



Engaging Content
Engaging People



Serving Ireland's Authoritative Geospatial Data as Linked Data

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- Context
- Requirement Analysis
- Knowledge Representation and Organization
- Linked Data Platform
- Future use of Oracle 12c
- Conclusion

- In 2014, the *Ordnance Survey Ireland* (OSi) delivered a newly developed spatial data storage model known as *Prime2*.
- With *Prime2*, OSi moved from a traditional map-centric model towards an object-oriented model from which various types of mapping and data services can be produced.
- OSi furthermore aims to adopt Linked Data to enable third parties to explore and consume some of OSi's *authoritative* datasets. *But how? Can Prime2 form the basis for that?*

Goal: To lay the foundations of a semantic architecture and Linked Data platform for the OSi taking into account best practices and guidelines in the domain of geospatial information and industry and OSi's current technology stack.

Starting from the boundaries dataset. These are open and already available on <http://data.gov.ie/>, but *not* as Linked Data.

- Requirements analysis included engagement with the *Central Statistics Office* and the *Department of Public Expenditure and Reform*.
- Formulation of two use case scenarios from which requirements were distilled:
 1. Accessing the **same features with different geometric representations**, i.e., different generalizations or “resolutions”.
 2. Capturing the **provenance and evolution of features and their geometric representations**. E.g., Statutory Instruments to change boundaries.

Ontologies

- Features and Geometries *based on* **GeoSPARQL**
- Provenance using Statute Instruments *based on* **PROV-O**
- Static and dynamic boundaries (and their relationships)
- Necessary ontologies developed

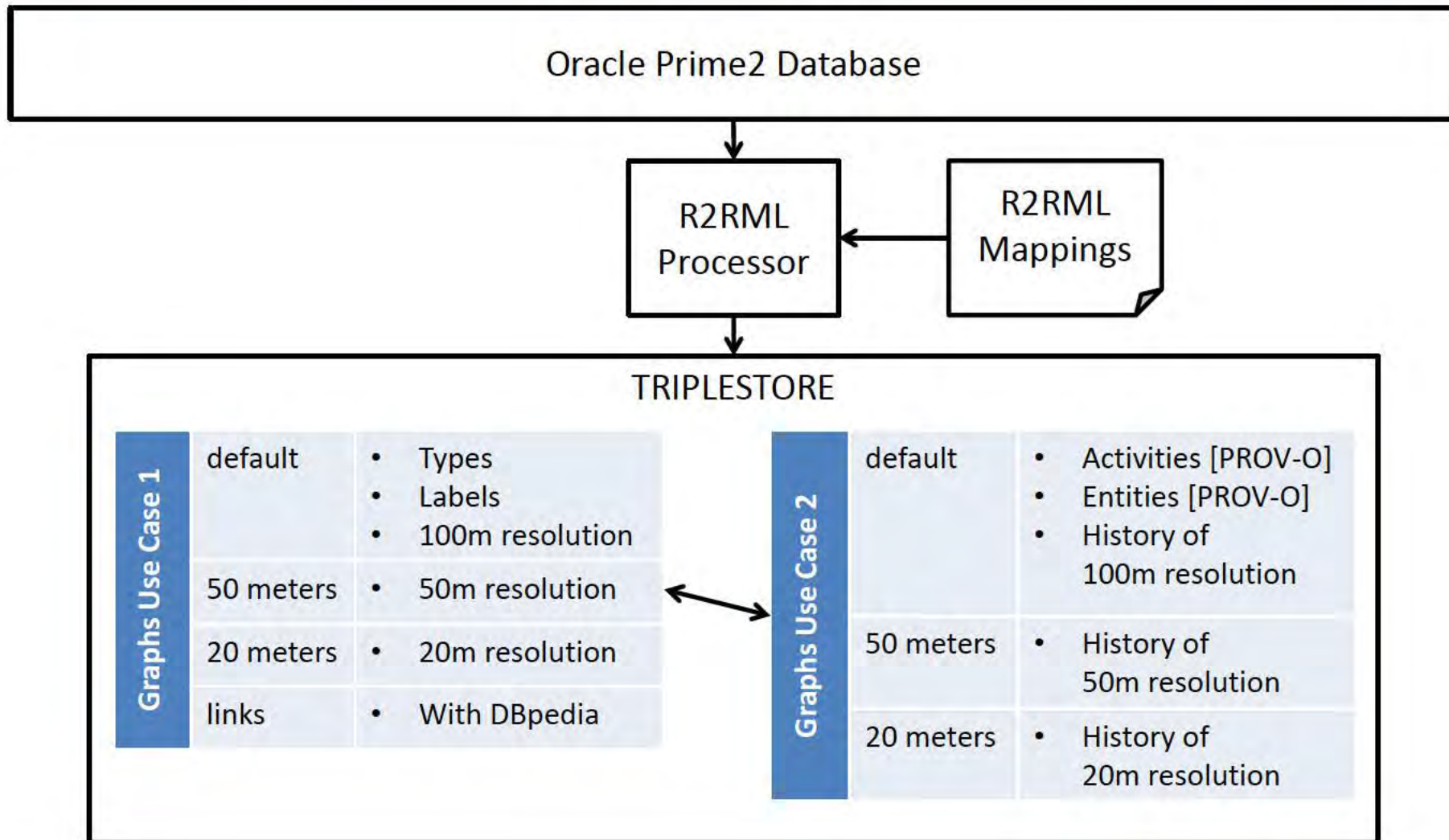
Meetings with DPER and CSO on a **URI Strategy**

- Information Resources vs. Non-Information Resources
 - Using Prime 2 GUIDs and a hint of the instance's nature
-
- <http://data.geohive.ie/resource/county/2AE19629144F13A3E055000000000001>
 - <http://data.geohive.ie/page/county/2AE19629144F13A3E055000000000001>
 - <http://data.geohive.ie/data/county/2AE19629144F13A3E055000000000001>

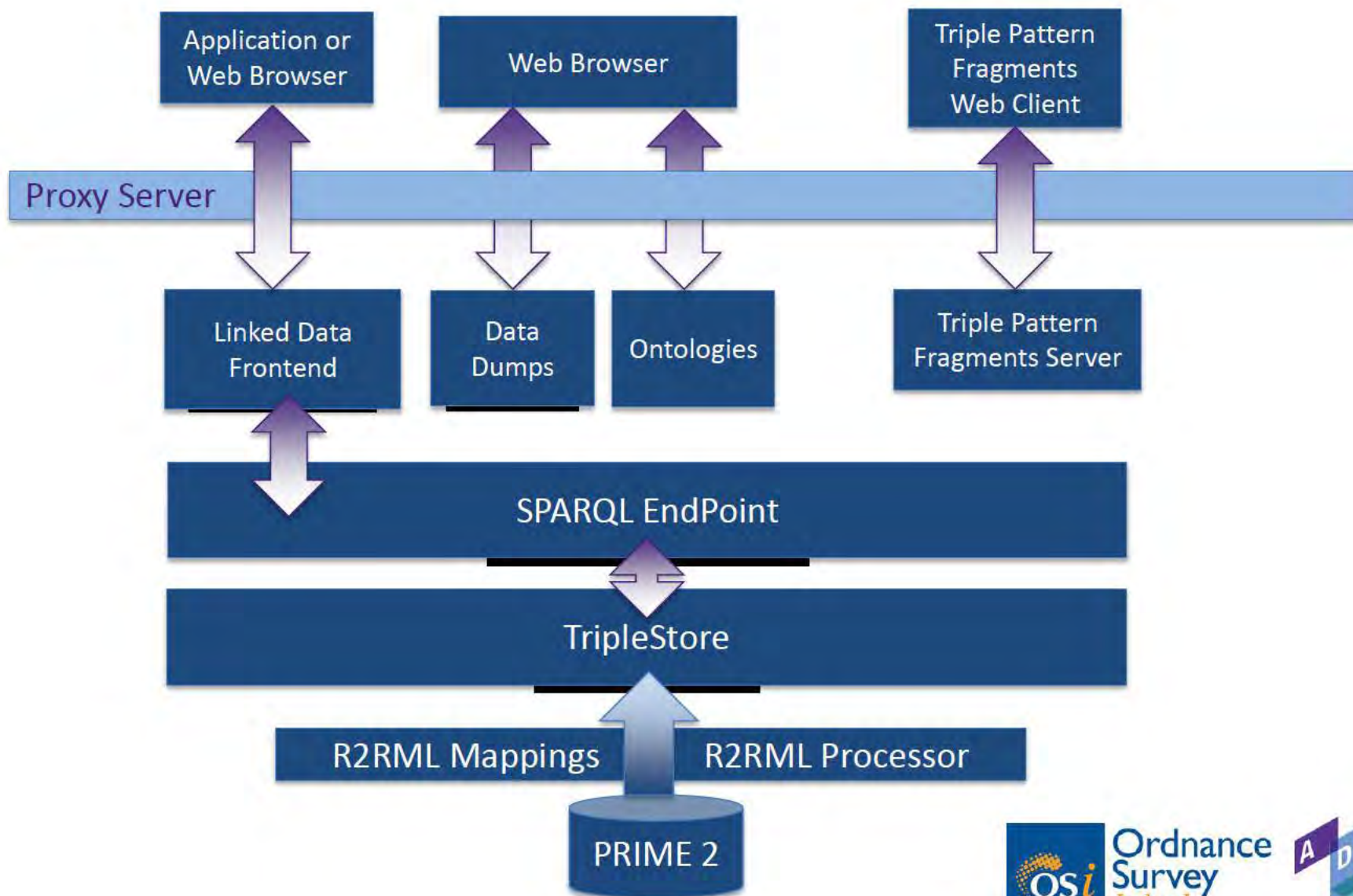
Mapping the Oracle Prime2 database to RDF with R2RML

Use of (named) graphs to support both use cases

```
<#TM50>
  rr:logicalTable [
    rr:sqlQuery "SELECT GUID, GEOM FROM COUNTY_50M" ;
  ] ;
  rr:subjectMap [
    rr:class geo:Geometry ;
    rr:graph <http://data.geohive.ie/graph/50m> ;
    rr:termType rr:BlankNode ;
    rr:column "GUID" ;
  ] ;
  rr:predicateObjectMap [
    rr:predicate geo:asWKT ;
    rr:graph <http://data.geohive.ie/graph/50m> ;
    rr:objectMap [
      rr:column "GEOM" ;
      rr:datatype geo:wktLiteral ;
    ] ;
  ] ;
.
```



Conceptual Architecture of the LD Platform





data.geohive.ie

Serving Ireland's geospatial information as Linked Data.

About the Initiative

The goal of [Ordnance Survey Ireland's](#) (OSi) initiative with [ADAPT](#) is to develop a platform to publish OSi's geospatial data as Linked Data on the Web whilst adhering to best practices in the domain of geospatial information. The publication of Linked Data enables third parties to explore and consume rich data in a meaningful manner via a combination of simple, standardized technologies (e.g., RDF and URI) that operate over the Web's existing HTTP infrastructure.

[View details »](#)

Download and Query

Ordnance Survey Ireland's geospatial data is available both via Triple Pattern Fragments [Server](#) and [web client](#), a Linked Data frontend (e.g., by following the HTTP URI of [County Dublin](#)) and as downloadable datasets for local use.

[View details »](#)

Contact and Legal

Contact us:

- [Corporate](#)
- [GeoHive](#)

Or send us an email via geohive@osi.ie.

Legal:

- [Corporate](#)
- [Privacy](#)
- The data served by the OSi via the Linked Data frontend, query endpoints and files is licensed under [CC BY 4.0](#).



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The screenshot shows a web browser window with the URL `client.geohive.ie/#datasources=http%3A%2F%2Fvma01.adaptcentre.ie%2Fboundaries-default;http%3A%2F%2Fvma01.adaptcentre.ie%2Fboundaries-50;ht...`. The page title is "Linked Data Fragments client" and it features the "#LD Linked Data Fragments" logo. The main content area includes a "Choose datasources:" section with a list of selected sources: "Boundaries -- metadata and 100m generalizations", "Boundaries -- 50m generalizations", "Boundaries -- 20m generalizations", and "Boundaries -- links with the LOD cloud". Below this is a "Type a SPARQL query:" section with the query:

```
SELECT DISTINCT ?subject ?label WHERE { ?subject dc:title ?label } UNION { ?subject rdfs:label ?label } LIMIT 100
```

. An "Execute query" button is present. The "Query results:" section displays five rows of results, each with a subject URI and a label. A red box on the left points to the query with the text "Query to list 'things' and their labels". A red box on the right points to the results with the text "Result of query".

Linked Data Fragments client **#LD**
Linked Data Fragments

Enter or choose a SPARQL query below and see then how your browser solves it using only *triple pattern fragments*.

Choose datasources:

- Boundaries -- metadata and 100m generalizations
- Boundaries -- 50m generalizations
- Boundaries -- 20m generalizations
- Boundaries -- links with the LOD cloud

Type a SPARQL query:

```
SELECT DISTINCT ?subject ?label WHERE { ?subject dc:title ?label } UNION { ?subject rdfs:label ?label } LIMIT 100
```

...or pick an example query: List things and their labels

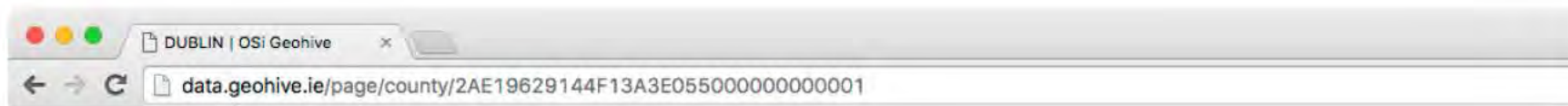
Execute query

Query results:

```
?subject: http://data.geohive.ie/resource/census2011-electoral-divisions/3576C5999005415  
?label: "Williamstown"  
  
?subject: http://data.geohive.ie/resource/census2011-electoral-divisions/3576C5999005415  
?label: "Williamstown"@en  
  
?subject: http://data.geohive.ie/resource/census2011-electoral-divisions/3576C5999006415  
?label: "Agha"  
  
?subject: http://data.geohive.ie/resource/census2011-electoral-divisions/3576C5999006415  
?label: "Agha"@en  
  
?subject: http://data.geohive.ie/resource/census2011-electoral-divisions/3576C5999007415  
?label: "Ballinacarrig"  
  
?subject: http://data.geohive.ie/resource/census2011-electoral-divisions/3576C5999007415  
?label: "Ballinacarrig"@en
```

Query to list "things" and their labels

Result of query



DUBLIN at OSi Geohive

<http://data.geohive.ie/resource/county/2AE19629144F13A3E055000000000001>

Property	Value
geo:defaultGeometry	<ul style="list-style-type: none">[1 geometrical representation]
geo:hasGeometry	<ul style="list-style-type: none">[3 geometrical representations]
rdfs:label	<ul style="list-style-type: none">Baile Átha Cliath (ga)DUBLIN (en)DUBLIN
ov:similarTo	<ul style="list-style-type: none"><http://dbpedia.org/resource/County_Dublin>
rdf:type	<ul style="list-style-type: none"><http://ontologies.geohive.ie/osi#County>geo:Feature

[As Turtle](#) | [As RDF/XML](#)



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Description of County Dublin linking to its three representations



DUBLIN >>> geo:hasGeometry at OSi Geohive

Default generalization with OSi's base map.

Back to DUBLIN

Geometrical Representation #50m

Property	Value
geo:asWKT	MULTIPOLYGON (((-6.17322835071853 53.4550587605824, -6.17324345299026 53.4550707210097, -6.17324216254192 53.4550537767041, -6.17322835071853 53.4550587605824)), ...more> (geo:wktLiteral)
is:geo:hasGeometry of	<http://data.geohive.ie/resource/county/2AE19629144F13A3E055000000000001>
rd:type	geo:Geometry

Geometrical Representation #100m

Property	Value
geo:asWKT	MULTIPOLYGON (((-6.17322835071853 53.4550587605824, -6.17324345299026 53.4550707210097, -6.17324216254192 53.4550537767041, -6.17322835071853 53.4550587605824)), ...more> (geo:wktLiteral)
is:geo:hasGeometry of	<http://data.geohive.ie/resource/county/2AE19629144F13A3E055000000000001>
rd:type	geo:Geometry

Geometrical Representation #20m

Property	Value
geo:asWKT	MULTIPOLYGON (((-6.17322835071853 53.4550587605824, -6.17324345299026 53.4550707210097, -6.17324216254192 53.4550537767041, -6.17322835071853 53.4550587605824)), ...more> (geo:wktLiteral)

Different representations

Download the Data

OSi "boundary" database contains geometrical representations of the boundaries of the administrative units (e.g., county, city, and rural area) of the Republic of Ireland. These are generalized up to 20, 50 and 100 meters. The following table allows boundary data to be downloaded in the [RDF Turtle format](#).

Administrative Unit	Boundary Generalisation (in meters)		
	20	50	100 (default)
Barony	Barony 20m	Barony 50m	Barony 100m
Census 2011 Cities and Legal Towns	Cen 11 Cities and Legal Towns 20m	Not available	Cen 11 Cities and Legal Towns 100m
Census 2011 Electoral Divisions	Cen 11 Electoral Divisions 20m	Not available	Cen 11 Electoral Divisions 100m
Census 2011 Electoral Divisions Links	Cen 11 Electoral Divisions Links		
Census 2011 Settlements	Cen 11 Settlements 20m	Not available	Cen 11 Settlements 100m
Census 2011 Small Areas General	Cen 11 Small Areas General 20m	Not available	Cen 11 Small Areas General 100m
City and County Council	City and County Council 20m	City and County Council 50m	City and County Council 100m
City Council	City Council 20m	City Council 50m	City Council 100m
County	County 20m	County 50m	County 100m
County Council	County Council 20m	County Council 50m	County Council 100m
Electoral Division	Electoral Divisions 20m	Electoral Divisions 50m	Electoral Divisions 100m
Local Electoral Area	Local Elec Area 20m	Local Elec Area 50m	Local Elec Area 100m
Municipal Districts	Municipal Districts 20m	Municipal Districts 50m	Municipal Districts 100m
Parish	Parish 20m	Parish 50m	Parish 100m
Rural Area	Rural Area 20m	Rural Area 50m	Rural Area 100m
Townland	Townland 20m	Townland 50m	Townland 100m
Totals	Totals 20m	Totals 50m	Totals 100m
Links to DBpedia	Links to DBpedia		
Full Dump	Full Dataset (large file)		

Datahub: <https://datahub.io/dataset/geohive>

- **Use native features of Oracle 12c:**

The Oracle logo, consisting of the word "ORACLE" in a bold, red, sans-serif font with a registered trademark symbol.The text "ORACLE 12C" in a bold, black, sans-serif font, positioned below a horizontal line.

- R2RML feature
- Triple store and (Geo) SPARQL processor
- SPARQL endpoint instead of TPF
- Access control for closed data

We have used OSi's Prime2 dataset to publish their authoritative geospatial data as Linked Data on the Web by creating R2RML mappings using ontologies that extend GeoSPARQL, and PROV-O.

Future Work:

- Publish authoritative URIs for every geospatial feature in the country (~55 million distinct features – how many triples for each feature?)

Questions?

Contact Email: alan.meehan@adaptcentre.ie