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resolute

RESOLUTE: Governing for Resilience – Implementation Challenges

http://www.resolute-eu.org/

Paolo Nesi

University of Florence, DISIT Lab

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

The Resilient City – Future Proofing our Urban Infrastructure, Symposium in Genoa, Italy!
24th May 2016 (Genoa Smart Week 2016)

HARMONISE

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KM4CITY

BY NC ND

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RESOLUTE Project Overview

- → **Resilience management guidelines and Operationalization applied to Urban Transport Environment**
  - www.resolute-eu.org, inforef@resolute-eu.org
- **Started**: 1st May 2015, **duration** 36 months
- **Topics**: Government, Society, Threats and Vulnerability, Interdependencies and Cascading Effects, Science and Technology
- **Pilots**: Florence and Athens

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Fraunhofer IAO | ISG Business & Economics School | ATTIKO METRO S.A. | Humanist | CERTH CENTRE FOR RESEARCH & TECHNOLOGY HELLAS | MILANO RICERCHE

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RESOLUTE Project Objectives

1) **Conducting systematic review and assessment** of the state of the art of Resilience Assessment and management concepts, national guidelines and their implementation strategies in order to develop a
   - **conceptual framework** for resilience with Urban Transport Systems, UTS
2) Development of **European Resilience Management Guidelines, ERMG**
3) Operationalize and validate the ERMG by implementing the **Collaborative Resilience Assessment and Management Support System (CRAMSS)** for UTS addressing Roads and Rails infrastructures
4) Enhancing resilience through improved support to human decision making processes, particularly through increased focus on the **training** of first responders and population on ERMG and RESOLUTE System
5) **ERMG wide dissemination** → promoting acceptance and adoption at EU and Associate Countries level

RESOLUTE Outcomes

- **European Resilience Management Guidelines** – (guidelines) – consensus driven approach improve guidelines acceptability at EU level
  - general version, and UTS version
  - http://www.resolute-eu.org/index.php/deliverables
- **CRAMSS** – (tools and algorithms) – ontology based static and dynamic CI data integration, processing and analysing platform
- **Mobile Emergency app** – (tools and procedures) – supporting users in their local decision before (early warnings), during and after an event
- **Game based training app** – (tools and procedures) – improving the current preparedness of the citizen in order to increase the community self-resilience

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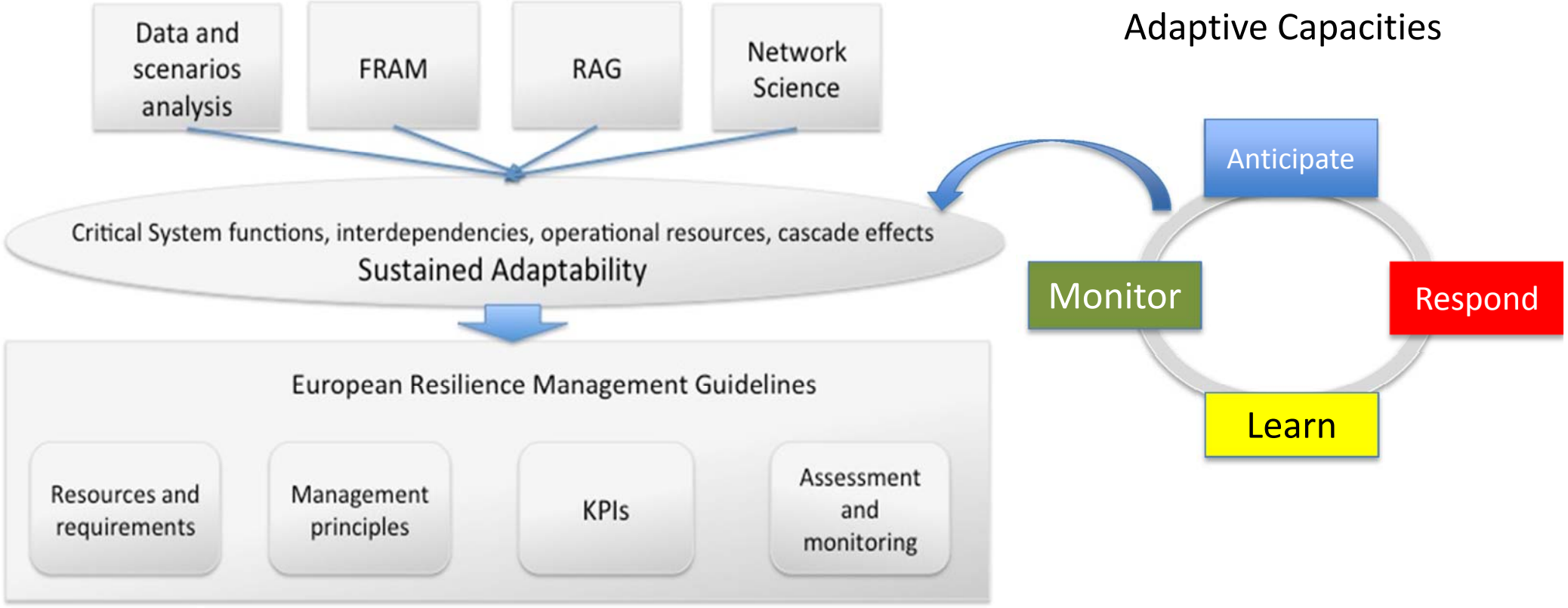
European Resilience Management Guidelines

For Critical Infrastructure (e.g. Transport System, Energy, Water, Oil, etc.)



- FRAM: Functional Resonance Analysis Method
- RAG: Resilience Analysis Grid, a resilience measurement and monitoring tool

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FRAM view

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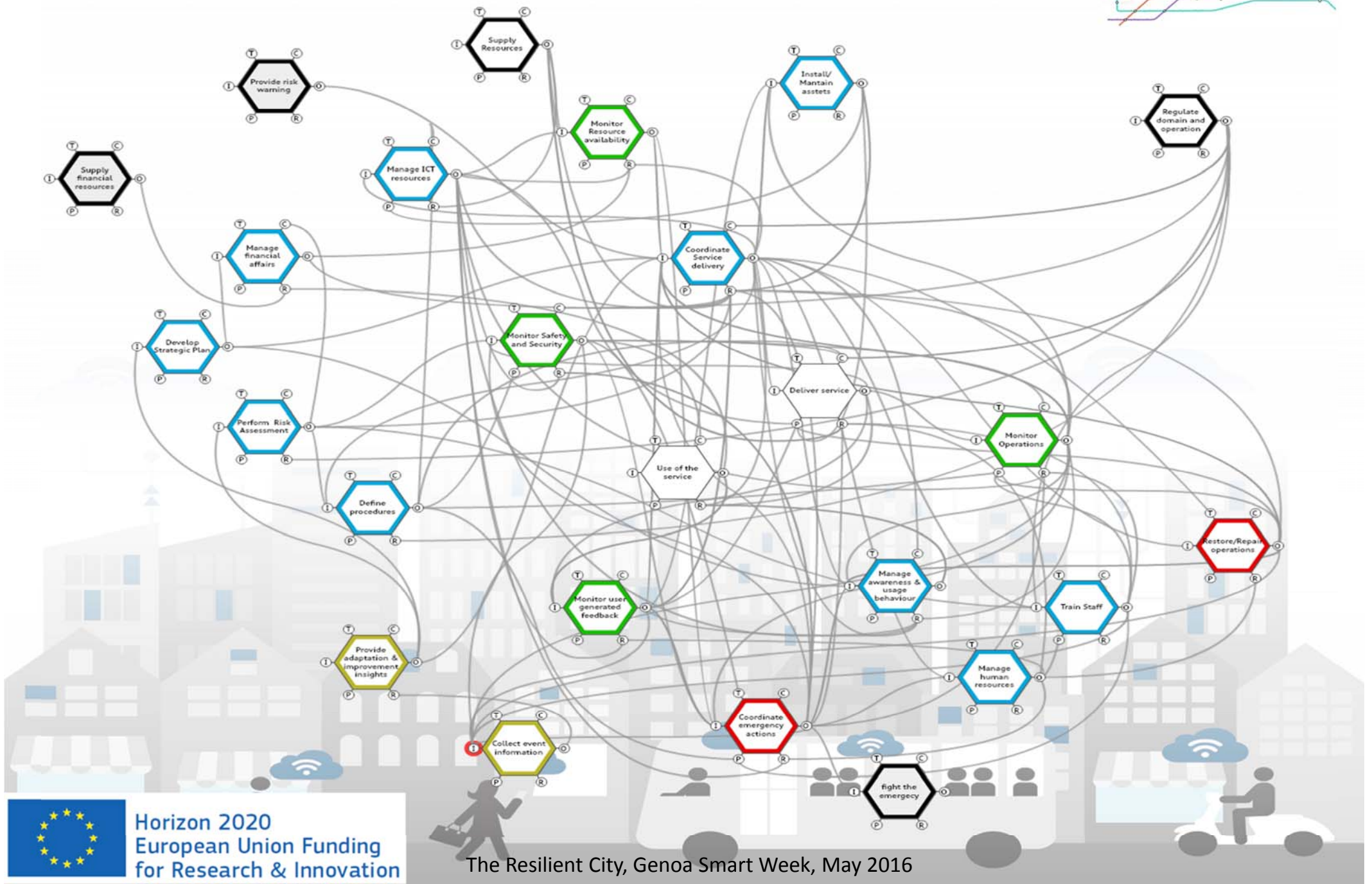

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ERMG in practice

- **Level I:** comparing "desired functions" defined in ERMG against functions in placet through a FRAM analysis of the
  - **CIs, Critical Infrastructures addressed.**
- **Level II:** assessing how functions implemented in the CIs are actually aligned with the ERMG recommendations.
- **Level III:** assessing function interdependencies. The ERMG provides a number of desired interdependencies capable to increase system resilience.

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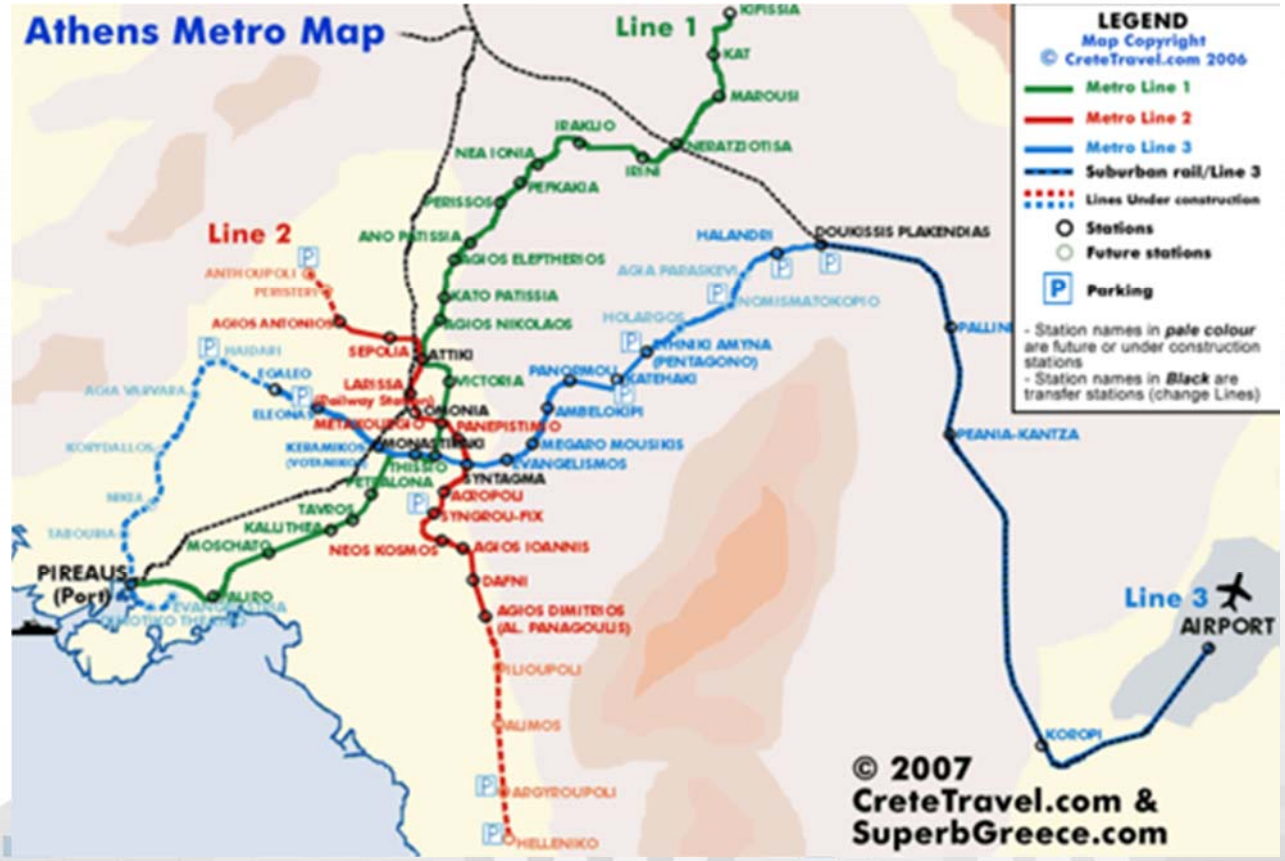
Athens Pilot



ATTIKO METRO A.E.

98Km of lines
65 stations
1M travelers per day

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Florence Scenarious

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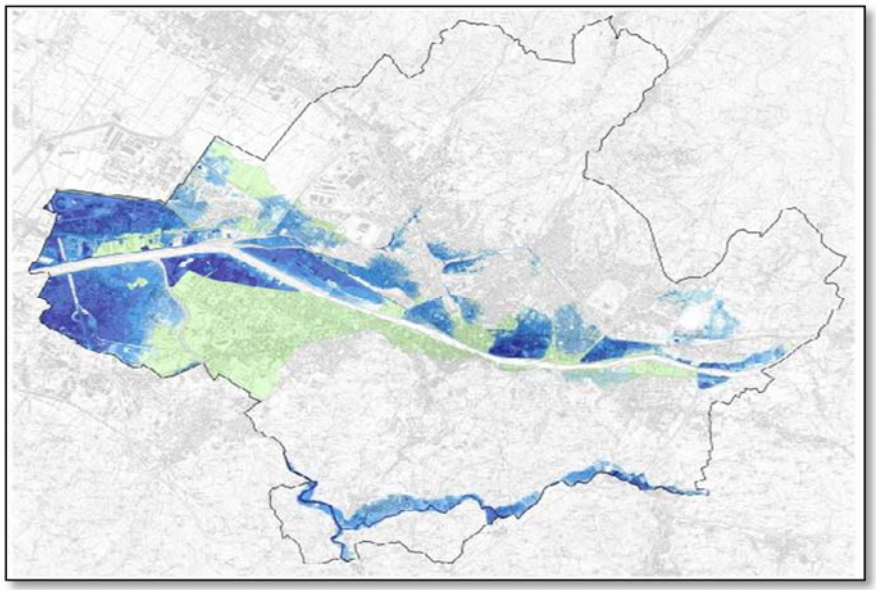
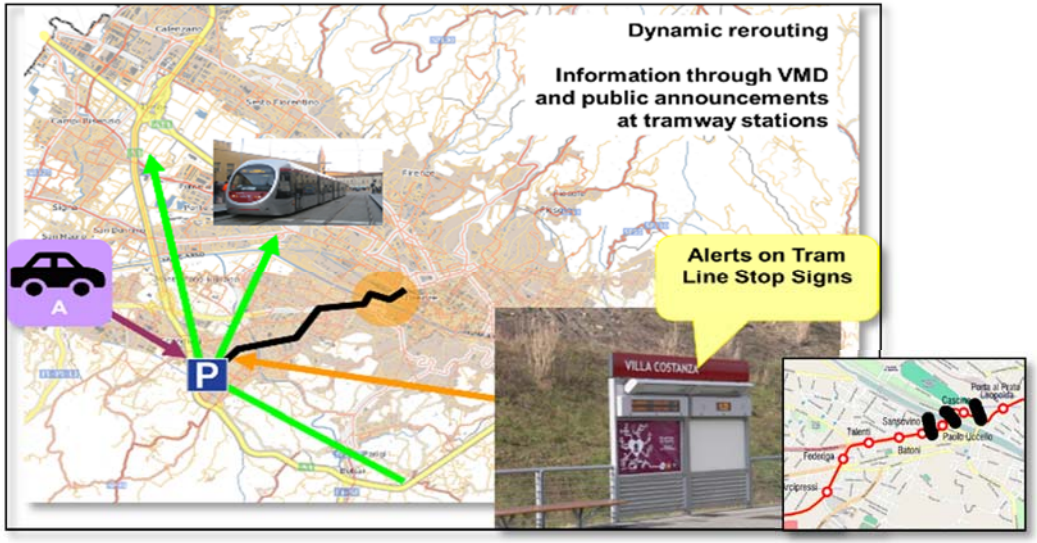
200 years probability Arno flooding

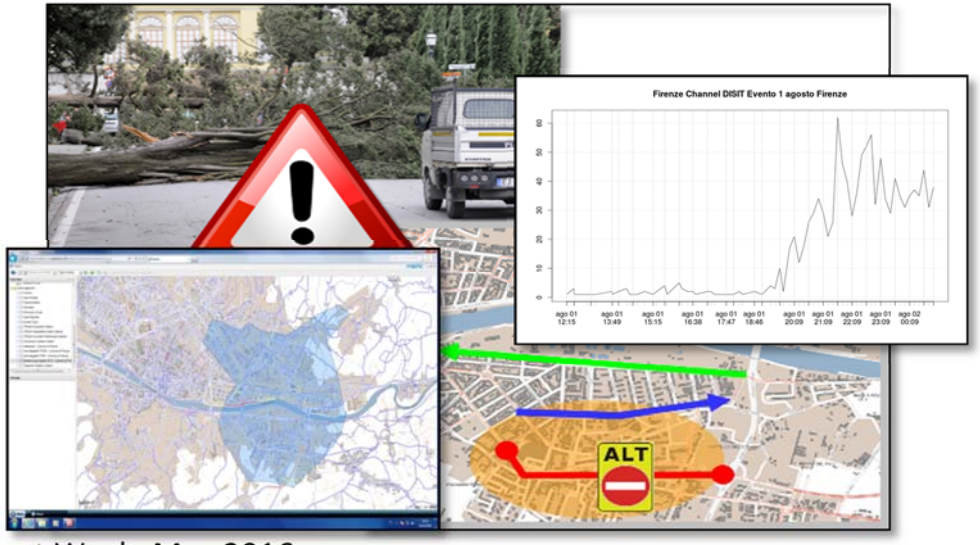


30 years probability Arno flooding

Arno Flood Impact on Tram Line & Traffic



Water bomb in South Florence



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RESOLUTE Architecture

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RESOLUTE RESILIENCE Dashboard

Presentation& Visualization

User guidance

RESOLUTE Mobile APPs

FRAM → ResilienceDS

CRAMSS

FRAM operalization

ITS DSS

Smart DS

Evacuation DSS

Application framework

Algoritms and models

Decision support system

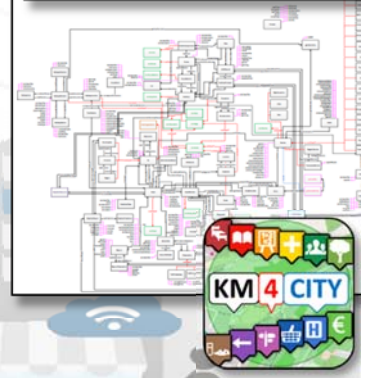
Data Integration APIs

User Profiler APIs

User profiler

Integration framework

Data and Service Aggregator



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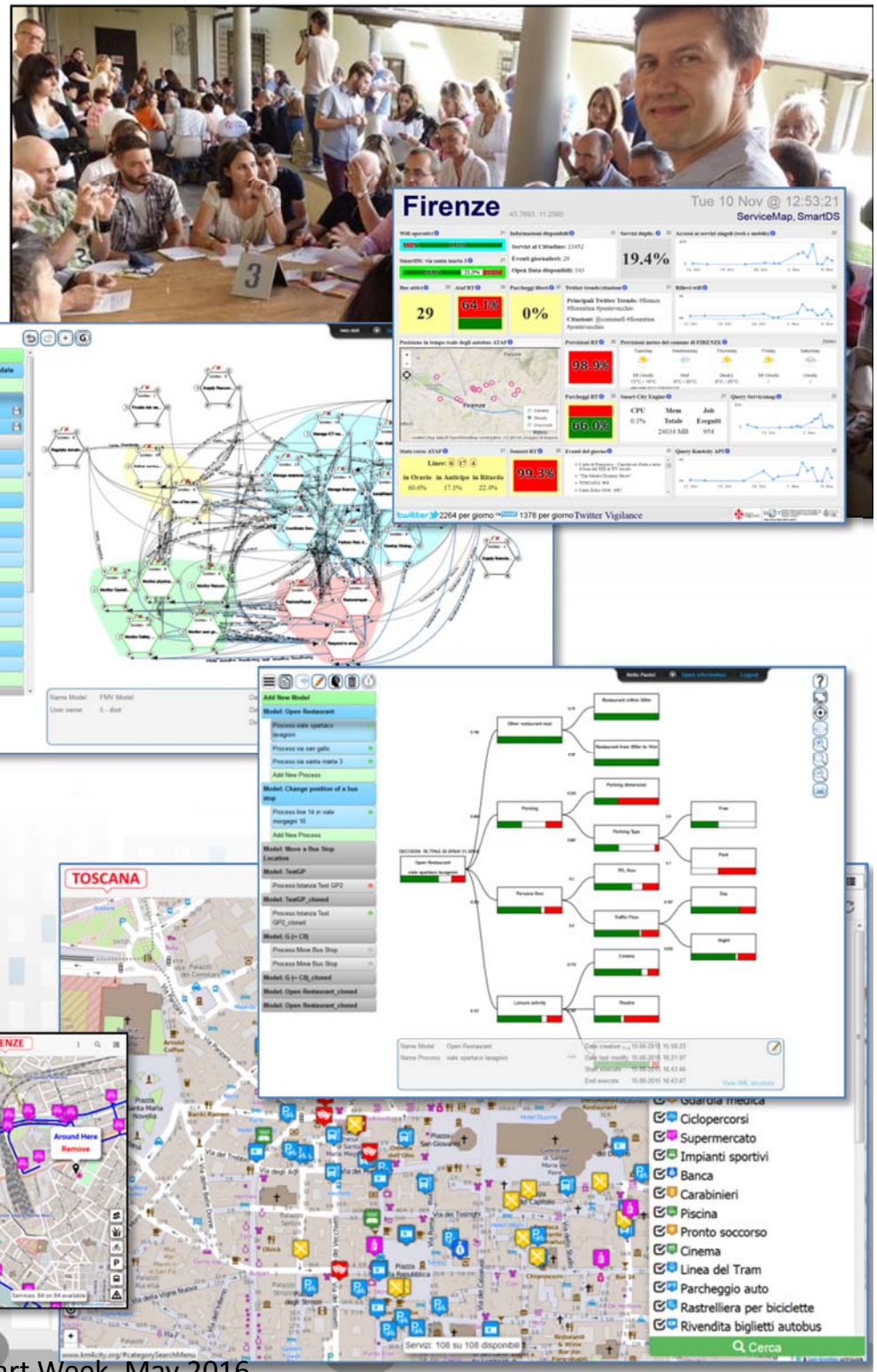
Improve city resilience, reducing risks and decision support

- **assessing city resilience** level
  - Resilience Decision Support, http://resilienceds.km4city.org
  - Smart decision support system, http://smartds.km4city.org
- **improving city users awareness** with personal city assistants and participatory tools
  - Dashboard: http://dashboard.km4city.org
  - Km4City Web App http://www.km4city.org
  - Km4City Mobile App: http://www.km4city.org/app



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Dashboarding city resilience

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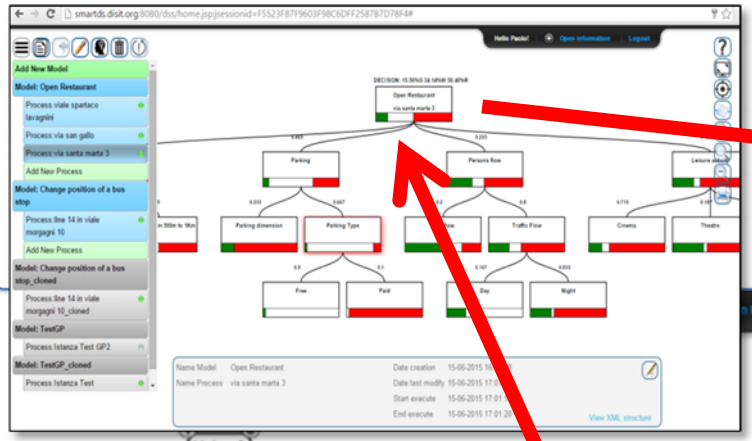

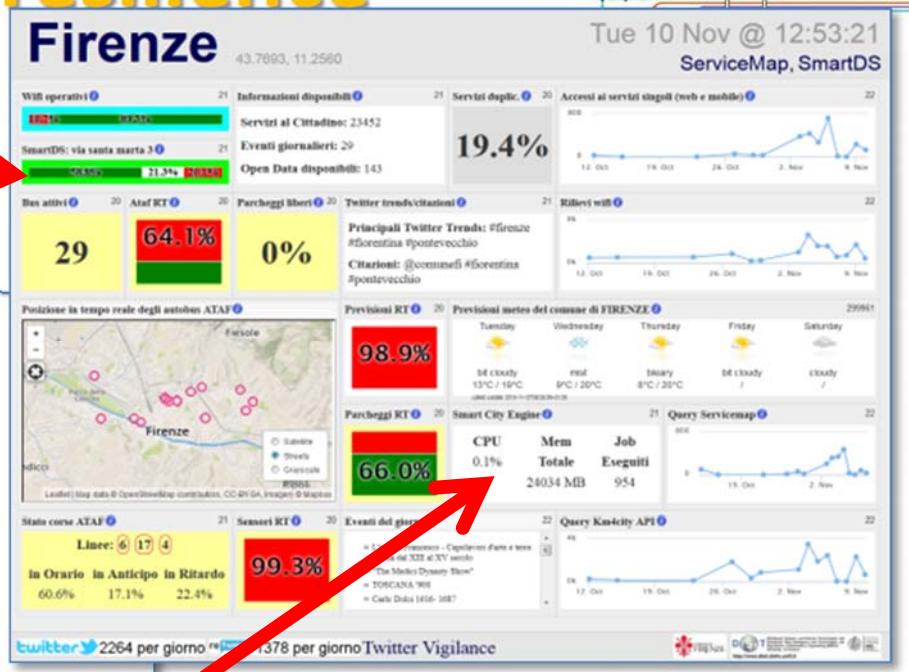

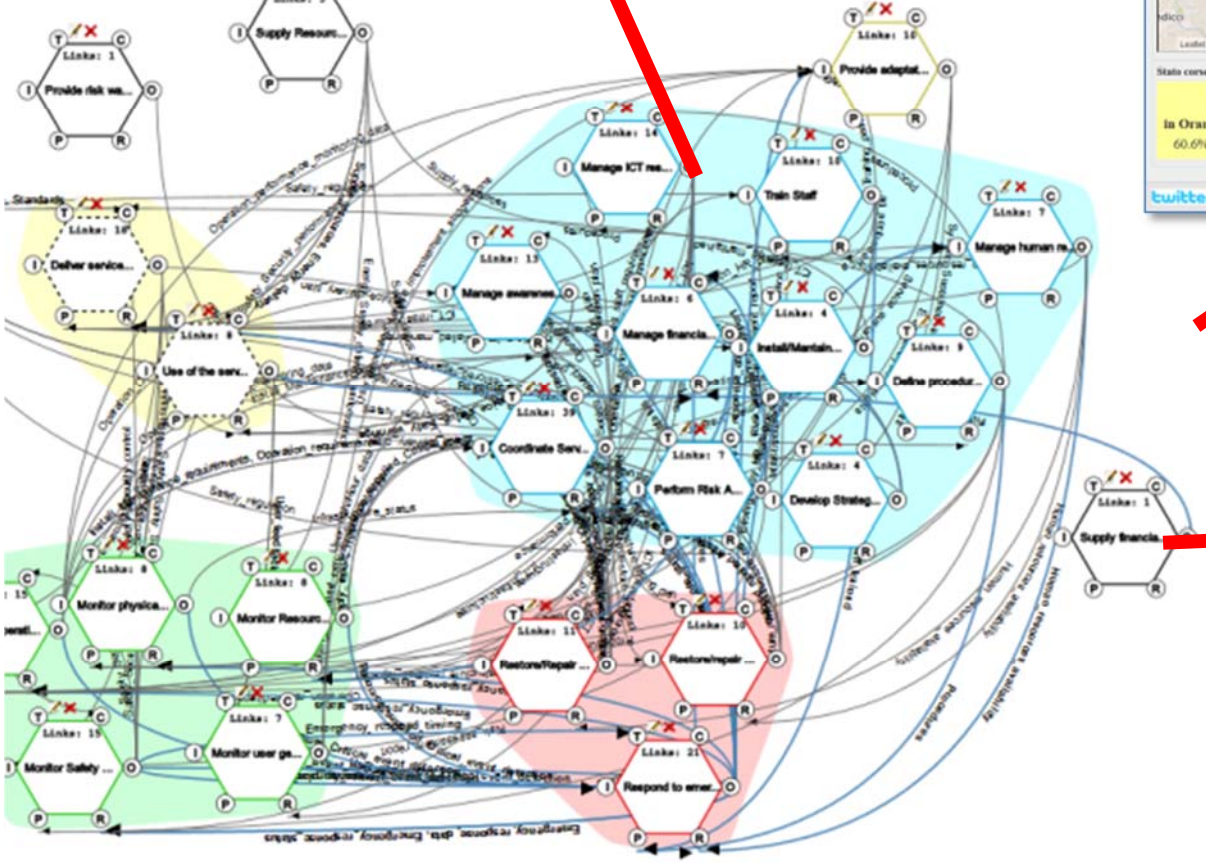

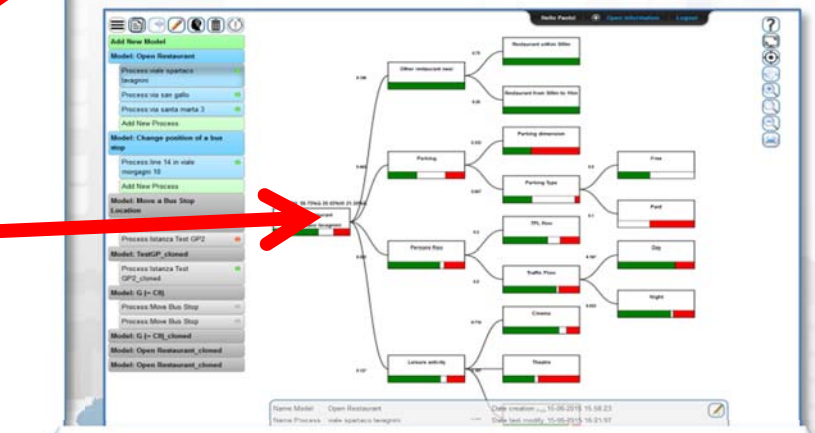

Data and Service Aggregator

The Resilient City, Genoa Sma

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Smart Decision Support

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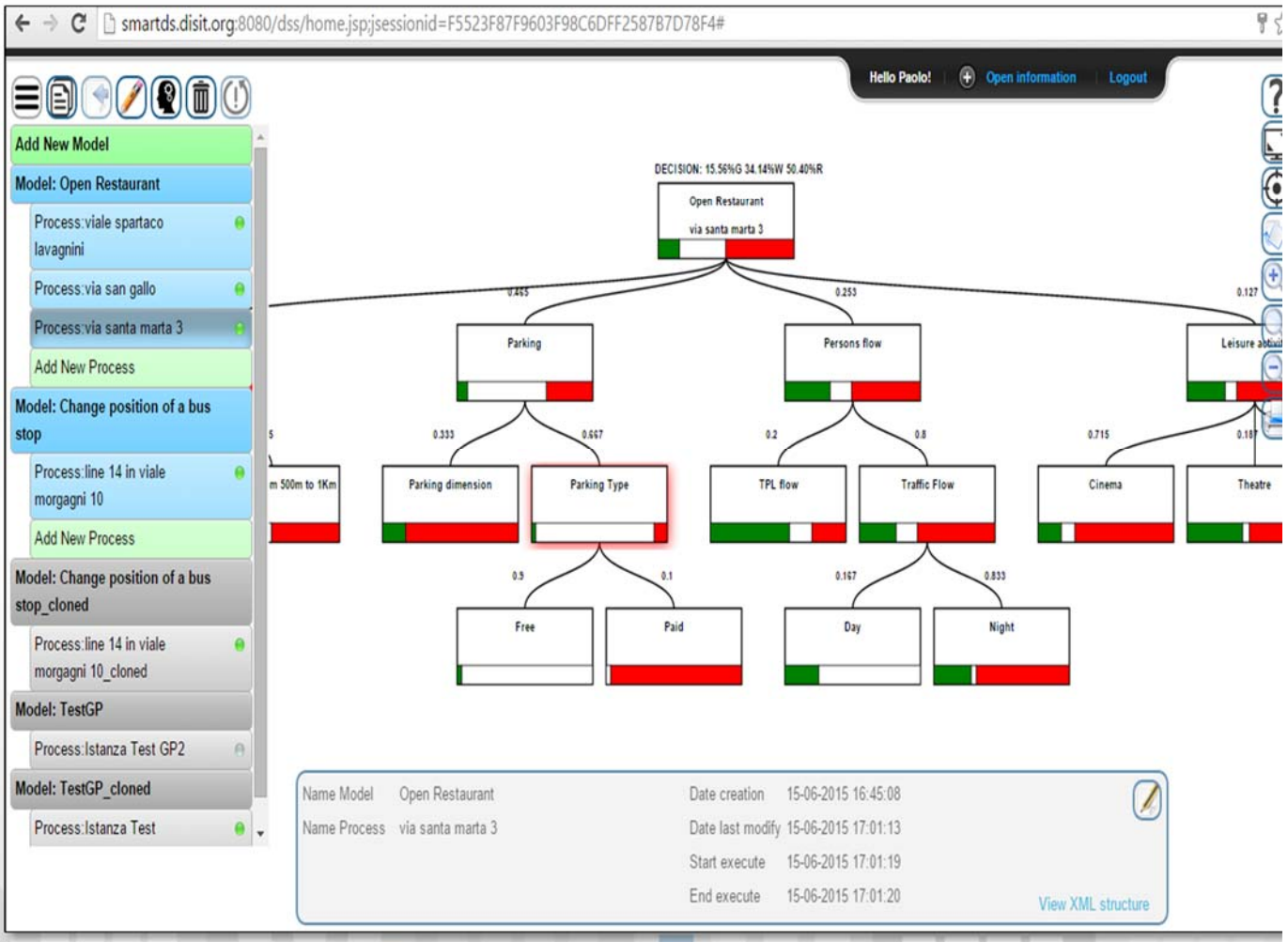
- ***Smart Decision Support System*** *based on System Thinking plus*
- Actions to city reaction, resilience, smartness..

Enforcing

- Mathematical model for propagation of decision confidence..
- Collaborative work…,
- Processes connected to city data: DB, RDF Store, Twitter, etc.
- Production of alerts/alarms
- Data analytics process
- Twitter Processes
- reuse, copy past, …



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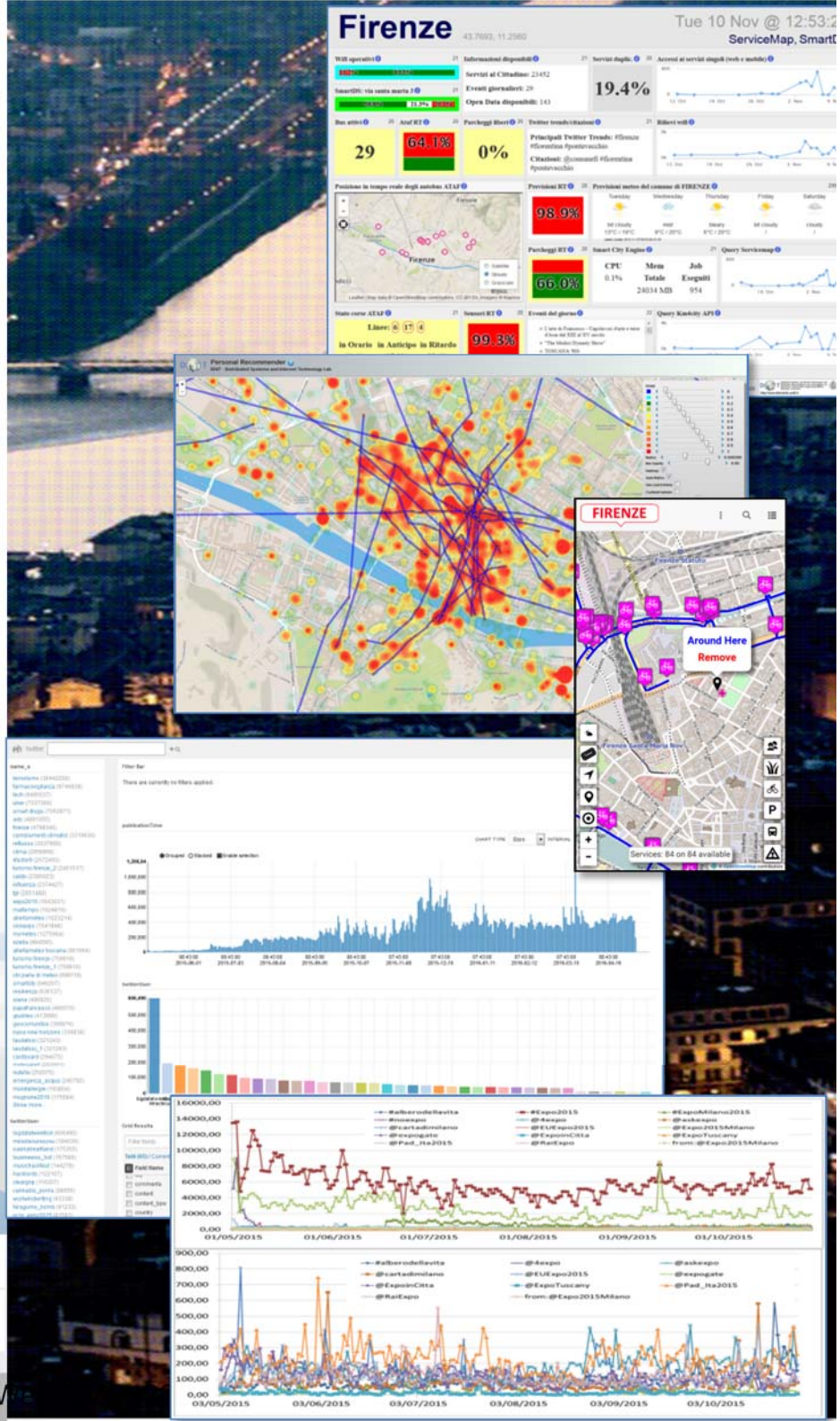
- **monitoring and taking info account services' status** of city operators
  - http://dashboard.km4city.org
- monitoring and understanding the **city users behaviour**
  - Recommender and User Behavior Analyzer
  - Origin Destination matrix tools
- **collecting moods**, contributions and data from the city users
  - **from Mobile App Km4City** Firenze dove Cosa
  - **from social media** for city services and events, event predictions
  - http://www.disit.org/tv , http://tvsolr.disit.org



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Firenze Smart City: UTS + ...

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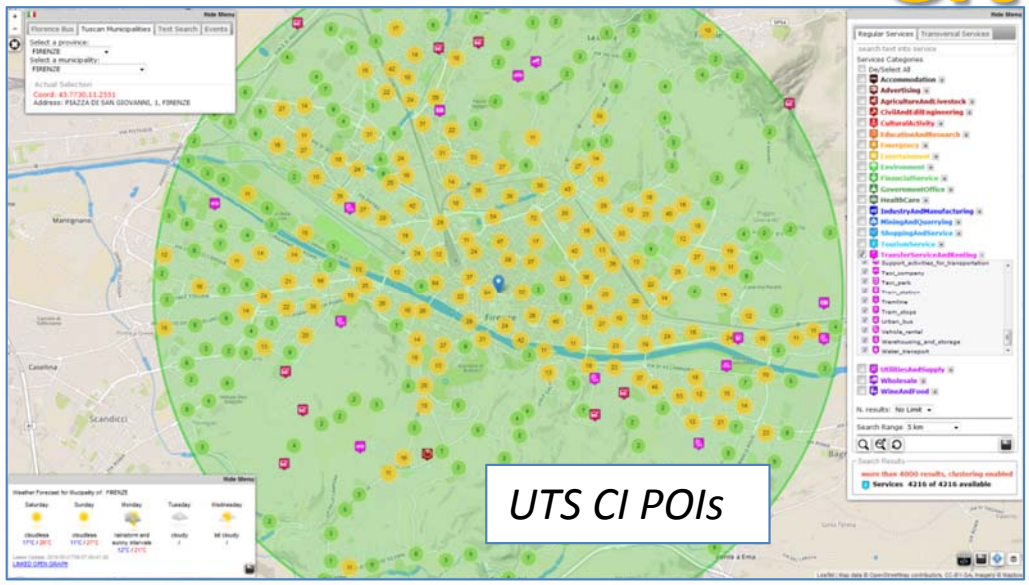

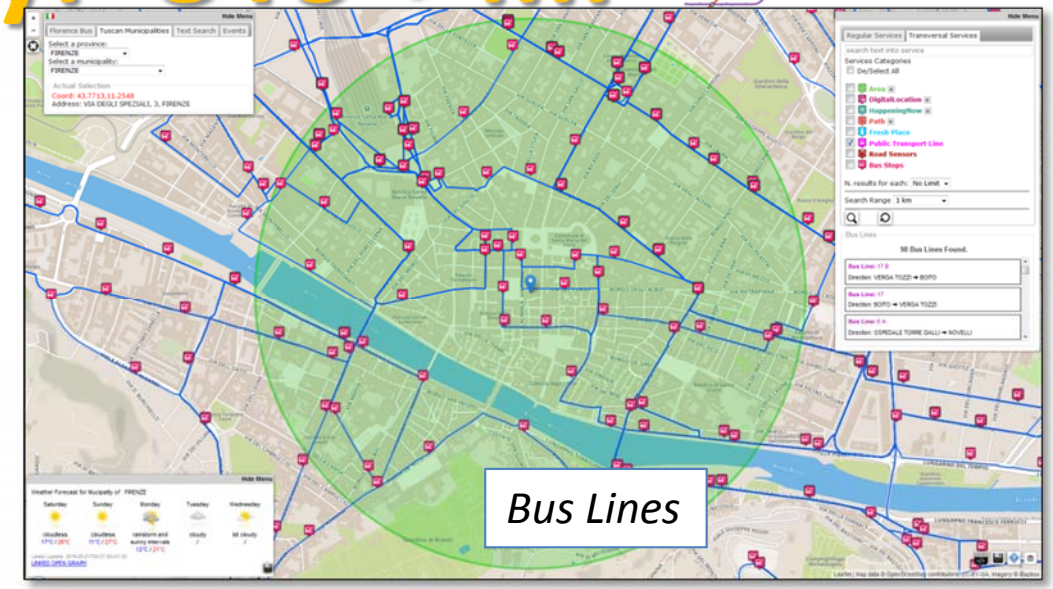

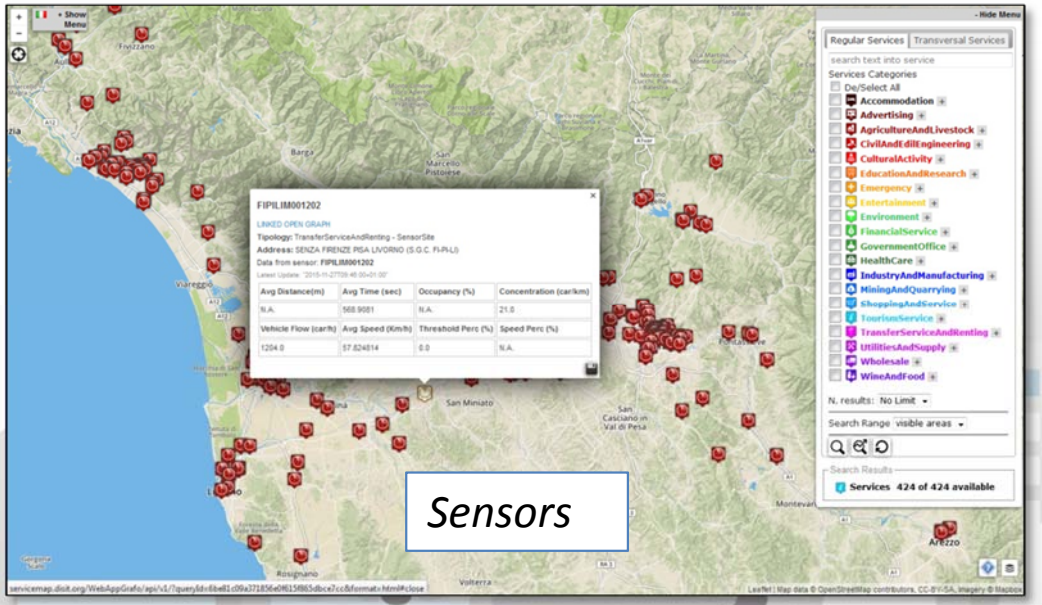

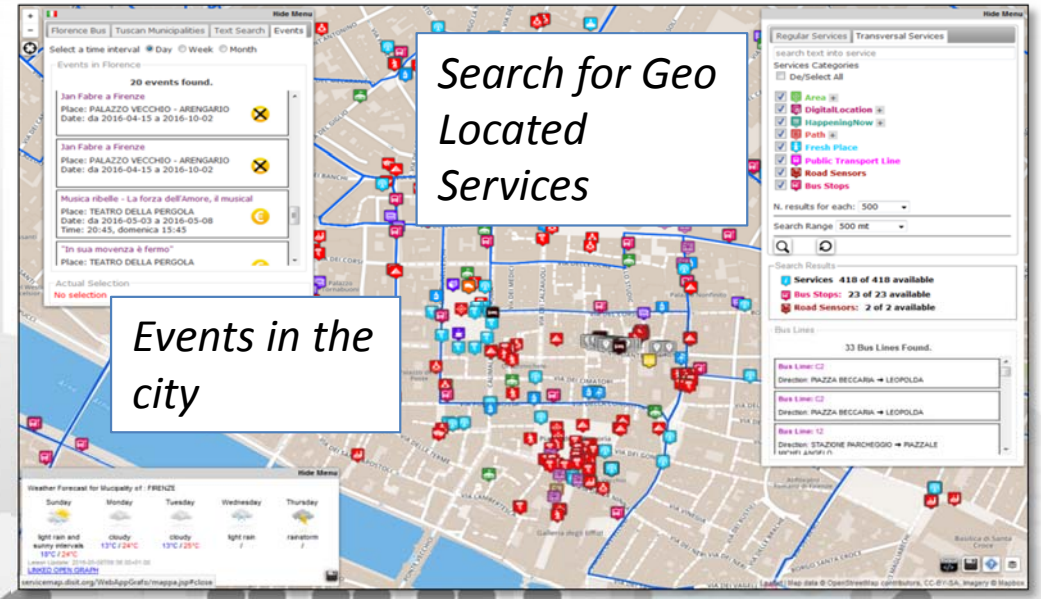

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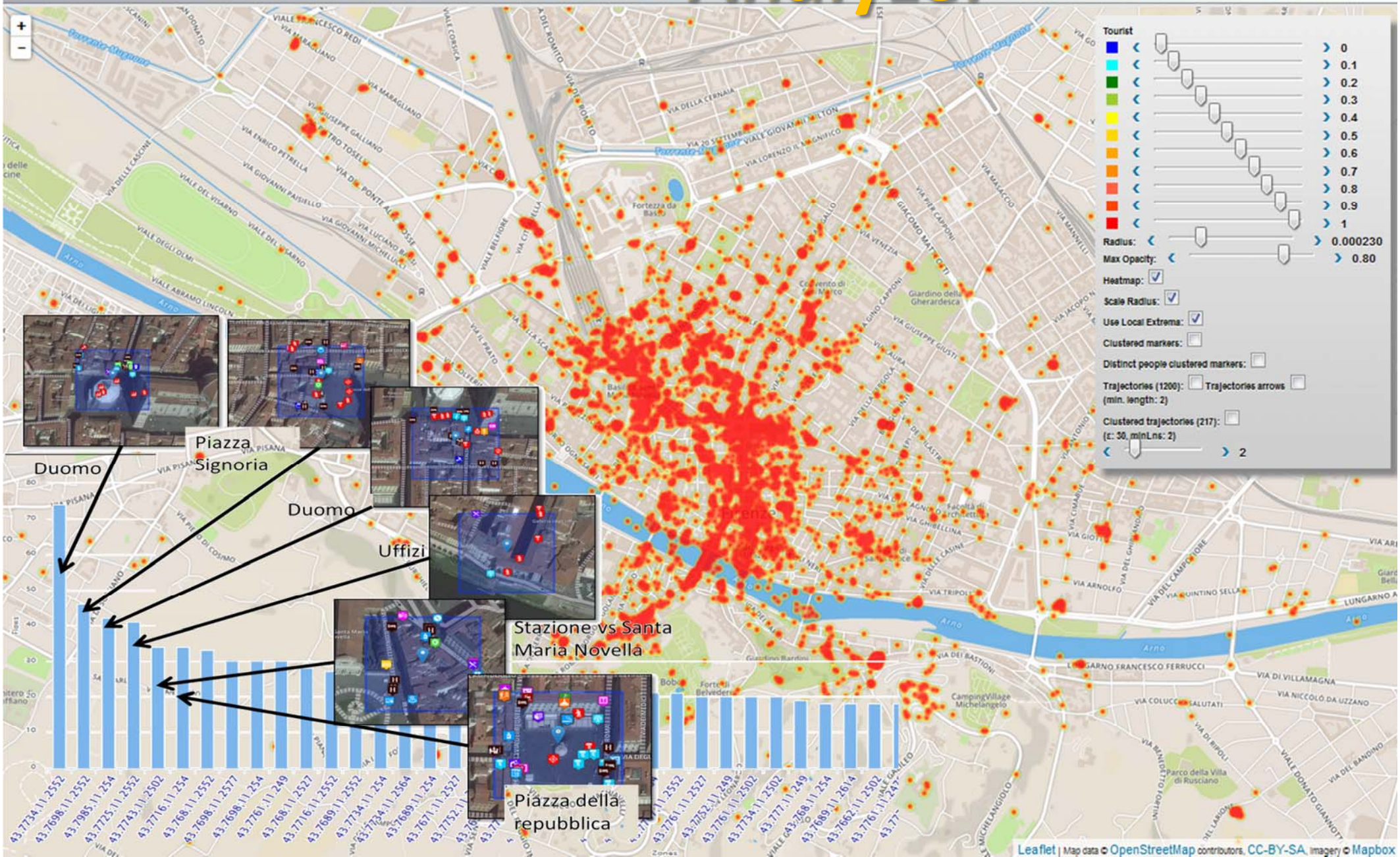
User Behavior Analyzer

resolute

Personal Recommender
DISIT - Distributed Systems and Internet Technology Lab



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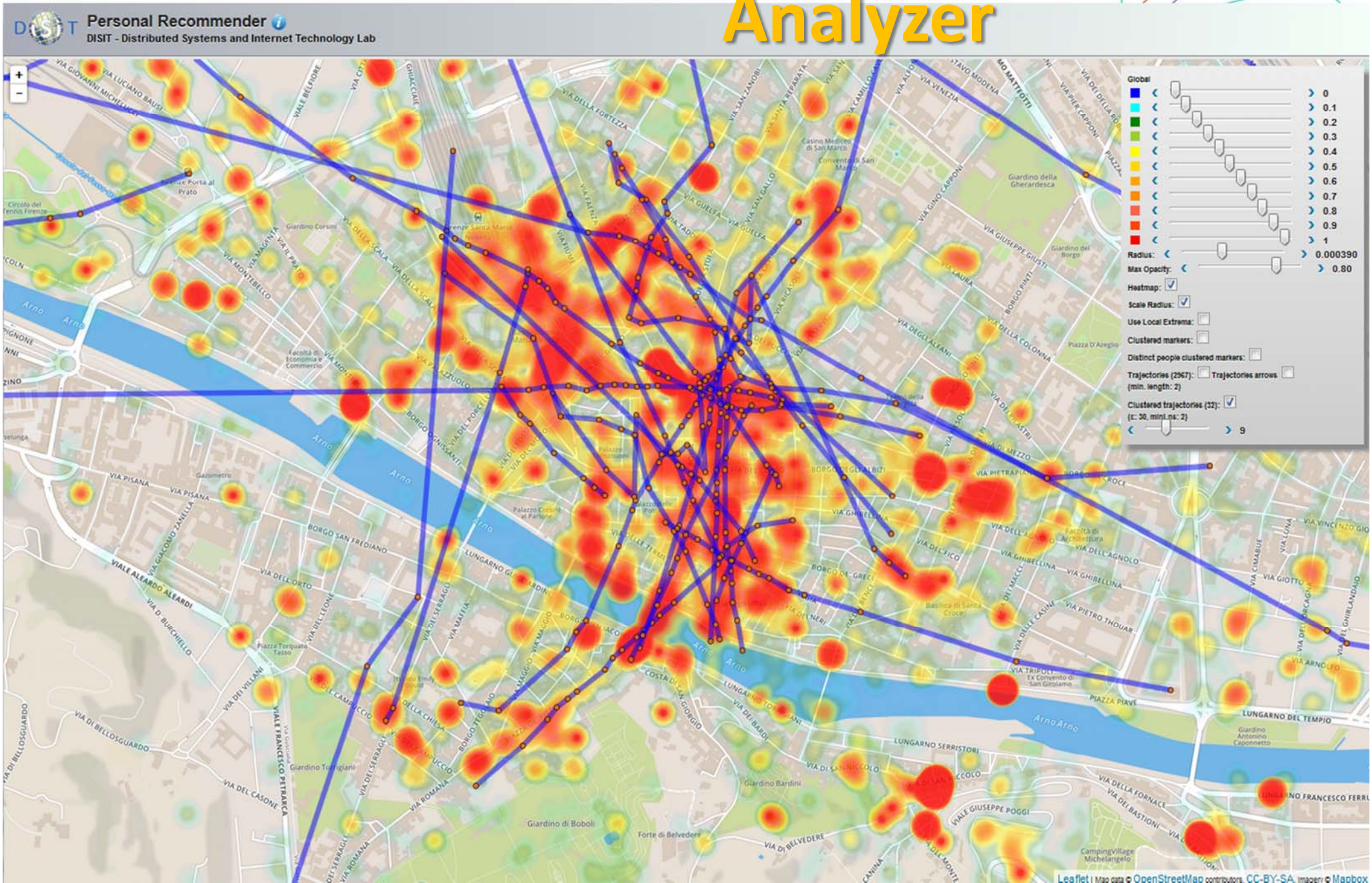

Twitter Vigilance, Sentiment Analysis, Monitoring and prediction

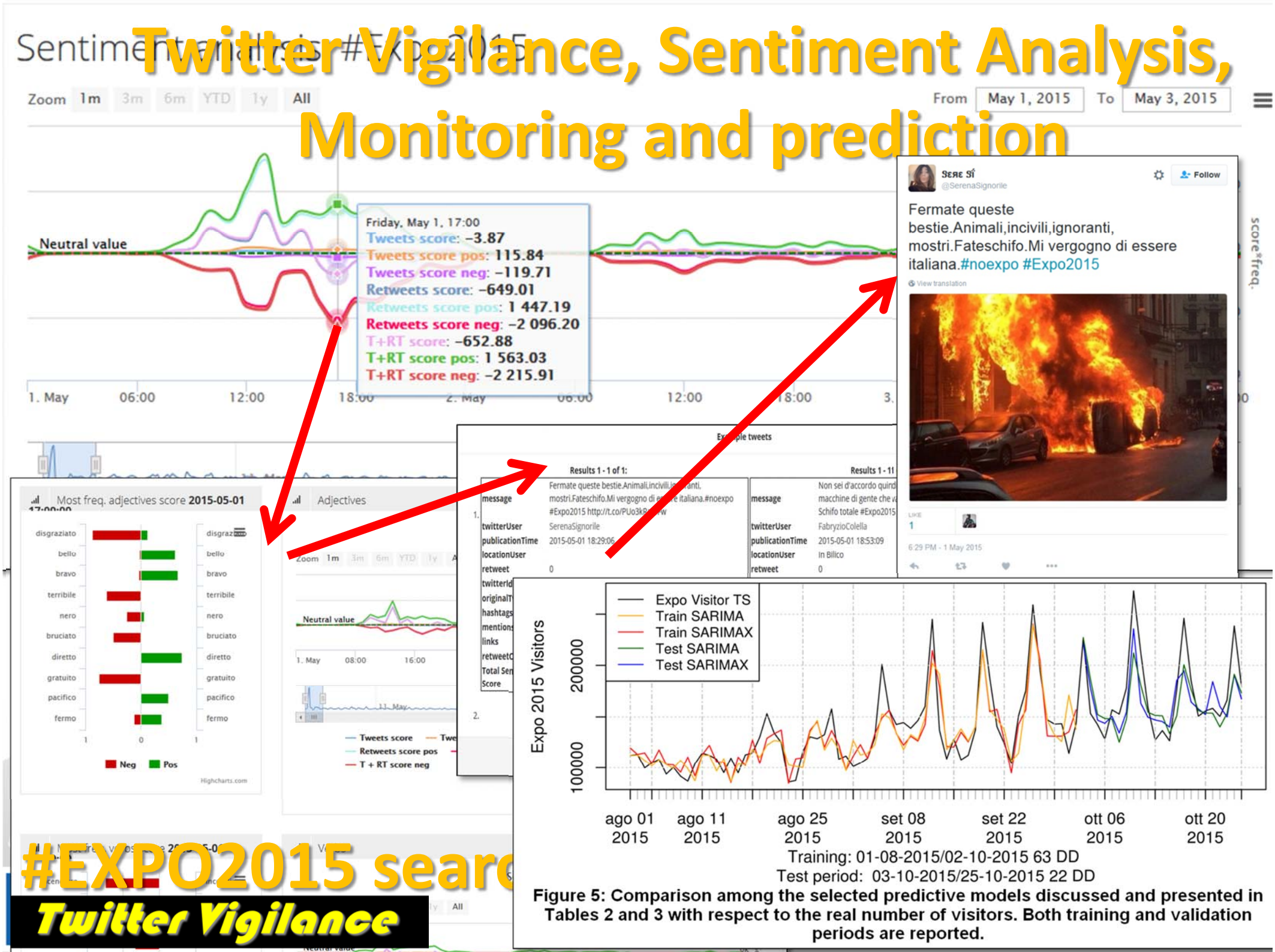

Figure 5: Comparison among the selected predictive models discussed and presented in Tables 2 and 3 with respect to the real number of visitors. Both training and validation periods are reported.

#EXPO2015 searc

Twitter Vigilance

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Improve city resilience, reducing risks and decision support

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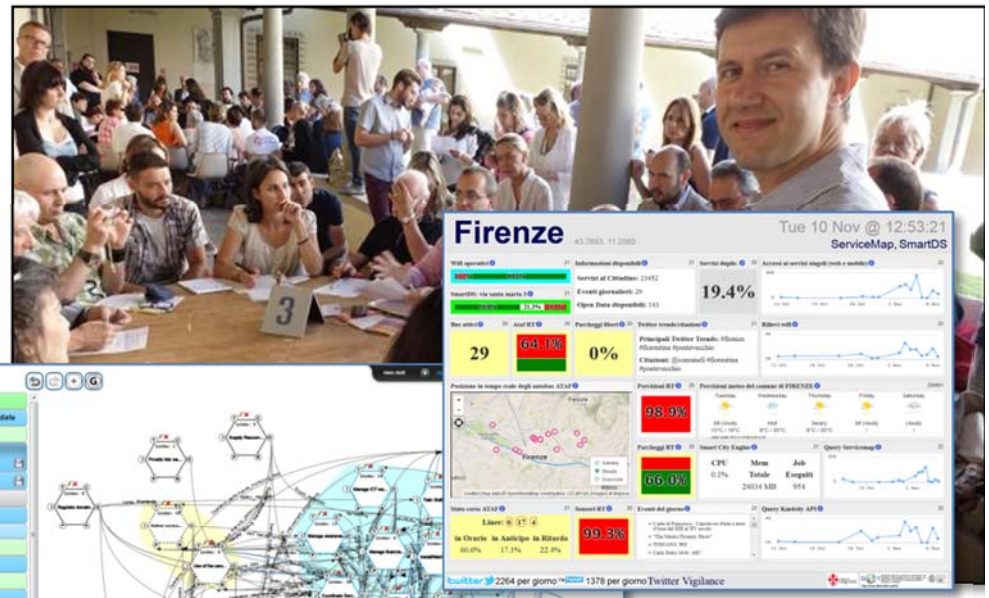

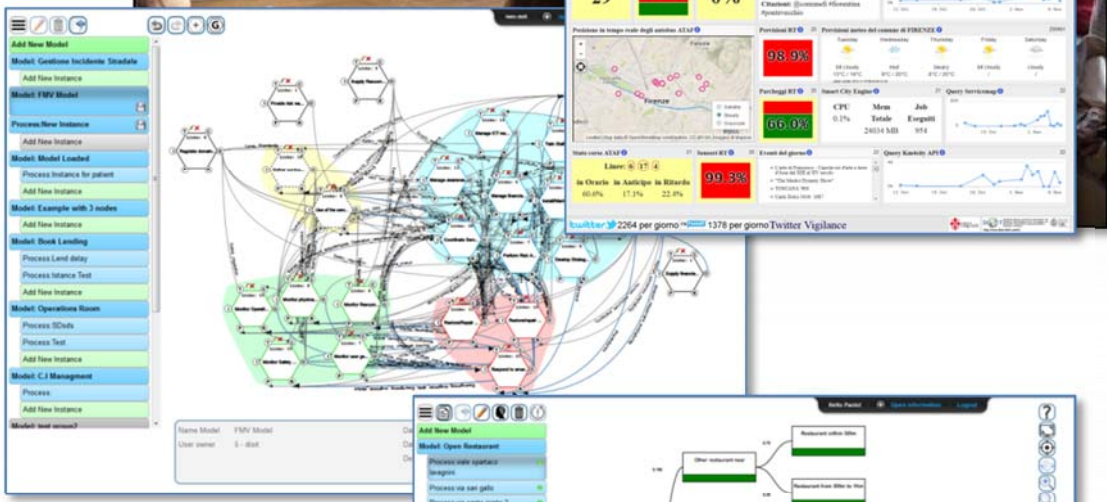

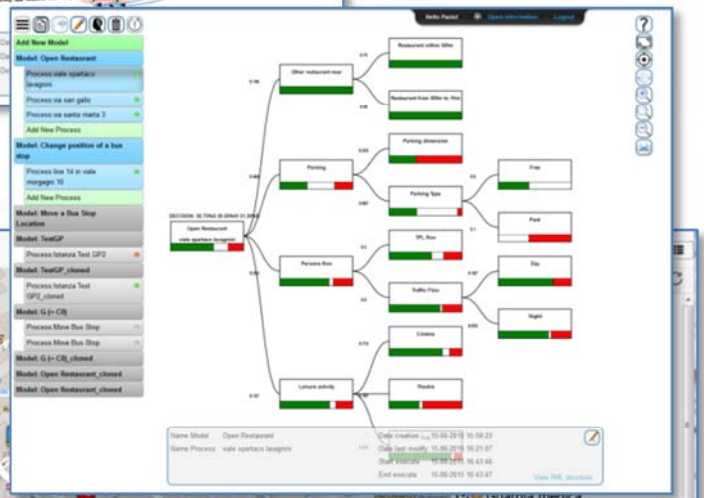

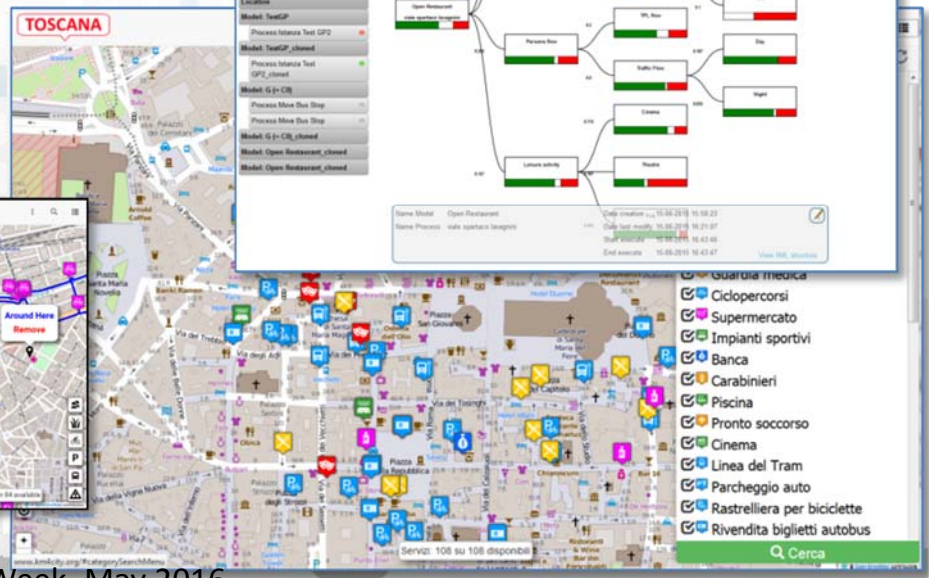

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Mobile Emergency

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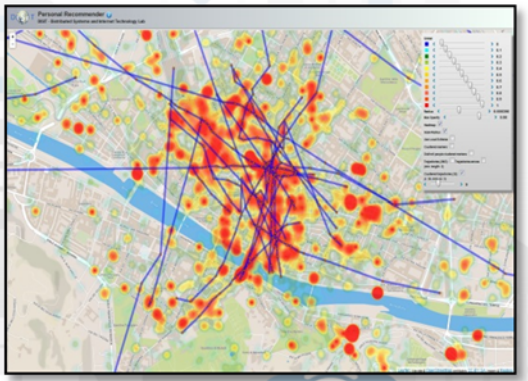
- Personalized menu for Operators
- Providing information and suggestions to citizens
  - Civil Protection Page
  - Twitter Info
  - Geolocalized Info
- Tracking people and operators flows
- Collecting information from citizens
  - Comments
  - Images



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http://www.km4city.org

Transport systems
Mobility, parking

Public Services
Govern, events,

Sensors, IOT
Cameras, ..

Environment,
Water, energy

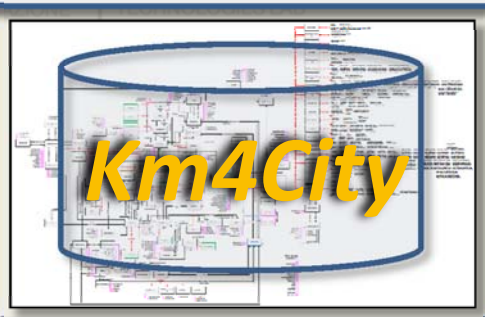
Shops, services,
operators

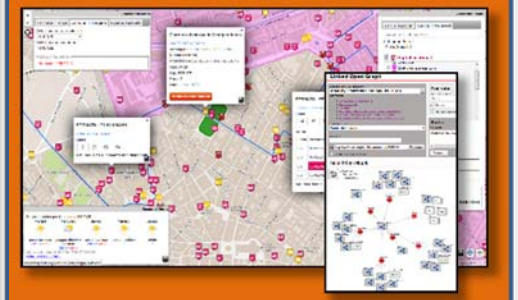
Social Media
WiFi, network

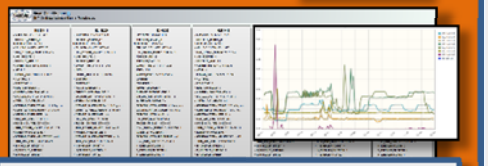
Static, Slow and Real Time data flows

DISCES -- Distributed and parallel architecture on Cloud

Km4City Smart City Engine

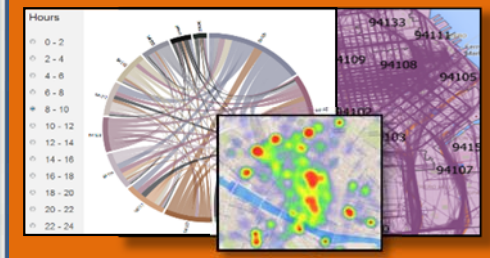






User Profiling and Suggestions on Demand

Flow and Origin Destination Matrix
Http://www.disit.org/odsf



Km4City Tools for Developers

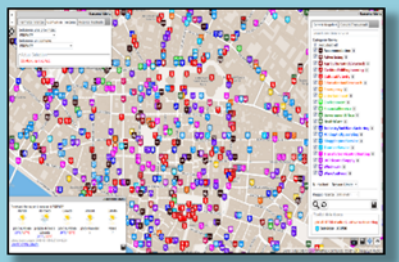
Km4City Smart City API

Tools for City Operators and Decision Makers

Smart City Dashboard
Http://dashboard.km4city.org/

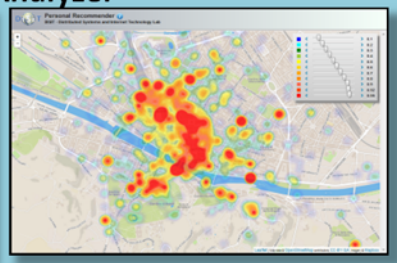
Smart Decision Support
Http://Smartds.km4city.org

Service map browser
Http://servicemap.km4city.org



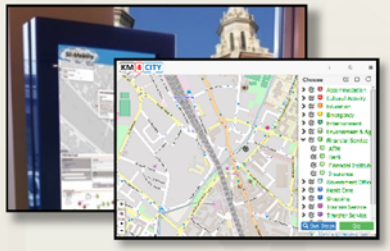
Twitter Vigilance
Http://www.disit.org/tv

Collective User behavior Analyzer



Tools for Final Users

Mobile e Web Apps
Http://www.km4city.org/webapp



Http://www.km4city.org/app

http://www.km4city.org

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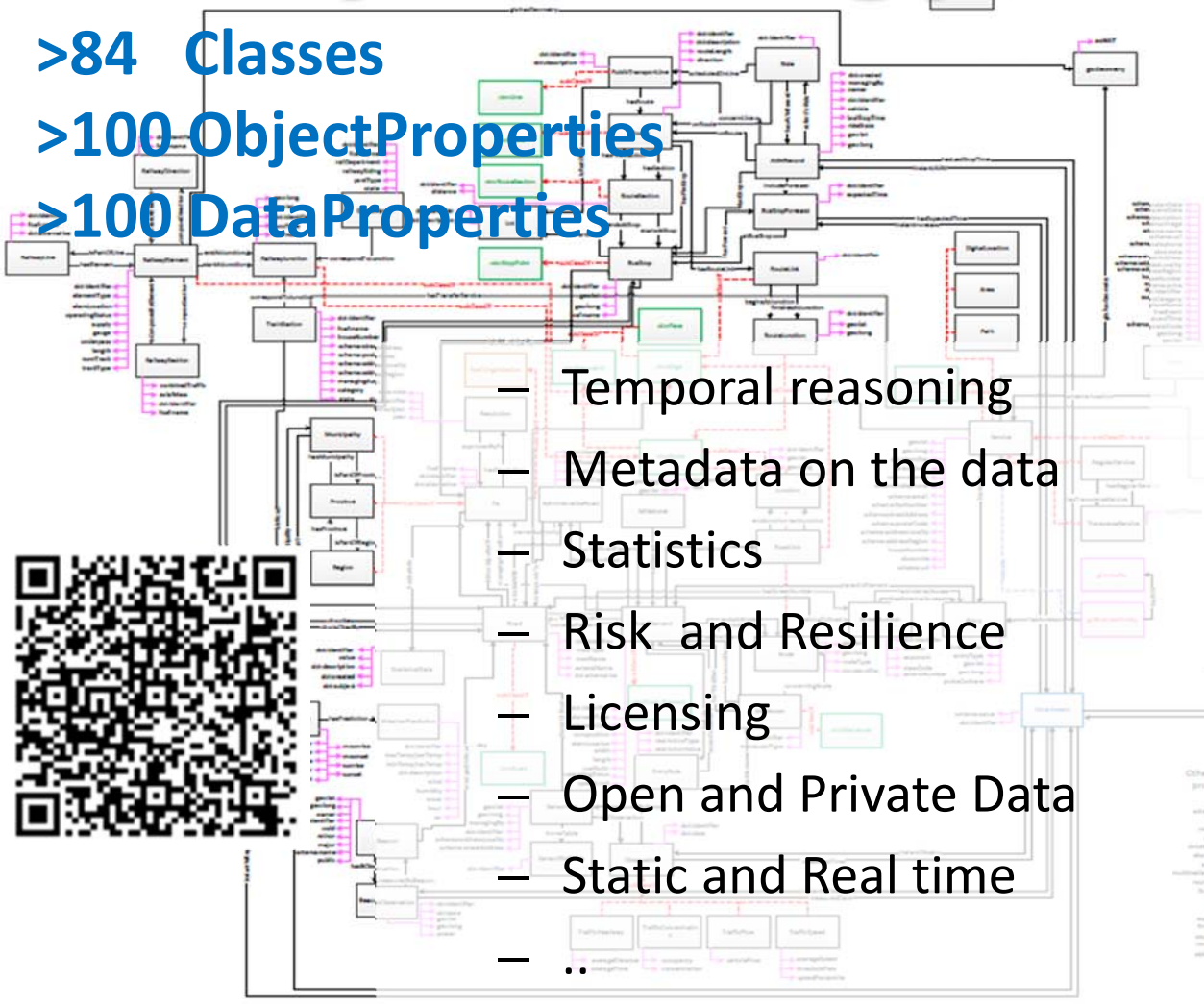
Km4City Smart CityOntology

>84 Classes

>100 ObjectProperties

>100 DataProperties



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

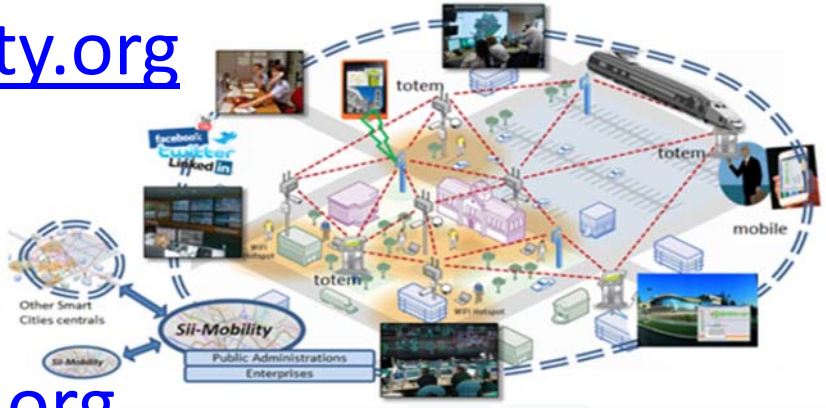
- to cover different aspects:
  - Administration
  - Street-Guide
  - Points of interest
  - Citations from strings
  - Mobility and transport
  - Energy
  - Sensors..
  - ..

Ontology Documentation:

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

Projects based on KM4City

- Sii-Mobility, http://www.sii-mobility.org



- Resolute, http://www.resolute-eu.org

RESilience management guidelines and Operationalization appLied to Urban Transport Environment

Horizon 2020 European Union Funding for Research & Innovation

- Replicate, http://www.disit.org/6778

REPLICATE
REnaissance of PLaces with Innovative Citizenship And TEchnology

Horizon 2020 European Union Funding for Research & Innovation

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resolute

Thank You for Your attention!

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Horizon 2020
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for Research & Innovation