

Smart city RDF Benchmark

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1 Introduction

This document describes the Smart city RDF benchmark for the performance evaluation of RDF stores for Smart city services.

2 SPARQL Queries

In the following sections are reported the queries to be used for the benchmark. Since each RDF store has a specific extension for full text search and geo-spatial search a line starting with #VOS should be used only when using Virtuoso and #OIM only for GraphDB/OWLIM. The queries may depend on some parameters as:

- %LAT %LNG for a geo-spatial position
- %LINE for a bus line
- %BUS_STOP for a bus stop
- %DIST for a distance in km
- %SENSOR for a sensor identifier
- %WORD for a word to be used for text search

Values to be used for these parameters are reported in the parameters data section in the following

2.1 Find-address

given the latitude and longitude position %LAT %LNG retrieves the nearest address within 100m.

```
#ID: find-address
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX vcard:<http://www.w3.org/2006/vcard/ns#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX dcterms:<http://purl.org/dc/terms/>
SELECT DISTINCT ?via ?numero ?comune      WHERE {
  ?entry rdf:type km4c:Entry.
  ?nc km4c:hasExternalAccess ?entry.
  ?nc km4c:extendNumber ?numero.
  ?nc km4c:belongsToRoad ?road.
  ?road km4c:extendName ?via.
  ?entry geo:lat ?elat.
  ?entry geo:long ?elong.
  ?road km4c:inMunicipalityOf ?com.
  ?com foaf:name ?comune.
```

```

#VOS ?entry geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=0.1)
#VOS BIND( bif:st_distance(?geo, bif:st_point(%LNG, %LAT)) AS ?dist)
#OIM ?entry omgeo:nearby(%LAT %LNG "0.1km").
#OIM BIND( omgeo:distance(?elat, ?elong, %LAT, %LNG) AS ?dist)
} ORDER BY ?dist LIMIT 1

```

2.2 Municipalities-florence

retrieves the list of municipalities within the province of Florence.

```

#ID:municipalities-florence
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX km4c:<http://www.disit.org/km4city/schema#>
SELECT DISTINCT ?mun ?nomeComune WHERE {
  ?mun rdf:type km4c:Municipality.
  ?mun km4c:isPartOfProvince ?prov.
  ?prov foaf:name "FIRENZE".
  ?mun foaf:name ?nomeComune.
}
ORDER BY ?nomeComune

```

2.3 Bus-lines

retrieve the list of bus lines.

```

#ID:bus-lines
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dcterms:<http://purl.org/dc/terms/>
select distinct ?n where {
  ?x rdf:type km4c:PublicTransportLine;
  dcterms:identifier ?n.
  bind(xsd:integer(?n) as ?d)
} order by ?d

```

2.4 Bus-stops-of-line

given the bus line %LINE retrieves the bus stops list of the line.

```

#ID:bus-stops-of-line
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dcterms:<http://purl.org/dc/terms/>
SELECT DISTINCT ?bs ?bslat ?bslong ?nomeFermata ?x WHERE {
  ?tpl1 rdf:type km4c:PublicTransportLine.
  ?tpl1 dcterms:identifier "%LINE".
  ?tpl1 km4c:hasRoute ?route.
  ?route km4c:hasSection ?rs.
  ?rs km4c:startsAtStop ?bs.
  ?bs foaf:name ?nomeFermata.
  ?bs geo:lat ?bslat.
  ?bs geo:long ?bslong.
} ORDER BY ?nomeFermata

```

Note: the ?x unused variable is needed by virtuoso to overcome a bug in the DISTINCT clause

2.5 Lines-of-bus-stop

given a bus stop name %BUS_STOP retrieves the lines passing from the same bus stop.

```
#ID:lines-of-stop
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX km4cr:<http://www.disit.org/km4city/resource/>
PREFIX schema:<http://schema.org/#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX vcard:<http://www.w3.org/2006/vcard/ns#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX dcterms:<http://purl.org/dc/terms/>
SELECT DISTINCT ?id WHERE{
  ?tpl1 rdf:type km4c:PublicTransportLine.
  ?tpl1 dcterms:identifier ?id.
  ?tpl1 km4c:hasRoute ?route.
  ?route km4c:hasSection ?rs.
  ?rs km4c:endsAtStop ?bs1.
  ?rs km4c:startsAtStop ?bs2.
  {?bs1 foaf:name "%BUS_STOP".}
UNION
  {?bs2 foaf:name "%BUS_STOP".}
} ORDER BY ?id
```

2.6 Bus-stop-latlng

given a position %LAT, %LNG and a radius %DIST finds the bus stops that are within the radius.

```
#ID:bus-stop-latlng-%DISTkm
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?bs (STR(?nome) AS ?bsName) ?bslat ?bslong ?x WHERE {
  ?bs rdf:type km4c:BusStop.
  ?bs foaf:name ?nome.
  ?bs geo:lat ?bslat.
  ?bs geo:long ?bslong.
#VOS ?bs geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
#OIM ?bs omgeo:nearby(%LAT %LNG "%DISTkm").
}
```

Note: the ?x unused variable is needed by virtuoso to overcome a bug in the DISTINCT clause

2.7 Bus-stop-florence

retrieves all the bus stops in the municipality of Florence.

```
#ID:bus-stop-florence
PREFIX km4c:<http://www.disit.org/km4city/schema#>
```

```

PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?bs ?nomeFermata ?bslat ?bslong ?x WHERE {
  ?bs rdf:type km4c:BusStop.
  ?bs foaf:name ?nomeFermata.
  ?bs geo:lat ?bslat.
  ?bs geo:long ?bslong.
  ?bs km4c:isInMunicipality ?com.
  ?com foaf:name "FIRENZE".
}

```

Note: the ?x unused variable is needed by virtuoso to overcome a bug in the DISTINCT clause

2.8 Bus-stop-forecast

given a bus stop %BUS_STOP finds the next forecasts for the lines crossing at the bus stop.

```

#ID:bus-stop-forecast
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX time:<http://www.w3.org/2006/time#>
SELECT DISTINCT ?avmr ?line ?state ?arrivalTime ?idRide WHERE {
  {
    SELECT ?ride (MAX(?avmr) AS ?avmrLast) WHERE{
      ?bs rdf:type km4c:BusStop.
      ?bs foaf:name "%BUS_STOP".
      ?bs km4c:hasForecast ?bsf.
      ?avmr km4c:includeForecast ?bsf.
      ?ride km4c:hasAVMRecord ?avmr.
    }GROUP BY ?ride ORDER BY DESC (?avmrLast) LIMIT 15
  }
  ?bs rdf:type km4c:BusStop.
  ?bs foaf:name "%BUS_STOP".
  ?bs km4c:hasForecast ?forecast.
  ?avmrLast km4c:includeForecast ?forecast.
  ?forecast km4c:expectedTime ?arrivalTime.
  ?avmrLast km4c:concernLine ?line.
  ?avmrLast km4c:rideState ?state.
  ?ride km4c:hasAVMRecord ?avmrLast.
  ?ride dcterms:identifier ?idRide.
  FILTER(?arrivalTime>=xsd:dateTime("2015-05-06T09:00:00+02:00"))
} ORDER BY ?arrivalTime

```

2.9 AVM-distribution

retrieves for each day the count of AVM records received.

```

#ID:avm-distribution
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX dcterms:<http://purl.org/dc/terms/>
SELECT ?yy ?mm ?dd (count(*) as ?c) where {
  ?x a km4c:AVMRecord.

```

```

?x dcterms:created ?d.
BIND( year(?d) as ?yy)
BIND( month(?d) as ?mm)
BIND( day(?d) as ?dd)
} GROUP BY ?yy ?mm ?dd ORDER BY ?yy ?mm ?dd

```

2.10 Service-florence

retrieves all the services in the municipality of Florence.

```

#ID:service-florence
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/>
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX dc:<http://purl.org/dc/elements/1.1/>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?ser ?serAddress ?serNumber ?elat ?elong ?sName ?sType ?email
?note ?labelIta ?multimedia ?description ?identifier ?x WHERE {
  ?ser rdf:type km4c:Service
#VOS OPTION (inference "urn:ontology").
  OPTIONAL{?ser schema:name ?sName. }
  ?ser schema:streetAddress ?serAddress.
  OPTIONAL {?ser km4c:houseNumber ?serNumber}.
  OPTIONAL {?ser dc:description ?description FILTER(LANG(?description) = "it")}
  OPTIONAL {?ser km4c:multimediaResource ?multimedia }
  OPTIONAL { ?ser dcterms:identifier ?identifier }
  OPTIONAL {?ser skos:note ?note }
  OPTIONAL {?ser schema:email ?email }
{
  ?ser km4c:hasAccess ?entry.
  ?entry geo:lat ?elat.
  ?entry geo:long ?elong.
  ?nc km4c:hasExternalAccess ?entry.
  ?nc km4c:belongToRoad ?road.
  ?road km4c:inMunicipalityOf ?mun.
  ?mun foaf:name "FIRENZE".
} UNION {
  ?ser km4c:isInRoad ?road .
  ?ser geo:lat ?elat.
  ?ser geo:long ?elong.
  ?road km4c:inMunicipalityOf ?mun.
  ?mun foaf:name "FIRENZE".
}
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
  ?sType rdfs:label ?labelIta. FILTER(LANG(?labelIta)="it")
}

```

Note: the ?x unused variable is needed by virtuoso to overcome a bug in the DISTINCT clause

2.11 Service-Acc-Clt-Trs-W&F-florence

retrieves all the services in the Accomodation, Cltural Activity, TourismService and Wine&Food classes within the municipality of Florence.

```
#ID:Service-acc-clt-trs-w&f-florence
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX km4cr:<http://www.disit.org/km4city/resource#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/>
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX dc:<http://purl.org/dc/elements/1.1/>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?ser ?serAddress ?serNumber ?elat ?elong ?sName ?sType ?email
?note ?labelIta ?multimedia ?description ?identifier ?x WHERE {
  ?ser rdf:type km4c:Service
#VOS OPTION (inference "urn:ontology").
  OPTIONAL{?ser schema:name ?sName. }
  ?ser schema:streetAddress ?serAddress.
  OPTIONAL {?ser km4c:houseNumber ?serNumber}.
  OPTIONAL {?ser dc:description ?description FILTER(LANG(?description) = "it")}
  OPTIONAL {?ser km4c:multimediaResource ?multimedia }
  OPTIONAL {?ser dcterms:identifier ?identifier }
  OPTIONAL {?ser skos:note ?note }
  OPTIONAL {?ser schema:email ?email }
  {
    ?ser km4c:hasAccess ?entry.
    ?entry geo:lat ?elat.
    ?entry geo:long ?elong.
    ?nc km4c:hasExternalAccess ?entry.
    ?nc km4c:belongsToRoad ?road.
    ?road km4c:inMunicipalityOf ?mun.
    ?mun foaf:name "FIRENZE".
  } UNION {
    ?ser km4c:isInRoad ?road .
    ?ser geo:lat ?elat.
    ?ser geo:long ?elong.
    ?road km4c:inMunicipalityOf ?mun.
    ?mun foaf:name "FIRENZE".
  }
  { ?ser a km4c:Accommodation
#VOS OPTION (inference "urn:ontology").
  }
  UNION { ?ser a km4c:CulturalActivity
#VOS OPTION (inference "urn:ontology").
  }
  UNION { ?ser a km4c:TourismService
#VOS OPTION (inference "urn:ontology").
  }
}
```

```

UNION { ?ser a km4c:WineAndFood
#VOS OPTION (inference "urn:ontology").
}
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
?sType rdfs:label ?labelIta. FILTER(LANG(?labelIta)="it")
}

```

2.12 Service-Htl-B&B-florence

retrieves all the services in the Hotel and Bed&Breakfast classes within the municipality of Florence.

```

#ID:Service-htl-b&b-florence
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/>
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX dc:<http://purl.org/dc/elements/1.1/>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?ser ?serAddress ?serNumber ?elat ?elong ?sName ?sType ?email
?note ?labelIta ?multimedia ?description ?identifier ?x WHERE {
?sSer rdf:type km4c:Service
#VOS OPTION (inference "urn:ontology").
OPTIONAL{?ser schema:name ?sName.
?sSer schema:streetAddress ?serAddress.
OPTIONAL {?ser km4c:houseNumber ?serNumber}.
OPTIONAL {?ser dc:description ?description FILTER(LANG(?description) = "it")}
OPTIONAL {?ser km4c:multimediaResource ?multimedia }
OPTIONAL {?ser dcterms:identifier ?identifier }
OPTIONAL {?ser skos:note ?note }
OPTIONAL {?ser schema:email ?email }
{
?sSer km4c:hasAccess ?entry.
?entry geo:lat ?elat.
?entry geo:long ?elong.
?nc km4c:hasExternalAccess ?entry.
?nc km4c:belongToRoad ?road.
?road km4c:inMunicipalityOf ?mun.
?mun foaf:name "FIRENZE".
} UNION {
?sSer km4c:isInRoad ?road .
?sSer geo:lat ?elat.
?sSer geo:long ?elong.
?road km4c:inMunicipalityOf ?mun.
?mun foaf:name "FIRENZE".
}
{ ?ser a km4c:Hotel
#VOS OPTION (inference "urn:ontology").
}
UNION { ?ser a km4c:Bed_and_breakfast

```

```

#VOS OPTION (inference "urn:ontology").
}
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
?sType rdfs:label ?labelIta. FILTER(LANG(?labelIta)="it")
}

```

2.13 Service-latlng

retrieves the services within a radius from a latitude, longitude position.

```

#ID:service-latlng-%DISTkm
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX schema:<http://schema.org/>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
PREFIX dc:<http://purl.org/dc/elements/1.1/>
SELECT DISTINCT ?ser ?serAddress ?elat ?elong ?sType ?sTypeIta ?sName ?email
?note ?multimedia ?description ?x WHERE {
  ?ser rdf:type km4c:Service
#VOS OPTION (inference "urn:ontology").
  OPTIONAL {?ser <http://schema.org/name> ?sName}
  ?ser <http://schema.org/streetAddress> ?serAddress.
  OPTIONAL {?ser skos:note ?note}
  OPTIONAL {?ser dc:description ?description FILTER(LANG(?description) = "it")}
  OPTIONAL {?ser km4c:multimediaResource ?multimedia}
  OPTIONAL {?ser schema:email ?email }
  {
    ?ser km4c:hasAccess ?entry.
    ?entry geo:lat ?elat.
    ?entry geo:long ?elong.
#VOS ?entry geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
#OIM ?entry omgeo:nearby(%LAT %LNG "%DISTkm") .
  } UNION {
    ?ser geo:lat ?elat.
    ?ser geo:long ?elong.
#VOS ?ser geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
#OIM ?ser omgeo:nearby(%LAT %LNG "%DISTkm") .
  }
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
?sType rdfs:label ?sTypeIta. FILTER(LANG(?sTypeIta)="it")
}

```


2.14 Service-Acc-Clt-Trs-W&F-latlng

retrieves all the services in the Accomodation, Clutural Activity, TourismService and Wine&Food classes within a radius %DIST from a position %LAT %LNG.

```
#ID:service-acc-clt-trs-w&f-latlng-%DISTkm
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX schema:<http://schema.org/>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
PREFIX dc:<http://purl.org/dc/elements/1.1/>
SELECT DISTINCT ?ser ?serAddress ?elat ?elong ?sType ?sTypeIta ?sName ?email
?note ?multimedia ?description ?x WHERE {
  ?ser rdf:type km4c:Service
#VOS OPTION (inference "urn:ontology").
  OPTIONAL {?ser <http://schema.org/name> ?sName}
  ?ser <http://schema.org/streetAddress> ?serAddress.
  OPTIONAL {?ser skos:note ?note}
  OPTIONAL {?ser dc:description ?description FILTER(LANG(?description) = "it")}
  OPTIONAL {?ser km4c:multimediaResource ?multimedia}
  OPTIONAL {?ser schema:email ?email }
  {
    ?ser km4c:hasAccess ?entry.
    ?entry geo:lat ?elat.
    ?entry geo:long ?elong.
#VOS ?entry geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
#OIM ?entry omgeo:nearby(%LAT %LNG "%DISTkm") .
  } UNION {
    ?ser geo:lat ?elat.
    ?ser geo:long ?elong.
#VOS ?ser geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
#OIM ?ser omgeo:nearby(%LAT %LNG "%DISTkm") .
  }
  { ?ser a km4c:Accommodation
#VOS OPTION (inference "urn:ontology").
  }
  UNION { ?ser a km4c:CulturalActivity
#VOS OPTION (inference "urn:ontology").
  }
  UNION { ?ser a km4c:TourismService
#VOS OPTION (inference "urn:ontology").
  }
  UNION { ?ser a km4c:WineAndFood
#VOS OPTION (inference "urn:ontology").
  }
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
```

```
?sType rdfs:label ?sTypeIta. FILTER(LANG(?sTypeIta)="it")
}
```

2.15 Service-Htl-B&B-latlng

retrieves all the services in the Hotel and Bed&Breakfast classes within a radius %DIST (km) from a position %LAT %LNG

```
#ID: service-htl-b&b-latlng-%DISTkm
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX schema:<http://schema.org/>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
PREFIX dc:<http://purl.org/dc/elements/1.1/>
SELECT DISTINCT ?ser ?serAddress ?elat ?elong ?sType ?sTypeIta ?sName ?email
?note ?multimedia ?description ?x WHERE {
  ?ser rdf:type km4c:Service
#VOS OPTION (inference "urn:ontology").
  OPTIONAL {?ser <http://schema.org/name> ?sName}
  ?ser <http://schema.org/streetAddress> ?serAddress.
  OPTIONAL {?ser skos:note ?note}
  OPTIONAL {?ser dc:description ?description FILTER(LANG(?description) = "it")}
  OPTIONAL {?ser km4c:multimediaResource ?multimedia}
  OPTIONAL {?ser schema:email ?email }
  {
    ?ser km4c:hasAccess ?entry.
    ?entry geo:lat ?elat.
    ?entry geo:long ?elong.
#VOS ?entry geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
#OIM ?entry omgeo:nearby(%LAT %LNG "%DISTkm") .
  } UNION {
    ?ser geo:lat ?elat.
    ?ser geo:long ?elong.
#VOS ?ser geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
#OIM ?ser omgeo:nearby(%LAT %LNG "%DISTkm") .
  }
  { ?ser a km4c:Hotel
#VOS OPTION (inference "urn:ontology").
  }
UNION { ?ser a km4c:Bed_and_breakfast
#VOS OPTION (inference "urn:ontology").
  }
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
  ?sType rdfs:label ?sTypeIta. FILTER(LANG(?sTypeIta)="it")
}
```

2.16 Service-text-florence

retrieves all services in the municipality of Florence matching the keyword %WORD.

```
#ID:service-text-firenze
PREFIX luc: <http://www.ontotext.com/owlim/lucene#>
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?ser ?elong ?elat ?sTypeIta WHERE {
  ?ser ?p ?txt.
#OIM ?txt luc:myIndex "%WORD".
#OIM ?txt luc:score ?sc.
#VOS ?txt bif:contains "%WORD" OPTION (score ?sc).
  {
    ?ser km4c:hasAccess ?entry.
    ?entry geo:lat ?elat.
    ?entry geo:long ?elong.
    ?nc km4c:hasExternalAccess ?entry.
    ?nc km4c:belongToRoad ?road.
    ?road km4c:inMunicipalityOf ?mun.
    ?mun foaf:name "FIRENZE".
  } UNION {
    ?ser km4c:isInRoad ?road.
    ?ser geo:lat ?elat.
    ?ser geo:long ?elong.
    ?road km4c:inMunicipalityOf ?mun.
    ?mun foaf:name "FIRENZE".
  }UNION {
    ?ser km4c:isInMunicipality ?com.
    ?com foaf:name "FIRENZE".
    ?ser geo:lat ?elat.
    ?ser geo:long ?elong.
  }
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
  ?sType rdfs:label ?sTypeIta. FILTER(LANG(?sTypeIta)="it")
}
```

2.17 Service-text-latlng

retrieves all services matching a keyword in any field given a position %LAT %LNG and a radius of 500m.

```
#ID:service-text-latlng
PREFIX luc: <http://www.ontotext.com/owlim/lucene#>
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/#>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
```

```

PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
SELECT DISTINCT ?ser ?elong ?elat ?sTypeIta WHERE {
  ?ser ?p ?txt.
#OIM ?txt luc:myIndex "%WORD".
#OIM ?txt luc:score ?sc.
#VOS ?txt bif:contains "%WORD" OPTION (score ?sc).
  {
    ?ser km4c:hasAccess ?entry.
    ?entry geo:lat ?elat.
    ?entry geo:long ?elong.
#OIM ?entry omgeo:nearby(%LAT %LNG "0.5km").
#VOS ?entry geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=0.5)
  } UNION{
    ?ser geo:lat ?elat.
    ?ser geo:long ?elong.
#OIM ?ser omgeo:nearby(%LAT %LNG "0.5km").
#VOS ?ser geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=0.5)
  }
#VOS ?ser a ?sType. FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
#OIM ?ser <http://www.openrdf.org/schema/sesame#directType> ?sType.
FILTER(?sType!=km4c:RegularService && ?sType!=km4c:Service)
  ?sType rdfs:label ?sTypeIta. FILTER(LANG(?sTypeIta)="it")
}

```

2.18 Sensor-florence

retrieves all the sensors within the municipality of Florence.

```

#ID:sensor-florence
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX schema:<http://schema.org/>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?sensor ?idSensore ?lat ?long ?address ?x WHERE {
  ?sensor rdf:type km4c:SensorSite.
  ?sensor geo:lat ?lat.
  ?sensor geo:long ?long.
  ?sensor dcterms:identifier ?idSensore.
  ?sensor km4c:placedOnRoad ?road.
  ?road km4c:inMunicipalityOf ?mun.
  ?mun foaf:name "FIRENZE".
  ?sensor schema:streetAddress ?address.
}

```

2.19 Sensor-latlng

retrieves all sensors within a radius %DIST (km) from a position %LAT %LNG.

```
#ID:sensor-latlng-%DISTkm
```

```

PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/>
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX dct:<http://purl.org/dc/terms/#>
PREFIX omgeo:<http://www.ontotext.com/owlim/geo#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX skos:<http://www.w3.org/2004/02/skos/core#>
PREFIX rdfs:<http://www.w3.org/2000/01/rdf-schema#>
SELECT DISTINCT ?sensor ?idSensore ?lat ?long ?address ?x WHERE {
  ?sensor rdf:type km4c:SensorSite.
  ?sensor geo:lat ?lat.
  ?sensor geo:long ?long.
  ?sensor dcterms:identifier ?idSensore.
#OIM ?sensor omgeo:nearby(%LAT %LNG "%DISTkm").
#VOS ?sensor geo:geometry ?geo.
#VOS filter(bif:st_distance (?geo, bif:st_point (%LNG,%LAT))<=%DIST)
  ?sensor schema:streetAddress ?address.
}

```

2.20 Sensor-status

retrieves the latest information associated with the sensor %SENSOR.

```

#ID:sensor-status
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX dcterms:<http://purl.org/dc/terms/>
SELECT ?avgDistance ?avgTime ?occupancy ?concentration ?vehicleFlow
?averageSpeed ?thresholdPerc ?speedPercentile ?timeInstant WHERE{
  ?sensor rdf:type km4c:SensorSite.
  ?sensor dcterms:identifier "%SENSOR".
  ?sensor km4c:hasObservation ?obs.
  ?obs km4c:measuredTime ?time.
  ?time dcterms:identifier ?timeInstant.
OPTIONAL {?obs km4c:averageDistance ?avgDistance}
OPTIONAL {?obs km4c:averageTime ?avgTime}
OPTIONAL {?obs km4c:occupancy ?occupancy}
OPTIONAL {?obs km4c:concentration ?concentration}
OPTIONAL {?obs km4c:vehicleFlow ?vehicleFlow}
OPTIONAL {?obs km4c:averageSpeed ?averageSpeed}
OPTIONAL {?obs km4c:thresholdPerc ?thresholdPerc}
OPTIONAL {?obs km4c:speedPrecentile ?speedPercentile}
} ORDER BY DESC (?timeInstant) LIMIT 1

```

2.21 Sensor-distribution

finds for each day the count of sensor status updates received.

```

#ID:sensor-distribution
PREFIX dcterms:<http://purl.org/dc/terms/>

```

```

PREFIX km4c:<http://www.disit.org/km4city/schema#>
SELECT ?yy ?mm ?dd (COUNT(*) AS ?c) where {
#VOS {
#VOS  SELECT DISTINCT * where {
    ?x a km4c:Observation.
    ?x km4c:measuredTime/dcterms:identifier ?d.
#VOS  }
#VOS }
    BIND( year(?d) as ?yy)
    BIND( month(?d) as ?mm)
    BIND( day(?d) as ?dd)
}
GROUP BY ?yy ?mm ?dd ORDER BY ?yy ?mm ?dd

```

2.22 Parking-status

retrieves the latest information associated with the parking lot %CAR_PARK.

```

#ID:parking-status
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/>
PREFIX time:<http://www.w3.org/2006/time#>
PREFIX dcterms:<http://purl.org/dc/terms/>
SELECT DISTINCT ?situationRecord ?instantDateTime ?occupancy ?free ?occupied
?capacity WHERE {
    ?park rdf:type km4c:Car_park.
    ?park schema:name "%CAR_PARK".
    ?cps km4c:observeCarPark ?park.
    ?cps km4c:capacity ?capacity.
    ?situationRecord km4c:relatedToSensor ?cps.
    ?situationRecord km4c:observationTime ?time.
    ?time dcterms:identifier ?instantDateTime.
    ?situationRecord km4c:parkOccupancy ?occupancy.
    ?situationRecord km4c:free ?free.
    ?situationRecord km4c:occupied ?occupied.
} ORDER BY DESC (?instantDateTime) LIMIT 1

```

2.23 Parking-distribution

retrieves for each day the count of parking status records acquired.

```

#ID:parking-distribution
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX km4c:<http://www.disit.org/km4city/schema#>
SELECT ?yy ?mm ?dd (COUNT(*) AS ?c) where {
#VOS {
#VOS  SELECT DISTINCT * where {
    ?x a km4c:SituationRecord.
    ?x km4c:observationTime/dcterms:identifier ?d.
#VOS  }
#VOS }
    BIND( year(?d) as ?yy)
    BIND( month(?d) as ?mm)
    BIND( day(?d) as ?dd)
}

```

```
}
GROUP BY ?yy ?mm ?dd ORDER BY ?yy ?mm ?dd
```

2.24 Weather-florence

retrieves the latest forecast available for the municipality of Florence.

```
#ID:weather-florence
PREFIX geo:<http://www.w3.org/2003/01/geo/wgs84_pos#>
PREFIX foaf:<http://xmlns.com/foaf/0.1/>
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX km4c:<http://www.disit.org/km4city/schema#>
PREFIX xsd:<http://www.w3.org/2001/XMLSchema#>
PREFIX rdf:<http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX schema:<http://schema.org/>
PREFIX time:<http://www.w3.org/2006/time#>
SELECT ?giorno ?descrizione ?minTemp ?maxTemp ?instantDateTime ?wPred WHERE {
  {
    SELECT DISTINCT ?wRep ?instantDateTime WHERE {
      ?comune rdf:type km4c:Municipality.
      ?comune foaf:name "FIRENZE".
      ?comune km4c:hasWeatherReport ?wRep.
      ?wRep km4c:updateTime ?instant.
      ?instant schema:value ?instantDateTime.
    } ORDER BY DESC (?instantDateTime) LIMIT 1
  }
  ?wRep km4c:hasPrediction ?wPred.
  ?wPred dcterms:description ?descrizione.
  ?wPred km4c:day ?giorno.
  ?wPred km4c:hour "giorno"^^xsd:string.
  OPTIONAL { ?wPred km4c:minTemp ?minTemp.}
  OPTIONAL { ?wPred km4c:maxTemp ?maxTemp.}
}
```

2.25 Weather-distribution

retrieves for each day the count of weather forecasts acquired.

```
#ID:meteo-distribution
PREFIX dcterms:<http://purl.org/dc/terms/>
PREFIX km4c:<http://www.disit.org/km4city/schema#>
SELECT ?yy ?mm ?dd (COUNT(*) AS ?c) where {
  ?x a km4c:WeatherReport.
  ?x km4c:updateTime/<http://schema.org/value> ?d.
  BIND( year(?d) as ?yy)
  BIND( month(?d) as ?mm)
  BIND( day(?d) as ?dd)
}
GROUP BY ?yy ?mm ?dd ORDER BY ?yy ?mm ?dd
```

3 Parameters data values

In the following sections are reported the values to be used in the queries

3.1 %LAT %LNG

```
43.778159022442345;11.255836486816406
```

43.774812450590474;11.256265640258789
43.77326304834337;11.24751091003418
43.770721941755674;11.261930465698242

3.2 %LINE

10	27	46	66	9
2	28	47	7	90
1	29	48	72	91
11	3	49	73	92
12	30	5	74	93
13	303	50	75	94
14	31	52	76	C1
15	35	54	77	C2
17	36	56	78	C3
19	38	57	8	D
20	4	59	81	G
21	40	6	82	M
22	41	60	83	R
23	42	61	84	S1
24	43	62	85	S3
25	44	63	86	SC
26	45	64	89	SF

3.3 %BUS_STOP

SAN ZANOBI
SANTA REPARATA
SCALA
STAZIONE PENSILINA
PIAZZA DI SAN MARCO
VENEZIA
VIA DELLE CARRA
MILLE 07
CAIROLI
MILLE 02
GIACOMINI
PACINOTTI
INDIPENDENZA
FRA' BARTOLOMMEO 01
SAVONAROLA
CONTI
VASARI
FICINO
PICO DELLA MIRANDOLA
FRA' BARTOLOMMEO
LA MARMORA
BRONZETTI
NICIOLDI
BALDESI
CENTO STELLE
PIERLUIGI DA PALESTRINA
BENEDETTO MARCELLO
TOSELLI BELLINI
VIALE VERGA
DUSE 04

DUSE 02
SAFFI
FRATELLI ROSSELLI
TARTINI 01
PERGOLESI 01
MANIFATTURA TABACCHI
CASCINE
LE CASCINE
BOITO
PERGOLESI
TARTINI 04
TARTINI
KENNEDY
CASCINE 02
PAISIELLO
SETTE SANTI
CARNESECCHI
SAN GERVASIO
DUSE
DUSE 03
VERGA 01
VERGA 03
PALAZZESCHI
RIDOLFI
ARAZZIERI
PIAZZA PUCCINI
TOSELLI
PASSERELLA
RINUCCINI
SQUARCIALUPI

VIVALDI
STAZIONE SCALETTE
ROSSELLI
STAZIONE VALFONDA
SANTI FIORENTINI
DON GIOVANNI VERITA'
STAZIONE ABSIDE S.M.N.
STAZIONE PIAZZA DELL'UNITA'
D'ANNUNZIO 04
FILAROCCA
DE AMICIS
D'ANNUNZIO 06
FANTI
CALZA 02
ROMANA
PIAZZA SAN FELICE
COMPARETTI
PASQUALI
MANNI 06
MANNI 04
MANNI 02
CAMPO D'ARRIGO 04
CAMPO D'ARRIGO 02
PODESTA'
SENESE
SENESE 14
I ROSSI 02
GLI ALLORI
DUE STRADE 02
SAN GAGGIO
SAN GAGGIO 04
SAN GAGGIO 02
VILLA TORRE ROSSA
LAVAGNINI LIBERTA'
VIGNA NUOVA
VECCHIETTI
FRESCOBALDI
GUICCIARDINI
D'ANNUNZIO RONDINELLA
RONDINELLA 03
NOVELLI
OSPEDALE TORRE GALLI
DI SCANDICCI 04
DI SCANDICCI 02
FILARETE SCUOLE
FILARETE 02
MASOLINO 02
PISANA 08
PISANA 06
VANNI
ROSSO FIORENTINO
CINEMA UNIVERSALE
PERGOLA
MASOLINO

STARNINA 01
DI SCANDICCI
DI SCANDICCI 03
DI SCANDICCI 05
DI SCANDICCI 07
DI SCANDICCI TORRE GALLI
LUNGO L'AFFRICO
RAMAZZINI
RONDINELLA
ARCIPRESSI
ANTONIO DEL POLLAILOLO 05
SCIPIONE AMMIRATO
LANDUCCI
BOVIO
SEGNI
MATTONAIA
D'AZEGLIO
COLONNA
MUSEO ARCHEOLOGICO
MUSEO DI SAN MARCO
PESCAIA DI SANTA ROSA
SODERINI
FONDERIA
SANTA MARIA AL PIGNONE
AMMANNATI
VIA ANTONIO DEL POLLAILOLO
PIER DELLA FRANCESCA 03
ALBERTINELLI
VIA PISANA
PISANA 10
MATTEO DI GIOVANNI
CESTELLO
SAN FREDIANO
SANTISSIMA ANNUNZIATA
COLONNA 01
NICCOLINI
LEOPARDI
MAZZINI 01
OBERDAN
FRA' PAOLO SARPI
VILLA ARRIVABENE
PIER DELLA FRANCESCA
FRANCAVILLA
OLIVUZZO
PIAZZA SANTA MARIA NOVELLA
NENNI 02
DI SCANDICCI DON GNOCCHI
OSPEDALE DON GNOCCHI
GIOVANNI DELLA CASA
T1 ALAMANNI
CURTATONE
RUCELLAI
VITTORIO VENETO
VIA GRAMIGNANO

PIAZZA TASSO
ALEARDI
ARNOLFO
ORCAGNA
STAGNI DI FOCOGNANO
BUOZZI
SANTA MARIA
LA VILLA
OLMO
CONFINI
TOSCA FIESOLI
TOSCA FIESOLI 02
PALAGETTA 04
PARADISO
CARMINE
ROSSINI
CAMPI BISENZIO TINTORI
DON GNOCCHI
GIORDANO BRUNO
BUONARROTI
PIAZZA GRAMSCI
STAZIONE GALLERIA
SANT'AGOSTINO
LEOPOLDA
IL PRATO
FUSINATO
IL CIONFO
SAN MARCO VECCHIO
PALANCOLA
PONTE ALLE RIFFE
SAN MARCO VECCHIO FS
BORGHINI
MORGAGNI 05
MORGAGNI 07
OSPEDALI DI CAREGGI
LEONE X
MORGAGNI 06
MARITI
MULINO BIONDI
BRAMBILLA
PORTA SAN FREDIANO
VOLTA 01
FERRARIS
PIAZZA EDISON
DI SAN DOMENICO
FRULLINO
FORESE DONATI
DI SAN DOMENICO 07
DI SAN DOMENICO 09
OSPEDALE CAMERATA 01
SAN DOMENICO 01
MANTELLINI
MANTELLINI 03
FIESOLE PIAZZA MINO

STAZIONE LARGO ALINARI
BALDINUCCI
BONAINI
MILANESI
PALAZZO BRUCIATO
PISACANE
DALMAZIA 01
GORE
PASSAVANTI
FAENTINA 36
FAENTINA 34
FAENTINA 32
FAENTINA 30
PIAN DI MUGNONE 02
FAENTINA 26
FAENTINA 24
CALDERAIO 02
FAENTINA 20
MANZOLO 02
PONTE ALLA BADIA 02
PONTE DI SAN DONATO
TERZOLLE
GALOPPO
PIOVANI
CORSALI
FONTE DI NARCISO
LA PIRA
CASTAGNETO
SALVIATI FS
MORGAGNI 04
DALMAZIA 02
STATUTO
CADORNA STATUTO
GIOIA
GIORGINI
MONTELATICI
CELSO
MERCATI
CAPPUCCINI
MASSAIA
MASSAIA 02
VITTORIO EMANUELE
BIGOZZI
STATUTO 04
GUIDO MONACO
PAGNINI FABBRONI
PAGNINI STATUTO FS
LAMI STATUTO FS
STAZIONE MERCATO CENTRALE
LIBERTA'
LUCA GIORDANO
DEPOSITO CURE
VIALE DEI MILLE
MILLE

3.4 %CAR_PARK

G. Boccaccio
B. Buozzi
A. Gramsci
G. Guerra
G. Leopardi
Bisarnella
Garage La Stazione Spa
Piazza del Mercato Centrale
Parcheggio Sant'Ambrogio

Parcheggio Piazza Beccaria
Parcheggio Parterre
Fortezza Fiera
Piazzale della Porta al Prato
Parcheggio Oltrarno
Parcheggio Viale Gaetano Pieraccini
Parcheggio Viale Europa
Piazzale Montelungo

3.5 %SENSOR

EM0100401
EM0100402
EM0100501
EM0100502
EM0100601
EM0100602
EM0100801
EM0100802
FI055SPI00502

FI055SPI00501
FI055ZTL00801
EM0100201
EM0100202
EM0100301
EM0100302
EM0100101
EM0100102

3.6 %WORD

casa
marte
michelangelo
leonardo
pitti