UNIVERSITÀ DEGLI STUDI FIRENZE
DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE
DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

https://www.disit.org/
Paolo Nesi, paolo.nesi@unifi.it

Sistemi Distribuiti

https://www.snap4City.org https://www.Km4City.org

Parte: 0

Agenda

- Modello del corso
- Laboratorio DISIT
- Infrastruttura e servizi
- Progetti in corso e attività correlate
- Visione generale del corso

Modello del Corso

- Tipicamente per ogni argomento sono presentati:
  - Requisiti e motivazioni dello sviluppo dell'argomento
    - Punto di vista dell'utente e del gestore
  - Stato dell'arte
    - Basi teoriche e tecnologiche
    - Eventuali standard
    - Prodotti di mercato (leader), pro e contro
  - Recenti Innovazioni e tendenze
  - Confronti fra le varie tecnologie e nuove soluzioni, pro e contro
  - Dettagli progettuali
  - Aspetti prestazionali e di scalabilità

- Seminari di altri studenti e/o esperti, ….

Ricevimento ed esame

- **Ricevimento per la didattica frontale**
  - In ufficio: Via S. Marta
  - Tutti i Venerdi dalle ore 11:00 alle 13:00
- **Ricevimento per elaborati**
  - *Ogni giorno, dalle 8:00 alle 20:00, inviate una email*
- **Modalita' per il superamento dell'esame**
- **Eventuali stage e tesi**

Elaborati

- **Gli elaborati 2015 possono essere di tipo**
  - (A) con sviluppo di software, oppure di tipo
  - (B) compilativi che non implicano lo sviluppo di software (per esempio: confronti fra prodotti, progettazione su carta di soluzioni, valutazione delle prestazioni di prodotti e soluzioni, etc.).
  - Possono essere o meno completati con successo raggiungendo o meno gli obiettivi proposti.
  - Il voto viene stimato sulla base del lavoro svolto su base qualitativa e quantitativa, in modo comparativo sull'anno in corso.
- **Lo studente** può
  - chiedere la sostituzione dell'elaborato e/o del tutor di laboratorio tramite email al docente.
  - decidere di interrompere l'elaborato in ogni momento chiedendo la valutazione e consegnando la relazione breve di alcune pagine.

Agenda

- Modello del corso
- Laboratorio DISIT
- Infrastruttura e servizi
- Progetti in corso e attività correlate
- Visione generale del corso

UNIVERSITÀ DEGLI STUDI FIRENZE

DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

Distributed Data Intelligence and Technologies Lab
Distributed Systems and Internet Technologies Lab

Paolo Nesi

Department of Information Engineering

University of Florence

Via S. Marta 3, 50139, Firenze, Italy

tel: +39-055-2758515, fax: +39-055-2758570

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

paolo.nesi@unifi.it , http://www.disit.dinfo.unifi.it/nesi/

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

DISIT Lab

- Researchers: 20
- Current Active Projects: 18
- Project in the last 4 years: 34
- Research Budget (last 2 years): 1.5M€
- Foreseen Research Budget (next 2 years): 2.2M€
- SpinOff: 1

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

http://www.disit.org

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

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

UNIVERSITÀ DEGLI STUDI FIRENZE — DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

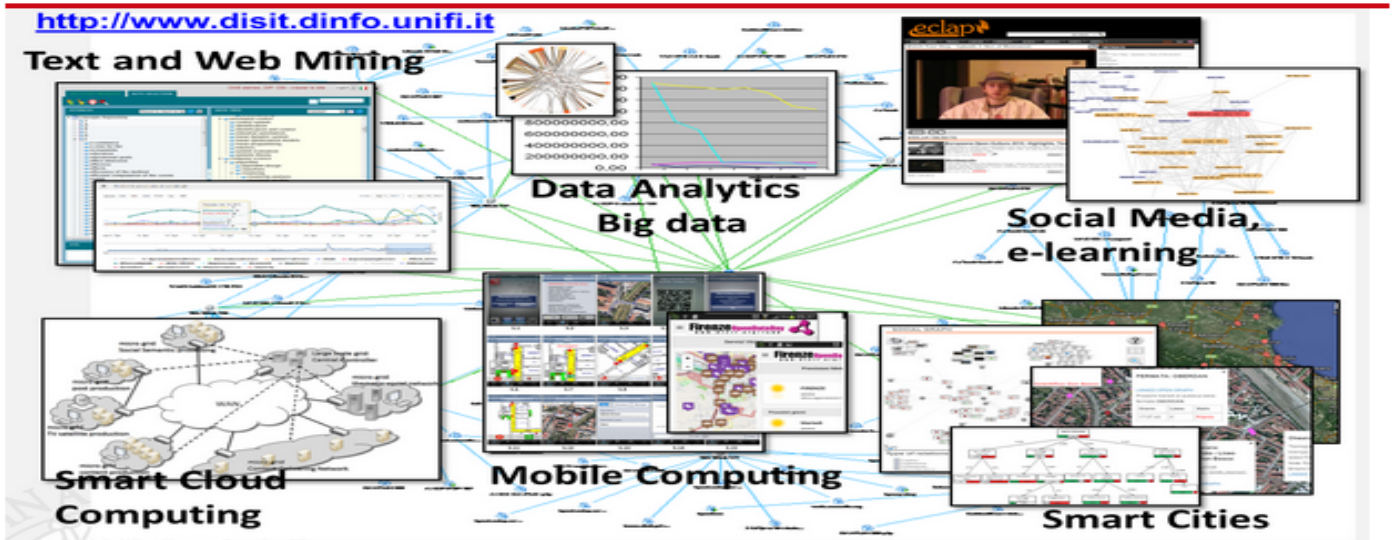
http://www.disit.dinfo.unifi.it

qualsiasi tipo | deep search

HOME | ABOUT | RESEARCH | INNOVATION | CORSI E TESI | COME FARE | EVENTI | MIO PROFILO | root | Uscire

Mostra | Modifica | Log | Translate | Devel

DISIT LAB OVERVIEW



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 [illegible] 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

CONTENUTI

- *Ultime Attività*
- *In primo piano*
- *Più visti*
- *Most Viewed (last 500)*
- *Most Viewed All (last 500)*
- *Ultimi caricati*
- *Più votati*
- *Mie collezioni pubblicate*
- *Miei contenuti*
- *Carica un nuovo contenuto*

ROOT

- Gruppi
- Cerca Utenti
- Contenuti ed attività non lette relative ai tuoi gruppi
- Crea la matrice di tassonomia
- Forum
- Invite a colleague
- Issues
- Keyword cloud
- Messaggi e Sottoscrizioni
- Mio MatchMaking
- My issues
- News Blog
- Salva informazioni del cluster
- Workflow summary

https://www.disit.org

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB
http://www.disit.org

Con chi lavoriamo

swarco First in Traffic Solutions. · VARgroup · THALES · BUSITALIA NORD GRUPPO FERROVIE DELLO STATO ITALIANE · BBC

TIM · LEONARDO · ALTAIR CHIMICA · ECM · COSTRUZIONI NOVICROM · ataf · NORD CTT · BMG · europeana think culture

ALSTOM · eutelsat · liberologico · SIAE Società Italiana degli Autori ed Editori · Rai

Hewlett Packard Enterprise · COMPUTER GROSS · ENGINEERING · GIUNTI EDITORE

PHILIPS · tiscali: · Effective Knowledge s.r.l.

e-distribuzione · Fondazione per la ricerca e l'innovazione

CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS · ENTE CASSA DI RISPARMIO DI FIRENZE · CITTÀ METROPOLITANA DI FIRENZE · COMUNE DI FIRENZE

Fraunhofer · Consiglio Nazionale delle Ricerche · cini · cnit consorzio nazionale interuniversitario per le telecomunicazioni · University of Pittsburgh · Camera di Commercio Firenze · ARPAT Agenzia regionale per la protezione ambientale della Toscana · REGIONE TOSCANA

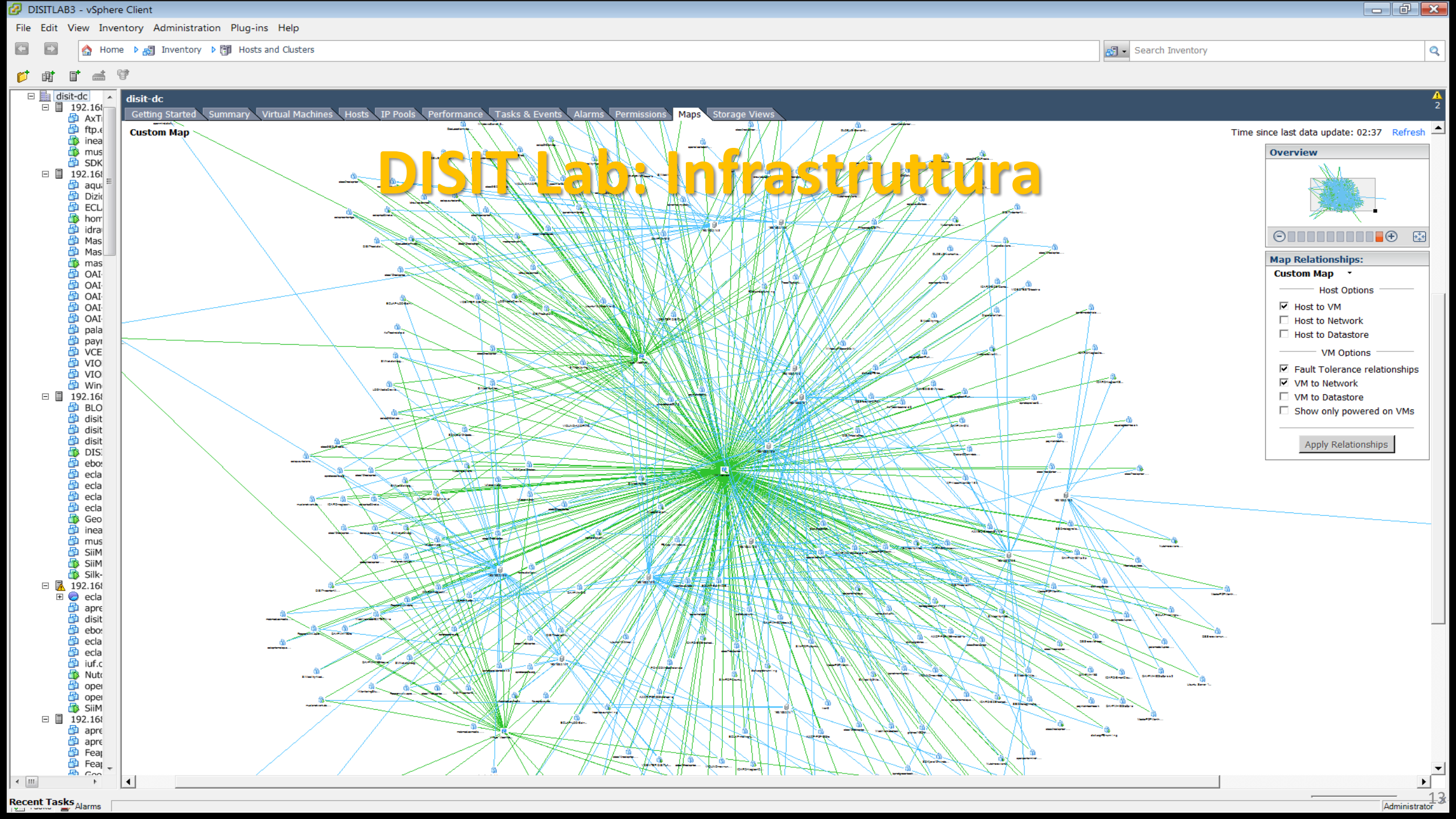
National Technical University of Athens · EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE · UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA · UNIVERSITÀ DEGLI STUDI DI CAGLIARI · APRE TOSCANA AGENZIA PER LA PROMOZIONE DELLA RICERCA EUROPEA · ACCADEMIA NAZIONALE DI SANTA CECILIA · CONSORZIO LaMMA

Agenda

- Modello del corso
- Laboratorio DISIT
- Infrastruttura e servizi
- Progetti in corso e attività correlate
- Visione generale del corso

Infrastructure and support

- **Research group since 1994**
- **Cloud and data center** with >700 TByte storage in raid 50/60,
  - >800 CPU cores, 14000 GPU cores, >8 Tbyte RAM, >500Tbyte
  - Managing several infrastructure
- **IOT center:** reference center
- **Nodo CINI per: Big data, Smart City**
- **Smart City infrastructure**
- **Snap4City Living Lab solution**


DISITLAB3 - vSphere Client
File Edit View Inventory Administration Plug-ins Help
Home Inventory Hosts and Clusters
Search Inventory
disit-dc
Getting Started Summary Virtual Machines Hosts IP Pools Performance Tasks & Events Alarms Permissions Maps Storage Views
Custom Map
Time since last data update: 02:37 Refresh
DISIT Lab: Infrastruttura
Overview
Map Relationships:
Custom Map
Host Options
Host to VM
Host to Network
Host to Datastore
VM Options
Fault Tolerance relationships
VM to Network
VM to Datastore
Show only powered on VMs
Apply Relationships
Recent Tasks
Alarms
Administrator

Corsi di docenti DISIT

- **Triennale**
  - Sistemi Distribuiti – Prof. Paolo Nesi
  - Sistemi Operativi – Pierfrancesco Bellini
  - Fondamenti di Informatica per Ingegneria Gestionale – Michela Paolucci
  - Fondamenti di Informatica per Infermieristica – Gianni Pantaleo
- **Magistrale**
  - Big Data Architectures – Prof. Paolo Nesi (Big Data, Architecture, Cloud, IoT)
  - Security and Knowledge Engineering – Prof. Pierfrancesco Bellini (Knowledge Engineering, Web Security, Natural Language Processing)
- **Altri corsi:**
  - Data Intelligence – Corso di Intelligence e Sicurezza Nazionale – Prof. Paolo Nesi
  - Master in Big Data-MABIDA: architetture, Big Data, Knowledge engineering, Natural Language Processing, cloud, etc.

Agenda

- Modello del corso
- Laboratorio DISIT
- Infrastruttura e servizi
- Progetti in corso e attività correlate
- Visione generale del corso

DISIT projects

- **Snap4City: IOT/IOE smart city https://www.snap4city.org**
- **Trafair: CEF project con varie Citta'**
- **Mosaic: Mobility and transport model**
- **Smart City of Florence Metropolitan Area**
- **Km4City**: http://www.km4city.org
- **REPLICATE H2020, SCC1, EC flagship**
  - http://replicate-project.eu/
- **Sii-Mobility SCN MIUR**: http://www.sii-mobility.org
- **Feedback: retail and GDO Big Data analytics**
- **5G with 3-Wind Open Fiber Estra**
- **Giustizia Semplice**
- **SODA Altair industria 4.0**
- **Coll@bora Social Innovation, MIUR:**
  - http://www.disit.org/5479
- **RESOLUTE H2020, EC:**
  - http://www.resolute-eu.org
- **TRACE-IT, RAISSS, TESYSRAIL, ….**
- **Mobile Emergency:**

Trace-IT

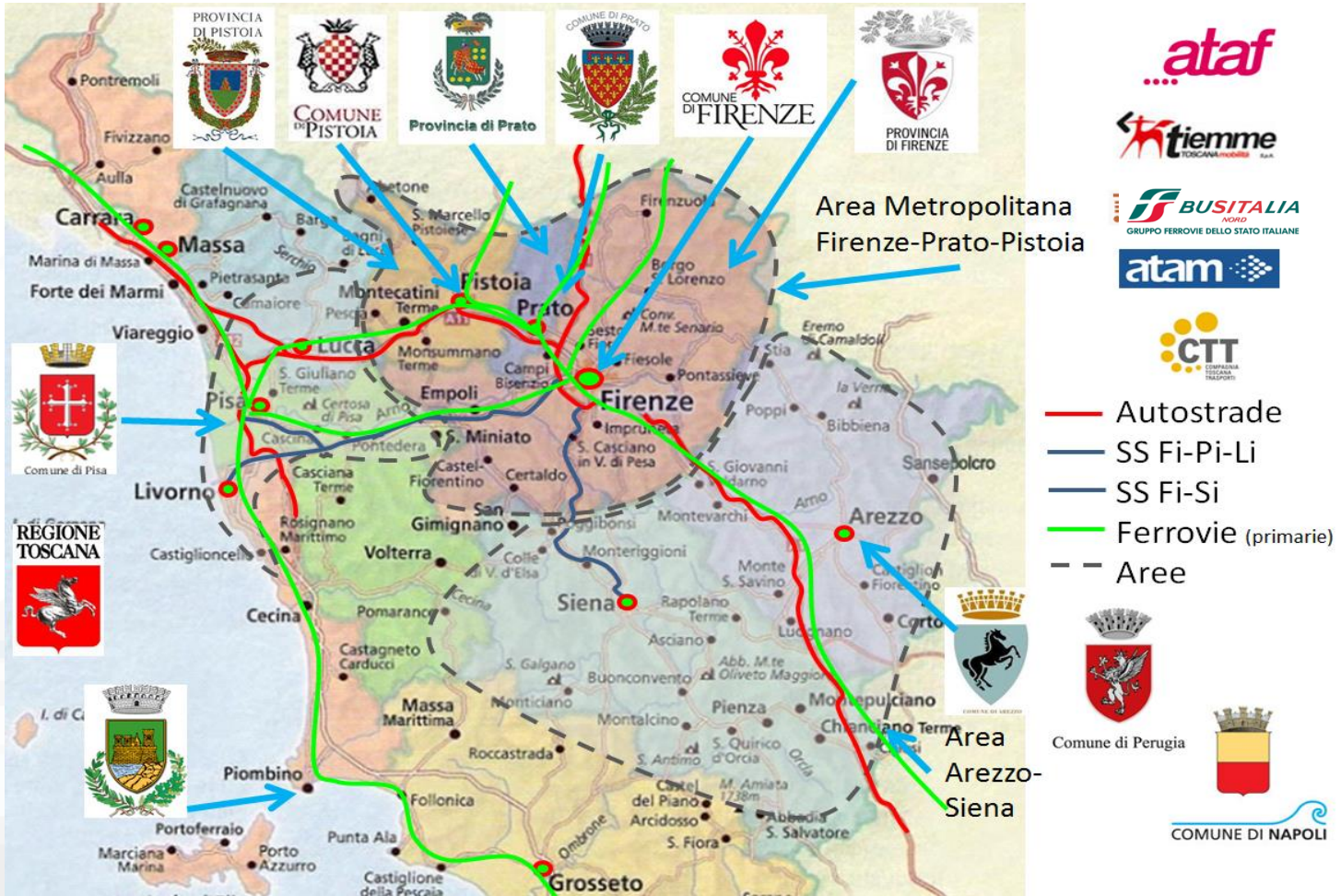
RAISSS

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB
http://www.disit.org

Sii-Mobility

http://www.Sii-Mobility.org

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



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

UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB http://www.disit.org

Sii-Mobility

http://www.Sii-Mobility.org

MIUR MINISTERO DELL'ISTRUZIONE DELL'UNIVERSITÀ E DELLA RICERCA

KM 4 CITY

Commenti dei cittadini, Social Media

Merci

AVM trasporto Pubblico

Sensori su trasporto Privato

Sensori, sistema monitoraggio

Sensori Parcheggi

UTC

Infomobility

Varchi Telematici, ZTL

Monitoraggio traffico, autostrade

Rete Ferroviaria

Parametri ambientali

Servizi ed enti

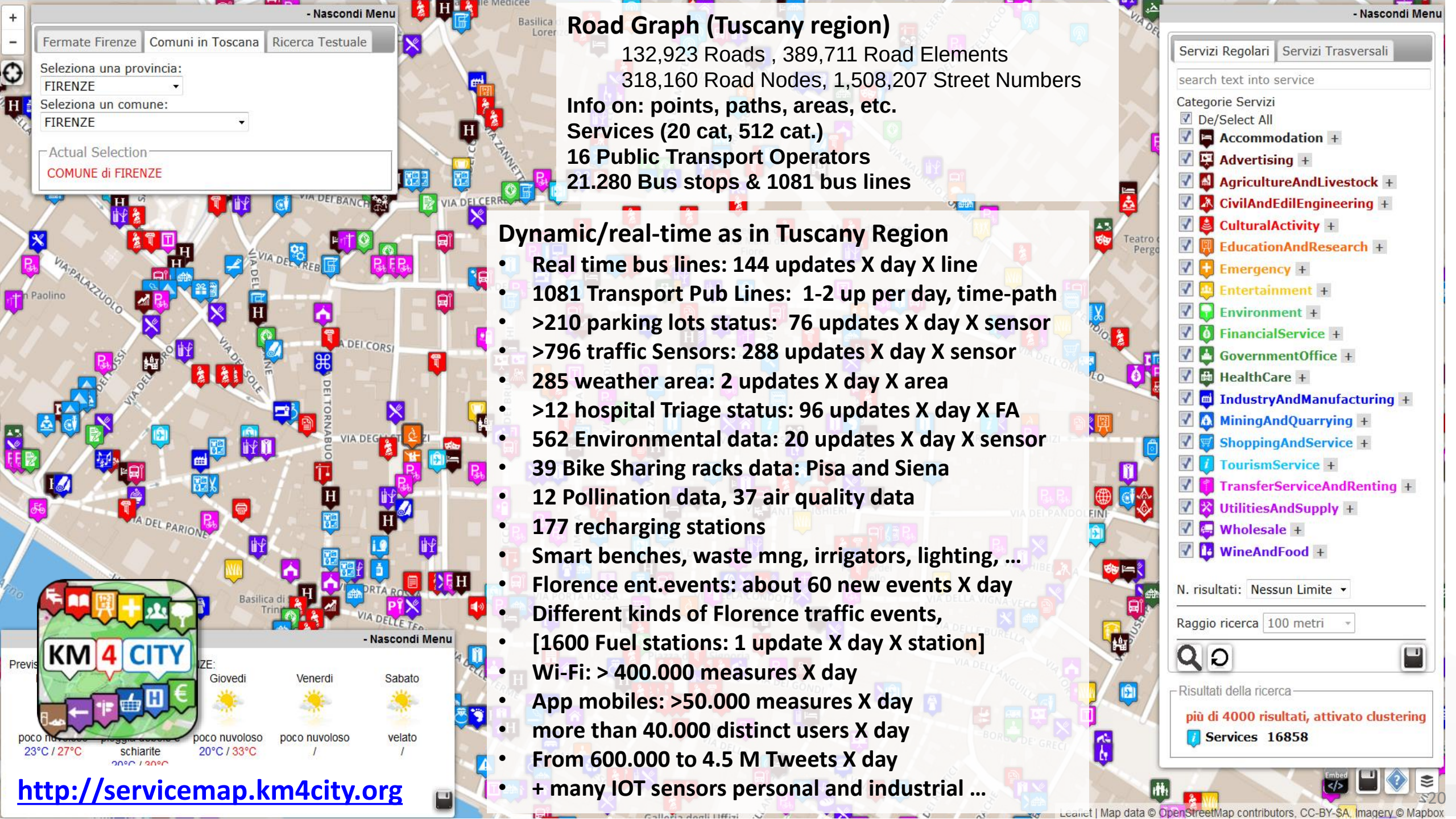
Ordinanze: eventi, lavori pubblici, ..

Emergenze, polizia, 118

General Objectives

http://www.Sii-Mobility.org

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



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

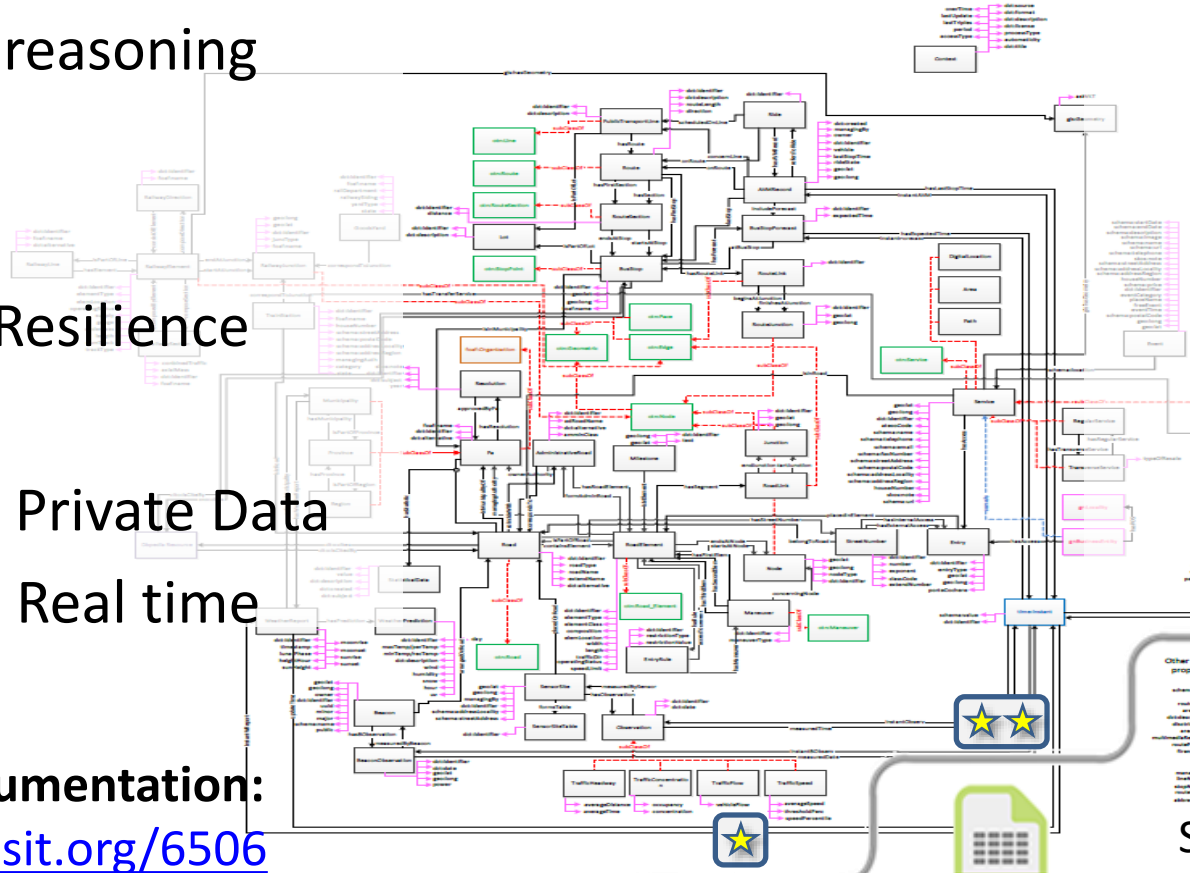
- Real time bus lines: 144 updates X day X line
- 1081 Transport Pub Lines: 1-2 up per day, time-path
- >210 parking lots status: 76 updates X day X sensor
- >796 traffic Sensors: 288 updates X day X sensor
- 285 weather area: 2 updates X day X area
- >12 hospital Triage status: 96 updates X day X FA
- 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 …

http://servicemap.km4city.org

Km4City: Knowledge Base

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

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



Big Data Tools

LOD and reasoners

Ontology Documentation:

http://www.disit.org/6506
http://www.disit.org/6507
http://www.disit.org/5606
http://www.disit.org/6461

Schema: http://www.disit.org/km4city/schema
RDF version: http://www.disit.org/km4city.rdf

Developers of ETL, Data Manager

kettle™ pentaho data integration

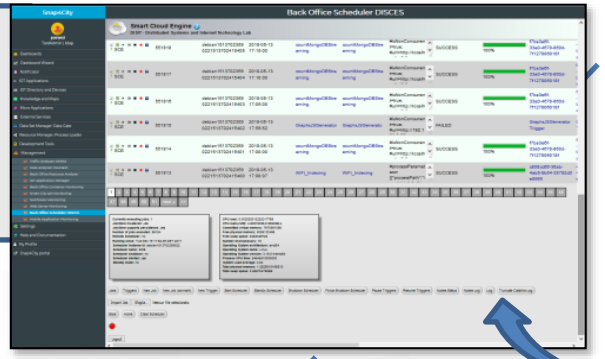
Distributed Back Office

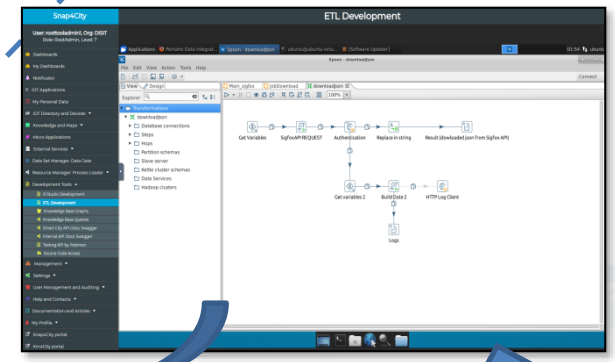
DISCES scheduler production

ETL Development Environment

Data sources

ETL Process

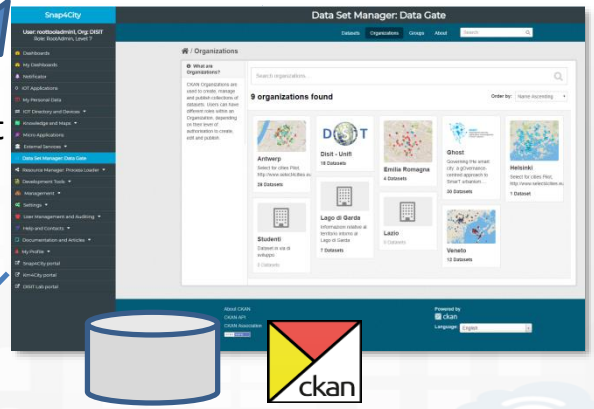




Knowledge Base, Km4City

Knowledge and Storage Data from the Field and City

Data Gate



Data Set Saving / Sharing

Saving / Sharing reusing

Data Set Loading/ Downloading

Resource Manager

Schedule Execute

Load data or prepare for data ingestion

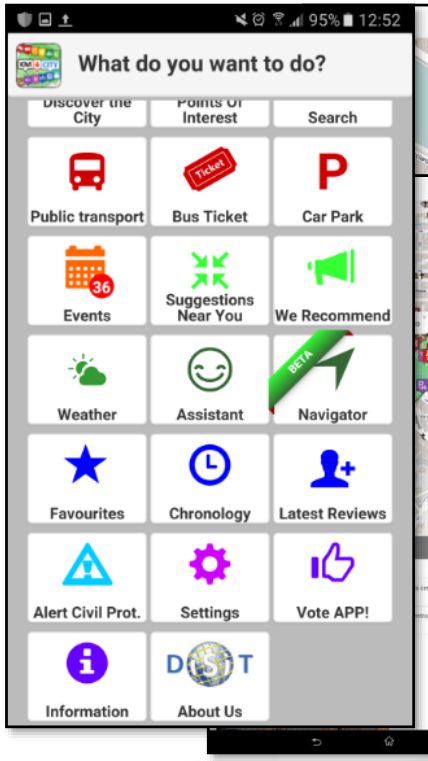
UNIVERSITÀ DEGLI STUDI FIRENZE

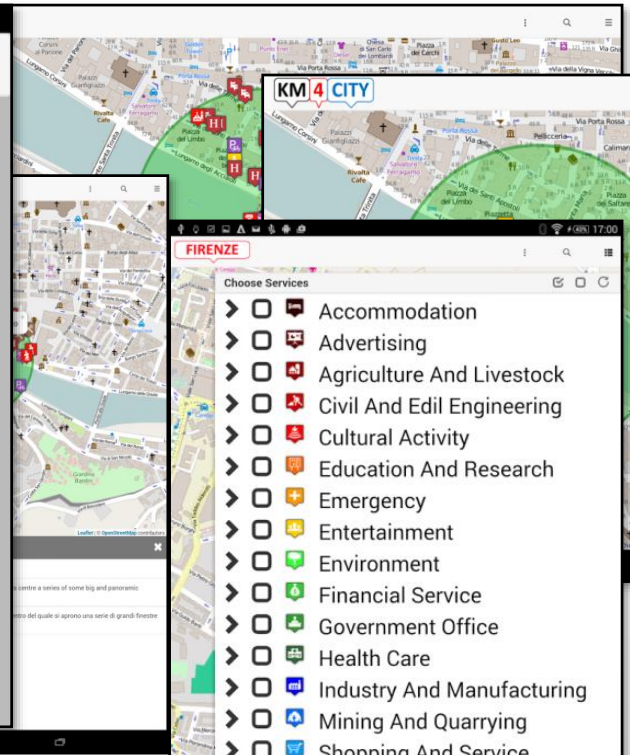
DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

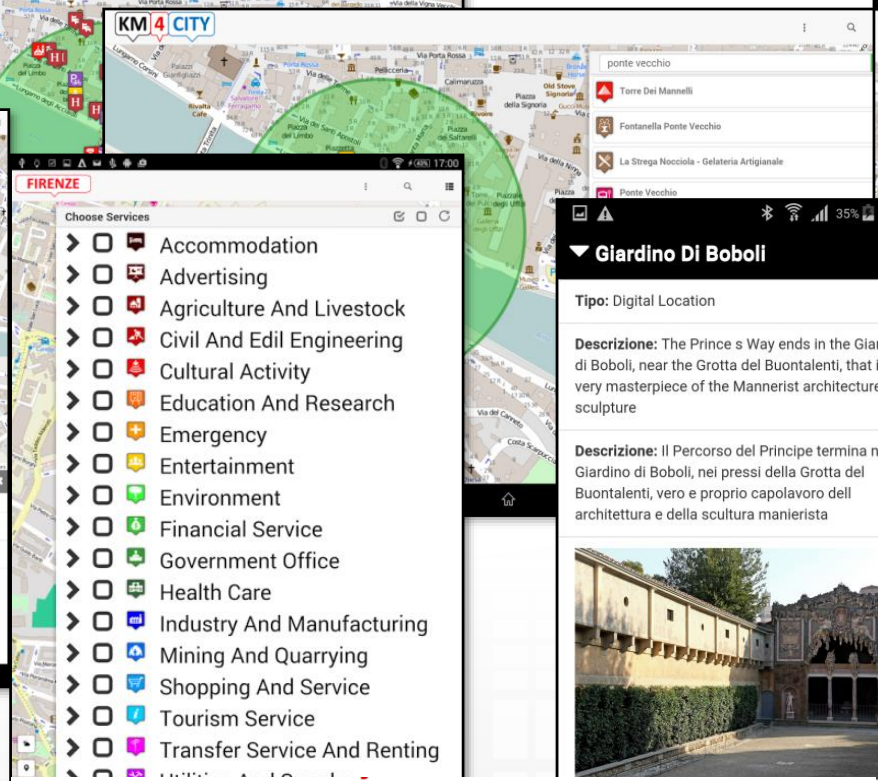
DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB
http://www.disit.org

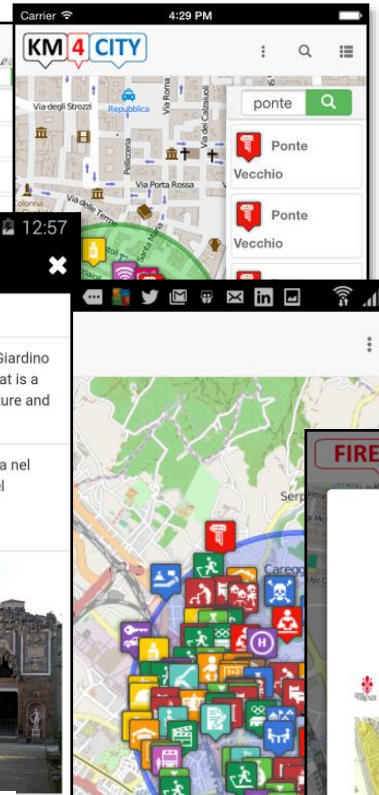
Km4CityMobile App

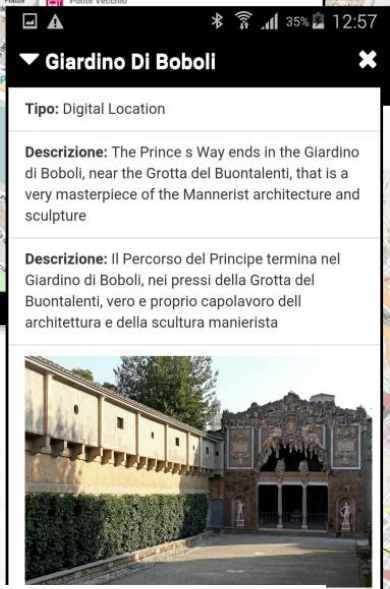
http://www.km4city.org

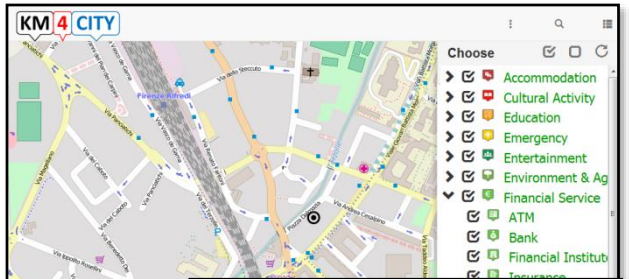


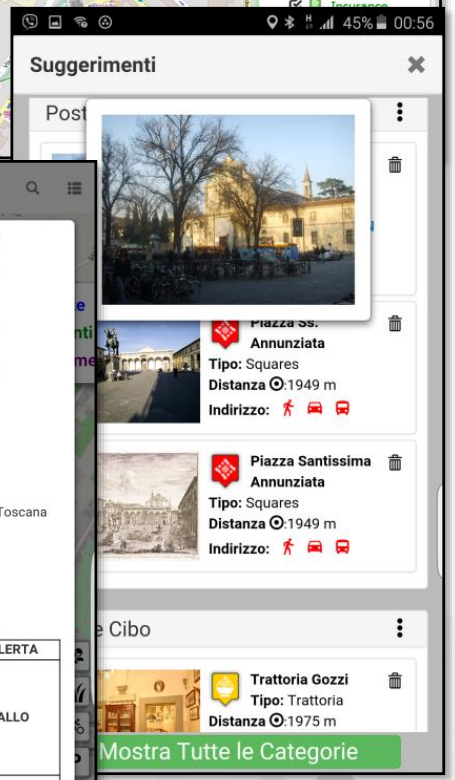












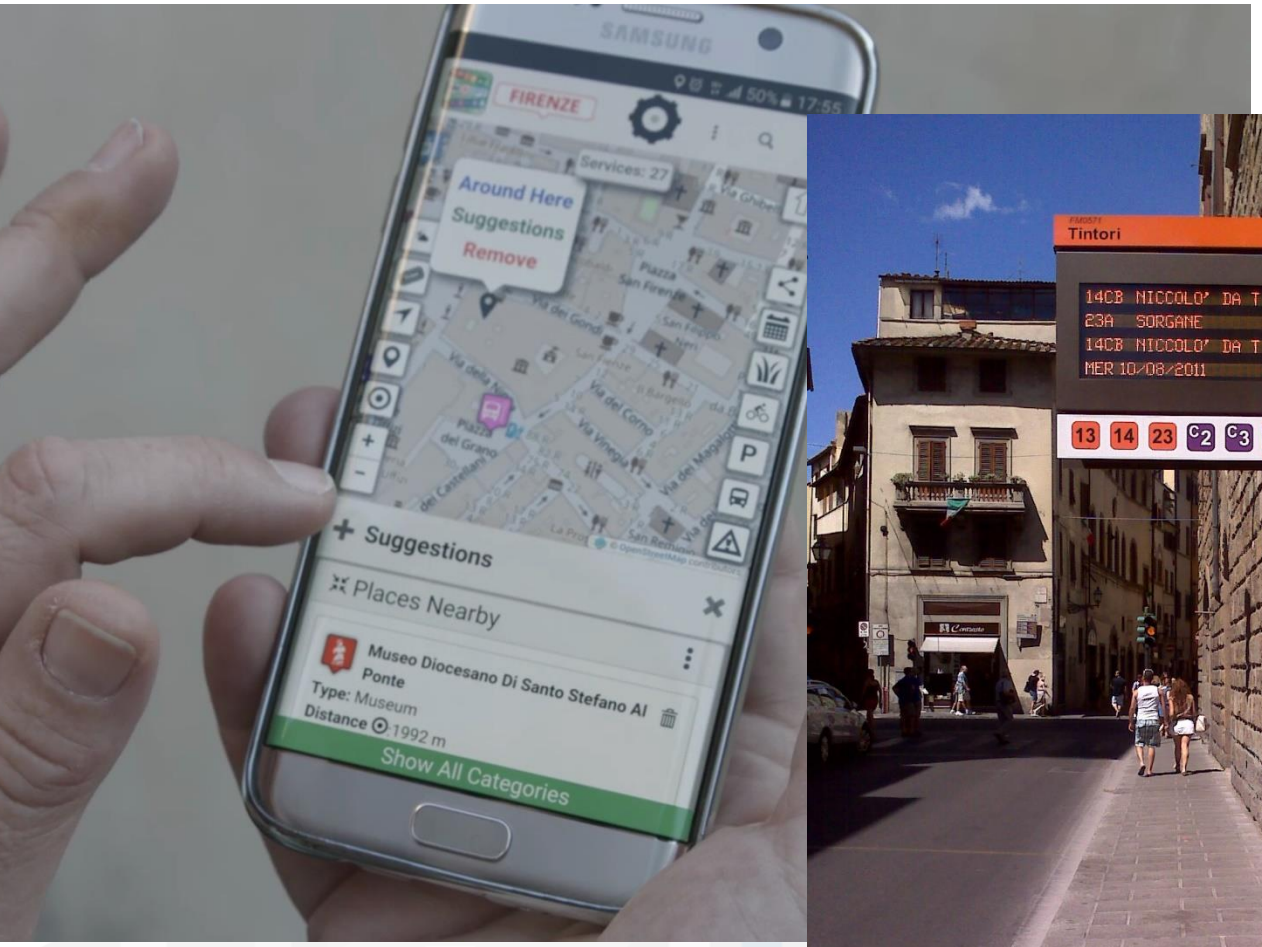
DISPONIBILE SU Google play

Scarica da App Store

Scarica da Windows Store

FIRENZE

Sii-Mobility



Free Parking Predictions

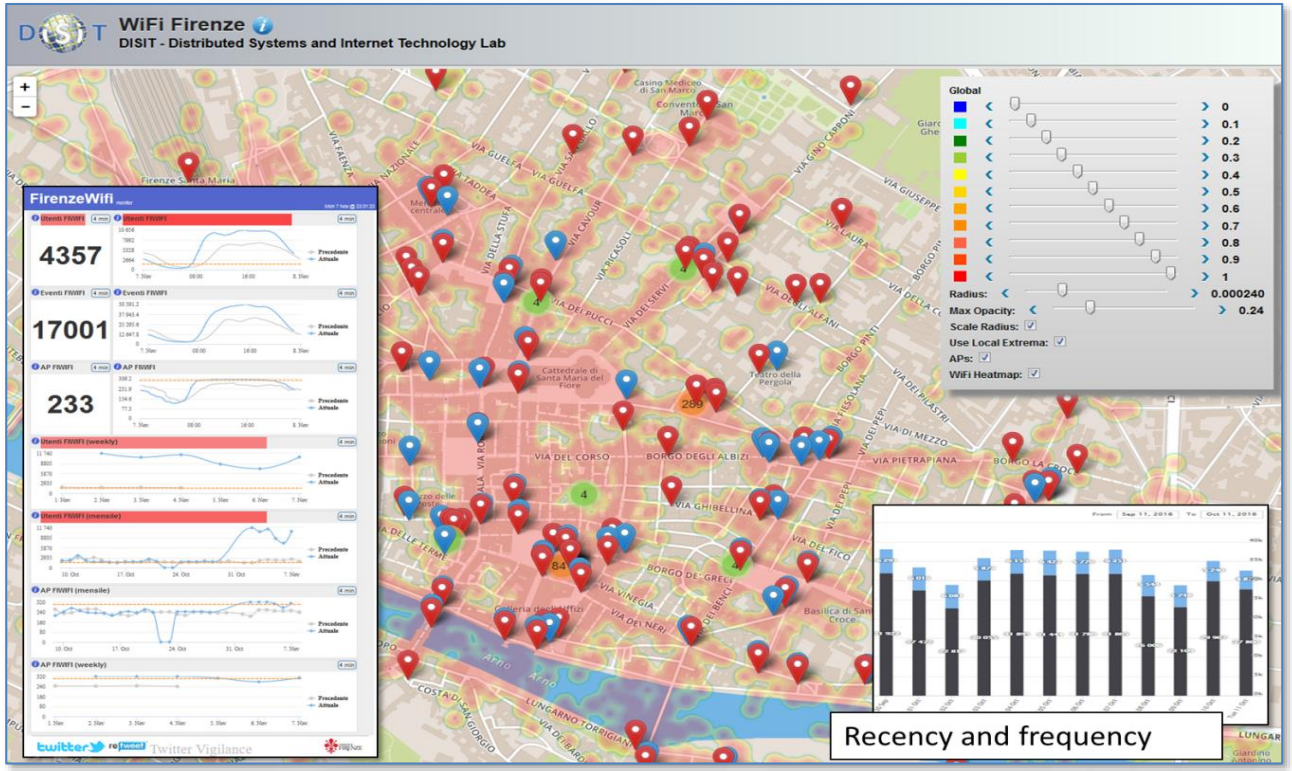
Careggi car park			
Model features	BRNN model results		
	R-squared	RMSE	MASE
Baseline	0.974	24	1.87
Baseline + Weather	0.975	24	1.75
Baseline + Traffic sensors	0.975	24	2.04
Baseline + Weather + Traffic sensors	0.975	24	1.87

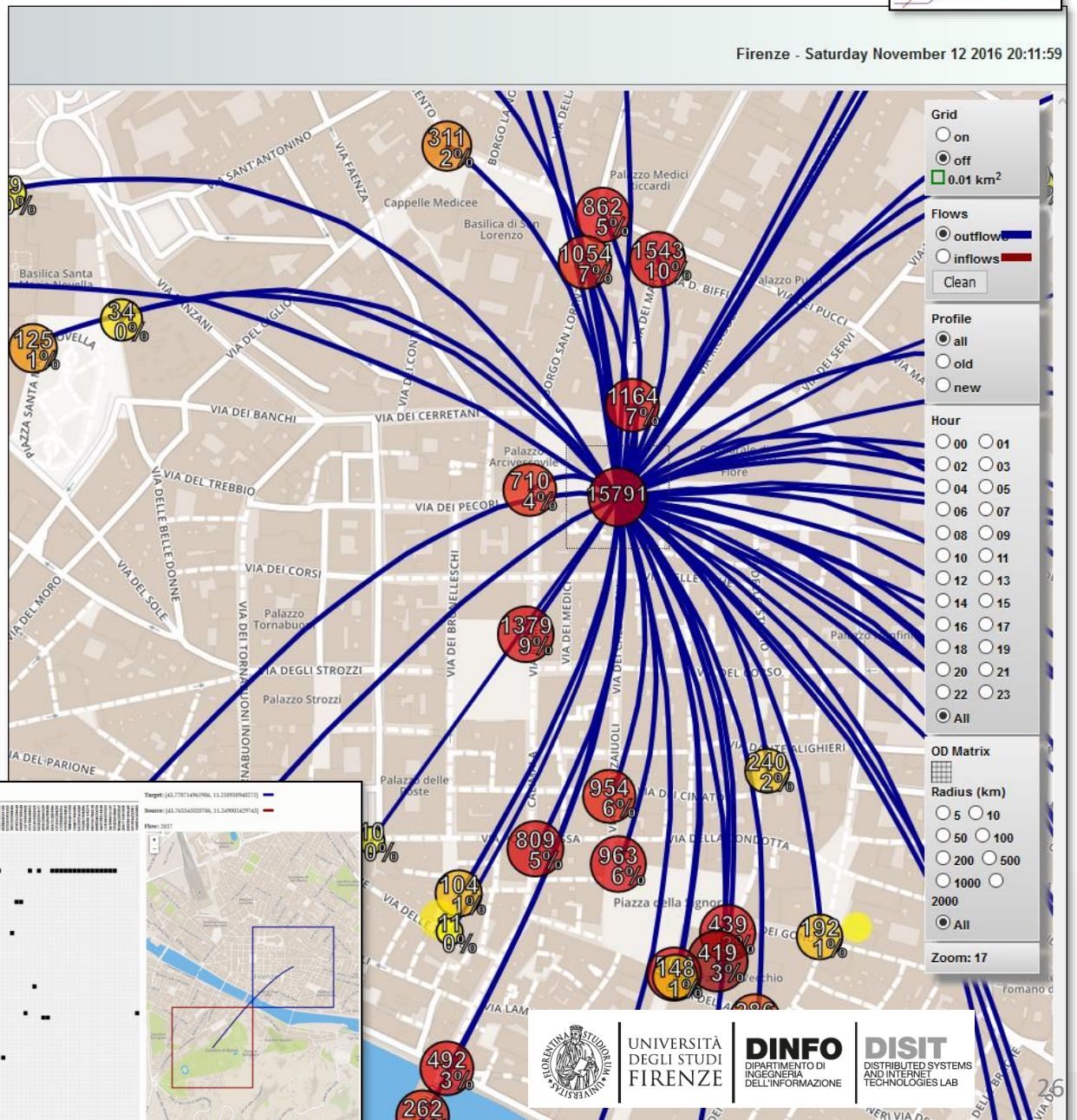
Active on Mobile Apps as:

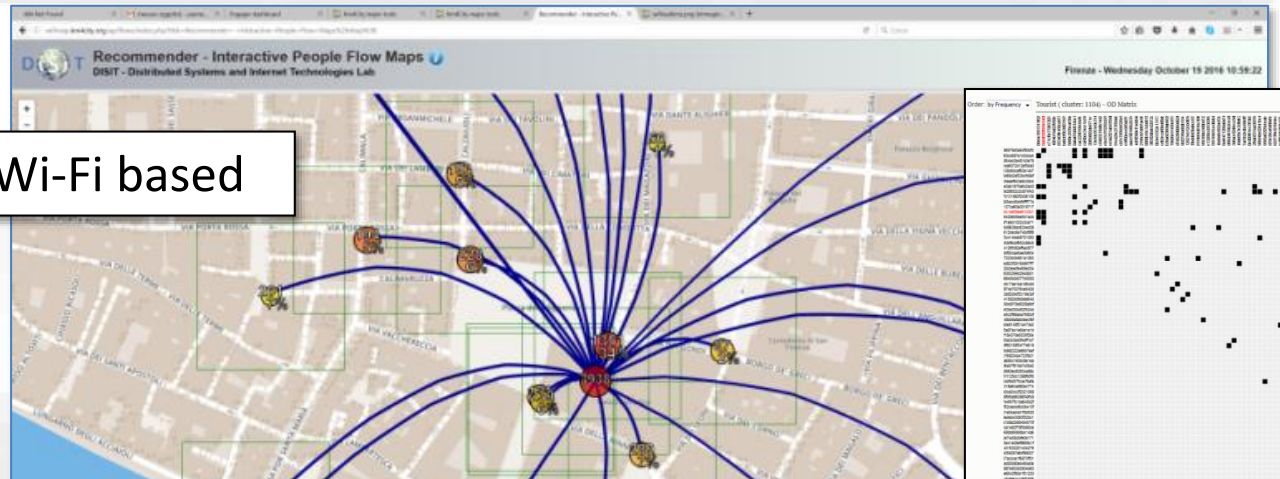
- «Firenze dove cosa»
- «Toscana dove cosa»

Precision: 97,5%

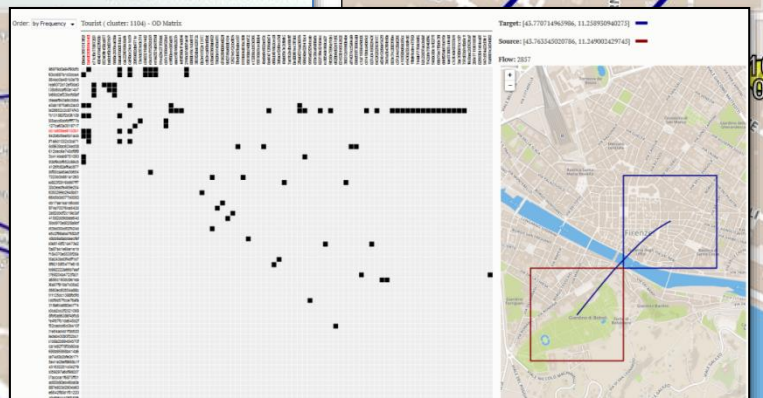
Origin Destination Matrix Estimation





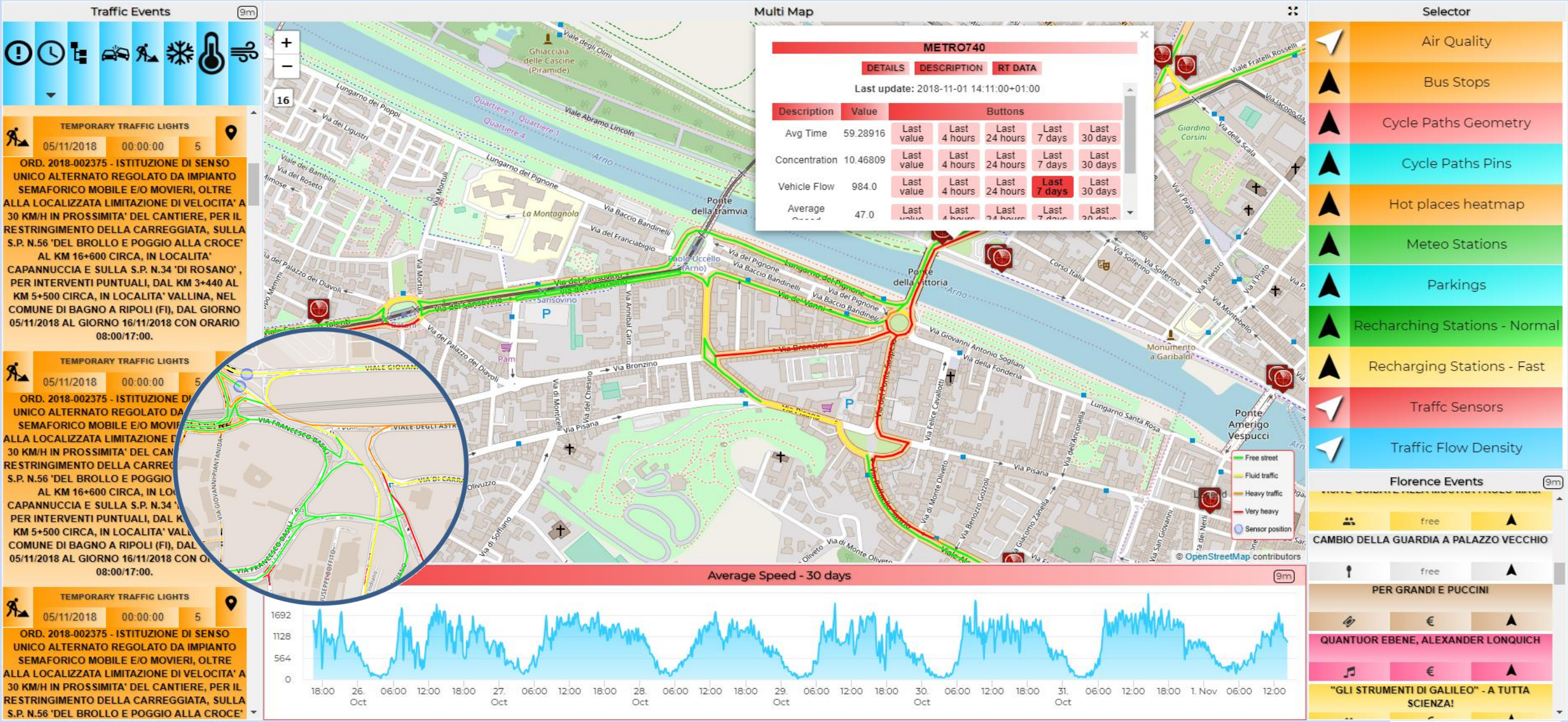


Wi-Fi based



Toscana Traffico

Thu 1 Nov 14:15:47

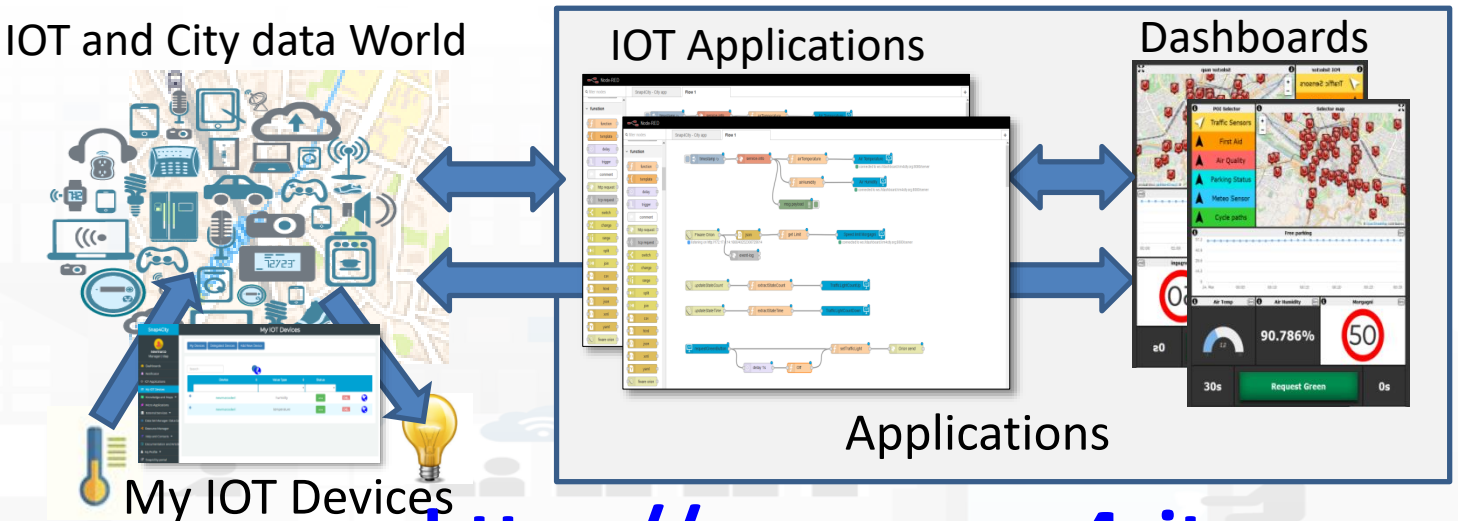


https://main.snap4city.org/view/index.php?iddasboard=MTE5MQ==

SNAP4CITY

KM4CITY

- enabling large-scale co-creation IOT/IOE applications for Helsinki, Antwerp:
  - Open source, standardized, data-driven, service-oriented, user-centric platform, robust, scalable, easy to use solution, 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, IOT Button,..), 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***



https://www.snap4city.org

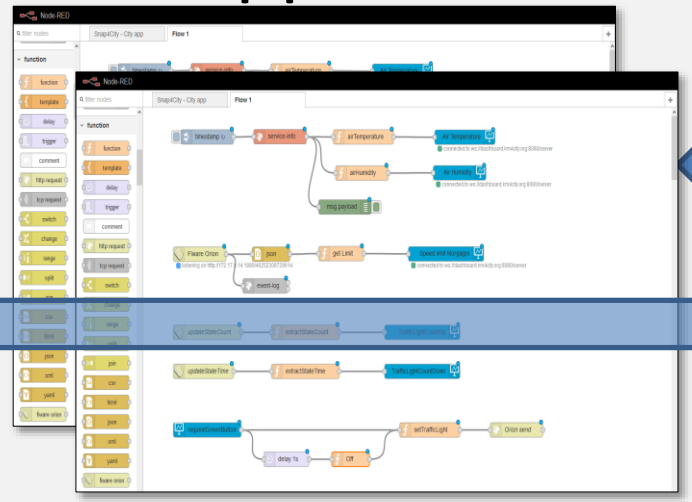
Dashboard with intelligence App

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

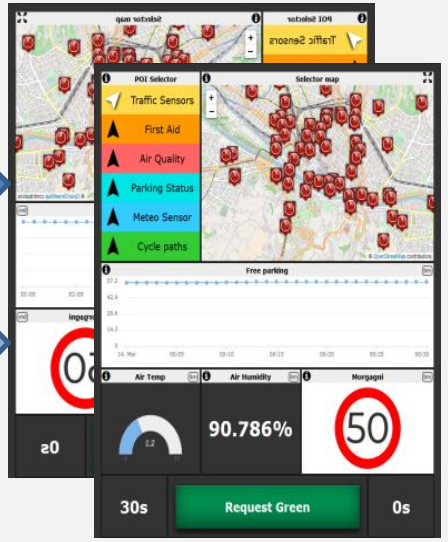
Dashboard-IOT App

IOT and City data World

IOT Applications



Dashboards



Applications

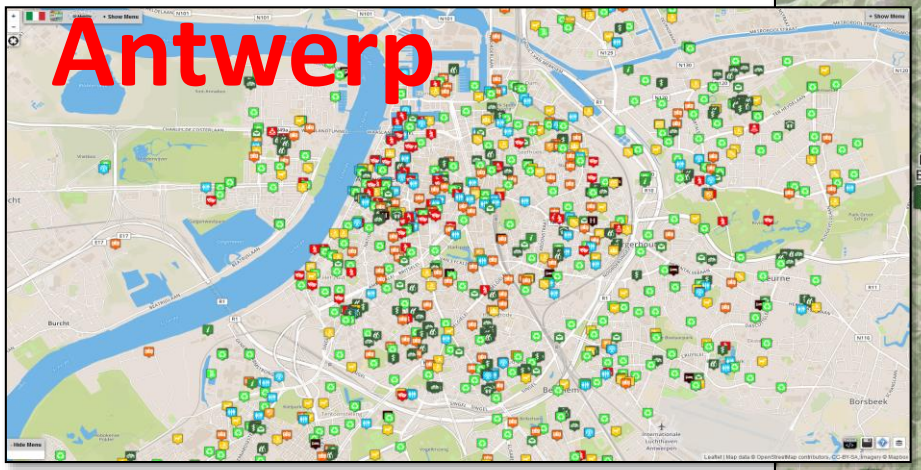
UNIVERSITÀ DEGLI STUDI FIRENZE

DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

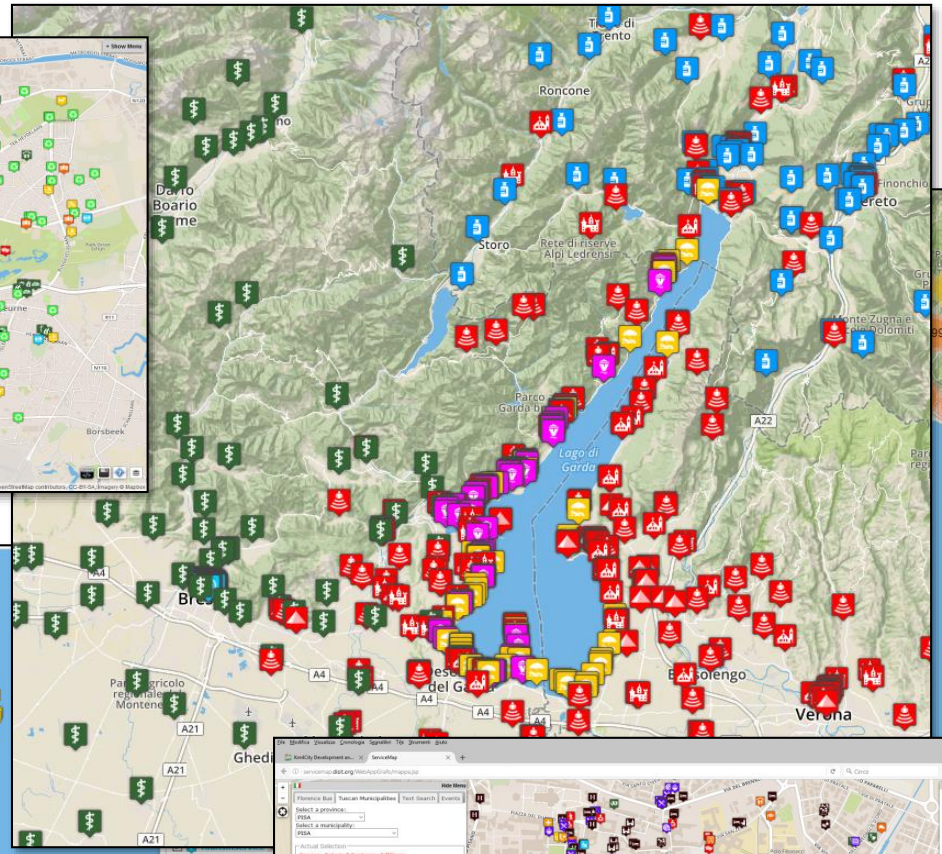
DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB
http://www.disit.org

Km4City in ...

Antwerp

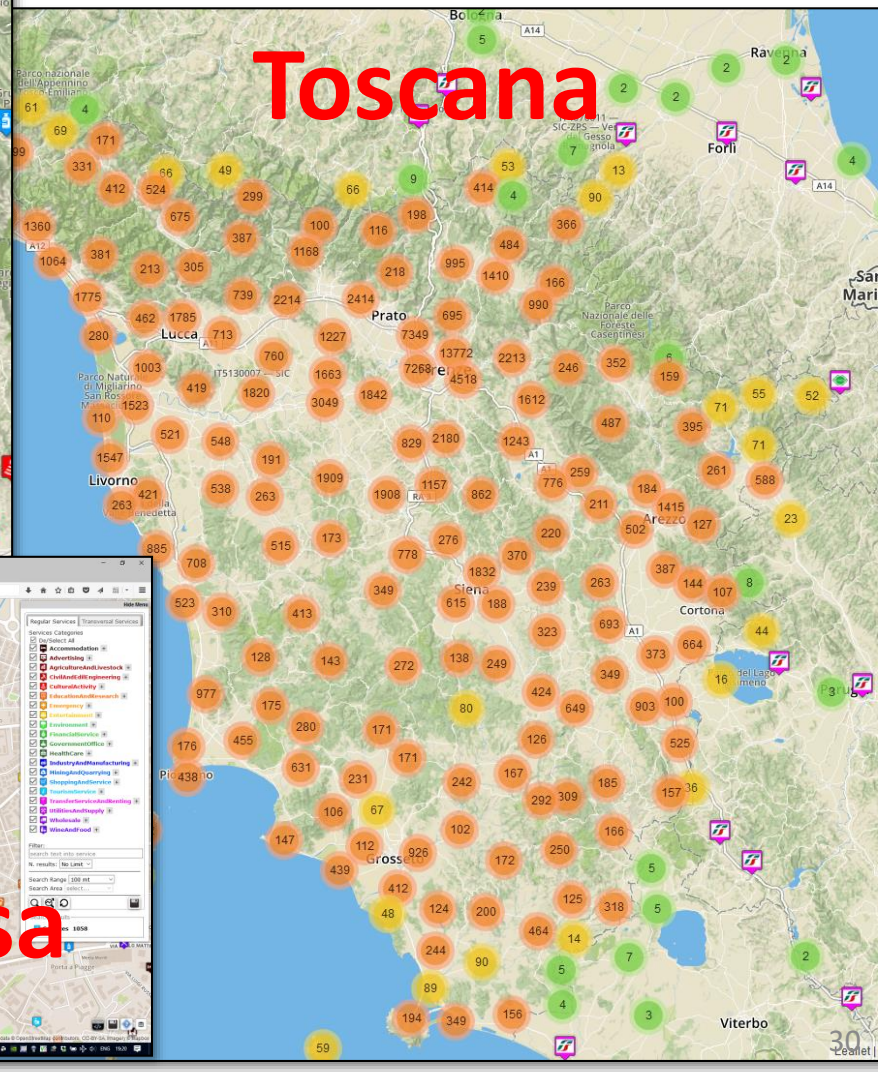


Garda Lake

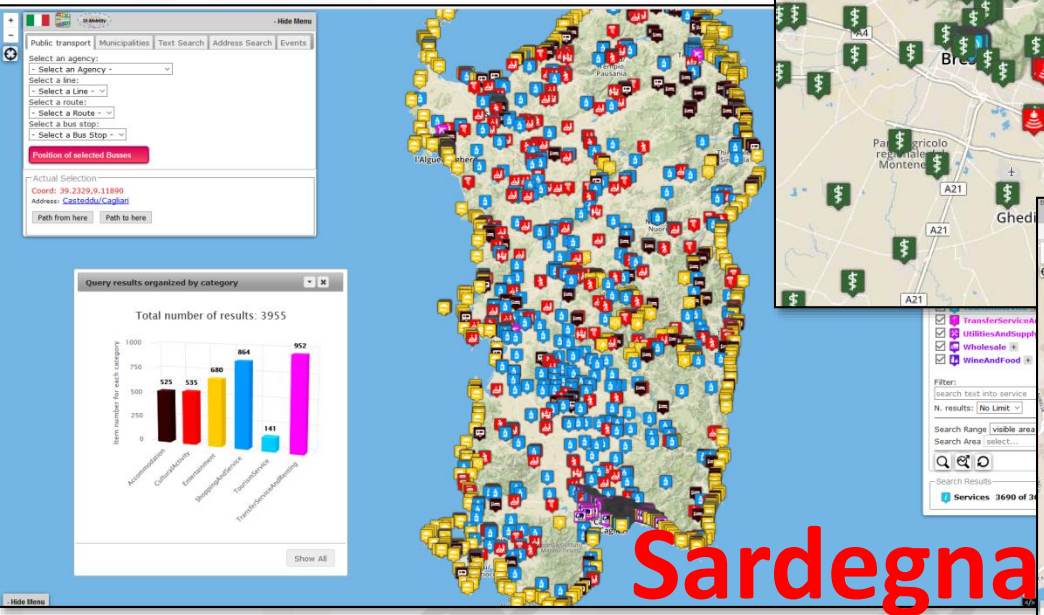


Sii-Mobility

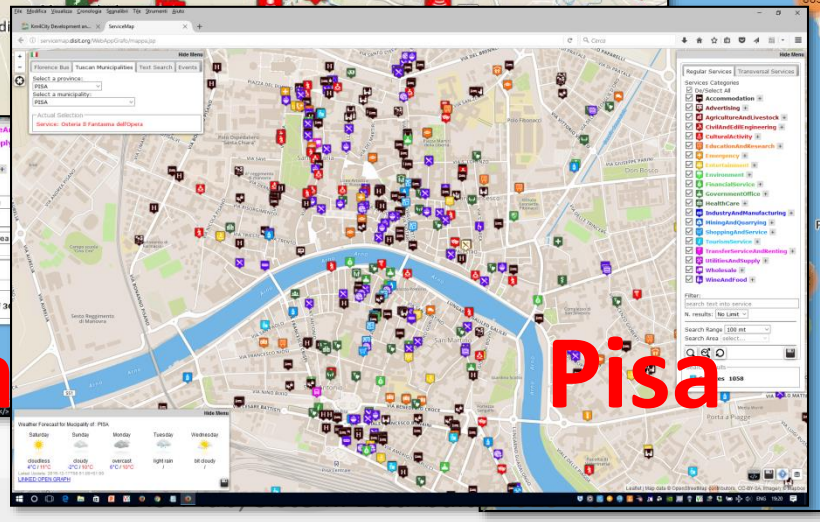
Toscana



Sardegna



Pisa



Search all services in the area

MicroServices

- S4CIoT
- S4CInfo
- S4CSearch
- S4CView
- S4CDataAnalytic
- S4CDashboard
- S4CSearchDev
- S4CInfoDev
- S4CLogDev
- S4CManagement
- S4CSearchExp
- S4CSearchUsr

fiware orion

fiware orion

ckants
- ckants insert
- ckants search
- ckants create

S4CIoT
- iot directory
- iot directory

S4CInfo
- service info
- tpl agencies
- tpl lines
- tpl routes by agency
- tpl routes by line
- tpl routes by stop name
- tpl routes by line stop name
- tpl stops by route

S4CSearch
- service search by queryid

S4CView
- show general iframe
- show micro web app

S4CDataAnalytic
- descriptive statistics
- trend plot
- time series predictions
- machine learning predictions

S4CDashboard
- city dashboard
- city dashboard
- geolocation

S4CSearchDev
- service search
- full text search dev
- event search dev
- address geometry search near gps position
- address poi search by text
- bus routes search

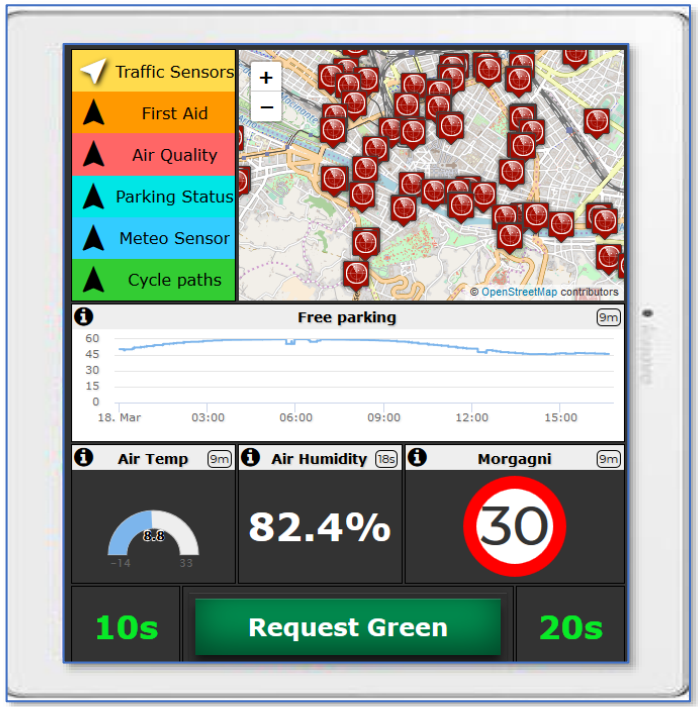
S4CInfoDev
- tpl routes
- tpl stops

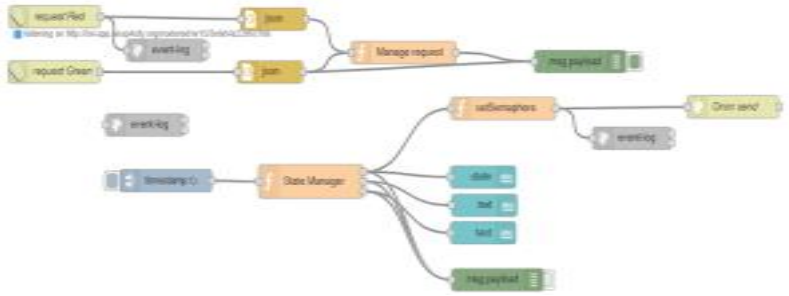
S4CLogDev
- event log

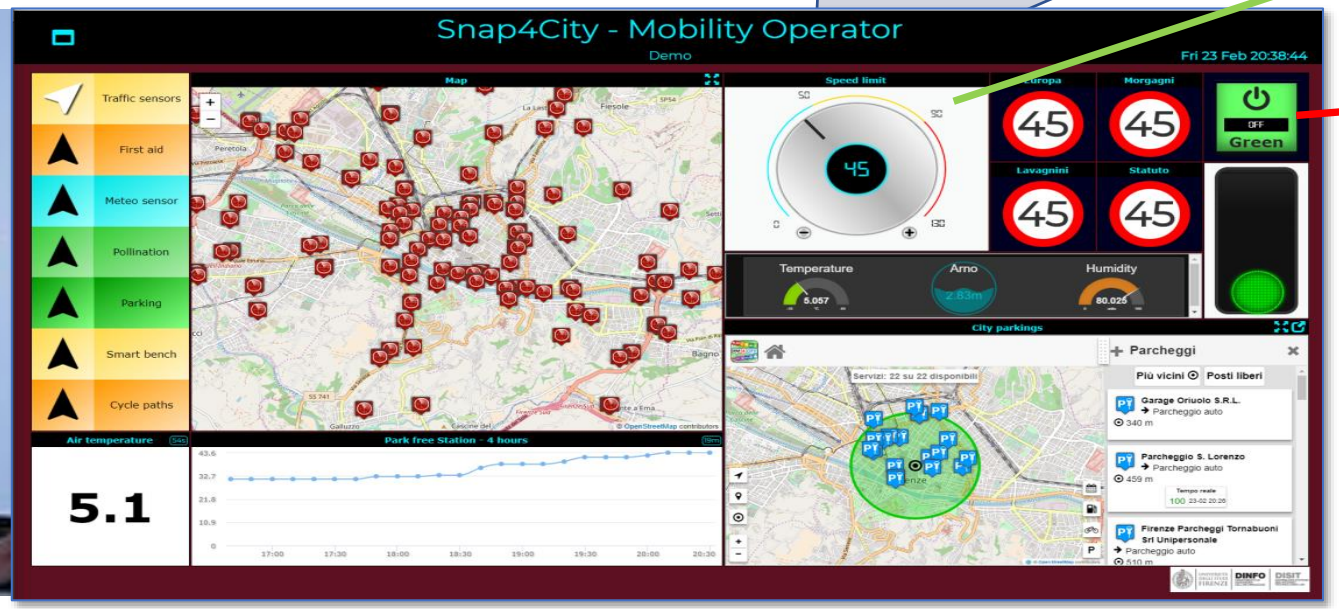
S4CSearchExp
- service search near gps position
- service search near service
- service search within gps area
- service search within wkt area
- service search within stored wkt area
- service search by municipality
- full text search within wkt area
- full text search within gps area
- full text search near gps position
- full text search exp
- event search within wkt area
- event search within gps area
- event search near gps position
- event search exp
- address search near gps position
- geometry search near gps position
- address poi search by text exp
- address poi search by text near gps position
- bus routes search near gps position
- bus routes search within gps area
- bus routes search within wkt area
- bus routes search within stored wkt area

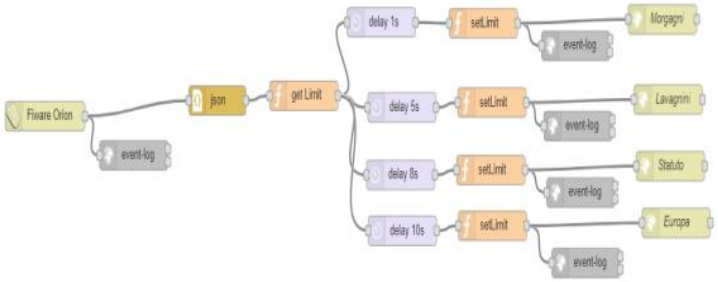
S4CSearchUsr
- service search near marker
- service search within circle
- service search within polygon
- service search along path
- full text search near marker
- full text search within circle
- full text search within polygon
- full text search along path
- full text search usr
- event search near marker
- event search within circle
- event search within polygon
- event search along path
- event search usr
- address search near marker
- geometry search near marker
- address poi search by text usr
- address poi search by text near marker
- address poi search by text within circle
- bus routes search near marker
- bus routes search within circle
- bus routes search within polygon

S4CManagement
- check exist job
- check exist trigger
- get currently executing jobs
- get job detail
- get triggers of job
- get job group names
- get trigger group names
- get paused trigger groups
- trigger job

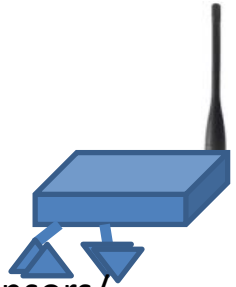

Traffic Sensors
First Aid
Air Quality
Parking Status
Meteo Sensor
Cycle paths
© OpenStreetMap contributors
Free parking
9m
60
45
30
15
0
18. Mar
03:00
06:00
09:00
12:00
15:00
Air Temp
9m
Air Humidity
18s
Morgagni
9m
82.4%
30
10s
Request Green
20s




Snap4City - Mobility Operator
Demo
Fri 23 Feb 20:38:44
Traffic sensors
First aid
Meteo sensor
Pollination
Parking
Smart bench
Cycle paths
Map
Speed limit
45
Europa
45
Morgagni
45
Lavagnini
45
Statuto
45
OFF
Green
Temperature
5.057
Arno
Humidity
80.025
City parkings
Parcheggi
Più vicini
Posti liberi
Garage Oriuolo S.R.L.
Parcheggio S. Lorenzo
Air temperature
5.1
Park free Station - 4 hours


Fiware Orion
event-log
json
get Limit
delay 1s
delay 5s
delay 8s
delay 10s
setLimit
event-log
Morgagni
Lavagnini
Statuto
Europa

IOT Devices

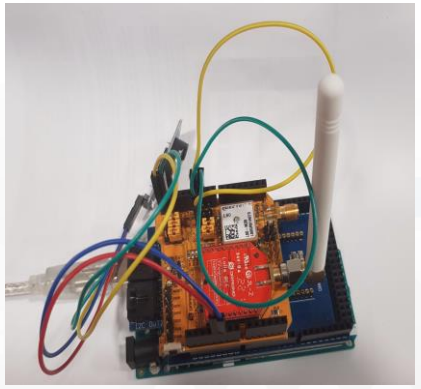


Sensors/
Actuators

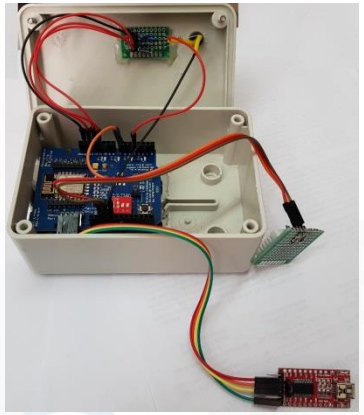
IOT Edge Devices

SigFOX
Any and
Arduino

LoraWAN +
Arduino +
I2C, NGSI



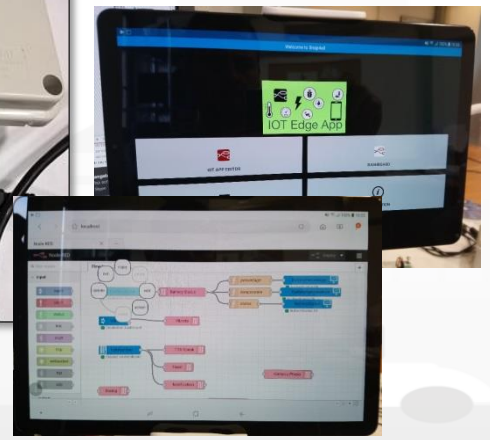
Arduino,
Wi-Fi,
NGSI



Snap4All
IOT Button
ESP

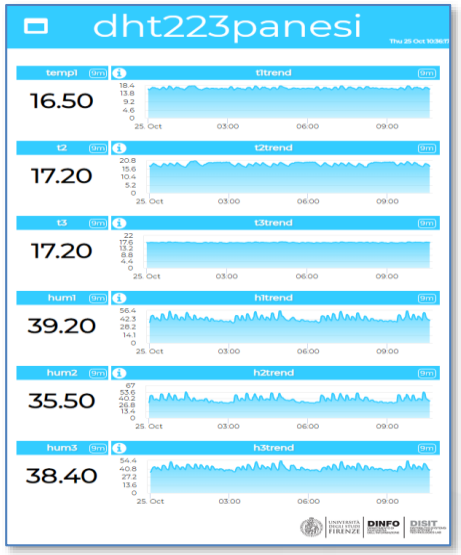
IOT Edge
NodeRED:
Raspberry

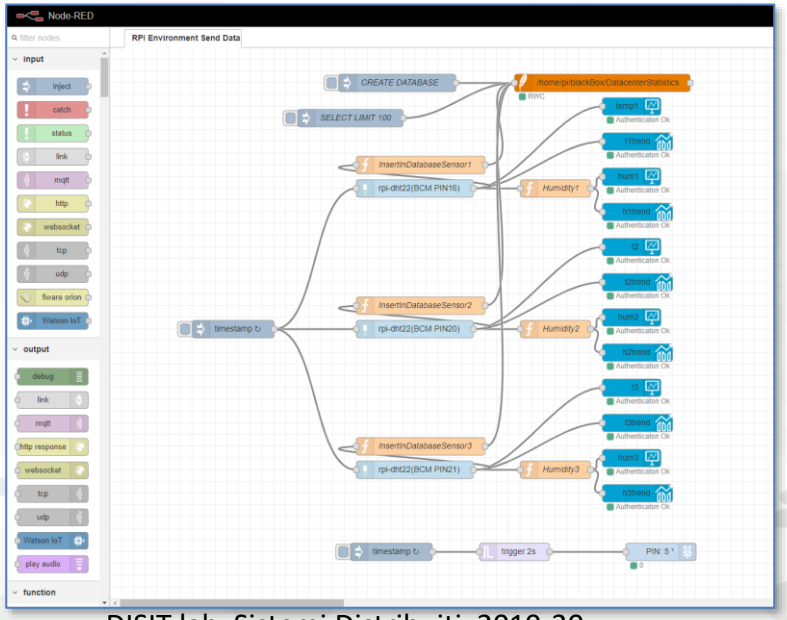
IOT Edge
NodeRED:
Android,
LINUX,
Windows

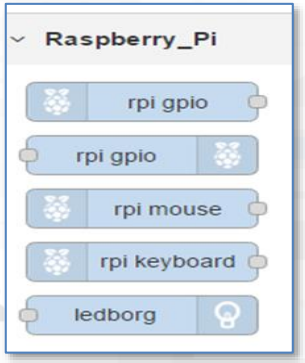


IOT Edge on Raspberry Pi

- 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....

IOT Devices

.....

WSs, HTTPS

WSs, HTTPS

WSs, HTTPS

[IOT Edge]

IOT Broker

[IOT Application]

Dashboard Engine

WSs HTTPS

Sensors/ Actuators

Shadow

Making IOT data always available

MicroServices
Ext-Services
.....

Executing permanent computation

Executing local computation

Internet

Internet

Intranet

Cloud

User interface On Browser

End 2 end security

IOT/IOE on the field

On Cloud

(0) Sensors & Actuators

(1) Registration

Raspberry pi

Sensors/ Actuators

Sensors/ Actuators

Sensors/ Actuators

Sensors/ Actuators

-- PC: Win, Linux

Sensors/ Actuators

Internet

IOT Edge
With IOT App distributed

IOT Directory

Other Connected IOT App

(2) Production of IOT App on IOT edge

(3) Production of Dashboard user interface

(4) IOT App and its Dashboard are executed

IOT Brokers

IOT Button

Mobiles

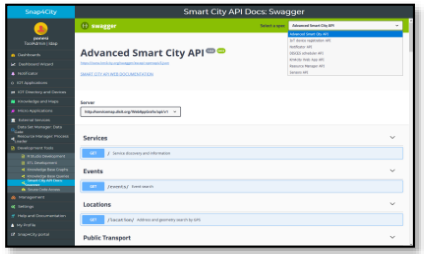
IOE Devices

Sensors/Actuators

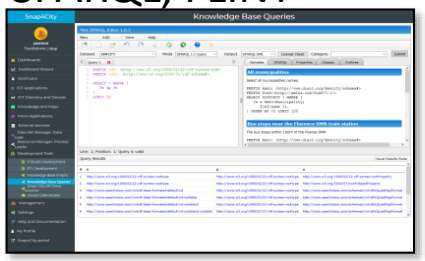
IOT App can be executed on IOT Edge and/or on Cloud. MicroServices calling Dashboards, Storage and Analytics are executed on Cloud.

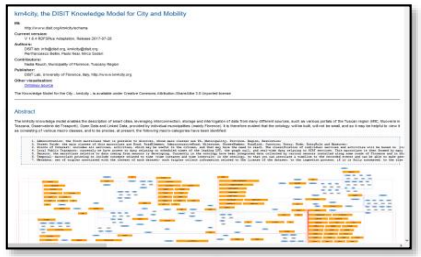
Data Analytics Dev. in R Studio and/or Tensor Flow

Swagger



SPARQL, FLINT





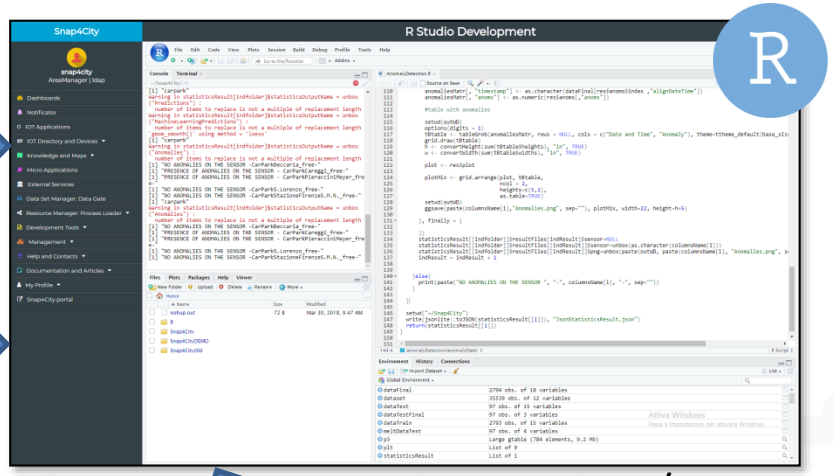
Ontology Schema

LOG.disit.org

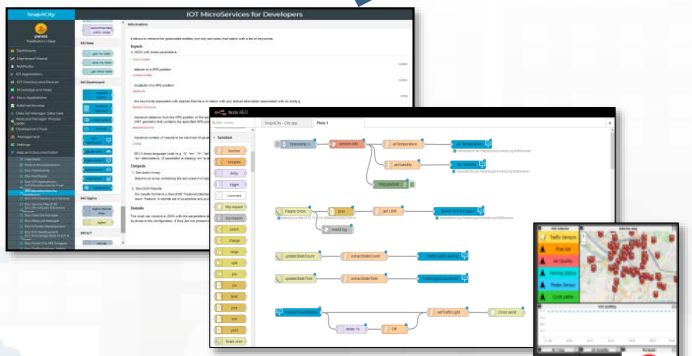
Knowledge Base, Km4City

Big Data Store Facility

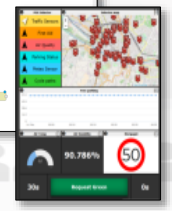
Smart City API from Knowledge Base and other tools



Creating MicroServices



Using them into IOT Applications



Saving / Sharing reusing

Resource Manager

Living Lab Flexibility: multiple modalities

Snap4City Satisfies all Requirements of ENOLL

European Network of Living Labs

- **Data ingestion**: ETL, IOT App/Node-RED, DataGate, IOT Directory
- **Data Analytics**: R Studio / TensorFlow, IOT App/Node-RED, Java/DISCES, ETL/DISCES
- **App**: IOT App via MicroServices, Web and Mobile App via Advanced Smart City API
- **User Interface**: Dashboard Builder (IOT App, or direct), Kibana from IOT Data/Banana, Web and Mobile App, MicroApplications
- **Sharing via**: Resource Manager, IOT App/Node-RED, GitHUB, Dashboard Builder, IOT Directory, www.Snap4City.org
- **Living and coworking**: www.Snap4City.org Portal

Your Level

Snap4City

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

- Dashboards (Public)
- Dashboards of My Organization
- My Dashboards in My Organization
- IOT Applications
- My IOT Devices
- Knowledge and Maps
- Micro Applications
- External Services
- Data Set Manager: Data Gate
- Resource Manager
- Help and Contacts
- Documentation and Articles
- My Profile
- Snap4City portal
- Km4City portal
- DISIT Lab portal

All Tools

Snap4City

Home | Partners and Interoperability | Tools | Tutorials and Videos | Blog | Contributions

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

Welcome: how to start using Snap4City for beginners

Personalized Suggestions

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 sugget to test these functionalties since you can:

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

See this test case to experiment some of the above possibilities:

TC1.10. Dashboard delegation to access, and passage of ownership, and/or cloning

Exercises

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

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

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

SLIDES

Flyer

News

VIDEOS

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

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

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

Username: adifino

Powered by www.km4city.org

Full Search

Search

Search

Your Org

Organization Groups

DISIT
- Operativo

Recent comments

- 1 month 6 days ago

Last Art.

Recent content

Ti Suggeriamo: Come realizzare la tua prima Dashboard (Step 1) new
roottooladmin1

Benvenuto al nostro Sindaco ed al suo Team new
roottooladmin1

We sugges to Antwerp Developers: How to manange my Dashboards

REPLICATE

Horizon 2020
European Union Funding
for Research & Innovation

REnaissance of PLaces
with Innovative Citizenship
And TEchnology

http://replicate-project.eu/

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

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

FIRENZE

Tue 16 Oct 16:18:39

INDICI DI CRITICITA' DELLA QUALITA' DELL'ARIA (ICQA) 2 — inviata comunicazione alla cittadinanza

OZONO 200 µ/m³ — superata la soglia di informazione

39492 Utenti WiFi

STATI DI ALLERTA 9m

GENERAL | METEO

MINIMO | BASSO | MEDIO | ALTO

RISCHIO IDRAULICO

RISCHIO TEMPORALI

RISCHIO IDROGEOLOGICO

RISCHIO NEVE

RISCHIO GHIACCIO

Mar 16 Ott
Firenze
Nuvoloso
19°C / 24 °C
Powered by LaMMA

Mer 17 Ott 16°C / 24°C	Nuvoloso
Gio 18 Ott 15°C / 26°C	Nuvoloso
Ven 19 Ott Temp N/A	Sereno
Sab 20 Ott Temp N/A	Sereno

TPL

N	14	57	21
Attesa	3'	8'	5'
Ritardo	2'	0'	2'

COLONNINE RICARICA 9m

180 INSTALLATE

81.1 % ATTIVE

8.9 % IN USO

REPLICATE

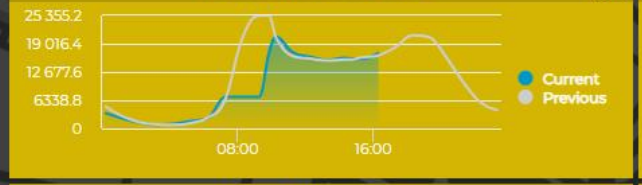
DISIT

FLORENCE DASHBOARD

This dashboard is the main entry point to access dashbaords realised in the REPLICATE H2020 EC project.

REPLICATE has received funding from the European Union's Horizon 2020 Research and Innovation Programme under grant agreement No. 691735.

FLUSSI INGRESSO CITTA 9m

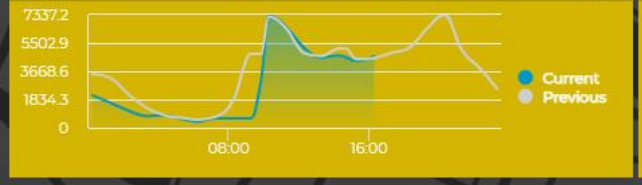


TOTALE 9m

141608

VEICOLI

FLUSSI INGRESSO ZTL 9m



TOTALE ZTL 9m

41146

VEICOLI

SITUAZIONE VIABILITA 54s

4 INCIDENTI

0 CHIUSURE AL TRAFFICO (TOT)

0 CHIUSURE PER CANTIERI

0 PROGR. | 0 NON PROG.

0 LIMITAZIONI AL TRAFFICO (TOT)

0 LIMITAZIONI PER CANTIERI

0 NON PROG. | 0 PROGR.

4 TOT. EVENTI SULLA RETE

SMN 9m	BINARIO16 9m	FORTEZZA 9m
63.4 % occupati su 901 posti	83 % occupati su 165 posti	17.9 % occupati su 521 posti
LEOPOLDA 9m	**CALZA 9m**	**S.AMBROGIO 9m**
36.3 % occupati su 300 posti	69.3 % occupati su 218	67 % occupati su 379 posti
PARTERRE 9m	**CAREGGI 9m**	**BECCARIA 9m**
64.9 % occupati su 106 posti	90.4 % occupati su 406 posti	78.6 % occupati su 210 posti

STATO TRIAGE CAREGGI 9m

Red code	Yellow code	Green code	Blue code	White code
3	12	83	37	9

MAPPA

Energy | Environment | Mobility | Social | Resilience

PM10	Riciclo rifiuto	Rifiuto per abitante	PIL residenti	Tasso di disoccupazione	Piste Ciclabili
26 superamenti/anno	56%	0,629 t/pers/anno	23.606 euro/pers	6,8%	19.7% km ciclabili/km totali

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

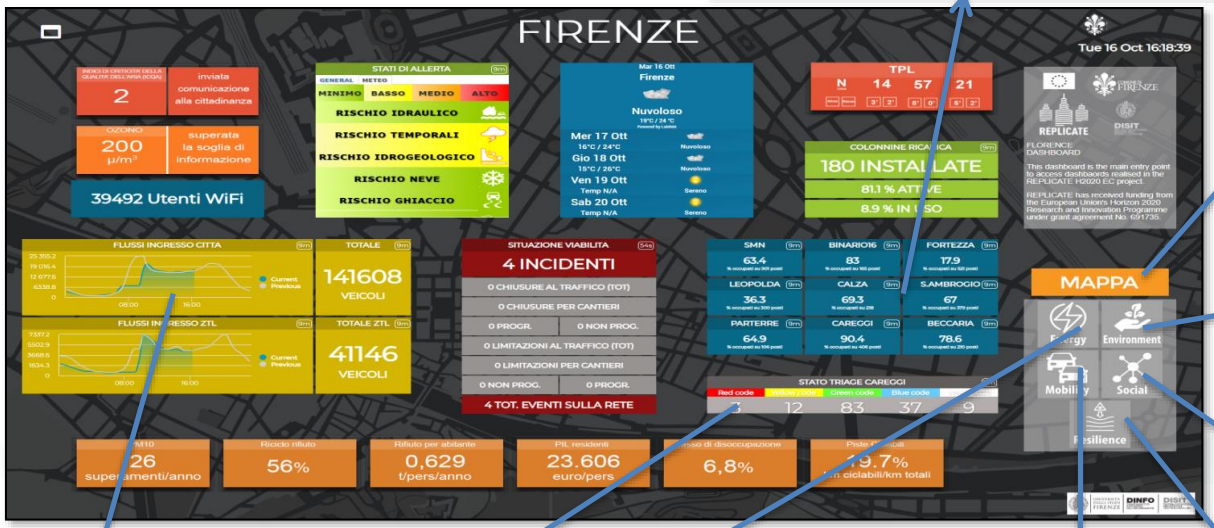
http://www.darionardella.it/il-sindaco-dario-nardella-in-missione-a-madrid-e-barcellona/

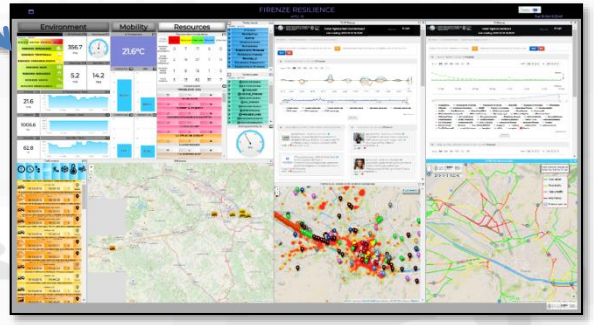
UNIVERSITÀ DEGLI STUDI FIRENZE

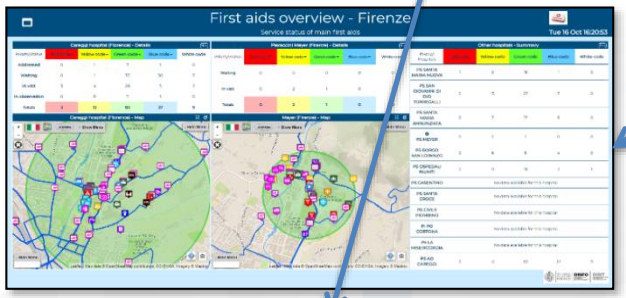
DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

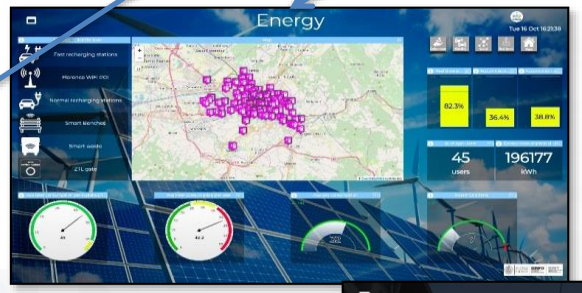
DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

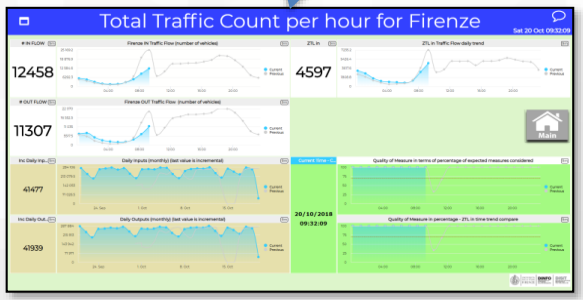
REPLICATE







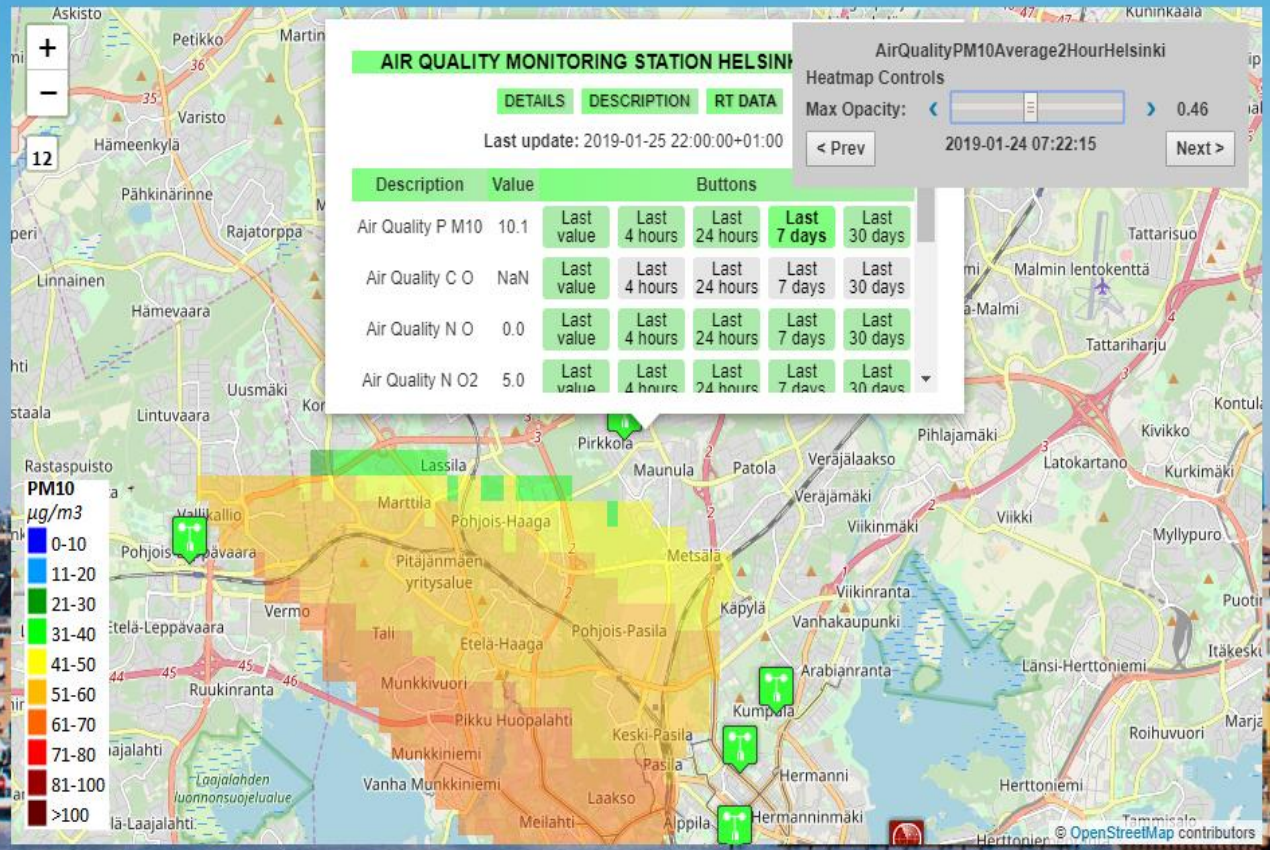


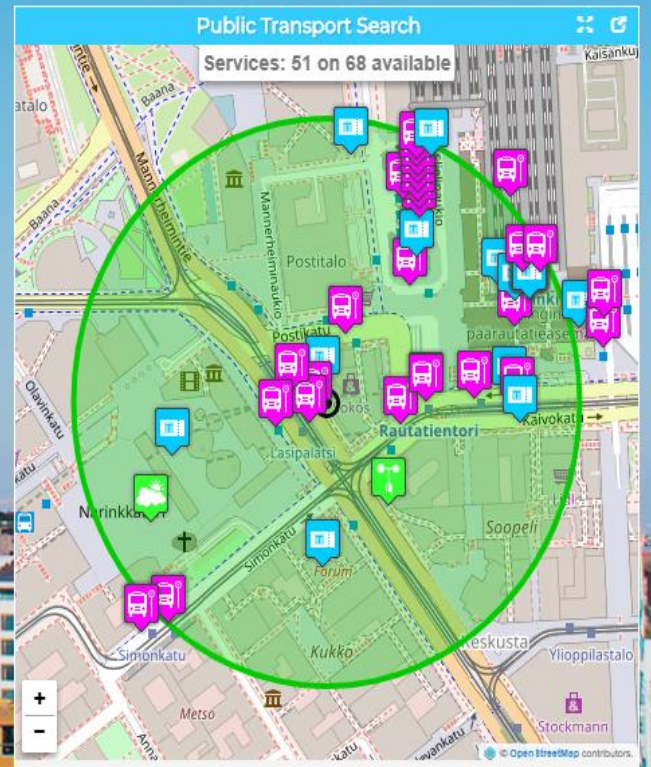


Helsinki Multi Data H2

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



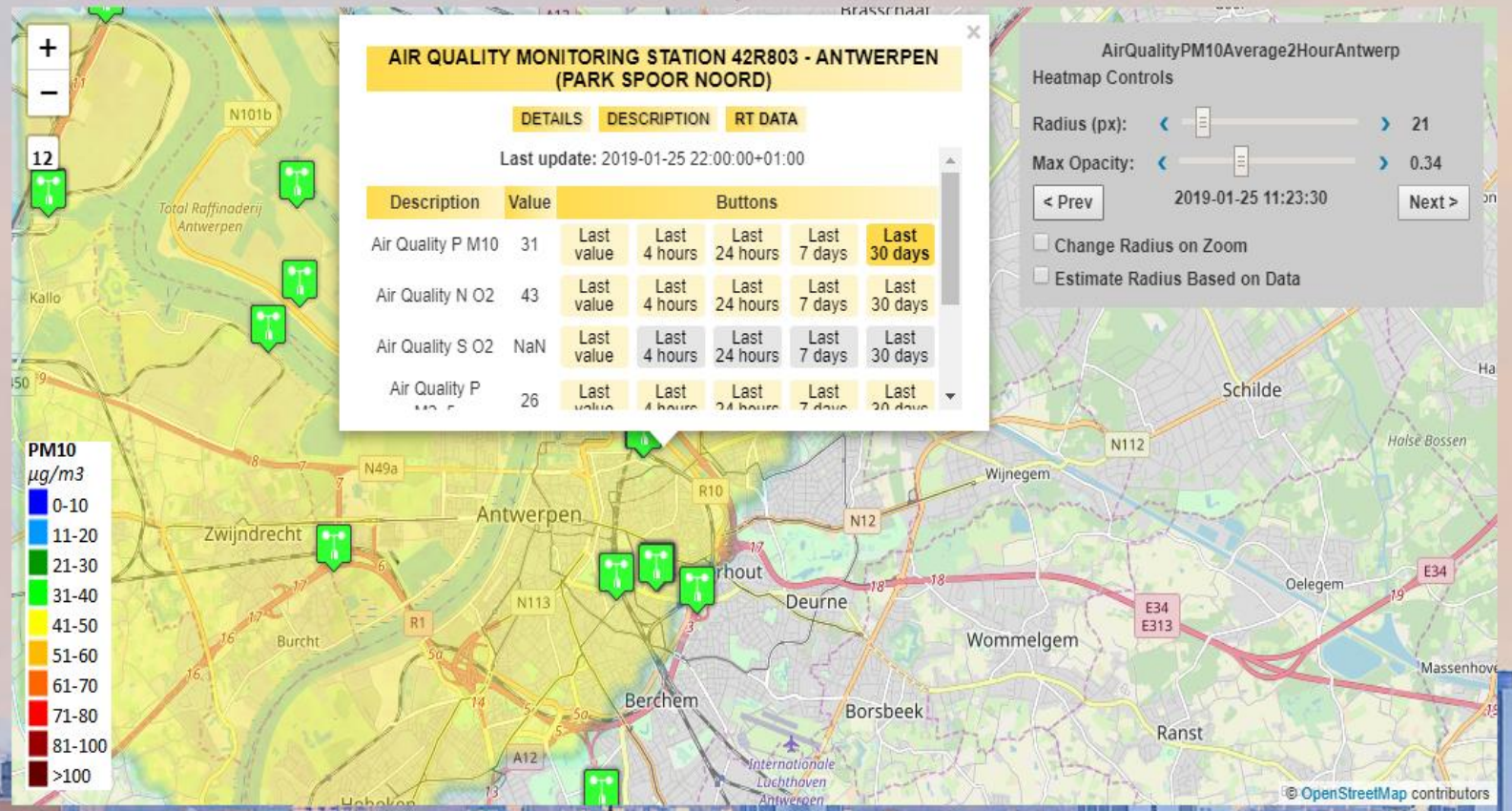


Antwerp Multi Data

Fri 25 Jan 23:46:00

- 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

map multi



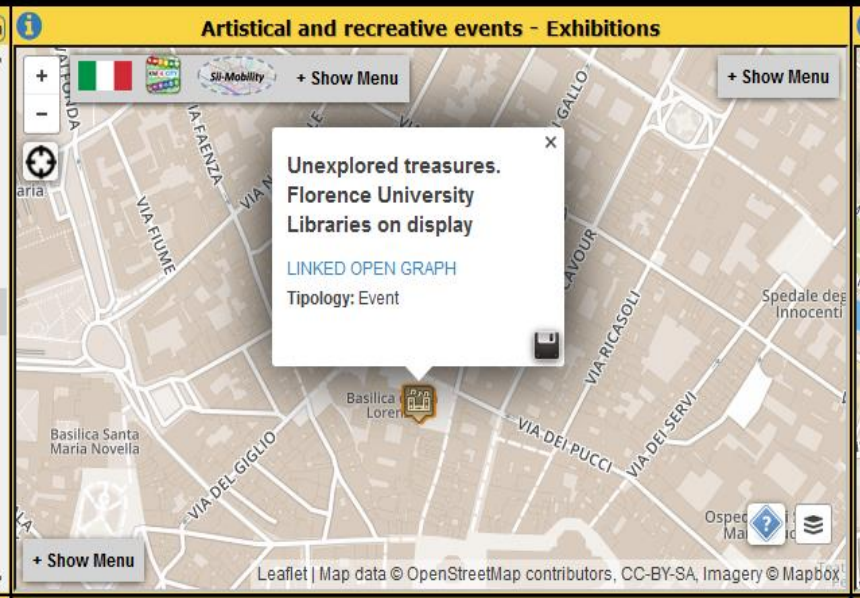
Last value 5m

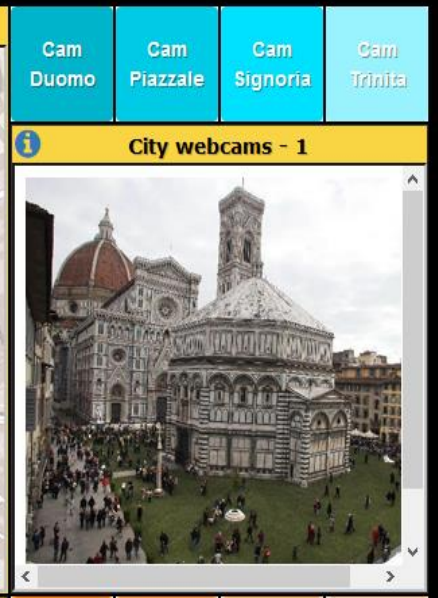
25.5

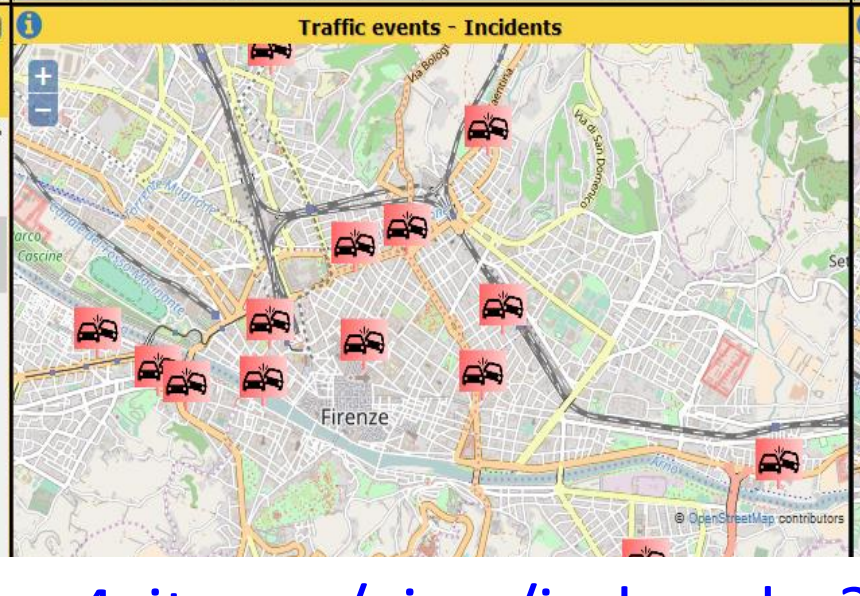
Cross widget interaction 1

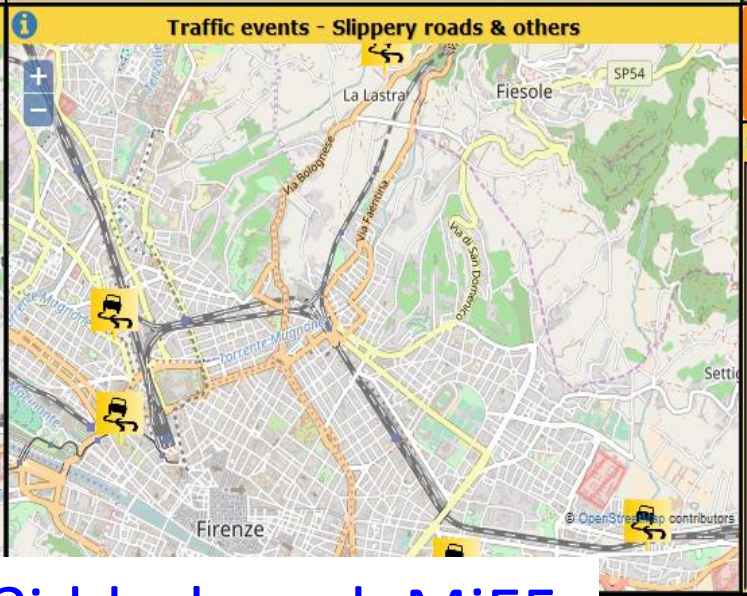
Artistical events, traffic events, city cams

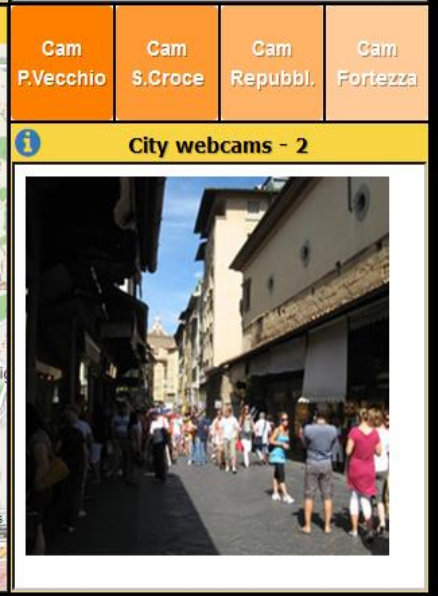
Tue 6 Jun @ 18:50:21











https://main.snap4city.org/view/index.php?iddasboard=MjE5

First aids overview - Tuscany

Service status of main first aids

Thu 25 May @ 11:00:34

Careggi hospital (Florence) - Details

9m

Priority\Status	Red code	Yellow code	Green code	Blue code	White code
Addressed	1	4	3	0	0
Waiting	0	2	9	2	0
In visit	1	9	18	3	0
In observation	4	19	2	0	0
Totals	6	34	32	5	0

Santa Chiara hospital (Pisa) - Details

9m

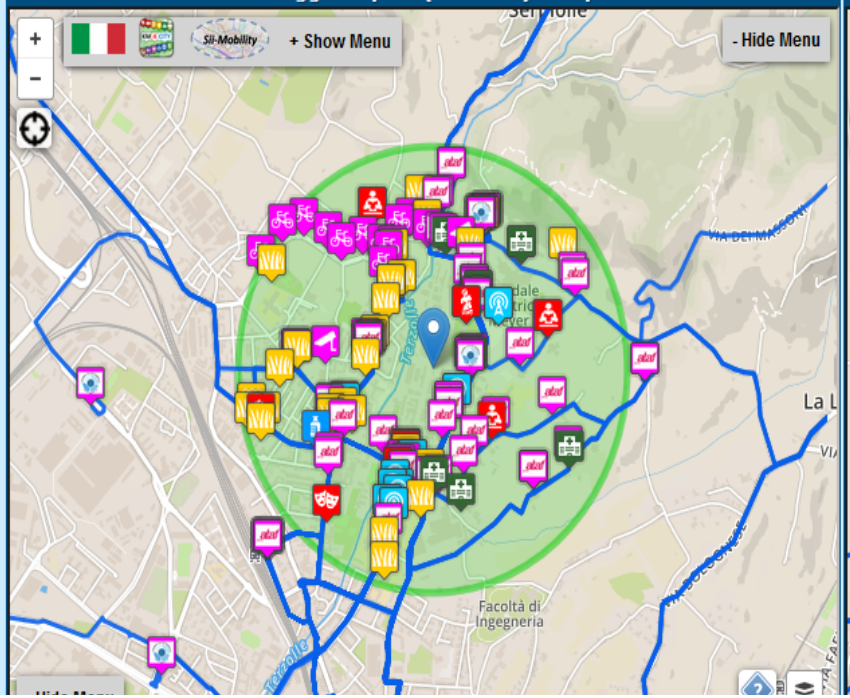
Priority\Status	Red code	Yellow code	Green code	Blue code	White code
Waiting	0	1	7	9	3
In visit	0	7	1	1	6
Totals	0	8	8	10	9

Other hospitals - Summary

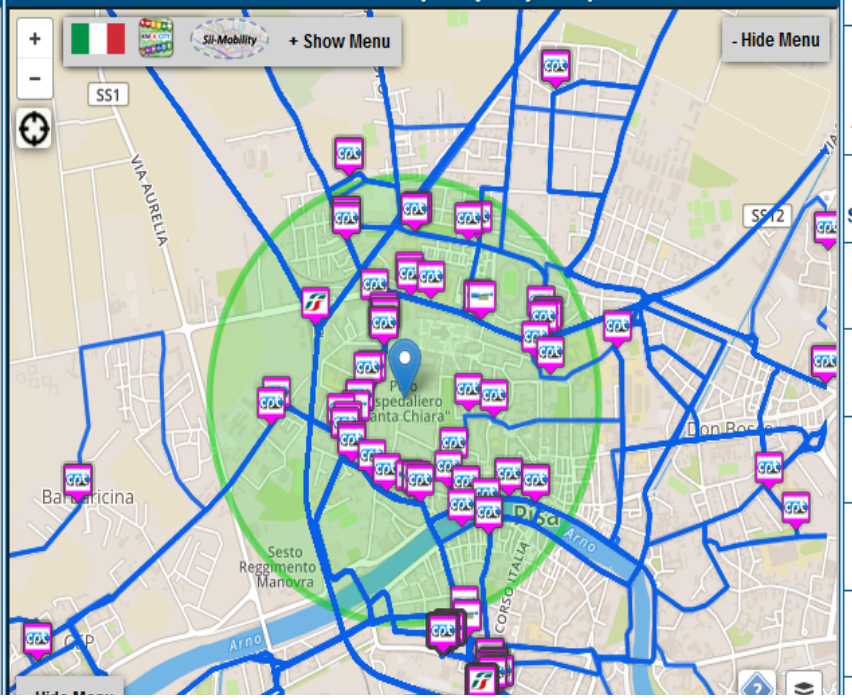
9m

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

Careggi hospital (Florence) - Map



Santa Chiara hospital (Pisa) - Map



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

Horizon 2020
European Union Funding
for Research & Innovation

http://www.resolute-eu.org

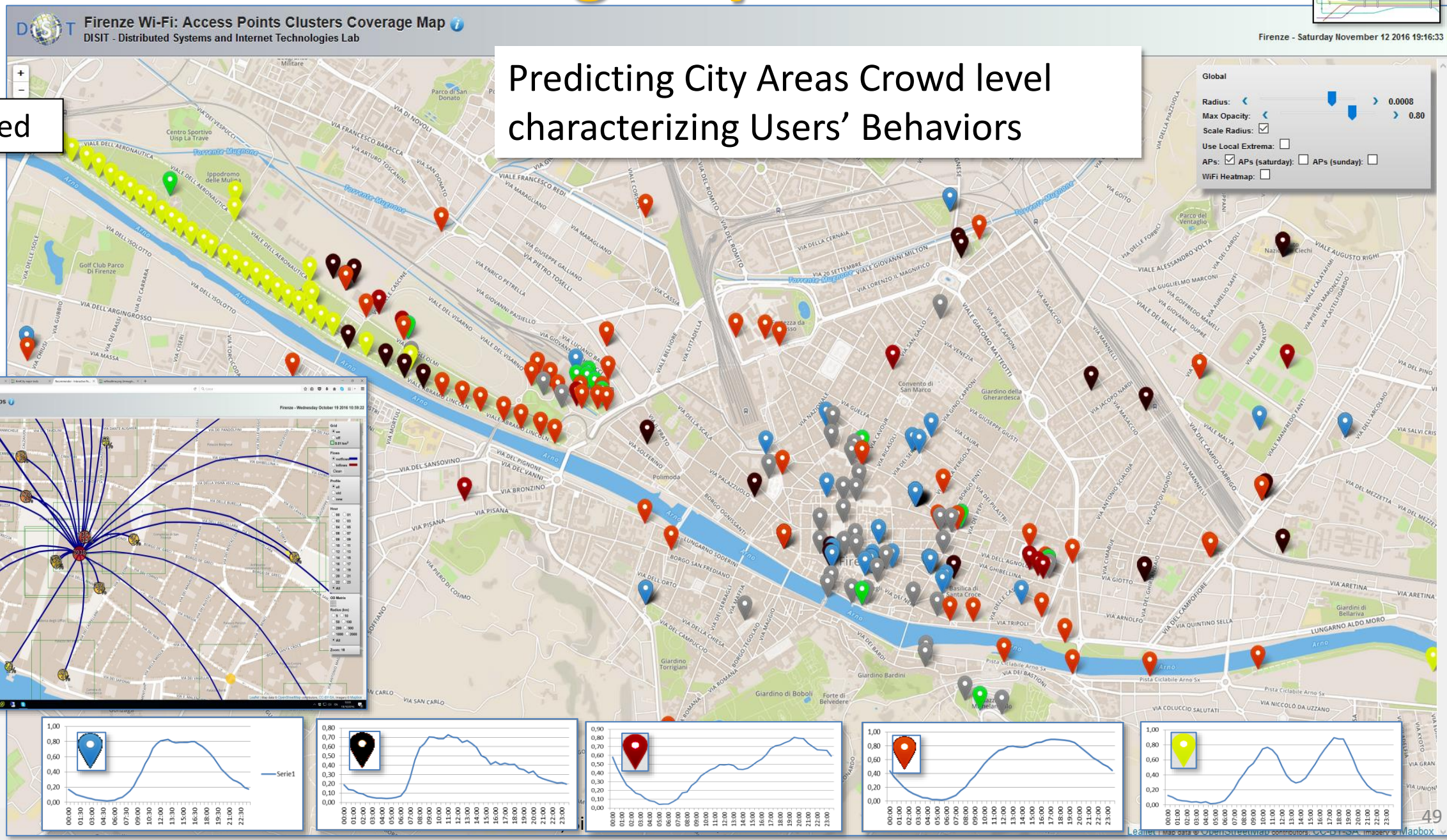
- Develop European Resilience Management Guidelines (ERMG)
  - Develop a conceptual framework for creating/ maintaining Urban Transport Systems
- Enhance resilience through improved support of human decision making processes, particularly by training professionals and civil users on the ERMG and the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

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

Characterizing City Areas

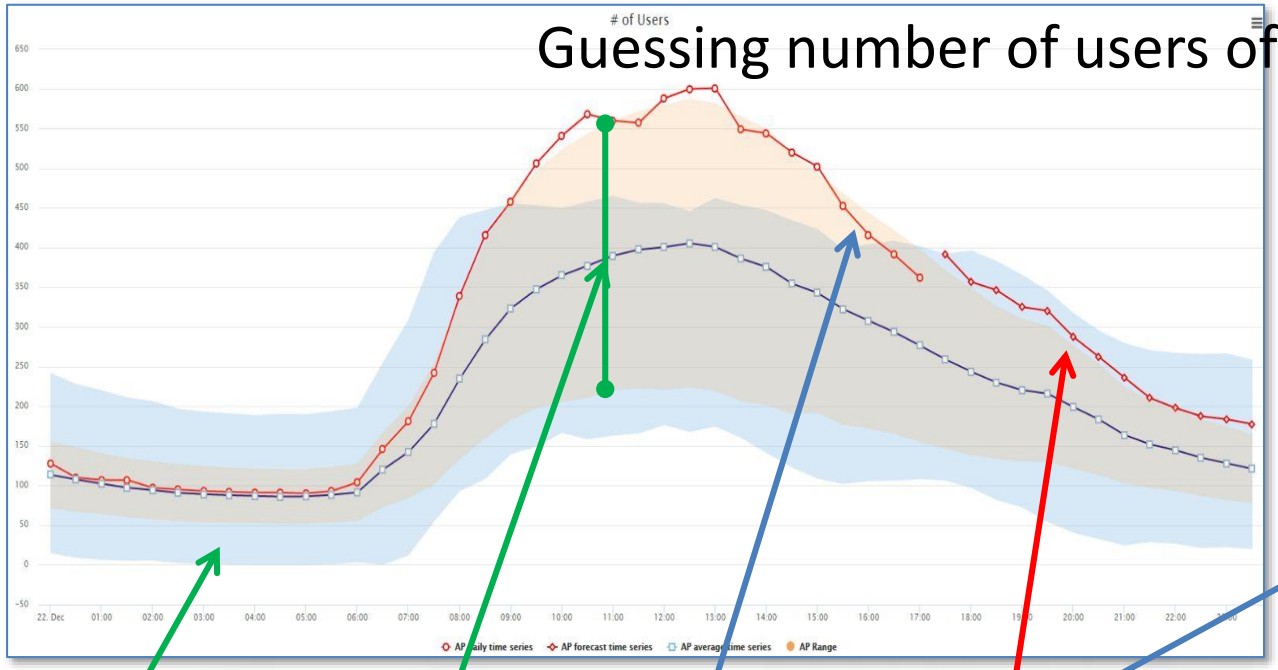
Wi-Fi based

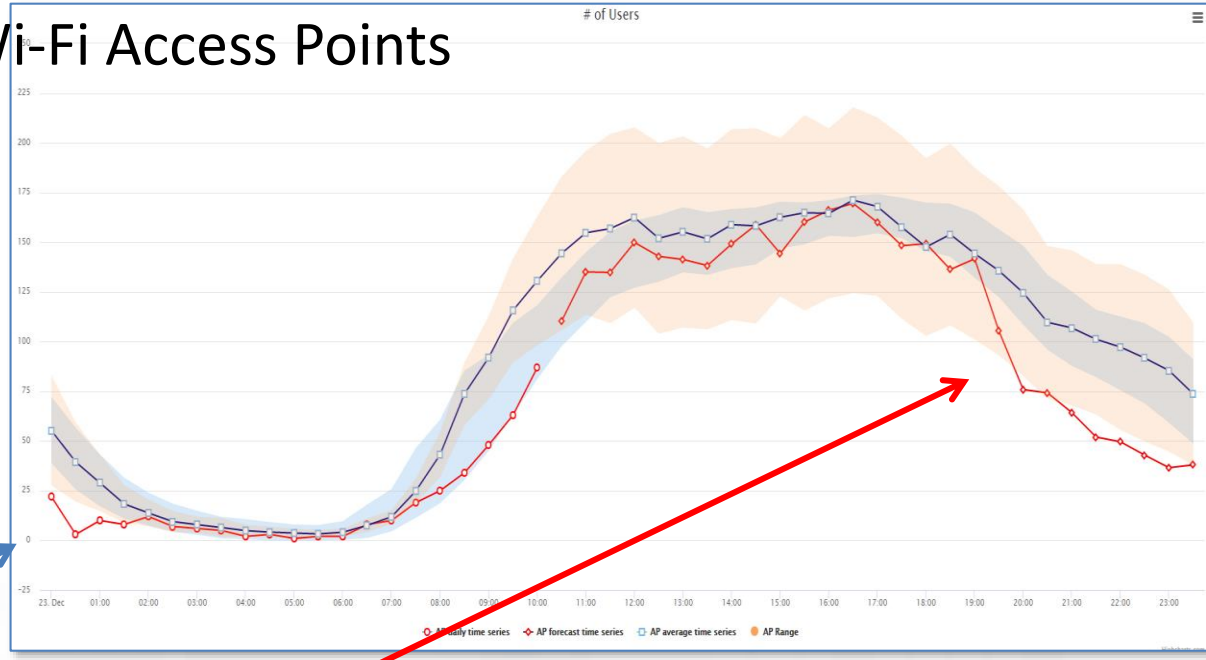
Predicting City Areas Crowd level characterizing Users' Behaviors



Prediction and Identification of Anomalies

Guessing number of users of Wi-Fi Access Points





Cluster confidence

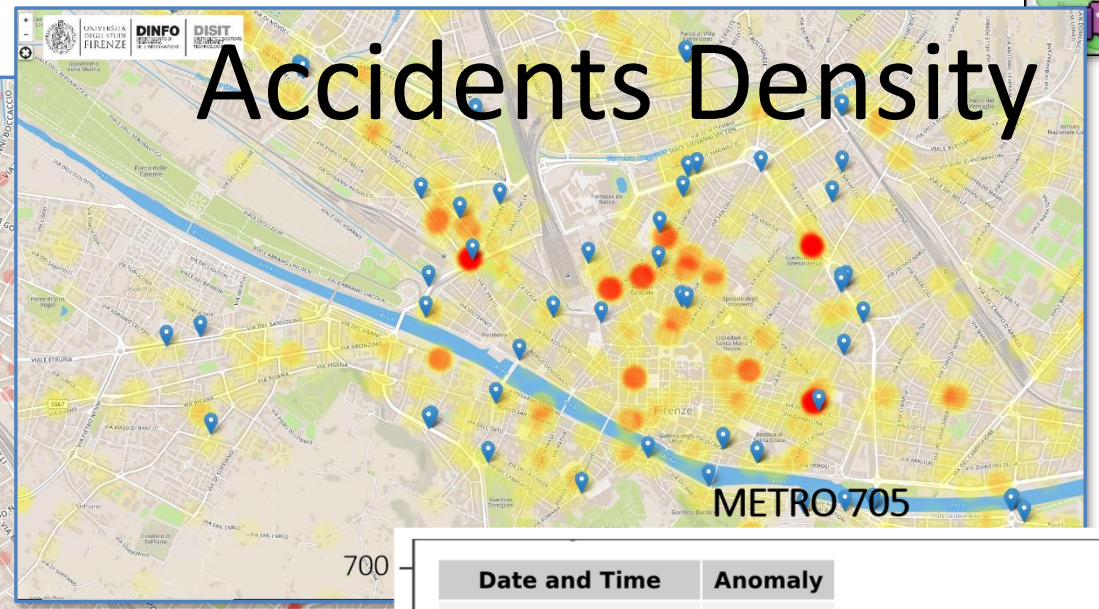
AP average and confidence

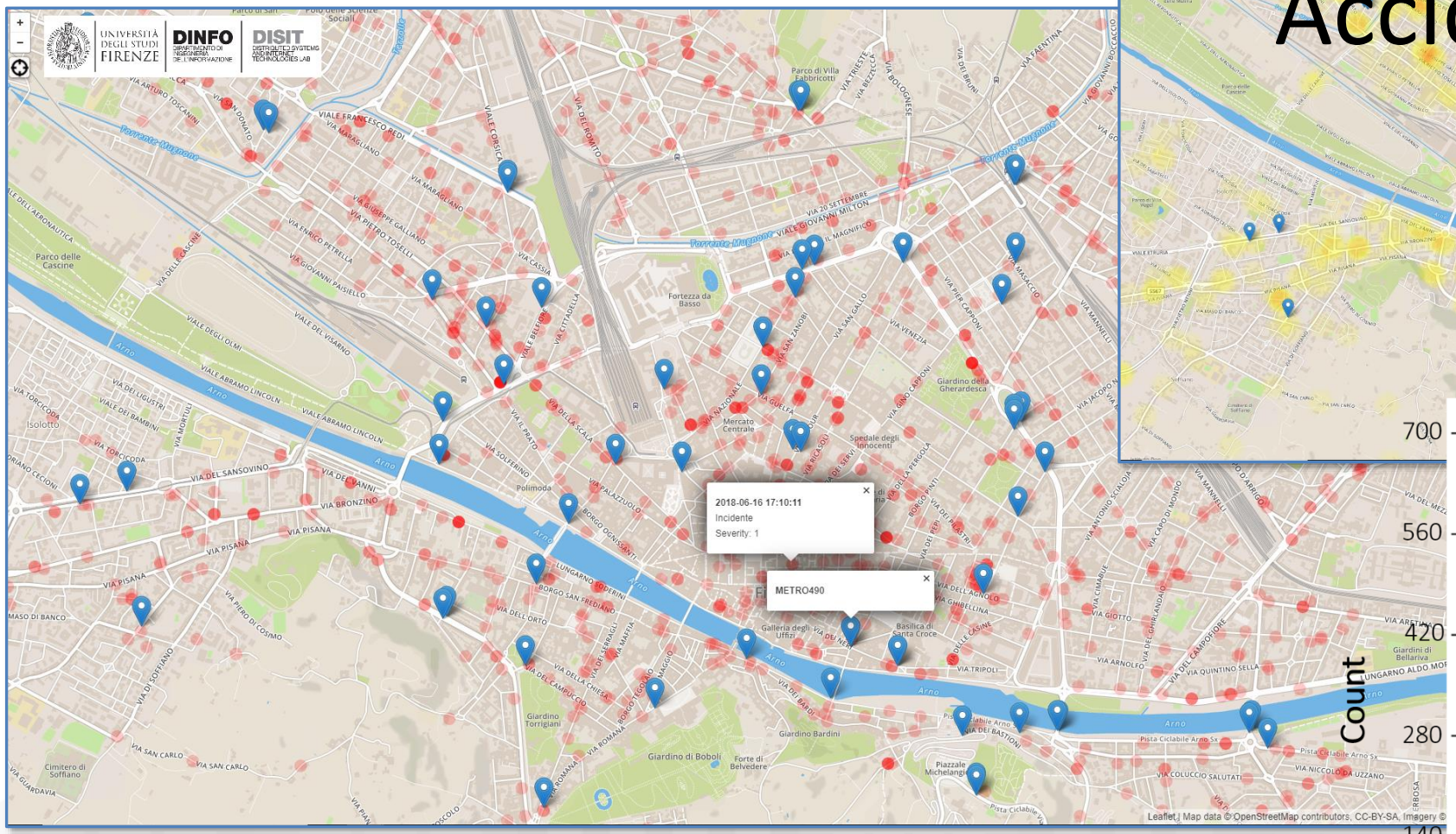
Actual AP trend for today

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

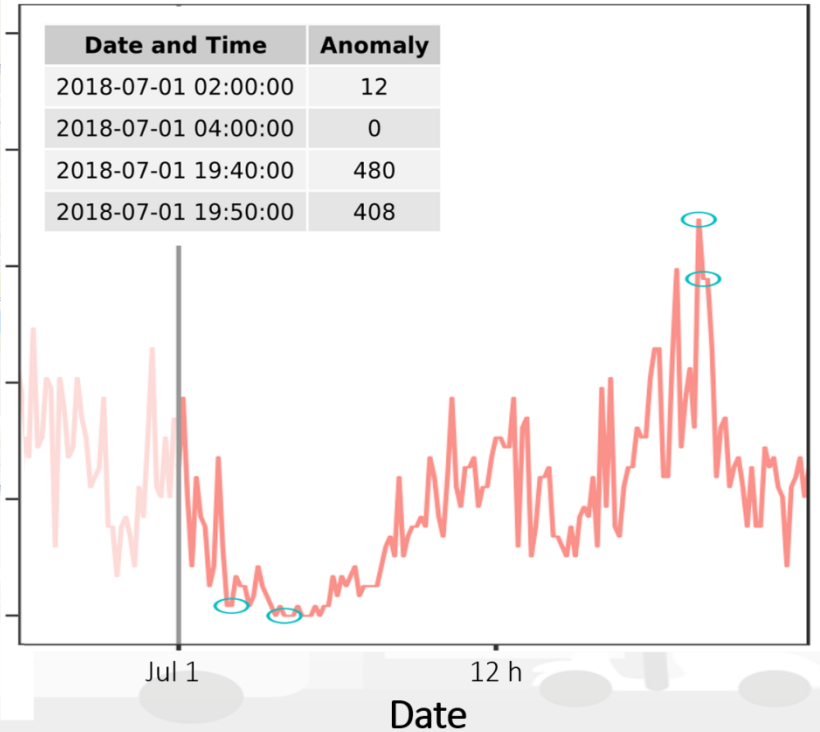
Predictive precision of the 95%

Anomaly Detection





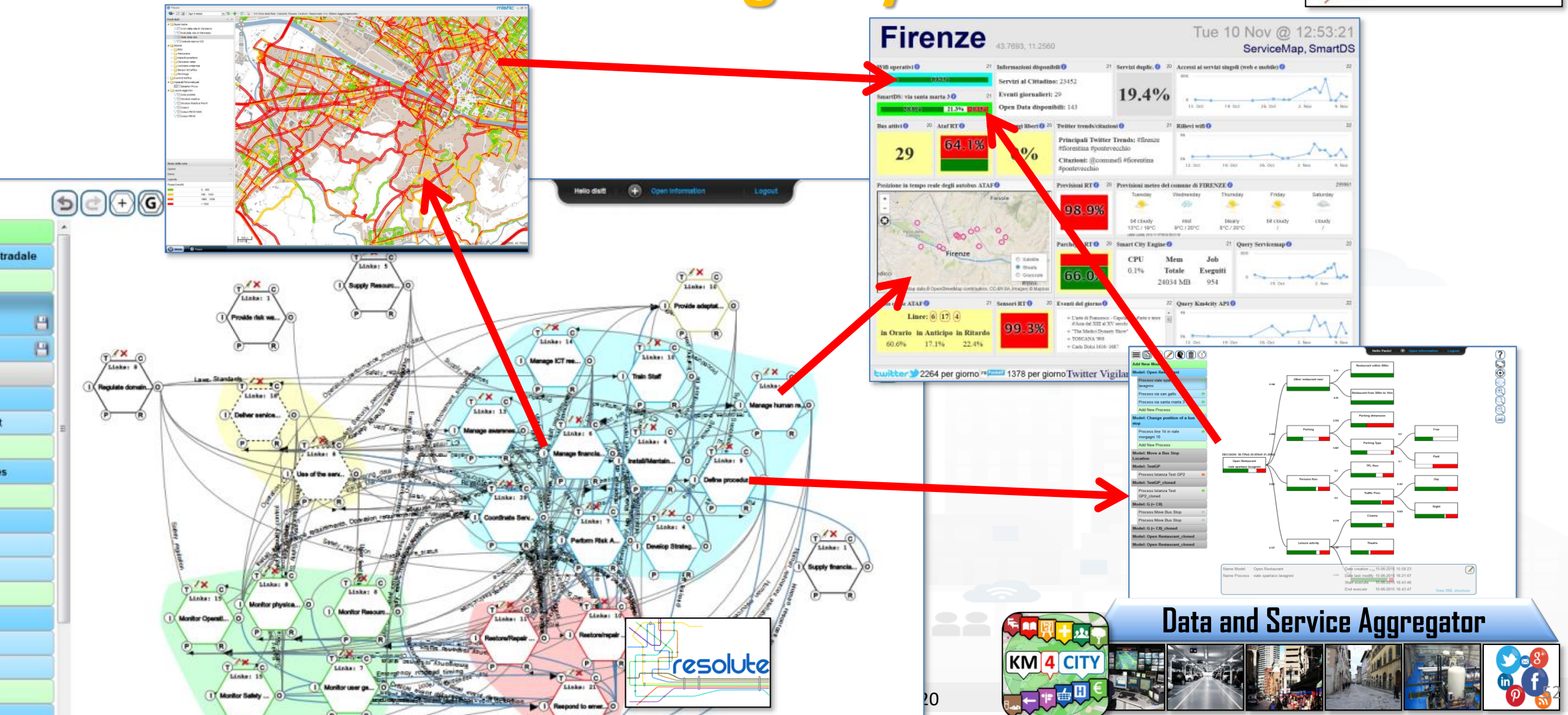
Date and Time	Anomaly
2018-07-01 02:00:00	12
2018-07-01 04:00:00	0
2018-07-01 19:40:00	480
2018-07-01 19:50:00	408



Accidents vs Traffic

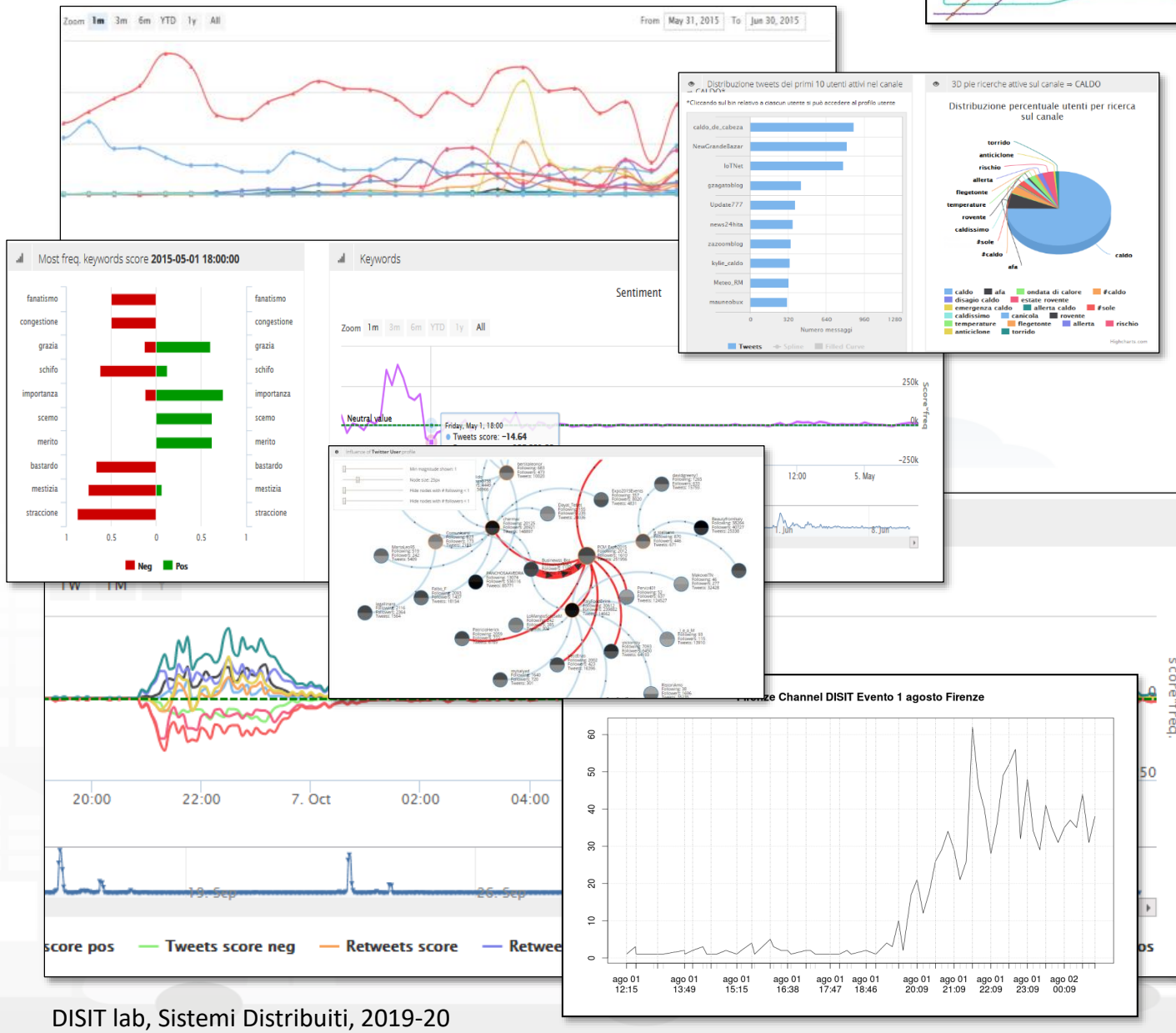
UNIVERSITÀ DEGLI STUDI FIRENZE | DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE | DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

Dashboarding City Resilience



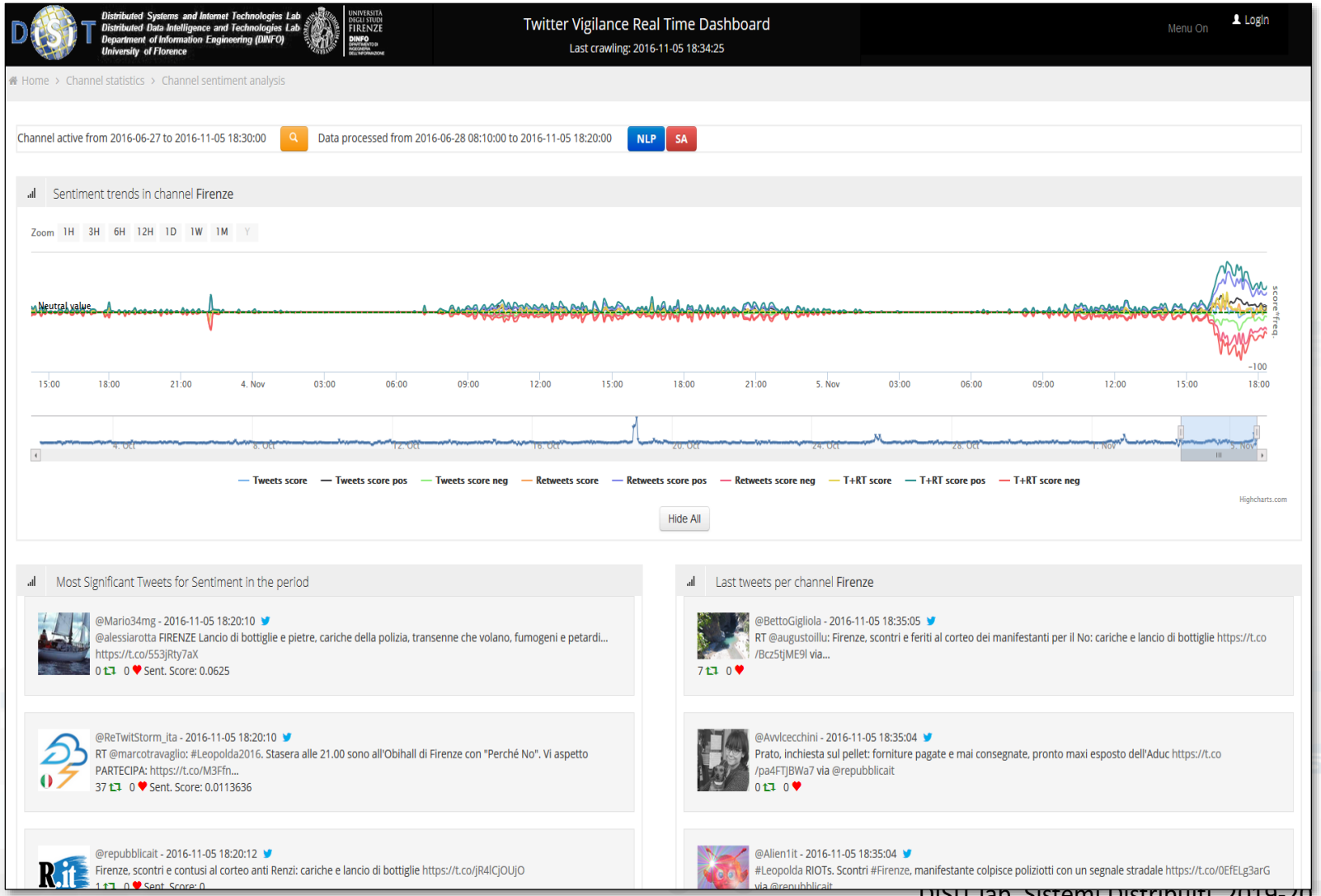
Twitter Vigilance

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

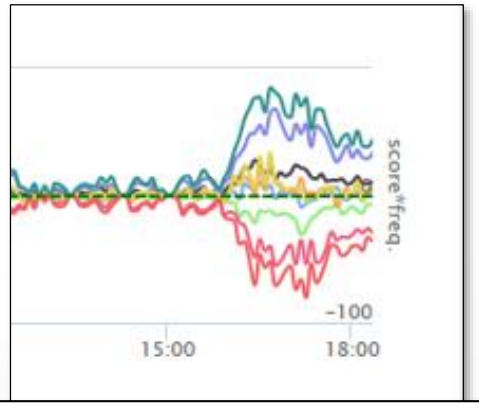


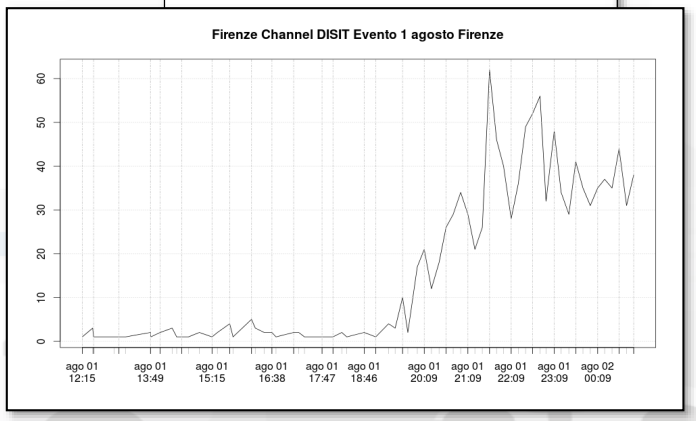
Twitter Vigilance

Twitter Vigilance RT: sentiment analysis



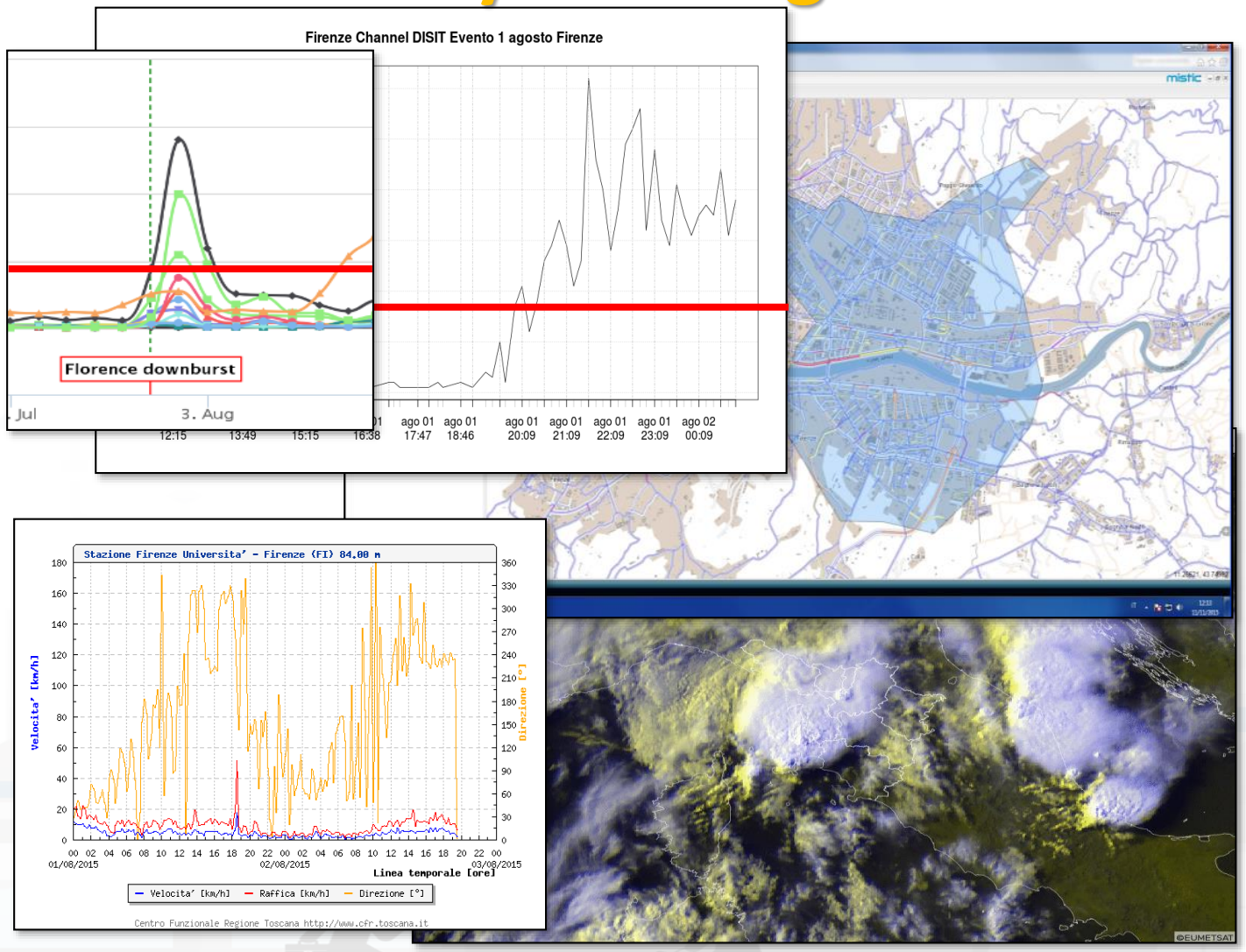
Real time Early Warning



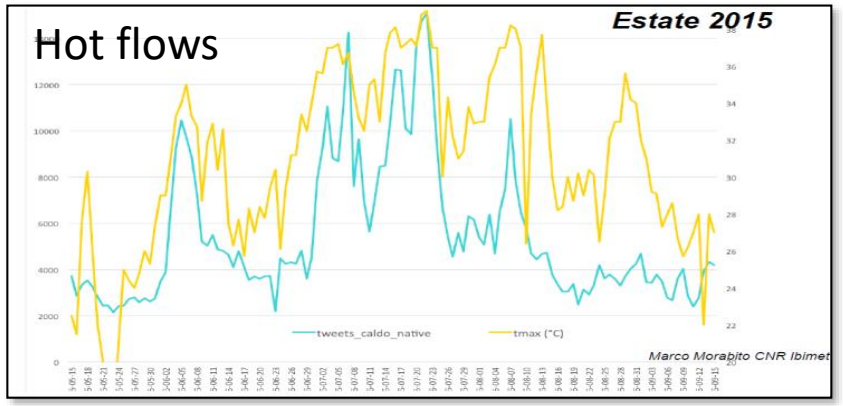


Twitter Vigilance

Early Warning



Predictive models



Attendance at long lasting events: EXPO2015

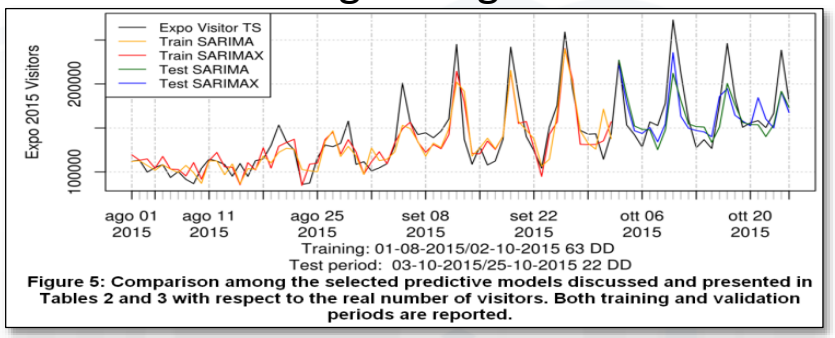
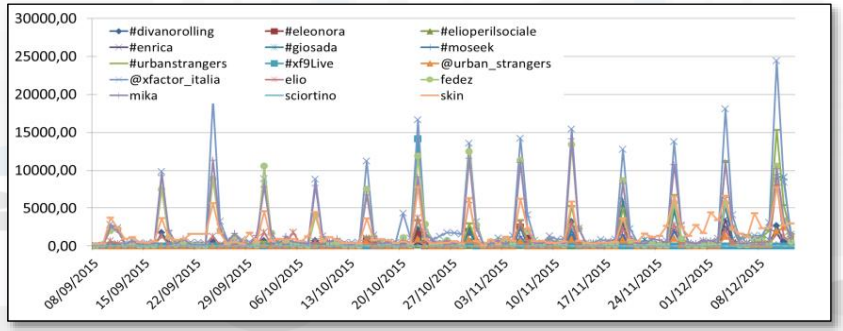


Figure 5: Comparison among the selected predictive models discussed and presented in Tables 2 and 3 with respect to the real number of visitors. Both training and validation periods are reported.

Attendance at recurrent events: TV, footbal



Understanding Traffic Flows to Improve Air quality

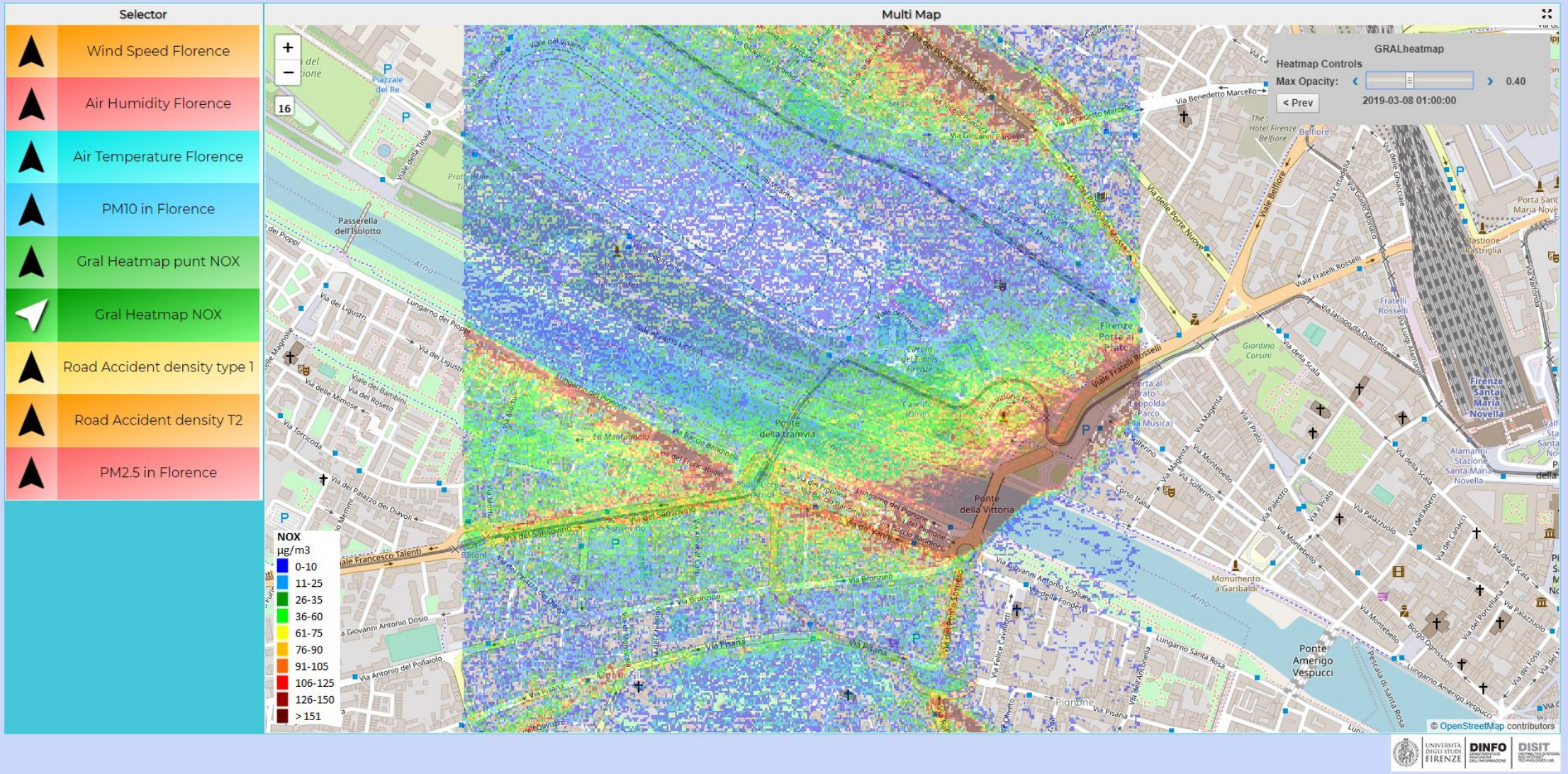
- **Objective:**
  - to develop a service that **combines traffic data on air quality**, weather conditions, and traffic flows in order to allow citizens and municipalities to estimate the level of pollution resulting from varying traffic flow conditions.
- **Where:**
  - **Zaragoza, Florence, Modena, Livorno, Santiago de Compostela, and Pisa**

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

Heatmap Firenze

different data

Sun 10 Mar 20:22:23

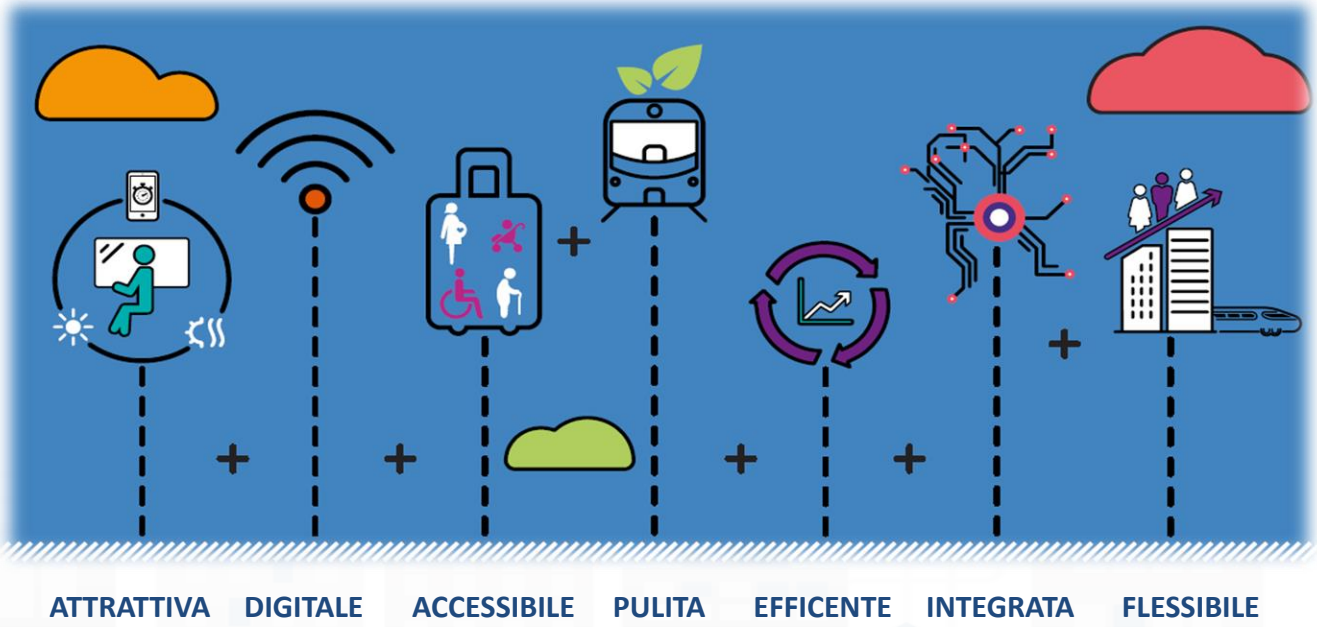


MObility 4.0 for SmArt (i) City

Tools for Mobility operators

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

Where: in Tuscany



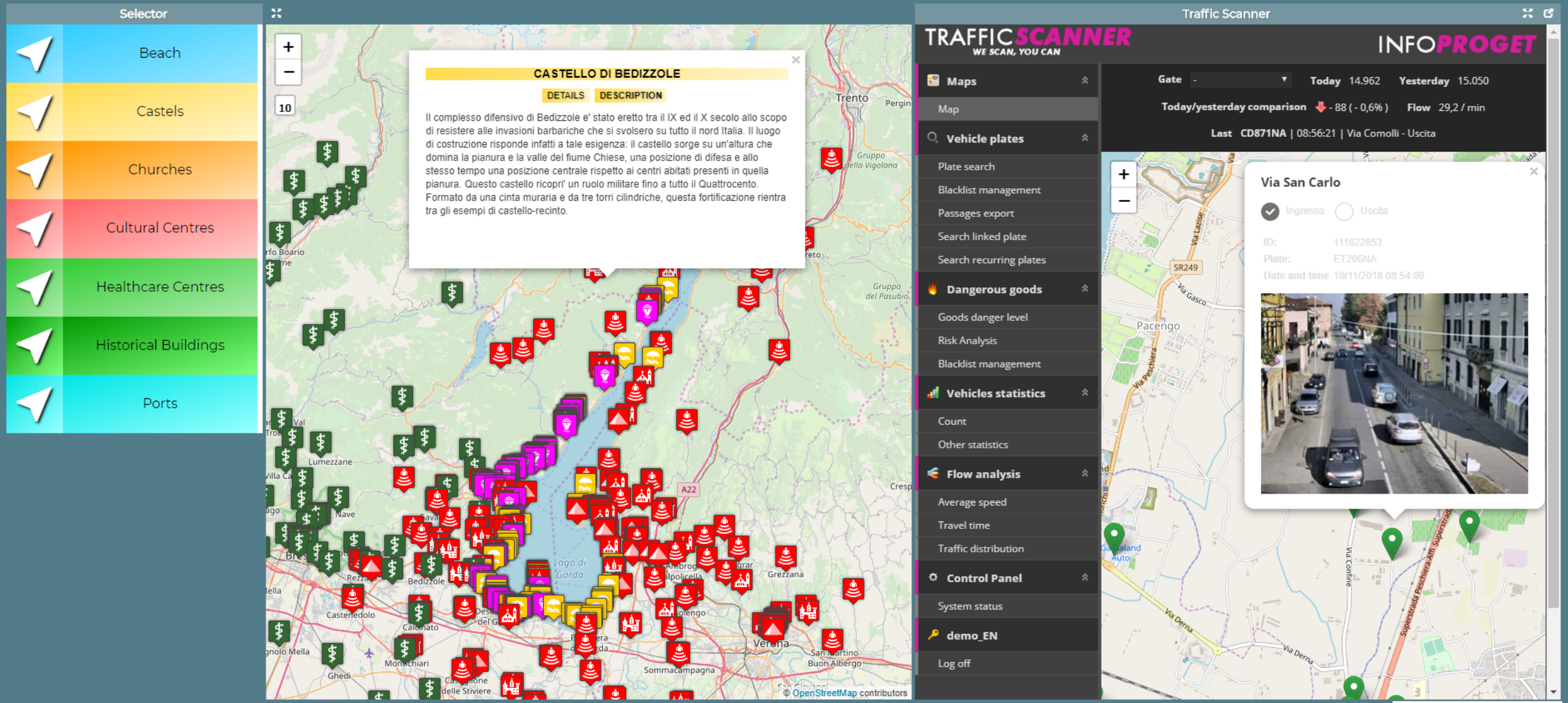
WEEE: Waste from Electrical and Electronic Equipment

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

http://www.regione.toscana.it/-/life-weee

Smart Garda Lake

Sat 10 Nov 08:56:28



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

UNIVERSITÀ DEGLI STUDI FIRENZE

DINFO DIPARTIMENTO DI INGEGNERIA DELL'INFORMAZIONE

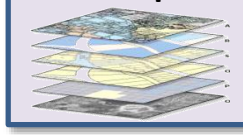
DISIT DISTRIBUTED SYSTEMS AND INTERNET TECHNOLOGIES LAB

SNAP4INDUSTRY

KM4CITY

Open Data

GIS + Map Data

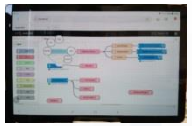


Proprietary Data

Personal Data

IOT Devices

IOT Edge Devices



IoT/IoE

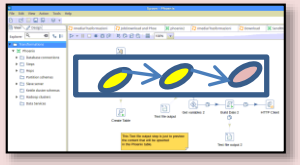
Industry 4.0

Social Media

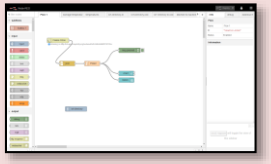
Static, Quasi static and Real Time data flows

Data Processing Tools

ETL Processes, Data Analytic, R; IOT App; etc.



ETL Processes

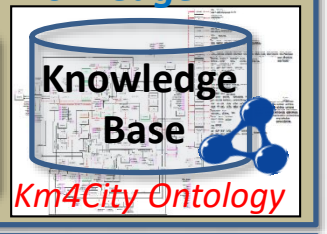


IoT/IoE Applications

Elastic Management of Containers

Big Data Storage Knowledge

Phoenix, Hbase + indexing



Km4City Ontology

Smart City Cloud Infrastructure

Km4City Smart City API

Final Users' Tools

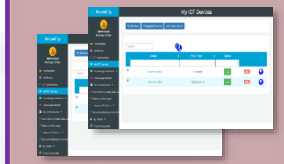
Dashboards

IOT / IOE Apps

Mobile and Web Apps

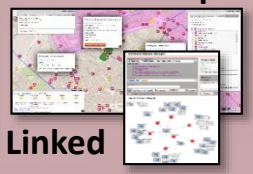
Living Lab, Development and Management Tools

Management



IOT Directory

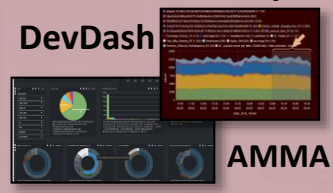
ServiceMap



Linked Open Graph

Data Flow Analysis

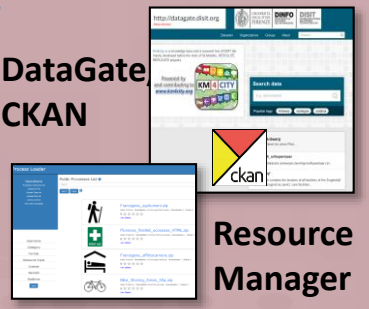
DevDash



AMMA

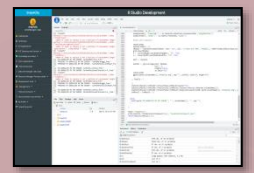
DataGate

CKAN



Resource Manager

RStudio



Authentication, Authorization, GDPR, Security Assessment

Experimenting 5G

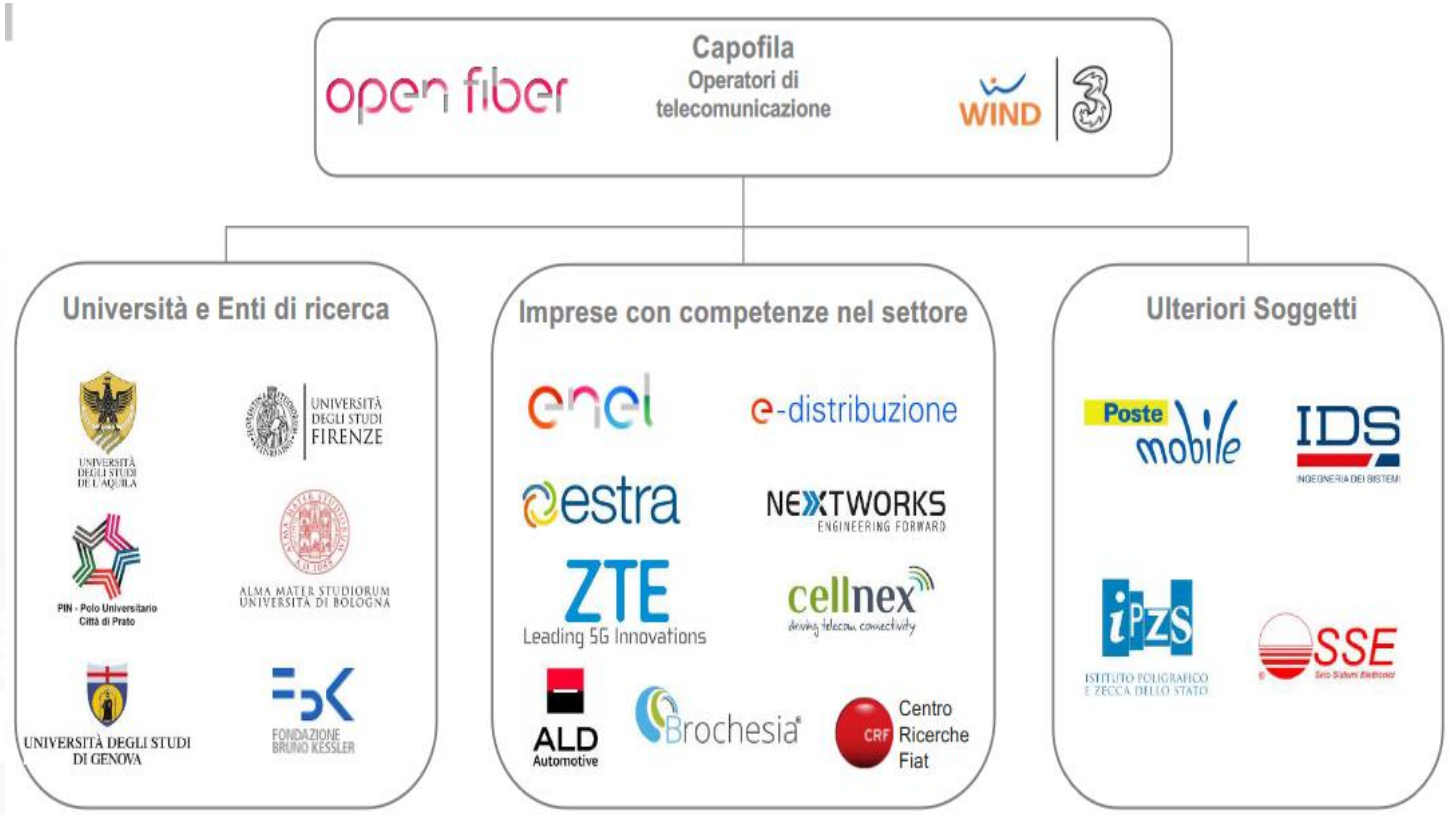
Fields:

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

Where in Italy:

- Prato and L'Aquila

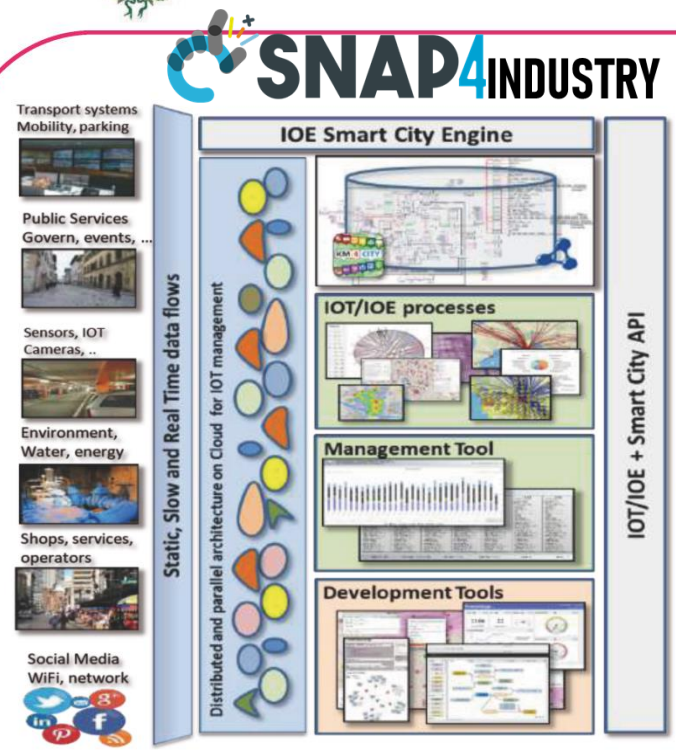
Partners:

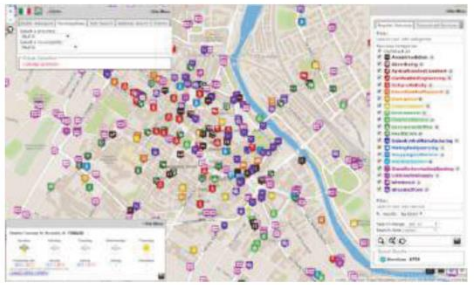


SENSORI E IOT - PRATO

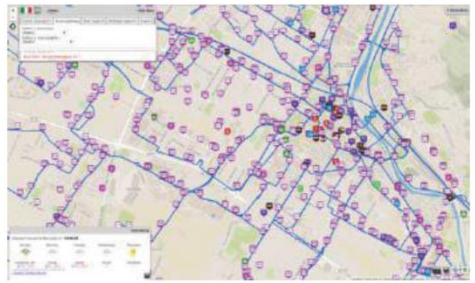
Piattaforma IoT/IoE abilitata dal 5G per applicazioni di:

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





Punti di interesse e servizi su Prato



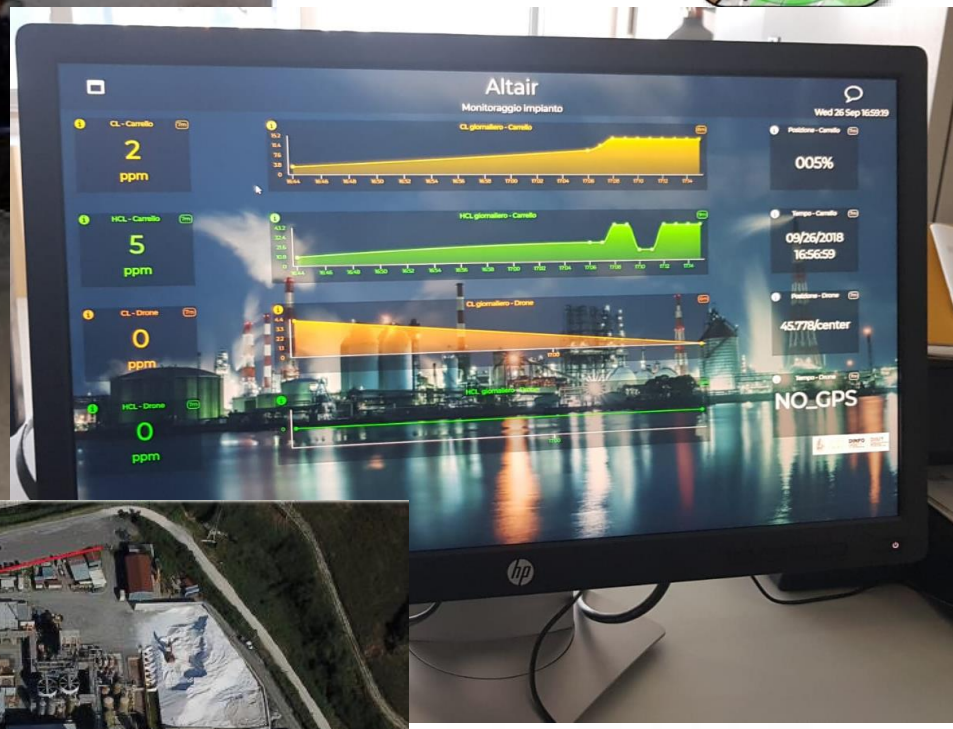
Use Case LEADER estra

Partner coinvolti open fiber, ZTE Leading 5G Innovations, Università degli Studi Firenze, cellnex driving telecom connectivity, SSE Sirio Sistemi Elettronici, PIN - Polo Universitario Città di Prato

Aziende/Enti Coinvolti Qualcomm, Interporto della Toscana Centrale, Unione Industriale Pratese Confindustria Prato, centria Reti Gas, Publiacqua, GIDA, Programma Ambiente

Green Impact Capacity (GIC)

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



Green Impact Capacity (GIC)

Altair Control room

SNAP4INDUSTRY

.....

WSs, HTTPS

WSs, HTTPS

WSs, HTTPS

IOT Devices

[IOT Edge]

IOT Broker

[IOT Application]

Dashboard Engine

WSs HTTPS

Sensors/ Actuators

Shadow

Making IOT data always available

MicroServices
Ext-Services
.....

Executing permanent computation

Executing local computation

Internet

Internet

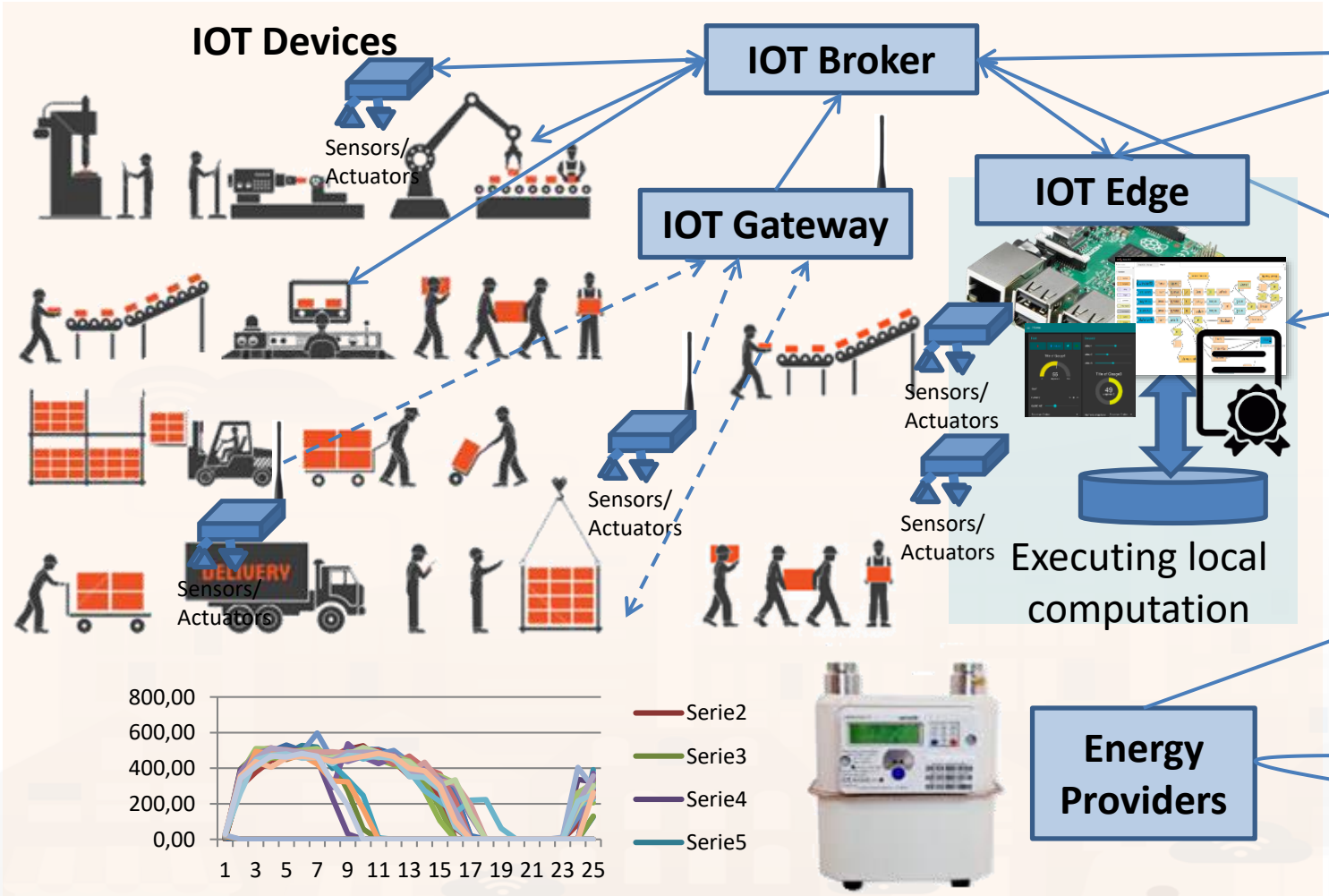
Intranet

Cloud

User interface On Browser

End 2 end security IOT

Industry 4.0 Application



Energy Providers

Internet

On Cloud

IOT Broker

[IOT Application]

Executing permanent computation

Dashboard on cloud

MicroServices
Ext-Services
.....

ETL Process

Data Analytics

-- predictions
-- suggestions
-- Anomaly detection

Feedback Project

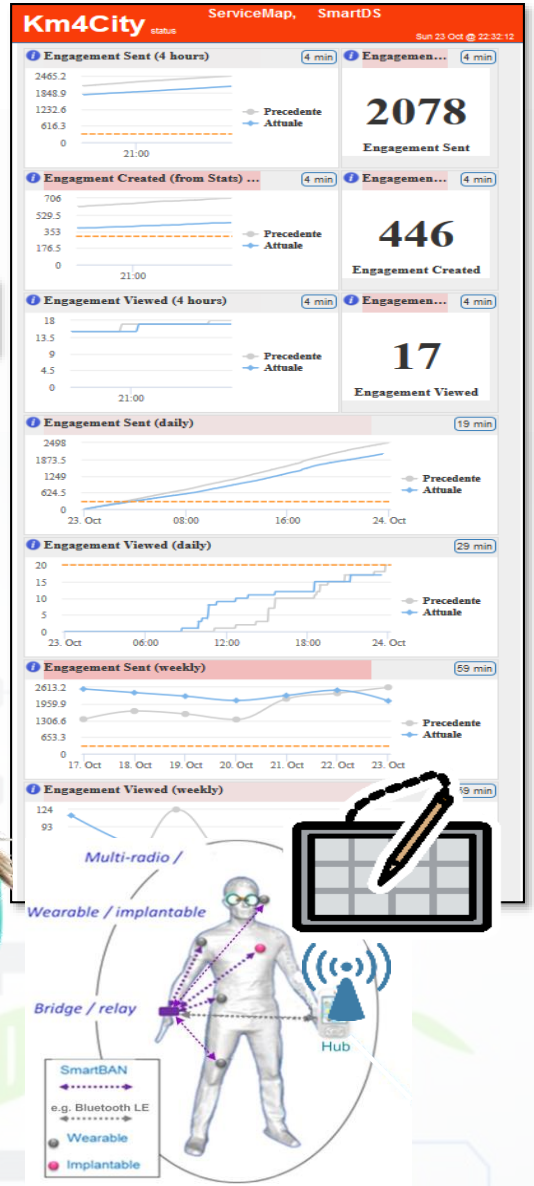
Personal Assistant

Operators

Strategy Editor and feedback

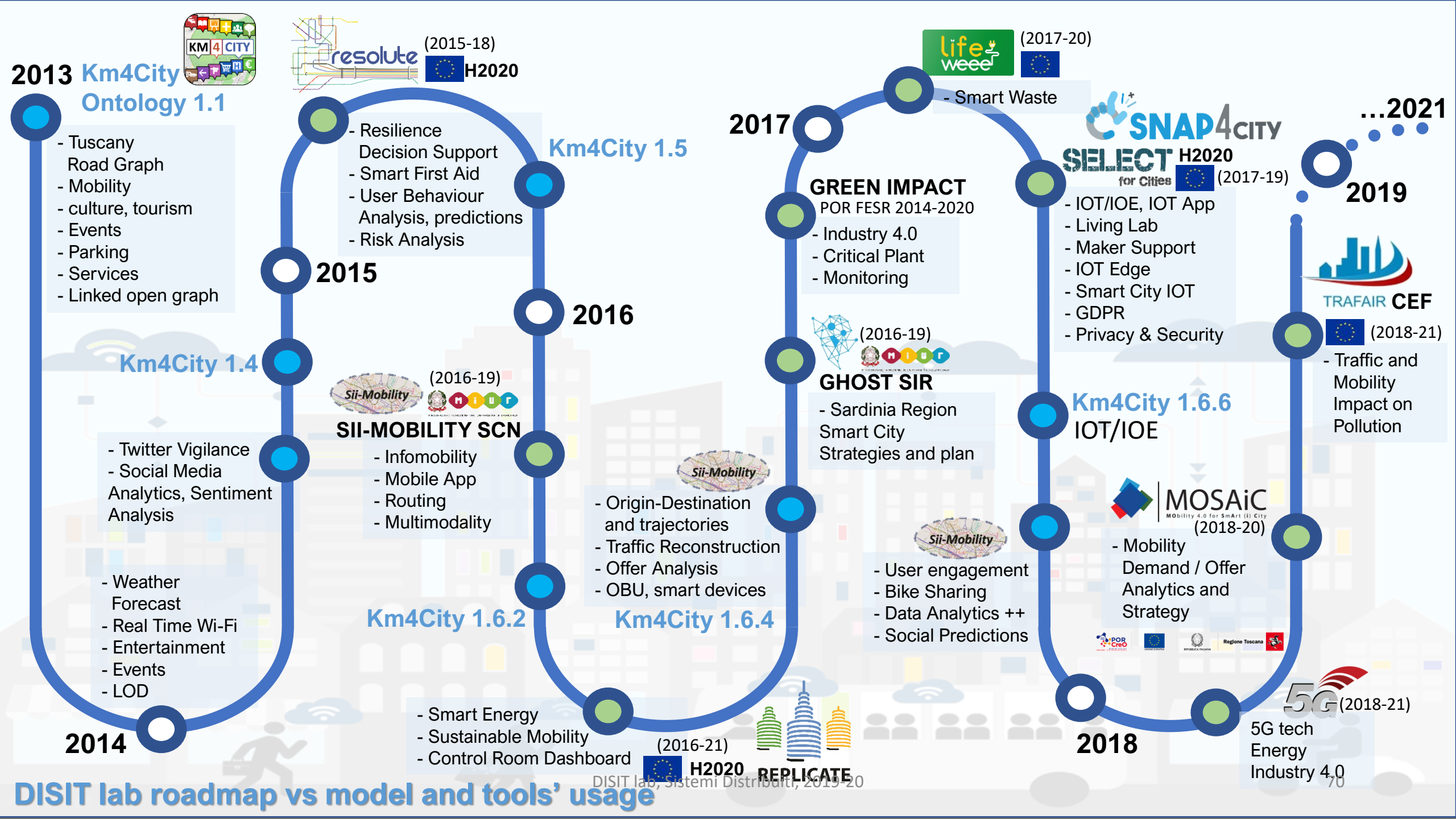
Rule name	Type	#sent	#viewed	#viewed on #sent	Description
daily_event_de	ENGAGEMENT	1 (0%)	0 (0%)	0%	Suggest (in german) an event currently on in Flore
daily_event_en	ENGAGEMENT	1720 (2.12%)	70 (7.1%)	4.07%	Suggest (in english) an event currently on in Florence
	- commuter	5 (0.29%)	0 (0%)	0 (0%)	
	- student	14 (0.81%)	0 (0%)	0 (0%)	
	- tourist	1462 (85%)	25 (35.71%)	25 (1.71%)	
	- citizen	113 (6.57%)	39 (55.71%)	39 (34.51%)	
	- operator	0 (0%)	0 (0%)	0 (0%)	
	- disabled	0 (0%)	0 (0%)	0 (0%)	
	- all	119 (6.92%)	6 (8.57%)	6 (5.04%)	
daily_event_es	ENGAGEMENT	6 (0.01%)	4 (0.41%)	66.67%	Suggest (in spanish) an event currently on in Florence
daily_event_fr	ENGAGEMENT	6 (0.01%)	0 (0%)	0%	Suggest (in french) an event currently on in Florence
daily_event_it	ENGAGEMENT	5459 (6.73%)	296 (30.02%)	5.42%	Suggest (in italian) an event currently on in Florence
parking_en	ASSISTANCE	141 (0.17%)	128 (12.98%)	90.78%	Alert (in english) if the user parked in a residential parking zone
parkin					parked in a residential parking zone
parkin					parked in a residential parking zone
shoot					on for a nearby point-of-interest

Inform
Engage
Stimulate / recommend
Anomalies Detection
Provide Bonus, incentives



DISIT projects

- **Non descritti:**
  - **SODA Altair, Industria 4.0**
  - **Coll@bora Social Innovation, MIUR:**
    - http://www.disit.org/5479
  - **Smart City of Florence Metropolitan Area**
  - **Giustizia Semplice**



DISIT lab roadmap vs model and tools' usage

Agenda

- Modello del corso
- Laboratorio DISIT
- Infrastruttura e servizi
- Progetti in corso e attività correlate
- Visione generale del corso

Sistemi Distribuiti

Corsi di Laurea in Ingegneria dell'Informatica, Telecomunicazioni, ed in Informatica di Scienze

Prof. Paolo Nesi

Parte: 0 – Overview del corso di Sistemi Distribuiti

Department of Systems and Informatics, University of Florence
Via S. Marta 3, 50139, Firenze, Italy
tel: +39-055-2758515, fax: +39-055-2758570

DISIT Lab, Sistemi Distribuiti e Tecnologie Internet

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

paolo.nesi@unifi.it

http://www.disit.dinfo.unifi.it/nesi

Corso triennale: Sistemi Distribuiti

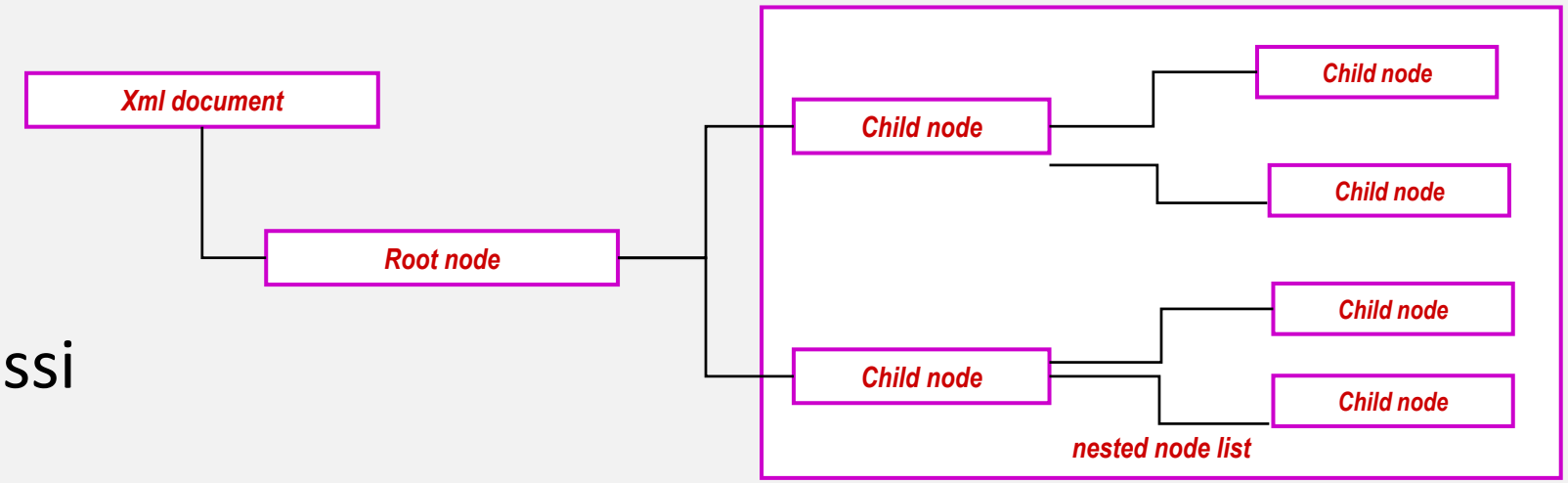
- Overview
- XML… WSDL
- JSON, JavaScript ← programmazione web
- Middleware, remote procedure call, corba
- Sistemi P2P
- Architetture parallele → Hadoop
- Data Warehouse, ETL, IOT, data streaming/driven, IOT Applications
- Smart City, IOT, IOE, etc.
- Programmazione per mobile

Introduzione ai Sistemi Distribuiti

- Cosa sono i sistemi distribuiti
- Tecnologie dei sistemi distribuiti
- Internet e sua Evoluzione, Intranet
- Sistemi IOT e Mobili
- Problemi dei sistemi distribuiti
- Web Server e servizi
- Architetture n-tier

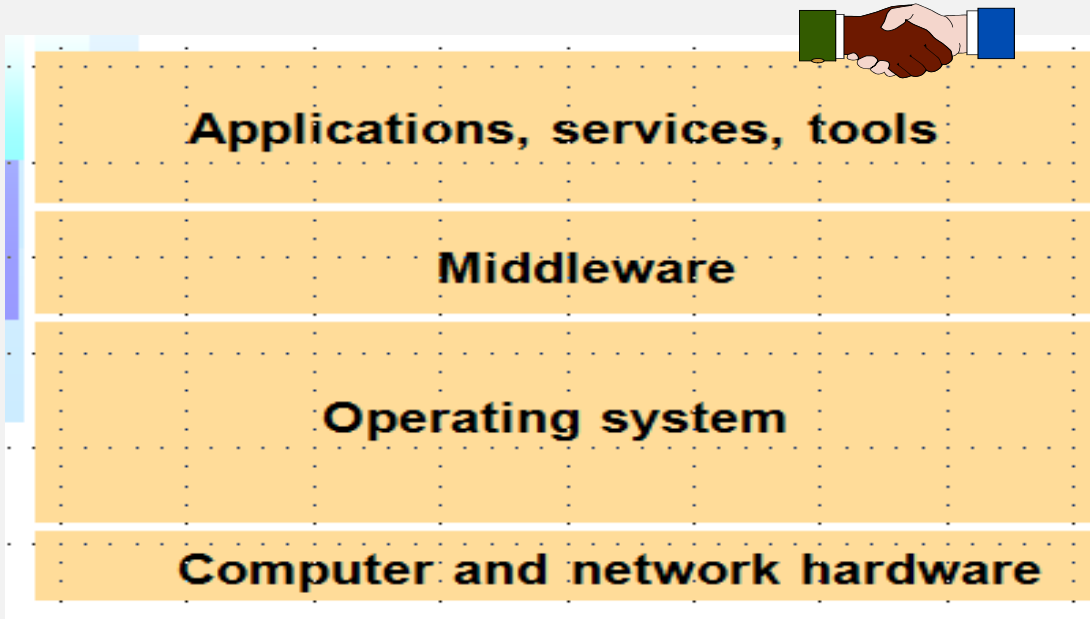
XML introduzione, JSON

- XML definizione, struttura formalizzazione
- XSLT
- Parser XML
- DTD e XML Schema
- XML e Tipi di dati complessi
- JSON
- JavaScript
- JQuery



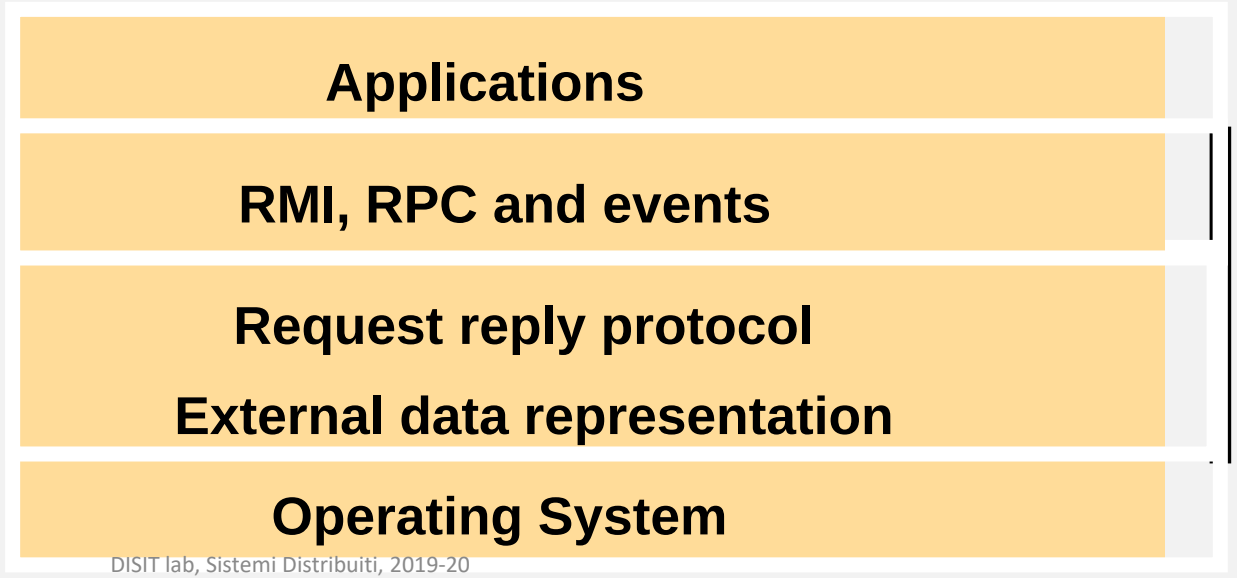
Modelli ed Architetture, Middleware 1/2

- **Modelli e Architetture Distribuite**:
  - Evoluzione delle architetture, Client Server, Comunicazione fra processi, Proxy, peer process, WEB applets, Thin clients
  - Modelli di Sistemi Mobili
  - Problemi di progettazione di Sistemi Distribuiti
  - Modelli di Interazione sincroni ed asincroni, sinc. di eventi
  - Modelli di Sicurezza e distribuzione contenuti
- **Middleware**:
  - Comunicazione fra processi, Livelli OSI
  - Perché il Middleware
  - Sockets and ports
  - UDP e TCP, RPC e RMI
  - Data representation and coding for transmission
  - MIME, Multipurpose Internet Mail Extensions
  - …



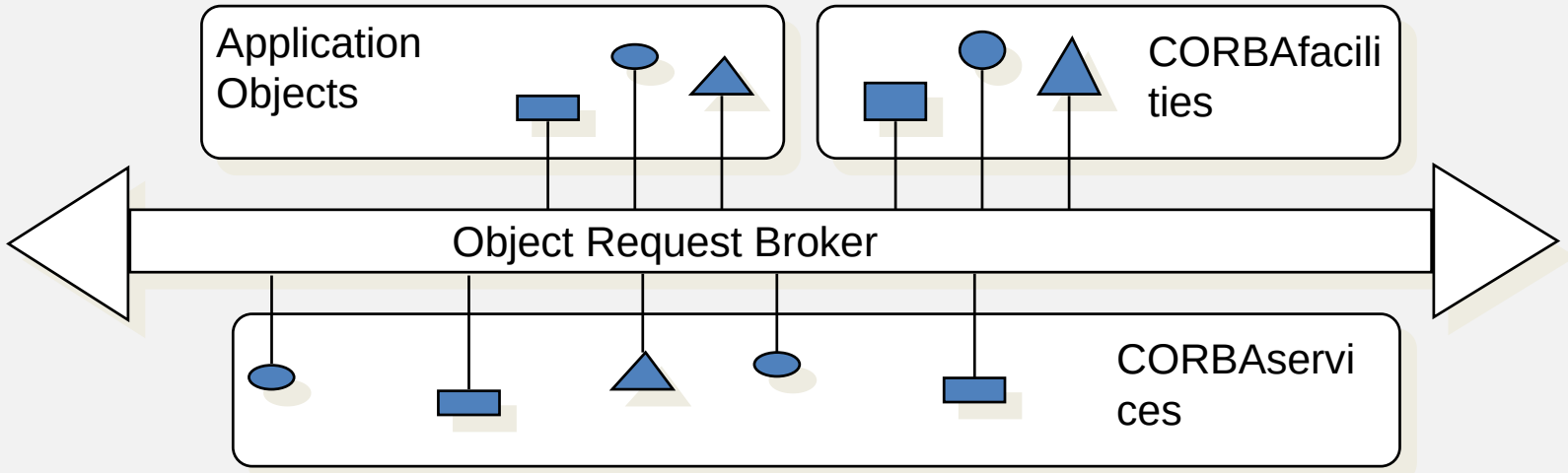
Middleware 2/2: Call Remote

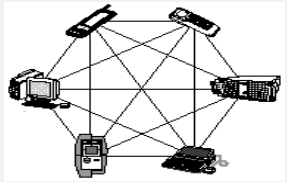
- Invocazioni Remote
- Interfacce, IDL
- Remote Procedure Call
- CORBA IDL
- Modello ad oggetti di sistemi distribuiti
- Oggetti remoti ed interfacce
- Comunicazione fra oggetti, RMI



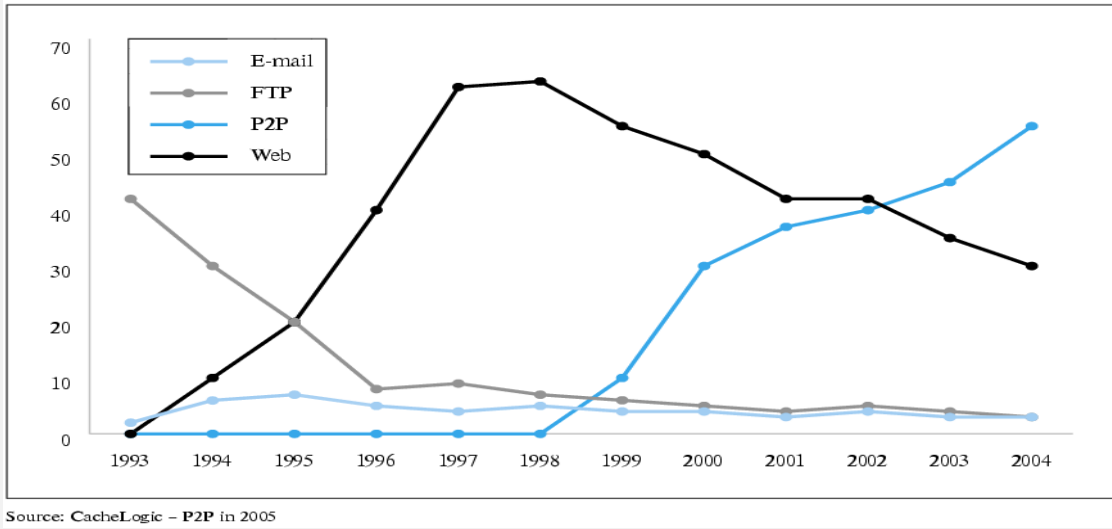
CORBA, a middleware

- CORBA Architecture
- General Concepts
- ORB Structure
- Client and Server in CORBA
- Object Adapter
- CORBA for WEB applications
- Usage of CORBA
- Single and Multithread CORBA

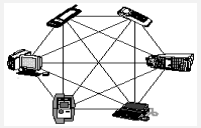




(5) Sistemi P2P

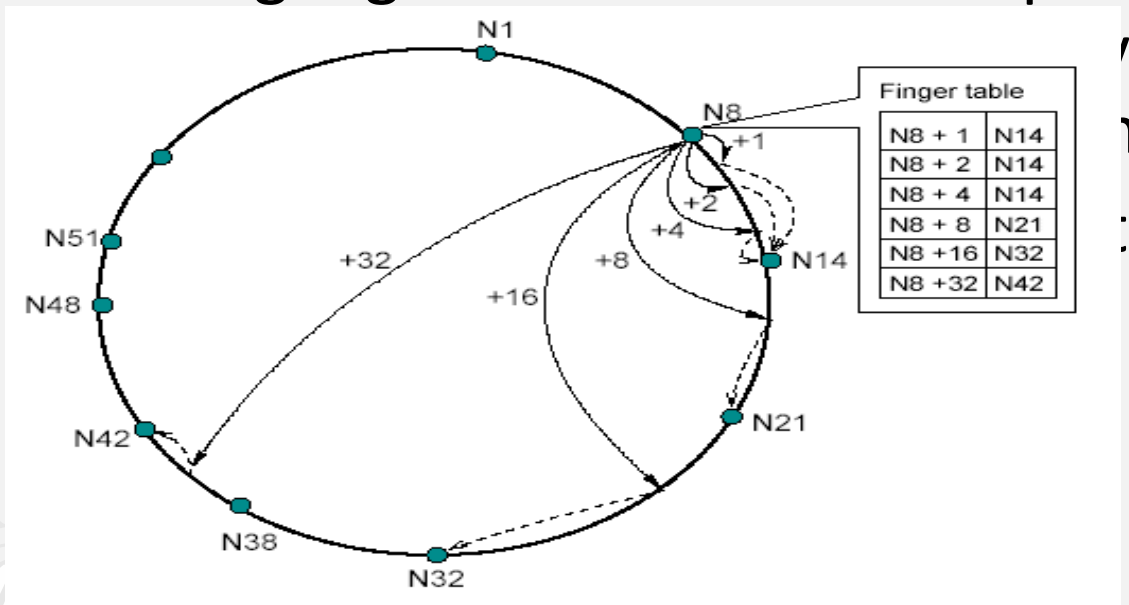


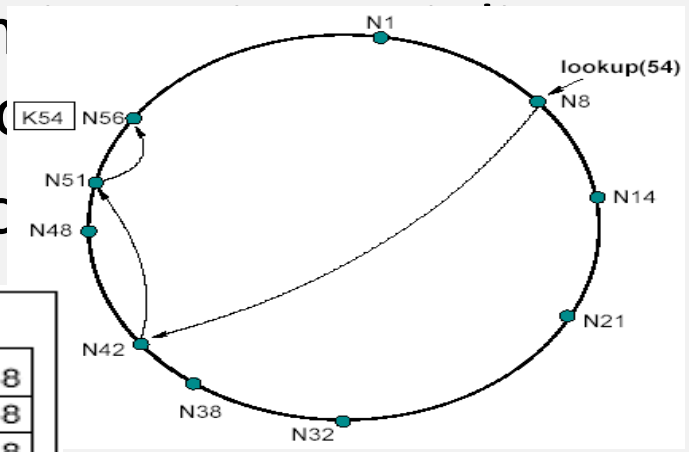
- Aspetti Generali, Applicazioni
- Evoluzione Storica
- Motivazioni per il P2P
- Requirements
- Architecture P2P e caratteristiche
- Ricerche e download multisorgente, BTorrent
- Reti P2P in Overlay
- Controllo e supervisione reti P2P



P2P: Criteri per la stima della distanza

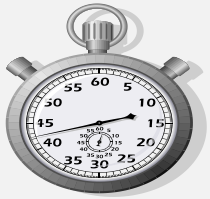
- **CHORD** come distanza usa la differenza fra il GUID del nodo presente e di quello che si cerca.
  - Distanza in un modello Hash uniforme
  - Nodi geograficamente distanti potrebbero trovarsi vicini nello spazio





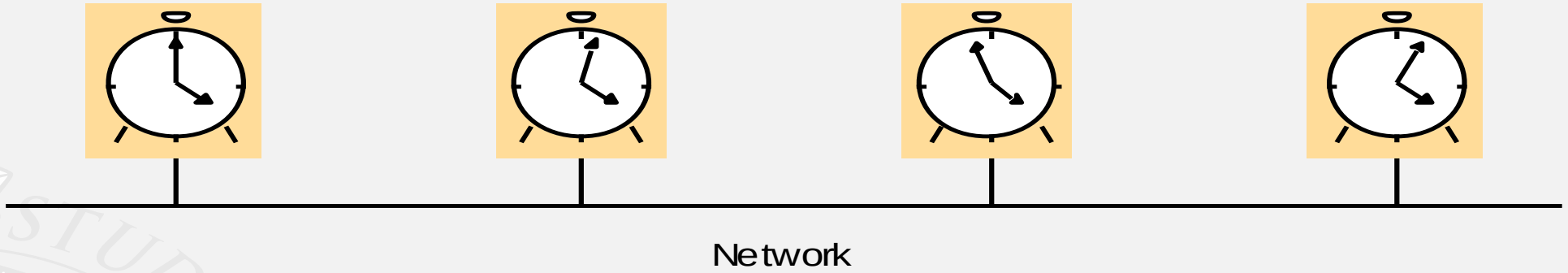
Finger table

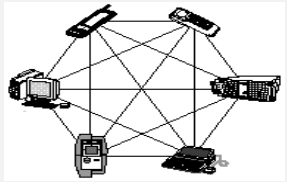
N42+ 1	N48
N42+ 2	N48
N42+ 4	N48
N42+ 8	N51
N42+16	N1
N42+32	N14



Clock e Ordinamenti

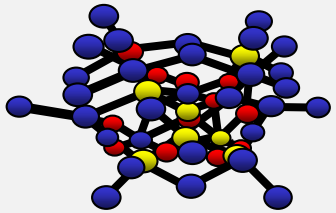
- Motivazioni
- Problemi di sincronizzazione fra nodi
- Algoritmi di sincronizzazione
- Sincronizzazione di tempo assoluto fra nodi
- Ordinamento di eventi sui nodi

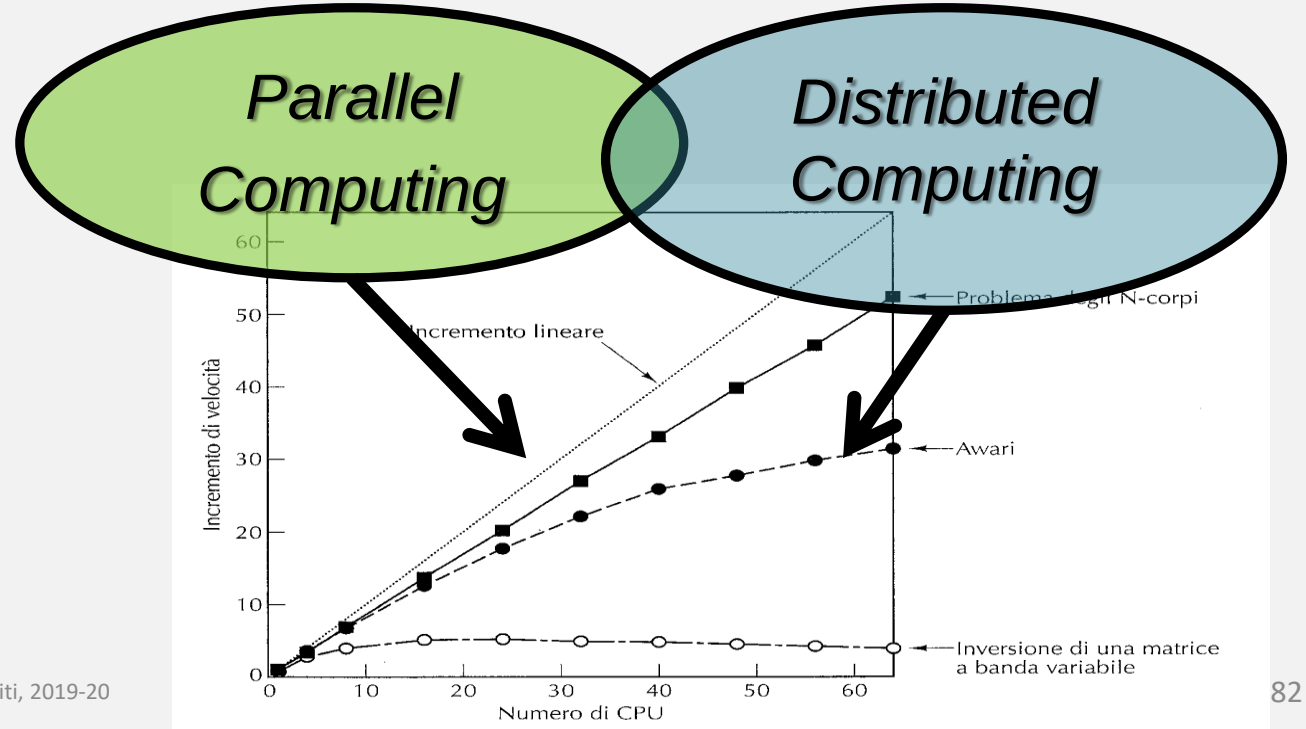




Architetture parallele

- Aspetti Generali, Applicazioni
- Architecture P2P e caratteristiche
- Ricerche e download multisorgente
- Reti BTorrent
- Reti P2P in Overlay
- Architetture parallele,
- Architetture GRID
- Architetture MapReduce



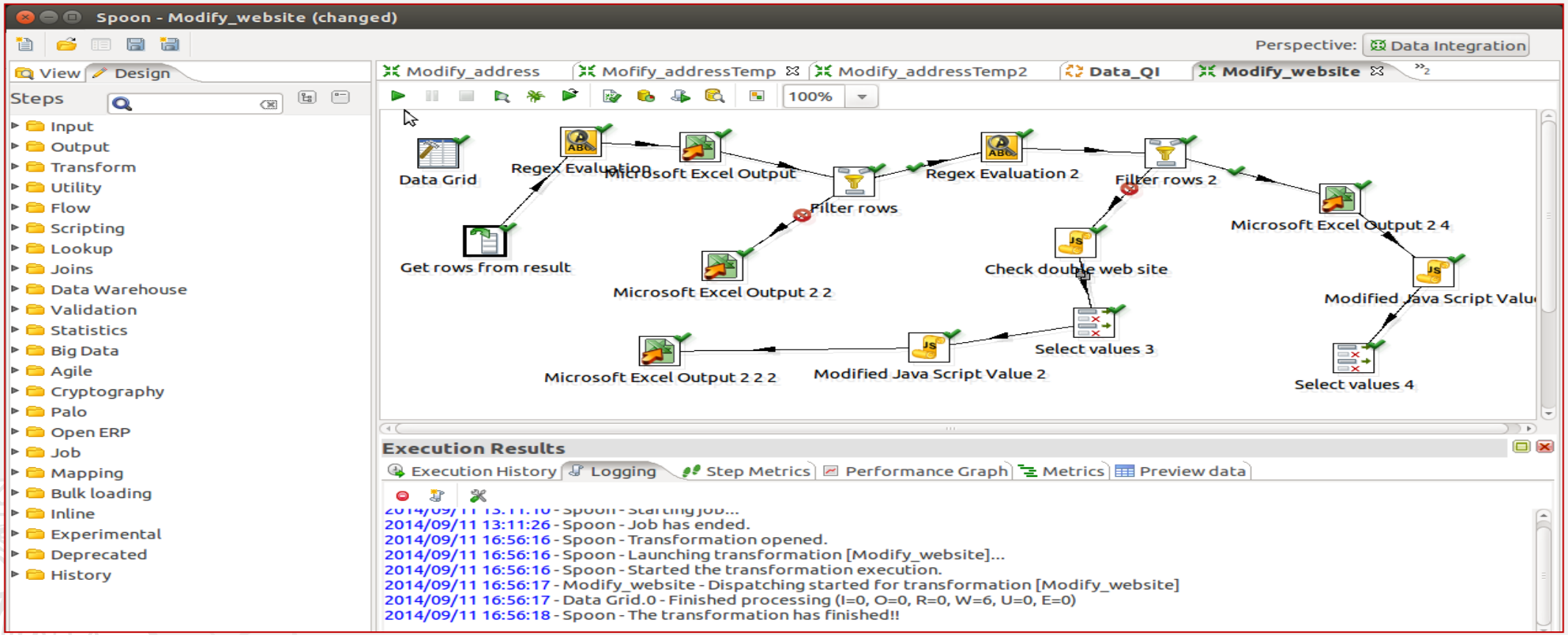


Data Warehouse, IOT, Programmazione ETL

1. Introduction
2. IOT
3. Big Data: from Open Data to Triples
4. ETL process
5. ETL tool: Pentaho Data Integration (PDI)

Kettle: Spoon

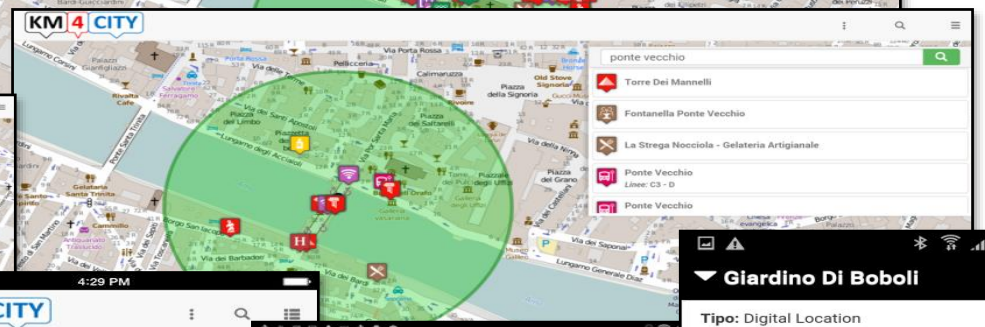
- *To run Spoon, just launch the instruction **./spoon.sh** from command line.*

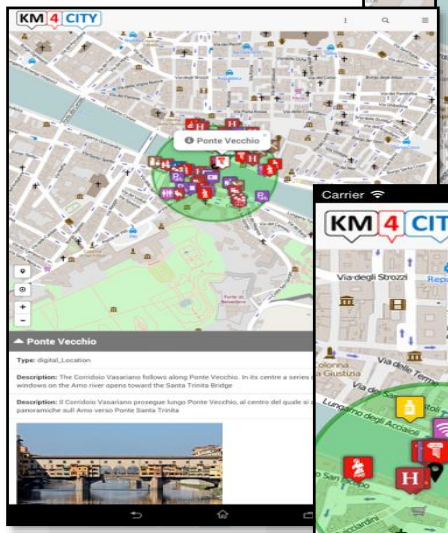


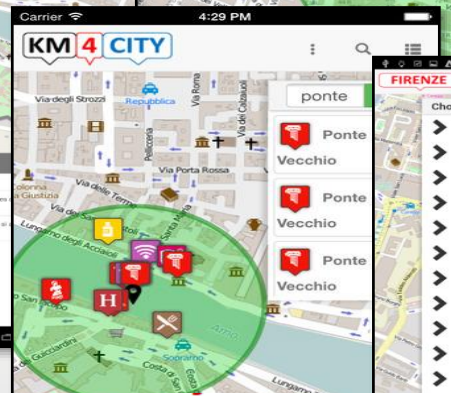
Programmazione Sistemi Mobili

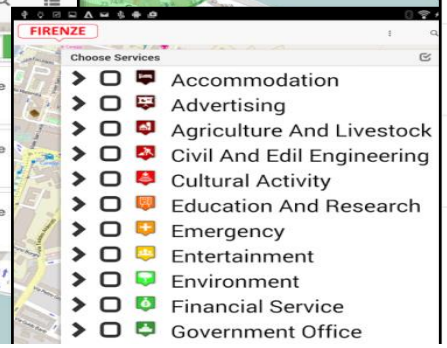
- Problematiche dei sistemi mobili
- Modelli di programmazione, per esempio
  - iPhone/iPad, Android, …
  - Windows Phone, Windows Mobile
- Programmazione multiplatform

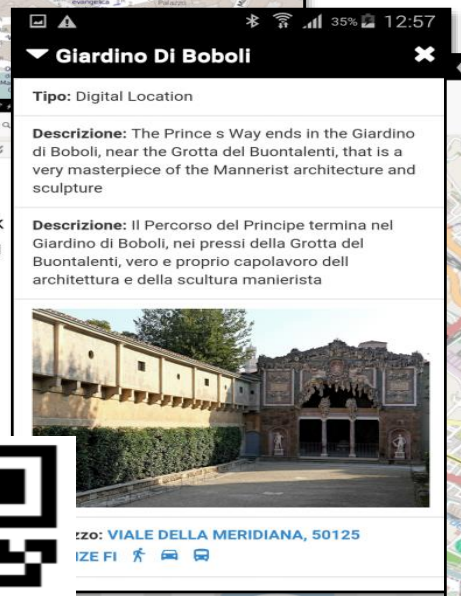
Km4CityMobile App

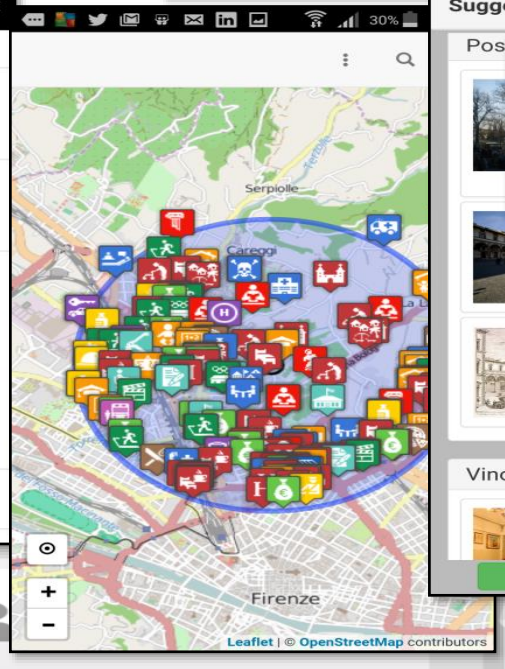


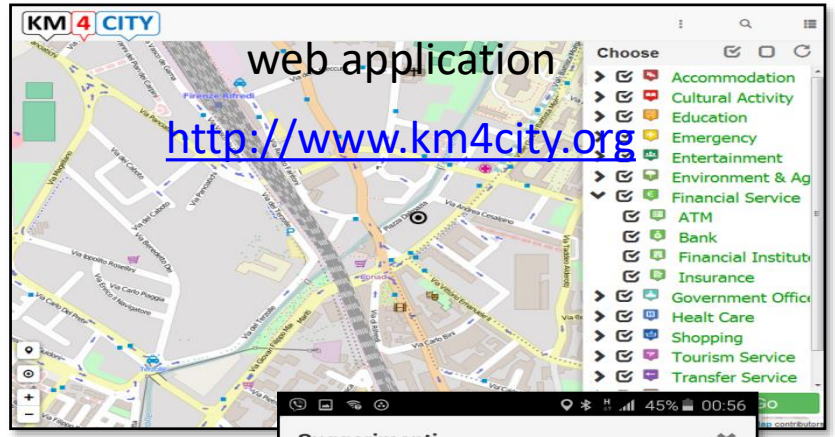






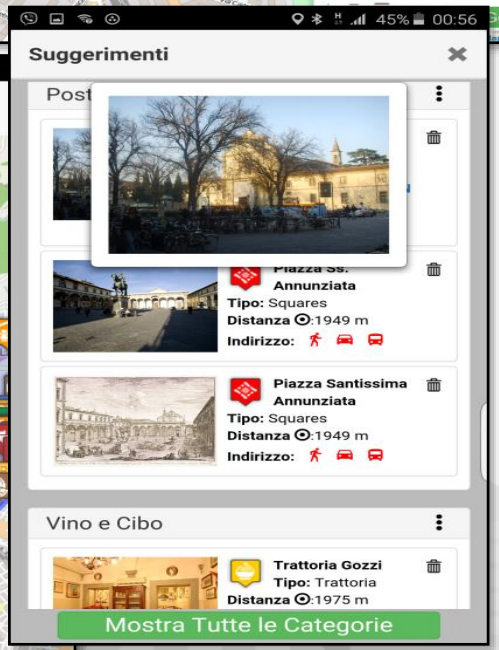






web application

http://www.km4city.org



DISPONIBILE SU Google play

Scarica da App Store

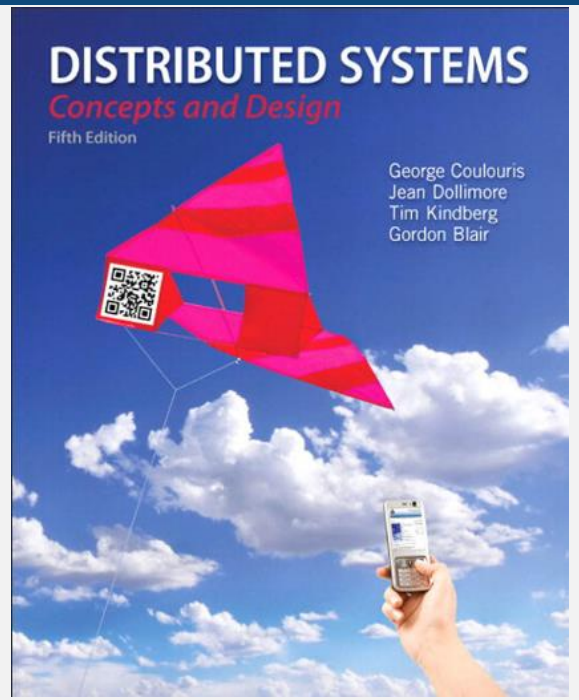
Scarica da Windows Store

FIRENZE

Smart City

- Review dei problemi delle smart city/big data
- Open data, Linked Open Data, LOG
- Reasoning: space, time, inferential
- IOT, IOT Applications

- SC for city strategy: Snap4City, KM4City project
- SC for Mobility and transport: Sii-Mobility MIUR project
- SC for City Energy and Mobility, ICT: REPLICATE H2020 project



Distributed Systems

- Coulouris, Dollimore and Kindberg
  Edition 5, Addison-Wesley

- Computer Supported Cooperative Work, Introduction to Distributed Applications, U. M. Borghoff, J. H. Schlinchter, Springer
- The GRID: Blue Print for a new Computing Structure, I. Foster, C. Kesselman, Morgan Kaufmann.
- A Methodology for Client/Server and WEB Application Development, Ro. Fournier, Yourdon Press.
- Advanced CORBA, Programming C++, M. Henning, S. Vinoski, Addison Wesley.
- Client/Server Programming with Java and CORBA, R. Orfali, D. Harkey, Wiley.
- Applied Microsoft .NET Framework Programming, J. Richter, Microsoft .net press