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Km4City

For a Sentient City

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

Paolo Nesi, paolo.nesi@unifi.it



A nighttime photograph of Siena, Italy, showing the Duomo di Siena and Palazzo Pubblico illuminated against a dark sky. The city lights are reflected in the Arno River in the foreground. The text '0 - Km4City Overview' is overlaid in large, bold, yellow letters.

0 - Km4City Overview

www.Km4City.org



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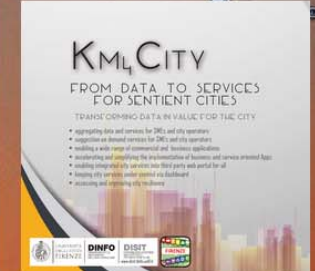
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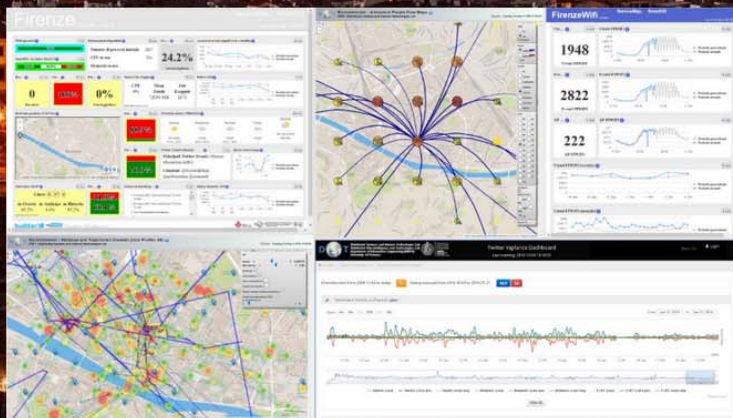
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Home Sentient City Control Room City Users' Tools Back Office and Dev Tools Info and Docs



City Users' Tools for Mobile Devices and Web

FIRENZE, Where, What

Km4City Mobile App Video

Suggestions and recommendations (*)

Engagements

Web and Totem Km4City Apps (*)



Sentient City Tools

Km4City Open Urban Platform

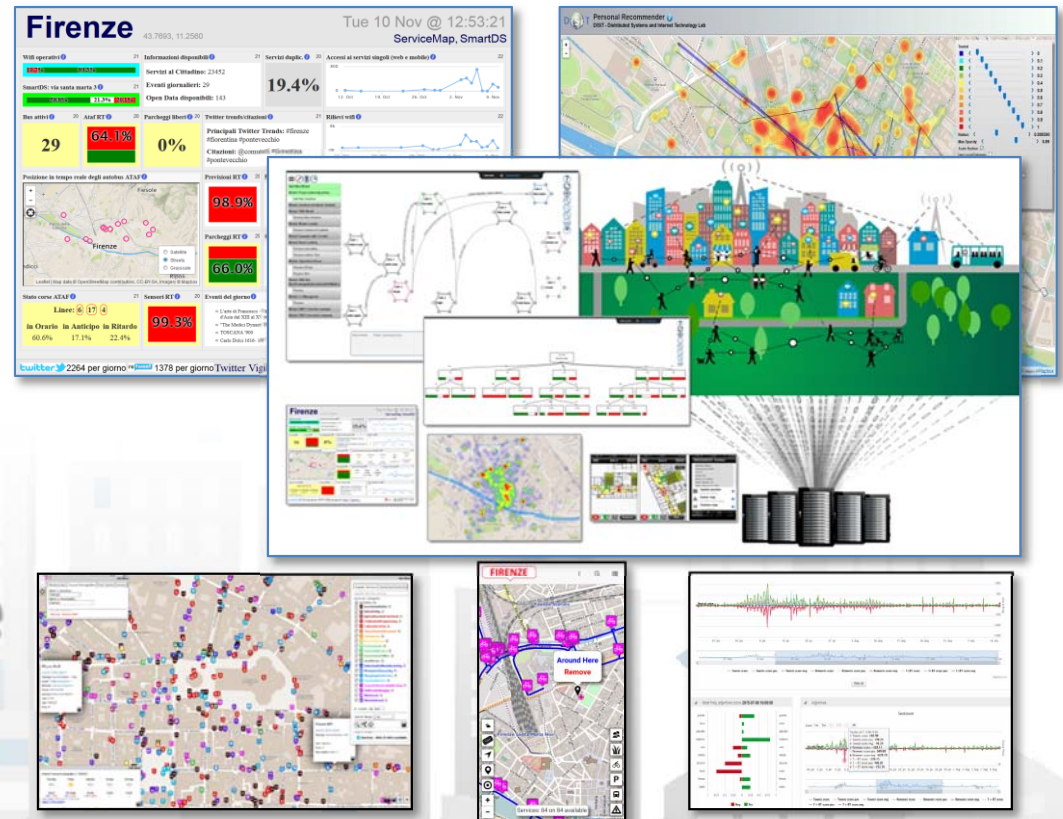
- **Produce value from data enabling to**
 - Increase efficiency in energy consumption
 - Reduce pollution and traffic congestion
 - Improve quality of service, quality of life
 - Create an ecosystem for innovation and punt in action any smart city solutions and services.
- **Perform integrated and unified data management and data analytics by a set of tools at service of city operators and city users, to:**
 - Perform predictions, reasoning, business intelligence, city users behavior analysis, ..;
 - Control Room, Real Time Monitoring tools,
- **Aggregate & integrate data and streams of any urban system, operator, provider, user, .., exploiting**
 - open data, IOT, sensors, internet of everything,
 - cloud, mobile devices, Wi-Fi, social media,
 - big data analytics, ecc;



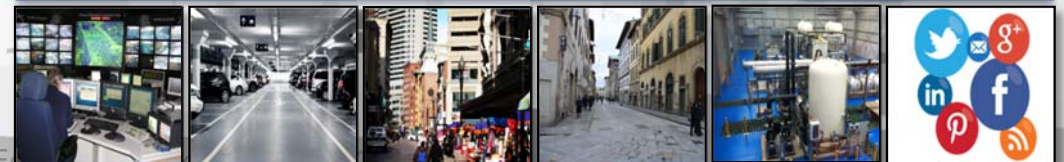
From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

1. keep city under control via personalized dashboards
2. improve city resilience, reducing risks and decision support
3. transform data in value for the city
4. Technical details
5. Who is using Km4City



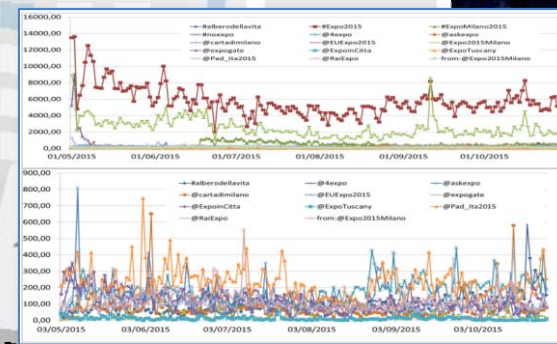
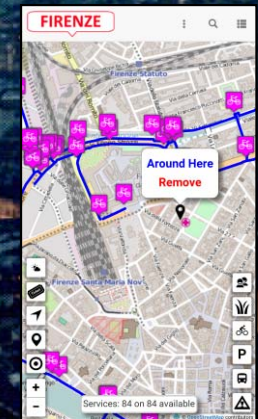
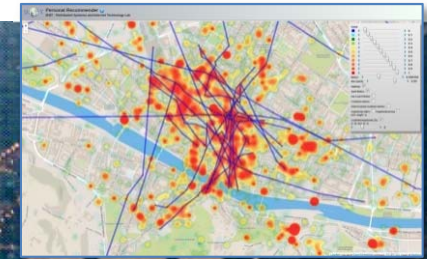
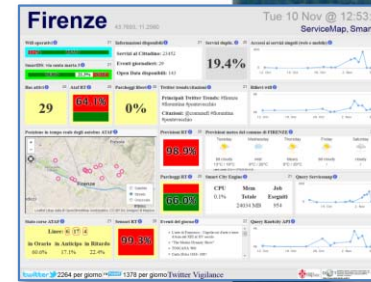
Km4City Data and Service Aggregator





city under control

- **monitoring services' status of city operators**
 - Smart City Dashboards
 - Continuous Business Intelligence
- **City users behaviour monitoring and analysis:**
 - Sensors, traffic flow, people flows, mobiles, sensors, IOT, IOE
 - Wi-Fi, Tv-Cameras
- **City users participation**
 - social media for city services and events, **Twitter Vigilance**
 - **Collecting contributions:** images, stars, comments



Sentient City Control Room



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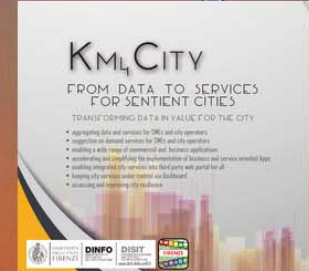
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Real Time Monitoring Tools for Control Room Dashboards

Control Room Dashboard ⓘ

Wi-Fi Coverage (*) ⓘ

Wi-Fi Usage (*) ⓘ

City Users Behaviour via Mobile App (*) ⓘ

Real Time Data on 3D (*) ⓘ

Parking Areas Status in Florence (*) ⓘ

Traffics Sensors in Tuscany Region (*) ⓘ

Twitter Vigilance Sentiment Analysis (*) ⓘ

Predicting Model for Admin. e city Users ⓘ

- Aim: Improving quality of service, distributing workload in city, early warning.
- Traffic Flows & People Flows → crowd
- Parking Status → free slots
- Weather Forecast (LAMMA)

Early Warning and Prediction Tools ⓘ

Smart City Control Room, Dashboard, Real Time Data

Big Data Analytics Tools, Business Intelligence, Decision Support Tools

Resilience Decision Support System (*) ⓘ

Smart Decision Support System (*) ⓘ

Risk & Vulnerability Analysis Tool ⓘ

Origin Destination Matrix by Wi-Fi data (*) ⓘ

Recency and Frequency by Wi-Fi data (*) ⓘ

Origin Destination Matrix via Mobile App (*) ⓘ

Heatmaps and Trajectories for City Users Tourists (*) ⓘ

City User Behavior Analysis (*) ⓘ

Social Media Twitter Vigilance (*) ⓘ

Twitter Data Analysis Tool (*) ⓘ

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Smart City Dashboard



Firenze

43.7693, 11.2960 Tue 4 Oct @ 12:09:48

ServiceMap, SmartDS

WiFi operativi: 1000/25
SmartDS: via Santa Marta 3
Bus...: 0
Ata...: 100%
Par...: 0%

Informazioni disponibili: 60 sec
Numero di processi lanciati: 2627
CPU in uso: 0%
Memoria in uso: 72094 MB
Job Eseguiti: 2673

Accessi ai servizi singoli (web e mobile): 24 sec
Smart City Engine: CPU 0%, Mem 72094 MB, Job Eseguiti 2673
Rilevati wifi: 42.619, 31.994.23, 21.329.5, 10.664.75

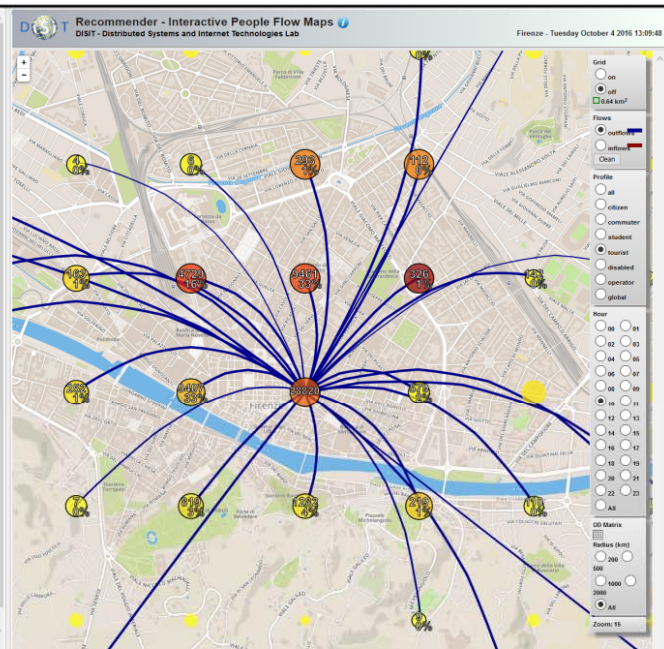
Real time position ATAF bus: Map of Firenze showing bus routes

Previsioni meteo: FIRENZE
Tuesday: 88.9%
Wednesday: 17°C / 24°C
Thursday: 10°C / 23°C
Friday: 12°C / 19°C
Saturday: rain and sunny intervals 7

Twitter Trends/citazioni: 76.0%
Principali Twitter Trends: #firenze, #fiorentina #uffizi
Citazioni: @NicolodiDaria, @acfflorentina @comunefi

Stato linee ATAF: Linee: 6, 17, 4
in Orario: 46.2%, in Anticipo in Ritardo: 4.6%, 49.2%
31.9%, 68.1%

Elenco eventi del giorno: 7 sec
Query Kinacity API: 28 sec



FirenzeWiFi monitor

ServiceMap, SmartDS Tue 4 Oct @ 12:09:48

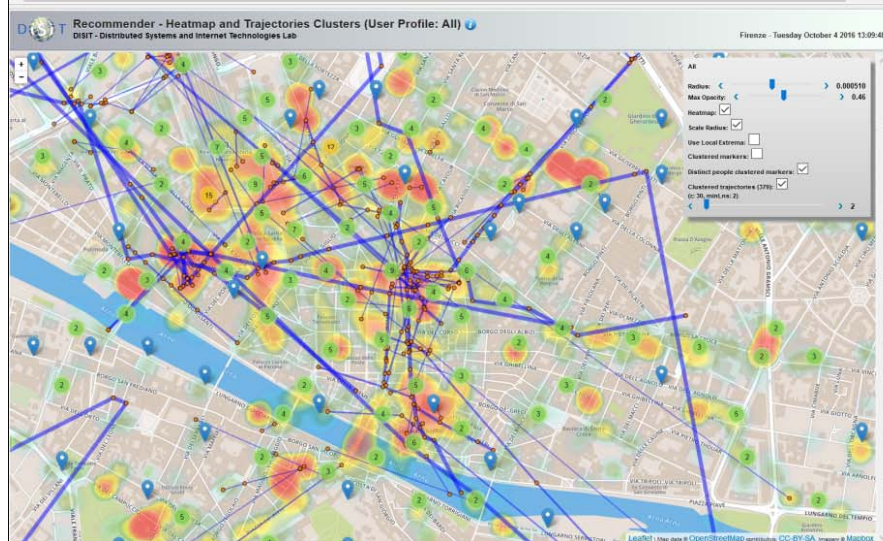
Utenti FIWIFI: 1948
Utenti FIWIFI (4 min): 2093, 1569.75, 1046.5, 523.25

Eventi FIWIFI: 2822
Eventi FIWIFI (4 min): 3184, 2388, 1592, 796

AP FIWIFI: 222
AP FIWIFI (4 min): 257, 192.75, 128.5, 64.25

Utenti FIWIFI (weekly): 2093, 1569.75, 1046.5, 523.25

Utenti FIWIFI (mensile): 2985, 2238.75, 1492.5



Twitter Vigilance Dashboard

Distributed Systems and Internet Technologies Lab
Department of Information Engineering (DII) - University of Florence

University of Florence

Twitter Vigilance Dashboard
Last crawling: 2016-10-04 13:16:53

Home > Channel statistics > Channel sentiment analysis

Channel active from 2009-12-06 to today
Data processed from 2015-09-09 to 2016-01-21

Sentiment trends in channel uber
Zoom: 1m, 3m, 6m, YTD, 1y, All
From: Jan 12, 2016 To: Jan 21, 2016

— Tweets score — Tweets score pos — Tweets score neg — Retweets score — Retweets score pos — Retweets score neg — T+RT score — T+RT score pos — T+RT score neg

Wifi operativi

100% 0%

SmartDS: via Santa Marta 3

36.0% 30.9% 33.2%

Informazioni disponibili

Servizi attivi su Firenze: 23452
Eventi del giorno a Firenze: 2173
Open Data disponibili: 138

Accessi ai servizi singoli (web e mobile)

42.4%

Day	Precedente	Attuale
3. Nov	3122.4	4163.2
4. Nov	2081.6	3122.4
5. Nov	1040.8	2081.6
6. Nov	1040.8	2081.6
7. Nov	2081.6	3122.4
8. Nov	2081.6	3122.4
9. Nov	2081.6	3122.4

Bus Attivi

24

Ataf RT

100% 0%

Parcheggi...

55.4%

Smart City Engine

CPU: 3.7%
RAM: 58.7 GB
DAILY JOBS: 4863

Rilievi wifi

Day	Precedente	Attuale
3. Nov	20046.9	30069.9
4. Nov	10023.3	20046.9
5. Nov	20046.9	30069.9
6. Nov	10023.3	20046.9
7. Nov	20046.9	30069.9
8. Nov	20046.9	30069.9
9. Nov	20046.9	30069.9

Real time position ATAF bus

Sensori RT

18.6% 81.4%

Previsioni meteo: FIRENZE

Day	Weather	Temp
Wednesday	light rain	7°C / 13°C
Thursday	cloudy	6°C / 16°C
Friday	moderate rain	7°C / 16°C
Saturday	cloudless	/
Sunday	cloudy	/

Parcheggi...

26% 74%

Twitter Trends/citazioni

PRINCIPALI TREND TWITTER:
#FIRENZE
#FIORENTINA
#UFFIZI

CITAZIONI:

Query Servicemap

Day	Precedente	Attuale
3. Nov	225	225
4. Nov	150	150
5. Nov	75	75
6. Nov	150	150
7. Nov	225	225
8. Nov	225	225
9. Nov	225	225

Stato linee ATAF

46% IN ORARIO
5% IN ANTICIPO
49% IN RITARDO

Previsioni...

8:8% 91.2%

Elenco eventi del giorno

- Il restauro delle "Storie della Genesi" di Paolo Uccello
- Tra arte e moda
- Winkelmann, Firenze e gli Etruschi - Il padre

Query Km4city API

Day	Precedente	Attuale
3. Nov	100360	100360
4. Nov	25090	25090
5. Nov	25090	25090
6. Nov	25090	25090
7. Nov	25090	25090
8. Nov	25090	25090
9. Nov	25090	25090



Km4City in Tuscany Area

- Nascondi Menu

Fermate Firenze Comuni in Toscana Ricerca Testuale

Seleziona una provincia:
FIRENZE

Seleziona un comune:
FIRENZE

Actual Selection
COMUNE di FIRENZE

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](#)

Road Graph (Tuscany region)

132,923 Roads
389,711 Road Elements
318,160 Road Nodes
1,508,207 Street Numbers

Services (20 cat, 512 cat.)

16 Pub. Transport Operators
21.280 Bus stops & 1081 bus lines
210 Parking areas
796 Traffic Sensors
Info on: points, paths, areas, etc.

- 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 +

nessun limite

ricerca 100 metri

Risultati della ricerca

più di 4000 risultati, attivato clustering

Services 16858

embed

StreetMap contributors, CC-BY-SA, Imagery © Mapbox

Dynamic/real-time

- bus lines: 144 updates X day X line
- parking status: 76 updates X day X sensor
- traffic Sensors: 288 updates X day X sensor
- weather: 2 updates X day for 285 areas
- events: about 60 new events X day
- Wi-Fi: > 350.000 measures X day
- mobiles: > 50.000 measures X day
- more than 35.000 distinct users X day
- From 600.000 to 4.5 M Tweets X day
-many other sensors see next slide

<http://servicemap.km4city.org>

Other Sensors and Actuators, IOT

Restricted Traffic Zone Gates

- Passages, payment, alerts, Wi-Fi control, RFI control, etc.



Road Direction manager: panel, red-light, etc.

- Status and action

Environmental Sensors:

- Air quality, pollution, rain, allergens, temperature,
- humidity,...



Public Light Pillar

- Traffic flows, environment,
- Wi-Fi, Tv-Camera, BT servers, on/off, percentage of light, ..



Waste Manager

- Level, kind, status, on/off

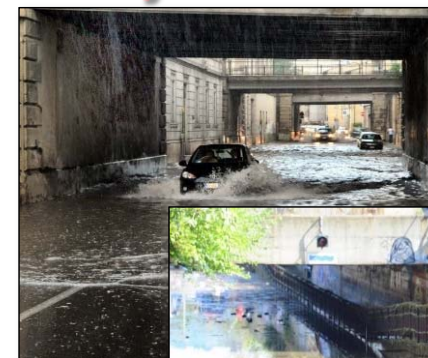


Recharge station, column

- Free slots, consumption, next time slot, ...

Environmental Sensors:

- Air, temperature, humidity,
- water level in rivers
- Status of underpass and bridges



Risk assessment

- Value of the buildings,
- hydrogeological risk map,
- earthquake risk map, ...
- people distribution and location
- Position of recover places,



Traffic Zone Gates

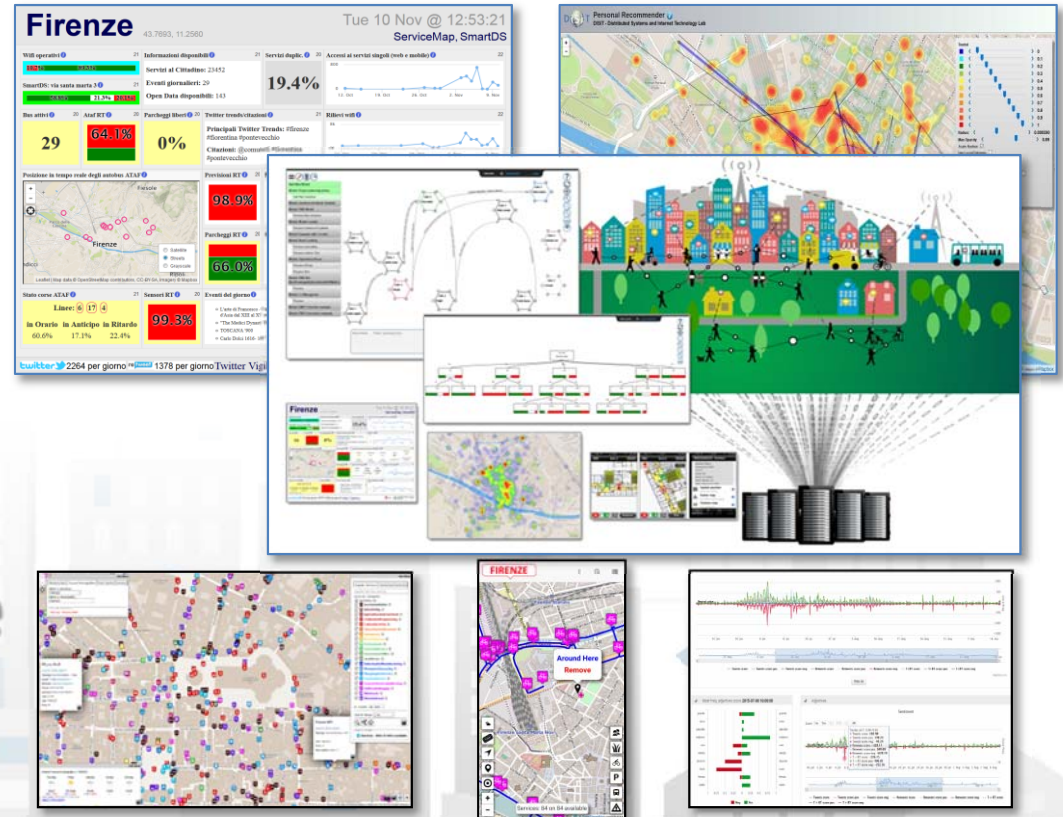
- Passages, alerts,
- Wi-Fi control,
- RFID control,
- etc.



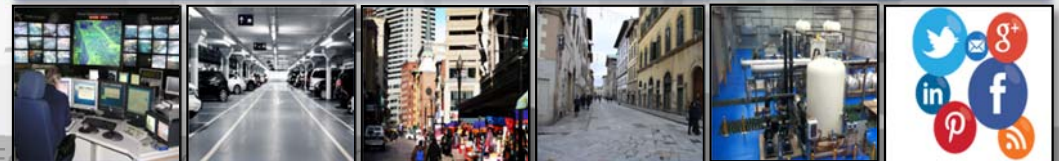
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Km4City Data and Service Aggregator



Improve city resilience, reducing risks and decision support

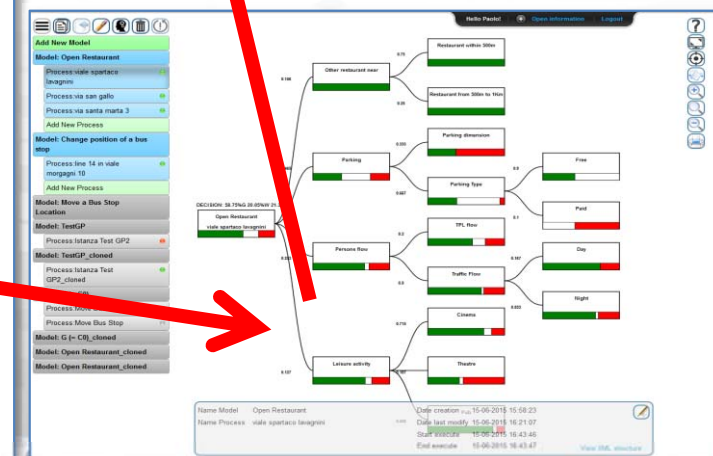
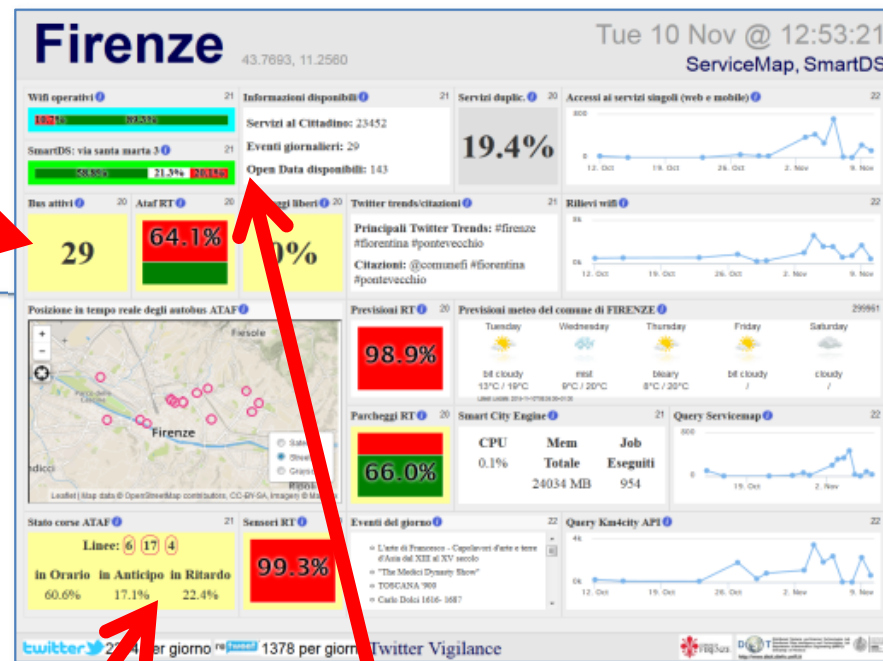
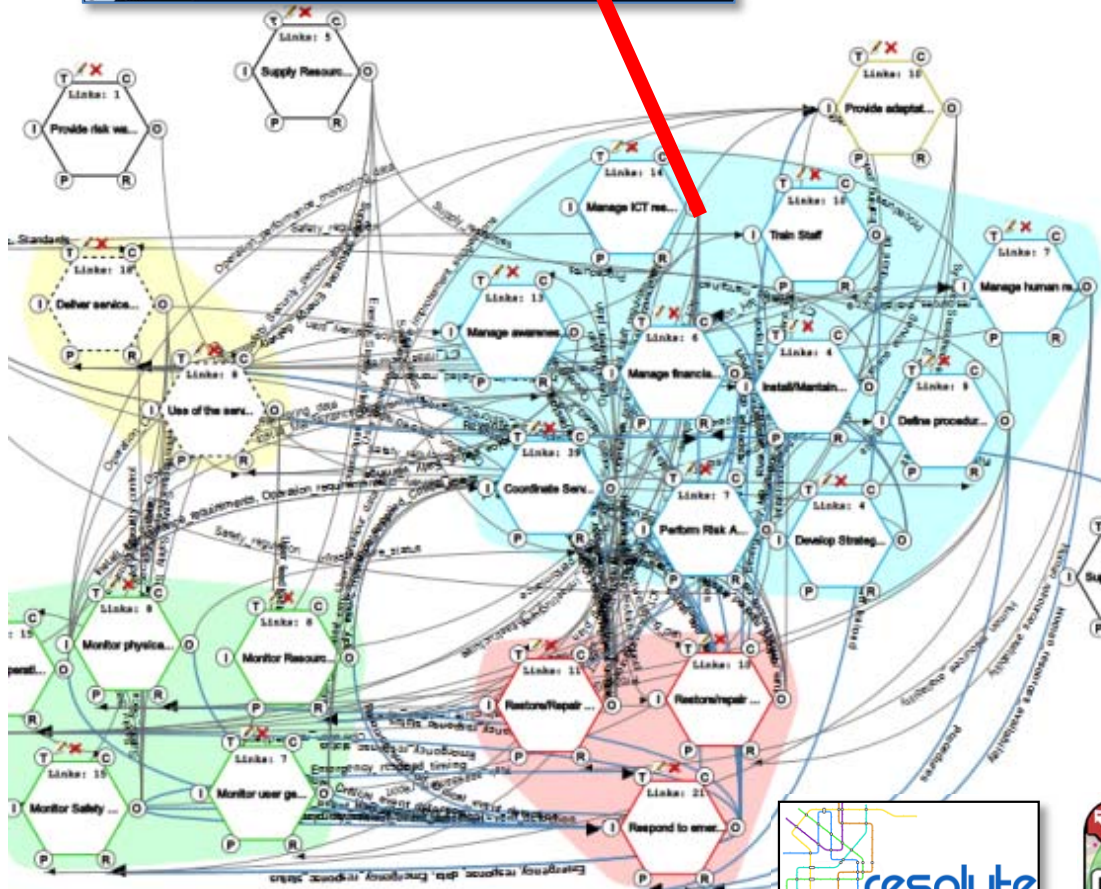
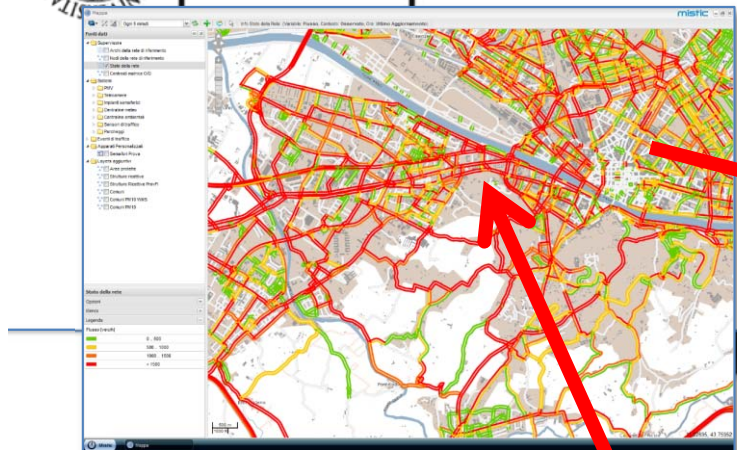
- assessing city resilience level
- improving city resilience, providing objective hints
- improving city users awareness with personal city assistants and participatory tools





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Dashboarding city resilience

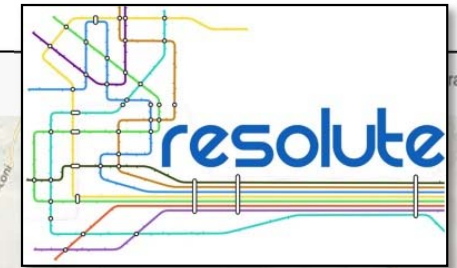


Data and Service Aggregator





Risk Assessment



Flood Event | Flood Observation | Traffic Observation | Damage analysis | Layers panel | Vulnerability info | Service Observation

Flood sensors observations:

From	Data	mm/h
<input checked="" type="checkbox"/> Firenze Genio Civile	2016-04-11T15:59:00	12
<input checked="" type="checkbox"/> Firenze Peretola	2016-04-11T15:59:00	20.5
<input checked="" type="checkbox"/> Firenze Università	2016-04-11T15:59:00	10.5

Threshold:

From: :

To: :

Draw region to analyze: On

Load predefined region:

Mean precipitation:

Traffic observations:

From	Date	km/h	car/km	car/h
<input type="checkbox"/> VIA DELLA MATTONAIA	2016-10-10 18:01:08	58	15	2435
<input type="checkbox"/> LUNGARNO AMERIGO VESPUCCI	2016-10-10 18:01:08	18	65	1842
<input type="checkbox"/> VIA CAMILLO CAVOUR	2016-10-10 18:01:08	61	12	2009
<input type="checkbox"/> VIA VALFONDA	2016-10-10 18:01:08	27	53	3307
<input type="checkbox"/> VIA VITTORIO ALFIERI	2016-10-10 18:01:08	23	58	2798
<input type="checkbox"/> VIA SENESE	2016-10-10 18:01:08	27	54	3216
<input type="checkbox"/> VIA GUELFA	2016-10-10 18:01:08	68	3	420
<input type="checkbox"/> VIA DELLA SCALA	2016-10-10 18:01:08	60	13	2157
<input type="checkbox"/> PIAZZA DI SAN FELICE	2016-10-10 18:01:08	62	10	1697
<input type="checkbox"/> BORGO SAN FREDIANO	2016-10-10 18:01:08	57	17	2690
<input type="checkbox"/> VIA VITTORIO ALFIERI	2016-10-10 18:01:08	10	74	195
<input type="checkbox"/> VIA DEL CAMPUCCIO	2016-10-10 18:01:08	60	13	2157
<input type="checkbox"/> VIA DEI BENCI	2016-10-10 18:01:08	22	59	2679
<input type="checkbox"/> PIAZZALE DI PORTA ROMANA	2016-10-10 18:01:08	64	8	1361

Relevant Services

Min asset value:

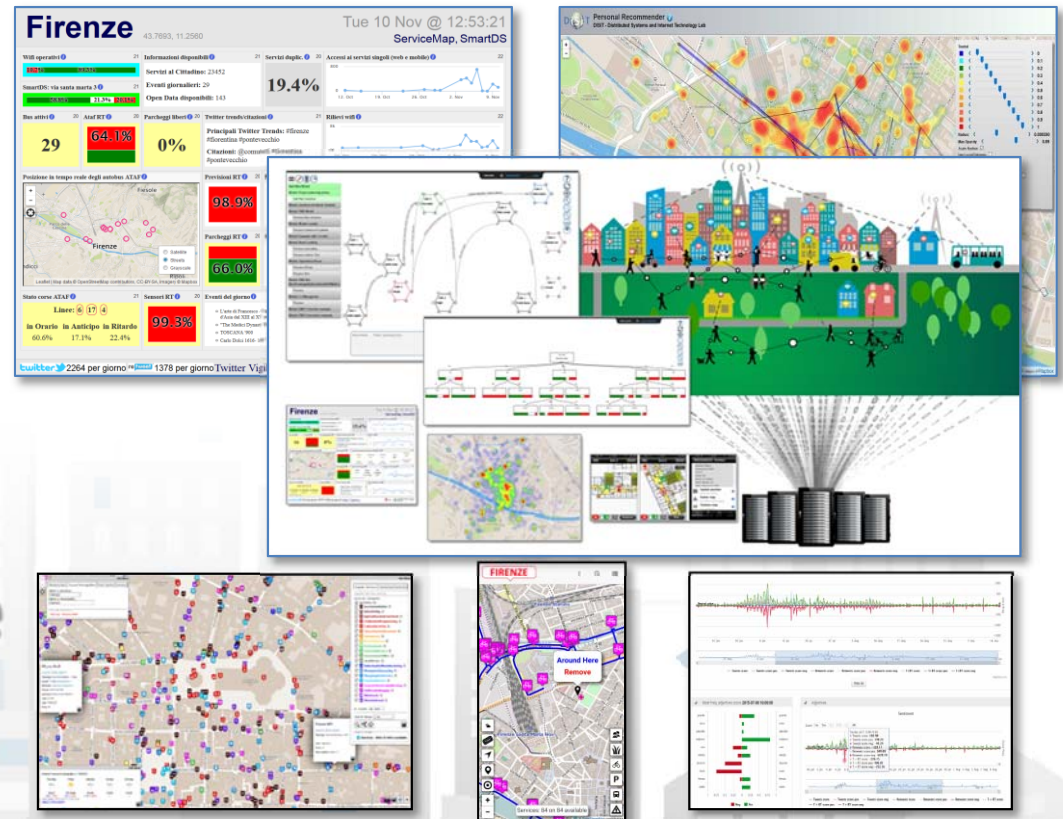
Service	Street	Type	Value
<input checked="" type="checkbox"/> villa delle terme case di cura	VIALE MAZZINI GIUSEPPE, FIRENZE	Public_hospital	100
<input checked="" type="checkbox"/> villa dei pini srl	VIA FOSCOLO UGO, FIRENZE	Public_hospital	100
<input checked="" type="checkbox"/> Poggio Secco	VIA INCONTRI, FIRENZE	Public_hospital	100
<input checked="" type="checkbox"/> Istituto di neuroscienze...	VIA DEI BASSI, FIRENZE	Public_hospital	100



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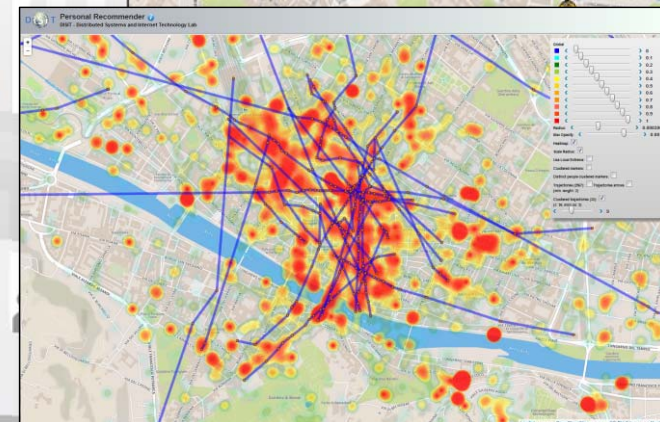
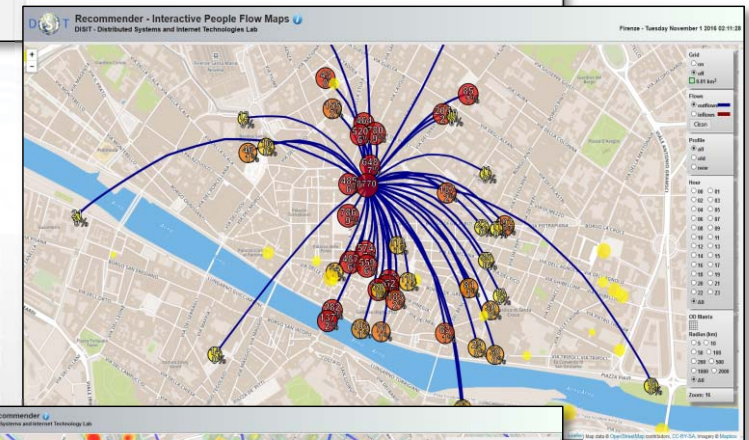
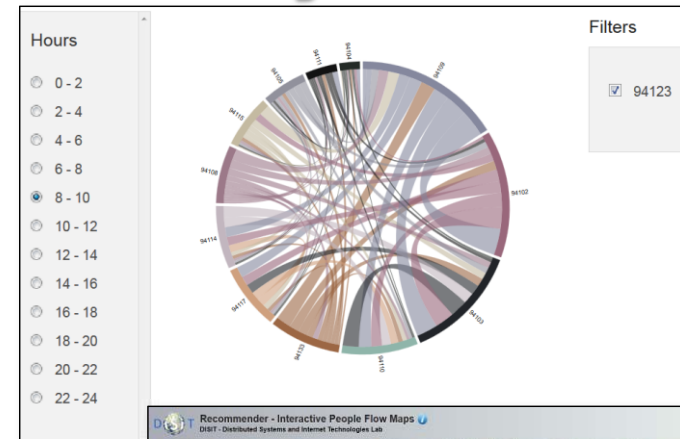


Km4City Data and Service Aggregator



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



Strategies Implementation via Engagement

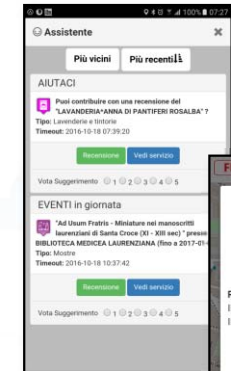
- **Produce value from data enabling to**
 - Increase efficiency in energy consumption
 - Reduce pollution and traffic congestion
 - Improve quality of service, quality of life
 - ...
- **Create an ecosystem for innovation and put in action any smart city solutions and services.**





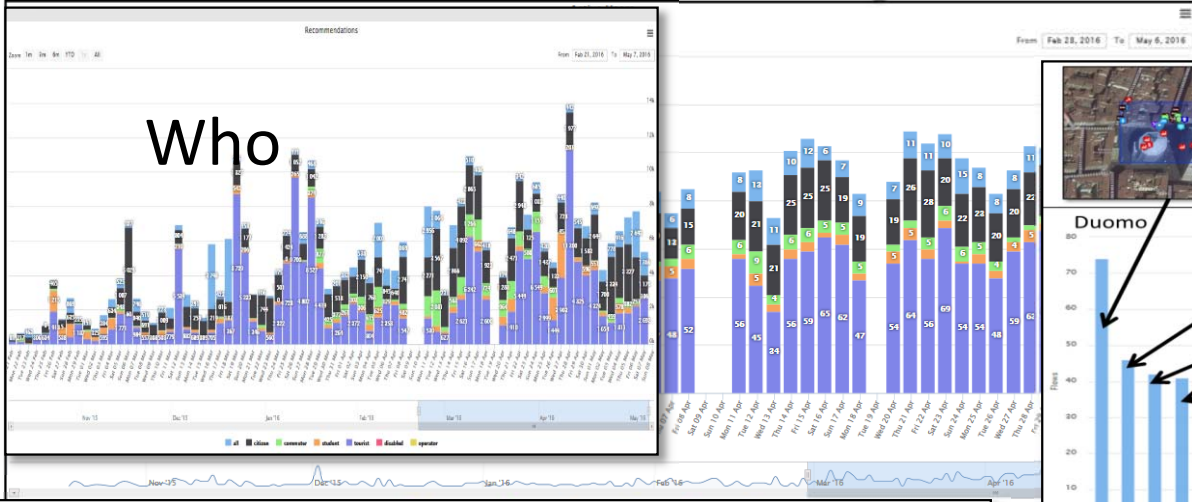
Engagement & Assistant Rules

- **Detecting** city users' habits about mobility
 - Private cars → stimulating Bus Usage & Bikes
 - Private cars parking → peripheral parking-lot + bus
 - Leave the car and take the bus twice → get a bonus..
 - → 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

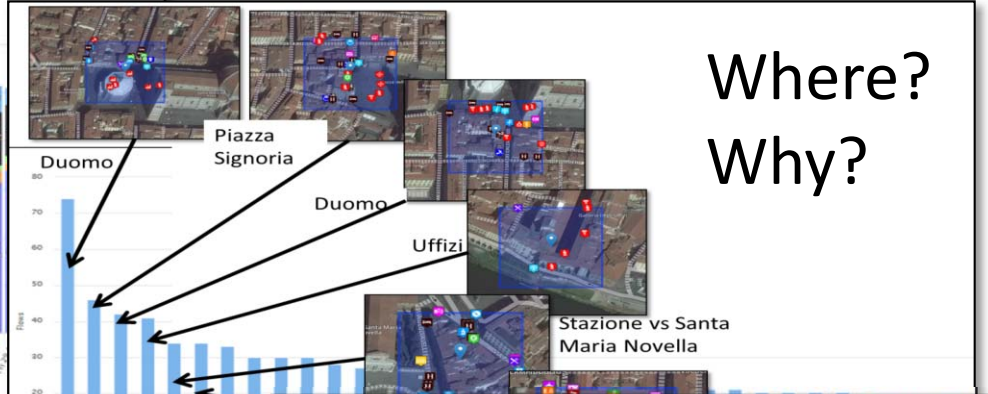


User Behavior Analyzer for Collective profiling

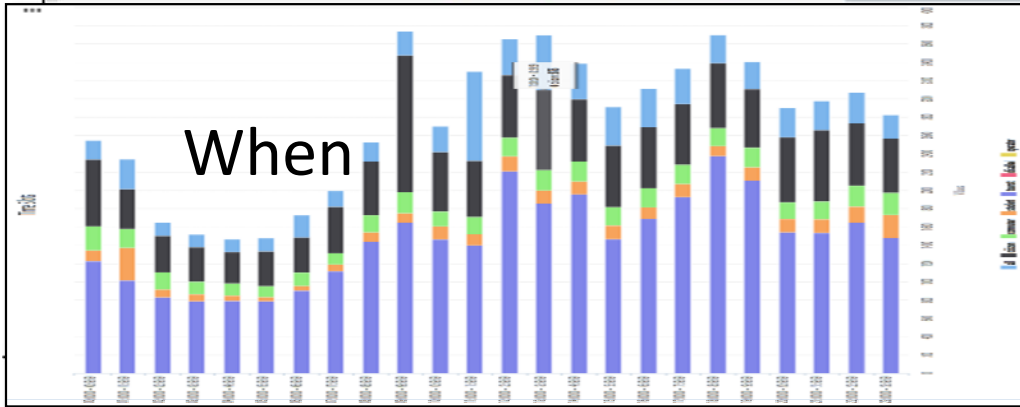
Who



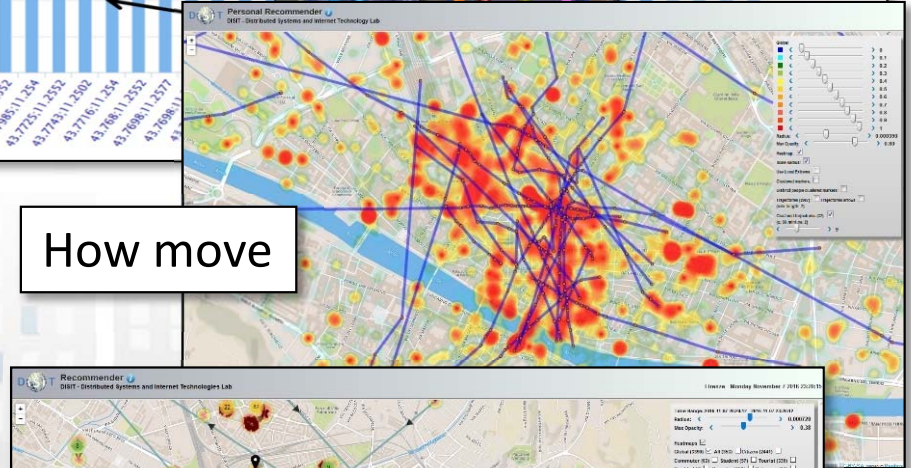
Where?
Why?



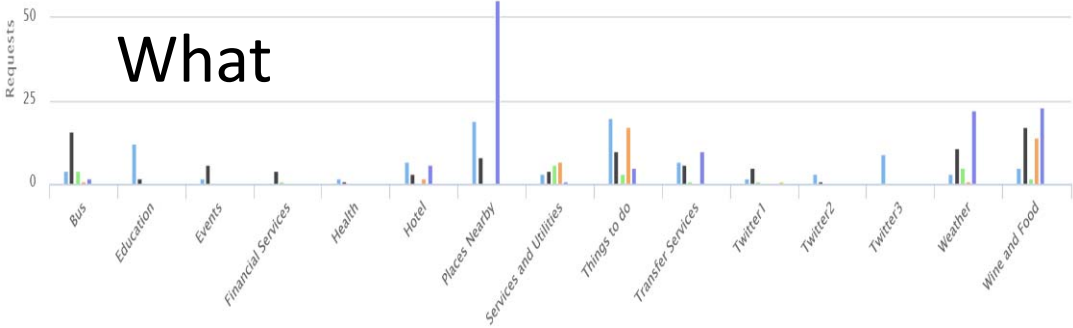
When



How move



What





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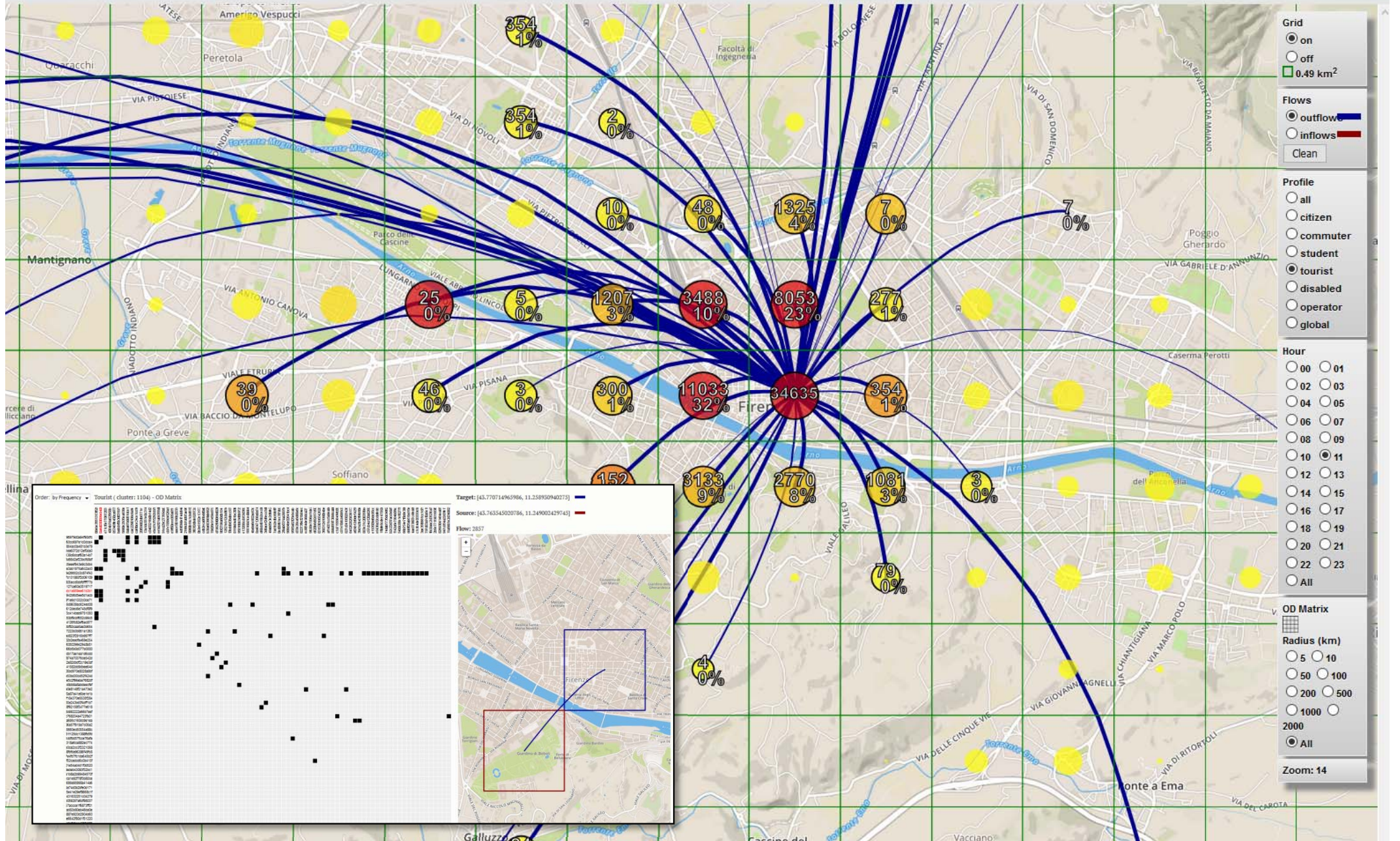
<http://www.disit.org>

OD Matrix scalabile



Active People Flow Maps
Internet Technologies Lab

Firenze - Monday November 7 2016 23:28:28



Predicting Models for Admin. & City Users

- Aiming at improving
 - quality of service,
 - distributing workload
 - early warning
- Traffic Flows & People Flows → crowd
- Parking Status → free slots
- Weather Forecast (LAMMA)

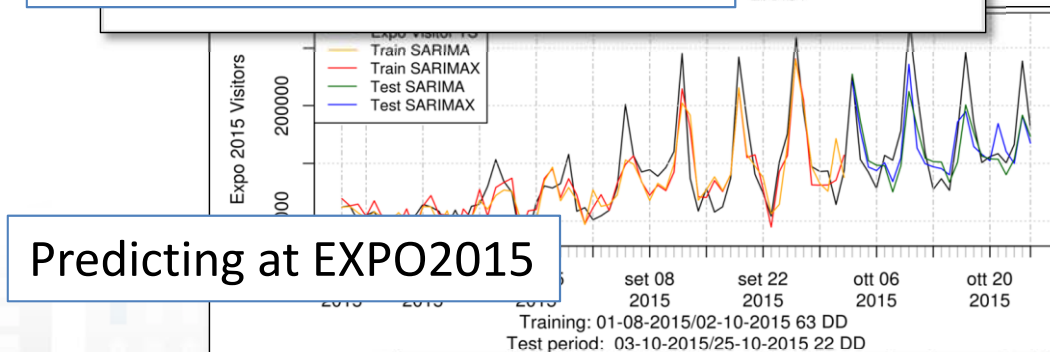
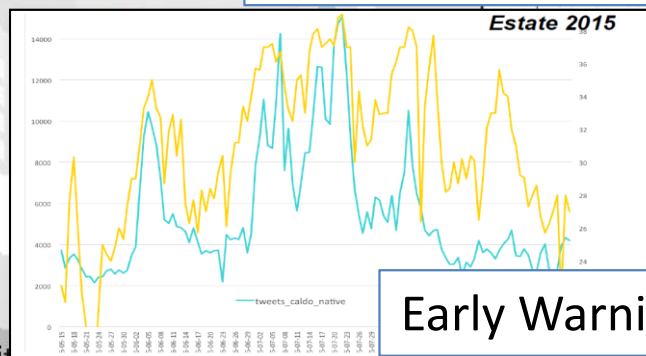
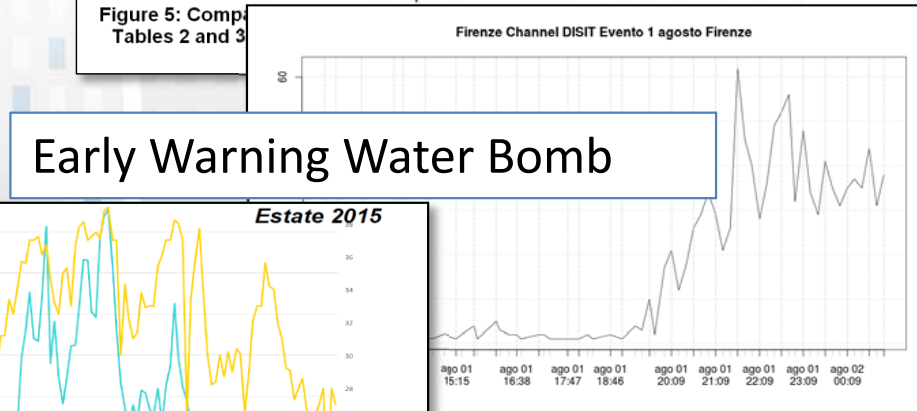


Figure 5: Comparison of Tables 2 and 3



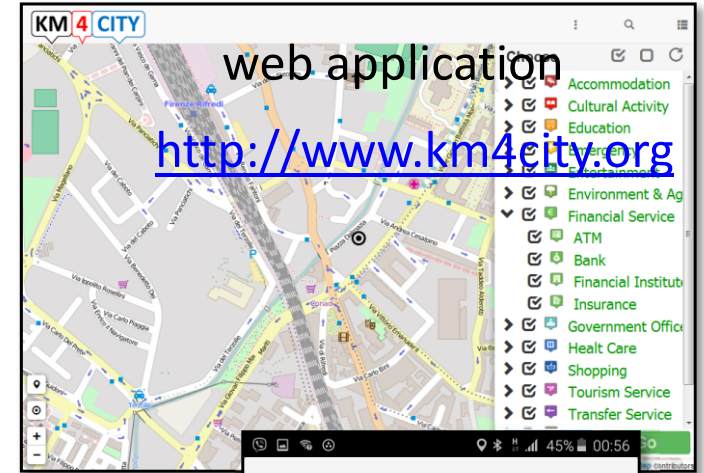
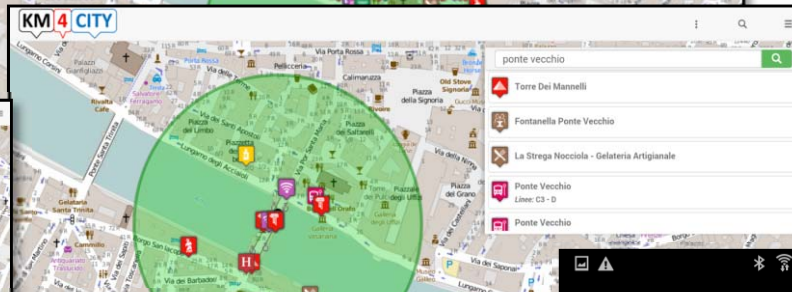


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DELL'INFORMAZIONE

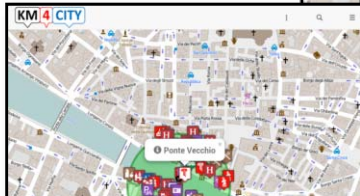
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TECHNOLOGIES LAB
<http://www.disit.org>

Km4CityMobile App

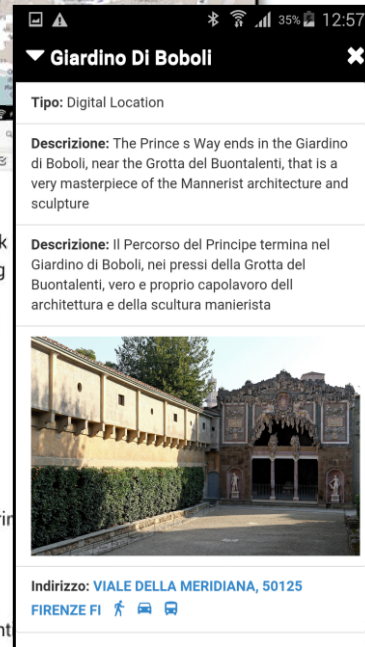


web application

<http://www.km4city.org>



- Choose Services
- > Accommodation
 - > Advertising
 - > Agriculture And Livestock
 - > Civil And Edil Engineering
 - > Cultural Activity
 - > Education And Research
 - > Emergency
 - > Entertainment
 - > Environment
 - > Financial Service
 - > Government Office



Giardino Di Boboli

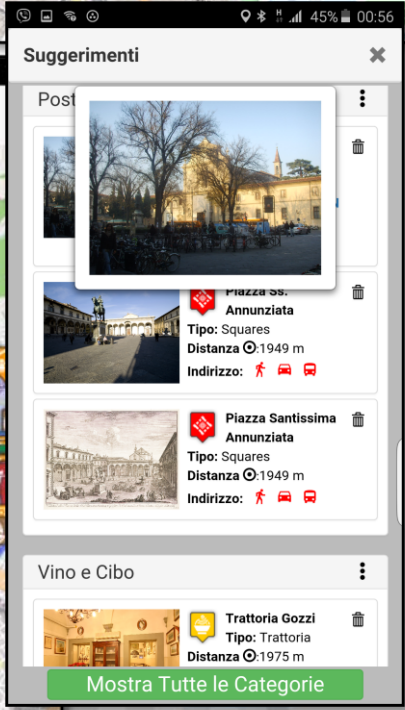
Tipo: Digital Location

Descrizione: The Prince s Way ends in the Giardino di Boboli, near the Grotta del Buontalenti, that is a very masterpiece of the Mannerist architecture and sculpture

Descrizione: Il Percorso del Principe termina nel Giardino di Boboli, nei pressi della Grotta del Buontalenti, vero e proprio capolavoro dell'architettura e della scultura manierista



Indirizzo: VIALE DELLA MERIDIANA, 50125 FIRENZE FI



Suggerimenti



Piazza SS. Annunziata
Tipo: Squares
Distanza 1949 m
Indirizzo: [Icons]

Piazza Santissima Annunziata
Tipo: Squares
Distanza 1949 m
Indirizzo: [Icons]

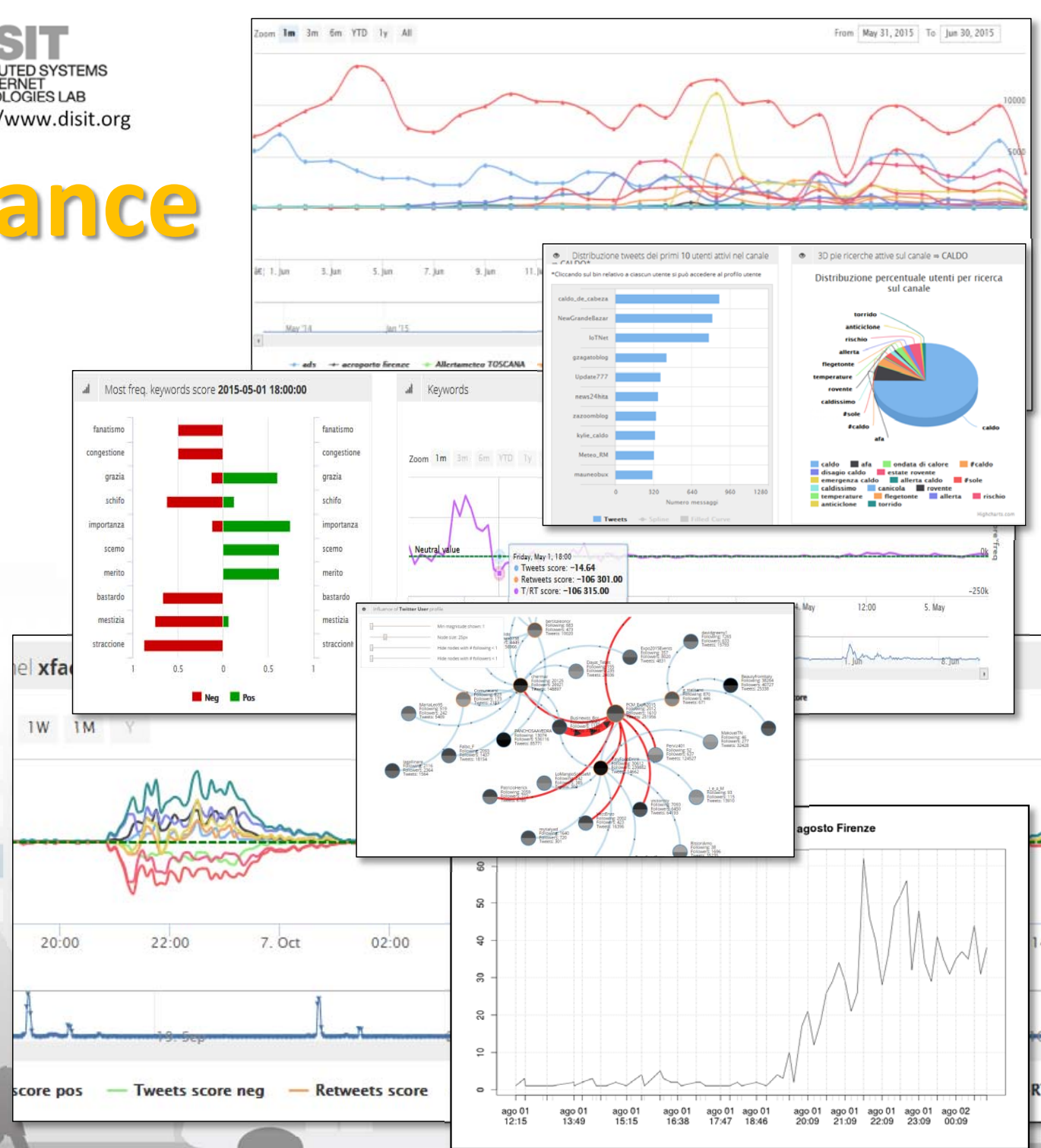
Vino e Cibo
Trattoria Gozzi
Tipo: Trattoria
Distanza 1975 m

Mostra Tutte le Categorie



Twitter Vigilance

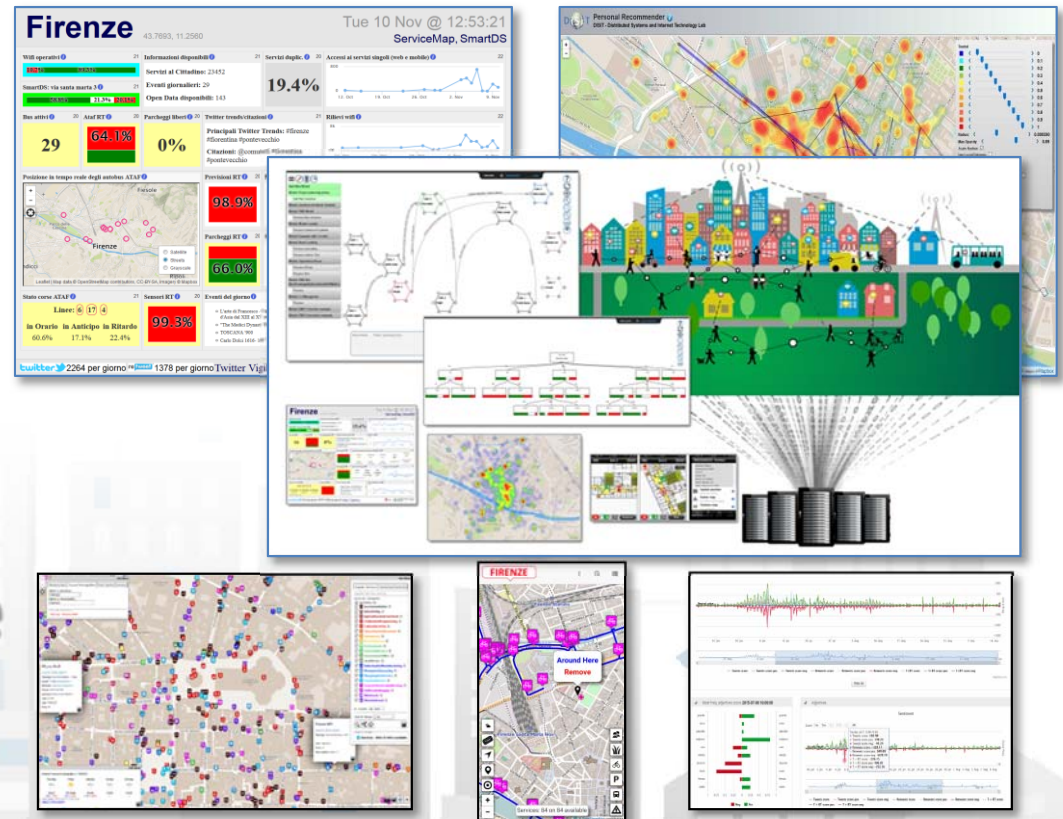
- <http://www.disit.org/tv>
- <http://www.disit.org/rttv>
- Citizens as sensors to
 - Assess sentiment on services, events, ...
 - Response of consumers wrt...
 - **Early detection** of critical conditions
 - Information channel
 - Opinion leaders
 - Communities
 - Formation
 - **Predicting volume of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



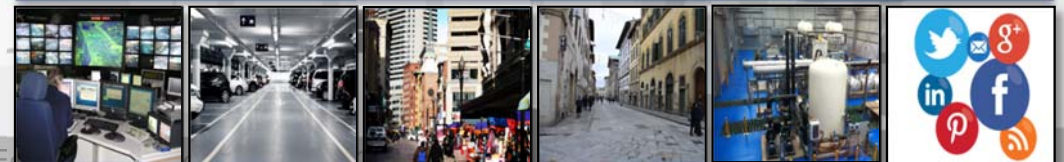
From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

1. keep city under control via personalized dashboards
2. improve city resilience, reducing risks and decision support
3. transform data in value for the city
4. Technical details
5. Who is using Km4City



Km4City Data and Service Aggregator





Development tools

- **Dashboard builder**
 - Creating personalized dashboards in few clicks
- **development tool** for fast and low cost implementation of business and service oriented Apps
 - access to aggregated data → **Smart City API**
 - ServiceMap → **Smart City API**
- aggregating multi-domain data and services for SMEs and city operators
 - **Data /Service Aggregator**: open, flexible and suitable access

Back Office and Dev Tools



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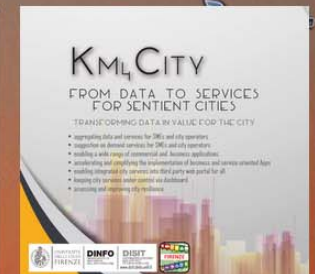
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Home Sentient City Control Room City Users' Tools Back Office and Dev Tools Info and Docs

Development Tools for Mobile App and Web App (the ServiceMap Tool), generating Smart City API calls

Service Map (visual query development tool) (*)	POI density in Florence Downtown (*)	Events in Florence (*)	Services & POI in Tuscany (*)	Services & POI in Florence (*)	Services & POI in Pisa (*)	Bus Lines and timelines in Tuscany	Green Areas in Florence (*)	Cycling Path in Florence (*)	Search on Area analysis (*)	Search along line analysis (*)
---	--------------------------------------	------------------------	-------------------------------	--------------------------------	----------------------------	------------------------------------	-----------------------------	------------------------------	-----------------------------	--------------------------------

Dashboard development tools

Dashboard Builder for control room (*)

Smart City API, Linked Open Data, RDF Store tools, 5 Stars Data

Web page: Km4City Smart City API documentation	Km4City Ontology, SVG File	ZIP File: Download Km4City Ontology, multiple formats	Linked Open Graph LOD (*)	SPARQL & Data Licenses (*)	Km4City in Tuscany Area Smart City Main Data, IOT, Sensors in Tuscany
--	----------------------------	---	---------------------------	----------------------------	--

Data Warehouse and Back Office Data Aggregation Tools

Smart City General Architecture	Programming User Engagements	DIM: Data Ingestion Manager DIM RFP Index Manager Web Page: Data Ingestion Manager, DIM data broker tool	DISCES Web Page: DISCES, Smart City Engine, Big Data Process manager	DIM: Data Ingestion Manager DIM RFP Index Manager Web Page: RDF store Indexer, RIM, and versioning manager
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www.Km4City.org



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Higher level Dashboard

Firenze

43.7693, 11.2560

Tue 4 Oct @ 12:18:04

ServiceMap, SmartDS

WiFi operativi: 1000%

SmartDS: via Santa Marta 3: 3650%

Numero di processi lanciati: 2676

CPU in uso: 0%

Memoria in uso: 24.2%

Bus attivi: 0

100%

Parcheggi liberi: 0%

Real time position ATAF bus

Previsioni meteo: FIRENZE

88.9%

Twitter Trends/citazioni

Principali Twitter Trends: #firenze

76.0%

Linee ATAF

Linee: 6 17 4

in Orario in Anticipo in Ritardo

46.2% 4.6% 49.2%

23.40%

71.6%

Twitter Vigilance

Firenze Wi-Fi: APs Streaming Realtime

DISIT - Distributed Systems and Internet Technologies Lab

Firenze - Tuesday October 4 2016 13:18:05

Time Range: 2016-10-04 12:03:00 - 2016-10-04 13:18:00

Radius: 0.0008

Max Opacity: 0.80

Heatmap (2868) Streaming APs

Time Range: 5 min 10 min 15 min 20 min 30 min 60 min

3 hours 6 hours 9 hours 12 hours

1 day 5 days 1 week 1 month

Distinct people Local Extrema

Clustered markers

To Date: static

Reply Speed: Realtime 10 s 1 min 5 min

15 min 30 min 1 h 2 h 5 h

Mugnone 2016

ServiceMap, SmartDS

Tue 4 Oct @ 12:18:04

Utenti attivi (12 ore): 79

Turisti attivi (12 ore): 34

Rilevi wifi al giorno: 42.639

Accessi ai servizi singoli (web e mobile): 7656

Query Km4city API: 52.367

Utenti attivi (4 ore): 77

Recommender - Heatmap and Trajectories Clusters (User Profile: All)

DISIT - Distributed Systems and Internet Technologies Lab

Firenze - Tuesday October 4 2016 13:18:05

Radius: 0.000510

Max Opacity: 0.46

Heatmap:

Scale Radius:

Use Local Extrema:

Clustered markers:

Distinct people clustered markers:

Clustered trajectories (15) (0-30 (max: 25))

Twitter Vigilance Dashboard

DISIT - Distributed Systems and Internet Technologies Lab

University of Florence

Twitter Vigilance Dashboard

Last crawling: 2016-10-04 13:16:53

Home > Channel statistics > Channel sentiment analysis

Channel active from 2009-12-06 to today

Data processed from 2015-09-09 to 2016-01-21

NLP SA

Sentiment trends in channel uber

Zoom 1m 3m 6m YTD 1y All

From Jan 12, 2016 To Jan 21, 2016

Neutral value

— Tweets score — Tweets score pos — Tweets score neg — Retweets score — Retweets score pos — Retweets score neg — T+RT score — T+RT score pos — T+RT score neg





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Dashboard Builder



Dashboard Builder

Operations Metrics Widgets Users

Dashboards Overview

My Dashboard

Name	Title	Creation Date	Status	User	Modify	Preview
12	Dashboard Giatta	2016-07-27 11:35:15				
A-01	Prova nuovo menu	2016-09-12 12:07:03				
Copia 59	Dashboard01	2016-08-01 16:01:32				
Copia Dupplicazione Dashboard	TEST DUPLICAZIONE	2016-07-26 15:17:16				

Sources Management

DataSources Overview

Id	Url
Km4CityApp	jdbc:mysql://192.168.0.20:3306
Km4Cityquartz	jdbc:mysql://192.168.0.20:3306
Km4CityRDF	http://192.168.0.206:8080/WebAPI/grafico.html
Km4CityRecommender	jdbc:mysql://192.168.0.55:3306
Km4CityServiceMap	jdbc:mysql://192.168.0.72:3306

Add new Widget

Click the Add button to add one or more metrics to the widget

Metric: **Sensors_Rt** Add

Metric Description: **Description:** Esclusione di Linee Sensori attive
Metric Typology: Percentuale 424
Data Area: Mobilità
Data Source: Osservatorio Regionale per la Mobilità del Trasporto
Refresh rate: 60 sec
Status: Active

Context: [Dropdown]

Type Widget: widgetPieChart max 1 metrics

Selected Metrics: Sensors_Rt

Link: www.km4city.self_operative.it

Information: [Chart Preview]

Widget Parameters

Title: Sensors RT Background color: error

Refresh rate (sec): 60

Columns number: 3

Modifica Widget

Id Widget: widgetBarContent

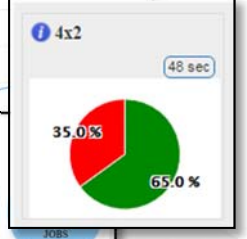
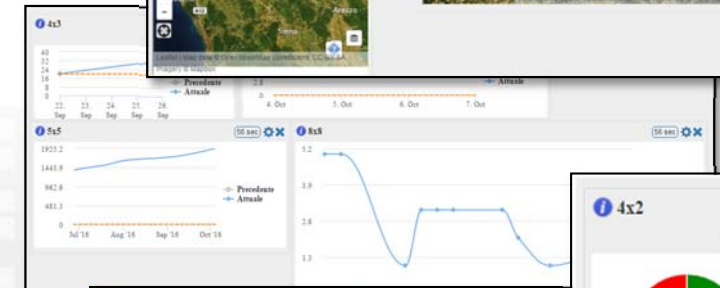
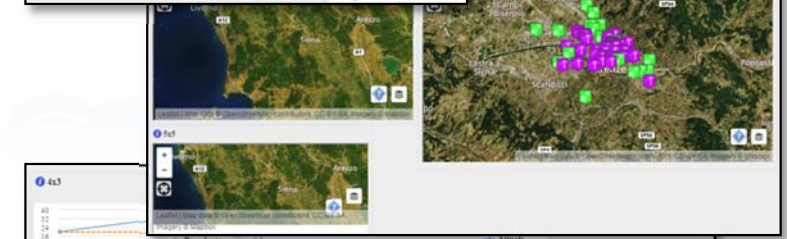
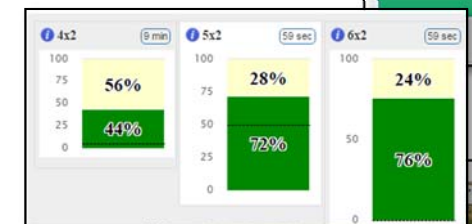
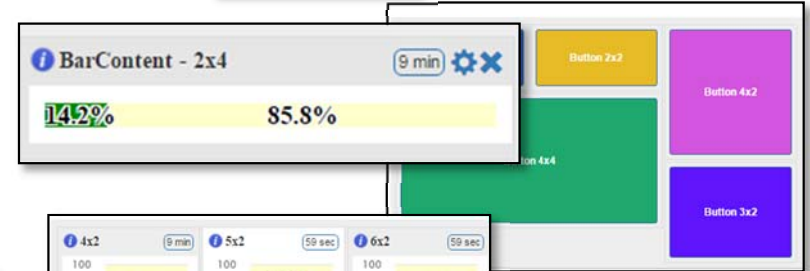
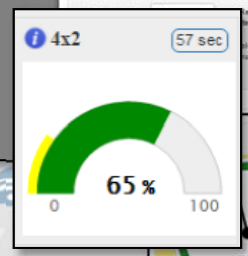
Type: Percentuale

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

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

n. metrics: 1 Color: 1

Buttons: Close, Modify





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ServiceMap



Search around a GPS point

Search along a line

Regular Services Transversal Services
search text into service
Services Categories
De/Select All
Area
DigitalLocation
HappeningNow
Path
Fresh Place
Public Transport Line
Road Sensors
Bus Stops

N. results for each: 200
Search Range 500 mt

Search Results
Services 35 of 35 available
Bus Stops: 13 of 13 available
Road Sensors: 2 of 2 available

Bus Lines
72 Bus Lines Found.

Bus Line 23
Direction: NAVE A ROVEZZANO → NUOVO PIGNONE
Bus Line 23
Direction: SORGANE → NUOVO PIGNONE
Bus Line 35
Direction: MAGENTA → STAZIONE VIA ALAMANNI

Weather Forecast for Municipality of FIRENZE
Sunday light rain and sunny intervals 18°C / 24°C
Monday cloudy 13°C / 24°C
Tuesday cloudy 13°C / 25°C
Wednesday light rain
Thursday rainstorm

Web App HTML5

Giardino Di Boboli

Tipo: Digital Location

Descrizione: The Prince s Way ends in the Giardino di Boboli, near the Grotta del Buontalenti, that is a very masterpiece of the Mannerist architecture and sculpture

Descrizione: Il Percorso del Principe termina nel Giardino di Boboli, nei pressi della Grotta del Buontalenti, vero e proprio capolavoro dell'architettura e della scultura manierista

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Scarica da
App Store
Scarica da
Windows Store

Regular Services Transversal Services
search text into service
Services Categories
De/Select All
Accommodation
Advertising
AgricultureAndLivestock
CivilAndITEngineering
CulturalActivity
EducationAndResearch
Emergency
Entertainment
Environment
FinancialService
GovernmentOffice
HealthCare
IndustryAndManufacturing
MiningAndQuarrying
ShoppingAndService
TourismService
TransferServiceAndRenting
UtilitiesAndSupply
Wholesale
WineAndFood

N. results: No Limit
Search Range visible areas

Search Results
Services 2231 of 2231 available

Query results organized by category

Total number of results: 2231

Category	Number of Results
Accommodation	498
Advertising	18
AgricultureAndLivestock	21
CivilAndITEngineering	31
CulturalActivity	1
EducationAndResearch	11
Emergency	38
Entertainment	24
Environment	25
FinancialService	100
GovernmentOffice	245
HealthCare	264
IndustryAndManufacturing	49
MiningAndQuarrying	54
ShoppingAndService	104
TourismService	1
TransferServiceAndRenting	1
UtilitiesAndSupply	1
Wholesale	1
WineAndFood	1

Weather Forecast for Municipality of FIRENZE
Sunday light rain and sunny intervals 18°C / 24°C
Monday cloudy 13°C / 24°C
Tuesday cloudy 13°C / 25°C
Wednesday light rain
Thursday rainstorm

Embed into Web pages

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

HOME ABOUT RESEARCH INNOVATION EDUCATION AND COURSES HOWTO EVENTS

KM4CITY SERVICE MAP EMBEDDED

OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

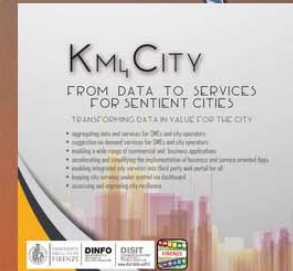
Info and Docs



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Km4City Information, Documentation, Tutorial, Training

Km4City Flyer PDF

Km4City Mobile App Video

Km4City Slides

Web Page: Projects exploiting & contributing to Km4City

Web Page: Km4City Information & Documentation page

Web Page: DISIT Lab (who we are)

Km4City Video 2015

Web Page: Km4City related Articles

Web Page: Data Ingestion Training and tools; ETL programming Development Environment

Web Page: GitHub Link Open Source Code

Roadmap of development

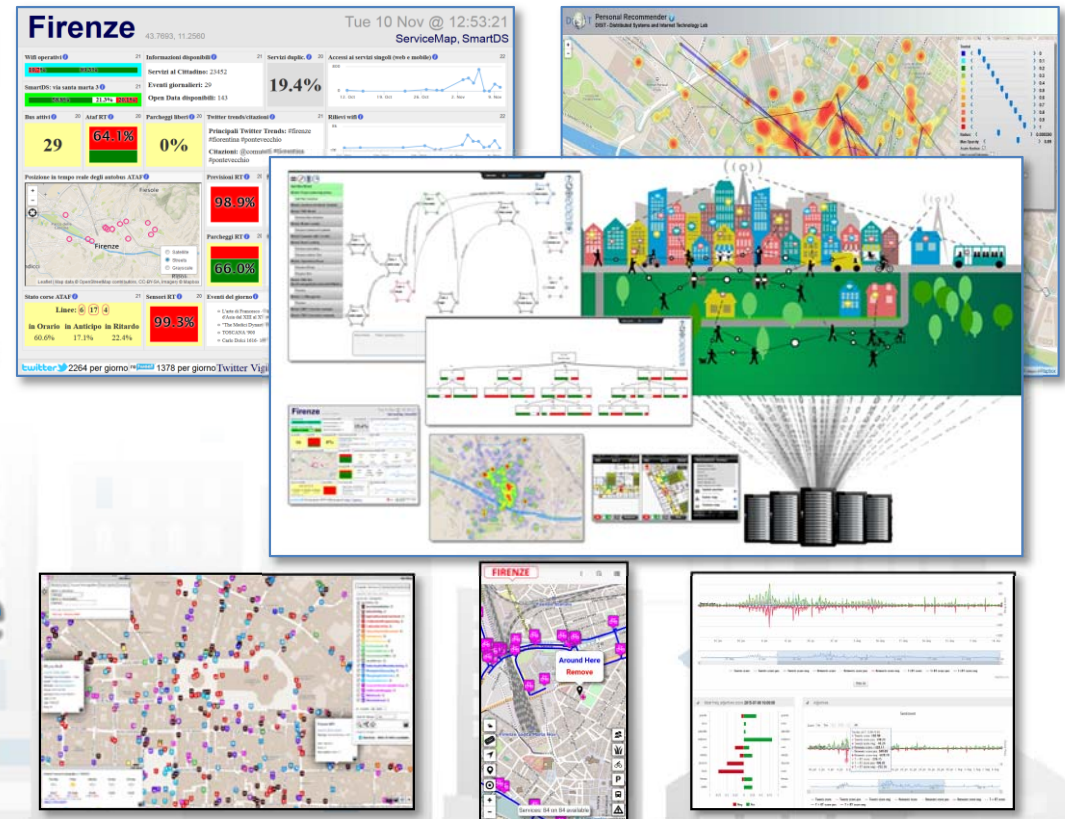


www.Km4City.org

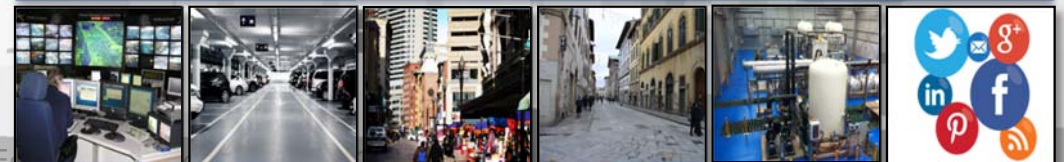
From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

1. keep city under control via personalized dashboards
2. improve city resilience, reducing risks and decision support
3. transform data in value for the city
4. Technical details
5. Who is using Km4City



Km4City Data and Service Aggregator





km4City Roadmap



2013

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>

2014

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

2015

Km4City 1.4

- Embed
- More API
- iBeacon



RESolute
RESilience management guidelines
and Operationalization appLied to
Urban Transport Environment

Km4City 1.5

- SmartDS
- Km4City App

RESOLUTE H2020
2015-2018 - Started



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

Sii-Mobility SCN
2016-2018 - Started
Km4City 1.6.2

2016

REPLICATE H2020
2016-2021- Started



REPLICATE
REnaissance of Places
with Innovative Citizenship
And Technology

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

2021

12/2017

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

6/2017

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

Today

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

GHOST SIR
2016-2019 - Started



GHOST SIR
Governing the smart city:
a governance oriented approach
to Smart Urbanism



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Who We Are



- **DISIT lab** is one of the excellence of the University of Florence: [Http://www.disit.org](http://www.disit.org)
- **Active since 1994** on parallel and distributed architectures for HPCN, GRID, Cloud, and Big Data
- **Track record** of huge number of research and innovation projects and infrastructures, working with almost all major international firms and institutions. See list on the portal.
 - **Presently involved in 15** projects and challenges most of them on Smart City and user behavior analysis and engagement, Big Data Analytics
- Contributing to standards as MPEG, and to the research on several areas:
 - **Coordinating and participating** to several European Commission projects, national project, innovation projects with industries and public administrations
- Several International R&D&I Awards

The screenshot shows the DISIT website interface. At the top, there is a navigation menu with links for HOME, ABOUT, RESEARCH, INNOVATION, EDUCATION AND COURSES, HOWTO, and EVENTS. Below the menu is a section titled "DISIT LAB OVERVIEW" with a URL <http://www.disit.dinfo.unifi.it>. The central part of the page features a diagram with "Data Analytics Big data" at the top center, connected to various other research areas: "Text and Web Mining", "Social Media e-learning", "Smart Cloud Computing", "Mobile Computing", and "Smart Cities". Below the diagram, there is a text block describing the lab's history and research areas, followed by a small thumbnail of a presentation slide titled "DISIT Lab Overview on Smart Cities and Training June 2016".

1 - keep city

under control via

personalized

dashboards

From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

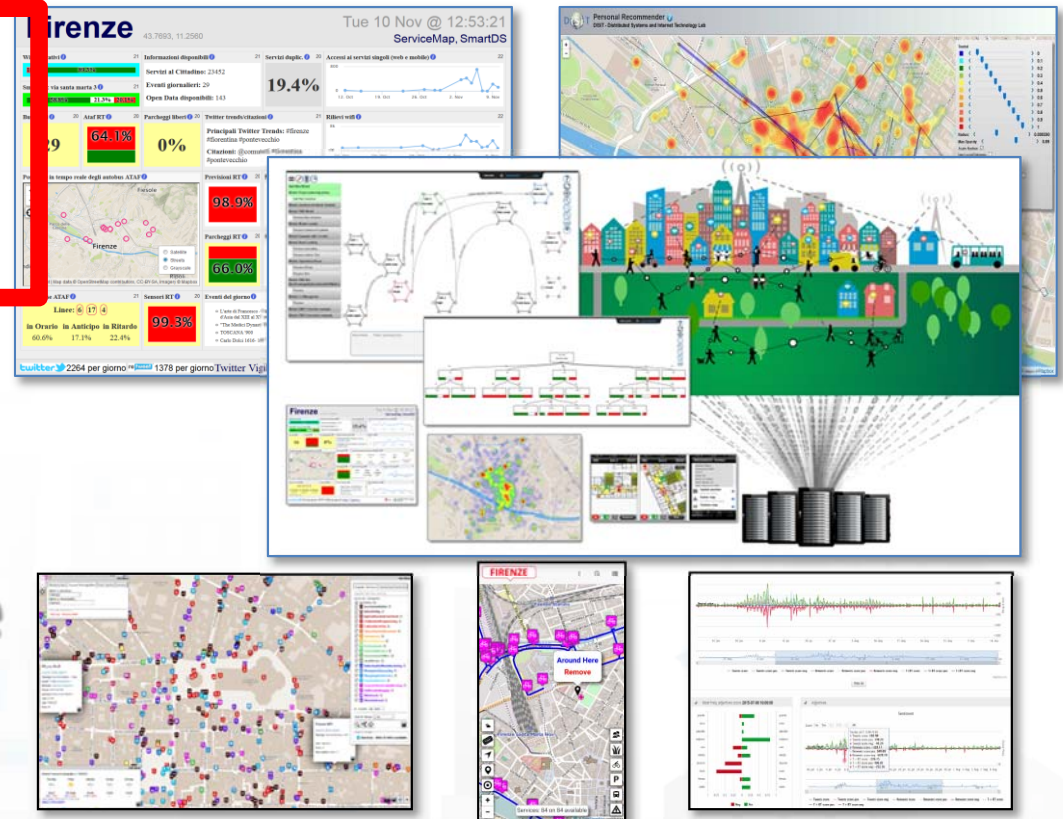
1. keep city under control via personalized dashboards

2. improve city resilience, reducing risks and decision support

3. transform data in value for the city

4. Technical details

5. Who is using Km4City



Km4City Data and Service Aggregator



Sentient City Control Room



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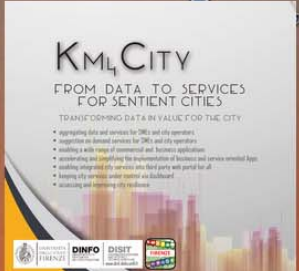
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Real Time Monitoring Tools for Control Room Dashboards

Control Room Dashboard ⓘ

Wi-Fi Coverage (*) ⓘ

Wi-Fi Usage (*) ⓘ

City Users Behaviour via Mobile App (*) ⓘ

Real Time Data on 3D (*) ⓘ

Parking Areas Status in Florence (*) ⓘ

Traffics Sensors in Tuscany Region (*) ⓘ

Twitter Vigilance Sentiment Analysis (*) ⓘ

Predicting Model for Admin. e city Users ⓘ

- Aim: Improving quality of service, distributing workload in city, early warning.
- Traffic Flows & People Flows → crowd
- Parking Status → free slots
- Weather Forecast (LAMMA)

Early Warning and Prediction Tools ⓘ

Smart City Control Room, Dashboard, Real Time Data

Big Data Analytics Tools, Business Intelligence, Decision Support Tools

Resilience Decision Support System (*) ⓘ

Smart Decision Support System (*) ⓘ

Risk & Vulnerability Analysis Tool ⓘ

Origin Destination Matrix by Wi-Fi data (*) ⓘ

Recency and Frequency by Wi-Fi data (*) ⓘ

Origin Destination Matrix via Mobile App (*) ⓘ

Heatmaps and Trajectories for City Users Tourists (*) ⓘ

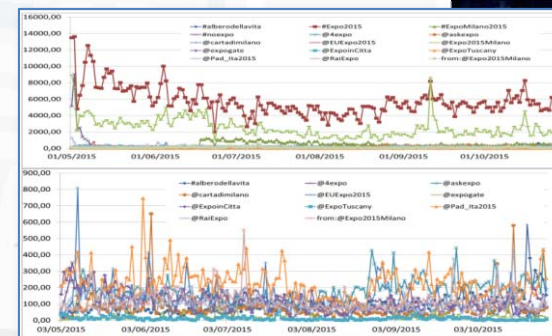
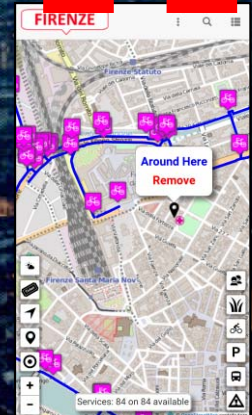
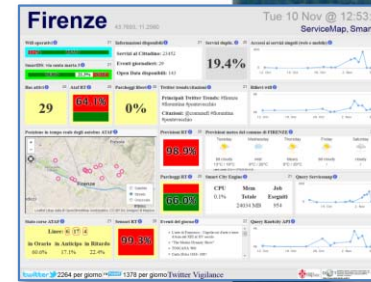
City User Behavior Analysis (*) ⓘ

Social Media Twitter Vigilance (*) ⓘ

Twitter Data Analysis Tool (*) ⓘ

www.Km4City.org

- **monitoring services' status**
of city operators
 - Smart City Dashboards
 - Continuous Business Intelligence
- **City users behaviour monitoring and analysis:**
 - Sensors, traffic flow, people flows, mobiles, sensors, IOT, IOE
 - Wi-Fi, Tv-Cameras
- **City users participation**
 - social media for city services and events, **Twitter Vigilance**
 - **Collecting contributions:** images, stars, comments





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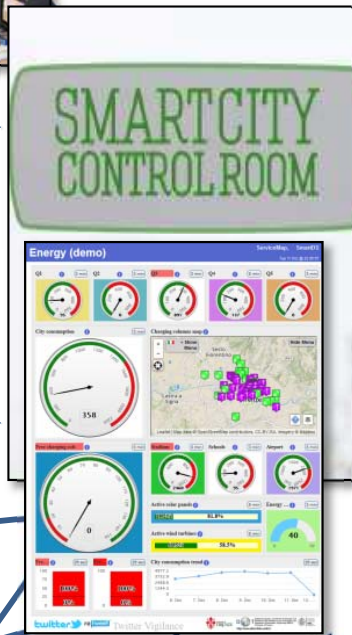
Dashboards



**Transport
systems,
Mobility, Parking**



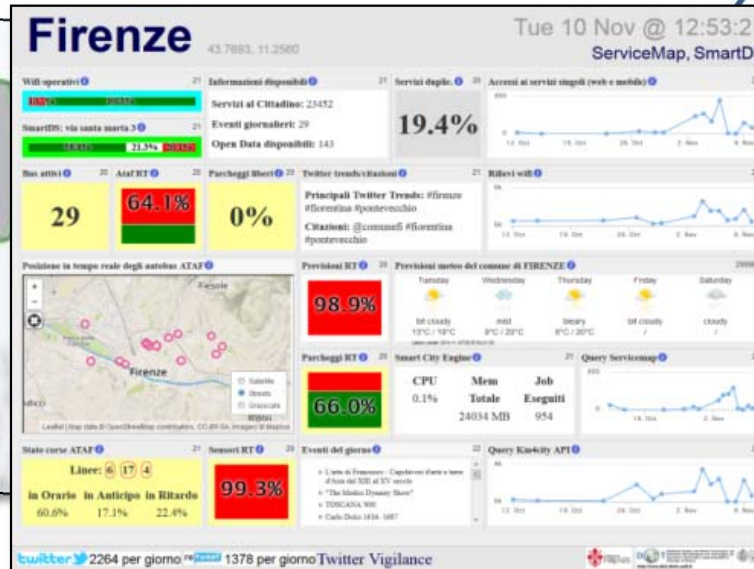
**Sensors, IOT
Cameras, ..**



**Public services,
Govern, Events**



**Environment,
Water, energy**



**Shops,
services,
operators**



**Social Media,
WiFi, Network**



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Smart City Dashboard



Firenze

43.7693, 11.2960 Tue 4 Oct @ 12:09:48

ServiceMap, SmartDS

WiFi operativi: 1000/25
SmartDS: via Santa Marta 3
Bus...: 0
ATA...: 100%
Par...: 0%

Informazioni disponibili: 60 sec
Numero di processi lanciati: 2627
CPU in uso: 0%
Memoria in uso: 72094 MB

Accessi ai servizi singoli (web e mobile): 24 sec
Smart City Engine: CPU 0%, Mem Totale 72094 MB, Job Eseguiti 2673

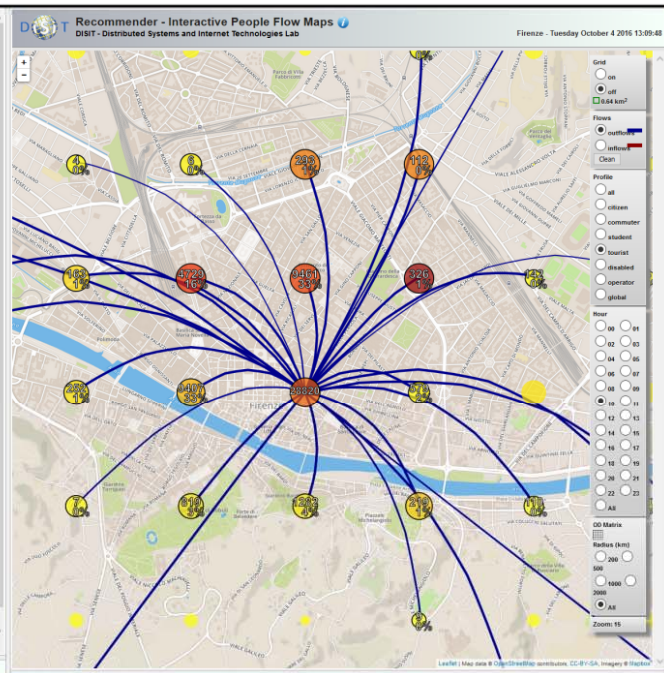
Real time position ATAF bus

Previsioni meteo: FIRENZE
Tuesday: 88.9%
Wednesday: 17°C / 24°C
Thursday: 10°C / 23°C
Friday: 12°C / 19°C
Saturday: rain and sunny intervals 7

Principali Twitter Trends: #firenze, #fiorentina #uffizi
Citazioni: @NicolodiDaria, @acfflorentina @comunefi

Stato linee ATAF: Linee: 6 | 17 | 4
in Orario: 46.2%, in Anticipo in Ritardo: 4.6%

Elenco eventi del giorno: 31.9%, 68.1%



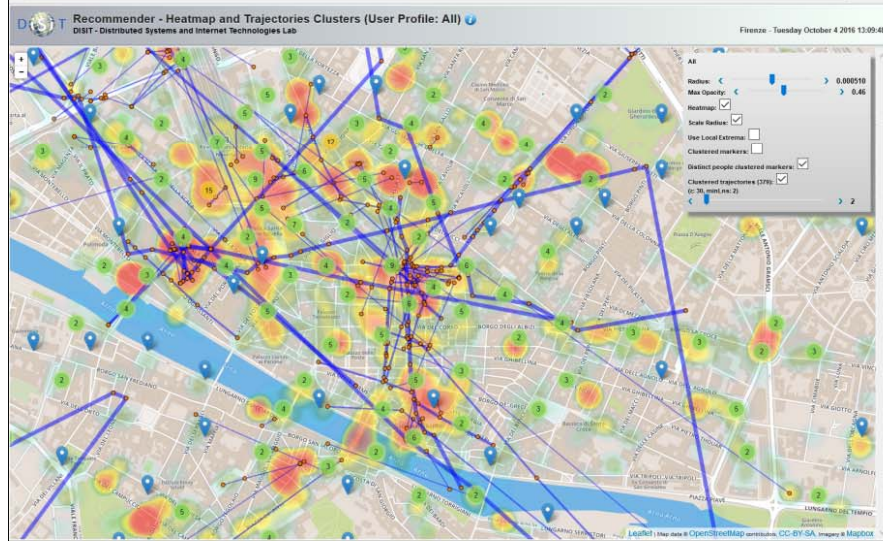
FirenzeWiFi monitor

ServiceMap, SmartDS Tue 4 Oct @ 12:09:48

Utenti FIWIFI: 1948
Eventi FIWIFI: 2822
AP FIWIFI: 222

Utenti FIWIFI (weekly): 2093, 1569.75, 1046.5, 523.25

Utenti FIWIFI (mensile): 2985, 2238.75, 1492.5



Twitter Vigilance Dashboard

Distributed Systems and Internet Technologies Lab
Department of Information Engineering (DII) - University of Florence

Firenze 2016

Twitter Vigilance Dashboard
Last crawling: 2016-10-04 13:16:53

Channel active from 2009-12-06 to today
Data processed from 2015-09-09 to 2016-01-21

Sentiment trends in channel uber
Zoom: 1m, 3m, 10m, YTD, 1y, All
From: Jan 12, 2016 To: Jan 21, 2016

Legend: Tweets score, Tweets score pos, Tweets score neg, Retweets score, Retweets score pos, Retweets score neg, T+RT score, T+RT score pos, T+RT score neg

Wifi operativi

100% 0%

SmartDS: via Santa Marta 3

36.0% 30.9% 33.2%

Informazioni disponibili

Servizi attivi su Firenze: 23452
Eventi del giorno a Firenze: 2173
Open Data disponibili: 138

42.4%

Accessi ai servizi singoli (web e mobile)

Day	Precedente	Attuale
3. Nov	3122.4	4163.2
4. Nov	2081.6	2081.6
5. Nov	1040.8	1040.8
6. Nov	1040.8	1040.8
7. Nov	2081.6	2081.6
8. Nov	2081.6	2081.6
9. Nov	4163.2	4163.2

Bus Attivi

24

Ataf RT

100% 0%

Parcheggi...

55.4%

Smart City Engine

CPU: 3.7%
RAM: 58.7 GB
DAILY JOBS: 4863

Rilievi wifi

Day	Precedente	Attuale
3. Nov	30060.9	40081.2
4. Nov	20040.6	20040.6
5. Nov	20040.6	20040.6
6. Nov	20040.6	20040.6
7. Nov	30060.9	30060.9
8. Nov	30060.9	30060.9
9. Nov	40081.2	40081.2

Real time position ATAF bus

Sensori RT

18.6% 81.4%

Previsioni meteo: FIRENZE

Day	Weather	Temp
Wednesday	light rain	7°C / 13°C
Thursday	cloudy	6°C / 16°C
Friday	moderate rain	7°C / 16°C
Saturday	cloudless	/
Sunday	cloudy	/

Parcheggi...

26% 74%

Twitter Trends/citazioni

PRINCIPALI TREND TWITTER:
#FIRENZE
#FIORENTINA
#UFFIZI

CITAZIONI:

Query Servicemap

Day	Precedente	Attuale
3. Nov	225	225
4. Nov	150	150
5. Nov	75	75
6. Nov	75	75
7. Nov	150	150
8. Nov	300	300
9. Nov	150	150

Stato linee ATAF

46% IN ORARIO
5% IN ANTICIPO
49% IN RITARDO

8:8% 91.2%

Previsioni...

Elenco eventi del giorno

- Il restauro delle "Storie della Genesi" di Paolo Uccello
- Tra arte e moda
- Winkelmann, Firenze e gli Etruschi - Il padre

Query Km4city API

Day	Precedente	Attuale
3. Nov	100360	100360
4. Nov	25090	25090
5. Nov	25090	25090
6. Nov	50180	50180
7. Nov	25090	25090
8. Nov	25090	25090
9. Nov	50180	50180



Km4City in Tuscany Area

Road Graph (Tuscany region)
 132,923 Roads
 389,711 Road Elements
 318,160 Road Nodes
 1,508,207 Street Numbers

Services (20 cat, 512 cat.)
 16 Pub. Transport Operators
 21.280 Bus stops & 1081 bus lines
 210 Parking areas
 796 Traffic Sensors
 Info on: points, paths, areas, etc.

Dynamic/real-time

- bus lines: 144 updates X day X line
- parking status: 76 updates X day X sensor
- traffic Sensors: 288 updates X day X sensor
- weather: 2 updates X day for 285 areas
- events: about 60 new events X day
- Wi-Fi: > 350.000 measures X day
- mobiles: > 50.000 measures X day
- more than 35.000 distinct users X day
- From 600.000 to 4.5 M Tweets X day
-many other sensors see next slide

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 /

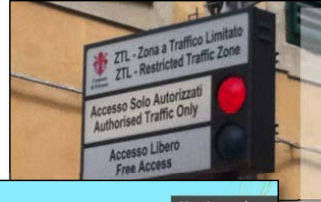
Ultimo Aggiornamento: 2015-09-15T09:07:00+02:00
[LINKED OPEN GRAPH](#)

<http://servicemap.km4city.org>

Other Sensors and Actuators, IOT

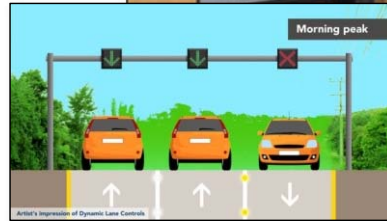
Restricted Traffic Zone Gates

- Passages, payment, alerts, Wi-Fi control, RFI control, etc.



Road Direction manager: panel, red-light, etc.

- Status and action



Environmental Sensors:

- Air quality, pollution, rain, allergens, temperature,
- humidity,...



Public Light Pillar

- Traffic flows, environment,
- Wi-Fi, Tv-Camera, BT servers, on/off, percentage of light, ..



Waste Manager

- Level, kind, status, on/off



Recharge station, column

- Free slots, consumption, next time slot, ...

Environmental Sensors:

- Air, temperature, humidity,
- water level in rivers
- Status of underpass and bridges



Risk assessment

- Value of the buildings,
- hydrogeological risk map,
- earthquake risk map, ...
- people distribution and location
- Position of recover places,



Traffic Zone Gates

- Passages, alerts,
- Wi-Fi control,
- RFID control,
- etc.



- **monitoring services' status of city operators**

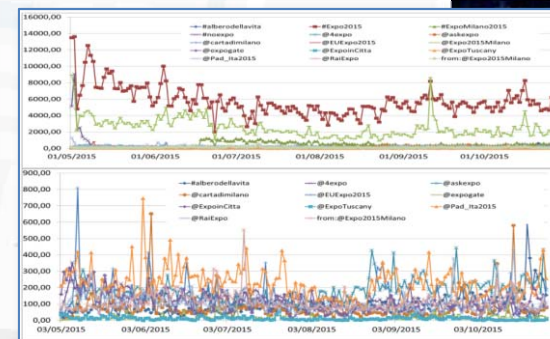
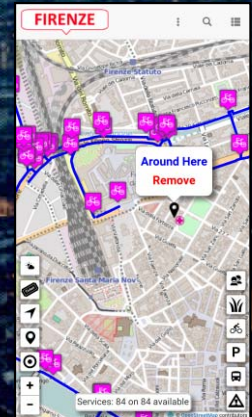
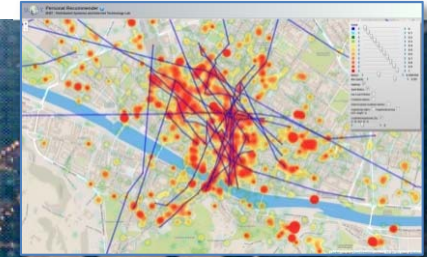
- Smart City Dashboards
- Continuous Business Intelligence

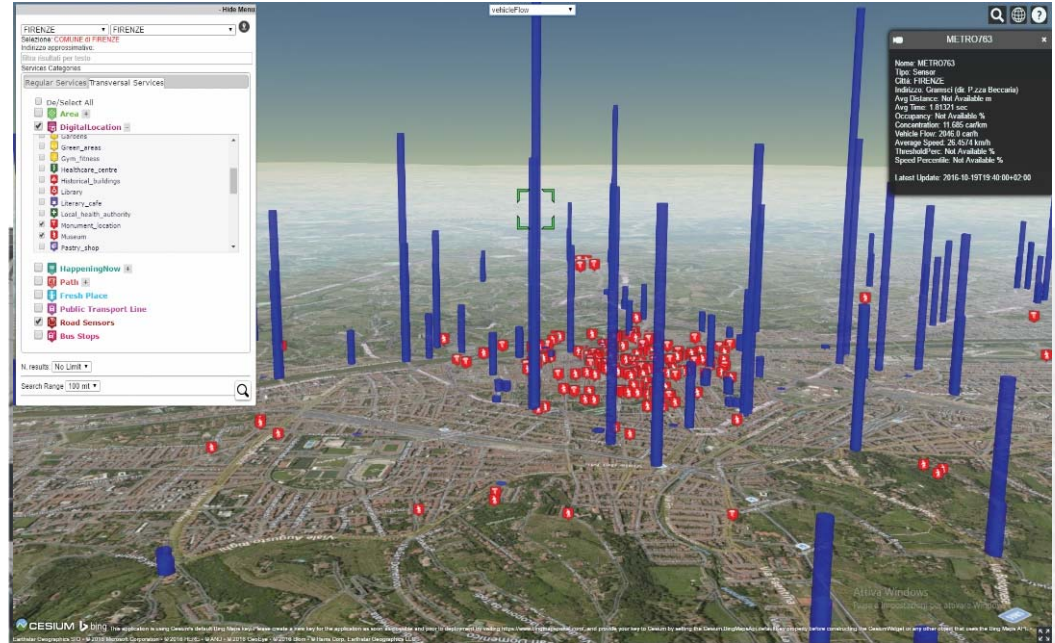
- **City users behaviour monitoring and analysis:**

- Sensors, traffic flow, people flows, mobiles, sensors, IOT, IOE
- Wi-Fi, Tv-Cameras

- **City users participation**

- social media for city services and events, **Twitter Vigilance**
- **Collecting contributions:** images, stars, comments





Traffic Flows





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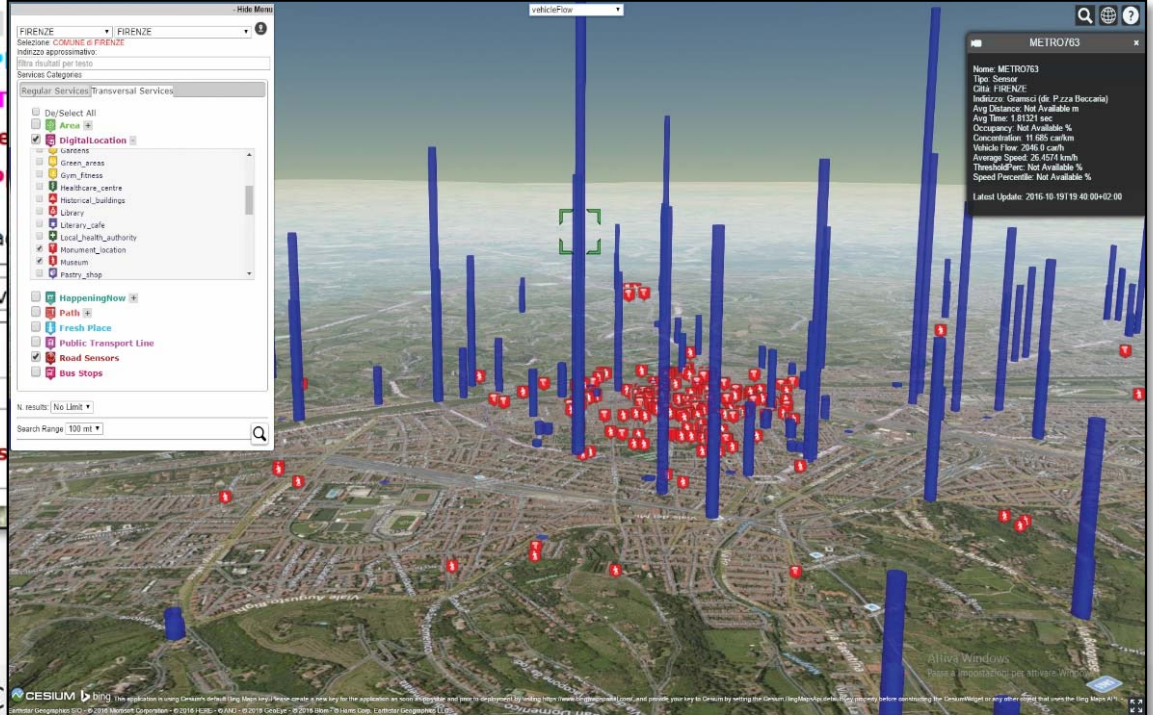
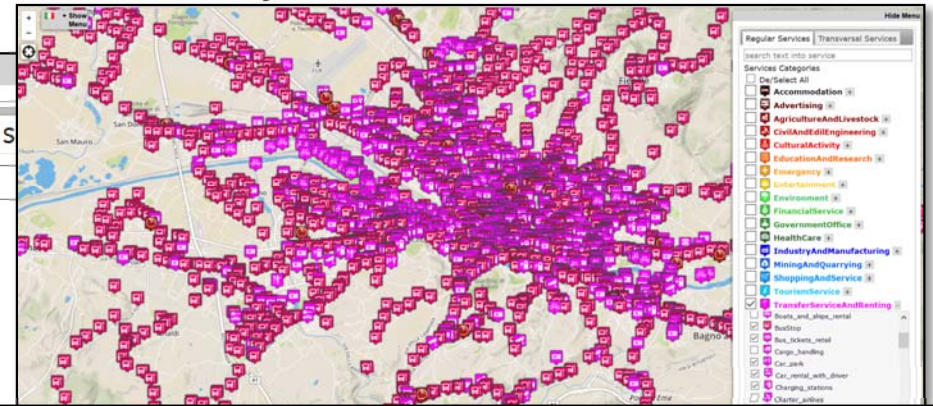
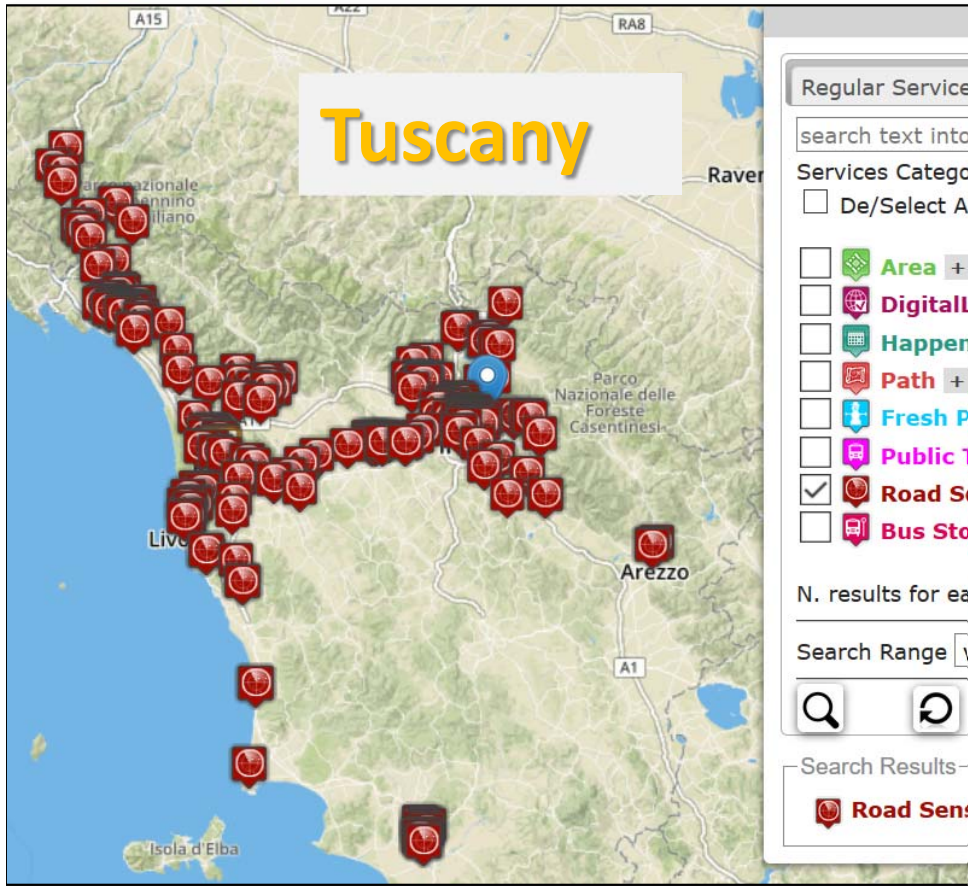
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Traffic Flow Tools

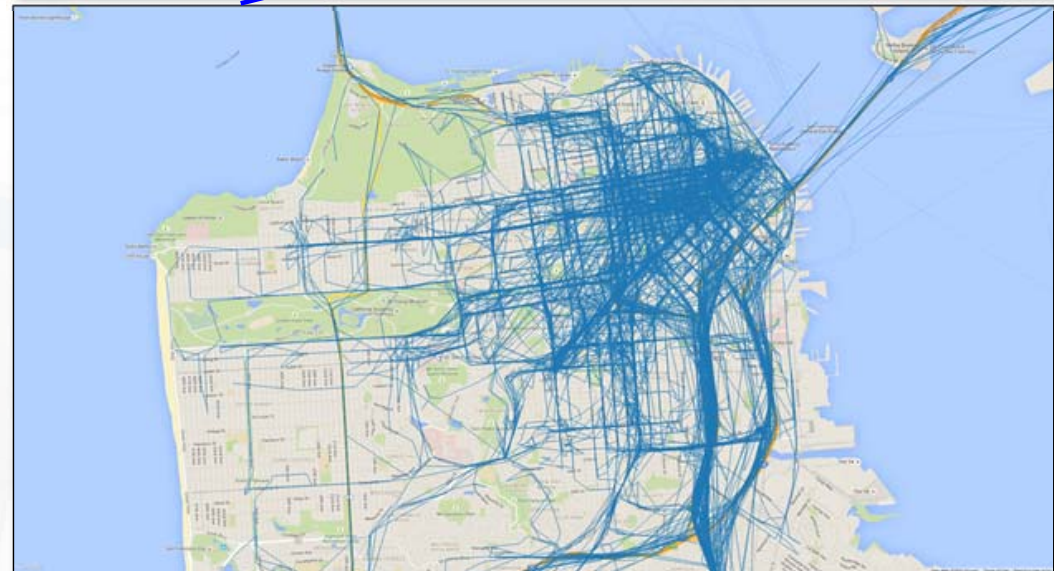
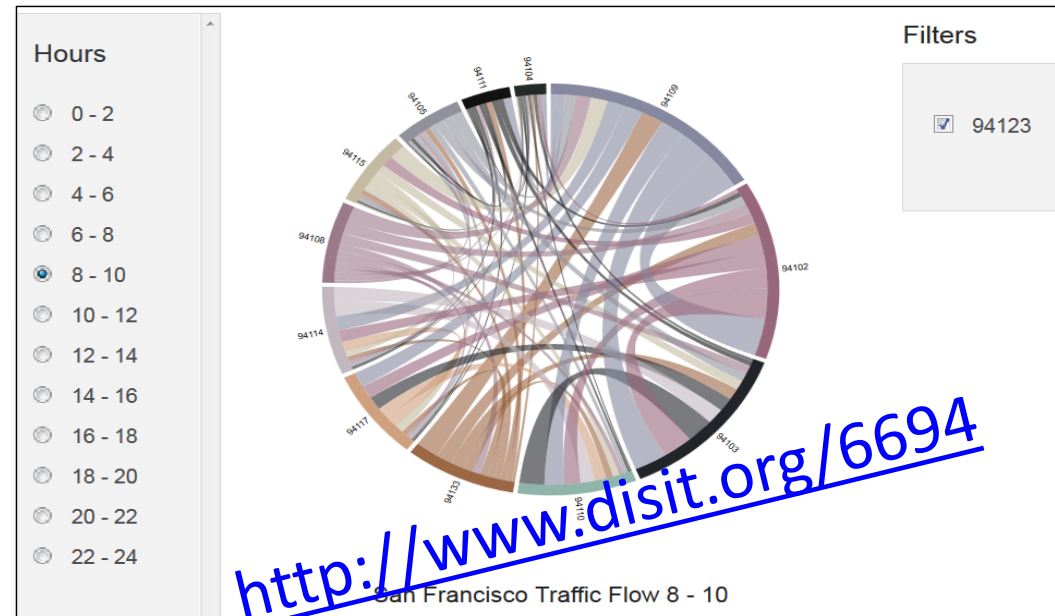


- Spire and Virtual Spires (cameras), Bluetooth, ..
- Specifically located: along, around, ..



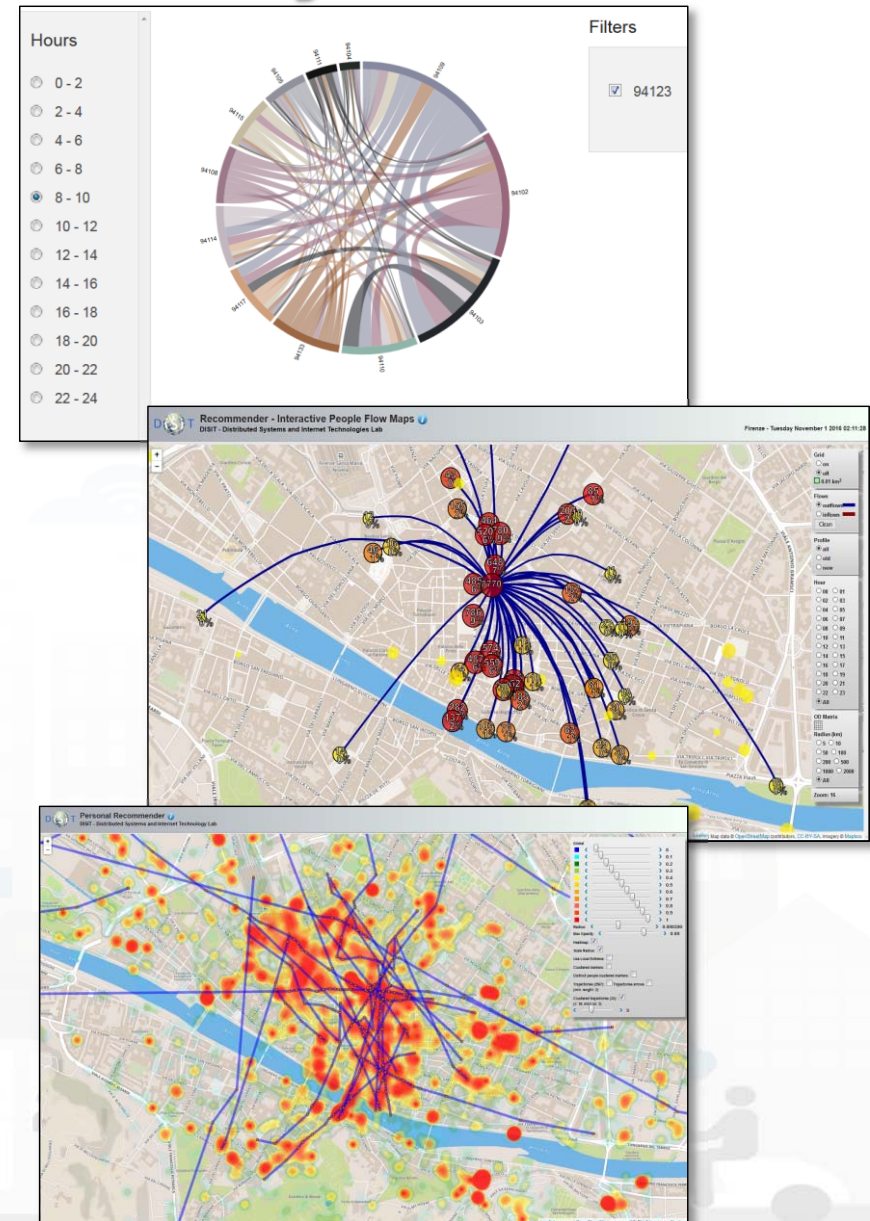
Traffic and People Flow Assessment

- **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



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





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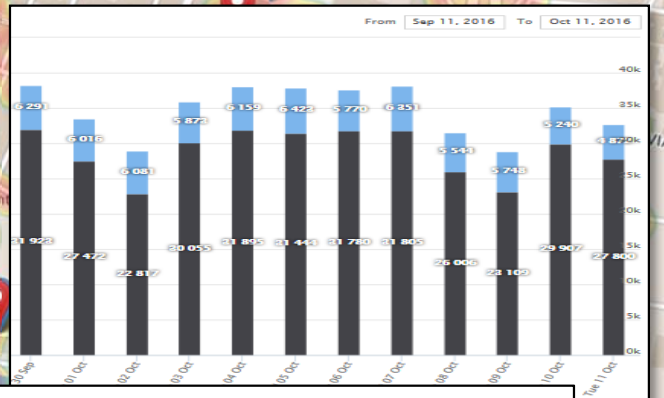
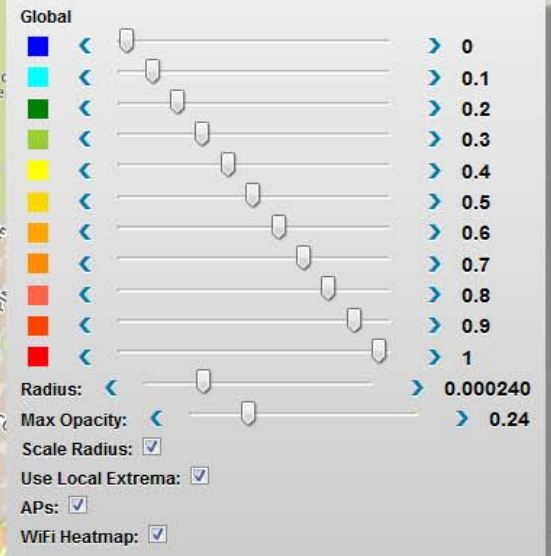
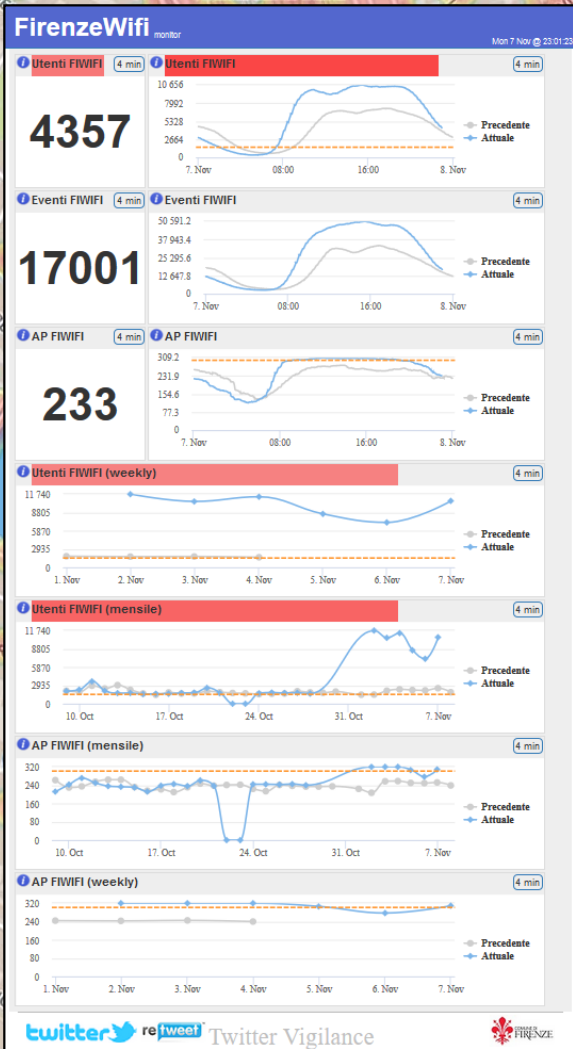
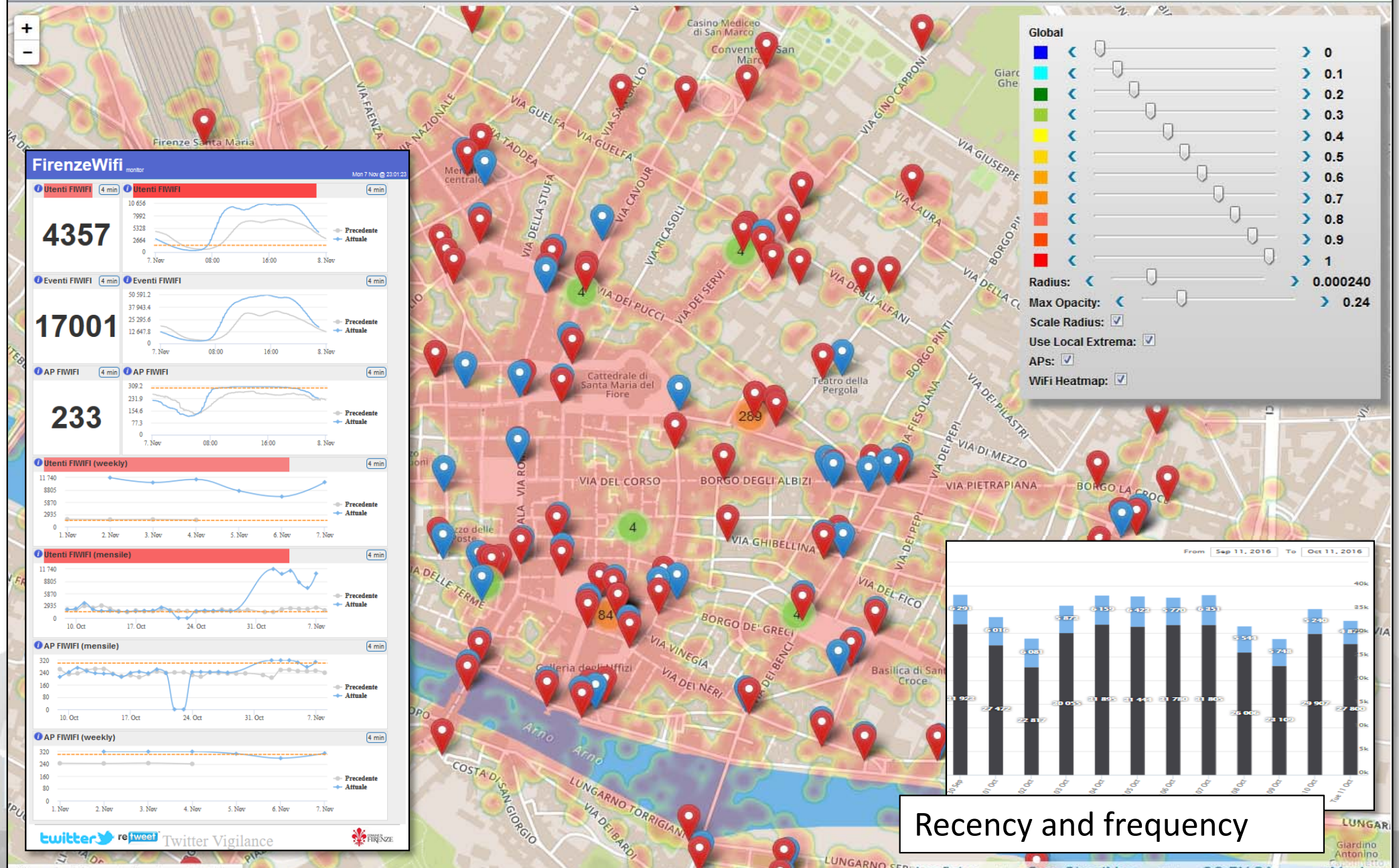
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WiFi Monitor tool



WiFi Firenze

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Recency and frequency



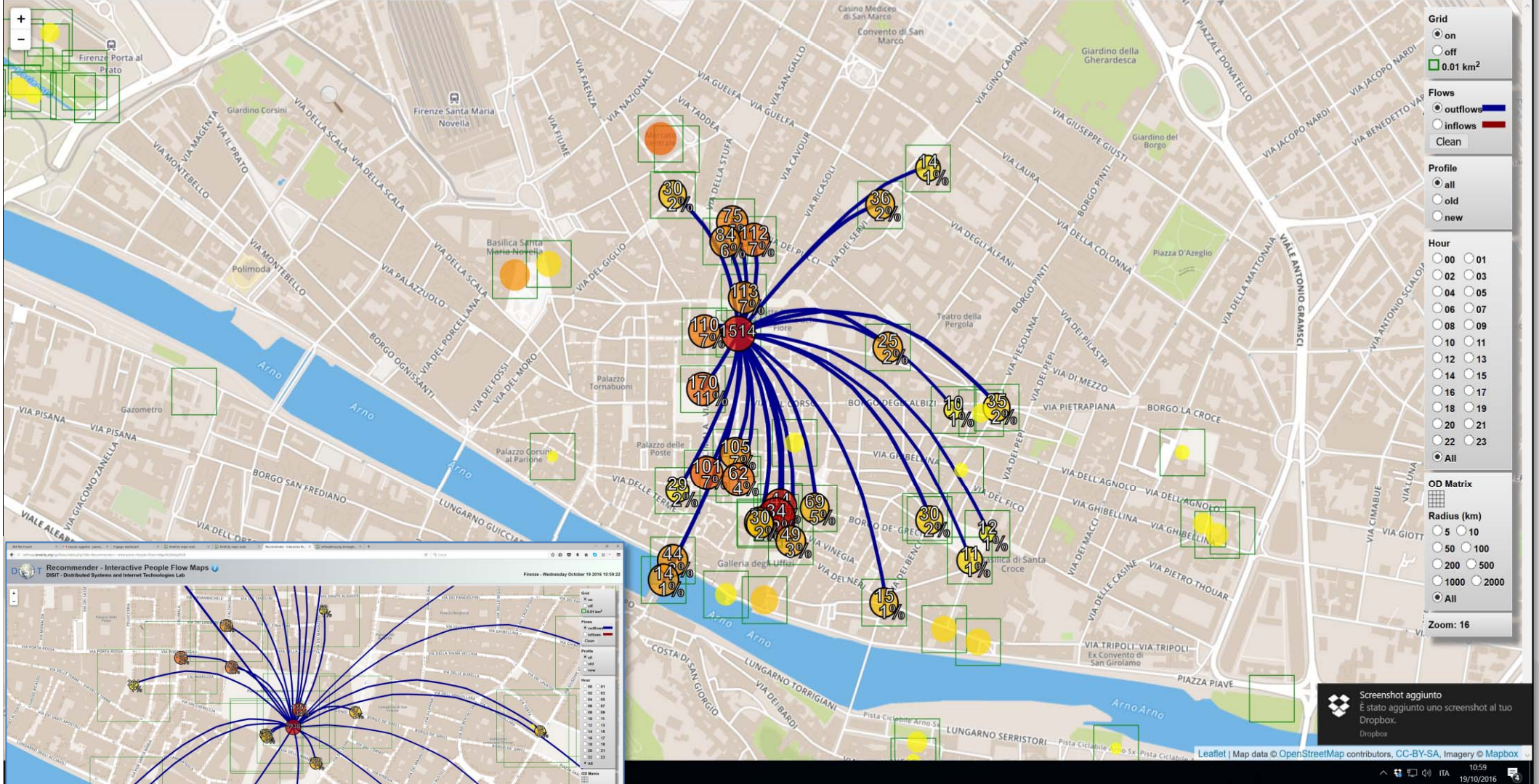
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People Flow in the city via Wi-Fi.

Firenze - Wednesday October 19 2016 10:59:36





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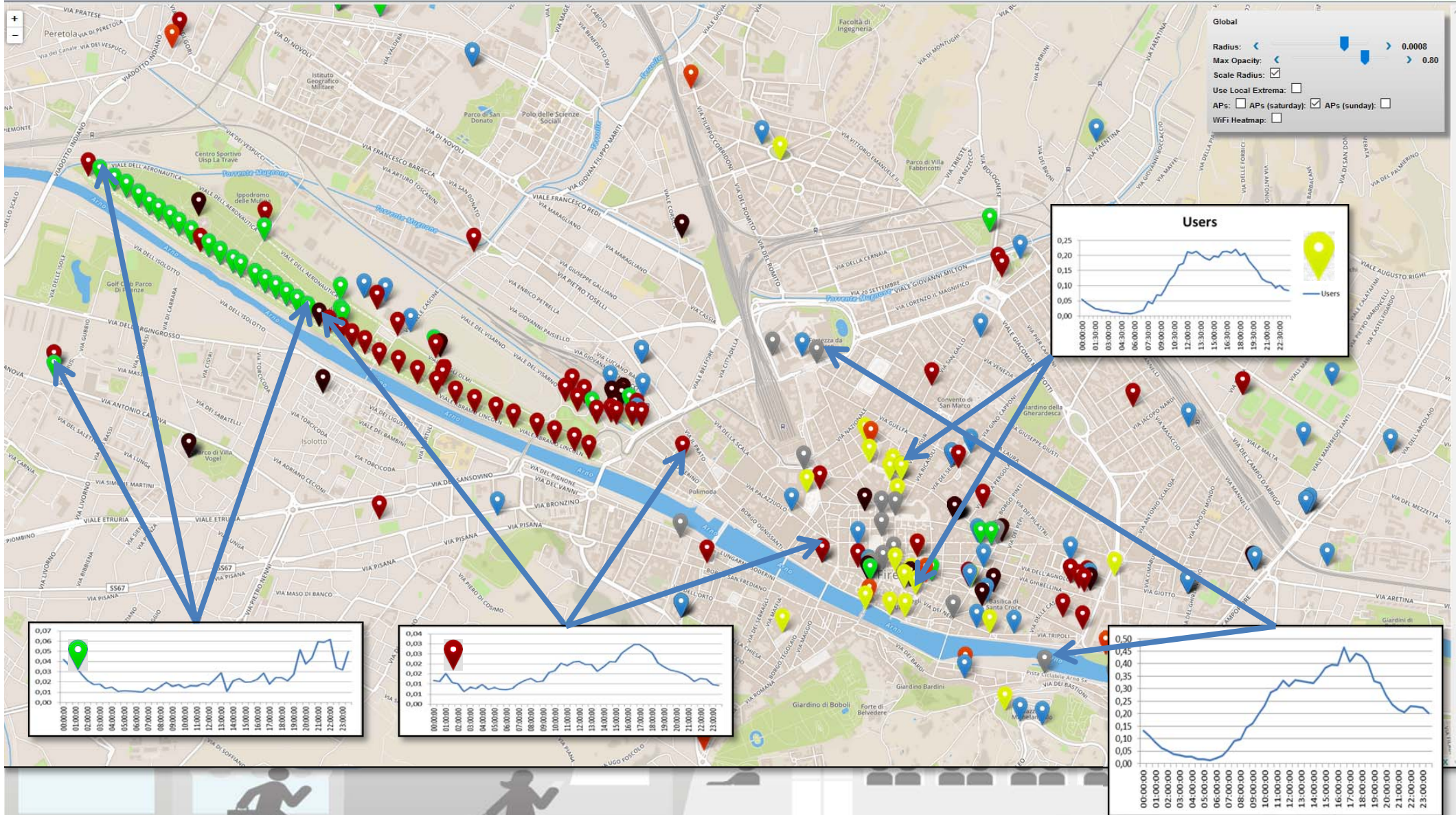
<http://www.disit.org>

City Users Behaviour



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

Firenze - Wednesday November 9 2016 22:33:30

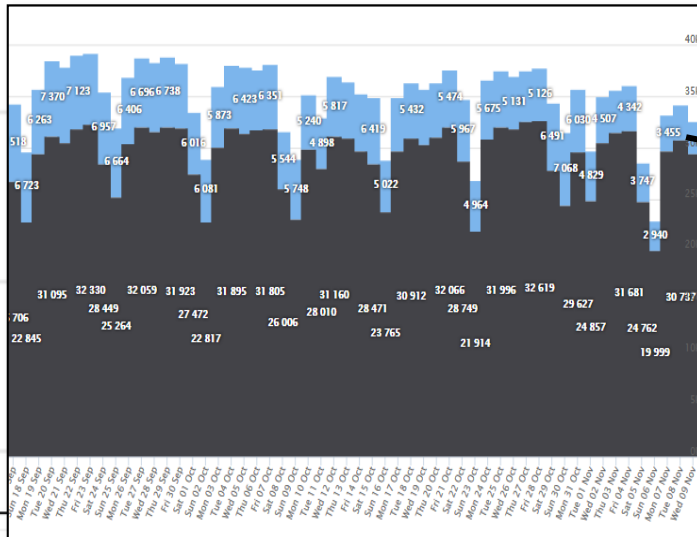
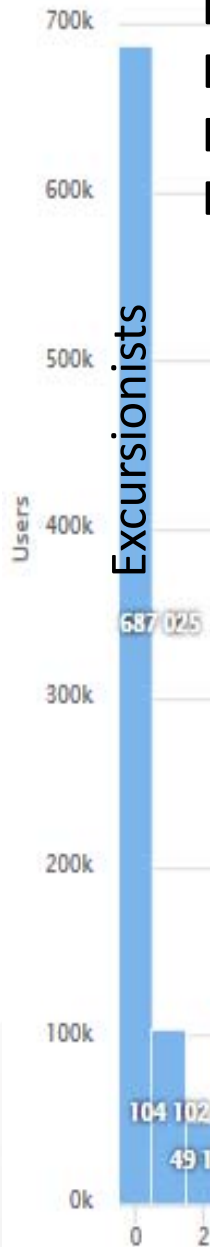




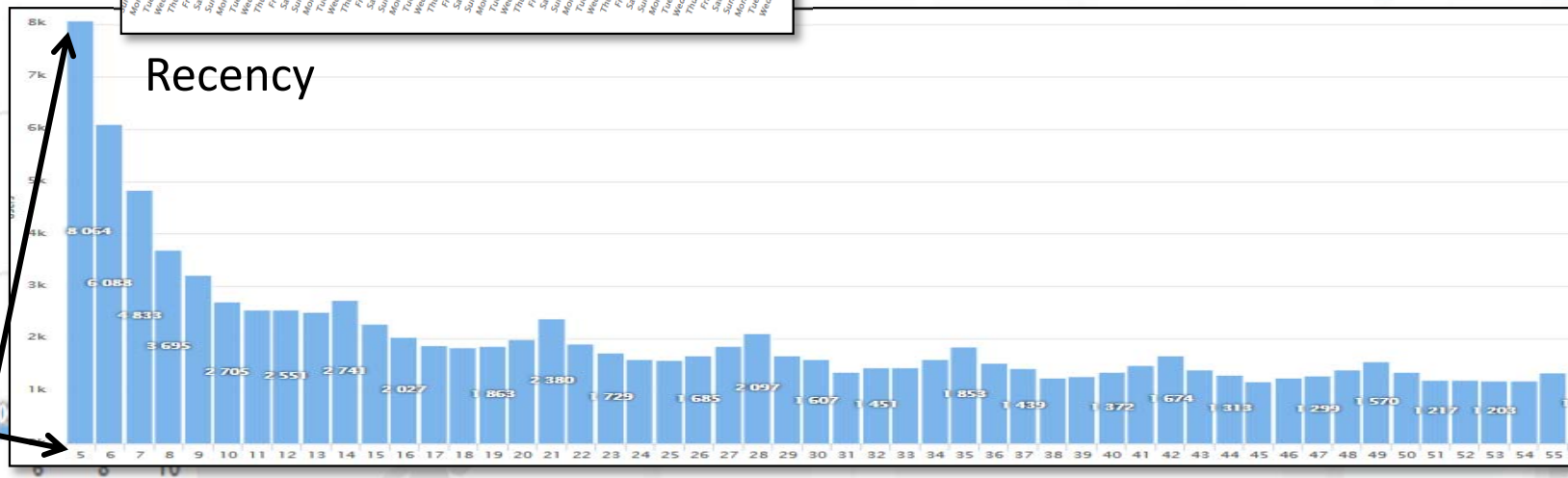
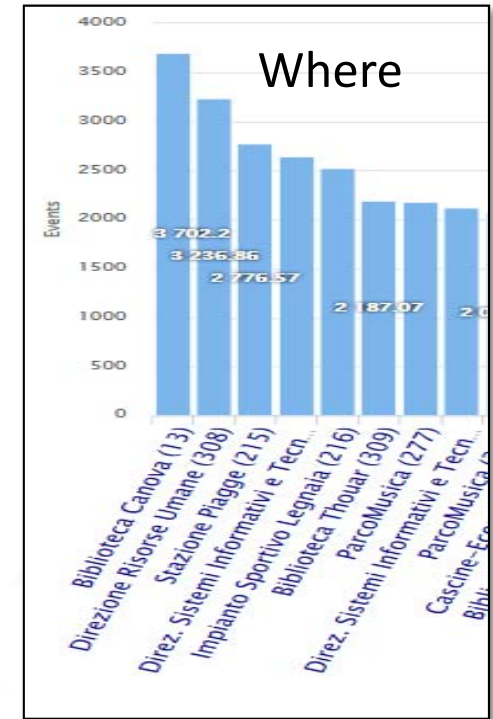
User Behavior Analysis



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

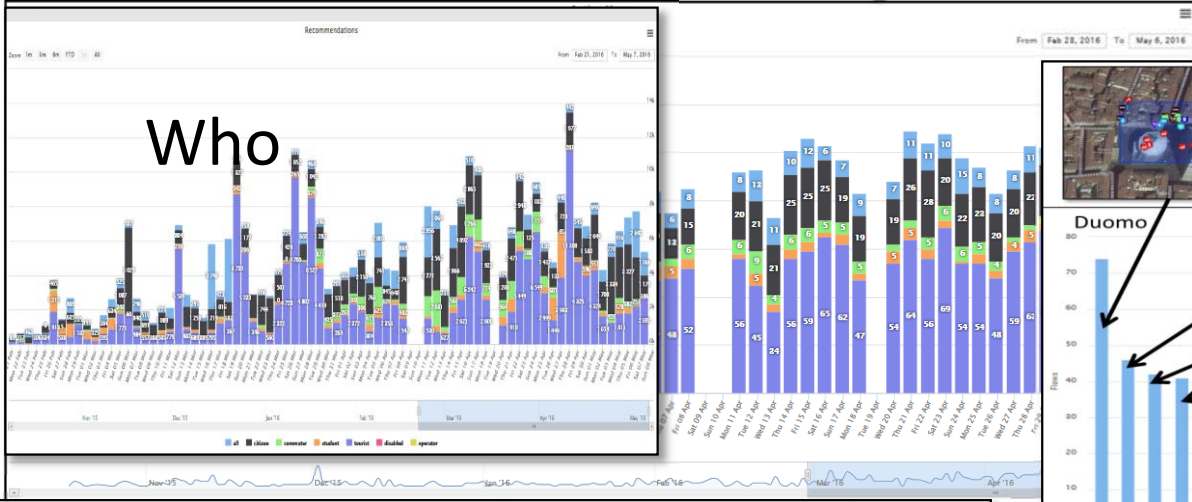


→ New City Users
VS
→ Returning

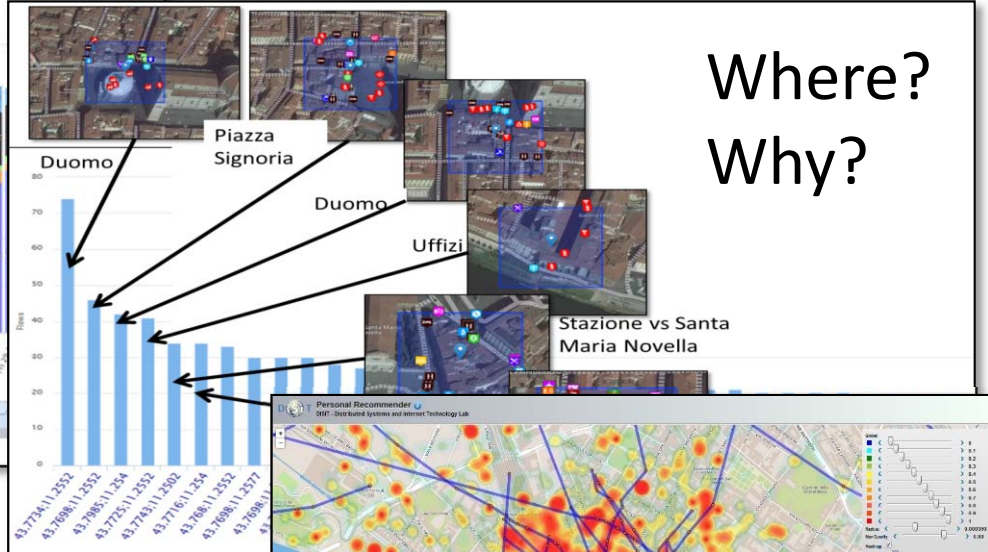


User Behavior Analyzer for Collective profiling

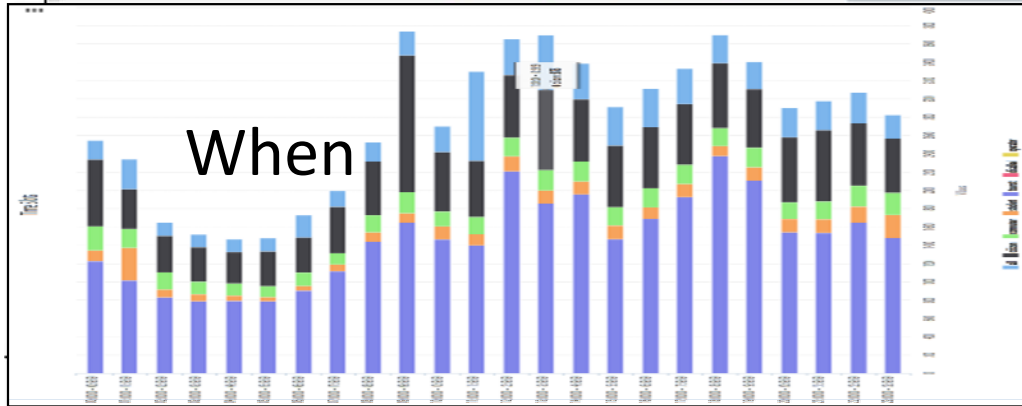
Who



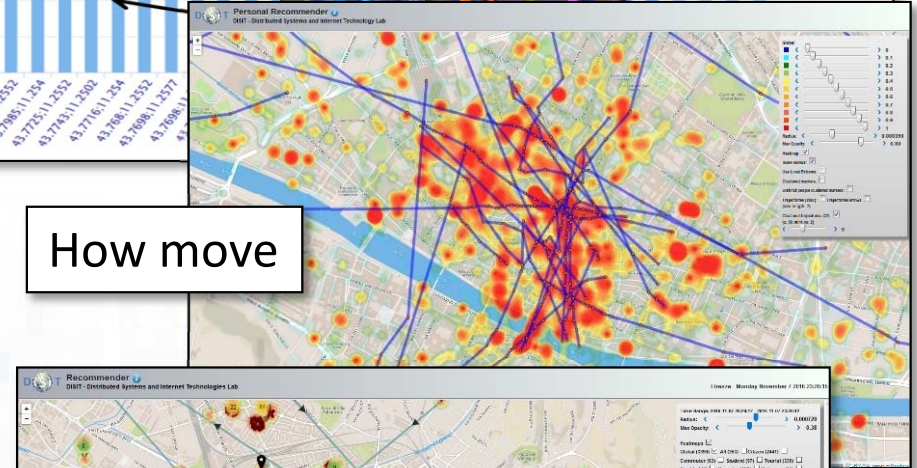
Where?
Why?



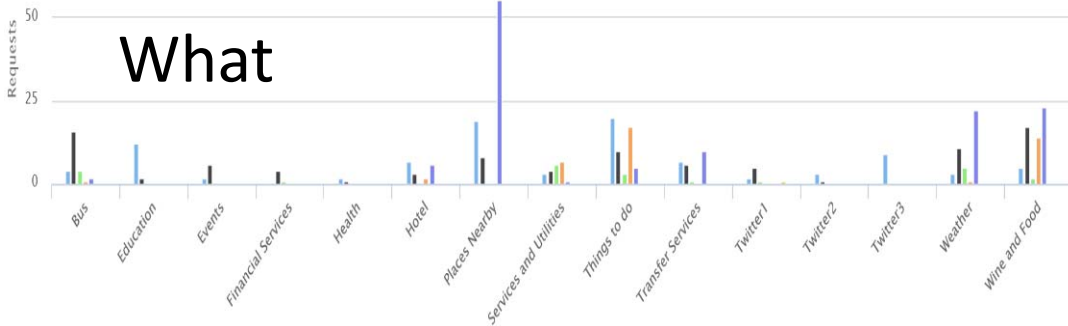
When



How move



What





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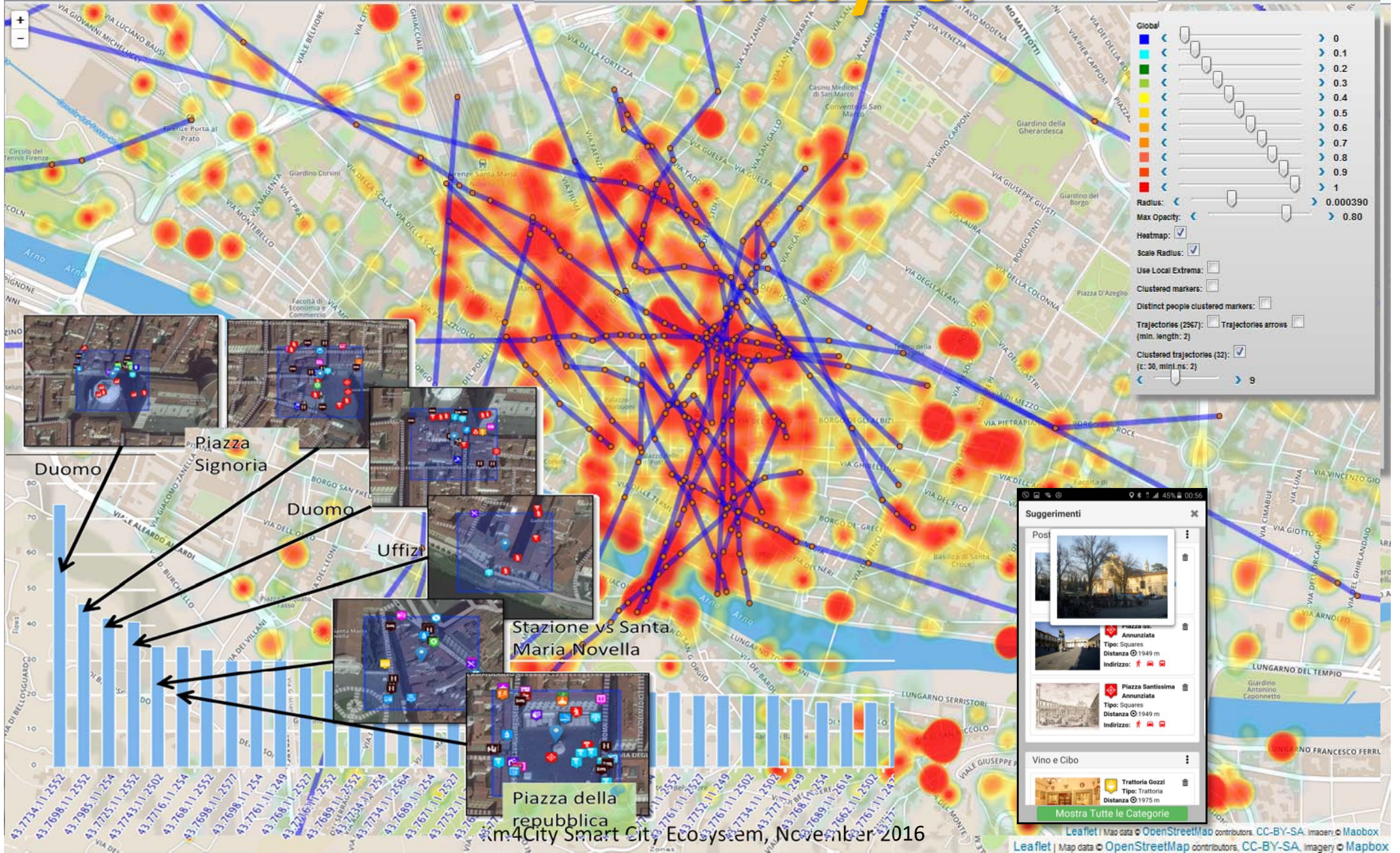
<http://www.disit.org>

User Behavior Analyzer



DISIT Personal Recommender
DISIT - Distributed Systems and Internet Technology Lab

Analyzer



Suggerimenti

Post

- Piazza Signoria**
Annuziata
Tipo: Squares
Distanza 1949 m
Indirizzo:
- Piazza Santissima**
Annuziata
Tipo: Squares
Distanza 1949 m
Indirizzo:

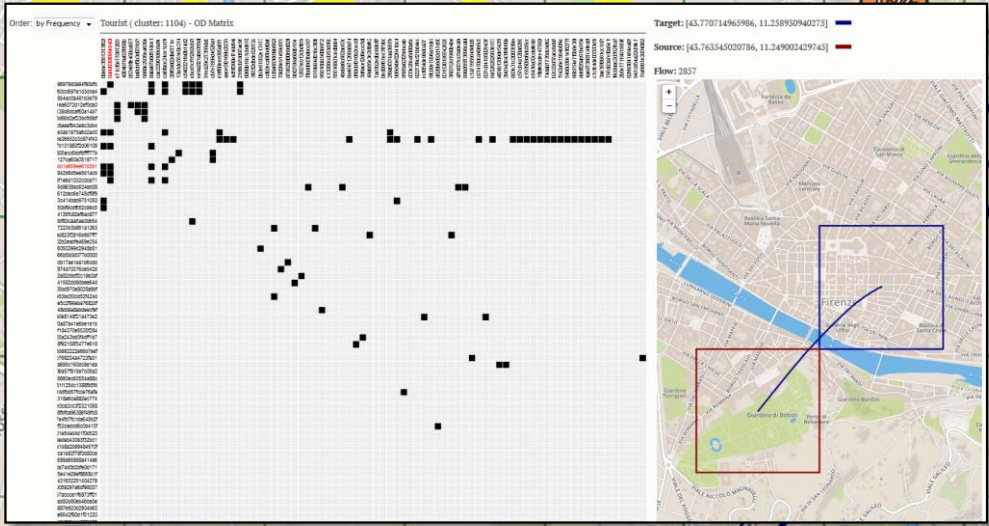
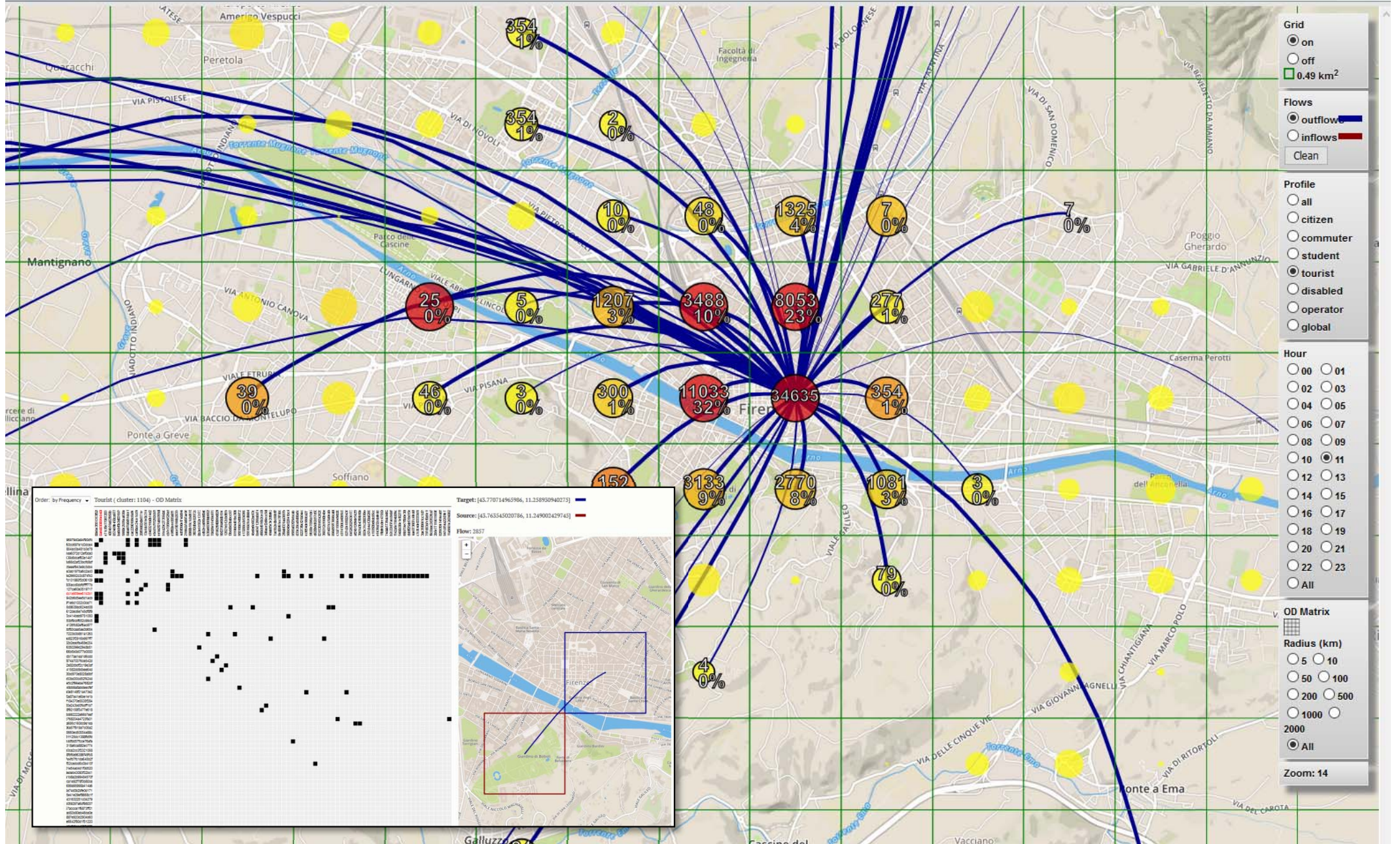
Vino e Cibo

- Trattoria Gozzi**
Tipo: Trattoria
Distanza 1975 m

[Mostra Tutte le Categorie](#)

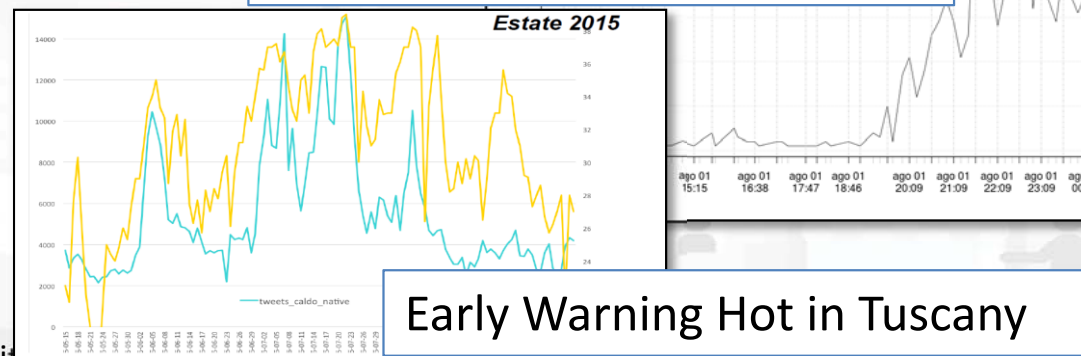
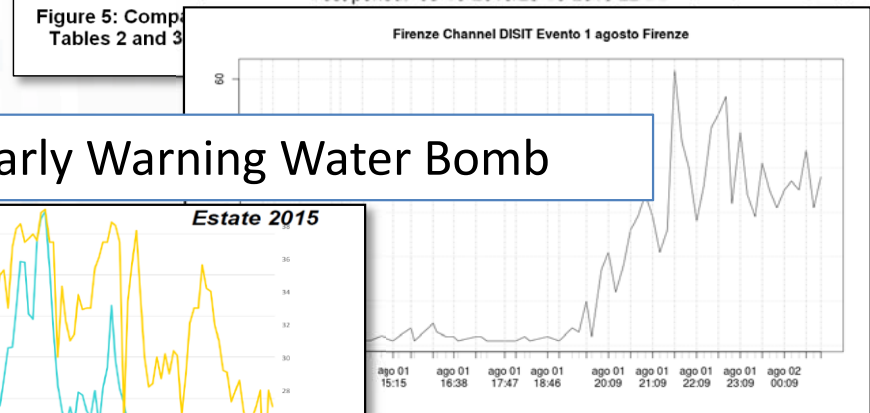
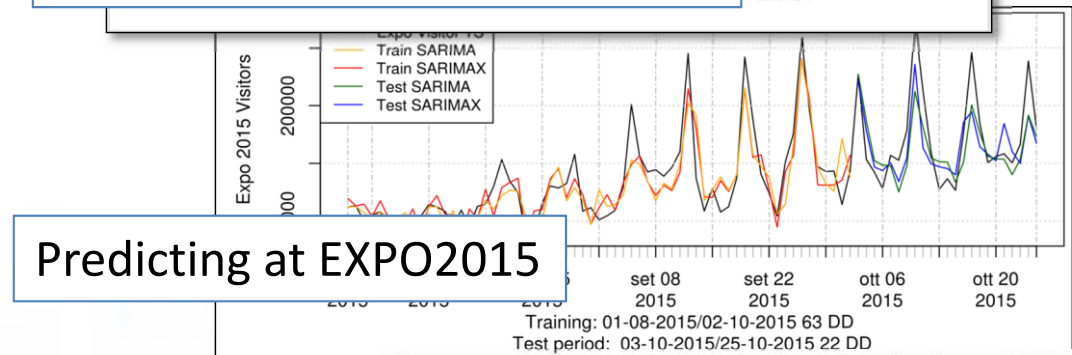


OD Matrix scalabile



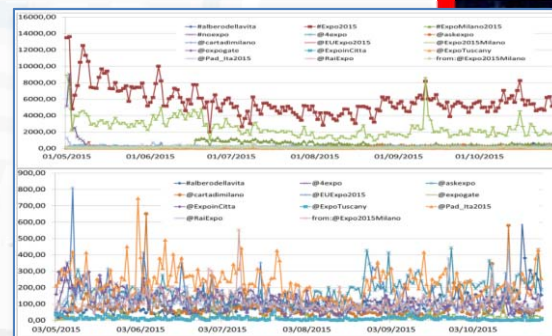
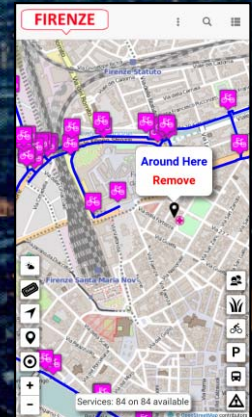
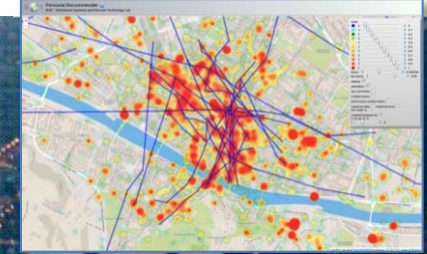
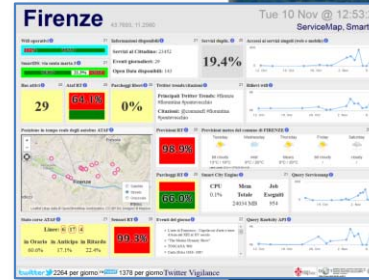
Predicting Models for Admin. & City Users

- Aiming at improving
 - quality of service,
 - distributing workload
 - early warning
- Traffic Flows & People Flows → crowd
- Parking Status → free slots
- Weather Forecast (LAMMA)



city under control

- **monitoring services' status**
of city operators
 - Smart City Dashboards
 - Continuous Business Intelligence
- **City users behaviour monitoring and analysis:**
 - Sensors, traffic flow, people flows, mobiles, sensors, IOT, IOE
 - Wi-Fi, Tv-Cameras
- **City users participation**
 - social media for city services and events, **Twitter Vigilance**
 - **Collecting contributions:** images, stars, comments



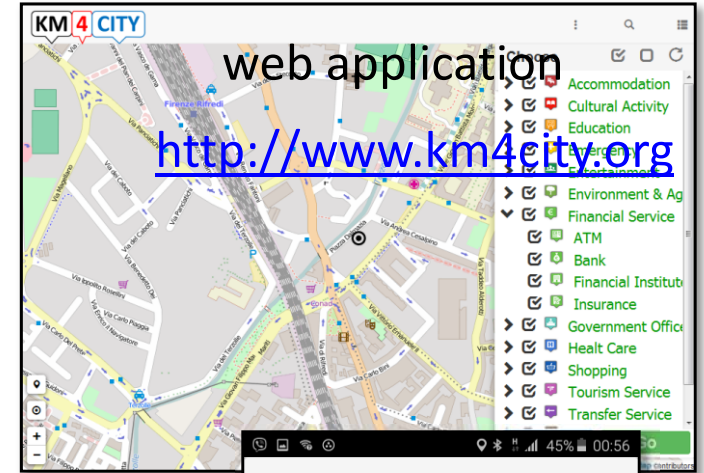


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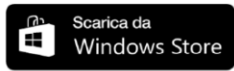
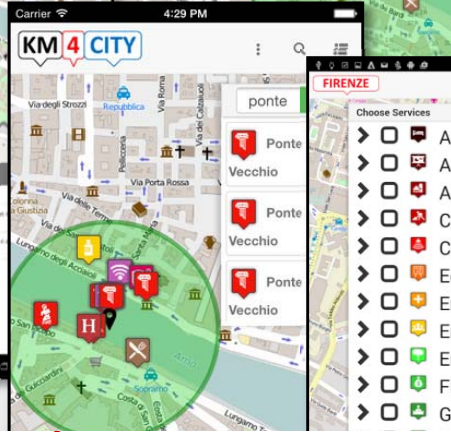
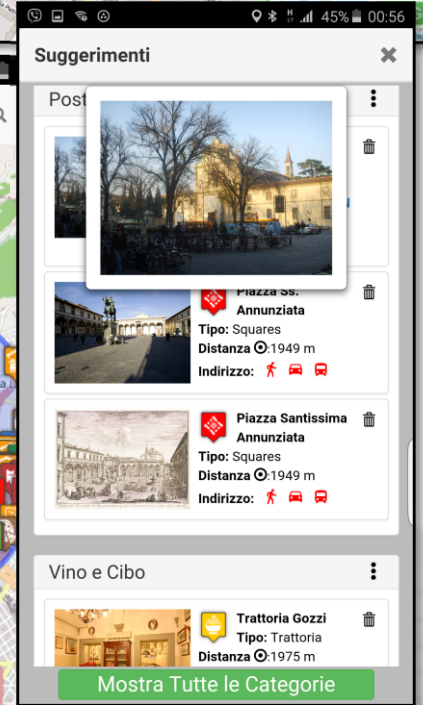
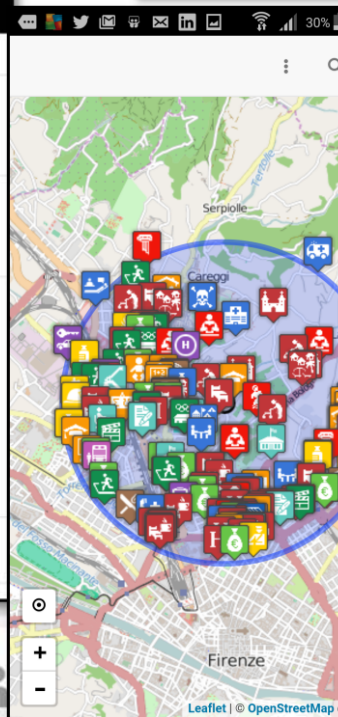
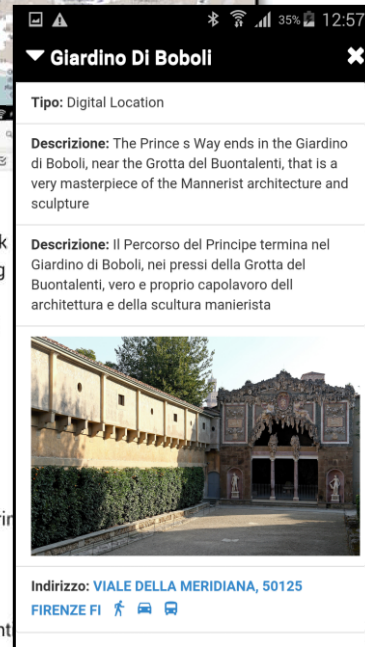
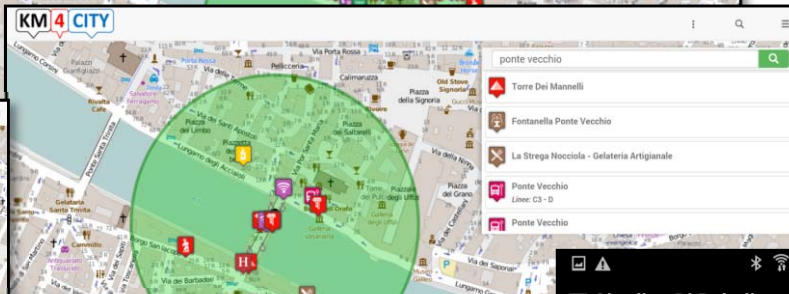
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Km4CityMobile App



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

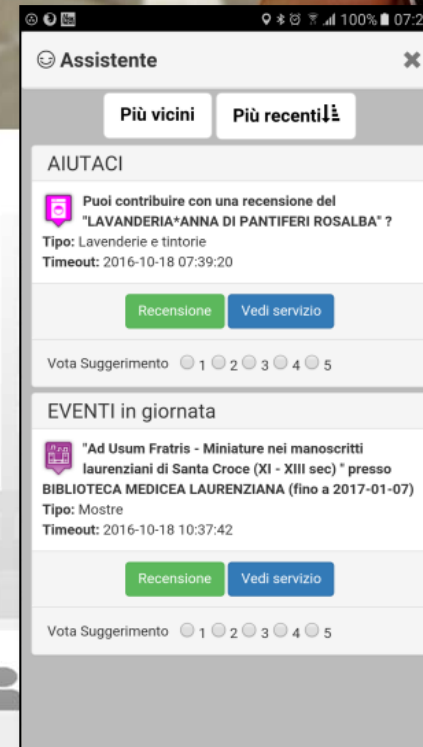
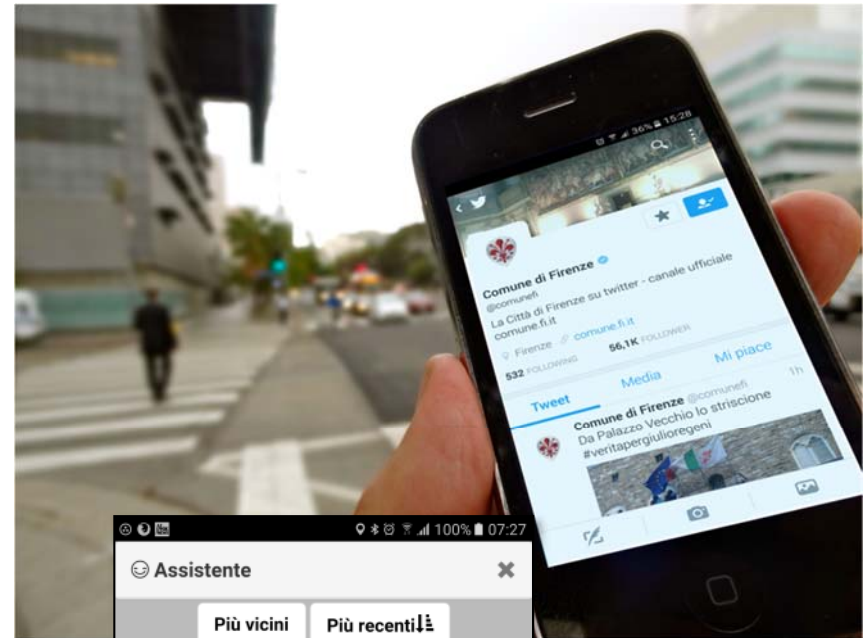


h Care
ity And Manufacurin
ing And Quarrying
ping And Service
sm Service
sfer Service And Ren
es And Supply

City Operator



- interested to **encourage participation** from citizens
- city operators can analyse the user's activities and the city context/situation with the aim to define a set of rules to engage the user in city participation.
- Via mobile App
 - **Systems of gamification** and rewarding are possible in ad-hoc scenario to stimulate virtuous behaviour.
 - citizens are stimulated to provide information about services dysfunctions, unexpected events, etc. contributing by uploading photos or scoring services in the city.
 - authorities provide information where it's needed rather than force citizens to looking for that, reducing the cost of services and improving their qualities.





Twitter Vigilance

- **Public parts accessible** on: <http://www.disit.org/tv>
- **Monitoring** twitter channels with
 - high reliability & precision, following slow, fast and explosive events
 - Multiuser managing multiple: public and private channels
 - Access to data, advanced search, data analytics, sentiment analysis,
- A **Twitter Vigilance** channel is a set of real time adaptive searches on twitter.
 - Each of them may have a complex syntax according to twitter API and service
 - Each user may manage a number of channels and searchers
- Active since April 2015 with data collection, since Sept. with big data analytics with Sentiment Analysis
 - Over than 110 Million of tweets, May 2016



Search parameters

Crawler Statistics

Config Twitter API

Data analysis 3

Channel Statistics

Search statistics

Retweet Statistics

Twitter Users statistics

Sentiment analysis 1

LOGS 9

Processes

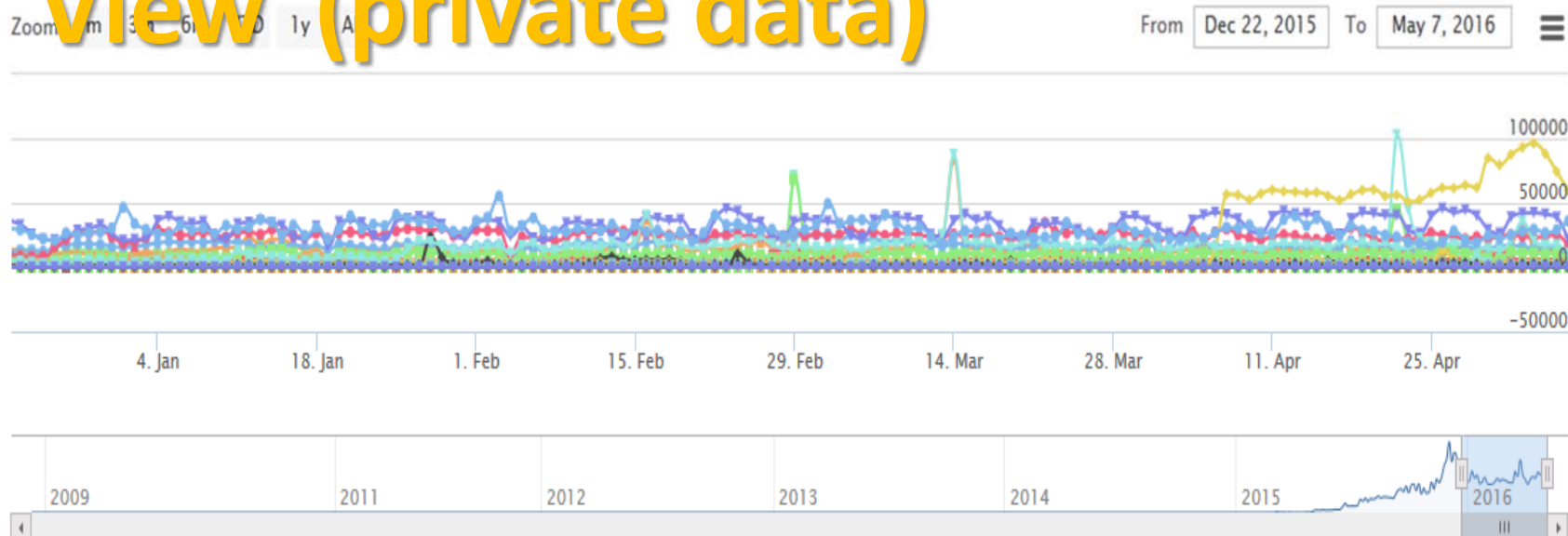
INFO

Home > Channel statistics

Twitter Vigilance Analysis Global

Global view of user channels

View (private data)



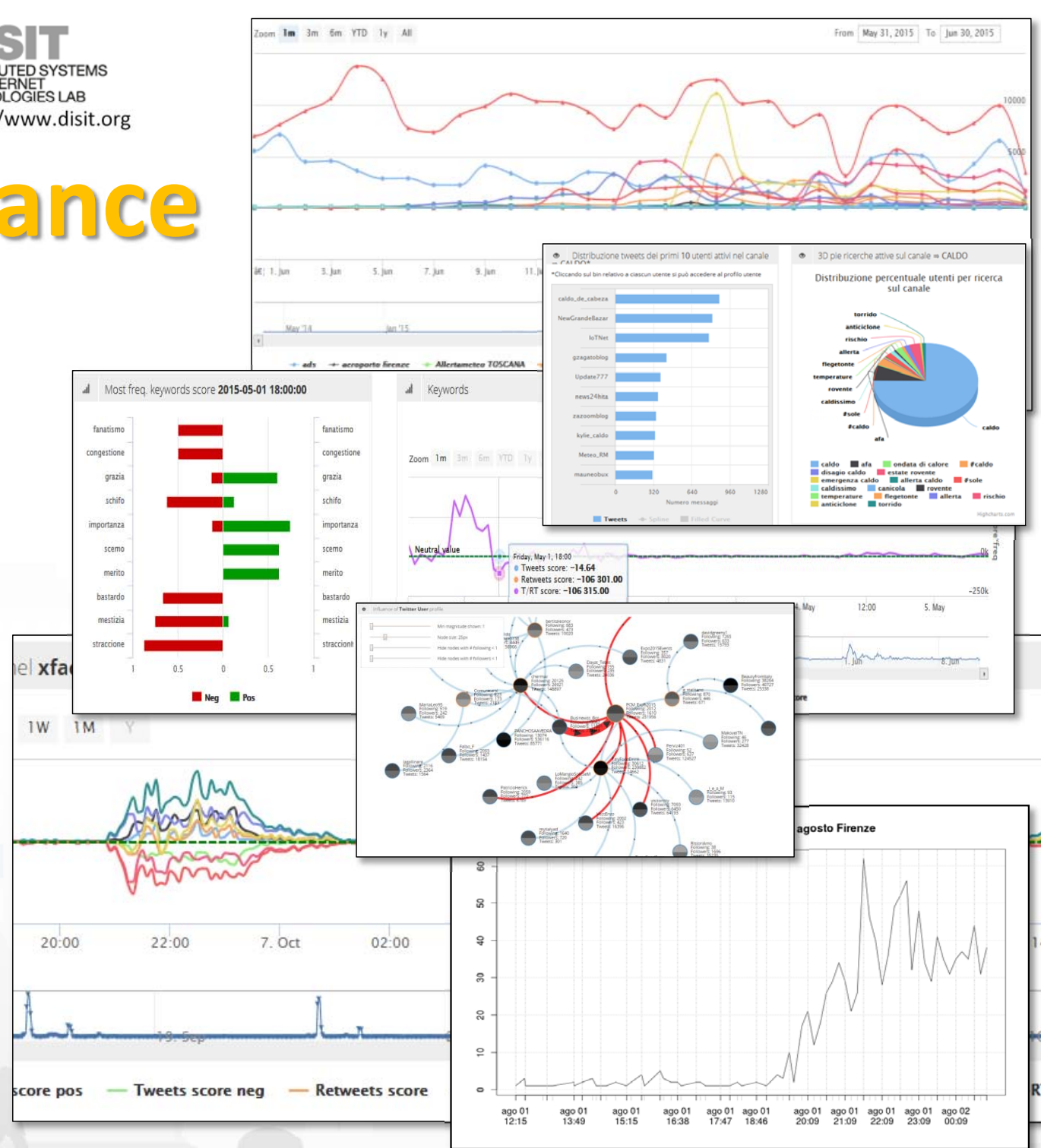
- ads
- aeroporto firenze
- Agenzie-ambientali
- Allertameteo
- Allertameteo TOSCANA
- Alluvione
- apretoscana
- ARPAT
- CALDO
- cambiamenti climatici
- cardboard
- chi parla di meteo
- Clima
- CNRxEXPO
- Codified Hashtags Allerta
- ConsumoSuolo
- eclap
- Emergenza_acqua
- Europeana
- EXPO2015
- EXPO2015Toscana
- fallbegins
- Farmacovigilanza
- Firenze
- firenzefuochi
- FirenzeICT
- geocomuniTOS
- Giubileo
- idrogeologico
- iene
- influenza
- iononrischio
- LaMMA
- laudatoSi
- laudatoSi_1
- Maltempo
- maturità 2015
- MeteoAlert
- MeteoUSER
- MissioneRosetta
- monitAllergie
- mrm
- mugnone2016
- mymeteo
- NASA New Horizons
- nutella
- PAAAlert
- PAEnvironment
- PAMeteoNews
- PAMeteoNewsStud
- paolonesi
- papafrancesco
- PAProtCivile
- PA_social_PA
- protezione civile toscana
- reflusso
- resilienza
- rettore
- rossano
- siena
- Smart Drugs
- smartcity
- smartcitybigdata2015
- SOLO allertameteoTOSCANA
- tech
- terrorismo
- TPL
- turismo Firenze
- turismo Firenze_1
- turismo Firenze_2
- uber
- Univ-Firenze
- vargroup
- Xfactor9
- Xylella
- zanzara
- Events

Highcharts.com

Hide All

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





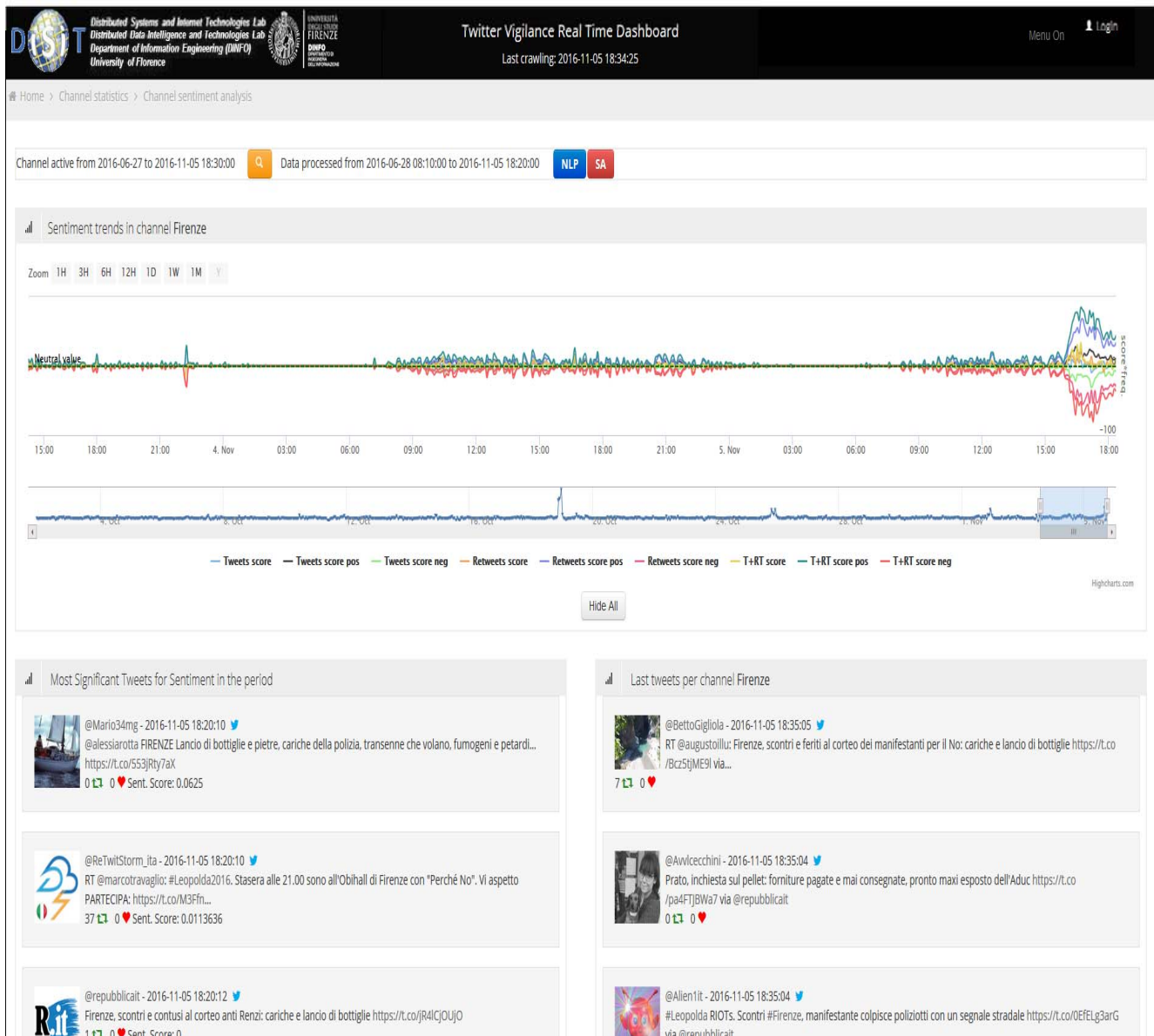
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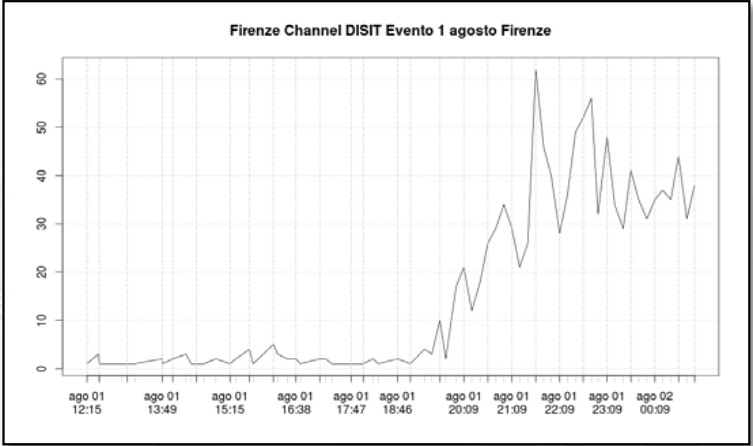
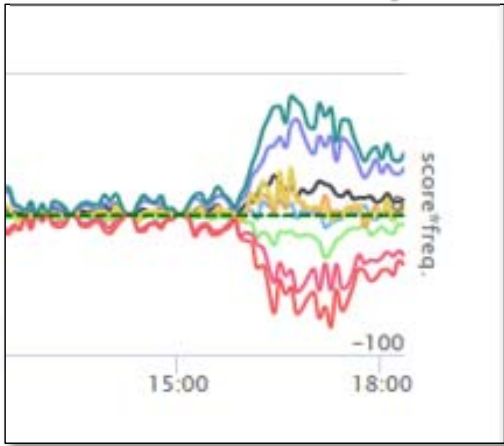
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Twitter Vigilance

Real Time Twitter Vigilance, Early Warning



Sentiment Analysis



ember 2016

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

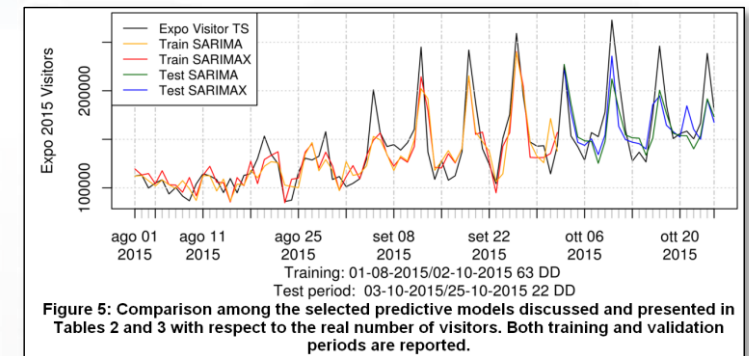
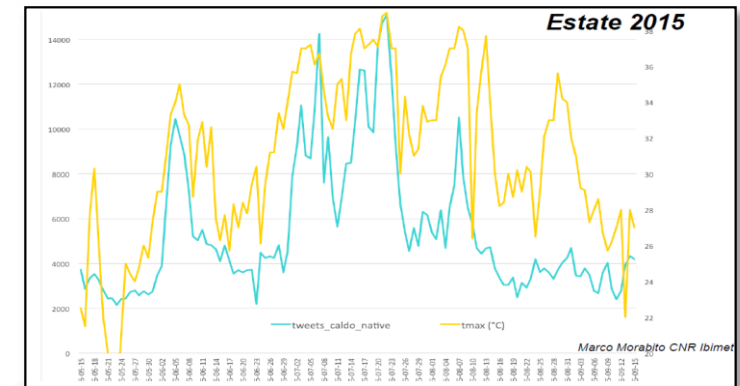
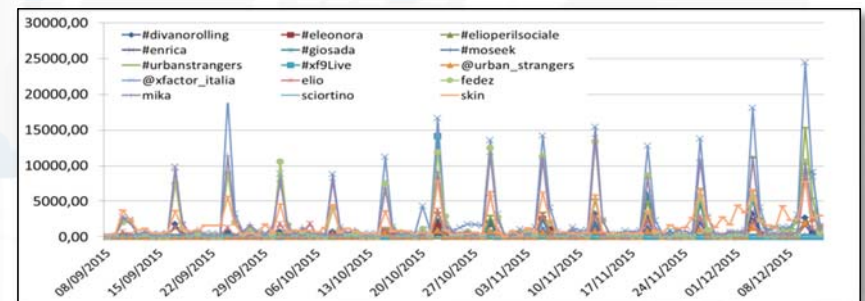


Figure 5: Comparison among the selected predictive models discussed and presented in Tables 2 and 3 with respect to the real number of visitors. Both training and validation periods are reported.





**2 improve city
resilience,
reducing risks and
decision support**

From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

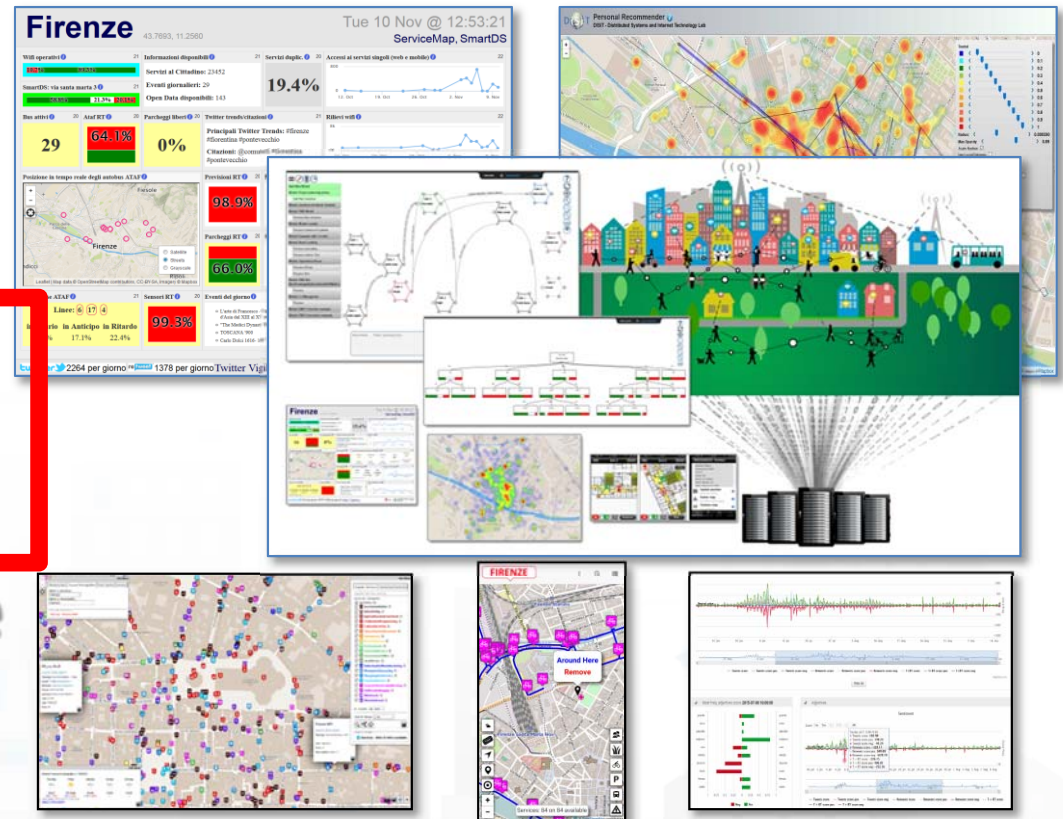
1. keep city under control via personalized dashboards

2. improve city resilience, reducing risks and decision support

3. transform data in value for the city

4. Technical details

5. Who is using Km4City



Km4City Data and Service Aggregator



Sentient City Control Room



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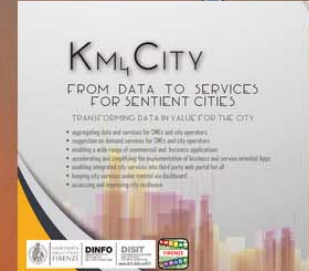
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Google play

Download on the
App Store

Download from
Windows Phone Store



Home Sentient City Control Room City Users' Tools Back Office and Dev Tools Info and Docs

Real Time Monitoring Tools for Control Room Dashboards

Control Room Dashboard ⓘ

Wi-Fi Coverage (*) ⓘ

Wi-Fi Usage (*) ⓘ

City Users Behaviour via Mobile App (*) ⓘ

Real Time Data on 3D (*) ⓘ

Parking Areas Status in Florence (*) ⓘ

Traffics Sensors in Tuscany Region (*) ⓘ

Twitter Vigilance Sentiment Analysis (*) ⓘ

Predicting Model for Admin. e city Users

- Aim: Improving quality of service, distributing workload in city, early warning.
- Traffic Flows & People Flows → crowd
- Parking Status → free slots
- Weather Forecast (LAMMA)

Early Warning and Prediction Tools ⓘ

Smart City Control Room, Dashboard, Real Time Data

Firenze

Data Center

Km4City

FirenzeWiFi

Energy (demo)

Municipio 2015

SmartCity Processes

Big Data Analytics Tools, Business Intelligence, Decision Support Tools

Resilience Decision Support System (*) ⓘ

Smart Decision Support System (*) ⓘ

Risk & Vulnerability Analysis Tool ⓘ

Origin Destination Matrix by Wi-Fi data (*) ⓘ

Recency and Frequency by Wi-Fi data (*) ⓘ

Origin Destination Matrix via Mobile App (*) ⓘ

Heatmaps and Trajectories for City Users Tourists (*) ⓘ

City User Behavior Analysis (*) ⓘ

Social Media Twitter Vigilance (*) ⓘ

Twitter Data Analysis Tool (*) ⓘ

www.Km4City.org

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



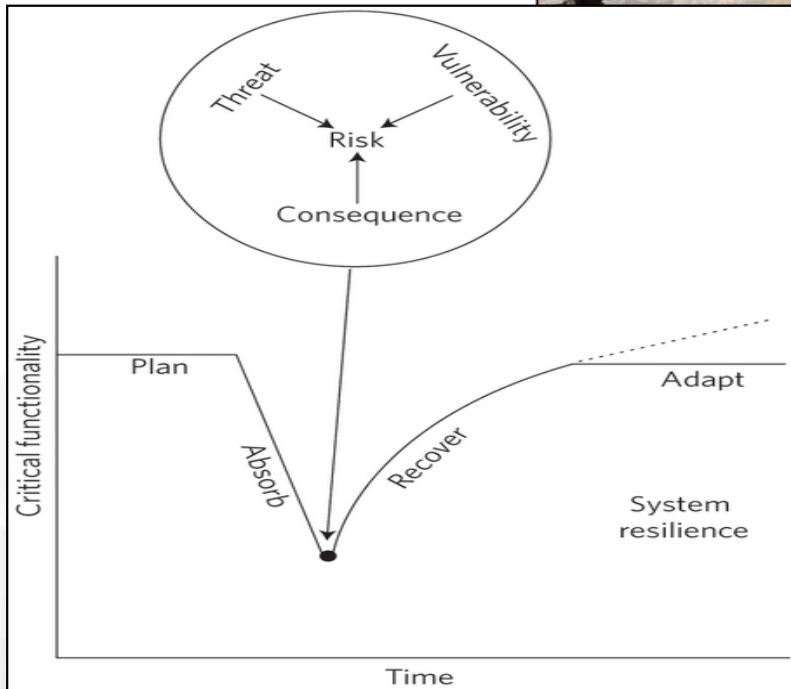


Problem and issues

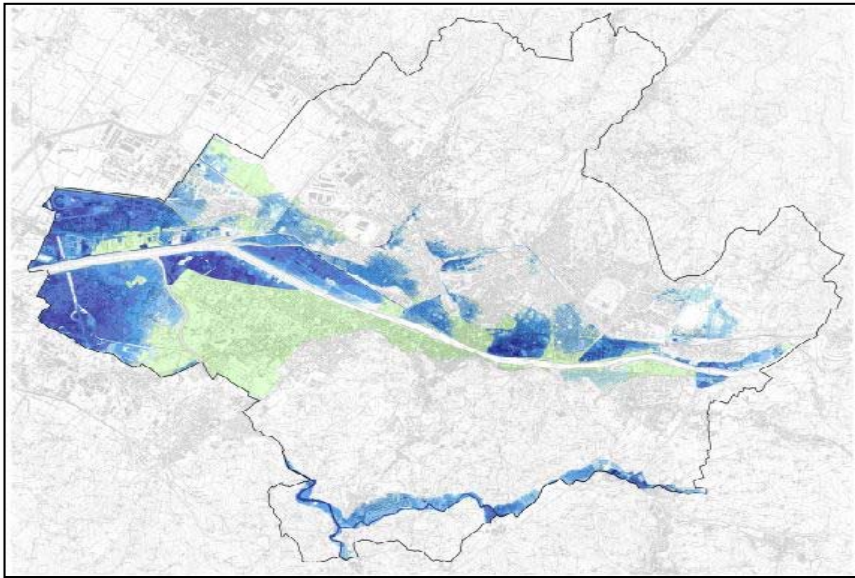
- **Cities include critical infrastructures strongly related / depended each other:**
Transport, energy, communication, cyber, health...
- **Risks for these Critical Infrastructure** (safety and security) may be due to natural and/or human made events.
- **UTS, Urban Transport System**, is one of the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



Prepare
Absorb
Recover
Adapt



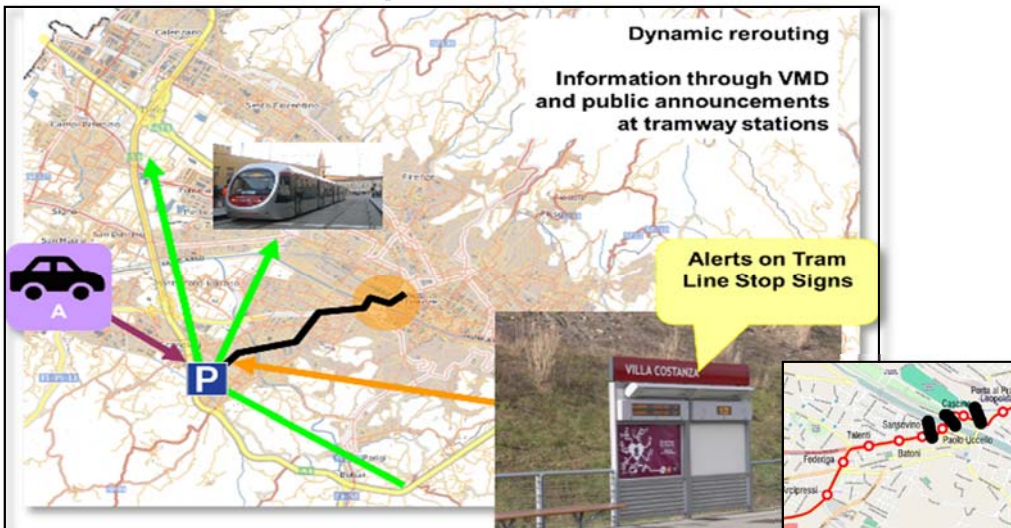
200 years probability Arno flooding



30 years probability Arno flooding



Arno Flood Impact on Tram Line & Traffic



Water bomb in South Florence





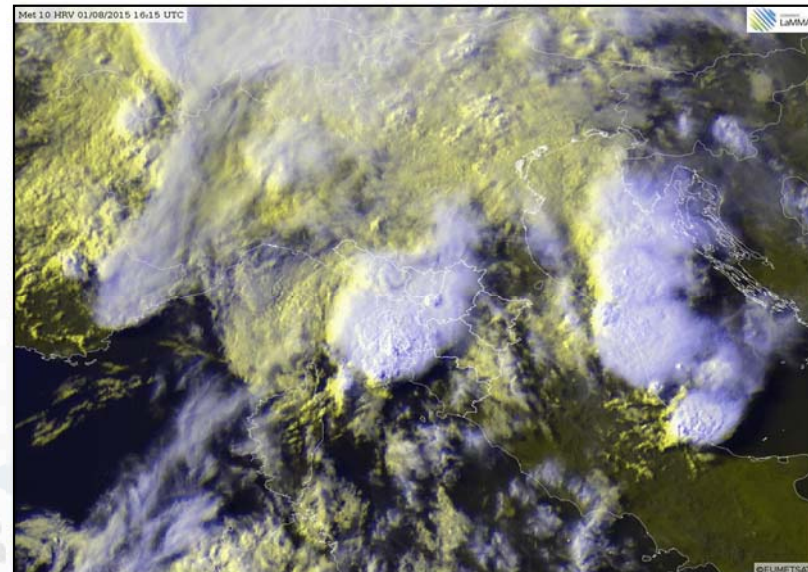
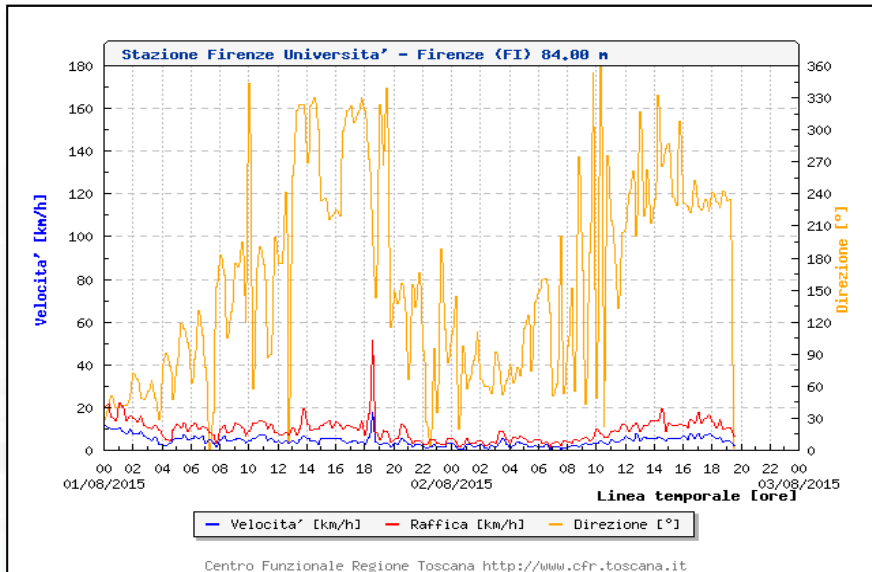
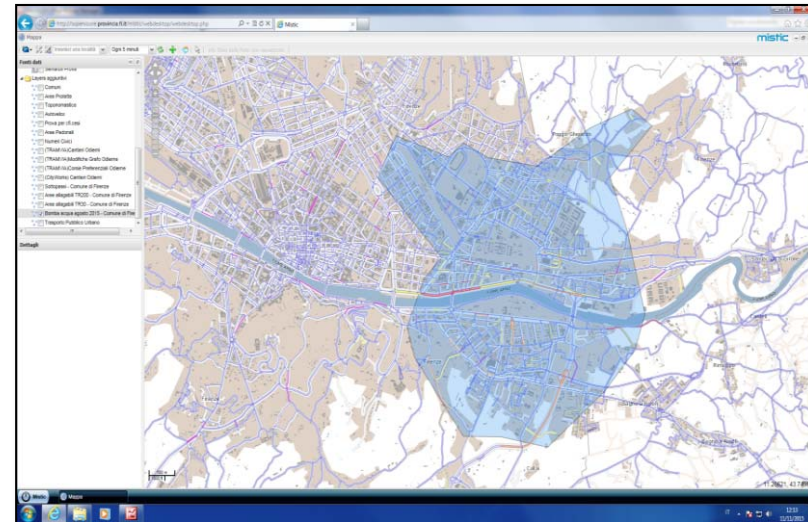
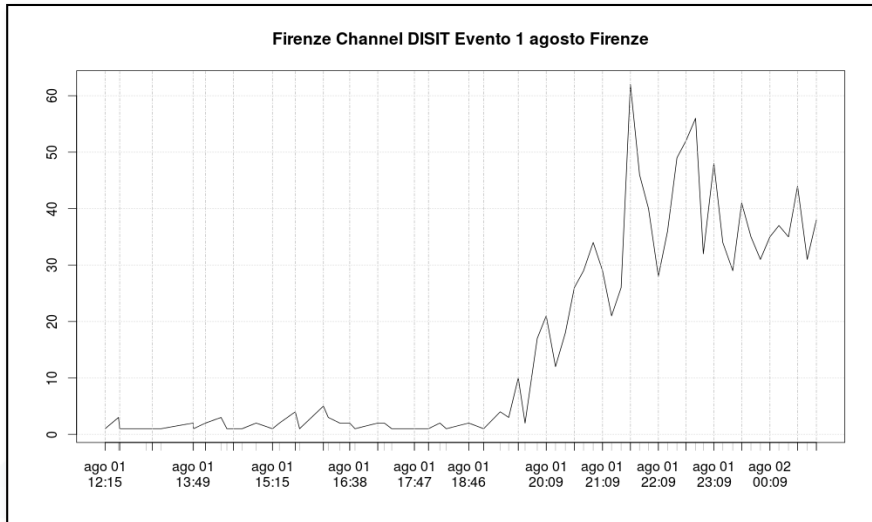
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<http://www.disit.org>

Early Warning

Twitter Vigilance and Water Bomb



Main Approach

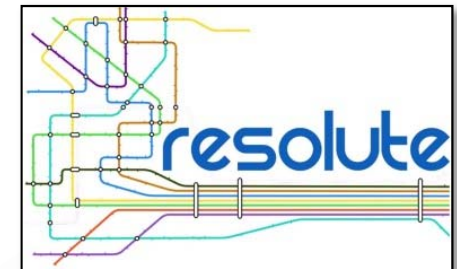
- **Three main layers**

1. **Complex System modeling:** function, processes, resources, time, events, etc..

- Functional Resonance Analysis Method, FRAM
- Resilience Analysis Grid, RAG

2. **Decision Support System, DSS**

- System Thinking, Goal Models
- Risk analysis
- UTS/ITS decision supports



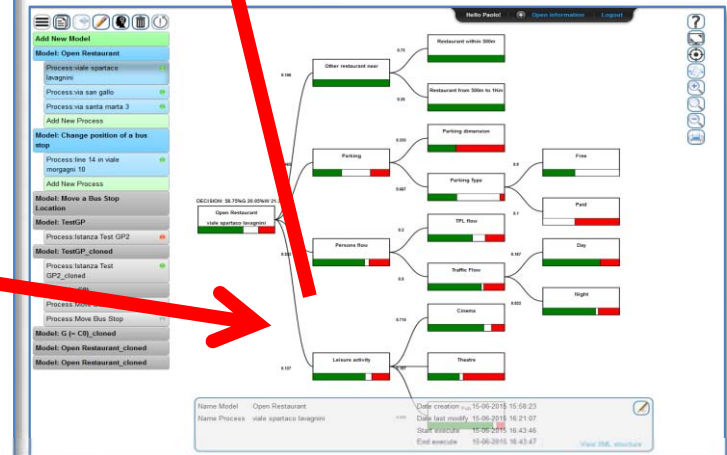
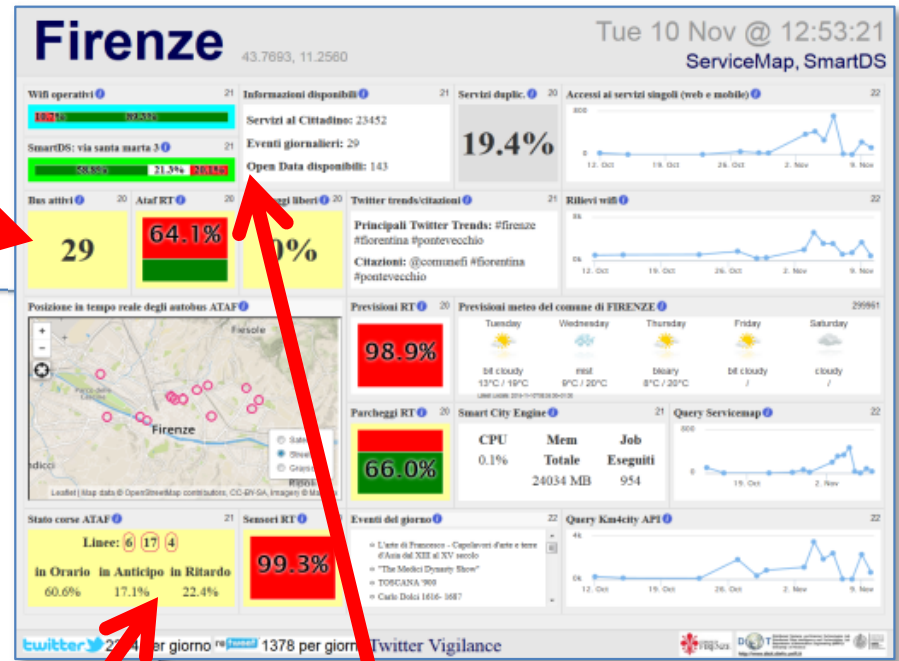
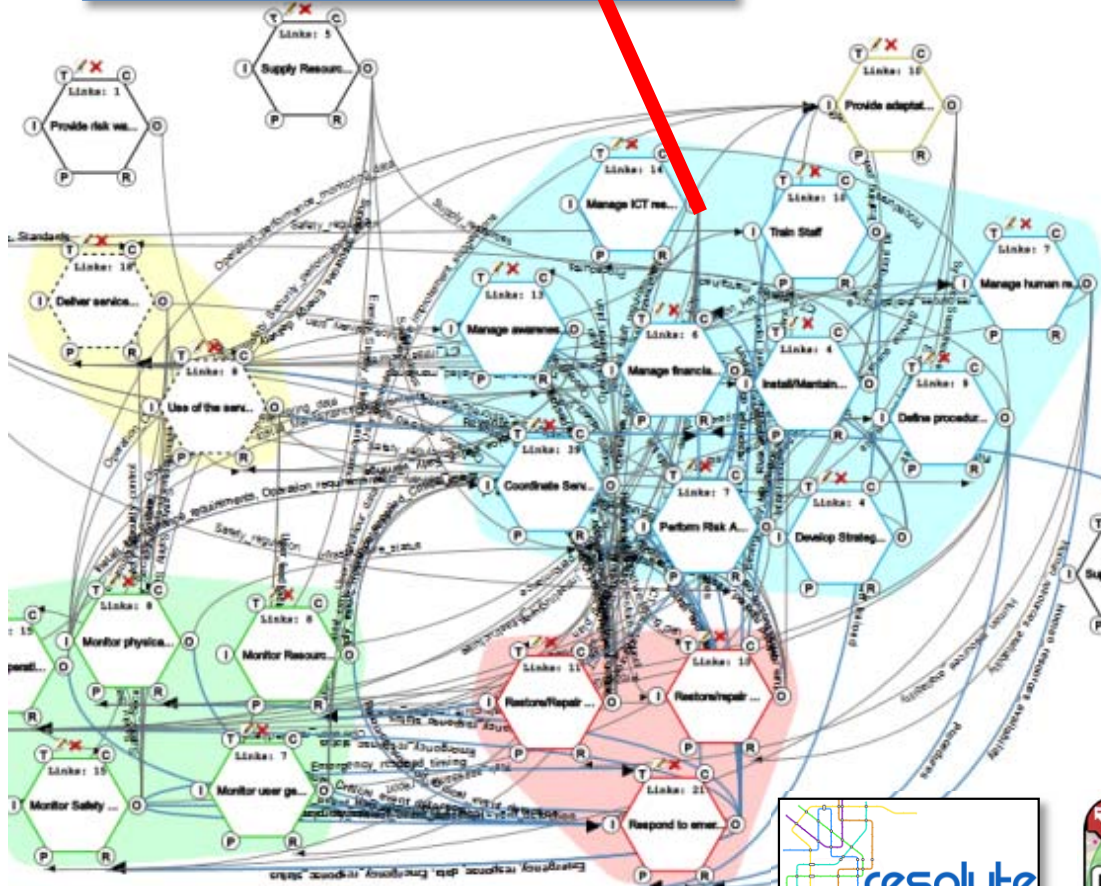
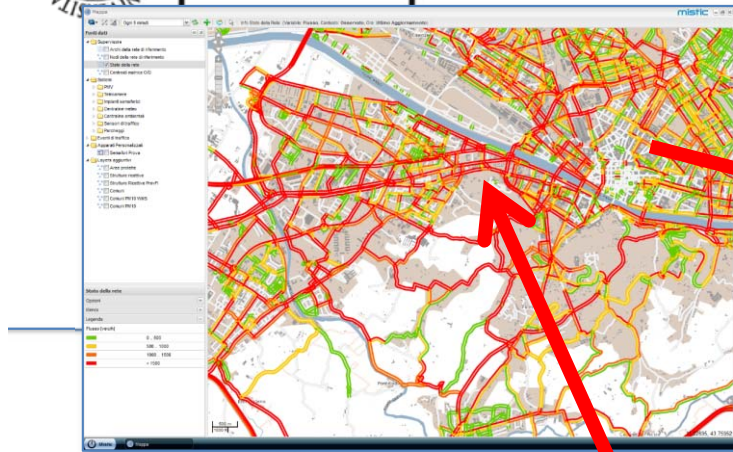
3. **Data, big data access and exploitation**

- Data Analytics, Internet of Things, sensors, flows
- People flow and behavior
- Social Media





Dashboarding city resilience



Data and Service Aggregator



Functional Resonance Analysis Method

Time:

This is simultaneously a resource and a constraint

Controls:

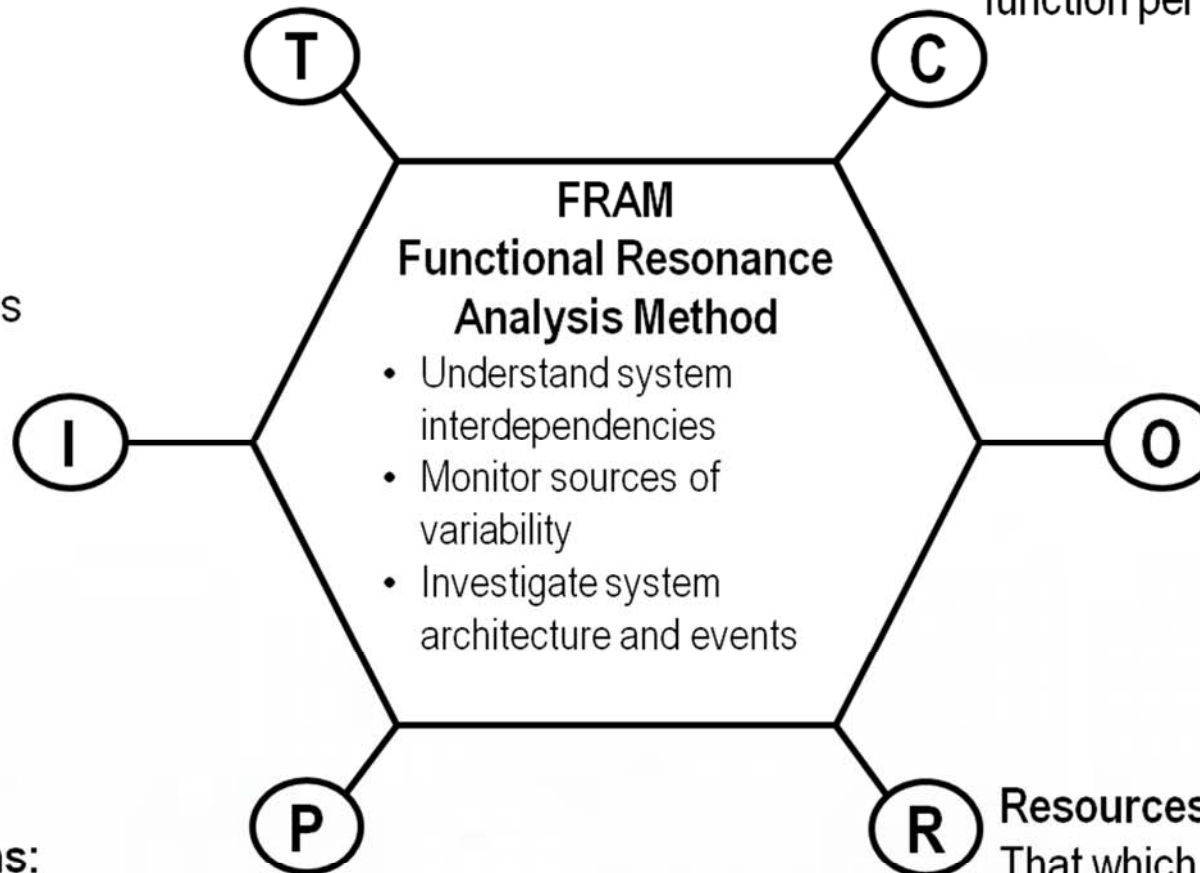
That which supervises or adjust function performance

Input:

That which engages function operation and is used to produce the function output

Output:

That which is produced by the function and becomes the input for other functions



Preconditions:

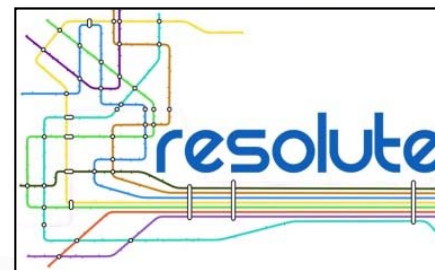
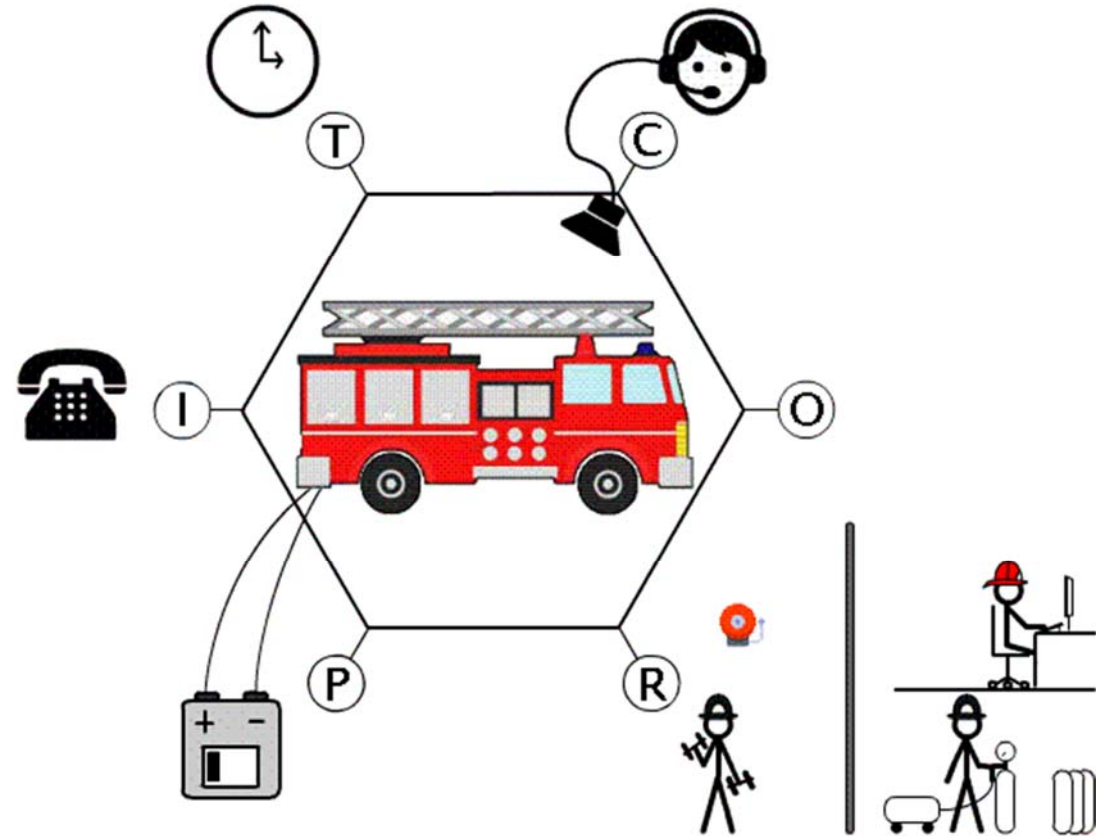
System conditions that must be met before function can be carried out

Resources:

That which is needed and/or consumed by the function to process the input

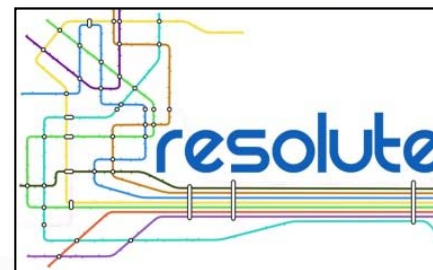
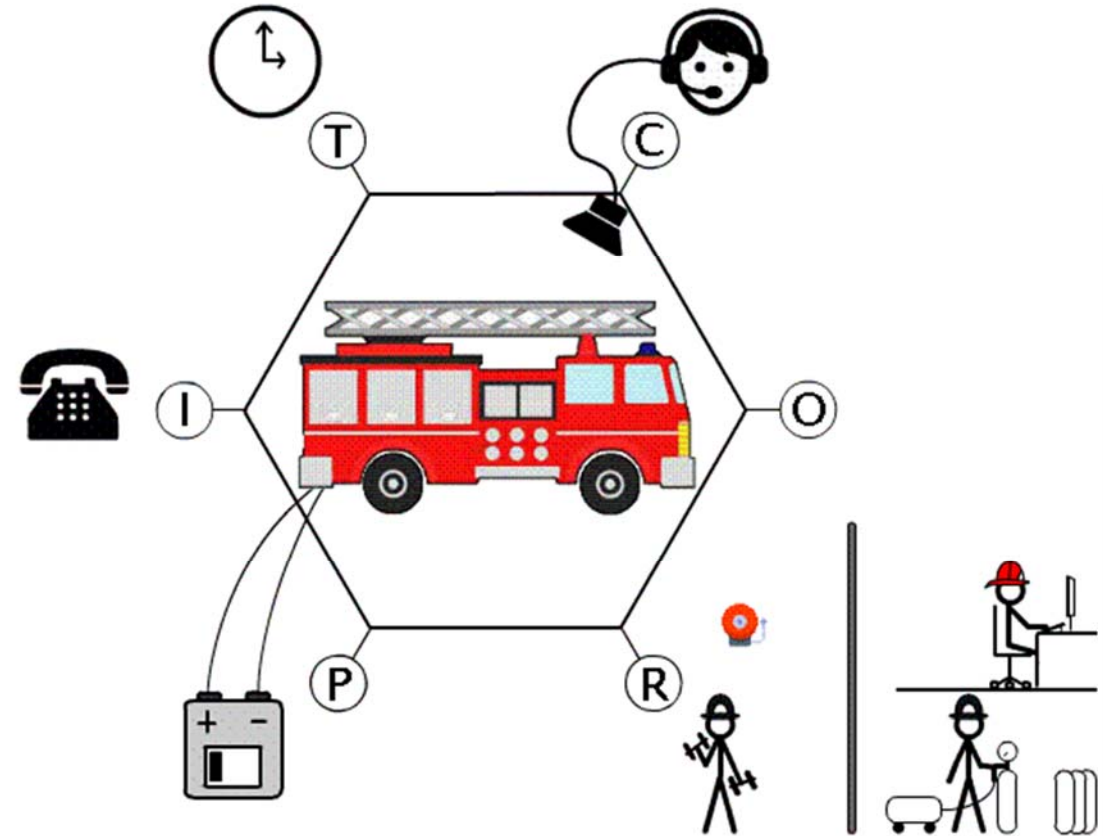
Functional Resonance Analysis Method

- **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.



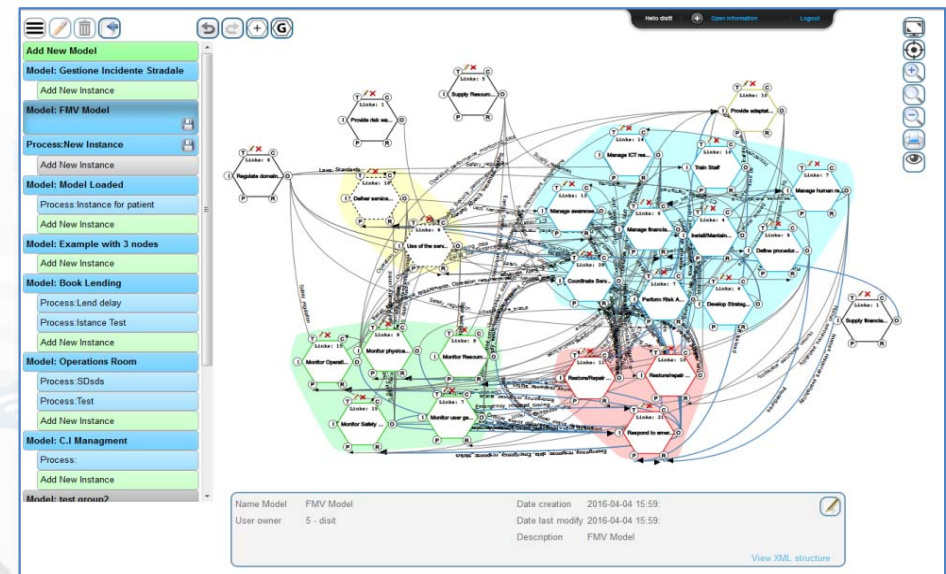
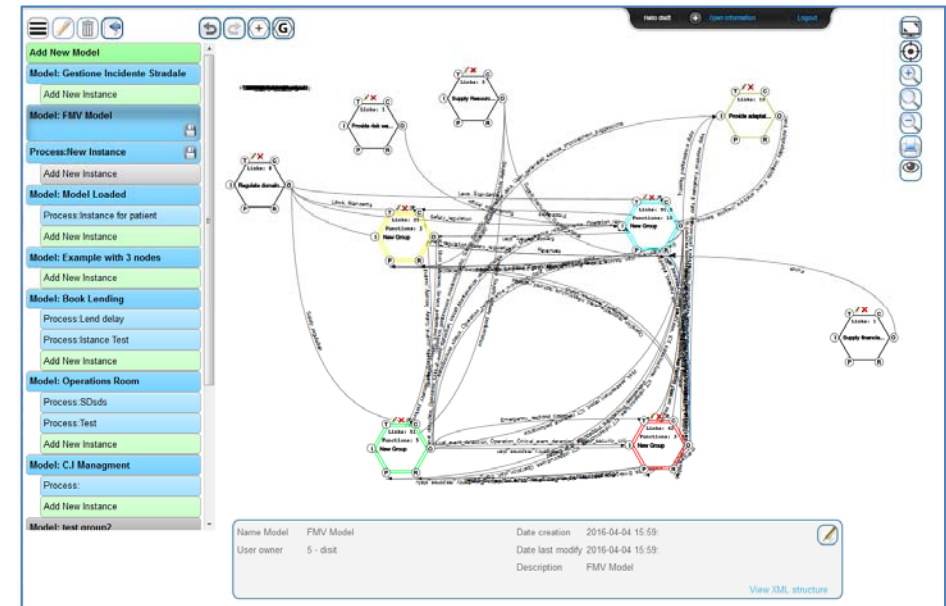
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ResilienceDS tool

- 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

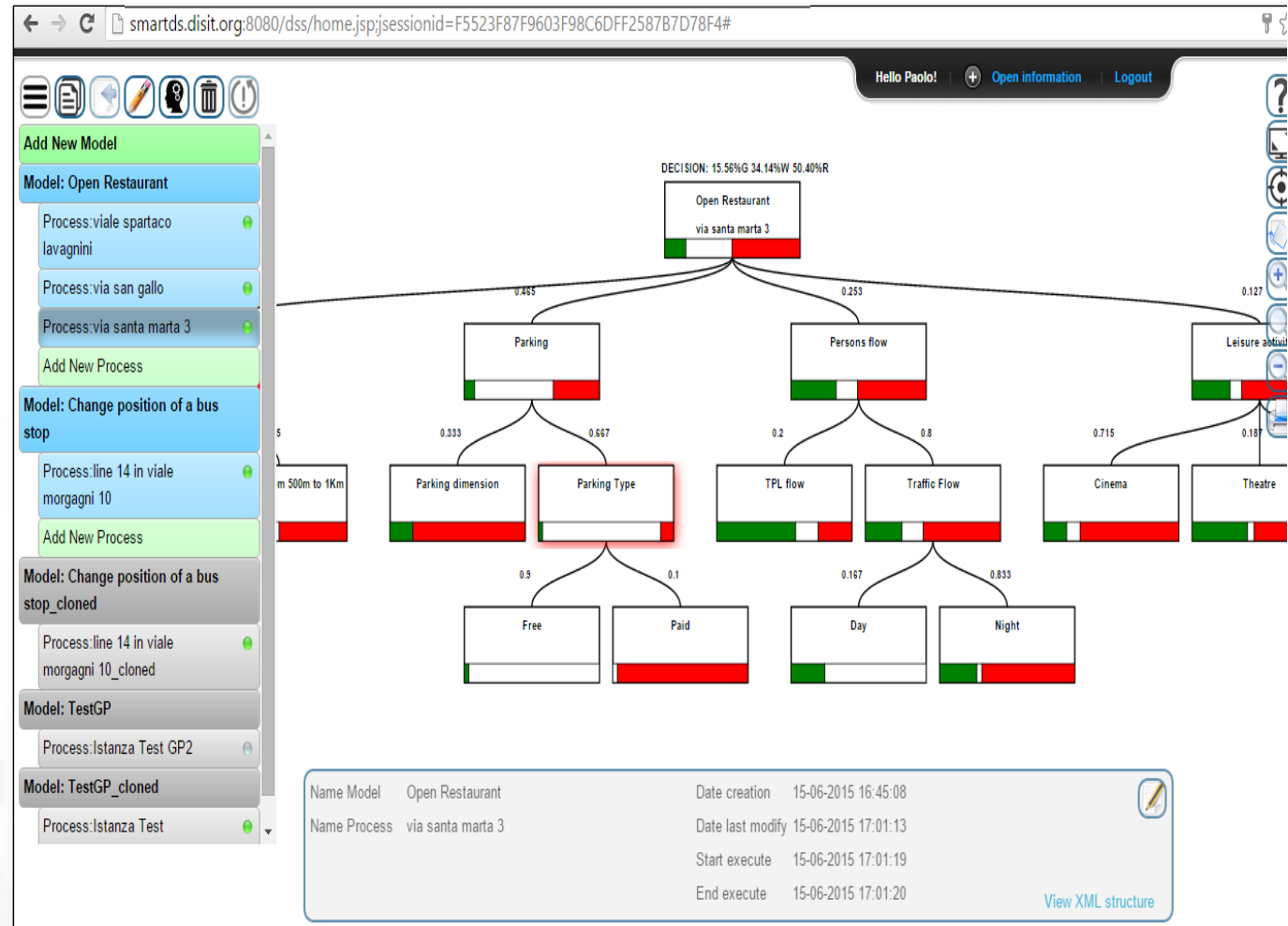


- **Smart Decision Support System based on System Thinking plus**

- Actions to city reaction, resilience, smartness..

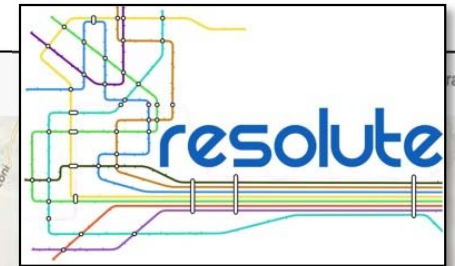
Enforcing

- 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, ...





Risk Assessment



Flood Event | Flood Observation | Traffic Observation | Damage analysis | Layers panel | Vulnerability info | Service Observation

Flood sensors observations:

<input checked="" type="checkbox"/>	From	Date	mm/h
<input checked="" type="checkbox"/>	Firenze Genio Civile	2016-04-11T15:59:00	12
<input checked="" type="checkbox"/>	Firenze Peretola	2016-04-11T15:59:00	20.5
<input checked="" type="checkbox"/>	Firenze Università	2016-04-11T15:59:00	10.5

Threshold:

From: :

To: :

Draw region to analyze:

Load predefined region:

Mean precipitation:

SERVICE

NAME: villa maria teresa hospital...

ADDRESS: VIA DELLA CERNAIA, FIRENZE, FIRENZE

SERVICE TYPE: http://www.disit.org/km4city/schema#Public_hospital

SERVICE CLASS: <http://www.disit.org/km4city/schema#HealthCare>

SERVICE: <http://www.disit.org/km4city/resource/77ab1bc45b84357b727dd67fe6081d2db>

VALUE: 100

WKT DESCRIPTION: POINT (11.2561 43.7866)

Traffic observations:

<input type="checkbox"/>	From	Date	km/h	car/km	car/h
<input type="checkbox"/>	VIA DELLA MATTONAIA	2016-10-10 18:01:08	58	15	2435
<input type="checkbox"/>	LUNGARNO AMERIGO VESPUCCI	2016-10-10 18:01:08	18	65	1842
<input type="checkbox"/>	VIA CAMILLO CAVOUR	2016-10-10 18:01:08	61	12	2009
<input type="checkbox"/>	VIA VALFONDA	2016-10-10 18:01:08	27	53	3307
<input type="checkbox"/>	VIA VITTORIO ALFIERI	2016-10-10 18:01:08	23	58	2798
<input type="checkbox"/>	VIA SENESE	2016-10-10 18:01:08	27	54	3216
<input type="checkbox"/>	VIA GUELFA	2016-10-10 18:01:08	68	3	420
<input type="checkbox"/>	VIA DELLA SCALA	2016-10-10 18:01:08	60	13	2157
<input type="checkbox"/>	PIAZZA DI SAN FELICE	2016-10-10 18:01:08	62	10	1697
<input type="checkbox"/>	BORGO SAN FREDIANO	2016-10-10 18:01:08	57	17	2690
<input type="checkbox"/>	VIA VITTORIO ALFIERI	2016-10-10 18:01:08	10	74	195
<input type="checkbox"/>	VIA DEL CAMPUCCIO	2016-10-10 18:01:08	60	13	2157
<input type="checkbox"/>	VIA DEI BENCI	2016-10-10 18:01:08	22	59	2679
<input type="checkbox"/>	PIAZZALE DI PORTA ROMANA	2016-10-10 18:01:08	64	8	1361

Relevant Services

Min asset value:

<input checked="" type="checkbox"/>	Service	Street	Type	Value
<input checked="" type="checkbox"/>	villa delle terme case di cura	VIALE MAZZINI GIUSEPPE, FIRENZE	Public_hospital	100
<input checked="" type="checkbox"/>	villa dei pini srl	VIA FOSCOLO UGO, FIRENZE	Public_hospital	100
<input checked="" type="checkbox"/>	Poggio Secco	VIA INCONTRI, FIRENZE	Public_hospital	100
<input checked="" type="checkbox"/>	Istituto di neuroscienze...	VIA DEI BASSI, FIRENZE	Public_hospital	100



Km4City in Tuscany Area

Road Graph (Tuscany region)
 132,923 Roads
 389,711 Road Elements
 318,160 Road Nodes
 1,508,207 Street Numbers

Services (20 cat, 512 cat.)
 16 Pub. Transport Operators
 21.280 Bus stops & 1081 bus lines
 210 Parking areas
 796 Traffic Sensors
 Info on: points, paths, areas, etc.

Dynamic/real-time

- bus lines: 144 updates X day X line
- parking status: 76 updates X day X sensor
- traffic Sensors: 288 updates X day X sensor
- weather: 2 updates X day for 285 areas
- events: about 60 new events X day
- Wi-Fi: > 350.000 measures X day
- mobiles: > 50.000 measures X day
- more than 35.000 distinct users X day
- From 600.000 to 4.5 M Tweets X day
-many other sensors see next slide

<http://servicemap.km4city.org>

Other Sensors and Actuators, IOT

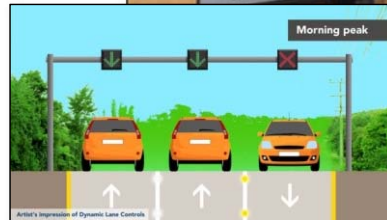
Restricted Traffic Zone Gates

- Passages, payment, alerts, Wi-Fi control, RFI control, etc.



Road Direction manager: panel, red-light, etc.

- Status and action



Environmental Sensors:

- Air quality, pollution, rain, allergens, temperature,
- humidity,...



Public Light Pillar

- Traffic flows, environment,
- Wi-Fi, Tv-Camera, BT servers, on/off, percentage of light, ..



Waste Manager

- Level, kind, status, on/off



Recharge station, column

- Free slots, consumption, next time slot, ...

Environmental Sensors:

- Air, temperature, humidity,
- water level in rivers
- Status of underpass and bridges



Risk assessment

- Value of the buildings,
- hydrogeological risk map,
- earthquake risk map, ...
- people distribution and location
- Position of recover places,



Traffic Zone Gates

- Passages, alerts,
- Wi-Fi control,
- RFID control,
- etc.





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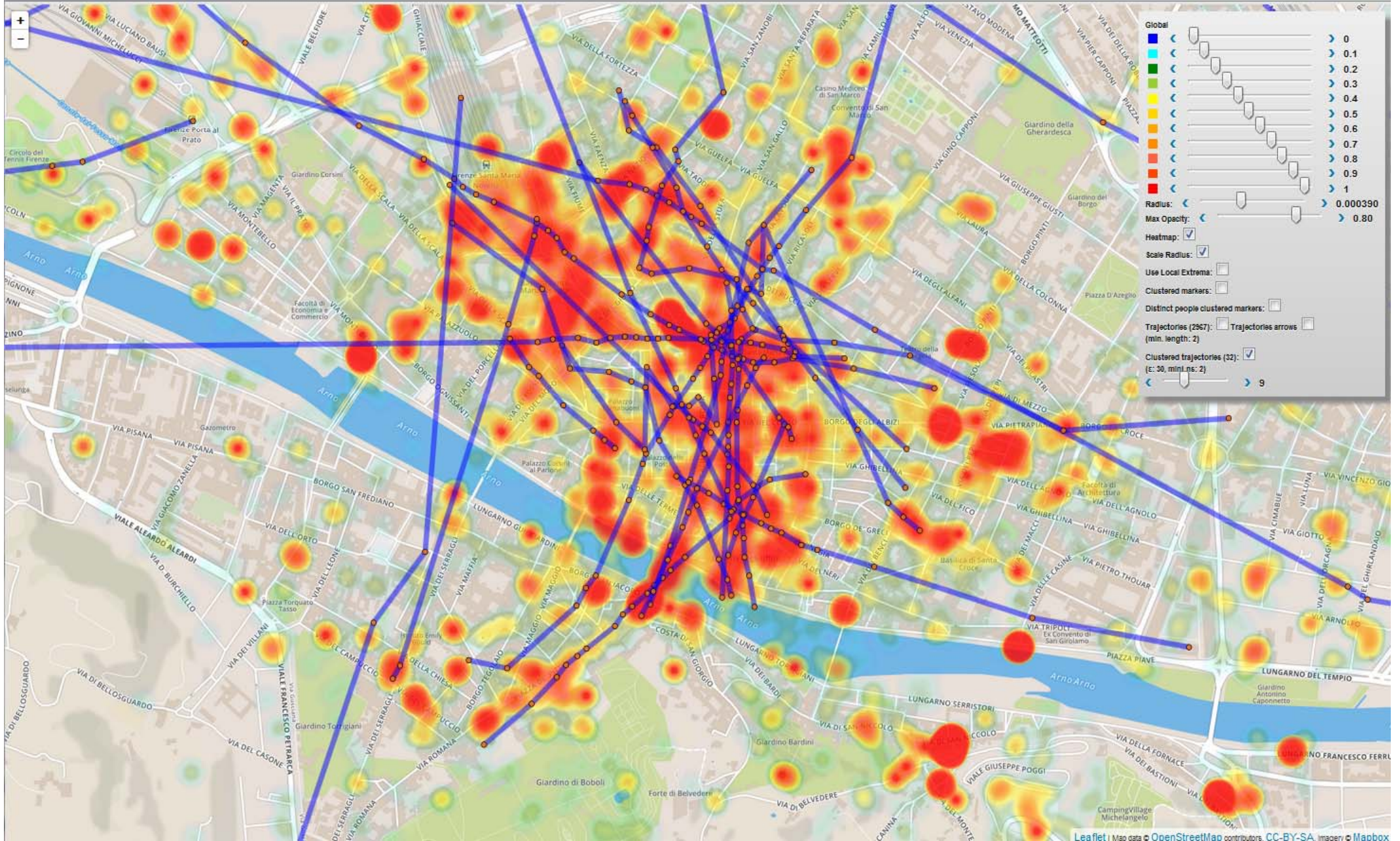
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User Behavior Analyzer



DISIT Personal Recommender
DISIT - Distributed Systems and Internet Technology Lab



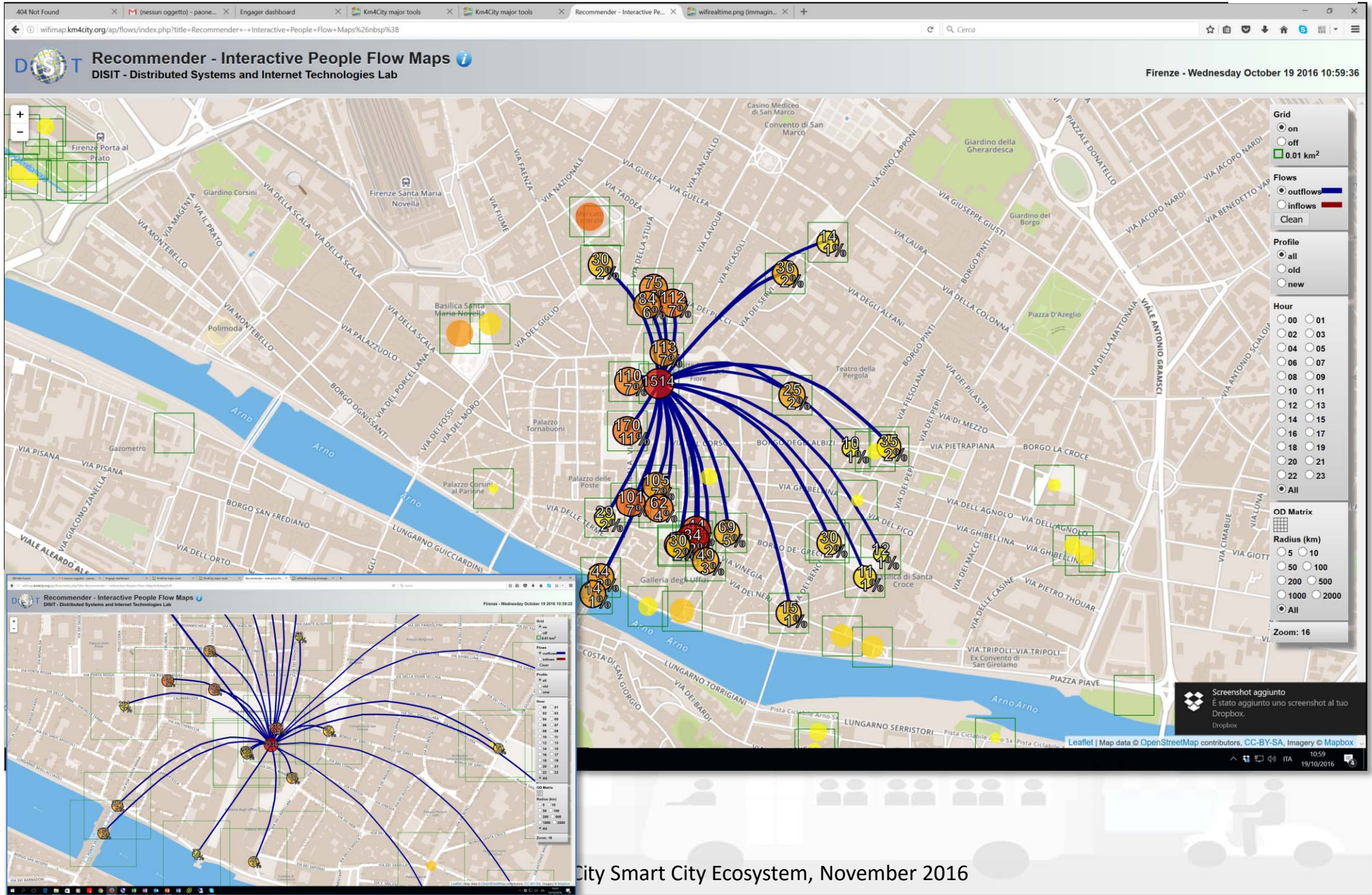


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People Flow OD





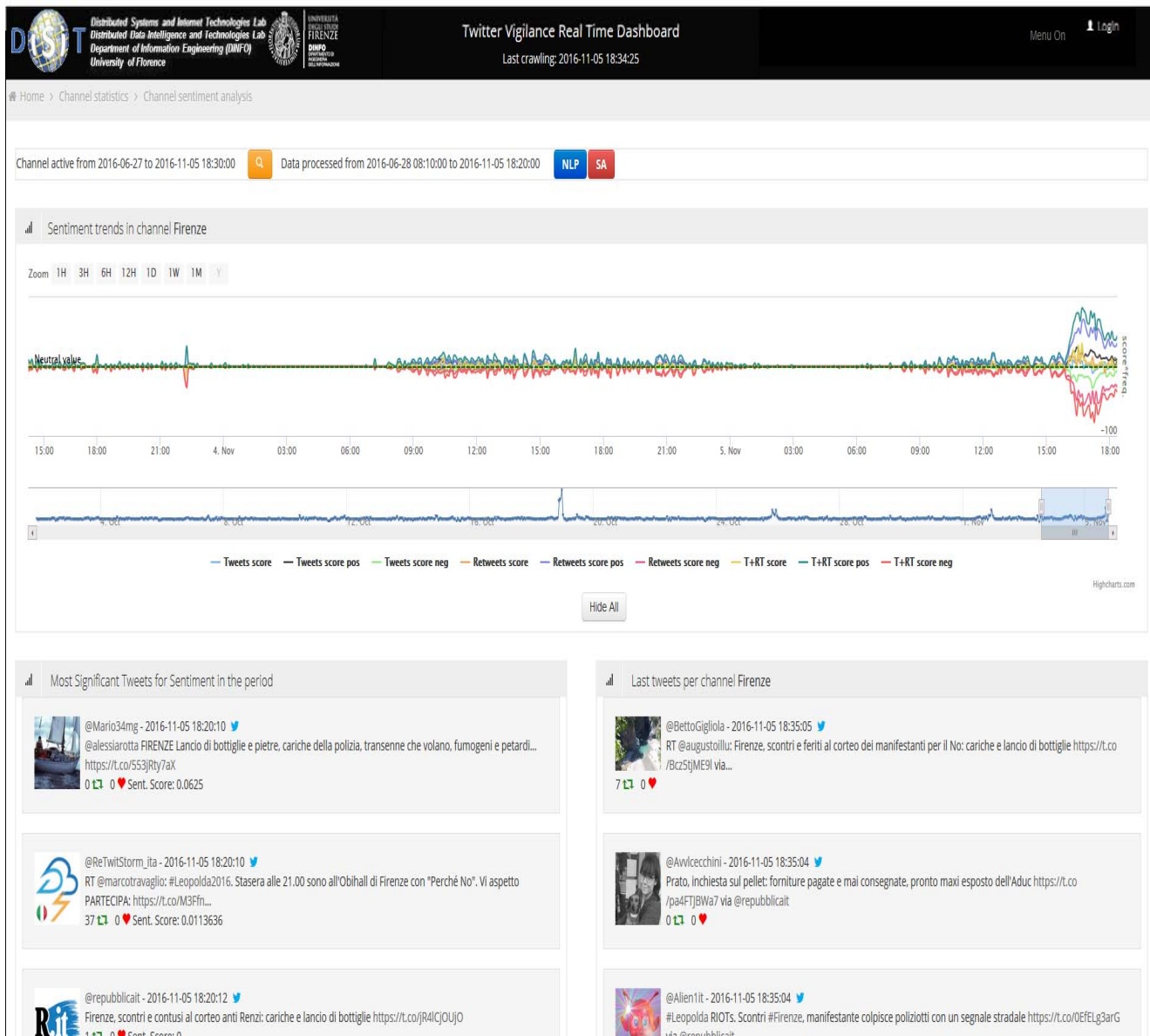
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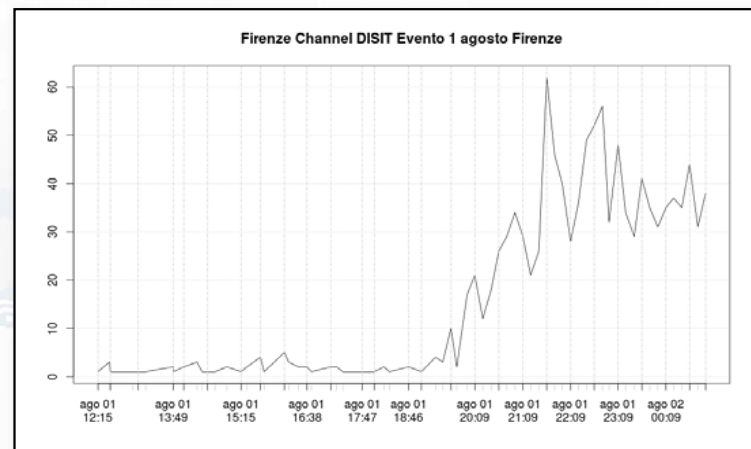
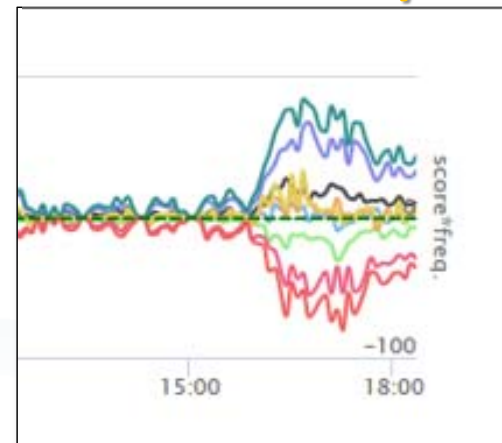
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Twitter Vigilance

Real Time Twitter Vigilance, Early Warning



Sentiment Analysis



ember 2016

Improve city resilience, reducing risks and decision support

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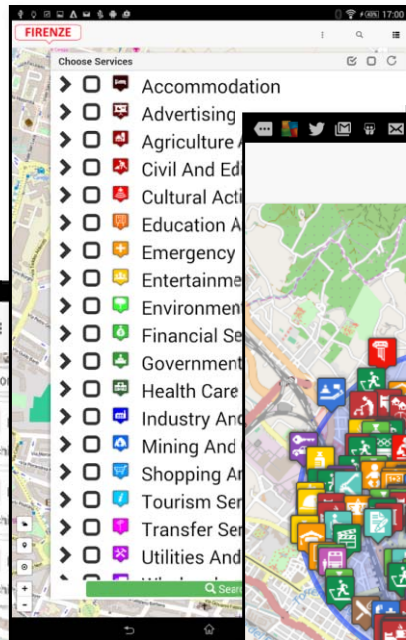
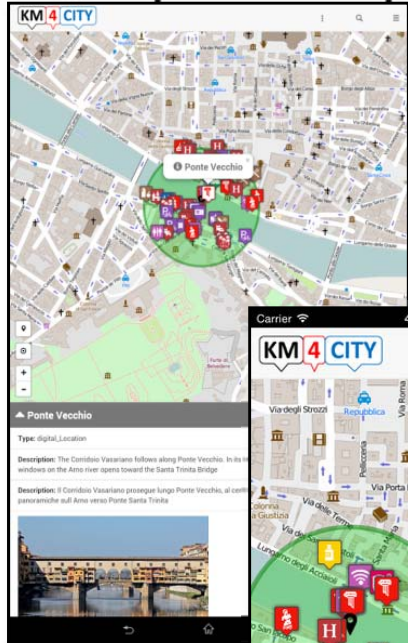


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DELL'INFORMAZIONE

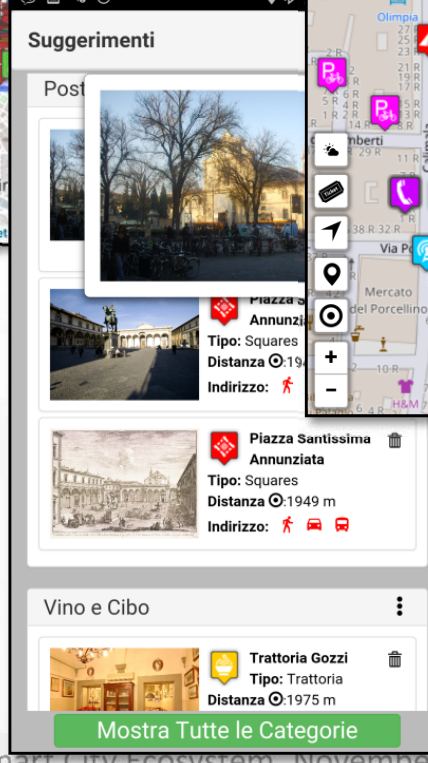
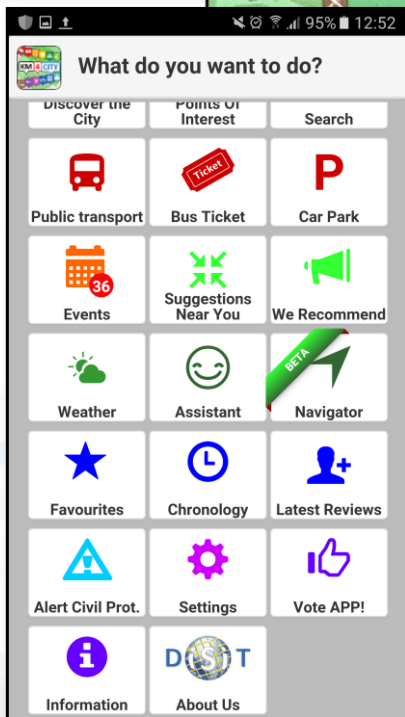
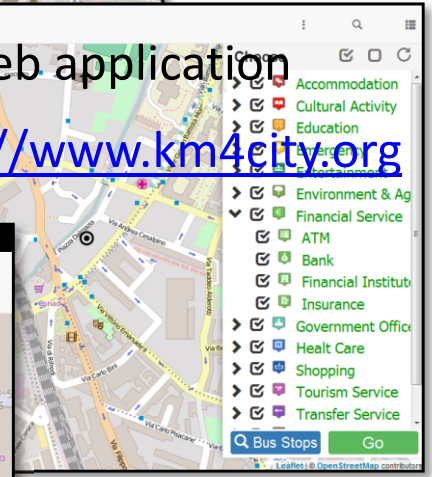
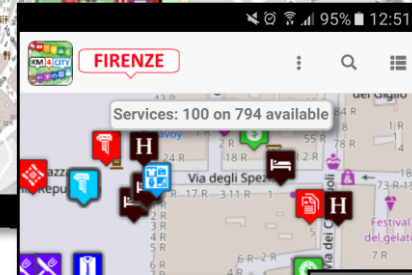
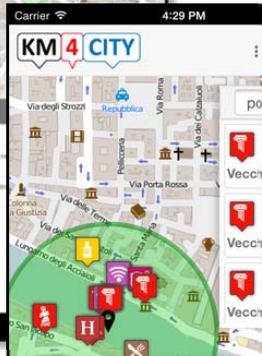
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TECHNOLOGIES LAB
<http://www.disit.org>

Km4CityMobile App



web application

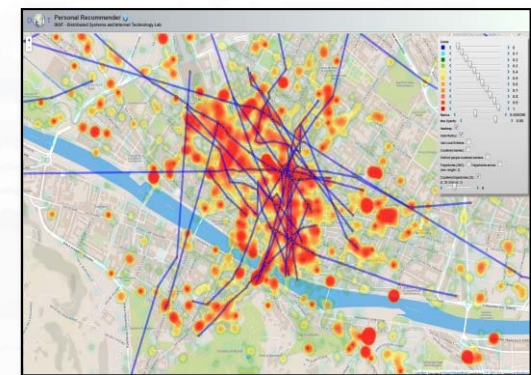
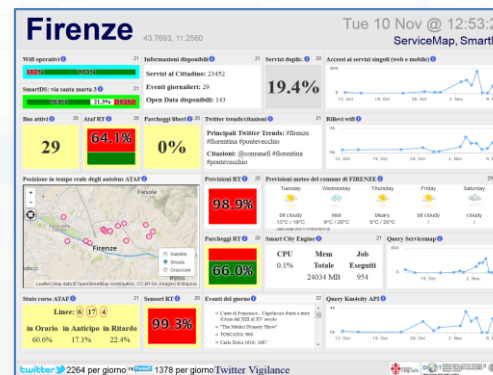
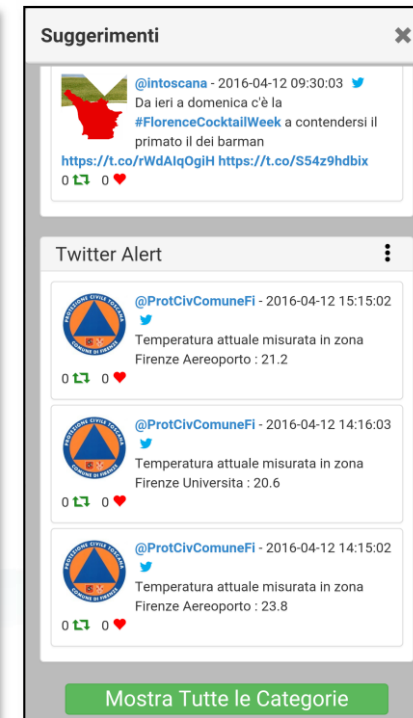
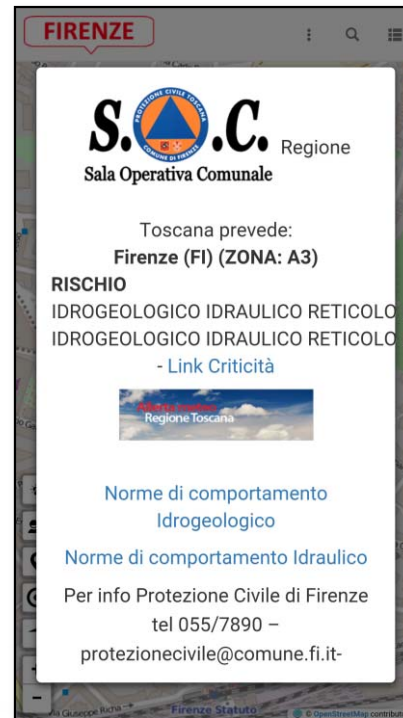
<http://www.km4city.org>



prevede: Firenze (FI) (ZONA: A3)

RISCHIO	TEMPI	ALLERTA
IDROGEOLOGICO IDRAULICO RETICOLO MINORE	Dalle ore 13.00 di Venerdì 27 maggio 2016 alle ore 18.00 di Venerdì 27 maggio 2016	GIALLO
IDROGEOLOGICO IDRAULICO RETICOLO MINORE	Dalle ore 18.00 di Venerdì 27 maggio 2016 alle ore 12.00 di	ARANCIONE

- 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



3 - transform

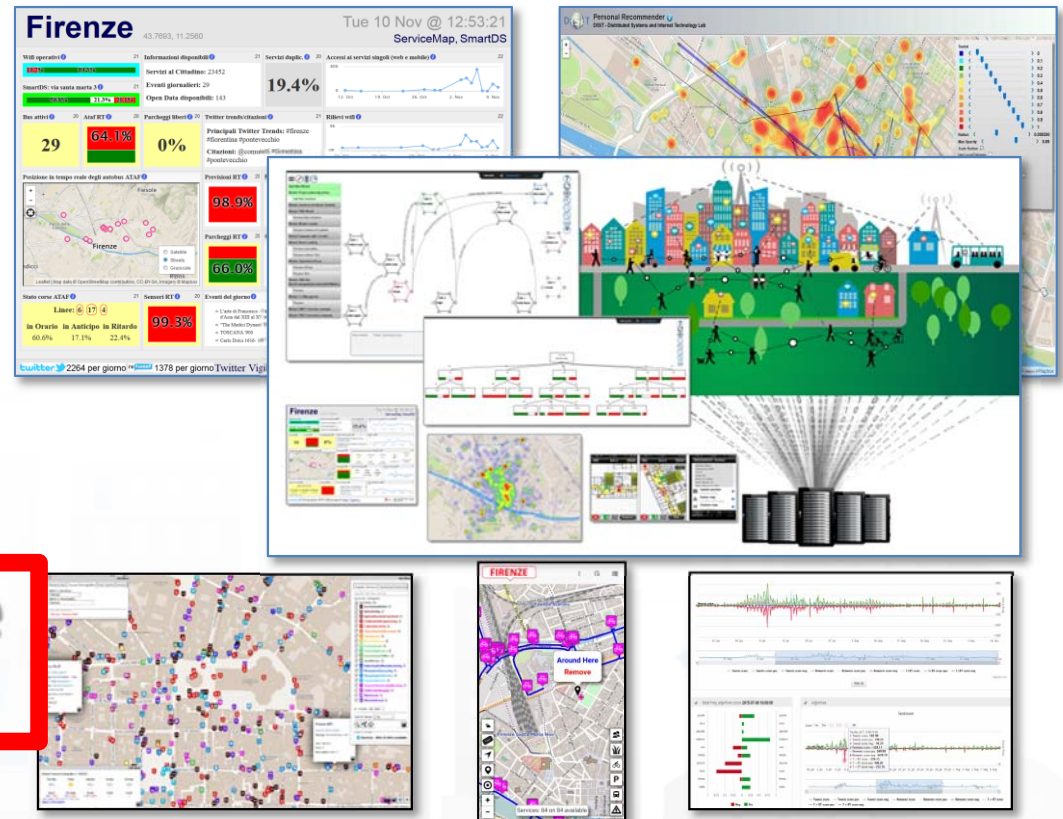
data in value

for the city

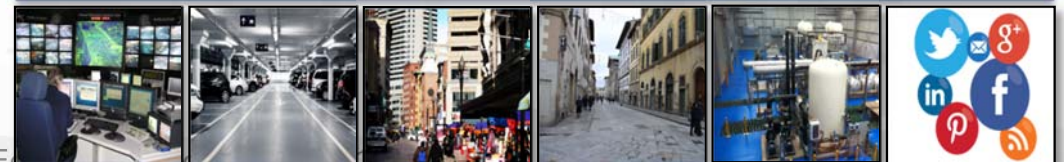
From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

1. keep city under control via personalized dashboards
2. improve city resilience, reducing risks and decision support
3. transform data in value for the city
4. Technical details
5. Who is using Km4City

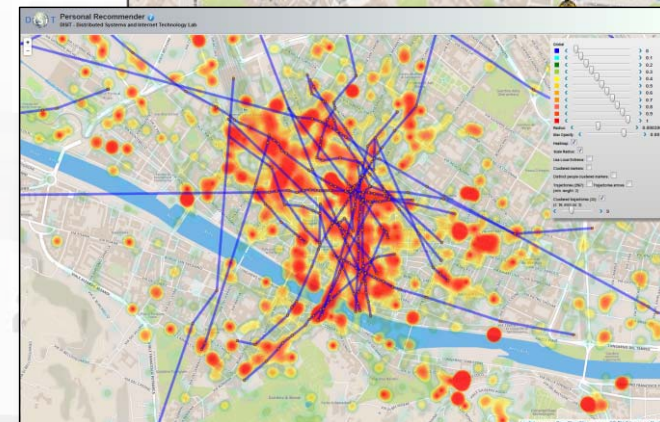
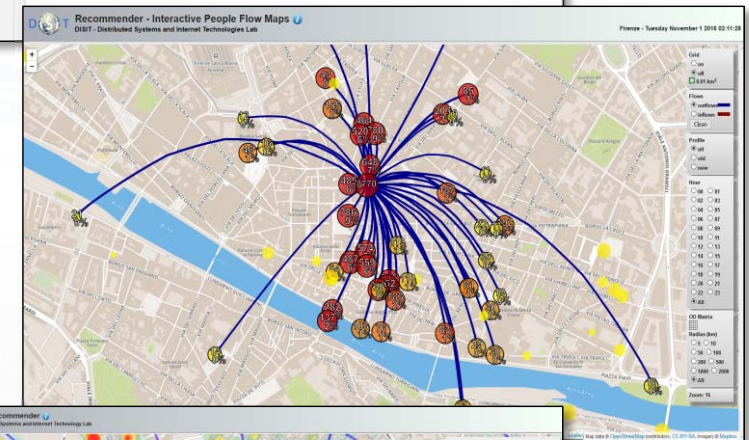
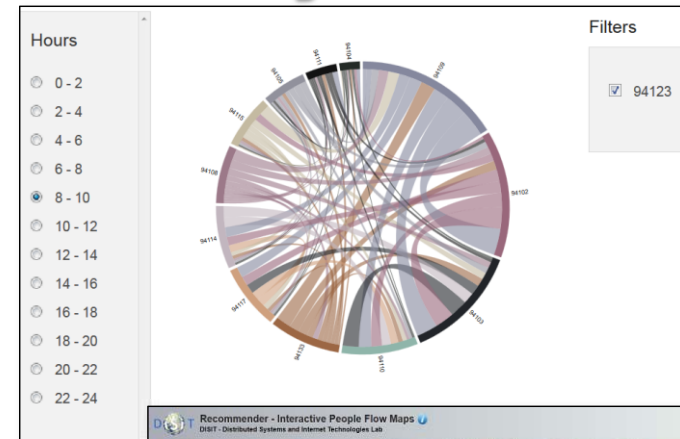


Km4City Data and Service Aggregator



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



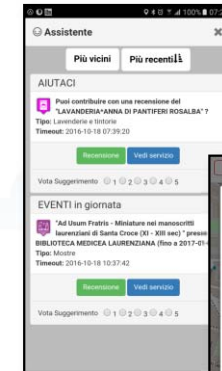
Strategies Implementation via Engagement

- **Produce value from data enabling to**
 - 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.**



Engagement & Assistant Rules

- **Detecting** city users' habits about mobility
 - Private cars → stimulating Bus Usage & Bikes
 - Private cars parking → peripheral parking-lot + bus
 - Leave the car and take the bus twice → get a bonus..
 - → 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



Strategies Implementation via Engagement

Transport systems
Mobility, parking



Public Services
Govern, events, ..



Sensors, IOT
Cameras, ..



Environment,
Water, energy



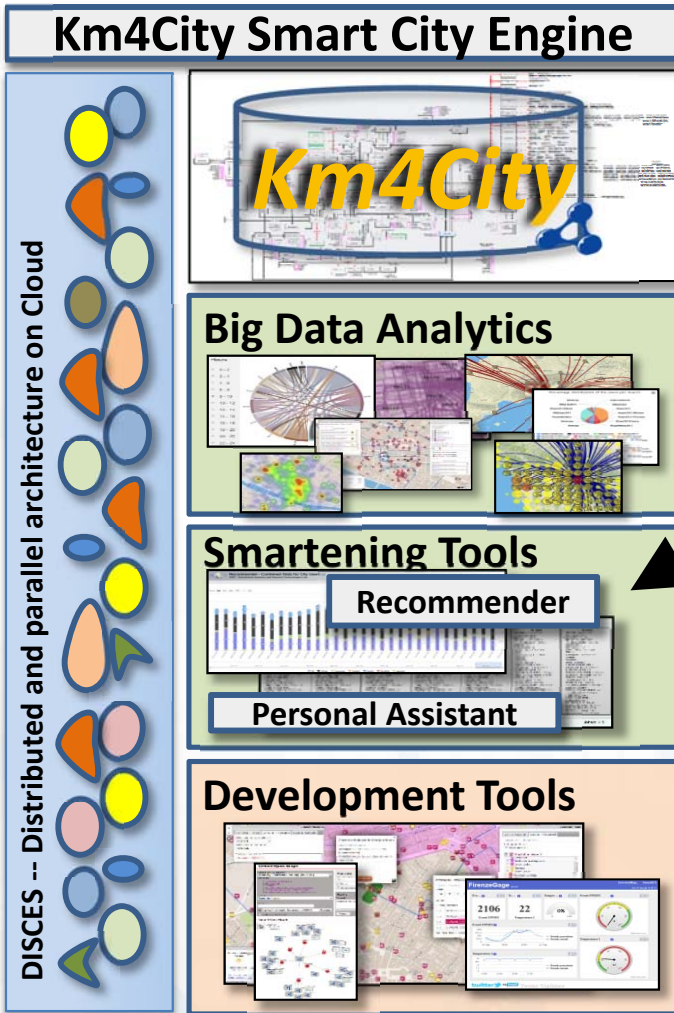
Shops, services,
operators



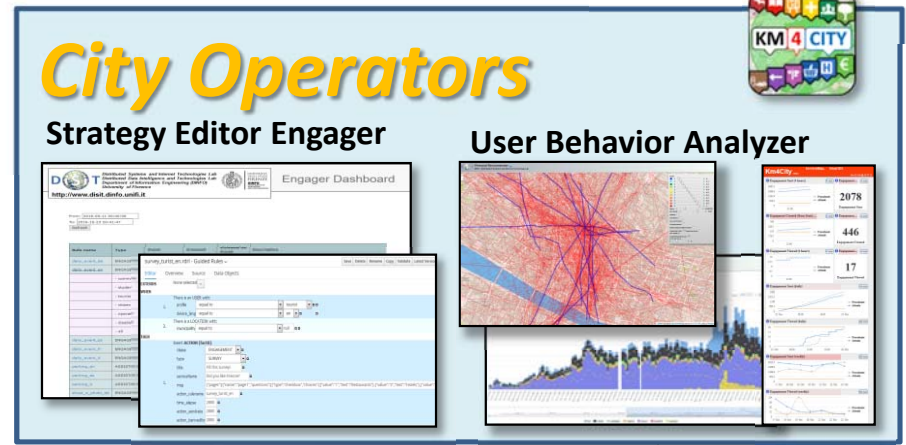
Social Media
WiFi, network



Static, Slow and Real Time data flows



Km4City Smart City API



Strategies and Wallet

Tools for
Final Users

Any Mobile
and Web
App





Km4City in Tuscany Area

- Nascondi Menu

Fermate Firenze Comuni in Toscana Ricerca Testuale

Seleziona una provincia:
FIRENZE

Seleziona un comune:
FIRENZE

Actual Selection
COMUNE di FIRENZE

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](#)

Road Graph (Tuscany region)

132,923 Roads
389,711 Road Elements
318,160 Road Nodes
1,508,207 Street Numbers

Services (20 cat, 512 cat.)

16 Pub. Transport Operators
21.280 Bus stops & 1081 bus lines
210 Parking areas
796 Traffic Sensors
Info on: points, paths, areas, etc.

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 +

nessun limite

ricerca 100 metri

Risultati della ricerca

più di 4000 risultati, attivato clustering

Services 16858

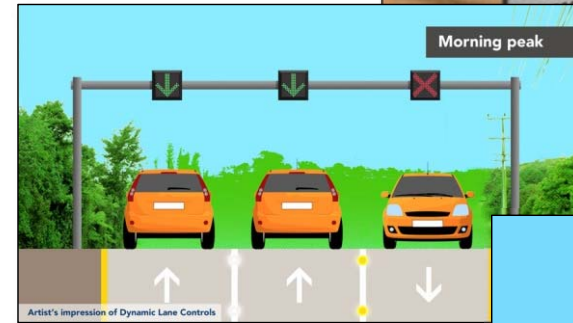
Dynamic/real-time

- bus lines: 144 updates X day X line
- parking status: 76 updates X day X sensor
- traffic Sensors: 288 updates X day X sensor
- weather: 2 updates X day for 285 areas
- events: about 60 new events X day
- Wi-Fi: > 350.000 measures X day
- mobiles: > 50.000 measures X day
- more than 35.000 distinct users X day
- From 600.000 to 4.5 M Tweets X day
-many other sensors see next slide

<http://servicemap.km4city.org>

Other Sensors and Actuators, IOT

- **Restricted Traffic Zone Gates**
 - Passages, payment, alerts, Wi-Fi control, RFI control, etc.
- **Road Direction manager:** panel, red-light, etc.
 - Status and action
- **Environmental Sensors:**
 - Air, pollution, rain, allergens, temperature, humidity, water level in rivers and underpass, status of bridges, ...
- **Public Light Pillar**
 - Traffic flows, environment, Wi-Fi, Tv-Camera, BT servers, on/off, percentage of light, ..
- **Waste Manager**
 - Level, kind, status, on/off
- **Recharge station, column**
 - Free slots, consumption, next time slot, ...





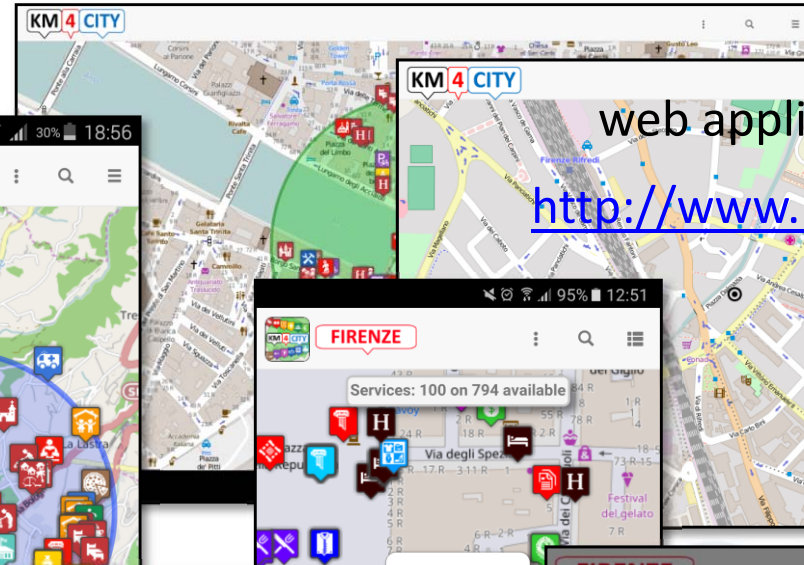
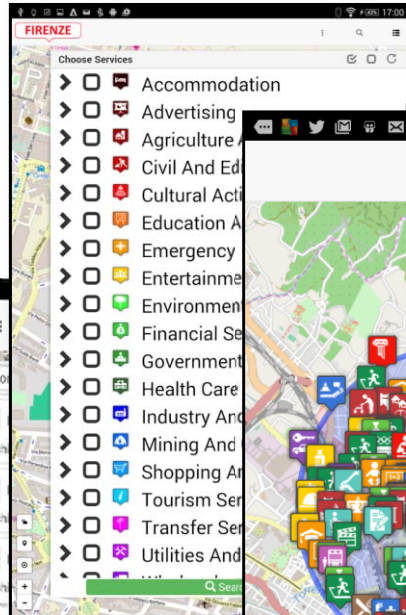
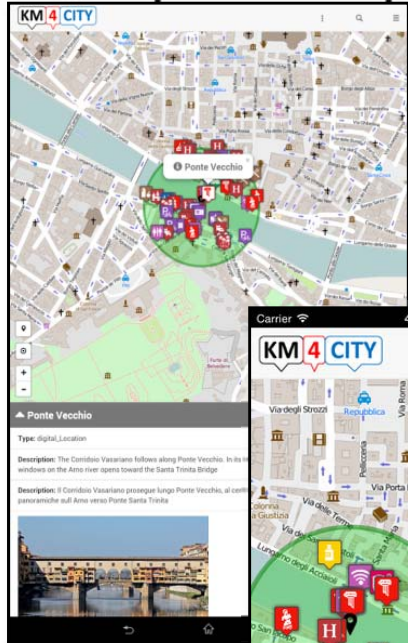
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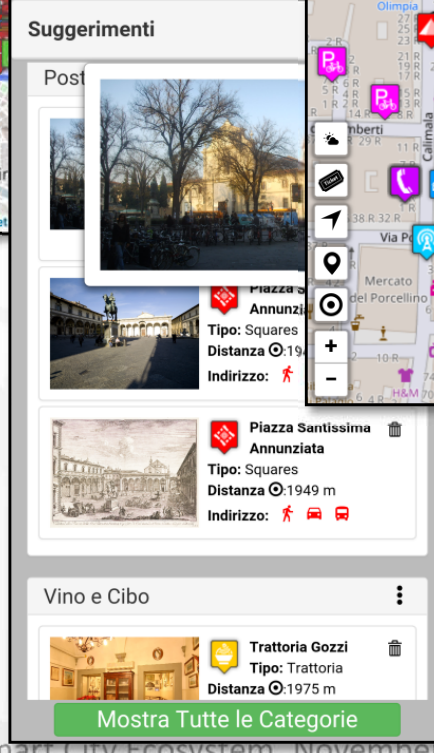
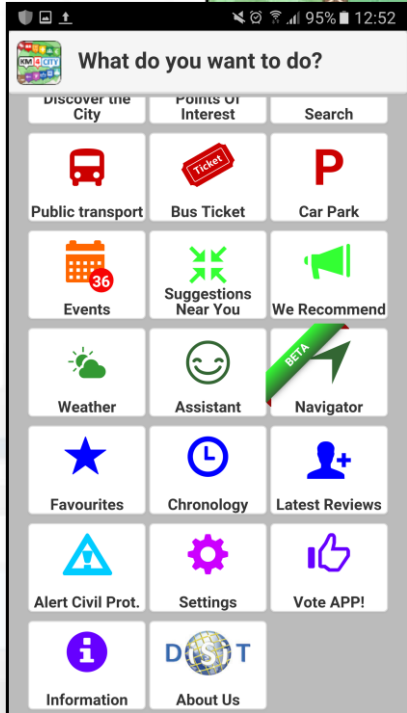
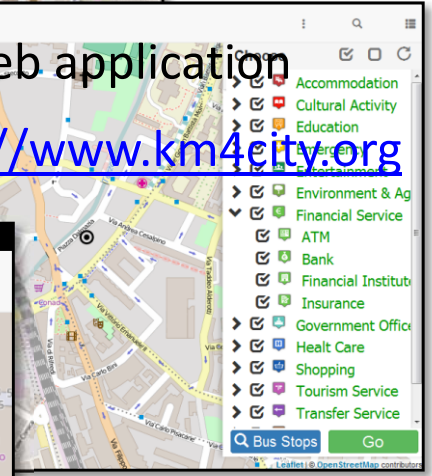
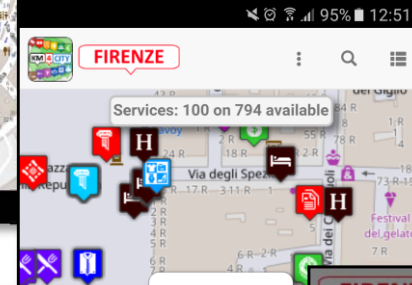
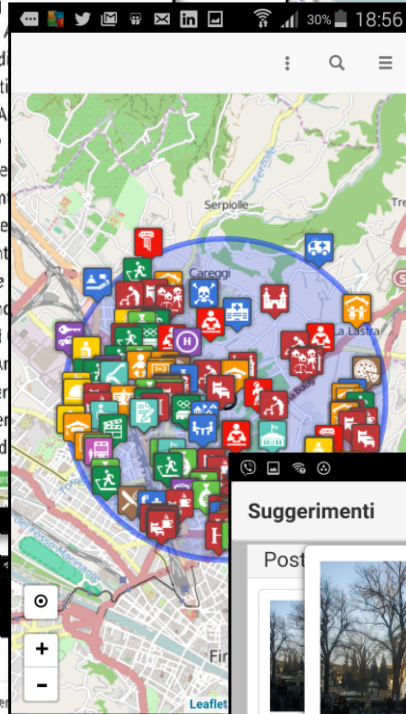
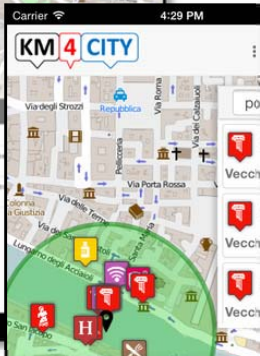
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Km4CityMobile App



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Suggestion on demand service



- Personalized menu on the basis of User Category
- **Automated Suggestions personalized:**
 - taking into account user profile and behavior, dislikes, requests, queries, etc.
- **Engagement**
 - Engine and Rule Editor
- **Advertising**
 - Engine and Rule Editor

Student	Tourist
* Things to do	* Places Nearby
* Wine and Food	* Transfer Services
* Places Nearby	* Wine and Food
* Services and Utilities	* Things to do
* Events	* Weather
* Transfer Services	* Events
* Hotel	* Sa
* Education	* Bu
* Bus	* H
* Financial Services	* Fi
* Weather	

Suggestions

Cose da fare

- Cinema Excelsior, Di Bertini Valerio E.C. - S.A.S.**
Type: Cinema
Distance: 1759 m
Distance: 445 m
Address: VIA FIUME, 1 50123 FIRENZE FI
- Eerre Entertainment S.R.L.**
Type: Cinema
Distance: 1792 m
Distance: 2682 m

Assistente

Più vicini | Più recenti

AIUTACI

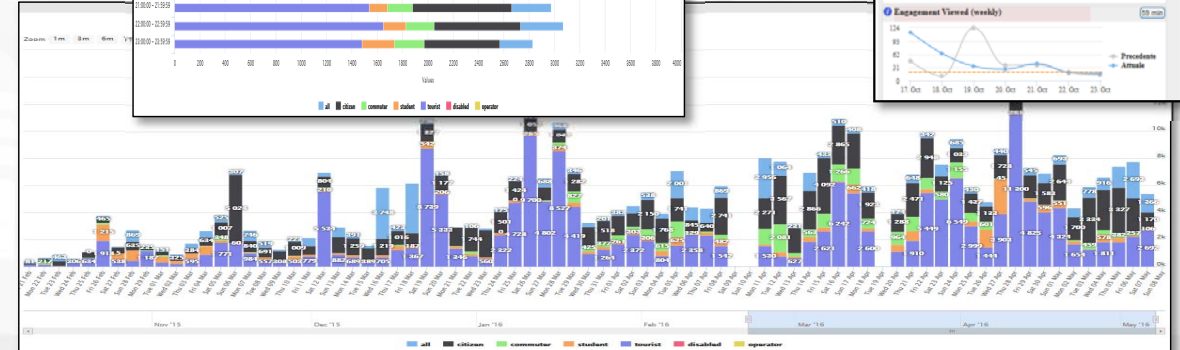
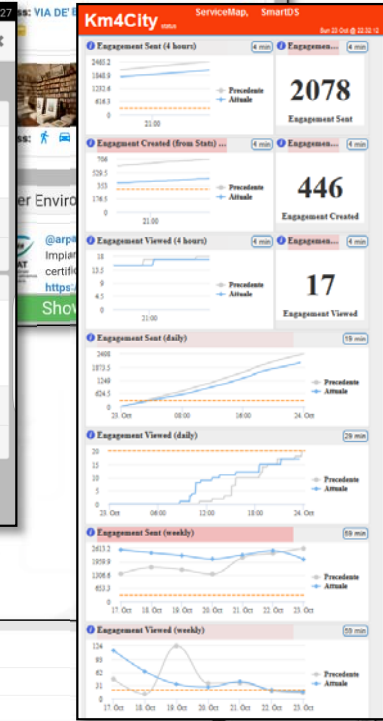
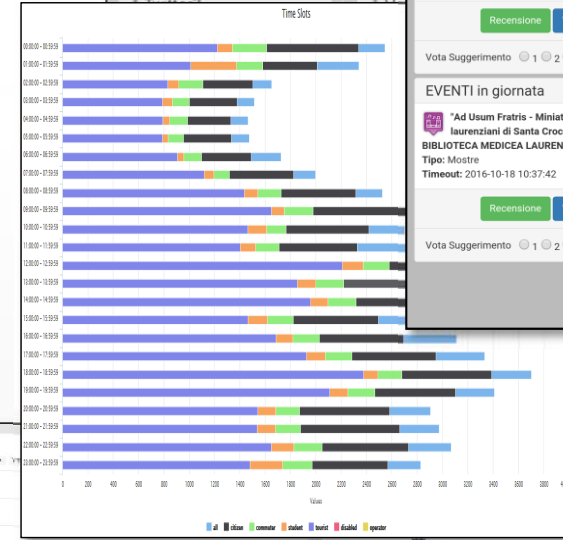
Puoi contribuire con una recensione del "LAVANDERIA ANNA DI PANTIFERI ROSALBA"?
Tipo: Lavanderie e tintorie
Timeout: 2016-10-18 07:39:20

Vota Suggestimento: 1 2 3 4 5

EVENTI in giornata

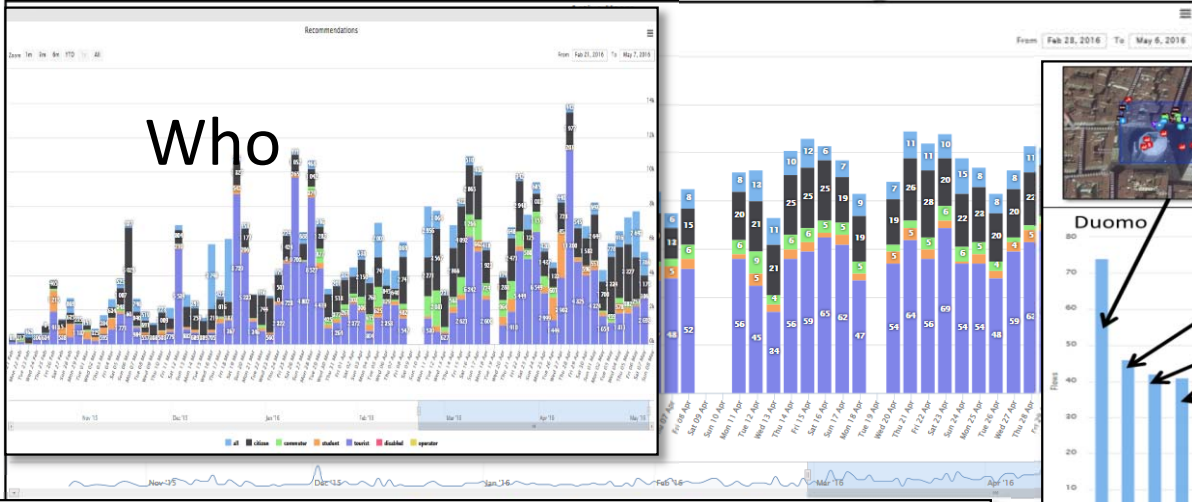
"Ad Usam Fratrīs - Miniature nei manoscritti laurenziani di Santa Croce (XI - XIII sec)" presso BIBLIOTECA MEDICA LAURENZIANA (fino a 2017-01-07)
Tipo: Mostre
Timeout: 2016-10-18 10:37:42

Vota Suggestimento: 1 2 3 4 5

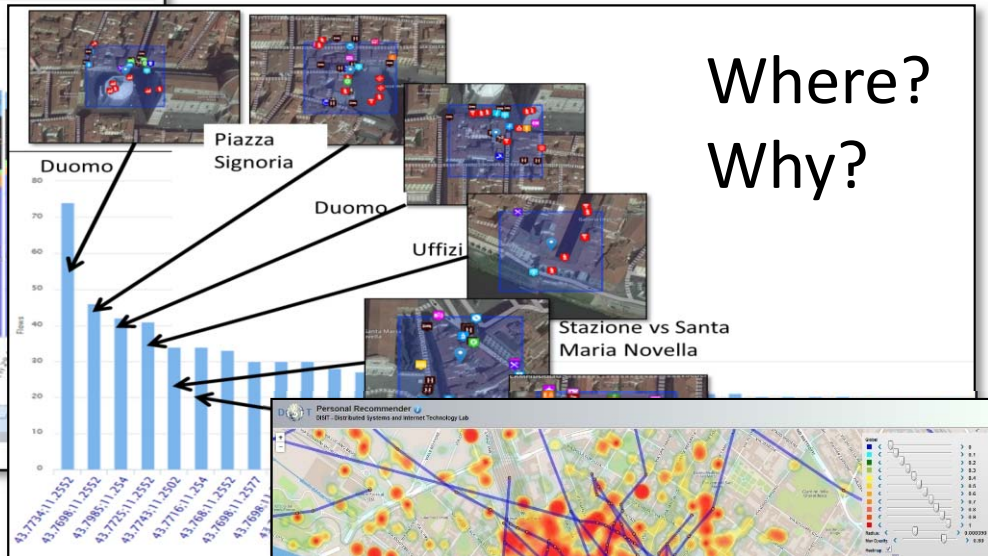


User Behavior Analyzer for Collective profiling

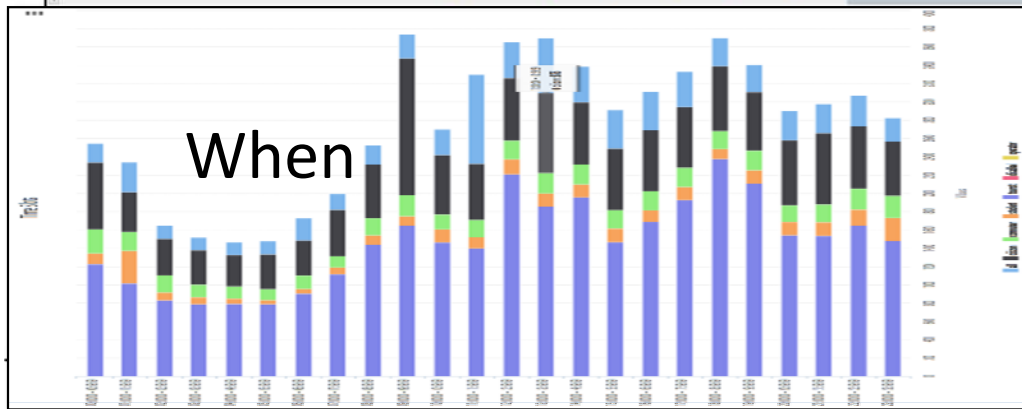
Who



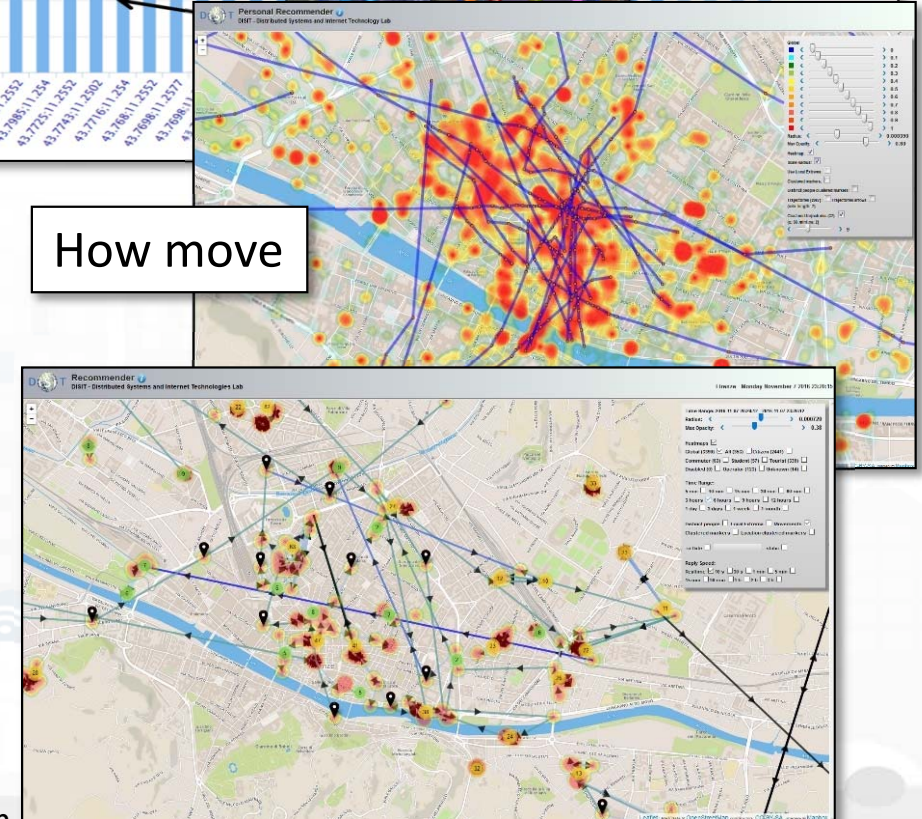
Where?
Why?



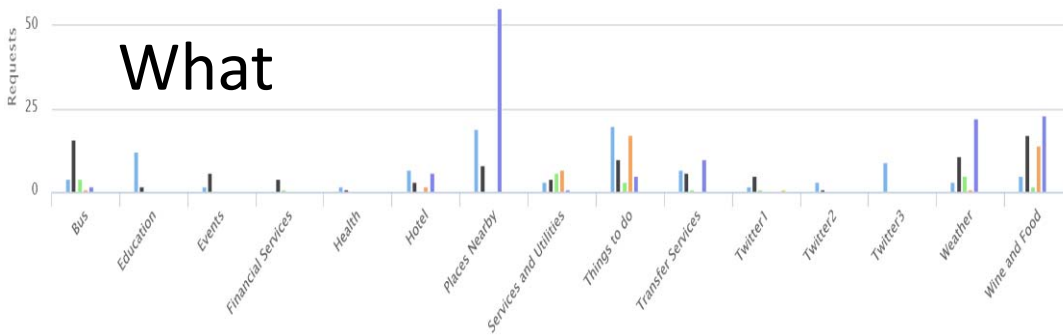
When



How move



What





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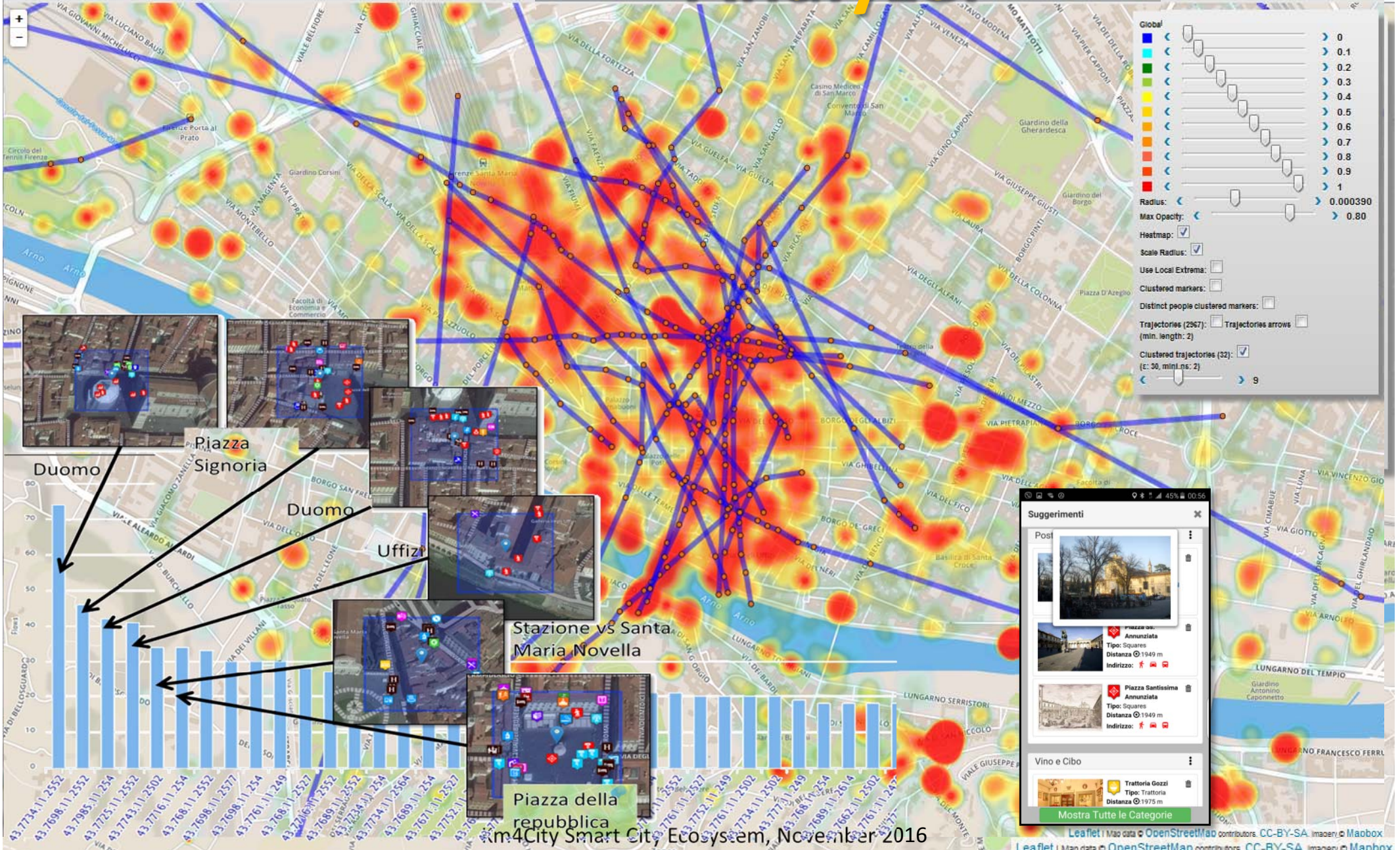
<http://www.disit.org>

User Behavior



DISIT Personal Recommender
DISIT - Distributed Systems and Internet Technology Lab

Analyzer





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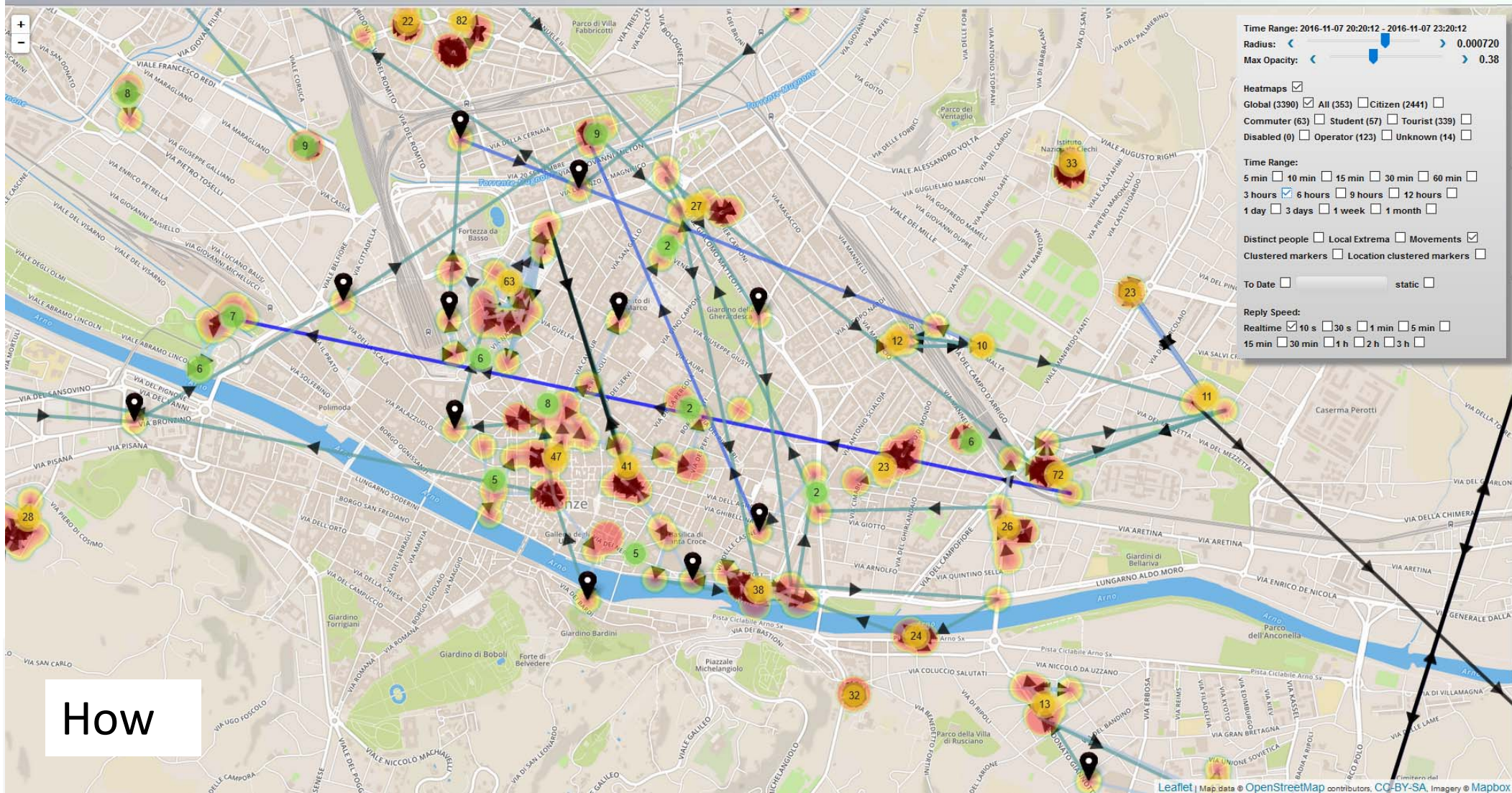
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<http://www.disit.org>



Anonymous User Behavior Analysis

DISIT Recommender
DISIT - Distributed Systems and Internet Technologies Lab

Firenze - Monday November 7 2016 23:20:15

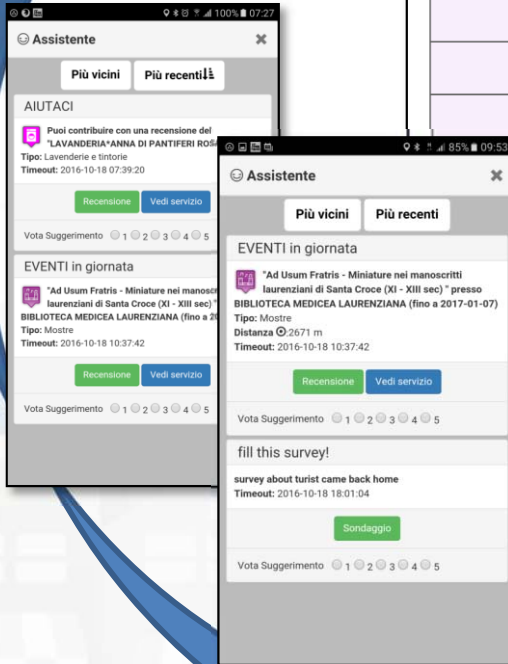
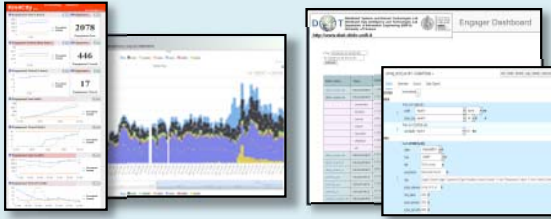


How

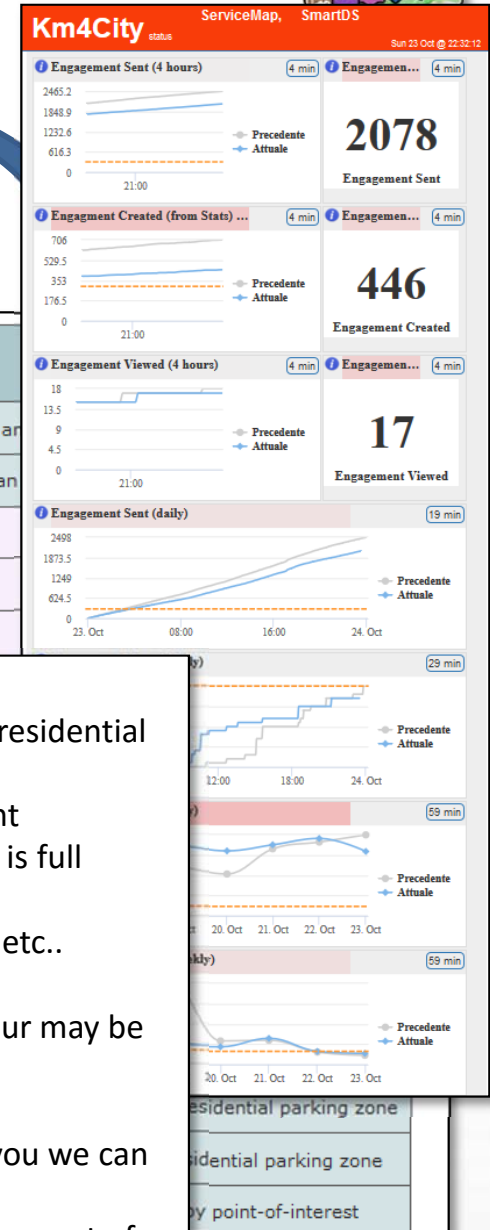
User Engagement, Monitoring & Follow Up

City Operators

Strategy Editor Engager



Event name	Type	#sent	#viewed	#viewed on #sent	Description
_event_de	ENGAGEMENT	1 (0%)	0 (0%)	0%	Suggest (in german) an
_event_en	ENGAGEMENT	1720 (2.12%)	70 (7.1%)	4.07%	Suggest (in english) an
	- 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%)			
_event_es	ENGAGEMENT	6 (0.01%)			
_event_fr	ENGAGEMENT	6 (0.01%)			
_event_it	ENGAGEMENT	5459 (6.73%)			
_en	ASSISTANCE	141 (0.17%)			
_es	ASSISTANCE	3 (0%)			
_it	ASSISTANCE	187 (0.23%)			
_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 you may be interested, etc..

Provide Bonus

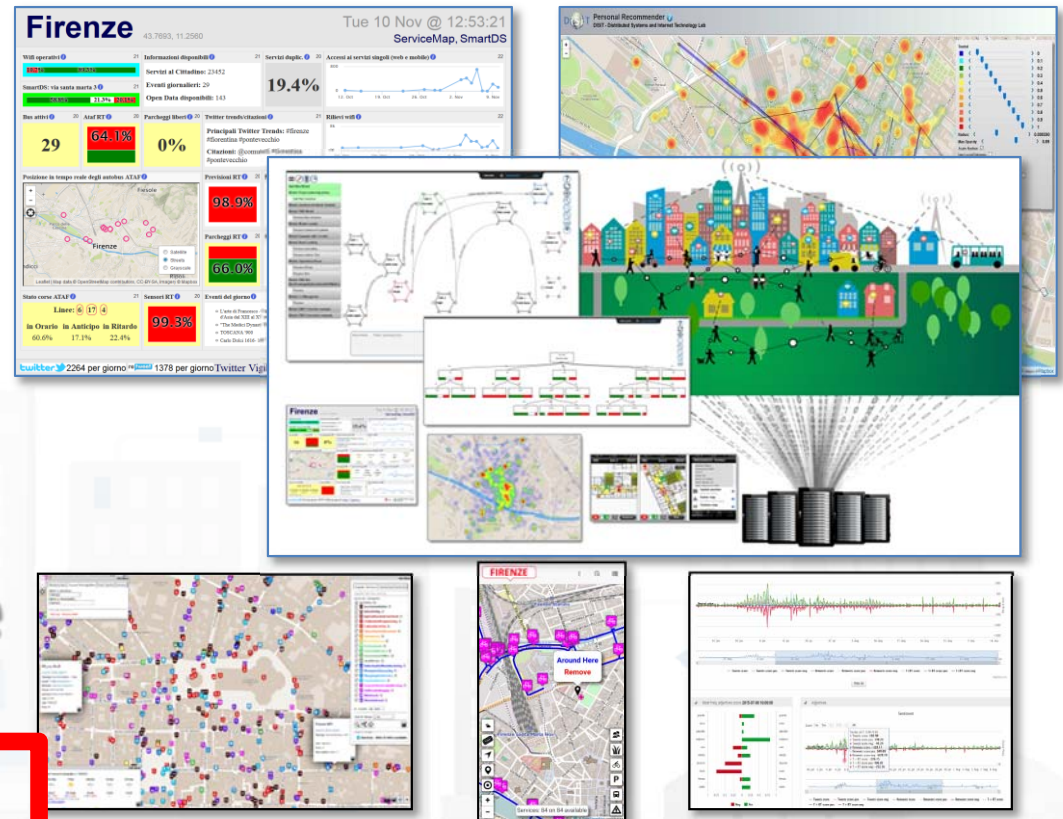
Since you have parked here you we can get 1 Bonus
 We suggest you to leave the car out of the city, this bonus can be used to by a bus ticket

4 – Technical Details

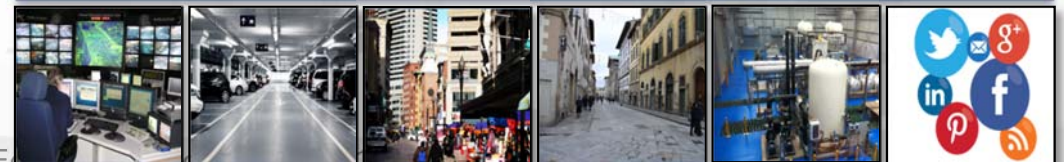
From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

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Km4City Data and Service Aggregator



Back Office and Dev Tools



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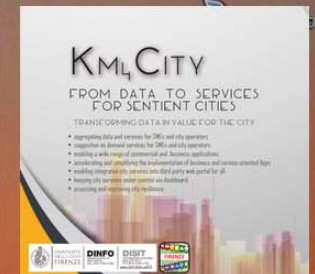
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App Store

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Home Sentient City Control Room City Users' Tools Back Office and Dev Tools Info and Docs

Development Tools for Mobile App and Web App (the ServiceMap Tool), generating Smart City API calls

Service Map (visual query development tool) (*)	POI density in Florence Downtown (*)	Events in Florence (*)	Services & POI in Tuscany (*)	Services & POI in Florence (*)	Services & POI in Pisa (*)	Bus Lines and timelines in Tuscany	Green Areas in Florence (*)	Cycling Path in Florence (*)	Search on Area analysis (*)	Search along line analysis (*)
---	--------------------------------------	------------------------	-------------------------------	--------------------------------	----------------------------	------------------------------------	-----------------------------	------------------------------	-----------------------------	--------------------------------

Dashboard development tools

Dashboard Builder for control room (*)

Smart City API, Linked Open Data, RDF Store tools, 5 Stars Data

Web page: Km4City Smart City API documentation	Km4City Ontology, SVG File	ZIP File: Download Km4City Ontology, multiple formats	Linked Open Graph LOD (*)	SPARQL & Data Licenses (*)	Km4City in Tuscany Area Smart City Main Data, IOT, Sensors in Tuscany
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Data Warehouse and Back Office Data Aggregation Tools

Smart City General Architecture	Programming User Engagements	Web Page: Data Ingestion Manager, DIM data broker tool	Web Page: DISCES, Smart City Engine, Big Data Process manager	Web Page: RDF store Indexer, RIM, and versioning manager
---------------------------------	------------------------------	--	---	--

www.Km4City.org

Development tools

- **Dashboard builder**
 - Creating personalized dashboards in few clicks
- **development tool** for fast and low cost implementation of business and service oriented Apps
 - access to aggregated data → **Smart City API**
 - ServiceMap → **Smart City API**
- aggregating multi-domain data and services for SMEs and city operators
 - **Data /Service Aggregator**: open, flexible and suitable access



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Higher level Dashboard

Firenze

43.7693, 11.2560

Tue 4 Oct @ 12:18:04

ServiceMap, SmartDS

WiFi operativi: 1000%

SmartDS: via Santa Marta 3

Bus attivi: 0

Ata...: 100%

Par...: 0%

Numero di processi lanciati: 2676

CPU in uso: 0%

Memoria in uso: 24.2%

Smart City Engine

CPU: 0%

Mem Totale: 72094 MB

Job Eseguiti: 2709

Real time position ATAF bus

Previsioni meteo: FIRENZE

88.9%

Twitter Trends/citazioni

Principali Twitter Trends: #firenze

76.0%

Stato linee ATAF

Linee: 6 17 4

in Orario in Anticipo in Ritardo

46.2% 4.6% 49.2%

23.40%

71.6%

Twitter Vigilance

Firenze Wi-Fi: APs Streaming Realtime

DISIT - Distributed Systems and Internet Technologies Lab

Firenze - Tuesday October 4 2016 13:18:05

Time Range: 2016-10-04 12:03:00 - 2016-10-04 13:18:00

Radius: 0.0008

Max Opacity: 0.80

Heatmap (2868) Streaming APs

Time Range: 5 min 10 min 15 min 20 min 30 min 60 min 3 hours 6 hours 9 hours 12 hours 1 day 3 days 1 week 1 month

Distinct people Local Extrema

Clustered markers

To Date: static

Reply Speed: Realtime 10 s 30 s 1 min 5 min 15 min 30 min 1 h 2 h 5 h

Mugnone 2016

ServiceMap, SmartDS

Tue 4 Oct @ 12:18:04

Utenti attivi (12 ore): 79, 57.75, 38.5, 19.25, 0

Turisti attivi (12 ore): 34, 25.5, 17, 8.5, 0

Rilevi wifi al giorno: 42 639, 31 994.25, 21 329.5, 10 664.75, 0

Accessi ai servizi singoli (web e mobile): 7656, 5742, 3828, 1914, 0

Query Km4city API: 52 367, 39 275.25, 26 183.5, 13 091.75, 0

Utenti attivi (4 ore): 77

Recommender - Heatmap and Trajectories Clusters (User Profile: All)

DISIT - Distributed Systems and Internet Technologies Lab

Firenze - Tuesday October 4 2016 13:18:05

Radius: 0.000510

Max Opacity: 0.46

Heatmap:

Scale Radius:

Use Local Extrema:

Clustered markers:

Distinct people clustered markers:

Clustered trajectories (15)

Clustered trajectories (5)

Twitter Vigilance Dashboard

Distributed Systems and Internet Technologies Lab
Department of Information Engineering (DII)
University of Florence

Menu On Login

Home > Channel statistics > Channel sentiment analysis

Channel active from 2009-12-06 to today

Data processed from 2015-09-09 to 2016-01-21

NLP SA

Sentiment trends in channel uber

Zoom 1m 3m 6m YTD 1y All

From Jan 12, 2016 To Jan 21, 2016

— Tweets score — Tweets score pos — Tweets score neg — Retweets score — Retweets score pos — Retweets score neg — T+RT score — T+RT score pos — T+RT score neg

Hide All



Dashboard Builder

- To create Control Room based on several views
 - Public and private single Dashboard
 - Higher level Dashboard with Web Browser composition:
 - Dashboard, OD matrix, flow map, heat map, Twitter Vigilance, WiFi
 - Recommendations, Engagment, flow,
- **Several ready to use widgets and custom widgets as:** single data or %, maps, real time data, POI maps, social media, gauge, speedometer, Italian Flags, AVM data, buttons, iframe web page, status, time trend compare, etc.
 - See <http://www.disit.org/6935>
- **Main Widget Feature:**
 - Automatic update data values on the screen
 - Managing alarms, providing info,
 - Interactive widget via URL



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Dashboard Builder



Dashboard Builder

Operations
Metrics
Widgets
Users

Dashboards Overview

Name	Title	Creation Date	Status	User	Modify	Preview
12	Dashboard Giatta	2016-07-27 11:35:15				
A-01	Prova nuovo menu	2016-09-12 12:07:03				
Copia 59	Dashboard01	2016-08-01 16:01:32				
Copia	Duplicazione Dashboard	TEST DUPLICAZIONE				
Copia		2016-07-26 15:17:16				

Sources Management

DataSources Overview

ID	Url
Km4CityApp	jdbc:mysql://192.168.0.20:3306
Km4Cityquartz	jdbc:mysql://192.168.0.20:3306
Km4CityRDF	http://192.168.0.206:8080/WebAPI/grafico.html
Km4CityRecommender	jdbc:mysql://192.168.0.55:3306
Km4CityServiceMap	jdbc:mysql://192.168.0.72:3306

Add new Widget

Click the Add button to add one or more metrics to the widget

Metric: **Sensors_Rt** Add

Metric Description: **Description:** Percentuale di Linee Sensori attive
Metric Typology: Percentuale/424
Data Area: Mobilità
Data Source: Osservatorio Regionale per la Mobilità del Trasporto
Refresh rate: 60 sec
Status: Active

Context: [Dropdown]

Type Widget: widgetPieChart max 1 metrics

Selected Metrics: Sensors_Rt

Link: www.km4city.self_operative.it

Information: Percentage of road sensors (underground coils) working or non compared to those declared in the day. The portion of the graph in red refers to the percentage of non-functioning, the green part refers to the active ones.

Widget Parameters

Title: Sensors RT Background color: error

Refresh rate (sec): 60

Columns number: 3

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

BarContent - 2x4 9 min

14.2% 85.8%

4x2 9 min **5x2** 59 sec **6x2** 59 sec

56% 28% 24%

44% 72% 76%

4x3 **5x5** **6x5**

4x2 48 sec

35.0% 65.0%

4x4 **5x5**

CPU Load 100% RAM 35.2 GB Daily jobs 212 JOBS CPU Load 100% RAM 35.2 GB

4x2 57 sec

65%

Q2 15 sec **Q3** 15 sec **Q4** 15 sec **Q5** 15 sec

GW 223 GW 1462 GW 481 GW 138 GW 1462

Wifi operativi

100% 0%

SmartDS: via Santa Marta 3

36.0% 30.9% 33.2%

Informazioni disponibili

Servizi attivi su Firenze: 23452
Eventi del giorno a Firenze: 2173
Open Data disponibili: 138

42.4%

Accessi ai servizi singoli (web e mobile)

Day	Precedente	Attuale
3. Nov	3122.4	4163.2
4. Nov	2081.6	3122.4
5. Nov	1040.8	2081.6
6. Nov	1040.8	2081.6
7. Nov	2081.6	3122.4
8. Nov	2081.6	3122.4
9. Nov	2081.6	3122.4

Bus Attivi

24

Ataf RT

100% 0%

Parcheggi...

55.4%

Smart City Engine

CPU: 3.7%
RAM: 58.7 GB
DAILY JOBS: 4863

Rilievi wifi

Day	Precedente	Attuale
3. Nov	20046.9	30069.9
4. Nov	10023.3	20046.9
5. Nov	20046.9	30069.9
6. Nov	20046.9	30069.9
7. Nov	20046.9	30069.9
8. Nov	20046.9	30069.9
9. Nov	20046.9	30069.9

Real time position ATAF bus

Sensori RT

18.6% 81.4%

Previsioni meteo: FIRENZE

Day	Weather	Temp
Wednesday	light rain	7°C / 13°C
Thursday	cloudy	6°C / 16°C
Friday	moderate rain	7°C / 16°C
Saturday	cloudless	/
Sunday	cloudy	/

Parcheggi...

26% 74%

Twitter Trends/citazioni

PRINCIPALI TREND TWITTER:
#FIRENZE
#FIORENTINA
#UFFIZI

CITAZIONI:

Query Servicemap

Day	Precedente	Attuale
3. Nov	225	225
4. Nov	150	150
5. Nov	75	75
6. Nov	75	75
7. Nov	150	150
8. Nov	225	300
9. Nov	150	150

Stato linee ATAF

46% IN ORARIO
5% IN ANTICIPO
49% IN RITARDO

Previsioni...

8:8% 91.2%

Elenco eventi del giorno

- Il restauro delle "Storie della Genesi" di Paolo Uccello
- Tra arte e moda
- Winkelmann, Firenze e gli Etruschi - Il padre

Query Km4city API

Day	Precedente	Attuale
3. Nov	25090	100360
4. Nov	25090	25090
5. Nov	25090	25090
6. Nov	25090	25090
7. Nov	25090	25090
8. Nov	25090	25090
9. Nov	25090	25090



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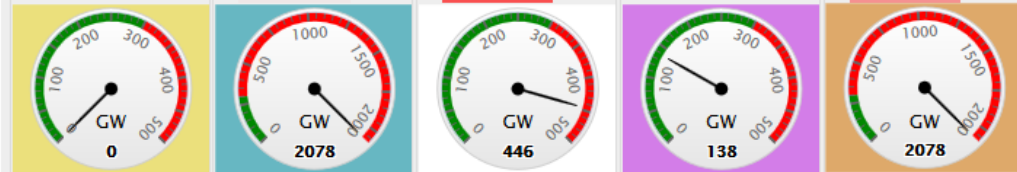
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Energy (demo)

ServiceMap, SmartDS

Sun 23 Oct @ 22:33:25

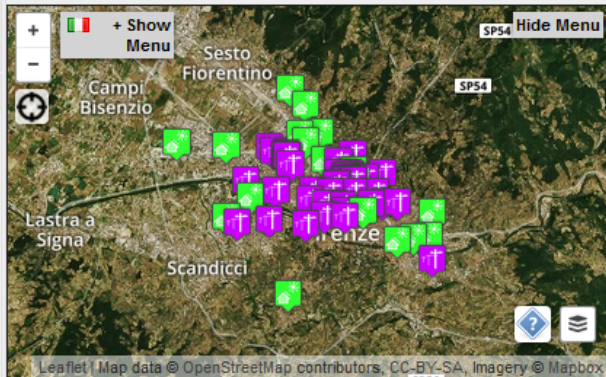
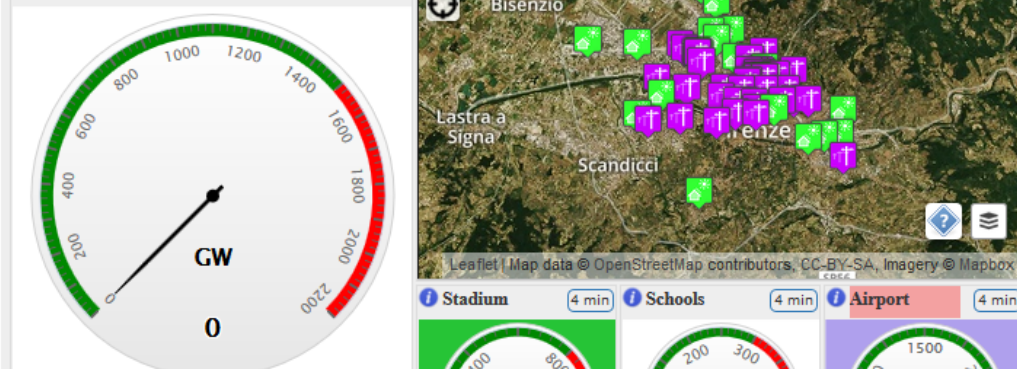
Q1 (4 min) Q2 (4 min) Q3 (4 min) Q4 (9 min) Q5 (4 min)



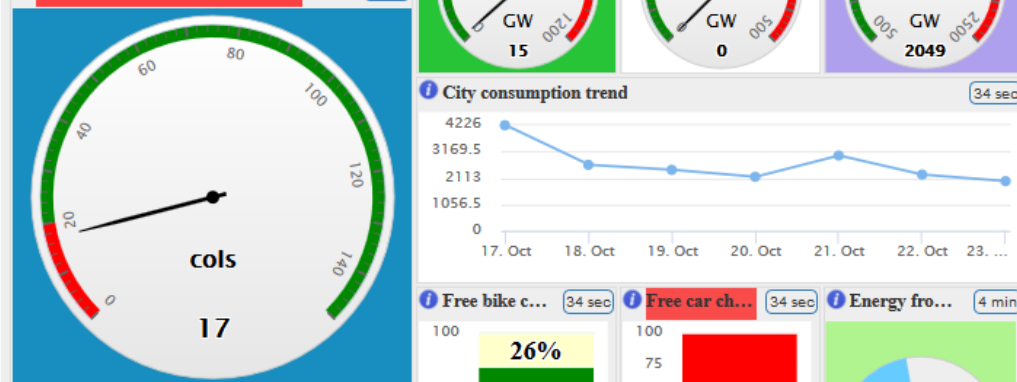
Active wind turbines (9 min) Charging columns map



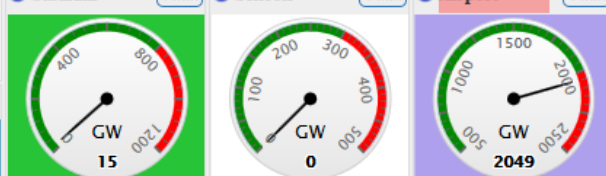
City consumption (4 min)



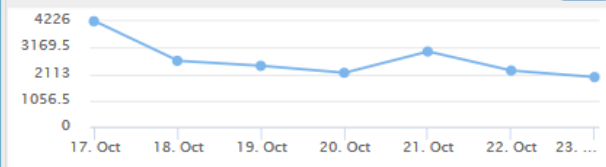
Free charging cols (4 min)



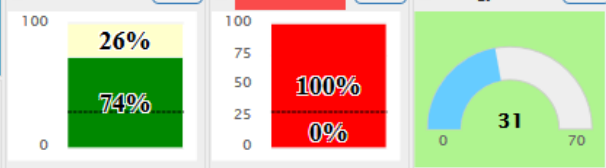
Stadium (4 min) Schools (4 min) Airport (4 min)



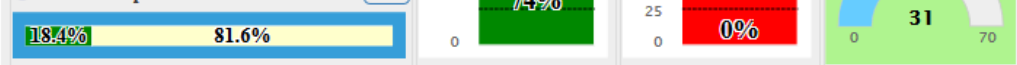
City consumption trend (34 sec)



Free bike c... (34 sec) Free car ch... (34 sec) Energy fro... (4 min)



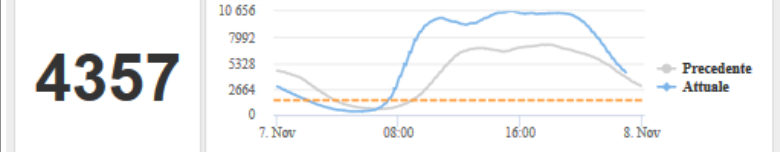
Active solar panels (9 min)



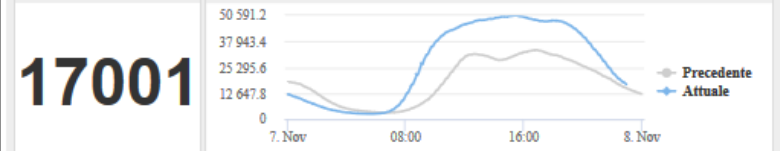
FirenzeWifi monitor

Mon 7 Nov @ 23:01:23

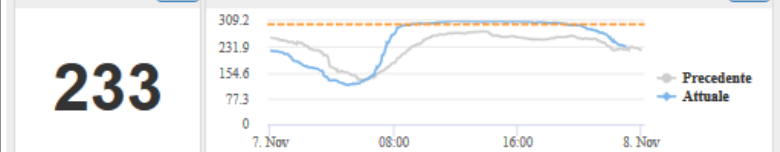
Utenti FIWIFI (4 min) Utenti FIWIFI (4 min)



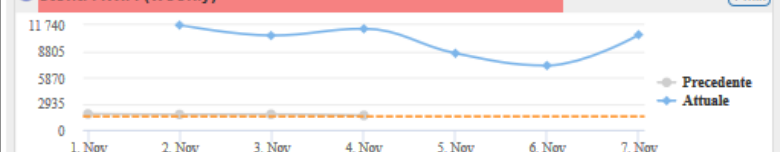
Eventi FIWIFI (4 min) Eventi FIWIFI (4 min)



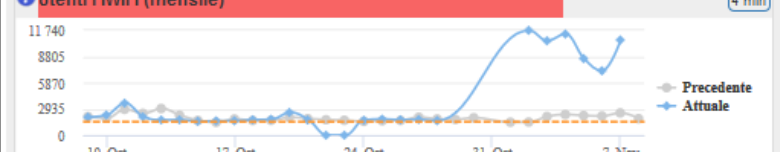
AP FIWIFI (4 min) AP FIWIFI (4 min)



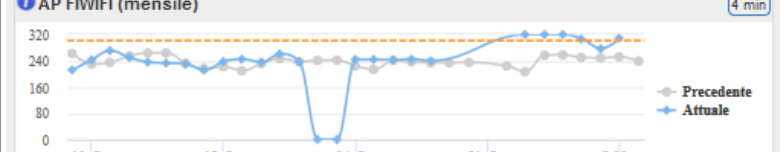
Utenti FIWIFI (weekly) (4 min)



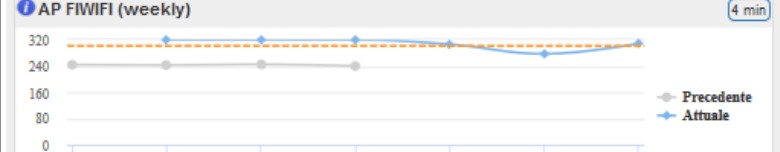
Utenti FIWIFI (mensile) (4 min)



AP FIWIFI (mensile) (4 min)



AP FIWIFI (weekly) (4 min)



twitter re tweet Twitter Vigilance





SmartCity Processes

Fri 4 Nov @ 18:51:20

ATAF 26 sec avm_linea17_I RUNNING 2016-11-04 18:42:31	ATAF 26 sec avm_linea31_I RUNNING 2016-11-04 18:40:00	ATAF 26 sec avm_linea4_I SUCCESS 2016-11-04 18:49:23	ATAF 26 sec avm_linea6_I SUCCESS 2016-11-04 18:43:12	CHECK RT 26 sec check_RT SUCCESS 2016-11-04 09:27:48	EVENTI FI 26 sec Eventi_a_Firenze_I SUCCESS 2016-11-04 18:05:32
PARK 26 sec parcheggi1_I FAILED 2016-11-04 18:49:18	PARK 26 sec parcheggi2_I SUCCESS 2016-11-04 18:49:33	PARK 26 sec parcheggi160_I SUCCESS 2016-11-04 18:49:30	PARK 26 sec parcheggi161_I SUCCESS 2016-11-04 18:49:20	PARK 26 sec parcheggi162_I SUCCESS 2016-11-04 18:49:26	PARK 26 sec parcheggi163_I SUCCESS 2016-11-04 18:49:21
METEO 26 sec Previ_meteo_Abetone_xml_I SUCCESS 2016-11-04 18:39:11	METEO 26 sec Previ_meteo_Arezzo_xml_I SUCCESS 2016-11-04 18:49:09	METEO 26 sec Previ_meteo_Fiesole_xml_I SUCCESS 2016-11-04 13:09:24	METEO 26 sec Previ_meteo_Firenze_xml_I SUCCESS 2016-11-04 13:15:14	METEO 26 sec revi_meteo_Impruneta_xml_I SUCCESS 2016-11-04 14:54:40	METEO 26 sec Previ_meteo_Lucca_xml_I SUCCESS 2016-11-04 14:45:24
SENSORI 26 sec sensoridynamicimetro SUCCESS 2016-11-04 18:42:15	SENSORI 26 sec sensori_AREZZO_I SUCCESS 2016-11-04 18:48:37	SENSORI 26 sec sensori_EMPOLI_I SUCCESS 2016-11-04 18:48:17	SENSORI 26 sec sensori_PISA_I SUCCESS 2016-11-04 18:45:08	SENSORI 26 sec sensori_FIRENZE_I SUCCESS 2016-11-04 18:48:21	SENSORI 26 sec sensori_PRATO_I SUCCESS 2016-11-04 18:47:03
TWITTER 26 sec insertTweetsRecommender SUCCESS 2016-11-04 18:46:58	TWITTER 26 sec TwitterVigilanceIndexing RUNNING 2016-11-04 17:00:00	FI WIFI 26 sec calculateAPsTimeSeries RUNNING 2016-11-04 10:30:07	FI WIFI 26 sec calculateNewUsers SUCCESS 2016-11-04 09:21:24	FI WIFI 26 sec calculateUsersStatus SUCCESS 2016-11-04 18:48:45	FI WIFI 26 sec GraphsJSGenerator FAILED 2016-11-04 18:24:49



RealTime Values 3D



Demo: <http://www.disit.org/servicemap3d>

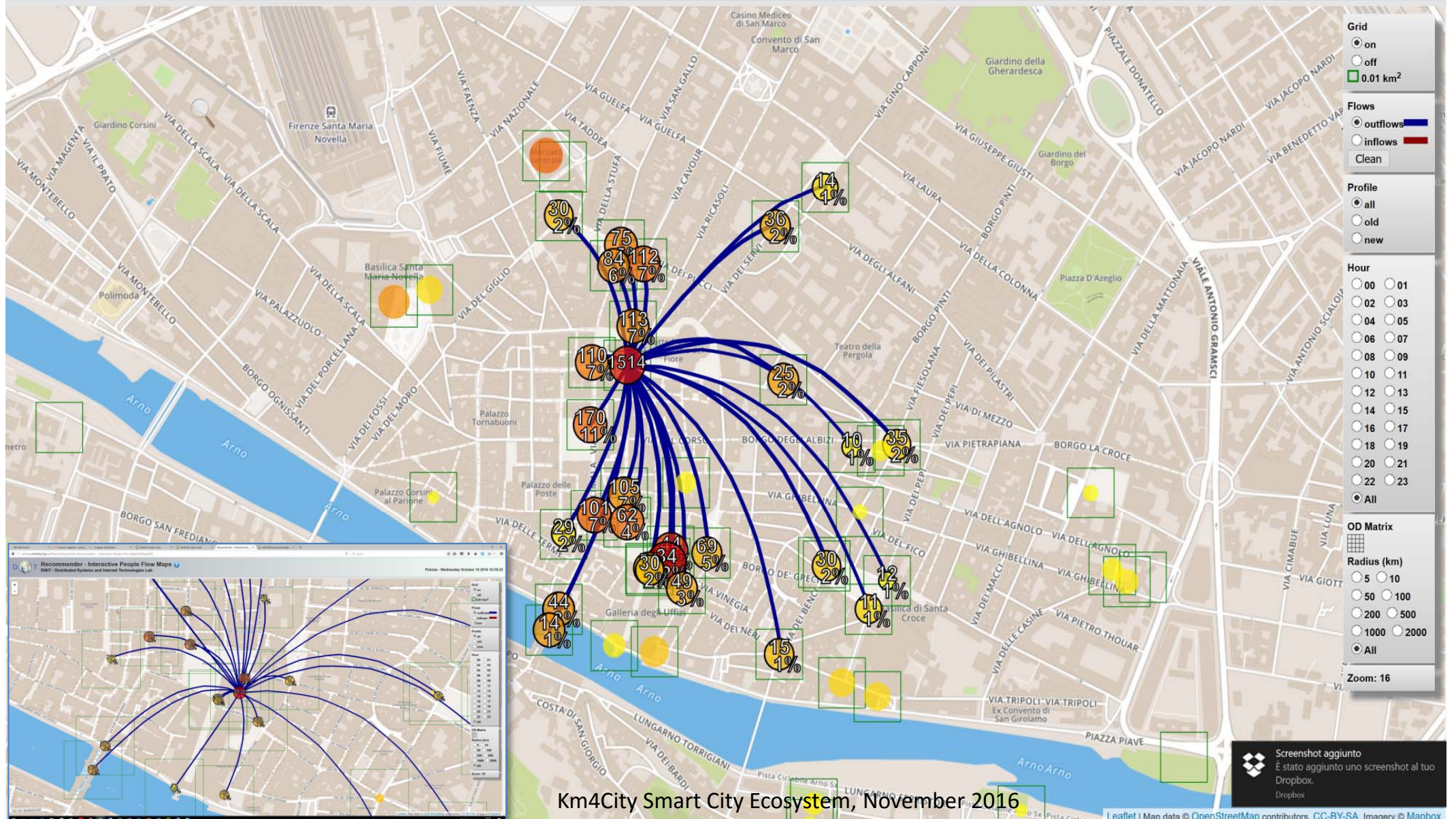


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Wi-Fi OD estim.

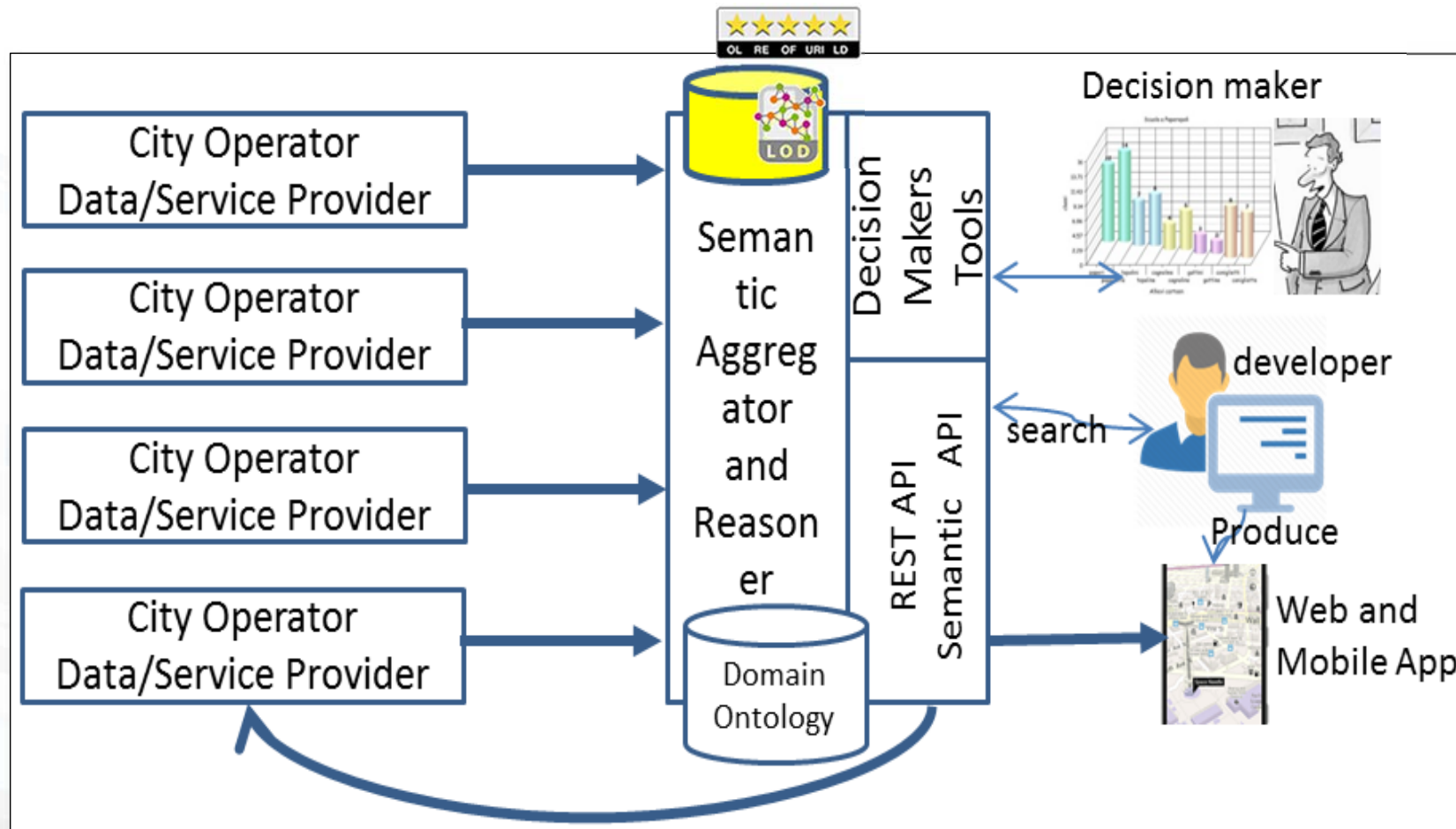




Development tools

- **Dashboard builder**
 - Creating personalized dashboards in few clicks
- **development tool** for fast and low cost implementation of business and service oriented Apps
 - access to aggregated data → **Smart City API**
 - ServiceMap → **Smart City API**
- aggregating multi-domain data and services for SMEs and city operators
 - **Data /Service Aggregator**: open, flexible and suitable access

- Only Data Aggregation with semantic support may provide reasoning services on integrated data
- Five Stars Linked Open Data, RDF Stores





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ServiceMap



Search around a GPS point

Search along a line

Regular Services Transversal Services

search text into service

Services Categories

De/Select All

- Area
- DigitalLocation
- HappeningNow
- Fresh Place
- Public Transport Line
- Road Sensors
- Bus Stops

N. results for each: 200

Search Range 500 mt

Search Results

Services 35 of 35 available

Bus Stops: 13 of 13 available

Road Sensors: 2 of 2 available

Bus Lines

72 Bus Lines Found.

Bus Line: 23
Direction: NAVE A ROVEZZANO → NUOVO PIGNONE

Bus Line: 23
Direction: SORGANE → NUOVO PIGNONE

Bus Line: 35
Direction: MAGENTA → STAZIONE VIA ALAMANNI

Weather Forecast for Municipality of: FIRENZE

Sunday light rain and sunny intervals 13°C / 24°C

Monday cloudy 13°C / 24°C

Tuesday cloudy 13°C / 25°C

Wednesday light rain

Thursday rainstorm

Search for Geo Located Services

Get Events in the city

Regular Services Transversal Services

search text into service

Services Categories

De/Select All

- Area
- DigitalLocation
- HappeningNow
- Fresh Place
- Public Transport Line
- Road Sensors
- Bus Stops

N. results for each: 500

Search Range 500 mt

Search Results

Services 418 of 418 available

Bus Stops: 23 of 23 available

Road Sensors: 2 of 2 available

Bus Lines

33 Bus Lines Found.

Bus Line: C2
Direction: PIAZZA BECCARIA → LEOPOLDA

Bus Line: C2
Direction: PIAZZA BECCARIA → LEOPOLDA

Bus Line: 12
Direction: STAZIONE PARCHEGGIO → PIAZZALE

Weather Forecast for Municipality of: FIRENZE

Sunday light rain and sunny intervals 13°C / 24°C

Monday cloudy 13°C / 24°C

Tuesday cloudy 13°C / 25°C

Wednesday light rain

Thursday rainstorm

Search in an area

Regular Services Transversal Services

search text into service

Services Categories

De/Select All

- Accommodation
- Advertising
- AgricultureAndLivestock
- CivilAndCivilEngineering
- CulturalActivity
- EducationAndResearch
- Emergency
- Entertainment
- Environment
- FinancialService
- GovernmentOffice
- HealthCare
- IndustryAndManufacturing
- MiningAndQuarrying
- ShoppingAndService
- TourismService
- TransferServiceAndRenting
- UtilitiesAndSupply
- Wholesale
- WineAndFood

N. results: No Limit

Search Range visible areas

Search Results

Services 2231 of 2231 available

Query results organized by category

Total number of results: 2231

Category	Item number for each category
Accommodation	498
Advertising	18
AgricultureAndLivestock	21
CivilAndCivilEngineering	31
CulturalActivity	11
EducationAndResearch	11
Emergency	11
Entertainment	11
Environment	11
FinancialService	11
GovernmentOffice	11
HealthCare	11
IndustryAndManufacturing	11
MiningAndQuarrying	11
ShoppingAndService	11
TourismService	11
TransferServiceAndRenting	11
UtilitiesAndSupply	11
Wholesale	11
WineAndFood	11

Weather Forecast for Municipality of: FIRENZE

Sunday light rain and sunny intervals 13°C / 24°C

Monday cloudy 13°C / 24°C

Tuesday cloudy 13°C / 25°C

Wednesday light rain

Thursday rainstorm

Get weather forecast

Get Real Time data (public busses, car parks, sensors, traffic flows)

Regular Services Transversal Services

search text into service

Services Categories

De/Select All

- Area
- DigitalLocation
- HappeningNow
- Fresh Place
- Public Transport Line
- Road Sensors
- Bus Stops

N. results for each: 200

Search Range 500 mt

Search Results

Bus Stops: 25 of 25 available

Road Sensors: 3 of 3 available

Weather Forecast for Municipality of: FIRENZE

Sunday light rain and sunny intervals 13°C / 24°C

Monday cloudy 13°C / 24°C

Tuesday cloudy 13°C / 25°C

Wednesday light rain

Thursday rainstorm

Actual Selection

Service: FI055ZTL01601

FI055ZTL01501

LINKED OPEN GRAPH

Typology: TransferServiceAndRenting - SensorSite

Address: VIA GUELFIA

Date from sensor: FI055ZTL01501

Latest Update: 2016-05-08T11:31:00+01:00

Avg Distance (m)	Avg Time (sec)	Occupancy (%)	Concentration (car/km)
N.A.	N.A.	N.A.	0.0

Vehicle Flow (car/h)	Avg Speed (Km/h)	Threshold Perc (%)	Speed Perc (%)
38.0	0.0	N.A.	N.A.



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ServiceMap



Search around a GPS point

Search along a line

Regular Services Transversal Services
 search text into service
 Services Categories
 De/Select All
 Area
 DigitalLocation
 HappeningNow
 Path
 Fresh Place
 Public Transport Line
 Road Sensors
 Bus Stops

N. results for each: 200
 Search Range 500 mt

Search Results
 Services 35 of 35 available
 Bus Stops 13 of 13 available
 Road Sensors 2 of 2 available

Bus Lines
 72 Bus Lines Found.

Bus Line 23
 Direction: NAVE A ROVEZZANO → NUOVO PIGNONE
 Bus Line 23
 Direction: SORGANE → NUOVO PIGNONE
 Bus Line 35
 Direction: MAGENTA → STAZIONE VIA ALAMANNI

Weather Forecast for Municipality of FIRENZE
 Sunday light rain and sunny intervals 18°C / 24°C
 Monday cloudy 13°C / 24°C
 Tuesday cloudy 13°C / 25°C
 Wednesday light rain
 Thursday rainstorm

Web App HTML5

Giardino Di Boboli

Tipo: Digital Location

Descrizione: The Prince s Way ends in the Giardino di Boboli, near the Grotta del Buontalenti, that is a very masterpiece of the Mannerist architecture and sculpture

Descrizione: Il Percorso del Principe termina nel Giardino di Boboli, nei pressi della Grotta del Buontalenti, vero e proprio capolavoro dell'architettura e della scultura manierista

DISPONIBILE SU
 Google play

Scarica da
 App Store

Scarica da
 Windows Store

Regular Services Transversal Services
 search text into service
 Services Categories
 De/Select All
 Accommodation
 Advertising
 AgricultureAndLivestock
 CivilAndEngineering
 CulturalActivity
 EducationAndResearch
 Emergency
 Entertainment
 Environment
 FinancialService
 GovernmentOffice
 HealthCare
 IndustryAndManufacturing
 MiningAndQuarrying
 ShoppingAndService
 TourismService
 TransferServiceAndRenting
 UtilitiesAndSupply
 Wholesale
 WineAndFood

N. results: No Limit
 Search Range visible areas

Search Results
 Services 2231 of 2231 available

Query results organized by category

Total number of results: 2231

Category	Number of Results
Accommodation	498
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CivilAndEngineering	31
CulturalActivity	1
EducationAndResearch	11
Emergency	4
Entertainment	38
Environment	24
FinancialService	25
GovernmentOffice	100
HealthCare	245
IndustryAndManufacturing	264
MiningAndQuarrying	49
ShoppingAndService	54
TourismService	104
TransferServiceAndRenting	0
UtilitiesAndSupply	0
Wholesale	0
WineAndFood	0

Weather Forecast for Municipality of FIRENZE
 Sunday light rain and sunny intervals 18°C / 24°C
 Monday cloudy 13°C / 24°C
 Tuesday cloudy 13°C / 25°C
 Wednesday light rain
 Thursday rainstorm

Embed into Web pages

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KM4CITY SERVICE MAP EMBEDDED

OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

Km4city ServiceMap Km4City API

- <http://www.disit.org/6597>
 - REST API: serviceURI or Selection or GPS
 - REST API: Query ID
 - Receive an email
 - Get a JSON, HTML, ...
- 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)

The screenshot shows the ServiceMap tool interface. It features two query windows and a 'Save your information for services' form.

Query Window 1: FERMATA : STATUTO 04

LINKED OPEN GRAPH

Linee: 20 28 4 54 8

Prossimi transiti:

Query Window 2: 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 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:

Insert a title:

Insert a description:



Development tools

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 - access to aggregated data → **Smart City API**
 - ServiceMap → **Smart City API**
- aggregating multi-domain data and services for SMEs and city operators
 - **Data /Service Aggregator**: open, flexible and suitable access

Transport systems
Mobility, parking



Public Services
Govern, events,



Sensors, IOT
Cameras, ..



Environment,
Water, energy



Shops, services,
operators



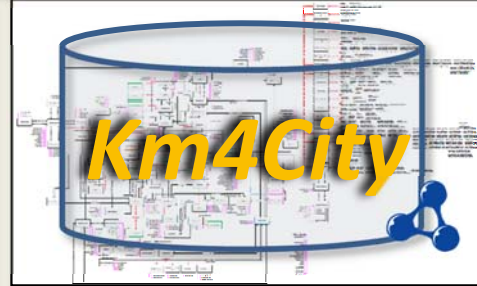
Social Media
WiFi, network



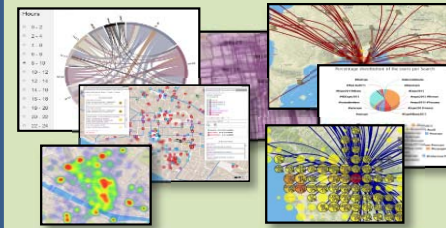
Static, Slow and Real Time data flows

DISCES -- Distributed and parallel architecture on Cloud

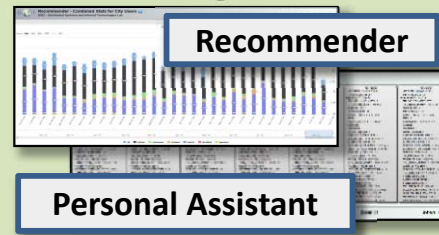
Km4City Smart City Engine



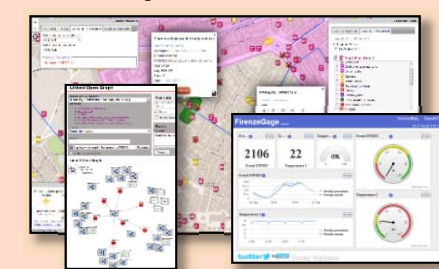
Big Data Analytics



Smartening Tools



Development Tools



Km4City Smart City API

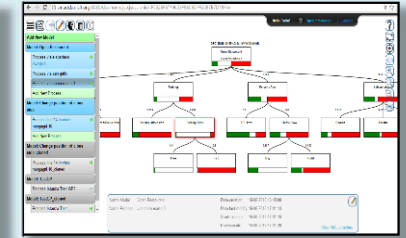
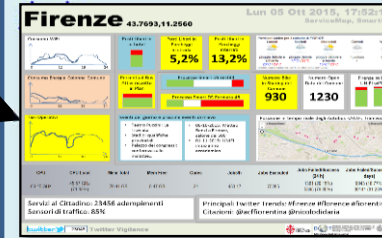
Tools for City Operators and Decision Makers

Smart City Dashboard

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

Smart Decision Support

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

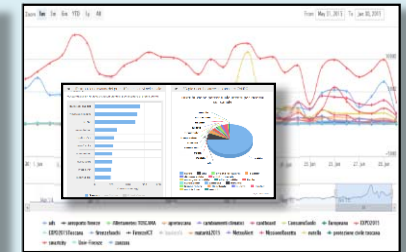
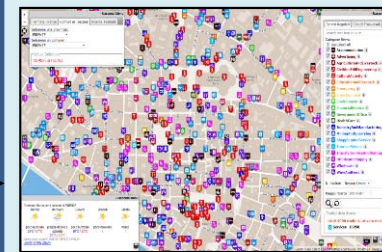


ServiceMap browser

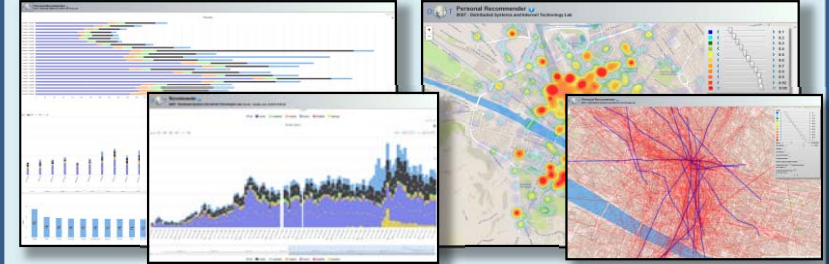
[Http://servicemap.km4city.org](http://servicemap.km4city.org)

Twitter Vigilance

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



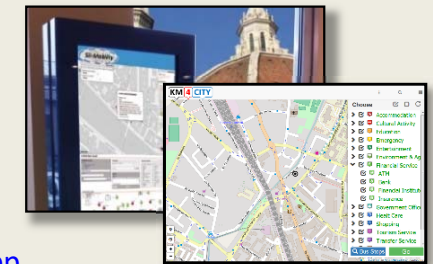
Analyzers of City User Behavior



Tools for Final Users

Mobile e Web Apps

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



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

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

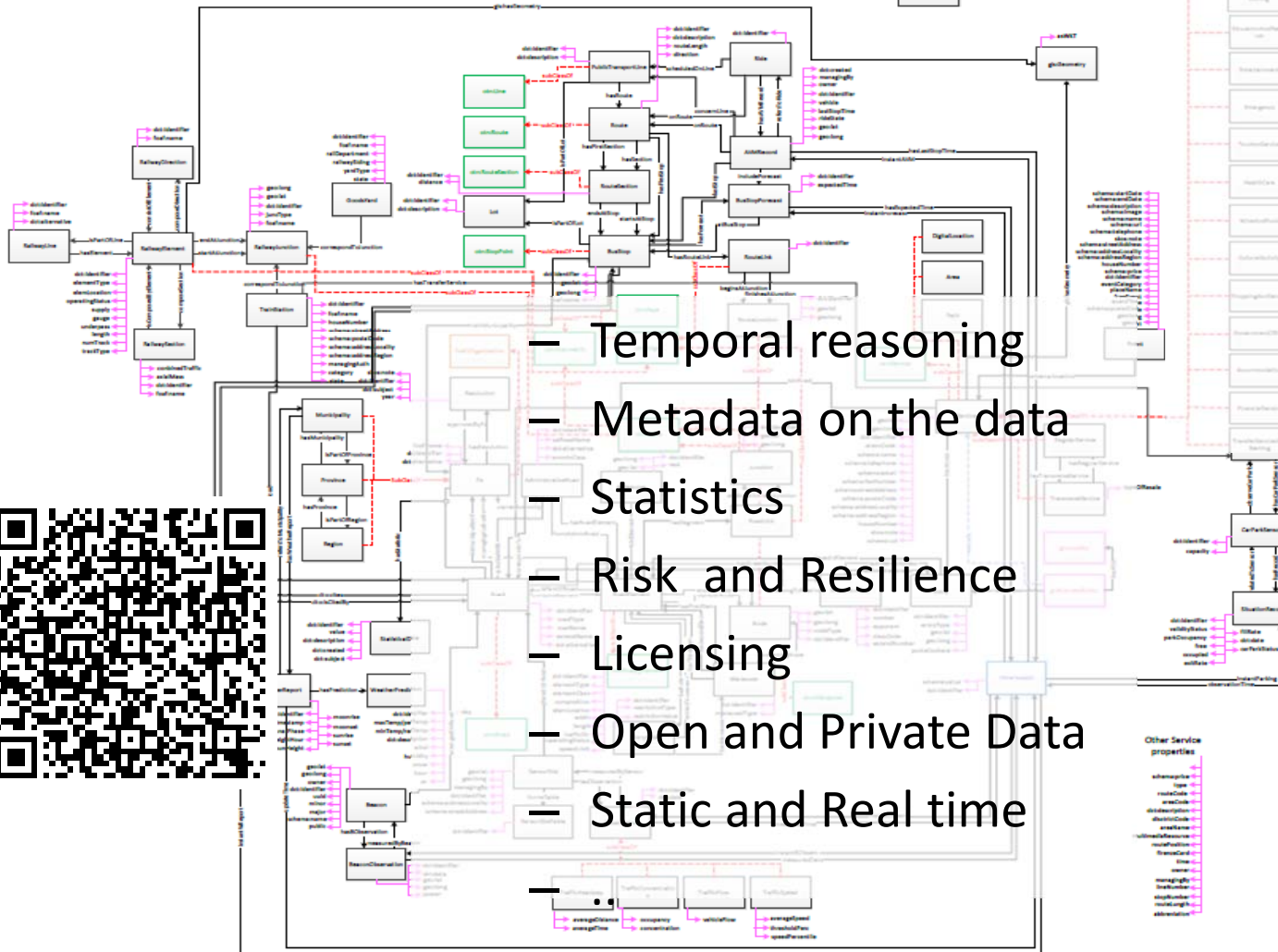


Km4City Ontology



RDF Store

- >84 Classes
- >100 ObjectProperties
- >100 DataProperties



- Temporal reasoning
- Metadata on the data
- Statistics
- Risk and Resilience
- Licensing
- Open and Private Data
- Static and Real time

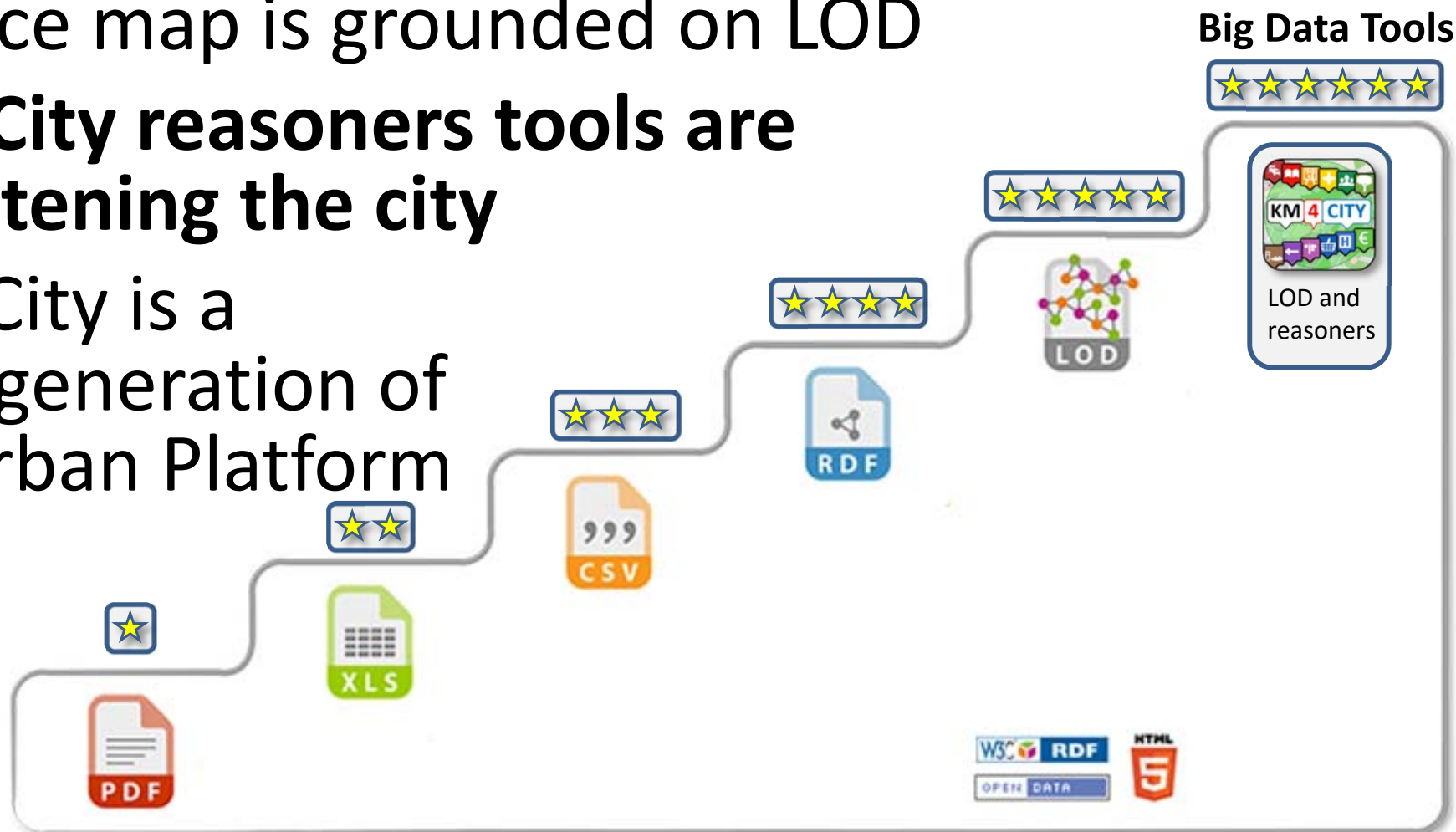
- different aspects:
 - Street-Guide
 - Mobility and transport
 - Points of interest
 - Sensors, IOT, ..
 - Energy
 - Administration
 - Citations from strings
 - ..

Ontology Documentation:

- <http://www.disit.org/6506>
- <http://www.disit.org/6507>
- <http://www.disit.org/5606>
- <http://www.disit.org/6461>

Km4City is Six Stars Linked Open Data

- Smart City API are grounded on LOD
- Service map is grounded on LOD
- **Km4City reasoners tools are smartening the city**
- Km4City is a new generation of an Urban Platform



Data Ingestion and Mining

Transport systems
Mobility, parking



Public Service
Govern, even



Sensors, IOT
Cameras, ..



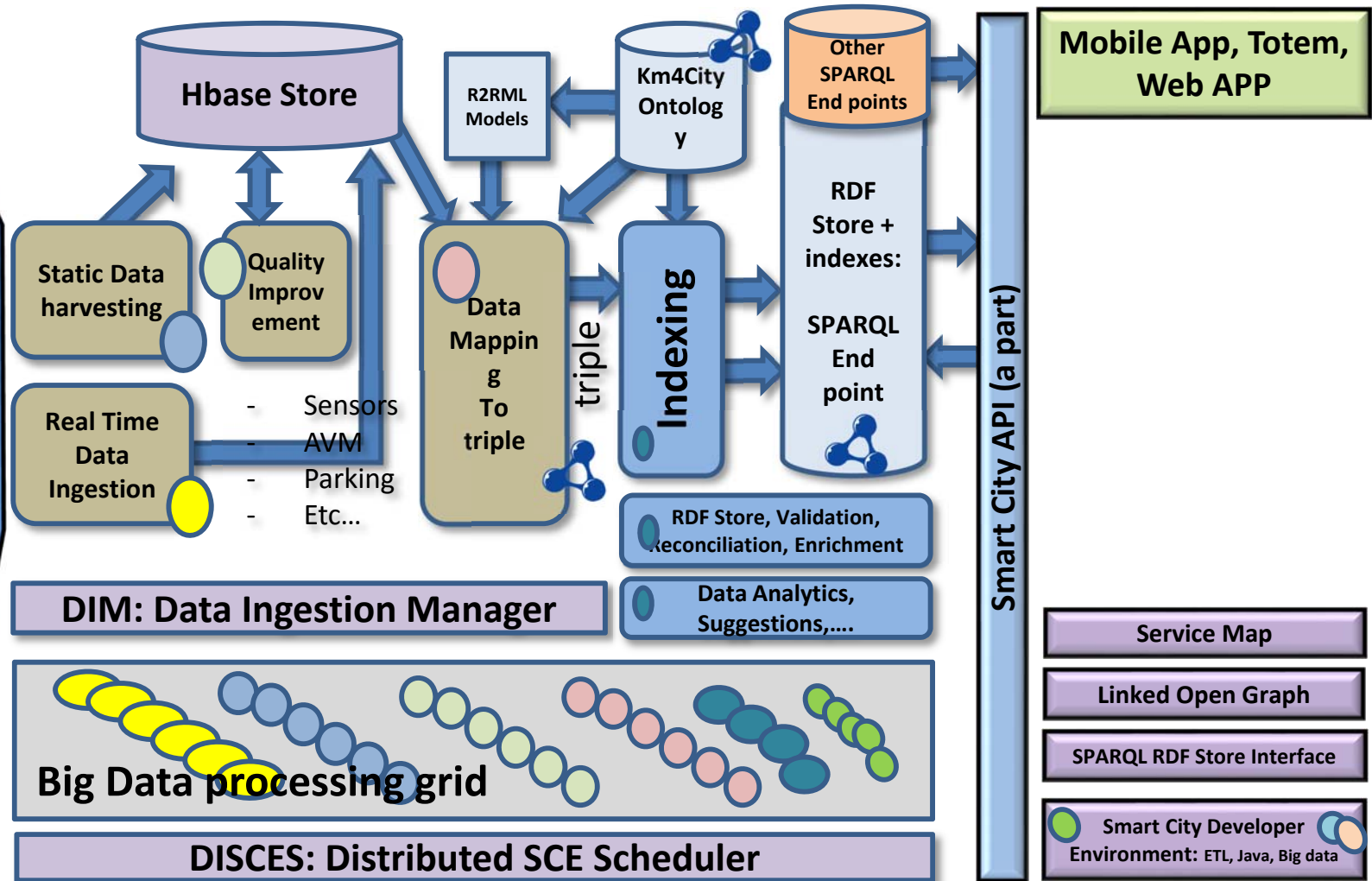
Environment,
Water, energy



Shops, service
operators



Social Media
WiFi, network



DIM: Data Ingestion Manager

10 entries

Schedule Delete Pause Resume Add row Remove row

General informations										Ingestion	
launch	Concatenate	process	Resource	Resource Class	Category	Format	Automaticity	Process_type	Access	Real Time	Source
Concatenate		Welfare_csv	Welfare	Servizi_csv1	Servizi	csv	automatic	ETL	HTTP	no	Opendata regione Toscana - file=/home/ubuntu/SaMobility/Trasformazioni
Concatenate		Visite_guidate_csv	Visite guidate	Servizi_csv1	Servizi	csv	auto				
Concatenate		Universita_e_conservatori_csv	Universita e conservatori	Servizi_csv1	Servizi	csv	auto				

RDF Repository & Index Manager

```

-- [git@redhat:~/git/rdflib3/rdflib$]
POST http://localhost:3030/ HTTP/1.1
Host: localhost:3030
Content-Type: application/rdf+xml
Content-Length: 1024
{
  "@id": "http://www.w3.org/2002-03-12/28/rdf-schema",
  "@type": "Class",
  "rdfs:label": "rdfs:Class",
  "rdfs:comment": "The class of all classes.",
  "rdfs:isDefinedBy": "http://www.w3.org/2002-03-12/28/rdf-schema#"
}

HTTP/1.1 200 OK
Content-Type: application/rdf+xml
Content-Length: 1024
{
  "@id": "http://www.w3.org/2002-03-12/28/rdf-schema",
  "@type": "Class",
  "rdfs:label": "rdfs:Class",
  "rdfs:comment": "The class of all classes.",
  "rdfs:isDefinedBy": "http://www.w3.org/2002-03-12/28/rdf-schema#"
}

```

Chosen

Name	Topics	Date	Type	Category	#Rows
Grab_urbale_Glossario		2015-04-14 09:40:33	Web>Data	GraphDatabase	11
Grab_urbale_Usanze		2015-04-14 09:20:33	Web>Data	GraphDatabase	11
Grab_urbale_Luca		2015-04-14 08:33:12	Web>Data	GraphDatabase	11
Grab_urbale_Matera_e_Corona		2015-04-14 08:22:10	Web>Data	GraphDatabase	11
Grab_urbale_Fluo		2015-04-14 11:01:10	Web>Data	GraphDatabase	11
Grab_urbale_Ribadi		2015-04-14 10:14:30	Web>Data	GraphDatabase	11
Grab_urbale_Pile		2015-04-14 11:34:24	Web>Data	GraphDatabase	11
Grab_urbale_Garag		2015-04-14 10:52:27	Web>Data	GraphDatabase	11
manager_01_Connectivity_01		2015-04-14 12:21:30	Web>Data	Service	1
manager_01_Connectivity_02		2015-04-14 12:29:29	Web>Data	Service	1
Manager_03w		2015-04-14 10:16:30	Web>Data	Service	1
Funzi_Molagga_01_02_03		2015-04-15 10:02:10	Web>Data	GeocoordinateObject	1
Scenari_01w		2015-04-15 10:52:00	Web>Data	GeocoordinateObject	1
Spide_01w		2015-04-14 14:36:50	Web>Data	Archive	2
Spide_01w_csv		2015-04-14 12:20:05	Web>Data	Service	1

Progress

Work done: 45.00%

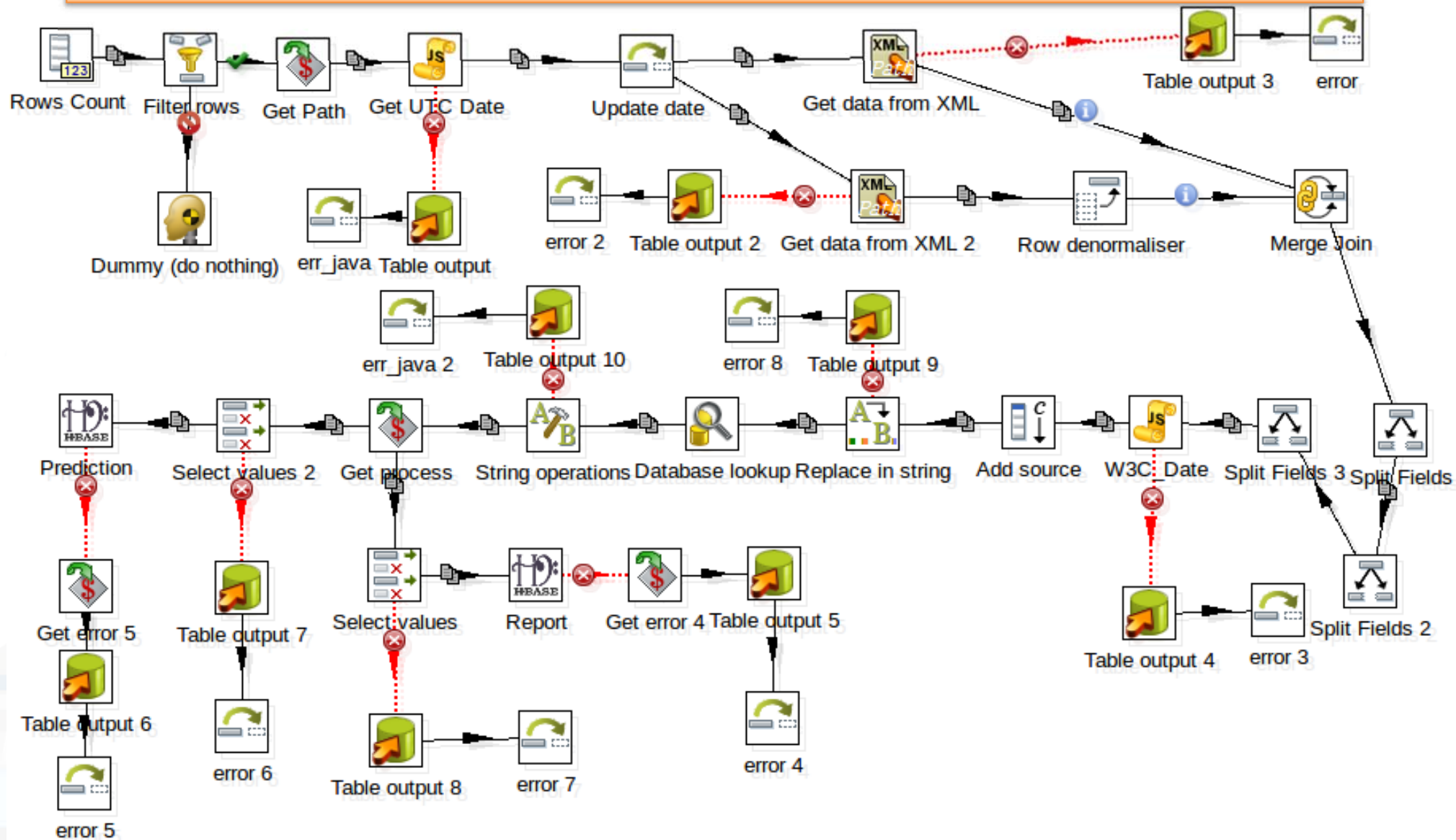
Total Rows: 12 Connected Nodes: 28
Total Files: 22/25 Max Rows: 22/1632

Comments List

Name	Start Timestamp	End Timestamp	Time (s)
Esistono	230415 12:15:28	230415 12:15:31	2
Esistono	230415 12:15:31	230415 12:15:31	1
Esistono	230415 12:15:32	230415 12:15:32	1
Esistono	230415 12:15:32	230415 12:15:32	1
Esistono	230415 12:15:33	230415 12:15:33	1
Esistono	230415 12:15:34	230415 12:15:34	1
Esistono	230415 12:15:34	230415 12:15:34	1
Esistono	230415 12:15:35	230415 12:15:35	2
Esistono	230415 12:15:36	230415 12:15:36	1
Esistono	230415 12:15:38	230415 12:15:39	1
Esistono	230415 12:15:38	230415 12:15:40	1
Esistono	230415 12:15:40	230415 12:15:40	1
Esistono	230415 12:15:40	230415 12:15:47	7
Esistono	230415 12:15:47	230415 12:15:48	1
Esistono	230415 12:15:49	230415 12:15:50	1
Esistono	230415 12:15:50	230415 12:15:58	8
Esistono	230415 12:15:58	230415 12:15:58	1
Esistono	230415 12:16:04	230415 12:16:04	1
Esistono	230415 12:16:05	230415 12:16:06	1
Esistono	230415 12:16:05	230415 12:16:06	1
Esistono	230415 12:16:05	230415 12:16:07	1
Esistono	230415 12:16:07	230415 12:16:17	10
Esistono	230415 12:16:18	230415 12:16:19	1

RIM RDF Index Manager

Example of Ingestion process



5 – Whos is

using

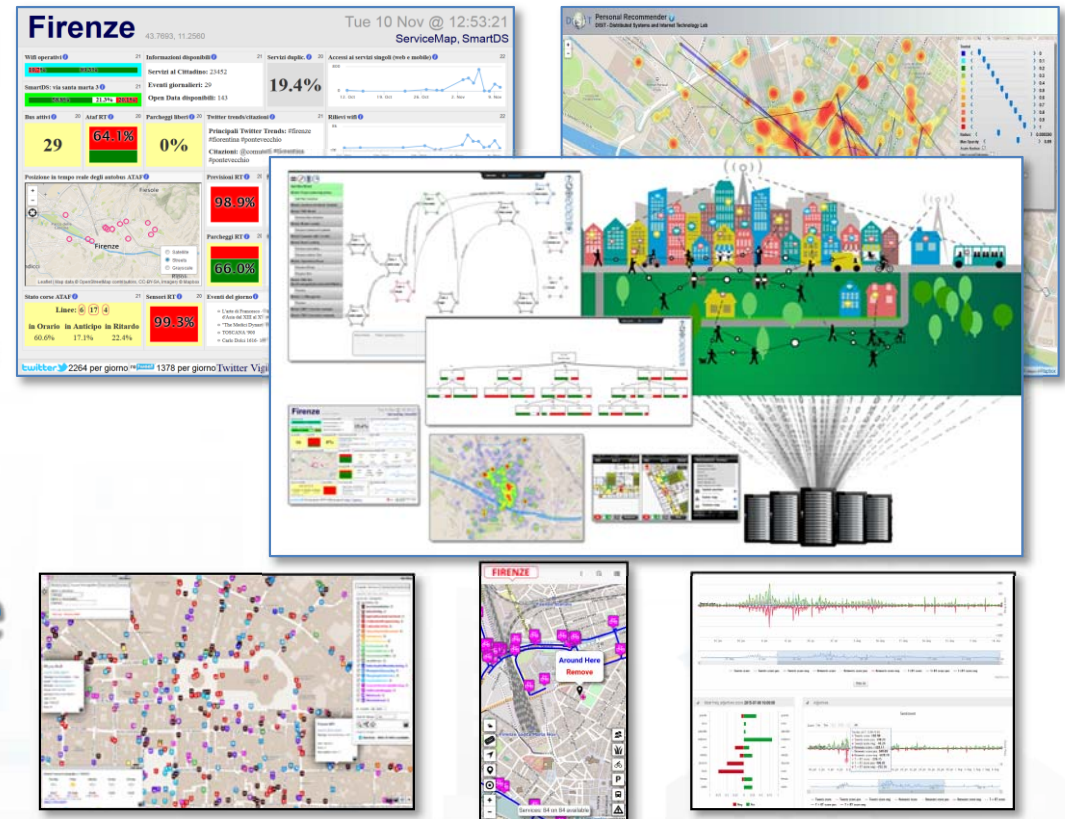
Km4City



From Data to Services for the Sentient Cities

Open Source and inter-operable tools to

1. keep city under control via personalized dashboards
2. improve city resilience, reducing risks and decision support
3. transform data in value for the city
4. Technical details
5. Who is using Km4City



Km4City Data and Service Aggregator



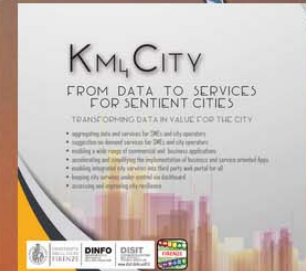
Info and Docs



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Home Sentient City Control Room City Users' Tools Back Office and Dev Tools Info and Docs

Km4City Information, Documentation, Tutorial, Training

 Km4City Flyer PDF	 Km4City Mobile App Video	 Km4City Slides	 Web Page: Projects exploiting & contributing to Km4City	 Web Page: Km4City Information & Documentation page	 Web Page: DISIT Lab (who we are)	 Km4City Video 2015	 Web Page: Km4City related Articles	 Web Page: Data Ingestion Training and tools; ETL programming Development Environment	 Web Page: GitHub Link Open Source Code	 Roadmap of development
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www.Km4City.org



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<http://www.disit.org>

Who We Are



- **DISIT lab** is one of the excellence of the University of Florence: [Http://www.disit.org](http://www.disit.org)
- **Active since 1994** on parallel and distributed architectures for HPCN, GRID, Cloud, and Big Data
- **Track record** of huge number of research and innovation projects and infrastructures, working with almost all major international firms and institutions. See list on the portal.
 - **Presently involved in** 15 projects and challenges most of them on Smart City and user behavior analysis and engagement, Big Data Analytics
- Contributing to standards as MPEG, and to the research on several areas:
 - **Coordinating and participating** to several European Commission projects, national project, innovation projects with industries and public administrations
- **Several International R&D&I Awards**

The screenshot shows the DISIT website interface. At the top, there is a navigation menu with links for HOME, ABOUT, RESEARCH, INNOVATION, EDUCATION AND COURSES, HOWTO, and EVENTS. Below the menu is a section titled "DISIT LAB OVERVIEW" with the URL <http://www.disit.dinfo.unifi.it>. The central part of the page features a diagram with several interconnected boxes representing research areas: Text and Web Mining, Data Analytics Big data, Social Media e-learning, Smart Cloud Computing, Mobile Computing, and Smart Cities. Below the diagram, there is a text block describing the lab's history and research focus, followed by a list of research areas and their applications.

DISIT lab and research group is active since 1994. It is one of the most active ICT labs of the University of Florence, metropolitan Tuscany area. DISIT successfully developed a relevant number of International and National research, development and innovation projects. DISIT provides an infrastructure for cloud and distributed computing.

DISIT has coordinated a number of large EC projects, in many others has covered the role of partner, and also coordinating scientific and technical WP and performing activities of dissemination and assessment. DISIT has received a relevant number of awards and is directly involved into top level international conferences, advisory boards, and committees.

DISIT research areas: big data, artificial intelligence, natural language processing, distributed systems, formal models, metrics definition and assessment:

- Smart City integrated solutions: <http://www.disit.org/km4city>
- Data Mining and understanding: OD ingestion, quality improvement, data processing, etc.



km4City Roadmap



2013

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>

2014

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

2015

Km4City 1.4

- Embed
- More API
- iBeacon



RESolute
RESilience management guidelines
and Operationalization appLied to
Urban Transport Environment

Km4City 1.5

- SmartDS
- Km4City App

RESOLUTE H2020
2015-2018 - Started



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

Sii-Mobility SCN
2016-2018 - Started
Km4City 1.6.2

2016

REPLICATE H2020
2016-2021- Started



REPLICATE
REnaissance of Places
with Innovative Citizenship
And Technology

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

2021

12/2017

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

6/2017

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

Today

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

GHOST SIR
2016-2019 - Started



GHOST SIR
Governing the smart city:
a governance oriented approach
to Smart Urbanism





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<http://www.disit.org>

Sii-Mobility



- Experimentations and validation in Tuscany <http://www.Sii-Mobility.org>
- Integration with present central station and subsystems 
- DISIT lab, Università di Firenze, is the tech-scientific coordinator 



ataf


tiemme
TOSCANA MOBILITÀ S.p.A.


BUSITALIA
GRUPPO FERROVIE DELLO STATO ITALIANE

atam

CTT
COMPAGNIA TOSCANI TRASPORTE

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

 Comune di Perugia

 COMUNE DI NAPOLI

*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*

Sii-Mobility

Commenti dei cittadini,
Social Media



AVM trasporto
Pubblico

Merci



Sensori su
trasporto Privato



Sensori,
sistema monitoraggio



Sensori
Parcheggi



Monitoraggio
traffico, autostrade



Rete
Ferroviaria



Parametri
ambientali



Servizi ed
enti



Ordinanze: eventi,
lavori pubblici, ..



Emergenze,
polizia, 118



UTC



Infomobility



Varchi
Telematici, ZTL



MINISTERO DELL'ISTRUZIONE, DELL'UNIVERSITÀ E DELLA RICERCA



General Objectives



- **Reduce the social costs of mobility**
 - minor inconvenience,
 - greater efficiency,
 - greater sensitivity to the needs of the citizen,
 - lower emissions,
 - better environmental conditions;
 - info-training programs to help city user in getting virtuous habits;
 - reduce transportation costs and travel times for users, for operators and administrations,
 - optimization solutions.
- **simplify the use of mobility systems**
 - innovative sensors for AVM and private transport on the territory
 - integrated systems for payment and identification
 - driving / offline routing solutions
 - connect the drive, smart drive or walk
 - Integration of data from operators and different type sources
 - advanced management of resources measurement of flows realization of sensors, actuators
- **Testing on municipalities and provinces of Tuscany**
- **Contribute to the improvement of national and international standards**



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Horizon 2020
European Union Funding
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<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	HUMANIS T	FR
SWARCO Mizar	SWMIZ	IT
Associação para o Desenvolvimento da Investigação no Instituto Superior de Gestão	ADI-ISG	PT
<i>Consorzio Milano Ricerche</i>	CMR	IT



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RESOLUTE Architecture



RESOLUTE RESILIENCE Dashboard

Presentation & Visualization



User guidance

FRAM → ResilienceDS

CRAMSS

FRAM operationalization



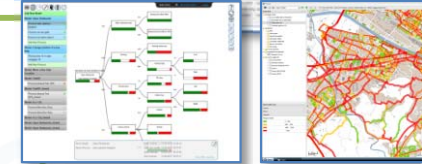
RESOLUTE Mobile APPs

ITS DSS

Smart DS

Evacuation DSS

Decision support system



Application framework

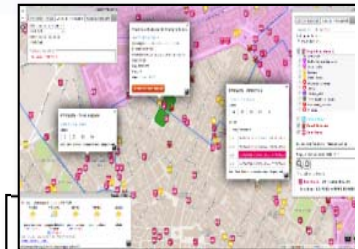
Algorithms and models

Data Integration APIs

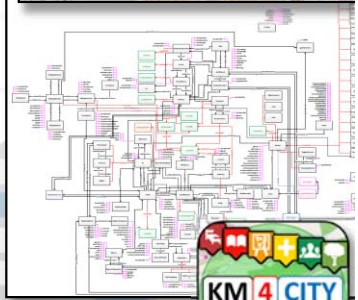
User Profiler APIs

User profiler

Integration framework



Data and Service Aggregator



Horizon 2020
European Union Funding
for Research & Innovation



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for Research & Innovation

REnaissance of PLaces
with Innovative Citizenship
And Technology



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

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



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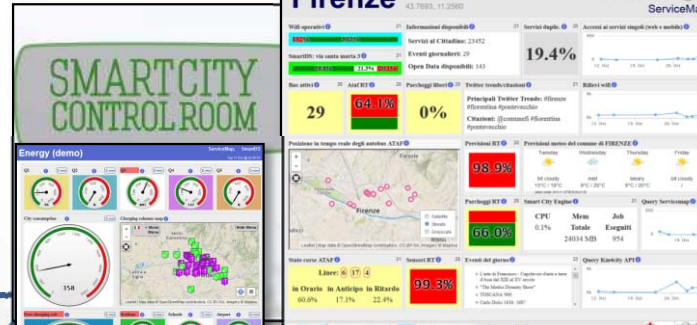
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REPLICATE in Firenze: Energy, ICT & Mobility



November 2016

www.Km4City.org



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