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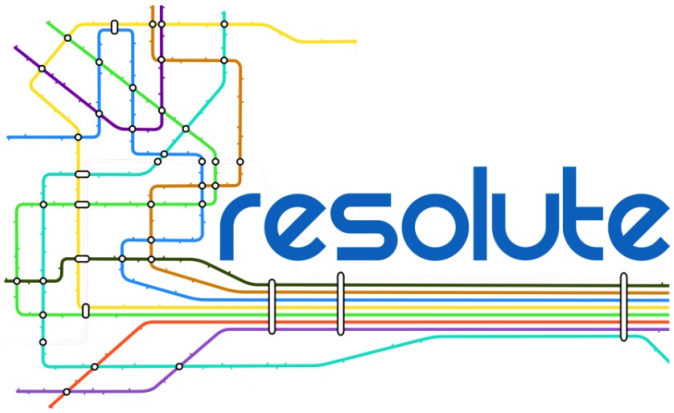


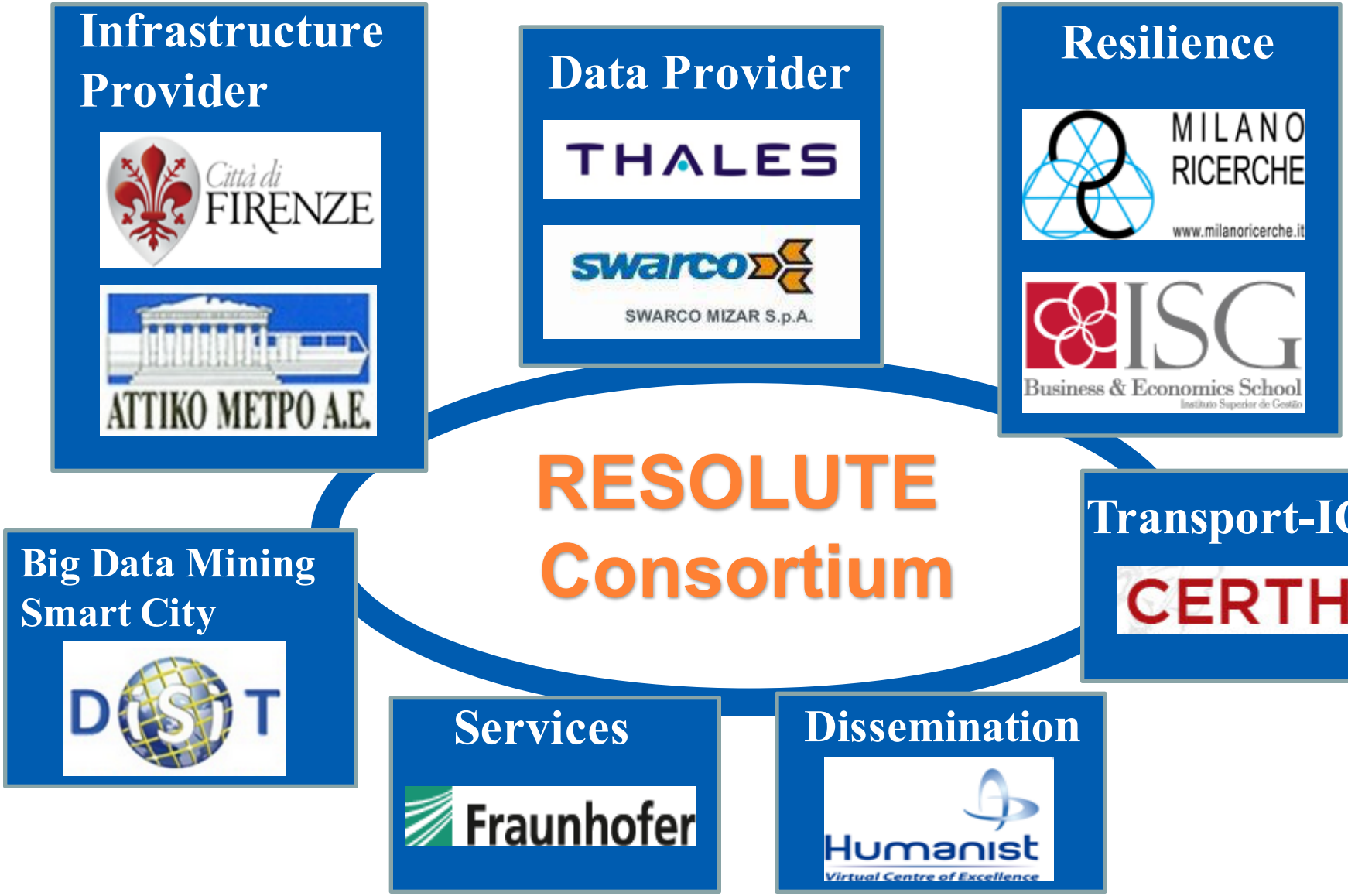
Resilience management guidelines and Operationalization applied to Urban Transport Environment

RESOLUTE project presentation

Emanuele Bellini, emanuele.bellini@unifi.it
Paolo Nesi, paolo.nesi@unifi.it
University of Florence

ASPEN

Co-ordinated by


Infrastructure Provider
Città di FIRENZE
ATTIKO METPO A.E.
Data Provider
THALES
swarco
SWARCO MIZAR S.p.A.
Resilience
MILANO RICERCHE
www.milanoricerche.it
ISG
Business & Economics School
Instituto Superior de Gestão
RESOLUTE Consortium
Transport-ICT
CERTH
Big Data Mining Smart City
DUST
Services
Fraunhofer
Dissemination
Humanist
Virtual Centre of Excellence

RESOLUTE 5 Objectives

Obj1- **Conducting a systematic review and assessment** of the state of the art of the Resilience assessment and Management concepts, national guidelines and their implementation strategies in order to develop a conceptual framework for resilience within Urban Transport Systems

Obj2 - Development of **European Resilience Management Guidelines** (ERMG)

Obj3 - Operationalize and validate the ERMG by implementing the RESOLUTE Collaborative **Resilience Assessment and Management Support System (CRAMSS)** for Urban Transport System (UTS) addressing Roads and Rails Infrastructures

Obj4 – Enhancing resilience through **improved support to human decision making processes**, particularly through increased focus on the training of final users (first responders, civil protections, infrastructure managers) and population on ERMG and RESOLUTE system

Obj5 – **ERMG wide dissemination, acceptance and adoption** at EU and Associated Countries level

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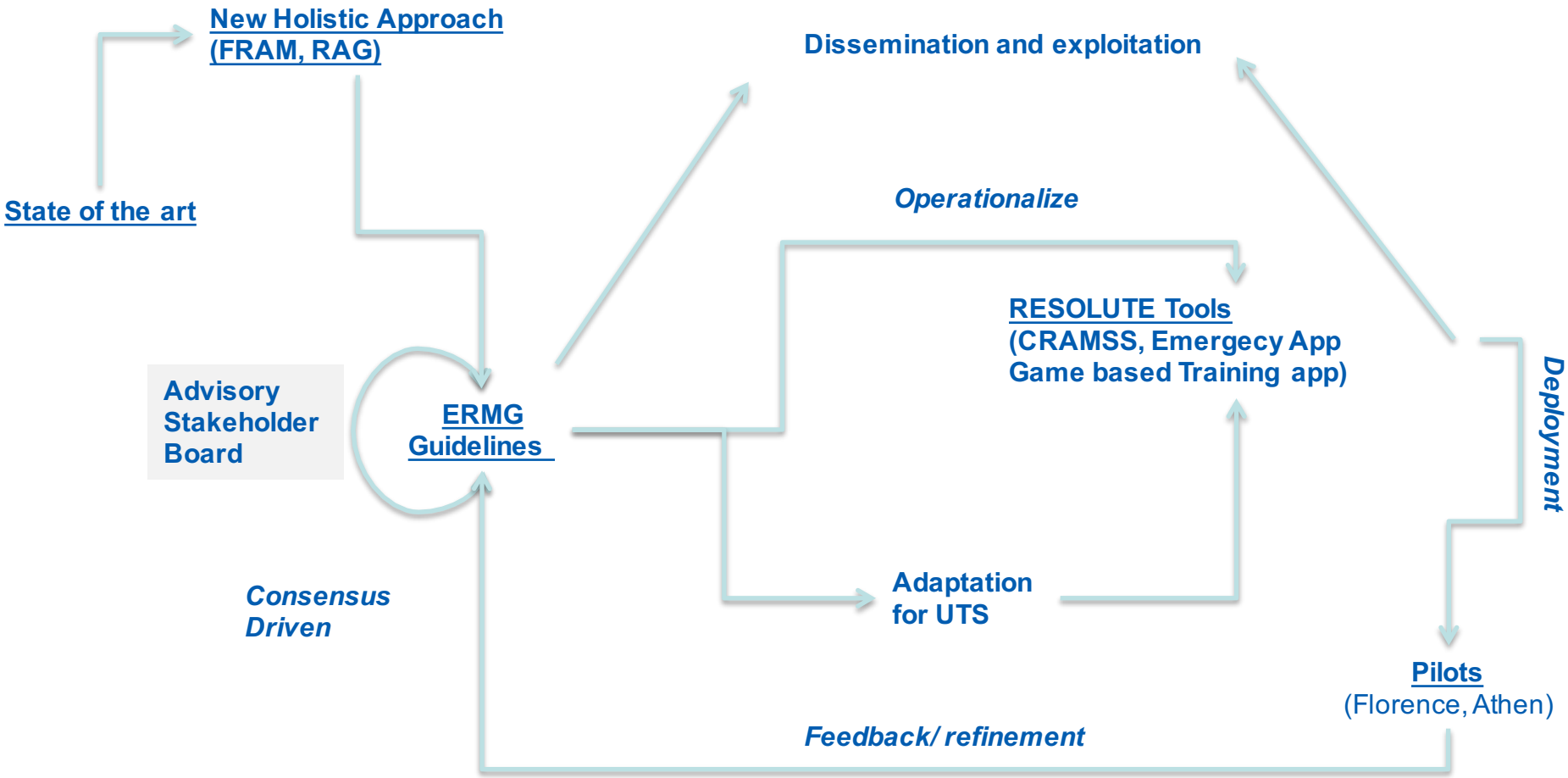
RESOLUTE Map



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Learning from Past

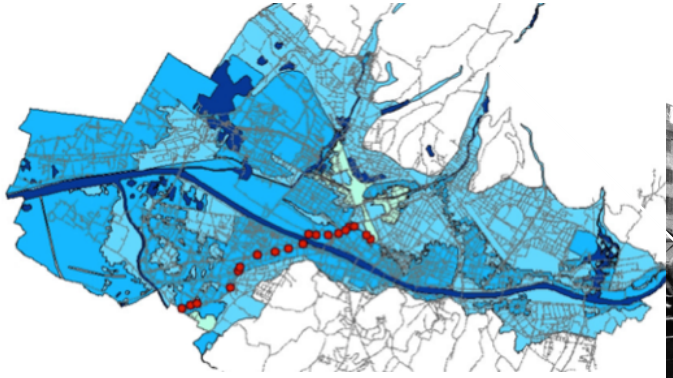
Big Flooding of 1966

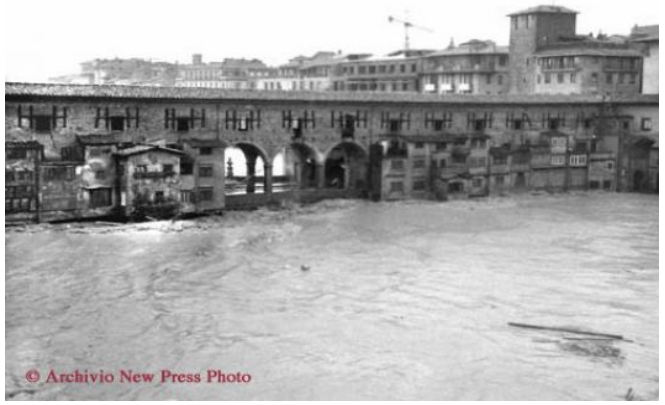
Approximately **90% of the city's population were completely unaware** of the imminent disaster that would befall them as they were sleeping during the early hours of 4 November 1966

killed 101 people and damaged or destroyed millions of masterpieces of art and rare books.

From the first signal (first victim was at 2.30PM of the 3 Nov.) to the big event at 5.00AM of the 4 NOV **passed 15 hours!!**

NB: The results of the risk assessment for flooding were there





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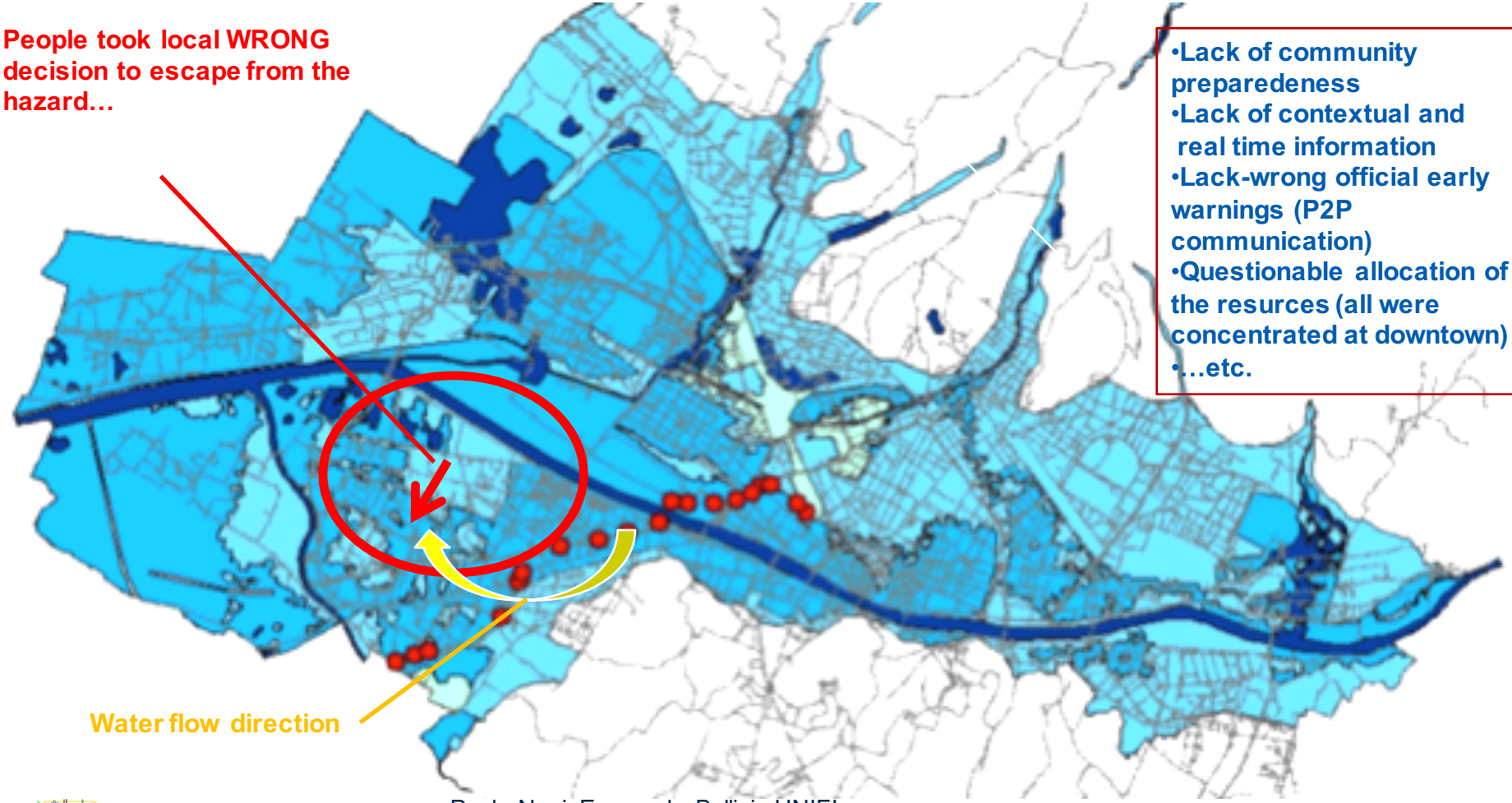
Learning from Past

People took local WRONG decision to escape from the hazard…



- Lack of community preparedeness
- Lack of contextual and real time information
- Lack-wrong official early warnings (P2P communication)
- Questionable allocation of the resurces (all were concentrated at downtown)
- …etc.

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"Mud Angels" - community resilience

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Florence Pilots objectives

Demonstrate and validate an integrated system of mobility management which, besides forecasting, will involve a corrective strategy actuation for restoring of safety condition for system users and of effectiveness of the public transport network in case of **flooding**.

- Reinforcing collaboration among city actors (and city departments..)
- Clarifying responsibilities and roles (e.g. underpasses)
- Improving self resilience of citizens and exploiting who is willing to help
- Improving communications and early warnings systems
- Monitoring the status of the Urban Transport System and detecting signals of possible issues
- Improving the interdependencies understanding
- Managing the resource available (e.g. First Responders) for planning and for real time emergency management
- Obtaining a tools to support the create and continuously update the city resilience plan.

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Smart City and Big Data

Huge amount of data are produced from: Open Data, Linked Data, Real Time sensors, Twitter, WiFi, etc.
(**Big Data: velocity, variety, volume, veracity, …**)

Data available and collected through km4cty platform
http://www.disit.org/km4city

- Traffic data flows
- Public mobility services real time positions (e.g. bus, metro)
- Open Data (close to 1K available datasets including
- Hidrogeological risk maps)
- City free Wifi covers the 80% of the city (traking peoole flows and movement)
- Social networks (twitters)
- IoT (real time data from environmental sensors e.g. level of the river)
- Real time Parking availability
- City services (business,
- Reat time status of the city hospitals-beds availability (pronto soccorso)
- Meteo data
- Cadastre data
- **….but more data are needed.**

ISSUES
Multiple data owners-producers,
Different delivery rate,
Different formats,
Different data quality,
Different licence for data reuse,
etc…

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Transport systems
Mobility, parking

Public Services
Govern, events,

Sensors, IOT
Cameras, ..

Environment,
Water, energy

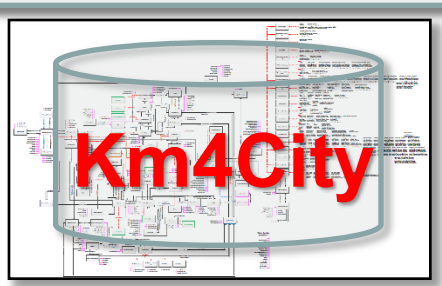
Shops, services,
operators

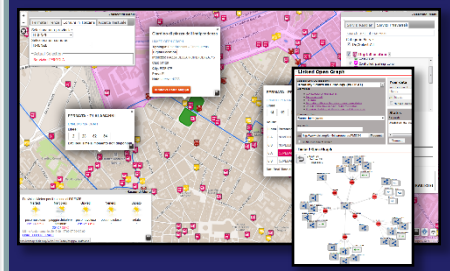
Social Media
WiFi, network

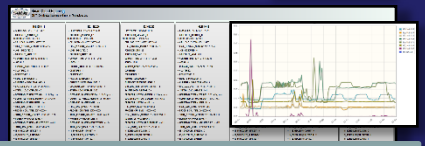
Static, Slow and Real Time data flows

DISCES -- Distributed and parallel architecture on Cloud

Km4City Smart City Engine

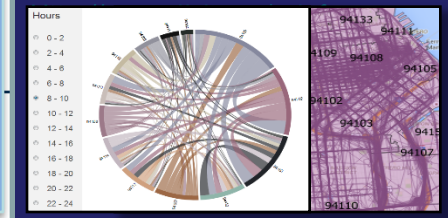






User Profiling and
Suggestions on Demand

Flow and Origin Destination
Matrix

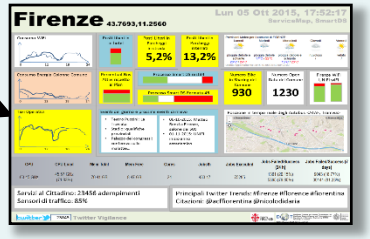


Km4City Smart City API

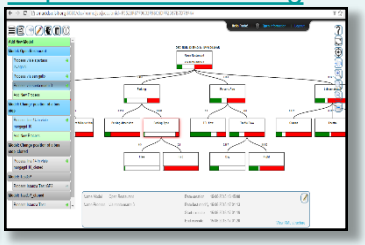
Km4City Tools for Developers

Tools for Operators

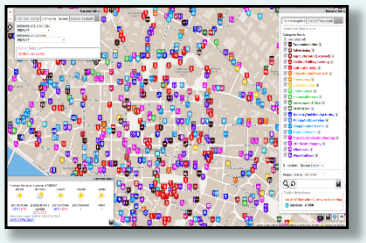
Smart City Dashboard
Http://www.disit.org/dash



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



Service map browser
Http://servicemap.disit.or

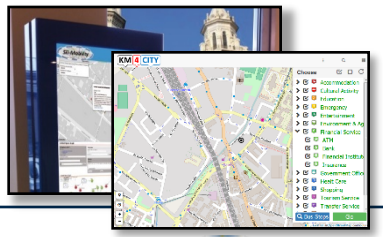


Twitter Vigilance
Http://www.disit.org/tv

Tools for Final Users

Mobile e Web Apps

Http://www.km4city.org



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DISIT

Firenze

43.7693, 11.2560

Tue 10 Nov @ 12:53:21

ServiceMap, SmartDS

Wifi operativi 21

10.7% 89.3%

SmartDS: via santa marta 3 21

58.8% 21.3% 20.1%

Informazioni disponibili 21

Servizi al Cittadino: 23452

Eventi giornalieri: 29

Open Data disponibili: 143

Servizi duplic. 20

19.4%

Accessi ai servizi singoli (web e mobile) 22

Bus attivi 20

29

Ataf RT 20

64.1%

Parcheggi liberi 20

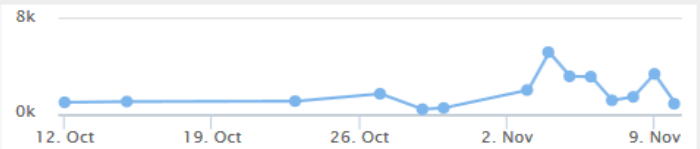
0%

Twitter trends/citazioni 21

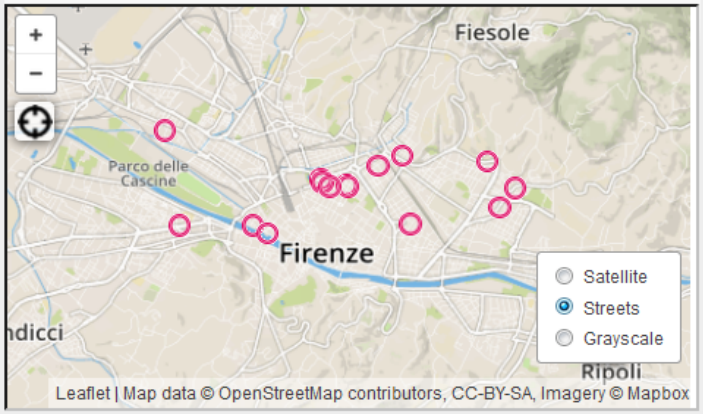
Principali Twitter Trends: #firenze #fiorentina #pontevecchio

Citazioni: @comunefi #fiorentina #pontevecchio

Rilievi wifi 22



Posizione in tempo reale degli autobus ATAF



Previsioni RT 20

98.9%

Previsioni meteo del comune di FIRENZE 299961

Tuesday	Wednesday	Thursday	Friday	Saturday
bit cloudy	mist	bleary	bit cloudy	cloudy
13°C / 19°C	9°C / 20°C	8°C / 20°C	/	/

Latest Update: 2015-11-10T08:35:00+01:00

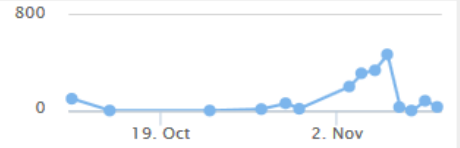
Parcheggi RT 20

66.0%

Smart City Engine 21

CPU	Mem	Job
0.1%	Totale	Eseguiti
	24034 MB	954

Query Servicemap 22



Stato corse ATAF 21

Linee: 6 17 4

in Orario	in Anticipo	in Ritardo
60.6%	17.1%	22.4%

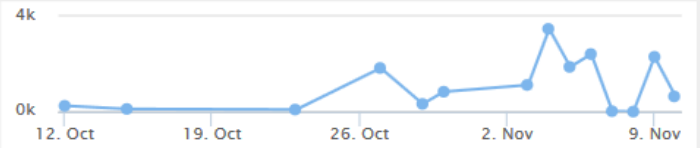
Sensori RT 20

99.3%

Eventi del giorno 22

- L'arte di Francesco - Capolavori d'arte e terre d'Asia dal XIII al XV secolo
- "The Medici Dynasty Show"
- TOSCANA '900
- Carlo Dolci 1616- 1687

Query Km4city API 22



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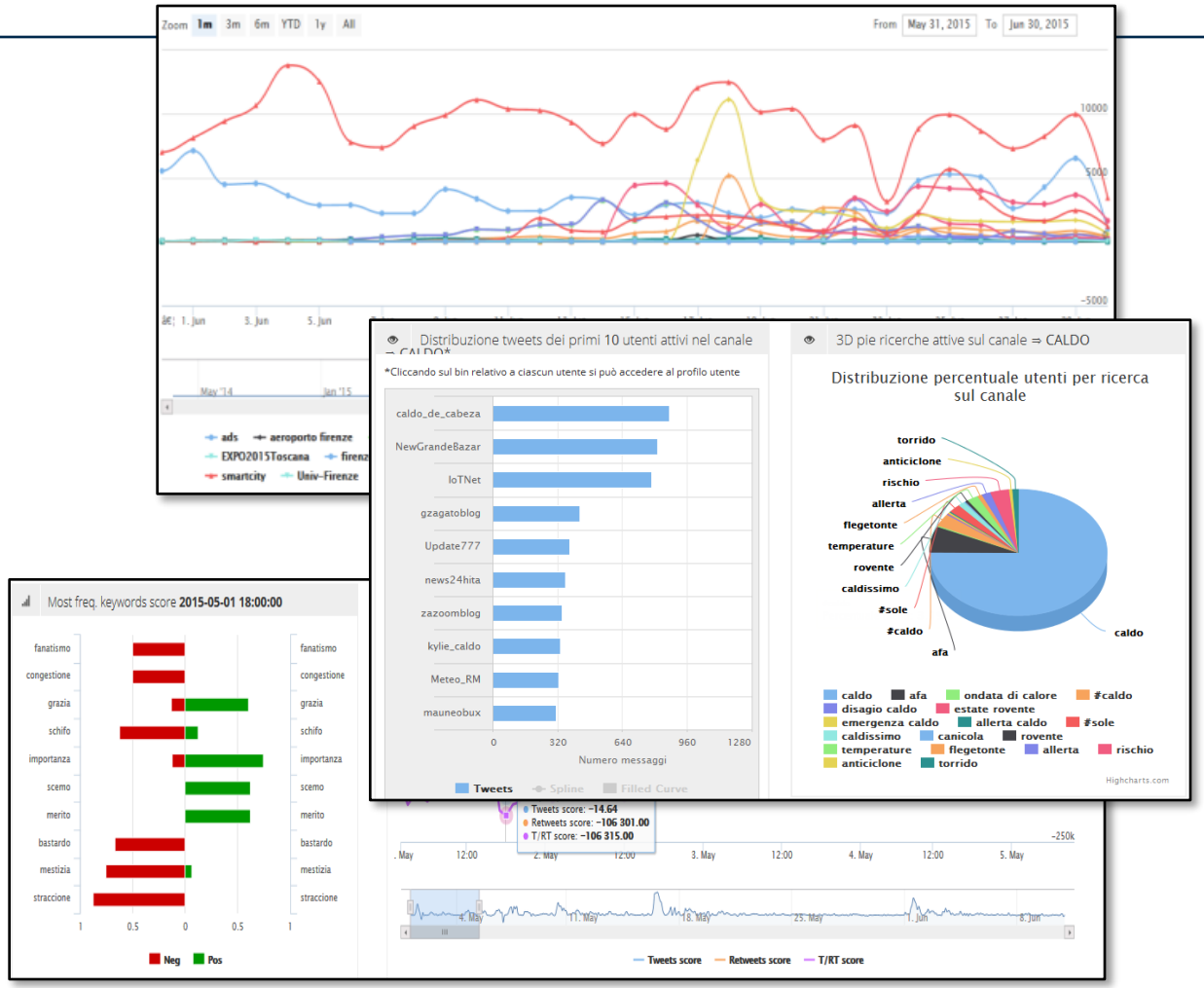
Twitter Vigilance

http://www.disit.org/tv

- Citizens as sensors to
  - Assess sentiment on services, events, …
  - Response of consumers wrt…
  - Early detection of critical conditions
  - Information channel
  - Opinion leaders
  - Communities
  - formation



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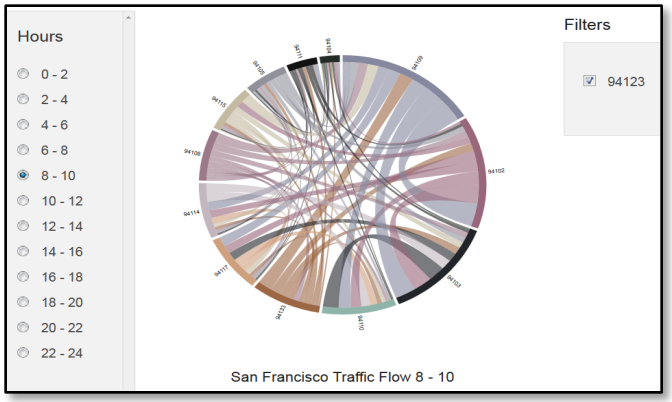
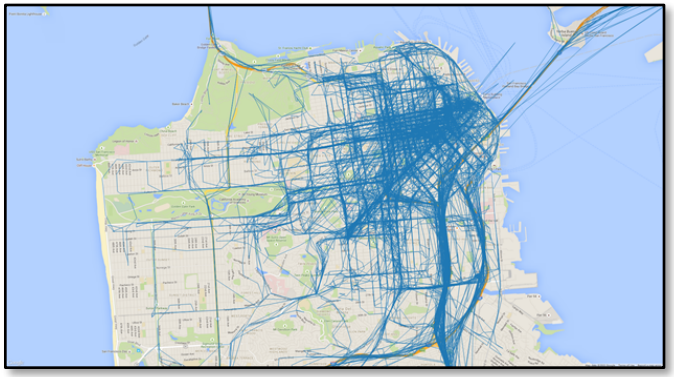
Learning from PastTraffic and People Flow Assessment

http://www.disit.org/6694

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





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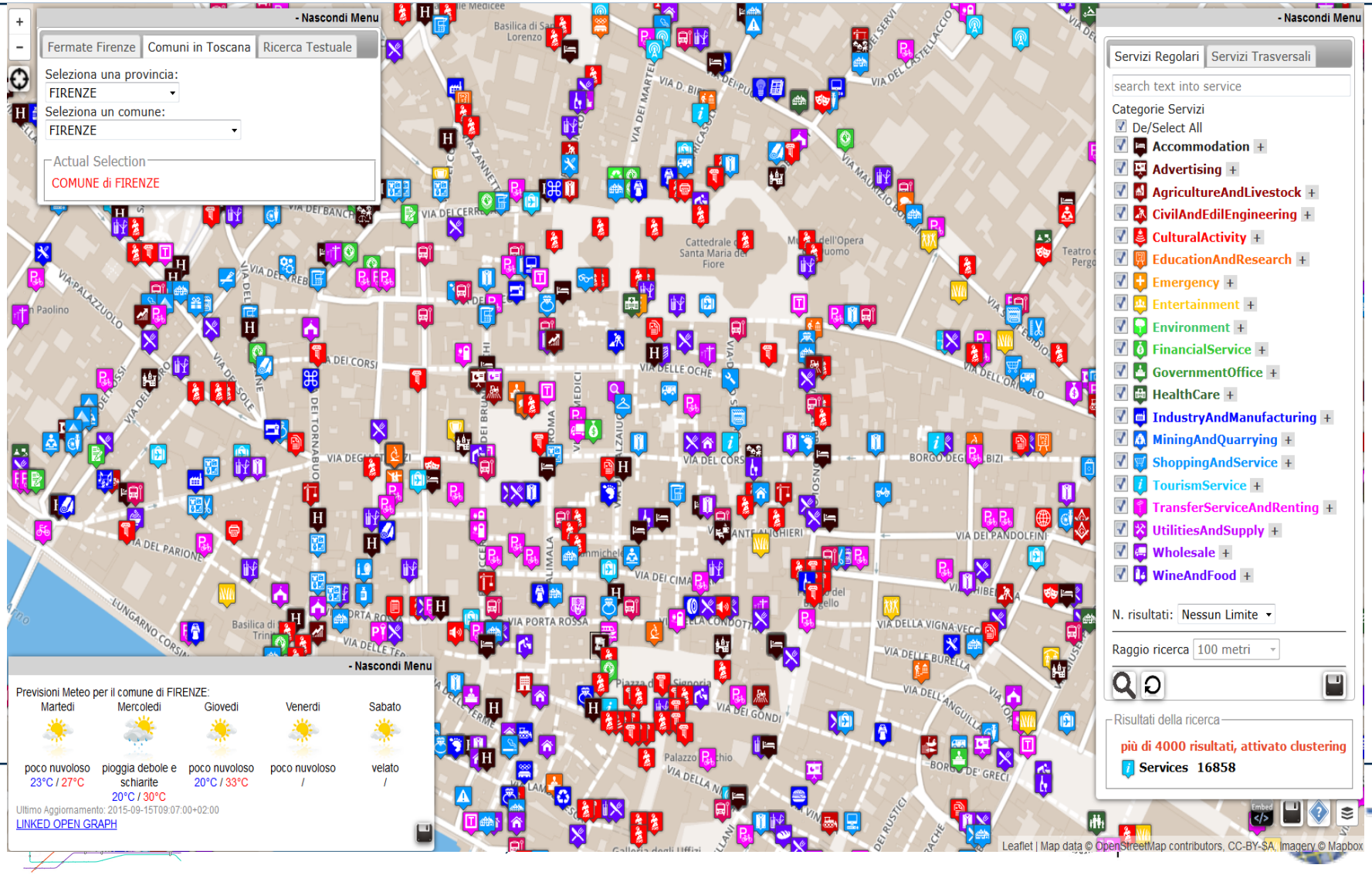
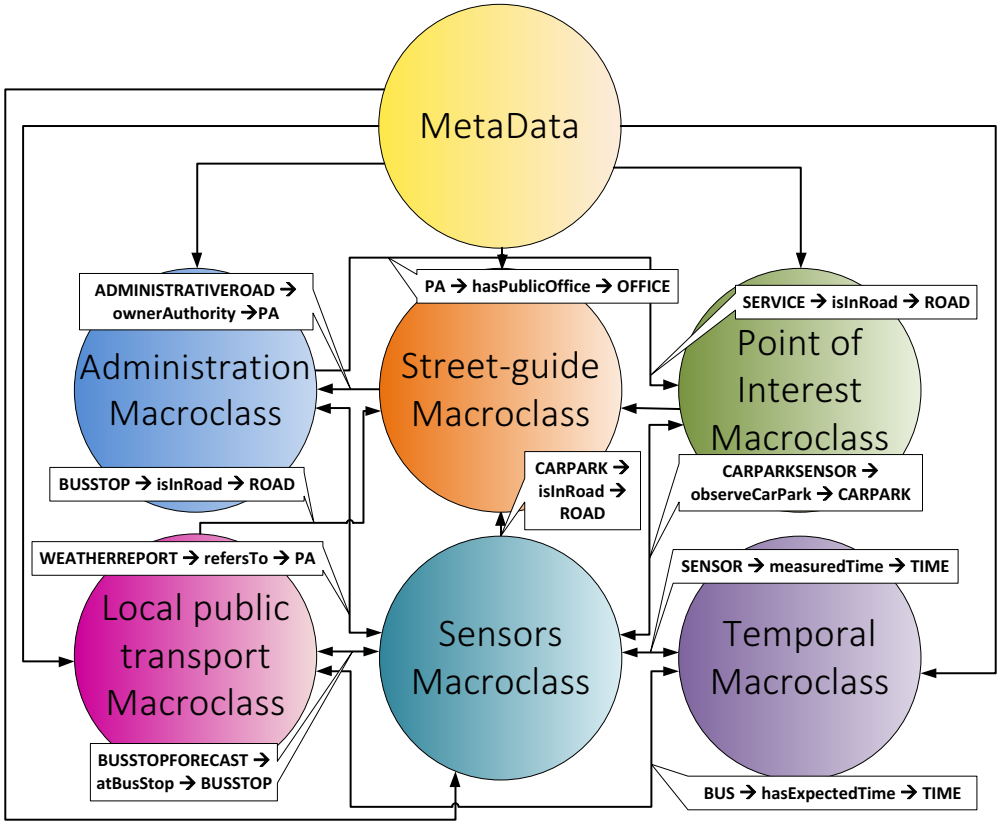
City Services mapped



Km4City: Open Smart-city Ontology

- The data model provided have been mapped into the ontology, it covers different aspects:
  - Administration
  - Street-Guide
  - Points of interest
  - Citations from strings
  - Local public transport
  - Sensors..
  - Temporal aspects
  - Metadata on the data
  - →Statistics



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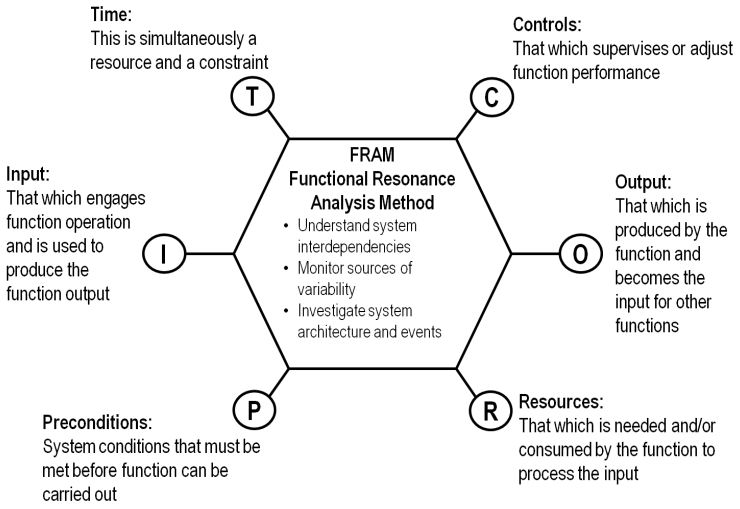
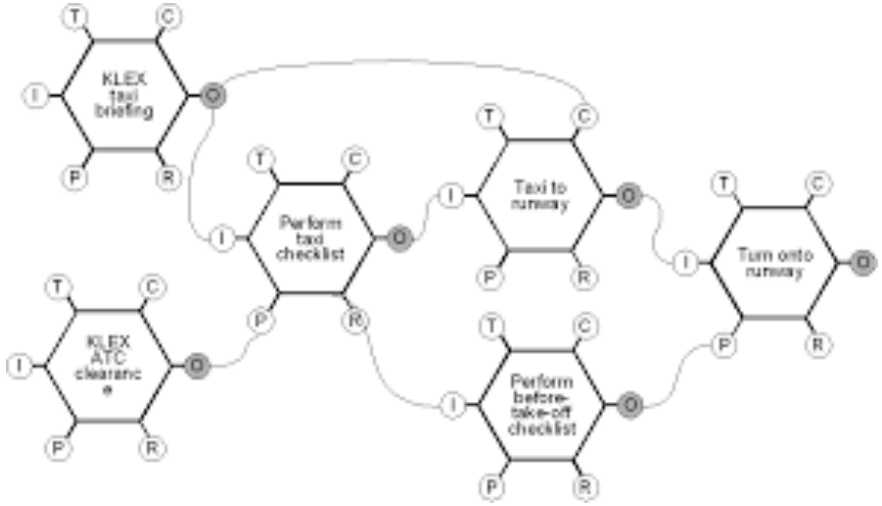
RESOLUTE Theoretical approch: FRAM

A system resilience side in the ability to understand and monitor resources and the capacities that they provide towards coping with both expected and unexpected amplitudes of performance variability

Efficiency-thoroughness trade-offs (ETTO model)





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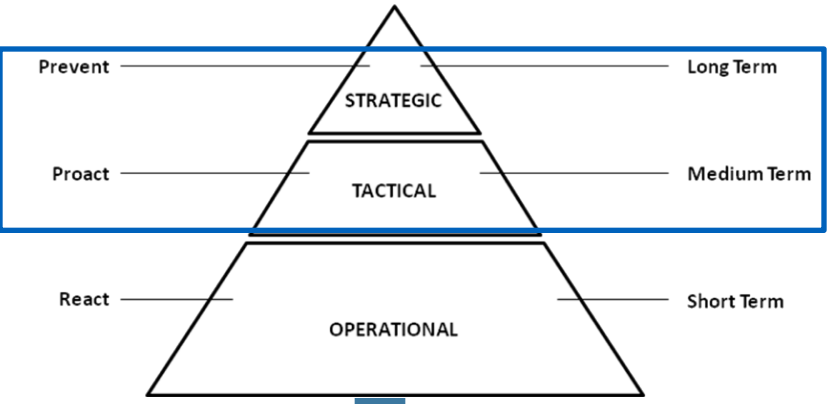
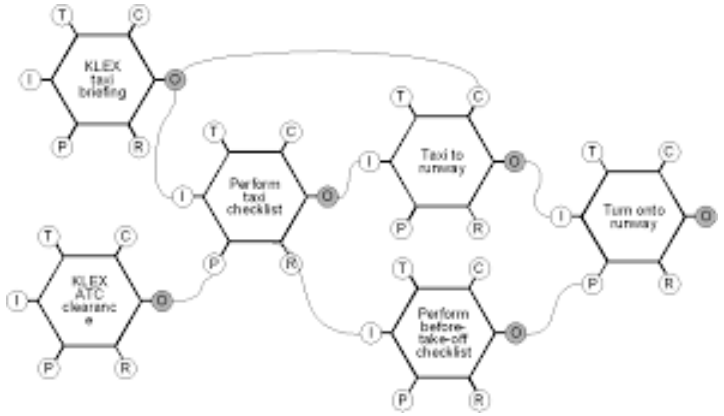
Data Driven Approch



Descriptive



KM 4 CITY

Connecting real (Big) Data to the model

Decision Support System for: Decision Makers and CI managers

- Data driven Resilience Assessment
- Prediction-simulation
- Real time emergency management (tradeoff costs-time to recovery)
- Data Driven training

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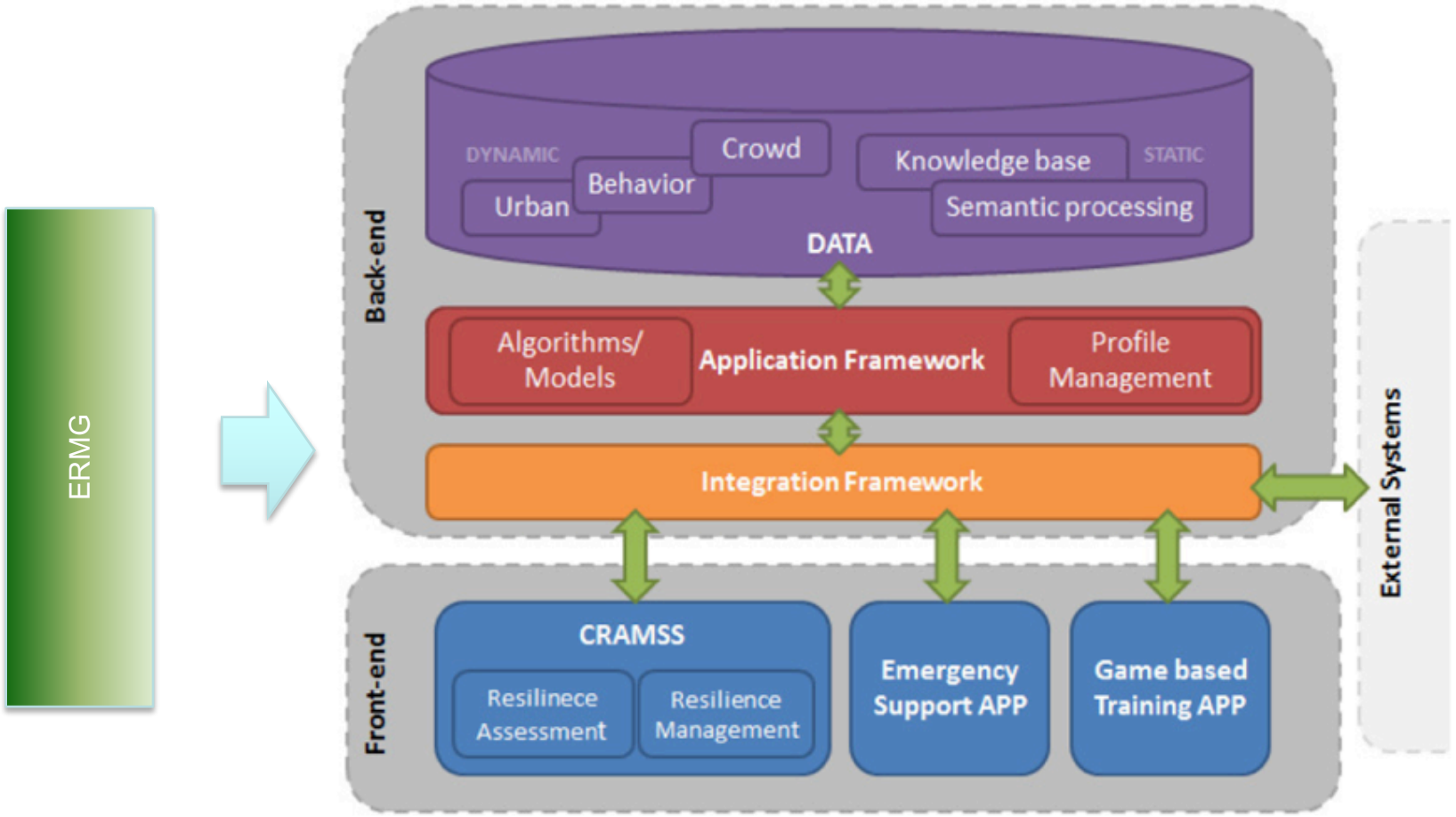
RESOLUTE Architecture



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RESOLUTE Solution

- **CRAMSS framework** is based on an open, service oriented, multi-layer architecture and will embrace both a vertical (top-down and bottom-up) and a horizontal (across sectors and stakeholders) approach and that incorporates, at a minimum – and subject to final architecture, open standards data ingestion services; a data substrate containing both reference and dynamic data (the DATA layer);

- **internal APIs** for the application of analytics tools, modelling and simulation services (the Application Framework), RESOLUTE applications (the Application layer), and so on;

- full public API that allows the integration with existing external systems (the Integration Framework), in order to promote and effect the exploitation of RESOLUTE services by third parties.

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Game based training for preparedness

Game-based training has been associated with greater cognitive effort - an important condition for skill learning and improvements in

- skill execution,
- problem solving and
- decision-making

following game-based training than training involving repetitious technical instruction.

In RESOLUTE we design and develop a game based **meta-application** for Training in order to train different user categories and to improve the community sef resilience

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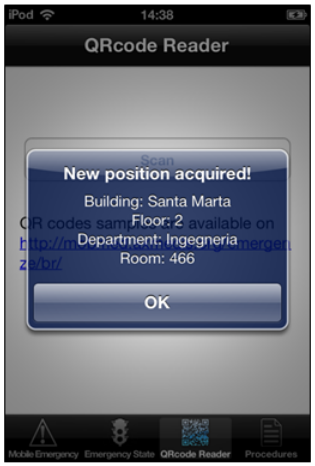
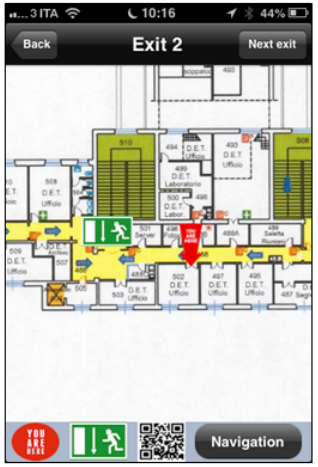
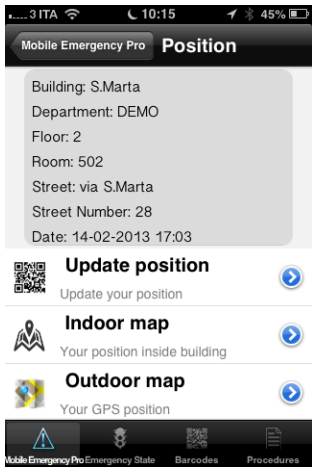
Emergency mobile app







14.1 14.2 14.3

Some notes:

- Is National Library of Florence adapted now? No..
  historical books are in the same places, no specific protections or recovery plan

- Are the citizen more prepared or aware now? No..
  they are only more worried each time the level of the river rises up a bit.

- Is there a clear communication protocol among public depts. involved in managing resilience in the city as civil protection, mobility dept, ICT dept, etc.?
  Thanks to RESOLUTE they just start to think about of sharing information

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Thanks for the resilient attention

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