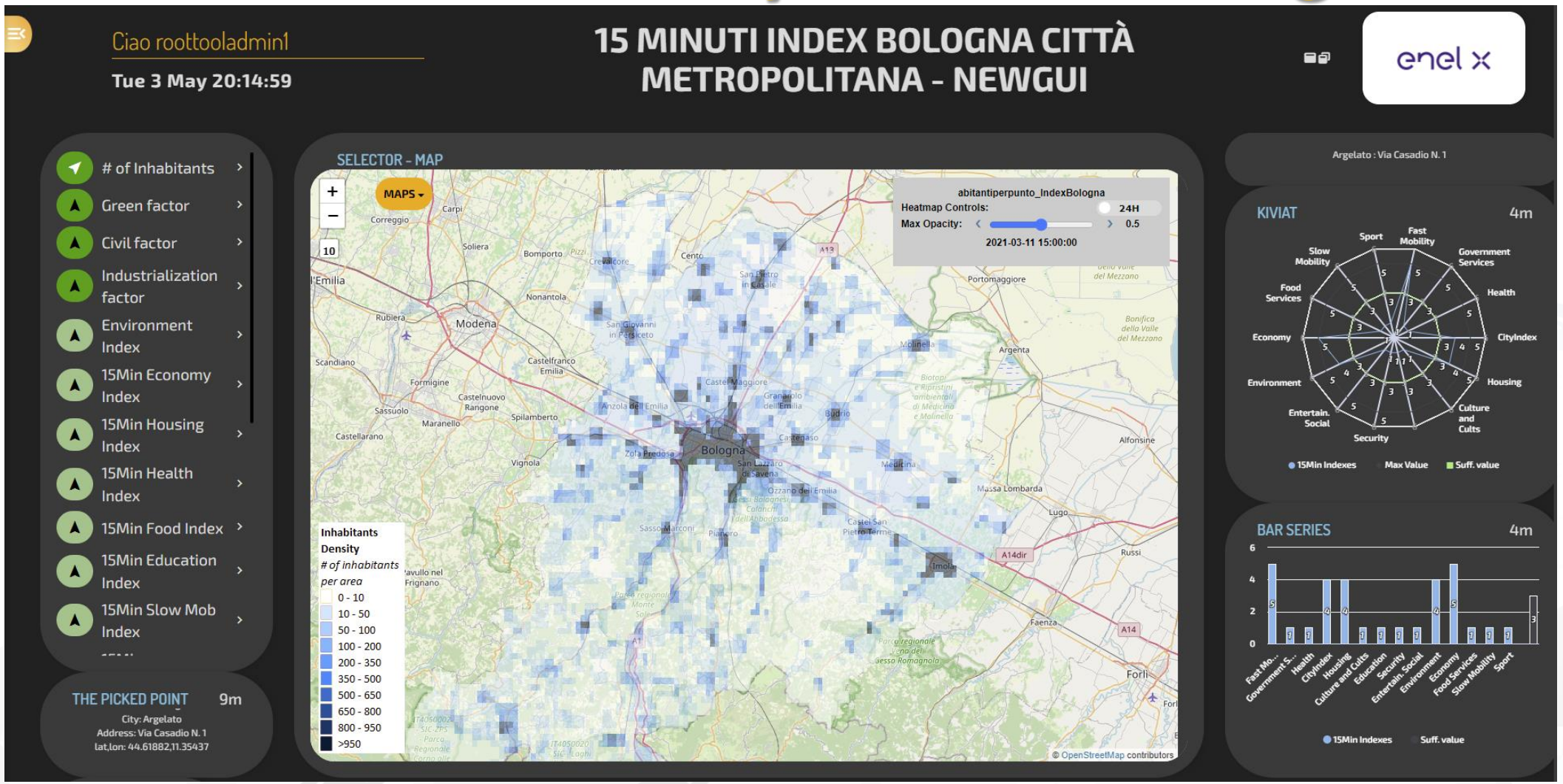
15MinCityIndex on Bologna



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

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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

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(9/2025)

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

City Users' Services, Tourism Management and Safety, Digital Twin

City

Monitoring

KPI

Digital Twin Models & Data

Predictions, Anomaly Detection, Analysis, Assessment Warning

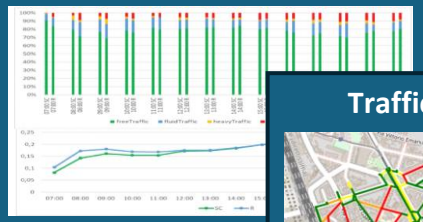
Decision Support System

Scenarious

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

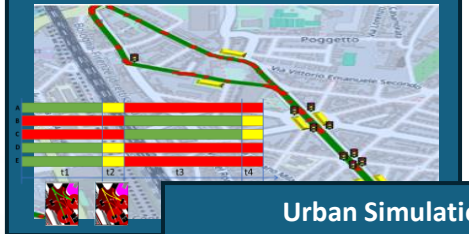
What-If Analysis, Optimization

KPI, Predictions, ...



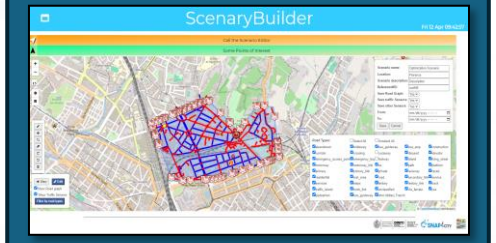
Traffic Reconstruction

Traffic Light Plan optimization

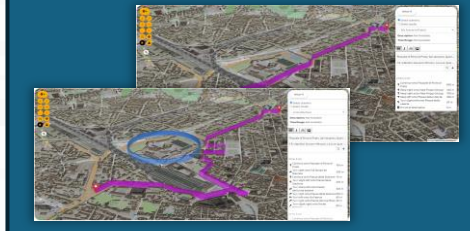


Urban Simulation

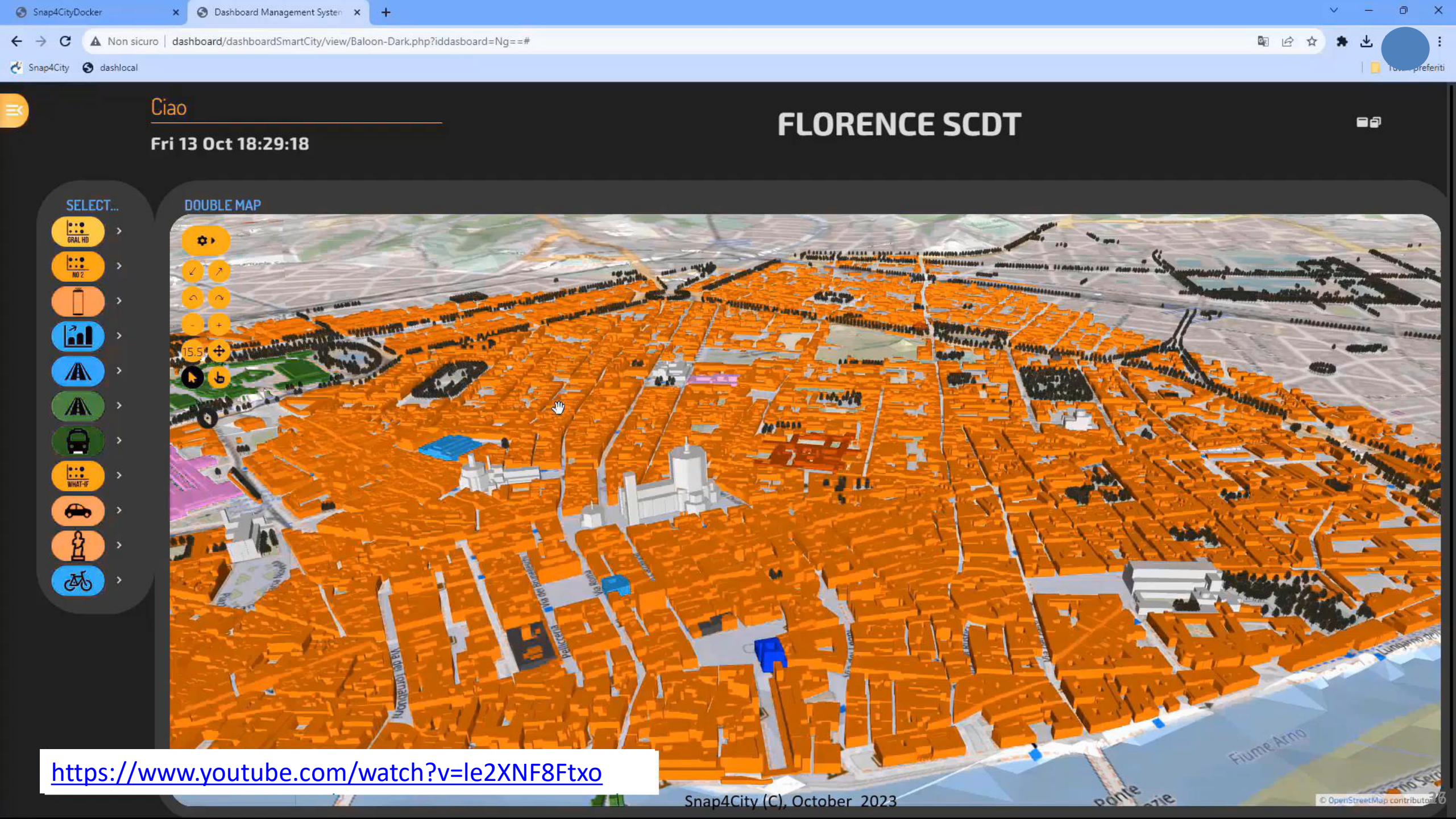
Scenario Editor



Routing / Dynamic Routing



Traffic Infrastructure optimization


Snap4CityDocker
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Fri 13 Oct 18:29:18
FLORENCE SCDT
SELECT...
GRAL HD
NO 2
WHAT-IF
DOUBLE MAP
Fiume Arno
© OpenStreetMap contributors
https://www.youtube.com/watch?v=le2XNF8Ftxo
Snap4City (C), October 2023

Data Analytic Artificial Intelligence, XAI, Machine and Deep Learning

City Users' Services, Tourism Management and Safety, Digital Twin

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

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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/

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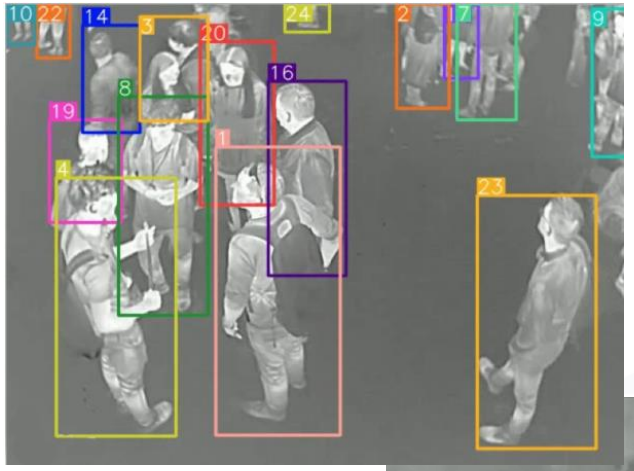
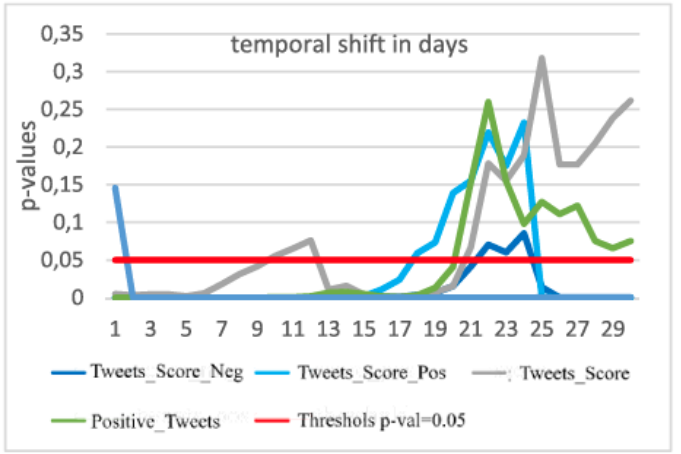
AI to Understand Users' Behavior, Tourism, DSS

- Classification of Users' transportation modalities
- Counting and tracking user via thermal cameras
- Prediction of Offered Services Reputation
- Assessing the causality time of advertising
- From Wi-Fi/BT Sniffing to ODM





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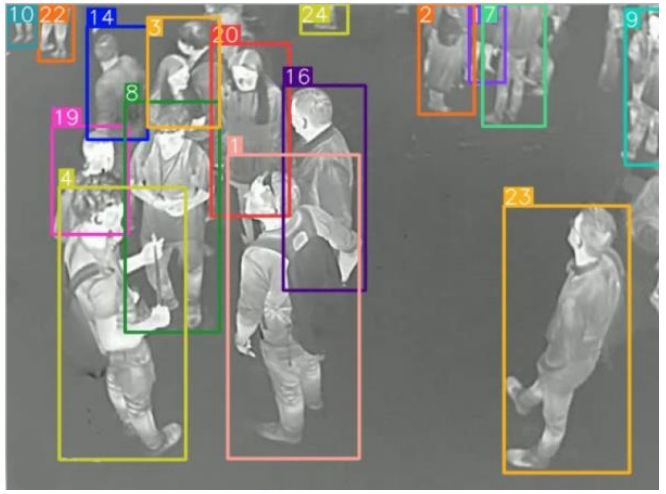
City User Behaviour/services, Tourism and Safety (2024/8)

- Goals:
  - Quality of Life, quality of services, over tourism mitigation, sustainability
  - Costs reduction of services
  - Accessibility to services: citizens, Tourists, commuters, etc.
  - Security/Safety of city users
- Solutions for Operation (monitoring, managing, mobile apps, digital signages, control rooms)
  - Monitoring services: tickets, reputation, usages, areas, etc.
  - Monitoring user behaviour (counting, trajectories): indoor/outdoor, hot places/services, ports, beaches,
  - Computing: origin destination, trajectories, travel means, etc.
  - Early detection/warning of critical conditions, connection with Video Management Systems
  - Managing entrances in city areas: restricted areas, touristic busses, etc.
  - Production of info-toursim, recommendations, nudging to city users and operators, second offer promotion
  - Providing Virtual Assistants for City Services, Tourist Offices, etc.
  - Monitoring reputation of services via: social media, blogs, etc.
  - Collecting complains, requests, participations from City users via mobile apps
  - Computing predictions of any kind
- Solutions for Planning (optimization and what-if analysis)
  - Reduction of Pollutant Emissions, via optimization
  - Optimization plan to distribution of workload on multiple touristic offers/services, area cleaning, etc.
  - Predicting reputation of services, touristic and operative
- Algorithms and computational solutions, see next slide



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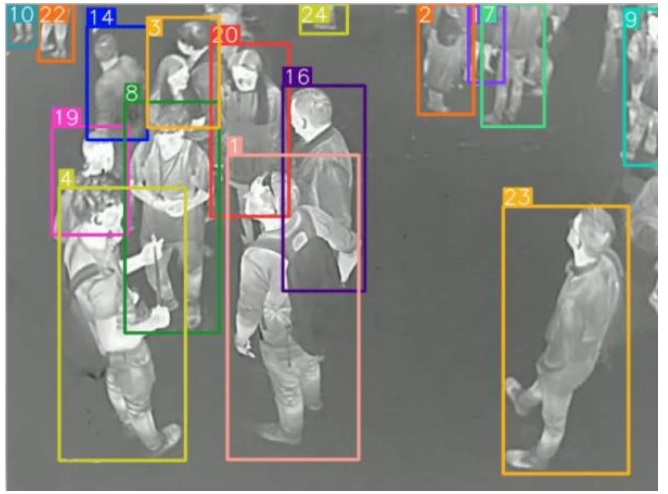
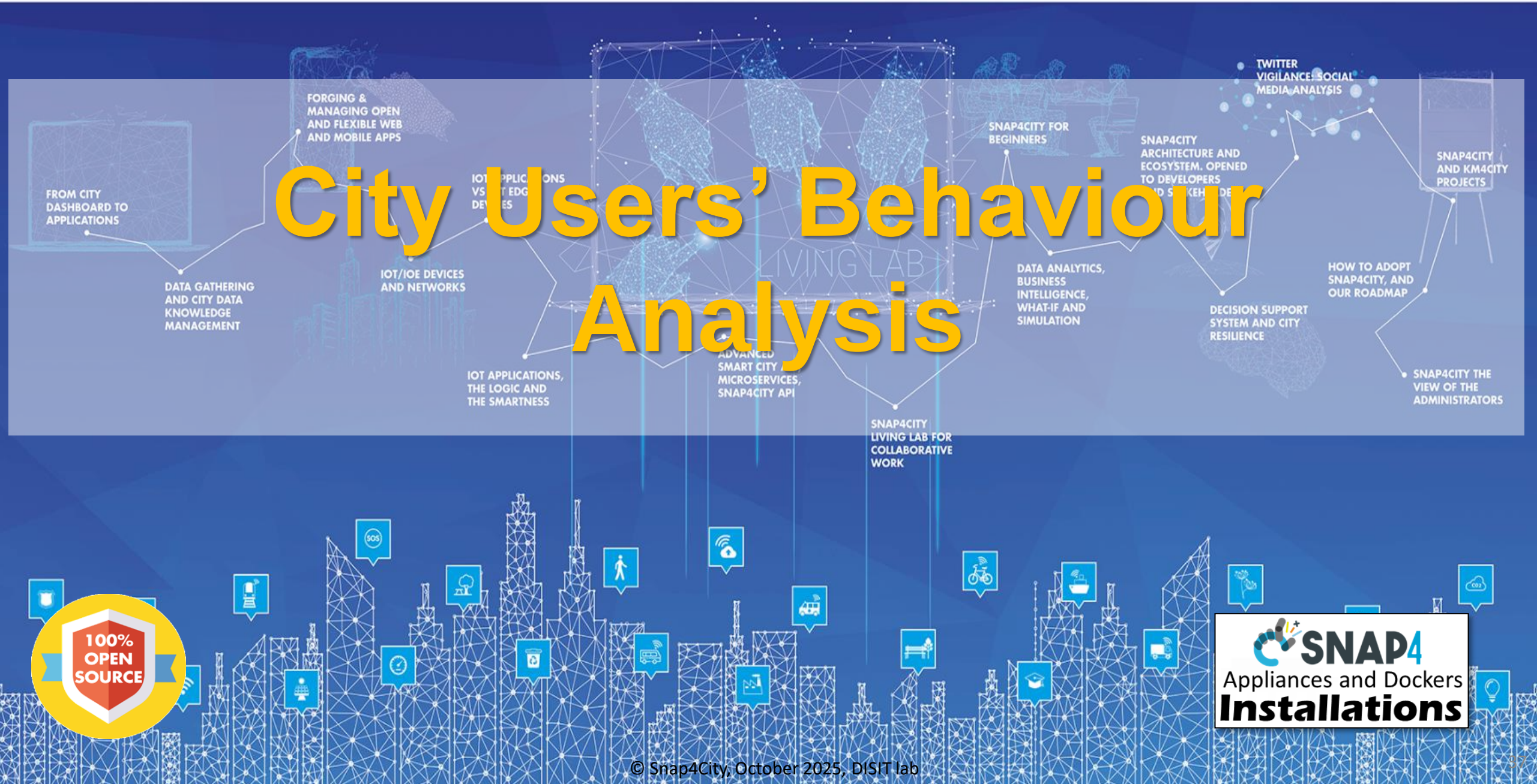
City Users Behaviour, Safety, Security and Social Analysis (2024/8)

- **People detection and classification**: persona, strollers, bikes, etc. (ML, DL)
- **people counting and tracking**, head counting, people trajectories (via thermal cameras, ML, DL)
- **People flows prediction** and reconstruction, (ML, DL)
  - Wi-Fi data, mobile apps data, Mobile Data, etc.
- **User's behaviour analysis**, **People flow analysis** from PAX Counters and heterogenous data sources (ML, AI)
  - origin destination matrices, hot places, time schedule,
  - Recency and frequency, permanence, typical trajectory, etc.
- **Computing User engagement and suggestions** for sustainable mobility (Rule Based, ML)
- **Social media analysis** on specific channel, specific keywords: see Twitter Vigilance,
  - Reputation, service assessment: MultiLingual NLP and Sentiment Analysis, SA
  - Tweet proneness, retweet-ability of tweets, impact guessing
  - Audience predictions on TV channels and physical events, locations
  - Prediction of attendance of events and on attractions
- **Virtual Assistant construction, LLM, NLP, Sentiment Analysis (DL, NLP)**
- **Video management System integration for security**
- **15 Minute City Index**, etc. (modeling and computability)
- Computing **SDG**, etc., (DP)
- Etc





City Users' Behaviour Analysis

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

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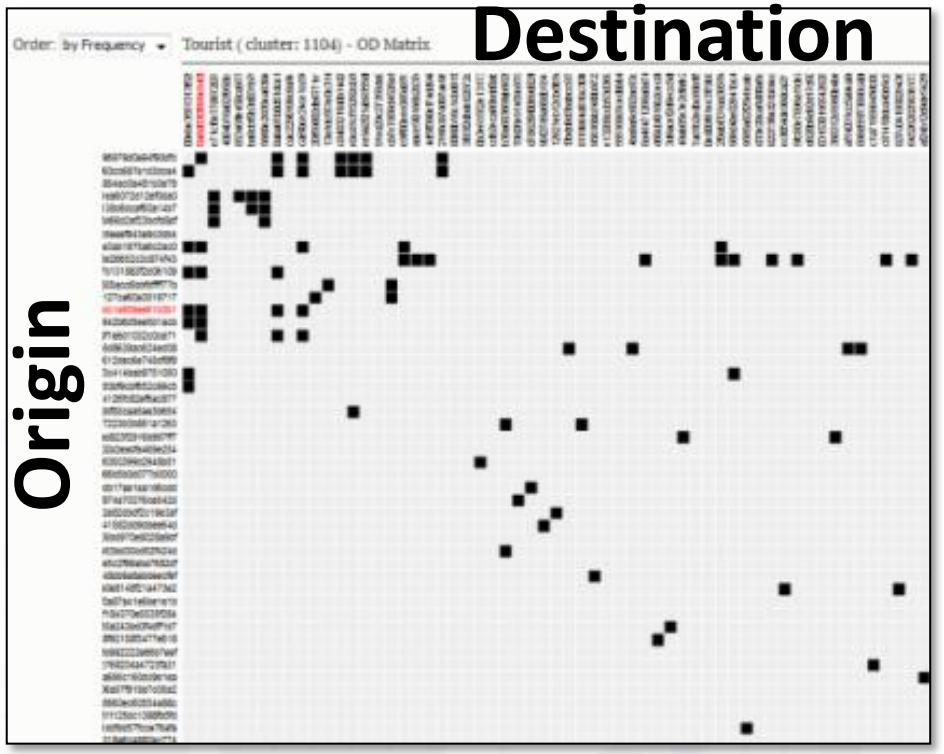
Origin Destination Matrices

- **computed** from several kinds of data
  - Census Data
  - Cellular Mobile Data
  - Mobile App Data **trajectories**
  - OBU from vehicles **trajectories**
  - Composition of multiple sources: ODM + Trj
- **may represent:**
  - Demand of mobility, effective movements,…
  - Offer of transportation
- **refer** to different area kinds for Origin and of Destination
  - Different kinds of OD areas
  - Different kinds of temporal resolutions → animations
    - Hourly, daily, weekly, monthly, etc…



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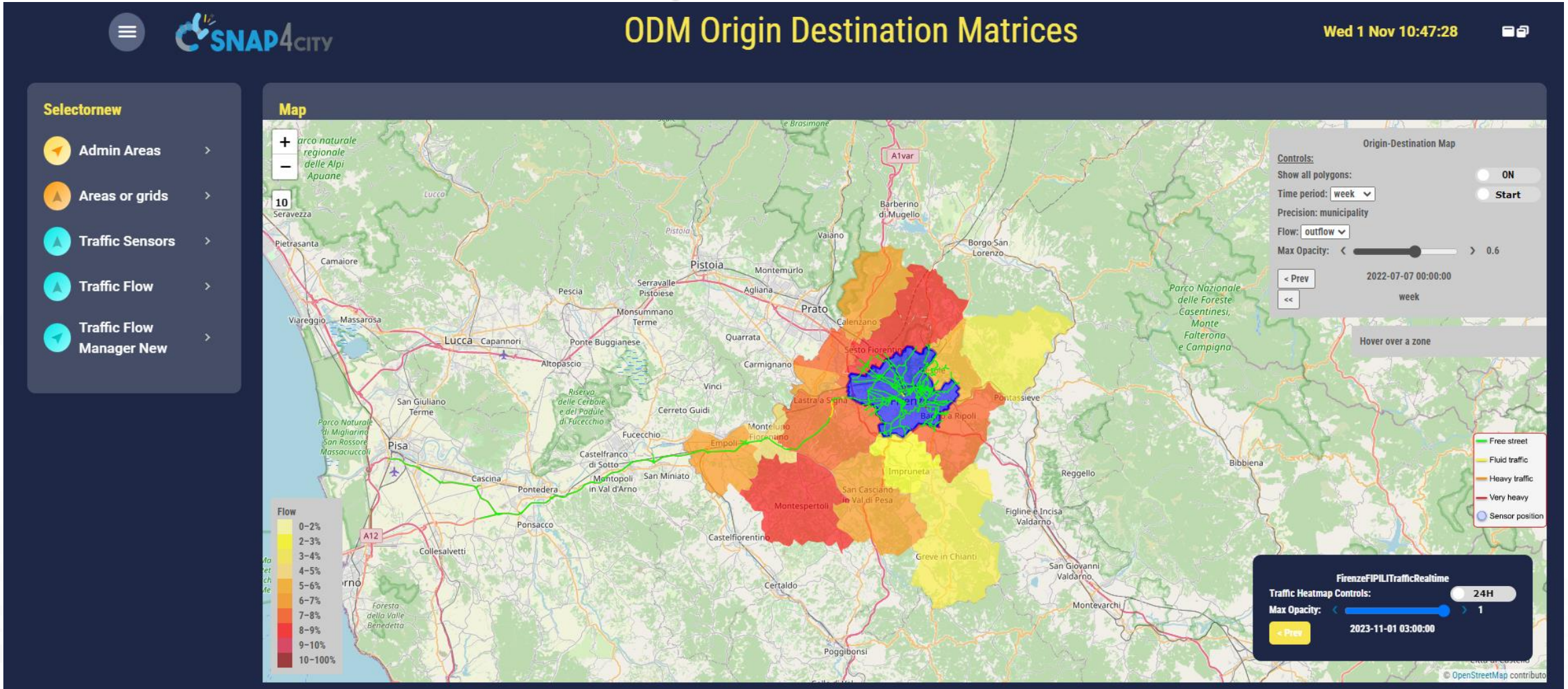
ODM, Traffic Flow



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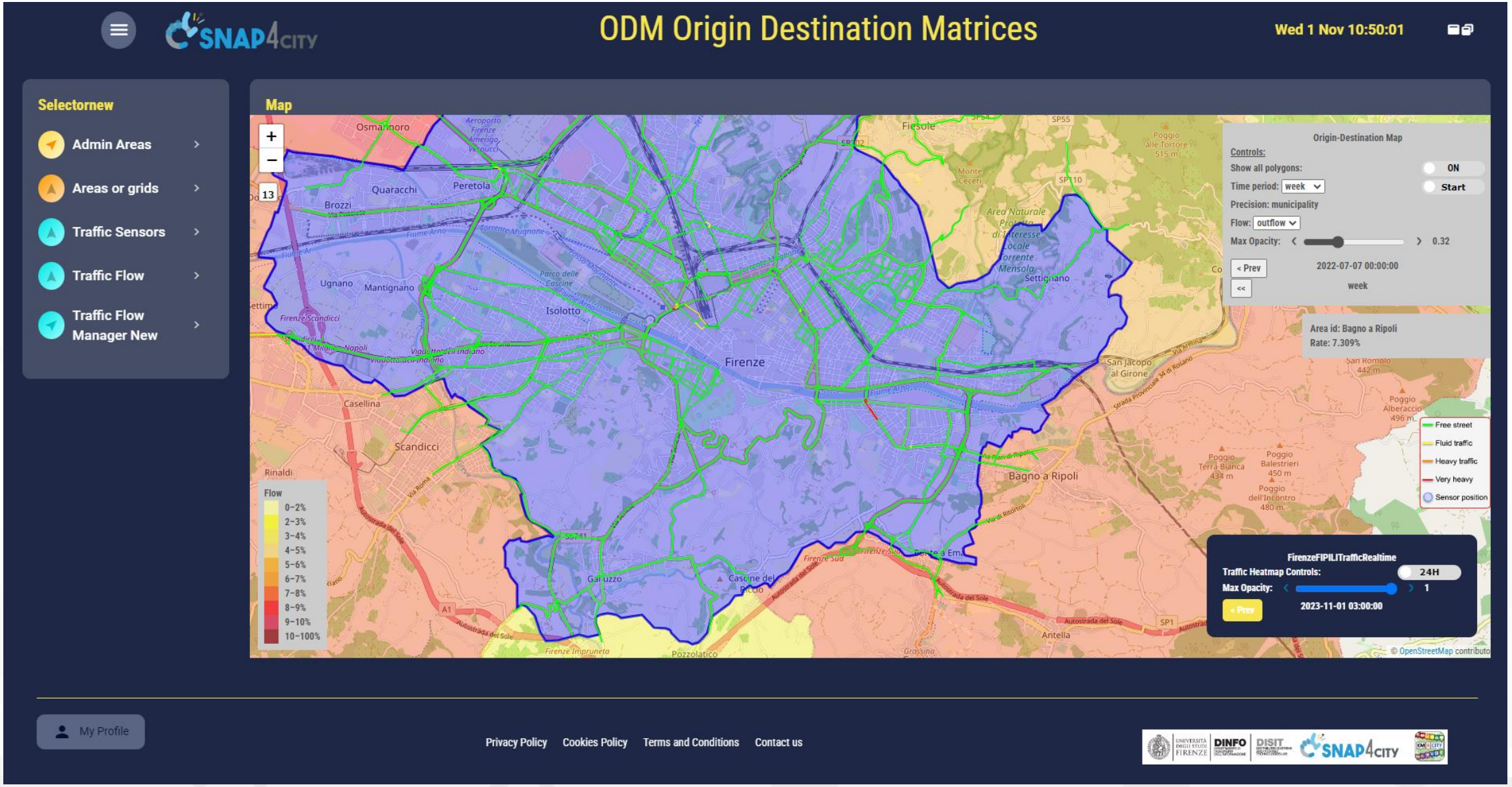

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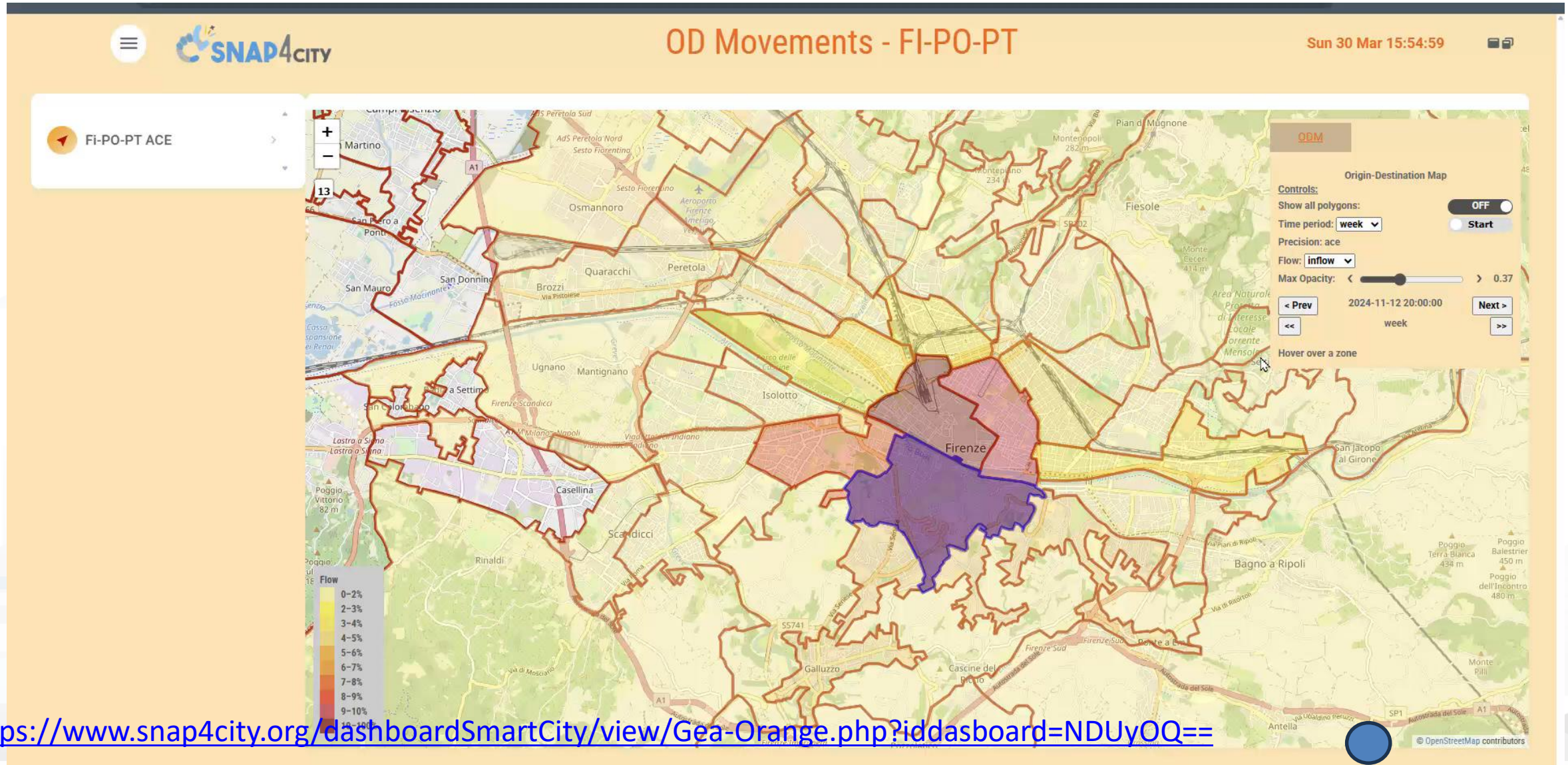
Origin Destination Matrices: Mobility Demand



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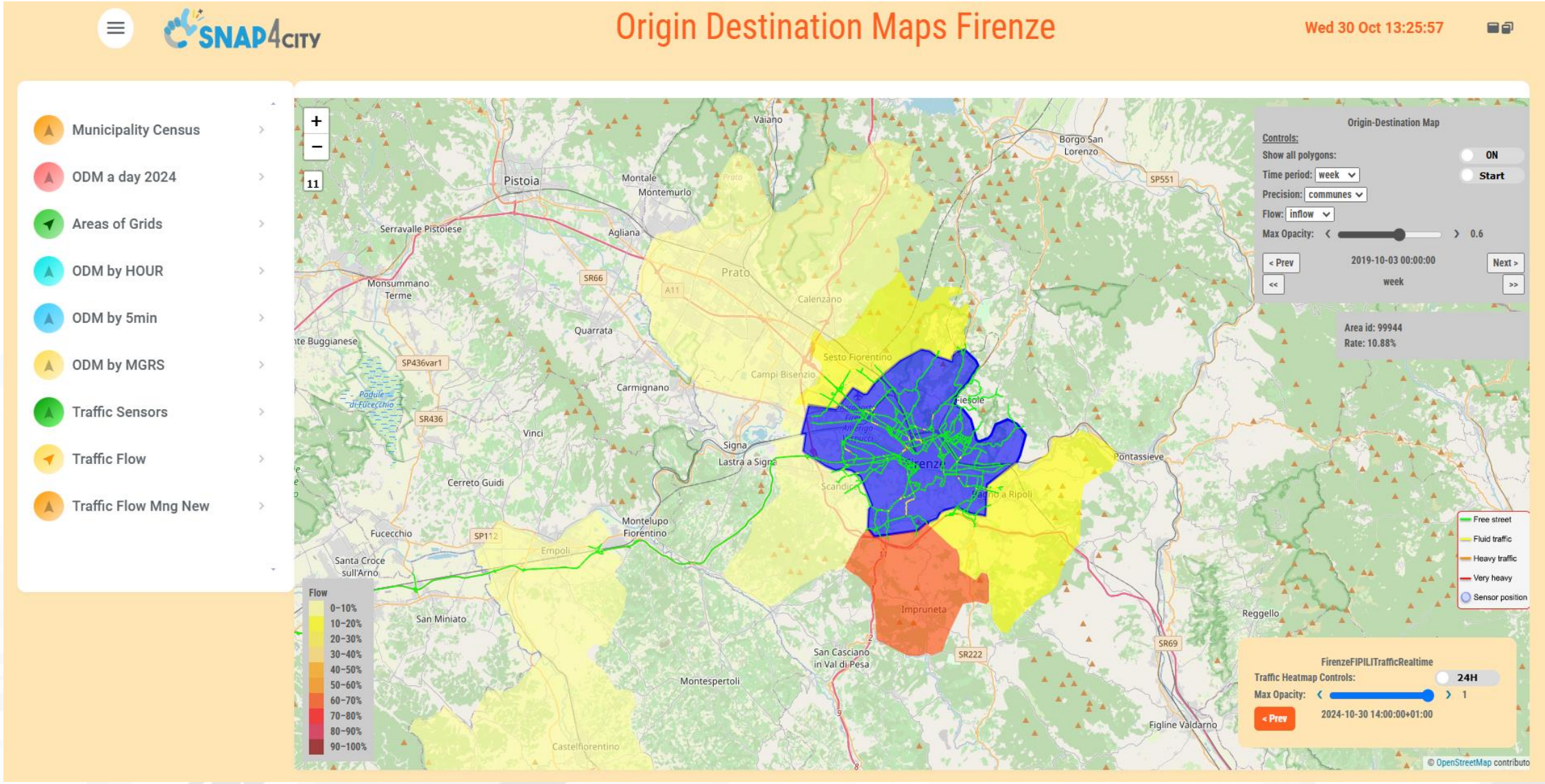

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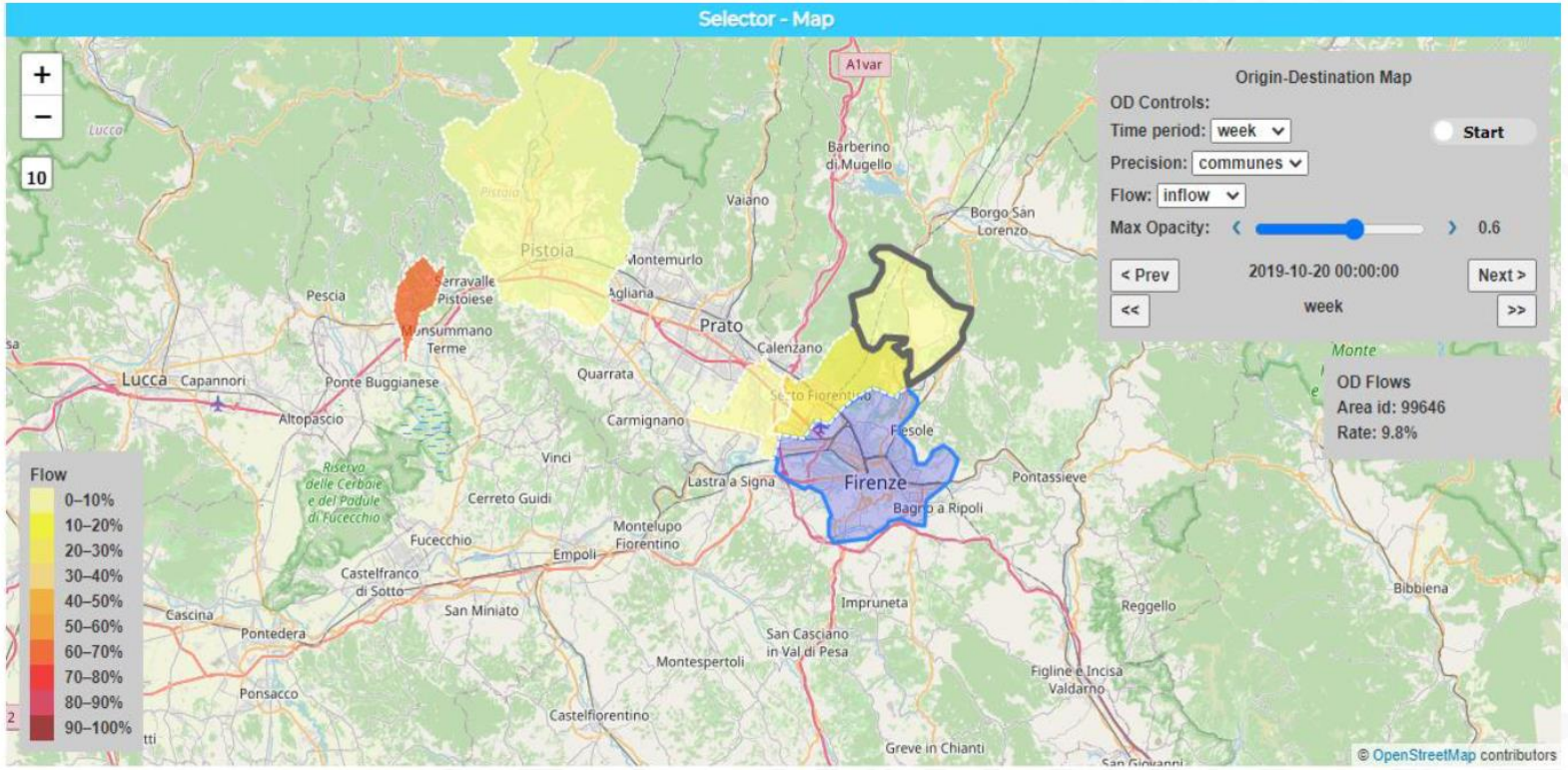
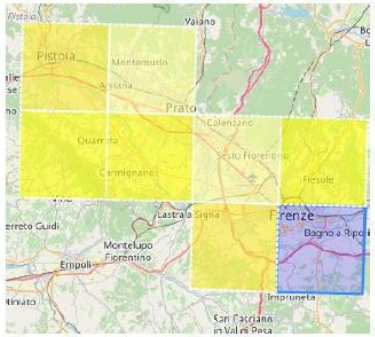
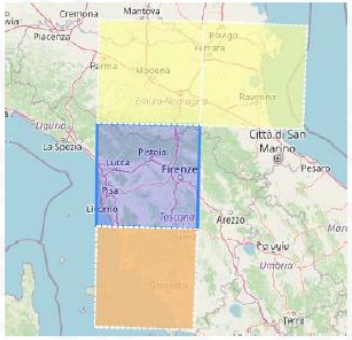
Different Origin Destination Matrices







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

shapes

- **Admin Shapes**: city, region, territories, etc.
  - GADM https://gadm.org/ ,
  - ACE
- **MGRS cells:**
  - 1m, 10m, 100m, **1Km, 10Km, 100Km**
- **Custom Shapes**
  - **GeoJSON**

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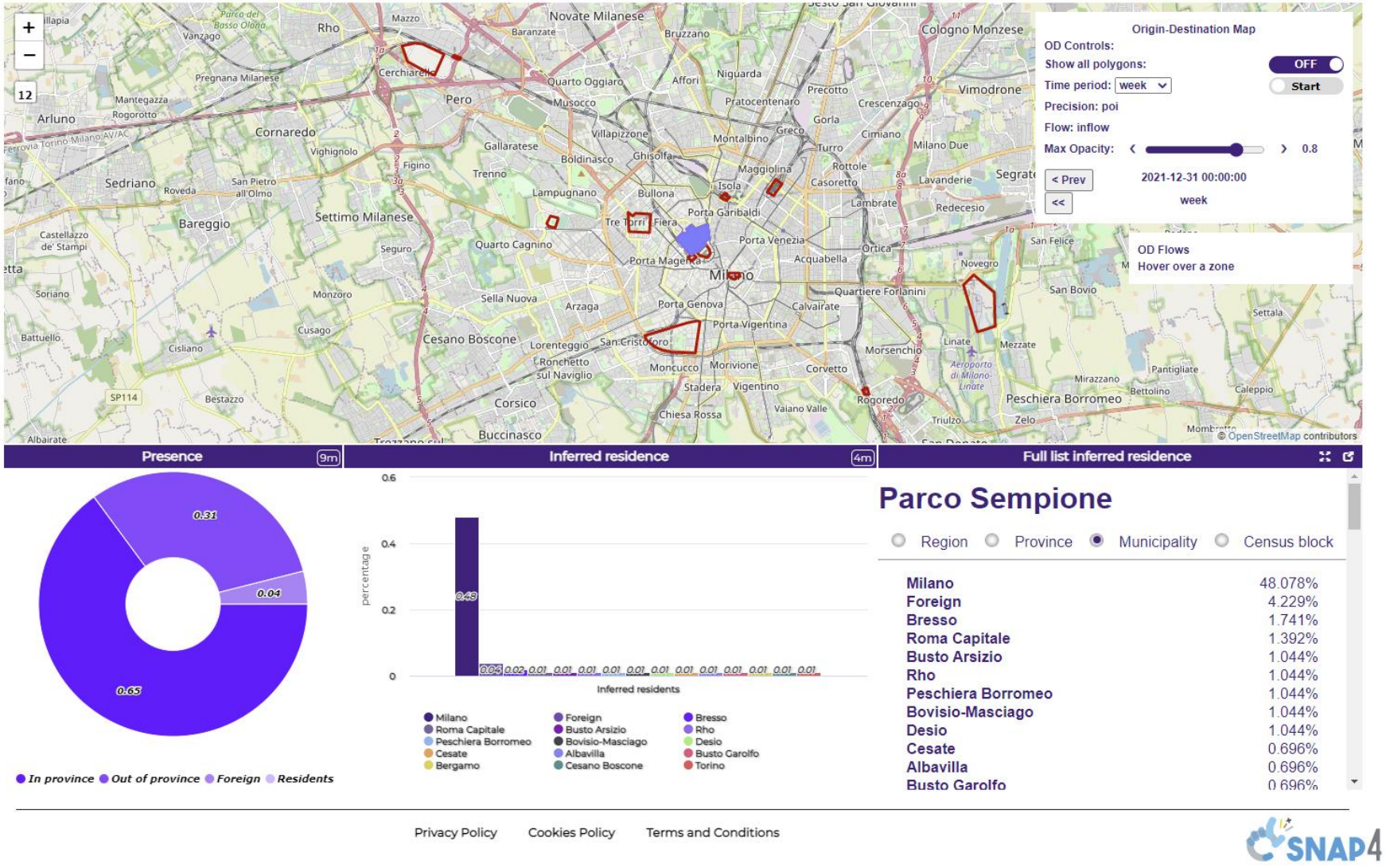
ODM Visual Analytic on Milan Area



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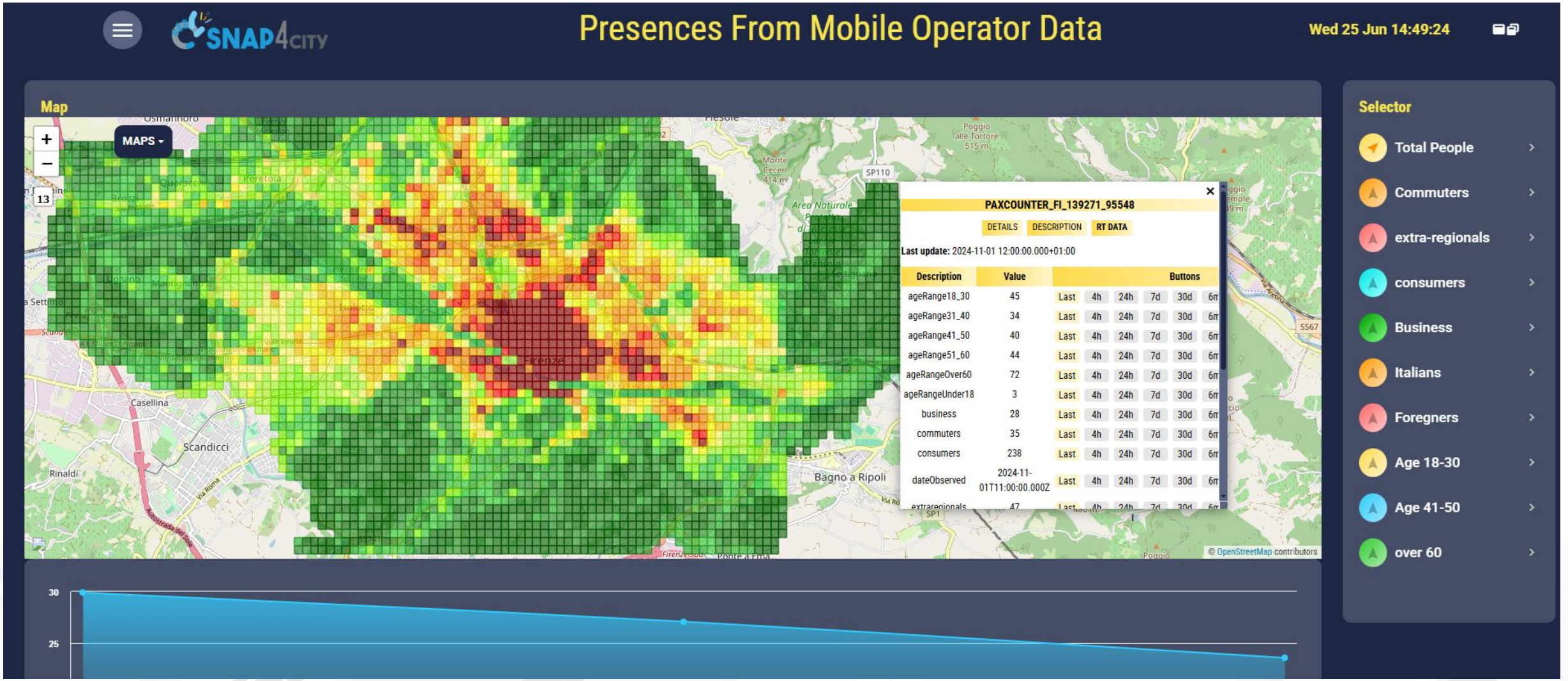
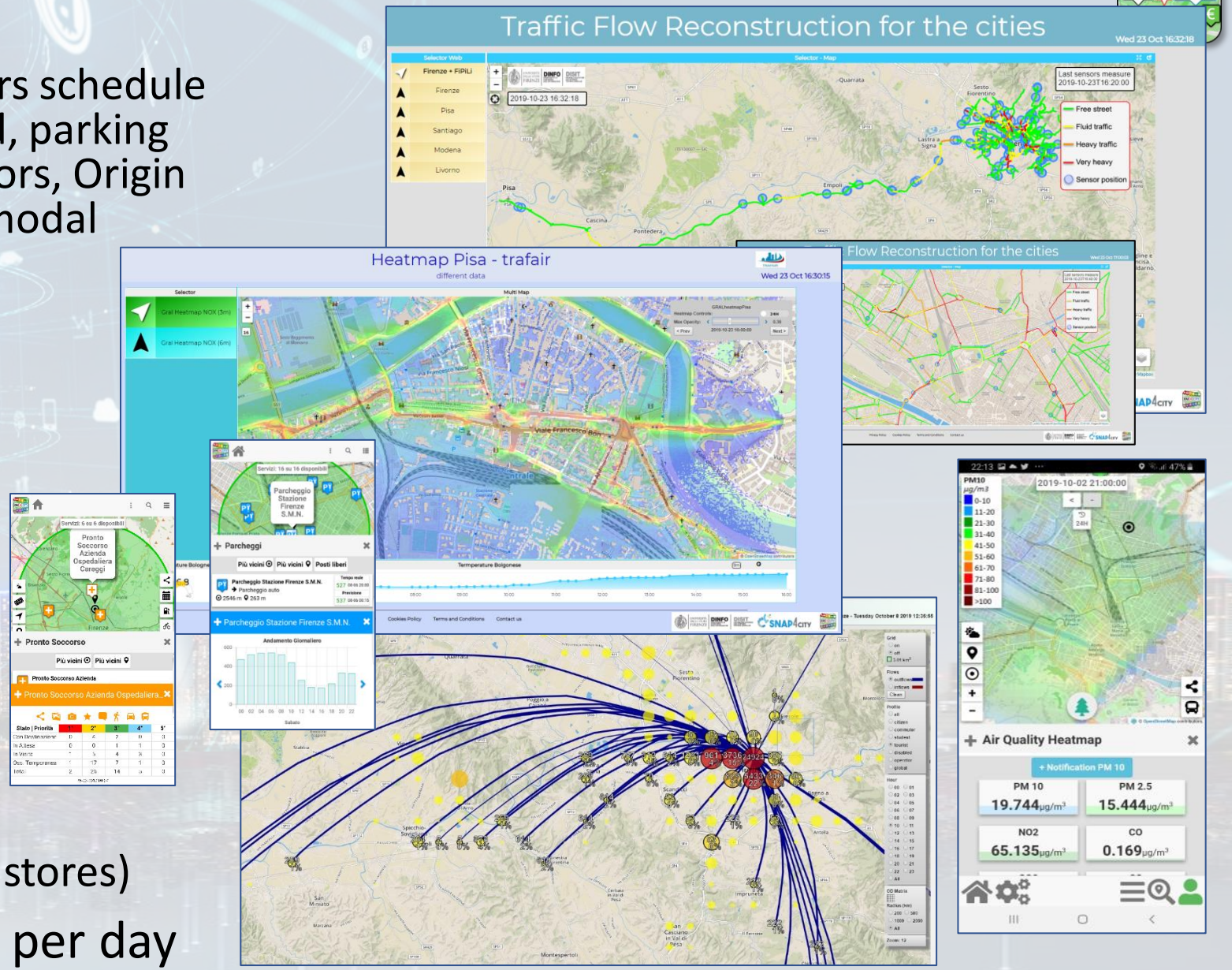
Presences from Mobile Operator



Tuscany Region

- **Dashboards & Services**:
  - **Mobility**: public transport operators schedule and paths, traffic Fi-Pi-Li main road, parking status and predictions, traffic sensors, Origin Destination matrix, routing, multimodal routing, etc.
  - **Social**: Hospitals and triage, etc.
  - **Environment**: sensors, heatmaps,
  - alerting,
    - **Pollution** Forecast: NOX, NO2
    - **Weather** Forecast,
  - **Culture** and **Tourisms**
  - Etc.
- **Mobile App and MicroApplications:**
  - Tuscany in a Snap (all stores)
  - Tuscany where what… km4city (all stores)
- **Numbers**: 1.5 M complex events per day



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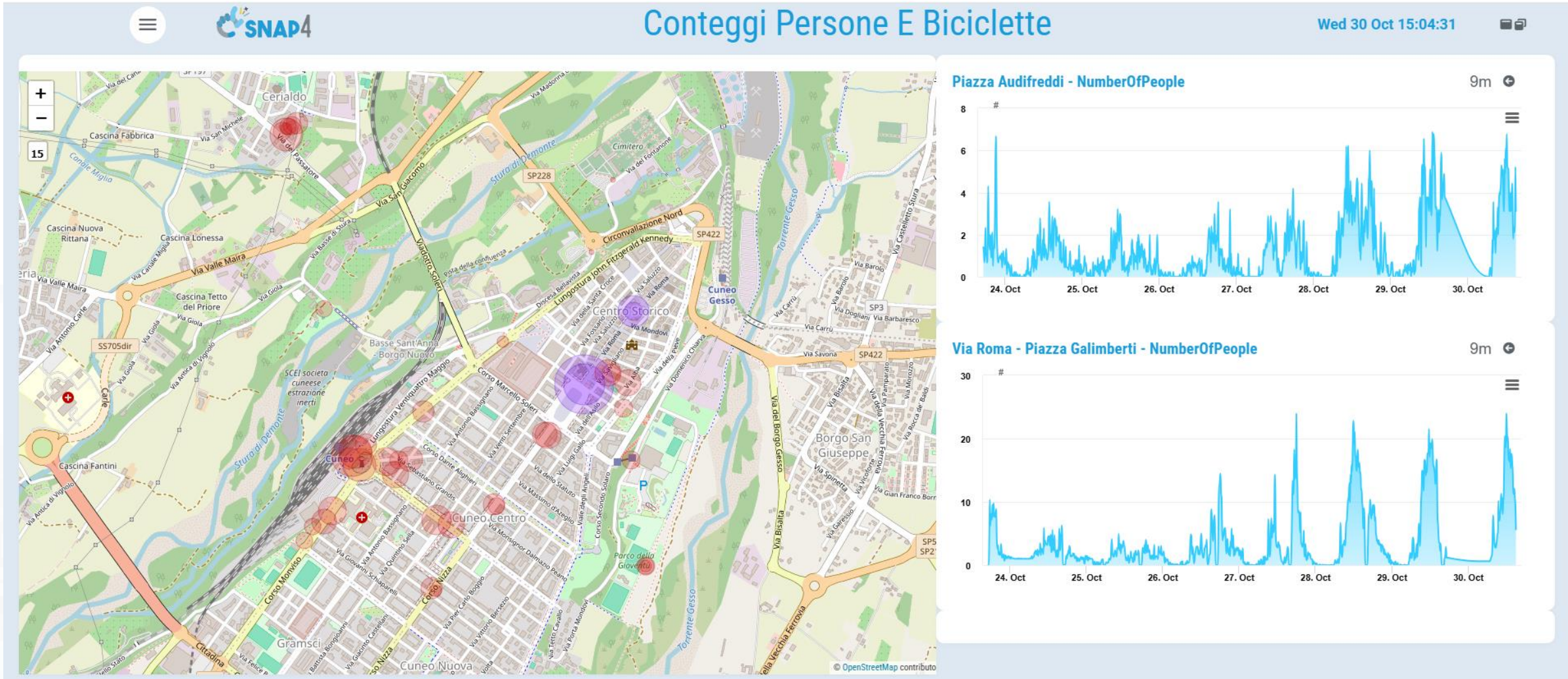
Cuneo Counting People and Bikes


SNAP4
Conteggi Persone E Biciclette
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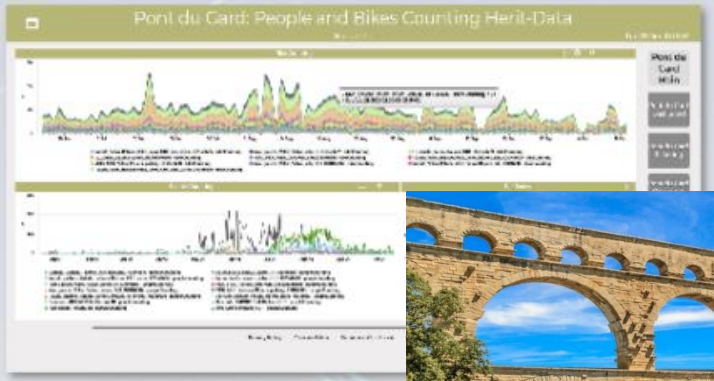
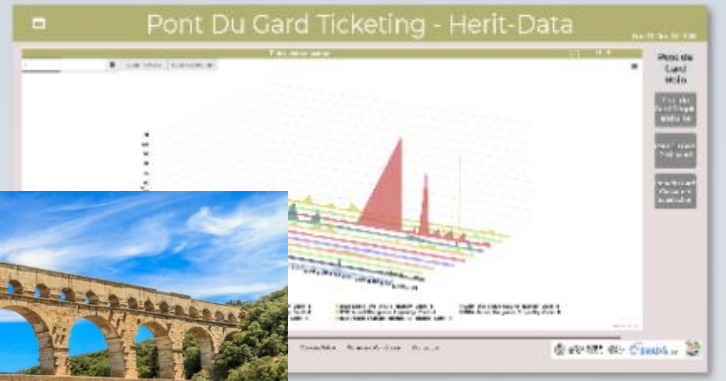
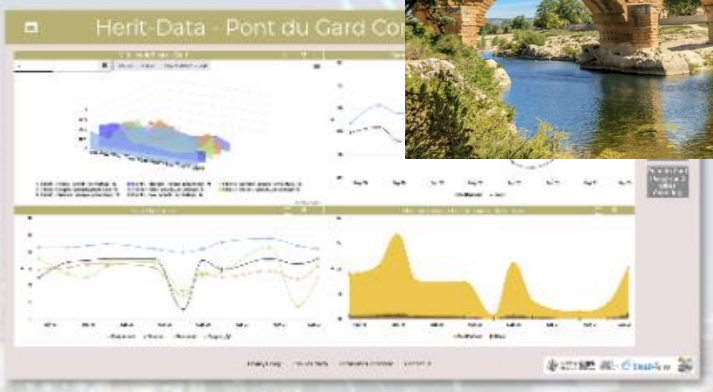
Piazza Audifreddi - NumberOfPeople
9m
8
6
4
2
0
24. Oct
25. Oct
26. Oct
27. Oct
28. Oct
29. Oct
30. Oct
Via Roma - Piazza Galimberti - NumberOfPeople
9m
30
20
10
0
Cuneo
Cuneo Centro
Centro Storico
Cuneo Gesso
Borgo San Giuseppe
Cerialdo
Cuneo Nuova
Gramsci
Basse Sant'Anna - Borgo Nuovo
Via Roma
Via Savona
Via Carrù
Via Barolo
Via Dogliani
Via Barbaresco
Via Bisalta
Via del Borgo Gesso
Via della Vecchia Ferrovia
Corso Nizza
Corso Marconi
Corso Dante Alighieri
Corso Monviso
Corso Marcello Soleri
Via Mondovì
Via Cuneo
Via Roma
Via Savigliano
Via Alba
Via Vittorio Amedeo II
Via Vittorio Emanuele II
Via Pietro Micca
Via Garessio
Via Spinetta
Via Gian Franco Borra
Via Rocca de' Baldi
Via Morozzo
Via Castelletto Stura
Via Domenico Chiarva
Via Luigi Gallo
Via Massimo d'Azeglio
Via Sebastiano Grandis
Via Antonio Bassignano
Via Quintino Sella
Via Giovanni Schiaparelli
Via Monsignor Dalmazzo Peano
Via Pier Carlo Boggio
Via Vittorio Bersezio
Via Tetto Cavallo
Via Ponte Mondovì
Via Giacomo Castellani
Via Battista Bongioanni
Via Felice Rossi

Pont du Gard

- **Tourism Domain**
  - KPIs
  - Social Media
  - People Flows
  - Bike Flows
- **Dashboards**
  - Monitoring KPI
  - People and bikes flows
  - Twitter Vigilance
- **Historical and updated data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**







https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE1Mw==

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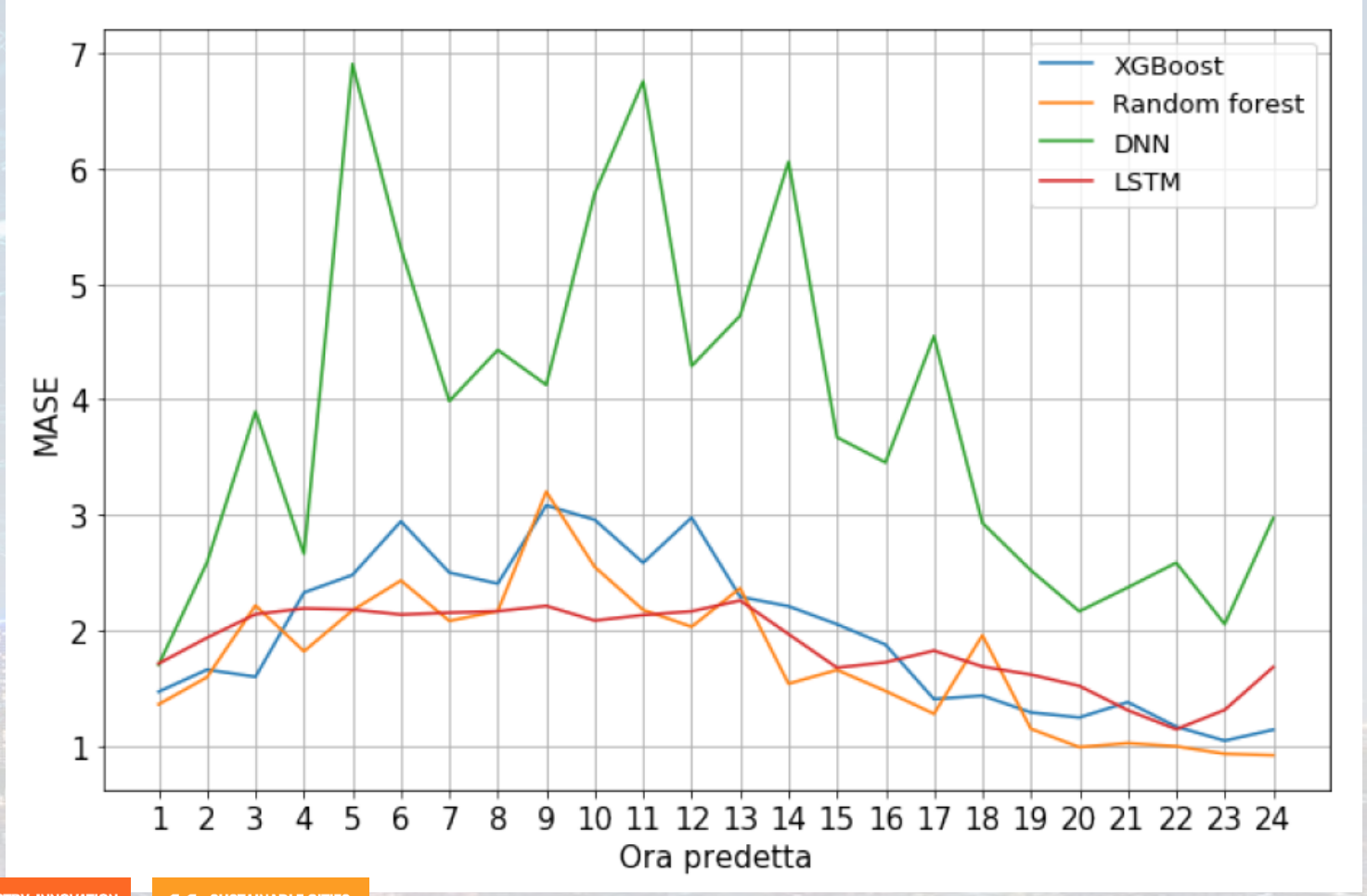
Pont du Gard: data analytics

- Prediction of the number of sold tickets 24 hours in advance

- Using:
  - Historical data
  - Weather conditions
  - Social Media



Twitter Vigilance

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

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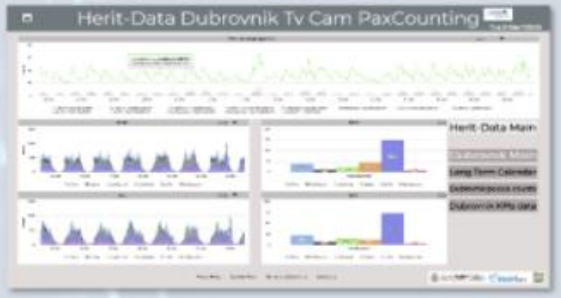
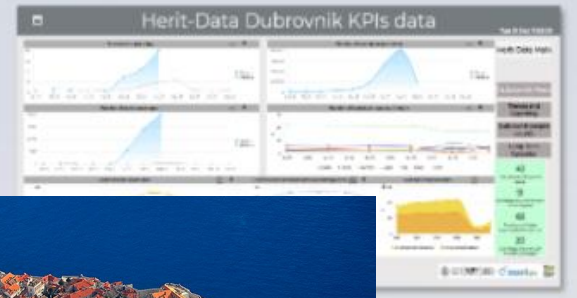
Dubrovnik

- **Tourism Domain**
  - Counting People
  - TV Cameras and WiFi
  - Social Media
- **Dashboards**
  - Monitoring and real time control
  - People flow
  - Twitter Vigilance
- **Historical and Real Time data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**





https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE0Ng==

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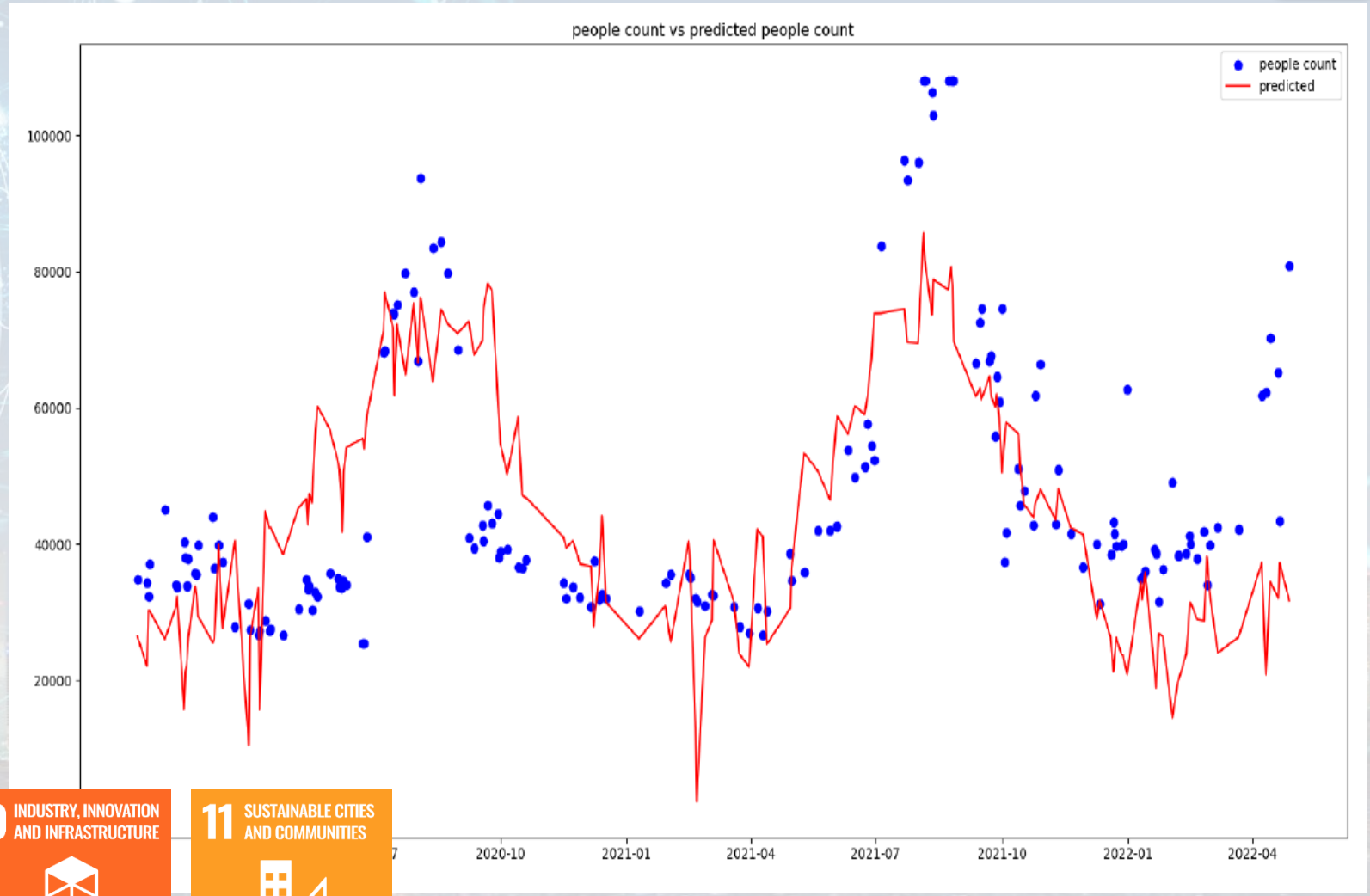
Dubrovnik: Data Analytics

- Assessing impact of advertising

- Prediction of presences on the basis of
  - Social Media Twitter Vigilance
  - weather conditions
  - Historical data



Twitter Vigilance

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

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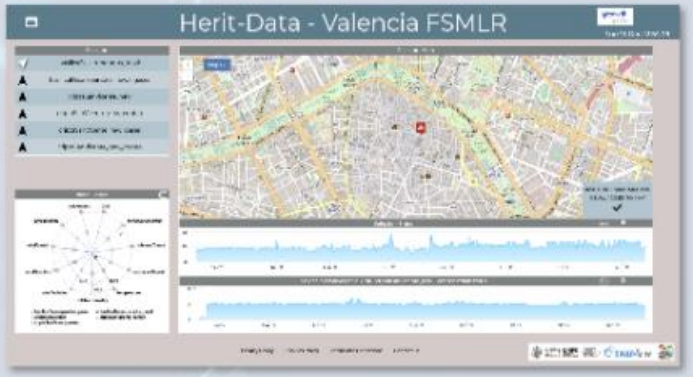
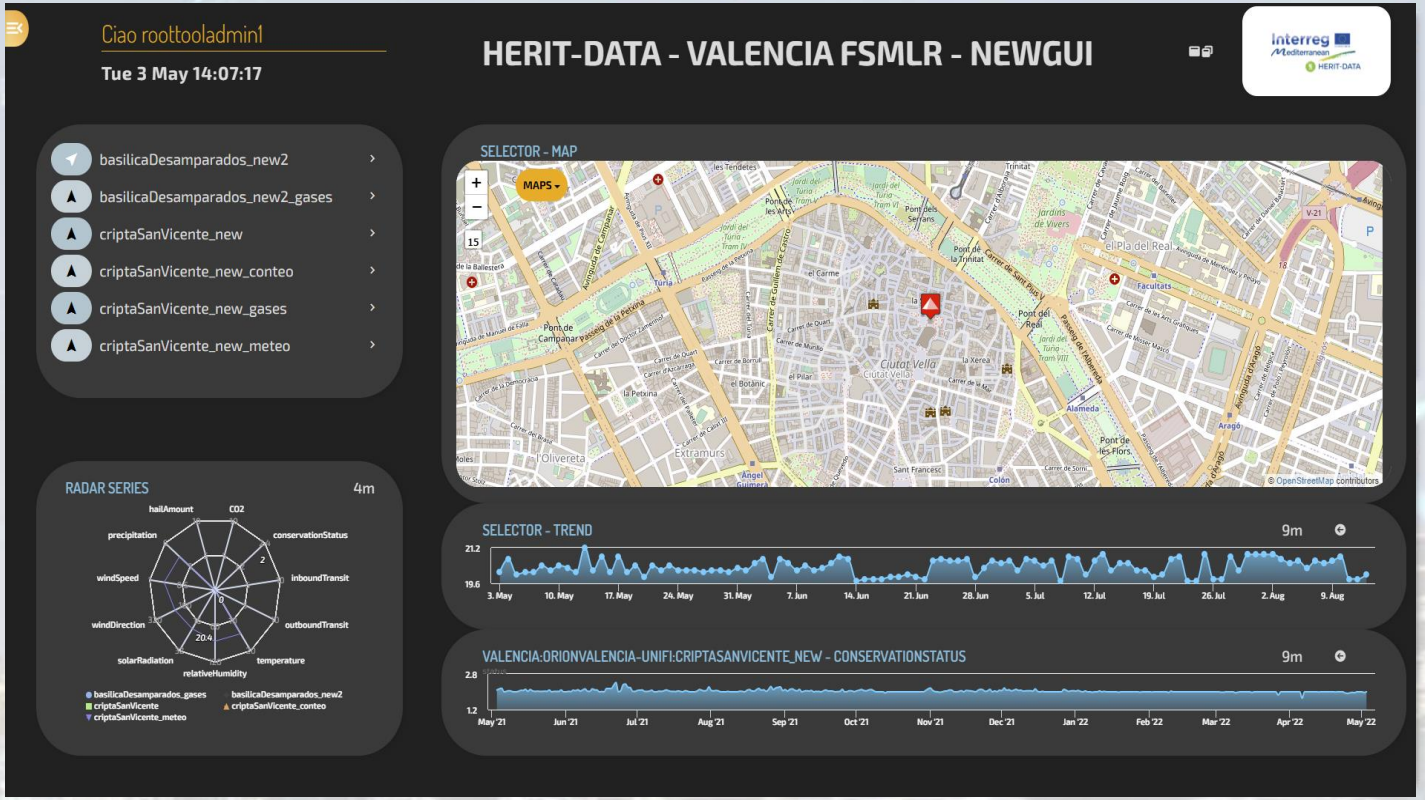
Valencia, FSMLR

- **Tourism Domain**
  - Counting People
  - Environmental data
  - Social Media
- **Dashboards**
  - Monitoring and real time control
  - People flow
  - Twitter Vigilance
- **Historical and Real Time data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**





https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE1MA==

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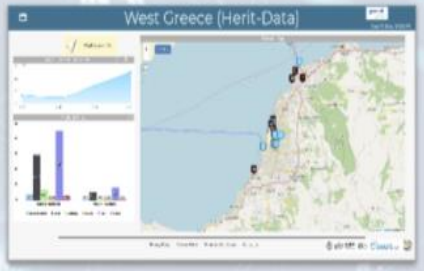
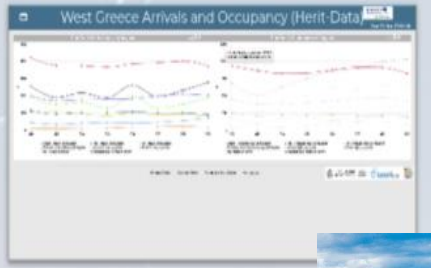
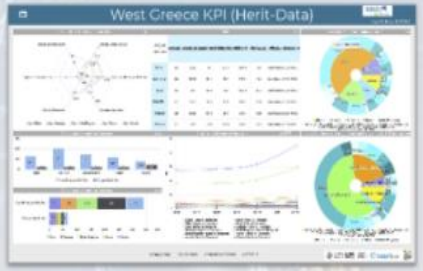
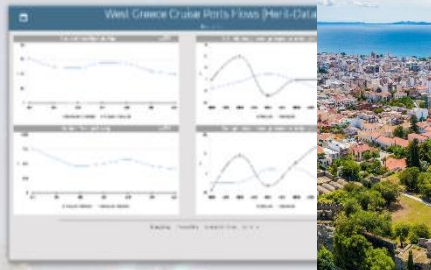
West Greece

- **Tourism Domain**
  - KPIs: ODM, Flows, …
  - Social Media
  - People Flows
- **Dashboards**
  - Monitoring KPI
  - People flows
  - Twitter Vigilance
- **Historical and updated data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**









https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE1NA==

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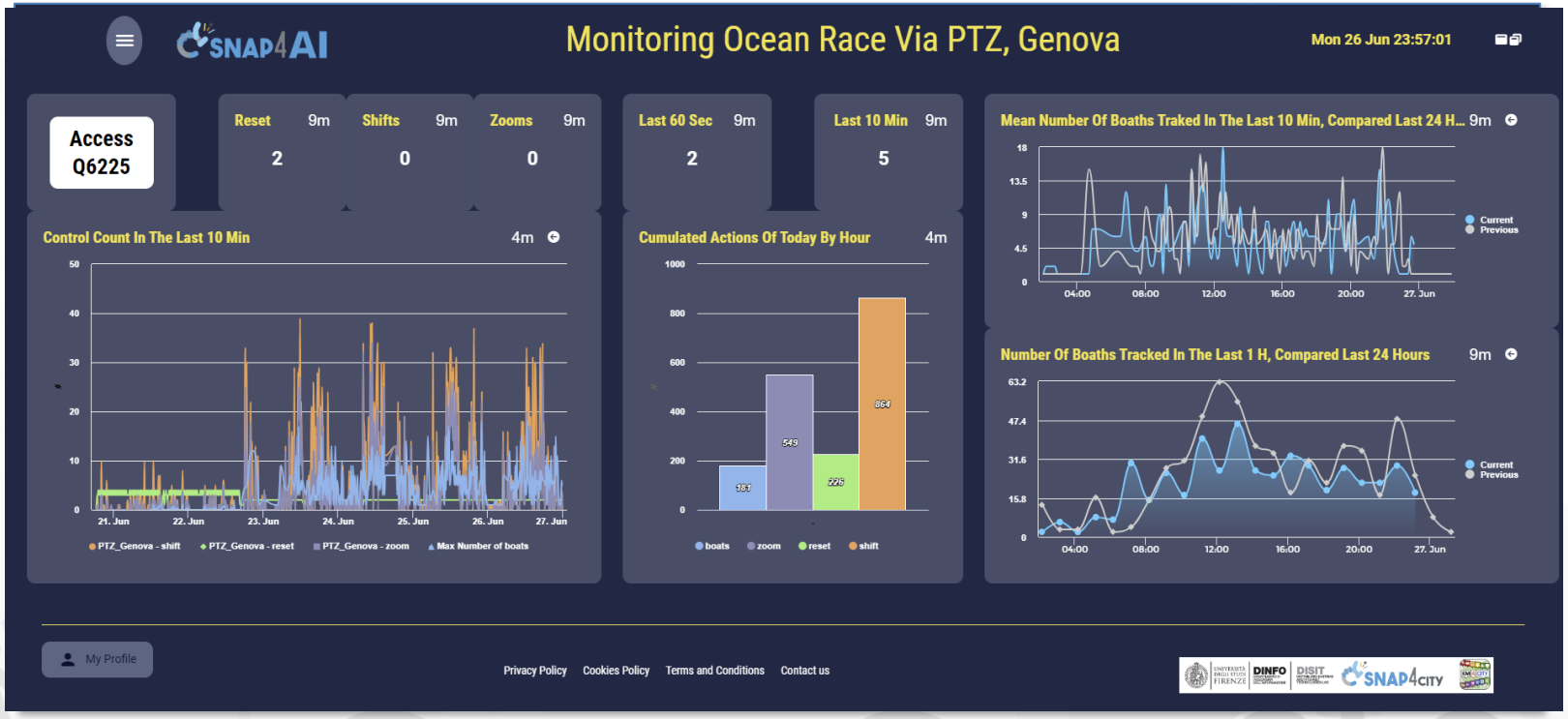
Monitoring Boats
AXIS Q6225

- Genova: Ocean Race, 2023



11 SUSTAINABLE CITIES AND COMMUNITIES

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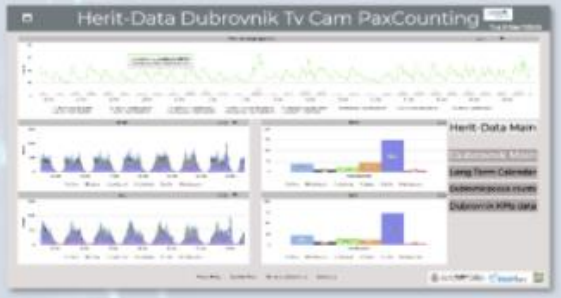
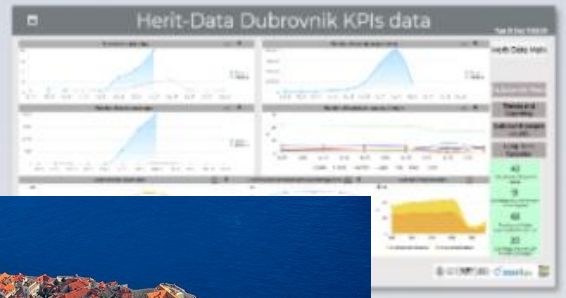
Predicting Service's Load via NLP on Social Media

© Snap4City, October 2025, DISIT lab

Dubrovnik

- **Tourism Domain**
  - Counting People
  - TV Cameras and WiFi
  - Social Media
- **Dashboards**
  - Monitoring and real time control
  - People flow
  - Twitter Vigilance
- **Historical and Real Time data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**





https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE0Ng==

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Pont du Gard

- **Tourism Domain**
  - KPIs
  - Social Media
  - People Flows
  - Bike Flows
- **Dashboards**
  - Monitoring KPI
  - People and bikes flows
  - Twitter Vigilance
- **Historical and updated data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE1Mw==

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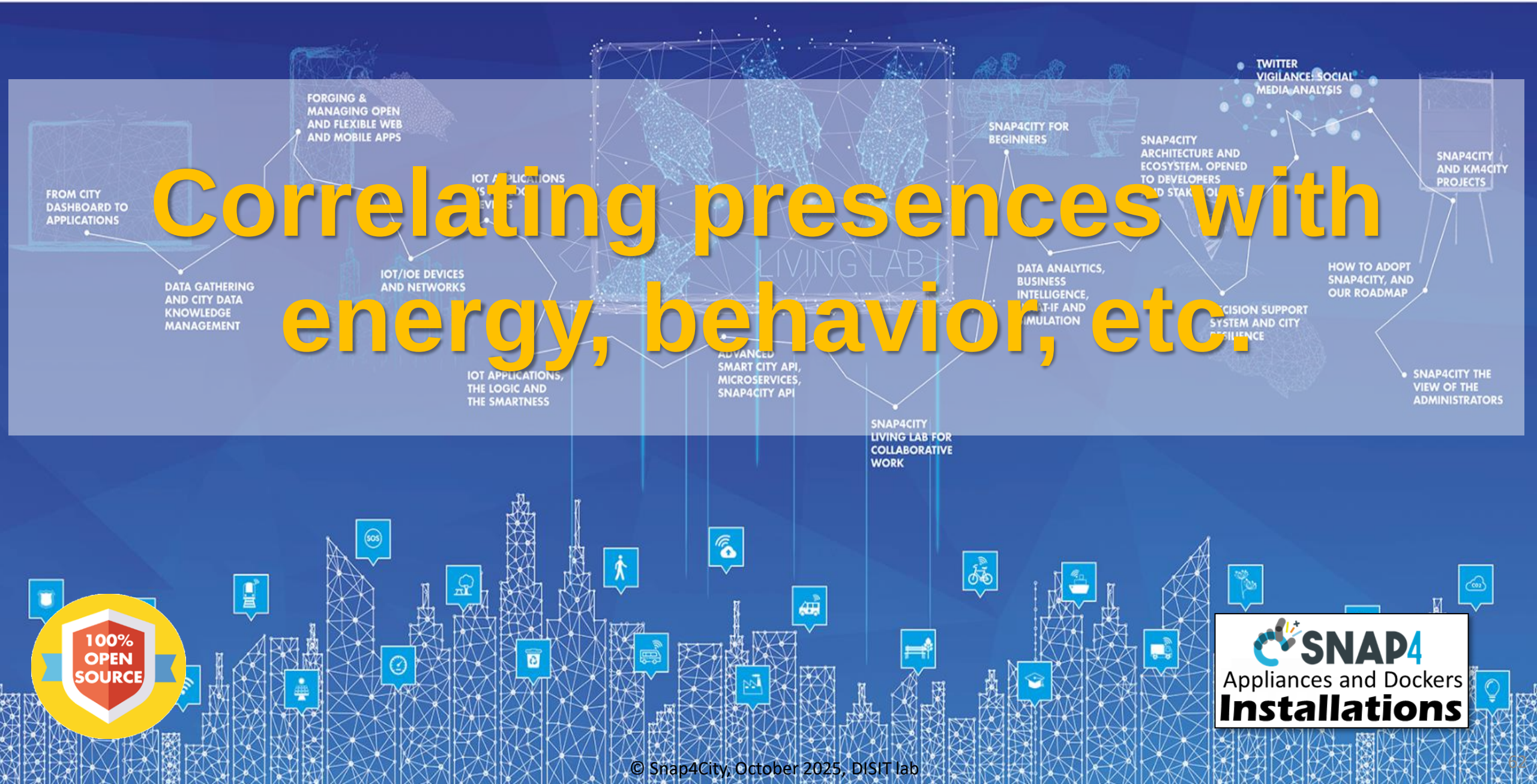

Correlating presences with energy, behavior, etc.

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

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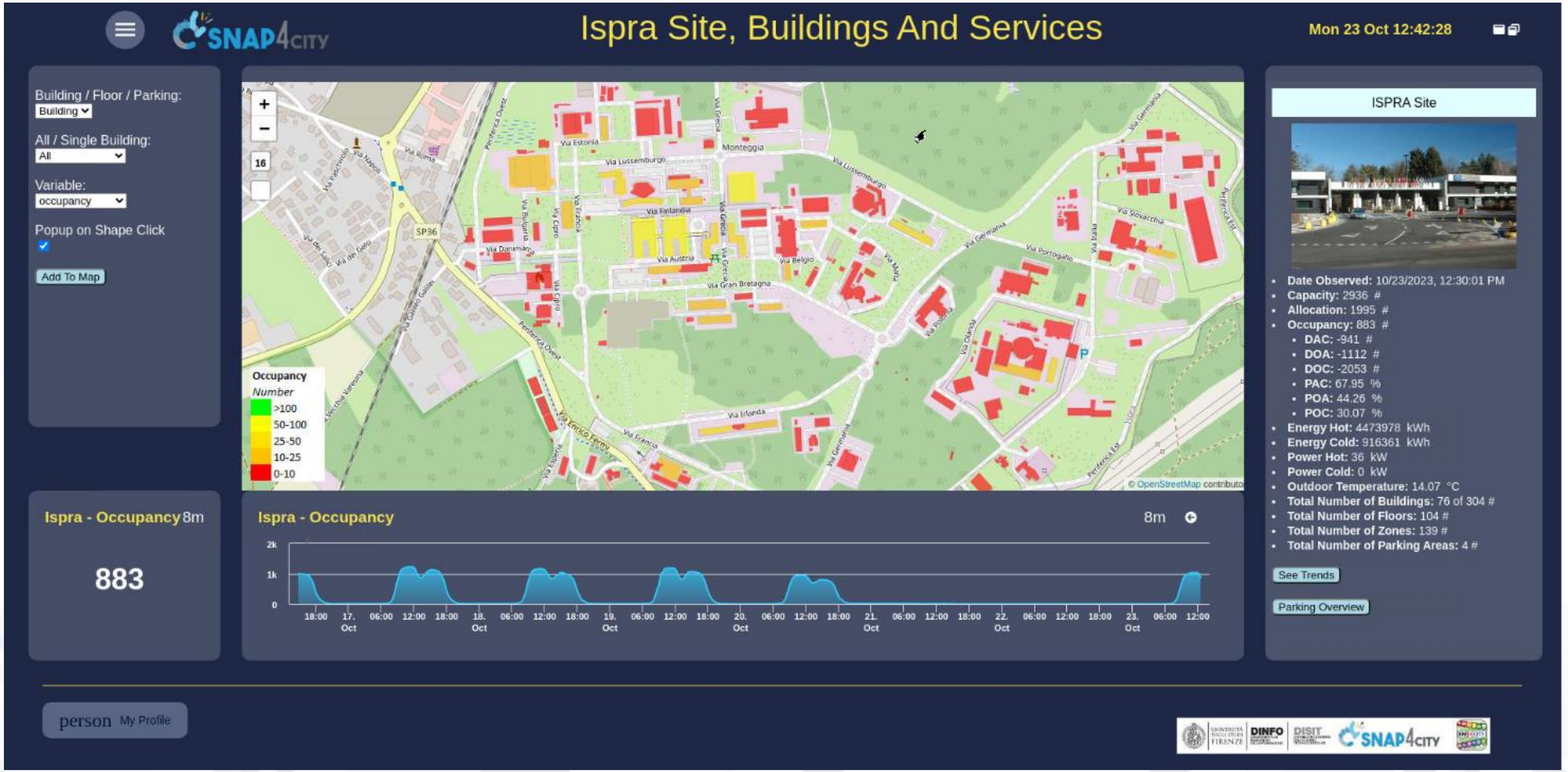

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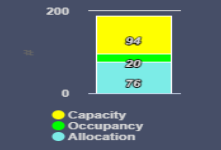
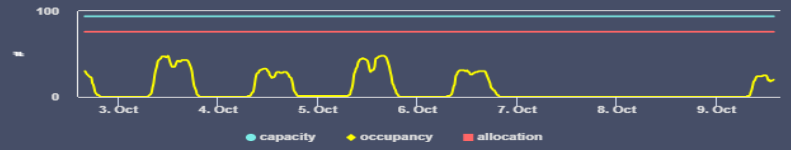
Building 27B Trends

Mon 9 Oct 13:47:14

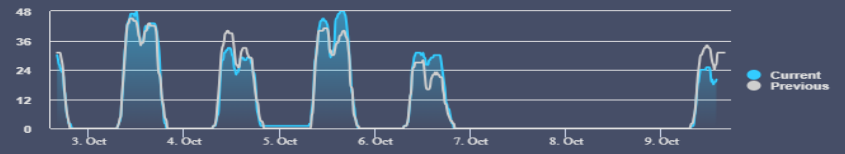
Actual 4m



Capacity - Allocation - Occupancy 4m



Occupancy Weekly Time Trend Compare 9m



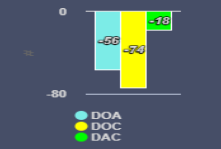
Office Mq 9m

803.9 m2

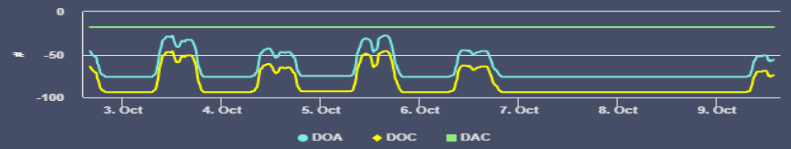
Temp. 9m

20.6 °C

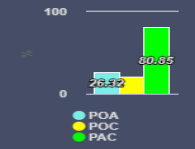
Difference 4m



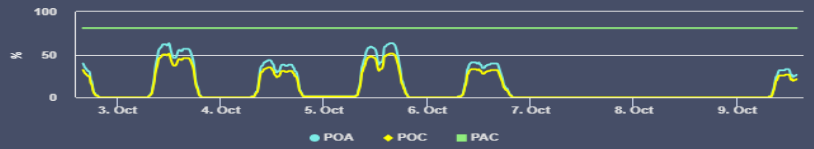
DOA - DOC - DAC 4m



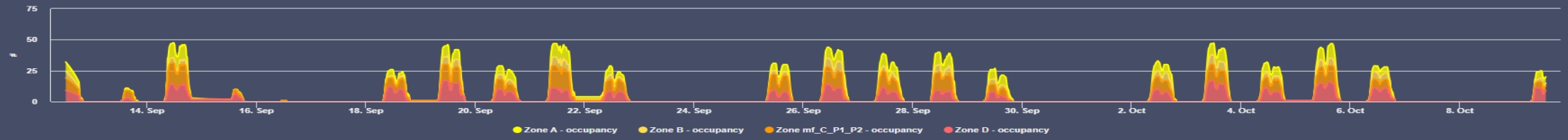
Percentage 4m



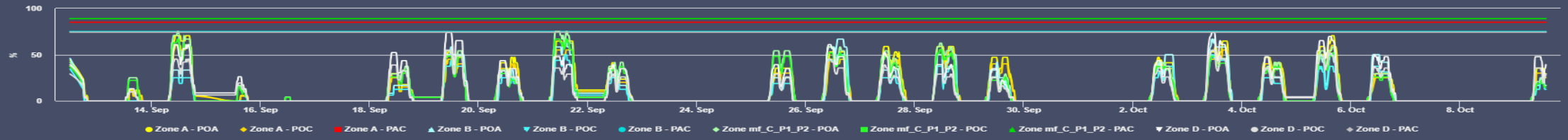
POA - POC - PAC 4m



Occupancy Per Zones - Monthly Time Trend Comparison Stacked 4m



Percentage Per Zones - Monthly Time Trend Comparison 4m



Heat Power 9m

0 kW

Heat Energy 9m

1931279 kWh

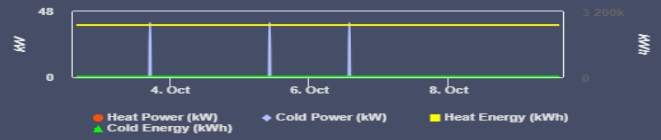
Cold Power 9m

0 kW

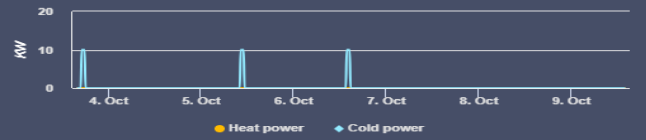
Cold Energy 9m

888311 kWh

Energy Trends 4m



Average Hourly Power 4m



En./Mq 9m

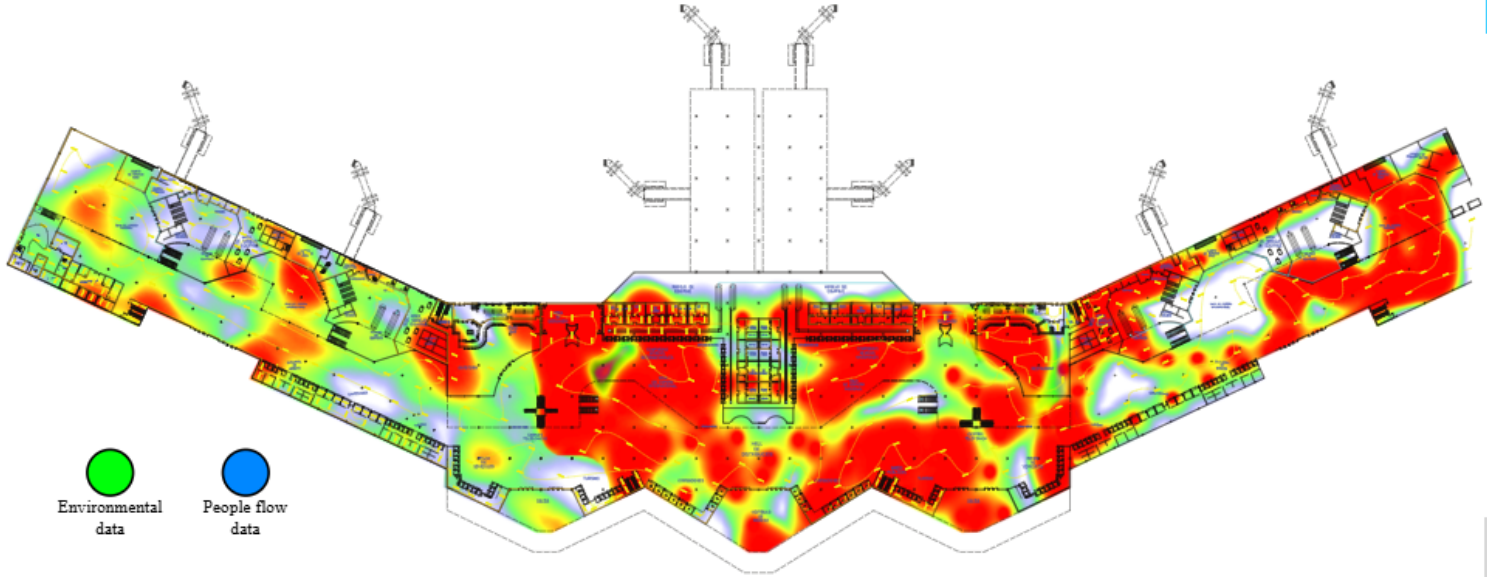
0 kWh

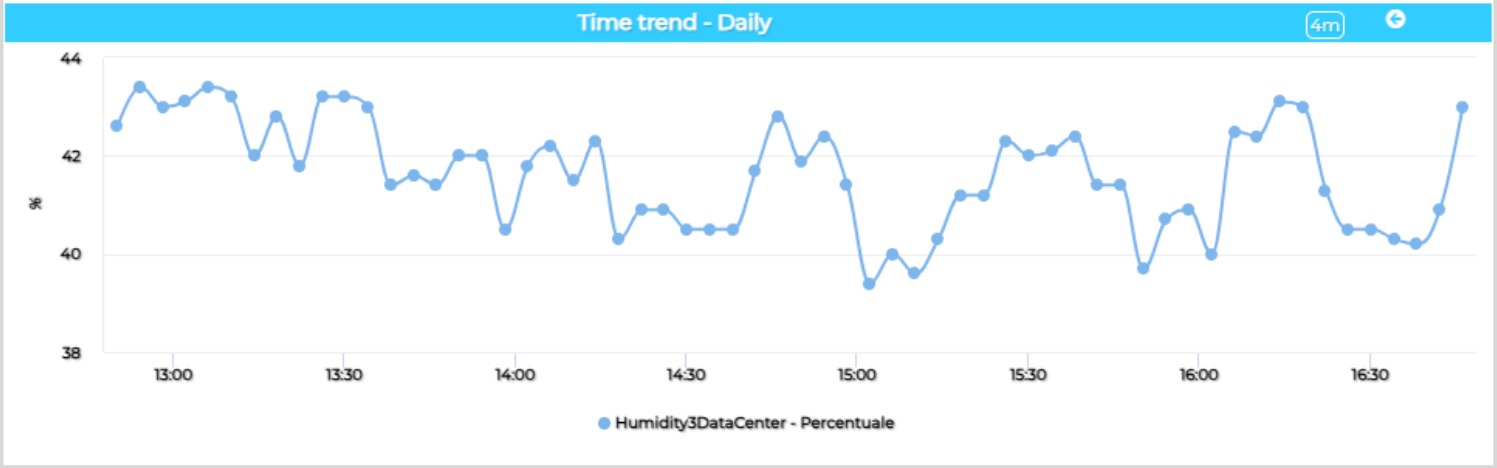
En./Pax 9m

0 kWh

person My Profile

People Flow densities





Environment zone A

Environment Zone B

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People monitoring, Wi-Fi PAX counters

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

© Snap4City, October 2025, DISIT lab

Tourism management, over-tourism

- **Operation**:
  - Monitoring: counting, tracking, flows, ODM, etc.
    - Differentiating: tourists, commuters, resident, students, etc.
    - Differentiating on Restricted zone: permissions
  - Early warning detection, predictions, etc.
  - Collecting participation, complains, etc.
  - Producing suggestions towards second offers, diversification
  - Informing of crowed conditions
- **Management**
  - Promoting best moments for visiting, pushing event organizers
  - Simulation and plan, improve services: transportation, sharing
  - Assessing and predicting reputation

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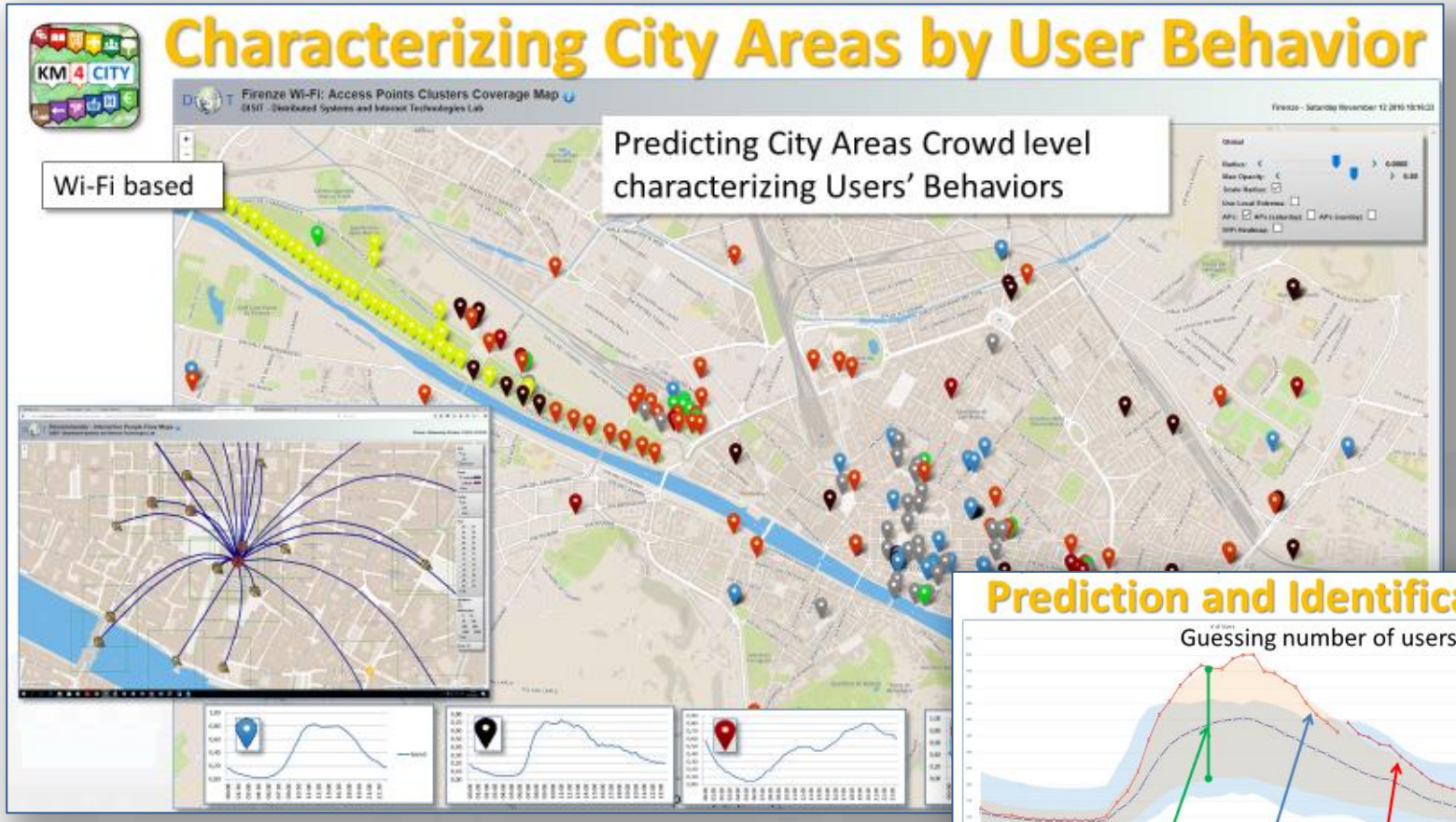
People Flows

- **Prediction of people flows** on the basis of Wi-Fi data
- **Anomaly** detection
- **Resolute** H2020
- Classification of city areas



11 SUSTAINABLE CITIES AND COMMUNITIES

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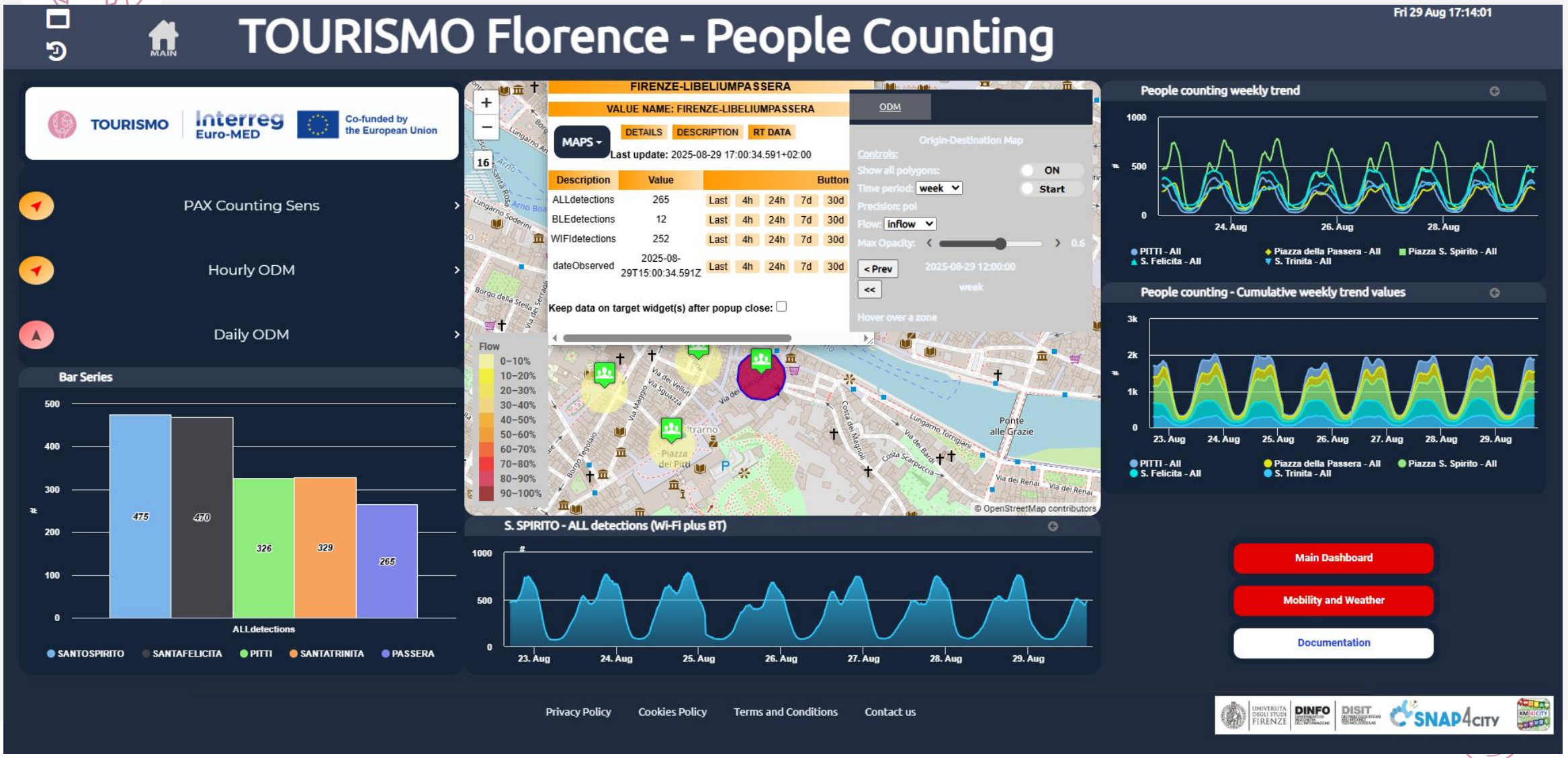
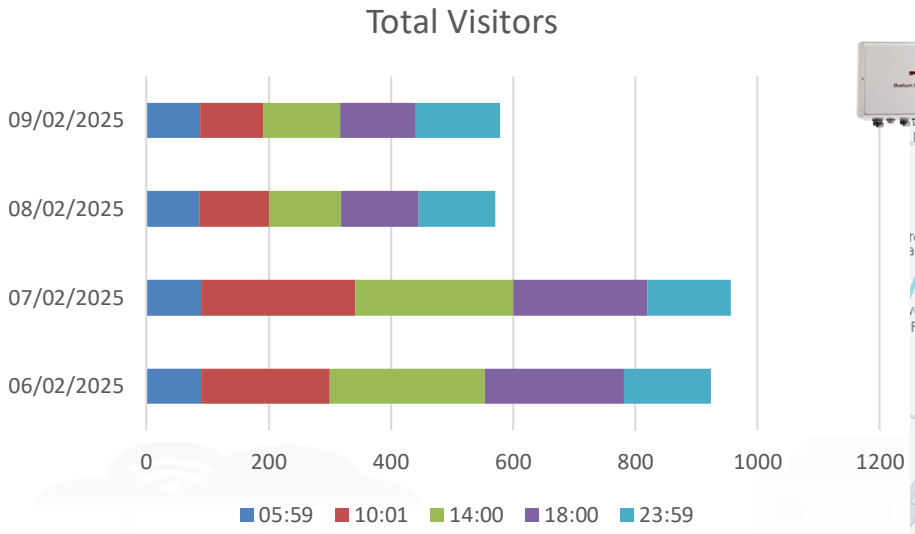
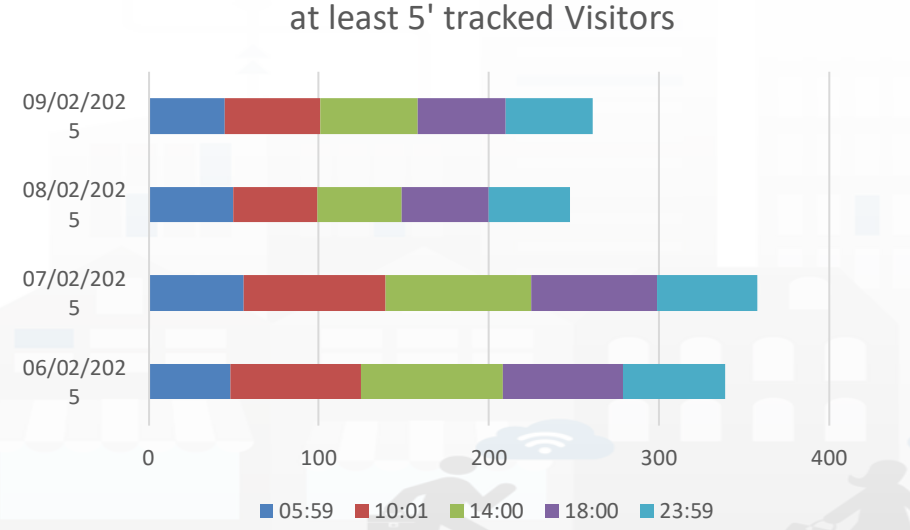
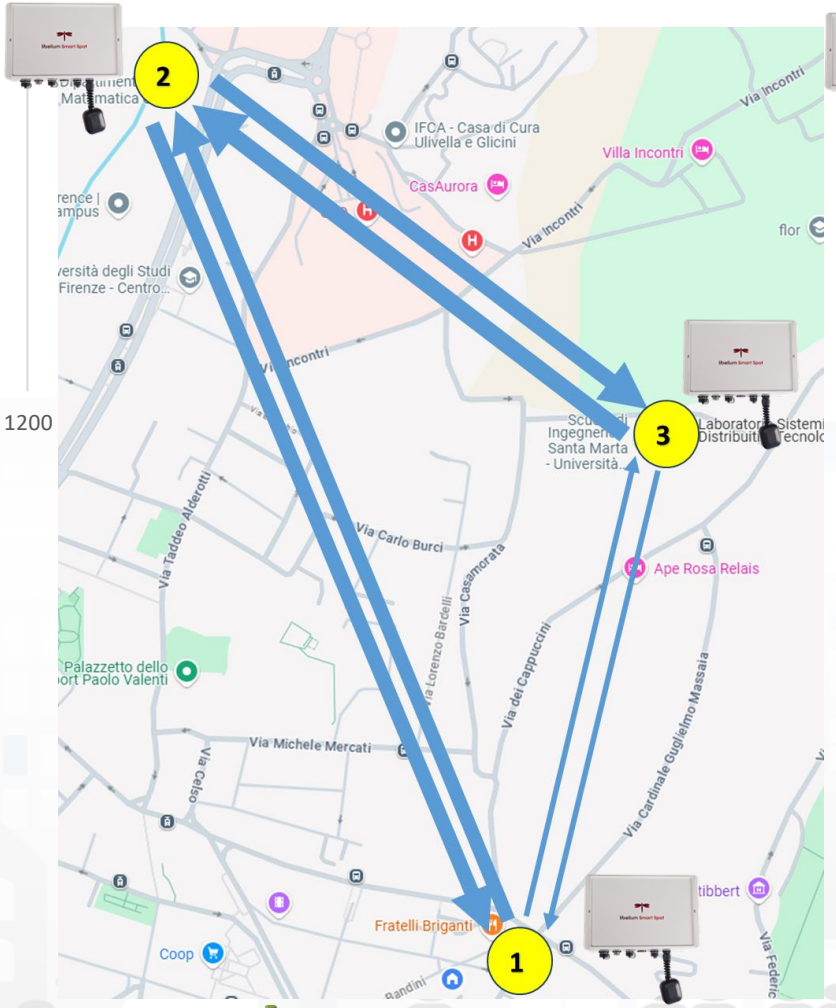
https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDYzNQ==



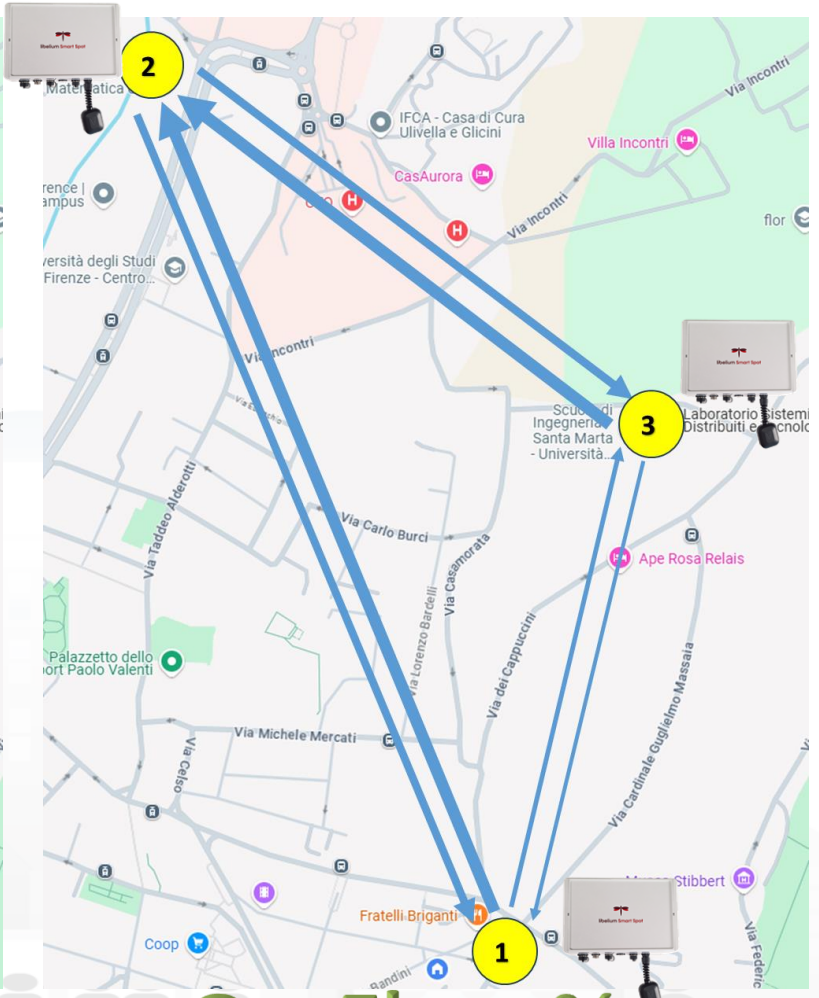
ODM PaxCounters







Flow Counts



OutFlow %

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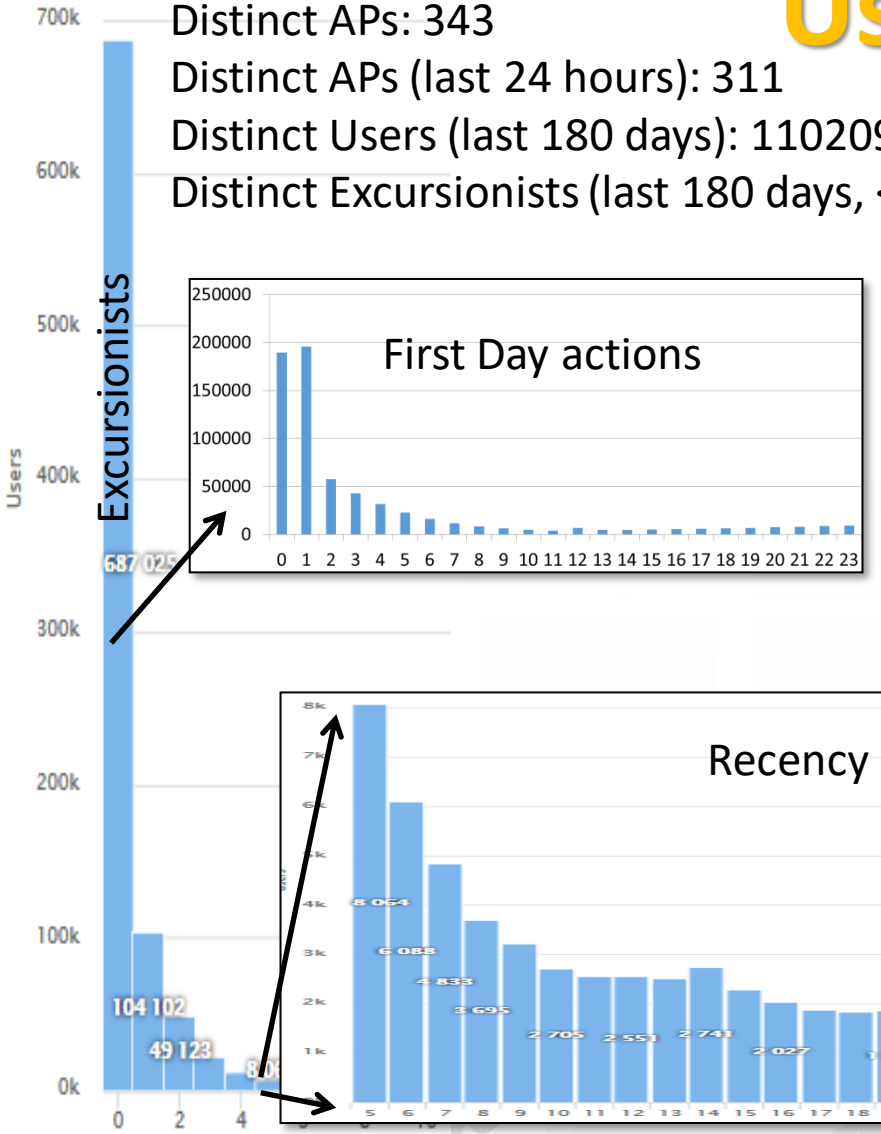
Tracking People vs Environment in Malta

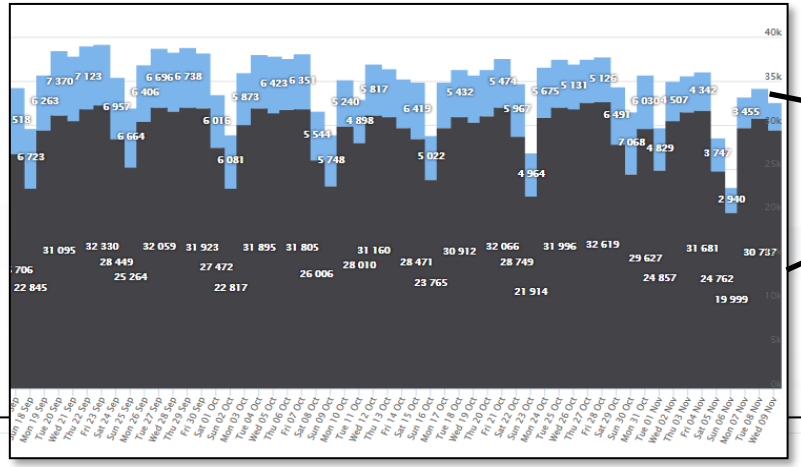
https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDMzNQ==

© Snap4City, October 2025, DISIT lab

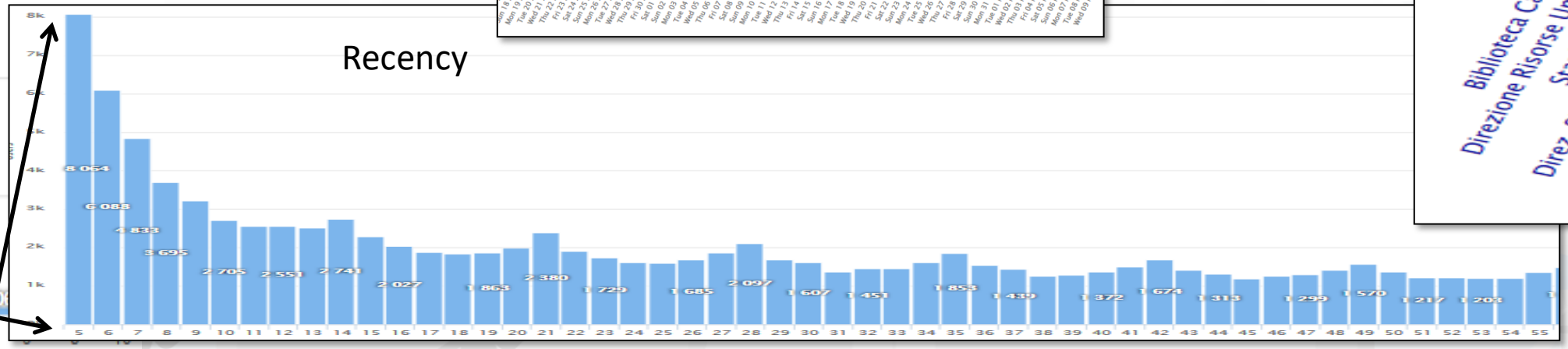
User Behaviour Analysis

Distinct APs: 343
Distinct APs (last 24 hours): 311
Distinct Users (last 180 days): 1102098
Distinct Excursionists (last 180 days, < 24 h): 687025

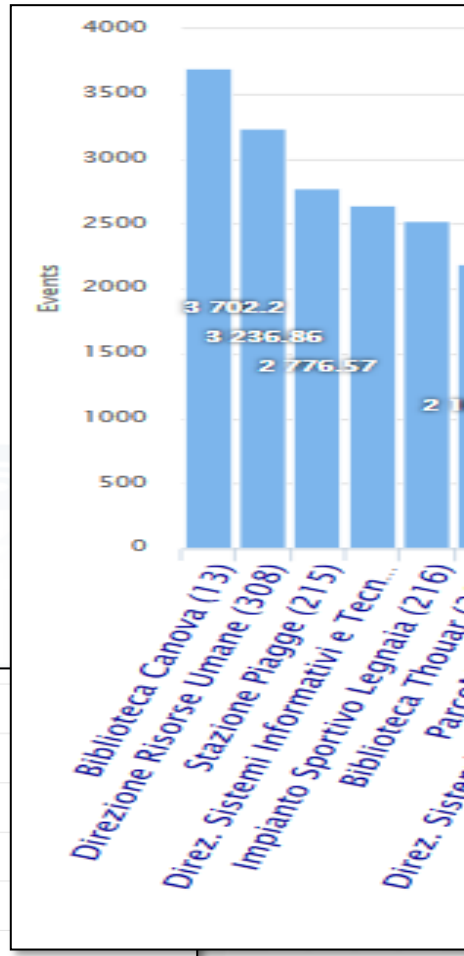




New City Users
VS
Returning

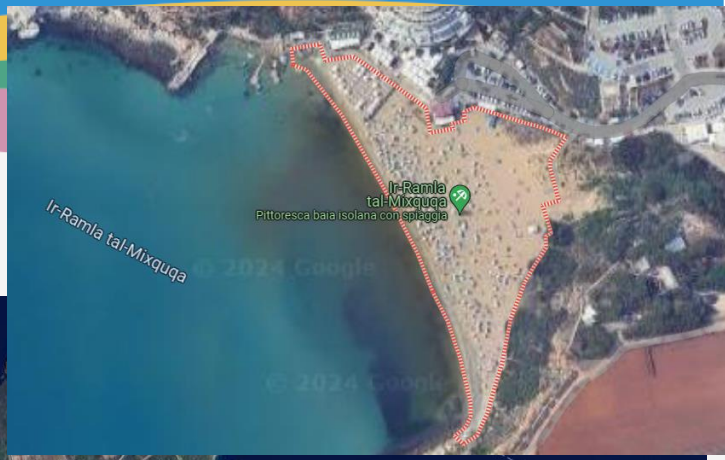


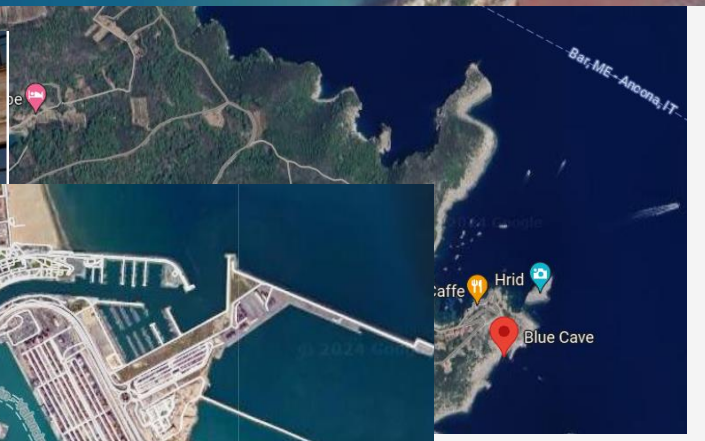
Where

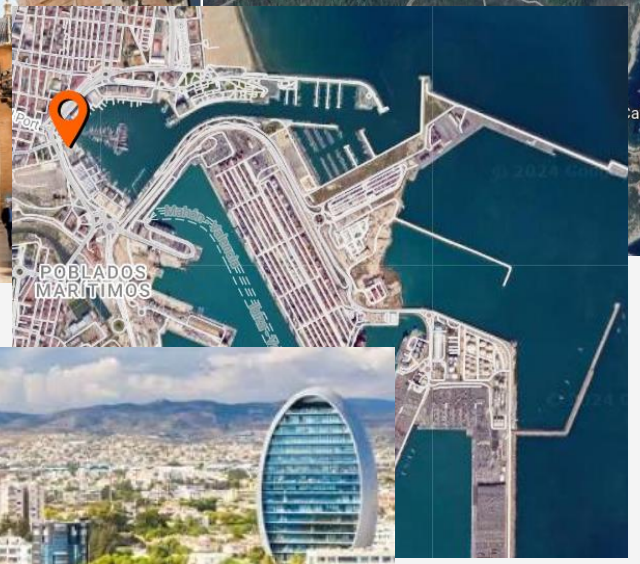


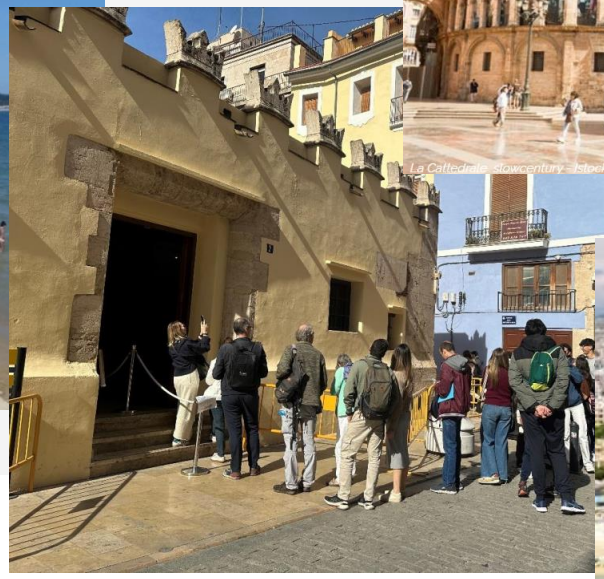
• Pilots of Snap4City on:

- Greece - READ S.A.: Rodi
- Italy – FRI, UNIFI: Firenze
- Spain – FV, FSMLR: Valencia
- Cyprus – ANELEM: Limassol
- Bulgaria – VEDA: Varna
- Croatia – RERA SD: Splitsko-dalmatinska županija
- Malta – MRDDF: La Valletta





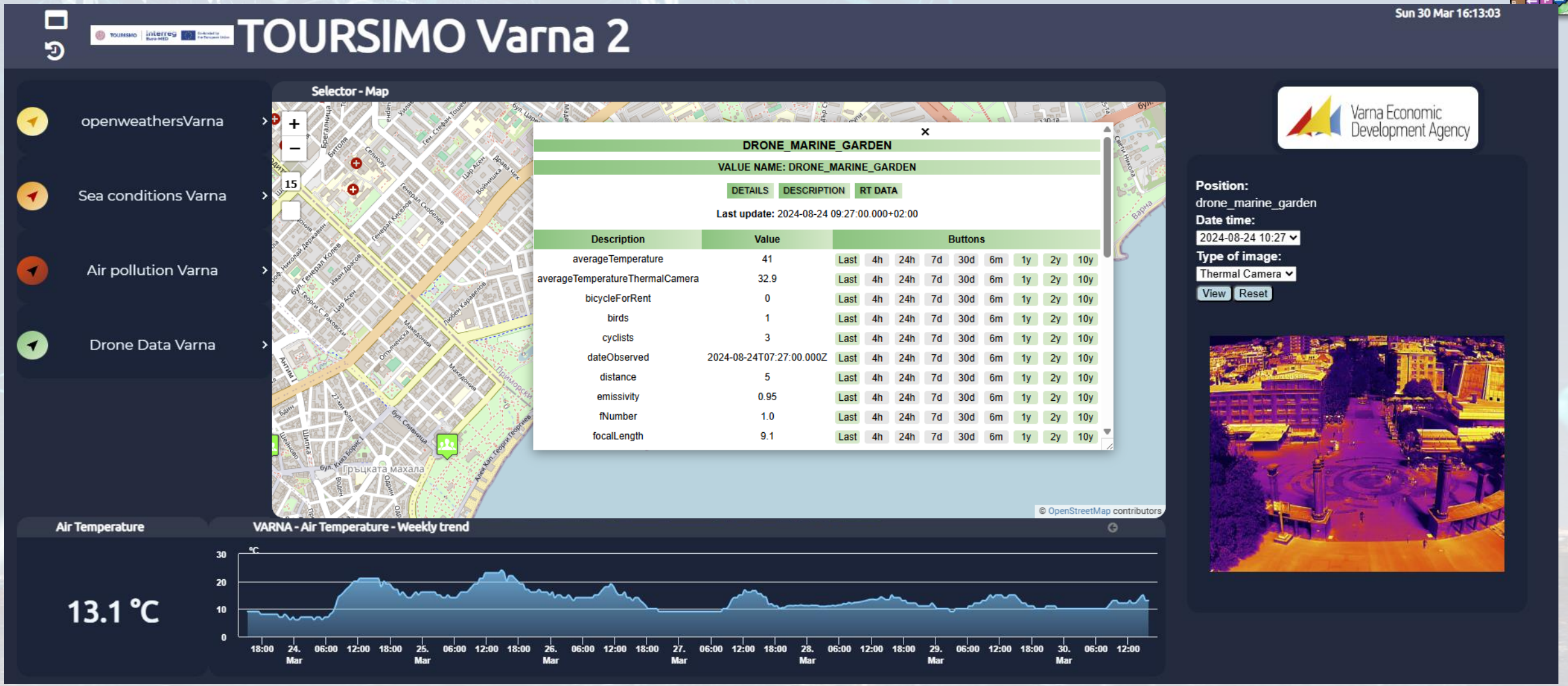




Interreg Euro-MED

Co-funded by the European Union

Counting People by Drones in Varna



https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDUxOA==

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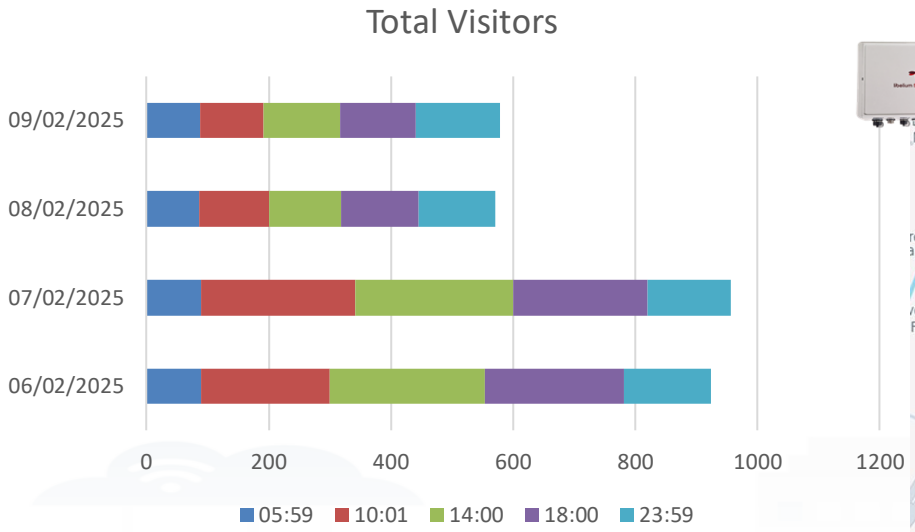
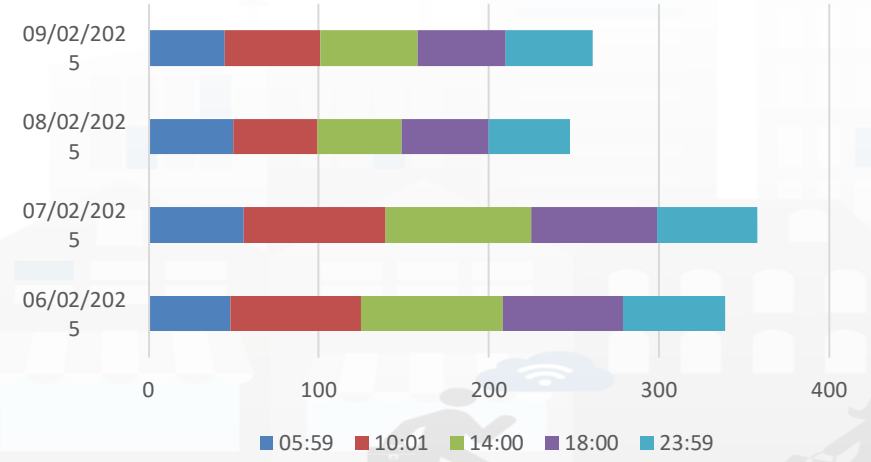
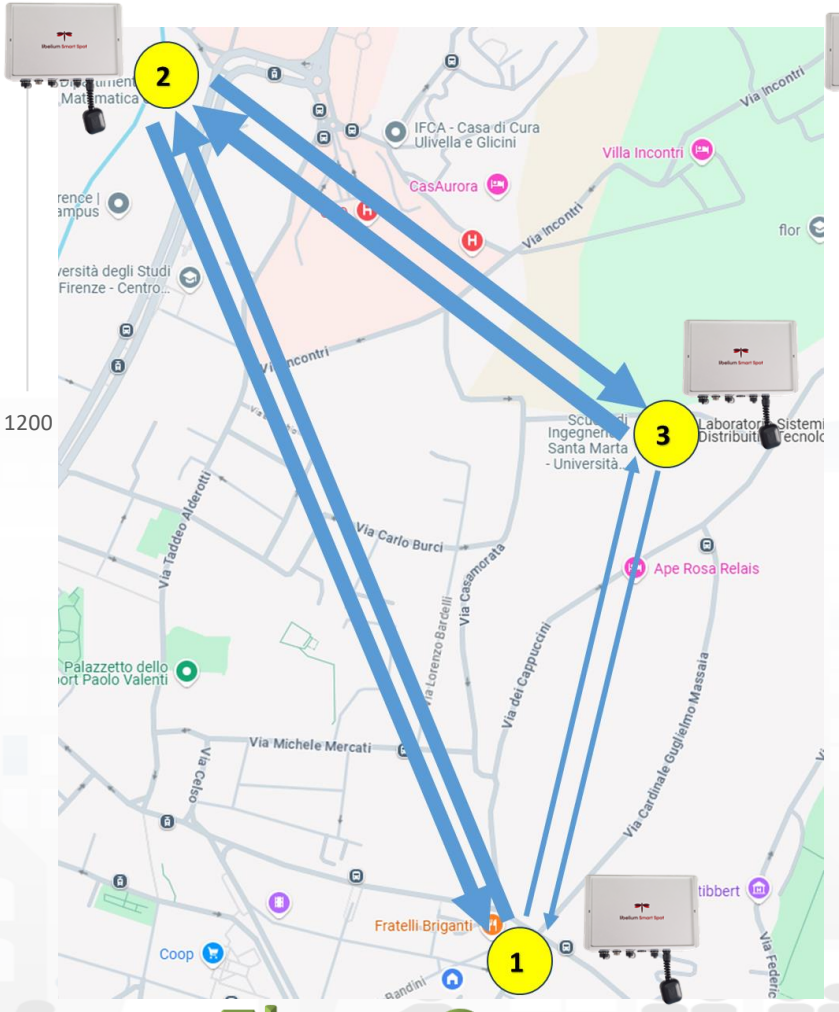
Tracking People vs Environment in Malta

https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDMzNQ==

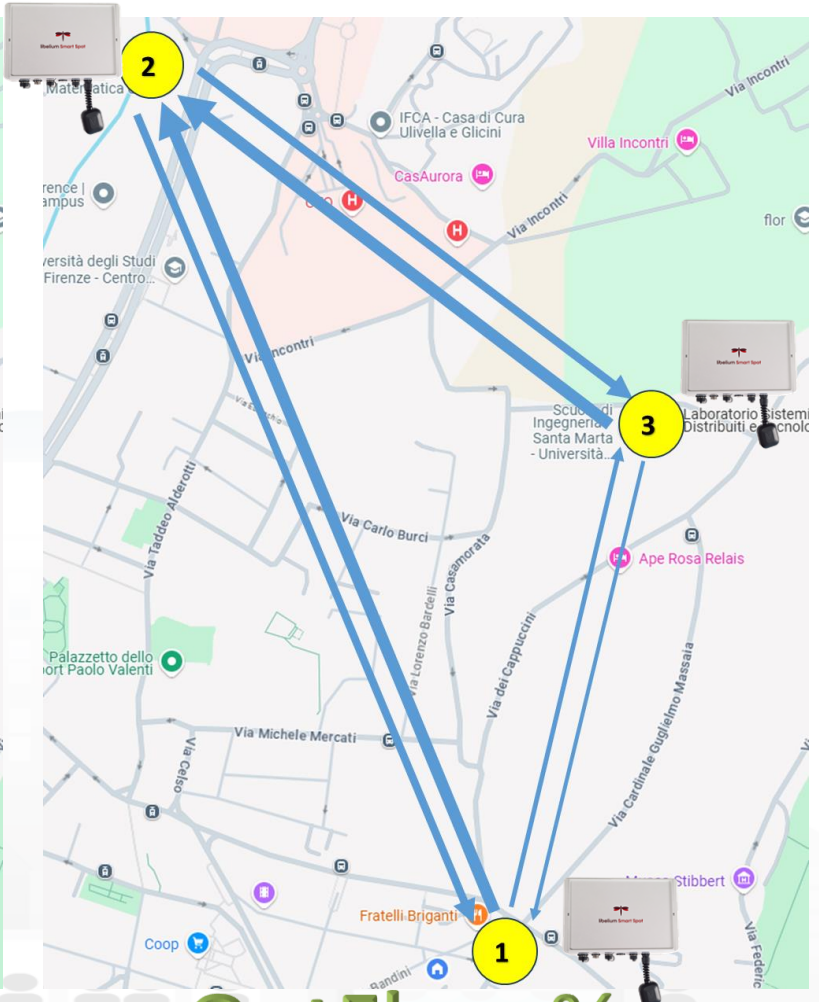
Libelium PaxCounters







Flow Counts



OutFlow %

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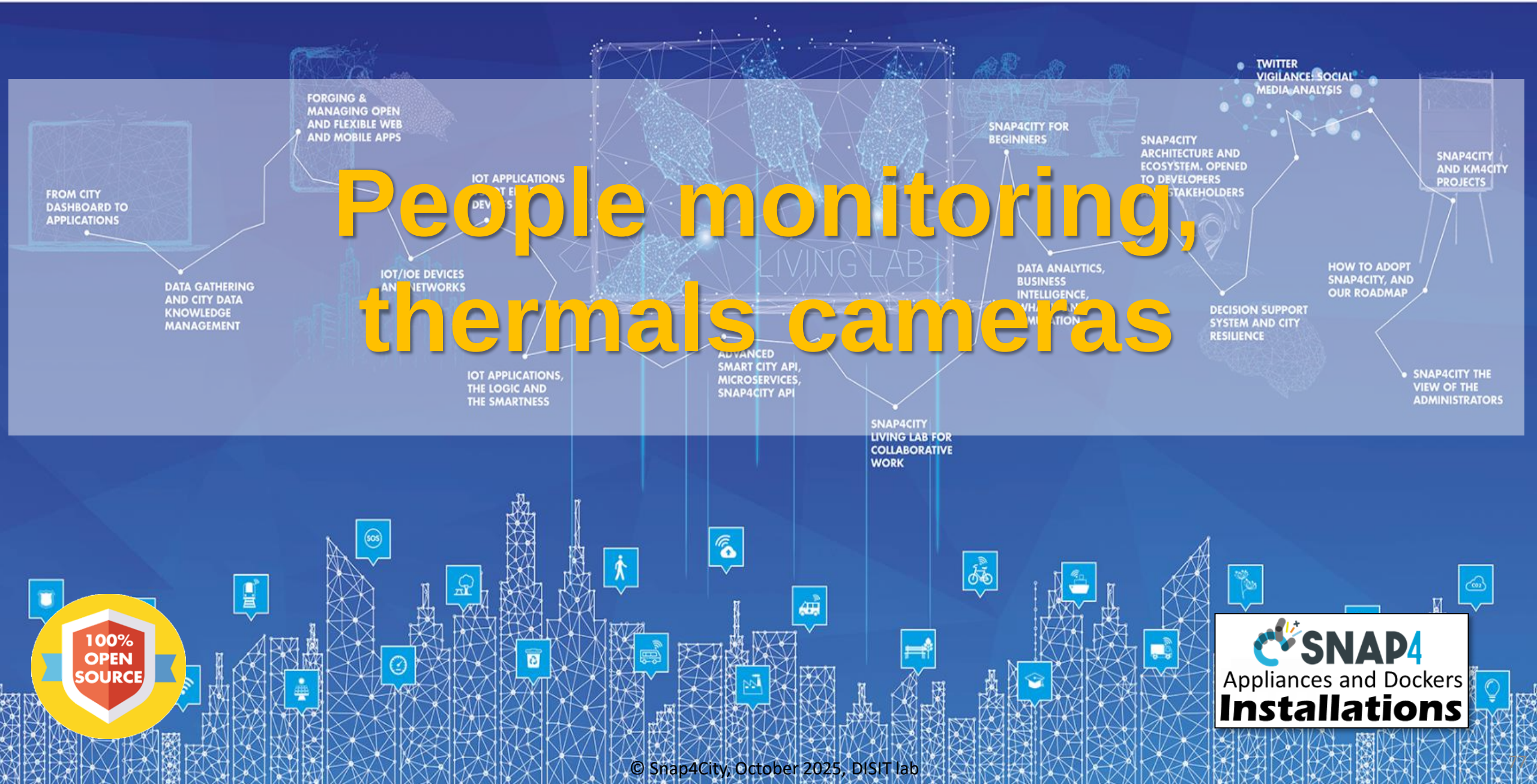
SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES



People monitoring, thermals cameras

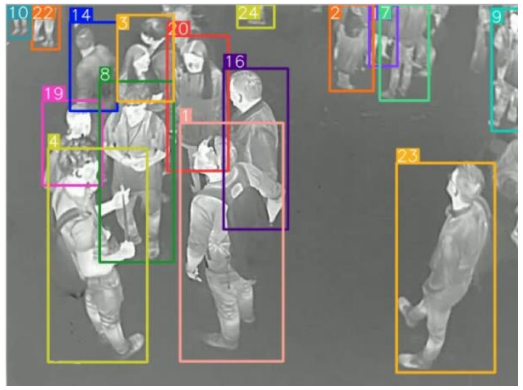
100% OPEN SOURCE

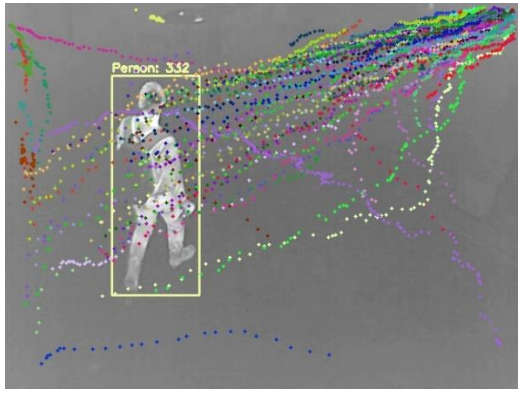
SNAP4 Appliances and Dockers **Installations**

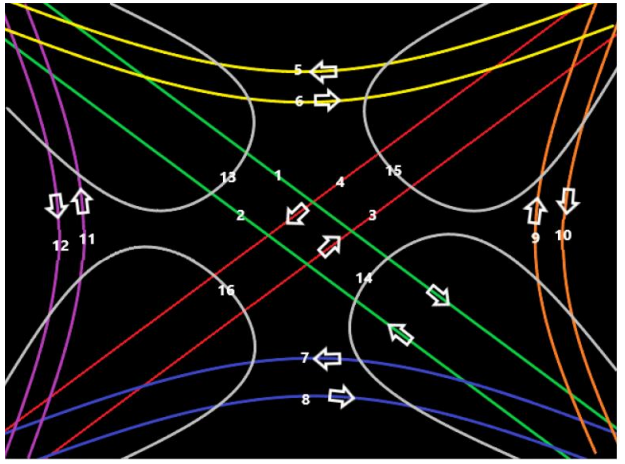
© Snap4City, October 2025, DISIT lab

User Behaviour: People Counting, Tracking, etc.

- **Behavior analysis in open or closed spaces**
  - HUB, metro, stations, production lines, parking lots, critical areas in cities,
  - shopping centers, retail, etc.
- **Thermal Cameras**
  - GDPR compliant
- **AI injection**
  - classification and counting
  - Identification of critical situations
  - Early warning
  - Integration with PAX counters, and with ODM data from operators
- **Real-time estimation**
  - Directly on the camera
  - High precision and reliability
  - Used by: Cuneo, Florence, Genoa, etc







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People counting and tracking

People Detection Plugin on AXIS Camera

- **Machine Learning**
- **Detection, classification, count**:
  - people, bikes/scooters, and strollers, ..
  - Age, …
  - critical conditions
  - Trajectories, origin destination matrix
  - Statistics over time, counting people in the area
- **Counting Accuracy: 92-99%**
  - **mAP_0.5 (0-75): 0.92-0.99**
- **Supported** and tested models:
  - Q1951 (tele), Q1952 (wide angle)
- **Output** on MQTT, NGSI
- Large range of application no tuning

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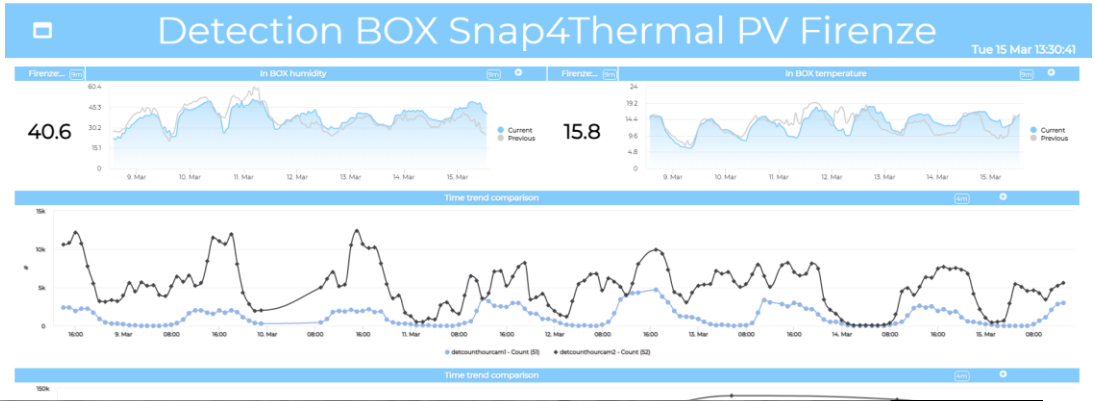
Interreg Mediterranean HERIT-DATA

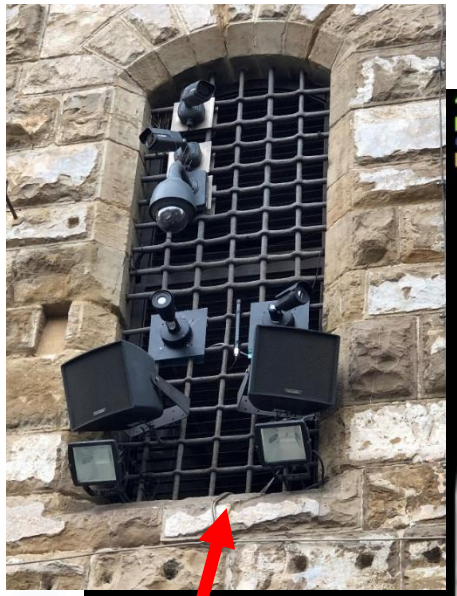
AXIS COMMUNICATIONS

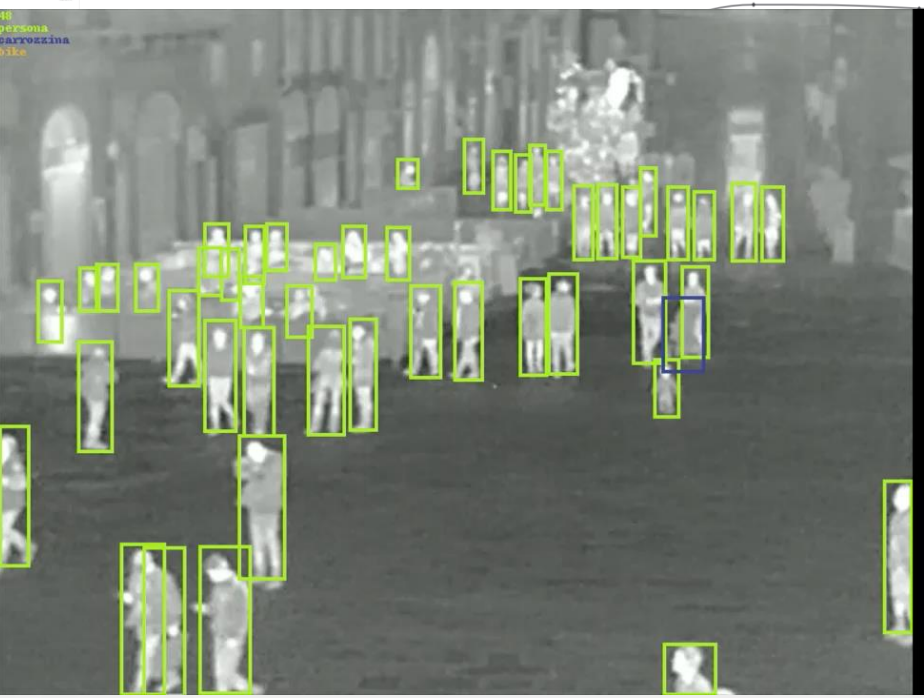
SNAP4CITY

KM 4 CITY

A view and data from the Thermal Camera







11 SUSTAINABLE CITIES AND COMMUNITIES

ab

1

ject Detector - DISIT

Avvia

Stato: In esecuzione

Versione: 1.0.0

Fornitore: DISIT

Apri avvisi di terze parti

Registro app

Apri

2

ecution model

Times:

1

Execute

Basic Settings

Times to execute on startup:

1

Sleep (ms):

5000

MQTT Connection:

On

Save

MQTT Client Connection

Address:

tcp://192.168.1.216

Port:

1883

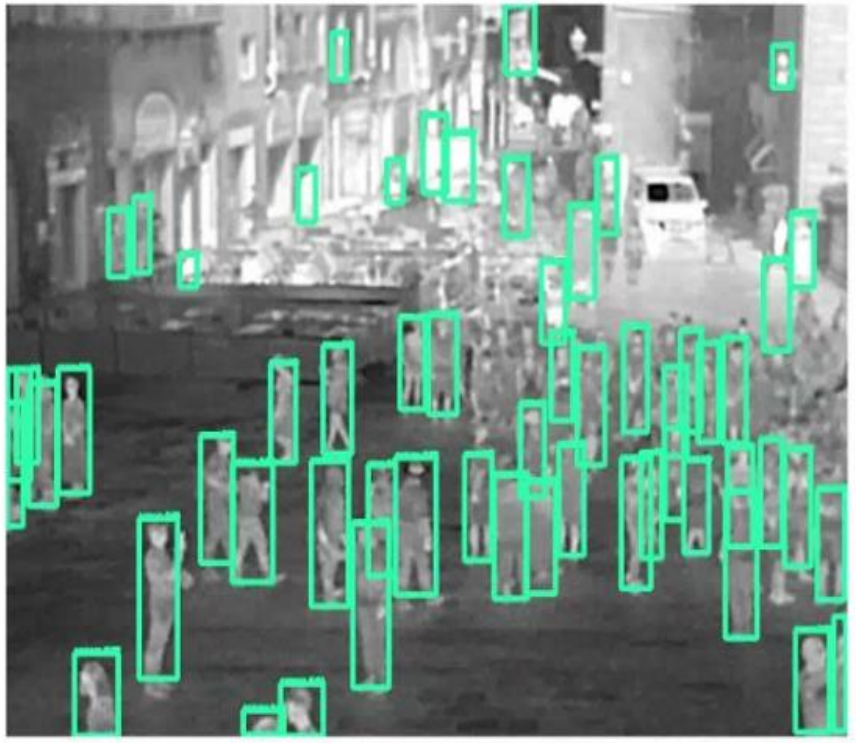
Topic Name:

3

AXIS Q1951-E Disit_app | Object Detector - DISIT | Results - DISIT

Non sicuro | 192.168.188.23:2001/results

Video Stream



Box Output

1/1

Time: 18.467603

Results: [[359.103638,246.654480,383.342926,320.320862,0.908089,person],
[206.960709,361.242645,245.294067,455.995239,0.904191,person],
[289.708099,268.565735,317.013062,355.144409,0.892965,person],
[504.246674,346.042816,529.062439,434.507538,0.891071,person],
[445.203094,370.814117,476.298676,469.302185,0.886001,person],
[121.531105,404.572266,158.478043,532.019104,0.884107,person],

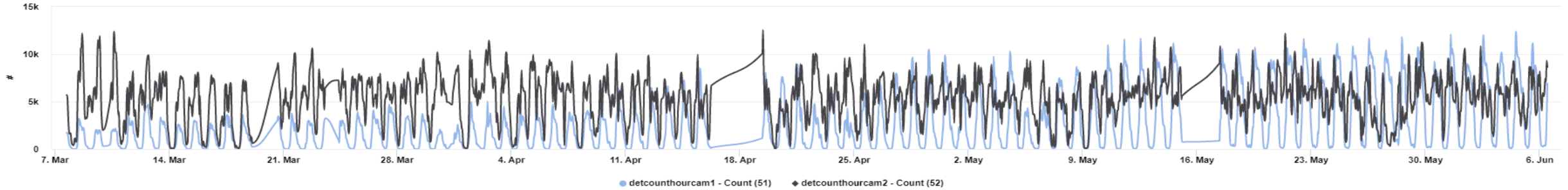
Advanced_People_Detection

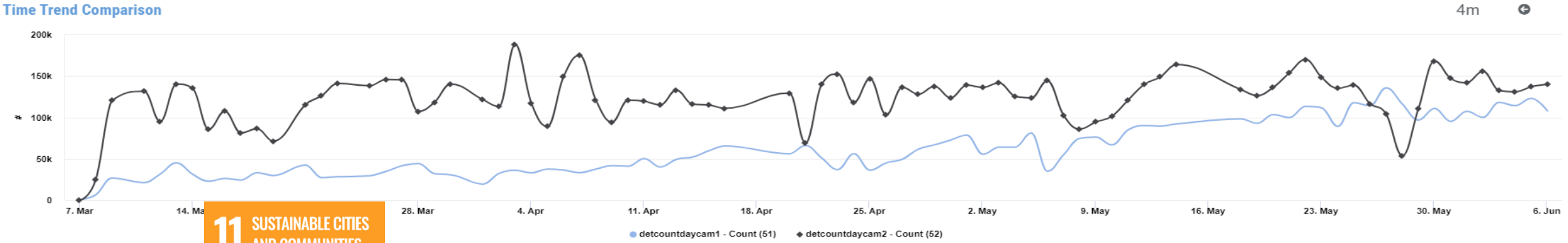
People Counting

https://www.snap4city.org/dashboardSmartCity/view/Gea.php?iddasboard=MzM3Ng==

Detection BOX Snap4Thermal PV Firenze

Thu 30 Mar 23:55:16





11 SUSTAINABLE CITIES AND COMMUNITIES

My Profile

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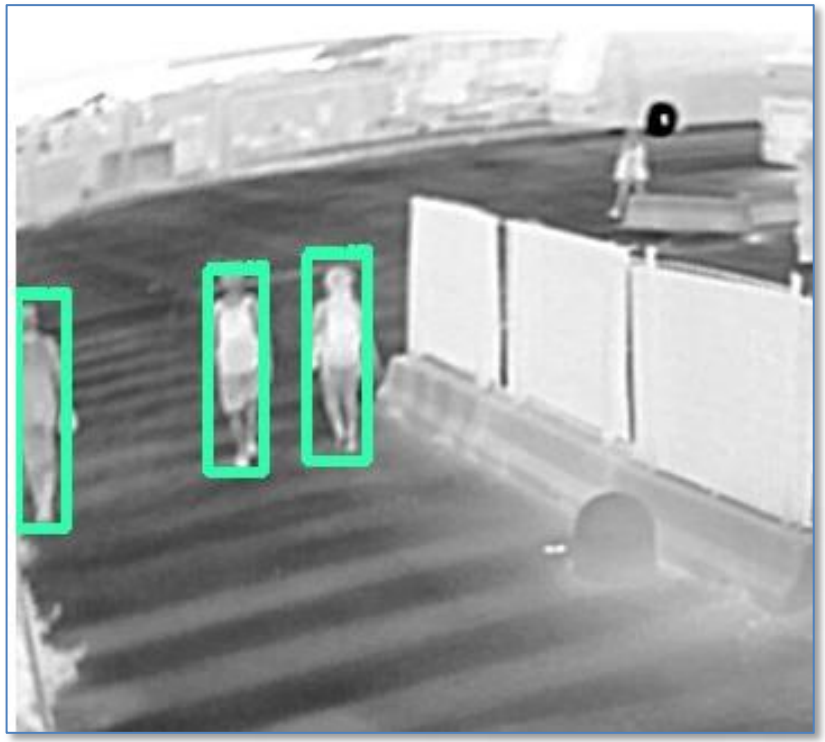
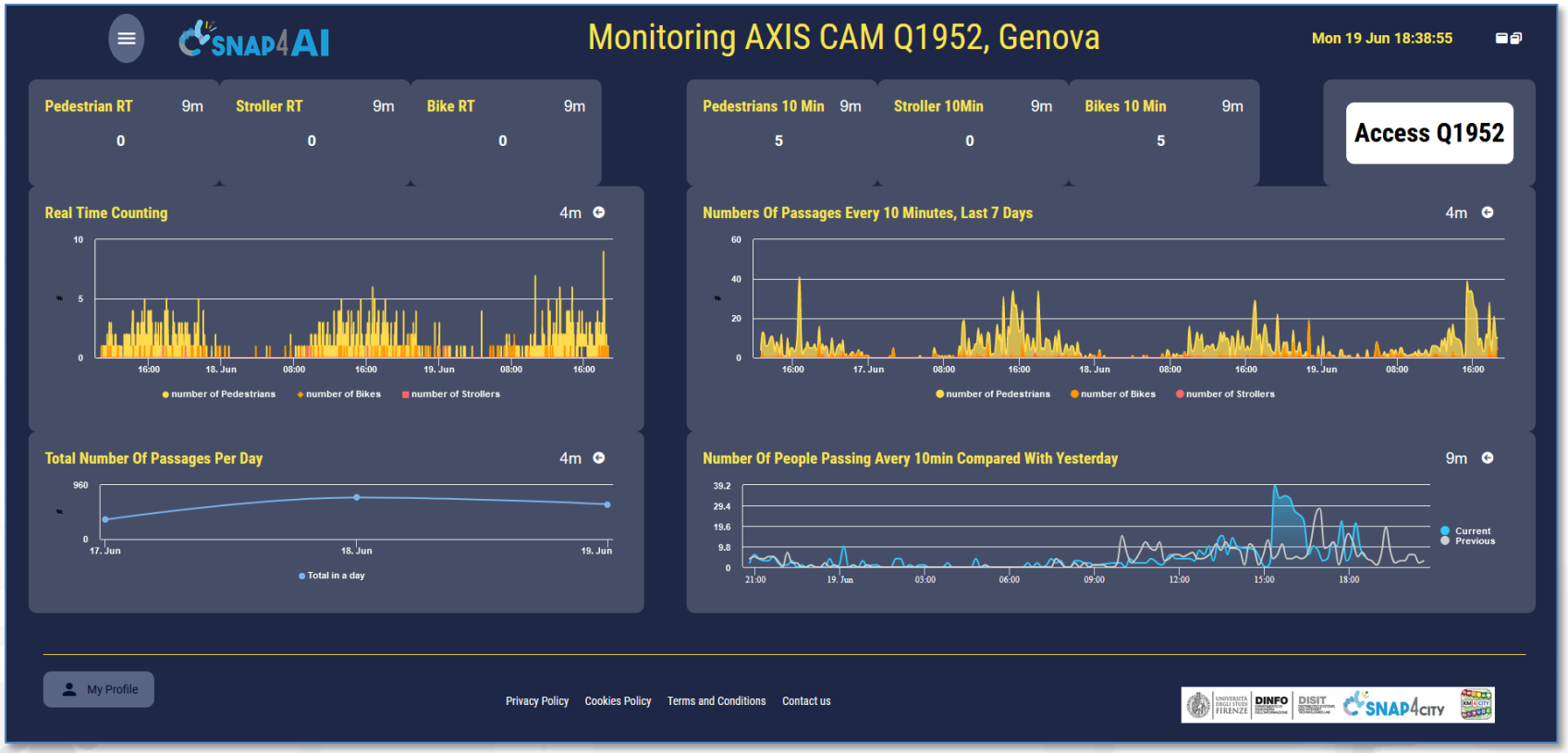


Monitoring Passages AXIS Q1952

- Genova: Ocean Race, 2023



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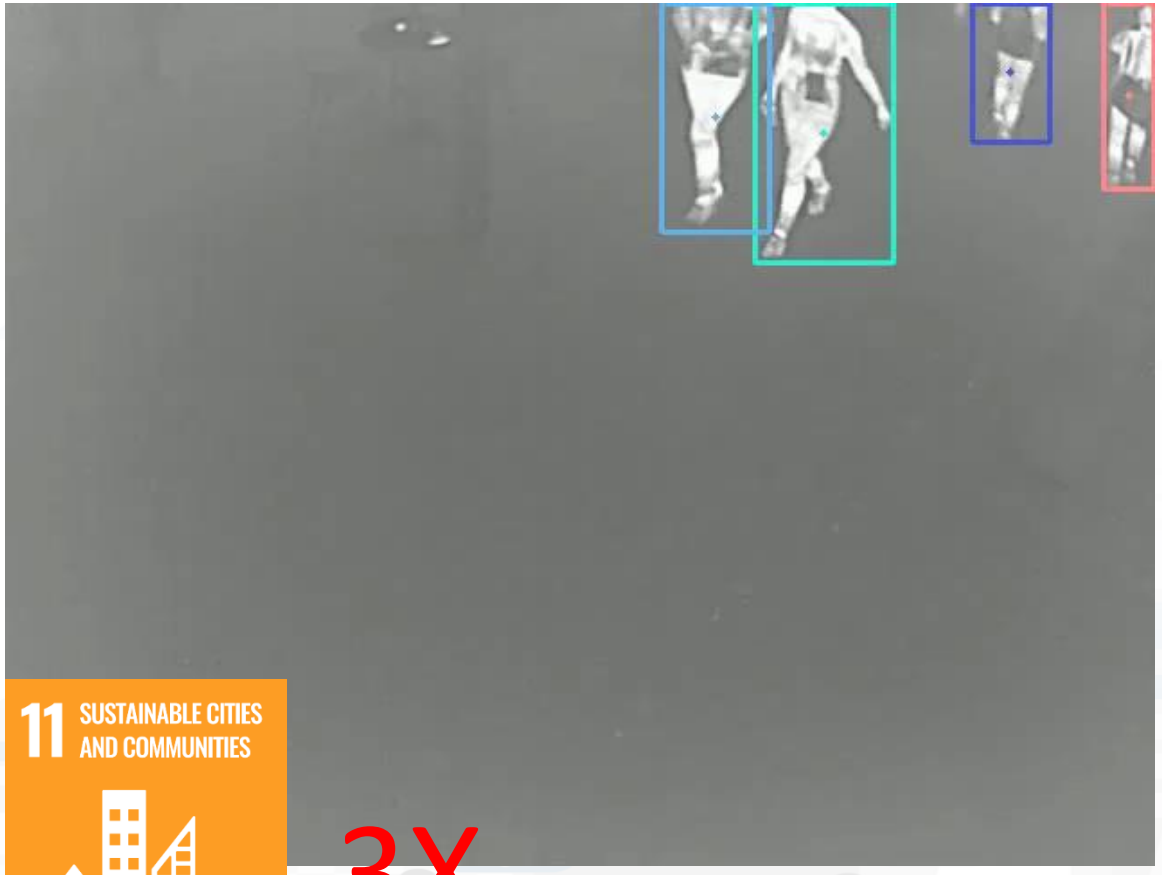
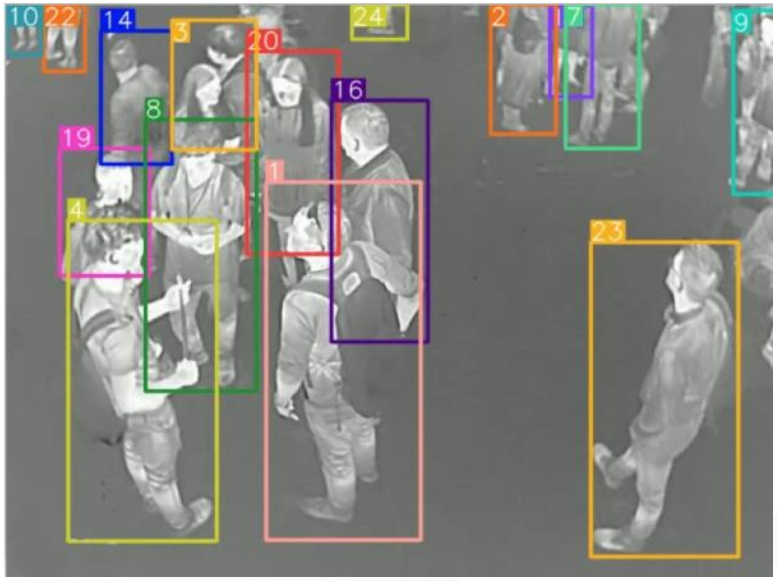
Barc 2022

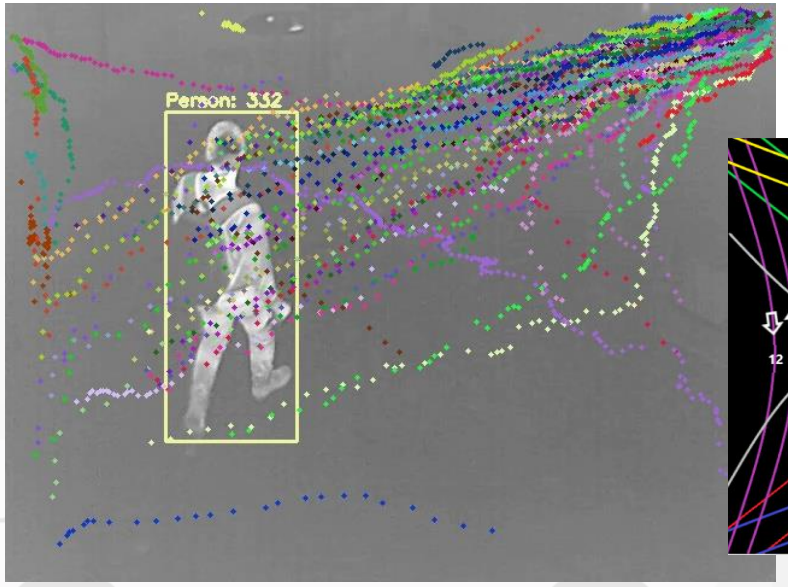
SNAP4CITY
AXIS
COMMUNICATIONS
SPAIN
SPAIN
3D MAP GLOBAL DIGITAL TWIN -NEWGUI
FREE TRIAL
E015

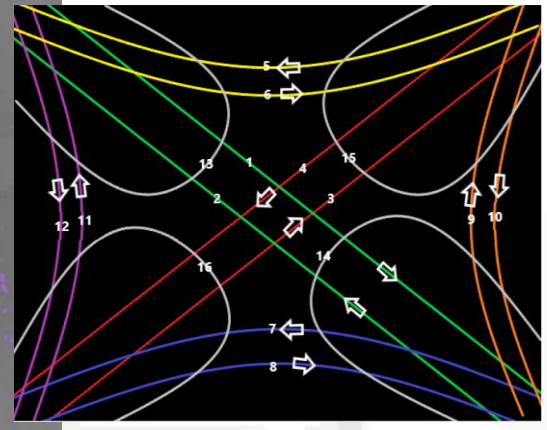
3
1
2
7
6
4
5

People Counting and Tracking









11 SUSTAINABLE CITIES AND COMMUNITIES

3X

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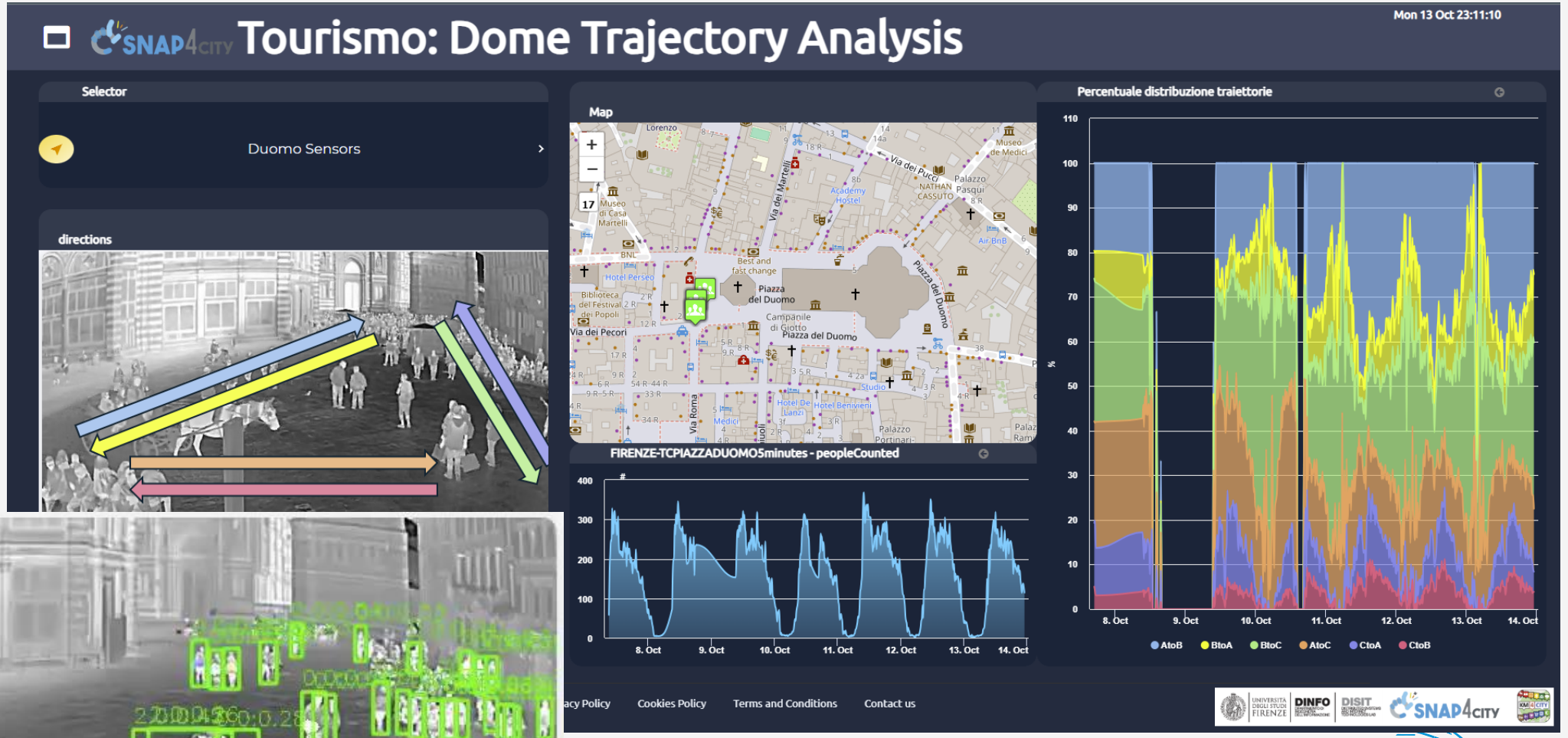
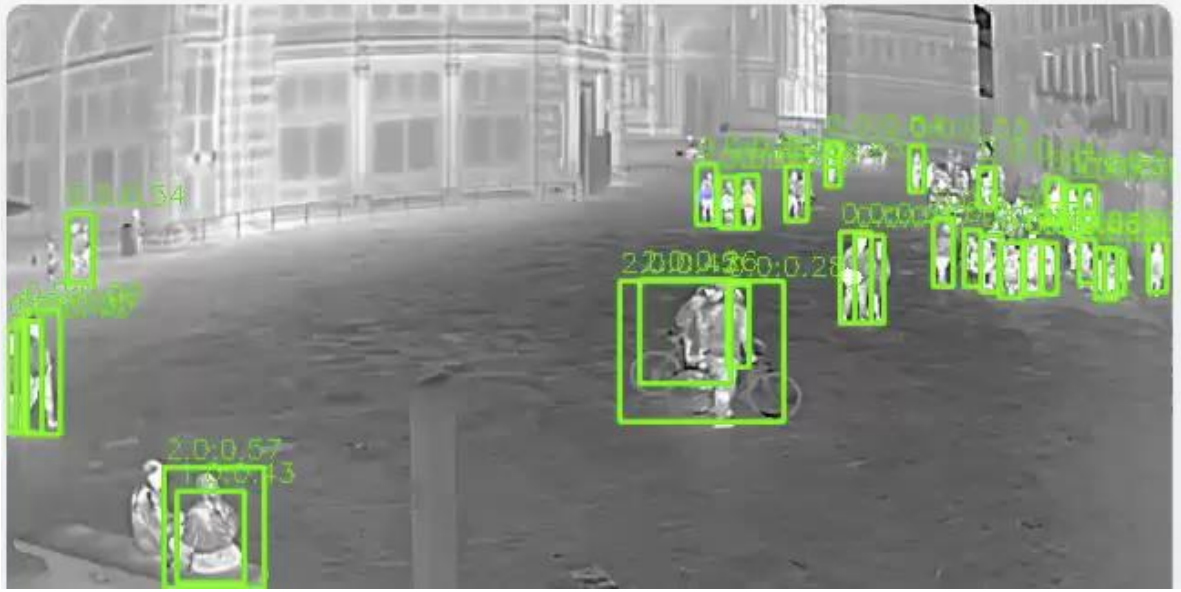
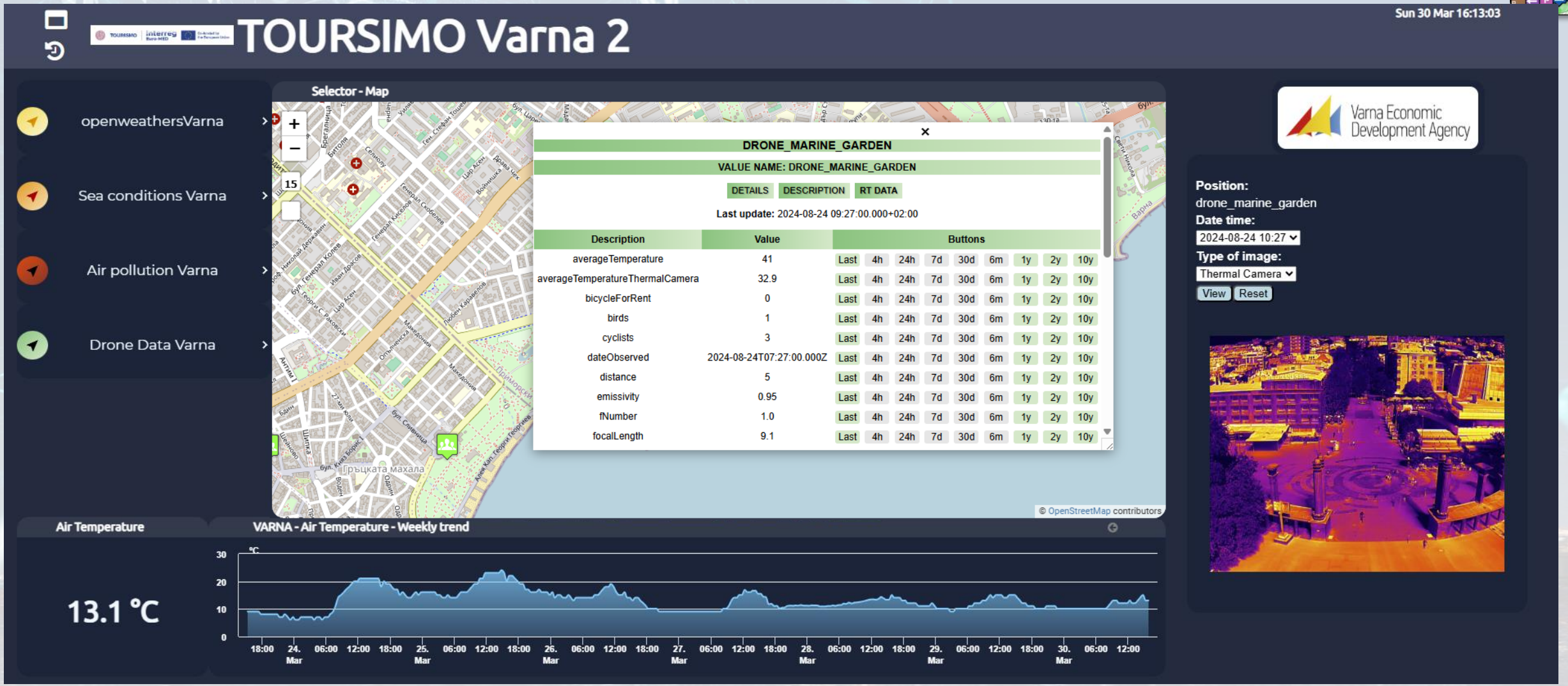
https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDcyMQ==





Counting People by Drones in Varna



https://www.snap4city.org/dashboardSmartCity/view/newTheme.php?iddasboard=NDUxOA==

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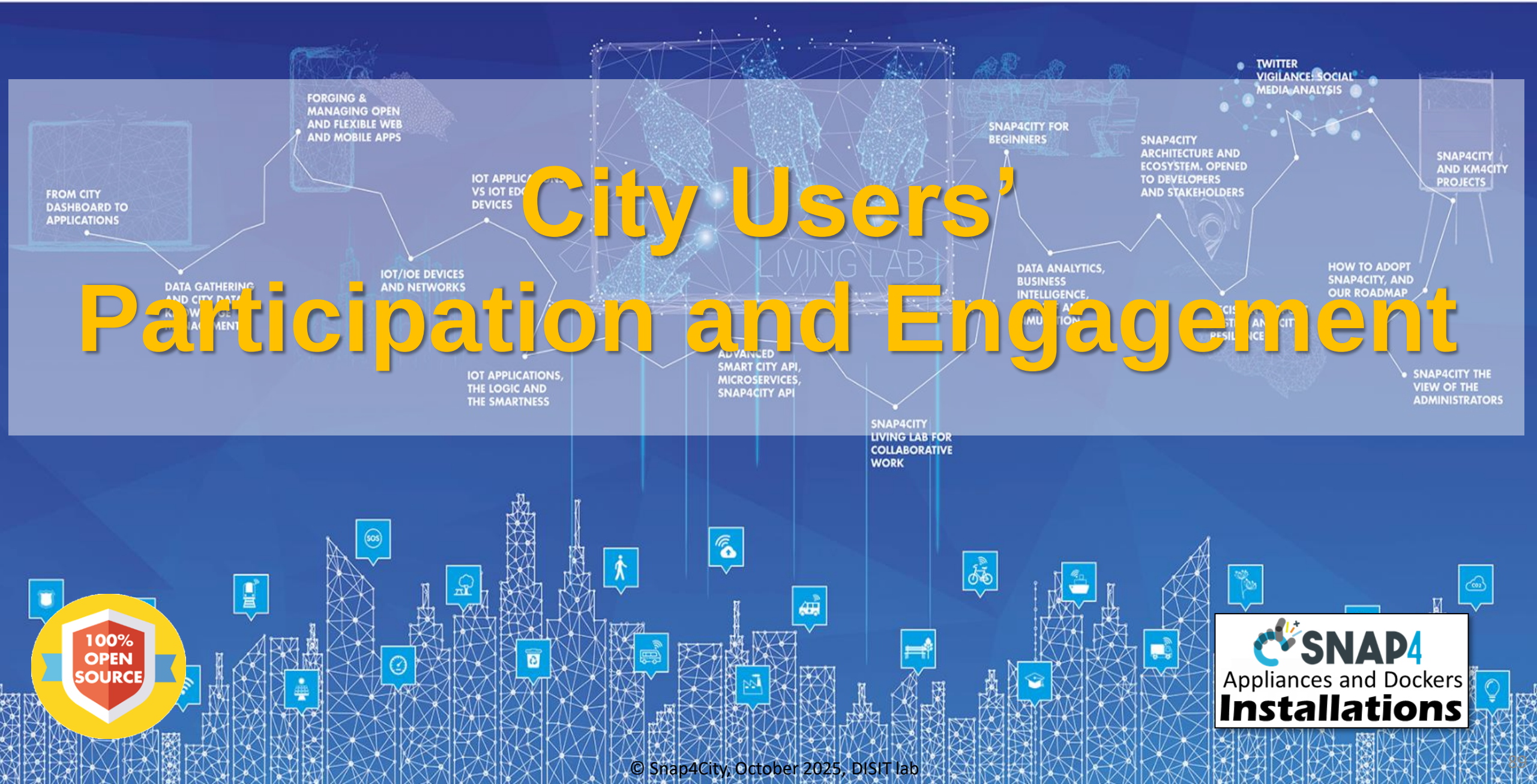

City Users' Participation and Engagement

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

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Participation and Engagement

- **City users:** residents, students, commuters, tourists, visitors, business visitors, etc.
- **Participation**
  - Collect complaints about city services
  - Multichannel: mobile Apps, open call numbers, web pages and blogs, social media, help desk, info points, white boxes in the city, telegrams, SMS, etc.
  - Data integration, usage of LLM, AI deep learning for sentiment analysis, text understanding, etc.
- **Engagement**
  - Involving city users to perform actions: take photo, provide a suggestion a rank, etc.
- **Commonalities**: data collection, workflow management, operators, etc.

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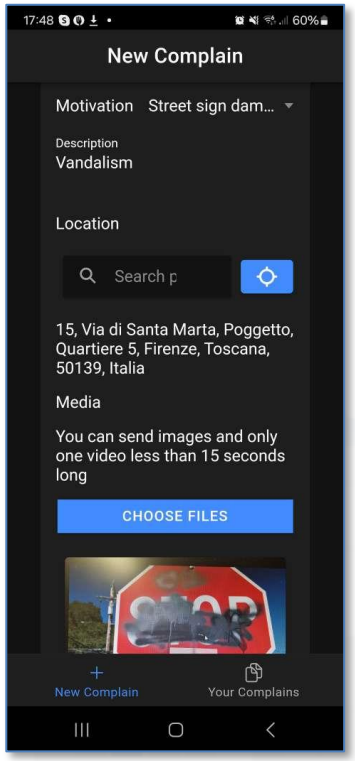
Operator Interface to manage complains



- mobile app Toscana in a Snap: https://www.snap4city.org/541
- User Engagement: https://www.snap4city.org/486
- MultiPurpose user engagement: https://www.snap4city.org/548
- User Engagement admin: https://www.snap4city.org/472

https://www.snap4city.org/1018

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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...

SnapAdvisor: AI based Assistants, DSS

- **Snap4CityAdvisor:**
  - for developers and promoters knowing all Snap4City and DISIT Lab literature, articles, manuals, slides, codes, etc. The SnapAdvisor with this skill is accessible only for selected Snap4City users. It allows users of saving a lot of time by providing answers to facilitate the development of smart solutions, to the exploitation of Snap4City tools, and recently on data and services accessible on the platform, producing offers, etc.
- **Legal Advisor**
  - expert on specific disputes at service of the Legal department of Careggi Hospital of Florence. It allows to save time in recovering precise information from complex legal documents, ordering of events, understanding causes and effects, producing reports, etc.
- **Expert of industrial machines, user manuals, technical manuals, rules,**
  - Answering on technical manuals
- **Complains and Questionnaire analysis**
  - Answering on trends, via questionnaires collected via QR, blobs, emails, etc.
- **Commercial Advisor:**
  - processing orders understanding them and preparing the offer, thus reducing the time to process them.
- **Generative Designs:**
  - Multimodal Generative AI supporting designers in producing innovations
- etc.

See: "Context-Aware Retrieval Augmented Generation using Similarity Validation to handle Context Inconsistencies in Large Language Models", IEEE Access, 2025. https://doi.org/10.1109/ACCESS.2025.3614553

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SnapAdvisor

- **working on your private content** and thus producing answers.
  - Select a subset of documents
- **domain control**: you can decide the knowledge base (internal wikis, PDFs, APIs),
- **explainability** capability, provide references to your documents
- **multilingual via content**
- **modularity**: it is possible to pass from one collection of documents to another, and multiple users can work on the advisor asking for different topic on different collections/domains at the same time, independently as needs change, without any interferences among them.
- **lower hallucinations**

https://www.snap4city.org/1116

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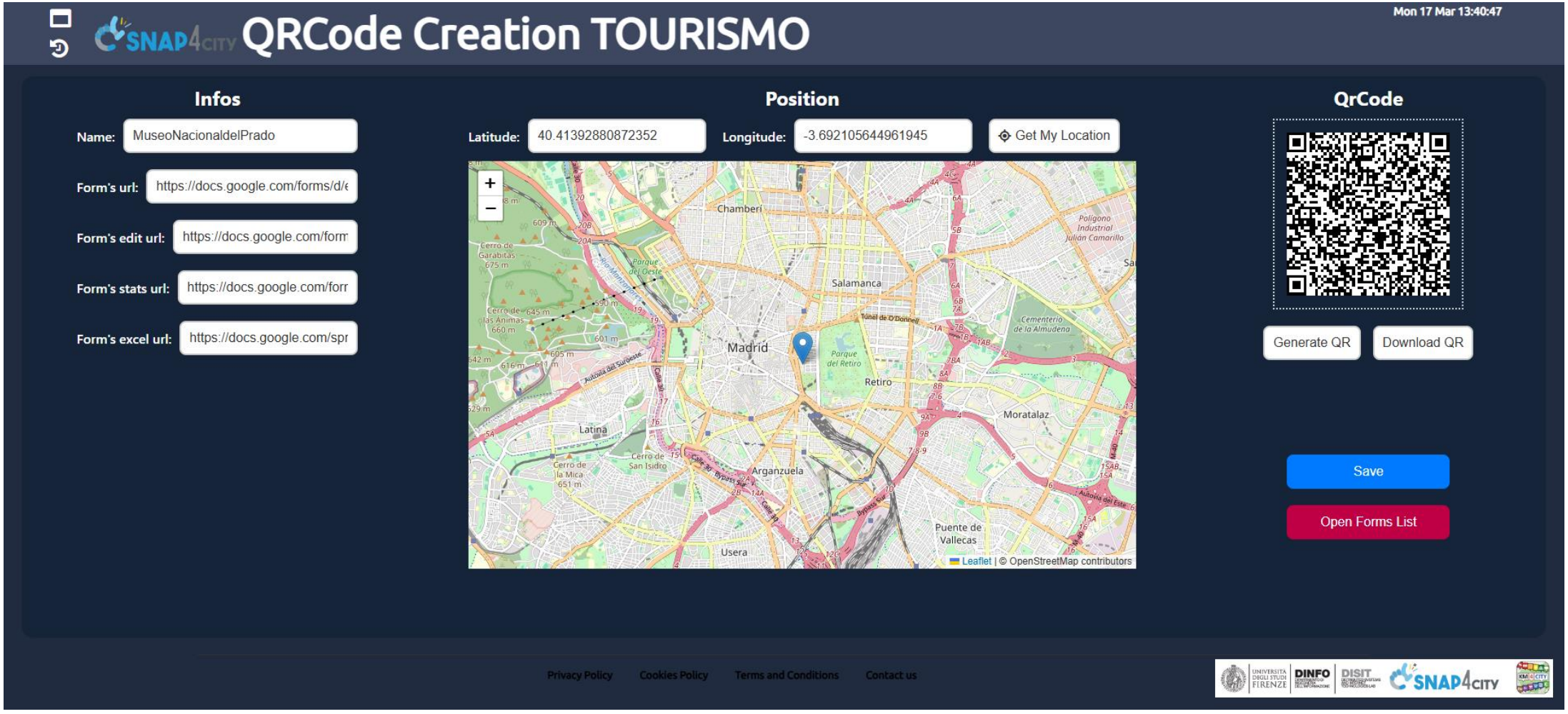
Complains Analysis to Support Decision Making Processes



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Complains Analysis to Support Decision Making Processes

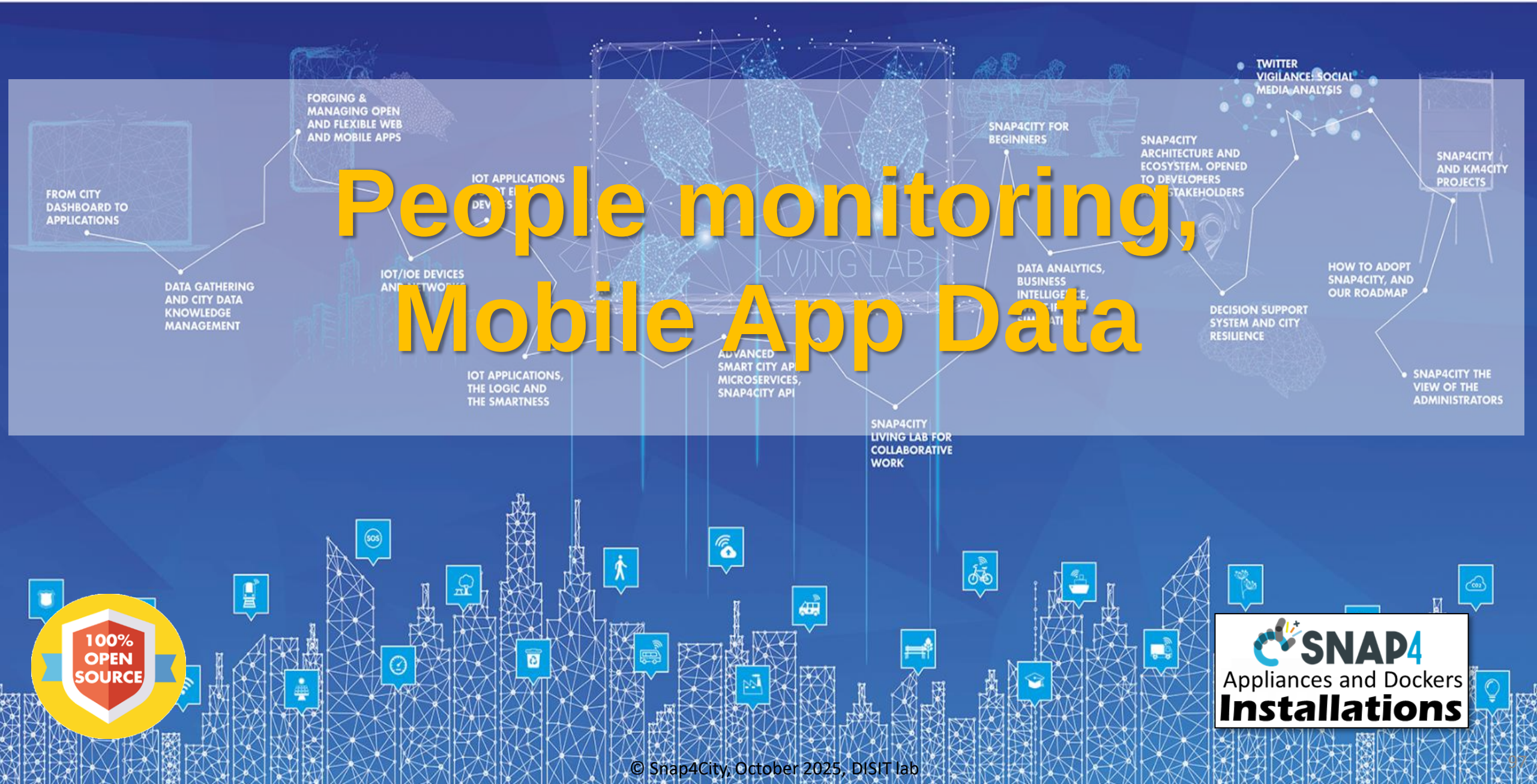
Standard data/form creation
for reputation analysis:

- Initial Sentiment Analysis/NLP by analysing questionnaires collected from QR code distribution.

Summary of Findings (June–August 2025, 36 responses received - Golden Bay, Malta) produced by a Large Language Model (LLM) based on the responses obtained from questionnaire

Average Ratings (scale -2 to +2)

Overall experience: +0.67 → slightly positive but inconsistent (range -2 to +2)
Toilets: -0.83 → strongly negative, among the worst-rated aspects.
Showers: -0.31 → generally negative.
Bins distribution: -0.33 → slightly negative, with complaints about lack of bins.
Safety & lifeguard services: +0.55 → moderately positive.
Cleanliness: -0.52 → overall negative, many complaints about cigarette butts and plastics.
Natural conditions (dunes, seawater, etc.): -0.40 → negative, issues with seagrass, water quality.



People monitoring, Mobile App Data

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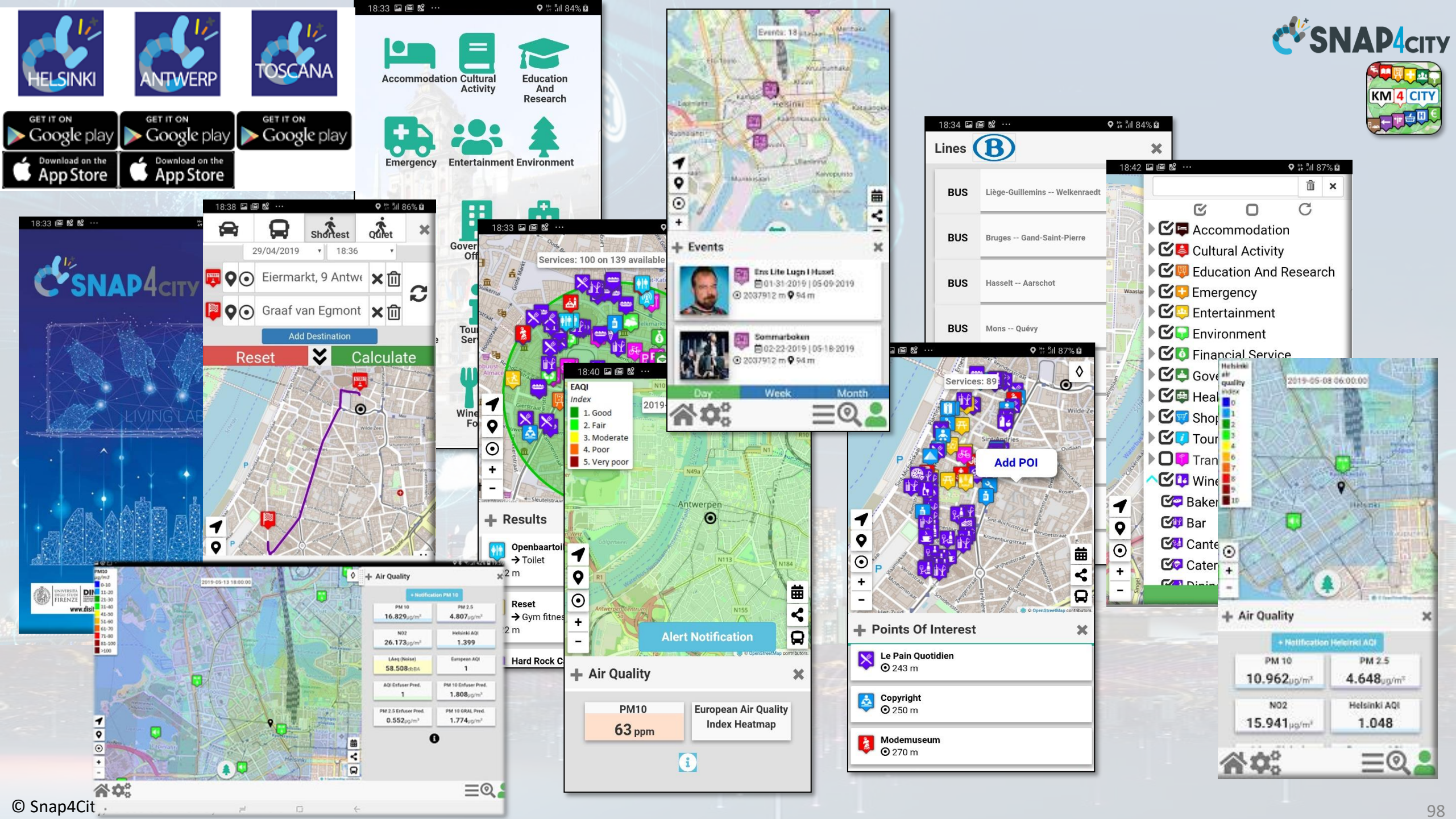
HELSINKI
ANTWERP
TOSCANA
GET IT ON Google play
Download on the App Store
Accommodation
Cultural Activity
Education And Research
Emergency
Entertainment
Environment
SNAP4CITY
KM 4 CITY
Shortest
Quiet
Eiermarkt, 9 Antwe
Graaf van Egmont
Add Destination
Reset
Calculate
Services: 100 on 139 available
EAQI
Index
1. Good
2. Fair
3. Moderate
4. Poor
5. Very poor
Results
Openbaartoi
Toilet
Reset
Gym fitnes
Hard Rock C
Antwerpen
Alert Notification
Air Quality
PM10
63 ppm
European Air Quality Index Heatmap
Events
Lines
BUS
Liège-Guillemins -- Welkenraedt
Bruges -- Gand-Saint-Pierre
Hasselt -- Aarschot
Mons -- Quévy
Day
Week
Month
Accommodation
Cultural Activity
Education And Research
Emergency
Entertainment
Environment
Financial Service
Add POI
Points Of Interest
Le Pain Quotidien
243 m
Copyright
250 m
Modemuseum
270 m
PM 10
16.829
PM 2.5
4.807
NO2
26.173
Helsinki AQI
1.399
58.508
1
1.808
0.552
1.774
PM 10
10.962
PM 2.5
4.648
NO2
15.941
Helsinki AQI
1.048

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Citizen Engagement/Participation via Mobile Apps

- GPS Positions
- Selections on menus
- Views of POI
- Access to Dashboards
- searched information
- Routing
- Ranks, votes
- Comments
- Images
- Subscriptions to notifications
- ….

Produced information

- Viewed ?
- Accepted ?
- Performed ?
- …

Users

Derived information

- Trajectories
- Hot Places by click and by move
- Origin destination matrices
- Most interested topics
- Most interested POI
- Delegation and relationships
- Accesses to Dashboards
- **Cumulated Scores from Actions**
- Requested information
- Routing performed
- …..

Produced information

- Suggestions
- Engagements
- Notifications
- …

System

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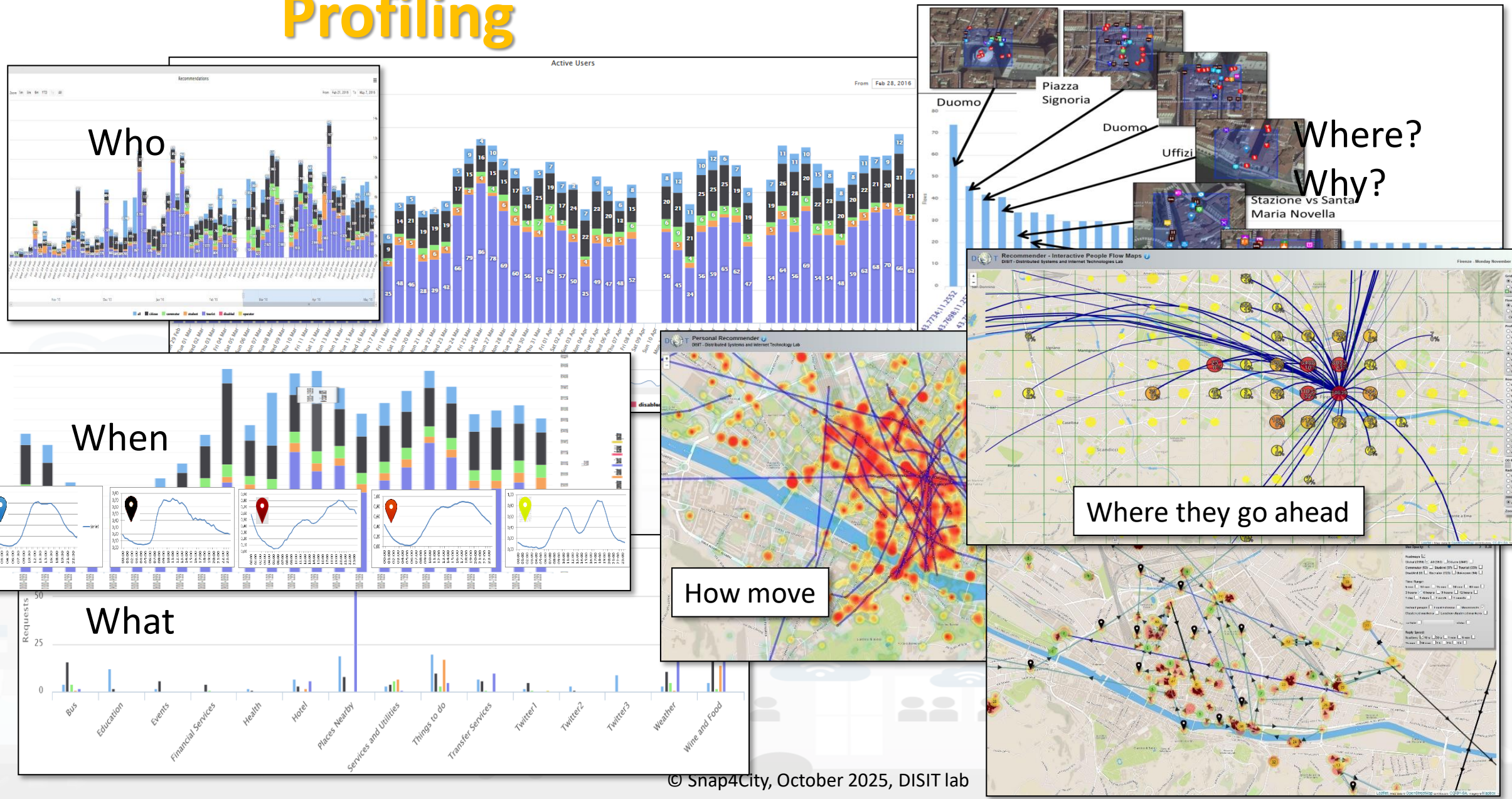
User Behavior Analyser for Collective Profiling



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Engaging via Mobile Apps

FROM CITY DASHBOARD TO APPLICATIONS

DATA GATHERING AND CITY DATA KNOWLEDGE MANAGEMENT

IOT APPLICATIONS VS IOT EDGE DEVICES

SNAP4CITY FOR BEGINNERS

SNAP4CITY ARCHITECTURE AND ECOSYSTEM. OPENED TO DEVELOPERS AND STAKEHOLDERS

DECISION SUPPORT SYSTEM AND CITY RESILIENCE

SNAP4CITY AND KM4CITY PROJECTS

HOW TO ADOPT SNAP4CITY, AND OUR ROADMAP

SNAP4CITY THE VIEW OF THE ADMINISTRATORS

100% OPEN SOURCE

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Informing and nudging via mobile App / QR

- **About:**
  - Good practices wrt: litter, queues, ticketing, water, services, ….
  - Opening hours of attractions/services
  - Info Mobility
  - Services for disables
  - How to actively participate ….
  - How to solve …
    - Emergency cases …
    - Evacuation roots

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7 AFFORDABLE AND CLEAN ENERGY

11 SUSTAINABLE CITIES AND COMMUNITIES

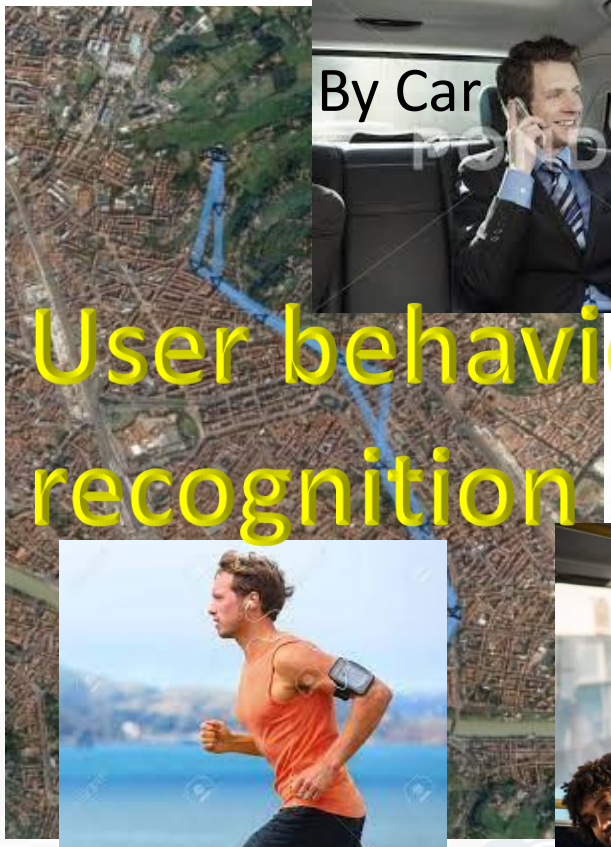
13 CLIMATE ACTION

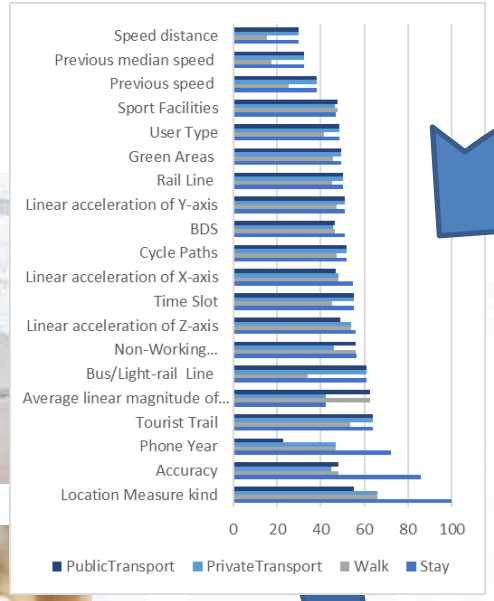
SNAP4CITY

KM4CITY

To propose suggestions and Engage city user

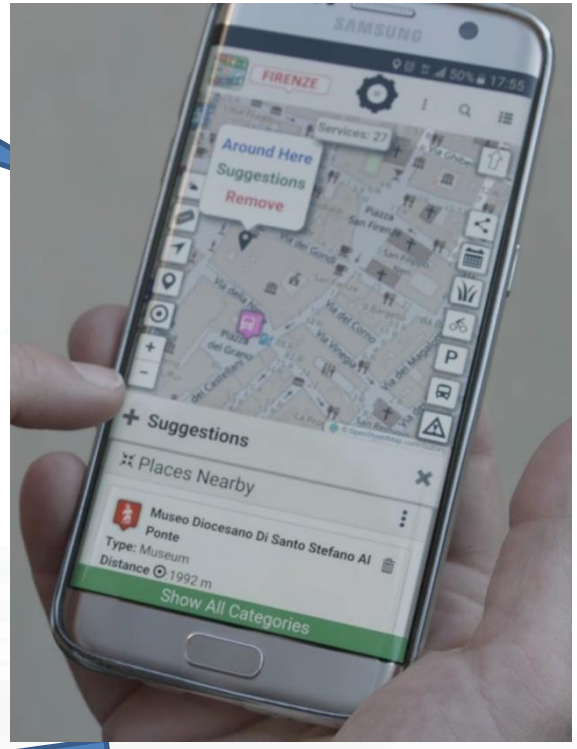
we need to know how they are moving





Artificial Intelligence Classification

Suggestions



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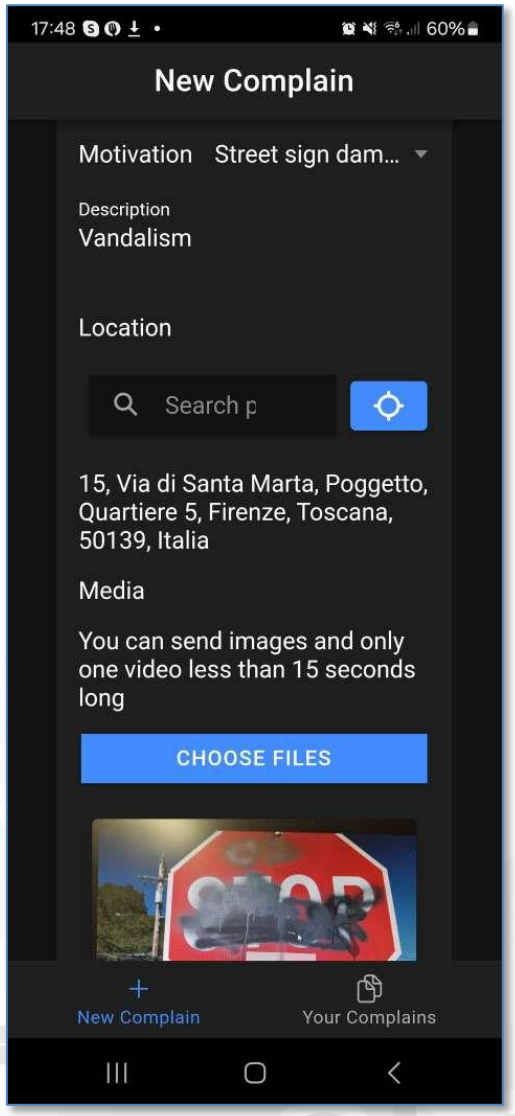
Safety Control Integration with Video Management Systems

© Snap4City, October 2025, DISIT lab

Event Managements

- **Bidirectional events**: from VMS to Snap4City and viceversa
  - From/to Snap4City to any service…
- **Snap4City collects and manages** events from:
  - Video Management System
  - Mobile Apps, city user complaints, operators, etc.
  - Web Apps, city users and operators
  - Early warning detected from Snap4City, etc.
  - Maintenance management tools, …
  - Other channels, …



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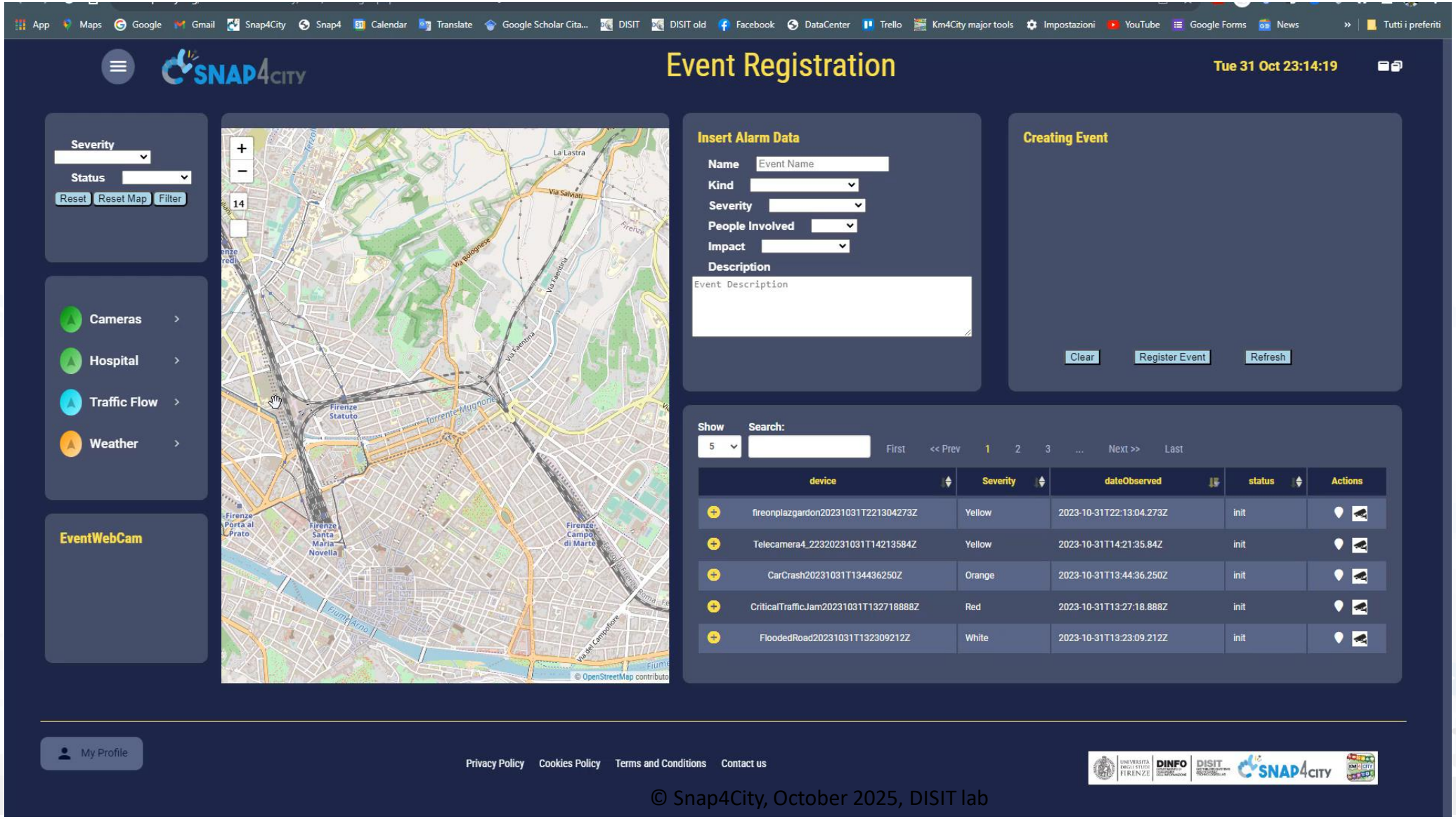
Event Management



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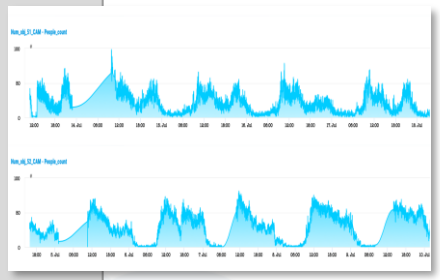
VMS vs Snap4City: sending and getting events, AI solutions

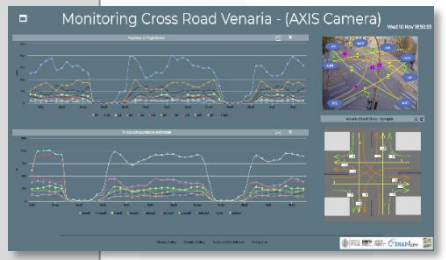
Events + info

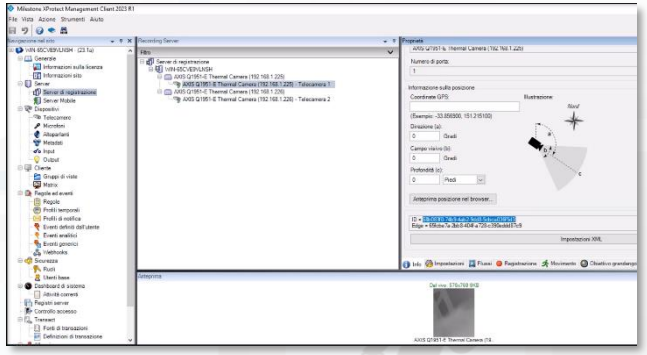
Snap4City Data Analytics

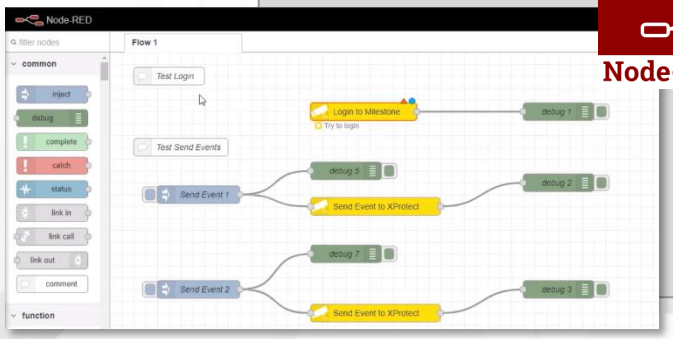
Snap4City Dashboards

Snap4City Data Interoperability









Node-RED

SNAP4CITY

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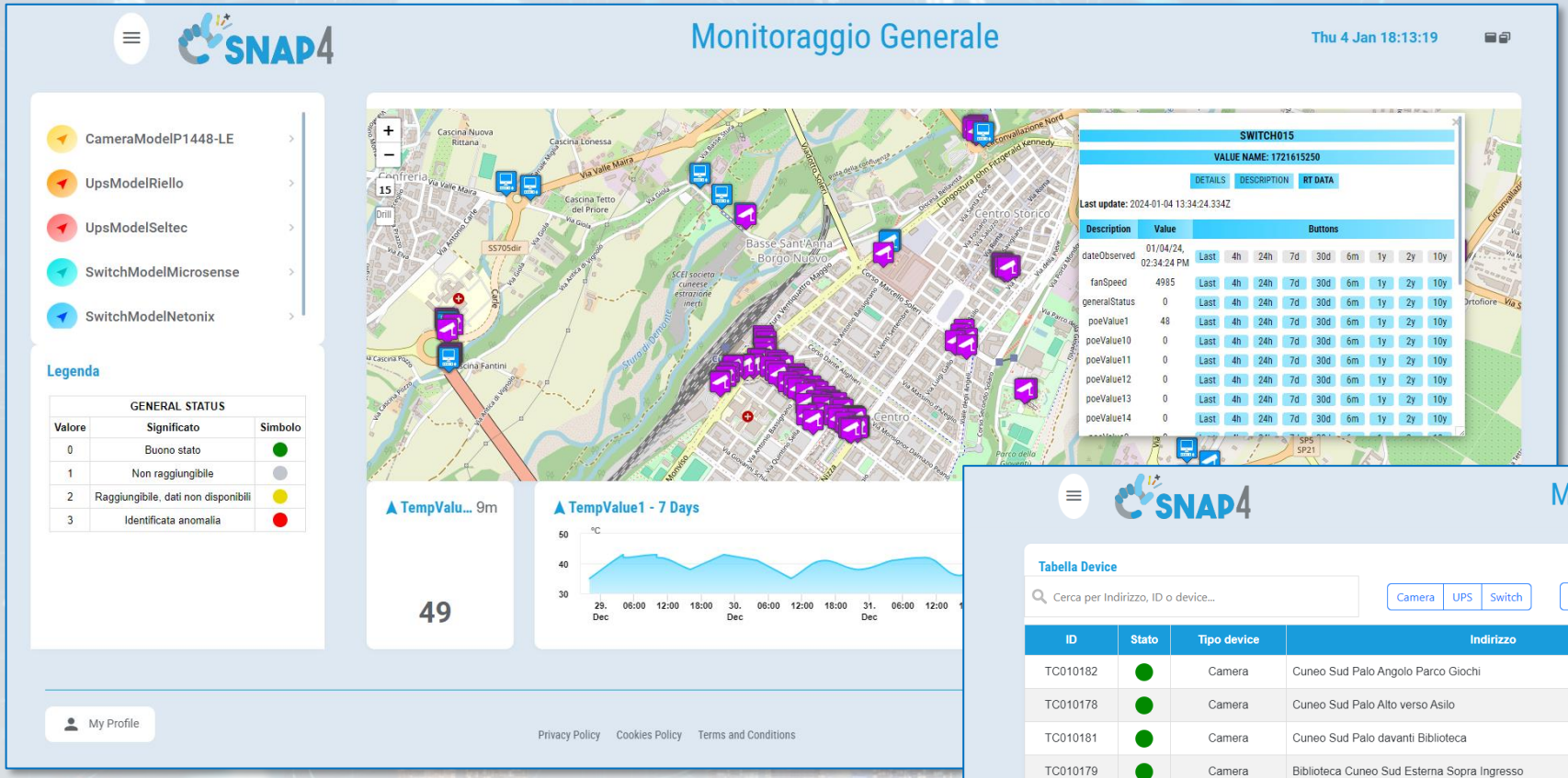
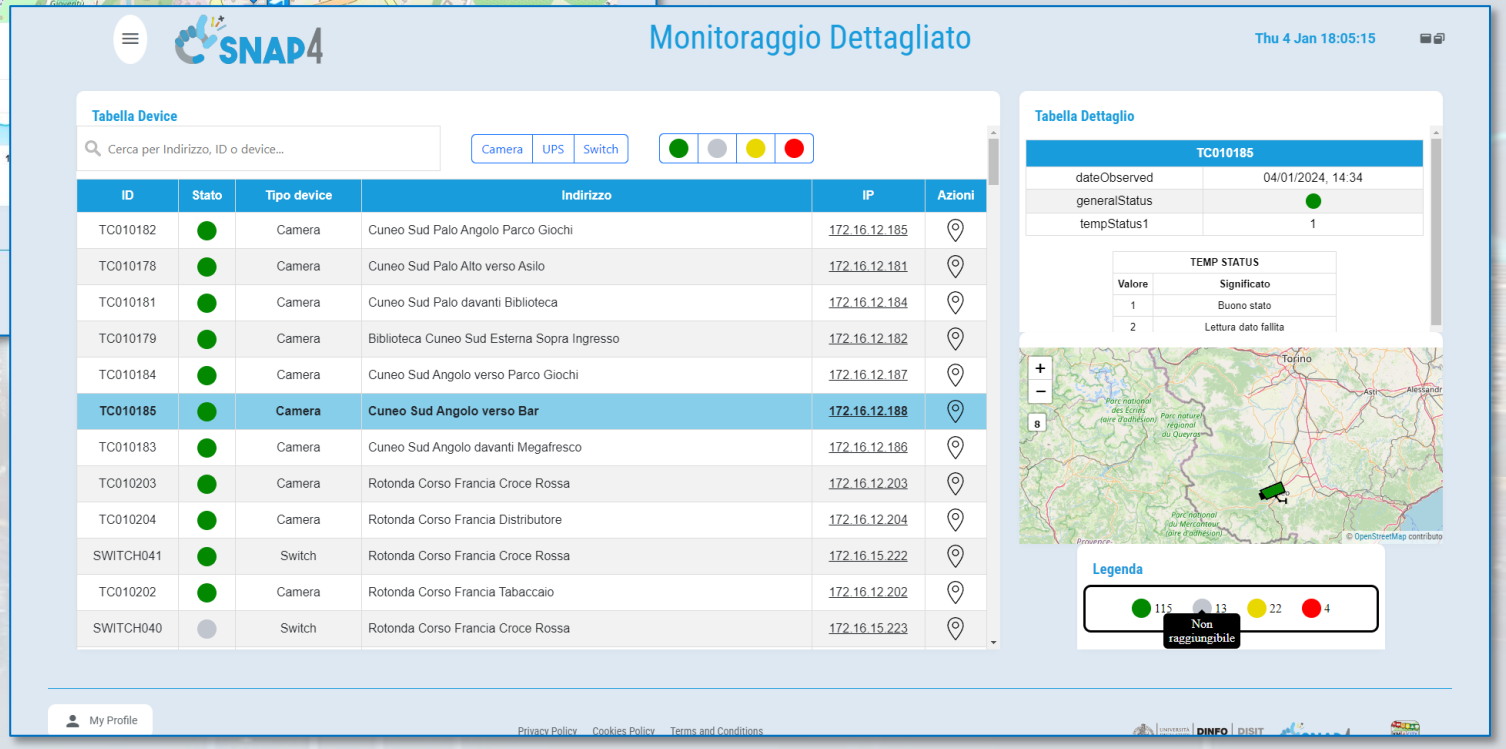
Cuneo Assets' Monitoring, Safety





- More than 400 devices

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

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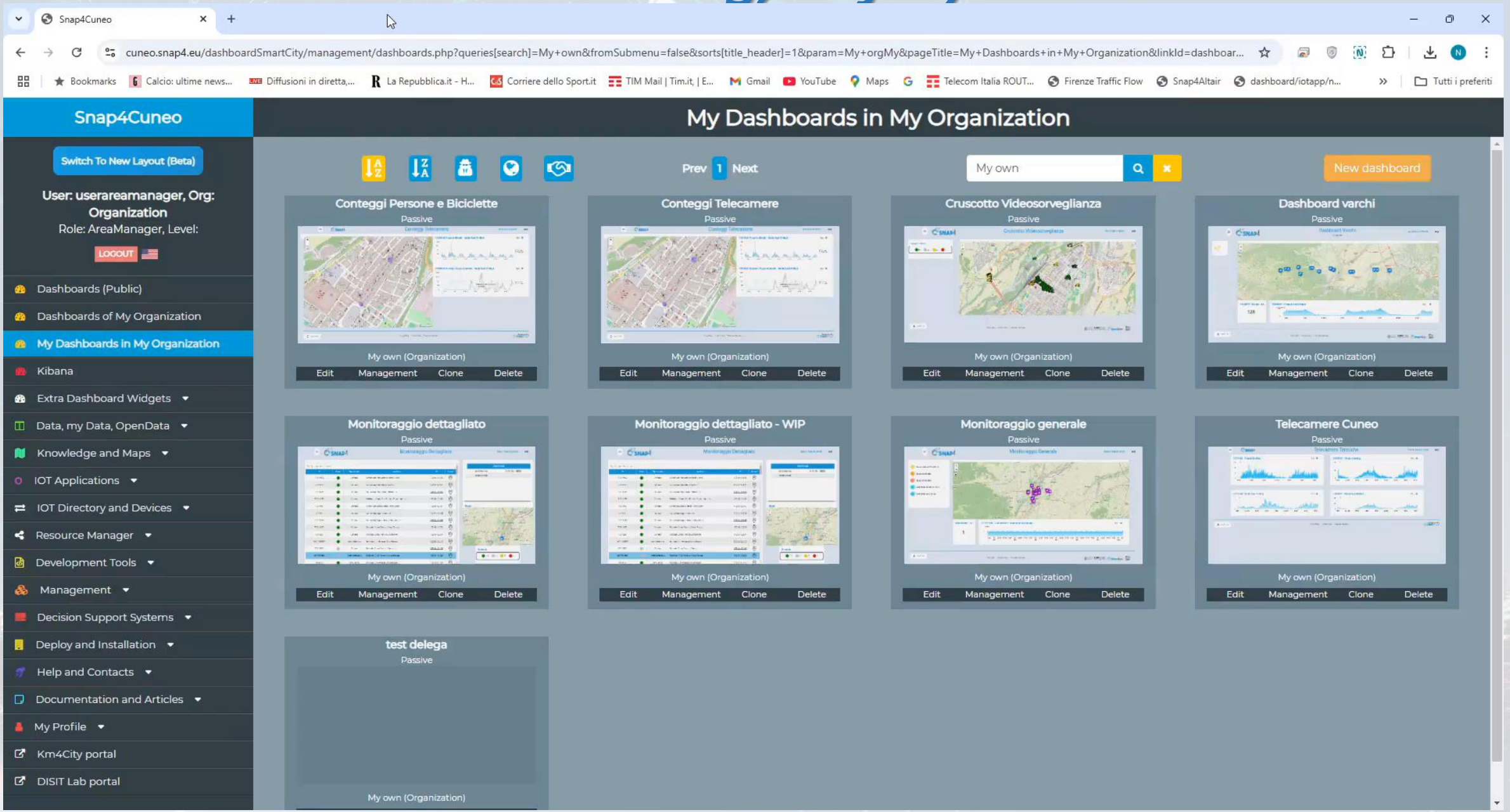
Cuneo Assets' Monitoring, Safety



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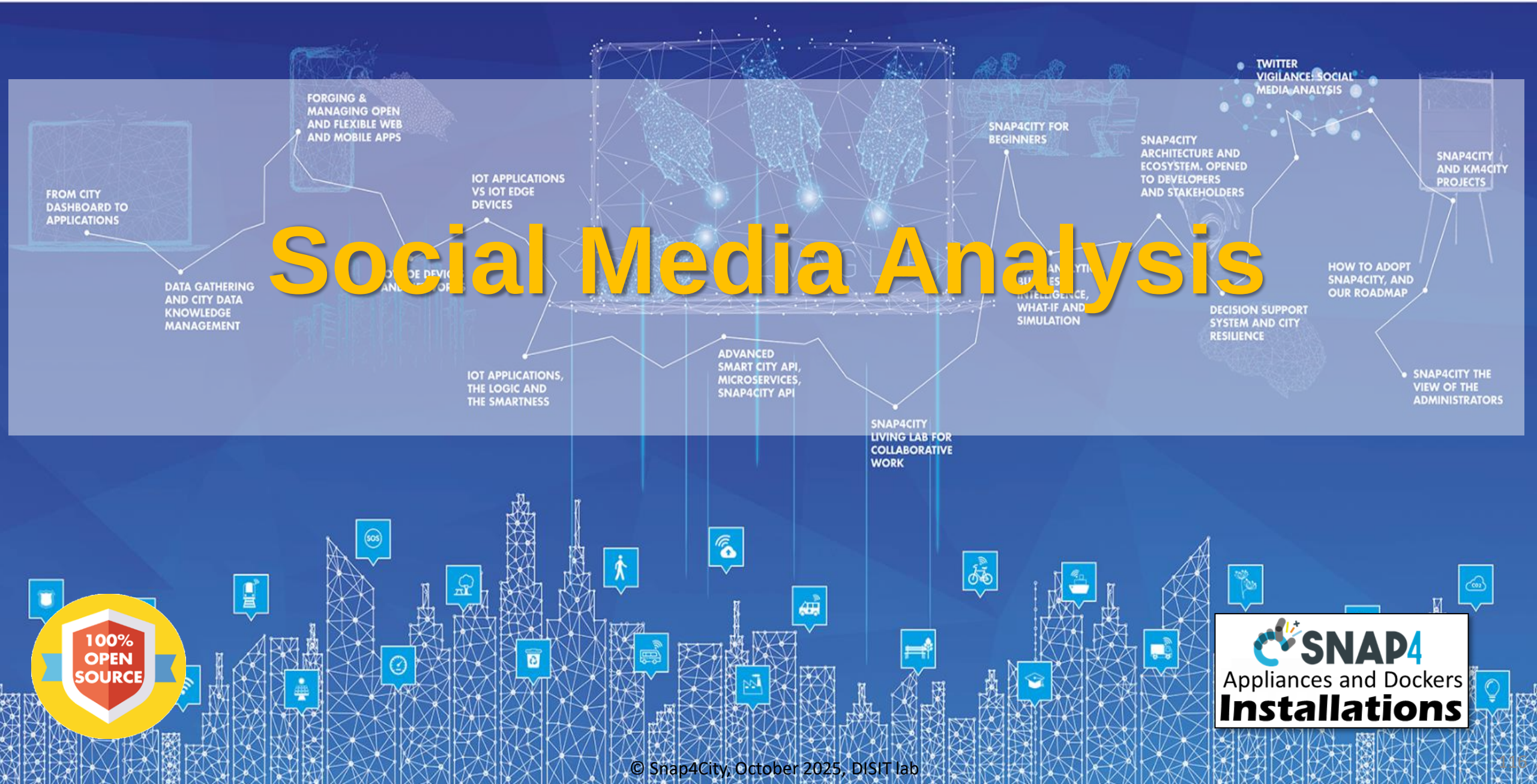

Social Media Analysis

100% OPEN SOURCE

SNAP4 Appliances and Dockers **Installations**

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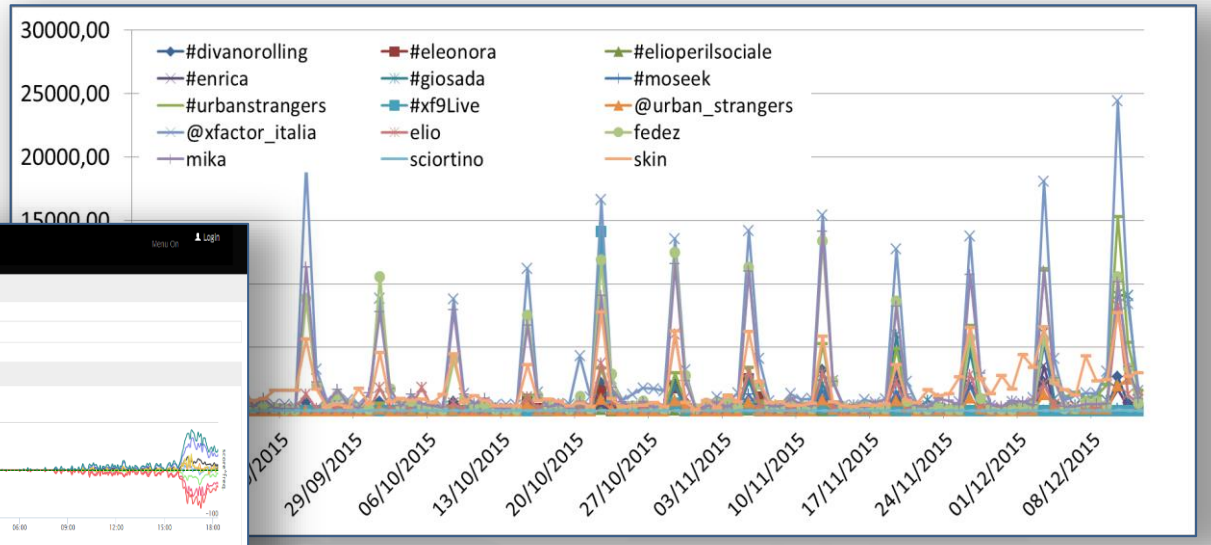
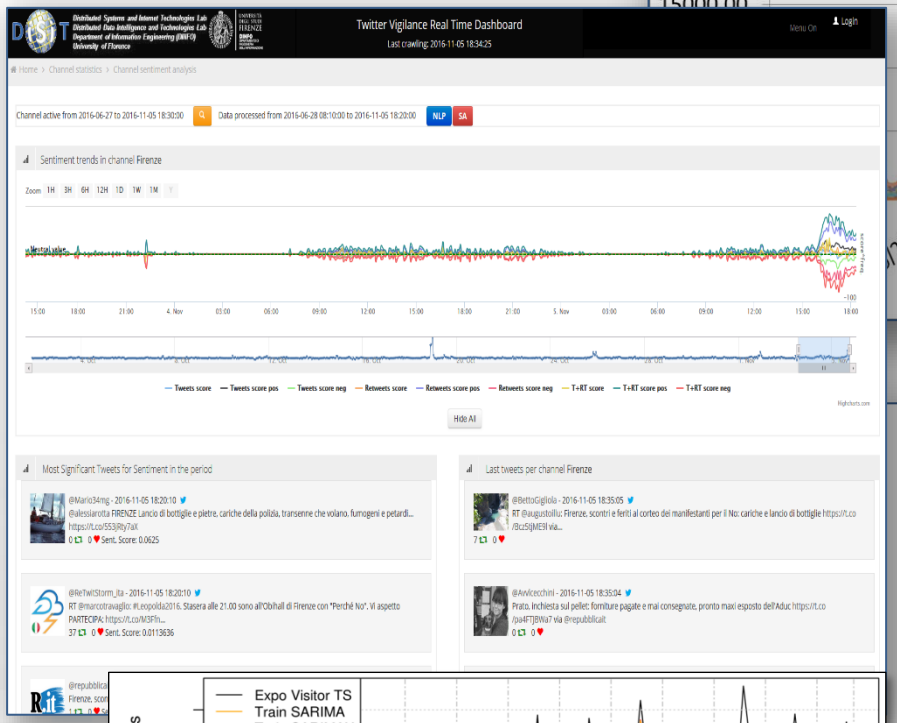
Social Media

Twitter Vigilance

- **Prediction** of Audience on TV programme
- **Prediction** of retweet proneness: RF, GBM, ..
- **Project**
  - TwitterVigilance
  - +NLP, SA





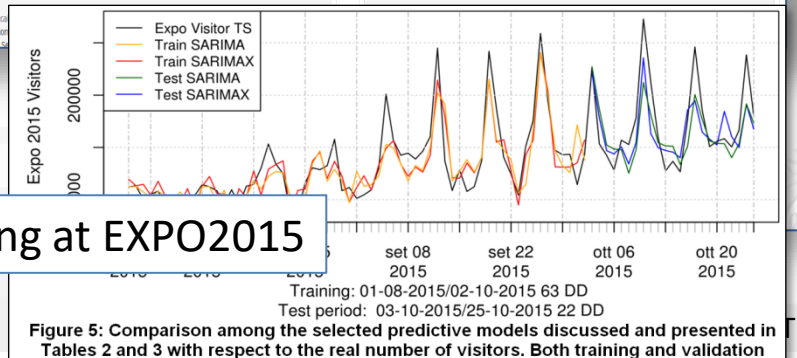
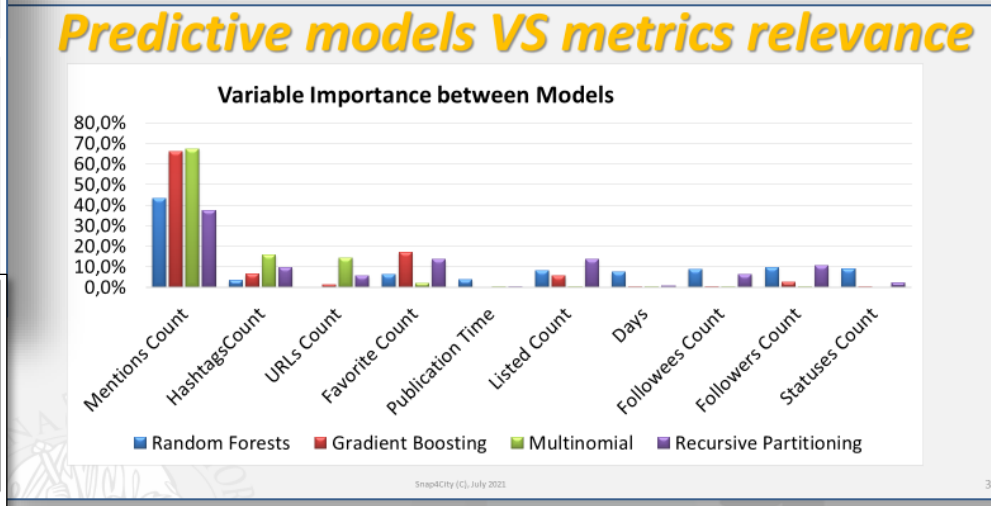


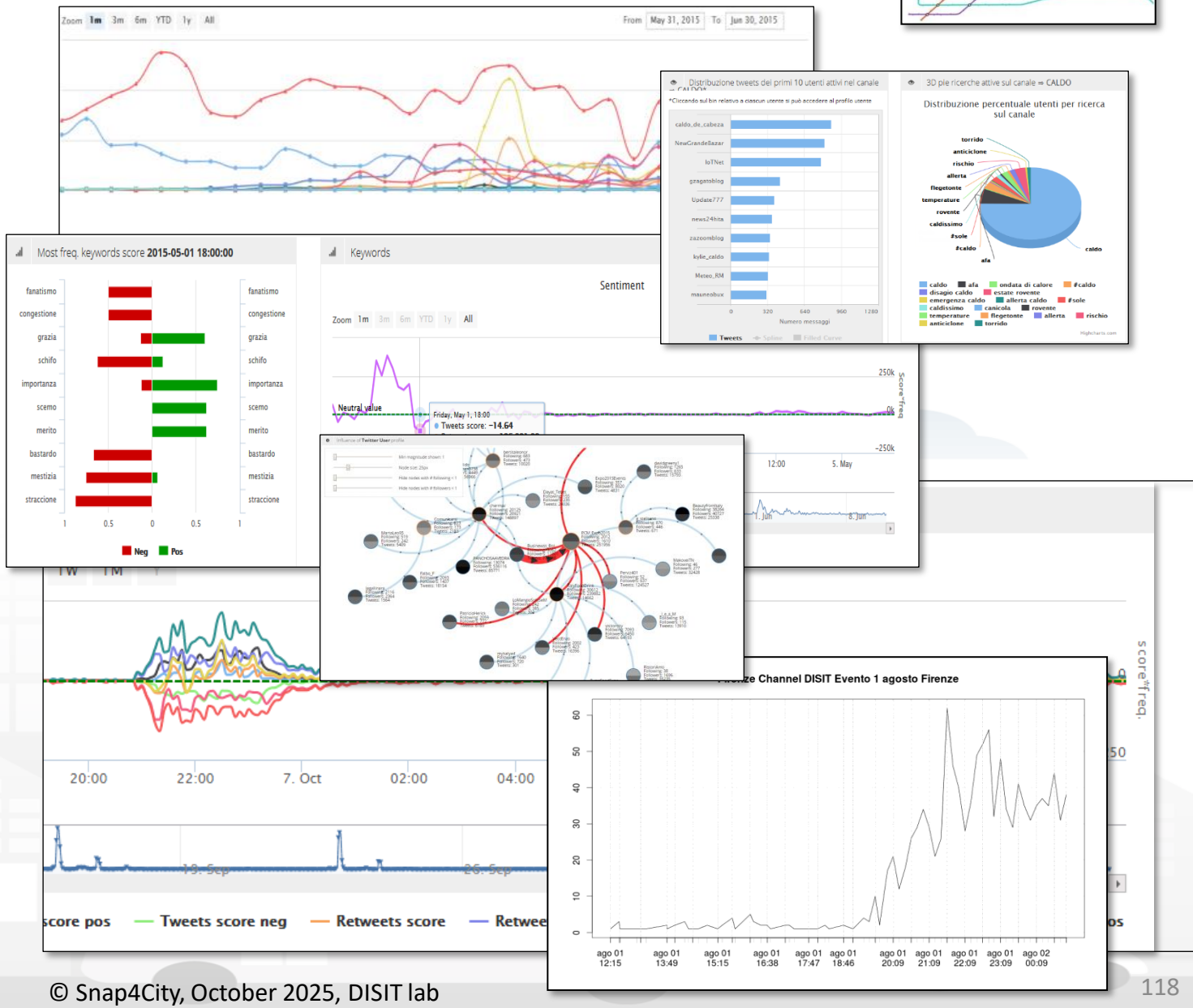
Figure 5: Comparison among the selected predictive models discussed and presented in Tables 2 and 3 with respect to the real number of visitors. Both training and validation

Predicting at EXPO2015



Twitter Vigilance

- http://www.disit.org/tv
- http://www.disit.org/rttv
- Citizens as sensors to
  - Assess sentiment on services, events, …
  - Response of consumers wrt, …
  - Early detection of critical conditions
  - Information channel
  - Opinion leaders
  - Communities
  - Formation
  - Predicting volume of visitors for tuning the services



Twitter Vigilance

© Snap4City, October 2025, DISIT lab

Several Channels

Twitter Vigilance Dashboard

Last crawling: 2015-12-11 01:20:20

Login

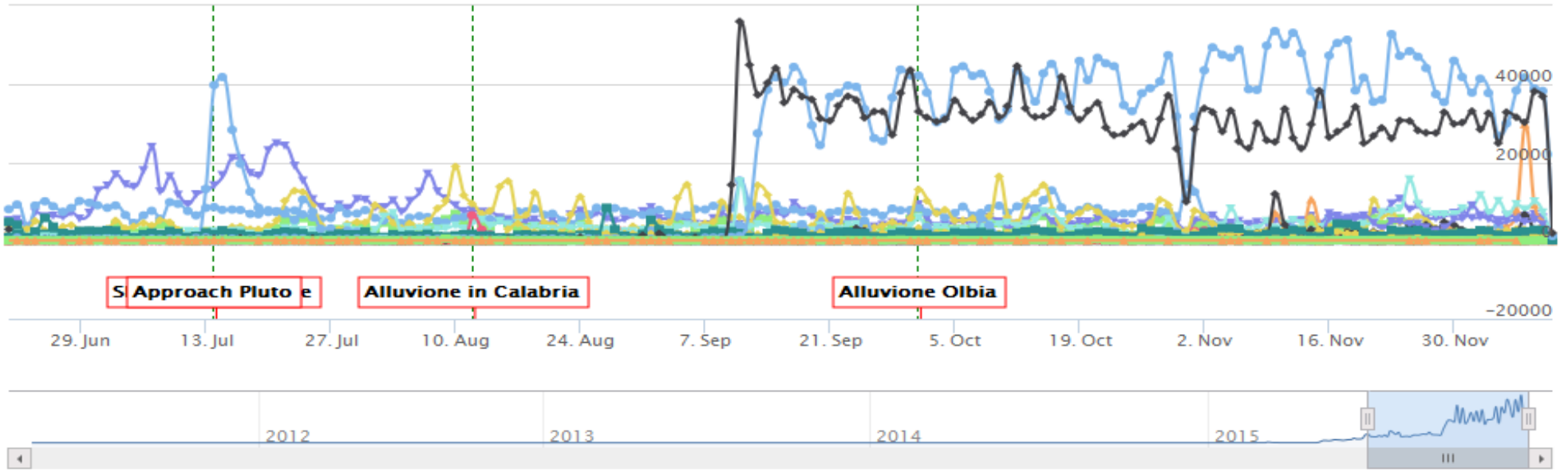
- Search parameters
- Data analysis 4
- Channel statistics
- Search statistics
- Retweet statistics
- Twitter Users statistics
- INFO

Home > Channel statistics

Global view of user channels

Zoom 1m 3m 6m YTD 1y All

From Jun 20, 2015 To Dec 11, 2015



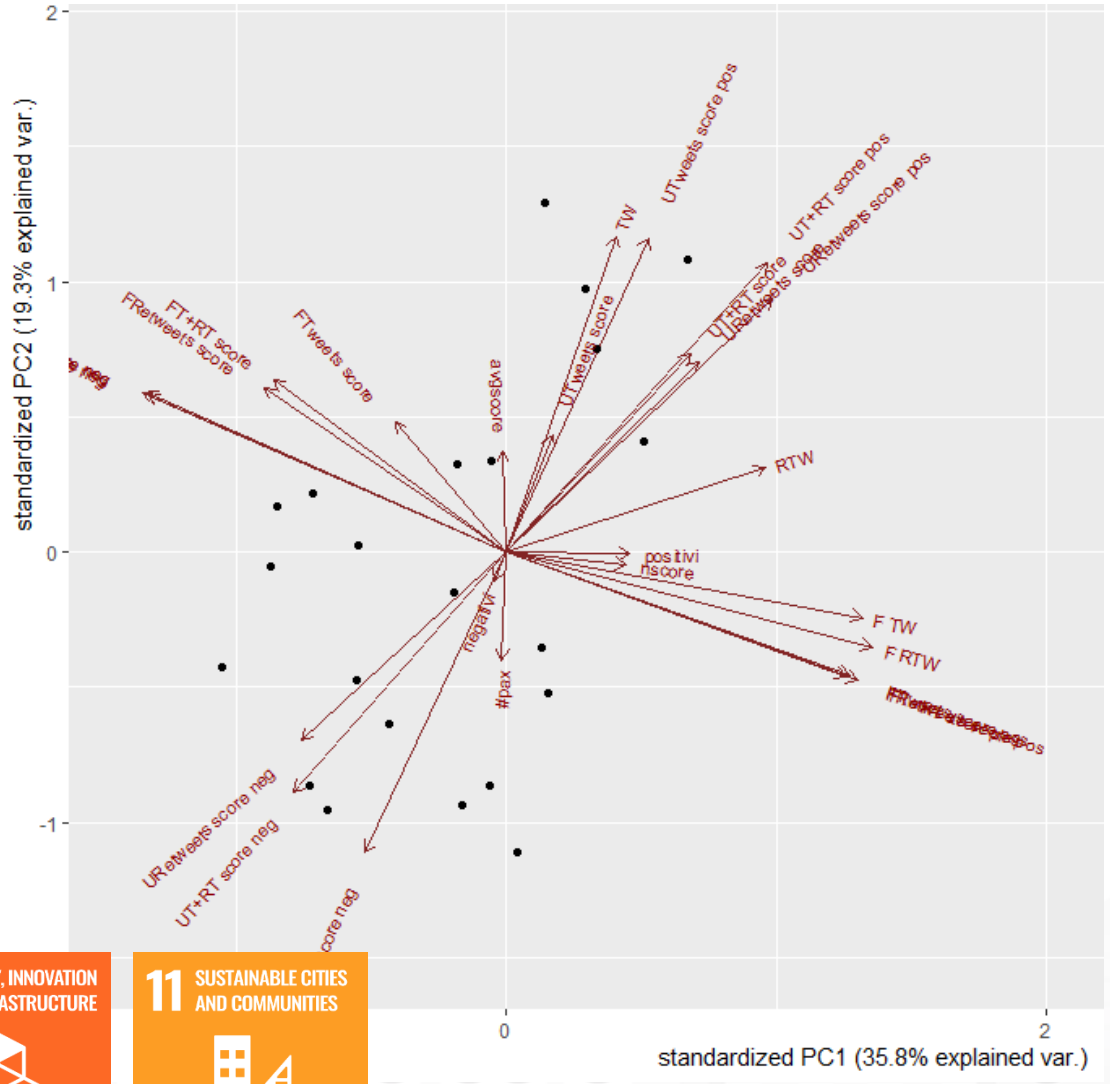
ads aeroporto firenze Allertameteo TOSCANA apretoscana CALDO cambiamenti climatici
Codified Hashtags Allerta ConsumoSuolo Emergenza_acqua Europeana EXPO2015 Firenze
FirenzeICT Giubileo iononrischio LaMMA Maltempo maturità 2015 MeteoUSER mymeteo
NASA New Horizons papafrancesco PA_social_PA protezione civile toscana resilienza rossano
siena smartcity smartcitybigdata2015 SOLO allertameteoTOSCANA tech uber Univ-Firenze
zanzara Events

Twitter Vigilance

© Snap4City, October 2025, DISIT lab

Reputation

- Prediction/estimation of **Average Score of Trip Advisor** as a function of *Twitter Vigilance Metrics + other information*
- Prediction/estimation of **Negative Scores on specific Museum** or service as a function *of Twitter Vigilance Metrics + other information*



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

Twitter Vigilance

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Indoor People Analysis and Suggestions for Smart Retail

feedback

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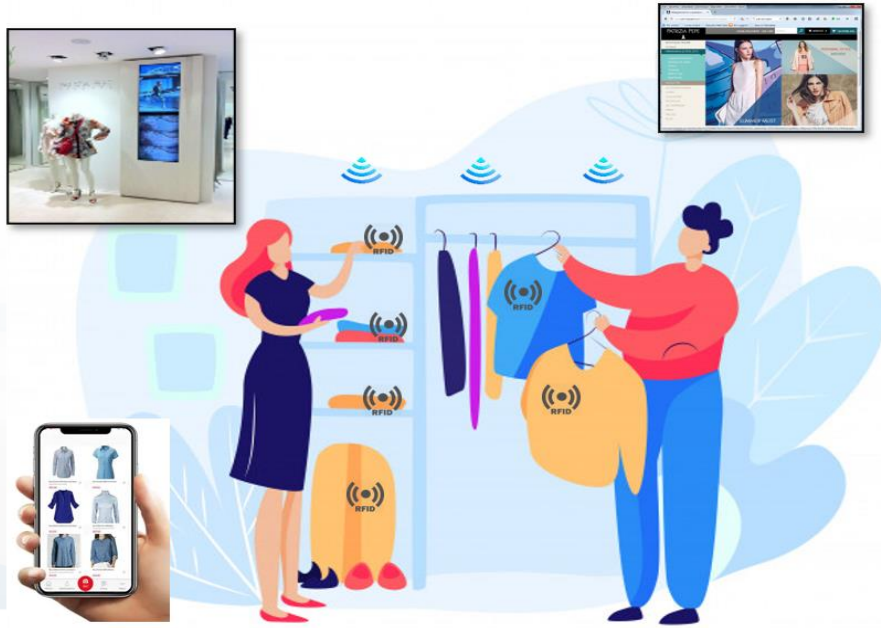
Smart Retail

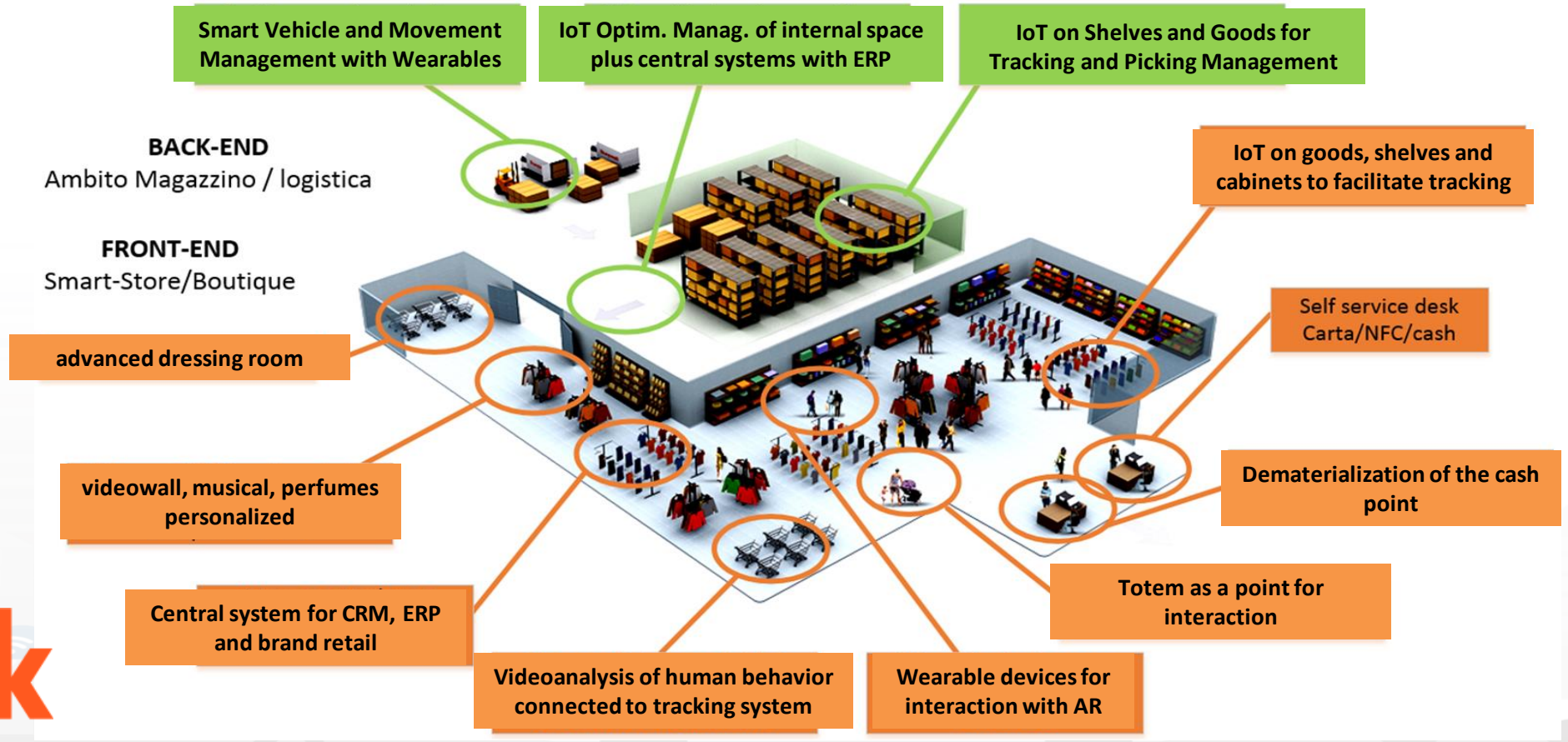
- **Feedback Project:**
  - Flexible Advanced Engagement Exploiting User Profiles and Product/Production Knowledge
  - VAR, PatriziaPepe (Tessilform), DISIT, SICE
  - Keywords: retail, GDO, …
- **Goals and drivers:**
  - adaptive user engagement, customer experience
  - Advanced user profiling, user behaviour analysis
  - IOT and instrumentation
  - Predictive models for engagement
  - Integrated in city customer experience

- **Aiming to solve current State of the Art issues:**
  - Cold start problems in generating recommendations for new users, also addressing seasonality of products and items
  - GDPR compliance

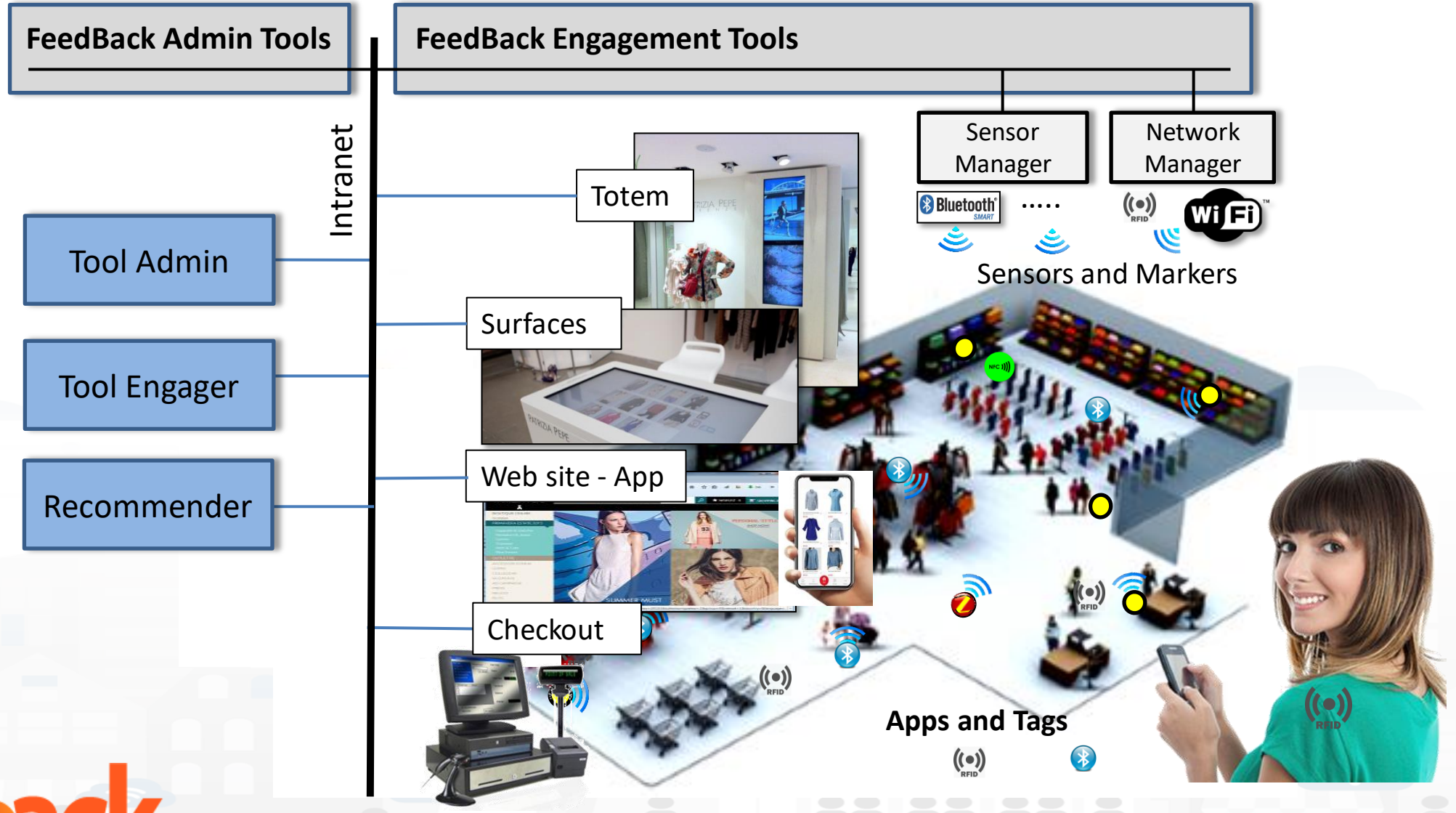


Smart Retail

- Using the stimulus of the recommendation system, we have increased the customers' attention of the 3.48%
- The solution is also functional in presence of a low number of customers and items
- The solution solved the cold start problems
- GDPR compliant



Scenario


FeedBack Admin Tools
FeedBack Engagement Tools
Intranet
Tool Admin
Tool Engager
Recommender
Totem
Surfaces
Web site - App
Checkout
Sensor Manager
Network Manager
Bluetooth SMART
.....
RFID
Wi Fi
Sensors and Markers
Apps and Tags

Suggestions

customer similarity for each customer cluster the most representative items are suggested;
item similarity: considering the last items purchased by the customer according to the information contained into its profile, and randomly selecting items in the same item clusters;
item complementary: considering items that may complement the last items that have been bought by the customer according to a table of complementary items;
item associated: in order to improve a customer's purchase frequency, we generated suggestions for customers who purchased an item in the last three months;
suggestions for serendipity: randomly selecting items to be suggested from the whole present collection, taking also into account what is available in the physical shop;

Item selection
1. Item previously not purchased
2. Confidence recommended item. Confidence established with Market Basket Analysis

feedback

- 20% of suggestions produced have been issued
- 9.84% of suggestions have led to transaction and/or trial
- 3.48% of increment of interest with respect of the previous period without recommendation

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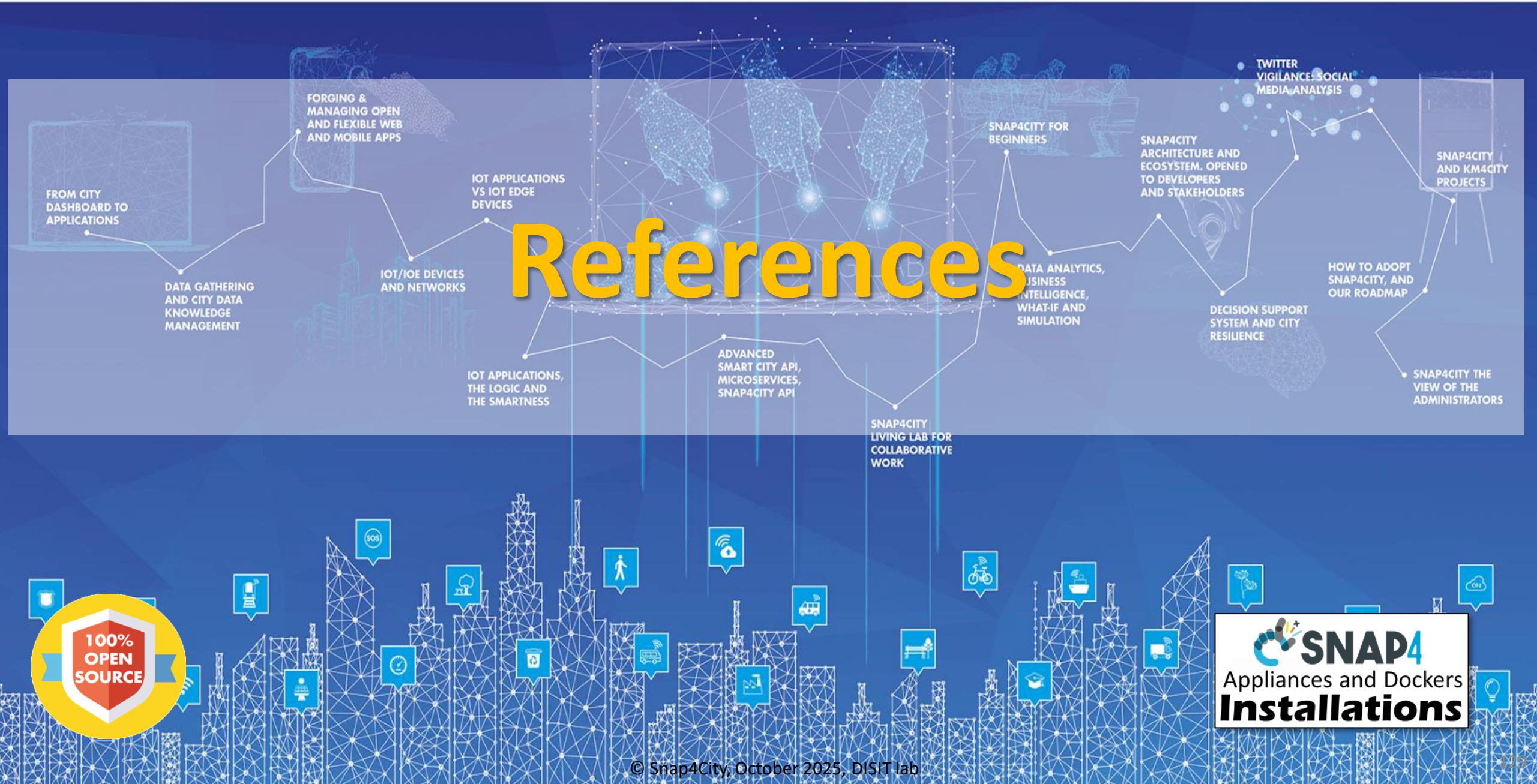

References

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SNAP4 Appliances and Dockers **Installations**

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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

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DISIT lab roadmap vs model and tools' usage

2013
Km4City Ontology 1.1

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

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

- Twitter Vigilance
- Social Media Analytics, Sentiment Analysis

Km4City 1.4

2015
Km4City 1.5

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

ckan, resolute

H2020 (2015-18)

2016
(2016-21) H2020 REPLICATE

Km4City 1.6.4

- Smart Energy
- Sustainable Mobility
- Control Room
- Dashboard

Km4City 1.6.2

Sii-Mobility (2016-21) MIUR

SII-MOBILITY SCN

- Infomobility
- Mobile App
- Routing
- Multimodality

FIWARE

Km4City 1.5

2017
Sii-Mobility

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

E0I5 digital ecosystem (Powered by EXPO MILANO 2015)

(2016-19) MIUR GHOST SIR

- Sardinia Region Smart City Strategies and plan

GREEN IMPACT C.A.P.A.C.I.T.Y.

GREEN IMPACT
POR FESR 2014-2020

- Industry 4.0
- Critical Plant
- Monitoring

- IOT/IOE, IOT App
- Living Lab
- Maker Support
- IOT Edge
- Smart City IOT
- GDPR,
- Privacy & Security

life weee (2017-20)

- Smart Waste

MOSAiC Mobility 4.0 for SmArt (i) City (POR CreO, Regione Toscana)

(2018-20)

2018
- Mobility Demand / Offer Analytics and Strategy

Sii-Mobility

- User engagement
- Bike Sharing
- Data Analytics ++
- Social Predictions
- OBD2

IOT/IOE

Km4City 1.6.6

Node-RED

SNAP4CITY SELECT for Cities H2020 (2017-19)

5G (2018-21)

- 5G tech
- Energy
- Industry 4.0
- Synoptics

TRAFAIR CEF (2018-21)

- Traffic and Mobility Impact on Pollution
- NOX predictions

2019
EUROPEAN OPEN SCIENCE CLOUD

SIRIUS

LAID Smart Bed (POR CreO, Regione Toscana)

- Smart Health

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

- Industry 4.0

bee smart city

- Smart Lonato

Reverberi Enetec Gruppo MPES

SODA

Winner of Select4Cities PCP

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

SNAP4CITY KM4CITY

SNAP4CITY roadmap

2020

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

- Smart Mobility
- PISA, PUMS
- Living lab

Km4City 1.6.7

smartGARDAlake

2021

Smart Ambulance (2021-22)

Enterprise (2021-22) Industry 4.0

Sii-Mobility Contract

JRC Contract

PC4City (2020-21) Monitoring Terrain

Winner of Open Data Challenge of enel x

- Smart Light
- Sweden

CAPELON

2022

Almafluida Industry 4.0 (2021-22)

AMPERE (2021-22) Industry 4.0

SYN-RG-AI SmartCity

GRUPPO PRETTO Industry 4.0

uni.systems SmartCity, 2021-23

AXIS collab SmartCity

Asymmetrica Smart City, 2022-23

JRC Contract, 2022-23

2023

ART-ER Contract, 2022-23

Filippi 2022-2023

enel x Contract, 15min

IMPETUS Security and Risk

Smartea

Italferr, Smart City

CN MOST, 2022-26

EI THE, 2022-26

G. Agile, 2021-23

TUSCANY EDIH 2023-26 Finanziato dall'Unione europea NextGenerationEU

Merano, smart light

OceanRace, Genova, AWS

Cuneo, smart city

2024

Km4City 1.6.8

TOURISMO

Interreg Euro-MED Co-funded by the European Union

ELLIE IA 2025-2027

UrbanDT4TF

JRC Contract, 2024-25

CAI4DSA

FAIR Future Artificial Intelligence Research

OPTIFaaS

SASUAM

Rhodes, smart city

eShare UNIFI TUSS

AMMIRARE

Interreg MARITTIMO-IT FR-MARITIME

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.

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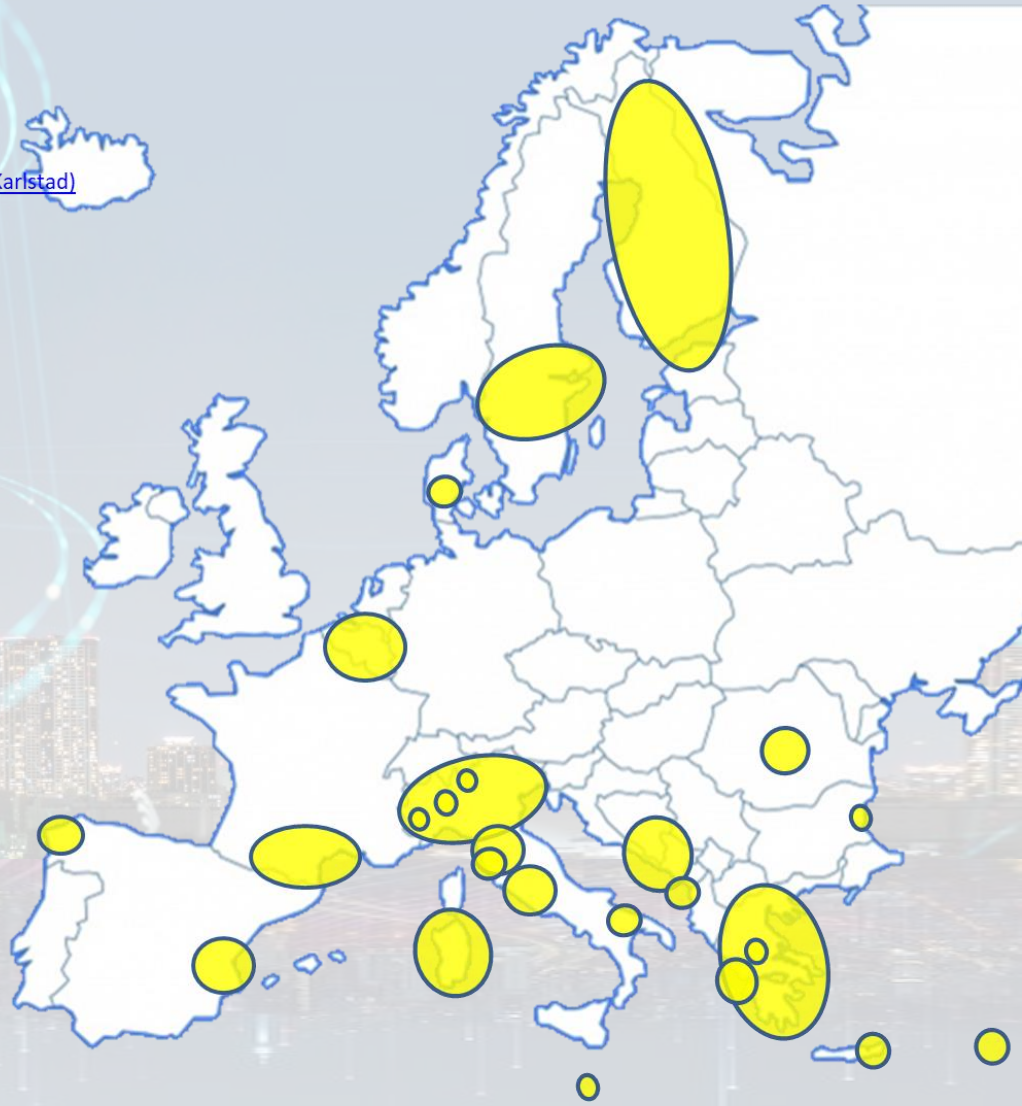
https://www.Snap4City.org

- 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.**

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Interreg
Euro-MED

Co-funded by
the European Union

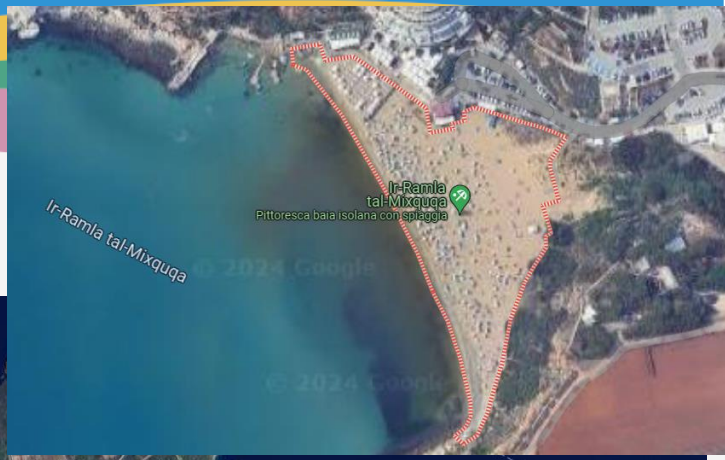
TOURISMO EURO MED

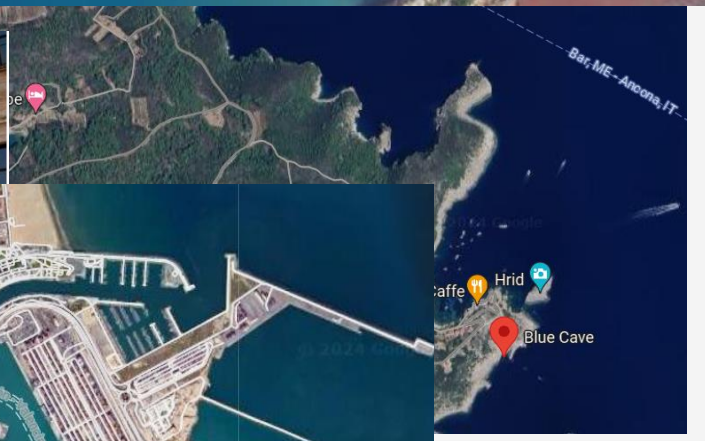
TOURism Innovative and Sustainable Management of flOws

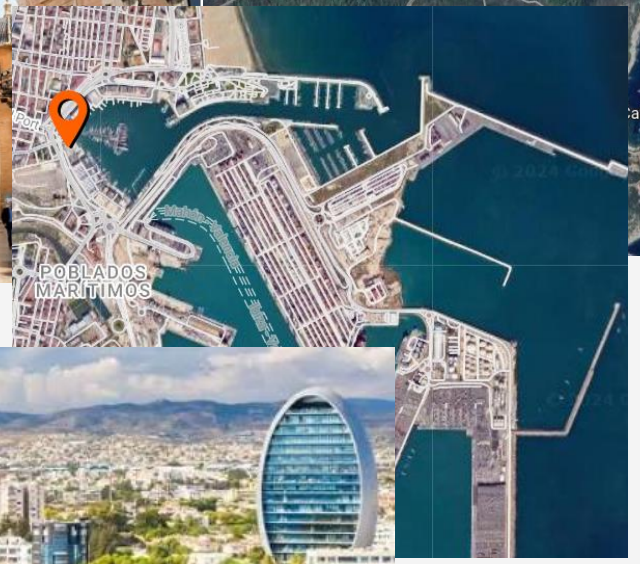
SNAP4CITY

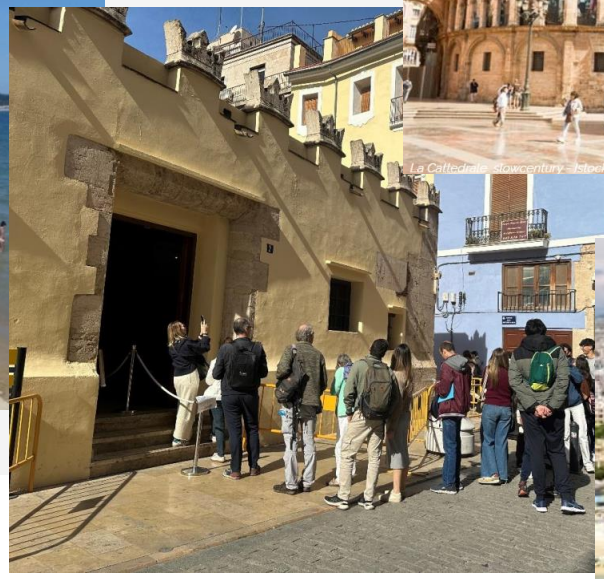
• Pilots of Snap4City on:

- Greece - READ S.A.: Rodi
- Italy – FRI, UNIFI: Firenze
- Spain – FV, FSMLR: Valencia
- Cyprus – ANELEM: Limassol
- Bulgaria – VEDA: Varna
- Croatia – RERA SD: Splitsko-dalmatinska županija
- Malta – MRDDF: La Valletta









Interreg Euro-MED

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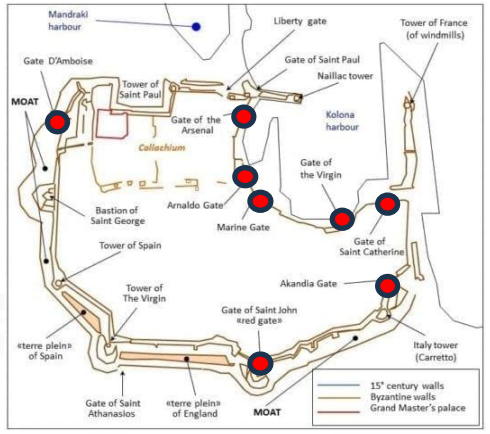
TOURISMO INTERREG ACTION OF THE EC



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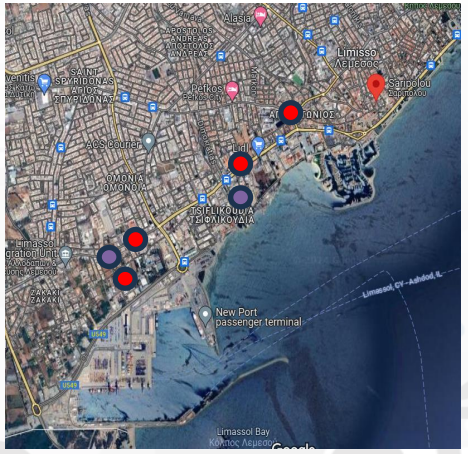

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Florence (Italy) – Scenario: City Centre

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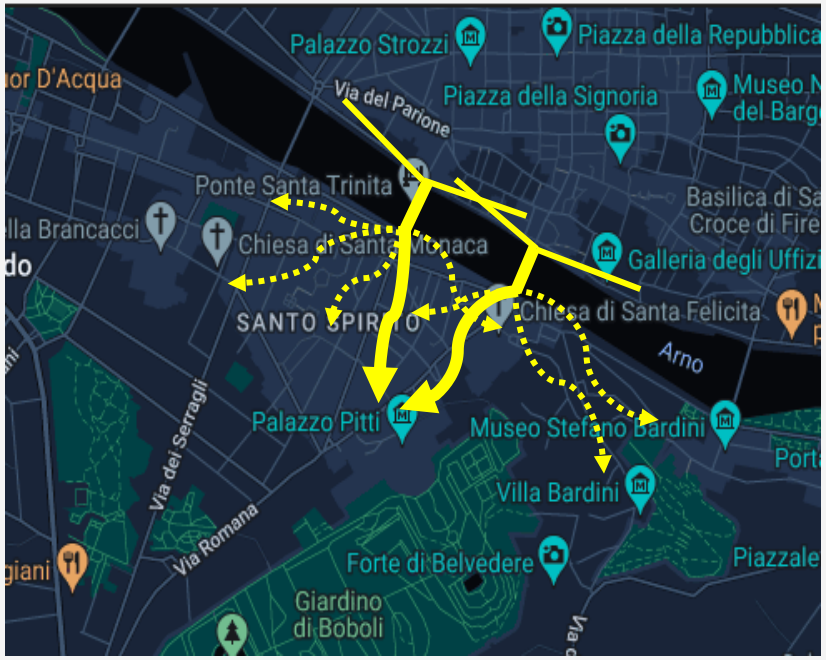
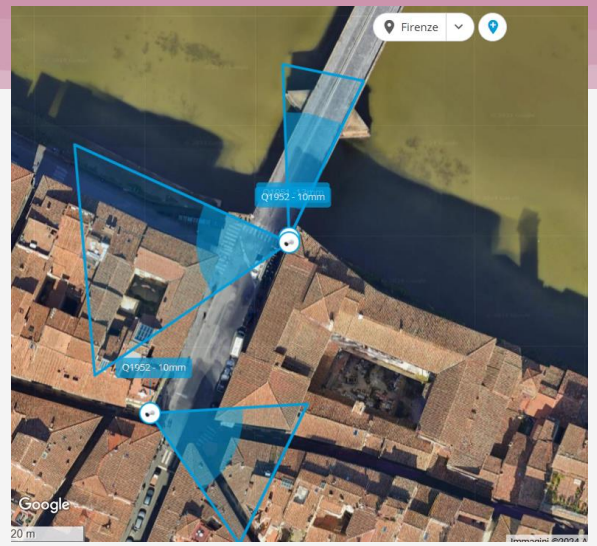
Florence (Italy) – Scenario: City Centre





Target:

Anticipate and mitigate negative or unexpected unknown events, predict flows and virtuously orient them

Equipment:

- 2 Thermal cameras
- 3 Pax counters: sniffer counting devices

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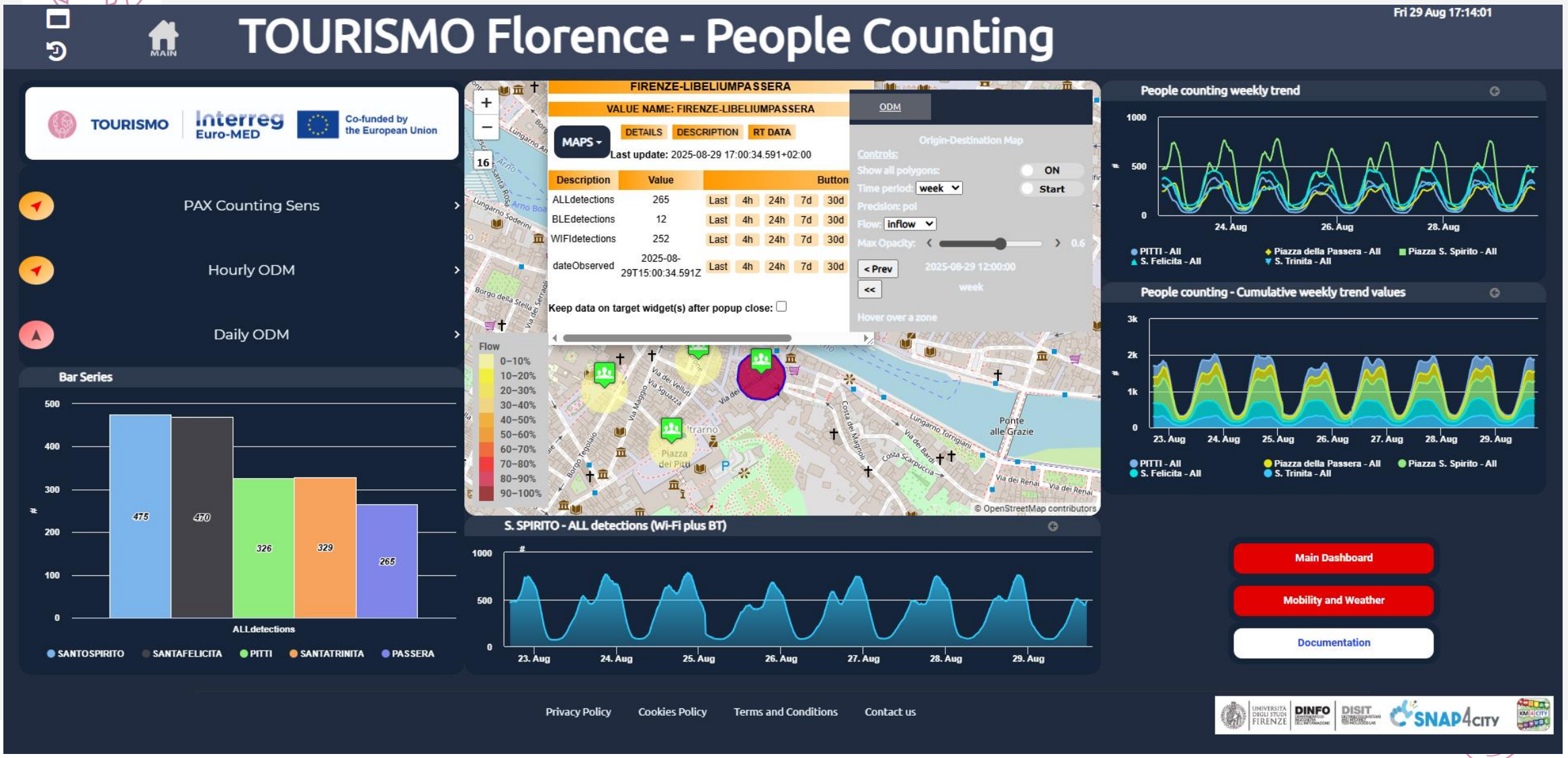

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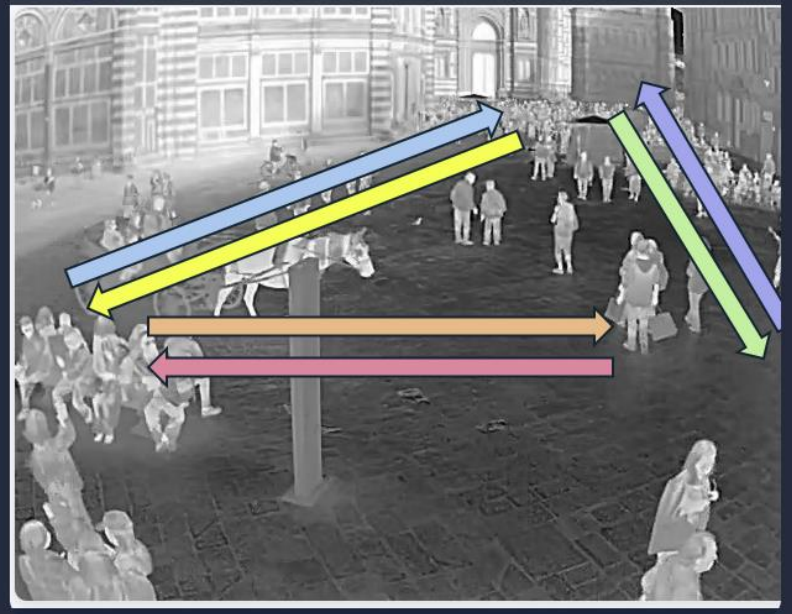
Tourismo: Dome Trajectory Analysis

Fri 10 Oct 21:48:22

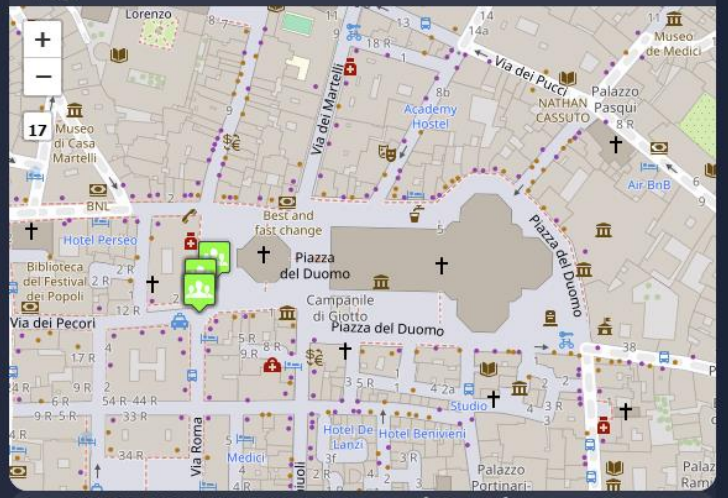
Selector

Duomo Sensors

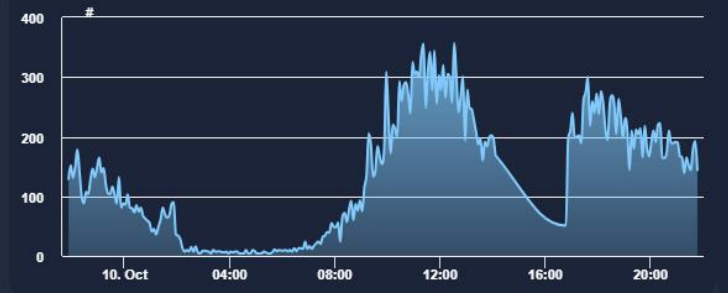
directions



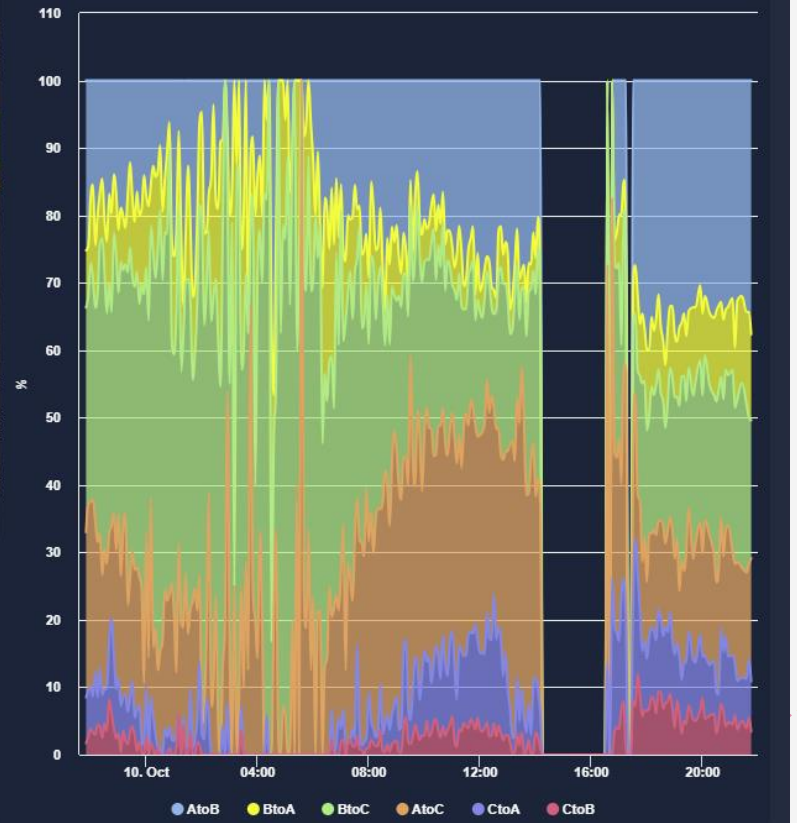
Map



FIRENZE-TCPIAZZADUOMO5minutes - peopleCounted



Percentuale distribuzione traiettorie



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Dome Trajectory Computation Manager

Fri 10 Oct 21:59:30

Duomo Trajectory Manager

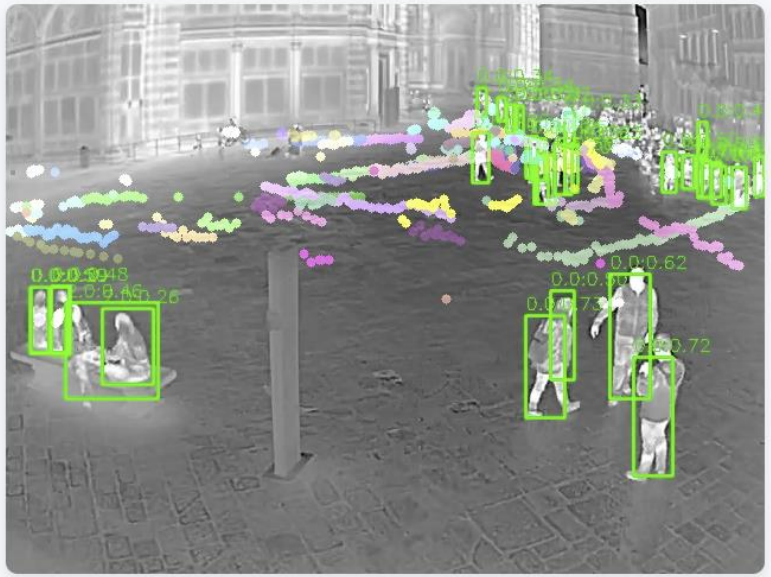
Streaming Processato

Boxes

Trajectories

Clear Trajectories

Stop Processing



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Malta – Scenario: Golden Bay

Target: Visitor behaviour analysis at the Golden Bay, with the intention of proposing a carrying capacity limit during peak seasons for conservation policy recommendations.

Equipment:

2 Thermal Cameras
4 Pax counters
1 Traffic counter

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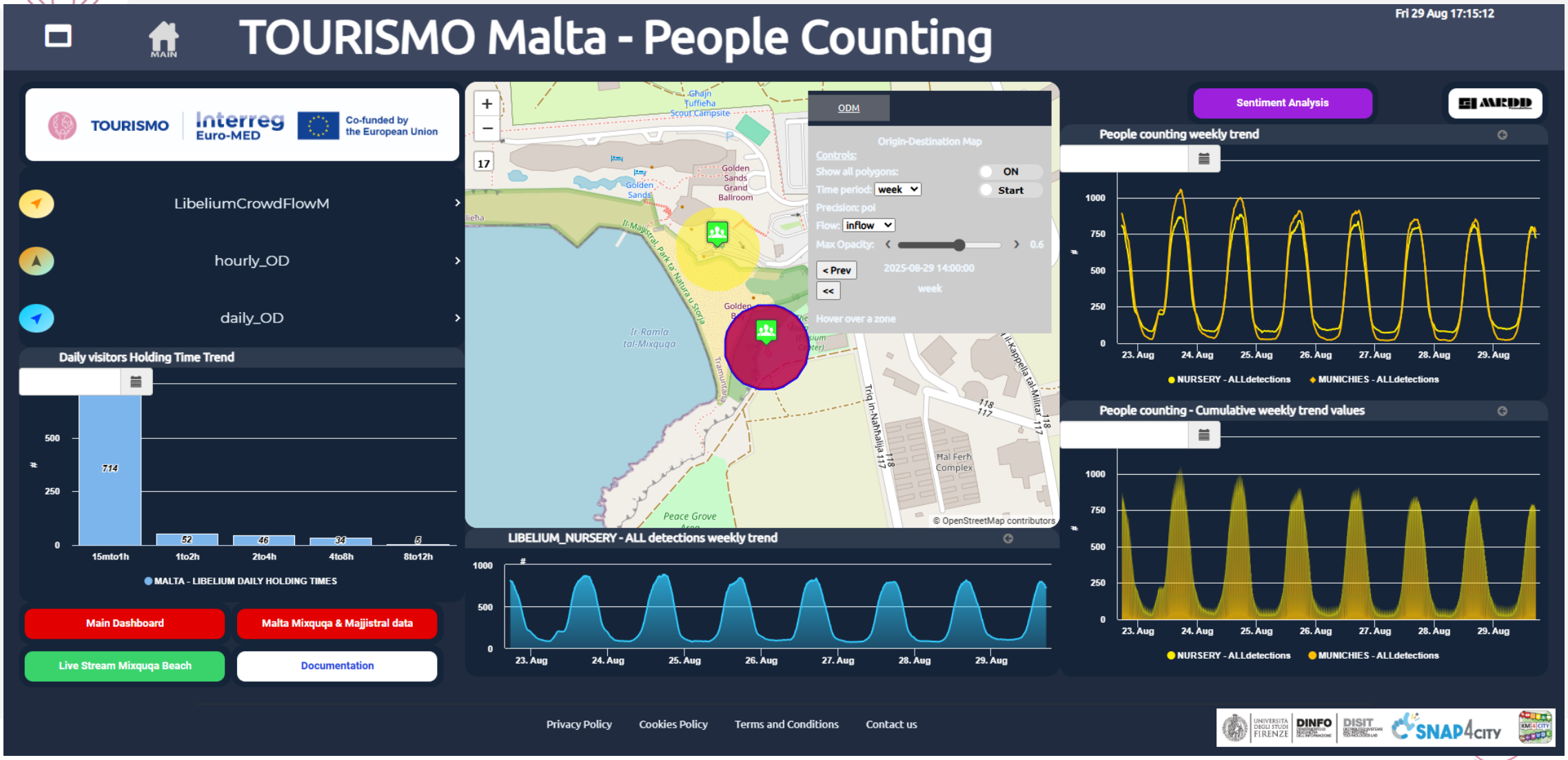

Varna (Bulgaria) – Scenario: City Centre

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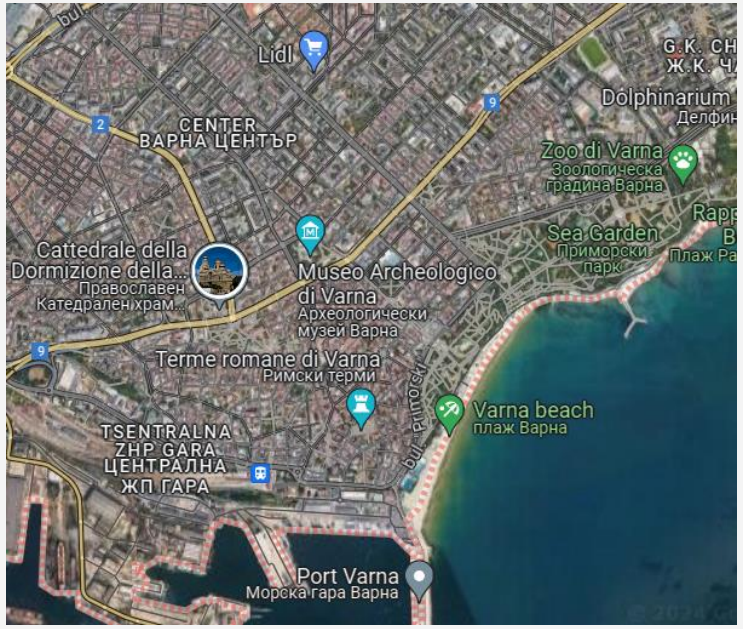

Target: Data collection and processing of the tourists' flows in key locations of the city of Varna to analyse crowd density and queue formations

Equipment: Drones: people flows images during the day

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Valencia (Spain) – Scenario: Valencia Port

Valencia (Spain) – Scenario: Valencia Port

Target:

Anticipate and develop methods to analyse the situation regarding the flow of cruise tourists, identify trends, and manage the tourist flows to prevent future overcrowding.

Equipment:

2 Thermal cameras

3 Pax counters

Valencia (Spain) – Scenario: Historic City Centre

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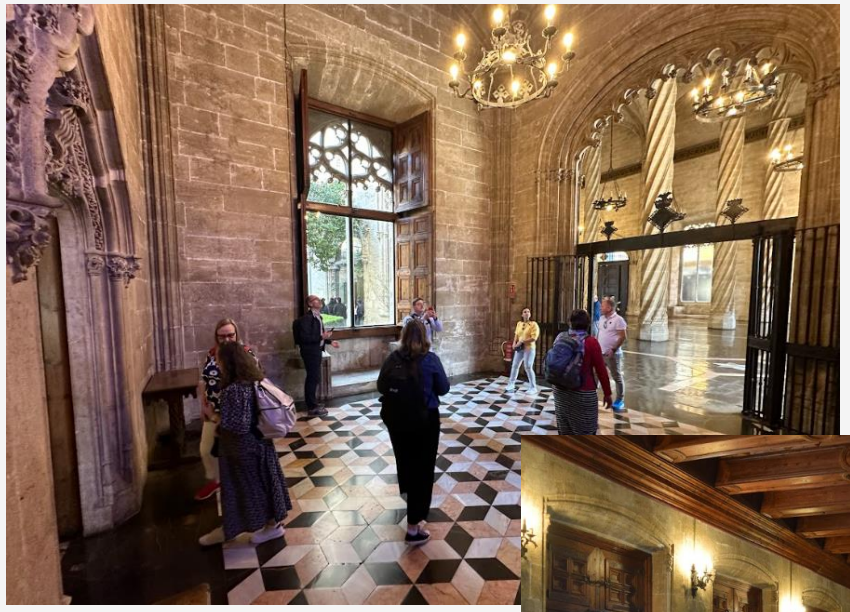
Valencia (Spain) – Scenario: Historic City Centre



Target:

Monitor the impact of tourism on the architectural heritage of Valencia's historic centre: real-time occupancy in La Lonja and in the Museum of the City (Palacio del Marqués de Campo)

Equipment:

Indoor pax counters: Entrance and exit sensors in the buildings

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Croatia – Scenario: Island of Biševo

Target: Achieve sustainable tourism on the islands of Biševo and Komiža by covering the flow of guests entering the famous 'Blue cave' on Biševo island.

Equipment:

2 Pax counters: sniffer counting devices

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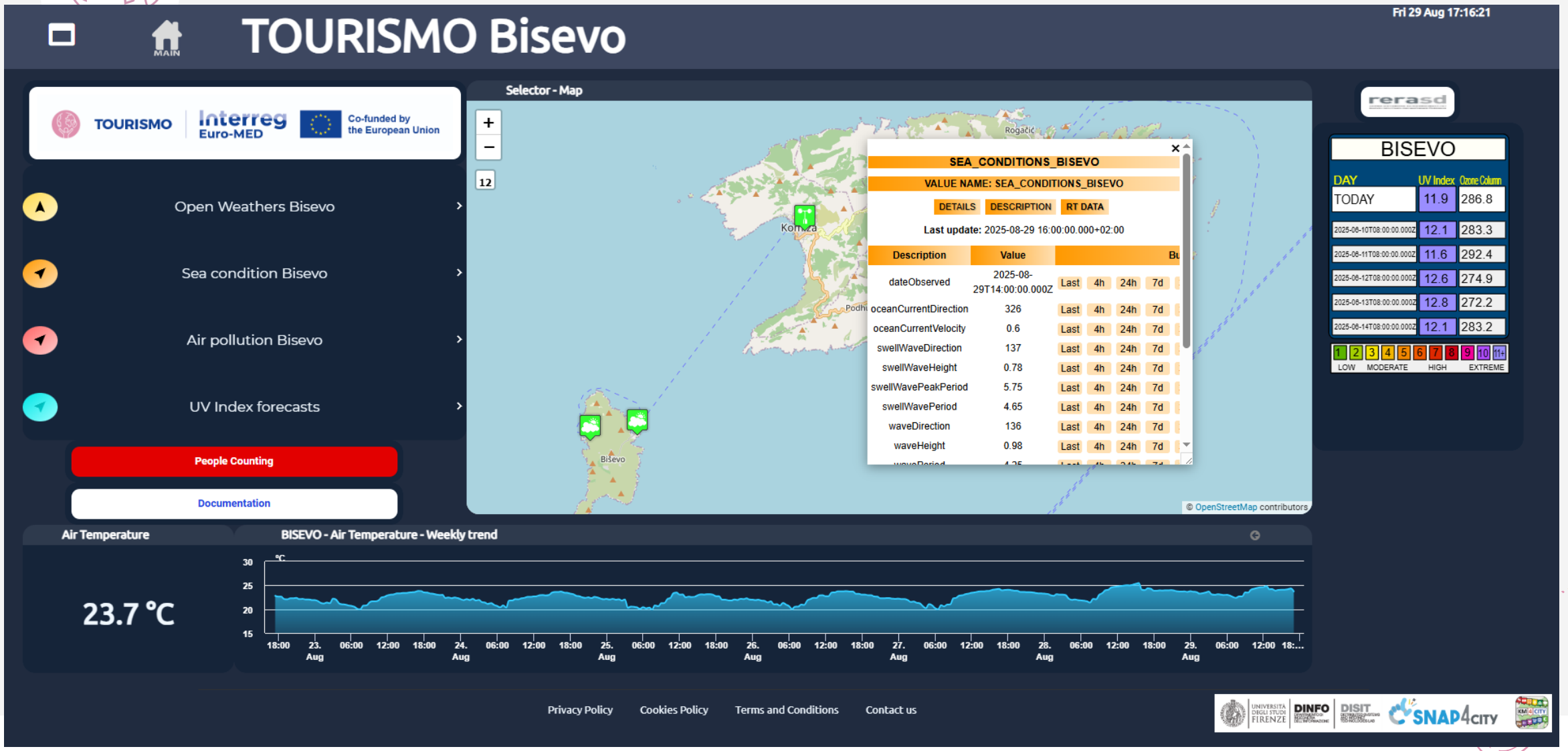

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Rhodes (Greece) – Scenario: Medieval city

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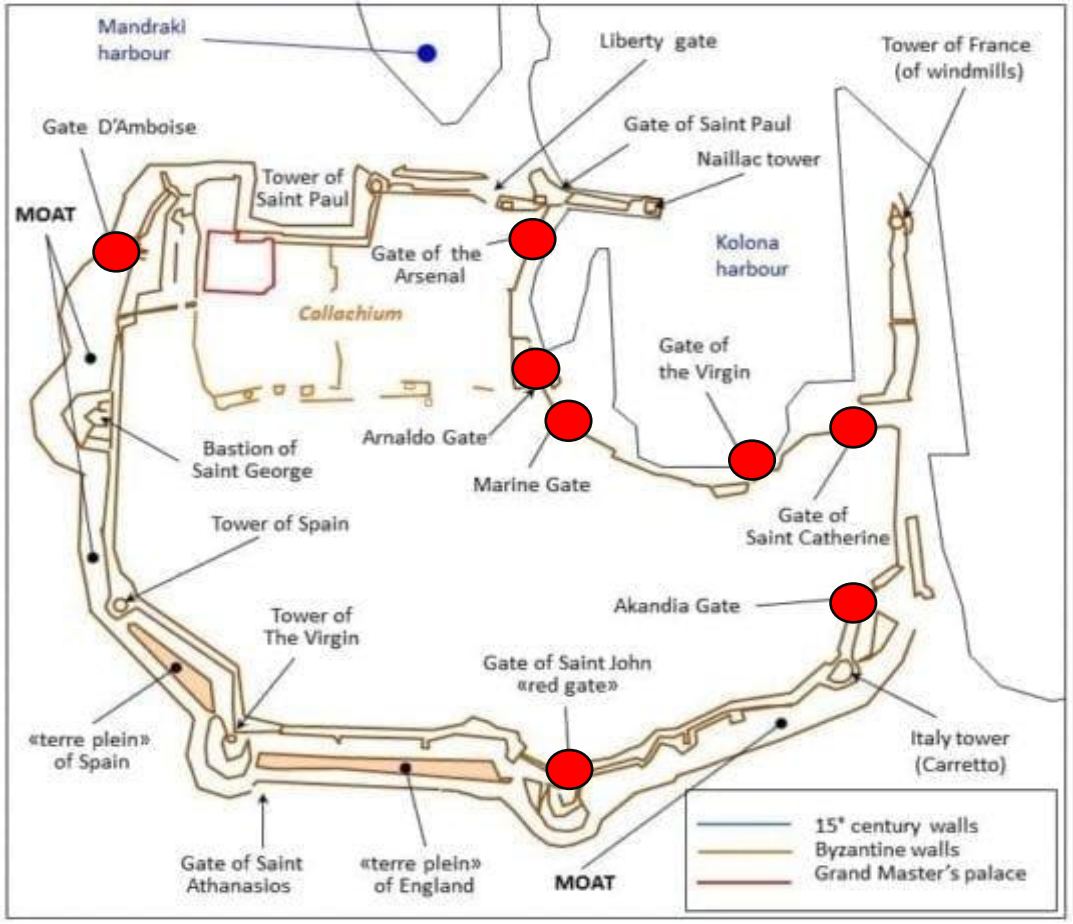
Rhodes (Greece) – Scenario: Medieval city



Target:

Medieval City's carrying capacity by comparing the data from higher and lower tourist seasons

Equipment:

- 8 Thermal cameras, one for each gate of Medieval City

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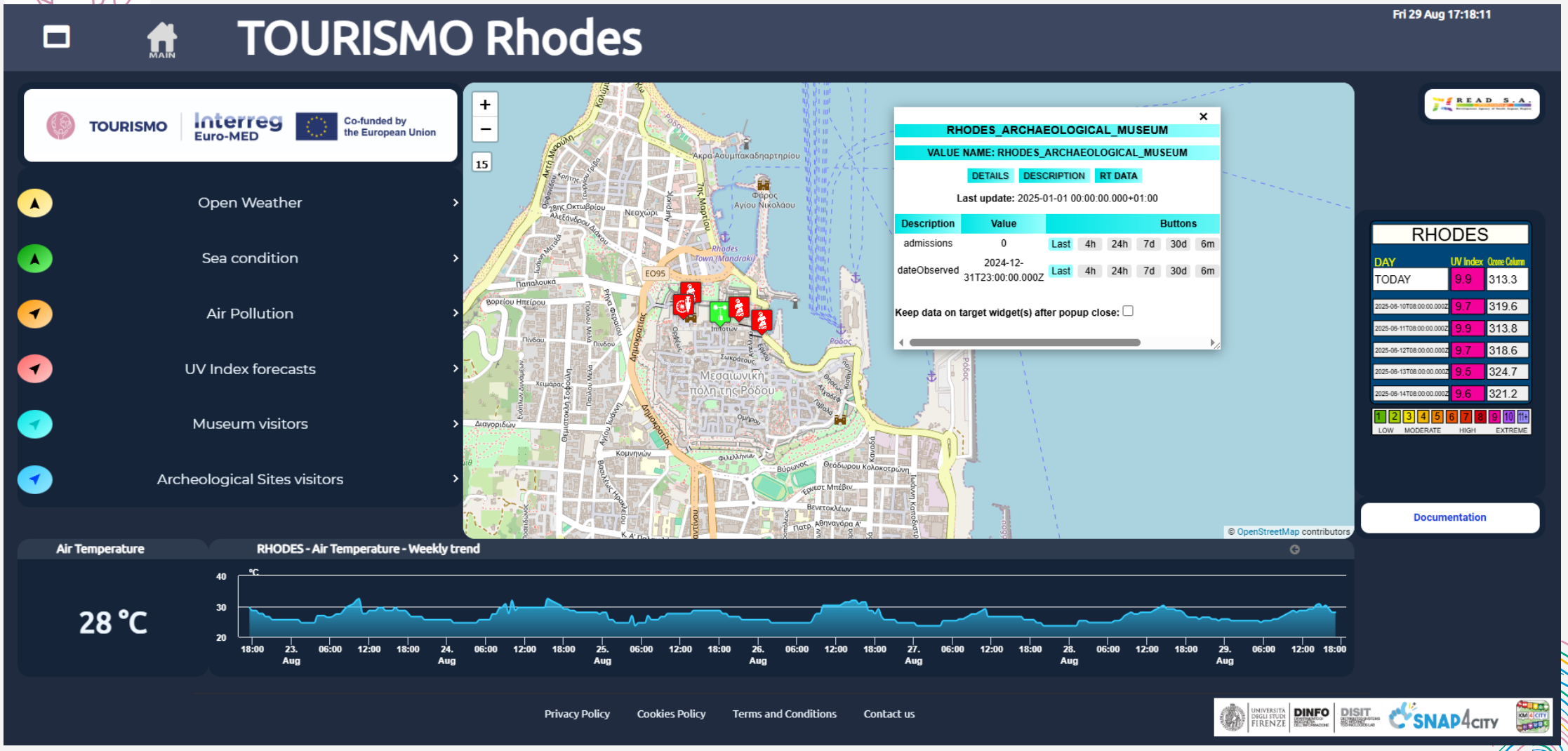
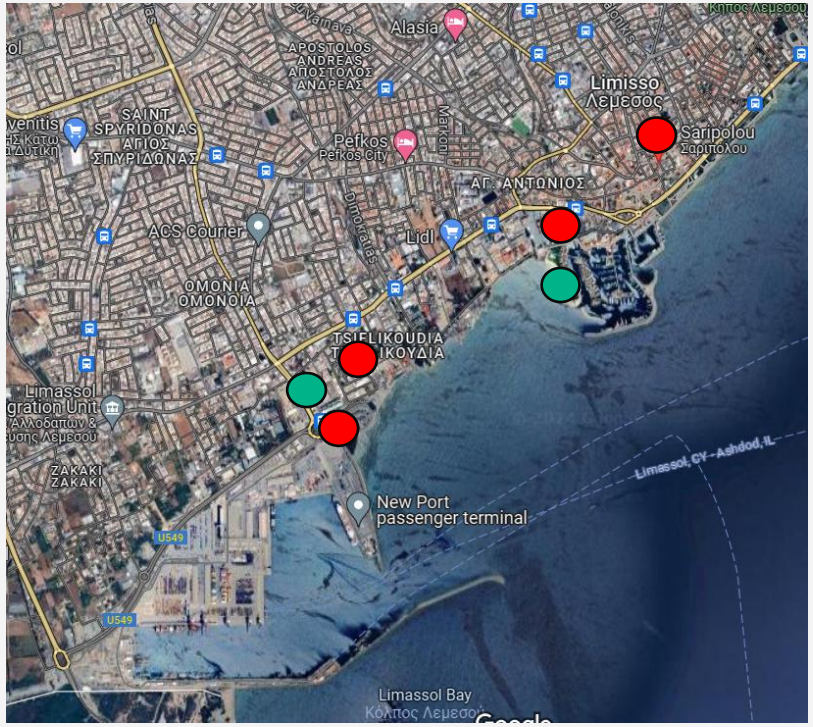


Cyprus – Scenario:
Limassol Port



Target: Measure and Analyse the Tourist flow within Old port of Limassol and Port of Limassol. Understand the patterns of tourist movement and behaviours.

Equipment:

4 Thermal cameras

10 Pax counters

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