Tutorial on RDF Stream Processing

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http://streamreasoning.org/rsp2014

SPARQLstream and Morph-streams: Hands on Session

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Share, Remix, Reuse — Legally

A bit of Morph-streams

- What we will cover:
  - SPARQLstream queries
  - Register queries
  - Pull data
  - Push data

- Morph-web: a demo web application for Morph-streams
  - https://github.com/jpcik/morph-web
  - Install it yourself (follow the instructions in github)

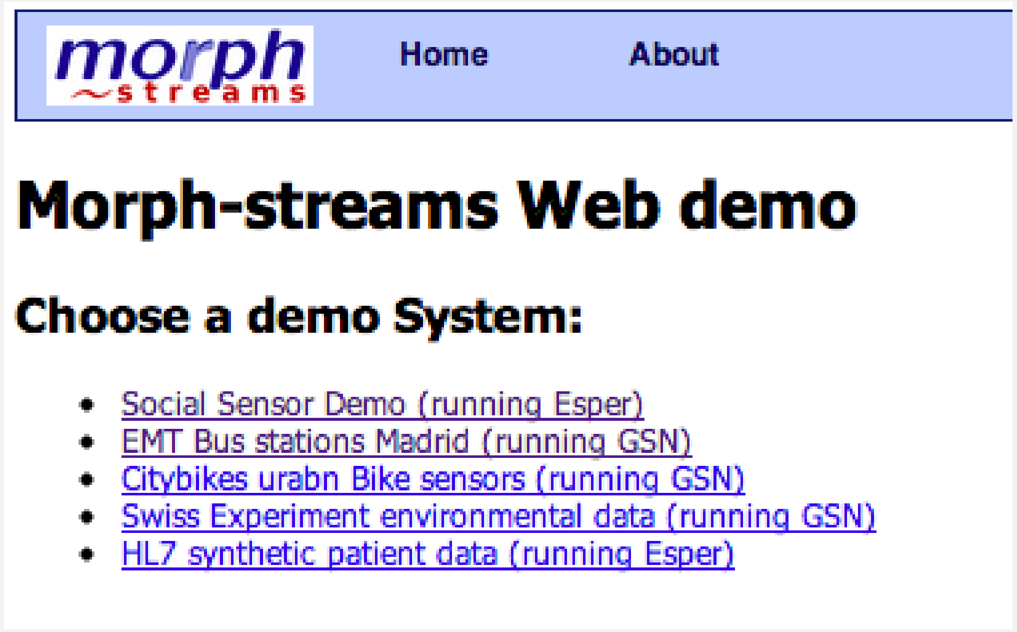
Hands-on instructions

- The instructions are on the github wiki:
  - https://github.com/jpcik/morph-web/wiki/Tutorial:-Morph-streams

- We'll be using this server for the hands-on:
  - http://linkeddata2.dia.fi.upm.es:9000
  - If port 9000 is blocked:
  - http://streams.linkeddata.es

Use cases in the Demo

- You can choose one of the use cases in the Demo home:



Morph-streams Web demo

Choose a demo System:

- Social Sensor Demo (running Esper)
- EMT Bus stations Madrid (running GSN)
- Citybikes urabn Bike sensors (running GSN)
- Swiss Experiment environmental data (running GSN)
- HL7 synthetic patient data (running Esper)

Social Sensor Use Case

- In short: People detected in rooms
- Use Esper as datasource

```
detections {roomid:string,person:string,time:string}
```

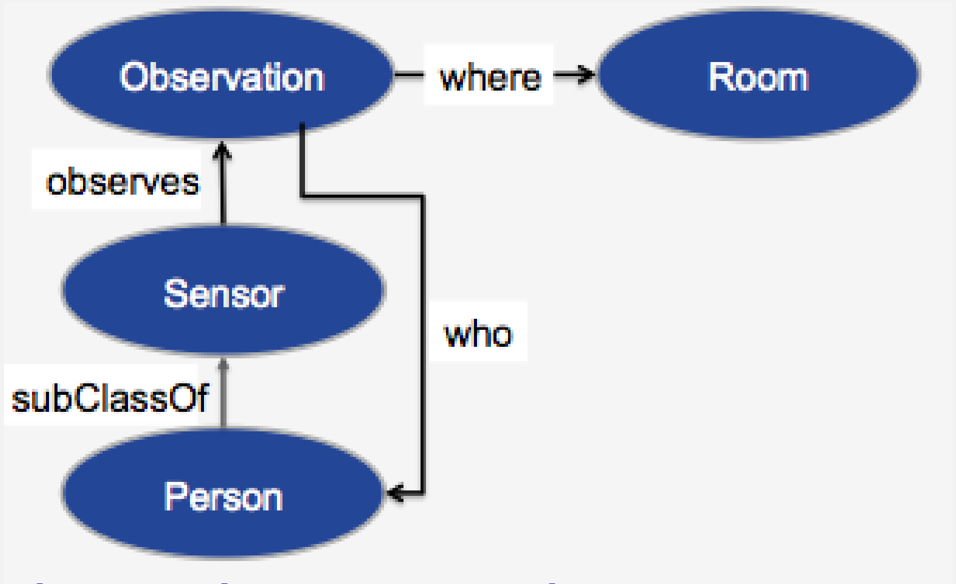
For example, this stream may contain tuples as the following:

```
r1,alice,2013-10-10T10:00
```

But of course we want to query this data through an ontology...

Query using an Ontology

Let's use this ontology:



Oversimplified ontology: an observation encapsulates something that a sensor has observed.

who was observed (a person), and **where** (in a room).

Continuous query

- Go to MORPH_HOST/query/social.
- Write a query or choose one

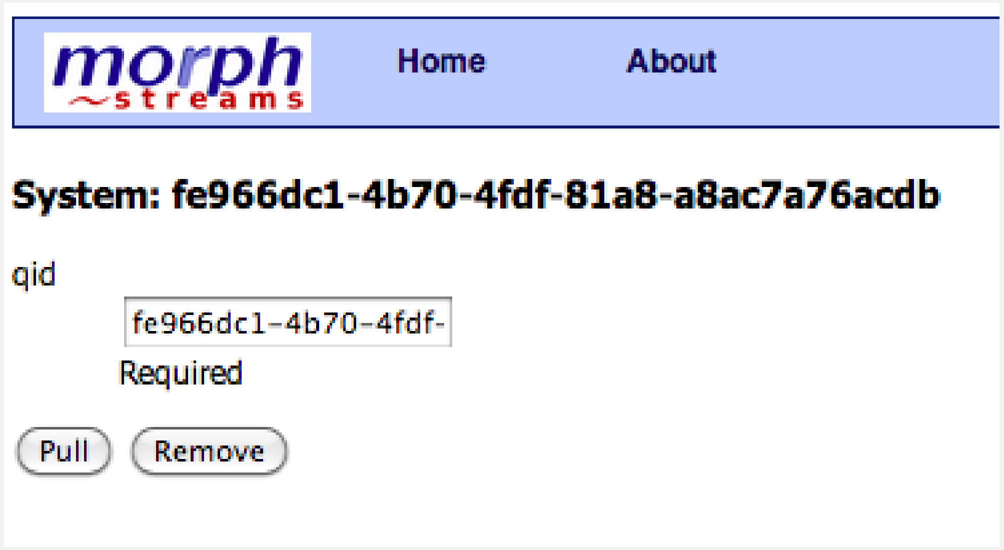
- e.g. all observations when carl was detected in the last 30 seconds:

```
PREFIX sr4ld: <http://streamreasoning.org/ontologies/social#>
PREFIX pers: <http://streamreasoning.org/data/person/id/>
SELECT ?obs
FROM NAMED STREAM <http://streamreasoning.org/data/social.srdf>
[NOW - 30 S]
WHERE {
  ?obs sr4ld:who pers:carl.
}
```

- Only registered the query. to see some data pull results.

Pull Data

- The query has been given an identifier
- Can be used to retreive results by pulling.



System: fe966dc1-4b70-4fdf-81a8-a8ac7a76acdb

qid

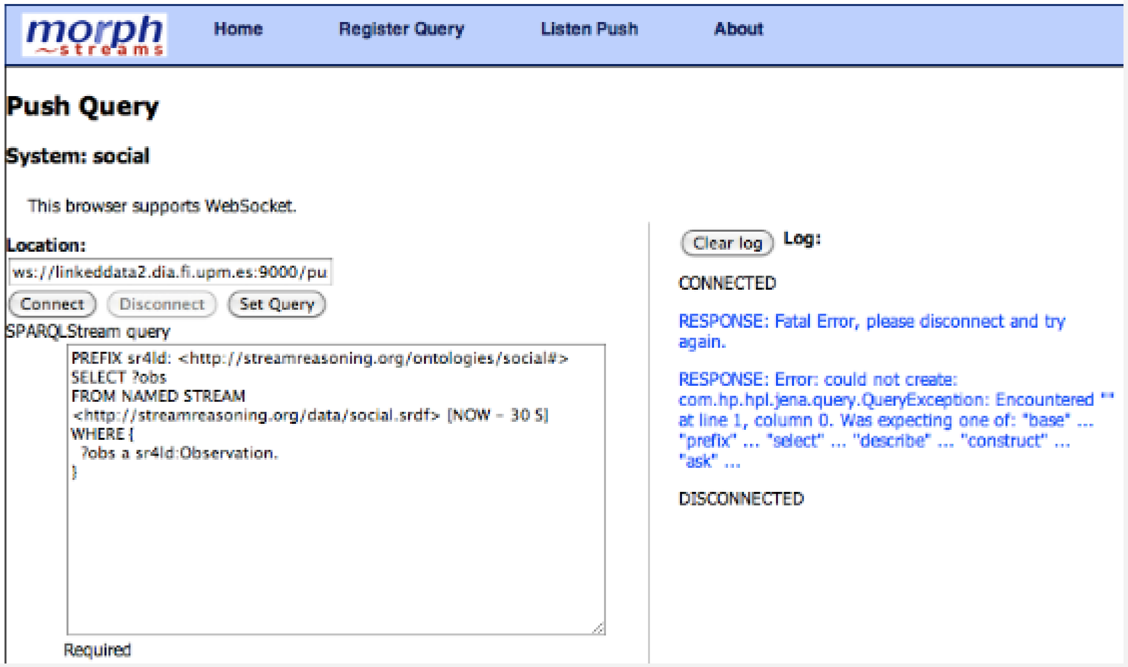
fe966dc1-4b70-4fdf-

Required

- You can also remove the query when you no longer need it.

Listen to a query

- Receive results as soon as they are available
- Using a WebSocket.
- WebSockets implement full-duplex communication via TCP, and are supported by most browsers.



Push Query

System: social

This browser supports WebSocket.

Location:
ws://linkeddata2.dia.fi.upm.es:9000/pu

Connect | Disconnect | Set Query

SPARQLStream query

```
PREFIX sr4ld: <http://streamreasoning.org/ontologies/social#>
SELECT ?obs
FROM NAMED STREAM
<http://streamreasoning.org/data/social.srdf> [NOW - 30 S]
WHERE {
 ?obs a sr4ld:Observation.
}
```

Required

Clear log **Log:**

```
CONNECTED

RESPONSE: Fatal Error, please disconnect and try again.

RESPONSE: Error: could not create:
com.hp.hpl.jena.query.QueryException: Encountered "" at line 1, column 0. Was expecting one of: "base" ... "prefix" ... "select" ... "describe" ... "construct" ... "ask" ...

DISCONNECTED
```

`ws://linkeddata2.dia.fi.upm.es:9000/push?query=PREFIX%20sr4l....`

Changing the mappings

For example you can change the URI template for a Person, instead of this predicate map:

```
rr:predicateObjectMap  [
  rr:predicate sr4ld:who;
  rr:objectMap [rr:template
"http://streamreasoning.org/data/person/id/{person}"]];
```

You can define the following:

```
rr:predicateObjectMap  [
  rr:predicate sr4ld:who;
  rr:objectMap [rr:template
"http://someotherplace.org/persons/Person/{person}"]];
```

Underlying queries

- Underlying queries checkbox
- To see what is being sent to the DSMS or CEP

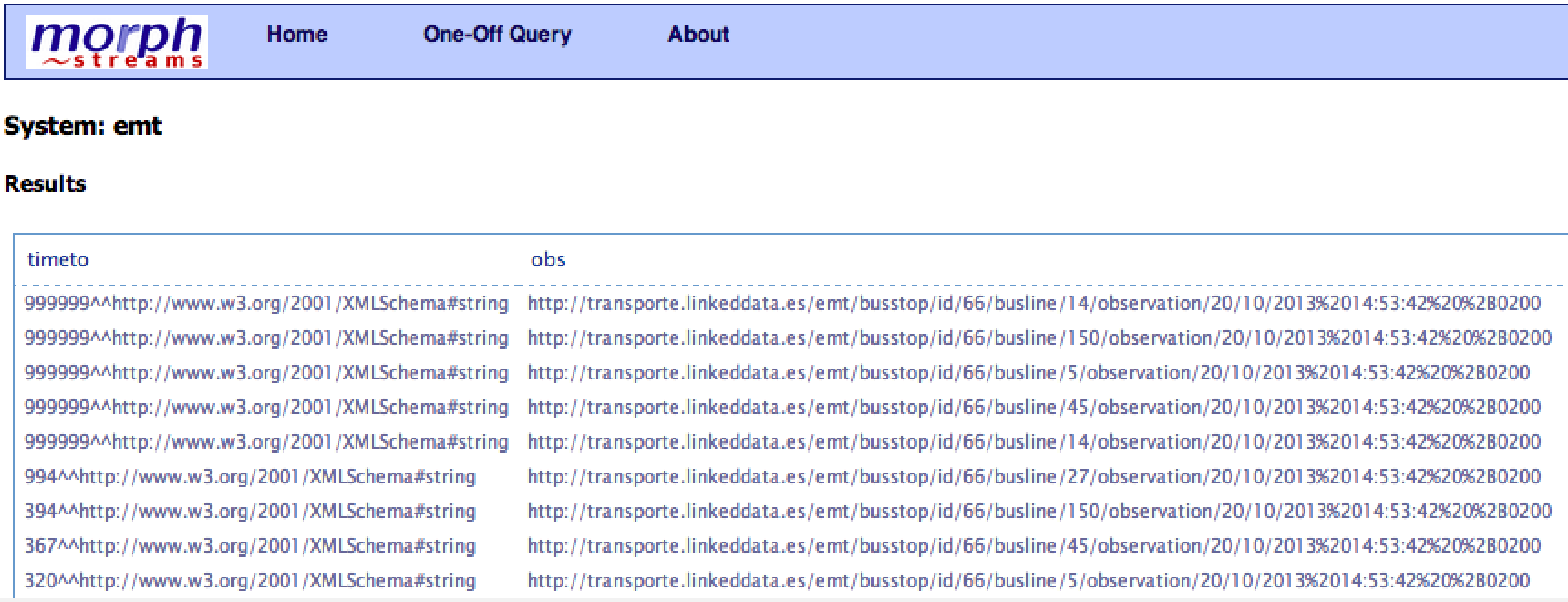
EMT Bus stops Madrid

- Using GSN
- Instantaneous one-off queries
- get all bus stop observations in the last 5 mins:

```
PREFIX ssn: <http://purl.oclc.org/NET/ssnx/ssn#>
PREFIX qudt: <http://data.nasa.gov/qudt/owl/qudt#>
PREFIX emt: <http://emt.linkeddata.es/data#>
SELECT ?timeto ?obs ?av
FROM NAMED STREAM <http://emt.linkeddata.es/data#busstops.srdf>
[NOW - 300 S]
WHERE {
  ?obs a emt:BusObservation.
  ?obs ssn:observationResult ?output.
   ?output emt:timeToBusValue ?av.
   ?av qudt:numericValue ?timeto.
}
```

One-off query results

- Fire and forget



System: emt

Results

timeto	obs
999999^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/14/observation/20/10/2013%2014:53:42%20%2B0200
999999^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/150/observation/20/10/2013%2014:53:42%20%2B0200
999999^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/5/observation/20/10/2013%2014:53:42%20%2B0200
999999^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/45/observation/20/10/2013%2014:53:42%20%2B0200
999999^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/14/observation/20/10/2013%2014:53:42%20%2B0200
994^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/27/observation/20/10/2013%2014:53:42%20%2B0200
394^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/150/observation/20/10/2013%2014:53:42%20%2B0200
367^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/45/observation/20/10/2013%2014:53:42%20%2B0200
320^^http://www.w3.org/2001/XMLSchema#string	http://transporte.linkeddata.es/emt/busstop/id/66/busline/5/observation/20/10/2013%2014:53:42%20%2B0200

Morph-streams as REST service

- MORPH_HOST/emt/sparqlstream?query=ENCODEDQUERY
- `ENCODEDQUERY´ is the SPARQLStream encoded for a URL. E.g.:

http://linkeddata2.dia.fi.upm.es:9000/emt/sparqlstream?query=PREFIX%20ssn%3A%20%3Chttp%3A//purl.oclc.org/NET/ssnx/ssn%23%3E%0APREFIX%20qudt%3A%20%3Chttp%3A//data.nasa.gov/qudt/owl/qudt%23%3E%0APREFIX%20emt%3A%20%3Chttp%3A//emt.linkeddata.es/data%23%3E%0ASELECT%20%3Ftimeto%20%3Fobs%20%3Fav%20%0AFROM%20NAMED%20STREAM%20%3Chttp%3A//emt.linkeddata.es/data%23busstops.srdf%3E%20%5BNOW%20-%20300%20S%5D%0AWHERE%20%7B%0A%20%20%3Fobs%20a%20emt%3ABusObservation.%0A%20%20%3Fobs%20ssn%3AobservationResult%20%3Foutput.%0A%20%20%20%3Foutput%20emt%3AtimeToBusValue%20%3Fav.%0A%20%20%20%3Fav%20qudt%3AnumericValue%20%3Ftimeto.%0A%7D

A bit ugly but it's a kind of SPARQLstream endpoint

Getting the results

```
{
  "head": {
    "vars": [ "timeto" , "obs" , "av" ]
  } ,
  "results": {
    "bindings": [
      {
        "timeto": { "datatype":
"http://www.w3.org/2001/XMLSchema#string" , "type": "typed-
literal" , "value": "999999" } ,
        "obs": { "type": "uri" , "value":
"http://transporte.linkeddata.es/emt/busstop/id/44/busline/147/
observation/20/10/2013%2010:35:38%20%2B0200" } ,
        "av": { "type": "uri" , "value":
"http://transporte.linkeddata.es/emt/busstop/id/44/busline/147/
timeToBusValue/20/10/2013%2010:35:38%20%2B0200" }
      } ,
```

More mapping changes

Add a predicate object map

```
rr:predicateObjectMap  [
  rr:predicate sr4ld:when;
  rr:objectMap [rr:column “time"]];
```

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