



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB

Industria 4.0 @ DISIT lab

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

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University of Florence

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

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



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DISIT Lab

- **Researchers: 20**
- **Current Active Projects: 10**
- **Project in the last 4 years: 19**
- **Research Budget: 1.2M€**
- **Foreseen Research Budget (next 2 years): 2.2M€**
- **Record:**
 - 17 progetti Europei
 - + regionali, nazionali, convezioni, etc..
 - Active since 1994



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

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

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

- Smart City integrated solutions: <http://www.disit.org/smartcity>
- Data Mining and understanding: OD ingestion, quality improvement, data fusion, reconciliation: <http://www.disit.org/od>
- Open Data: OD, LOD, RDF stores visual tools, link discovering, enrichment.



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



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DISIT Lab, Distributed Data Intelligence and Technologies
Distributed Systems and Internet Technologies
Department of Information Engineering (DINFO)
<http://www.disit.dinfo.unifi.it>

Con chi lavoriamo



First in Traffic Solutions.



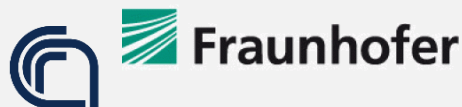
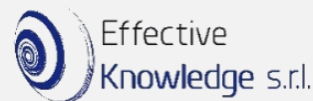
GRUPPO FERROVIE DELLO STATO ITALIANE



ENGINEERING



Società Italiana degli Autori ed Editori



Consiglio Nazionale
delle Ricerche



consorzio nazionale
interuniversitario
per le telecomunicazioni



Agenzia regionale
per la protezione ambientale
della Toscana



ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE



AGENZIA PER LA PROMOZIONE
DELLA RICERCA EUROPEA



ACCADEMIA NAZIONALE
DI SANTA CECILIA





Industria 4.0 vs Regione Toscana

Piattaforma Industria 4.0



Regione Toscana
(coordinamento)

DTR Advanced Manufacturing 4.0
DTR Nanotecnologie/nuovi materiali

Advisory Board

Nucleo Tecnico
Inter-direzionale

(*) Rete di
competenze

Presidenza
DG/Attrazione investimenti
DG/Ris3
Attività produttive
Ricerca e università
Formazione e istruzione
Lavoro

IRPET

Organismi e enti
di ricerca

Alta
formazione

Formazione
tecnica e
professionale

Industrial
Internet

Cloud

Additive
Manufacturing

Cyber- security

Big Data &
analytics

Augmented
reality

Advanced
Manufacturing
Solutions

Allegato b)



DISIT: Competenze per Industria 4.0

- **Technical Areas:**

- **Industrial Internet:** integrazione di fabbrica, ..
- **Smart/Advanced manufacturing:** mobility, delivering, optimization, etc.
- **(Smart City:** mobility and transport, energy, IOT/IOE, analytics, ...)
- **(Smart Retail:** user behavior analysis, engagement, ...)

- **Technologies:**

- **Big Data and Analytics:** data management, user analysis, user engagement, prediction, early detection, data intelligence, ...
- **Data Mining:** artificial intelligence, semantic computing, semantic reasoner, expert systems, statistic analysis, ..
- **IOT/IOE:** internet of things/everything, brokers, microservices, ..
- **Cloud:** smart cloud, cloud simulation, optimization, ..
- **Mobile Computing:** mobile application, user behavior analysis, ..
- **NLP and Sentiment Analysis:** response Vigilance, interaction, answering, ..

- **See projects on:** <http://www.disit.org/5501>

Big Data analytics Aree Applicative

- Smart manufacturing
- Personal assistants
- Autonomous engine, semantic reasoners
- Experts systems
- Smart Cloud
- Services and microservices integration
- Industrie farmaceutiche
- Mobilità e Trasporti
- Turismo e Cultura
- Smart City, Innovation Lab
- Servizi alla persona



Integrazione e Flessibilità

- **integrazione orizzontale**
 - tra imprese, impianti,..
- **integrazione digitale end-to-end**
 - processo di ingegnerizzazione
 - Integrazione:
 - mondo digitale e reale
 - catena del valore tra aziende diverse
 - Logistica vs controllo distribuito,
 - *manufacturing as a service...*
- **integrazione verticale**
 - all'interno della fabbrica
 - sistemi di produzione flessibili, riconfigurabili



Smart Manufacturing: e.g.

- **Riduzione costi e incremento efficienza via renovation, integration**
- **Industrial Internet:**
 - integrazione di fabbrica
 - nuova vita alle macchine
 - Integrazione: CAD/CAM vs produzione
 - Interconnessione, Interoperabilità
 - Tracciamento: QR, RFID, NFC, ..
- **Advanced manufacturing:**
 - Process LifeCycle, management
 - API e servizi
 - mobility, delivering, etc.
- **Mobile Computing:**
 - mobile application,
 - user behavior analysis

FRONTMAN

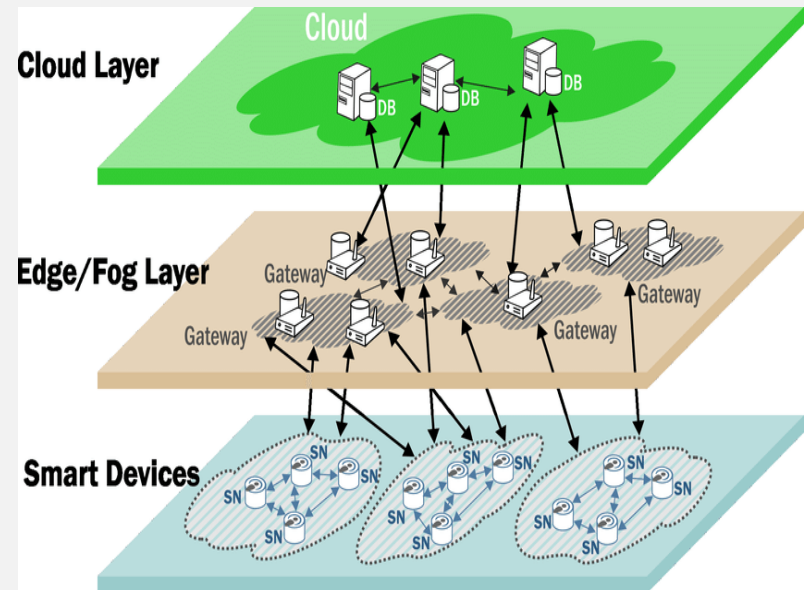


COSTRUZIONI **CN** NOVICROM

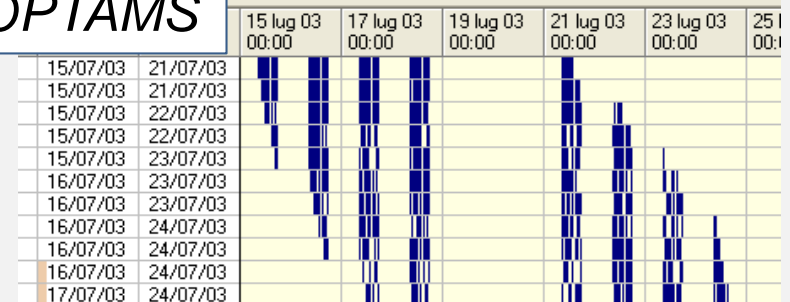


Cloud and Smart Cloud

- **Virtualizzazione/decentralizzazione della produzione**
 - Brokering dei servizi manufacturing
 - Service Level Agreement
- **Service and microservices**
 - Definizione dei processi, workflow
 - Simulazione cloud, simulazione processi
 - Progetto e realizzaz. di simulatori
 - Edge Computing/Fog Computing, → IOT/IOE
 - Advanced API for services
 - Ottimizzazione allocazione delle risorse



OPTAMS



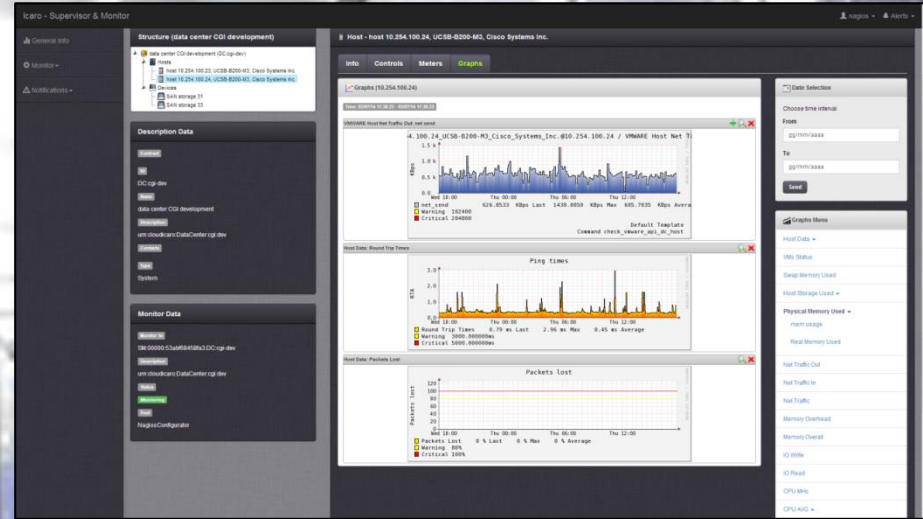
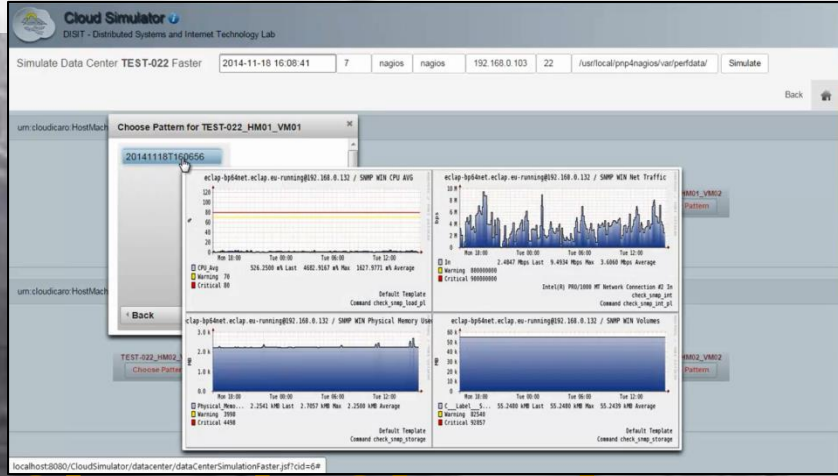
Smart Cloud



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Cloud Simulator Cloud Monitoring Cloud Management Progetti Regionali: ICARO

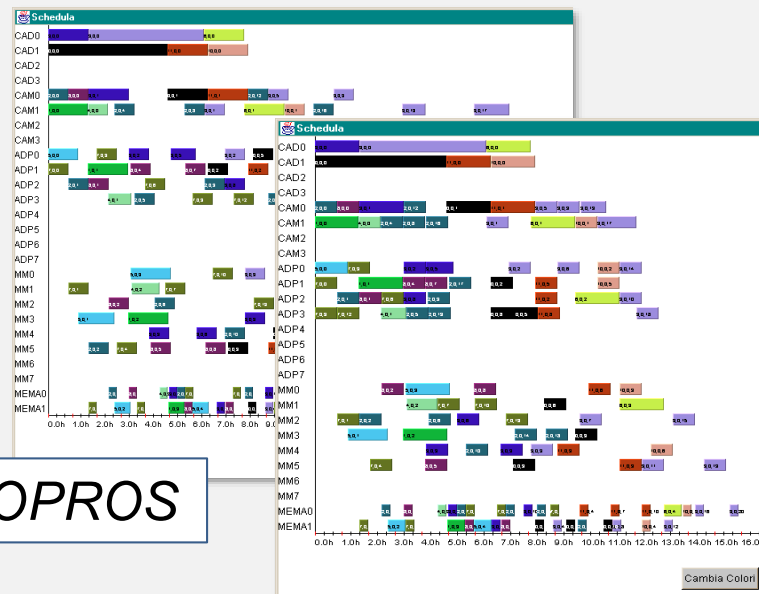
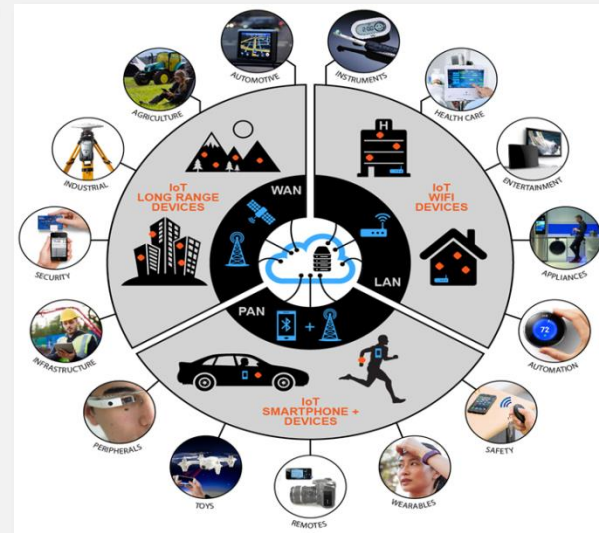


TT verso PMI e GI

Start Cup Toscana 2016, Pisa

Big Data & Analytics

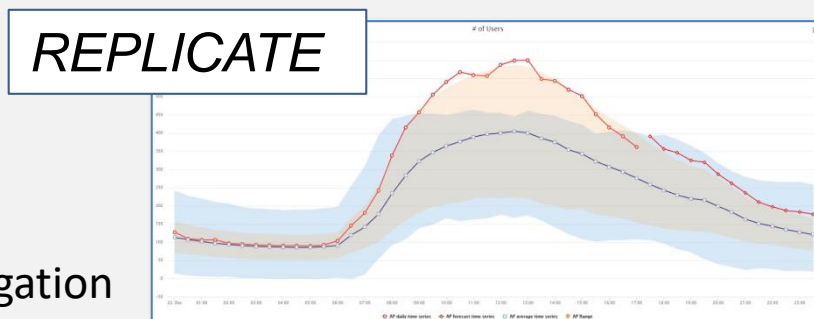
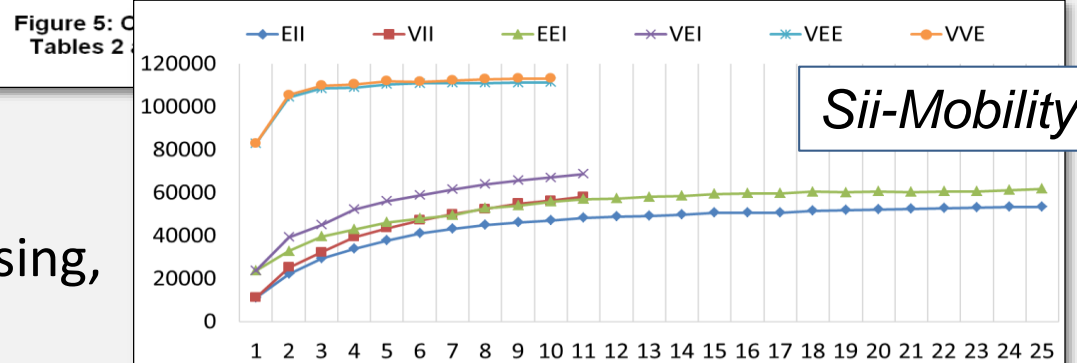
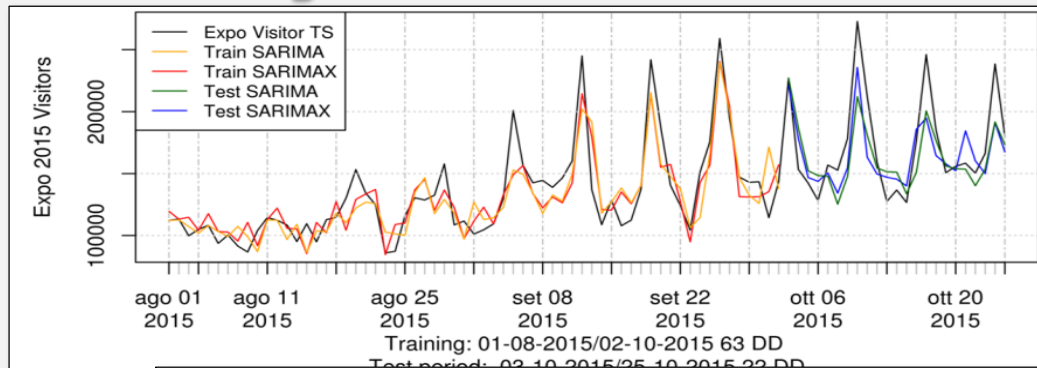
- **IOT/IOE, Internet of Thing/Internet of Everything vs Industria 4.0**
 - Oggetti intelligenti, oggetti che (conoscono come si) producono/lavorano, collaudano, ...
 - Sensorizzazione di impianti per l'automazione e il maggior controllo
 - Sistemi mobili, e soluzioni di distribuzione integrati
- **Algoritmi e soluzioni per**
 - Ottimizzazione della produzione, anche decentrata
 - Visual Analytics, Business Intelligence
 - Manutenzione, prevenzione, controllo
- **Tecnologie di base**
 - Architetture parallele
 - Data Analytics
 - IOT/IOE



SAMOPROS

Big Data & Analytics

- Solutions for
 - Predicting models
 - Early detection
 - Anomaly detection
- Data Analytics
 - Data mining, Clustering
 - Semantic computing
 - Machine learning
 - Natural Language Processing, Sentiment Analysis
- Architetture parallele
 - Hadoop, Spark
 - Hdfs, Hbase, Mongo, Virtuoso, RDF stores
 - Distributed Scheduling
 - GPU
- IOT/IOE
 - Protocols
 - Devices
 - Data aggregation





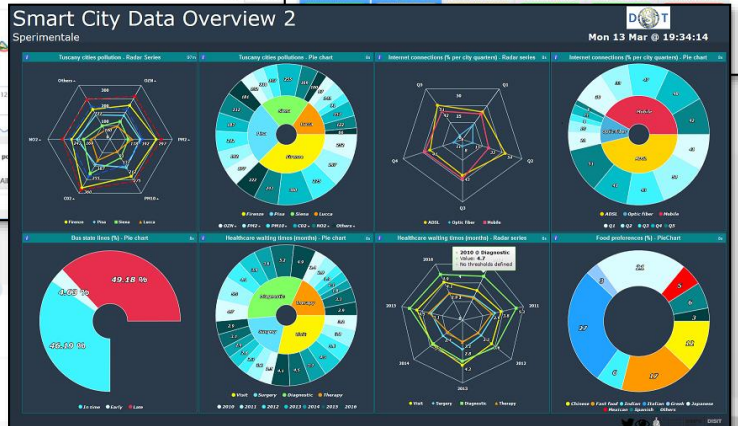
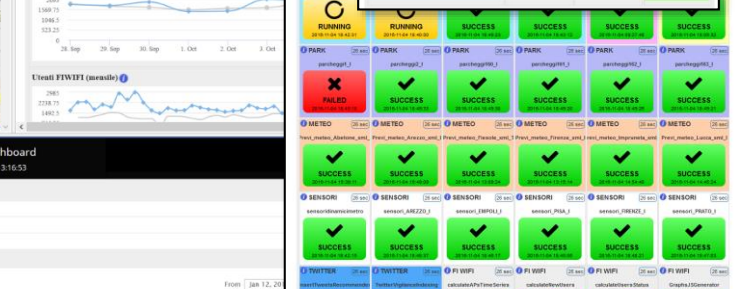
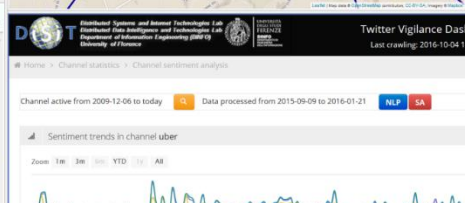
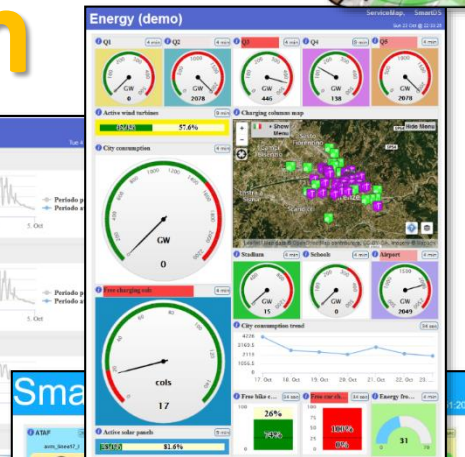
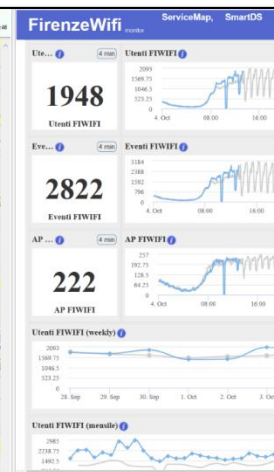
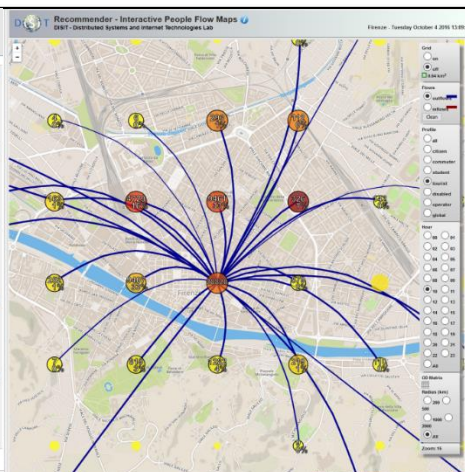
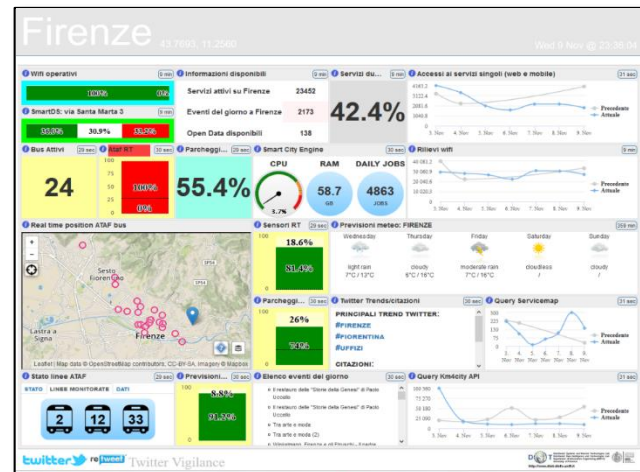
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Dashboard: Control Room



<http://www.km4city.org>

DISIT lab overview, Maggio 2017, Florence



Smart City

<http://www.km4city.org>

**Present data
Tuscany Region
April 2017**

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 Pub. Transport Operators
- 21.280 Bus stops & 1081 bus lines

Dynamic/real-time in Tuscany Region

- Real time bus lines: 144 updates X day X line
- 1081 Pub Lines: 1-2 updates per day, time and path
- 210 parking 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
- 1600 Fuel stations: 1 update X day X station
- 22 Environmental data: 20 updates X day X sensor
- Florence events: about 60 new events X day
- 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 are coming

Services (20 cat, 512 cat.)

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

Weather:

Giorno	Icona	Descrizione	Temperatura
Giovedì	[Icona]	poco nuvoloso	23°C / 27°C
Venerdì	[Icona]	poco nuvoloso	20°C / 33°C
Sabato	[Icona]	velato	20°C / 20°C

Footer: DISIT lab, Km4City, January 2017

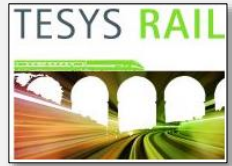
- **Smart City of Florence Metropolitan Area**
- **Km4City**: <http://www.km4city.org>
- **RESOLUTE H2020, EC**:
 - <http://www.resolute-eu.org>
- **REPLICATE H2020, SCC1, EC flagship**
 - <http://replicate-project.eu/>
- **Sii-Mobility SCN MIUR**:
 - <http://www.sii-mobility.org>
- **Coll@bora Social Innovation, MIUR**.
 - <http://www.disit.org/5479>
- **TRACE-IT, RAISSS, TESYSRAIL,**
- **Mobile Emergency**:
 - <http://www.disit.org/5404>



Trace-IT



RAISSS





Feedback Project Personal Assistant

Operators

Strategy Editor and feedback

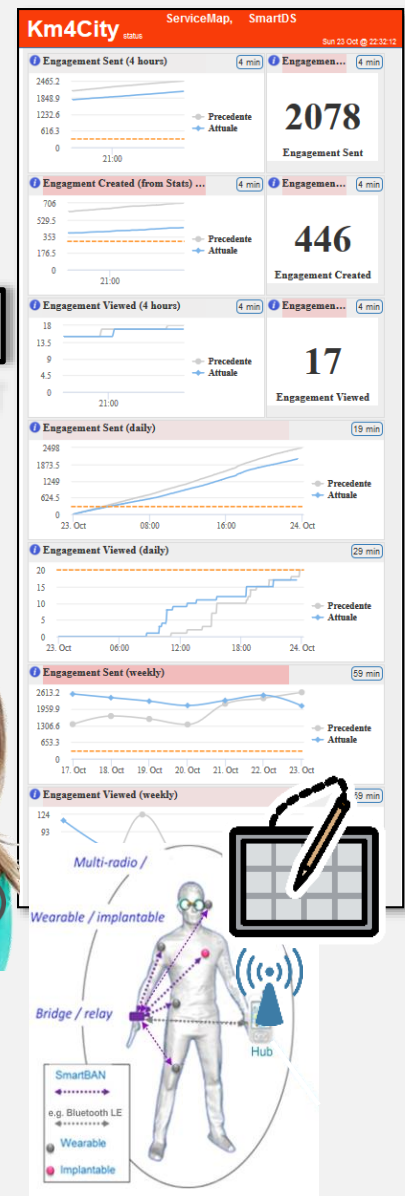


Rule name	Type	#sent	#viewed	#viewed on #sent	Description
daily_event_de	ENGAGEMENT	1 (0%)	0 (0%)	0%	Suggest (in german) an event currently on in Florence
daily_event_en	ENGAGEMENT	1720 (2.12%)	70 (7.1%)	4.07%	Suggest (in english) an event currently on in Florence
- commuter		5 (0.29%)	0 (0%)	0 (0%)	
- 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					for a nearby point-of-interest

- Inform
- Engage
- Stimulate / recommend
- Anomalies Detection
- Provide Bonus, incentives



IOT/IOE





Toscana dove cosa,



- Tutta la Toscana
- Personalizzabile
- Profilata per tipo di utente
- Trasporto pubblico
- Traffico, percorsi, navigazione
- Parcheggi liberi
- Costi benzina
- Suggerimenti
- Assistenza
- Protezione civile
- Meteo
- Biglietti bus
- Punti di Interesse
- Contributi degli utenti

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

Stazione Pensilina

Orario	Linea	Direzione
17:05:00	52	Stazione Pensilina
17:09:00	1	Stazione Palazzo Congressi
17:09:00	17	Boito
17:09:00	2	Stazione Palazzo Congressi
17:11:00	54	Bilfredi Fs Fantoni

Assistente

Più vicini | Più recenti

AIUTACI

Puoi contribuire con una recensione del "LAVANDERIA*ANNA DI PANTIFERI ROSALBA"?

Evento: "Ad Usam Frateris - Miniature nel m... laurenziani di Santa Croce (XI - XII) BIBLIOTECA MEDICEA LAURENZIANA (II) Tipo: Mostre Timeout: 2016-10-18 10:37:42

EVENTI in giornata

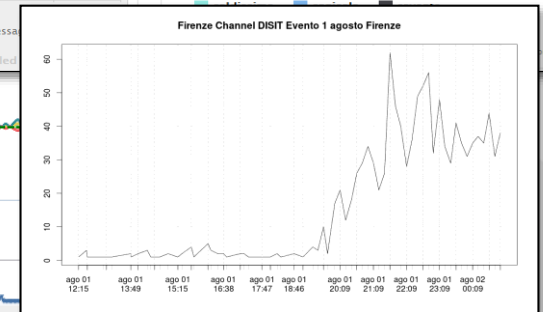
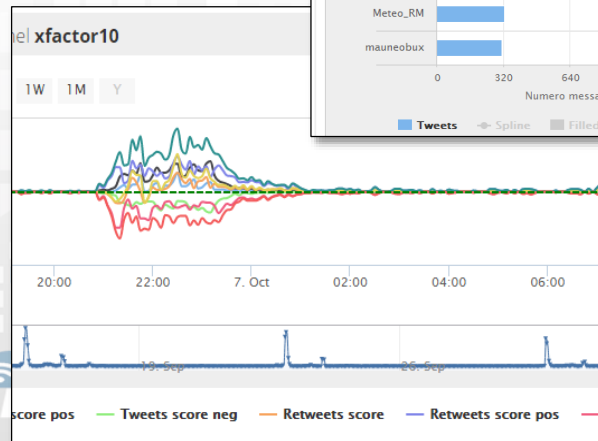
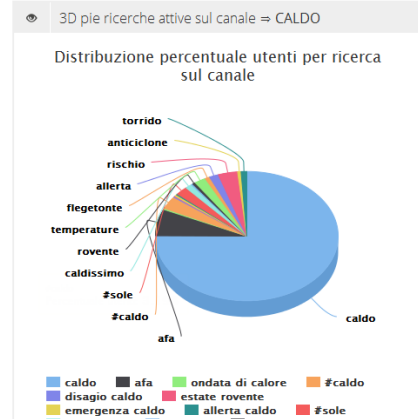
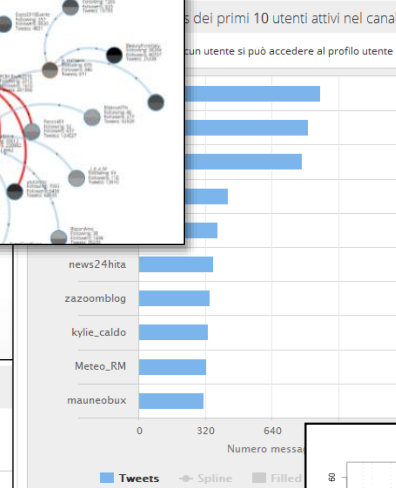
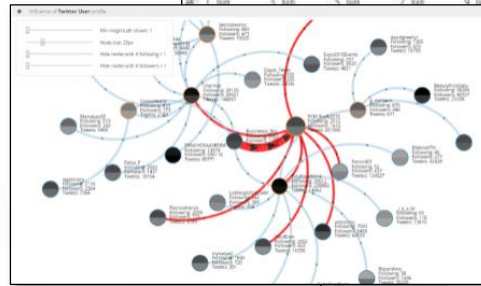
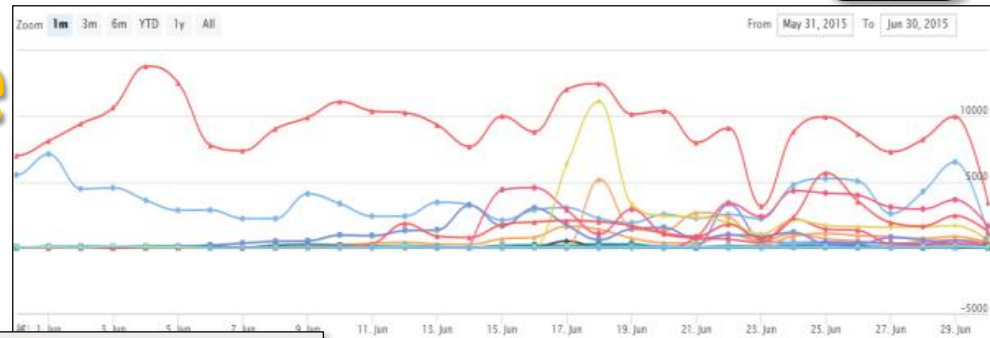
2016-12-18T08:52:00+01:00

Giorno	Tempo
Domenica	10°C
Lunedì	11°C
Martedì	12°C
Mercoledì	10°C
Giovedì	10°C



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
 - **Predicting volume of visitors for tuning the services**





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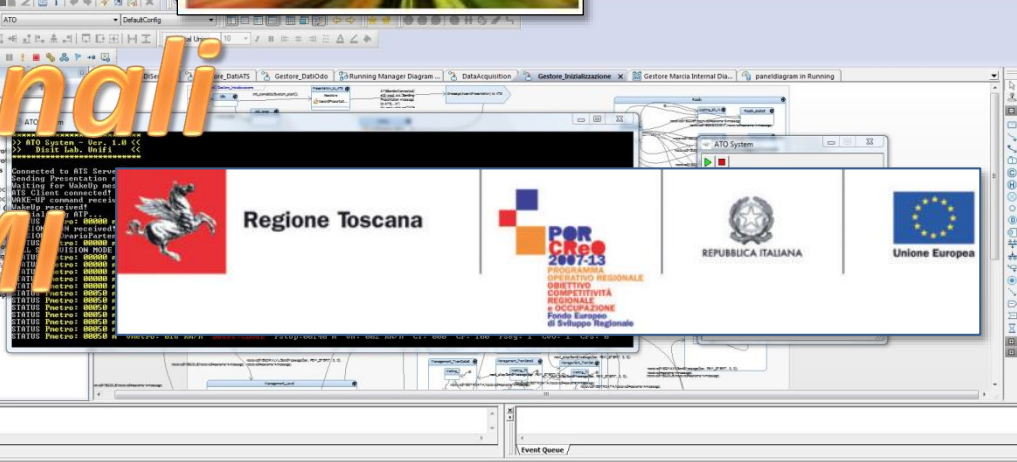
Trace-IT RAIS



Sistemi a Guida Autonoma Segnalamento Ferroviario



Progetti Regionali IT verso GI e PMI





Conclusioni

- Per partire ad usare le soluzioni di Digitalizzazione di Industria 4.0 basta volerlo fare
- Le tecnologie di data analytics, data warehouse, dashboarding, machine learning, data mining, NLP, SA, sono alla portata di tutti
- si può partire da ogni condizione,
 - i maggiori benefici in termini di recupero di efficienza sono tanto maggiori quanto siamo distanti dalla completa integrazione e digitalizzazione dei processi.