



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



SNAP4city



Powered by

Snap4City: a platform for Smart Cities and Living Labs

<https://www.snap4City.org>



VENIS

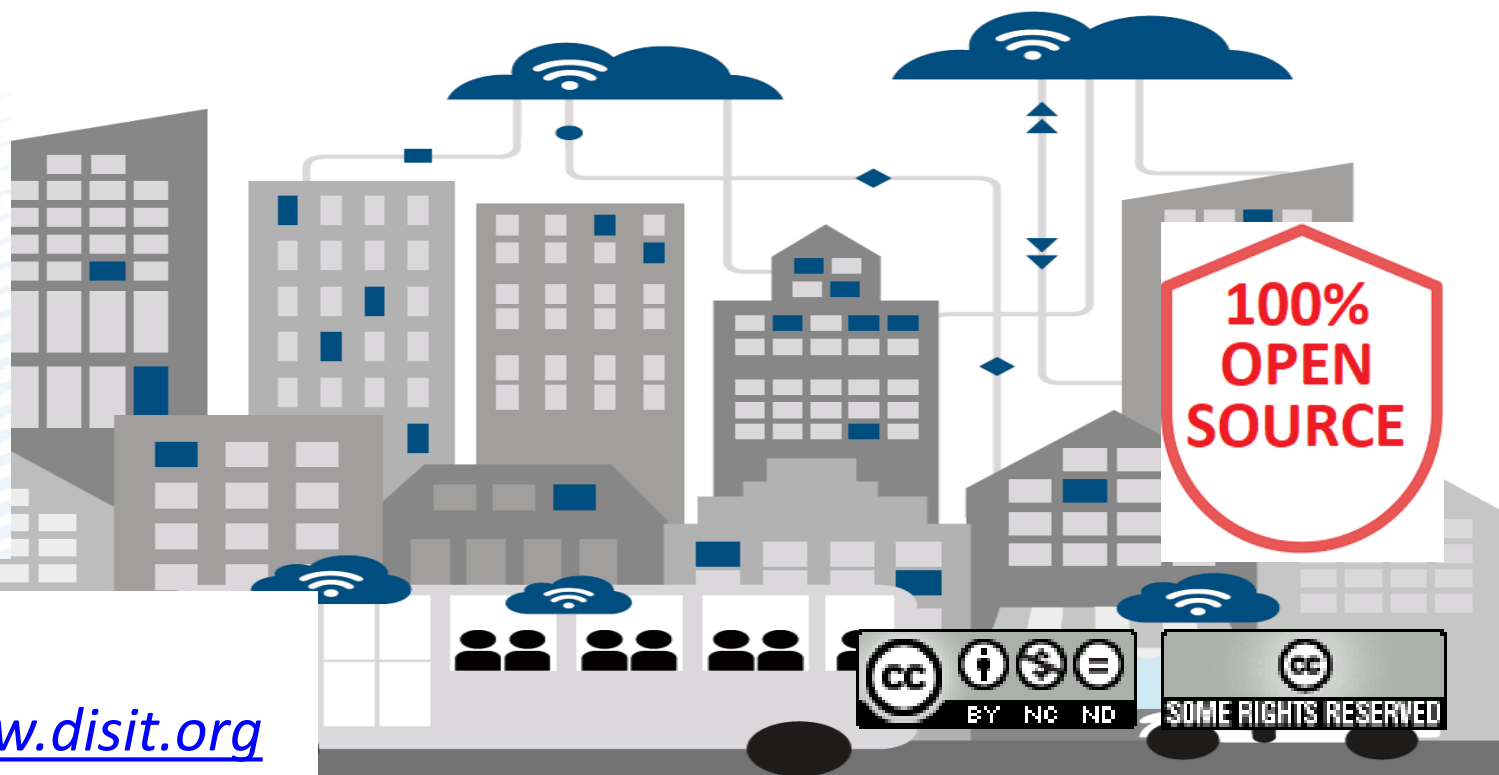


Università
Ca' Foscari
Venezia

Channeling Change

Venice, June 13-14, 2019

Digital Cities in a Changing World
explore more, discover more, create more



Paolo Nesi, paolo.nesi@unifi.it

<https://www.Km4City.org> - <https://www.disit.org>



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



- GDPR
- SECURITY
- PRIVACY
- ASSESSMENT
- AUDITING

- OPEN HW/SW
- IOT EDGE
- IOT BUTTONS
- IOT DEVICES

IOT APPLICATIONS • INSTANT APPS



PERSONAL DATA • DATA DRIVEN •
REAL TIME - ANY PROTOCOL & FORMAT

DASHBOARDS & APPLICATIONS



CONTROL ROOM • KPI • BUSINESS INTELLIGENCE •
DECISION SUPPORT • WHAT-IF ANALYSIS

MOBILE & WEB APPLICATIONS



DEV KIT • SUGGESTIONS • USER ENGAGEMENT •
COWORKING • SMART APPLICATIONS

MICROSERVICES & ADVANCED SMART CITY API

LIVING LAB - DEV TOOLS - COWORKING



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

BIG DATA ANALYTICS: AI, MACHINE LEARNING



SMART SOLUTIONS • PREDICTIONS • ANOMALY DETECTION •
TRAFFIC RECONSTRUCTION • ORIGIN-DESTINATION MATRIX •
SOCIAL MEDIA ANALYSIS • OFFER & DEMAND ANALYSIS •
RISK & RESILIENCE ANALYSIS

SMART MICRO-APPLICATIONS - OPEN TO EXTERNAL SERVICES



SMART PARKING • ROUTING • PERSONAL
ASSISTANT • INFOMOBILITY • ALERTING •
INFO TRIAGE

KM4CITY DATA AGGREGATOR, KNOWLEDGE BASE OF THE CITY

OPEN DATA

GIS+MAP DATA

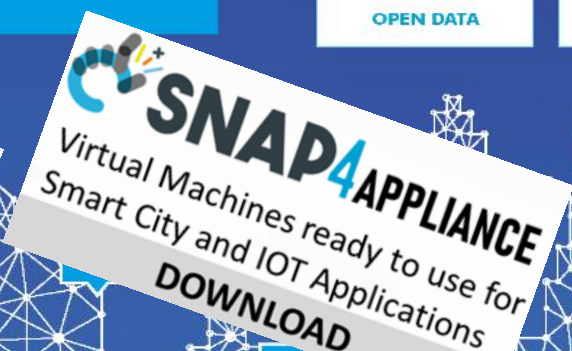
PROPRIETARY DATA

PERSONAL DATA

IOT / IOE

INDUSTRY 4.0

SOCIAL MEDIA



Standards and Interoperability

Compliant with: AMQP, COAP, MQTT, OneM2M, HTTP, HTTPS, Rest Call, SMTP, TCP, UDP, NGSI, LoraWan, TheThingsNetwork, SigFOX, DATEX II, SOAP, WSDL, Twitter, FaceBook, Telegram, SMS, OLAP, MySQL, Mongo, HBASE, SOLR, SPARQL, EMAIL, FTP, FTPS, WebSocket, WebSocket Secure, ModBUS, OPC, RS485, WFS, WMS, ODBC, JDBC, Elastic Search, Phoenix, JSON, XML, GeoJSON, Enfuser FMI, Android, Raspberry Pi, Local File System, etc.

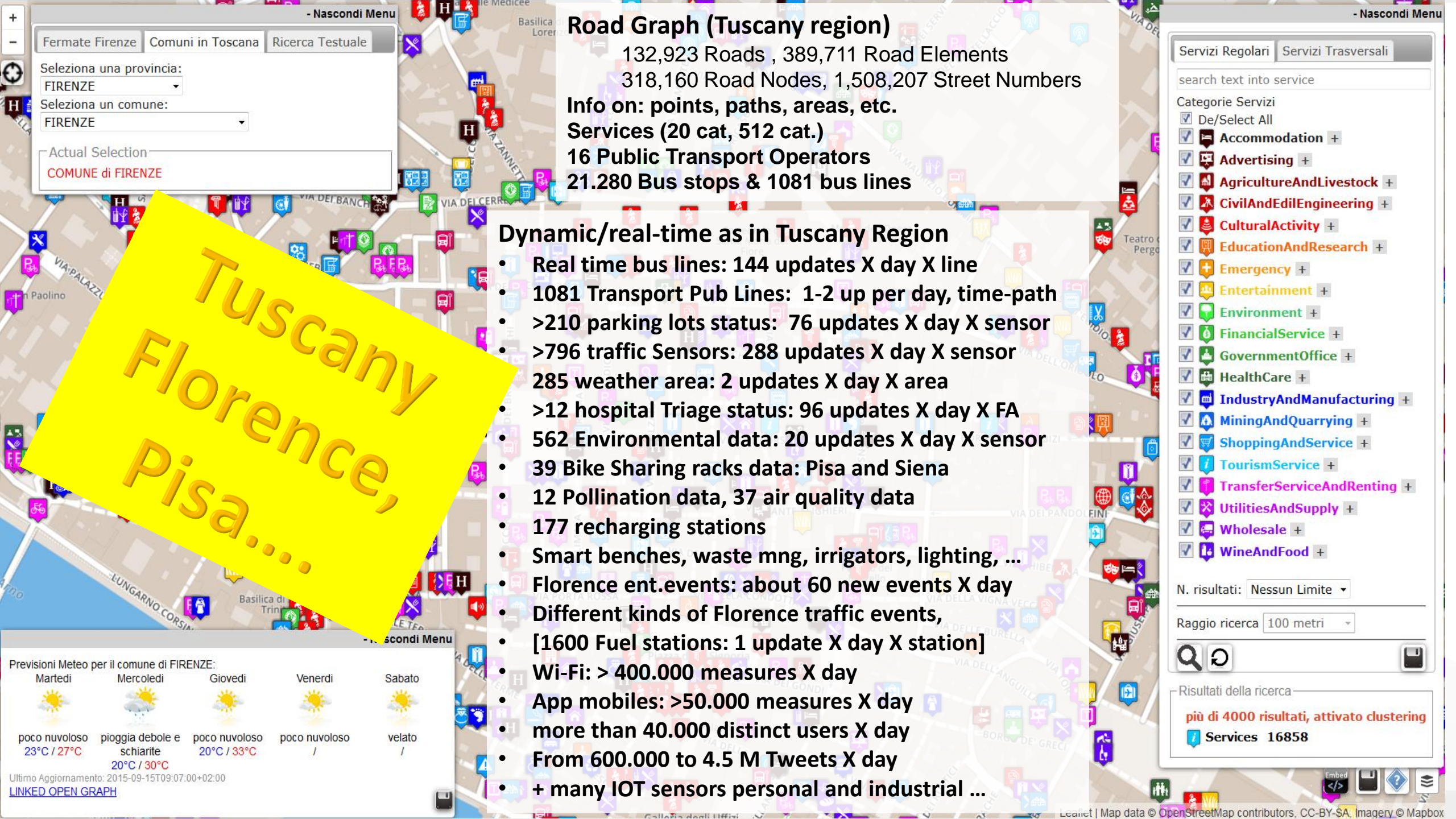


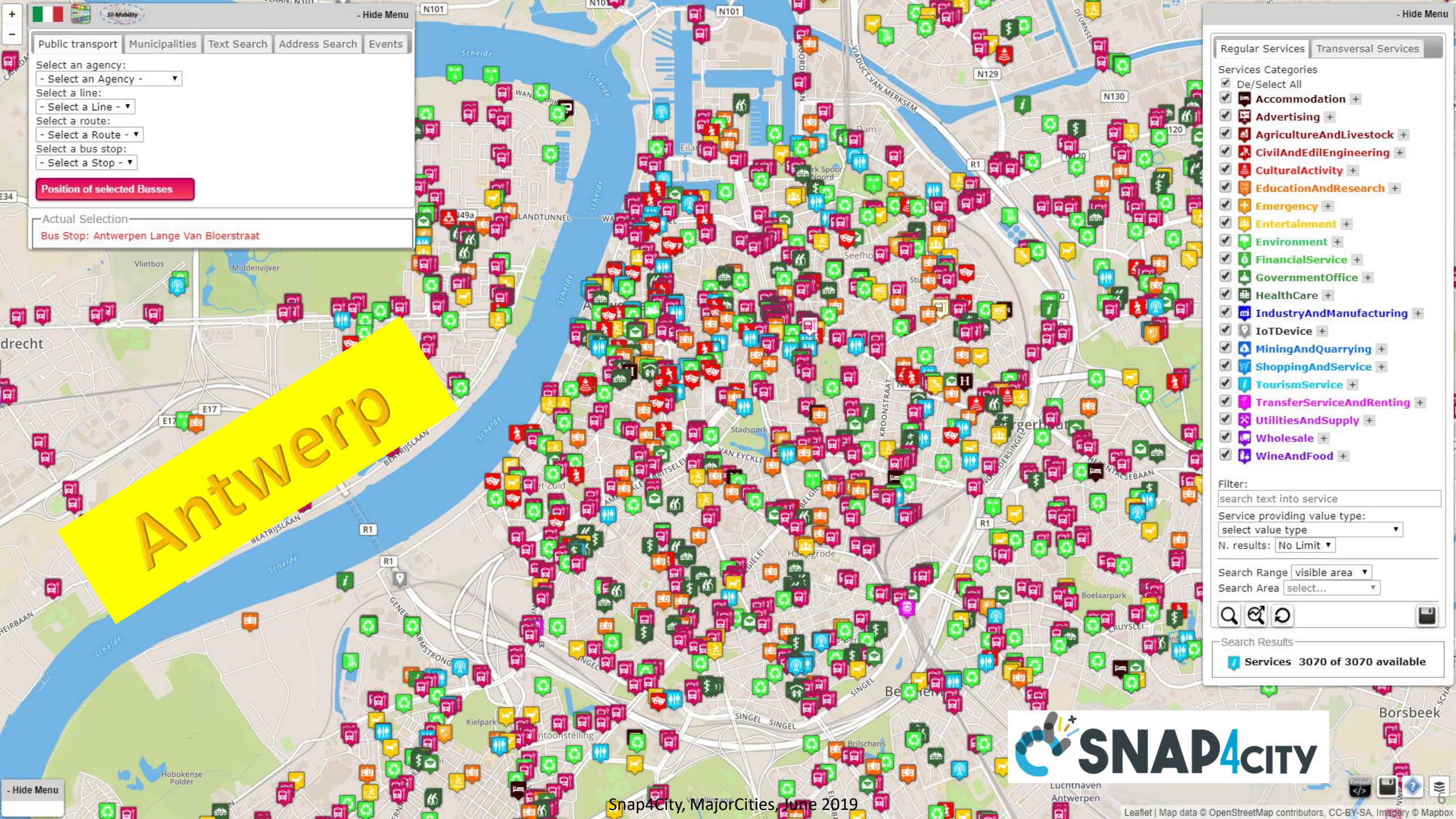
Data and Knowledge Smart City API



ARC

INDEX





Public transport Municipalities Text Search Address Search Events

Select an agency:
- Select an Agency -

Select a line:
- Select a Line -

Select a route:
- Select a Route -

Select a bus stop:
- Select a Stop -

Position of selected Busses

Actual Selection
Bus Stop: Antwerpen Lange Van Bloerstraat

Regular Services Transversal Services

Services Categories

- ☒ De/Select All
- ☒ Accommodation +
- ☒ Advertising +
- ☒ AgricultureAndLivestock +
- ☒ CivilAndEdilEngineering +
- ☒ CulturalActivity +
- ☒ EducationAndResearch +
- ☒ Emergency +
- ☒ Entertainment +
- ☒ Environment +
- ☒ FinancialService +
- ☒ GovernmentOffice +
- ☒ HealthCare +
- ☒ IndustryAndManufacturing +
- ☒ IoTDevice +
- ☒ MiningAndQuarrying +
- ☒ ShoppingAndService +
- ☒ TourismService +
- ☒ TransferServiceAndRenting +
- ☒ UtilitiesAndSupply +
- ☒ Wholesale +
- ☒ WineAndFood +

Filter:
search text into service

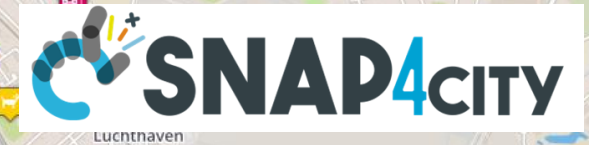
Service providing value type:
select value type

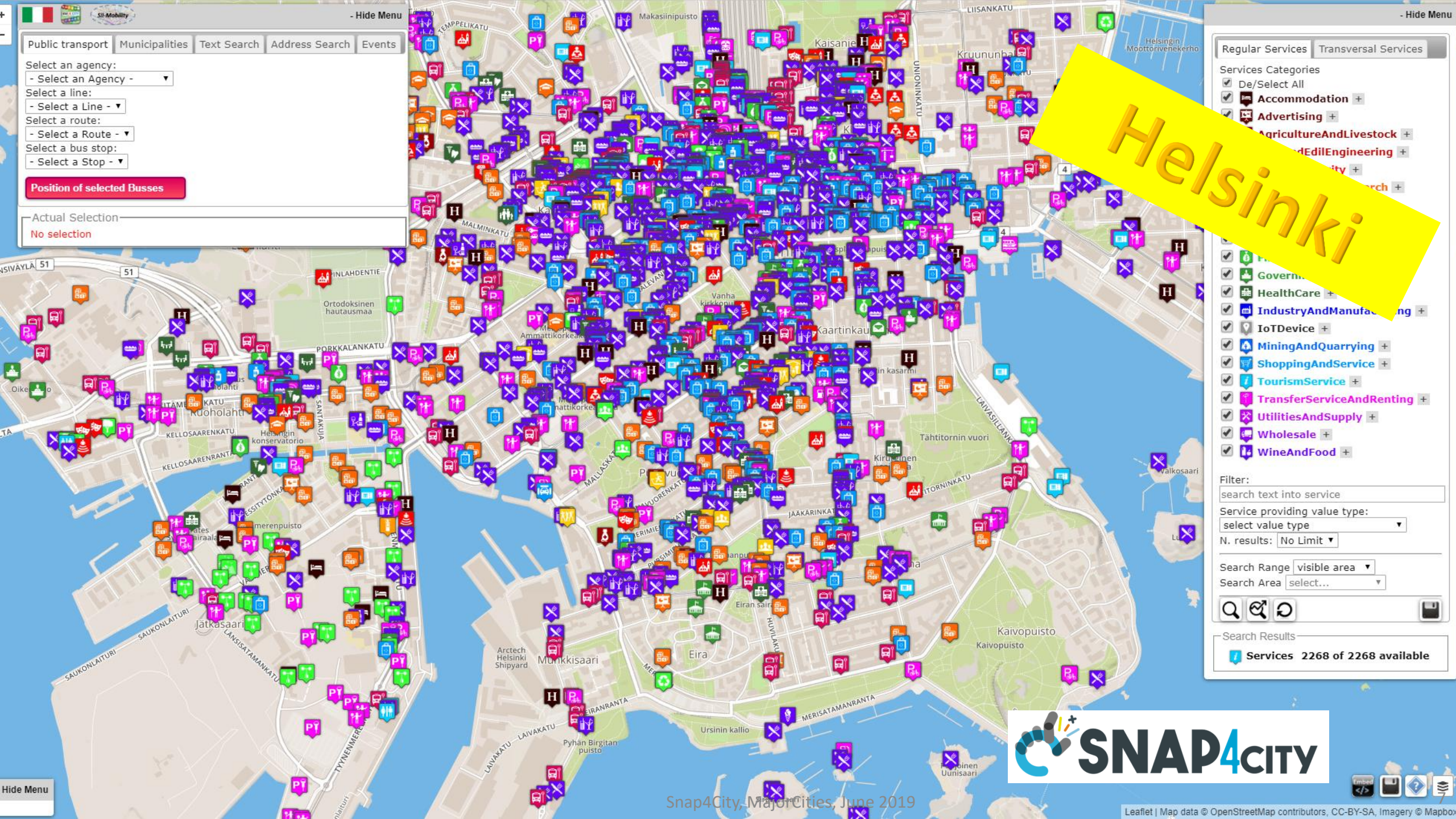
N. results: No Limit

Search Range visible area

Search Area select...

Search Results
Services 3070 of 3070 available





Helsinki



Dashboards: Smart City Control Room



Snap4City

User: roottooladmin1, Org: Other
Role: RootAdmin, Level: 7

LOGOUT

- My Snap4City.org
- Dashboards
- My Dashboards in All Org.
- Dashboards of My Organization
- My Dashboards in My Organization
- Notificator
- Data Inspector
- My Data, KPI, POI
- IOT Applications
- IOT Directory and Devices
- Knowledge and Maps
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager: Process Loader
- Development Tools
- Management
- Settings
- User Management and Auditing
- Help and Contacts
- Documentation and Articles
- My Profile
- Km4City portal

Dashboards

Prev 1 ... 4 5 6 7 8 ... 17 Next

Public

Cards

Garda Twitter Vigilance
Passive
Garda Twitter Vigilance

nicolaroot: Public - DISIT

Edit Management Clone Delete

GIS WFS WMS connected
Passive
GIS WFS WMS connected

My own: Public (DISIT)

Edit Management Clone Delete

IsWFS Examples
Passive
IsWFS Examples

dbologna0: Public - DISIT

Edit Management Clone Delete

IsWFS Sardegna
Passive
IsWFS Sardegna

dbologna0: Public - DISIT

Edit Management Clone Delete

gp Antwerp public test
Passive
gp Antwerp public test

gp.antw.test: Private - Antwerp

Edit Management Clone Delete

gpspax001-nodered tracking
Passive
gpspax001-nodered tracking

disitpax: Public - DISIT

Edit Management Clone Delete

Heatmap Firenze
Passive
Heatmap Firenze

My own: Public (DISIT)

Edit Management Clone Delete

Heatmap Modena - traifair
Passive
Heatmap Modena - traifair

stefanobilotta: Public - DISIT

Edit Management Clone Delete

Heatmap Pisa - traifair
Passive
Heatmap Pisa - traifair

stefanobilotta: Public - DISIT

Edit Management Clone Delete

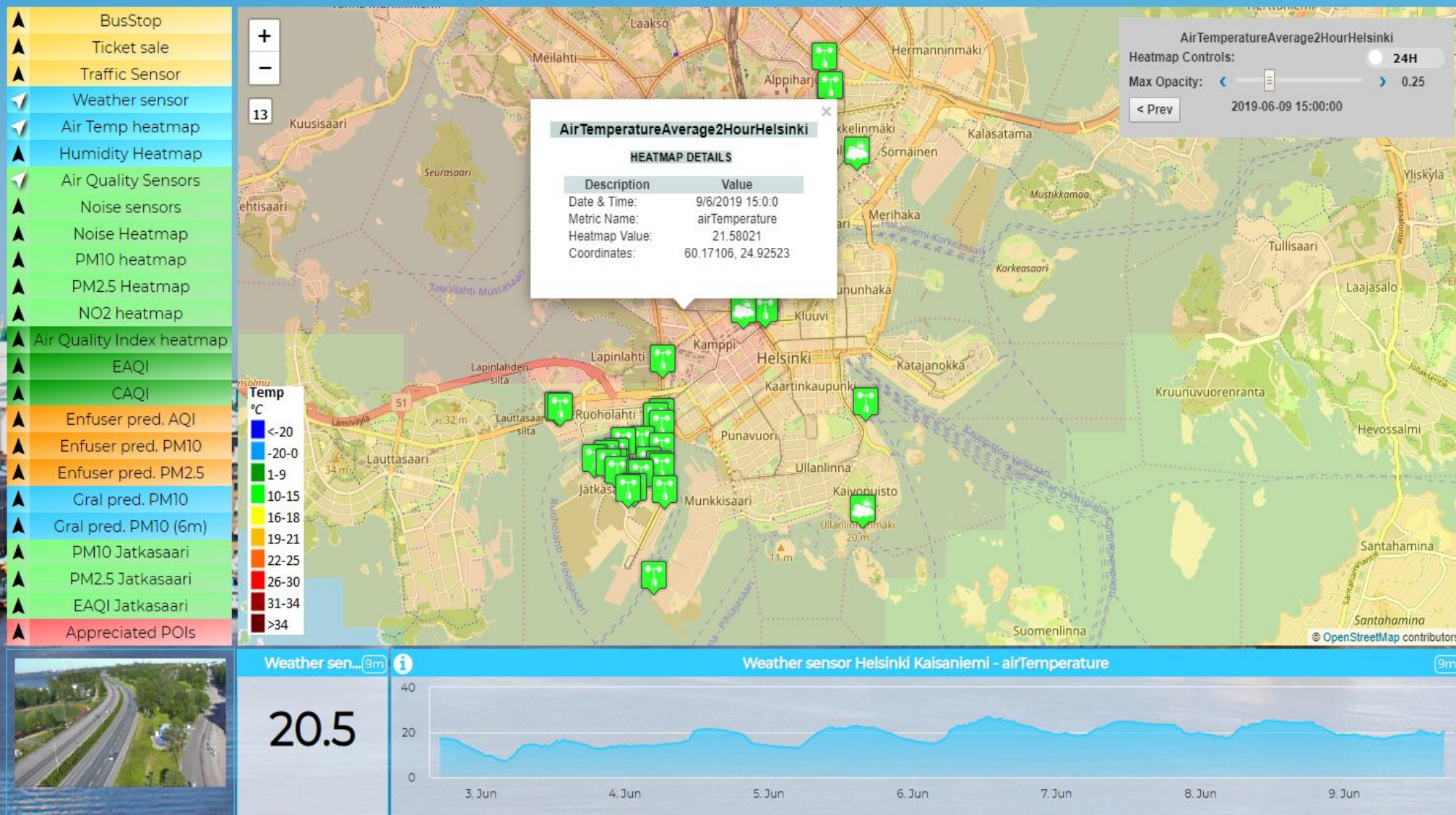
<https://www.snap4City.org>



Helsinki City Overview (H5a)

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

Sun 9 Jun 17:07:25



The Life of Helsinki

Documentation

Forum
Discussion

Survey

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



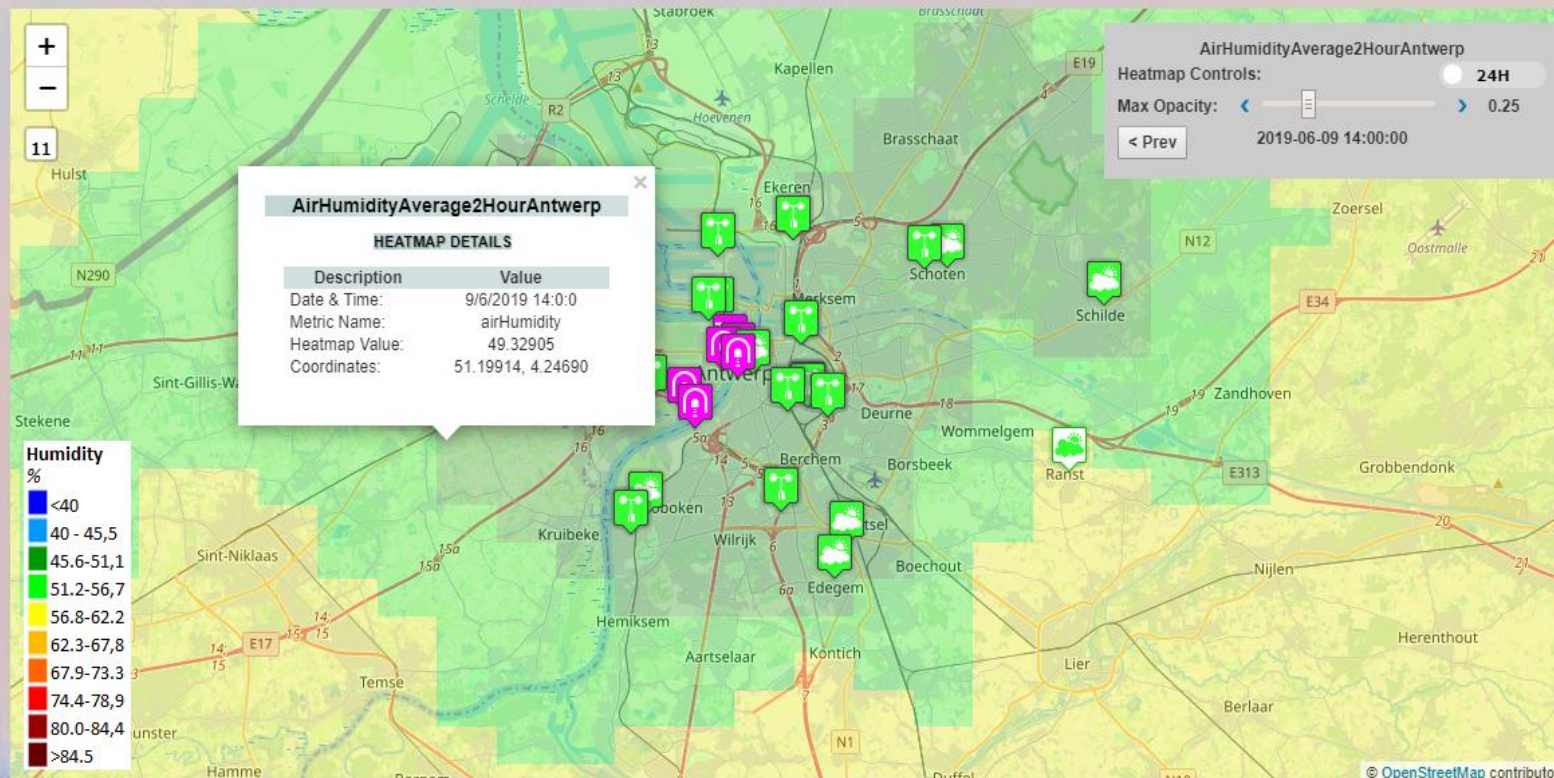


Antwerp City Overview - A5

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

Sun 9 Jun 17:09:04

- ▲ Cultural Activity
- ▲ Entertainment
- ▲ Tourism Service
- ▲ Education & Research
- ▲ Government Office
- ▲ Accommodation
- ▲ Air Quality Sensor
- ▲ Weather sensor
- ▲ PM10 Heatmap
- ▲ PM2.5 Heatmap
- ▲ Air Temperature Heatmap
- ▲ Humidity Heatmap
- ▲ NO Heatmap
- ▲ NO2 Heatmap
- ▲ SO2 Heatmap
- ▲ O3 Heatmap
- ▲ EAQI
- ▲ CAQI
- ▲ Biking Safe Heatmap
- ▲ Tunnels and Ferry



Weather sensor Zwijndr... (9m)

19.4



Documentation

Survey

Forum Discussion

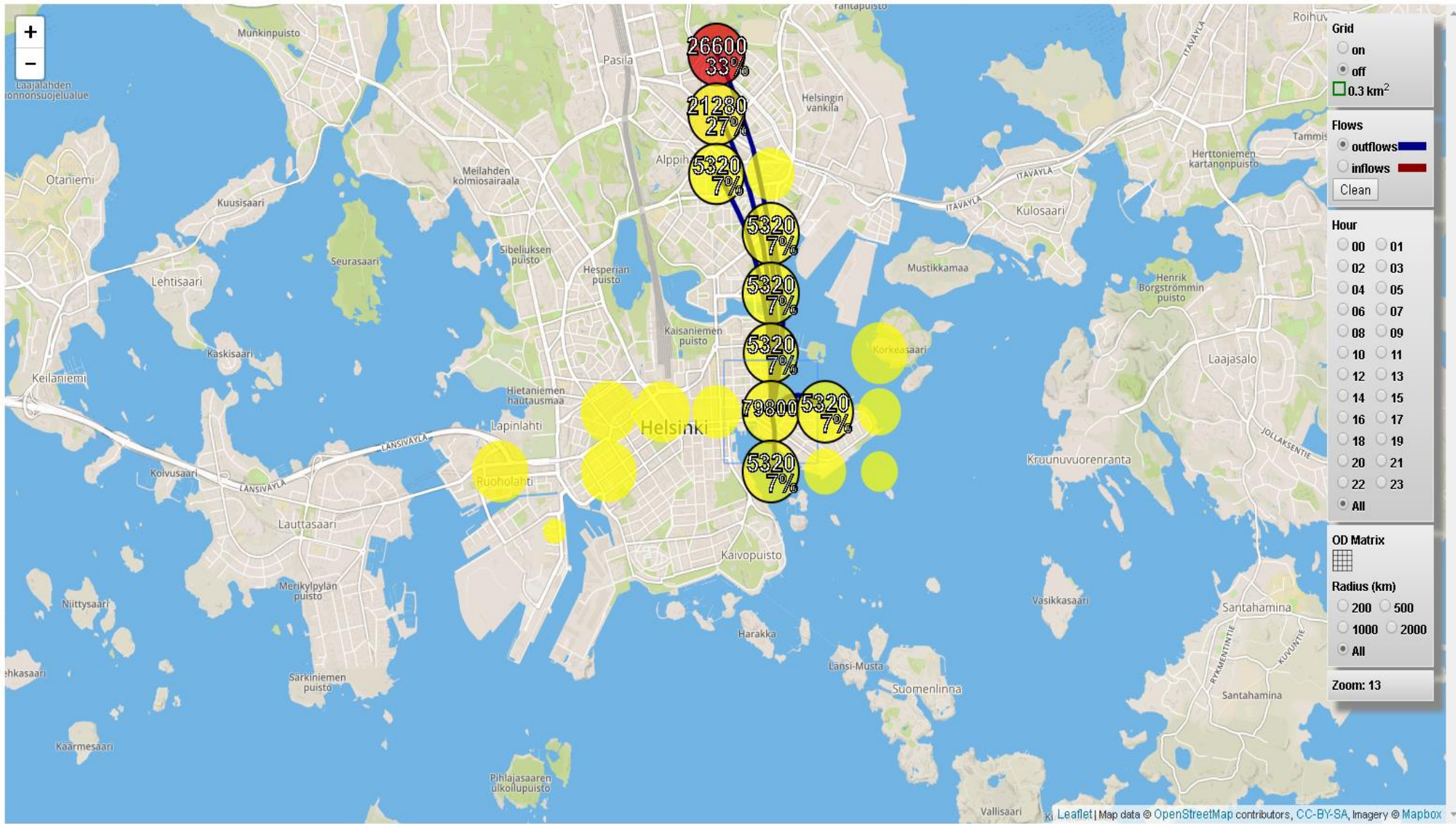
<https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTQwNw==>



Helsinki White Dashboard

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

Thu 13 Jun 23:37:56

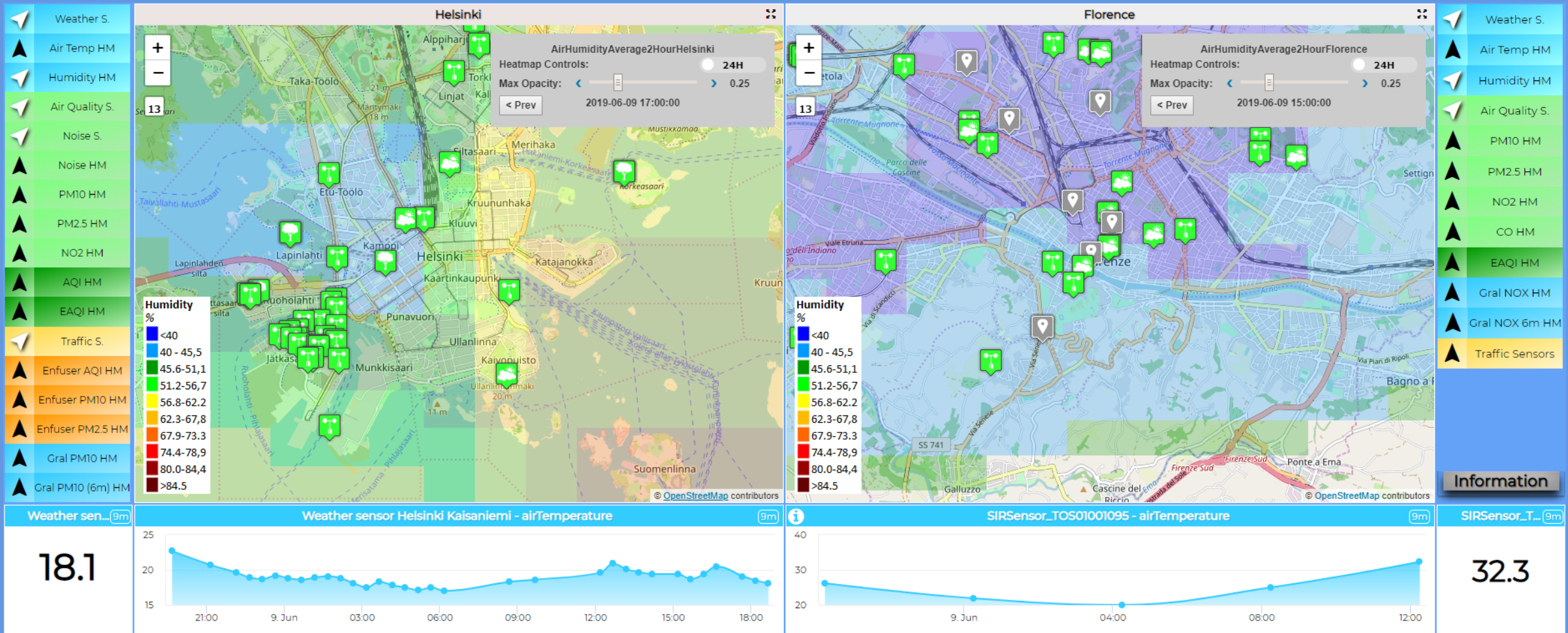


Helsinki vs Florence comparison

Helsinki vs Florence comparison

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

Sun 9 Jun 19:18:35



Antwerp and Helsinki



25 dashboards



12 IoT Apps

	Antwerp				Helsinki				Where				Main Data Sources
	Official	Technical	On the go	Visitor	City officials	Domain experts	City developers	City developers	City developers	Business Owners	MicroApp-ation	MicroApp-ation	
Discovery near to me	x	x	x	x	x	x	x	x	x	x	x	x	POI, OSM
Discovery along a path	x	x	x	x	x	x	x	x	x	x	x	x	POI, OSM
Discovery in an area, shape	x	x	x	x	x	x	x	x	x	x	x	x	POI, OSM
browsing Public Transport	x	x	x	x	x	x	x	x	x	x	x	x	OSM, GTFS
Full Text search	x	x	x	x	x	x	x	x	x	x	x	x	POI, OSM
Routing: pedestrian	x	x	x	x	x	x	x	x	x	x	x	x	OSM
Routing: pedestrian quite	x	x	x	x	x	x	x	x	x	x	x	x	OSM
Routing: private vehicles	x	x	x	x	x	x	x	x	x	x	x	x	OSM
Routing: Multimodal Public Transport	x	x	x	x	x	x	x	x	x	x	x	x	OSM, GTFS
heatmaps: weather (Temp, Humidity)	x	x	x	x	x	x	x	x	x	x	x	x	Sensors data, OSM
heatmaps: environmental variables, PM10, PM2.5, NO2, EAQI	x	x	x	x	x	x	x	x	x	x	x	x	Sensors data, OSM
heatmaps: environmental variables, Noise	x	x	x	x	x	x	x	x	x	x	x	x	Sensors data, OSM
heatmaps: safe on bike (Antwerp)	x	x	x	x	x	x	x	x	x	x	x	x	Spec. Portal
heatmaps: Enfuser prediction, PM10, PM2.5, AQI	x	x	x	x	x	x	x	x	x	x	x	x	Enfuser data
heatmaps piking values any place	x	x	x	x	x	x	x	x	x	x	x	x	Computed Heatmps
heatmaps: GRAL prediction, PM10	x	x	x	x	x	x	x	x	x	x	x	x	OSM, Traffic, Weather
Comparison: Enfuser, Gral, Real Time	x	x	x	x	x	x	x	x	x	x	x	x	Enfuser, Sensors, GRAL
Sensors Data Time Trends, & drill down	x	x	x	x	x	x	x	x	x	x	x	x	Sensors data, OSM
Weather Forecast	x	x	x	x	x	x	x	x	x	x	x	x	Forecast Service
Origin Destination Matrices	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City Mobile App
Typical trajectories	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City Mobile App
Hot Area in the city	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City Mobile App
Hot Places in Smart Zone	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City PAXcounters
Services Suggestions on mobiles	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City Mobile App
Alerts on critical cases: several variables	x	x	x	x	x	x	x	x	x	x	x	x	Sensors data, OSM
The most used services	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City Mobile App
Twitter Trends Daily	x	x	x	x	x	x	x	x	x	x	x	x	Twitter Vigilance
The auditing of user and living lab	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City Portal
Self assessment	x	x	x	x	x	x	x	x	x	x	x	x	Snap4City Portal



>70 MicroApps

+2 Apps
2 plat.



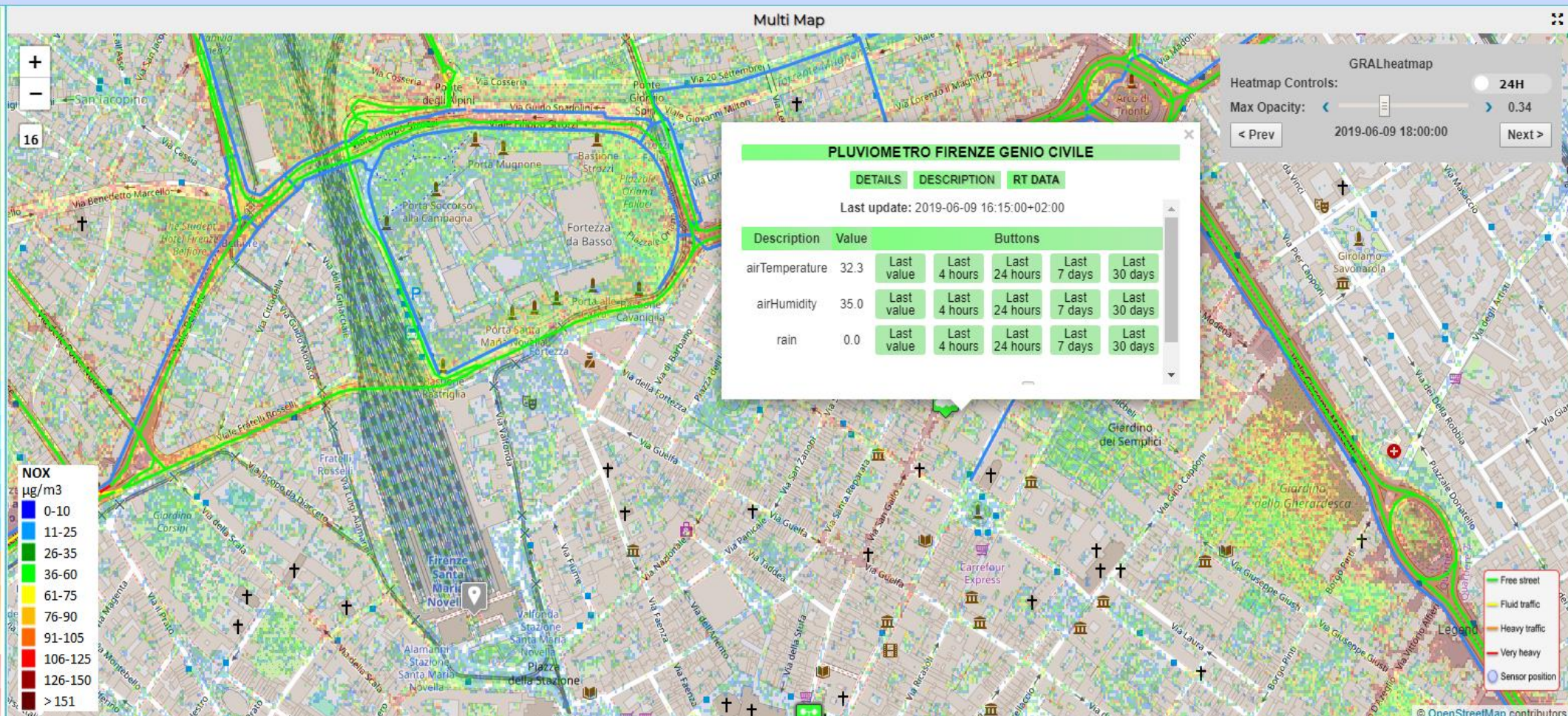
Firenze - Trafair - AirQuality Heatmaps



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

Sun 9 Jun 18:53:01

- Air Quality Sensors
- Weather Sensors
- PM10 Heatmap
- PM2.5 Heatmap
- CO Heatmap
- CO2 Heatmap
- SO2 Heatmap
- O3 Heatmap
- NO2 Heatmap
- Benzene Heatmap
- H2S Heatmap
- Air Humidity Heatmap
- Air Temp. Heatmap
- Wind Speed Heatmap
- Gral Pred. HM NOX (3m)
- Gral Pred. HM NOX (6m)
- Traffic Sensors
- Traffic Flow
- Cycling Paths
- Accident Heatmap
- Accident Heatmap 2



Air Temperature Bolognese (8m)

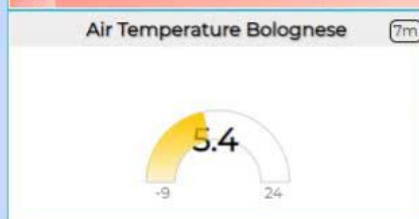
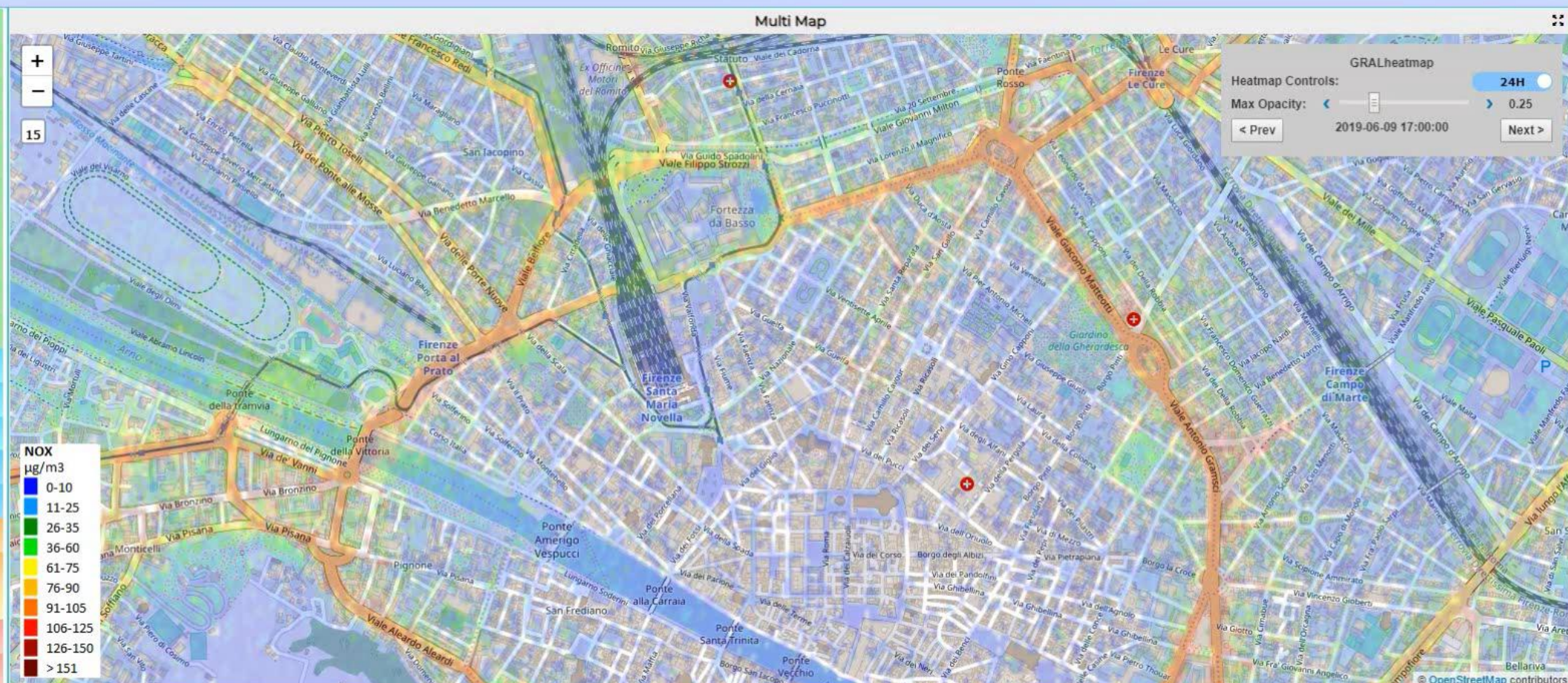


SIRSensor_TOS01001095 - airTemperature

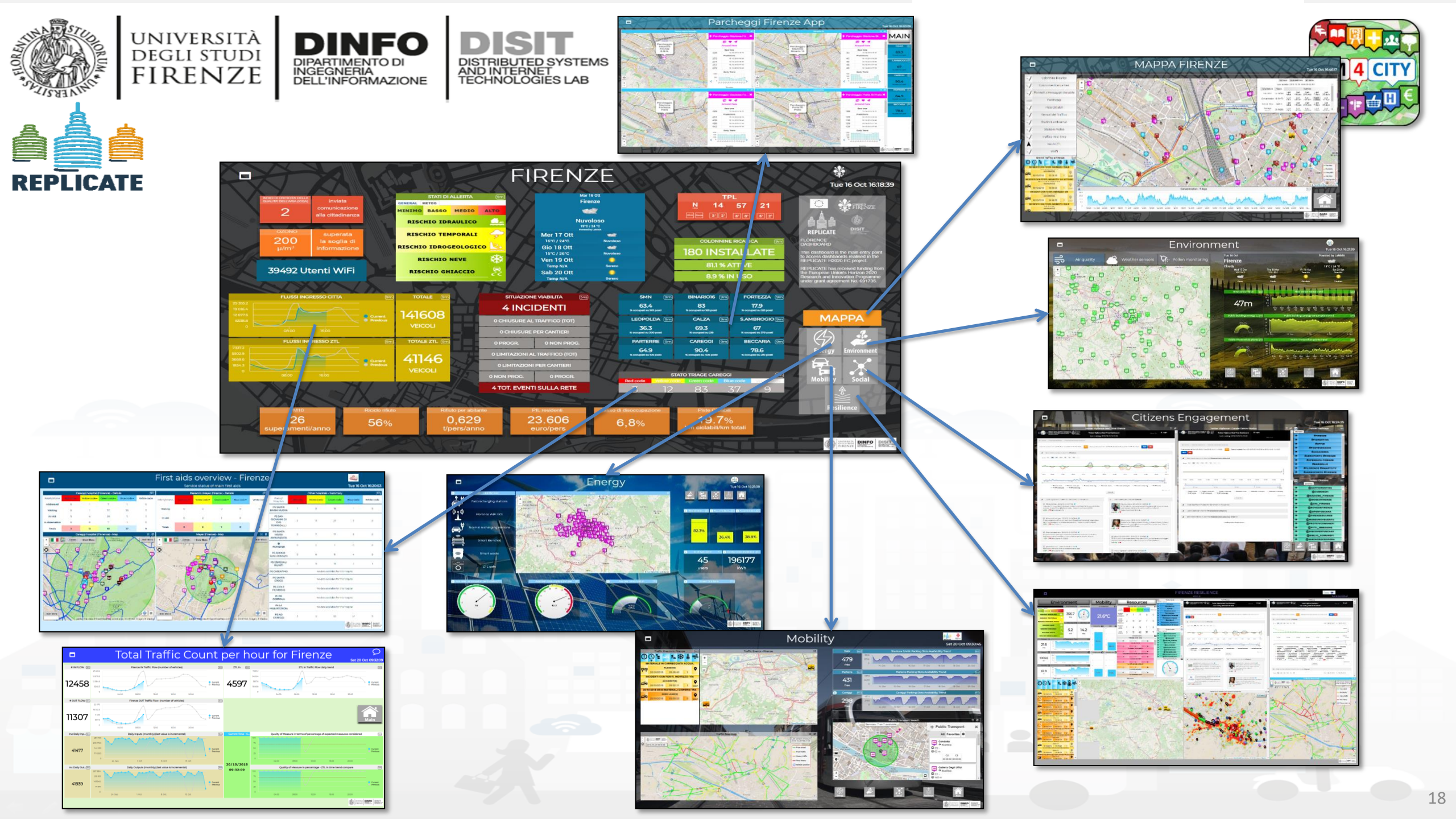


<https://www.snap4city.org/dashboardSmartCity/view/index.php?iddasboard=MTUzMg==>

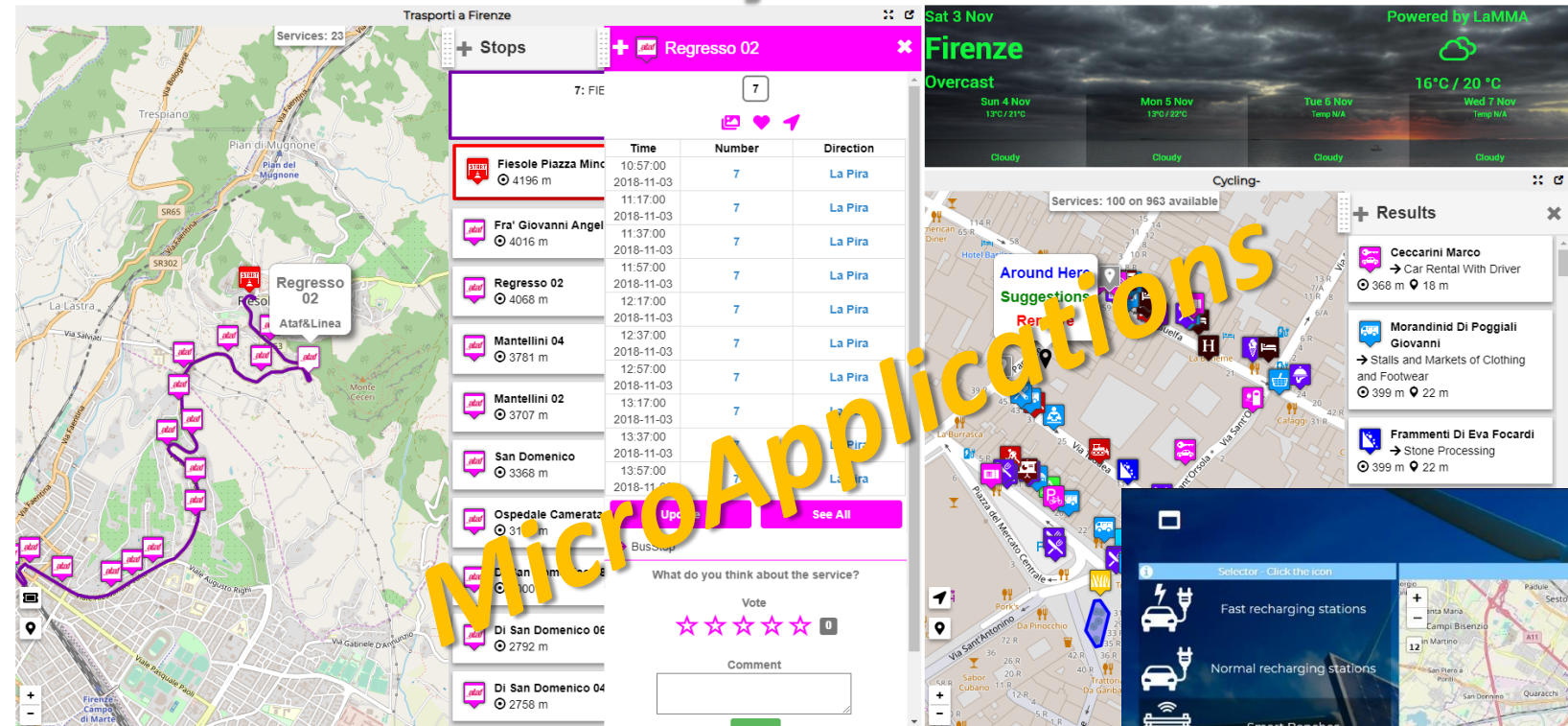
Sun 9 Jun 17:41:58





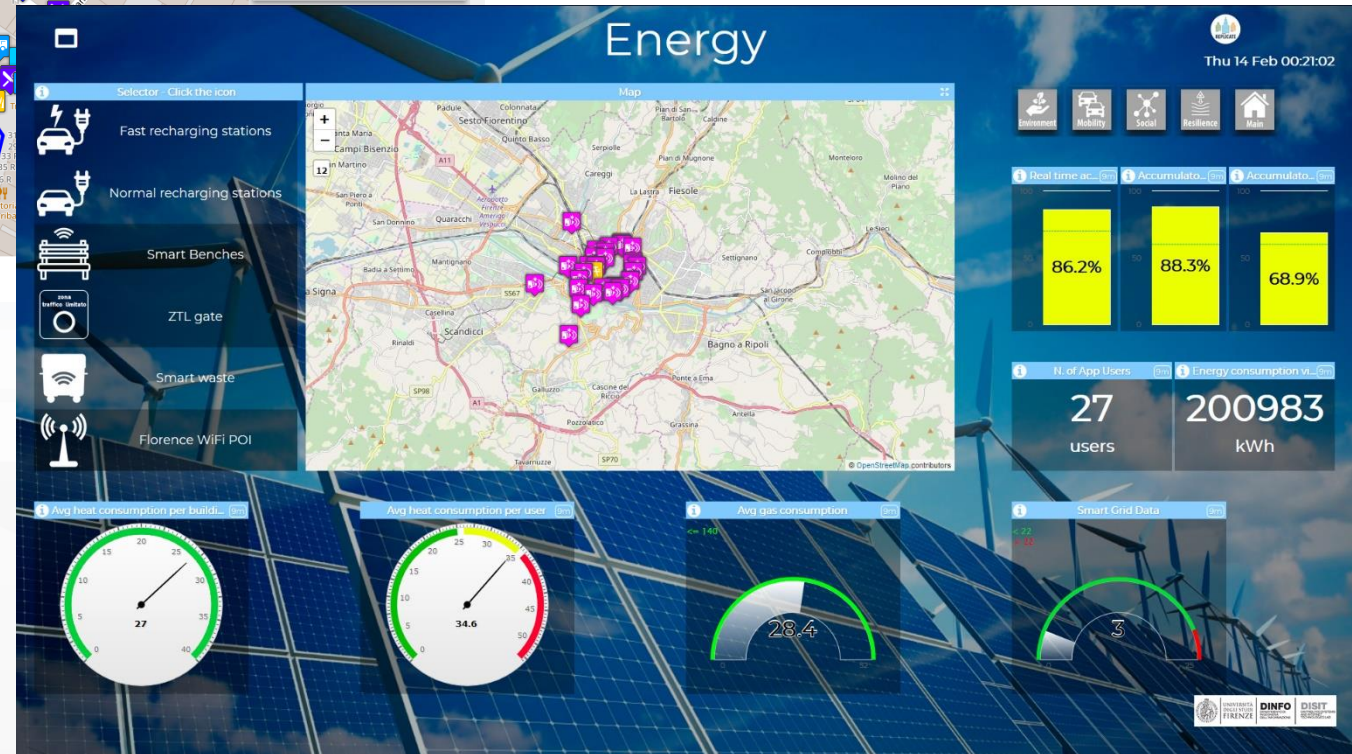


Infomobility Dashboard



<https://main.snap4city.org/view/index.php?iddasboard=OTQw>

<https://main.snap4city.org/view/index.php?iddasboard=MjE0>



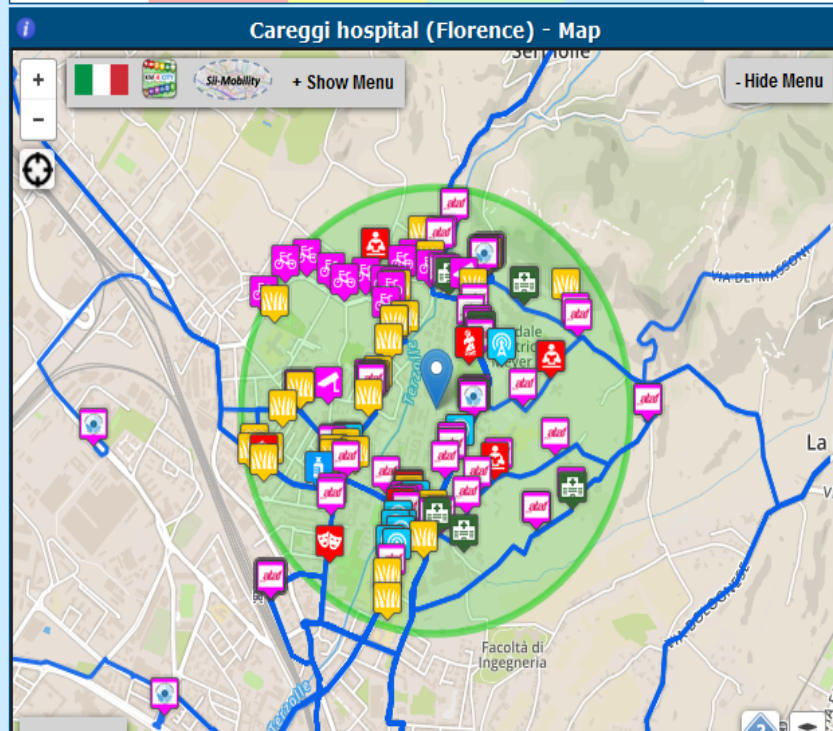
First aids overview - Tuscany

Service status of main first aids

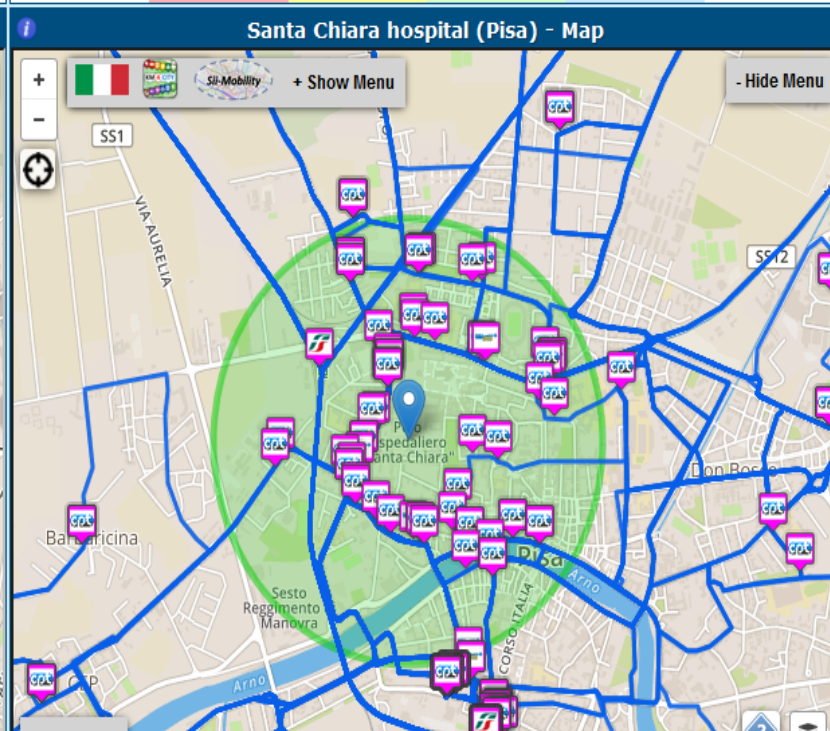


Thu 25 May @ 11:00:34

Careggi hospital (Florence) - Details					
Priority\Status	Red code	Yellow code	Green code	Blue code	White code
Addressed	1	4	3	0	0
Waiting	0	2	9	2	0
In visit	1	9	18	3	0
In observation	4	19	2	0	0
Totals	6	34	32	5	0



Santa Chiara hospital (Pisa) - Details					
Priority\Status	Red code	Yellow code	Green code	Blue code	White code
Waiting	0	1	7	9	3
In visit	0	7	1	1	6
Totals	0	8	8	10	9



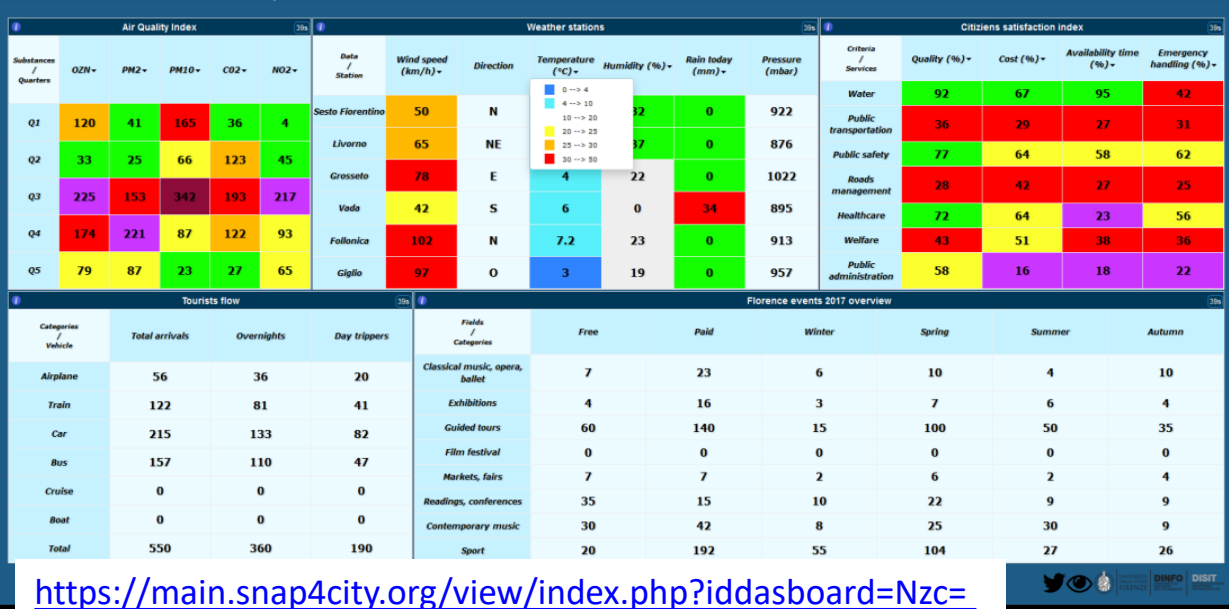
Other hospitals - Summary					
Priority\Hospitals	Red code	Yellow code	Green code	Blue code	White code
PS SAN GIOVANNI DI DIO TORREGALLI	1	16	20	1	0
PS SANTA MARIA NUOVA	1	14	12	3	0
PS AO CAREGGI	6	34	32	5	0
PS SANTA MARIA ANNUNZIATA	1	8	11	1	0
PS BORGO SAN LORENZO	0				0
PS OSPEDALI RIUNITI	3				1
PS CASENTINO					
PS SANTA CROCE					
PI PO CORTONA					
PS CIVILE PIOMBINO					



<https://main.snap4city.org/view/index.php?iddashboard=MTly>

Florence data overview

A table based overview over city main data



<https://main.snap4city.org/view/index.php?iddasboard=Nzc=>

Smart City Data Overview 2

Sperimentale

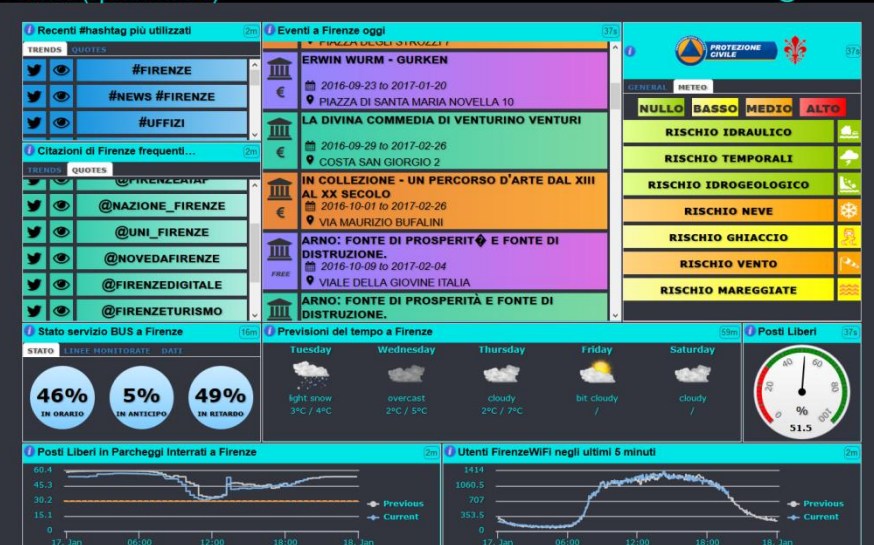


<https://main.snap4city.org/view/index.php?iddasboard=MTAw>

Snap4City, MajorC

Servizi agli Utenti

Firenze (sperimentale)



<https://main.snap4city.org/view/index.php?iddasboard=NjQ=>

Smart City Data Overview

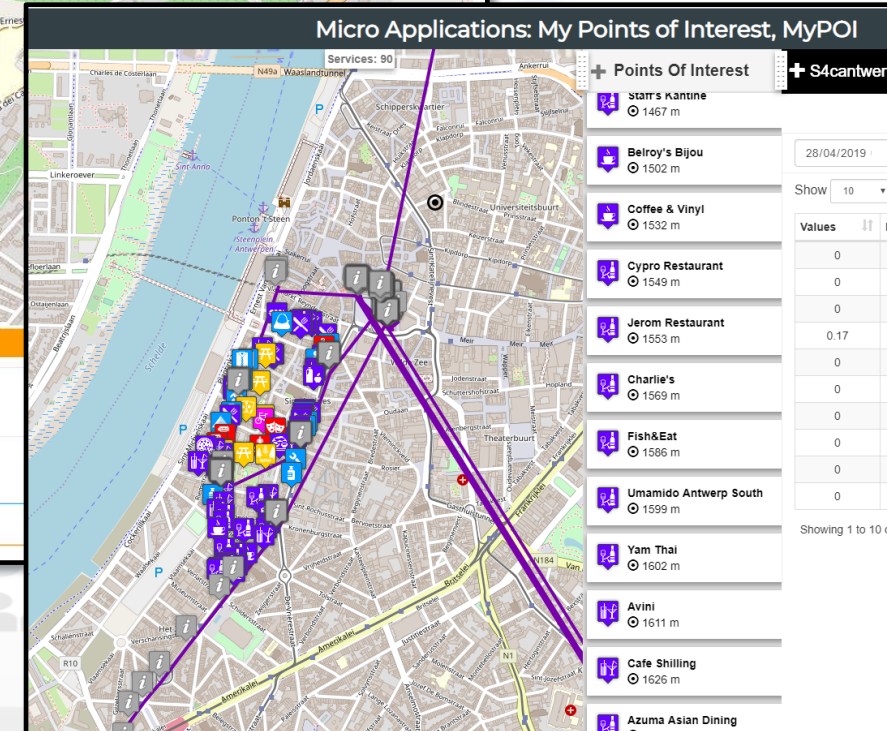
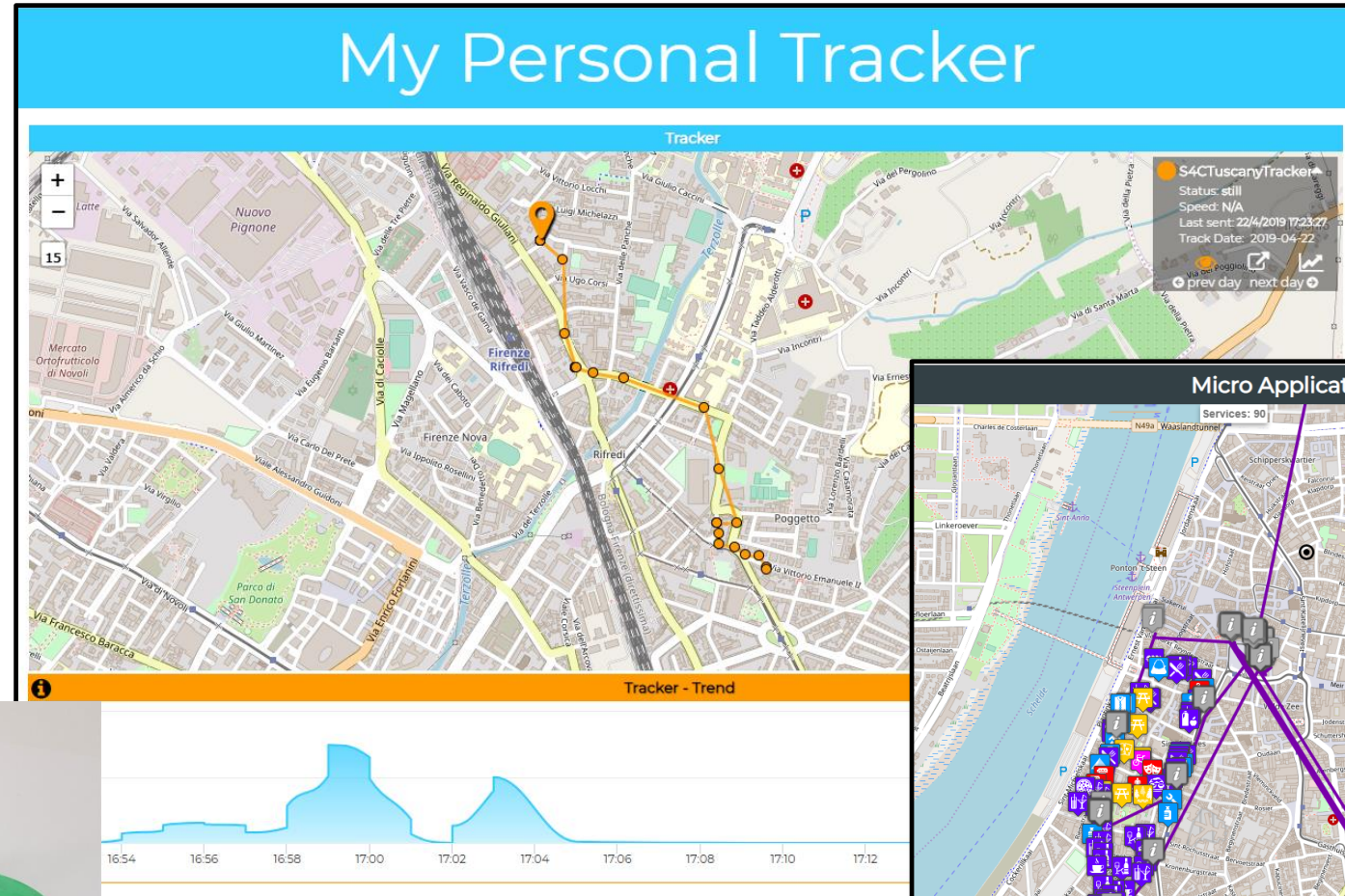
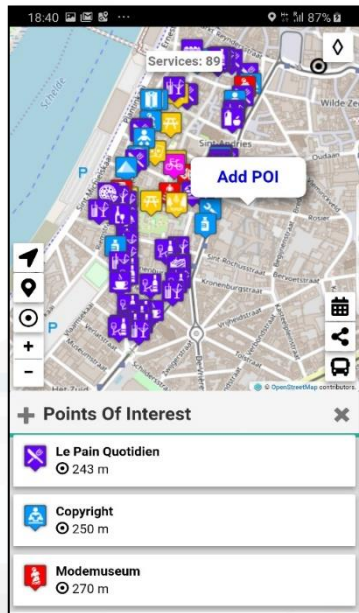
Sperimentale



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

Tracking of Devices and Mobiles

- Real Time Trajectories for Mobile and Moving IOT Devices
 - Multiple tracks
 - Day by day
- Micro Application



GIS data connection exploiting WFS/WMS map

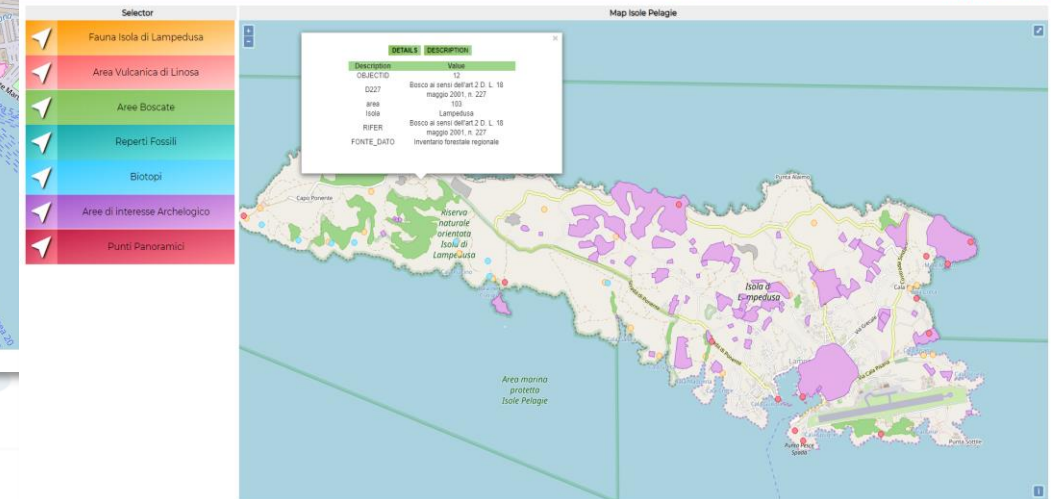
GisWFS Examples

Thu 14 Feb 15:27:11



GisWFS Isole Pelagie

Thu 14 Feb 15:28:56



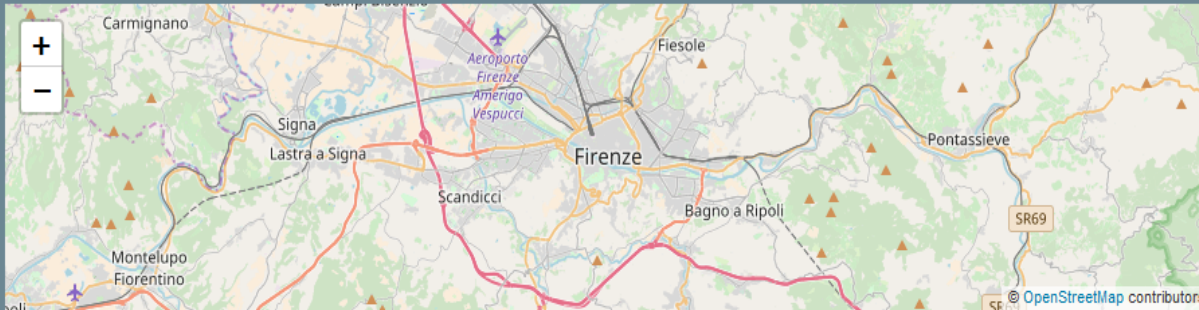
Wizard

Dashboard features

Data and widgets

Check and summary

Map



Single data widgets



Multi data widgets



Data sources

All selected (10) ▾	All selected (55) ▾	All selected (776) ▾	All selected (315) ▾	All selected (47) ▾	All selected (2) ▾			
High-Level Type	Nature	Subnature	Value Type	Value Name	Data Type	Last Date	Last Check	Ownership
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
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Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
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Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
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Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
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Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather			2018-07-08 16:00:18	public
Special Widget	Environment	Weather Forecast	Previ_Meteo	special weather	</			

- Select the area of your interest: panning and zooming

- Select the

- graphic aspect of your interest, or
- High Level Type of your interest, or
- Make a search if you have a precise idea or
- Act on filters: nature, subnature, type, name, value, date, health, owner, ...
- Combine them as you like

- Select the lines of your interest
- Then click on Next and get the Dashboard by wizard

Close



Dashboard with intelligence App

Dashboards with IOT Applications for enforcing data driven smart and intelligence into them

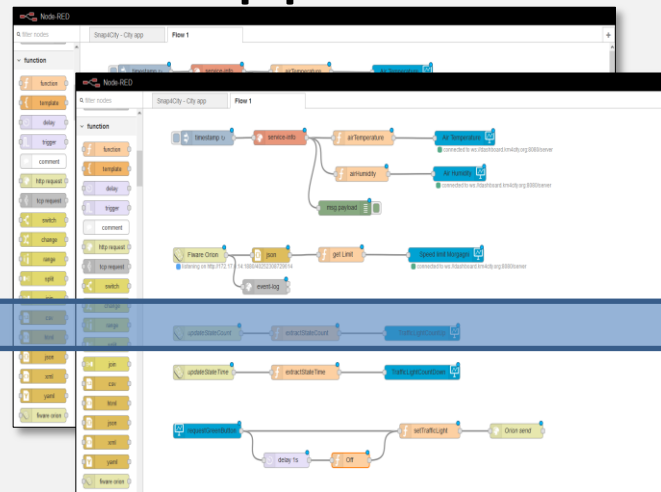
IOT and City data World

IOT Applications

Dashboards

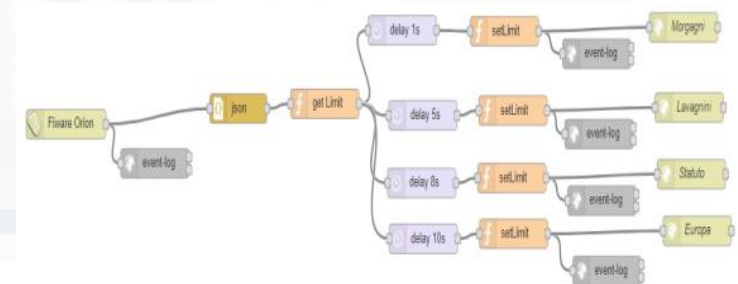
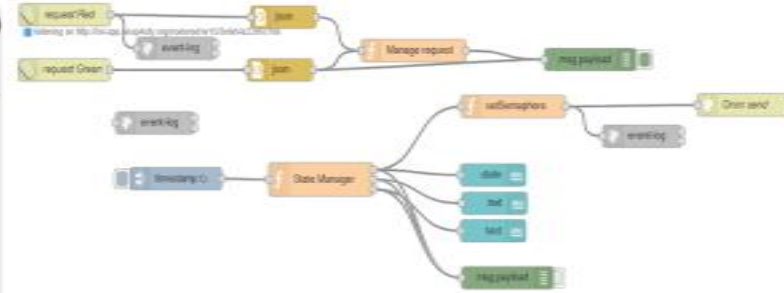
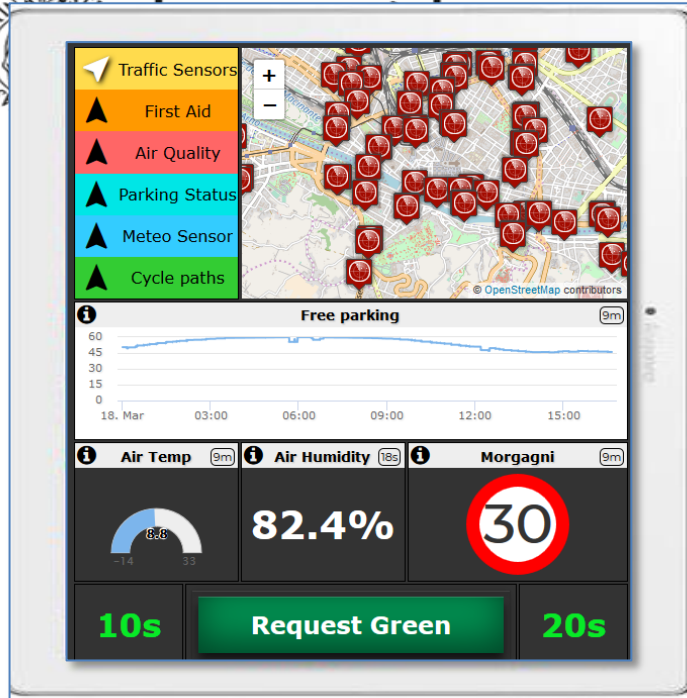


My IOT Devices



Applications

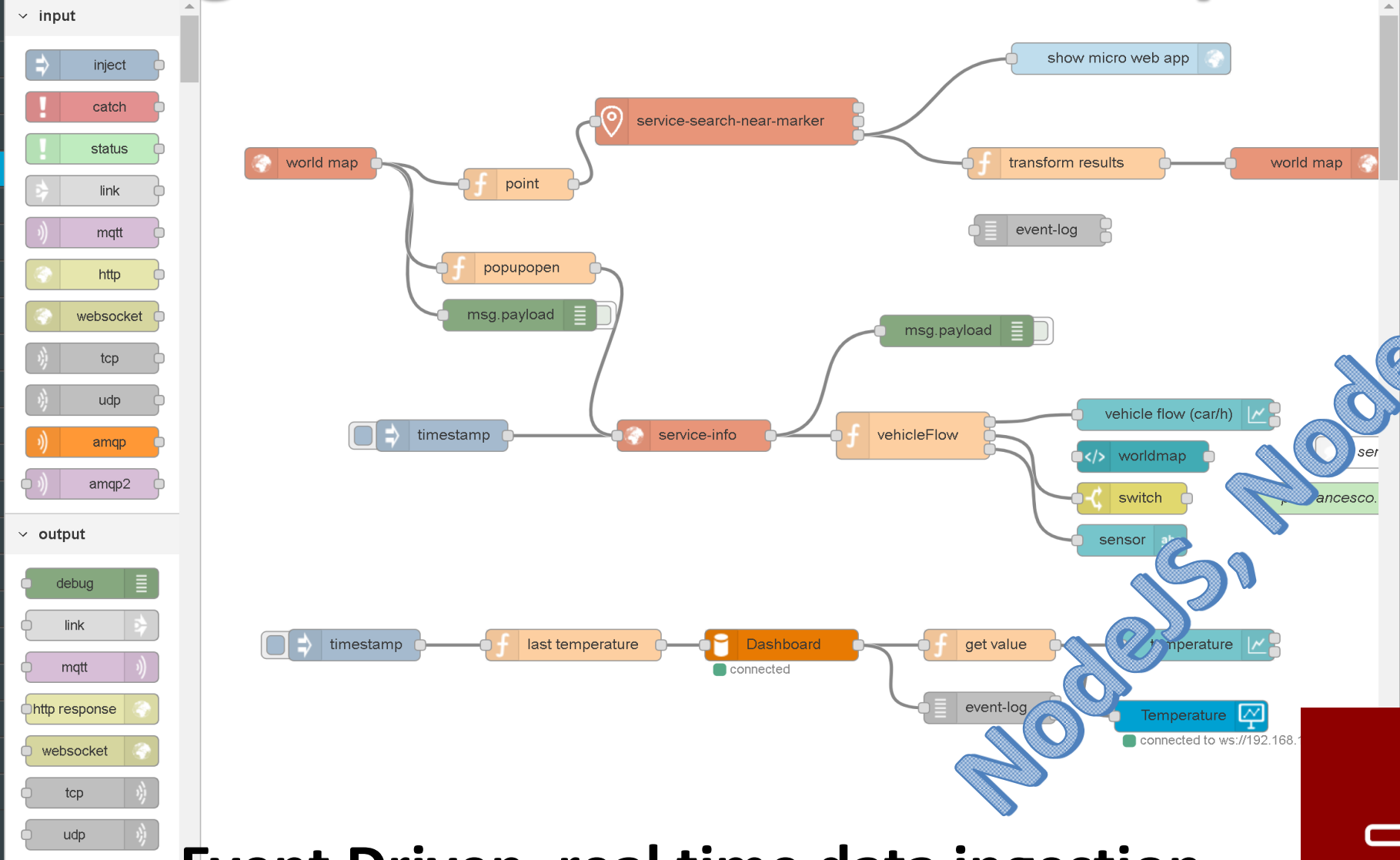




Integrated Node-RED development

roottooladmin1
RootAdmin | Idap

- Dashboards
- My Dashboards
- Notifier
- IOT Applications
- My Personal Data
- IOT Directory and Devices
- Knowledge and Maps
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager: Process Loader
- Development Tools
- Management
- Settings
- User Management and Auditing
- Help and Contacts
- Documentation and Articles
- My Profile
- Snap4City portal
- Km4City portal
- DISIT Lab portal



Event Driven, real time data ingestion

input

output

function

social

storage

analysis

advanced

lwm2m

S4C SearchDev

S4C Mapping

S4C Management

S4C DataAnalytic

S4C BigData

S4C Search

S4C Data

S4C Dashboard

S4C Sigfox

S4C IoT

S4C LogDev

S4C View

S4C Social

location

dashboard

S4C SearchDev

service search

service search near gps position

service search near service

service search within gps area

service search within wkt area

service search within stored wkt area

service search by municipality

service search by queryid

service info dev

full text search dev

full text search within wkt area

full text search within gps area

full text search near gps position

full text search exp

event search dev

event search exp

event search within wkt area

event search within gps area

event search near gps position

address geometry search near gps position

address geometry search near gps position

geometry search near gps position

address poi search by text

address poi search by text exp

address poi search by text near gps position

bus routes search

bus routes search near gps position

bus routes search within gps area

bus routes search within wkt area

bus routes search within stored wkt area

tpl routes

tpl stops

S4CDataAnalytic

descriptive statistics

trend plot

time series predictions

machine learning predictions

anomaly detection

S4CBigData

datagate insert

datagate search

datagate create

S4CMapping

service info mapped

mapping

set mapping

S4CLogDev

event log

S4CManagement

check exist job

check exist trigger

is in standby mode

is shutdown

is started

get currently executing jobs

get job detail

get triggers of job

get job group names

get trigger group names

get paused trigger groups

get job fire times

get system status

trigger job

pause job

pause jobs

pause trigger

pause triggers

resume all

resume job

resume jobs

resume trigger

resume triggers

notificator last events

notificator history events

S4C Search

service search near marker

service search within circle

service search within polygon

service search along path

service info

full text search near marker

full text search within circle

full text search within polygon

full text search along path

full text search u

event search near marker

event search within polygon

event search along path

event search usr

address search near marker

geometry search near marker

address poi search by text usr

address poi search by text near marker

address poi search by text within circle

bus routes search near marker

bus routes search within circle

S4CData

get my data

get my delegator

get my delegated

get my activity

get other activity on my data

save my data

get my annotation

get anonymous data

get other data

S4CSigfox

sigfox device filter

sigfox

S4CDashboard

impulse button

numeric keyboard

switch button

dimmer

city dashboard

gauge chart

single content

speedometer

time trend

geolocator

bar content

column content

S4CKPIData

get my kpdata

get my kpdata values

get public kpdata values

get delegated kpdata values

save my kpdata values

S4CIoT

iot directory

iot directory

iot directory link

iot directory link

fiware orion

fiware orion

orion test

fiware orion

Snap4all Button

S4CView

show micro web app

show general iframe

S4CSocial

twitter last channel

twitter last tweet

BASIC

ADV

Smart City API and Mobile Apps



ARC

INDEX

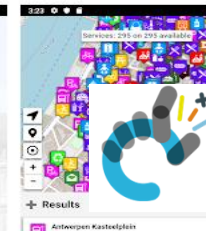
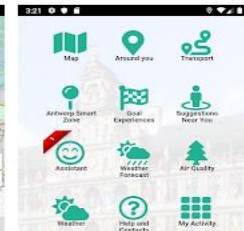
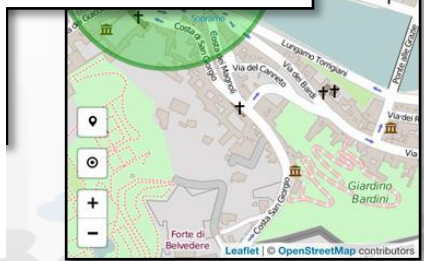
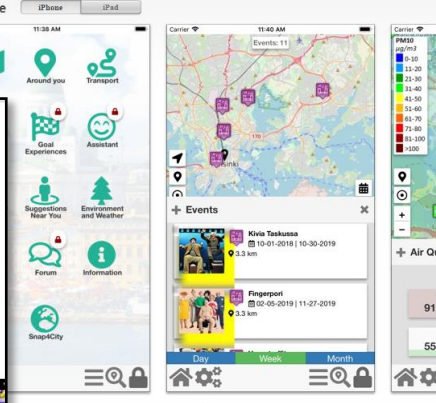
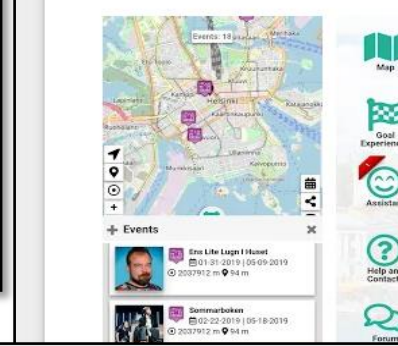
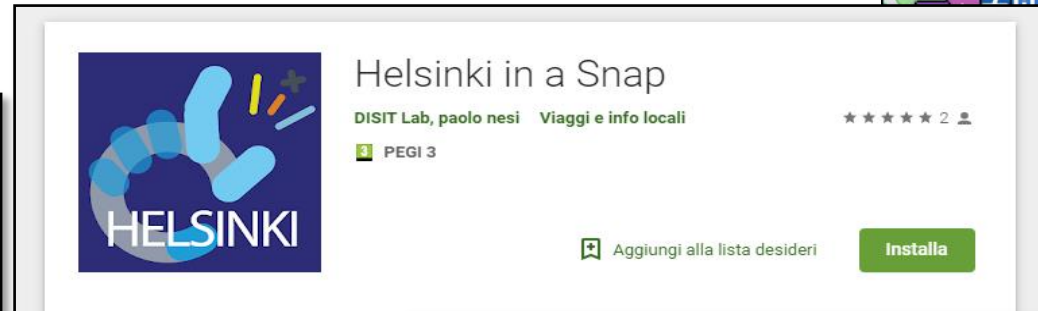
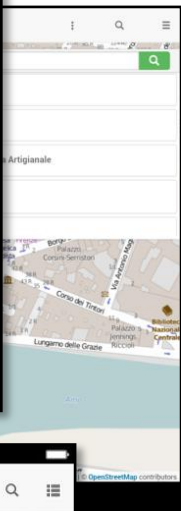
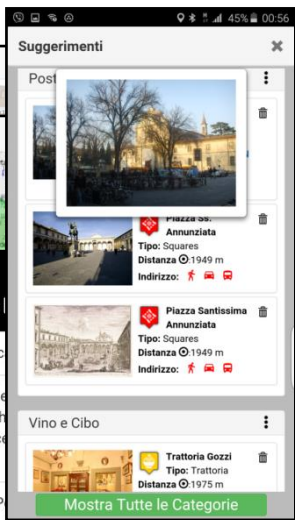
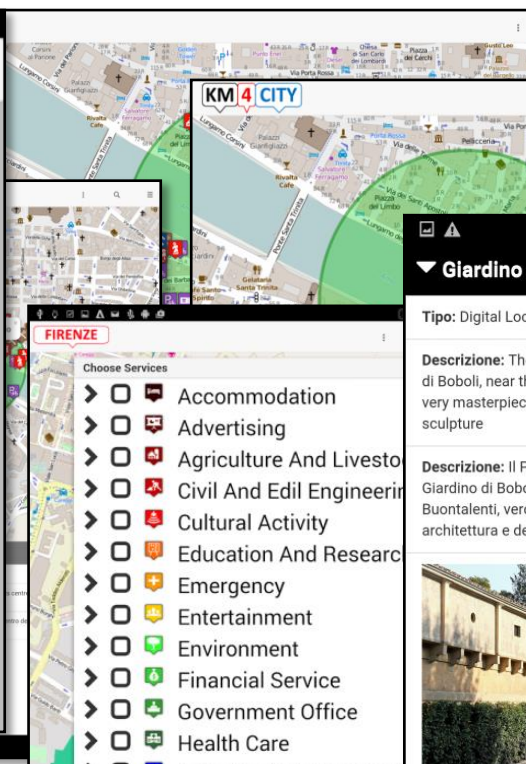
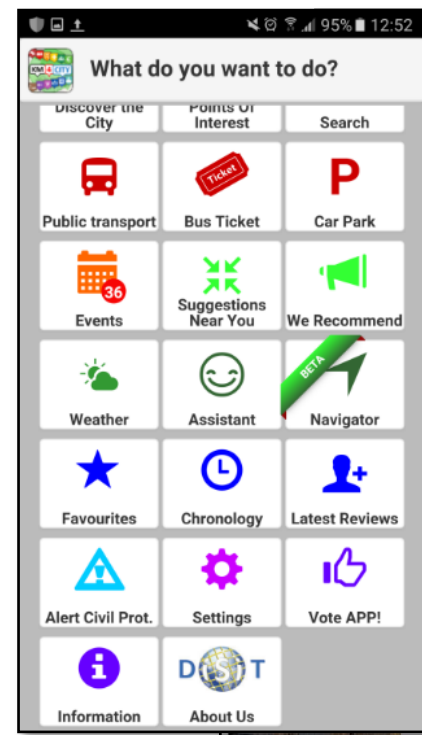


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FIRENZE

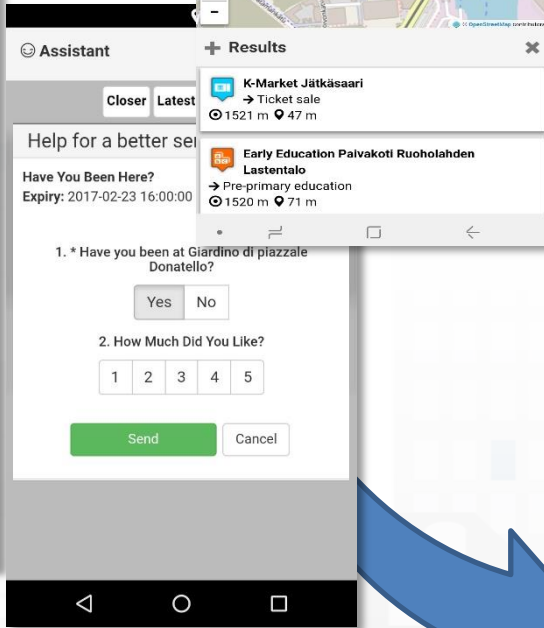
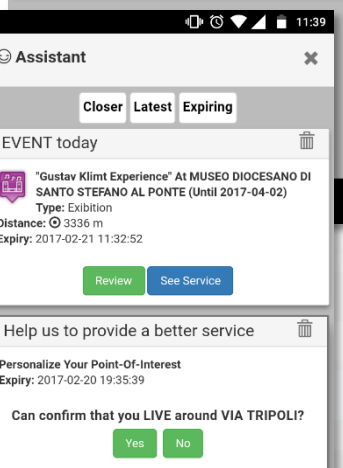
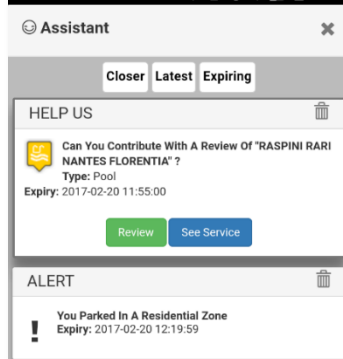
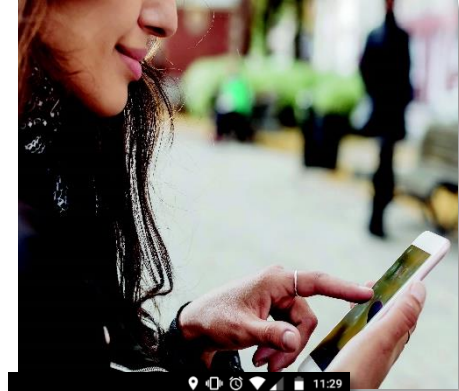
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DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB

Mobile Apps



Users' Engagement



User
context

Rules

City
context

Rule name	Type	#sent	#viewed	#viewed / #sent
daily_event_de	ENGAGEMENT	1 (0%)	0 (0%)	0%
daily_event_en	ENGAGEMENT	1720 (2.12%)	70 (7.1%)	4.07%
- commuter		5 (0.29%)	0 (0%)	0 (0%)
- student		14 (0.81%)	0 (0%)	0 (0%)
- tourist		113 (6.57%)	39 (5.71%)	39 (5.71%)
- resident		58 (0.08%)	1 (0.1%)	1.47%

Inform

Air Quality forecast is not very nice
You have parked out of your residential parking zone
The Road cleaning is this night
The waste in S.Andreas Road is full

Engage

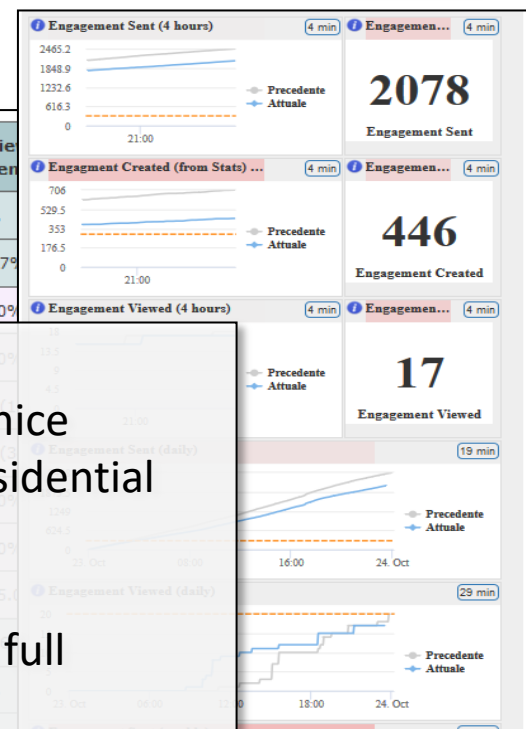
Provide a comment, a score, etc.

Stimulate / recommend

Events in the city, services you may be interested, etc..

Provide Bonus, rewards if needed

you get a bonus since you parked here
We suggest: leave the car out of the city, this bonus can be used to by a bus ticket





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TECHNOLOGIES LAB
<http://www.disit.org>



Sii smart.

In palio per te

Sii
Scarica

Dal 15 aprile al
trasporto pubbl
Scarica l'app "T
guadagna punti
autobus e vinci
Per maggiori inf
il sito info.sii-mo

Sii smart. Sii-Mobility!

Scarica, viaggia, vinci!

Dal 15 aprile al 15 luglio scegliere il trasporto pubblico ti premia! Scarica l'app "Toscana dove, cosa", guadagna punti viaggiando in autobus e vinci tanti fantastici premi! Per maggiori informazioni visita il sito info.sii-mobility.org



In palio per te

Carnet multicorsa Cpt e
voucher per:



Campaing on Sustainable Mobility

Snap4City, MajorCities,

Sii smart. Sii-Mobility!

Scarica, viaggia, vinci!



Dal 15 aprile al 15 luglio scegliere il trasporto pubblico ti premia! Scarica l'app "Toscana dove, cosa", guadagna punti viaggiando in autobus e vinci tanti fantastici premi. Per maggiori informazioni visita il sito info.sii-mobility.org



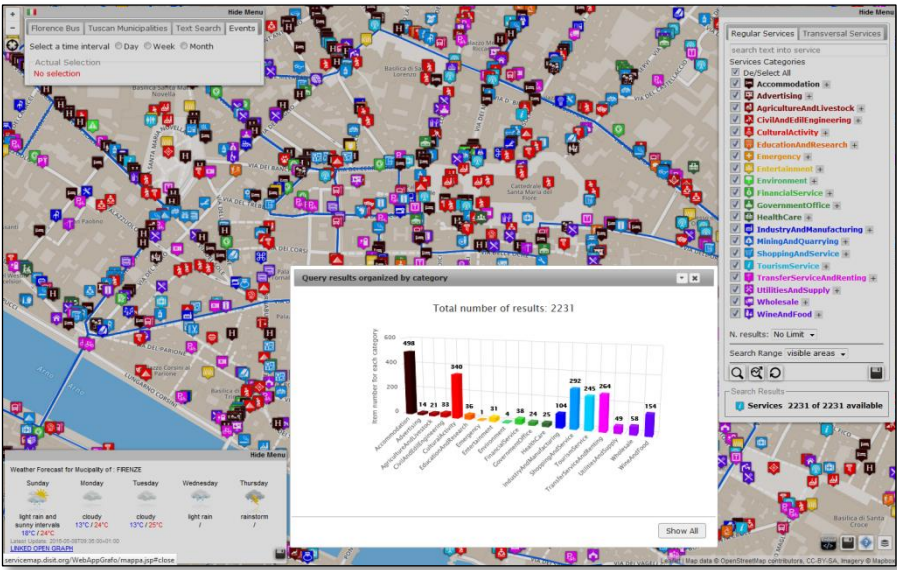
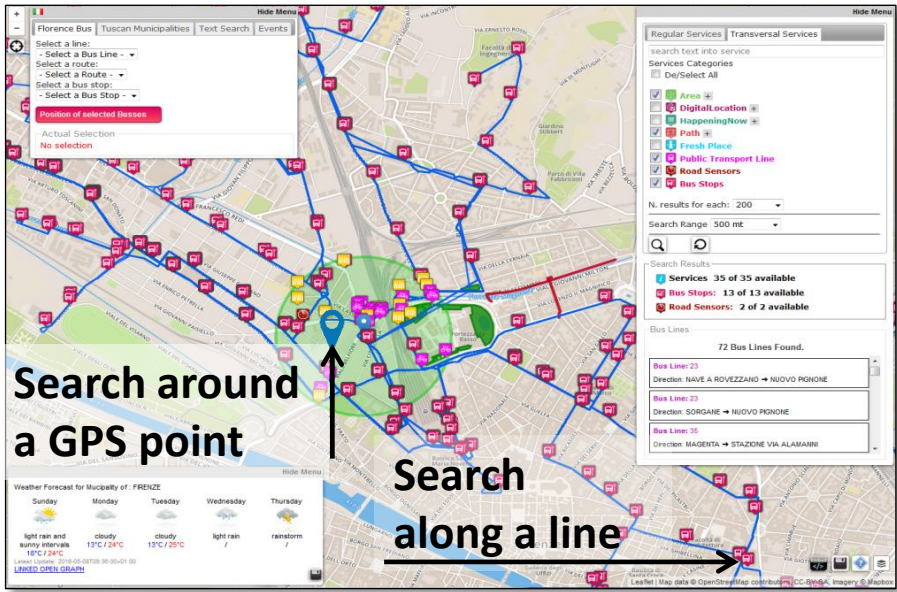
Advanced SmartCity API

Swagger

- Search data: by text, near, along, etc.
 - Resolving text to GPS and formal city nodes model
- Empowering city users: contributions, suggestions, forum discussions, etc.
- Events: Entertainment, critical and mobility
- Public and Private Mobility & Transport, and predictions
- POIs, Cultural and Touristic info
- Health services and predictions
- Environmental information, heatmaps; values
- Profiled Suggestions to City Users
- Traffic flow reconstruction
- Personal Assistant: PAVAL
- User Engagement: goal experiences, and assessment
- *Sharing knowledge among cities → see Knowledge base Management*

The screenshot shows the Swagger UI for the Snap4City Smart City API. The left sidebar contains a navigation menu with items like 'Dashboards', 'My Dashboards', 'Notificator', 'IOT Applications', 'My Personal Data', 'IOT Directory and Devices', 'Knowledge and Maps', 'Micro Applications', 'External Services', 'Data Set Manager: Data Gate', 'Resource Manager: Process Loader', 'Development Tools', 'Smart City API Docs: Swagger', 'Internal API Docs: Swagger', 'Testing API by Postman', 'Source Code Access', 'Management', 'Settings', 'User Management and Auditing', 'Help and Contacts', 'Documentation and Articles', 'My Profile', 'Snap4City portal', 'Km4City portal', and 'DISIT Lab portal'. The main content area is titled 'Smart City API Docs: Swagger' and features a 'swagger' tab. Below this, there's a section for 'Advanced Smart City API' with a link to the documentation. A 'Services' section is expanded, showing a list of endpoints and their descriptions. The 'Parameters' section at the bottom lists parameters like 'selection' and 'string' with their descriptions and sample values.

ServiceMap Dev Tool (knowledge & Map tool)

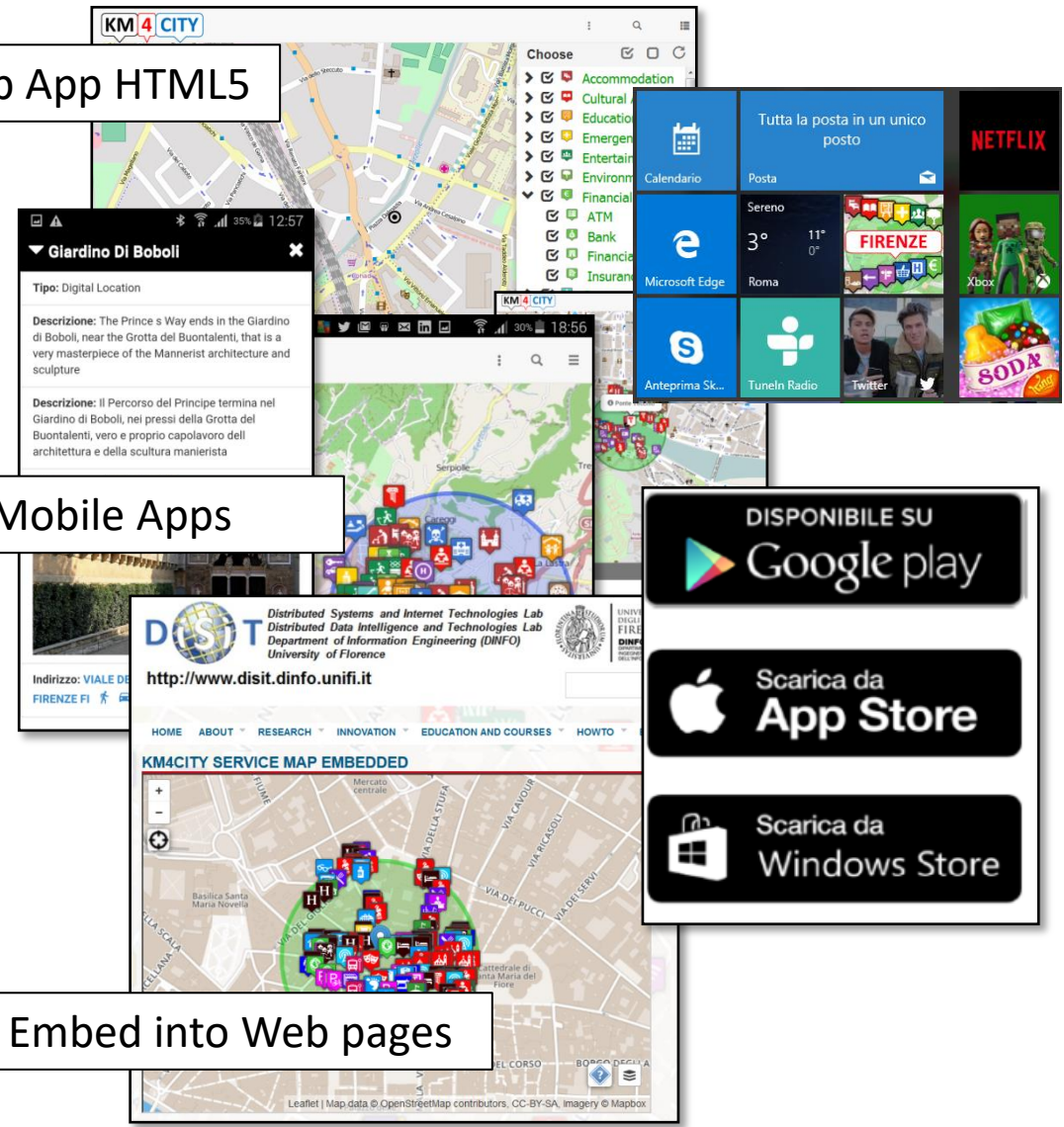


Smart City API call generation

Web App HTML5

Mobile Apps

Embed into Web pages



Data Analytics

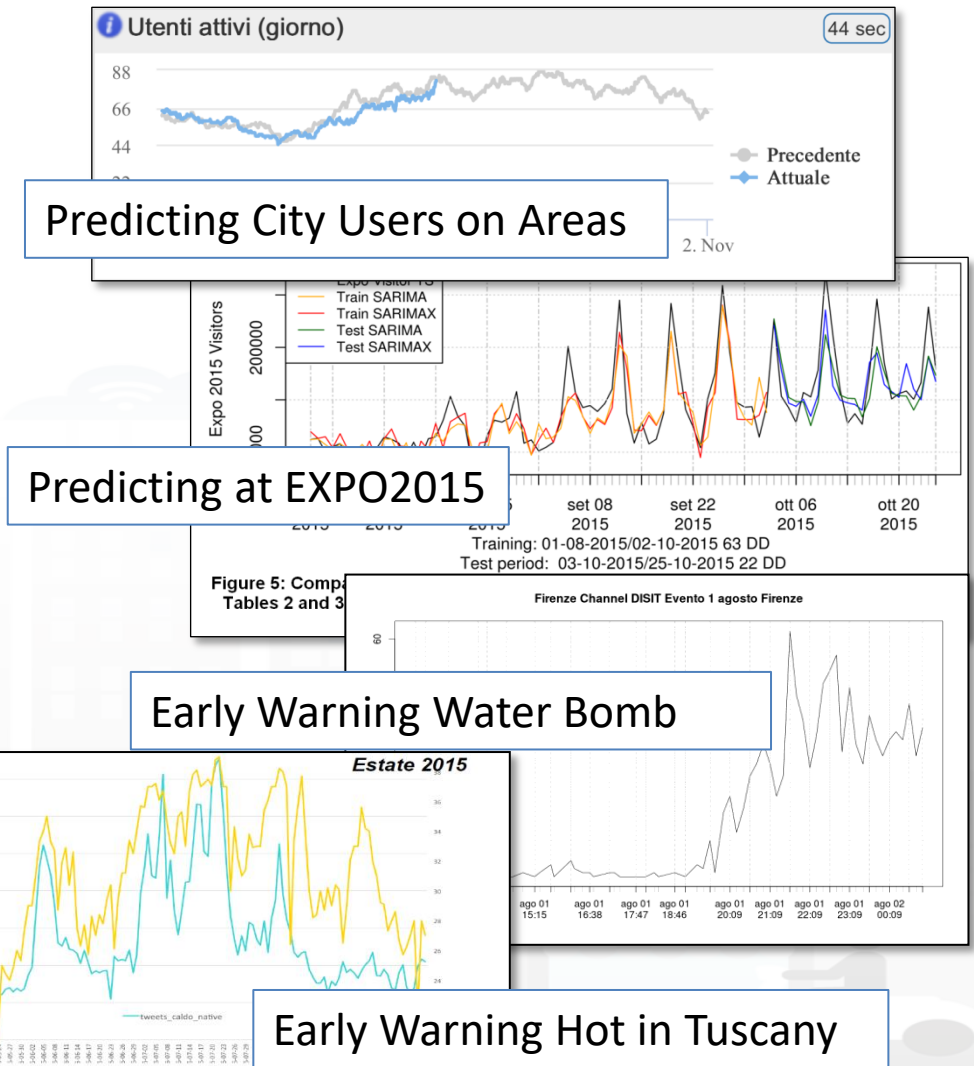


ARC

INDEX

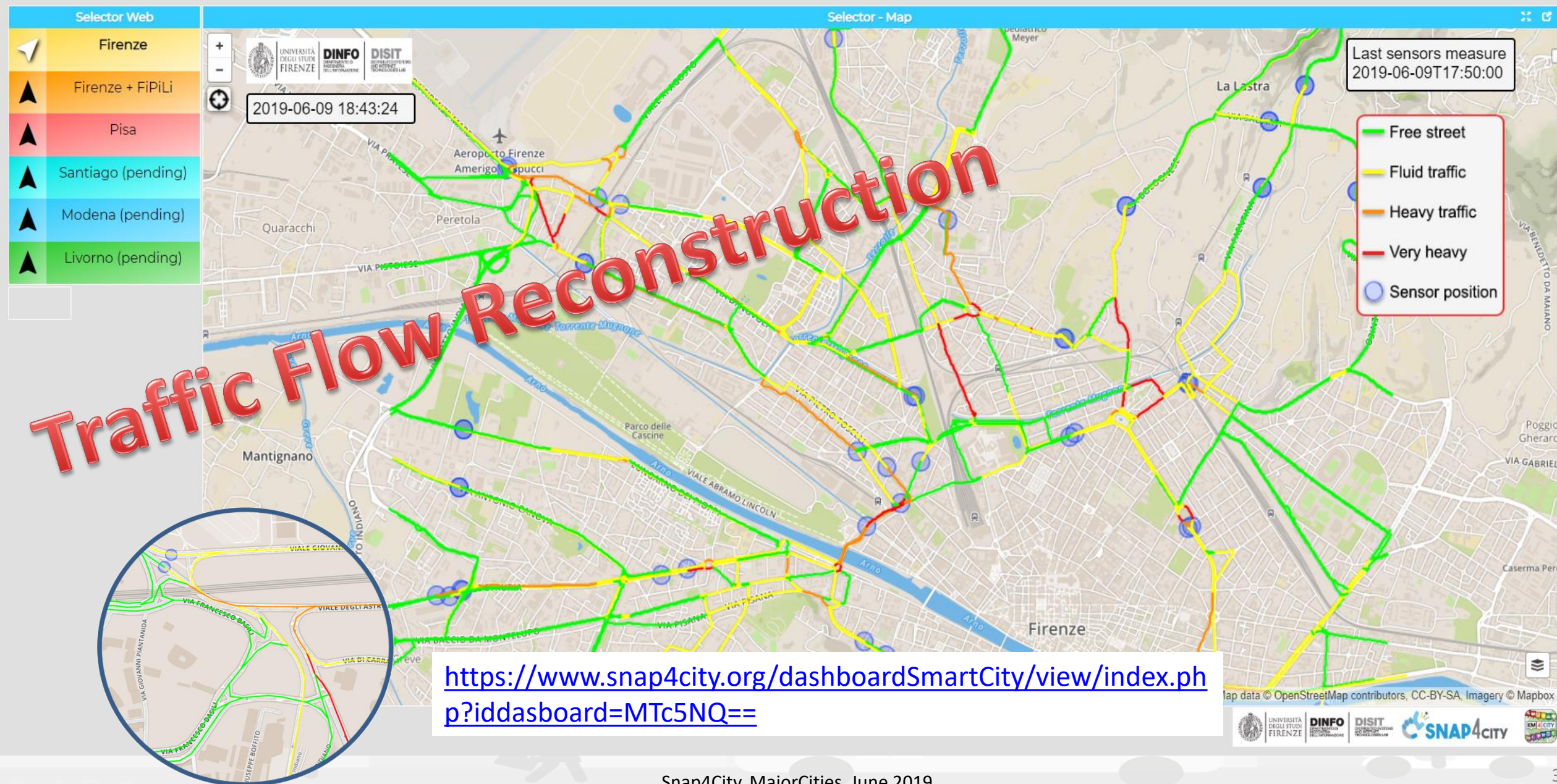
Predictions, Anomaly Detections, Analytics for Administrators & City Users

- **Aiming at improving**
 - quality of service, distributing workload
 - early warning, anomaly detection
- **Data Analytics: ML, NLP/SA, Clust., ...**
 - Traffic Flows → multi-flow reconstruction
 - Environmental alarms
 - Parking Status → free slots
 - Origin destination Matrices
 - Prediction of Environmental values
 - People Flows (Wi-Fi, Twitter)
 - crowd , #number of people





Traffic Flow Reconstruction for the cities





Car Park Stazione Binario 16

Parcheggio Stazione Binario 16

Real time

120	11-03-2018 23:26
-----	------------------

Predictions

69	11-03-2018 23:45
28	11-04-2018 01:30
28	11-04-2018 01:45
69	11-03-2018 23:45

Daily Trend

Parking Status Prediction 97% of precision

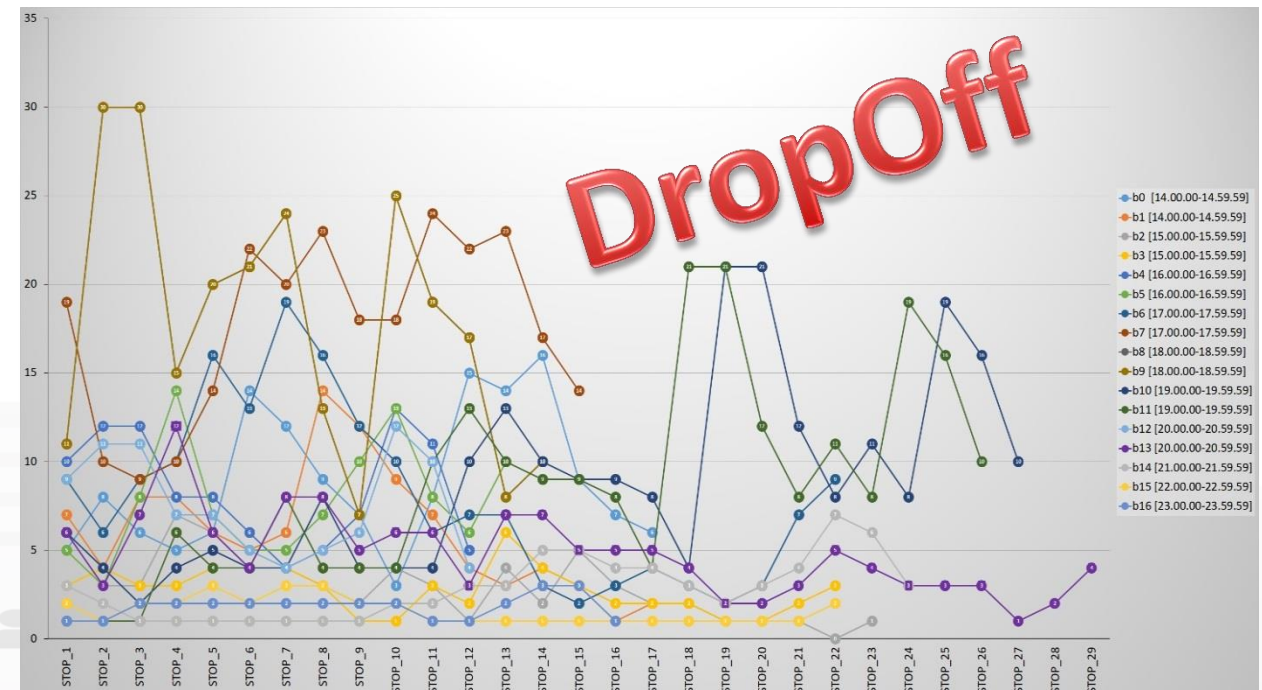
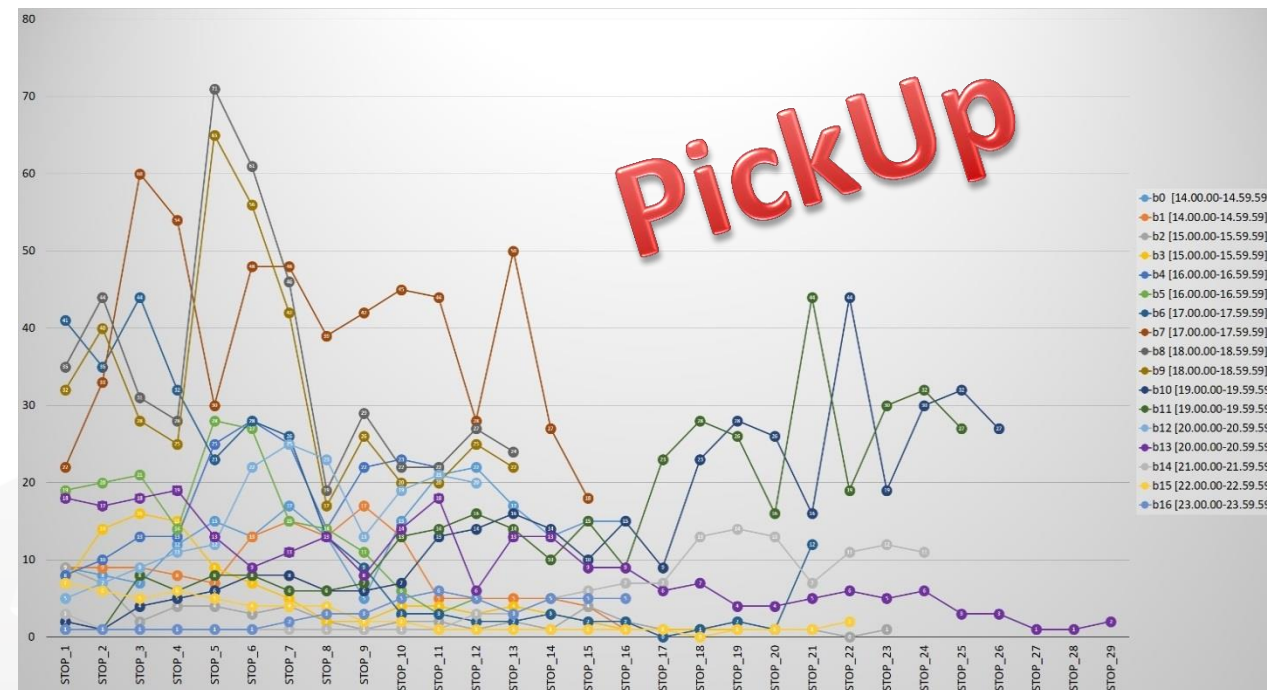
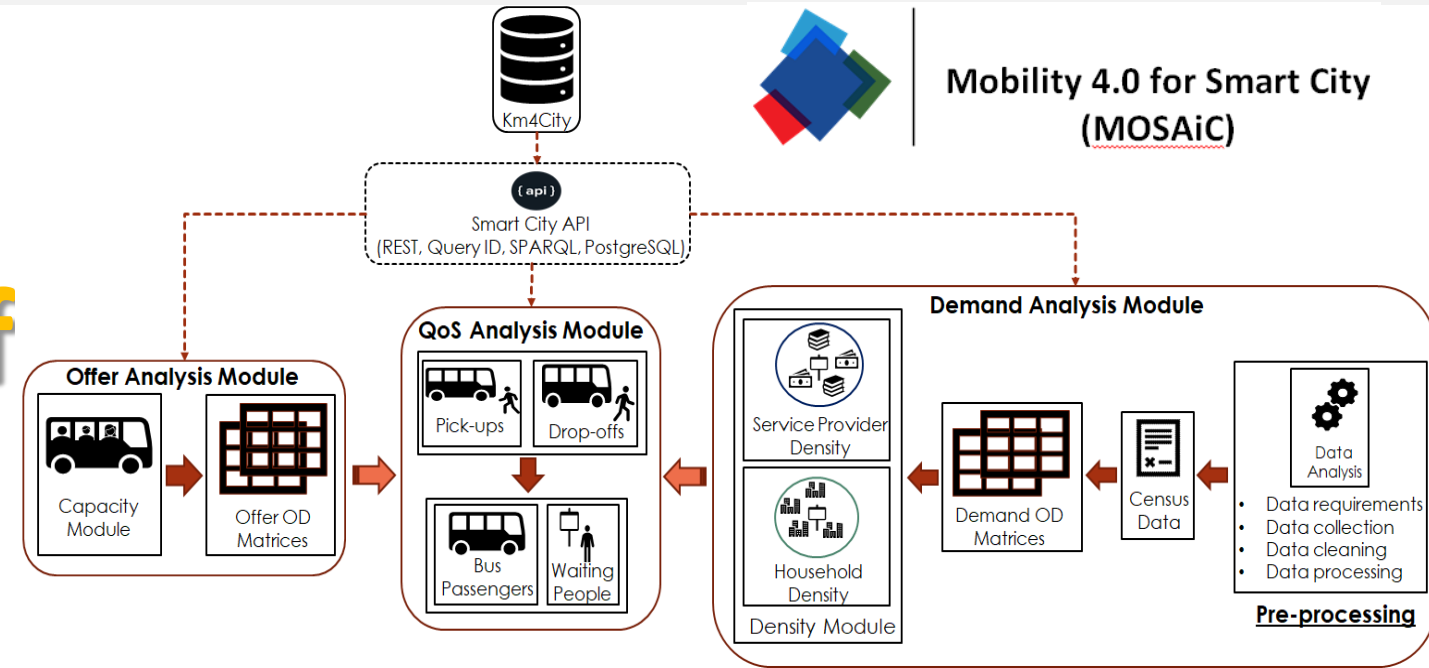
Abbonamenti: - Tessera a scalare dal valore di ? 120,00 Euro al costo di 100,00 *salvo disponibilità tariffe annue e escluse le non vengono anticipate. Valore mese solare ovvero dal primo all'ultimo giorno del mese solare di riferimento indipendentemente dalla data di acquisto. L'abbonamento mensile potrà essere utilizzato anche in un mese successivo a quello dell'acquisto.----

Abbonamenti_autovetture: N/A----

Abbonamenti_moto: N/A----



Demand vs Offer of Mobility Analysis



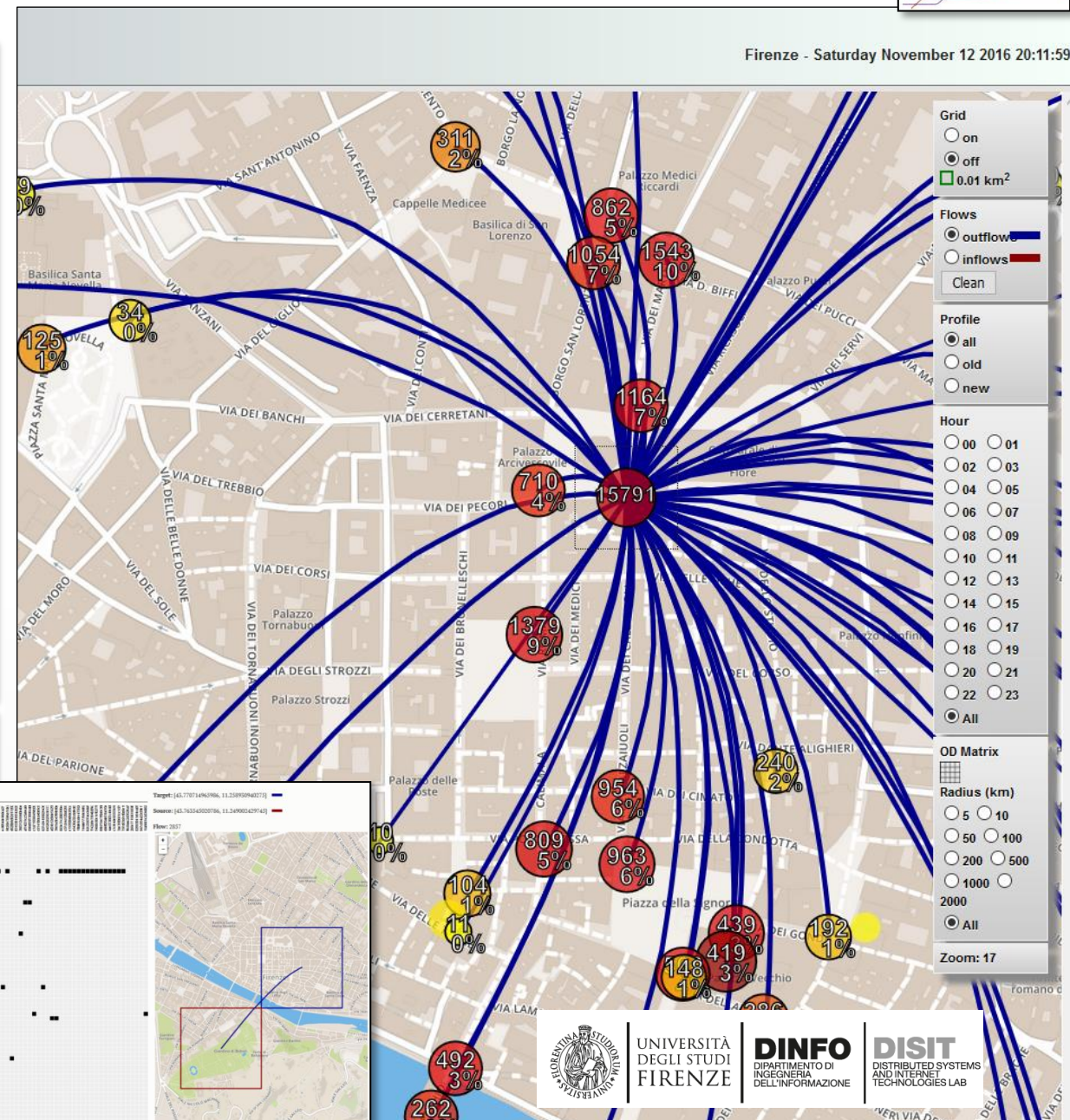
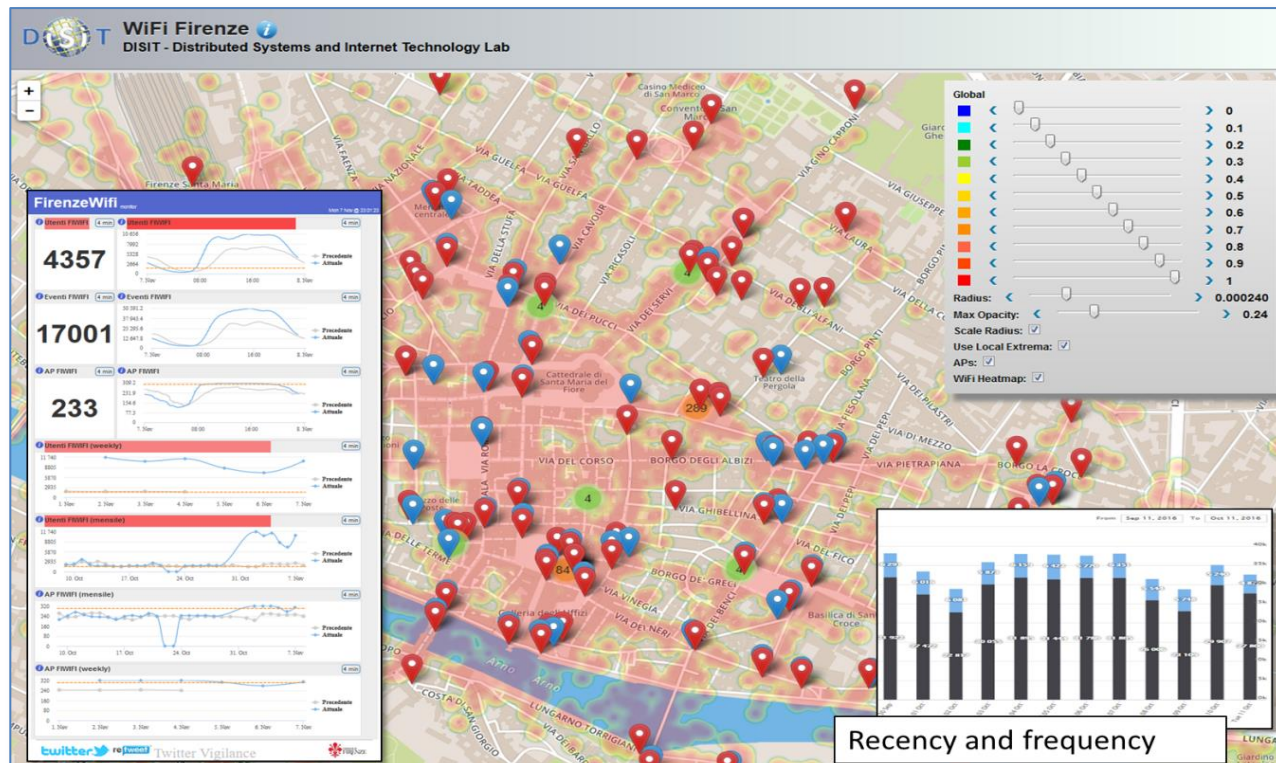
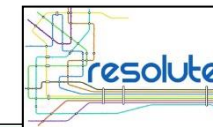
Environmental data predictions: GRAL

- GRAL pred.: PM10, NOX,
 - Comparison wrt real time values in Two Sensor Points
 - Graz Lagrangian Model.
- GRAL model takes into account:
 - pollution sources (for example the vehicles, their distribution on the streets, the about of pollution they produce according to their distribution over time and space, etc.),
 - structure of the city (streets and shape 3D of the buildings),
 - weather forecast (wind intensity and direction), etc.
- GRAL can be applied on NOX, PM10, PM2.5, ... or any other particles

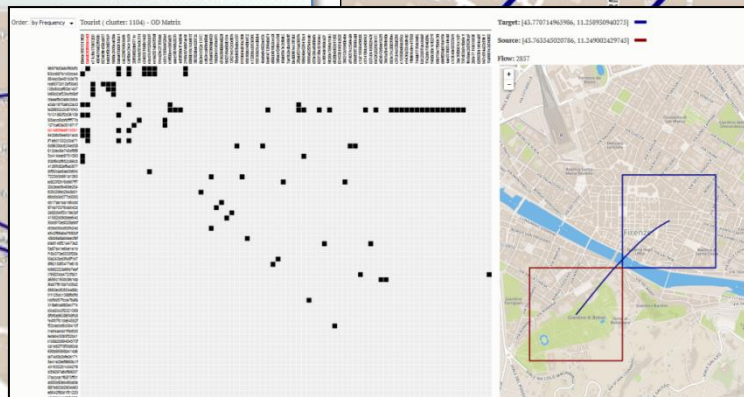
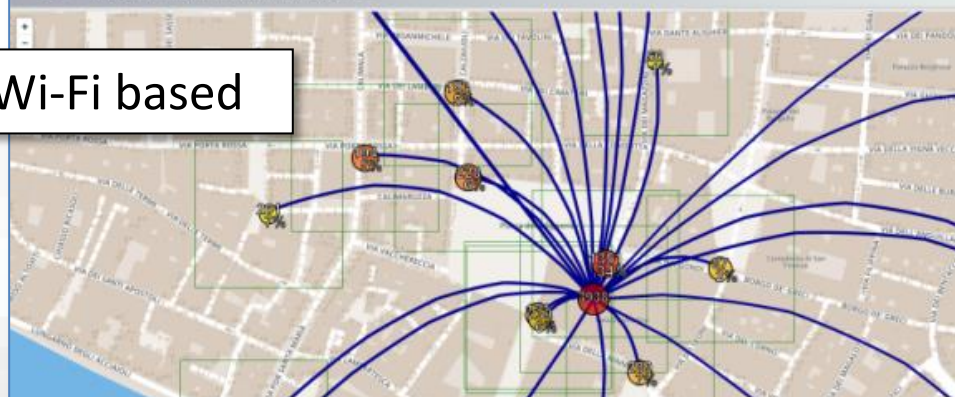


42

Origin Destination Matrix Estimation



Wi-Fi based



User Behaviour Analysis

Where

Distinct APs: 343

Distinct APs (last 24 hours): 311

Distinct Users (last 180 days): 1102098

Distinct Excursionists (last 180 days, < 24 h): 687025

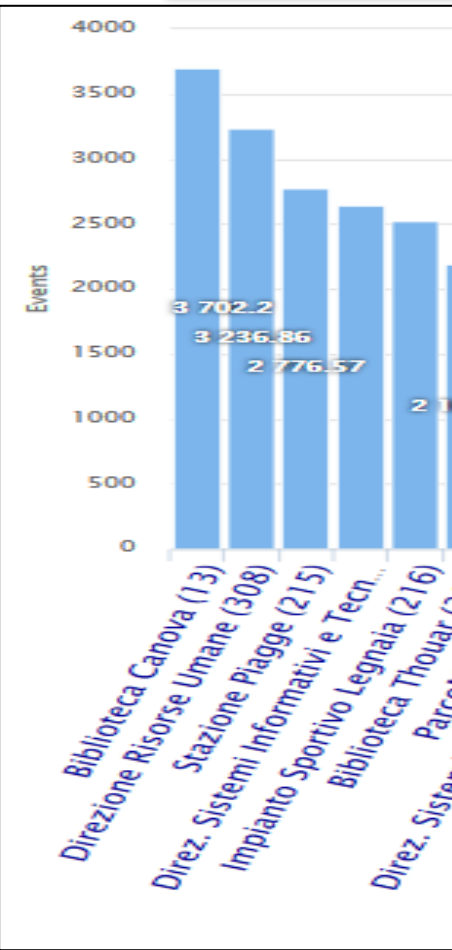
Excursionists

Users

First Day actions

Recency

New City Users
VS
Returning



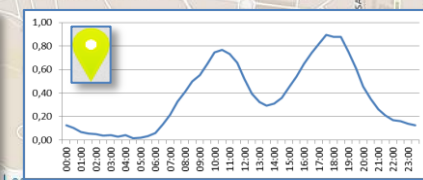
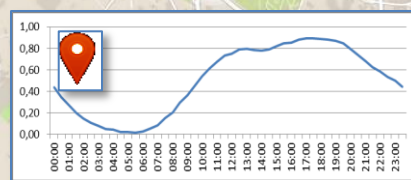
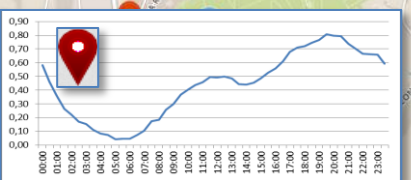
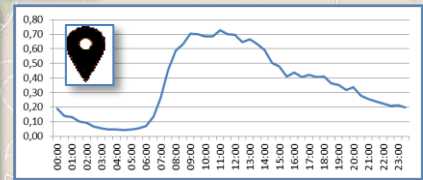
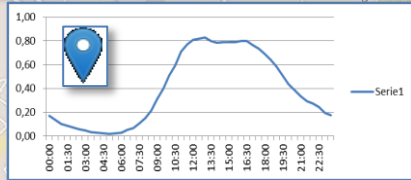
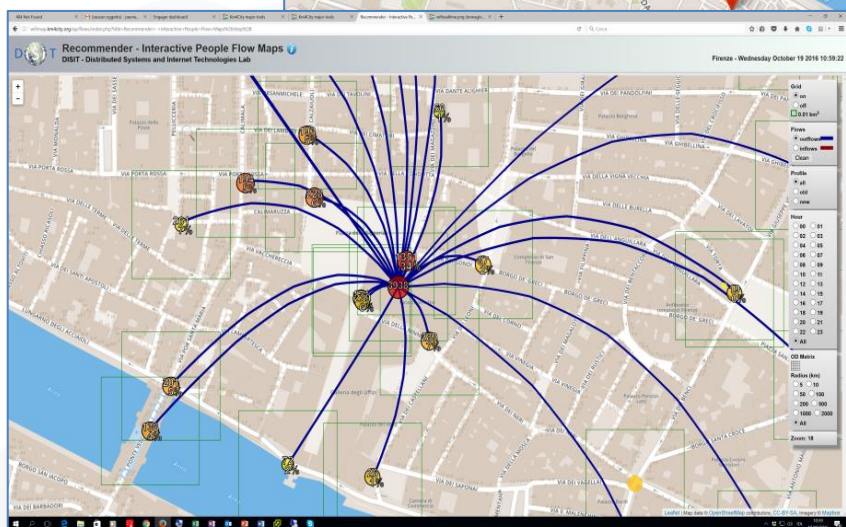
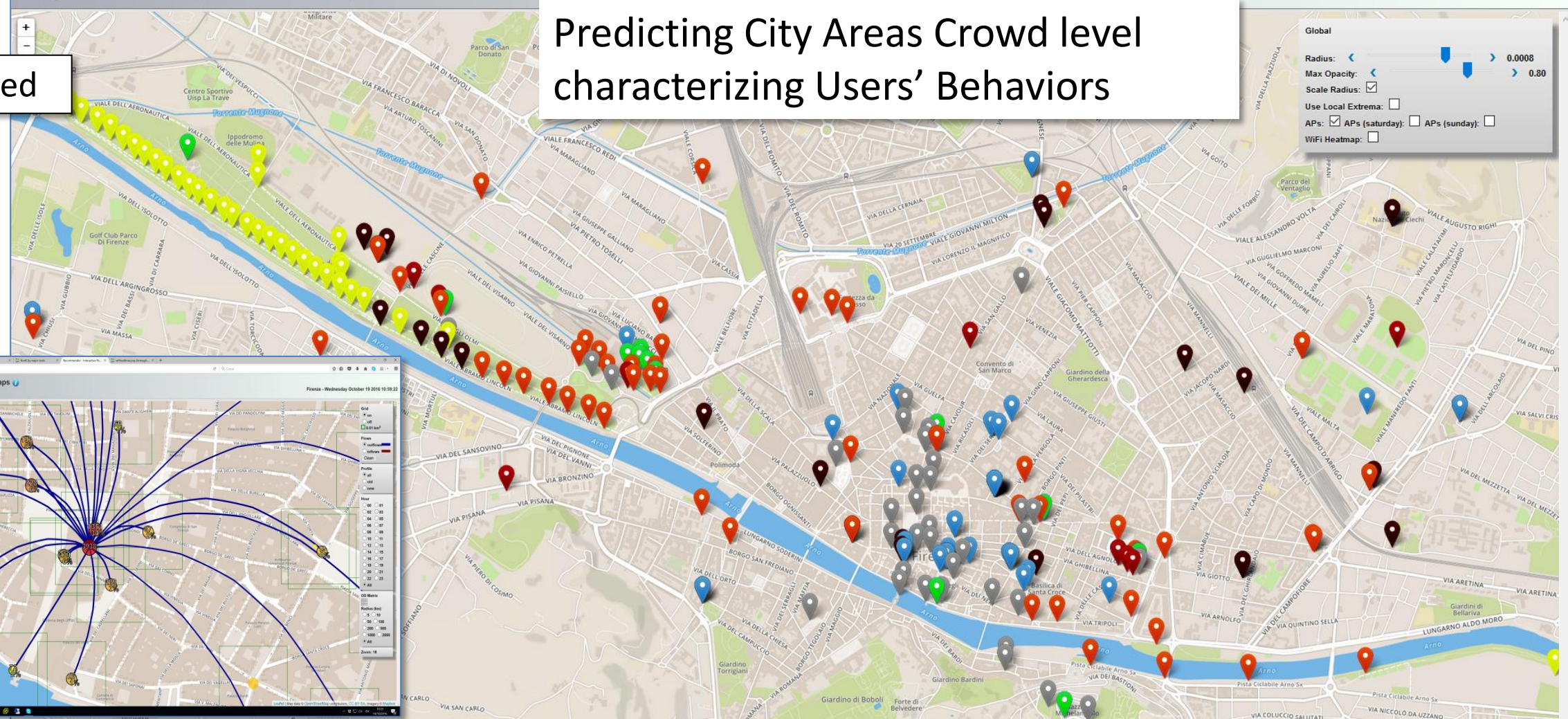
Characterizing City Area

Firenze - Saturday November 12 2016 19:16:33

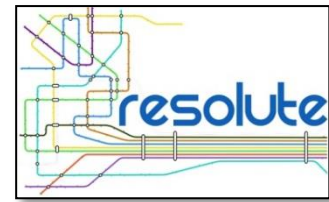
Wi-Fi based

Predicting City Areas Crowd level
characterizing Users' Behaviors

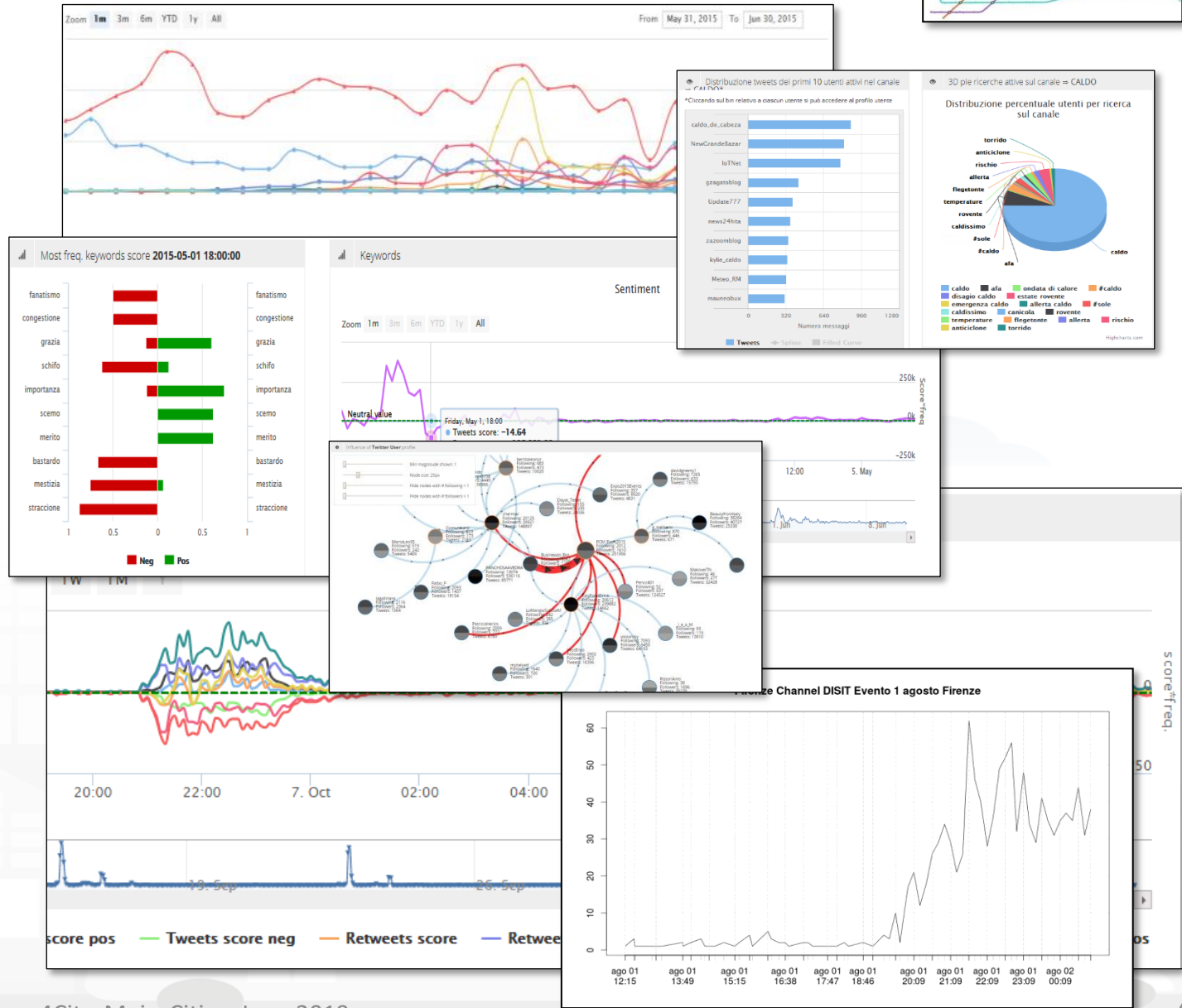
Firenze Wi-Fi: Access Points Clusters Coverage Map
DISIT - Distributed Systems and Internet Technologies Lab



Twitter Vigilance



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



Twitter Vigilance

User: roottooladmin1, Org: DISIT
Role: RootAdmin, Level: 7

- Dashboards
- My Dashboards
- Notificator
- IOT Applications
- My Personal Data
- IOT Directory and Devices
- Knowledge and Maps
- Service Map**
- Loading WKT on Service Map
- Creating WKT
- Service Map 3D
- Helsinki Service Map
- Antwerp Service Map
- My Annotation on Services/Data
- Mapping Services Data
- ArcGIS DISIT Service
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager: Process Loader
- Development Tools
- Management
- Settings
- User Management and Auditing
- Help and Contacts
- Documentation and Articles
- My Profile
- Snap4City portal
- Km4City portal
- DISIT Lab portal

Public transport Municipalities Text Search Address Search Events

Select an agency:
- Select an Agency -

Select a line:
- Select a Line -

Select a route:
- Select a Route -

Select a bus stop:
- Select a Stop -

Position of selected Busses

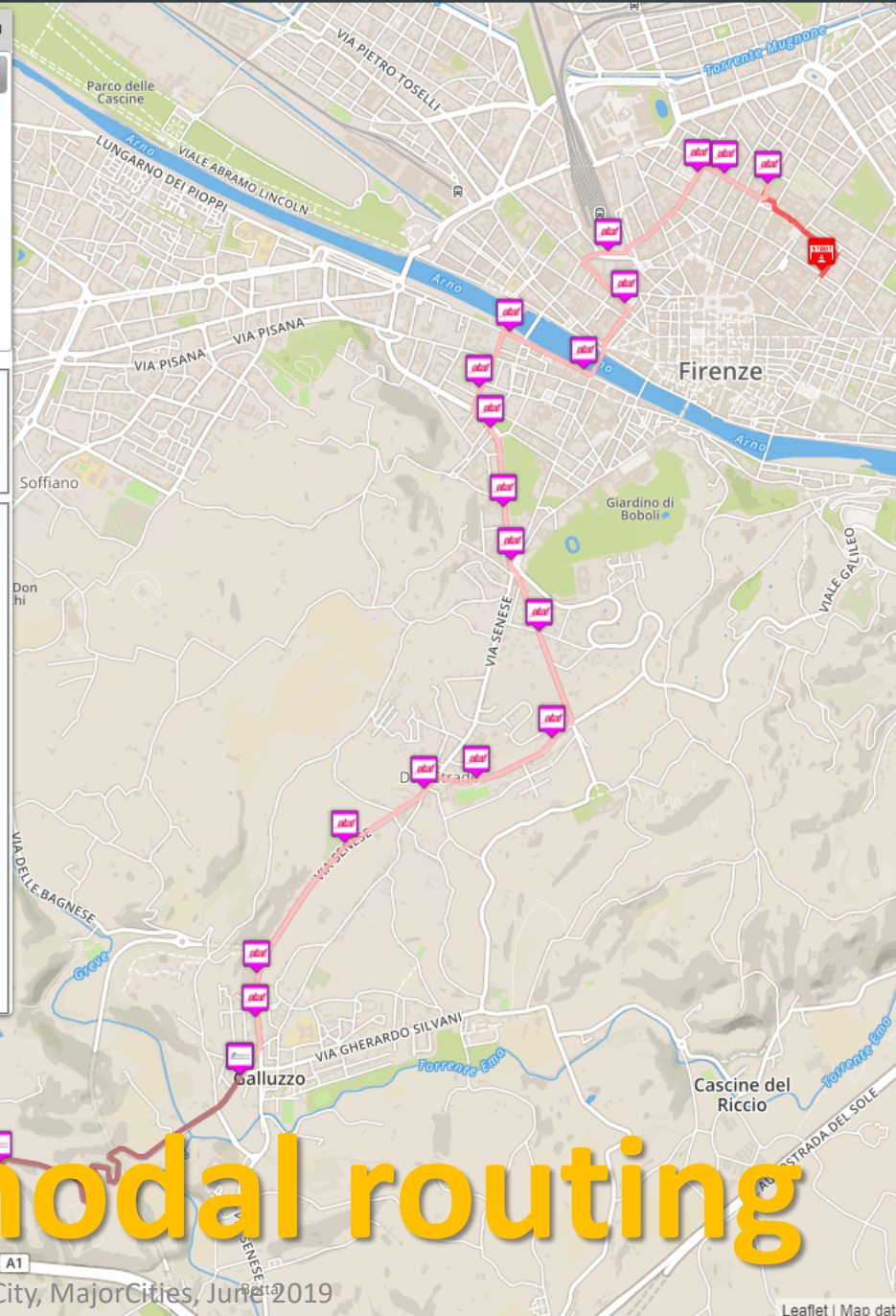
Actual Selection
Coord: 43.7130,10.9272
Address: [VIA DI PRATOVECCHIO, 58, EMPOLI](#)

Path from here Path to here Search geometry

Path
From: VIA DELLA PERGOLA, 39, FIRENZE
To: VIA DI PRATOVECCHIO, 58, EMPOLI
Route via: public_transport
Start date&time: today now

Search Path

3. Piazza della Santissima Annunziata 49m (14:40:13)
4. Via Cesare Battisti 148m (14:40:52)
5. Piazza San Marco 126m (14:42:47)
6. Via Camillo Cavour 1m (14:44:17)
7. 11 : Arazzieri - Volterrana 7800m (15:06:00)
8. 37 : Galluzzo Via Volterrana - Montespertoli (V. Risorgimento) Sn 26620m (18:52:00)
9. Viale Risorgimento 207m (19:45:00)
10. 32 : Montespertoli (V. Risorgimento) Sn - Viasanzio Fr.157 Sn 17534m (07:16:00)
11. 1 : Via Sancio Fr.157 - Via Sancio Fr. Coop Sn 1002m (08:08:00)
12. Via Raffaello Sancio 45m (08:10:00)
13. nd 33m (08:10:35)



Regular Services Transversal Services

Services Categories

- ☐ De/Select All
- ☐ Accommodation +
- ☐ Advertising +
- ☐ AgricultureAndLivestock +
- ☐ CivilAndEdilEngineering +
- ☐ CulturalActivity +
- ☐ EducationAndResearch +
- ☐ Emergency +
- ☐ Entertainment +
- ☐ Environment +
- ☐ FinancialService +
- ☐ GovernmentOffice +
- ☐ HealthCare +
- ☐ IndustryAndManufacturing +
- ☐ IoTDevice +
- ☐ MiningAndQuarrying +
- ☐ ShoppingAndService +
- ☐ TourismService +
- ☐ TransferServiceAndRenting +
- ☐ UtilitiesAndSupply +
- ☐ Wholesale +
- ☐ WineAndFood +

Filter:
search text into service

Service providing value type:
select value type

N. results: 100

Search Range 100 mt

Search Area
select...

Search icons: magnifying glass, location pin, refresh, save



Multimodal routing

Living Lab on Snap4City

Collaborative Work



ARC

INDEX

Welcome: how to start using Snap4City for beginners

Snap4City developers suggest you reading:

You have already created a **Dashboard**. Now, you may decide to make it public (visible and accessible) to all on WEB, or to provide access in view to other specific users that you know by nickname. In addition, you can pass the **Ownership** of a **Dashboard** to some other user of the system, and you can clone the **Dashboard** as well. So that you can create **Dashboard** for other users as well. We suggest to test these functionalities since you can:

- access to Data Set **Manager** to upload/download, share data sets as files in CSV: https://datagate.snap4city.org/ssologin_handler
- upload data for the **knowledge base** and **dashboards** via Data Set **Manager**,
- access and share of resources as: **dashboards**, **IOT Applications**, blocks, etc.: <https://processloader.snap4city.org/processloader/ssologin.php?redirect=page.php%3FshowFrame=false>
- access to help and contacts, **FAQ**, documentation and articles
- manage personal data: profile, **IOT Sensors**, **Annotations**, **Personal Data**, **Dashboards**...: <https://www.snap4city.org/drupal/myprofiledata>
- Auditing Access to My Data according to **GDPR**.

See this [video](#) to learn more about the above possibilities:

[TC110: Dashboard delegation to access and passage of ownership, and/or cloning](#)

If you are not registered please apply for a **free registration** from <https://www.snap4city.org> and then pass to ACCESS AT THE TOOLS and full Snap4City environment.

Snap4City puts in the hands of City Users a flexible environment to quickly create a large range of smart city applications/views exploiting heterogeneous data and services of stakeholders by IOT/IOE and big data technologies. For Snap4City, City Users can be citizens, students, operators, researchers, decision makers, developers, etc. see [Users' Roles on Snap4City](#).

- **Manager**: is a **final user**, has the capability of: accessing and creating Dashboards with a large set of data (high level types as: POI, sensors, KPI, micro applications, external services, etc.), attaching alerts and notifications; registering IOT Devices; creating IOT Applications exploiting MicroServices; loading and sharing data sets; managing personal data and annotations; full access to documentation, help desk, FAQ, coworking; managing personal profile and data according to GDPR; **NOTE**: accessible features are mainly visual and simple to understand and to use, and provide a limited number of parameters on each dialog and for each action. Default values of created elements can be changed editing elements.
- **AreaManager**: is a **Developer/researcher, students, city operator**, with additional capabilities with respect to the Manager to: register IOT Brokers; creating advanced IOT applications; create massive data transformation processes; create data analytics in multiple languages, testing and load them, create microservices; adding external services; sharing results, loading shapes; analyzing performance of the back office; **NOTE**: technical views and details are fully accessible

Suggested Activities to be performed to learn HOW to use Snap4City:

This page would guide you along few steps to see how the solution allows you to incrementally pass from **Level 0** to 5, from a **Manager** to an **Area Manager**:

- **Level 0 user**: access at data/services views of the city by using public Dashboards; (Public User) [\(overview on dashboards\)](#)
- **Level 1 user**: create personal/professional views/dashboards on data; (Manager) [\(see what a Manager can do\)](#) [\(see how Dashboards can be created\)](#)

Personalized Suggestions

Full Search

Search

Organization Groups

DISIT

- Operative

Recent comments

- 1 month 6 days ago

Recent content

Ti Sugeriamo di realizzare la tua prima Dashboard (Step 1) [new](#)
roottooladmin1

Benvenuto al nostro Sindaco ed al suo Team [new](#)
roottooladmin1

We suggest to Antwerp Developers: How to manage my Dashboards

SLIDES



Flyer

News

VIDEOS

All Tools



Validation with developers

- 65 performed operational activities:
 - dashboards, IOT Applications, registering IOT devices, etc.
 - More than the 80% created both Dashboards and IOT Applications, thus validating the solution and the process of engaging them in working on the platform

The 65 users	left on platform	Average per day over last 90 days	Total activity 90 days
Number of IOT Applications	117	81,6	7341
Number of private IOT devices	27	25,5	2296
Number of public dashboards	11	6,2	562
Number of private dashboards	173	135,1	12159
Number of accesses to dashboards	--	33,9	3048
Number of minutes	--	337,1	30337



Greenifiers

BIG DATA FOR SMART CITIES

An app for sustainable mobility

- The End
- Details
- Data
- App
- Context
- About

HelsinKEY
Opening the doors of Helsinki to people

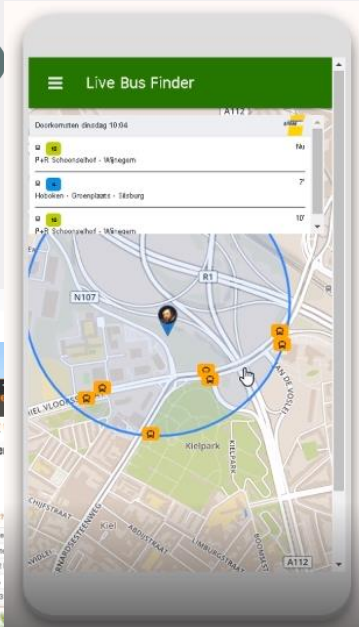


Team: The Unlocker
Snap4City Hackathon - Finals
30th April 2019



SNAP4CITY

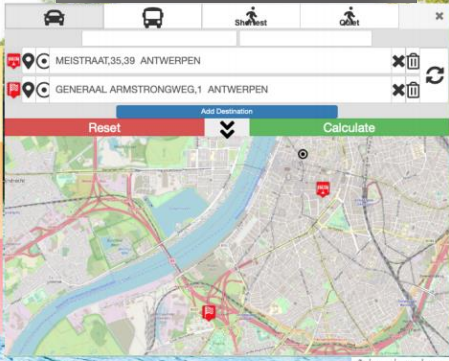
Andrea Pescetti



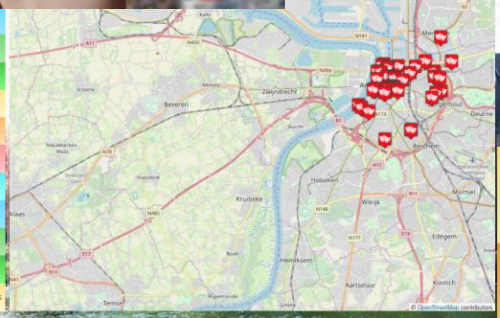
Antwerp @ First Sight



OpenWeather
Current
Weather in Antwerp
12 °C



- ▲ Social_centre
- ▲ Other_accommodation
- ▲ Museum
- ▲ Library
- ▲ Hotel
- ▲ Gym_fitness
- ▲ Dog_area
- ▲ Cultural_centre
- ▲ Cinema
- ▲ Camping
- ▲ Amusement_and_theme_parks



East west, DeWaterbus is best
Smart Ways to Antwerp
Traffic via Michelin
De Lijn routeplanner
Safety on Bike

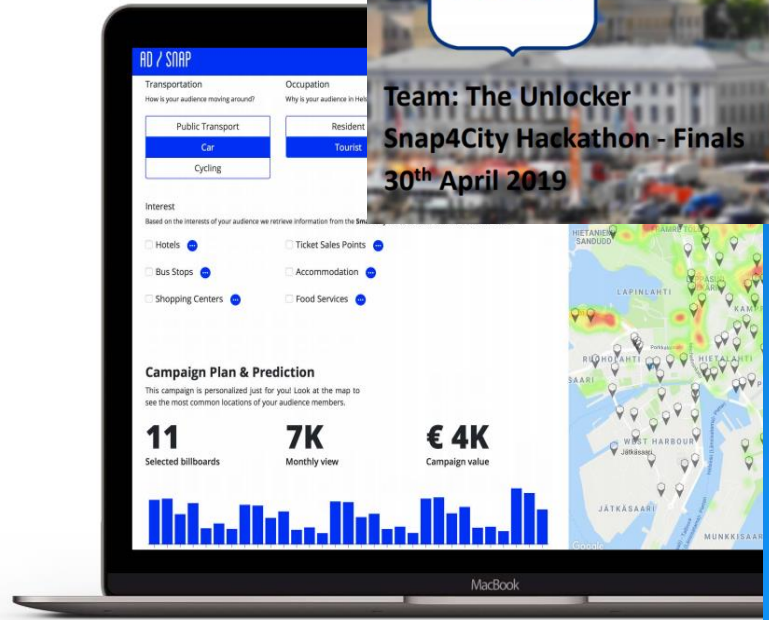
Data-driven design platform for offline advertising

Built on big data to determine the most popular location for a customer group

Automatically select billboards with the highest traction. The platform is capable of predicting the reach of every location on a city based on big data analytics.

Skyrocket the traction of offline campaigns

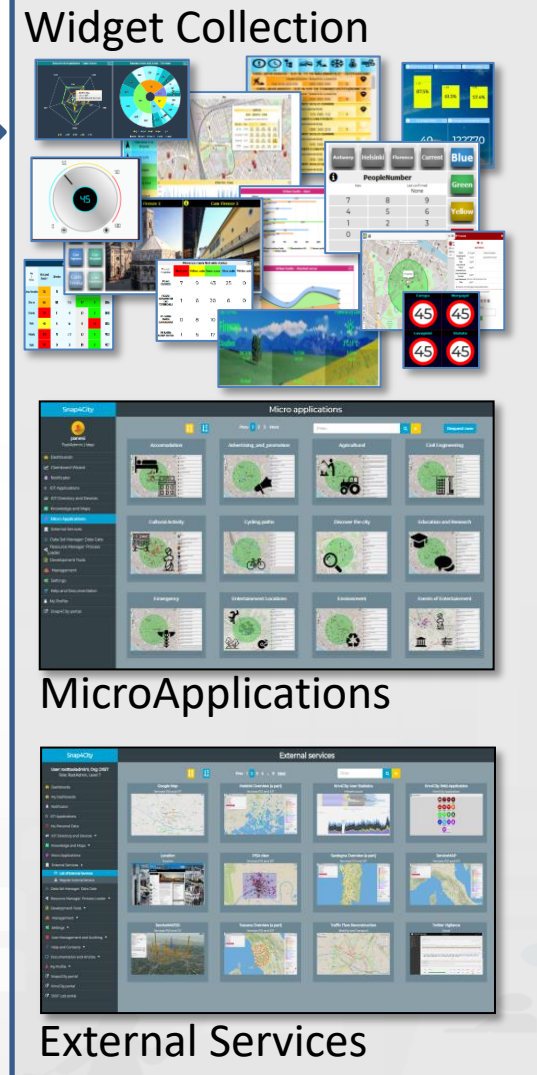
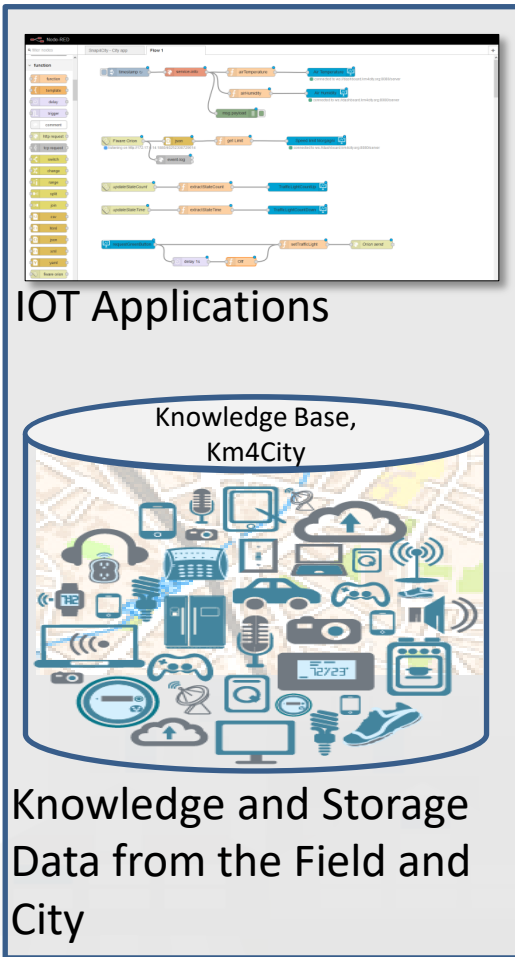
Citizens will run into more relevant advertisements resulting in higher conversion rates and more successful campaigns.



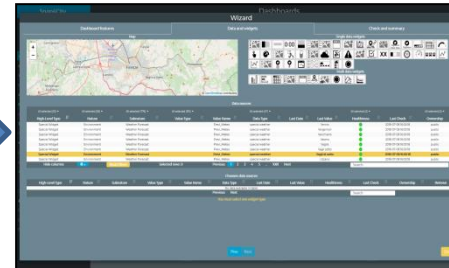
Dashboard Development



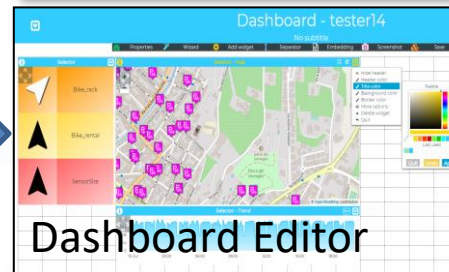
SNAP4CITY



Dashboard Wizard



Create, save, load,
delegate, grant access




My Own Dash/App



R Studio integrated environment for Data Analytics

Snap4City


rootooladmin1
RootAdmin | Idap

Dashboards

My Dashboards

Notificator

IOT Applications

My Personal Data

IOT Directory and Devices

Knowledge and Maps

Micro Applications

External Services

Data Set Manager: Da

Resource Manager: Pr

Development Tools

R Studio Developn

ETL Development

Knowledge Base C

Knowledge Base C

Smart City API Doc

Internal API Docs

Testing API by Pos

Source Code Acc

Management

Settings

User Management and Auditing

R Studio Development

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

Console

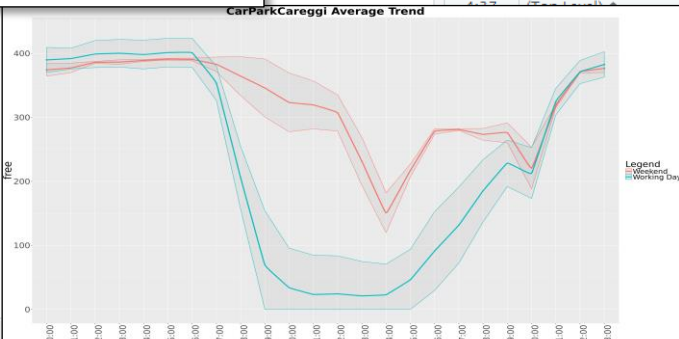
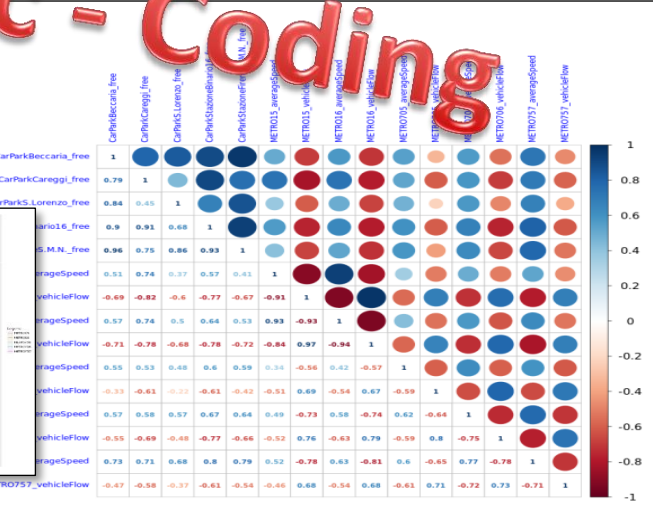
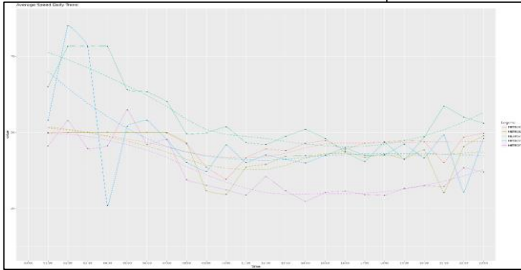
```
> source('~/.Snap4City/Snap4CityStatistics/RunRestA...')
Starting server to listen on port 8080
Running the swagger UI at http://127.0.0.1:8080/_swagger_/

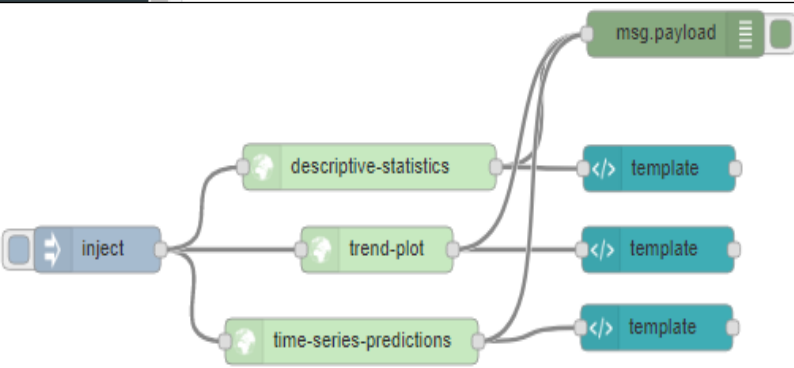
> setwd('~/.Snap4City/Snap4CityStatistics')
> source('~/.Snap4City/Snap4CityStatistics/Stat4CityFunctions.R')
> api <- plumber::plumb("Stat4CityFunctions.R")
> api$run(host = "0.0.0.0", port=8080)
Starting server to listen on port 8080
Running the swagger UI at http://127.0.0.1:8080/_swagger_/
```

RunRestApi.R 00Index.html INDEX

```
1 setwd("~/Snap4City/Snap4CityStatistics")
2 source("~/Snap4City/Snap4CityStatistics/Stat4CityFunctions.R")
3 api <- plumber::plumb("Stat4CityFunctions.R")
4 api$run(host = "0.0.0.0", port=8080)
```

Living Lab - Data Analytic - Coding





Connections

1500 obs. of 2 variables

<Object containing active binding>

"CarParkBeccaria"


"http://192.168.0.20:8890/sparql?default-graph-uri=&query=SELECT+DISTINCT+%3Fdate+%3Ffre..."


function (server, list, and ...)

function (api, ...)

function (serverTypeList)

function (ServerToPredict)





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Snap4City projects/pilots



ARC

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Main Projects/Pilots

Projects

SELECT
for Cities



Green Impact

- Sii-Mobility → DISIT (mobility and transport)
- REPLICATE → DISIT (ICT, Energy, IOT)
- RESOLUTE → DISIT (Resilience, ICT, Big Data)
- GHOST → UNICA (strategies, smart city)
- TRAFair → UNIMORE, DISIT (environment & transport)
- MOSAIC → DISIT (mobility and transport)
- WEEE Life → DISIT (waste, environment)
- Smart Garda Lake → Castelnovo del Garda
- 5G → DISIT (Industry 4.0 vs SmartCity)
- Green Impact → DISIT (Industry 4.0)
- PISA Agreement → data aggregation



SNAP4APPLIANCE

Virtual Machines ready to use for
Smart City and IOT Applications

DOWNLOAD



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FIRENZE



DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE



DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



Training Snap4City: Dai Dati alla Città Senziente, Smart City and IOT

- 25 Giugno 2019
- 9 Luglio 2019
- 23 Luglio 2019

*Scuola di Ingegneria, Università di Firenze
Via Santa Marta 3, Firenze*

PROGRAMMA

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<https://www.disit.org>

www.snap4city.org

Email: snap4city@disit.org

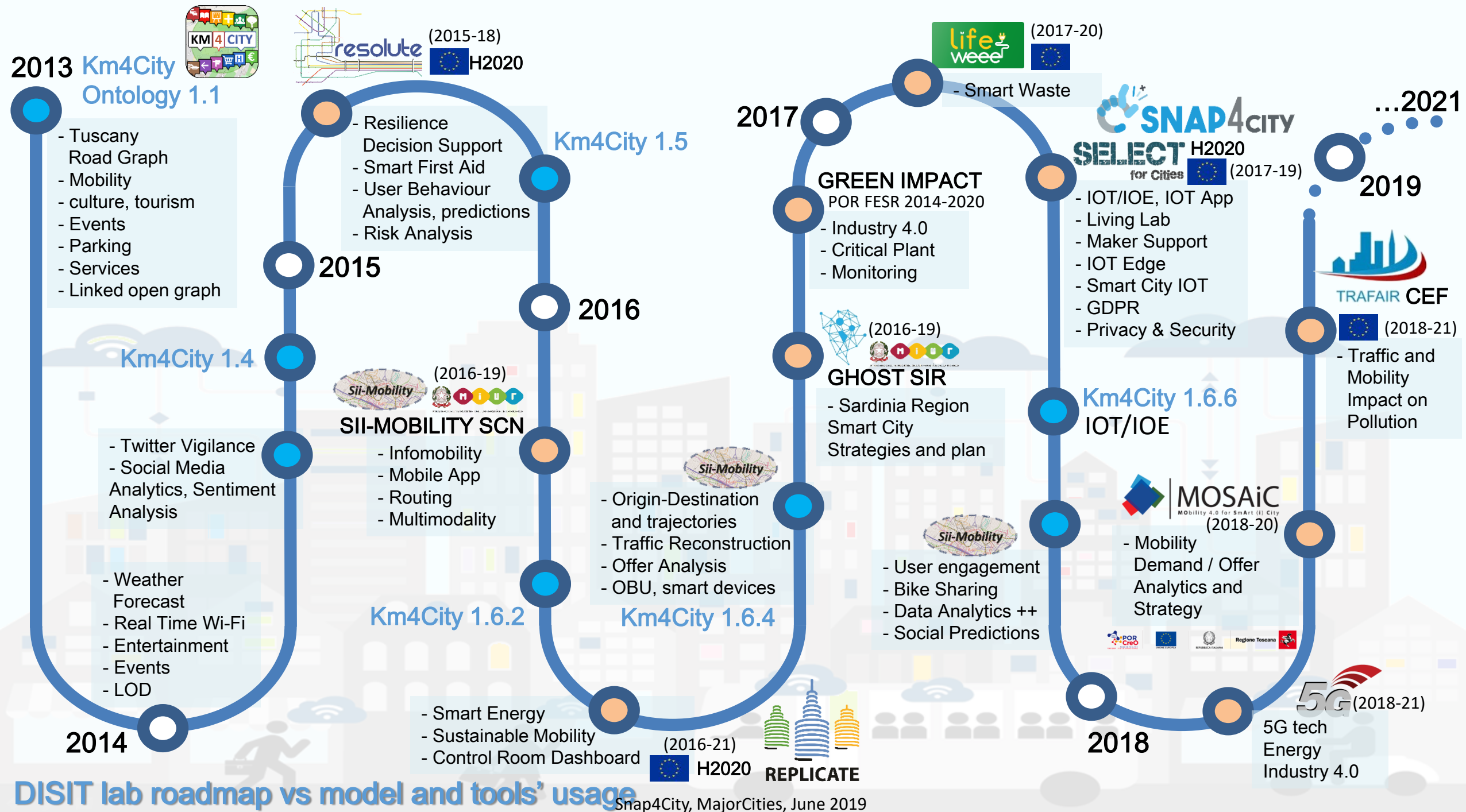
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Fax.: +39-055-2758570



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- **Km4City** is an open technology and research line of DISIT Lab exploited by a number of projects. Some of the innovative solutions and research issues developed into projects are also compliant and contributing to the Km4City approach and thus are released as open sources and are interoperable, scalable, modular, standard compliant, etc.

