

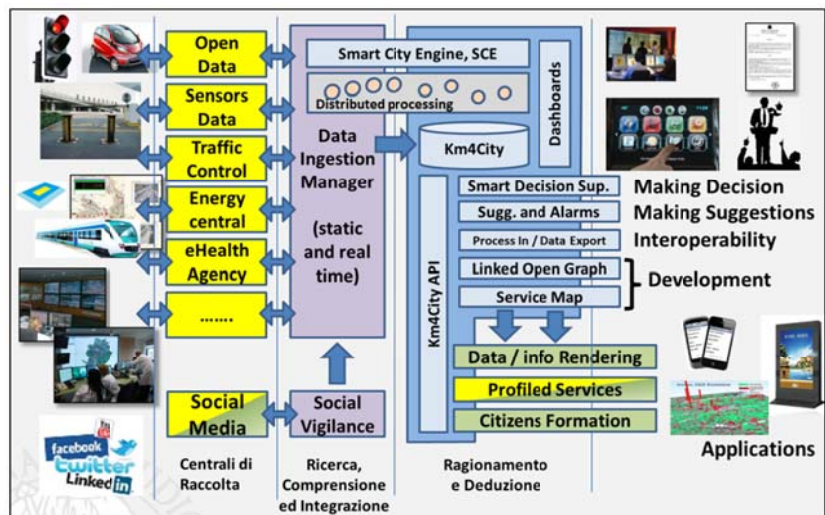
Km4City White Paper: Production tools for Smart City, from data to services for citizens and companies

In the Smart City context, hundreds of data sets are available. Many of them are open data, accessible from local, regional, national, European public administrations, national institute of statistics, etc. These data can be static, statistical data or real time. In addition, many other data are produced by other institutions like Europeana, ECLAP, Getty, Voc, dbPedia, etc. Typically most of the data are geolocated and can be accessed as files in various formats (CSV, XLS, KMZ, JSON, XML, HTML, MySQL, ZIP, LSMA, SHP, etc.), other are accessible as Linked Data, Linked Open Data or via RDF Store end points (see dpPedia, Europeana, Senate of the Republic, Chamber of Deputies, ECLAP, km4city, etc.). Personal, private and critical data can be added to these open data. Some private data are produced by companies, like for example the position of car sharing vehicles, the position of taxis, busses, flows in the city, energy consumption data in a neighborhood, etc. Many of these data can be useful for public administrations to take decisions and to provide services. Personal data are related to a person, include personal identifications, the position of the person, its profile, etc., and need to be managed in accordance with terms of use and privacy policies. Finally, critical and personal data may be used by bad-intentioned to take actions against citizens security and infrastructures, and thus licensing and conditional access solutions are adopted.

Data are typically produced by central data producers, and many of these can provide their data in different ways and formats. Among them: traffic management systems, fleet management, LTZ management, hospitals, weather, social network, etc. These data have to be accessible by an aggregator that makes queries, understanding and data integration. This is not a trivial operation since it implies the semantic understanding of the data that have to be

uniformed in a single data model. A single and unified model of aggregated data allows making integrated queries to provide these data via API, and the possibility to realize services and applications. Examples of services could be those that allow geographical search, the production of suggestions based on statistical evaluations, geographic structure, similarities, etc., also on the basis of citizen behaviors on the city and with respect to the available services.

Data aggregation and provision services enable the development of apps for tourism, cultural heritage, transport and mobility, personal services, wellness, energy saving, etc. actually these opportunities are difficult to be exploited for public administrations and companies. Mainly obstacles are related to the high costs of data integration and aggregation, due the limited interoperability among data that are produced in different periods by different entities and companies.



Km4City is a solution to realize data aggregation and provision services

Km4City is a scalable and effective solution to quickly provide innovative services. It provides:

- Flexible Km4City model: <http://www.disit.org/km4city>;
- Simple and effective APIs to develop mobile and web applications that use coherent data, by providing a channel with updated aggregated data;
- Tools for web and mobile applications: **ServiceMap** <http://servicemap.disit.org>
- Demo tools in open source: **Firenze Open Data Day**: <http://www.disit.org/6595>
- Tools for data management: multisource acquisition (multi-format, multi-protocol, static and real time), enrichment, extension, conversion, augmentation, integration, equalization, rationalization, quality enhancement, etc. **DIM: Data Ingestion Manager**: <http://www.disit.org/6732>
- Intelligence tools for heterogeneous data aggregation for semantic, format, source, etc.
- Tools for RDF store navigation: **LOG: Linked Open Graph** <http://log.disit.org>, <http://log.disit.org/spqlquery/>;
- Tool for definition of decisional processes based on advanced System Thinking: **SmartDS, Smart Decision System**, <http://www.disit.org/6711>
- Tool for Twitter channels monitoring: **TV, Twitter Vigilance** <http://www.disit.org/tv>
- Mobile applications for Android, iOS, smartphone and tablets, see Google Play, Apple store.

Km4City Service Map

ServiceMap allows to visually develop searches and to receive via email the code for the production of web and mobile applications:

- Search and visualization by municipality;
- Search of services near a location, position
- Search and visualization by free text;
- Search and visualization by type of services;
- Search and visualization of transversal services (digital locations, Wi-Fi, shops, sensors, bus stops, parking, bicycle path, green areas, busses and trains paths, events in the city, etc.);
- Access to statistical data services (geolocated services) and real time; busses, events, flow sensors, meteo forecast, twitter, etc.

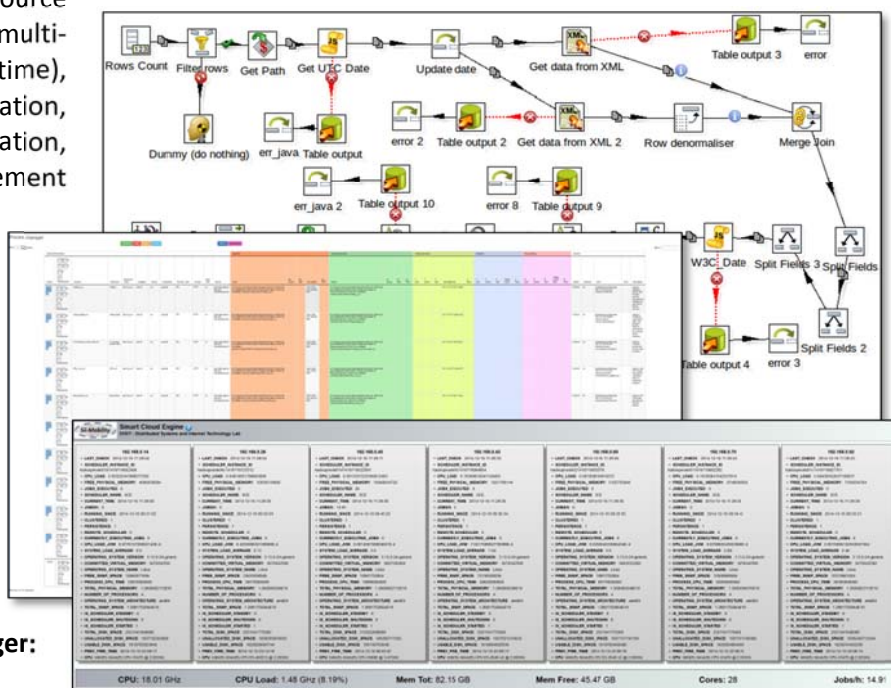


Accessible data are described in <http://www.disit.org/6726>. In July 2015 there were 9500 services in Florence, 1000 in Pisa, 800 in Prato, 460 in Pistoia, 420 in Arezzo, 180 in Empoli, etc. So that these data are referred to the whole Tuscany Region, mainly Florence municipality. They are coming from MIIC of Tuscany Region, LAMMA consortium, transport and traffic observatory, Florence Municipality, etc. These data are about mobility and transport, cultural heritage, hospitals, meteo, services, emergencies, shops, tourism, wine and food services, education, wellness, etc.

Tools for data management: Data Ingestion Manager and Smart City Engine

Data Ingestion Manager (DIM) (<http://www.disit.org/6732>) is a tool allowing to manage activities to process data sets, like: multisource acquisition (multi-format, multi-protocol, static and real time), enrichment, conversion, integration, equalization, rationalization, increment, etc., via: data management processes in ETL, Java, Perl, etc.; the DIM allows to manage complex processes via the **Smart City Engine**:

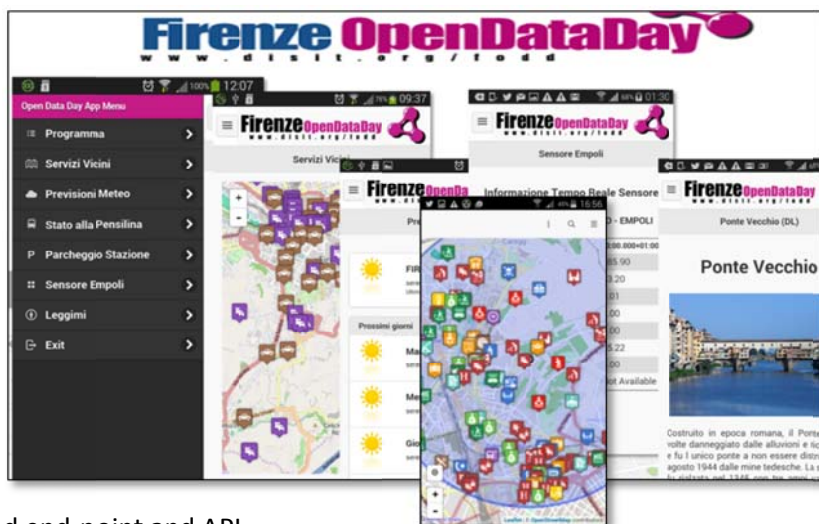
<http://www.disit.org/6515>
To manage intelligence tools for heterogeneous data aggregation per semantic, format, source, etc. the generation of LD indexes, RDF Store, etc. and the creation of complex indexes see: **RIM, RDF Index Manager**:
<http://www.disit.org/6708>



A simple tool to create Web and mobile applications

Km4City can be used to create services for qualified personnel and/or for citizen, with App and web pages using ServiceMap services.

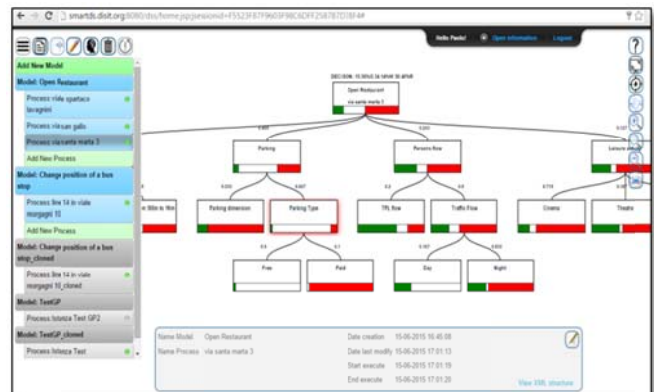
- A demo open source app is provided as example, with video tutorial and slides: <http://www.disit.org/6595> for iOS, Android and Windows Phone.
- API are accessible as described here: <http://www.disit.org/6597>
- Publication of data via RDF Store and end-point and API.



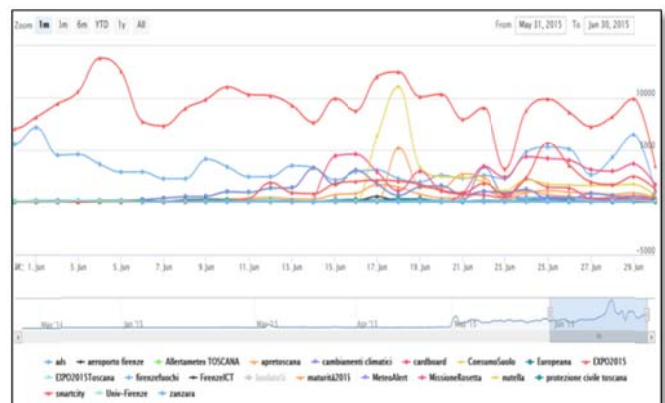
Km4City tools have been developed and are actually used by the Florence aggregator developed by DISIT Lab, also accessible via API. **Km4City** solution is at the basis of the Sii-Mobility national project on smart cities (<http://www.sii-mobility.org>), and RESOLUTE H2020 project (<http://www.resolute-eu.org>). **Km4City** has been evaluated with a high rank by Ready4SmartCity FP7 (<http://smartcity.linkeddata.es>) and it is considered by IBM as one of the most interesting Smart City models (<http://cognitive-science.info/community/weekly-update/>).

Tools integrating Km4City solution

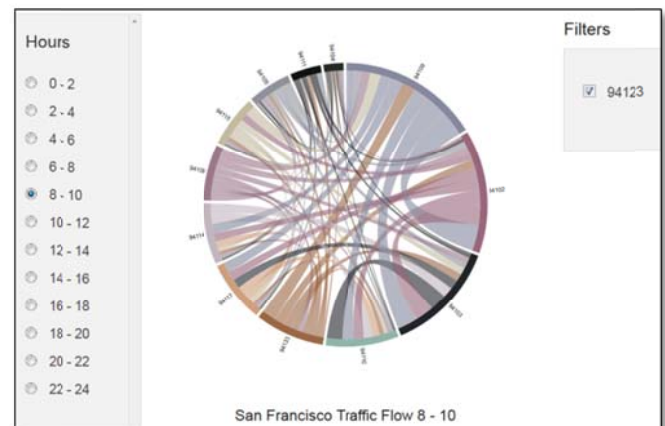
Automation of decision support with System Thinking model: <http://smartds.disit.org> it allows to develop decision models (in a cooperative or reserved manner, by using and integrating information from your databases and from social) that can be used in different point in the city, for example for determining: displacements of stops, changes of direction, opening of new services such as restaurants, relocate services, etc.



Solution for Twitter channels monitoring: <http://www.disit.org/tv>. It identifies critical conditions on the territory, qualifies and evaluates the sources, evaluates the ambient and weather critical conditions (by reducing costs for sensors), understands moods of citizens in relation to services, includes consumer responses with respect to certain products, etc.



Solutions for analyzing Smart City flows and user behavior: <http://www.disit.org/6694>. It allows to understand which are the most used areas, streets, and provides suggestions on how to have better coverage of the monitoring system and it poses the basis of adapt services, stimulate the use of alternative streets to reduce flow peaks, enhance mobility and transport services but also those distributed on the city.



Km4City is available as service e and can be declined in different contexts by providing management tools like: SCE (Smart City Engine), Data Ingestion Manager, Smart Decision Support System, etc. (see <http://www.disit.org/km4city>)

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