Helio

From Heterogeneus Data Sources to Link Data Services

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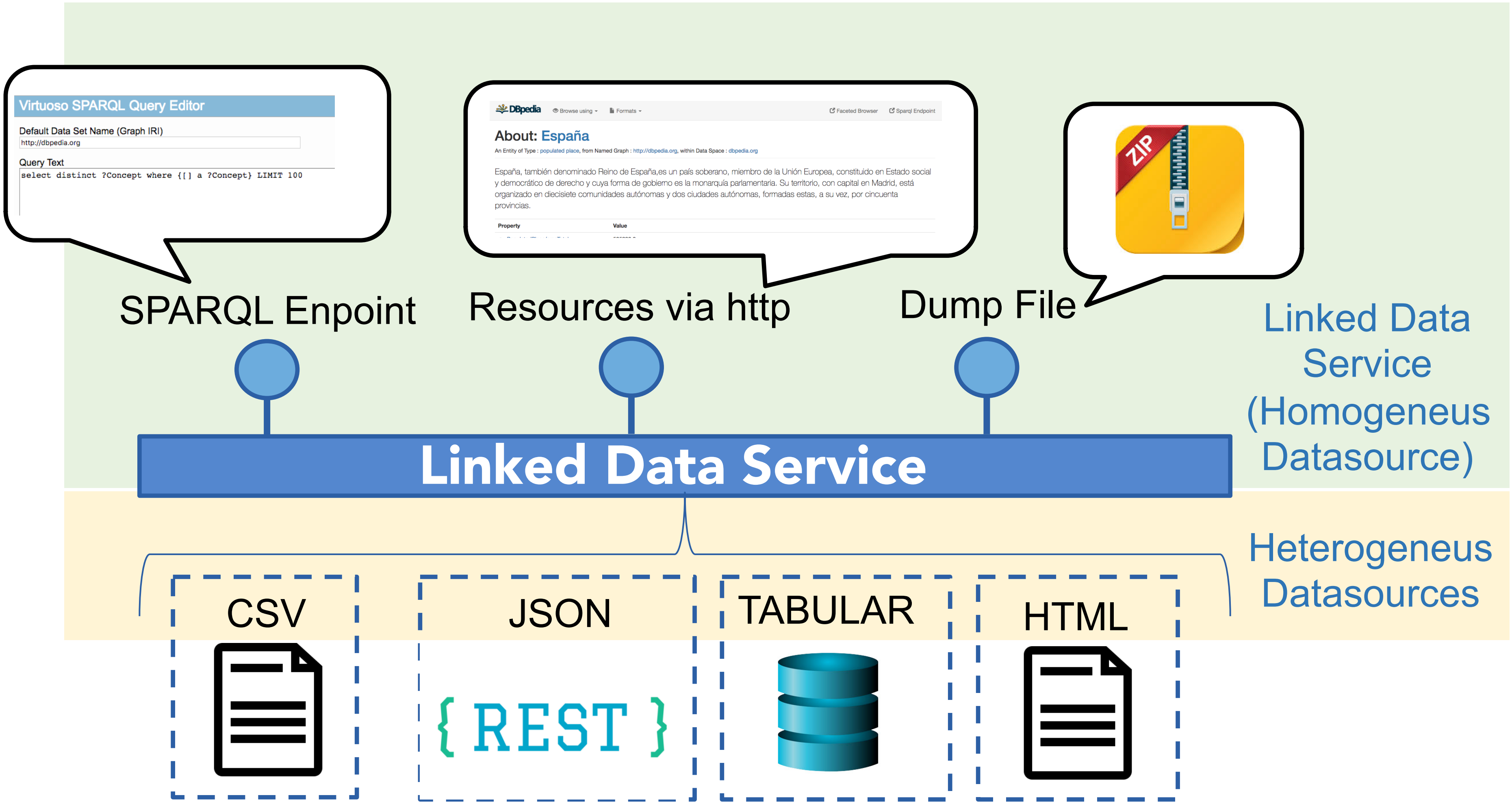
From Heterogeneus Data Sources to Linked Data Services



Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IRI)
http://dbpedia.org

Query Text

```
select distinct ?Concept where {[] a ?Concept} LIMIT 100
```

About: España

An Entity of Type : populated place, from Named Graph : http://dbpedia.org, within Data Space : dbpedia.org

España, también denominado Reino de España,es un país soberano, miembro de la Unión Europea, constituido en Estado social y democrático de derecho y cuya forma de gobierno es la monarquía parlamentaria. Su territorio, con capital en Madrid, está organizado en diecisiete comunidades autónomas y dos ciudades autónomas, formadas estas, a su vez, por cincuenta provincias.

Property	Value

Challenges

- Cope with the different data sources
  - Access methods, i.e., API, file, DB
  - Formats, i.e., JSON, CSV, Tabular, HTML
  - Security, e.g., APIs with Oath, files with passwords
- Clean data
  - Lowercase, missing values
- Relate data
  - Interlink data from differente sources
- Publish as an RDF view the data
  - Enable a SPARQL endpoint
  - Allow resource access
  - Dump generation
- Others
  - Real-time data
  - API restrictions in the number of calls per day
  - Validation of published data

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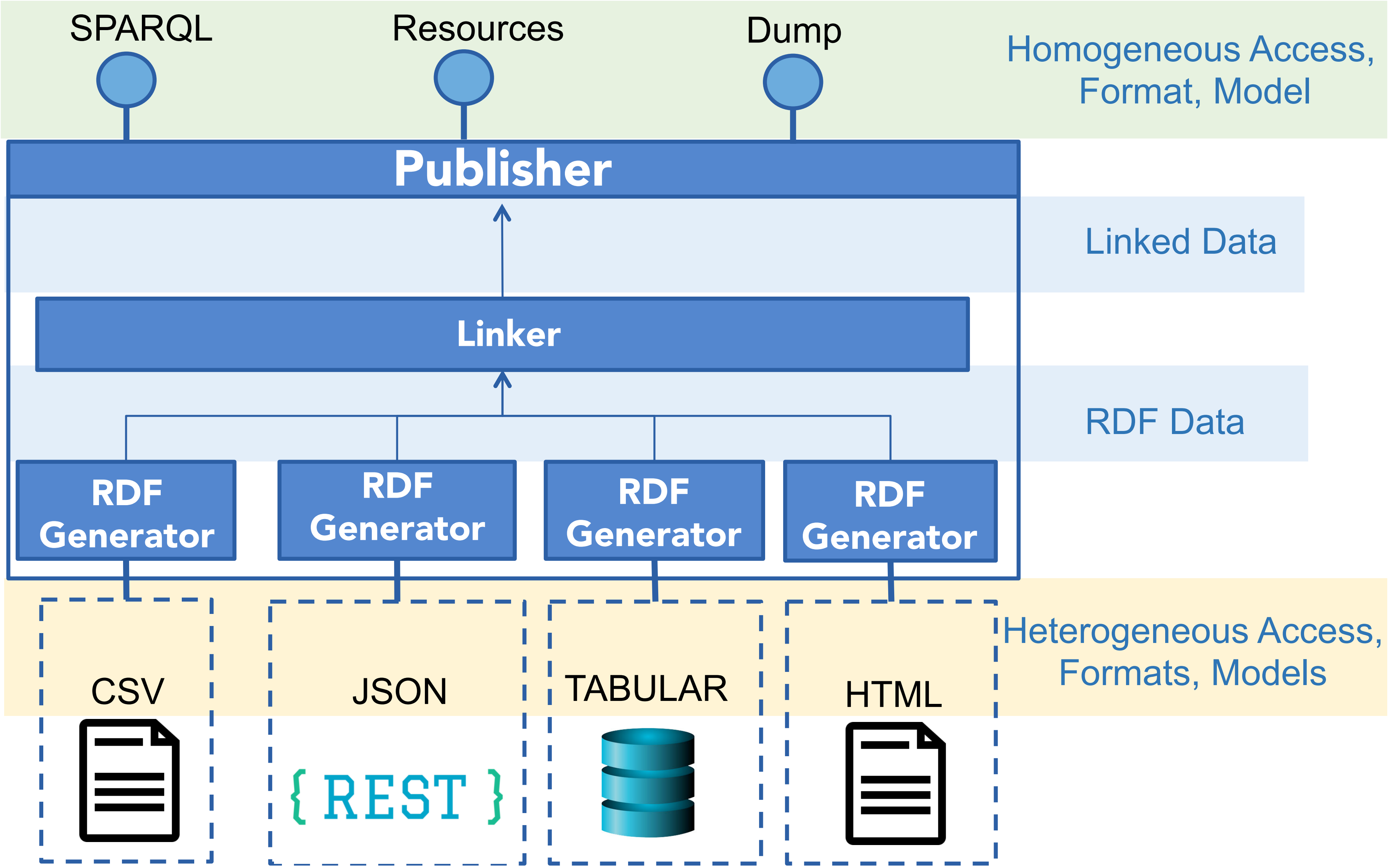
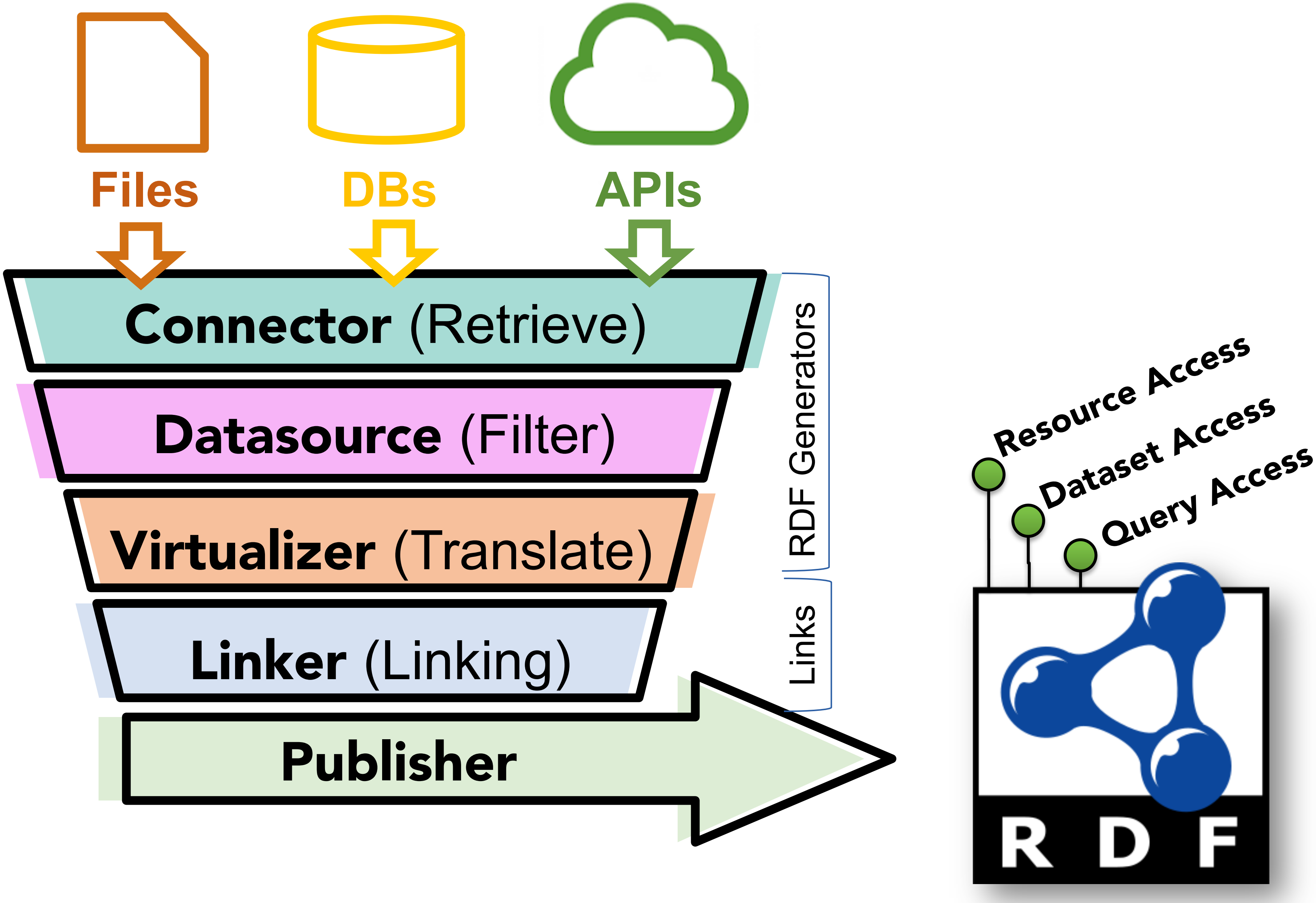
3. Implementation
4. Helio Deployment Scenarios
5. Conclusions

Helio Approach

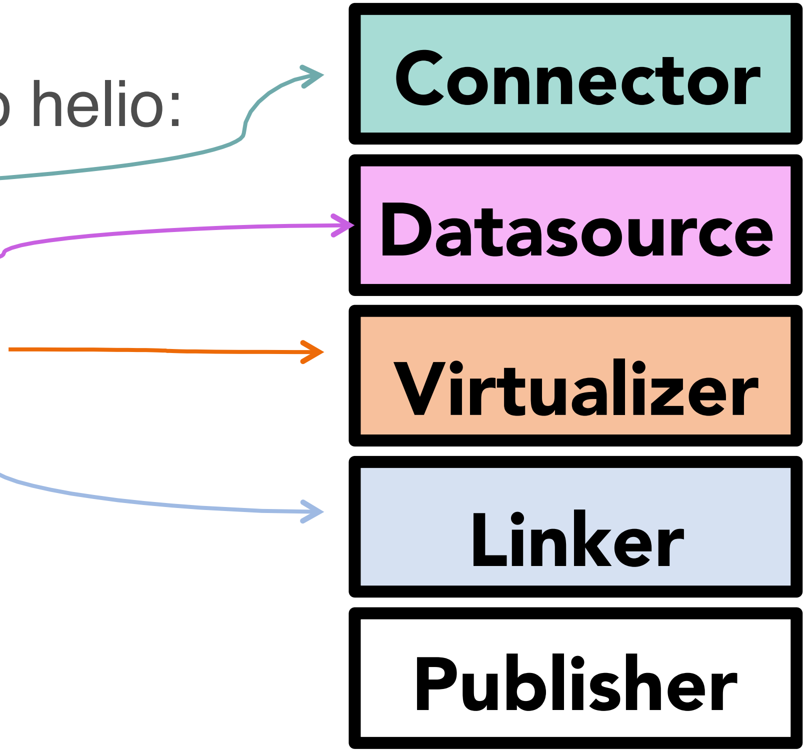


Helio Internal Pipeline



Using Helio

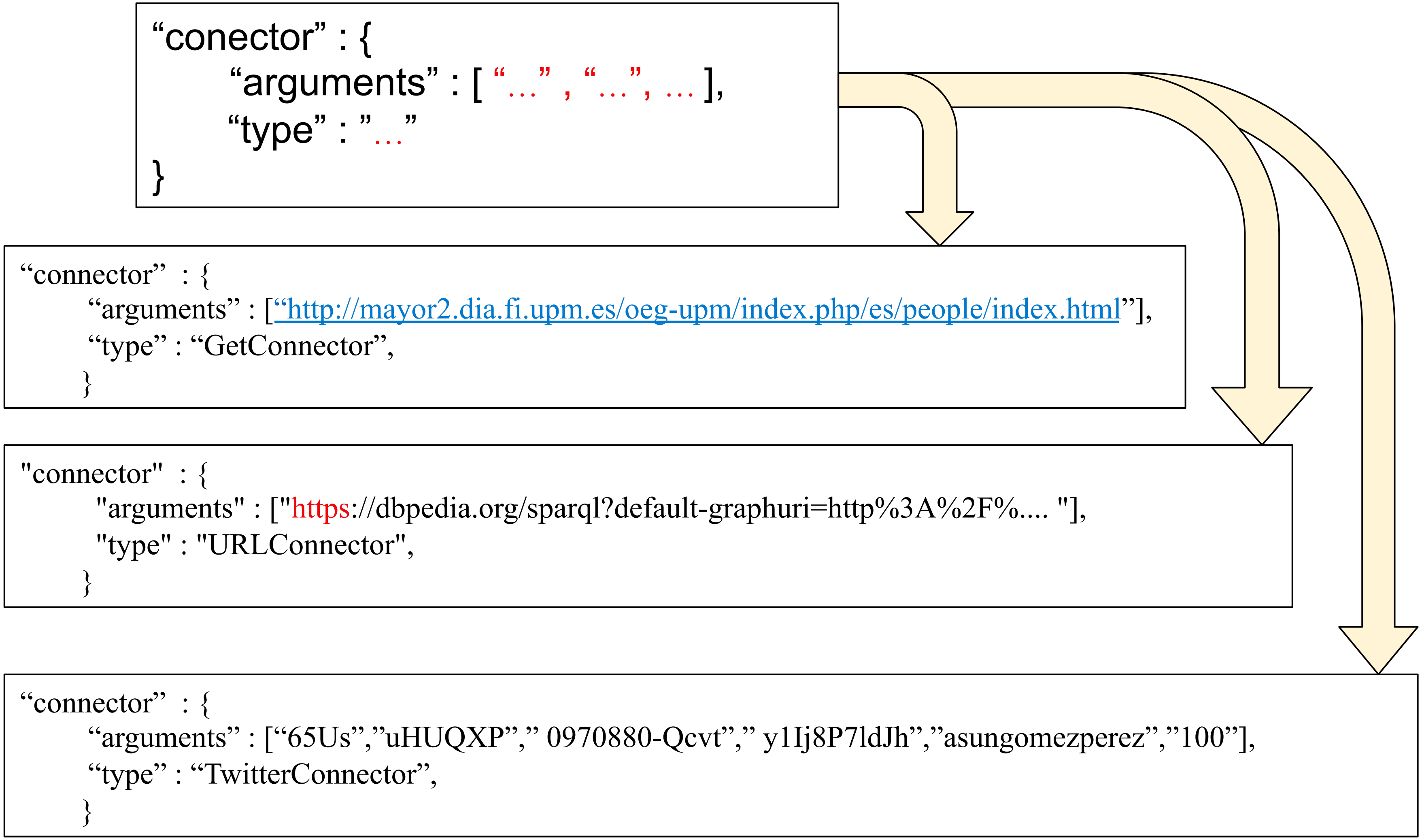
- Download the jar
- Write specifications to setup helio:
  - **Connectors**
  - **Datasources**
  - **Translation** rules (mappings)
  - **Linking rules**



- Run the jar → A service is published automatically

Helio Connector Specification

- Conector specification template



```
“conector” : {
        “arguments” : [ “…” , “…”, … ],
        “type” : ”…”
}
```

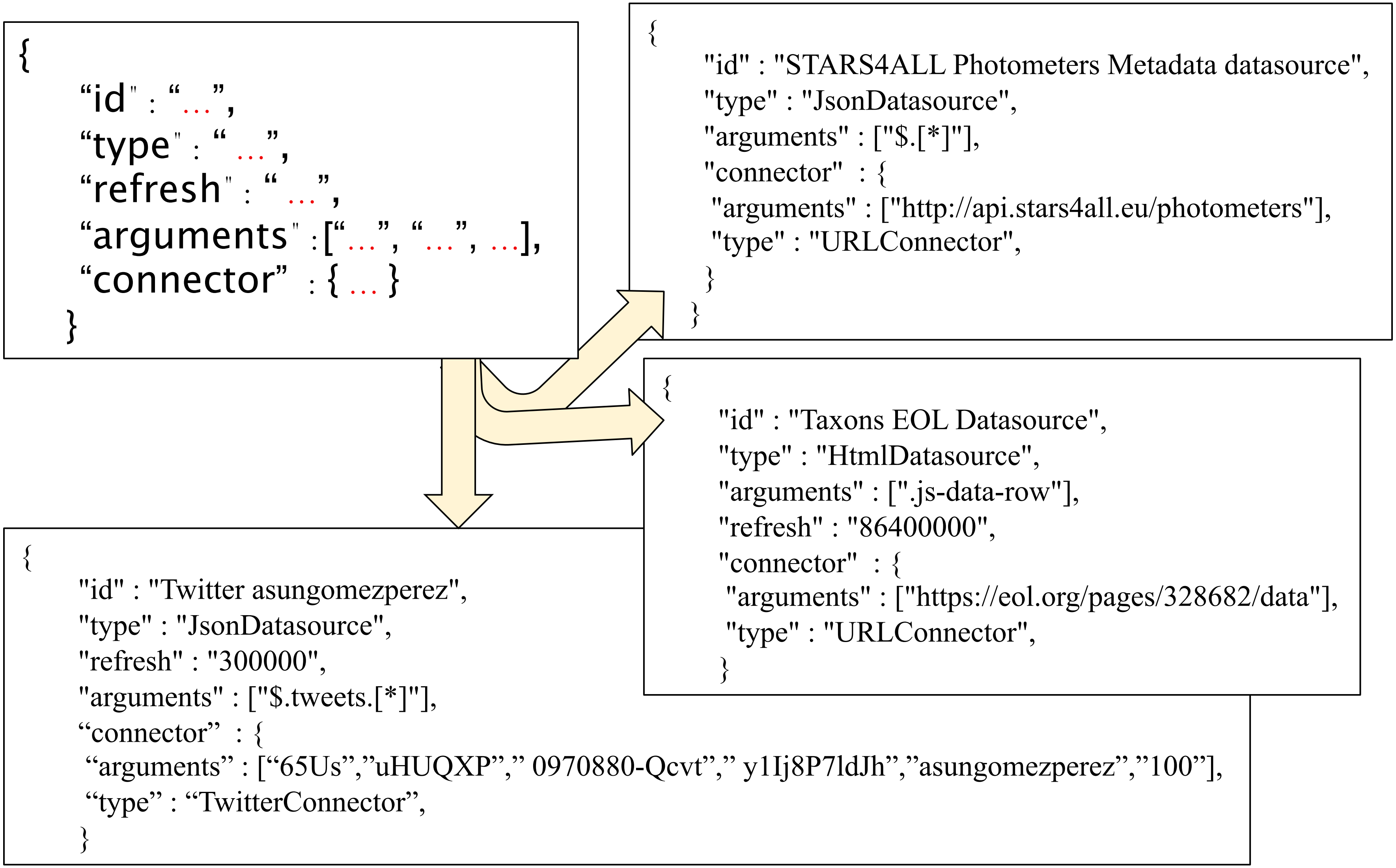
```
“connector”  : {
        “arguments” : [“http://mayor2.dia.fi.upm.es/oeg-upm/index.php/es/people/index.html”],
        “type” : “GetConnector”,
        }
```

```
"connector"  : {
         "arguments" : ["https://dbpedia.org/sparql?default-graphuri=http%3A%2F%.... "],
         "type" : "URLConnector",
        }
```

```
“connector”  : {
        “arguments” : [“65Us”,”uHUQXP”,” 0970880-Qcvt”,” y1Ij8P7ldJh”,”asungomezperez”,”100”],
        “type” : “TwitterConnector”,
        }
```

Helio Datasources Specification

- Datasource specification template



```
{
    “id" : “…”,
    “type" : “ …”,
    “refresh" : “ …”,
    “arguments" :[“…”, “…”, …],
    “connector” : { … }
  }
```

```
{
    "id" : "STARS4ALL Photometers Metadata datasource",
    "type" : "JsonDatasource",
    "arguments" : ["$.[*]"],
    "connector"  : {
     "arguments" : ["http://api.stars4all.eu/photometers"],
     "type" : "URLConnector",
    }
  }
```

```
{
    "id" : "Taxons EOL Datasource",
    "type" : "HtmlDatasource",
    "arguments" : [".js-data-row"],
    "refresh" : "86400000",
    "connector"  : {
     "arguments" : ["https://eol.org/pages/328682/data"],
     "type" : "URLConnector",
    }
```

```
{
    "id" : "Twitter asungomezperez",
    "type" : "JsonDatasource",
    "refresh" : "300000",
    "arguments" : ["$.tweets.[*]"],
    “connector”  : {
     “arguments” : [“65Us”,”uHUQXP”,” 0970880-Qcvt”,” y1Ij8P7ldJh”,”asungomezperez”,”100”],
     “type” : “TwitterConnector”,
    }
```

Helio Translation Rules Specification

- Translation rules template

```
{
    “id” : “…”,
    “datasource_ids : [“…”, “…”, …]
    “subject” : “…”,
    “properties” : [
        {
            “predicate” : “…”
            “object” : “…”,
            “is_literal” : ”True/False”,
             “datatype” : “…”,
             “lang” : “…”
        }
      ]
}
```

Helio Translation Rules Specification

```
{
    "id" : "STARS4ALL Photometers metadata",
    "datasource_ids" : ["STARS4ALL Photometers Metadata datasource"],
    "subject" : "http://helio.linkeddata.es/stars4all/photometers/{$.name}",
    "properties"  : [
        {
          "predicate" : "http://www.w3.org/2003/01/geo/wgs84_pos#location",
          "object" : "http://helio.linkeddata.es/stars4all/photometers/{$.name}/location",
          "is_literal" : "False"
        },{
          "predicate" : "http://schema.org/location",
       "object" : "http://helio.linkeddata.es/stars4all/locations/countries/[lower(regexp_replace(escapeHtml4(stripAccents({$.country})), '\\s+',
'_'))]",
          "is_literal" : "False"
        },{
          "predicate" : "http://schema.org/location",
          "object" : "http://helio.linkeddata.es/stars4all/locations/cities/[lower(regexp_replace(escapeHtml4(stripAccents({$.city})), '\\s+', '_'))]",
          "is_literal" : "False"
        },{
          "predicate" : "http://schema.org/location",
          "object" : "http://helio.linkeddata.es/stars4all/locations/places/[lower(regexp_replace(escapeHtml4(stripAccents({$.place})), '\\s+', '_'))]",
          "is_literal" : "False"
        }
```

Helio Linking Rules Specification

- Linking Rules template(s)

```
{
   “condition” : “…”,
   “predicates” : [“…”],
  “inverse_predicates” : [“…”],
   “source_resource_rule_id” : “…”,
   “target_resource_rule_id” : “…”
  }
```

```
{
    "condition" : "cosine(stripAccents(T({$.name})),
                   stripAccents(trim(regexp_replace(replace(S({a.PostHeader}),'&nbsp;','’),'<br>.*',"))))) > 0.70",
    "predicates" : ["http://www.schema.org/tweets"],
    "inverse_predicates" : ["http://www.schema.org/writtenBy"],
    "source_resource_rule_id" : "OEG People",
    "target_resource_rule_id" : "UPM Tweets"
  }
```

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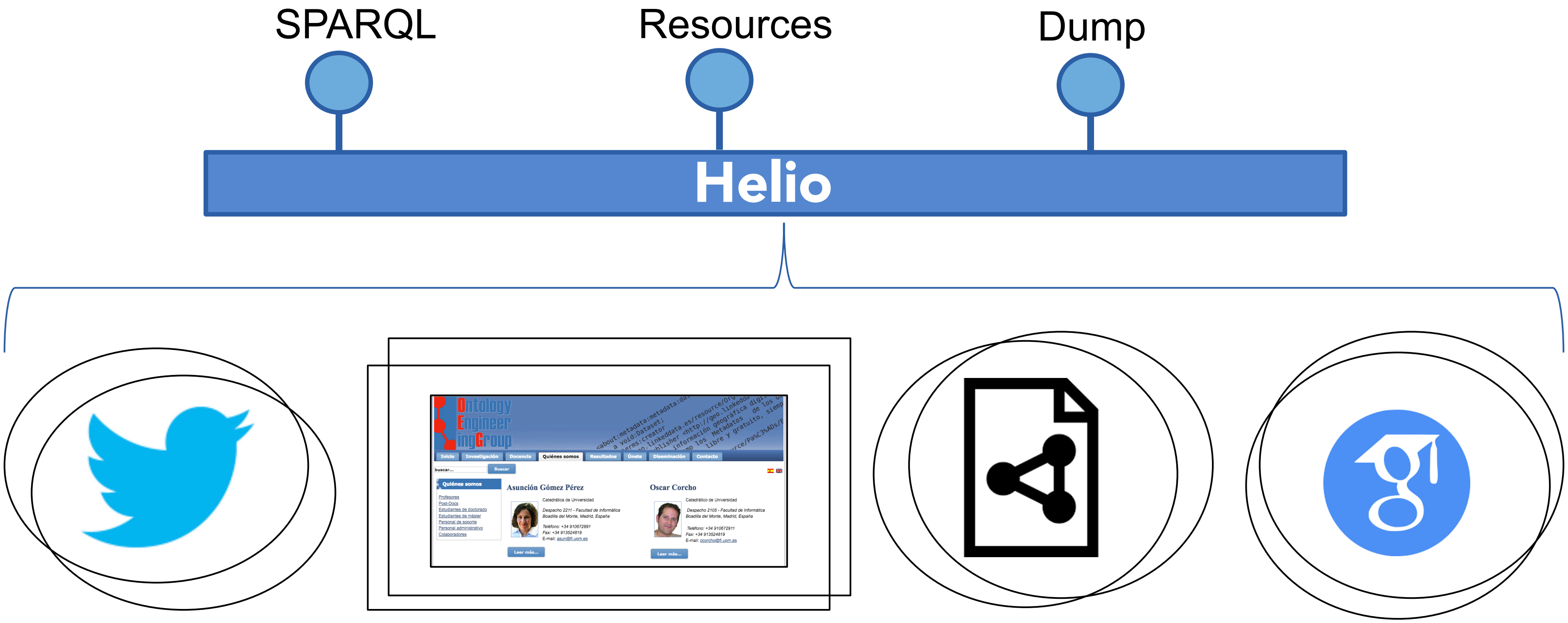
OEG People Use Case

	Connector	Datasource	Translation	Linking
Challenges	✓	✓	✓	✓



SPARQL

Resources

Dump

Helio

Tweets of OEG Members

OEG Members

Static data of OEG Group

Scholar indexes

Connector Challenge

- Twitter API requires credentials
  - Our connector passes them as argument in the specification

```
{
        "id" : "Twitter asungomezperez",
        "type" : "JsonDatasource",
        "refresh" : "300000",
        "arguments" : ["$.tweets.[*]"],
        "connector"  : {
         "arguments" :["65UsI12RvUVH”,"uHUQcp9YXP”, "100880-QcvtT3”,
                                     ”o4SZmiRfTh6","asungomezperez","100"],
         "type" : "TwitterConnector",
        }
      }
```

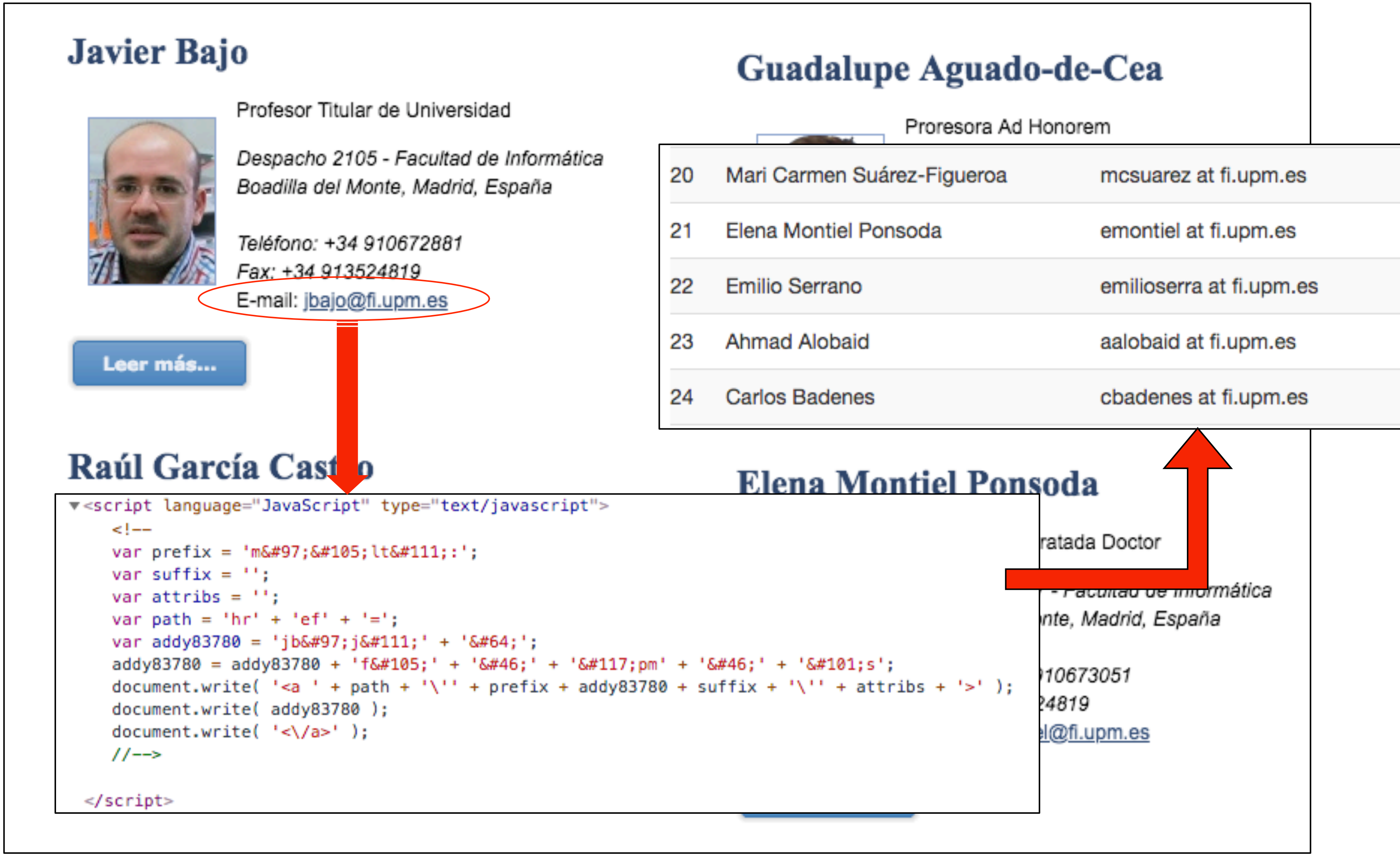
Datasource Challenge

- Twitter API has a limitation of the number of calls
  - Our specification updates the data asyncronously from user requests

```
{
       "id" : "Twitter asungomezperez",
       "type" : "JsonDatasource",
       "refresh" : "300000",
       "arguments" : ["$.tweets.[*]"],
       "connector"  : {
        "arguments" :["65UsI12RvUVH”,"uHUQcp9YXP”, "100880-QcvtT3”,
                              ”o4SZmiRfTh6","asungomezperez","100"],
        "type" : "TwitterConnector",
       }
     }
```

Translation Challenge

- Data cleaning and transformation [link]



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24819
l@fi.upm.es

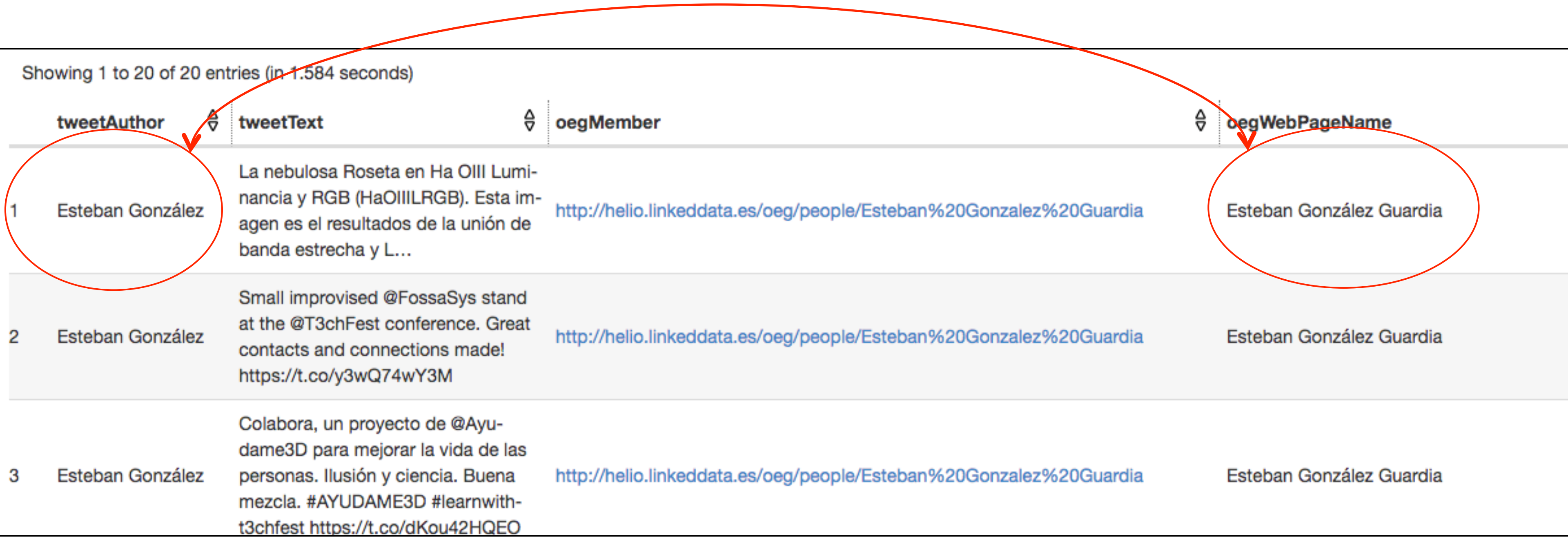
```
▼<script language="JavaScript" type="text/javascript">
    <!--
    var prefix = 'm&#97;&#105;lt&#111;:';
    var suffix = '';
    var attribs = '';
    var path = 'hr' + 'ef' + '=';
    var addy83780 = 'jb&#97;j&#111;' + '&#64;';
    addy83780 = addy83780 + 'f&#105;' + '&#46;' + '&#117;pm' + '&#46;' + '&#101;s';
    document.write( '<a ' + path + '\'' + prefix + addy83780 + suffix + '\'' + attribs + '>' );
    document.write( addy83780 );
    document.write( '<\/a>' );
    //-->

  </script>
```

Linking Challenge

- Relate the author name in a tweet with his/her name in the OEG web [link]
- **In addition we had to cope with Twitter API request limitations**

Equality of names does not solve this problem, Fuzzy rules required

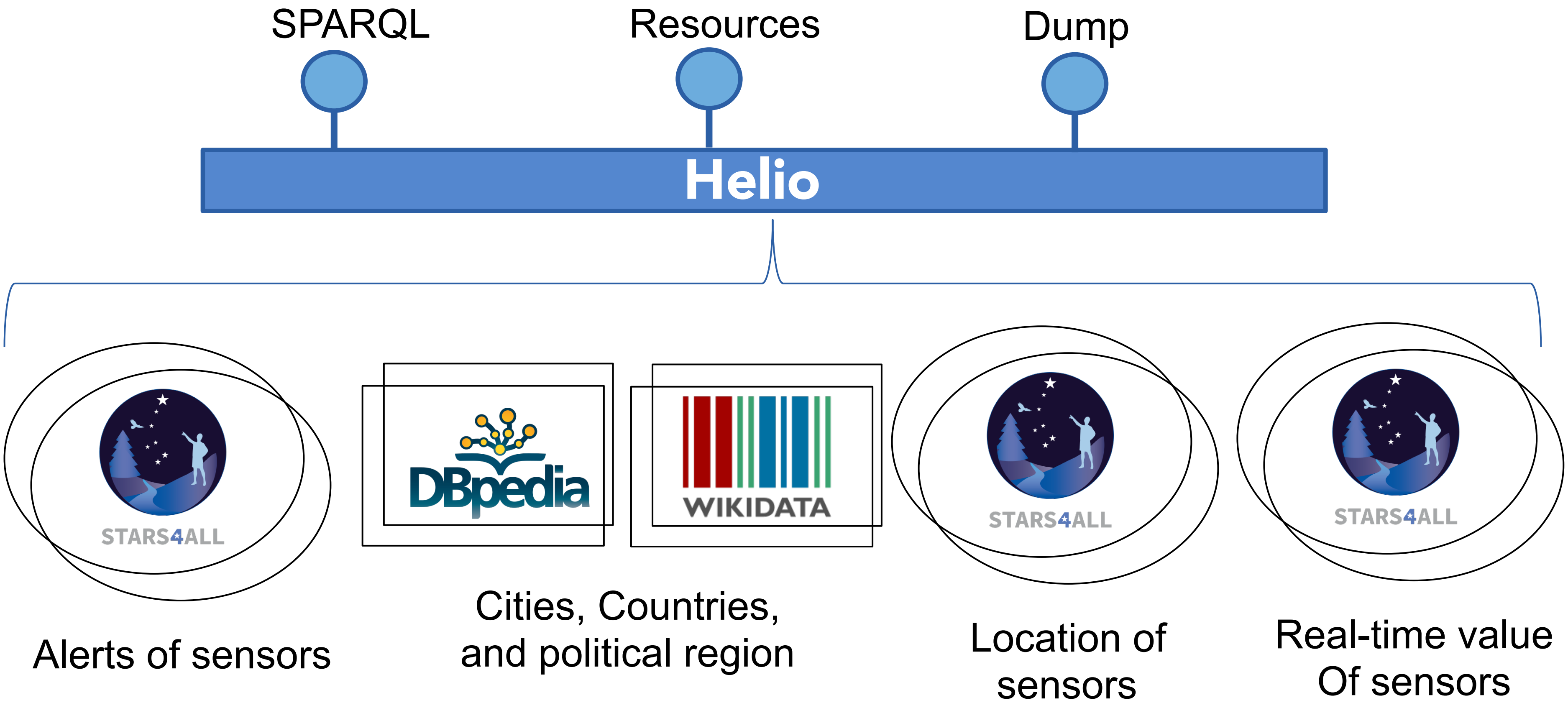


Showing 1 to 20 of 20 entries (in 1.584 seconds)

	tweetAuthor	tweetText	oegMember	oegWebPageName
1	Esteban González	La nebulosa Roseta en Ha OIII Luminancia y RGB (HaOIIILRGB). Esta imagen es el resultados de la unión de banda estrecha y L...	http://helio.linkeddata.es/oeg/people/Esteban%20Gonzalez%20Guardia	Esteban González Guardia
2	Esteban González	Small improvised @FossaSys stand at the @T3chFest conference. Great contacts and connections made! https://t.co/y3wQ74wY3M	http://helio.linkeddata.es/oeg/people/Esteban%20Gonzalez%20Guardia	Esteban González Guardia
3	Esteban González	Colabora, un proyecto de @Ayudame3D para mejorar la vida de las personas. Ilusión y ciencia. Buena mezcla. #AYUDAME3D #learnwitht3chfest https://t.co/dKou42HQEO	http://helio.linkeddata.es/oeg/people/Esteban%20Gonzalez%20Guardia	Esteban González Guardia

Stars4ALL Use Case

	Connector	Datasource	Translation	Linking
Challenges	✗	✗	✓	✓



Alerts of sensors

Cities, Countries, and political region

Location of sensors

Real-time value Of sensors

Translation challenge

- One field in JSON contained more than one RDF property

```
"name” : "stars001 - Coslada, Spain”
```

```
{
        "predicate" : "http://stars4all.es/ontology#referTo",
         "object" : "http://helio.linkeddata.es/stars4all/photometers/[trim(regexp_replace({$.name}, '-.*', "))]",
         "is_literal" : "False"
       }
```

```
{
        "predicate" : "http://schema.org/name",
        "object" : "[trim(regexp_replace(regexp_replace({$.name}, '.*\\s+-', "), '.*,', "))]",
        "is_literal" : "True"
       }
```

```
{
        "predicate" : "http://schema.org/name",
        "object" : "[trim(regexp_replace(regexp_replace({$.name}, '.*\\s+-', "), ',.*', "))]",
        "is_literal" : "True"
       }
```

Linking Challengee

- Cities & Countries were tricky to [link]

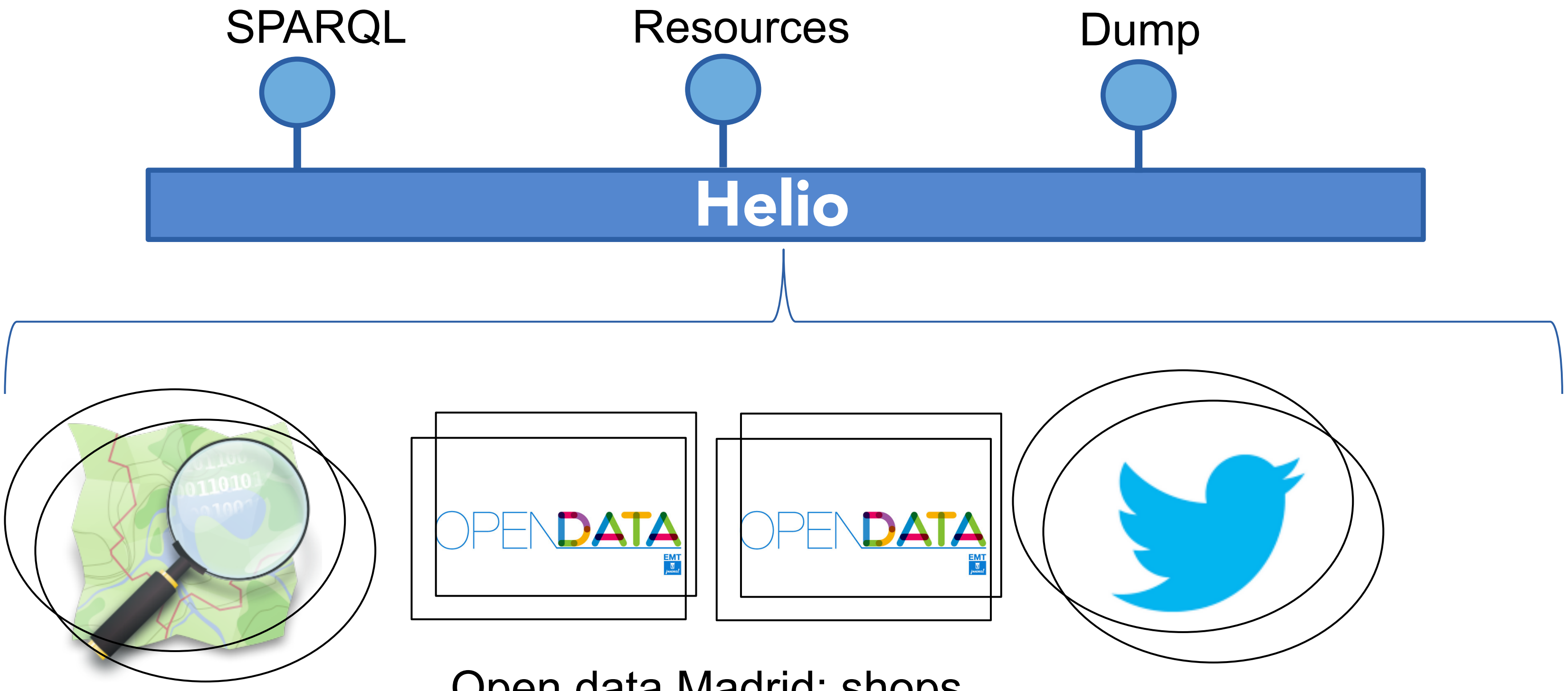
```
"name" : "stars001 - Coslada, España"
```

```
"country":"España","city":"Coslada","place":"Coslada",
```

```
"relationships": [
   {
    "condition" : "levenshtein(lower(regexp_replace(trim(escapeHtml4(stripAccents(regexp_replace(
                  regexp_replace(S({$.name}), '.*\\s+-', "), ',.*', ")))), '\\s+', '_')),
                                  lower(regexp_replace(escapeHtml4(stripAccents(T({$.city}))), '\\s+', '_'))) < 3",
    "predicates" : ["http://www.w3.org/2002/07/owl#sameAs"],
    "inverse_predicates" : ["http://www.w3.org/2002/07/owl#sameAs"],
    "source_resource_rule_id" : "STARS4ALL Alerts Cities metadata",
    "target_resource_rule_id" : "STARS4ALL Cities metadata"
   }
 ]
```

Climathron Use Case

	Connector	Datasource	Translation	Linking
Challenges	✓	✓	✗	✓



SPARQL

Resources

Dump

Helio

Street Lamps

Open data Madrid: shops, bus stops (without downloading)

Twitter

Connector Challenge

- Twitter API required credentials
  - Our connector passes them as argument in the specification

```
{
      "id" : "Twitter climapatron",
      "type" : "JsonDatasource",
      "arguments" : ["$.tweets.[*]"],
      "connector"  : {
       "arguments" :
["65UsIe34FvDoT","uHmwcp9YXP","100434VjLypDt",”oZmiRfTh6","climapatron","
100"],
       "type" : "TwitterConnector",
      }
    }
```

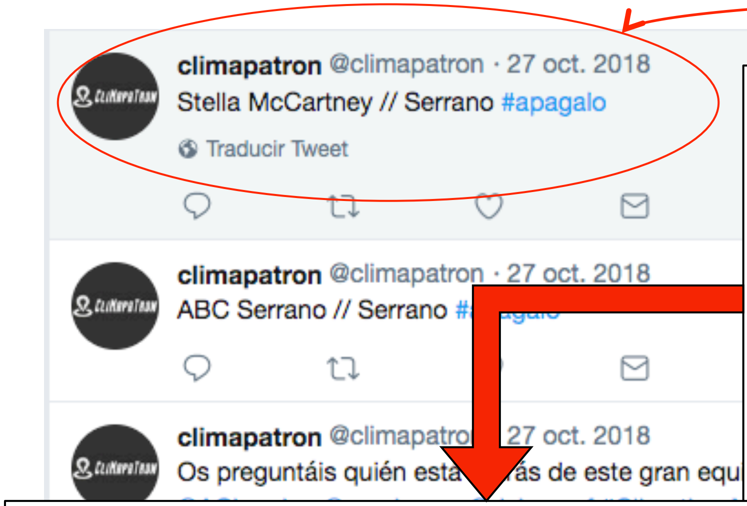
Datasource Challenge

- OpenStreet Map have a limitation for the number of calls
  - Our specification updates the data asyncronously from user requests

```
{
        "id" : "OpenStreetMaps Lamps Datasource",
        "type" : "XmlDatasource",
        "refresh" : "36000000",
        "arguments" : ["//node"],
        "connector"  : {
         "arguments" : ["https://www.overpass-api.de/api/interpreter?
data=[out:xml];node[highway=street_lamp]
(40.1497785,-4.1736937,40.6159541,-3.2877552);out%20meta;"],
         "type" : "GetConnector",
        }
      }
```

Linking Challengee

- Some Tweets create relationships in the dataset



climapatron @climapatron · 27 oct. 2018
Stella McCartney // Serrano #apagalo
Traducir Tweet

climapatron @climapatron · 27 oct. 2018
ABC Serrano // Serrano #apagalo

climapatron @climapatron · 27 oct. 2018
Os preguntáis quién esta ás de este gran equ

```
{
    "condition" :
"(levenshtein(trim(regexp_replace(regexp_replace(S({$.text}),'^[^#]
+',''),'[^/]+[/]+','')), '#apagalo') < 1) AND
(cosine(regexp_replace(regexp_replace(regexp_replace(S({$.text}),'
@[^\\s]+\\s+',''),'#.+',''),'[/]+.+',''), T({//basicData//name})) > 0.4)
AND
(cosine(regexp_replace(regexp_replace(regexp_replace(S({$.text}),'
@[^\\s]+\\s+',''),'#.+',''),'[^/]+[/]+',''),T({//geoData//address})) > 0.4)",
redicates" : ["http://www.schema.org/light-overkill", "http://
schema.org/isrelatedto"],
ource_resource_rule_id" : "Climapathron Tweets",
rget_resource_rule_id" : "Tiendas madrid"
```

```
SELECT DISTINCT ?text ?shopName ?address {

 ?tweet sch:light-overkill ?shop .
 ?tweet sch:text ?text .
 ?shop sch:legalName ?shopName .
 ?shop sch:address ?address .
}
```

```
  "text": { "type": "literal" , "value": "Stella McCartney // Serrano #apagalo" } ,
  "shopName": { "type": "literal" , "value": "Stella McCartney" } ,
  "address": { "type": "literal" , "value": "Serrano, 62" }
 } ,
```

Other Use Cases

- Taxons:
  - Sources: Wikidata, custom csv, patheria csv
  - Challenges: Linking
- VICINITY:
  - Sources: Google weather, RDF files about sensors, Helio Stars4all
  - Challenges: translation and linking

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Helio current status

Specification	Elements	Implemented
Helio Specification	Connector	FederatedSparqlConnector, GetConnector, LocalFileConnector, TwitterConnector, URLConnector
	Datasource	CsvDatasource, HtmlDatasource, JsonDatasource, RDFDatasource, TextDatasource, XmlDatasource
	Translator	Helio Virtualizer
	Linking	Helio Linker
RML* (proof of concept)	Connector	LocalFileConnector
	Datasource	JsonDatasource
	Translator	Helio Virtualizer
	Linking	Helio Linker

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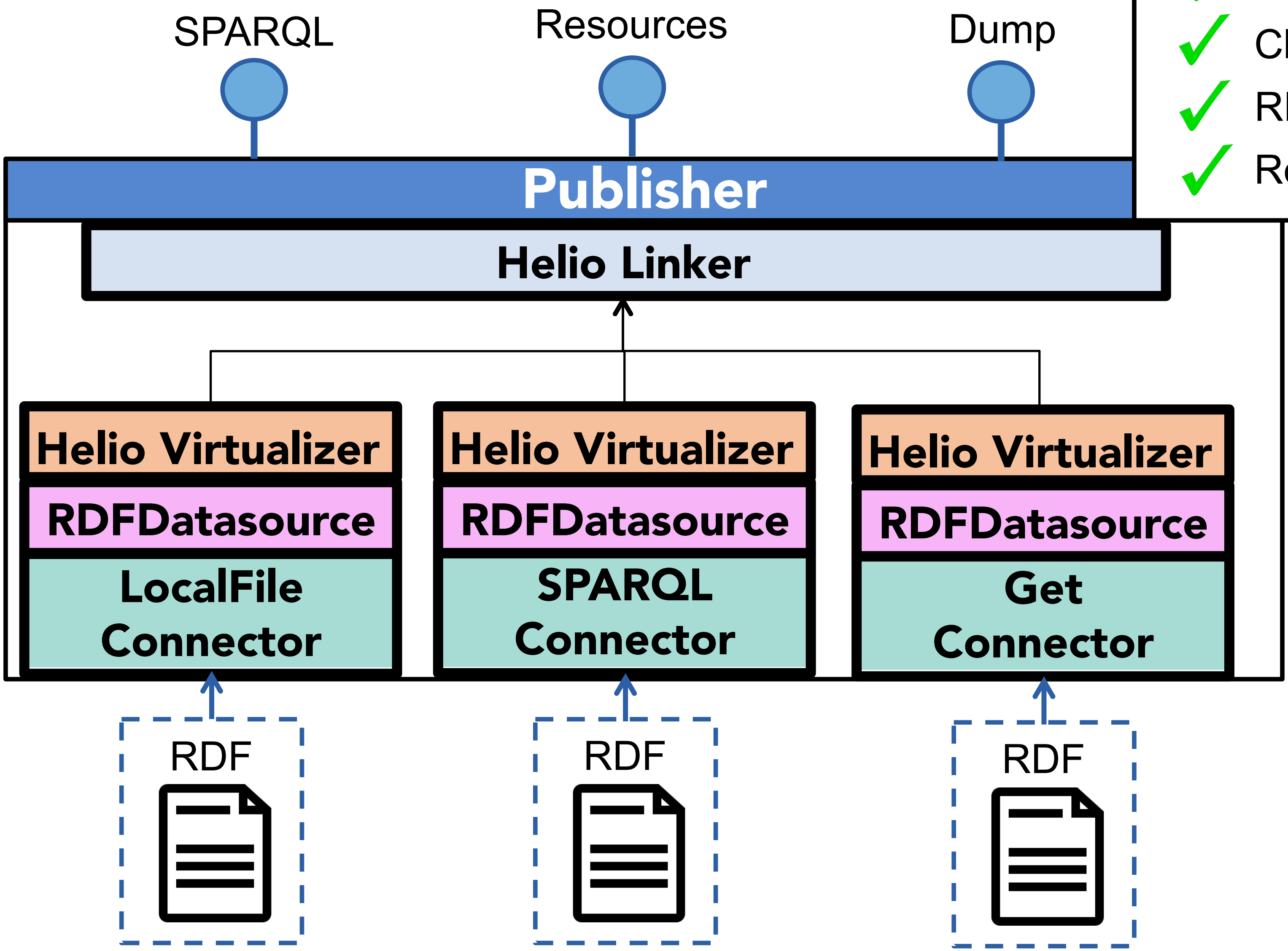
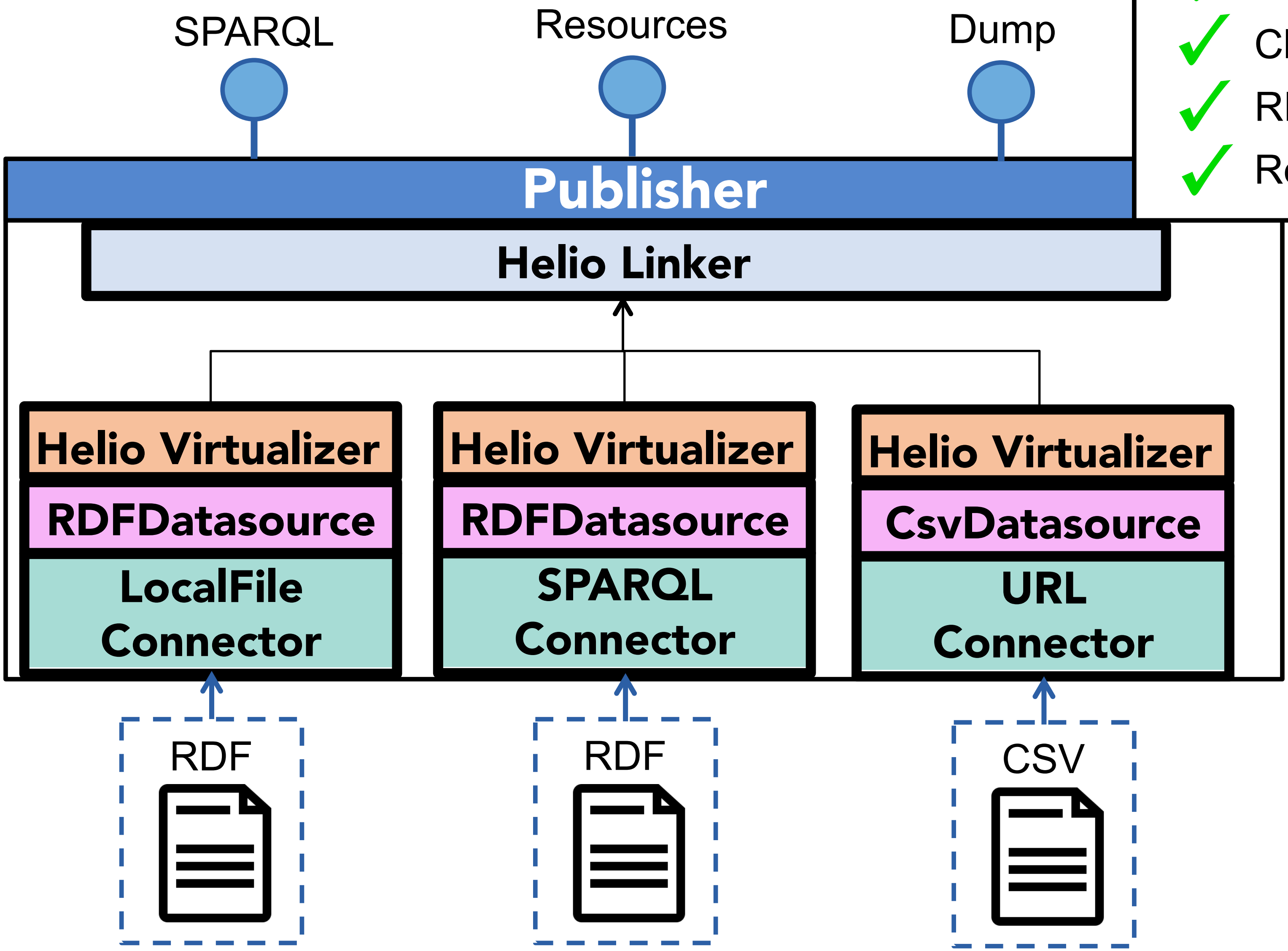
Helio Scenario 1: Refining RDF



- ✓ Linking
- ✓ Cleaning
- ✓ RDF generation
- ✓ Real Time data

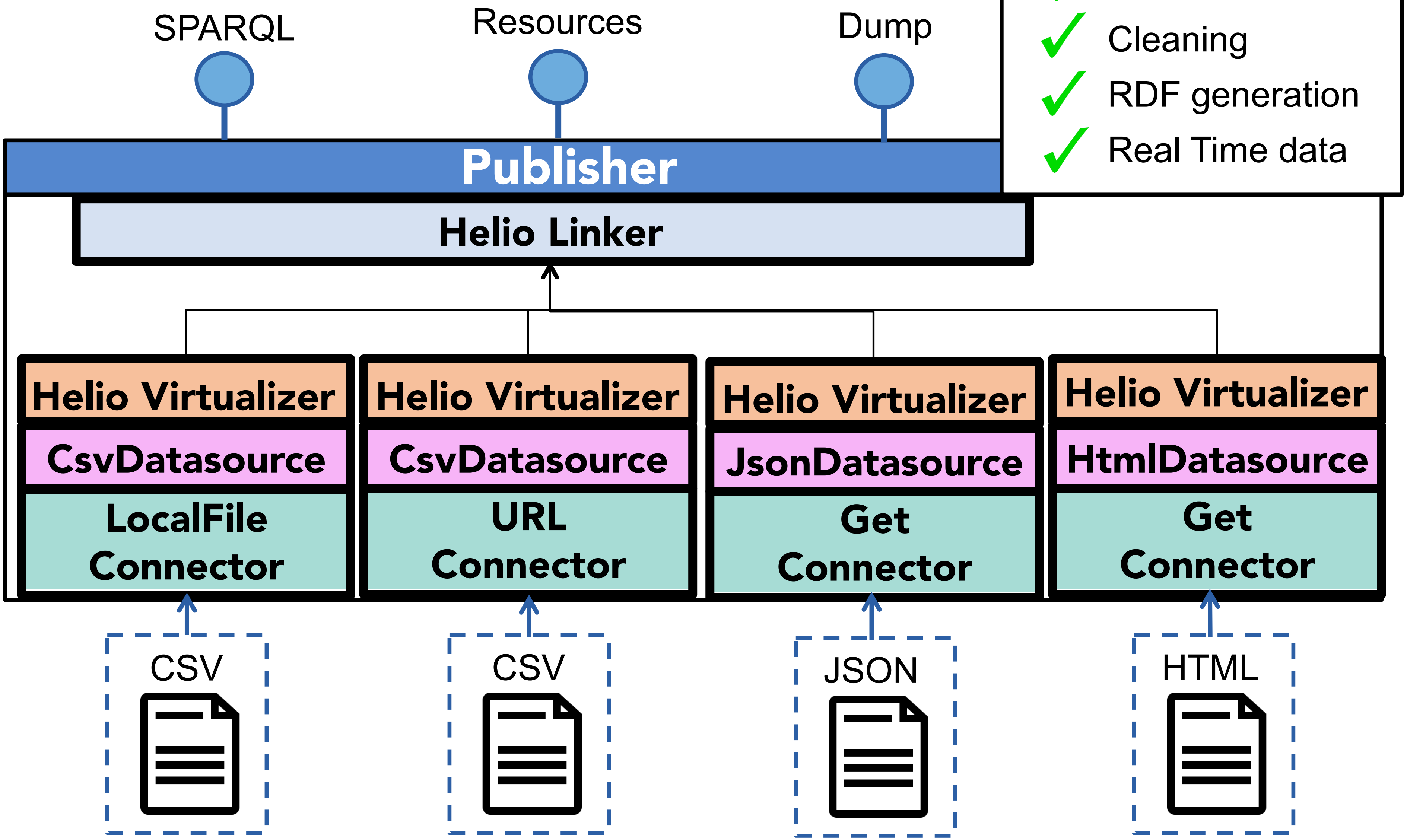
Helio Scenario 2: Enhancing RDF



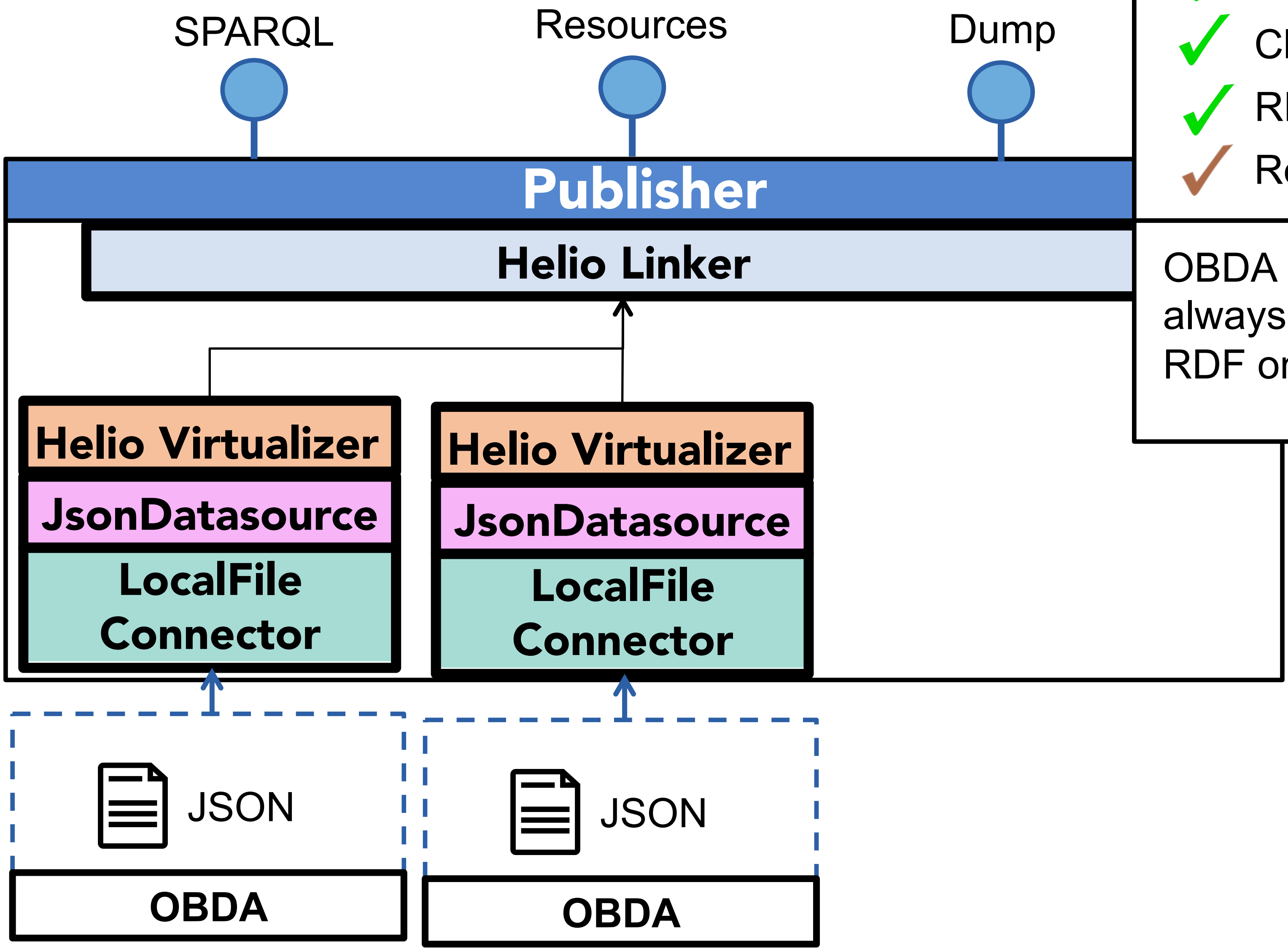
- ✓ Linking
- ✓ Cleaning
- ✓ RDF generation
- ✓ Real Time data

Helio Scenario 3: Data Integration

- ✓ Linking
- ✓ Cleaning
- ✓ RDF generation
- ✓ Real Time data



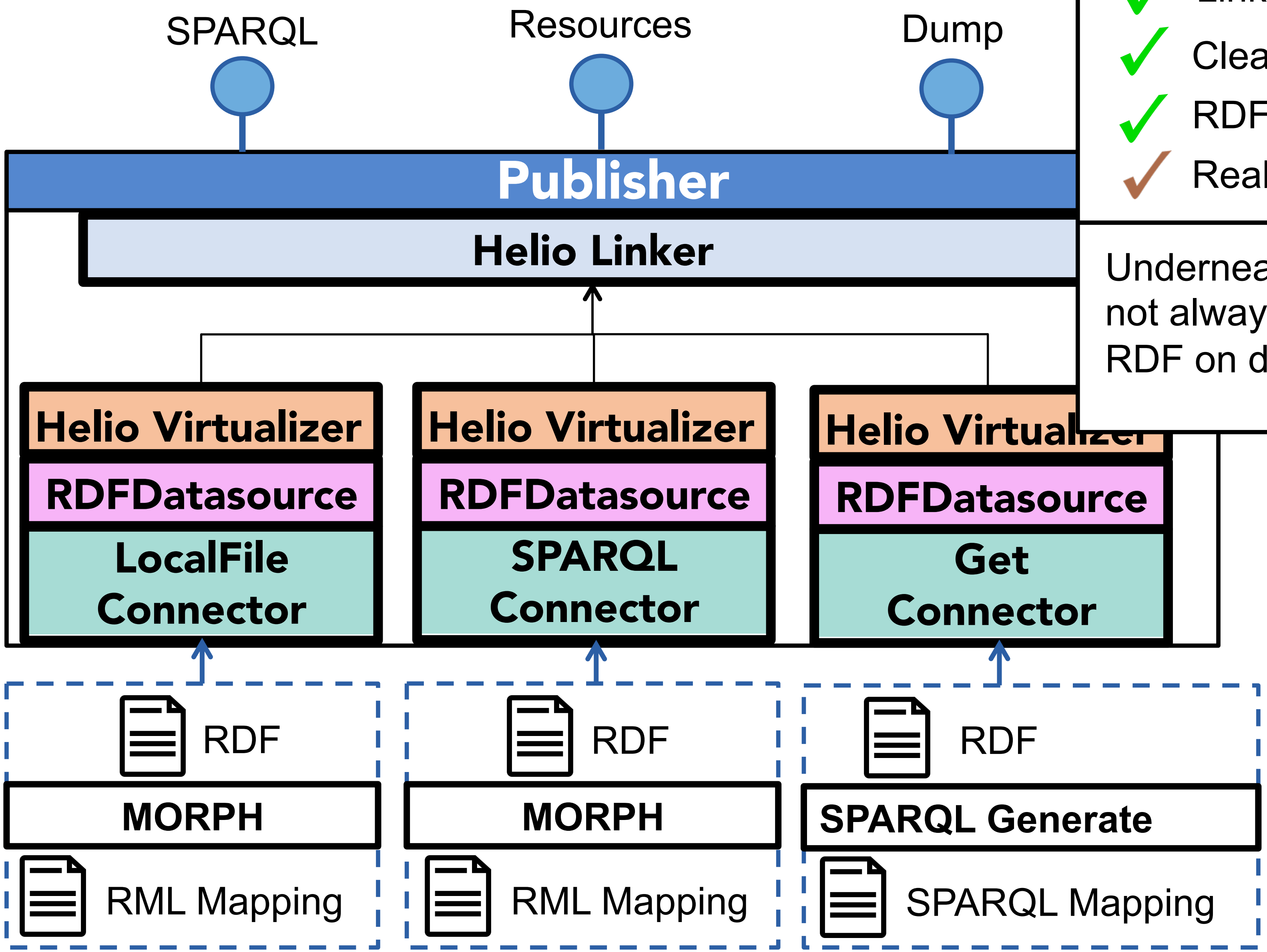
Helio Scenario 4: OBDA



- ✓ Linking
- ✓ Cleaning
- ✓ RDF generation
- ✓ Real Time data

OBDA software not always generates RDF on demand

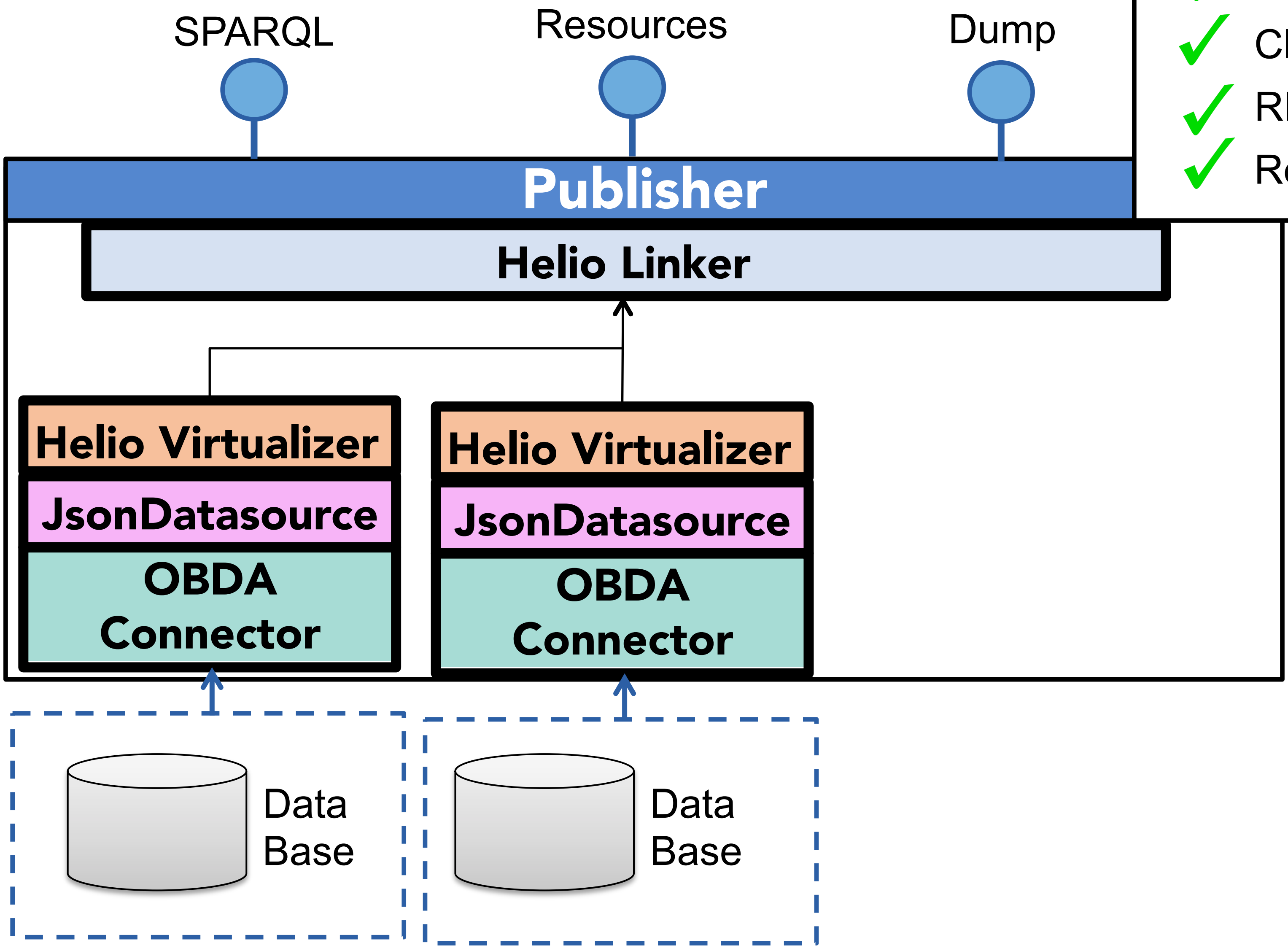
Helio scenario 5: Using third-part RDF generators



- ✓ Linking
- ✓ Cleaning
- ✓ RDF generation
- ✓ Real Time data

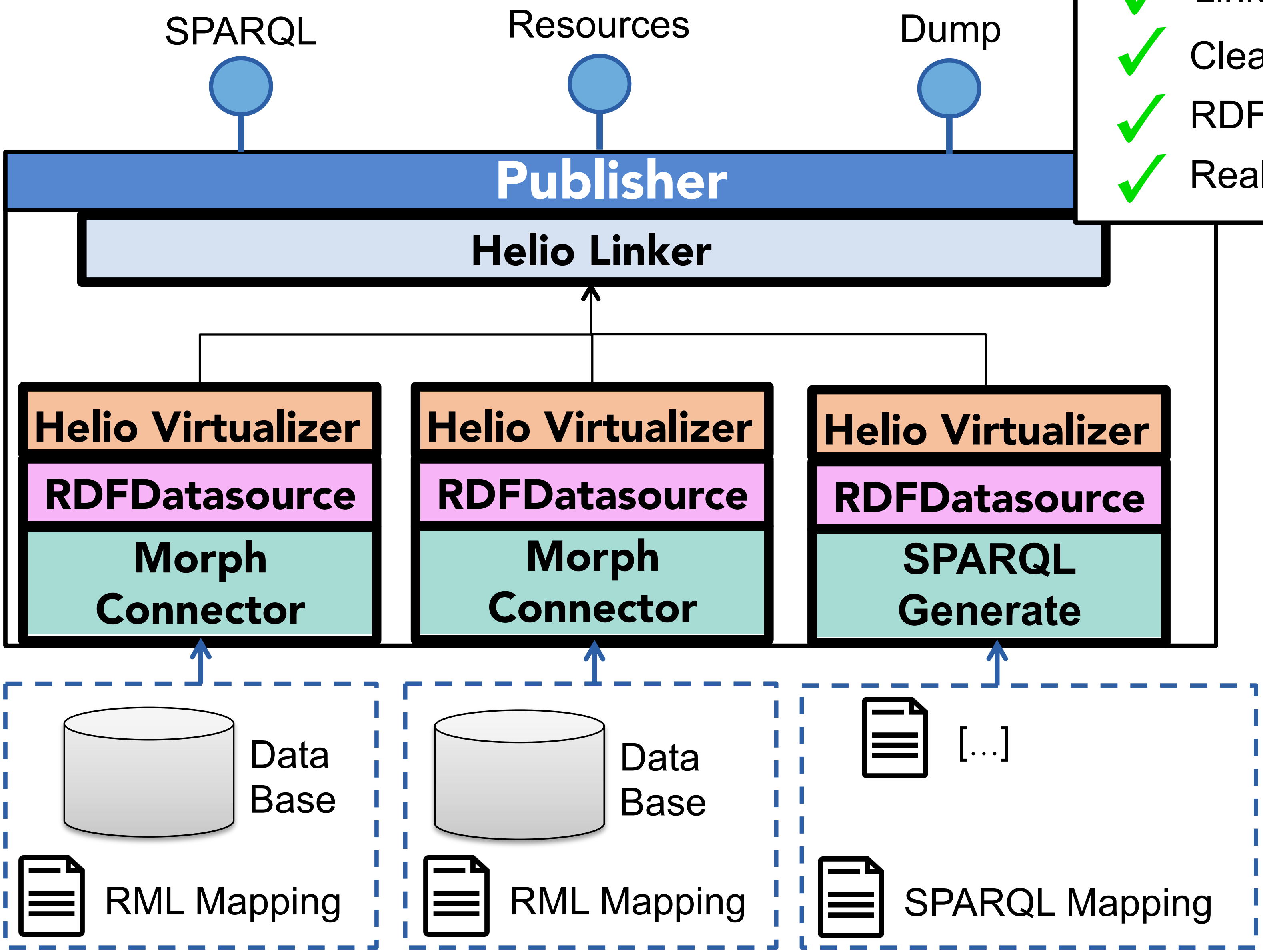
Underneath software not always generates RDF on demand

Helio Scenario 6: Integrating OBDA



- ✓ Linking
- ✓ Cleaning
- ✓ RDF generation
- ✓ Real Time data

Helio scenario 7: Integrating third-part RDF generators



- ✓ Linking
- ✓ Cleaning
- ✓ RDF generation
- ✓ Real Time data

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Conclusions

- Publish data from heterogeneus datasources
  - Clean & transform
  - Data interlinking
- Integrate existing technoligies to generate RDF
- Helio is meant to be pluggable
- Specifications for the pipeline with:
  - RML
  - SPARQL-Generate
  - ….

- Helio can validate published data with Shapes in different levels of pipleline due to its modularity
- Helio aim at integrating current technoliges

Thanks to all