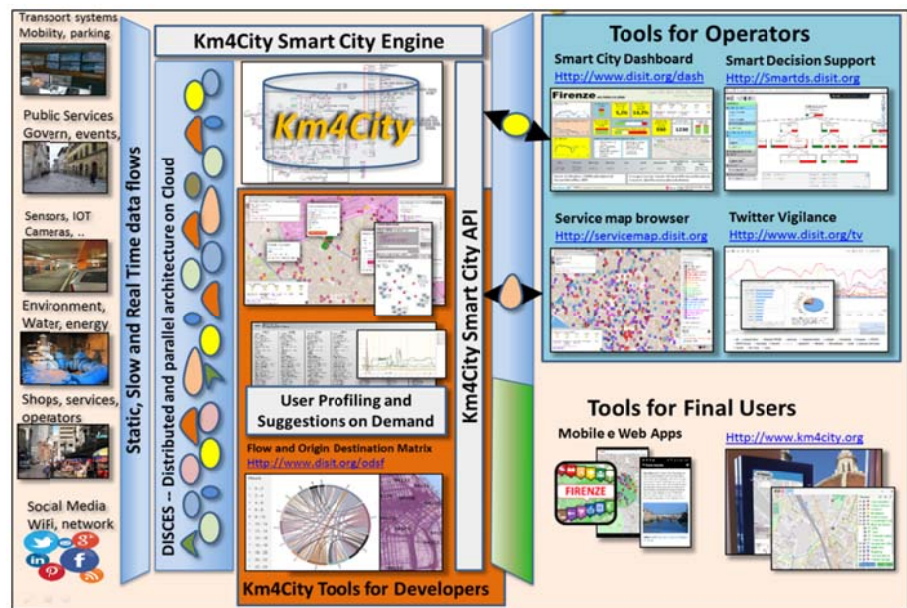


Km4City White Paper: Production tools for Smart City, from data to services for citizens and companies

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 and real time data. 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.). Personal, private and critical data can be added to open data. Private data are produced by companies: car sharing vehicles, position of taxis, busses, flows in the city, energy consumption data in a neighborhood, traffic management systems, fleet management, LTZ management, hospitals, weather, social network, etc. 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. 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. Other data are produced by institutions like Europe, Europeana, ECLAP, Getty, Voc, dbPedia, etc., and may be used to enrich those of the local administrations. They may be accessible as Linked Data, Linked Open Data or via RDF Store end points.

Data are a value for the city, and once accessible in aggregated manner may be used to enable services via complex geo-graphic queries, relationships, etc. The **data aggregation and semantic interoperability** among data is not a trivial task since implies the semantic understanding of data that have to be uniformed to a unified semantic and versatile model.



Examples of services could be those that allow the **detection of critical condition, assessment of city smartness and resilience**, production of geographical search, proximity suggestions, monitoring of wifi and city service conditions in Control Room dashboard, **production of on demand services** for final user applications on the basis of their behaviors in the city and with respect to the available services. Thus the **provision of personalized services** to develop apps for tourism, cultural heritage, transport and mobility, al services, wellness, energy saving, etc., actually these opportunities are difficult to be exploited for public administrations and companies, for the high costs of data integration and aggregation, and to the limited interoperability among data, that are produced in different periods by different entities and companies, and by using different formats. Km4City solve these problems and enable the **provision of personalized services on demand for a large range of smart city applications.**

Km4City is a solution to realize city control rooms, city monitoring, data aggregation services

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

Back Office Tools for Public Administrations:

- Tool for definition of decisional processes based on advanced System Thinking: **SmartDS, Smart Decision System**, <http://www.disit.org/6711>
- Smart City Dash boards
- Tool for Twitter channels monitoring: **TV, Twitter Vigilance** <http://www.disit.org/tv>
- 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>
- **RIM: RDF Index Manager**: user manual, for versioning of graph databases RDF stores. <http://www.disit.org/6708>

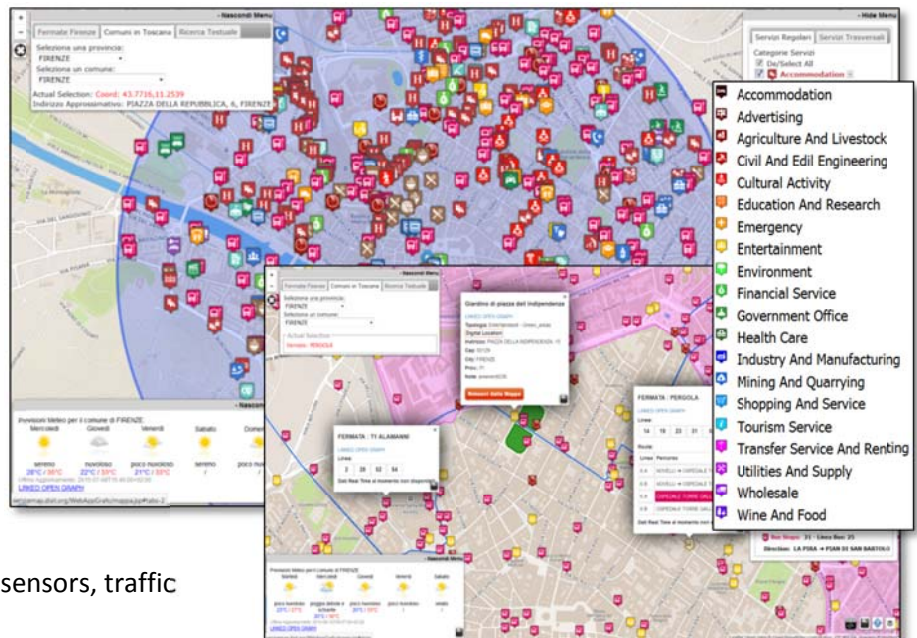
Developers tools:

- Flexible Km4City model, ontology documentation: <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 <http://www.disit.org/6597>
- Tool for developing web and mobile applications: **ServiceMap** <http://servicemap.disit.org>
- Tools for RDF store navigation: **LOG: Linked Open Graph** <http://log.disit.org>, <http://log.disit.org/spqlquery/>;
- Demo tools in open source: **Firenze Open Data Day**: <http://www.disit.org/6595>

Km4City Service Map, a tool for developers and city service browsing, discovering

ServiceMap allows to visually develop searches and to receive via email the programming code for the production of web and mobile applications exploiting Km4City API:

- 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.);



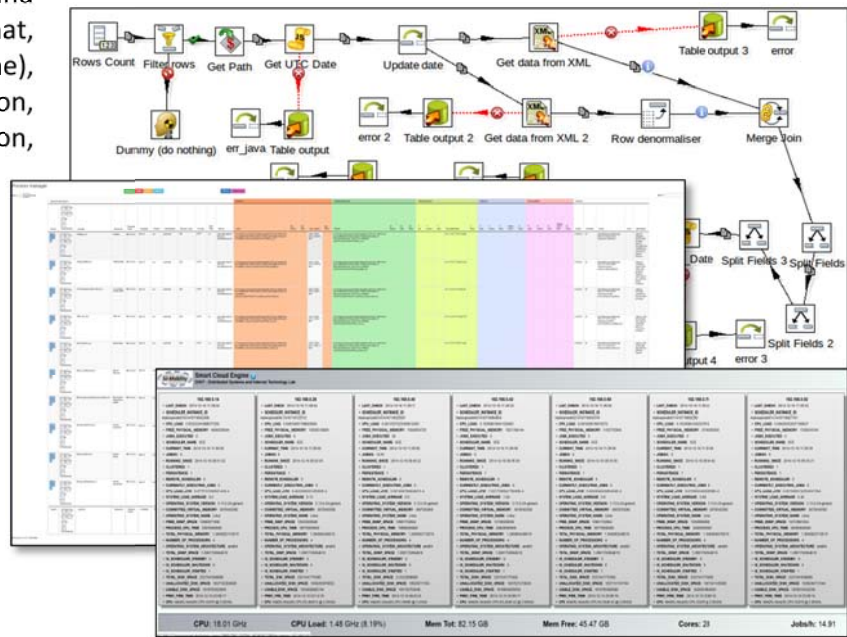
- Monitoring real time busses, sensors, traffic flows, events, etc.
- Access to statistical data services (geolocated services) and real time; busses, events, flow sensors, weather forecast, twitter, etc.
- Identify data for the control room of the smart city.

These accessible data are described here <http://www.disit.org/6726> were over than 100.000 services, mainly in Florence and Tuscany all. 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, environment, 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>) automatically manages processes associated with data sets for: heterogeneous and multisource acquisition (multi-format, multi-protocol, static and real time), enrichment, conversion, integration, equalization, rationalization, increment, integration, etc., via: ETL, Java, Perl, etc., keeping under control the licensing aspects and the dependencies; DIM manages complex processes via the **Smart City Engine: <http://www.disit.org/6515>**

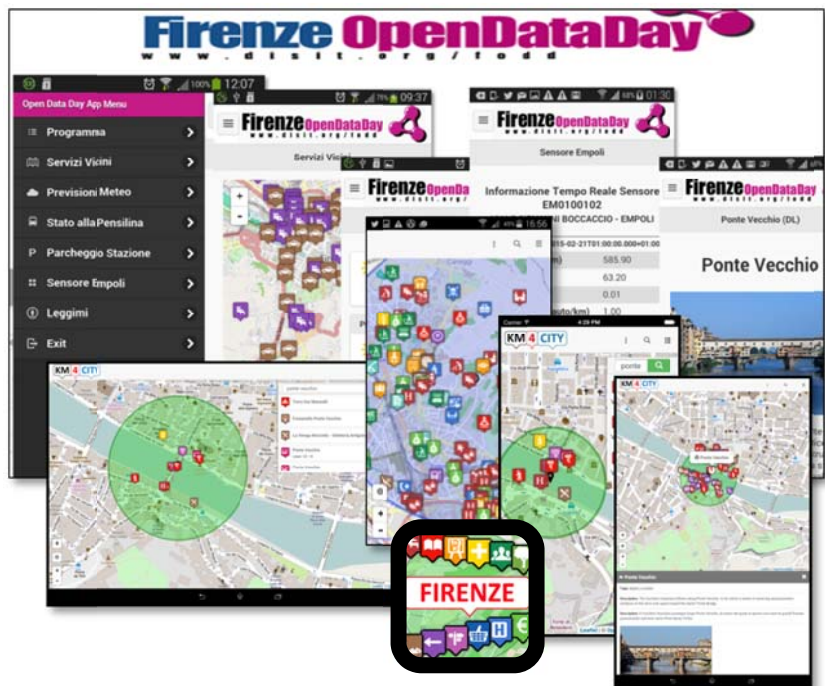
RIM, RDF Index Manager: <http://www.disit.org/6708> manage the versioning of the final RDF store thus reducing the costs and time on new store production and improvement.



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.

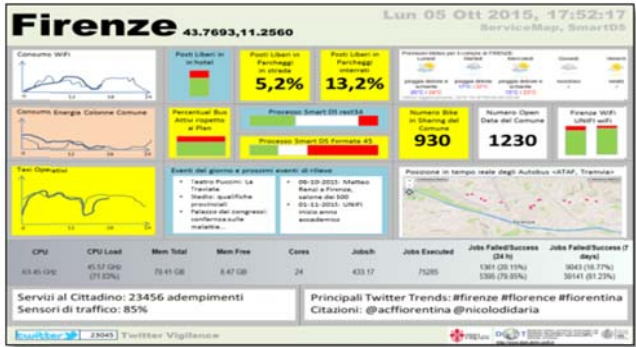
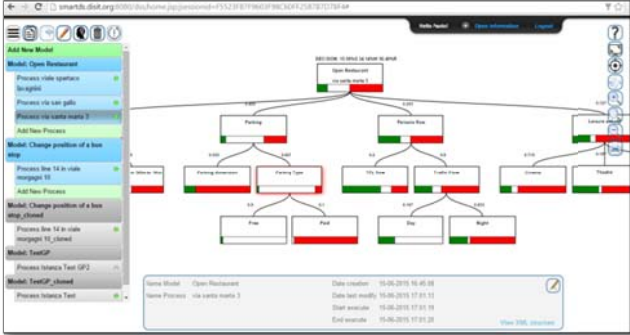
- API accessible as described here: <http://www.disit.org/6597>
- open source app FODD is provided as example, with video tutorial and slides: <http://www.disit.org/6595> for iOS, Android and Windows Phone.
- Firenze where, what... App is accessible on all stores.
- Publication of data via RDF Store and end-point and 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>), and REPLICATE H2020 Smart City project. **Km4City** has been evaluated with a high rank by Ready4SmartCity FP7 (<http://smartcity.linkeddata.es>) and it is considered as one of the most interesting Smart City models (<http://cognitive-science.info/community/weekly-update/>). Km4city has also mobile applications on Google Play, Apple Store and Windows Market.

Tools integrating Km4City solution

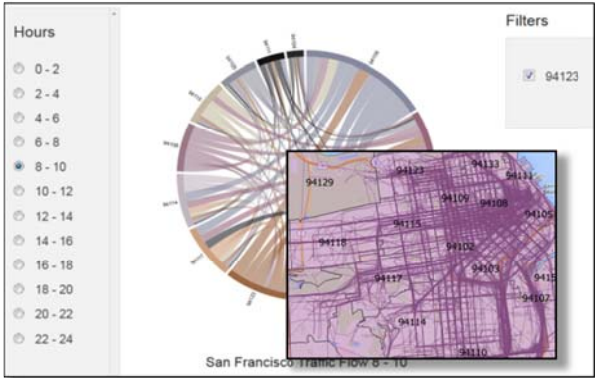
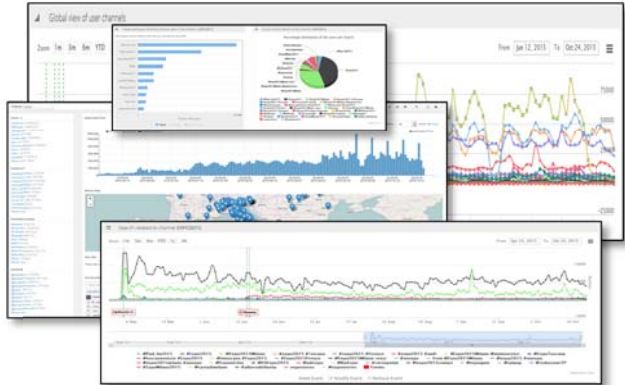
Smart City dashboards for administrators and managers. Data coming from ICT, mobility, environment, energy, etc.



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> 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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