



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DINFO
DIPARTIMENTO DI
INGEGNERIA
DELL'INFORMAZIONE

DISIT
DISTRIBUTED SYSTEMS
AND INTERNET
TECHNOLOGIES LAB



MINISTERO DELL'ISTRUZIONE DELL'UNIVERSITÀ E DELLA RICERCA



Smart City API Scenari e Training

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<http://www.Km4City.org>

<http://www.sii-mobility.org>



Scenari VS

Smart City API





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<http://www.disit.org>



Scenari vs SmartCity API

- Dati e aree tematiche
- Cosa sono i punti di Interesse, POI
- Empowering the city users
- Access to event information
- Supporting City Users in using Public Mobility
- Supporting City Users in using Private Mobility
- New Experience to access at Cultural and Touristic info
- New way to access at health services
- Access at Environmental information
- Profiled Suggestions to City Users
- Personal Assistant

Present data Tuscany Region

Road Graph (Tuscany region)

132,923 Roads
389,711 Road Elements
318,160 Road Nodes
1,508,207 Street Numbers

Services (20 cat, 512 cat.)

16 Pub. Transport Operators
21.280 Bus stops & 1081 bus lines
210 Parking areas
796 Traffic Sensors
Info on: points, paths, areas, etc.

Dynamic/real-time

- bus lines: 144 updates X day X line
- **NEW:** Timeline PT: 1081 lines, 1-2 updates per day
- parking status: 76 updates X day X sensor
- traffic Sensors: 288 updates X day X sensor
- weather: 2 updates X day for 285 areas
- **NEW:** Triage status: 96 updates per day, per hospital
- **NEW:** Fuel stations: 1 update per day, 1600 stations
- **NEW:** environmental data:
- events: about 60 new events X day
- Wi-Fi: > 360.000 measures X day
- mobiles: > 50.000 measures X day
- more than 38.000 distinct users X day
- From 600.000 to 4.5 M Tweets X day
-+ many IOT are coming

DISIT lab, Km4City, January 2017

Servizi Regolari Servizi Trasversali

search text into service

Categorie Servizi

- ☒ De/Select All
- ☒ Accommodation +
- ☒ Advertising +
- ☒ AgricultureAndLivestock +
- ☒ CivilAndEdilEngineering +
- ☒ CulturalActivity +
- ☒ EducationAndResearch +
- ☒ Emergency +
- ☒ Entertainment +
- ☒ Environment +
- ☒ FinancialService +
- ☒ GovernmentOffice +
- ☒ HealthCare +
- ☒ IndustryAndManufacturing +
- ☒ MiningAndQuarrying +
- ☒ ShoppingAndService +
- ☒ TourismService +
- ☒ TransferServiceAndRenting +
- ☒ UtilitiesAndSupply +
- ☒ Wholesale +
- ☒ WineAndFood +

N. risultati: Nessun Limite

Raggio ricerca 100 metri

Risultati della ricerca

più di 4000 risultati, attivato clustering

Services 16858



- Nascondi Menu

Previs

Giovedì Venerdì Sabato

poco nuvoloso 23°C / 27°C

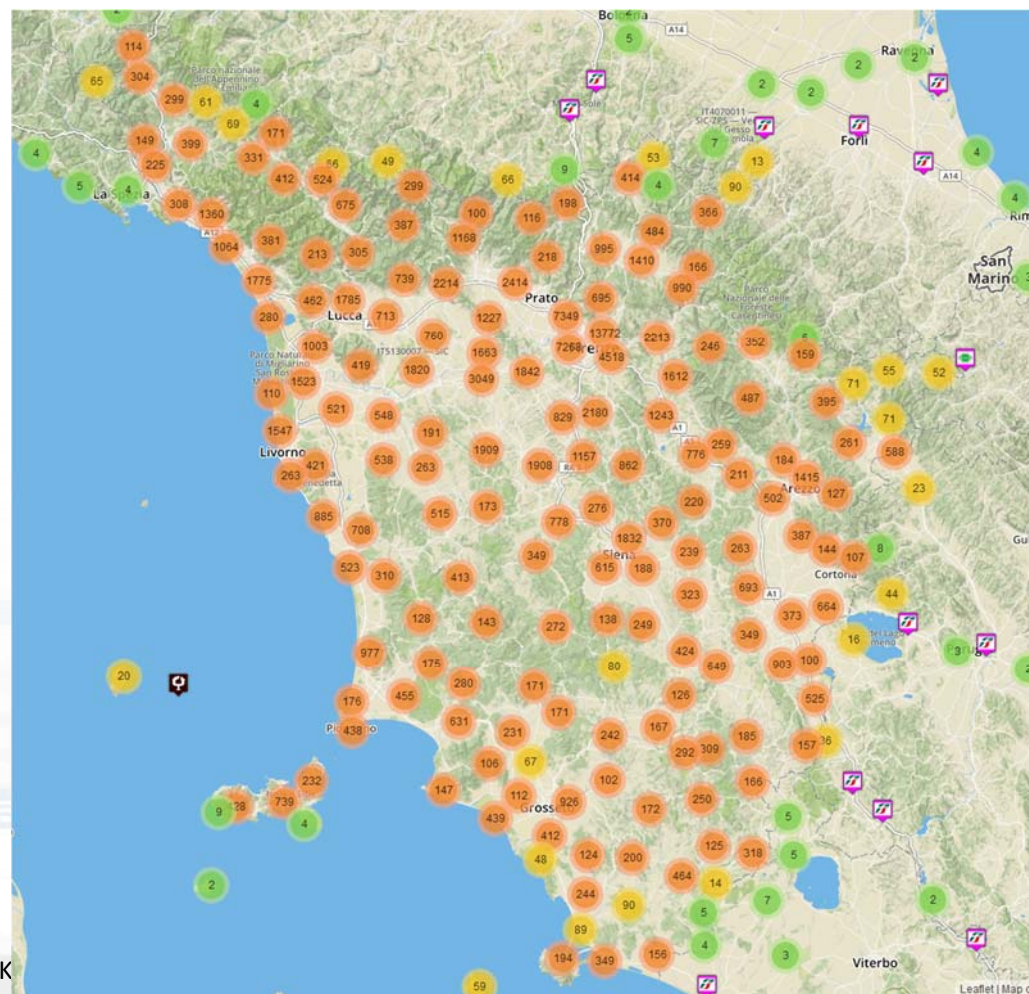
poco nuvoloso 20°C / 33°C

poco nuvoloso

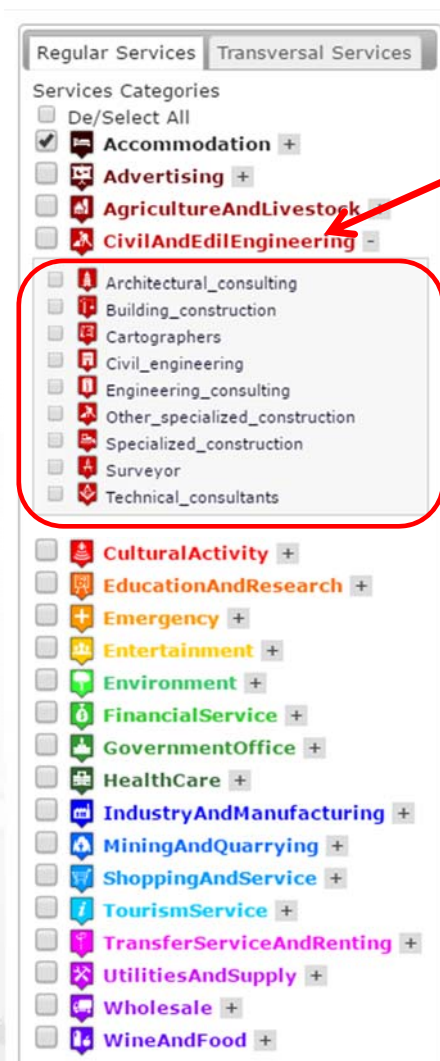
velato

<http://servicemap.km4city.org>

- **Street and geoinformation of the territory and details for routing, navigation, ...**
- **Mobility and Transport:** public and private, public transport, parking status, fuel stations prices, traffic sensors, etc.
- **Culture and Tourism:** POI, churches, museum, schools, university, theatres, events in Florence
- **Environmental:** pollution real time, weather forecast, etc.
- **Social Media:** twitter data
- **Health:** hospital, pharmacies, status of the first aid triage in major hospitals, ...
- **Alarms:** civil protection alerts, hot areas, ...

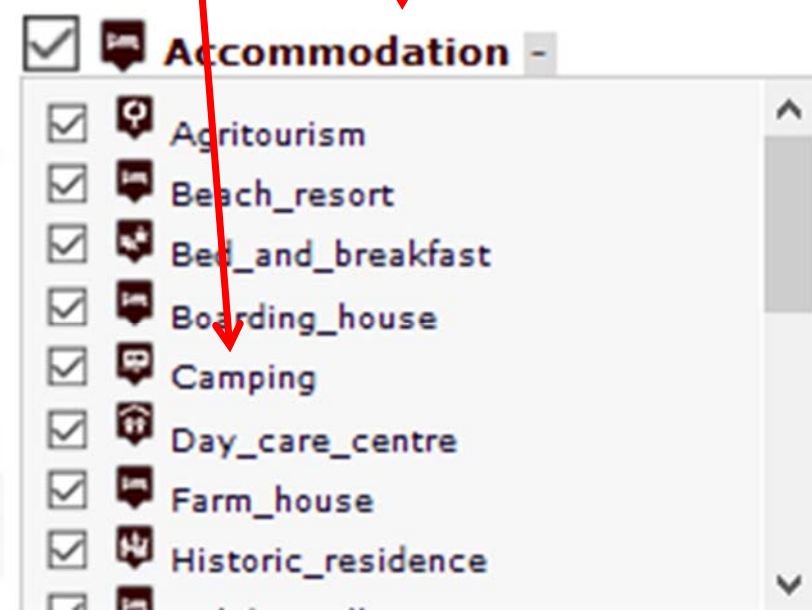


Concepts of Services: Macro and subcategory



20 Service Macro Classi

Service Class



Access to Point of Interest information, POI

- **POI:** point of interest:
- **type:** macro and categoria
- **Position:** GPS, address, telephone, fax, email, URL, ..
- **Description:** textual, multilingua, with images, ...
- **Link** to dbPedia, Linked Open Data
- **Links to other services**
- **Real time data if any:** sensors data, timeline, events, prices, opening time, rules of access, status of services, status of queue, etc..
- *See transversal services on ServiceMap*
 - *Regular and in test platform*



Service Information: different kind of services

AURORA

[LINKED OPEN GRAPH](#)

Tipology: Accommodation - Hotel

Email: info@hotelaurore.info

Website: www.hotelaurore.info

Phone: 055210283

Address: VIA L. ALAMANNI, 5

Cap: 50100

City: FIRENZE

Prov.: FI

TPL STOP : Piazza Stazione (Fr. Cc)

Vaibus

[LINKED OPEN GRAPH](#)

Lines:

No available routes

Display Bus per page

Search:

Time	Line	Direction
08:48:00 2017-03-20	FI-LU	Piazzale Verdi
08:16:00 2017-03-20	FI-LU	Piazzale Verdi
10:09:00 2017-03-20	FI-LU	Piazzale Verdi
2017-03-20	FI-LU	Piazzale Verdi
2017-03-20	FI-LU	Piazzale Verdi
2017-03-20	FI-LU	Piazzale Verdi

Page 1 of 1

Data currently not available

Loggia San Paolo

[LINKED OPEN GRAPH](#)

Tipology: CulturalActivity - Monument_location

[Digital Location](#)

Address: VIA DELLA SCALA, 3

Cap: 50123

City: FIRENZE

Prov.: FI

Photos:

Description: The rounded arches, the stone skeleton and the glazed terracotta medallions recall the model of the Loggiato degli Innocenti. The medallions in glazed terracotta by Andrea della Robbia and his sons Marco and Luca contain seven polychrome figures of Santi Francescani and two works of mercy Cristo conforta un Giovane and Cristo conforta un Anziano. Beneath the portico can be admired the expressive embrace between San Domenico Guzman and San Francesco d Assisi by Andrea della Robbia

Giardino di piazza dell Indipendenza

[LINKED OPEN GRAPH](#)

Tipology: Entertainment - Green_areas

[Digital Location](#)

Address: PIAZZA DELLA INDIPENDENZA, 15

Cap: 50129

City: FIRENZE

Prov.: FI

Note: areeverdi238

[Remove from map](#)

ZCS_1_D

[LINKED OPEN GRAPH](#)

Tipology: TransferServiceAndRenting - Controlled_parking_zone

[Digital Location](#)

Address: VIA GUSCIANA

Cap: 50124

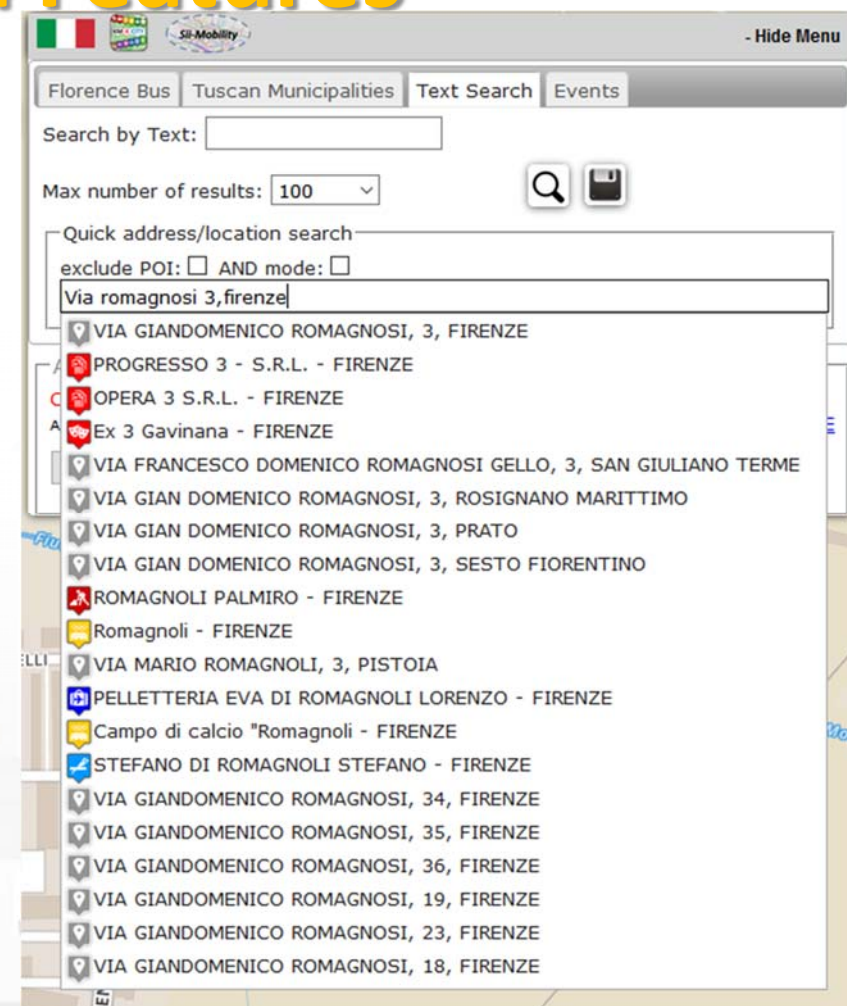
City: FIRENZE

Prov.: FI

[Remove from map](#)

General Text Search Features

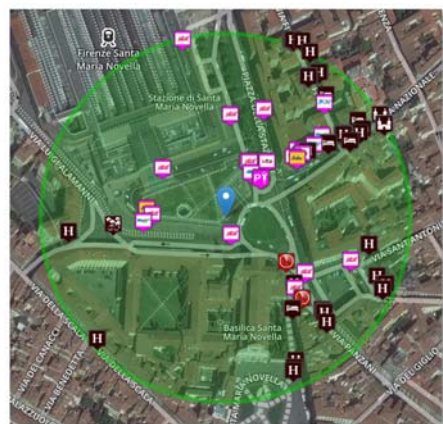
- **Search by text for POIs via**
 - Full text: description, title, macro and category name
 - Filtering by macro and category
 - Filtering on distance and geometric shape
- **Search by text with assisted suggestion to get:**
 - Streets and civic numbers, or POI, locations



Search by Shape and Distance

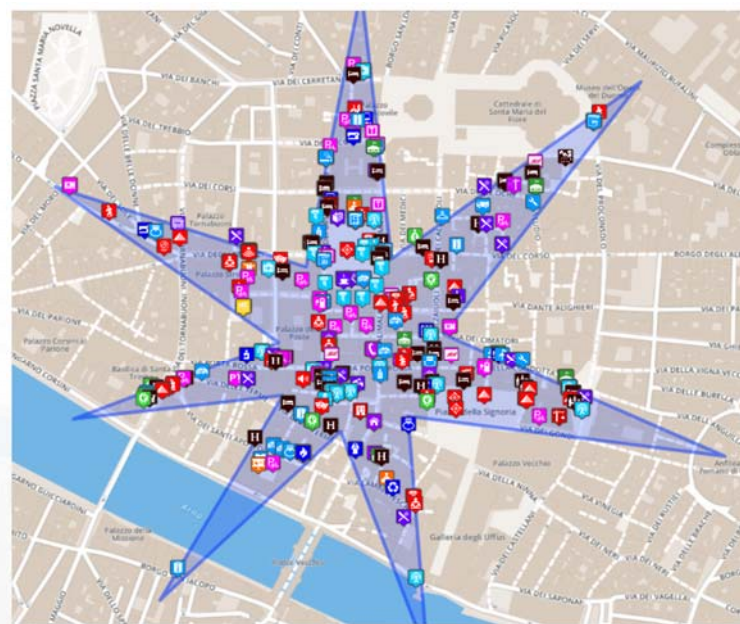


Around a point or POI

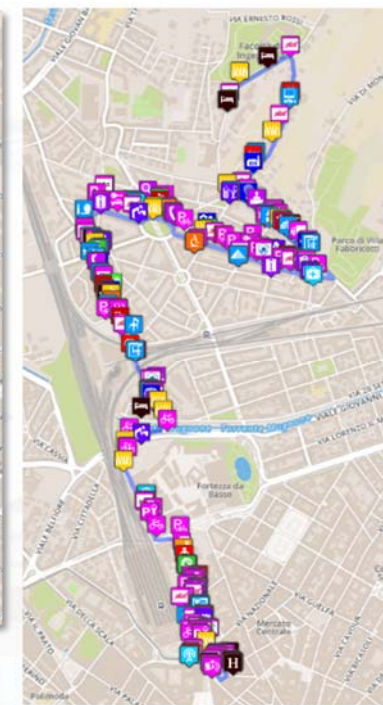


Each request or search in the Km4City model can be referred to a point and a ray, to an area, to a polyline

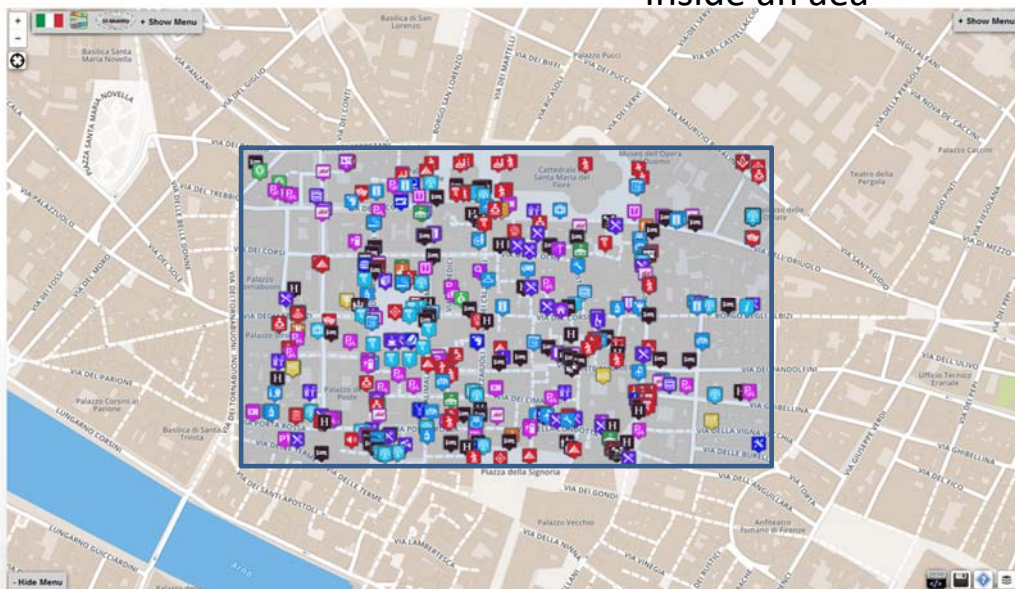
In a polyline



Along a polyline



Inside an area



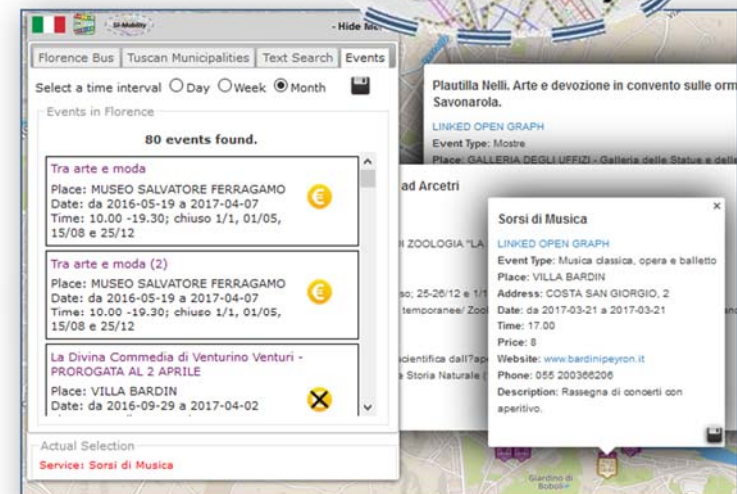
Empowering City Users

- Allow city users to
 - provide comments, images and scores associated with a certain Service (or place, via GPS)
 - Get list of last contributions of the same kind provided by other users
- They can be:
 - used as feedbacks
 - moderated by a back office personnel
 - ..
- In the future (→) connection with a more powerful server based on 311 standard would be possible



Access to Event information

- Getting Events in the city
 - Theater, museum, show, sport, etc.
- Getting Event details
 - Event kind, and thus ordering
 - in the day, week, and month
 - Location, and thus ordering, or selecting events per area, per residence
 - General information
 - Opening and cost (if any)
 - Etc.

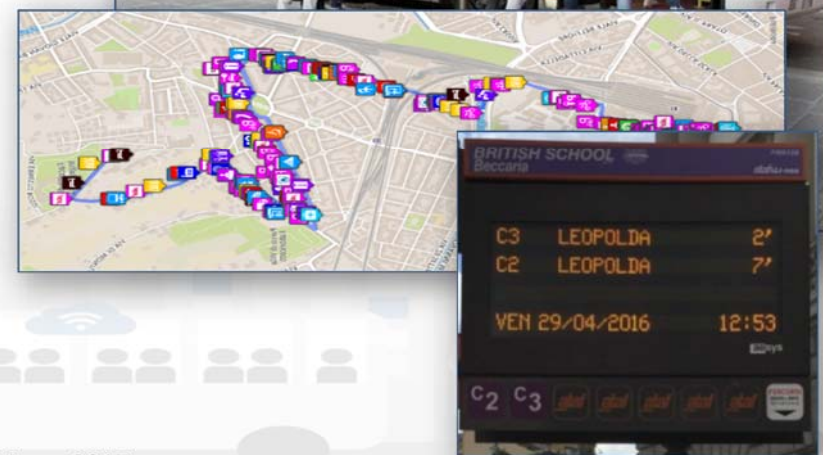


DISIT lab, Sii-Mobility, Km4City, 4 Marzo 2017

Supporting City Users in using Public Mobility

- **Public Transport, PT**

- Getting tickets
- Getting bus stops, lines, and timelines for bus, train and tramline
- Searching Services along a PT line or closer to a stop
- Searching the closest bus stops
- → searching for BUS stops via name
- → multimodal routing for Pub. Transport
- → real time delays of busses



Supporting City Users in using Private Mobility

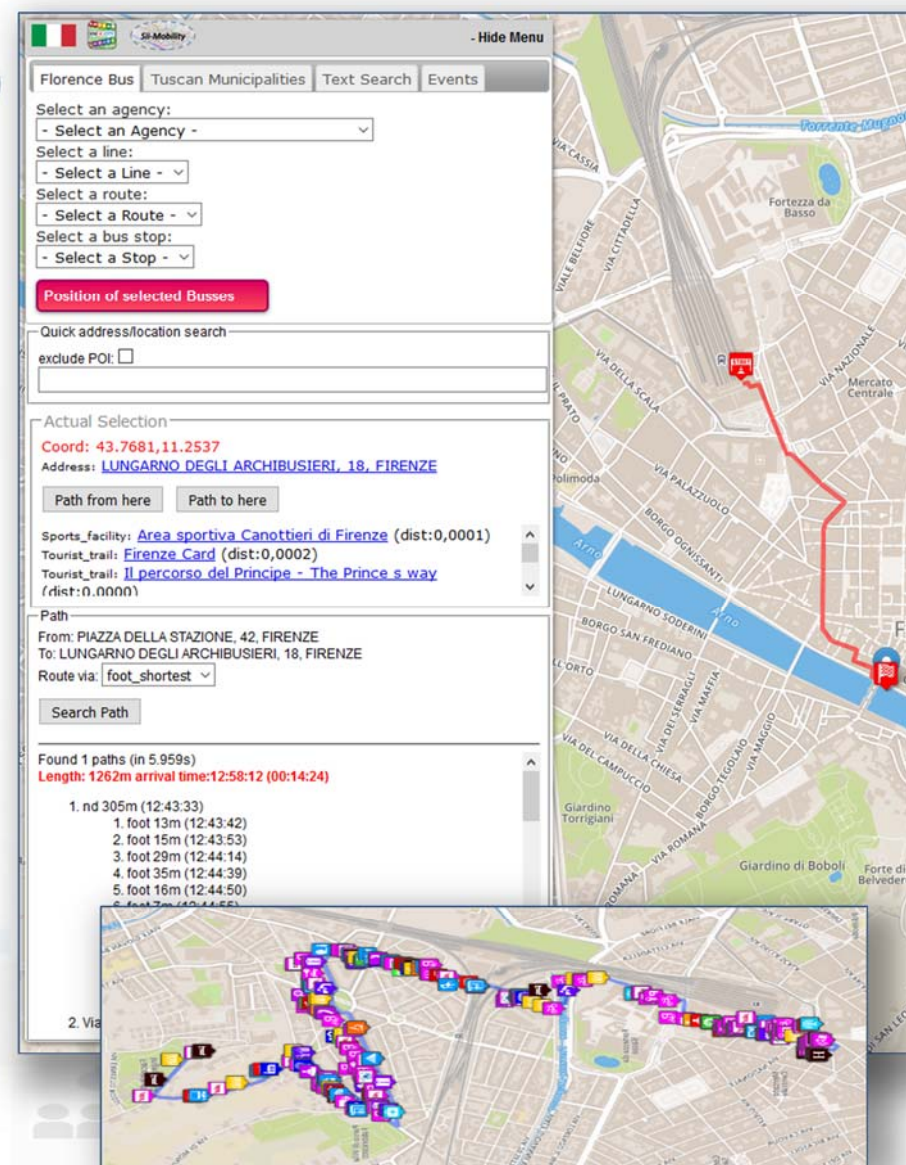
• Private Transport

- Getting closer parking
- Getting closer free space on parking
- Getting fuel stations location and prices
- Searching Services along a path or closer to a point or Service as Hotel, Restaurants, square, etc.
- Getting closer cycling paths
- → Recharging stations: location and status
- → Getting traffic information



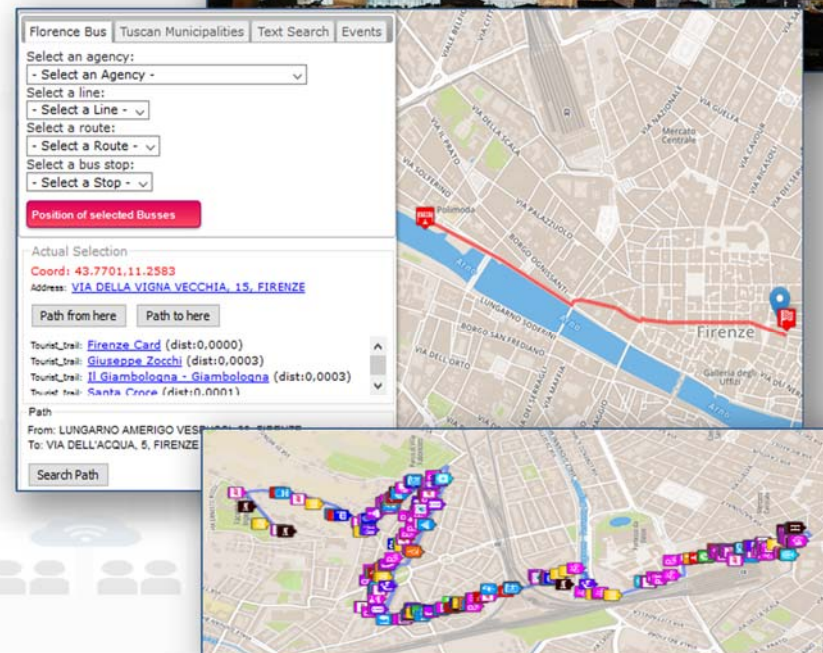
Private Mobility: routing and navigation paths

- To get the path from two points/POIs:
 - Shortest for pedestrian
 - Quietest for pedestrian
 - Shortest for private vehicles
- Search for POIs along the identified Path!
- <http://www.disit.org/ServiceMap>



New Experience to access at Cultural and Touristic info

- Getting location and description of Point of Interests, POIs: culture and tourism first
 - Location, images, phone, URL, etc.
- Search for POIs in areas and closer
- Get routing to reach location or POI by walking downtown
 - searching Services along the path
- Search for location, full text assisted



New way to access at health services

- Searching for pharmacies and hospitals
- Getting the closest hospital first aid locations and status
- Getting real time updated information about the first aid status of major hospitals (triage)



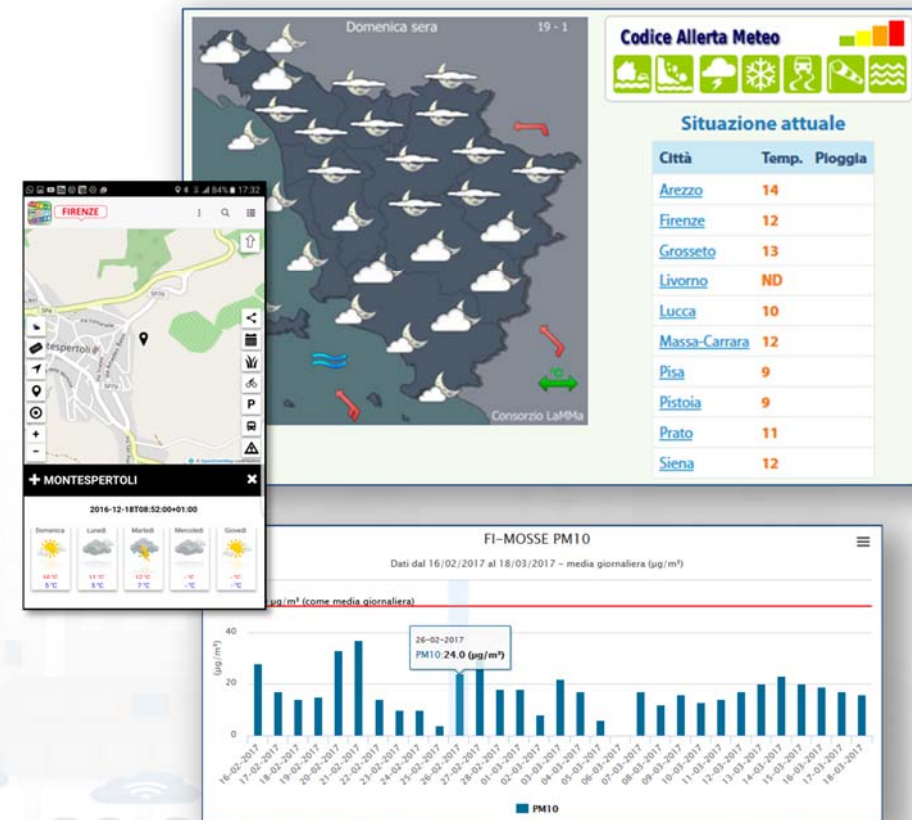
I CODICI DEL PRONTO SOCCORSO	
CODICE ROSSO EMERGENZA accesso immediato	Casi con pericolo di vita Il trattamento di questi pazienti avviene immediatamente in via prioritaria
CODICE GIALLO URGENZA accesso rapido	Casi con lesioni gravi ed eventuale alterazione di una o più funzioni vitali L'assistenza viene assicurata nel minor tempo possibile
CODICE VERDE URGENZA differibile	Casi in condizioni critiche, ma non in pericolo di vita L'assistenza viene assicurata dopo i casi più urgenti
CODICE AZZURRO NON URGENZA	Casi in condizioni non gravi La prestazione sanitaria è differibile
CODICE BIANCO	Casi con problematiche risolubili dal medico curante, dalla guardia medica o da ambulatori specialistici Tempi di attesa molto lunghi

Stato Priorità	1*	2*	3*	4*	5*
Con Destinazione	0	1	0	0	0
In Attesa	0	1	1	0	0
In Visita	3	10	11	2	0
Oss. Temporanea	2	11	10	1	0
Totali	5	23	22	3	0

20-03-2017 00:37

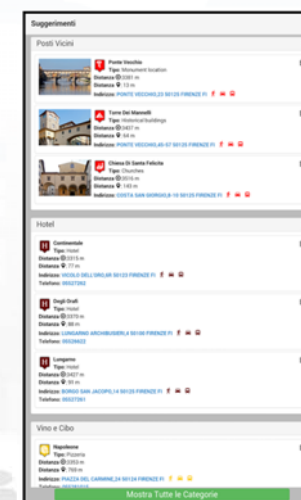
Access at Environmental information

- Getting weather forecast for the next days
- Getting alert information from Civil protection
- Getting air quality status
- → getting actual weather status: temperature, humidity, pressure, rain level, etc.



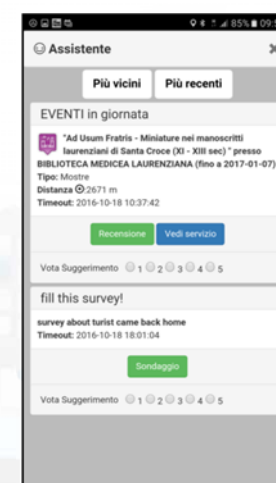
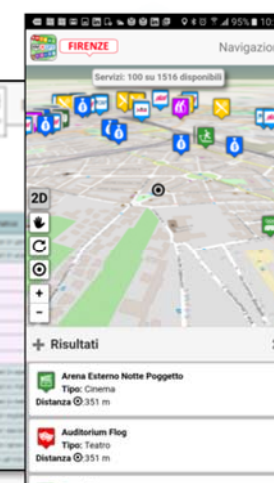
Profiled Suggestions to City Users

- Personalized suggestions
 - The server provide suggestions in the user context (location and time) arranged in a number of categories
 - Culture, mobility, food and drink, etc.
 - Alerts: civil protection, city council, twitter data, etc.
 - The city user may reject some of them, thus the suggestion engine learns about preferred topics and category



Profiled Engagements to City Users

- The user are profiled to learn habits:
 - Personal POI and paths
 - Mobility habits
- Information and engagements sent to the city users are programmed according to the user evolution to:
 - Stimulate virtuous habits
 - More sustainable habits
 - More healthy habits, etc.
 - Get feedbacks
 - Provide bonus and prices,
 - Send alerts,



Smart City API



SmartCity API

- **API di ricerca servizi ed eventi**
- **API ricerca indirizzo e geometrie**
- **API trasporto pubblico**
- **API feedback**
- **API ricerca percorsi**
- **API tecniche**
- **Accesso LinkedData & SPARQL**

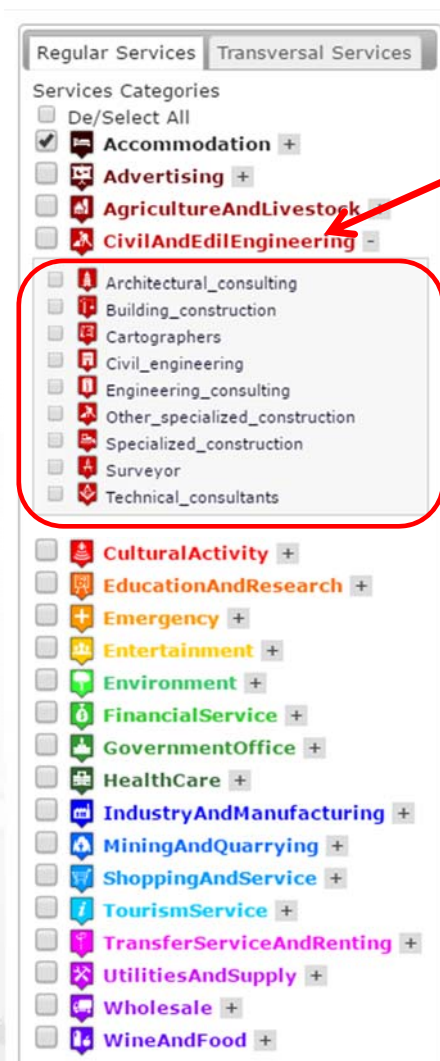
API ricerca servizi ed eventi

- Esempi
 - Ricerca un ristorante vicino a me
 - Quali eventi ci sono oggi qua vicino?
 - Sulla strada per andare ad arezzo quale benzinaio è più conveniente?
 - Sono in una zona a sosta limitata?
 - Sono su una pista ciclabile?
 - Sono su una linea di trasporto pubblico?
 - Ci sono parcheggi liberi sul percorso per la mia destinazione?
 - Come è il traffico sul percorso che devo fare?
 - Oggi come è la qualità dell'aria? Che temperatura è prevista? Pioverà?

API ricerca servizi ed eventi

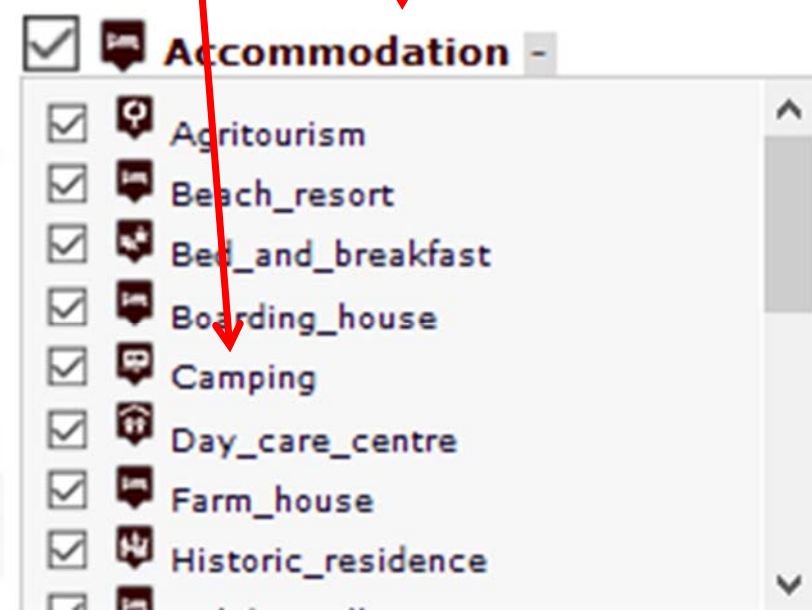
- **Ricerca servizi in una area geografica**
 - **area geografica (si veda esempio precedente):**
 - posizione GPS o identificatore servizio e distanza massima,
 - area rettangolare,
 - poligono o linea descritti con formato standard WKT
 - **categorie dei servizi da ricercare** (20 macro classi e 537 classi)
 - **filtro sulle parole** che devono essere contenute nei dati associati al servizio
- restituisce **GeoJSON** o **HTML** per embed in siti web

Concepts of Services: Macro and subcategory



20 Service Macro Classi

Service Class





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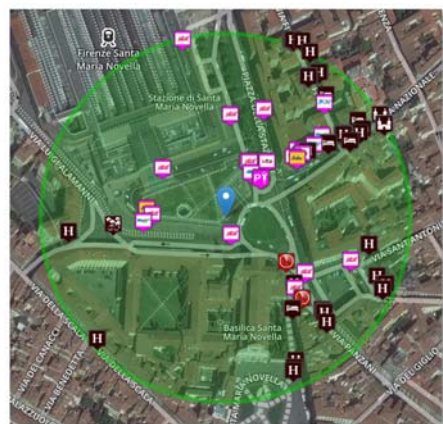
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<http://www.disit.org>

Search by Shape and Distance

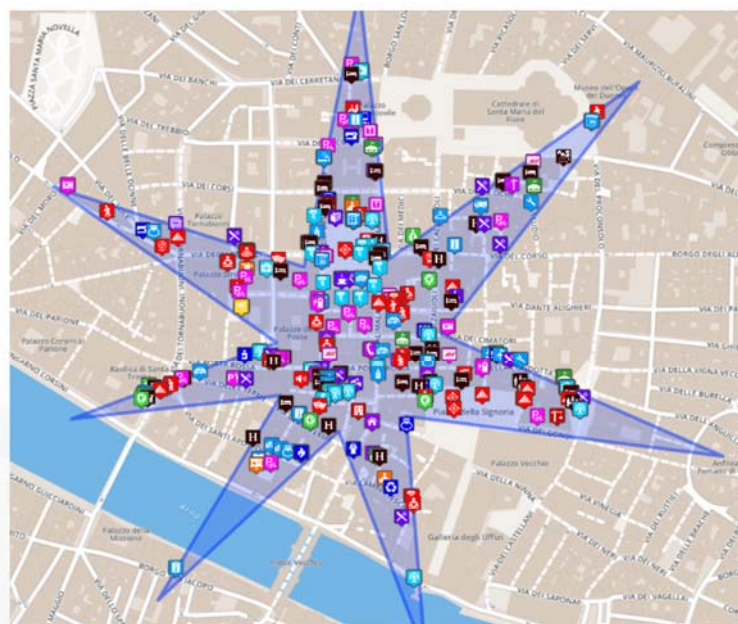


Around a point or POI

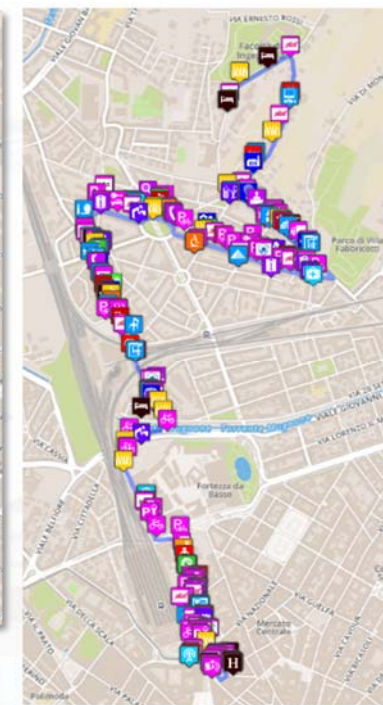


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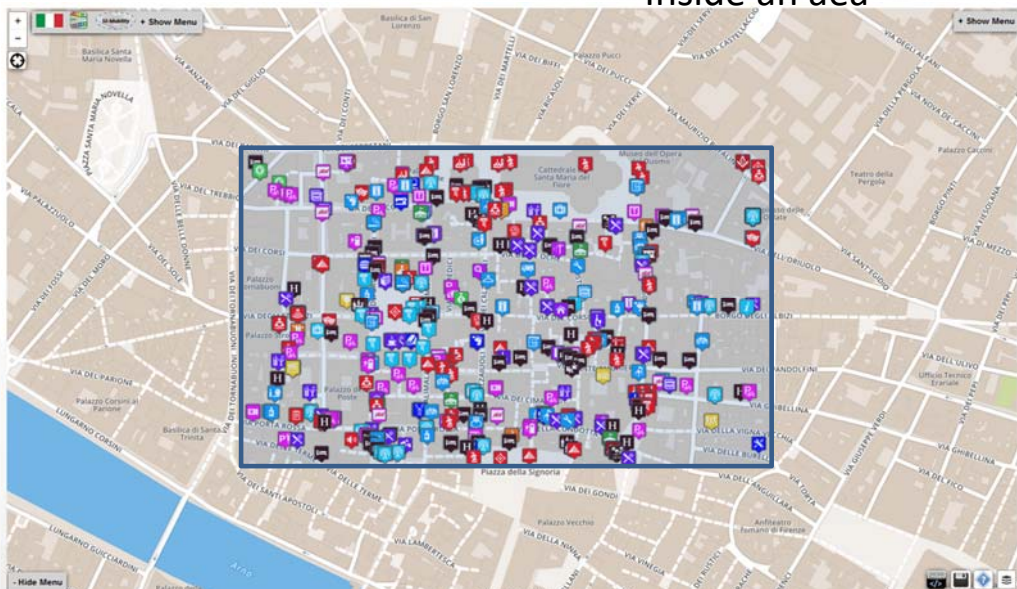
In a polyline



Along a polyline



Inside an area



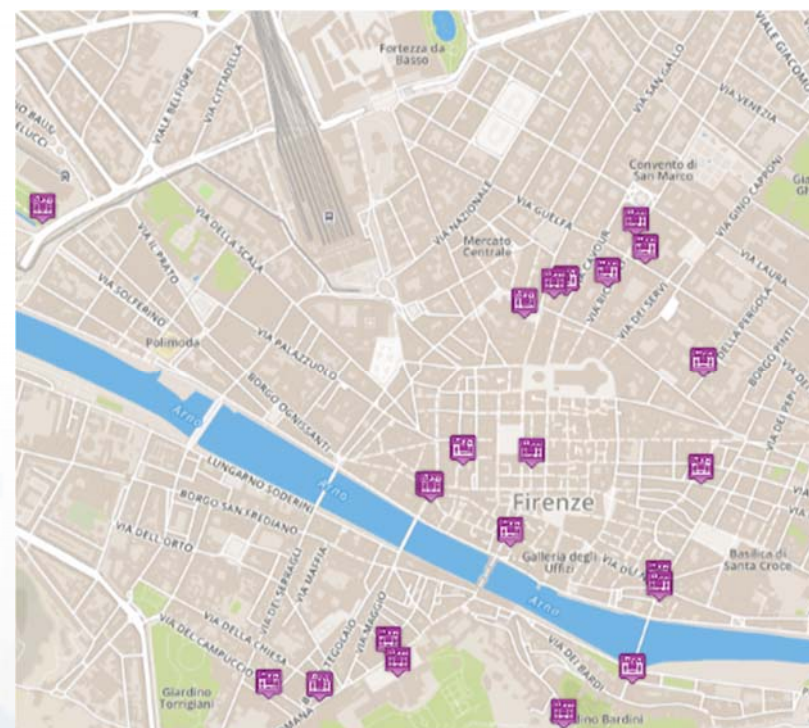
lab, Sii-Mobility, Km4City, 17Marzo 2017

Ricerca servizi

- **Ricerca servizi per comune**
indicando le categorie dei servizi da ricercare ed un eventuale filtro sulle parole da ricercare
- **Ricerca full text**
ricerca full text sui servizi ma anche su toponimi o altre entità georeferenziate
- **Ricerca servizi per queryID**
permette di eseguire una query precedentemente salvata tramite ServiceMap

Ricerca eventi

- **Ricerca di eventi**
 - attivi il giorno, i prossimi 7 giorni o prossimi 30 giorni,
 - in una certa area geografica espressa con posizione GPS e distanza, area rettangolare, poligono o linea WKT.



Informazioni su un servizio

AURORA

[LINKED OPEN GRAPH](#)

Tipology: Accommodation - Hotel

Email: info@hotelauroa.info

Website: www.hotelauroa.info

Phone: 055210283

Address: VIA L. ALAMANNI, 5

Cap: 50100

City: FIRENZE

Prov.: FI

TPL STOP : Piazza Stazione (Fr. Cc)

Vaibus

[LINKED OPEN GRAPH](#)

Lines:

FI-LU **FI-VG**

No available routes

Display **50** Bus per page

Search:

Time	Line	Direction
08:48:00 2017-03-20	FI-LU	Piazzale Verdi
08:16:00 2017-03-20	FI-LU	Piazzale Verdi
10:09:00 2017-03-20	FI-LU	Piazzale Verdi
017-03-20	FI-LU	Piazzale Verdi
017-03-20	FI-LU	Piazzale Verdi
017-03-20	FI-LU	Piazzale Verdi

Page 1 of 1

Data currently not available

Loggia San Paolo

[LINKED OPEN GRAPH](#)

Tipology: CulturalActivity - Monument_location

Digital Location

Address: VIA DELLA SCALA, 3

Cap: 50123

City: FIRENZE

Prov.: FI

Photos:

Description: The rounded arches, the stone skeleton and the glazed terracotta medallions recall the model of the Loggiato degli Innocenti. The medallions in glazed terracotta by Andrea della Robbia and his sons Marco and Luca contain seven polychrome figures of Santi Francescani and two works of mercy Cristo conforta un Giovane and Cristo conforta un Anziano. Beneath the portico can be admired the expressive embrace between San Domenico Guzman and San Francesco d Assisi by Andrea della Robbia

Giardino di piazza dell'Indipendenza

[LINKED OPEN GRAPH](#)

Tipology: Entertainment - Green_areas

Digital Location

Address: PIAZZA DELLA INDIPENDENZA, 15

Cap: 50129

City: FIRENZE

Prov.: FI

Note: areeverdi238

[Remove from map](#)

ZCS_1_D

[LINKED OPEN GRAPH](#)

Tipology: TransferServiceAndRenting - Controlled_parking_zone

Digital Location

Address: VIA GUSCIANA

Cap: 50124

City: FIRENZE

Prov.: FI

[Remove from map](#)

Informazioni su un servizio

- **Accesso ad informazioni su un servizio**

tramite identificatore del servizio, restituisce dati diversi a seconda del tipo di servizio in particolare dati “realtime” per:

- parcheggi (posti disponibili),
- sensori traffico (flussi veicolari),
- previsioni meteo,
- fermate bus (orario e prossimi transiti),
- pompe benzina (prezzi dei prodotti della benzina),
- pronto soccorso (stato triage, pronto soccorso),
- stazioni qualità dell'aria (concentrazione inquinanti),
- In futuro ma non ora:
 - contatori energia (meter), colonnine di ricarica, panchine, irrigatori, lampioni, etc

Raccomandazioni

- **Raccomandazione di servizi ed eventi**

sulla base della

- posizione dell'utente;
- delle visualizzazioni di servizi fatte da un utente;
- delle ricerche fatte in passato

raccomanda i servizi che potrebbero essere di interesse per l'utente
raggruppati per categorie (fornisce anche tweet della protezione civile)

API ricerca indirizzi e geometrie

- **Ricerca indirizzo o geometrie tramite posizione GPS**
trova numero civico, strada e il comune data una posizione GPS
inoltre può determinare se la posizione indicata è dentro un'area o vicino ad un percorso associato ad un qualche servizio come ZCS, parchi, linee dei trasporti pubblici etc.
- **Ricerca posizione GPS tramite indirizzo/POI (under development)**
permette di trovare una posizione GPS associata al nome di una strada, comune e numero civico o nome di punto di interesse

API per trasporto pubblico

- **Lista delle agenzie**
elenco delle agenzie di trasporto pubblico disponibili (Bus, Tram, Treni, Traghetto)
- **Lista delle linee di una agenzia**
restituisce l'elenco delle linee gestite da una agenzia di trasporto pubblico
- **Lista dei percorsi di una linea**
restituisce l'elenco dei percorsi di una linea, anche con la descrizione geografica WKT del percorso
- **Lista delle fermate di un percorso**
restituisce l'elenco delle fermate di un percorso
- **Ricerca dei percorsi che passano in una area geografica**
restituisce i percorsi che hanno almeno una fermata in una certa area geografica indicata tramite posizione GPS e distanza massima, area rettangolare, poligono o linea WKT
- **Posizione stimata dei bus**
restituisce la posizione stimata dei bus sulla base dell'orario o tramite informazioni provenienti dal sistema di monitoraggio dei mezzi.

API di feedback

- **Aggiungere commenti e/o stelle ad un servizio**
permette di aggiungere commenti o stelle ad un servizio o evento, i commenti sono validati prima di essere associati al servizio
- **Aggiungere foto ad un servizio**
permette di aggiungere una foto ad un servizio o evento, le foto sono validate prima di essere associate al servizio.
- **Ottenere la lista degli ultimi contributi degli utenti**
restituisce l'elenco degli ultime foto inviate dagli utenti, gli ultimi commenti fatti e le ultime valutazioni ricevute.

API per ricerca di percorsi

- **Ricerca percorso tra due posizioni GPS o servizi**
si può indicare se il percorso deve essere fatto a piedi, con trasporto pubblico, in bici o in macchina.



API annotazioni geografiche

- Permetteranno di:
 - Associare un qualsiasi oggetto JSON ad un punto geografico, e potrà essere pubblico o privato ed appartenente ad una classe definita dall'applicazione (es. km4c.servizi.sensori).
 - Recuperare le annotazioni in un'area rettangolare o entro distanza da un punto e appartenente ad una classe o ad una sua derivata
 - Aggiornare e cancellare l'annotazione
- **Non ancora disponibili**

API info utente

- Permetteranno dato un *uid* di:
 - Avere informazioni sull'utente come:
 - Profilo (cittadino, turista, studente, ...), posizione casa/lavoro, commenti inseriti, stelle messe ai servizi, foto inviate
 - Avere informazioni sulla mobilità dell'utente:
 - In un intervallo di date:
 - Quanti km in macchina/piedi/bus
 - Valutazione sullo stile di guida urbano ed extra urbano
- **Non ancora disponibili**

Informazioni tecniche di base

- Documentazione completa accessibile da <http://www.disit.org/6991>
- API REST
 - Disponibili principalmente via HTTP GET
 - Parametri forniti nella query string della URL
 - Produzione & Test
 - Esempio produzione:
 - <http://servicemap.disit.org/WebAppGrafo/api/v1?selection=...&format=...>
 - Esempio test:
 - <http://www.disit.org/ServiceMap/api/v1?selection=...&format=...>
 - Il parametro **format** può essere **json** o **html** (default *json*)
 - json → machine readable, CORS enabled
 - html → human readable, embeddable in iframes (generated by ServiceMap UI)
 - Attualmente no API key o autenticazione necessaria.

accesso Linked Data & SPARQL

- Dati accessibili tramite protocollo W3C Linked Data
 - usare "Accept: application/rdf+xml" nell'header HTTP per ottenere una rappresentazione RDF/XML della risorsa
- Dati accessibili via SPARQL endpoint (virtuoso 7.2)
 - <http://servicemap.disit.org/WebAppGrafo/sparql>
 - <http://log.disit.org> per navigare il Knowledge Graph
 - http://log.disit.org/sparql_query_frontend/ per fare query SPARQL

API attualmente disponibili (1/3)

Description	API	Save on ServiceMap	Embed	Where?
Service search near GPS position	Y	Y	Y	Prod & Test
Service search within a GPS area	Y	Y	Y	Prod & Test
Service search within a WKT described area	Y	N	Y	Prod & Test
Service search within a stored WKT described area	Y	Y	Y	Prod & Test
Service search by municipality	Y	Y	Y	Prod & Test
Service search by query id	Y		Y	Prod & Test
Full text search	Y	Y	Y	Prod & Test
Event search	Y	Not yet	Not yet	Prod & Test
Address and geometry search by GPS	Y	Not yet	Not yet	Prod & Test
GPS search by text address/POI name	Y	Not yet	Not yet	Test

API attualmente disponibili (2/3)

Service info	API	Save on ServiceMap	Embed	Where?
Generic Service	Y	Y	Y	Prod & Test
Event	Y	Y	Y	Prod & Test
Parking service	Y	Y	Y	Prod & Test
Traffic sensor	Y	Y	Y	Prod & Test
Weather Forecast	Y	Y	N	Prod & Test
Bus station	Y	Y	Y	Prod & Test
Fuel Station	Y	Y	Y	Prod & Test
First aid	Y	Y	Y	Prod & Test
Air quality monitoring station	Y	Y	Y	Prod & Test
Smart waste container	Y	Y	Y	Test
Smart bench	Y	Y	Y	Test
Smart irrigator	Y	Y	Y	Test
Energy meter	Not yet	Not yet	Not yet	-
Recharge station	Not yet	Not yet	Not yet	-
Smart street light	Not yet	Not yet	Not yet	-

API attualmente disponibili (3/3)

Description	API	Save on ServiceMap	Embed	Where
(Bus) Agency list	Y	N	N	Prod & Test
(Bus) Lines list	Y	N	N	Prod & Test
(Bus) Routes list	Y	Not yet	Not yet	Prod & Test
(Bus) Stop list	Y	Not yet	Not yet	Prod & Test
Search (Bus) Routes in a geographic area	Y	Not yet	Not yet	Prod & Test
Estimated Bus position	Y	Not yet	Y	Prod & Test
Rating and comment API	Y	N	N	Prod & Test
Service Photo API	Y	N	N	Prod & Test
Last contributions API	Y	N	N	Prod & Test
Recommender API	Y	N	N	Prod & Test
Shortest path finder API	Y	Not yet	Not yet	Prod & Test
Image caching API	Y	N	Y	Prod & Test

Smart City API

technical



Accessing data vs API Kind

- REST Call (call smart city API to search for services with all details)
 - http://servicemap.disit.org/WebAppGrafo/api/v1/?selection=43.7756;11.2490&categories=Accommodation;BusStop;SensorSite;Car_park&maxResults=0&maxDists=0.2&lang=it&format=json
- Query ID (call a query saved into our ServiceMap facility)
 - <http://servicemap.disit.org/WebAppGrafo/api/v1/?queryId=e02db54355fea40808300473c3537ff&format=json&lang=it>
- SPARQL (semantic queries on RDF stores)
 - SELECT ?subject ?property ?object
WHERE{{
<<http://www.disit.org/km4city/resource/45c57ebc4c52871f2ec23e06a7dba377>>
?property ?object } UNION { ?subject ?property
<<http://www.disit.org/km4city/resource/45c57ebc4c52871f2ec23e06a7dba377>> } }
- Linked Data (direct access to elements)
 - <http://www.disit.org/km4city/resource/45c57ebc4c52871f2ec23e06a7dba377>

Service search near GPS position



URL	http://servicemap.disit.org/WebAppGrafo/api/v1/
it allows to retrieve the set of services that are near a given GPS position. The services can be filtered as belonging to specific categories (e.g. Accomodation, Hotel, Restaurant etc), or having specific words in any textual field. It can also be used to find services that have a WKT spatial description that contains a specific GPS position.	
Parameters:	
selection	"<latitude>;<longitude>" of the GPS position
categories	the list of categories of the services to be retrieved, if omitted all kinds of services are returned. It can contain macro categories or categories, if a macro category is specified all categories in the macro category are used. The complete list of categories and macro categories can be retrieved on servicemap.disit.org .
text	words in this parameter are used to retrieve services that contain all these words in any textual description associated with the service.
maxDists	maximum distance from the GPS position of the services to be retrieved, expressed in Km (0.1 is used if parameter is missing) if it is equal to "inside" it searches for services with a WKT geometry that contains the specified GPS position (e.g a park)
maxResults	maximum number of results to be returned (if parameter is missing 100 is assumed), if it is 0 all results are returned.
lang	ISO 2 chars language code (e.g. "it", "en", "fr", "de") to be used for returned descriptions if available in multiple languages. Currently for languages other than "it" and "en" it returns "en" descriptions. (if parameter is missing "en" is assumed)
geometry	true/false, if true it returns a "hasGeometry" property for each service stating if the service has a complex WKT geometries (linestring, polygon) associated with it (if parameter is missing "false" is assumed)
uid	optional user identifier (see later)
format	html or json

HTML Example

- Search for all Accommodations, bus stops, sensor sites or car parks within 200m from 43.7756;11.2490

<http://servicemap.disit.org/WebAppGrafo/api/v1/?>

[selection=43.7756;11.2490&](#)

[categories=Accommodation;BusStop;SensorSite;Car_park&](#)

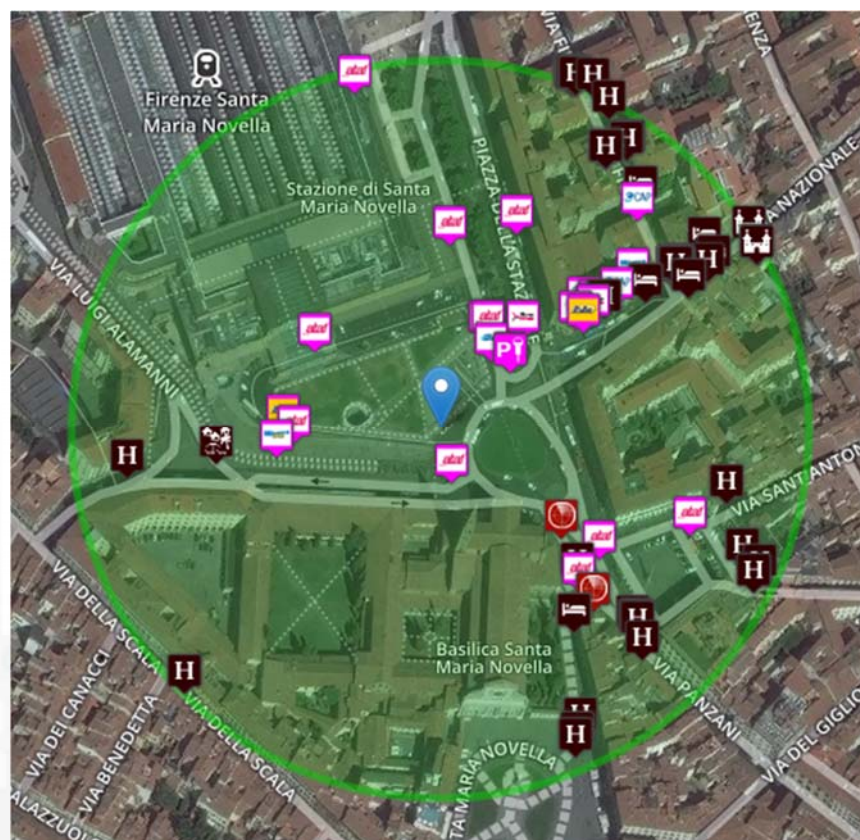
[maxResults=0&](#)

[maxDists=0.2&](#)

[lang=it&](#)

[format=html](#)

Result



JSON Example

- Search for all Accommodations, bus stops, sensor sites or car parks within 200m from 43.7756;11.2490

<http://servicemap.disit.org/WebAppGrafo/api/v1/?>

[selection=43.7756;11.2490&](#)

[categories=Accommodation;BusStop;SensorSite;Car_park&](#)

[maxResults=0&](#)

[maxDists=0.2&](#)

[lang=it&](#)

[format=json](#)



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Result



```
{
  "BusStops": {
    "fullCount": 26,
    "type": "FeatureCollection",
    "features": [{
      "geometry": {
        "type": "Point",
        "coordinates": [11.249078, 43.775326]
      },
      "type": "Feature",
      "properties": {
        "name": "Stazione Abside S.M.N.",
        "typeLabel": "Fermata",
        "tipo": "fermata",
        "serviceType": "TransferServiceAndRenting_BusStop",
        "busLines": "13 - 36 - 37",
        "serviceUri":
"http://www.disit.org/km4city/resource/Bus_ataflinea_Stop_FM0328_5",
        "agency": "Ataf&Linea",
        "agencyUri":
"http://www.disit.org/km4city/resource/Bus_ataflinea_Agency_172",
        "photoThumbs": []
      },
      "id": 1
    }, ... ]
  },

  "SensorSites": {
    "fullCount": 3,
    "type": "FeatureCollection",
    "features": [{
      "geometry": {
        "type": "Point",
        "coordinates": [11.24982, 43.77505]
      },
      "type": "Feature",
      "properties": {
        "name": "FI055ZTL00101",
        "tipo": "sensore",
        "typeLabel": "Sensore",
        "serviceType": "TransferServiceAndRenting_SensorSite",
        "serviceUri":
"http://www.disit.org/km4city/resource/FI055ZTL00101",
        "photoThumbs": []
      },
      "id": 1
    }, ... ]
  },

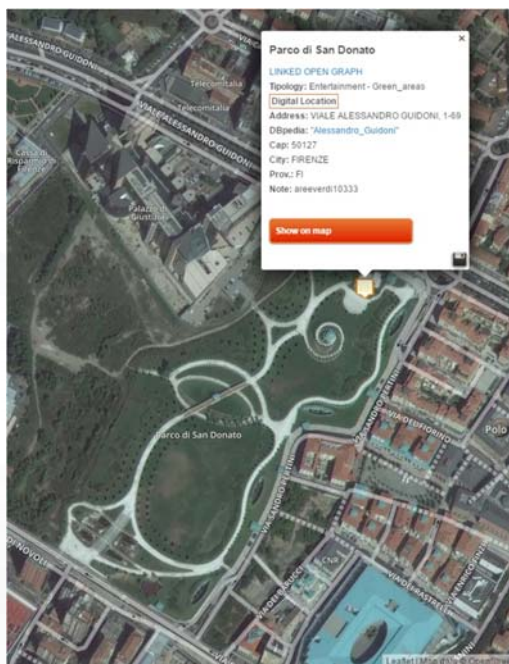
  "Services": {
    "fullCount": 84,
    "type": "FeatureCollection",
    "features": [{
      "geometry": {
        "type": "Point",
        "coordinates": [11.249473, 43.775867]
      },
      "type": "Feature",
      "properties": {
        "name": "Parcheggio Stazione Firenze S.M.N.",
        "tipo": "Parcheggio_auto",
        "typeLabel": "Parcheggio auto",
        "serviceType": "TransferServiceAndRenting_Car_park",
        "serviceUri":
"http://www.disit.org/km4city/resource/CarParkStazioneFirenzeS.M.N.",
        "multimedia": ""
      },
      "id": 1
    }, ... ]
  }
}
```

Example

- Any Entertainment service whose geometry contains a GPS position

<http://servicemap.disit.org/WebAppGrafo/api/v1/?selection=43.7754;11.2494&categories=Entertainment&maxDists=inside&geometry=true&format=html>

format=html



format=json

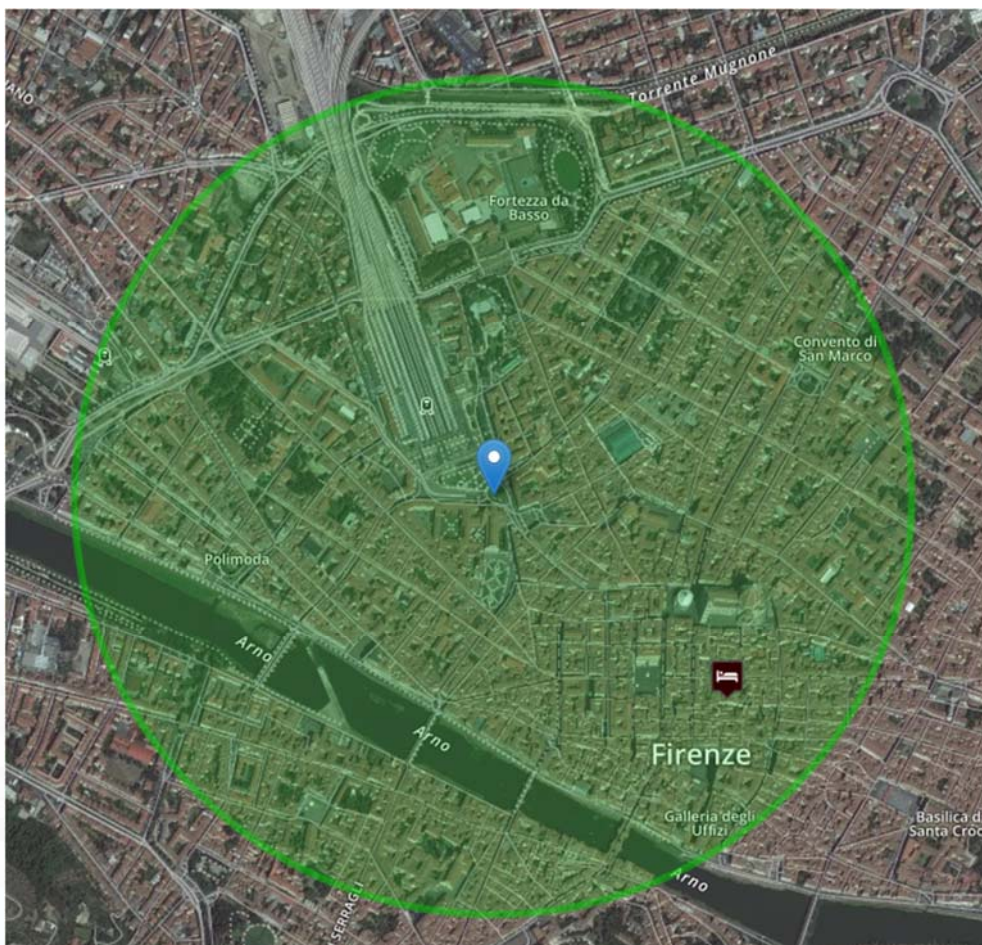
```
{
  "Services": {
    "fullCount": 3,
    "type": "FeatureCollection",
    "features": [
      {
        "geometry": {
          "type": "Point",
          "coordinates": [11.228672, 43.79453]
        },
        "type": "Feature",
        "properties": {
          "name": "Parco di San Donato",
          "tipo": "Green_areas",
          "typeLabel": "Green areas",
          "serviceType": "Entertainment_Green_areas",
          "hasGeometry": true,
          "serviceUri": "http://www.disit.org/km4city/resource/b92d4592bfb340d4ca7ea881b3334f61",
          "multimedia": ""
        }
      },
      {
        "id": 1
      }
    ]
  }
}
```

Example

- **Accommodation within 1Km with “casa di dante” in a textual description**

[http://servicemap.disit.org/WebAppGrafo/api/v1/?
selection=43.7754;11.2494&
maxDists=1&
categories=Accommodation&
text=casa%20di%20dante&
lang=it&
format=json](http://servicemap.disit.org/WebAppGrafo/api/v1/?selection=43.7754;11.2494&maxDists=1&categories=Accommodation&text=casa%20di%20dante&lang=it&format=json)

format=html



format=json

```
{
  "Services": {
    "fullCount": 2,
    "type": "FeatureCollection",
    "features": [{
      "geometry": {
        "type": "Point",
        "coordinates": [11.256365, 43.771023]
      },
      "type": "Feature",
      "properties": {
        "name": "CASA_DI_DANTE",
        "tipo": "Affittacamere",
        "typeLabel": "Affittacamere",
        "serviceType": "Accommodation_Boarding_house",
        "serviceUri":
"http://www.disit.org/km4city/resource/c1cd4b12fabce2d9b3a1527fd5a7be79",
        "multimedia": ""
      },
      "id": 1
    }, ...]
  }
}
```


Note on format=html

- The following additional parameters are available:
 - map* : type of map to be used can be *satellite* (default), *streets*, *grayscale*.
 - controls* : apperance of control panels can be *hidden* or *false*, *collapsed*
 - info*: apperance of info panel can be *hidden* or *false*, *collapsed*



Note on uid parameter

- All requests can have an optional unique user identifier that is used by the recommender API to see which requests were made by the user in the past.
- Currently the *uid* is generated as a SHA256 hash of the device uuid generated by cordova device plugin
(see <https://cordova.apache.org/docs/en/latest/reference/cordova-plugin-device/>)

Service search within a GPS area

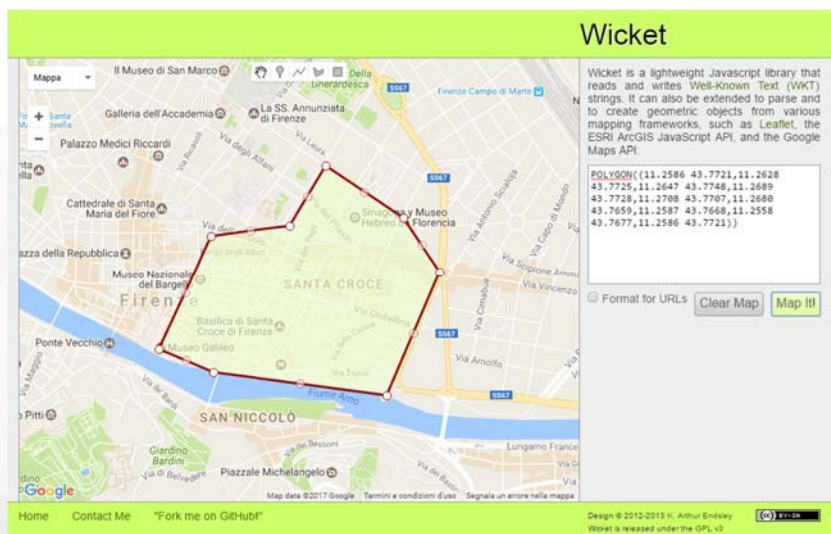
- Search within a rectangular area
- The same as the previous API but *selection* parameter is like:
 - "<lat1>;<long1>;<lat2>;<long2>"



- http://servicemap.disit.org/WebAppGrafo/api/v1/?selection=43.7741;11.2453;43.7768;11.2515&categories=Accommodation;BusStop;SensorSite;Car_park&maxResults=10&lang=it&format=json

Service search within a WKT described area

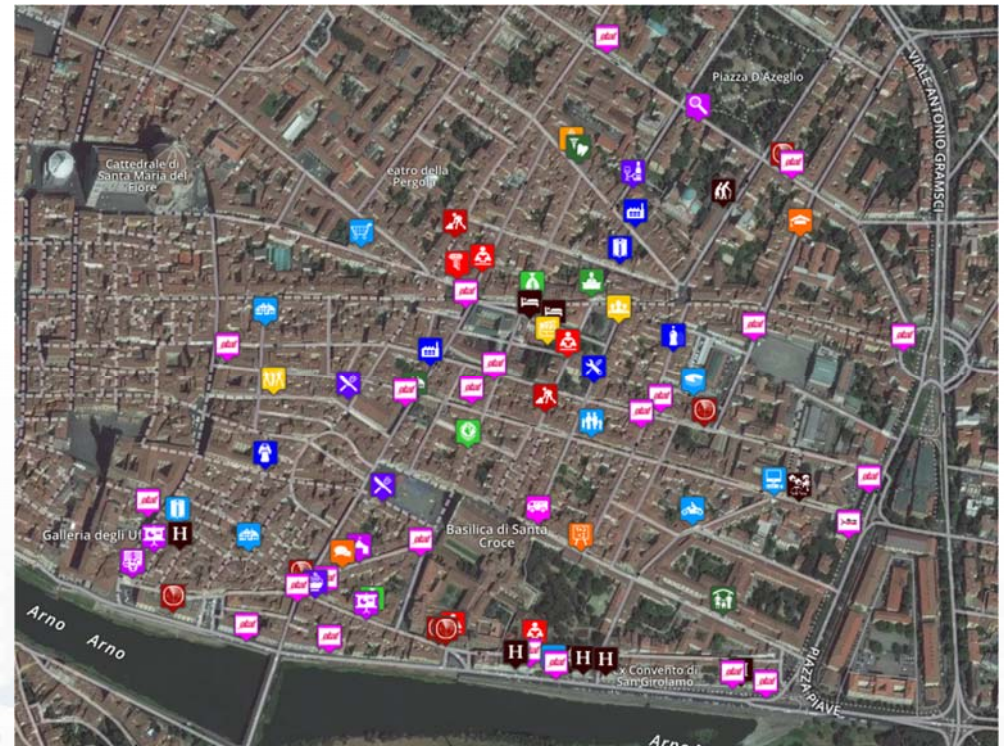
- Search within a geographic area described using **Well-Known Text (WKT)** format (https://en.wikipedia.org/wiki/Well-known_text) with WGS84 coordinate system.
- to write a WKT string <https://arthur-e.github.io/Wicket/sandbox-gmaps3.html> can be used



```
POLYGON((11.2586
43.7721,11.2628 43.7725,11.2647
43.7748,11.2689 43.7728,11.2708
43.7707,11.2680 43.7659,11.2587
43.7668,11.2558 43.7677,11.2586
43.7721))
```

Service search within a WKT described area

- The same as the previous APIs but *selection* parameter is like:
 - "wkt:<WKT string>"
- Example:
 - [http://servicemap.disit.org/WebAppGrafo/api/v1/?selection=wkt:POLYGON\(\(11.2586%2043.7721,11.2628%2043.7725,11.2647%2043.7748,11.2689%2043.7728,11.2708%2043.7707,11.2680%2043.7659,11.2587%2043.7668,11.2558%2043.7677,11.2586%2043.7721\)\)&format=html](http://servicemap.disit.org/WebAppGrafo/api/v1/?selection=wkt:POLYGON((11.2586%2043.7721,11.2628%2043.7725,11.2647%2043.7748,11.2689%2043.7728,11.2708%2043.7707,11.2680%2043.7659,11.2587%2043.7668,11.2558%2043.7677,11.2586%2043.7721))&format=html)

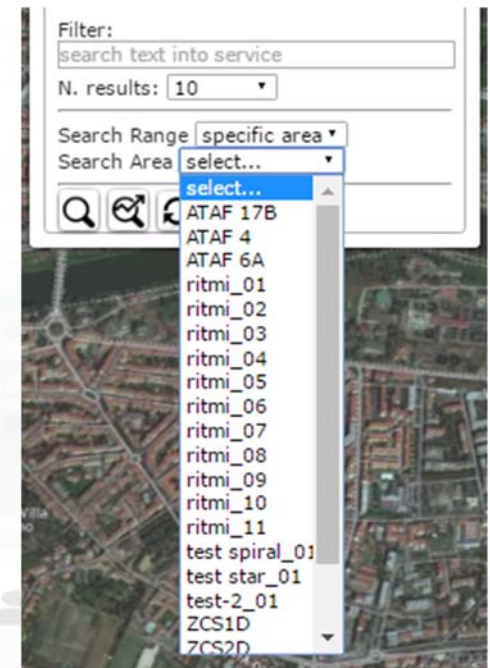


Service search within a stored WKT described area

- The same as previous API but the WKT geometry was uploaded using <http://www.km4city.org/wkt>
- The geometry can be used using its «label» in `selection=geo:<geometry label>`
- The labels available can be found on servicemap
- Example:

<http://servicemap.disit.org/WebAppGrafo/api/v1/?>

`selection=geo:test%20star_01&maxResults=0&format=html`





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Service search by municipality

- Search for services of a specific municipality
- Similar to previous API but selection is the name of the municipality like FIRENZE, EMPOLI, PISA possibly with prefix "COMUNE di ".

- Example

<http://servicemap.disit.org/WebAppGrafo/api/v1/?selection=COMUNE%20di%20FIRENZE&categories=Entertainment&maxResults=100&lang=it&format=html>

Service search by query id

- it allows to retrieve the set of services associated with a query stored using the servicemap user interface and received by email.
- Parameters:
 - *queryId*: identifier of the query stored on servicemap
 - *lang*: language code (e.g. “it”, “en”, “fr”, “de”)
 - *geometry*: true/false, if true it returns a “hasGeometry” property for each service stating if the service has a complex WKT geometries (linestring, polygon) associated with it (if parameter is missing “false” is assumed)
 - *uid*: optional user identifier
 - *format*: json or html
- Example:
 - <http://servicemap.disit.org/WebAppGrafo/api/v1/?queryId=e02db54355fea40808300473c3537ff&format=json&lang=it>

Full text search

- it allows to retrieve the geolocated entities (not only services) that match with a list of keywords. The results can be possibly filtered to be within a specified distance from a GPS position, or within a rectangular area or inside a WKT geolocated area.
- Parameters:
 - *search*: the keywords separated with spaces that have to match with any textual description associated with an entity.
 - *selection*: optional the geographic area where to search (GPS point, GPS rectangle, WKT)
 - *maxDists*: optional maximum distance (used when selection is a GPS point)
 - *and maxResults, geometry, uid, format*

Example



<http://servicemap.disit.org/WebAppGrafo/api/v1/?search=via%20nave&maxResults=10&lang=en&format=json>

```
{
  "fullCount": 558,
  "type": "FeatureCollection",
  "features": [{
    "geometry": {
      "type": "Point",
      "coordinates": [11.315443, 43.756367]
    },
    "type": "Feature",
    "properties": {
      "serviceUri":
"http://www.disit.org/km4city/resource/e96076db6e4e2b8b43fb660579eb4de8",
      "name": "PICCIOLI DANIELE",
      "tipo": "servizio",
      "photoThumbs": [],
      "multimedia": "",
      "civic": "",
      "serviceType": "CulturalActivity_Theatre",
      "typeLabel": "Theatre"
    },
    "id": 1
  }, ... {
    "geometry": {
      "type": "Point",
      "coordinates": [10.898357, 43.729973]
    },
    "type": "Feature",
    "properties": {
      "serviceUri": "http://www.disit.org/km4city/resource/RT04801406596TO",
      "name": "VIA NAVE DI VITIANA",
      "tipo": "servizio",
      "photoThumbs": [],
      "multimedia": "",
      "civic": "1",
      "serviceType": "",
      "typeLabel": "Road"
    },
    "id": 8
  }, ... ]
}
```

Event search

- it allows to retrieve the geolocated events in a given temporal range (day, week or month). The results can be possibly filtered to be within a specified distance from a GPS position, or within a rectangular area or inside a WKT described geographic area.
- Parameters:
 - *range*: time range for the events to be retrieved, it can be 'day' for the events of the day of the request, 'week' for the events in the next 7 days or 'month' for the events in the next 30 days (if omitted 'day' is assumed).
 - *selection*: optional the geographic area where to search (GPS point, GPS rectangle, WKT)
 - *maxDists*: optional maximum distance (used when selection is a GPS point)
 - *and maxResults, uid, format (only json by now)*

Example



<http://servicemap.disit.org/WebAppGrafo/api/v1/events/?range=day&format=json>

```
{
  "Event": {
    "type": "FeatureCollection",
    "features": [{
      "geometry": { "type": "Point", "coordinates": [11.251058,
43.769848]},
      "type": "Feature",
      "properties": {
        "serviceUri":
"http://www.disit.org/km4city/resource/Event_18794_973b96efaf3f99f1b70
af19cda4e3bf4",
        "name": "Tra arte e moda",
        "tipo": "event",
        "place": "MUSEO SALVATORE FERRAGAMO ",
        "startDate": "2016-05-19",
        "startTime": "10.00 -19.30; chiuso 1/1, 01/05, 15/08 e 25/12",
        "endDate": "2017-04-07",
        "freeEvent": "NO",
        "address": "PIAZZA DI SANTA TRINITA",
        "civic": "2",
        "categoryIT": "Mostre",
        "price": "6 (incluso museo/including museum)",
        "phone": "055 3562466",
        "descriptionIT": "La mostra riflette il complesso rapporto fra arte e
moda prendendo spunto dalla storia di Salvatore Ferragamo che si ispirò
alle avanguardie artistiche del '900 per realizzare le sue creazioni. ",
        "website": "www.ferragamomuseo.com/museo",
        "serviceType": "Event"
      }
    },
    {
      "id": 1
    },
    ...
  ]
}
```


Address and geometry search by GPS

- it allows to retrieve the complete address (municipality, street and civic number) given the GPS position. It may also provide a list of services or public transport lines intersecting with the provided GPS position.
- Parameters:
 - *position*: “<lat>;<long>” with GPS position
 - *intersectGeom*: true or false (assumed false if missing), if true it reports all the services and public transportation lines that have a geometry intersecting with the provided GPS position.
 - *uid*: optional user identifier
 - *format*: only json

Without geometry intersection

<http://servicemap.disit.org/WebAppGrafo/api/v1/location/?position=43.7741;11.2505&format=json>

```
{
  "address": "VIA PANZANI",
  "municipality": "FIRENZE",
  "number": "17\A",
  "addressUri":
    "http://www.disit.org/km4city/resource/RT048017023351CV",
  "municipalityUri":
    "http://www.disit.org/km4city/resource/048017"
}
```

With geometry intersection

<http://servicemap.disit.org/WebAppGrafo/api/v1/location/?position=43.7741;11.2505&intersectGeom=true&format=json>

```
{
  ... Same as the other plus ...,
  "intersect": [{
    "distance": 1.2392468323025842E-4,
    "name": "Firenze Card",
    "class": "http://www.disit.org/km4city/schema#Tourist_trail",
    "type": "LineString",
    "uri":
      "http://www.disit.org/km4city/resource/2a93692aa1eb7d680d9b4e0da668b408"
  }, {
    "distance": 3.1448272583131523E-4,
    "routeType": "Bus",
    "direction": "Salviatino",
    "name": "11",
    "agency": "Ataf&Linea",
    "class": "http://vocab.gtfs.org/terms#Route",
    "type": "LineString",
    "uri": "http://www.disit.org/km4city/resource/Bus_ataflinea_Trip_1923_3337883"
  }, ... ]
}
```

GPS search by street name or POI name

- It allows to find a GPS position by street name or POI name or TPL stops (next version)
- Parameters:
 - *search*: the words to be searched (using fuzzy match)
 - *searchMode*: can be AND or ANDOR (default ANDOR)
 - *position*: optional "<lat>;<lng>"
 - *maxDists*: optional maximum distance (default 5km)
 - *excludePOI*: true/false (default false) to exclude searching in POI names
 - *maxResults*: maximum number of results (default 10)
 - *uid*: optional user identifier performing the query
 - *format*: only json
- Provides a GeoJSON FeatureCollection object with the results

GPS search by street name

<http://servicemap.disit.org/WebAppGrafo/api/v1/location/?search=via%20calzaioli&format=json>

```
{
  "type": "FeatureCollection",
  "count": 1263003,
  "features": [{
    "geometry": {
      "type": "Point",
      "coordinates": [11.255358, 43.77244]
    },
    "type": "Feature",
    "properties": {
      "serviceUri":
"http://www.disit.org/km4city/resource/817ccce02f5aa0ef8c34744c4c25bcc6",
      "serviceType": "CulturalActivity Monument_location",
      "name": "Via dei Calzaiuoli",
      "city": "FIRENZE",
      "id": 1
    }
  }, {
    "geometry": {
      "type": "Point",
      "coordinates": [11.309124, 43.835896]
    },
    "type": "Feature",
    "properties": {
      "serviceUri":
"http://www.disit.org/km4city/resource/f9fbe7453f63d3063cd4e33c43c1f5eb",
      "serviceType": "CulturalActivity Printing_and_services",
      "name": "FUTURE GRAPHIC DI CAMAIOLI GIUSTI VERONICA",
      "city": "FIESOLE - CALDINE",
      "id": 2
    }
  }, ... {
    "geometry": {
      "type": "Point",
      "coordinates": [11.255217, 43.77035]
    },
    "type": "Feature",
    "properties": {
      "serviceUri": "http://www.disit.org/km4city/resource/RT048017002601CV",
      "serviceType": "StreetNumber",
      "address": "VIA DEI CALZAIOLI",
      "civic": "15 R",
      "city": "FIRENZE",
      "id": 5
    }
  }, ...]
}
```



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<http://www.disit.org>

GPS search by street name

<http://servicemap.disit.org/WebAppGrafo/api/v1/location/?search=via%20calzaoli&excludePOI=true&format=json>

```
{
  "type": "FeatureCollection",
  "count": 1261873,
  "features": [{
    "geometry": {
      "type": "Point",
      "coordinates": [11.255217, 43.77035]
    },
    "type": "Feature",
    "properties": {
      "serviceUri": "http://www.disit.org/km4city/resource/RT048017002601CV",
      "serviceType": "StreetNumber",
      "address": "VIA DEI CALZAIOLI",
      "civic": "15 R",
      "city": "FIRENZE",
      "id": 1
    }
  }, ...]
}
```

Service info

- it allows to retrieve information about a service using its serviceUri. It can return an html representation (format="html") or a machine readable representation (format="json")
- Paramters:
 - *serviceUri*: the serviceUri of the service
 - *lang*: language code (e.g. "it", "en", "fr", "de")
 - *realtime*: true or false (if omitted true is implied) indicates if the last value of the time varying properties should be provided in the result or not.
 - *uid*: optional user identifier
 - *format*: html or json
- The properties returned depend on the type of service



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Example General Service

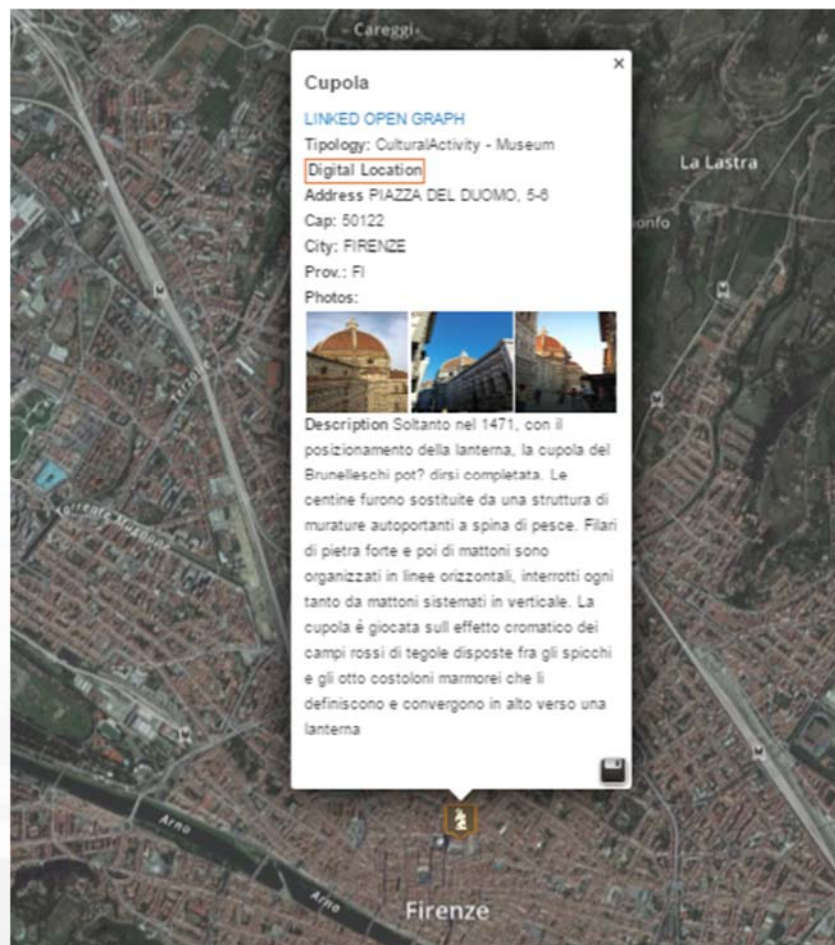
<http://servicemap.disit.org/WebAppGrafo/api/v1/?serviceUri=http://www.disit.org/km4city/resource/45e458d0c9e5bf53e34e7e2fed73a6b4>

```
{
  "Service": {
    "type": "FeatureCollection",
    "features": [
      {
        "geometry": {"type": "Point", "coordinates": [11.256423, 43.773254]},
        "type": "Feature",
        "properties": {
          "name": "Cupola",
          "typeLabel": "Museum",
          "serviceType": "CulturalActivity_Museum",
          "phone": "",
          "fax": "",
          "website": "",
          "province": "FI",
          "city": "FIRENZE",
          "cap": "50122",
          "email": "",
          "linkDBpedia": [],
          "note": "",
          "description": "Soltanto nel 1471, ...",
          "description2": "The Brunelleschi s Cupola ...",
          "multimedia":
            "http://www.florenceheritage.it/mobileApp/immagini/aebTornabuoni/35.jpg",
```

```
          "serviceUri":
            "http://www.disit.org/km4city/resource/45e458d0c9e5bf53e34e7e2fed73a6b4",
          "address": "PIAZZA DEL DUOMO",
          "civic": "5-6",
          "wktGeometry": "POINT (11.256423 43.773254)",
          "photos": ["http://servicemap.disit.org/WebAppGrafo/api/v1/photo/file-
            1558826286406815456.jpg", "http://servicemap.disit.org/WebAppGrafo/api/v1/photo/file-
            538829262336420198.jpg"],
          "photoThumbs":
            ["http://servicemap.disit.org/WebAppGrafo/api/v1/photo/thumbs/file-
            1558826286406815456.jpg",
            "http://servicemap.disit.org/WebAppGrafo/api/v1/photo/thumbs/file-
            538829262336420198.jpg"],
          "photoOrigins":
            ["http://servicemap.disit.org/WebAppGrafo/api/v1/photo/originals/file-
            1558826286406815456.jpg",
            "http://servicemap.disit.org/WebAppGrafo/api/v1/photo/originals/file-
            538829262336420198.jpg"],
          "avgStars": 5.0,
          "starsCount": 2,
          "comments": []
        },
        "id": 1
      }
    ]
  }
}
```



Example General Service Html



Example Parking



```
{
  "Service": {
    "type": "FeatureCollection",
    "features": [
      {
        "geometry": {
          "type": "Point",
          "coordinates": [11.24947, 43.77587]
        },
        "type": "Feature",
        "properties": {
          "name": "Garage La Stazione Spa",
          "typeLabel": "Car park",
          "serviceType": "TransferServiceAndRenting_Car_park",
          "phone": "055284784",
          "fax": "", "website": "",
          "province": "FI",
          "city": "FIRENZE",
          "cap": "50123",
          "email": "",
          "linkDBpedia": [],
          "note": "", "description": "", "description2": "",
          "multimedia": "",
          "serviceUri": "http://www.disit.org/km4city/resource/RT04801702315PO",
          "address": "PIAZZA DELLA STAZIONE",
          "civic": "3A",
          "wktGeometry": "",
          "photos": [],
          "photoThumbs": [],
```

```
        "photoOrig": [],
        "avgStars": 0.0,
        "starsCount": 0,
        "comments": []
      },
      "id": 1
    ]
  },
  "realtime": {
    "head": {
      "parkingArea": ["Garage La Stazione Spa"],
      "vars": ["capacity", "freeParkingLots", "occupiedParkingLots", "occupancy",
        "updating"]
    },
    "results": {
      "bindings": [{
        "capacity": {"value": "617"},
        "freeParkingLots": {"value": "322"},
        "occupiedParkingLots": {"value": "579"},
        "occupancy": {"value": "0.0"},
        "status": {"value": "enoughSpacesAvailable"},
        "updating": {"value": "2017-01-18T14:25:00+01:00"}
      }]
    }
  }
}
```


Example Fuel station



http://www.disit.org/ServiceMap/api/v1/?serviceUri=http://www.disit.org/km4city/resource/Fuel_station_01a234db6235dd55448a5044d9d26a52

```
{
  "Service": {
    "type": "FeatureCollection",
    "features": [
      {
        "geometry": {
          "type": "Point",
          "coordinates": [11.279211, 43.78041]
        },
        "type": "Feature",
        "properties": {
          "serviceUri":
"http://www.disit.org/km4city/resource/Fuel_station_01a234db6235dd55448a5044d9d26a52",
          "serviceType": "TransferServiceAndRenting_Fuel_station",
          "name": "PINI E SETTESOLDI SNC",
          "typeLabel": "Fuel station",
          "province": "FI",
          "city": "FIRENZE",
          "cap": "50131",
          "address": "VIALE DEI MILLE",
          "brand": "AgipEni",
          ...
        }
      }
    ]
  }
}
```

```
"realtime": {
  "head": {"vars": ["measuredTime", "fuel", "price", "currency", "self"]},
  "results": {
    "bindings": [{
      "measuredTime": {"value": "2017-01-13 16:01:52"},
      "fuel": {"value": "Benzina"},
      "price": {"value": "1.579"}, "currency": {"value": "EUR"},
      "self": {"value": "true"}
    }, {
      "measuredTime": {"value": "2017-01-13 16:01:52"},
      "fuel": {"value": "Blue Diesel"},
      "price": {"value": "1.539"}, "currency": {"value": "EUR"},
      "self": {"value": "true"}
    }, {
      "measuredTime": {"value": "2017-01-13 16:01:52"},
      "fuel": {"value": "Blue Super"},
      "price": {"value": "1.729"}, "currency": {"value": "EUR"},
      "self": {"value": "true"}
    }, {
      "measuredTime": {"value": "2017-01-13 16:01:52"},
      "fuel": {"value": "Gasolio"},
      "price": {"value": "1.439"}, "currency": {"value": "EUR"},
      "self": {"value": "true"}
    }
  ]
}
```



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Many other



- **Bus stops** with timetable and next passings
- **Traffic sensors** with current traffic status
- **Weather forecasts** for municipality
- **First aids** with number of users per status and color code
- **Air quality stations** with information on air quality
- **Smart waste containers** with waste level
- **Smart benches** with number of seatings and passings, temperature, air quality, etc.
- **Smart irrigators** with information on soil and leaves
- **Smart street lights**
- **Energy meters**
- **etc.**

Image Caching API

- provides a cache for the given image url, it downloads the image, scales it to the thumbnail or medium size depending on the size requested and save it for future requests.
- Parameters:
 - imageUrl: url to the image
 - size: the size of the image to be produced (can be «thumb» or «medium» or a number between 1 and 2000 pixels)
- It provides the scaled image produced in the same format as the original to be fit in a square of *size x size*, if the url is not an image it redirects to the original url.

Managing multimedia

- The *multimedia* sources provided by some APIs often contains a URL to an external multimedia file that is no more available. Since the Image Caching APIs was created because the original images were too large for mobiles, now using this cache is currently the only way to retrieve these images. Unfortunately the cache was realized only for images and thus pdf files and audio files are no more available.
- Example:
 - <http://servicemap.disit.org/WebAppGrafo/api/v1/imgcache?imageUrl=http://www.florenceheritage.it/mobileApp/immagini/zocchi/148.jpg&size=thumb>

Recommender API

- The API suggests a set of services near a user, the services are grouped depending on the user profile and it can suggest services on the basis of past user behavior (svd=true) or only by position.
- Example: <http://screcommender.km4city.org/SmartCityRecommender/?action=recommend&user=3043b85d23d6f4879e1765c2c2e431cbc71d393065af06b03486ba4a04642b5b&profile=student&language=en&latitude=43.7727&longitude=11.2532&distance=1&version=1>

Shortest Path Finder API

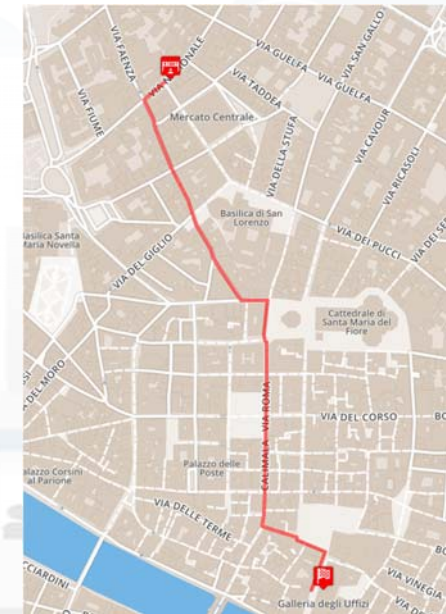
- allows to find a path between two geographic positions or services by:
 - feet, bicycle, public transport or car (current version only by feet).



Shortest Path Finder API

- allows to find a path between two geographic positions or services (identified with serviceUri) by:
 - foot, bicycle, public transport or car (current version by foot (shortest or quiet) or by car).

http://servicemap.disit.org/WebAppGrafo/api/v1/shortestpath/?source=43.7772;11.2522&destination=http://www.disit.org/km4city/resource/e76655ae0ae0a956df3a60500b2861dd&routeType=foot_shortest&format=html



Example

```
{
  "journey": {
    "source_node": {
      "node_id": "2531656503",
      "lon": 11.2477,
      "lat": 43.7767
    },
    "destination_node": {
      "node_id": "4006368396",
      "lon": 11.262,
      "lat": 43.7687
    },
    "search_route_type": "shortest_foot_optimization",
    "search_max_feet_km": 0.1,
    "start_datetime": "2017-01-12T12:34:00",
    "routes": [{
      "wkt": "LINESTRING(11.247773299999992 43.7765506,11.247889799999999 43.7765815,...)",
      "eta": "12:40:00",
      "time": "00:06:00",
      "distance": 1.1609571842375381,
      "arc": [{
        "distance": 0.009997643869982628,
        "start_datetime": "12:34:00",
        "end_datetime": "12:34:07",
        "destination_node": {
          "lon": 11.247889799999999,
          "lat": 43.7765815,
          "node_id": "2531656503"
        },
        "source_node": {
          "lon": 11.247773299999992,
          "lat": 43.7765506,
          "node_id": "2531656503"
        }
      ]
    }
  ]
}
```

OpenStreetMap node ids

```
,
  "transport_provider": "",
  "transport": "foot",
  "transport_service_type": "",
  "desc": "nd"
}, ... {
  "distance": 0.013927524955311556,
  "start_datetime": "12:38:05",
  "end_datetime": "12:38:15",
  "destination_node": {
    "lon": 11.250239099999982,
    "lat": 43.774658600000007,
    "node_id": "271149487"
  },
  "source_node": {
    "lon": 11.2501089000000013,
    "lat": 43.774740999999993,
    "node_id": "1754184405"
  },
  "transport_provider": "",
  "transport": "foot",
  "transport_service_type": "",
  "desc": "Via Panzani"
}, ... ]
},
"response": {
  "error_message": "successful",
  "current_operation": "route optimization",
  "error_code": "0"
},
"elapsed_ms": 3943,
"message_version": "1.0"
}
```

Public transport API

- Note: in the API urls and parameter names it is often referred to «bus», it should be intended any public transport not only buses.
- **Agency list (only json)**
 - provide a list of the public transport agencies available
- **(Bus) Lines list**
 - provide a list of the public transport lines available for a given agency
- **(Bus) Routes list**
 - provide a list of the public transport routes available for a given line or passing by a specific stop
- **(Bus) Stop list**
 - provide a list of the public transport stops available for a given route.
- **Search (Bus) Routes in a geographic area**
 - provides a list of the public transport routes that have a stop in a specified geographic area
- **Estimated Bus position**
 - provides the estimated current position of buses (currently only for ATAF&Linea)

Feedback API

- Rating and comment API
 - accepts a star rating (1-5) and/or a comment on a specific service. Comments are not automatically associated with the service, a moderator has to validate the comment provided.
- Service Photo API
 - accepts in POST as a multipart form the serviceUri, the user id and a photo in jpeg or png format. The photo provided is not automatically associated with the serviceUri a moderator will check it and decide.
- Last contributions API
 - Reports a list of the last ratings, comments and photos provided by users



Documentazione



- Hackathon su Sii-mobility.org <http://www.sii-mobility.org/index.php/eventi/hackathon-sii-mobility>
- pagina ["Workshop su App development" del 24 Gennaio 2017](http://www.sii-mobility.org/index.php/eventi/mobile-app-workshop)
 - <http://www.sii-mobility.org/index.php/eventi/mobile-app-workshop>
- overview su Smart City API: <http://www.disit.org/6920>
- Link alla documentazione online primaria per le [Smart City API](#)
- Pagina di ServiceMap per le API e la verifica de dati: <Http://servicemap.disit.org>
- Scarica il Flyer di Km4City: <http://www.km4city.org/km4city-booklet-v02-21x21-md1.pdf>
- pagina web Km4City: <http://www.km4city.org>
- pagina Open Source di DISIT Org: <http://www.disit.org/6763>
- [VIDEO "FIRENZE dove cosa" Mobile App \(kit promozione\), le app sono accesibili sugli store](#)
- [VIDEO "TOSCANA dove, cosa" Mobile App \(kit promozione\), le app sono accessibili sugli store](#)
- [GUIDA e strumenti: Programmazione ETL per Data Warehouse](#)
- [esempi di processi formalizzati in ETL per il DataWarehouse](#)
- video youtube sulla piattaforma: <https://www.youtube.com/watch?v=YjUH-dKVkUM>



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Documentation



- **Development of Sii-Mobility App modules tutorial**
 - <http://www.sii-mobility.org/index.php/eventi/mobile-app-workshop>
- **Documentation Smart City API, version 1, January 2017**
 - <http://www.disit.org/6991> (document from Sii-Mobility), <http://www.disit.org/6995>
- **App Kit development page:**
 - <http://www.disit.org/6977> (slides ready, and video) <http://www.disit.org/6992>
 - Servicemao: <http://www.disit.org/6994>
- **Ontology and Km4City Tools:**
 - [Http://www.km4city.org](http://www.km4city.org)
 - <http://www.disit.org/6506> Ontology and documentation
- **Sii-Mobility is Open Source on GitHub as DISIT lab:**
 - <https://github.com/disit>
 - <https://github.com/disit/siiMobilityAppKit> (mobile App kit)
- **Data Ingestion processes and tools, tutorial:**
 - <http://www.sii-mobility.org/index.php/documentazione/slide-e-altro>
 - <http://www.disit.org/6690>
- **Deliverables of Sii-Mobility:**
 - <http://www.sii-mobility.org/index.php/documentazione/deliverable>
- **FAQ of Sii-Mobility:**
 - <http://www.sii-mobility.org/index.php/il-progetto/faq>
- **Promotional Kit for «Toscana dove cosa App»**
 - <http://www.sii-mobility.org/index.php/documentazione/kit-promozionale-app-toscana>



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Open Source



Km4City, Sii-Mobility, RESOLUTE, REPLICATE: smart city big data open source tools. Km4City is a knowledge base and a research line of DISIT lab mainly developed before the start of Sii-Mobility, RESOLUTE, REPLICATE projects. While it has been mainly improved by them. Those projects are complementar each other and almost all of them use and contribute the Km4City research line. **ServiceMap smart city knowledge base tool**: smart city service tool (mainly developed for Sii-Mobility project) for accessing to km4city knowledge base, for service browsing and query, for **Smart City API** for mobile and for mobile development tool, <http://www.disit.org/km4city>

- Open Source on DISIT: <http://www.disit.org/6763>
- GITHUB: <https://github.com/disit>

Roadmap

2013

Km4City 1.1

- Tuscany Map
- Services
- AVM
- Sensors
- Parking
- Cultural Heritage
- Enrichment cities
- Event in the city
- Digital Locations
- Fresh places

- <http://servicemap.km4city.org> API
- <http://log.disit.org>
- <http://www.disit.org/fodd>
- <http://www.disit.org/tv> Twitter Vigilance
- <http://smartds.km4city.org>

2014

- Weather
- Cultural Heritage
- Energy recharge pillar
- Wi-Fi
- Events in the city

2015

Km4City 1.4

- Embed
- More API
- iBeacon



Km4City 1.5

- SmartDS
- Km4City App

RESOLUTE H2020
2015-2018 - Started



Sii-Mobility SCN
2016-2018 - Started
Km4City 1.6.2

2016

REPLICATE H2020
2016-2021- Started



- Suggestions on demand
- User Behaviour Analysis
- Trajectories and OD

2021

12/2017

- Territorial areas and paths
- Health, Bike sharing
- Statistics, Energy, ICT, ...
- E-vehicles

6/2017

- Risk analysis
- Environmental, water
- Data Licensing models
- Energy Meters
- Fi-Ware compliant

Today

- More Sensors, IOE, IOT
- Dashboard Builder
- Territorial areas and paths
- User Engagement
- Mobility and transport
- Resilience Decision Support

GHOST SIR
2016-2019 - Started



Acknowledgement

- Thanks to the European Commission for founding. All slides reporting logo of **RESOLUTE H2020** are representing tools and research founded by European Commission for the RESOLUTE project. **RESOLUTE** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 653460).
- Thanks to the European Commission for founding. All slides reporting logo of **REPLICATE H2020** are representing tools and research founded by European Commission for the REPLICATE project. **REPLICATE** has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 691735).
- Thanks to the MIUR for co-founding and to the University of Florence and companies involved. All slides reporting logo of **Sii-Mobility** are representing tools and research founded by MIUR for the Sii-Mobility SCN MIUR project.
- **Km4City** is an open technology exploited by those projects and line of research of DISIT Lab. Some of the innovative solutions and research issues developed into the above mentioned projects are also compliant and contributing to the Km4City approach and thus are contributing to the open Km4City model of DISIT lab.

