

SCALABLE SMART ANALYTIC APPLICATION BUILDER FOR SENTIENT CITIES



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INFORMATICA
E TECNICHE DELL'INFORMAZIONE

DISIT
DIPARTIMENTO DI
SISTEMI
DISTRIBUTI E
TECNICHE DELL'INFORMAZIONE



UNIVERSITÀ
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INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



Powered by

Snap4City (IoT): Integrating Data and Devices

Data analytic Smart City platform for Living Lab and co-working for Stakeholders, Industries & Researchers

<https://www.snap4City.org>



Paolo Nesi paolo.nesi@unifi.it

<https://www.Km4City.org>

<https://www.disit.org>

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



- GDPR
- SECURITY
- PRIVACY
- ASSESSMENT
- AUDITING

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

IOT APPLICATIONS • INSTANT APPS



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

DASHBOARDS & APPLICATIONS



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

MOBILE & WEB APPLICATIONS



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

MICROSERVICES & ADVANCED SMART CITY API

LIVING LAB - DEV TOOLS - COWORKING



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

BIG DATA ANALYTICS: AI, MACHINE LEARNING



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

SMART MICRO-APPLICATIONS - OPEN TO EXTERNAL SERVICES



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

KM4CITY DATA AGGREGATOR, KNOWLEDGE BASE OF THE CITY

OPEN DATA

GIS+MAP DATA

PROPRIETARY DATA

PERSONAL DATA

IOT / IOE

INDUSTRY 4.0

SOCIAL MEDIA



● Projects

SELECT
for Cities



Green Impact

● Co-founding institutions on projects



Regione Toscana



● Qualified Partners



● Technical Partnerships

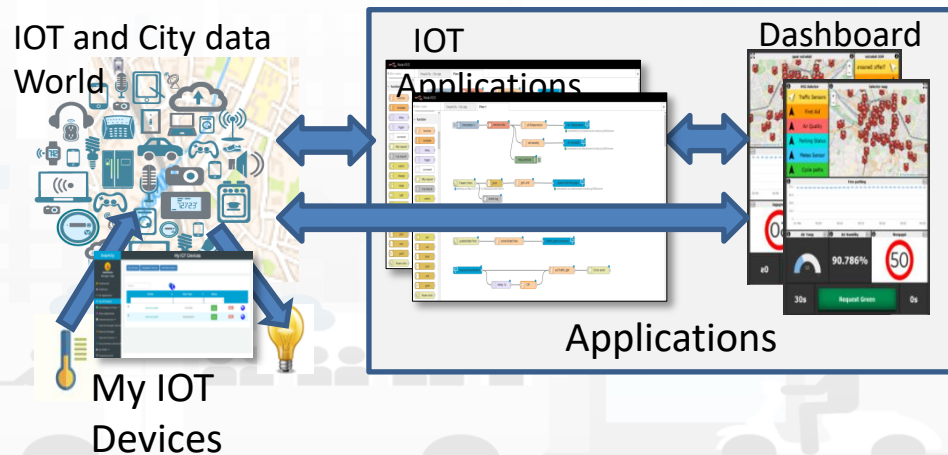


Powered by  **FIWARE**



- Snap4City is an open, standardized, data-driven, service-oriented, user-centric platform enabling large-scale co-creation IOT/IOE applications. It has been developed in the context of Select4Cities project of Helsinki and Antwerp.
- Snap4City is a fully open source, robust, scalable, easy to use solution, provides tools for
 - co-creation of mixt data driven, stream and batch processing, extending the powerful semantic reasoner of Km4City <https://www.km4city.org> , with IOT/IOE, GDPR, and city dashboards
- validated in multiple devices (PC, Android, Raspberry, ...), and domains: mobility and transport, tourism, health, welfare, social
- The innovation on semantic reasoning, IOT interoperability, microservices, automated dashboard production, .. thus

smart city solutions in a



DASHBOARDS: FROM CITY DASHBOARD TO APPLICATIONS

FROM CITY DASHBOARD TO APPLICATIONS

DATA GATHERING AND CITY DATA KNOWLEDGE MANAGEMENT

FORGING & MANAGING OPEN AND FLEXIBLE WEB AND MOBILE APPS

IOT/IOE DEVICES AND NETWORKS

IoT APPLICATIONS, THE LOGIC AND THE SMARTNESS

ADVANCED SMART CITY MICROSERVICES, SNAP4CITY API

SNAP4CITY LIVING LAB FOR COLLABORATIVE WORK

SNAP4CITY FOR BEGINNERS

DATA ANALYTICS, BUSINESS INTELLIGENCE, WHAT-IF AND SIMULATION

SNAP4CITY ARCHITECTURE AND SYSTEMS OPEN TO DEVELOPERS AND STAKEHOLDERS

TWITTER VIGILANCE SOCIAL MEDIA ANALYSIS

DECISION SUPPORT SYSTEM AND CITY RESILIENCE

HOW TO ADOPT SNAP4CITY, AND OUR ROADMAP

SNAP4CITY AND KM4CITY PROJECTS

SNAP4CITY THE VIEW OF THE ADMINISTRATORS

Public Dashboards for your perusal

Snap4City

[LOGIN](#)

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


Dashboards (Public by (ORG))

Prev 1 ... 12 13 **14** 15 16 ... 20 Next

Filter by dashboard title

ServiceMap for data comparison


Passive



Public (DISIT)

Servizi agli utenti


Passive



Public (DISIT)

Smart City Control Room Console


Passive



Public (DISIT)

Smart City Control Room Console - new


Passive



Public (DISIT)

Smart City Data Overview

Passive



Public (DISIT)

Smart City Data Overview 2


Passive



Public (DISIT)

Smart Garda Lake

Passive



Public (DISIT)

SmartCity processes


Passive



Public (DISIT)

Snap4City - App dashboard


IOT apps



Public (DISIT)

Snap4City - Buttons with images

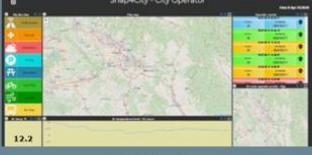
Passive



Public (DISIT)

Snap4City - City Operator

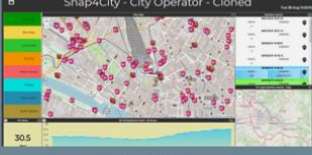
IOT apps



Public (DISIT)

Snap4City - City Operator - Cloned

Passive



Public (DISIT)

<https://www.snap4City.org>

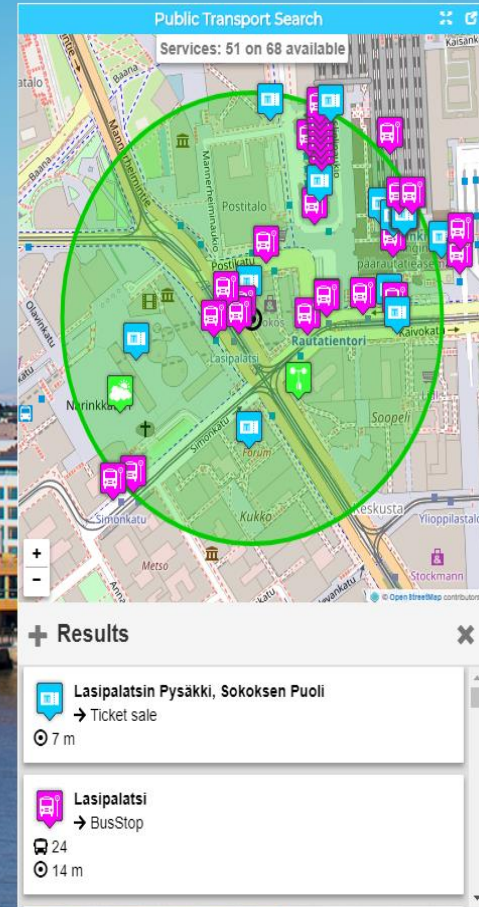
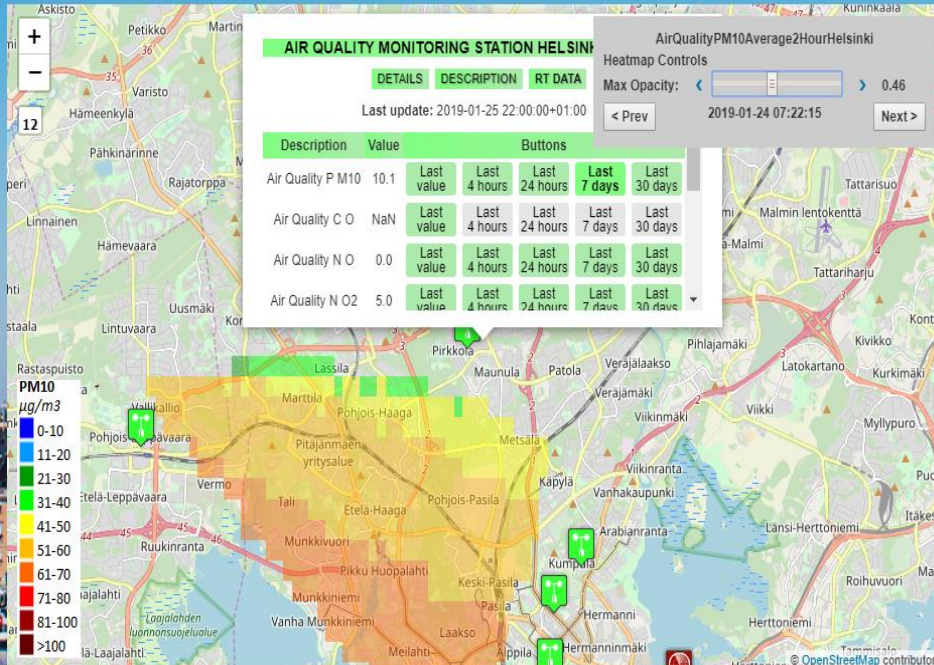




Helsinki Multi Data H2

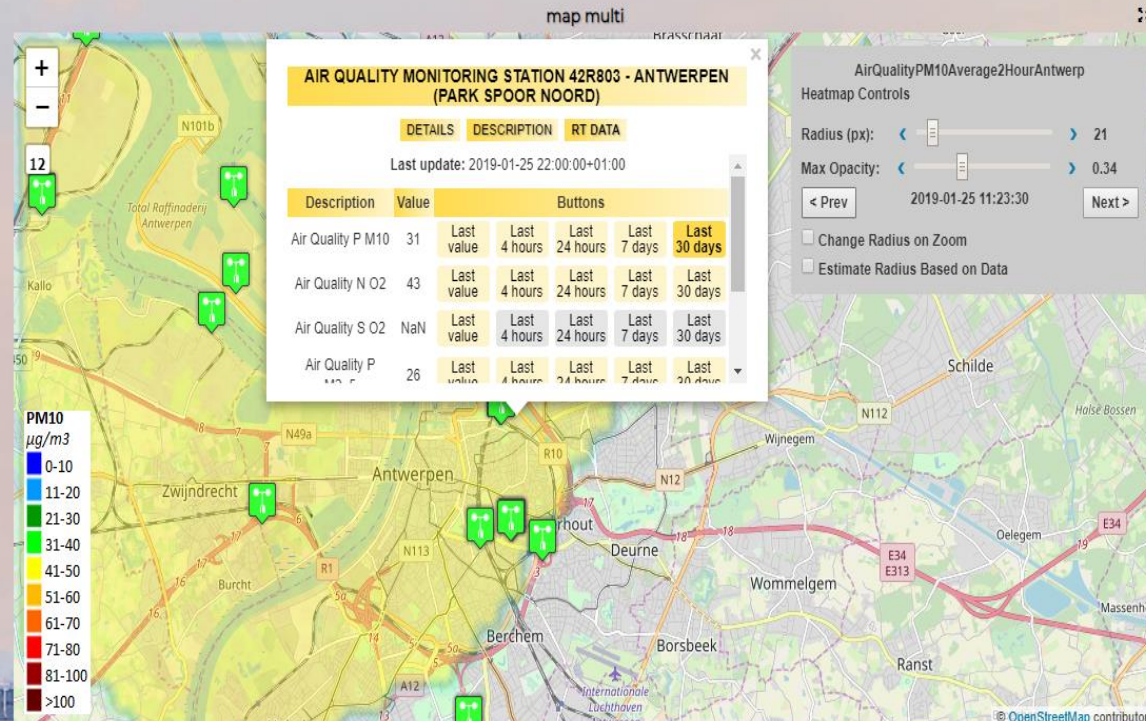
Fri 25 Jan 23:06:14

- BusStop
- Ticket sale
- Weather sensor
- Air Temp heatmap
- Humidity Heatmap
- Air Quality Sensors
- Noise sensors
- Noise Heatmap
- PM10 heatmap
- PM2.5 Heatmap
- NO2 heatmap
- Air Quality Index heatmap (?)
- Traffic Sensor



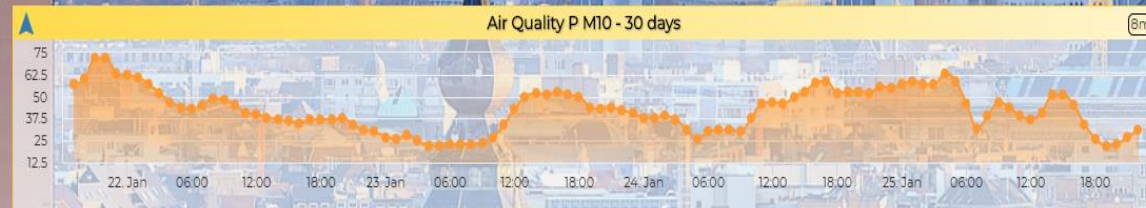
Antwerp Multi Data

- ▲ Cultural Activity
- ▲ Entertainment
- ▲ Tourism Service
- ▲ Education & Research
- ▲ Government Office
- ▲ Accommodation
- ▲ Air Quality Sensor
- ▲ Weather sensor
- ▲ PM10 Heatmap
- ▲ PM2.5 Heatmap
- ▲ Air Temperature Heatmap
- ▲ Humidity Heatmap
- ▲ Biking Safe Heatmap



Last value

25.5

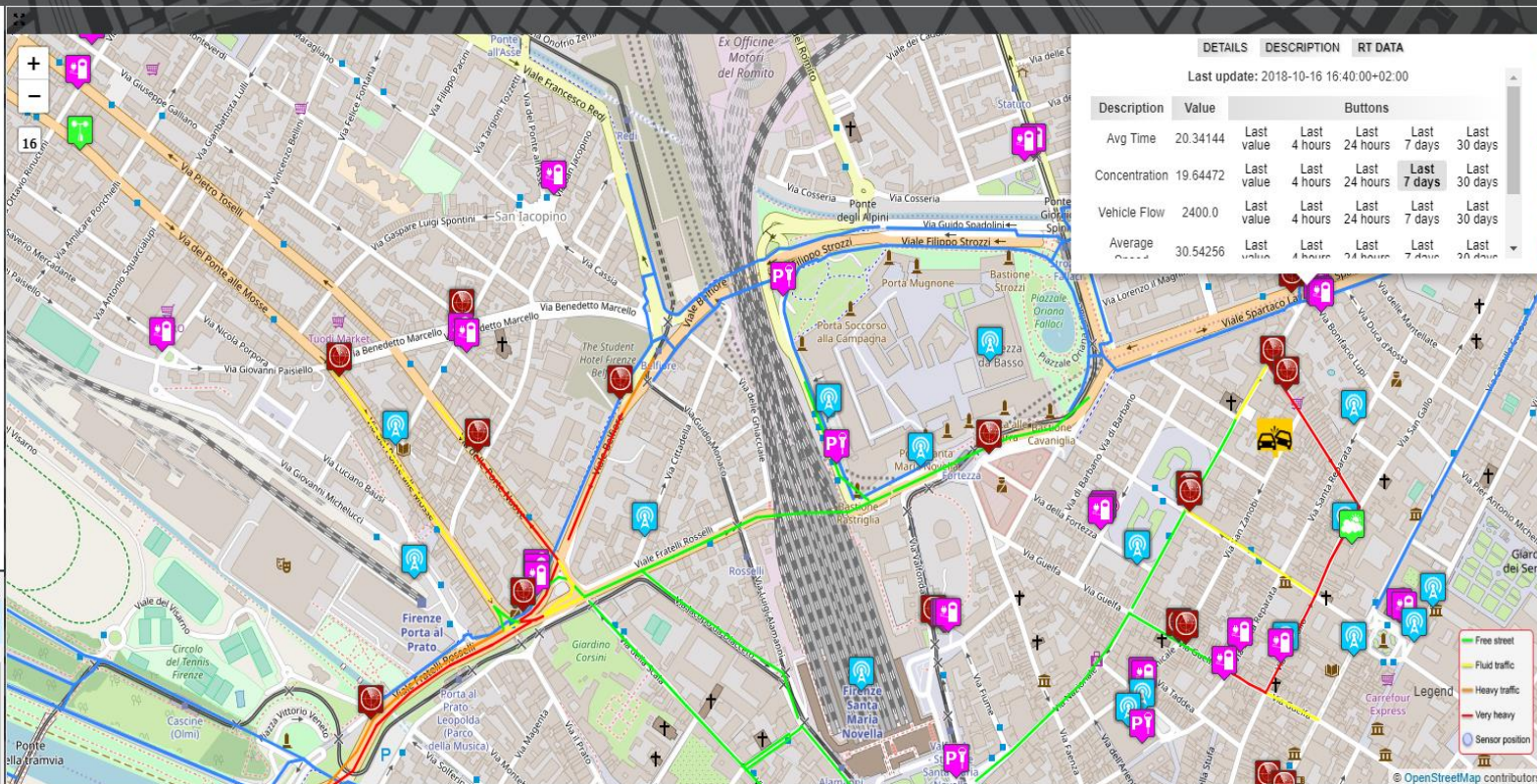




MAPPA FIRENZE

Tue 16 Oct 16:46:17

- Colonnine Ricarica
- Colonnine ricarica Fast
- Pannelli a Messaggio Variabile
- Parcheggi
- Piste Ciclabili
- Sensori del Traffico
- Stazioni ambientali
- Stazioni meteo
- Traffico Real Time
- Varchi ZTL
- Wi-Fi



Eventi Traffico a Firenze

INCIDENTI CON FERITI, INDIRIZZO: VIALE

ACCIDENT(S)	MAP
16/10/2018 15:54:19 1	MAP

INCIDENTI CON FERITI, INDIRIZZO: VIA VITTORIO

ACCIDENT(S)	MAP
16/10/2018 14:56:03 1	MAP

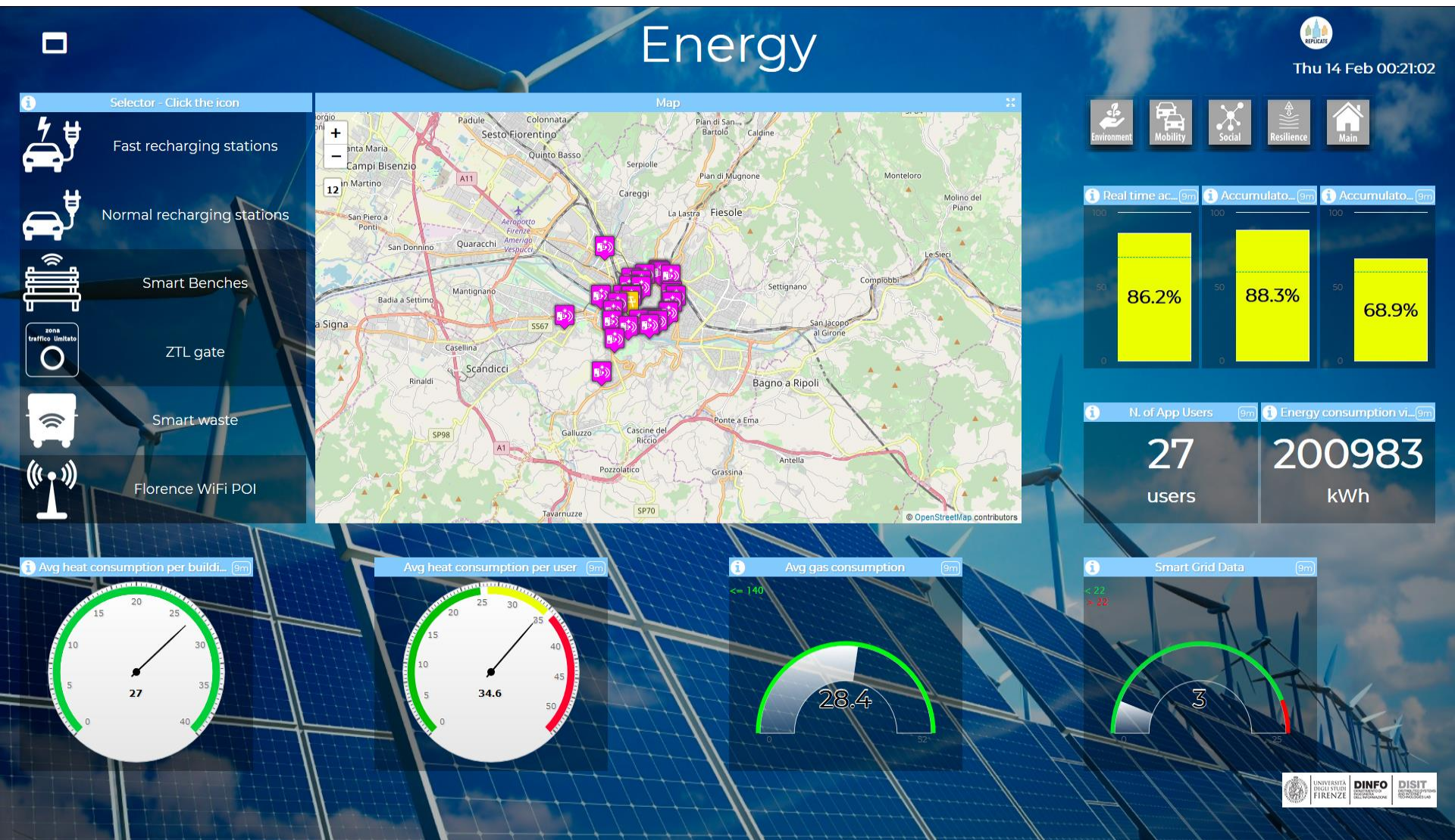
INCIDENTI CON FERITI, INDIRIZZO: VIA

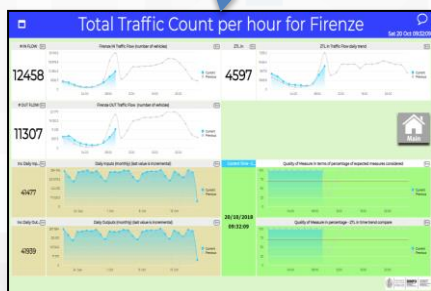
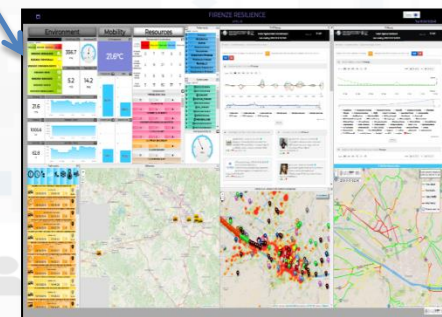
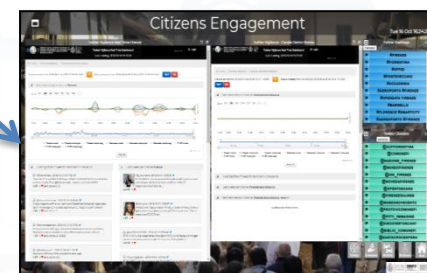
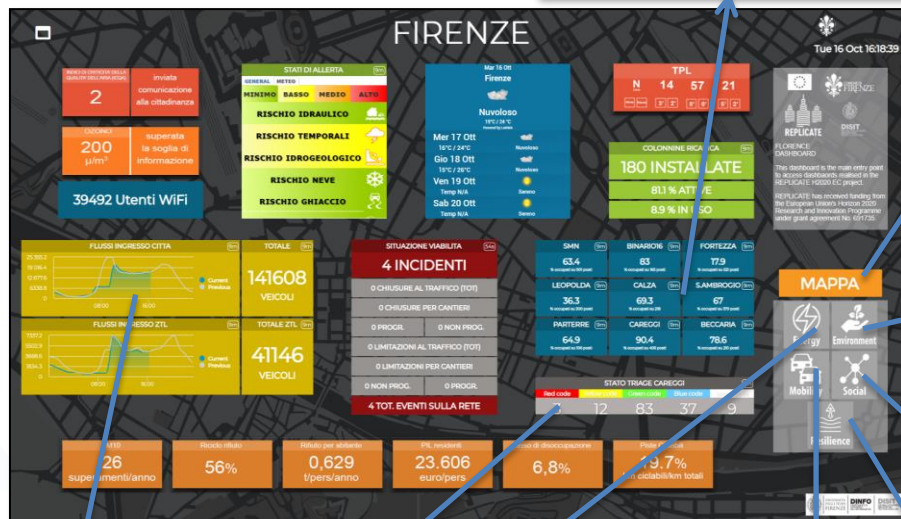
ACCIDENT(S)	MAP
16/10/2018 14:44:29 1	MAP

INCIDENTI CON FERITI, INDIRIZZO: VIALE

ACCIDENT(S)	MAP









Totem for InfoMobility

Firenze

Sat 3 Nov 10:49:30

The collage displays four different mobile applications:

- Top Left:** A map application showing a route in Florence, Italy. The route is highlighted in purple and passes through several stops marked with bus icons. A callout box identifies the route as "Regresso 02" by "Ataf&Linea".
- Top Right:** A weather application for Florence. It shows the current weather as "Overcast" and provides a 7-day forecast with temperatures and cloud conditions.
- Bottom Left:** A bus stop application for "Regresso 02". It displays a list of bus arrivals with columns for Time, Number, and Direction. The list includes stops like "Fiesole Piazza Minc...", "Fra' Giovanni Angel...", "Regresso 02", "Mantellini 04", "Mantellini 02", "San Domenico", "Ospedale...", "Di San Domenico 06", and "Di San Domenico 04".
- Bottom Right:** A map application showing "Around Here" suggestions. The map is populated with various service icons (e.g., car rental, restaurant, hotel). A list of results is shown on the right, including "Ceccarini Marco" (Car Rental With Driver), "Morandinid Di Poggiali Giovanni" (Stalls and Markets of Clothing and Footwear), "Frammenti Di Eva Focardi" (Stone Processing), "Qamil Zeqiri" (Specialized Construction), "Trattoria Pizzeria Sara Di El Bouzidi Joanna Jolanta" (Restaurant), and "Sviluppo Esercizi Alberghieri' Sea - Societa' A Responsabilita Li- Mitata" (Hotel).

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

Dashboard with intelligence App

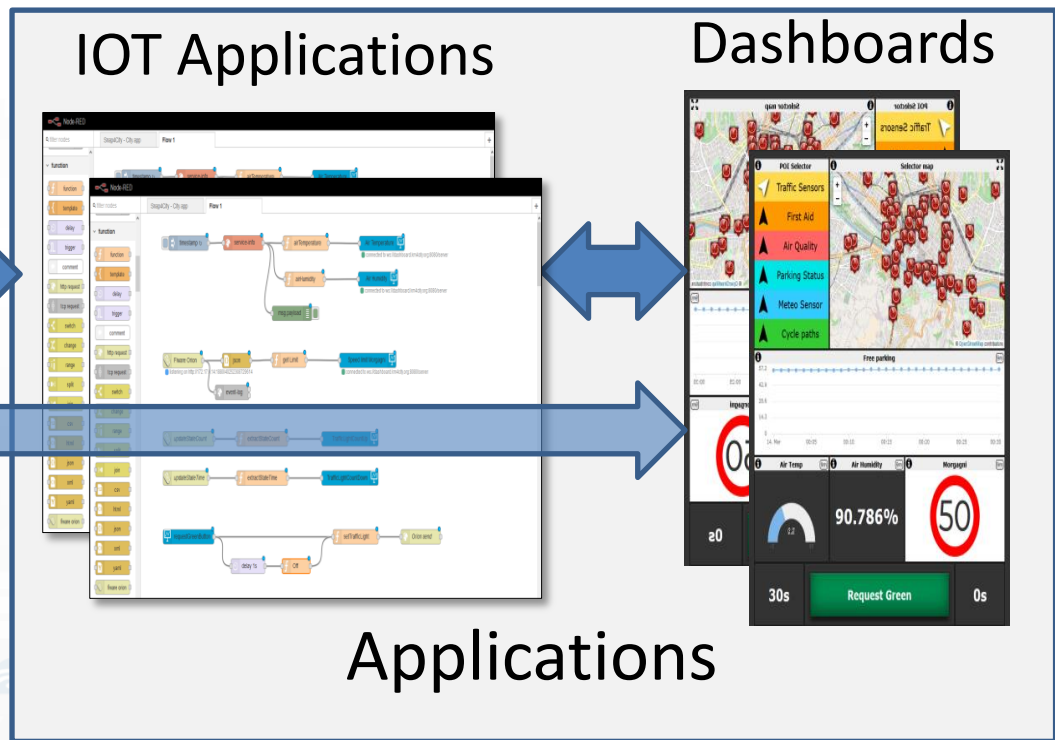
Dashboards with IOT Applications for enforcing data driven smart and intelligence into them

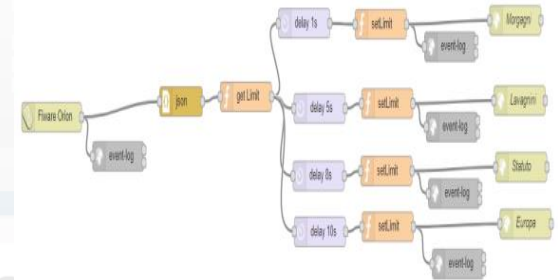
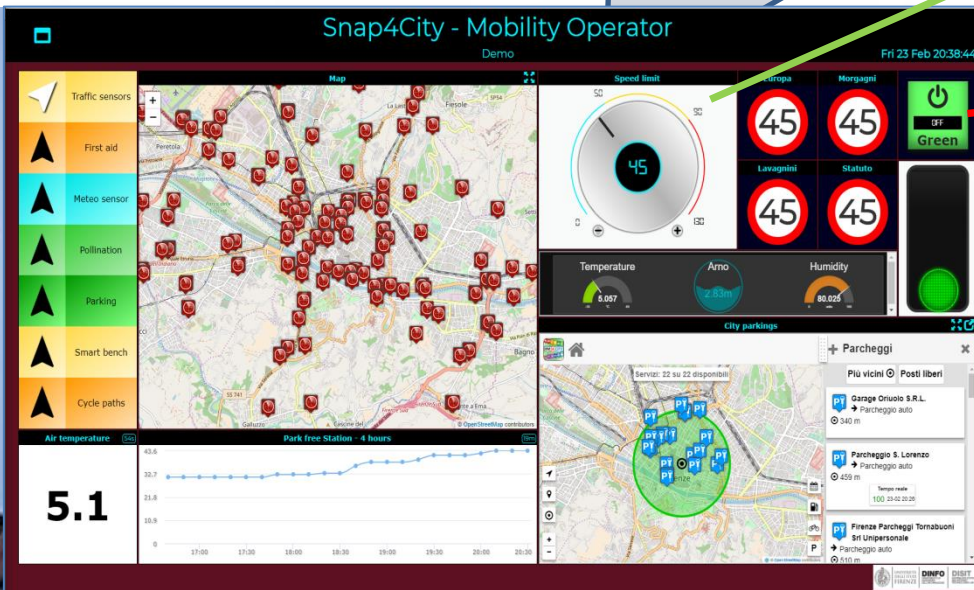
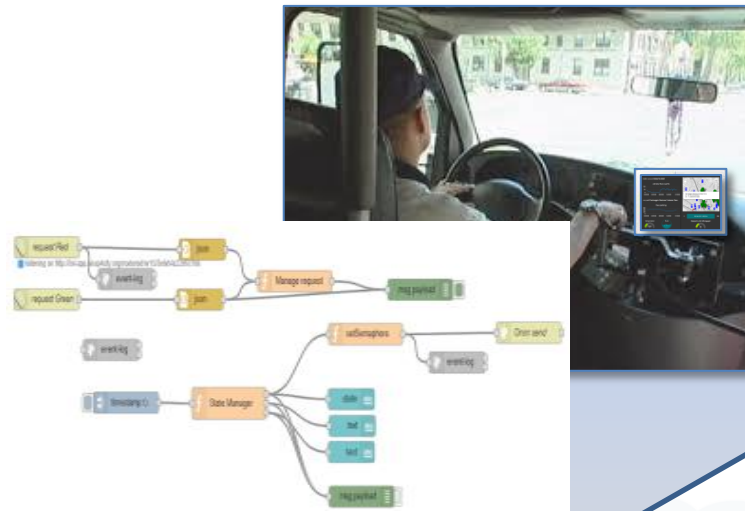
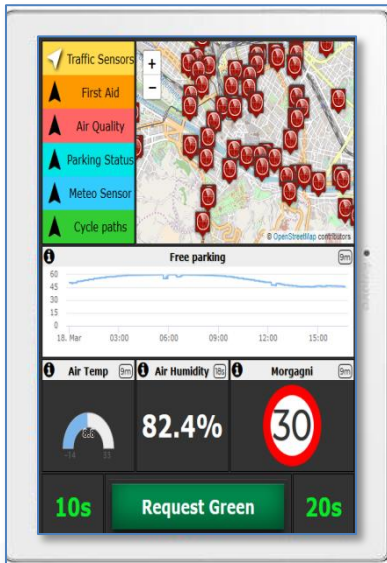
Dashboard-IOT App

IOT and City data World

IOT Applications

Dashboards





Mobile App

What do you want to do?

- Discover the City
- Points Of Interest
- Search
- Public transport
- Bus Ticket
- Car Park
- Events
- Suggestions Near You
- We Recommend
- Weather
- Assistant
- Navigator
- Favourites
- Chronology
- Latest Reviews
- Alert Civil Prot.
- Settings
- Vote APP!
- Information
- About Us

Choose Services

- Accommodation
- Advertising
- Agriculture And Livestock
- Civil And Edil Engineering
- Cultural Activity
- Education And Research
- Emergency
- Entertainment
- Environment
- Financial Service
- Government Office
- Health Care
- Industry And Manufacturing
- Mining And Quarrying
- Shopping And Service
- Tourism Service
- Transfer Service And Renting
- Utilities And Supply

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

ESERCITAZIONE MUGNONE 2016

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

Suggerimenti

Post

Piazza SS. Annunziata

Tipo: Squares

Distanza 1949 m

Indirizzo: Piazza SS. Annunziata

Piazza Santissima Annunziata

Tipo: Squares

Distanza 1949 m

Indirizzo: Piazza Santissima Annunziata

Cibo

Trattoria Gozzi

Tipo: Trattoria

Distanza 1975 m

Mostra Tutte le Categorie

DISPONIBILE SU Google play

Scarica da App Store

Scarica da Windows Store

QR CODE

NETFLIX

Microsoft Edge

Anteprima Sk...

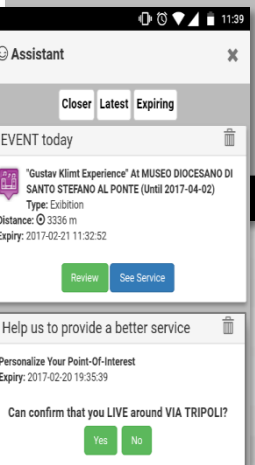
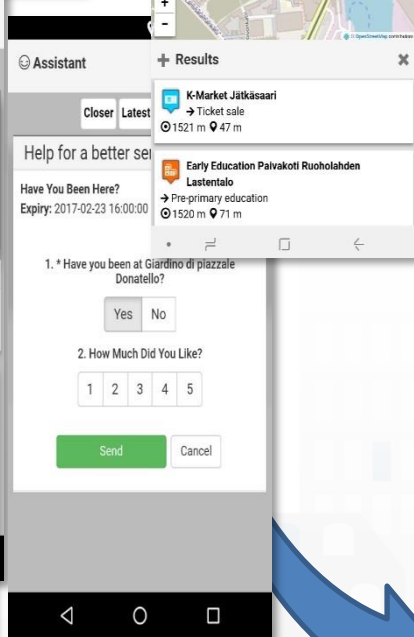
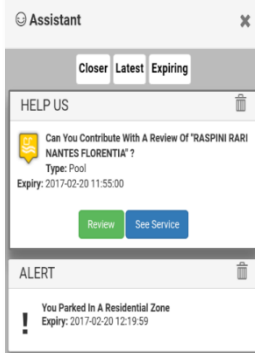
Tuneln Radio

Twitter

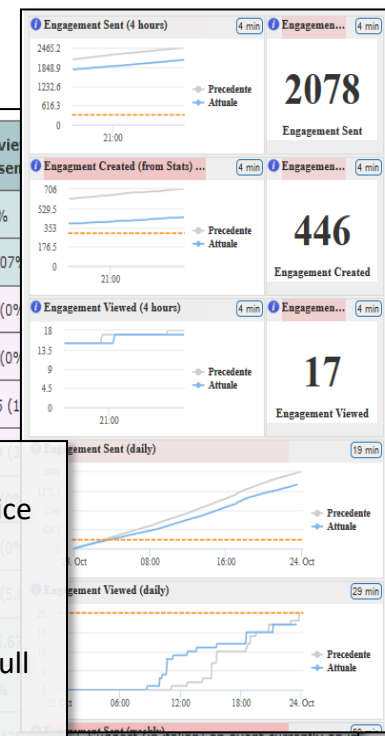
SODA

Sii-Mobility

Users' Engagement



Rule name	Type	#sent	#viewed	#viewed / #sent
daily_event_de	ENGAGEMENT	1 (0%)	0 (0%)	0%
daily_event_en	ENGAGEMENT	1720 (2.12%)	70 (7.1%)	4.07%
- commuter		5 (0.29%)	0 (0%)	0 (0%)
- student		14 (0.81%)	0 (0%)	0 (0%)
- tourist		1462 (85%)	25 (35.71%)	25 (17.1%)



Inform

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

Engage

Provide a comment, a score, etc.

Stimulate / recommend

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

Provide Bonus, rewards if needed

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

Rules

User context

City context

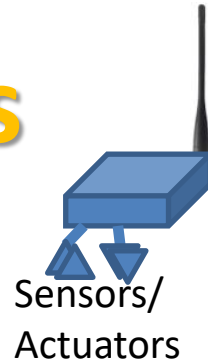
Interoperability



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

IOT Devices

IOT Edge Devices



SigFOX
Any and
Arduino

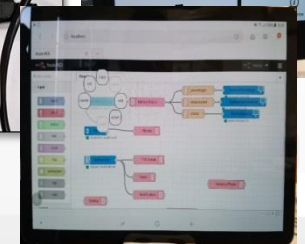
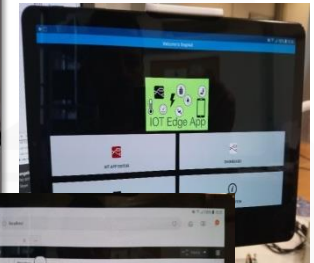
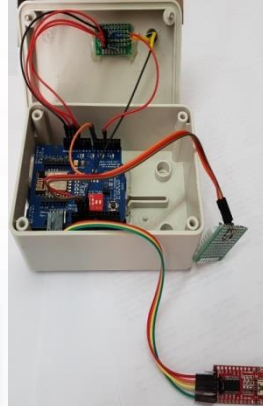
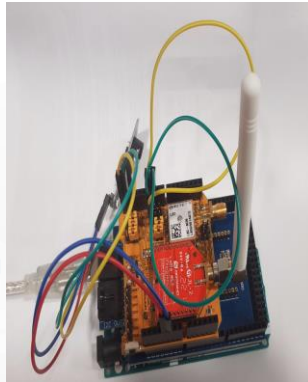
LoraWAN +
Arduino +
I2C, NGSI

Arduino,
Wi-Fi,
NGSI

Snap4All
IOT Button
ESP

IOT Edge
NodeRED:
Raspberry

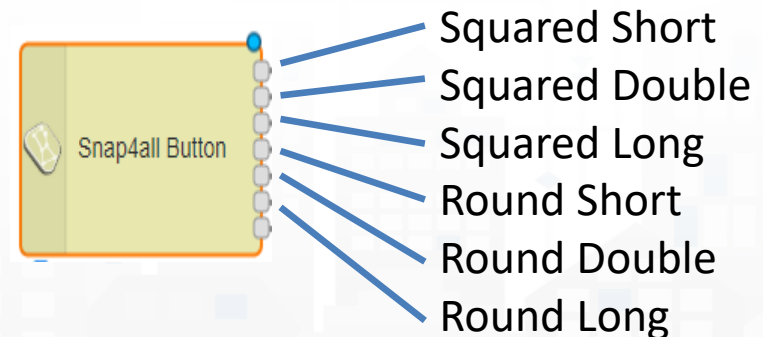
IOT Edge
NodeRED:
Android,
LINUX,
Windows



Snap4All IOT Button

- Multi Wi-Fi
- Ready to use BLE
- ESP based, cheap & easy
 - low/no energy consumption/ standby
- Mutual Authentication with certificates, or K1,K2,sha
- secure encrypted connection, **NGSI**
- Open Source, Fully Customizable
- HW extensible to sensors

version: 3

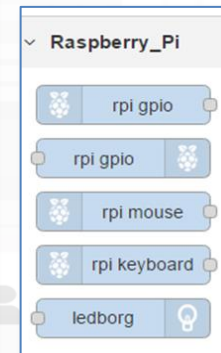
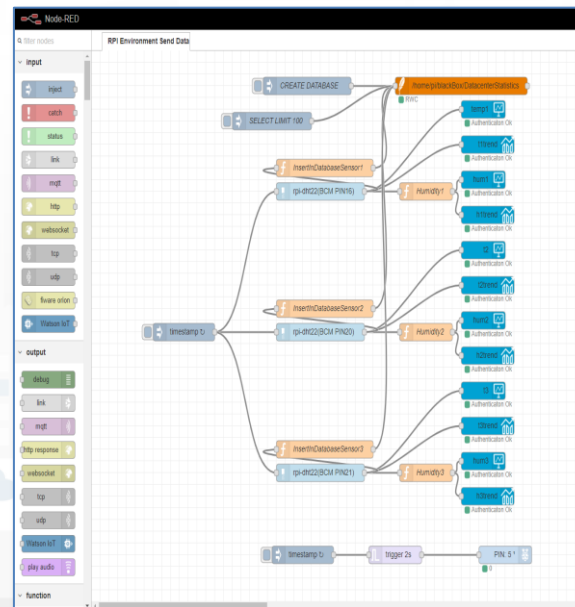
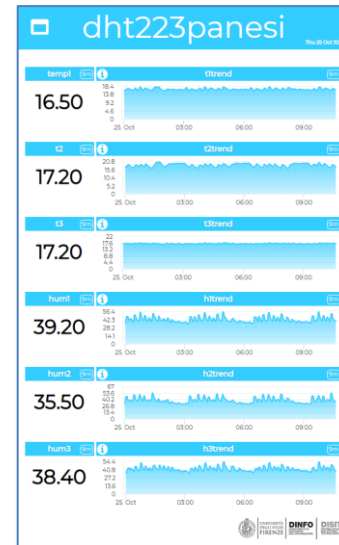


<https://www.snap4city.org/drupal/node/276>

<https://www.snap4city.org/drupal/node/297> help config

IOT Edge on Raspberry Pi

- Raspberry Pi
- Mutual Authentication with certificates
- Secure encrypted connection
- IOT Application inside
- Any sensor
- Any protocol from IOT devices
- **NGSI** or any other protocol
- Fully Customizable
- Local and Cloud Dashboard
- **Special MicroServices**



MicroServices:

- DHT
- ModBus
- any shield
- etc....

PaxCounter devices

- Fixed PaxCounter LoraWan
 - Based on Wi-Fi- Bluetooth
- Mobile PaxCounter LoraWan
 - Based on Wi-Fi- Bluetooth
- Fixed PaxCounter (LoraWan+Wifi out)
 - Based on Wi-Fi- Bluetooth



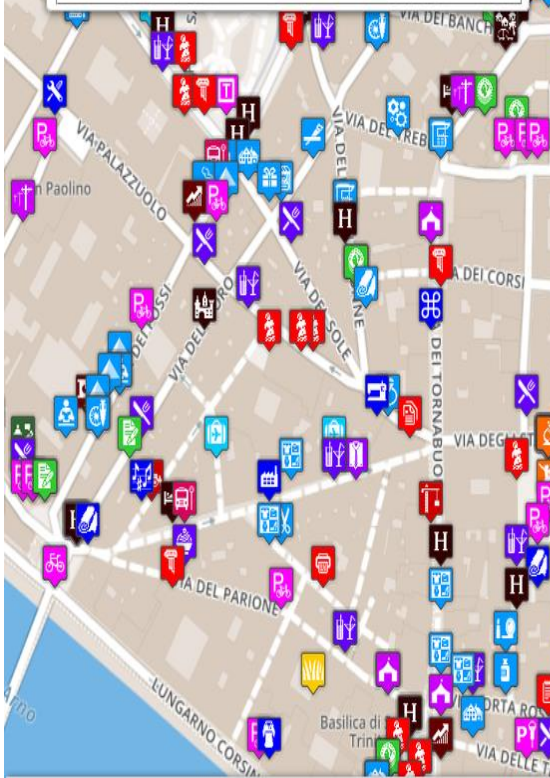
- Nascondi Menu

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](#)

- Nascondi Menu

What is enabling and providing smart services

- **Public Transportation and mobility**
 - Smart parking and Fuel pricing
 - Routing, multimodal routing
 - Traffic events and Resilience
 - Car and Bike Sharing, Cycling paths
 - Recharge stations for e-vehicles
 - Underpass status
 - Traffic Flow Sensors and reconstruction
 - Critical mobility and critical events
- **Social and Users Behaviour**
 - Smart: First Aid
 - search for POI and public transport srv.
 - Social Media Monitoring and acting
 - Entertainment Events
 - Origin Destination Matrices, trajectories
 - People Monitoring Assessment in the City
 - People Monitoring, via App
- **Weather and environment**
 - Weather forecast/condition
 - Air quality Pollution and Pollination
 - Heatmaps for weather and air quality
 - Air quality indexes, and forecast

All Point of Interests, cultural activities, IOT, ...
Over than 1.8 Million of complex events per day!

- Nascondi Menu

Servizi Regolari Servizi Trasversali

search text into service

Categorie Servizi

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

N. risultati: Nessun Limite

Raggio ricerca 100 metri

Risultati della ricerca

più di 4000 risultati, attivato clustering

Services 16858

Embed

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

- Nascondi Menu

Fermate Firenze Comuni in Toscana Ricerca Testuale

Seleziona una provincia:
FIRENZE

Seleziona un comune:
FIRENZE

Actual Selection
COMUNE di FIRENZE

**Tuscany
Florence
, Pisa....**

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

Info on: points, paths, areas, etc.

Services (20 cat, 512 cat.)

16 Public Transport Operators

21.280 Bus stops & 1081 bus lines

Dynamic/real-time as in Tuscany Region

- Real time bus lines: 144 updates X day X line
- 1081 Transport Pub Lines: 1-2 up per day, time-path
- >210 parking lots status: 76 updates X day X sensor
- >796 traffic Sensors: 288 updates X day X sensor
- 285 weather area: 2 updates X day X area
- >12 hospital Triage status: 96 updates X day X FA
- 562 Environmental data: 20 updates X day X sensor
- 39 Bike Sharing racks data: Pisa and Siena
- 12 Pollination data, 37 air quality data
- 177 recharging stations
- Smart benches, waste mng, irrigators, lighting, ...
- Florence ent.events: about 60 new events X day
- Different kinds of Florence traffic events,
- [1600 Fuel stations: 1 update X day X station]
- Wi-Fi: > 400.000 measures X day
- App mobiles: >50.000 measures X day
- more than 40.000 distinct users X day
- From 600.000 to 4.5 M Tweets X day
- + many IOT sensors personal and industrial ...

- Nascondi Menu

Servizi Regolari Servizi Trasversali

search text into service

Categorie Servizi

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

N. risultati: Nessun Limite ▾

Raggio ricerca 100 metri ▾

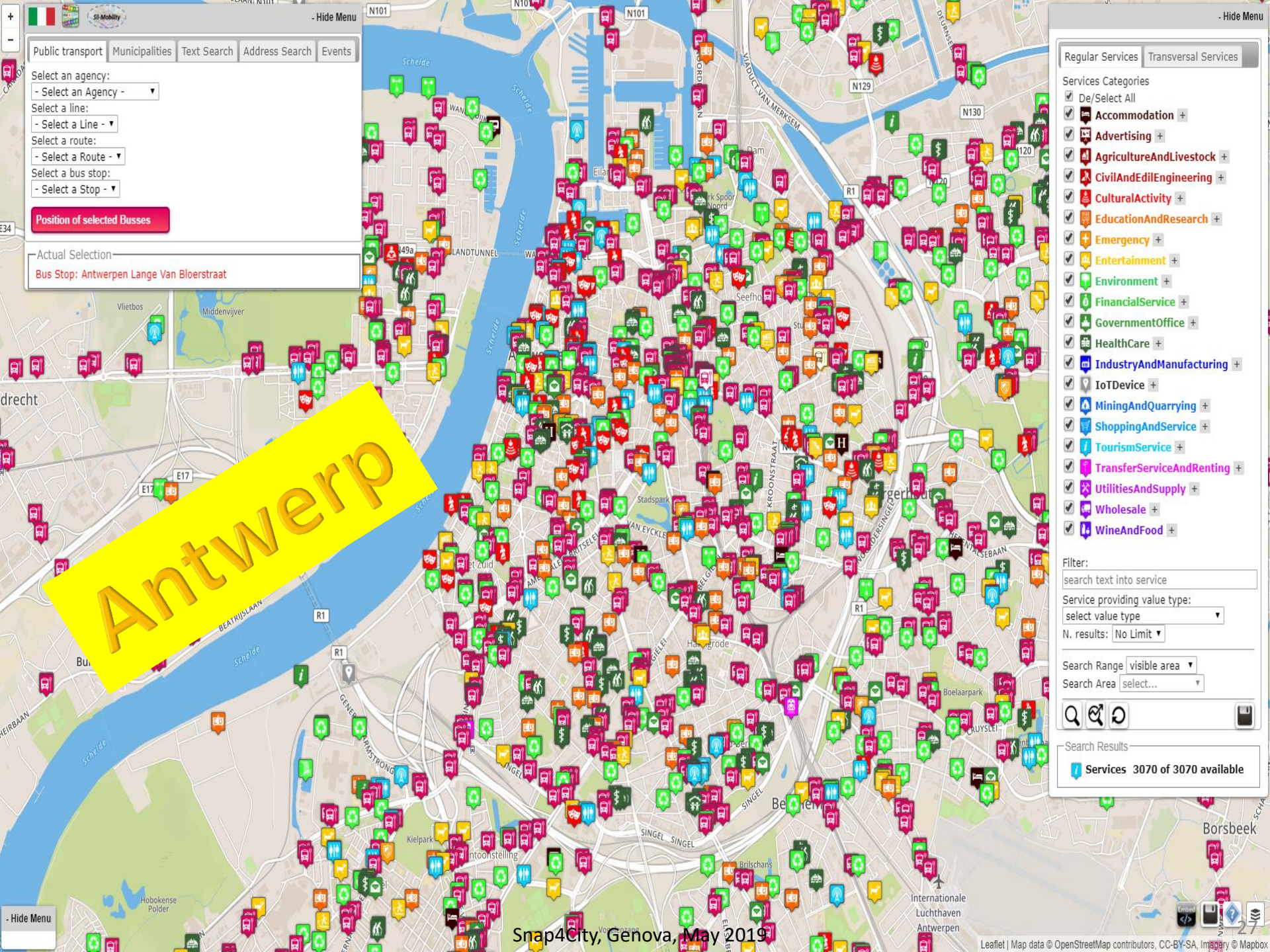
Risultati della ricerca

più di 4000 risultati, attivato clustering

Services 16858

Embed

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



Public transport Municipalities Text Search Address Search Events

Select an agency:
- Select an Agency -

Select a line:
- Select a Line -

Select a route:
- Select a Route -

Select a bus stop:
- Select a Stop -

Position of selected Busses

Actual Selection
Bus Stop: Antwerpen Lange Van Bloerstraat

Antwerp

Regular Services Transversal Services

Services Categories

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

Filter:
search text into service

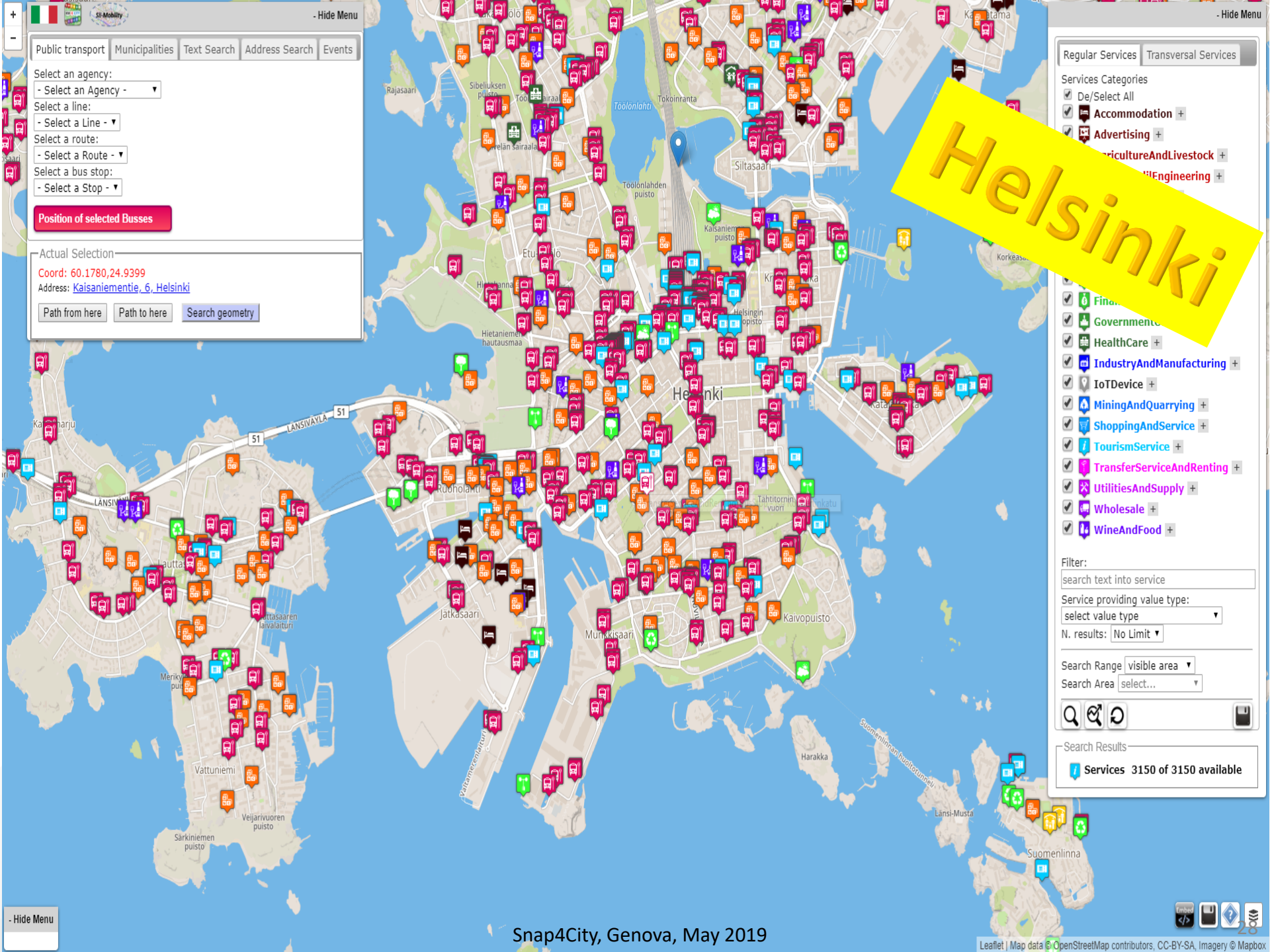
Service providing value type:
select value type

N. results: No Limit

Search Range visible area

Search Area select...

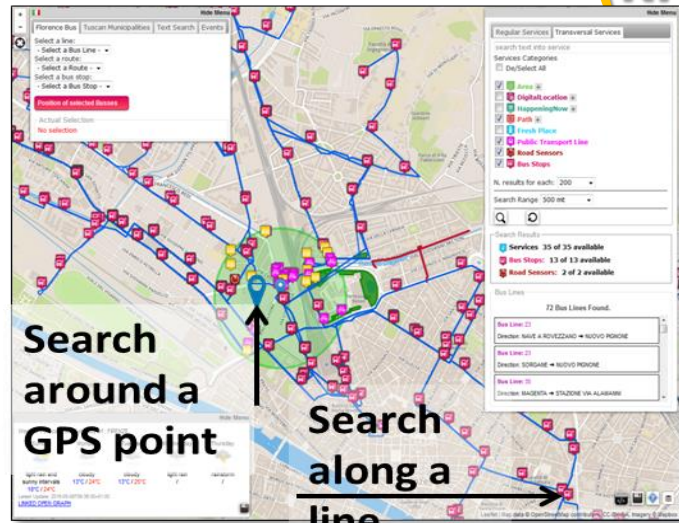
Search Results
Services 3070 of 3070 available



Helsinki

ServiceMap Dev Tool

(knowledge & Map tool)

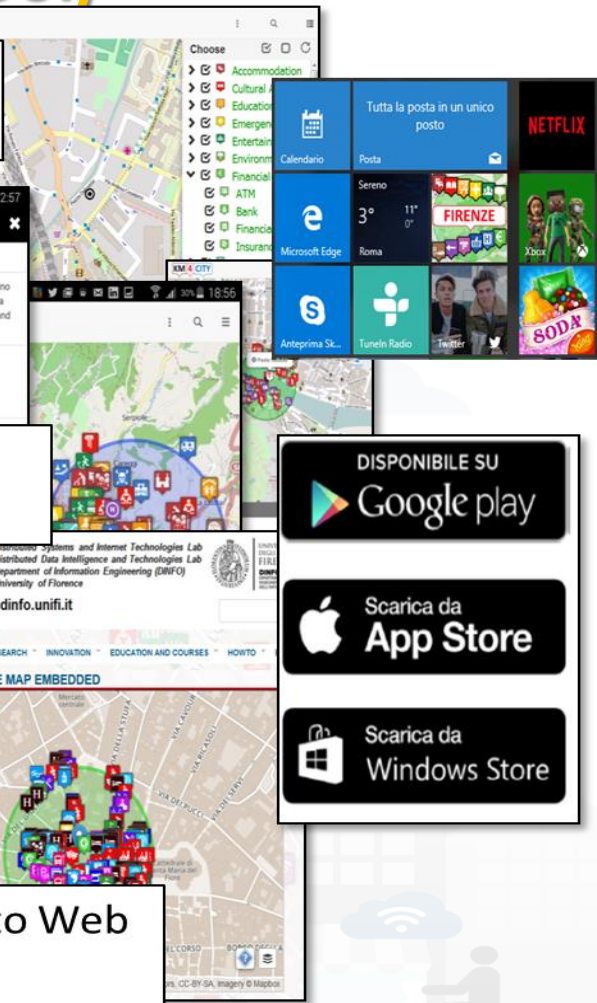


Smart City API call generation

Web App
HTML5

Mobile
Apps

Embed into Web
pages




Advanced SmartCity API

Swagger

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

The screenshot displays the Swagger UI for the Advanced Smart City API. The left sidebar lists various application areas such as Dashboards, My Dashboards, Notifications, IoT Applications, and IoT Directory and Devices. The main content area shows the API title and a list of services. The 'Service search near a GPS position' endpoint is highlighted, with its description and parameters visible.

Snap4City



roottooladmin1
RootAdmin | ldap

Dashboards

My Dashboards

Notifier

IOT Applications

My Personal Data

IOT Directory and Devices

Knowledge and Maps

Micro Applications

External Services

Data Set Manager: Data Gate

Resource Manager: Process Loader

Development Tools

Management

Settings

User Management and Auditing

Help and Contacts

Documentation and Articles

My Profile

Snap4City portal

Km4City portal

DISIT Lab portal

nr1

Node-RED

flow1

Flow 1

world map

point

service-search-near-marker

show micro web app

transform results

world map

event-log

timestamp

service-info

vehicleFlow

veh

worldma

switch

ser

timestamp

last temperature

Dashboard

value

temperature

Temperature

timestamp

last temperature

Dashboard

value

temperature

Temperature

input

inject

catch

status

link

mqtt

http

websocket

tcp

udp

amqp

amqp2

output

debug

link

mqtt

http response

websocket

tcp

udp

amqp

amqp2

info

debug

dashb

Flow

Name

flow1

ID

"491...1.b297"

Status

enabled

Node-RED

Node-RED

Node-RED

Node-RED

Event Driven, real time data ingestion

Snap4City, Genova, May 2019

31

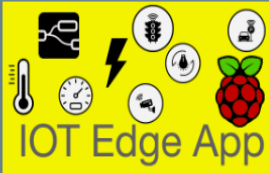
Snap4City

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

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

IOT Applications

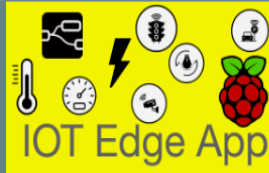
2018-09-14T04:44


IOT Edge App

owner: badii

Management

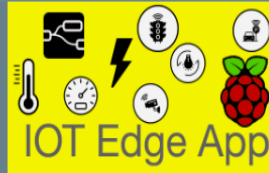
2018-09-21T03:19


IOT Edge App

owner: panesi

Management

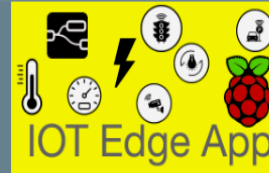
2018-10-19T16:07


IOT Edge App

owner: pb3

Management

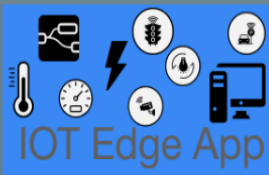
2018-10-19T17:17


IOT Edge App

owner: pb3

Management

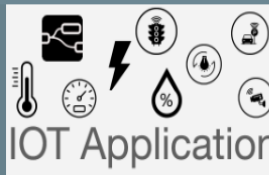
2018-10-22T11:57


IOT Edge App

owner: semolarudy

Management

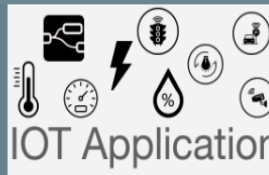
application


IOT Application

owner: tester5

Management

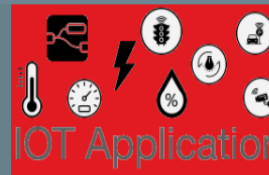
Bib APP


IOT Application

owner: semolarudy

Management

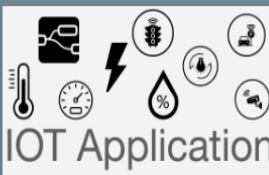
ChargingStations


IOT Application

owner: comunedashres

Management

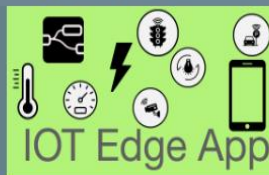
Deprecated - SiiMobilityControlRoom


IOT Application

owner: badii

Management

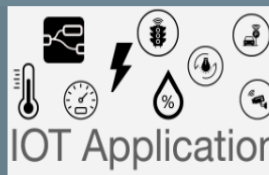
SamsungGalaxyS4BarCode


IOT Edge App

owner: badii

Management

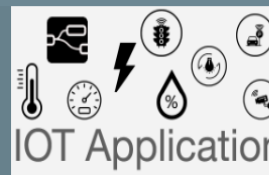
esercitazione


IOT Application

owner: tester2

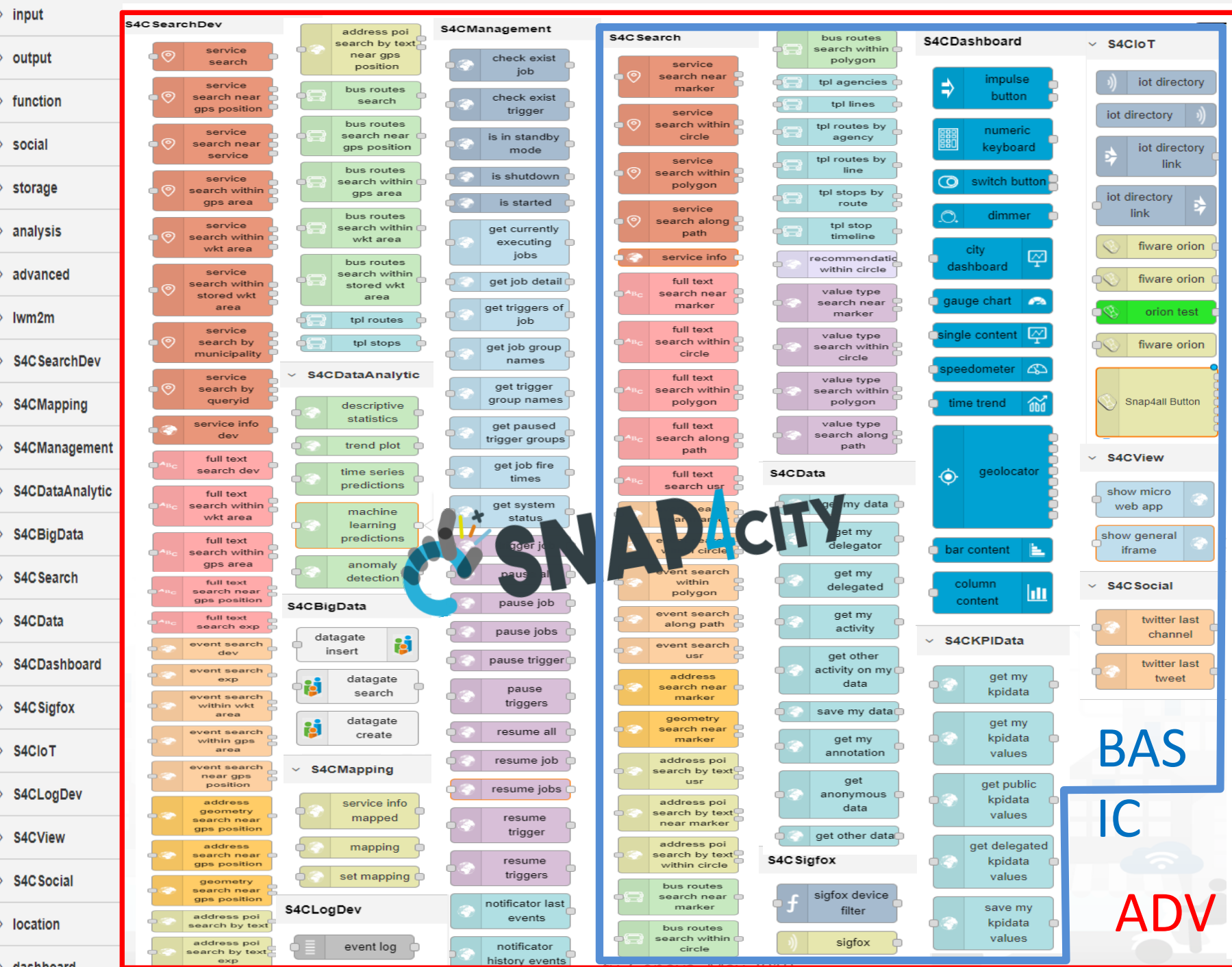
Management

lot-App


IOT Application

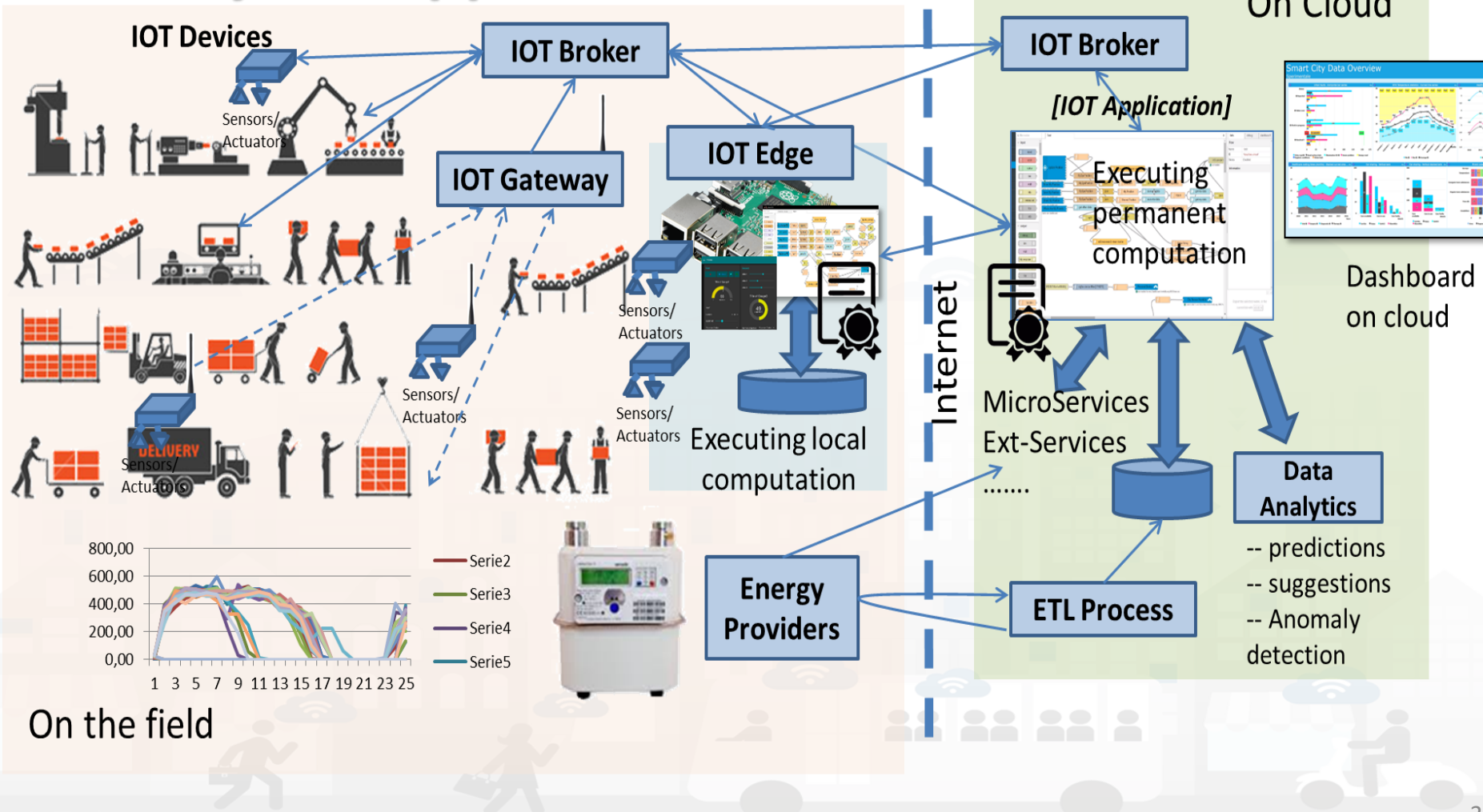
owner: tester14

Management



<https://flows.nodered.org/?term=snap4city>

Industry 4.0 Application



SNAP4CITY LIVING LAB FOR COLLABORATIVE WORK

FROM CITY
DASHBOARD TO
APPLICATIONS

FORGING &
MANAGING OPEN
AND FLEXIBLE WEB
AND MOBILE APPS

IOT APPLICATIONS
VS KNOWLEDGE
DEFENSE

IOT/IOE DEVICES
AND SENSORS

IOT APPLICATIONS,
THE LOGIC AND
THE SMARTNESS

ADVANCED
SMART CITY API,
MICROSERVICES,
SNAP4CITY API

SNAP4CITY
LIVING LAB FOR
COLLABORATIVE
WORK

SNAP4CITY FOR
BEGINNERS

SNAP4CITY
ARCHITECTURE AND
ECOSYSTEM, OPENED
TO DEVELOPERS
AND STAKEHOLDERS

DATA ANALYTICS,
BUSINESS
INTELLIGENCE,
WHAT'S HOT
AND TRENDING

TWITTER
VIGILANCE, SOCIAL
MEDIA ANALYSIS

HOW TO ADOPT
SNAP4CITY, AND
SOCIAL MEDIA

SNAP4CITY
AND KM4CITY
PROJECTS

SNAP4CITY THE
VIEW OF THE
ADMINISTRATORS

User: adifino, Org: DISIT
Role: Manager, Level: 4

Home / Tutorials and Videos / Welcome: how to start using Snap4City for beginners

Username: adifino

Welcome: how to start using Snap4City for beginners

Snap4City developers suggest you reading:

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

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

See this to use some of the new functionalities:

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

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

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

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

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

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

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

Your Level

Personalized Suggestions

Full Search

Search

Search

Organization Groups

DISIT

Cooperativo

Recent comments

• 1 month 6 days ago

Recent content

Ti Suggeriamo: come registrare la tua prima Dashboard (Step 1) [new](#)
roottooladmin1

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

We suggest to Antwerp Developers: How to manage my Dashboards

All Tools

SLIDES

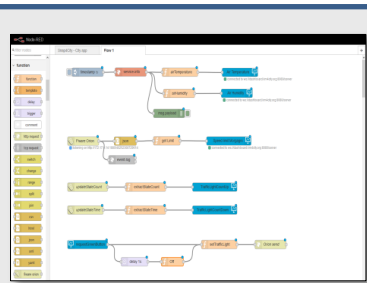
VIDEO

Flyer

News

Art.

Dashboard Development

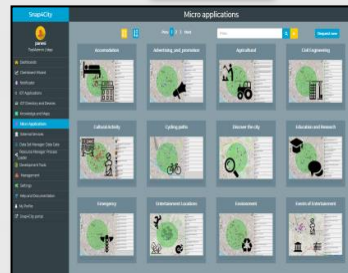


IOT Applications

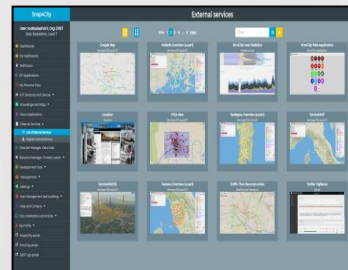


Knowledge and Storage
Data from the Field and
City

Widget Collection

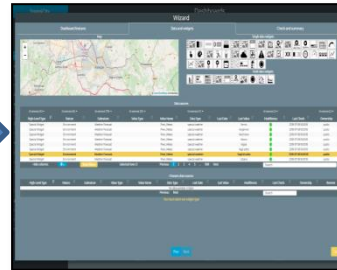


MicroApplications

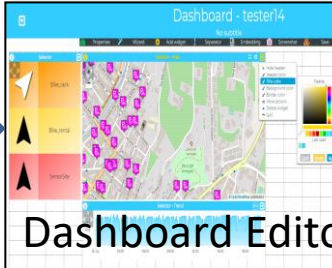


External Services

Dashboard Wizard



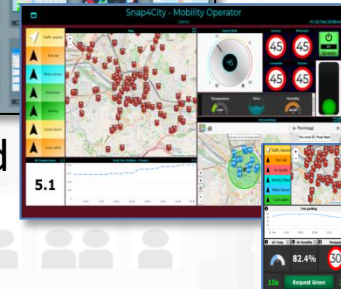
Create, save,
load, delegate,
grant access



Dashboard Editor



Dashboard
Collection



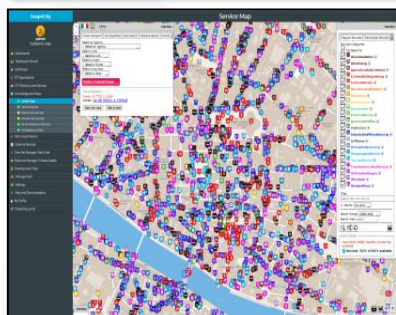
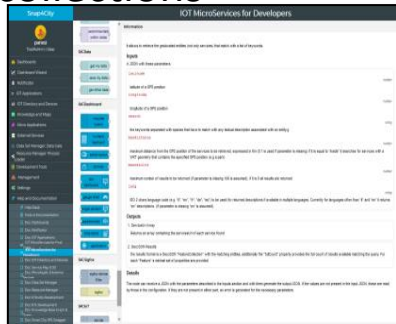
My Own Dash/App



IOT Applications Development

IOT Discovering

MicroServices
collections



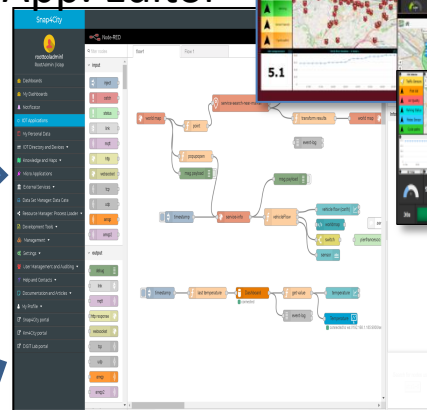
ServiceMap Discovery
Knowledge Base,
Km4City

My IOT
Applications

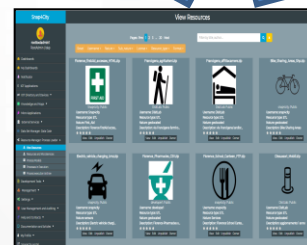


Dashboard
Collection, Editor
and Wizard

IOT App. Editor



Sharing/saving
reusing IOT App

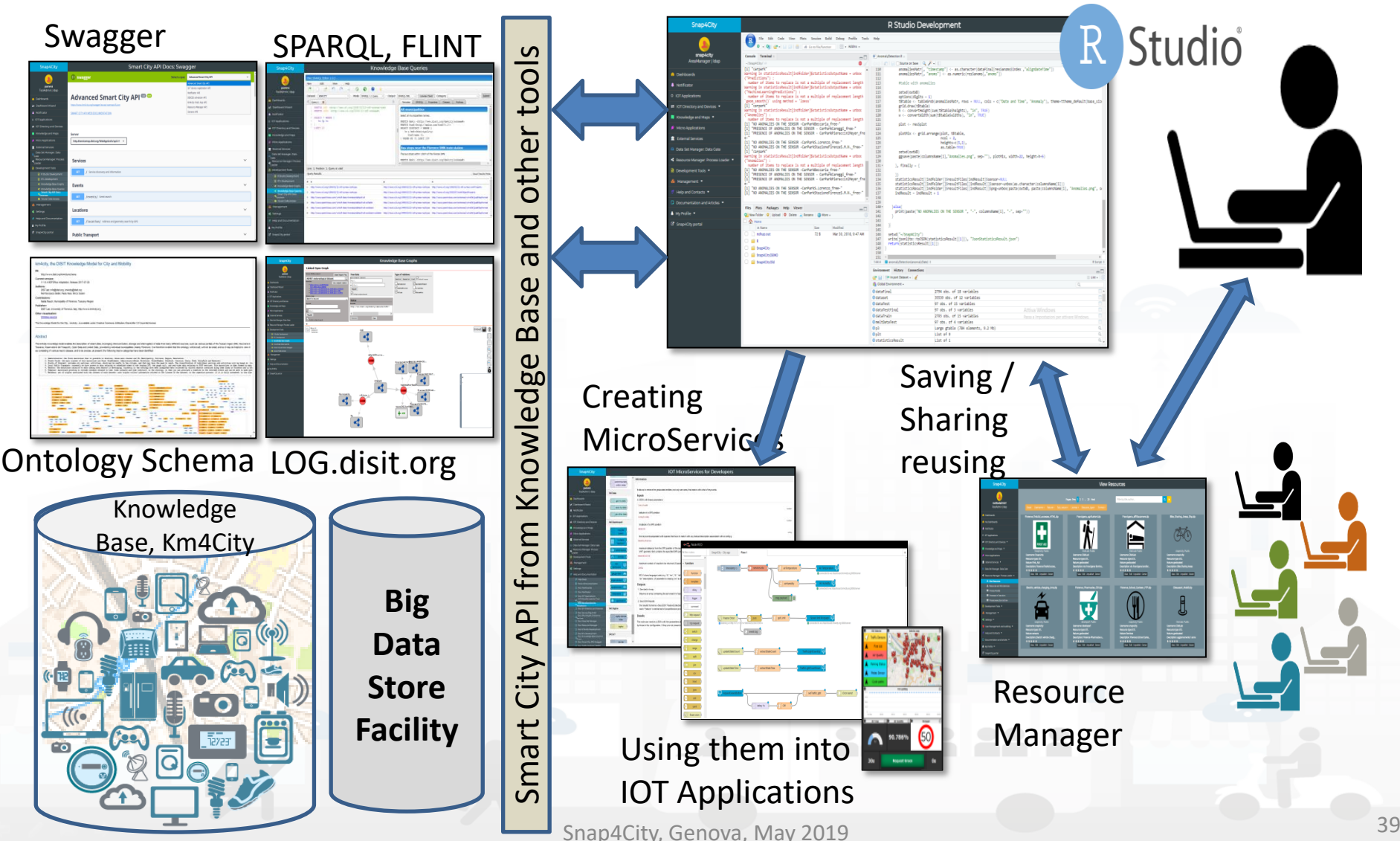


Resource
Manager

Generating
IOT App
With Dashboard



Data Analytics Dev. in R Studio and/or Tensor Flow



Data Analytics

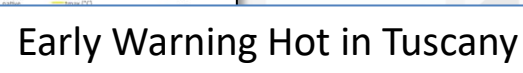
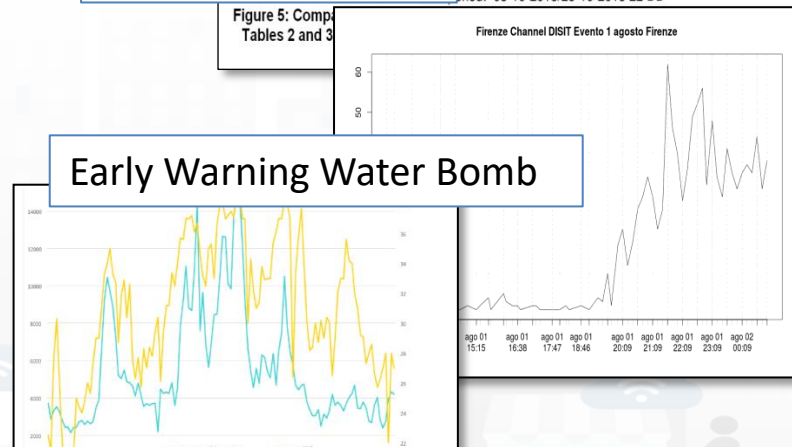
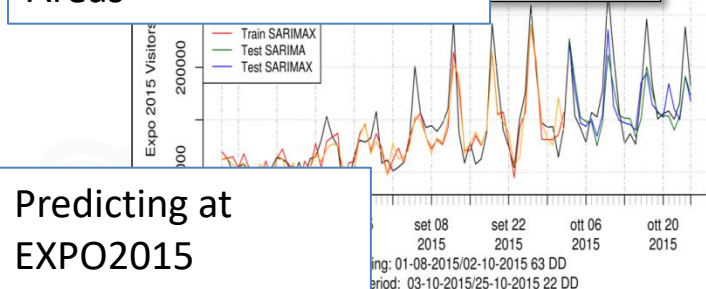
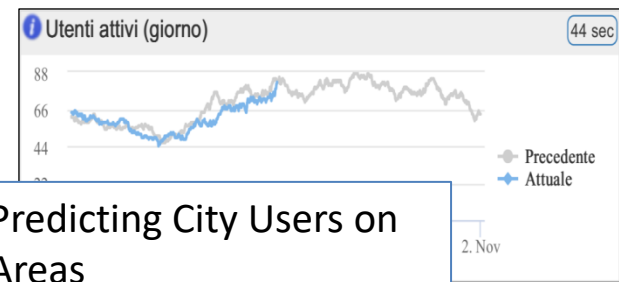


ARC

INDEX

Predictions, Anomaly Detections, Analytics for Administrators & City Users

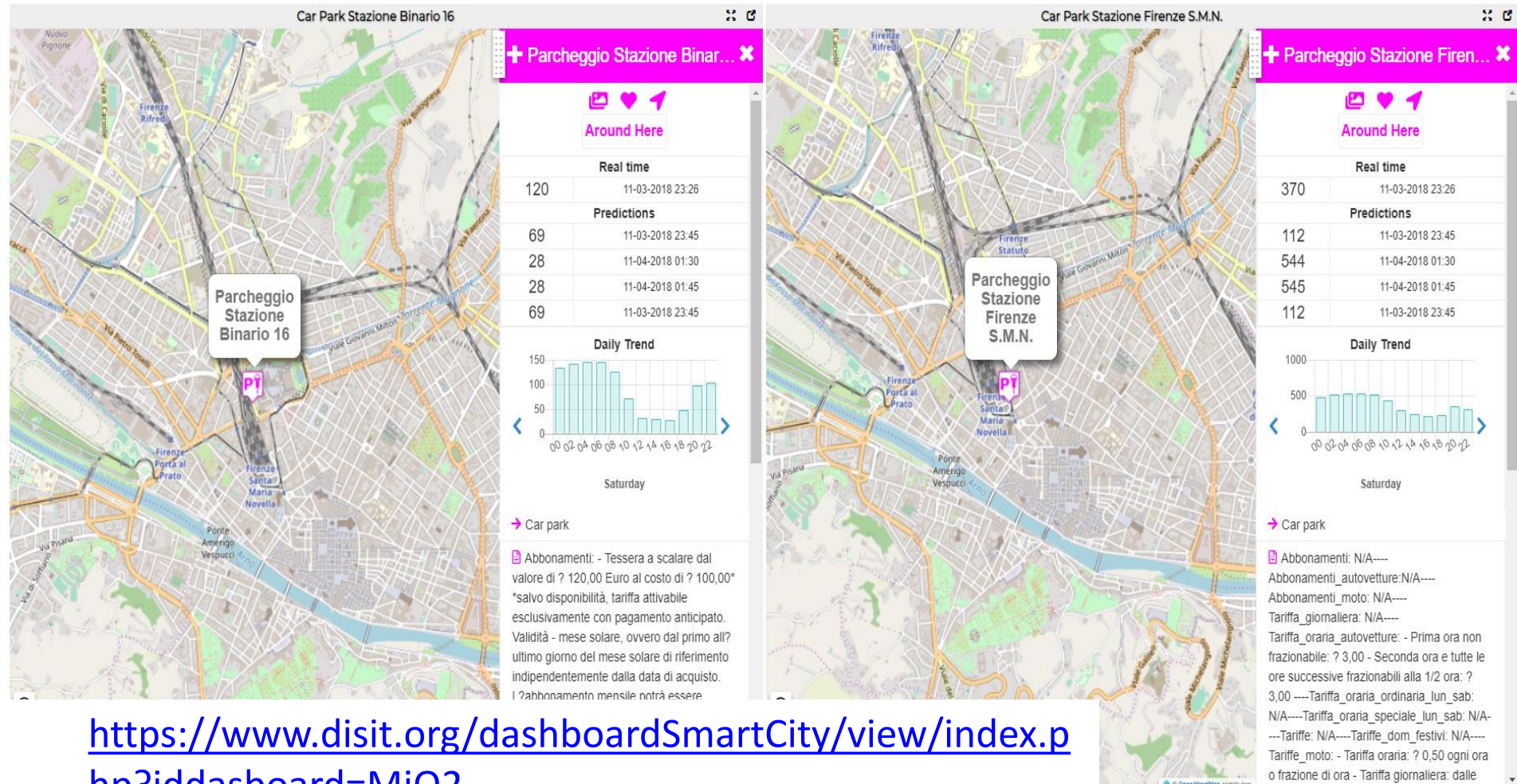
- **Aiming at improving**
 - quality of service, distributing workload
 - early warning
- **Data Analytics: ML, NLP/SA, Clust., ...**
 - Traffic Flows → multi-flow reconstruction
 - Environmental alarms
 - Parking Status → free slots
 - People Flows (Wi-Fi, Twitter) → crowd, #number of people





Monitoring Station for Parking

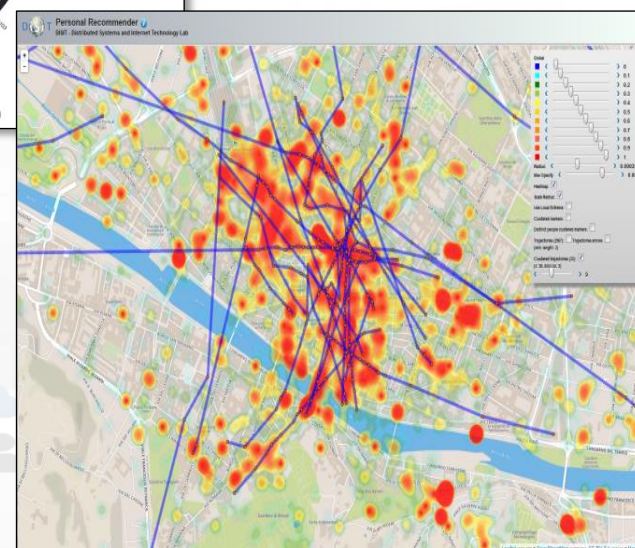
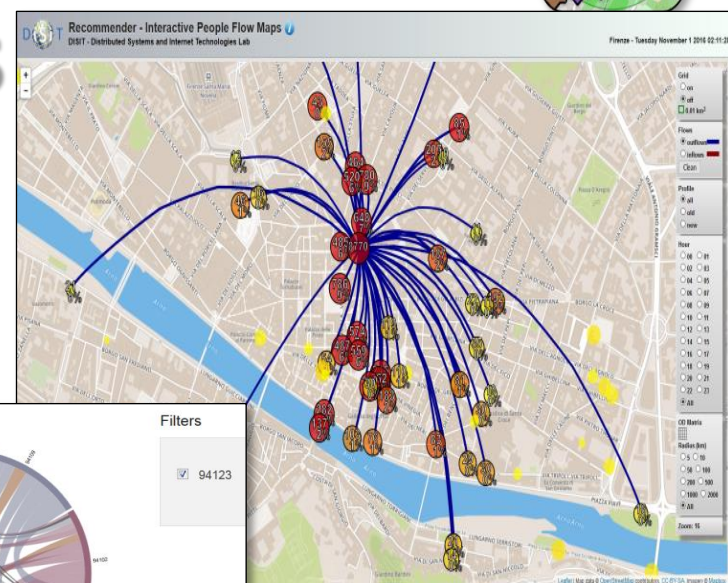
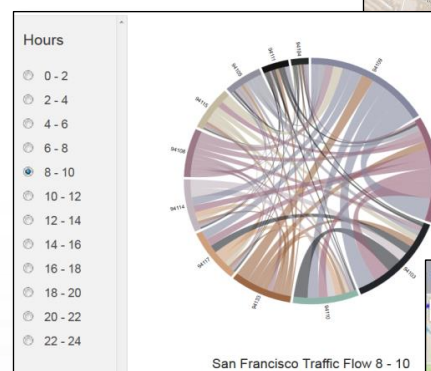
Sat 3 Nov 23:39:55



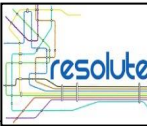
<https://www.disit.org/dashboardSmartCity/view/index.php?iddasboard=MjQ2>

User Behaviour Analysis

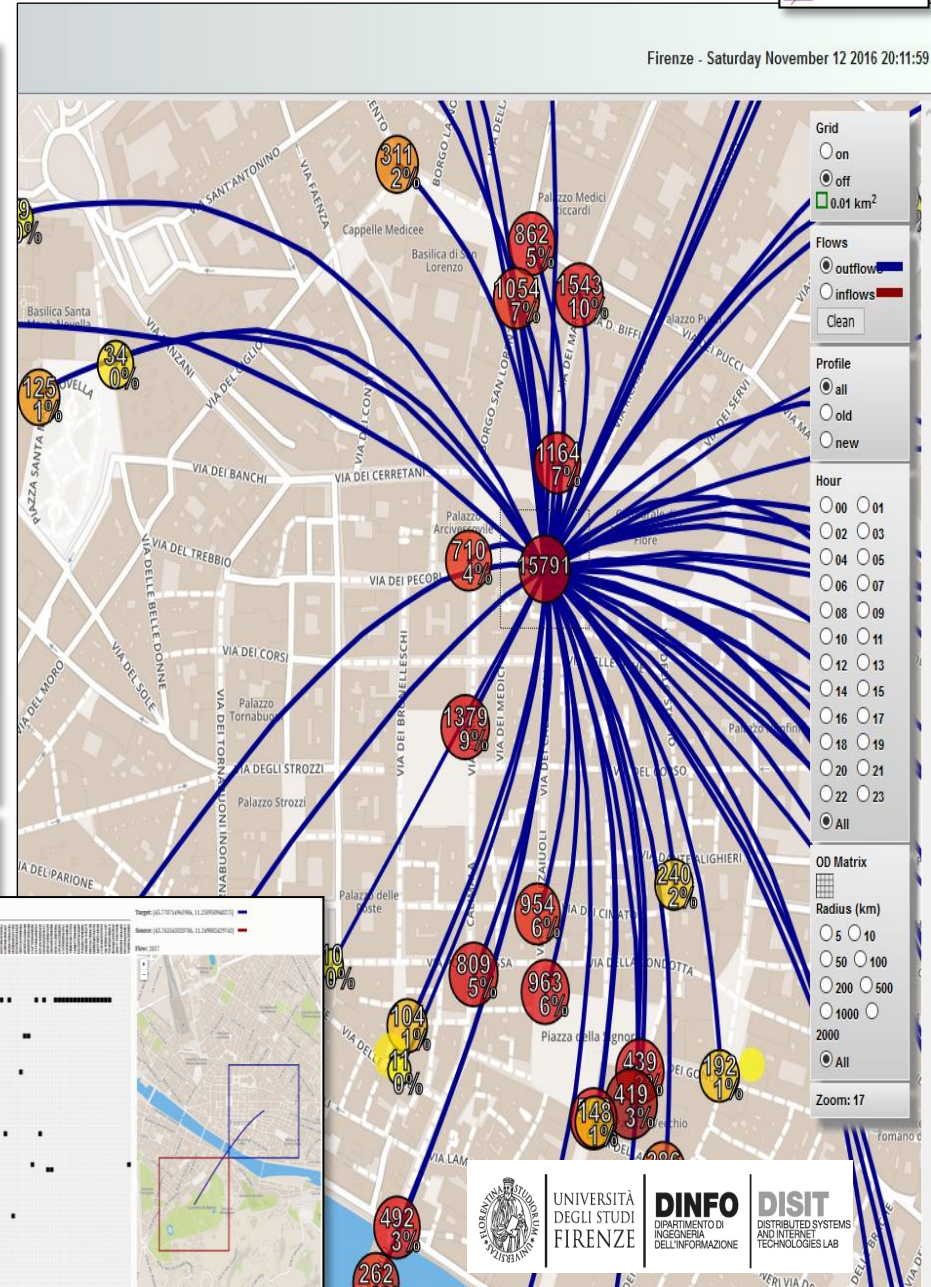
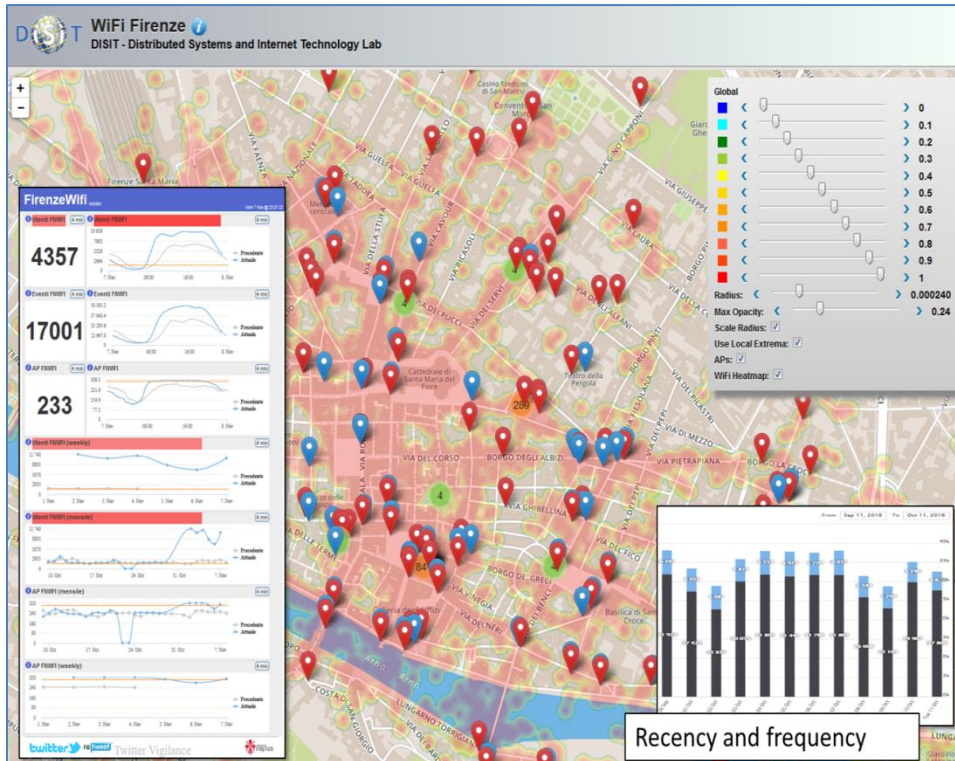
- **Monitoring movements by traffic flow sensors**
 - Spires and virtual spires
- **Monitoring movements from Mobile Cells**
 - Unsuitable for precise tracking and OD production
- **Monitoring movements from Wi-Fi**
- **Monitoring movements and much more from mobile Apps**



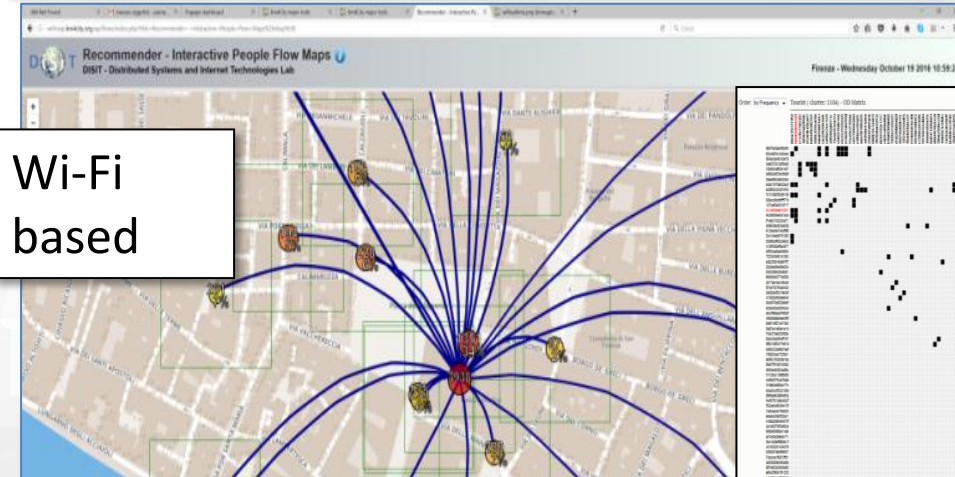
Origin Destination Matrix Estimation



Firenze - Saturday November 12 2016 20:11:59

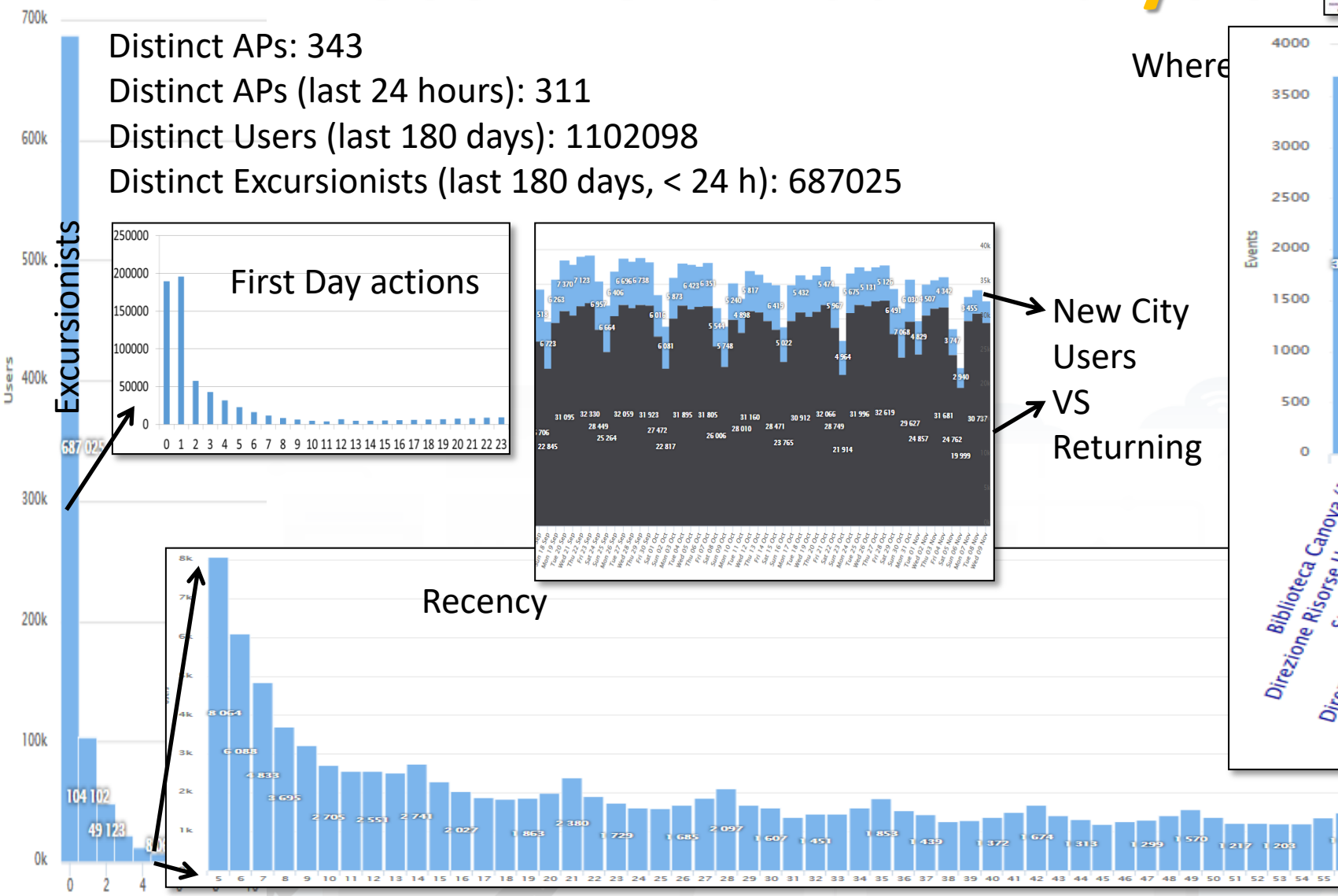


Wi-Fi
based



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

Where



Characterizing City Areas

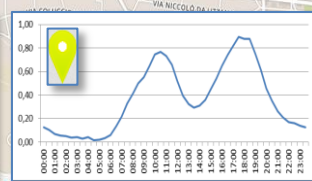
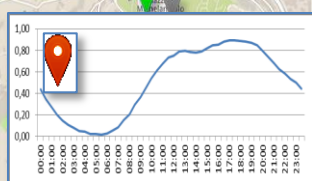
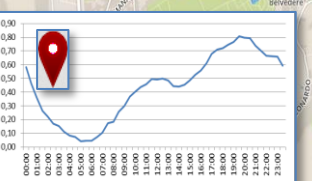
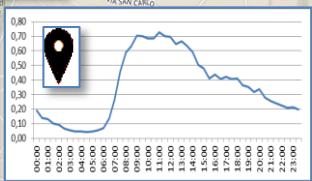
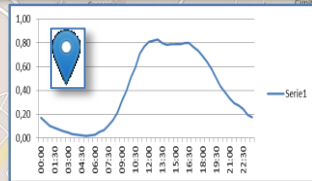
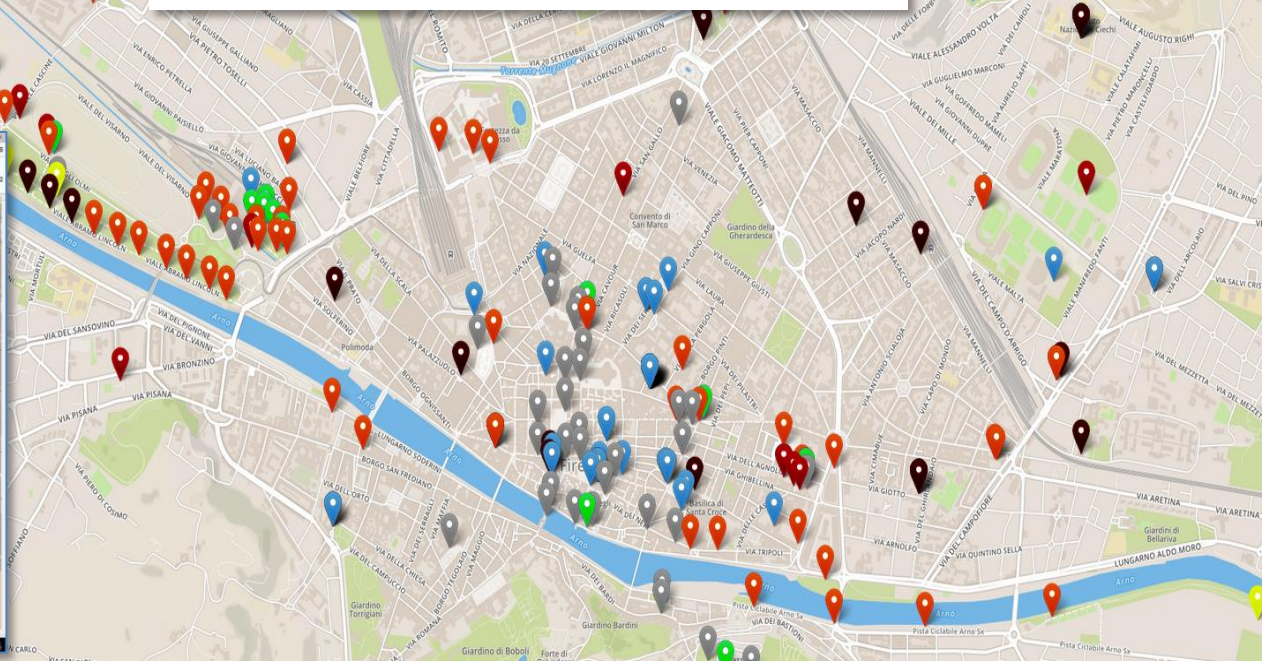
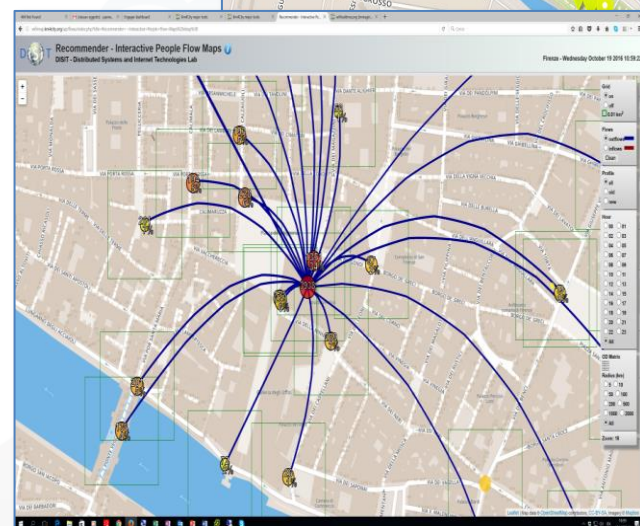
Wi-Fi
based

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

Predicting City Areas Crowd
level
characterizing Users'
Behaviors

Firenze - Saturday November 12 2016 19:16:33

Global
Radius: < 0.0008 >
Max Opacity: < 0.80 >
Scale Radius: ☒
Use Local Extrema: ☐
APs: ☒ APs (saturday): ☐ APs (sunday): ☐
WiFi Heatmap: ☐

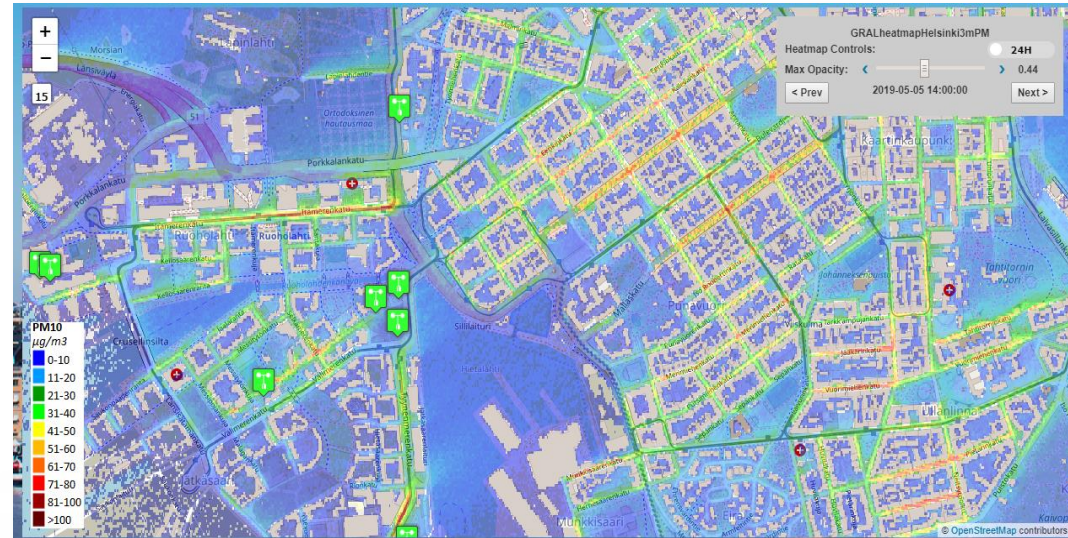


Thu 1 Nov 14:15:47



Data Analytics: GRAL predictions


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





R Studio integrated environment for Data Analytics

Snap4City


roottooladmin1
RootAdmin | Idap

Dashboards

My Dashboards

Notifier

IOT Applications

My Personal Data

IOT Directory and Devices

Knowledge and Maps

Micro Applications

External Services

Data Set Manager: Data Gate

Resource Manager: Process Loader

Development Tools

R Studio Development

ETL Development

Knowledge Base Graphs

Knowledge Base Queries

Smart City API Docs: Swagger

Internal API Docs: Swagger

Testing API by Postman

Source Code Access

Management

Settings

User Management and Auditing

R Studio Development

File Edit Code View Plots Session Build Debug Profile Tools Help

Go to file/function Addins

Project: (None)

Console

Terminal

Files

Plots

Packages

Help

Viewer

RunRestApi.R

00Index.html

INDEX

1 setwd("~/Snap4City/Snap4CityStatistics")

2 source("~/Snap4City/Snap4CityStatistics/Stat4CityFunctions.R")

3 api <- plumber::plumber("Stat4CityFunctions.R")

4 api\$run(host = "0.0.0.0", port=8080)

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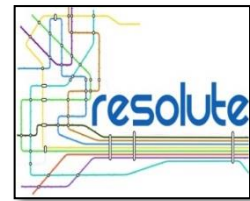
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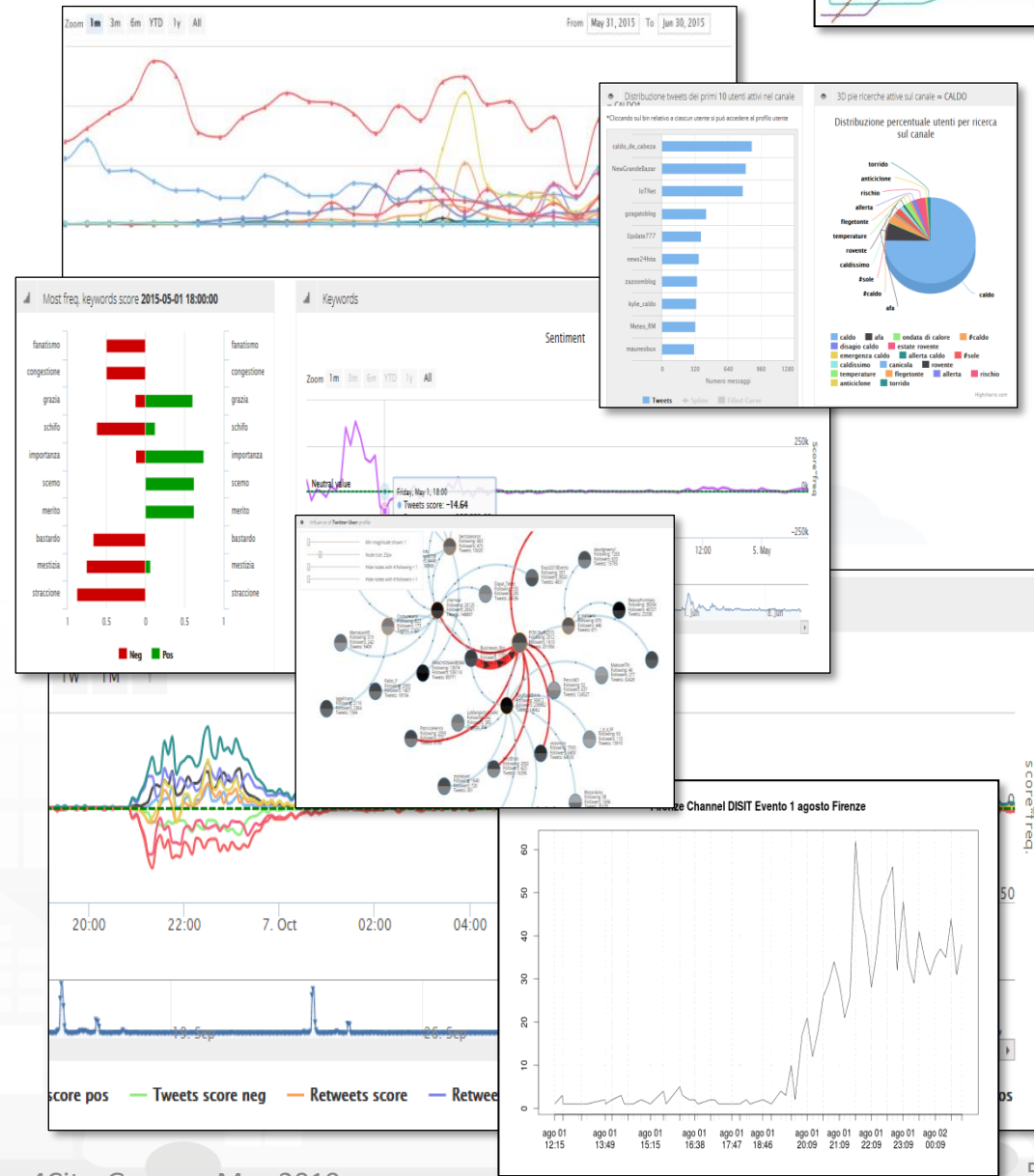
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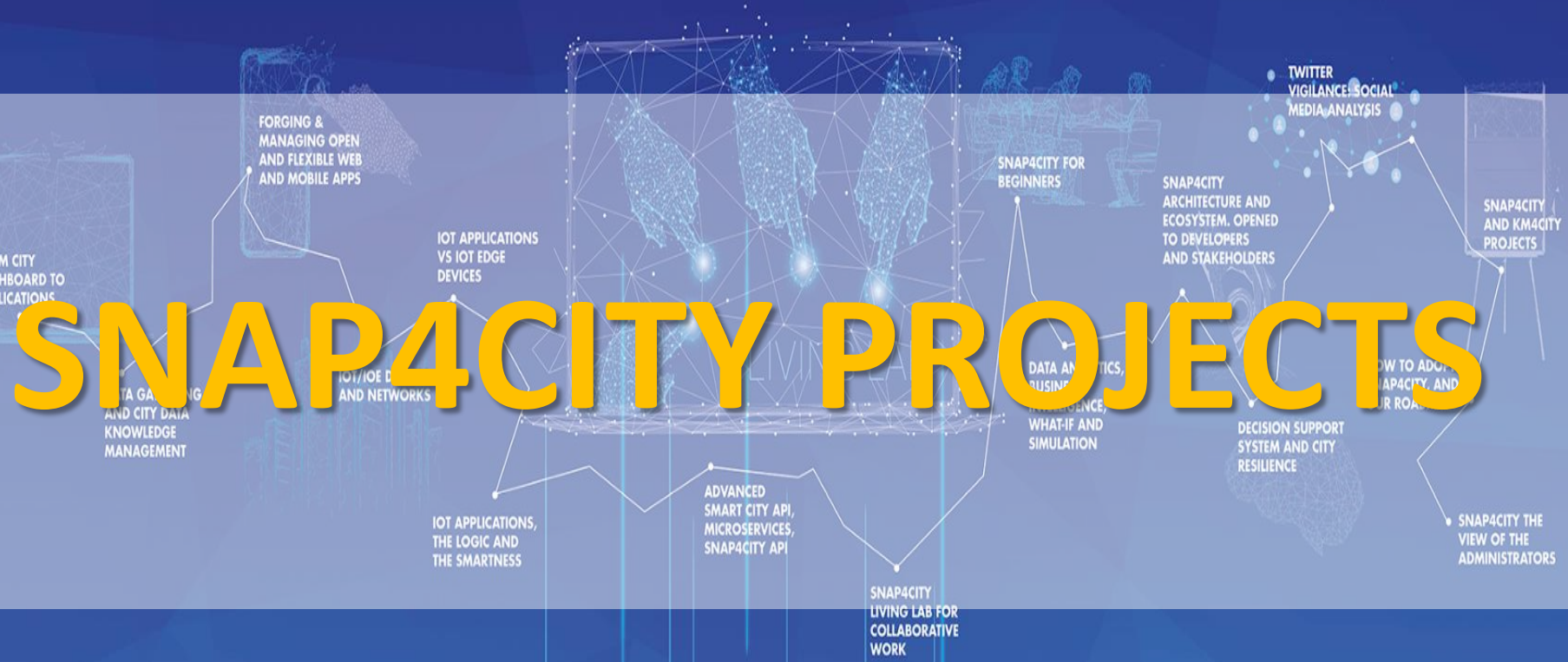
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- <http://www.disit.org/tv>
- <http://www.disit.org/rttv>
- Citizens as sensors to
 - Assess sentiment on services, events, ...
 - Response of consumers wrt, ...
 - Early detection of critical conditions
 - Information channel
 - Opinion leaders
 -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





Main projects

Projects

SELECT
for Cities



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

Green Impact



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FIRENZE

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INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB