Best Practices for Multilingual Linked Open Data

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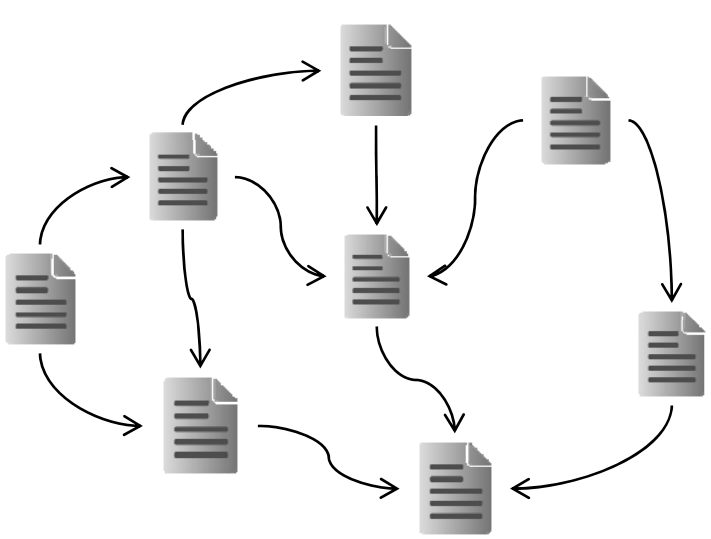
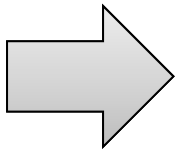
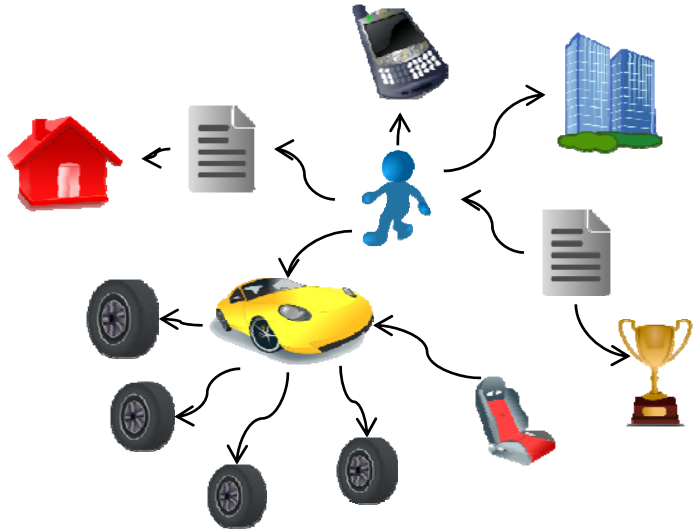
Towards the web of data







Web of documents

Unit of information: Web page (HTML)
Human readable
Challenge: Multilingual pages

Web of Data

Unit of information: data (RDF)
Machine readable
Intrinsically Multilingual

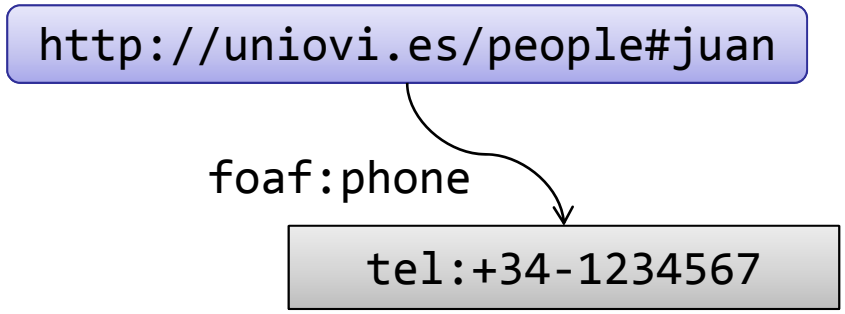
Example

English

```
<html lang="en">
<body>
<h1>Juan's Home page</h1>

<p>Juan is a Professor at the
University of Oviedo, Spain</p>

<p>Phone: +34-1234567</p>
</body>
</html>
```

Espanish

```
<html lang="es">
<body>
<h1>Página personal de Juan</h1>

<p>Juan es Catedrático en la
   Universidad de Oviedo, España</p>

<p>Tlfno: +34-1234567</p>
</body>
</html>
```



Intrinsically multilingual

Multilingual data

- Data that appears in a multilingual context
  - It contains labels/comments
  - Human-readable information
  - Using different languages/conventions

Example of Multilingual Data

English

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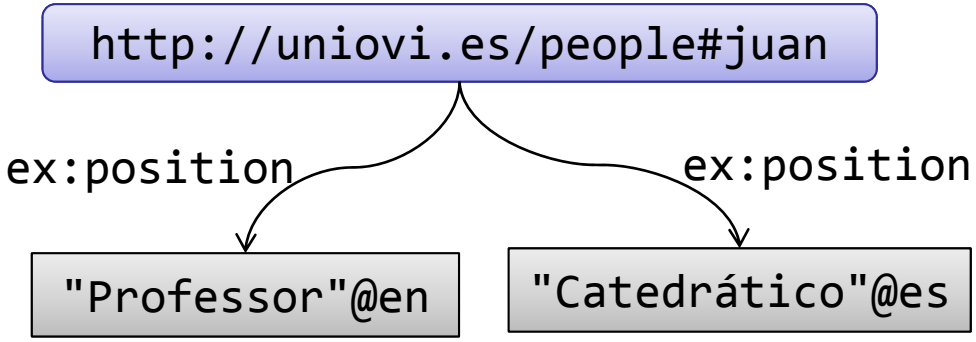
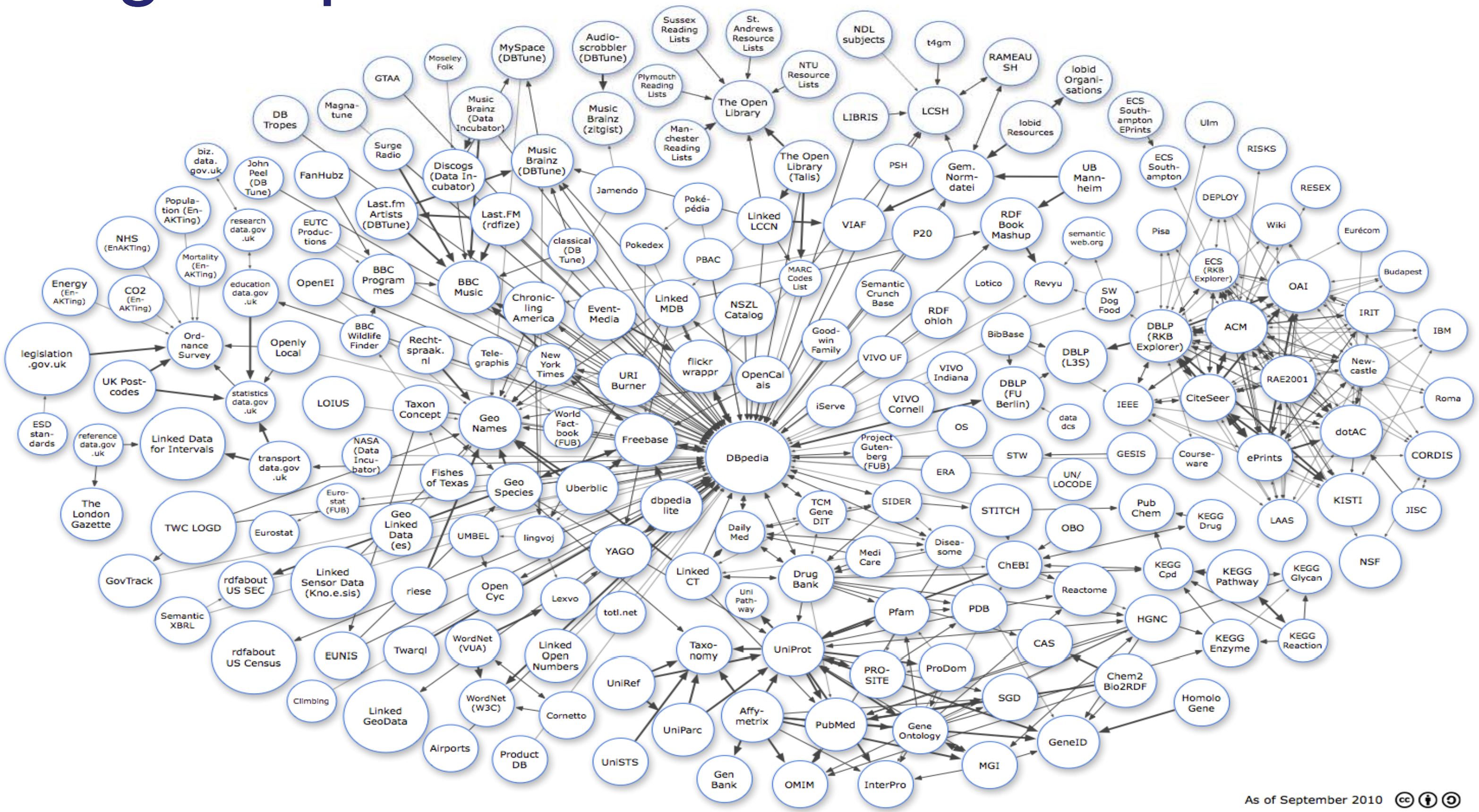


Web of Data

Unit of information: data (RDF)
Human + Machine readable
New Challenge: Multilingual

Linked Open Data

- Principles on how to publish data
- Increasing adoption



Best practices for LOD

Several proposals:

- Linked data book [Heath, Bizer, 2011]
- Linked data patterns [Dodds, Davis, 2012]
- Best Practices for Publishing Linked Data [Hyland et al]
- SemWeb Rules of thumb [R. Cyganiak]
- etc. . .

In this talk

- Best practices affected by multilinguality

Multilingual LOD patterns

1. Design a good IRI scheme
2. Separate domains by language
3. Model resources, not labels
4. Provide human-readable info
5. Labels for all
6. Use Multilingual literals
7. Language Content negotiation
8. Literals without language
9. Multilingual vocabularies
10. Interlanguage links

1. Design a good IRI scheme

Cool URIs → Cool IRIs

- Don't change
- Identify things
- If possible, use human-readable IRIs

`http://dbpedia.org/resource/Armenia`

`http://դբպեդիա.օրգ/ռեսուրսե/Հայաստան`

1. Design a good IRI scheme

- Most datasets use only URIs
- IRIs may be difficult to maintain
  - Domain names, phising, …
  - IRI support in current libraries
  - Some hybrid solutions

```
http://dbpedia.org/resource/Armenia

http://dbpedia.org/resource/Հայաստան

http://դբպեդիա.օրգ/ռեսուրսե/Հայաստան
```

2. Separate domains by language

Instead of

`http://dbpedia.org/resource/Հայաստան`

Language dependant URIs

`http://en.dbpedia.org/resource/Armenia`

`http://hy.dbpedia.org/resource/Հայաստան`

Language identifiers ≠ Country identifiers
Example: Use "hy" instead of "am"

2. Separate domains by language

Where should we put the language tag?

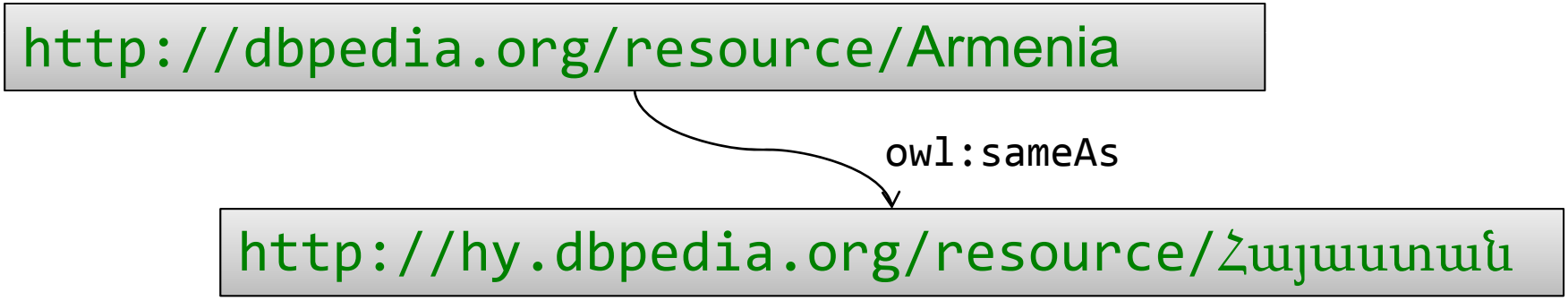
`http://hy.dbpedia.org/resource/Հայաստան`

`http://dbpedia.org/resource/hy/Հայաստան`

`http://dbpedia.org/resource/Հայաստան/hy`

3. Interlanguage links

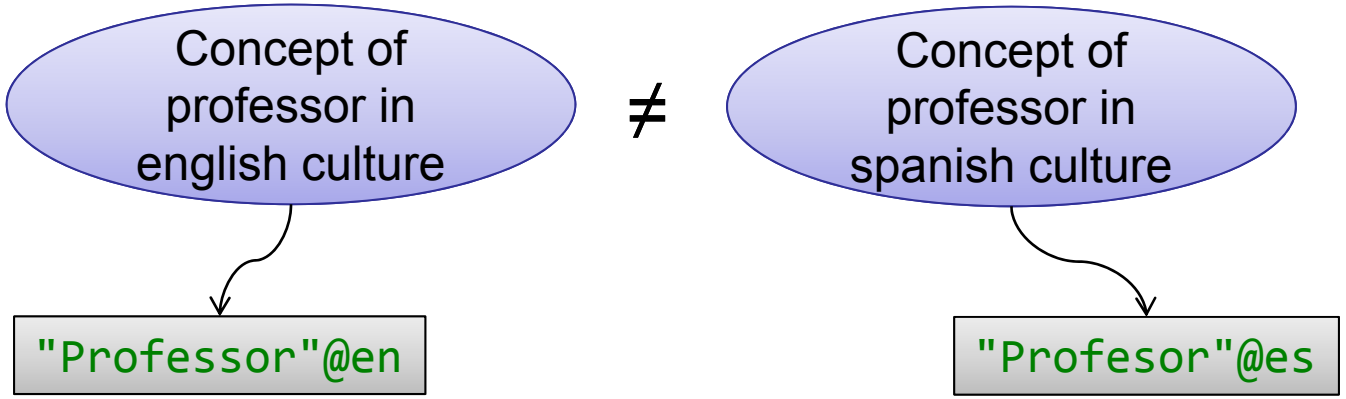
Provide links between concepts in different languages



3. Interlanguage links

Beware of cross-lingual mappings

Example:



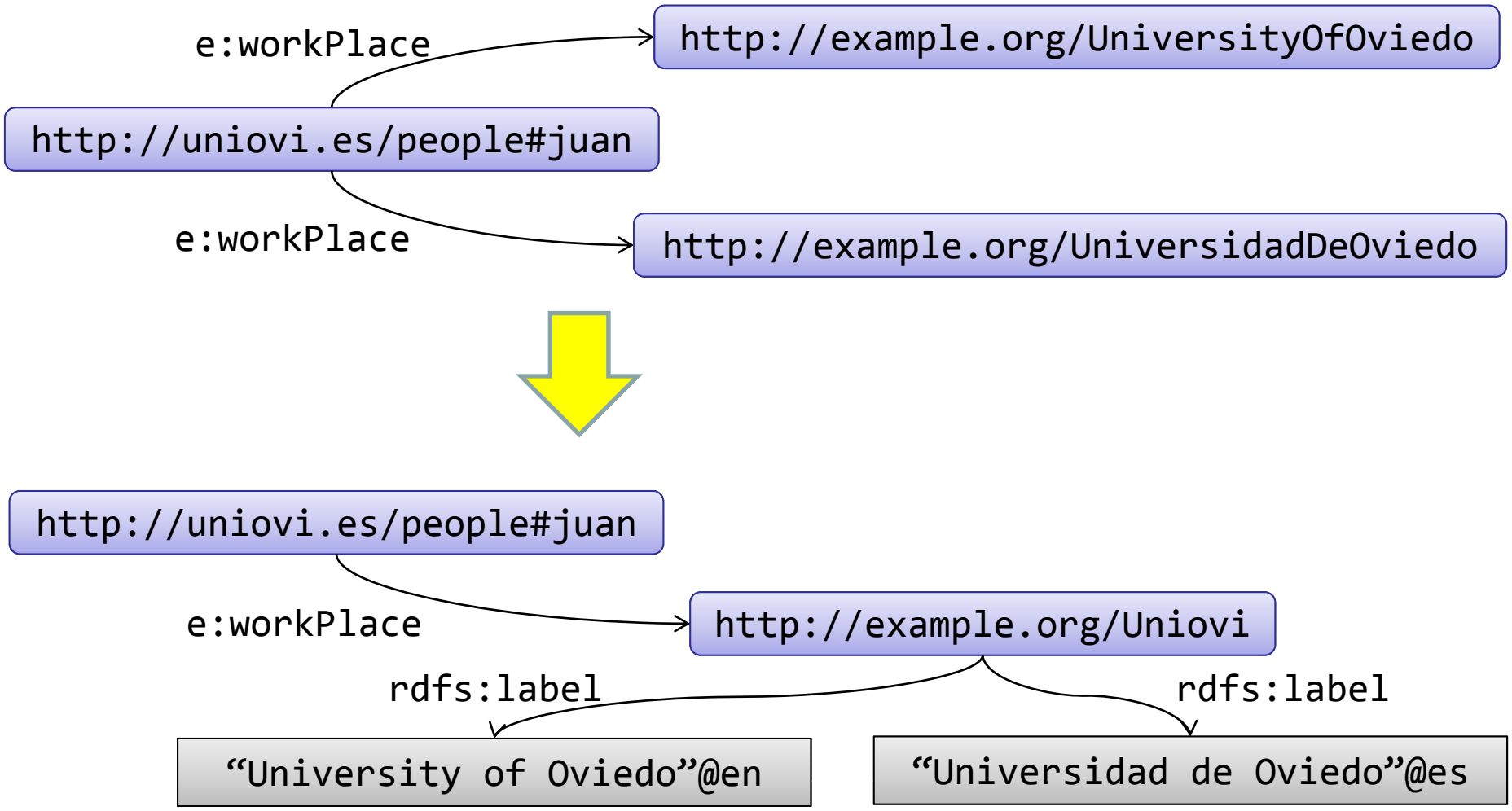
Use other properties to link:

```
dbo:interlanguageLink
rdfs:seeAlso
skos:related
...
```

4. Model resources, not labels

- Define URIs only for resources
  - Resources do not depend on a given language
  - Assign labels to those resources
- Do not mint separate URIs for labels

4. Model resources, not labels



4. Model resources, not labels

- Some domains may want to model labels
  - Linguistic resources
    - Thesaurus, corpora, etc.
    - Assertions and relations between labels
    - Examples:
      - SKOS-XL labels *
        - Resources of type sxosxl:Label
      - Strings URI-identifiable: NIF

*http://www.w3.org/TR/skos-reference/skos-xl.html

5. Provide human-readable info

Not only machine-readable information

Combine machine & human-readable info

Human-readable info must be multilingual

5. Provide human-readable info

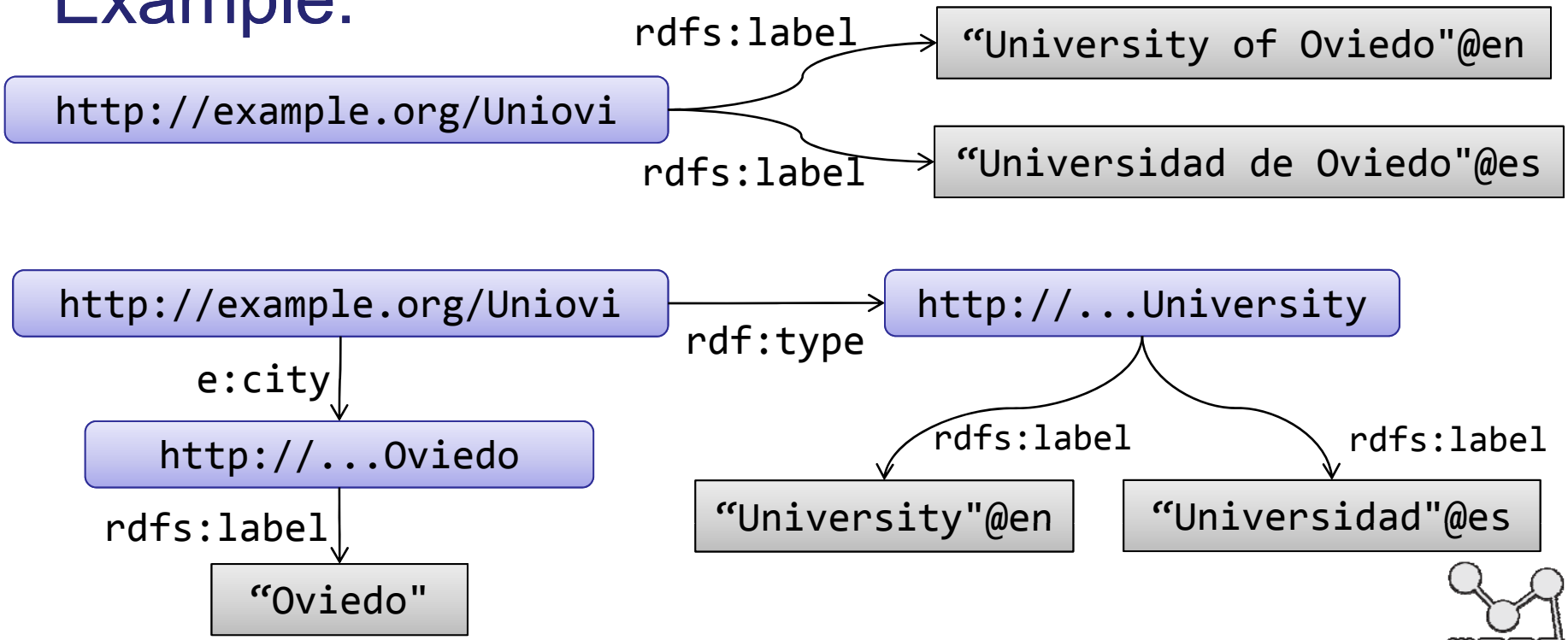
- Facilitates search over the web of data
- Linked data browsing
  - Applications can display labels instead of URIs
- Common properties:
  - `rdfs:label`
  - `skos:prefLabel`
  - `dcterms:title`
  - `dcterms:description`
  - `rdfs:comment`
  - `etc.`

5. Provide human-readable info

What is the right level of textual information?

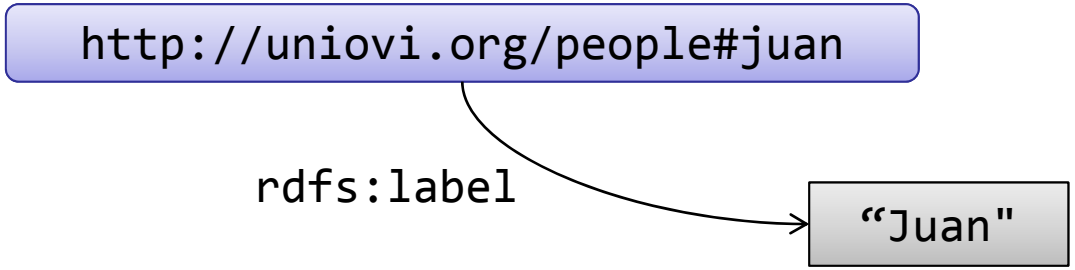
Balance between RDF/Textual world

Example:



6. Labels for all

- Provide labels for all URIs
  - Individuals / Concepts / Properties
  - Not just the main entities
- Displaying labels becomes easier and faster



6. Labels for all

- It may be difficult to select the right label
  - Don't provide more than one preferred label
  - Not feasible for some datasets
    - Only 38% non-information resources have labels

[B. Ell et al, 2011]

- Labels are for humans
  - Avoid camel case or similar notations
  - Guidelines for labelling
    - Upper case, space delimitters, etc

[Montiel et al, 2011]

7. Use Multilingual literals

Use language tags

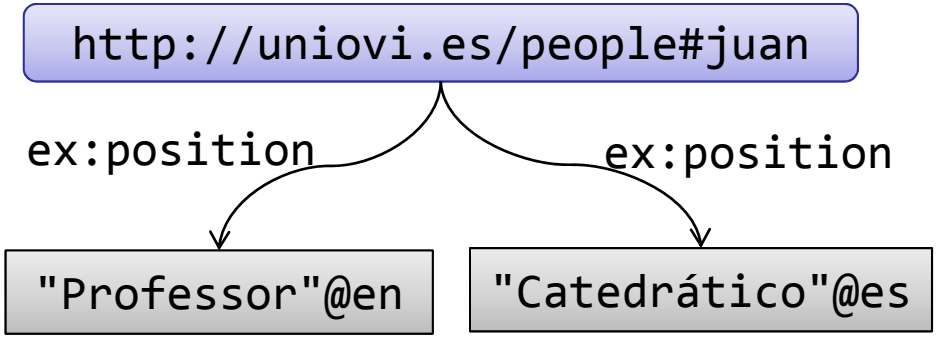
- Select the right IETF language tag (RFC 5646)

Example:

```
"University of Oviedo"@en
"Universidad de Oviedo"@es
"Universidá d'Uvieu"@ast
"Օվիեդոյի համալսարան"@hy
```

7. Use Multilingual literals

Multilingual literals & SPARQL




```
SELECT * WHERE {
  ?x ex:position "Professor" .
}
```

Returns Nothing

```
SELECT * WHERE {
  ?x ex:position "Professor"@en .
}
```

Returns <...#juan>

7. Use Multilingual literals

Underused feature

- 4.78% non info-resources have one language tag
- Only 0.7% datasets contain several language tags

Most commonly language used:

44.72% (en), 5.22% (de), 5.11% (fr), 3.96% (it),...

[B.Ell et al, 2011]

7. Use Multilingual literals

What about longer descriptions:

`dcterms:description, rdfs:comment`...

CDATA like or XML literals ?

Reuse existing practices in XML I18n

Problems:

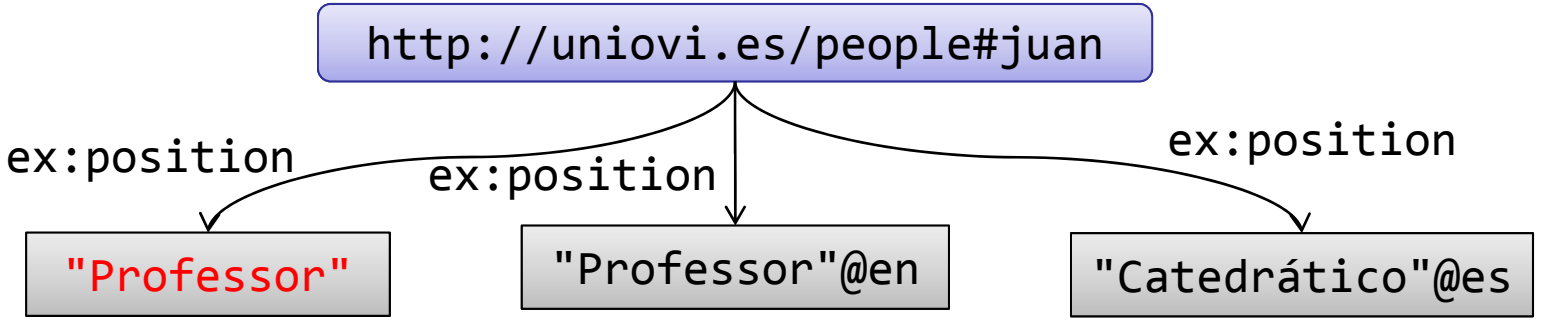
- Gap between descriptions and RDF model
- SPARQLing may be a challenge

8. Literals without language tag

Include literals without language-tag

SPARQL queries are easier

Example:




```
SELECT * WHERE {
  ?x ex:position "Professor" .
}
```

Returns <...#juan>

8. Literals without language tag

- Selecting a default language = controversial
  - Declare the primary language of a dataset
    - Some properties: `lexvo:language`
  - Consumers may not be aware of the default language

9. Language Content negotiation

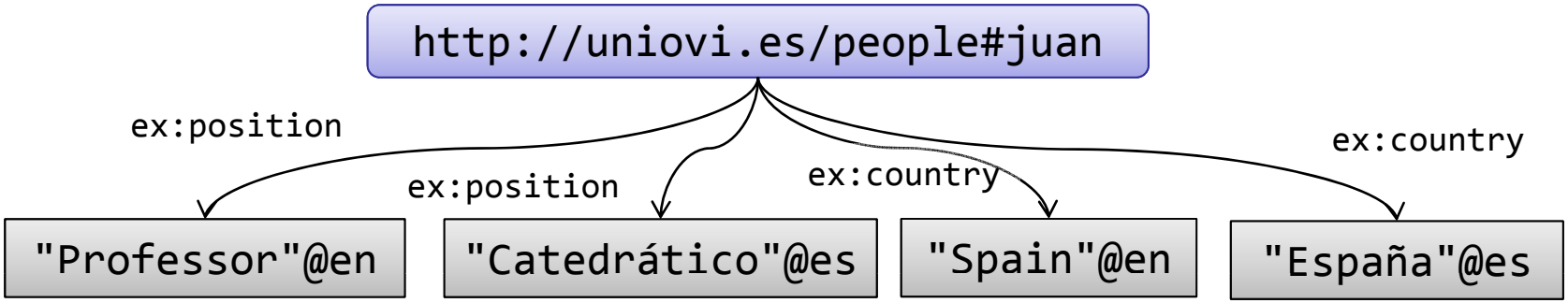
Use HTTP Accept-Language

Return different sets of labels

Reduce load in client applications

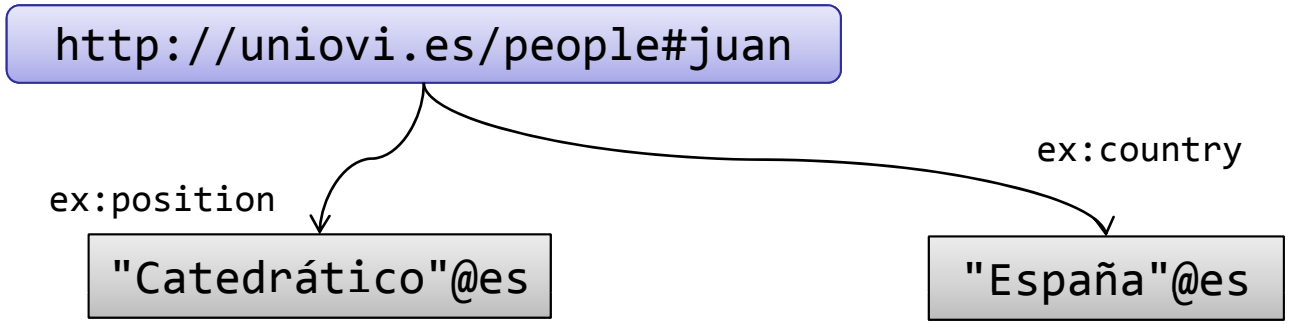
9. Language Content negotiation

No Accept-Language declaration (all)



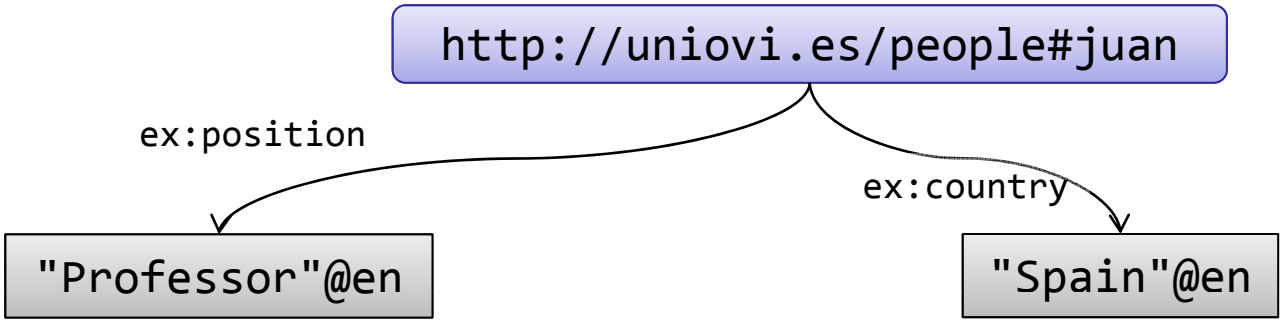
9. Language Content negotiation

```
Accept-language: es
```



9. Language Content negotiation

```
Accept-language: en
```



9. Languge Content negotiation

Not done in practice.

- Implementation issues?

Ensure equivalent representations for each language

10. Multilingual vocabularies

Link to existing vocabularies

Quality selection criteria for vocabularies

- Use vocabularies that contain descriptions in more than one language

[Hyland et al, 2012]

10. Multilingual vocabularies

Popular vocabularies are not localized

- Example: FOAF, DC, etc.

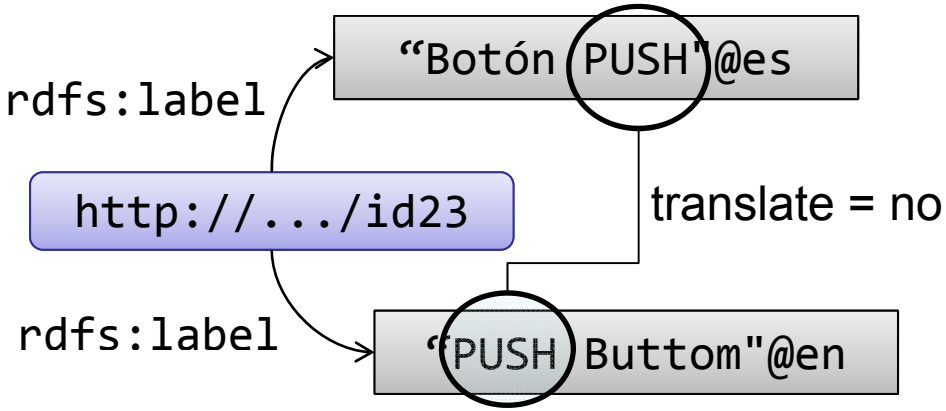
Should we extend it?

- Example:

```
dc:contributor rdfs:label "Colaborador"@es .
```

Other issues, not covered

- Unicode support in RDF
- Language declarations & Microdata
- Internationalization topics:
  - Text direction
  - Ruby annotations
  - Notes for localizers
  - Translation rules
- Linguistic topics
  - Ontology-lexicon, Lemon Model



[Gracia et al, 2011, Buitelaar et al, 2011, McCrae et al 2011]

Conclusions

Web of data is not just for machines

LOD applications will be used by humans

...and

Human users talk many different languages

Best? practices for Multilingual LOD

Acknowledgements

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End of presentation

http://purl.org/weso