















SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES





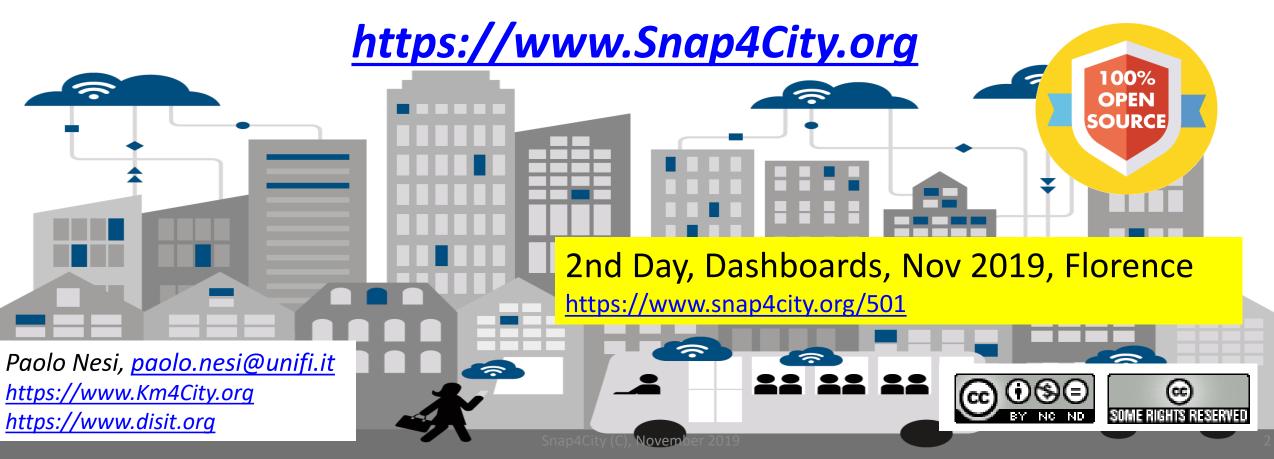








scalable Smart aNalytic APplication builder for sentient Cities: for Living Lab and co-working with Stakeholders







General Overview of the full Course

- 1st Day: General overview (1 day, 6 hours)
- 2nd Day: Dashboards, how to build and manage them (4 hours)
- 3rd Day: IOT Applications development, IOT Devices, IOT Networks (4 hours)
- 4th Day: Data Analytics, in R Studio, In Python, how to integrate with IOT Applications (4 hours)
- **5th Day:** Data Ingestion, Data Warehouse, ETL Development, Data Gate, IOT Device Data ingestion, etc.. (5 hours)
- 6th Day: Snap4City Architecture, How To Install Snap4City (3 hours)
- 7th Day: Smart city API (internal and external) Web and Mobile App development tool kit (4 hours)

A number of the training sections include exercitations Updated versions on: https://www.snap4city.org/501









Agenda of 2nd day: dashboard building

- GO
- Recall on Snap4City Architecture
- GO
- Dashboard Usage and Authoring
 - Dashboard usage vs Widgets
 - Multi Data Map Widget
 - Unified Data and Services Inspection (data inspector)
- GO
- Data Inspector vs Data Processes Details
- From Data to Graphic Widgets
- GIS Data Gathering /Connection

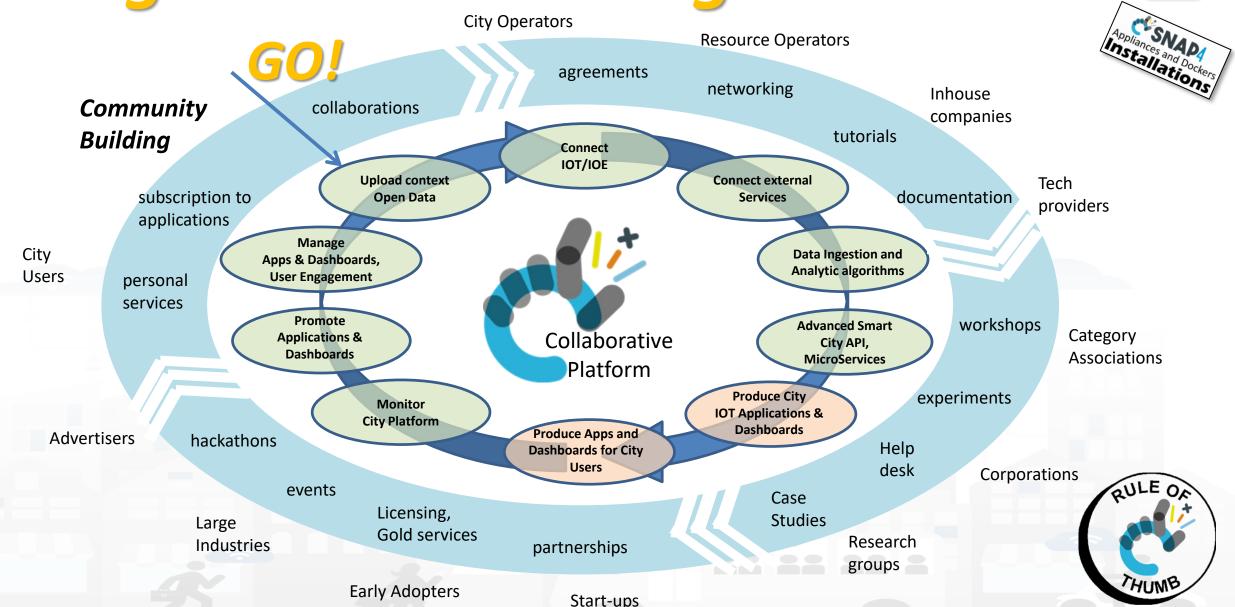
- GO
- Dashboard Creation & Exercitation
 - Dashboard Creation, Exercitation
- GO
- Synoptics and Custom Widgets Creation
- Dashboards Intelligence on Web and Mobile Devices
- Dashboard ChatRoom and Notifications

- GO
- Data Type Management GDPR Compliant
 - Dashboard Listing, Managing, Sharing, Delegation
 - Dashboards GDPR Management
 - Personal Data Management GDPR Compliant: POI, Data, KPI

- GO
- Snap4City and Km4City Projects
- GO
- Acknowledgments

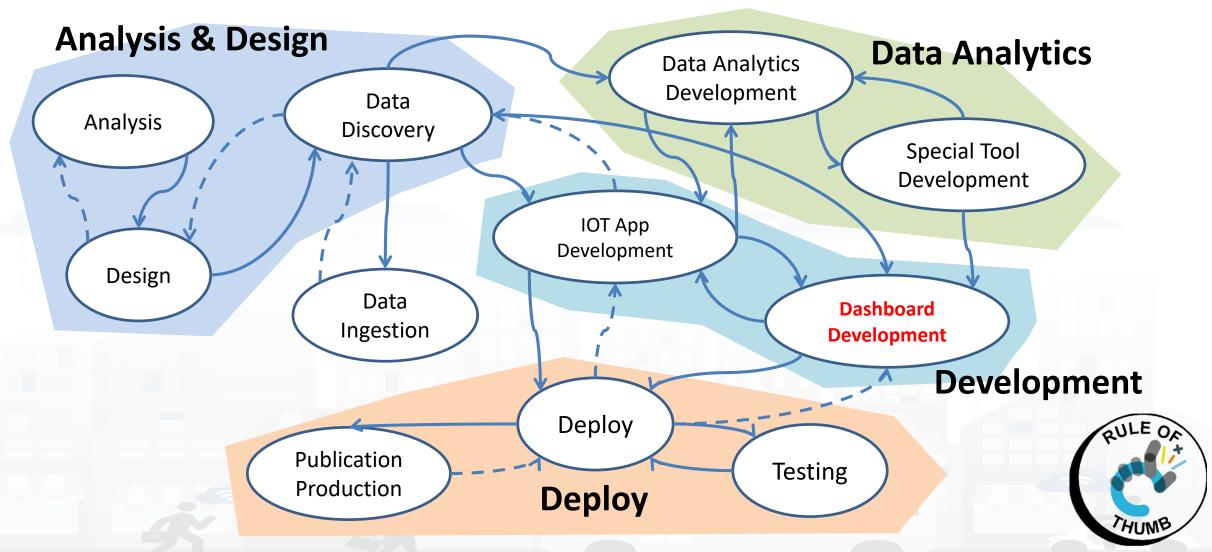
Living Lab Accelerating





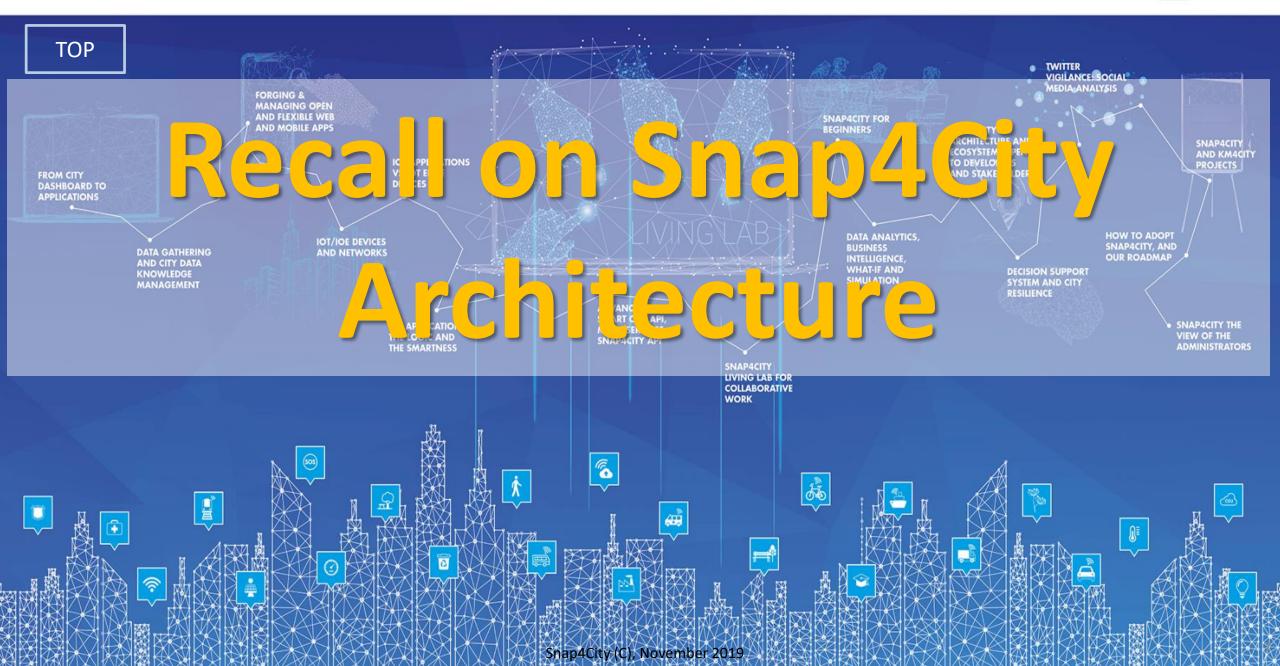
Development Life Cycle Smart City Services





SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES









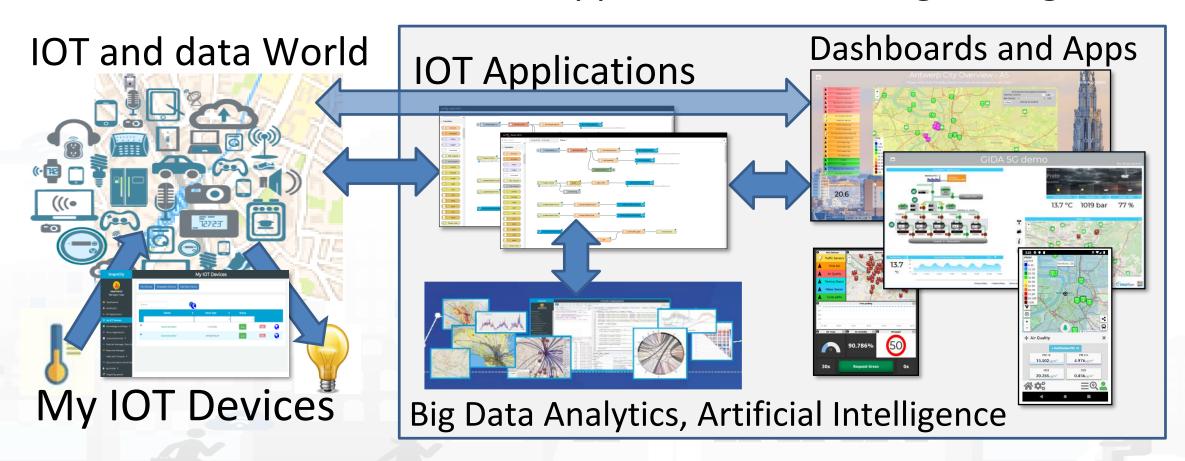






Snap4City: Builder of Sentient Cities Solutions

Dashboards with data driven IOT Applications enforcing intelligence







URBAN PLATFORM: SMART CITY IOT AS A SERVICE AND ON PREMISE



- LOCAL GOVERN
- STAKEHOLDERS
- CITY USERS
- IN-HOUSE
- ENERGY OPERATORS
- MOBILITY OPERATORS
- COMMERCIAL **OPERATORS**
- SECURITY OPERATORS
- INDUSTRIES
- RESEARCHERS
- START-UPS
- ASSOCIATIONS



- ASSESSMENT
- AUDITING

- OPEN IOT DEVICES
- IOT EDGE
- IOT GATEWAY
- PAX COUNTERS
- IOT BUTTONS
- TEST CASES, SCENARIOUS, VIDEOS, HACKATHONS
- OPEN SOURCES, COMMUNITY OF CITIES
- TRAINING TUTORIALS, COMMUNITY MANAGEMENT

IOT APPLICATIONS - INSTANT APPS



DATA DRIVEN APPLICATIONS • REAL TIME PROCESSING . BATCH PROCESSING . ANY **PROTOCOL & FORMAT**

DASHBOARDS & APPLICATIONS



CONTROL ROOM • SITUATION ROOM • OPERATOR DASHBORDS • BUSINESS INTELLIGENCE • WHAT-IF ANALYSIS • DECISION SUPPORT • SIMULATIONS • RISK ANALYSIS • **RESILIENCE ANALYSIS**

MOBILE & WEB APPLICATIONS



DEVELOPMENT KIT • SUGGESTIONS • MOBILE APPS MONITORING PANELS
 PLATFORM UTILITIES READY TO USE SMART APPLICATIONS

MICROSERVICES & ADVANCED SMART CITY API

LIVING LAB - DEV TOOLS - COWORKING

BIG DATA - DATA ANALYTICS

DATA ANALYTICS TOOLS - MICRO-APPLICATIONS



IOT DIRECTORY • SERVICE MAP • **RESOURCE MANAGER • DATA GATE •** R STUDIO • ETL



PREDICTIONS • ANOMALY DETECTION • WHAT-IF ANALYSIS • TRAFFIC FLOW RECONSTRUCTION • ORIGIN-DESTINATION MATRICES • SOCIAL MEDIA ANALYSIS • OFFER VS DEMAND ANALYSIS • ENVIRONMENTAL DATA ANALYSIS AND PREDICTIONS • REAL TIME HEATMAPS • ROUTING • ALERTING • EARLY WARNING • PERSONAL AND VIRTUAL

KM4CITY DATA AGGREGAT KNOWLEDGE BASE - EXPERT SYSTEM OF THE CITY - BIG DATA STORE

IOT MNG - DATA MNG - DATA INSPECTOR - PROCESS MNG - USER ENGAGEMENT - GDPR MNG ...

GIS

CITY UTILITIES

OPEN DATA

LEGACY & EXTERNAL SERVICES

PERSONAL DATA

IOT / IOE

BROKERS

ASSISSTANTS • SMART SOLUTIONS • SMART SHARING • PARTECIPATORY

INDUSTRY 4.0

SOCIAL MEDIA

























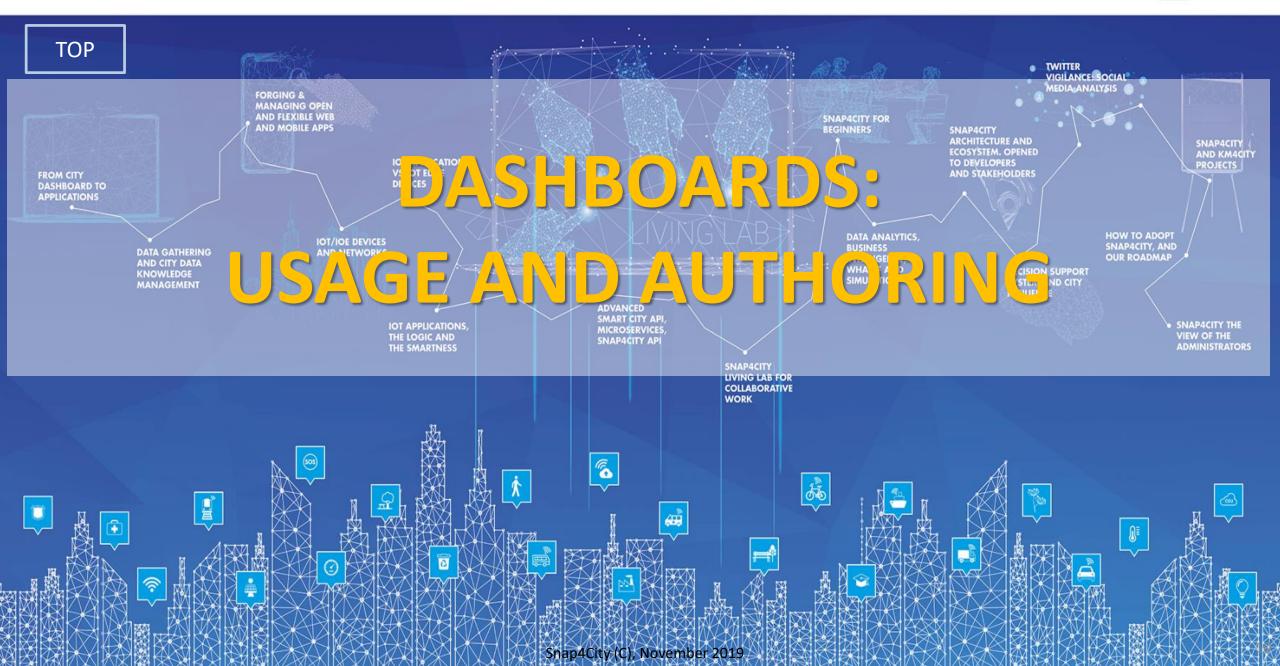






SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES













Public Dashboards (see them on the Portal)

Snap4City

LOGIN

- Dashboards (Public)
- 📕 Knowledge and Maps 🔻
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager
- Development Tools ▼
- Management
- Help and Contacts
- Documentation and Articles
- Km4City portal
- DISIT Lab portal

Dashboards (Public by (ORG))



































TOP

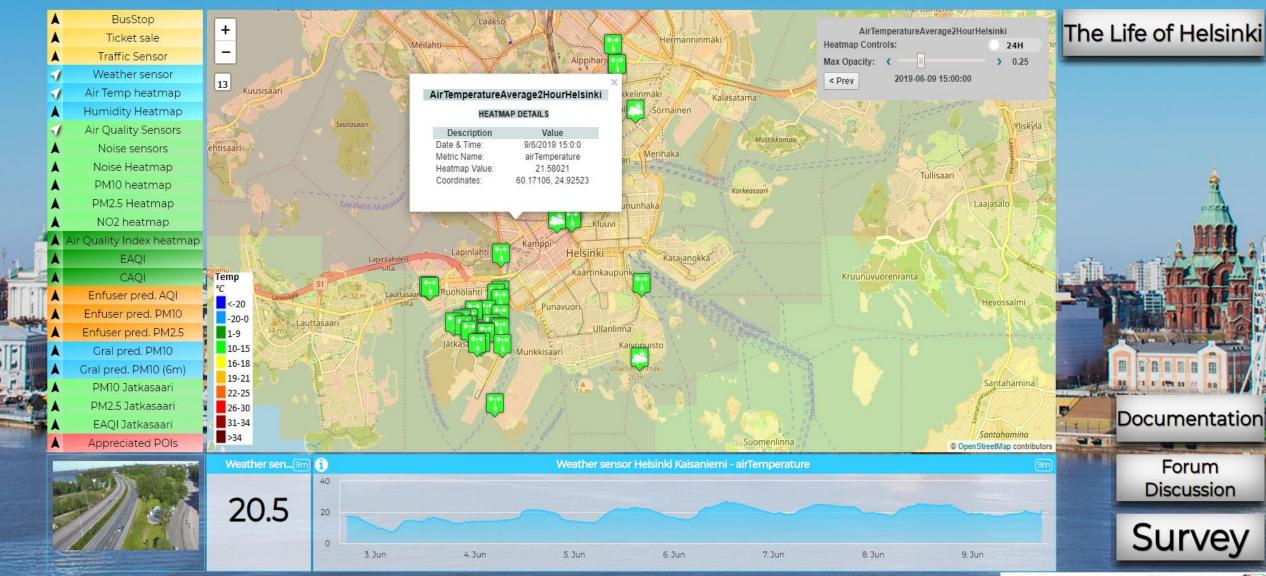
Dashboards Usage vs Widgets



Helsinki City Overview (H5a)

Please note that the data results are not always based on real data.

Sun 9 Jun 17:07:25



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





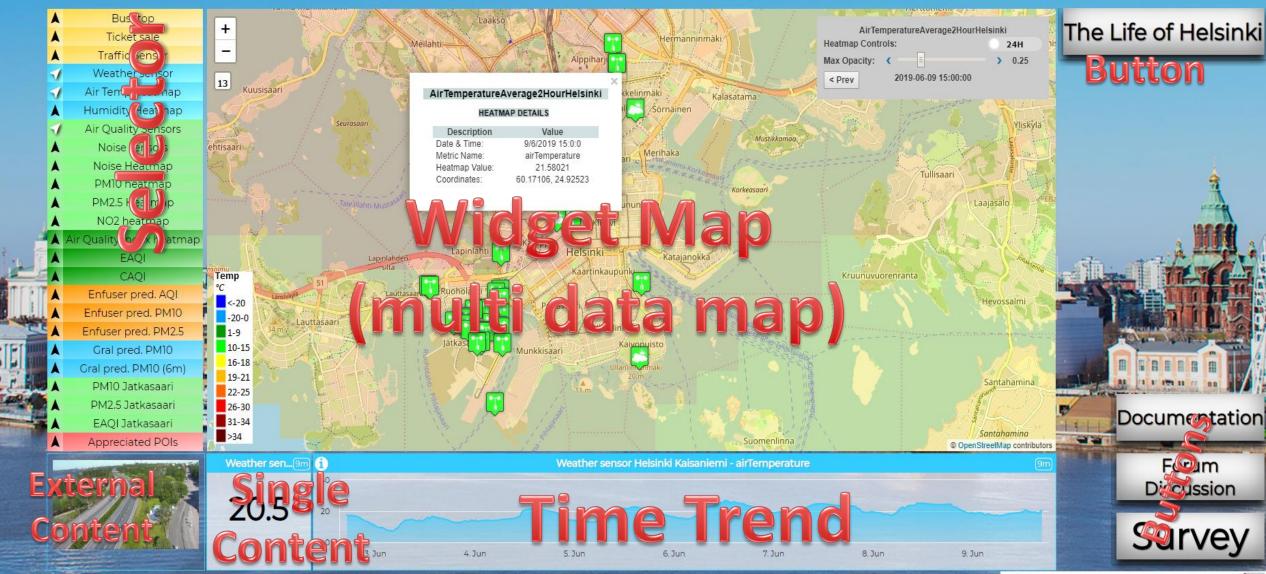




Helsinki City Overview (H5a)

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Sun 9 Jun 17:07:25



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













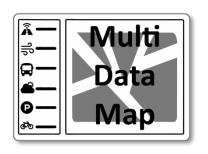


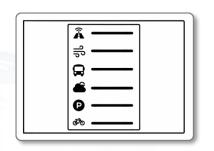




Dashboard Usage & Recipe

- https://www.snap4city.org/dashboardSmartCity/view/index.php ?iddasboard=MTQwNg==
- Selector Widget: (of different kinds) present "Information", according to the HighLevelType (HLT), as overlapped layers on **Target**
 - Additive: PIN (POI, sensors, etc.), Cycling Paths, shapes, ...
 - Mutual Exclusive: Heatmaps, traffic, etc.
- MultiDataMap Widget (Target: (may be of different kind), this one may manage
 - Multiple representations on the same map
 - Each representation may provide specific interaction modalities and controls











Other Widgets in the dashboard

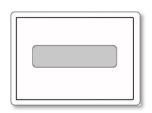
- Button Widget may be of different kind and may
 - Open external web pages, services, forum, surveys, etc.
 - Send messages on the field (IOT), etc.

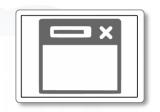
• External Content:

- Web pages, Video Streams
- Many many other tools see next exercise

Single Content

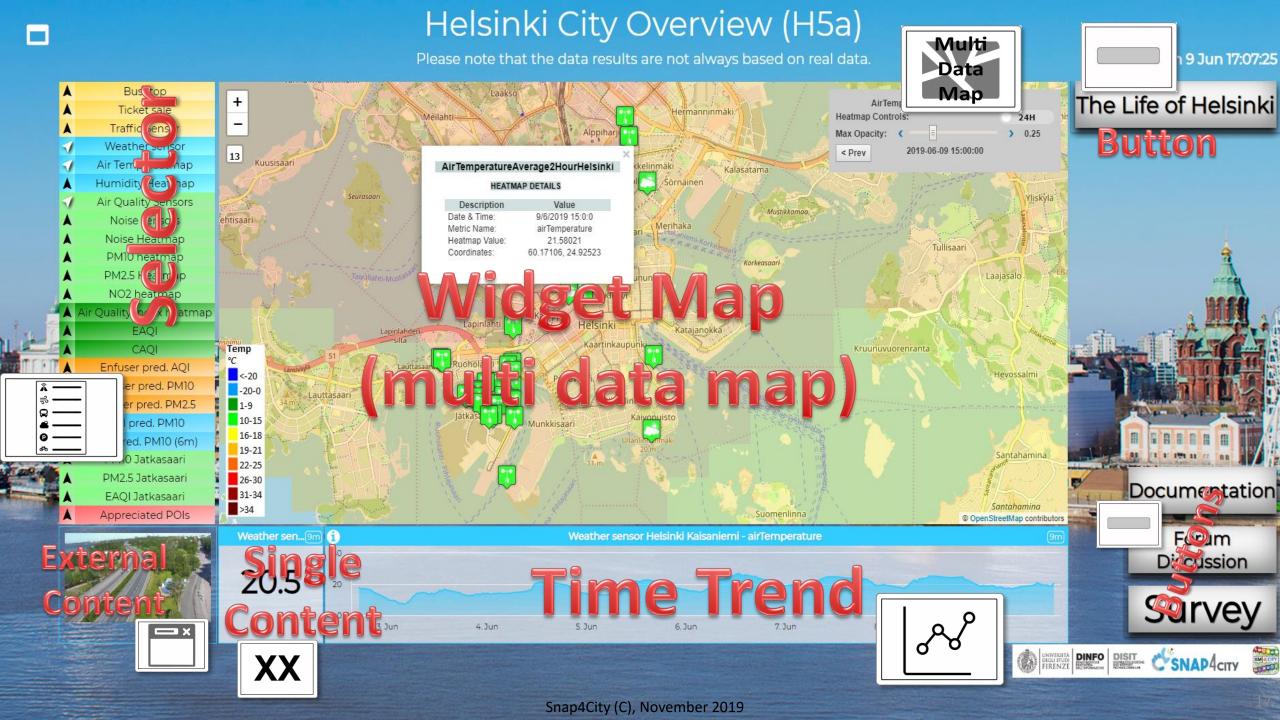
- Single value: numeric, string, HTML, etc.
- Time Trend
 - Time Series: numeric values over time





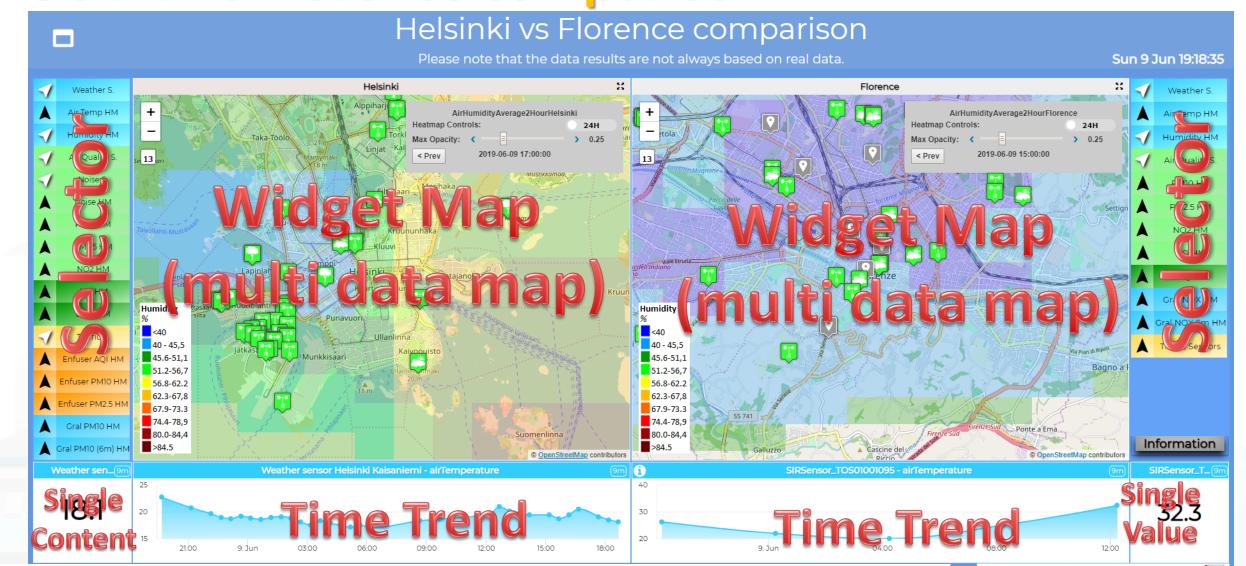








lsinki vs Florence comparison





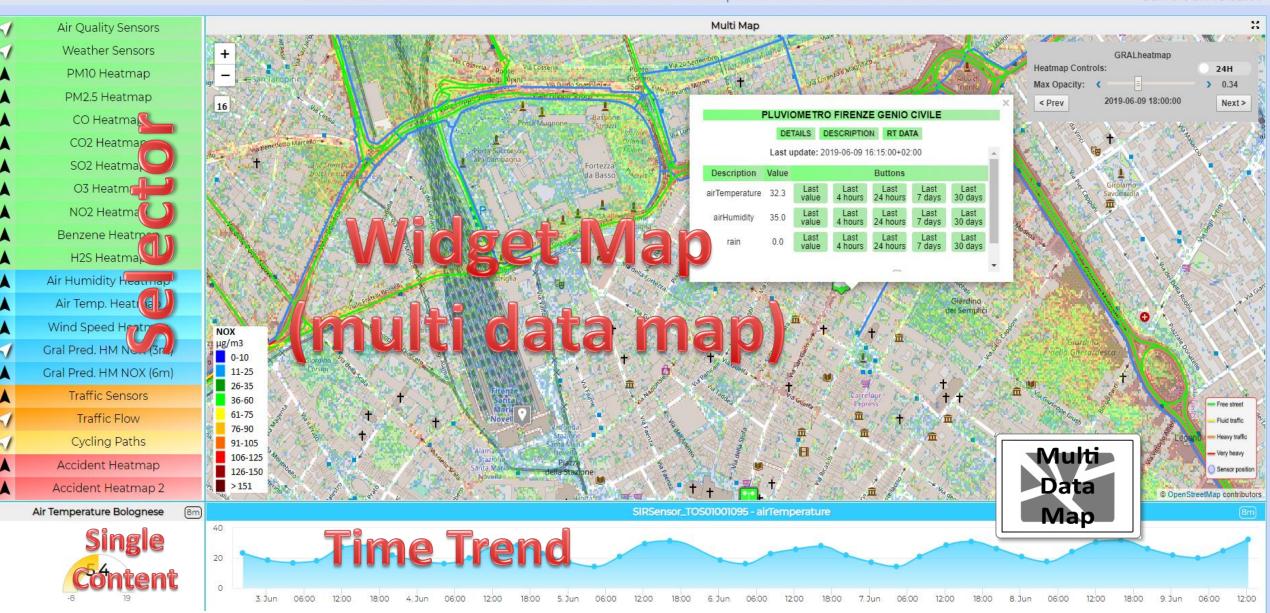


Firenze - Trafair - AirQuality Heatmaps



This dashboad contains data derived from actual sensors and predictive values under validation

Sun 9 Jun 18:53:01



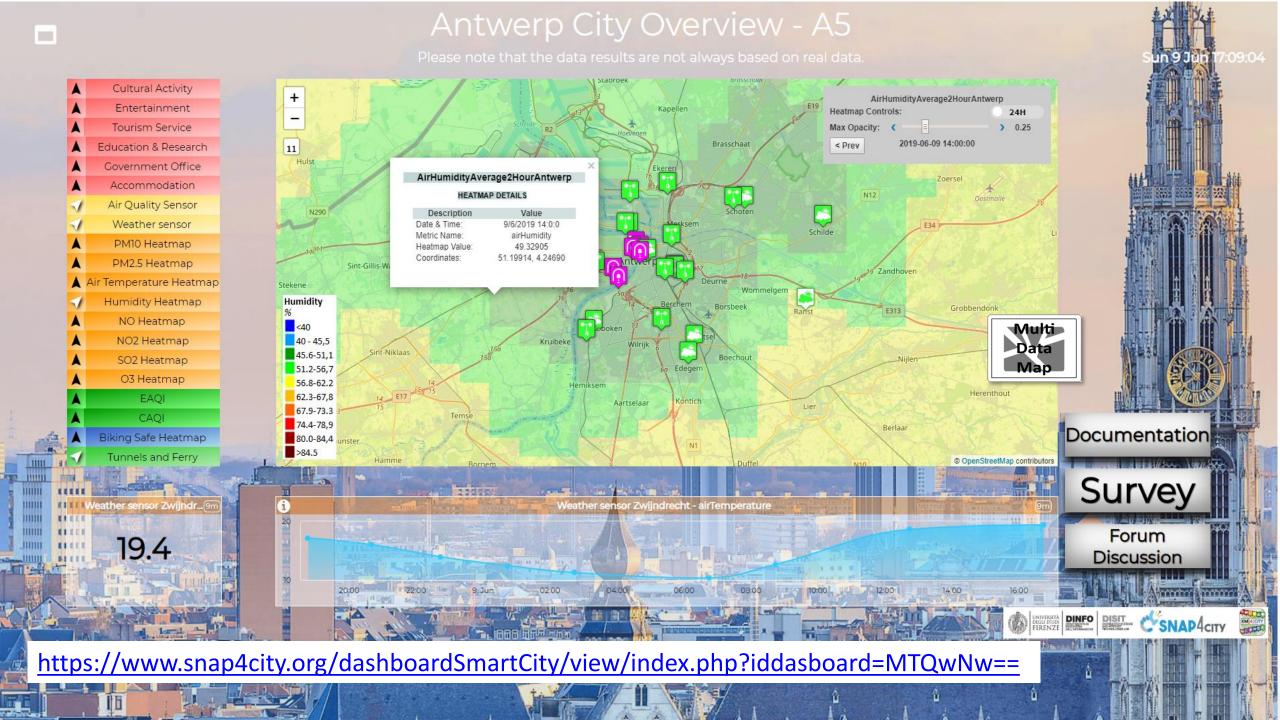












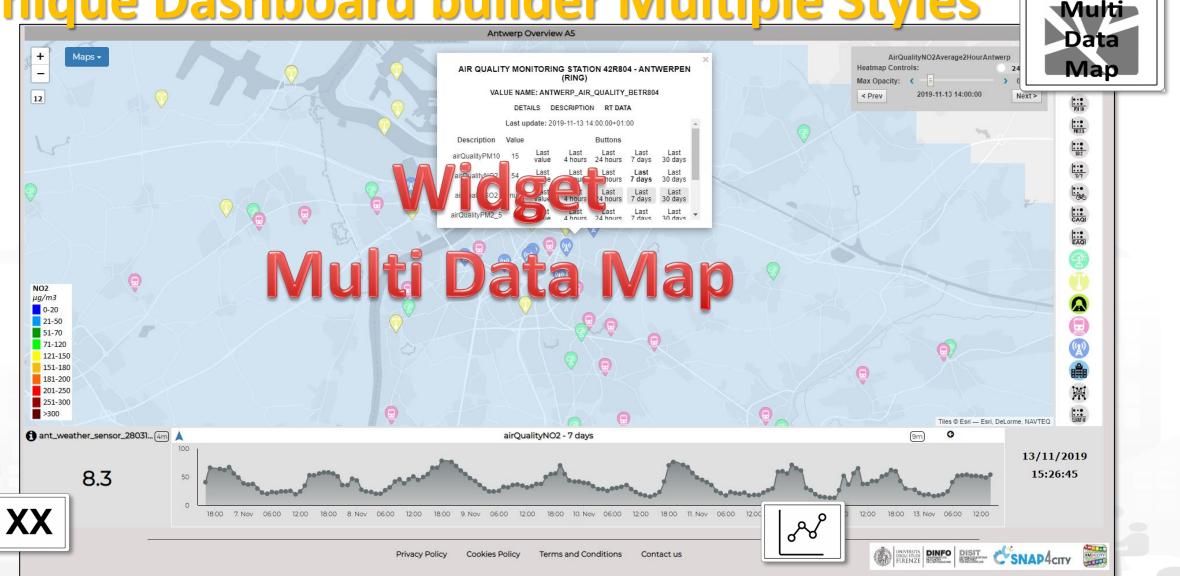






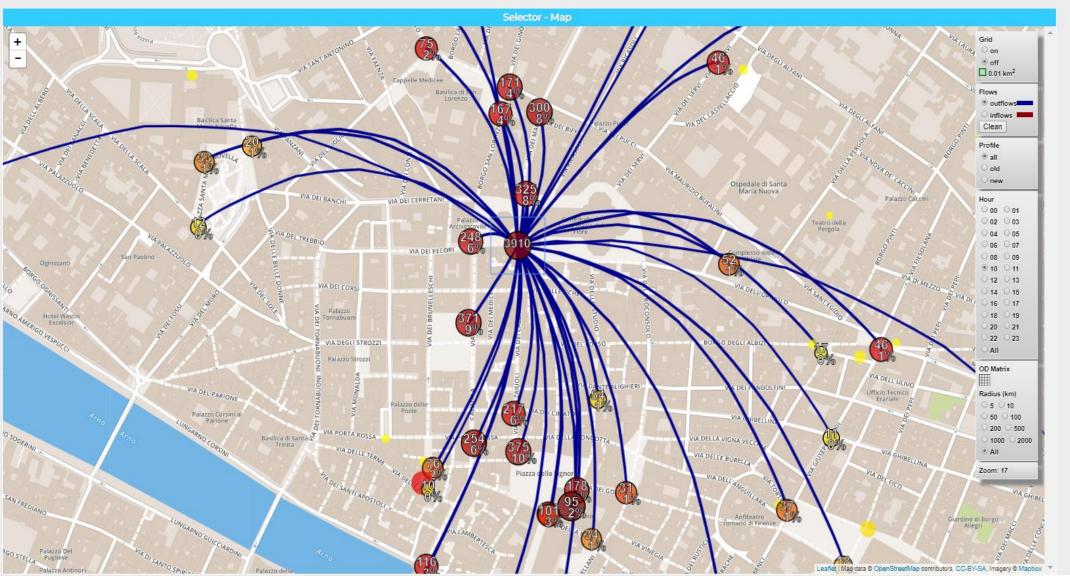


ique Dashboard builder Multiple Styles



Life in Toscana: Dashboard

Sat 29 Jun 23:32:24



Transport Public Transport Travel Plan Traffic Flow Air Quality Weather Origin Dest. Typical Trajectories People Flow Cultural Activities Forum Discussion CAM













Life in Toscana: Dashboard

Sat 29 Jun 23:32:24



Transport Public Transport Travel Plan Traffic Flow FIPILI Air Quality Weather Origin Dest. Matrix Typical Trajectories People Flow WIFI Cultural Activities Forum Discussion www www www www

https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTc3NA==

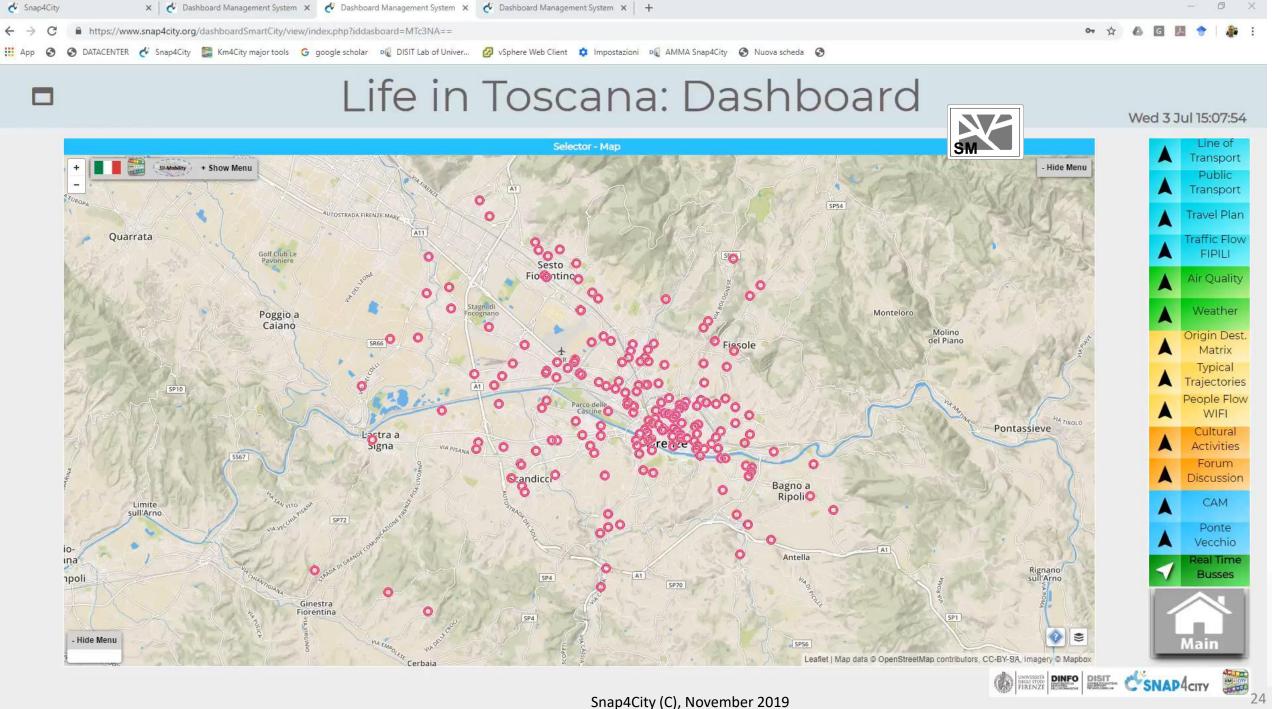














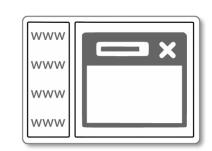


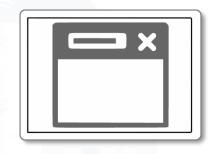


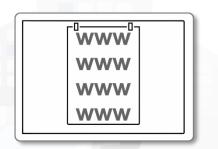


Dashboard Usage and Recipe

- https://www.snap4city.org/dashboardSmartCity/view/index.php?id dasboard=MTc3NA==
- External Content Widget (optional zoom feature):
 - External Services: Web Pages, web sites, web tools (registered or not)
 - Tools: Twitter Vigilance, Origin Destination Matrices, WiFi Tool, ...
 - GIS & MAPs: ServiceMap, ArcGIS, ServiceMap3D, GoogleMap, etc. etc.
 - TV CAM Proxy adapted, VideoCam Streams, ...
 - MicroApplications
 - More than 300 micro applications based on Snap4City and Km4City Tech.
 - Snap4City pages: Form discussion, help desk, user manual, ...
 - Snap4City Dashboards for nested views, MultiDashboards views
 - Ultra ultra HD screens....
- Selector WEB
 - Anything that can be shown on External Content WG, one or more









Documentation and Articles

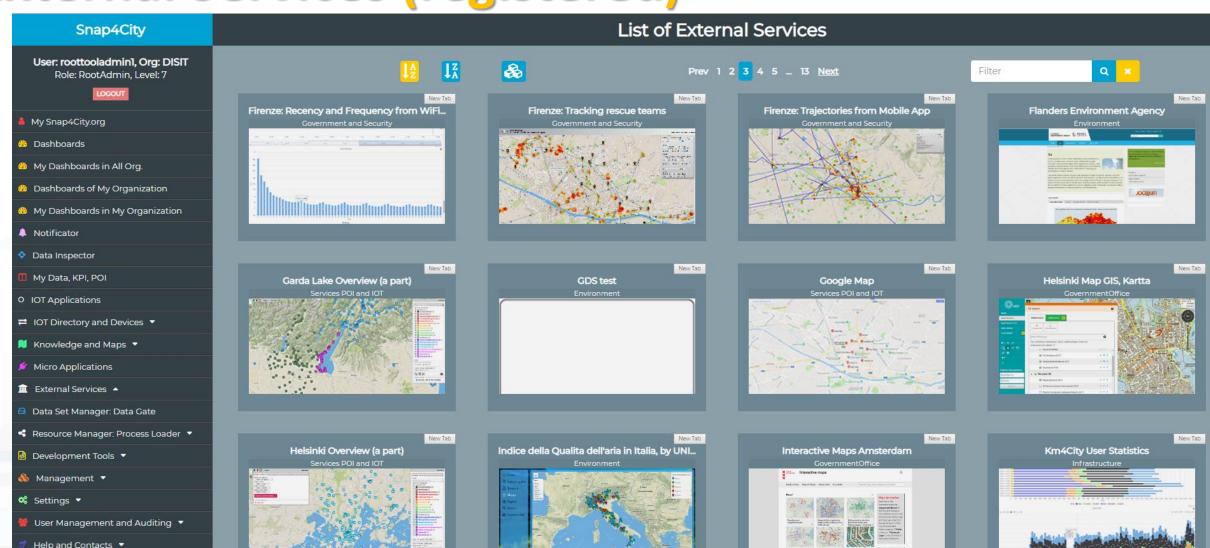
My Profile ▼







External Services (registered)











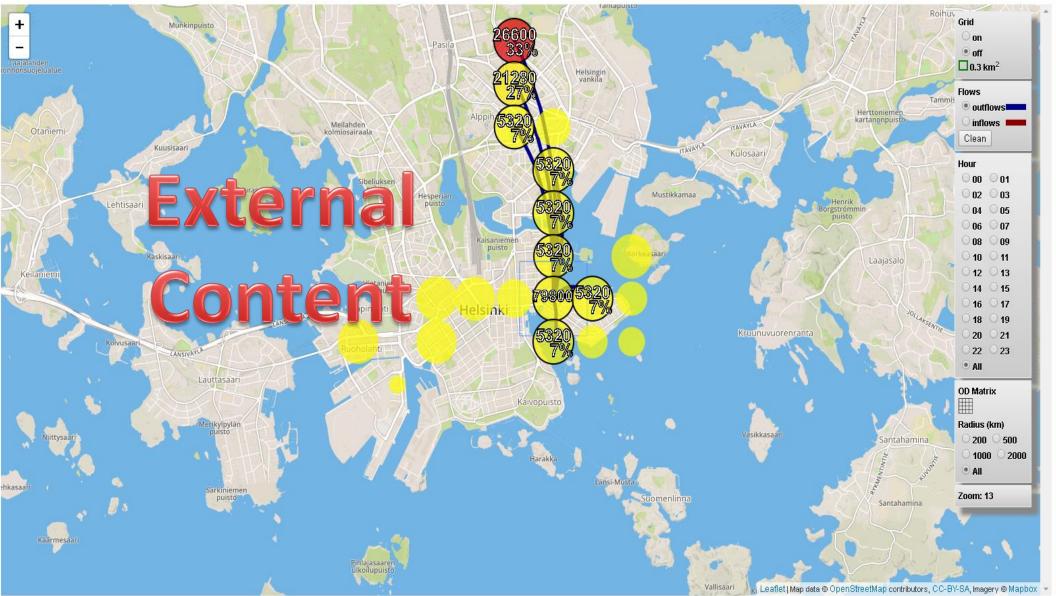
MicroApplications



Helsinki White Dashboard

Please note that the data results are not always based on real data.

Thu 13 Jun 23:37:56







Real Time Sensors via ServiceMap3D



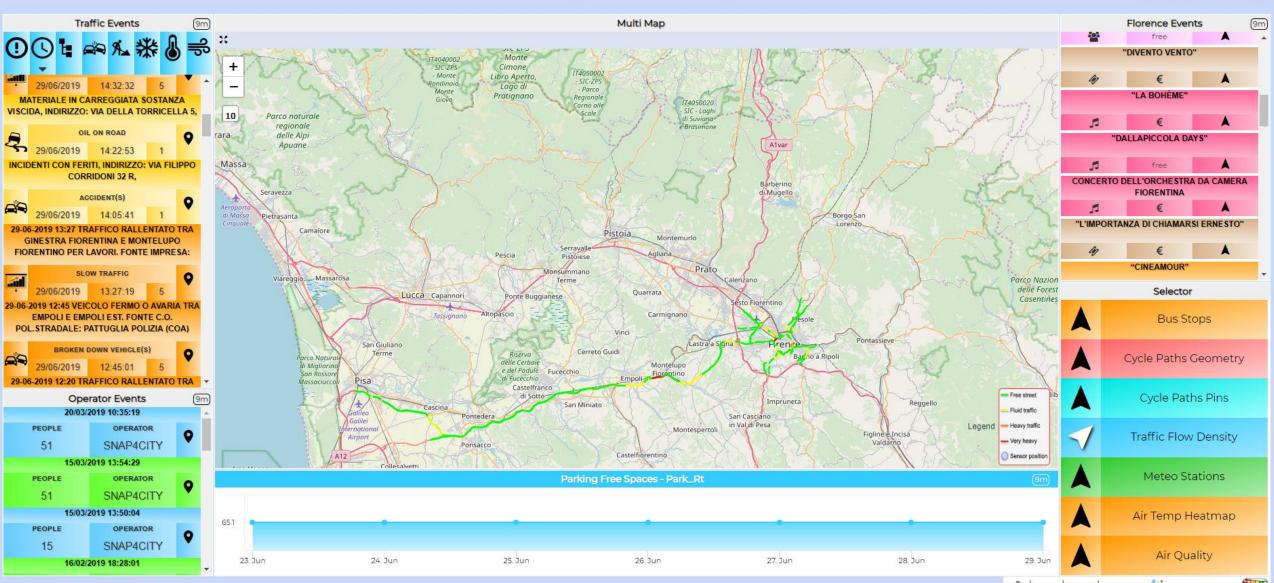
3D data rendering

Sat 1 Dec 16:57:33



Multi-Widget Map - Demo

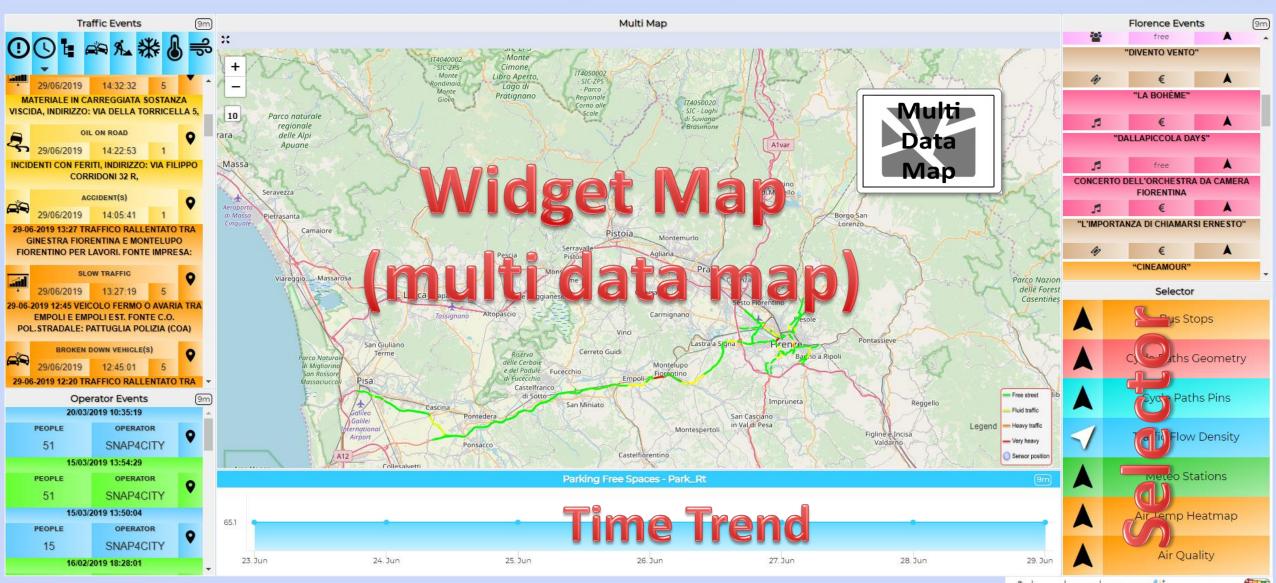
Sat 29 Jun 16:42:24



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTA2NA==

Multi-Widget Map - Demo

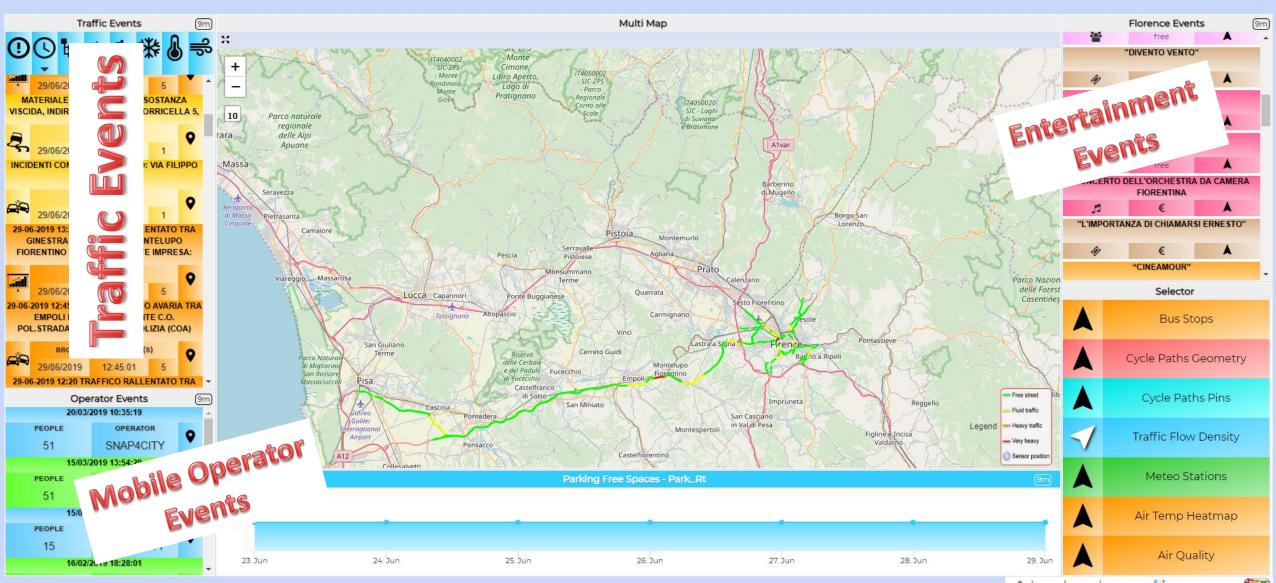
Sat 29 Jun 16:42:24



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTA2NA==

Multi-Widget Map - Demo

Sat 29 Jun 16:42:24



https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTA2NA==



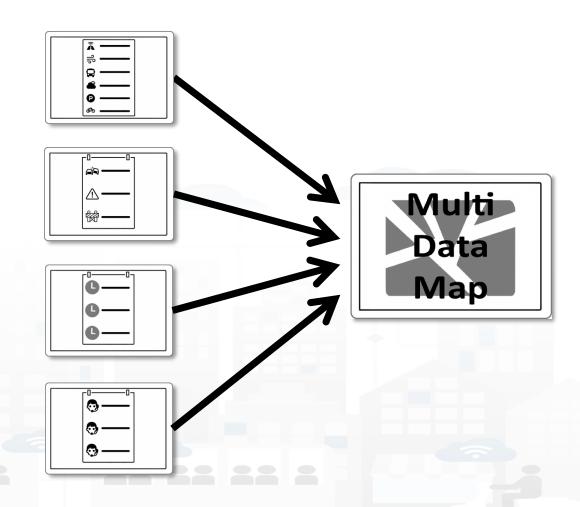






Dashboard Usage and recipe: Event map target

- Selector
 - POI, Heatmap, traffic, etc.
- Traffic Events:
 - From gestore (manager)
- Entertainment events:
 - From several sources
- Mobile Operator Events:
 - From operators with Mobile Apps

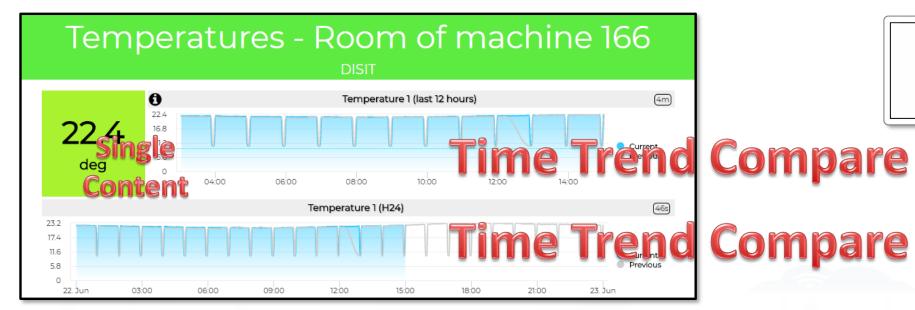






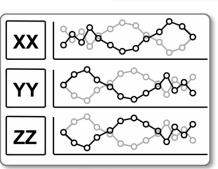


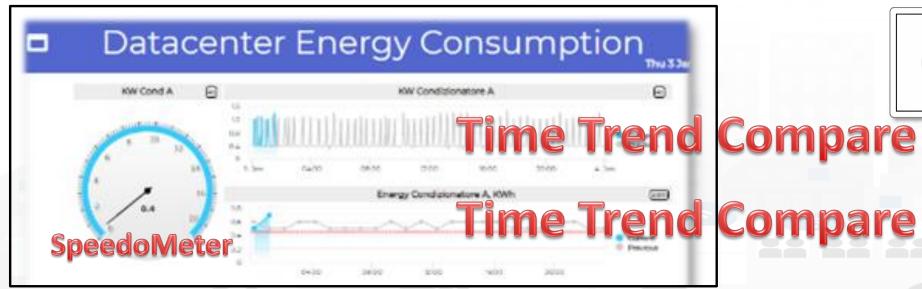


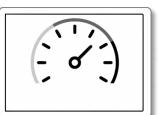


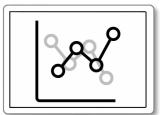


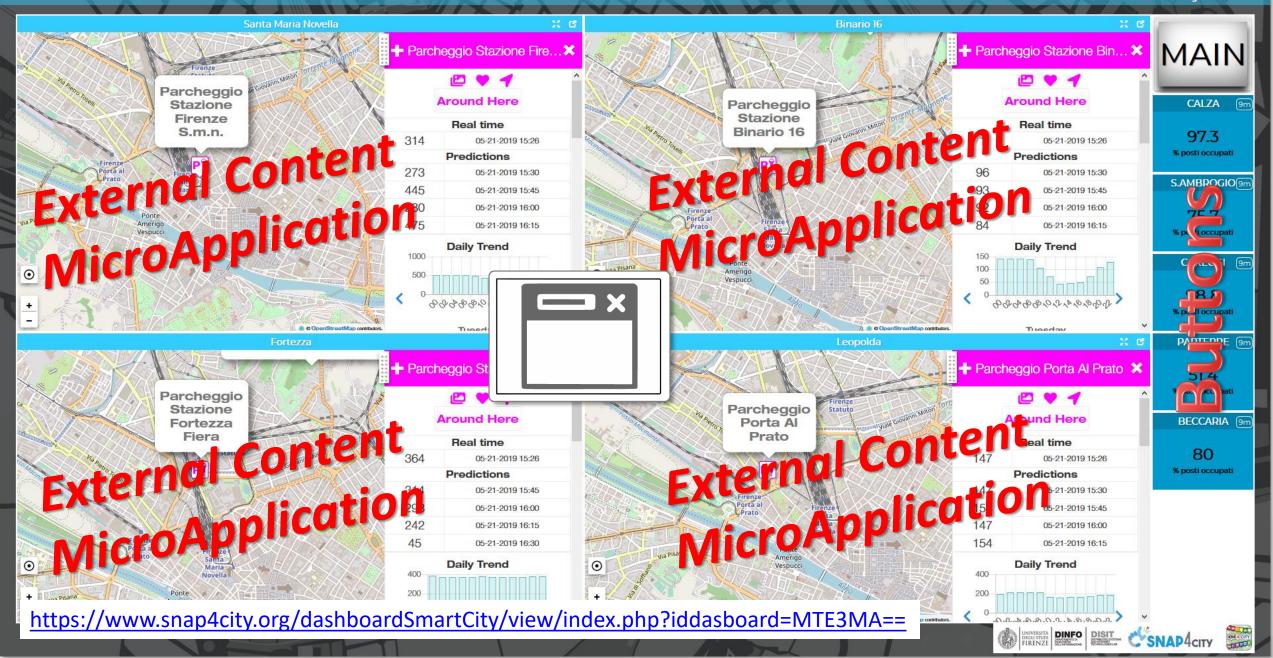














User: roottooladmin1, Org: DISII



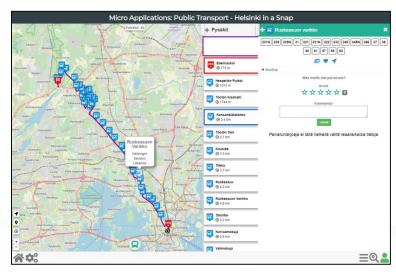




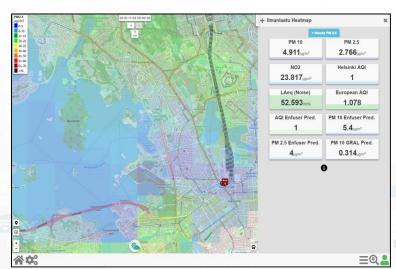


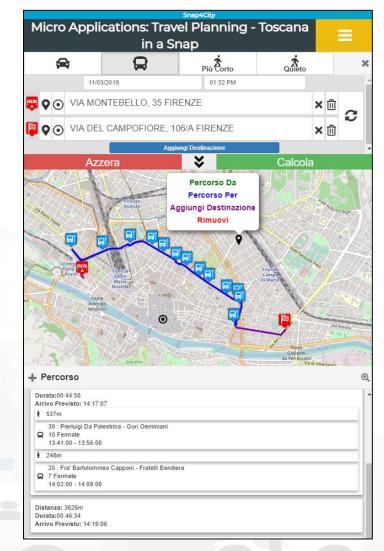
MIcroApplications for Dashboards

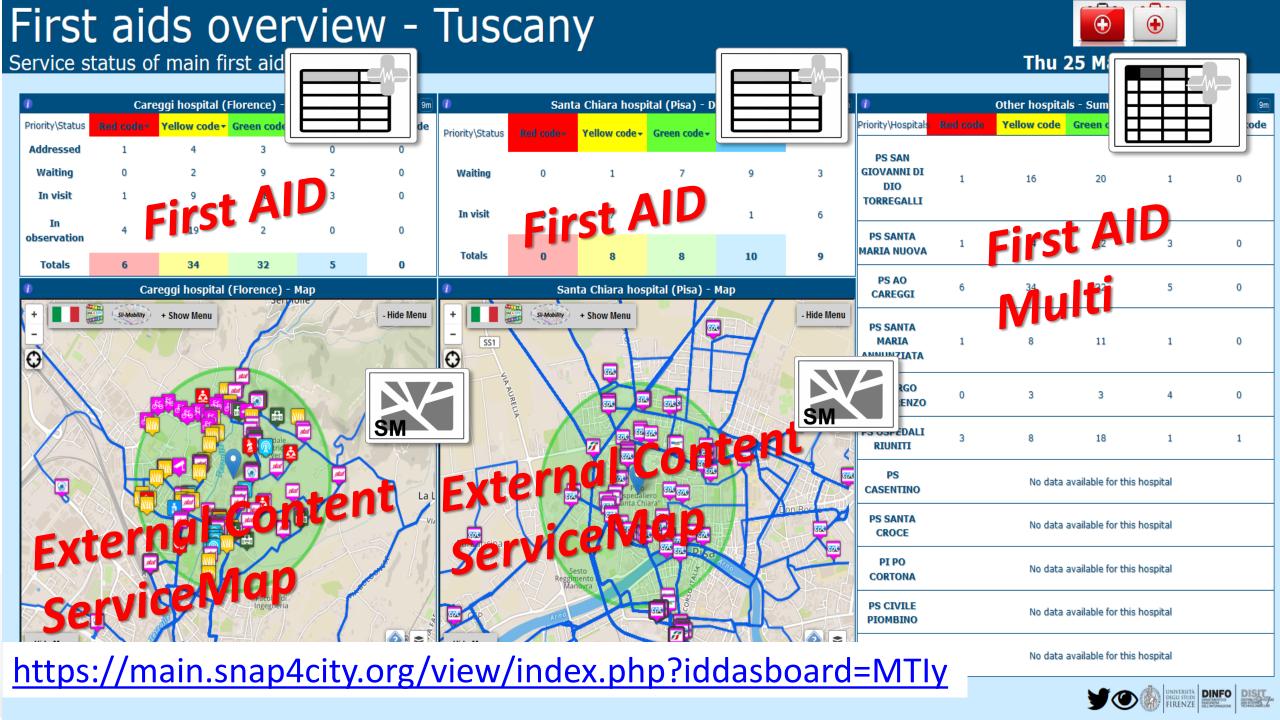












Firenze Social and Social Media new



Demo cams Sun 11 Mar 16:





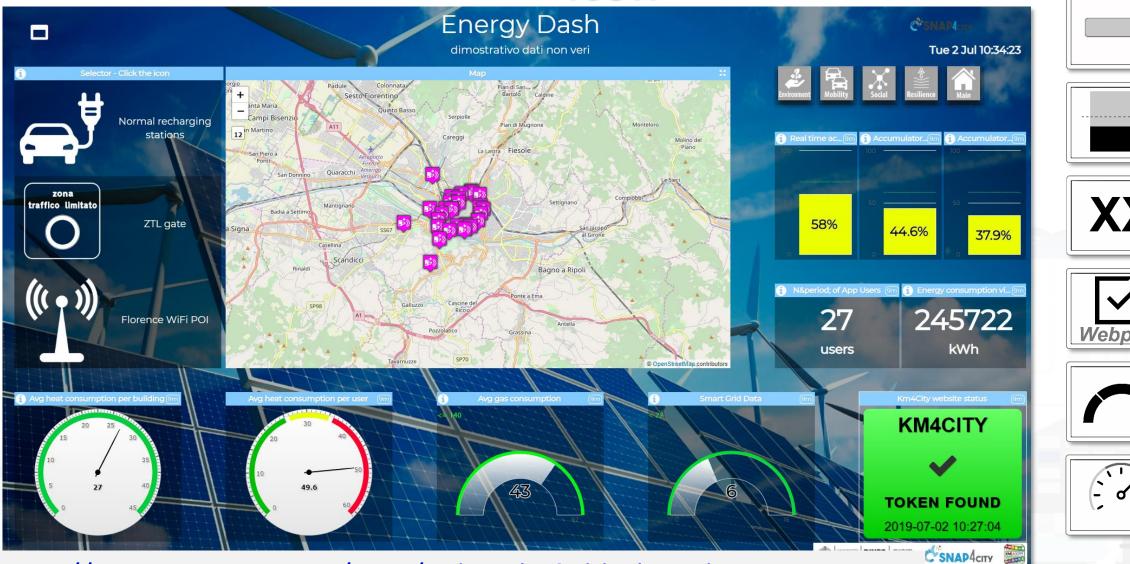


DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB





Icon



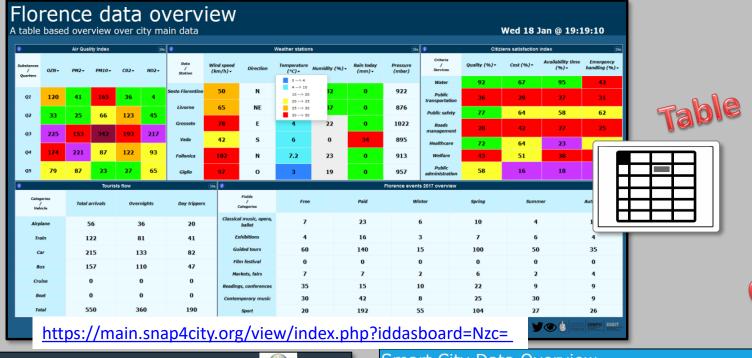




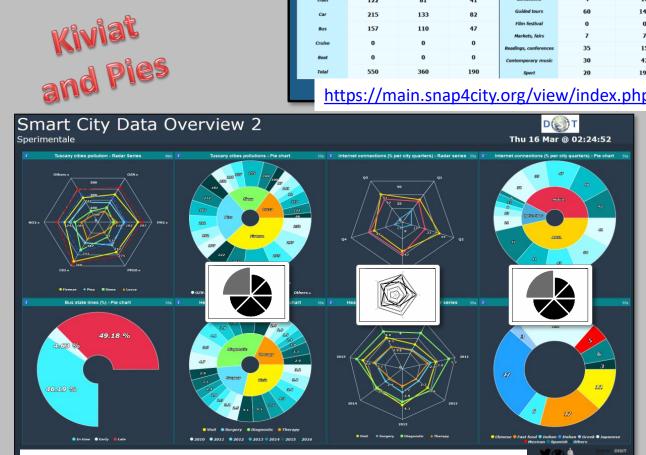




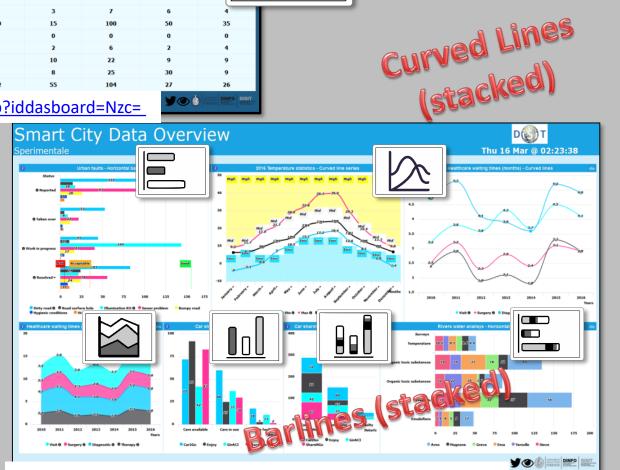
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Snap4City (C), No



https://main.snap4city.org/view/index.php?iddasboard=MTAw

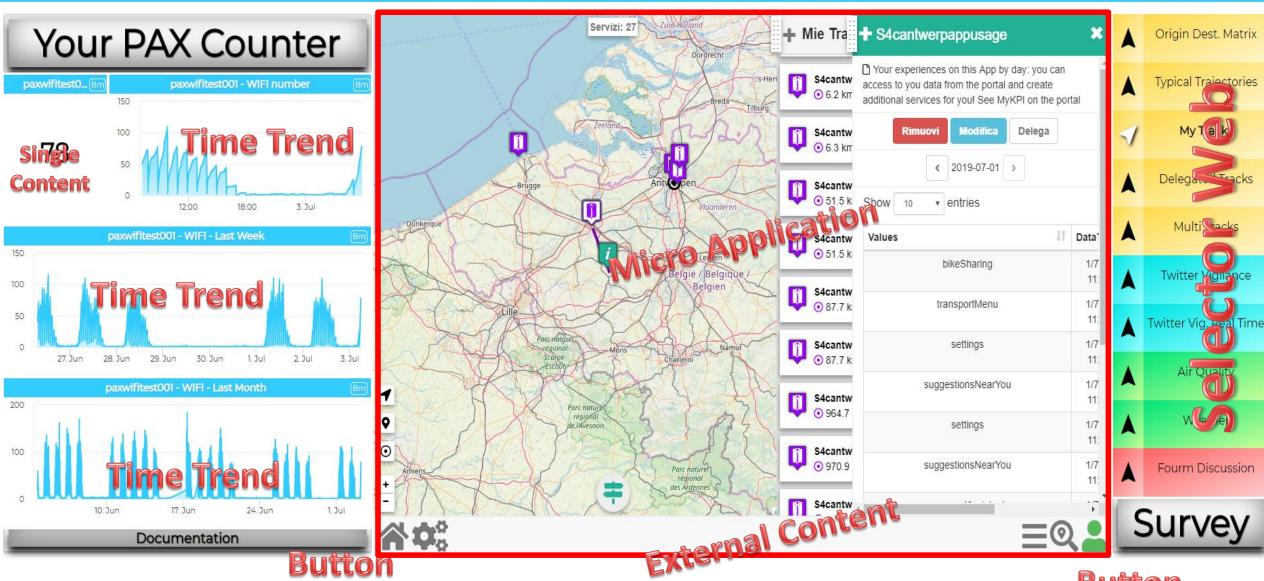


https://main.snap4city.org/view/index.php?iddasboard=ODM=

Monitoring My PAXCounter and Tracks (example)

Please note that the data results are not always based on real data.

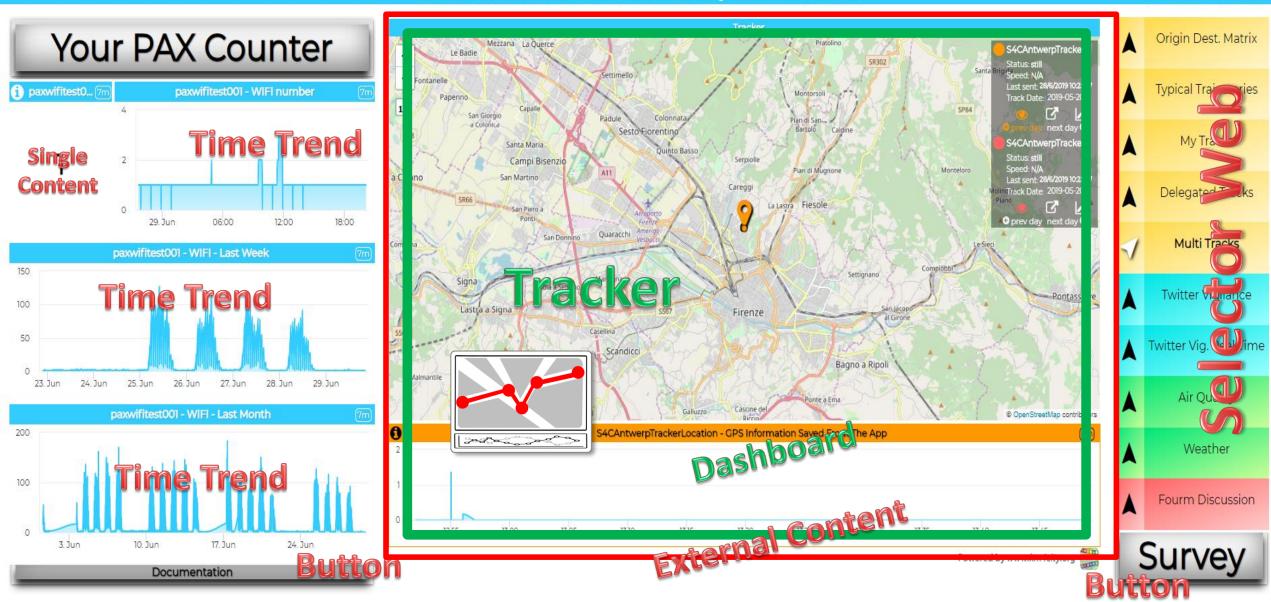
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Monitoring My PAXCounter and Tracks (example)

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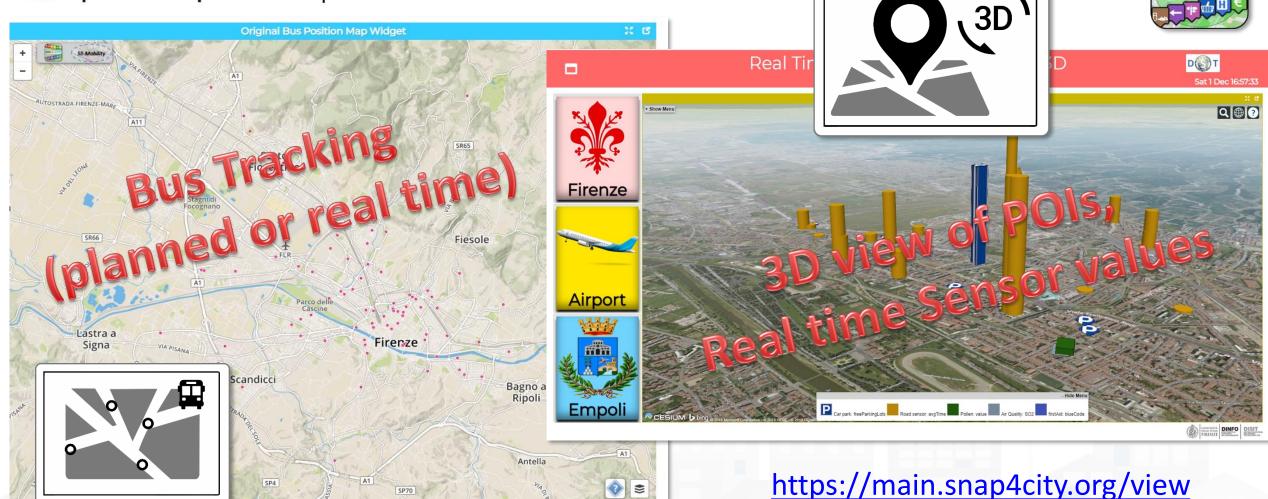
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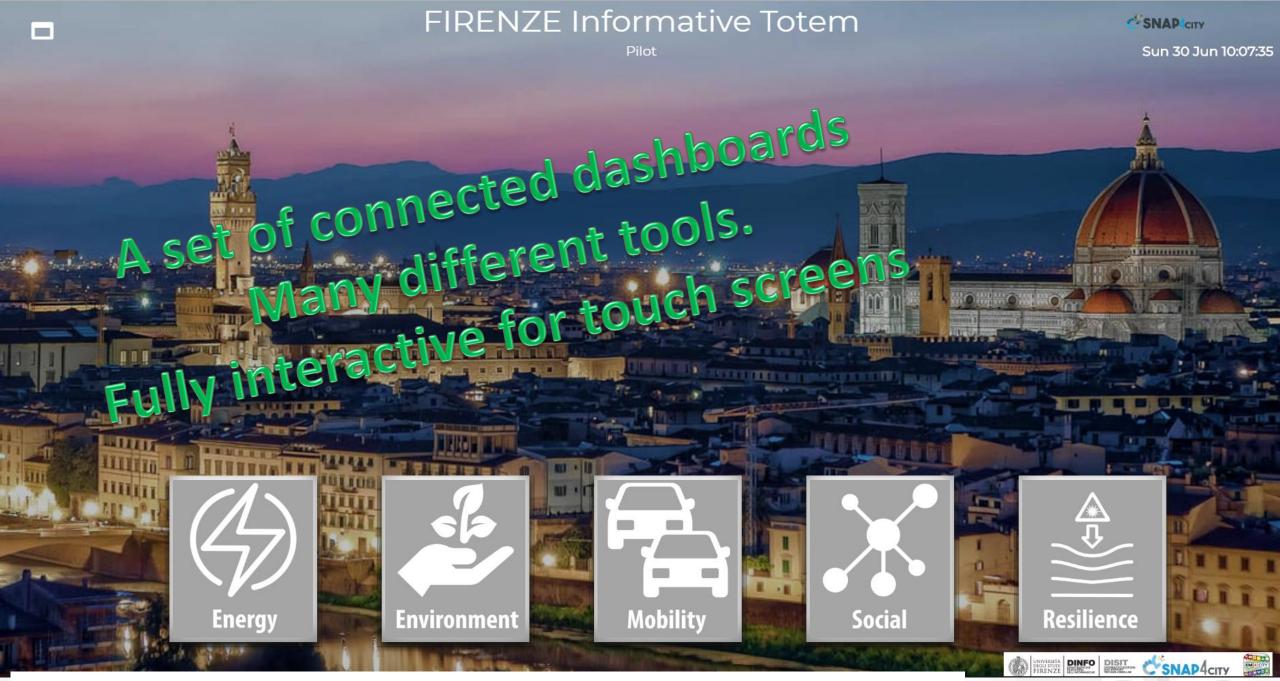






https://www.snap4city.org/dashboardSmartCity/ view/index.php?iddasboard=MTUxMQ==

/index.php?iddasboard=MTY2





FIRENZE



Tue 16 Oct 16:18:39



200

superata la soglia di informazione

39492 Utenti WiFi







180 INSTALLATE

81.1 % ATTIVE

8.9 % IN USO



REPLICATE has received funding from under grant agreement No. 691735.







MAPPA











26 superamenti/anno Riciclo rifiute 56%

Rifiuto per abitante 0.629 t/pers/anno

23.606 euro/pers

6,8%

19.7% km ciclabili/km totali









RISCHIO IDRAULICO

RISCHIO TEMPORALI

RISCHIO IDROGEOLOGICO

RISCHIO NEVE

O GHIACCIO



Tue 16 Oct 16:18:39





COLONNINE RICARICA PASILINSTALLATE 81.1 % GOME 8.9 % IN USO 77





Single Content 39492 Utenti WiFi

Con







56% superamenti/anno

t/pers/anno

23.606 euro/pers

6,8%

19.7% km ciclabili/km total

19°C / 24 °C

Mer 17 Ott 16°C / 24°C

Gio 18 Ott

15°C / 26°C

Ven 19 Ott

Temp N/A

Sab 20 Ott

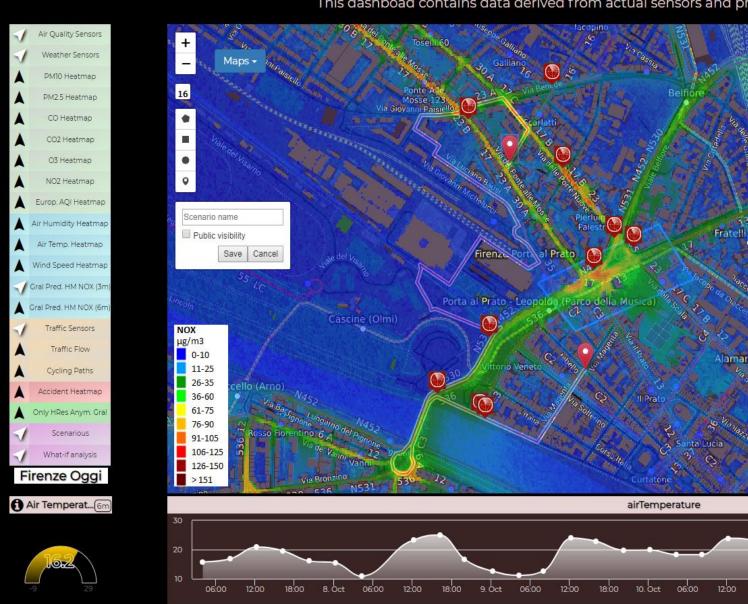
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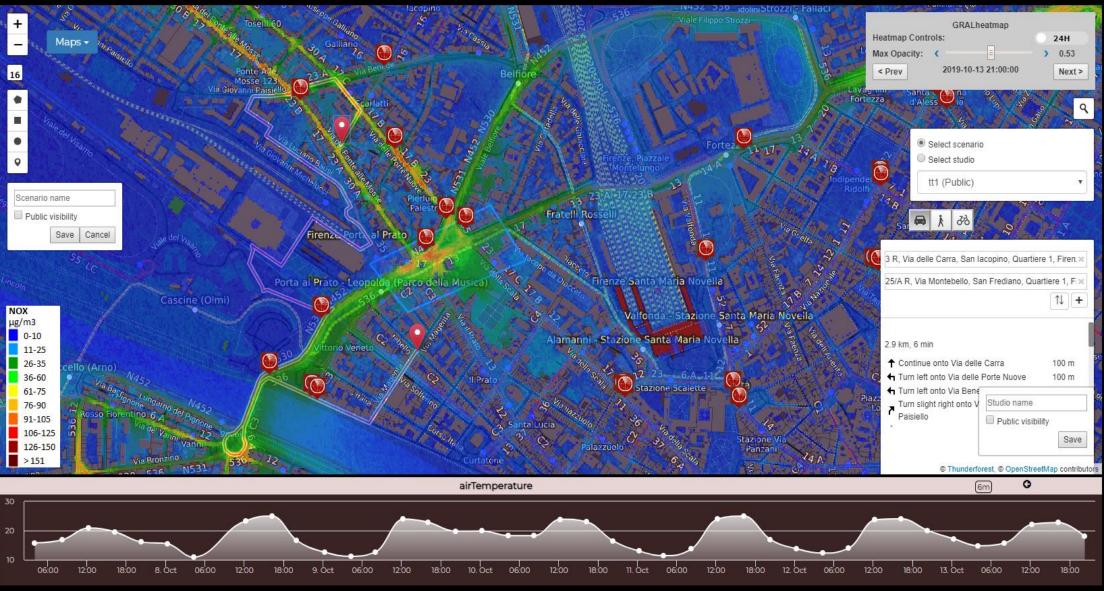
Mobility and Environment What-IF Analysis

C'SNAP4CITY

This dashboad contains data derived from actual sensors and predictive values under validation

Mon 14 Oct 00:48:17













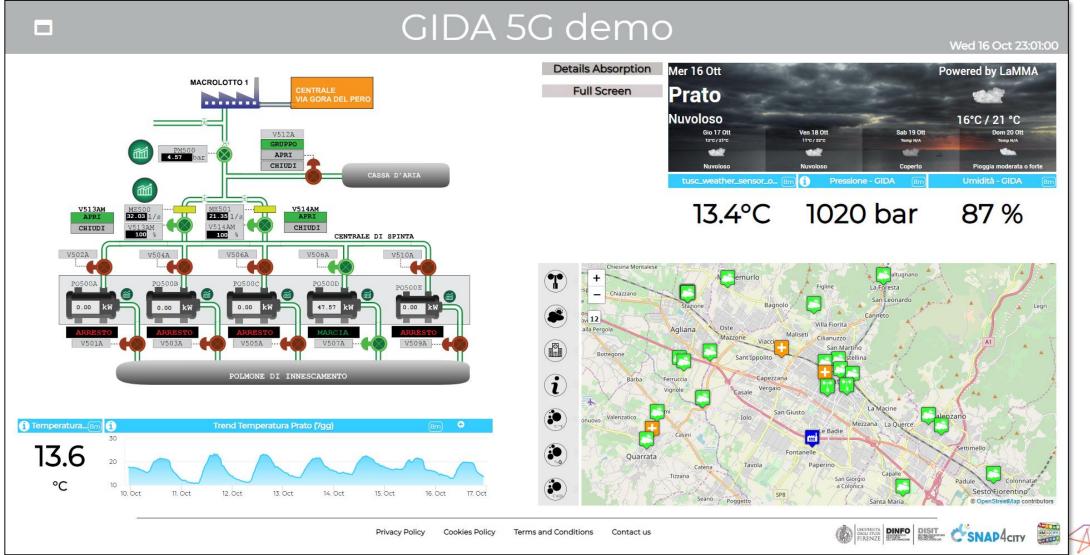


Demo UC5 GIDA





















TOP

Multi Data Maps Widget







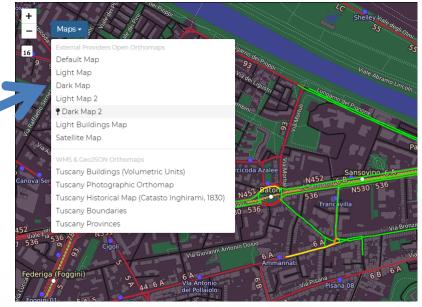




- The most powerful Data Map rendering tool, it supports:
 - KB Sensor data: POI, sensors, actuators, etc. (see in the following)
 - WFS data (see in the following)
 - WMS background maps
 - Ask to a RootAdmin for activating this feature on your MultiDataMap widgets once created the dashboard
 - Maps can come from GIS servers, and WMS
 - WMS Heatmaps
 - Special tools
 - Traffic flow
 - Scenario (see in the following)
 - What-IF (see in the following)







https://www.snap4city.org/dashboardSmartCity/view/ind ex.php?iddasboard=MjE5MA==#





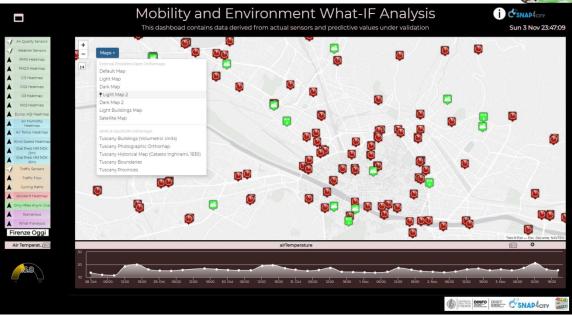
DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB











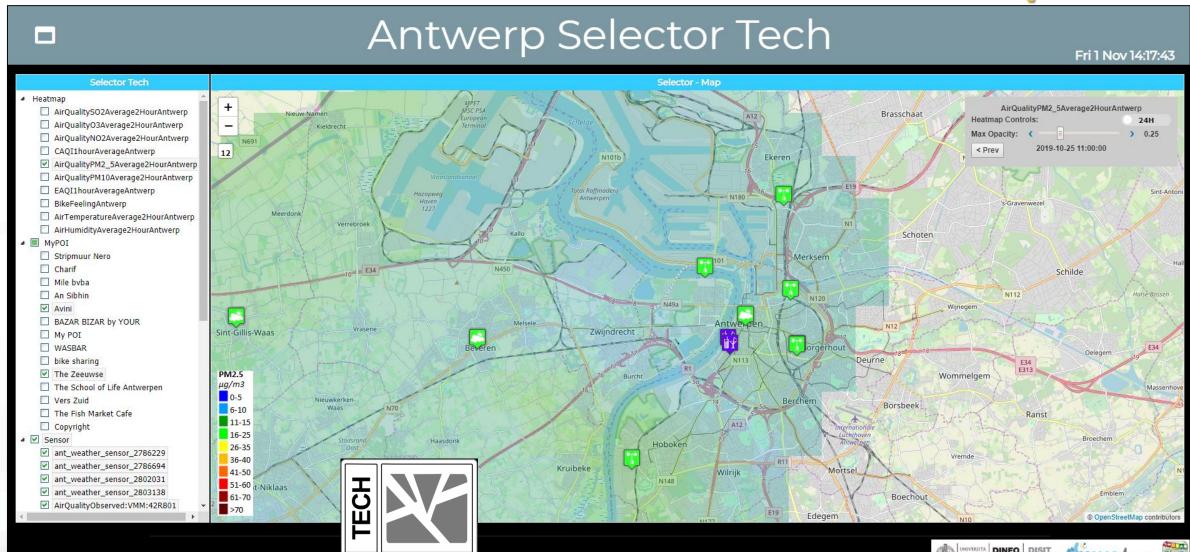








Technical Selector: TECH MultiDataMap





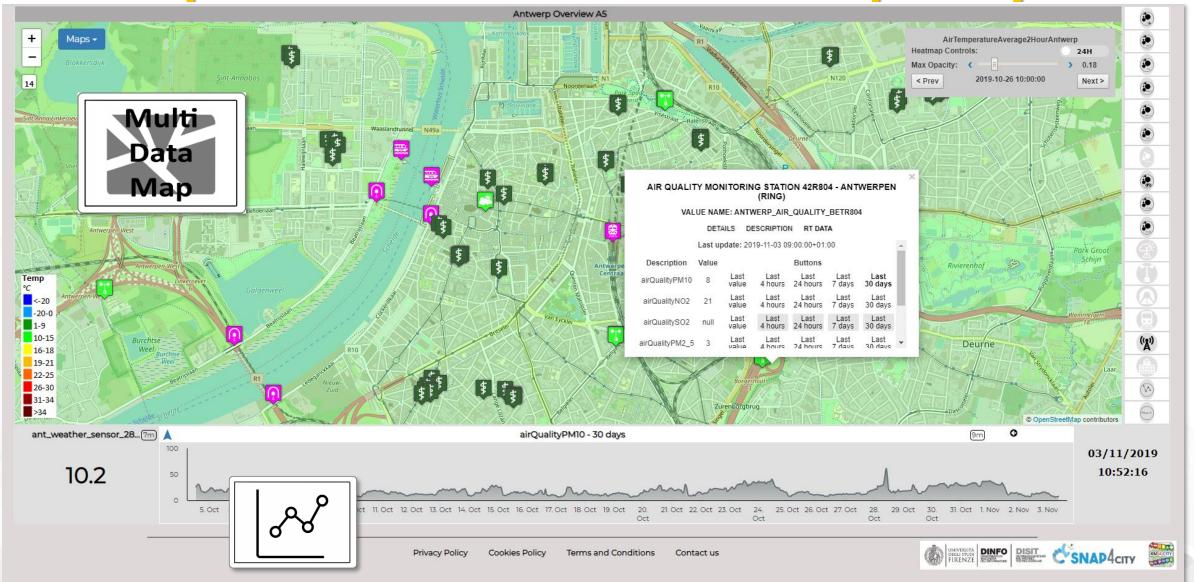








Unique Dashboard builder Multiple Styles











TOP

Unified Data and Services Inspection: Data Inspector



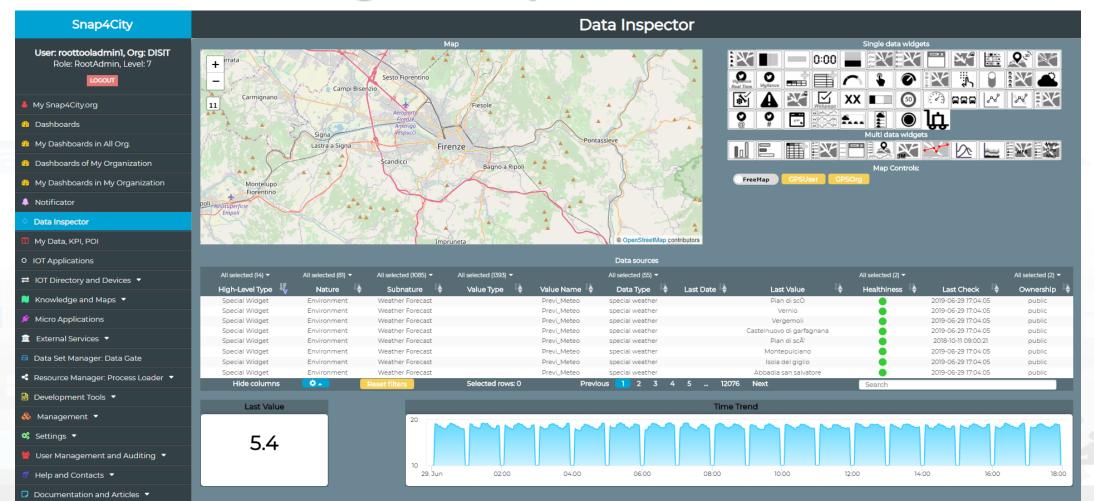








Data Inspector: all you need to know about data, data sources and ingestion processes









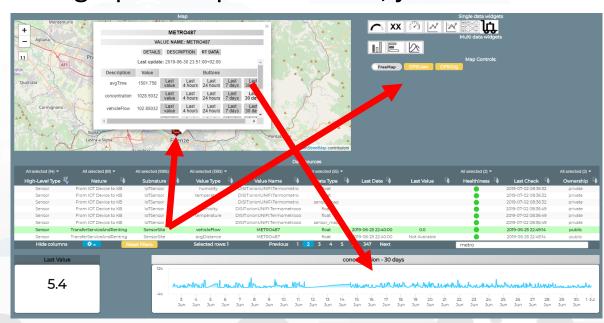
Data Inspector (open on your left side menu)

- Cross Filtering on the basis of:
 - MAP: pan and zoom → lock , center on GPS coordinates of the user
 - Data Source Classification:
 - faceted filtering
 - full text search

Click on data source to see it on map, and see the graphics representation, just to learn

how widgeting it.

- Selecting a Data Source on Map: on its Pin you can see:
 - Real time data
 - Time trend: 4 hours, 12 hours, 1 day, 1 week, 30 days.
 - Full status and description (only for Administrators)



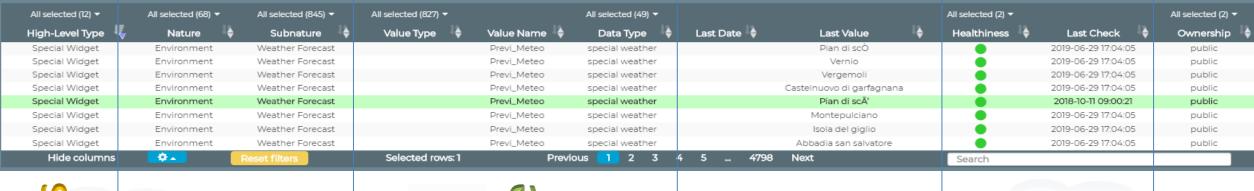








Unified Data and Services Model/Classification



Snap4City (C), November 2019

Semantic

Technical

RealTime

O









All of them can be shown on Dashboards, what about manipulate them!!!!

UIT High Lovel Types L	CDS	Static	Dynamie	MacraCat	Cingle	Time Series	Trainctory	шттр	How to ingest /shange /manage
HLT, High Level Types++	GPS	Static	Dynamic	MacroCat	Single	Time Series	Trajectory	НТТР	How to ingest/change/manage
Complex Event	Yes		Yes	Yes	Yes	Yes			Dashboard, ETL, Special, IOT App
API (Ext. Srv., any prot.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	ETL, Special, IOT App
External Service (web pag)								Yes	ETL, Special, IOT App, Web Scraper
KPI			Yes		Yes				Dashboard, IOT App, API
MicroApplication								Yes	Dashboard, IOT App, API
Dashboard-IOT App			Yes		Yes	Yes			Dashboard, IOT App, API
My Personal Data			Yes			Yes			Dashboard, IOT App, UserInterf, API
MyKPI	Yes		Yes		Yes	Yes	Yes		Dashboard, IOT App, UserInterf, API
MyPOI	Yes	Yes		Yes	Yes				Dashboard, IOT App, UserInterf, API
Heatmap	Yes		Yes		Yes	Yes			IOT App, MicroService, UserInterf, API
Sensor	Yes	Yes	Yes	Yes	Yes	Yes			IOT Directory, IOT App, UserInterf, API
Sensor Actuator	Yes	Yes	Yes	Yes	Yes	Yes			Dashboard, IOT App, UserInterf, API
POI (Point of Interest)	Yes	Yes		Yes	Yes				DataGate, ETL, IOT App, API
Special Widget								Yes	ETL, special, IOT App, API
Synoptics MyKPI (groups)			(Yes)		(Yes)	(Yes)		Yes	Special, API
Special Tools	(Yes)		(Yes)		(Yes)		(Yes)	Yes	As MyPersonalData
WFS/WMF (GIS)	Yes								From third party tools





Legenda: How to ingest/change/manage

- Dashboard: by creating a Dashboard Widget that can act/change the values with actuators (2nd Day Slides)
- API: you can use the Smart City API to change / provide the values (see 3rd Day Slides)
- IOT App: by developing an IOT Application on Node-RED exploiting Snap4City MicroServices (4th Day Slide, and in part in these slides)
- DataGate: you can use the DataGate tool to ingest the data, and publish them
- ETL: by developing an ETL process, and put it in execution via DISCES
- **IOT Directory**: you can use the IOT Directory tool to change the parameters, and set up the ingestion process, via IOT Brokers, IOT Devices, IOT Edge.
- **Special**: by using a special tool for developing a process, or for creating SVG Synoptics
- **UserInterf**: there is a number of Tools with Graphic User Interface that you can use to change the values, see in the menu on the left.
- Web Scraper: by creating a Web Scraping process and exploiting the results into an IOT Application
- As MyPersonalData: they are substantialy MyPersonalData
- From third party tools: they can be manipulated by using third party tools









TOP

Data Inspector vs Data Processes Details

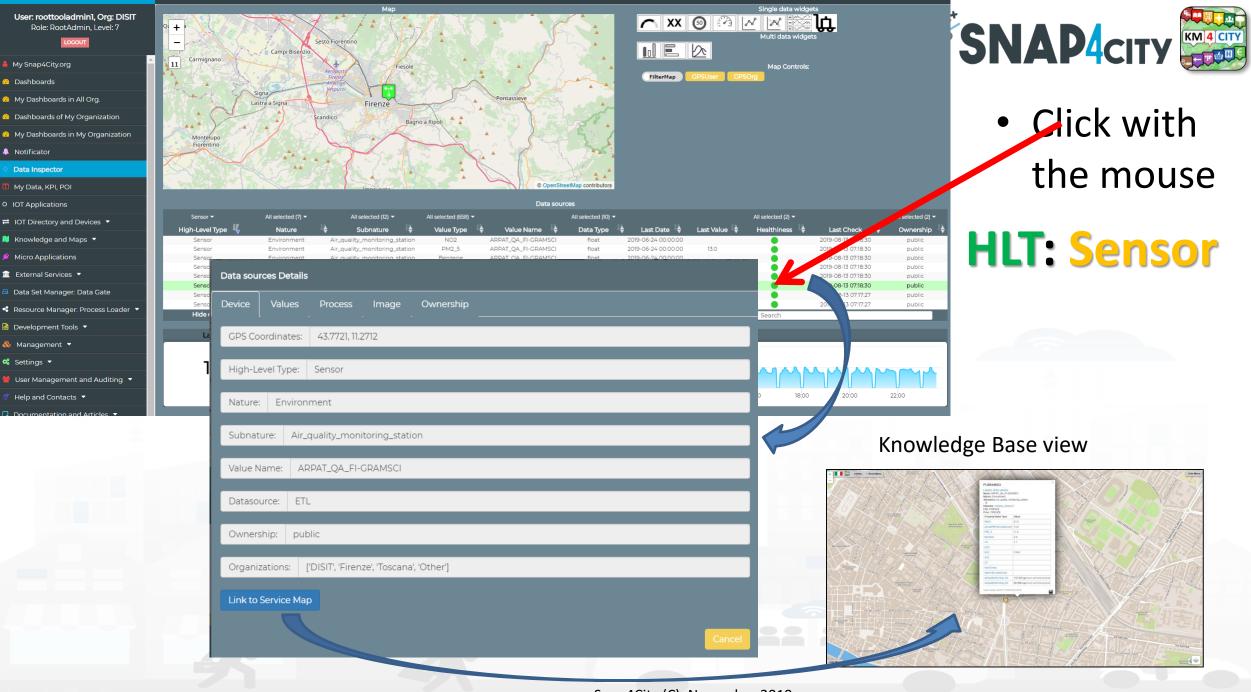






Advanced Features of the Data Inspector

- The data inspector has a number of feature accessible only for RootAdmin, such as:
 - Views on Detailed information on the basis of the High Level Type
 - Values connected to the data (structure of the single data)
 - Details regarding the ingestion process
 - Eventual image representing the City Entity, for example the sensor
 - Ownership (licensing) details regarding the data owner
- So that you can access on the Snap4City version if you install on premise.
- A part of these features can be activate for the Organization Managers: «ToolAdmin» roles.



Data Inspector

Snap4City

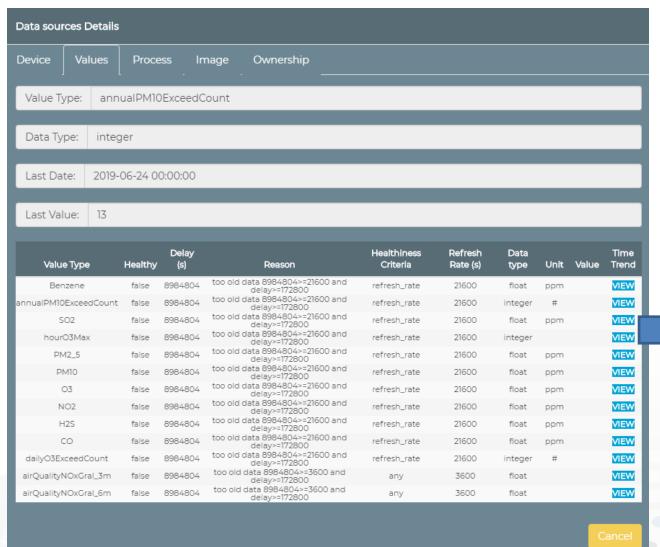




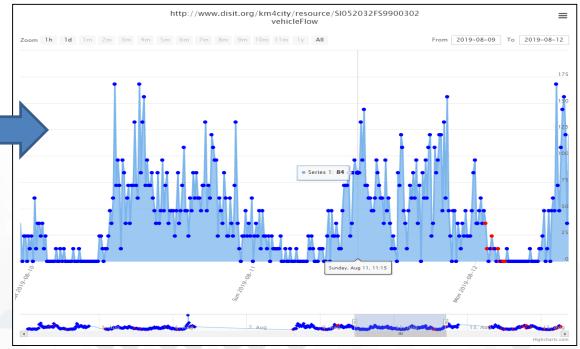








- Specific values of selected
- Infomation of the values of the other sensors on the same device
- View Trends, marking problems, healthiness by point according to a Fuzzy model







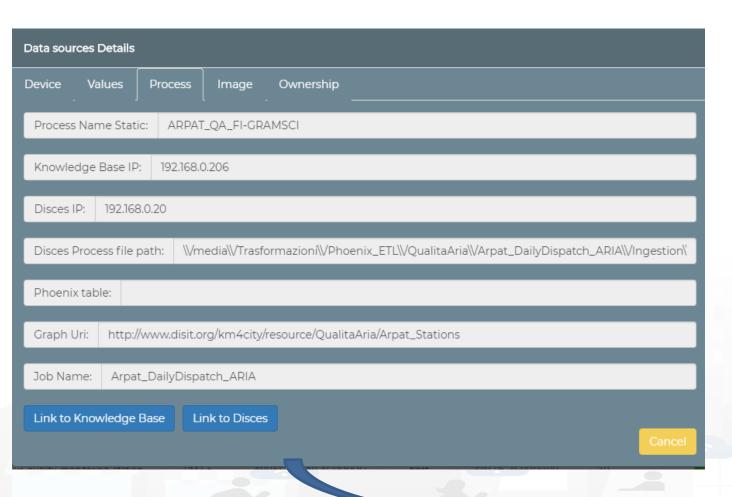








Details regarding the Ingestion process



- For ETL processes
- Scheduling details and status

DISCES Process Scheduler view

Jobs Triggers New	Job New Job (dormant)	New Trigger Start Scheo	duler Standby Scheduler	Shutdown Scheduler	Force Shutdown Scheduler	Pause Triggers Resun	ne Triggers Nodes Status	Nodes Log Log Cl	uster Back Home	Push
1 2 3 4 5 6	7 8 9 10 11 12	13 14 15 16 17	18 19 20 21 22	23 24 25 26 2	7 28 29 30 31	32 33 34 35 36	37 38 39 40 41	42 43 44 45 46	47 48 49 50 51	next > >>
SCHEDULER NAME	ID ‡	DATE	JOB NAME	JOB GROUP	STATUS	PROGRESS	TRIGGER NAME	TRIGGER GROUP	PREV FIRE TIME	NEXT FIRE TIME
# ∰ ► H ■ ■ # SCE	9448	2019-10-26 23:58:00	TheThingsNetwork_A ntwerp_KPI	TheThingsNet_PaxCo unter	RUNNING		TheThingsNetwork_A ntwerp_KPI_trigger	TheThingsNet_PaxCo unter_trigger	2019-10-26 23:58:00	2019-10-27 00:03:0
X ∰ ► II ■ ■ W / SCE	9447	2019-10-26 23:58:00	Pronto_Soccorso_Pist oia_Phoenix	Pronto_Soccorso_Ph oenix	RUNNING		Pronto_Soccorso_Pist oia_Phoenix_trigger	Pronto_Soccorso_Ph oenix_trigger	2019-10-26 23:58:00	2019-10-27 00:13:0
# ∰ ► H ■ ■ W	9446	2019-10-26 23:58:04	Pronto_Soccorso_Car eggi	Pronto_Soccorso	FAILED		Pronto_Soccorso_Car eggi_trigger	Pronto_Soccorso_trig ger	2019-10-26 23:58:00	2019-10-27 00:13:0
# ∰ ► H ■ ■ W / SCE	9445	2019-10-26 23:58:00	CarPark_FirenzeParc heggi_Phoenix	CarPark_Phoenix	RUNNING		CarPark_FirenzeParc heggi_Phoenix_trigge r	CarPark_Phoenix_trig	2019-10-26 23:58:00	2019-10-27 00:13:0
# ∰ ► H ■ ■ # SCE	9444	2019-10-26 23:58:00	AVM_delay_Firenze_ ATAF	AVM_tuscany	RUNNING		AVM_delay_Firenze_ ATAF_trigger	AVM_tuscany_trigger	2019-10-26 23:58:00	2019-10-27 00:03:0
# SCE ■ ■ ■ ■	9443	2019-10-26 23:58:00	sensori_FIRENZE_I	sensori_FIRENZE	RUNNING		sensori_FIRENZE_tri	Sensori_trig	2019-10-26 23:57:59	2019-10-27 00:02:5
# ≅ ► H ■ ■ FSCE	9442	2019-10-26 23:58:03	Previ_meteo_Poppi_x ml_T	Previ_meteo_Poppi_x ml	SUCCESS	100%	MT_bhco9jib9ddj1	DEFAULT	2019-10-26 23:57:29	1970-01-01 01:00:0
/ SCE	9441	2019-10-26 23:58:00	Previ_meteo_Badia_T edalda_xml_I	Previ_meteo_Badia_T edalda_xml	RUNNING		Previ_meteo_Badia_T edalda_xml_trig_I	Previsioni_trig	2019-10-26 23:57:05	2019-10-27 04:57:0
# B ► H ■ ■ FSCE	9440	2019-10-26 23:57:14	CarPark_MIIC_160_P hoenix	CarPark_Phoenix	SUCCESS	100%	CarPark_MIIC_160_P hoenix_trigger	CarPark_Phoenix_trig ger	2019-10-26 23:57:00	2019-10-27 00:17:0
# 8 ► II ■ ■ II	9439	2019-10-26 23:57:05	sensori_PRATO_I	sensori_PRATO	SUCCESS	100%	sensori_PRATO_trig_I	Sensori_trig	2019-10-26 23:56:59	2019-10-27 00:01:5
# ∰ ► ■ ■ SCE	9438	2019-10-26 23:57:29	Previ_meteo_Poppi_x ml_l	Previ_meteo_Poppi_x ml	SUCCESS	100%	Previ_meteo_Poppi_x ml_trig_l	Previsioni_trig	2019-10-26 23:56:42	2019-10-27 04:56:4
% ∰ ► H ■ ■ W / SCE	9437	2019-10-26 23:57:46	TheThingsNet_PaxCo unter_FI_KPI	TheThingsNet_PaxCo unter	FAILED		TheThingsNet_PaxCo unter_FI_KPI_trigger	TheThingsNet_PaxCo unter_trigger	2019-10-26 23:56:00	2019-10-27 00:01:
# ∰ ► H ■ ■ W / SCE	9436	2019-10-26 23:56:12	Pronto_Soccorso_US L10 Phoenix	Pronto_Soccorso on onix	CCESS	100%	Pronto_Soccorso_US L10 Phoenix triager		2019-10-26 23:56:00	2019-10-27 00:11:0





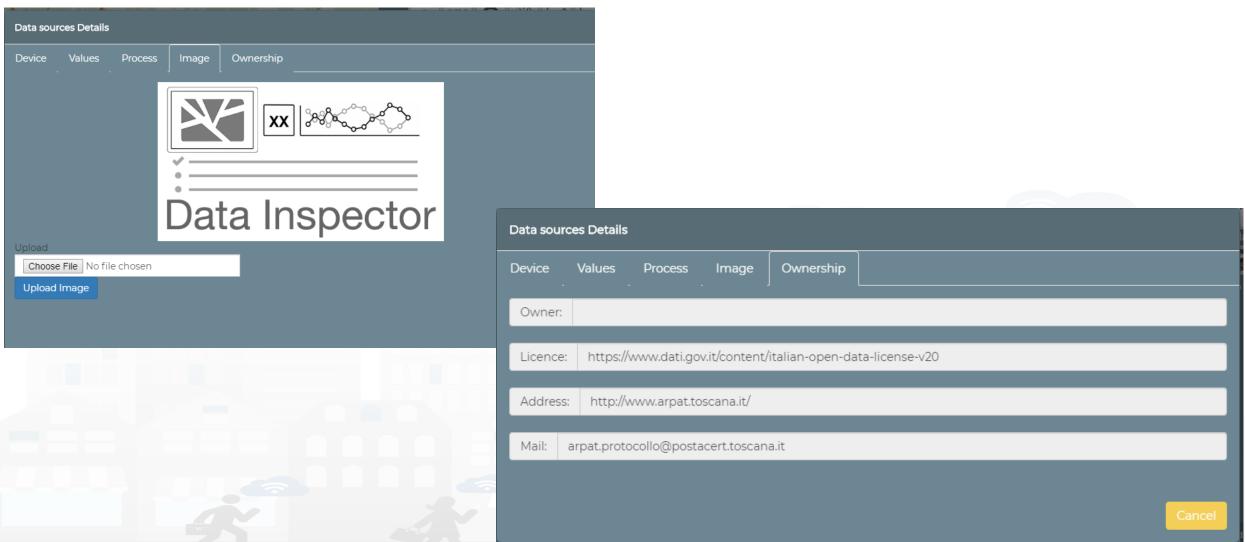








Image of the Devices and Licensing

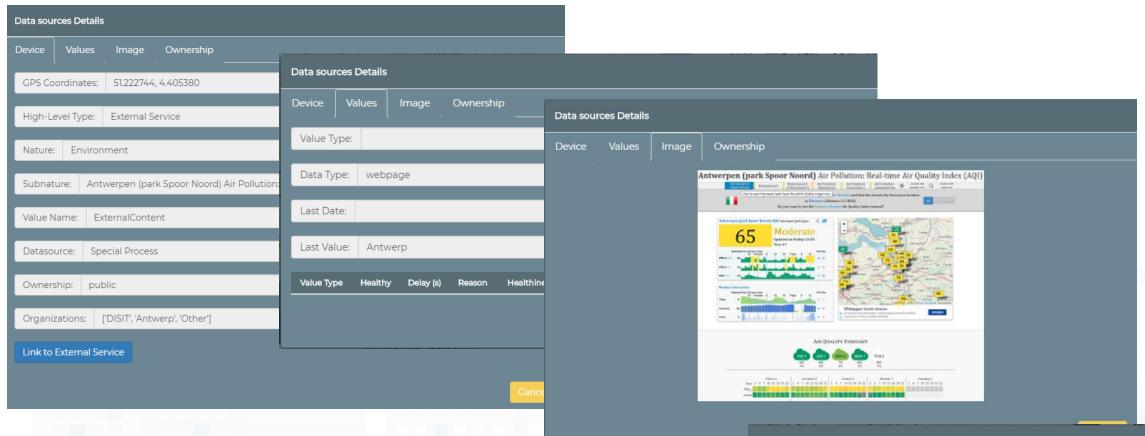












The fields shown may be present or not depending on the HLT and on the information received

Data sources Details								
	Values .	Image	Ownership					
Owner:			, 					
Owner.								
				Cancel				









TOP

From Data to Graphic Widgets







HLT: Complex events

• Complex Event

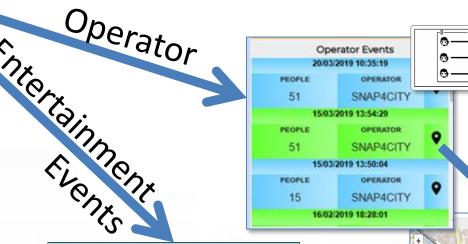
- Dashboard-IOT App
- External Service
- Heatmap
- **KPI** (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

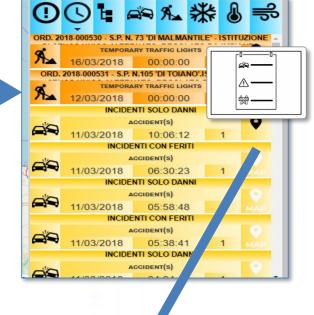
Level

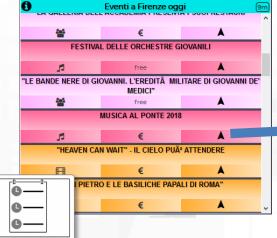
High

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- WFS (GIS)

Traffic Events









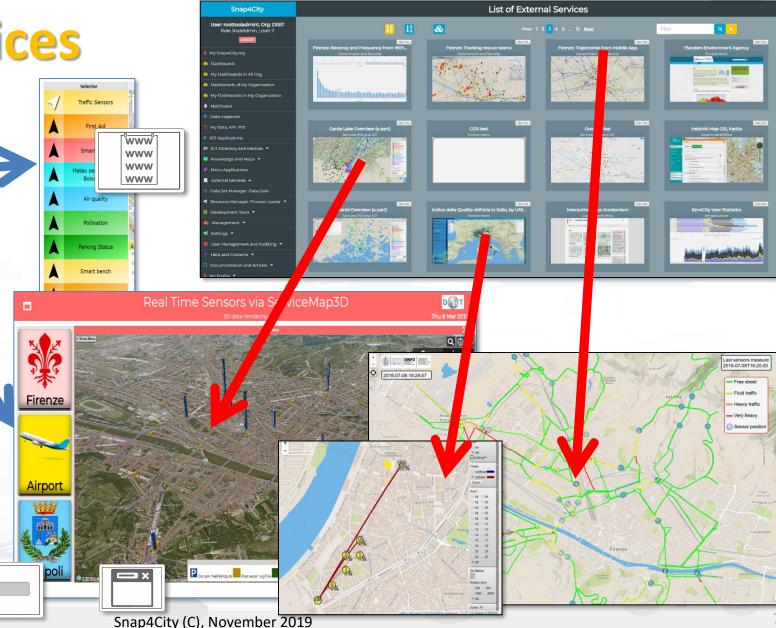


HLT: External Services

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- KPI (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

Level

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)



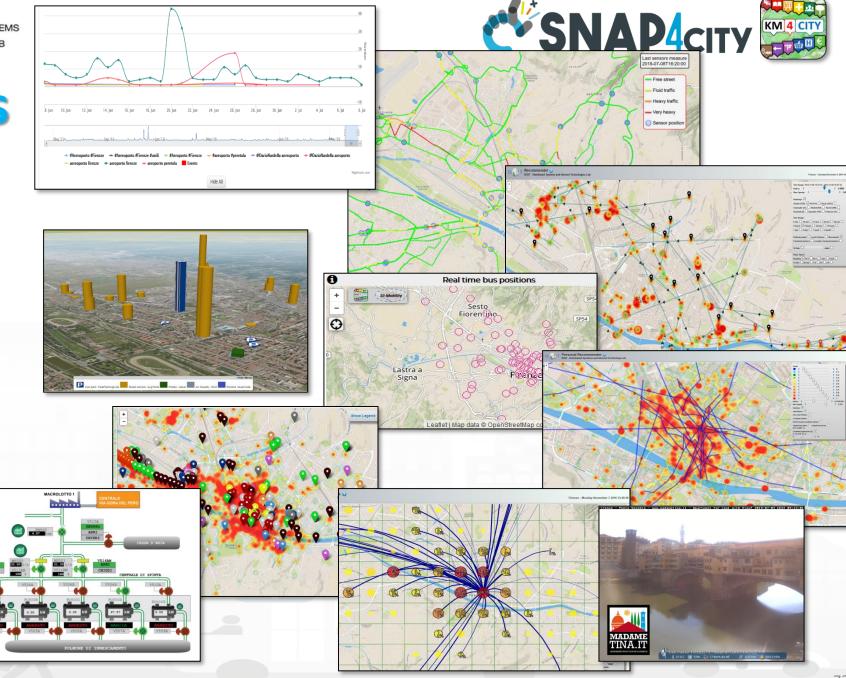






External Services

- Twitter Vigilance:
 - Daily and real time
 - Volume and sentiment analysis
- Services on Maps, GIS, ArcGIS
- Real time sensors on 3D
- Web HTML5 Applications
- Origin Destination Matrix
- Real Time fleets
- Routing, Multimodal tools
- IPCAM connector
- Synoptics
- Third party tools!
- •
- Other tools also internal
 - Traffic Flow Reconstruction
 - User behaviour monitoring
 - Tracking tools
 - Heatmaps tools
 - Trajectories tools







IPCAM Service

• Examples:

- https://main.snap4city.org/cam/ipCam.php?IP=www. meteofirenzehoteldavid.com/webcam/pontevecchio.j pg
- https://main.snap4city.org/cam/ipCam.php?IP=www. meteofirenzehoteldavid.com/webcam/Firenze-HotelDavid.jpg
- https://main.snap4city.org/cam/ipCam.php?IP=192.16
 8.0.240/tmpfs/auto.jpg
- https://main.snap4city.org/cam/ipCam.php?IP=www.c agliarimeteo.it/images/webcam/1/Cam1.jpg
- **—** ...
- To access with credentials you need to add setting on an IP Cam Table on Dashboard Builder!
- Use <a href="https://main.snap4city.org/cam/ipCams.php?IP="https://main.snap4city.org/cam/ipCams.php."https://main.snap4city.org/cam/ipCams.php.





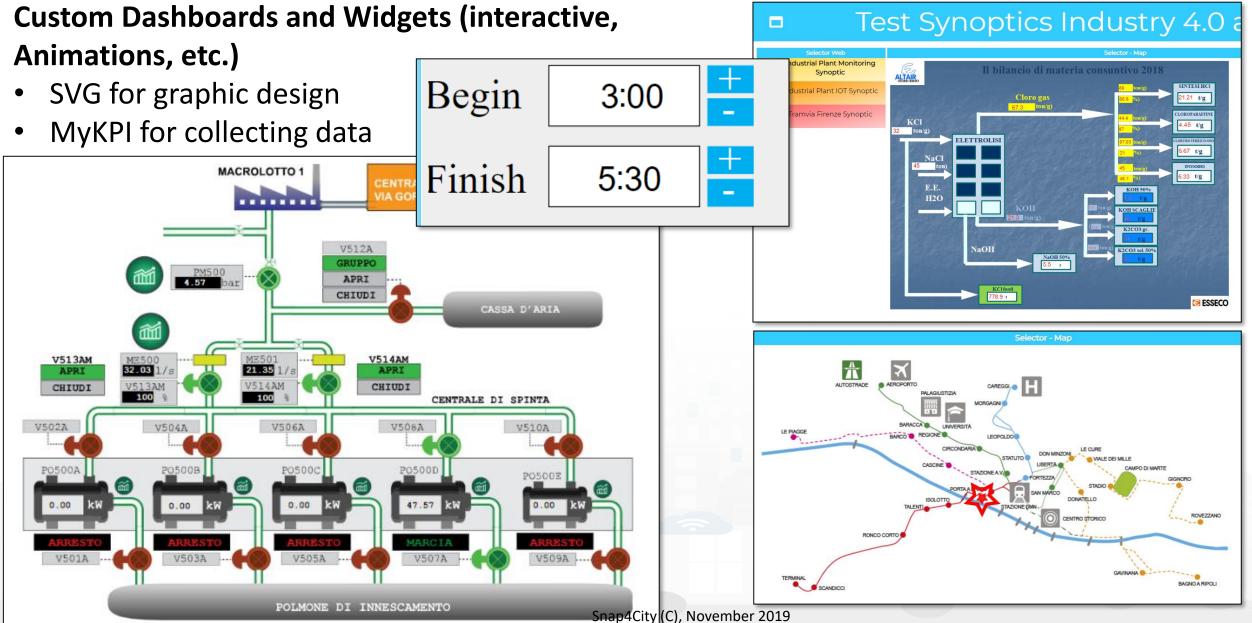




DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB CUSTOM Widgets











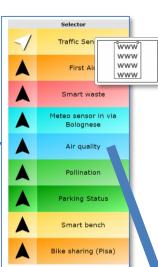


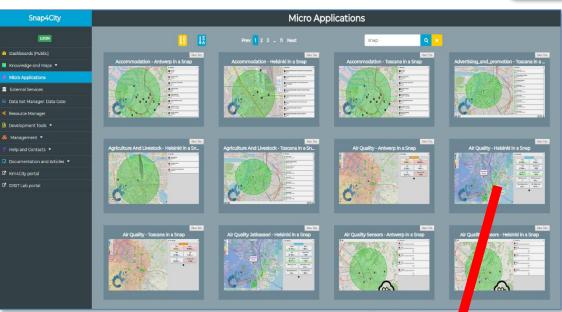
HLT: MicroApplications

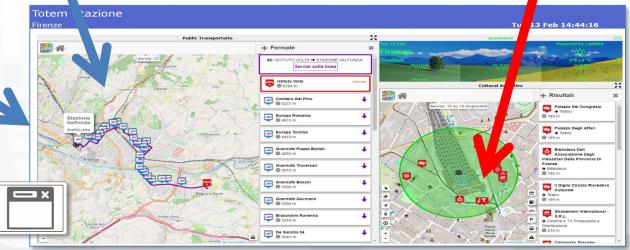
- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- KPI (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

Level

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- WFS (GIS)

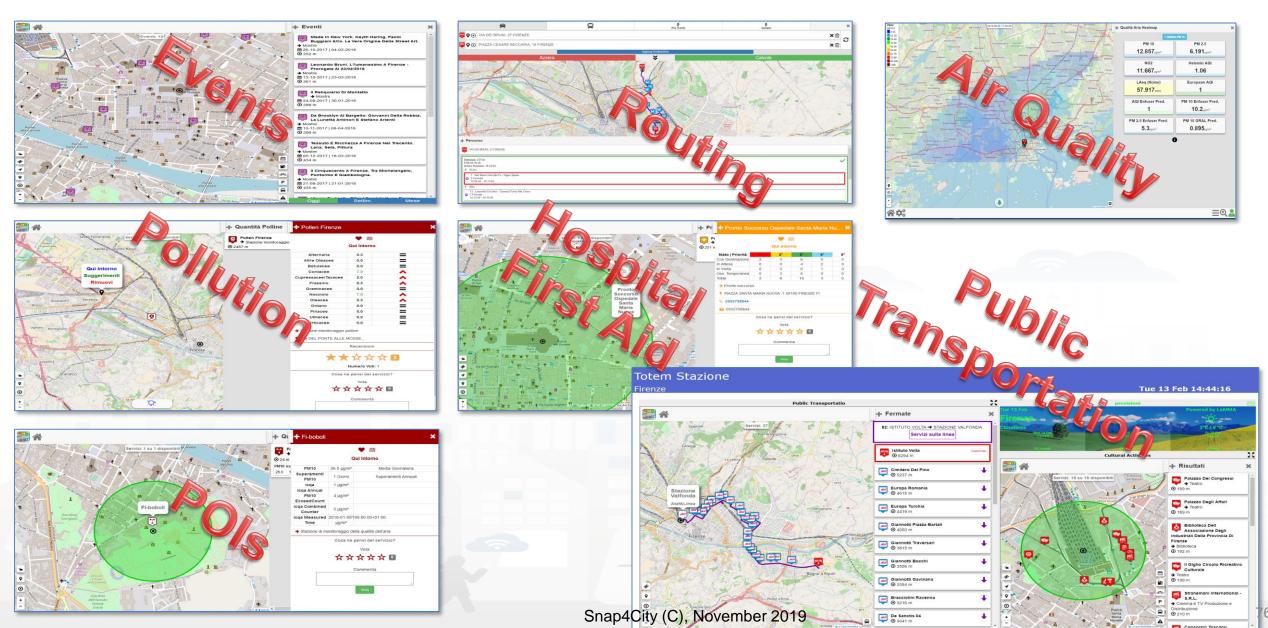






HTML5 MicroApplications



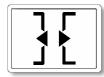








Webpage







HLT: Special Widgets

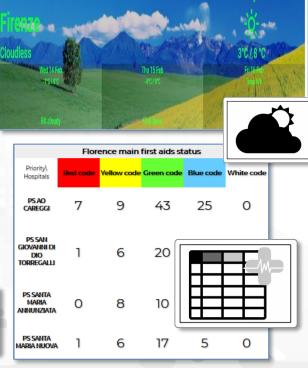
- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- KPI (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI
- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)





Snap4City (C), November 2019









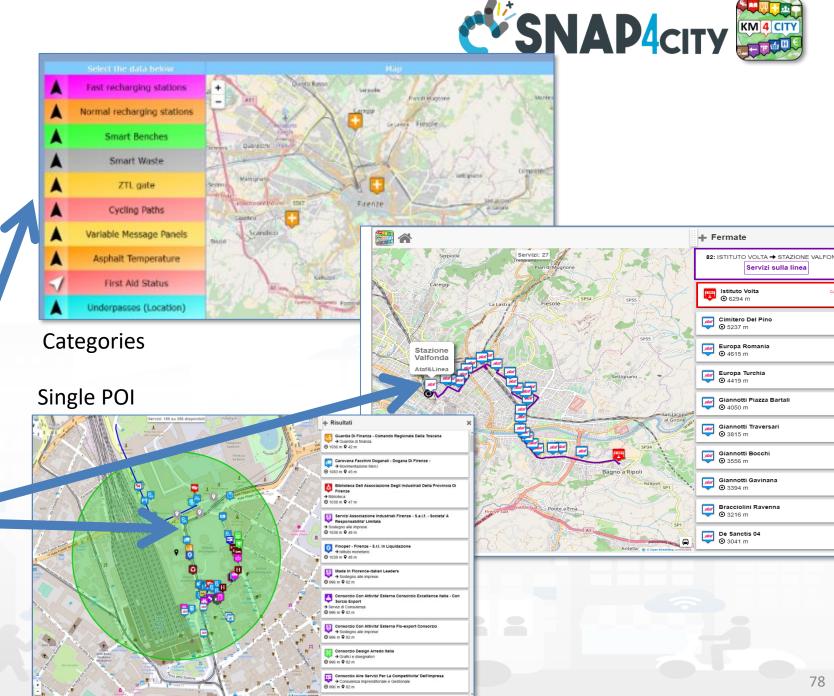


HLT: POI

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- **KPI** (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

evel

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)







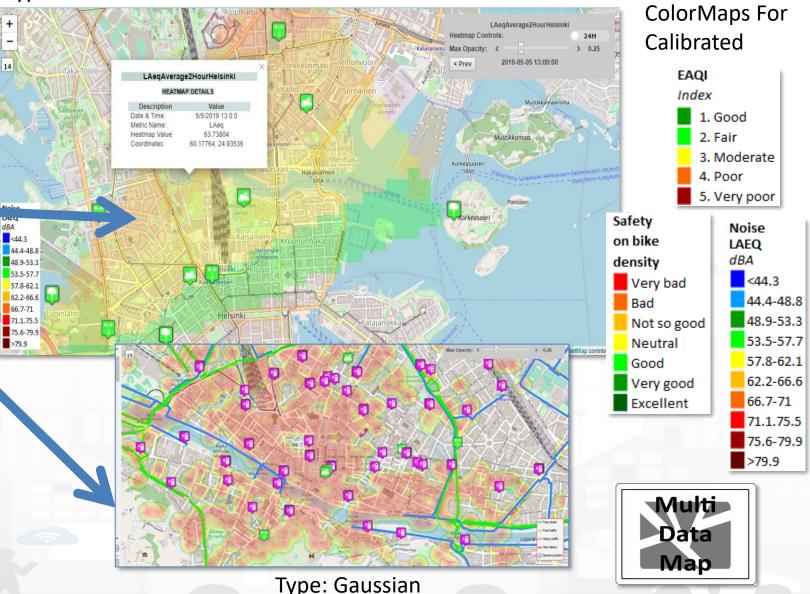




HLT: Heatmaps

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- KPI (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI
- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)







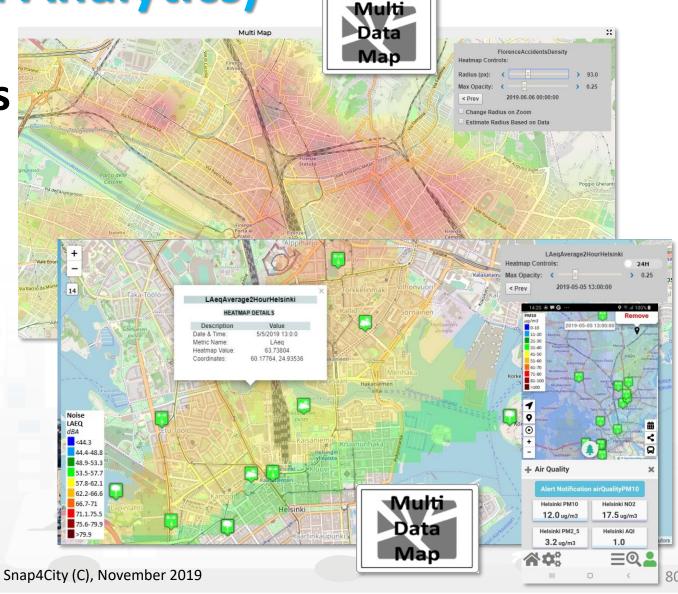






Heatmaps (flexible Data Analytics)

- Main:
 - -Heatmaps are Time series
- A) Gaussian Heatmaps
- B) Calibrated heatmaps
 - From 200x200 to 4x4 mt
 - PM10, PM2.5, SO2, NO2, Noise,
 NO, O3, Enfuser, **GRAL**,....
 - Any programmed Color map
 - Animations
 - Piking values in any place, values on their position.
 - On Web and Mobile App



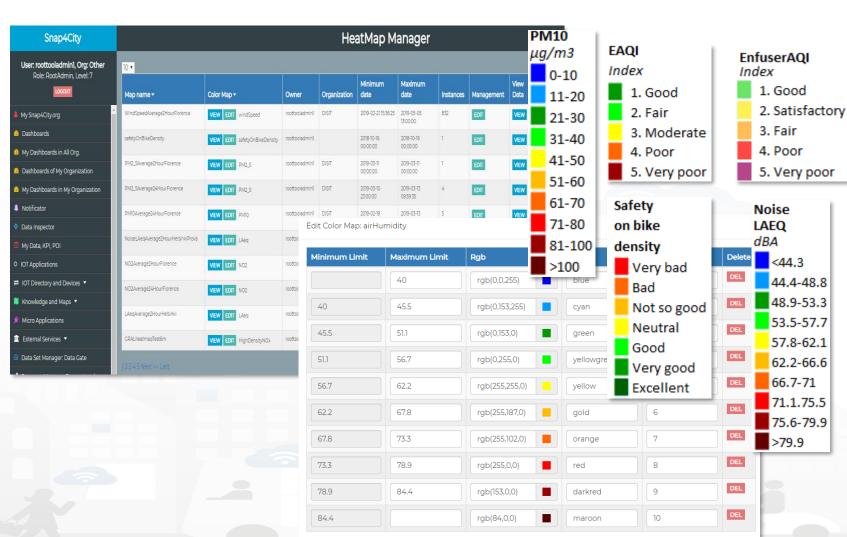






HeatMap Manager: managing, colormaps

- Historical data, time series
- Huge amount of data and points per heatmap
- Multiple formats
- High speed computing
- WMS (GIS) compliant
- Animations
- Color maps: from few (5) to dense color scale (1000)
- Picking any place
- Smart City API to get them



HLT: KPI (key Performance Indicator)

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- **KPI** (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

Level

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)





Snap4City (C), November 2019



Dirty road Road surface hole

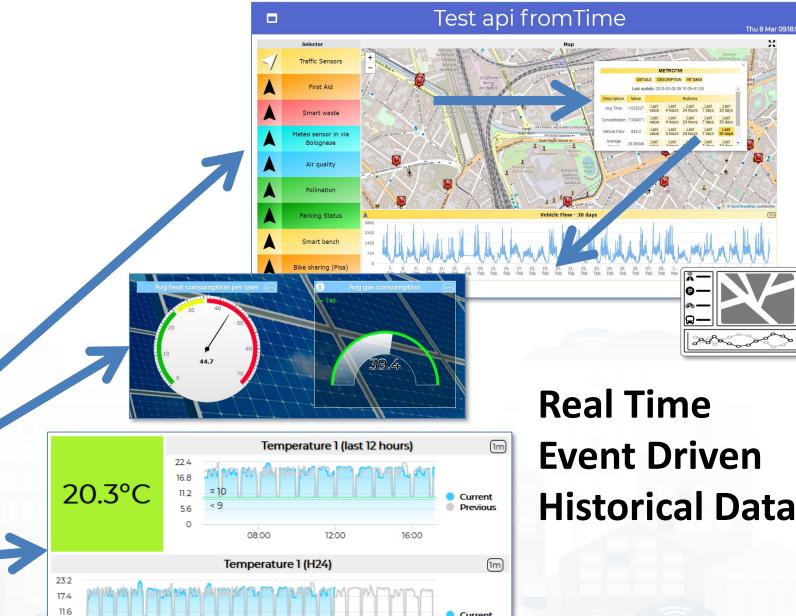
Hygienic conditions

Urban faults - Bars

Illumination KO

HLT: Sensors

- **Complex Event**
- Dashboard-IOT App
- **External Service**
- Heatmap
- **KPI** (Key Performance Indicator)
- **MicroApplication**
- My Personal Data
- MyKPI
- MyPOI
- POI (Point of Interest)
- Sensor
- (Sensor Actuator)
- **Special Widget**
- Wfs (GIS)



5.8











HLT: Sensors

- Sensors can arrive in platform as follows (see Nature)
 - ETL processes in PULL
 - As Periodic processes
 - From IOT Devices to KB (knowledge) base). Registered via IOT Directory, arriving via IOT Broker and saved into the Data Shadow,
 - IOT data driven process in PUSH
 - From Dashboard to IOT Devices (echo) is a virtual sensor Sensor Actuators (HLT),
 - IOT data driven process in PUSH

Accommodation + 🔛 Advertising + AgricultureAndLivestock + 🕅 CivilAndEdilEngineering 🛨 CulturalActivity + EducationAndResearch + + Emergency + Lntertainment + Environment + 6 FinancialService + GovernmentOffice + ⊞ HealthCare + IndustryAndManufacturing + ☑ IoTDevice + MiningAndQuarrying + ShoppingAndService + TourismService + TransferServiceAndRenting + UtilitiesAndSupply + Wholesale +

WineAndFood +

SubNature



Nature

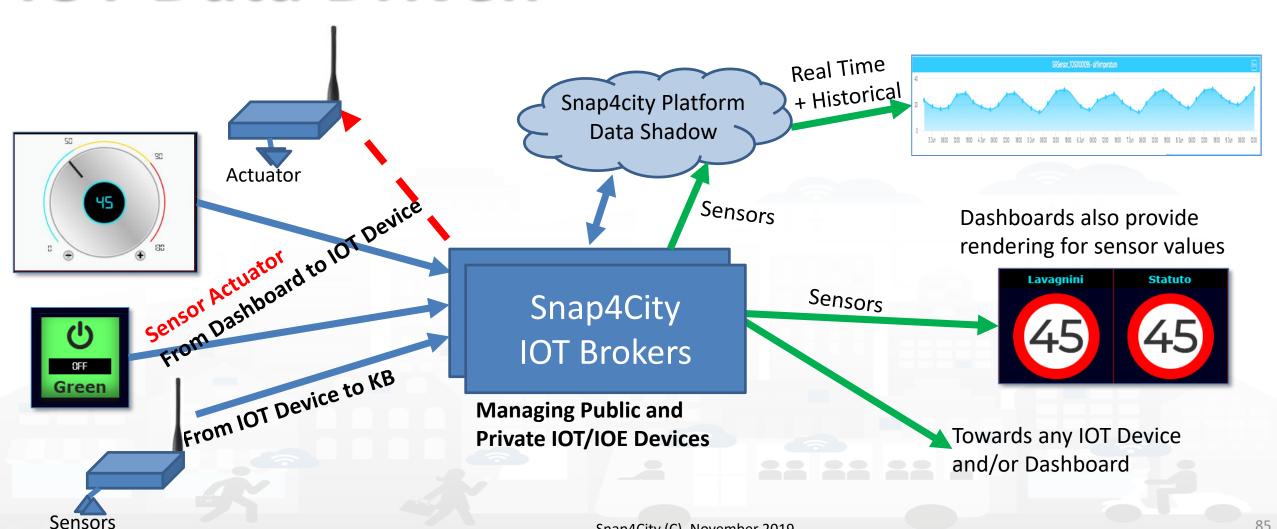








IOT Data Driven





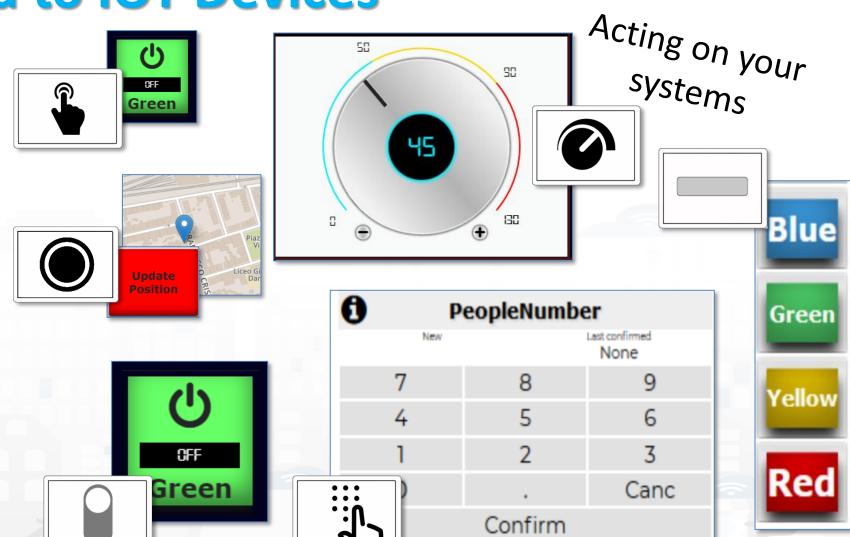






From Dashboard to IOT Devices

- Widgets:
 - Impulse Button
 - Button
 - Switch
 - Dimer/Knowb
 - KeyPad
 - geolocator
- Registered on some IOT brokers with NGSI mutual authentication









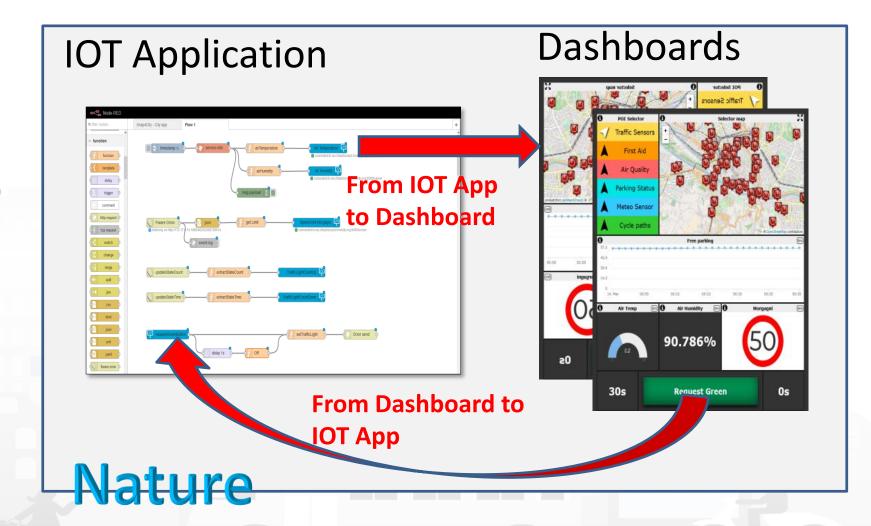


HLT: Sensors-Actuators

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- **KPI** (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

Level

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)









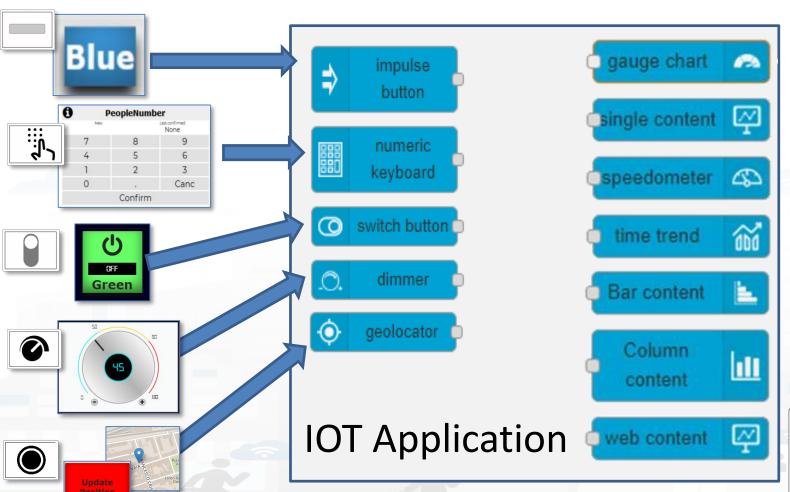
SNAP4city KM4 City



Dashboard-IOT App

From Dashboard to IOT App







Nature





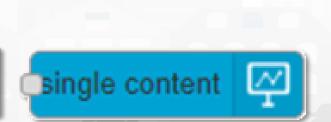
Single Content Widget (flexibility)

From Dashboard
Editor and IOT
Applications, accepts
in input:

- Numbers
- String

XX

HTML code







11440 Utenti WiFi



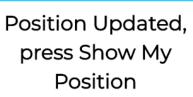
















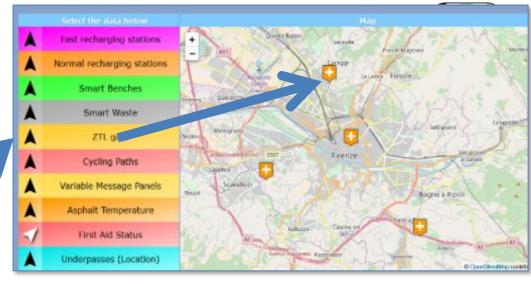


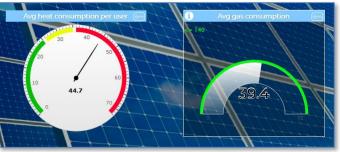
HLT: MyKPI,

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- KPI (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

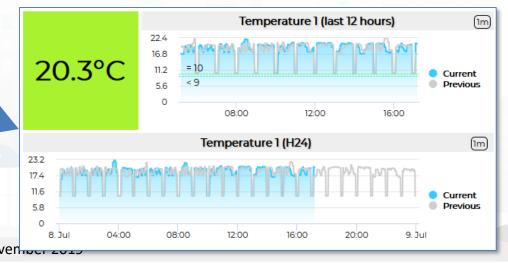
Level

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)





Real Time Event Driven Historical Data





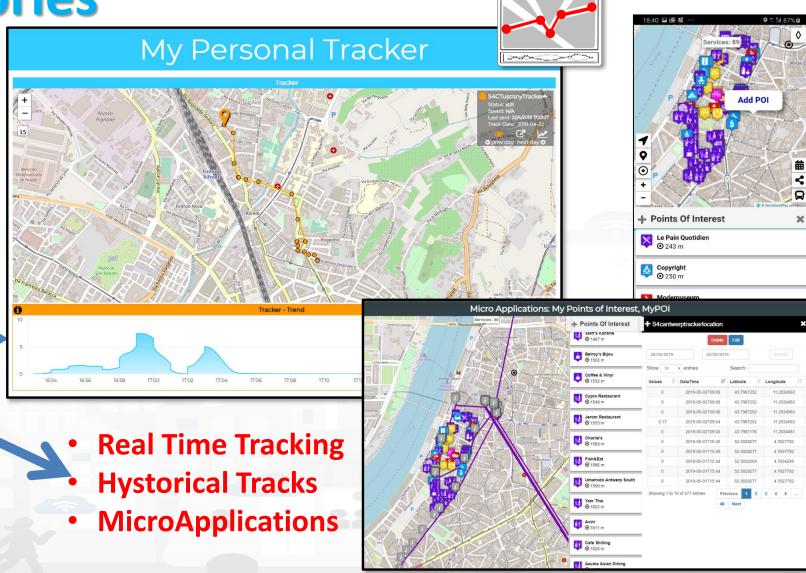


MyKPI as Trajectories

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- KPI (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI

Level

- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- Wfs (GIS)







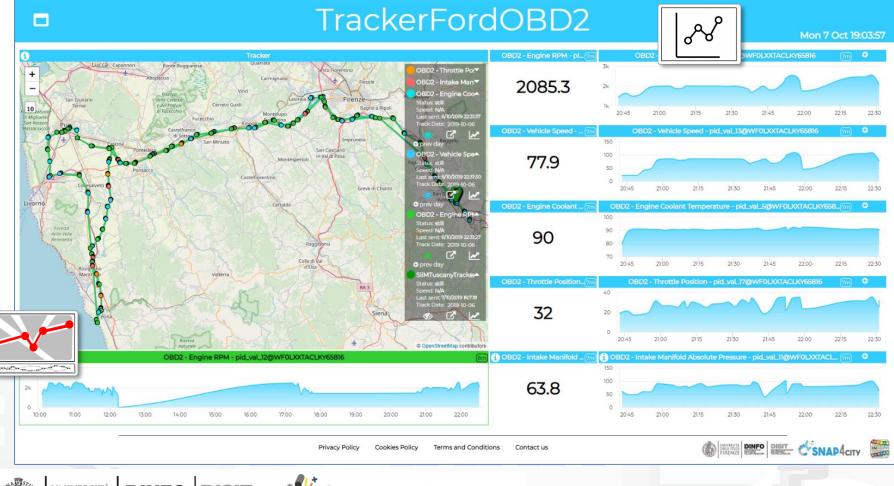




MyKPI: Tracking of Devices and Mobiles • Real Time Trajectories for

- - Mobile Phone
 - Moving IOT Devices
 - **OBU**, Vehicular Kits
 - Multiple tracks
 - Day by day
- Micro Application











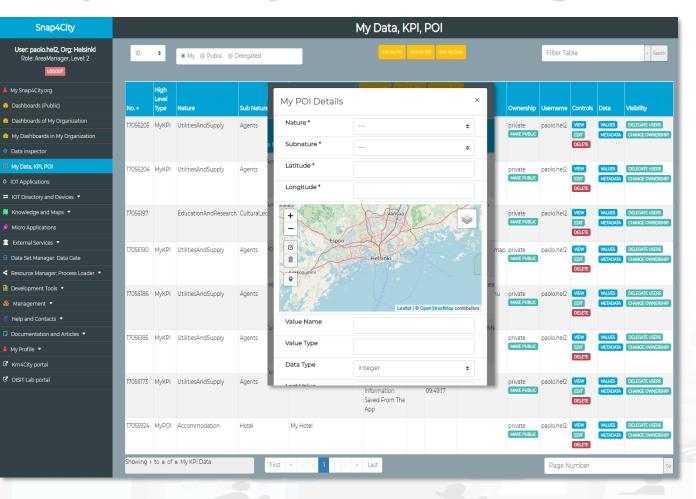


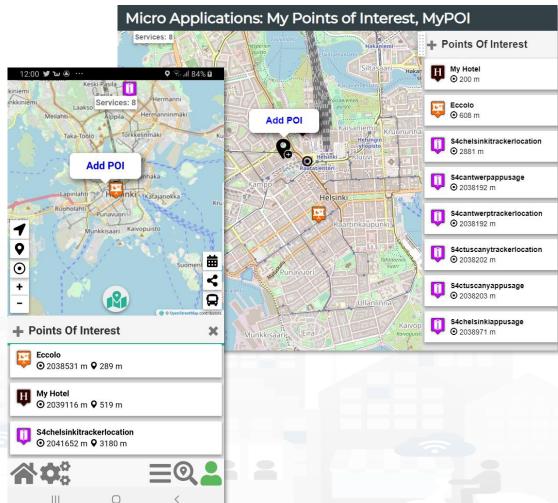






MyKPI, MyPOI: Management as GDPR



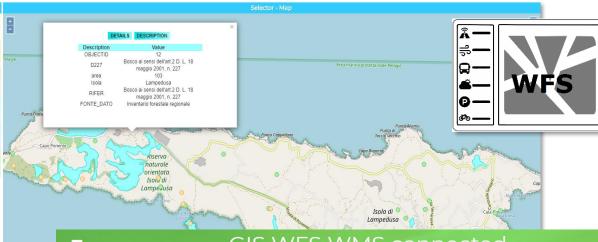




HLT: WFS (GIS)

- Complex Event
- Dashboard-IOT App
- External Service
- Heatmap
- **KPI** (Key Performance Indicator)
- MicroApplication
- My Personal Data
- MyKPI
- MyPOI
- POI (Point of Interest)
- Sensor
- Sensor Actuator
- Special Widget
- WFS (GIS)





-Points
-Shapes, paths
-Heatmaps

Snap4City WFS WMS Tools





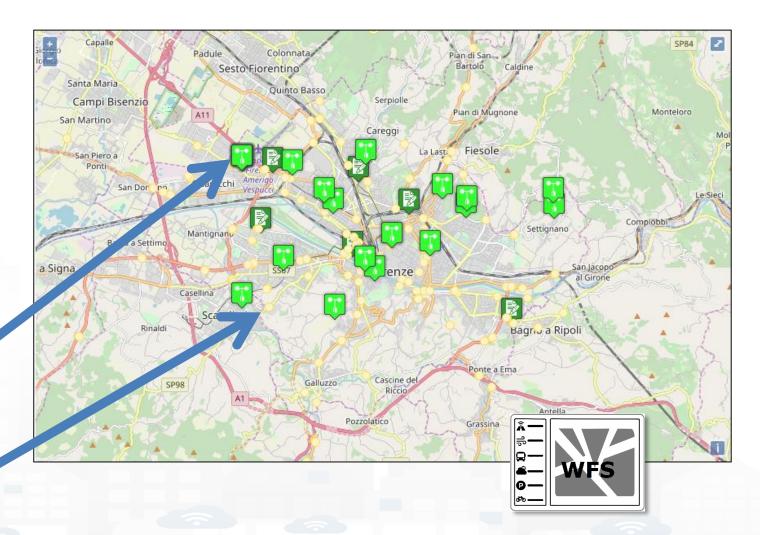






HLT: WFS (GIS)

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Piazza Giovan Battista Giorgin

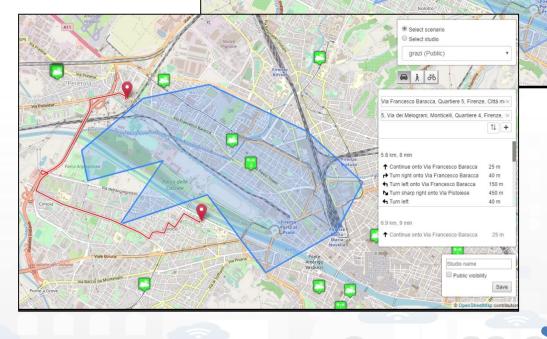
Via Vittorio Emanuele I

HLT: Special Tools

Scenarious

 Full text search of roads and geolocations. Global map of OSM

- **What-IF**
 - Conditional routing
 - **Dynamic** routing
 - Multiple paths



Traffic Flows

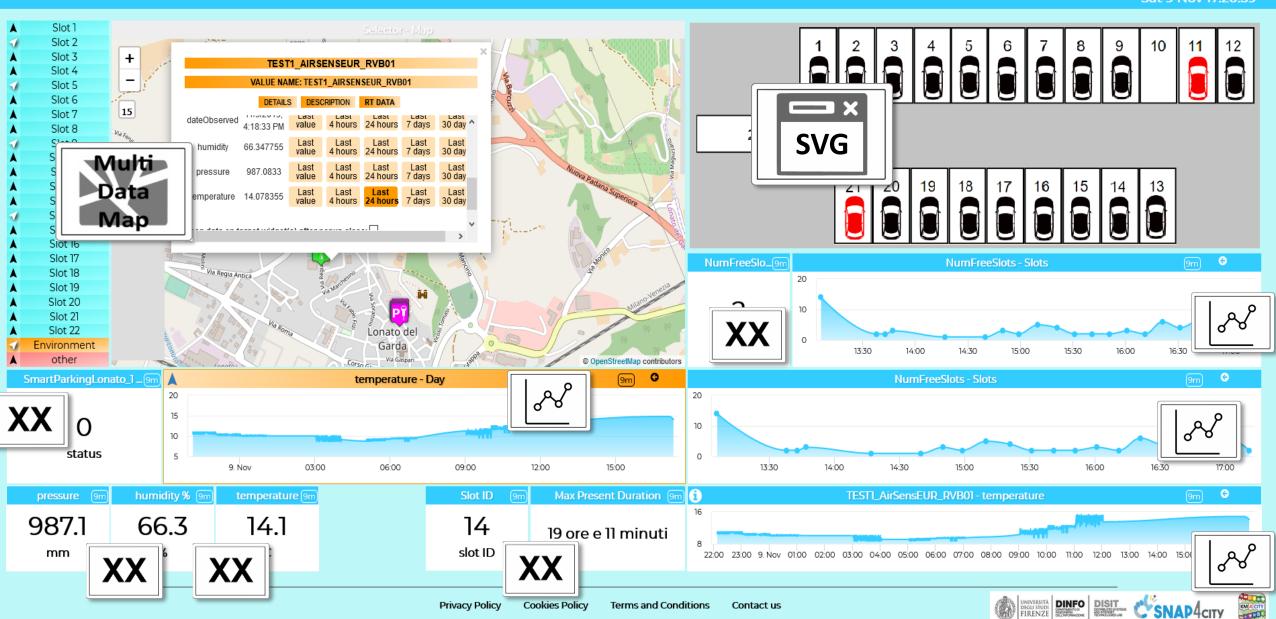
Multi

Data

Map

Smart Lonato del Garda

Sat 9 Nov 17:20:59



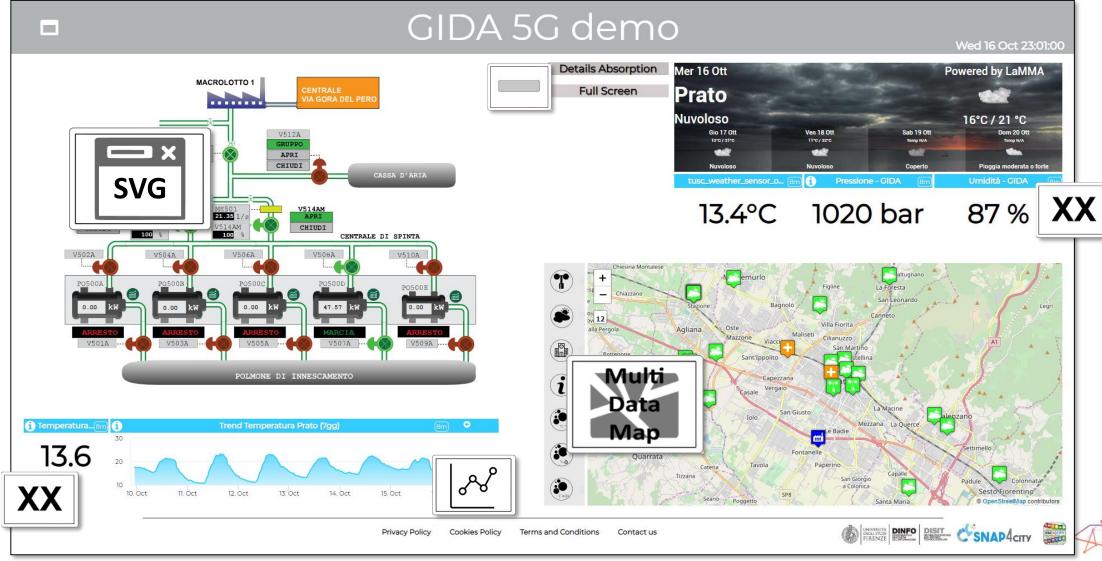


Demo UC5 GIDA

















TOP









GIS Data Import, Export and Exploitation







DISTRIBUTED SYSTEMS INTEROPERABILITY ESRI CSNAP4CITY KM CITY AND INTERNET TECHNOLOGIES LAB INTEROPERABILITY ESRI CSNAP4CITY



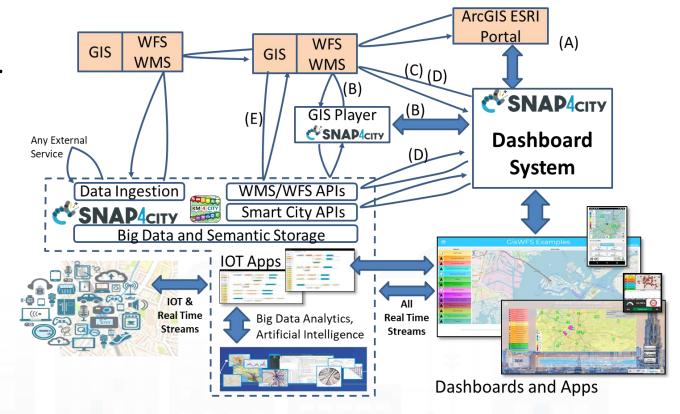


Snap4City is interoperable with

- ESRI ArcGIS Enterprise, Portal, Pro/MAP, ...
- other GIS tools supporting WFS, WMS, GeoJSON, GML

Snap4City is interoperable since:

- Provides info/data in WFS, WMS
- Exploits data/info from WFS, WMS
- Import data/info from WFS/WMS
- The Snap4City platform can be installed on premise using **Snap4City Appliance** https://www.snap4city.org/drupal/node/471
 - StartSNAP4CITYVM includes the Dashboard Builder that is capable to work with WFS WMS protocols for the integration with GIS platforms as ESRI ArcGIS, QGIS, directly or using Snap4City GIS player.
 - KBSSMVM includes the Smart City API and WFS API which can be used to data harvest from any GIS servers and GIS desktop tool







Case ESRI ArcGIS CSNAP4CITY

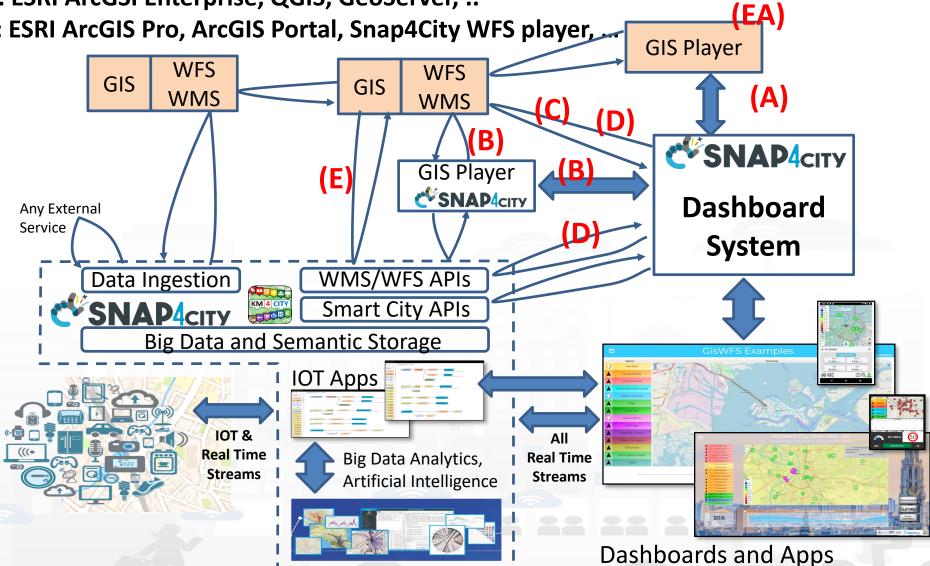
Snap4City (C), November 2019







GIS Player can be: ESRI ArcGIS Pro, ArcGIS Portal, Snap4City WFS player,



• GIS:

- Geographic Information System
- WMS:
 - Web Map Service
- WFS:
 - Web Feature Services









(A) ArcGIS ESRI as External Service

- DISIT Lab has ESRI ArcGIS Enterprise 10.6 installed
- ArcGIS Portal accesses to ArcGIS Enterprise server
 - https://arcgis.km4city.org/arcg isportal/apps/Embed/index.ht ml?webmap=5774fa9d0f7f4a2 fb2d7cd52dffcd8c9&extent=1 2.3144,45.4276,12.3461,45.44 19&home=true&zoom=true& previewImage=false&scale=true&search=true&searchextent =true&details=true&legendlay ers=true&active_panel=details &basemap_gallery=true&disa ble_scroll=true&theme=light
- Snap4City Dashboard uses as External Service: ArcGIS ESRI Portal
- https://main.snap4city.org/vi ew/index.php?iddasboard=O Tkw



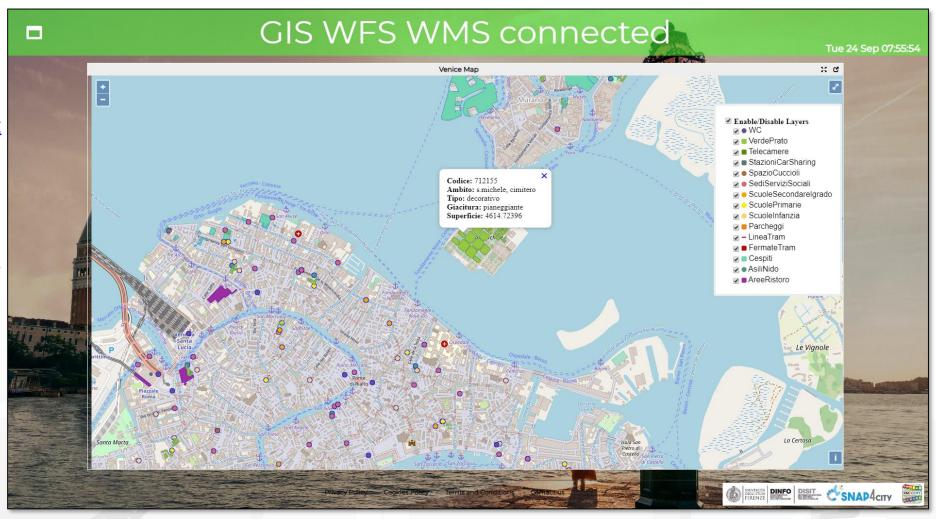






(B) GIS data on Dashboard via Snap4City GIS Player

- DISIT Lab has ESRI ArcGIS Enterprise 10.6 installed
- Snap4City has its WFS Player
 https://main.snap4city.org/widg
 ets/venezia/index.php
- Snap4City Dashboard uses as External Service: Snap4City GIS viewer via WFS/WMS: https://main.snap4city.org/view/ /index.php?iddasboard=MTIxNg





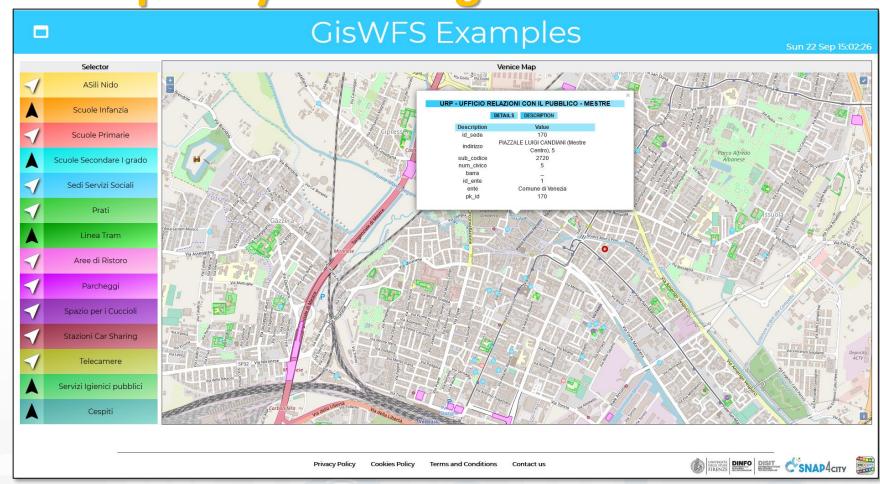






(C) Dash with Snap4City GIS widget and Selector

- DISIT Lab has ESRI ArcGIS Enterprise 10.6 installed
- Snap4City has its WFS / WMS widget / Player
- Snap4City Dashboard shows WFS/WMS data via Special GIS Widget Map:
 - https://www.snap4city.org/dash boardSmartCity/view/index.php
 ?iddasboard=MTQwMw==
- Snap4City can use Selector to select WFS / WMS sources to be shown from ESRI ArcGIS (as well as from any other WFS service) on Widget map







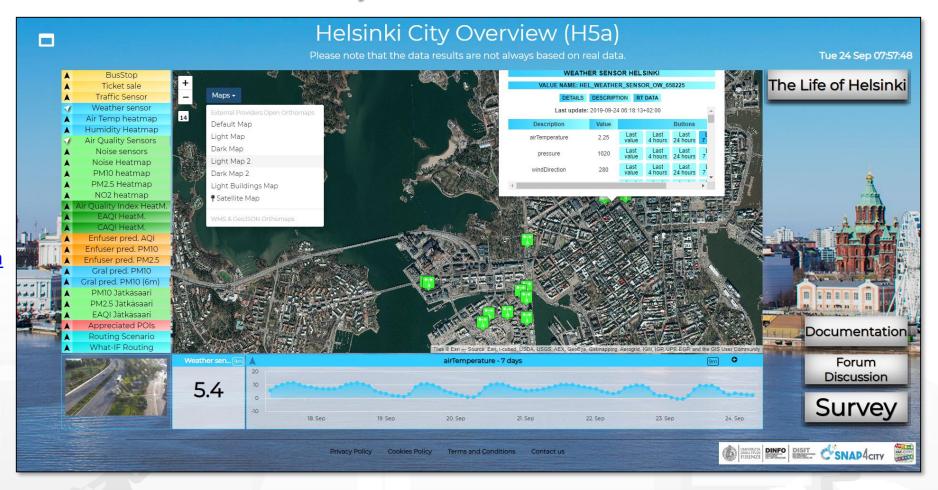




(D) Dashboard with Orthomaps and shapes layers

- DISIT Lab has ESRI ArcGIS Enterprise 10.6 installed, and GeoServer
- Snap4City main MultidataMap Widget can load WMS background images and shapes, the Orthomaps
- Also Heatmaps calibrated are provided from GeoServer using WMS protocol
- Maps in this case are directly taken from ESRI Server, free of charge
- https://www.snap4city.org/dash boardSmartCity/view/index.php ?iddasboard=MTQwNg==#

based on WMS, GeoJSON





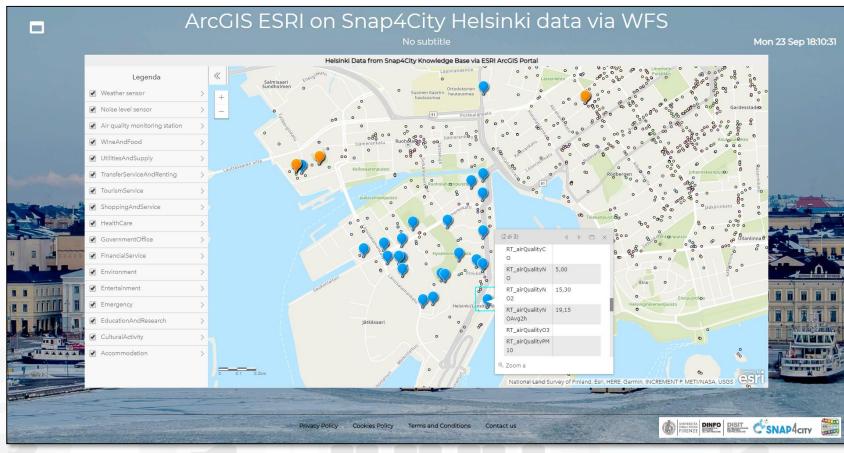




(E) Snap4City via WFS on top of Smart City API provide data to ESRI ArcGIS Enterprise or

ArcGIS Pro, and thus the data become accessible on ArcGIS ESRI Portal

- Snap4City provides a WFS service on top of SmartCity API. Thus providing data to any GIS/WFS client, including ESRI ArcGIS Enterprise, ArcGIS Pro, QGIS, etc.
- In the example, our ingested Helsinki Data have been harvested from ESRI ArcGIS via WFS.
 - Once ingested on ESRI ArcGIS can be visualized, by using ArcGIS Portal
 - https://arcgis.km4city.org/arcgisportal/apps/ Embed/index.html?webmap=fbcec7055a344 6e29fc1e9c55cb53d79&extent=24.8335,60.1 465,25.013,60.1965&zoom=true&previewIm age=false&scale=true&legendlayers=true&dis able scroll=false&theme=light
- Snap4City Dashboard can show ESRI ArcGIS Portal (A) as External Services in a dashboard.
 - https://www.snap4city.org/dashboardSmartC ity/view/index.php?iddasboard=MjlwNg==







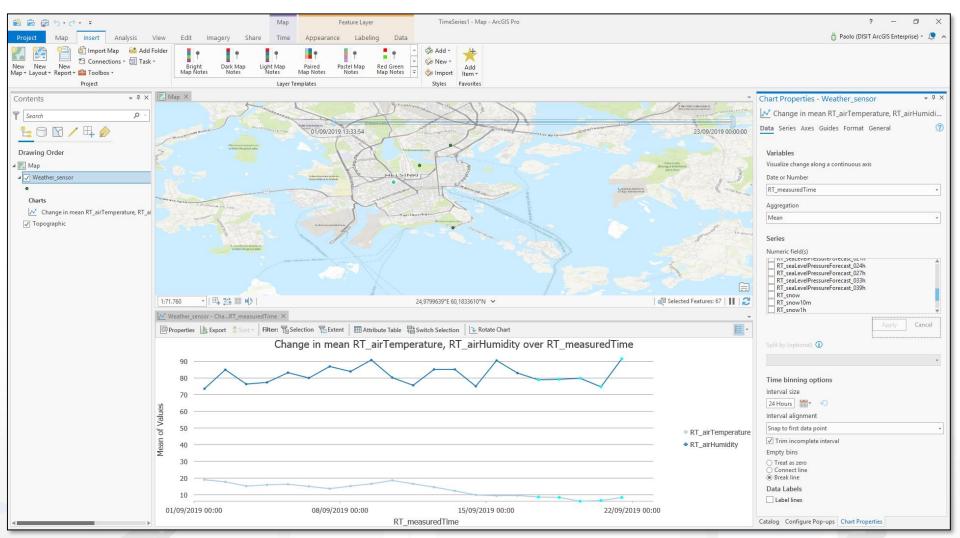




(EA) ArcGIS ESRI Pro as GIS / WFS play

To test you need to have installed ArcGIS pro on your pc and connect with Snap4City WFS/WMF server or with ArcGIS server which has done the same connection with our server WFS/WMS On PC:

- (i) Get data via WFS connected to ESRI ArcGIS Enterprise or other sources
- (ii) Download data via WFS ... from...







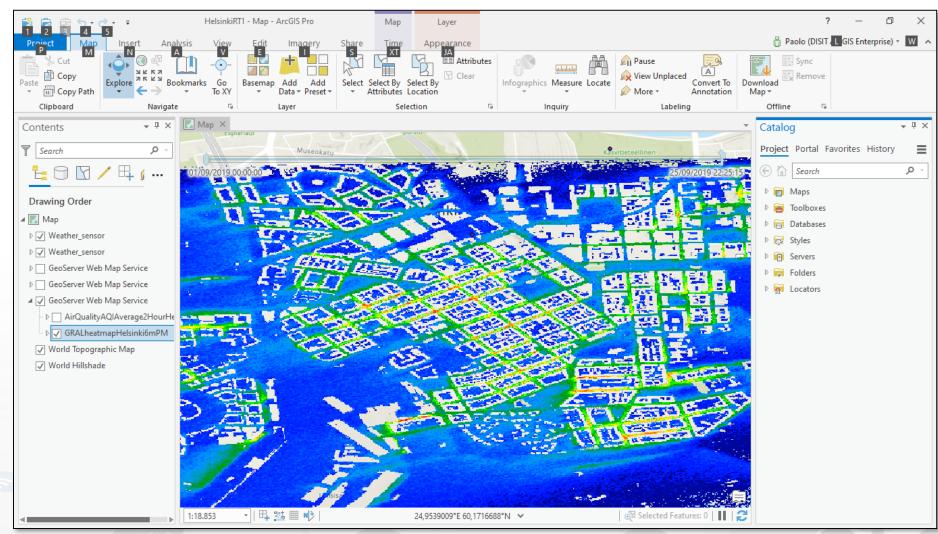




(EA) ArcGIS ESRI Pro as GIS / WMS play

To test it you need to have installed ArcGIS pro on your pc and connect with our WFS/WMF server or with ArcGIS server which has done the same connection with our server WFS/WMS

Heatmap taken from Snap4City GeoServer via WMS protocol







ESRI ArcGIS has an IOT solution based on ESRI GeoEvent, for real time data

- You need to have
 - ArcGIS Enterprise + GeoEvent Server + SpatioTemporal Big Data Store
- Limitations on the number of protocols addressed
- Snap4City solution solves the limitations by ingesting data from a plethora
 of protocols and sources and
 - (a) posting the IOT data into their **Spatio-Temporal Big Data Store**
 - (b) collecting data from several protocols and posting them into ESRI GeoEvent in MQTT,
 - (c) making them available via WFS protocol.







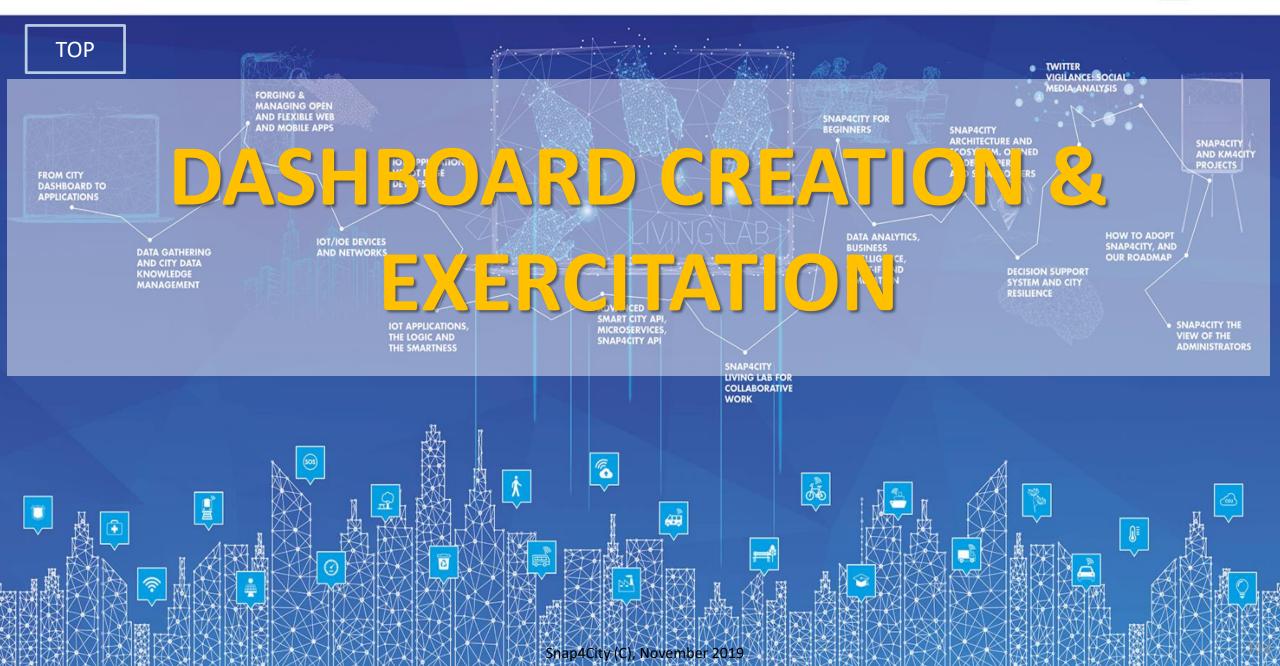
Snap4City vs GIS, WFS/WMS

• GIS data:

- Ingested via WFS/WMS protocols, and then managed as the other data.
 Data ingestion from GIS server can be performed via ETL processes, or directly from Dashboards
- Shown on Dashboards via third party GIS tools as External Services
- Shown on Dashboards using Special GIS Widget Map which directly access to GIS data via WFS/WMS
- Heatmaps and Maps are distributed via a GeoServer
- Snap4City can interact with ArcGIS Real Time Events via MQTT protocol as well

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES









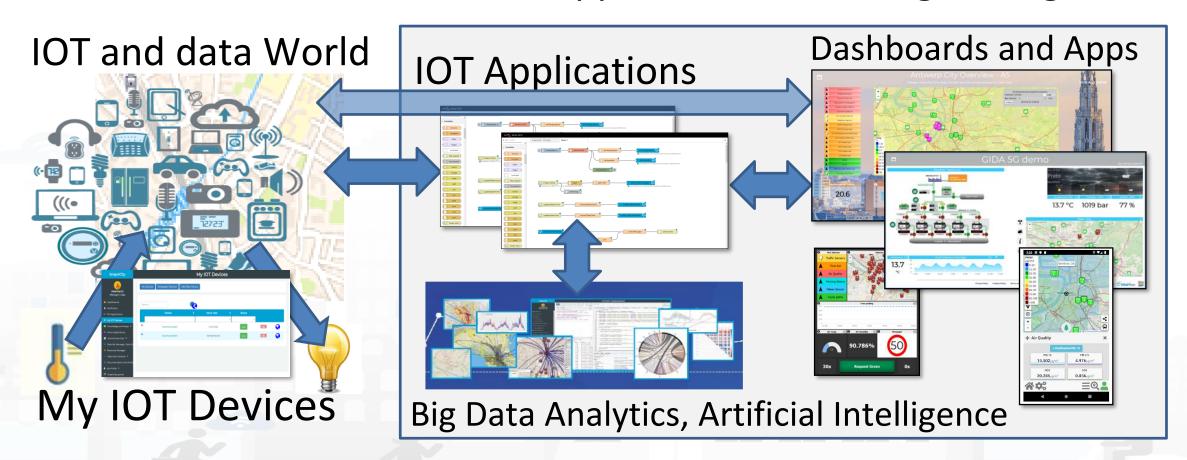






Snap4City: Builder of Sentient Cities Solutions

Dashboards with data driven IOT Applications enforcing intelligence



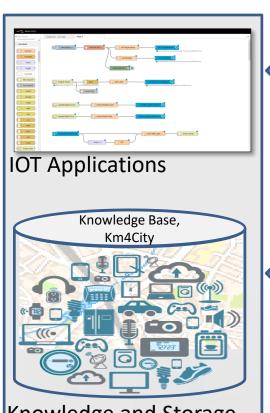


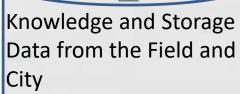






Dashboard Development









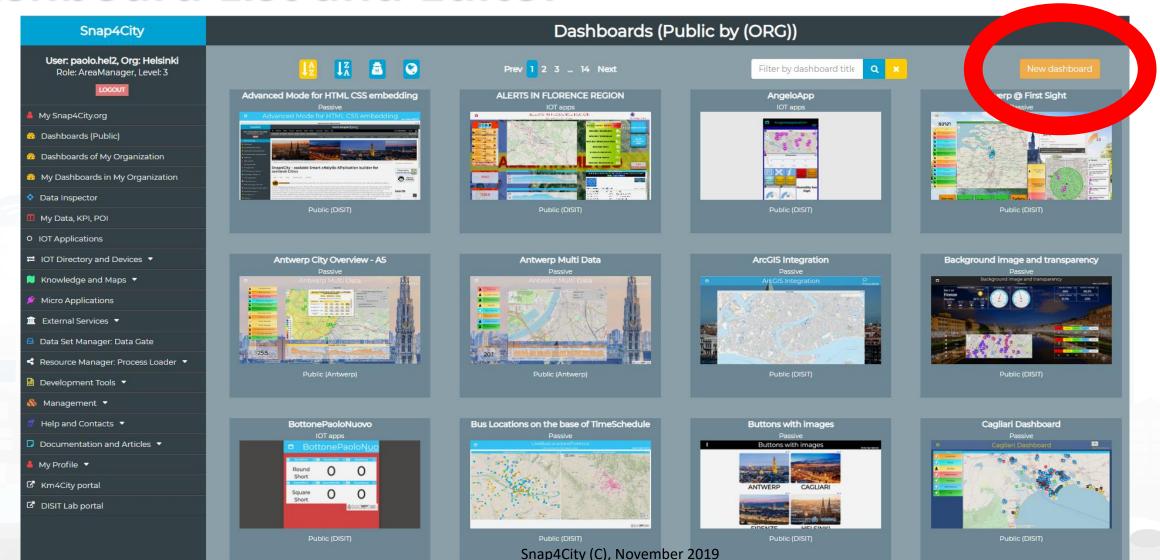








Dashboard List and Editor











From Templates to Wizard and Dashboards

Dashboard template

Click on a template to choose it, click on it again to unselect it

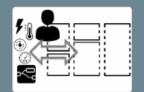
You must choose one template



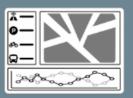
Selector and POI Preset widget choice



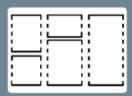
MicroApp and services
Preset widget choice



My Private Data Manual widget choice



Selector, POI, trend Preset widget choice

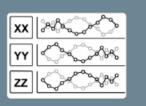


Fully custom

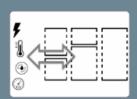
Manual widget choice



Empty Dashboard Empty dashboard



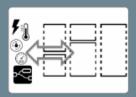
Data and trends Preset widget choice



IOT devices
Manual widget choice



Events vs. map Manual widget choice



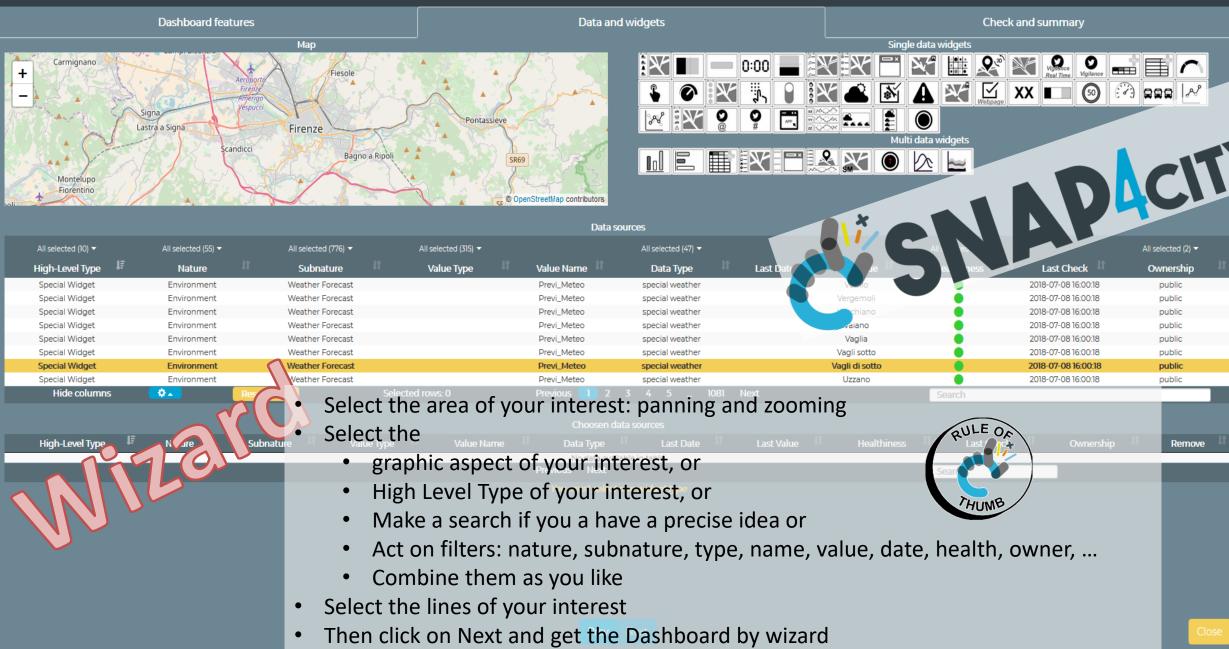
IOT applications
Manual widget choice

 to create a new Dashboard

 to add widgets and/or groups of them on any Dashboard Snap4City

Dashboards

Wizard



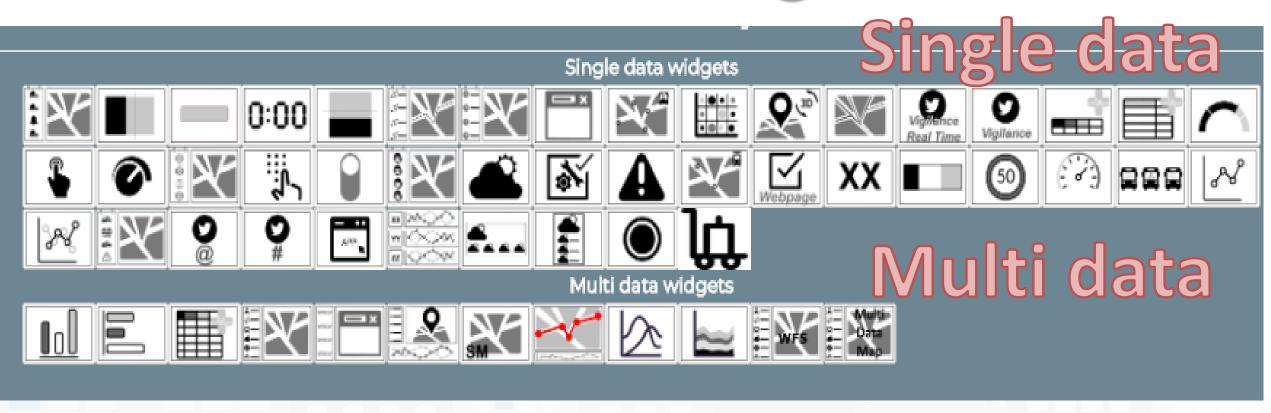


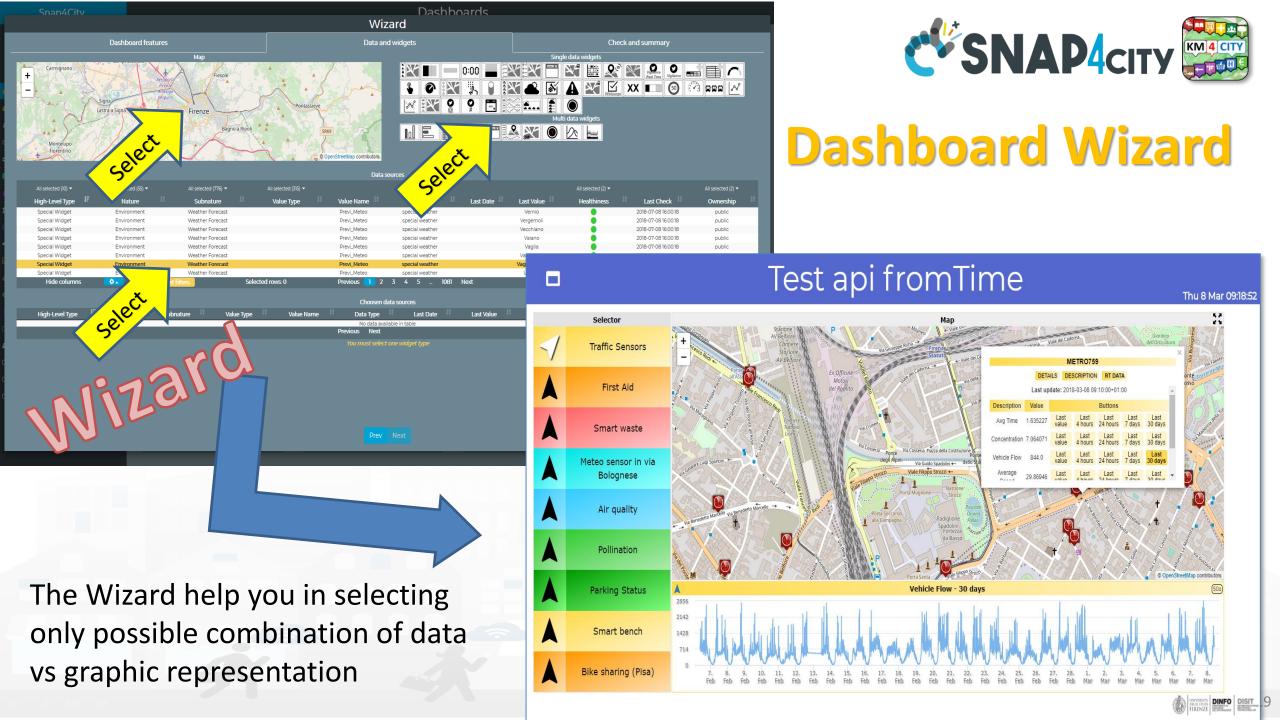






ICONS of Widgets



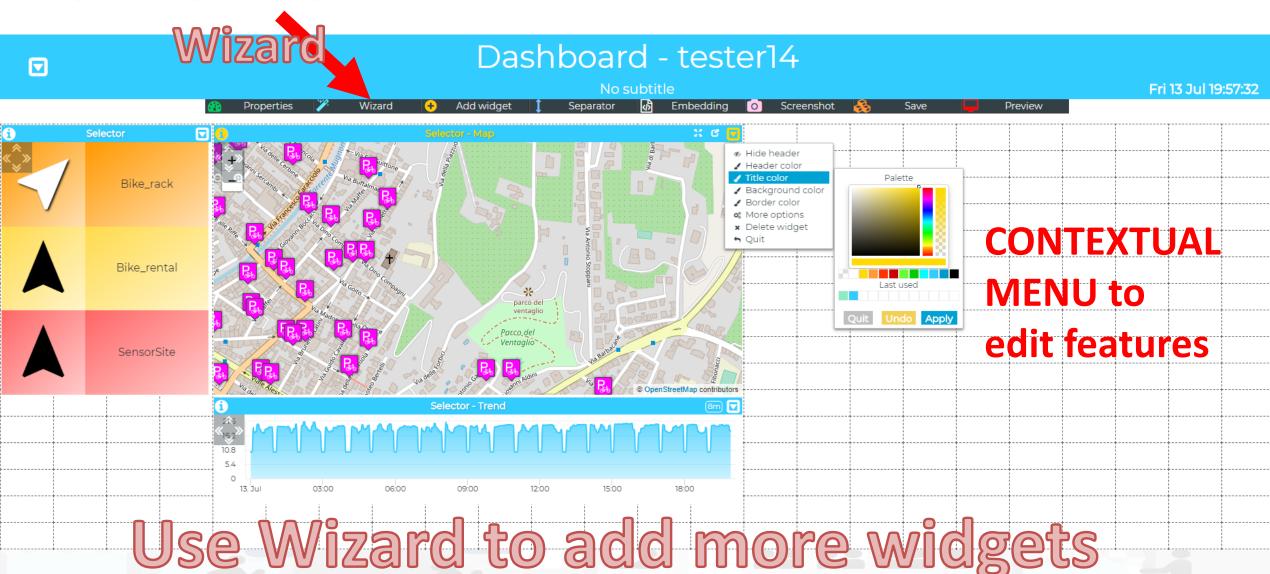










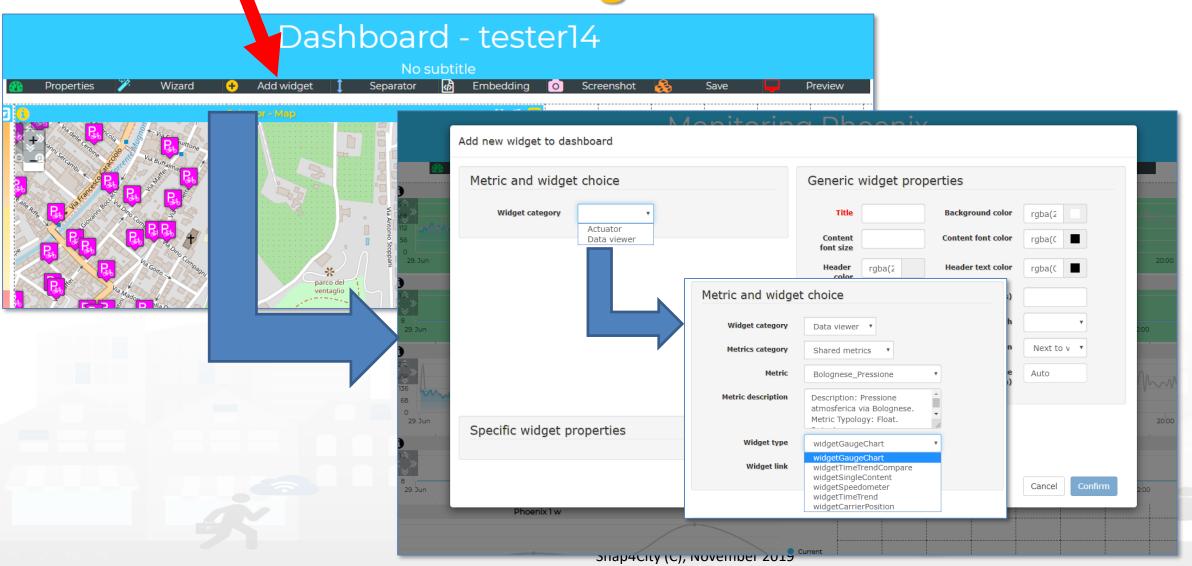








Manual Addition of Widgets







Dashboards summary and further exercises

- **Suitable** as: City Dashboard, App interface, and Control Room Dashboards, Situation Room Dashboard, Operator Dashboard
- Created visually compounding graphic Widgets
 - Each widget can be set to have an autonomous update
 - Each metric/data-source may have associated with an alarm: blinking and sending events to people and machines in different manners
- Can be: public or private, private dash can be delegated or passed in ownership
- See https://main.snap4city.org/management/dashboards.php?linkId=dashboardsLink&fromSubmenu=false&sorts[title_header]=1
- See the following tutorials
 - HOW TO: create a Dashboard in Snap4City
 - HOW TO: add data sources to the Snap4City Platform
 - US1. Using City Dashboards
 - US2. Using and Creating Snap4City Applications with Dashboards
 - US4. Creating City Dashboards and related Event Monitoring and Actions









TOP

Dashboards Creation Exercitation













To Start we are going to use Direct Dashboards

Dashboards accessing data available on Platform, including your own data coming from Mobile App, already registered!!!



Dashboards Applications











In this exercitation we are going to use the main Dashboard Templates

Dashboard template

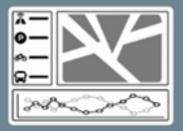
Click on a template to choose it, click on it again to unselect it



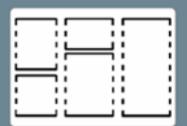
Selector and POI Preset widget choice



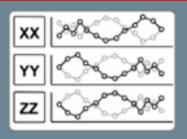
MicroApp and services Preset widget choice



Selector, POI, trend Preset widget choice



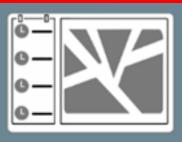
Fully custom Manual widget choice



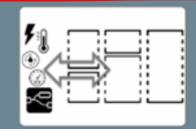
Data and trends Preset widget choice



IOT devices Manual widget choice



Events vs. map Manual widget choice



IOT applications Manual widget choice



My Private Data Manual widget choice







Exercitation on dashboard building

- 1. Create a Dashboard for the visualization of sensors values: actual and their trend
- 2. Create a Dashboard for the visualization of geolocated services (POI, Sensors, heatmap, etc.) and their selection on Map, with eventual target to see the time trend
- 3. Create a Dashboard for the visualization of MyKPI regarding my trajectories and eventually those of other users.











1) Create a Dashboard for the visualization of sensors values: actual and their trend

- The sensors to be selected should
 - Be located downtown in Florence around a POINT of YOUR interest: home, work, study, etc.
 - Report data regarding: environment, traffic, parking, pollution, etc.
- We suggest to:
 - Understand how to work with data by using the Data Inspector
 - Create a new Dashboard by Wizard
 - Customize look and fill of the Dashboard and widgets
- Time: 20 minutes



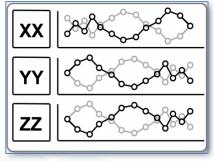


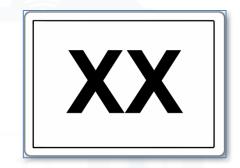


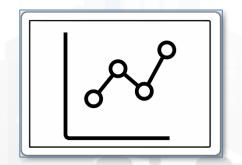


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 - Customize look and fill of the Dashboard and widgets
- Time: 10-20 minutes





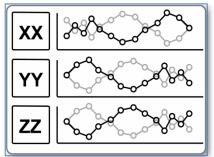






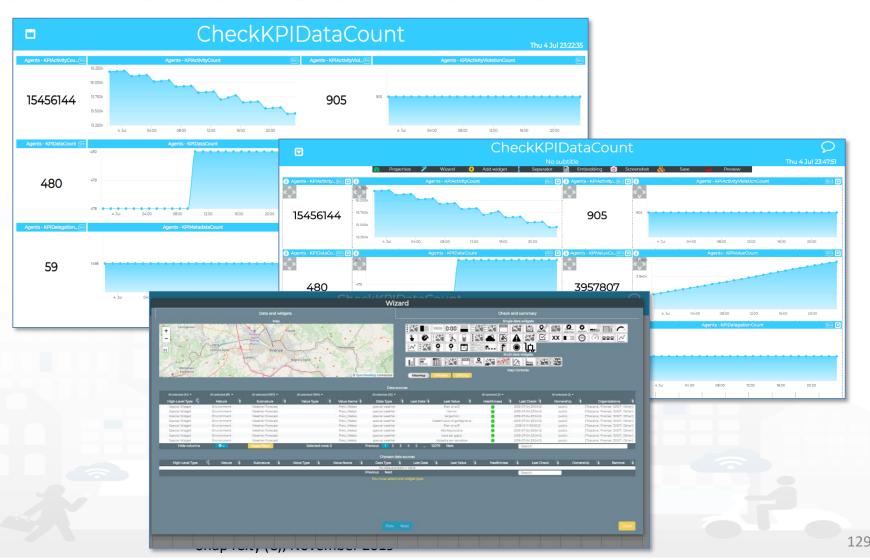






Result could be similar to

- You can add more Widgets by:
 - Wizard
 - Editormanually















2) Create a Dashboard for the visualization of geolocated services (POI, Sensors, heatmap, etc.) and their selection on Map, with

eventual target to see the time trend

- The HLT to be selected should
 - Be located downtown in Florence
 - Could be of different kind of nature. At least 5 of them
 - Data regarding: environment, traffic, parking, pollution, etc.
- We suggest to:
 - Start creating the New Dashboard by Wizard
 - Customize look and fill of the Dashboard and widgets
- Time: 10-20 minutes
- There are different modalities to get similar results





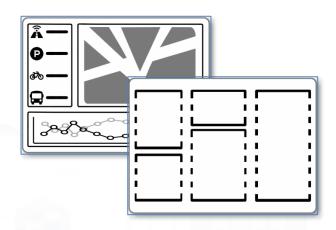


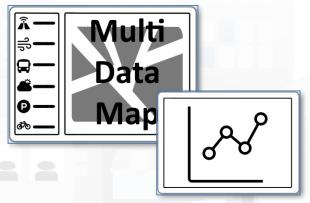




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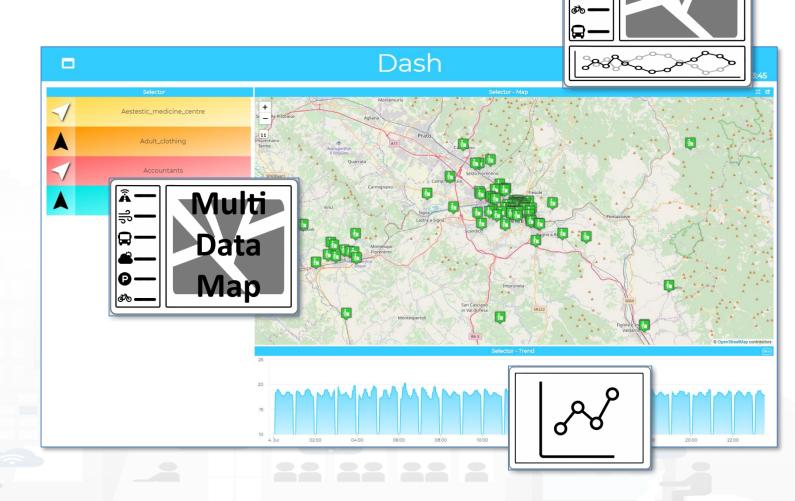




Result could be similar to

- Not all combinations provide the same effective result
- You can
 - customize the resulting dash
 - add other widgets by wizard
 - see how a Selector is built















3) Create a Dashboard for the visualization of MyKPI regarding my trajectories and [eventually those of other users]

We suggest to:

- Open Dashboard Wizard
- Search for your trajectory on mobile looking for MyKPI
- Create a Dashboard exploiting the Widget Tracker
- Customize look and fill of the Dashboard and widgets, change color of the header, etc.
- Time: 10-15 minutes



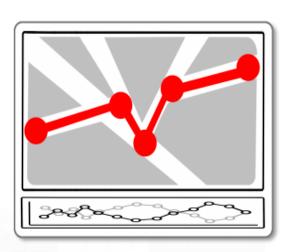




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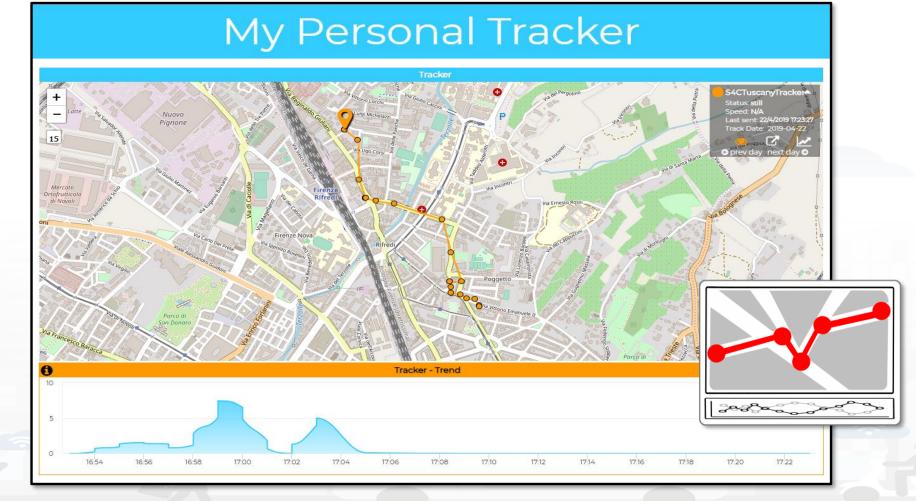








Result could be similar to







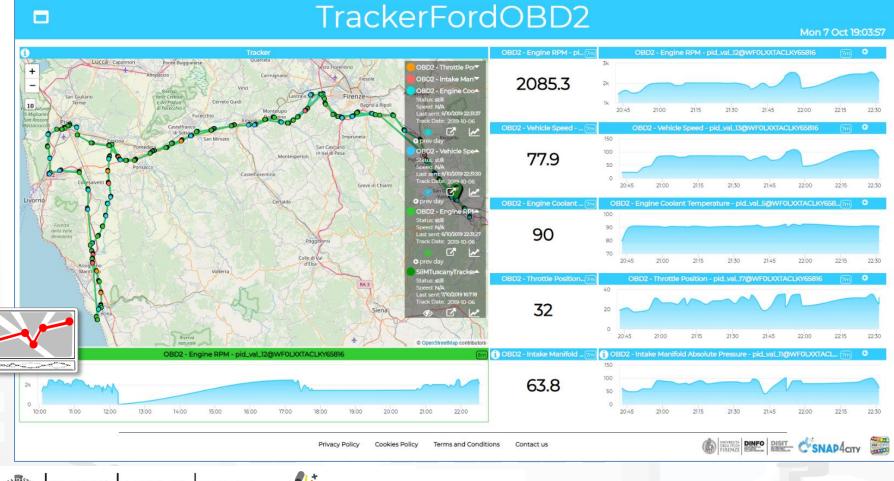




MyKPI: Tracking of Devices and Mobiles • Real Time Trajectories for

- - Mobile Phone
 - Moving IOT Devices
 - **OBU**, Vehicular Kits
 - Multiple tracks
 - Day by day
- Micro Application



















TOP

Synoptic and Custom Widgets Creation



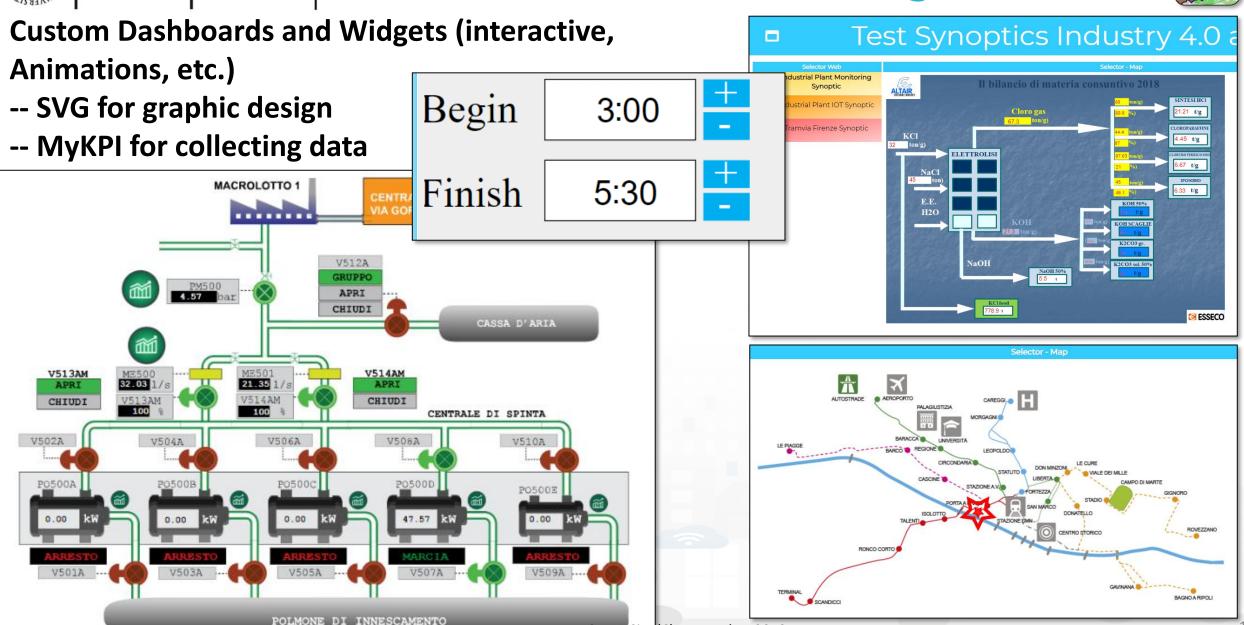






DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB CUSTOM Widgets





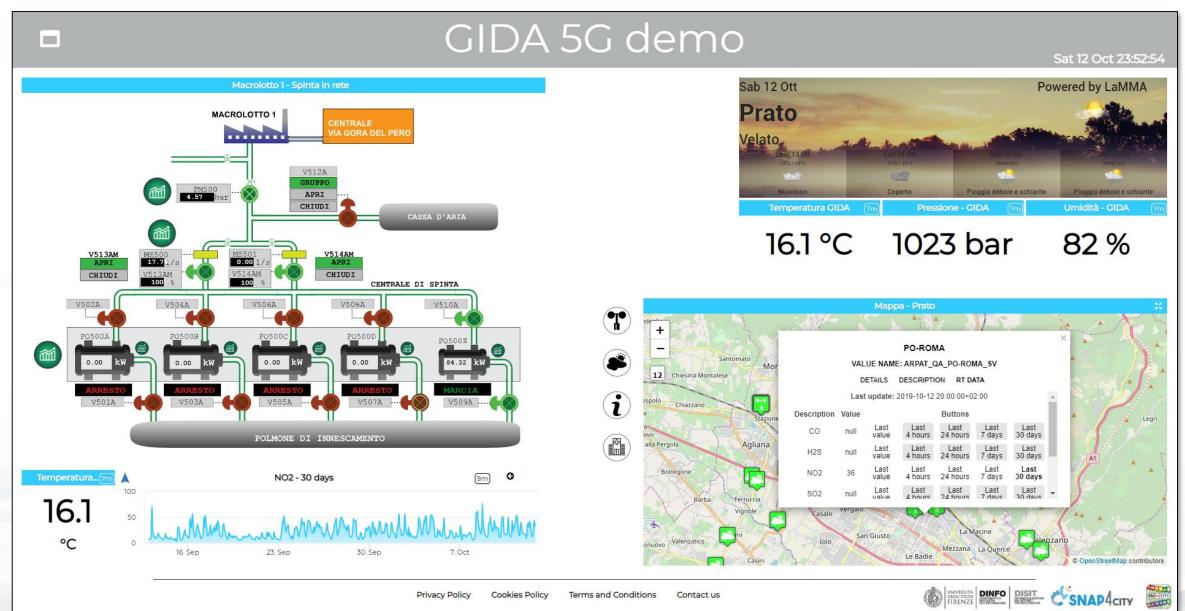
Snap4City (C), November 2019















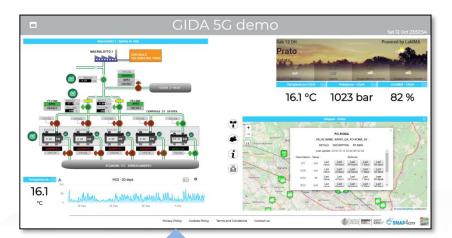


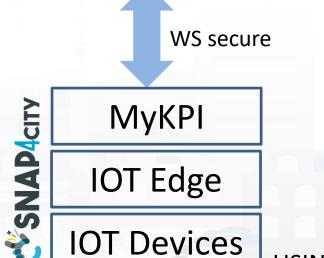
USING





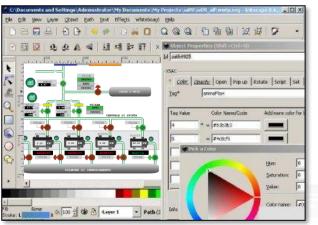
Creating custom Widgets for Dashboards





Producing and **Publishing**











DEVELOPING









TOP

Dashboards' Intelligence on Web and Mobile Devices

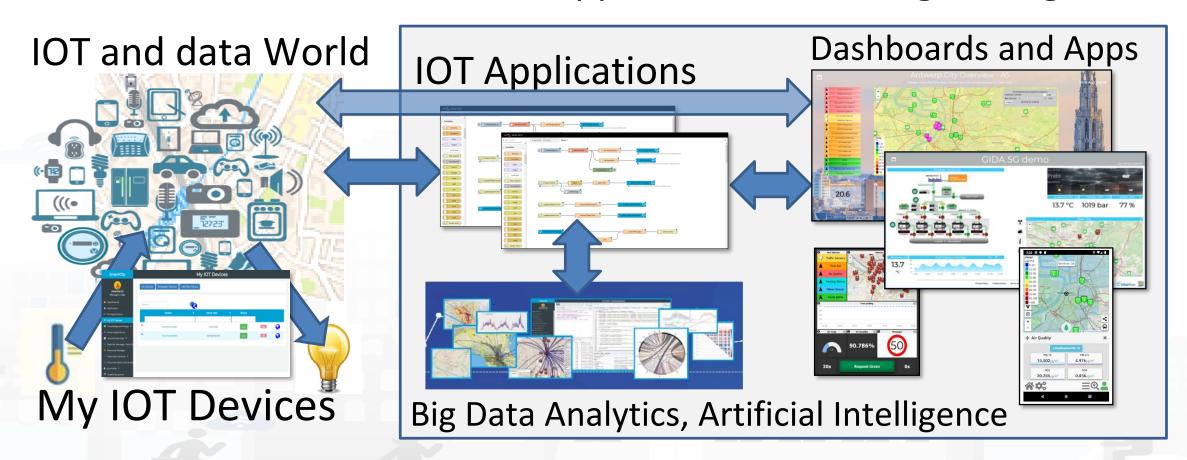






Snap4City: Builder of Sentient Cities Solutions

Dashboards with data driven IOT Applications enforcing intelligence



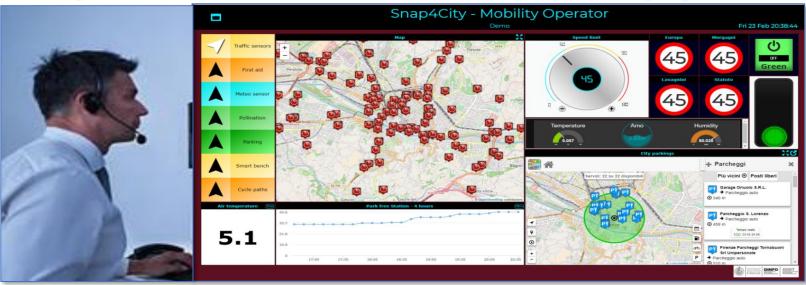


Control Room Operator

Would like to:

- Monitor traffic flow,
 Environment, Car parking,
 Cycling, First aid, temp., ...
- Act and monitor Dynamic Plates
- Act and monitor red lights

City Dashboard + IOT App



Driver, Policeman

Would like to:

- Monitor traffic,
 Parking, env., speed
 limit, ...
- Act and monitor red lights

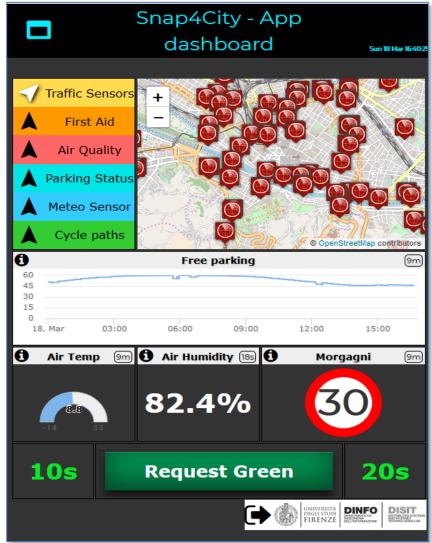


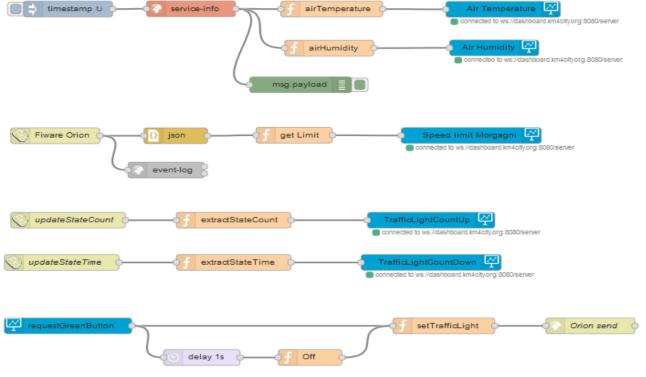




IOT Application with City Dashboard Simple development





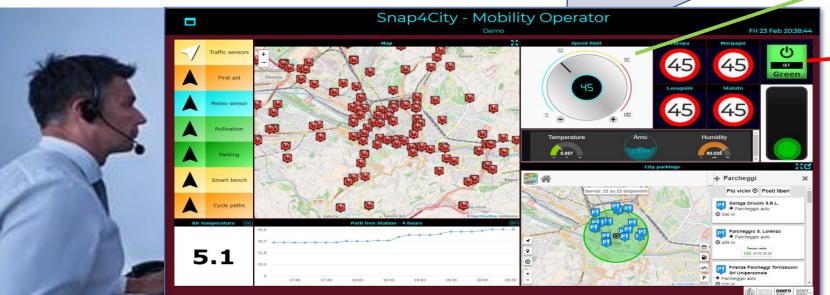


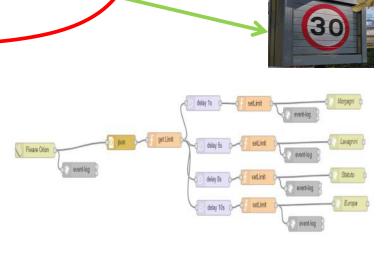
- -Virtual Sensors and Virtual Actuators
- -From Dashboard to IOT App and viceversa
- -From Dashboard to IOT Brokers/Devices and viceversa

Snap4City (C), November 2019









SNAP4city





IOT Applications vs Dashboards

- IOT Applications, realized by using Snap4City Node-RED and integrated with Snap4City Nodes/MicroServices block, can be behind dashboards to get data from them with Virtual Sensors and Actuators.
 - Dashboards may be connected to multiple IOT Applications and IOT devices
 - IOT Applications may be connected with multiple Dashboards and IOT devices
- A network of Dashboards, IOT Apps and IOT Devices and data is easily realized exchanging data via secure connections.
- Training Cases:
 - US2. Using and Creating Snap4City Applications with Dashboards
 - US9. Creating Snap4City IOT Applications, different formats, protocols, brokers, communications









TOP

Dashboard Chatroom and Notifications



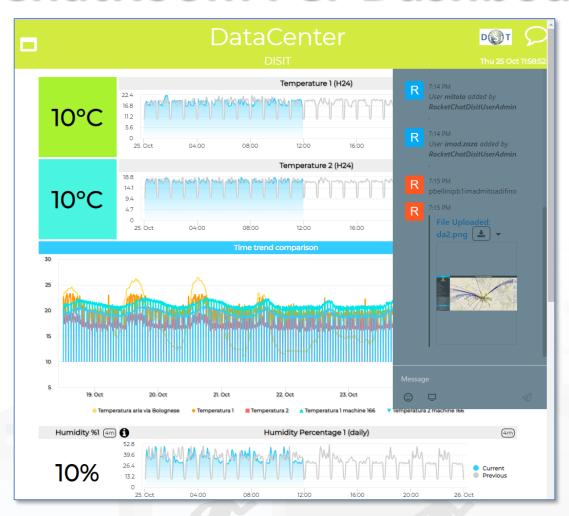




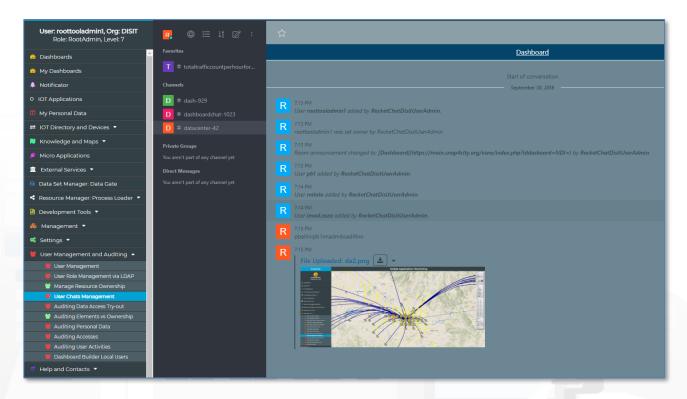




ChatRoom Per Dashboard



Chat Management











Dashboard's Chat Rooms

- Each Dashboard may have only one separate ChatRoom
- The Dashboard Owner can
 - Activate the Chat Room on Dashboard header in Edit
 - Add a number of users platform to chat room
- The Chat Room
 - Allows to Exchange Comments and Pictures
 - Can be Accessed on web and mobile
 - May Provoke notifications on the header of the Dashboard
 - Is accessible only under authentication
- The Administrators can access to the Log for review of the discussions





Chat Rooms

- Activated by the Dashboard creator which can invite a number of users of the platform to
 - Exchange Comments and Pictures
 - access on web and mobile
 - provoke notifications
- Accessible only under authentication
- The administrator can access to the log for review and log of the discussions.







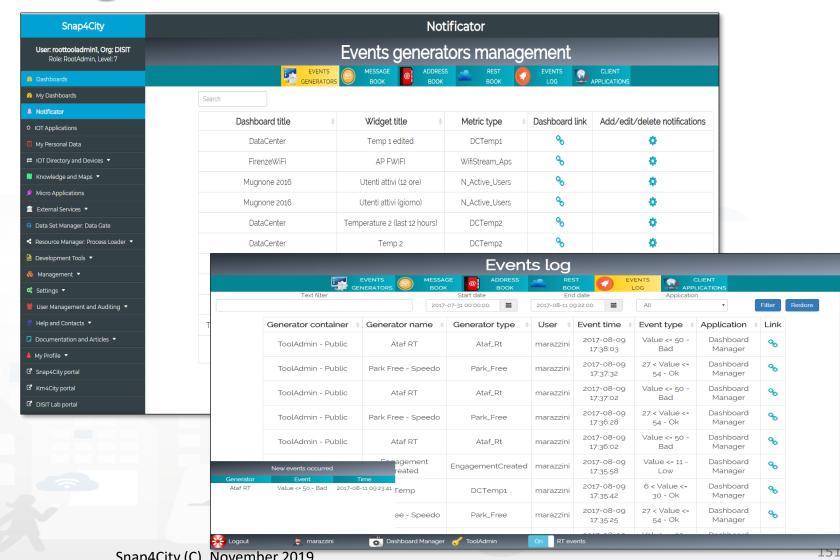


Smart City Monitoring: Notificator

Associated with metrics shown on Widgets

Alternative with IOT App

- Notifications may arrive via Facebook, Telegram, SMS, email, etc., by exploiting IOT App behind the dashboard
- Integration with workflow management system for ticketing





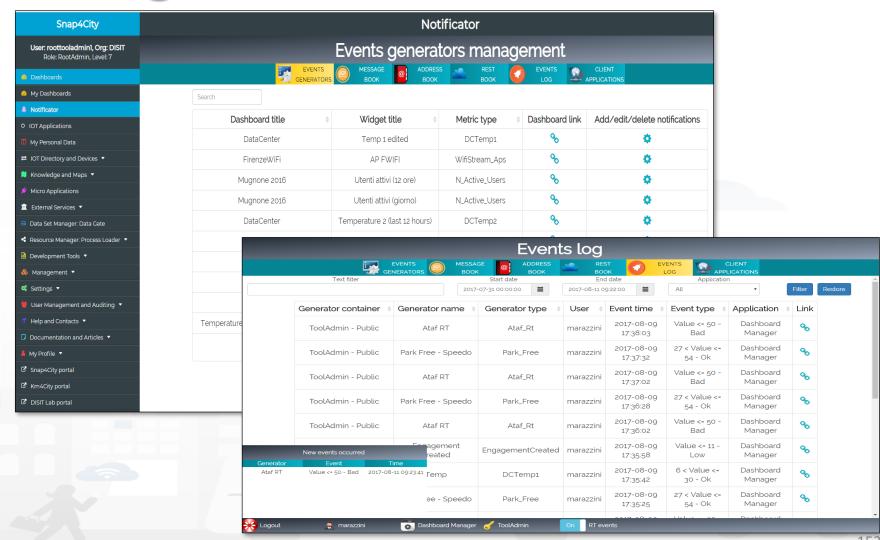






Smart City Monitoring: Notificator

- Notifications may arrive via Facebook, Telegram, SMS, email, etc., by exploiting IOT App behind the dashboard
- Integration with workflow management system for ticketing







Dashboards

- Suitable as: City Dashboard, App interface, and Control Room Dashboards, Situation Room Dashboard, Operator Dashboard
- Created visually compounding graphic Widgets
 - Each widget has an autonomous update
 - Each metric/data-source may have associated with an alarm: blinking and sending events to people and machines in different manners
- Can be: public or private, private dash can be delegated or passed in ownership
- See https://main.snap4city.org/management/dashboards.php?linkId=dashboardsLink&fromSubmenu=false&sorts[title_header]=1
- See the following tutorials
 - HOW TO: create a Dashboard in Snap4City
 - US1. Using City Dashboards
 - US2. Using and Creating Snap4City Applications with Dashboards
 - US4. Creating City Dashboards and related Event Monitoring and Actions

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES











GDPR: General Data Protection Regulation

Users may decide to:

- provide access to who, for do what, until when consented
- accept terms of use by signed consent for data management service

From each service, the user is capable to:

- See what we collect in terms of Data Type: traces, logs, paths, profiles, accesses, IOT devices, sensors, maps, etc.
- Download, delete, inspect Data
- Auditing and Revoke access or grant access right to each single Data
- Delete all Data in single shot or singularly (forget all about me)

- Correctness
- Transparency
- Security
- Integrity
- Privacy
- Auditing
- ...





GDPR: General Data Protection Regulation

If personal data are published by the owner:

- the data are **released anonymously**,
 - → also in this case they can be **revoked at any time**:

Snap4City is also compliant to GDPR Technical Constraints as it:

- Performs Secure connections in any private data exchange
- Encrypts data store for all private data
- Decouples data and personal IDs
- Audits private data usage











GDPR Compliant

My Personal Data Types

View

Edit

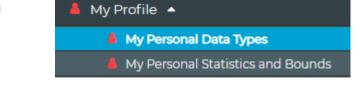
Track

Access control

Convert

This page allows you to access at your Data Types, which are your personal data that we comost cases, a specific tool and view is provided to manage them.

- · My profile data and Blogs
 - o to manage your user profile data (name, email,): view, edit, delete
- · My Personal Statistics and Bounds: daily or Monthly
 - to access at your statistics about the data access and volume of resources use that may depend on the Organization at which one belong and on the role in
- My Personal Data, My KPI and My POI
 - to manage your personal MyKPI, MyPOI and trajectories, if any: view, edit, dele
- My Personal Engagement
 - to manage your personal engagements recevied on the Mobile Apps, auditing
- My IOT Devices
 - o to manage your IOT Devices in which it is possible to: edit, delete, make public
- · My IOT Applications
 - o to manage your IOT Applications in which it is possible to: delete, restart, char
- My Dashboards
 - to manage your Dashboards in which it is possible to: edit, delete, change owr
- My IOT sensor data service URI (for programmers)
 - o to manage the Delegations to access at the ServiceURI of the knowledge base
- My IOT sensor data service GraphID (for programmers)
 - o to manage the Delegations to access at the a Graph (data set) of the knowled
- · My personal data by IOT App (partially deprecated)
 - o to manage your MyPersonal Data, if any: view, edit, delete, delegation in acces
- My Annotation data
 - o to manage the Delegation to access at the Annotations: delegation in access,
- · Auditing Access to My Data
 - · to audit the accesses to MyData



Manage Profile and MyPersonalData For each Data Type:

- Start as private → making them public (anonymous) and revoke
- The Owner is the only one that can: (1)
 modify values; (2) change the ownership
- Define/revoke Delegation to Access
- Delete/forget per Data Type and "me all"!
- Auditing









TOP

Dashboards Listing, Managing, Sharing, Delegation











Dashboard List and Editor



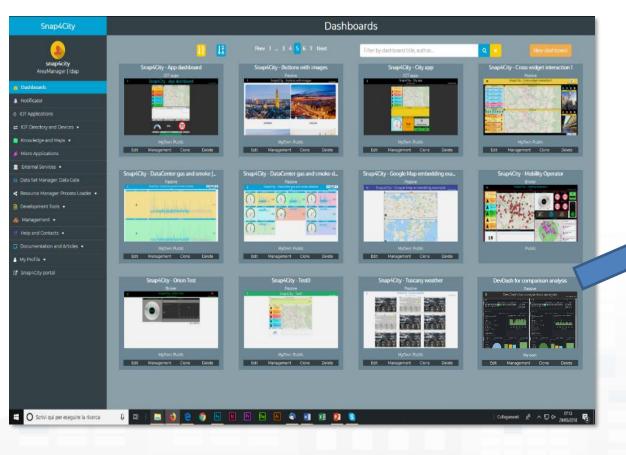


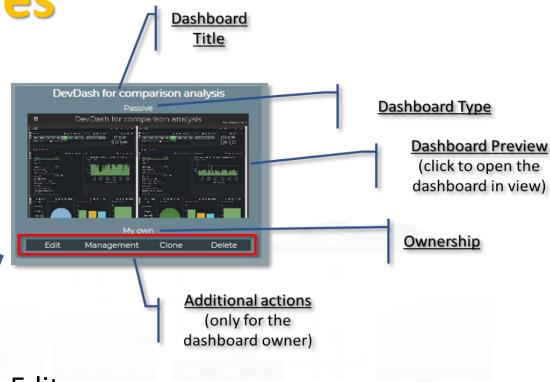






Dashboard Listing and Features





- Edit
- Management
- Clone
- Delete
- (add Thumbnail is inside Edit)

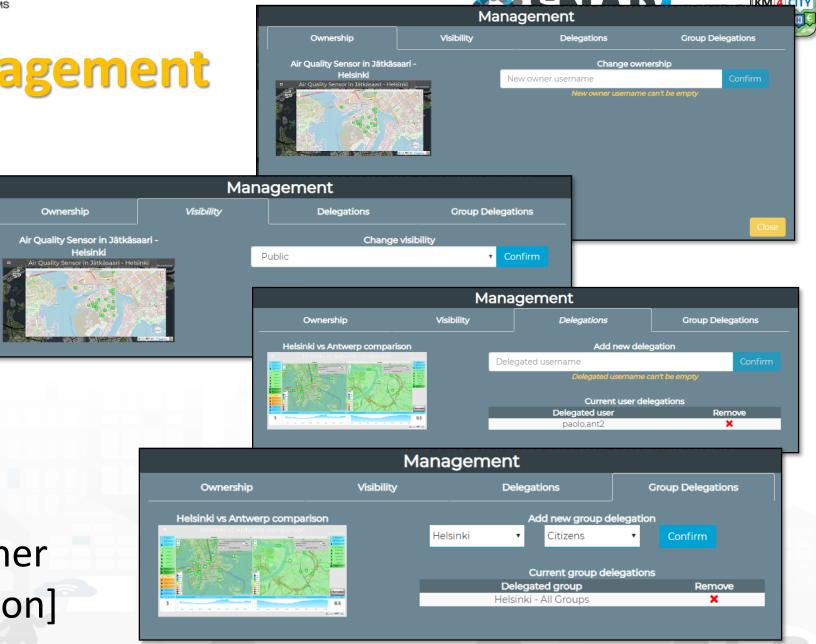


Dashboard Management

- Change Ownership
- Public or Private

 Delegation access to other users

 Delegation Access to other Groups [Higher roles cross Organization]





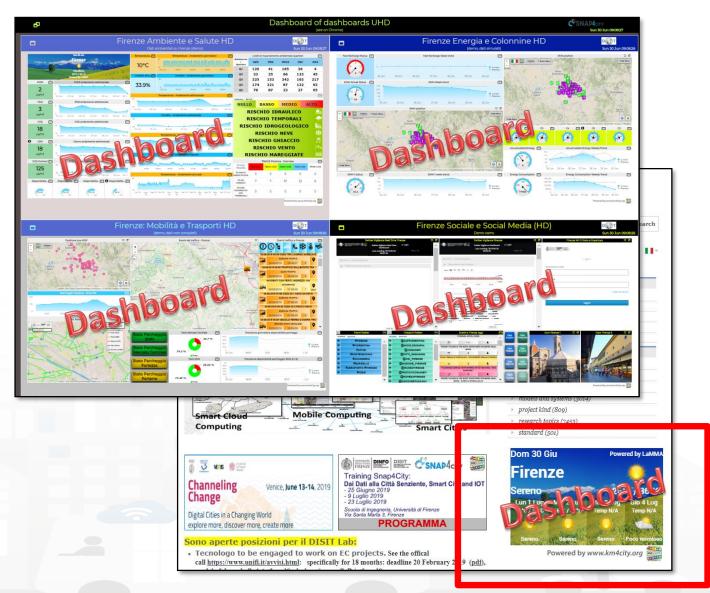






Additional Properties from Edit

- Embedding Dashboards into
 - a Dashboard
 - third Party Web Page
- Header or not
- Responsive or not
- Size
- Background Image
- Add / change Screenshot (Thumbnails)
- ...etc..











TOP

Dashboard GDPR management







Details for Main Data Kinds

My Personal Data, My KPI and My POI

 to manage your personal MyKPI, MyPOI and trajectories, if any: view, edit, delete, delegation in access, revoke delegation, make public, change ownership

My Personal Engagement

 to manage your personal engagements received on the Mobile Apps, auditing, if any: view, delete

My IOT Devices

to manage your IOT Devices in which it is possible to: edit, delete, make public, delegate in access, revoke delegation, change ownership

My IOT Applications

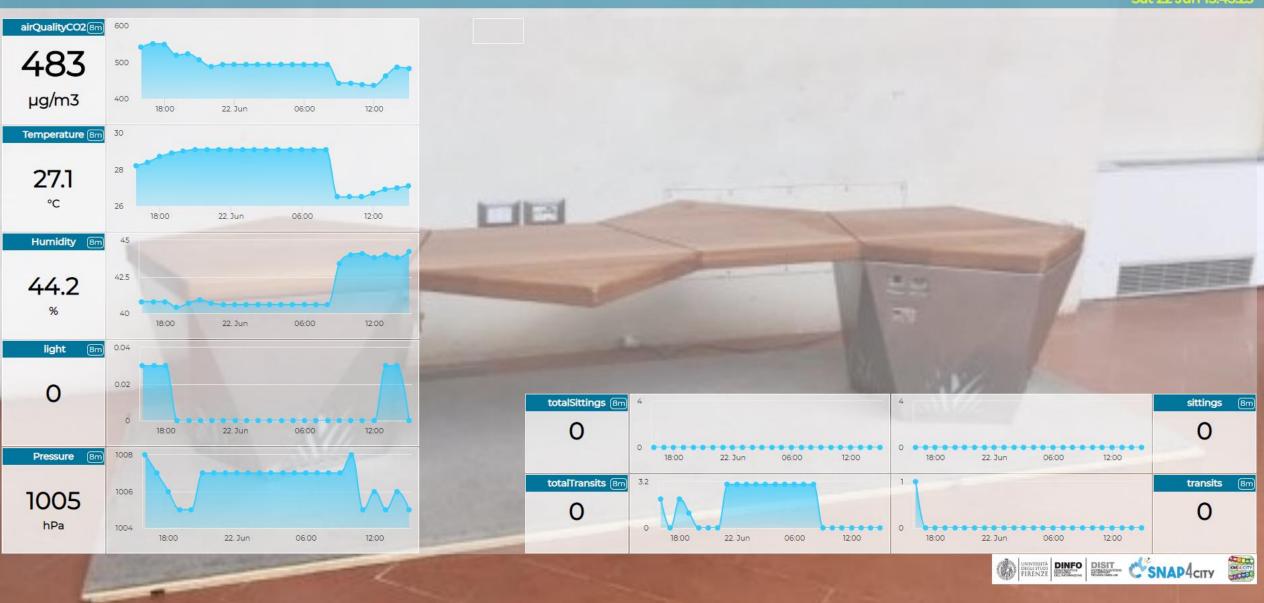
to manage your IOT Applications in which it is possible to: delete, restart, change ownership.

My Dashboards

 to manage your Dashboards in which it is possible to: edit, delete, change ownership, delegate in access, revoke delegation, see list of delegations, make public.



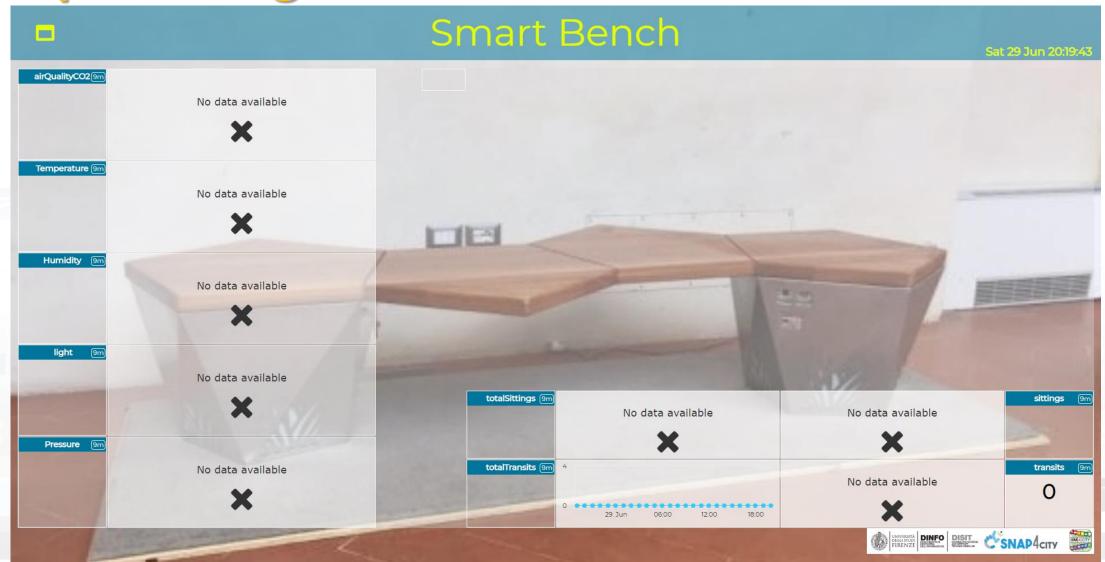
Smart Bench







Example: Delegated Dashboard but not all data



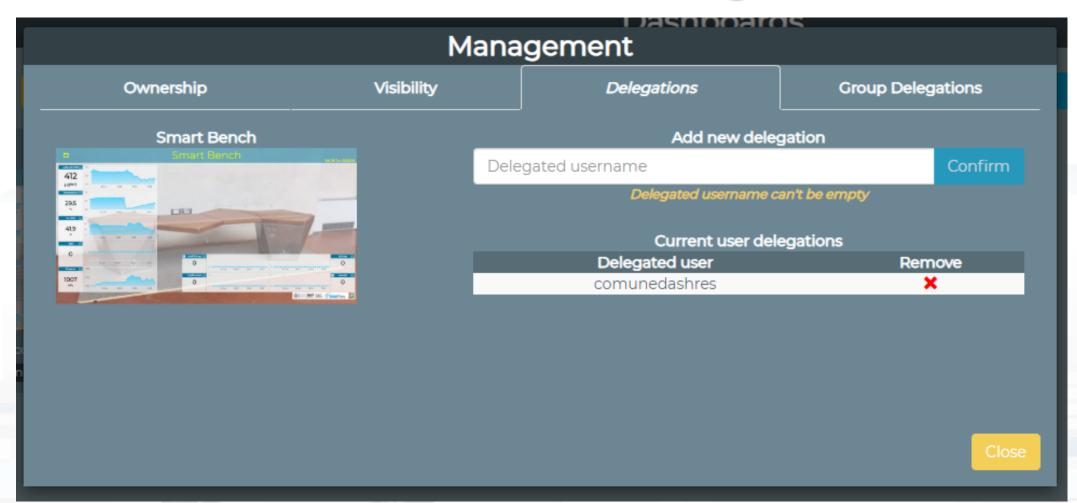








Dashboard Delegation











TOP

Personal Data Management, GDPR compliant: POI, Data, KPI



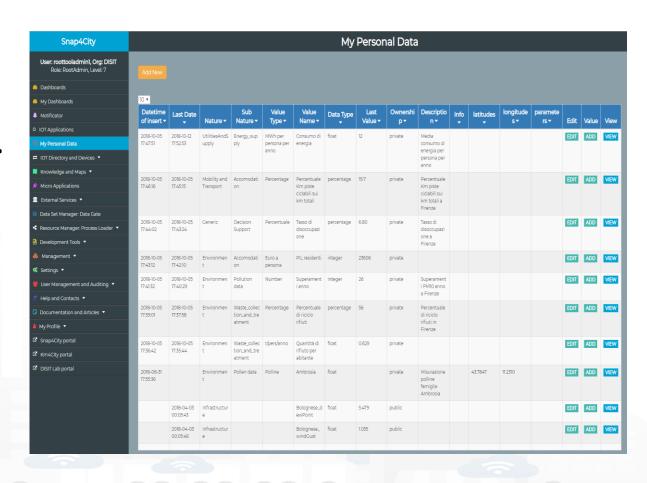




Managing Personal: KPI, Data, POIs

Which can be:

- Acquired from any source: SQL,
 SPARQL, API, etc., ODBC, JDBC, etc.
- Computed by means of IOT App,
 Data Analytics, ETL
- Stored/retrieved into personal safe or general storage
- Edited from tool, or from IOT App
- Added Manually or Automatically
- Shown via Dashboard



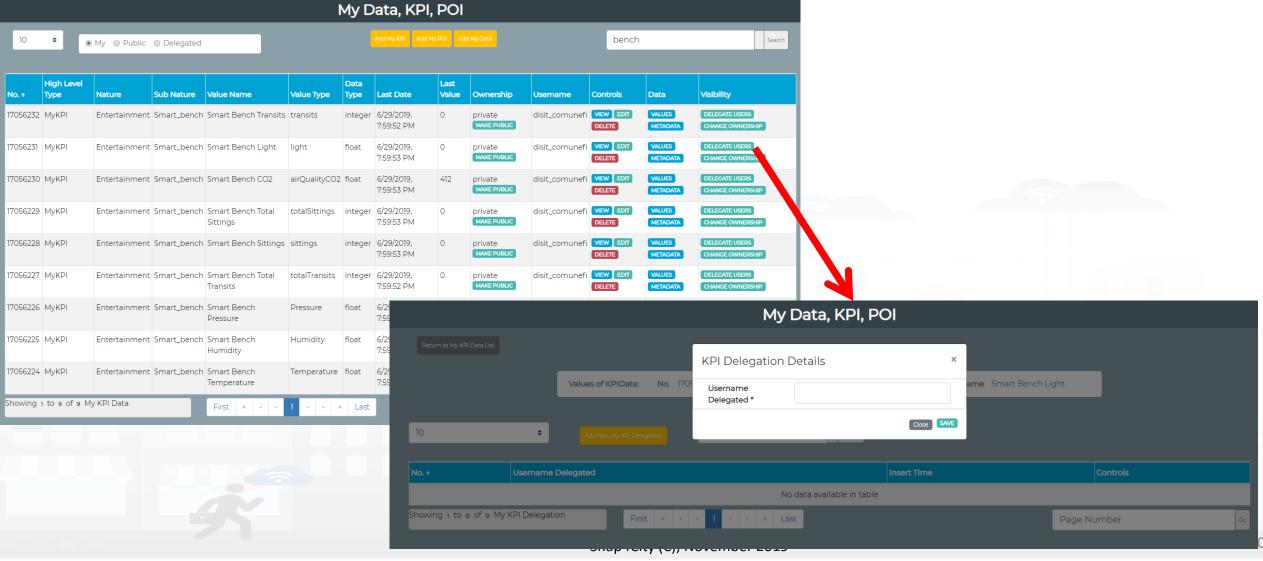








Smart Bench Data Delegation



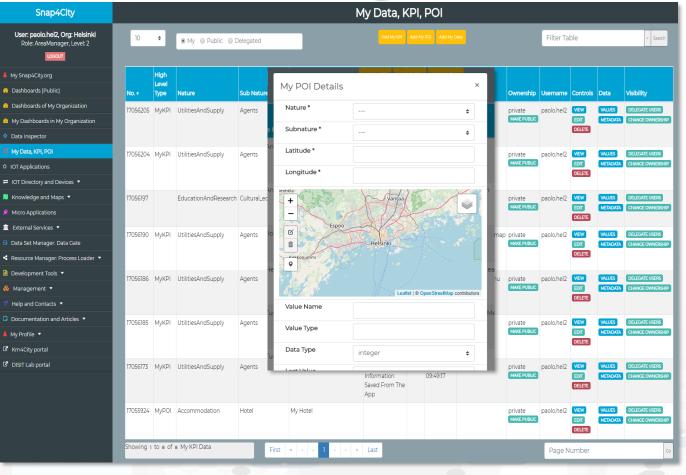


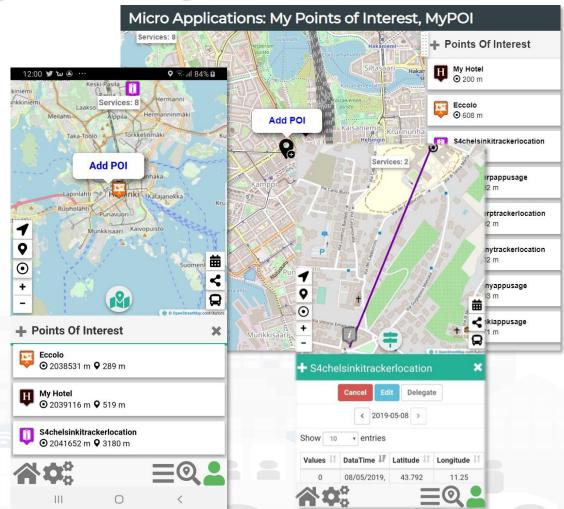






Management of MyKPI, MyPOI, ...





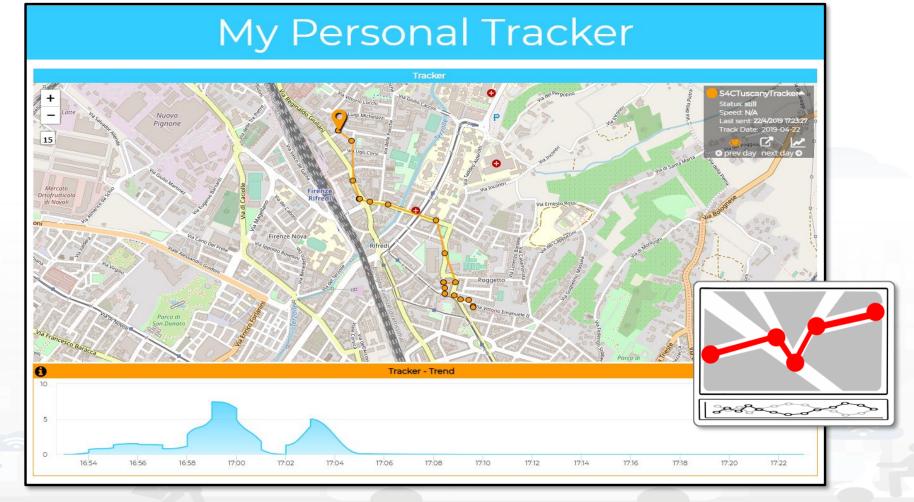








Recalling Exercize number 3





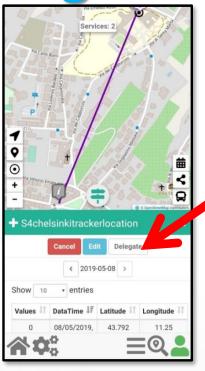




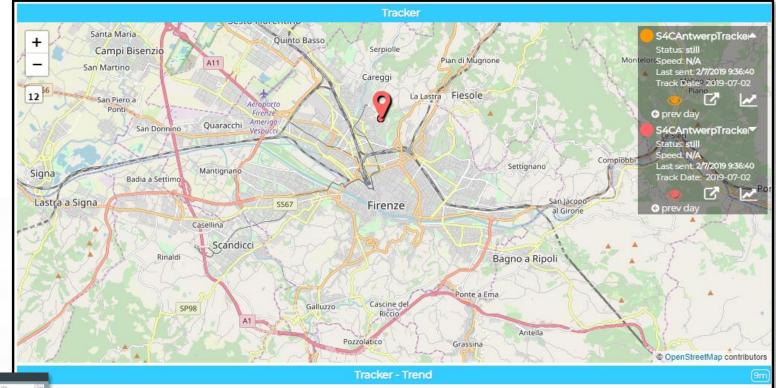


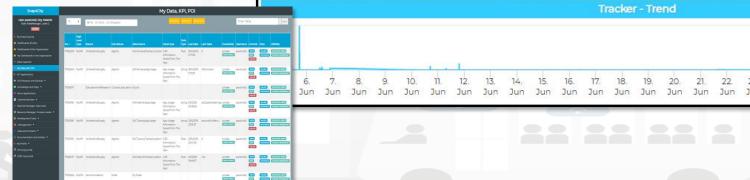


Accessing Multiple Trajectories



You can revoke at any instant from Web and mobile App







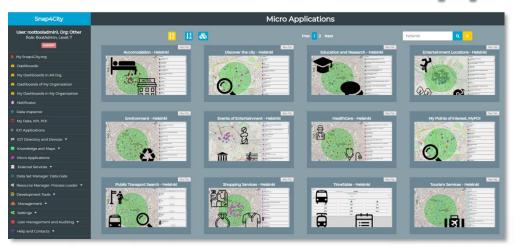


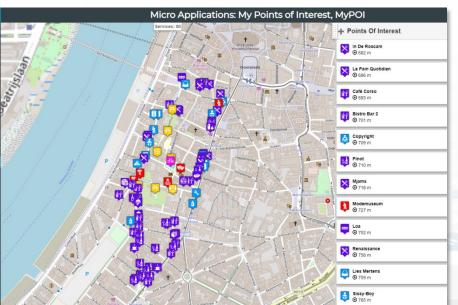


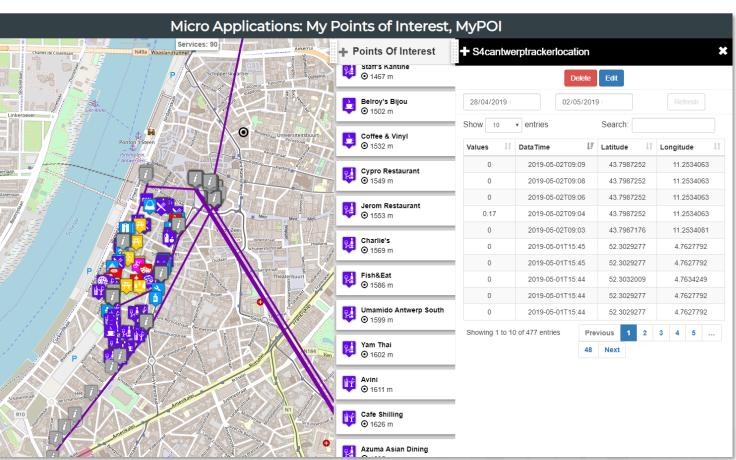




MicroApplications: several new



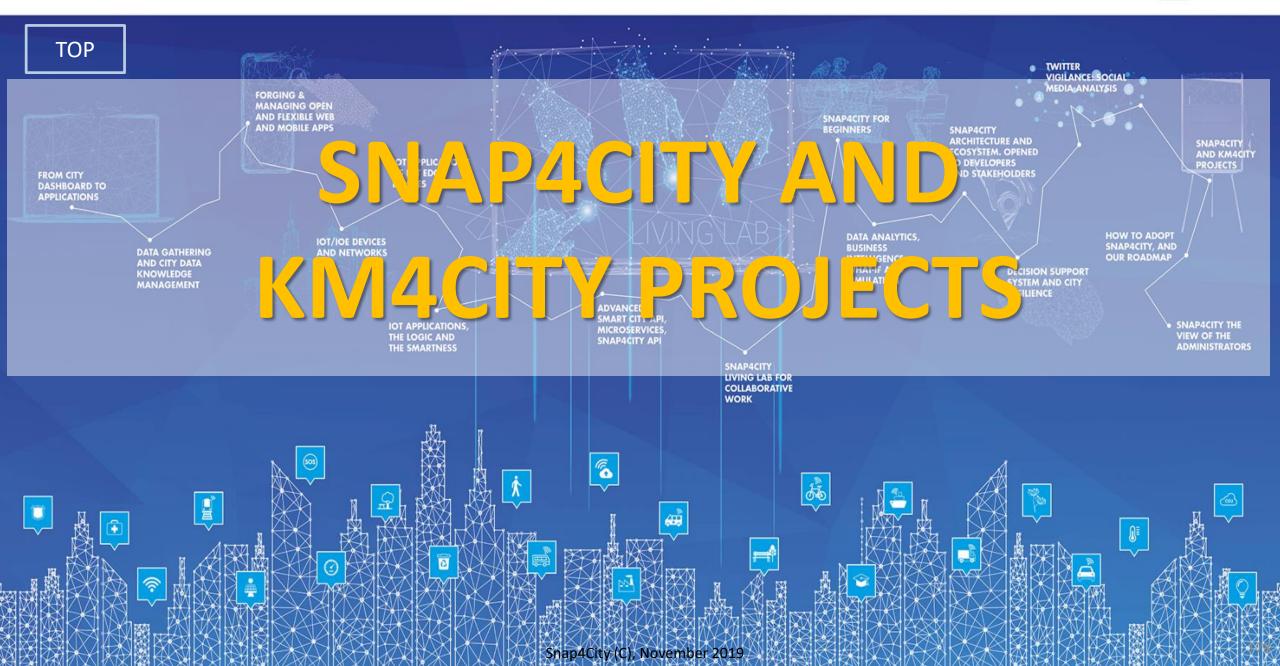




Personal POI, KPI, Trajectories/trips

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES





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
- Events
- LOD



- Twitter Vigilance
- Social Media Analytics, Sentiment Analysis

Km4City 1.4



Km4City 1.6.2

- Infomobility
- Mobile App
- Routing
- Multimodality

(2015-18)

resolute

H2020

Decision Support

Analysis, predictions

Smart First Aid

User Behaviour

- Risk Analysis

- Resilience

2016



(2016-21)



- Smart Energy

- Sustainable Mobility

Control Room

Dashboard



Sii-Mobility

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



GHOST SIR

- Sardinia Region **Smart City** Strategies and plan

EØ15

digital ecosystem







Km4City 1.6.6 IOT/IOE

8

Node-RED

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

for Cities

- Privacy & Security



(2017-20)

- Smart Waste

2017

GREEN IMPACT

POR FESR 2014-2020

- Industry 4.0

- Critical Plant

- Monitoring



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

2018



- Mobility Demand / Offer Analytics and Strategy











(2018-21)

5G tech Energy

Industry 4.0

Synoptics

- Traffic and Mobility Impact on Pollution
- NOX predictions

















Reverberi Enetec

bee smart city

GREEN FIELD PEAS

Soda4.0



2015





Main running projects

Projects





















Green Impact

- Snap4City → The platform!
- Sii-Mobility → DISIT (mobility and transport)
- REPLICATE → DISIT (ICT, Energy, IOT)
- RESOLUTE → DISIT (Resilience, ICT, Big Data)
- GHOST → UNICA, UNIFI (strategies, smart city)
- TRAFAIR → UNIMORE, DISIT (environ. & transport)
- MOSAIC → DISIT (mobility and transport)
- WEEE Life → DISIT (waste, environment)
- Smart Garda Lake -> Castelnuovo del Garda
- 5G → DISIT (Industry 4.0 vs SmartCity)
- Green Impact → DISIT (Industry 4.0, Chemical)
- PISA Agreement \rightarrow data aggregation



Sii-Mobility

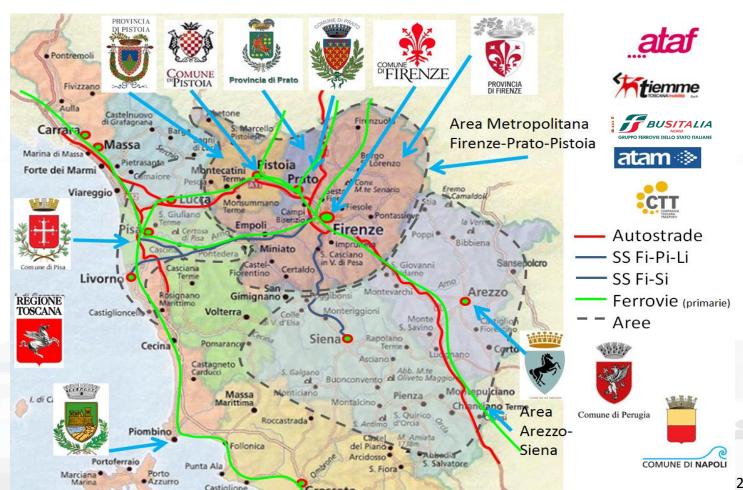


http://www.Sii-Mobility.org

- Experimentations and validation in Tuscany
- Integration with present central station and subsystems
- DISIT lab, Università di Firenze, is the tech-scientific coordinator







ECM; Swarco Mizar; Inventi In20; Geoin; QuestIT; Softec; T.I.M.E.; LiberoLogico; MIDRA (autostrade, motorola); ATAF; Tiemme; CTT Nord; BUSITALIA; A.T.A.M.; Effective Knowledge; eWings; Argos Engineering; Elfi; Calamai & Agresti; Project; Negentis





DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

Sii-Mobility





□<u>http://www.Sii-Mobility.org</u>

Commenti dei cittadini, Social Media

Merci





AVM trasporto Pubblico



sistema monitoraggio



Sensori su



trasporto Privato



Monitoraggio traffico, autostrade



Rete

Rete Parametr Ferroviaria ambienta



Parametri ambientali Servizi ed

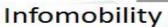


polizia, 118
Ordinanze: eventi,
lavori pubblici, .













Telematici, ZTL







General Objectives





http://www.Sii-Mobility.org

- Reduce the social costs of mobility
 - minor inconvenience,
 - greater efficiency,
 - greater sensitivity to the needs of the citizen,
 - lower emissions,
 - better environmental conditions;
 - info-training programs to help city user in getting virtuous habits;
 - reduce transportation costs and travel times for users, for operators and administrations,
 - optimization solutions.

- simplify the use of mobility systems
 - innovative sensors for AVM and private transport on the territory
 - integrated systems for payment and identification
 - driving / offline routing solutions
 - connect the drive, smart drive or walk
 - Integration of data from operators and different type sources
 - advanced management of resources measurement of flows realization of sensors, actuators
- Testing on municipalities and provinces of Tuscany
- Contribute to the improvement of national and international standards



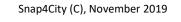
with Innovative Citizenship And TEchnology

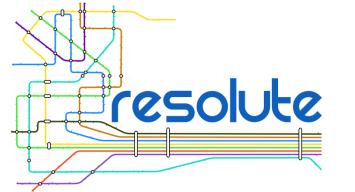
http://replicate-project.eu/

- Demonstrate Smart City technologies in energy, transport and ICT in districts in:
 - San Sebastian, Florence and Bristol,
 - follower cities of Essen, Nilufer and Lausanne
- Cities are the customer: considering local specificities
- Solutions must be replicable, interoperable and scalable:
 - Integrated Infrastructure: deployment of ICT architecture, from internet of things to applications
 - Low energy districts
 - Urban mobility: sustainable and smart urban services

- □1 (coordinator) FOMENTO DE SAN SEBASTIAN FSS SPAIN
- □2 AYUNTAMIENTO DE SAN SEBASTIAN SAN SEBASTIAN SPAIN
- **3 COMUNE DI FLORENCE FLORENCE ITALY**
- □4 BRISTOL COUNCIL BRISTOL UNITED KINGDOM
- □5 STADT ESSEN ESSEN GERMANY
- 6 NILUFER BELEDIYESI NILUFER TURKEY
- □7 VILLE DE LAUSANNE LAUSANNE SWITZERLAND
- □8 IKUSI ANGEL IGLESIAS, S.A. IKUSI SPAIN
- 9 ENDESA ENERGÍA, S.A. ENDESA SPAIN
- □ 10 EUROHELP CONSULTING, S.L. EUROHELP SPAIN
- 11 ILUMINACION INTELIGENTE LUIX, S.L. LUIX SPAIN
- 12 FUNDACION TECNALIA RESEARCH & INNOVATION TECNALIA SPAIN
- 13 EUSKALTEL, S.A. EUSKALTEL SPAIN
- □ 14 COMPAÑÍA DEL TRANVÍA DE SAN SEBASTIÁN DBUS SPAIN
- □15 CONSIGLIO NAZIONALE DELLE RICERCHE CNR ITALY
- □ 16 ENEL DISTRIBUZIONE, SPA ENEL ITALY
- 17 MATHEMA, SRL MATHEMA ITALY
- **□ 18 SPES CONSULTING SPES ITALY**
- □ 19 TELECOM ITALIA, SPA TELECOM ITALY
- **20 UNIVERSITA DEGLI STUDI DI FLORENCE UNIFI ITALY:** DINFO.DISIT Lab and DIEF
- 21 THALES ITALIA, SPA THALES ITALY
- □22 ZABALA INNOVATION CONSULTING ZABALA SPAIN
- □23 TECHNOMAR TECHNOMAR GERMANY
- **24 UNIVERSITY OF BRISTOL UOB UNITED KINGDOM**
- □25 UNIVERSITY OF OXFORD UOXF UNITED KINGDOM
- □26 BRISTOL IS OPEN, LTD BIO UNITED KINGDOM
- ■27 ZEETTA NETWORKS ZEETTA UNITED KINGDOM
- □28 KNOWLE WEST MEDIA CENTRE, LGB KWMC UNITED KINGDOM
- □29 TOSHIBA RESEARCH EUROPE, LTD TREL UNITED KINGDOM
- 30 ROUTE MONKEY, LTD ROUTE MONKEY UNITED KINGDOM
- □31 ESOTERIX SYSTMES, LTD ESOTERIX UNITED KINGDOM
- 32 NEC LABORATORIES EUROPE, LTD NEC UNITED KINGDOM
- 33 COMMONWHEELS CAR CLUB CIC CO-WHEELS UNITED KINGDOM
- 34 UNIVERSITY OF THE WEST OF ENGLAND UWE UNITED KINGDOM
- □35 ESADE BUSINESS SCHOOL ESADE SPAIN
- 36 SISTELEC SOLUCIONES DE TELECOMUNICACION, S.L.

 SISTELEC SPAIN









http://www.resolute-eu.org

- Develop European Resilience Management Guidelines (ERMG)
 - Develop a conceptual framework for creating/ maintaining Urban Transport Systems
- Enhance resilience through improved support of human decision making processes, particularly by training professionals and civil users on the ERMG and the RESOLUTE system
- Operationalize and validate the ERMG by implementing the RESOLUTE Collaborative Resilience Assessment and Management Support Systems (CRAMSS) for Urban Transport Systems addressing Road and Urban Rail Infrastructures
 - Pilots in Florence and Athens
- Adoption of the ERMG at EU and Associated Countries level

University of Florence: DISIT lab DINFO (Proj coordinator), DISIA and DST	UNIFI	ΙΤ
THALES	THALES	ΙΤ
ATTIKOMetro	ATTIKO	GR
Comune di Firenze	CDF	ΙΤ
Centre for Research and Technology Hellas	CERTH	GR
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.	FHG	DE
HUMANIST	HUMANIST	FR
SWARCO Mizar	SWMIZ	IT
Associação para o Desenvolvimento da Investigação no Instituto Superior de Gestão	ADI-ISG	PT
Consorzio Milano Ricerche	CMR	IT



GHOST: Governing tHe smart city: a gOvernance-centred approach to SmarT urbanism



General Objectives

- Offer a comprehensive framework for measuring and reassessing urban smart development and related rankings
- Critical assessment of Smart City ranking index existence
- Definition of an enabling technology supporting the action plans for strengthening multi-level place-based governance, applied in the tourism context
- Definition of strategies for good smart governance, with the purpose of providing recommendations to start or implement an institutional and development process leading towards smart city governance.

Partners:

University of Cagliari (Coordinator) DICAAR and DMI

University of Florence SAGAS and DISIT University of Turin ESOMAS University of Sassari DADU

Under the patronage of the Municipality of Cagliari



Duration: 23/09/2015 - 23/09/2018

http://sites.unica.it/ghost



http://trafair.eu/



Understanding Traffic Flows to Improve Air quality

TRAFAIR

Objective:

– to develop a service that combines traffic data on air quality, weather conditions, and traffic flows in order to allow citizens and municipalities to estimate the level of pollution resulting from varying traffic flow conditions.

Where:

Zaragoza, Florence, Modena, Livorno,
 Santiago de Compostela, and Pisa

- Università degli studi di Modena e Reggio Emilia (UNIMORE) -- Italy
- Università degli Studi di Firenze –
 DISIT DINFO -- Italy
- Universidade de Santiago de Compostela (USC) - Spain
- Comune di Modena (CMO) Italy
- Regione Toscana (TR) Italy
- Concello de Santiago de Compostela (CSC) - Spain
- Fundación Pública Gallega Centro
 Tecnológico de Supercomputación de Galicia (Fundacion CESGA) - Spain
- Universidad de Zaragoza (UNIZAR) Spain
- Lepida S.p.A. (LP) Italy











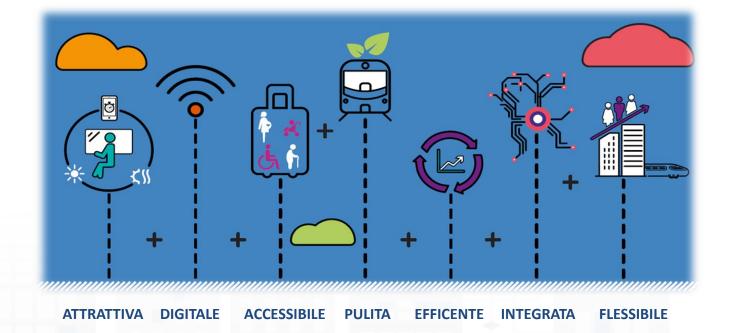


MObility 4.0 for SmArt (i) City

Tools for Mobility operators

- Demand Analysis
- Prediction on Parking
- Connected Drive
- Offer Analysis
- Simulation of Mobility
- Etc.

Where: in Tuscany































WEEE: Waste from Electrical and Electronic Equipment

 maximize the collection of WEEE in Tuscany through a new governance model based on the involvement of SMEs and awareness raising activities towards citizens and its replication in Andalucía.

Actions:

- Improve the regional governance
- Support municipalities in capacity building of public officials and improving services to citizens.
- Develop a system of services and incentives for SMEs
- Develop IT tools for companies and citizens: a software and guidelines for the simplification of administrative and bureaucratic activities and an App to easily locate collection sites.
- Develop an awareness raising information campaign to increase public attention on the topic.
- Test the replicability and transferability of project results through the implementation of actions in the Region of Andalucía.



















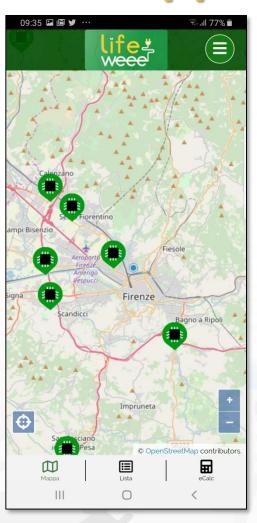


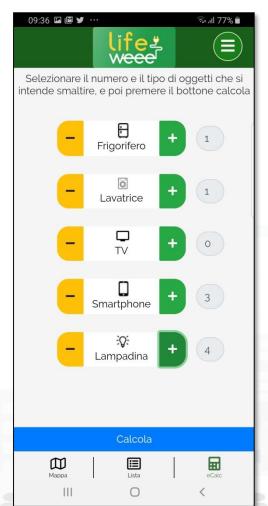


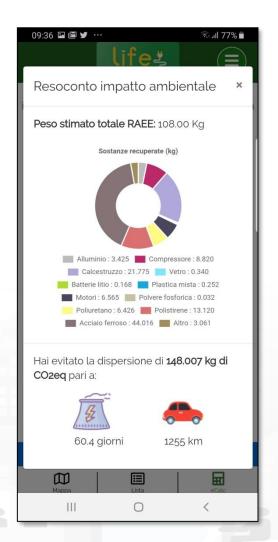


Example of Mobile App on Stores











www.smartgardalake.it









OPEN DATA, IOT, SOCIAL





CONTROL ROOM FOR SMART GOVERNCANCE





APP E SERVIZI ON DEMAND SMART CITY & SMART TOURISM















Fields:

- Internet of Things: Industry IOT,
 Smart City
- Mobility and transport
- Safety & Security: video analysis
- Culture and Tourism, Education, Health

Where in Italy:

- Prato and L'Aquila

Partners:













open fiber



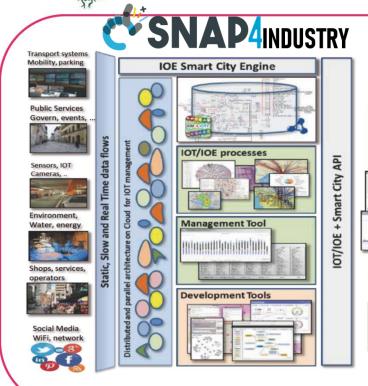




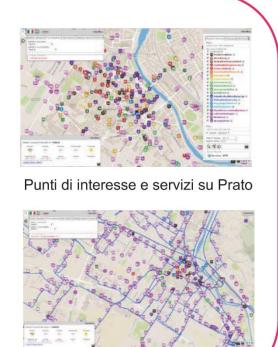


Piattaforma IoT/IoE abilitata dal 5G per applicazioni di:

- Smart City management (in ottica Smart City)
- monitoraggio utenze in modo smart
- industrial automation (in ottica Industria 4.0)















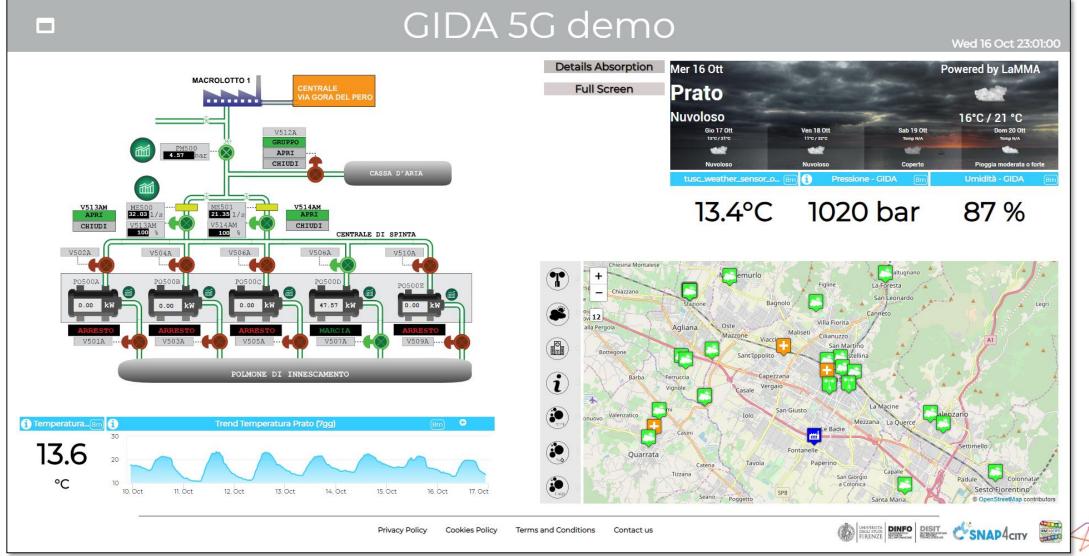


Demo UC5 GIDA

















Green Impact Capacity (GIC)

- Improve productivity of chemical plant
- Keep GREEN the environmental impact
- Exploiting innovative technologies
- Diversify the production
- Monitoring environmental conditions

























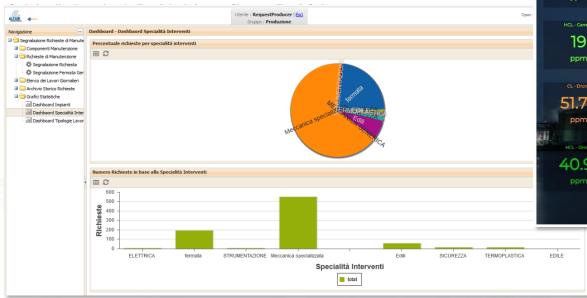






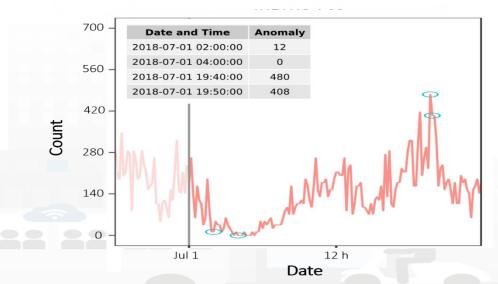






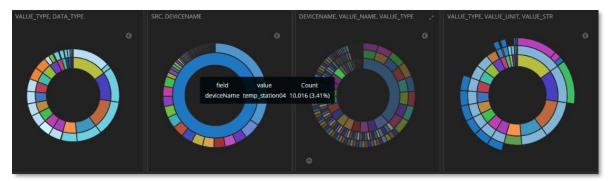
Anomaly detection Early Warning

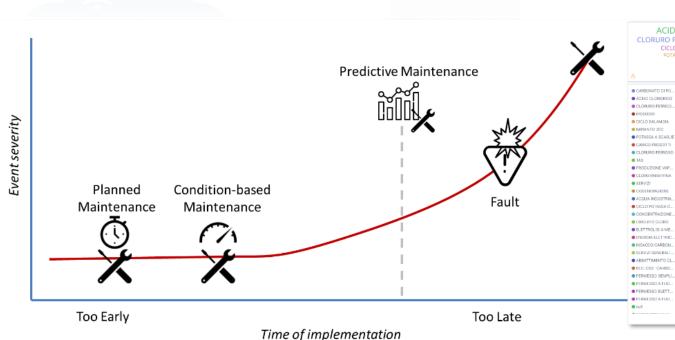






Business Intelligence and Predictive Maintenant













Supporto Collaborativo Protetto per Genitori e Operatori di Disabili

Tema primario: Tecnologie Welfare e Inclusione

Tema Secondario: Salute

Nicola Mitolo, DISIT Lab, UNIFI Evaristo Ricci, Associazione Modi di Dire











Coll@bora

Giuseppe Bondi

Funzioni di Logopedia

Nuovo Elemento
Lista Pazienti

Lista Categorie

Lista Elementi
Esercizi
Libreria Elementi
Report Esercizi esequit

My account



Casa

DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

Collabora Mobile (DEMO)



Coll@bora Mobile Manager

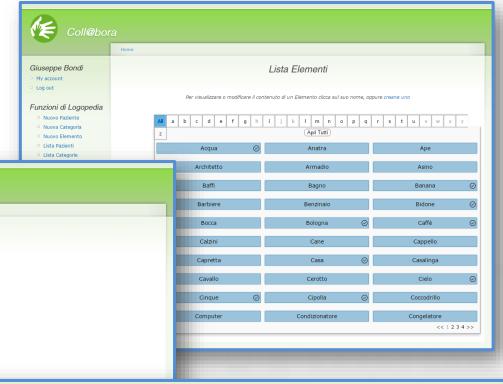
Mon. 10/19/2015 - 11:12 - Giuseppe Bond

Frase descrittiva:

Carica un'immagine

Download: casa.mp3

Mobili e stanze della casa File audio:



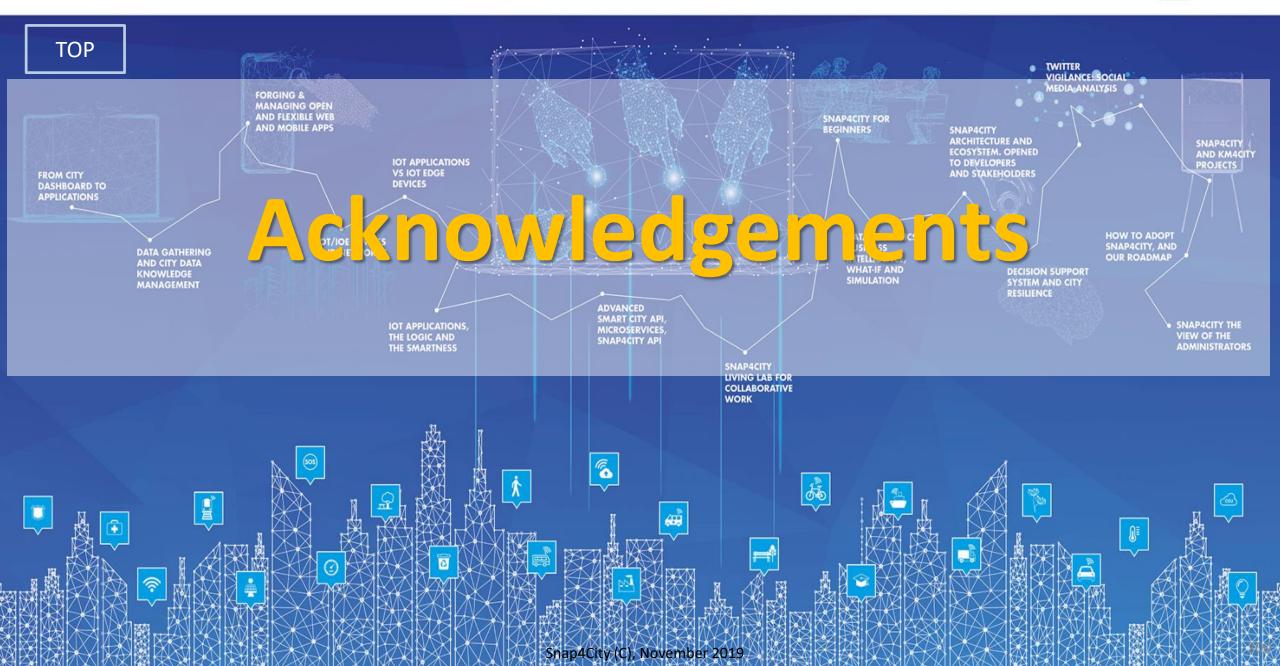


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Coll@bora Mobile App

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES





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Horizon 2020 European Union Funding for Research & Innovation





INEA CEF-TELECOM Project funded by European Union





Horizon 2020 European Union Funding for Research & Innovation



























TOP









CONTACT

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

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







Email: snap4city@disit.org

Office: +39-055-2758-515 / 517

Cell: +39-335-566-86-74 Fax.: +39-055-2758570