SNAP4CITY

KM4CITY

SNAP4 Appliances and Dockers Installations

100% OPEN SOURCE

EU GDPR COMPLIANT

PEN Test Passed

Powered by FIWARE

SNAP4CITY on EUROPEAN OPEN SCIENCE CLOUD MARKETPLACE

Node-RED

A Framework for rapid implementation of
- Sustainable Smart Solutions
- Decision Support Systems
as a no-coding, low-coding

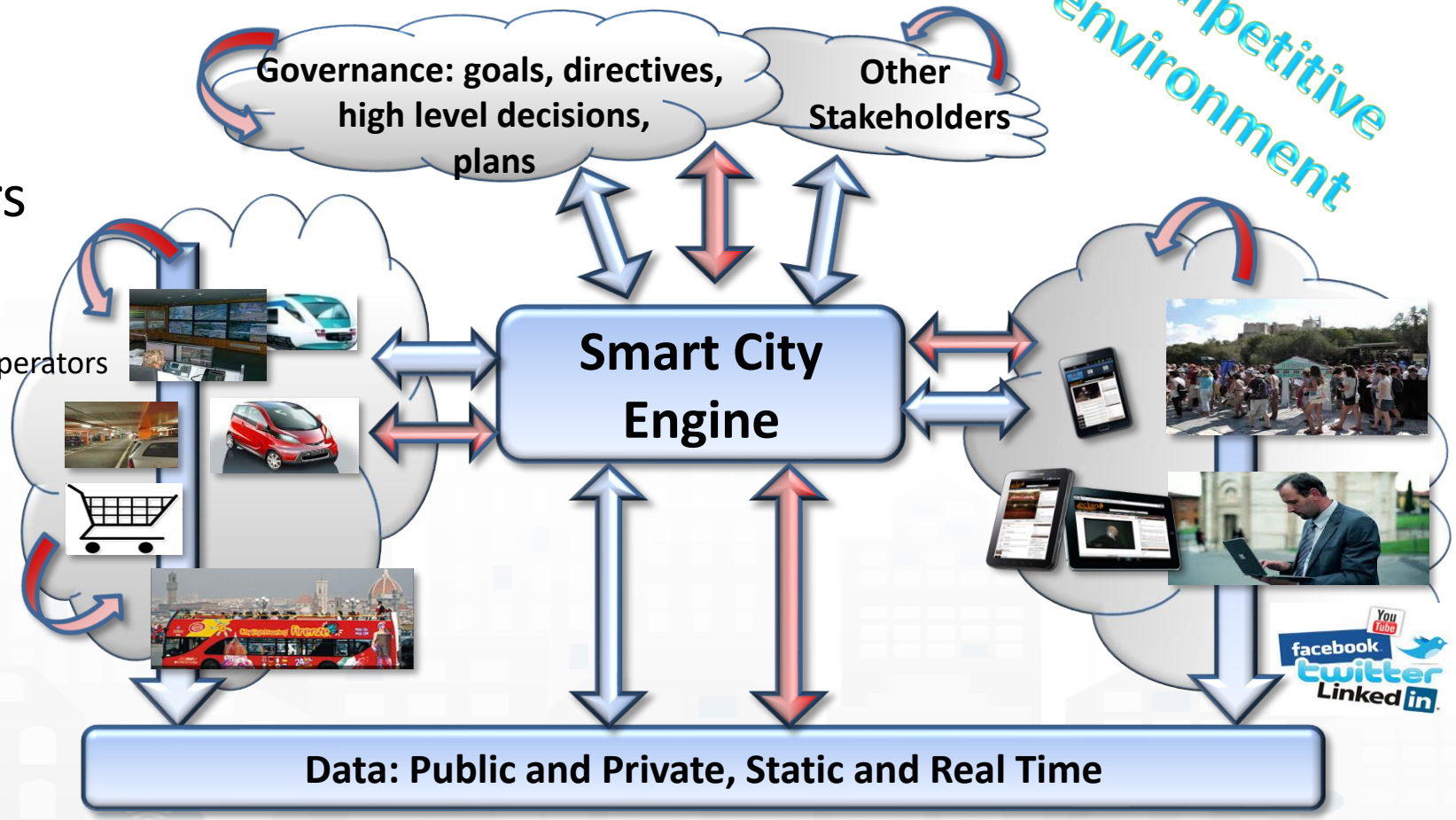
Study Visit, Firenze, 29/03/2022, https://www.snap4city.org/779

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO | DISIT

From Strategies to (re-)Actions

- Analyze
- Alerting, Early Warning
- Support Decision makers
- Plans
- Prescriptions
- Inform
- Suggest
- Engage
- Research



Tools for rapid implementation of sustainable Smart Solutions and Decision Support Systems

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www.snap4city.org

100% OPEN SOURCE

Powered by FIWARE

FREE TRIAL

PEN Test Passed

EU GDPR COMPLIANT

SNAP4 Appliances and Dockers Installations

EUROPEAN OPEN SCIENCE CLOUD

Node-RED

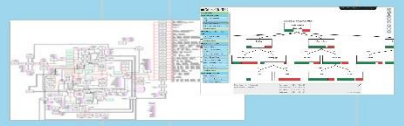
JS Foundation

EØ15 digital ecosystem

NVIDIA

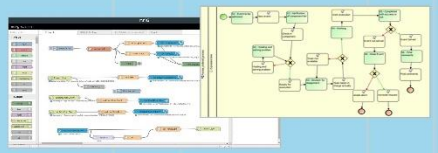
DASHBOARDS AND APPS - CONTROL ROOMS - DECISION SUPPORT SYSTEMS - WHAT-IF ANALYSIS - VISUAL ANALYTICS

PREDICTION - ANOMALY DETECTION - ENVIRONMENTAL MODEL - 3D MODEL
KPI - SIMULATION - EARLY WARNING - SYNOPTIC - DIGITAL TWIN - VIRTUAL REALITY



EXPERT SYSTEM
KNOWLEDGE BASE
STORAGE

BIG DATA ANALYTICS
EXPLAINABLE ARTIFICIAL INTELLIGENCE
BUSINESS INTELLIGENCE
MACHINE LEARNING

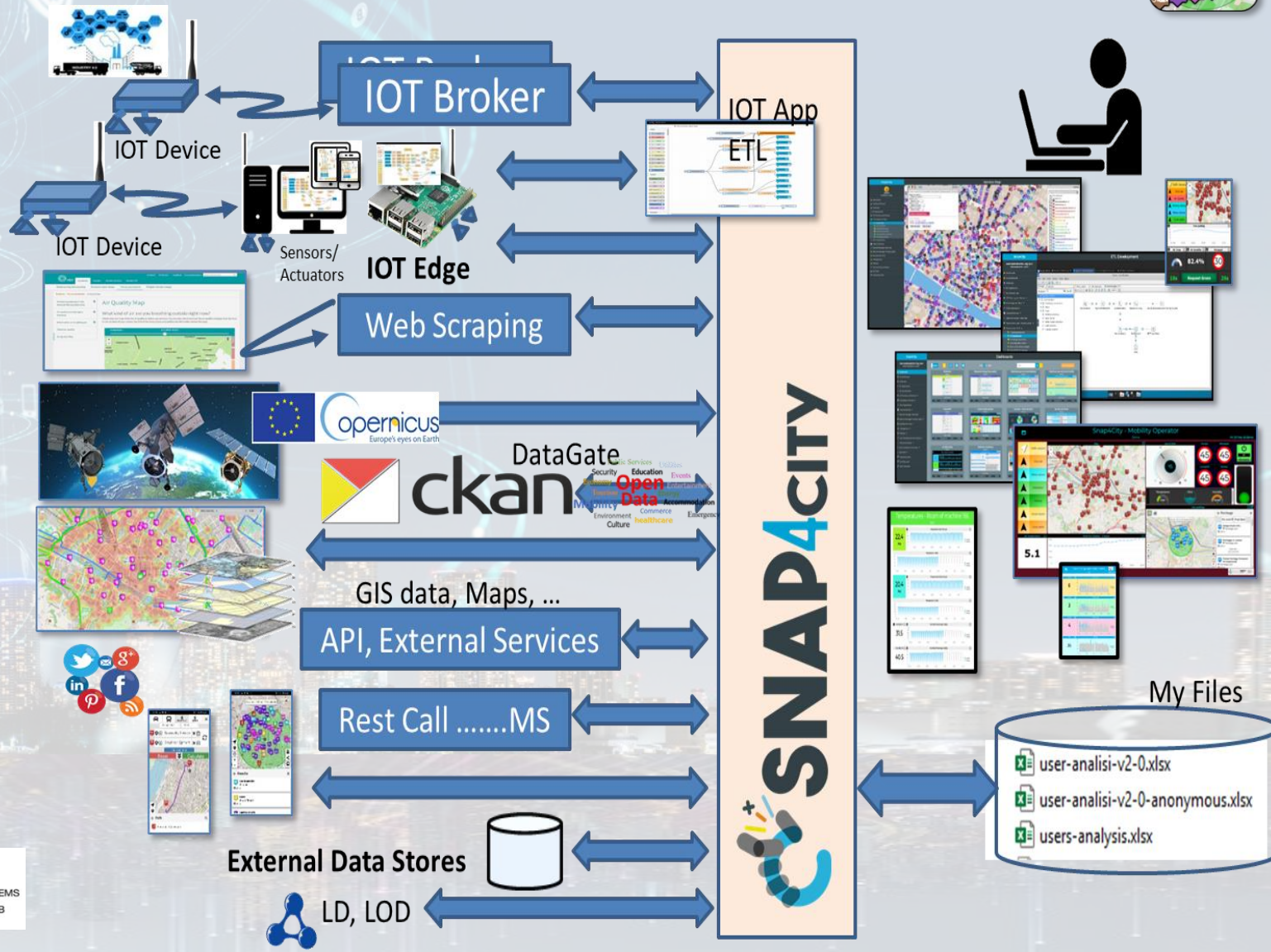


DATA FLOWS, DATA DRIVEN
WORKFLOWS, MICROSERVICES
PARALLEL DISTRIBUTED PROCESSING

METHODOLOGIES
COURSES AND COMMUNITY
LIVING LABS
DEVELOPMENT TOOLS

Ingestion, aggregation → exploitation

- **Snap4City efficient tools for**
  - Bidirectional data channels
  - Any format, any channel, any data, any broker, any protocol, …
  - **Km4City** Knowledge base Ontology reasoning on geo, space, time, relationships



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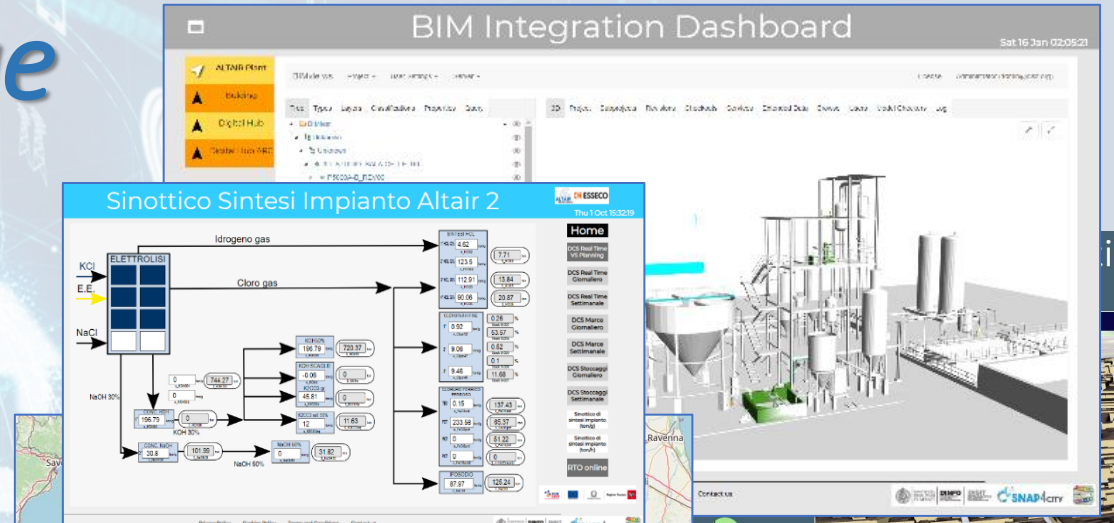
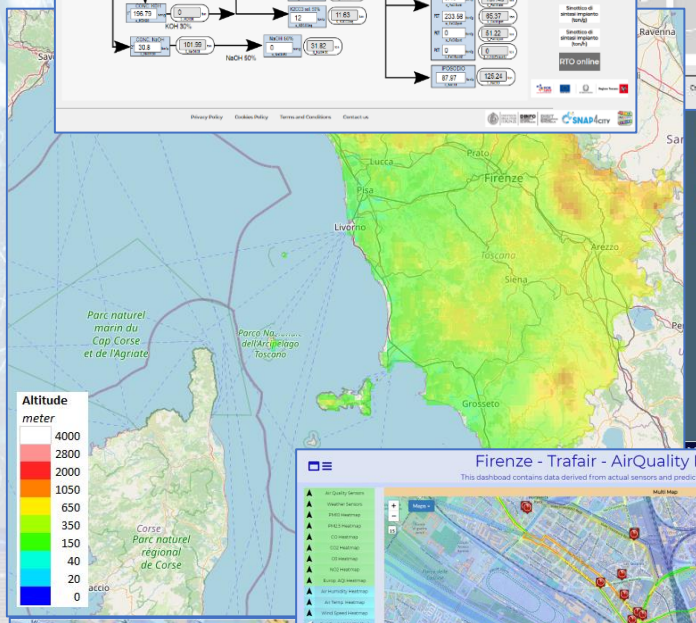
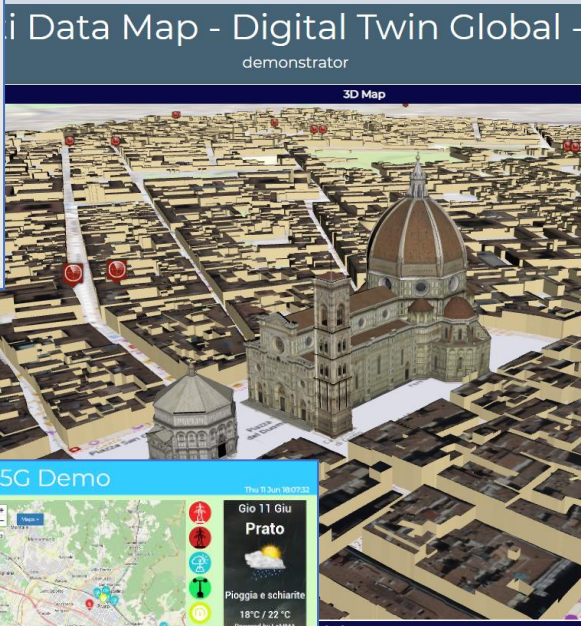
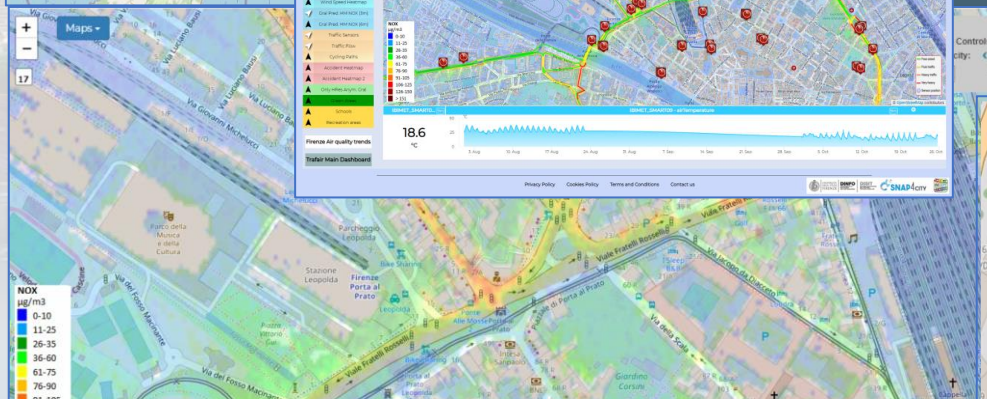
Data Type Coverage

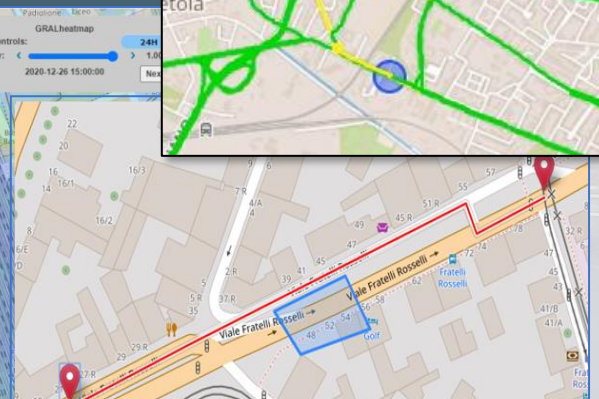
- POI, IOT, shapes,..
- maps, orthomaps, GTFS, GIS WFS/WMS, GeoTiff, ..
- calibrated heatmaps, ..
- traffic flow, typical trends, ..
- trajectories, events, ..
- 3D, BIM, Workflow, ..
- Dynamic icons/pins, ..
- OD Matrices, scenarios, ..
- prediction models, ….
- decision support, ….
- Synoptics, animations, ..
- social media, Routing, ..
- Satellite data, ..
- KPI, personal KPI,..
- etc.











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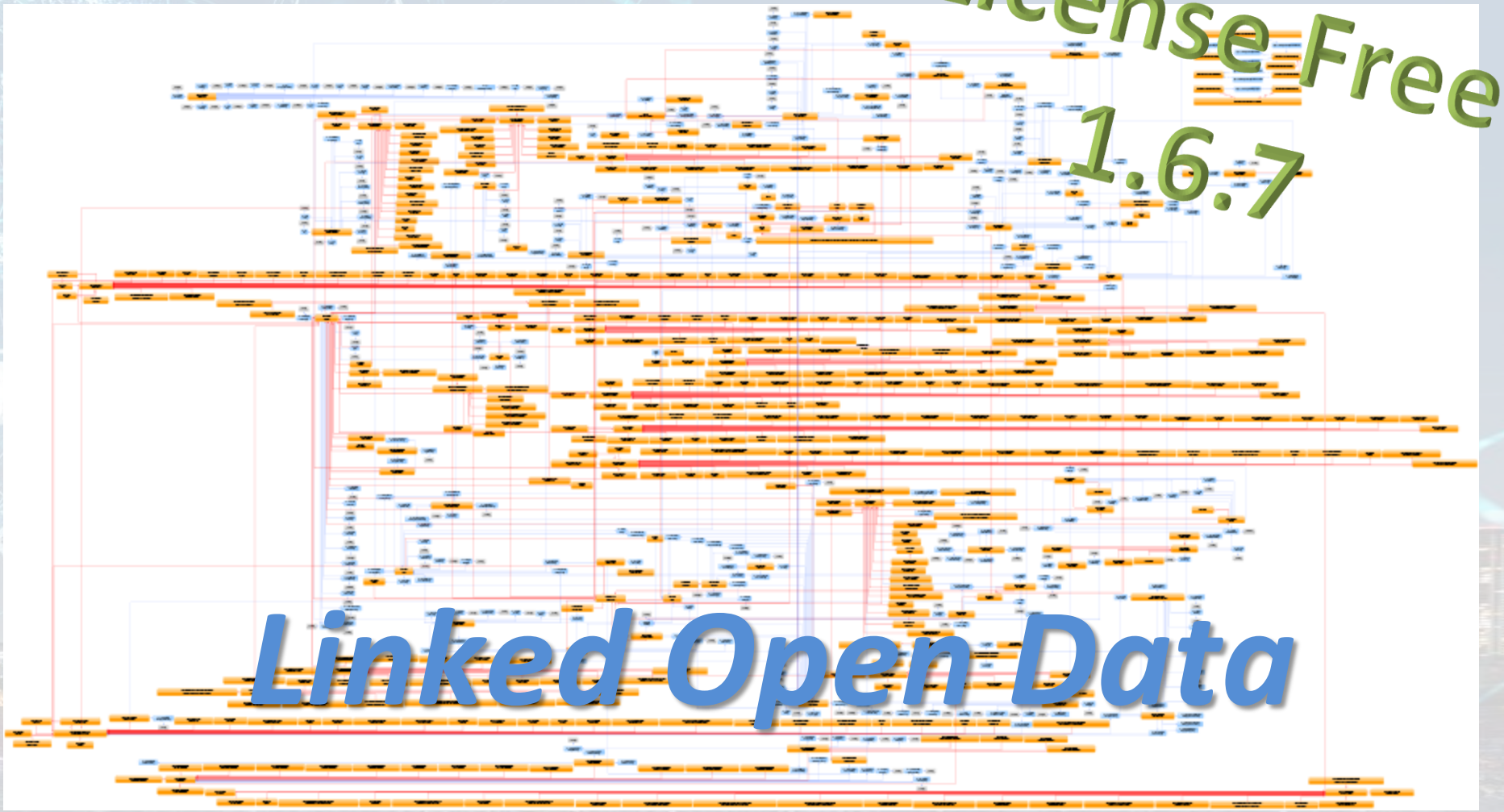
Standards and Interoperability (2021)

Compliant with: AMQP, COAP, MQTT, OneM2M, HTTP, HTTPS, TLS, Rest Call, SMTP, TCP, UDP, NGSI, LoRa, LoRaWan, TheThingsNetwork, SigFOX, DATEX II, SOAP, WSDL, Twitter, FaceBook, Telegram, SMS, OLAP, MySQL, Mongo, HBASE, SOLR, SPARQL, EMAIL, FTP, FTPS, WebSocket, WebSocket Secure, ModBUS, OPC/OPC-UA, GML, RS485, RS232, WFS, WMS, ODBC, JDBC, Elastic Search, Phoenix, XML, JSON, CSV, GeoTIFF, OWL, WKT, KML, SHP, db, GeoJSON, Enfuser FMI, Android, Raspberry Pi, Local File System, ESP32, Libelium, IBIMET/IBE, OBD2, SVG, XLS, XLSX, TXT, HTML, CSS, KNX, Enocean, Zigbee, DALI, ISEMC, Alexa, Sonoff, HUE Philips, Tplink, BACnet, TALQ, Copernicus, Protocol Buffer, IFC, XPDL, etc.

https://www.snap4city.org/65

Expert System semantic queries

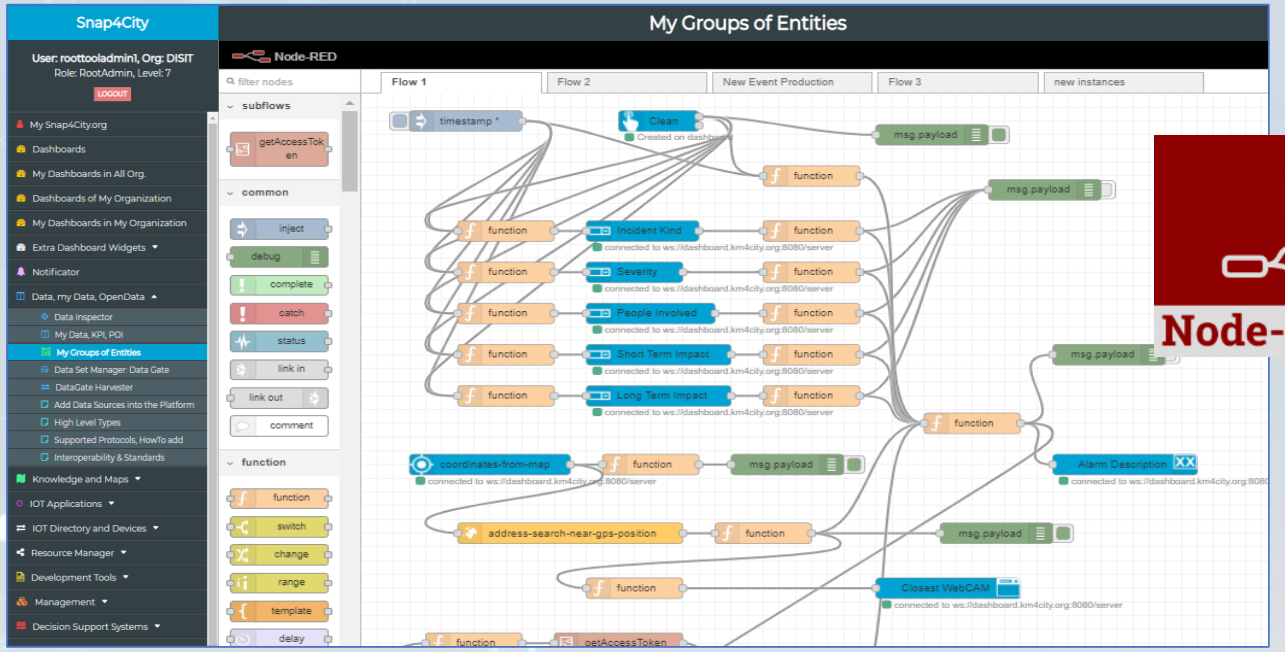
- **via**:
- **Smart City API** for Apps and third party
- **MicroServices** data driven develop via visual language Node-RED

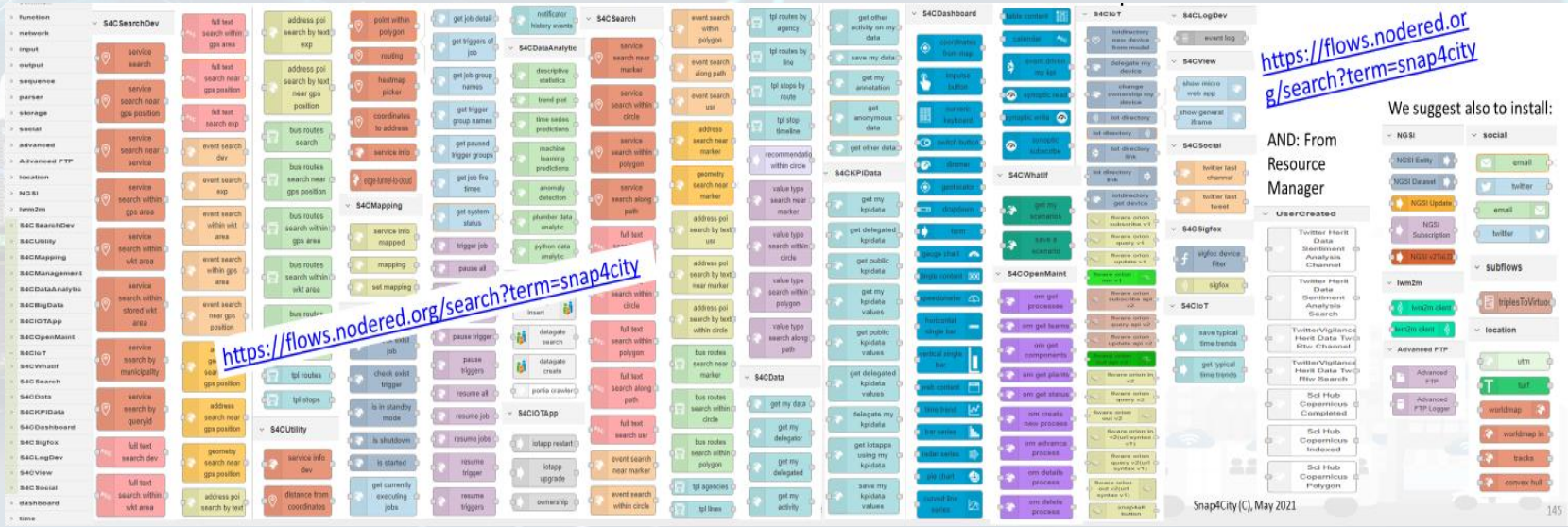


https://www.snap4city.org/19

Ingestion, aggreg. → exploitation

- **IoT App Visual Programming, no coding**
  - **Data transformation**
  - **Integration**
  - **Scripting Data Analytics**
  - **Data ingestion**
  - **Business logic**
- **MicroServices** data driven develop via visual language Node-RED





Big Data Analytics + Artificial Intelligence

- **Decision support**
  - **Early warning, City Indexes, etc.**
  - **What-IF analysis** (simulation + AI + data)
- **Predictions**
  - **Short and Long terms predictive models on:**
    - traffic, parking, people flow, maintenance, land sliding, NO2
  - **3D Flow prediction:** Pollutant (NOX, NO2, …)
- **Suggestions and recommendations**
- **Modeling, simulation, routing**
  - **Traffic Flow reconstruction**
  - **Constrained Routing**

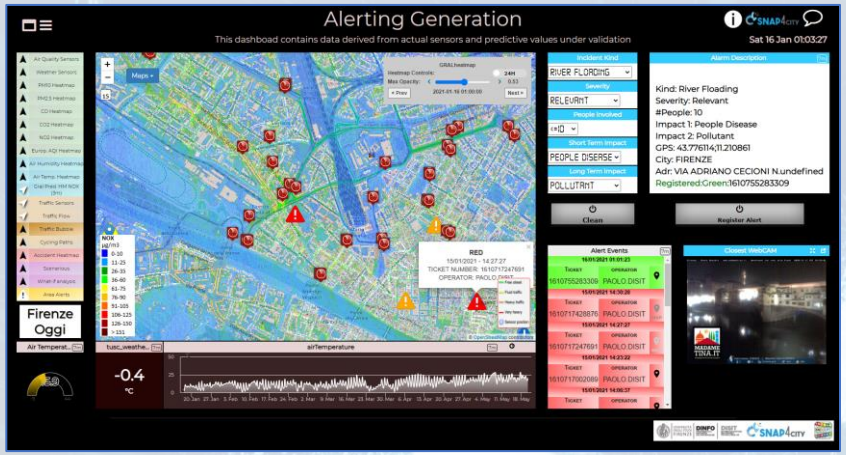
AI & XAI:

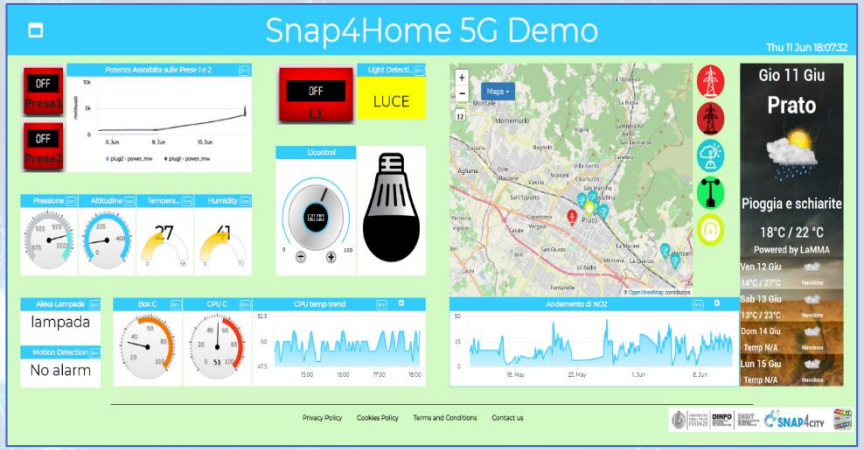
- RF, XGBoost, BRNN, RNN, SVR, DNN, LSTM, CNN-LSTM, Autoencoders, …
- Clustering: K-means, K-Medoid, …
- XAI: Shap, variations,

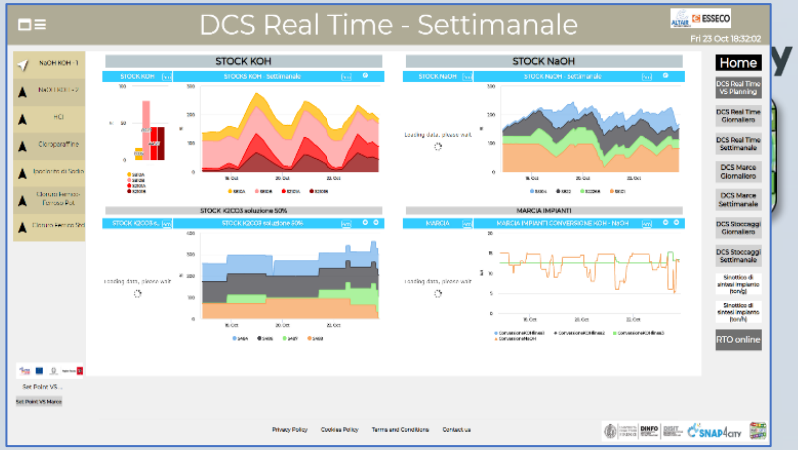
Computational processes:

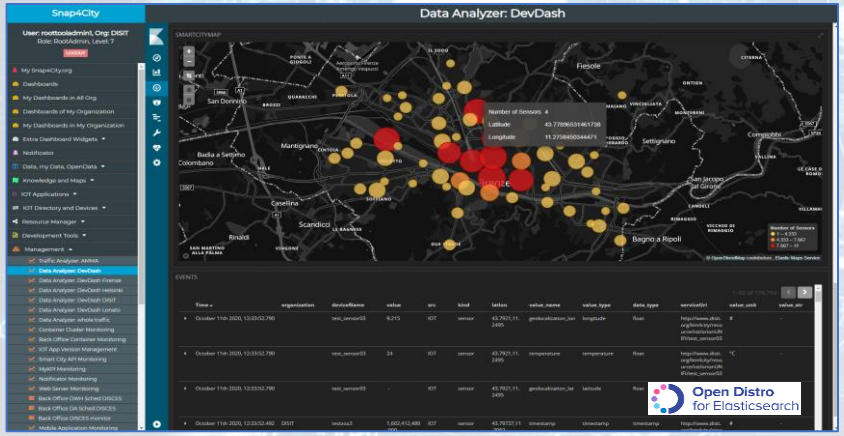
- Heatmaps, ..
- trajectories,
- OD matrices,
- Typical Time Trends, etc.

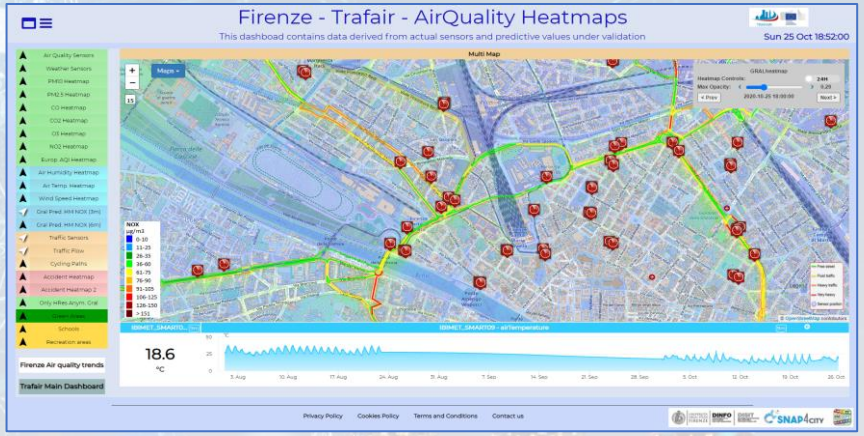
https://www.snap4city.org/download/video/course2020/da/Snap4City-4th-slot-Data-Analytic-v4-6.pdf

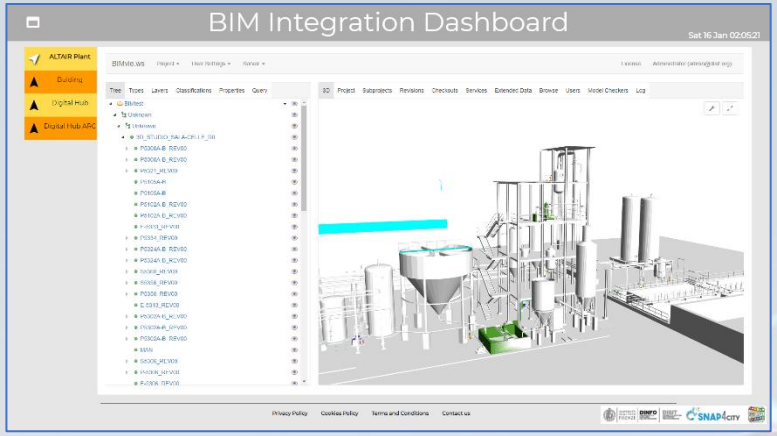

Alerting Generation
This dashboad contains data derived from actual sensors and predictive values under validation
Sat 16 Jan 01:03:27
Firenze Oggi
-0.4


Snap4Home 5G Demo
Thu 11 Jun 18:07:32
LUCE
lampada
No alarm
Gio 11 Giu
Prato
Pioggia e schiarite
18°C / 22 °C
Powered by LaMMA

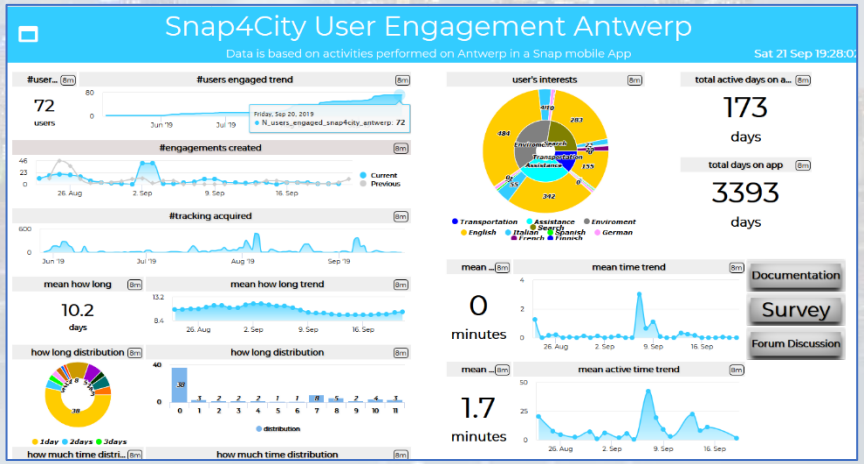

DCS Real Time - Settimanale
Fri 23 Oct 18:32:02
STOCK KOH
STOCK NaOH
Home

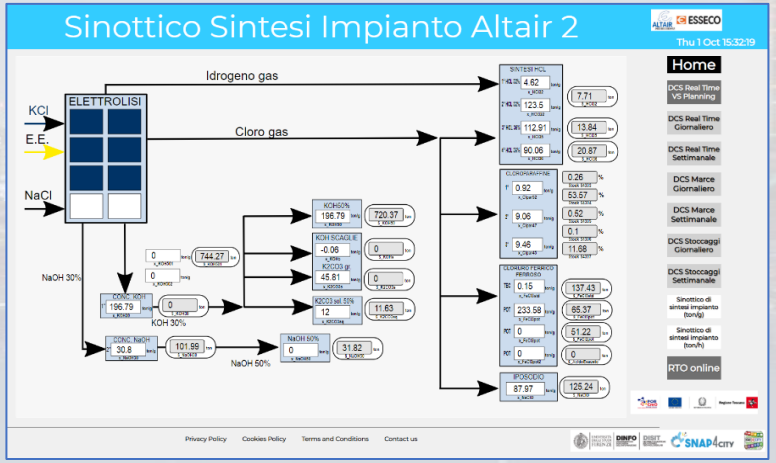

Snap4City
Data Analyzer: DevDash
Open Distro for Elasticsearch


Firenze - Trafair - AirQuality Heatmaps
This dashboad contains data derived from actual sensors and predictive values under validation
Sun 25 Oct 18:52:00
18.6


BIM Integration Dashboard
Sat 16 Jan 02:05:21

3D Multi Data Map - Digital Twin Global - Firenze
demonstrator
Wed 3 Nov 19:05:27
120

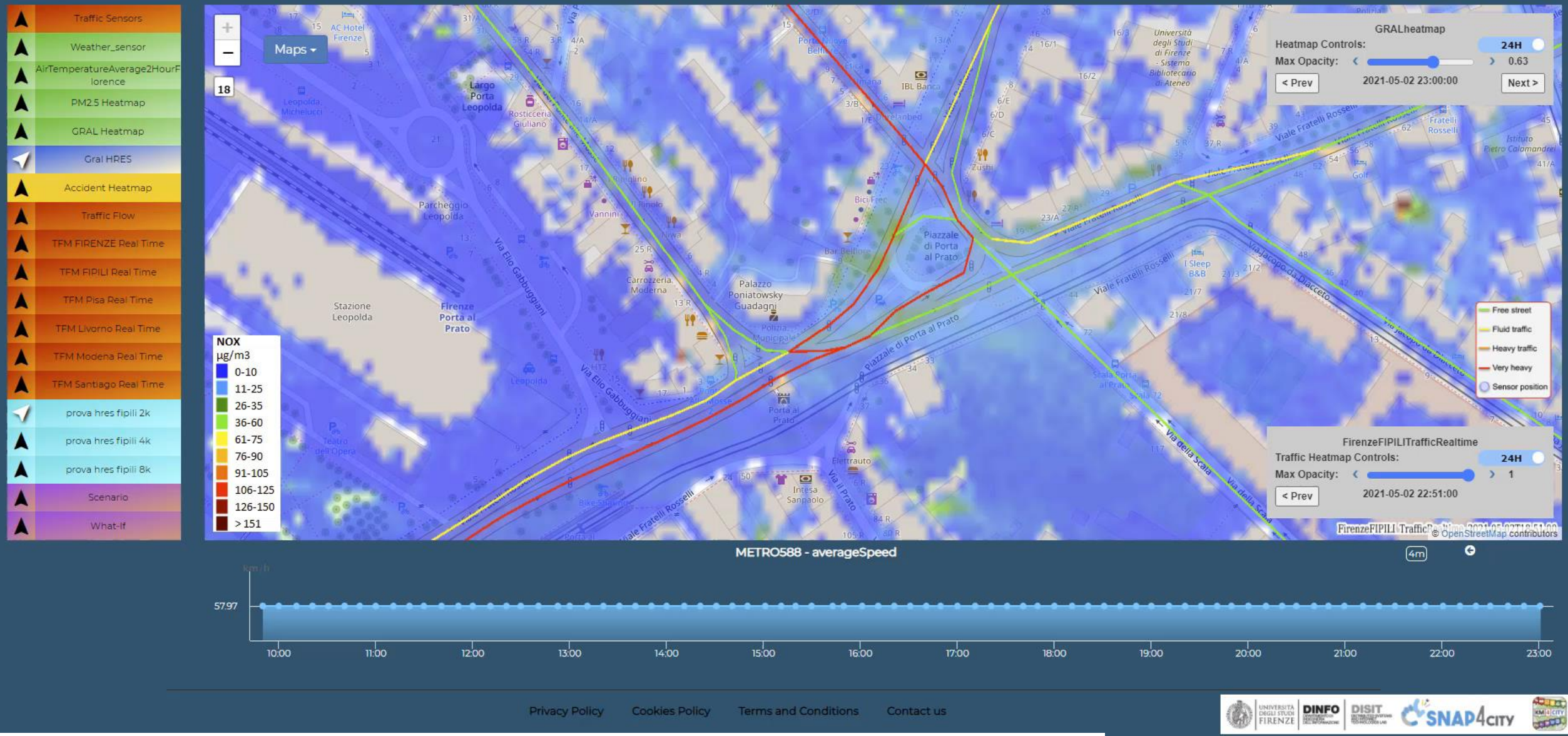

Snap4City User Engagement Antwerp
Data is based on activities performed on Antwerp in a Snap mobile App
Sat 21 Sep 19:28:0
72
users
173
days
3393
days
10.2
days
0
minutes
1.7
minutes
Documentation
Survey
Forum Discussion


Sinottico Sintesi Impianto Altair 2
Thu 1 Oct 15:32:19
Home
Idrogeno gas
Cloro gas
ELETTROLISI
KCl
E.E.
NaCl
NaOH 30%
KOH 30%
NaOH 50%

3D views

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

Traffic Flow Manager on multiple cities



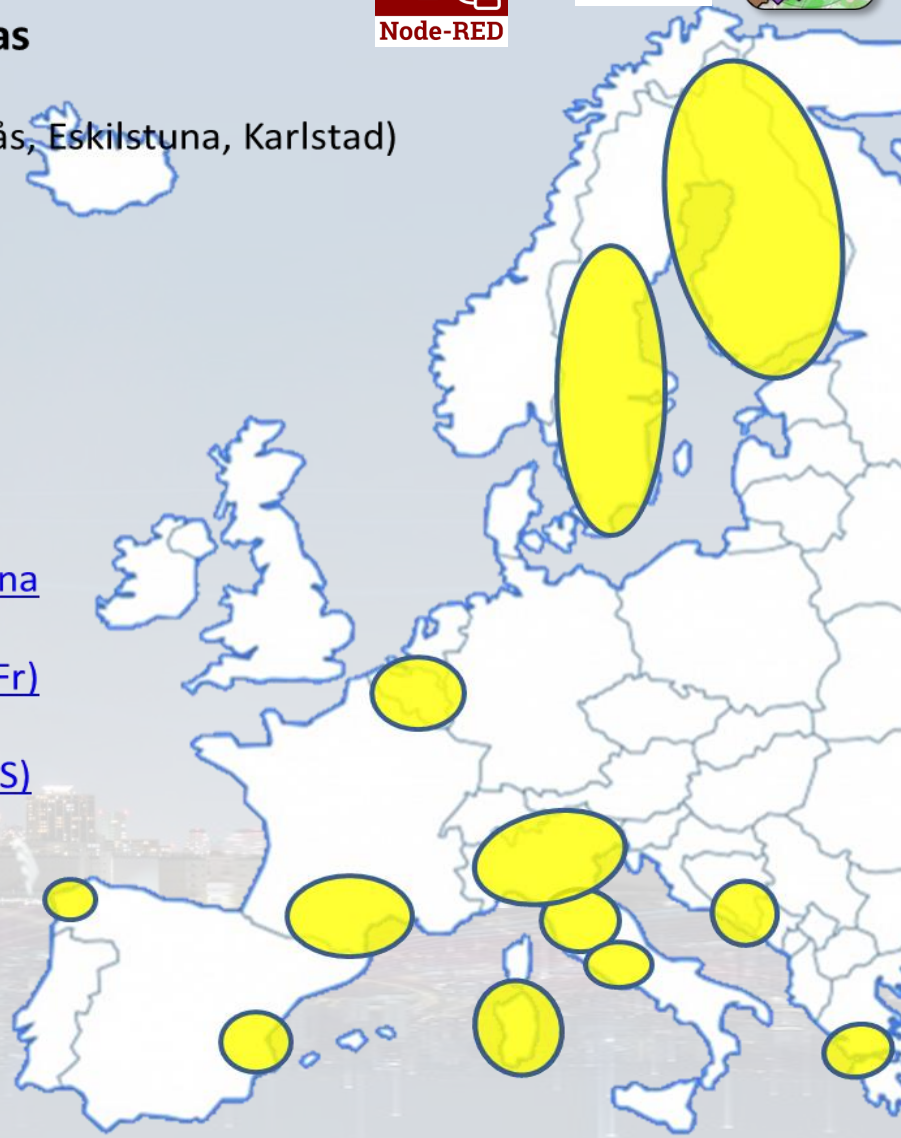
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzEyNg==

https://www.Snap4City.org

- > 7 running installations
  - Pisa, Toscana, Sweden, ISPRA, Snap4.eu,
  - Altair, Italmatic, ….
- 13 projects, 12 pilots on 9 Countries
  - >40 cities/area
- **Wide MULTItenant deploy, e.g.,**
  - 18 Organizations / tenant
  - > 7000 users on
  - > 1300 Dashboards
  - > 15 mobile Apps
  - **> 2 Million of structured data per day**
  - > 500 IoT Applications/node-RED
  - > 700 web pages with training
  - > 45 videos, training videos

Main Organizations/areas

- Antwerp area (Be)
- Capelon (Sweden: Västerås, Eskilstuna, Karlstad)
- DISIT demo (multiple)
- Dubrovnik, Croatia
- Firenze area (I)
- Garda Lake area (I)
- Helsinki area (Fin)
- Livorno area (I)
- Lonato del Garda (I)
- Modena (I)
- Mostar, Bosnia-Herzegovina
- Pisa area (I)
- Pont du Gard, Occitanie (Fr)
- Roma (I)
- Santiago de Compostela (S)
- Sardegna Region (I)
- SmartBed (multiple)
- Toscana Region (I), SM
- Valencia (S)
- Venezia area (I)
- WestGreece area (Gr)
- ……
- …..



Domains

- Smart City, control room
- Green Deal, smart light, ..
- Environment, pollutant, ..
- Mobility and transport
- Tourism and People
- Energy , Industry
- Social Media

- Big Data
- Artificial Intelligence
- Public and private data

Publications http://www.disit.org/5487

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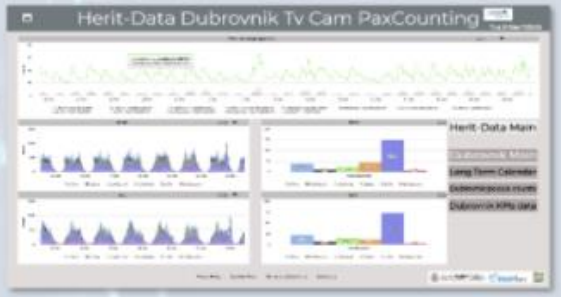
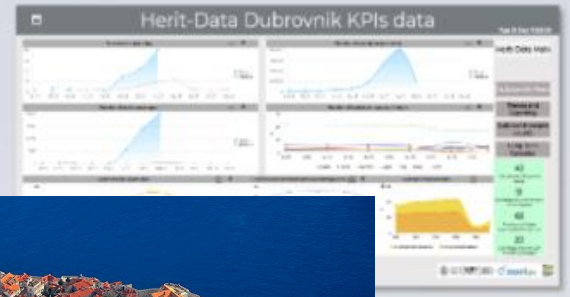
Herit-Data Twitter Vigilance

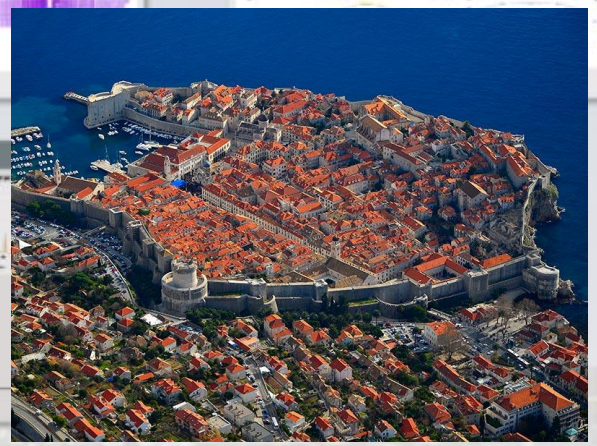
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzExNQ==

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**



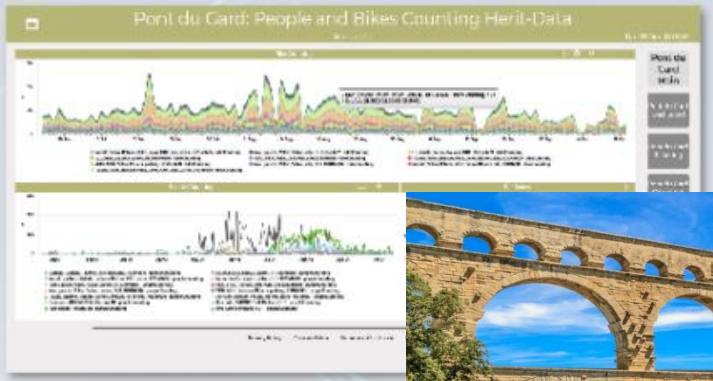


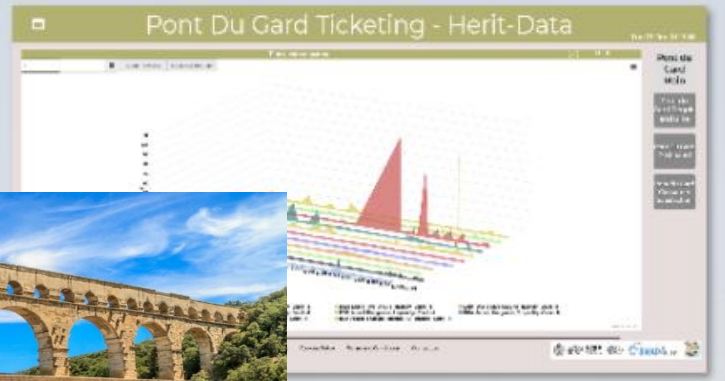


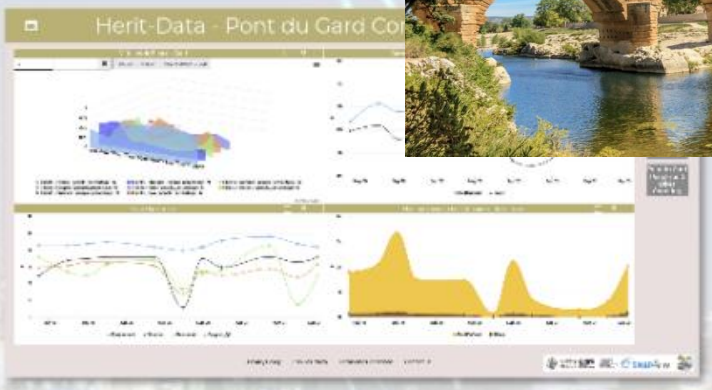
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE0Ng==

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**



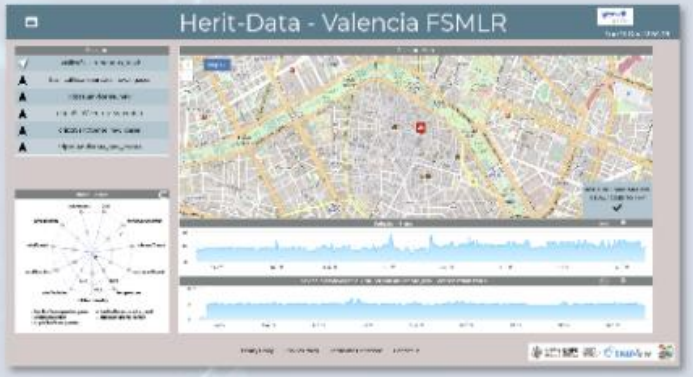


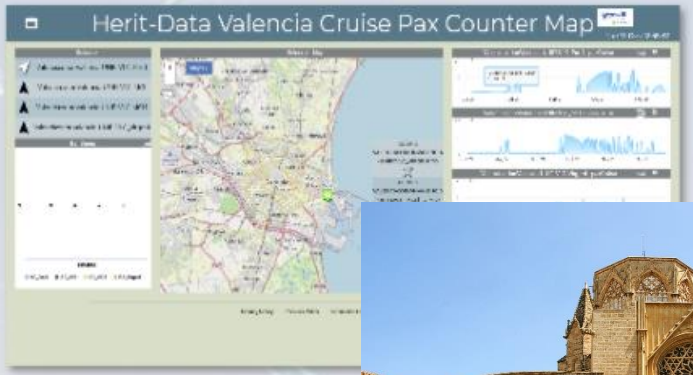


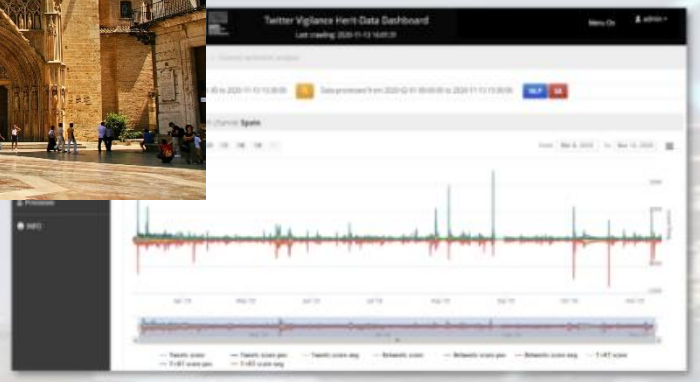
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE1Mw==

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**



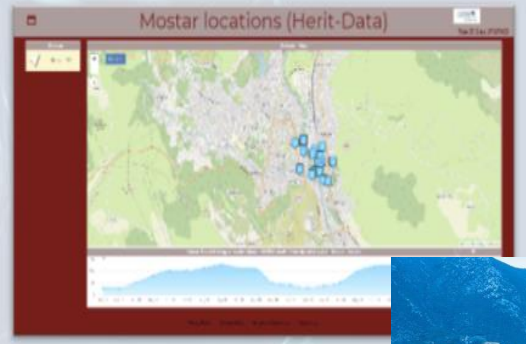


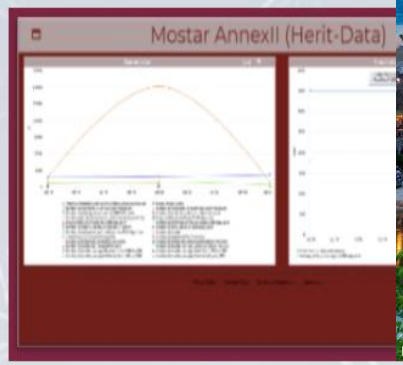


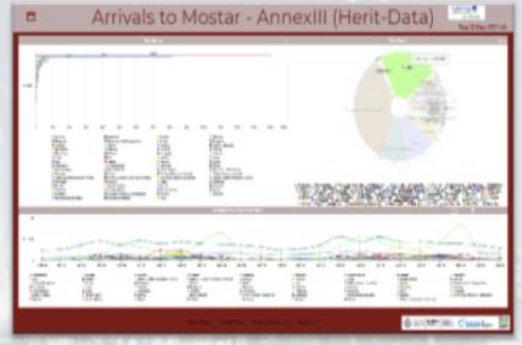
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE1MA==

Mostar, Bosnia Herzegovina

- **Tourism Domain**
  - KPI: business, house prices, investments, stay duration, etc.
  - Profiled POI, Point of Interests
  - People flows: arrivals, overhights
- **Dashboards**
  - Monitoring KPI
  - POI, flows
- **Historical and updated data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**



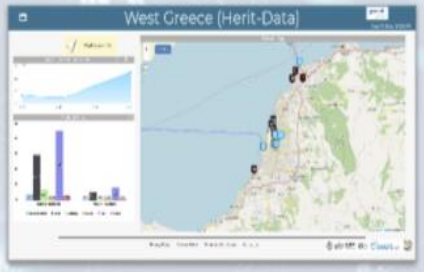


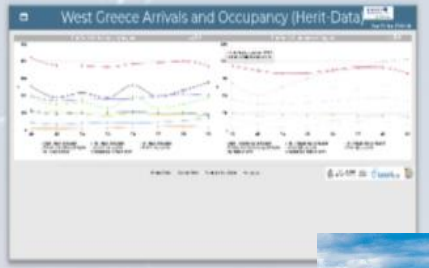


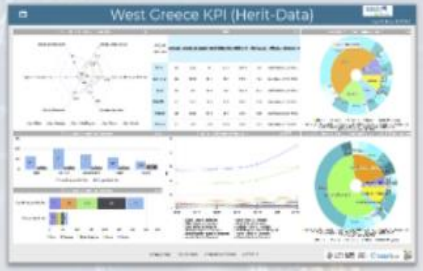
https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE0OQ==

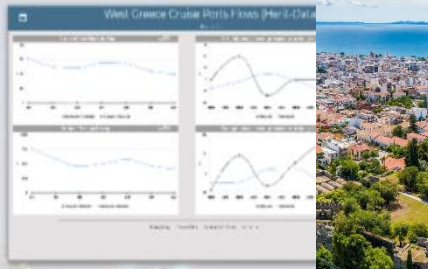
West Greece

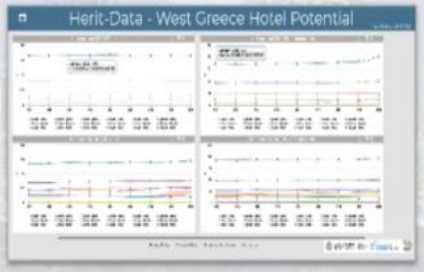
- **Tourism Domain**
  - KPIs: ODM, Flows, …
  - Social Media
  - People Flows
- **Dashboards**
  - Monitoring KPI
  - People flows
  - Twitter Vigilance
- **Historical and updated data**
- **Services Exploited on:**
  - Dashboard
- **Since 2020**











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

Florence

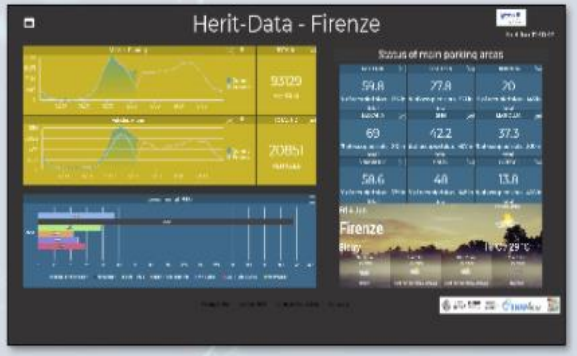
https://www.snap4city.org/747

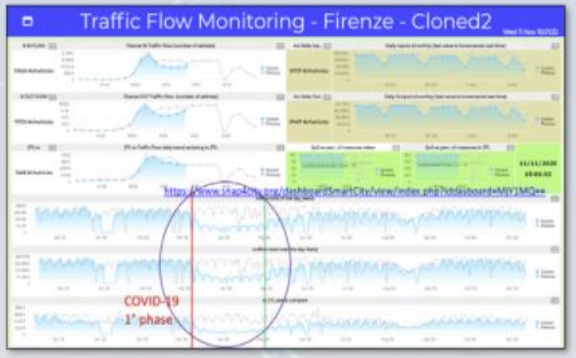
Herit-Data - Florence Main

Tue 21 Dec 23:38:03

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MzE0NA==

- **Multiple Domains Data**
  - Traffic, environment, People, parking, stock options, Twitter, tc.
- **Decision Makers Multiple Locations**
  - NO2 long term predictions
  - Twitter analysis
- **Historical and Real Time data**
- **Services Exploited on:**
  - Dashboards
  - Social media,
  - Sentiment Analysis
- **Since 2019, 2020**





Interreg Mediterranean HERIT-DATA

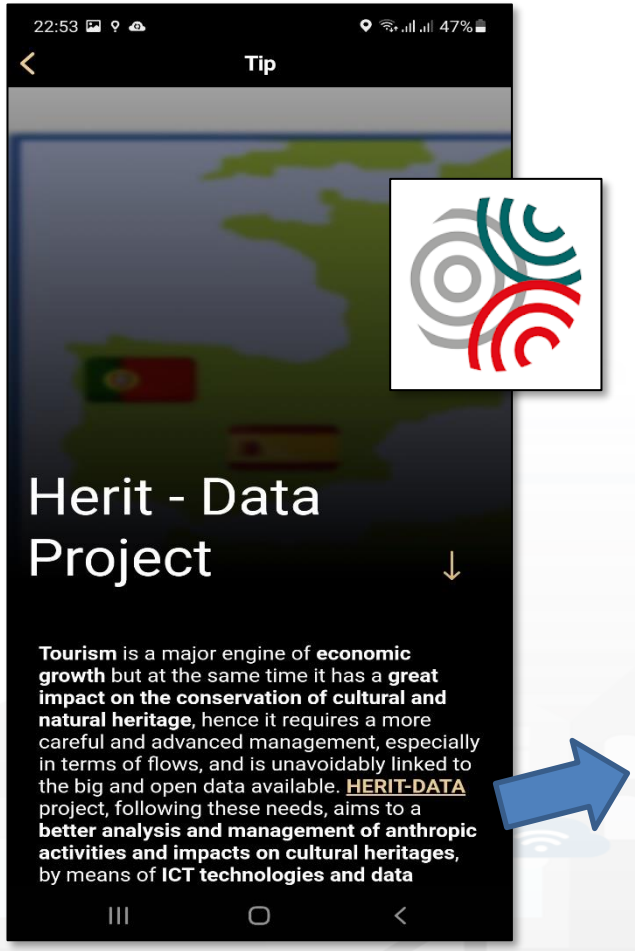
Main
Herit-Data Main

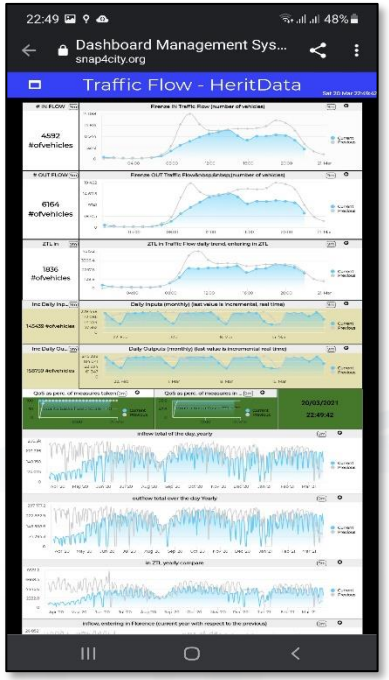
Regione Toscana

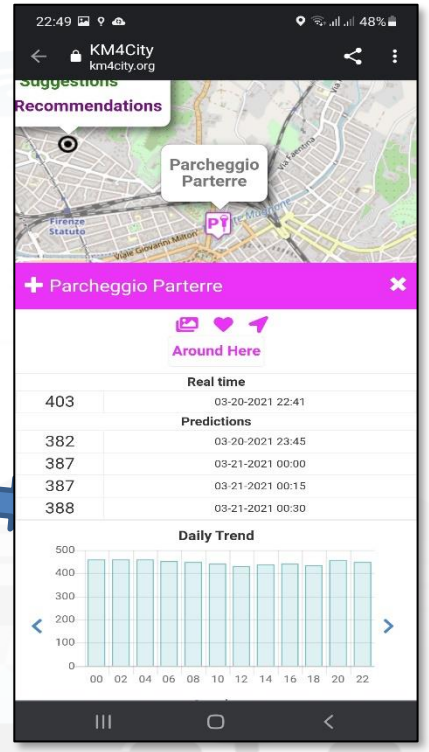
Università degli Studi Firenze | DINFO | DISIT | SNAP4CITY | KM4CITY

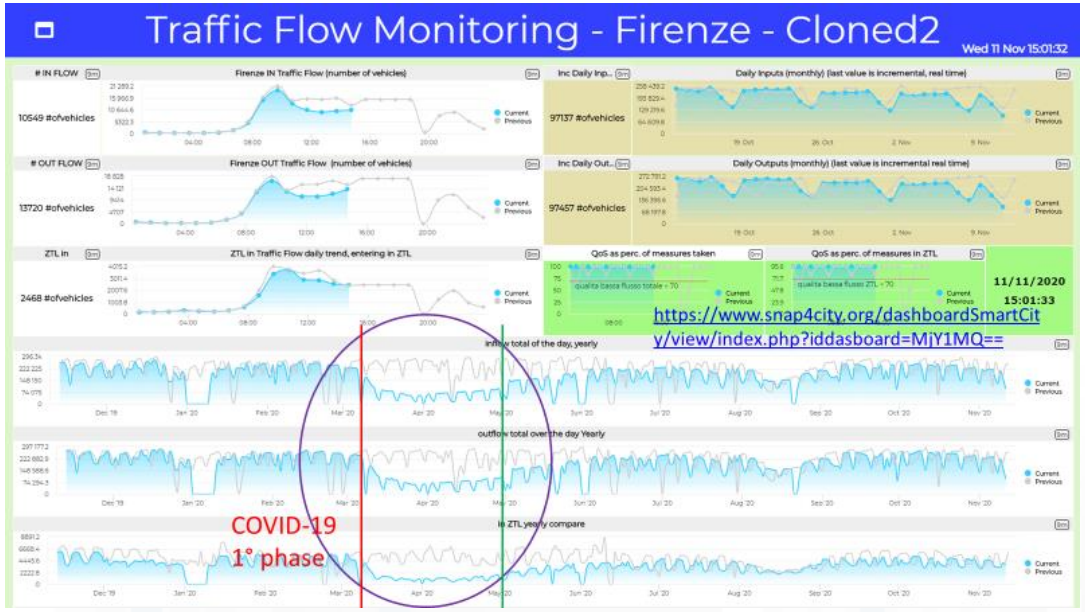
Florence Dashboard

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









Different Reduction of parking for Covid

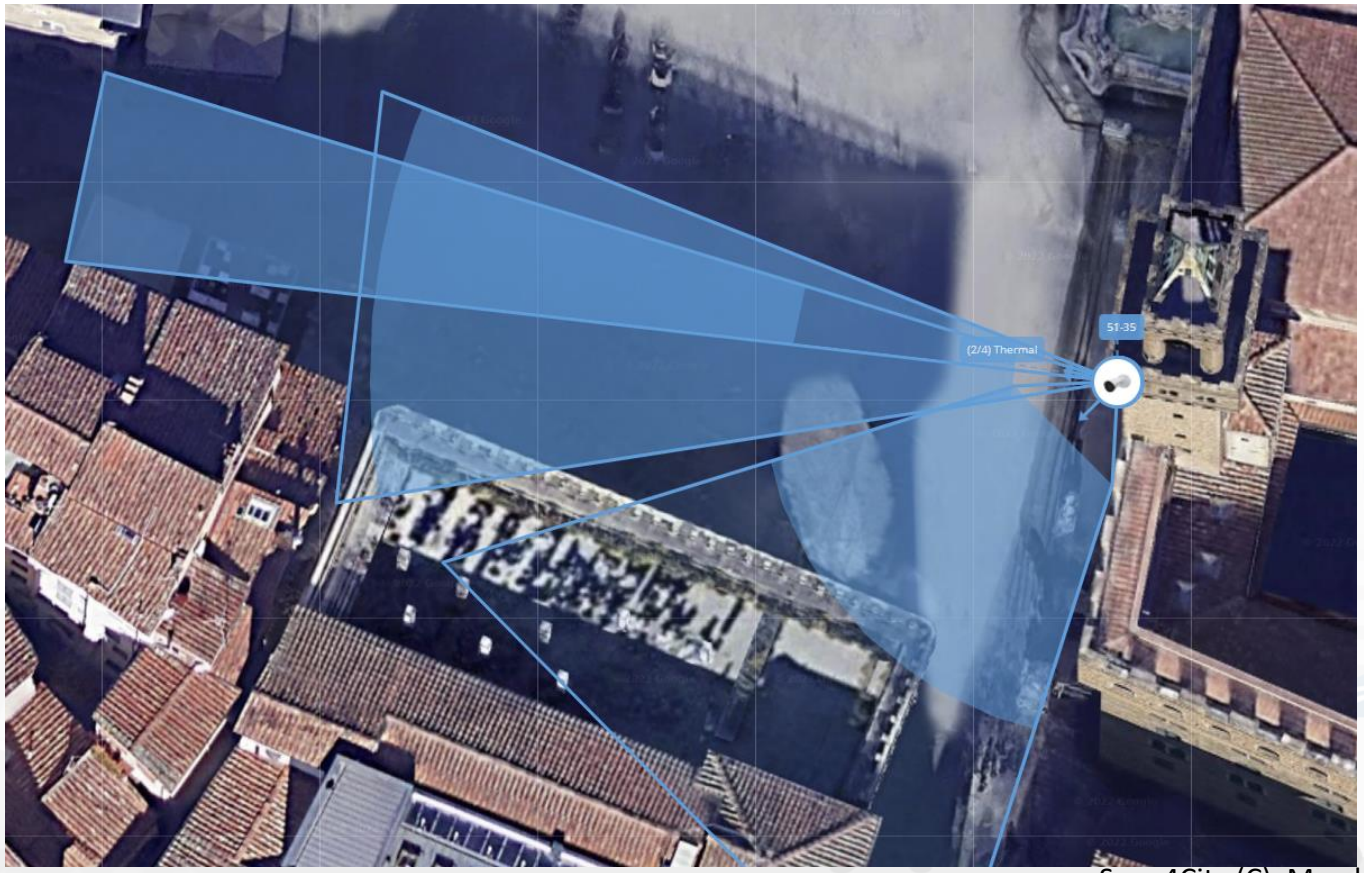
main Purpose	% of reduction in Lockdown	Recover in July 2020
Hospitals	55,9	31%
railway stations	84,2	60%
social hubs	85,8	72%
markets	45,1	25%
justice	96,1	82%

Impact on Pollutant on LockDown 2020

	CO2	CO	NO2	PM10
Percentage at which the average value of the pollutant has been reduced (February wrt April, 2020)	41,06	47,54	38,84	61,99
Percentage at which the MAX value of the pollutant has been reduced (February wrt April 2020)	38,89	34,62	63,02	60,21

Snap4City (C), March 2022 33

Tracking People
AXIS Camera with Snap4City



3D views

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

Twitter Vigilance Herit-Data: *Some Numbers*

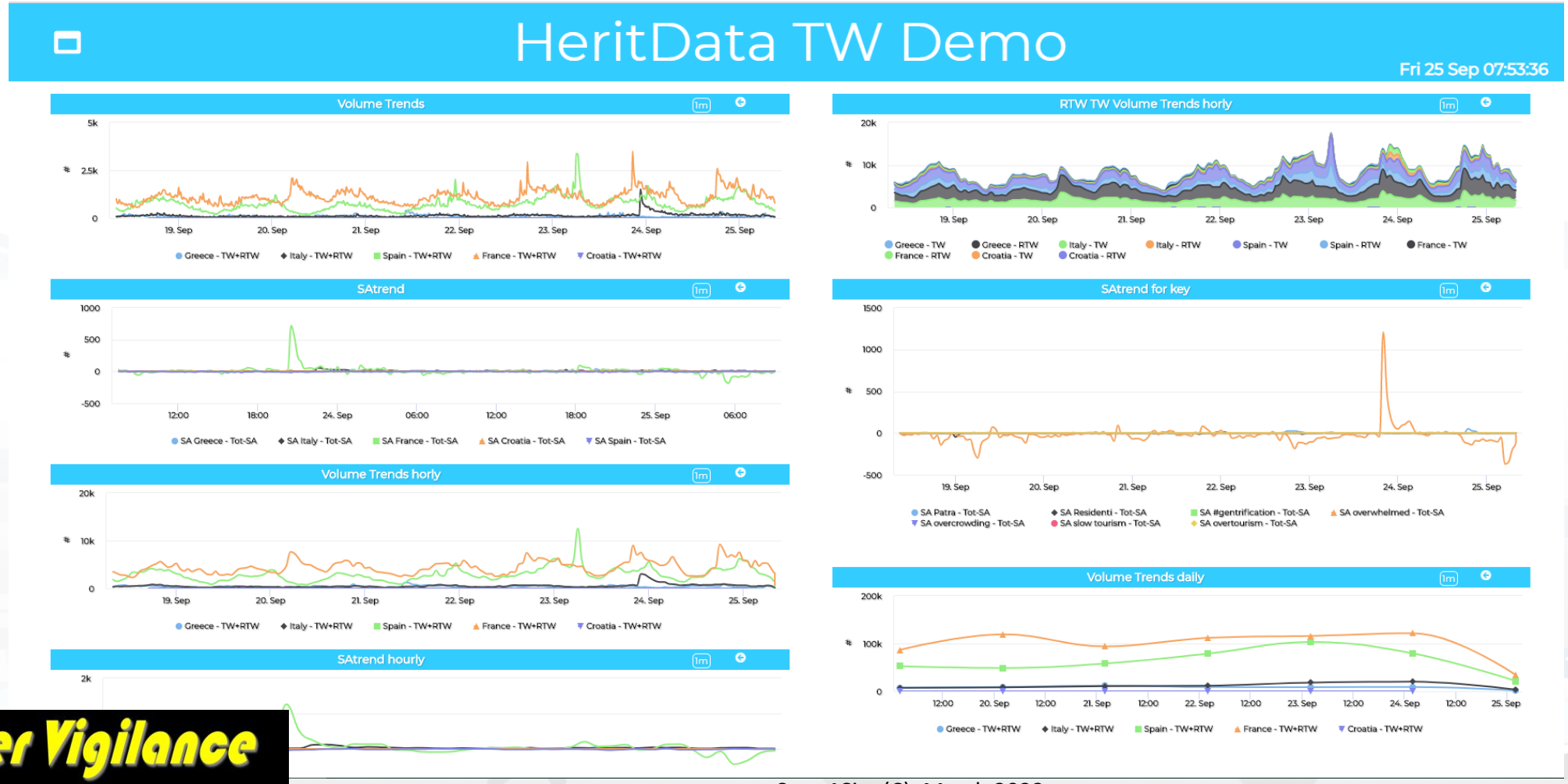
Channel Name	Total Number of Collected TW+RTW	Number of Collected Tweets	Number of Collected Retweets	Twitter Volume Processing Time Range	NLP & Sentiment Analysis Processing Time Range	NLP & Sentiment Analysis Languages
Spain	113.7 Millions	40.99 Millions	72.49 Millions	From 30-01-2020 to current datetime	From 01-02-2020 to current datetime	English, Spanish
France	50,1 Millions	16.0 Millions	34.1 Millions	From 30-01-2020 to current datetime	From 01-02-2020 to current datetime	Italian, English, French
Greece	12.3 Millions	4.2 Millions	8.1 Millions	From 30-01-2020 to current datetime	From 01-02-2020 to current datetime	English
Italy	2.97 Millions	1.0 Million	1.9 Millions	From 30-01-2020 to current datetime	From 01-02-2020 to current datetime	Italian, English
Croatia	35.8 Thousands	15.5 Thousands	19,8 Thousands	From 30-01-2020 to current datetime	From 01-02-2020 to current datetime	English

Updated: Dec. 2021

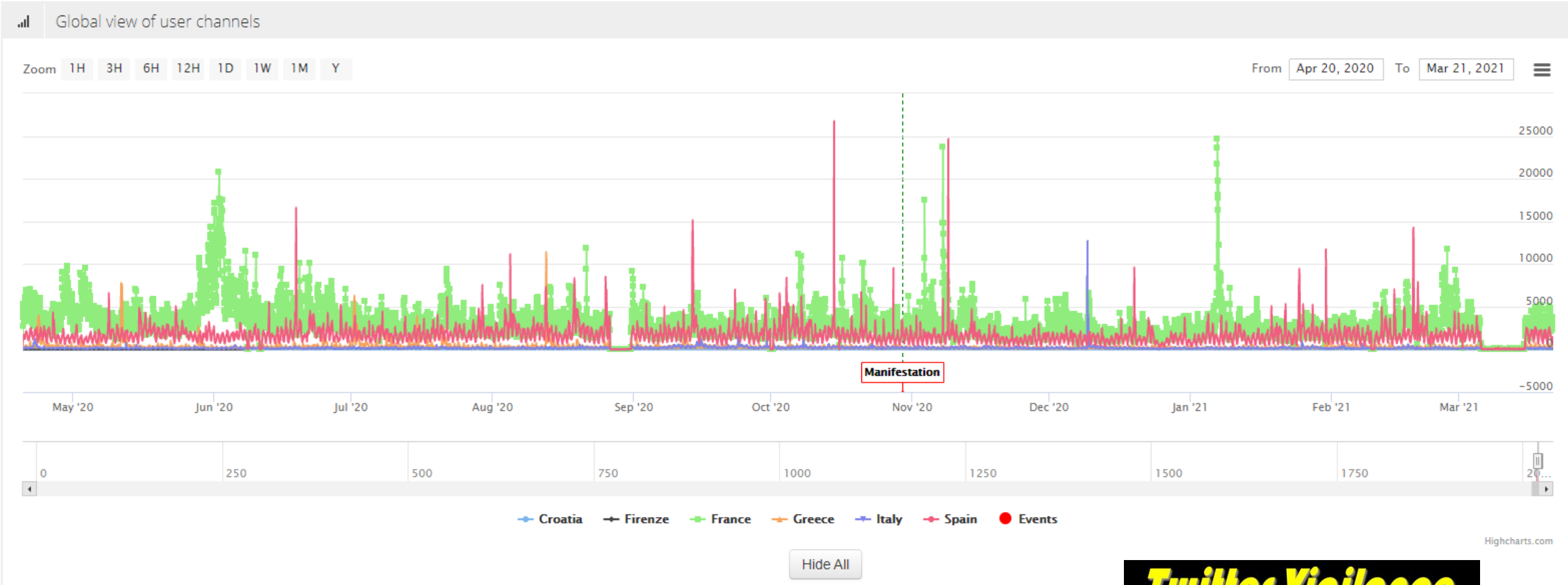
Twitter Vigilance

Twitter Vigilance Data on Dashboards trought IoT-App

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=Mjc3NQ==



Overview on the last 12 months



Twitter Vigilance

Event: clashes between police and demonstrators in Florence, during an unauthorized demonstration against the restrictions of Covid-19 government measures (on 30th October 2020 night).

Italy: Protests flare in Florence over restrictions

31 Oct, 2020

Facebook | Twitter | Mi piace 655 | Tweet

Florence mayor condemns violence and vandalism in historic centre in "surreal, terrible and painful night" for Tuscan city.

Protesters clashed with police in central Florence last night during an unauthorised protest over Italy's latest restrictions aimed at curbing the spread of covid-19.

In partnership with la Repubblica FIRENZE.it

Oct. 30 Protest Devastates Florence

10/31/2020

During the unauthorized evening demonstration against recent social lockdown pandemic measures lasting four hours in downtown Florence on the evening of October 30 saw

TOP NEWS STORIES

Oct. 30 Protest Devastates Florence
During the unauthorized evening demonstration against recent social lockdown pandemic measures lasting four hours in downtown Florence [...]

COVID Demonstrations Hit Florence
Unlike the U.S. protesters in Italy reserve public space for peaceful demonstrations which are organized to communicate a [...]

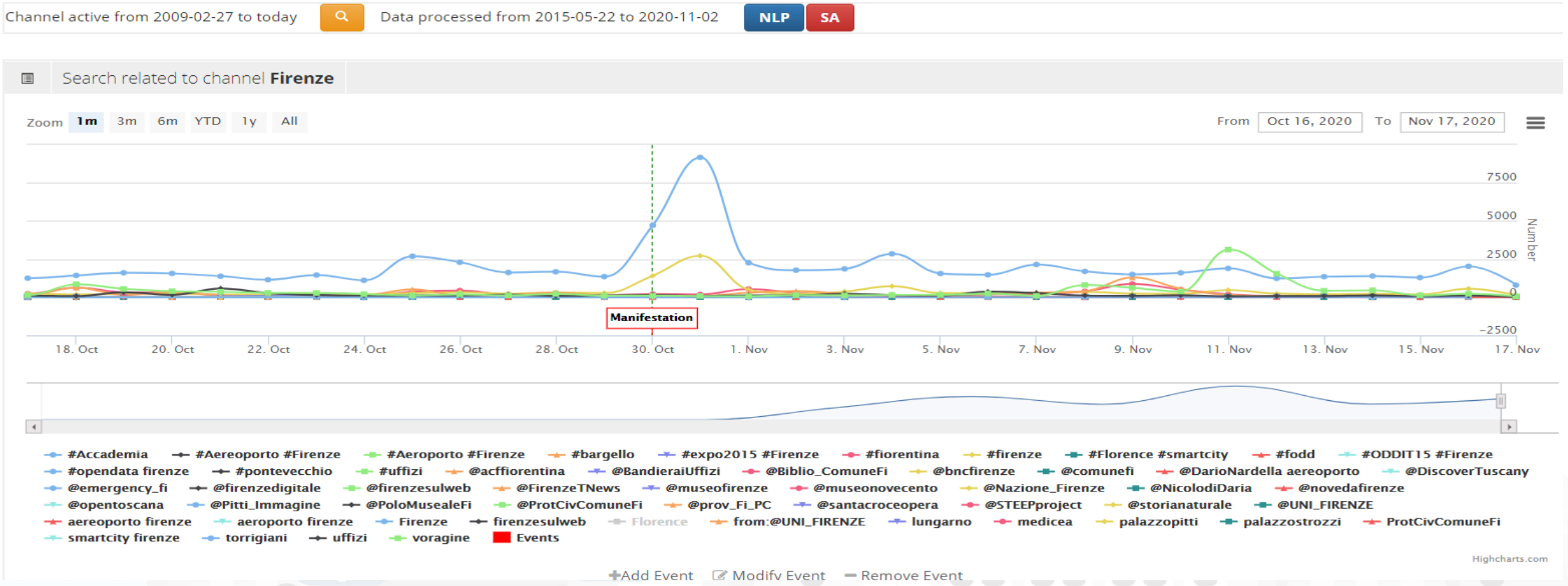
New Anti-Covid Regulations: Dos & Dont's
Given the upswing in Coronavirus infections and consequent hospital admissions since the beginning of October, Italian Prime Minister [...]

New Pandemic Regulations in Italy
In the face of the rise of Coronavirus infections, the Italian government has extended the national state [...]

LA COMPAGNIA
Original Language Movies
International Film Festivals

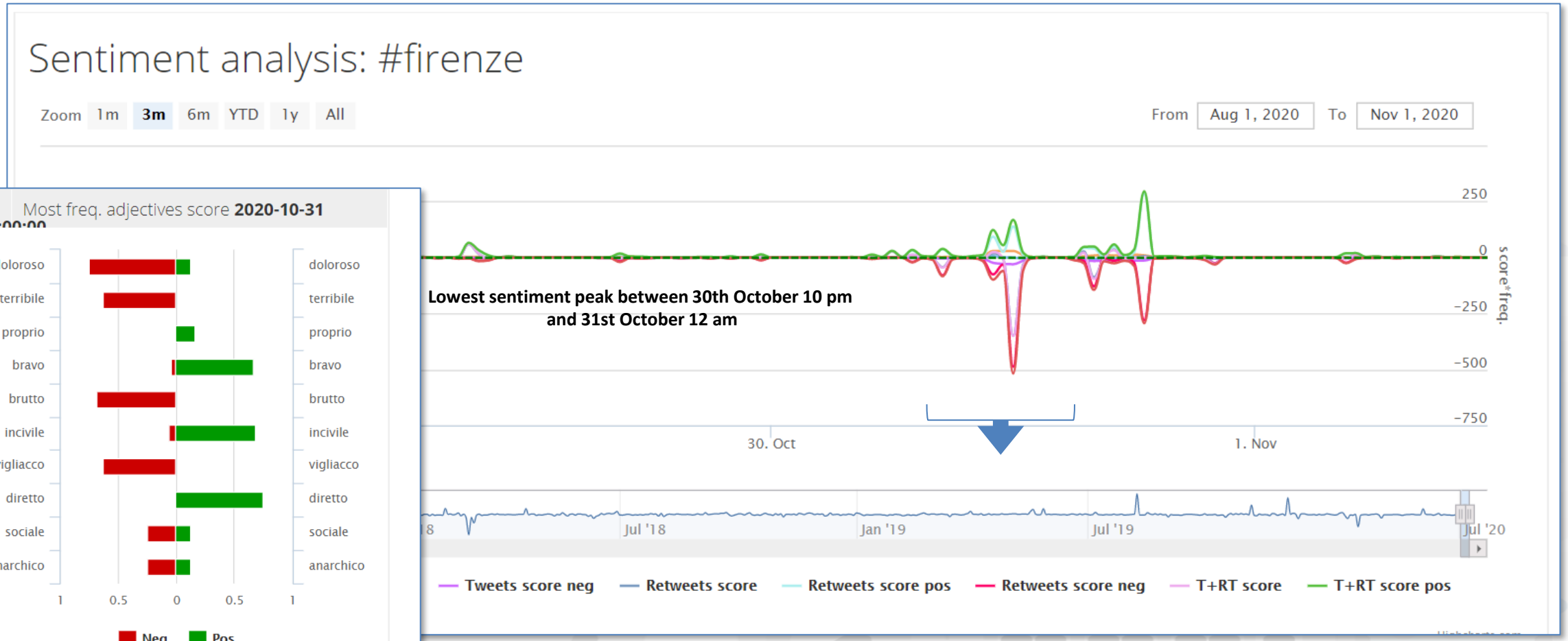
ORCHESTRA DELLA TOSCANA

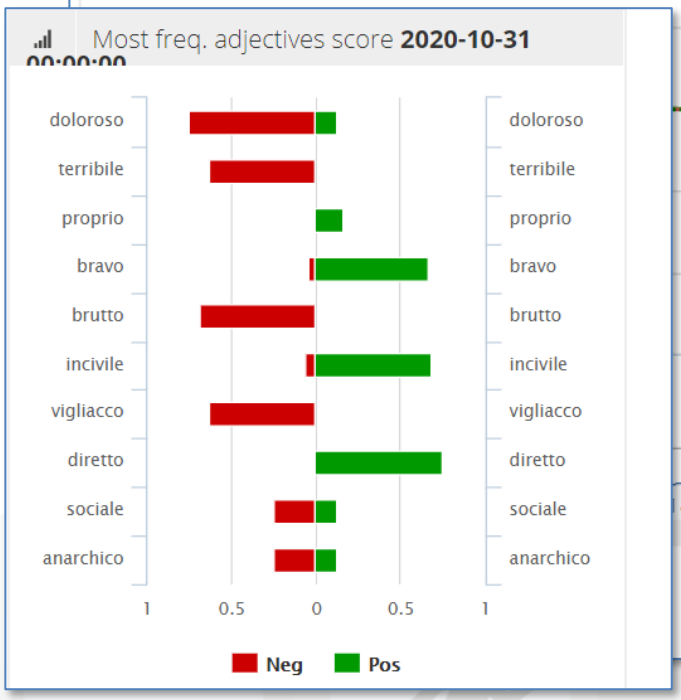
30 October Manifestation



Twitter Vigilance

Sentiment Analysis for search «Firenze»

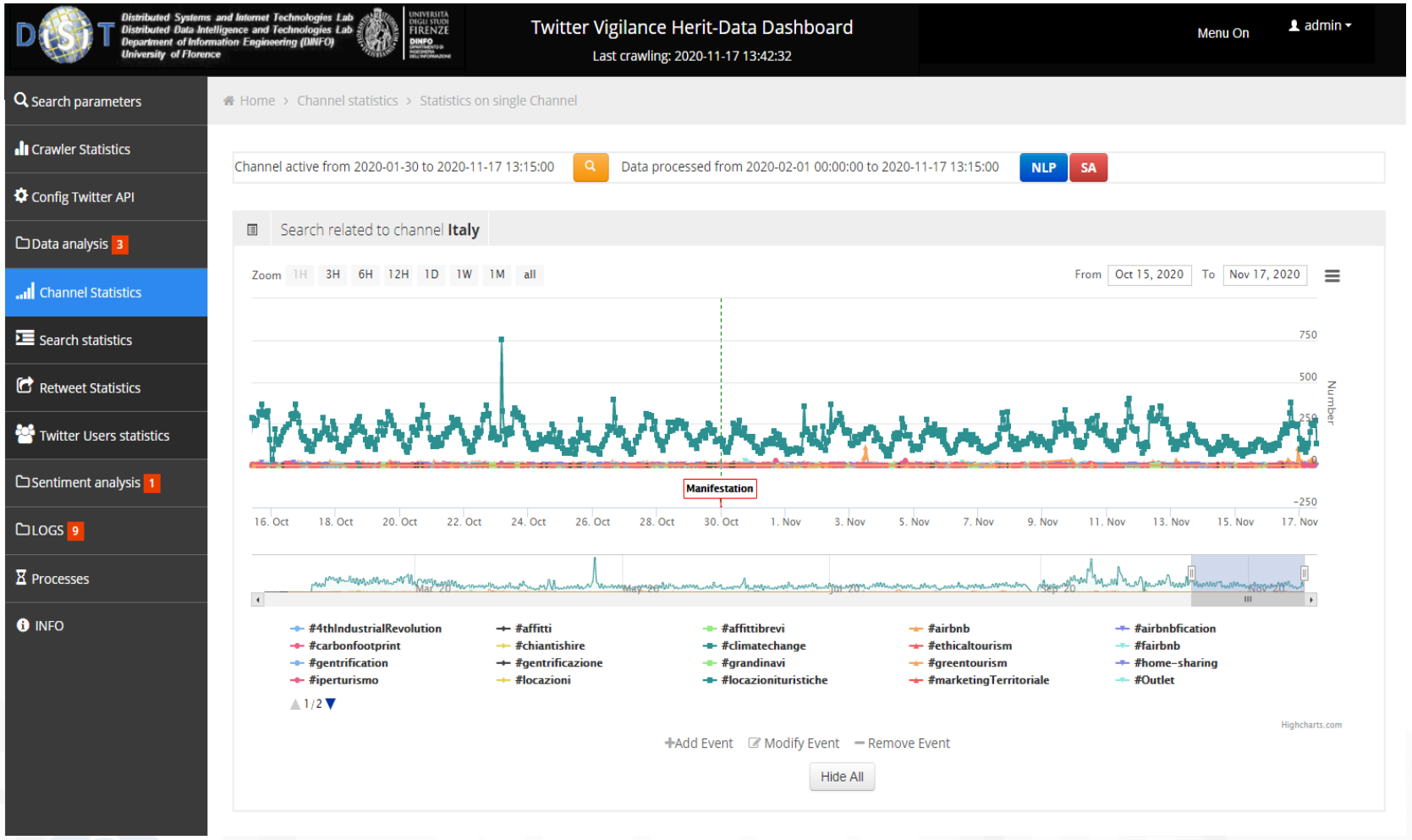




http://disit.org/tv/index.php?p=sa_ricerche&ricerca=436

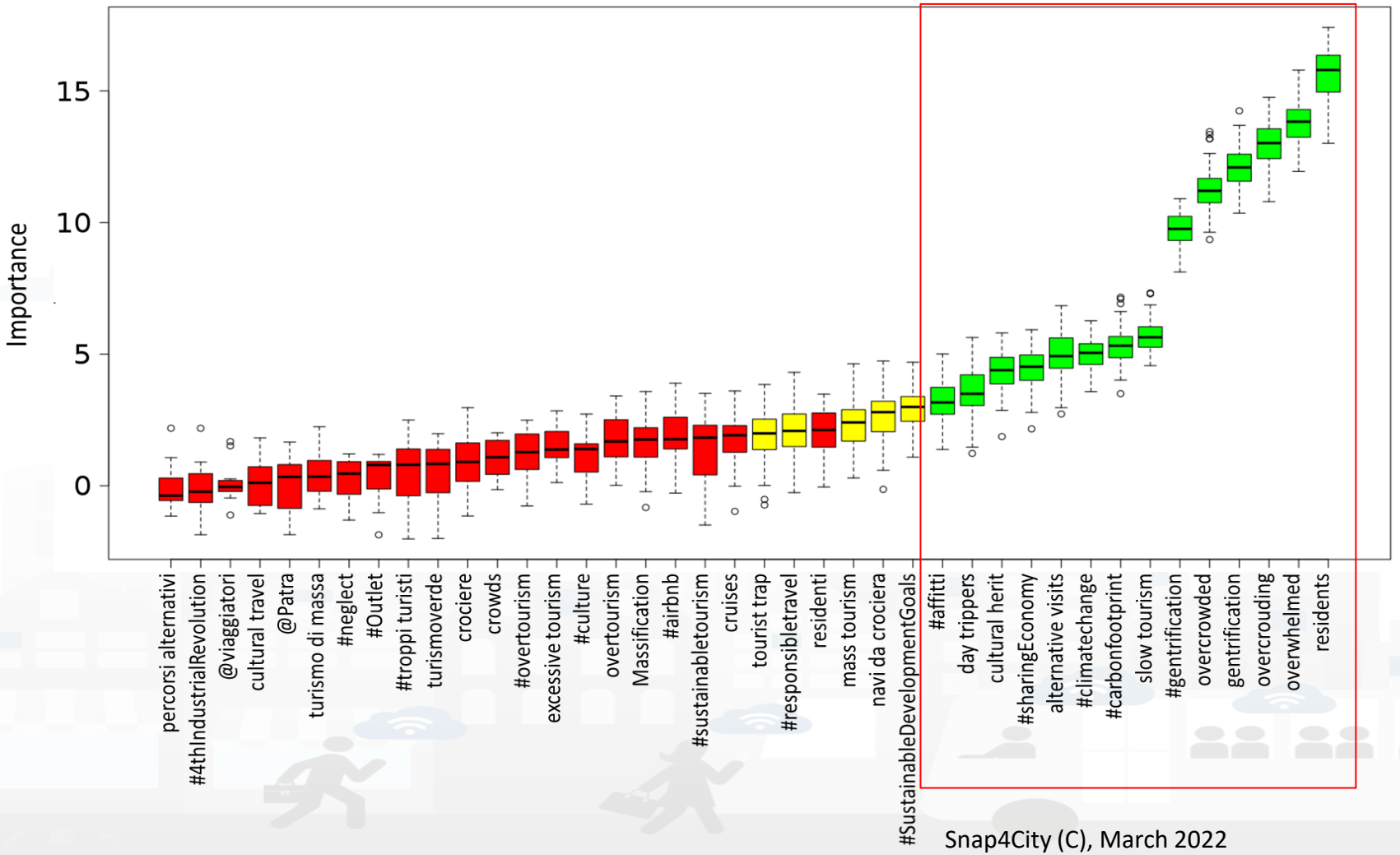
TV on Florence

#4thIndustrialRevolution #affitti #affittibrevi #airbnb
#airbnbfication #carbonfootprint #chiantishire #climatechange
#ethicaltourism #fairbnb #gentrification #gentrificazione
#grandinavi #greentourism #home-sharing #iperturismo
#locazioni #locazionituristiche #marketingTerritoriale #Outlet
#overtourism #responsibletravel #sharingEconomy
#socialtourism #SustainableDevelopmentGoals
#sustainabletourism #Tourism4SDGs #turismoEnogastronomico
#turismoEsperenziale #turismoetico #turismoSmart
#turismosostenibile #turismoverde #voluntourism



Twitter Vigilance

Relevant Feature Selection - Italy



Random Forest Model Results expoiting the *confirmed* keys:

- Accuracy = 0.90
- Kappa index = 0.81

Twitter Vigilance

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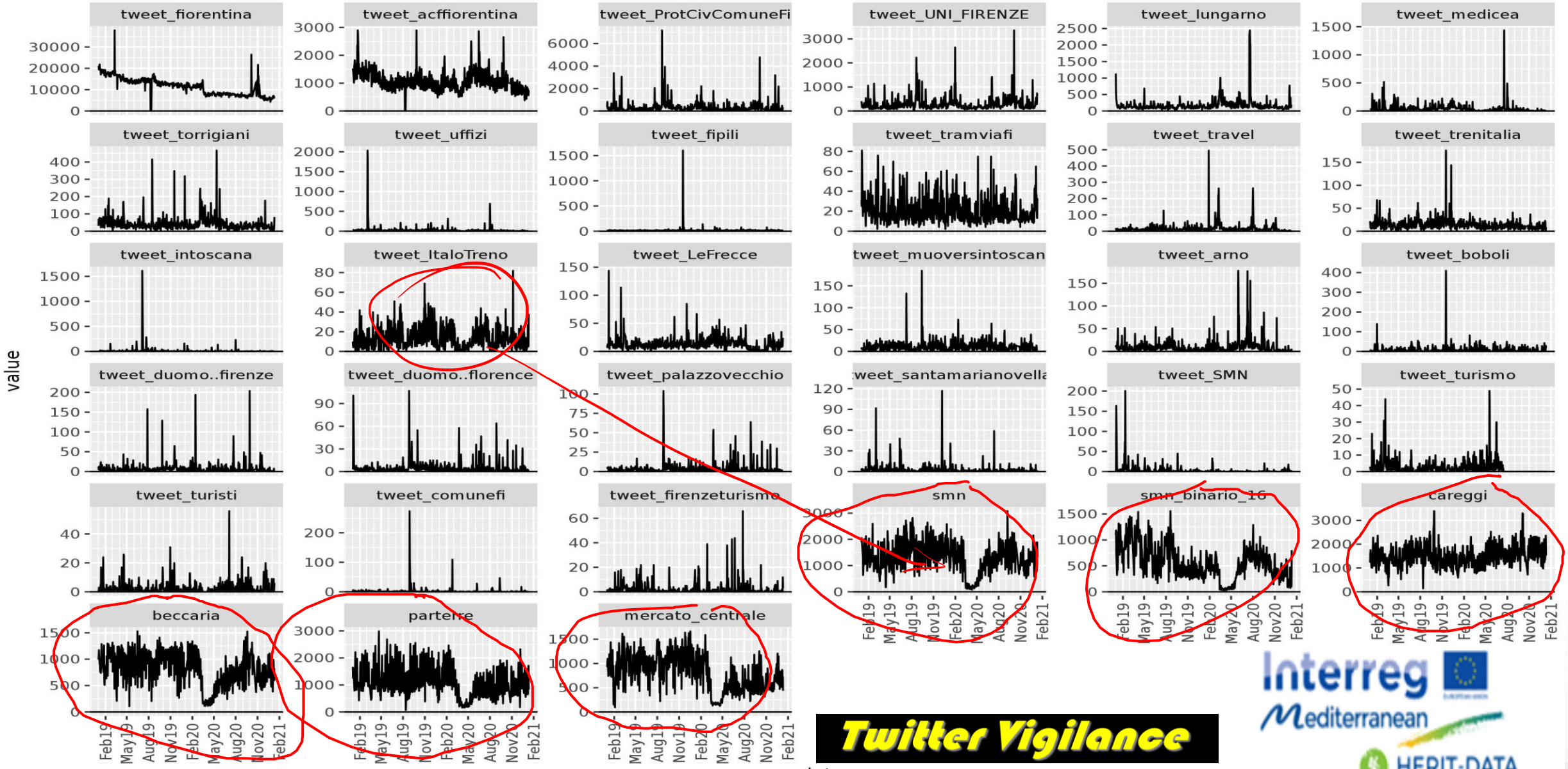
Twitter trends

SNAP4CITY | KM4CITY



Twitter Vigilance

Interreg Mediterranean HERIT-DATA

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES

TOP

Get other info on……

100% OPEN SOURCE

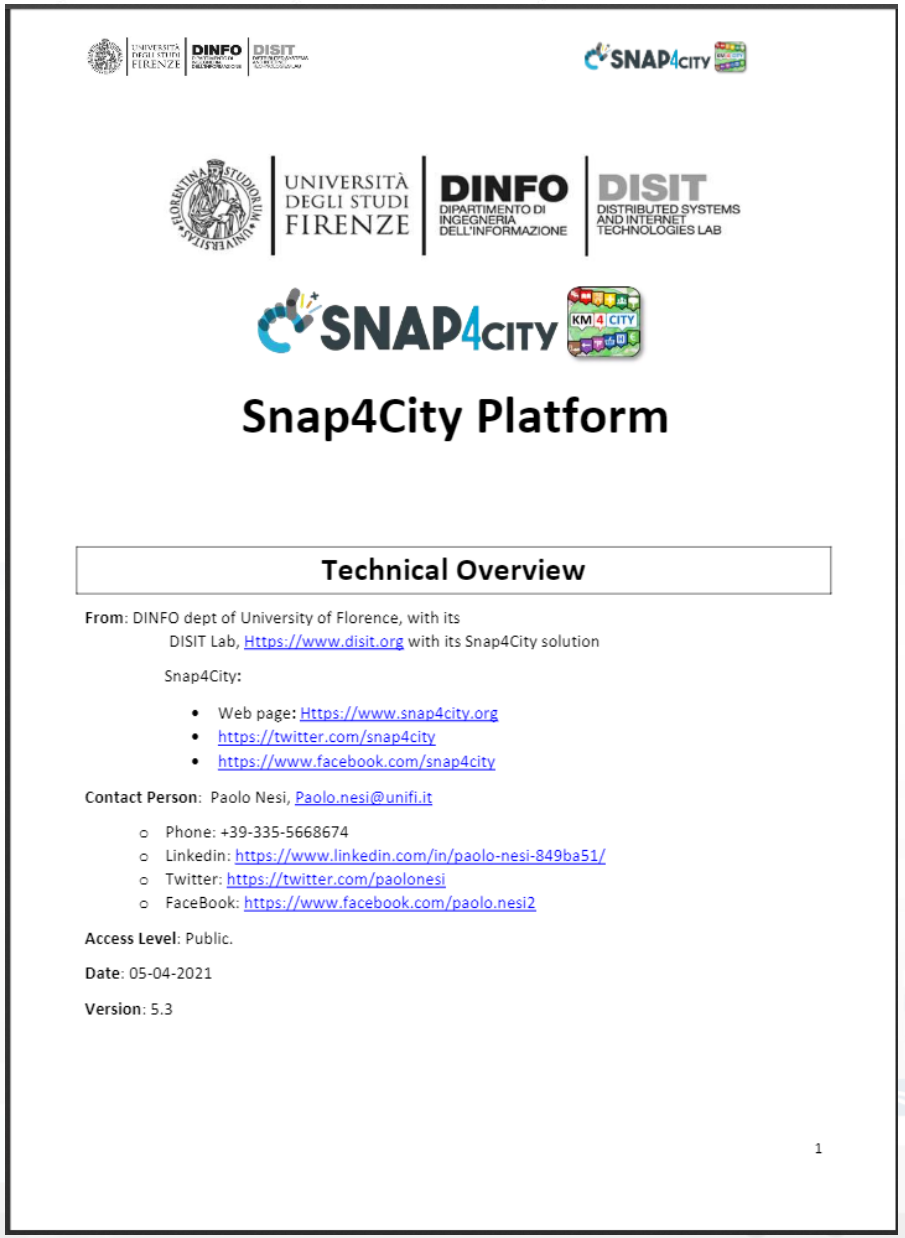
SNAP4 Appliances and Dockers **Installations**

https://www.snap4city.org/577

On Line Training Material (free of charge)

	1st part (*)	2nd part (*)	3rd part (*)	4th part (*)	5th part (*)	6th part (*)	7th part (*)
what	General	Dashboards	IOT App, IOT Network	Data Analytics	Data Ingestion processes	System and Deploy Install	Smart City API: Web & Mob. App
PDF							
Inter active							
Video1							
Video2							
Video3							
Video4				none		none	none
duration	2:55	3:16	3:41	2:00	2:48	2:35	1:47

Overview



Snap4City Platform

Technical Overview

From: DINFO dept of University of Florence, with its
DISIT Lab, Https://www.disit.org with its Snap4City solution

Snap4City:

- Web page: Https://www.snap4city.org
- https://twitter.com/snap4city
- https://www.facebook.com/snap4city

Contact Person: Paolo Nesi, Paolo.nesi@unifi.it

- Phone: +39-335-5668674
- Linkedin: https://www.linkedin.com/in/paolo-nesi-849ba51/
- Twitter: https://twitter.com/paolonesi
- FaceBook: https://www.facebook.com/paolo.nesi2

Access Level: Public.

Date: 05-04-2021

Version: 5.3

1

- https://www.snap4city.org/drupal/sites/default/files/files/Snap4City-PlatformOverview.pdf

Overview

- https://fiware-foundation.medium.com/snap4city-fiware-powered-smart-app-builder-for-sentient-cities-acfe24df49d5
- https://www.snap4city.org/drupal/sites/default/files/files/FF_ImpactStories_Snap4City.pdf

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DINFO
DISIT
Interreg
Mediterranean
HERIT-DATA
MANAGE TOURISM FLOWS IN A BETTER WAY
HOW CAN DO?
PILOT SITE FLORENCE
Tuesday 29 March 2022 in Florence
10:00 – 16:00 | Study Visit & Panel
Regione Toscana
AViTeM
Agency for sustainable Mediterranean cities and territories
La Région Occitanie
TURISME COMUNITAT VALENCIANA
Santa María la Real fundación
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UNIVERSIDADE NOVA DE LISBOA
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DINFO