



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



Open Urban Platform: Technical View 2018

<http://www.disit.org/km4city>

Paolo Nesi, paolo.nesi@unifi.it

www.Km4City.org





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Km4City Roadmap



SELECT
for Cities
Snap4City



12/2017
WEEE
2017-2020

6/2017

- waste
- Territorial areas and paths
- Health, Bike sharing
- Statistics, Energy, ICT, ...
- E-vehicles

- Risk analysis
- Environmental, water
- Data Licensing models
- Energy Meters
- Fi-Ware compliant



- IOT/IOE
- Monitoring
- Smart City IOT integration
- Living Lab

5G

Smart City vs
IOT, Industria 4.0

6/2018

11/2018

Already Planned
up to 2021

GHOST SIR
2016-2019 - Started



- Suggestions on demand
- User Behaviour Analysis
- Trajectories and OD

2016

REPLICATE H2020
2016-2021 - Started



Sii-Mobility SCN
2016-2018 - Started
Km4City 1.6.2



Km4City 1.5
- SmartDS
- Km4City App

RESOLUTE H2020
2015-2018 - Started



2015

Km4City 1.4
- Embed
- More API
- iBeacon

Km4City 1.1

- Tuscany Map
- Services
- AVM
- Sensors
- Parking
- Cultural Heritage
- Enrichment cities
- Event in the city
- Digital Locations
- Fresh places

- <http://servicemap.km4city.org> API
- <http://log.disit.org>
- <http://www.disit.org/fodd>
- <http://www.disit.org/tv> Twitter Vigilance
- <http://smartds.km4city.org>

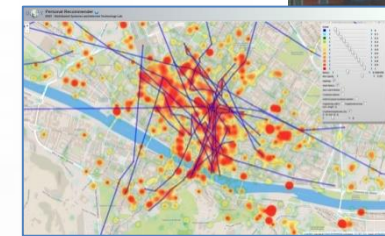
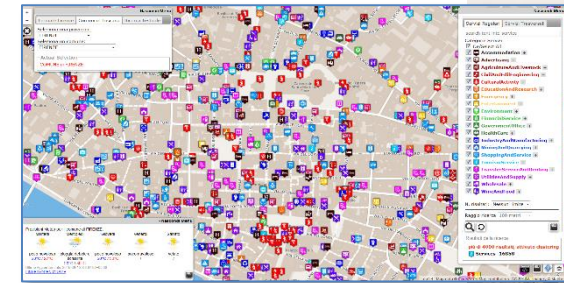
- Weather
- Cultural Heritage
- Energy recharge pillar
- Wi-Fi
- Events in the city

2014



Km4City: Integrated Urban Platform

- **Aggregate & integrate data**
 - Multiple protocols from urban operators,
 - open data, IOT, sensors, internet of everything, cloud, mobile devices, Wi-Fi, social media, ...
- **Data Exploitation performing**
 - predictions, reasoning, business intelligence, ..
 - users behavior analysis, decision support system, ..
 - Control Room, Real Time Monitoring tools,
- **Produce value from data enabling to**
 - Stimulate virtuous behavior, influence City Users!
 - Put in action CITY Strategies



- Nascondi Menu

Fermate Firenze Comuni in Toscana Ricerca Testuale

Seleziona una provincia:
FIRENZE

Seleziona un comune:
FIRENZE

Actual Selection
COMUNE di FIRENZE

KM4CITY

Previsione meteo:

Giorno	Icona	Descrizione	Temperatura
Giovedì		poco nuvoloso	23°C / 27°C
Venerdì		poco nuvoloso	20°C / 33°C
Sabato		velato	20°C / 30°C

- Nascondi Menu

http://servicemap.km4city.org

What is enabling and providing smart services

- Smart Parking, in Tuscany
- Smart First Aid in Tuscany
- Smart Fuel pricing in Tuscany
- Smart search for POI and public transport srv.
- Public Transportation in Tuscany
- Routing in Tuscany
- Social Media Monitoring and acting
- Traffic events and Resilience in Florence
- Bike Sharing in Pisa and Siena
- Recharge stations for e-vehicles
- Entertainment Events in Florence
- Traffic Sensors in Tuscany
- Weather forecast/condition in Tuscany
- Pollution and Pollination in Tuscany
- People Monitoring Assessment in the City, in Florence via WiFi
- People Monitoring, in Tuscany via App

All Point of Interests, cultural activities, IOT, ...

Over than 1.2 Million of complex events per day!

- Nascondi Menu

Servizi Regolari Servizi Trasversali

search text into service

Categorie Servizi

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

N. risultati: Nessun Limite

Raggio ricerca 100 metri

Risultati della ricerca

più di 4000 risultati, attivato clustering

Services 16858

Embed

Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

Services



- **Dashboard and Notifications for Decision Makers**
 - Control Room Dashboard, Notifications, personalized
 - Widgets in third party web pages
- **Development Tools for Applications**
 - Development of Web and Mobile App, HTML5, Open
 - Development of IOT Application for all
 - **Smart City API to access and exploit the city knowledge Km4City**
 - **Easy upload of Data Set and Data Analytics/Processing Processes**
 - **Development Environment for Data Analytics**
 - Sand Box, VM for developers: ETL, Python, C/C++, Java, etc.

Smart Interoperability and how to start with

Km4City



Transport systems
Mobility, parking



Public Services
Govern, events, ...



Sensors, IOT
Cameras, ..



Environment,
Water, energy



Shops, services,
operators

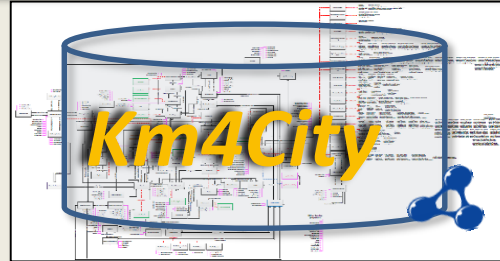


Social Media
WiFi, network

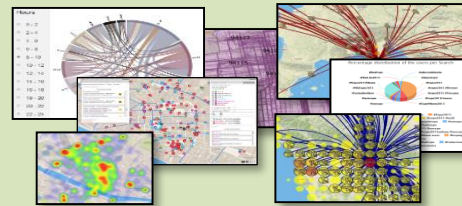


Static, Slow and Real Time data flows

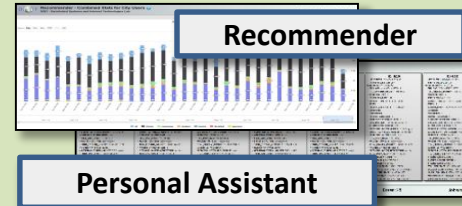
Km4City Smart City Engine



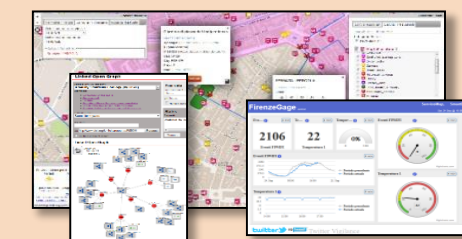
Big Data Analytics



Smartening Tools



Development Tools

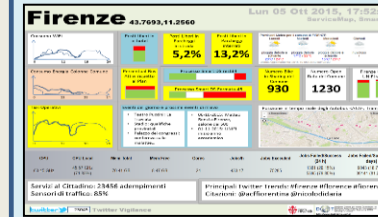


DISCES -- Distributed and parallel architecture on Cloud

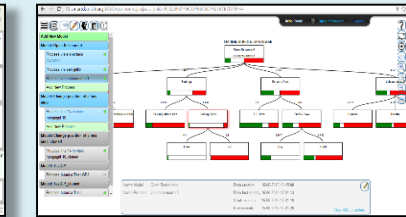
Km4City Smart City API

City Operators and Decision Makers

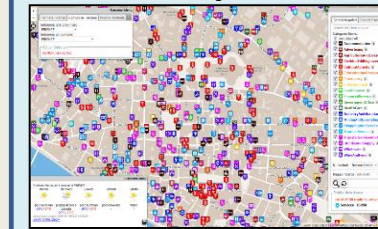
Dashboards



Smart Decision Support



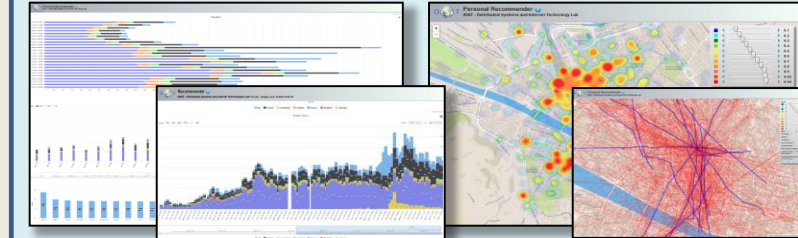
ServiceMap browser



Twitter Vigilance

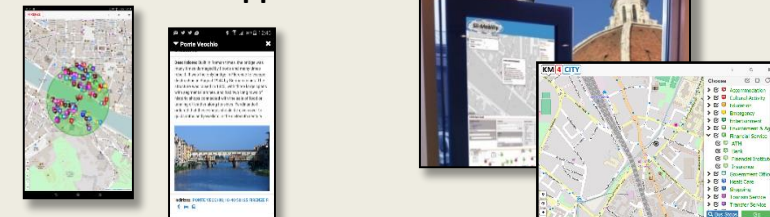


Analyzers of City User Behavior



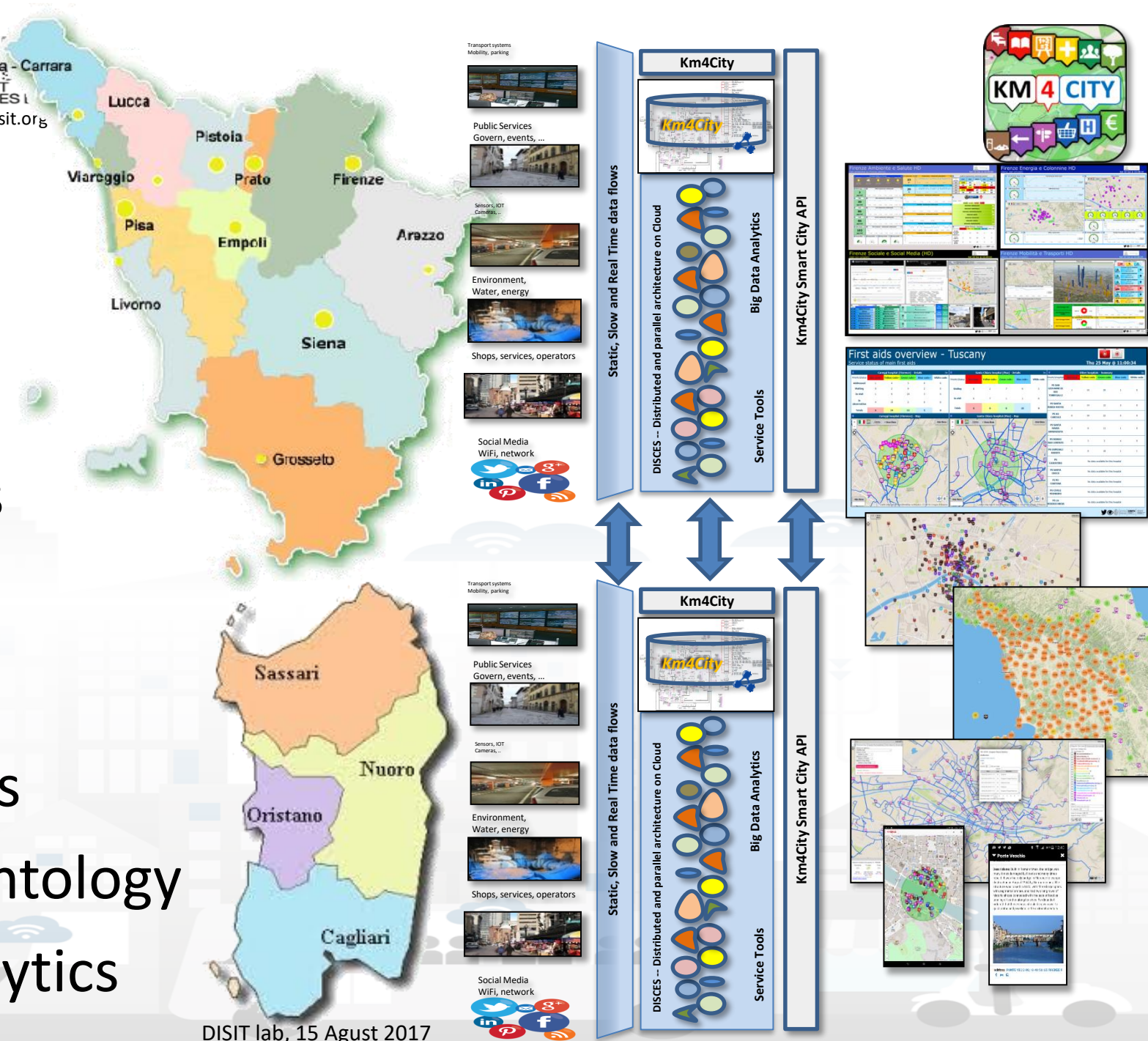
Tools for Final Users

Mobile e Web Apps



Interoperability

- At different levels:
 - Among cities/regions
 - Among data providers
 - Among Operators
- By Means of:
 - Smart City API → Apps
 - Km4City Smart City Ontology
 - Dashboards/data analytics



Data & Model

<http://www.km4city.org/?infoDocs>

<http://www.km4city.org/?controlRoom>

<http://www.km4city.org/?devTools>

<http://www.km4city.org/?app>



Km4City: Knowledge Base



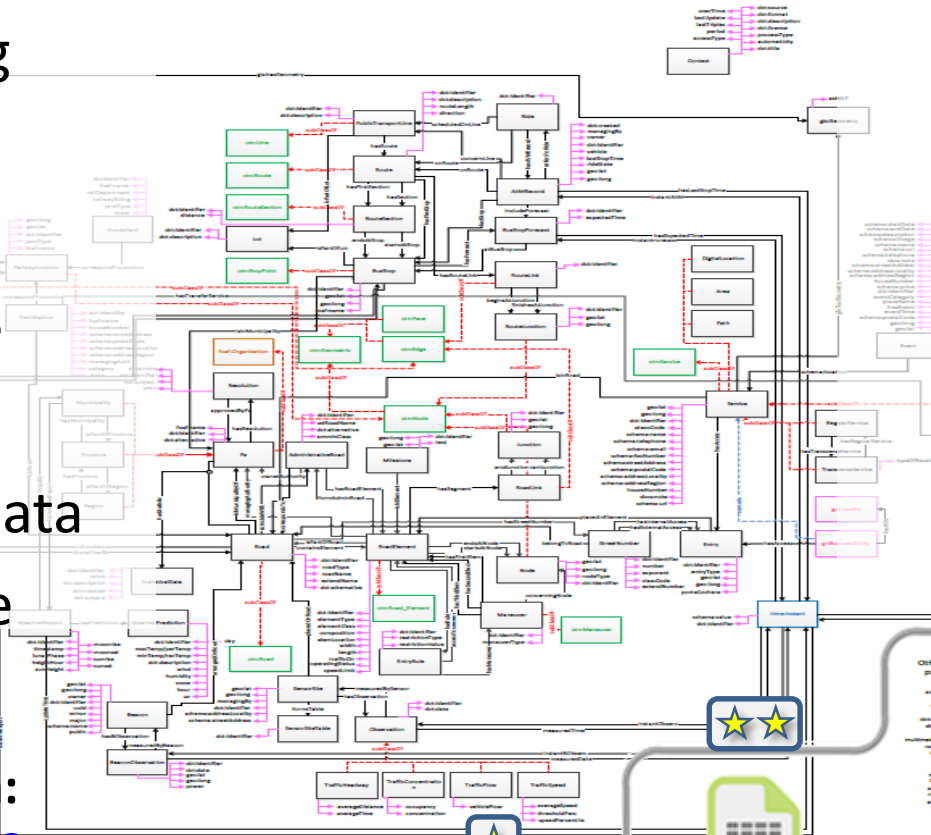
- Multiple DOMAINS
- Geospatial reasoning
- Temporal reasoning
- Metadata
- Statistics
- Risk and Resilience
- Licensing
- Open and Private Data
- Static and Real time

- Street-Guide
- Mobility and transport
- Points of interest
- Sensors, IOT, ..
- Energy
- Administration
- Citations from strings

Big Data Tools



LOD and reasoners



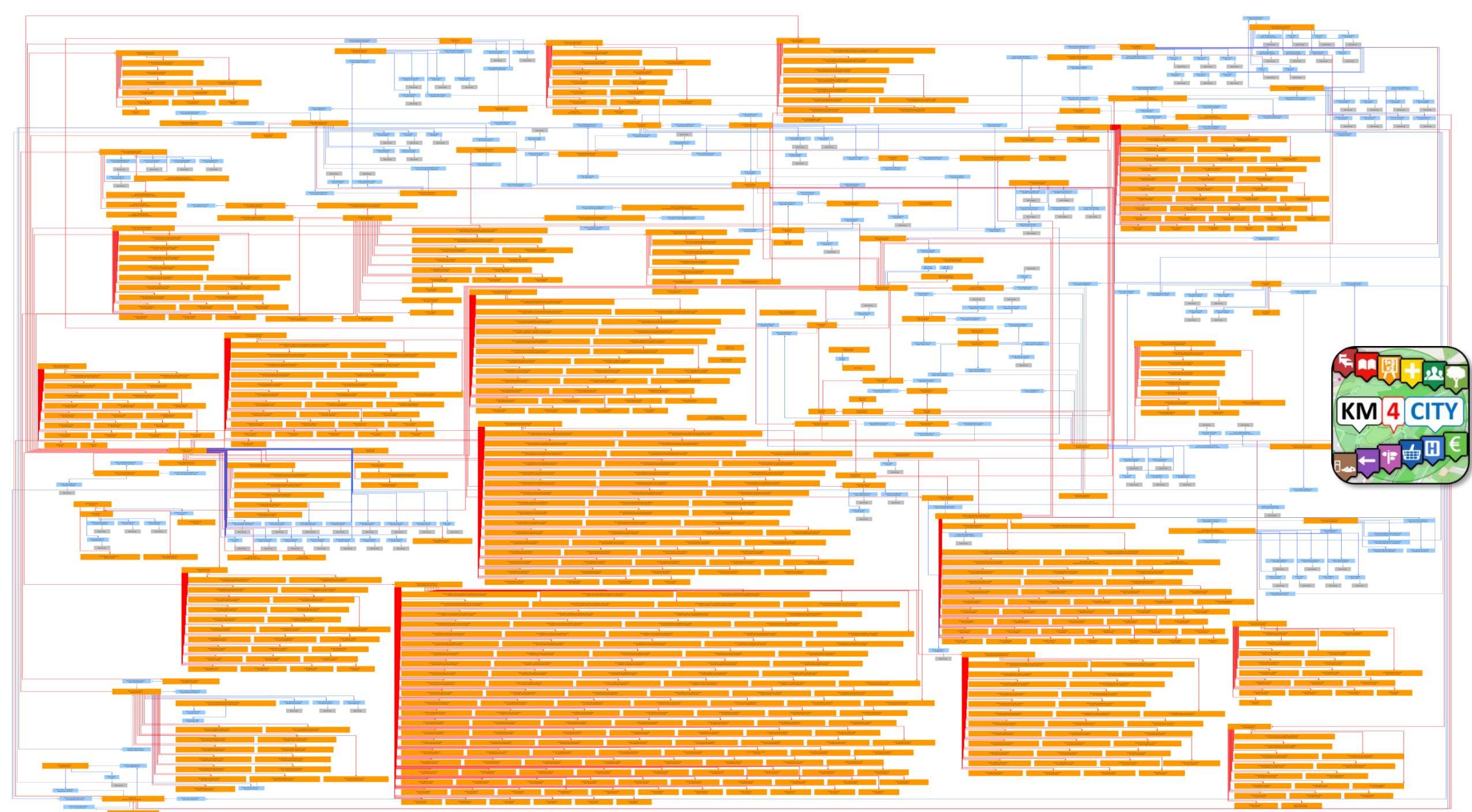
Ontology Documentation:

<http://www.disit.org/6506>

<http://www.disit.org/6507>

<http://www.disit.org/5606>

<http://www.disit.org/6461>



**Present data on
Tuscany Region
January 2018**



<http://servicemap.km4city.org>

Road Graph (Tuscany region)

132,923 Roads , 389,711 Road Elements

318,160 Road Nodes, 1,508,207 Street Numbers

Info on: points, paths, areas, etc.

Services (20 cat, 512 cat.)

16 Public Transport Operators

21.280 Bus stops & 1081 bus lines

Dynamic/real-time in Tuscany Region

- Real time bus lines: 144 updates X day X line
- 1081 Transport Pub Lines: 1-2 up per day, time-path
- >210 parking lots status: 76 updates X day X sensor
- >796 traffic Sensors: 288 updates X day X sensor
- 285 weather area: 2 updates X day X area
- >12 hospital Triage status: 96 updates X day X FA
- 22 Environmental data: 20 updates X day X sensor
- 39 Bike Sharing data: Pisa and Siena
- 12 Pollination data
- 140 recharging stations
- Smart benches, waste mng, irrigators, lighting,...
- Florence ent.events: about 60 new events X day
- Different kinds of Florence traffic events,
- [1600 Fuel stations: 1 update X day X station]
- Wi-Fi: > 400.000 measures X day
- App mobiles: >50.000 measures X day
- more than 40.000 distinct users X day
- From 600.000 to 4.5 M Tweets X day
- many IOT sensors

- Nascondi Menu

Fermate Firenze Comuni in Toscana Ricerca Testuale

Seleziona una provincia:

FIRENZE

Seleziona un comune:

FIRENZE

Actual Selection

COMUNE di FIRENZE

Servizi Regolari Servizi Trasversali

search text into service

Categorie Servizi

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

N. risultati: Nessun Limite

Raggio ricerca 100 metri



Risultati della ricerca

più di 4000 risultati, attivato clustering

Services 16858



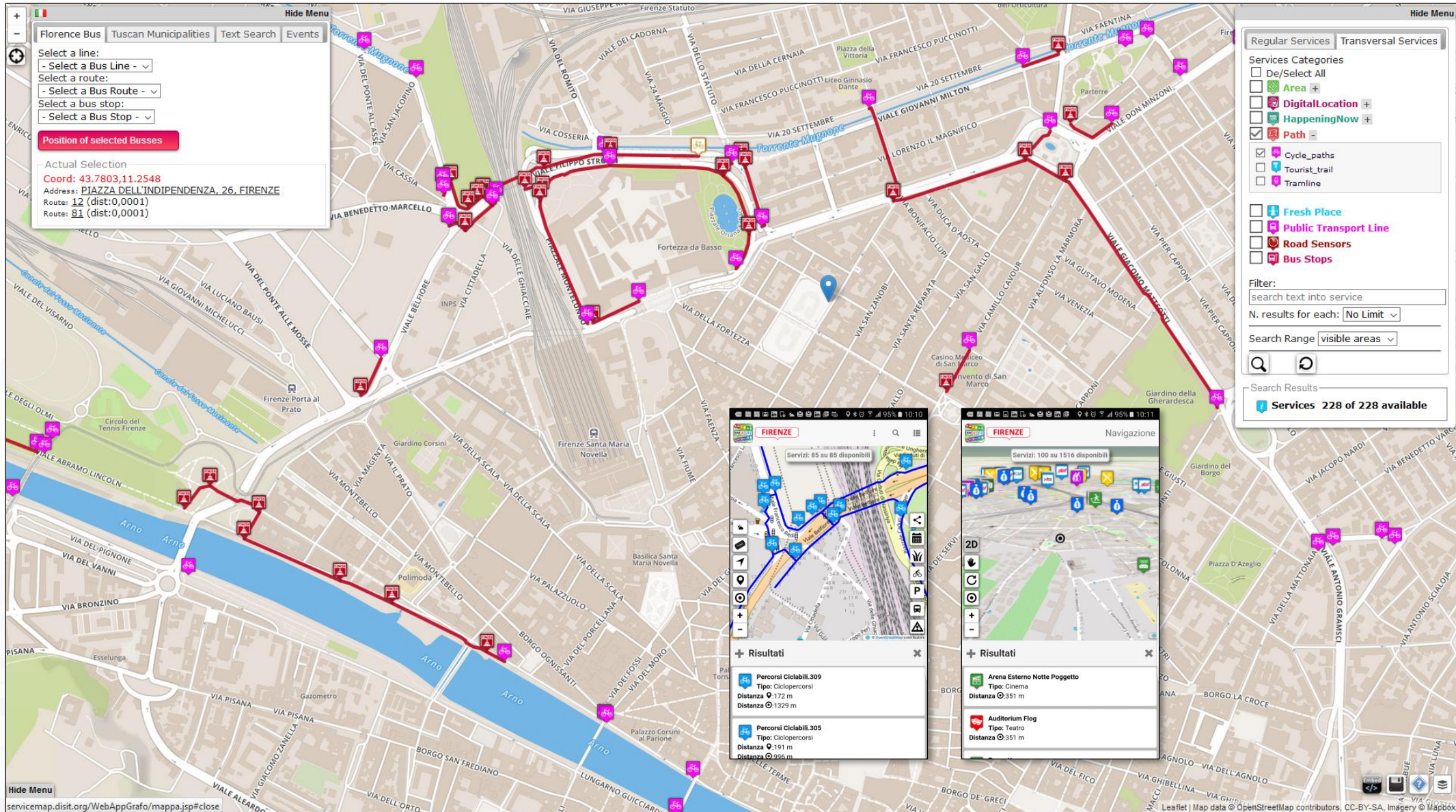


Service Map Tool

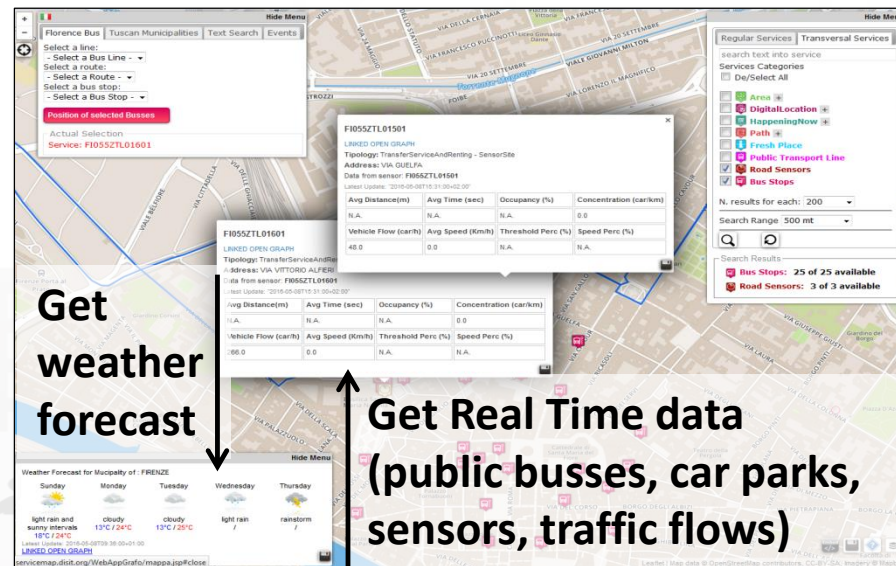
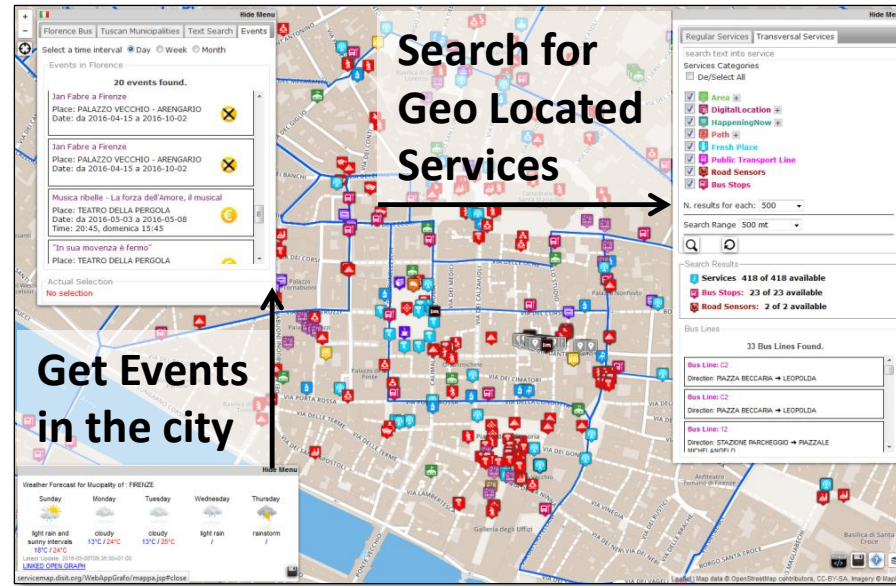
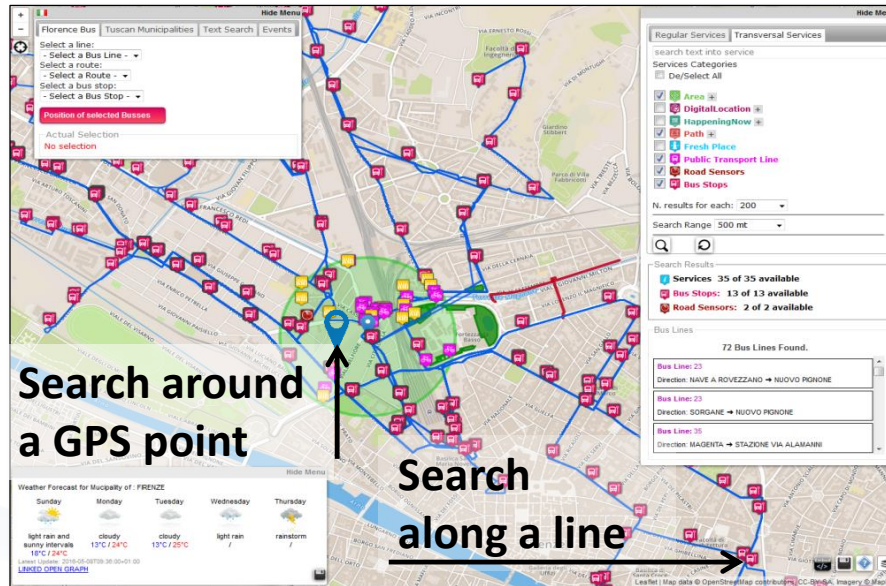


- The Km4City model consists of an ontology and documentation to populate and reasoning on a GraphDB.
- **ServiceMap tool**
 - with Km4City are substantially a Smart City Expert System, SCES
 - includes the Smart City API
 - is a for developers to: search and browse on Smart City Knowledge, also to generate examples of the Smart City API call to be used in the development of Web and Mobile Apps
- Final users tools exploiting Km4City are:
 - Web and Mobile Applications and Dashboards

Cycling Paths



ServiceMap



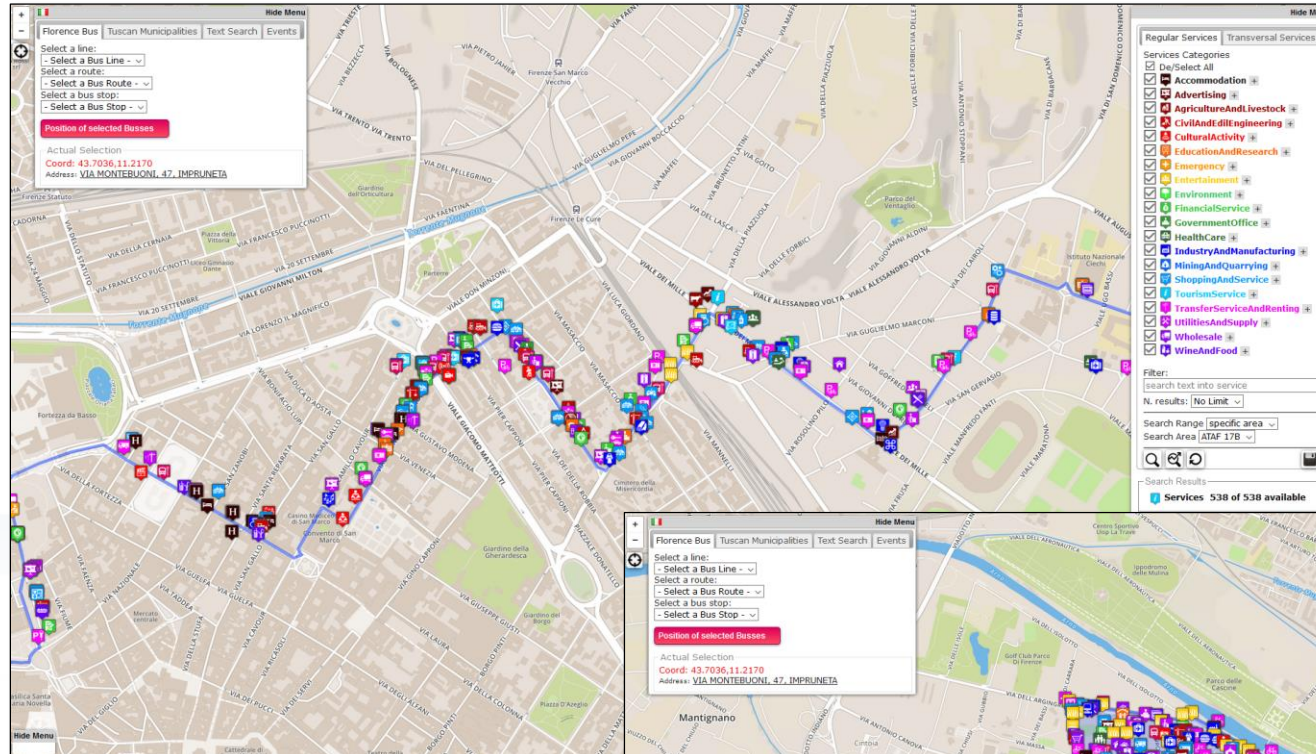


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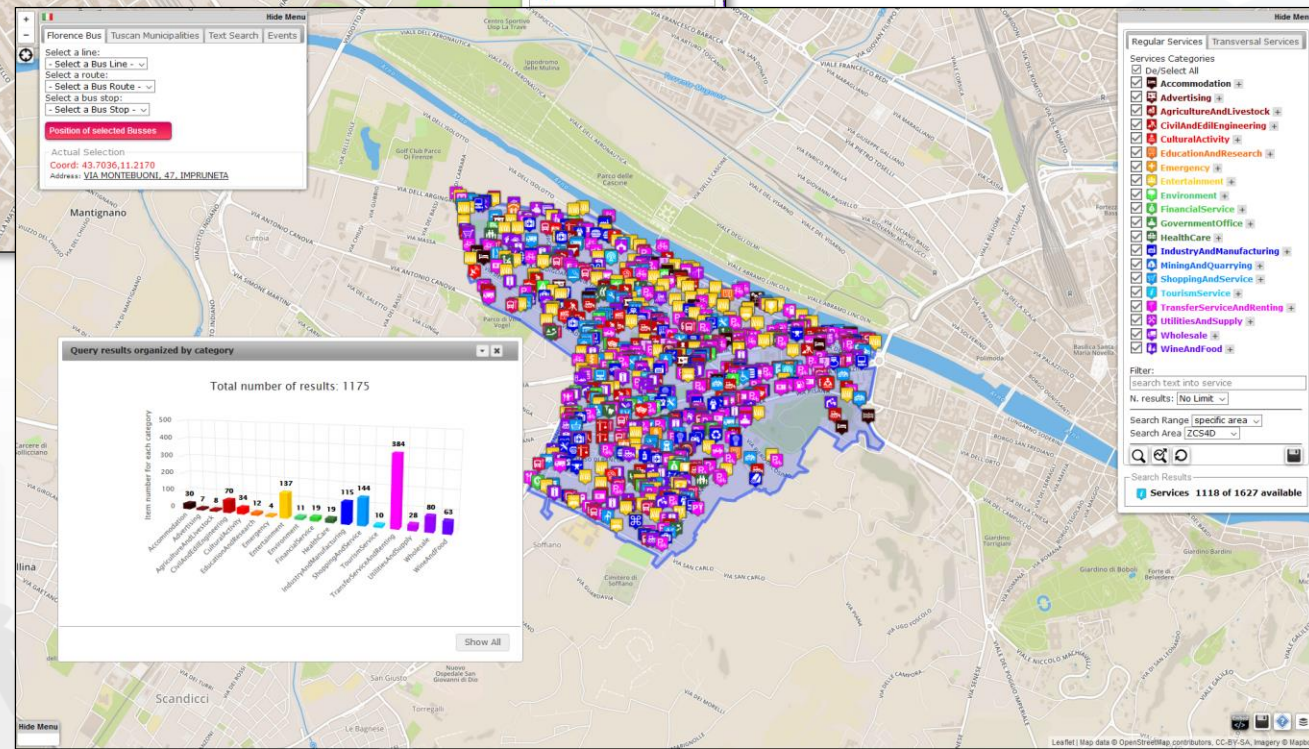
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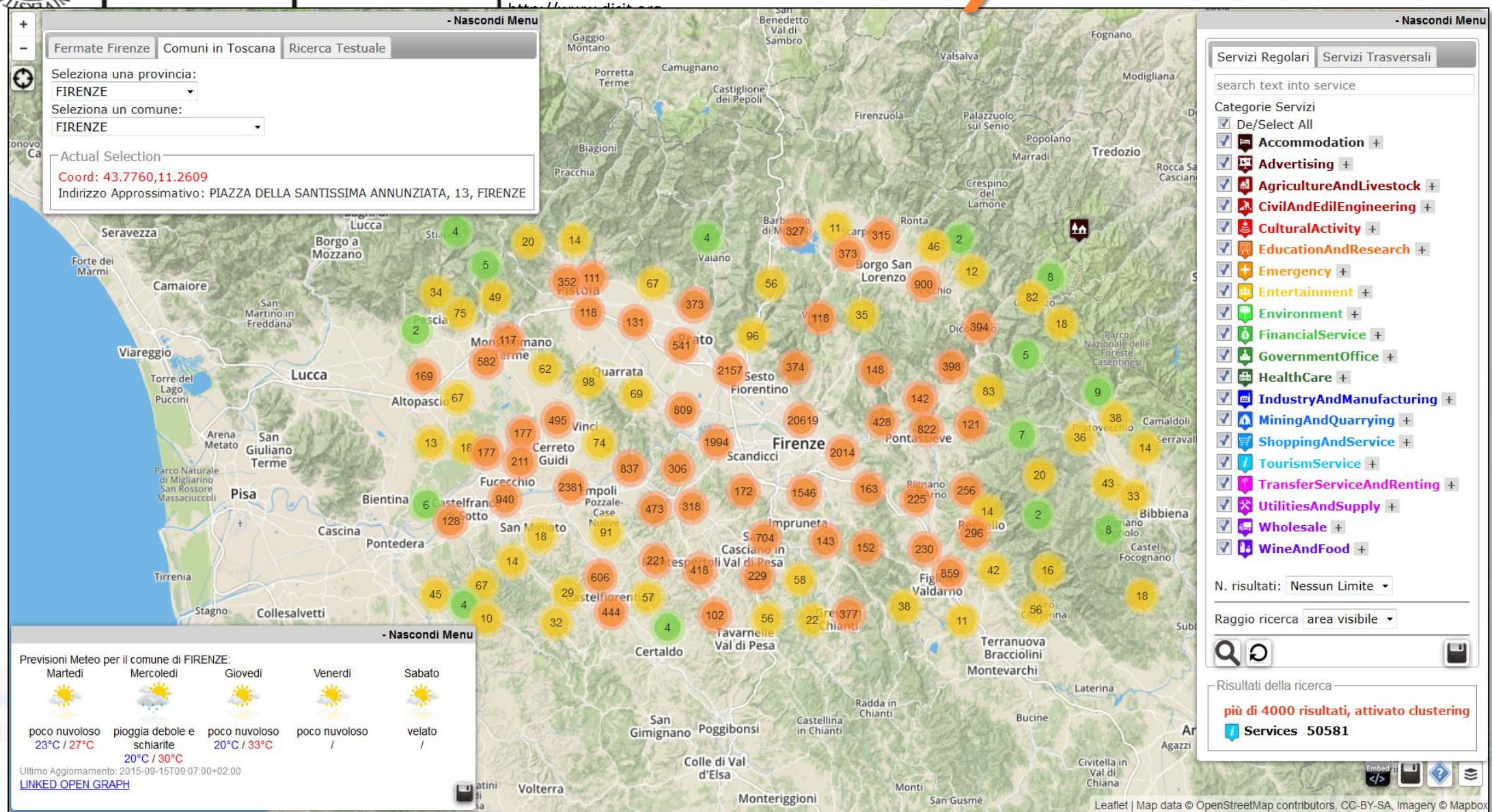
Along a Line



Into an Area

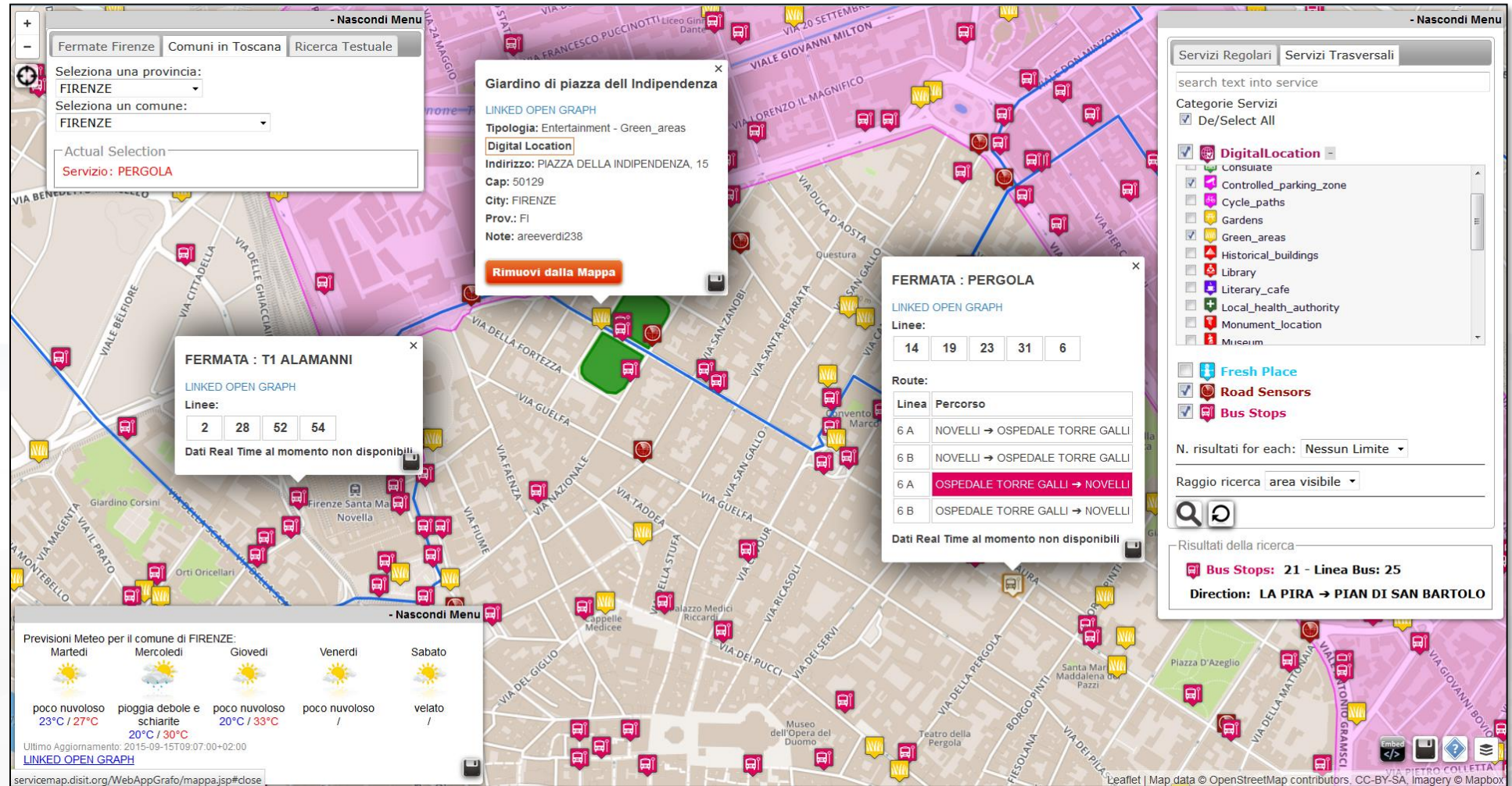


Km4City in Toscana



- *Search all services in the area*

Km4City in Firenze

- Nascondi Menu

Fermate Firenze | Comuni in Toscana | Ricerca Testuale

Seleziona una provincia:
FIRENZE

Seleziona un comune:
FIRENZE

Actual Selection
Servizio: PERGOLA

Giardino di piazza dell'Indipendenza

LINKED OPEN GRAPH

Tipologia: Entertainment - Green_areas

Digital Location

Indirizzo: PIAZZA DELLA INDIPENDENZA, 15

Cap: 50129

City: FIRENZE

Prov.: FI

Note: areeverd238

Rimuovi dalla Mappa

FERMATA : T1 ALAMANNI

LINKED OPEN GRAPH

Linee:
2 28 52 54

Dati Real Time al momento non disponibili

FERMATA : PERGOLA

LINKED OPEN GRAPH

Linee:
14 19 23 31 6

Route:

Linea	Percorso
6 A	NOVELLI → OSPEDALE TORRE GALLI
6 B	NOVELLI → OSPEDALE TORRE GALLI
6 A	OSPEDALE TORRE GALLI → NOVELLI
6 B	OSPEDALE TORRE GALLI → NOVELLI

Dati Real Time al momento non disponibili

Servizi Regolari | Servizi Trasversali

search text into service

Categorie Servizi

☒ De/Select All

☒ DigitalLocation

- ☒ Consulate
- ☒ Controlled_parking_zone
- ☐ Cycle_paths
- ☐ Gardens
- ☒ Green_areas
- ☐ Historical_buildings
- ☐ Library
- ☐ Literary_cafe
- ☐ Local_health_authority
- ☐ Monument_location
- ☐ Museum

☐ Fresh Place

☒ Road Sensors

☒ Bus Stops

N. risultati for each: Nessun Limite

Raggio ricerca: area visibile

Risultati della ricerca:

Bus Stops: 21 - Linea Bus: 25

Direction: LA PIRA → PIAN DI SAN BARTOLO

Previsioni Meteo per il comune di FIRENZE:

Martedì	Mercoledì	Giovedì	Venerdì	Sabato
poco nuvoloso 23°C / 27°C	pioggia debole e schiarite 20°C / 30°C	poco nuvoloso 20°C / 33°C	poco nuvoloso /	velato /

Ultimo Aggiornamento: 2015-09-15T09:07:00+02:00

LINKED OPEN GRAPH

servicemap.disit.org/WebAppGrafo/mappa.jsp#close

Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

• **Areas, Bus lines, bike lanes, tram, RTZ, etc.**



Pisa only POI

The screenshot displays the ServiceMap web application in a browser window. The main map shows the city of Pisa, Italy, with the Arno river and numerous service icons representing different categories like accommodation, education, and healthcare. The left sidebar contains a 'Hide Menu' button, a 'Florence Bus' button, and a 'Text Search' button. Below these are dropdown menus for 'Select a province:' (PISA) and 'Select a municipality:' (PISA). The 'Actual Selection' section shows 'Service: Osteria Il Fantasma dell'Opera'. The right sidebar features a 'Hide Menu' button, a 'Regular Services' button, and a 'Transversal Services' button. Below these are 'Services Categories' with checkboxes for various service types, a 'Filter:' section with a search text input, and a 'Search Results' section showing 'Services 1058'. The bottom left corner displays a 'Weather Forecast for Municipality of: PISA' with a table of weather conditions for Saturday through Wednesday. The bottom right corner shows the 'Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox' attribution.



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Km4City in Sardegna



File Modifica Visualizza Cronologia Segnalibri Strumenti Aiuto

ServiceMap ServiceMap ServiceMap +

www.disit.org/smosm/

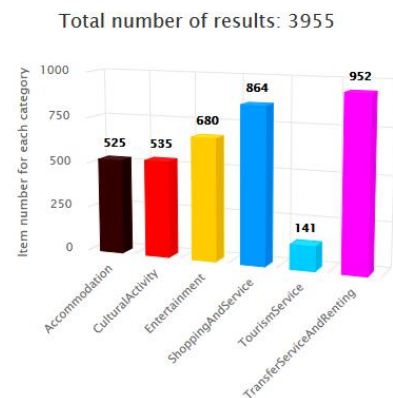
Public transport Municipalities Text Search Address Search Events

Select an agency:
- Select an Agency -
Select a line:
- Select a Line -
Select a route:
- Select a Route -
Select a bus stop:
- Select a Bus Stop -

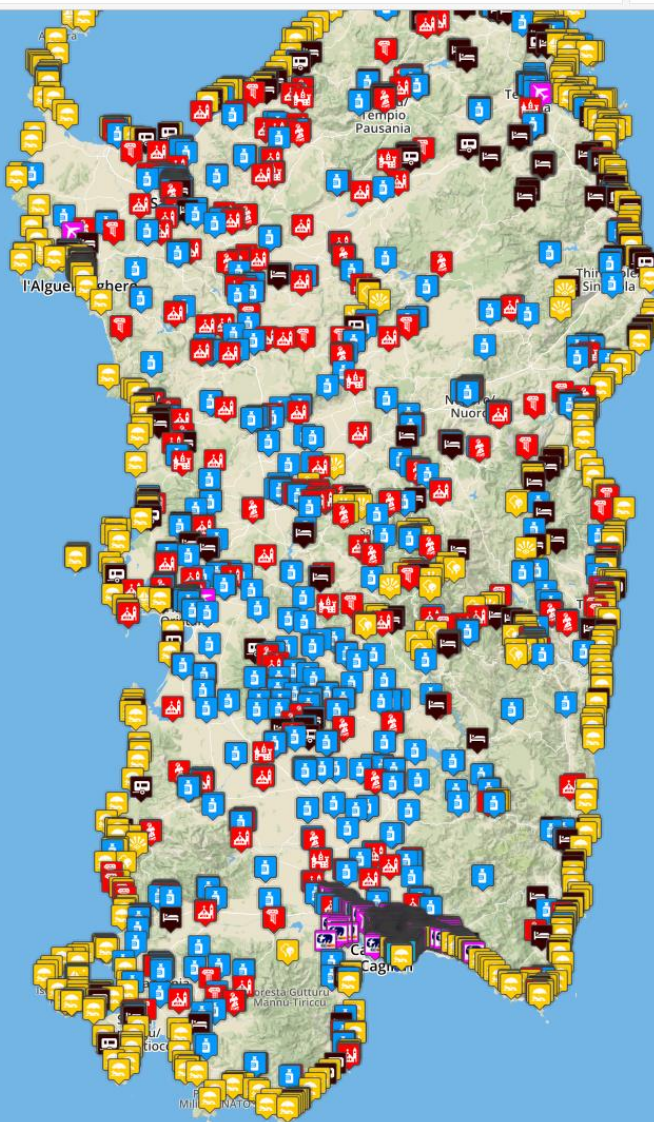
Position of selected Busses

Actual Selection
Coord: 39.2329,9.11890
Address: [Casteddu/Cagliari](#)
Path from here Path to here

Query results organized by category



Show All



Regular Services Transversal Services

Filter:
search text into categories

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

Filter:
search text into service

N. results: No Limit

Search Range visible area

Search Area select...



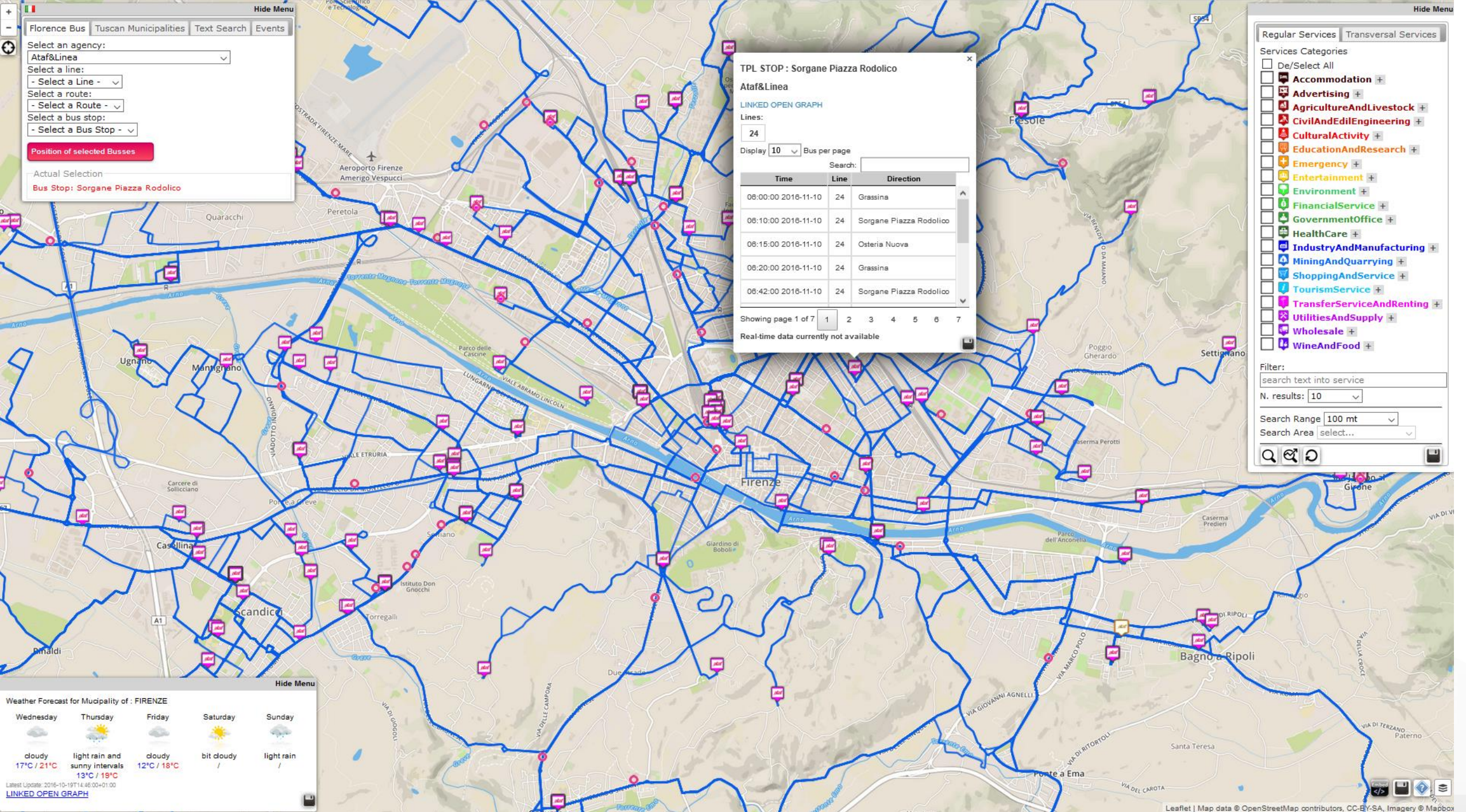
Search Results

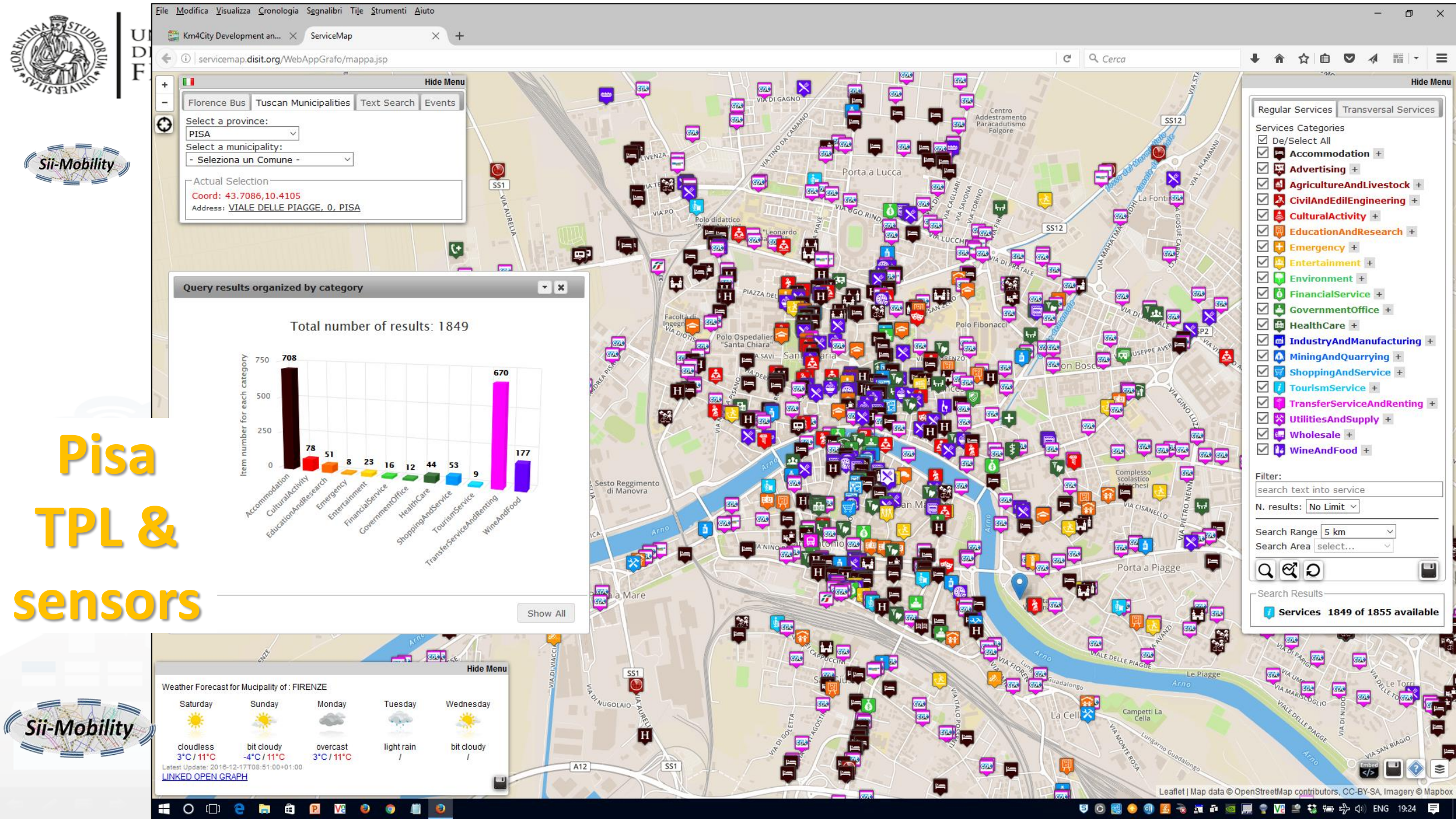
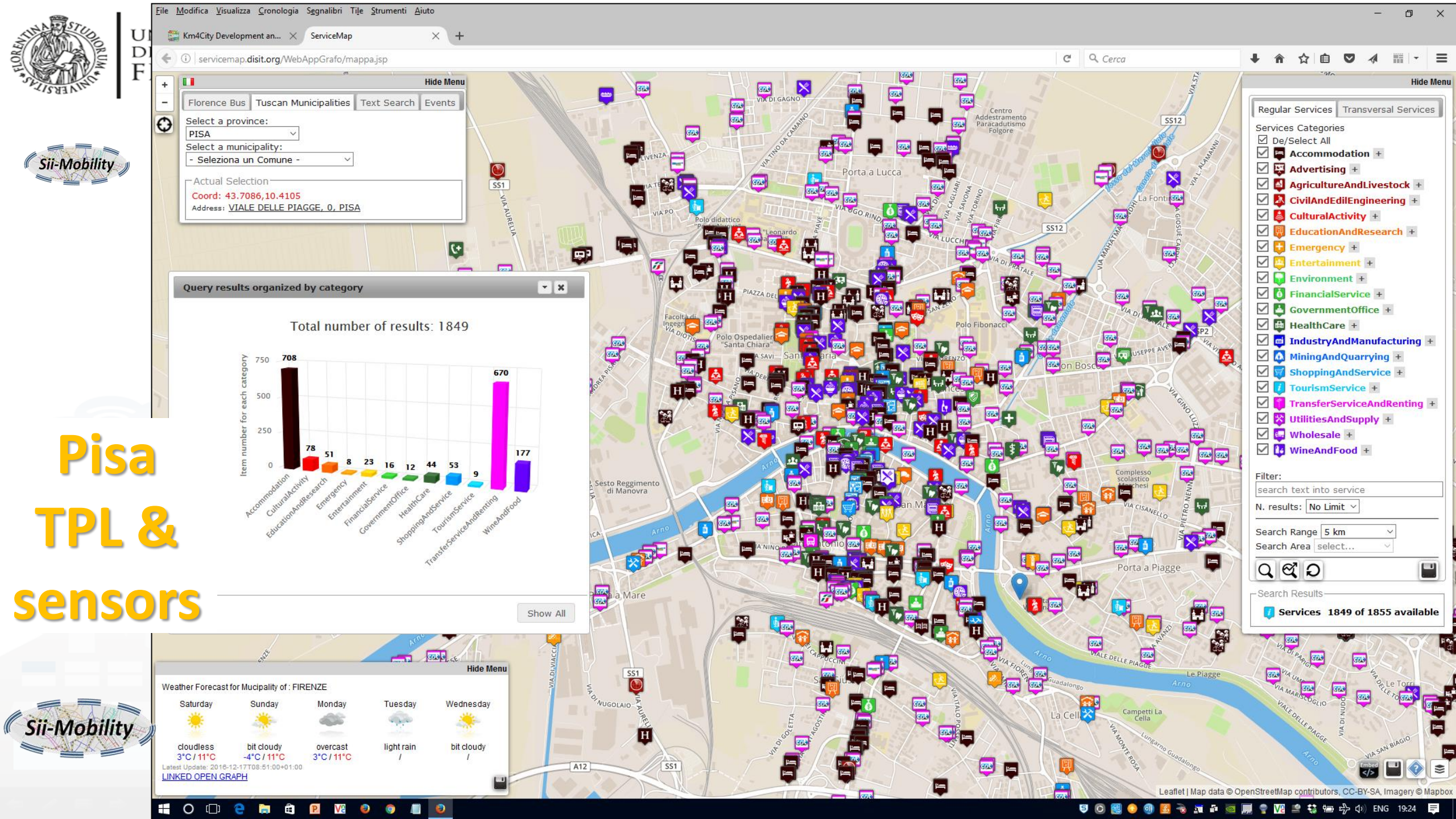
Services 3690 of 3690 available

- Hide Menu

www.disit.org/smosm/#close

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Pisa
TPL &
sensors



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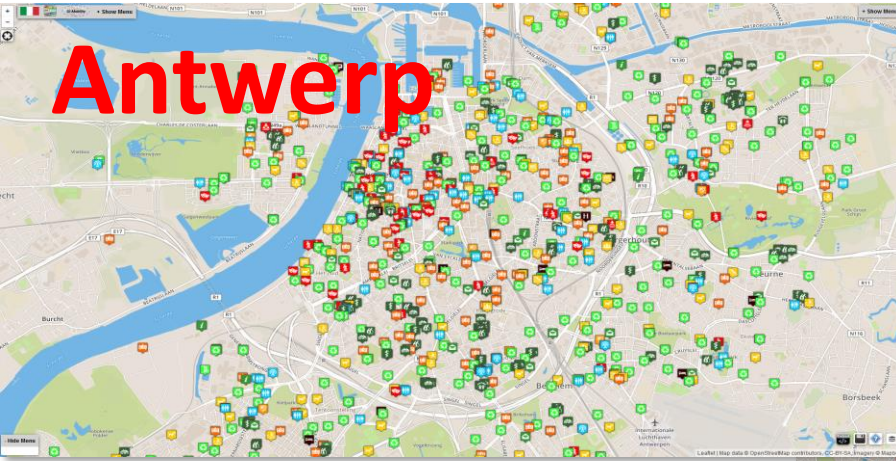
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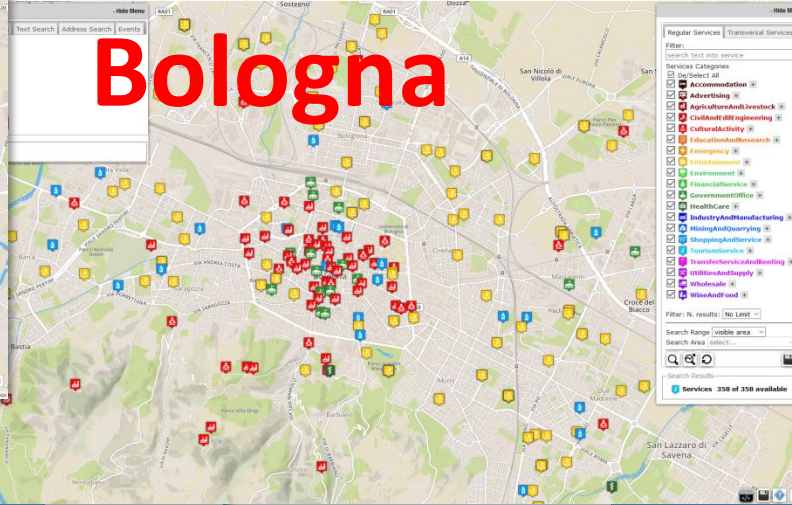
Km4City in ...



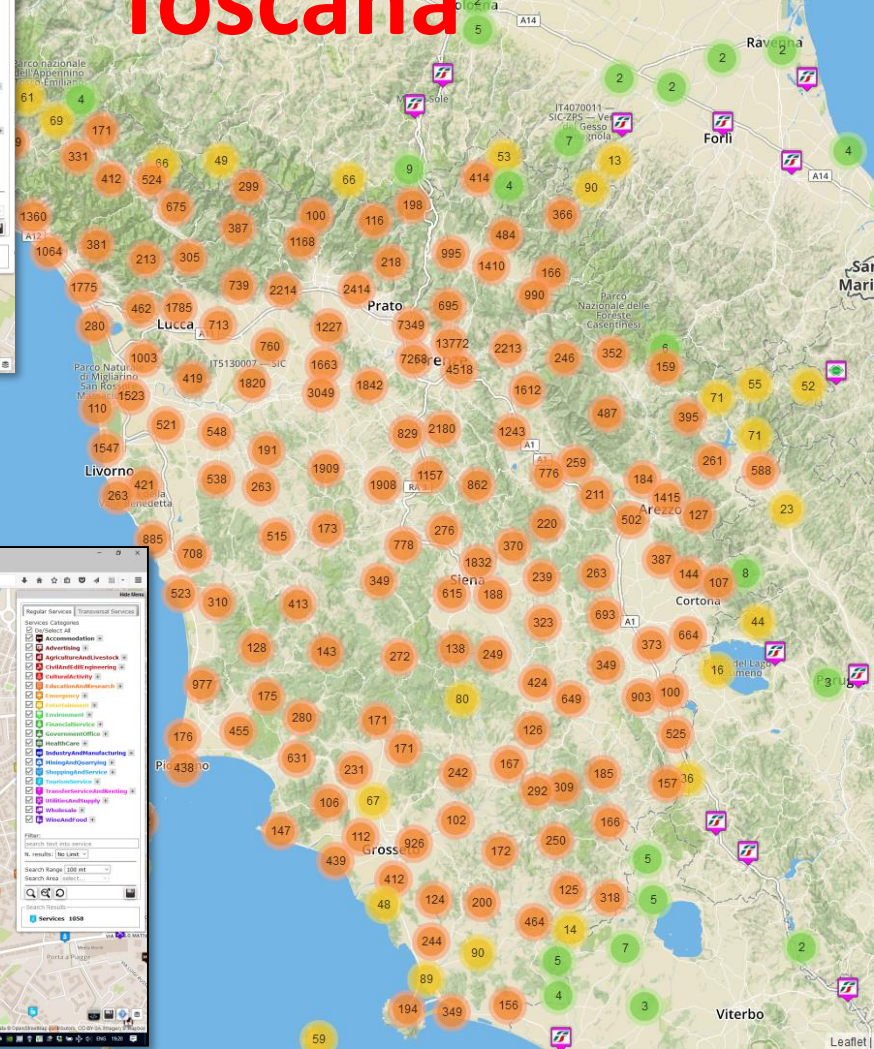
Antwerp



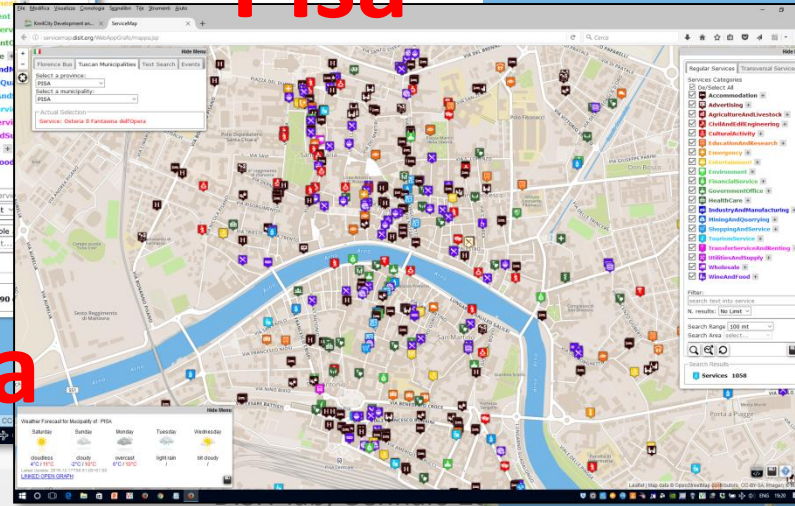
Bologna



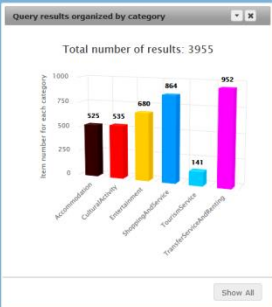
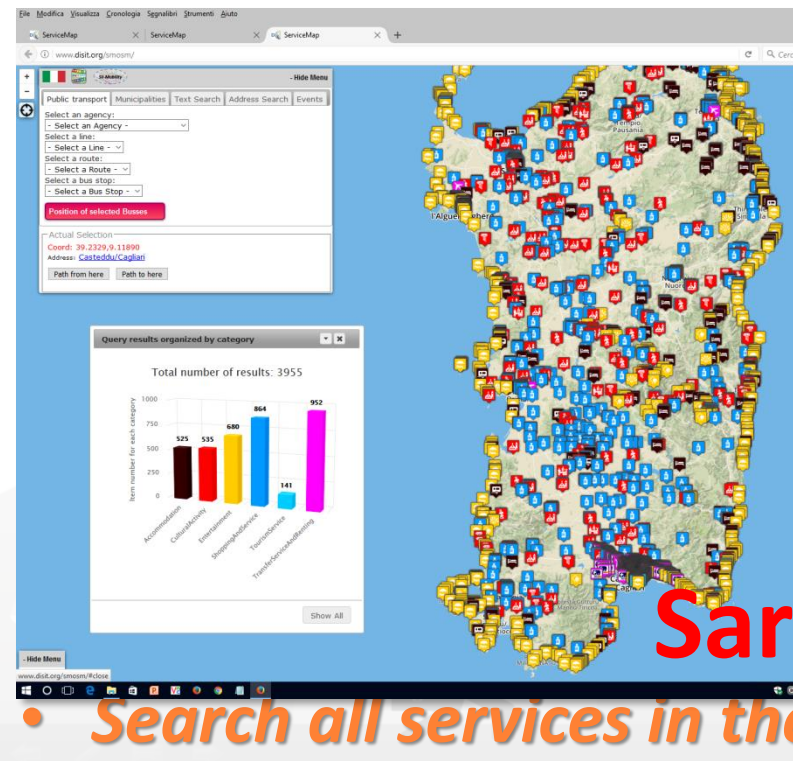
Toscana



Pisa



Sardegna



• Search all services in the area

Smart City Control Room

<http://www.km4city.org/?controlRoom>



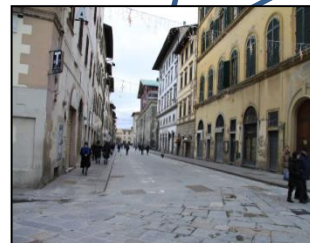
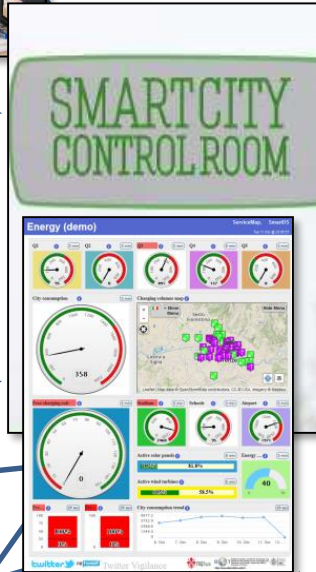
Sentient City Control Room



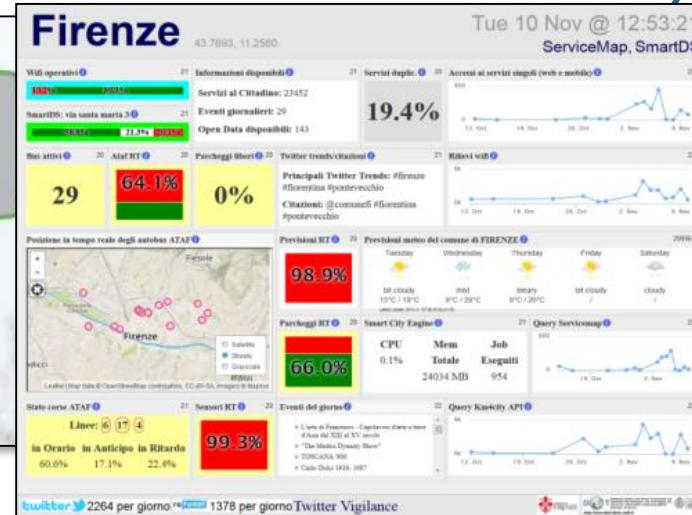
**Transport
systems,
Mobility, Parking**



**Sensors, IOT
Cameras, ..**



**Public services,
Govern, Events**



**Environment,
Water, energy**



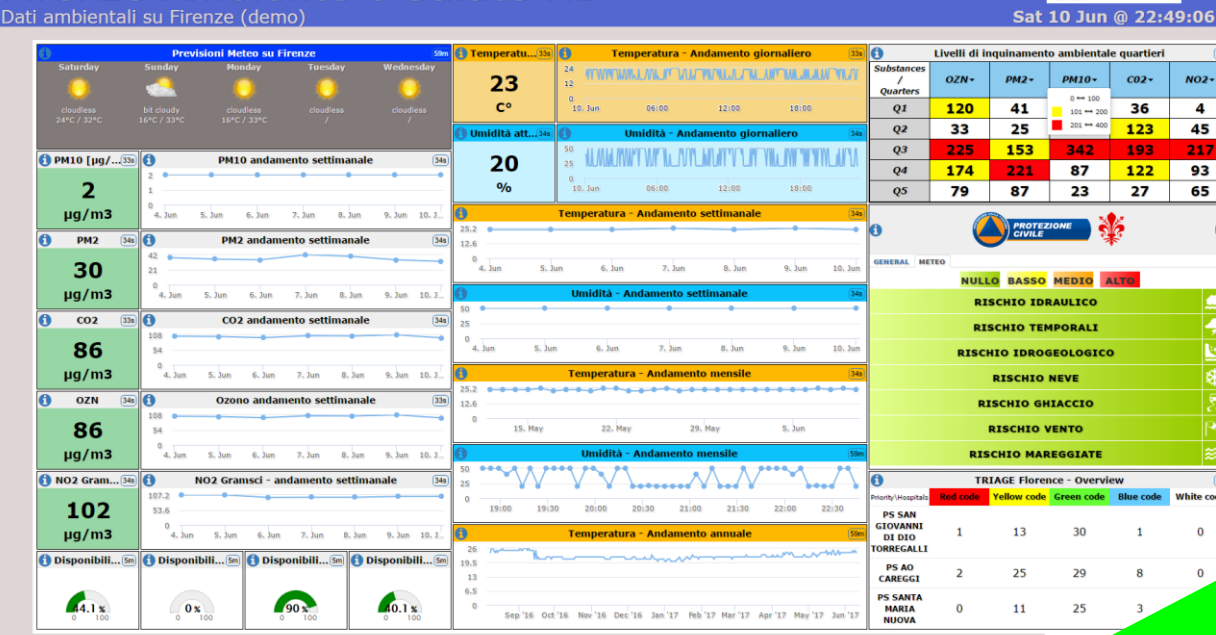
**Shops,
services,
operators**



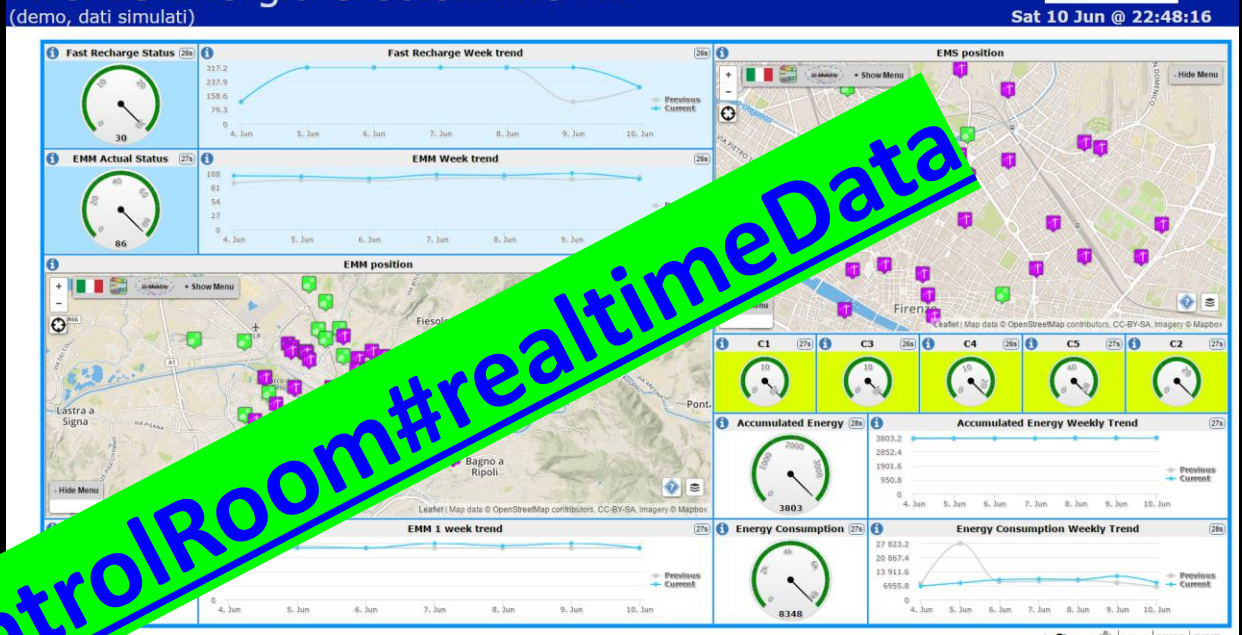
**Social Media,
WiFi, Network**

Dashboards

Firenze Ambiente e Salute HD



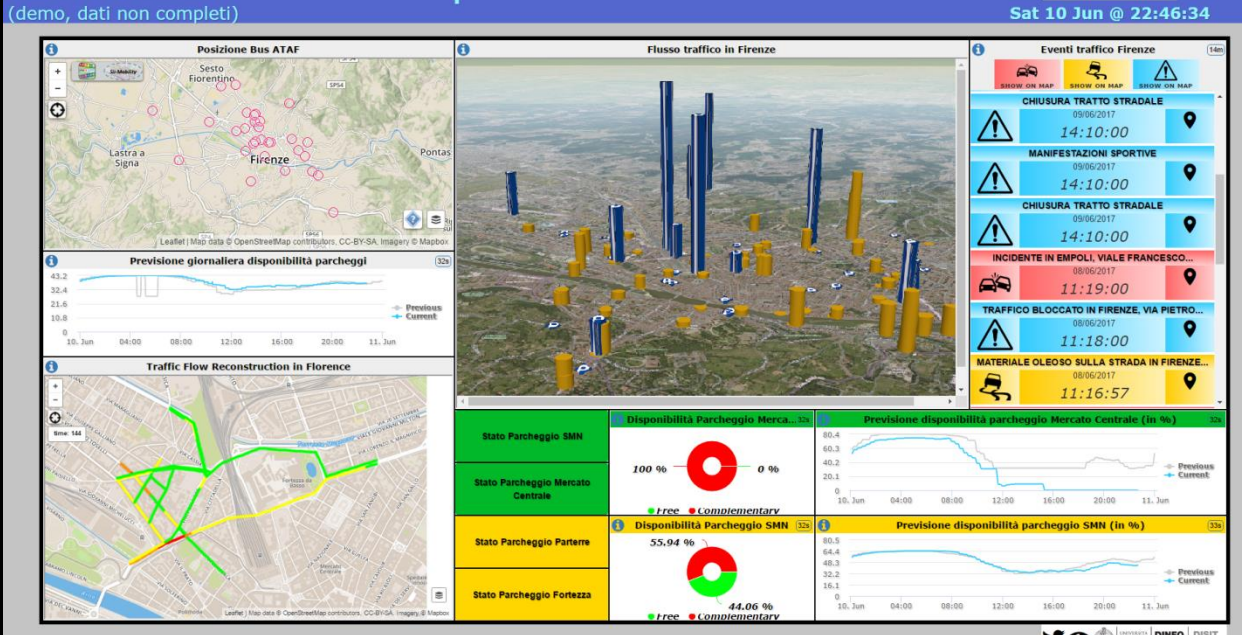
Firenze Energia e Colonnine HD



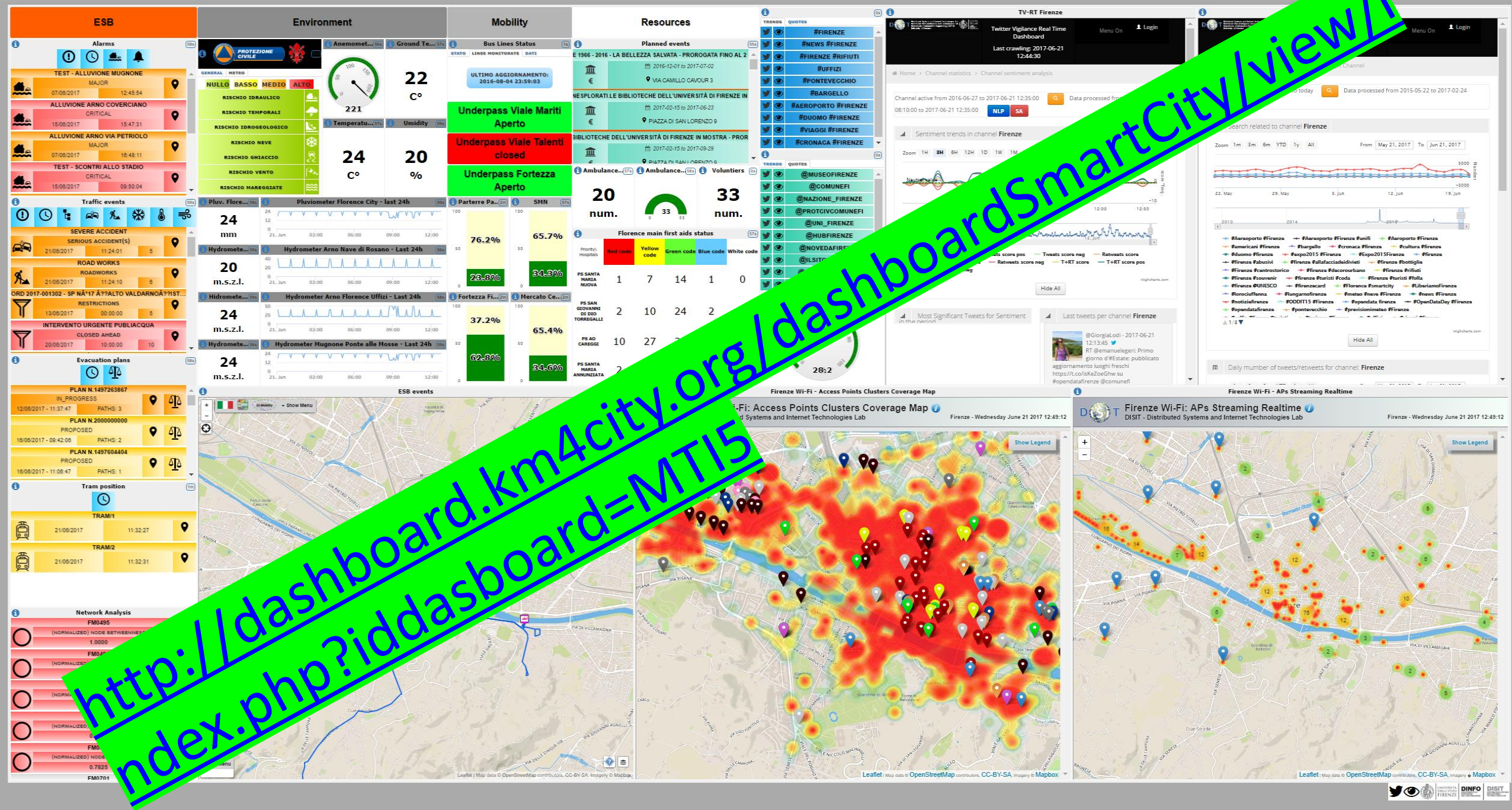
Firenze Sociale e Social Media (HD)



Firenze Mobilità e Trasporti HD



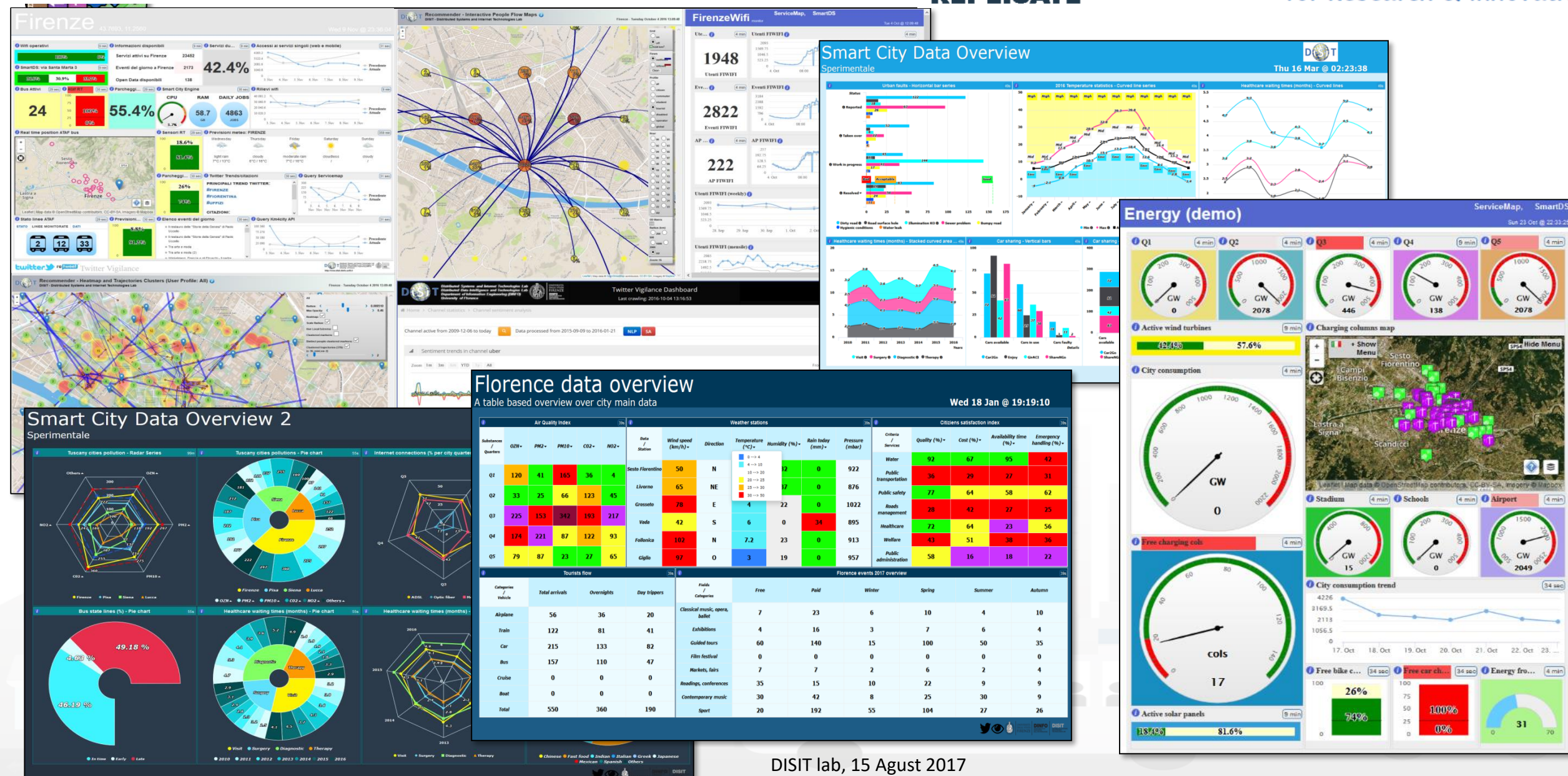
- Dashboards can render data coming from multiple data sources: SQL, noSQL, RDF Stores, etc.
 - Each Dashboard is based on a number of Widgets that can be fully configured for color, size, style, etc. and connected to data sources
 - Each Widget can show in different manner multiple metrics, taken from multiple sources
 - Widget can be created and changed at source level in PHP and JavaScript
- At each metric of a Widget, a number of Notifications can be set up with multiple firing conditions
- You can access to the Dashboard Manual via Km4City docs web pages



Smart City Dashboard



Horizon 2020
European Union Funding
for Research & Innovation



Cross widget interaction 1

Artistical events, traffic events, city cams



Tu 18:50:21

<http://dashboard.km4city.org/dashboardSmartCity/view/index.php?iddashboard=MT10>

Artistical and recreative events

PIAZZALE DEGLI UFFIZI 2

LA FABBRICA DELLA BELLEZZA. LA MANIFATTURA GINORI E IL SUO POPOLO DI STATUE

2017-05-18 to 2017-10-01

VIA DEL PROCONSOLO 4

"DANTE INFERNO"

2017-05-22 to 2017-06-30

VIA RICASOLI

UN FRAGILE CAPOLAVORO

2017-05-24 to 2017-09-24

VIA DEGLI ALFANI 78

ESTATE FIORENTINA DEL GIARDINO DELL'ARTECULTURA

Artistical and recreative events - Exhibitions

Unexplored treasures. Florence University Libraries on display

LINKED OPEN GRAPH

Tipology: Event

Artistical and recreative events - Others

Traffic events

ALL ON MAP

ALL ON MAP 06/06/2017

SHOW ON MAP

14:21:55

ON MAP

INCIDENTE IN FIRENZE, VIALE EUROPA

06/06/2017

13:43:23

ON MAP

INCIDENTE

06/06/2017

13:38:41

MATERIALE OLE

06/06/2017

13:20:41

INCIDENTE IN FIRENZE, VIALE EUROPA

06/06/2017

Traffic events - Slippery roads & others

City webcams - 1

City webcams - 2

Cam Duomo

Cam Piazzale

Cam Signoria

Cam Trinita

Cam P.Vecchio

Cam S.Croce

Cam Repubbl.

Cam Fortezza



COMUNE DI FIRENZE

INFORMAZIONI

DISIT

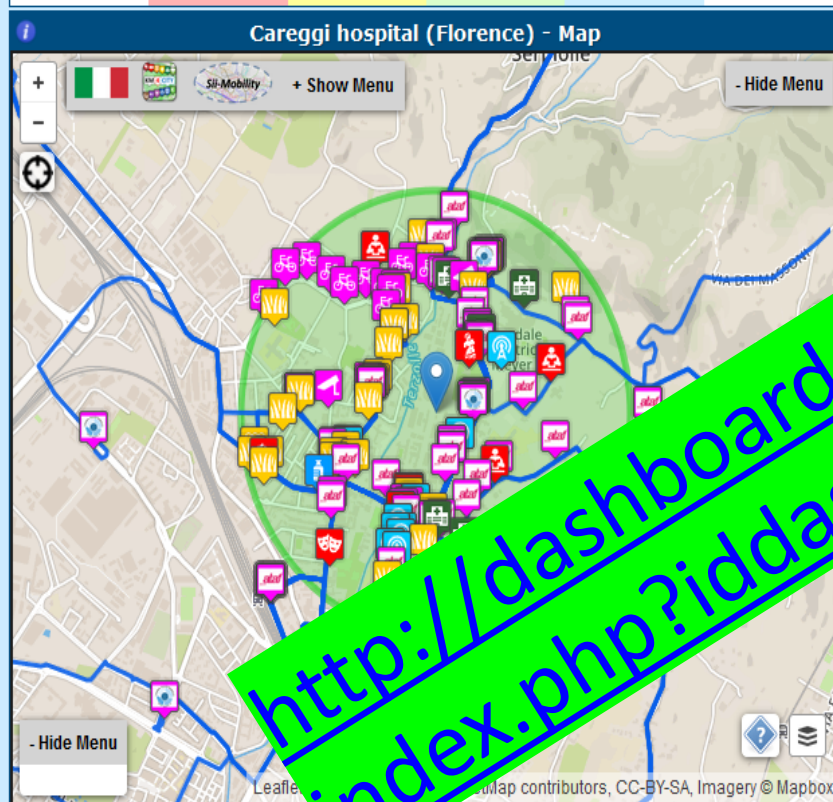
First aids overview - Tuscany

Service status of main first aids

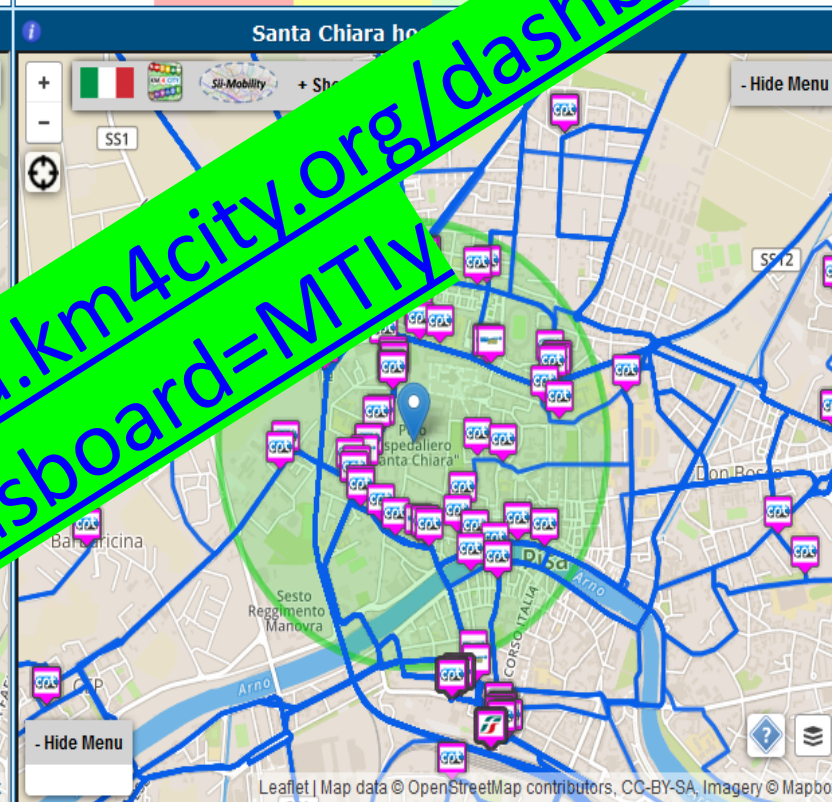


Day @ 11:00:34

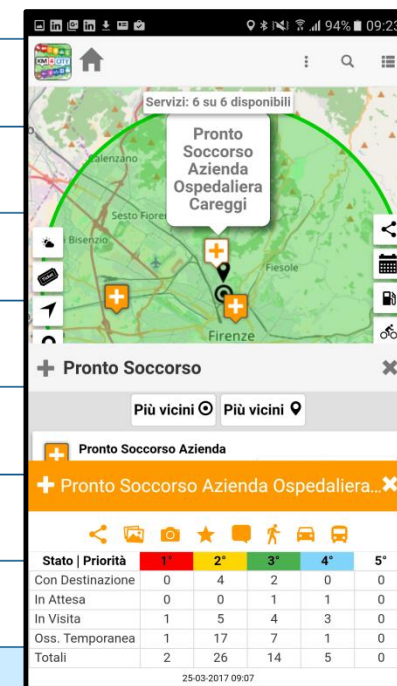
Careggi hospital (Florence) - Details					
Priority\Status	Red code	Yellow code	Green code	Blue code	White code
Addressed	1	4	3	0	0
Waiting	0	2	9	2	0
In visit	1	9	18	3	0
In observation	4	19	2	0	0
Totals	6	34	32	5	0



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	0
Totals	0	8	8	9	0



Hospitals - Summary					
Priority\Hospital	Red code	Yellow code	Green code	Blue code	White code
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	0	0	0
PS OSPEDALI RIUNITI	3	0	0	0	1
PS CASENTINO	0	0	0	0	0
PS SANTA CROCE	0	0	0	0	0
PI PO CORTONA	0	0	0	0	0
PS CIVILE PIOMBINO	0	0	0	0	0
PS LA MISERICORDIA	0	0	0	0	0



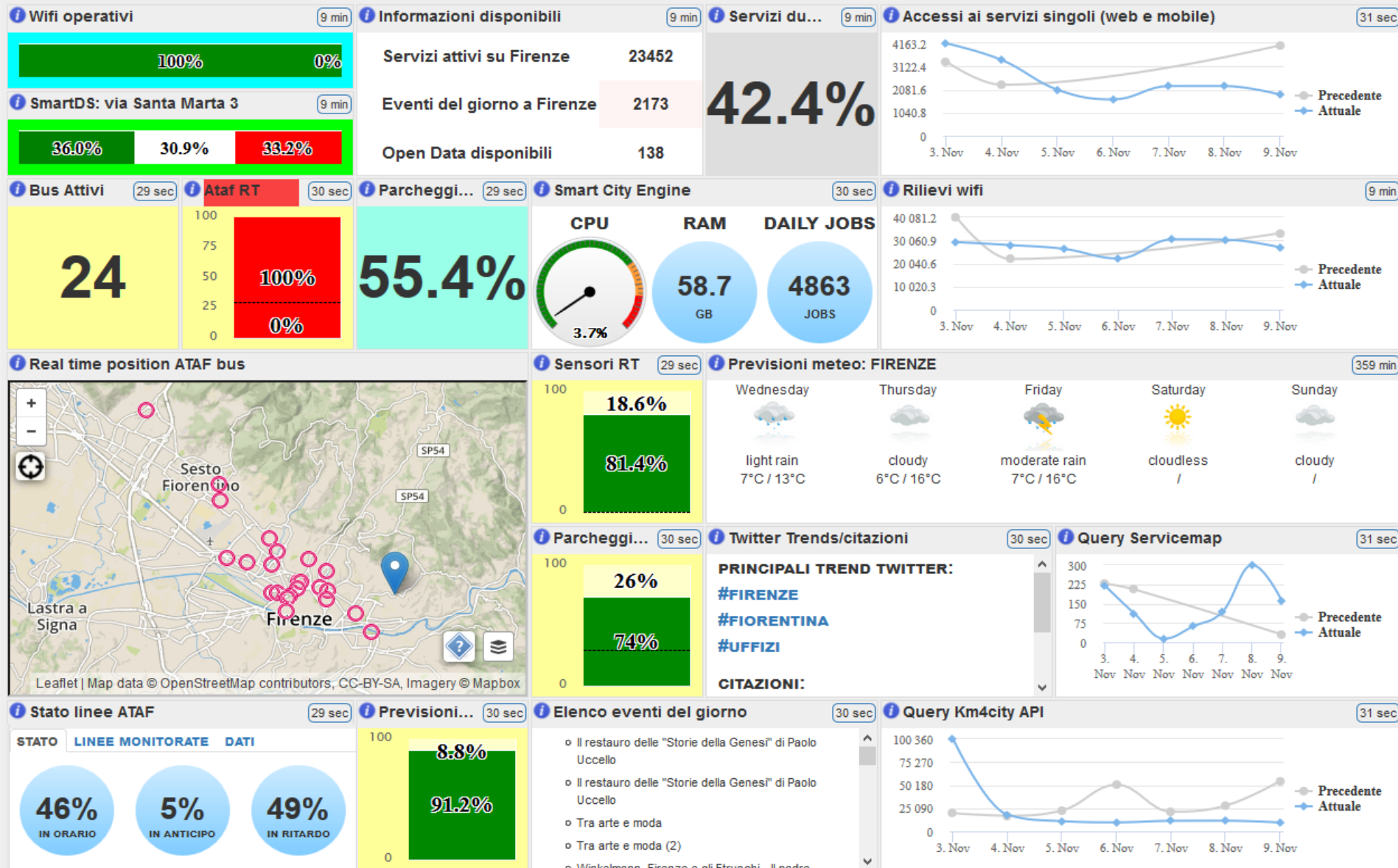
<http://dashboard.km4city.org/dashboardSmartCity/view/index.php?iddashboard=MTIV>



Firenze

43.7693, 11.2560

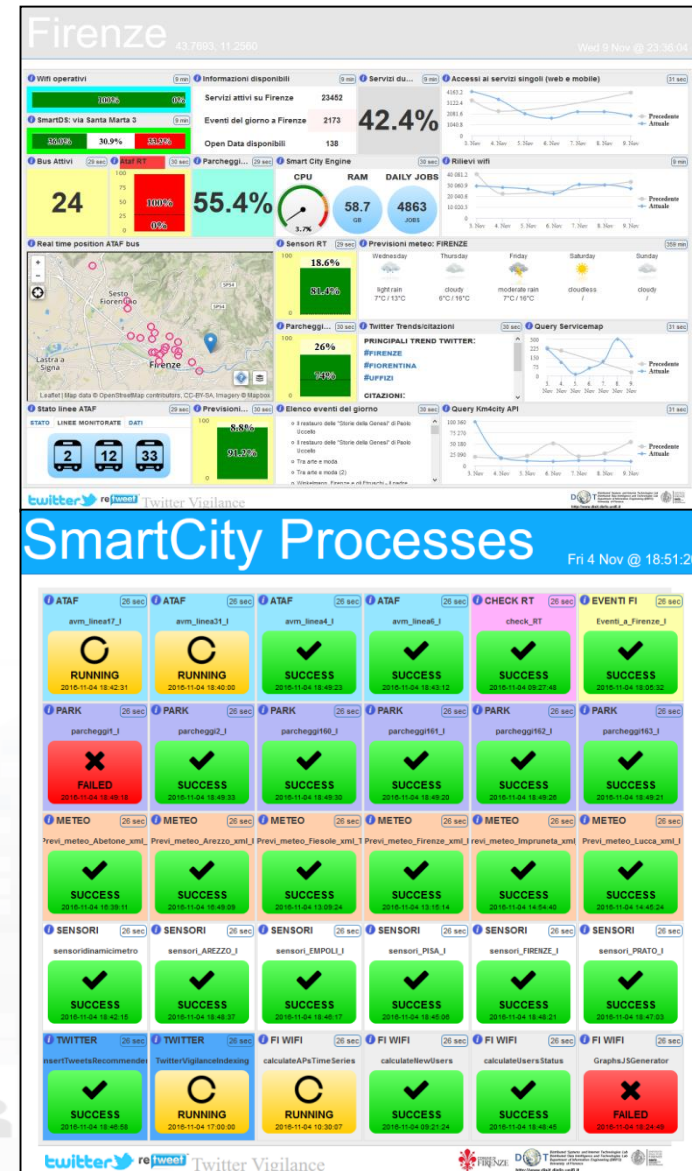
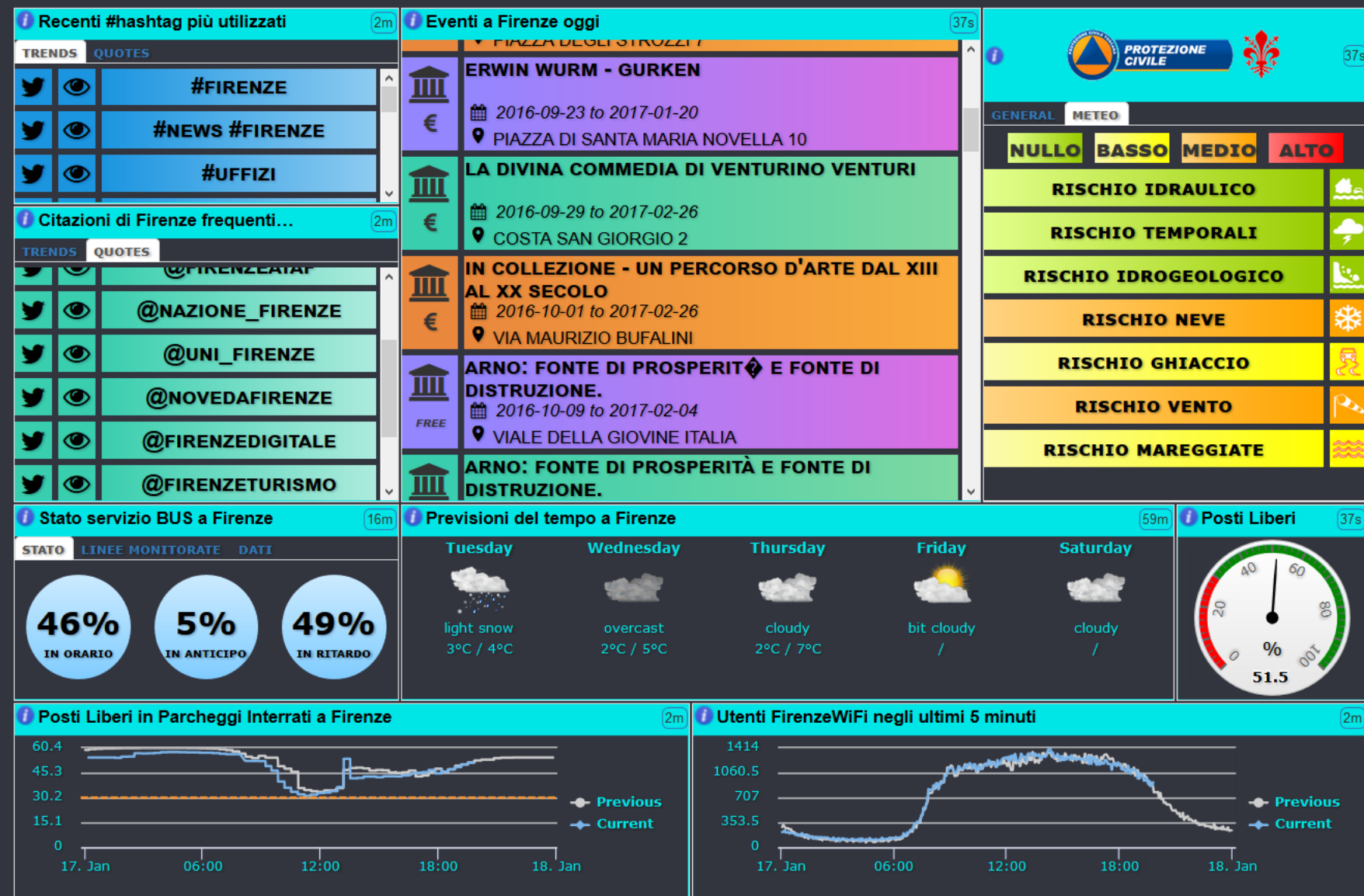
Wed 9 Nov @ 23:36:04



Servizi agli Utenti

Firenze (sperimentale)

Tue 17 Jan @ 19:52:49



Florence data overview

A table based overview over city main data

Wed 18 Jan @ 19:19:10

Air Quality Index 39s						Weather stations 39s							Citizens satisfaction index 39s					
Substances / Quarters	OZN▼	PM2▼	PM10▼	CO2▼	NO2▼	Data / Station	Wind speed (km/h)▼	Direction	Temperature (°C)▼	Humidity (%)▼	Rain today (mm)▼	Pressure (mbar)	Criteria / Services	Quality (%)▼	Cost (%)▼	Availability time (%)▼	Emergency handling (%)▼	
	Q1	120	41	165	36	4	Sesto Fiorentino	50	N	12	32	0	922	Water	92	67	95	42
	Q2	33	25	66	123	45	Livorno	65	NE	10	37	0	876	Public transportation	36	29	27	31
	Q3	225	153	342	193	217	Grosseto	78	E	4	22	0	1022	Public safety	77	64	58	62
	Q4	174	221	87	122	93	Vada	42	S	6	0	34	895	Roads management	28	42	27	25
	Q5	79	87	23	27	65	Follonica	102	N	7.2	23	0	913	Healthcare	72	64	23	56
							Giglio	97	O	3	19	0	957	Welfare	43	51	38	36
														Public administration	58	16	18	22

0 --> 4

4 --> 10

10 --> 20

20 --> 25

25 --> 30

30 --> 50

Tourists flow 39s				Florence events 2017 overview 39s						
Categories / Vehicle	Total arrivals	Overnights	Day trippers	Fields / Categories	Free	Paid	Winter	Spring	Summer	Autumn
Airplane	56	36	20	Classical music, opera, ballet	7	23	6	10	4	10
Train	122	81	41	Exhibitions	4	16	3	7	6	4
Car	215	133	82	Guided tours	60	140	15	100	50	35
Bus	157	110	47	Film festival	0	0	0	0	0	0
Cruise	0	0	0	Markets, fairs	7	7	2	6	2	4
Boat	0	0	0	Readings, conferences	35	15	10	22	9	9
Total	550	360	190	Contemporary music	30	42	8	25	30	9
				Sport	20	192	55	104	27	26

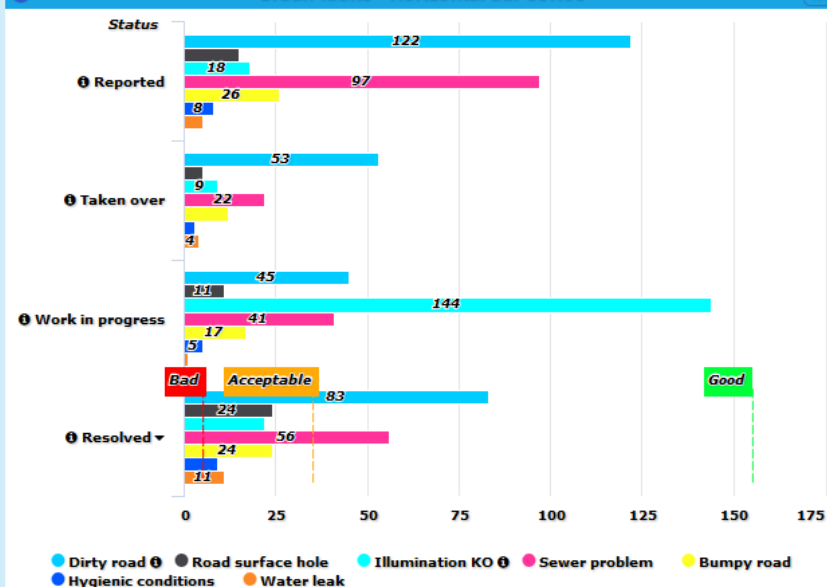
Smart City Data Overview

Sperimentale

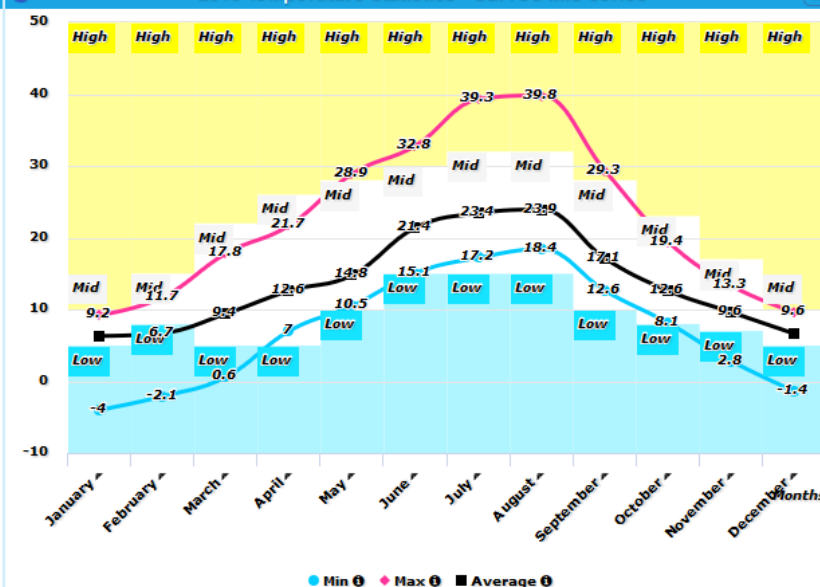


Thu 16 Mar @ 02:23:38

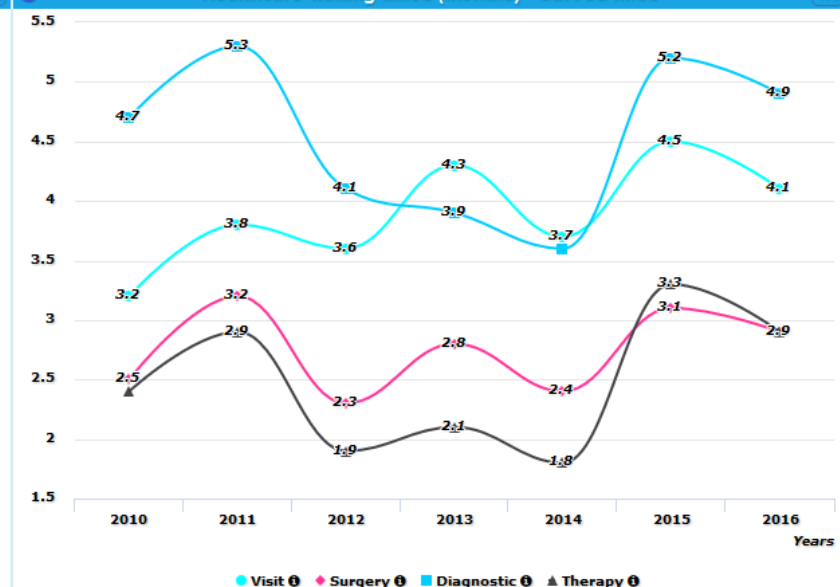
Urban faults - Horizontal bar series



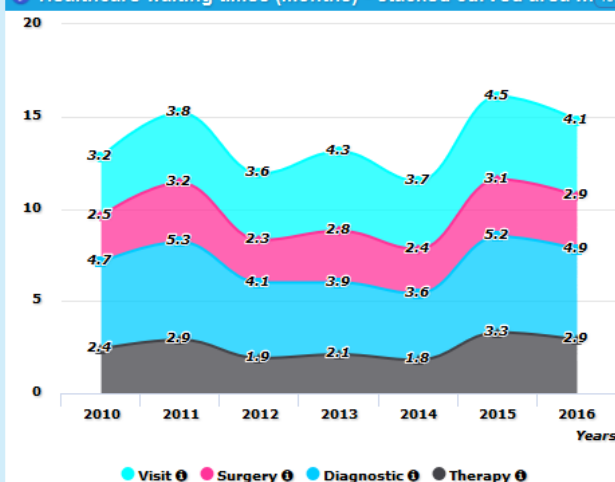
2016 Temperature statistics - Curved line series



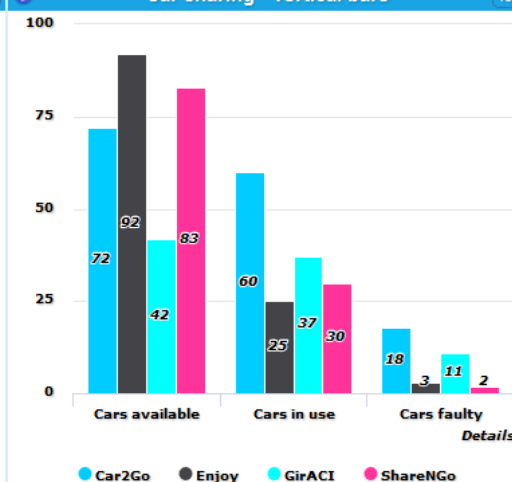
Healthcare waiting times (months) - Curved lines



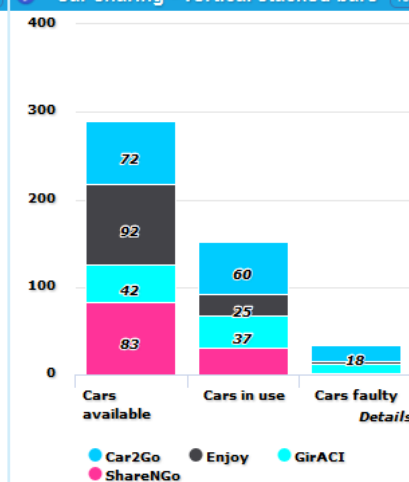
Healthcare waiting times (months) - Stacked curved area



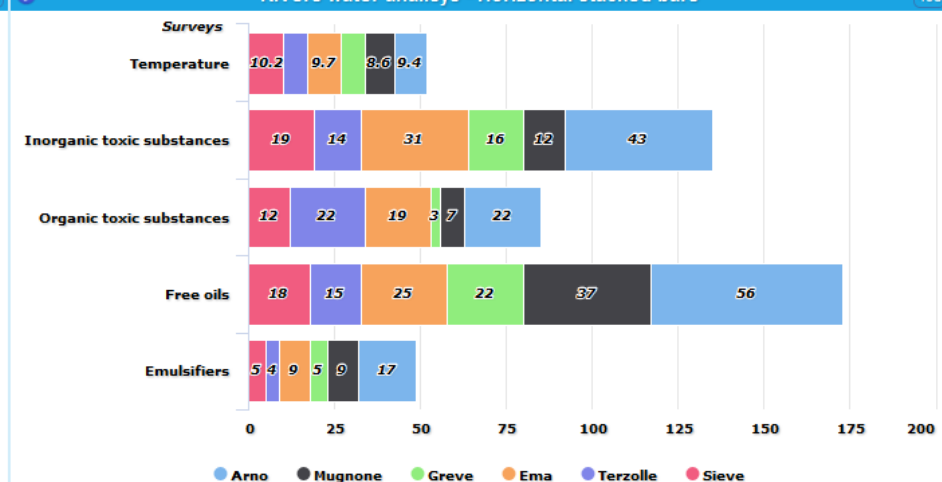
Car sharing - Vertical bars



Car sharing - Vertical stacked bars



Rivers water analysis - Horizontal stacked bars



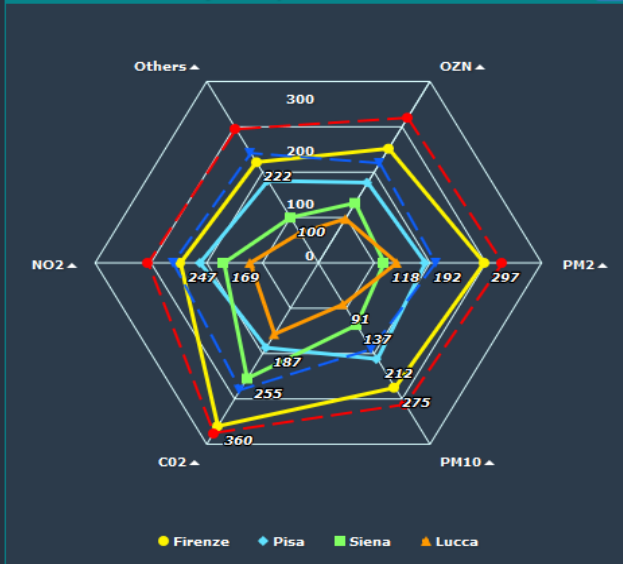
Smart City Data Overview 2

Sperimentale

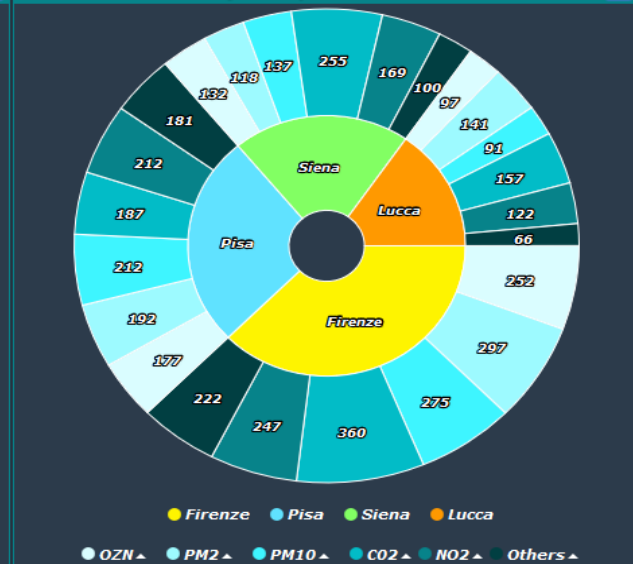


Thu 16 Mar @ 02:24:52

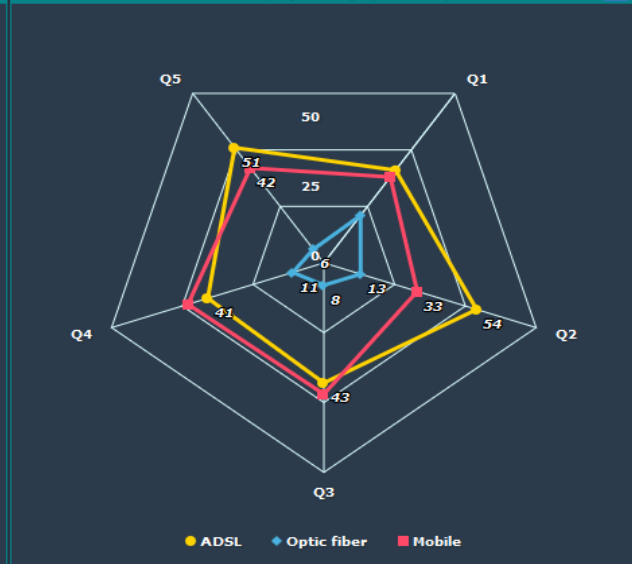
Tuscany cities pollution - Radar Series 99m



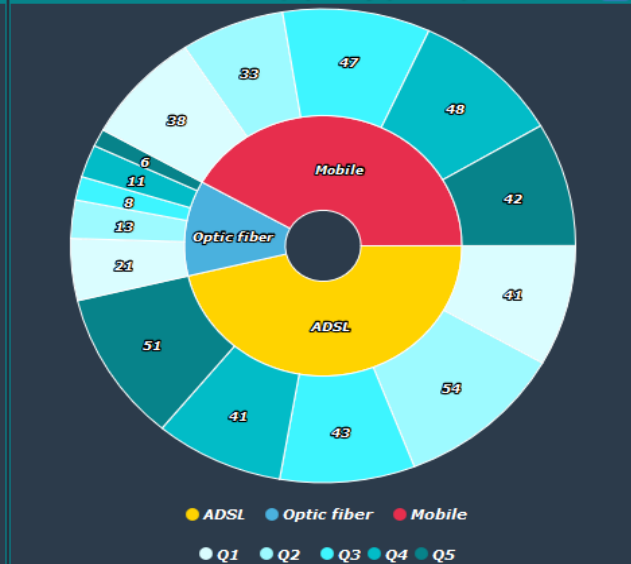
Tuscany cities pollutions - Pie chart 55s



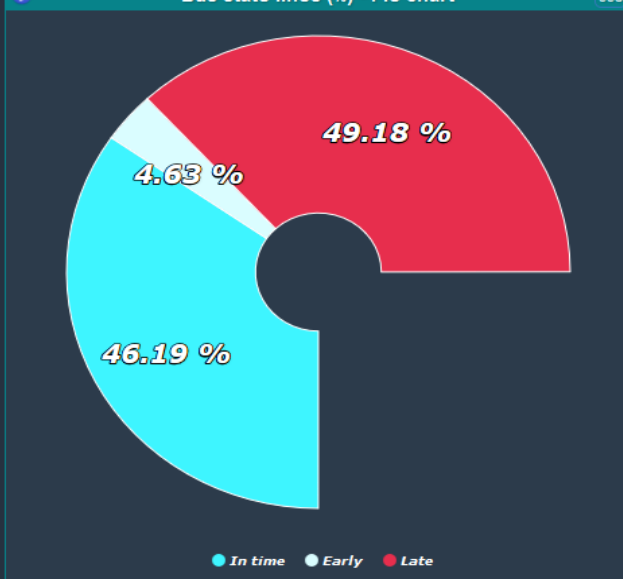
Internet connections (% per city quarters) - Radar series 55s



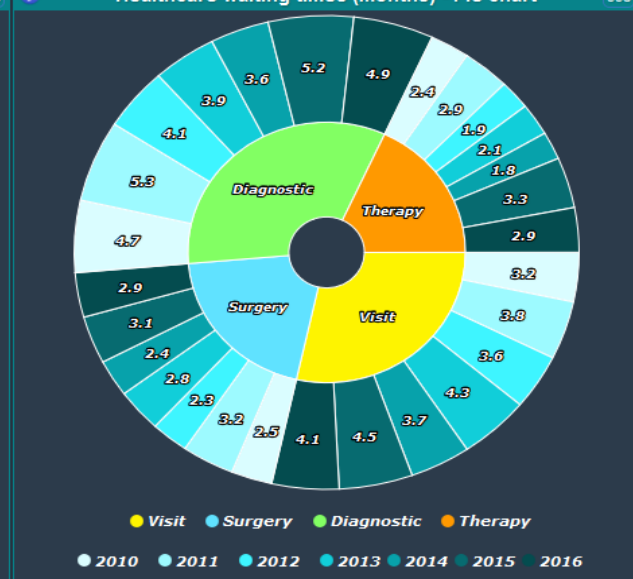
Internet connections (% per city quarters) - Pie chart 55s



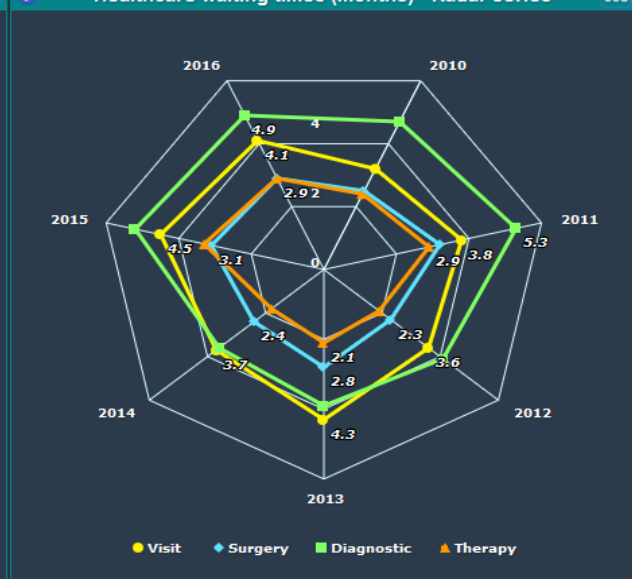
Bus state lines (%) - Pie chart 55s



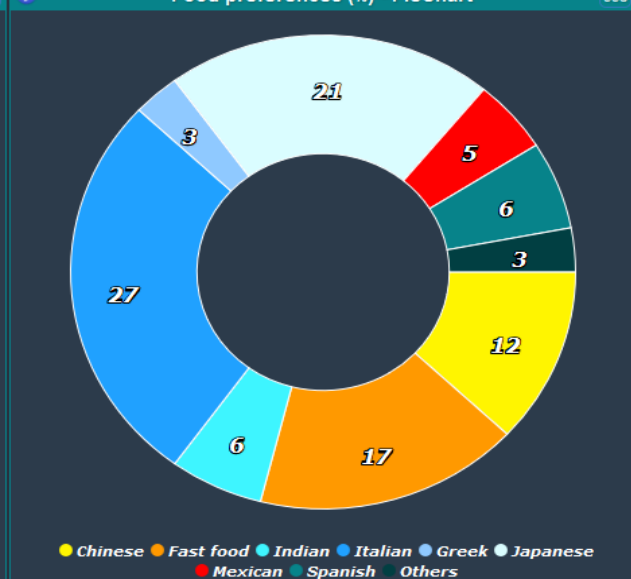
Healthcare waiting times (months) - Pie chart 55s



Healthcare waiting times (months) - Radar series 55s



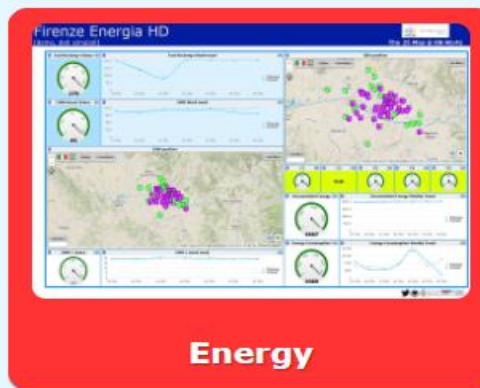
Food preferences (%) - PieChart 55s



Smart City Control Room Console

Entry point for REPLICATE dashboards

Tue 21 Nov 19:30:36



<http://www.disit.org/dashboardSmartCity/view/index.php?idashboard=MTY1>

Real Time Sensors via ServiceMap3D

3D data rendering



Fri 26 Jan 00:23:19



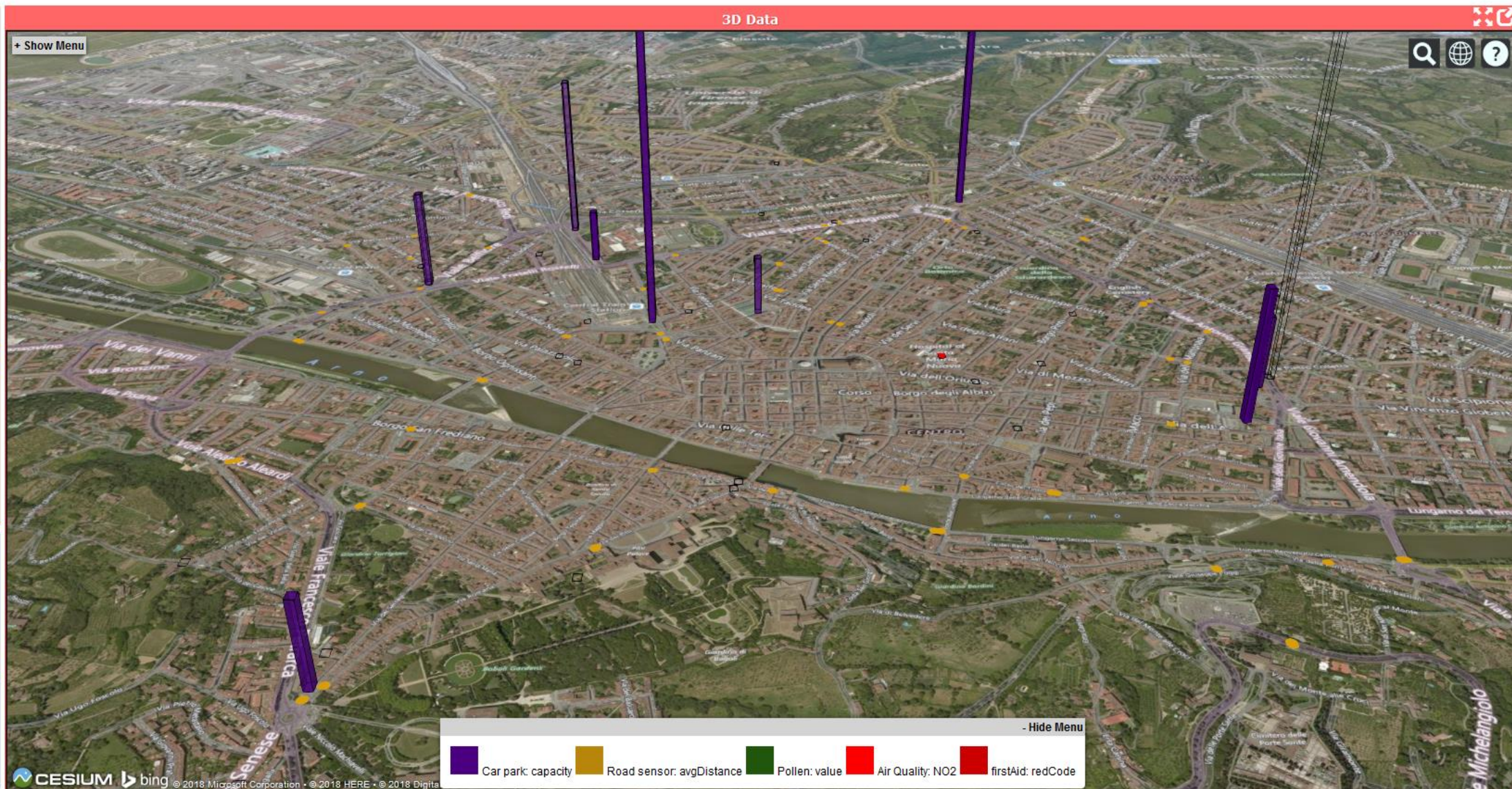
Firenze



Airport



Empoli



Click POI of interest below

▲ Fast recharging stations

▲ Normal recharging stations

▲ Cycle paths

▲ Public transport paths (F)

▲ Restricted traffic areas

▲ Parking status

▲ Variable Message Signs

Traffic events

!

🕒

🚧

🚗

🚶

❄️

🌡️

🌀

05/02/2018

07:44:07

1

MAP

ORD. 2018-000257 - S.P. N. 56 'DEL BROLLO E POGGIO ALLA

TEMPORARY TRAFFIC LIGHTS

05/02/2018

00:00:00

5

📍

ORD. 2018-000222 - S.P. 503 'DEL PASSO DEL GIOGO'.ISTITUZIONE

TEMPORARY TRAFFIC LIGHTS

04/02/2018

00:00:00

5

📍

ORD. 2018-000252 - S.P. 10 'VAL D'ELSA'.CHIUSURA TOTALE AL

BLOCKED AHEAD

📍

POI Map

+

-

PARCHEGGIO STAZIONE BINARIO 16

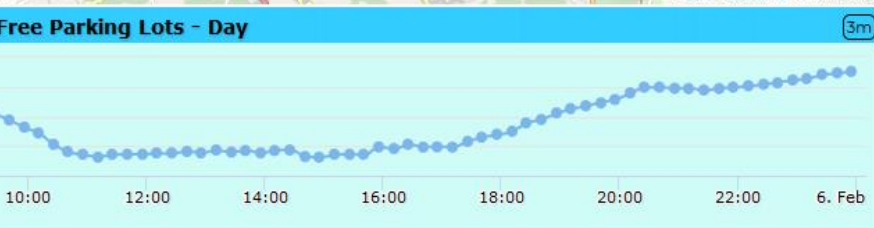
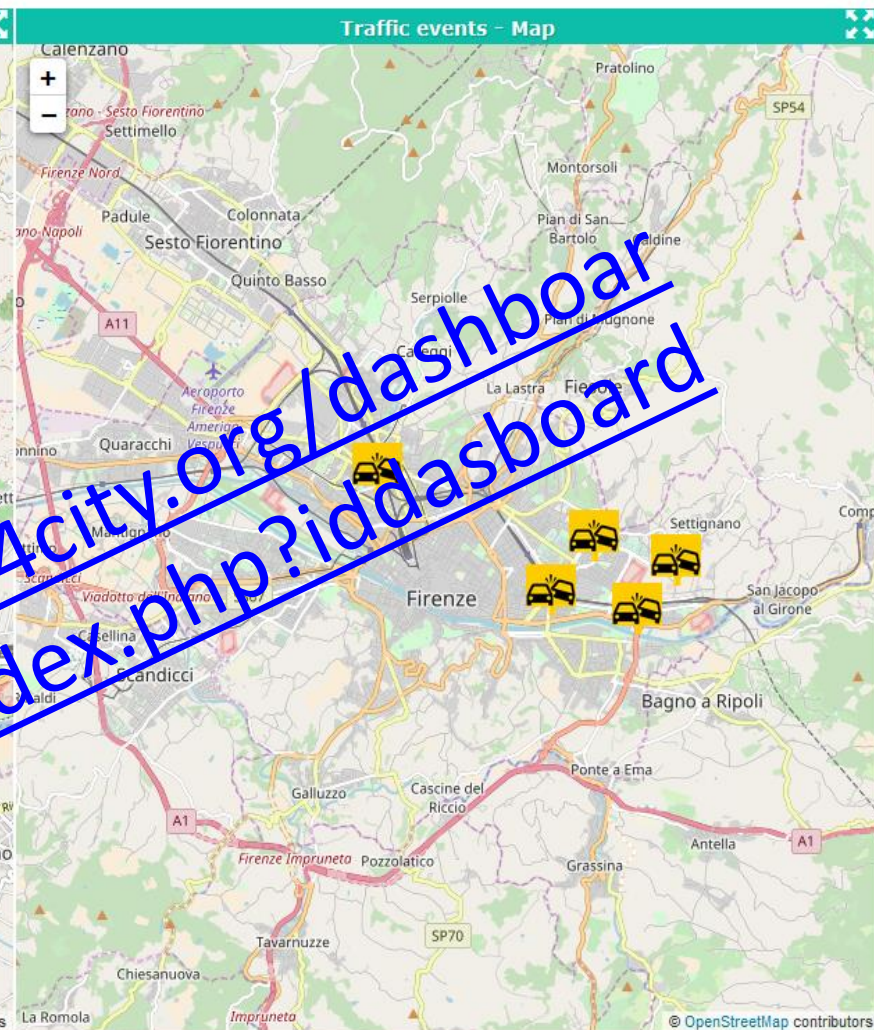
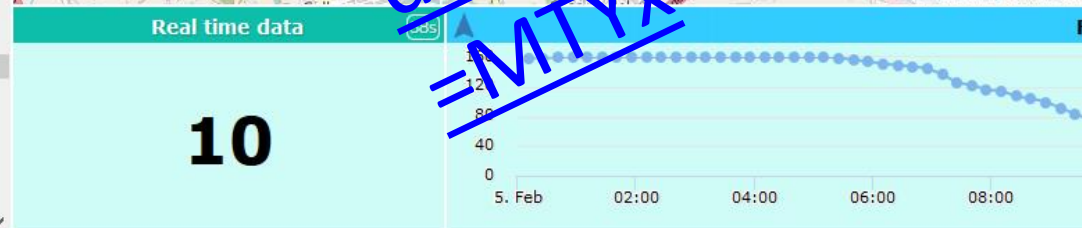
DETAILS

DESCRIPTION

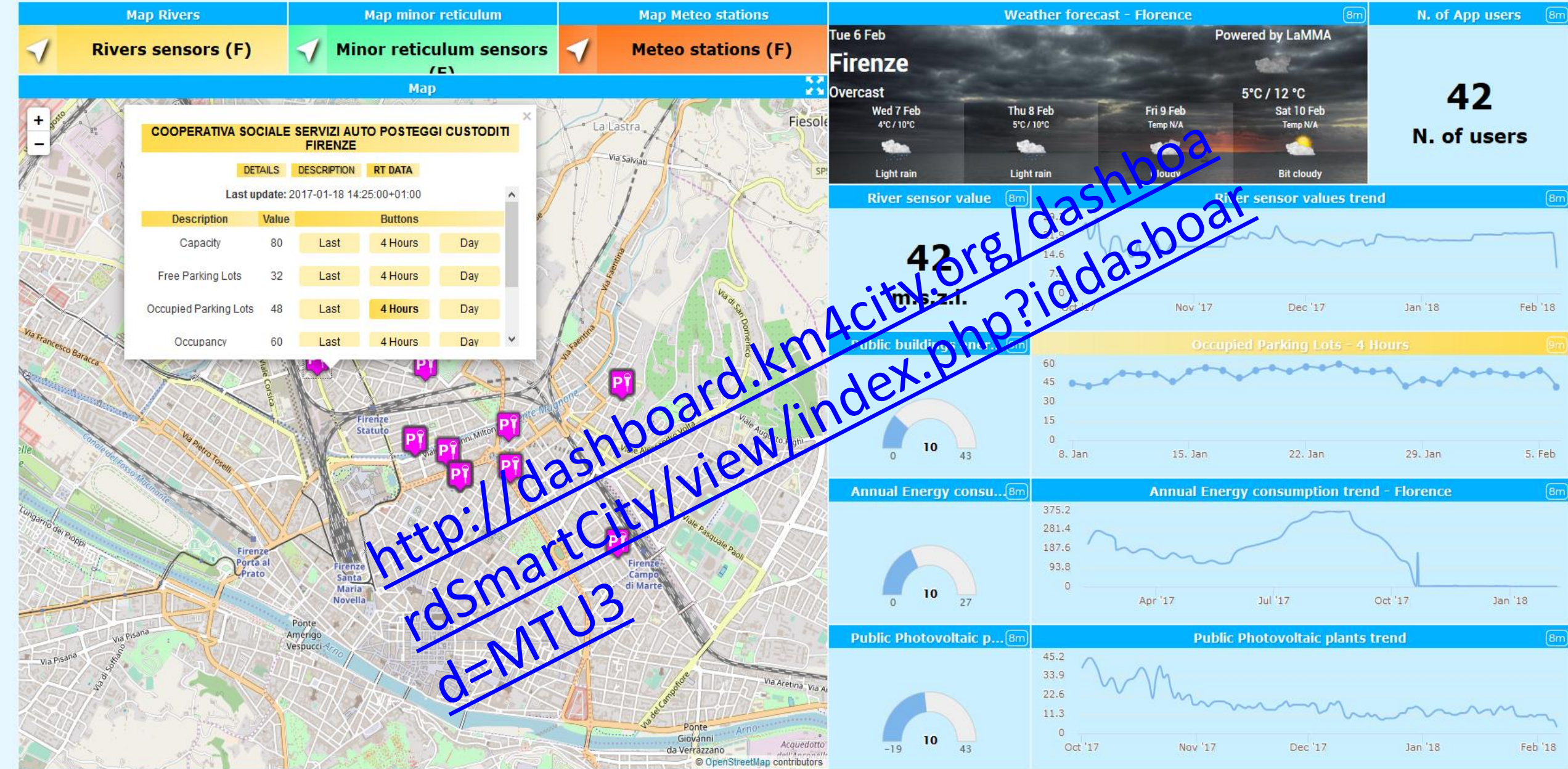
RT DATA

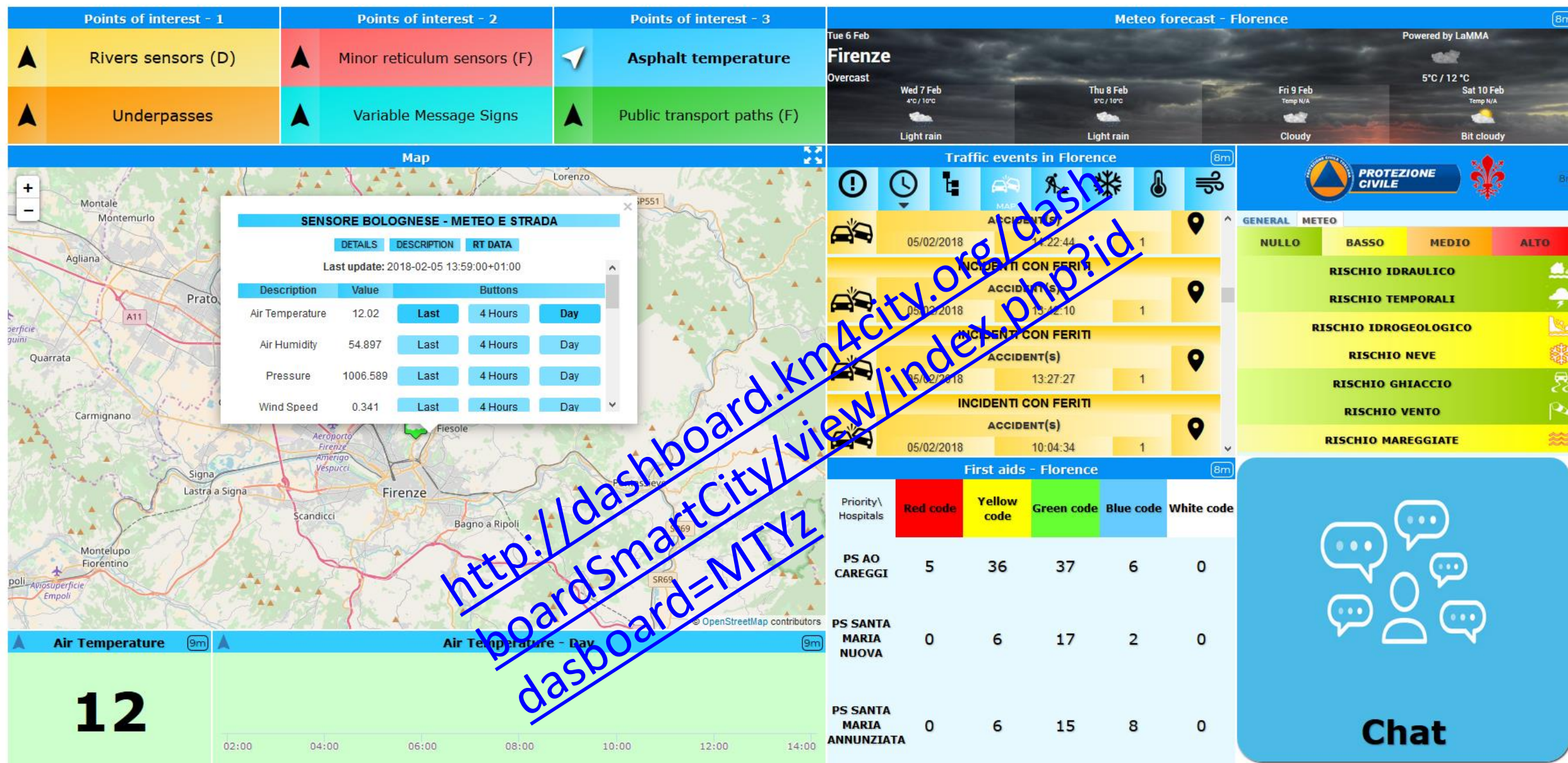
Last update: 2018-02-05 23:56:03+01:00

Description	Value	Buttons		
Capacity	165	Last	4 Hours	Day
Free Parking Lots	141	Last	4 Hours	Day
Occupied Parking Lots	24	Last	4 Hours	Day



<http://dashboard.km4city.org/dashboard-smartCity/view/index.php?iddashboard=MTYx>





Map

+

-

Montale

Montemurlo

Agliana

Quarrata

Carmignano

Signa

Lastra a Signa

Montelupo Fiorentino

Empoli

Fiesole

Scandicci

Bagno a Ripoli

Firenze

SENSORE BOLOGNESE - METEO E STRADA

DETAILS

DESCRIPTION

RT DATA

Last update: 2018-02-05 13:59:00+01:00

Description	Value	Buttons		
Air Temperature	12.02	Last	4 Hours	Day
Air Humidity	54.897	Last	4 Hours	Day
Pressure	1006.589	Last	4 Hours	Day
Wind Speed	0.341	Last	4 Hours	Day

Traffic events in Florence

!

🕒

🚗

🚚

🚑

🔥

🌪️

Icon	Date	Time	Count	Location
🚗	05/02/2018	11:22:44	1	
🚗	05/02/2018	13:02:10	1	
🚗	05/02/2018	13:27:27	1	
🚗	05/02/2018	10:04:34	1	

PROTEZIONE CIVILE

GENERAL

METEO

	NULLO	BASSO	MEDIO	ALTO
RISCHIO IDRAULICO				
RISCHIO TEMPORALI				
RISCHIO IDROGEOLOGICO				
RISCHIO NEVE				
RISCHIO GHIACCIO				
RISCHIO VENTO				
RISCHIO MAREGGIATE				

First aids - Florence

Priority\ Hospitals

Red code

Yellow code

Green code

Blue code

White code

PS AO CAREGGI	5	36	37	6	0
PS SANTA MARIA NUOVA	0	6	17	2	0
PS SANTA MARIA ANNUNZIATA	0	6	15	8	0

Air Temperature

9m

12

Air Temperature - Day

9m

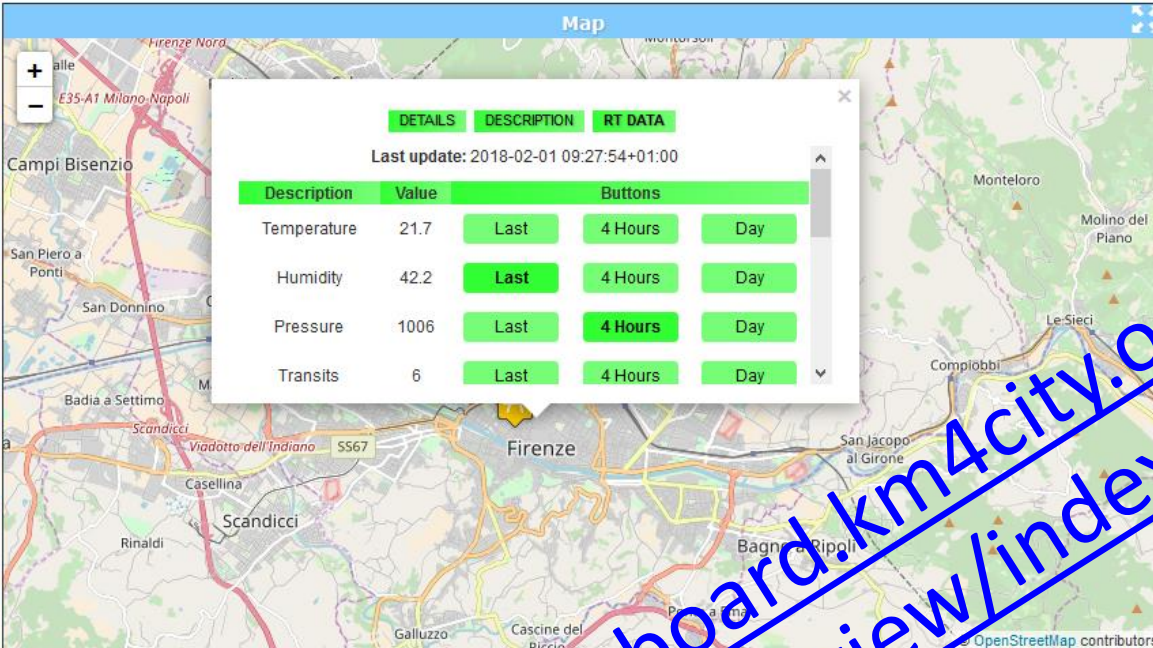
02:00 04:00 06:00 08:00 10:00 12:00 14:00

Chat

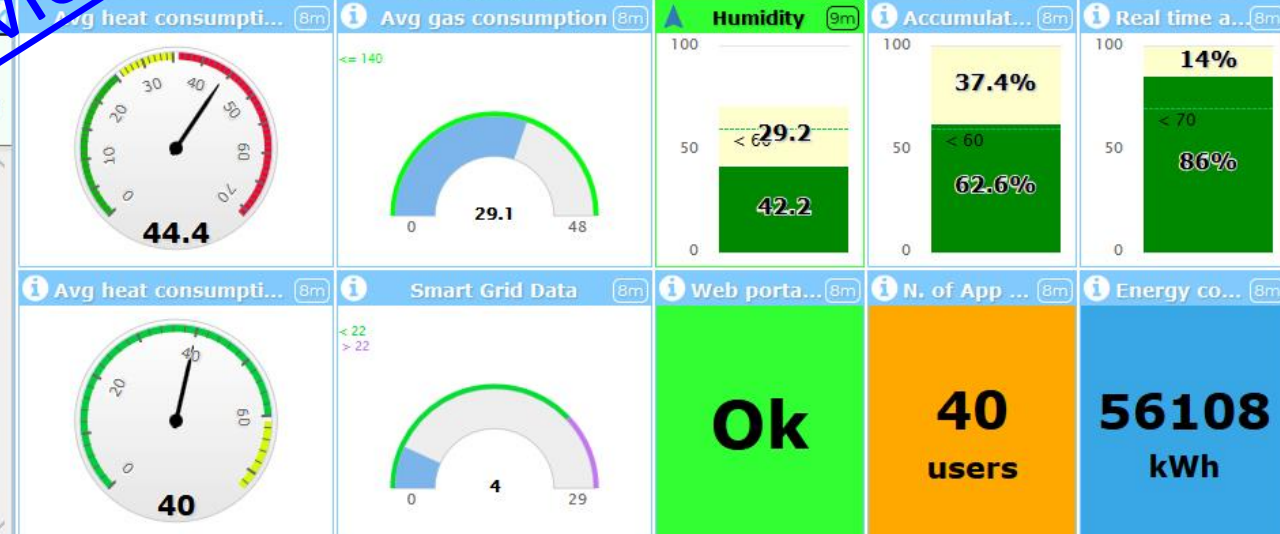
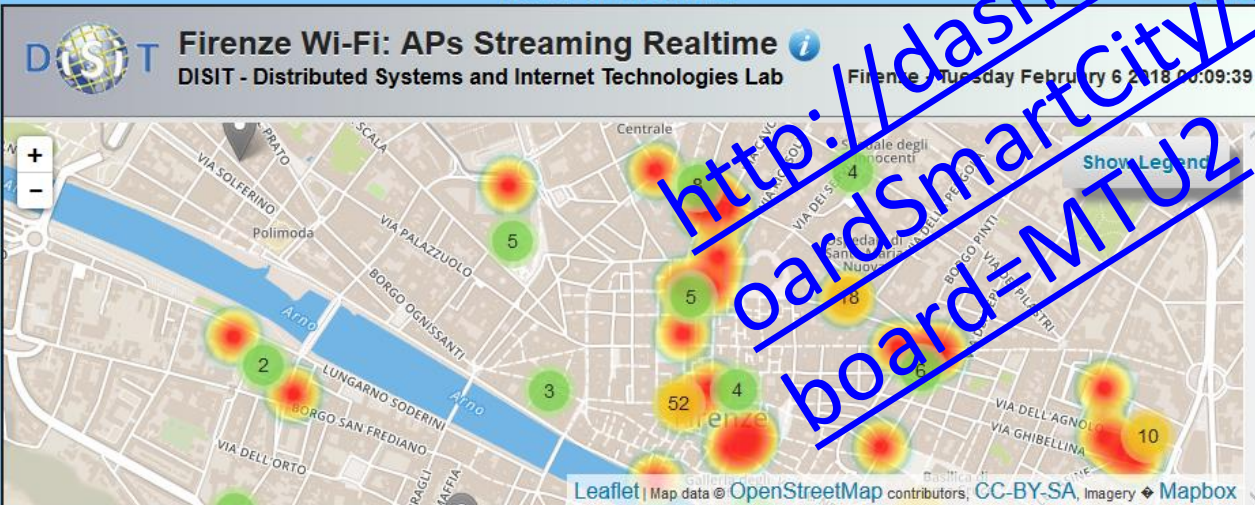
http://dashboard.km4city.org/dashboardSmartCity/view/index.php?id_dashboard=MTYz

Select the data below

- Fast recharging stations
- Normal recharging stations
- Smart Benches**
- Smart Lights (F)
- Smart Irrigation (F)
- ZTL gate
- Smart waste
- Florence WiFi POI



Firenze Wi-Fi RealTime



<http://dashboard.km4city.org/dashboardsmartcity/view/index.php?id=2>

Trasporti a Firenze

Servizi: 9 su 9 disponibili

Piazza Di San Marco
Ataf&Linea

Piazza Di San Marco

1 10 11 11N 14 14N 17 19 20

23 23N 25 31 4 52 54 6 7 82

C1

Orario	Linea	Direzione
00:31:00	11	Salviatino
2018-02-06		
00:31:00	6	Novelli
2018-02-06		
00:32:00	4	Cappuccini
2018-02-06		
00:36:00	17	Verga Tozzi
2018-02-06		
00:43:00	14	Il Girone
2018-02-06		
01:04:00	25	La Pira
2018-02-06		
01:11:00	6	Novelli
2018-02-06		
01:17:00		La Pira
2018-02-06		
01:18:00		Verga Tozzi
2018-02-06		
05:28:00	23	Sorbonne
2018-02-06		

Aggiorna

Fermata Bus

Cosa ne pensi del servizio?

Vota

★★★★★ 0

previsioni

Tue 6 Feb
Firenze
Overcast

Wed 7 Feb
4°C / 10°C
Light rain

Thu 8 Feb
6°C / 10°C
Light rain

Fri 9 Feb
Temp N/A
Cloudy

Sat 10 Feb
Temp N/A
Bit cloudy

5°C / 12°C

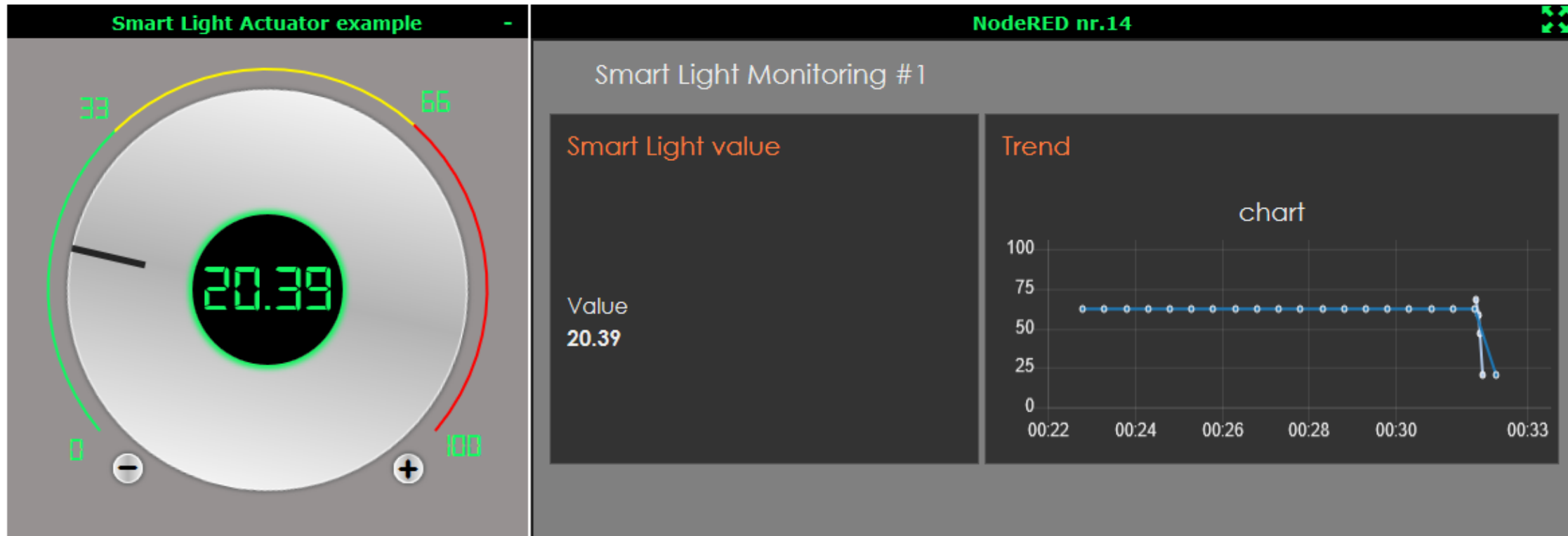
Powered by LaMMA

Cycling

Risultati

Servizi: 1 su 1 disponibili

Percorsi Ciclabili.148
→ Ciclopercorsi
167 m

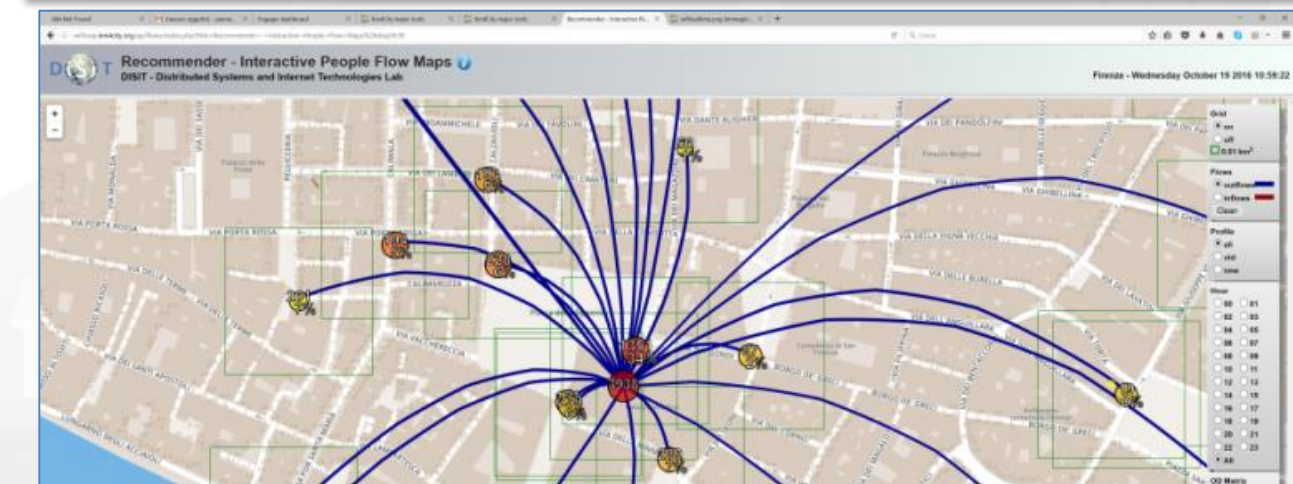
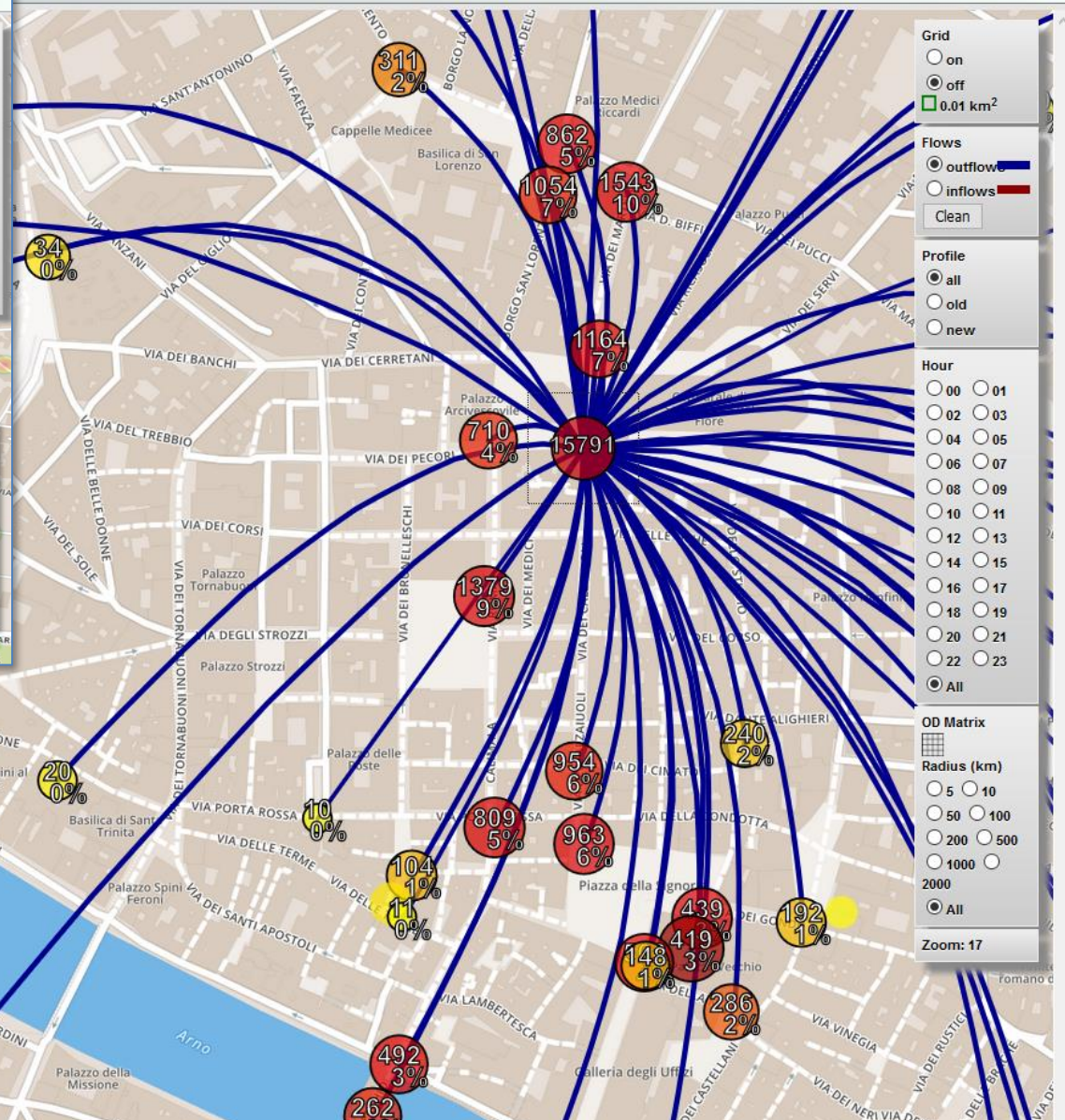
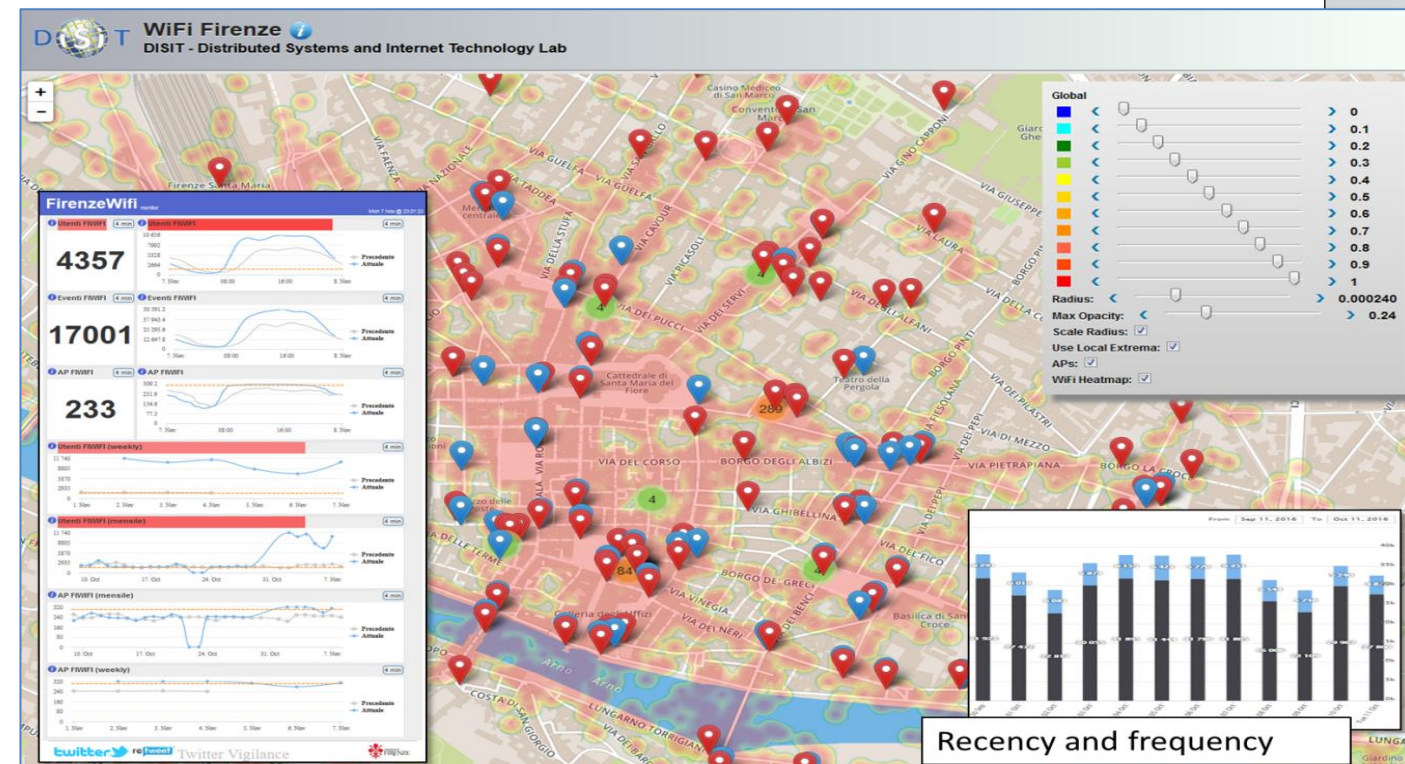


IOT and Dashboard real time, data driven

<http://www.disit.org/dashboardSmartCity/view/index.php?iddashboard=Mjlx>

Wi-Fi OD estimation.

Firenze - Saturday November 12 2016 20:11:59





UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB
<http://www.disit.org>

Embedded Widgets



DESTINATION FLORENCE Destination Official Partner del Comune di Firenze

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COME MUOVERSI

Fermate bus Piste ciclabili Parcheggi Distributori

Powered by www.km4city.org



Distributed Systems and Internet Technologies Lab
Distributed Data Intelligence and Technologies Lab
Department of Information Engineering (DINFO)
University of Florence



<http://www.disit.dinfo.unifi.it>

visi qualsiasi tipo deep search

HOME ABOUT RESEARCH INNOVATION EDUCATION AND COURSES HOWTO EVENTS

Log in/Create account

Sort by Relevance Sort by Upload Sort by Update

RISULTATI DELLA RICERCA

(1-10 of 857 in 2723 ms)



DISIT in difficoltà per la neve nel 2010!

DSI DISIT nel 2010, problemi di neve!

UNIVERSITÀ DEGLI STUDI FIRENZE **DINFO** Dipartimento di Ingegneria dell'Informazione

Informazioni sui mezzi di trasporto pubblico disponibili, per una mobilità sostenibile nell'ateneo fiorentino

Scegli il raggio di ricerca - Choose the search distance

0.500 m 1 km 2 km

Vista iniziale - First view Km4city WebApp Indicazioni stradali - Directions

Scegli altri servizi da visualizzare

Choose other services to show

- ☐ Rastrelliere bici - Bike racks
- ☐ Piste ciclabili - Cycle paths
- ☐ Strutture UNIFI - UNIFI Depts
- ☐ Linee Tpl - Bus routes

Clicca sul nome della fermata qui sotto per avere il dettaglio delle linee

Click the stop name for more details on the routes

- Massaia
- Massaia 02
- Cappuccini
- Mercati
- Incontri

Rilevanza 0.35

ella conoscenza, anal...

dati e conoscenze mining,
gio naturale, intelligenza artificiale,

Rilevanza 0.3

alisi comparativa dei ...

ation system and besides it, the
e key issues such safety of the

Rilevanza 0.3

di sistemi collaborat...

ti, e benefici per gli studenti del
digitali, DRM e CAS Parte 2:

Rilevanza 0.28

mica su Smart City: ci...

rastrutture elaboratori periferici
deduzione Processori Recitazione

Rilevanza 0.28

turismo e la formazio...

minerario, gestione delle
n gestione dei dati? strumenti per il

Rilevanza 0.28

multiple SPARQL entry ...

essibili popolano il mondo linked
dati sta diventando ogni giorno

FILTRI DI RICERCA

CONTENUTI

- In primo piano
- Most Viewed (last 500)
- Most Viewed All (last 500)
- Ultimi caricati
- Più votati
- Risultati della Ricerca

CLASSIFICAZIONE

Lista dei termini

- application fields (3425)
- content kind (962)
- models and systems (3014)
- project kind (809)
- research topics (7453)
- standard (501)

Ven 26 Gen Powered by LaMMA

Firenze

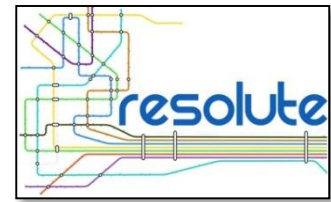
Nuvoloso 5°C / 10°C

Sab 27 Gen	Dom 28 Gen	Lun 29 Gen	Mar 30 Gen
1°C / 14°C	1°C / 15°C	Temp N/A	Temp N/A
Sereno	Sereno	Nuvoloso	Coperto

Powered by www.km4city.org



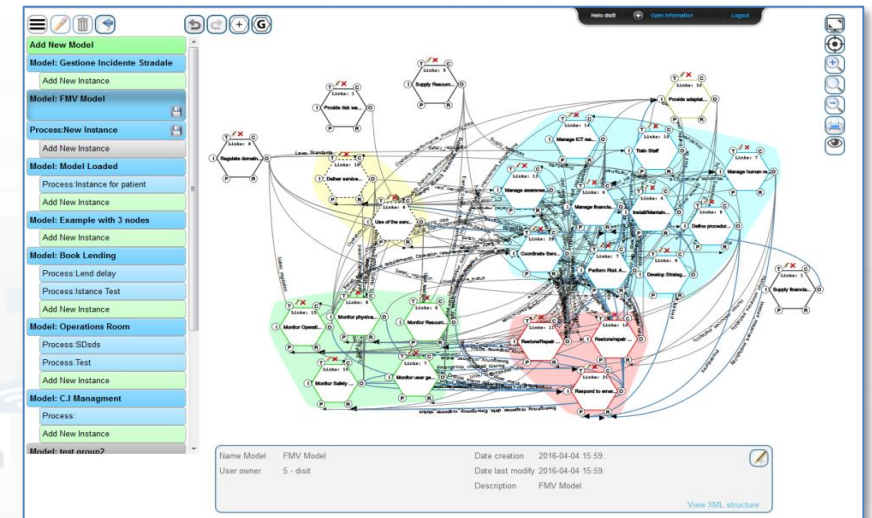
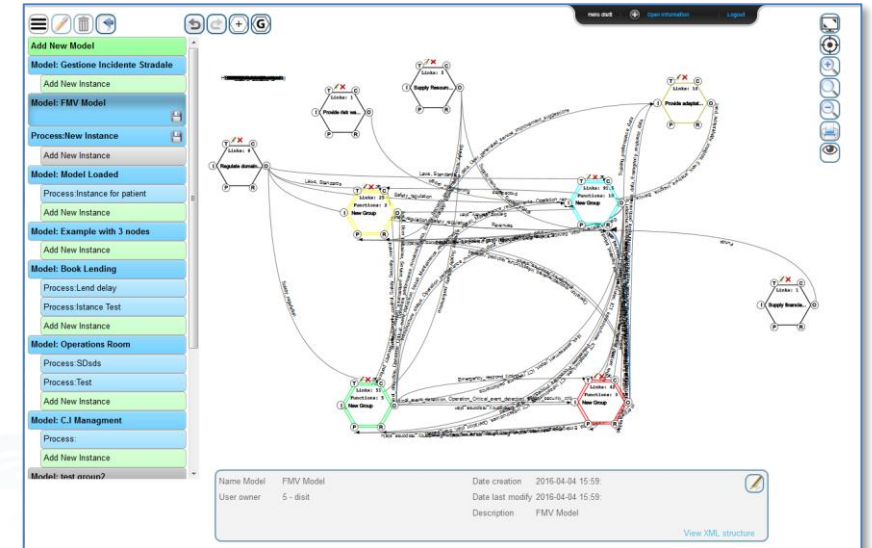
ResilienceDS tool

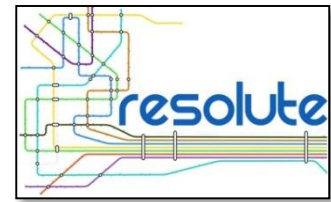


- **FRAM Model**
 - Macro FRAM processes
 - Metrics for Process complexity assessment
 - Operational Semantic for executing FRAM model
 - Connection with SmartDS
 - Connection with BigData open to multiple sources of data and workgroup results, Km4City
- **Collaborative work**
- **Open for all**
- **Validated on ERMG**
- **Web Tool**

<http://resilienceds.disit.org>

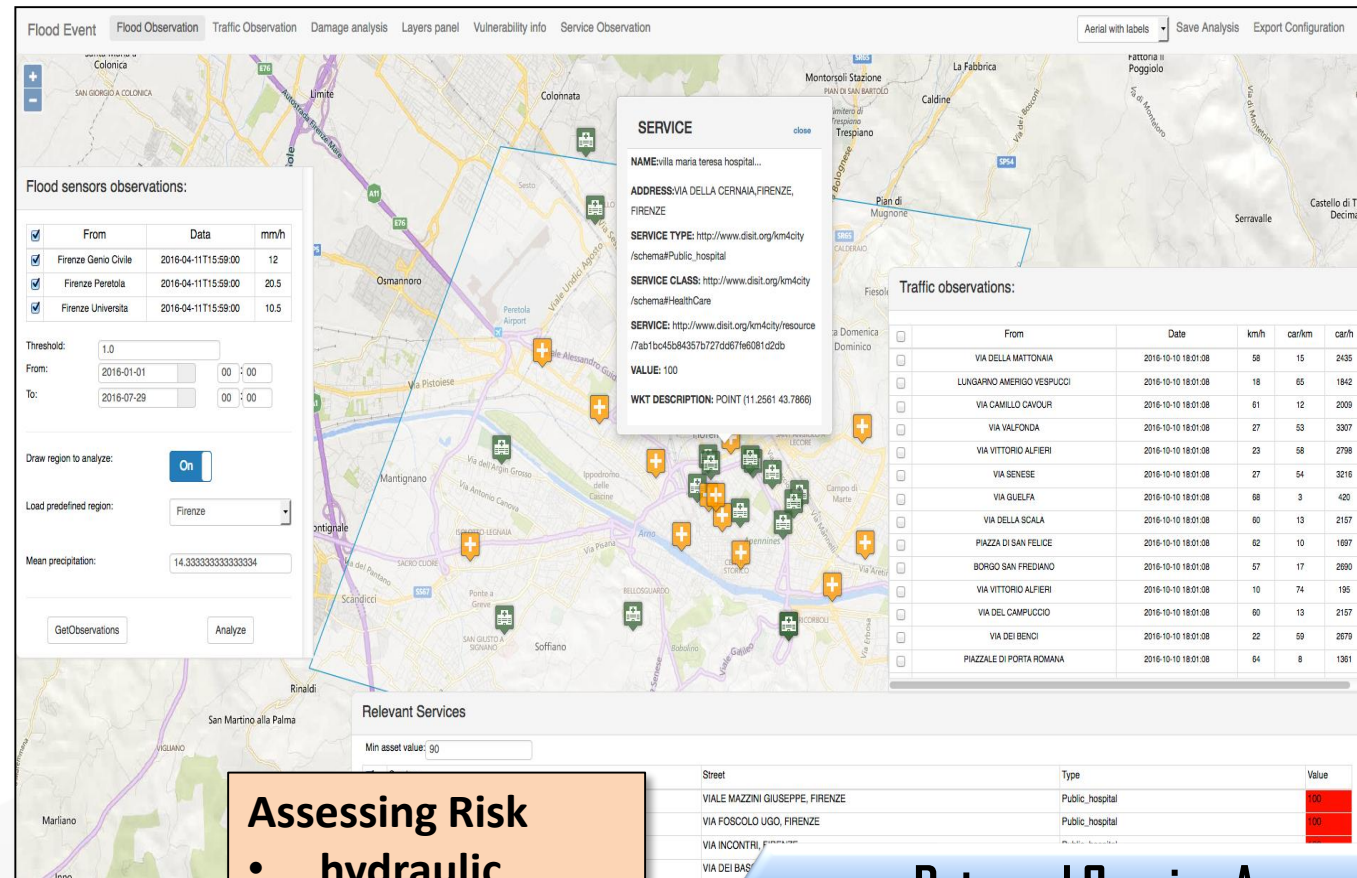
DICIT lab, 15 August 2017





Risk Assessment

Decision Support Systems



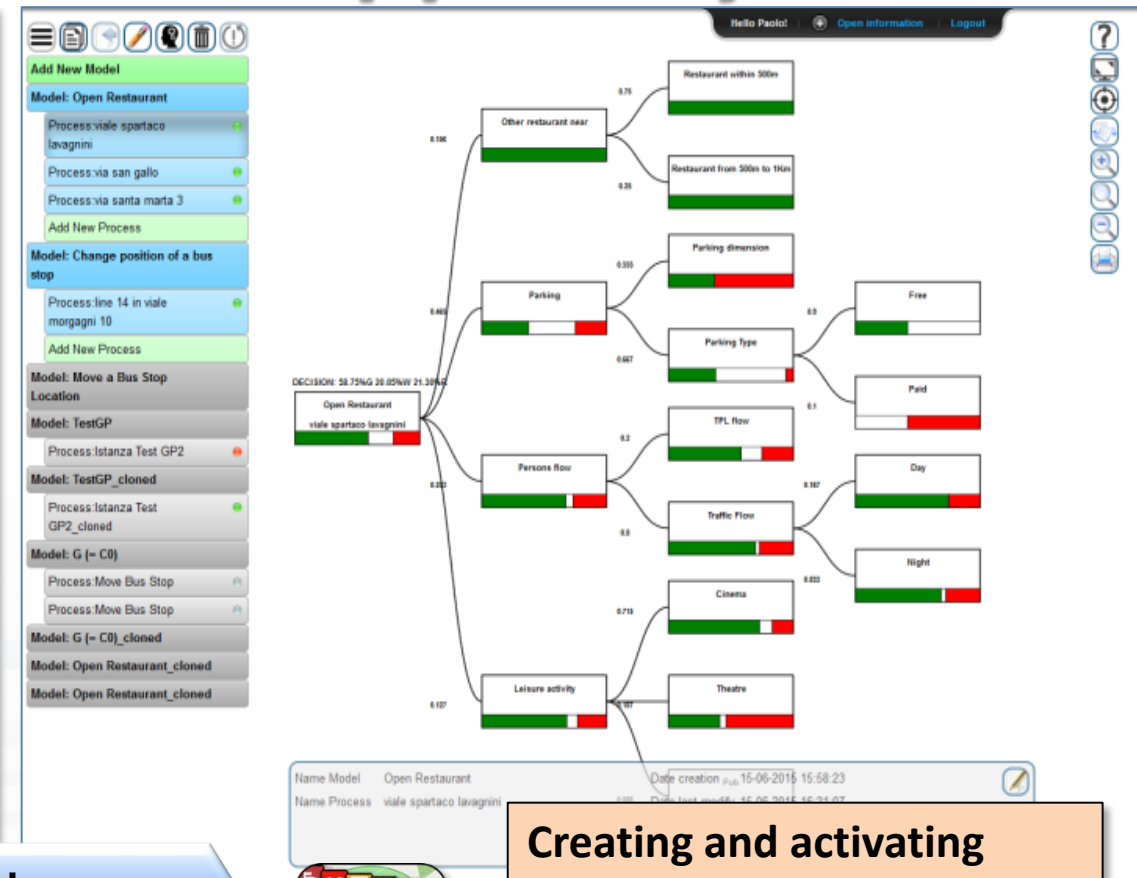
Assessing Risk

- hydraulic
- Seismic

Data and Service Aggregator



DISIT lab, 15 August 2017



Creating and activating

- Decision Support models



Smart City Monitoring: Notificator

EVENTS GENERATORS

MESSAGE BOOK

ADDRESS BOOK

REST BOOK

EVENTS LOG

CLIENT APPLICATIONS

Text filter

Start date

End date

Application

Filter

Restore

Generator container	Generator name	Generator type	User	Event time	Event type	Application	Link
ToolAdmin - Public	Ataf RT	Ataf_Rt	marazzini	2017-08-09 17:38:03	Value <= 50 - Bad	Dashboard Manager	
ToolAdmin - Public	Park Free - Speedo	Park_Free	marazzini	2017-08-09 17:37:32	27 < Value <= 54 - Ok	Dashboard Manager	
ToolAdmin - Public	Ataf RT	Ataf_Rt	marazzini	2017-08-09 17:37:02	Value <= 50 - Bad	Dashboard Manager	
ToolAdmin - Public	Park Free - Speedo	Park_Free	marazzini	2017-08-09 17:36:28	27 < Value <= 54 - Ok	Dashboard Manager	
ToolAdmin - Public	Ataf RT	Ataf_Rt	marazzini	2017-08-09 17:36:02	Value <= 50 - Bad	Dashboard Manager	
New events occurred			EngagementCreated	marazzini	2017-08-09 17:35:58	Value <= 11 - Low	Dashboard Manager
Ataf RT	Value <= 50 - Bad	2017-08-11 09:23:41	Temp	DCTemp1	marazzini	2017-08-09 17:35:42	6 < Value <= 30 - Ok
	ee - Speedo	Park_Free	marazzini	2017-08-09 17:35:25	27 < Value <= 54 - Ok	Dashboard Manager	

Logout

marazzini

Dashboard Manager

ToolAdmin

On

RT events

Notifierator monitoring

Data about events received by Notificator

Sat 30 Sep @ 18:17:50

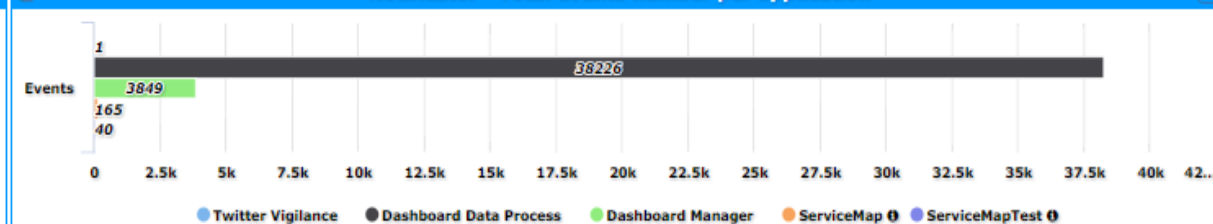
Notifierator - Client applications list

	Has local users	Has ldap users	Container alias	Generator alias	Generator type alias
Dashboard Manager	yes	yes	Dashboard title	Widget title	Metric type
Twitter Vigilance	no	yes	Metric page	Metric name	Metric type
Dashboard Data Process	no	yes	Generator context	Generator name	Generator type
ServiceMap	no	yes	ServiceMap	Generator name	Generator Type
ServiceMapTest	no	yes	ServiceMapTest	Generator name	Generator Type

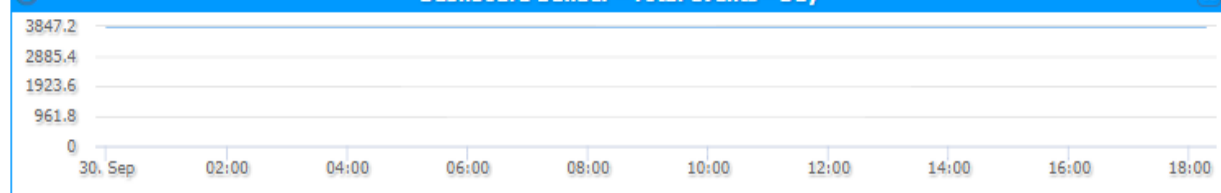
Notifierator - Total events of to... 7s

30
events

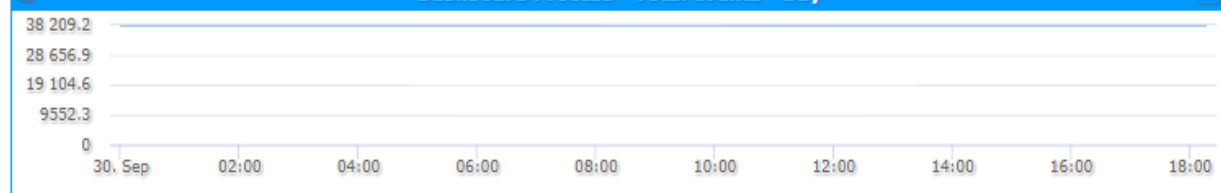
Notifierator - Total events number per application



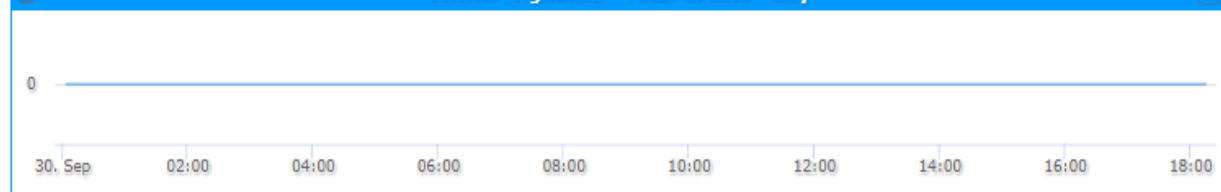
Dashboard Builder - Total events - Day



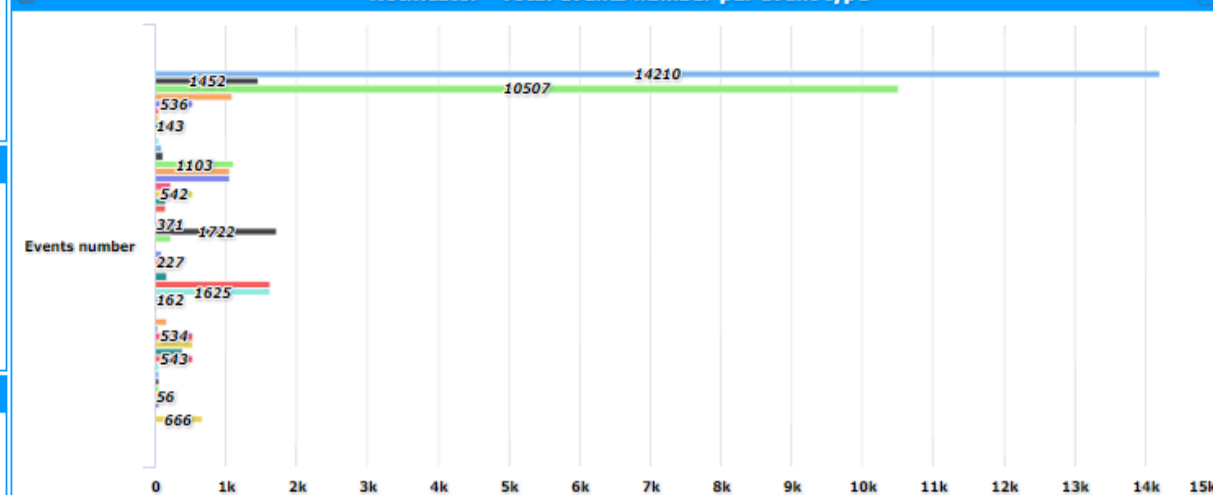
Dashboard Process - Total events - Day



Twitter Vigilance - Total events - Day



Notifierator - Total events number per event type



Service Map API

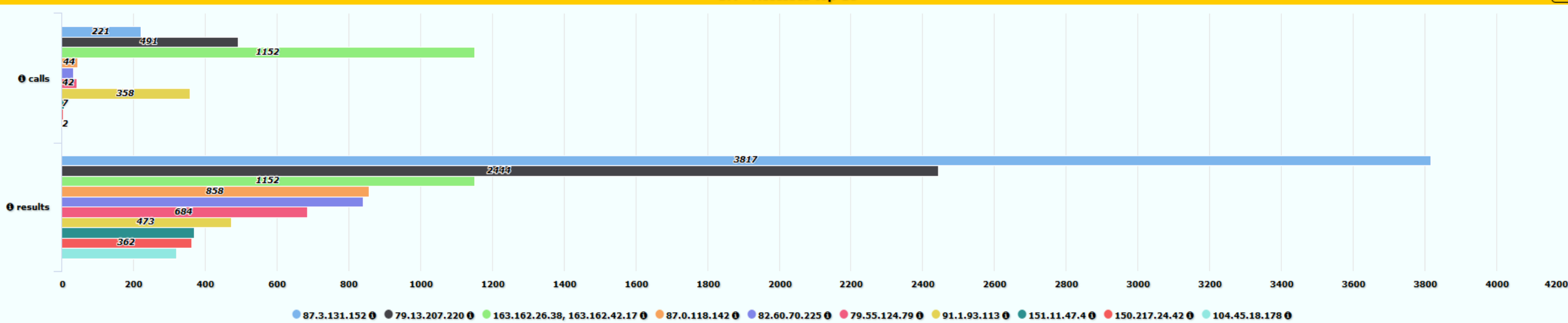
Statistics on API



Mon 5 Feb 23:55:07

SM - Accesses top 10

28m



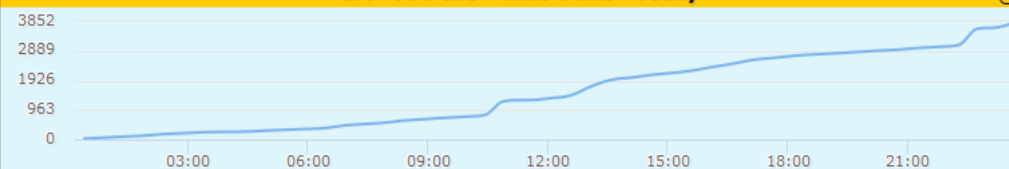
SM - API use today

28m

3852
requests

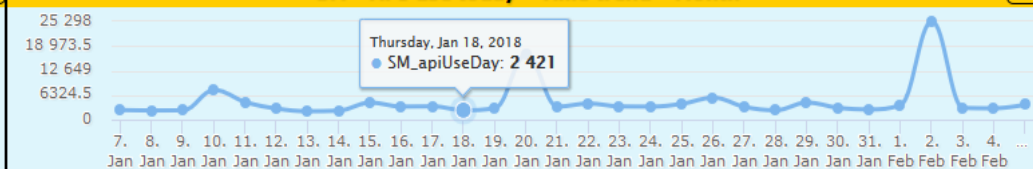
SM - API use - Time trend - Today

28m



SM - API use today - Time trend - Month

28m



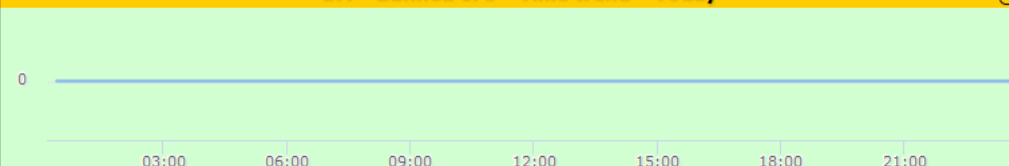
SM - Banned IPs today

28m

0
IPs

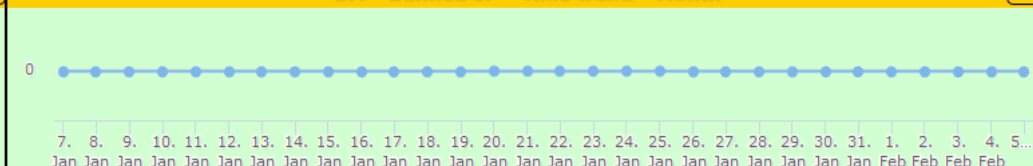
SM - Banned IPs - Time trend - Today

28m



SM - Banned IP - Time trend - Month

28m



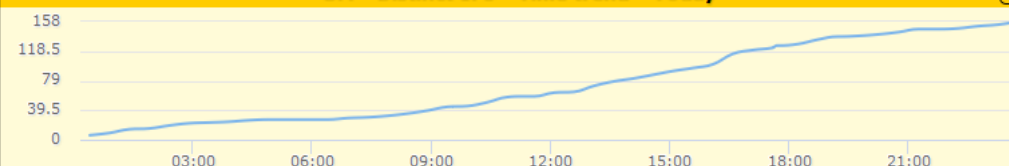
SM - Distinct IPs today

28m

158
IPs

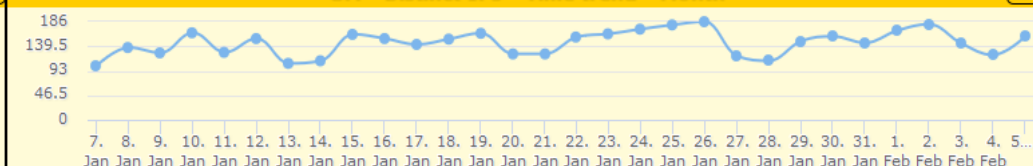
SM - Distinct IPs - Time trend - Today

28m



SM - Distinct IPs - Time trend - Month

28m



Smart City API

<http://www.disit.org/7044>



Providing Services to City Users

- Cities aims at **providing new Smart Services** to city users:
 - operators, final users, etc.
- In most cases via **Web and Mobile Apps** which **exploit data**:
 - Structural data, open data, real time data, etc., private data from companies
 - **to be aggregated and transformed** in services (providing: prediction, information, early warning, relations)
 - **at reasonable cost** for: developers, operators, and SME to realize new Apps and services.
- *If cost is not affordable, Services and Apps are not developed*, in most cases the Apps are also provided for free, so that high costs are not sustainable → Public Private Partnership

- **Case A)** Data may be accessible as single non-Aggregated Data Sets
 - → very expensive for App builders or
- **Case B)** Services and microservices may become accessible via Smart City API, providing a view on Aggregated Data and Services.
 - → Affordable for App builders

Case B) Smart City API on aggregated data is as solution

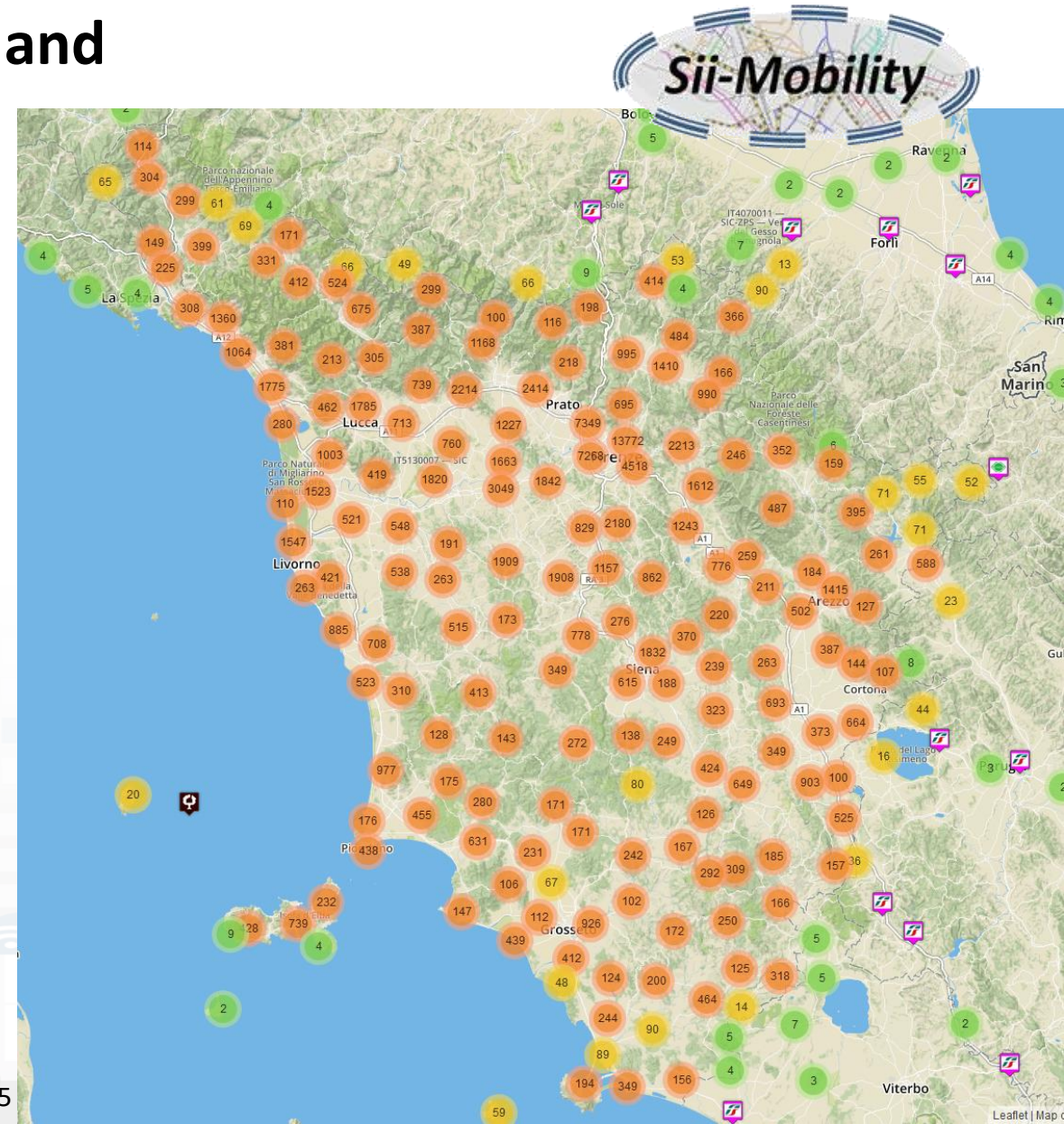
- PROS: May abstract from the underlined data model, but can exploit it to provide insight, inference, reasoning about the aggregated data and services
- CONS: may be complex and difficult to use without training and without knowing the context.
- CONS: they have not been standardized yet.

Scenariious vs SmartCity API

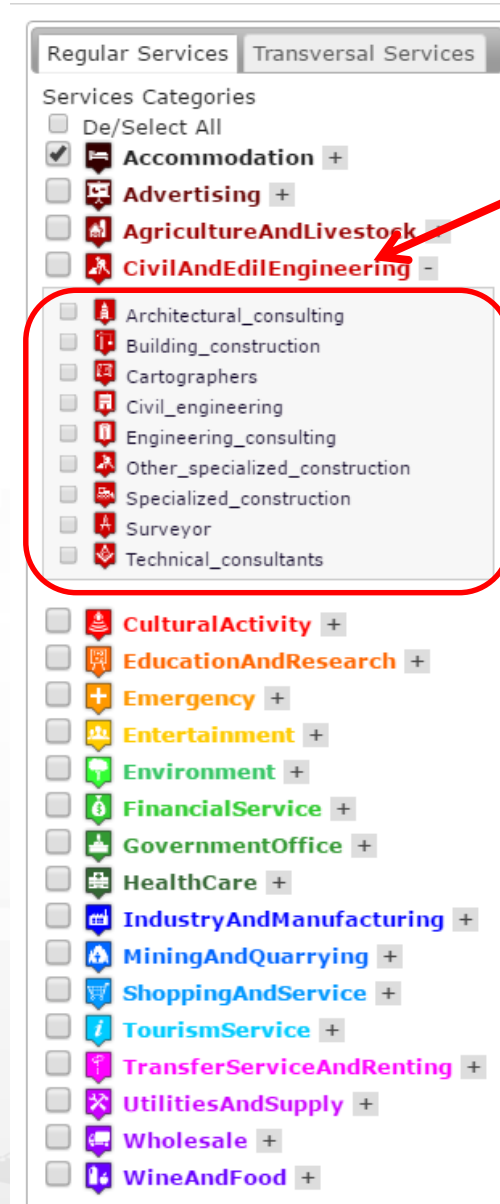
- Search data: by text, near, along, etc...
 - Resolving text to GPS and formal city nodes model
- Empowering the city users
- Access to event information
- Supporting City Users in using Public Mobility
- Supporting City Users in using Private Mobility
- New Experience to access at Cultural and Touristic info
- New way to access at health services
- Access at Environmental information
- Profiled Suggestions to City Users
- Personal Assistant
- Sharing knowledge among cities

Thematic Data Domain Tuscany

- **Street and geoinformation of the territory and details for routing, navigation, ...**
- **Mobility and Transport:** public and private, public transport, parking status, fuel stations prices, traffic sensors, etc.
- **Culture and Tourism:** POI, churches, museum, schools, university, theatres, events in Florence
- **Environmental:** pollution real time, weather forecast, etc.
- **Social Media:** twitter data
- **Health:** hospital, pharmacies, status of the first aid triage in major hospitals, ...
- **Alarms:** civil protection alerts, hot areas, ...

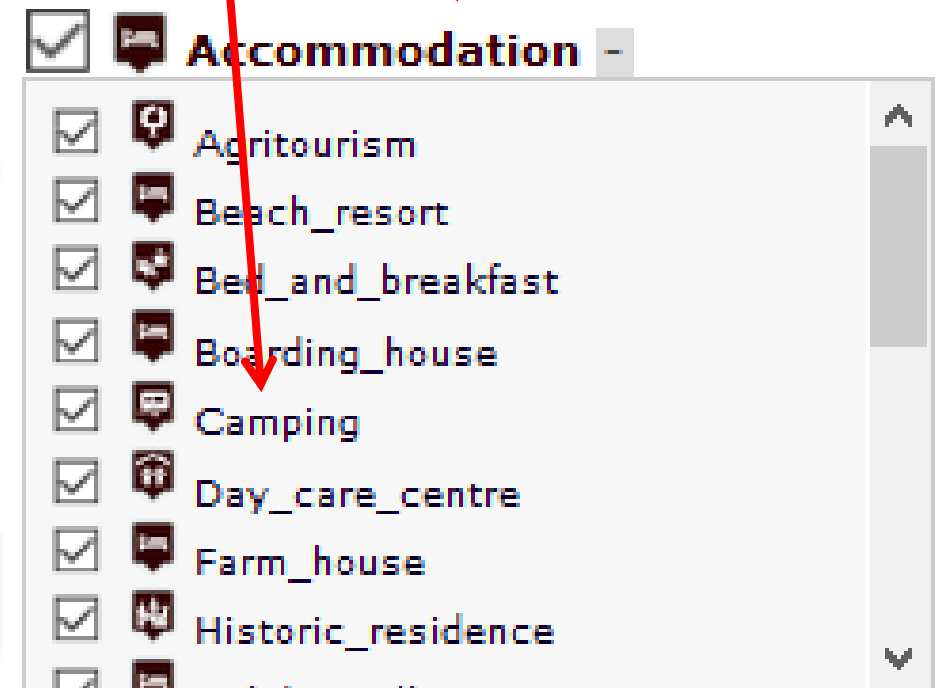


Concepts of Services: Macro and subcategory



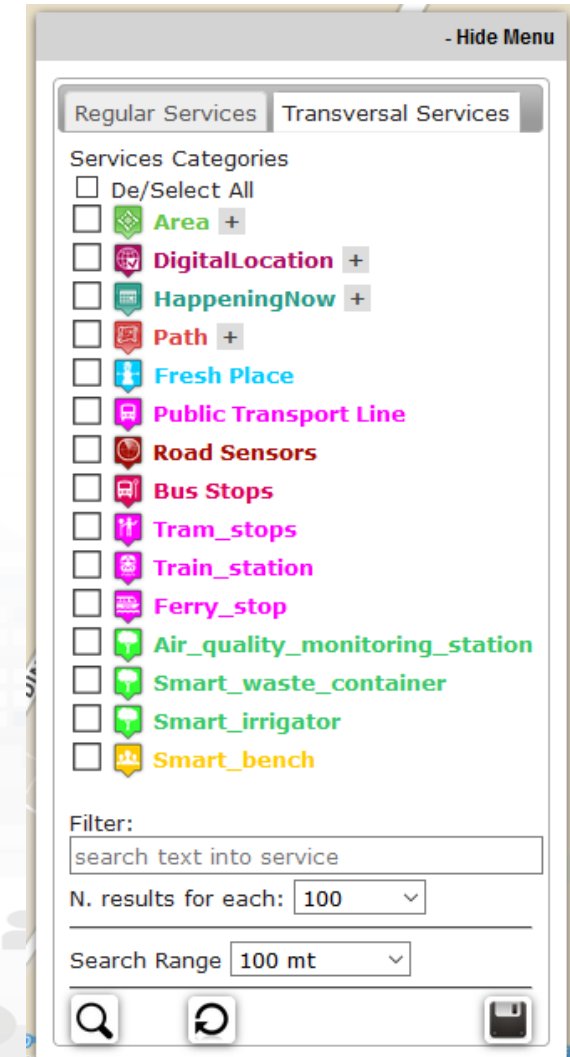
20 Service Macro Classes

Service Class



Access to Point of Interest information, POI

- **POI:** point of interest
- **type:** macro and subcategories
- **Position:** GPS, address, telephone, fax, email, URL, ..
- **Description:** textual, multilingual, with images, ...
- **Link** to dbPedia, Linked Open Data
- **Links to other services**
- **Real time data if any:** sensors data, timeline, events, prices, opening time, rules of access, status of services, status of queue, etc..
- *See transversal services on ServiceMap*
 - *Regular and in test platform*



Service Information: different kind of services

AURORA

[LINKED OPEN GRAPH](#)

Tipology: Accommodation - Hotel

Email: info@hotelauroa.info

Website: www.hotelauroa.info

Phone: 055210283

Address: VIA L. ALAMANNI, 5

Cap: 50100

City: FIRENZE

Prov.: FI

TPL STOP : Piazza Stazione (Fr. Cc)

Vaubus

[LINKED OPEN GRAPH](#)

Lines:

FI-LU **FI-VG**

No available routes

Display Bus per page

Search:

Time	Line	Direction
08:48:00 2017-03-20	FI-LU	Piazzale Verdi
08:16:00 2017-03-20	FI-LU	Piazzale Verdi
10:09:00 2017-03-20	FI-LU	Piazzale Verdi
2017-03-20	FI-LU	Piazzale Verdi
2017-03-20	FI-LU	Piazzale Verdi
2017-03-20	FI-LU	Piazzale Verdi

Page 1 of 1

Data currently not available

Loggia San Paolo

[LINKED OPEN GRAPH](#)

Tipology: CulturalActivity - Monument_location

Digital Location

Address: VIA DELLA SCALA, 3

Cap: 50123

City: FIRENZE

Prov.: FI

Photos:

Description: The rounded arches, the stone skeleton and the glazed terracotta medallions recall the model of the Loggiato degli Innocenti. The medallions in glazed terracotta by Andrea della Robbia and his sons Marco and Luca contain seven polychrome figures of Santi Francescani and two works of mercy Cristo conforta un Giovane and Cristo conforta un Anziano. Beneath the portico can be admired the expressive embrace between San Domenico Guzman and San Francesco d Assisi by Andrea della Robbia

Giardino di piazza dell Indipendenza

[LINKED OPEN GRAPH](#)

Tipology: Entertainment - Green_areas

Digital Location

Address: PIAZZA DELLA INDIPENDENZA, 15

Cap: 50129

City: FIRENZE

Prov.: FI

Note: areeverdi238

[Remove from map](#)

ZCS_1_D

[LINKED OPEN GRAPH](#)

Tipology: TransferServiceAndRenting - Controlled_parking_zone

Digital Location

Address: VIA GUSCIANA

Cap: 50124

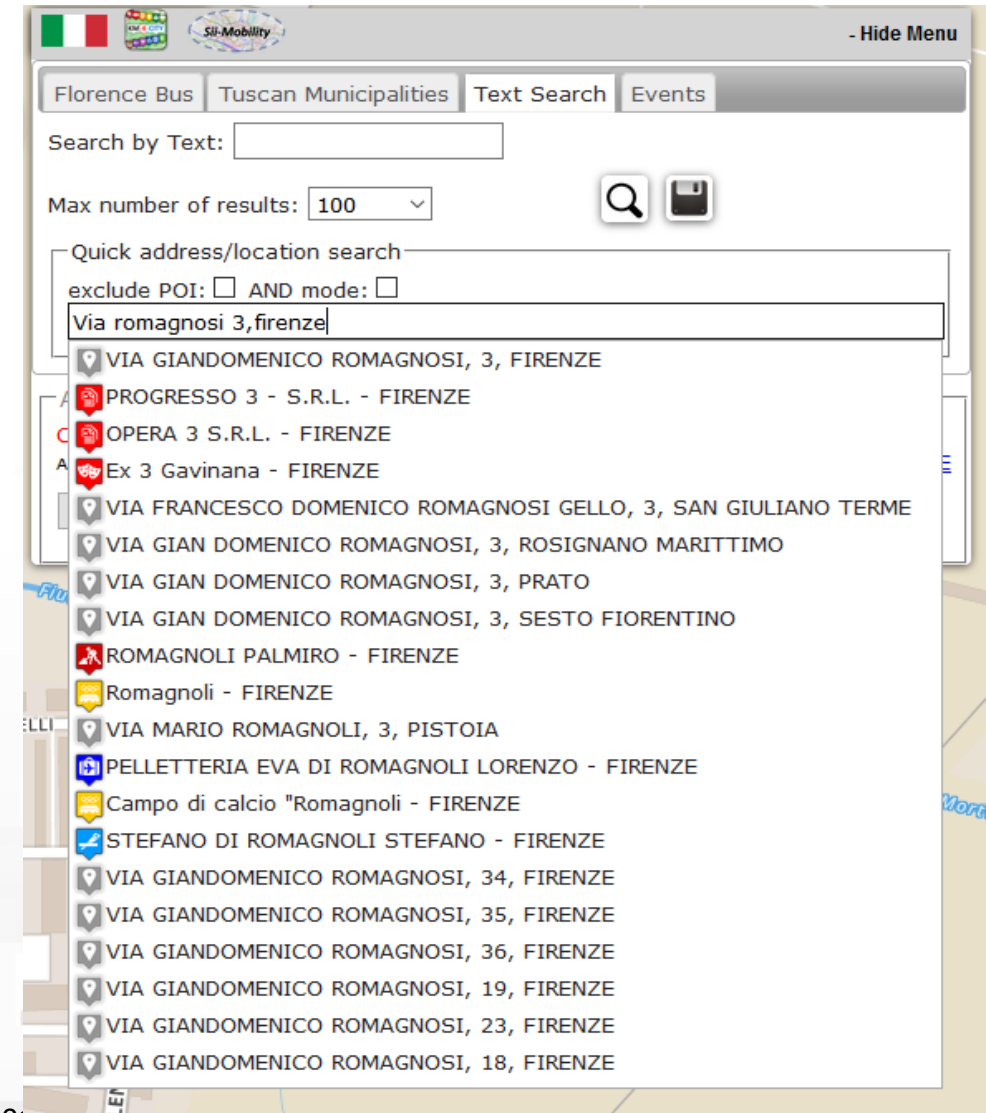
City: FIRENZE

Prov.: FI

[Remove from map](#)

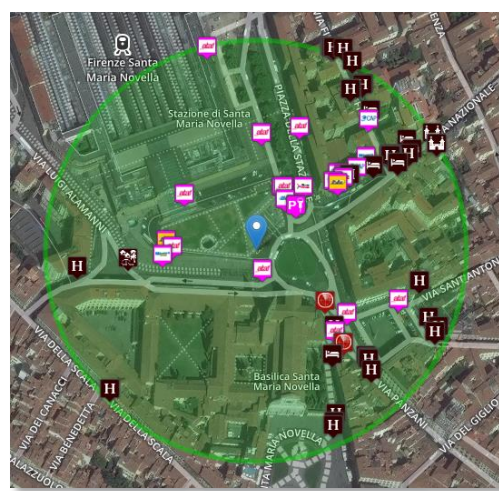
General Text Search Features

- **Search by text for POIs via**
 - Full text: description, title, macro and category name
 - Filtering by macro-cat and subcategory
 - Filtering on distance and geometric shape
- **Search by text with assisted suggestion to get:**
 - Streets and civic numbers, or POI, locations



The screenshot shows the Sii-Mobility web application interface. At the top, there are tabs for 'Florence Bus', 'Tuscan Municipalities', 'Text Search', and 'Events'. The 'Text Search' tab is active. Below the tabs, there is a search bar labeled 'Search by Text:' with a text input field containing 'Via romagnosi 3, firenze'. To the right of the search bar are icons for a magnifying glass and a document. Below the search bar, there is a dropdown menu showing a list of suggestions. The suggestions include various locations and POIs, such as 'VIA GIANDOMENICO ROMAGNOSI, 3, FIRENZE', 'PROGRESSO 3 - S.R.L. - FIRENZE', 'OPERA 3 S.R.L. - FIRENZE', 'Ex 3 Gavinana - FIRENZE', 'VIA FRANCESCO DOMENICO ROMAGNOSI GELLO, 3, SAN GIULIANO TERME', 'VIA GIAN DOMENICO ROMAGNOSI, 3, ROSIGNANO MARITTIMO', 'VIA GIAN DOMENICO ROMAGNOSI, 3, PRATO', 'VIA GIAN DOMENICO ROMAGNOSI, 3, SESTO FIORENTINO', 'ROMAGNOLI PALMIRO - FIRENZE', 'Romagnoli - FIRENZE', 'VIA MARIO ROMAGNOLI, 3, PISTOIA', 'PELLETTERIA EVA DI ROMAGNOLI LORENZO - FIRENZE', 'Campo di calcio "Romagnoli - FIRENZE', 'STEFANO DI ROMAGNOLI STEFANO - FIRENZE', 'VIA GIANDOMENICO ROMAGNOSI, 34, FIRENZE', 'VIA GIANDOMENICO ROMAGNOSI, 35, FIRENZE', 'VIA GIANDOMENICO ROMAGNOSI, 36, FIRENZE', 'VIA GIANDOMENICO ROMAGNOSI, 19, FIRENZE', 'VIA GIANDOMENICO ROMAGNOSI, 23, FIRENZE', and 'VIA GIANDOMENICO ROMAGNOSI, 18, FIRENZE'.

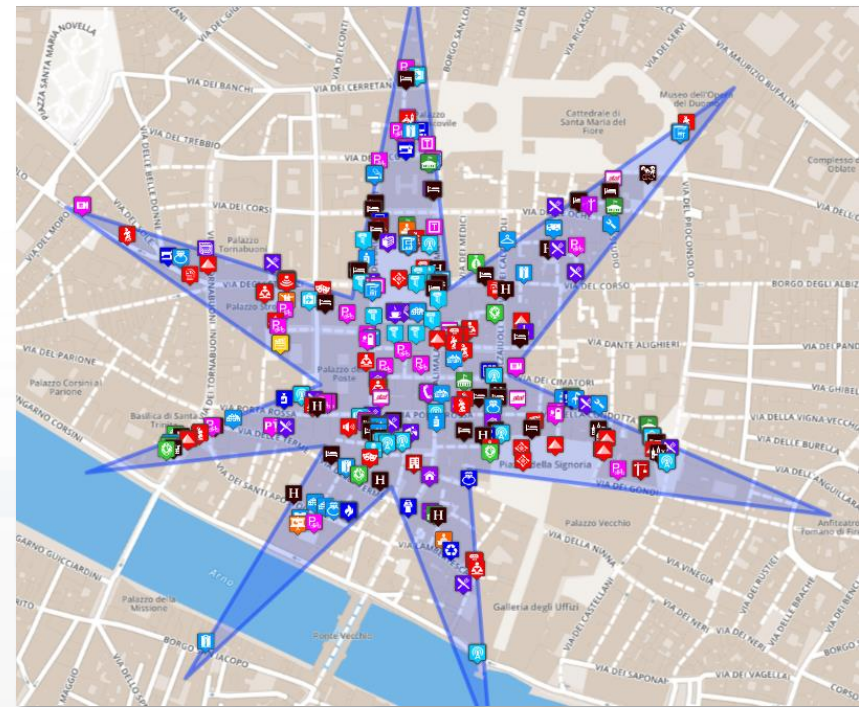
Around a point or POI



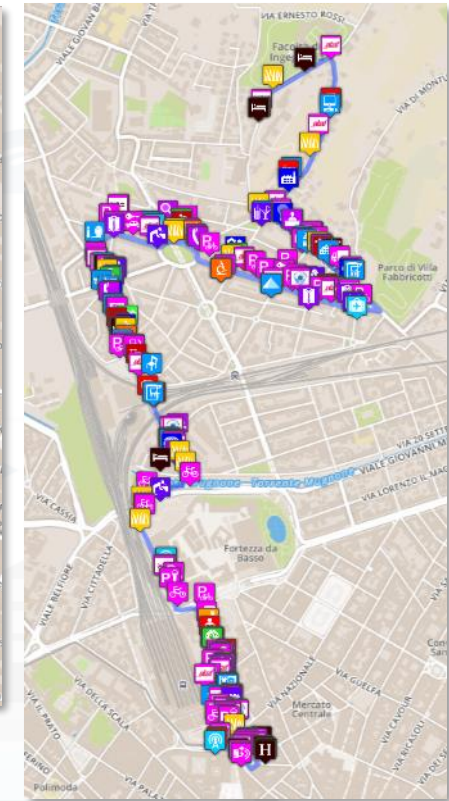
Each request or search in the Km4City model can be referred to a point and a ray, to an area, to a polyline



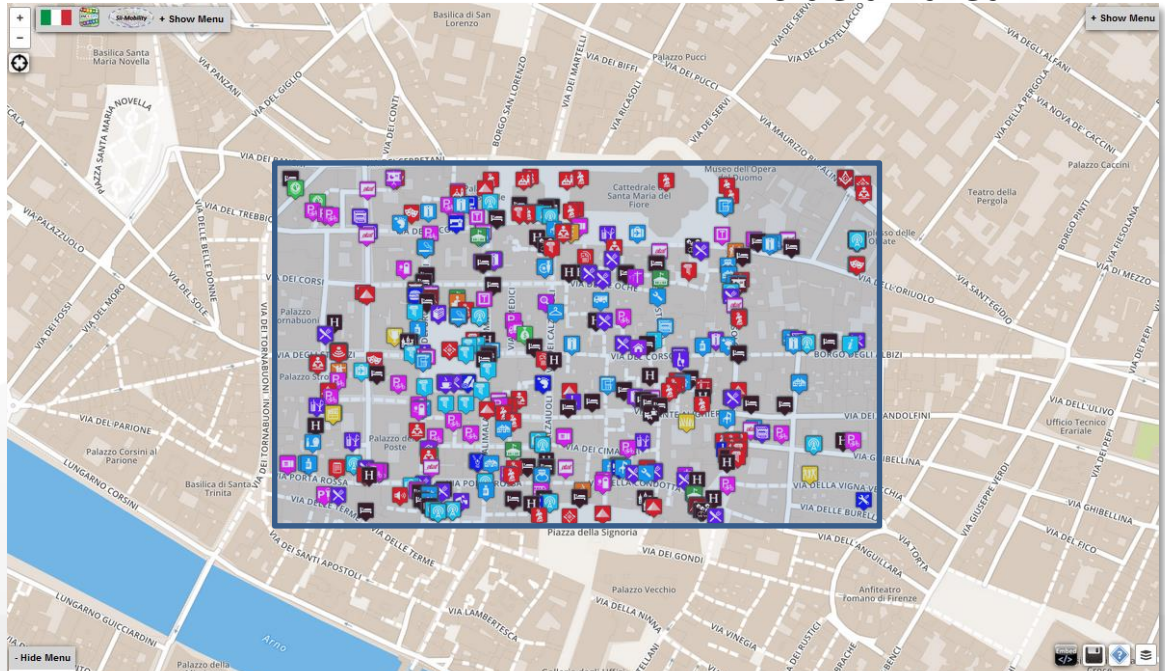
Inside a closed polyline



Along a polyline



Inside an area



Main ServiceMap features

- **Search**: provides a set of different searches on MAP and LOG
- **Save & Get API Call**: saves the performed visual query to send via e-mail the Rest call to the developer
- **Save & Get QueryID API Call**: saves the performed visual queries and send via e-mail a Rest call with a simplified syntax referring to a QueryID and not reporting the complexity of the query.
- **Save & Get Embed Code**: saves the visual query of the user in visually recall smart city elements on the map, and gives the HTML Iframe code for embedding the view on a third party web page;

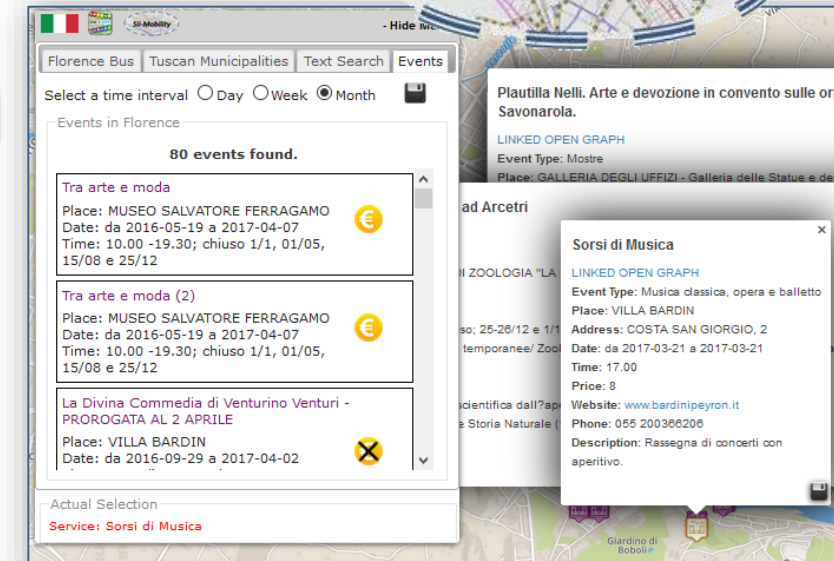
Empowering City Users

- Allow city users to
 - provide comments, images and scores associated with a certain Service (or place, via GPS)
 - Get list of last contributions of the same kind provided by other users
- They can be:
 - used as feedbacks
 - moderated by a back office personnel
 - ..
- In the future (→) connection with a more powerful server based on 311 standard would be possible



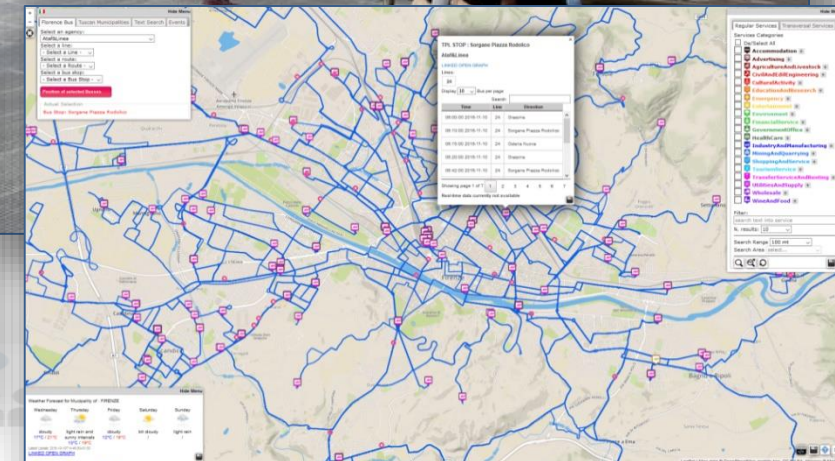
Access to Event information

- Getting Traffic Events
- Getting Critical Events
- Getting Events in the city
 - Theater, museum, show, sport, etc.
 - Getting Event details
 - Event kind, and thus ordering
 - in the day, week, and month
 - Location, and thus ordering, or selecting events per area, per residence
 - General information
 - Opening and cost (if any)
 - Etc.



Supporting City Users in using Public Mobility

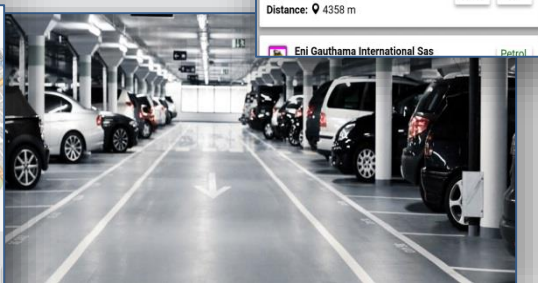
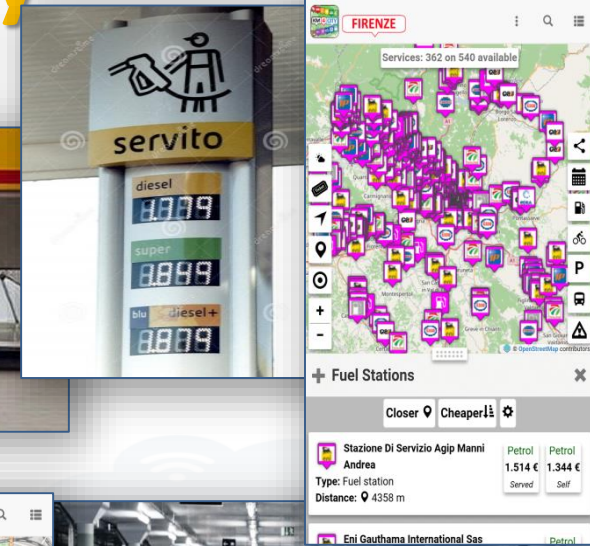
- **Public Transport, PT**
 - Getting tickets
 - Getting bus stops, lines, and timelines for bus, train and tramline (GTFS, ETL, ..)
 - Searching Services along a Pub. Transport line or closer to a stop
 - Searching the closest bus stops
 - searching for BUS stops via name
 - real time delays of busses
 - modal routing for Pub. Transport



Supporting City Users using Private Mobility

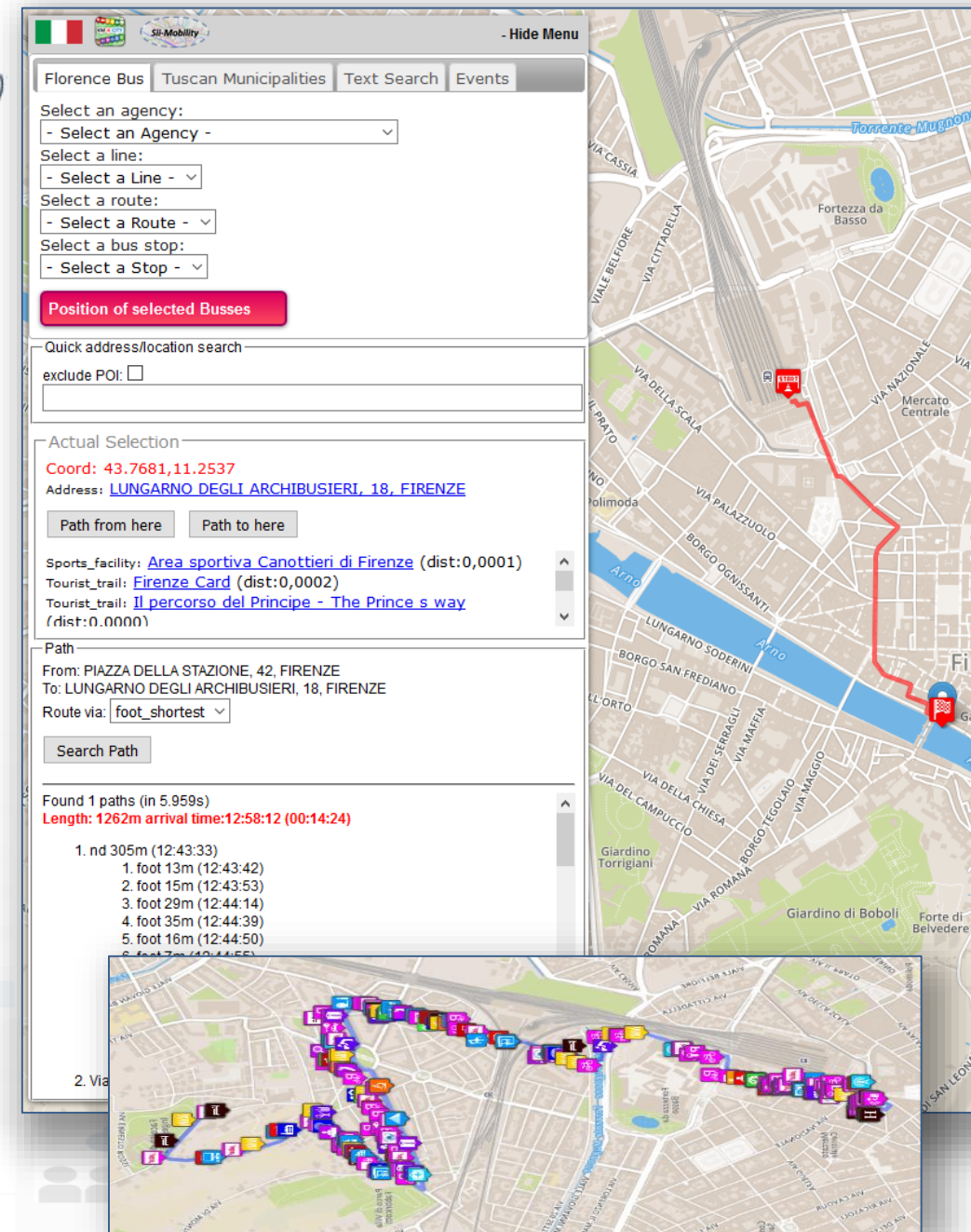
• Private Transport

- Getting closer parking
- Getting parking forecast
- Getting closer free space on parking
- Getting fuel stations location and fuel product prices
- Getting bike sharing rack status
- Searching Services along a **path** or closer to a point or Service as Hotel, Restaurants, square, etc.
- Getting closer **cycling paths**
- Recharging stations: location and status
- Getting traffic information



Private Mobility: routing and navigation paths

- To get the path from two points/POIs:
 - Shortest for pedestrian
 - Quietest for pedestrian
 - Shortest for private vehicles
- Search for POIs along the identified Path!
- <http://www.disit.org/ServiceMap>



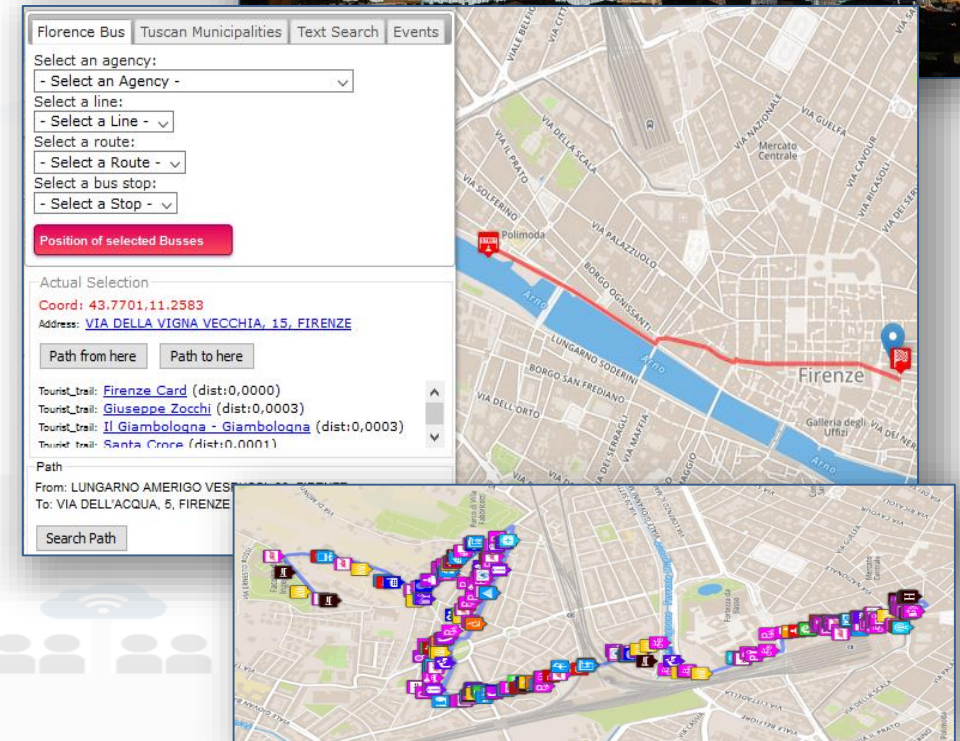
The screenshot displays the Sii-Mobility web application interface. The top navigation bar includes the Italian flag, the Sii-Mobility logo, and a 'Hide Menu' button. Below this, there are tabs for 'Florence Bus', 'Tuscan Municipalities', 'Text Search', and 'Events'. The main content area is divided into several sections:

- Select an agency:** A dropdown menu with the option '- Select an Agency -'.
- Select a line:** A dropdown menu with the option '- Select a Line -'.
- Select a route:** A dropdown menu with the option '- Select a Route -'.
- Select a bus stop:** A dropdown menu with the option '- Select a Stop -'.
- Position of selected Busses:** A red button.
- Quick address/location search:** A text input field with an 'exclude POI' checkbox.
- Actual Selection:**
 - Coord: 43.7681,11.2537
 - Address: [LUNGARNO DEGLI ARCHIBUSIERI, 18, FIRENZE](#)
 - Buttons: 'Path from here' and 'Path to here'.
 - Sports_facility: [Area sportiva Canottieri di Firenze](#) (dist:0,0001)
 - Tourist_trail: [Firenze Card](#) (dist:0,0002)
 - Tourist_trail: [Il percorso del Principe - The Prince s way](#) (dist:0,0000)
- Path:**
 - From: PIAZZA DELLA STAZIONE, 42, FIRENZE
 - To: LUNGARNO DEGLI ARCHIBUSIERI, 18, FIRENZE
 - Route via: [foot_shortest](#)
 - Search Path button.
- Found 1 paths (in 5.959s):**
 - Length: 1262m arrival time:12:58:12 (00:14:24)
 - 1. nd 305m (12:43:33)
 - 1. foot 13m (12:43:42)
 - 2. foot 15m (12:43:53)
 - 3. foot 29m (12:44:14)
 - 4. foot 35m (12:44:39)
 - 5. foot 16m (12:44:50)
 - 6. foot 7m (12:44:55)

The right side of the interface shows a map of Florence with a red route line connecting the start and end points. The bottom of the interface features a detailed view of the route, showing a series of colorful bus stop icons along the path.

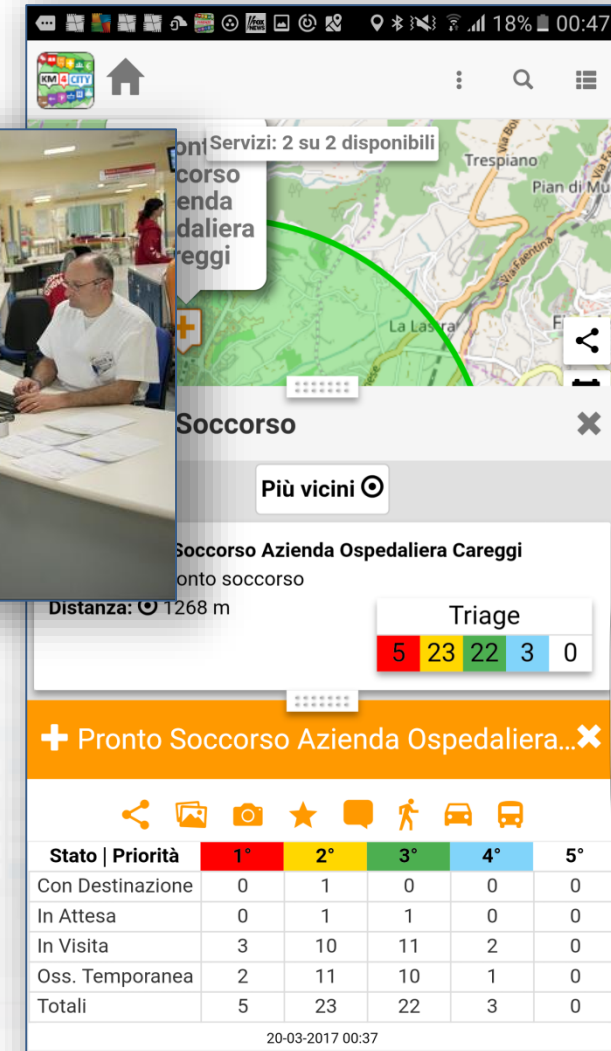
New Experience to access at Cultural and Touristic info

- Getting location and description of Point of Interests, POIs: culture and tourism first
 - Location, images, phone, URL, etc.
 - Get image, video, audio, ...
- Search for POIs in areas and closer
- Get routing to reach location or POI by walking downtown
 - searching Services along the path
- Search for location, full text assisted
- Leave a score, take a picture, etc..



New way to access at health services

- Searching for pharmacies and hospitals
- Getting the closest hospital first aid locations and status
- Getting real time updated information about the first aid status of major hospitals (triage)

Sii-Mobility app interface showing a map, search results for 'Soccorso', and a triage status table.

Soccorso

Più vicini

Soccorso Azienda Ospedaliera Careggi

Distanza: 1268 m

Triage

5	23	22	3	0
+ Pronto Soccorso Azienda Ospedaliera...				

Stato | Priorità

	1°	2°	3°	4°	5°
Con Destinazione	0	1	0	0	0
In Attesa	0	1	1	0	0
In Visita	3	10	11	2	0
Oss. Temporanea	2	11	10	1	0
Totali	5	23	22	3	0

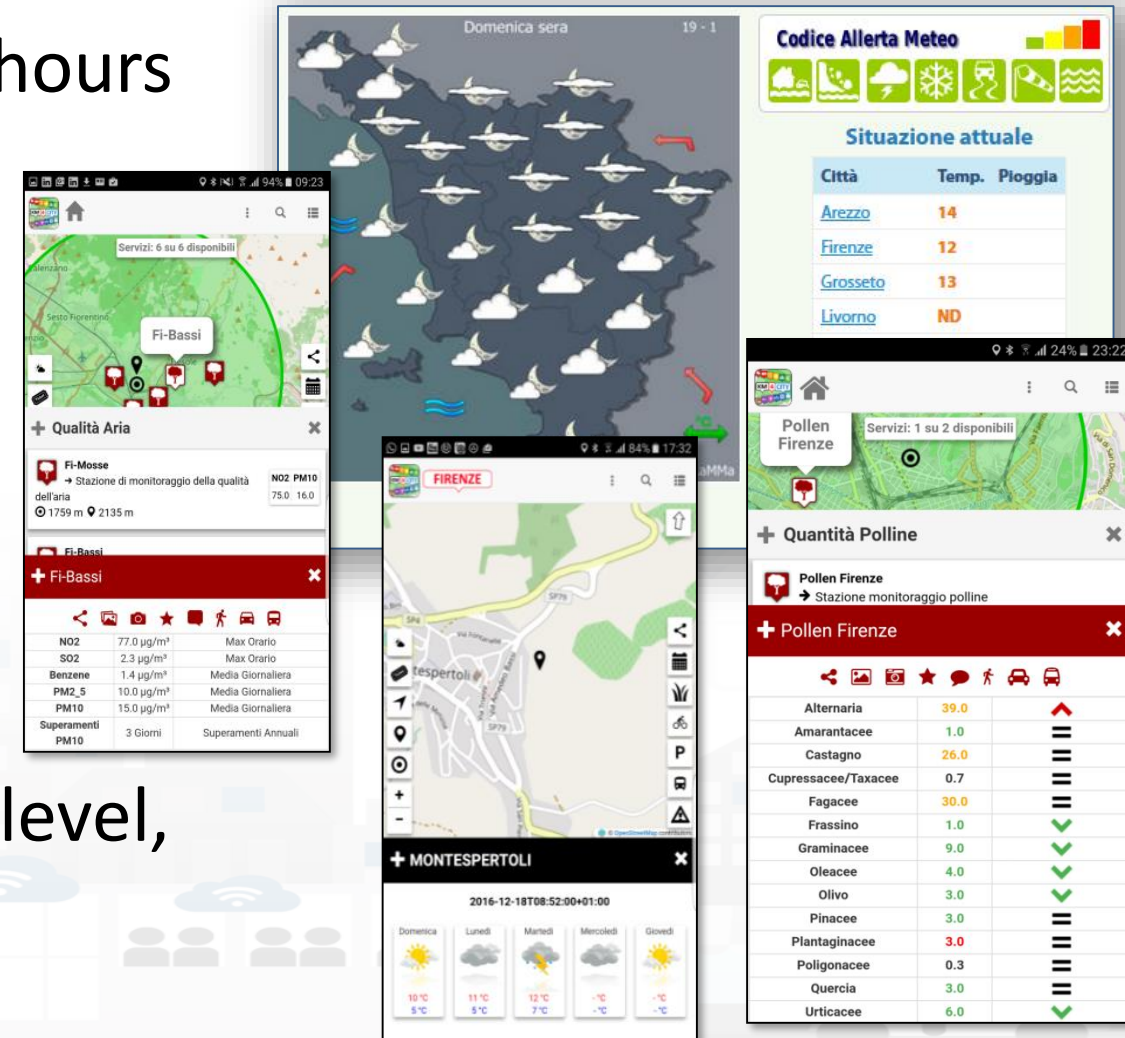
20-03-2017 00:37

I CODICI DEL PRONTO SOCCORSO

CODICE ROSSO EMERGENZA accesso immediato	Casi con pericolo di vita Il trattamento di questi pazienti avviene immediatamente in via prioritaria
CODICE GIALLO URGENZA accesso rapido	Casi con lesioni gravi ed eventuale alterazione di una o più funzioni vitali L'assistenza viene assicurata nel minor tempo possibile
CODICE VERDE URGENZA differibile	Casi in condizioni critiche, ma non in pericolo di vita L'assistenza viene assicurata dopo i casi più urgenti
CODICE AZZURRO NON URGENZA	Casi in condizioni non gravi La prestazione sanitaria è differibile
CODICE BIANCO	Casi con problematiche risolvibili dal medico curante, dalla guardia medica o da ambulatori specialistici Tempi di attesa molto lunghi

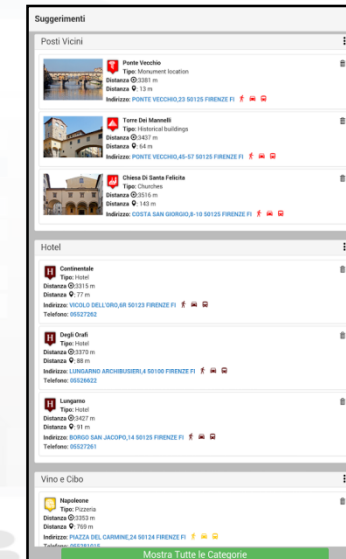
Access at Environmental information

- Getting weather forecast for the next hours and days
- Getting alert information from Civil protection
- Getting air quality status
- Getting pollination status
- getting actual weather status: temperature, humidity, pressure, rain level, etc.



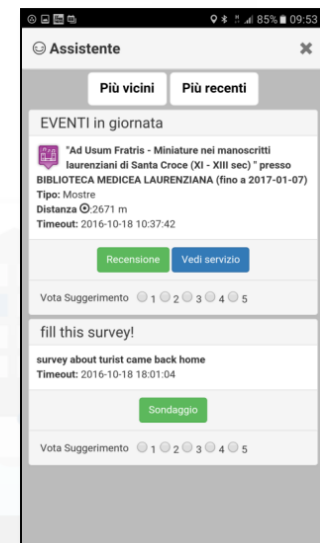
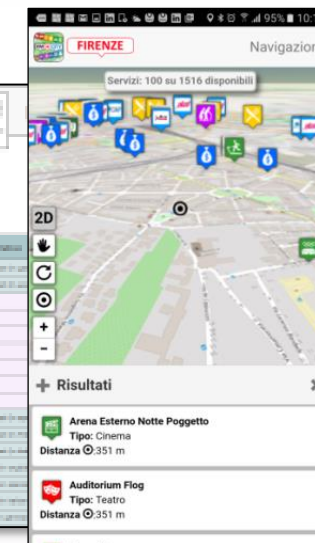
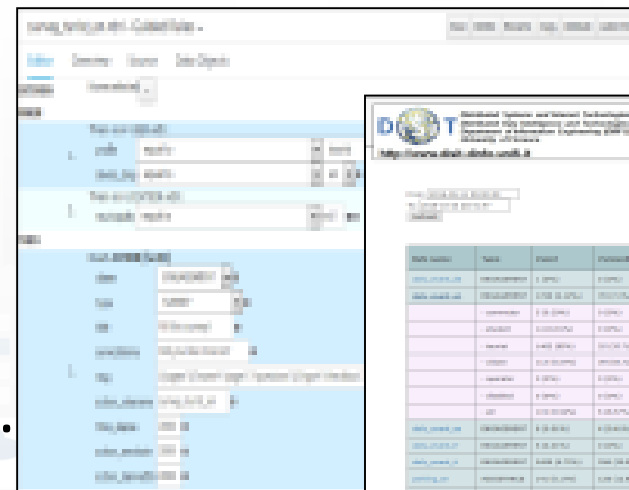
Profiled Suggestions to City Users

- Personalized suggestions
 - The server provide suggestions in the user context (location and time) arranged in a number of categories
 - Culture, mobility, food and drink, etc.
 - Alerts: civil protection, city council, twitter data, etc.
 - The city user may reject some of them, thus the suggestion engine learns about preferred topics and category



Profiled Engagements to City Users

- The user are profiled to learn habits:
 - Personal POI and paths
 - Mobility habits
- Information and engagements sent to the city users are programmed according to the user evolution to:
 - Stimulate virtuous habits
 - More sustainable habits
 - More healthy habits, etc.
 - Get feedbacks
 - Provide bonus and prices,
 - Send alerts,





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<http://www.disit.org>

To appear, the Virtual Assistant PAVAL



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DISIT - Km4City Semantic Service Search



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A quale servizio sei
interessato...?

Select Language: ITA ▼

Cosa vuoi fare? Dove?

Specificare Coordinate Utente
(opzionale):

Latitudine:

Longitudine:

Submit

Il servizio permette la ricerca tramite query in linguaggio naturale di servizi di interesse per l'utente nella provincia di Firenze, restituendo le aziende legate al tipo di servizio cercato attraverso interrogazione del repository semantico di [Km4City](#), piattaforma Smart City ideata, progettata e realizzata da [DISIT Lab](#) dell'Università di Firenze. Se l'utente accetta di inviare le coordinate relative alla sua posizione attuale, il sistema restituisce i risultati dei servizi considerati attinenti alla ricerca effettuata ordinati in base alla vicinanza con la posizione dell'utente stesso. In alternativa, e' possibile per l'utente specificare una coppia di coordinate negli appositi box; in questo caso, le coordinate inserite verranno prese come riferimento di posizione al posto delle coordinate di posizione rilevate. Se inoltre l'utente inserisce nella query di ricerca il riferimento geografico ad un luogo di interesse (via, comune, quartiere), i risultati restituiti saranno ordinati per vicinanza con tale destinazione e non piu' in base al riferimento posizionale dell'utente.

Esempi di domande:

Esempio 1: "Vorrei vedere un museo in centro"

Esempio 2: "Sono in Via di Novoli e voglio fare la manicure"

Esempio 3: "Mi fanno male i denti"

Esempio 4: "Voglio tagliarmi i capelli a Firenze"

<http://paval.disit.org/Paval/>

Sharing with other Cities

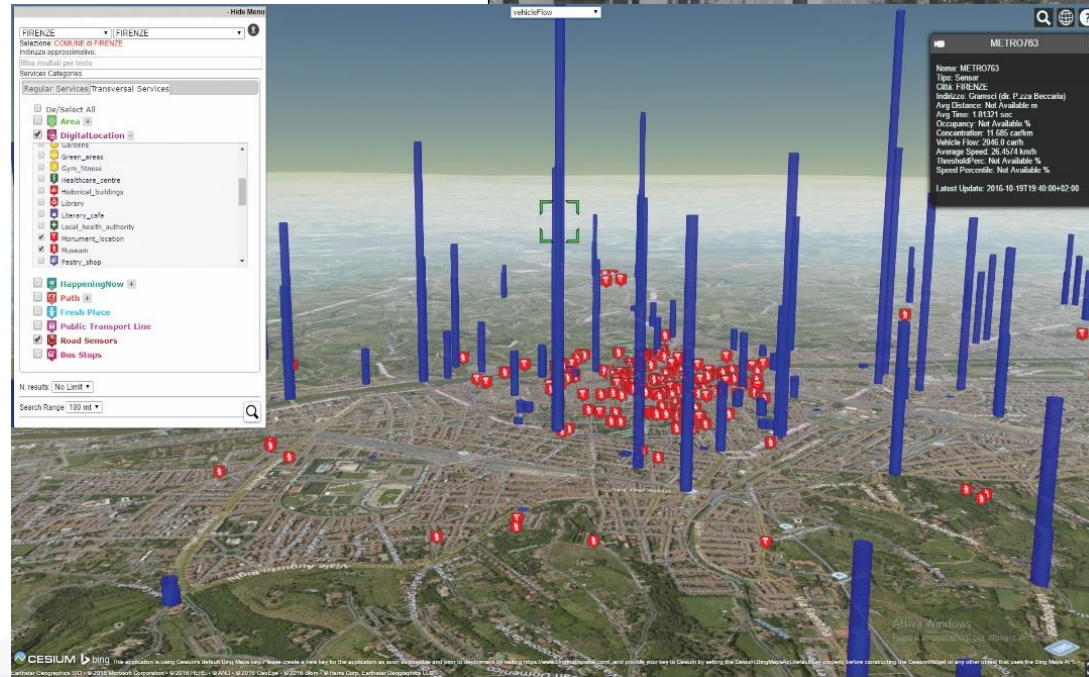
- Collaboration can be performed in terms of data, tools, Application, Apps, Dashboard, process, etc.
- **Machine to Machine connections** via
 - Sharing and gathering data via DataGate API, CKAN API
 - Reusing IOT from other cities via DataMapper
 - Sharing Dashboard models
 - Sharing Notifications, alerts...
 - **Exchanging knowledge with KB interconnection Smart InterCity API with Public/Private datasets/graphs**
 - See Tuscany ↔ Sardegna

Monitoring Traffic Flow and Parking

<http://www.km4city.org/?controlRoom>

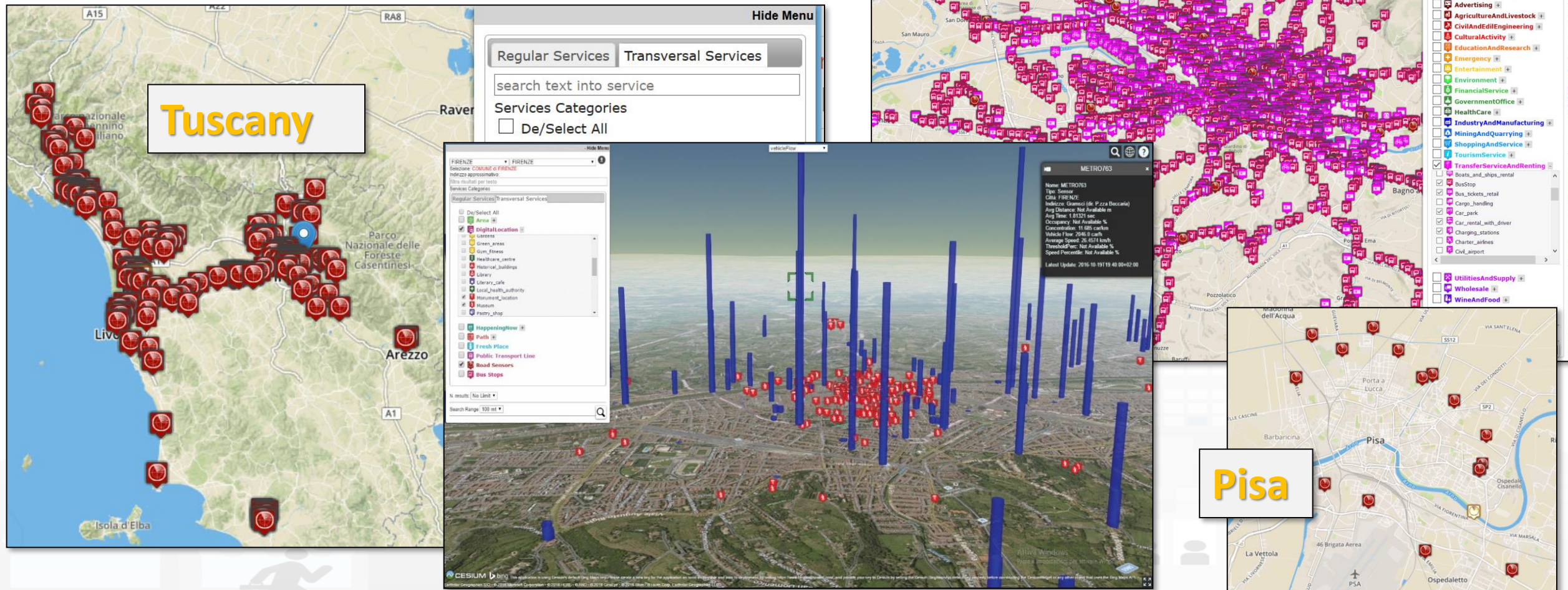


Traffic Flows

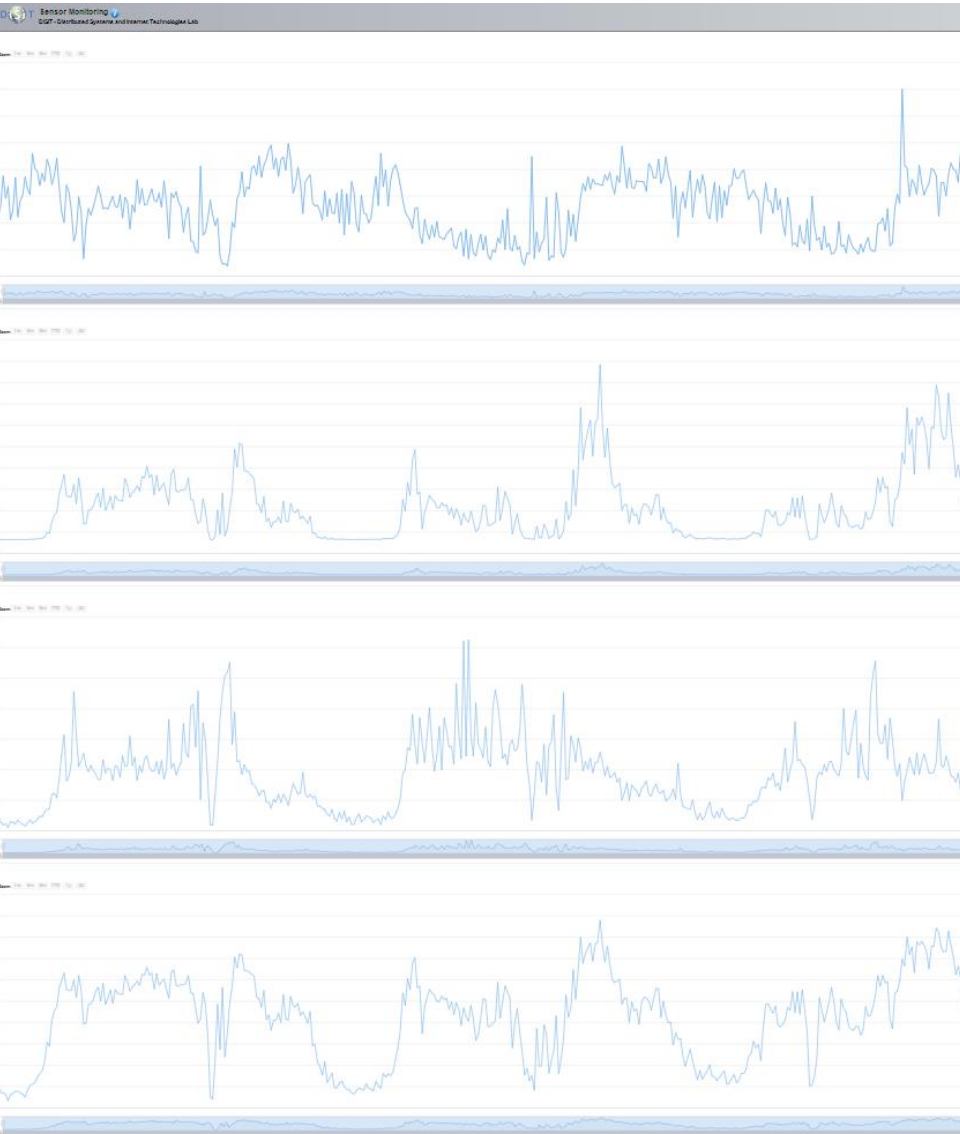


Traffic Flow Tools

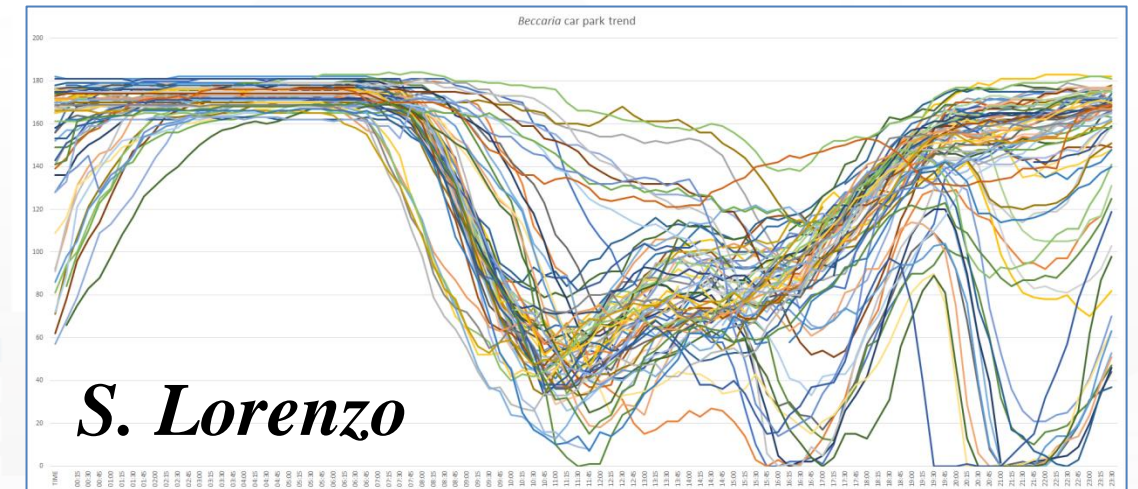
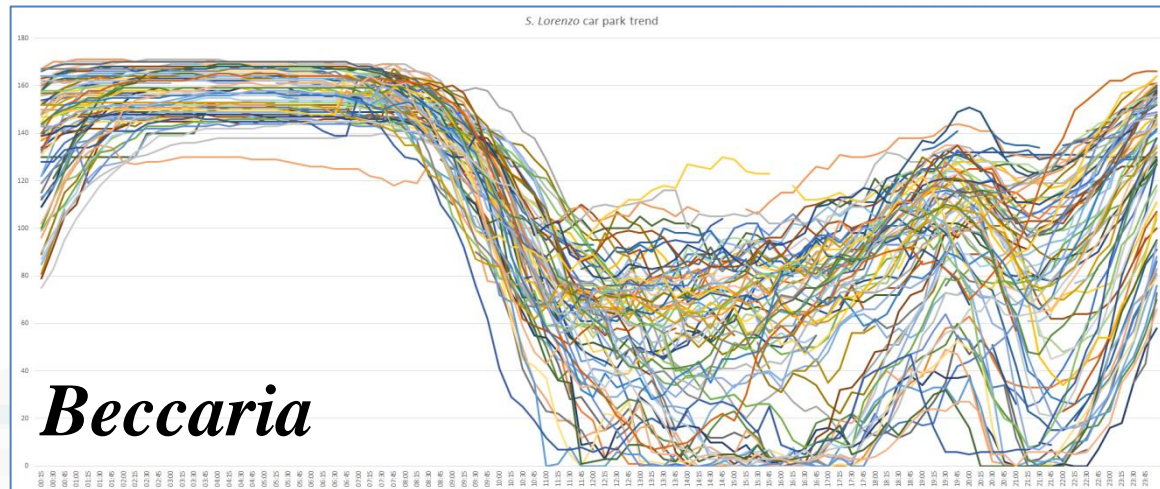
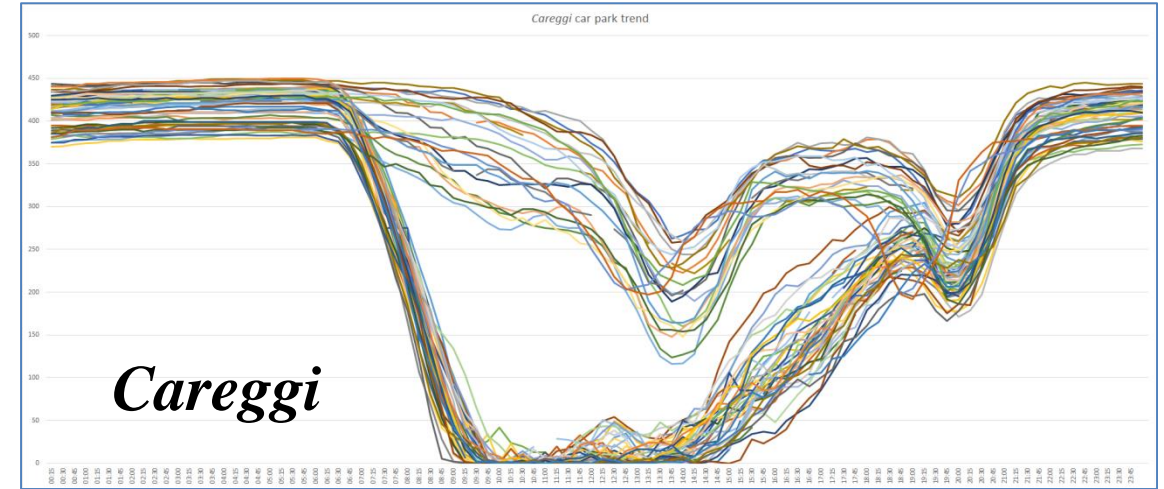
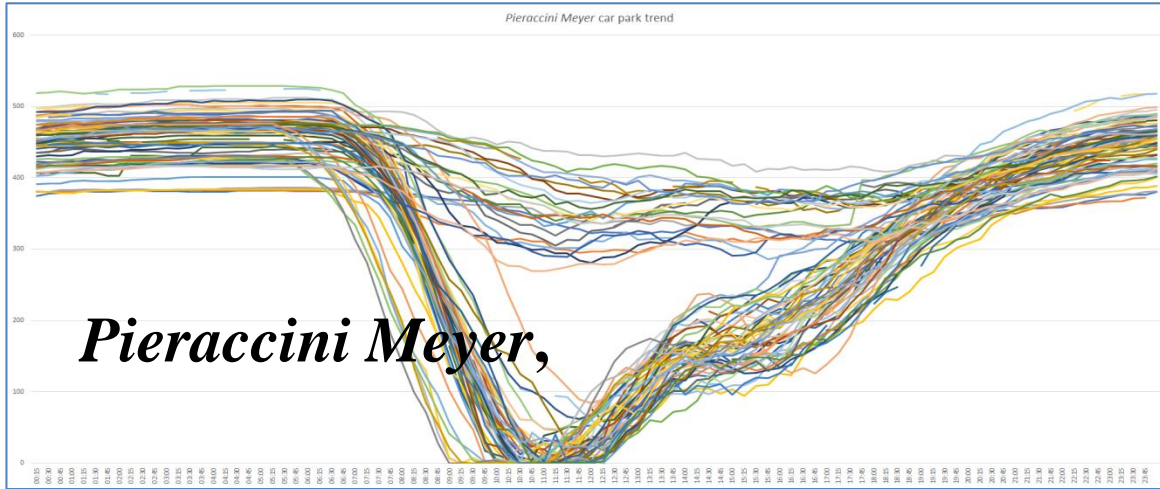
- Spire and Virtual Spires (cameras), Bluetooth, ..
- Specifically located: along, around, ..



Traffic Flow data



Free Parking space trends



Free Parking PREDICTIONS



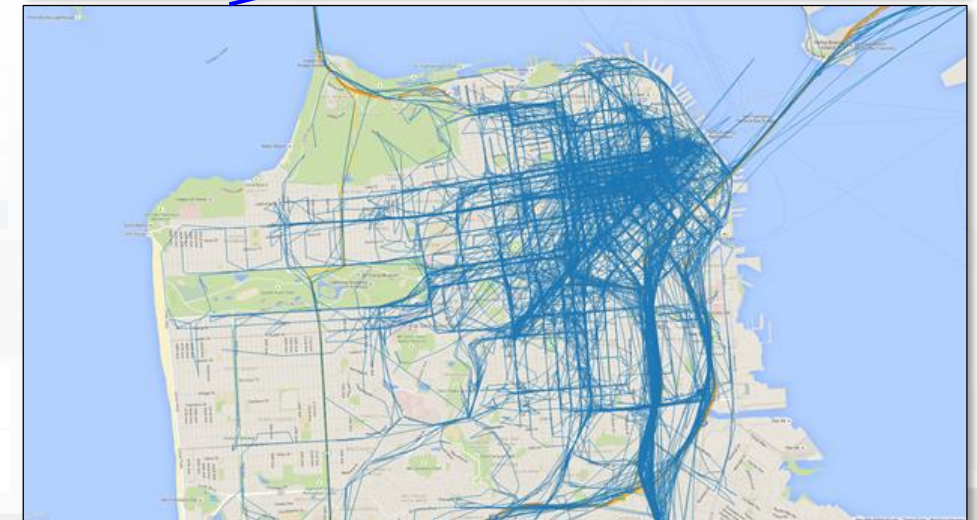
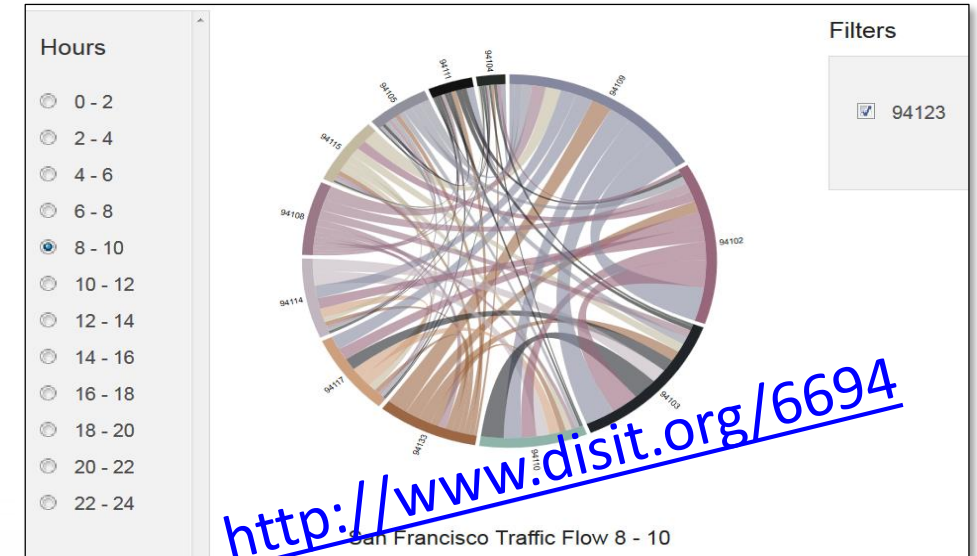
Careggi car park			
Model features	BRNN model results		
	R-squared	RMSE	MASE
Baseline	0.974	24	1.87
Baseline + Weather	0.975	24	1.75
Baseline + Traffic sensors	0.975	24	2.04
Baseline + Weather + Traffic sensors	0.975	24	1.87

- Active on Apps
 - «Firenze dove cosa»
 - «Toscana dove cosa»



Traffic and People Flow Assessment

- **Origin Destination Matrix**
 - Specific Sensors, vehicle Kits, mobile App, Wi-Fi Access Points, etc.
- **Assess people and traffic flows to**
 - improve services
 - predict critical conditions on Crit. Infra.
 - take real time decisions and sending messages in push to population
 - Increase city resilience
 - optimize traffic flow
 - take decision of routing



Monitoring City users Via Wi-Fi

<http://www.km4city.org/?controlRoom>

<http://www.km4city.org/?devTools>

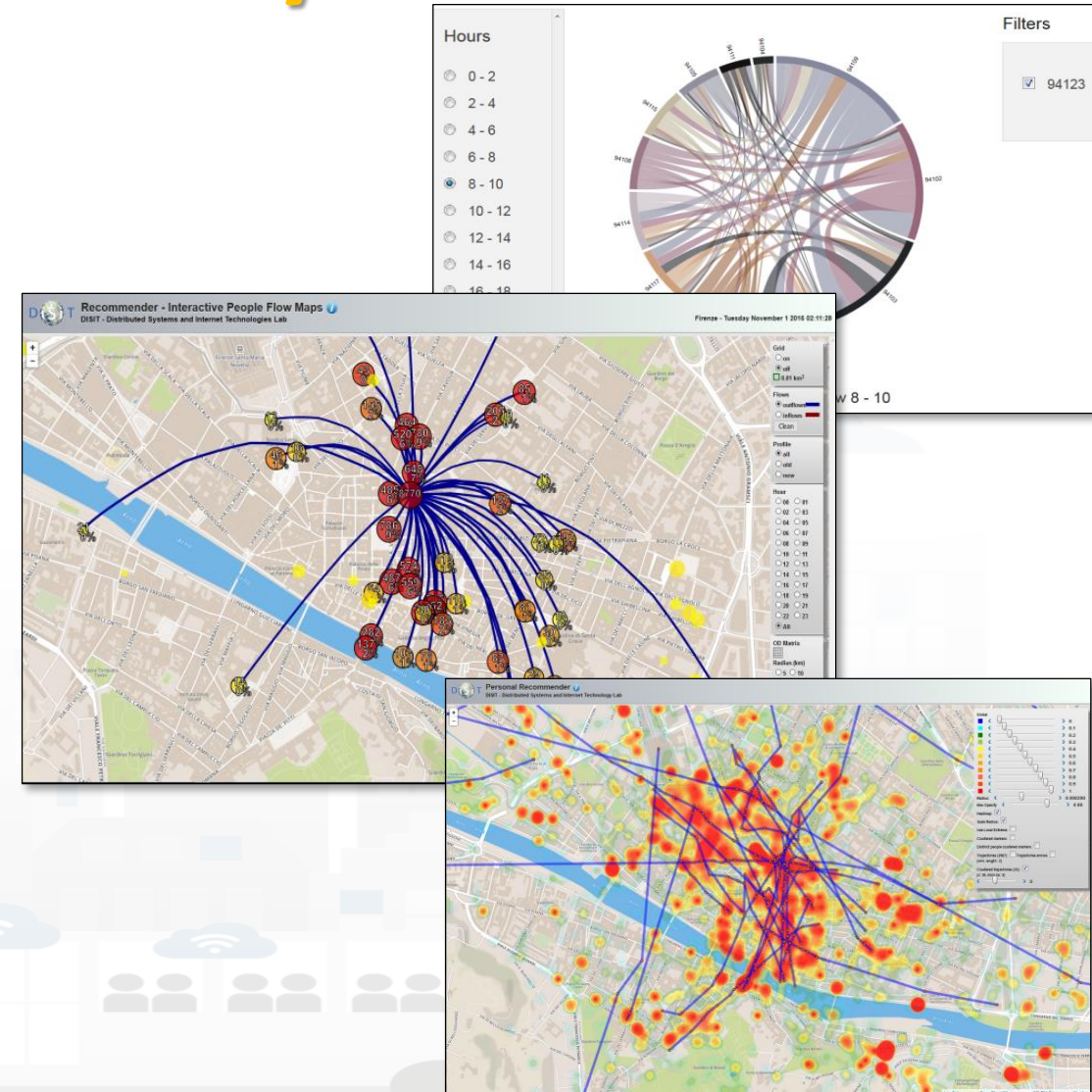
<http://www.km4city.org/?infoDocs>

<http://www.km4city.org/?app>



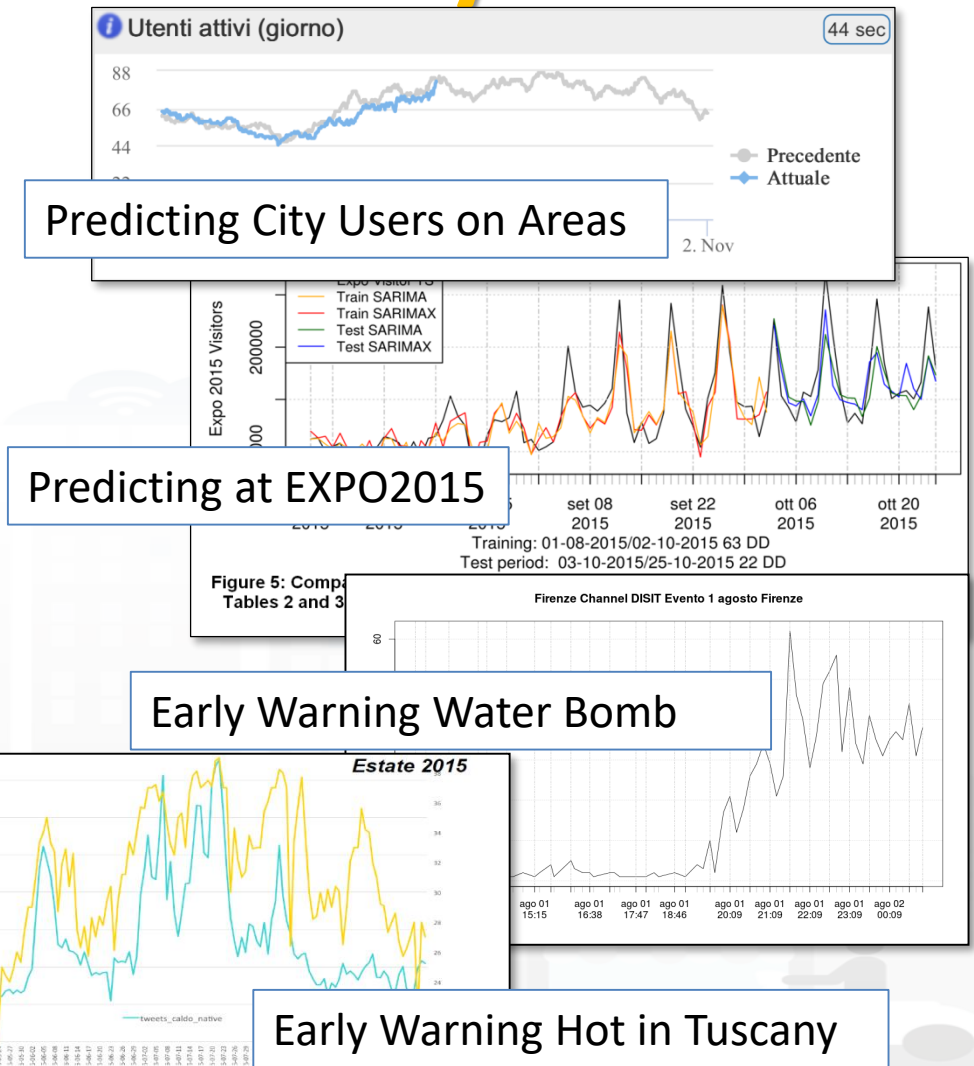
User Behaviour Analysis

- **Monitoring movements by traffic flow sensors**
 - Spires and virtual spires
- **Monitoring movements from Mobile Cells**
 - Unsuitable for precise tracking and OD production
- **Monitoring movements from Wi-Fi**
- **Monitoring movements and much more from mobile Apps**

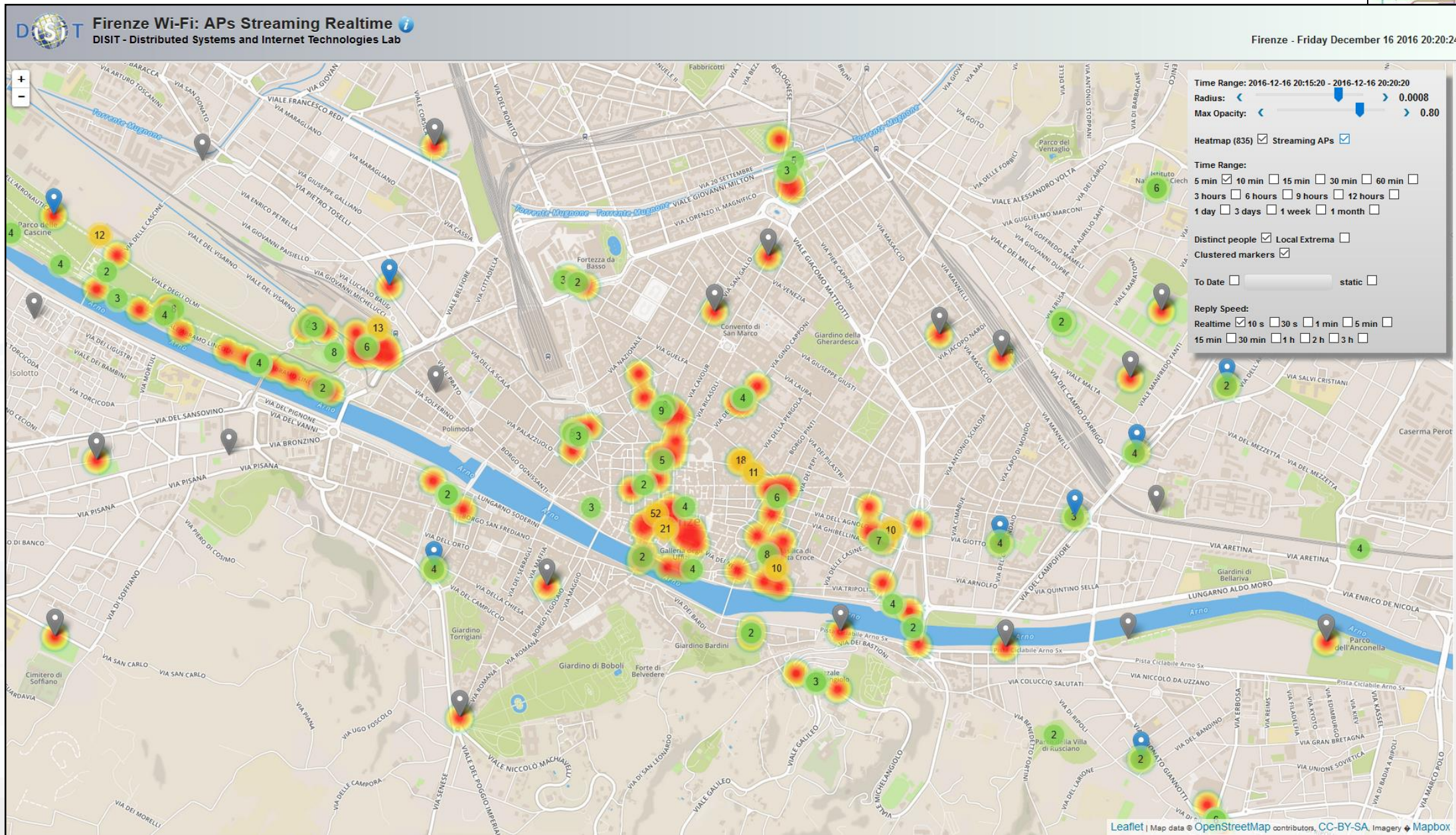


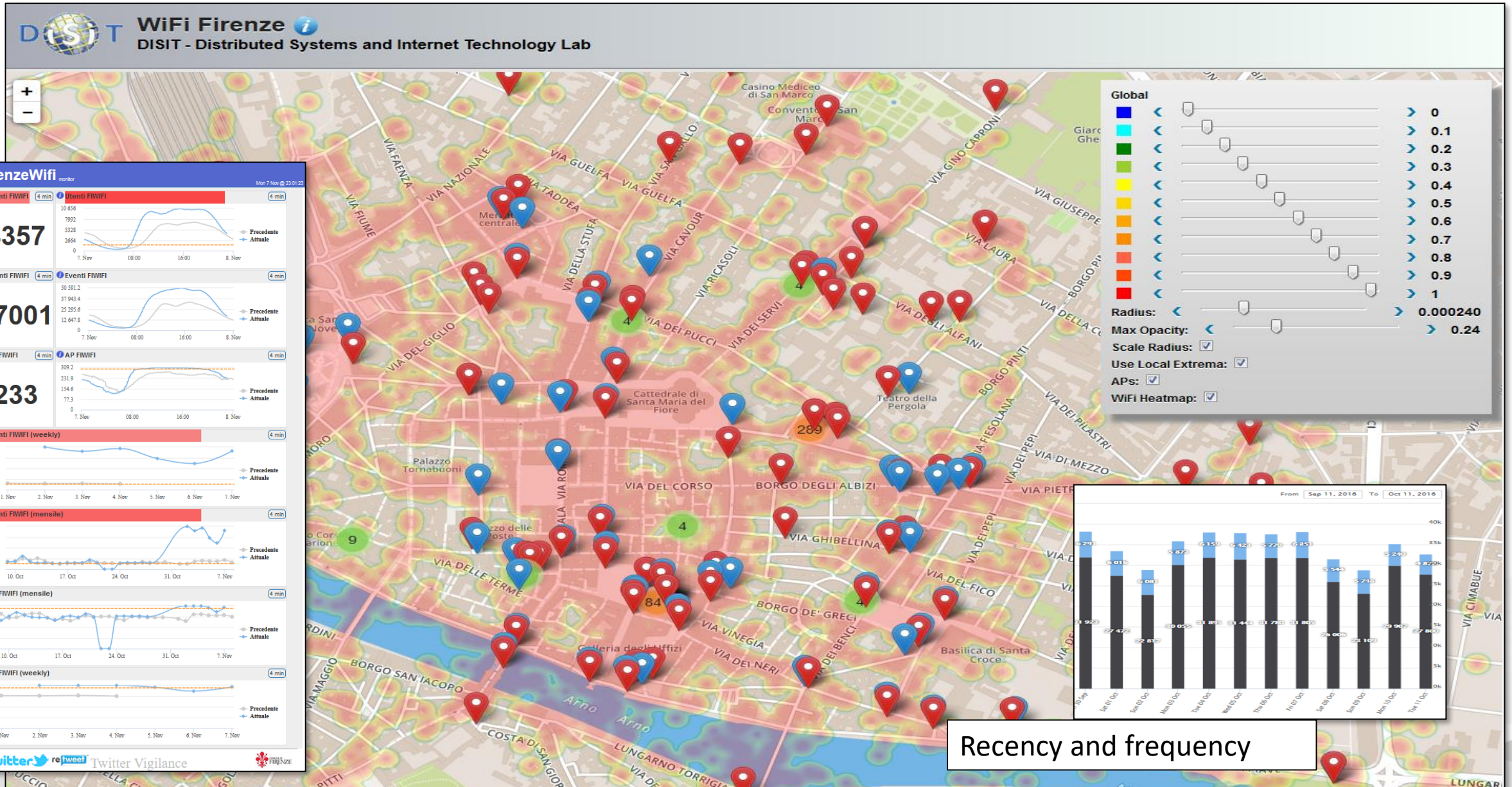
Predicting Models for Admin. & City Users

- **Aiming at improving**
 - quality of service, distributing workload
 - early warning
- **Predictions: Short (15 min, 30 Min) and mid Term (1 week)**
- **Data Analytics: ML, NLP/SA, Clust...**
 - Traffic Flows → multiflow reconstruction
 - Parking Status → free slots
 - People Flows (WiFi, Twitter) → crowd , #number of people

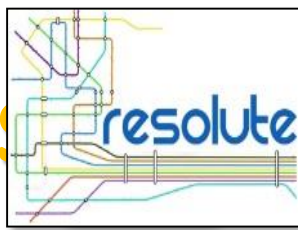


Real Time Monitoring of Wi-Fi network





User Behavior Analysis



Distinct APs: 343

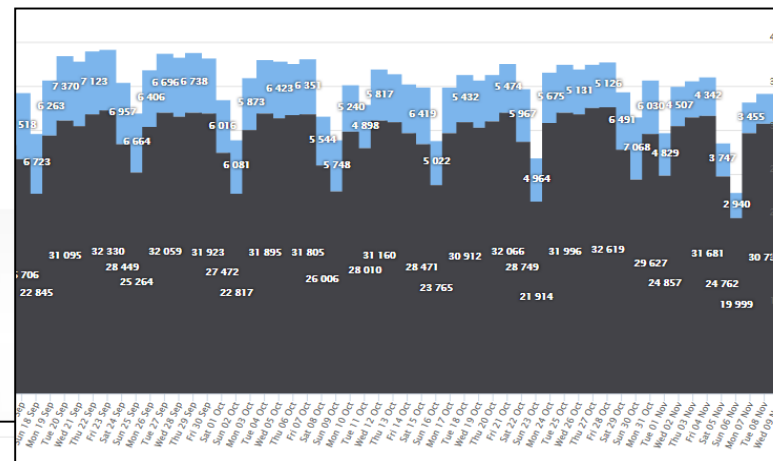
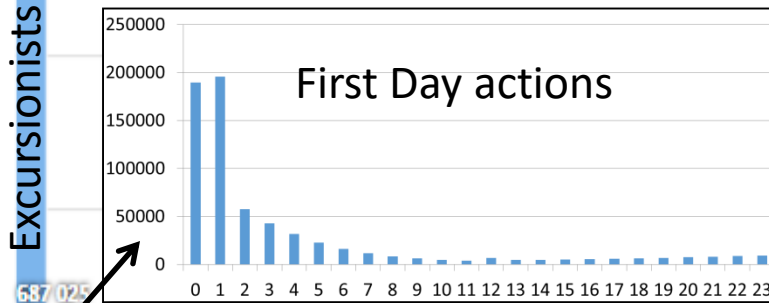
Distinct APs (last 24 hours): 311

Distinct Users (last 180 days): 1102098

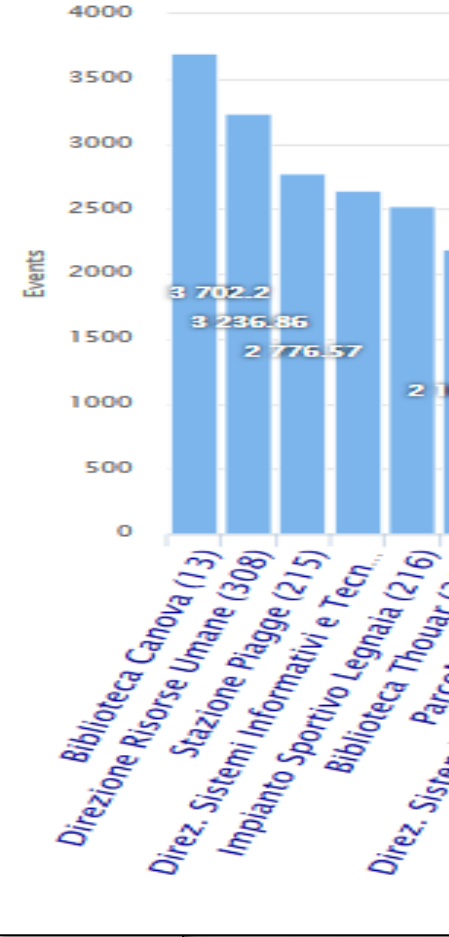
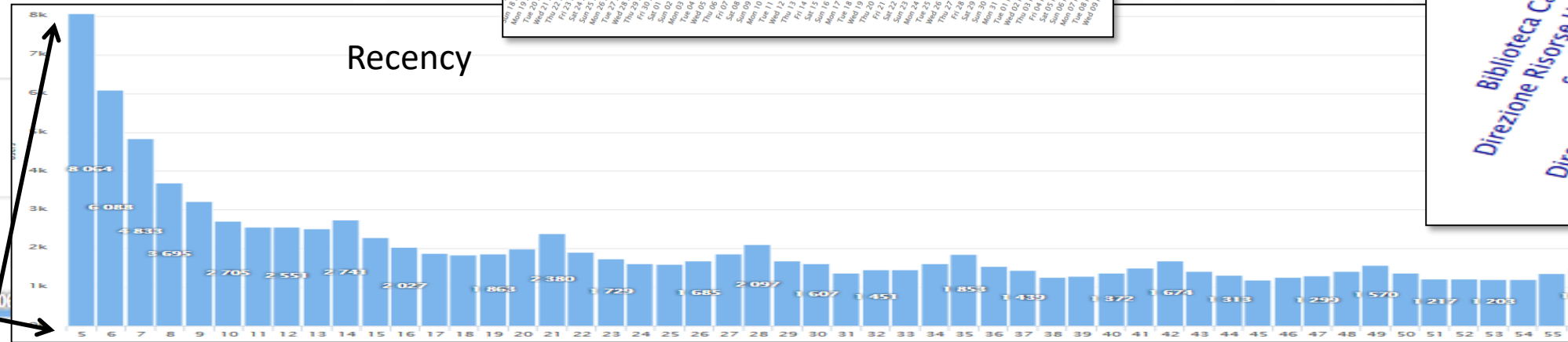
Distinct Excursionists (last 180 days, < 24 h): 687025

When

Excursionists



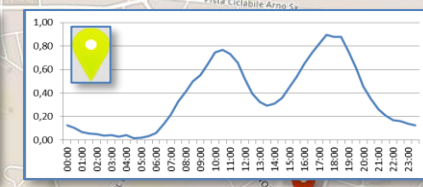
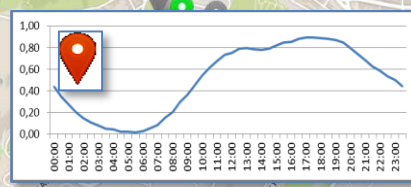
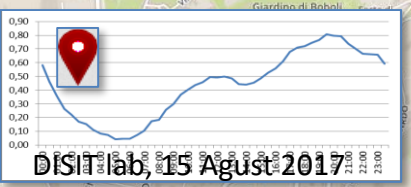
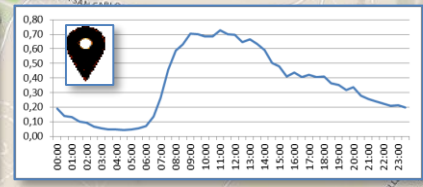
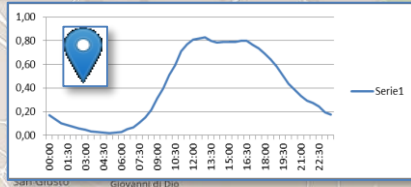
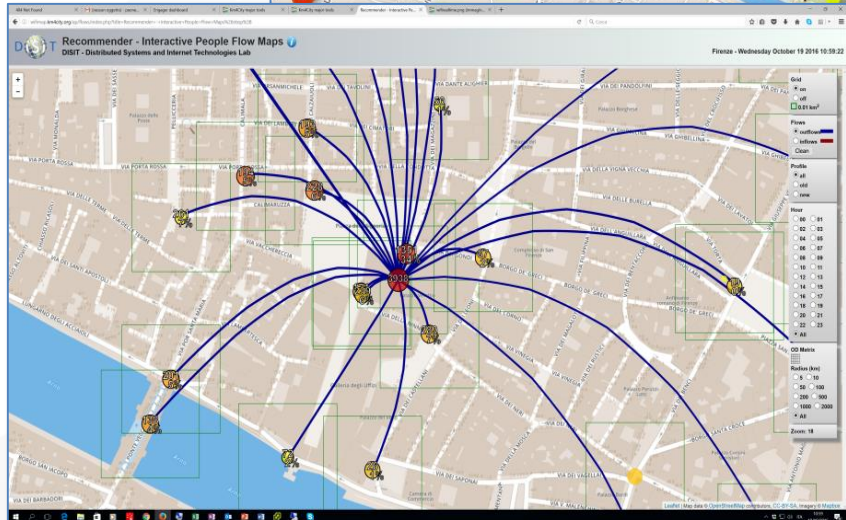
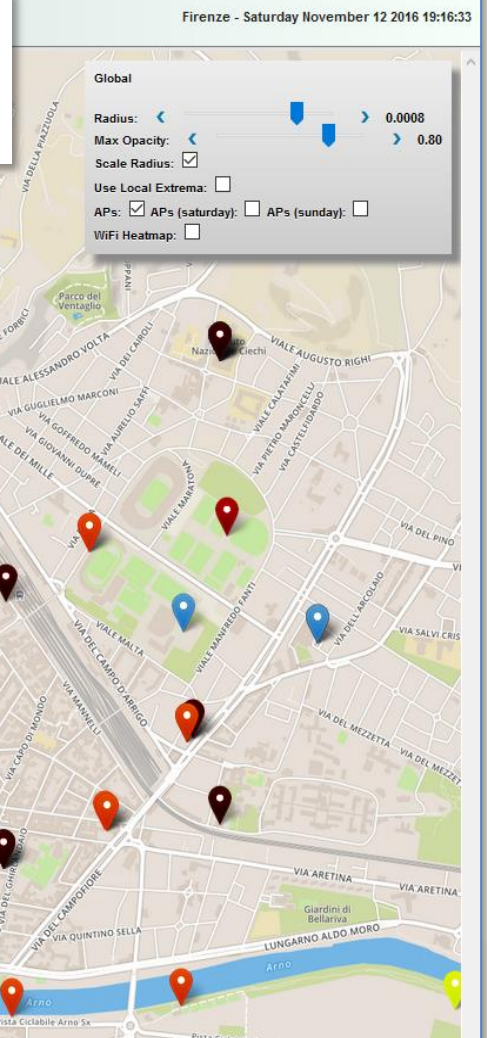
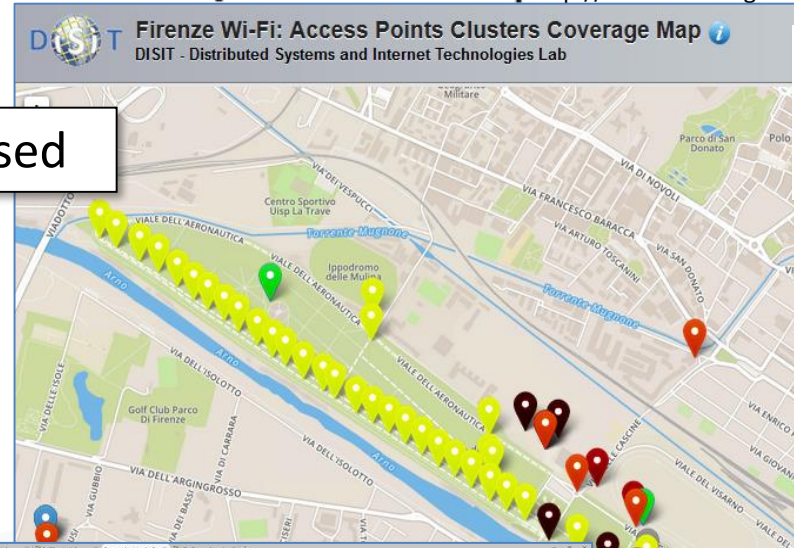
Recency



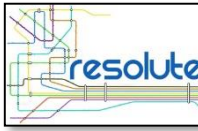
Characterizing City Areas

Wi-Fi based

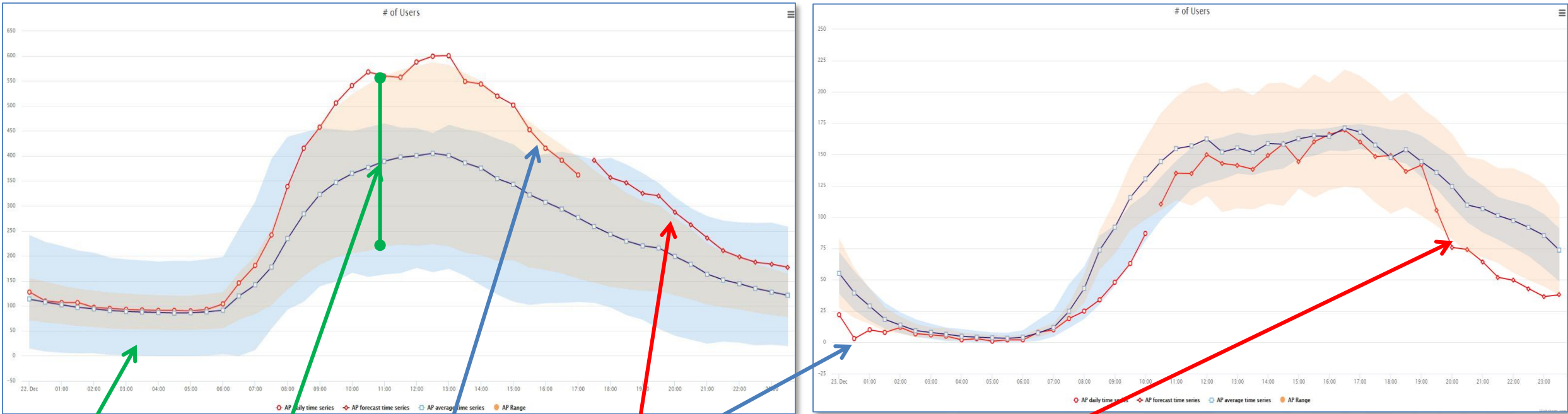
Predicting City Areas Crowd level
characterizing Users' Behaviors



Prediction and identification of anomalies



Guessing number of users of Wi-Fi Access Points



Cluster confidence

AP average and confidence

Actual AP trend for today

AP prediction for the next time slot in the day on the basis of past weeks

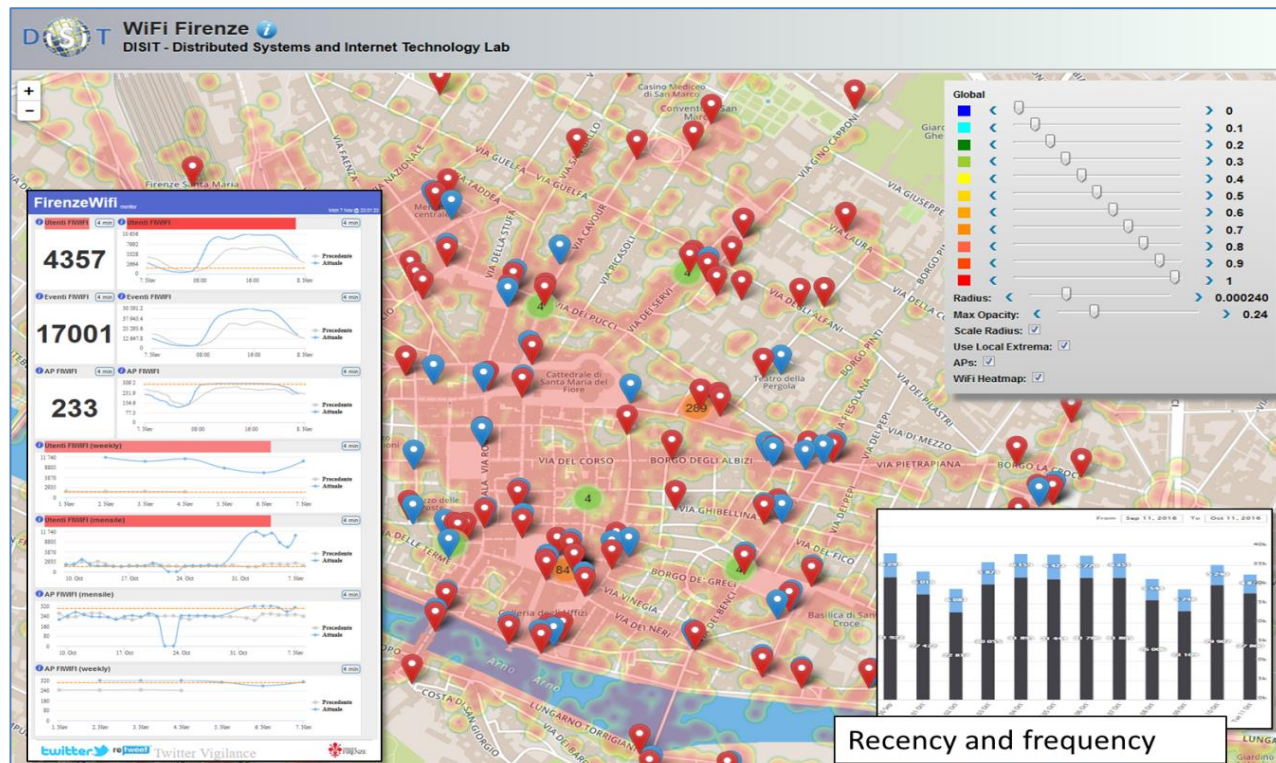
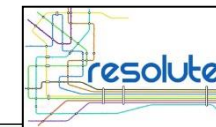


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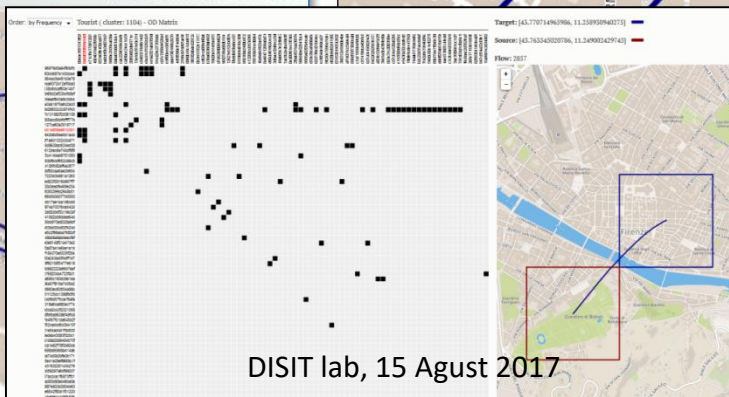
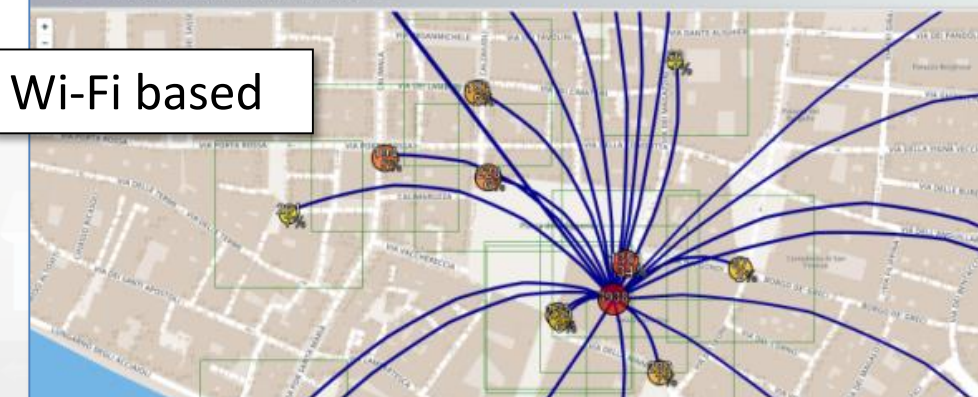
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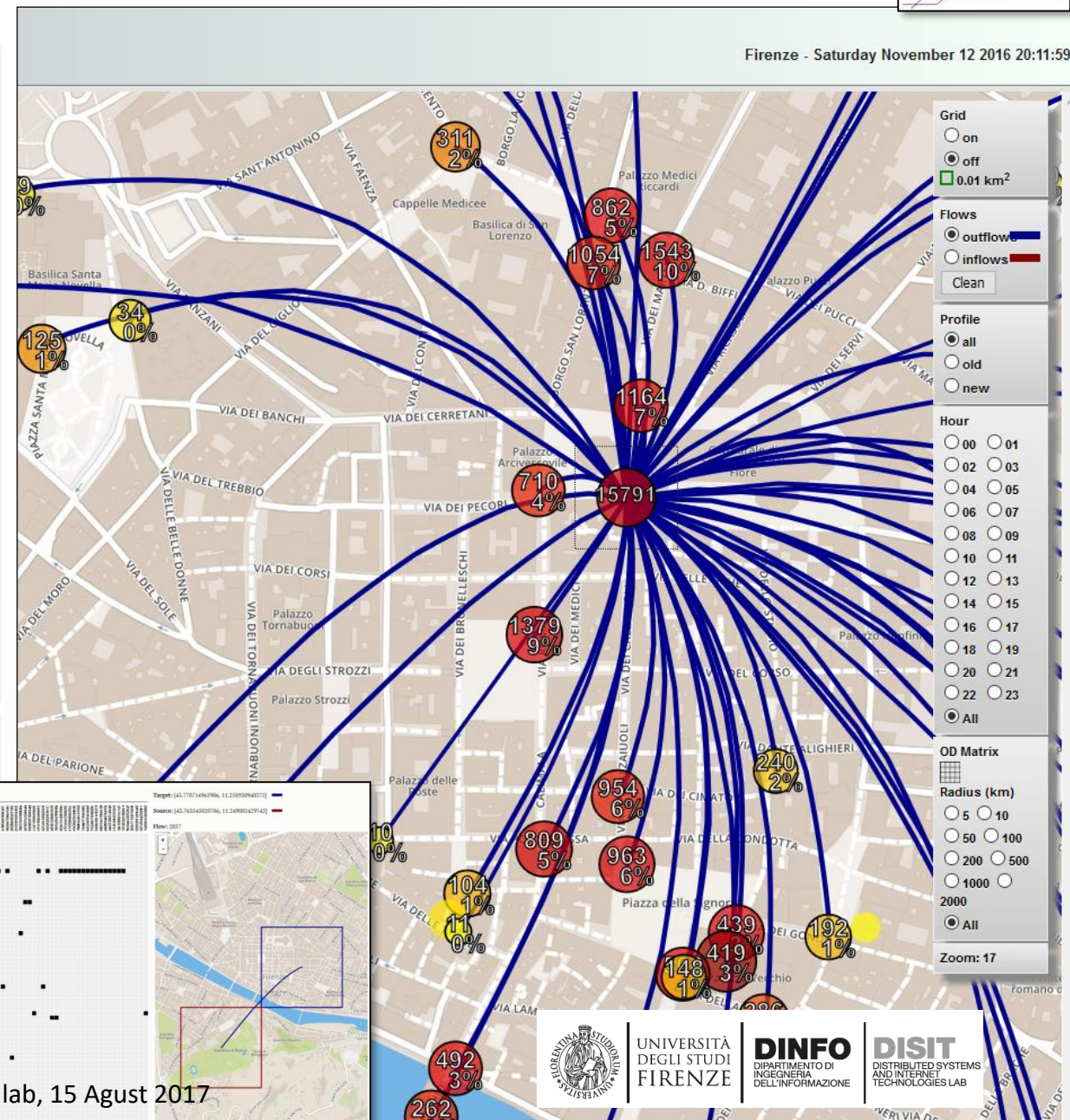
Origin Destination Matrix Estimation



Wi-Fi based



DISIT lab, 15 August 2017



Engaging Users via Mobile App

<http://www.km4city.org/?controlRoom>

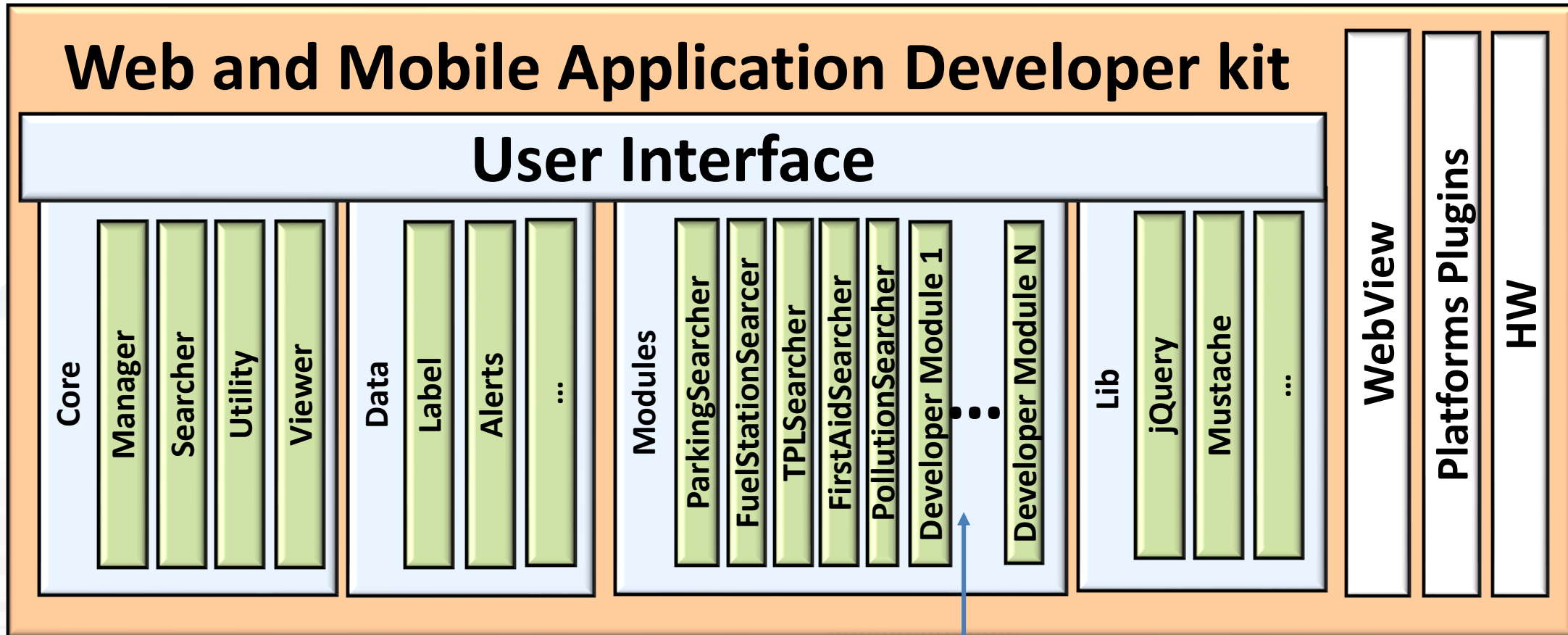
<http://www.km4city.org/?devTools>

<http://www.km4city.org/?infoDocs>

<http://www.km4city.org/?app>



Web and Mobile App. Development Kit



Developers



- **Exploiting Km4City Smart City API**
 - Open Source
 - Multiplatform: exploiting Apache Cordova Framework
 - Active since 2015
 - Adopted by a community of several Projects, Cities and SME.
- **Respecting user privacy:**
 - Anonymous usage vs Authenticated usage (OAuth, email, ..)
- **Modular & Dynamic:**
 - loading new modules from the WEB, and/or creating App by modular approach
- **Personalization and Profiling:**
 - personalized menu, proposed POI for search,
- **Reaching City Users:**
 - alerting and notifications by location, by user behaviour



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Km4CityMobile App



web application
<http://www.km4city.org>

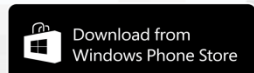
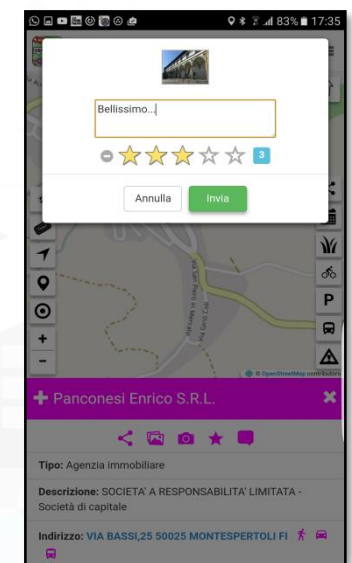
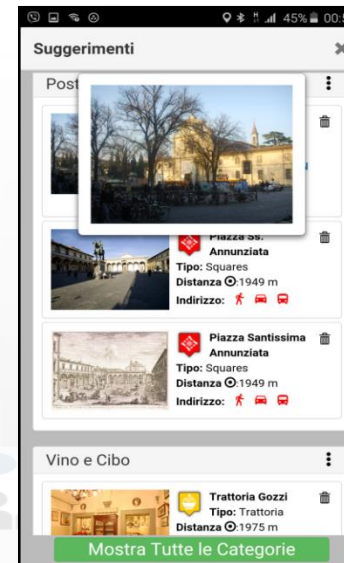
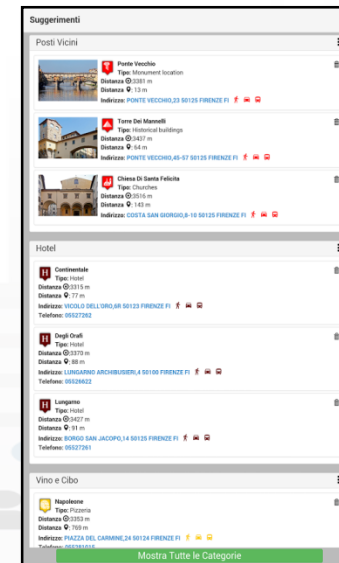
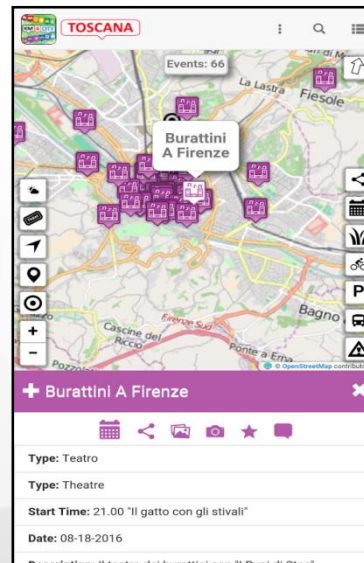
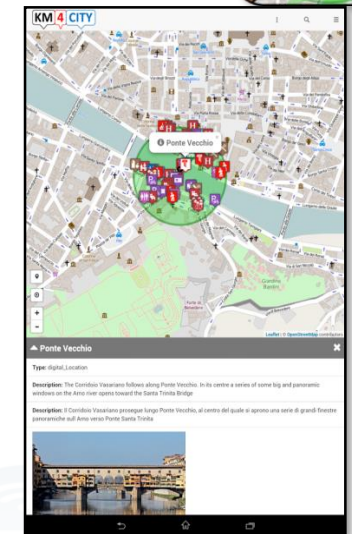
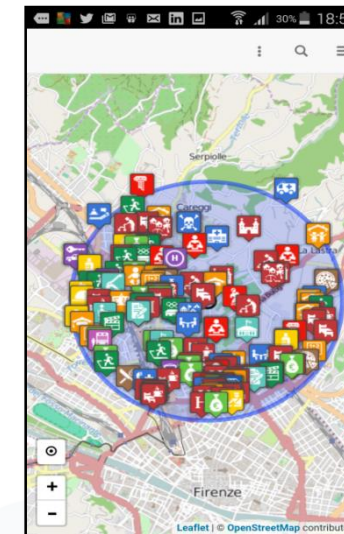
The collage displays various app interfaces. On the left, a 'What do you want to do?' menu lists services like Public transport, Bus Ticket, Car Park, Events, Suggestions Near You, Weather, Assistant, Navigator, Favourites, Chronology, Latest Reviews, Alert Civil Prot., Settings, Vote APP!, Information, and About Us. Below this is a Windows-style interface with tiles for Calendar, Posta, Netflix, Microsoft Edge, Roma, Firenze, Xbox, Antepima Sk..., Tuneln Radio, Twitter, and SODA. In the center, a 'Giardino Di Boboli' location page shows a list of services (Accommodation, Advertising, Agriculture And Livestock, Civil And Edil Engineering, Cultural Activity, Education And Research, Emergency, Entertainment, Environment, Financial Service, Government Office, Health Care, Industry And Manufacturing, Mining And Quarrying, Shopping And Service, Tourism Service, Transfer Service And Renting) and a description of the garden. To the right, a map view shows various location markers. At the bottom right, a 'Suggerimenti' (Suggestions) section lists places like Piazza SS. Annunziata and Piazza Santissima Annunziata. A QR code is located at the bottom center, with a 'FIRENZE' label. Below the QR code are logos for Google Play, App Store, and Windows Store.

DISIT lab, 15 August 2017

Km4City APP, features 1/3



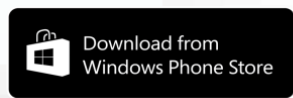
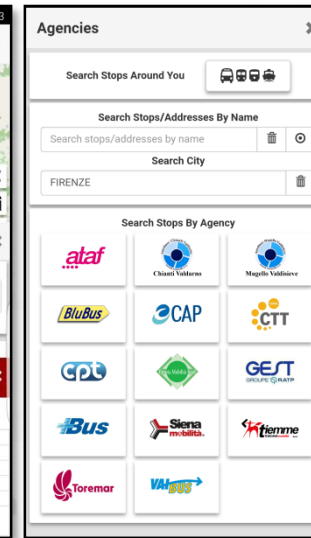
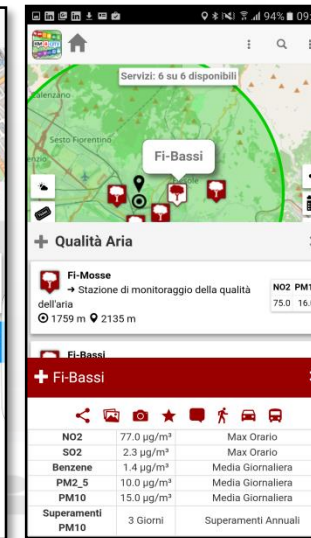
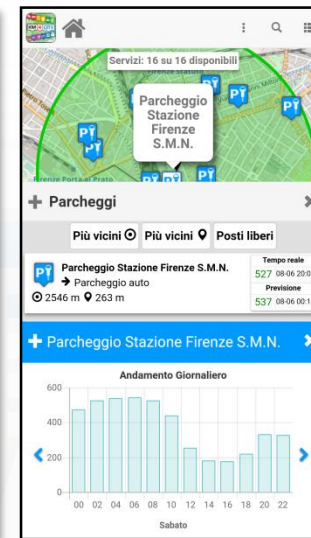
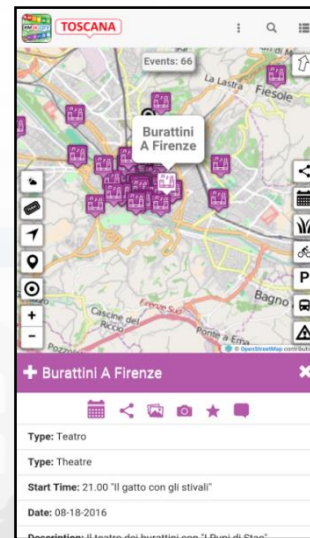
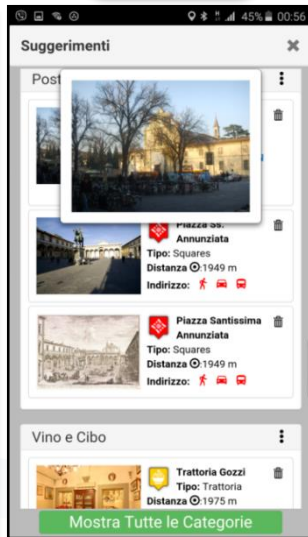
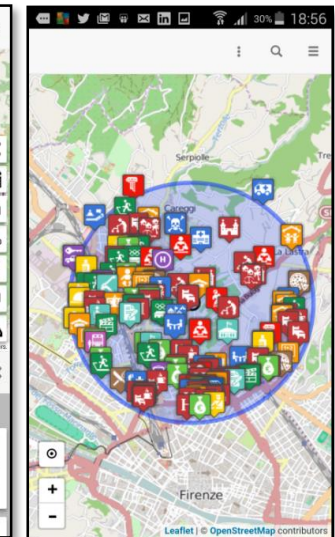
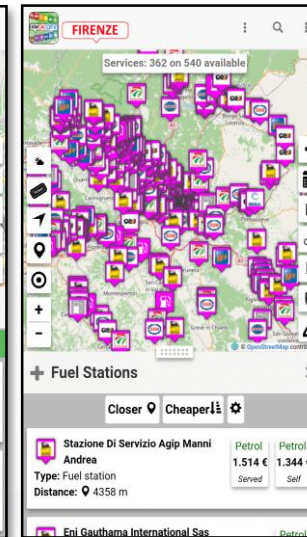
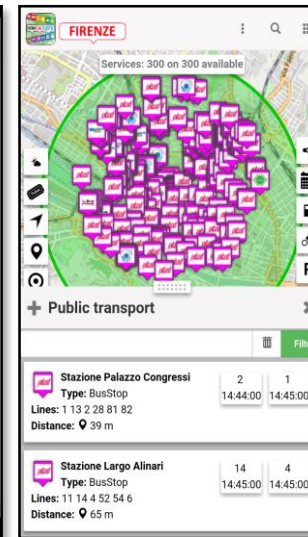
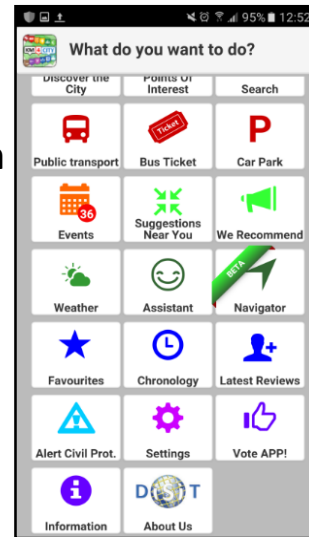
- **5 languages:** IT, EN, SP, DE, FR
- **Profiles** city users: Citizens, commuter, student, tourist, operator, etc..
- **Profiled Menu** per POI
 - adaptive
- **Main Menu: dynamic, and personalized**
- **Search Text**
- **Search per POI**
 - Near to you, near to a point, line...
- **Other search**
 - Close to you, events green areas, public transport, tickets, Cycling, parking,
 - Etc.
- **POI**
 - Preferred, Social icon
 - Ranking, Comments, images



Km4City APP



- Smart Parking, in Tuscany
- Smart First Aid in Tuscany
- Smart Public Transportation in Tuscany
- Smart Fuel pricing in Tuscany
- Bike Sharing in Pisa
- Weather condition in Tuscany
- Pollution and Pollination in Tuscany
- Traffic Sensors in Tuscany
- Smart Routing in Tuscany
- Smart Transportation in Florence
 - Events, traffic, ...
- Entertainment Events in Florence



Km4City APP



- **Mobility**

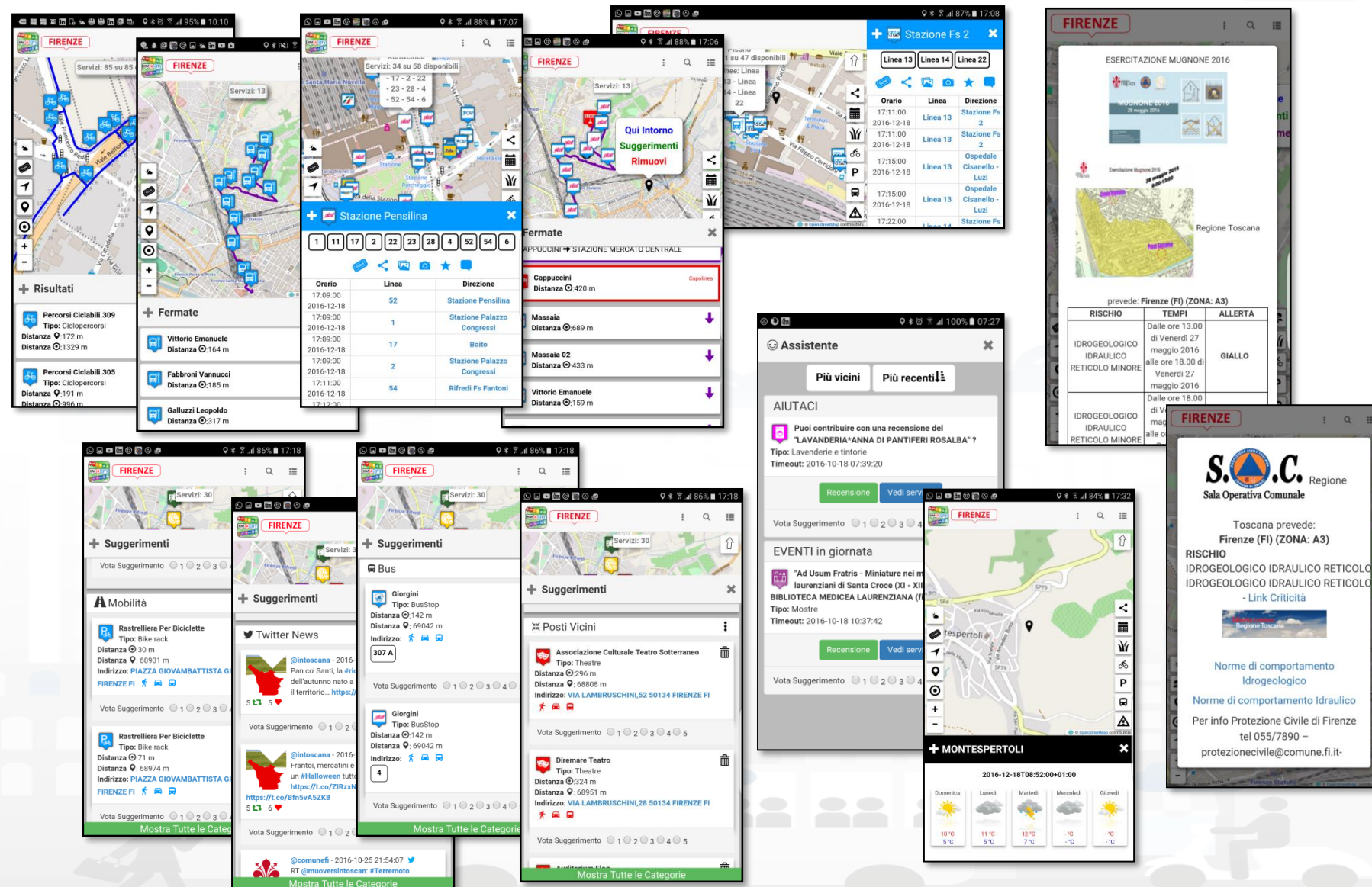
- Paths and stops, time
- Parking + prediction
- Ticketing
- Flow + prediction
- Navigation
- Connection with devices
- XXX Sharing

- **Personal Assistant**

- Info, Engagement
- Help, Civil protection

- **Suggestions:**

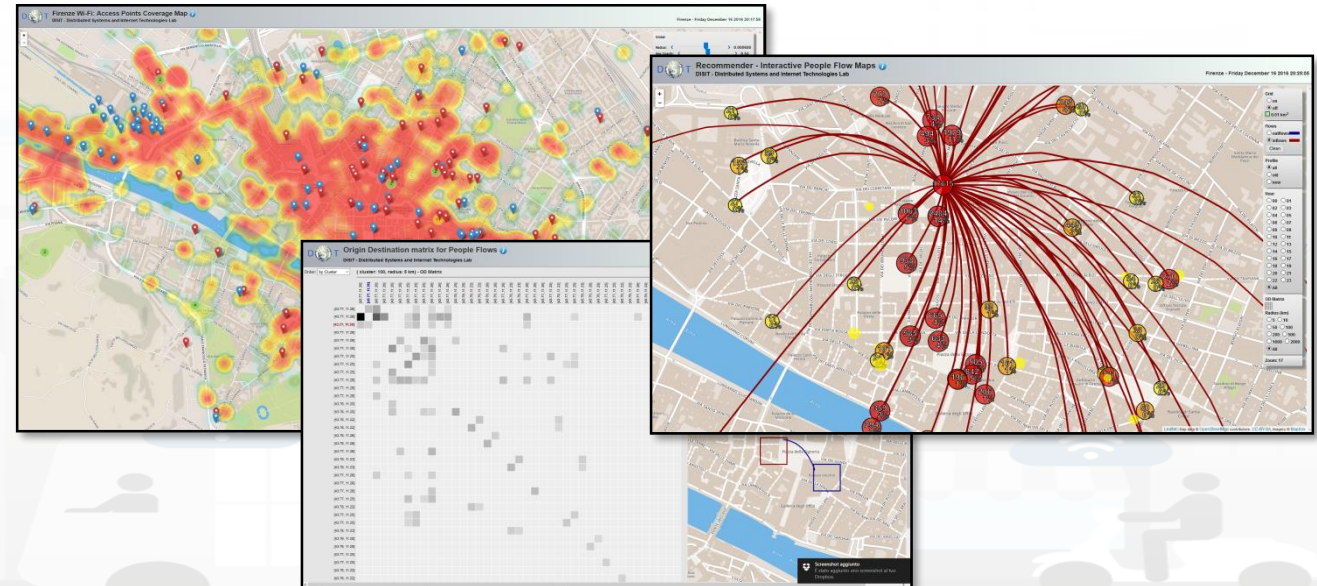
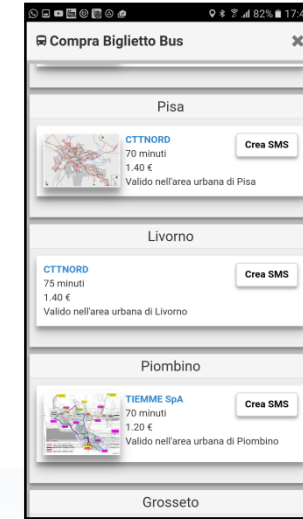
- Personalized and adaptive: banned e typed per city user.
- POI, Twitter, Events,
- Weather forecast,
- Civil Protection



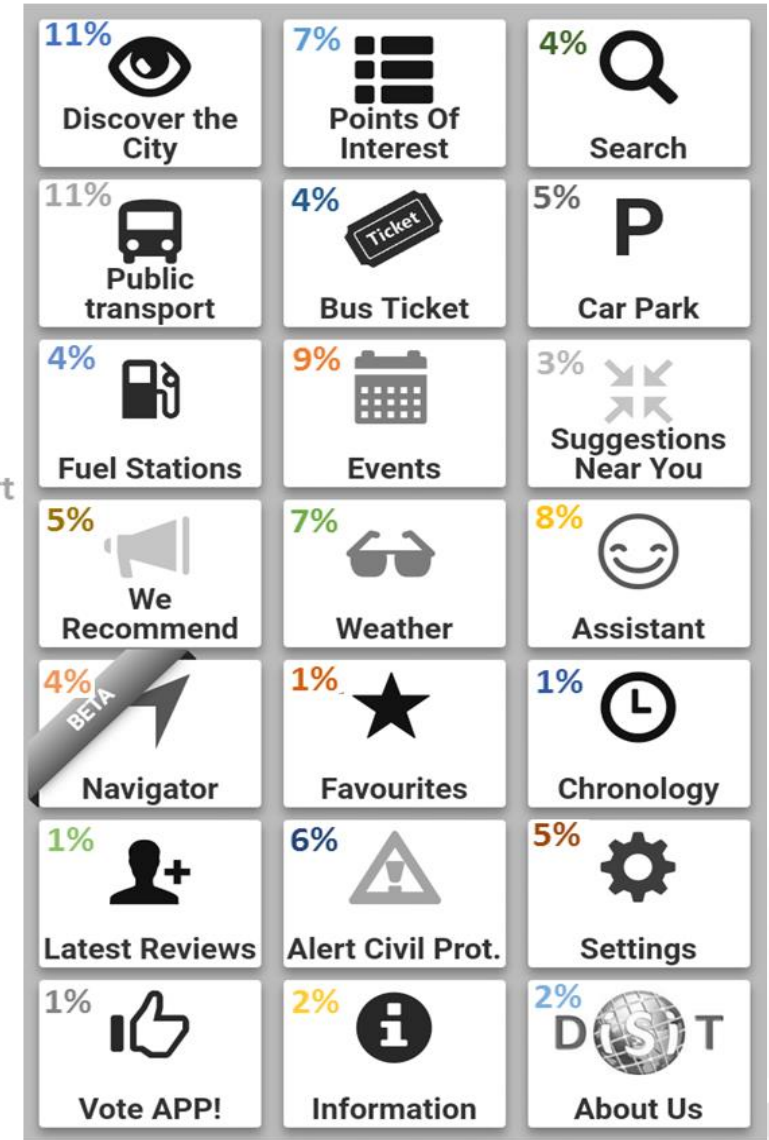
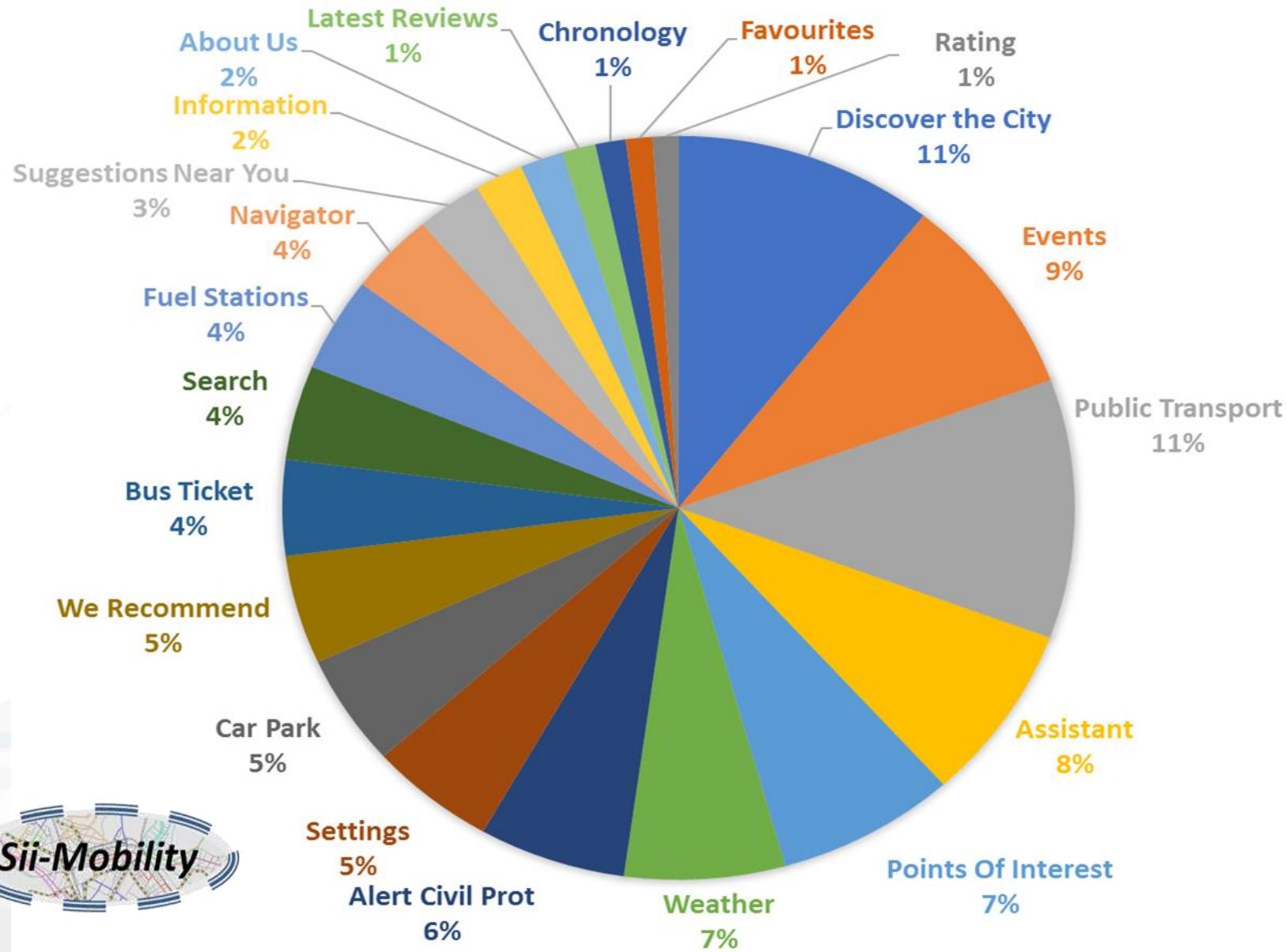
Km4City APP, features 3/3



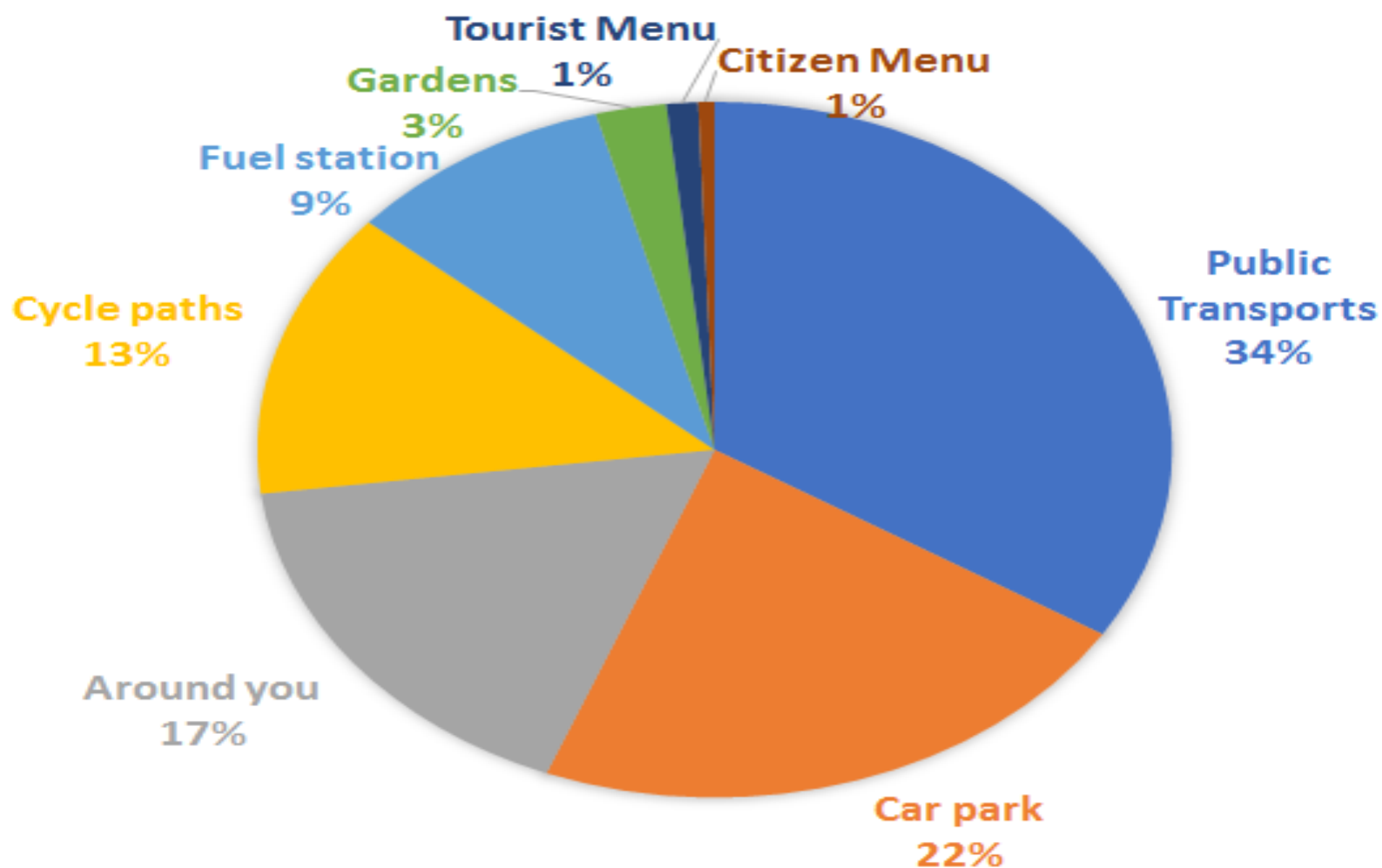
- Navigation 3D (BETA)
- Ticketing for busses
- App used as tool for city assessment
 - Wifi status
 - iBeacon status
 - User behavior analysis
 - GPS movements kinds
 - OD matrix
 - International flows



Usage of the main Menu

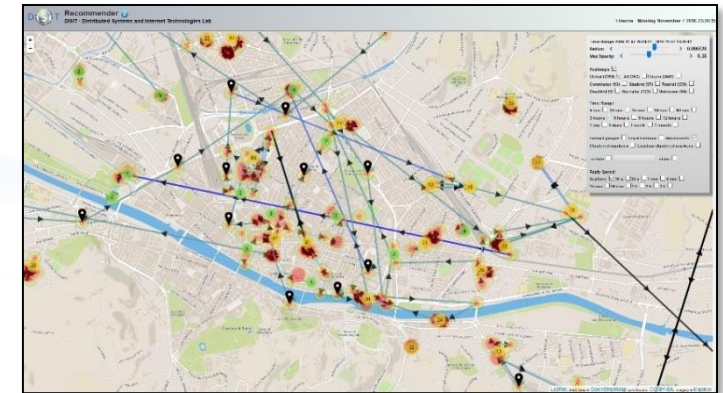
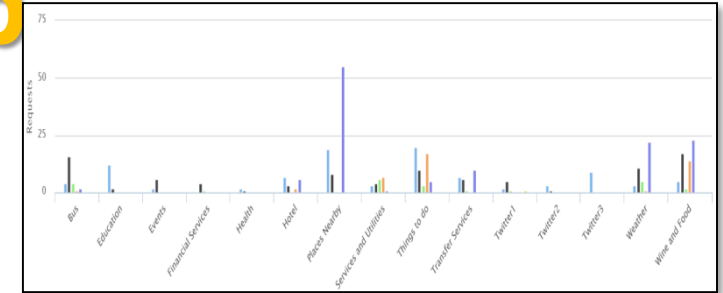


The most searches categories



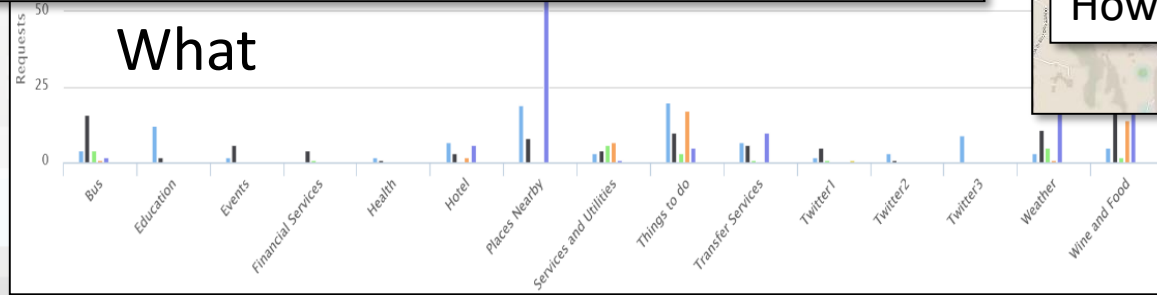
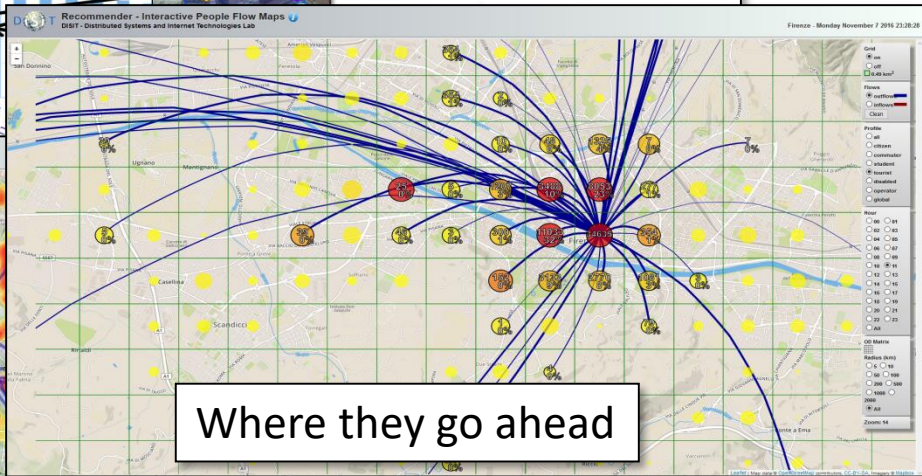
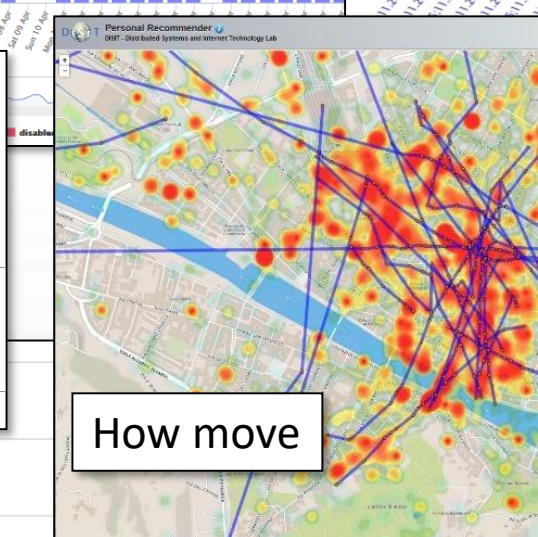
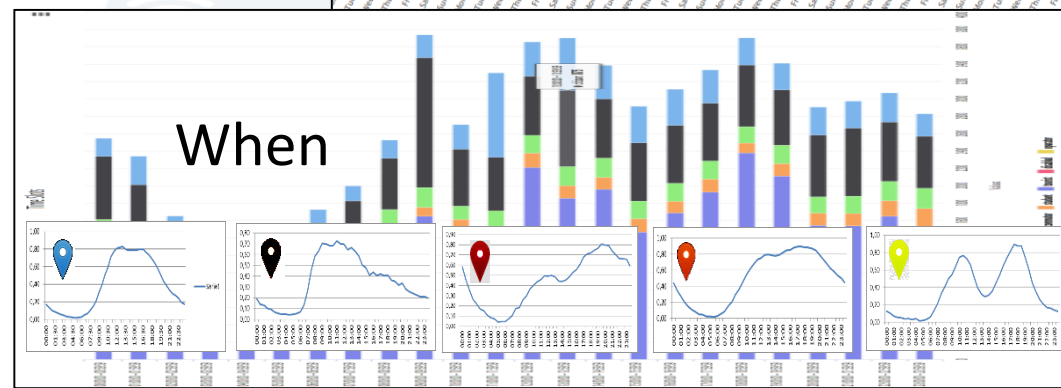
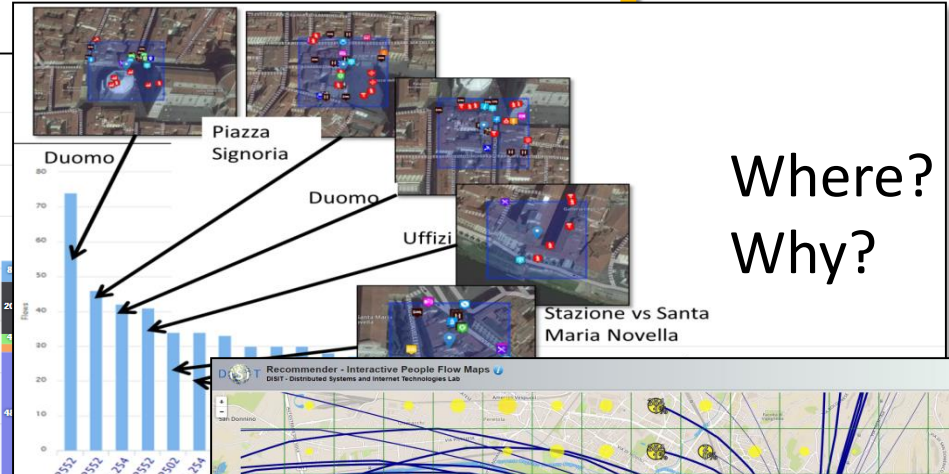
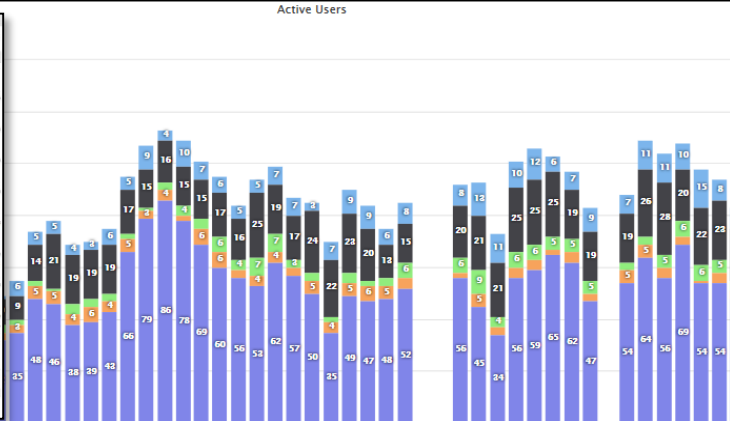
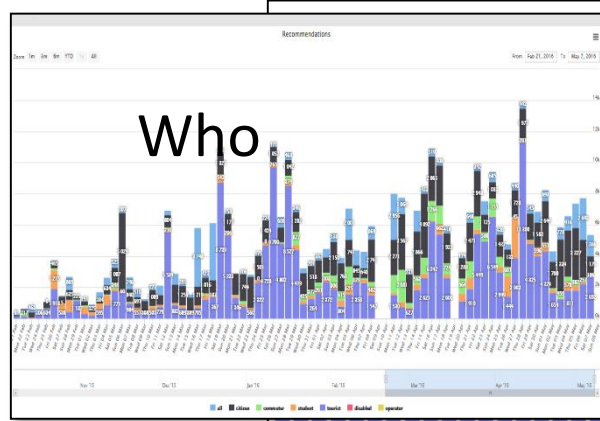
Reasoning on App Data and for App

- **Suggestions....**
 - ML, clustering..
- **Engagements....**
 - Rules systems, ML, city strategies
- **User behavior analysis**
 - *Reconstruction of user behavior on the move and in the city in general*
 - *Pedestrian, TPL, Bike, private, etc.*

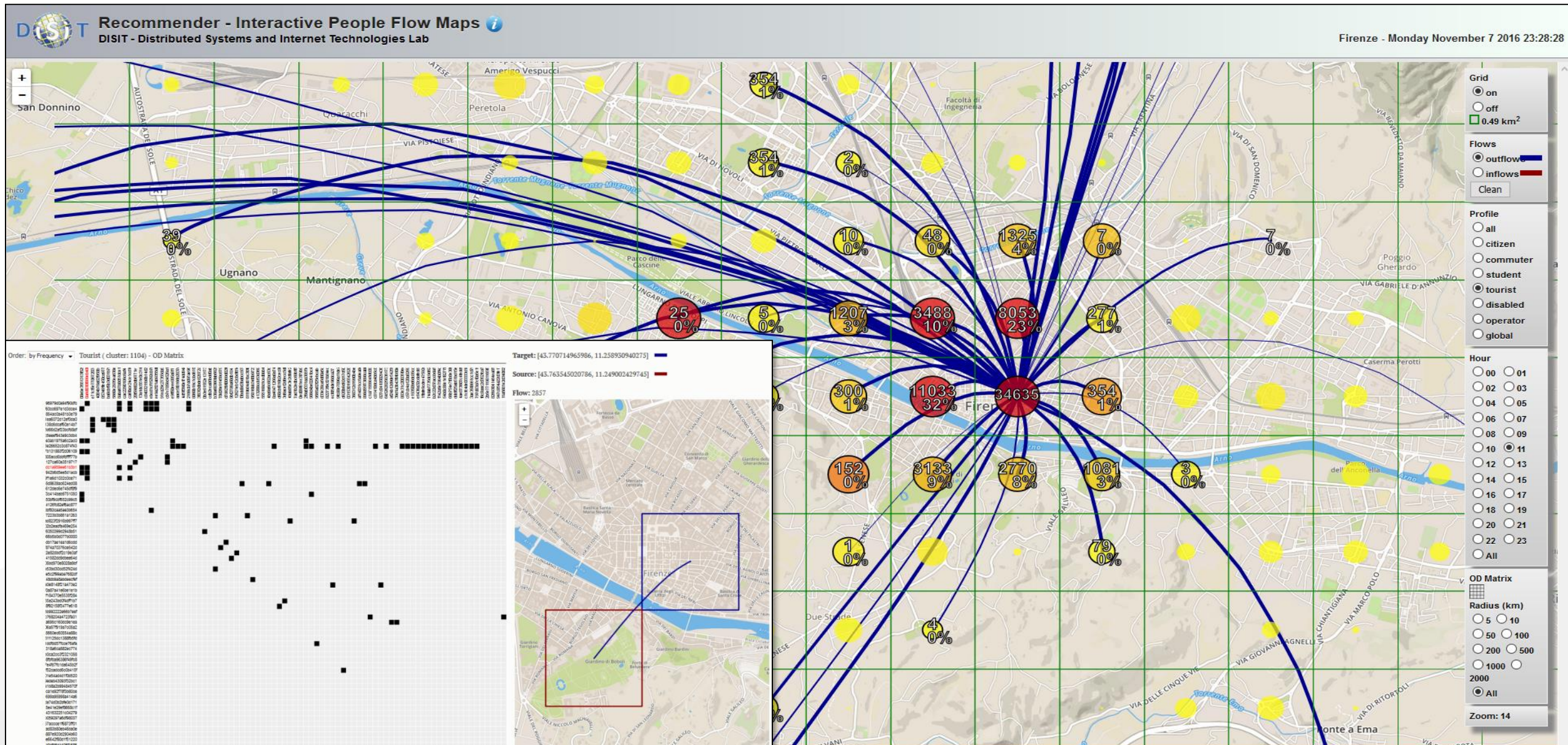


Rule name	Type	#sent	#viewed	#viewed on #sent	Description
daily_event_de	ENGAGEMENT	1 (0%)	0 (0%)	0%	Suggest (in german) an event currently on in Florence
daily_event_en	ENGAGEMENT	1720 (2.12%)	79 (7.1%)	4.07%	Suggest (in english) an event currently on in Florence
	- commuter	5 (0.29%)	0 (0%)	0 (0%)	
	- student	14 (0.81%)	0 (0%)	0 (0%)	
	- tourist	1462 (85%)	25 (35.71%)	25 (1.71%)	
	- citizen	113 (6.57%)	39 (55.71%)	39 (34.51%)	
	- operator	0 (0%)	0 (0%)	0 (0%)	
	- disabled	0 (0%)	0 (0%)	0 (0%)	
	- all	119 (6.92%)	6 (8.57%)	6 (5.04%)	
daily_event_es	ENGAGEMENT	6 (0.01%)	4 (0.41%)	66.67%	Suggest (in spanish) an event currently on in Florence
daily_event_fr	ENGAGEMENT	6 (0.01%)	0 (0%)	0%	Suggest (in french) an event currently on in Florence
daily_event_it	ENGAGEMENT	5459 (6.73%)	296 (30.02%)	5.42%	Suggest (in italian) an event currently on in Florence
parking_en	ASSISTANCE	141 (0.17%)	128 (12.98%)	90.78%	Alert (in english) if the user parked in a residential parking zone
parking_es	ASSISTANCE	3 (0%)	3 (0.3%)	100%	Alert (in spanish) if the user parked in a residential parking zone
parking_it	ASSISTANCE	187 (0.23%)	1 (0.1%)	0.53%	Alert (in italian) if the user parked in a residential parking zone
shoot_a_photo_de	ENGAGEMENT	68 (0.08%)	1 (0.1%)	1.47%	Ask (in german) a contribution for a nearby point-of-interest

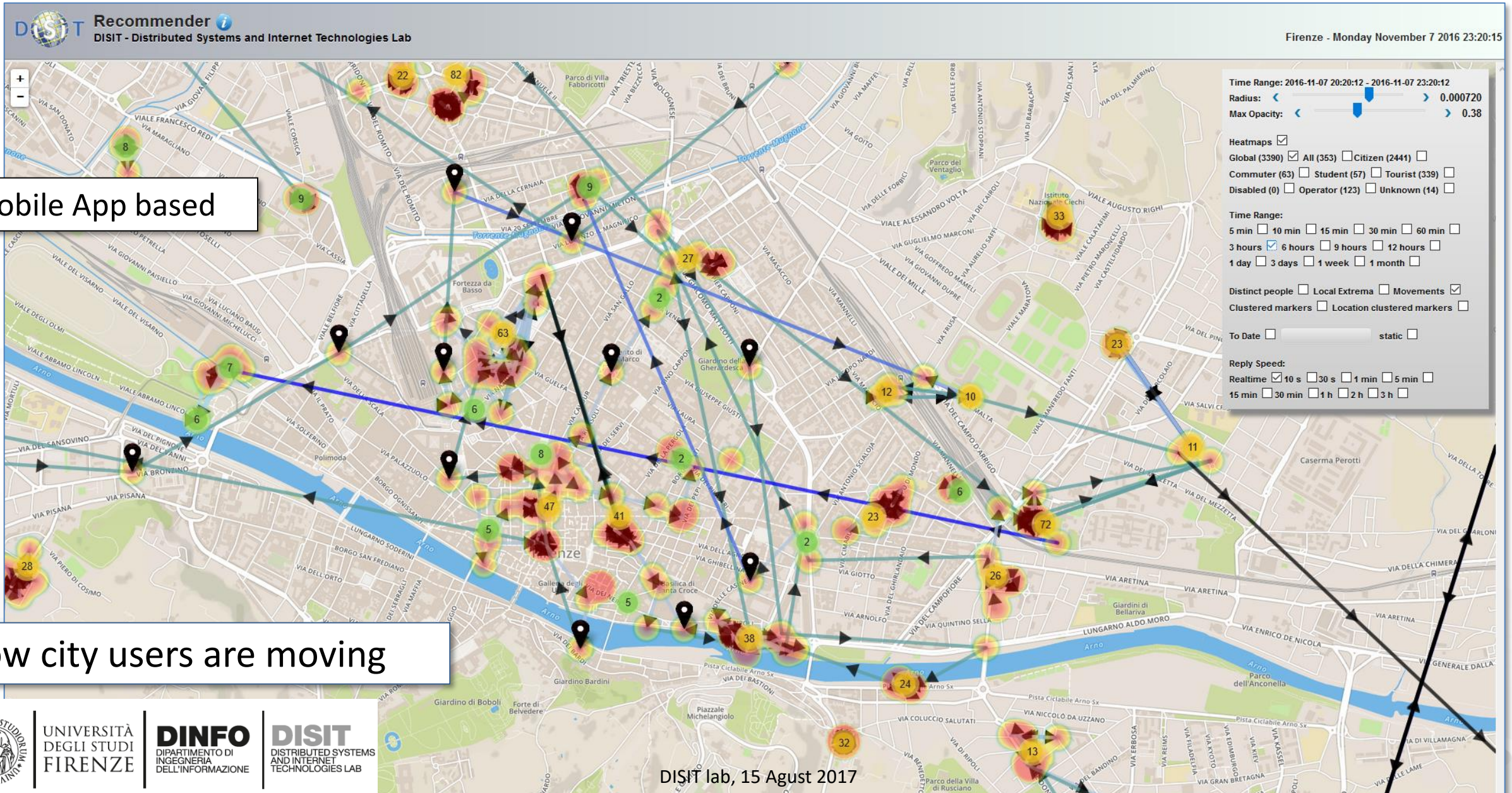
User Behavior Analyzer for Collective profiling



OD Matrix scalable

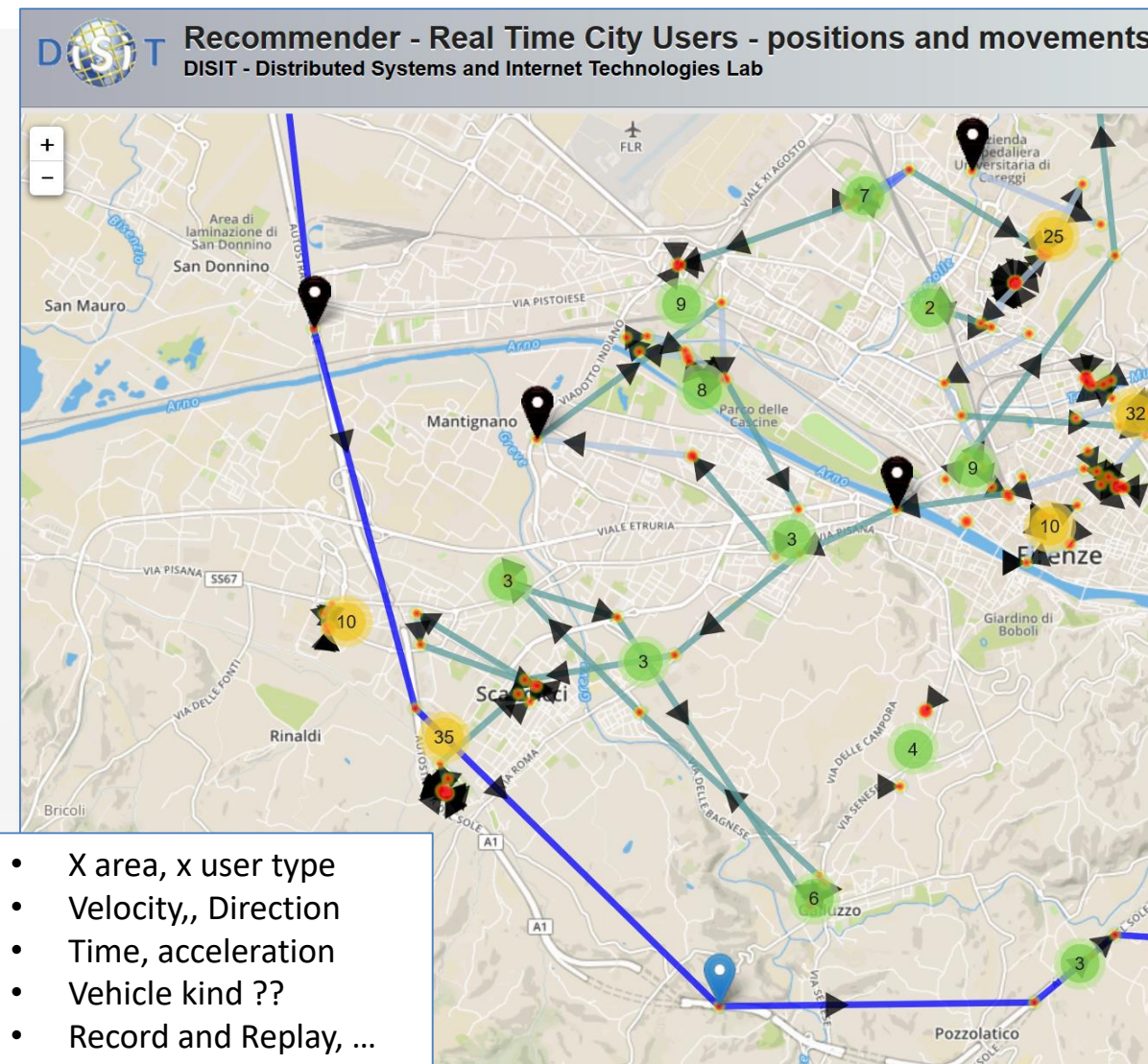


Anonymous User Behavior Analysis



Problems of Trajectories from Apps

- **From mobile app:**
 - Resolving GPS location: GPS, cells, wifi-network, ..mixt
 - Noisy, different kind of devices, ..
 - Smart algorithm on devices for location acquisition
 - Anonymized data, terms of use on mobile
- **Issues and Filtering**
 - Gps Accuracy, kind of measure (GPS, mixt)
 - Jump in time, space, velocity
 - General noise (diff. devices)
 - Knowledge of precision map
- **Clustering:** time, space, user kind, etc.

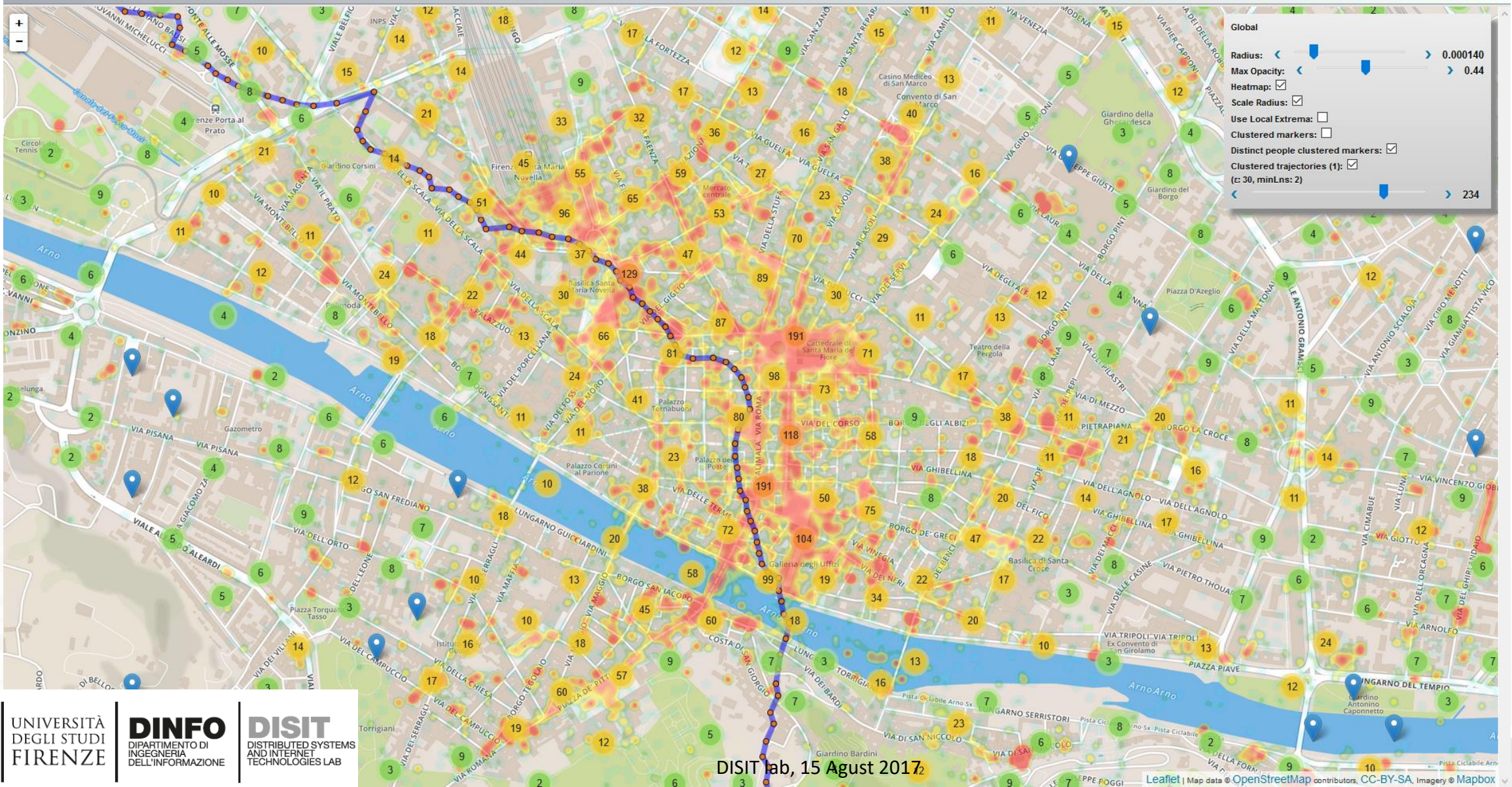


Heat Map from Mobile: users as sensors



Recommender - Heatmap and Trajectories Clusters of City Users Together
DISIT - Distributed Systems and Internet Technologies Lab

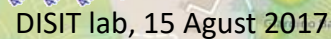
Firenze - Sunday January 8 2017 13:57:00



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DELL'INFORMAZIONE

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DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



Strategies Implementation via Engagement

- Produce value from data enabling to
 - *Stimulate virtuous behavior,*
 - *influence engage City Users!*
 - Increase efficiency in energy consumption
 - Reduce pollution and traffic congestion
 - Improve quality of service, quality of life
- Create an ecosystem for innovation and put in action any smart city solutions and services.



User influencing, engaging, monitoring & Follow Up

City & City Operators Strategy Editor



Rule name	Type	#sent	#viewed	#viewed on #sent	Description
daily_event_de	ENGAGEMENT	1 (0%)	0 (0%)	0%	Suggest (in german) an event currently on in
daily_event_en	ENGAGEMENT	1720 (2.12%)	70 (7.1%)	4.07%	Suggest (in english) an event currently on in
- commuter		5 (0.29%)	0 (0%)	0 (0%)	
- student		14 (0.81%)	0 (0%)	0 (0%)	
- tourist		1462 (85%)	25 (35.71%)	25 (1.71%)	
- citizen		113 (6.57%)			
- operator		0 (0%)			
- disabled		0 (0%)			
- all		119 (6.92%)			
daily_event_es	ENGAGEMENT	6 (0.01%)			
daily_event_fr	ENGAGEMENT	6 (0.01%)			
daily_event_it	ENGAGEMENT	5459 (6.73%)			
parking_en	ASSISTANCE	141 (0.17%)			
parking_es	ASSISTANCE	3 (0%)			
parking_it	ASSISTANCE	187 (0.23%)			
shoot_a_photo_de	ENGAGEMENT	68 (0.08%)			

Inform

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..

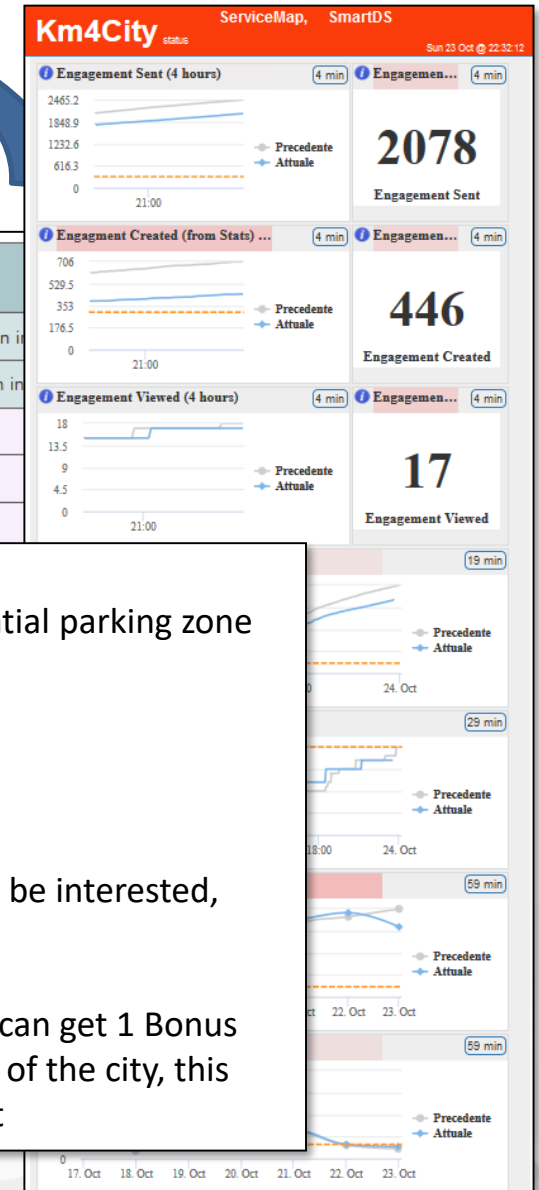
Stimulate / recommend

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

Provide Bonus

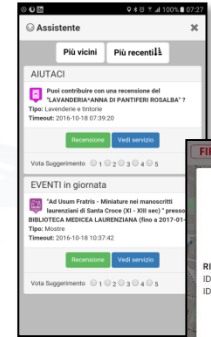
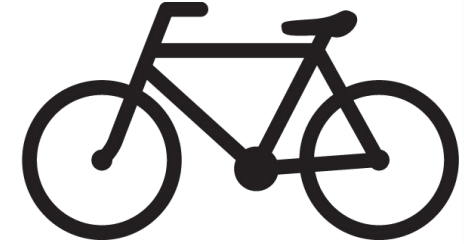
Since you have parked here you we can get 1 Bonus
We suggest you to leave the car out of the city, this bonus can be used to by a bus ticket

Any Mobile and Web App



Engagement & Assistant Rules

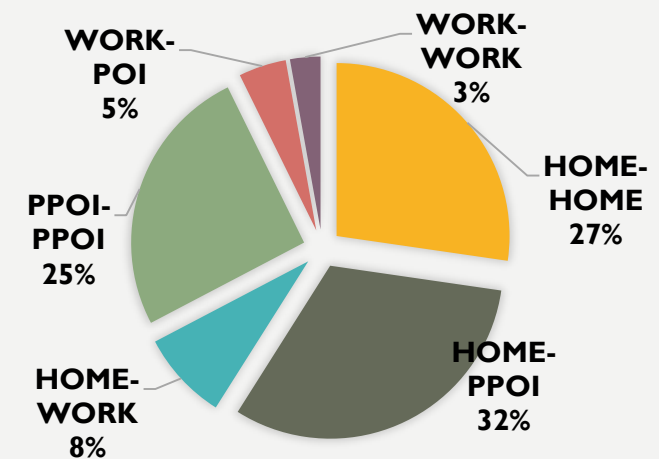
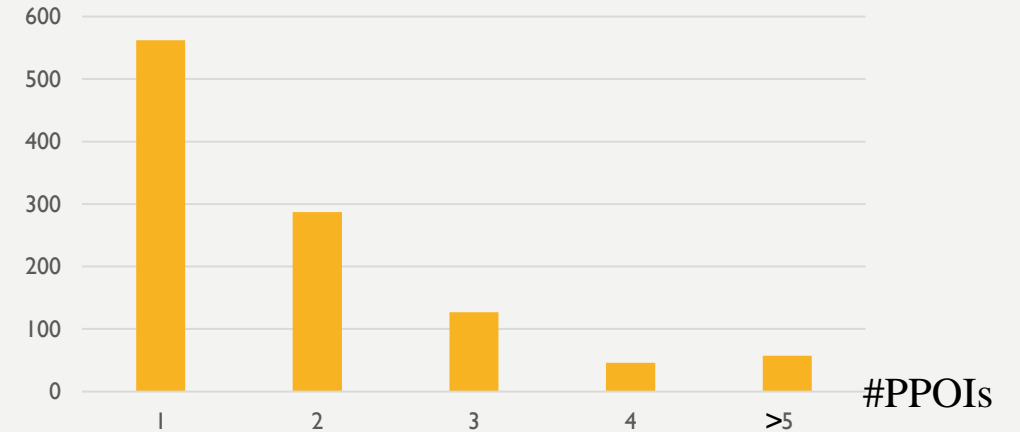
- **Detecting** city users' habits about mobility
 - Private cars → **stimulating Bus Usage & Bikes**
 - Private cars parking → usage of **peripheral parking-lot + bus**
 - Leave the car and take the bus twice → by using **bonus, tickets..**
 - → different solutions for moving...
- **Assisting by notifying** when one is
 - parking out of the residential parking zone
 - parking in a zone subjected to cleaning in the next two days
 - entering in the restricted traffic zone
- **Suggesting** you about
 - Events, **Civil Protection Alerts**,
 - **Closer free parking** ...
- **Administering** questionnaires
 - Getting assessment about services, city experience
 -
- **Requesting** ranking, photo and/or comments



CURRENT NUMBERS

- From 1° September 2016
 - Detected 2108 PPOIs on 1080 users
 - 437 HOME
 - 285 WORK
 - 34 SCHOOL
 - 1350 EXTRA
 - 130 PPOIs are feedbacked
 - 460 survey responses
- From 1° August 2017
 - Built 524 Markov Networks about user's trajectories

Number of users with #PPOIs



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www.disit.org

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www.sii-mobility.org



www.km4city.org

Monitoring City users Via Social Media

<http://www.km4city.org/?controlRoom>

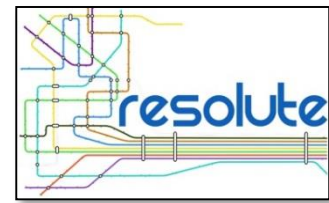
<http://www.km4city.org/?devTools>

<http://www.km4city.org/?infoDocs>

<http://www.km4city.org/?app>

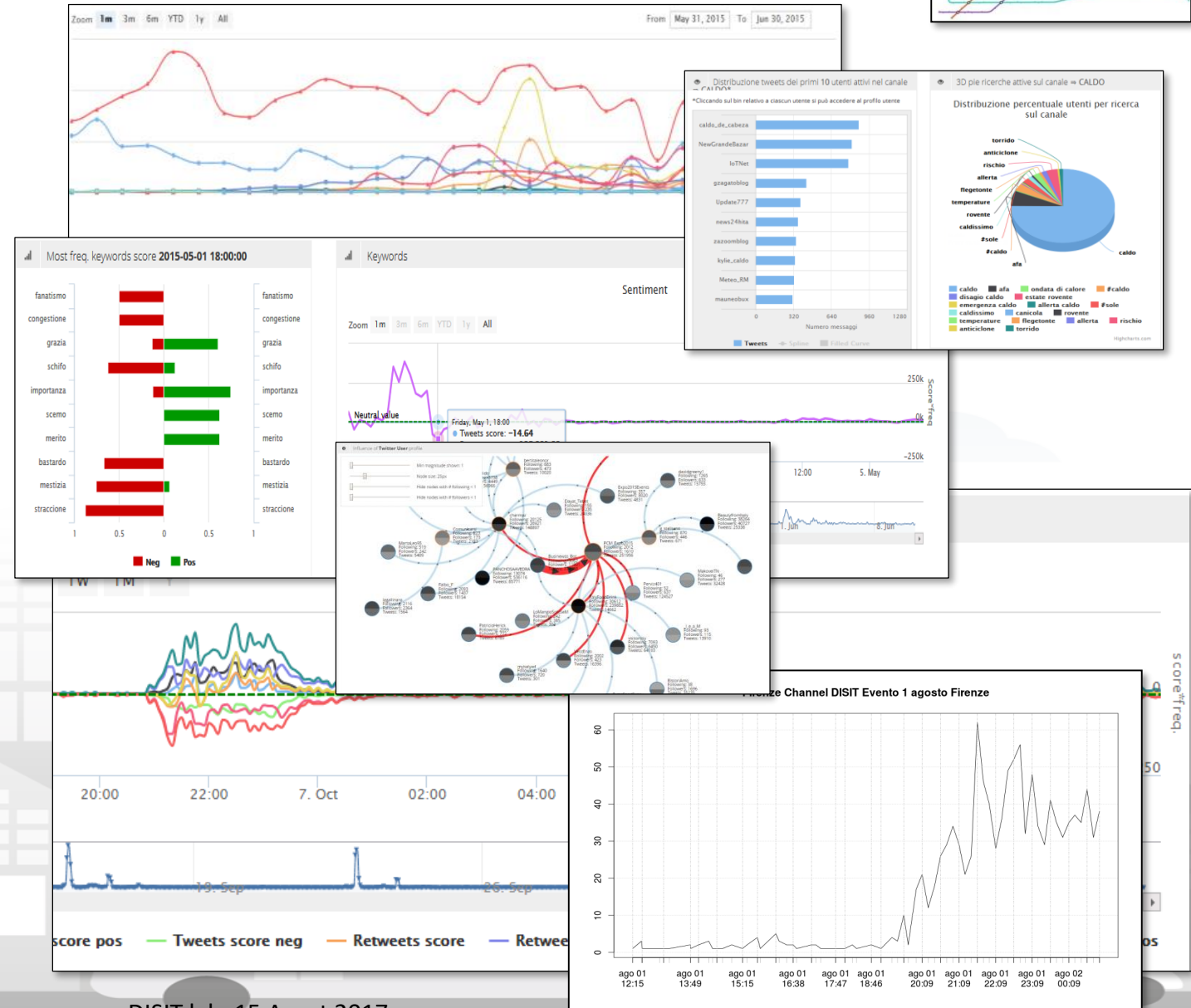


Twitter Vigilance

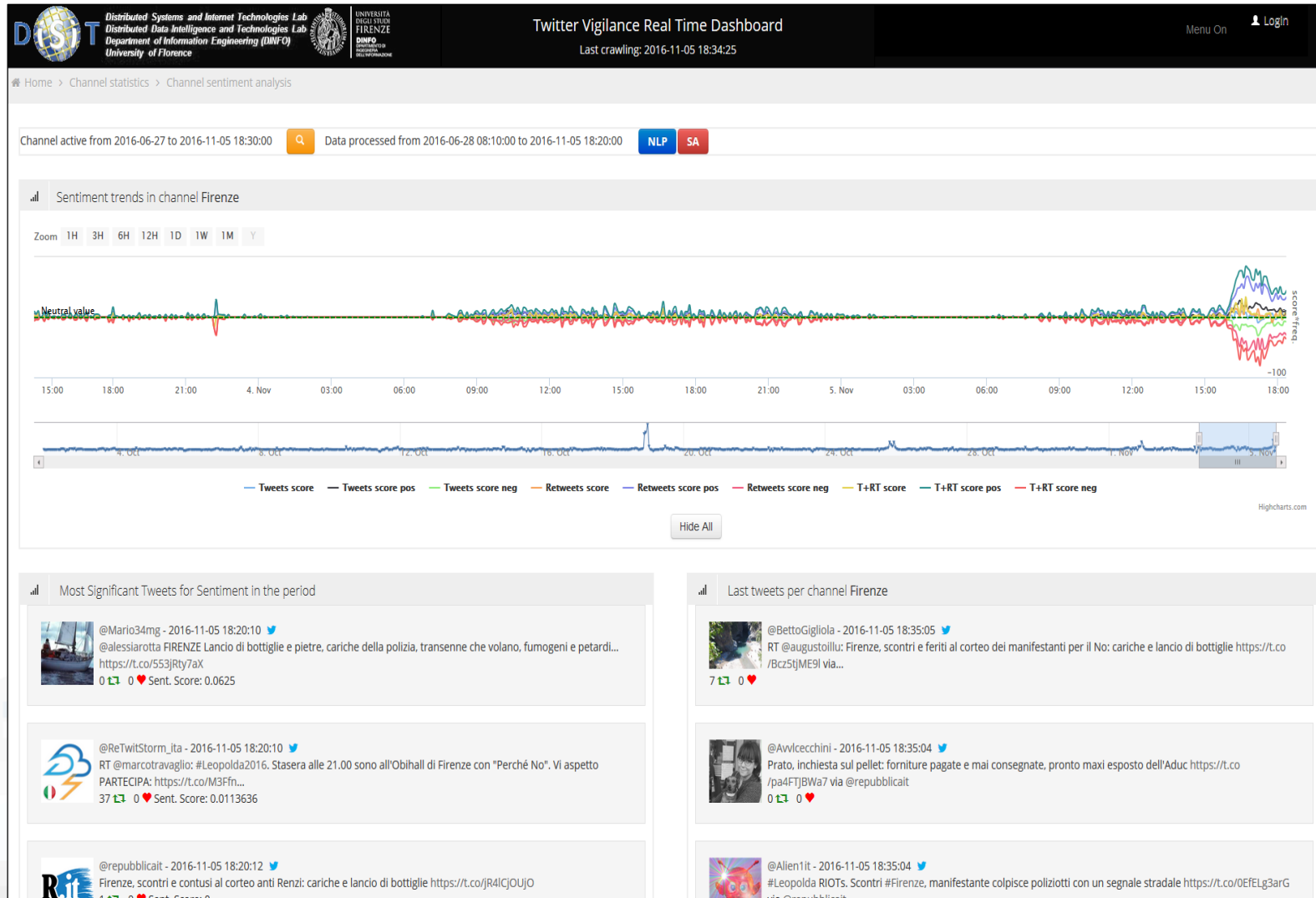


- <http://www.disit.org/tv>
- <http://www.disit.org/rttv>
- Citizens as sensors to
 - Assess sentiment on services, events, ...
 - Response of consumers wrt...
 - Early detection of critical conditions
 - Information channel
 - Opinion leaders
 - Communities
 - Formation
 - Predicting volume of visitors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

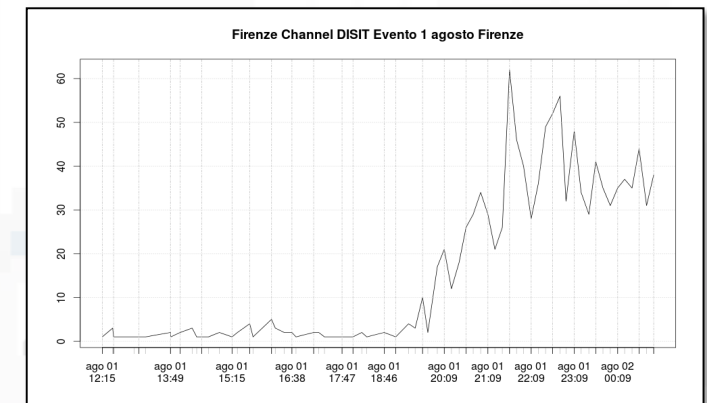
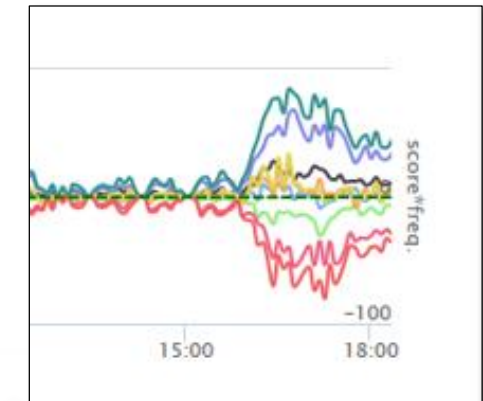
Twitter Vigilance



Real Time Twitter Vigilance, Early Warning

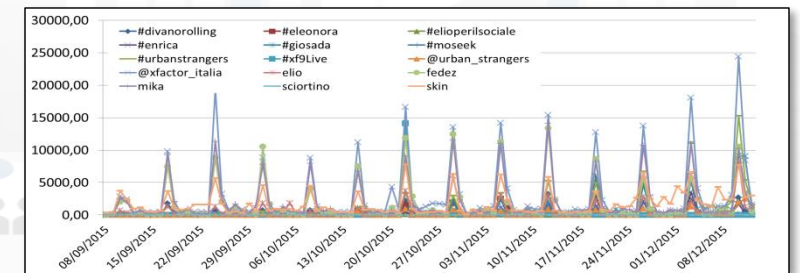
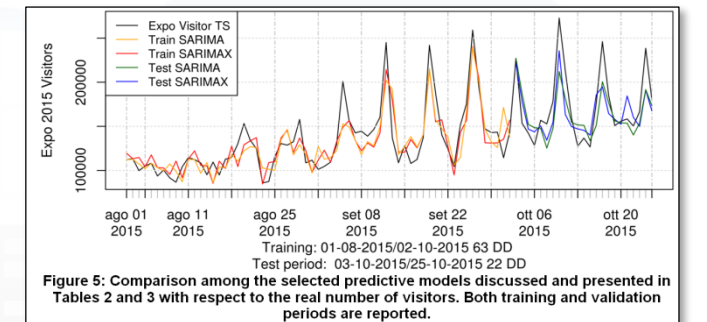
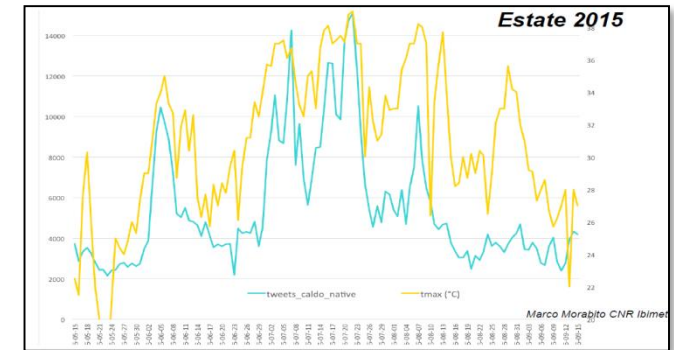


Sentiment Analysis



Prediction/Assessment

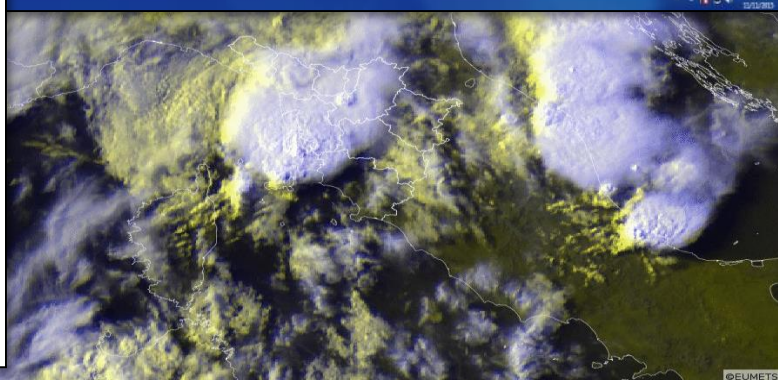
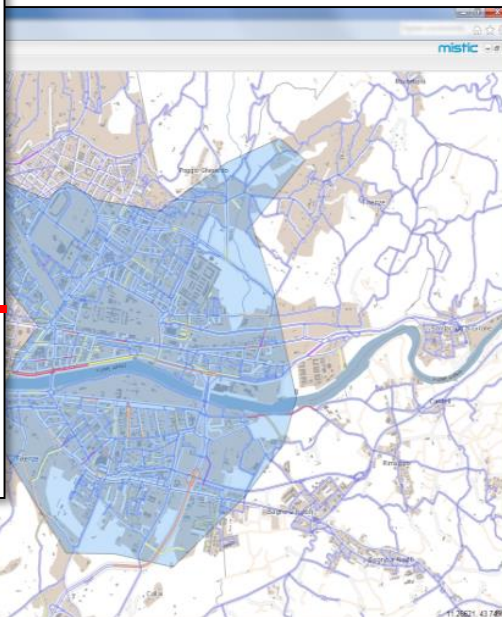
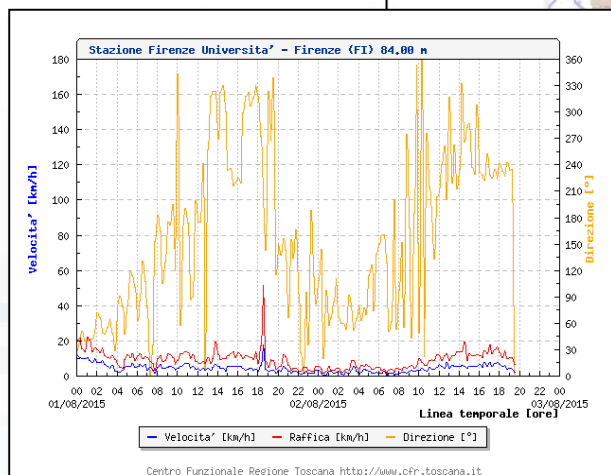
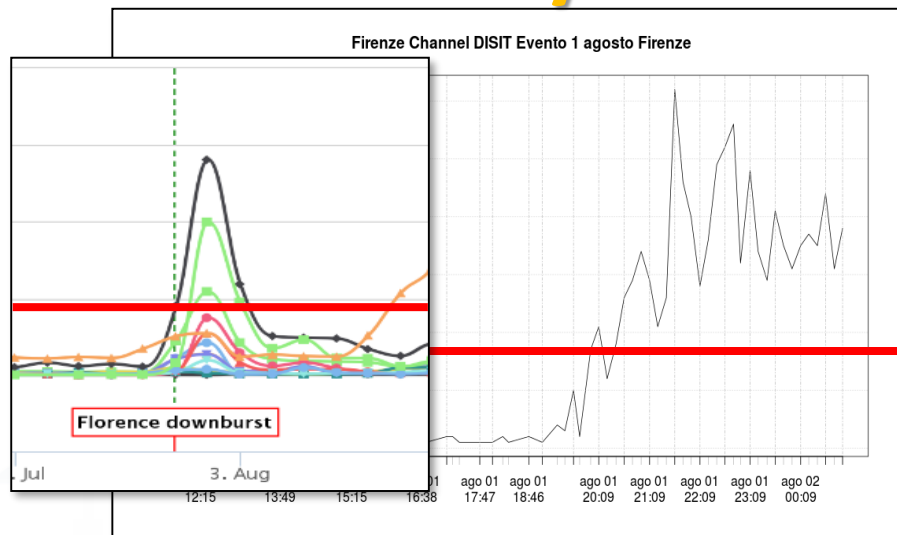
- Football game results as related to the volume of Tweets
- Number of votes on political elections, via sentiment analysis, SA
- Size and inception of contagious diseases
- marketability of consumer goods
- public health seasonal flu
- box-office revenues for movies
- places to be visited, most visited
- number of people in locations like airports
- audience of TV programmes, political TV shows
- weather forecast information
- Appreciation of services



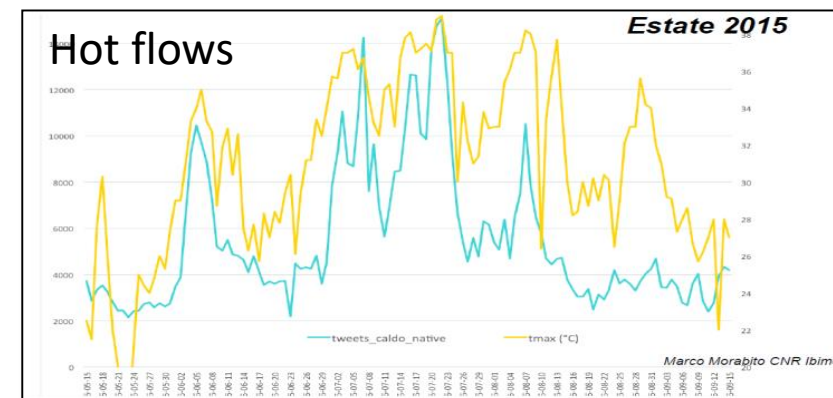


Twitter Vigilance

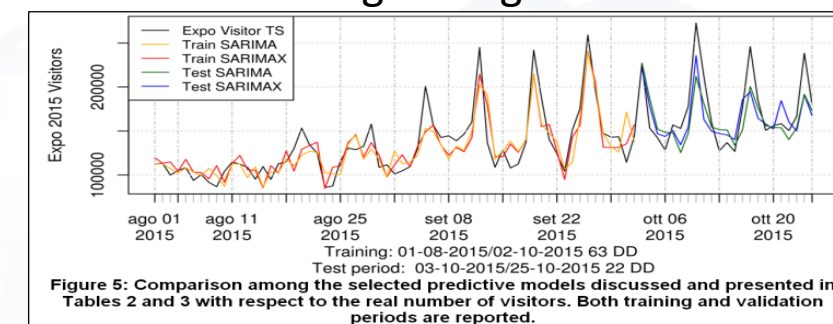
Early Warning



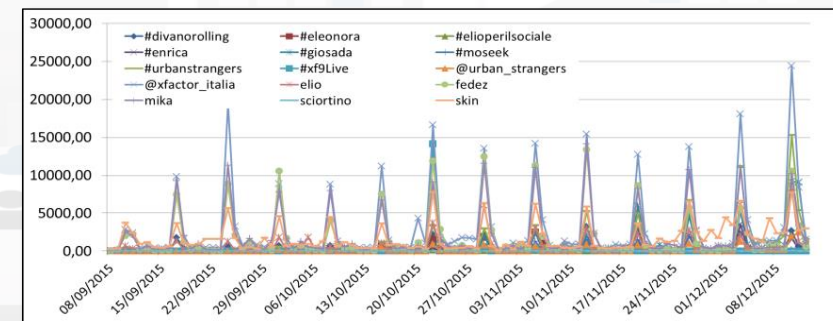
Predictive models



Attendance at long lasting events: EXPO2015

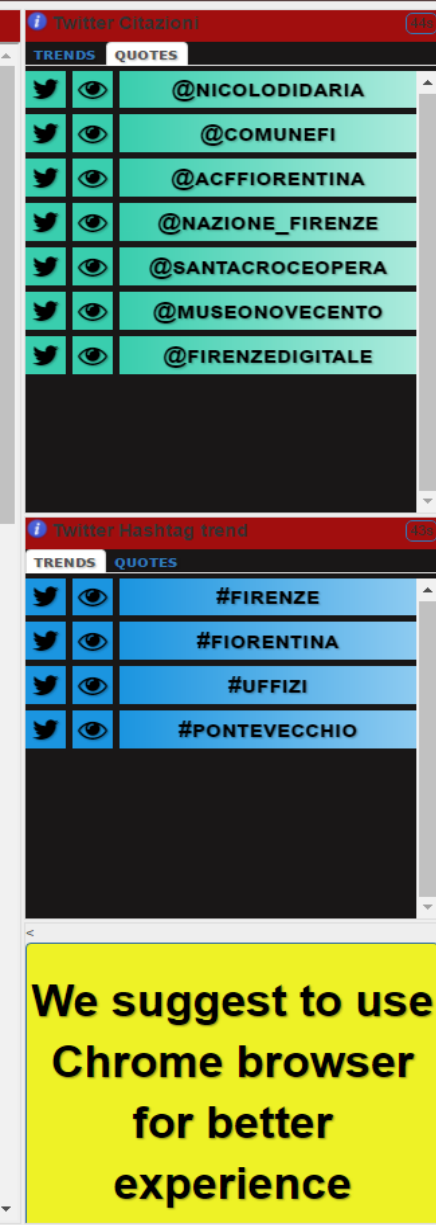
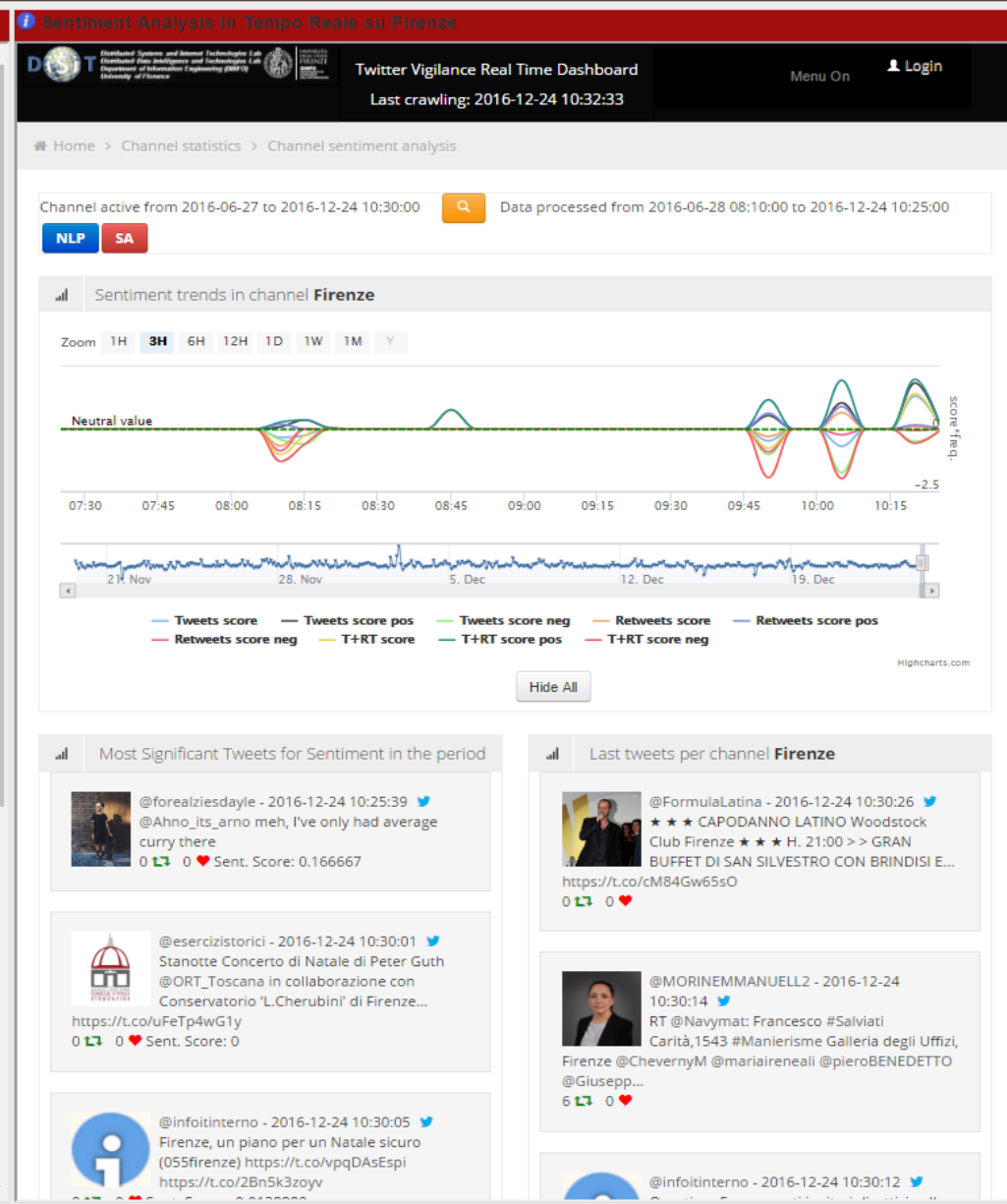
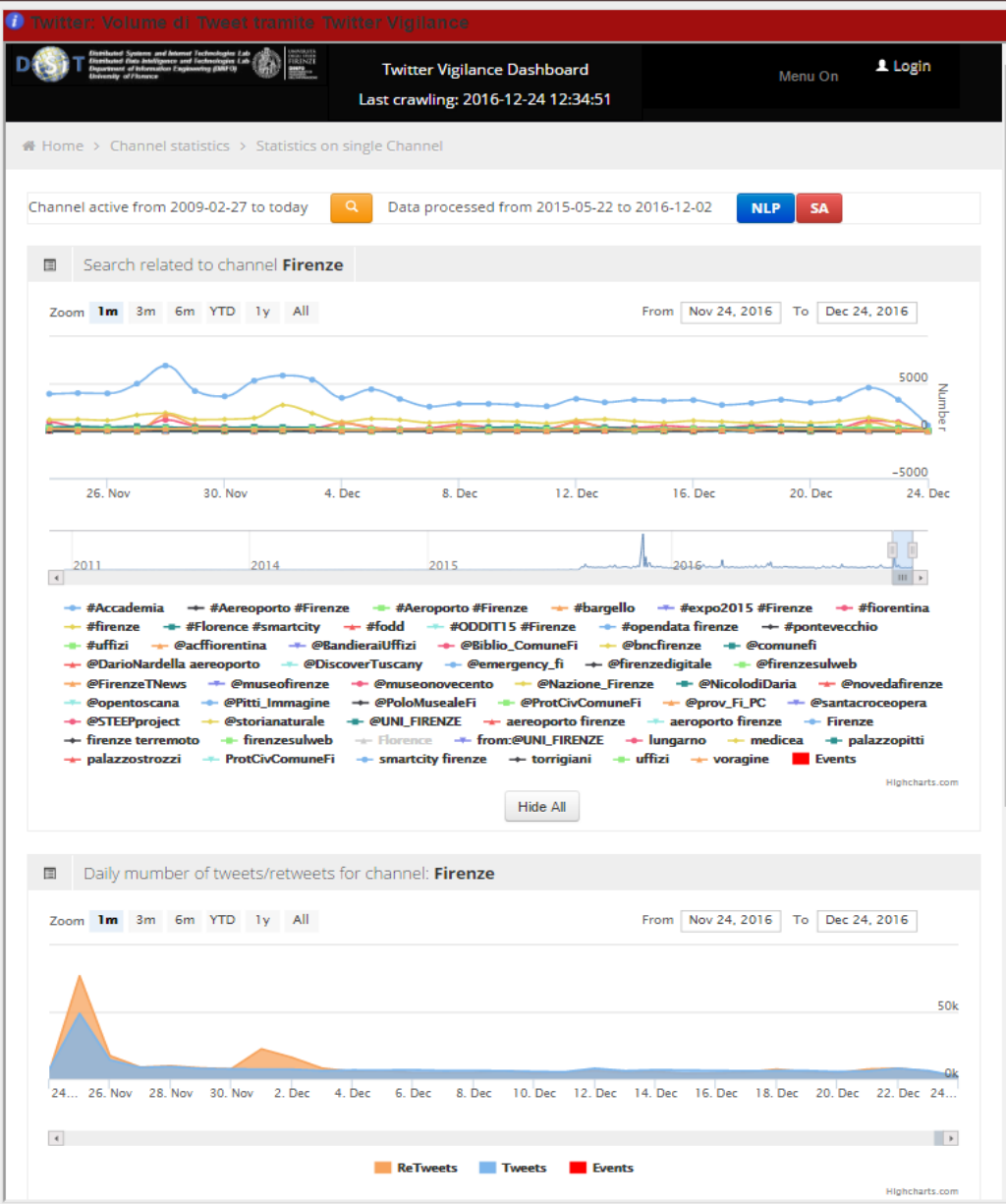


Attendance at recurrent events: TV, football



Twitter Vigilance su Firenze (sperimentale)

Sat 24 Dec @ 10:37:57



Development Tools

<http://www.km4city.org/?controlRoom>

<http://www.km4city.org/?devTools>

<http://www.km4city.org/?infoDocs>

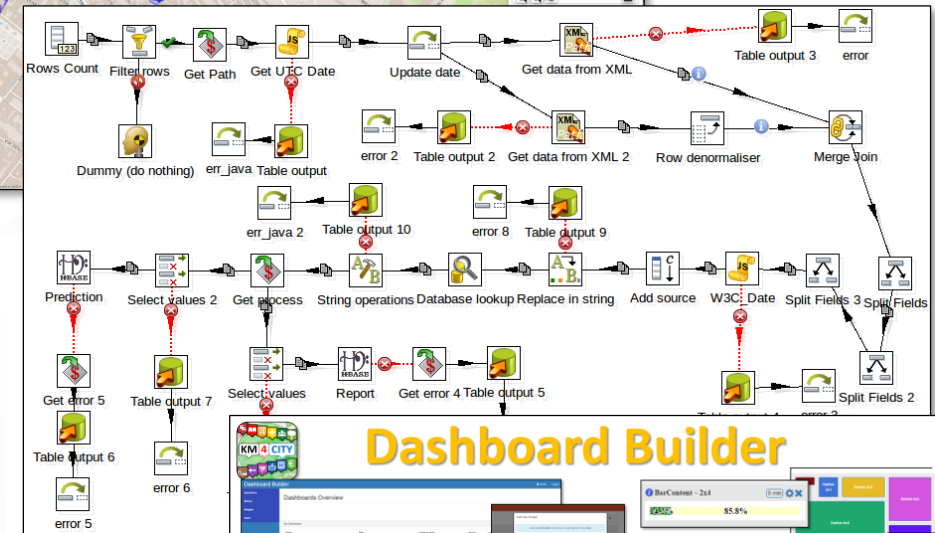
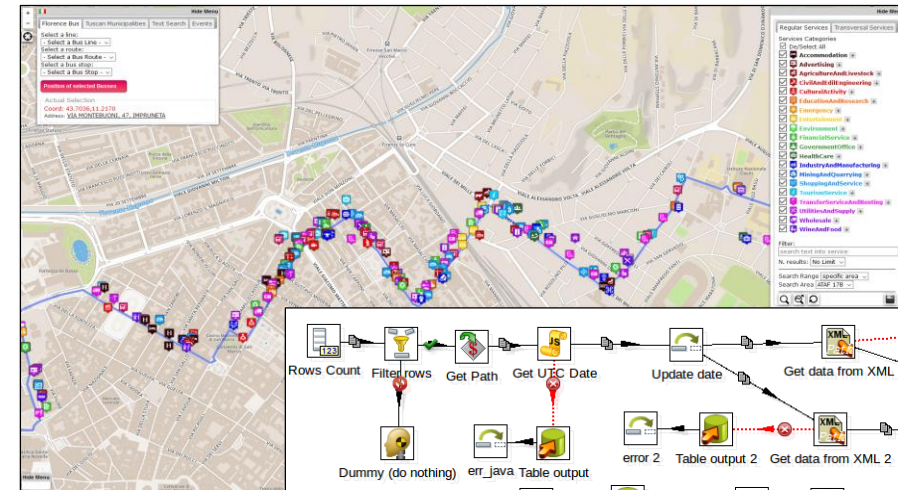
<http://www.km4city.org/?app>



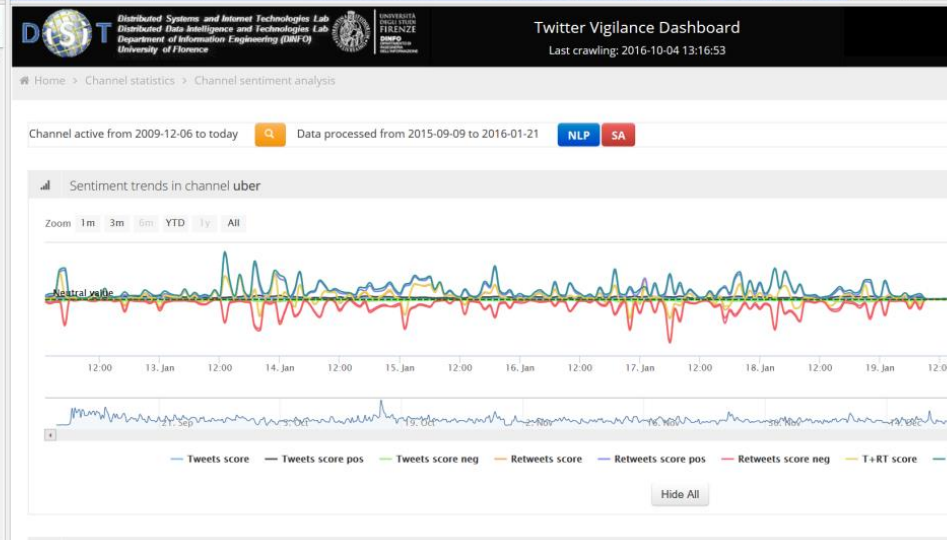
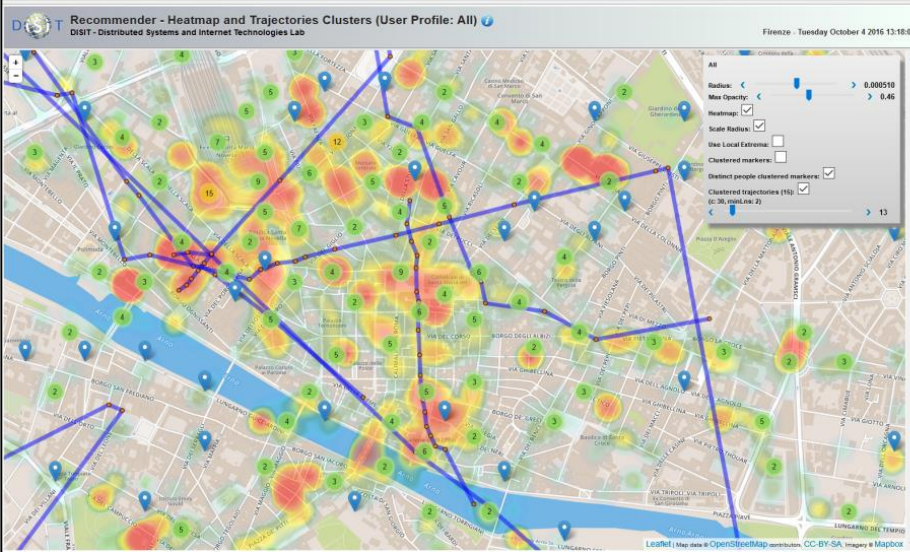
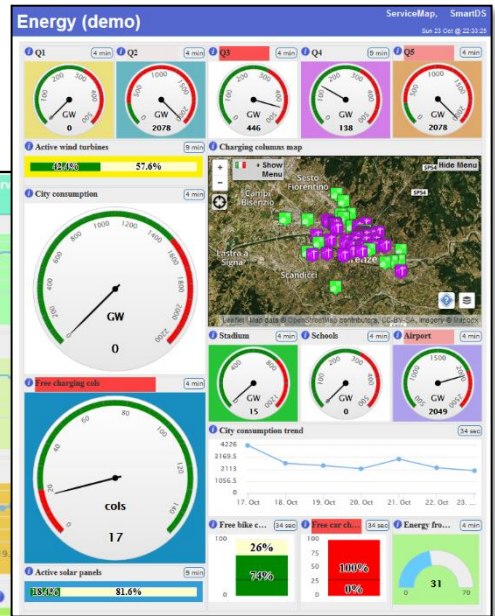
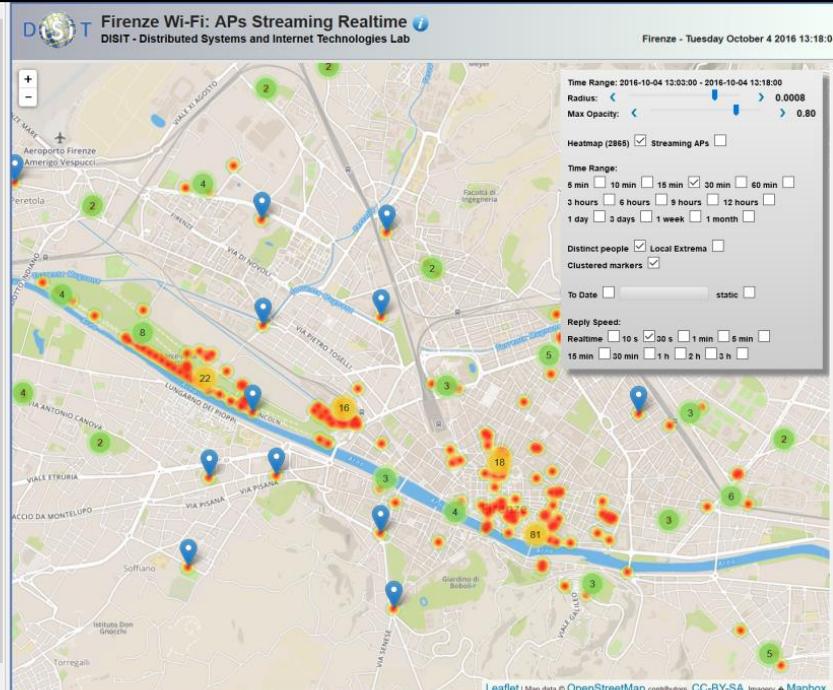
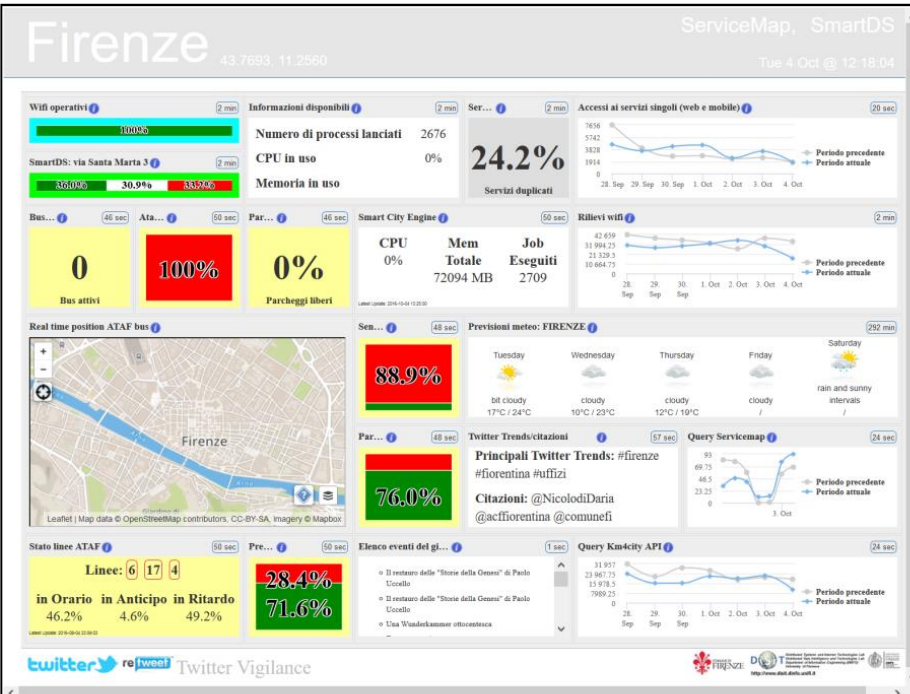
Development Tools



- **Smart City API:**
 - Several kind of APIs
- **Generator “ServiceMap”,**
<http://servicemap.km4city.org>
 - Call per web and mobile App
 - Embedding in web pages
 - **Collaborative work**
- **Load new data: manual and automatic**
 - POI, IOT, etc.
 - Load of Shape & Paths
 - **Collaborative work**
- **Dashboard builder**
 - Production of dashboard per control room
 - Embedding view of any other analytics of Km4City or of third party: wifi, 3D, flow, recommend, engager, etc.
 - **Collaborative work**



Higher level Dashboard





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<http://www.disit.org>

Dashboard Builder

<http://www.disit.org/6935>



Dashboard Builder

Admin Logout

Operations

Metrics

Widgets

Users

Dashboards Overview

My Dashboard

Name	Title	Creation Date	Status	Users
12	Dashboard Gialla	2016-07-27 11:35:15		
A - 01				
Copia 59				
Copia Duplicazione Dashboard				
CopiaAdminDash				
CopiaDashAttuale				
dashboard creata				
DASHBOARD DUPLICATA 41				
DashobarAdmin				
Menu_dash				
nuova Copia				
nuova Copia01				
Nuova Dashboard				
NUOVA DASHBOARD 40				

Sources Management

Operations

Dashboard Builder

Metrics

Widgets

DataSources Overview

Data Sources

ID	URI
Km4CityApp	jdbc:mysql://redislog:3306
Km4Cityquartz	jdbc:mysql://192.168.0.20:3306
Km4CityRDF	http://192.168.0.208:8080/WebApp/Grafico/Spargi
Km4CityRecommender	jdbc:mysql://192.168.0.55:3306
Km4CityServiceMap	jdbc:mysql://192.168.0.72:3306
Km4CitySillMobility	jdbc:mysql://192.168.0.72:3306
prova	jdbc:mysql://redislog:3306
SmorDS	jdbc:mysql://192.168.0.25:3306
TwitterTv	jdbc:mysql://192.168.0.50:3306

Modifica Widget

Id Widget: widgetBarContent

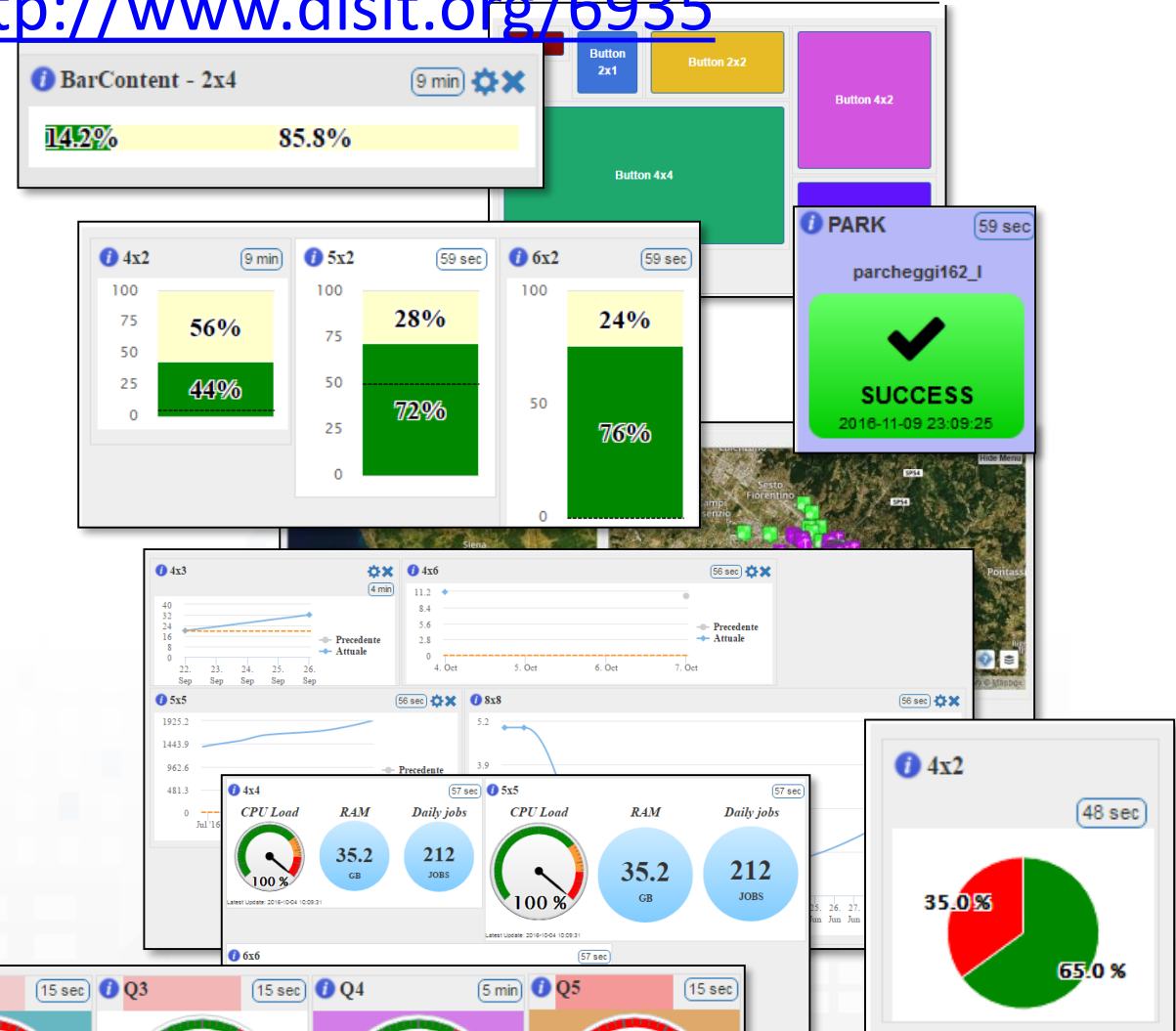
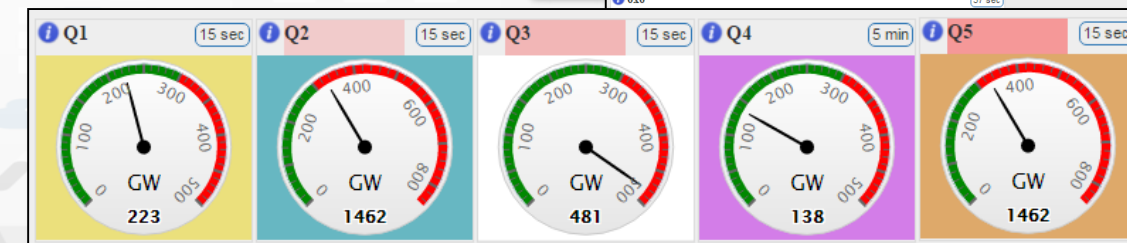
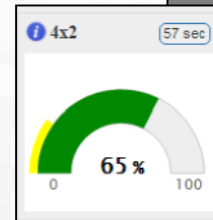
Type: Percentuale

Min. Columns number: 1, Max. Columns number: 2

Min. Rows number: 2, Max. Rows number: 3

n. metrics: 1, Color: 1

Close Modify



Transport systems
Mobility, parking



Public Services
Govern, events, ...



Sensors, IOT
Cameras, ..



Environment,
Water, energy



Shops, services,
operators

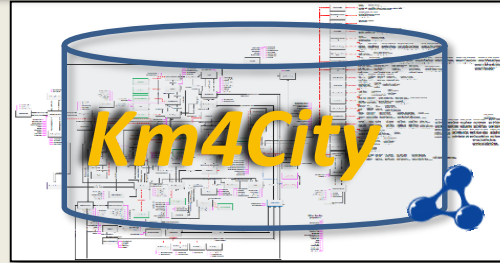


Social Media
WiFi, network

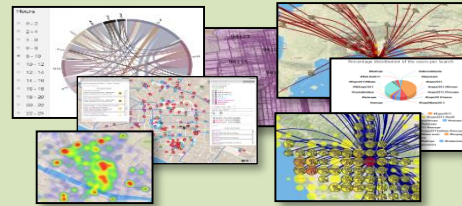


Static, Slow and Real Time data flows

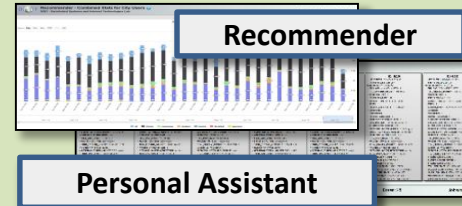
Km4City Smart City Engine



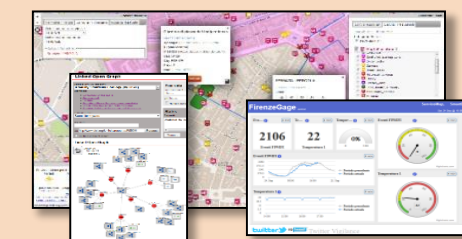
Big Data Analytics



Smartening Tools



Development Tools

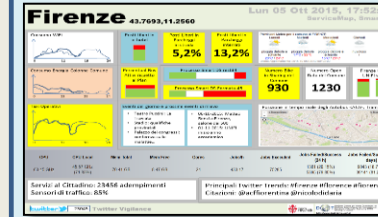


DISCES -- Distributed and parallel architecture on Cloud

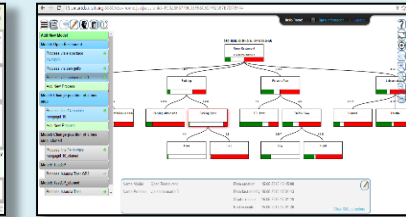
Km4City Smart City API

City Operators and Decision Makers

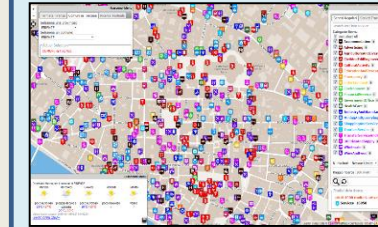
Dashboards



Smart Decision Support



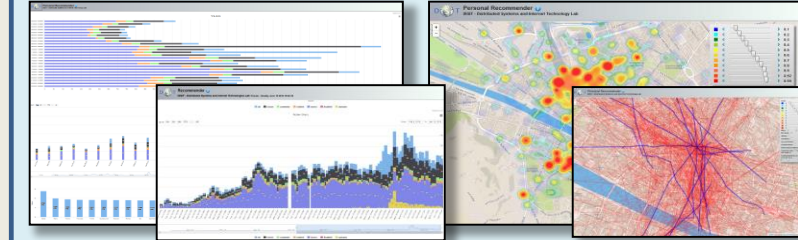
ServiceMap browser



Twitter Vigilance

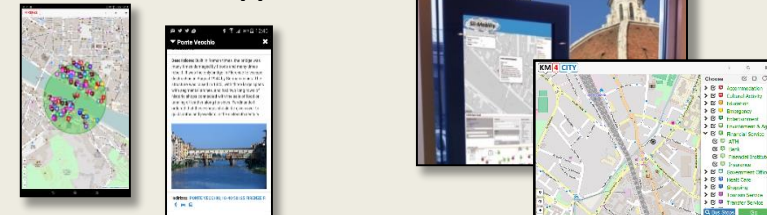


Analyzers of City User Behavior



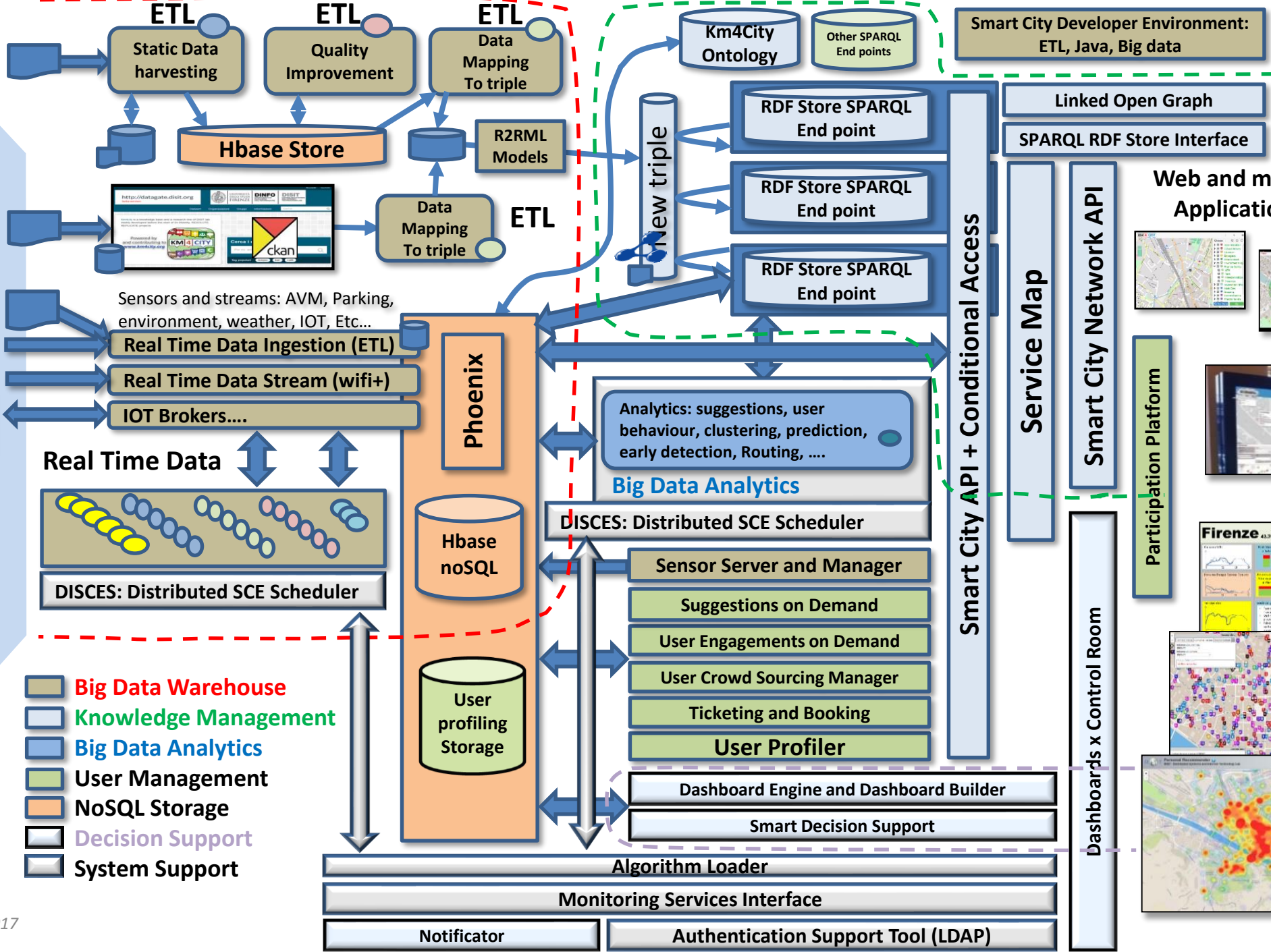
Tools for Final Users

Mobile e Web Apps





- Transport systems
Mobility, parking
- Public Services,
Govern, events, ...
- Sensors, IOT Cameras,
Wi-Fi ..
- Environment, Water,
energy
- Shops, services,
operators
- Social Media

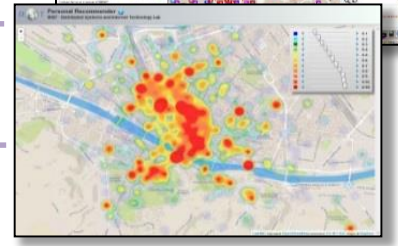
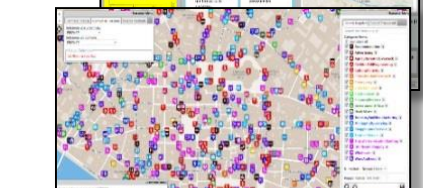
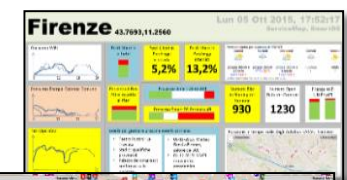


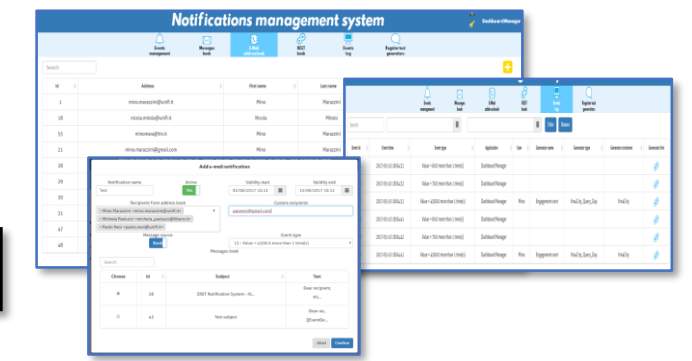
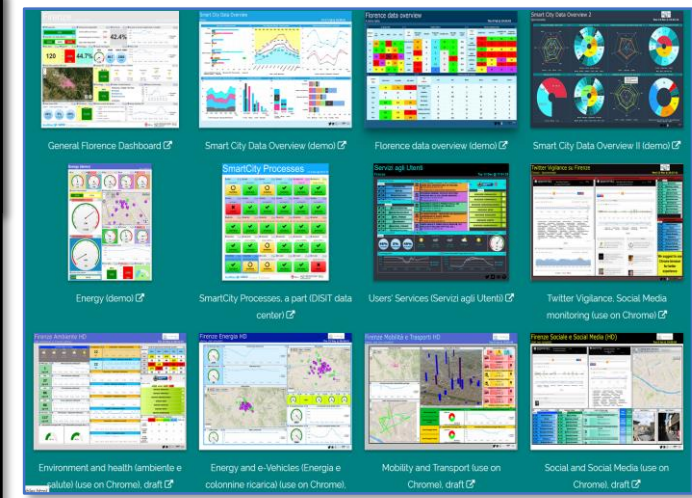
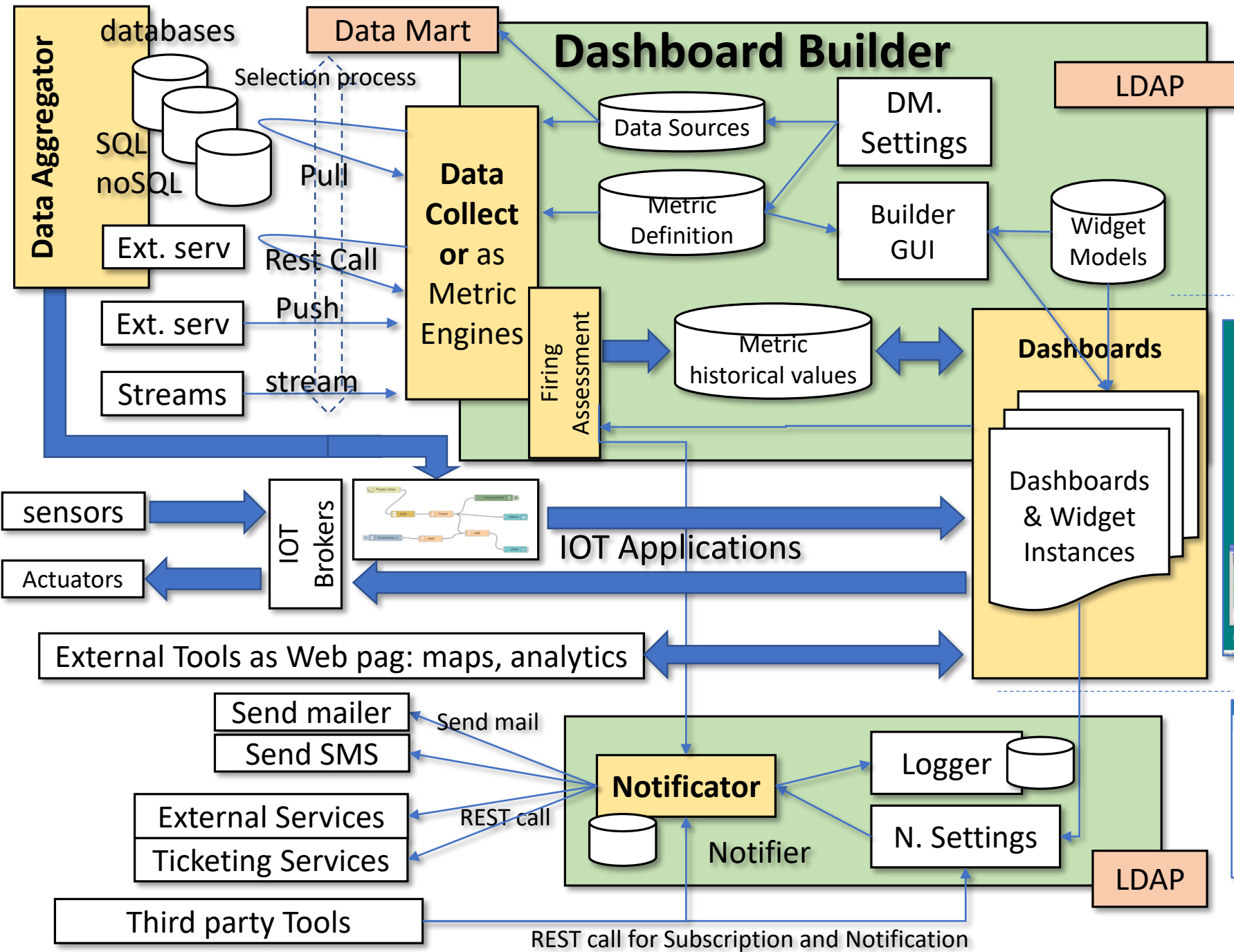
- Big Data Warehouse
- Knowledge Management
- Big Data Analytics
- User Management
- NoSQL Storage
- Decision Support
- System Support

Smart City Developer Environment:
ETL, Java, Big data

Linked Open Graph
SPARQL RDF Store Interface

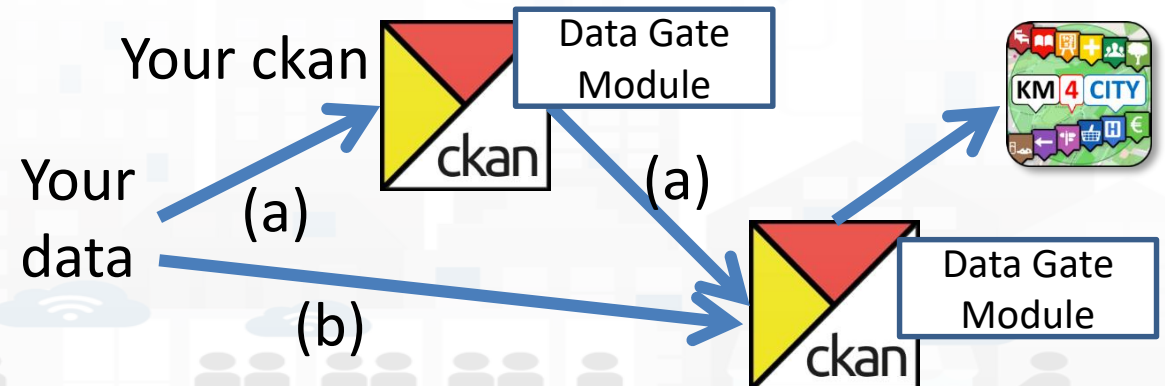
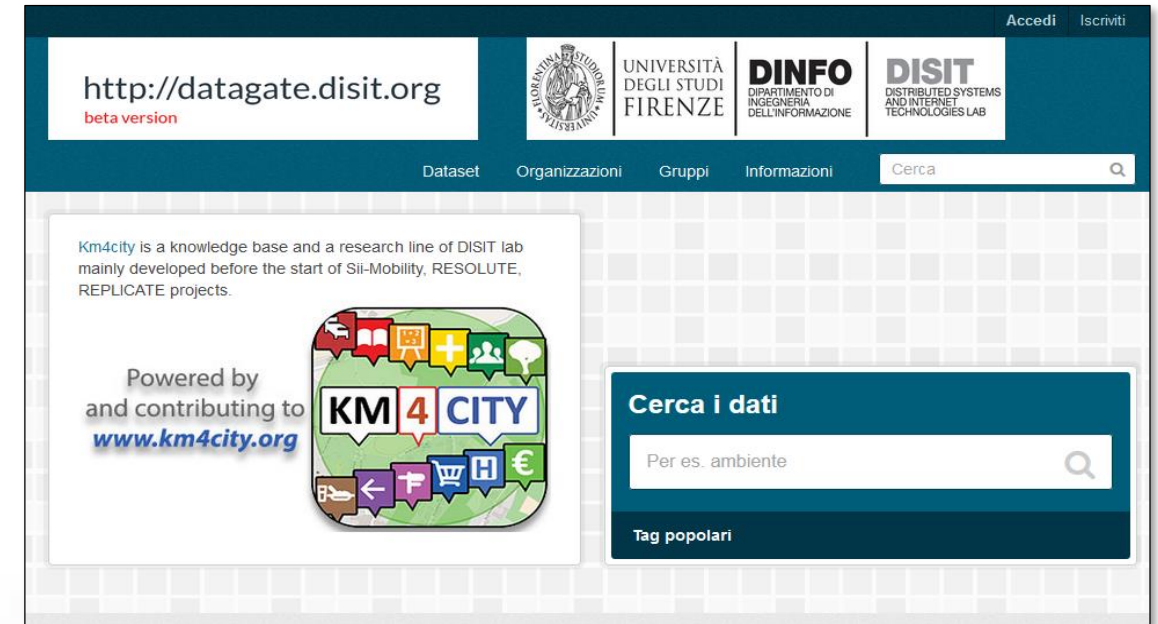
Web and mobile
Applications





DISIT DataGate

- To load new data into Km4City model in short time ..
 - Upload your CSV, XLS, XLSX directly on our CKAN DataGate.
- DataGate allows you
 - fastening the data ingestion, from your CKAN to our model
 - formatting and improving your data, assisting you in the process

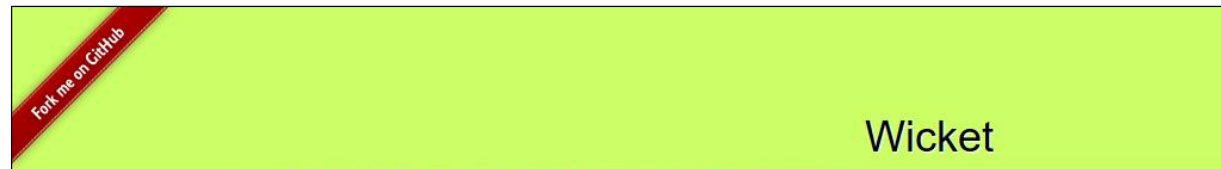


<http://DataGate.disit.org>

Loading Shapes and Paths for search

<https://arthur-e.github.io/Wicket/sandbox-gmaps3.html>

<http://www.km4city.org/wkt/>




Wicket

Wicket is a lightweight Javascript library that reads and writes Well-Known Text (WKT) strings. It can also be extended to parse and to create geometric objects from various mapping frameworks, such as Leaflet, the ESRI ArcGIS JavaScript API, and the Google Maps API.

```
MULTIPOLYGON (((40 40, 20 45, 45 30, 40 40)), ((20 35, 10 30, 10 10, 30 5, 45 20, 20 35)), (30 20, 20 15, 20 25, 30 20)))
```

☐ Format for URLs



Home Contact Me "Fork me on GitHub!"

Design © 2012-2013 K. Arthur Endsley
Wicket is released under the GPL v3

Upload a SHP file or paste a WKT

You can add SHP files to the system to convert them in WKT or paste a valid WKT.

SHP File

Label

Nessun file selezionato.

Paste a WKT

Label

WKT



- **ServiceMap tool**

- with Km4City are substantially a Smart City Expert System, SCES
- includes the Smart City API
- is a for developers to: search and browse on Smart City Knowledge, also to generate examples of the Smart City API call to be used in the development of Web and Mobile Apps

Smart City API



- <http://www.disit.org/6597>
 - REST API: serviceURI or Selection or GPS
 - REST API: Query ID
 - Receive an email
 - Get a JSON, HTML, ...
 - Call SPARQL
- EMBED facility in third party web pages
- Developers may use the ServiceMap tool to:
 - compose geographical and textual queries
 - THEN request an e-mail containing the calls (same results in JSON and/or in HTML)

FERMATA : STATUTO 04

LINKED OPEN GRAPH

Linee: 20 28 4 54 8

Prossimi transiti:

FERMATA : STAZIONE PENSILINA

LINKED OPEN GRAPH

Linee: 11 17 22 23 36 4 52 54 6

Prossimi transiti:

Orario	Linea	Stato	Ride
13:01:40	4	In orario	5084813
13:05:04	17	Ritardo	4933186
13:07:24	6	In orario	4829621
13:09:02	17	In orario	4848688
13:12:02	6	Anticipo	4867907
13:12:20	6	In orario	4829654

Save your information for services.

You can save this service on ServiceMap. Please insert a valid e-mail, and you will receive a link that could allow you to access at the results and share it with your friends.

Insert your e-mail: email@domain.ext

Insert a title: Service title

Insert a description: Insert a description

Send

Save your information for services.

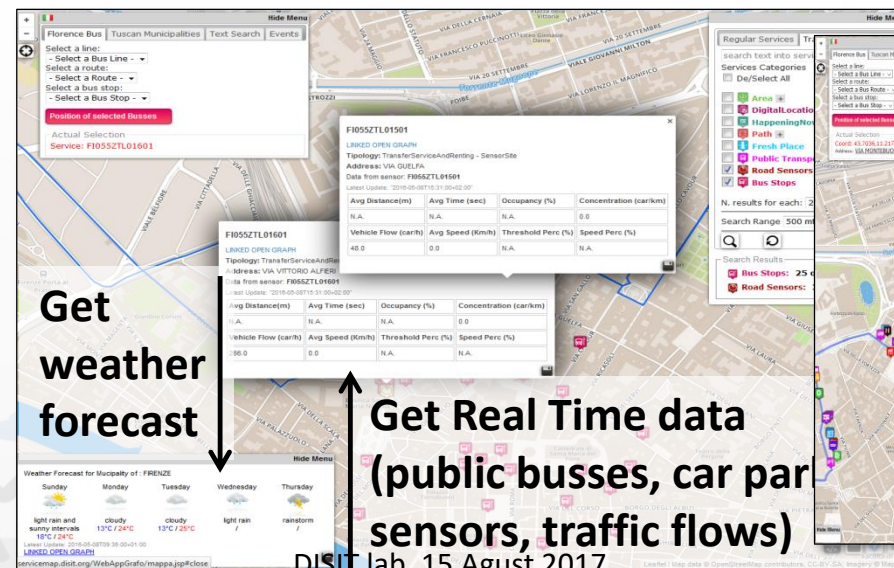
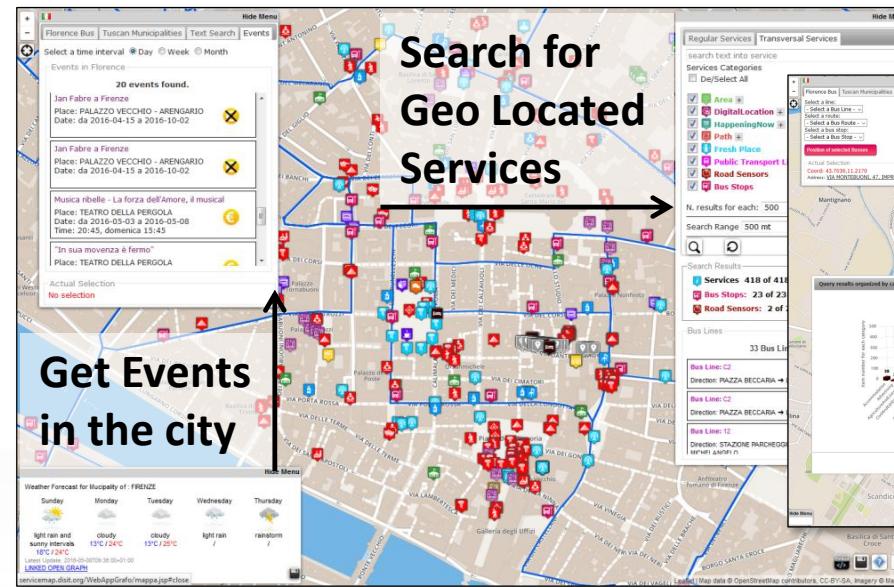
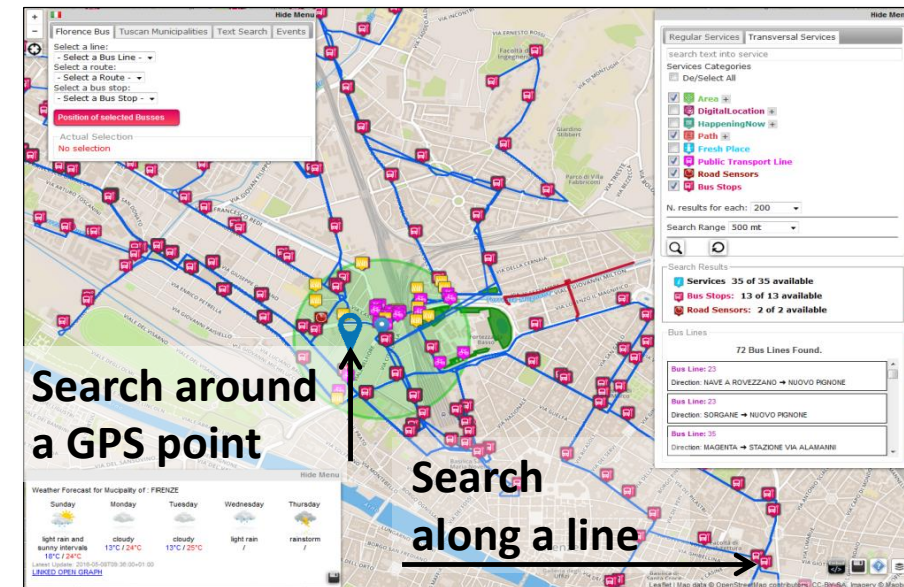
You can save this query on ServiceMap. Please insert a valid e-mail, and you will receive a link that could allow you to access at the results and share it with your friends.

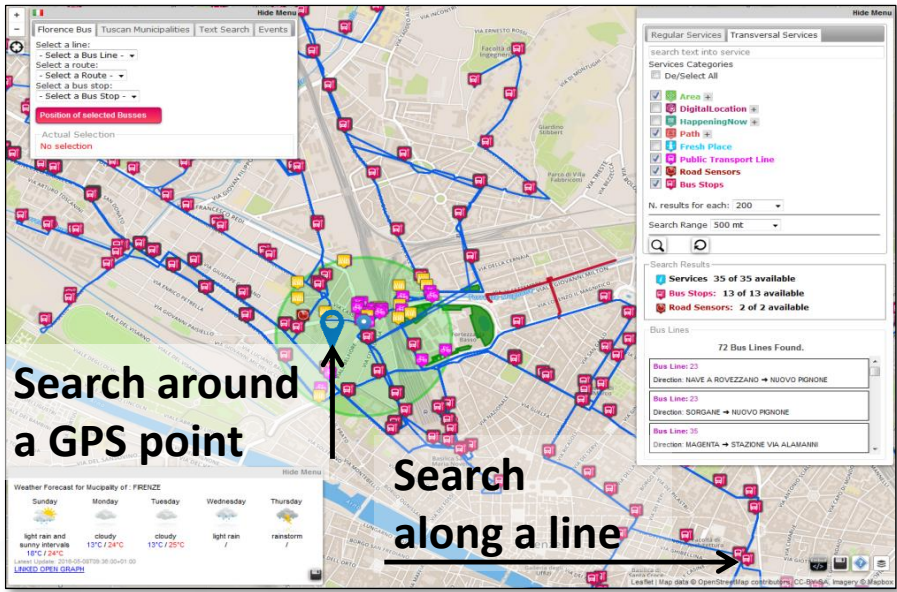
Insert your e-mail: michela.paolucci@unifi.it

Insert a title: My Query

Insert a description: Busses available at Florence station

Send



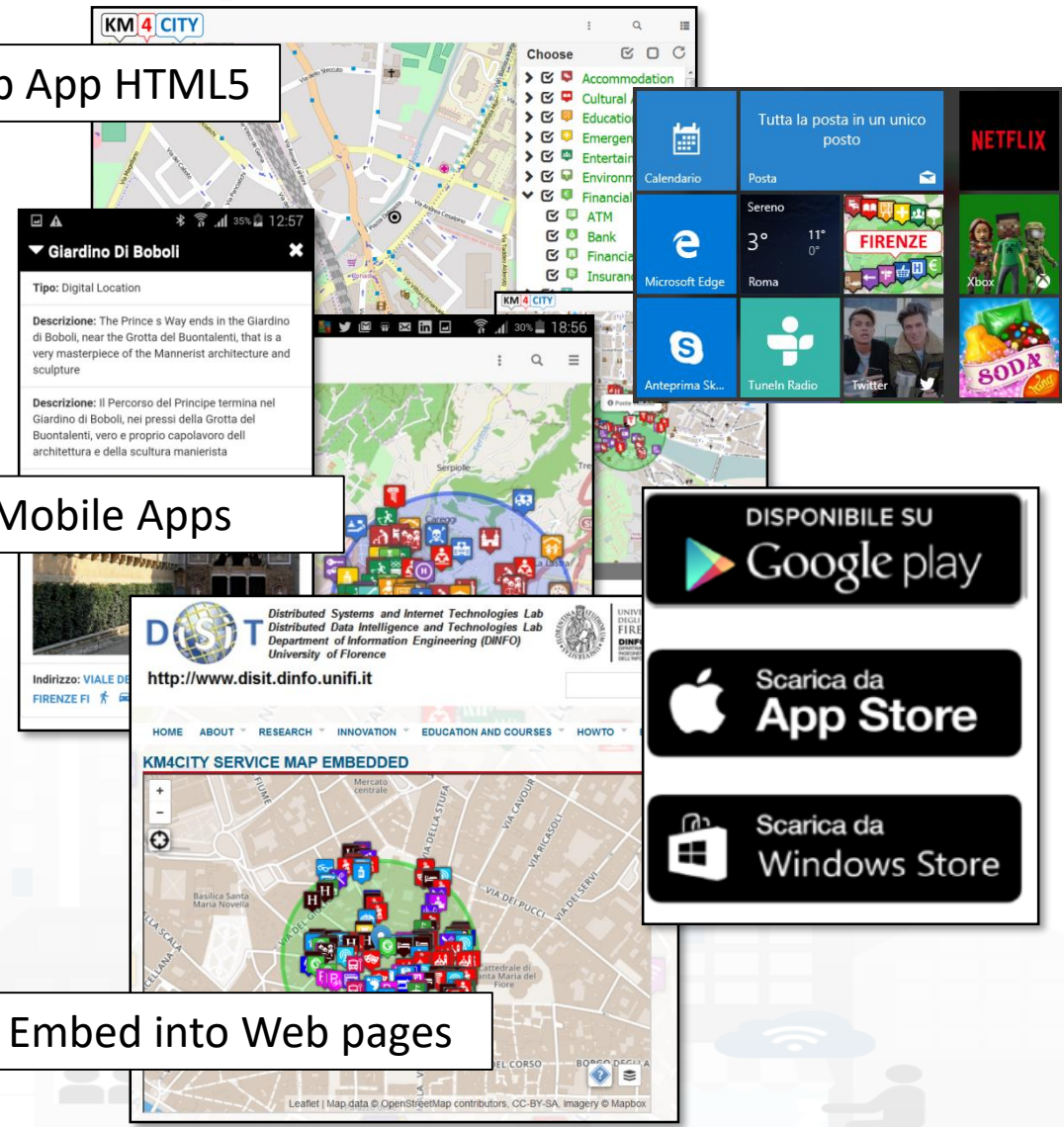


Smart City API call generation

Web App HTML5

Mobile Apps

Embed into Web pages



Linked Open Graph

log.disit.org/service/?graph=df5b4f67f01b7d96071475d62068e0fe

Linked Open Graph

SiiMobility (by DISIT)

Examples:

- VIA GIACOMO MATTEOTTI
- Bagno a Rossi
- Florence

Choose a class:

Search for keyword

keyword:

uri: http://... Request

Your data

sparql endpoint: (optional)

http://...

uri: http://... Request

Status

Requests:

http://www.disit.dinfo.unifi.it/SiiMobility/MUSE

Remove Clear

Type of relations

Select all Deselect all Invert Hide all inverse

- ☒ belongTo
- ☒ contains
- ☒ ends
- ☒ has
- ☒ hasExternalAccess
- ☒ hasProvince
- ☒ hasStreetNumber
- ☒ isIn
- ☒ isPartOfProvince
- ☒ managingAuthority
- ☒ placedIn
- ☒ seeAlso
- ☒ coincideWith
- ☒ depiction
- ☒ forming
- ☒ hasAccess
- ☒ hasMunicipality
- ☒ hasRule
- ☒ inMunicipalityOf
- ☒ isPartOf
- ☒ isPartOfRegion
- ☒ ownerAuthority
- ☒ sameAs
- ☒ starts

Linked Open Graph

Entities: 14

Relations: 32

PISTOIA

TOSCANA

FIRENZE

hasProvide

isPartOfRegion

hasMunicipality...

ownerAuthority

managingAuthority...

isPartOfProvinc...

coincideWith

isIn

type

belongTo

isIn

isPartOf

contains

RT04801702380TO...

MUSEO_SALVATORE...

hasAccess

placedIn

RT048017017682A...

RT04801723494ES...

RT04801708991ET04801724784ES...

RT04801724785ES...

forming

hasRule

managingAuthority...

ownerAuthority

inMunicipalityO...

type

museo ferragamo

Relations of Museo Ferragamo with the road graph

Querying the knowledge base in SPARQL

<http://log.disit.org/spqlquery/>

Flint SPARQL Editor 1.0.3

New Edit View Help

Dataset: KM4CITY Mode: SPARQL 1.1 Query Output: SPARQL/XML Submit

Query 1

```

1 PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
2 PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
3
4 SELECT * WHERE {
5   ?s ?p ?o
6 }
7 LIMIT 10

```

All municipalities

Select all municipalities names.

```

PREFIX km4cr: <http://www.disit.org/km4city/schema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT * WHERE {
  ?s a km4cr:Municipality;
  rdfs:label ?l.
} ORDER BY ?l

```

Bus stops near the Florence SMN train station

The bus stops within 100m of the Firenze SMN

```

PREFIX km4cr: <http://www.disit.org/km4city/schema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

```

Line: 1; Position: 1; Query is valid

Query Results

#	s	p	o
1	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/1999/02/22-rdf-syntax-ns#Property
2	http://www.w3.org/2000/01/rdf-schema#subPropertyOf	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/1999/02/22-rdf-syntax-ns#Property
3	http://www.w3.org/2000/01/rdf-schema#subClassOf	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/1999/02/22-rdf-syntax-ns#Property
4	http://www.w3.org/2000/01/rdf-schema#domain	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/1999/02/22-rdf-syntax-ns#Property
5	http://www.w3.org/2000/01/rdf-schema#range	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/1999/02/22-rdf-syntax-ns#Property
6	http://www.w3.org/2002/07/owl#equivalentProperty	http://www.w3.org/1999/02/22-rdf-syntax-ns#type	http://www.w3.org/1999/02/22-rdf-syntax-ns#Property

Browsing the knowledge base
Linked Open Graph
<http://log.disit.org>

Using and Contributing to Km4City





UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB
<http://www.disit.org>

Km4City Roadmap



SELECT
for Cities
Snap4City



12/2017
WEEE
2017-2020

6/2017

- waste
- Territorial areas and paths
- Health, Bike sharing
- Statistics, Energy, ICT, ...
- E-vehicles

- Risk analysis
- Environmental, water
- Data Licensing models
- Energy Meters
- Fi-Ware compliant

- More Sensors, IOE, IOT
- Dashboard Builder
- Territorial areas and paths
- User Engagement
- Mobility and transport
- Resilience Decision Support

GHOST SIR
2016-2019 - Started



- IOT/IOE
- Monitoring
- Smart City IOT integration
- Living Lab

5G

Smart City vs
IOT, Industria 4.0

6/2018

11/2018

Already Planned
up to 2021

2015



Km4City 1.5
- SmartDS
- Km4City App

RESOLUTE H2020
2015-2018 - Started



Sii-Mobility SCN
2016-2018 - Started
Km4City 1.6.2

Km4City 1.4

- Embed
- More API
- iBeacon

API

- <http://servicemap.km4city.org>
- <http://log.disit.org>
- <http://www.disit.org/fodd>
- <http://www.disit.org/tv> Twitter Vigilance
- <http://smartds.km4city.org>

2016

REPLICATE H2020
2016-2021 - Started



- Suggestions on demand
- User Behaviour Analysis
- Trajectories and OD

2013

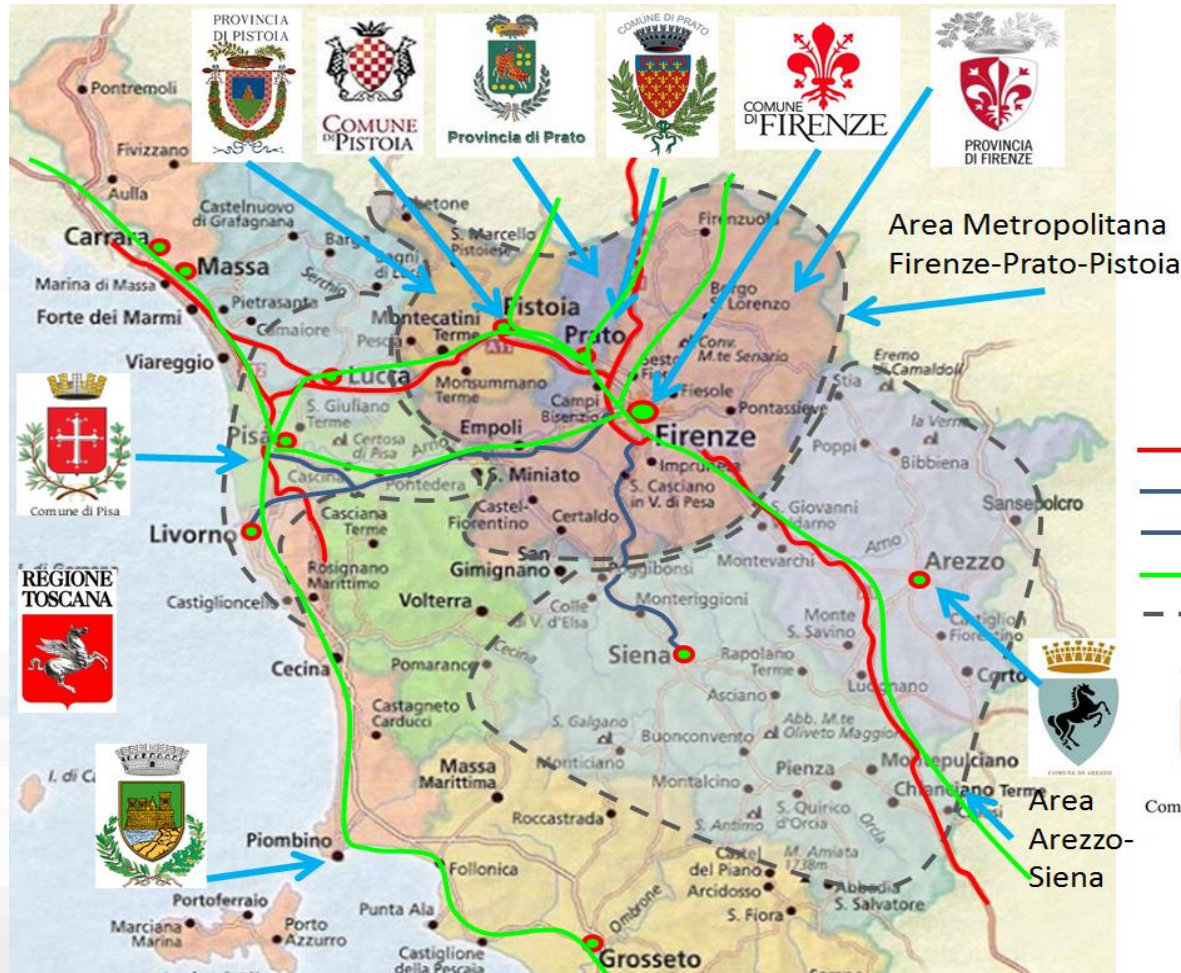
Km4City 1.1

- Tuscany Map
- Services
- AVM
- Sensors
- Parking
- Cultural Heritage
- Enrichment cities
- Event in the city
- Digital Locations
- Fresh places

2014

- Weather
- Cultural Heritage
- Energy recharge pillar
- Wi-Fi
- Events in the city

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



- Autostrade
- SS Fi-Pi-Li
- SS Fi-Si
- Ferrovie (primarie)
- - - Aree

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



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB

Sii-Mobility



<http://www.Sii-Mobility.org>

Commenti dei cittadini,
Social Media



AVM trasporto
Pubblico

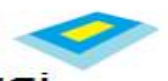


Sensori,
sistema monitoraggio

Merci
Sensori su
trasporto Privato



Sensori
Parcheggi



Monitoraggio
traffico, autostrade



Rete
Ferroviaria

Parametri
ambientali

Servizi ed
enti



Ordinanze: eventi,
lavori pubblici, ..



Emergenze,
polizia, 118



Infomobility



Varchi
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.
- **Testing on municipalities and provinces of Tuscany**
- **Contribute to the improvement of national and international standards**
- **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

Principali Delibere su Sii-Mobility



PA	Tipo di atto
Provincia di Prato	Delibera di Giunta n.267 del 30.10.2012
Comune di Prato	Delibera di Giunta n.474 del 30.10.2012
Provincia di Firenze	Delibera di Giunta n.147 del 06.11.2012
Comune di Firenze	Delibera di Giunta n.403 del 06.11.2012
Provincia di Pistoia	Delibera di Giunta n.156 del 08.11.2012
Comune di Pistoia	Delibera di Giunta n.321 del 08.11.2012
Comune di Pisa	Delibera di Giunta n.203 del 06.11.2012
Comune di Arezzo	Delibera di Giunta n.498 del 07.11.2012
Regione Toscana	Delibera di Giunta n.249 del 15.04.2013

□ <http://www.Sii-Mobility.org>



Horizon 2020
European Union Funding
for Research & Innovation

<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	IT
THALES	THALES	IT
ATTIKOMetro	ATTIKO	GR
Comune di Firenze	CDF	IT
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

RESOLUTE Architecture

RESOLUTE RESILIENCE Dashboard

Presentation & Visualization

User guidance

RESOLUTE Mobile APPs

FRAM → ResilienceDS

CRAMSS

FRAM operationalization

ITS DSS

Smart DS

Evacuation DSS

Decision support system

Application framework

Algorithms and models

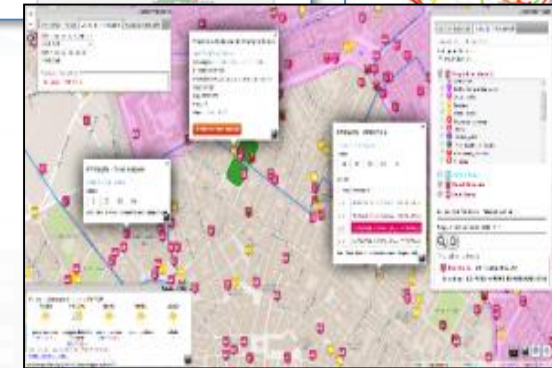
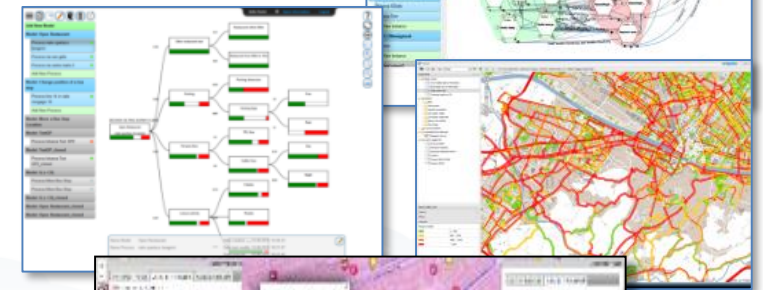
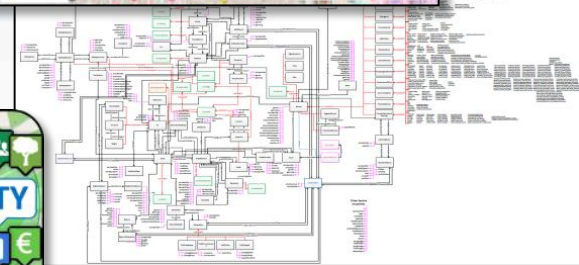
Data Integration APIs

User Profiler APIs

User profiler

Integration framework

Data and Service Aggregator





UNIV
DEGI
FIR



Horizon 2020
European Union Funding
for Research & Innovation

REnaissance of PLaces
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 DIF
- 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

DISIT Lab actions for REPLICATE

- **Integrated infrastructure: aggregation model and urban platform**
 - Adoption of Km4City solutions and tools as starting point
 - Improvements of Km4City ontology, by adding:
 - energy, sustainable mobility, dashboarding, urban services, IOT of several kind
 - Improving Smart City API, providing support for:
 - Above mentioned domains in addition to those of Km4City for developing energy based APPs REPLICATE
- Developing and putting in place a **dashboard** system and development tool





e-distribuzione

Social Media
WiFi, network



Transport systems
Mobility, parking



Public Services
Govern, events,



Sensors, IOT
Cameras, ..



Environment,
Water, energy



Shops, services,
operators



**Twitter
Vigilance**

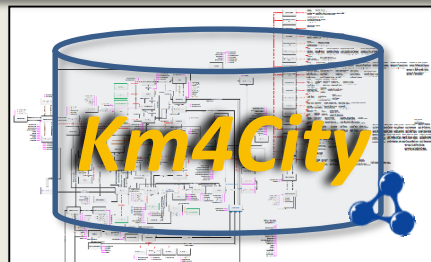
Static, Slow and Real Time data flows

DISCES -- Distributed and parallel architecture on Cloud

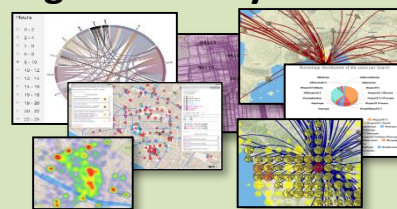


[Http://www.km4city.org](http://www.km4city.org)

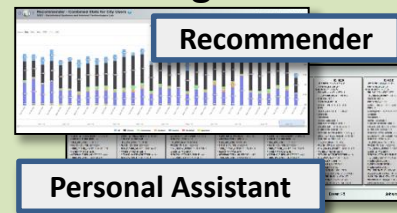
Km4City Smart City Engine



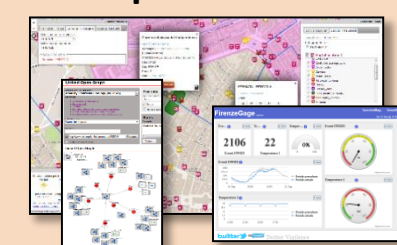
Big Data Analytics



Smartening Tools



Development Tools



Km4City Smart City API

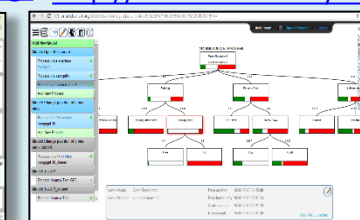
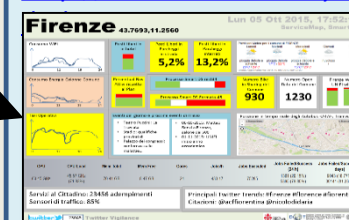
Tools for City Operators and Decision Makers

Smart City Dashboard

[Http://dashboard.km4city.org/](http://dashboard.km4city.org/)

Smart Decision Support

[Http://Smartds.km4city.org](http://Smartds.km4city.org)

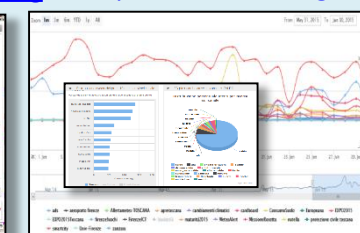
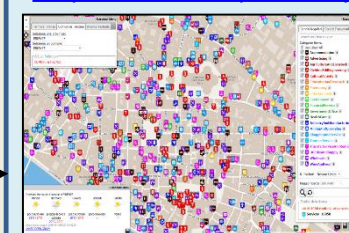


ServiceMap browser

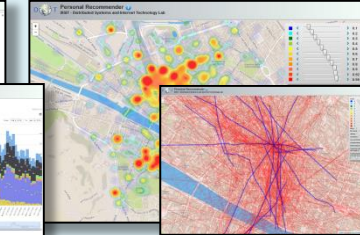
[Http://servicemap.km4city.org](http://servicemap.km4city.org)

Twitter Vigilance

[Http://www.disit.org/tv](http://www.disit.org/tv)



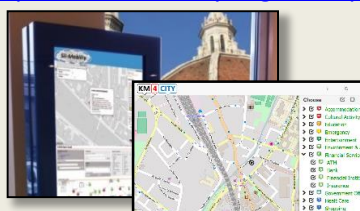
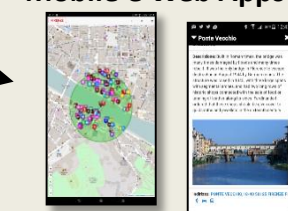
Analyzers of City User Behavior



Tools for Final Users

Mobile e Web Apps

[Http://www.km4city.org/webapp](http://www.km4city.org/webapp)



[Http://www.km4city.org/app](http://www.km4city.org/app)



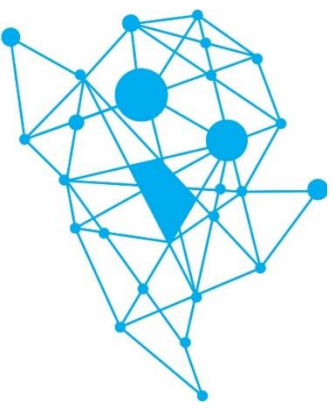
<http://replicate-project.eu/>



UNIVERSITÀ
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DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



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



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>

City Resilience and, DSS, Decision Support Systems

<http://www.km4city.org/?controlRoom>

<http://www.km4city.org/?devTools>

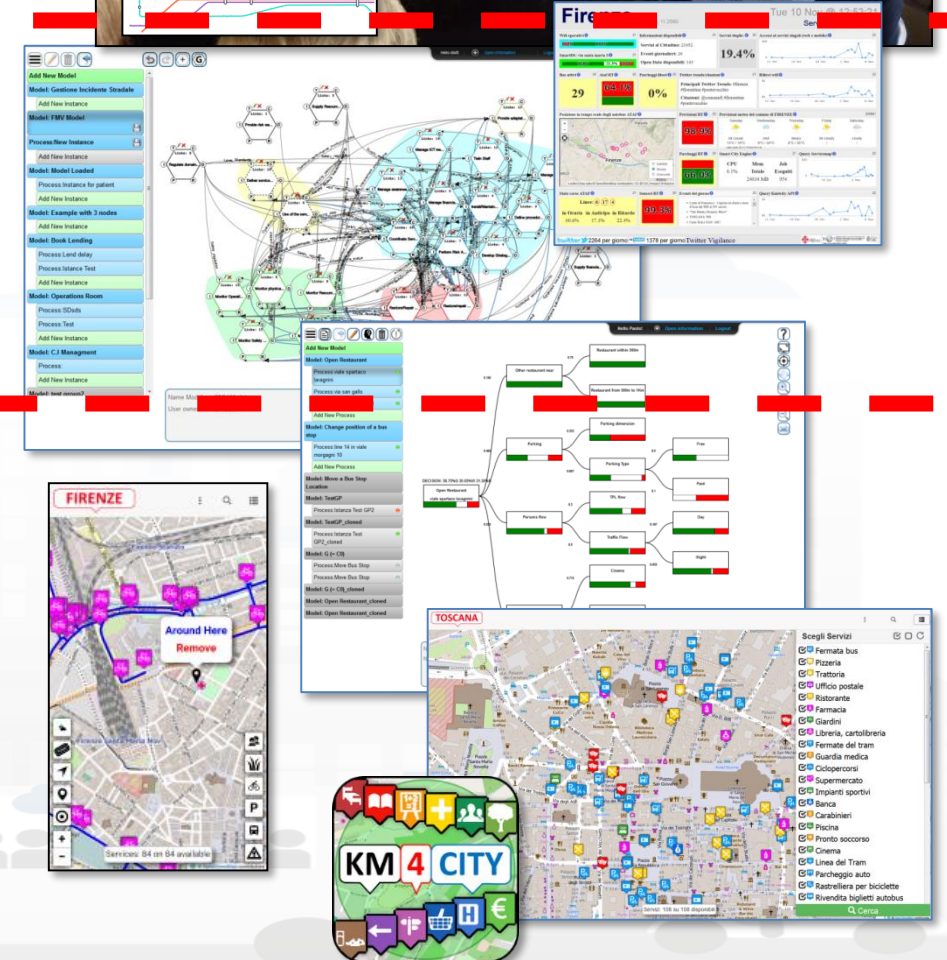
<http://www.km4city.org/?infoDocs>

<http://www.km4city.org/?app>



Improve city resilience, reducing risks and decision support

- assessing city resilience level
- improving city resilience, providing objective hints
- improving city users awareness with personal city assistants and participatory tools



Problems and issues

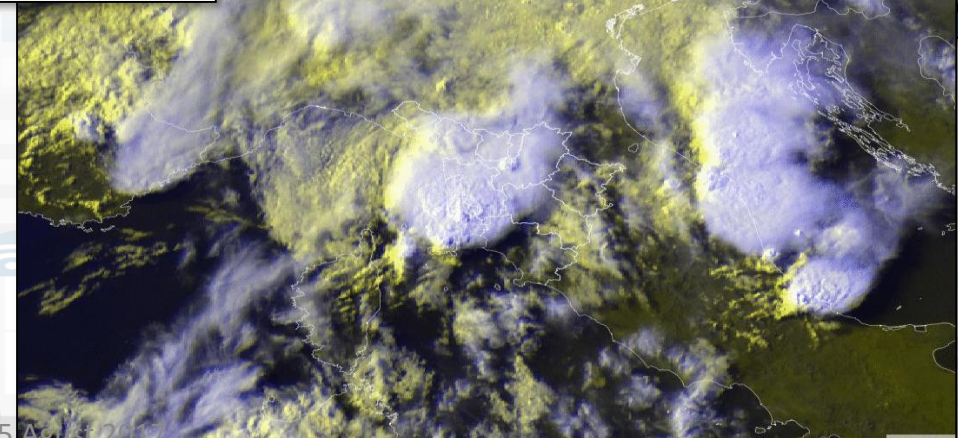
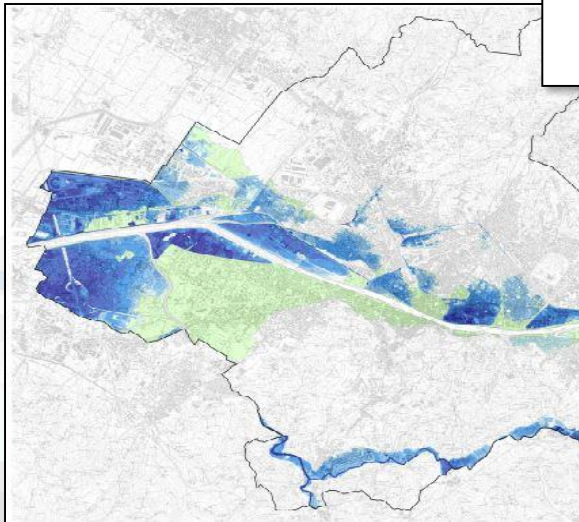
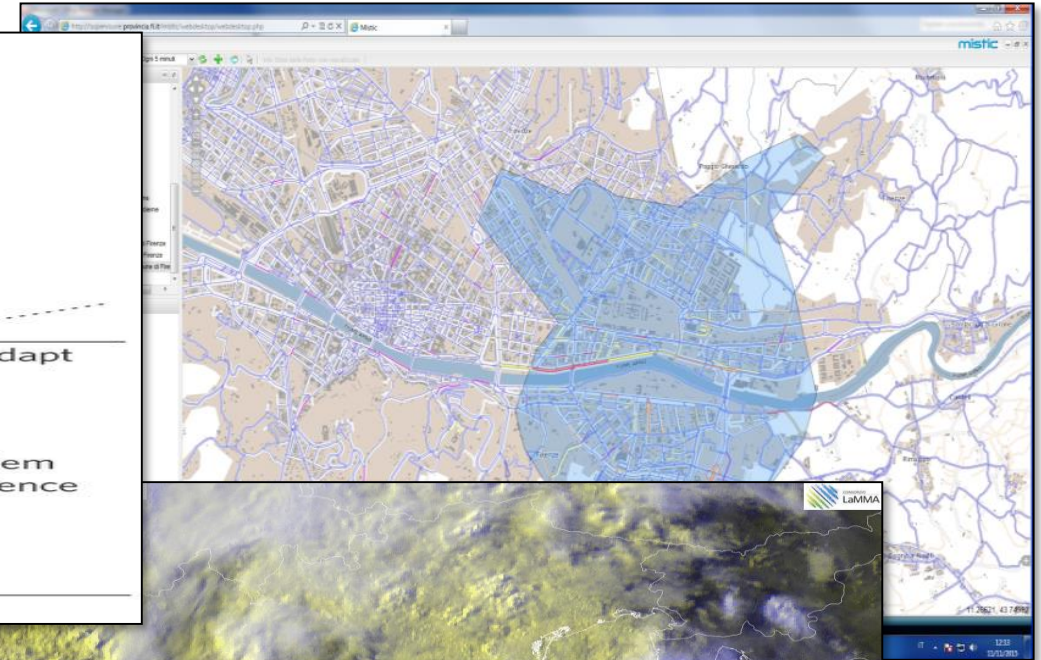
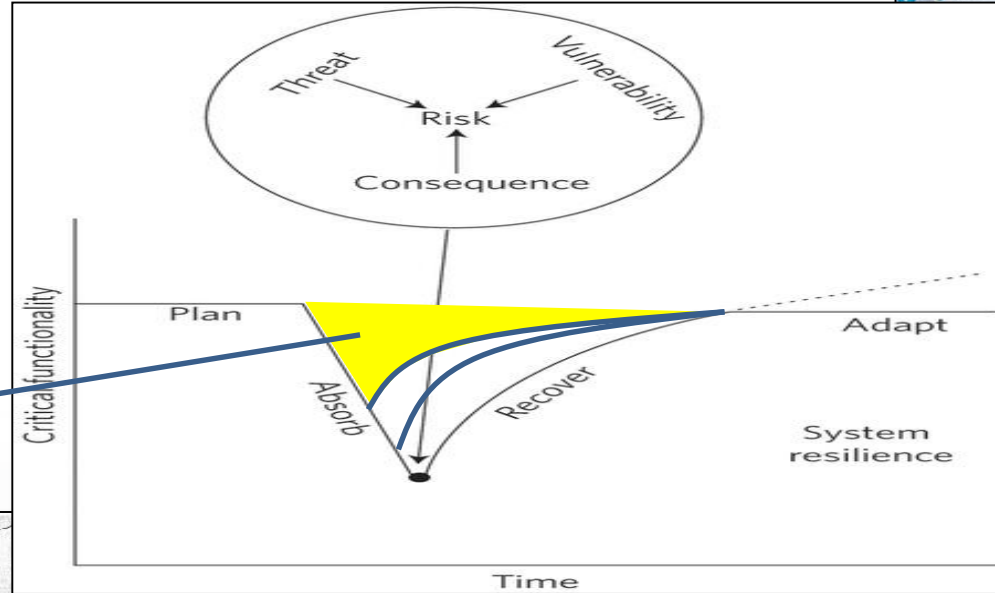
- Cities include critical infrastructures strongly related / depended each other:
 - Transport, energy, communication, cyber, health...
- Risks for these Critical Infrastructure (safety and security) may be due to natural and/or human made events.
- UTS, Urban Transport System, is one of the most challenging since UTS is the via by which many problems may propagate but also the path used by solutions and the recovery actions.



Early warning, detection

Prepare
Absorb
Recover
Adapt

damage

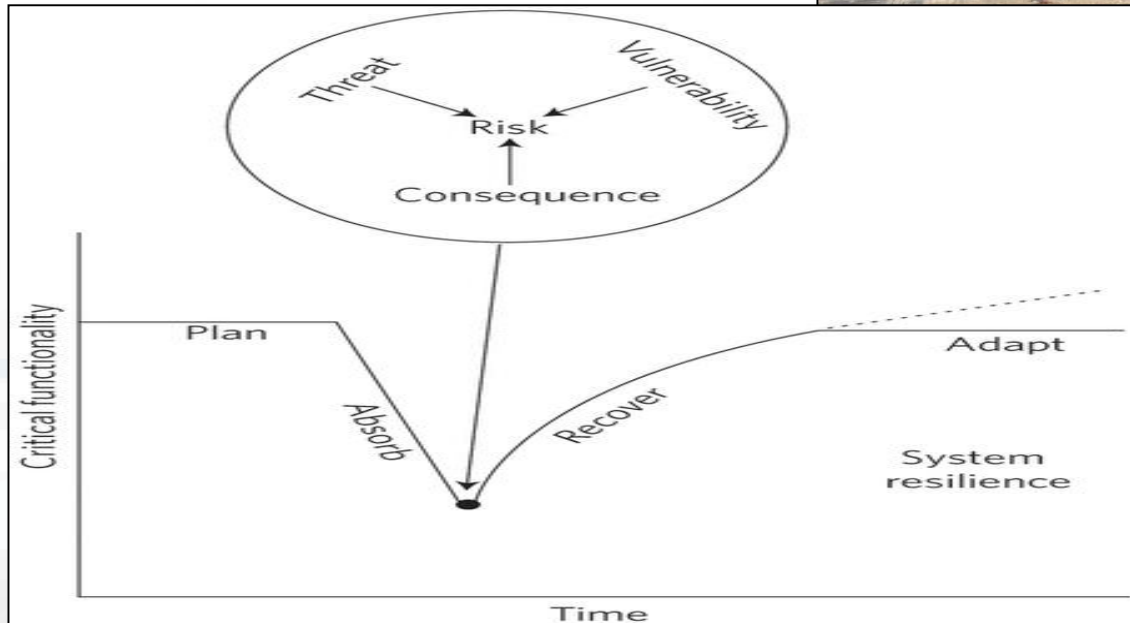
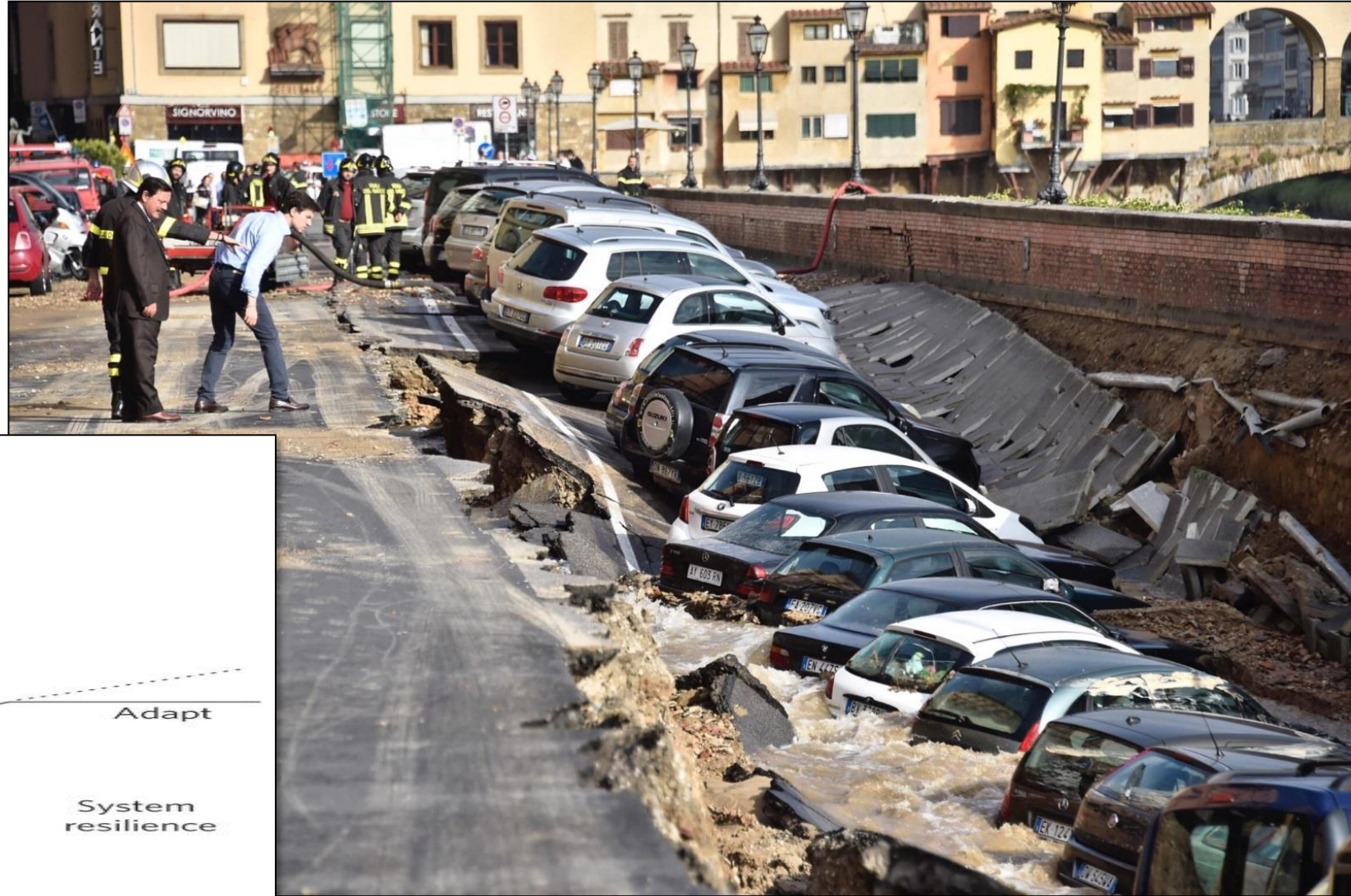


Prepare

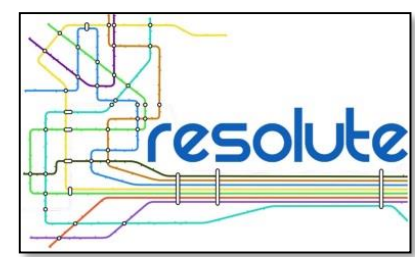
Absorb

Recover

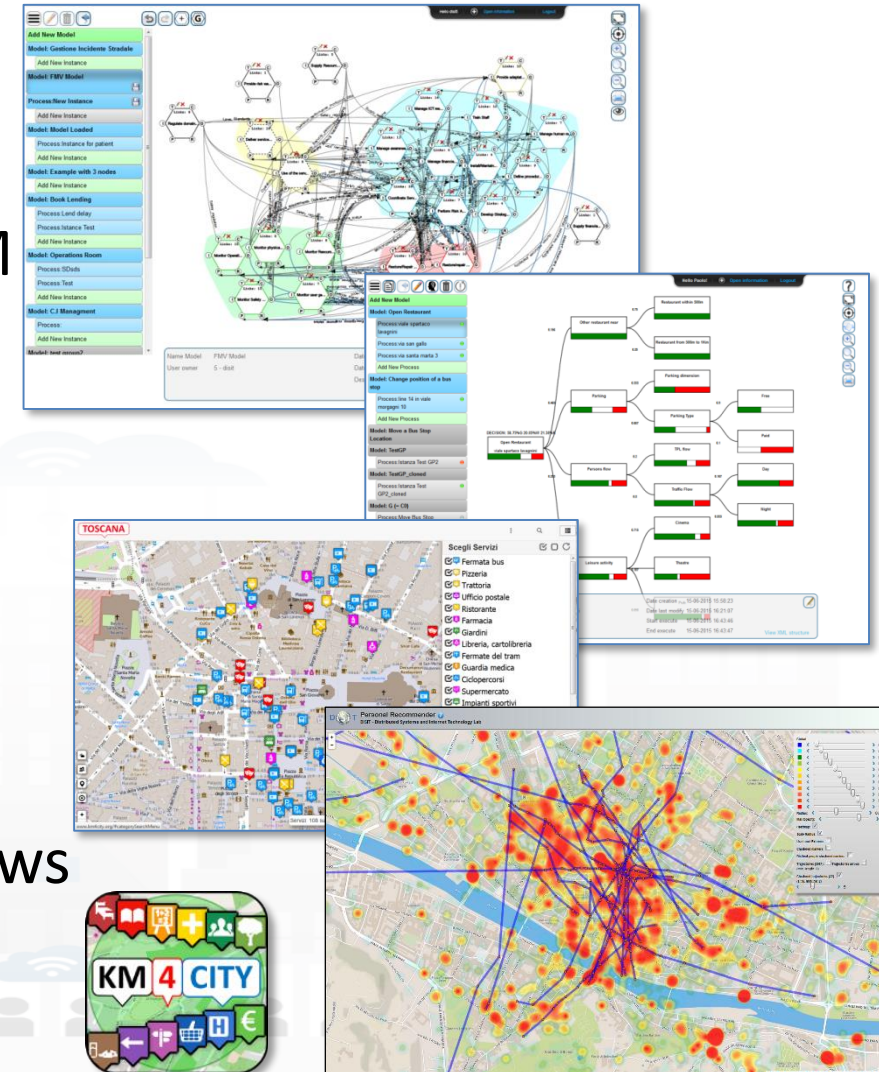
Adapt



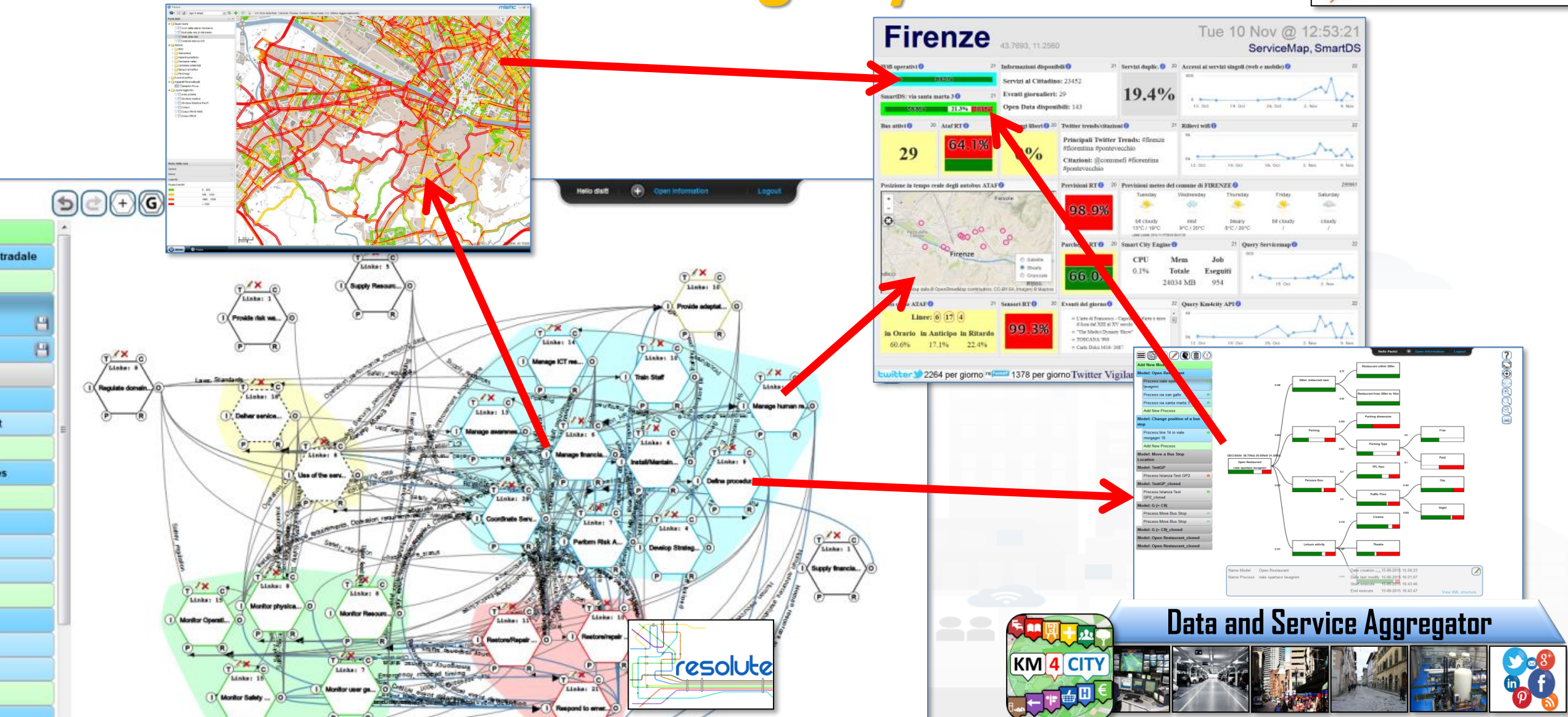
Main Approach



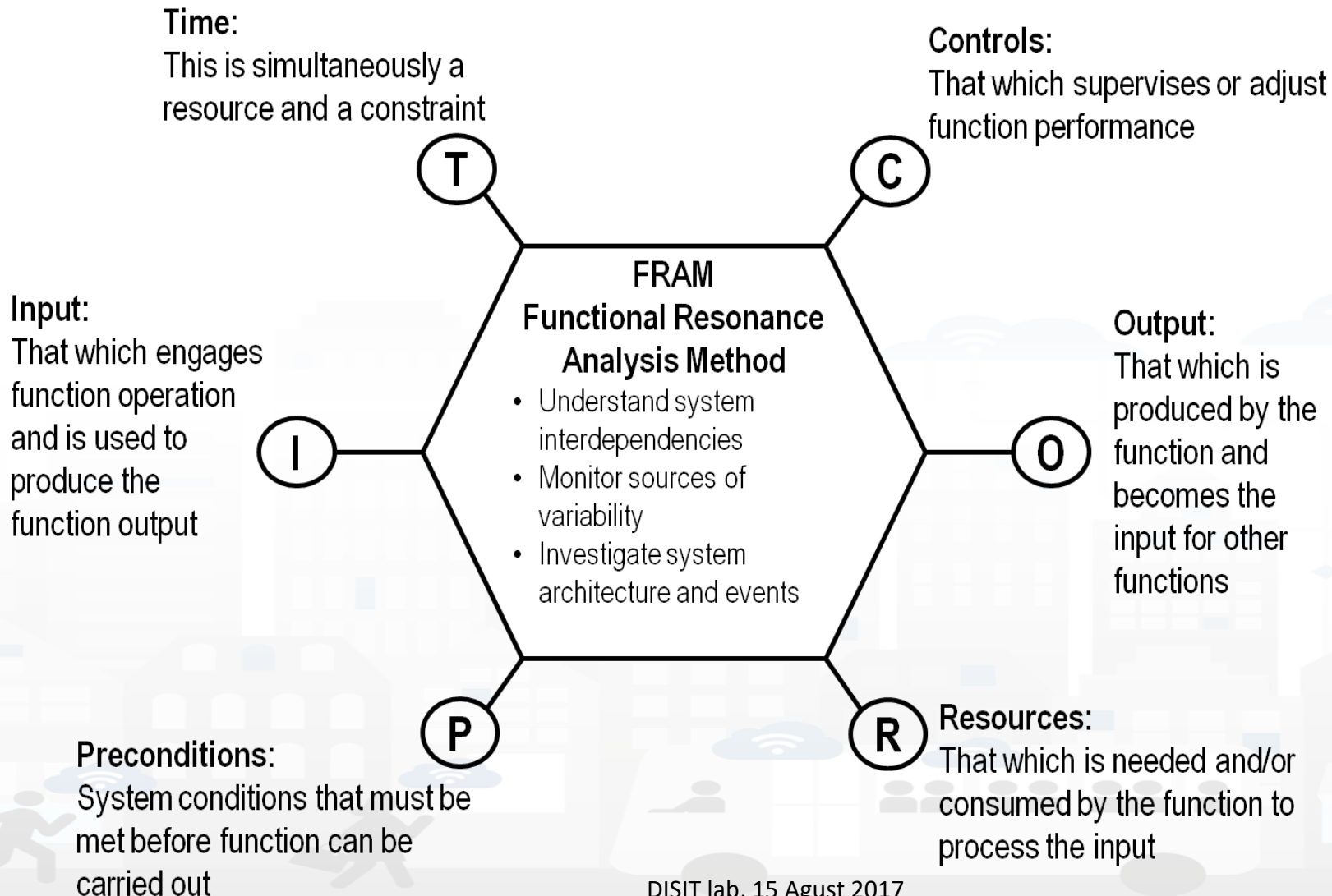
- Three main layers
- Complex System modeling: function, processes, resources, time, events, etc..
 - Functional Resonance Analysis Method, FRAM
 - Resilience Analysis Grid, RAG
- Decision Support System, DSS
 - System Thinking, Goal Models
 - Risk analysis
 - UTS/ITS decision supports
- Data, big data access and exploitation
 - Data Analytics, Internet of Things, sensors, flows
 - People flow and behavior
 - Social Media



Dashboarding city resilience

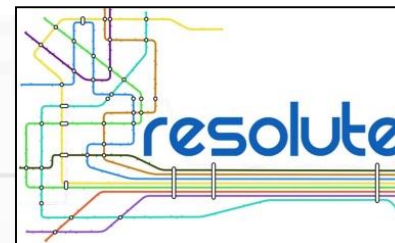
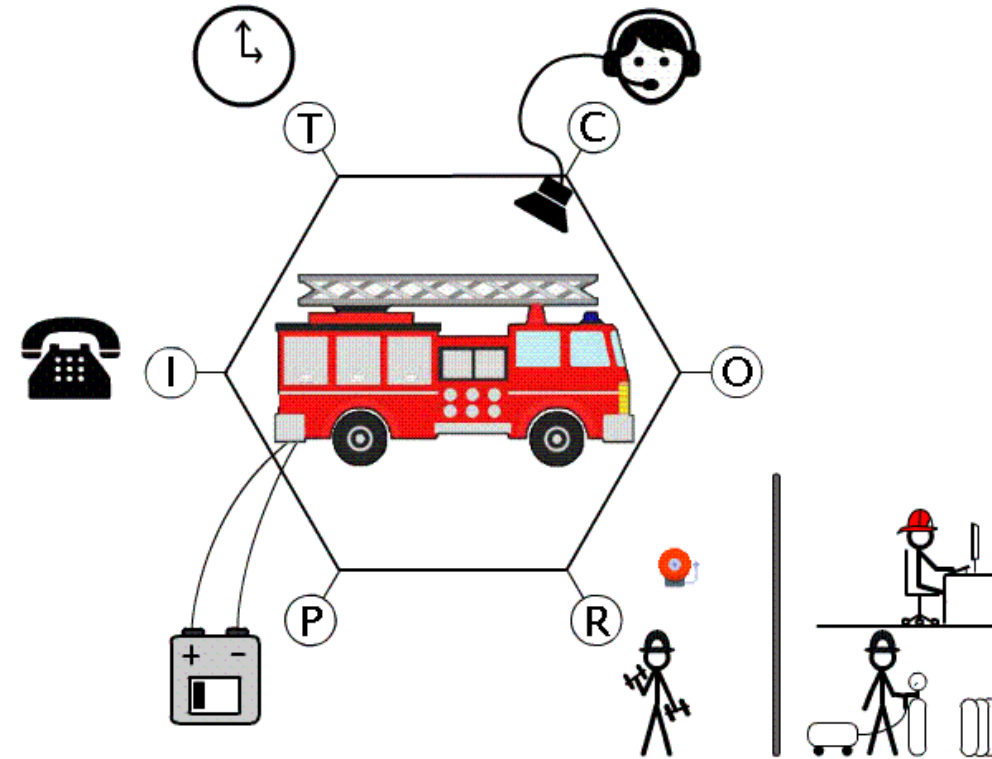


Functional Resonance Analysis Method



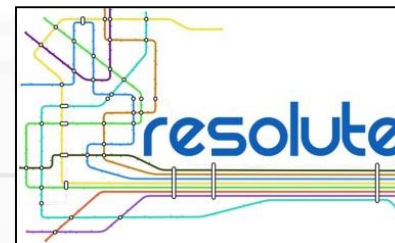
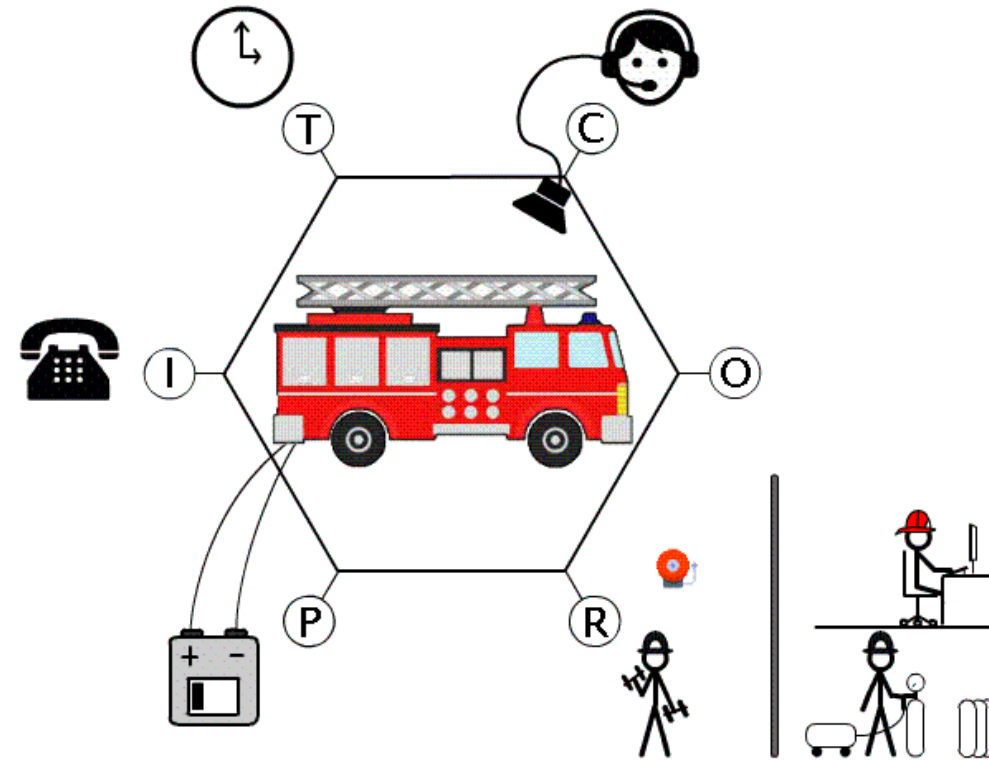
- Success and failure are equivalent in the sense that they both emerge from performance variability.
- Variability, intended as a way for people to adjust tools and procedures to match operating conditions.
- Emergence of either success or failure is due to unexpected combination of variability from multiple functions.
- The unexpected “amplified” effects of interactions between different sources of variability are at the origin of the phenomenon described by functional resonance.

Functional Resonance Analysis Method

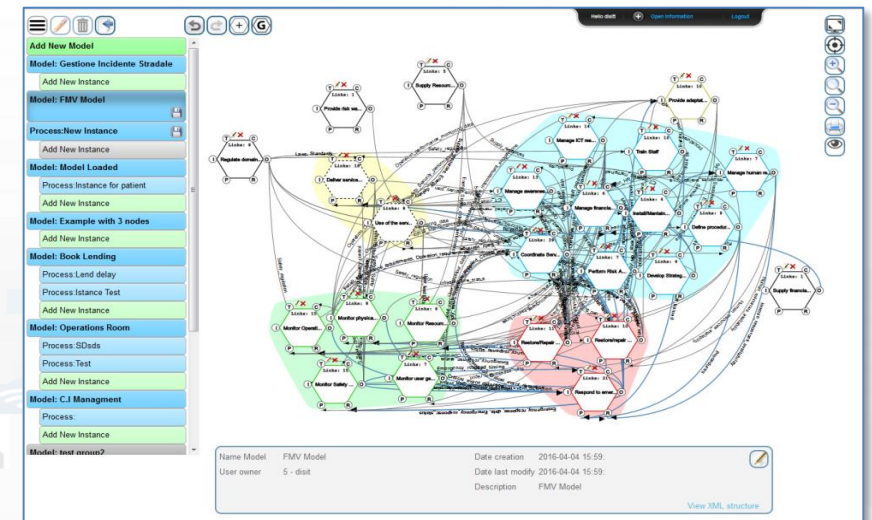
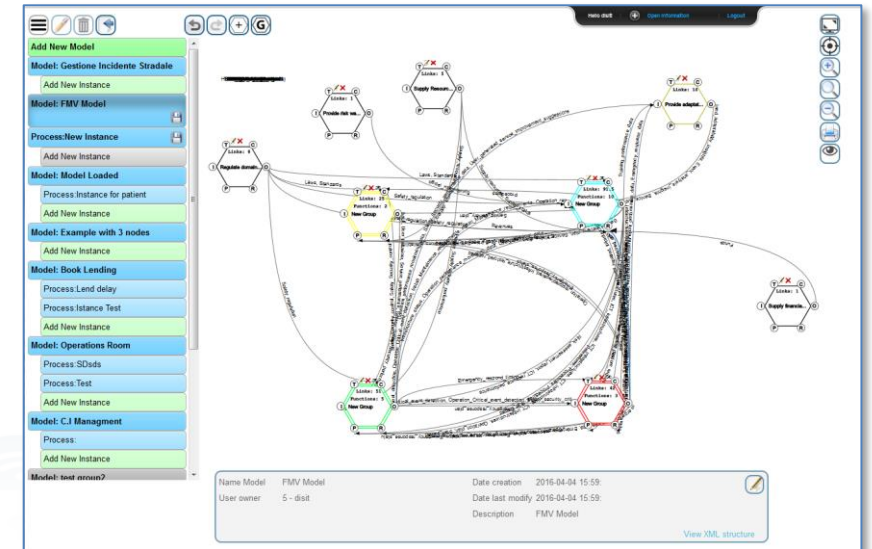


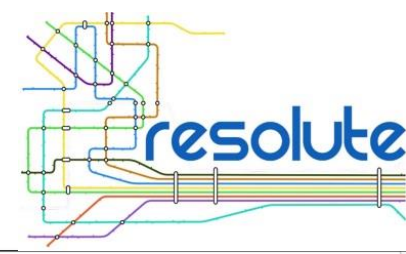
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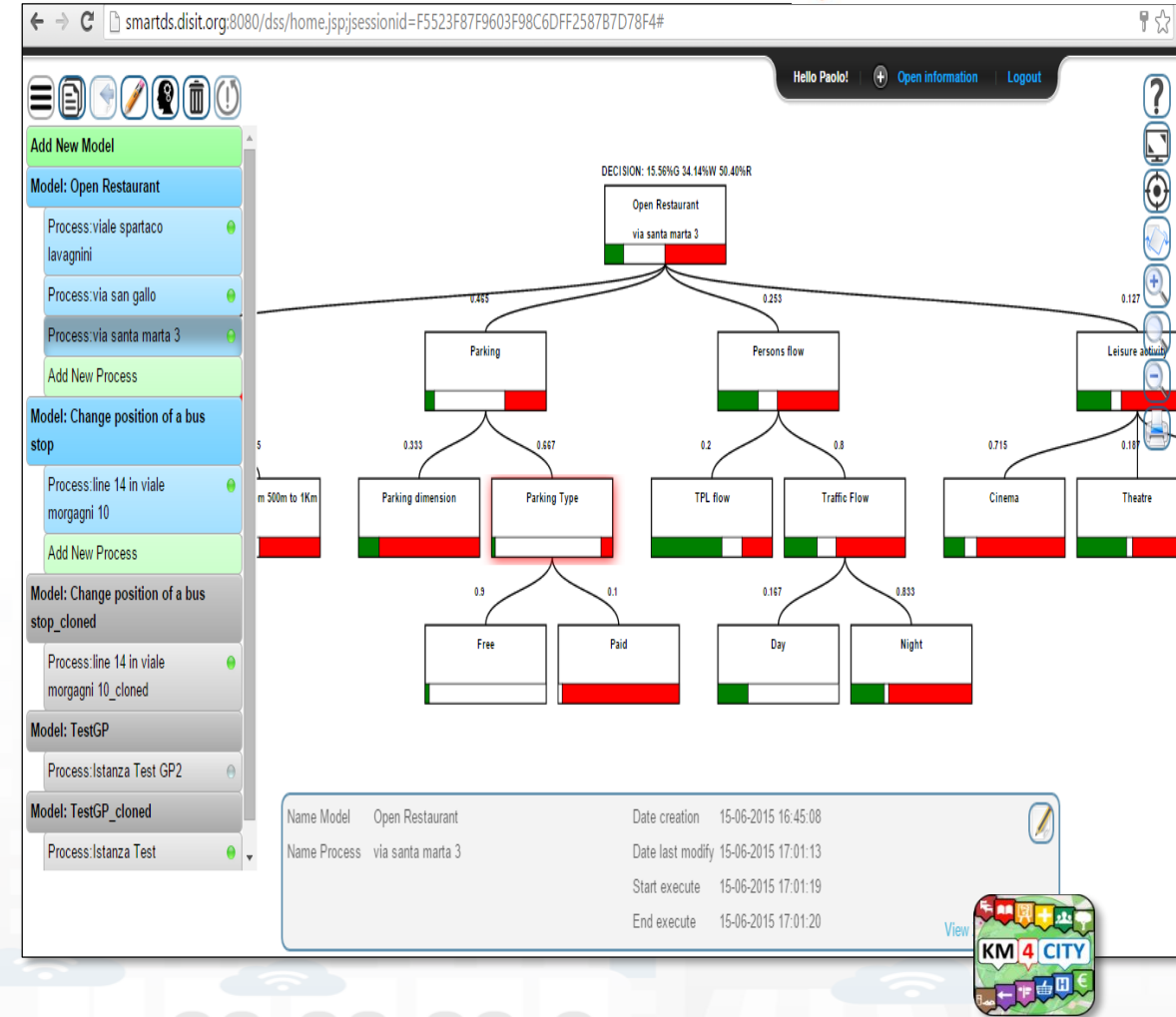


- FRAM Model
 - Macro FRAM processes
 - Metrics for Process complexity assessment
 - Operational Semantic for executing FRAM model
 - Connection with SmartDS
 - Connection with BigData open to multiple sources of data and workgroup results, Km4City
- Collaborative work
- Open for all
- Validated on ERMG
- Web Tool





- Smart Decision Support System based on System Thinking plus
- Actions to city reaction, resilience, smartness..
- Enforcing
- Mathematical model for propagation of decision confidence..
- Collaborative work...,
- Processes connected to city data: DB, RDF Store, Twitter, etc.
- Production of alerts/alarms
- Data analytics process
- Twitter Processes
- reuse, copy past, ...



Improve city resilience, reducing risks and decision support

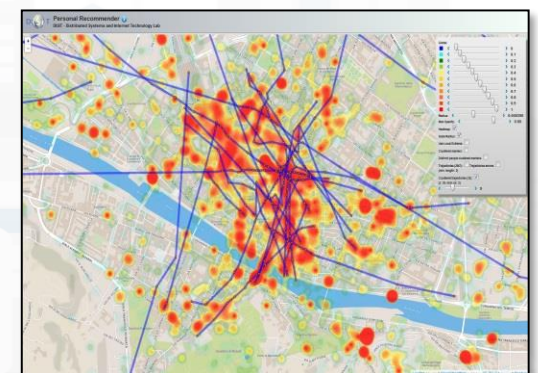
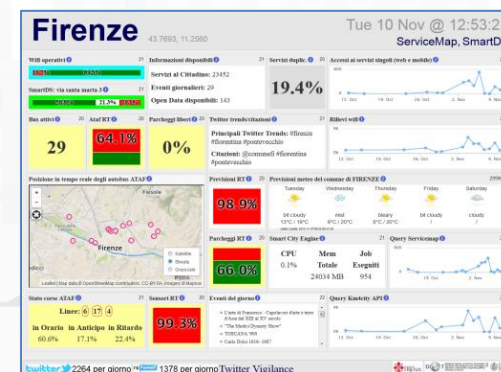
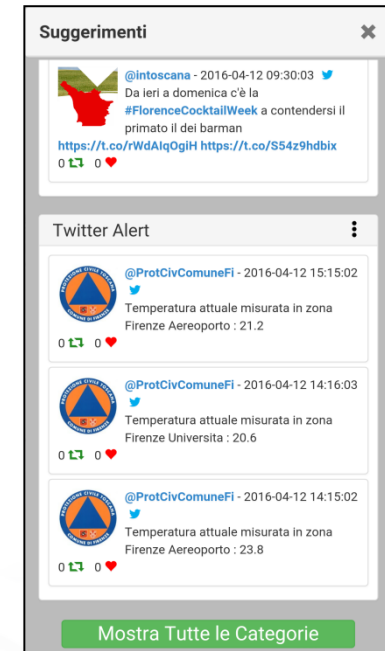
- assessing city resilience level
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- improving city users awareness with personal city assistants and participatory tools



Mobile Emergency



- Personalized menu for Operators
- Providing information and suggestions to citizens
 - Civil Protection Page
 - Twitter Info
 - Geolocalized Info
- Tracking people and operators flows
- Collecting information from citizens
 - Comments
 - Images



Info and Documents

<http://www.km4city.org/?infoDocs>



Open Source



- **[Km4City](#)**, Sii-Mobility, RESOLUTE, REPLICATE: smart city big data open source tools. Km4City is a knowledge base and a research line of DISIT lab mainly developed before the start of Sii-Mobility, RESOLUTE, REPLICATE projects. While it has been mainly improved by them. Those projects are complementar each other and almost all of them use and contribute the Km4City research line. **[ServiceMap smart city knowledge base tool](#)**: smart city service tool (mainly developed for Sii-Mobility project) for accessing to km4city knowledge base, for service browsing and query, for **[Smart City API](#)** for mobile and for mobile development tool, <http://www.disit.org/km4city>
- **[Km4City ontology model and files](#)** are accessible from <http://www.disit.org/km4city> improved with the support of projects as Sii-mobility, REPLICATE and RESOLUTE
- **[SCE, Smart City/Cloud Engine front end interface](#)**, SCE is part of **[DISCES](#)** a Distributed SCE Scheduler Tools (SCE: Smart City/Cloud Engine), a DISIT tool for smart environments. It is currently in use in **[Km4City](#)** tools, and in **[ICARO Cloud project and service, see CLOUD page. Developed for ICARO, and then improved for Sii-Mobility, and used in many other projects](#)**
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- **[DIM-RIM](#)**: Data Ingestion Manager and RDF Indexing Manager, **[WEB page on DISIT lab with user manuals, DIM and RIM](#)** area used in **[Km4City](#)** and tools, **[Sii-Mobility](#)** smart city national SCN project, **[RESOLUTE H2020](#)**
- **[Dashboard Builder and executor](#)**: a tool for creating dashboard for smart city. See Km4City example of dashboard as reported in <http://www.km4city.org/controlroomtools.html> for the documentation see <http://www.disit.org/6935> which is manual with examples regarding widgets. Developed for REPLICATE Project, and used in others as Sii-Mobility, RESOLUTE.
- **[Sii-Mobility Dev Kit Mobile AppKm4city](#)**: Open Source version of the Sii-Mobility mobile and web app, open modular (the full version is operative and accessible on all stores as "Firenze dove cosa", or "Toscana dove cosa", you can install from <http://www.km4city.org/app>). Developed for Sii-Mobility, adopted for the training and development meeting of the 24 january 2017, and as a basis for the Hackathon of 7-8 April 2017 in Florence.

Acknowledgement

- Thanks to the European Commission for founding. All slides reporting logo of **RESOLUTE H2020** are representing tools and research founded by European Commission for the RESOLUTE project. **RESOLUTE** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 653460).
- Thanks to the European Commission for founding. All slides reporting logo of **REPLICATE H2020** are representing tools and research founded by European Commission for the REPLICATE project. **REPLICATE** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 691735).
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- Thanks to the European Commission for founding. All slides reporting logo of **Snap4City** <http://www.snap4city.org> of **Select4Cities H2020** are representing tools and research founded by European Commission for the **Select4Cities** project. **Select4Cities** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 688196)
- **Km4City** is an open technology exploited by those projects and line of research of DISIT Lab. Some of the innovative solutions and research issues developed into the above mentioned projects are also compliant and contributing to the Km4City approach and thus are contributing to the open Km4City model of DISIT lab.



Horizon 2020
European Union Funding
for Research & Innovation



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Open Urban Platform: Technical View 2018

<http://www.disit.org/km4city>

www.Km4City.org

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